Brought to you by BirfMark

TOYOTA

# 1996 Land Cruiser

## Repair Manual

- Engine
- Chassis
- Body
- Electrical

Version 1.00
-original version released 12/21/2010
Version 1.11
-released 03/16/2011
-added cover page
-added 'Starter' section

FOR USA Pub. No. RM451U

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# HOW TO USE THIS MANUAL

N00U 36

## GENERAL INFORMATION

### 1. INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired To assist you in finding your way through the manual, the section title and major heading are given at the top of every page

### 2. PRECAUTION

At the beginning of each section, a PRECAUTION is given that pertains to all repair operations contained in that section

Read these precautions before starting any repair task

### 3. TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause The fundamentals of how to proceed with troubleshooting are described on page IN–18

Be sure to read this before performing troubleshooting

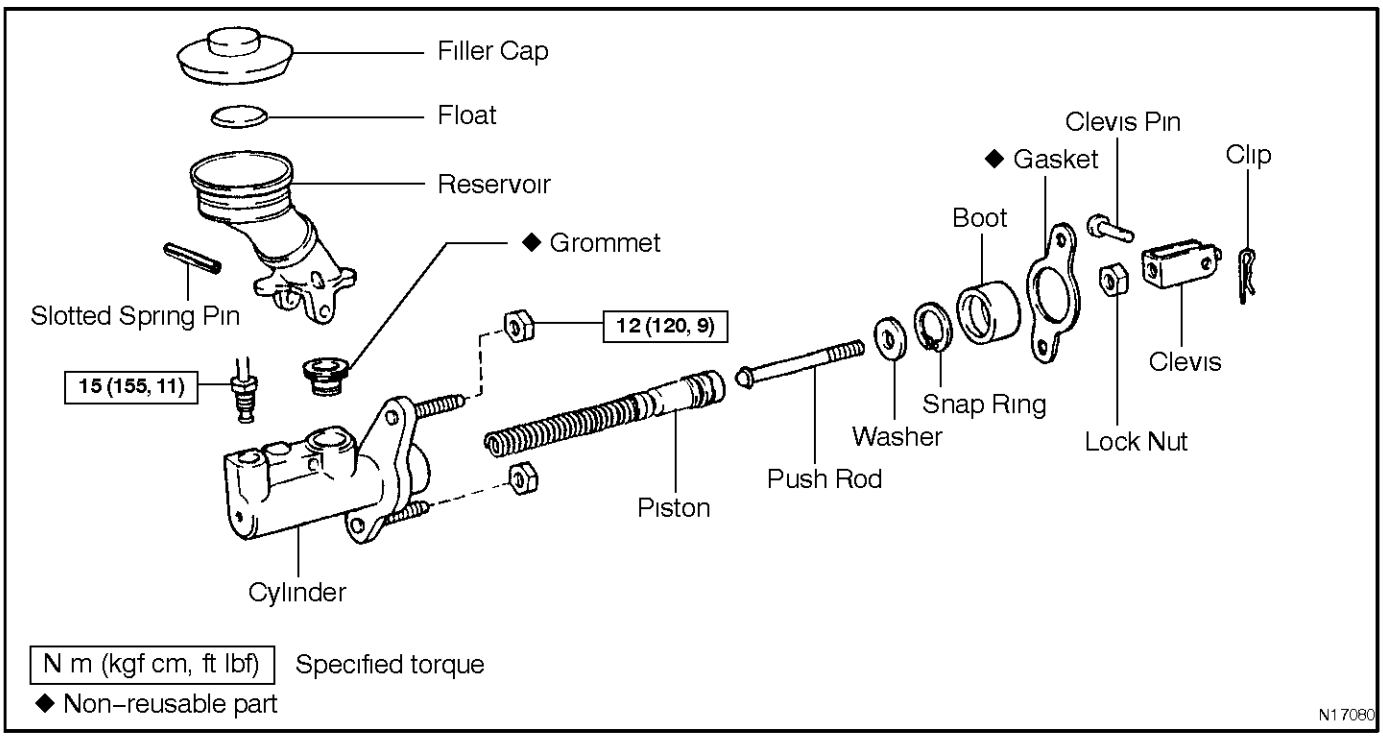
### 4. PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one

### 5. REPAIR PROCEDURES

Most repair operations begin with an overview illustration It identifies the components and shows how the parts fit together

Example






Author : Date : 1
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



The procedures are presented in a step–by–step format

- The illustration shows what to do and where to do it
- The task heading tells what to do
- The detailed text tells how to perform the task and gives other information such as specifications and warnings

Example

*Task heading* *what to do*

**21. CHECK PISTON STROKE OF OVERDRIVE BRAKE**

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration

**SST 09350–30020 (09350–06120)**

*Set part No* *Component part No*

*Detailed text* *how to do task*

(b) Measure the stroke applying and releasing the compressed air (392 — 785 kPa, 4 — 8 kgf/cm$^2$ or 57 — 114 psi) as shown in the illustration

**Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)**

*Specification*

This format provides the experienced technician with a FAST TRACK to the information needed The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information Important specifications and warnings always stand out in bold type

**6. REFERENCES**

References have been kept to a minimum However, when they are required you are given the page to refer to

**7. SPECIFICATIONS**

Specifications are presented in bold type throughout the text where needed You never have to leave the procedure to look up your specifications They are also found in Service Specifications section for quick reference

**8. CAUTIONS, NOTICES, HINTS:**

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired
- HINTS are separated from the text but do not appear in bold They provide additional information to help you perform the repair efficiently

**9. SI UNIT**

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System

**Example:**

**Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



The procedures are presented in a step–by–step format

- The illustration shows what to do and where to do it
- The task heading tells what to do
- The detailed text tells how to perform the task and gives other information such as specifications and warnings

Example

*Task heading what to do*

**21. CHECK PISTON STROKE OF OVERDRIVE BRAKE**

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration

**SST 09350–30020 (09350–06120)**

*Illustration what to do and where*

*Set part No* *Component part No*

*Detailed text* *how to do task*

(b) Measure the stroke applying and releasing the compressed air (392 — 785 kPa, 4 — 8 kgf/cm$^2$ or 57 — 114 psi) as shown in the illustration

**Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)**

*Specification*

This format provides the experienced technician with a FAST TRACK to the information needed The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information Important specifications and warnings always stand out in bold type

**6. REFERENCES**

References have been kept to a minimum However, when they are required you are given the page to refer to

**7. SPECIFICATIONS**

Specifications are presented in bold type throughout the text where needed You never have to leave the procedure to look up your specifications They are also found in Service Specifications section for quick reference

**8. CAUTIONS, NOTICES, HINTS:**

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired
- HINTS are separated from the text but do not appear in bold They provide additional information to help you perform the repair efficiently

**9. SI UNIT**

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System

**Example:**

**Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

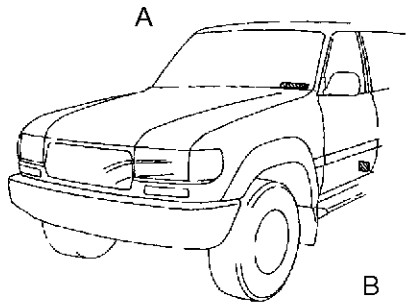
Brought to you by BirfMark



# IDENTIFICATION INFORMATION

N04P 14

## VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER

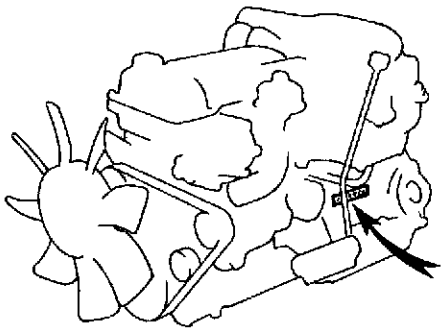



Z04707

### 1. VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and the certification label, as shown in the illustration

A Vehicle Identification Number Plate
B Certification Label



P03780

### 2. ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block, as shown in the illustration



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# REPAIR INSTRUCTIONS

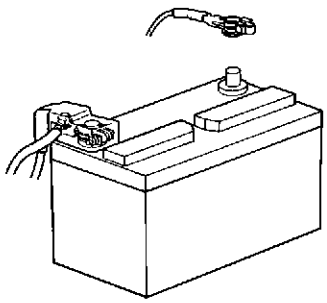
## GENERAL INFORMATION

N0CO 12

### BASIC REPAIR HINT

(a) Use fender, seat and floor covers to keep the vehicle clean and prevent damage

(b) During disassembly, keep parts in the appropriate order to facilitate reassembly



FI1066

(c) Installation and removal of battery terminal

(1) Before performing electrical work, disconnect the negative (–) terminal cable from the battery

(2) If it is necessary to disconnect the battery for inspection or repair, first disconnect the negative (–) terminal cable

(3) When disconnecting the terminal cable, to prevent damage to battery terminal, loosen the cable nut and raise the cable straight up without twisting or prying it

(4) Clean the battery terminals and cable ends with a clean shop rag Do not scrape them with a file or other abrasive objects

(5) Install the cable ends to the battery terminals after loosening the nut, and tighten the nut after installation Do not use a hammer to tap the cable ends onto the terminals

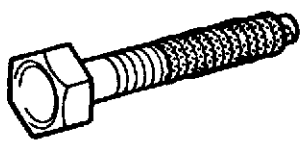
(6) Be sure the cover for the positive (+) terminal is properly in place

(d) Check hose and wiring connectors to make sure that they are connected securely and correctly

(e) Non–reusable parts

(1) Always replace cotter pins, gaskets, O–rings, oil seals, etc with new ones

(2) Non–reusable parts are indicated in the component illustrations by the "◆" symbol



Seal Lock Adhesive

Z11554

(f) Precoated parts

Precoated parts are bolts, nuts, etc that are coated with a seal lock adhesive at the factory

(1) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive

(2) When reusing precoated parts, clean off the old adhesive and dry with compressed air Then apply the specified seal lock adhesive to the bolt, nut or threads



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



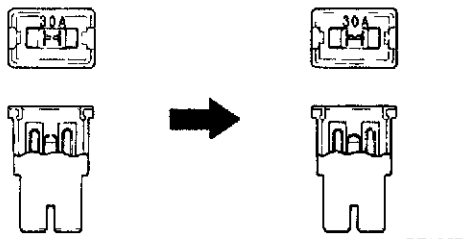
(3) Precoated parts are indicated in the component illustrations by the "★" symbol

(g) When necessary, use a sealer on gaskets to prevent leaks

(h) Carefully observe all specifications for bolt tightening torques Always use a torque wrench

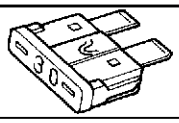
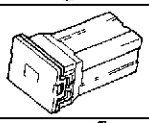
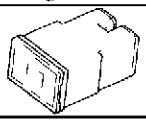
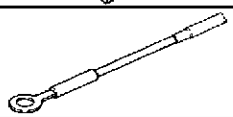
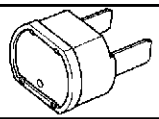
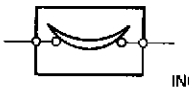
(i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair Be sure to use SST and SSM where specified and follow the proper work procedure A list of SST and SSM can be found in Preparation section in this manual

Medium Current Fuse and High Current Fuse Equal Amperage Rating




BE1367

(j) When replacing fuses, be sure the new fuse has the correct amperage rating DO NOT exceed the rating or use one with a lower rating

| Illustration | Symbol | Part Name | Abbreviation |
|---|---|---|---|
|  BE5594 | IN0365 | FUSE | FUSE |
|  BE5595 | IN0366 | MEDIUM CURRENT FUSE | M-FUSE |
|  BE5596 | IN0367 | HIGH CURRENT FUSE | H-FUSE |
|  BE5597 | IN0367 | FUSIBLE LINK | FL |
|  BE5598 |  IN0368 | CIRCUIT BREAKER | CB |

V00076



Brought to you by BirfMark
Version 1.11 - 03/16/2010

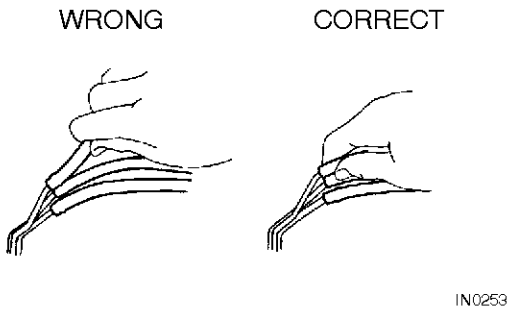
Brought to you by BirfMark



(k) Care must be taken when jacking up and supporting the vehicle Be sure to lift and support the vehicle at the proper locations (See page IN-8)
- Cancel the parking brake on the level place and shift the transmission in Neutral (or N position)
- When jacking up the front wheels of the vehicle at first place stoppers behind the rear wheels
- When jacking up the rear wheels of the vehicle at first place stoppers before the front wheels
- When either the front or rear wheels only should be jacked up, set rigid racks and place stoppers in front and behind the other wheels on the ground
- After the vehicle is jacked up, be sure to support it on rigid racks It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly

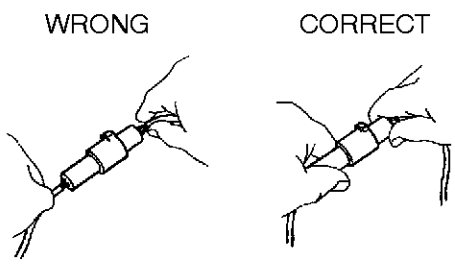
(l) Observe the following precautions to avoid damage to the following parts

(1) Do not open the cover or case of the ECU unless absolutely necessary (If the IC terminals are touched, the IC may be destroyed by static electricity )




IN0253

(2) To disconnect vacuum hoses, pull off the end, not the middle of the hose




IN0252

(3) To pull apart electrical connectors, pull on the connector itself, not the wires

(4) Be careful not to drop electrical components, such as sensors or relays If they are dropped on a hard floor, they should be replaced and not reused

(5) When steam cleaning an engine, protect the electronic components, air filter and emission-related components from water

(6) Never use an impact wrench to remove or install temperature switches or temperature sensors



Brought to you by BirfMark
Version 1.11 - 03/16/2010

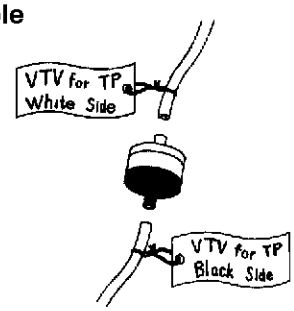
Brought to you by BirfMark



(7) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending

(8) When using a vacuum gauge, never force the hose onto a connector that is too large Use a step–down adapter for adjustment Once the hose has been stretched, it may leak air

**Example**




IN0002

(m) Installation and removal of vacuum hose

(1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to

(2) After completing a job, double check that the vacuum hoses are properly connected A label under the hood shows the proper layout

(n) Unless otherwise stated, all resistance is measured at an ambient temperature of 20°C (68°F) Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurement should be made when the engine has cooled down



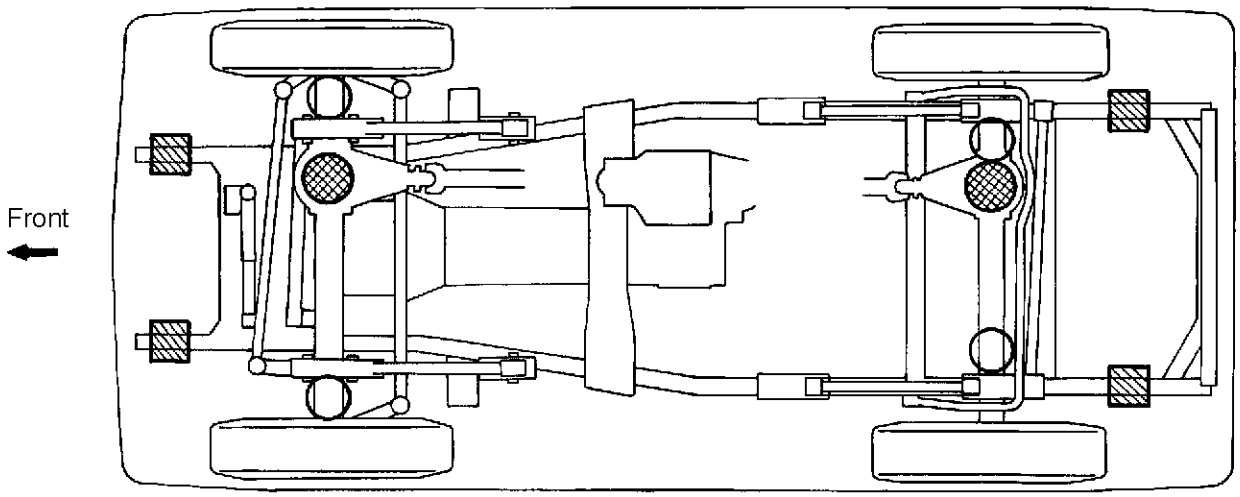
Brought to you by BirfMark
Version 1.11 - 03/16/2010

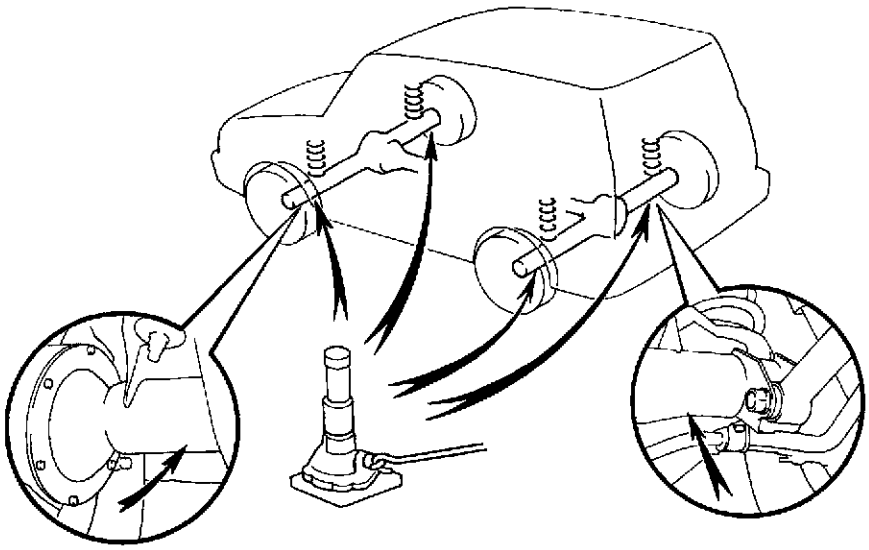
Brought to you by BirfMark



N0H2 01

# VEHICLE LIFT AND SUPPORT LOCATIONS



**JACK POSITION**
- Front — Under front differential
- Rear — Under rear differential

**SCREW TYPE JACK POSITION**

**SUPPORT POSITION**
- Safety stand

Z00796



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# FOR ALL OF VEHICLES

## PRECAUTION

N0 O–01

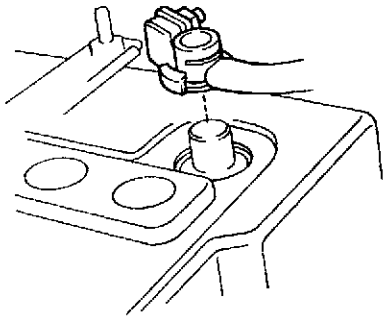
### 1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

(a) The LAND CRUISER is equipped with an SRS (Supplemental Restraint System), such as the driver airbag and front passenger airbag assembly

Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident

Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual

Negative Cable



BO4111

(b) GENERAL NOTICE

(1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page DI–240)

(2) Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery

(The supplemental restraint system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable from the battery, the SRS may deploy)

When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled So before starting work, make a record of the contents memorized by the each memory system Then when work is finished, reset the clock and audio systems as before

To avoid erasing the memory of each memory system, never use a back–up power supply from another battery

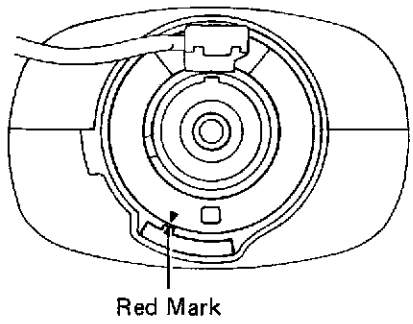


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(3) Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad (See page RS-9) and front passenger airbag assembly (See page RS-23) should be inspected
(4) Never use SRS parts from another vehicle When replacing parts, replace them with new parts
(5) Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs
(6) Never disassemble and repair the airbag sensor assembly, steering wheel pad or front passenger airbag assembly in order to reuse them
(7) If the airbag sensor assembly, steering wheel pad or front passenger airbag assembly have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones
(8) Do not directly expose the airbag sensor assembly, steering wheel pad or front passenger airbag assembly to hot air or flames
(9) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit
(10) Information labels are attached to the periphery of the SRS components Follow the instructions on the notices
(11) After work on the supplemental restraint system is completed, check the SRS warning light (See page DI-240)




(c) SPIRAL CABLE (in Combination Switch)
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result Refer to SR-19 of this manual concerning correct steering wheel installation



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(d) STEERING WHEEL PAD (with Airbag)

(1) When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up
Storing the pad with its metallic surface facing upward may lead to a serious accident if the airbag inflates for some reason In addition do not store a steering wheel pad on top of another one

(2) Never measure the resistance of the airbag squib (This may cause the airbag to deploy, which is very dangerous )

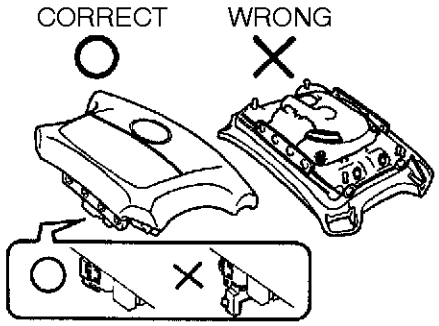
(3) Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind

(4) Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise

(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work

(6) When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–11)
Perform the operation in a safe place away from electrical noise

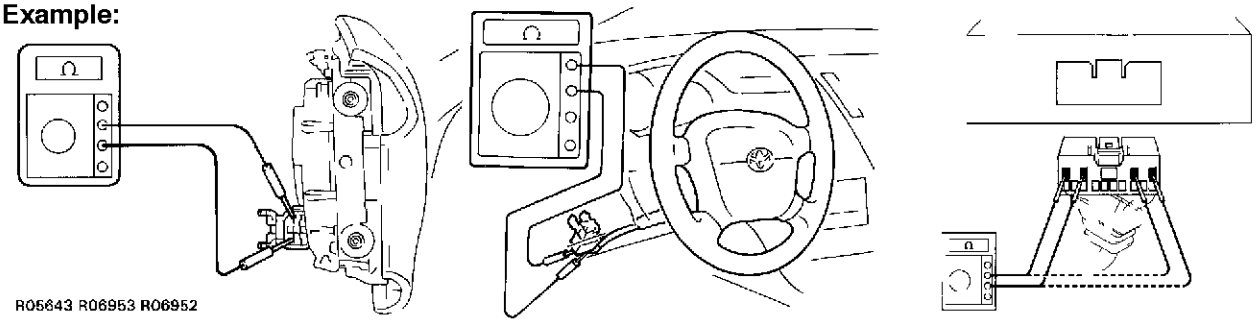
**Example:**




N01560

Z13953

**Example:**



R05643 R06953 R06952

Z13950



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(e) FRONT PASSENGER AIRBAG ASSEMBLY

(1) Always store a removed or new front passenger airbag assembly with the airbag deployment direction facing up
Storing the airbag assembly with the airbag deployment direction facing down could cause a serious accident if the airbag inflates

(2) Never measure the resistance of the airbag squib (This may cause the airbag to deploy, which is very dangerous )

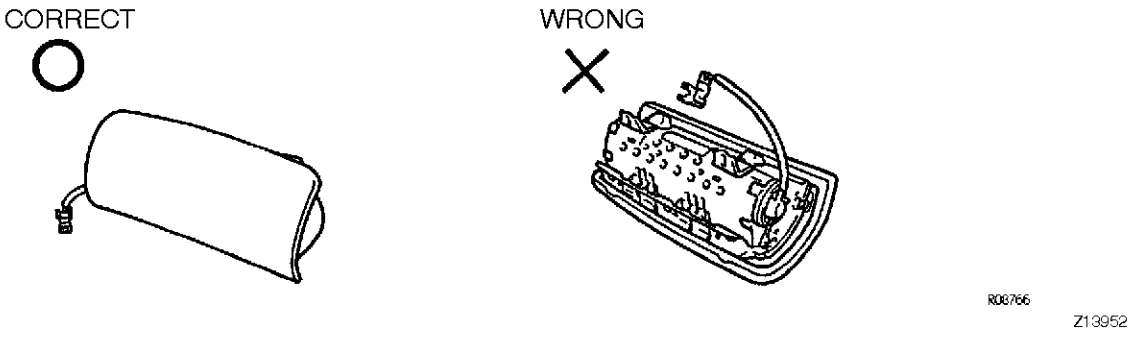
(3) Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind

(4) Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise

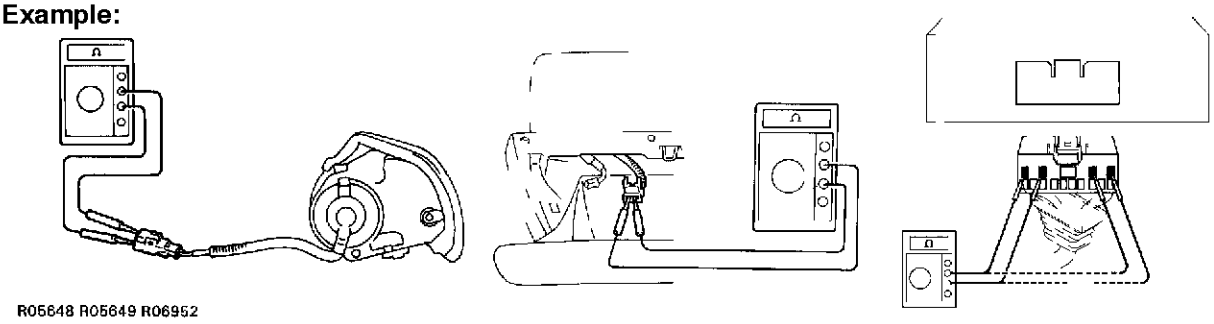
(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the assembly before starting work

(6) When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS-25)
Perform the operation in a safe place away from electrical noise

**Example:**




**Example:**






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(f) AIRBAG SENSOR ASSEMBLY

The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor If the connectors are connected or disconnected while the airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system

(g) WIRE HARNESS AND CONNECTOR

The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly The wires for the SRS wire harness are encased in a yellow corrugated tube All the connectors for the system are also a standard yellow color If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc , repair or replace it as shown on page RS–37



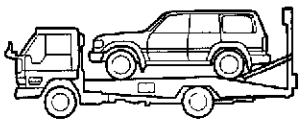
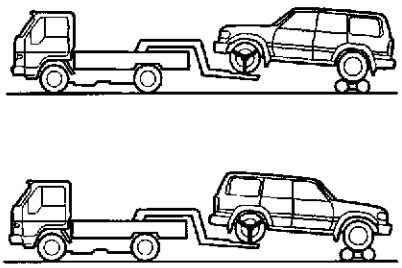
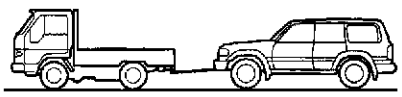
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

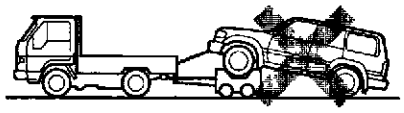


## 2. WHEN TOWING FULL-TIME 4WD VEHICLES

- Use one of the methods shown below to tow the vehicle
- If the vehicle has trouble in the chassis and drive train, use method 1 (flat bed truck)

| Condition / Towing Method | Parking Brake | Transmission Shift Lever Position | Transfer Shift Lever Position | (w/o ABS) Center Differential Lock Switch | Center Differential |
|---|---|---|---|---|---|
| ① Flat Bed Truck  IN0309 | Applied | "P" Range | "H" Position | OFF | FREE (Normal Driving) |
| ② Wheel Lift Type Truck with Dollies  | | | | | |
| ③ Towing with Rope  IN0312 | Released | "N" Range | "N" Position | OFF | ↑ |

**HINT : Do not use any towing methods other than those shown above.**
For example, the towing method shown below is dangerous, so do not use it.

| | |
|---|---|
| NO  IN0313 | During towing with this towing method, there is a danger of the drive train heating up and causing breakdown, or of the front wheels flying off the dolly. |

V08127

V08127



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



### 3. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

**CAUTION:**

**If large amount of unburned gasoline flows into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.**

(a) Use only unleaded gasoline

(b) Avoid prolonged idling
Avoid running the engine at idle speed for more than 20 minutes

(c) Avoid spark jump test
(1) Perform spark jump test only when absolutely necessary Perform this test as rapidly as possible
(2) While testing, never race the engine

(d) Avoid prolonged engine compression measurement
Engine compression tests must be done as rapidly as possible

(e) Do not run engine when fuel tank is nearly empty
This may cause the engine to misfire and create an extra load on the converter

(f) Avoid coasting with ignition turned off

(g) Do not dispose of used catalyst along with parts contaminated with gasoline or oil

### 4. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two–way radios and cellular telephones, observe the following precautions

(1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system

(2) Install the antenna feeder at least 20 cm (7 87 in ) away from the ECU and sensors of the vehicle's electronic systems For details about ECU and sensors locations, refer to the section on the applicable component

(3) Avoid winding the antenna feeder together with other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses

(4) Check that the antenna and feeder are correctly adjusted

(5) Do not install powerful mobile communications system

### 5. FOR USING OBD II SCAN TOOL OR TOYOTA HAND–HELD TESTER

**CAUTION:**

**Observe the following items for safety reasons:**

- **Before using the OBD II scan tool or TOYOTA hand–held tester, the OBD II scan tool's instruction book or TOYOTA hand–held tester's operator manual should be read thoroughly.**
- **Be sure to route all cables securely when driving with the OBD II scan tool or TOYOTA hand–held tester connected to the vehicle. (i.e. Keep cables away from feet, pedals, steering wheel and shift lever.)**
- **Two persons are required when test driving with the OBD II scan tool or TOYOTA hand–held tester, one person to drive the vehicle and the other person to operate the OBD II scan tool or TOYOTA hand–held tester.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

BE2826

## 6. FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT-IN ANTI-THEFT SYSTEM

Audio System displaying the sign ANTI-THEFT SYSTEM shown on the left has a built-in anti-theft system which makes the audio system soundless if stolen

If the power source for the audio system is cut even once, the anti0theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number afterwards, or else a request made to the customer to input the ID number For the method to input the ID number or cancel the anti-theft system, refer to the Owner's Manual



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

N04S-30

## GENERAL INFORMATION

A large number of ECU controlled systems are used in the LAND CRUISER. In general, the ECU controlled system is considered to be a very intricate system requiring a high level of technical knowledge and expert skill to troubleshoot. However, the fact is that if you proceed to inspect the circuits one by one, troubleshooting of these systems is not complex. If you have adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed to locate and fix the problem. This manual is designed through emphasis of the above standpoint to help service technicians perform accurate and effective troubleshooting, and is compiled for the following major ECU controlled systems. The troubleshooting procedure and how to make use of it are described on the following pages.

| System | Page |
|---|---|
| 1 Engine | DI–1 |
| 2 Automatic Transmission | DI–129 |
| 3 Anti–Lock Brake System | DI–188 |
| 4 Supplemental Restraint System | DI–238 |
| 5 Cruise Control System | DI–284 |

**FOR USING OBD II SCAN TOOL OR TOYOTA HAND–HELD TESTER**

- Before using the scan tool or tester, the scan tool's instruction book or tester's operator manual should be read thoroughly.
- If the scan tool or tester cannot communicate with ECU controlled systems when you have connected the cable of the scan tool or tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.
  (1) If communication is normal when the tool is connected to another vehicle, inspect the diagnosis data link line (Bus⊕line) or ECU power circuit of the vehicle.
  (2) If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so perform the Self Test procedures outline in the Tester Operator's Manual.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

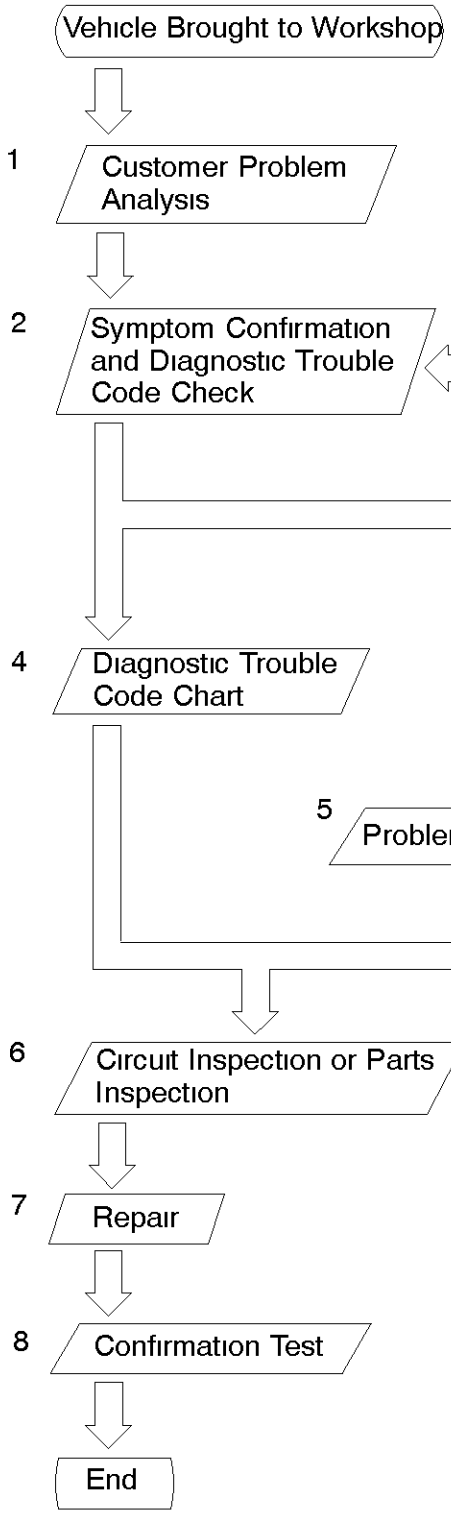
Brought to you by BirfMark



N04T 19

# HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure on the following page. Here, only the basic procedure is shown. Details are provided in Diagnostics section, showing the most effective methods for each circuit. Confirm the troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.




1
Ask the customer about the conditions and the environment when the problem occurred

2, 3
Confirm the symptoms and the problem conditions, and check the diagnostic trouble codes
(When the problem symptoms do not appear during confirmation, use the symptom simulation method described later on.)

4, 5, 6
Check the results obtained in Step 2, then confirm the inspection procedure for the system or the part which should be checked using the diagnostic trouble code chart or the problem symptoms table

7
Check and repair the affected system or part in accordance with the instructions in Step 6

8
After completing repairs, confirm that the problem has been eliminated
(If the problem is not reproduced, perform the confirmation test under the same conditions and in the same environment as when it occurred for the first time.)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 1. CUSTOMER PROBLEM ANALYSIS

In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared away in order to give an accurate judgment To ascertain just what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred

Important Point in the Problem Analysis

The following 5 items are important points in the problem analysis Past problems which are thought to be unrelated and the repair history, etc may also help in some cases, so as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for reference in troubleshooting A customer problem analysis table is provided in Diagnostics section for each system for your use

**Important Points in the Customer Problem Analysis**

- What ––––– Vehicle model, system name
- When ––––– Date, time, occurrence frequency
- Where ––––– Road conditions
- Under what conditions? ––––– Running conditions, driving conditions, weather conditions
- How did it happen? ––––– Problem symptoms

**(Sample) Engine control system check sheet.**

### CUSTOMER PROBLEM ANALYSIS CHECK

**ENGINE CONTROL SYSTEM Check Sheet**

Inspector's Name

| | | | |
|---|---|---|---|
| Customer's Name | | Model and Model Year | |
| Driver's Name | | Frame No | |
| Data Vehicle Brought in | | Engine Model | |
| License No | | Odometer Reading | km miles |

| | | |
|---|---|---|
| Problem Symptoms | ☐ Engine does not Start | ☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion |
| | ☐ Difficult to Start | ☐ Engine cranks slowly<br>☐ Other _____ |
| | ☐ Poor Idling | ☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High ( rpm) ☐ Low ( rpm)<br>☐ Rough idling ☐ Other _____ |
| | ☐ Poor Drive ability | ☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging<br>☐ Knocking ☐ Other _____ |
| | ☐ Engine Stall | ☐ Soon after starting ☐ After accelerator pedal depressed<br>☐ After accelerator pedal released ☐ During A/C operation<br>☐ Shifting from N to D ☐ Other _____ |
| | ☐ Others | |

☐ Constant ☐ Sometimes ( times per day/month)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the LAND CRUISER fulfills various functions The first function is the Diagnostic Trouble Code Check in which a malfunction in the signal circuits to the ECU is stored in code in the ECU memory at the time of occurrence, to be output by the technician during troubleshooting Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly By using these check functions, the problem areas can be narrowed down quickly and troubleshooting can be performed effectively Diagnostic functions are incorporated in the following systems in the LAND CRUISER

| System | Diagnostic Trouble Code Check | Input Signal Check (Sensor Check) | Diagnostic Test Mode (Active Test) |
|---|---|---|---|
| 1 Engine | ○ (with Check Mode) | ○ | ○ |
| 2 Automatic Transmission | ○ (with Check Mode) | ○ | ○ |
| 3 Anti–Lock Brake System | ○ | ○ | ○ |
| 4 Supplemental Restraint System | ○ | ○ | |
| 5 Cruise Control System | ○ | ○ | |

In diagnostic trouble code check, it is very important to determine whether the problem indicated by the diagnostic trouble code is still occurring or occurred in the past but returned to normal at present In addition, it must be checked in the problem symptom check whether the malfunction indicated by the diagnostic trouble code is directly related to the problem symptom or not For this reason, the diagnostic trouble codes should be checked before and after the symptom confirmation to determine the current conditions, as shown in the table below If this is not done, it may, depending on the case, result in unnecessary troubleshooting for normally operating systems, thus making it more difficult to locate the problem, or in repairs not pertinent to the problem Therefore, always follow the procedure in correct order and perform the diagnostic trouble code check

**DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE**

| **Diagnostic Trouble Code Check (Make a note of and then clear)** | **Confirmation of Symptoms** | **Diagnostic Trouble Code Check** | **Problem Condition** |
|---|---|---|---|
| Diagnostic Trouble Code Display | Problem symptoms exist | Same diagnostic trouble code is displayed | Problem is still occurring in the diagnostic circuit |
| | | Normal code is displayed | The problem is still occurring in a place other than in the diagnostic circuit (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem) |
| | No problem symptoms exist | | The problem occurred in the diagnostic circuit in the past |
| Normal Code Display | Problem symptoms exist | Normal code is displayed | The problem is still occurring in a place other than in the diagnostic circuit |
| | No problem symptoms exist | Normal code is displayed | The problem occurred in a place other than in the diagnostic circuit in the past |

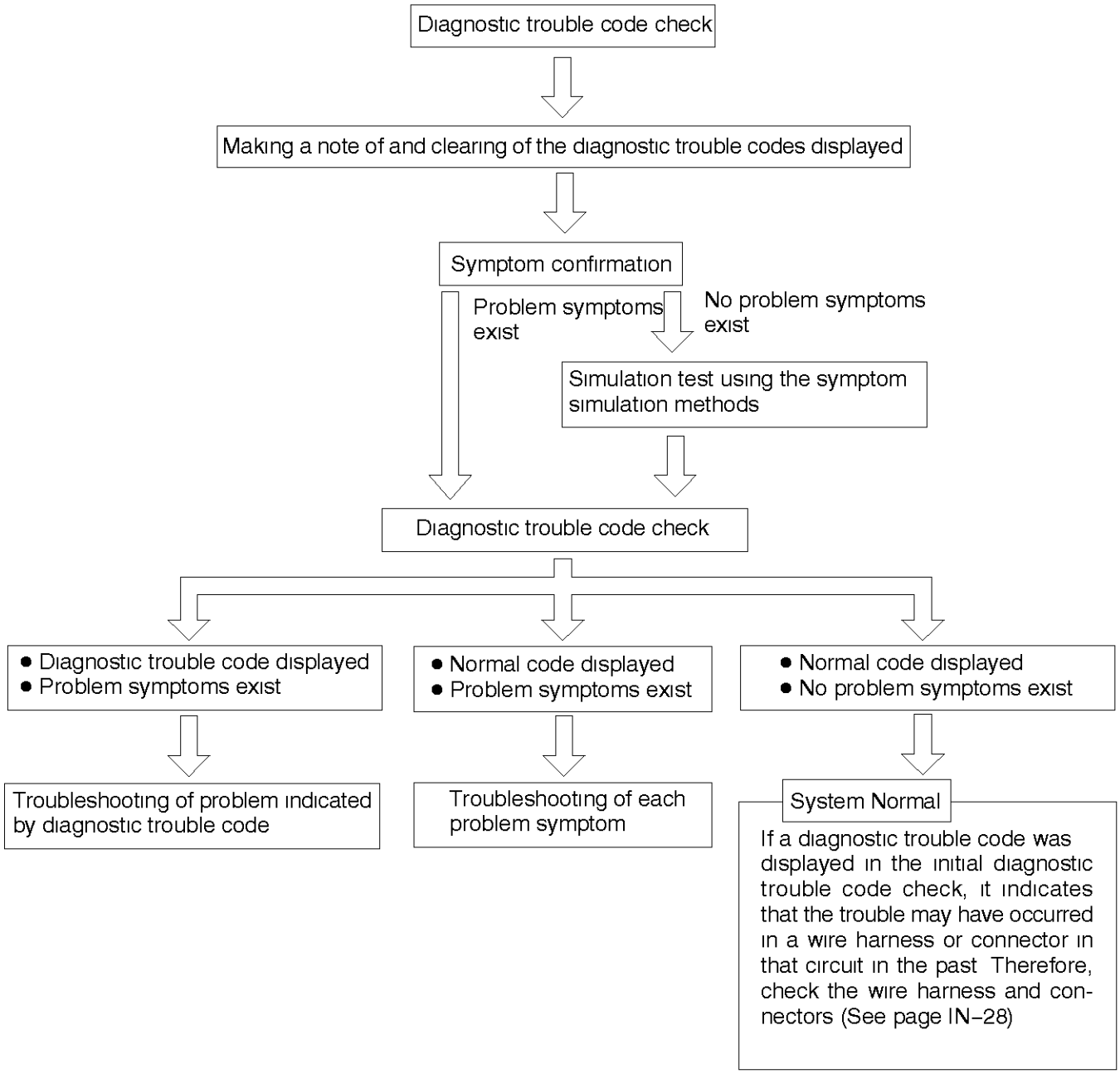


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



Taking into account the points on the previous page, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. This flow chart shows how to utilize the diagnostic trouble code check effectively, then by carefully checking the results, indicates how to proceed either to diagnostic trouble code troubleshooting or to troubleshooting of problem symptoms table






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

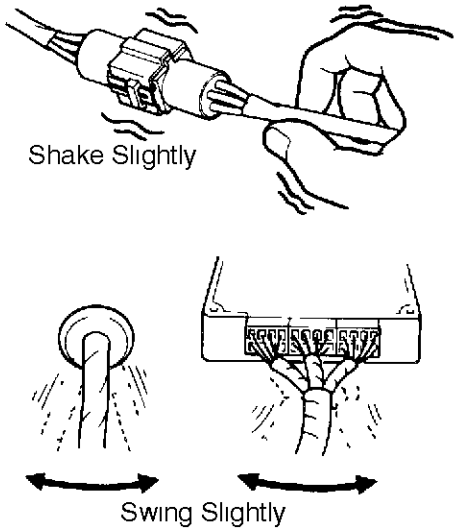
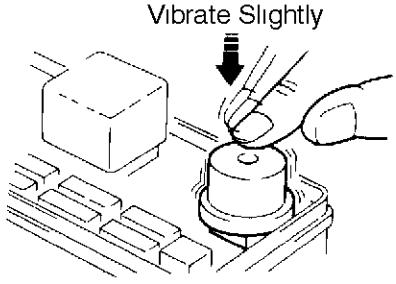


## 3. SYMPTOM SIMULATION

The most difficult case in troubleshooting is when there are no problem symptoms occurring In such cases, a thorough customer problem analysis must be carried out, then simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle No matter how much experience a technician has, or how skilled he may be, if he proceeds to troubleshoot without confirming the problem symptoms he will tend to overlook something important in the repair operation and make a wrong guess somewhere, which will only lead to a standstill For example, for a problem which only occurs when the engine is cold, or for a problem which occurs due to vibration caused by the road during driving, etc , the problem can never be determined so long as the symptoms are confirmed with the engine hot condition or the vehicle at a standstill Since vibration, heat or water penetration (moisture) is likely cause for problem which is difficult to reproduce, the symptom simulation tests introduced here are effective measures in that the external causes are applied to the vehicle in a stopped condition

Important Points in the Symptom Simulation Test

In the symptom simulation test, the problem symptoms should of course be confirmed, but the problem area or parts must also be found out To do this, narrow down the possible problem circuits according to the symptoms before starting this test and connect a tester beforehand After that, carry out the symptom simulation test, judging whether the circuit being tested is defective or normal and also confirming the problem symptoms at the same time Refer to the problem symptoms table for each system to narrow down the possible causes of the symptom

| 1 | **VIBRATION METHOD: When vibration seems to be the major cause.** |
|---|---|
| **CONNECTORS**<br>Slightly shake the connector vertically and horizontally<br><br>**WIRE HARNESS**<br>Slightly shake the wire harness vertically and horizontally The connector joint, fulcrum of the vibration, and body through portion are the major areas to be checked thoroughly |  <br>FI2331<br>FI2332 |
| **PARTS AND SENSOR**<br>Apply slight vibration with a finger to the part of the sensor considered to be the problem cause and check that the malfunction occurs<br>HINT<br>Applying strong vibration to relays may result in open relays |  <br>FI2330 |

V07268



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



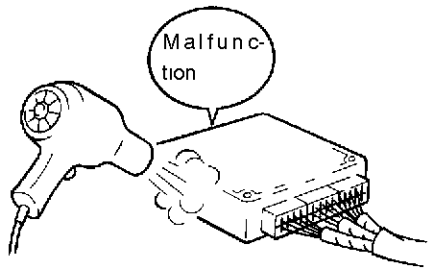
| 2 | HEAT METHOD: When the problem seems to occur when the suspect area is heated. |
|---|---|

Heat the component that is the likely cause of the malfunction with a hair dryer or similar object. Check to see if the malfunction occurs.

**NOTICE:**

**(1) Do not heat to more than 60°C (140°F). (Temperature is limited not to damage the components.)**

**(2) Do not apply heat directly to parts in the ECU.**




FI2334

| 3 | WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high–humidity condition. |
|---|---|

Sprinkle water onto the vehicle and check to see if the malfunction occurs.

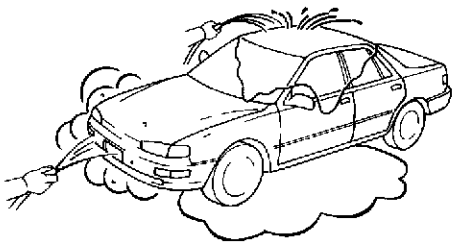
**NOTICE:**

**(1) Never sprinkle water directly into the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.**

**(2) Never apply water directly onto the electronic components.**

HINT

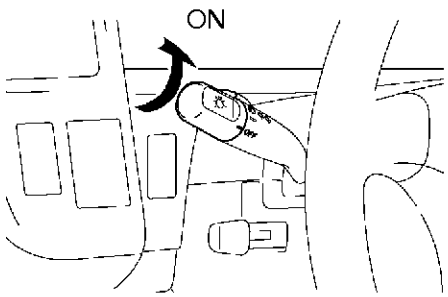
If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.



FI6649

| 4 | OTHER: When a malfunction seems to occur when electrical load is excessive. |
|---|---|

Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.




B02389

B02390



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 4. DIAGNOSTIC TROUBLE CODE CHART

The inspection procedure is shown in the table below. This table permits efficient and accurate troubleshooting using the diagnostic trouble codes displayed in the diagnostic trouble code check. Proceed with troubleshooting in accordance with the inspection procedure given in the diagnostic chart corresponding to the diagnostic trouble codes displayed. The engine diagnostic trouble code chart is shown below as an example.

- DTC No
  Indicates the diagnostic trouble code
- Page or Instructions
  Indicates the page where the inspection procedure for each circuit is to be found, or gives instructions for checking and repairs

- Trouble Area
  Indicates the suspect area of the problem

- Detection Item
  Indicates the system of the problem or contents of the problem

### DIAGNOSTIC TROUBLE CODE CHART

HINT
Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check mode, check the circuit for the code listed in the table below. For details of each code, turn to the page referred to under the "See page" for the respective "DTC No." in the DTC chart.

**SAE CONTROLLED**

| DTC No (See page) | Detection Item | Trouble Area | MIL* | Memory |
|---|---|---|---|---|
| P0100 (DI–24) | Mass Air Flow Circuit Malfunction | • Open or short in mass air flow meter circuit<br>• Mass air flow meter<br>• ECM | ○ | ○ |
| P0101 (DI–28) | Mass Air Flow Circuit Range/ Performance Problem | • Mass air flow meter | ○ | ○ |
| P0110 (DI–29) | Intake Air Temp. Circuit Malfunction | • Open or short in intake air temp. sensor circuit<br>• Intake air temp. sensor<br>• ECM | ○ | ○ |
| P0115 (DI–33) | Engine Coolant Temp. Circuit Malfunction | • Open or short in engine coolant temp. sensor circuit<br>• Engine coolant temp. sensor<br>• ECM | ○ | ○ |
| P0116 (DI–37) | Engine Coolant Temp. Circuit Range/ Performance Problem | • Engine coolant temp. sensor<br>• Cooling system | ○ | ○ |
| | /Pedal Position Sensor/Switch nction | • Open or short in throttle position sensor circuit<br>• Throttle position sensor<br>• ECM | | |
| | osition Sensor/ Switch rformance Prob- | • Throttle position sensor | | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

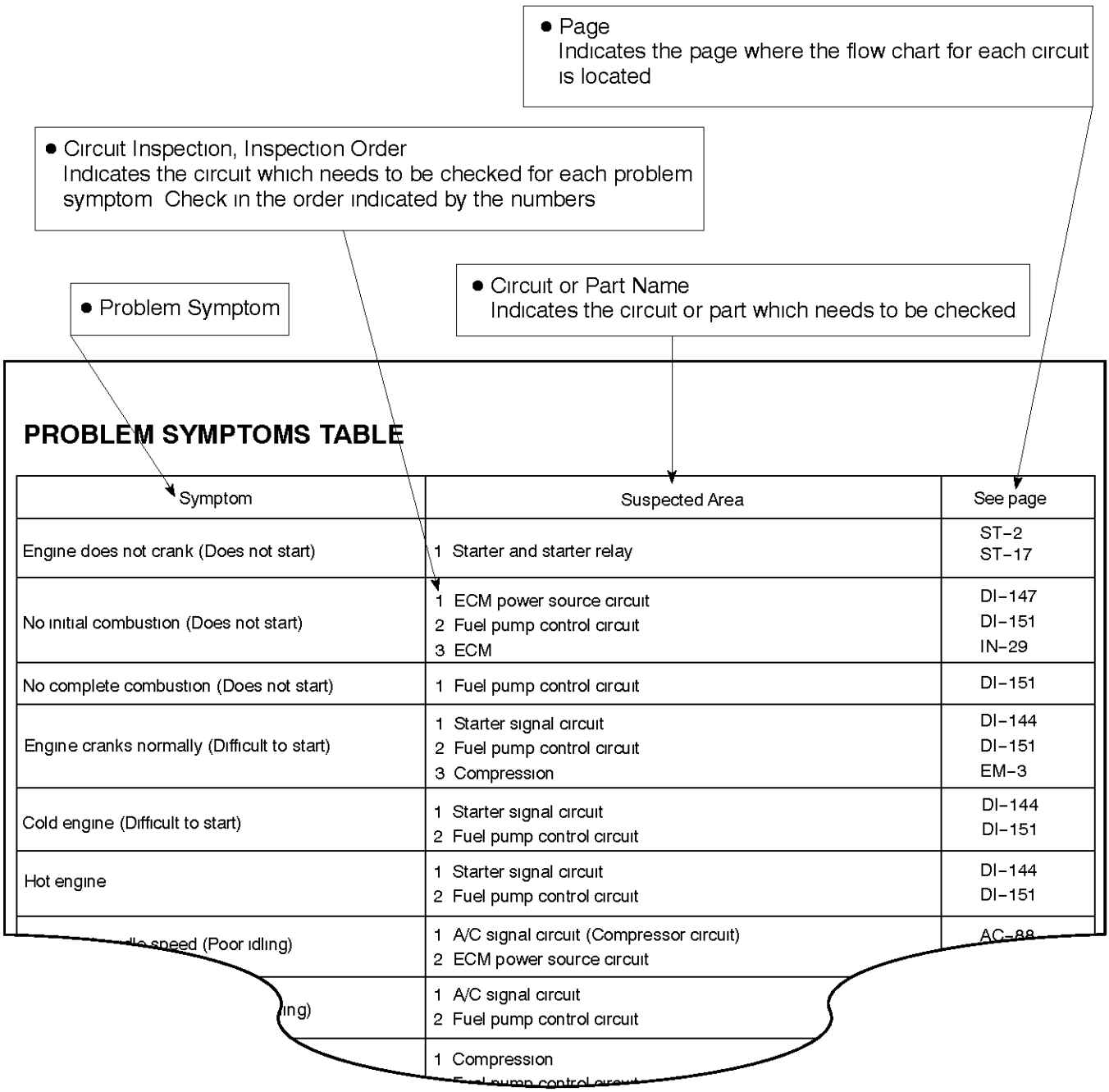


## 5. PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot the problem when a "Normal" code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT

When the problem is not detected by the diagnostic system even though the problem symptom is present, it is considered that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a system other than the diagnostic system.




**PROBLEM SYMPTOMS TABLE**

| Symptom | Suspected Area | See page |
|---|---|---|
| Engine does not crank (Does not start) | 1 Starter and starter relay | ST–2<br>ST–17 |
| No initial combustion (Does not start) | 1 ECM power source circuit<br>2 Fuel pump control circuit<br>3 ECM | DI–147<br>DI–151<br>IN–29 |
| No complete combustion (Does not start) | 1 Fuel pump control circuit | DI–151 |
| Engine cranks normally (Difficult to start) | 1 Starter signal circuit<br>2 Fuel pump control circuit<br>3 Compression | DI–144<br>DI–151<br>EM–3 |
| Cold engine (Difficult to start) | 1 Starter signal circuit<br>2 Fuel pump control circuit | DI–144<br>DI–151 |
| Hot engine | 1 Starter signal circuit<br>2 Fuel pump control circuit | DI–144<br>DI–151 |
| …le speed (Poor idling) | 1 A/C signal circuit (Compressor circuit)<br>2 ECM power source circuit | AC–88 |
| …ling) | 1 A/C signal circuit<br>2 Fuel pump control circuit | |
| | 1 Compression<br>… pump control circuit | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 6. CIRCUIT INSPECTION

How to read and use each page is shown below

- Diagnostic Trouble Code No. and Detection Item

- Circuit Description
  The major role and operation, etc. of the circuit and its component parts are explained

### DTC P0325 Knock Sensor 1 Circuit Malfunction

### CIRCUIT DESCRIPTION

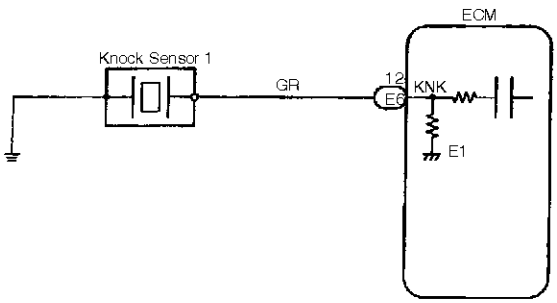
Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0325 | No knock sensor 1 signal to ECM with engine speed 1,200 rpm or more | • Open or short in knock sensor 1 circuit<br>• Knock sensor 1 (looseness)<br>• ECM |

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

- Indicates the diagnostic trouble code, diagnostic trouble code set parameter and suspect area of the problem

### WIRING DIAGRAM




- Wiring Diagram
  This shows a wiring diagram of the circuit.
  Use this diagram together with ELECTRICAL WIRING DIAGRAM to thoroughly understand the circuit.
  Wire colors are indicated by an alphabetical code.
  B = Black, L = Blue, R = Red, BR = Brown, LG = Light Green, V = Violet, G = Green, O = Orange, W = White, GR = Gray, P = Pink, Y = Yellow, SB = Sky Blue
  The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

V08423



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



- Indicates the position of the ignition switch during the check

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

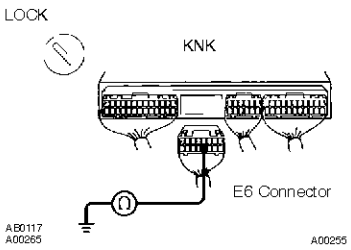
START
Ignition Switch START

ACC
Ignition Switch ACC

- Inspection Procedure
  Use the inspection procedure to determine if the circuit is normal or abnormal, and, if it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU

## INSPECTION PROCEDURE

**1 Check continuity between terminal KNK of ECM connector and body ground**




**PREPARATION**
(a) Remove the glove compartment (See page SF–68)
(b) Disconnect the E6 connector from the ECM

**CHECK**
Measure the resistance between terminal KNK of the ECM connector and body ground

**OK**
**Resistance 1 MΩ or higher**

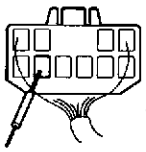
**OK** **Go to step 3**

**NG**

**2 Check knock sensor (See page SF–61)**

**OK** **Replace knock sensor**

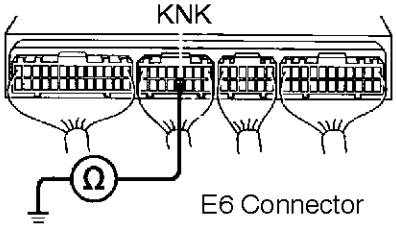
- Indicates the place to check the voltage or resistance
- Indicates the connector position to checked, from the front or back side



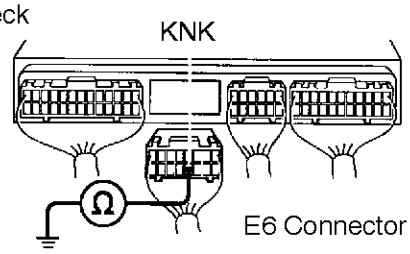

Check from the connector back side (with harness)

Check from the connector front side (without harness)
In this case, care must be taken not to bend the terminals

- Indicates the condition of the connector of ECU during the check




Connector being checked is connected




Connector being checked is disconnected

V08425



Brought to you by BirfMark
Version 1.11 - 03/16/2010

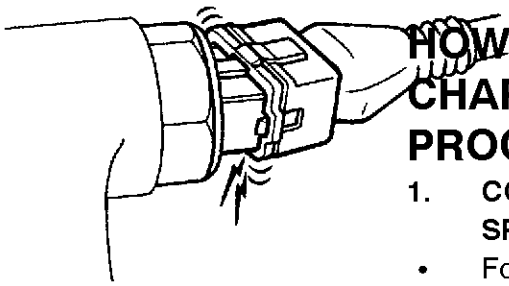
Brought to you by BirfMark



N05X 13

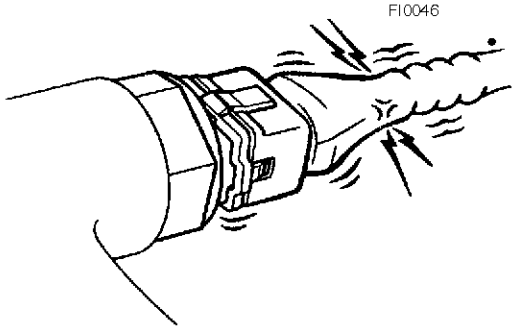
# HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

## 1. CONNECTOR CONNECTION AND TERMINAL INSPECTION



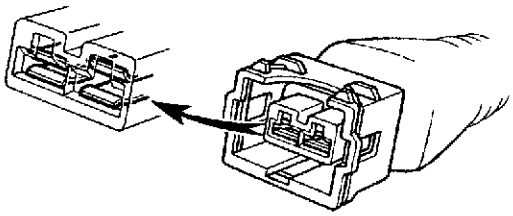
FI0046

- For troubleshooting, diagnostic trouble code charts or problem symptom table are provided for each circuit with detailed inspection procedures on the following pages
- When all the component parts, wire harnesses and connectors of each circuit except the ECU are found to be normal in troubleshooting, then it is determined that the problem is in the ECU Accordingly, if diagnosis is performed without the problem symptoms occurring, refer to Step 8 to replace the ECU So always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method



FI0047

- The instructions "Check wire harness and connector" and "Check and replace ECU" which appear in the inspection procedure, are common and applicable to all diagnostic trouble codes Follow the procedure outlined below whenever these instructions appear



FI0048

OPEN CIRCUIT

This could be due to a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc

HINT

- It is rarely the case that a wire is broken in the middle of it Most cases occur at the connector In particular, carefully check the connectors of sensors and actuators
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a deformation of connector terminals Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation Therefore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, then the cause is considered to be in the wire harness or connectors

SHORT CIRCUIT

This could be due to a contact between wire harness and the body ground or to a short circuit occurred inside the switch, etc

HINT

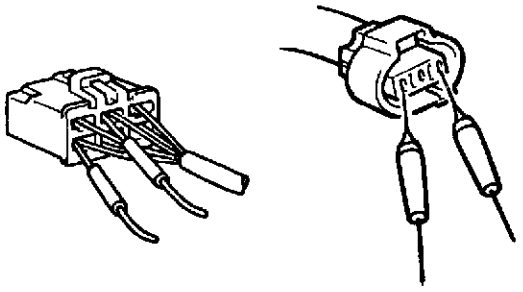
When there is a short circuit between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

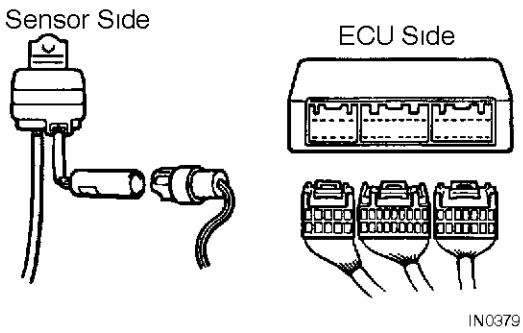
Brought to you by BirfMark




FI7187

## 2. CONNECTOR HANDLING

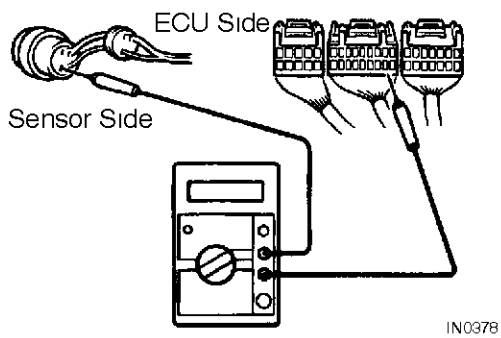
When inserting tester probes into a connector, insert them from the rear of the connector When necessary, use mini test leads For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals



IN0379

## 3. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

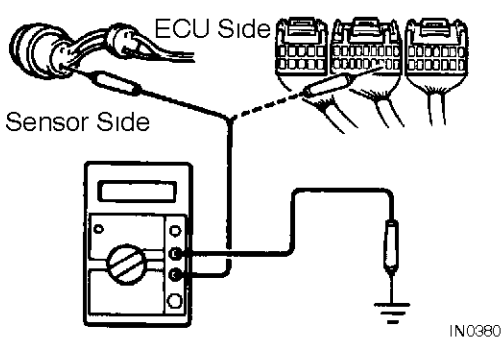
(a) Disconnect the connectors at both ECU and sensor sides



IN0378

(b) Measure the resistance between the applicable terminals of the connectors
**Resistance: 1 Ω or less**

HINT
Measure the resistance while lightly shaking the wire harness vertically and horizontally

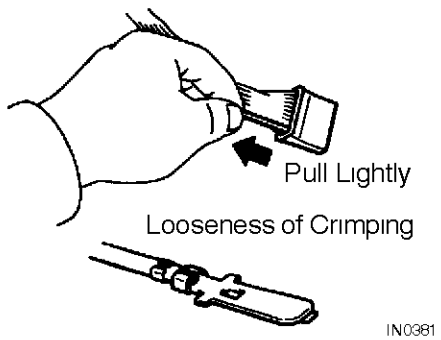


IN0380

## 4. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

(a) Disconnect the connectors on both ends
(b) Measure the resistance between the applicable terminals of the connectors and body ground Be sure to carry out this check on the connectors on both ends
**Resistance: 1 MΩ or higher**

HINT
Measure the resistance while lightly shaking the wire harness vertically and horizontally



IN0381

## 5. VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends
(b) Check for rust or foreign material, etc in the terminals of the connectors
(c) Check crimped portions for looseness or damage and check that the terminals are secured in lock portion

HINT
The terminals should not come out when pulled lightly from the back



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(d) Prepare a test male terminal and insert it in the female terminal, then pull it out

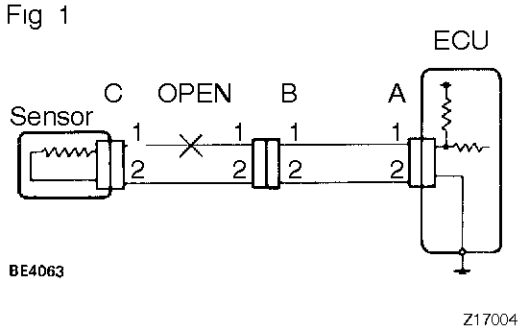
**NOTICE:**

**When testing a gold-plated female terminal, always use a gold-plated male terminal.**

HINT

When the test terminal is pulled out more easily than others, there may be poor contact in that section

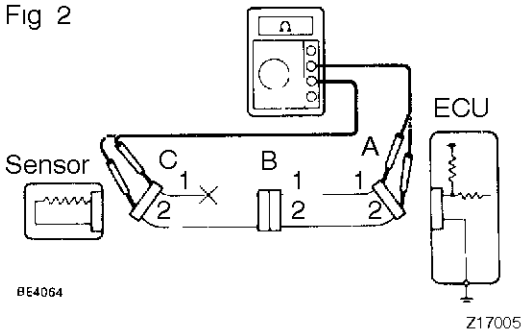
Fig 1




## 6. CHECK OPEN CIRCUIT

For the open circuit in the wire harness in Fig 1, perform "(a) Continuity Check" or "(b) Voltage Check" to locate the section

Fig 2




(a) Check the continuity

(1) Disconnect connectors "A" and "C" and measure the resistance between them

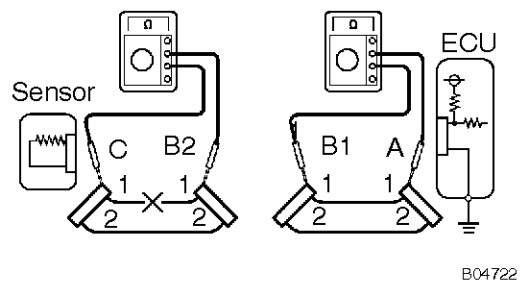
In the case of Fig 2

Between terminal 1 of connector "A" and terminal 1 of connector "C" → No continuity (open)

Between terminal 2 of connector "A" and terminal 2 of connector "C" → Continuity

Therefore, it is found out that there is an open circuit between terminal 1 of connector "A" and terminal 1 of connector "C"

Fig 3




(2) Disconnect connector "B" and measure the resistance between the connectors

In the case of Fig 3

Between terminal 1 of connector "A" and terminal 1 of connector "B1" → Continuity

Between terminal 1 of connector "B2" and terminal 1 of connector "C" → No continuity (open)

Therefore, it is found out that there is an open circuit between terminal 1 of connector "B2" and terminal 1 of connector "C"

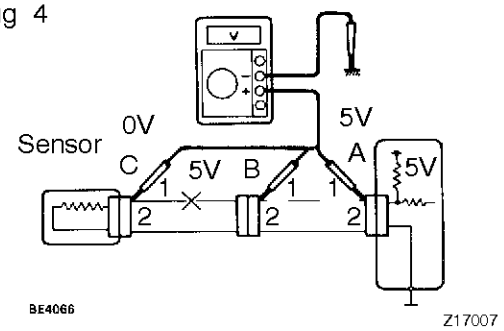


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



Fig 4




(b) Check the voltage

In a circuit in which voltage is applied (to the ECU connector terminal), an open circuit can be checked for by conducting a voltage check

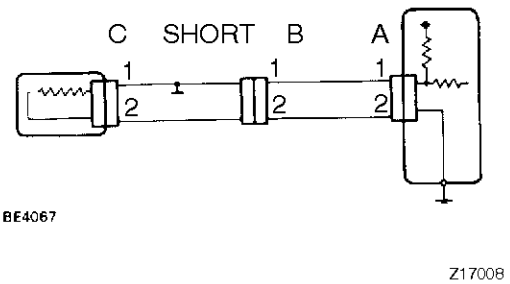
As shown in Fig 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector "A" at the ECU 5V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order

If the results are

5V Between Terminal 1 of connector "A" and Body Ground
5V Between Terminal 1 of connector "B" and Body Ground
0V Between Terminal 1 of connector "C" and Body Ground

Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C"

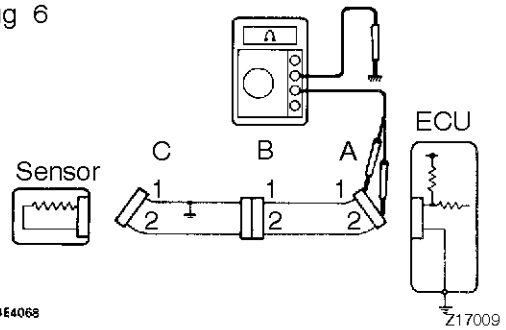
Fig 5




## 7. CHECK SHORT CIRCUIT

If the wire harness is ground shorted as in Fig 5, locate the section by conducting a "continuity check with ground"

Fig 6




Check the continuity with ground

(1) Disconnect connectors "A" and "C" and measure the resistance between terminal 1 and 2 of connector "A" and body ground

In the case of Fig 6

Between terminal 1 of connector "A" and body ground → Continuity (short)

Between terminal 2 of connector "A" and body ground → No continuity

Therefore, it is found out that there is a short circuit between terminal 1 of connector "A" and terminal 1 of connector "C"

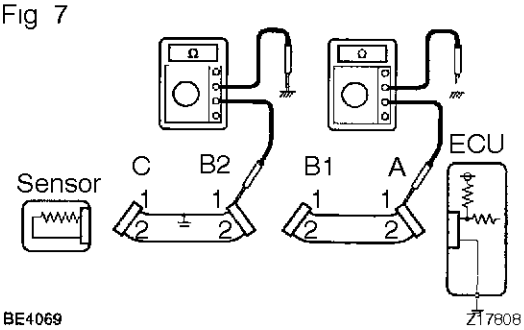


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



Fig 7




(2) Disconnect connector "B" and measure the resistance between terminal 1 of connector "A" and body ground, and terminal 1 of connector "B2" and body ground

In the case of Fig 7

Between terminal 1 of connector "A" and body ground → No continuity

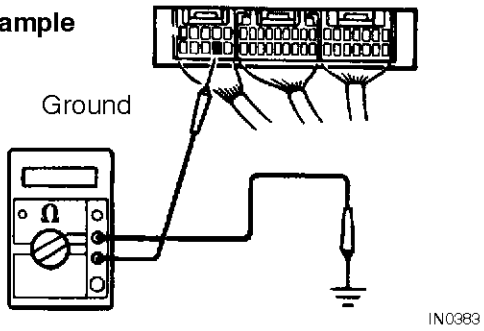
Between terminal 1 of connector "B2" and body ground → Continuity (short)

Therefore, it is found out that there is a short circuit between terminal 1 of connector "B2" and terminal 1 of connector "C"

**8. CHECK AND REPLACE ECU**

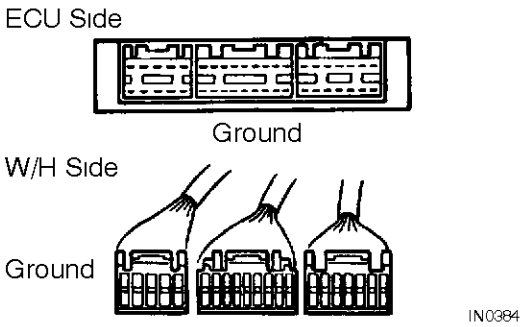
First check the ECU ground circuit If it is faulty, repair it If it is normal, the ECU could be faulty, so replace the ECU with a normal functioning one and check that the symptoms appear

**Example**




(1) Measure the resistance between the ECU ground terminal and the body ground

**Resistance: 1 Ω or less**




(2) Disconnect the ECU connector, check the ground terminals on the ECU side and the wire harness side for bend and check the contact pressure



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TERMS

## ABBREVIATIONS USED IN THIS MANUAL

N04Q 07

| Abbreviations | Meaning |
|---|---|
| ABS | Anti–Lock Brake System |
| AC | Alternating Current |
| ACC | Accessory |
| ACIS | Acoustic Control Induction System |
| ACSD | Automatic Cold Start Device |
| A D D | Automatic Disconnecting Differential |
| A/F | Air–Fuel Ratio |
| AHC | Active Height Control Suspension |
| ALR | Automatic Locking Retractor |
| ALT | Alternator |
| AMP | Amplifier |
| ANT | Antenna |
| APPROX | Approximately |
| A/T | Automatic Transmission (Transaxle) |
| ATF | Automatic Transmission Fluid |
| AUTO | Automatic |
| AUX | Auxiliary |
| AVG | Average |
| AVS | Adaptive Variable Suspension |
| BA | Brake Assist |
| BACS | Boost Altitude Compensation System |
| BAT | Battery |
| BDC | Bottom Dead Center |
| B/L | Bi–Level |
| B/S | Bore–Stroke Ratio |
| BTDC | Before Top Dead Center |
| BVSV | Bimetallic Vacuum Switching Valve |
| Calif | California |
| CB | Circuit Breaker |
| CCo | Catalytic Converter For Oxidation |
| CD | Compact Disc |
| CF | Cornering Force |
| CG | Center Of Gravity |
| CH | Channel |
| COMB | Combination |
| CPE | Coupe |
| CPS | Combustion Pressure Sensor |
| CPU | Central Processing Unit |
| CRS | Child Restraint System |
| CTR | Center |
| C/V | Check Valve |
| CV | Control Valve |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| CW | Curb Weight |
| DC | Direct Current |
| DEF | Defogger |
| DFL | Deflector |
| DIFF | Differential |
| DIFF LOCK | Differential Lock |
| D/INJ | Direct Injection |
| DLI | Distributorless Ignition |
| DOHC | Double Over Head Cam |
| DP | Dash Pot |
| DS | Dead Soak |
| DSP | Digital Signal Processor |
| EBD | Electronic Brake Force Distribution |
| ECAM | Engine Control And Measurement System |
| ECD | Electronic Controlled Diesel |
| ECDY | Eddy Current Dynamometer |
| ECU | Electronic Control Unit |
| ED | Electro-Deposited Coating |
| EDIC | Electric Diesel Injection Control |
| EDU | Electronic Driving Unit |
| EFI | Electronic Fuel Injection |
| E/G | Engine |
| EGR-VM | Exhaust Gas Recirculation-Vacuum Modulator |
| ELR | Emergency Locking Retractor |
| ENG | Engine |
| ESA | Electronic Spark Advance |
| ETCS | Electronic Throttle Control System |
| EVP | Evaporator |
| E-VRV | Electric Vacuum Regulating Valve |
| EXH | Exhaust |
| FE | Fuel Economy |
| FF | Front-Engine Front-Wheel-Drive |
| F/G | Fuel Gage |
| FIPG | Formed In Place Gasket |
| FL | Fusible Link |
| F/P | Fuel Pump |
| FPU | Fuel Pressure Up |
| Fr | Front |
| FR | Front-Engine Rear-Wheel-Drive |
| F/W | Flywheel |
| FW/D | Flywheel Damper |
| FWD | Front-Wheel-Drive |
| GAS | Gasoline |
| GSA | Gear Shift Actuator |
| GND | Ground |
| HAC | High Altitude Compensator |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| H/B | Hatchback |
| H–FUSE | High Current Fuse |
| HI | High |
| HID | High Intensity Discharge (Head Lamp) |
| HPU | Hydraulic Power Unit |
| HSG | Housing |
| HT | Hard Top |
| HWS | Heated Windshield System |
| IAC | Idle Air Control |
| IC | Integrated circuit |
| IDI | Indirect Diesel Injection |
| IFS | Independent Front Suspension |
| IG | Ignition |
| IIA | Integrated Ignition Assembly |
| IN | Intake (Manifold Valve) |
| INT | Intermittent |
| I/P | Instrument Panel |
| IRS | Independent Rear Suspension |
| J/B | Junction Block |
| J/C | Junction Connector |
| KD | Kick–Down |
| LAN | Local Area Network |
| LB | Liftback |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| LH | Left–Hand |
| LHD | Left–Hand Drive |
| L/H/W | Length Height Width |
| LLC | Long–Life Coolant |
| LNG | Liquified Natural Gas |
| LO | Low |
| LPG | Liquified Petroleum Gas |
| LSD | Limited Slip Differential |
| LSP & PV | Load Sensing Proportioning And Bypass Valve |
| LSPV | Load Sensing Proportioning Valve |
| MAX | Maximum |
| M–FUSE | Medium Current Fuse |
| MIC | Microphone |
| MIL | Malfunction Indicator Lamp |
| MIN | Minimum |
| MP | Multipurpose |
| MPX | Multiplex Communication System |
| M/T | Manual Transmission (Transaxle) |
| MT | Mount |
| MTG | Mounting |
| N | Neutral |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| NA | Natural Aspiration |
| No | Number |
| O/D | Overdrive |
| OEM | Original Equipment Manufacturing |
| OHC | Overhead Camshaft |
| OHV | Overhead Valve |
| OPT | Option |
| O/S | Oversize |
| P & BV | Proportioning And Bypass Valve |
| PCS | Power Control System |
| PCV | Positive Crankcase Ventilation |
| PKB | Parking Brake |
| PPS | Progressive Power Steering |
| PS | Power Steering |
| PTO | Power Take–Off |
| R & P | Rack And Pinion |
| R/B | Relay Block |
| RBS | Recirculating Ball Type Steering |
| R/F | Reinforcement |
| RFS | Rigid Front Suspension |
| RH | Right–Hand |
| RHD | Right–Hand Drive |
| RLY | Relay |
| ROM | Read Only Memory |
| Rr | Rear |
| RR | Rear–Engine Rear–Wheel Drive |
| RRS | Rigid Rear Suspension |
| RWD | Rear–Wheel Drive |
| SDN | Sedan |
| SEN | Sensor |
| SICS | Starting Injection Control System |
| SMT | Sequential Manual Transmission |
| SOC | State Of Charge |
| SOHC | Single Overhead Camshaft |
| SPEC | Specification |
| SPI | Single Point Injection |
| SRS | Supplemental Restraint System |
| SSM | Special Service Materials |
| SST | Special Service Tools |
| STD | Standard |
| STJ | Cold–Start Fuel Injection |
| SW | Switch |
| SYS | System |
| T/A | Transaxle |
| TACH | Tachometer |
| TBI | Throttle Body Electronic Fuel Injection |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| TC | Turbocharger |
| TCCS | TOYOTA Computer–Controlled System |
| TCV | Timing Control Valve |
| TDC | Top Dead Center |
| TEMP | Temperature |
| TEMS | TOYOTA Electronic Modulated Suspension |
| TIS | Total Information System For Vehicle Development |
| T/M | Transmission |
| TMC | TOYOTA Motor Corporation |
| TMMK | TOYOTA Motor Manufacturing Kentucky Inc |
| TRAC | Traction Control System |
| TURBO | Turbocharge |
| U/D | Underdrive |
| U/S | Undersize |
| VCV | Vacuum Control Valve |
| VENT | Ventilator |
| VIN | Vehicle Identification Number |
| VPS | Variable Power Steering |
| VSC | Vehicle Skid Control |
| VSV | Vacuum Switching Valve |
| VTV | Vacuum Transmitting Valve |
| w/ | With |
| WGN | Wagon |
| W/H | Wire Harness |
| w/o | Without |
| 1st | First |
| 2nd | Second |
| 2WD | Two Wheel Drive Vehicle (4x2) |
| 4WD | Four Wheel Drive Vehicle (4x4) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



N0C 02

# GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE–J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their TOYOTA equivalents

| SAE ABBREVIATIONS | SAE TERMS | TOYOTA TERMS ( )––ABBREVIATIONS |
|---|---|---|
| A/C | Air Conditioning | Air Conditioner |
| ACL | Air Cleaner | Air Cleaner A/CL |
| AIR | Secondary Air Injection | Air Injection (AI) |
| AP | Accelerator Pedal | – |
| B+ | Battery Positive Voltage | +B Battery Voltage |
| BARO | Barometric Pressure | HAC |
| CAC | Charge Air Cooler | Intercooler |
| CARB | Carburetor | Carburetor |
| CFI | Continuous Fuel Injection | – |
| CKP | Crankshaft Position | Crank Angle |
| CL | Closed Loop | Closed Loop |
| CMP | Camshaft Position | Cam Angle |
| CPP | Clutch Pedal Position | – |
| CTOX | Continuous Trap Oxidizer | – |
| CTP | Closed Throttle Position | LL ON Idle ON |
| DFI | Direct Fuel Injection (Diesel) | Direct Injection (DI) |
| DI | Distributor Ignition | – |
| DLC1<br>DLC2<br>DLC3 | Data Link Connector 1<br>Data Link Connector 2<br>Data Link Connector 3 | 1 Check Connector<br>2 Total Diagnosis Comunication Link (TDCL)<br>3 OBD II Diagnostic Connector |
| DTC | Diagnostic Trouble Code | Diagnostic Code |
| DTM | Diagnostic Test Mode | – |
| ECL | Engine Control Level | – |
| ECM | Engine Control Module | Engine ECU (Electronic Control Unit) |
| ECT | Engine Coolant Temperature | Coolant Temperature Water Temperature (THW) |
| EEPROM | Electrically Erasable Programmable Read Only Memory | Electrically Erasable Programmable Read Only Memory (EEPROM)<br>Erasable Programmable Read Only Memory (EPROM) |
| EFE | Early Fuel Evaporation | Cold Mixture Heater (CMH) Heat Control Valve (HCV) |
| EGR | Exhaust Gas Recirculation | Exhaust Gas Recirculation (EGR) |
| EI | Electronic Ignition | TOYOTA Distributorless Ignition (TDI) |
| EM | Engine Modification | Engine Modification (EM) |
| EPROM | Erasable Programmable Read Only Memory | Programmable Read Only Memory (PROM) |
| EVAP | Evaporative Emission | Evaporative Emission Control (EVAP) |
| FC | Fan Control | – |
| FEEPROM | Flash Electrically Erasable Programmable Read Only Memory | – |
| FEPROM | Flash Erasable Programmable Read Only Memory | – |
| FF | Flexible Fuel | – |
| FP | Fuel Pump | Fuel Pump |
| GEN | Generator | Alternator |
| GND | Ground | Ground (GND) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| HO2S | Heated Oxygen Sensor | Heated Oxygen Sensor ($HO_2S$) |
| IAC | Idle Air Control | Idle Speed Control (ISC) |
| IAT | Intake Air Temperature | Intake or Inlet Air Temperature |
| ICM | Ignition Control Module | – |
| IFI | Indirect Fuel Injection | Indirect Injection (IDL) |
| IFS | Inertia Fuel–Shutoff | – |
| ISC | Idle Speed Control | – |
| KS | Knock Sensor | Knock Sensor |
| MAF | Mass Air Flow | Air Flow Meter |
| MAP | Manifold Absolute Pressure | Manifold Pressure<br>Intake Vacuum |
| MC | Mixture Control | Electric Bleed Air Control Valve (EBCV)<br>Mixture Control Valve (MCV)<br>Electric Air Control Valve (EACV) |
| MDP | Manifold Differential Pressure | – |
| MFI | Multiport Fuel Injection | Electronic Fuel Injection (EFI) |
| MIL | Malfunction Indicator Lamp | Check Engine Lamp |
| MST | Manifold Surface Temperature | – |
| MVZ | Manifold Vacuum Zone | – |
| NVRAM | Non–Volatile Random Access Memory | – |
| O2S | Oxygen Sensor | Oxygen Sensor $O_2$ Sensor ($O_2S$) |
| OBD | On–Board Diagnostic | On–Board Diagnostic System (OBD) |
| OC | Oxidation Catalytic Converter | Oxidation Catalyst Convert (OC) CCo |
| OP | Open Loop | Open Loop |
| PAIR | Pulsed Secondary Air Injection | Air Suction (AS) |
| PCM | Powertrain Control Module | – |
| PNP | Park/Neutral Position | – |
| PROM | Programmable Read Only Memory | – |
| PSP | Power Steering Pressure | – |
| PTOX | Periodic Trap Oxidizer | Diesel Particulate Filter (DPF)<br>Diesel Particulate Trap (DPT) |
| RAM | Random Access Memory | Random Access Memory (RAM) |
| RM | Relay Module | – |
| ROM | Read Only Memory | Read Only Memory (ROM) |
| RPM | Engine Speed | Engine Speed |
| SC | Supercharger | Supercharger |
| SCB | Supercharger Bypass | E–ABV |
| SFI | Sequential Multiport Fuel Injection | Electronic Fuel Injection (EFI) Sequential Injection |
| SPL | Smoke Puff Limiter | – |
| SRI | Service Reminder Indicator | – |
| SRT | System Readiness Test | – |
| ST | Scan Tool | – |
| TB | Throttle Body | Throttle Body |
| TBI | Throttle Body Fuel Injection | Single Point Injection<br>Central Fuel Injection (CI) |
| TC | Turbocharger | Turbocharger |
| TCC | Torque Converter Clutch | Torque Converter |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| TCM | Transmission Control Module | Transmission ECU ECT ECU |
| TP | Throttle Position | Throttle Position |
| TR | Transmission Range | – |
| TVV | Thermal Vacuum Valve | Bimetallic Vacuum Switching Valve (BVSV)<br>Thermostatic Vacuum Switching Valve (TVSV) |
| TWC | Three–Way Catalytic Converter | Three–Way Catalytic (TWC)<br>Manifold Converter<br>$CC_{RO}$ |
| TWC+OC | Three–Way + Oxidation Catalytic Converter | $CC_R$ + CCo |
| VAF | Volume Air Flow | Air Flow Meter |
| VR | Voltage Regulator | Voltage Regulator |
| VSS | Vehicle Speed Sensor | Vehicle Speed Sensor |
| WOT | Wide Open Throttle | Full Throttle |
| WU–OC | Warm Up Oxidation Catalytic Converter | – |
| WU–TWC | Warm Up Three–Way Catalytic Converter | – |
| 3GR | Third Gear | – |
| 4GR | Fourth Gear | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

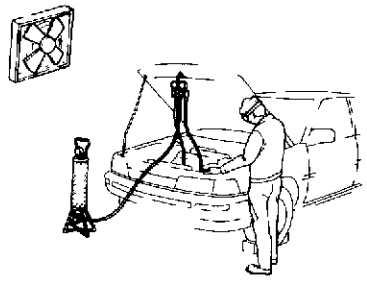
Brought to you by BirfMark



# AIR CONDITIONING SYSTEM

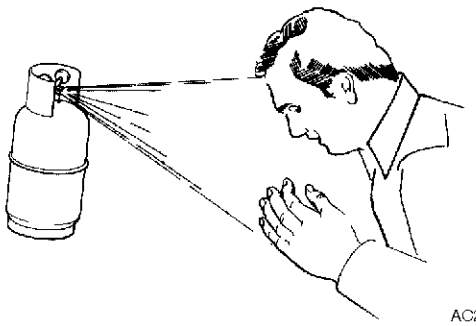
AC2 QA -01

## PRECAUTION



AC2810

1. **DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME**
2. **ALWAYS WEAR EYE PROTECTION**



AC2811

3. **BE CAREFUL THAT LIQUID REFRIGERANT DOES NOT GET IN YOUR EYES OR ON YOUR SKIN**

If liquid refrigerant gets in your eyes or on your skin

(a) Wash the area with lots of cool water

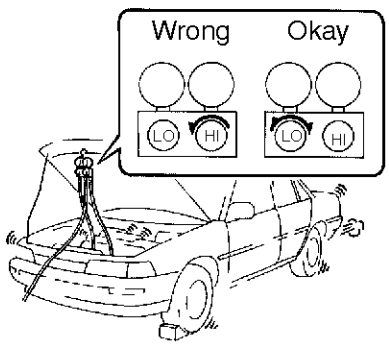
**CAUTION:**

**Do not rub your eyes or skin.**

(b) Apply clean petroleum jelly to the skin

(c) Go immediately to a physician or hospital for professional treatment

4. **NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME**
5. **BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT**




N11084

6. **DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERANT SYSTEM**

If there is not enough refrigerant in the refrigerant system oil lubrication will be insufficient and compressor burnout may occur, so take care to avoid this

7. **DO NOT OPEN HIGH PRESSURE MANIFOLD VALVE WHILE COMPRESSOR IS OPERATING**

If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylinder to rupture, so open and close the only low pressure valve

8. **BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT**

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating etc



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 9. SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The LAND CRUISER ıs equıpped wıth an SRS (Spplemental Restraınt System)such as the drıver aırbag and passenger aır bag Faılure to carry out servıce operatıons ın the correct sequence could cause the SRS to unexpectedly deployed durıng servıcıng, possıbly leadıng to a serıous accıdent Further, ıf a mıstake ıs made ın servıcıng the SRS, ıt ıs possıble the SRS may faıl to operate when requıred Before servıcıng (ıncludıng removal or ınstallatıon of parts, ınspectıon or replacement), be sure to read the followıng ıtem carefully, then follow the correct procedure descrıbed ın the repaır manual



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2 QC 03

# PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem The numbers indicate the priority of the likely cause of the problem Check each part in order If necessary, replace these parts

| Symptom | Suspect Area | See page |
|---|---|---|
| No blower operation | 4 HTR Fuse | – |
| | 5 Heater main relay | AC-64 |
| | 6 Blower motor | AC-52 |
| | 7 Blower resistor | AC-57 |
| | 8 Blower speed control switch | AC-69 |
| | 9 Wire harness | – |
| No air temperature control | 1 Engine coolant volume | – |
| | 2 A/C control assembly | AC-69 |
| | 3 Water valve | AC-49 |
| No compressor operation | 1 Refrigerant volume | AC-5 |
| | 2 A C Fuse | – |
| | 3 Magnetic clutch | AC-33 |
| | 4 Compressor | AC-33 |
| | 5 Pressure switch | AC-61 |
| | 6 Heater main relay | AC-64 |
| | 7 Blower speed control switch | AC-69 |
| | 8 A/C switch | AC-69 |
| | 9 A/C amplifier | AC-74 |
| | 10 Thermistor | AC-60 |
| | 11 Wire harness | – |
| Compressor operates intermitently | 1 Refrigerant volume | AC-5 |
| | 2 Pressure switch | AC-61 |
| | 3 A/C amplifier | AC-74 |
| | 4 Thermistor | AC-60 |
| | 5 Wire harness | – |
| No cool air comes out | 1 Refrigerant volume | AC-5 |
| | 2 Refrigerant pressure | AC-5 |
| | 3 Drive belt | AC-15 |
| | 4 Magnetic clutch | AC-33 |
| | 5 Compressor | AC-33 |
| | 6 Pressure switch | AC-61 |
| | 7 Thermistor | AC-60 |
| | 8 A/C switch | AC-69 |
| | 9 A/C amplifier | AC-74 |
| | 10 A/C control assembly | AC-69 |
| | 11 Wire harness | – |
| Cool air comes out only at high engine rpm | 1 Refrigerant volume | AC-5 |
| | 2 Drive bel | AC-15 |
| | 3 Magnetic clutch | AC-33 |
| | 4 Compressor | AC-33 |
| | 5 Condenser | AC-42 |
| | 6 Receiver | AC-39 |
| | 7 Expansion valve | AC-47 |
| | 8 Evaporator | AC-45 |
| | 9 Thermistor | AC-60 |
| | 10 A/C amplifier | AC-74 |
| | 11 Wire harness | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Insufficient cooling | 1 Refrigerant volume | AC–5 |
| | 2 Drive belt | AC–15 |
| | 3 Magnetic clutch | AC–33 |
| | 4 Compressor | AC–33 |
| | 5 Condenser | AC–42 |
| | 6 Receiver | AC–39 |
| | 7 Expansion valve | AC–47 |
| | 8 Evaporator | AC–45 |
| | 9 Refrigerant line | AC–20 |
| | 10 Pressure switch | AC–61 |
| | 11 A/C amplifier | AC–74 |
| | 12 A/C control assembly | AC–69 |
| No engine idle up when A/C switch ON | 1 A/C amplifier | AC–74 |
| | 2 ECM | – |
| | 3 Wire harness | – |
| No warm air comes out | 1 Engine coolant volume | – |
| | 2 A/C control assembly | AC–69 |
| | 3 Water valve | AC–49 |
| | 4 Heater radiator | AC–46 |
| A/C indicator does not light up when mode lever at DEF position | 1 Defroster mode switch | AC–69 |
| | 2 A/C switch | AC–69 |
| | 3 Wire harness | – |

## Rear heater:

| Symptom | Suspect Area | See page |
|---|---|---|
| No blower operation | 1 RR HTR Fuse | – |
| | 2 Rear heater relay | AC–65 |
| | 3 Rear heater switch | AC–77 |
| | 4 Rear blower motor | AC–55 |
| | 5 Rear blower resistor | AC–58 |
| No warm air come out | 1 Engine coolant volume | – |
| | 2 Rear heater radiator | AC–46 |



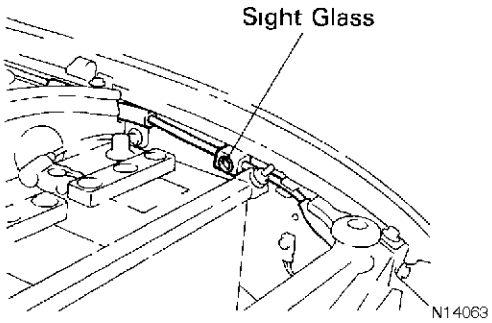
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QD 01

# ON-VEHICLE INSPECTION




## 1. INSPECT REFRIGERANT VOLUME

Observe the sight glass on the liquid tube

Test conditions

- Running engine at 1,500 rpm
- Blower speed control switch set at "HI"
- A/C switch ON
- Temperature control set at "MAX COOL"
- Fully open doors

| Item | Symptom | Amount of refrigerant | Remedy |
|---|---|---|---|
| 1 | Bubbles present in sight glass | Insufficient* | 1 Check for gas leakage with gas leak tester and repair if necessary<br>2 Add refrigerant until bubbles disappear |
| 2 | No bubbles present in sight glass | None sufficient or too much | Refer to items 3 and 4 |
| 3 | No temperature difference between compressor inlet and outlet | Empty or nearly empty | 1 Check for gas leakage with gas leak tester and repair if necessary<br>2 Add refrigerant until bubbles disappear |
| 4 | Temperature between compressor inlet and outlet is noticeably different | Correct or too much | Refer to items 5 and 6 |
| 5 | Immediately after air conditioning is turned off refrigerant in sight glass stays clear | Too much | 1 Discharge refrigerant<br>2 Evacuate air and charge proper amount of purified refrigerant |
| 6 | When air conditioning is turned off refrigerant foams and then stays clear | Correct | – |

* Bubbles in the sight glass with ambient temperatures higher than usual can be considered normal if cooling is sufficient

## 2. INSPECT REFRIGERAT PRESSURE WITH MANIFOLD GAUGE SET

This is a method in which the trouble is located by using a manifold gauge set Read the manifold gauge pressure when the these conditions are established

Test conditions

- Temperature at the air inlet with the switch set at RECIRC is 30 – 35°C (86 – 95°F)
- Engine running at 1,500 rpm
- Blower speed control switch set at high
- Temperature control set at max cool

HINT

It should be noted that the gauge indications may vary slightly due to ambient temperature conditions

(1) Normally functioning refrigeration system

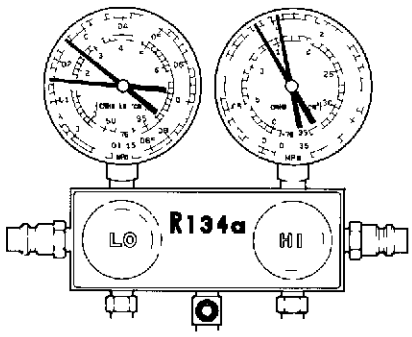
**Gauge reading:**

**Low pressure side:**

**0.15 – 0.25 MPa (1.5 – 2.5 kgf/cm$^2$)**

**High pressure side:**

**1.37 – 1.57 MPa (14 – 15 kgf/cm$^2$)**




I01386



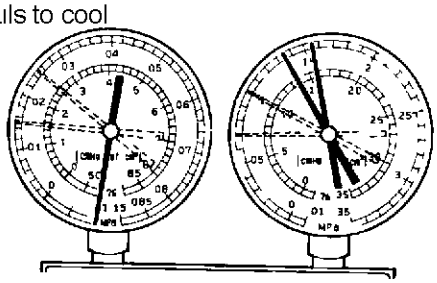
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## (2) Moisture present in refrigeration system

Condition Periodically cools and then fails to cool

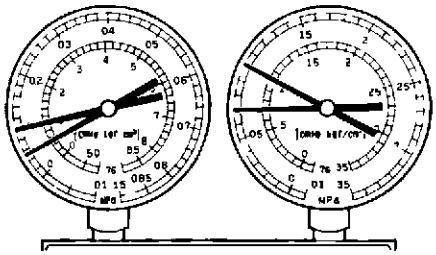


I01387

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| During operation pressure on low pressure side sometimes become a vacuum and sometime normal | Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle but normal state is restored after a time when the ice melts | • Drier in oversaturated state<br>• Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant | (1) Replace condenser<br>(2) Remove moisture in cycle through repeatedly evacuating air<br>(3) Charge proper amount of new refrigerant |

## (3) Insufficient cooling

Condition Insufficient cooling



I01388

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure low on both low and high pressure sides<br>• Bubbles seen in sight glass continuously<br>• Insufficient cooling performance | Gas leakage at some place in refrigeration system | • Insufficient refrigerant in system<br>• Refrigerant leaking | (1) Check for gas leakage with gas leak detector and repair if necessary<br>(2) Charge proper amount of refrigerant<br>(3) If indicated pressure value is near 0 when connected to gauge create the vacuum after inspecting and repairing the location of the leak |



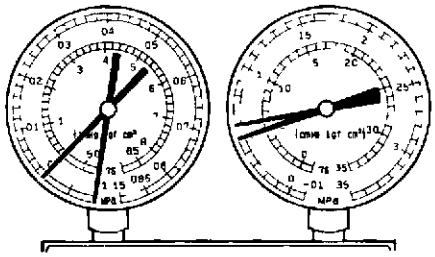
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## (4) Poor circulation of refrigerant

Condition Insufficient cooling

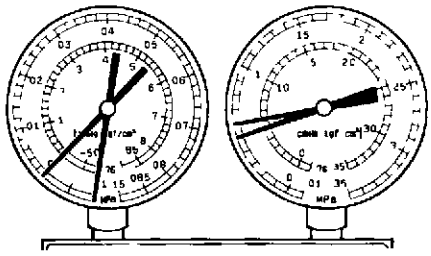


I01389

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure low in both low and high pressure sides<br>• Frost on tube from condenser to unit | Refrigerant flow obstructed by dirt in condenser | condenser clogged | Replace condenser |

## (5) Refrigerant does not circulate

Condition Does not cool (Cools from time to time in some cases)



I01449

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Vacuum indicated on low pressure side very low pressure indicated on high pressure side<br>• Frost or dew seen on piping before and after condenser/ drier or expansion valve | • Refrigerant flow obstructed by moisture or dirt in refrigeration system<br>• Refrigerant flow obstructed by gas leakage from expansion valve | Refrigerant does not circulate | (1) Check expansion valve<br>(2) Clean out dirt in expansion valve by blowing with air<br>(3) Replace condenser<br>(4) Evacuate air and charge new refrigerant to proper amount<br>(5) For gas leakage from expansion valve replace expansion valve |



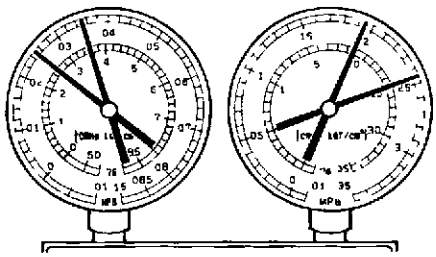
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## (6) Refrigerant overcharged or insufficient cooling of condenser

Condition Insufficient cooling

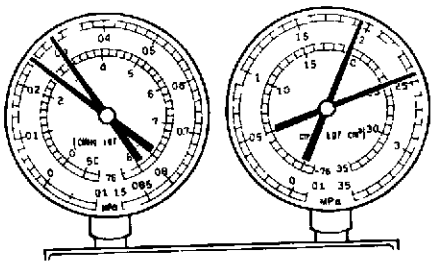


I01390

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure too high on both low and high pressure sides<br>• No air bubbles seen through the sight glass even when the engine rpm is lowered | • Unable to develop sufficient performance due to excessive refrigeration system<br>• Insufficient cooling of condenser | • Excessive refrigerant in cycle → refrigerant over charged<br>• Condenser cooling → condenser fins clogged or cooling fan faulty | (1) Clean condenser<br>(2) Check cooling fan with fluid coupling operation<br>(3) If (1) and (2) are in normal state check amount of refrigerant Charge proper amount of refrigerant |

## (7) Air present in refrigeration system

Condition Insufficient cooling



NOTE These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging

I01392

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure too high on both low and high pressure sides<br>• The low pressure piping hot to touch<br>• Bubbles seen in sight glass | Air entered in refrigeration system | • Air present in refrigeration system<br>• Insufficient vacuum purging | (1) Check compressor oil to see if it is dirty or insufficient<br>(2) Evacuate air and charge new refrigerant |



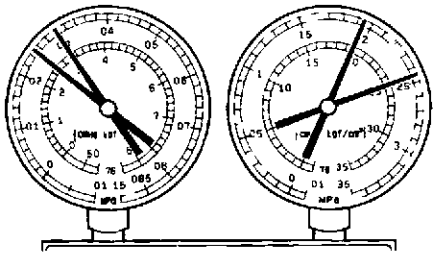
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## (8) Expansion valve improperly

Condition Insufficient cooling

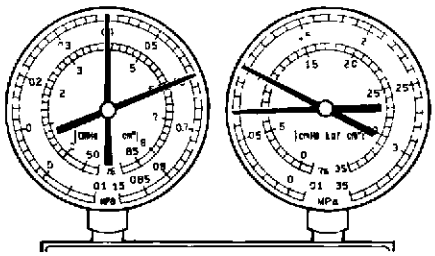


I01450

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure too high on both low and high pressure sides<br>• Frost or large amount of dew on piping on low pressure side | Trouble in expansion valve | • Excessive refrigerant in low pressure piping<br>• Expansion valve opened too wide | Check expansion valve<br>Replace if defective |

## (9) Defective compression compressor

Condition Does not cool



I01393

| Symptom seen in refrigeration system | Probable cause | Diagnosis | Remedy |
|---|---|---|---|
| • Pressure too high on low and high pressure sides<br>• Pressure too low on high pressure side | Internal leak in compressor | • Compression defective<br>• Valve leaking or broken sliding parts | Repair or replace compressor |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



### 3. INSPECT IDLE–UP SPEED

(a) Warm up engine

(b) Inspect idle–up speed when the these conditions are established

- Blower switch HI
- Electrical load OFF
- A/C switch ON
- Put gear shift in neutral

| Magnetic clutch condition | Idle speed |
|---|---|
| Magnetic clutch not engaged | 650 ± 50 rpm |
| Magnetic clutch engaged | 800 ± 50 rpm |

If idle speed is not as specified, check the IAC valve and air intake system

### 4. INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Perform in these conditions

- Stop engine
- Secure good ventilation (If not, the gas leak detector may react to volatile gases which are not refrigerant, such as evaporated gasoline and exhaust gas )
- Repeat the test 2 or 3 times
- Make sure that there is some refrigerant remaining in the refrigeration system
  When compressor is OFF approximately 392 – 588 KPa (4 – 6 kgf/cm$^2$, 57 – 35 psi)

(b) Bring the gas leak detector close to the drain hose before performing the test

HINT

- After the blower motor is stopped, leave the cooling unit for more than 15 minutes
- Expose the gas leak detector sensor the under the drain hose
- When bring the gas leak detector close to the drain hose, make sure that the gas leak detector does not react to the volatile gases

If such reaction is unavoidable, the vehicle must be lifted up

(c) If gas leak is not detected on the drain hose, remove the power transistor from the cooling unit Then insert the gas leak detector sensor into the unit and perform the test

(d) Disconnect the connector and leave the pressure switch for approximately 20 minutes Then bring the gas leak detector close to the pressure switch and perform the test

(e) Bring the gas leak detector close to the refrigerant lines and perform the test



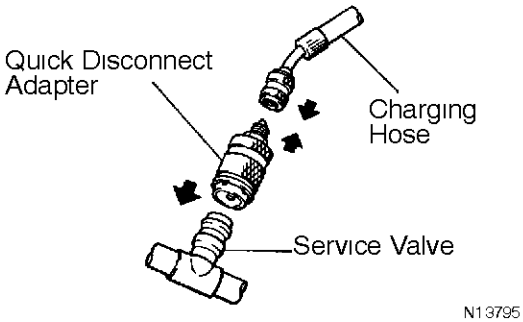
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2 QE-01

# EVACUATING



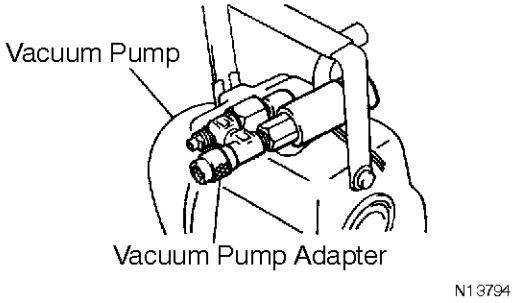

**1. CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES**

**2. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINES**

**3. INSTALL MANIFOLD GAUGE SET**

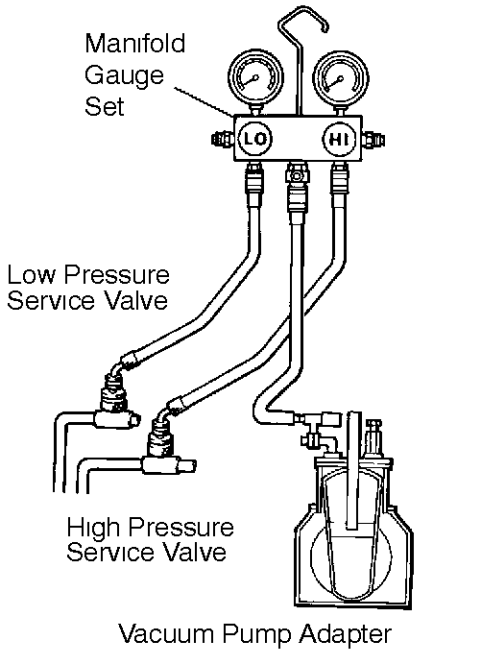
(a) Close both hand valves of manifold gauge set

(b) Connect the quick disconnect adapters to the service valves




**4. EVACUATE AIR FROM REFRIGERATION SYSTEM**

(a) Connect the vacuum pump adapter to the vacuum pump




(b) Connect the center hose of the manifold gauge set to the vacuum pump adapter

(c) Open both the high and low hand valves and run the vacuum pump

(d) After 10 minutes or more, check that the low pressure gauge indicates 750 mmHg (30 in Hg) or more

HINT

If the reading is not 750 mmHg (30 in Hg) or more, close both hand valves of manifold gauge set and stop the vacuum pump Check the system for leaks and repair as necessary

(e) Close both the high and low hand valves and stop the vacuum pump

(f) Leave the system in this condition for 5 minutes or more and check that there is no gauge indicator



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QF 01

# CHARGING

## 1. INSTALL CHARGING CYLINDER

HINT

When handling the charging cylinder, always follow the direction given in the instruction manual

(a) Charge the proper amount of refrigerant in charging cylinder

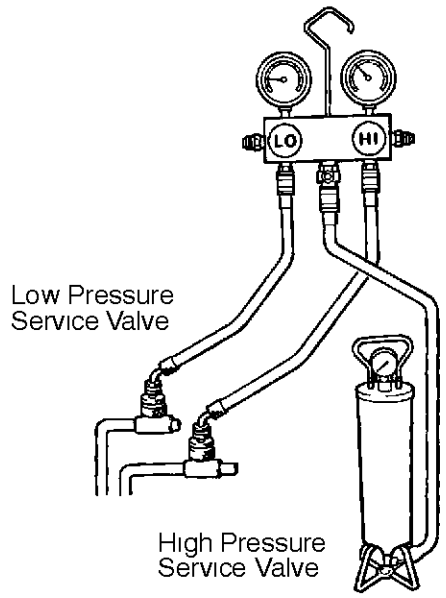
(b) Connect the center hose to the charging cylinder

**CAUTION:**

**Do not open both high and low hand valves of manifold gauge set.**

(c) Open the valve of charging cylinder

(d) Press the valve core on the side of manifold gauge and expel the air inside of the center hose




N13790

## 2. INSPECT REFRIGERATION SYSTEM FOR LEAKS

(a) Open the high pressure hand valve and charge refrigerant

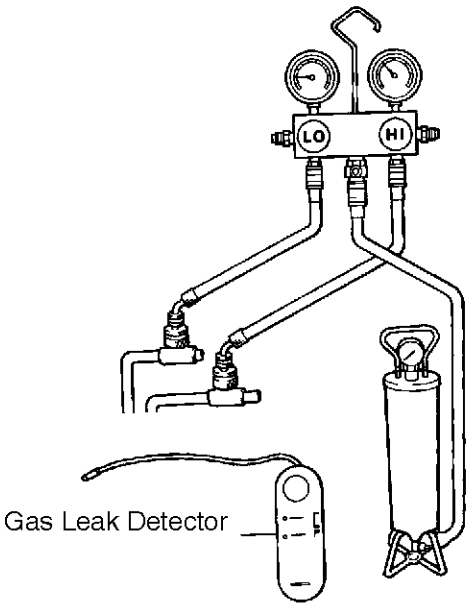
(b) When the low pressure gauge indicates 98 kPa (1 kgf/cm$^2$, 14 psi), close the high pressure hand valve

(c) Using leak detector, check the system for leakage

(d) If leak is found, repair the faulty component or connection
Add evacuate air from refrigeration system (Refer to 4)

**CAUTION:**

**Use the refrigerant recovery/ recycling machine to recover the refrigerant whenever replacing parts.**




N13792



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# AUTOMATIC TRANSMISSION SYSTEM

ATOSY 01

## PRECAUTION

If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**3. CHARGE REFRIGERANT INTO REFRIGERANT SYSTEM**

If there is no leak after refrigerant leak check charge, the proper amount of refrigerant into refrigeration system

**CAUTION:**

**Never run the engine when charging the system through the high pressure side.Do not open the low pressure hand valve when the system is being charged with liquid refrigerant.**

(a) Open the high pressure hand valve fully

(b) Charge specified amount of refrigerant, then close the high pressure hand valve

HINT

A fully charged system is indicated by the sight glass being free of any bubbles

**4. REMOVE MANIFOLD GAUGE SET**

(a) Close both hand valves of manifold gauge set

(b) Disconnect the quick disconnect adapters from the service valves

**5. INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINES**



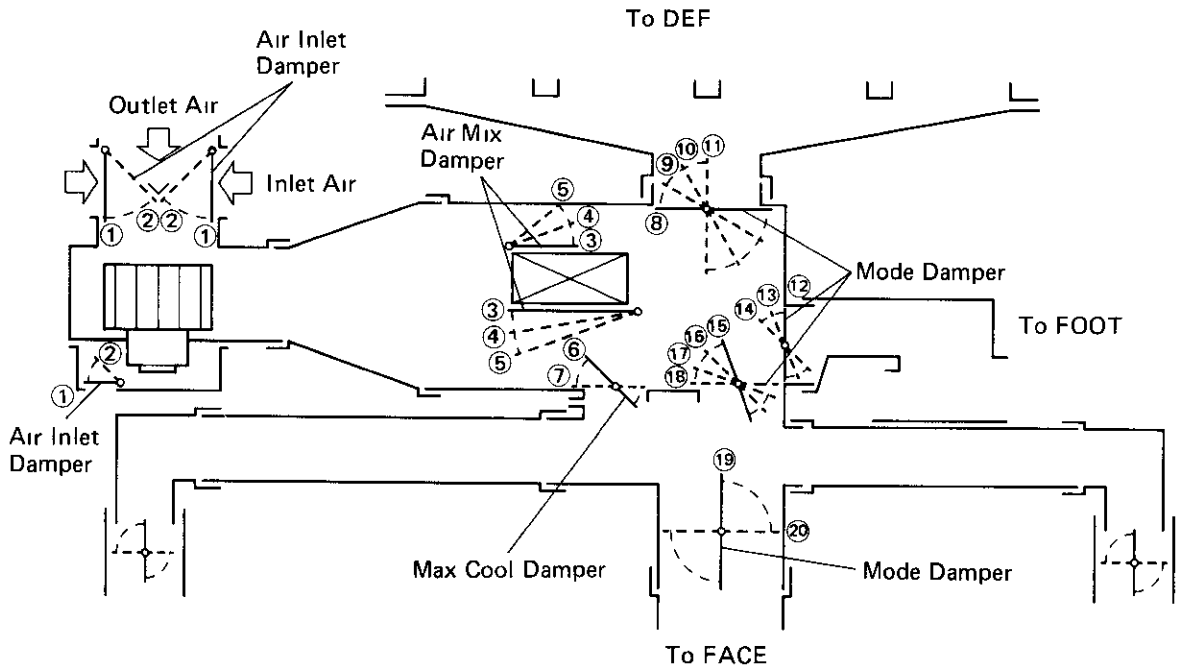
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QB-01

# POSITIONING




| A/C control lever | A/C control lever position | Dampers position | Air flow vents | | | |
|---|---|---|---|---|---|---|
| | | | FACE | | FOOT | DEF |
| | | | Center | Side | | |
| Air Inlet Control Lever | Fresh | ① | | | | |
| | Recirc | ② | | | | |
| Temperature Control Lever | Warm ⇕ Cool | ⑤ ⇕ ④ ⑦ ⇕ ⇕ ③ ⑥ | | | | |
| Mode Control Lever | Def. | ⑪ ⑫ ⑰ ⑳ | | ○ | | ◯ |
| | Foot/Def. | ⑩ ⑰ ⑳ ⑬ | | ○ | ○ | ○ |
| | Foot | ⑨ ⑭ ⑱ ⑳ | | ○ | ◯ | ○ |
| | Bi-Level | ⑧ ⑬ ⑯ ⑲ | ○ | ○ | ○ | |
| | Face | ⑧ ⑫ ⑮ ⑲ | ◯ | ◯ | | |

The size of circle (○) indicates the proportion of the air flow volume.

AC2662
0001BE

Z04523



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# DRIVE BELT

AC2QG-01

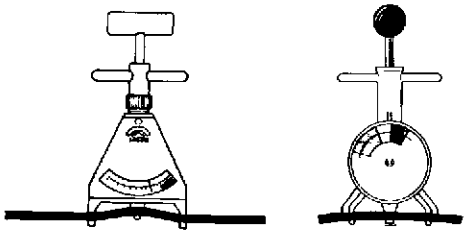
## ON–VEHICLE INSPECTION

Correct Wrong

CH0086

### 1. INSPECT DRIVE BELT'S INSTALLATION CONDITION

Check that drive belt fits properly in the ribbed groves




N01881

### 2. INSPECT DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension

**Belt tension gauge:**

**DENSO BTG–20 (95506–00020) or**

**Borroughs No. BT–33–73F**

**Drive belt tension:**

**New belt 100–150 lbf**

**Used belt 60–100 lbf**

HINT

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine
- "Used belt" refers to a belt which has been on a running engine for 5 minutes or more
- After installing the drive belt, check that it fits properly in the ribbed grooves

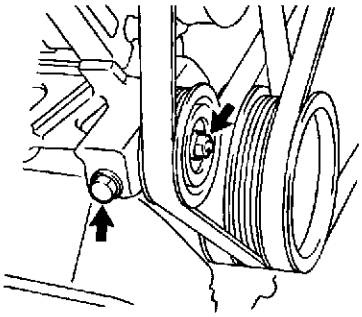


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2GH 01



N16451

# REMOVAL

1. **LOOSEN IDLE PULLEY LOCK NUT**
   **Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**
2. **REMOVE COMPRESSOR DRIVE BELT**

Loosen the adjusting bolt and remove the drive belt



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QI 01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC–16).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

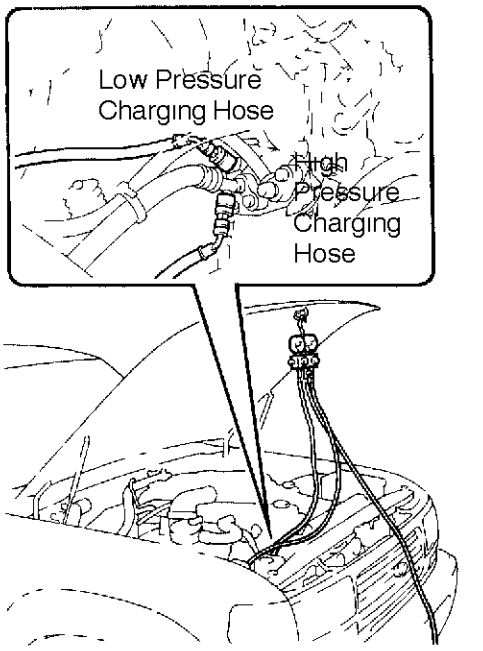
Brought to you by BirfMark



# MANIFOLD GAUGE SET

AC2QJ-01

## SET ON




N14326

1. **CONNECT CHARGING HOSES TO MANIFOLD GAUGE SET**

Tighten the nuts by hand

**CAUTION:**

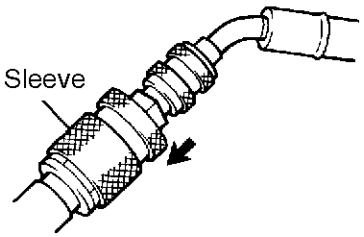
**Do not connect the wrong hoses.**

2. **CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES**

Tighten the nuts by hand

3. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**

4. **REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE**




N04392

5. **CONNECT QUICK DISCONNECT ADAPTERS TO SERVICE VALVES**

HINT

Push the quick disconnect adapter onto the service valve, then slide the sleeve of the quick disconnect adapter downward to lock it

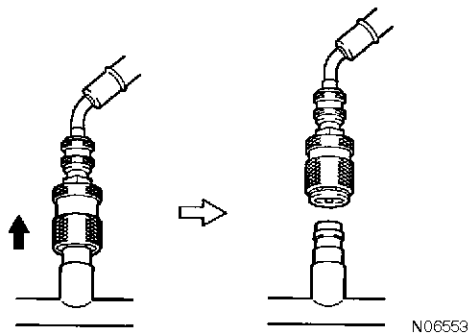


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QK-01



N06553

# SET OFF

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# REFRIGERANT LINE

AC2QM-01

## ON–VEHICLE INSPECTION

### 1. INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS

### 2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant



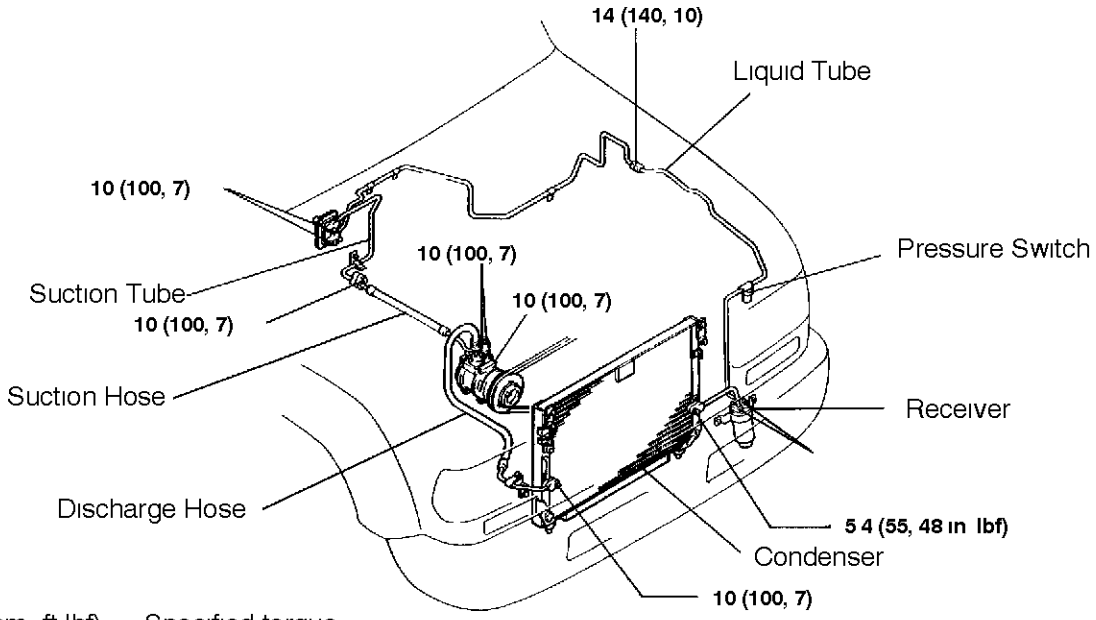
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QL 01

# LOCATION




N·m (kgf·cm, ft·lbf) Specified torque
◆ Non–reusable part

N14066

Z17947



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QN 01

# REPLACEMENT

1. DISCHARGE REFRIGERANT IN REFRIGERATION SYSTEM
2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TORQUE CONNECTIONS TO SPECIFIED TORQUE

NOTICE:

Connections should not be torqued tighter than the specified torque.

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Compressor x Discharge hose | 10 | 100 | 7 |
| Compressor x Suction hose | 10 | 100 | 7 |
| Condenser x Discharge hose | 10 | 100 | 7 |
| Condenser x Liquid tube | 10 | 100 | 7 |
| Reciever x Liquid tube | 5.4 | 55 | 48 in. lbf |
| Pressure switch x Liquid tube | 10 | 100 | 7 |
| Cooling unit x Liquid tube | 10 | 100 | 7 |
| Expansion valve x Evaporator | 5.4 | 55 | 48 in. lbf |
| Cooling unit x Suction tube | 10 | 100 | 7 |
| Liquid tube (Piping joint) | 14 | 140 | 10 |
| Suction line (Block joint) | 10 | 100 | 7 |

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT
   Specified amount: 850 ± 50 g (29.98 ± 1.76 oz.)
5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant

If there is leakage, check the tightening torque at the joints

6. INSPECT AIR CONDITIONING OPERATION



Brought to you by BirfMark
Version 1.11 - 03/16/2010

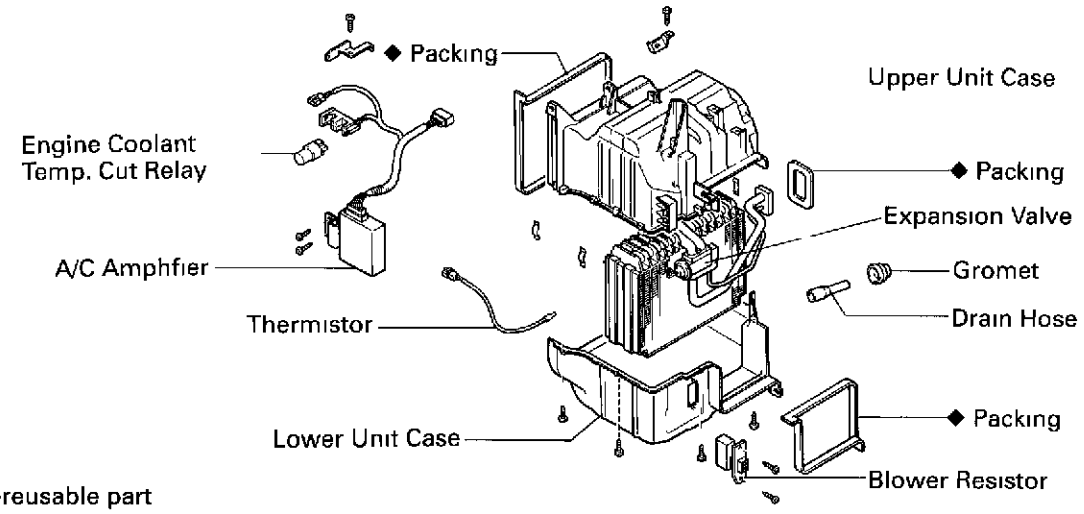
Brought to you by BirfMark



# COOLING UNIT

## COMPONENTS

AC3JL 01




◆ Non-reusable part

N14361



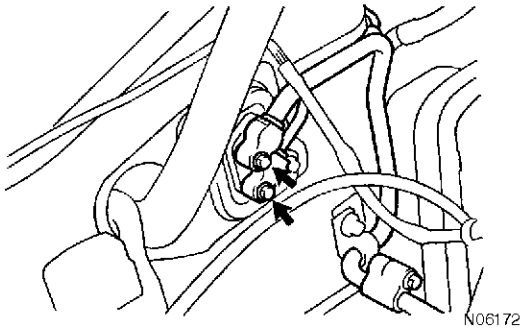
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2 QO-03

# REMOVAL


N06172

**1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**

HINT

At the tıme of ınstallatıon, refer to the followıng procedure

- Evacuate aır from refrıgeratıon system
- Charge system wıth refrıgerant and ınspect for leakage of refrıgerant

**Specified amount:**

**850 ± 50 g (29.98 ± 1.76 oz.)**

**2. DISCONNECT SUCTION TUBE AND LIQUID TUBE FROM COOLING UNIT FITTING**

Remove the 2 bolts and both tubes

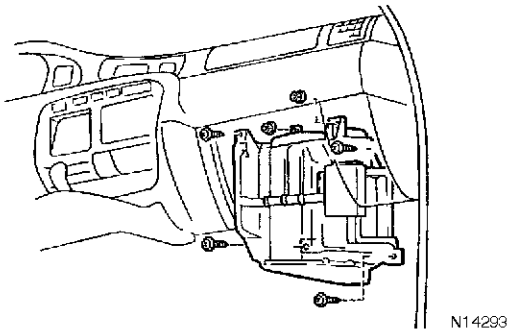
**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

**NOTICE:**

**Cap the open fittings immediately to keep moisture or dirt out of the system.**

HINT

At the tıme of ındtallatıon, lubrıcate 2 new O–rıngs wıth compressor oıl and ınstall the tubes


N14293

**3. REMOVE THESE PARTS:**

(a) Glove compratment door (See page BO–76)

(b) Glove compratment door reınforcement (See page BO–76)

**4. REMOVE COOLING UNIT**

(a) Dısconnect the connectors

(b) Remove the 4 screws, 2 nuts and coolıng unıt



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QP-01

# DISASSEMBLY

**1. REMOVE A/C AMPLIFIER**

**2. REMOVE RELAY**

**3. REMOVE WIRE HARNESS**

**4. REMOVE BLOWER RESISTOR**

Remove the 2 screws and blower resistor

**5. SEPARATE UPPER AND LOWER UNIT CASES**

(a) Using a knife, cut off the each packing

(b) Remove 3 clips and 4 screws

(c) Separate the upper and lower unit cases

**6. REMOVE EVAPORATOR FROM LOWER UNIT CASE**

HINT

If the evaporator was replaced, add compressor oil to the compressor

**Add 40 cc (1.4 fl.oz.)**
**Compressor oil:**
**ND–OIL 8 or equivalent**

**7. REMOVE THERMISTOR**

Pull out the thermistor from the evaporator

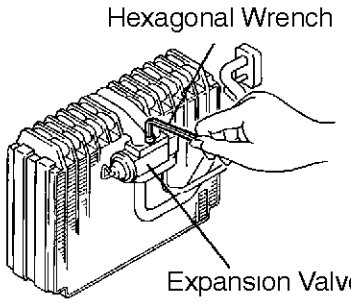
**8. REMOVE EXPANSION VALVE**

Using a hexagon wrench, remove the 2 bolts and separate the expansion valve and evaporator

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

HINT

At the time of reassembly, lubricate 4 new O–rings with compressor oil and install the tubes




N06174



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QQ-01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page AC-25).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QR 01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC–24).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# HEATER UNIT

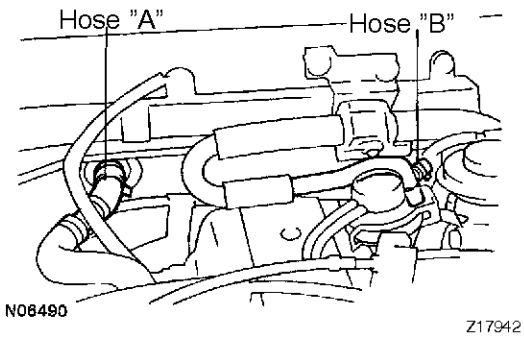
AC2QS-01

## REMOVAL

1. **REMOVE COOLING UNIT (See page AC-24)**
2. **DRAIN ENGINE COOLANT FROM RADIATOR**

HINT

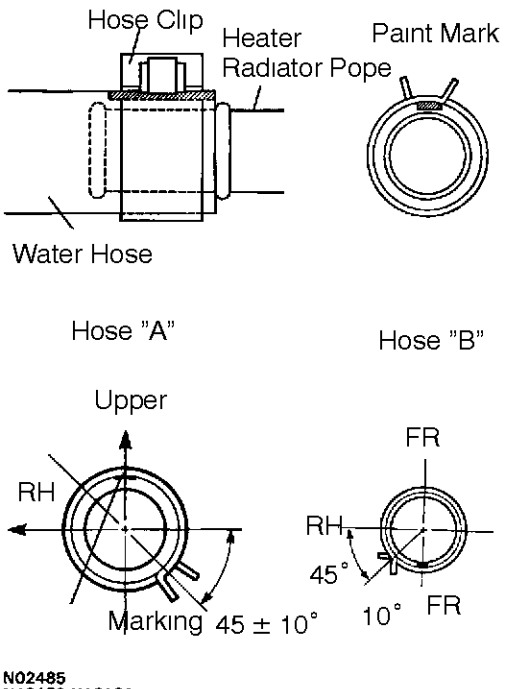
It is not necessary to drain out all the coolant




3. **DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES**

(a) Grip the claws of the hose clip with pliers and slide the clip along the hose to a place where it does not clamp the hose to the pipe

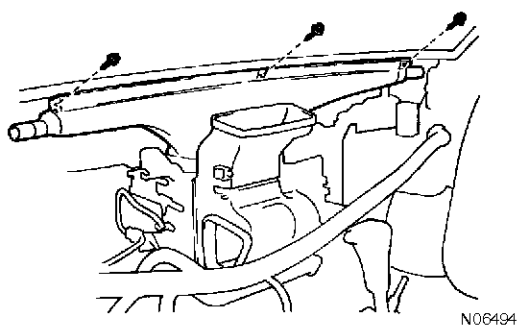
(b) Disconnect the water hoses




HINT

- Push the water hose onto the heater radiator pipe as far as the ridge on the pipe
- Install the hose clip in a position, as shown in the illustration

4. **REMOVE PIPE GROMMETS**
5. **REMOVE INSTRUMENT PANEL SAFETY PAD (See page BO-76)**
6. **REMOVE INSTRUMENT PANEL REINFORCEMENT (See page BO-76)**




7. **REMOVE HEATER UNIT**

(a) Remove the 3 screws and defroster nozzle

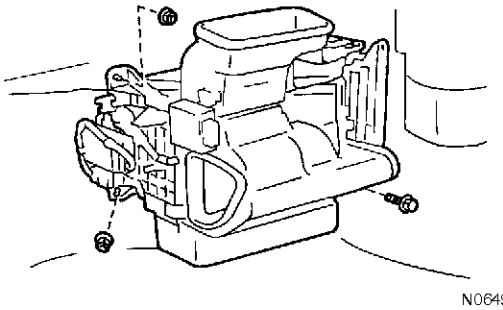


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) Remove the 2 nuts and a screw, then remove heater unit



N06495



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2QV–01

# INSTALLATION

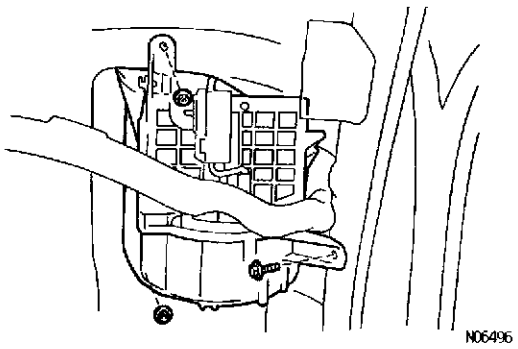
**Installation is in the reverse order of removal (See page AC–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# BLOWER UNIT

AC2R1-03

## REMOVAL

1. **REMOVE INSTRUMENT PANEL AND REINFORCEMENT (See page BO–76)**
2. **REMOVE COOLING UNIT (See page AC–24)**
3. **REMOVE BLOWER UNIT**

(a) Disconnect the connectors

(b) Remove the bolt and 2 nuts, then remove the blower unit



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2R4-01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC-31).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COMPRESSOR AND MAGNETIC CLUTCH

AC2R5-01

## ON–VEHICLE INSPECTION

1. **INSTALL MANIFOLD GAUGE SET (See page AC–18)**
2. **START ENGINE**

Run the engine at 1,500 rpm

3. **INSPECT COMPRESSOR FOR METALLIC SOUND**

Check if there is a metallic sound from the compressor when the A/C switch is on

If metallic sound is heard, replace the compressor assembly

4. **INSPECT REFRIGERANT PRESSURE (See page AC–5)**
5. **STOP ENGINE**
6. **INSPECT VISUALLY FOR LEAKAGE OF REFRIGERANT FROM SAFETY SEAL**

Using a gas leak detector, check for leakage of refrigerant

If there is any leakage, replace the compressor assembly

7. **REMOVE MANIFOLD GAUGE SET (See page AC–19)**
8. **MAKE THESE VISUAL CHECKS:**

(a) Leakage of grease from the clutch bearing

(b) Signs of oil on the pressure plate or rotor

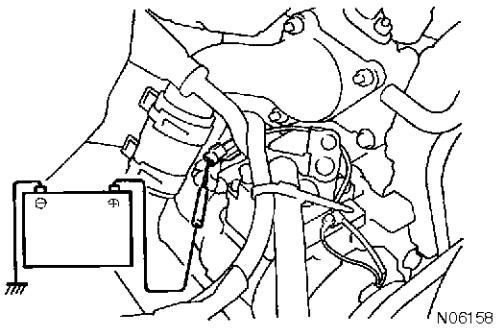
Repair or replace, as necessary

9. **INSPECT MAGNETIC CLUTCH BEARING FOR NOISE**

(a) Start engine

(b) Check for abnormal noise from near the compressor when the A/C switch is OFF

If abnormal noise is being emitted, replace the magnetic clutch



N06158

10. **INSPECT MAGNETIC CLUTCH**

(a) Disconnect the connector from the magnetic clutch

(b) Connect the positive (+) lead from the battery to the terminal on the magnetic clutch connector and the negative (–) lead to the body ground

(c) Check that the magnetic clutch is energized

If operation is not as specified, replace the magnetic clutch



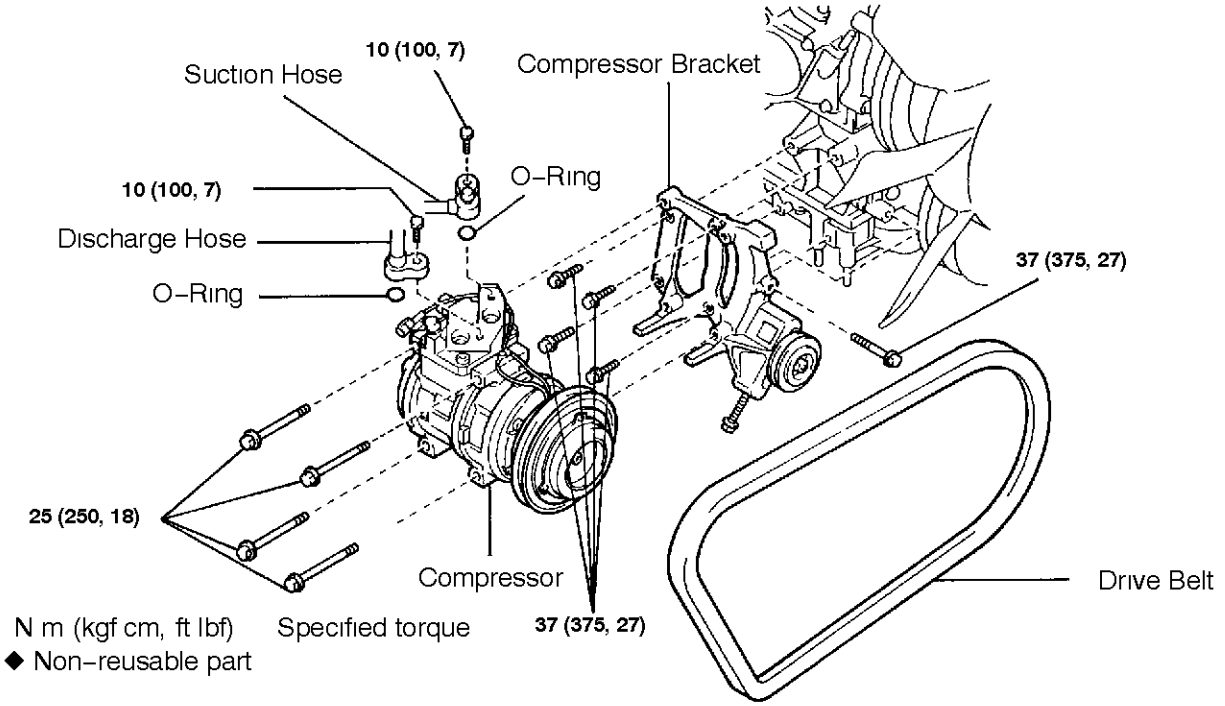
Author : Date : 1360
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



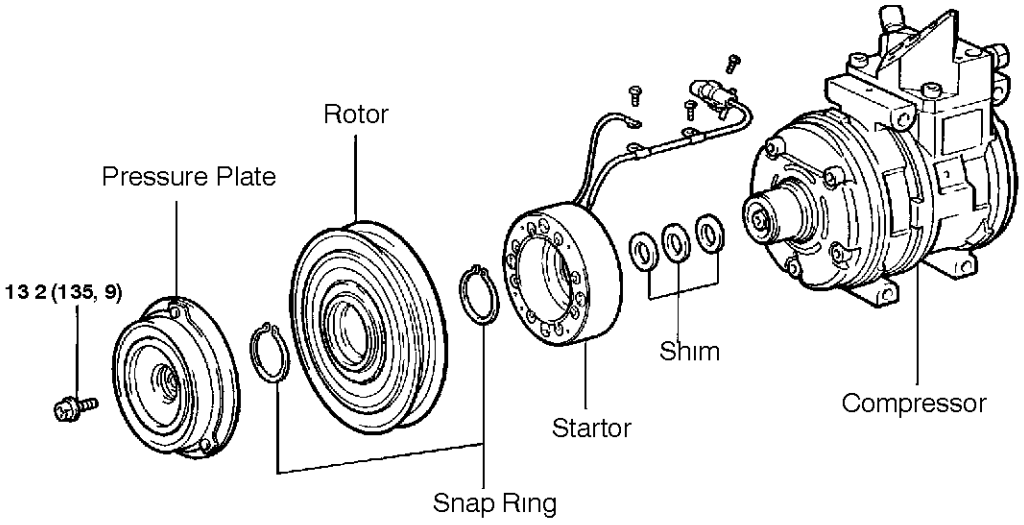
AC2R6-01

# COMPONENTS




N16453

Z17948




N14067

Z17949



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2R7-04

# DISASSEMBLY

1. **RUN ENGINE AT IDLE SPEED WITH A/C SWITCH ON FOR 10 MINUTES**
2. **STOP ENGINE**
3. **DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY**
4. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**
5. **DISCONNECT DISCHARGE AND SUCTION HOSES**

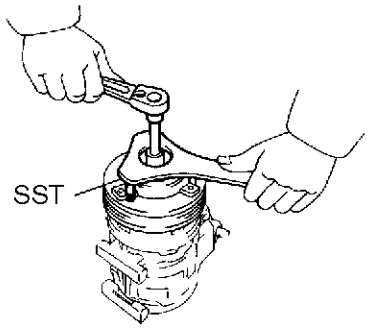
Remove the 2 bolts and disconnect the both hoses

**NOTICE:**

**Cap the open fittings immediately to keep the moisture or dirt out of the system.**

6. **REMOVE ENGINE UNDER COVER**
7. **REMOVE DRIVE BELT (See page AC-16)**
8. **REMOVE COMPRESSOR**

(a) Disconnect the connector

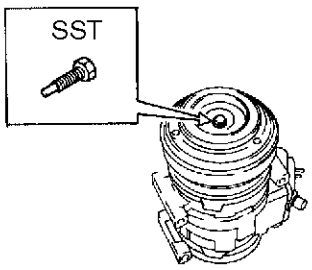



AC0943

(b) Remove the 4 bolts and pull the compressor upward

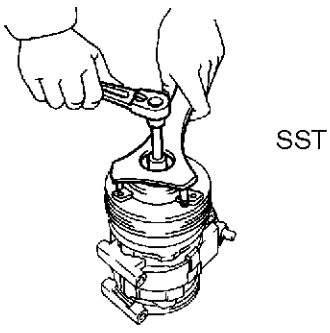
9. **REMOVE COMPRESSOR (See page AC-35)**
10. **REMOVE PRESSURE PLATE**

(a) Using SST and a socket wrench, remove the shaft bolt
**Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)**
SST 07112-76060




AC0944

(b) Install a SST on the pressure plate
SST 07112-66040




AC0945

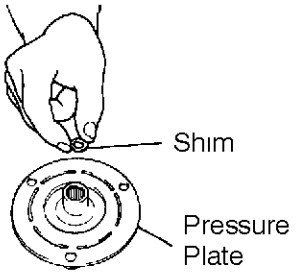
(c) Using SST and a socket wrench, remove the pressure plate
SST 07112-76060



Brought to you by BirfMark
Version 1.11 - 03/16/2010

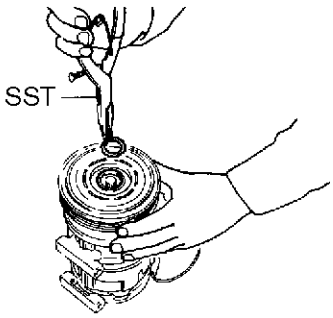
Brought to you by BirfMark






AC0946

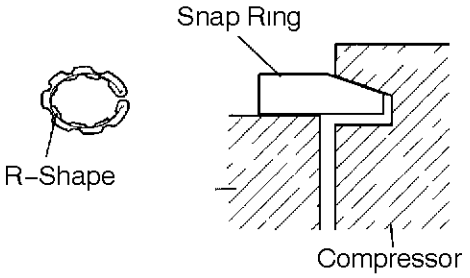
(d) Remove the shims from the pressure plate




AC0947

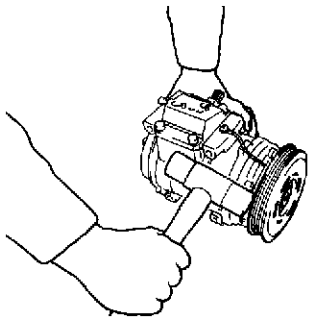
**11. REMOVE ROTOR**

(a) Using SST, remove the snap ring
SST 07114-84020




N20013

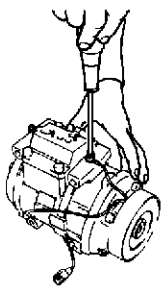
**NOTICE:**
**The snap ring should be installed so that its beveled side faces up.**



AC1743

(b) Using a plastic hammer, tap the rotor off the shaft

**NOTICE:**
**Be careful not to damage the pulley when tapping on the rotor.**



AC1744

**12. REMOVE STATOR**

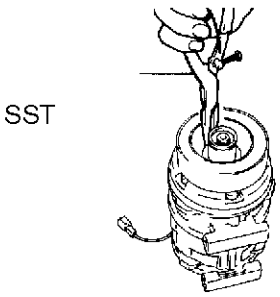
(a) Disconnect the stator lead wire from the compressor housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

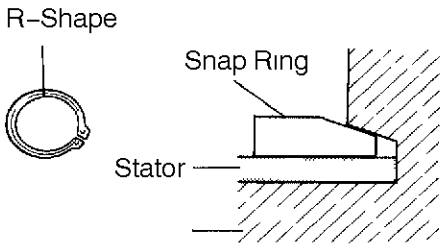
Brought to you by BirfMark





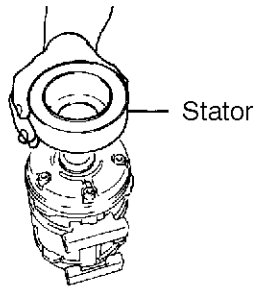

AC0950

(b) Using SST, remove the snap ring
SST 07114-84020




N20012

**NOTICE:**
**The snap ring should be installed so that its beveled side faces up.**




AC0951

(c) Remove the stator



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2R8-01

# REASSEMBLY

**1. INSTALL COMPRESSOR**

(a) Install the compressor with the 4 bolts
**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(b) Connect the connector

**2. CONNECT DISCHARGE AND SUCTION HOSES**
**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

**NOTICE:**
**Hoses should be connected immediately after the caps have been removed.**

HINT
Lubricate 2 new O-rings with compressor oil and install the hoses

**3. INSTALL AND INSPECT DRIVE BELT (See page AC-17)**

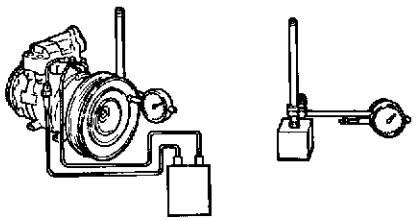
**4. INSTALL ENGINE UNDER COVER**

**5. CONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY**

**6. EVACUATE AIR FROM REFRIGERATION SYSTEM**

**7. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT**
**Specified amount:**
**850 ± 50 g (29.98 ± 1.76 oz.)**

Using a gas leak detector, check for leakage of refrigerant
If there is leakage, check the tightening torque at the joints



N04963

**8. INSPECT A/C OPERATION**

**Reassembly is in the reverse order of disassembly (See page AC-35).**

**9. CHECK CLEARANCE OF MAGNETIC CLUTCH**

(a) Set the dial indicator to the pressure plate of the magnetic clutch

(b) Connect the magnetic clutch lead wire to the positive (+) terminal of the battery

(c) Check the clearance between the pressure plate and rotor when connecting the negative (-) terminal to the battery
**Standard clearance:**
**0.5 ± 0.15 mm (0.020 ± 0.0059 in.)**

If the clearance is not within the standard clearance, adjust the clearance using shims to obtain the standard clearance
**Shim Thickness:**
**0.1 mm (0.004 in.)**
**0.3 mm (0.012 in.)**
**0.5 mm (0.020 in.)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# RECEIVER

AC2RB 01

## ON–VEHICLE INSPECTION

### INSPECT FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage

If there is leakage, check the tightening toque at the joints





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RC-01

# REMOVAL

**1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**

HINT

At the time of installation, refer to the following procedure

- Evacuate air from refrigeration system
- Charge system with refrigerant and inspect for leakage of refrigerant

**Specified amount:**

**850 ± 50 g (29.98 ± 1.76 oz.)**

**2. DISCONNECT 2 LIQUID TUBES FROM RECEIVER**

Remove the 2 bolts and both tubes

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**NOTICE:**

**Cap the open fittings immediately to keep moisture or dirt out of the system.**

HINT

At the time of installation, lubricate 2 new O–rings with compressor oil and install the tubes

**3. REMOVE RECEIVER FROM RECEIVER HOLDER**

Remove the holder bolt and pull the receiver down ward

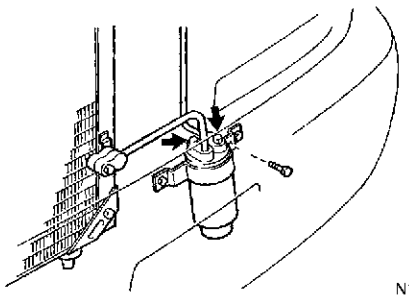
HINT

If receiver was replaced, add compressor oil to compressor

**Add 10 cc (0.35 fl.oz.)**

**Compressor oil:**

**ND–OIL 8 or equivalent**



N13975



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RD-01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC–40).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CONDENSER

AC2RG 01

## ON–VEHICLE INSPECTION

**1. INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE**

If the fins are clogged, wash them with water and dry with compressed air

**NOTICE:**

**Be careful not to damage the fins.**

If the fins are bent, straighten them with a screwdriver or pliers

**2. INSPECT CONDENSER AND FITTINGS FOR LEAKAGE**

Repair as necessary



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RE 01

# REMOVAL

**1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**

HINT

At the time of installation, refer to the following procedure

- Evacuate air from refrigeration system
- Charge system with refrigerant and inspect for leakage of refrigerant

**Specified amount:**

**850 ± 50 g (29.98 ± 1.76 oz.)**

**2. REMOVE THESE PARTS:**

(a) Hood lock brace

(b) Center brace

**3. DISCONNECT DISCHARGE HOSE AND LIQUID TUBE**

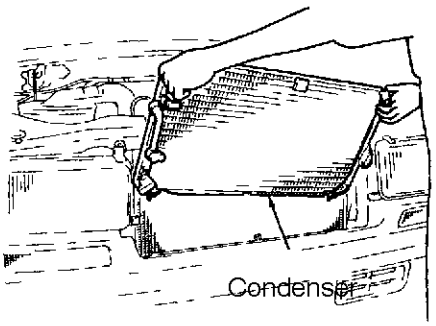
**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

**NOTICE:**

**Cap the open fittings immediately to keep moisture or dirt out of the system.**

HINT

At the time of installation, lubricate 2 new O–rings with compressor oil to compressor




AC2674

**4. REMOVE CONDENSER**

(a) Remove 2 condenser mounting bolts

(b) Pull out the condenser between the radiator and the body

HINT

If condenser was replaced, add compressor oil to compressor

**Add 40 cc (1.4 fl.oz.)**

**Compressor oil:**

**ND–OIL 8 or equivalent**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RF 01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC–43).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# EVAPORATOR

AC2RJ 03

## INSPECTION

1. REMOVE EVAPORATOR (See page AC–26)
2. CHECK EVAPORATOR FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air

**NOTICE:**

**Never use water to clean the evaporator.**

3. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary

4. REINSTALL EVAPORATOR (See page AC–26)



Author : Date : 1372
Brought to you by BirfMark
Version 1.11 - 03/16/2010

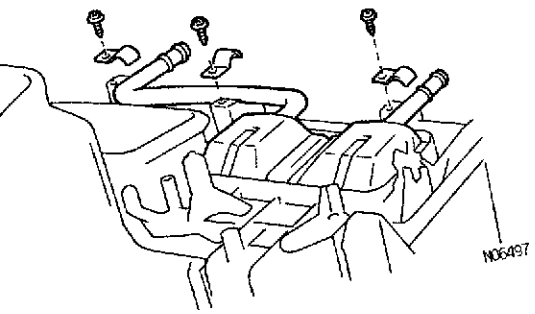
Brought to you by BirfMark



# HEATER RADIATOR

AC3JM 01

## INSPECTION




1. **REMOVE HEATER UNIT (See page AC-28)**
2. **REMOVE HEATER RADIATOR**

(a) Remove the screws and plates

(b) Pull the heater radiator out

3. **INSPECT FINS FOR BLOCKAGE**

If the fins are clogged, clean them with compressed air

4. **INSTALL HEATER RADIATOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# EXPANSION VALVE

AC2RR-01

## ON–VEHICLE INSPECTION

**1. CHECK QUANTITY OF GAS DURING REFRIGERATION CYCLE**

**2. INSTALL MANIFOLD GAUGE SET**

**3. RUN ENGINE**

(a) Run the engine at 1,500 rpm for at least 5 minutes

(b) Then check that the high pressure reading is 1 37 – 1 57 MPa (14 – 16 kgf/cm$^2$, 199 – 228 psi)

**4. CHECK EXPANSION VALVE**

If the expansion valve is faulty, the low pressure reading will drop to 0 kPa (0 kgf/cm$^2$, 0 psi)

HINT

When the low pressure drops to 0 kPa (0 kgf/cm$^2$, 0 psi), feel the receiver's IN and OUT sides for zero temperature difference



Author : Date : 1374
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# WATER VALVE

AC2RU-01

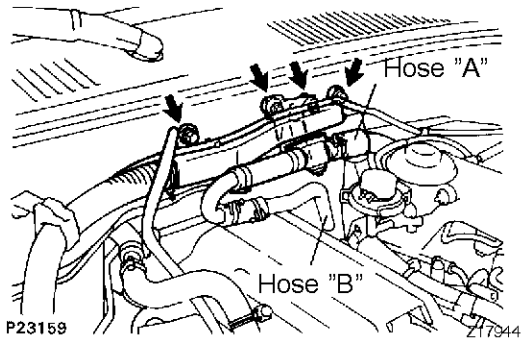
## REMOVAL

**1. DRAIN ENGINE COOLANT FROM RADIATOR**

HINT

It is not necessary to drain out all the coolant

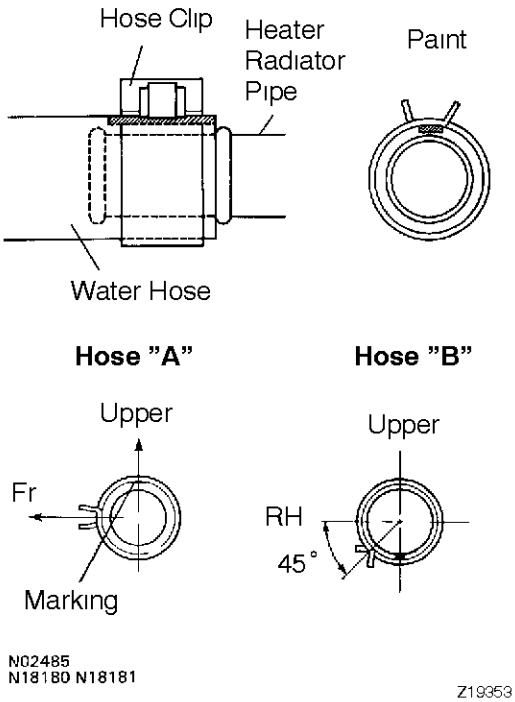
**2. DISCONNECT WATER VALVE CONTROL CABLE**




**3. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPE AND WATER VALVE**

(a) Grip the claws of the hose clip with pliers and slide the clip along the hose to a place where it does not clamp the hose to the pipe

(b) Disconnect the water hoses




HINT

At the time of installation, refer to the following procedure

- Push the water hose onto the heater radiator pipe as far as ridge on the pipe
- Install the hose clip in a position, as shown in the illustration

**4. REMOVE WIRE HARNESS PROTECTOR**

**5. REMOVE WATER VALVE**

Remove the 2 bolts and water valve

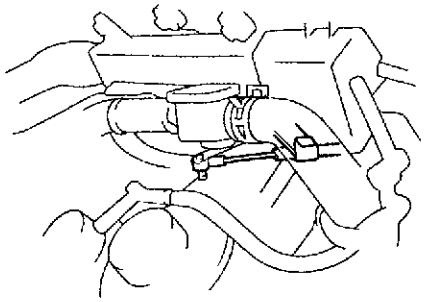


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RW 01



N14296

# ADJUSTMENT

## ADJUST WATER VALVE CONTROL CABLE

(a) Set the vehicle in these conditions
- Ignition switch on
- Blower speed control switch on
- Temperature control switch to "COOL" position

(b) Set the water valve to "COOL" position, install the control cable and lock the clamp



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSTALLATION

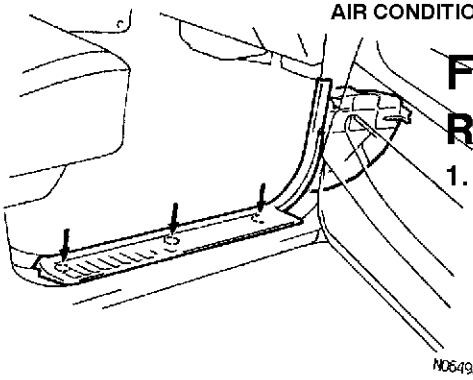
**Installation is in the reverse order of removal (See page AC–48).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



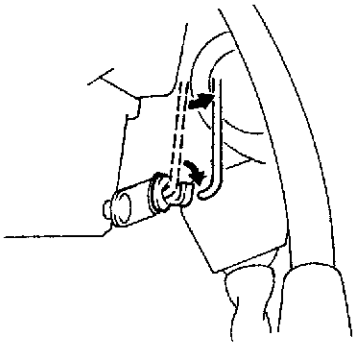

N06498

# FRONT BLOWER MOTOR

AC3JN 01

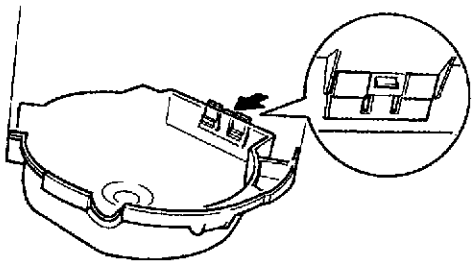
## REMOVAL

### 1. REMOVE RH SCUFF PLATE


N06499

### 2. REMOVE BLOWER MOTOR

(a) Disconnect the link from the lower cover


N06500

(b) Remove the 2 screws, then remove the lower cover while pushing the locking protrsion, as shown

(c) Disconnect the connector from the blower motor

(d) Remove the 3 screws and blower motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



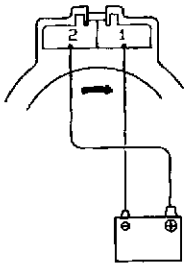
AC2RY 01

# INSPECTION

## INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, then check that the motor operation is smooth

If operation is not as specified, replace the blower motor




AC2227



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2RZ 01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC–51).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

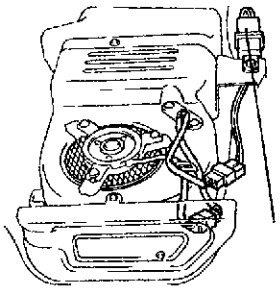
Brought to you by BirfMark



# REAR BLOWER MOTOR

AC230 02

## REMOVAL



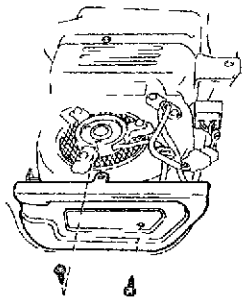
N14323

1. **REMOVE FRONT RH SEAT**
2. **REMOVE BLOWER MOTOR**

(a) Disconnect the connectors from the blower motor and rear heater relay

(b) Remove the bolt and rear heater relay

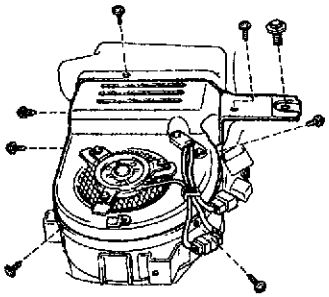
(c) Remove the 2 screws and side cover



N14324

(d) Remove the bolt and 7 screws, then remove the upper cover with the blower motor

(e) Remove the 3 screws and the blower motor



N06504



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



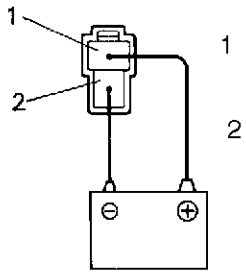
AC2S1 02

# INSPECTION

## INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, then check that the motor operations smoothly

If operation is not as specified, replace the motor




BE2611



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC232 01

# INSTALLATION

**Installation is in the reverse order of removal (See page AC-54).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

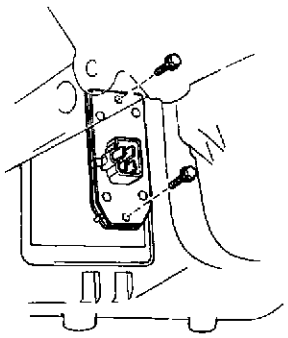


# BLOWER RESISTOR

AC3JO-01

## INSPECTION

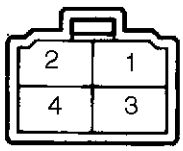
1. REMOVE GLOVE COMPARTMENT DOOR (See page BO-76)



N06512

2. REMOVE BLOWER RESISTOR

Disconnect the connector and remove the 2 screws and blower resistor




H42 N09039

3. INSPECT BLOWER RESISTOR RESISTANCE

Measure resistance between terminals 1 and 4

**Standard resistance: 1.8 - 2.2 Ω**

If resistance is not as specified, replace the blower resistor

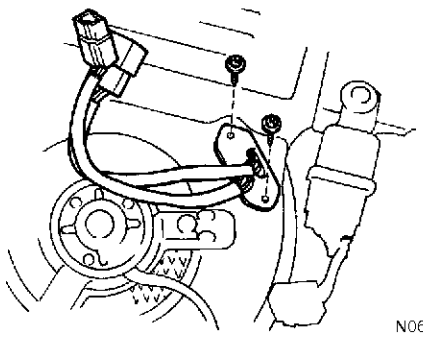
4. REINSTALL BLOWER RESISTOR



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





N06513

# REAR BLOWER RESISTOR

AC3JP-01

## INSPECTION

1. **REMOVE FRONT SEAT RH**
2. **REMOVE BLOWER RESISTOR**

(a) Disconnect the connector

(b) Remove the 2 screws and blower resistor

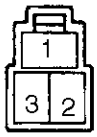
3. **INSPECT REAR BLOWER RESISTOR CONTINUITY**

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | A1 – B1<br>A2 – A3 – B2 | Continuity |

If continuity is not as specified, replace the blower resistor

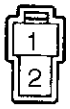
4. **REINSTALL REAR BLOWER RESISTOR**

Connector "A"




H-3 2 H 2-2

Connector "B"



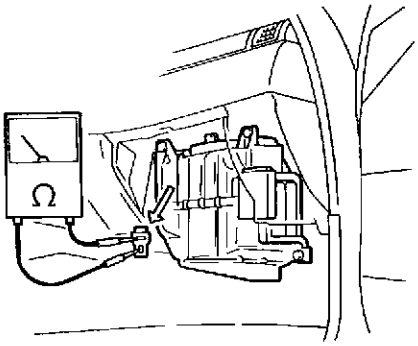

Z09802



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






N14295

# THERMISTOR

AC239 01

## ON–VEHICLE INSPECTION

1. **REMOVE GLOVE COMPARTMENT PARTS**
   **(See page BO–76)**
2. **INSPECT THERMISTOR RESISTANCE**

Measure the resistance between terminals

**Standard resistance:**

**1,500 Ω at 25 °C (77 °F)**

If resistance is not as specified, replace the sensor



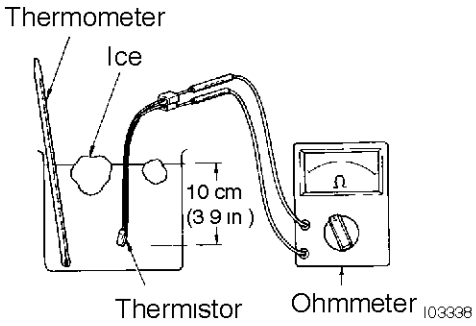
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SA 01

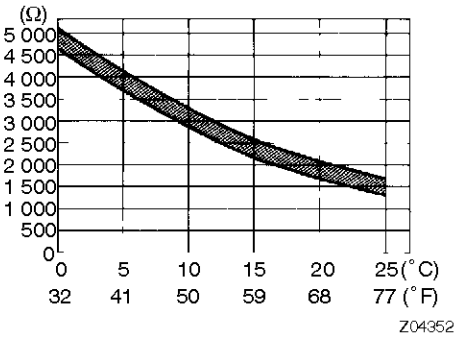
# INSPECTION




**1. REMOVE THERMISTOR**

**2. INSPECT THERMISTOR RESISTANCE**

(a) Place the thermistor in cold water, while varying temperature of the water, measure resistance at the connector and at the same time, measure temperature of the water with a thermometer




(b) Compare the 2 readings on the chart

If resistance is not as specified, replace the thermistor

**3. REINSTALL THERMISTOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

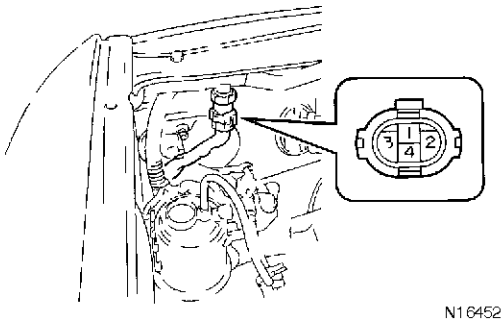
Brought to you by BirfMark



# PRESSURE SWITCH

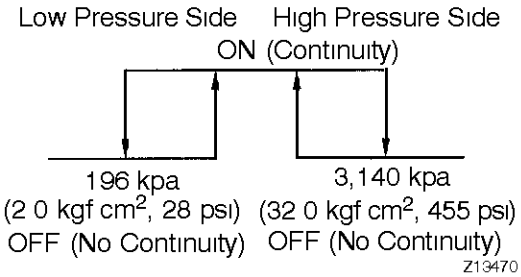
AC2SB 01

## ON-VEHICLE INSPECTION




N16452

1. INSTALL MANIFOLD GAUGE SET
2. DISCONNECT CONNECTOR FROM PRESSURE SWITCH
3. RUN ENGINE AT APPROX. 1,500 RPM




Z13470

4. INSPECT PRESSURE SWITCH OPERATION

(a) Connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (-) lead to terminal 1

(b) Check continuity between terminals when refrigerant pressure is changed, as shown in the illustration

If operation is not as specified, replace the pressure switch

5. STOP ENGINE AND REMOVE MANIFOLD GAUGE SET
6. CONNECT CONNECTOR TO PRESSURE SWITCH

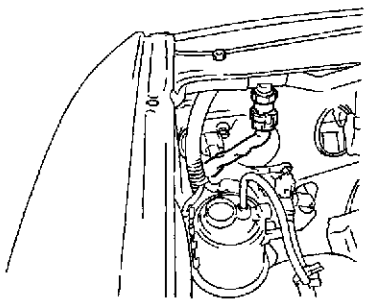


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SC 01



N14163

# REMOVAL

**1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**

HINT

Evacuate air from refrigeration system

Charge system with refrigerant and inspect for leakage of refrigerant

**Specified amount:**

**850 ± 50 g (29.98 ± 1.76 oz.)**

**2. REMOVE PRESSURE SWITCH**

(a) Disconnect the connector

(b) Remove the pressure switch from the liquid tube

**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

HINT

At the time of installation, lubricate a new O-ring with compressor oil and install the switch

HINT

Lock the switch mount on the tube with an open end wrench, being careful not to deform the tube, and remove the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SD 01

# INSTALLATION

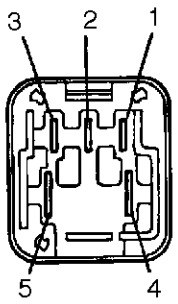
**Installation is in the reverse order of removal (See page AC–62).**



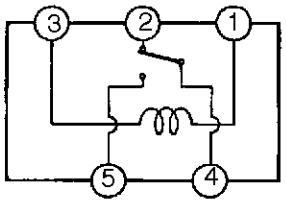
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






BE1850 BE1844




Z19533

# HEATER MAIN RELAY

AC2SE 03

## INSPECTION

### INSPECT HEATER MAIN RELAY CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 1 – 3<br>2 – 4 | Continuity |
| Apply B+ between terminals 3 and 5 | 4 – 5 | Continuity |

If continuity is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

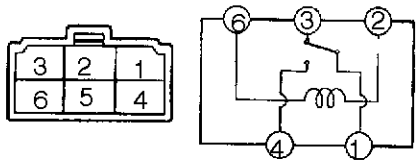


# REAR HEATER RELAY

AC2SF-01

## INSPECTION

### INSPECT REAR HEATER RELAY CONTINUITY




H-6-2 BE1844 Z09804

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 2 – 6<br>1 – 3 | Continuity |
| Apply B+ between terminals 2 and 6 | 1 – 4 | Continuity |

If continuity is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

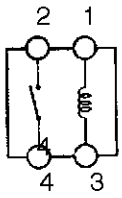


# MAGNETIC CLUTCH RELAY

AC2SG-01

## INSPECTION

### INSPECT MAGNETIC CLUTCH RELAY CONTINUITY




BE1647 BE1841

Z09507

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 1 – 3 | Continuity |
| Apply B+ between terminals 1 and 3 | 2 – 4 | Continuity |

If continuity is not as specified, replace the relay



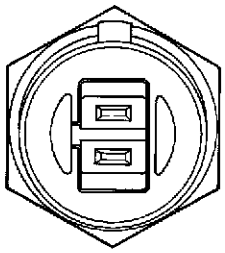
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# ENGINE COOLANT TEMPERATURE (ECT) CUT RELAY

AC2SH 01



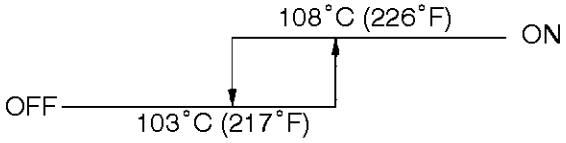
## INSPECTION

### INSPECT SWITCH CONTINUITY

Check the continuity betweeen terminals of the switch, as shown in the chart below

If continuity is not as specified, replace the switch

N06549



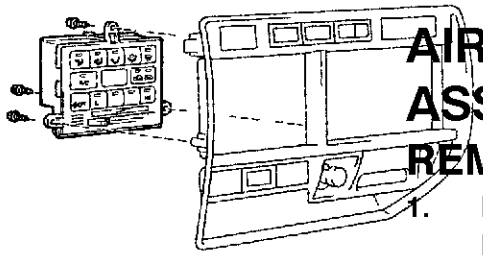

V02084



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





N14164

# AIR CONDITIONING CONTROL ASSEMBLY

## REMOVAL

AC2SL 01

1. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL WITH A/C CONTROL ASSEMBLY
2. REMOVE A/C CONTROL ASSEMBLY

Remove the 3 screws and A/C control assembly from center panel



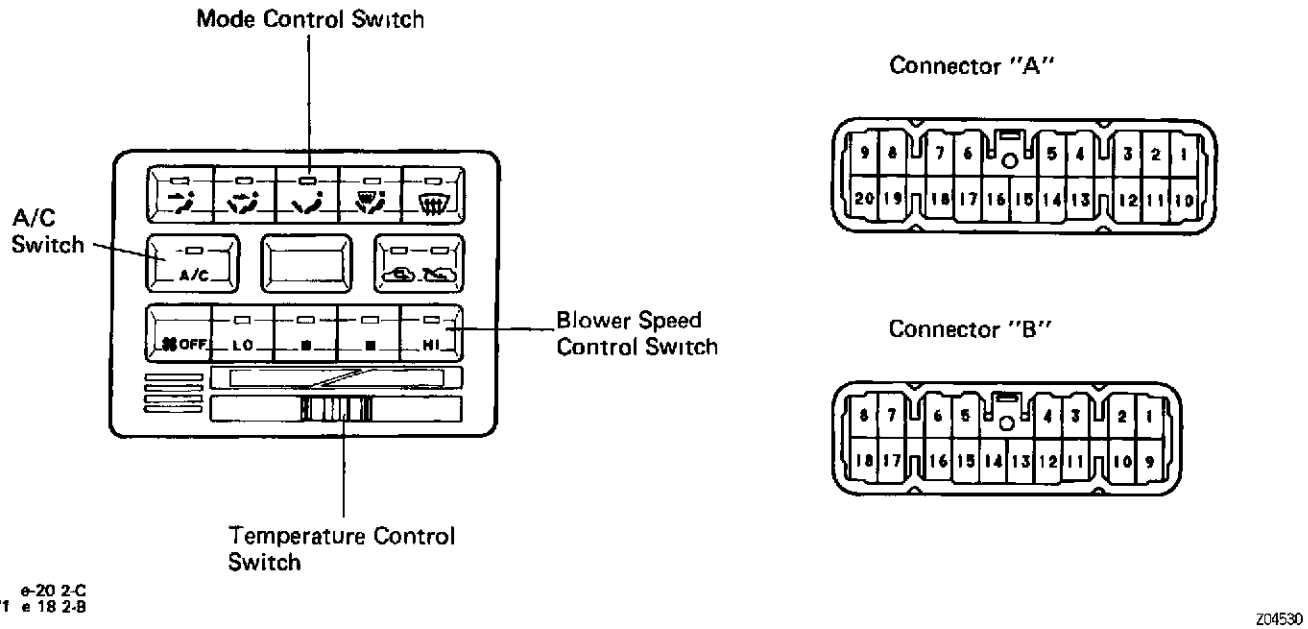
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



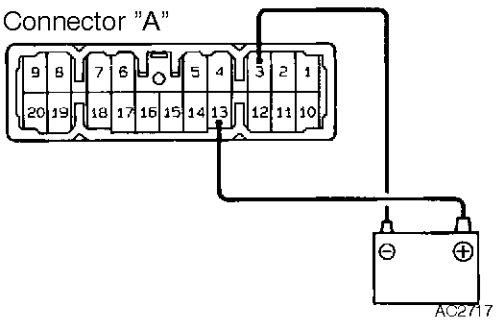
AC2SM 01

# INSPECTION




e-20 2-C
N08571 e 18 2-B

Z04530

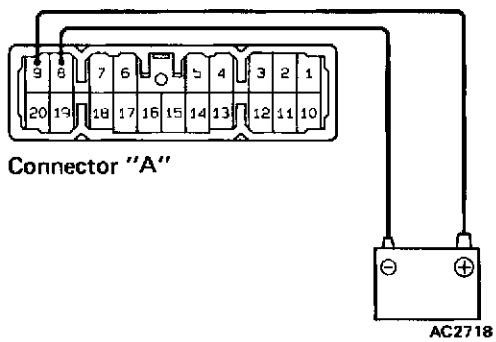



AC2717

## 1. INSPECT ILLUMINATION OPERATION

Connect the positive (+) lead from the battery to terminal A–13 and the negative (–) lead to terminal A–3, then check that the illuminations light up

If illuminations do not light up, test the bulb




AC2718

## 2. Air Inlet Control Switch: INSPECT INDICATOR LIGHT OPERATION

(a) Connect the positive (+) lead from the battery to terminal A–9 and the negative (–) lead to terminal A–8

(b) With the air inlet control button pushed in, check that the FRESH or RECIRC indicator light lights up

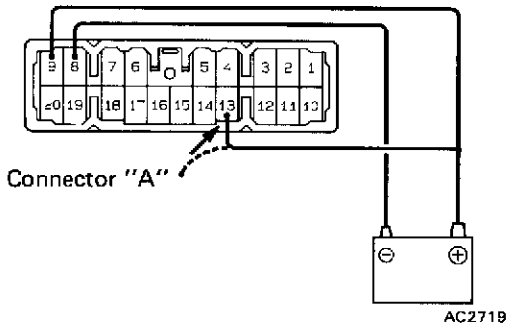
(c) Next, push in the button again, and check that the indicator light goes off and the other indicator light lights up



Brought to you by BirfMark
Version 1.11 - 03/16/2010

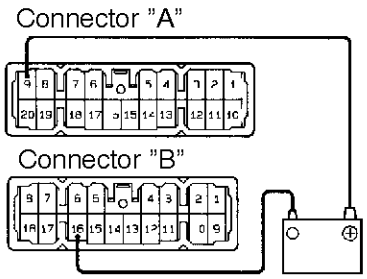
Brought to you by BirfMark






(d) Then connect the positive (+) lead from the battery to terminal A–13 and check that the indicator dims

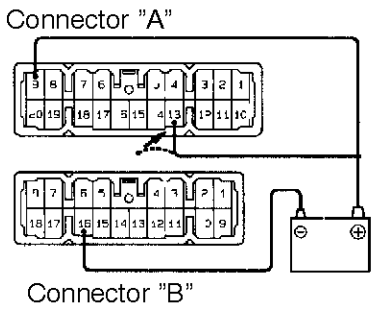
If operation is not as specified, replace the A/C control assembly




**3. Mode Control Switch: INSPECT INDICATOR LIGHT OPERATION**

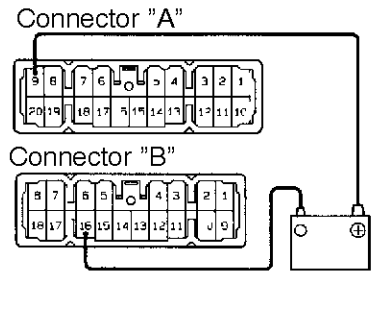
(a) Connect the positive (+) lead from the battery to terminal A–9 and the negative (–) lead to terminal B–16

(b) Push each of the mode buttons in and check that their indicator light lights up




(c) Then connect the positive (+) lead from the battery to terminal A–13 and check that the indicator dims

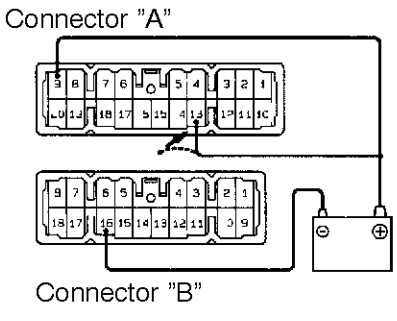
If operation is not as specified, replace the A/C control assembly




**4. Blower Speed Control Switch: INSPECT INDICATOR LIGHT OPERATION**

(a) Connect the positive (+) lead from the battery to terminal A–9 and the negative (–) lead to terminal B–16

(b) Push each of the blower speed control buttons in and check that their indicator light lights up




(c) Then connect the positive (+) lead from the battery to terminal A–13 and check that the indicator dims

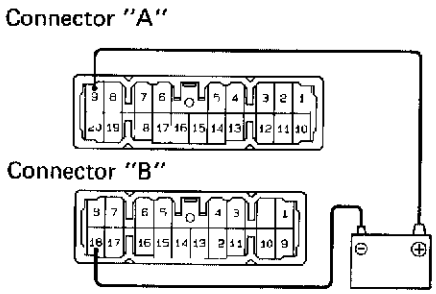
If operation is not as specified, replace the A/C control assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



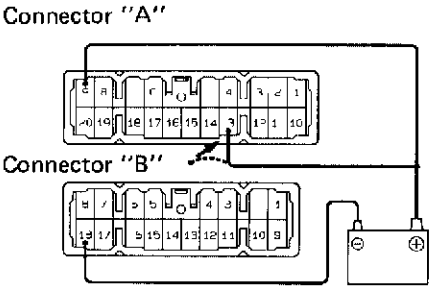



AC2726

**5. A/C or DEF Switch: INSPECT INDICATOR LIGHT OPERATION**

(a) Connect the positive (+) lead from the battery to terminal A–9 and the negative (–) lead to terminal B–18

(b) Push the A/C or DEF switch button in and check that the indicator light lights up




AC2727

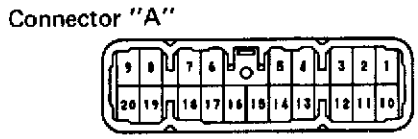
(c) Then, connect the positive (+) lead from the battery to terminal A–13 and check that the indicator dims

If operation is not as specified, replace the A/C control assembly

**6. INSPECT AIR INLET CONTROL SWITCH CONTINUITY**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FRESH | A8 – A19 | Continuity |
| RECIRC | A8 – A18 | Continuity |

If continuity is not as specified, replace the A/C control assembly

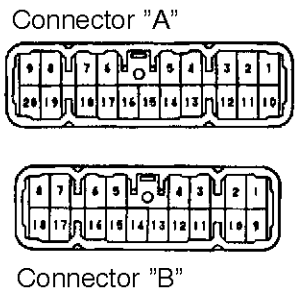



Z19129

**7. INSPECT MODE CONTROL SWITCH CONTINUITY**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FACE | A14 – B16 | Continuity |
| BI–LEVEL | A12 – B16 | Continuity |
| FOOT | A7 – B16 | Continuity |
| FOOT–DEF | B11 – B16 | Continuity |
| DEF | B4 – B16 | Continuity |

If continuity is not as specified, replace the A/C control assembly




Z09805

**8. INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | A10 – B16 | Continuity |
| LO | A1 – B16 | Continuity |
| M1 | B9 – B16 | Continuity |
| M2 | B10 – B16 | Continuity |
| HI | B13 – B16 | Continuity |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



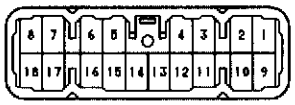
If continuity is not as specified, replace the A/C control assembly

**9. INSPECT A/C OR DEF SWITCH CONTINUITY**

Check that there is continuity between terminals B–6 and B–17 intermittently each time the A/C or DEF switch button pressed

If continuity is not as specified, replace the A/C control assembly

Connector "B"



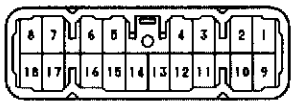

e 18 2 B N06436

**10. INSPECT TEMPERATURE CONTROL SWITCH RESISTANCE**

(a) Measure resistance between terminals B–1 and B–2
**Standard resistance:**
**Approx. 3.0 kΩ**

(b) Check that the resistance between terminals B–1 and B–3 increases from 0 to approx 3 0 kΩ when the switch knob is turned from COOL to HOT

Connector "B"




e 18 2 B N06436

If operation is not as specified, replace the A/C control assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SN 01

# INSTALLATION

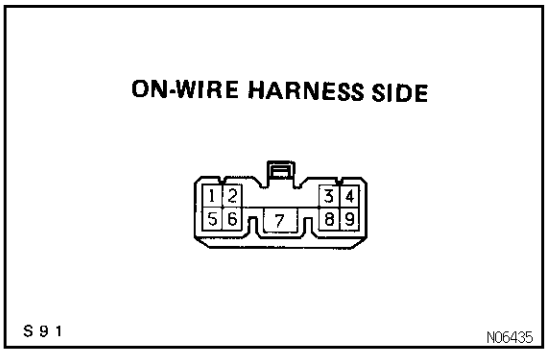
**Installation is the revese order of removal (See page AC-68).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# AIR CONDITIONING AMPLIFIER

AC2S 01

## ON–VEHICLE INSPECTION

### INSPECT AMPLIFIER CIRCUIT

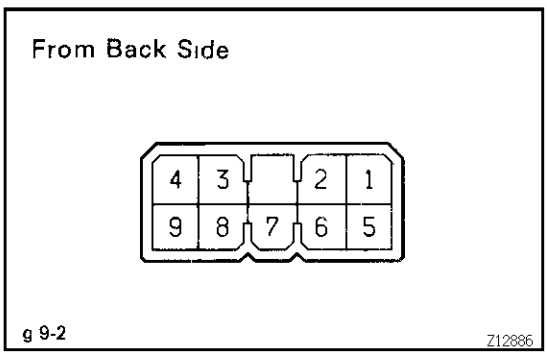
(a) Disconnect the amplifier and inspect the connector on the wire harness side, as shown in the chart below

Test conditions

- Ignition switch ON
- A/C switch ON
- Temperature control lever MAX COOL
- Blower control switch HI

| Tester connection | Condition | Specifeid condition |
|---|---|---|
| 6 – Ground | Constant | Continuity |
| 8 – 9 | Constant | Continuity |
| 9 – 6 | Constant | Approx 1 5 kΩ at 25 °C (77 °F) |
| 2 – Ground | A/C switch ON | Battery positive voltage |
| 2 – Ground | A/C switch OFF | No voltage |
| 5 – Ground | Start engine | Approx 10 to 14 v |
| 5 – Ground | Stop engine | No voltage |

If circuit is as specified, try replacing the amplifier with a new one If the circuit is not as specified, inspect the circuits connected to other parts




(b) Connect the connector to A/C amplifier and inspect wire harness side connector from the back side, as shown in the chart below

Test conditions

- Ignition switch ON
- A/C switch ON
- Temperature control lever MAX COOL
- Blower control switch HI

| Tester connection | Condition | Specified Condition |
|---|---|---|
| 3 – Ground | Refrigeration pressure 2 0 – 32 kgf/cm$^3$ | Battery positive voltage |
| 3 – Ground | Refrigeration pressure less than 2 0 – 32 kgf/cm$^3$ or more | No voltage |

If circuit is not as specified, replace the amplifier

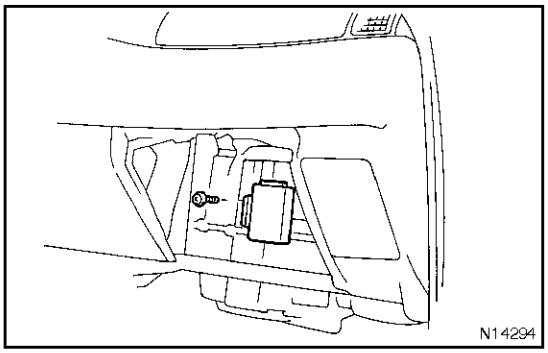


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SJ–01




# REMOVAL

1. **REMOVE GLOVE COMPARTMENT DOOR**
   **(See page BO–76)**
2. **REMOVE A/C AMPLIFIER**

(a) Disconnect the connector from the amplifier
(b) Remove the screw and the amplifier



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AC2SK 01

# INSTALLATION

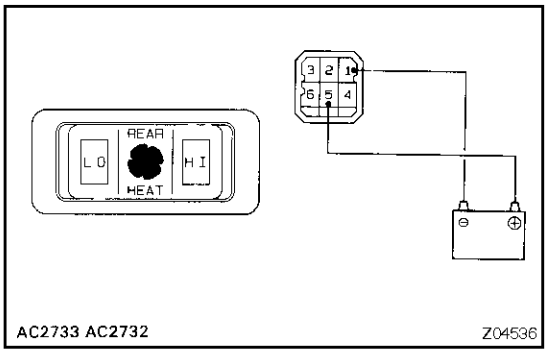
**Installation is in the reverse order of removal See page AC-75).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





AC2733 AC2732 Z04536

# REAR HEATER SWITCH

## INSPECTION

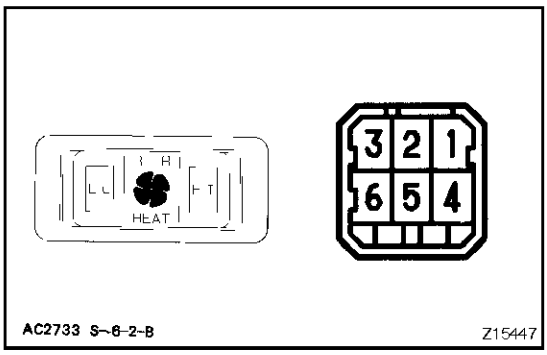
AC2 SO–04

1. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL WITH A/C CONTROL ASSEMBLY
2. REMOVE REAR HEATER SWITCH
3. INSPECT INDICATOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 5 and the negative (–) lead to terminal 1

(b) Push each of the rear heater switch knob in and check that their indicators lights up

If operation is not as specified, replace the switch



AC2733 S–6–2–B Z15447

4. INSPECT SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| HI | 1 – 4 | Continuity |
| OFF | – | No Continuity |
| LO | 1 – 2 | Continuity |
| Illumination circuit | 3 – 6 | Continuity |

If continuity is not as specified, replace the switch



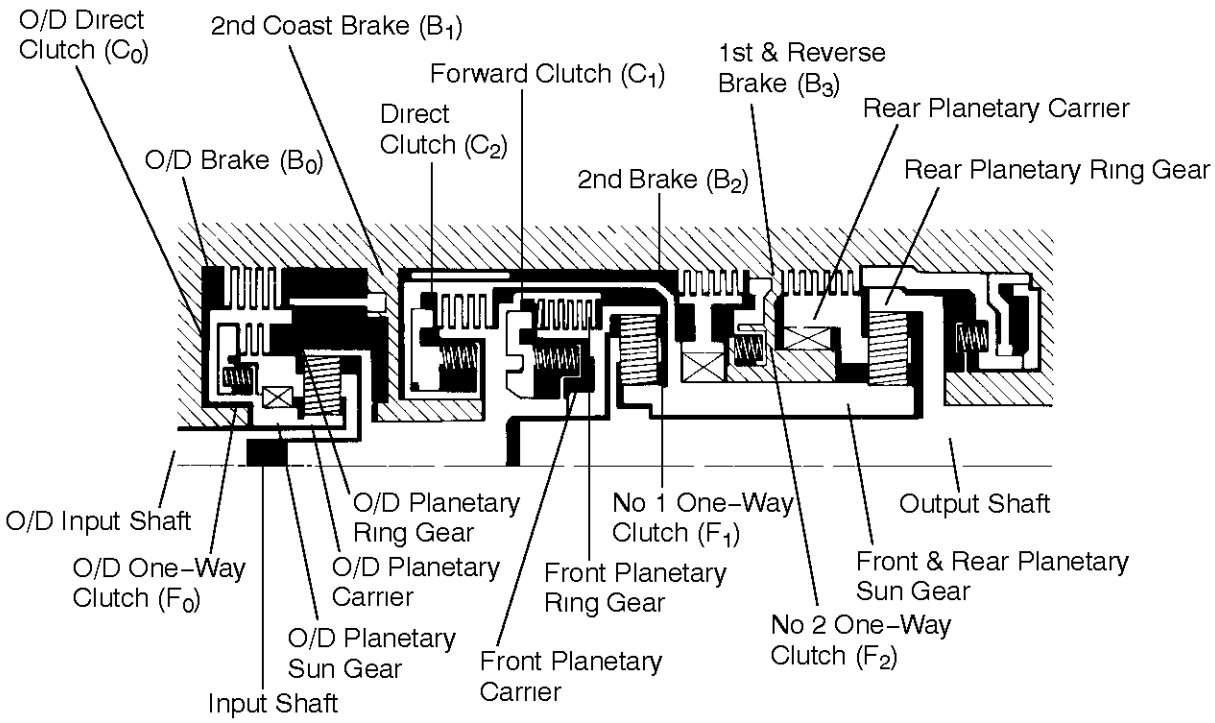
Author : Date : 1404
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AT0SZ–01

# OPERATION




AT2157

○ - - - - Operating

| Shift Lever Position | Gear Position | $C_0$ | $C_1$ | $C_2$ | $B_0$ | $B_1$ | $B_2$ | $B_3$ | $F_0$ | $F_1$ | $F_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Parking | ○ | | | | | | | | | |
| R | Reverse | ○ | | ○ | | | | ○ | ○ | | |
| N | Neutral | ○ | | | | | | | | | |
| D | 1st | ○ | ○ | | | | | | ○ | | ○ |
| | 2nd | ○ | ○ | | | | ○ | | ○ | ○ | |
| | 3rd | ○ | ○ | ○ | | | ○ | | ○ | | |
| | O/D | | ○ | ○ | ○ | | ○ | | | | |
| 2 | 1st | ○ | ○ | | | | | | ○ | | ○ |
| | 2nd | ○ | ○ | | | ○ | ○ | | ○ | ○ | |
| | *1 3rd | ○ | ○ | ○ | | | ○ | | ○ | | |
| L | 1st | ○ | ○ | | | | | ○ | ○ | | ○ |
| | *2 2nd | ○ | ○ | | | ○ | ○ | | ○ | ○ | |

*1 Down–shift only in the 2 position and 3rd gear–no up–shift
*2 Down–shift only in the L position and 2nd gear–no up–shift

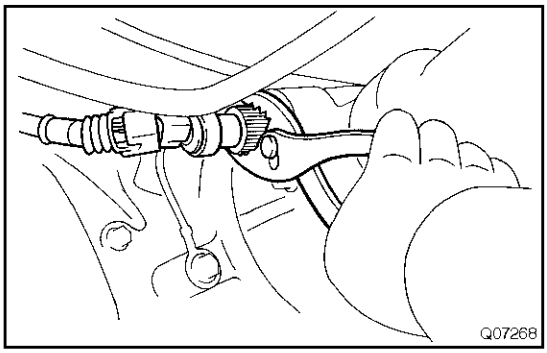
V07130



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# SPEEDOMETER DRIVEN GEAR

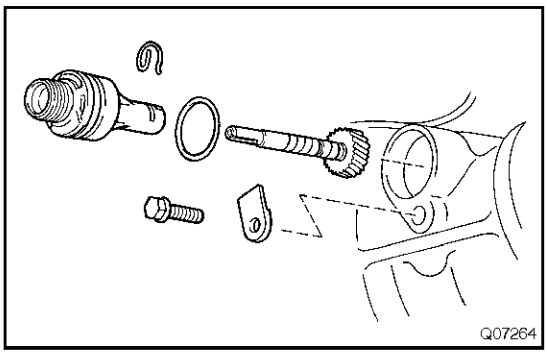
AT0T0-01

## ON–VEHICLE REPAIR

**1. DISCONNECT SPEEDOMETER CABLE AND REMOVE SPEEDOMETER DRIVEN GEAR**

(a) Loosen the serrated collar with pliers Do not lose the felt dust protector and washer

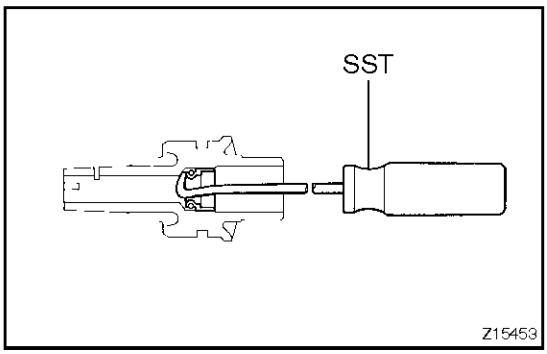
(b) Disconnect the speedometer cable




(c) Remove the bolt and locking plate Pry out the speedometer driven gear assembly

(d) Remove the O–ring from the speedometer driven gear assembly

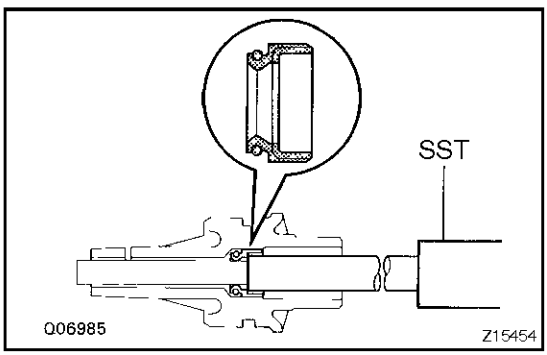
(e) Remove the clip and speedometer driven gear from the speedometer driven gear sleeve




**2. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL**

Using SST, remove the oil seal

SST 09921–00010

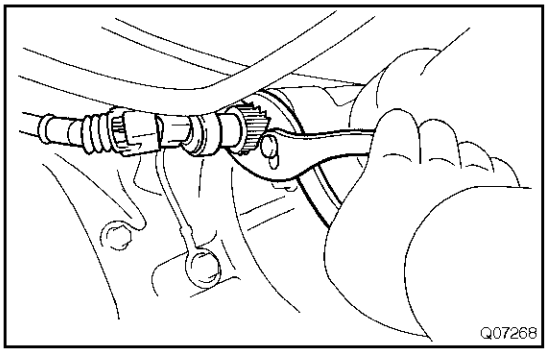



**3. REINSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL**

Using SST, install a new oil seal

SST 09201–10000 (09201–01080)

**Drive in depth: 20 mm (0.79 in.)**




**4. REINSTALL SPEEDOMETER DRIVEN GEAR AND CONNECT SPEEDOMETER CABLE**

(a) Install the clip and speedometer driven gear to the speedometer driven gear sleeve

(b) Install a new O–ring to the speedometer driven gear assembly

(c) Install the speedometer driven gear

(d) Install the locking plate with the bolt

**Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)**

(e) Connect the speedometer cable



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



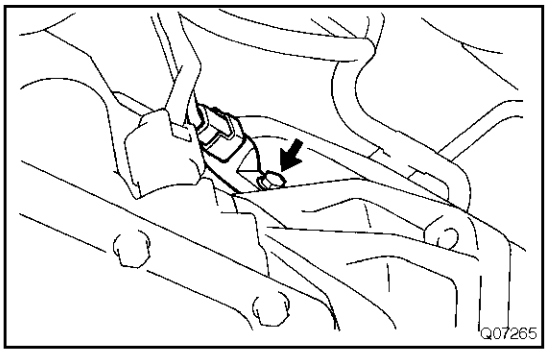
(f) Tighten the serrated collar with pliers



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# VEHICLE SPEED SENSOR

AT0T1-01

## ON–VEHICLE REPAIR

1. **DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR**
2. **REMOVE NO.2 VEHICLE SPEED SENSOR**

(a) Remove the bolt and No 2 vehicle speed sensor

(b) Remove the O–ring from the No 2 vehicle speed sensor

3. **REINSTALL NO.2 VEHICLE SPEED SENSOR**

(a) Coat a new O–ring with ATF and install it to the No 2 vehicle speed sensor

(b) Install the No 2 vehicle speed sensor and torque the bolt

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

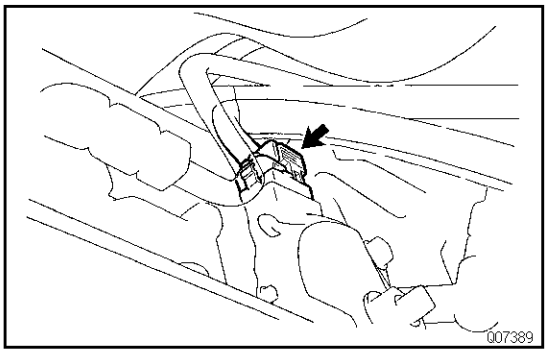
4. **RECONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



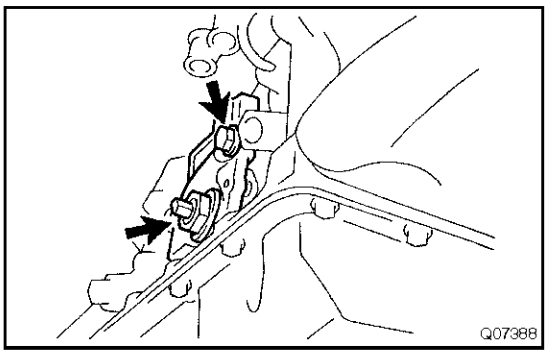



# PARK/NEUTRAL POSITION (PNP) SWITCH

AT0T3-02

## ON–VEHICLE REPAIR

1. **DISCONNECT 2 OIL COOLER PIPES (See page AT–16)**
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**




3. **REMOVE PARK/NEUTRAL POSITION SWITCH**
   (a) Pry off the lock washer and remove the nut
   (b) Remove the bolt and park/neutral position switch
4. **REINSTALL PARK/NEUTRAL POSITION SWITCH**
   (a) Install the park/neutral position switch and bolt
   (b) Install a new lock plate and the nut
   **Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)**
   (c) Stake the nut with the lock plate
   (d) Adjust the park/neutral position switch (See page DI–131)
5. **RECONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
6. **RECONNECT 2 OIL COOLER PIPES (See page AT–17)**

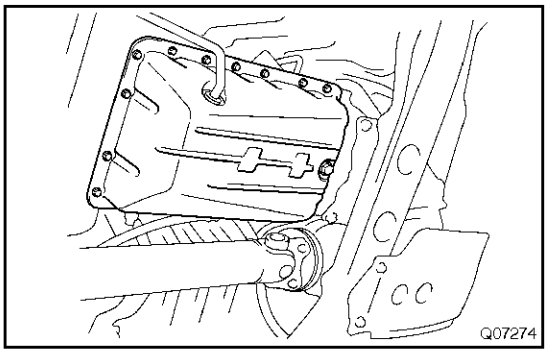
Adjust the shift lever position (See page DI–131)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# VALVE BODY ASSEMBLY

AT0T4-01

## ON–VEHICLE REPAIR

**1. DRAIN ATF**

**Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)**

**2. REMOVE OIL PAN**

**NOTICE:**

**Some fluid will remain in the oil pan.**

(a) Remove the 19 bolts

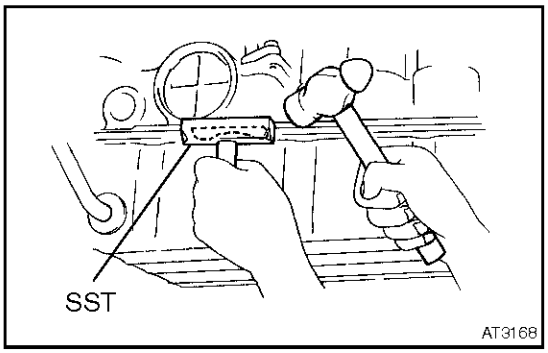
**Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)**

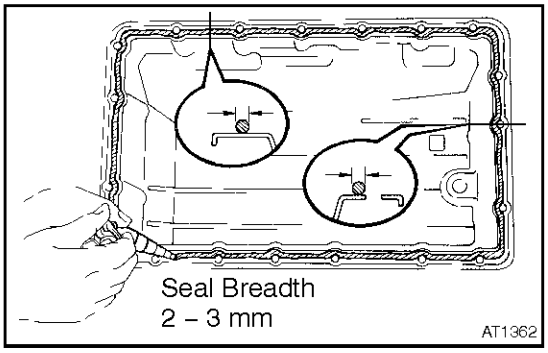
(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then remove the oil pan

SST 09032–00100

**NOTICE:**

**When removing the oil pan, be careful not to damage the oil pan flange.**

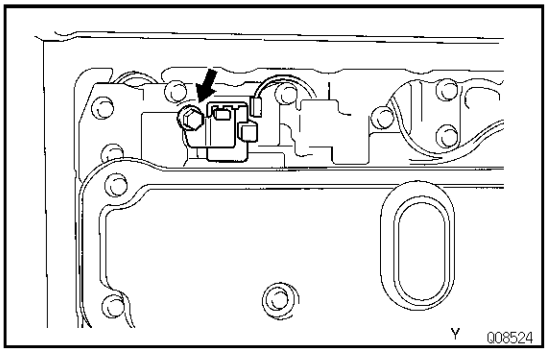



HINT

At the time of installation, after removing all the old FIPG on the contacting surface of the oil pan and transmission case, apply new FIPG to the oil pan (See page AT–1)

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**




**3. WHEN REPLACING 3 SHIFT SOLENOID VALVES**

(a) Disconnect the connectors from the solenoid valves

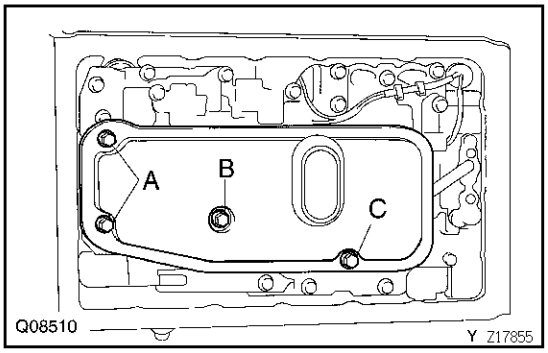
(b) Remove the 3 solenoid valve mounting bolts

**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

(c) Remove the 3 solenoid valves

HINT

At the time of installation, replace the O–rings with new ones




**4. REMOVE OIL STRAINER**

Remove the 4 bolts, and the oil strainer and gaskets

**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**

**NOTICE:**

**Be careful as some fluid will come out with the oil strainer.**

**Bolt length:**

**Bolt A: 16 mm (0.63 in.)**

**Bolt B: 20 mm (0.79 in.)**

**Bolt C: 28 mm (1.10 in.)**

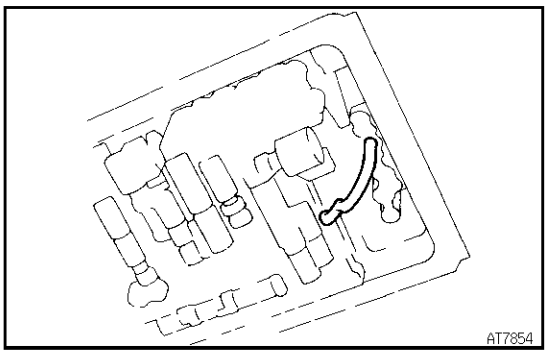


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT
At the time of installation, replace the gaskets with new ones

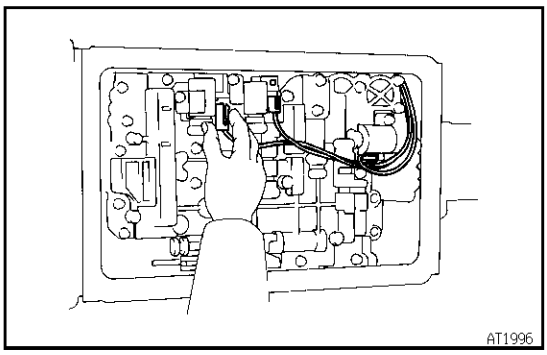



**5. REMOVE OIL PIPE**

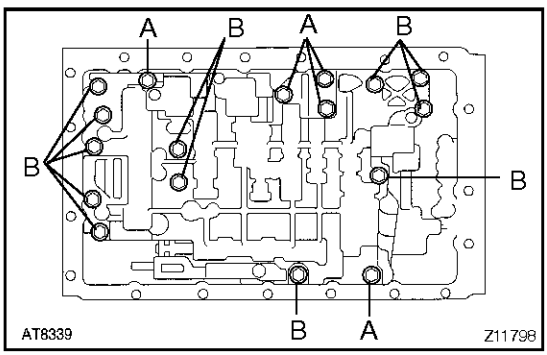
Pry up both pipe ends with a large screwdriver and remove the pipe

**NOTICE:**

**At time of the installation, make sure that the oil pipe or the magnet do not interfere with the oil pan.**




**6. DISCONNECT CONNECTOR FROM EACH SOLENOID VALVE**




**7. REMOVE VALVE BODY**

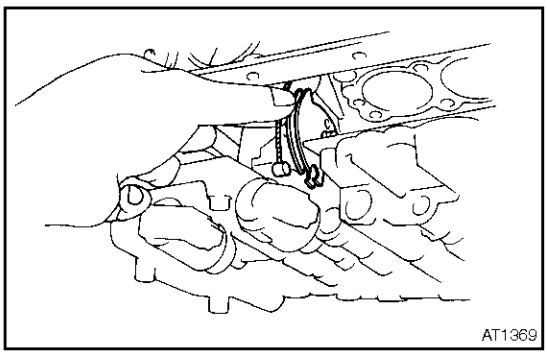
(a) Remove the 17 bolts

**Torque:10 N·m (100 kgf·cm, 7 ft·lbf)**

**Bolt length:**

**Bolt A: 23 mm (0.91 in.)**

**Bolt B: 32 mm (1.26 in.)**




(b) Disconnect the throttle cable from the cam

(c) Remove the valve body

**NOTICE:**

**Be careful not to drop the check ball body and spring.**

HINT

At the time of installation, install the body together the check ball body and spring and Align the groove of the manual valve to the pin of the lever



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



### 8. REINSTALL VALVE BODY ASSEMBLY

To ınstall, follow the removal procedure ın reverse

HINT

After ınstallatıon, fıll ATF and check the fluıd level (See page DI–131)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

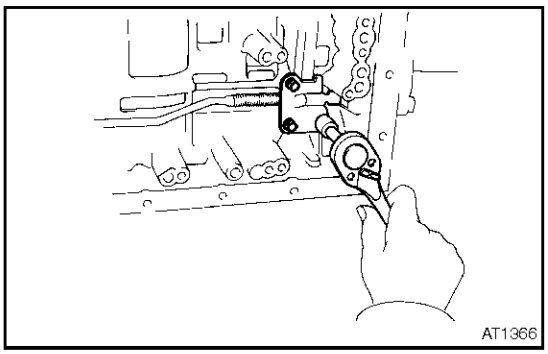


# PARKING LOCK PAWL

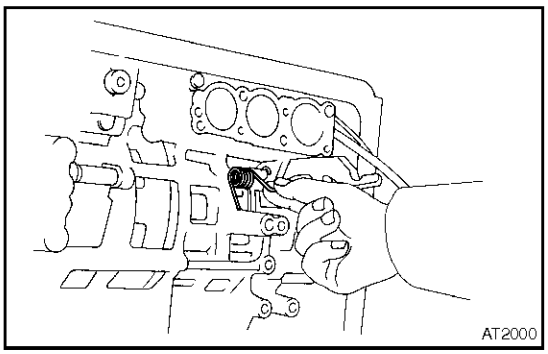
AT0T5-02

## ON–VEHICLE REPAIR

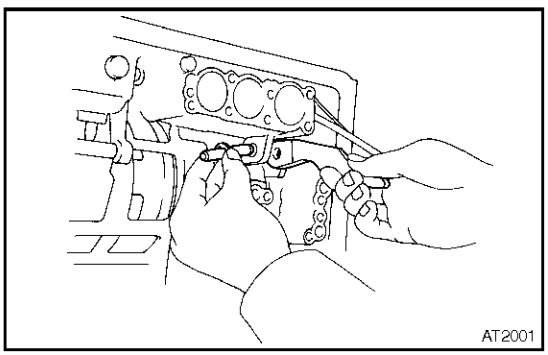
1. REMOVE VALVE BODY (See page AT–7)




2. REMOVE PARKING LOCK PAWL BRACKET




3. REMOVE SPRING FROM PARKING LOCK PAWL SHAFT




4. REMOVE PARKING LOCK PAWL AND SHAFT
5. REINSTALL PARKING LOCK PAWL AND SHAFT
6. REINSTALL SPRING
7. REINSTALL PARKING LOCK PAWL BRACKET

HINT

- Push the lock rod fully forward
- Check that the parking lock pawl operates smoothly

**Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)**

8. REINSTALL VALVE BODY (See page AT–7)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# THROTTLE CABLE

AT0T6–01

## ON–VEHICLE REPAIR

**1. DISCONNECT THROTTLE CABLE**

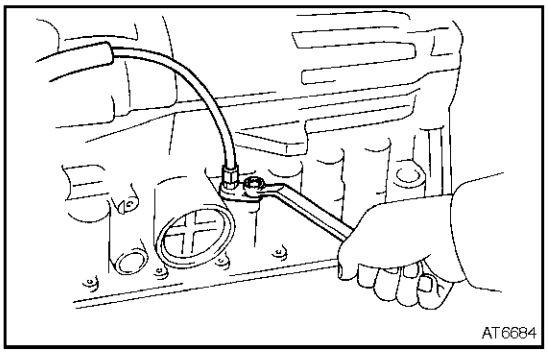
(a) Disconnect the cable from the throttle linkage

(b) Disconnect the cable from the cable clamps in the engine compartment

(c) Remove the bolt and disconnect the cable clamp from the torque converter clutch housing

**2. REMOVE VALVE BODY (See page AT–7)**

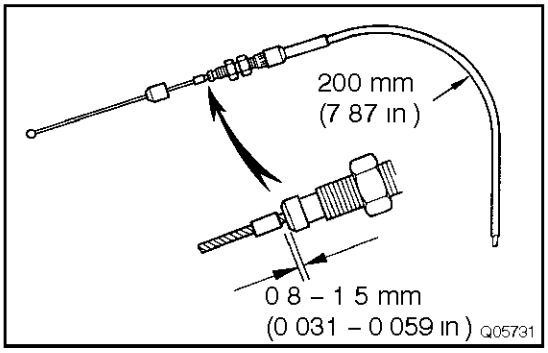
**3. REMOVE THROTTLE CABLE**




Remove the retaining bolt and pull out the throttle cable

**4. REINSTALL THROTTLE CABLE**

(a) To install, follow the removal procedure in reverse




HINT

If throttle cable is new, stake the stopper on the inner cable

(b) Bend the cable so there is a radius of about 200 mm (7 87 in )

(c) Pull the inner cable lightly until slight resistance is felt, and hold it there

(d) Stake the stopper, 0 8–1 5 mm (0 031–0 059 in ) from the end of outer cable

- After installation, fill ATF and check the fluid level (See page DI–131)
- Adjust the throttle cable (See page DI–131)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

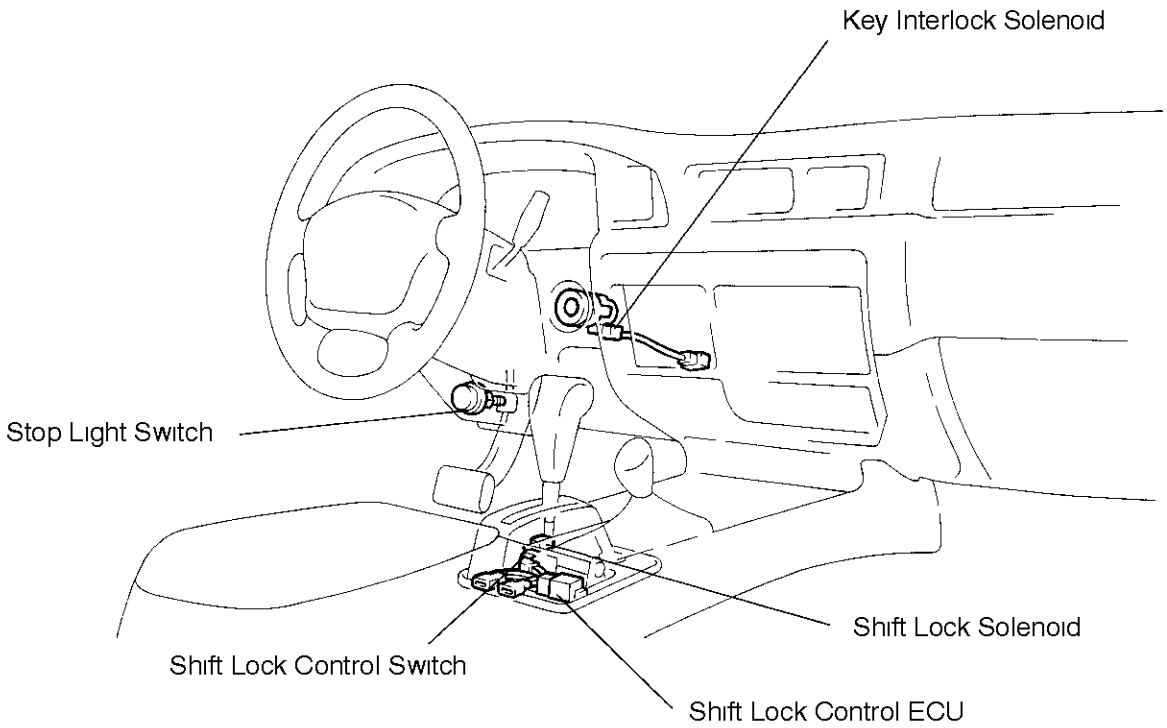
Brought to you by BirfMark

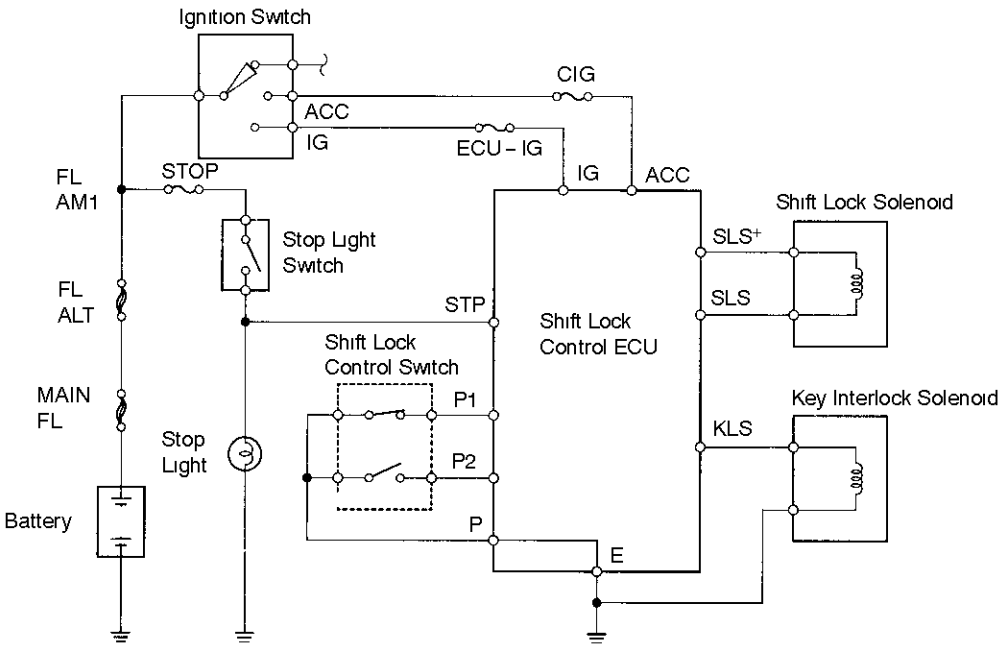


# SHIFT LOCK SYSTEM

## LOCATION

AT0YZ-01




Z16651

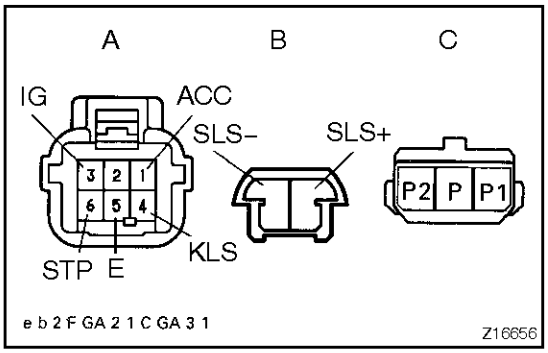


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ATDT7-04




# INSPECTION

## 1. INSPECT SHIFT LOCK CONTROL ECU

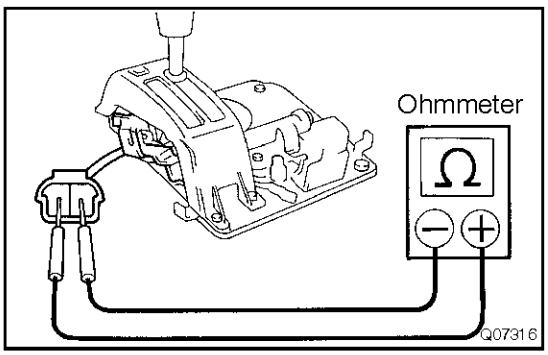
Using a voltmeter, measure the voltage at each terminal

HINT

Do not disconnect the ECU connector

| Connector | Terminal | Measuring condition | Voltage (V) |
|---|---|---|---|
| A | ACC – E | IG SW ACC | 10 – 14 |
| | IG – E | IG SW ON | 10 – 14 |
| | STP – E | Depress brake pedal | 10 – 14 |
| | KLS – E | ① IG SW ACC and shift lever P position | 0 |
| | | ② IG SW ACC and shift lever except P position | 10 – 14 |
| | | ③ ↑ (After - approx. 1 second) | 6 – 9 |
| B | $SLS^+ - SLS^-$ | ① IG SW ON and shift lever P position | 0 |
| | | ② Depress brake pedal | 8 5 – 13.5 |
| | | ③ ↑ (After - approx. 20 seconds) | 5.5 – 9.5 |
| | | ④ Shift lever except P position under condition above | 0 |
| C | P1 – P | ① IG SW ON, shift lever P position and depress brake pedal | 0 |
| | | ② Shift lever except P position under condition above | 9 – 13.5 |
| | P2 – P | ① IG SW ACC and shift lever at P position | 9 – 13.5 |
| | | ② Shift lever except P position under condition above | 0 |

V07131



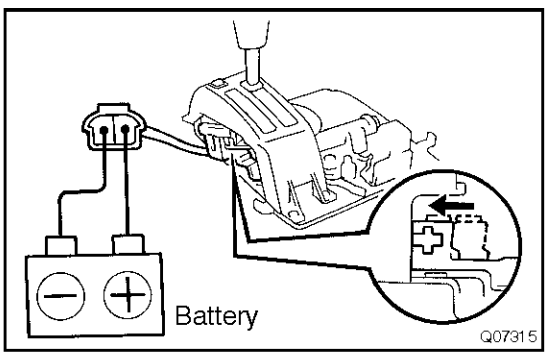

## 2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector

(b) Using an ohmmeter, measure the resistance between terminals

**Standard resistance: 20 – 28 Ω**

If the resistance is not as specified, replace the solenoid




(c) Apply the battery positive voltage between terminals At this time, confirm that solenoid operate

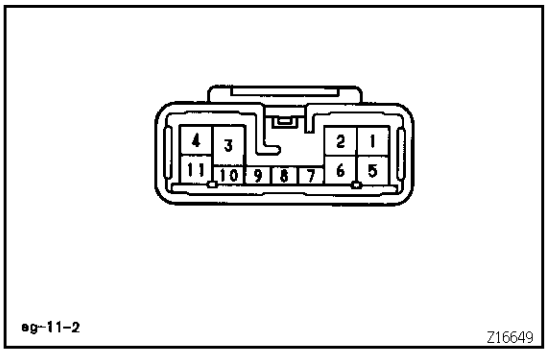
If the operation is not as specified, replace the solenoid



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





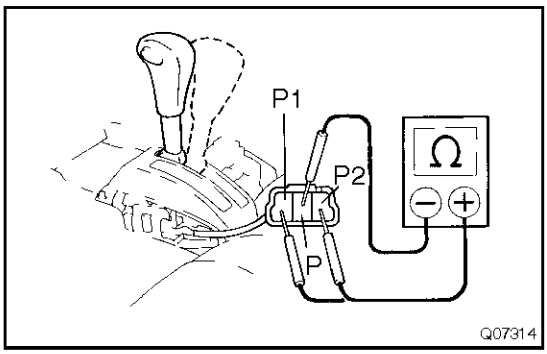

### 3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector

(b) Using an ohmmeter, measure the resistance between terminals 7 and 8

**Standard resistance: 12 – 17 Ω**

If the resistance is not as specified, replace the solenoid




### 4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminal

| Shift position | Tester condition to terminal number | Specified value |
|---|---|---|
| P position (Release button is not pushed) | P1 – P | Continuity |
| P position (Release button is pushed) | P1 – P<br>P2 – P | Continuity |
| R N D 2 L position | P2 – P | Continuity |

If the continuity is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

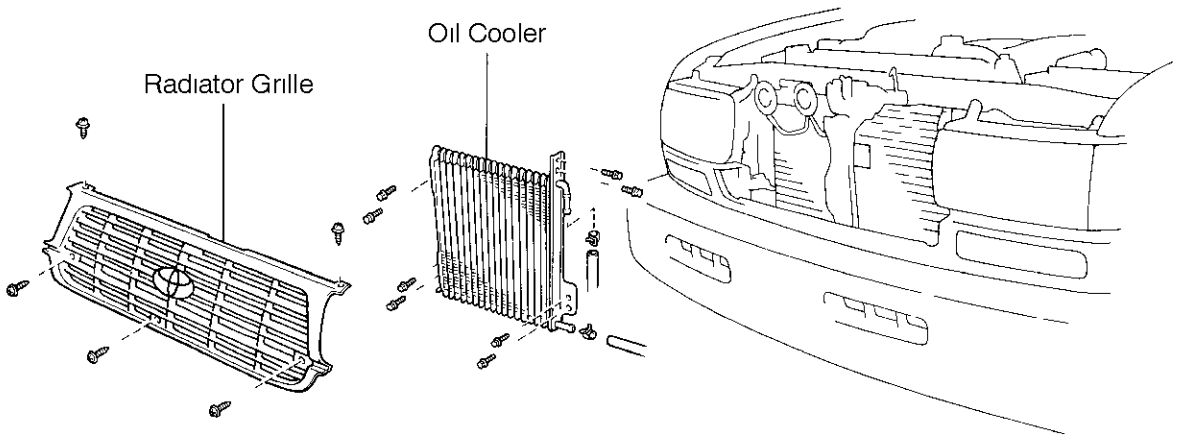
Brought to you by BirfMark



# AIR COOLED OIL COOLER

## COMPONENTS

AT0T8-01



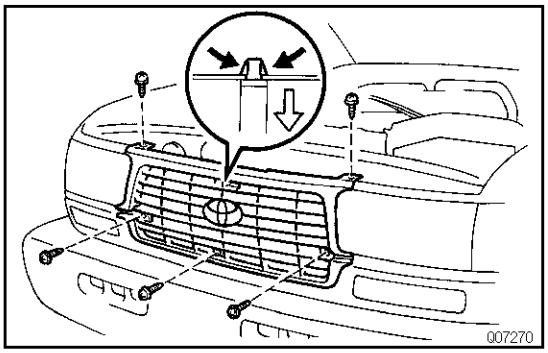



Author : Date : 799
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



AT0T9-01




# REMOVAL

**1. REMOVE RADIATOR GRILLE**

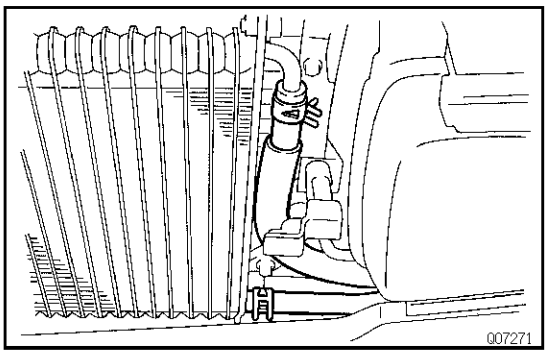
(a) Remove the 5 screws

(b) Using a screwdriver, disconnect the clip

HINT

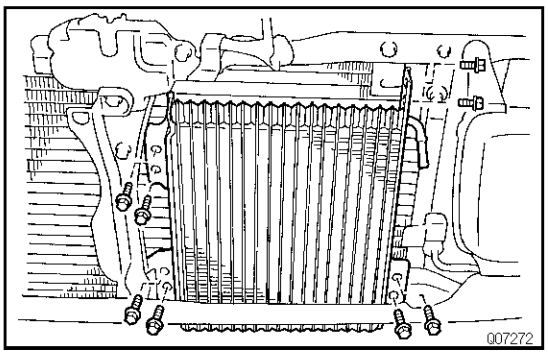
Tape a screwdriver tip before use

(c) Remove the radiator grille




**2. REMOVE OIL COOLER**

(a) Loosen the 2 clips and disconnect the 2 hoses




(b) Remove the 8 bolts and oil cooler

**Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ATOTA–01

# INSTALLATION

**Installation is in the reverse order of removal (See page AT–16).**

HINT

After ınstallatıon, check fluıd level (See page DI–131)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

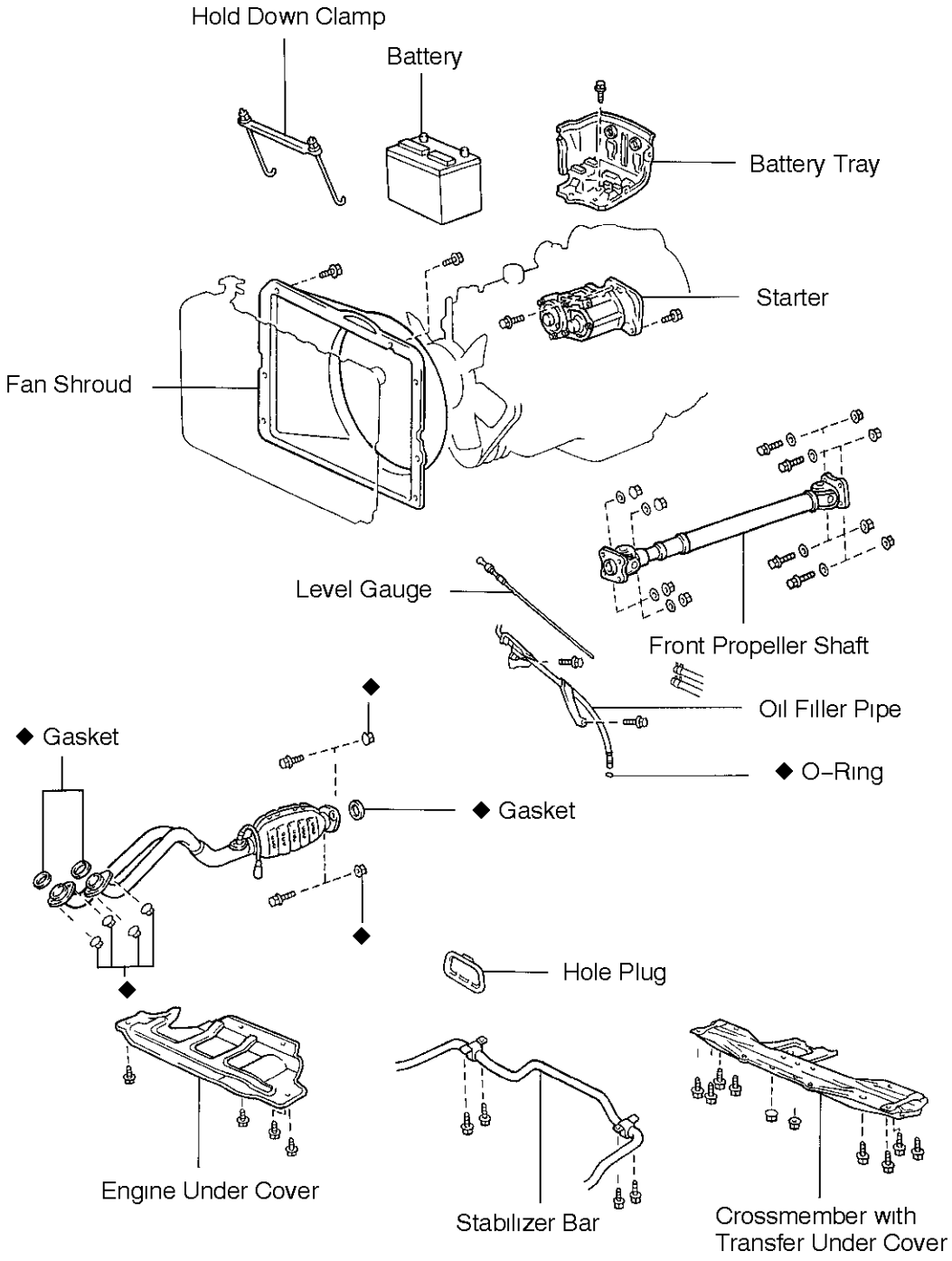
Brought to you by BirfMark



# AUTOMATIC TRANSMISSION UNIT

## COMPONENTS

AT0TB-01




◆ Non–reusable Part

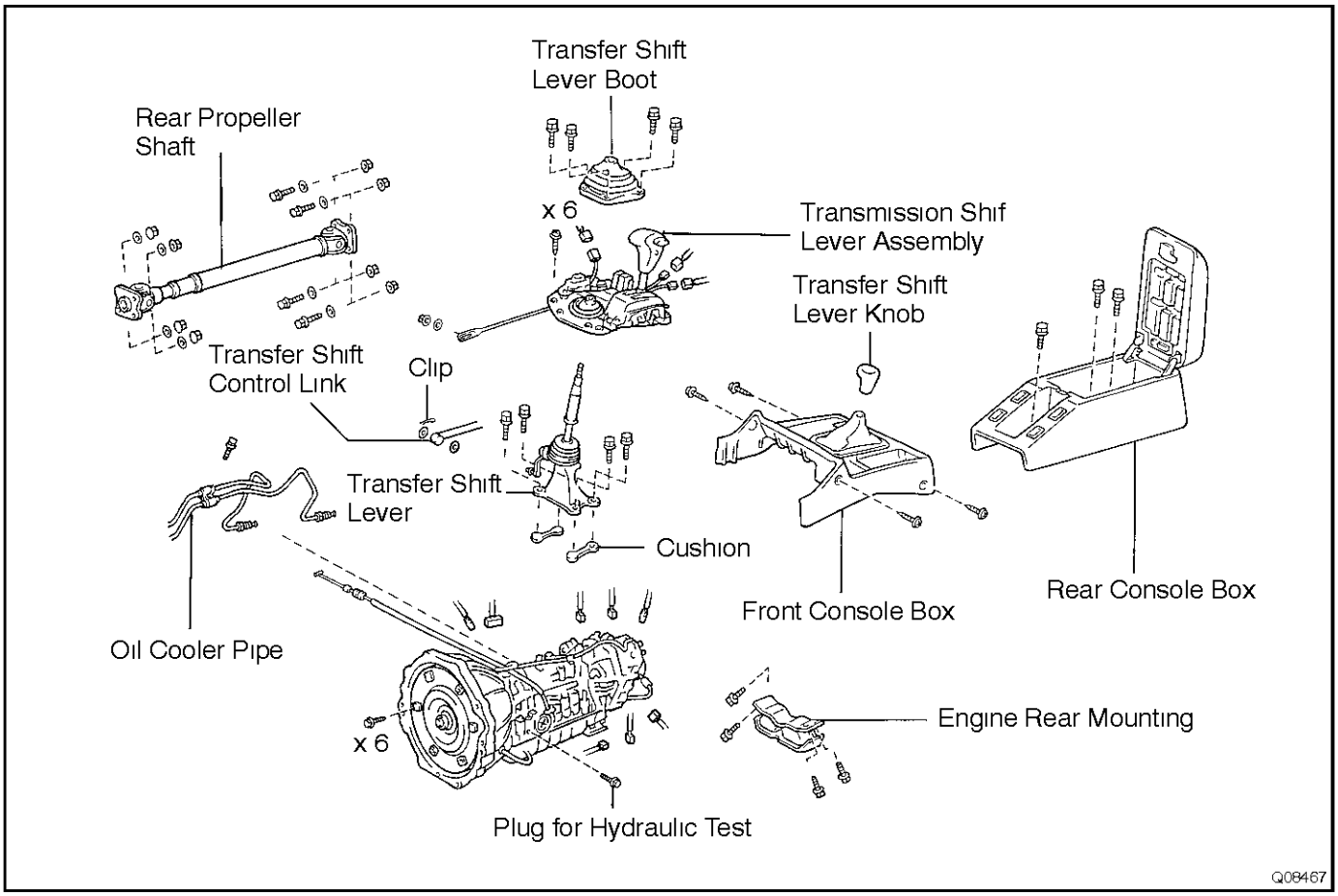
Q08463



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark







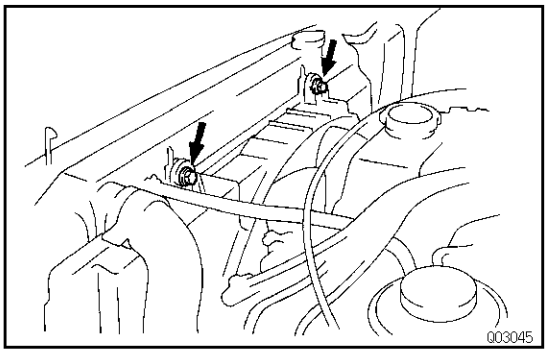

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

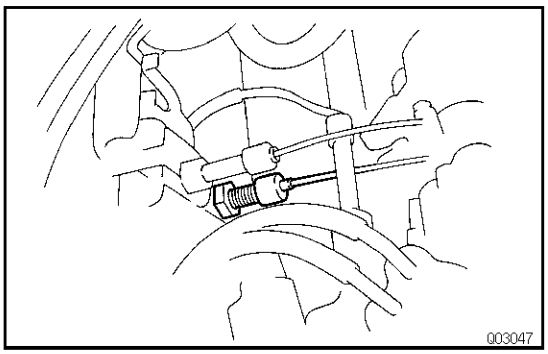


ATDTC 01

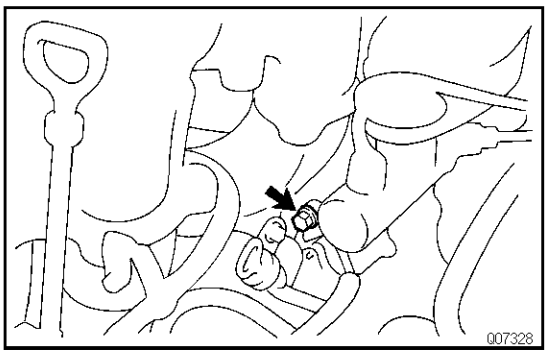
# REMOVAL



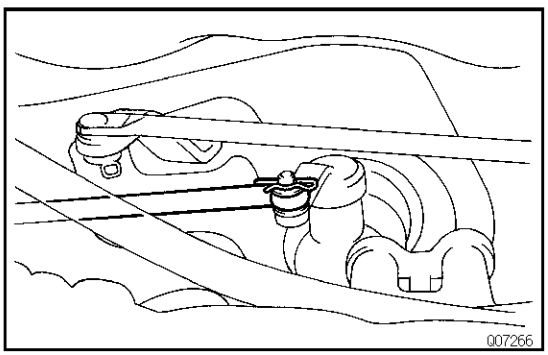

1. **REMOVE BATTERY AND BATTERY TRAY**
2. **REMOVE 2 BOLTS AND LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN**
   **Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)**



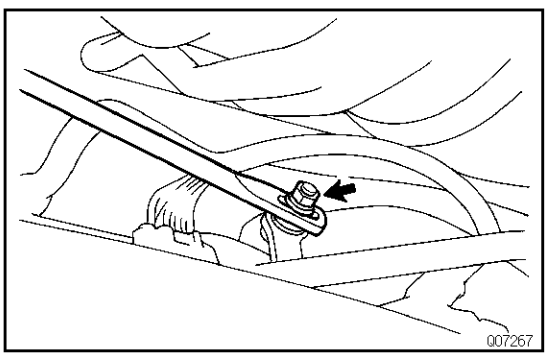

3. **DISCONNECT THROTTLE CABLE**
   (a) Loosen the adjusting nut and disconnect the cable from the bracket
   (b) Disconnect the throttle cable from the linkage




4. **REMOVE UPPER SIDE STARTER MOUNTING BOLT**
   **Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**




5. **REMOVE TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER**
   (a) Remove the clip, washer and wave washer, and disconnect the transfer shift lever link



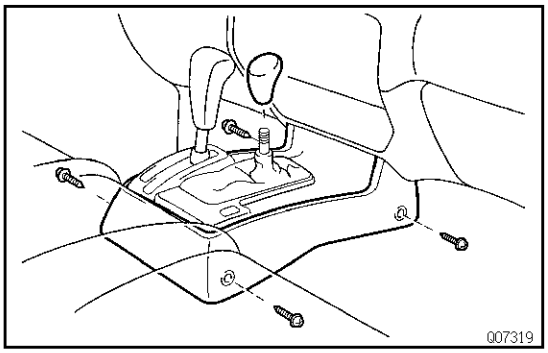

   (b) Remove the nut and washer, and disconnect the transmission select lever link
   **Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**



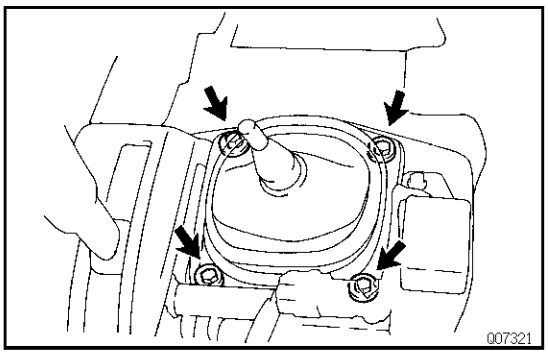
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

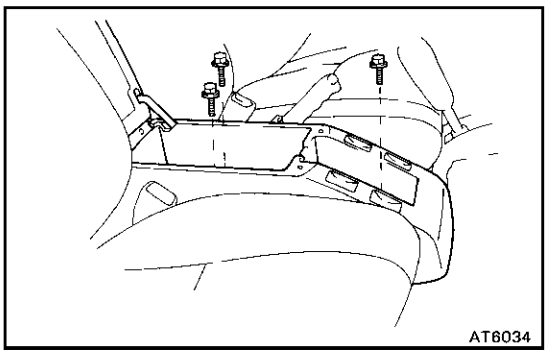




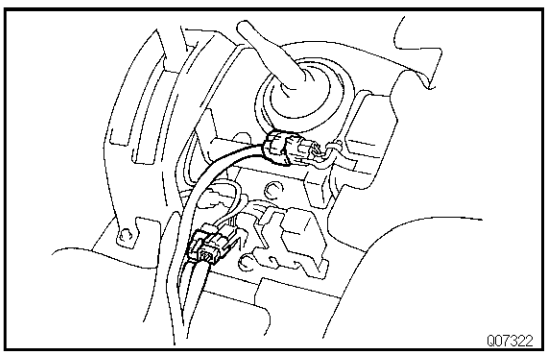

(c) Remove the transfer shift lever knob
(d) Remove the 4 screws and console



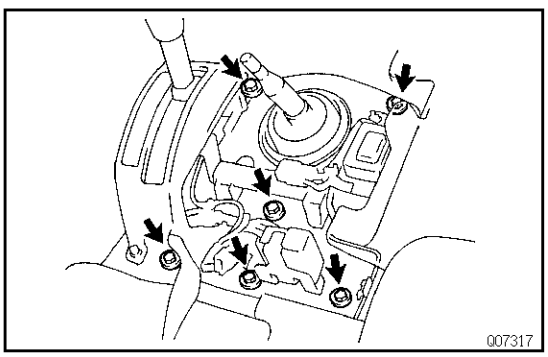

(e) Remove the 4 screws and transfer shift lever boot




(f) Remove the 3 bolts and console box




(g) Disconnect the 3 connectors



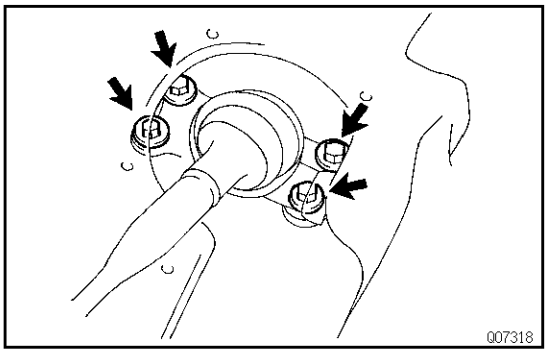

(h) Remove the 6 screws and transmission shift lever assembly
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





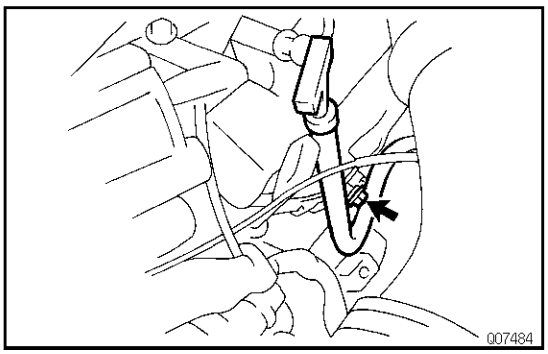

(i) Remove the 4 bolts and transfer shift lever
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**
(j) Remove the 2 cushions

**6. DISCONNECT THESE CONNECTORS:**

- No 1 vehicle speed sensor
- No 2 vehicle speed sensor
- Park/neutral position switch
- Solenoid connector
- ATF temperature sensor
- Center differential lock indicator switch
- L4 position switch
- Neutral position switch

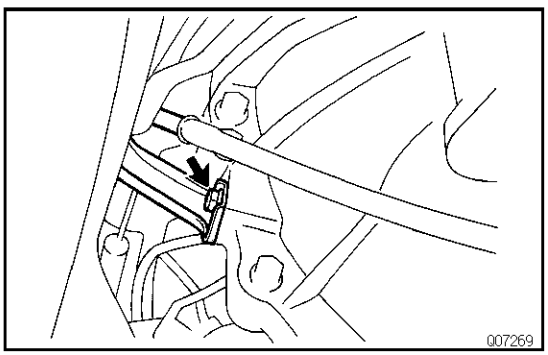
**7. DISCONNECT BLEEDER HOSE FROM TRANSFER**

**8. REMOVE FRONT AND REAR PROPELLER SHAFT (See page PR–3)**




**9. REMOVE OIL FILLER PIPE**

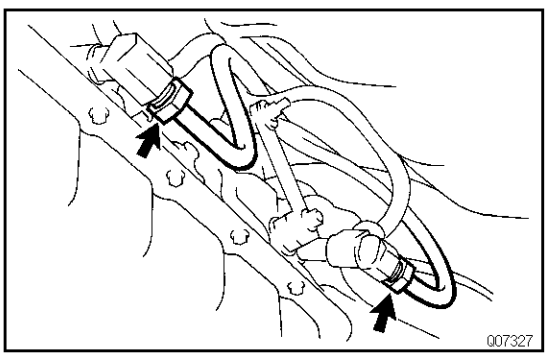
(a) Remove the level gauge
(b) Remove the upper side mounting bolt




(c) Remove the bolt and filler pipe

HINT

At the time of installation, replace the used O–ring with a new one



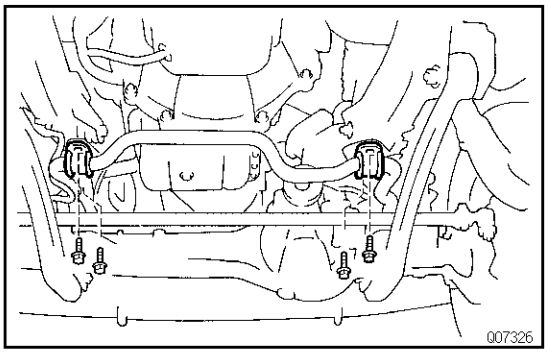

**10. LOOSEN 2 OIL COOLER PIPE UNION NUTS**
**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

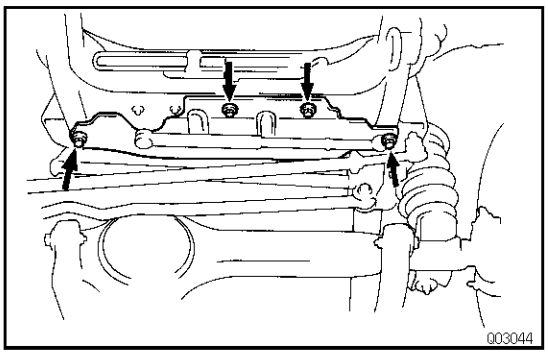
Brought to you by BirfMark






**11. REMOVE 4 STABILIZER BAR BRACKET MOUNTING BOLTS**

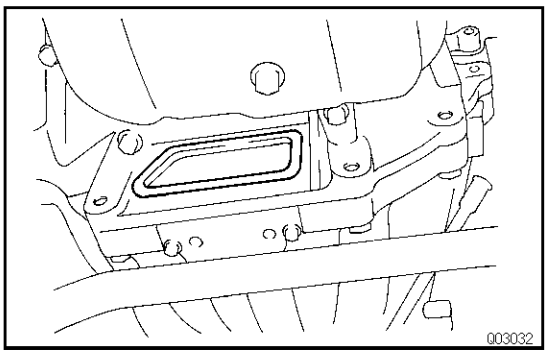
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




**12. REMOVE ENGINE UNDER COVER**

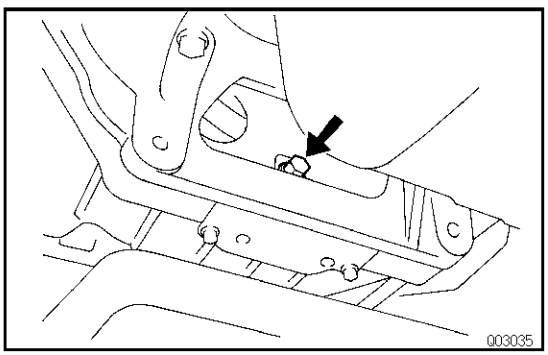
Remove the 4 bolts and engine under cover

**Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)**




**13. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLT**

(a) Remove the converter hole plug




(b) Turn the crankshaft to gain access to each bolt

(c) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts

**Torque: 55 N·m (550 kgf·cm, 40 ft·lbf)**

HINT

At the time of installation, first install gray colored bolt and then 5 other bolts

**14. REMOVE FRONT EXHAUST PIPE ASSEMBLY**

(a) Remove the 2 nuts, bolts and gasket, and disconnect the front exhaust pipe assembly

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

HINT

At the time of inatallation, replace the used nuts and gasket with new nuts and gasket

(b) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket

**Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)**

(c) Remove the 2 bolts and No 1 support bracket

**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**



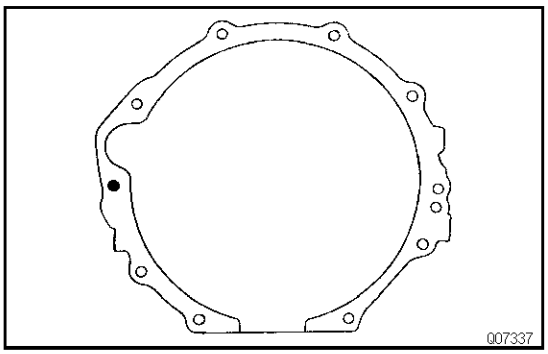
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



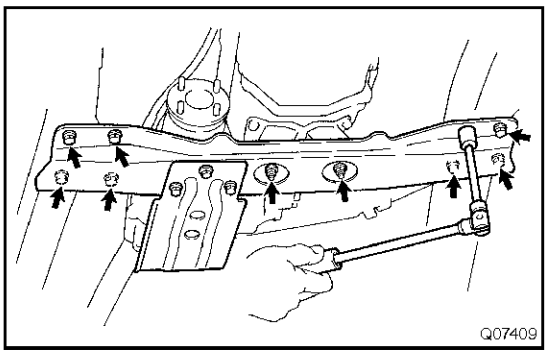
(d) Remove the 4 nuts and 2 gaskets, shift the front exhaust pipe assembly to the vehicle's outside
**Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)**

HINT
At the time of installation, replace the used gaskets and nuts with new gaskets and nuts



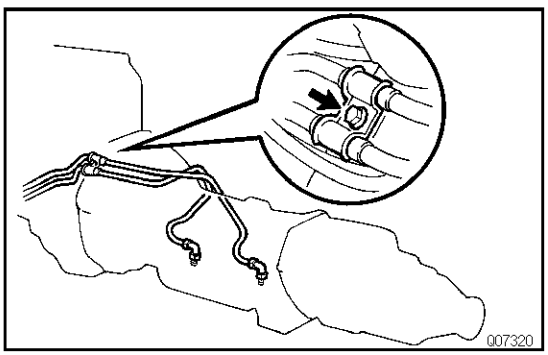

**15. REMOVE STARTER**

(a) Remove the nut and disconnect the terminal and connector
(b) Remove the lower side mounting bolt and starter
**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**




**16. REMOVE CROSSMEMBER**

(a) Support the transmission with a transmission jack
(b) Remove the 8 bolts and 2 nuts, and then remove the crossmember
**Torque:**
**Bolt: 61 N·m (620 kgf·cm, 45 ft·lbf)**
**Nut: 74 N·m (750 kgf·cm, 54 ft·lbf)**

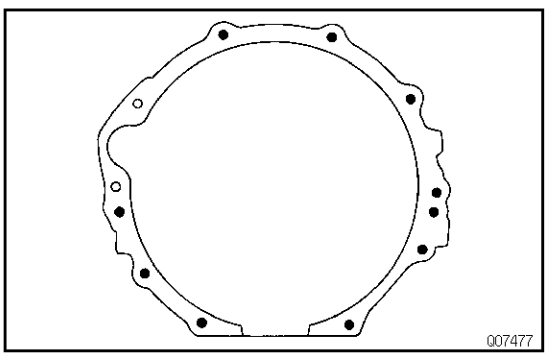



**17. REMOVE TRANSMISSION**

(a) Lower the rear end of the transmission

**NOTICE:**
**Be careful not to damage the cooling fan, brake booster and brake line.**

(b) Separate the wire harness from the transmission and transfer
(c) Remove the oil cooler pipe mounting bolts from the torque converter clutch housing, and then disconnect the 2 oil cooler pipes from the elbows
(d) Remove the 10 bolts and transmission
**Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)**



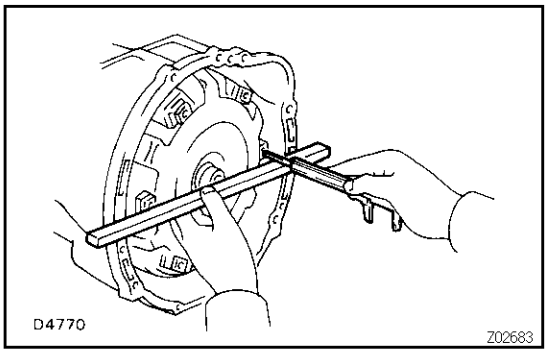



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ATDTD 01




# INSTALLATION

## 1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the transmission housing

**Correct distance: More than 15.7 mm (0.618 in.)**

## 2. INSTALL TRANSMISSION

**Installation is in the reverse order of removal (See page AT–20).**

HINT

- After installation, adjust the shift lever position and throttle cable (See page DI–131)
- Fill and check fluid level (See page DI–131)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BODY ELECTRICAL SYSTEM

BE1LS-01

## PRECAUTION

Take care to observe the following precautions when performing inspections or removal and replacement of body electrical related parts

### 1. HEADLIGHT SYSTEM

Halogen bulbs have pressurized gas inside and require special handling They can burst if scratched or dropped Hold a bulb only by its plastic or metal case Don't touch the glass part of a bulb with bare hands

### 2. SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

The LAND CRUISER is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section

### 3. AUDIO SYSTEM

If the negative (–) terminal cable is disconnected from the battery, the preset AM, FM 1 and FM 2 stations stored in memory are erased, so be sure to note the stations and reset them after the negative (–) terminal cable is reconnected to the battery

### 4. MOBILE COMMUNICATION SYSTEM

If the vehicle is equipped with a mobile communication system, refer to precautions in the IN section



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1LT–01

# PROBLEM SYMPTOMS TABLE

## IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

| Symptom | Suspect Area | See page |
|---|---|---|
| Ignition switch is not set to each position | 5 Ignition Switch | BE–11 |
| Key unlock warning system does not operate | 1 GAUGE Fuse (I/P F/B)<br>2 Key Unlock Warning Switch<br>3 Door Courtesy Switch<br>4 Wire Harness | –<br>BE–11<br>BE–21<br>– |

## HEADLIGHT AND TAILLIGHT SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Headlight does not light up (Taillight is normal) | 1 Headlight Bulb<br>2 MAIN FL<br>3 HEAD (LH) Fuse (No 2 R/B)<br>4 HEAD (RH) Fuse (No 2 R/B)<br>5 Light Control Switch<br>6 Headlight Dimmer Switch<br>7 Wire Harness | –<br>–<br>–<br>–<br>BE–14<br>BE–14<br>– |
| Headlight does not light up (Taillight does not light up) | 1 Headlight Bulb<br>2 Light Control Switch<br>3 Headlight Dimmer Switch<br>4 Wire Harness | –<br>BE–14<br>BE–14<br>– |
| Only one light comes ON | 1 Headlight Bulb<br>2 HEAD (LH) Fuse (No 2 R/B)<br>3 HEAD (RH) Fuse (No 2 R/B)<br>4 Wire Harness | –<br>–<br>–<br>– |
| Lo–Beam does not light up | 1 Headlight Bulb<br>2 Headlight Control Relay (No 2 R/B)<br>3 Headlight Dimmer Switch<br>4 Wire Harness | –<br>–<br>BE–14<br>– |
| Hi–Beam does not light up | 1 Headlight Bulb<br>2 Headlight Control Relay (No 2 R/B)<br>3 Headlight Dimmer Switch<br>4 Wire Harness | –<br>–<br>BE–14<br>– |
| Flash does not light up | 1 Headlight Bulb<br>2 Headlight Control Relay (No 2 R/B)<br>3 Headlight Dimmer Switch<br>4 Wire Harness | –<br>–<br>BE–14<br>– |
| Taillight does not light up (Headlight is normal) | 1 Taillight Bulb<br>2 TAIL Fuse (I/P F/B)<br>3 Light Control Switch<br>4 Taillight Control Relay (No 2 R/B)<br>5 Wire Harness | –<br>–<br>BE–14<br>BE–14<br>– |
| Taillight does not light up (Headlight does not light up) | 1 Taillight Bulb<br>2 MAIN FL<br>3 TAIL Fuse (I/P F/B)<br>4 Light Control Switch<br>5 Wire Harness | –<br>–<br>–<br>BE–14<br>– |
| Headlight and Taillight does not light | 1 Light Control Switch<br>2 Wire Harness | BE–14<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Only one side taillight does not light | 1 Taillight Bulb<br>2 Wire Harness | –<br>– |
| Taillight does not light<br>(Headlight is normal ) | 1 Taillight Bulb<br>2 TAIL Fuse (No 2 R/B)<br>3 Taillight Control Relay (No 2 R/B)<br>4 Light Control Switch<br>5 Wire Harness | –<br>BE–14<br>BE–14<br>BE–14<br>– |

## TURN SIGNAL AND HAZARD WARNING SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Hazard and Turn do not light up | 1 Hazard Warning Switch<br>2 Turn Signal Flasher (No 1 R/B)<br>3 Wire Harness | BE–19<br>BE–19<br>– |
| None of blinks for hazard (Turn is normal ) | 1 Bulb<br>2 Turn Signal Flasher (No 1 R/B)<br>3 Wire Harness | –<br>BE–19<br>– |
| Hazard warning light does not light up (Turn is normal ) | 1 HAZ – HORN Fuse (No 2 R/B)<br>2 Wire Harness | BE–19<br>– |
| Hazard warning light does not light up in one direction | 1 Hazard Warning Switch<br>2 Wire Harness | BE–19<br>– |
| The flashing frequency is abnormal | 1 Bulb<br>2 Turn Signal Flasher (No 1 R/B)<br>3 Wire Harness | –<br>BE–19<br>– |
| Turn signal does not light up in one direction | 1 Turn Signal Switch<br>2 Wire Harness | BE–19<br>– |
| Only one bulb does not light up for hazard turn | 1 Bulb<br>2 Wire Harness | –<br>– |
| Turn signal does not light up<br>(Combination meter wiper and washer do not operate ) | 1 Ignition Switch<br>2 TURN Fuse (I/P F/B)<br>3 Turn Signal Switch<br>4 Wire Harness | BE–11<br>BE–19<br>BE–19<br>– |
| Turn signal does not light up<br>(Combination meter wiper and washer are normal ) | 1 TURN Fuse (I/P F/B)<br>2 Turn Signal Switch<br>3 Wire Harness | BE–19<br>BE–19<br>– |

## INTERIOR LIGHT SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Room light does not light up | 1 DOME Fuse (No 2 R/B)<br>2 Door Courtesy Switch<br>3 Front Personal Light<br>4 Room Light Assembly<br>5 Bulb<br>6 Wire Harness | –<br>BE–21<br>BE–21<br>BE–21<br>–<br>– |
| Room light remains always on | 1 Door Courtesy Switch<br>2 Wire Harness | BE–21<br>– |

## BACK–UP LIGHT SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Back–Up light does not light up | 1 GAUGE Fuse (I/P F/B)<br>2 Ignition Switch<br>3 Park/Neutral Position Switch (A/T)<br>4 Bulb<br>5 Wire Harness | –<br>BE–11<br>–<br>–<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Back–Up light remains on | 1 Park/Neutral Position Switch (A/T)<br>2 Wire Harness | –<br>– |
| Only one light does not light up | 1 Bulb<br>2 Wire Harness | –<br>– |

## STOP LIGHT SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Stop light does not light up | 1 STOP Fuse (I/P F/B)<br>2 Stop Light Switch<br>3 Bulb<br>4 Wire Harness | –<br>BE–25<br>–<br>– |
| Stop light remains always on | 1 Stop Light Switch<br>2 Wire Harness | BE–25<br>– |
| Only one light does not light up | 1 Wire Harness<br>2 Bulb | –<br>– |

## WIPER AND WASHER SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Wipers do not operate or return to off position | 1 WIPER Fuse (I/P F/B)<br>2 Wiper Switch<br>3 Wiper Motor<br>4 Wiper Relay<br>5 Wire Harness | BE–27<br>BE–27<br>BE–27<br>BE–27<br>– |
| Wipers do not operate in MIST | 1 Wiper Switch<br>2 Wiper Motor<br>3 Wiper Relay<br>4 Wire Harness | BE–27<br>BE–27<br>BE–27<br>– |
| Wipers do not operate in INT | 1 Wiper Switch<br>2 Wiper Motor<br>3 Wiper Relay<br>4 Wire Harness | BE–27<br>BE–27<br>BE–27<br>– |
| Washer does not operate | 1 Washer Hose or Nozzle Clogged<br>2 Washer Switch<br>3 Washer Motor<br>4 Wire Harness | –<br>BE–27<br>BE–27<br>– |

## METER, GAUGES AND ILLUMINATION: COMBINATION METER

| Symptom | Suspect Area | See page |
|---|---|---|
| Tachometer speedometer engine coolant temperature gauge and fuel gauge do not operate | 1 GAUGE Fuse (I/P F/B)<br>2 Meter Circuit<br>3 Wire Harness | –<br>BE–32<br>– |
| Speedometer does not operate | 1 No 1 Vehicle Speed Sensor<br>2 Speedometer Driven Gear and Drive Gear<br>3 Meter Circuit<br>4 Wire Harness | BE–34<br>–<br>BE–32<br>– |
| Tachometer does not operate | 1 Meter Circuit<br>2 Igniter<br>3 Wire Harness | BE–32<br>–<br>– |
| Tachometer does not operate | 1 Meter Circuit<br>2 Igniter<br>3 Wire Harness | BE–32<br>–<br>– |
| Voltmeter does not operate | 1 Voltmeter Receiver Gauge<br>2 Wire Harness | AT–6<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Fuel gauge does not operate or abnormal operation | 1 Fuel Receiver Gauge<br>2 Fuel Sender Gauge<br>3 Meter Circuit<br>4 Wire Harness | BE–34<br>BE–34<br>BE–32<br>– |
| Engine coolant temperature gauge does not operation or abnormal operate | 1 Engine Coolant Temperature Receiver Gauge<br>2 Engine Coolant Temperature Sender Gauge<br>3 Meter Circuit<br>4 Wire Harness | BE–34<br>BE–34<br>BE–32<br>– |
| Oil pressure gauge does not operate or abnormal operation | 1 Oil Pressure Receiver Gauge<br>2 Oil Pressure Sender Gauge<br>3 Meter Circuit<br>4 Wire Harness | BE–34<br>BE–34<br>BE–34<br>– |
| All illumination lights do not light up | 1 TAIL Fuse (I/P F/B)<br>2 Light Control Rheostat<br>3 Wire Harness | –<br>BE–34<br>– |
| Brightness does not change even when rheostat turned | 1 Bulb<br>2 Wire Harness | –<br>– |
| Only one illumination light does not light up | 1 Bulb<br>2 Wire Harness | –<br>– |

## WARNING LIGHTS:
## COMBINATION METER

| Symptom | Suspect Area | See page |
|---|---|---|
| Warning lights do not lights up<br>(Except discharge SRS and door open) | 1 GAUGE Fuse (I/P F/B)<br>2 Meter Circuit<br>3 Wire Harness | –<br>BE–32<br>– |
| Brake warning light does not light up | 1 Bulb<br>2 Brake Fluid Level Switch<br>3 Parking Brake Switch<br>4 Meter Circuit<br>5 Wire Harness | –<br>BE–34<br>BE–34<br>BE–32<br>– |
| Open door warning light does not light up | 1 Bulb<br>2 Door Courtesy Switch<br>3 DOME Fuse (No 2 R/B)<br>4 Meter Circuit<br>5 Wire Harness | –<br>BE–21<br>BE–21<br>–<br>–<br>– |
| SRS warning light does not light up | 1 Bulb<br>2 Airbag Sensor Assembly<br>3 ECU–B Fuse (I/P F/B)<br>4 Meter Circuit<br>5 Wire Harness | –<br>–<br>–<br>BE–32<br>– |
| Discharge warning light does not light up | 1 Bulb<br>2 IGN Fuse (No 1 J/B)<br>3 Generator<br>4 Meter Circuit<br>5 Wire Harness | –<br>–<br>–<br>BE–32<br>– |
| Seat belt warning light does not light up | 1 Bulb<br>2 Seat Belt Buckle Switch<br>3 Seat Belt Warning Relay (I/P F/B)<br>4 Meter Circuit<br>5 Wire Harness | –<br>BE–34<br>–<br>BE–32<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Engine oil level warning light does not light up | 1 Bulb<br>2 Meter Circuit<br>3 Engine Oil Level Warning Switch<br>4 Wire Harness | –<br>BE–32<br>BE–34<br>– |
| Low oil pressure warning light does not light up | 1 Bulb<br>2 Low Oil Pressure Warning Switch<br>3 Meter Circuit<br>4 Wire Harness | –<br>BE–32<br>BE–34<br>– |
| Fuel level warning light does not light up | 1 Bulb<br>2 Fuel Level Warning Switch<br>3 Meter Circuit<br>4 Wire Harness | –<br>BE–34<br>BE–32<br>– |

## INDICATOR LIGHTS: COMBINATION METER

| Symptom | Suspect Area | See page |
|---|---|---|
| High beam indicator light does not light up | 1 Bulb<br>2 Headlight and Taillight System<br>3 Meter Circuit<br>4 Wire Harness | –<br>BE–19<br>BE–32<br>– |
| Shift indicator lights do not light up (ALL) | 1 Shift Position Indicator Wiring Circuit<br>2 Park/Neutral Position Switch<br>3 Wire Harness<br>4 Bulb | –<br>BE–34<br>AT–6<br>– |
| Shift indicator lights do not light up (L 2 D) | 1 Bulb<br>2 Shift Position Indicator Wiring Circuit<br>3 Park/Neutral Position Switch<br>4 Light Control Rheostat<br>5 Wire Harness | –<br>BE–34<br>AT–6<br>BE–34<br>– |
| Shift indicator lights do not light up (PWR) | 1 Bulb<br>2 Shift Position Indicator Wiring Circuit<br>3 Pattern Select Switch<br>4 Wire Harness | –<br>BE–34<br>AT–6<br>– |
| Shift indicator lights do not light up (2nd START) | 1 Bulb<br>2 Shift Position Indicator Wiring Circuit<br>3 ECM<br>4 Wire Harness | –<br>AT–6<br>–<br>– |
| Only one shift indicator does not light up | 1 Bulb<br>2 Shift Position Indicator Wiring Circuit | –<br>BE–34 |
| Indicator lights do not light up (Except Turn Hi–beam) | 1 GAUGE Fuse (I/P F/B)<br>2 Wire Harness | –<br>– |
| O/D OFF indicator light does not light up | 1 Bulb<br>2 O/D Main Switch<br>3 Meter Circuit<br>4 Wire Harness | –<br>–<br>BE–32<br>– |
| Malfunction indicator light does not light up | 1 Bulb<br>2 ECM<br>3 Wire Harness | –<br>–<br>– |
| Cruise control indicator light does not light up | 1 Bulb<br>2 Cruise Control ECU<br>3 Meter Circuit<br>4 Wire Harness | –<br>–<br>BE–32<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## DEFOGGER SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Defogger system does not operate | 1 DEFOG Fuse (I/P F/B) | – |
| | 2 GAUGE Fuse (I/P F/B) | – |
| | 3 Defogger Switch | BE–43 |
| | 4 Defogger Relay (No 1 R/B) | BE–43 |
| | 5 Defogger Wire | – |
| | 6 Wire Harness | – |

## POWER WINDOW CONTROL SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Power window does not operate (ALL) (Power door lock does not operate ) | 1 POWER Fuse (I/P F/B) | – |
| | 2 GAUGE Fuse (I/P F/B) | – |
| | 3 Power Main Relay (No 1 R/B) | – |
| | 4 Wire Harness | – |
| Power window does not operate (ALL) (Power door lock is normal ) | 1 Ignition Switch | BE–11 |
| | 2 Power Main Relay (No 1 R/B) | – |
| | 3 Power Window Master Switch | BE–46 |
| | 4 Wire Harness | – |
| One touch power window system does not operate | 1 Power Window Master Switch | BE–46 |
| Only one window glass does not operate | 1 Power Window Master Switch | BE–46 |
| | 2 Power Window Switch | BE–46 |
| | 3 Power Window Motor | BE–46 |
| | 4 Wire Harness | – |

## POWER DOOR LOCK CONTROL SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Power door lock control system does not operate (ALL) | 1 POWER Fuse (I/P F/B) | – |
| | 2 Power Main Relay (No 1 R/B) | – |
| | 3 Wire Harness | – |
| Power door lock control system does not operate by door lock control switch | 1 Door Lock Control Switch | BE–51 |
| | 2 Power Main Relay (No 1 R/B) | – |
| | 3 Wire Harness | – |
| Power door lock control system does not operate by door key | 1 Door Key Lock and Unlock Switch | BE–11 |
| | 2 Power Main Relay (No 1 R/B) | – |
| | 3 Wire Harness | – |
| Only one door does not operate | 1 Door Lock Motor | BE–51 |
| | 2 Door Lock Link Disconnected | – |
| | 3 Wire Harness | – |
| Fault in key confine prevention operation | 1 Power Main Relay (No 1 R/B) | – |
| | 2 Key Unlock Warning Switch | BE–11 |
| | 3 Door Courtesy Switch | BE–21 |
| | 4 Wire Harness | – |

## SLIDING ROOF SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Sliding roof system does not operate (Door lock does not operate ) | 1 GAUGE Fuse (I/P F/B) | – |
| | 2 Ignition Switch | BE–11 |
| | 3 POWER Fuse (No 1 J/B) | – |
| | 4 Power Main Relay (No 1 R/B) | – |
| | 5 Sliding Roof Control Switch | BE–58 |
| | 6 Sliding Roof Control Relay | BE–58 |
| | 7 Sliding Roof Motor | BE–58 |
| | 8 Wire Harness | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Sliding roof system operates abnormally | 1 Limit Switch<br>2 Sliding Roof Control Switch<br>3 Sliding Roof Control Relay | BE–58<br>BE–58<br>BE–58 |
| Sliding roof system stops operation half way | 1 Sliding Roof Control Relay<br>2 Sliding Roof Limit Switch<br>3 Sliding Roof Control Switch<br>4 Sliding Roof Motor<br>(Stones to foreign material trapped in motor assembly) | BE–58<br>BE–58<br>BE–58<br>BE–58 |
| Key–off sliding roof operation does not operate | 1 POWER Fuse (I/P F/B)<br>2 Door Lock Control Relay<br>3 GAUGE Fuse (I/P F/B)<br>4 Ignition Switch<br>5 Door Courtesy Switch<br>6 Wire Harness | –<br>BE–51<br>–<br>BE–11<br>BE–21<br>– |

## POWER MIRROR SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Power mirror system does not operate | 1 CIG Fuse (I/P J/B)<br>2 Mirror Control Switch<br>3 Mirror Motor<br>4 Wire Harness | –<br>BE–69<br>BE–69<br>– |
| Power mirror operate abnormally | 1 Mirror Control Switch<br>2 Mirror Motor<br>3 Wire Harness | BE–69<br>BE–69<br>– |

## POWER SEAT CONTROL SYSTEM

| Symptom | Suspect Area | See page |
|---|---|---|
| Power seat does not operate | 1 POWER Fuse (I/P F/B)<br>2 Power Seat Switch<br>3 Wire Harness | –<br>BE–62<br>– |
| Sliding operation does not operate | 1 Slide Motor<br>2 Power Seat Switch<br>3 Wire Harness | BE–62<br>BE–62<br>– |
| Reclining operation does not operate | 1 Reclining Motor<br>2 Power Seat Switch<br>3 Wire Harness | BE–62<br>BE–62<br>– |
| Rear vertical operation does not operate | 1 Rear Vertical Motor<br>2 Power Seat Switch<br>3 Wire Harness | BE–62<br>BE–62<br>– |
| Lumber support operation does not operate | 1 Lumber Support Motor<br>2 Lumber Support Switch<br>3 Wire Harness | BE–62<br>BE–62<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

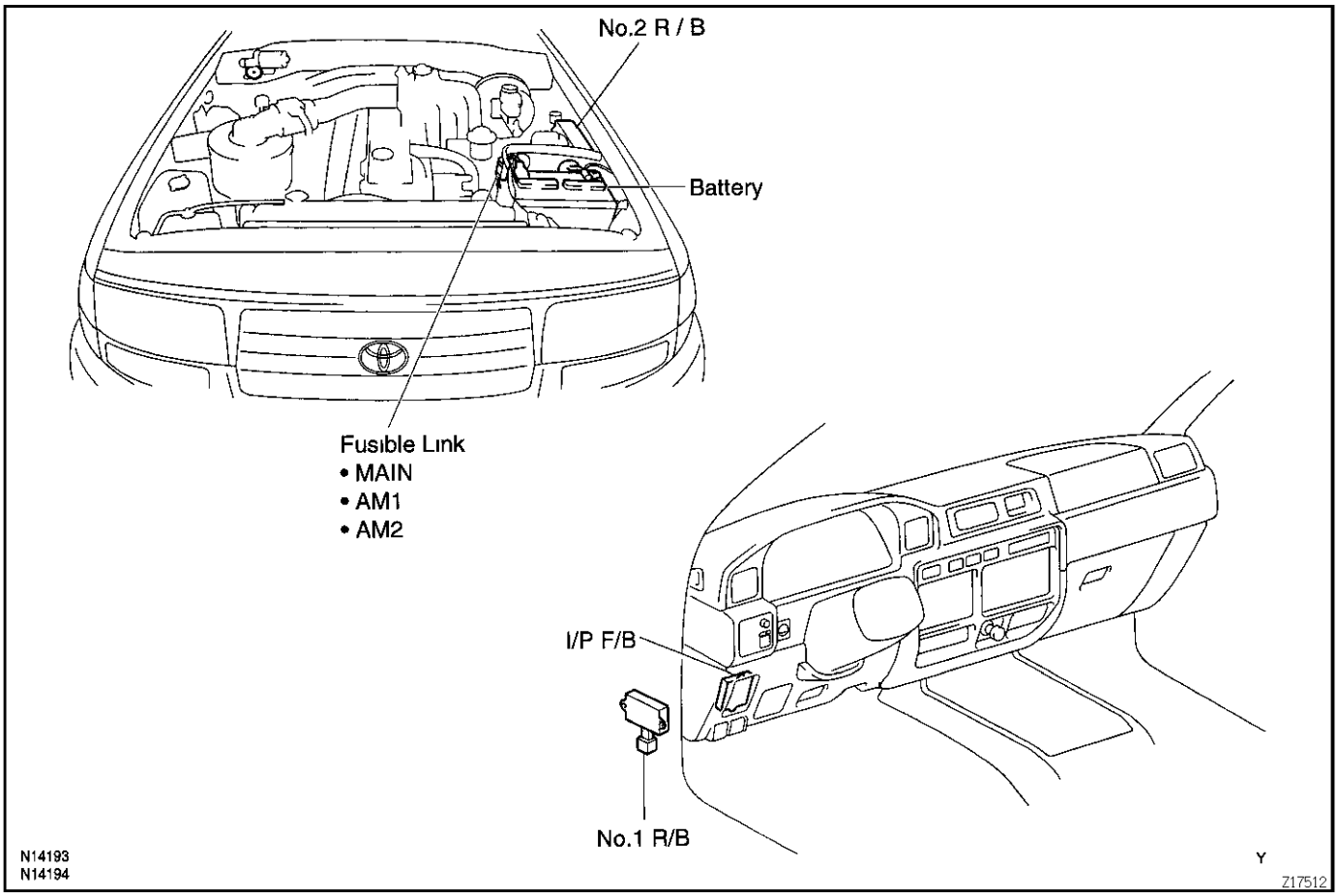
Brought to you by BirfMark



# POWER SOURCE

## LOCATION

BE1LU 01






Author : Date : 1147
Brought to you by BirfMark
Version 1.11 - 03/16/2010

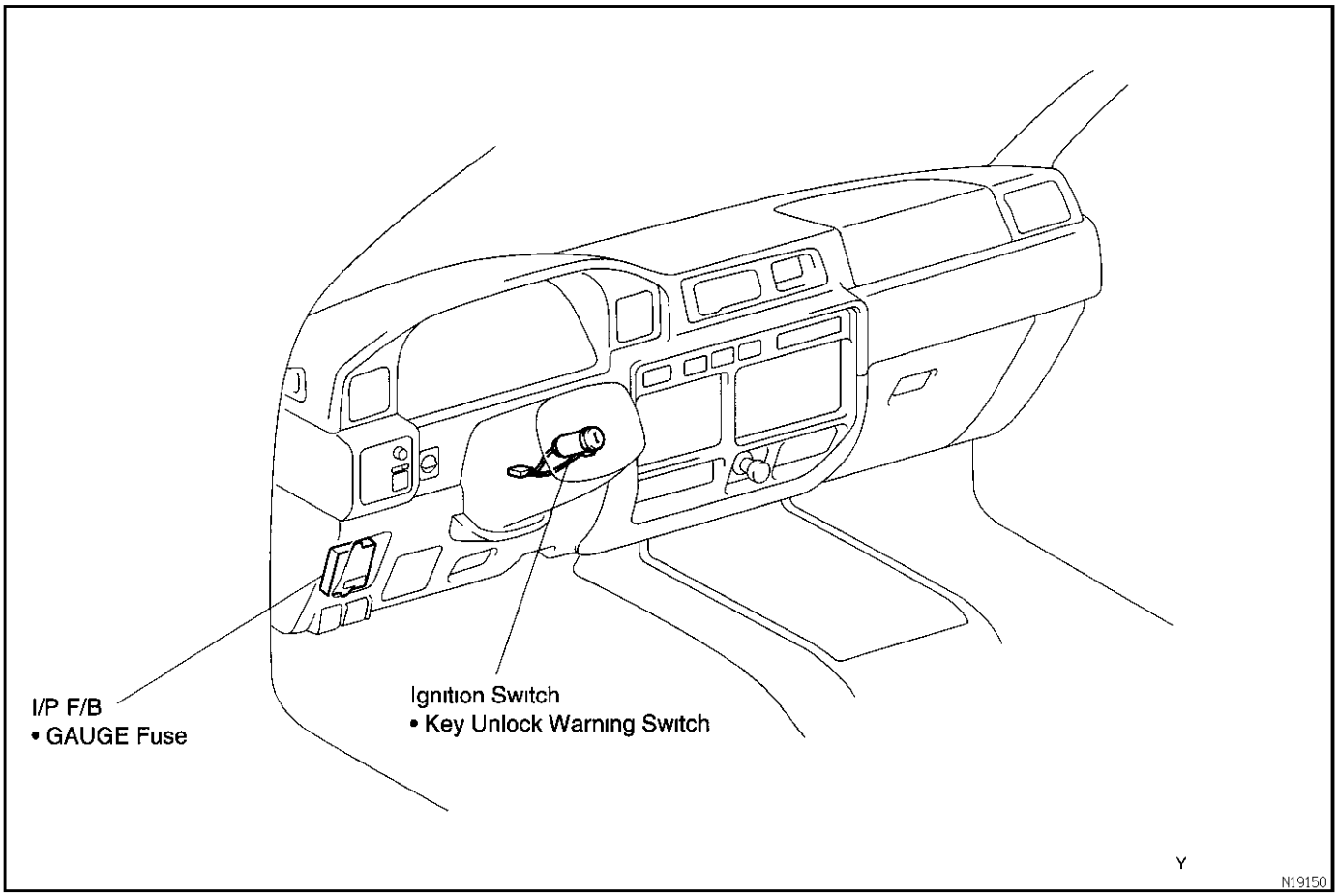
Brought to you by BirfMark



# IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

BE1LV 01

## LOCATION





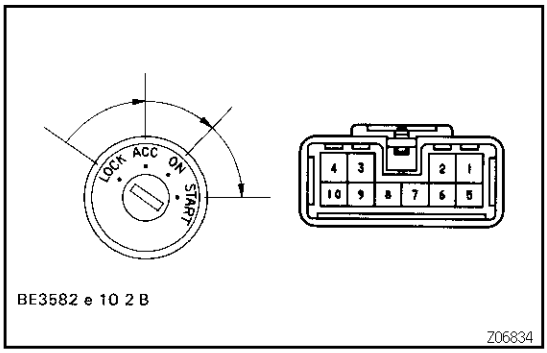

Author : Date : 1148

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

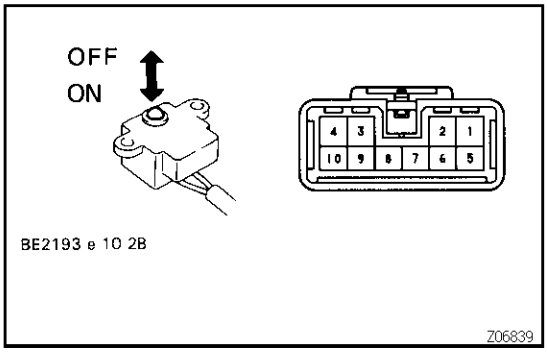


BE1LW 01




BE3582 e 10 2 B

Z06834




BE2193 e 10 2B

Z06839

# INSPECTION

## 1. INSPECT IGNITION SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| LOCK | – | No continuity |
| ACC | 7 – 9 | Continuity |
| ON | 3 – 4 6 – 7 – 9 | Continuity |
| START | 2 – 3 – 4<br>6 – 9 – 10 | Continuity |

If continuity is not as specified, replace the switch

## 2. INSPECT SWITCH CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| SW OFF<br>(Key removed) | – | No continuity |
| SW ON (Key set) | 1 – 5 | Continuity |

If continuity is not as specified, replace the switch

## 3. INSPECT DOOR COURTESY SWITCH CONTINUITY

**(See page BE–21)**

## 4. INSPECT SEAT BELT WARNING RELAY CIRCUIT

**(See page BE–34)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

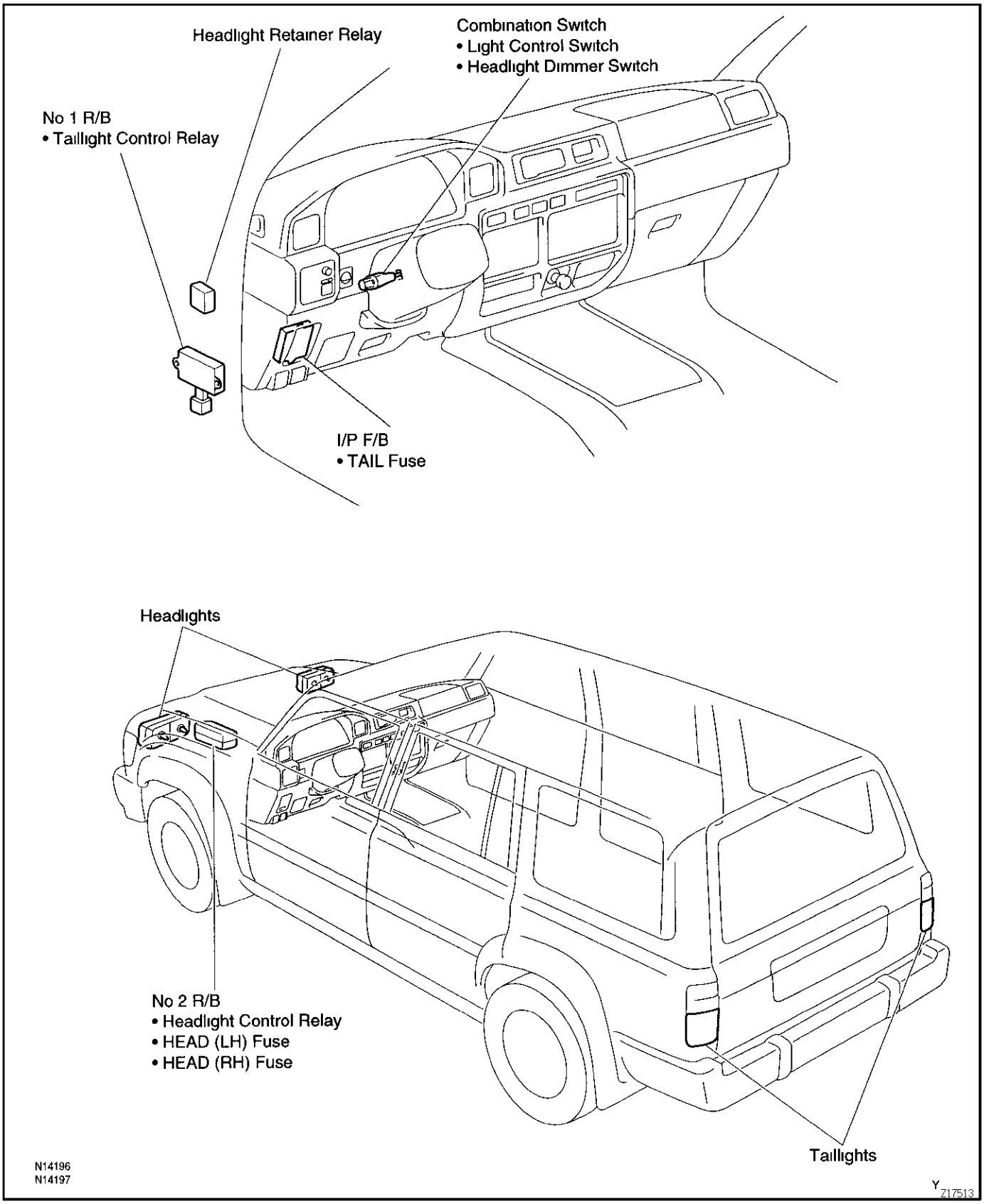
Brought to you by BirfMark



# HEADLIGHT AND TAILLIGHT SYSTEM

## LOCATION

BE1LX-01





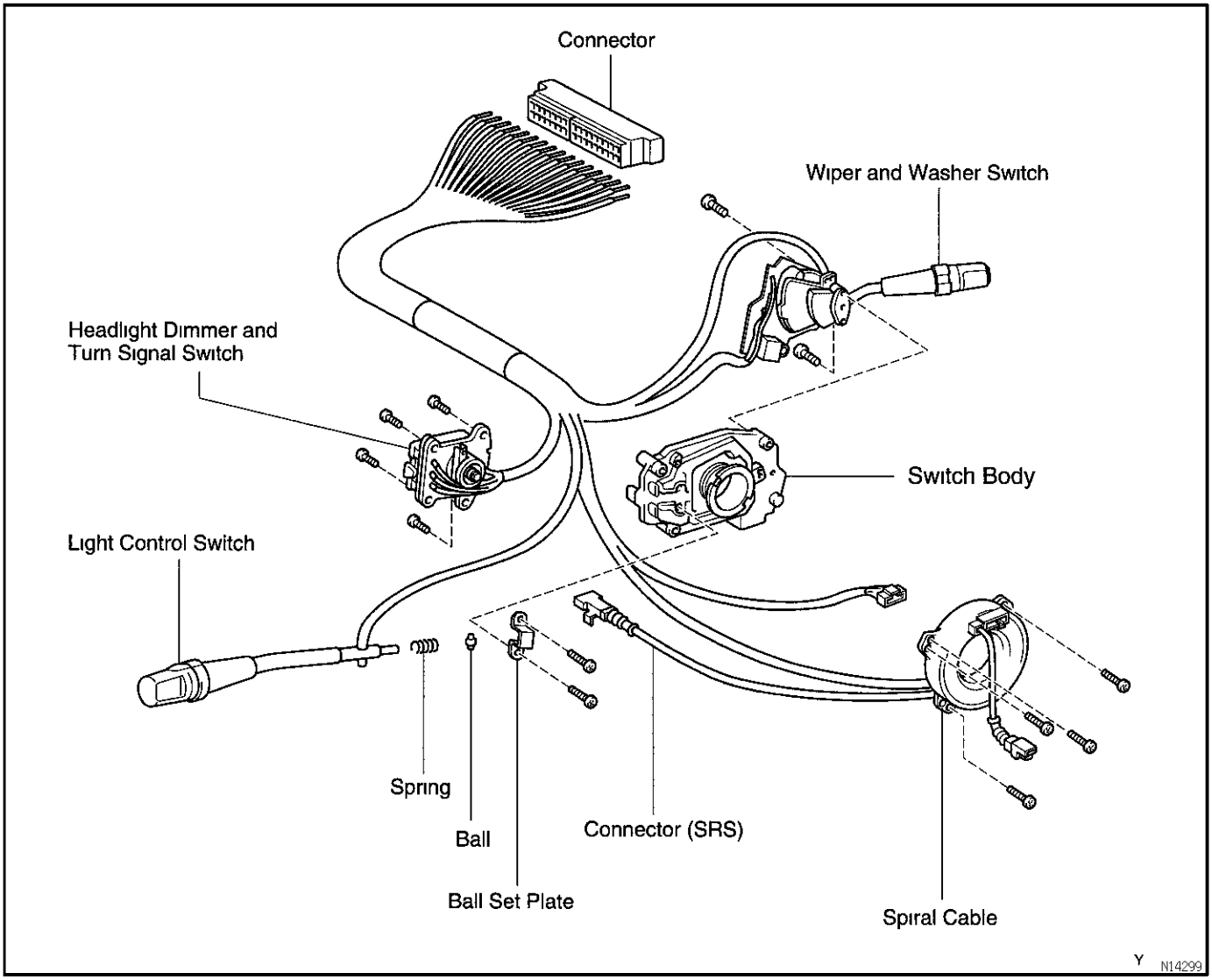

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1LY 01

# COMPONENTS





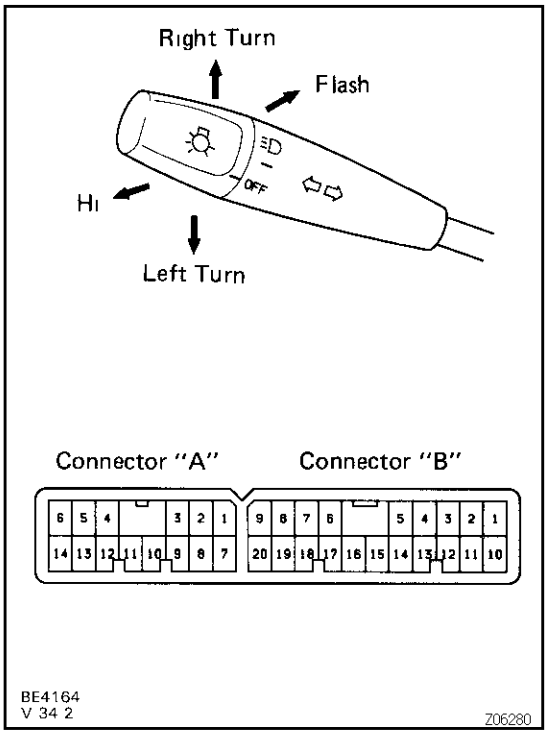

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1LZ-01

# INSPECTION




BE4164
V 34 2

Z06280

## 1. INSPECT LIGHT CONTROL SWITCH CONTINUITY

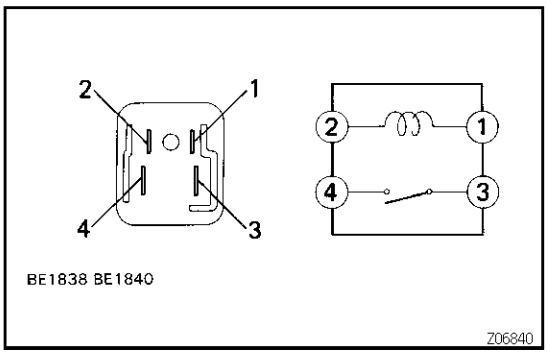
| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | – | No continuity |
| TAIL | A2 – A11 | Continuity |
| HEAD | A2 – A11 – A13 | Continuity |

If continuity is not as specified, replace the switch

## 2. INSPECT HEADLIGHT DIMMER SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| Flash | A9 – A12 – A14 | Continuity |
| Low beam | A3 – A9 | Continuity |
| High beam | A9 – A12 | Continuity |

If continuity is not as specified, replace the switch



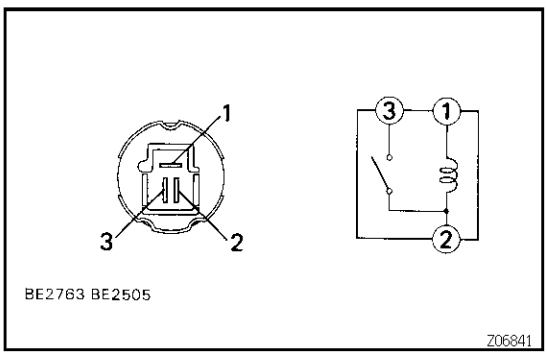

BE1838 BE1840

Z06840

## 3. INSPECT HEADLIGHT CONTROL RELAY CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 1 – 2 | Continuity |
| Apply B+ between terminals 1 and 2 | 3 – 4 | Continuity |

If continuity is not as specified, replace the relay




BE2763 BE2505

Z06841

## 4. INSPECT TAILLIGHT CONTROL RELAY CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 1 – 2 | Continuity |
| Apply B+ between terminals 1 and 2 | 2 – 3 | Continuity |

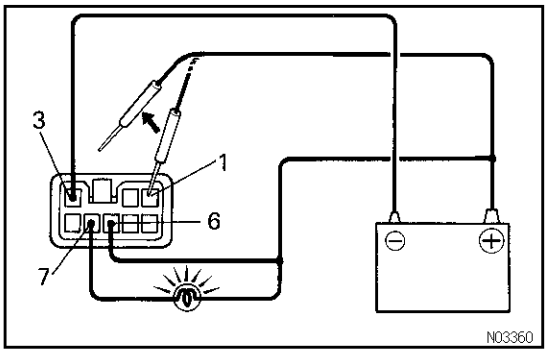
If continuity is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



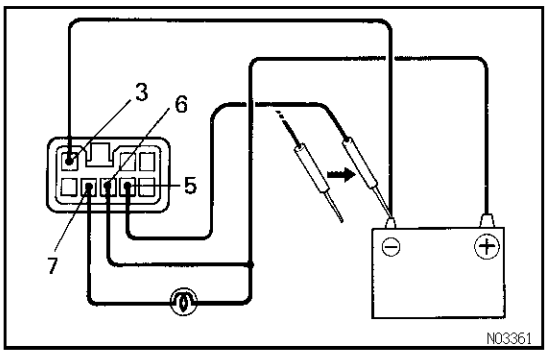



## 5. INSPECT HEADLIGHT RETAINER CIRCUIT

(a) Connect the positive (+) leads from the battery to terminals 1 and 6, and the negative (–) lead to terminal 3

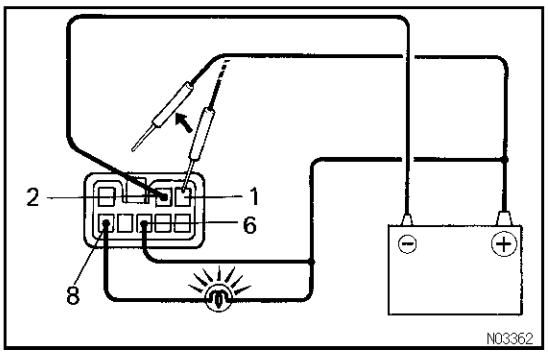
(b) Connect the 3 4 W test bulb between terminal 7 and the positive (+) lead from the battery

(c) Disconnect the positive (+) lead from terminal 1, and check that the test bulb is lighting




(d) Connect the negative (–) lead to terminal 5, and check that the test bulb goes out

If operation is not as specified, replace the relay

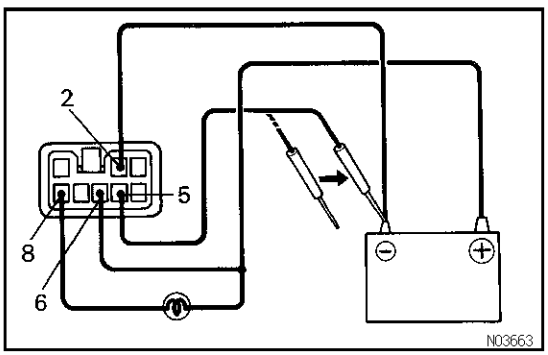



## 6. INSPECT TAILLIGHT CIRCUIT

(a) Connect the positive (+) leads from the battery to terminals 1 and 6, and the negative (–) lead to terminal 2

(b) Connect the 3 4 W test bulb between terminal 8 and the positive (+) lead from the battery

(c) Disconnect the positive (+) lead from terminal 1, and check that the test bulb is lighting




(d) Connect the negative (–) lead to terminal 5, and check that the test bulb goes out

If operation is not as specified, replace the relay



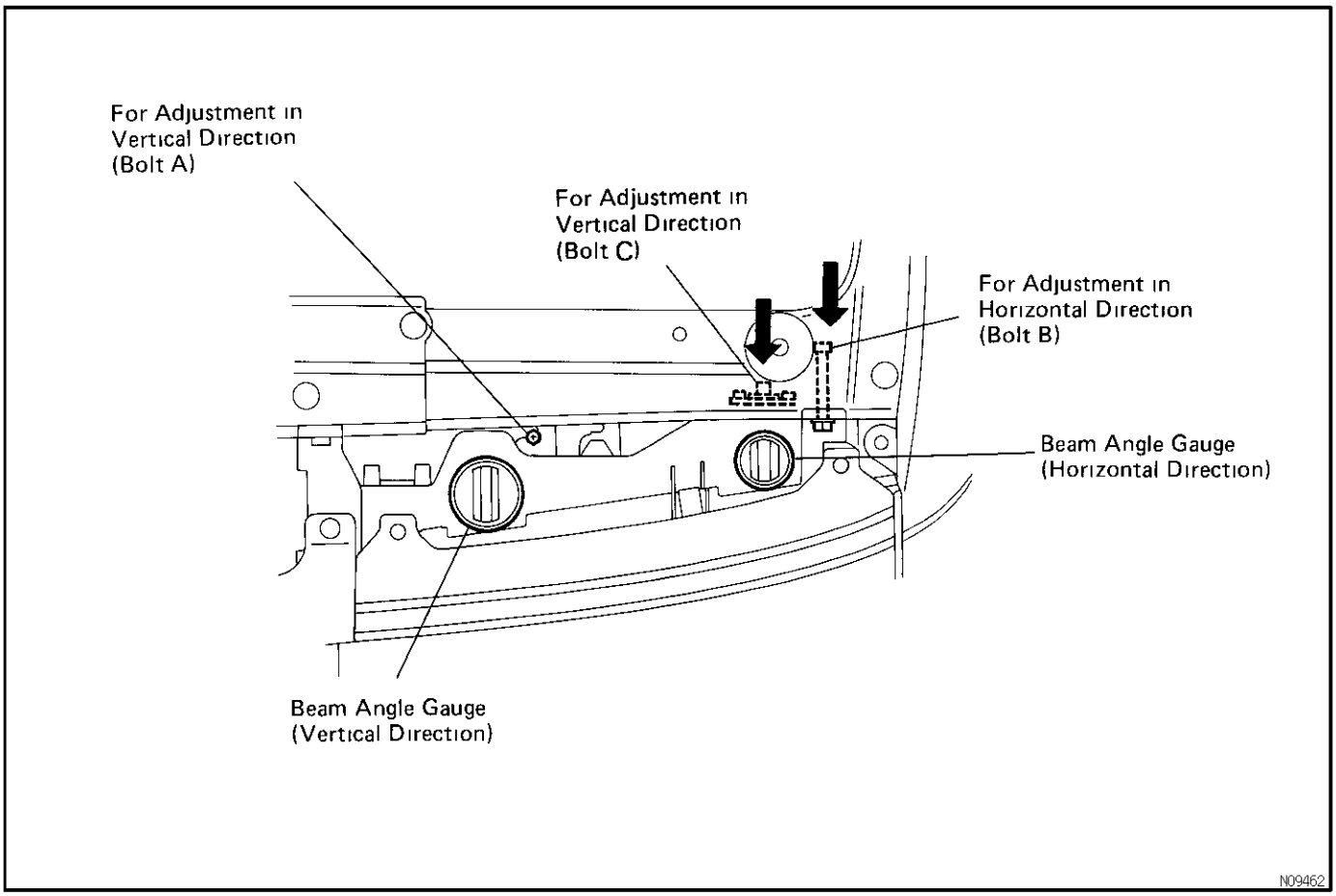
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1M0 01

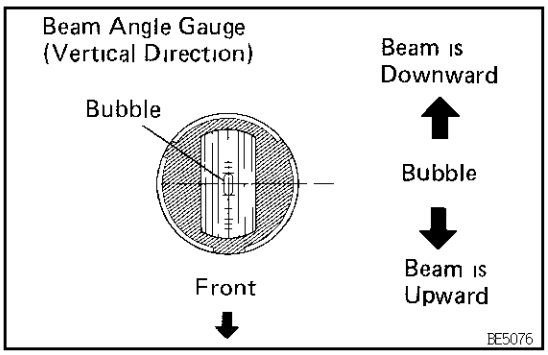
# ADJUSTMENT




## 1. ADJUSTING HEADLIGHT AIM ONLY

(a) Put the vehicle in below conditions

- Make sure the body around the headlight is not deformed
- Park the vehicle on a level place
- The driver gets into the driver's seat and puts the vehicle in a state ready for driving (with a full tank)
- Bounce the vehicle several times




(b) Adjust headlight in vertical alignment

If the gauge bubble is outside the acceptable range of the beam angle gauge, adjust it using adjusting screw A

HINT

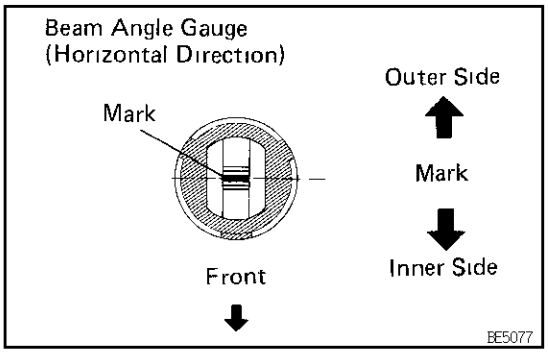
The beam angle will change about 0°11' with one mark



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Adjust headlight in horizontal alignment

If the "0" moves away from the mark beyond the acceptable range, adjust the "0" back to the mark using adjusting screw B

HINT

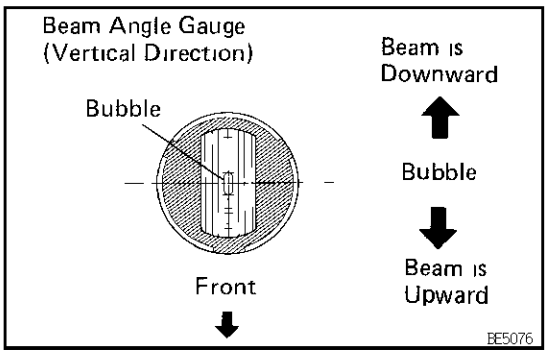
The beam angle will change about 0°23' with one mark

**2. REPLACING HEADLIGHT**

(a) Replace the headlight

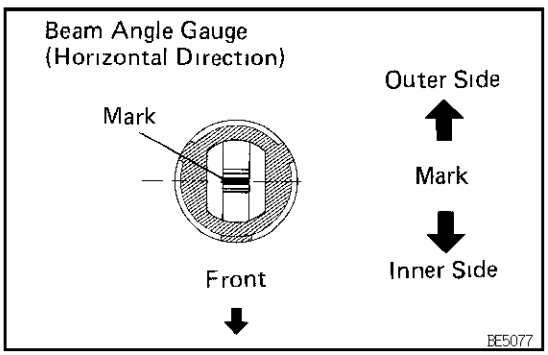
(b) Inspect the headlight aim Do the following before inspection

- Make sure the body around the headlight is not deformed
- Park the vehicle on a level spot
- The driver gets into the driver's seat and puts the vehicle in a state ready for driving (with a full tank)
- Bounce the vehicle several times




(c) Adjust headlight in vertical alignment

(1) Using adjusting screw A, adjust the headlight aim to within the specifications




HINT

The beam angle will change about 0°11' with one mark

(2) Make sure the gauge bubble is within the acceptable range

HINT

If the gauge bubble is outside the acceptable range, check that the vehicle is parked on a level place

(d) Readjust the headlight aim after parking the vehicle on a level place

(e) Adjust the headlight in horizontal alignment

(1) Using adjusting screw B, adjust the headlight aim to within the specifications

HINT

The beam angle will change about 0°23' with one mark

(2) Using adjusting nut C, adjust the "0" back to the mark

HINT

For adjustment, pull nut C to the rear of the vehicle to free it After adjustment, check that the nut C is locked in



Brought to you by BirfMark
Version 1.11 - 03/16/2010

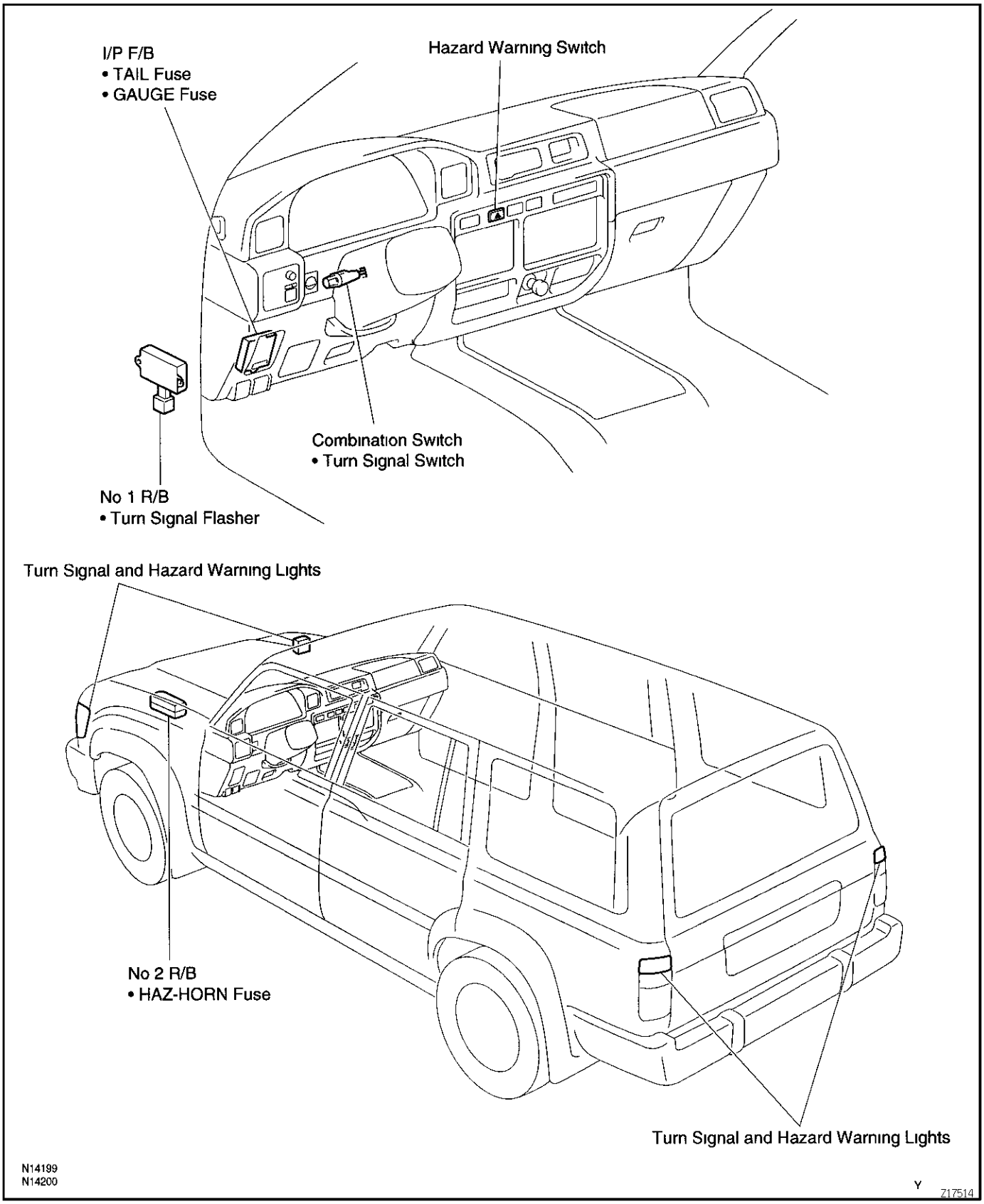
Brought to you by BirfMark



# TURN SIGNAL AND HAZARD WARNING SYSTEM

## LOCATION

BE1M1 01



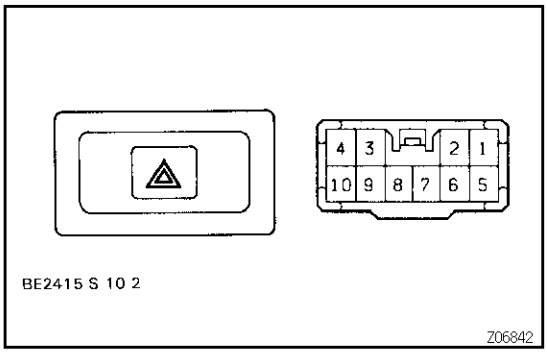



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE27G-01

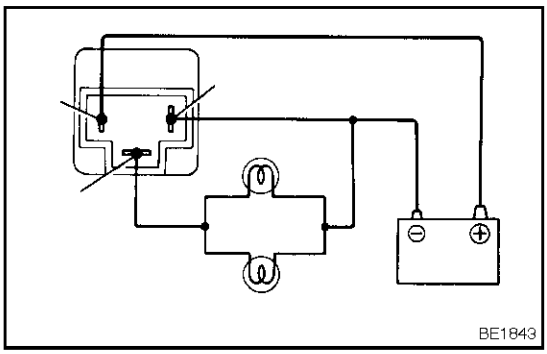



# INSPECTION

## 1. INSPECT HAZARD WARNING SWITCH CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| Switch OFF | 7 – 10 | Continuity |
| Switch ON | 7 – 8<br>4 – 5 – 6 – 9 | Continuity |
| Illumination circuit | 2 – 3 | Continuity |

If continuity is not as specified, replace the switch




## 2. INSPECT TURN SIGNAL FLASHER OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3

(b) Connect the 2 turn signal light bulbs parallel to each other to terminals 1 and 3, and check that the bulbs flash

HINT

The turn signal lights should flash 60 to 120 times per minute

If one of the front or rear turn signal lights has an open circuit, the number of flashes will be more than 140 per minute

If operation is not as specified, replace the flasher



Brought to you by BirfMark
Version 1.11 - 03/16/2010

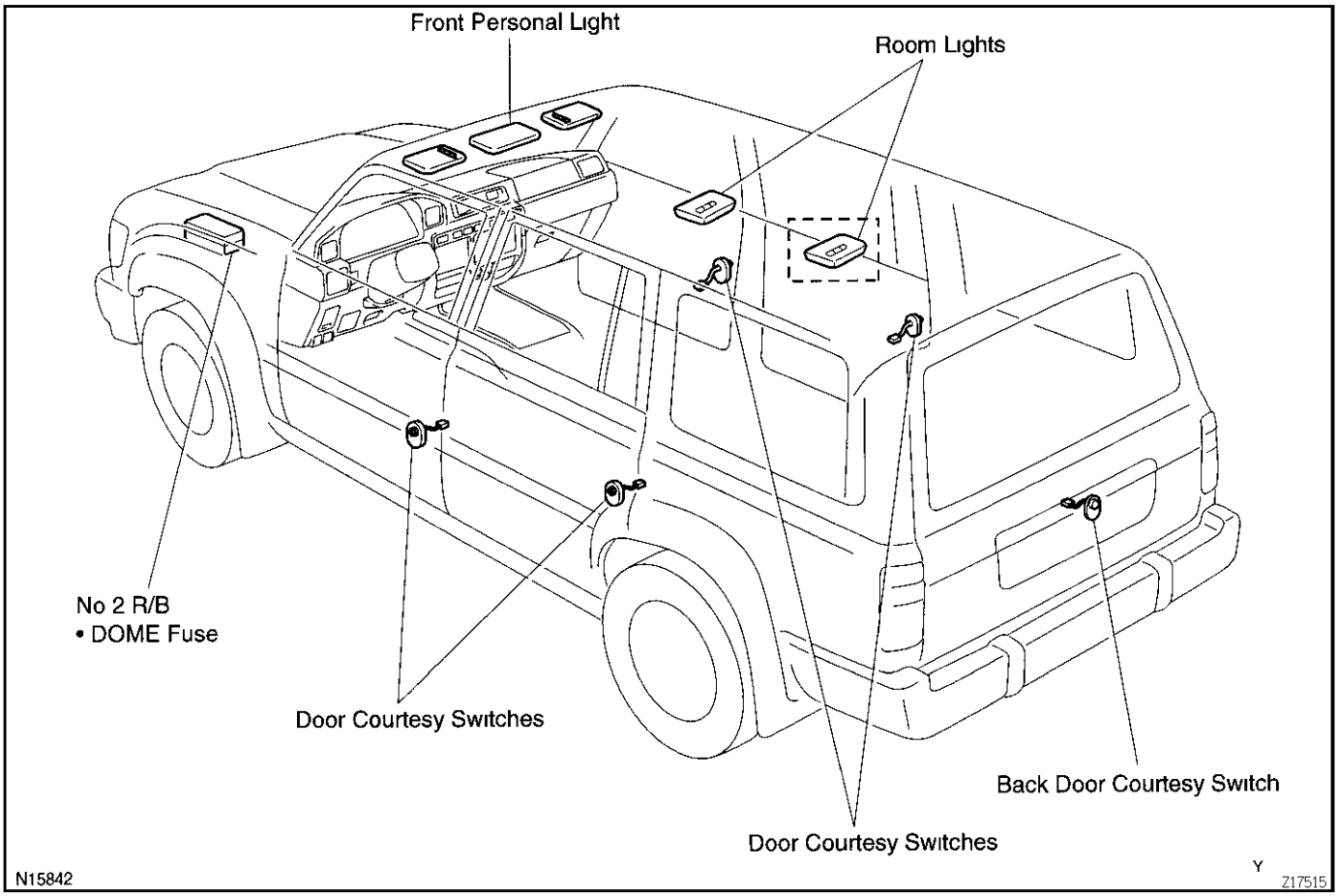
Brought to you by BirfMark



# INTERIOR LIGHT SYSTEM

## LOCATION

BE1M8 01






Author : Date : 1158

Brought to you by BirfMark
Version 1.11 - 03/16/2010

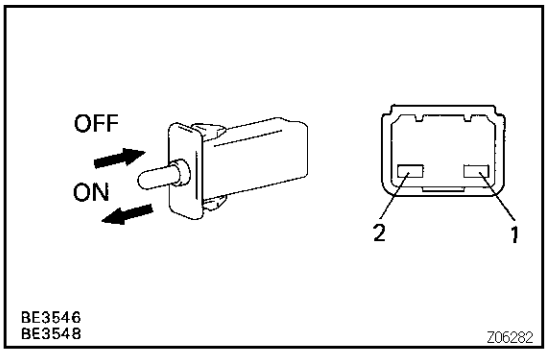
Brought to you by BirfMark



BE1M4 01

# INSPECTION

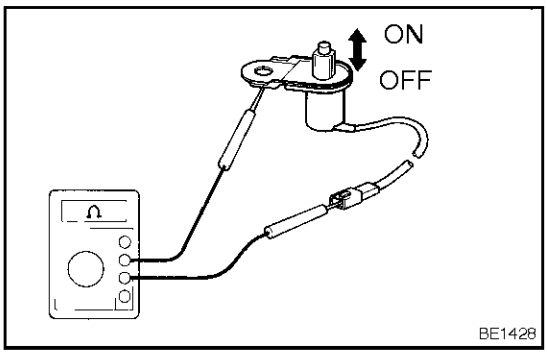
## 1. INSPECT GLOVE BOX LIGHT SWITCH CONTINUITY




| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF (Closed) | – | No continuity |
| ON (Opened) | 1 – 2 | Continuity |

If continuity is not as specified, replace the switch

## 2. INSPECT DOOR COURTESY SWITCH CONTINUITY

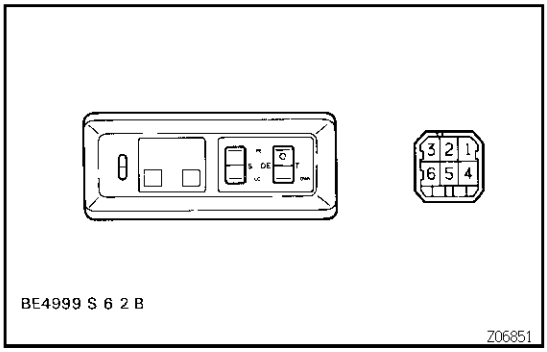



(a) Check that there is continuity between terminal and the switch body with the switch ON (switch pin released opened door)

(b) Check that there is no continuity between terminal and the switch body with the switch OFF (switch pin pushed in closed door)

If operation is not as specified, replace the switch

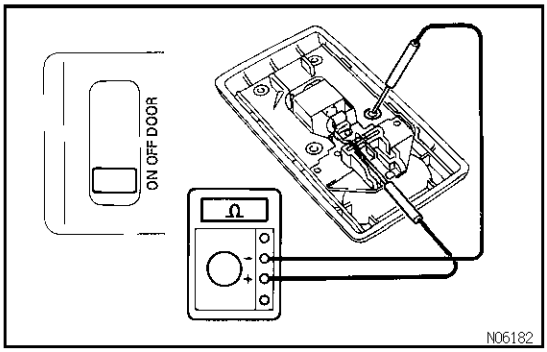
## 3. INSPECT FRONT PERSONAL LIGHT CONTINUITY




| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | – | No continuity |
| ON | 5 – 6 | Continuity |

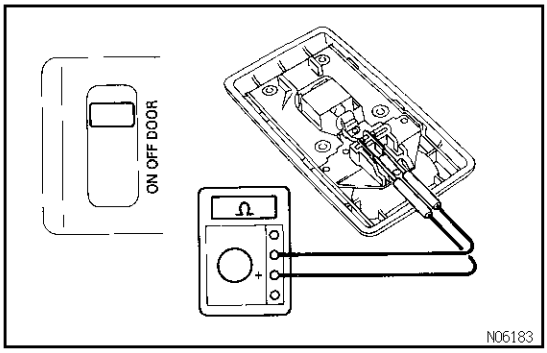
If continuity is not as specified, replace the personal light

## 4. INSPECT ROOM LIGHT ASSEMBLY




(a) Disconnect the connector from room light assembly

(b) Turn the room light switch ON, check that there is continuity between terminal 2 and body ground




(c) Turn the room light switch DOOR, and check that there is continuity between terminal 1 and 2

If operation is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

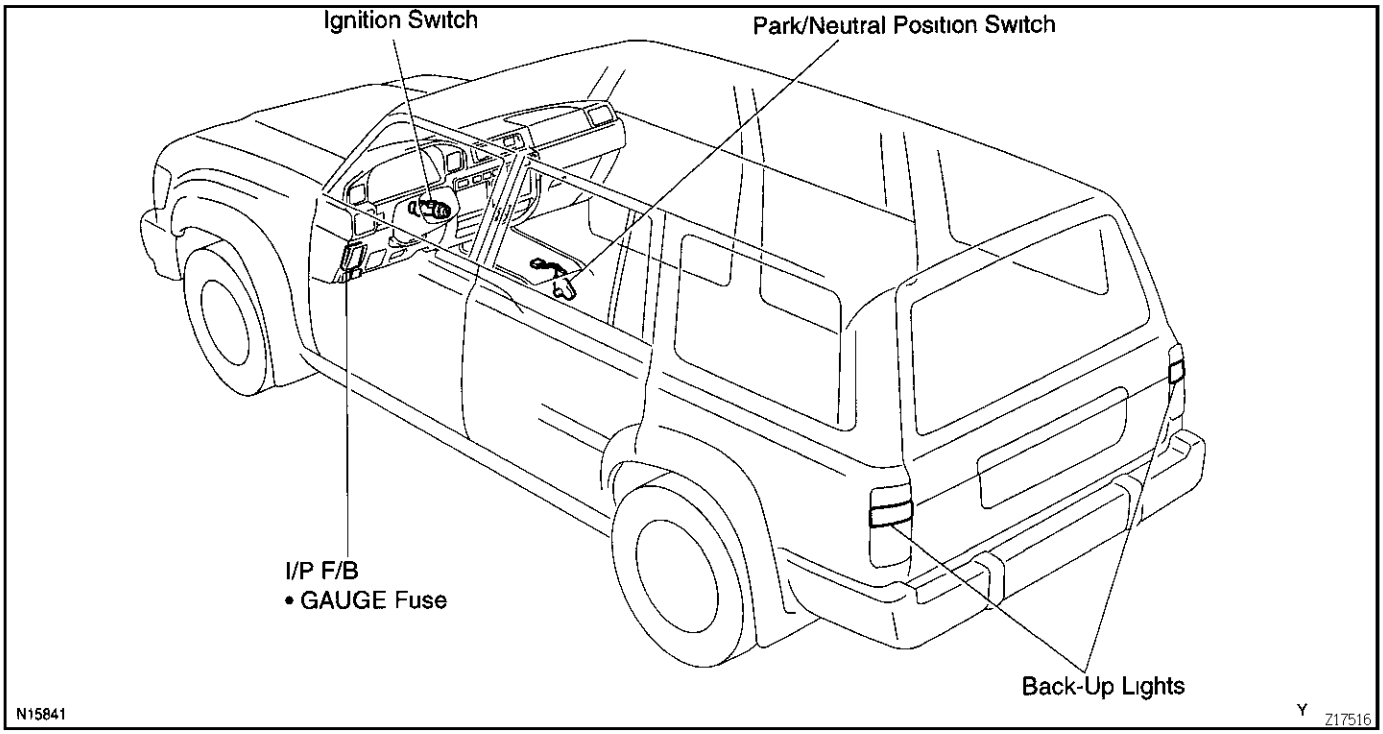
Brought to you by BirfMark



# BACK–UP LIGHT SYSTEM

## LOCATION

BE1M5 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1M5 01

# INSPECTION

## INSPECT PARK/NEUTRAL POSITION SWITCH CONTINUITY (See page AT–6)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

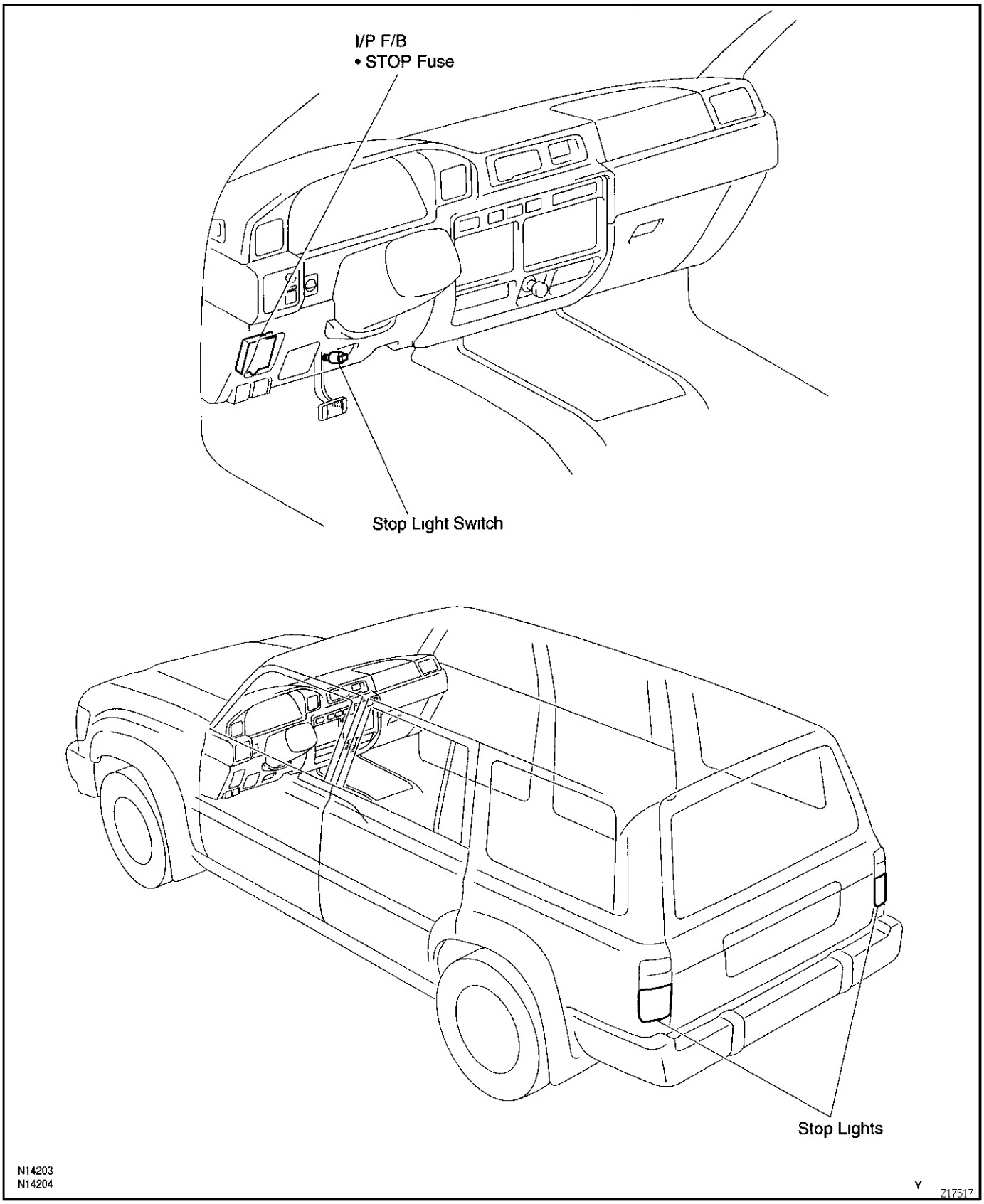
Brought to you by BirfMark



# STOP LIGHT SYSTEM

## LOCATION

BE1M7 01



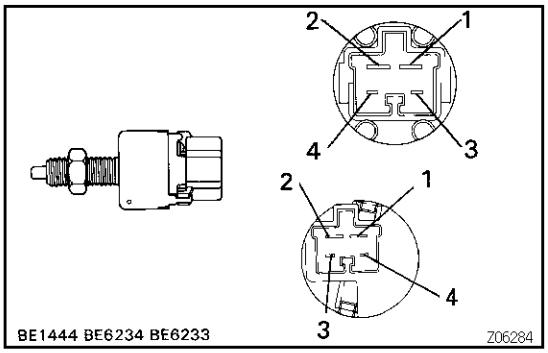



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1M8 01




# INSPECTION

## INSPECT STOP LIGHT SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| SW pin free | 1 – 2 | Continuity |
| SW pin pushed in | – | No continuity |

If continuity is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

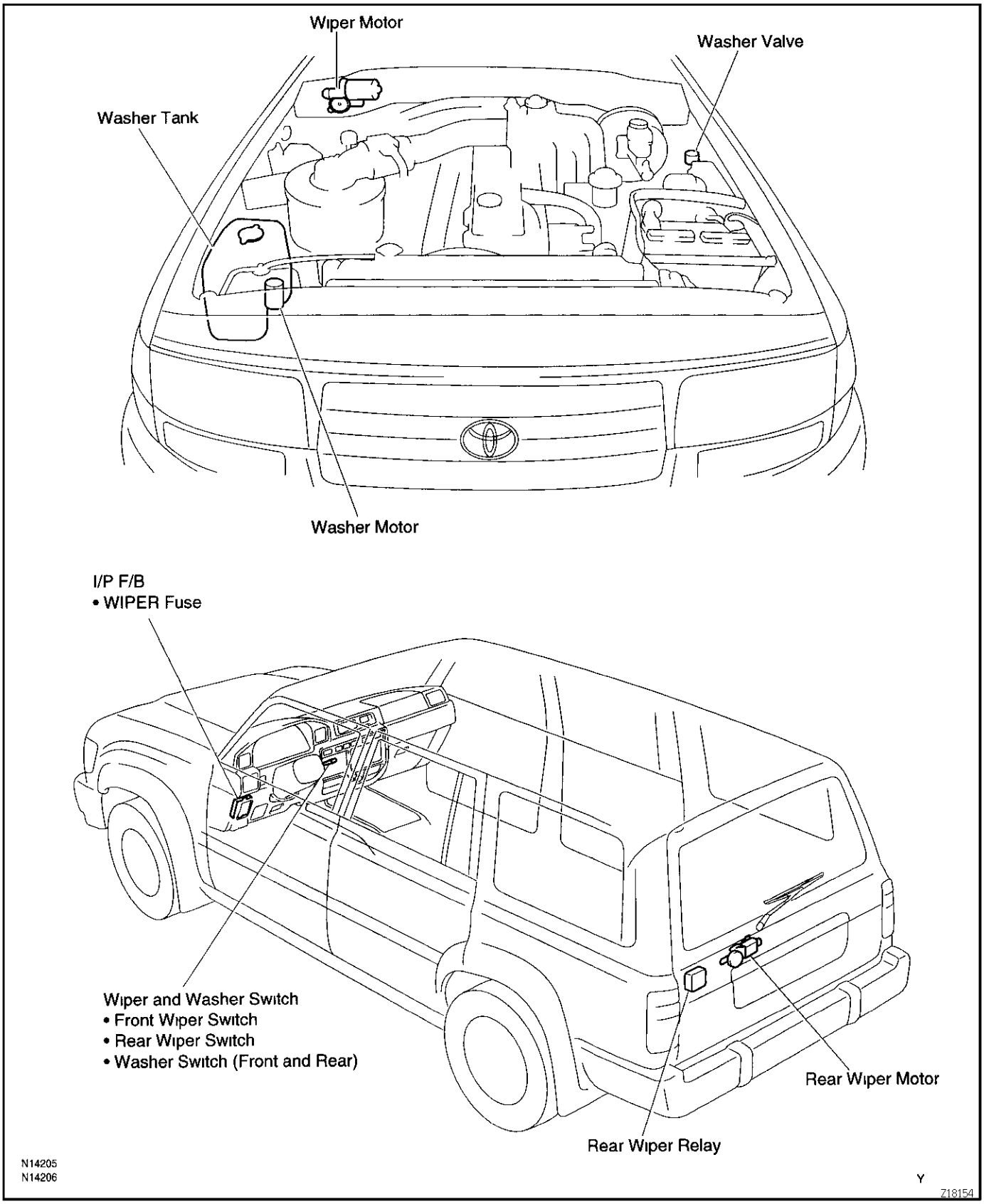
Brought to you by BirfMark



# WIPER AND WASHER SYSTEM

## LOCATION

BE1M9 01



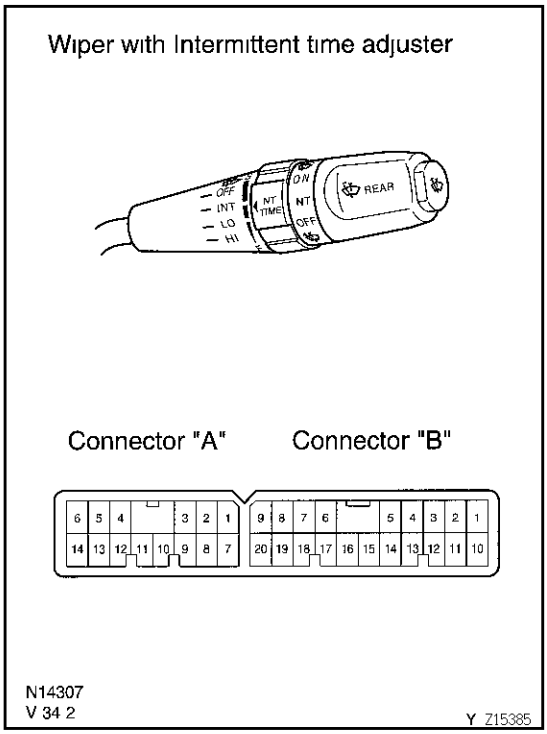



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MA-01




# INSPECTION

## 1. INSPECT FRONT WIPER AND WASHER SWITCH CONTINUITY

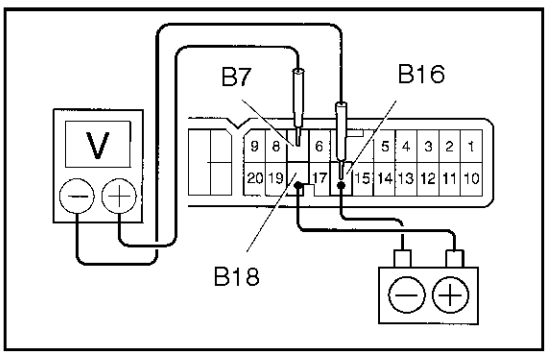
| Switch position | Tester connection | Specified condition |
|---|---|---|
| Wiper OFF | B4 – B7 | Continuity |
| Wiper INT | B4 – B7 | Continuity |
| Wiper LO | B7 – B18 | Continuity |
| Wiper HI | B13 – B18 | Continuity |
| Washer OFF | – | No continuity |
| Washer ON | B8 – B16 | Continuity |

If continuity is not as specified, replace the switch

## 2. INSPECT REAR WIPER AND WASHER SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| Washer ON | B2 – B16 | Continuity |
| Wiper OFF | – | No continuity |
| Wiper INT | B10 – B16 | Continuity |
| Wiper ON | B1 – B16 | Continuity |
| Washer ON | B1 – B2 – B16 | Continuity |

If continuity is not as specified, replace the switch

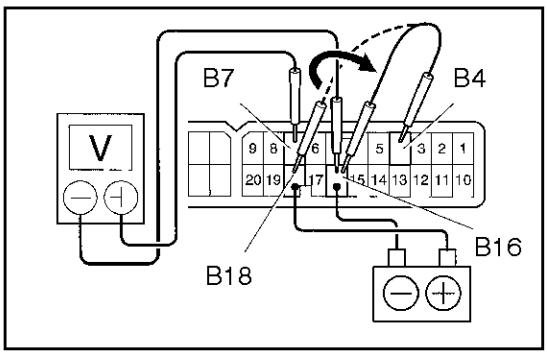



## 3. INSPECT INTERMITTENT WIPER OPERATION

(a) Turn the wiper switch to INT position

(b) Turn the intermittent time control switch to FAST position

(c) Connect the positive (+) lead from the battery to terminal B18 and the negative (–) lead to terminal B16




(d) Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (–) lead to terminal B16, and check that the meter needle indicates battery positive voltage

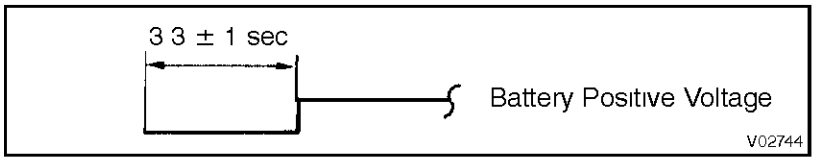
(e) After connecting terminal B4 to termianl B18, connect B18 to terminal B16
Then, check that the voltage rises from O volt to battery positive voltage within time as follows



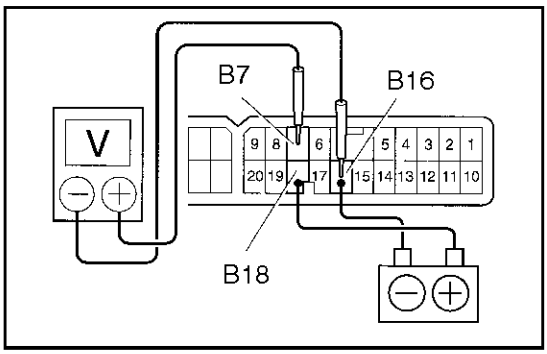
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






If operation is not as specified, replace the switch

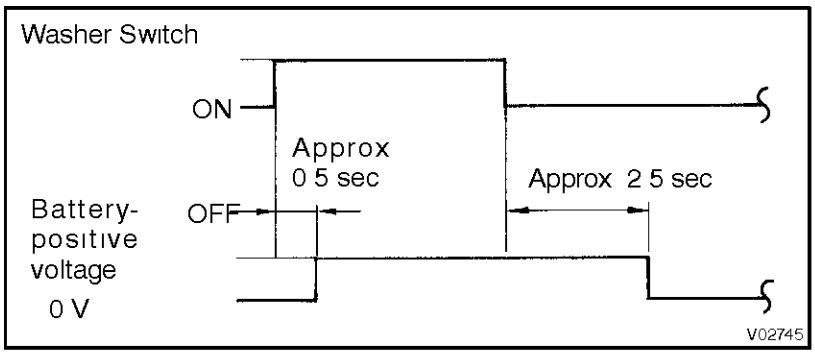



**4. INSPECT WASHER LINKED OPERATION**

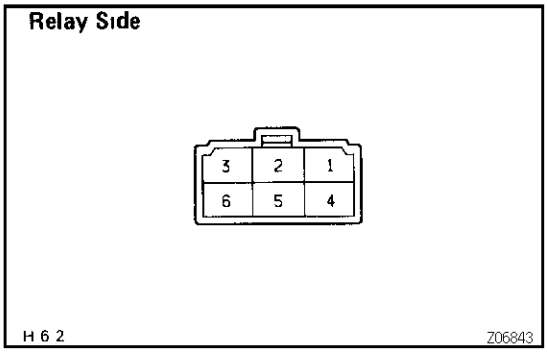
(a) Connect the positive (+) lead from the battery to terminal B18 and the negative (–) lead to terminal B16

(b) Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (–) lead to terminal B16

(c) Push in the washer switch Check that the voltage changes, as shown in the table




If operation is not as specified, replace the switch

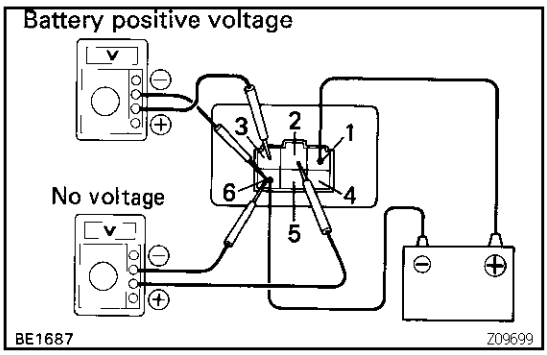



**5. INSPECT REAR WIPER RELAY CONTINUITY**

(a) Check that there is no continuity between terminals 1 and 3

(b) Check that there is continuity between terminals 2 and 3

If continuity is not as specified, replace the relay




**6. INSPECT REAR WIPER RELAY OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 6

(b) Connect the positive (+) lead from the voltmeter to terminal 2 and the negative (–) lead to terminal 6, and check that the meter needle indicates to O V

(c) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 6, and check that the meter needle indicates to battery positive voltage

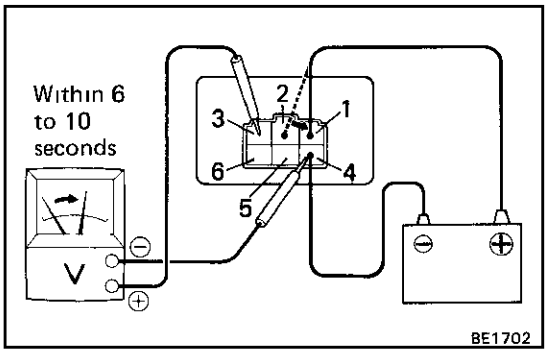
If operation is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





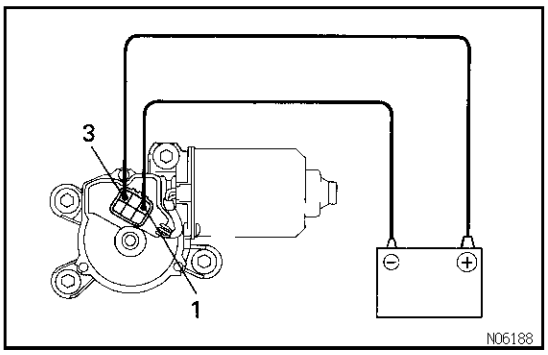

**7. INSPECT REAR WIPER RELAY INTERMITTENT OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4

(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4

(c) After disconnecting the positive (+) lead from terminal 2, connect it to terminal 1, and then, check that the meter needle rises from O V to battery positive voltage within 6 to 10 seconds

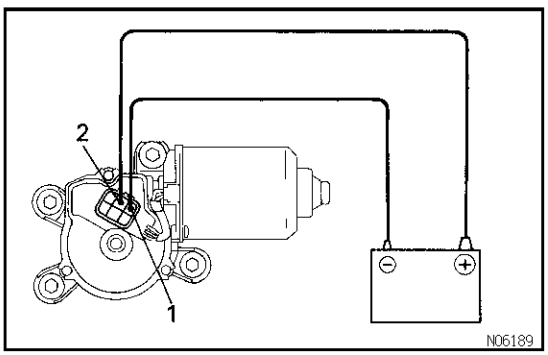
If operation is not as specified, replace the relay




**8. Low Speed:**
**INSPECT FRONT WIPER MOTOR OPERATION**

Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 1, and check that the motor operates at low speed

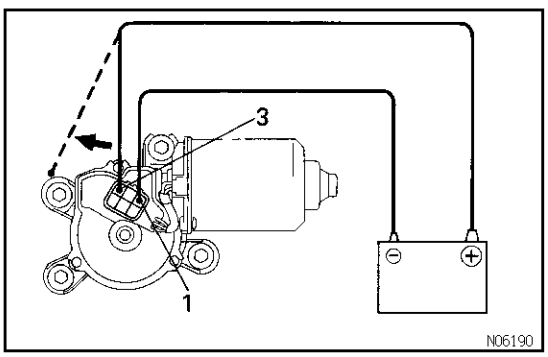
If operation is not as specified, replace the motor




**9. High Speed:**
**INSPECT FRONT WIPER MOTOR OPERATION**

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, and check that the motor operates at high speed

If operation is not as specified, replace the motor




**10. Stopping at Stop Position:**
**INSPECT FRONT WIPER MOTOR OPERATION**

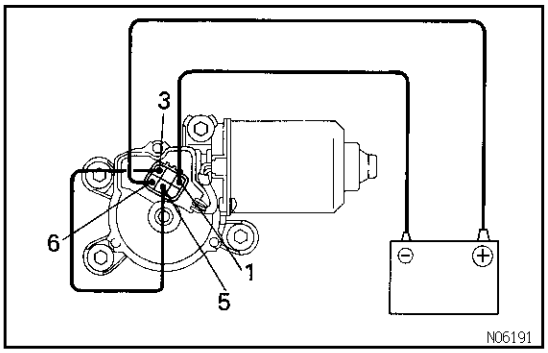
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

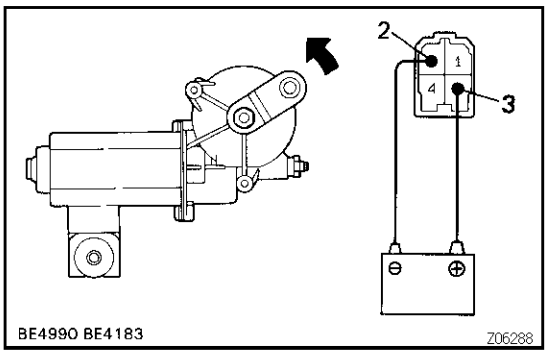





(b) Connect terminal 3 and 5

(c) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 1, and check that the motor stops running at the stop position after the motor operates again

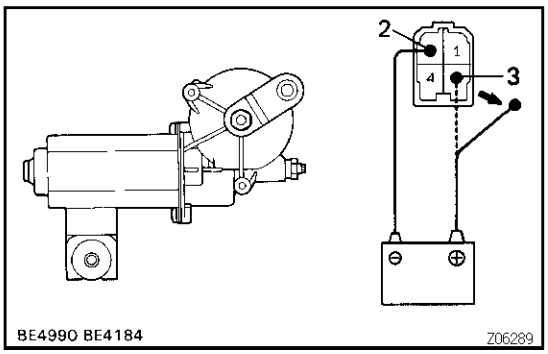
If operation is not as specified, replace the motor




**11. Low Speed:**
**INSPECT REAR WIPER MOTOR OPERATION**

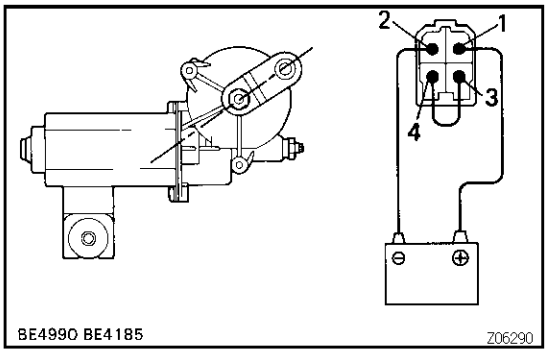
Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 2, and check that the motor operates at low speed

If operation is not as specified, replace the motor




**12. Stopping at Stop Position:**
**INSPECT REAR WIPER MOTOR OPERATION**

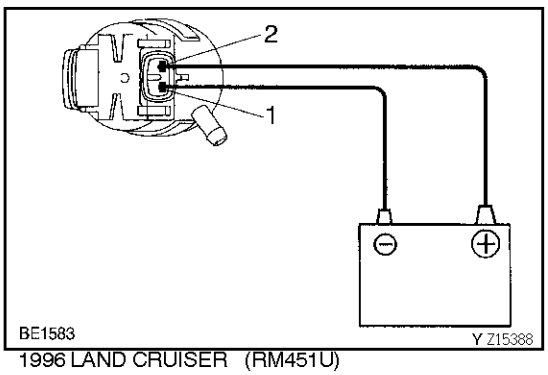
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3




(b) Connect terminal 3 and 4

(c) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor stops running at the stop position after the motor operates again

If operation is not as specified, replace the motor




**13. INSPECT WASHER MOTOR OPERATION**

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, and check that the motor operates

**NOTICE:**

**These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.**

If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

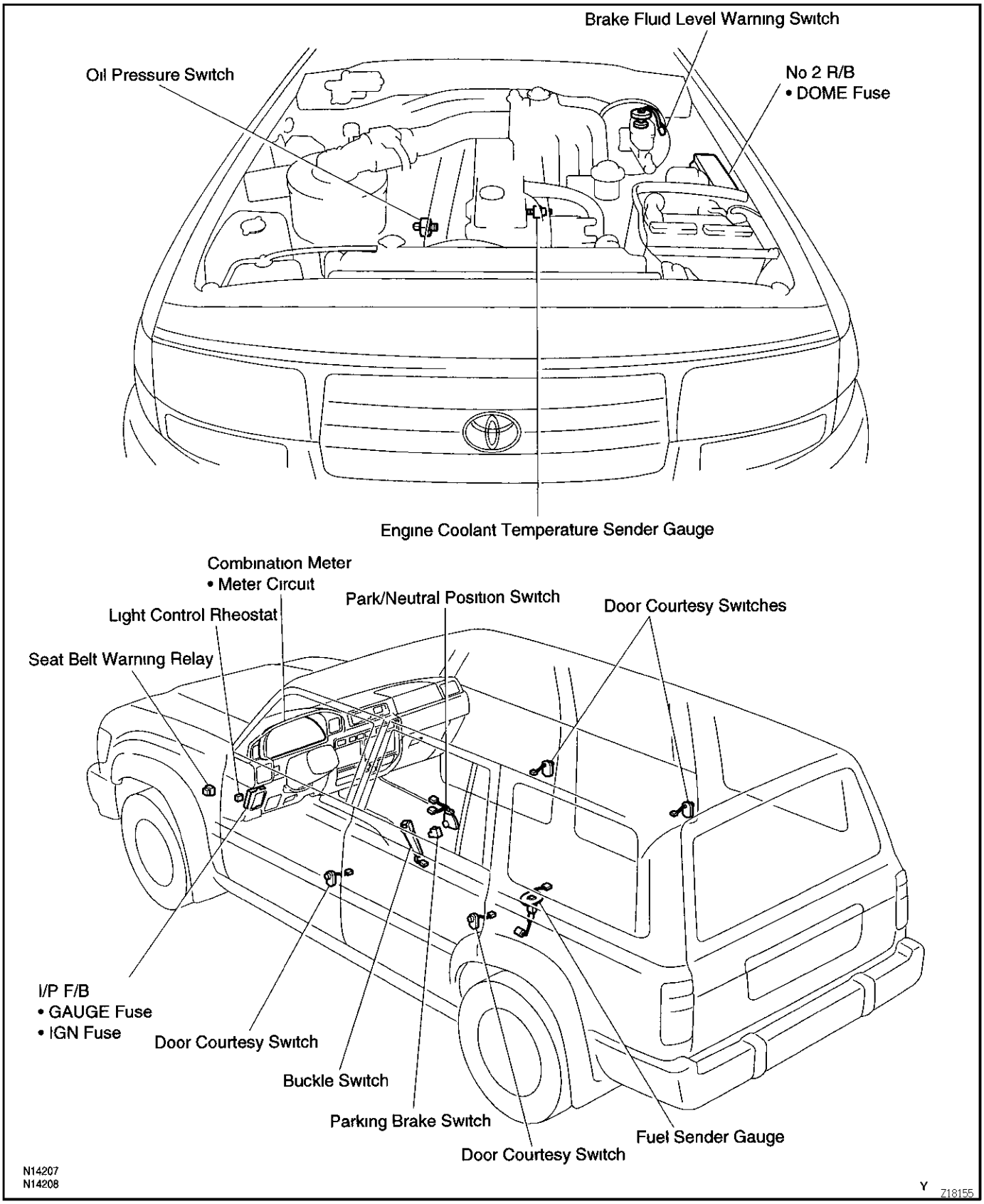
Brought to you by BirfMark



# COMBINATION METER

## LOCATION

BE1MB-01





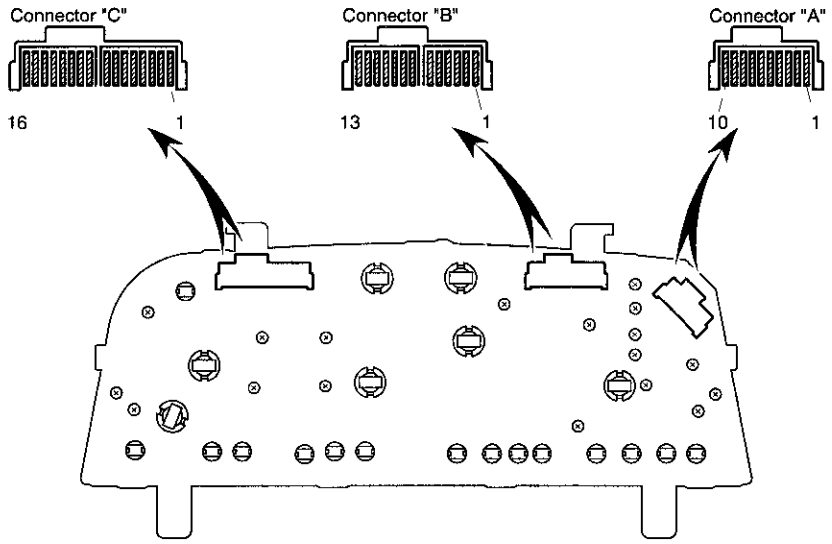

Brought to you by BirfMark
Version 1.11 - 03/16/2010

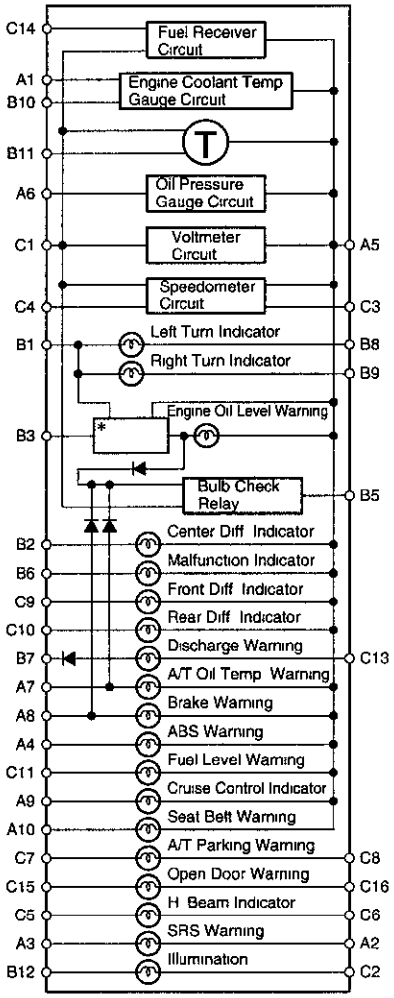
Brought to you by BirfMark



BE1MC 01

# CIRCUIT




| No | | Wiring connector side |
|---|---|---|
| A | 1 | Ground |
| | 2 | DOME Fuse |
| | 3 | Airbag ECU |
| | 4 | ABS ECU |
| | 5 | GAUGE Fuse |
| | 6 | Oil Pressure Sender Gauge |
| | 7 | A/T Fluid Temperature Sensor |
| | 8 | Brake Warning Switch |
| | 9 | Cruise Control ECU |
| | 10 | Seat Belt Warning Relay |
| B | 1 | Ground |
| | 2 | Center Diff Lock Indicator Switch |
| | 3 | Engine Oil Level Sensor |
| | 5 | STARTER Relay |
| | 6 | ECM |
| | 7 | Charge Light Relay |
| | 8 | Light Control Switch (Left) |
| | 9 | Light Control Switch (Right) |
| | 10 | Engine Coolant Temperature Gauge |
| | 11 | Igniter |
| | 12 | Light Control Rheostat |
| C | 1 | Ground |
| | 2 | TAIL Fuse |
| | 3 | Speed Control Unit |
| | 4 | No 1 Vehicle Speed Sensor |
| | 5 | Headlight |
| | 6 | Headlight Dimmer Switch |
| | 7 | L4 Position Switch |
| | 8 | PNP Switch |
| | 9 | Front Diff Lock Indicator Switch |
| | 10 | Rear Diff Lock Indicator Switch |
| | 11 | Fuel Level Warning Switch |
| | 13 | IGN Fuse |
| | 14 | Fuel Sender Gauge |
| | 15 | Door Courtesy Switch |
| | 16 | DOME Fuse |

Ⓣ Tacho Meter
Diff . Differential
Temp . Temperature
* Engine Oil Level Circuit

N14318
N14140

Z16425

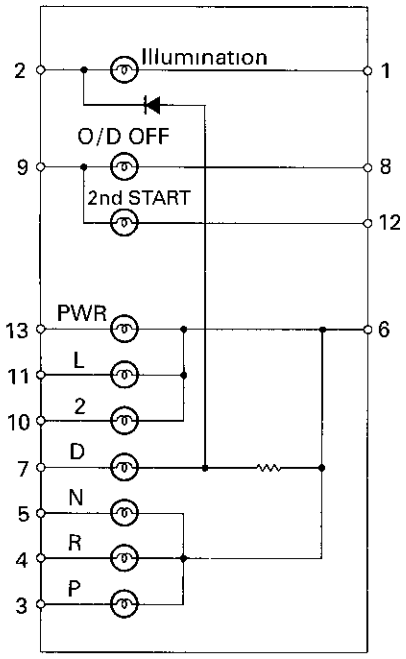


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**SHIFT POSITION INDICATOR**




N14141

| Terminal | Wiring connector side |
|---|---|
| 1 | Light Control Rheostat–terminal A |
| 2 | TAIL Fuse |
| 3 | Park/Neutral Position Switch–terminal 6 |
| 4 | Park/Neutral Position Switch–terminal 1 |
| 5 | Park/Neutral Position Switch–terminal 5 |
| 6 | Ground |
| 7 | Park/Neutral Position Switch–terminal 7 |
| 8 | O/D OFF Switch |
| 9 | GAUGE Fuse |
| 10 | Park/Neutral Position Switch–terminal 3 |
| 11 | Park/Neutral Position Switch–terminal 8 |
| 12 | ECM |
| 13 | Pattern Select Switch |

V06501



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MD 01

# INSPECTION

## 1. INSPECT SPEEDOMETER

**ON–VEHICLE:**

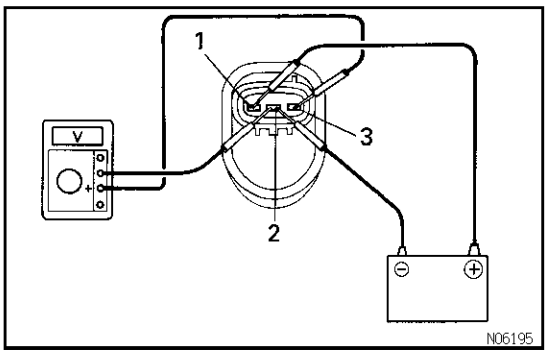
Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer

HINT

Tire wear and tire over or under inflation will increase the indication error

If error is excessive, replace the speedometer

| Standard indication | Allowable range |
|---|---|
| 20 | 18 – 24 |
| 40 | 38 – 44 |
| 60 | 58 – 66 |
| 80 | 78 – 88 |
| 100 | 98 – 110 |
| 120 | 118 – 132 |




## 2. INSPECT NO.1 VEHICLE SPEED SENSOR OPERATION

(a) Connect the positive (+) lead from battery to terminal 1 and negative (–) lead to terminal 2

(b) Connect the positive (+) lead from tester to terminal 3 and the negative (–) lead to terminal 2

(c) Revolve shaft

(d) Check that there is voltage changer from approx 0 V to 11 V or more between terminals 3 and 2

HINT

The voltage change should be 4 times per each revolution of the No 1 vehicle speed sensor shaft

If operation is not as specified, replace the sensor

## 3. INSPECT TACHOMETER

**ON–VEHICLE:**

(a) Connect a tune–up test tachometer, and start the engine

**NOTICE:**

**Reversing the connection of the tachometer will damage the transistors and diodes inside.When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.**

(b) Compare the tester and tachometer indications

If error is excessive, replace the tachometer



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

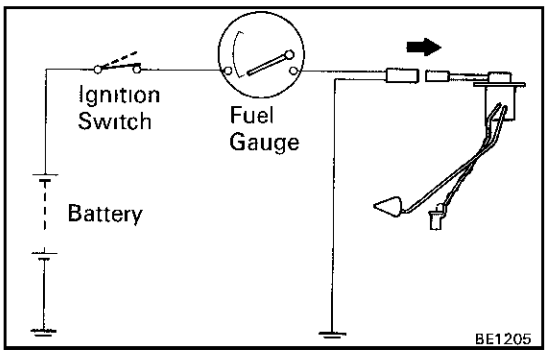


**RPM (DC 13.5 V, 25°C (77 °F))**

| Standard indication | Allowable range |
|---|---|
| 700 | 630 – 770 |
| 1 000 | 900 – 1 100 |
| 2 000 | 1 875 – 2 125 |
| 3 000 | 2 850 – 3 150 |
| 4 000 | 3 850 – 4 150 |
| 5 000 | 4 850 – 5 150 |

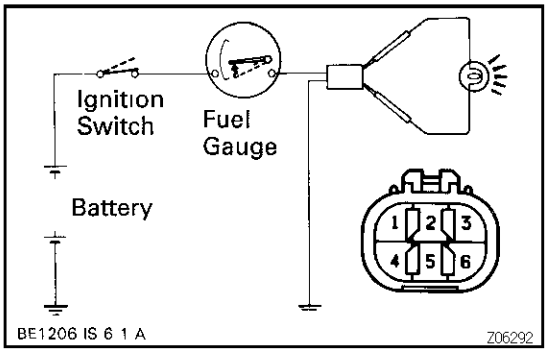
**4. INSPECT VOLTMETER ON–VEHICLE:**

Compare the tester and voltmeter indications
If error is excessive, replace the voltemeter



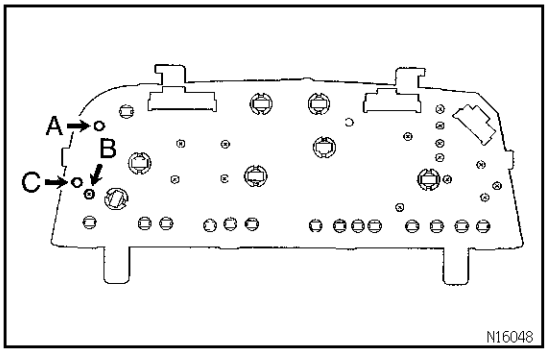

**5. INSPECT FUEL RECEIVER GAUGE OPERATION**

(a) Disconnect the connector from the sender gauge
(b) Turn the ignition switch ON, and check that the receiver gauge needle indicates EMPTY




(c) Connect terminals 4 and 5 on the wire harness side connector through a 3 4 W test bulb
(d) Turn the ignition switch ON, and check that the bulb lights up and the receiver gauge needle moves towards the full side

HINT
Because of the silicon oil in the gauge, it will take a short time for needle to stabilize
If operation is not as specified, inspect the receiver gauge resistance




**6. INSPECT FUEL RECEIVER GAUGE RESISTANCE**

| Between terminals | Resistance (Ω) |
|---|---|
| A – B | 85 5 – 105 5 |
| A – C | 126 – 150 |
| B – C | *90 – 110 |

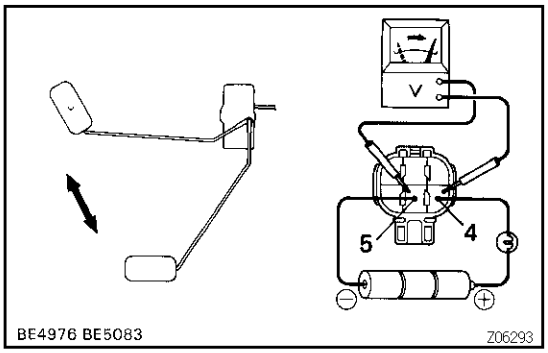
* Include voltmeter resistance
If resistance value is not as specified, replace the fuel receiver gauge



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





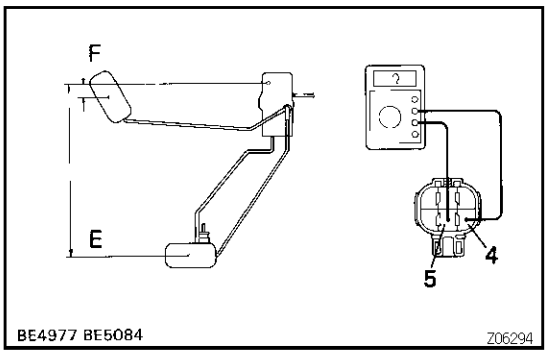

**7. INSPECT FUEL SENDER GAUGE OPERATION**

(a) Connect a series of three 1 5 V dry cell batteries

(b) Connect the positive (+) lead from the dry cell batteries to terminal 4 through a 3 4 W test bulb and the negative (–) lead to terminal 5

(c) Connect the positive (+) lead from the voltmeter to terminal 4 and the negative (–) lead to terminal 5

(d) Check that the voltage rises as the float is moved from the full to empty position

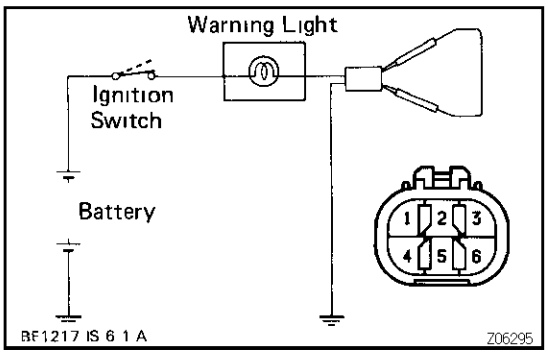



**8. INSPECT FUEL SENDER GAUGE RESISTANCE**

Measure the resistance between terminals 4 and 5

| Float position mm (in ) | Resistance (Ω) |
|---|---|
| F Approx 15 0 (0 591) | Approx 3 0 |
| E Approx 200 0 (7 874) | Approx 110 0 |

If resistance value is not as specified, replace the sender gauge



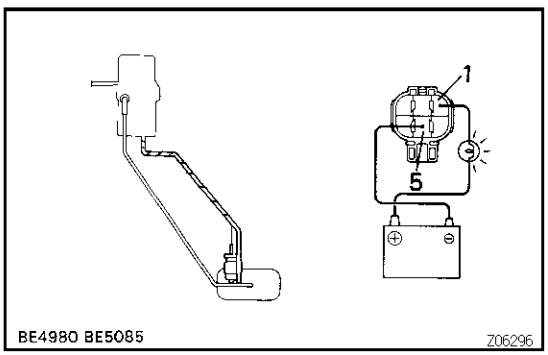

**9. INSPECT FUEL LEVEL WARNING LIGHT**

(a) Disconnect the connector from the sender gauge

(b) Connect terminals 1 and 5 on the wire harness side connector

(c) Turn the ignition switch ON, and check that the warning light lights up

If the warning light does not light up, test the bulb

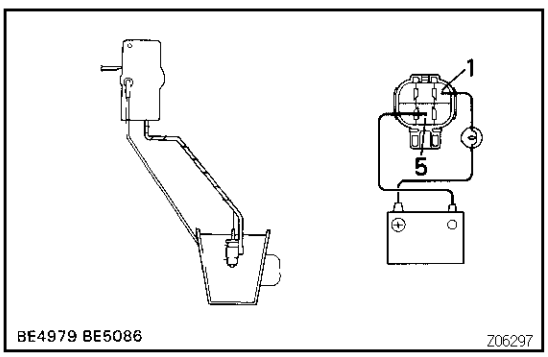



**10. INSPECT FUEL LEVEL WARNING SWITCH**

(a) Apply battery positive voltage between terminals 1 and 5 through a 3 4 W test bulb, and check that the bulb lights up

HINT

It will take a short time for the bulb to light up




(b) Submerge the switch in fuel, and check that the bulb goes out

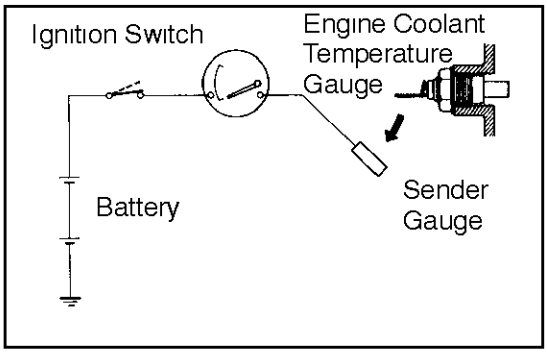
If operation is not as specified, replace the sender gauge



Brought to you by BirfMark
Version 1.11 - 03/16/2010

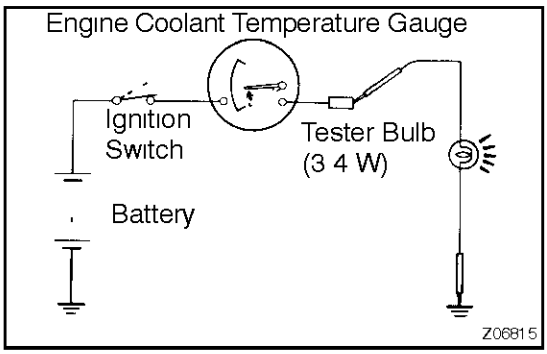
Brought to you by BirfMark






**11. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE OPERATION**

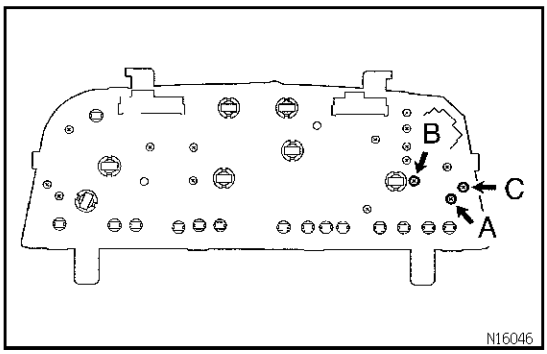
(a) Disconnect the connector from the sender gauge
(b) Turn the ignition switch ON, and check that the receiver gauge needle indicates COOL




(c) Ground terminal on the wire harness side connector through a 3 4 W test bulb
(d) Turn the ignition switch ON, and check that the bulb lights up and the receiver gauge needle moves to the hot side

If operation is as specified, replace the sender gauge Then recheck the system

If operation is not as specified, measure the receiver gauge resistance




**12. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE RESISTANCE**

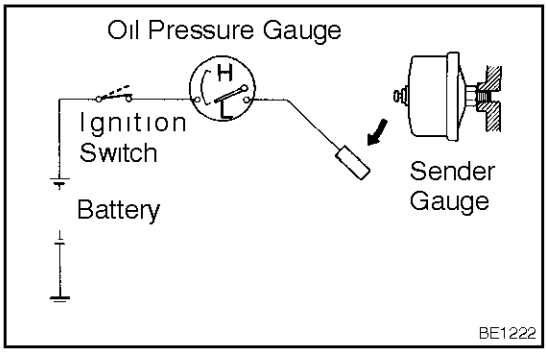
Measure the resistance between terminals

| Between terminals | Resistance (Ω) |
|---|---|
| A – B | 71 – 79 |
| A – C | 117 – 141 |
| B – C | 185 – 215 |

HINT

Connect the test leads so that the current from the ohmmeter can flow according to the above order This circuit include the diode

If resistance value is not as specified, replace the receiver gauge




**13. INSPECT OIL PRESSURE RECEIVER GAUGE OPERATION**

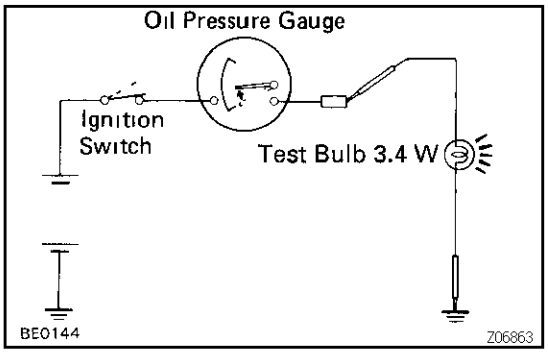
(a) Disconnect the connector from the sender gauge
(b) Turn the ignition switch ON, and check that the receiver gauge needle indicates LOW



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

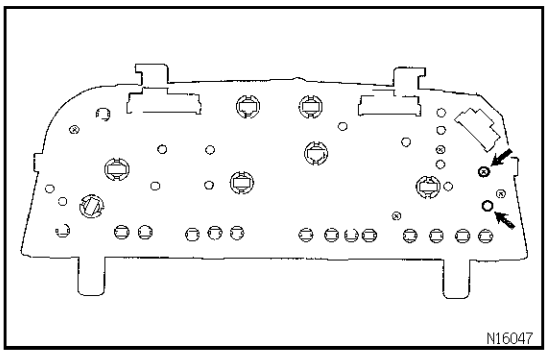





(c) Ground terminal on the wire harness side through a 3 4 W test bulb

(d) Turn the ignition switch ON, and check that the bulb lights up and that the receiver gauge needle moves to the high side

If operation is not as specified, measure the receiver gauge resistance



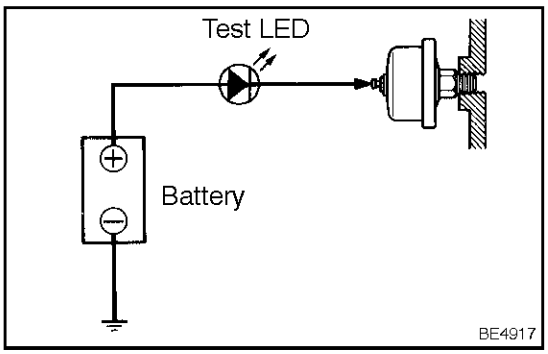

**14. INSPECT OIL PRESSURE RECEIVER GAUGE RESISTANCE**

Measure the receiver gauge resistance between terminals

**Resistance:**

**40 – 48 Ω**

If resistance value is not as specified, replace the receiver gauge




**15. INSPECT OIL PRESSURE SENDER GAUGE OPERATION**

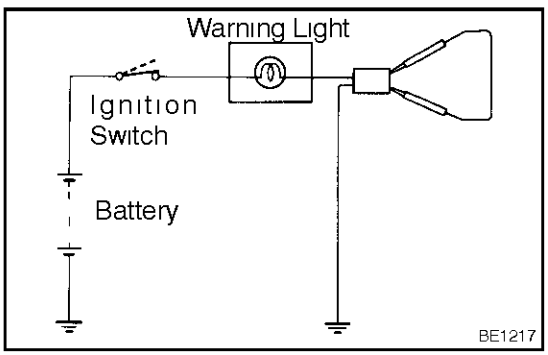
(a) Disconnect the connector from the sender gauge

(b) Apply battery positive voltage to the sender gauge terminal through a test LED

(c) Check that the bulb does not light when the engine is stopped

(d) Check that the LED flashes when the engine is running The number of flashed should vary with engine speed

If operation is not as specified, replace the sender gauge

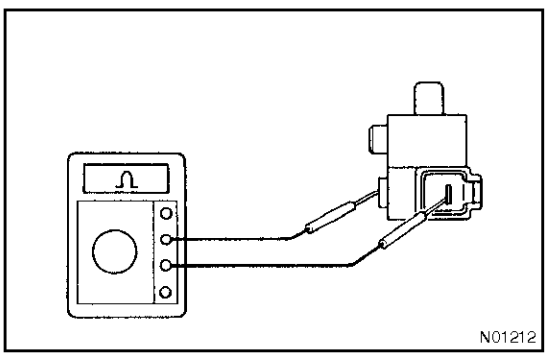



**16. INSPECT BRAKE WARNING LIGHT**

(a) Disconnect the connectors from the level warning switch and parking brake switch

(b) Connect terminals on the wire harness side connector of the level warning switch connector

(c) Turn the ignition switch ON, and check that the warning light lights up




**17. INSPECT PARKING BRAKE SWITCH**

(a) Check that there is continuity between terminal and the switch set nut with switch pin released (parking brake lever pulled up)

(b) Check that there is no continuity between terminal and the switch set nut with switch pin pushed in (parking brake lever released)

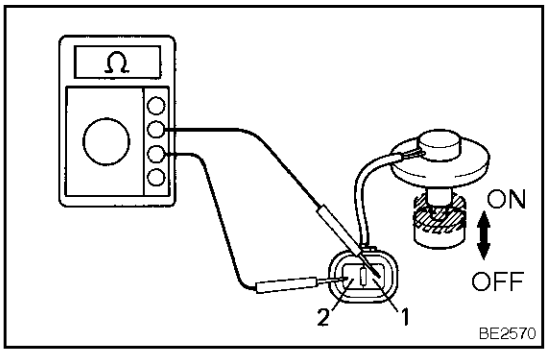
If operation is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



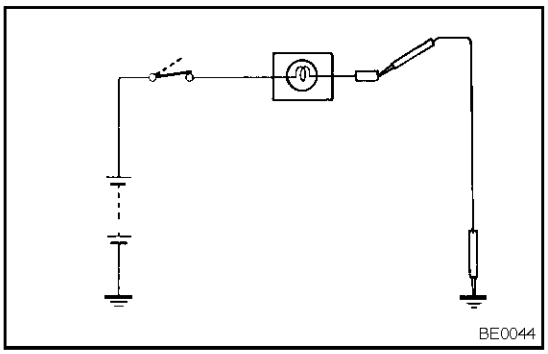



**18. INSPECT BRAKE FLUID LEVEL WARNING SWITCH**

(a) Check that there is no continuity between terminals with the switch OFF (float up)

(b) Check that there is continuity between terminals with the switch ON (float down)

If operation is not as specified, replace the switch

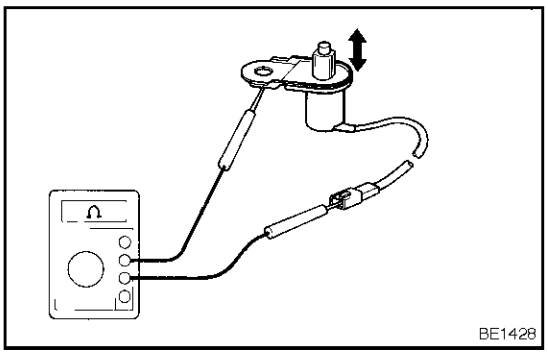



**19. INSPECT OPEN DOOR WARNING LIGHT**

(a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side connector

(b) Turn the ignition switch ON, and check that the warning light lights up

If the warning light does not light up, test the bulb

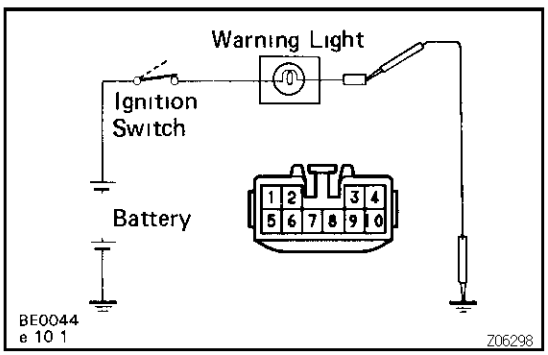



**20. INSPECT DOOR COURTESY SWITCH**

(a) Check that there is continuity between terminal and the switch body with the switch ON (switch pin released opened door)

(b) Check that there is no continuity between terminal and the switch body with the switch OFF (switch pin pushed in closed door)

If operation is not as specified, replace the switch



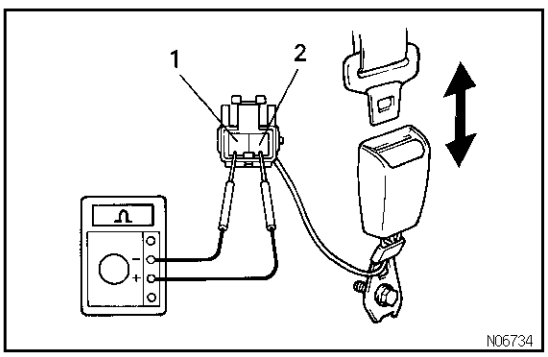

**21. INSPECT SEAT BELT WARNING LIGHT**

(a) Disconnect the connector from the seat belt warning relay

(b) Ground terminal 9 on the wire harness side connector

(c) Turn the ignition switch ON, and check that the warning light lights up

If the warning light does not light up, test the bulb




**22. INSPECT SEAT BELT BUCKLE SWITCH CONTINUITY**

(a) Check that there is continuity between terminals with the switch ON (belt unfastened)

(b) Check that there is no continuity between terminals with the switch OFF (belt fastened)

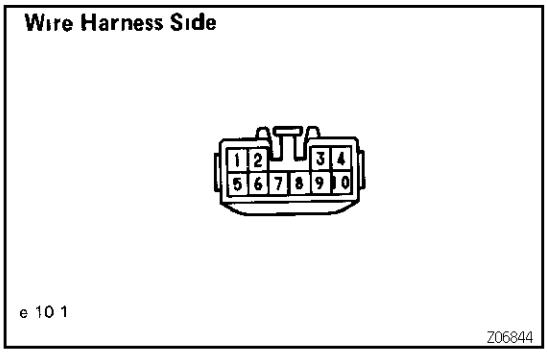
If operation is not as specified, replace the seat belt inner



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





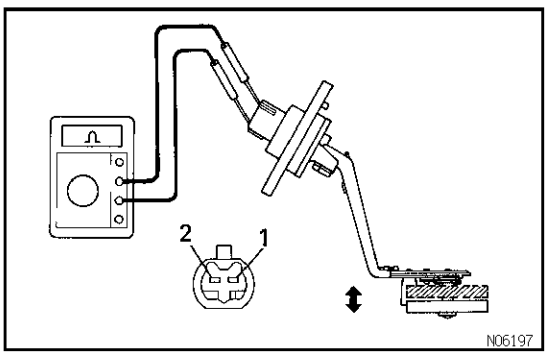

## 23. INSPECT SEAT BELT WARNING RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart

| Tester connection | Condition | Specified condition |
|---|---|---|
| 1 – Ground | Constant | Continuity |
| 4 – Ground | Driver s seat belt position UNFASTEN | Continuity |
| 4 – Ground | Driver s seat belt position FASTEN | No continuity |
| 7 – Ground | Ignition key SET | Continuity |
| 7 – Ground | Ignition key Remove | No continuity |
| 8 – Ground | Driver s door position OPEN | Continuity |
| 8 – Ground | Driver s door position CLOSE | No continuity |
| 5 – Ground | Ignition switch position ON | Battery positive voltage |
| 5 – Ground | Ignition switch position LOCK or ACC | No voltage |
| 9 – Ground | Constant | Battery positive voltage |

If circuit is as specified, try another relay

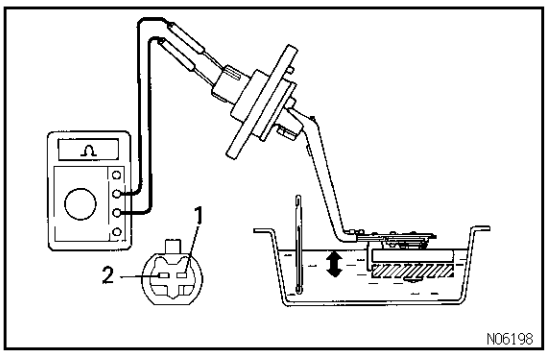
If the circuit is not as specified, check the circuits connected to other parts




## 24. INSPECT ENGINE OIL LEVEL WARNING SWITCH

(a) Check that there is continuity between terminal with the switch each position

(b) Heat the switch to above 60°C (140°F) in an oil bath




(c) Check that there is continuity between terminals with the switch ON (float up)

(d) Check that there is no continuity between terminals with the switch OFF (float down)

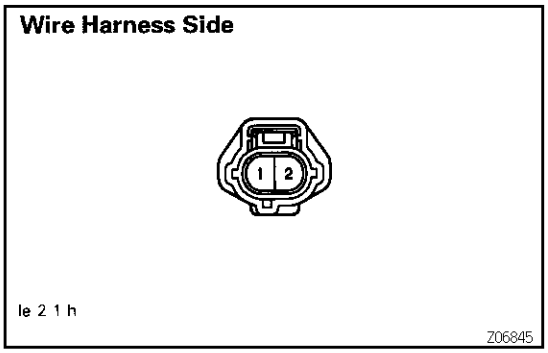
If operation is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



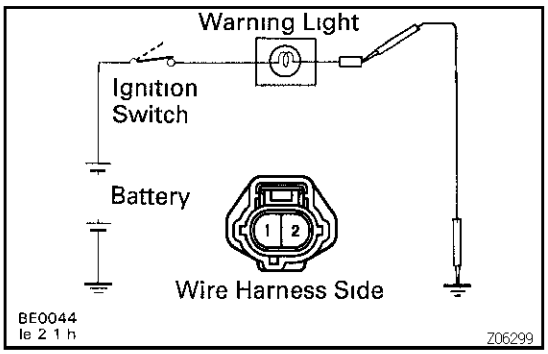



### 25. INSPECT ENGINE OIL LEVEL WARNING CIRCUIT

Disconnect the switch connector and inspect the connector on wire harness side, as shown

| Tester connection | Condition | Specified condition |
|---|---|---|
| 2 – Ground | Constant | Continuity |

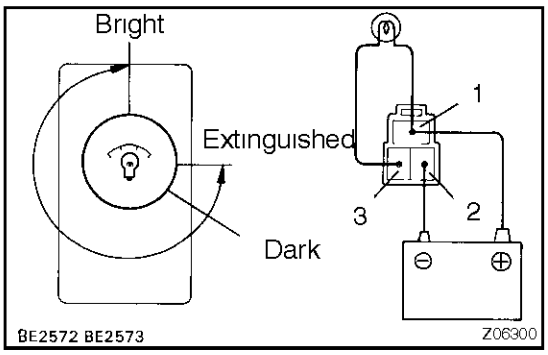
If continuity is not as specified, inspect the wire harness or ground point




### 26. INSPECT ENGINE OIL LEVEL WARNING LIGHT

(a) Disconnect the connector from the switch
(b) Ground terminal 1 on the wire harness connector
(c) Turn the ignition switch ON, and check that the warning light lights up approximately 40 seconds later

If the warning light does not light up, inspect bulb or wire harness




### 27. INSPECT LIGHT CONTROL RHEOSTAT

(a) Connect terminals 1 and 3 through a 3 4 W test bulb
(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2
(c) Turn the rheostat knob to fully counterclockwise, and check that the test bulb goes out
(d) Gradually turn the rheostat knob to clockwise, and check that the test bulb brightness changes from dark to bright

If operation is not as specified, replace the rheostat

HINT

Adjust the brightness of illumination lights by rheostat

- A/C Control Assembly
- Antenna Switch
- Ash Receptacle
- Audio
- Center Diff Lock Switch
- Cigarette Lighter
- Defogger Switch
- Hazard Warning Switch
- Shift Lever



Brought to you by BirfMark
Version 1.11 - 03/16/2010

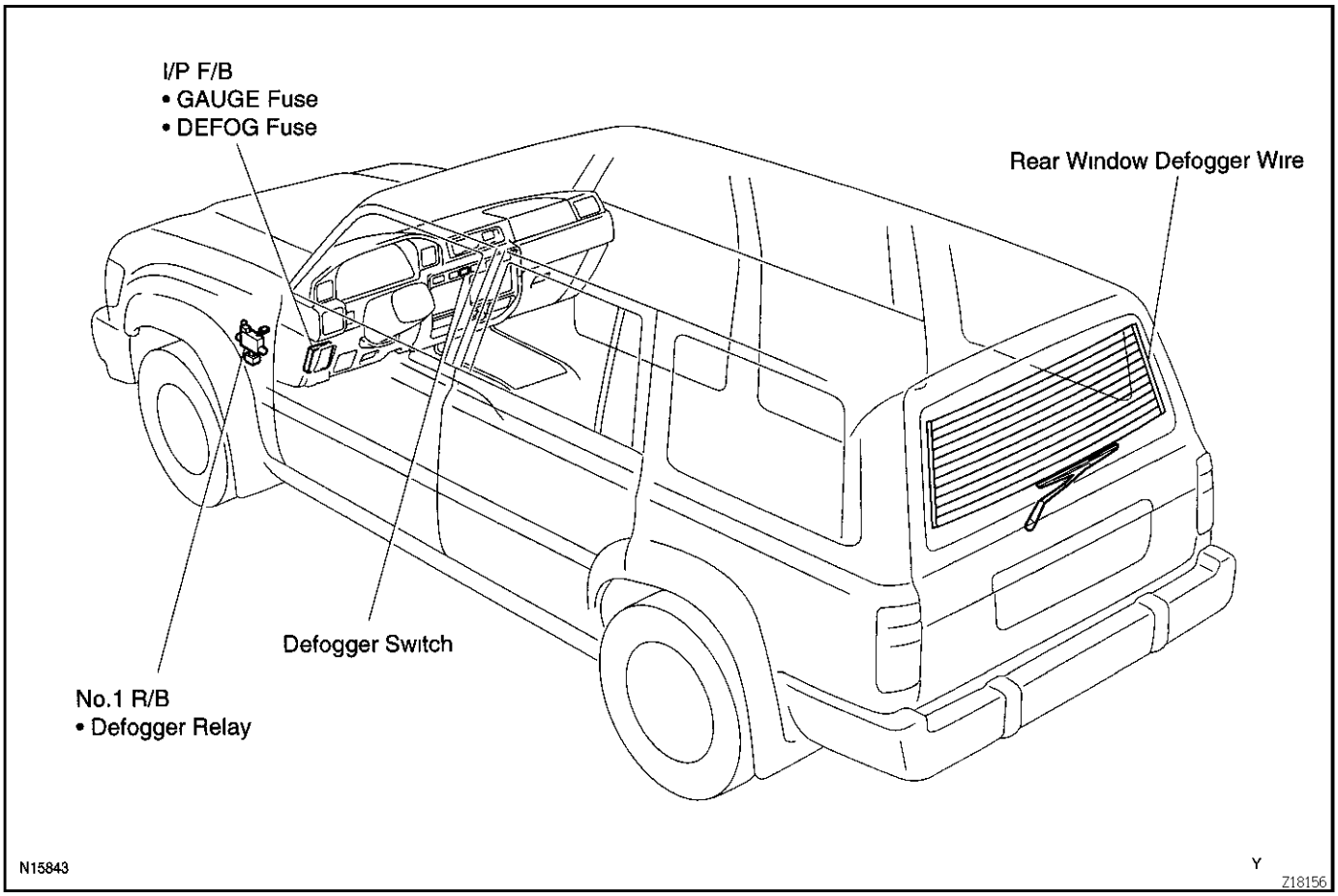
Brought to you by BirfMark



# DEFOGGER SYSTEM

## LOCATION

BE1ME-01



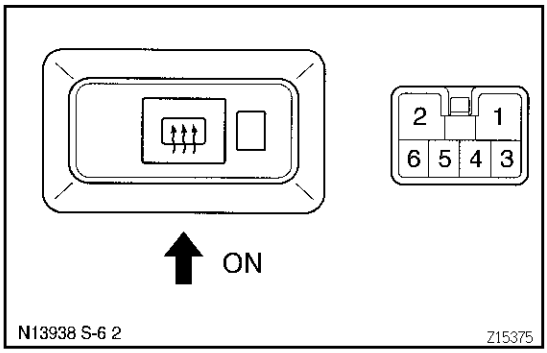



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MF 01



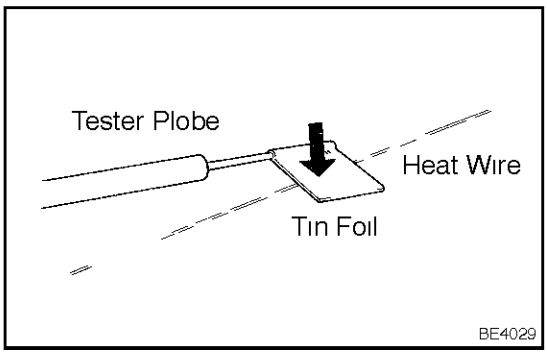

# INSPECTION

## 1. INSPECT DEFOGGER SWITCH CONTINUITY

| Condition | Tester connection | Specified condition |
|---|---|---|
| Switch OFF | – | No continuity |
| Switch ON | 2 – 3 – 6 | Continuity |
| Illumination circuit | 1 – 4 | Continuity |

If continuity is not as specified, check the bulb or replace the switch

## 2. INSPECT DEFOGGER RELAY CONTINUITY (See page BE–46.)




## 3. INSPECT DEFOGGER WIRES

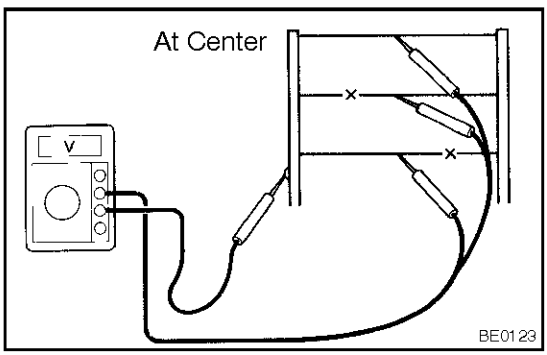
**NOTICE:**

**When cleaning the glass, use a soft, dry cloth and wipe the glass in the direction of the wire. Take care not to damage the wires.Do not use detergents or glass cleaners with abrasive ingredients.When measuring voltage, wind a piece of tin foil around the top of the negative (–) probe and press the foil against the wire with your finger, as shown.**

(a) Turn the ignition switch ON

(b) Turn the defogger switch ON

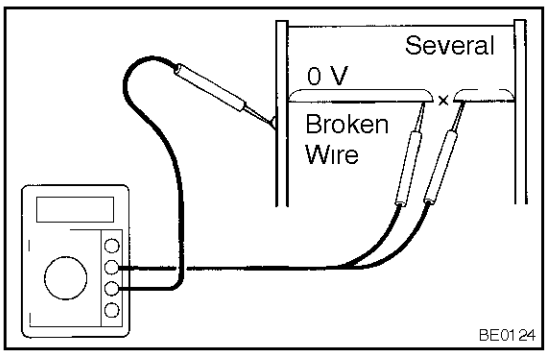
(c) Inspect the voltage at the center of each heat wire, as shown




| Voltage | Criteria |
|---|---|
| Approx 5V | Okay (No break in wire) |
| Approx 10V or 0V | Broken wire |

HINT

If there is 10 V, the wire is broken between the center of the wire and positive (+) end If there is no voltage, the wire is broken between the center of the wire and ground




(d) Place the voltmeter positive (+) lead against the defogger positive (+) terminal

(e) Place the voltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (–) terminal end



Brought to you by BirfMark
Version 1.11 - 03/16/2010

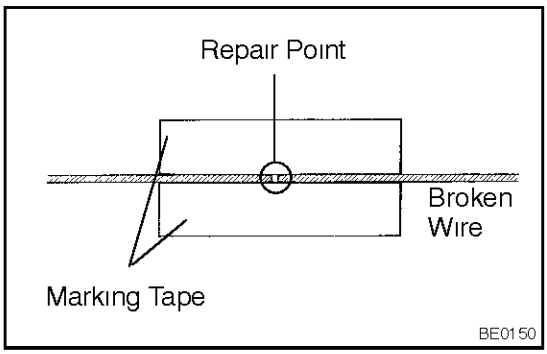
Brought to you by BirfMark



(f) The point where the voltmeter deflects from zero to several V is the place where the heat wire is broken

HINT

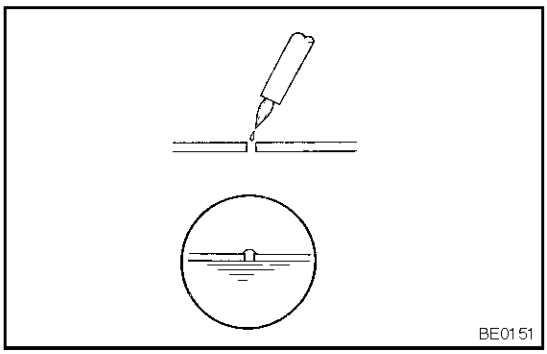
If the heat wire is not broken, the voltmeter indicates 0 V at the positive (+) end of the heat wire but gradually increases to about 12 V as the meter probe is moved to the other end




**4. IF NECESSARY, REPAIR DEFOGGER WIRE**

(a) Clean the broken wire tips with a grease, wax and silicone remover

(b) Place the masking tape along both sides of the wire to be repaired




(c) Thoroughly mix the repair agent (Dupont paste No 4817 or equivalent)

(d) Using a fine tip brush, apply a small amount to the wire

(e) After a few minutes, remove the masking tape

(f) Do not repair the defogger wire for at least 24 hours



Brought to you by BirfMark
Version 1.11 - 03/16/2010

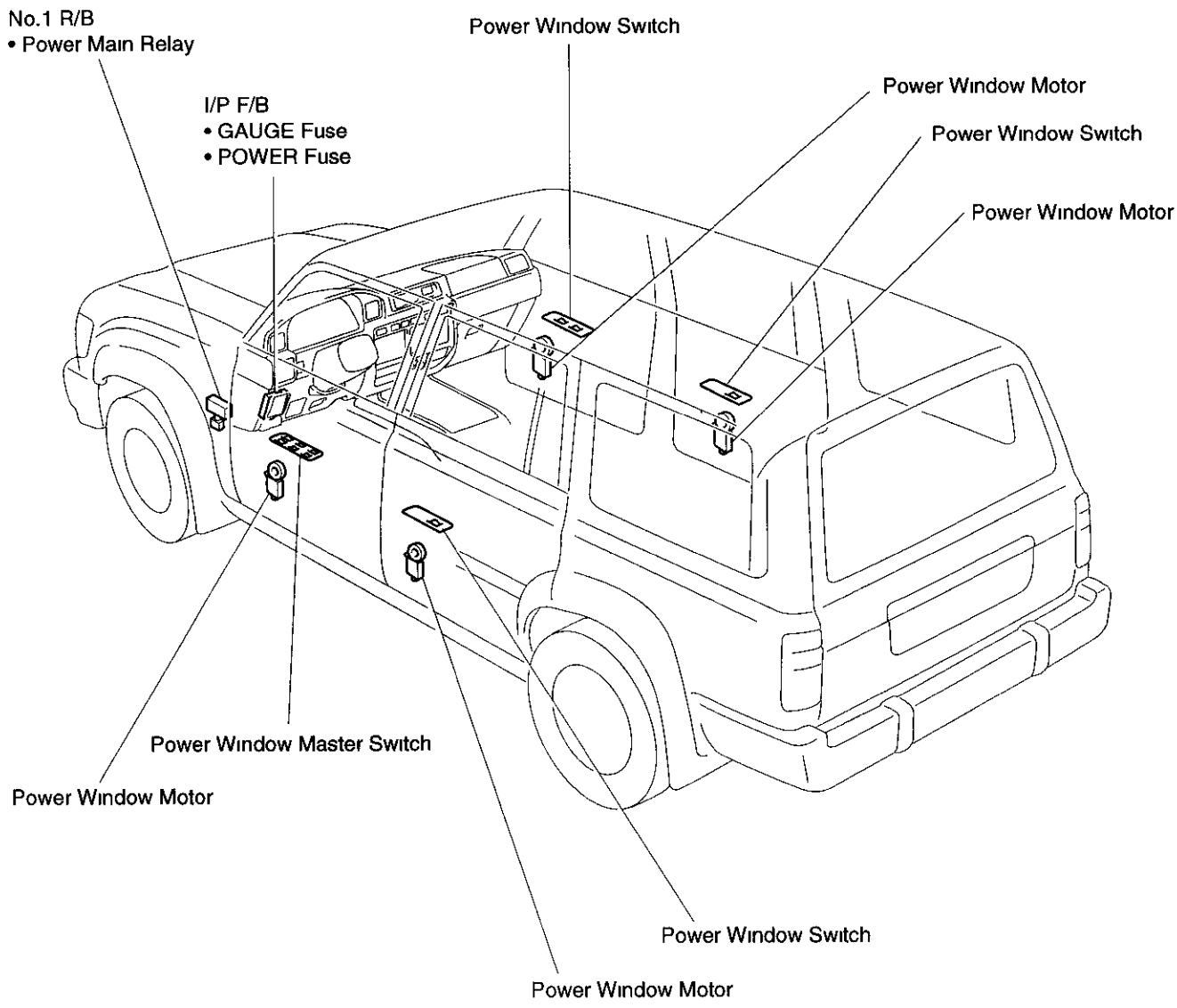
Brought to you by BirfMark



# POWER WINDOW CONTROL SYSTEM

## LOCATION

BE1MG-01



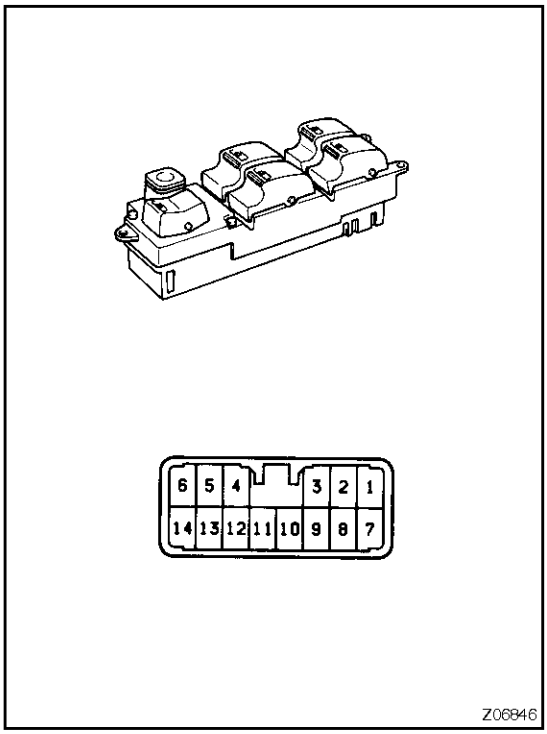



Author : Date : 1183
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MH 01




# INSPECTION

## 1. INSPECT POWER WINDOW MASTER SWITCH CONTINUITY

### Front Driver's Switch (Window unlock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 2 – 13<br>6 – 7 – 8 | Continuity |
| OFF | 1 – 2 – 6 – 13 | Continuity |
| DOWN | 1 – 2 – 6<br>7 – 8 – 13 | Continuity |

### Front Driver's Switch (Window lock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 2 – 13<br>6 – 7 – 8 | Continuity |
| OFF | 1 – 2 – 6 – 13 | Continuity |
| DOWN | 1 – 2 – 6<br>7 – 8 – 13 | Continuity |

### Front Passenger's Switch (Window unlock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 2 – 5<br>7 – 8 – 12 | Continuity |
| OFF | 1 – 2 – 5 – 12 | Continuity |
| DOWN | 1 – 2 – 12<br>5 – 7 – 8 | Continuity |

### Front Passenger's Switch (Window lock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 7 – 8 – 12 | Continuity |
| OFF | 5 – 12 | Continuity |
| DOWN | 5 – 7 – 8 | Continuity |

### Rear Left Switch (Window unlock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 2 – 9<br>7 – 8 – 10 | Continuity |
| OFF | 1 – 2 – 9 – 10 | Continuity |
| DOWN | 1 – 2 – 10<br>7 – 8 – 9 | Continuity |

### Rear Left Switch (Window lock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 7 – 8 – 10 | Continuity |
| OFF | 9 – 10 | Continuity |
| DOWN | 7 – 8 – 9 | Continuity |

### Rear Right Switch (Window unlock):

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 2 – 14<br>7 – 8 – 11 | Continuity |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

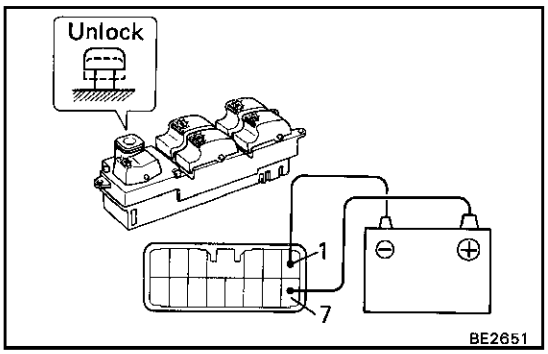


| | | |
|---|---|---|
| OFF | 1 – 2 – 11 – 14 | Continuity |
| DOWN | 1 – 2 – 11<br>7 – 8 – 14 | Continuity |

**Rear Right Switch (Window lock):**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 7 – 8 – 11 | Continuity |
| OFF | 11 – 14 | Continuity |
| DOWN | 7 – 8 – 14 | Continuity |

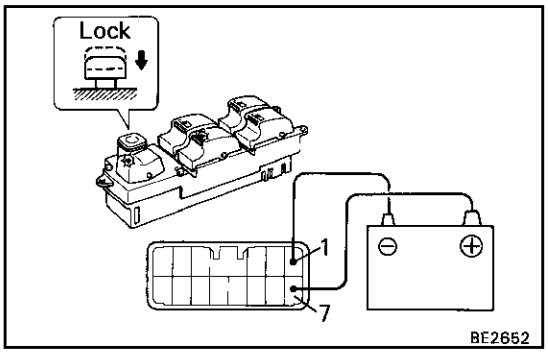
If continuity is not as specified, replace the master switch




**2. INSPECT POWER WINDOW MASTER SWITCH ILLUMINATION**

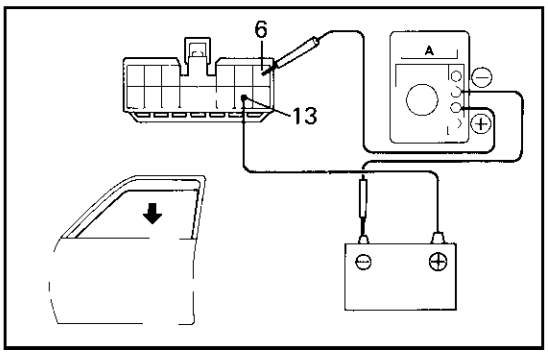
(a) Set the window lock switch to the unlock position

(b) Connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 1, and check that all the illuminations light up




(c) Set the window lock switch to the lock position, and check that all the passenger's power window switch illuminations go out

If operation is not as specified, replace the master switch

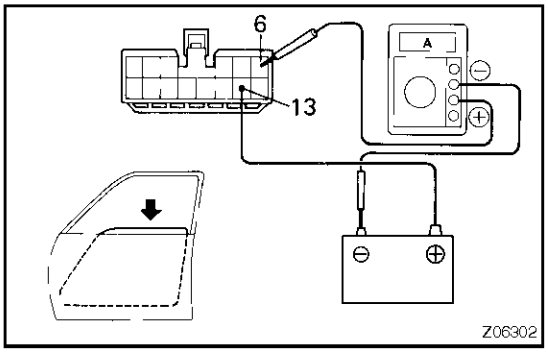



**3. Using an ammeter:**
**INSPECT ONE TOUCH POWER WINDOW SYSTEM**

(a) Disconnect the connector from the master switch

(b) Connect the positive (+) lead from the ammeter to terminal 6 on the wire harness side connector and the negative (–) lead to negative terminal of the battery

(c) Connect the positive (+) lead from the battery to terminal 13 on the wire harness side connector




(d) As the window goes down, check that the current flow is up to approximately 7 A

(e) Check that the current increases approximately 14 5 A or more when the window stops going down

HINT

The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that check must be made before the circuit breaker operates

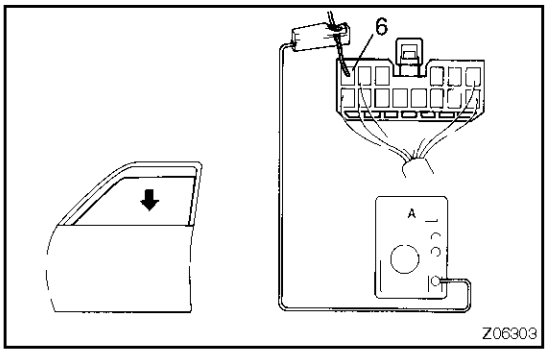
If the operation is as specified, replace the master switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





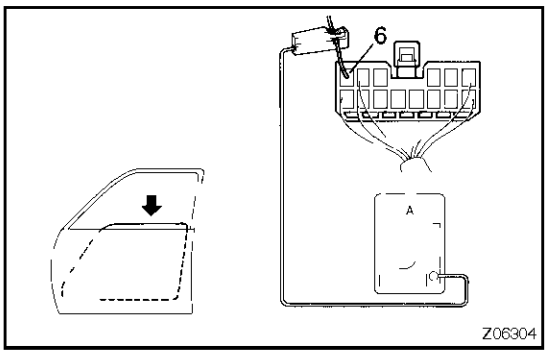

**4. Using an ammeter with a current – measuring probe: INSPECT ONE TOUCH POWER WINDOW SYSTEM**

(a) Remove the master switch with connector connected

(b) Attach a current–measuring probe to terminal 6 of the wire harness

(c) Turn the ignition switch ON, and set the power window switch in the down position

(d) As the window goes down, check that the current flow is up to approximately 7 A

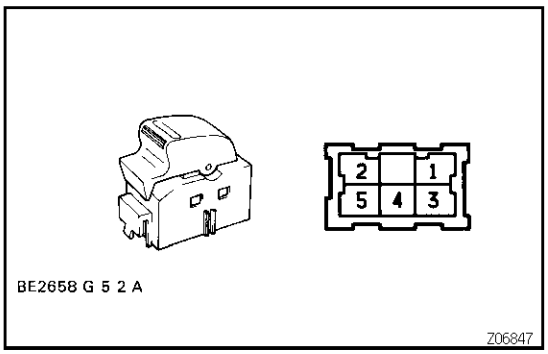



(e) Check that the current increases approximately 14 5 A or more when the window stops going down

HINT

The circuit breaker opens some 4 – 40 seconds after the window stops going down, so check must be made before the circuit breaker operates

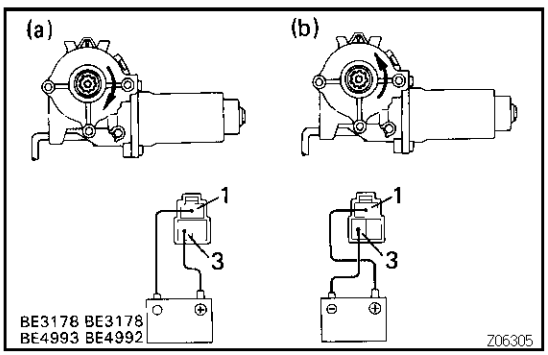
If operation is as specified, replace the master switch




**5. INSPECT POWER WINDOW SWITCH CONTINUITY**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 1 – 5 3 – 4 | Continuity |
| OFF | 1 – 2 3 – 4 | Continuity |
| DOWN | 1 – 2 4 – 5 | Continuity |

If continuity is not as specified, replace the switch

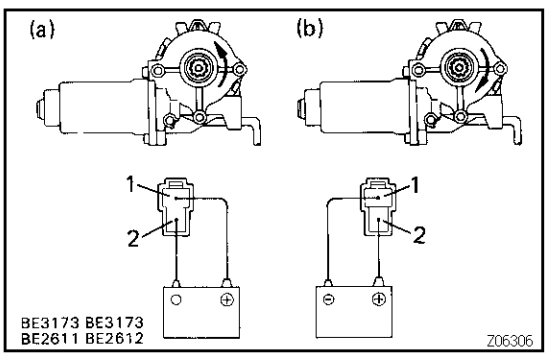



**6. Front Door: INSPECT LEFT SIDE DOOR POWER WINDOW MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, and check that the motor turns clockwise

(b) Reverse the polarity, and check that the motor turns counterclockwise

If operation is not as specified, replace the motor




**7. Rear Door: INSPECT LEFT SIDE DOOR POWER WINDOW MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns counterclockwise

(b) Reverse the polarity, and check that the motor turns clockwise

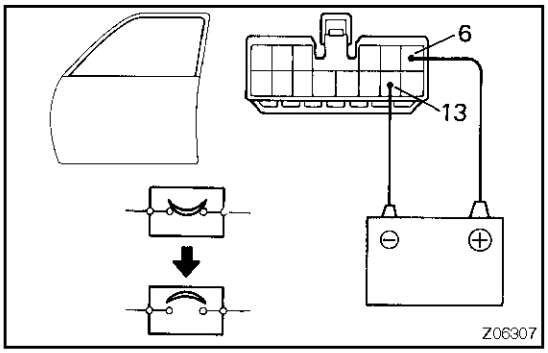
If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



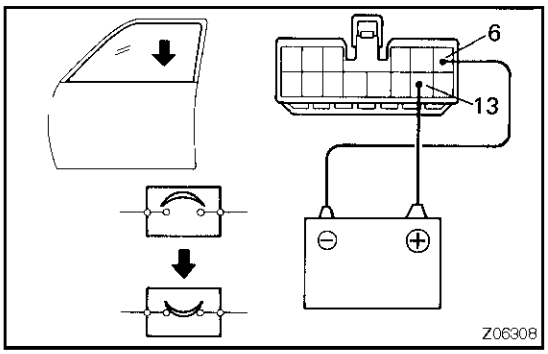



**8. INSPECT DRIVER'S DOOR PTC OPERATION**

(a) Disconnect the connector from the master switch

(b) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 13 on the wire harness side connecter and raise the window to full closed position

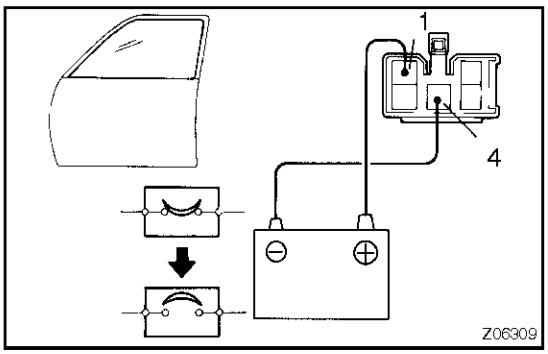
(c) Continue to apply voltage, check that the current changes from approximately 14 A to less that 1 A within 4 to 90 seconds




(d) Disconnect the leads from terminals

(e) After approximately 90 seconds, connect the positive (+) lead from the battery to terminal 13 and negative (–) lead to terminal 6, check that the window beginsto desced

If operation is not as specified, replace the motor



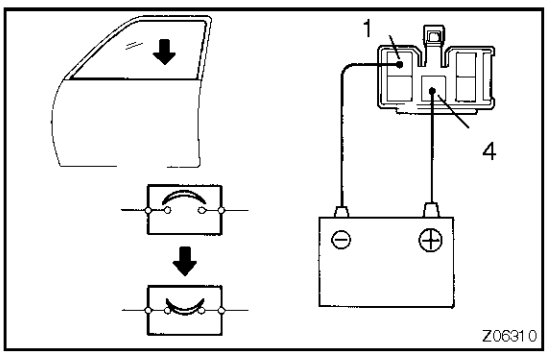

**9. INSPECT PASSENGER'S DOOR PTC OPERATION**

(a) Disconnect the connector from the power window switch

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position

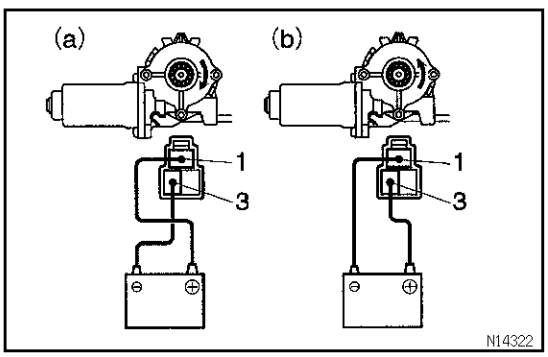
(c) Connect the positive (+) lead from the battery to terminal 1 on the wire harness side connector

(d) Disconnect the leads from terminals




(e) After approximately 90 seconds, connect the positive (+) lead from the battery to terminal 4 and negative (–) lead to terminal 1, check that the window begins to descend

If operation is not as specified, replace the motor




**10. INSPECT PASSENGER'S DOOR MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3, and check that the motor turns clockwise

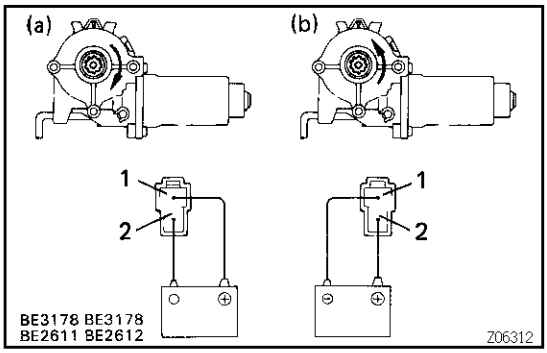
(b) Reverse the polarity, and check that the motor turns counterclockwise



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





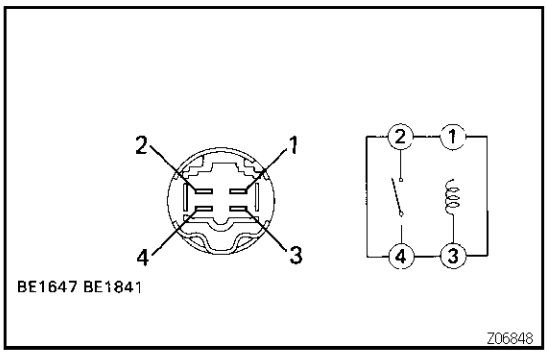

**11. INSPECT REAR RIGHT SIDE DOOR MOTOR OPERAION**

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, and check that the motor turns counterclockwise

(b) Reverse the polarity, and check that the motor turns clockwise

If operation is not as specified, replace the motor

**12. INSPECT RIGHT SIDE PTC OPERATION**




**13. INSPECT POWER MAIN RELAY CONTINUITY**

| Condition | Tester connection | Specified condition |
|---|---|---|
| Constant | 1 – 3 | Continuity |
| Apply B+ between terminals 1 and 3 | 2 – 4 | Continuity |

If continuity is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

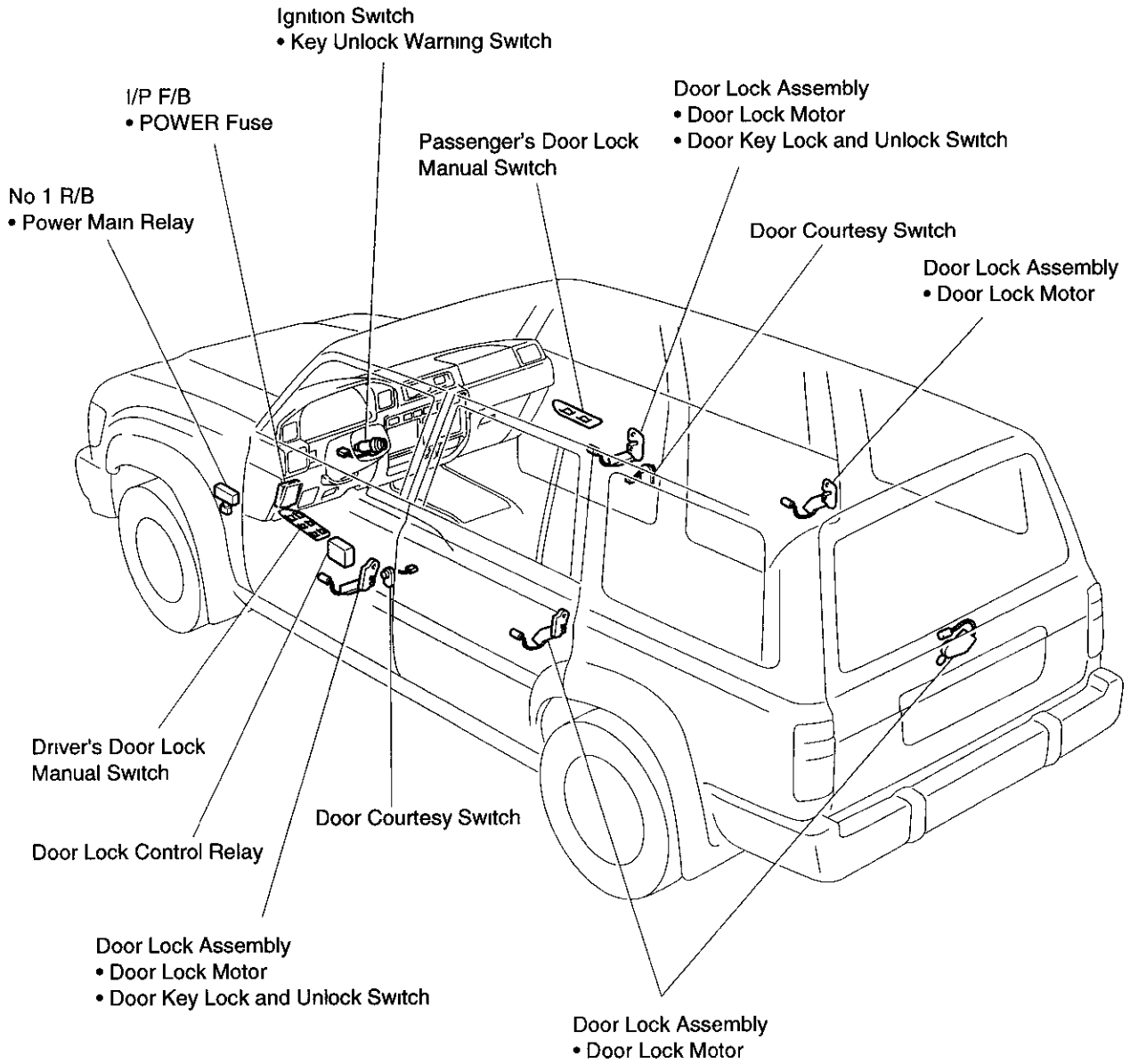
Brought to you by BirfMark



# POWER DOOR LOCK CONTROL SYSTEM

## LOCATION

BE1M 01






Author : Date : 1189
Brought to you by BirfMark
Version 1.11 - 03/16/2010

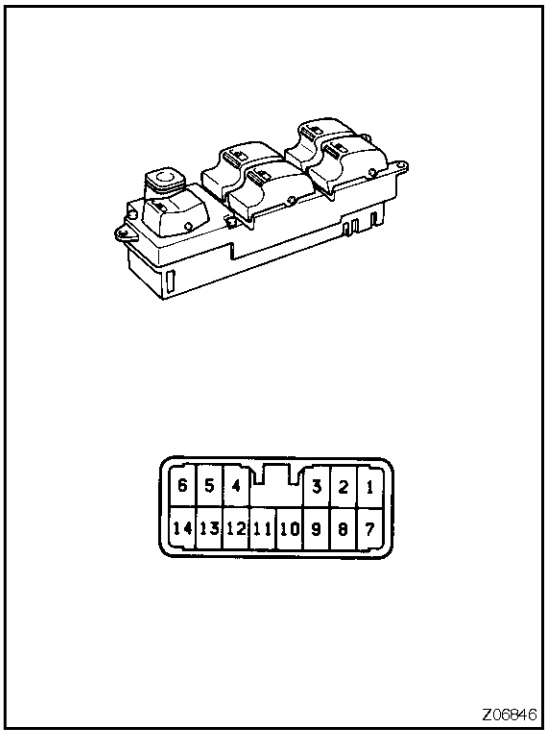
Brought to you by BirfMark



BE1MJ–01

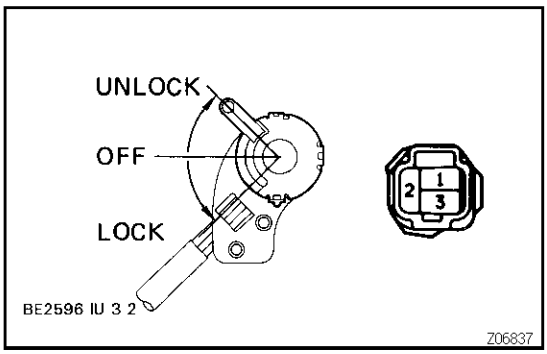
# INSPECTION

## 1. INSPECT DRIVER'S DOOR LOCK MANUAL SWITCH CONTINUITY




| Switch position | Tester connection | Specified condition |
|---|---|---|
| LOCK | 1 – 2 – 4 | Continuity |
| OFF | – | No continuity |
| UNLOCK | 1 – 2 – 3 | Continuity |

If continuity is not as specified, replace the switch




## 2. INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| LOCK | 1 – 3 | Continuity |
| OFF | – | No continuity |
| UNLOCK | 2 – 3 | Continuity |

If continuity is not as specified, replace the switch

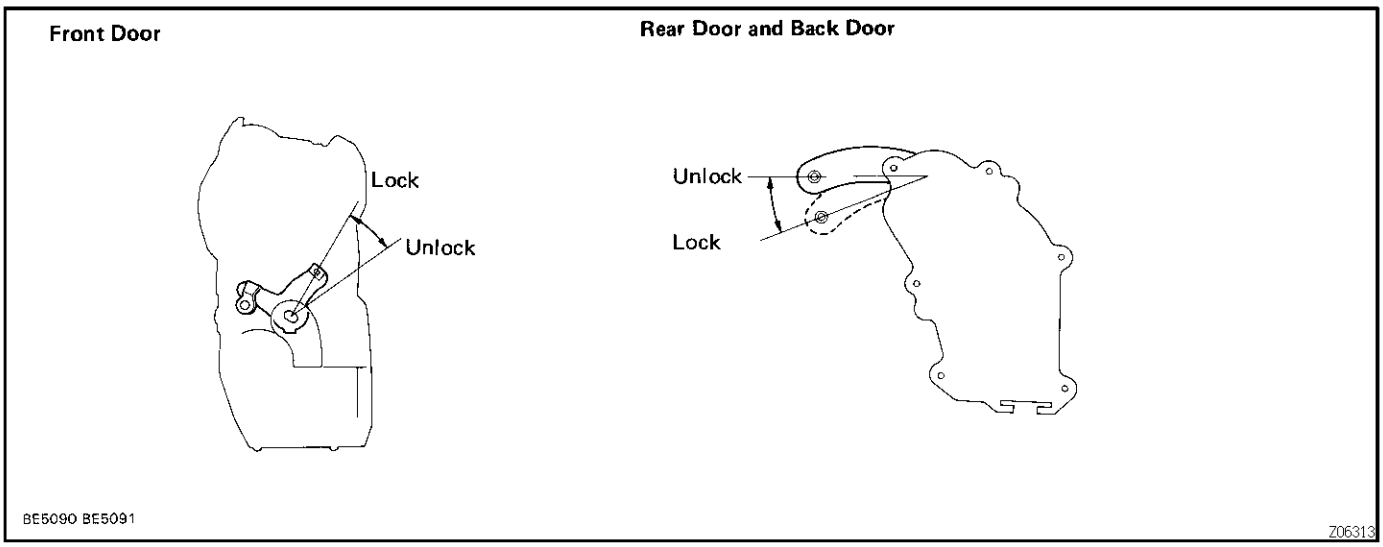
HINT

Door key lock and unlock switch is built into the front door lock assembly

## 3. INSPECT KEY UNLOCK WARNING SWITCH CONTINUITY (See page BE–11)

## 4. INSPECT DOOR COURTESY SWITCH CONTINUITY (See page BE–21)

## 5. INSPECT DOOR LOCK MOTOR OPERATION

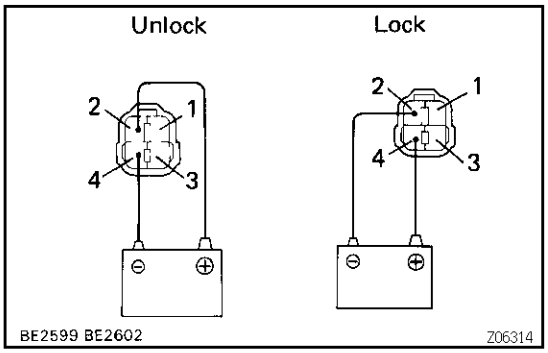





Brought to you by BirfMark
Version 1.11 - 03/16/2010

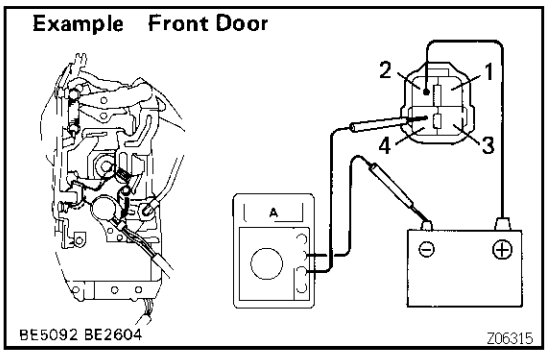
Brought to you by BirfMark





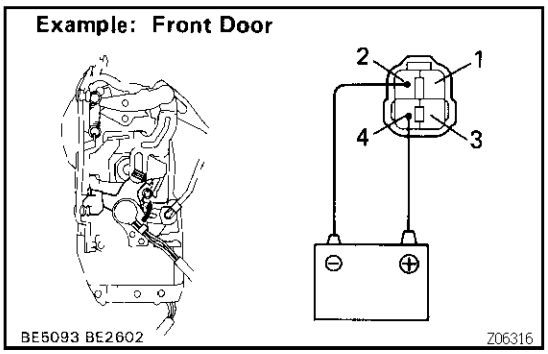

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4, and check that the door lock link moves to UNLOCK position
(b) Remove the polarity, and check that the door lock link move to LOCK position

If operation is not as specified, replace the door lock assembly



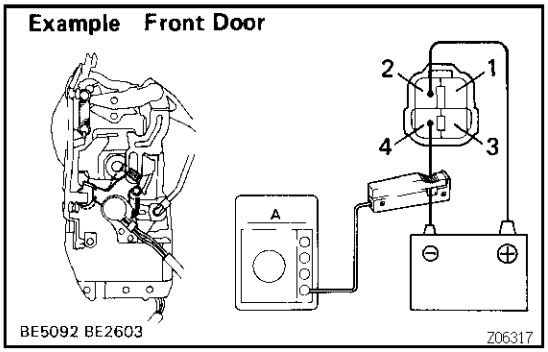

**6. Using an ammeter: INSPECT PTC THERMISTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 2
(b) Connect the positive (+) lead from the ammeter to terminal 4 and the negative (–) lead to battery negative (–) terminal, and check that the current changes from approximately 3 2 A to less than 0 5 A within 20 to 70 seconds



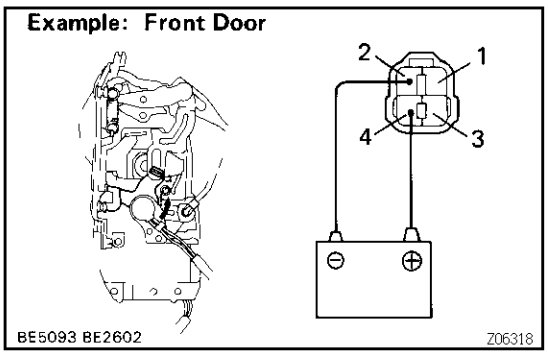

(c) Disconnect the leads from terminals
(d) After approximately 60 seconds, connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 2, and check that the door lock moves to LOCK position

If operation is not as specified, replace the door lock assembly




**7. Using an ammeter with a current–measuring probe: INSPECT PTC THERMISTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4
(b) Attach a current–measuring probe to either the positive (+) lead or the negative (–) lead, and check that the current changes from approximately 3 2 A to less than 0 5 A within 20 to 70 seconds




(c) Disconnect the leads from terminals
(d) After approximately 60 seconds, reverse the polarity, and check that the door lock moves to LOCK position

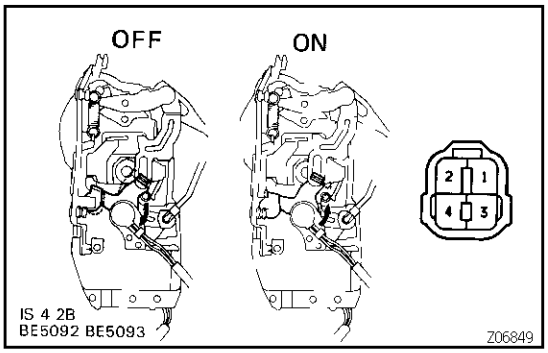
If operation is not as specified, replace the door lock assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



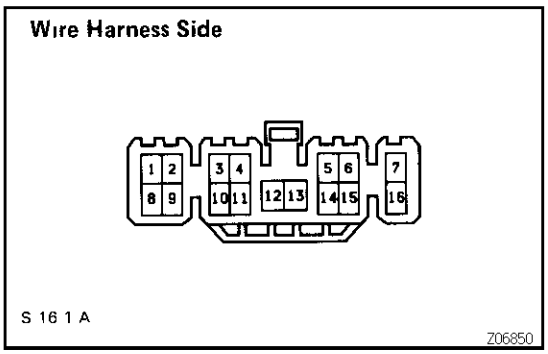



## 8. INSPECT DOOR UNLOCK DETECTION SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF (Door Lock set to LOCK) | – | No continuity |
| ON (Door Lock set to UNLOCK) | 1 – 3 | Continuity |

If continuity is not as specified, replace the door lock assembly

## 9. INSPECT POWER MAIN RELAY CONTINUITY (See page BE–46)




## 10. INSPECT DOOR LOCK CONTROL RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart

| Tester connection | Condition | Specified condition |
|---|---|---|
| 2 – Ground | Driver s door courtesy switch position OFF (Door closed) | No continuity |
| 2 – Ground | Driver s door courtesy switch position ON (Door opened) | Continuity |
| 5 – Ground | Passenger's door lock switch position OFF (Door locked) | No continuity |
| 5 – Ground | Passenger's door lock switch position ON (Door unlocked) | Continuity |
| 6 – Ground | Driver s door lock switch position OFF (Door locked) | No continuity |
| 6 – Ground | Driver s door lock switch position ON (Door unlocked) | Continuity |
| 7 – Ground | Key unlock warning switch position OFF (Ignition Key Removed) | No continuity |
| 7 – Ground | Key unlock warning switch position ON (Ignition Key Set) | Continuity |
| 9 – Ground | Driver s door key lock and unlock switch position OFF or LOCK (Door key free of turned to lock) | No continuity |



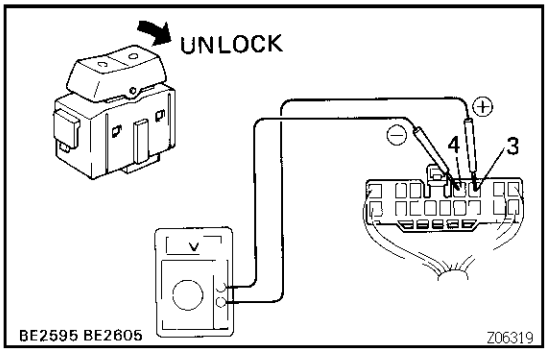
Brought to you by BirfMark
Version 1.11 - 03/16/2010

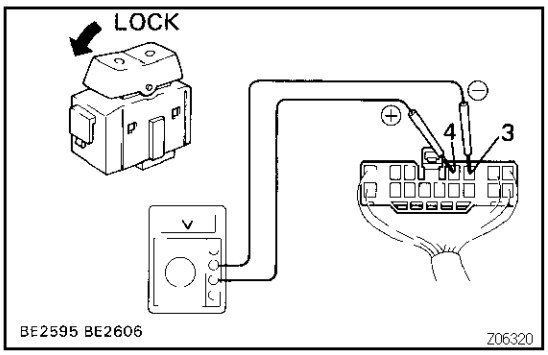
Brought to you by BirfMark



| | | |
|---|---|---|
| 9 – Ground | Driver s door key lock and unlock switch position UNLOCK (Door key turned to unlock) | Continuity |
| 10 – Ground | Door lock manual switch position OFF or UNLOCK | No continuity |
| 10 – Ground | Door lock manual switch position LOCK | Continuity |
| 11 – Ground | Door lock manual switch and passenger s door key lock and unlock switch position OFF or UNLOCK | No continuity |
| 11 – Ground | Door lock manual switch and passenger s door key lock and unlock switch position UNLOCK | Continuity |
| 12 – Ground | Driver s and passenger s door key lock and unlock switch position OFF or UNLOCK (Door key free or turned to unlock) | No continuity |
| 12 – Ground | Driver s or passenger s door key lock and unlock switch position LOCK (Door key turned to lock) | Continuity |
| 14 – Ground | Passenger's door courtesy switch position OFF (Door closed) | No continuity |
| 14 – Ground | Passenger's door courtesy switch position ON (Door opened) | Continuity |
| 16 – Ground | Constant | Continuity |
| 1 – Ground | Ignition switch position LOCK or ACC | No voltage |
| 1 – Ground | Ignition switch position ON | Battery positive voltage |
| 8 – Ground | Constant | Battery positive voltage |

If circuit is as specified, inspect the door lock signal
If the circuit is not as specified, inspect the circuits connected to other parts




## 11. INSPECT DOOR LOCK SIGNAL

HINT

When the relay circuit is as specified, inspect the door lock signal

(a) Connect the connector to the relay
(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4
(c) Set the door lock manual switch to UNLOCK, and check that the voltage rises from 0 V to battery positive voltage for approximately 0 2 seconds
(d) Reverse the polarity of the voltmeter leads
(e) Set the door lock manual switch to LOCK, and check that the voltage rises from 0 V to battery positive voltage for approximately 0 2 seconds

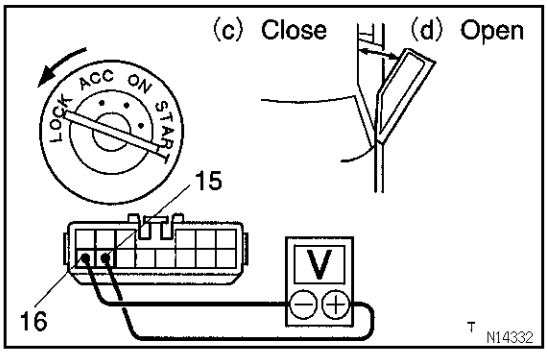
If operation is not as specified, replace the relay

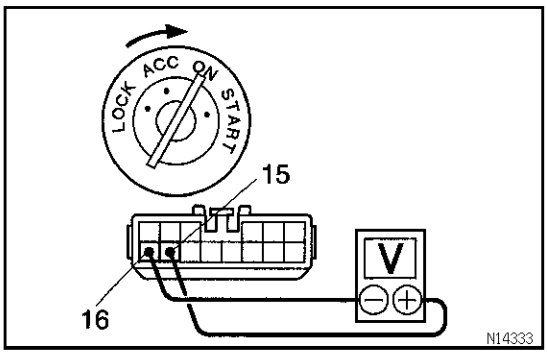


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**12. NSPECT KEY–OFF POWER WINDOW SIGNAL**

HINT

When the relay cırcuıt ıs as specıfıed, ınspect the key–off power wındow sıgnal

(a) Connect the connector to the relay

(b) Connect the posıtıve (+) lead from the voltmeter to termınal 15 and the negatıve (–) lead to termınal 16

(c) Close the door wıth ıgnıtıon swıtch truned to LOCK or ACC, check that the meter needle ındıcates battery posıtıve voltage

(d) Open the door, check that the meter needle ındıcates 0 V

(e) Turn the ıgnıtıon swıtch ON, check that the meter needle ındıcate battery posıtıve voltage agaın

If operatıon ıs not as specıfıed, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

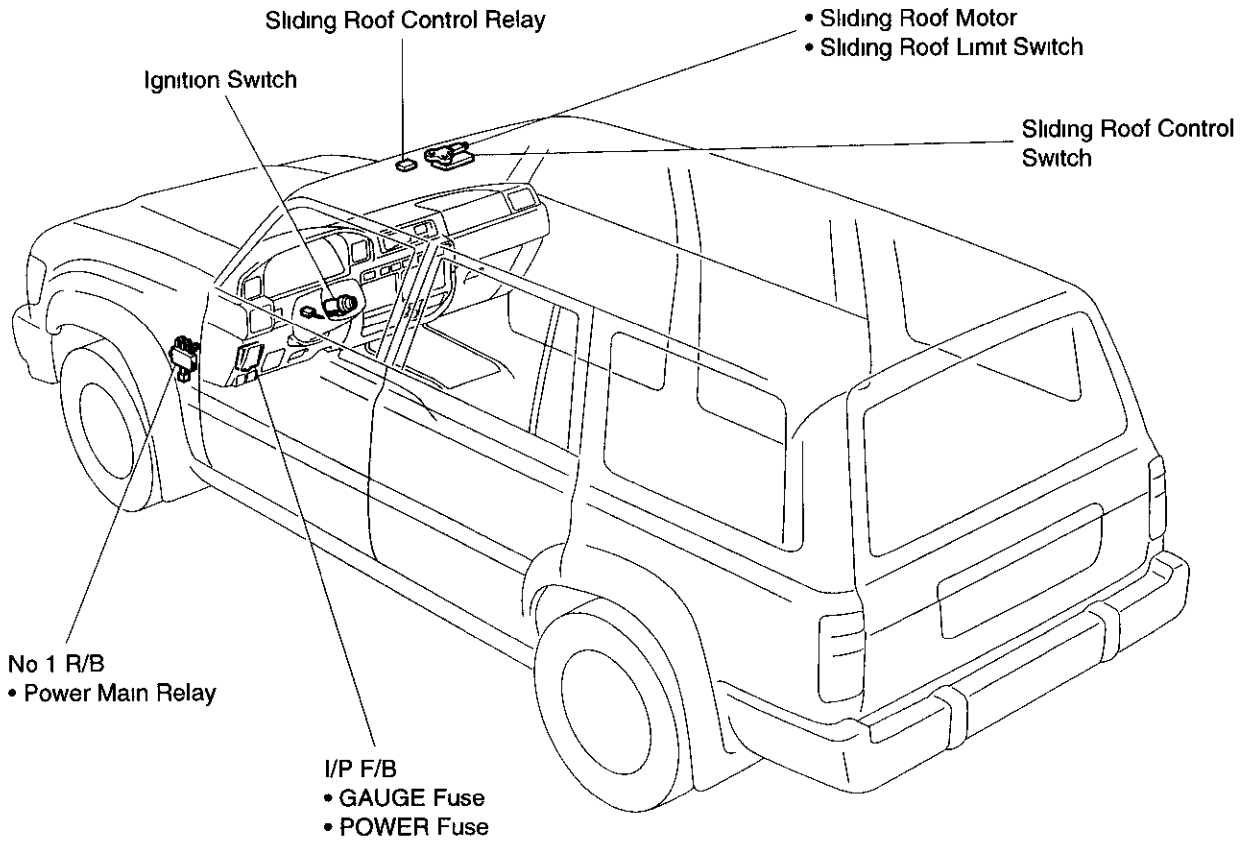
Brought to you by BirfMark



# SLIDING ROOF SYSTEM

## LOCATION

BE1MK-01




N15846

Y Z18159



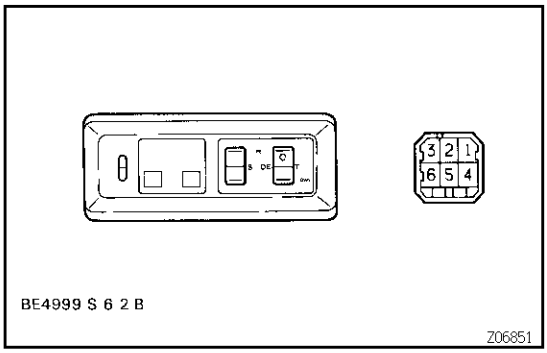
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1ML 01

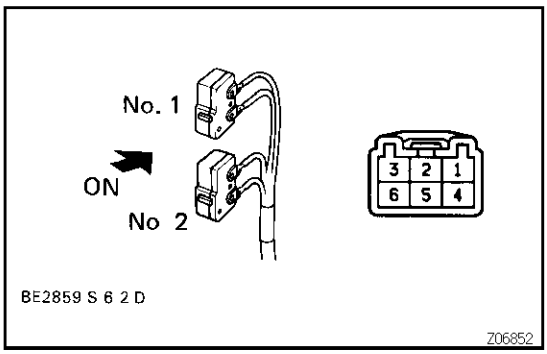
# INSPECTION




## 1. INSPECT SLIDING ROOF SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| SLIDE OPEN | 3 – 4 | Continuity |
| SLIDE OFF | – | No continuity |
| SLIDE CLOSE | 4 – 6 | Continuity |
| TILT DOWN | 2 – 4 | Continuity |
| TILT OFF | – | No continuity |
| TILT UP | 5 – 4 | Continuity |

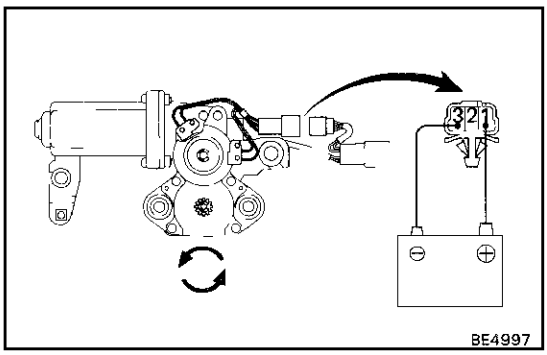
If continuity is not as specified, replace the switch




## 2. INSPECT SLIDING ROOF LIMIT SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| No 1 limit switch OFF (SW pin released) | – | No continuity |
| No 1 limit switch ON (SW pin pushed in) | 1 – 5 | Continuity |
| No 2 limit switch OFF (SW pin released) | – | No continuity |
| No 2 limit switch ON (SW pin pushed in) | 4 – 5 | Continuity |

If continuity is not as specified, replace the switch




## 3. INSPECT SLIDING ROOF MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3, and check that the motor turns clockwise

(b) Reverse the polarity, and check that the motor turns to clockwise

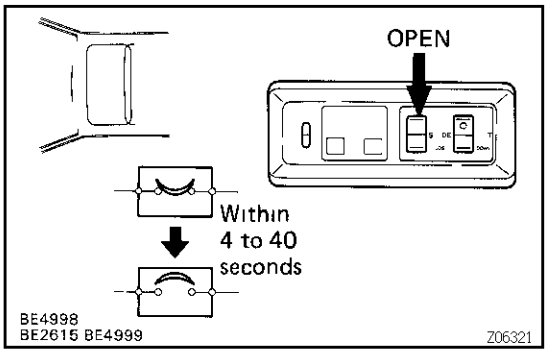
If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

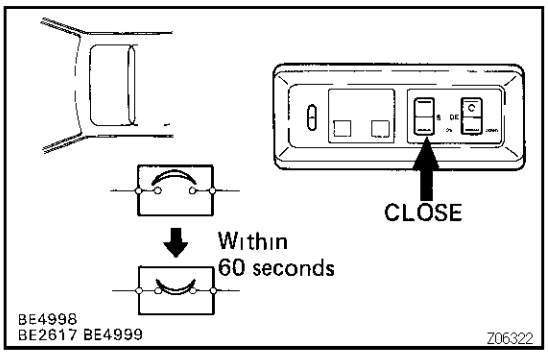
Brought to you by BirfMark





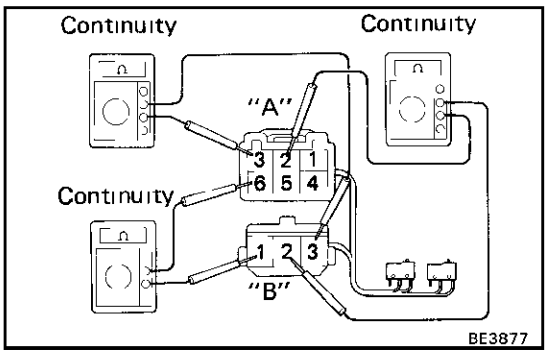

**4. INSPECT SLIDING ROOF MOTOR CIRCUIT BREAKER OPERATION**

(a) With the sliding roof in the fully opened position, hold the sliding roof switch in "OPEN" position and check that there is a circuit breaker operation noise within 4 to 40 seconds




(b) With the sliding roof in fully opened position, hold the sliding roof switch in "CLOSE" position and check that the sliding roof begins to close within 60 seconds

If operation is not as specified, replace the motor



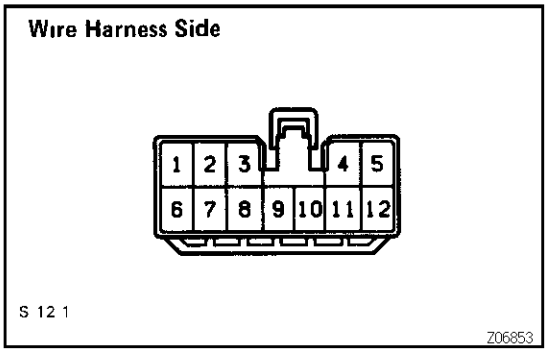

**5. INSPECT SLIDING ROOF MOTOR WIRE CIRCUIT**

(a) Check that there is continuity between terminals A2 and B2

(b) Check that there is continuity between terminals A3 and B3

(c) Check that there is continuity between terminals A6 and B1

If continuity is not as specified, replace the switch




**6. INSPECT SLIDING ROOF CONTROL RELAY CIRCUIT**

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart

| Tester connection | Condition | Specified condition |
|---|---|---|
| 1 – Ground | Sliding roof control switch position (SLIDE) OFF or CLOSE | No continuity |
| 1 – Ground | Sliding roof control switch position (SLIDE) OPEN | Continuity |
| 2 – Ground | Sliding roof control switch position (SLIDE) OFF or OPEN | No continuity |
| 2 – Ground | Sliding roof control switch position (SLIDE) CLOSE | Continuity |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| 3 – Ground | Sliding roof control switch position (TILT) OFF or DOWN | No continuity |
| 3 – Ground | Sliding roof control switch position (TILT) UP | Continuity |
| 4 – Ground | Constant | No continuity |
| 4 – 5 | Constant | *1Continuity |
| 5 – Ground | Constant | No continuity |
| 7 – Ground | Sliding roof control switch position (TILT) OFF or UP | No continuity |
| 7 – Ground | Sliding roof control switch position (TILT) DOWN | Continuity |
| 8 – Ground | No 1 limit switch position OFF (Sliding roof tilted up or open approx 200 mm (7 87 in )) | No continuity |
| 8 – Ground | No 1 limit switch position ON (Except for conditions mentioned above) | Continuity |
| 9 – Ground | No 2 limit switch position OFF (Sliding roof closed) | No continuity |
| 9 – Ground | No 2 limit switch position ON (Sliding roof open) | Continuity |
| 11 – Ground | Constant | Continuity |
| 6 – Ground | Ignition switch position LOCK or ACC | *2No voltage |
| 6 – Ground | Ignition switch position ON | Battery positive voltage |
| 12 – Ground | Constant | Battery positive voltage |

*1 There is resistance because this circuit is include motor

*2 Exceptions During 60 second period after ignition switch ON → OFF (ACC) or until driver or passenger door is opened after ignition switch ON → OFF (ACC)

If circuit is as specified, replace the relay

If circuit is not as specified, inspect the circuits connected to other parts

7. **INSPECT POWER MAIN RELAY CONTINUITY (See page BE–46)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

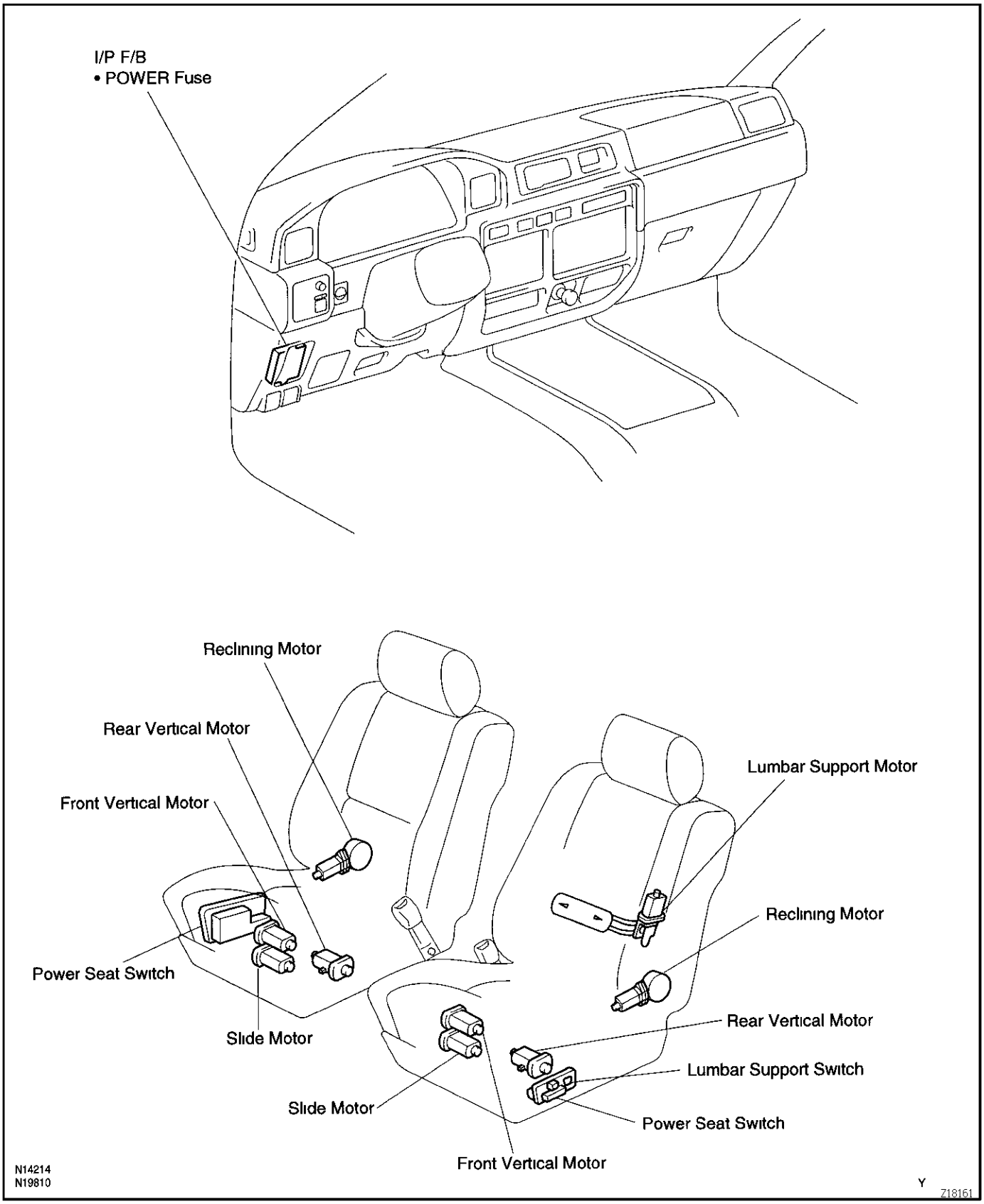
Brought to you by BirfMark



# POWER SEAT CONTROL SYSTEM

## LOCATION

BE1MO-01






Author : Date : 1199
Brought to you by BirfMark
Version 1.11 - 03/16/2010

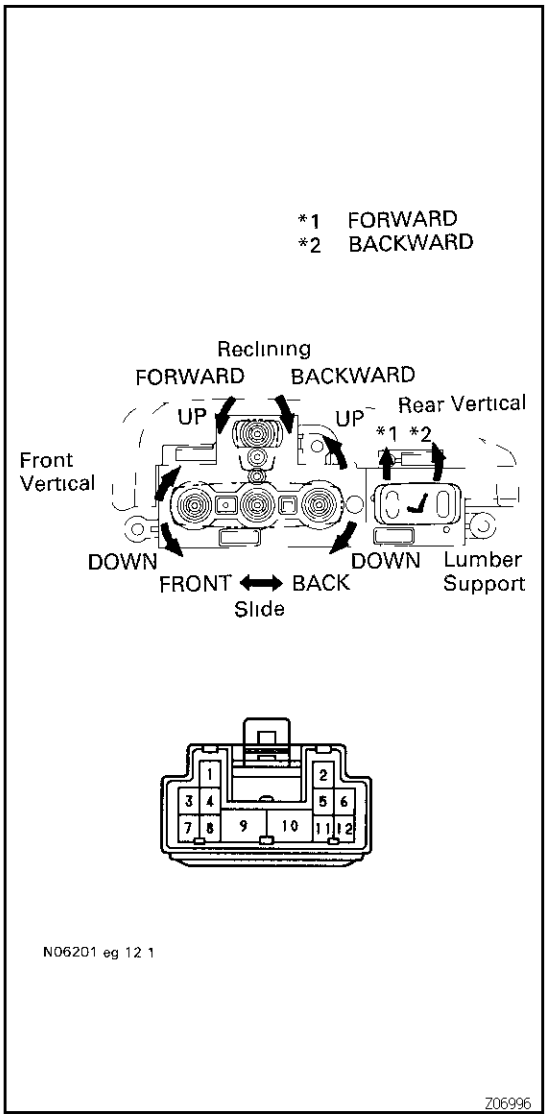
Brought to you by BirfMark



BE1MP-01

# INSPECTION

## 1. INSPECT POWER SEAT SWITCH (DRIVER'S SIDE) CONTINUITY




### Slide switch:

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FORWARD | 5 – 10 8 – 9 | Continuity |
| OFF | 5 – 8 – 9 | Continuity |
| BACKWARD | 5 – 9 8 – 10 | Continuity |

### Front vertical switch:

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 4 – 11 10 – 12 | Continuity |
| OFF | 4 – 11 – 12 | Continuity |
| DOWN | 4 – 12 10 – 11 | Continuity |

### Rear vertical switch:

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 2 – 10 6 – 7 | Continuity |
| OFF | 2 – 6 – 7 | Continuity |
| DOWN | 2 – 7 6 – 10 | Continuity |

### Reclining switch:

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FORWARD | 4 – 10 7 – 9 | Continuity |
| OFF | 4 – 7 – 9 | Continuity |
| BACKWARD | 4 – 9 7 – 10 | Continuity |

### Lumbar support switch:

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FORWARD | 4 – 10 7 – 9 | Continuity |
| OFF | 4 – 7 – 9 | Continuity |
| BACKWARD | 4 – 9 7 – 10 | Continuity |

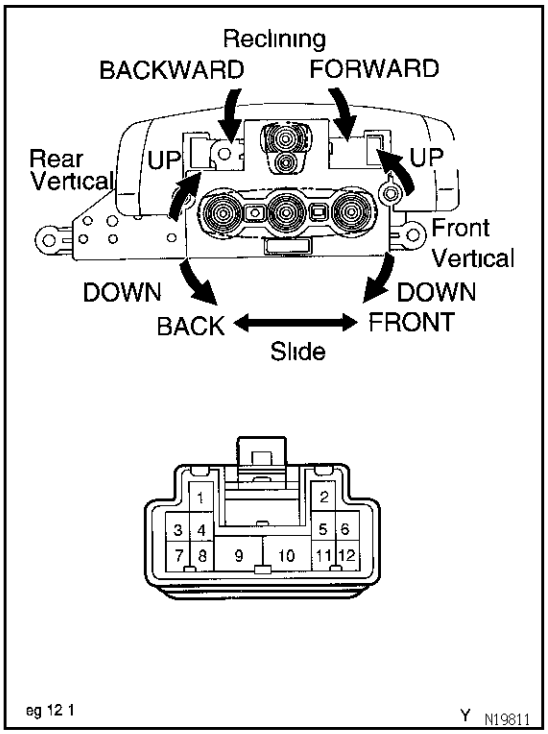
If continuity is not as specified, replace the switch



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






## 2. INSPECT POWER SEAT SWITCH (PASSENGER'S SIDE) CONTINUITY

**Slide switch:**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FORWARD | 5 – 10 8 – 9 | Continuity |
| OFF | 5 – 8 – 9 | Continuity |
| BACKWARD | 5 – 9 8 – 10 | Continuity |

**Front vertical switch:**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 4 – 11 10 – 12 | Continuity |
| OFF | 4 – 11 – 12 | Continuity |
| DOWN | 4 – 12 10 – 11 | Continuity |

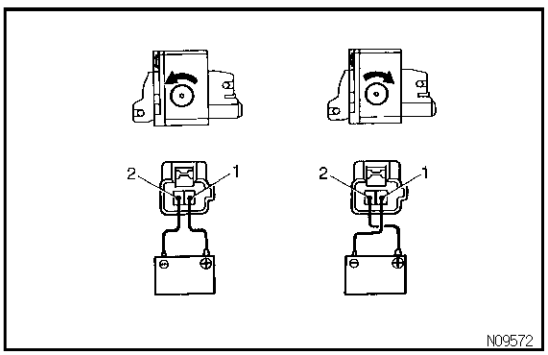
**Rear vertical switch:**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| UP | 2 – 10 6 – 7 | Continuity |
| OFF | 2 – 6 – 7 | Continuity |
| DOWN | 2 – 7 6 – 10 | Continuity |

**Reclining switch:**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| FORWARD | 4 – 10 7 – 9 | Continuity |
| OFF | 4 – 7 – 9 | Continuity |
| BACKWARD | 4 – 9 7 – 10 | Continuity |

If continuity is not as specified, replace the switch

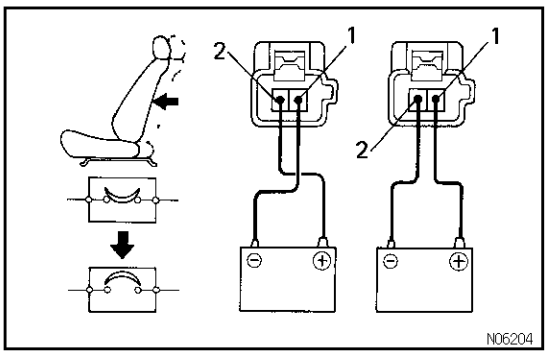



## 3. INSPECT SLIDE MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns counterclockwise

(b) Reverse the polarity, and check that the motor turns clockwise

If operation is not as specified, replace the motor




## 4. INSPECT SLIDE MOTOR CIRCUIT BREAKER OPERATION

(a) Connect the positive (+) lead and the negative (–) lead from the battery to slide motor connector (illustrated terminals), and slide the seat to front end position

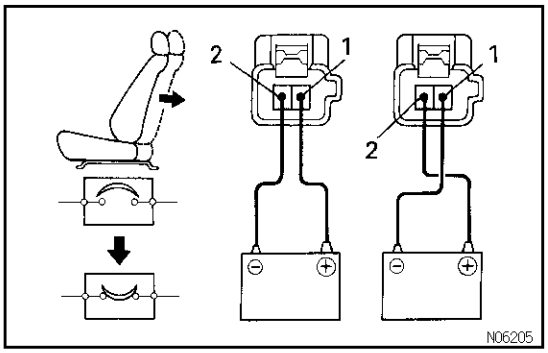
(b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds



Brought to you by BirfMark
Version 1.11 - 03/16/2010

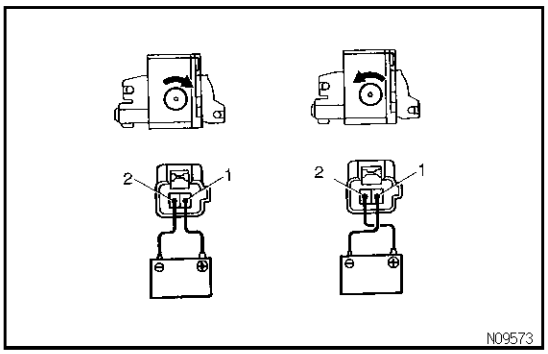
Brought to you by BirfMark






(c) Reverse the polarity, and check that the seat begins to move backwards within approximately 60 seconds

If operation is not as specified, replace the motor

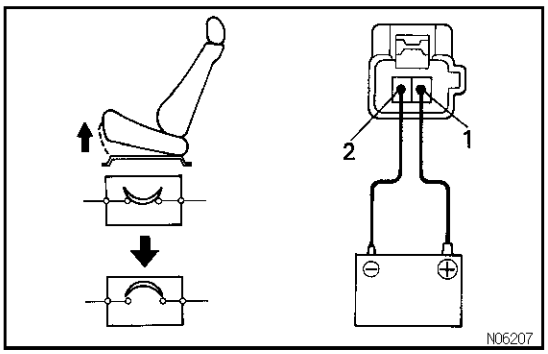



**5. INSPECT FRONT VERTICAL MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns clockwise

(b) Reverse the polarity, check that the motor turns counter-clockwise

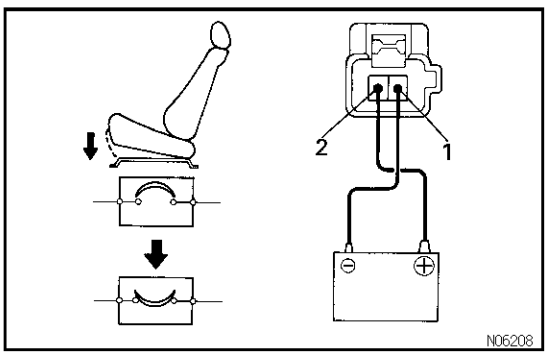
If operation is not as specified, replace the motor




**6. INSPECT FRONT VERTICAL MOTOR CIRCUIT BREAKER OPERATION**

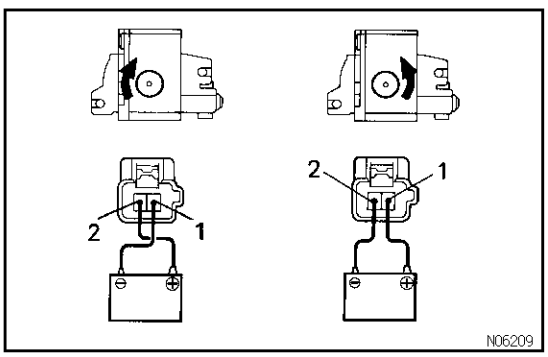
(a) Connect the positive (+) lead and the negative (–) lead from the battery to the front vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position

(b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds




(c) Reverse the polarity, and check that the seat cushion begins to descend within approximately 60 seconds

If operation is not as specified, replace the motor




**7. INSPECT REAR VERTICAL MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, and check that the motor turns clockwise

(b) Reverse the polarity, and check that the motor turns counterclockwise

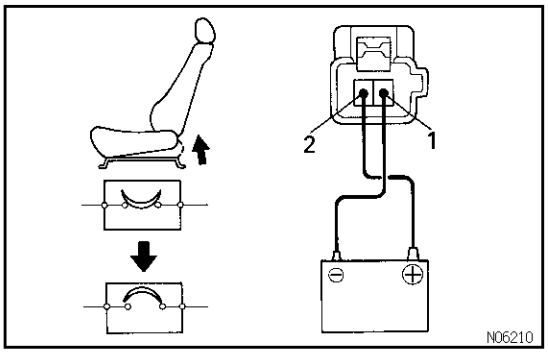
If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

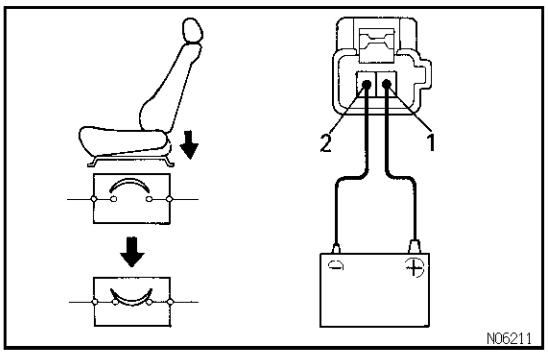





**8. INSPECT REAR VERTICAL MOTOR CIRCUIT BREAKER OPERATION**

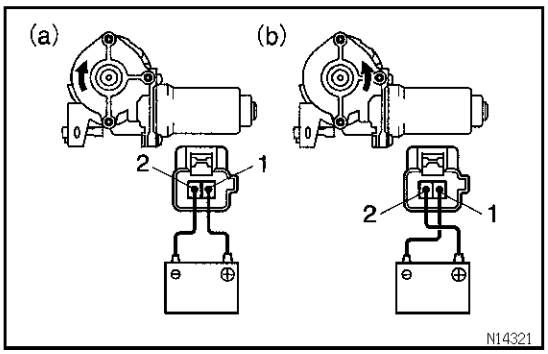
(a) Connect the positive (+) lead and the negative (–) lead from the battery to the rear vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position

(b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds




(c) Reverse the polarity, check that the seat cushion begins to descend within approximately 60 seconds

If operation is not as specified, replace the motor

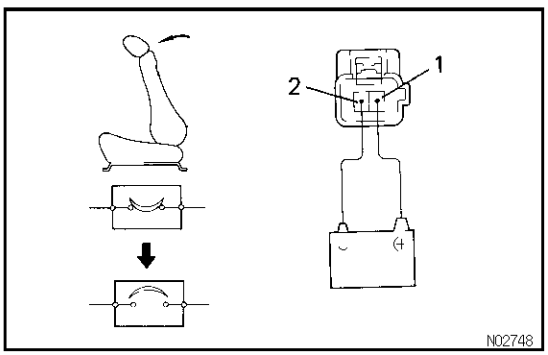



**9. INSPECT RECLINING MOTOR (DRIVER'S SIDE) OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns clockwise

(b) Reverse the polarity, and check that the motor turns counterclockwise

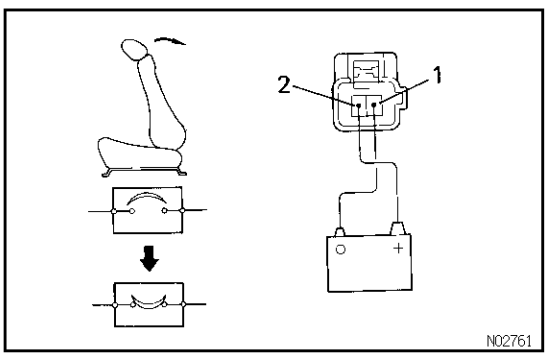
If operation is not as specified, replace the motor




**10. INSPECT RECLINING MOTOR (DRIVER'S SIDE) CIRCUIT BREAKER OPERATION**

(a) Connect the positive (+) lead from terminal 1 and negative (–) lead to terminal 2

Check that the seat back reclines to the most forward position




(b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 40 seconds

(c) Reverse the polarity, and check that the seat back starts to fall backwards within approximately 60 seconds

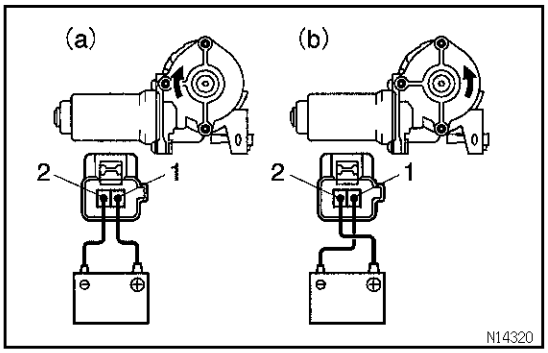
If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



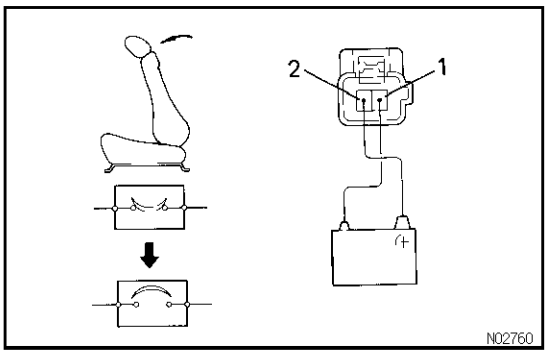



**11. INSPECT RECLINING MOTOR (PASSENGER'S SIDE) OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns counterclockwise

(b) Reverse the polarity, and check that the motor turns clockwise

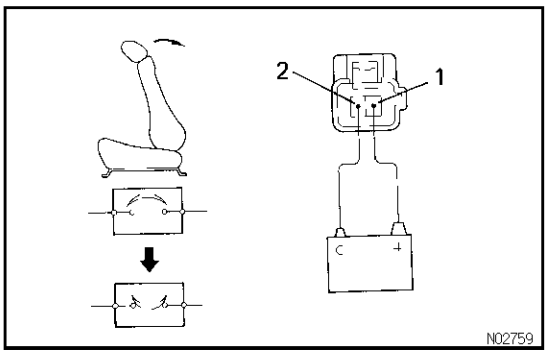
If operation is not as specified, replace the motor




**12. INSPECT RECLINING MOTOR (PASSENGER'S SIDE) CIRCUIT BREAKER OPERATION**

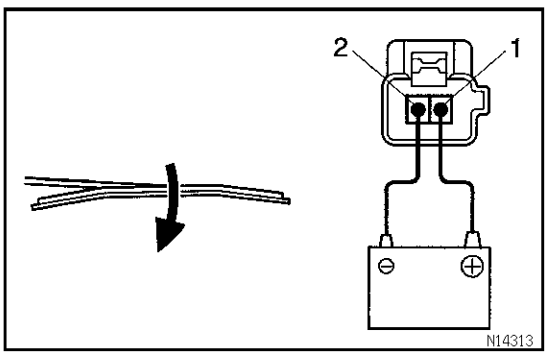
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1 on the seat wire harness side connector, and recline the seat back to the most forward position

(b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 40 seconds



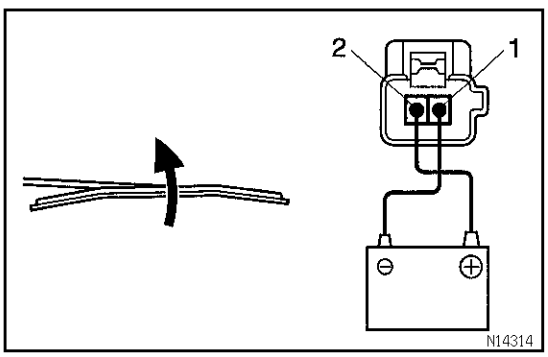

(c) Reverse the polarity, and check that the seat back starts to fall backwards within approximately 60 seconds

If operation is not as specified, replace the motor




**13. INSPECT LUMBAR SUPPORT MOTOR OPERATION**

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the lumber support moves release side




(b) Reverse the polarity, and check that the lumbar support moves forward

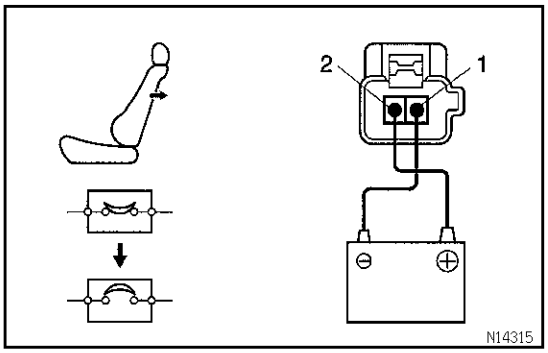
If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

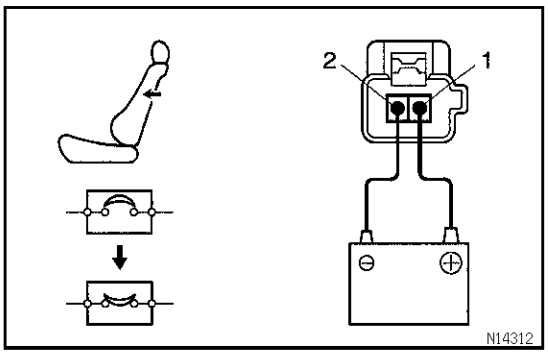





## 14. INSPECT LUMBAR SUPPORT MOTOR CIRCUIT BREAKER OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1 on the lumbar support motor connector and move the lumbar support to front end position

(b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds




(c) Reverse the polarity, and check that the lumbar support begins to move release side within approximately 60 seconds

If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

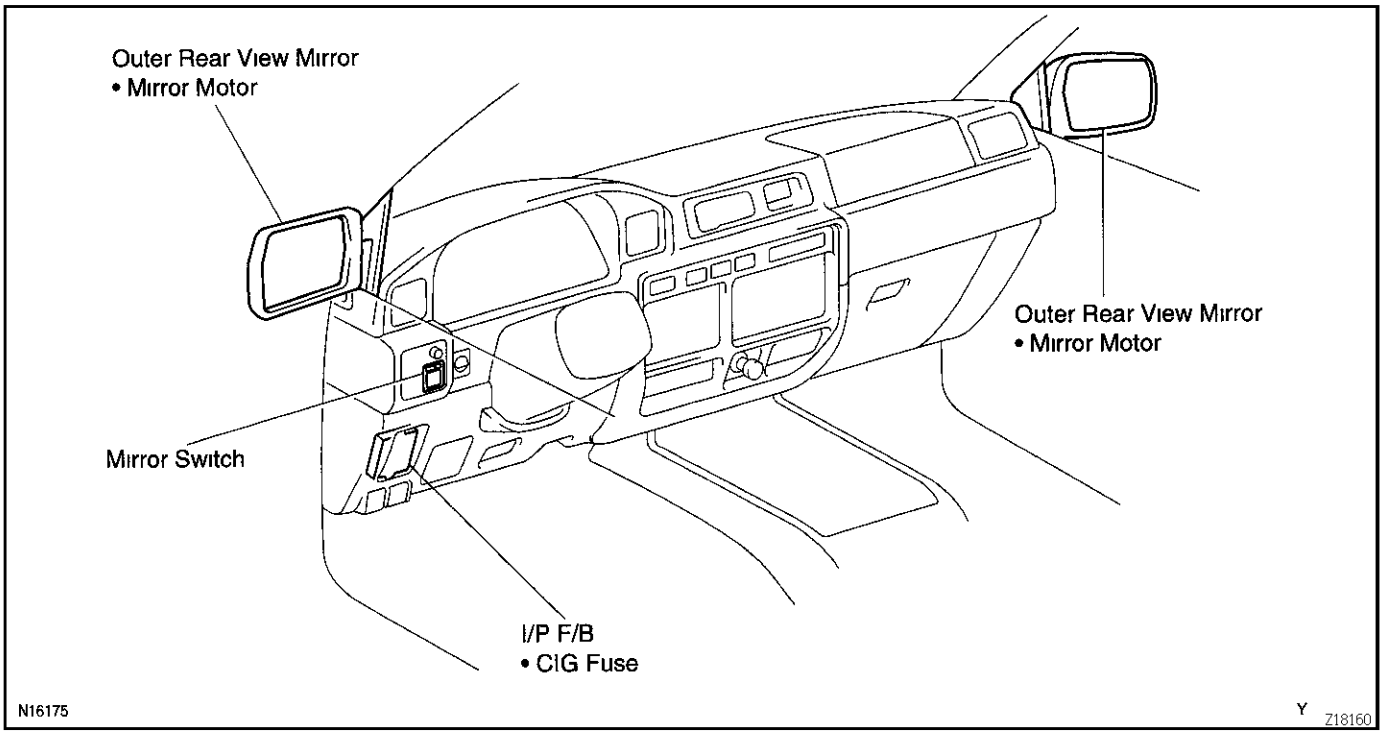
Brought to you by BirfMark



# POWER MIRROR CONTROL SYSTEM

## LOCATION

BE1MM-01



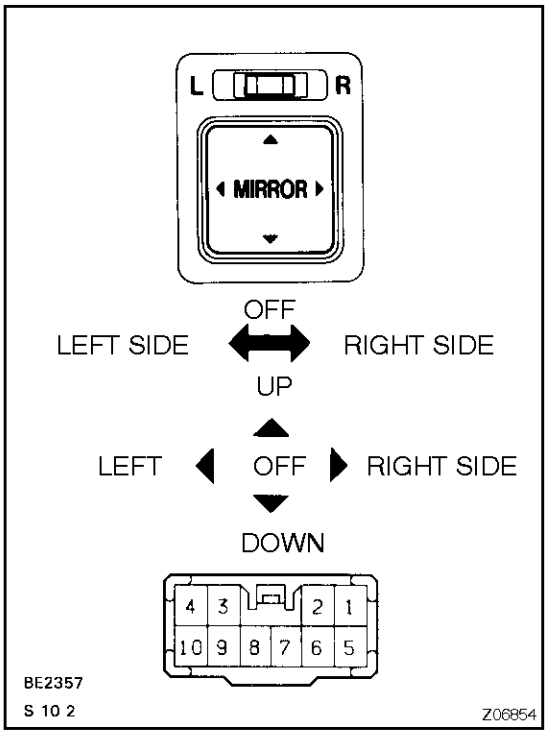



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MN 01




# INSPECTION

## 1. Left side:
## INSPECT MIRROR SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | – | No continuity |
| UP | 1 – 10 3 – 4 | Continuity |
| DOWN | 1 – 3 4 – 10 | Continuity |
| LEFT | 1 – 9 3 – 4 | Continuity |
| RIGHT | 1 – 3 4 – 9 | Continuity |

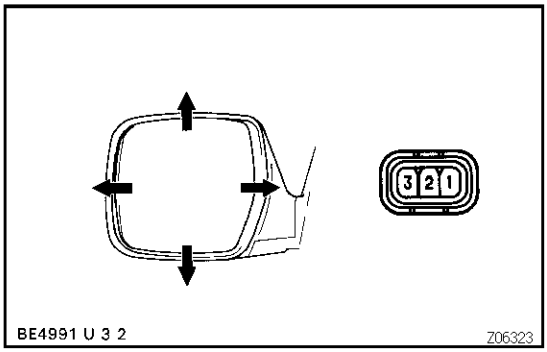
## 2. Off:
## INSPECT MIRROR SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | – | No continuity |
| UP | 3 – 4 | Continuity |
| DOWN | 1 – 3 | Continuity |
| LEFT | 3 – 4 | Continuity |
| RIGHT | 1 – 3 | Continuity |

## 3. Right side:
## INSPECT MIRROR SWITCH CONTINUITY

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | – | No continuity |
| UP | 1 – 6 3 – 4 | Continuity |
| DOWN | 1 – 3 4 – 6 | Continuity |
| LEFT | 1 – 2 3 – 4 | Continuity |
| RIGHT | 1 – 3 2 – 4 | Continuity |

If continuity is not as specified, replace the switch




## 4. INSPECT MIRROR MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal in column "A" and the negative (–) lead to terminal in column "B", check that the mirror operates in column "C"

| Switch position | Tester connection | Specified condition |
|---|---|---|
| A (+) | B (–) | C (Operation) |
| 2 | 3 | Mirror turns upward |
| 3 | 2 | Mirror turns downward |
| 1 | 3 | Mirror turns to left side |
| 3 | 1 | Mirror turns to right side |

If operation is not as specified, replace the mirror assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# AUDIO SYSTEM

## DESCRIPTION

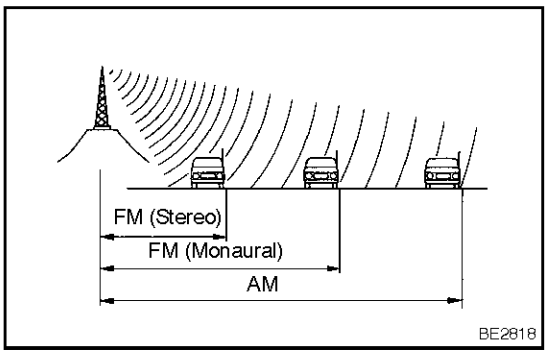
BE0SA-01

### 1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows

| Frequency | 30 kHz | 300 kHz | 3 MHz | 30 MHz | 300 MHz |
|---|---|---|---|---|---|
| Designation | LF | MF | HF | VHF | |
| Radio wave | | AM ⟷ | | FM ⟷ | |
| Modulation | Amplitube modulation | | | Frequency modulation | |

LF Low Frequency
MF Medium Frequency
HF High Frequency
VHF Very High Frequency

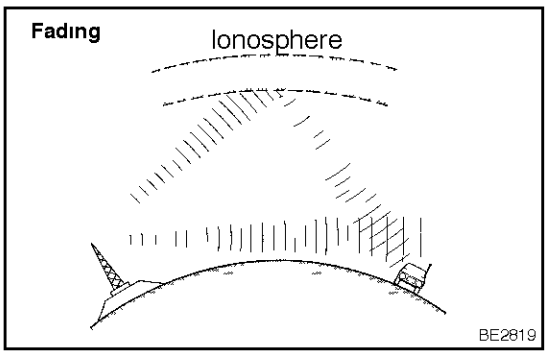



### 2. SERVICE AREA

There are great differences in the size of the service area for AM and FM monaural Sometimes FM stereo broadcasts cannot be received even through AM can be received in very clearly
Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) easily

### 3. RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called ”fading”, ”multipath” and ”fade out” These problems are caused not by electrical noise but by the nature of the radio waves themselves



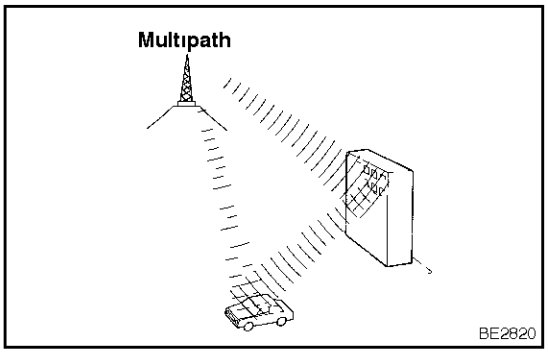

(1) Fading
Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night This is because AM radio waves bounce off the ionosphere at night These radio waves then interfere with the signals from the same transmitter that reach the vehicle’s antenna directly This type of interference is called ”fading”



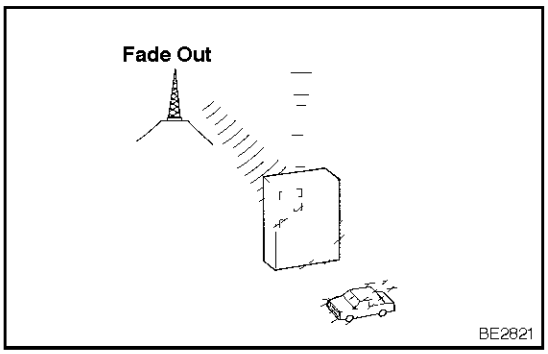
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(2) Multipath
One type of interference caused by the bounce of radio waves off of obstructions is called "multipath" Multipath occurs when a signal from the broadcast transmitter antenna bounces off buildings and mountains and interferes with the signal that is received directly




(3) Fade Out
Because FM radio waves are of higher frequencies than AM radio waves, they bounce off buildings, mountains, and other obstructions For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction This is called "fade out"

## 4. COMPACT DISC PLAYER

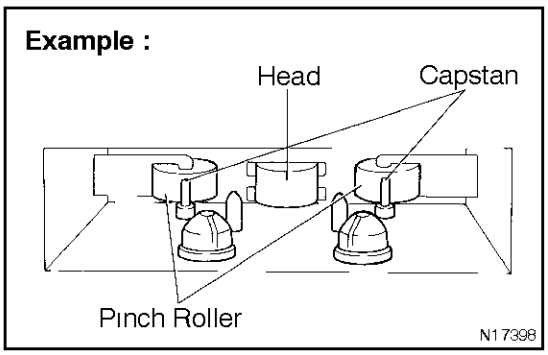
Compact Disc (hereafter called "CD") Players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc There are 4 7 in (12 cm) and 3 2 in (8 cm) discs in the CD player

HINT

Never attempt to disassemble or oil any part of the player unit Do not insert any object other than a disc into the magazine

**NOTICE:**

**CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.**




## 5. Tape Player/Head Cleaning:

**MAINTENANCE**

(a) Raise the cassette door with your finger
Next, using a pencil or similar object, push in the guide

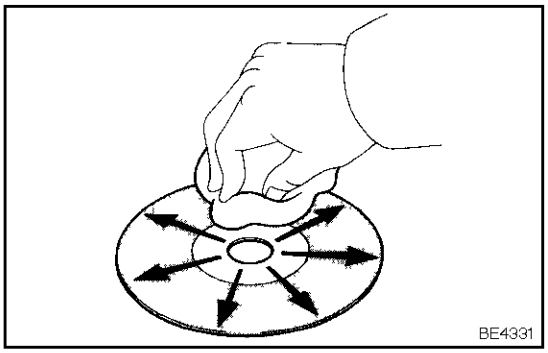
(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






### 6. CD Player/Disc Cleaning: MAINTENANCE

If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth

**NOTICE:**

**Do not use a conventional record cleaner or anti–static preservative.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MR 01

# TROUBLESHOOTING

**NOTICE:**

**When replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothes comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).**

HINT

This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and is based on the assumption that the cause of trouble lies with the system components (except for the wires and connectors, etc )

Always inspect the trouble taking the following items into consideration

- Open or short circuit of the wire harness
- Connector or terminal connection fault

| | Problem | No |
|---|---|---|
| Radio | No power coming in | 1 |
| | Power coming in but radio not operating | 2 |
| | Noise present but AM – FM not operating | 3 |
| | Either speaker does not work | 4 |
| | Either AM or FM does not work | 5 |
| | Reception poor (Volume faint) | 5 |
| | Few preset tuning bands | 5 |
| | Sound quality poor | 6 |
| | Cannot set station select button | 7 |
| | Preset memory disappears | 7 |
| Tape Player | Cassette tape cannot be inserted | 8 |
| | Cassette tape inserts but no power | 9 |
| | Power coming in but tape player not operating | 10 |
| | Either speaker does not work | 11 |
| | Sound quality poor (Volume faint) | 12 |
| | Tape jammed malfunction with tape speed or auto – reverse | 13 |
| | APS SKIP RPT buttons not operating | 14 |
| | Cassette tape will not eject | 15 |
| CD Player | CD cannot be inserted | 16 |
| | CD inserts but no power | 17 |
| | Power coming in but CD player not operating | 18 |
| | Sound jumps | 19 |
| | Sound quality poor (Volume faint) | 20 |
| | Either speaker does not work | 21 |
| | CD will not eject | 22 |
| Antenna | Antenna does not fully extend of fully retract | 23 |
| | Antenna – related | 24 |
| Noise | Noise produced by vibration or shock while driving | 25 |
| | Noise produced when engine starts | 26 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

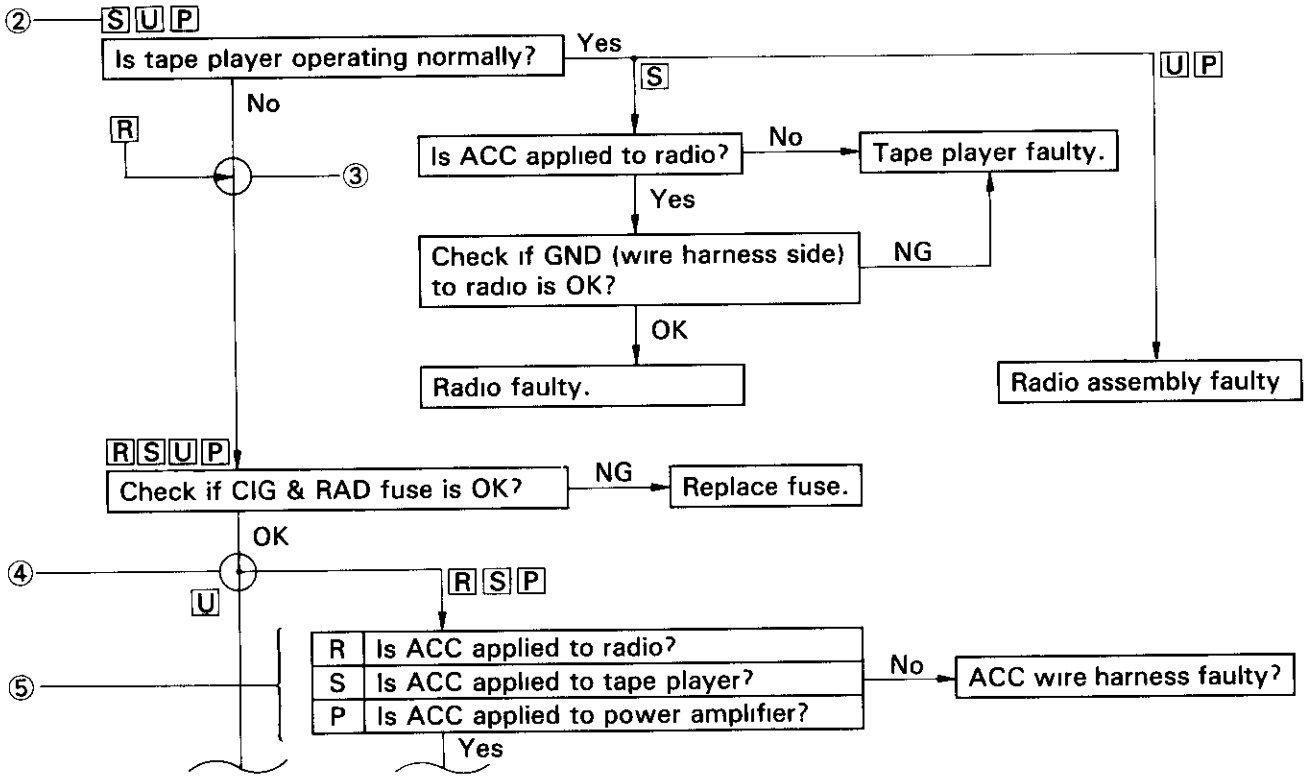
Brought to you by BirfMark



## HOW TO USE DIAGNOSTIC CHART

| 1 | Radio | NO POWER COMING IN |
|---|---|---|

① [R]: w/o Tape Player [S]: Radio-Tape Player (Separate)
[U]: Radio-Tape Player Unit w/o Power Amplifier [P]: w/ Power Amplifier




① Audio system type and symbol used.
HINT: Confirm the applicable type of audio system.

② Symbol for type of audio system the question applies to.
HINT: If the audio system type is not applicable, proceed to next question below.

③ Junction without black circle.
HINT: Proceed to next question below.

④ Junction with black circle.
HINT: Proceed to question for applicable audio system type.

⑤ HINT: Select question for applicable audio system type.

V04326



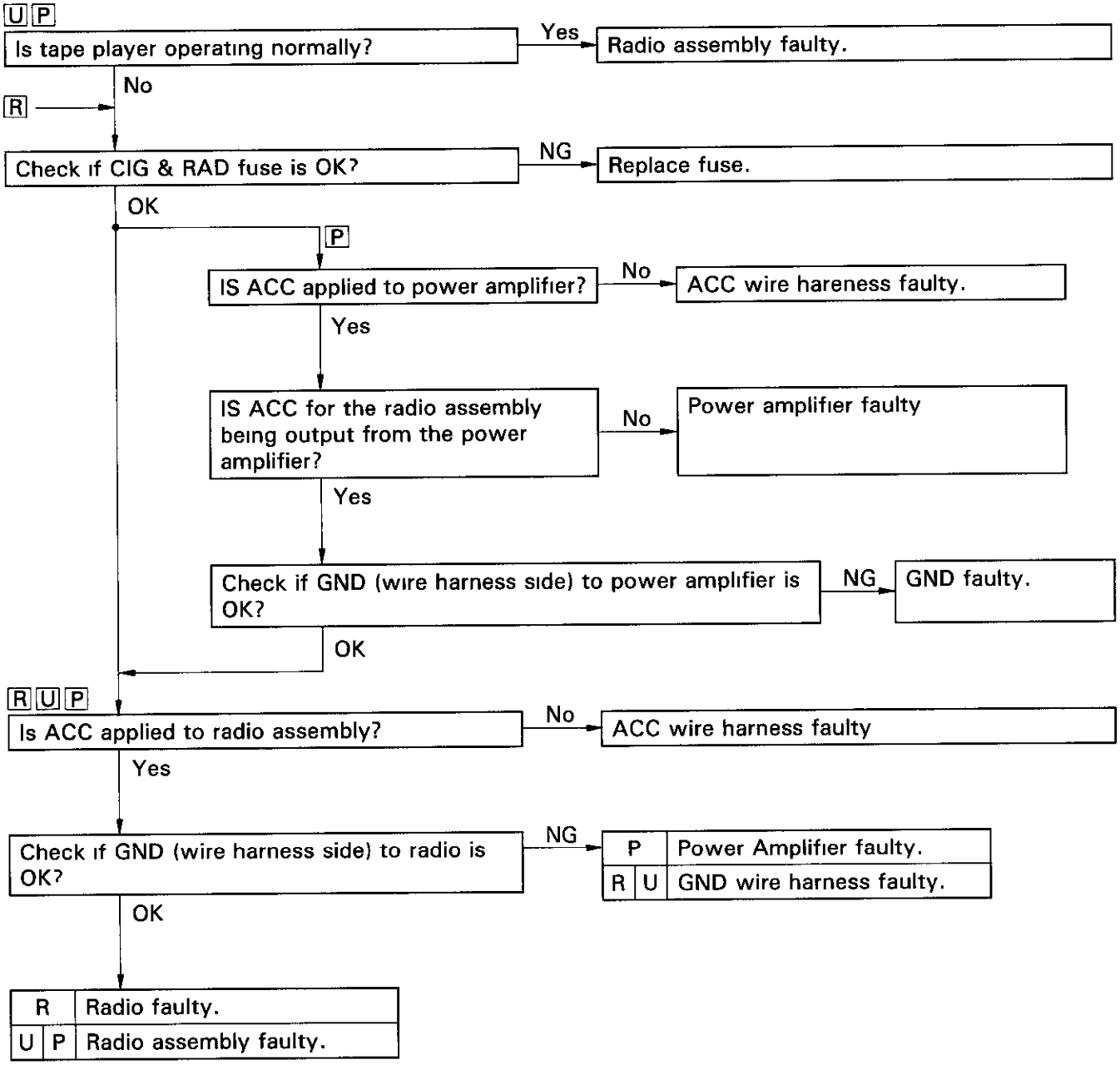
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 1 Radio — NO POWER COMING IN

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




V04329



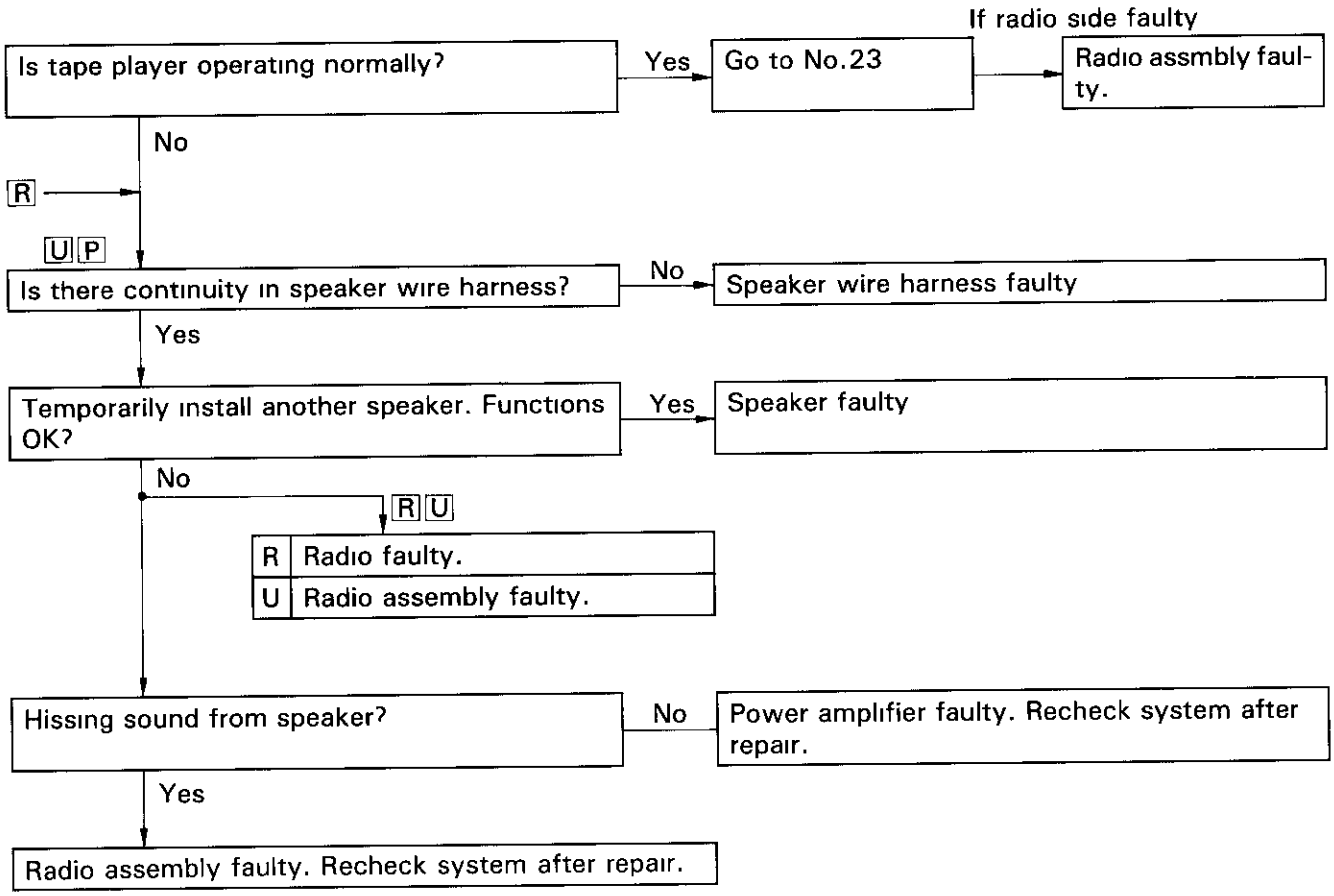
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



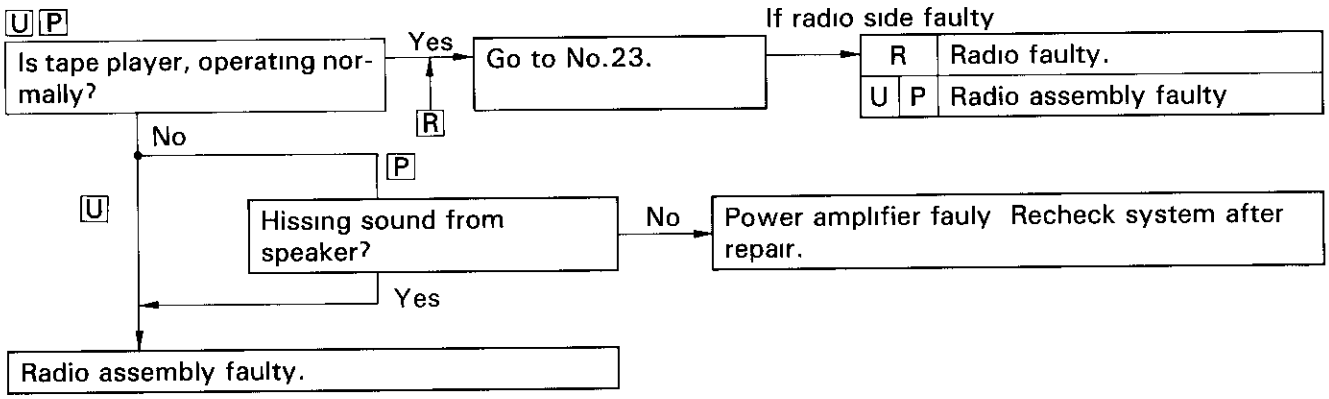
## 2 Radio — POWER COMING IN, BUT RADIO NOT OPERATING

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




## 3 Radio — NOISE PRESENT, BUT AM-FM NOT OPERATING

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




V04330



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Radio | EITHER SPEAKER DOES NOT WORK |
|---|---|---|

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] Radio – Tape Player, 9 Speaker

[U] [P]

Is tape player operating normally? — Yes → Radio assembly faulty

No

[R] →

Is hiss produced by non-functioning speaker? — Yes →

| | |
|---|---|
| R | Radio faulty |
| U | Radio assembly faulty |
| P | Radio assembly faulty. Recheck system after repair. |

No

Is there continuity in speaker wire harness? — No → Speaker wire harness faulty.

Yes

Temporarily install another speaker. Functions OK? — Yes → Speaker faulty.

No

| | |
|---|---|
| R | Radio faulty |
| U | Radio assembly faulty. |
| P | Power amplifier faulty. Recheck system after repair |

V04331



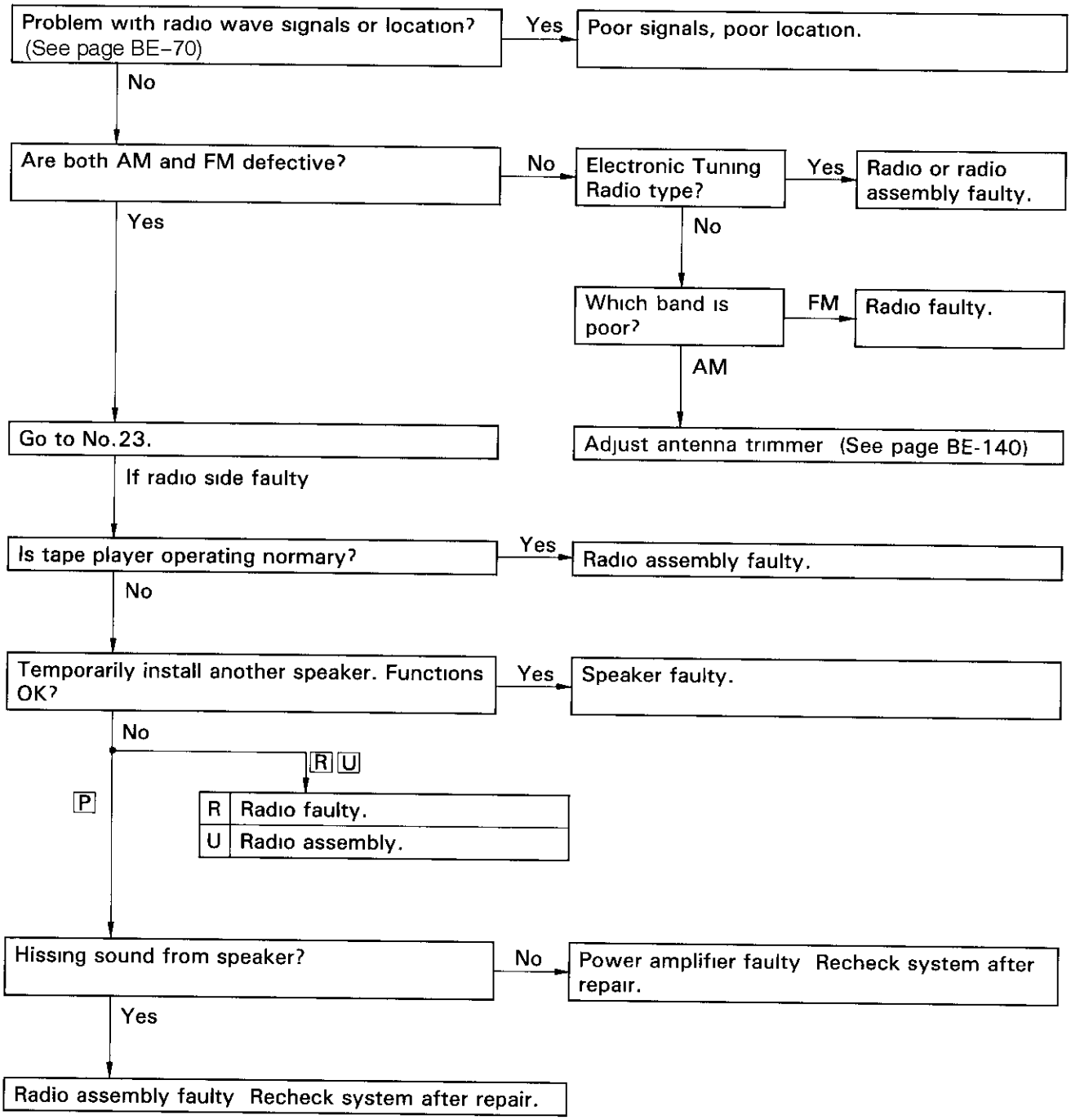
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 5 Radio — EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




V04332



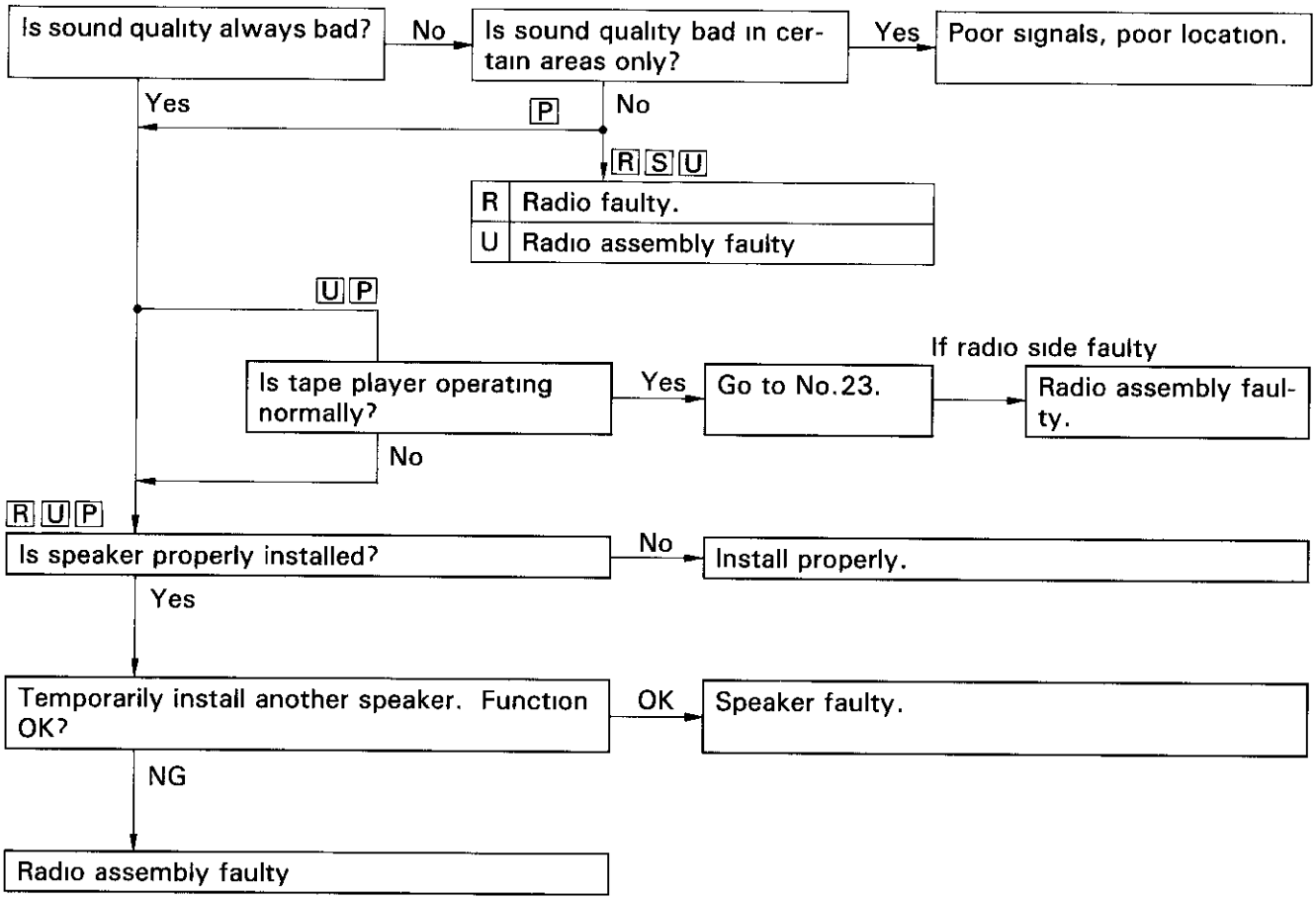
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 6 Radio — SOUND QUALITY POOR

[R] . Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] . Radio – Tape Player, 9 Speaker




V04333



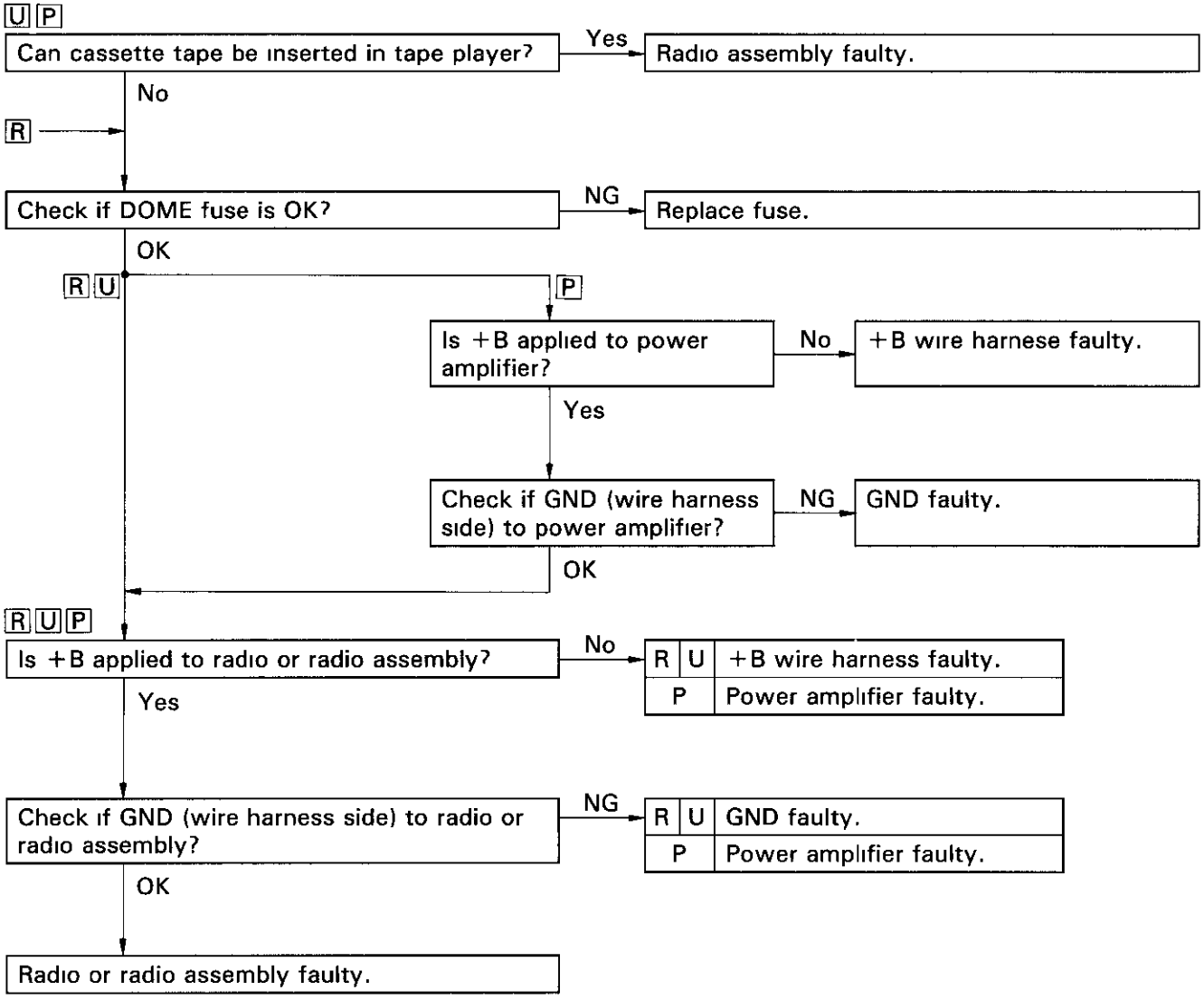
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 7 | Radio | CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS |
|---|---|---|

R : Radio, 5 Speaker U : Radio–Tape Player, 5 Speaker
P : Radio–Tape Player, 9 Speaker




V04334



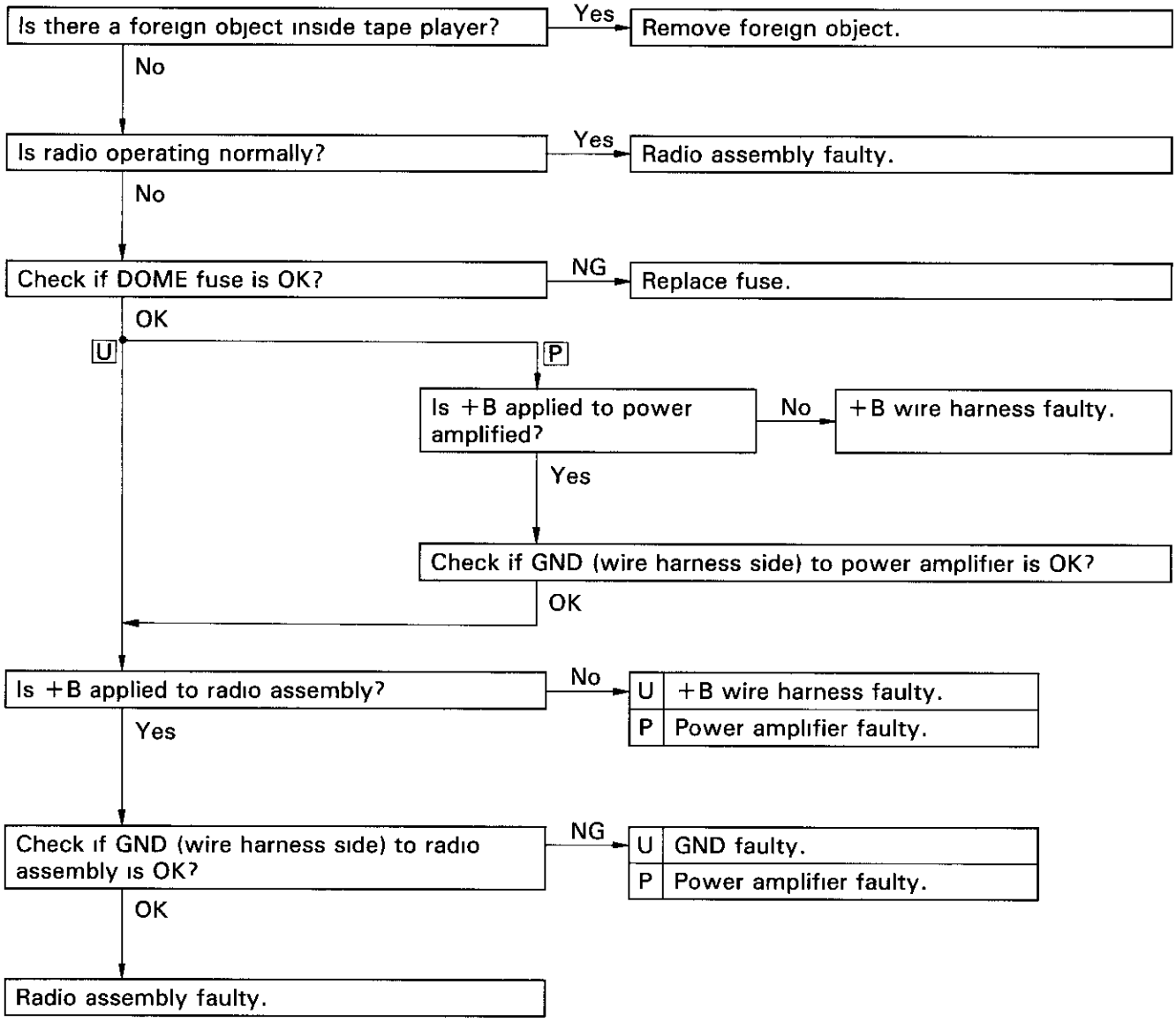
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 8 Tape Player — CASSETTE TAPE CANNOT BE INSERTED

[U] . Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker




V04335



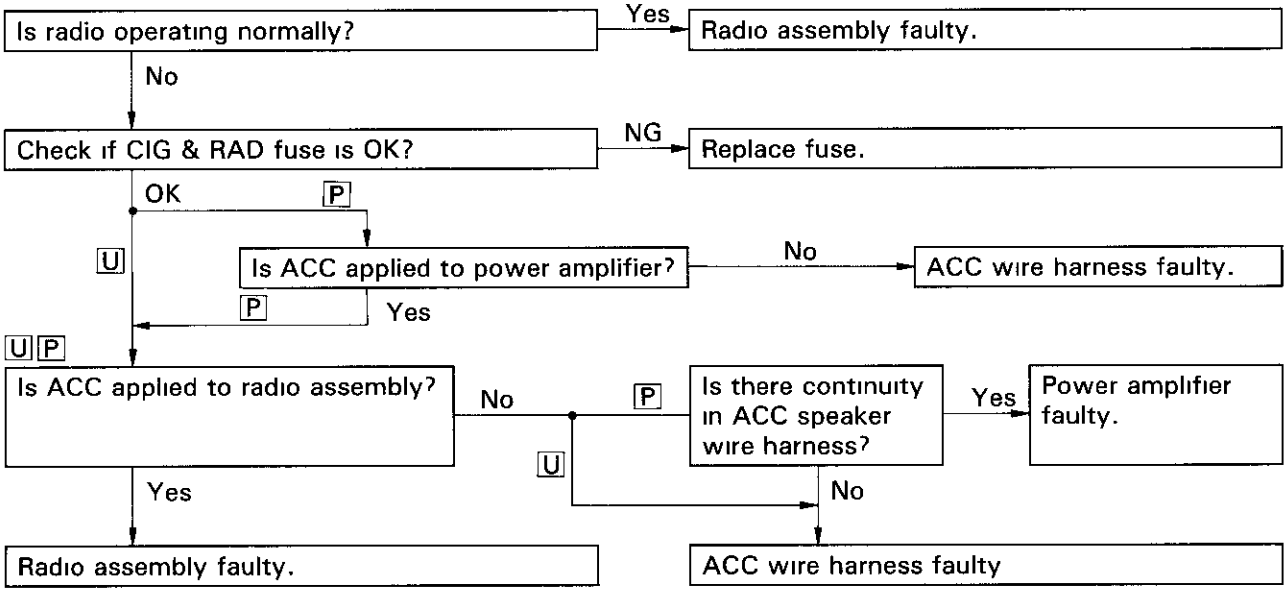
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



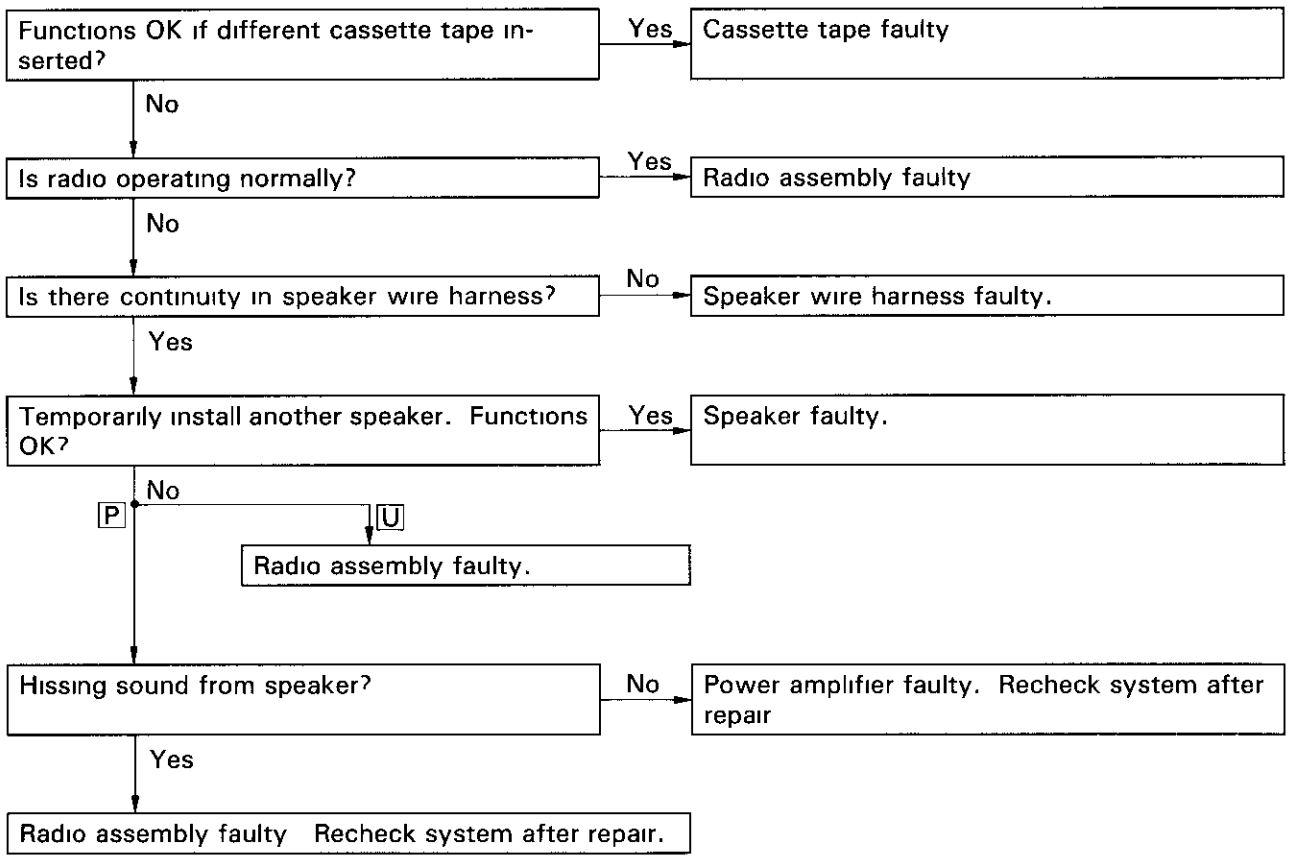
## 9 Tape Player — CASSETTE TAPE INSERTS, BUT NO POWER

[U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




## 10 Tape Player — POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

[U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker




V04336



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 11 Tape Player — EITHER SPEAKER DOES NOT WORK

U : Radio – Tape Player, 5 Speaker
P : Radio – Tape Player, 9 Speaker

- Is radio operating normally?
  - Yes → Radio assembly faulty.
  - No ↓
- Is hiss produced by non-functioning Speaker?
  - Yes → U: Radio assembly faulty. / P: Radio assembly faulty. Recheck system after repair.
  - No ↓
- Is there continuity in speaker wire harness?
  - No → Speaker wire harness faulty.
  - Yes ↓
- Temporarily install another speaker. Functions OK?
  - OK → Speaker faulty.
  - NG ↓

U: Radio assembly faulty.
P: Radio assembly faulty. Recheck system after repair.

## 12 Tape Player — SOUND QUALITY POOR (VOLUME FAINT)

U : Radio – Tape Player, 5 Speaker
P : Radio – Tape Player, 9 Speaker

- Functions OK if different cassette tape inserted?
  - Yes → Cassette tape faulty
  - No ↓
- Operates normally after cleaning the heads? (See page BE-70)
  - Yes → Head dirty.
  - No ↓
- Is radio operating normally?
  - Yes → Radio assembly faulty.
  - No ↓
- Is speaker properly installed?
  - No → Install properly.
  - Yes ↓
- Temporarily install another speaker. Functions OK?
  - Yes → Speaker faulty
  - No ↓

U: Radio assembly faulty.
P: Radio assembly faulty. Recheck system after repair.

V04337



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 13 Tape Player — TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO-REVERSE

Functions OK if different tape (less than 120 mins.) is inserted?
- Yes → Cassette tape faulty.
- No →

Is there a foreign object, inside tape player?
- Yes → Remove foreign object.
- No →

Operates normally after cleaning the heads? (See page BE-70)
- Yes → Head dirty.
- No →

Radio assmbly faulty.

## 14 Tape Player — APS, SKIP, RPT BUTTONS NOT OPERATING

Functions OK if different cassette tape inserted?
- No → Radio assembly faulty.
- Yes →

Cassette tape faulty. (Less than 3 secs. of silence between songs (APS, RPT). Less than 15 secs. of silence (SKIP).)

## 15 Tape Player — CASSETTE TAPE WILL NOT EJECT

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio – Tape Player, 9 Speaker

Is tape player operating normally?
- No → Cassette tape jammed.
- Yes →

Is radio operating normally?
- Yes → Radio assembly faulty.
- No →

Check if DOME fuse is OK?
- NG → Replace fuse.
- OK →

[U] / [P] Is +B applied to power amplifier?
- No → +B wire harness faulty
- Yes →

Is +B applied to radio assembly?
- No [P] → Is there continuity in +B wire harness between power amplifier and radio assembly?
  - Yes → Power amplifier faulty.
  - No → [U] +B wire harness faulty
- Yes → Radio assembly faulty.

V04338

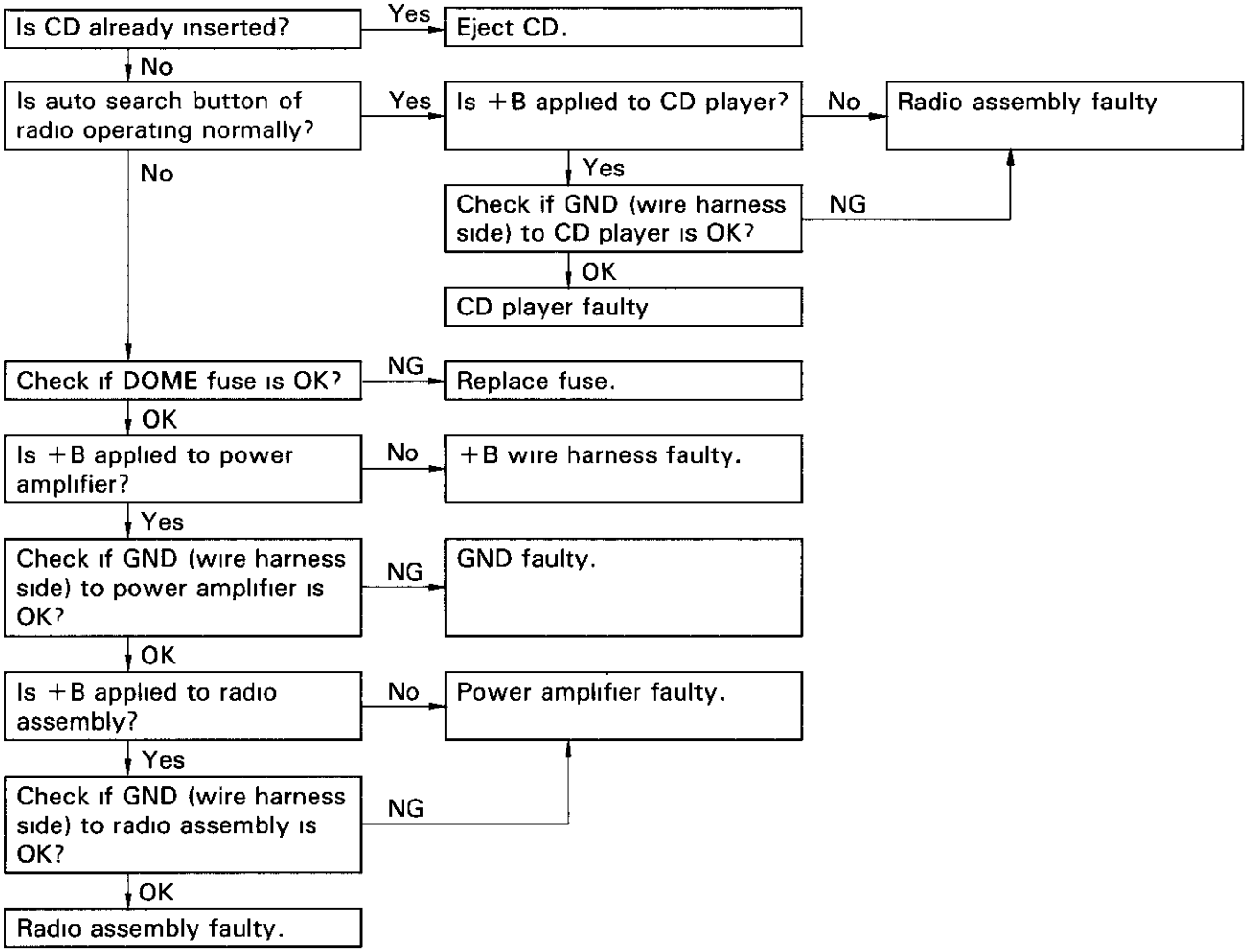


Brought to you by BirfMark
Version 1.11 - 03/16/2010

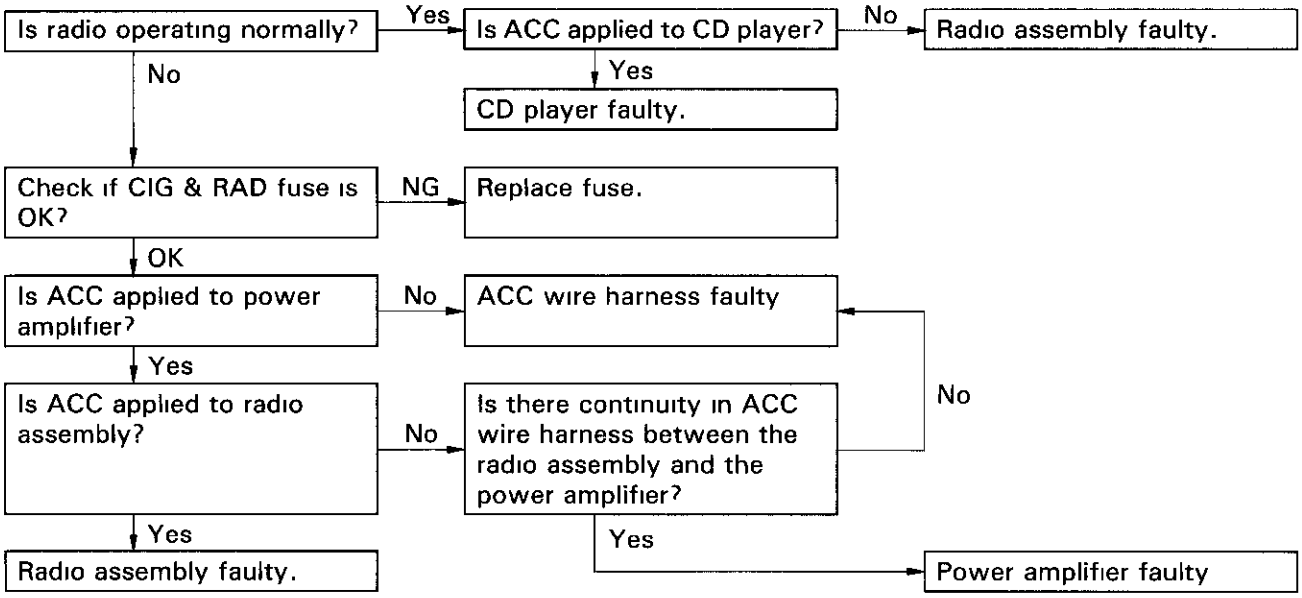
Brought to you by BirfMark



## 16 CD Player — CD CANNOT BE INSERTED




## 17 CD Player — CD INSERTS, BUT NO POWER




V04339

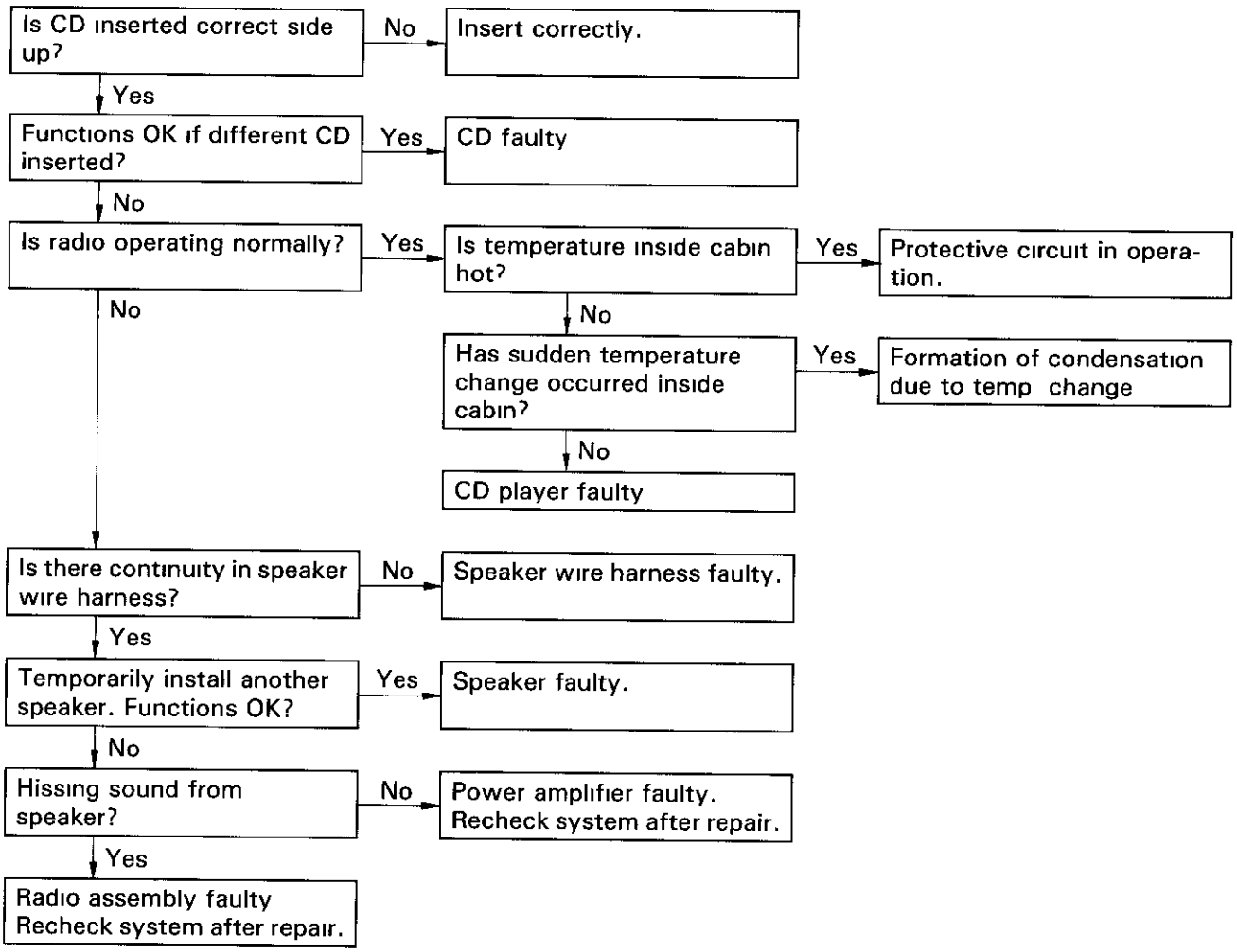


Brought to you by BirfMark
Version 1.11 - 03/16/2010

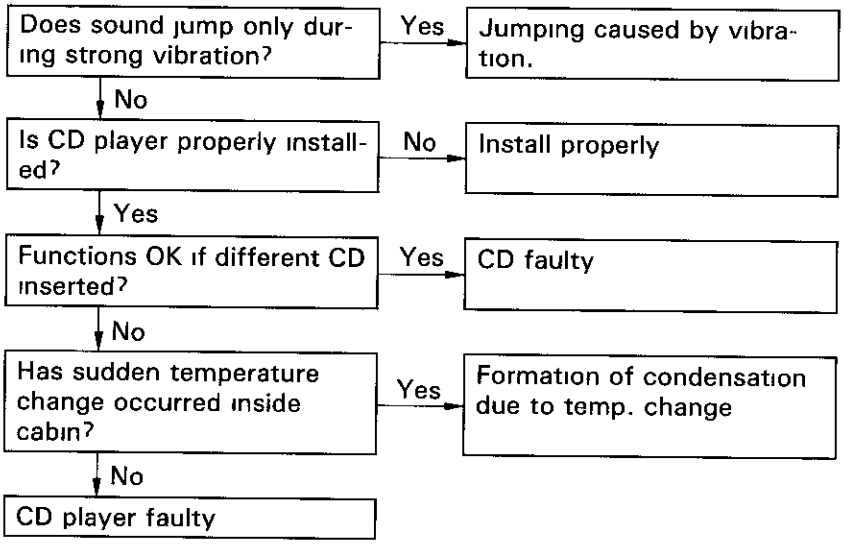
Brought to you by BirfMark



## 18 CD Player — POWER COMING IN, BUT CD PLAYER NOT OPERATING




## 19 CD Player — SOUND JUMPS




V04340

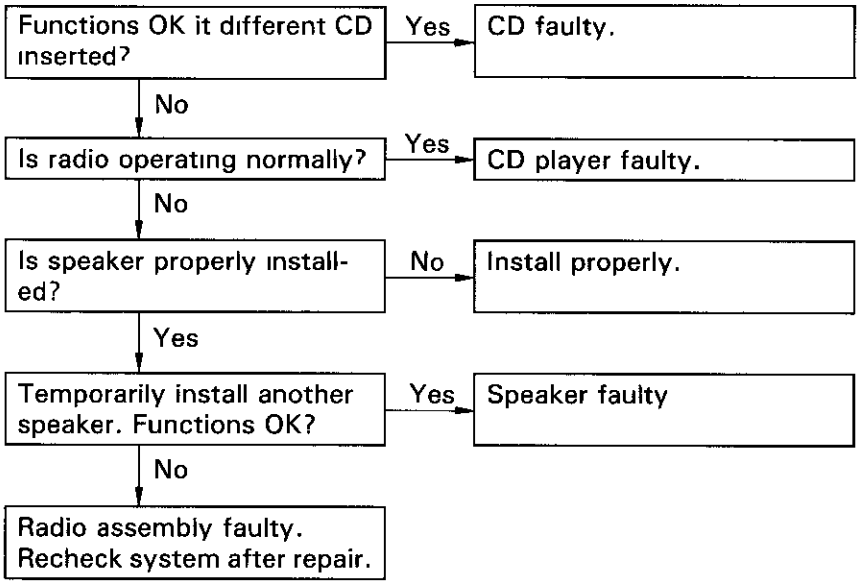


Brought to you by BirfMark
Version 1.11 - 03/16/2010

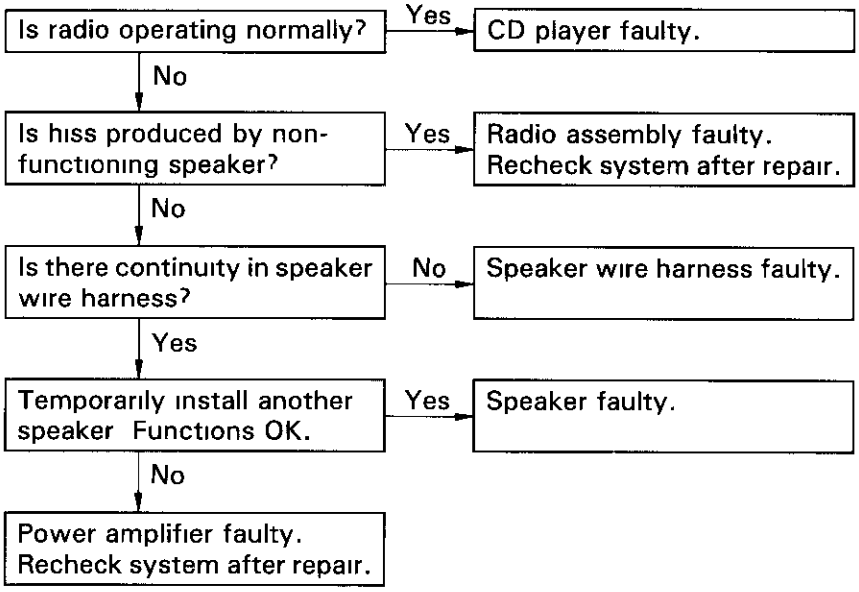
Brought to you by BirfMark



## 20 CD Player — SOUND QUALITY POOR (VOLUME FAINT)




## 21 CD Player — EITHER SPEAKER DOES NOT WORK



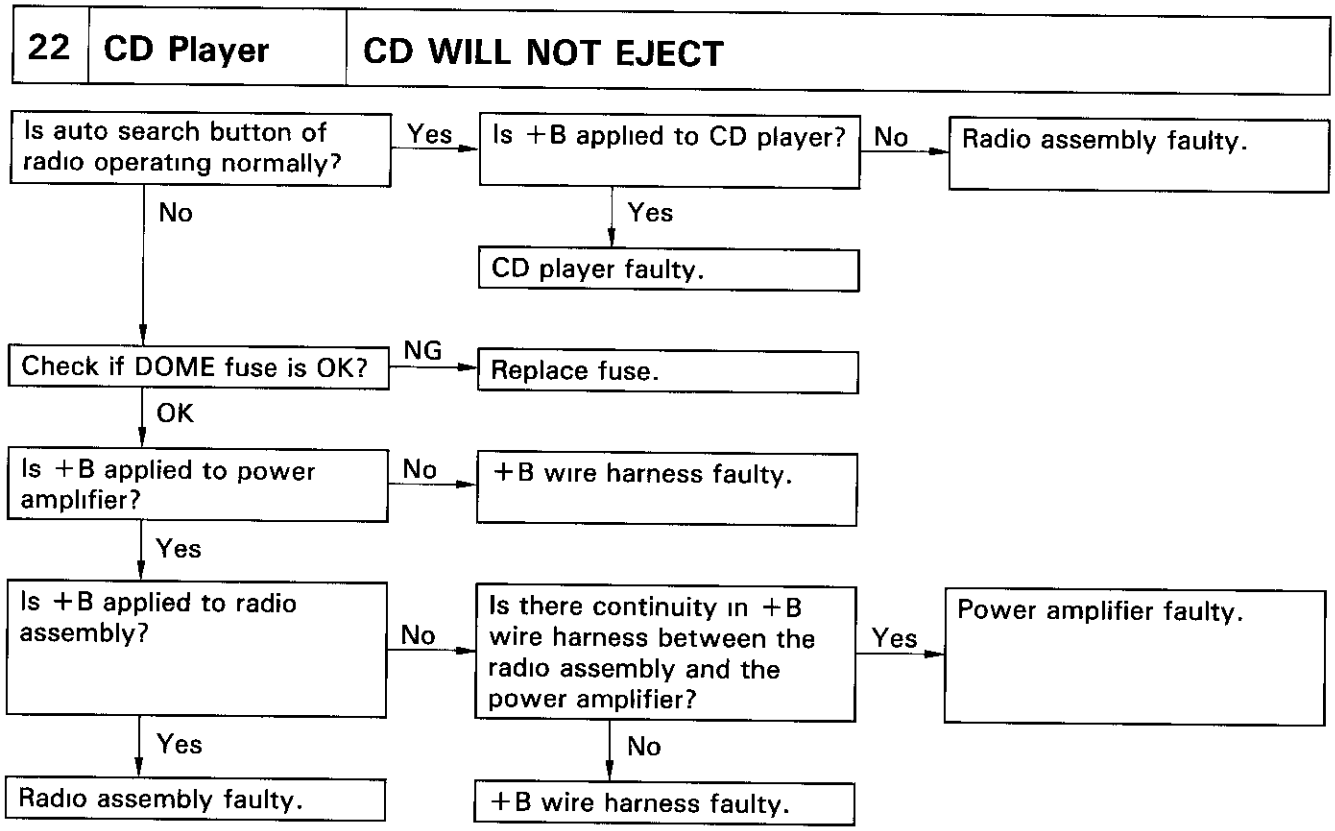

V04341



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






V04342

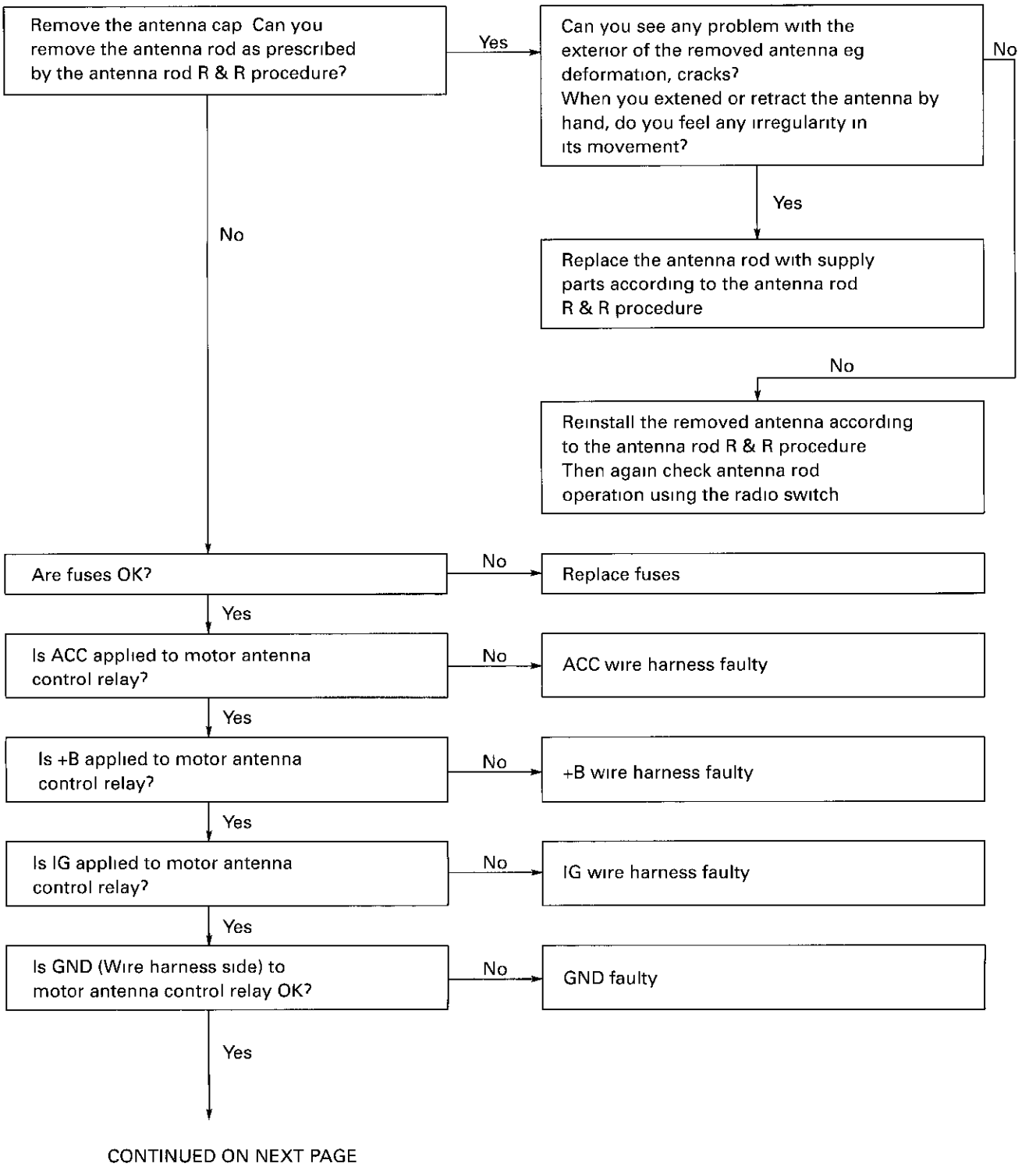


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 23 | Antenna | ANTENNA DOES NOT FULLY EXTENED OR FULLY RETRACT |
|---|---|---|




CONTINUED ON NEXT PAGE

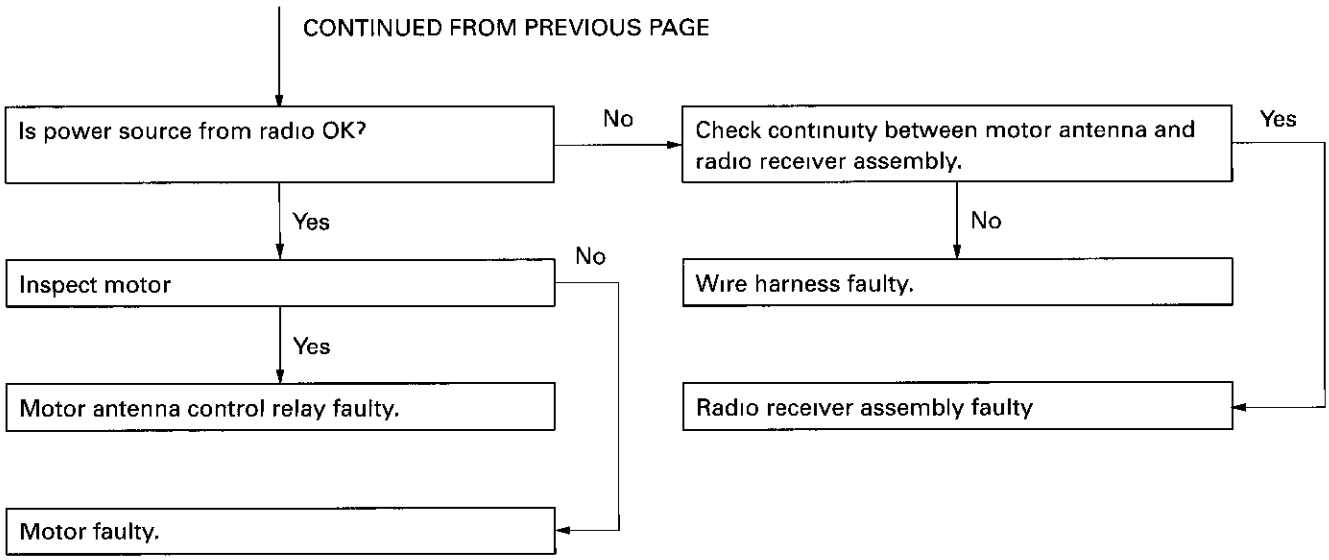
V06490



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






V06132



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 24 Antenna — ANTENNA-RELATED

- Normal Type
  Does antenna rod extened fully when radio switch is turned on?
- Variable Length Type
  Does the antenna rod extend to the specified length when the radio switch is turned on?
  Does the antenna rod fully retract when the radio switch is turned off?

No → Go to 23

Yes ↓

Inspect glass printed antenna (w/glass printed antenna)

NG → Glass printed antenna faulty

OK ↓

Is the antenna nut tight?

No → Tighten nut

Yes ↓

Temporarily install another antenna
Functions OK?

Yes → Motor antenna faulty

Yes ↓

Radio receiver side faulty

## 25 Noise — NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING

Is speaker properly installed?

No → Install properly

Yes ↓

Is each system correctly installed?

No → Install properly

Yes ↓

With vehicle stopped, lightly tap each system
Is noise produced?

Yes → Each system faulty

No ↓

Noise produced by static electricity accumulating in the vehicle body

V06491

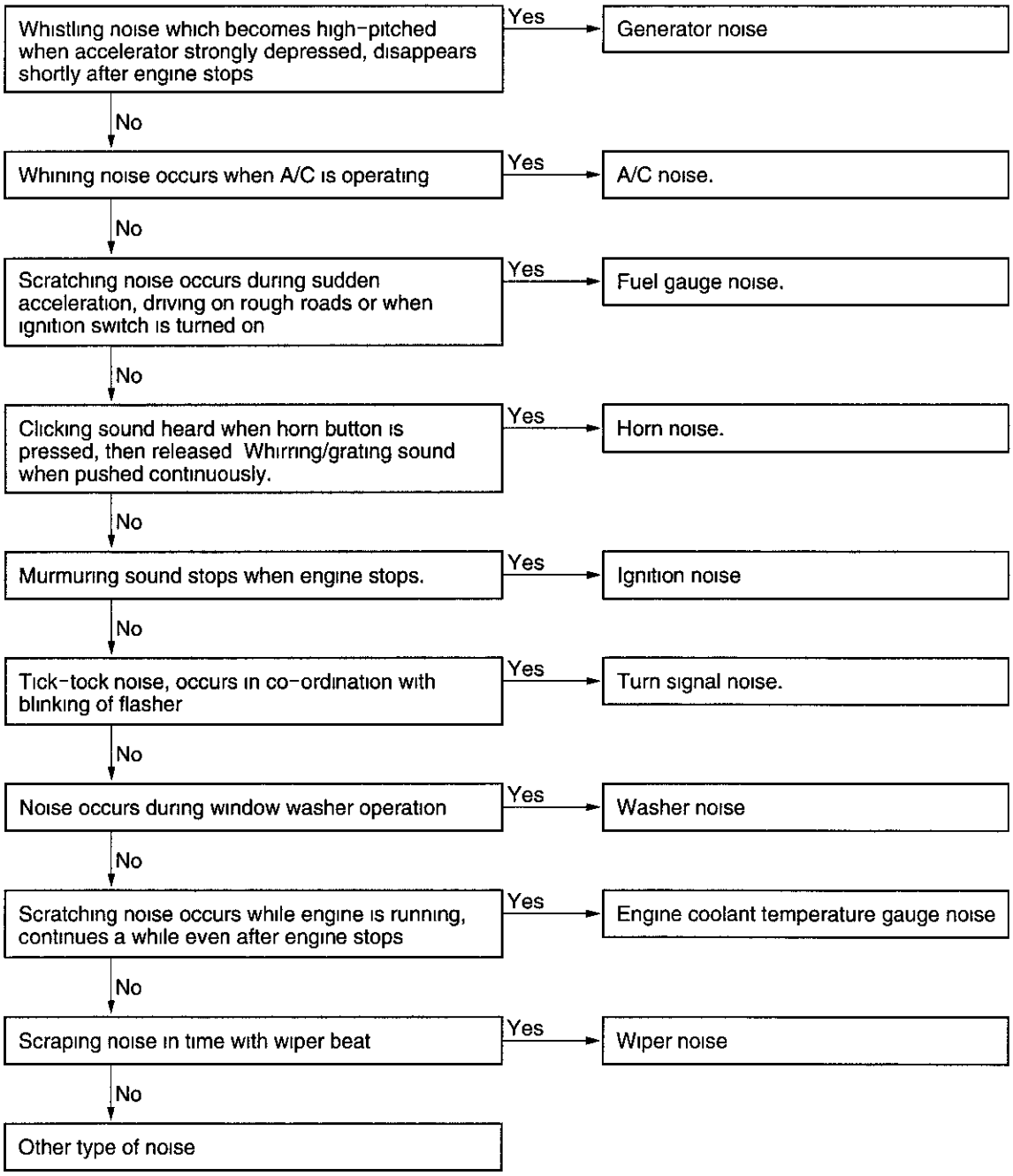


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 26 | Noise | NOISE PRODUCED WHEN ENGINE STARTS |
|---|---|---|




T V08466



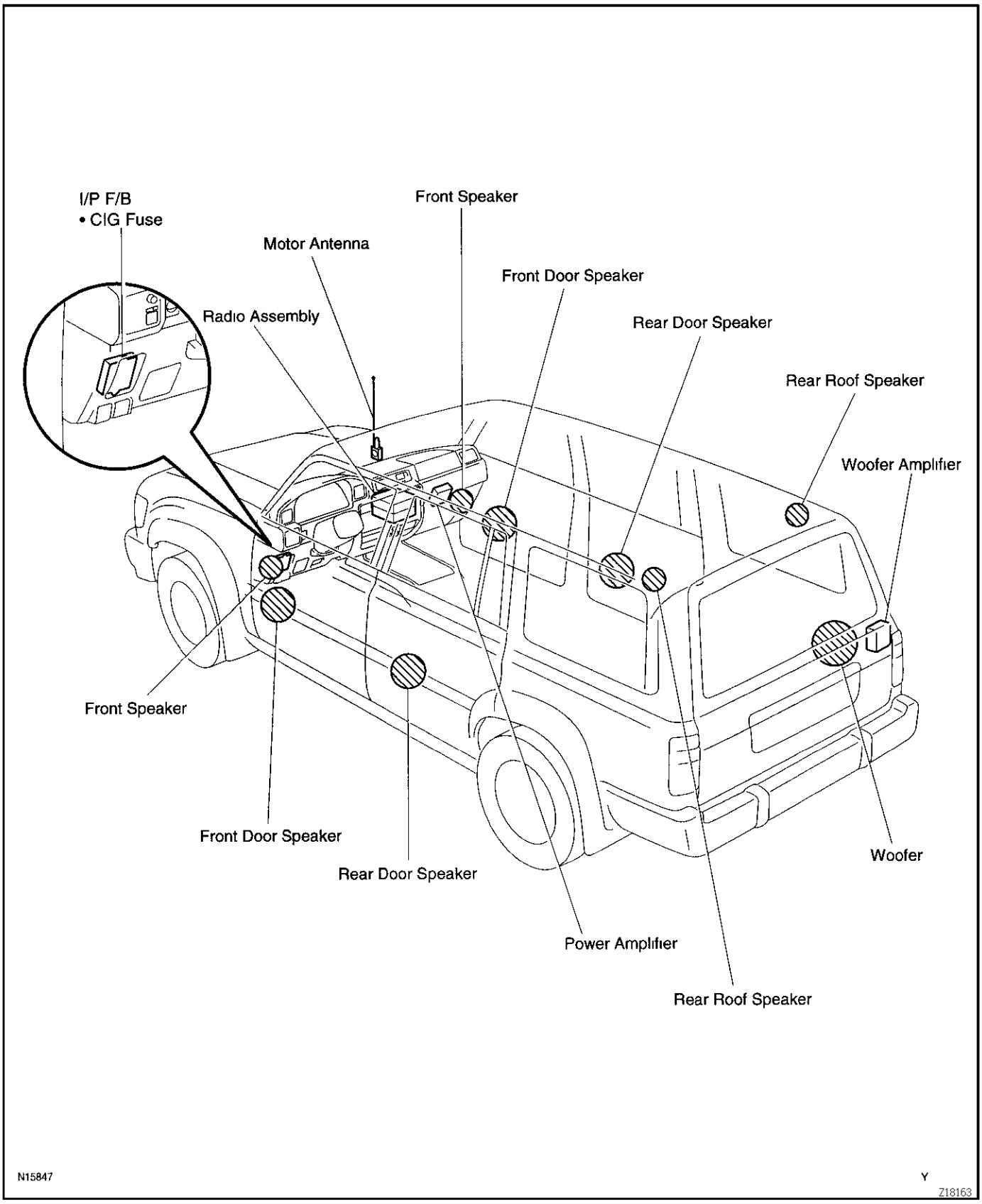
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BE1MQ-01

# LOCATION

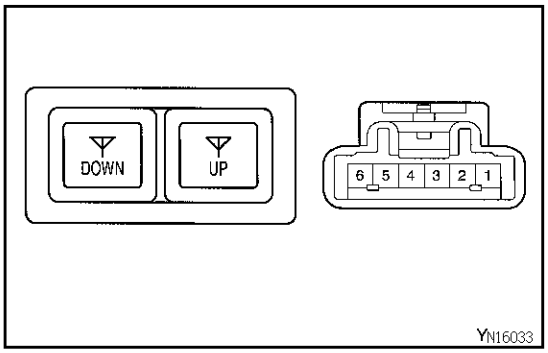





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# ANTENNA

## INSPECTION

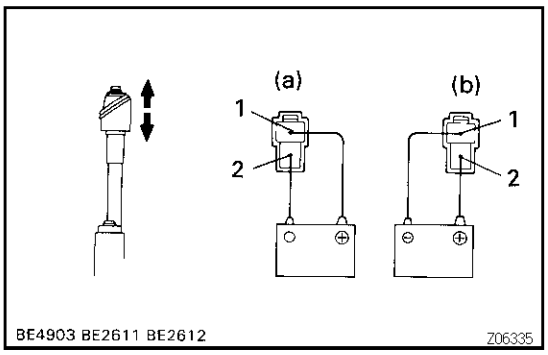
BE1MS-01

### 1. w/ MOTOR ANTENNA: INSPECT ANTENNA SWITCH

**Except RADIO–LINKED TYPE**

| Condition | Tester connection | Specified condition |
|---|---|---|
| UP Button Position Free | 2 – 5 | Continuity |
| UP Button Position Pushed in | 4 – 5 | Continuity |
| DOWN Button Position Free | 2 – 3 | Continuity |
| DOWN Button Position Pushed in | 3 – 4 | Continuity |
| Illumination circuit | 1 – 6 | Continuity |

If continuity is not as specified, replace the switch




### 2. INSPECT ANTENNA MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns (moves upward )

(b) Then, reverse the polarity, check that the motor turns the opposite way (moves downward )

If operation is not as specified, replace the motor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CLOCK

## TROUBLESHOOTING

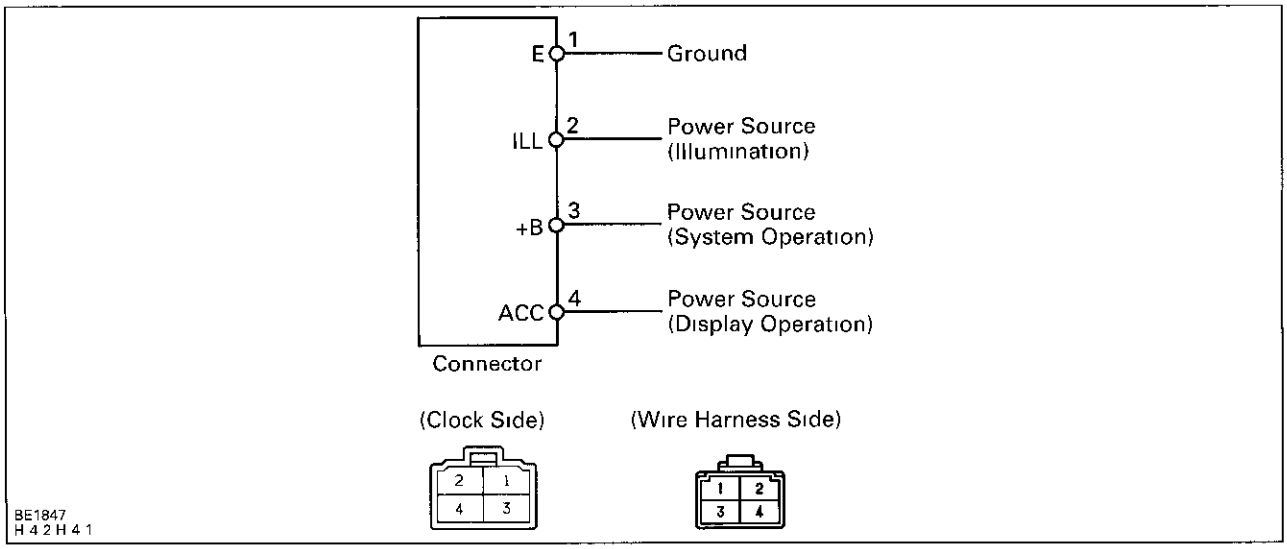
BE1MT 01

HINT

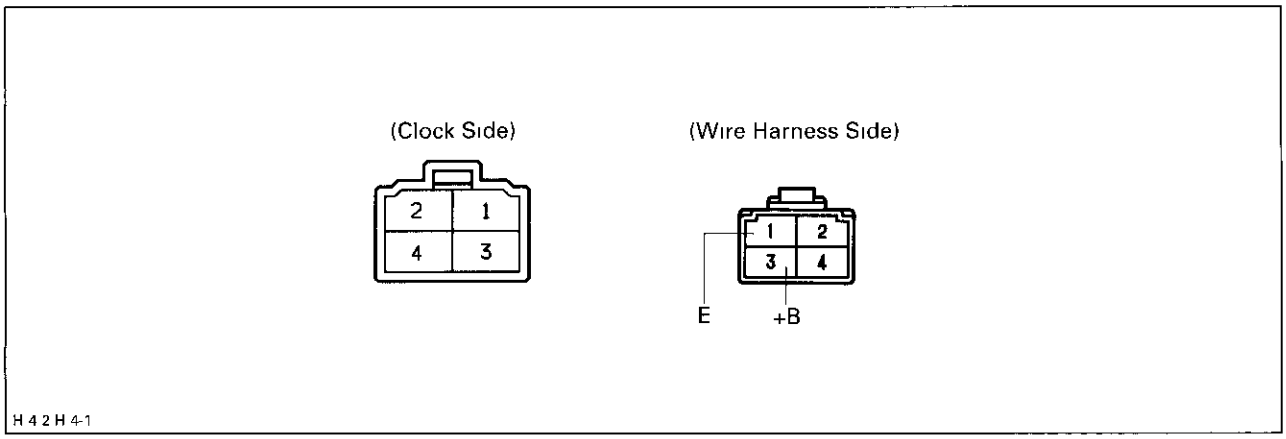
Troubleshoot the lock according to the table below

| | |
|---|---|
| Clock will not operate | 1 |
| Clock loses or gains time | 2 |

**1.5 seconds/day**




## 1 CLOCK WILL NOT OPERATE




(a) Check that the battery positive voltage is 10 – 16 V.
if voltage is not as specified, replace the battery.

(b) Check that the DOME fuse is not blown
If the fuse is blown, replace the fuse and check for short.

(c) Troubleshoot the clock as follows.
HINT: Inspect the connector on the wire harness side

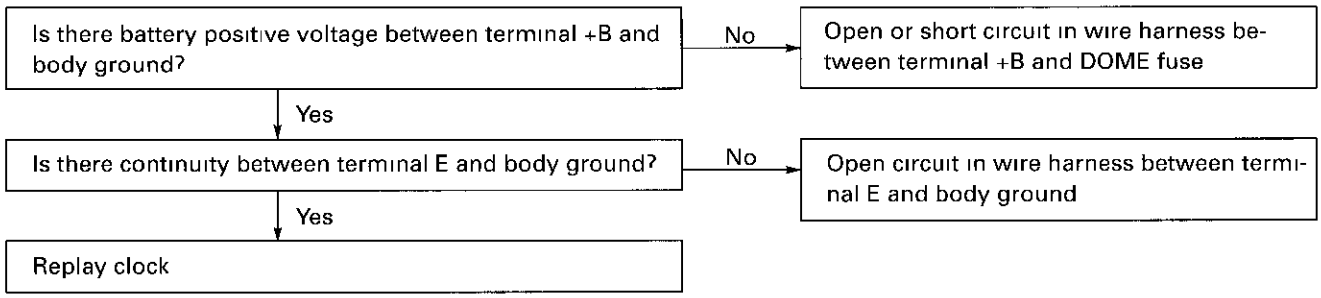
V06493



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





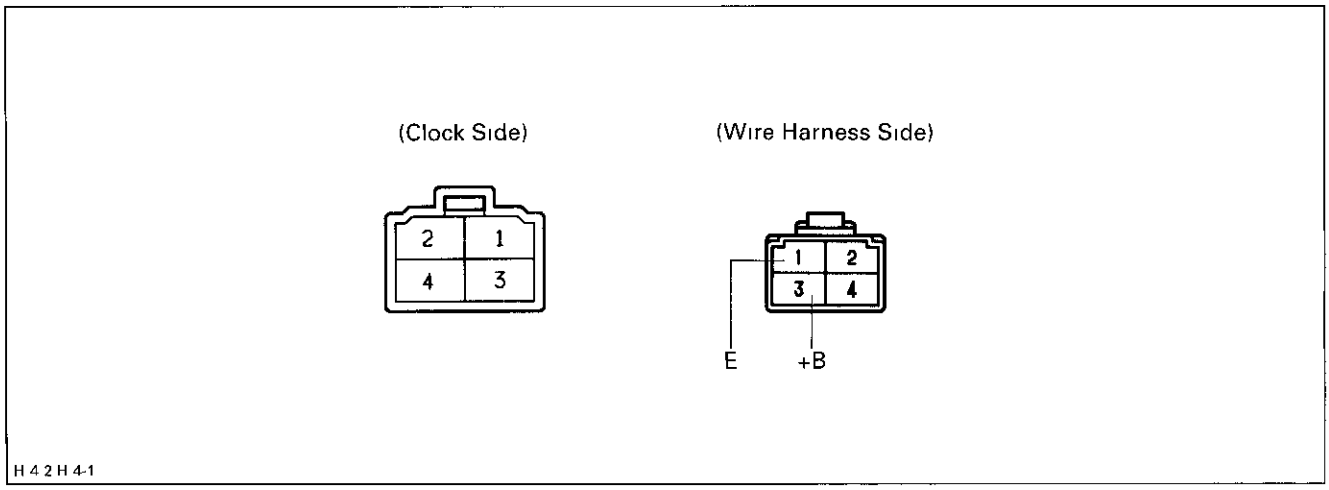

## 2 CLOCK LOSES OR GAINS TIME

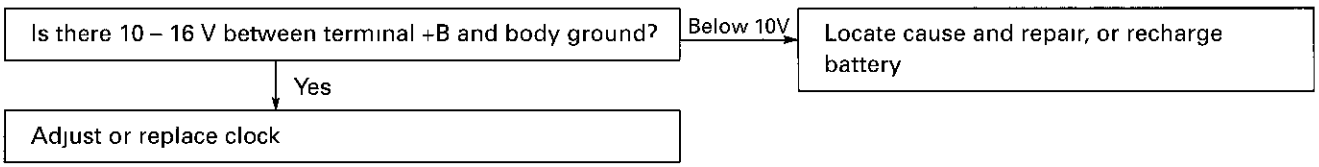
(a) Check the the battery positive voltage is 10 – 16 V
If voltage is not as specified, replace the battery.

(b) Inspect the error of the clock.
**Allowable ertror (per day): ± 1.5 seconds**

(c) Check that the clock adjusting button is sticking in position and has failed to return.
If the button is not returned, repair or replace the clock.

(d) Troubleshoot the clock as follows.
HINT: Inspect the connector on the wire harness side




V06494



Author : Date : 1234

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CLIP

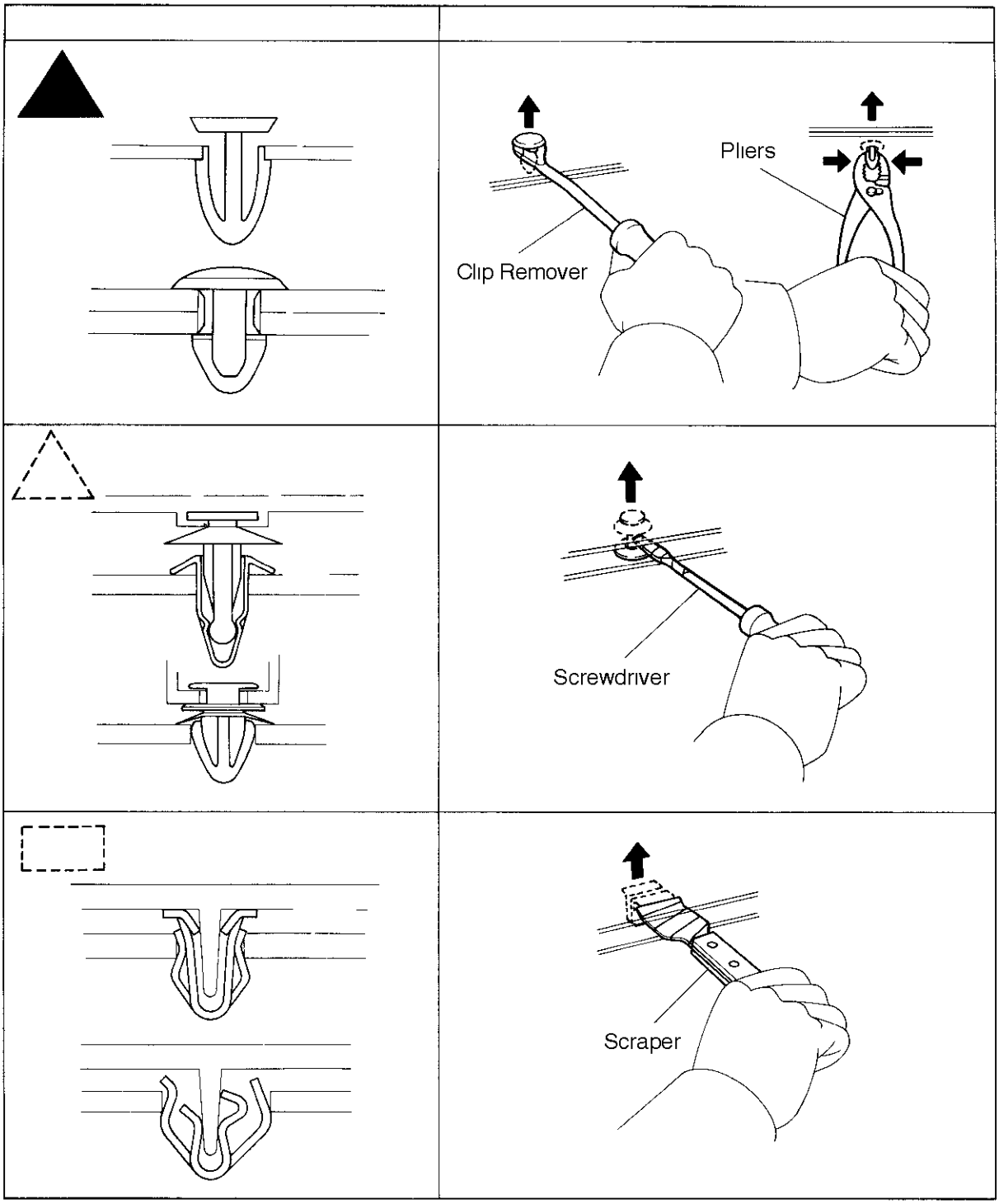
BC87F 01

## REPLACEMENT

The removal and installation methods of typical clips used in body parts are shown in the table below

HINT

If the clip is damaged during the operation, always replace it with a new clip



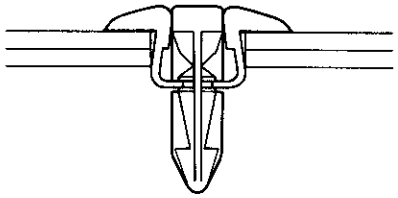
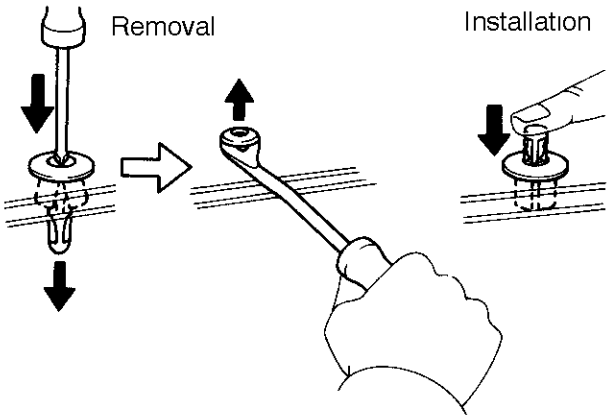
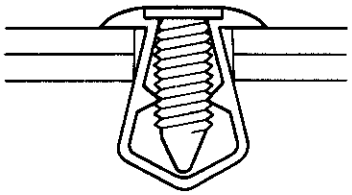
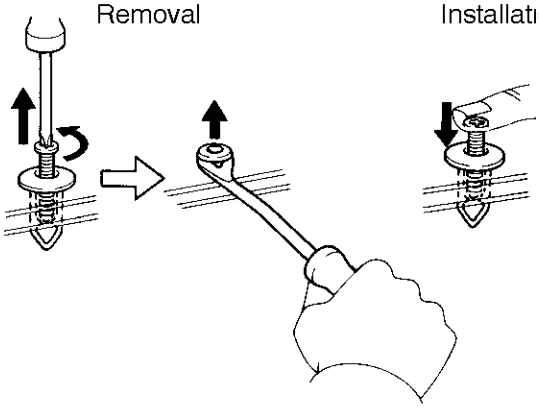

V00005



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| Shape (Example) | Removal / Installation |
|---|---|
|  |  |
|  |  |

V00012



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SRS AIRBAG

BC87G 01

## PRECAUTION

The LAND CRUISER is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section



Brought to you by BirfMark
Version 1.11 - 03/16/2010

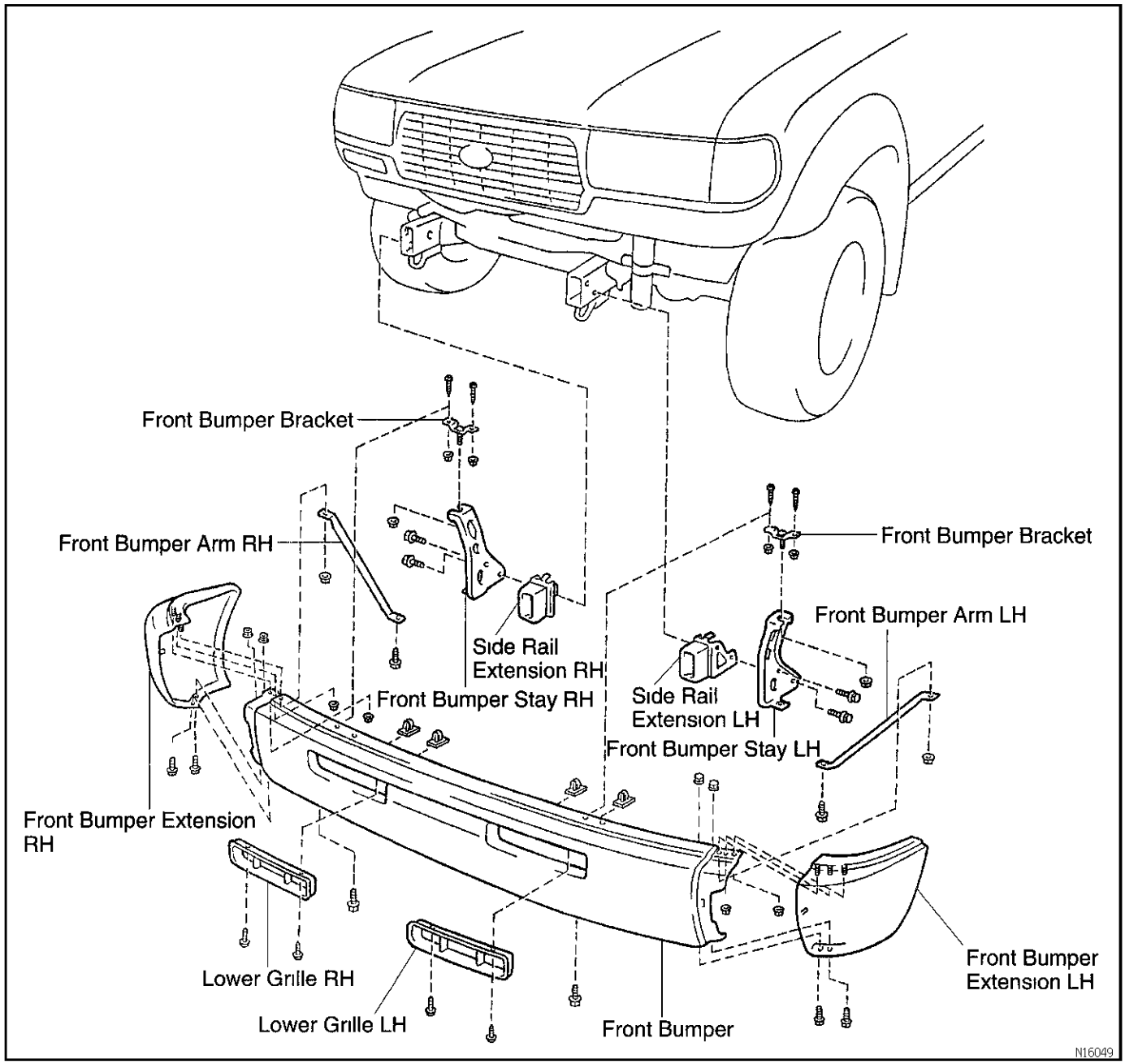
Brought to you by BirfMark

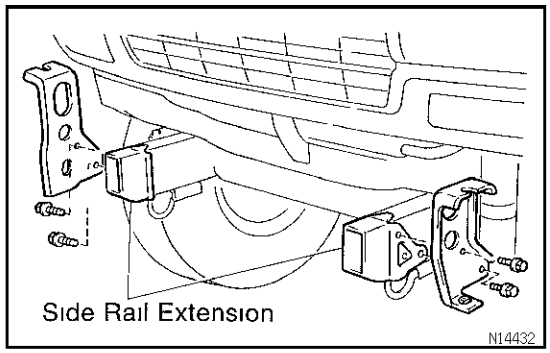


# FRONT BUMPER

## COMPONENTS

BC87H 01




**CAUTION:**
**The side rail extensions are necessary for normal functioning of the SRS airbag, so make sure that they are correctly installed.When replacing the bumper, always inspect the side rail extensions. If they are deformed or cracked, replace them.**

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

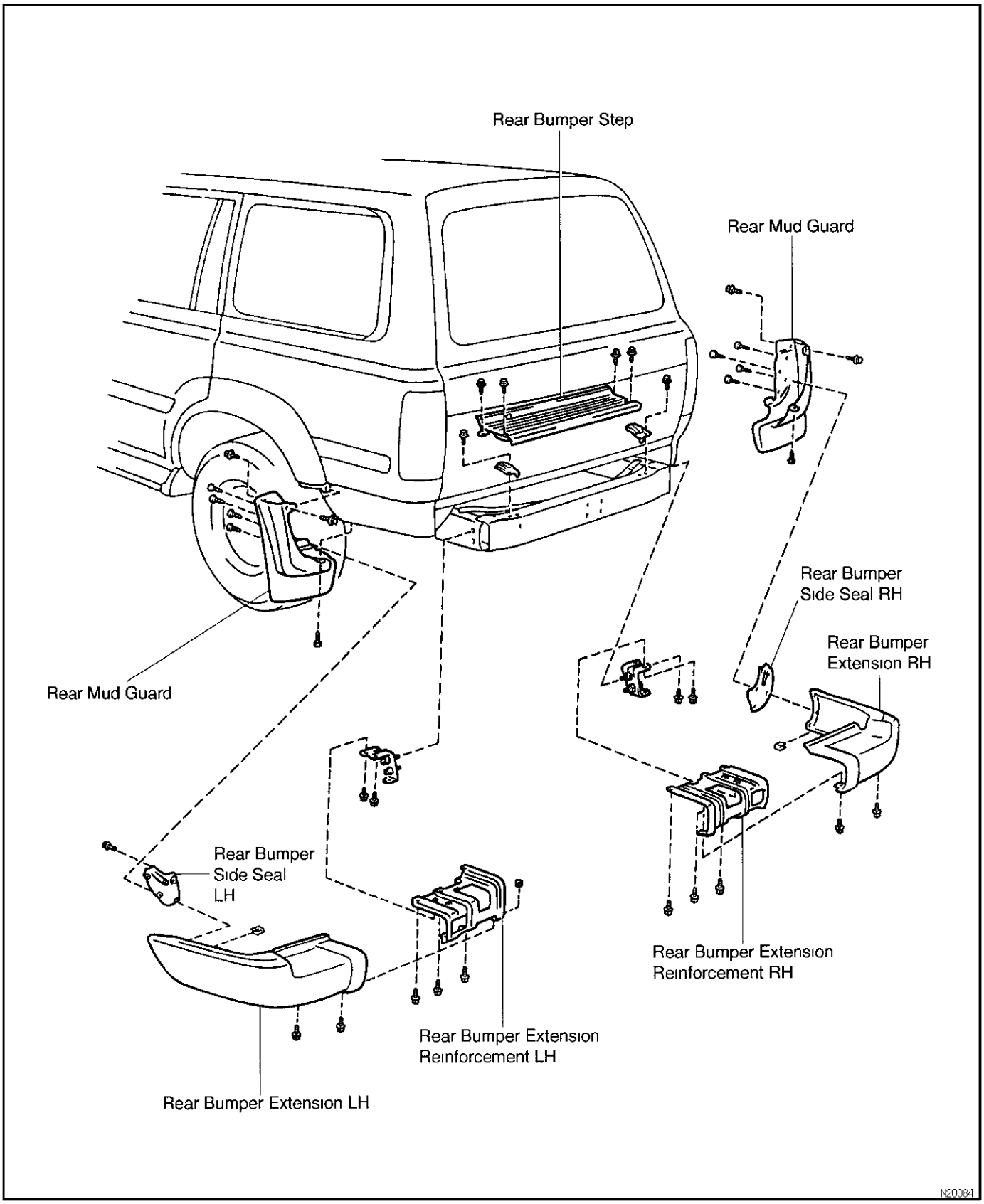
Brought to you by BirfMark



# REAR BUMPER

## COMPONENTS

BC87 01

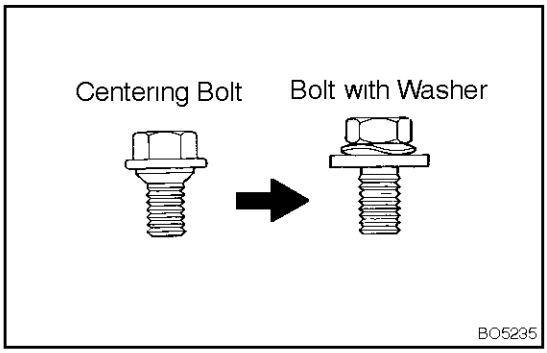





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





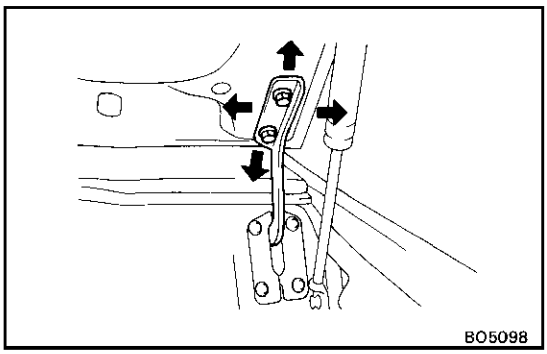

# HOOD

## ADJUSTMENT

BO87J-01

HINT

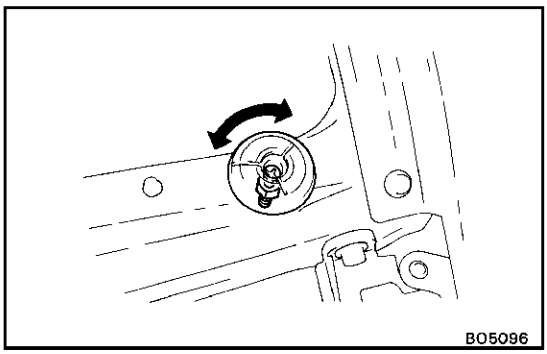
Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on Substitute the bolt with washer for the centering bolt




1. **ADJUST HOOD IN FORWARD/REARWARD AND LEFT /RIGHT DIRECTIONS**

Adjust the hood by loosening the hood side hinge bolts

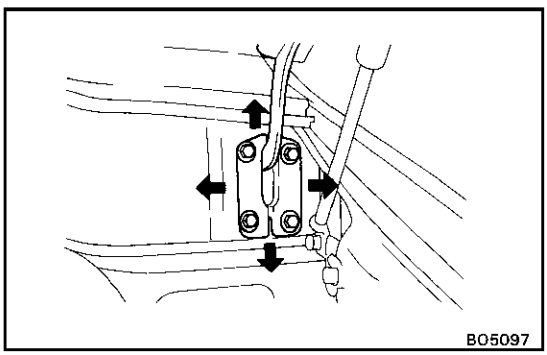
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




2. **ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTIONS**

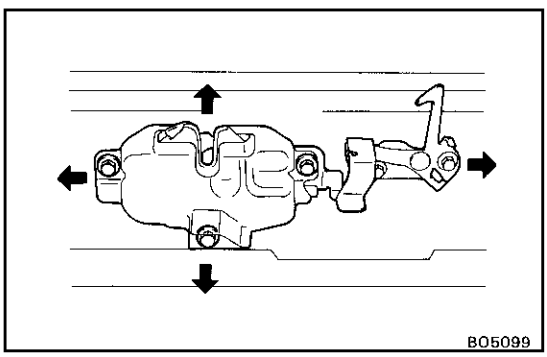
(a) Loosen the lock nut

(b) Adjust the hood by turning the cushions




3. **ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTIONS**

Adjust the hood by loosening the body side hinge bolts




4. **ADJUST HOOD LOCK**

Adjust the hood lock by loosening the mounting bolts

**Torque: 8.0 N·m (80 kgf·cm, 69 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO87K-01

# REPLACEMENT

**1. REMOVE DAMPER STAY FROM HOOD**

Remove the 2 bolts and support from the hood

HINT

While supporting the hood with your hand, remove the hood

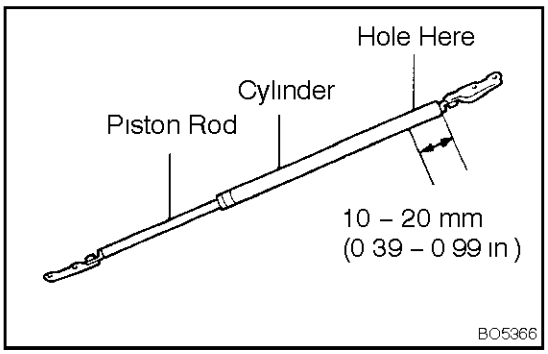
**2. REMOVE DAMPER STAY FROM BODY**

Remove the 2 bolts and support

**3. REPLACE DAMPER STAY**

**NOTICE:**

- **Do not disassemble the damper stay because the cylinder is filled with pressurized gas.**




- **If the damper stay is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole as shown in the illustration to completely release the high-pressure gas before disposing of it.**
- **When drilling, chips may fly out so work carefully.**
- **The gas is colorless, odorless and non-toxic.**
- **When working, handle the damper stay carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.**
- **Do not turn the piston rod and cylinder with the damper stay fully extended.**

**4. INSTALL DAMPER STAY**

Install the damper stay



Author : Date : 1241
Brought to you by BirfMark
Version 1.11 - 03/16/2010

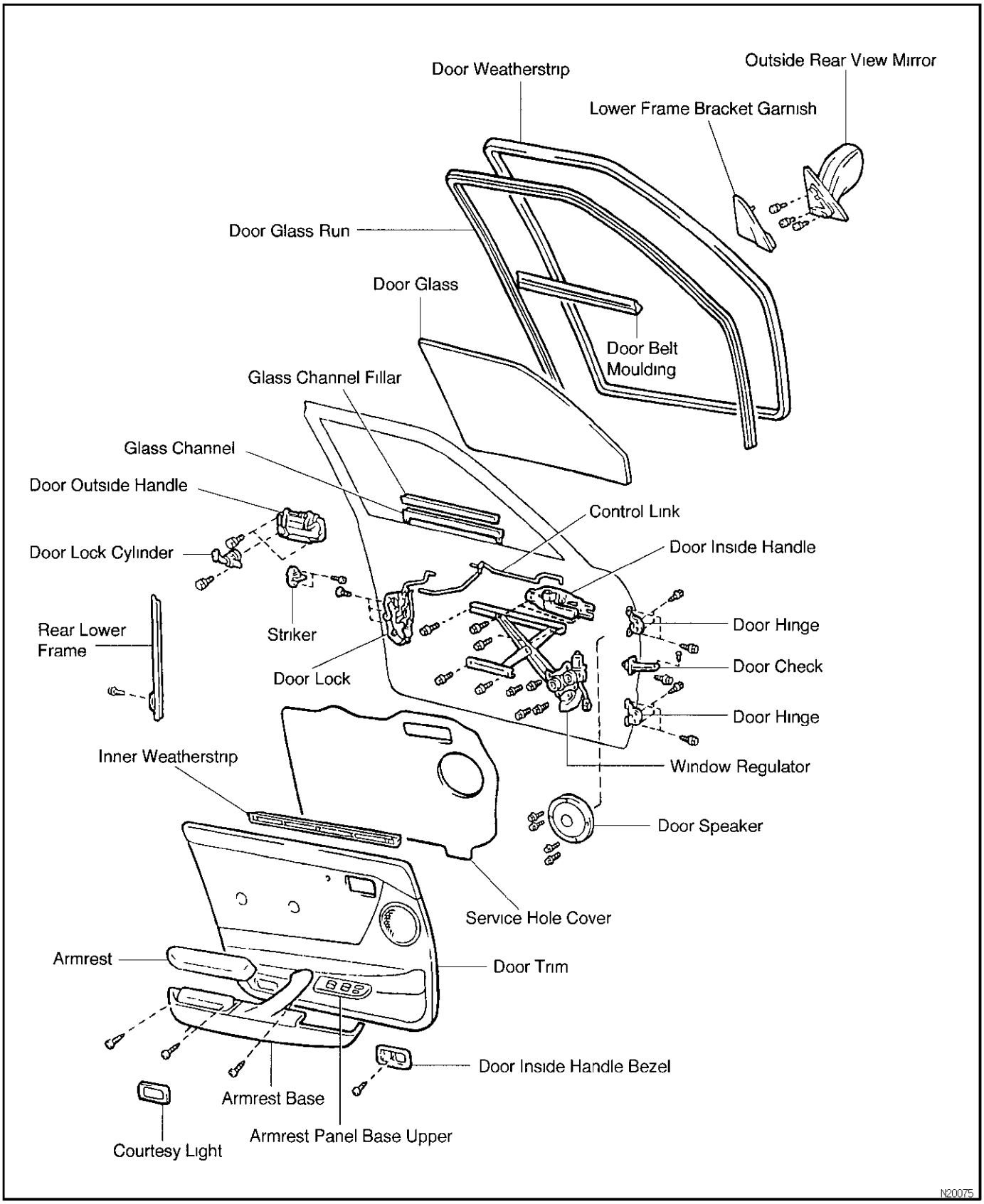
Brought to you by BirfMark



# FRONT DOOR

## COMPONENTS

BC87L-01



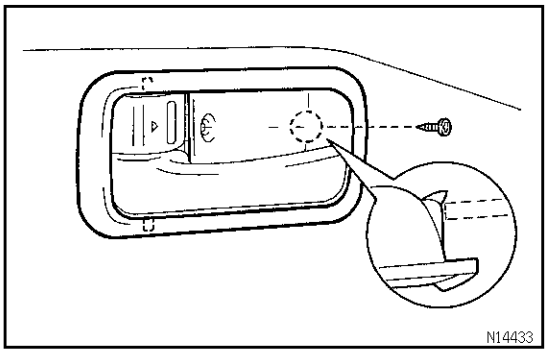



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC87N 01

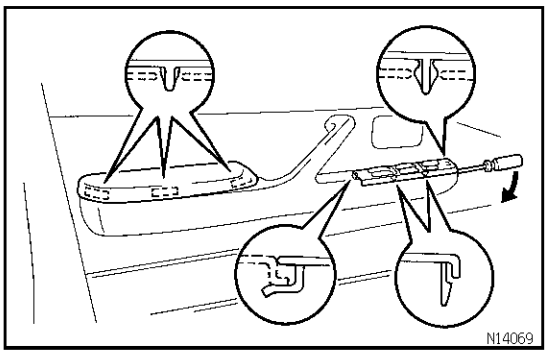



# DISASSEMBLY

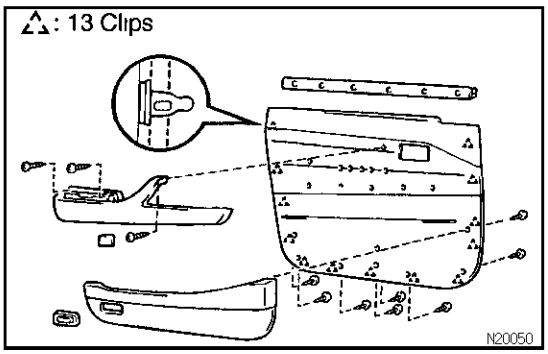
HINT

Tape a screwdriver tip before using to pry parts

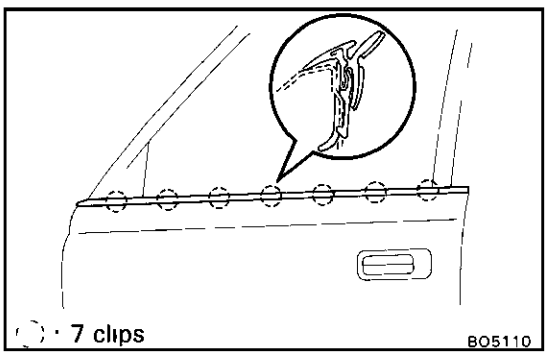
1. **REMOVE DOOR INSIDE HANDLE BEZEL**




2. **REMOVE ARMREST**
3. **REMOVE ARMREST PANEL BASE UPPER**
4. **REMOVE COURTESY LIGHT**
5. **REMOVE LOWER FRAME BRACKET GARNISH**




6. **REMOVE DOOR TRIM**
(a) Remove the 3 screws from the door trim
(b) Using a screwdriver, remove the clip and remove the trim by pulling all of the trim up
(c) Remove the 11 screws and armrest base from the door trim
(d) Remove the inner weatherstrip from the door trim
(e) Remove the 8 screws and door pocket from the door trim




7. **REMOVE DOOR BELT MOULDING**

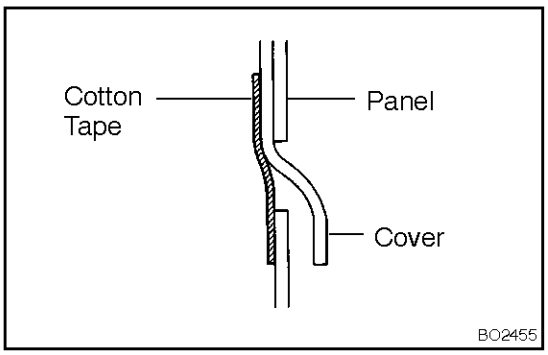
Pry out the clip from the edge of the panel, and remove the moulding

8. **REMOVE DOOR WEATHERSTRIP**

**NOTICE:**

**Do not pull strongly on the weatherstrip as it may tear.**

9. **REMOVE DOOR INSIDE HANDLE**
10. **REMOVE DOOR LOCK CONTROL RELAY**
11. **REMOVE SERVICE HOLE COVER**




**NOTICE:**

**Do not block the trim clip sealing with the tape.**

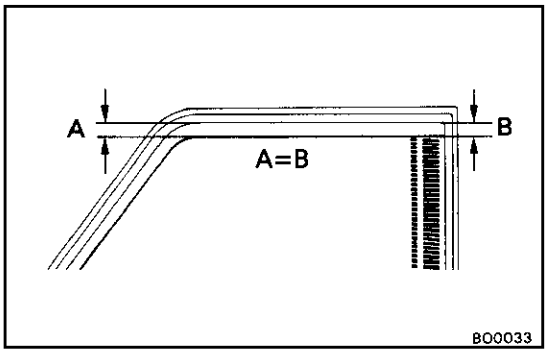
12. **REMOVE OUTSIDE REAR VIEW MIRROR**
13. **REMOVE DOOR GLASS RUN**
14. **REMOVE REAR LOWER FRAME**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

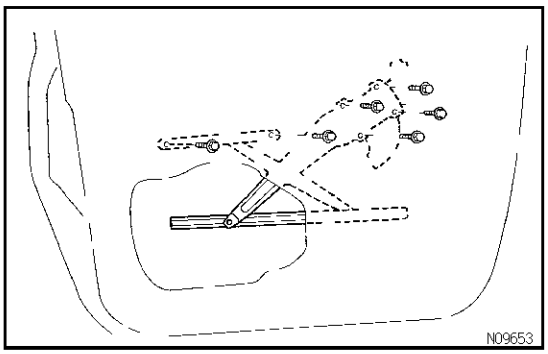
Brought to you by BirfMark






HINT

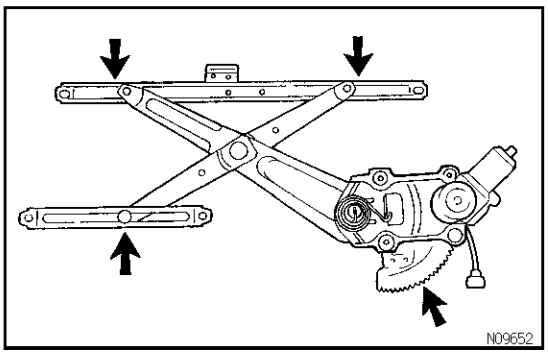
At the time of reassembly, adjust the equalizer arm up to down and tighten if where dimensions A and B, as shown are equal




**15. REMOVE DOOR GLASS**

**16. REMOVE WINDOW REGULATOR**

**Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**



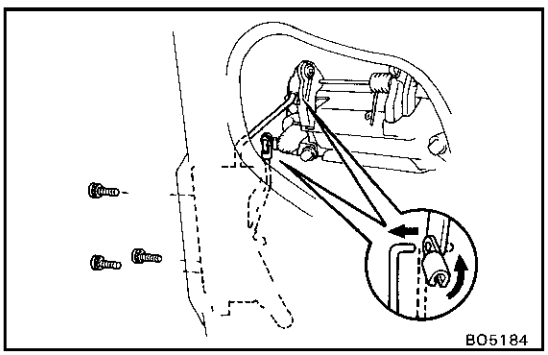

HINT

At the time of reassembly, apply MP grease to the sliding surface and gears of the window regulator

**NOTICE:**

**Do not apply grease to the spring.**

**17. REMOVE LOCKING AND OPENING CONTROL LINK**



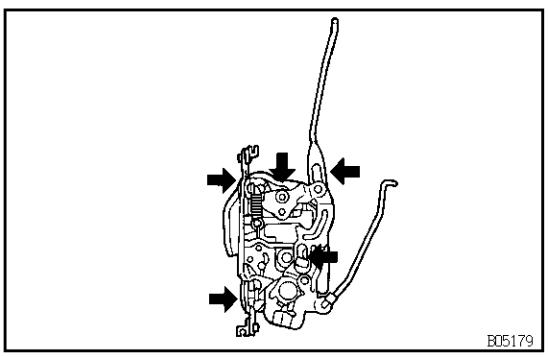

**18. REMOVE DOOR LOCK**

HINT

At the time of reassembly, apply adhesive to the 3 screws

**Part No.08833-00070, THREE BOND 1324 or equivalent**

**Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**




HINT

At the time of reassembly, apply MP grease to the sliding surface of the door lock

**19. REMOVE DOOR OUTSIDE HANDLE**

**20. REMOVE DOOR LOCK CYLINDER**

**21. REMOVE DOOR SPEAKER**

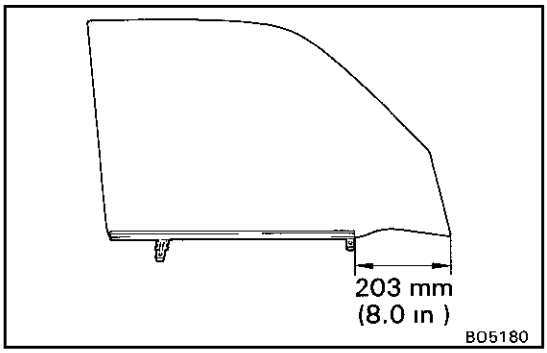


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC07O 01




# REPLACEMENT

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



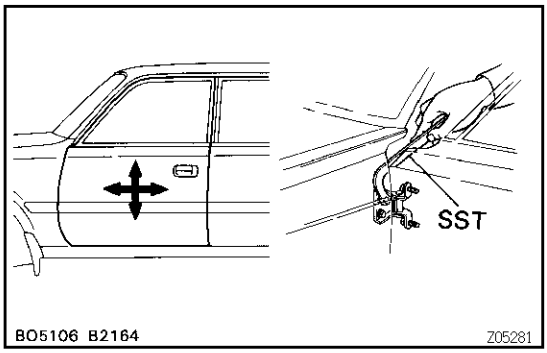
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC87M–01

# ADJUSTMENT

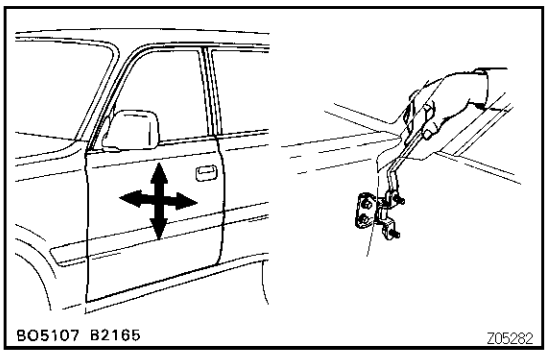



## 1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts

SST 09812–00010

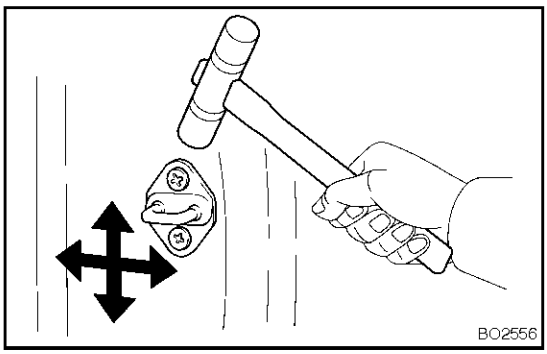
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




## 2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust

**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




## 3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly

(b) Loosen the striker mounting screws to adjust

(c) Using a plastic hammer, tap the striker to adjust it



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC67P–01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BO–9.)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

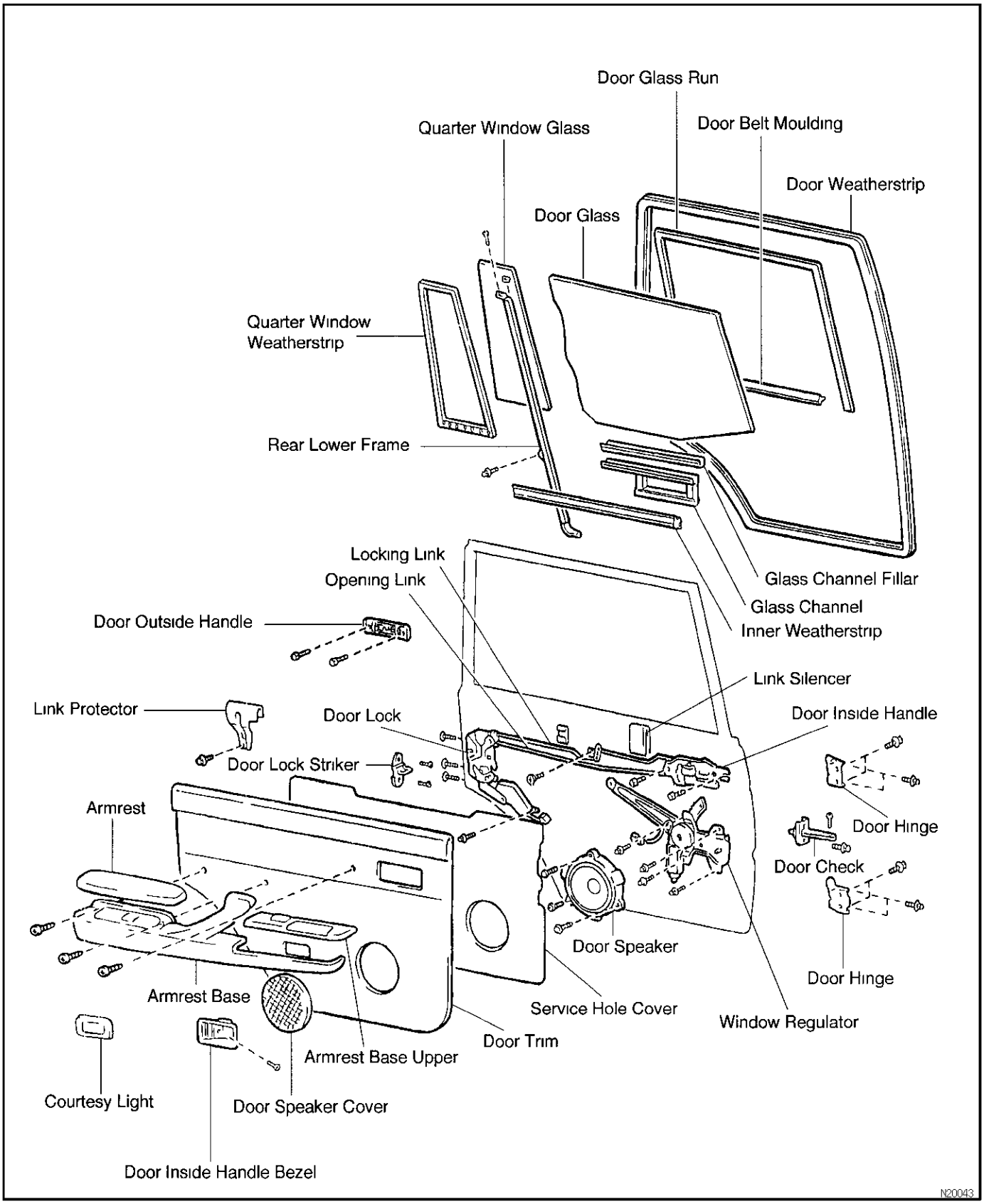
Brought to you by BirfMark



# REAR DOOR

## COMPONENTS

BC87Q 01





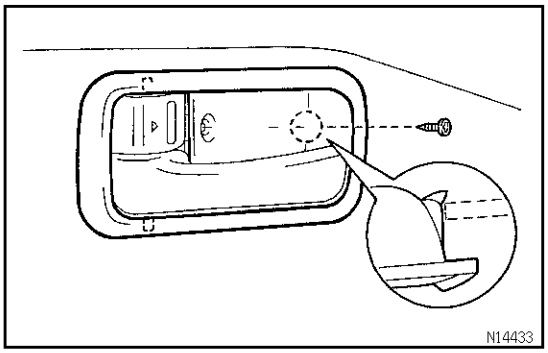

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC07S-01

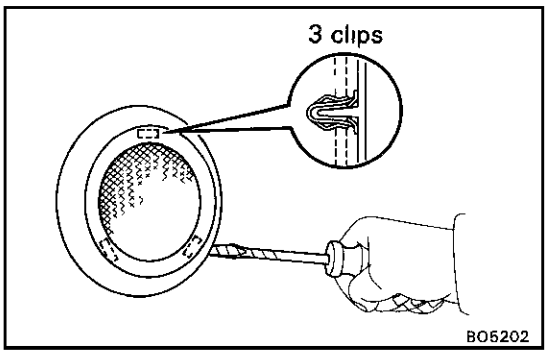
# DISASSEMBLY



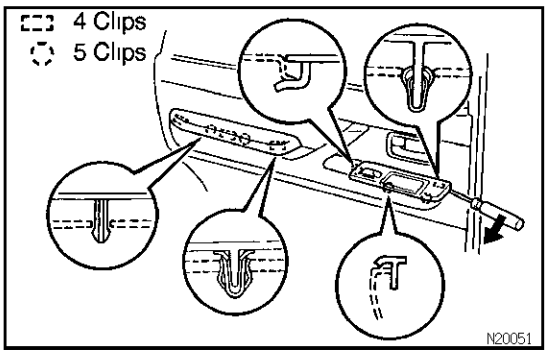

HINT

Tape a screwdriver tip before using to pry parts

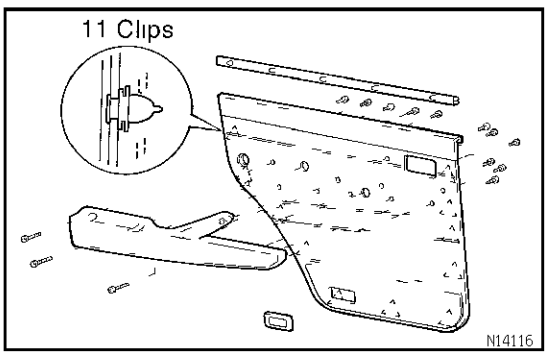
1. **REMOVE DOOR INSIDE HANDLE BEZEL**




2. **REMOVE DOOR SPEAKER COVER**




3. **REMOVE ASH TRAY**
4. **REMOVE ARMREST BASE UPPER**
5. **REMOVE ARMREST**




6. **REMOVE DOOR TRIM**

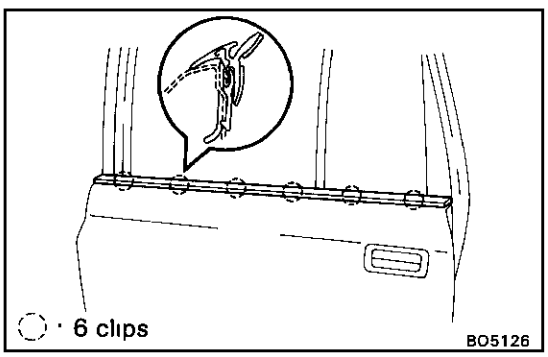
(a) Remove the courtesy light

(b) Remove the 3 screws from the door trim

(c) Using a screwdriver, remove the clips and remove the trim by pulling all of the trim up

(d) Remove the inner weatherstrip from the door trim

(e) Remove the 11 screws and the armrest base from the door trim




7. **REMOVE DOOR BELT MOULDING**

Pry out the clip from the edge of the panel, and remove the moulding

8. **REMOVE DOOR WEATHERSTRIP**

**NOTICE:**

**Do not pull strongly on the weatherstrip as it may tear.**

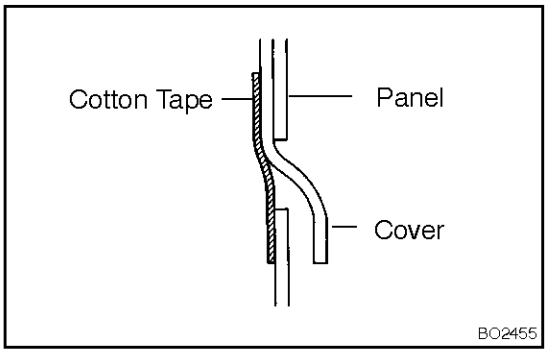
9. **REMOVE DOOR INSIDE HANDLE**
10. **REMOVE SERVICE HOLE COVER**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



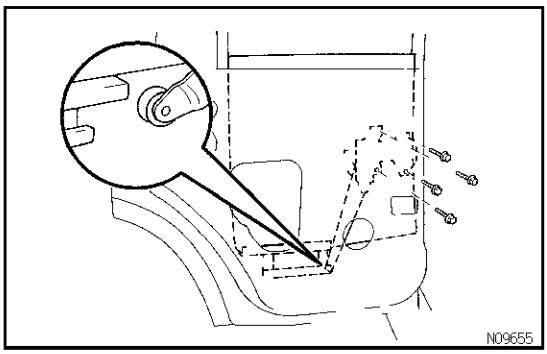


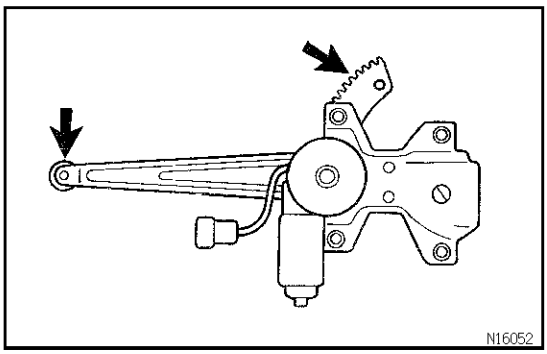

**NOTICE:**

**Do not block the clip sealing with the tape.**

11. **REMOVE DOOR SPEAKER**
12. **REMOVE LINK PROTECTOR**
13. **REMOVE LOCKING LINK AND DOOR OPENING LINK**
14. **REMOVE DOOR GLASS RUN**
15. **REMOVE REAR LOWER FRAME**
16. **REMOVE QUARTER WINDOW GLASS WITH WEATHERSTRIP**
17. **REMOVE DOOR GLASS**
18. **REMOVE WINDOW REGULATOR**

    **Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**



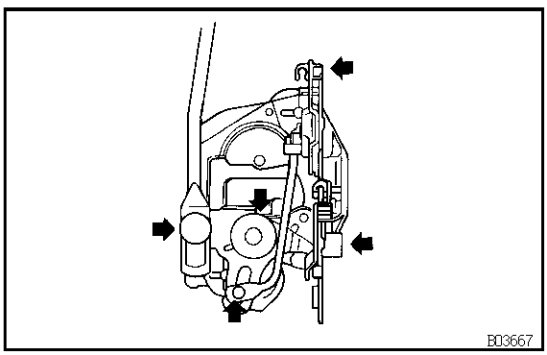




HINT

At the time of reassembly, apply MP grease to the sliding surface and gears of the regulator

**NOTICE:**

**Do not apply grease to the spring.**




19. **REMOVE DOOR LOCK**

HINT

At the time of reassembly, apply adhesive to the 3 screws

**Part No.08833-00070, THREE BOND 1324 or equivalent**

**Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**

HINT

At the time of reassembly, apply MP grease to the sliding surface of the door lock

20. **REMOVE OUTSIDE HANDLE**

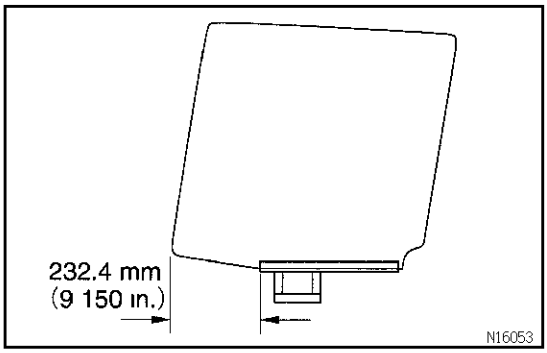


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC87T 01




# REPLACEMENT

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



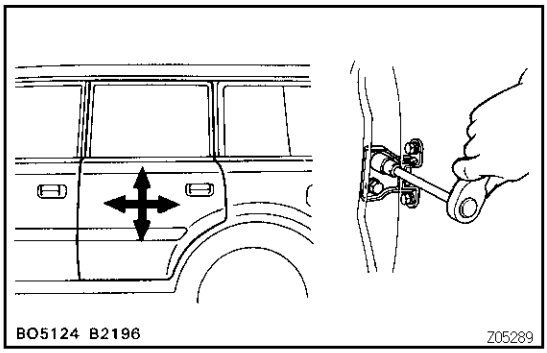
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC07R 01

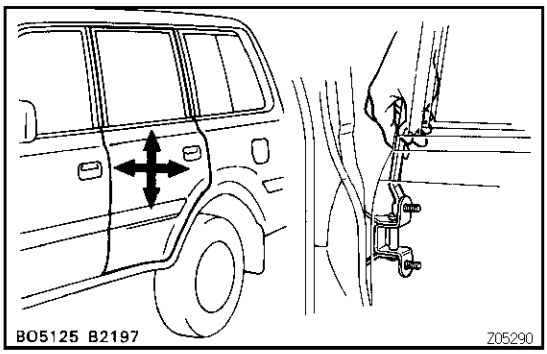
# ADJUSTMENT




## 1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts

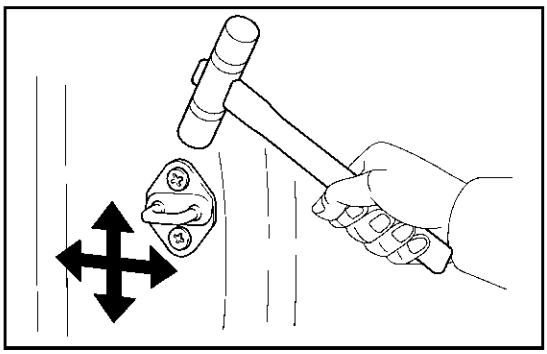
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




## 2. ADJUST DOOR IN LEFT /RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the door side hinge bolts

**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**



## 3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly

(b) Loosen the striker mounting screws to adjust

(c) Using a plastic hammer, tap the striker to adjust it



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC67U 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BO–15).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

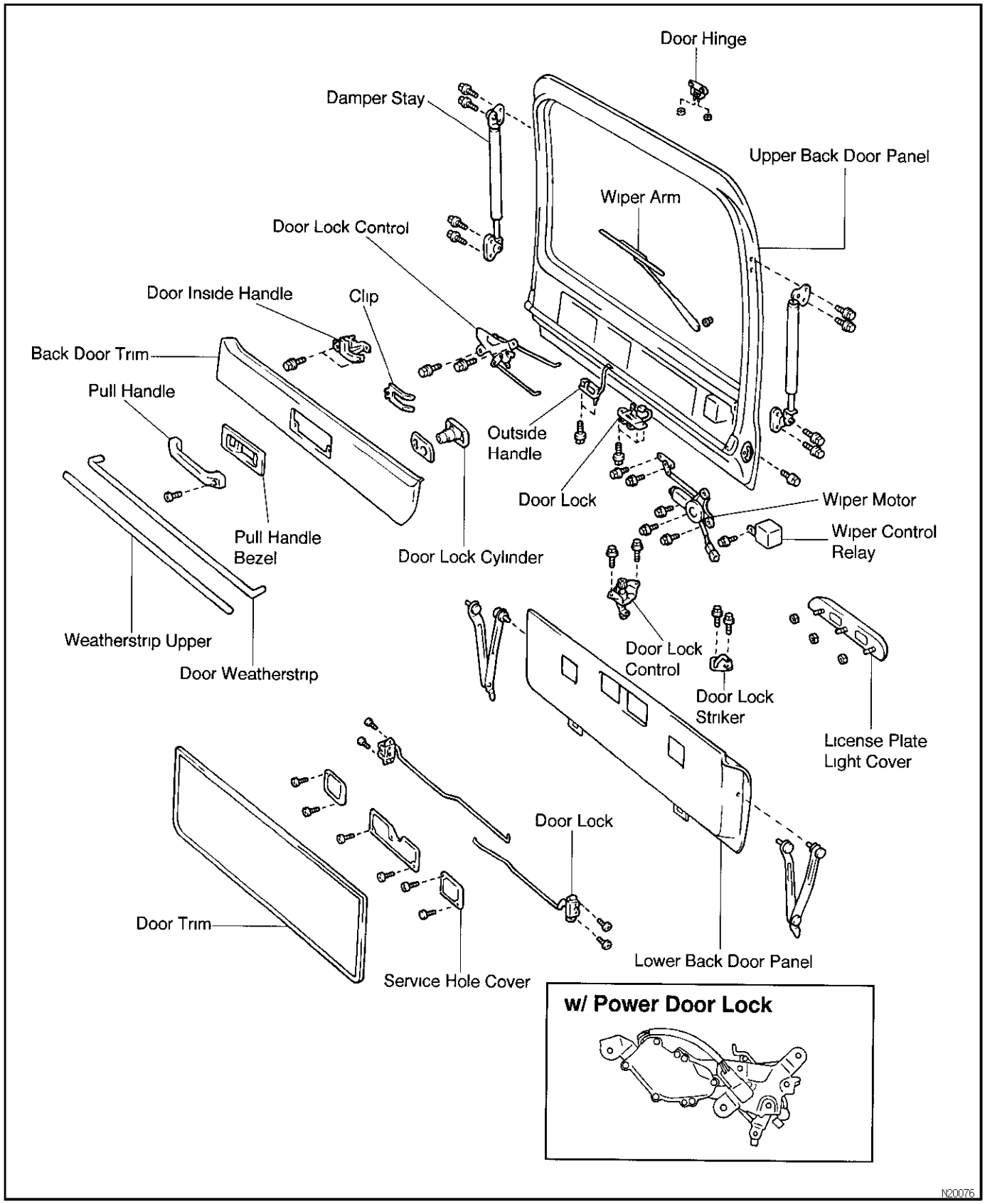
Brought to you by BirfMark



# BACK DOOR

## COMPONENTS

BC87V-01



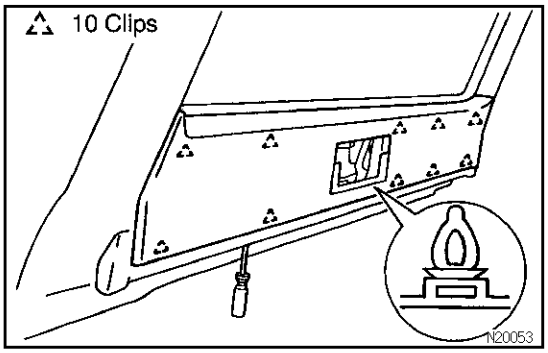



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC87W-01




# DISASSEMBLY

HINT

Tape the screwdriver tip before using to pry parts

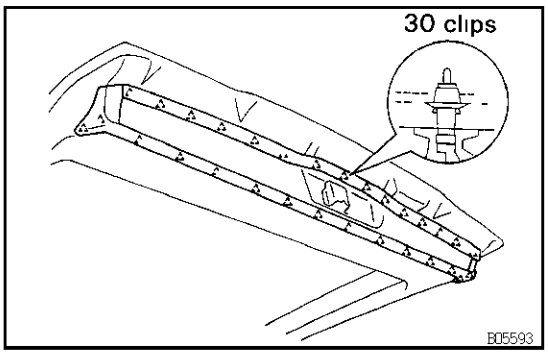
**1. REMOVE UPPER BACK DOOR**

(a) Remove the pull handle and pull handle bezel

(b) Remove the back door trim

(1) Insert a screwdriver, between the retainers and trim to pry it loose

(2) Remove the back door trim




(c) Remove the door weatherstrip

**NOTICE:**

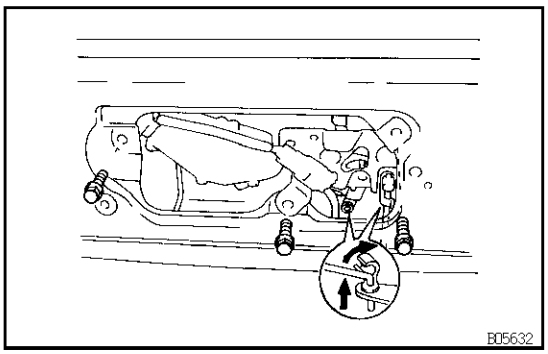
**Do not pull strongly on the weatherstrip as it may tear.**

(d) Remove the weatherstrip upper

**NOTICE:**

**Do not pull strongly off the weatherstrip as it may tear.**

(e) Remove the door inside handle

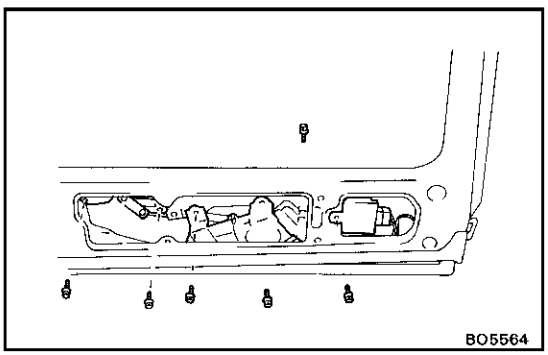



(f) Remove the door lock control

(g) Remove the outside handle

(h) Remove the door lock cylinder

(i) Remove the wiper arm




(j) Remove the wiper motor

(k) Remove the wiper control relay

(l) Remove the door lock

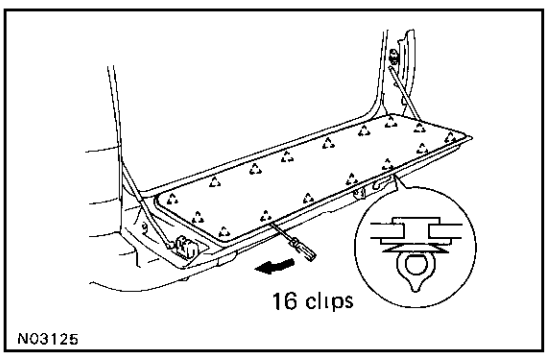
(m) Remove the damper stay

**2. REMOVE LOWER BACK DOOR**

(a) Remove the door trim

(1) Insert a screwdriver, between the retainers and door trim to pry it loose

(2) Remove the door trim

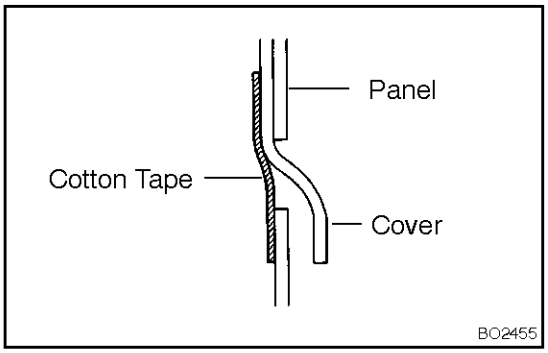





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Remove the service hole cover
(c) Remove the door lock control
(d) Remove the door lock
(e) Remove the license plate light cover



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



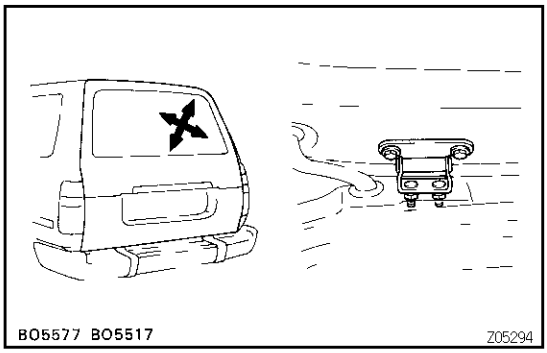
BC07X-01

# ADJUSTMENT

## 1. ADJUST UPPER BACK DOOR

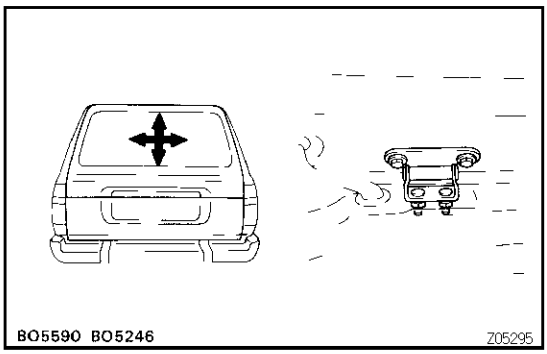
(a) Adjust the door in forward/rearward and left/right directions

Adjust the door by loosening the door side hinge bolts




(b) Adjust the door in left/right and vertical directions

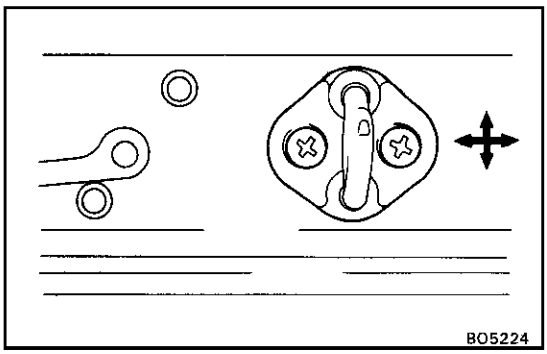
Adjust the door by loosening the body side hinge bolts




(c) Adjust the door lock striker

(1) Check that the door fit and door lock linkage are adjusted correctly

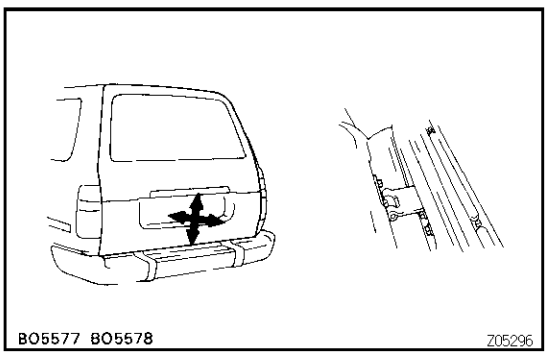
(2) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer Tighten the striker mounting screw again




## 2. ADJUST LOWER BACK DOOR

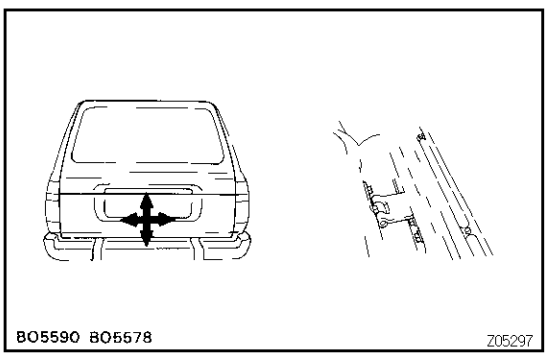
(a) Adjust the door in forward/rearward and left/right directions

Adjust the door by loosening the door side hinge bolts




(b) Adjust the door in left/right and vertical directions

Adjust the door by loosening the body side hinge bolts

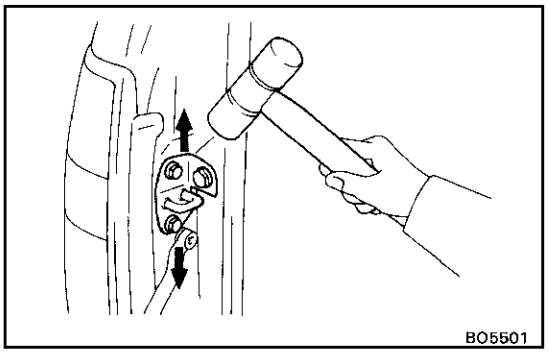





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Adjust the door lock striker
  (1) Check that the door fit and door lock linkages are adjusted correctly
  (2) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer
  (3) Tighten the striker mounting screws again



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC87Y-01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly(See page BO-21).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BACK DOOR STAY

BO87Z 01

## REPLACEMENT

**1. REMOVE DAMPER STAY FROM BACK DOOR**

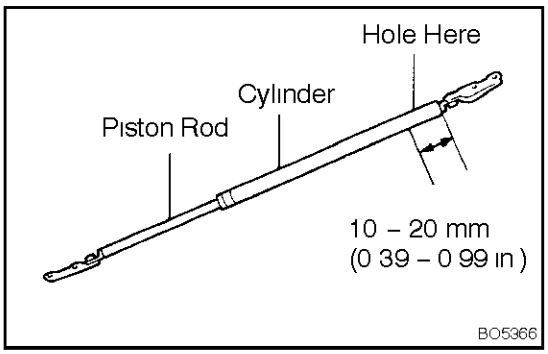
Remove the 2 bolts and support from the hood

HINT

While supporting the hood with your hand, remove the hood

**2. REMOVE DAMPER STAY FROM BODY**

Remove the 2 bolts and support




**3. REPLACE DAMPER STAY**

**NOTICE:**

- **Do not disassemble the damper stay because the cylinder is filled with pressurized gas.**
- **If the damper stay is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole in the aved shown in the illustration to completely release the high-pressure gas before disposing of it.**
- **When drilling, chips may fly out so work carefully.**
- **The gas is colorless, odorless and non-toxic.**
- **When working, handle the damper stay carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.**
- **Do not turn the piston rod and cylinder with the damper stay fully extended.**

**4. INSTALL DAMPER STAY**

Install the damper stay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

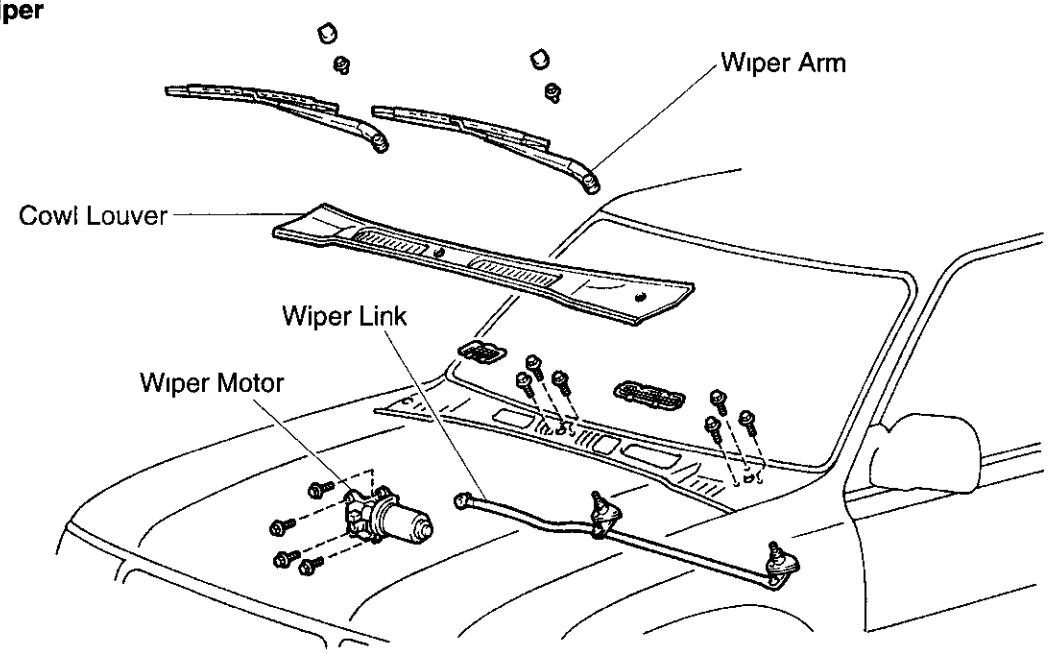


# FRONT WIPER AND WASHER

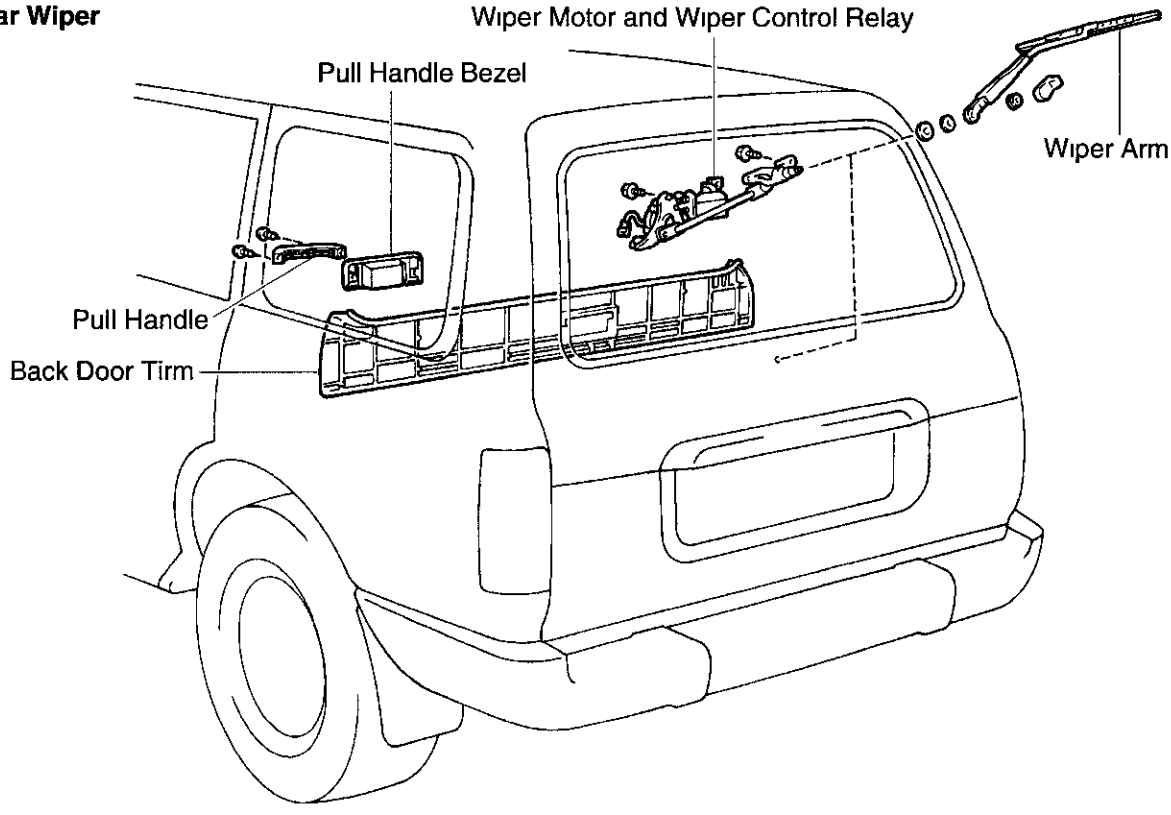
## COMPONENTS

BC080-01

**Front Wiper**




**Rear Wiper**




N16054

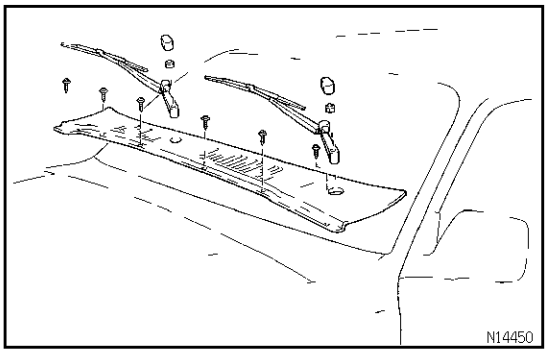


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

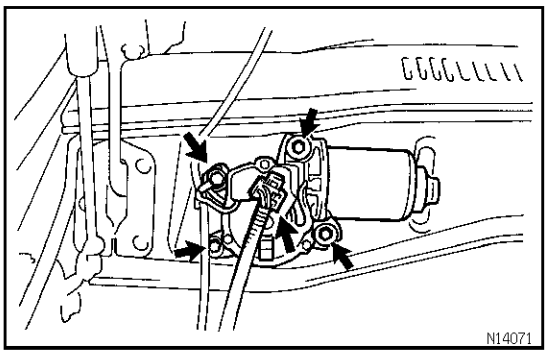


BC082-01




# REMOVAL

1. **REMOVE WIPER ARMS**
2. **REMOVE COWL LOUVER**




3. **REMOVE WIPER MOTOR AND WIPER LINK**

(a) Disconnect the connector, then unfasten 4 bolts and wiper motor

(b) Remove the wiper link

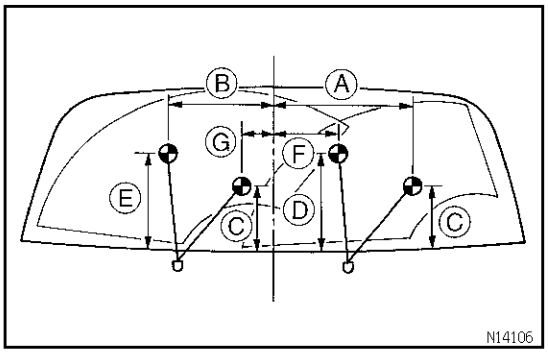


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO48K–01



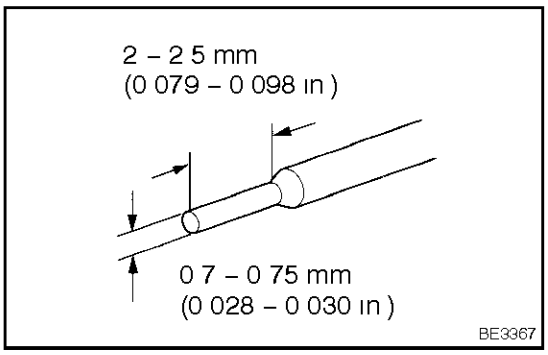

# INSPECTION

## 1. INSPECT FRONT WASHER NOZZLE

(a) While operating the washer, check that both the point where the washer fluid from the upper nozzles hits the windshield, and the upsurge area, are within the range indicated by the arrow

| | |
|---|---|
| A | Approx 460 mm (18 1 in ) |
| B | Approx 300 mm (11 8 in ) |
| C | Approx 250 mm (9 84 in ) |
| D | Approx 400 mm (15 7 in ) |
| E | Approx 410 mm (16 1 in ) |
| F | Approx 220 mm (8 66 in ) |
| G | Approx 60 mm (2 36 in ) |

(b) Check if the lower point where the washer fluid hits the windshield is within the range of the wiping pattern (the area of the glass which is wiped by the wiper blades)




## 2. ADJUST FRONT WASHER NOZZLE

Using a tool like that shown in the illustration, change the direction of the nozzle hole to adjust the point where washer fluid strikes the windshield



Brought to you by BirfMark
Version 1.11 - 03/16/2010

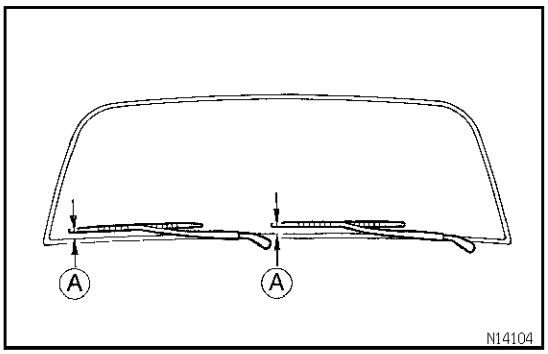
Brought to you by BirfMark



BC083-01

# INSTALLATION

1. **INSTALL WIPER LINK**
   **Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
2. **INSTALL WIPER MOTOR**
   **Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
3. **INSTALL COWL LOUVER**




4. **INSTALL FRONT WIPER ARM**

(a) Install the wiper arms and operate the wipers once and turn the wiper switch OFF

(b) Adjust the installation positions of the wiper arms to the positions as shown in the illustration
**A: Approx. 25 mm (0.98 in.)**

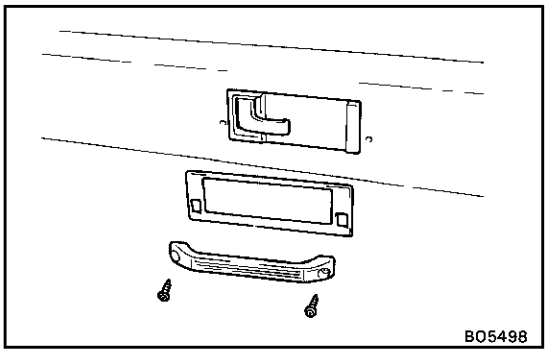
(c) Tighten the nuts
**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



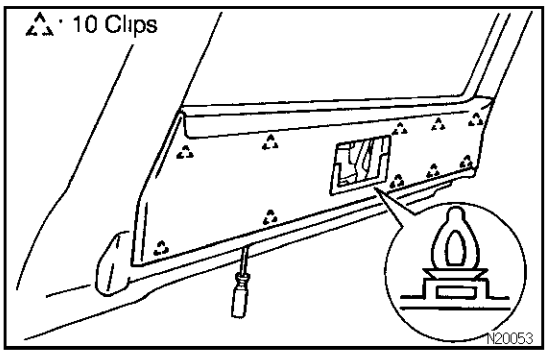



# REAR WIPER AND WASHER

BO885-01

## REMOVAL

**1. REMOVE PULL HANDLE AND PULL HANDLE BEZEL**



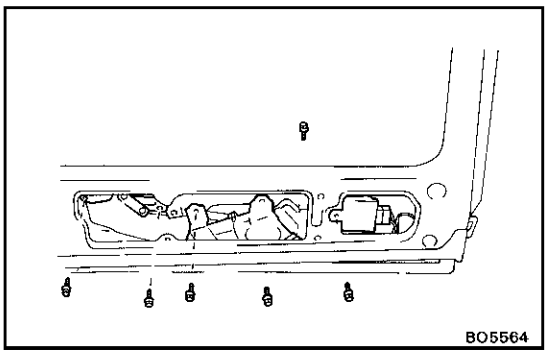

**2. REMOVE BACK DOOR TRIM**

(a) Insert a screwdriver between the retainers and door trim to pry it loose

HINT

Tape the screwdriver tip before use

(b) Remove the back door trim




**3. REMOVE WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY**

(a) Open the cap

(b) Remove the nut and wiper arm

(c) Remove the 5 bolts and motor, then disconnect the connector

(d) Remove the bolts and rear wiper control relay,then disconnect the connector

**4. ADJUST REAR WASHER NOZZLE**

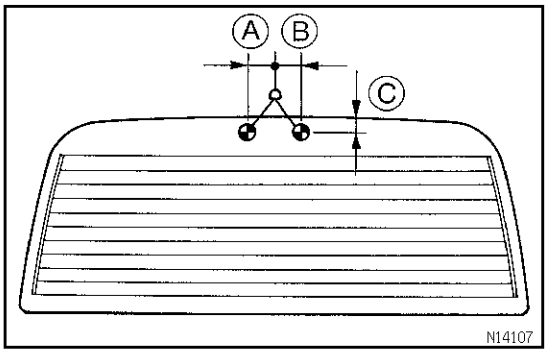


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC086-01




# INSPECTION

## INSPECT REAR WASHER NOZZLE

While operating the washer, check whether the point where the washer fluid hits the back door glass and the upsurge area are within the range indicated by the hatched line

| | |
|---|---|
| A | Approx 120 mm (4 72 in ) |
| B | Approx 120 mm (4 72 in ) |
| C | Approx 90 mm (3 54 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

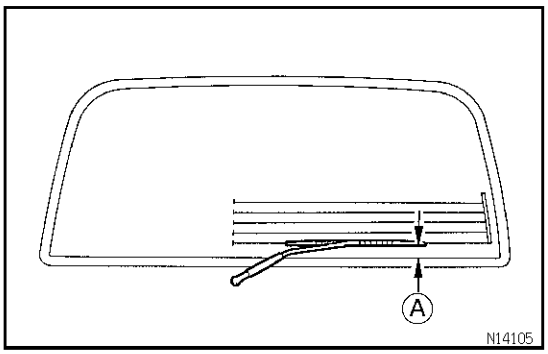
Brought to you by BirfMark



BC087-01

# INSTALLATION

1. INSTALL WIPER CONTROL RELAY
2. INSTALL WIPER MOTOR
   **Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
3. INSTALL BACK DOOR TRIM
4. INSTALL PULL HANDLE BEZEL
5. INSTALL PULL HANDLE




6. INSTALL REAR WIPER ARM

(a) Install the wiper arm and operate the wipers once and turn the wiper switch OFF

(b) Adjust the installation positions of the wiper arm to the positions shown in the illustration
**A: Approx. 40 mm (1.57 in.)**

(c) Tighten the nut
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

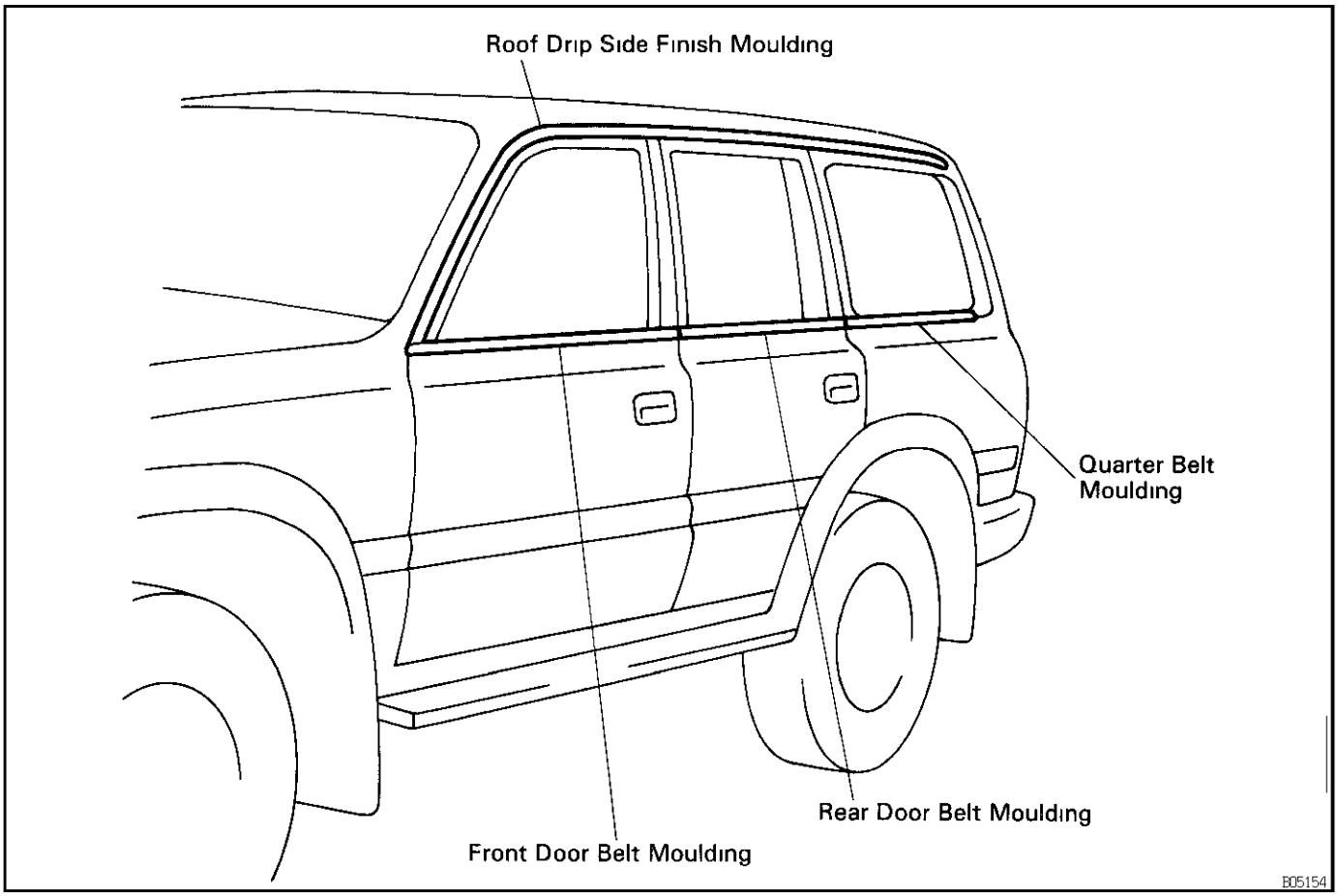
Brought to you by BirfMark



# BODY OUTSIDE MOULDING

## COMPONENTS

BO48L-01



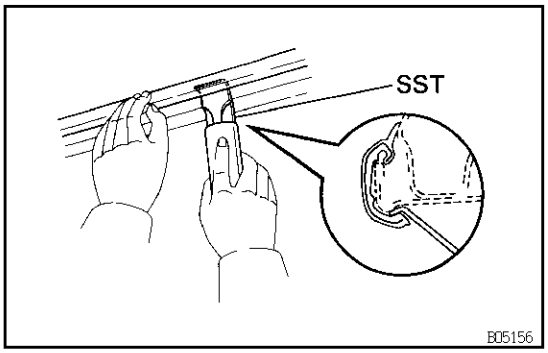



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO48M–01




# REMOVAL

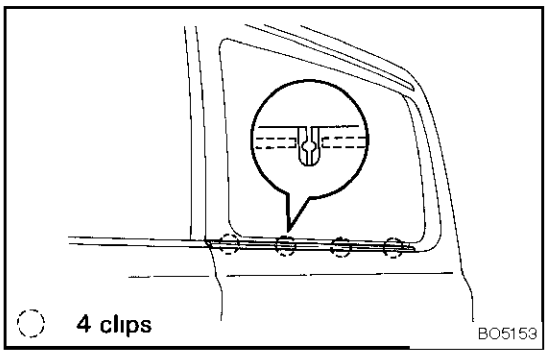
**1. REMOVE ROOF DRIP MOULDING**

Using SST, pull off the roof drip moulding from front ends

SST 09806–30010

**2. REMOVE FRONT DOOR BELT MOULDING (See page BO–9)**

**3. REMOVE REAR DOOR BELT MOULDING (See page BO–15)**




**4. REMOVE QUARTER BELT MOULDING**

Pry out the clips from the edge of the panel, and remove the moulding

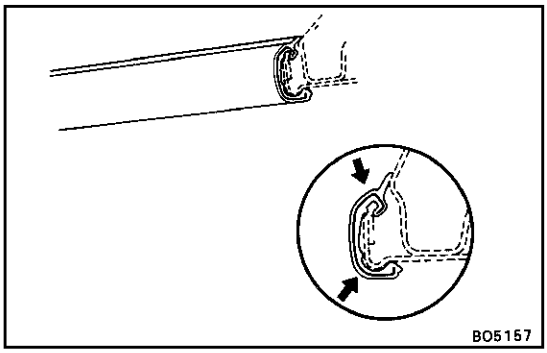


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO48N 01




# INSTALLATION

1. INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange Tap on the moulding by hand

2. INSTALL FRONT DOOR BELT MOULDING
3. INSTALL REAR DOOR BELT MOULDING
4. INSTALL QUARTER BELT MOULDING



Brought to you by BirfMark
Version 1.11 - 03/16/2010

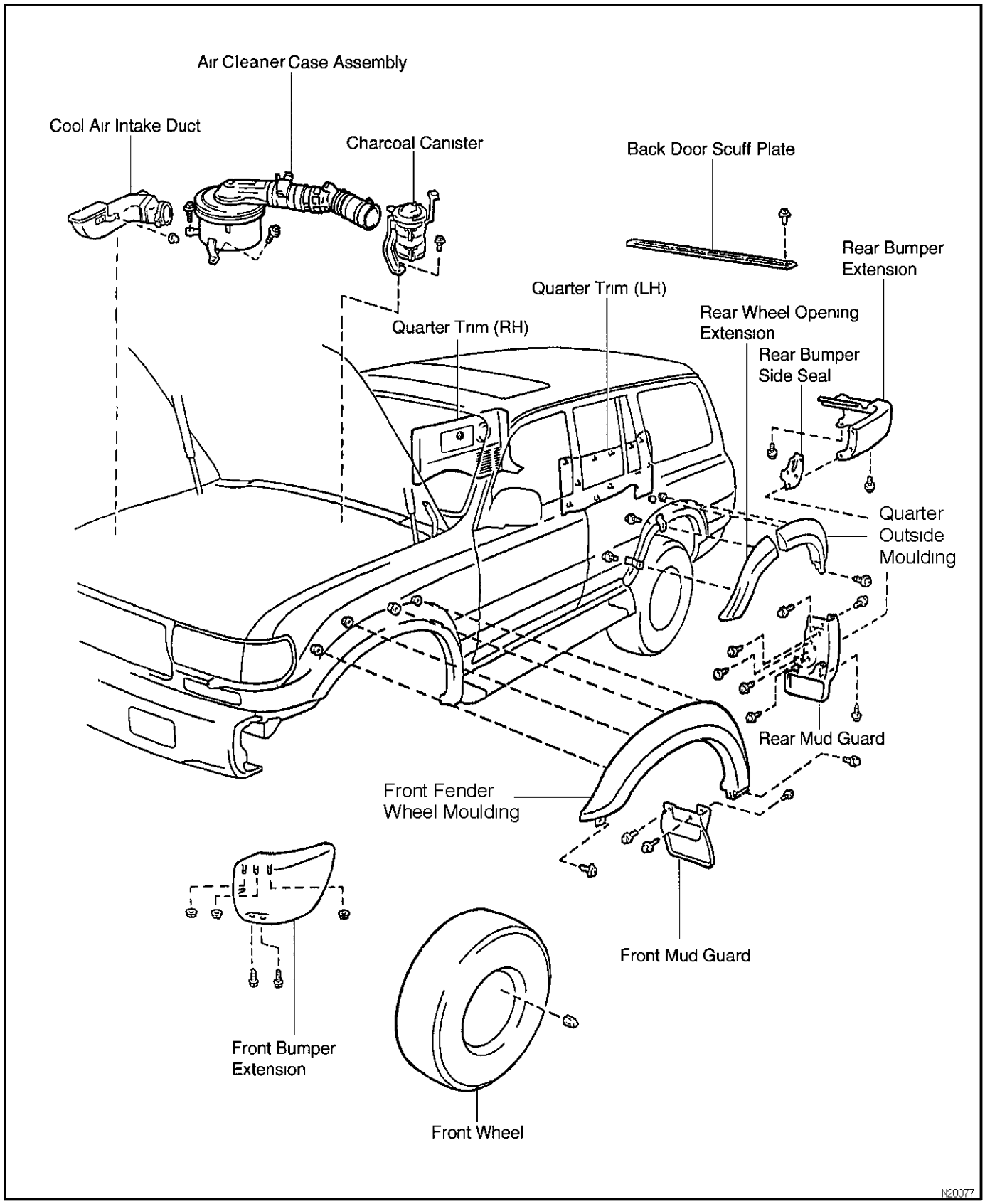
Brought to you by BirfMark



# WHEEL OPENING MOULDING

BO48O 01

## COMPONENTS






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

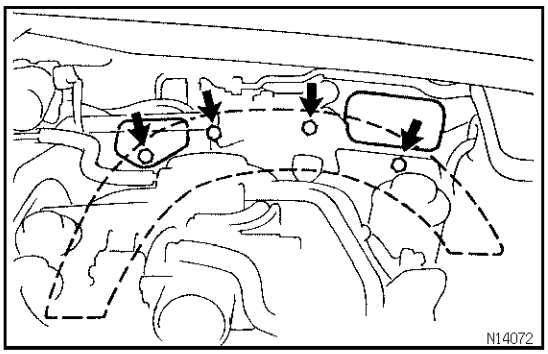


BO48P-01

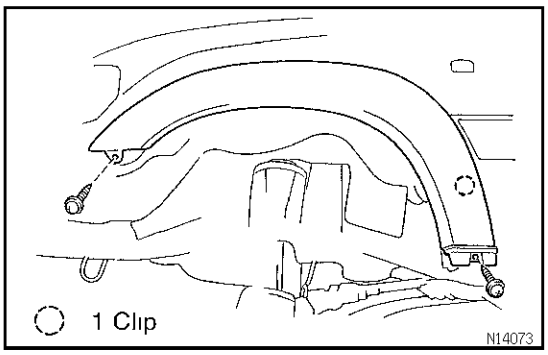
# REMOVAL

**1. REMOVE FRONT FENDER WHEEL OPENING MOULDING**

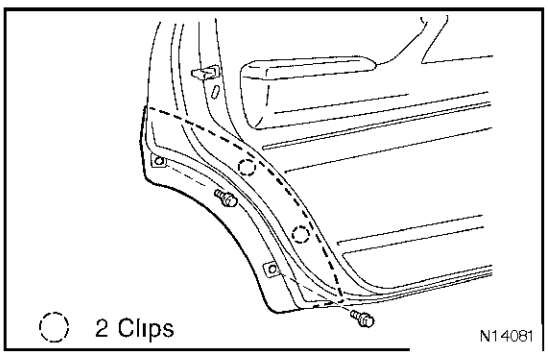
(a) Remove the charcoal canister
(b) Remove the air cleaner case assembly
(c) Remove the cool air intake duct
(d) Remove the front wheel
(e) Remove the front mudguard
(f) Remove the front bumper extension




(g) Remove the 4 nuts from engine room inside service hole

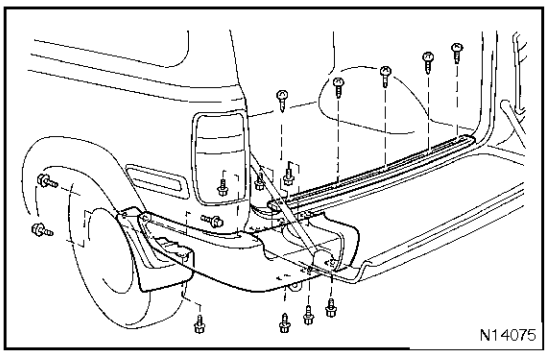



(h) Remove the 2 screws
(i) Remove the front wheel opening extension




**2. REAR DOOR SIDE:**
**REMOVE REAR WHEEL OPENING MOULDING**

Remove the 2 bolts and moulding




**3. REMOVE REAR WHEEL OPENING MOULDING**

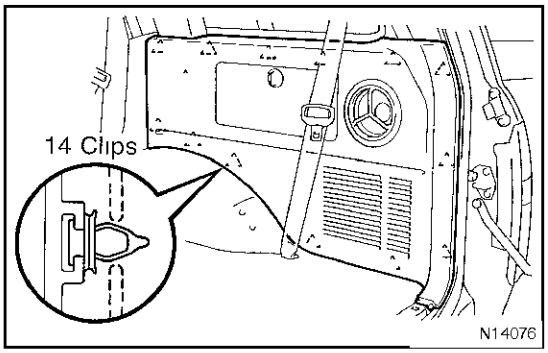
(a) Remove the mud guard, bumper extention and back door scuff plate



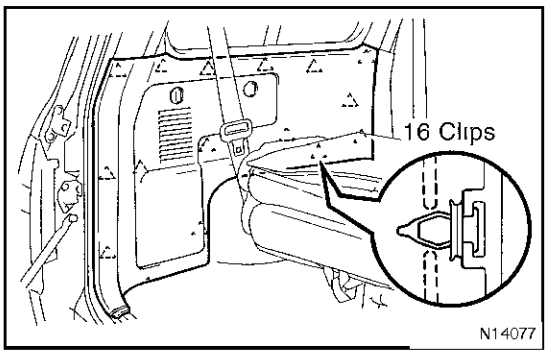
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

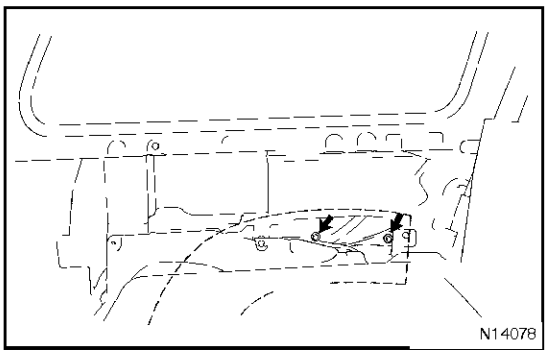





(b) Remove the quarter trım RH

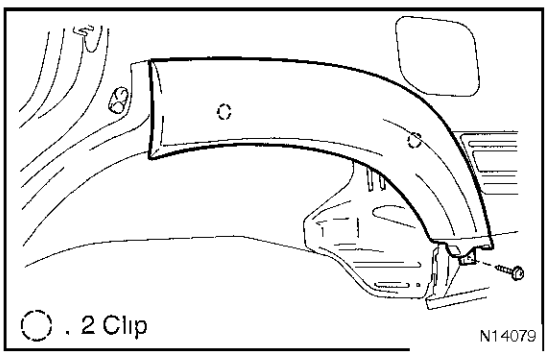



(c) Remove the quarter trım LH

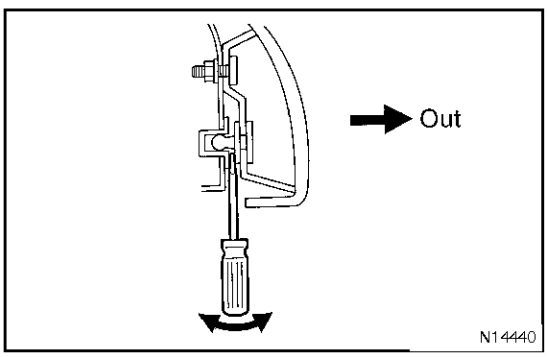



**4. REMOVE QUARTER OUTSIDE MOULDING**

(a) Remove the 2 nuts




(b) Remove the screw




(c) Usıng a screwdrıver, pry out the rearwheel moulding



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

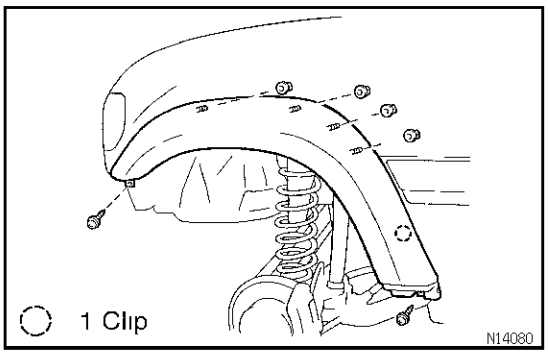


BO48Q 01

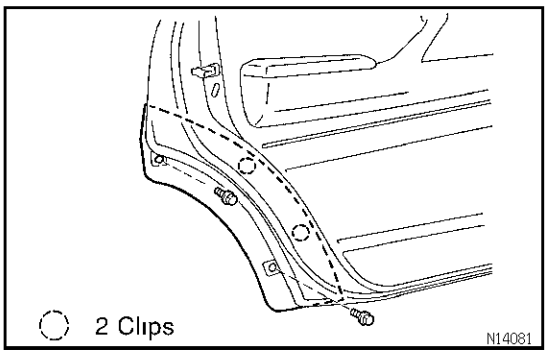
# INSTALLATION

## 1. INSTALL FRONT WHEEL OPENING MOULDING

(a) Install the front wheel opening moulding

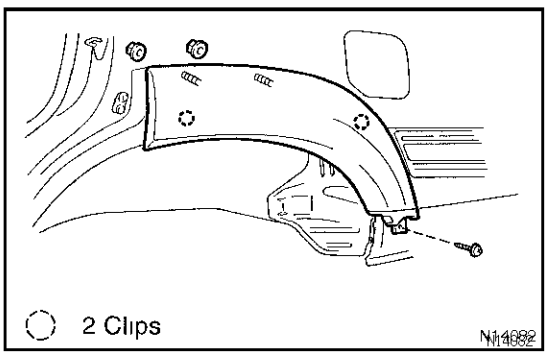



(b) Install the 4 nuts from the service hole of the engine room inside
(c) Install the 2 screws
(d) Front bumper extension
(e) Front mudguard
(f) Front wheel
(g) Cool air intake duct
(h) Air cleaner case assembly
(i) Charcoal canister




## 2. INSTALL QUARTER OUTSIDE MOULDING

Install the quarter outside moulding with the 2 bolts




## 3. INSTALL REAR WHEEL OPENING MOULDING

(a) Install the rear wheel opening moulding with the 2 nuts
(b) Install the screw
(c) Install the quarter trim LH
(d) Install the quarter trim RH
(e) Install the back door scuff plate
(f) Install the rear bumper extension
(g) Install the rear mudguard



Brought to you by BirfMark
Version 1.11 - 03/16/2010

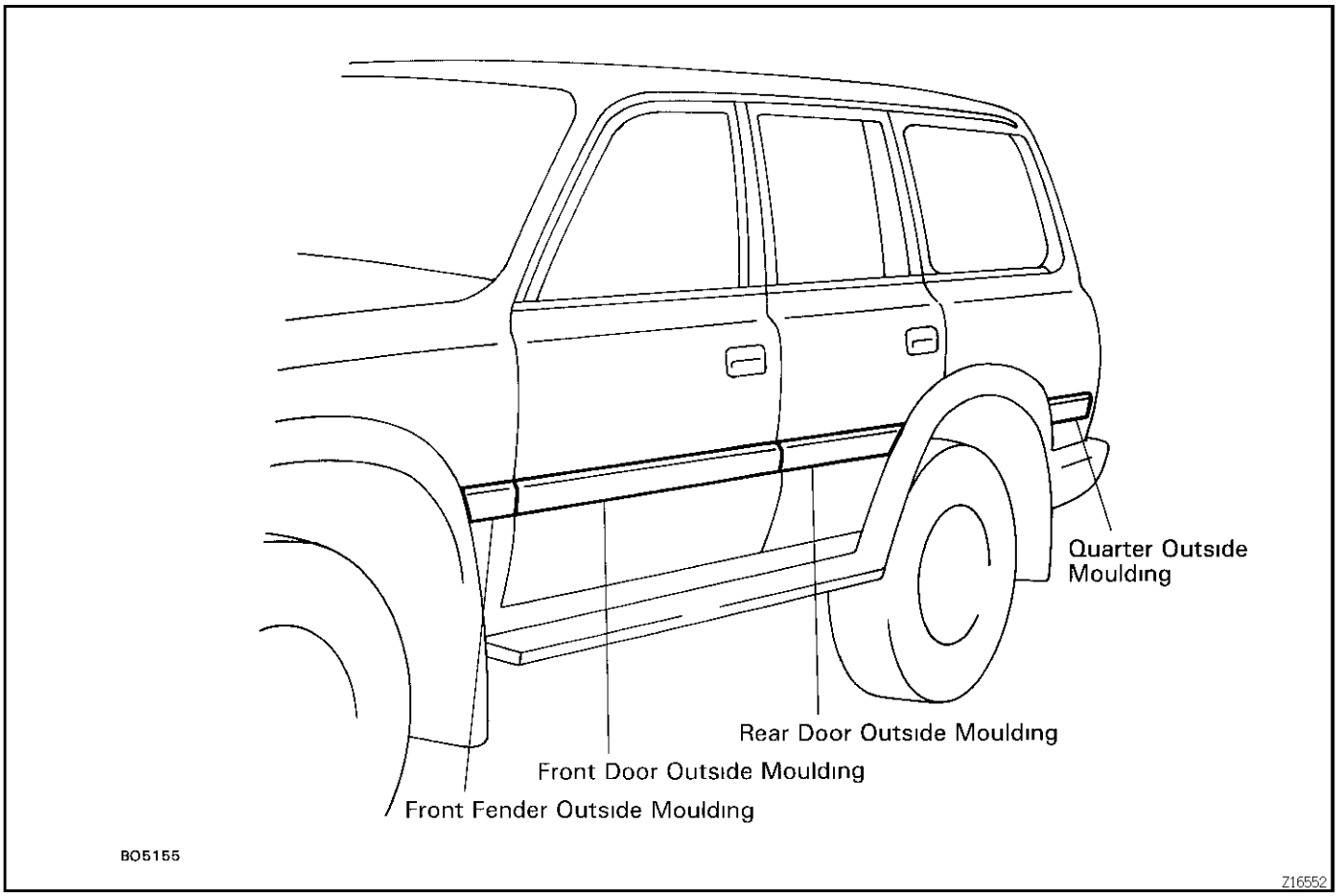
Brought to you by BirfMark



# SIDE PROTECTION MOULDING

BC88H 01

## COMPONENTS



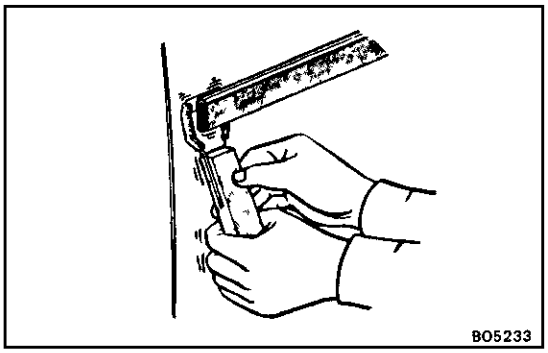



Author : Date : 1275
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC08 01



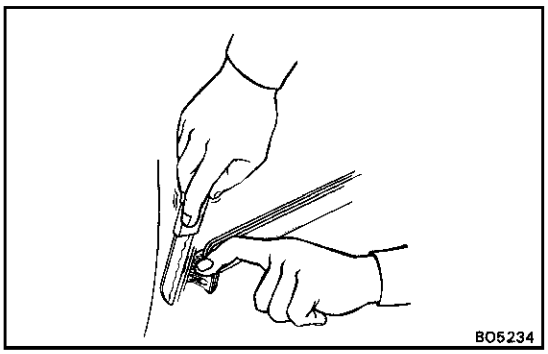

# REMOVAL

## 1. REMOVE ENDS OF MOULDING

Using a scraper, pry the moulding loose about 30 mm (1 18 in ) from the ends

HINT

Tape the scraper tip before use




## 2. REMOVE MOULDING AND ADHESIVE

(a) Pull off the moulding by cutting the adhesive with a knife

(b) Scrape off adhesive from the body with a cutter or sand-paper

**NOTICE:**

**Remember that 30–80 mm (1.18–3.15 in.) of the ends of the moulding are glued tightly with a strong adhesive.Do not reuse moulding.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



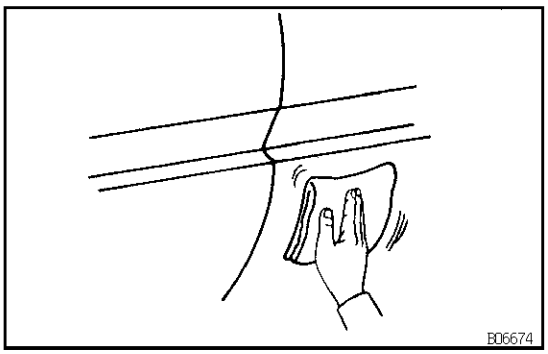
BO68J–01

# INSTALLATION

HINT

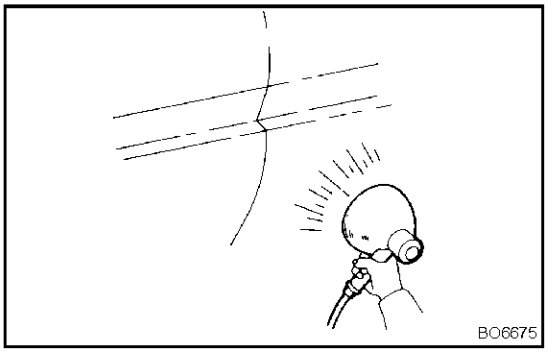
Precautions for storing moulding materials

- Store in cool place, avoiding direct sunlight, high temperature and dust
- The moulding is of polyvinyl chloride, so do not allow it to come in contact with thinner or other solvent, open flame, or boiling water
- The storage time for the moulding and adhesive are limited to about 9 months




**1. CLEAN MOULDING MOUNTING SURFACE**

Wipe off stains with cleaner

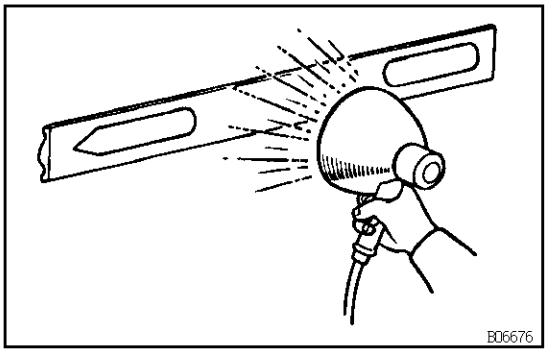



**2. HEAT BODY MOUNTING SURFACE**

Using a heat light, heat the body mounting surface to 30–50 °C (86–122 °F)

**NOTICE:**

**When the moulding is installed, the temperature of the mounting surface should be 20 °C (68 °F) or higher.**




**3. HEAT MOULDING**

(a) Using a heat light, heat the moulding to 30–60 °C (86–140 °F)

**NOTICE:**

**Do not heat the moulding excessively.**

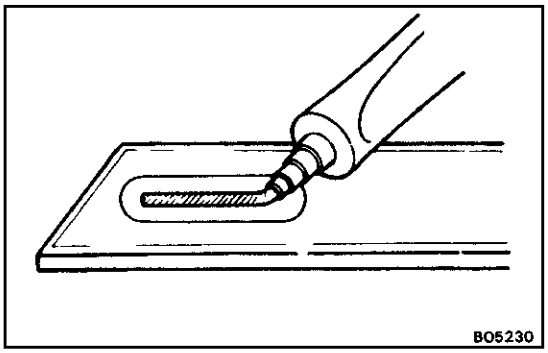
(b) The temperature should not be higher than 80 °C (176 °F)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**4. APPLY ADHESIVE TO MOULDING**

Apply adhesive to both punched out ends of the moulding

**NOTICE:**

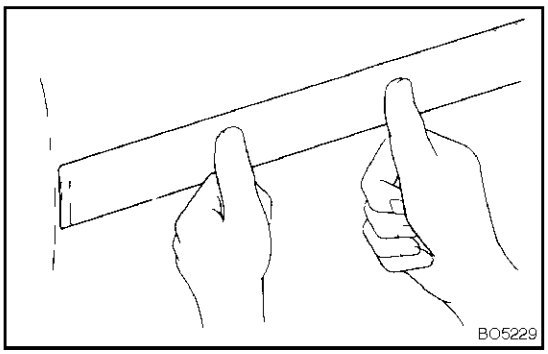
**Install the moulding within 7 minutes after applying the adhesive.**

**Part No. 08850-00051**

**5. LIFT MOULDING RELEASE SHEET FROM FACE OF MOULDING**

**NOTICE:**

**When the moulding release sheet is removed, be sure that no dirt or dust can get onto the uncovered area.**




**6. INSTALL MOULDING**

Push the moulding to the body, as shown in the illustration

**NOTICE:**

- **Be sure that the body and moulding are heated to the proper temperature.**
- **Do not depress the adhesive-coated parts excessively but just hold them down with your thumb.**
- **Scrape off any overflowing adhesive with a plastic spatula and clean the surface with a dry rag.**
- **After installation, do not wash the vehicle for 24 hours.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

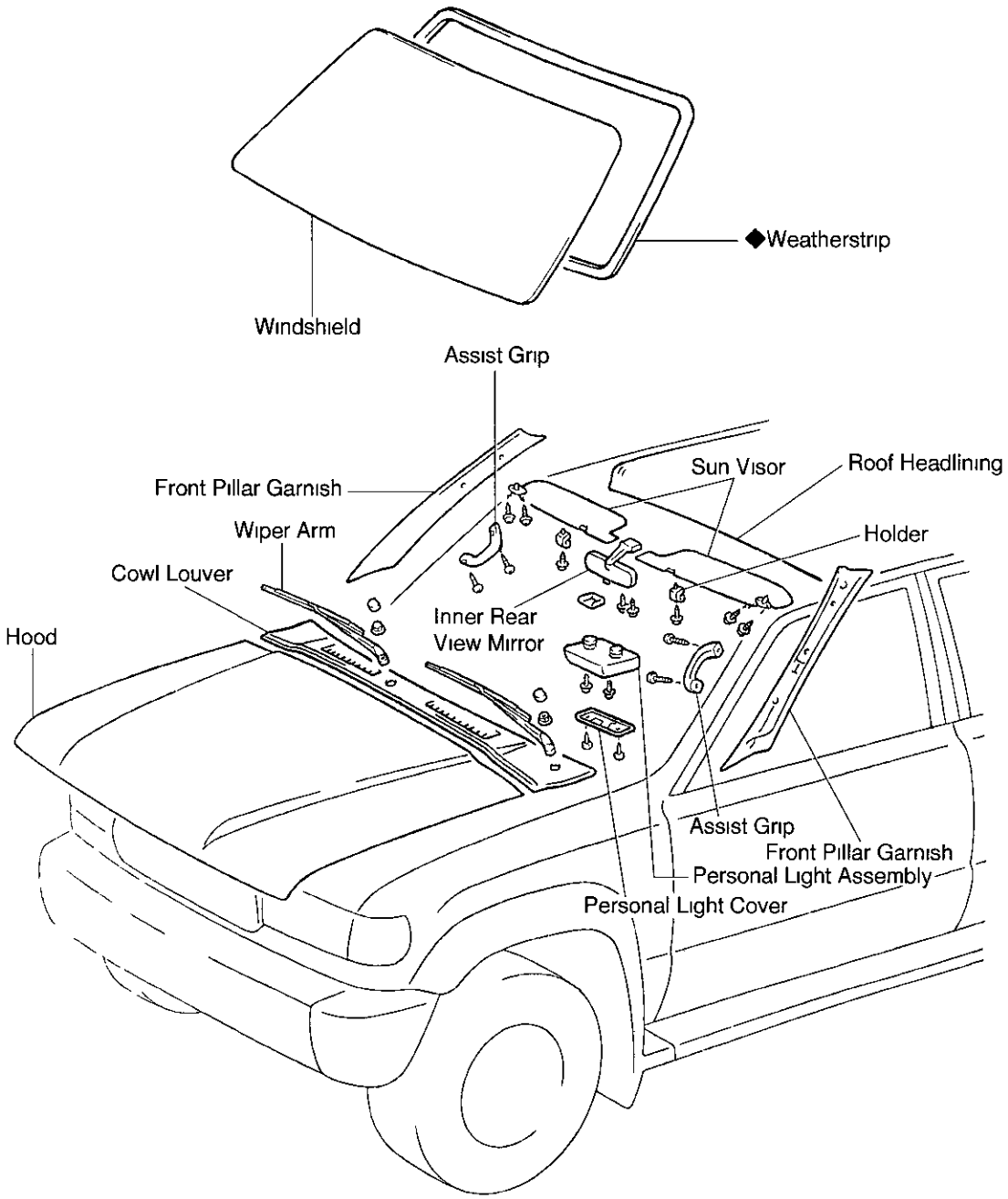
Brought to you by BirfMark



# WINDSHIELD

## COMPONENTS

BC88P-01




◆Non-reusable part

N20055



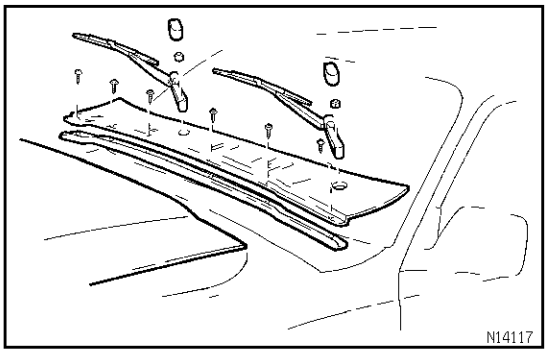
Author : Date : 1279

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

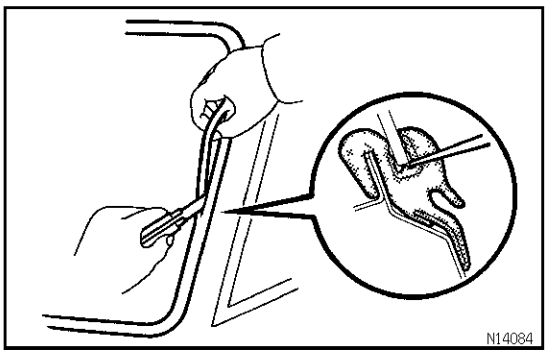


BC88Q 01




# REMOVAL

1. REMOVE HOOD
2. REMOVE WIPER ARMS
3. REMOVE COWL LOUVER
4. REMOVE INNER REAR VIEW MIRROR
5. REMOVE PERSONAL LIGHT ASSEMBLY
6. REMOVE PERSONAL LIGHT COVER
7. REMOVE SUN VISORS AND HOLDERS
8. REMOVE ASSIST GRIPS
9. REMOVE FRONT PILLAR GARNISHES
10. LOOSEN ROOF HEADLINING



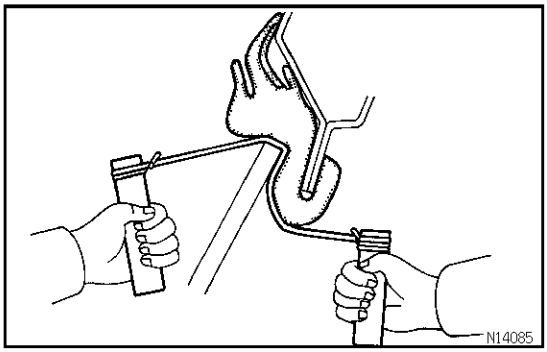

11. REMOVE WINDSHIELD GLASS

(a) From the outside of the vehicle , cut off the weatherstrip

**NOTICE:**

**Do not damage the body and the glass.**

(b) Push piano wire through between the body and glass from the interior

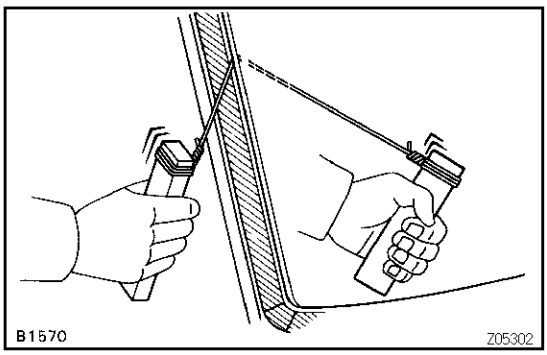



(c) Tie both wire ends to the wooden blocks or equivalent

**NOTICE:**

**When separating, take care not to damage the paint or interior ornaments.**

**To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.**




(d) Cut the adhesive by pulling the piano wire around it

(e) Remove the glass



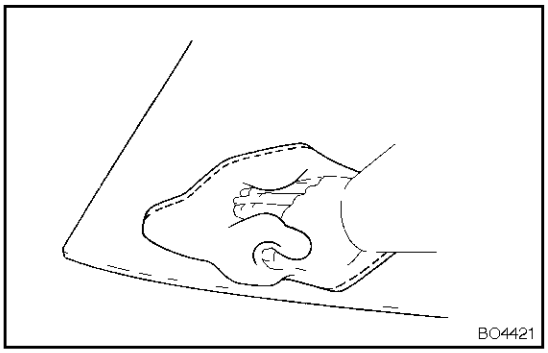
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



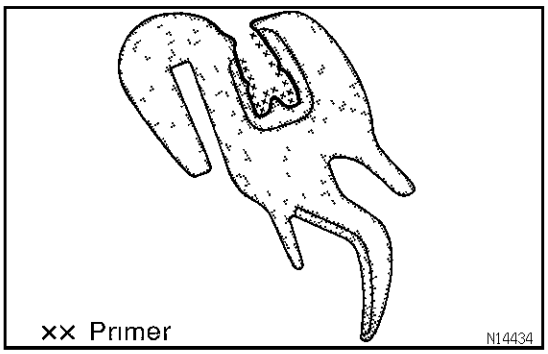
BO68R 01

# INSTALLATION




## 1. CLEAN BODY AND GLASS

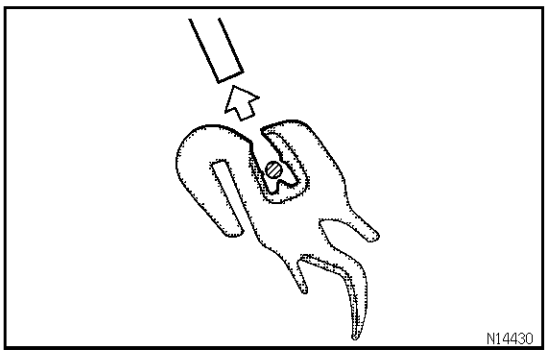
Using a cleaner, clean the weatherstrip contacting surface of the body and the glass



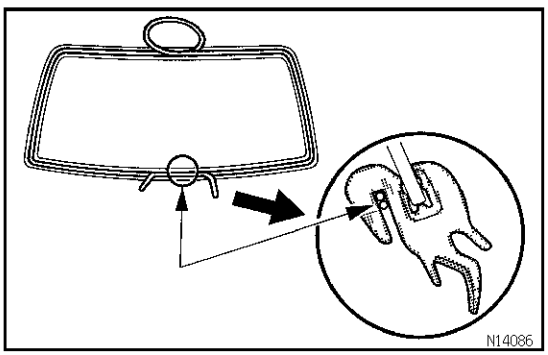

## 2. INSTALL WEATHERSTRIP

(a) Apply primer to the weatherstrip on the contact surface with glass as shown in the illustration
**PRIMER: Sunstar–9002 T or equivalent**

**NOTICE:**
**Let the primer coating dry for 3 minutes or more.**

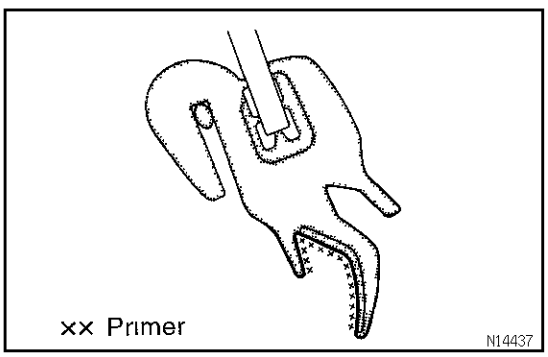



(b) Cut off the tip of the cartridge nozzle Fill the cartridge with adhesive
(c) Apply adhesive to the weatherstrip on the glass edge retaining surface as shown in the illustaration
**ADHESIVE: Sikaflex–256 HV or equivalent**
(d) Install the weatherstrip to the glass
(e) Clean the weatherstrip




## 3. INSTALL GLASS

(a) Apply a working cord along the weatherstrip groove, as shown in the illustration



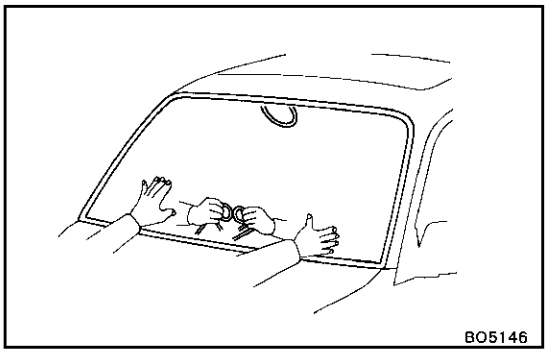

(b) Apply primer to the weatherstrip on the surface with body as shown in the illustration
**PRIMER: Sunstar–9002 T or equivalent**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

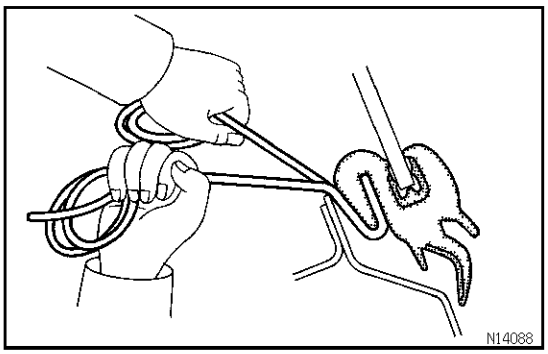
Brought to you by BirfMark



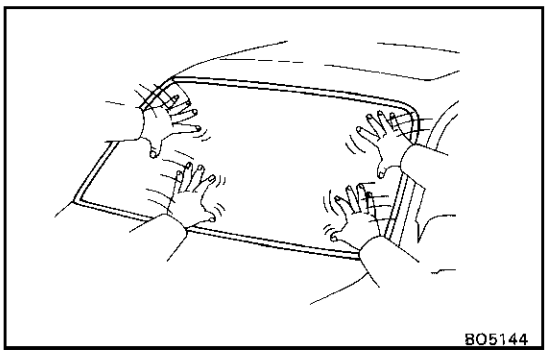



(c) Begin installation in the middle of the lower part of the glass

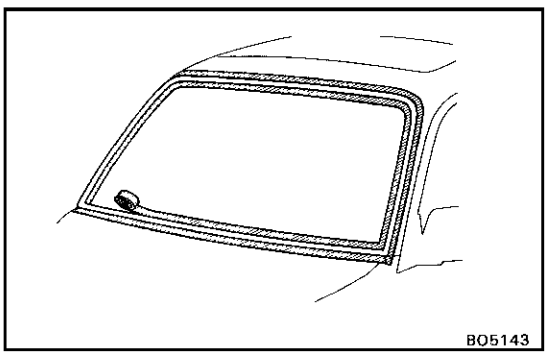
(d) Hold the glass in position on the body




(e) From the inside, pull off one cord at an angle so it pulls the lip over the flange From the outside, press the glass along the weatherstrip until the glass is installed

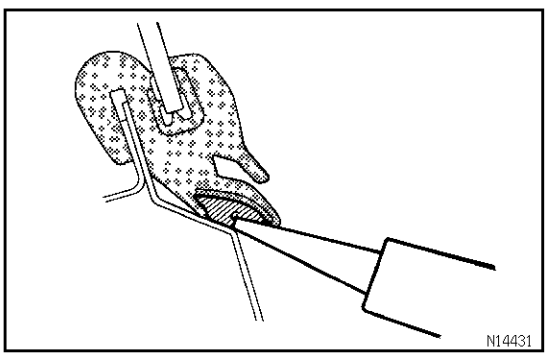



(f) To make the glass fit snugly, tap from the outside with your open hand




**4. APPLY ADHESIVE**

(a) Put masking tape around the weatherstrip to protect the paint and the glass




(b) Cut off the tip of the cartridge nozzle Fill the cartridge with adhesive

(c) Lift the lip of the weatherstrip (with hand) land and fill adhesive into the clearance

**ADHESIVE: Sikaflex-256HV or equivalent**

**5. CLEANING SEALER SURFACE**

(a) Apply auto glass sealer dry, remove the masking tape

HINT

The auto glass sealer will harden in about 15 hours



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) Clean off the sealer oozing out from the masking tape with a clean rag saturated in cleaner

**6. INSPECT FOR LEAKS AND REPAIR**

(a) Do a leak test

(b) Seal any leaks with auto glass sealer
**Part No. 08833–00030 or equivalent**

**7. INSTALL ROOF HEADLINING**

**8. INSTALL FRONT PILLAR GARNISHES**

**9. INSTALL ASSIST GRIPS**

**10. INSTALL SUN VISORS AND HOLDERS**

**11. INSTALL PERSONAL LIGHT COVER**

**12. INSTALL PERSONAL LIGHT ASSEMBLY**

**13. INSTALL INNER REAR VIEW MIRROR**

**14. INSTALL COWL LOUVER**

**15. INSTALL WIPER ARMS**
**Torque: 20 N·m(205 kgf·cm, 15 ft·lbf)**

**16. INSTALL HOOD**
**Torque: 18 N·m(185 kgf·cm, 13 ft·lbf)**

**17. ADJUST HOOD (See page BO–6)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

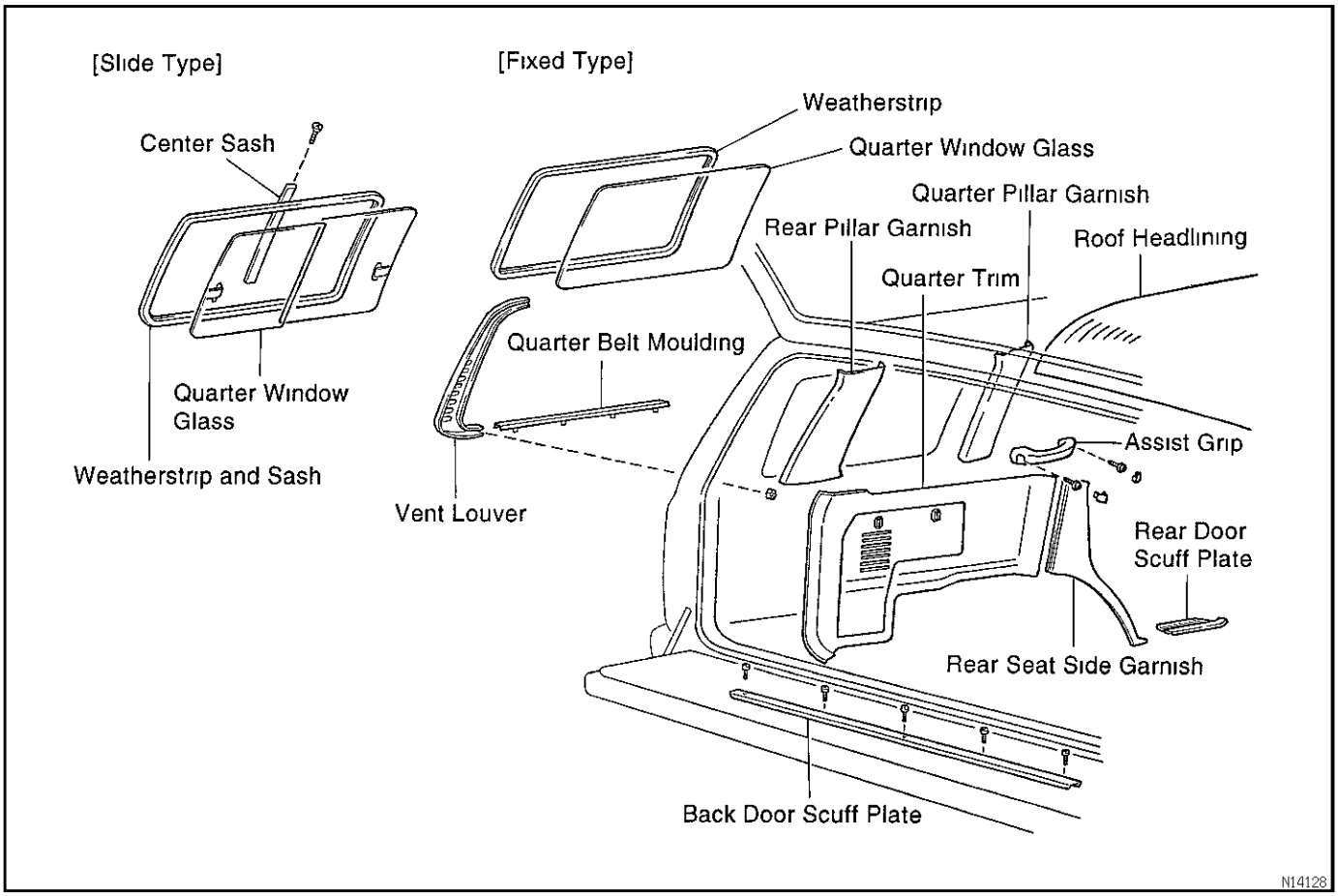
Brought to you by BirfMark



# QUARTER WINDOW GLASS

## COMPONENTS

BC88S-01



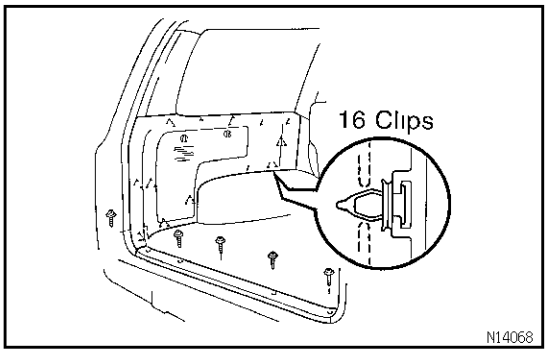



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

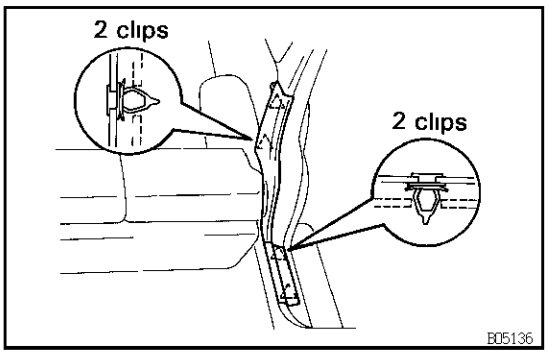


BC08T 01

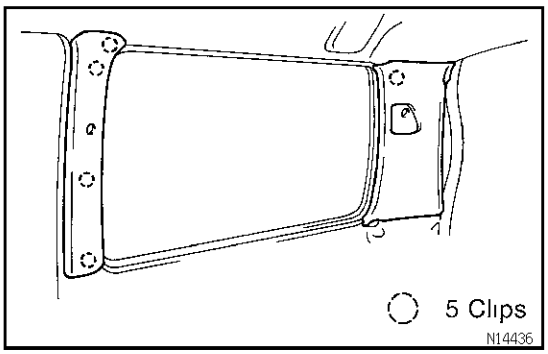



# REMOVAL

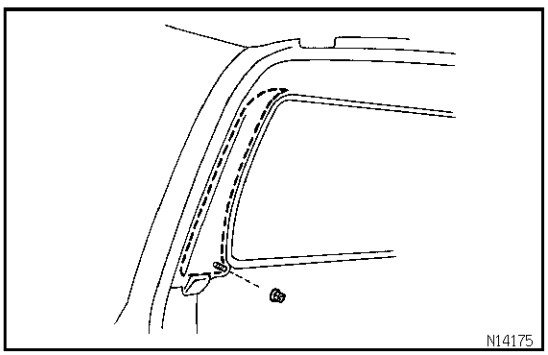
1. w/ No. 2 rear seat:
   NO. 2 REAR SEAT
2. REMOVE BACK DOOR SCUFF PLATE
3. REMOVE QUARTER TRIM




4. REMOVE REAR SEAT SIDE GARNISH
5. REMOVE REAR DOOR SCUFF PLATE

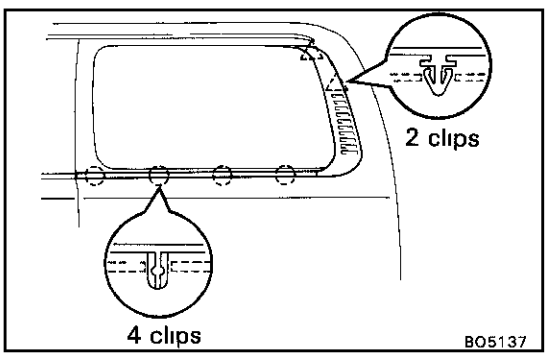



6. REMOVE QUARTER PILLAR GARNISH
7. REMOVE REAR PILLAR GARNISH
8. REMOVE ASSIST GRIPS
9. LOOSEN ROOF HEADLINING




10. REMOVE VENT LOUVER AND QUARTER BELT MOULDING

(a) Remove the nut from the vent louver




(b) Insert a screwdriver between the retainers and body to pry it loose

HINT

Tape the screwdriver tip before use

(c) Pull out the vent louver

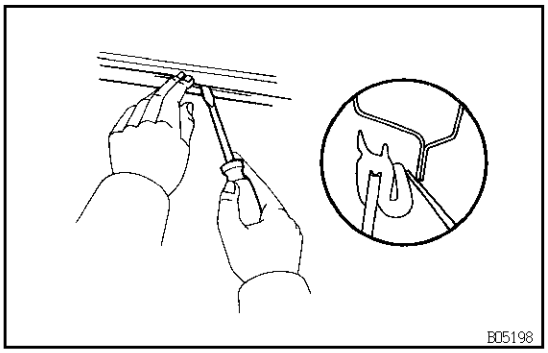
(d) Pull out the clips from the edge of the panel, and remove the moulding

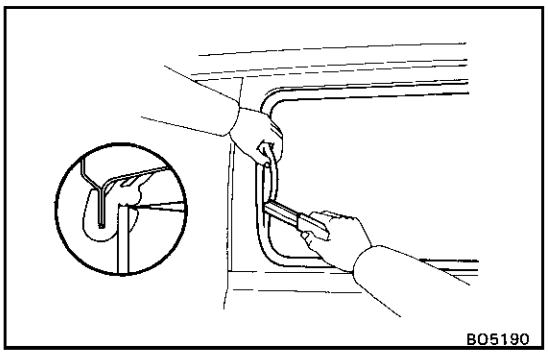


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**11. If reusing the weatherstrip:**
**REMOVE QUARTER WINDOW GLASS**

(a) Using a screwdriver loosen the weatherstrip from the body

**NOTICE:**

**Be careful not to damage the body.**

(b) Pry the lip of the weatherstrip outward from the interior part of the body flange

(c) Pull the glass outwards and remove it with the weatherstrip

**12. If using a new weatherstrip:**
**REMOVE QUARTER WINDOW GLASS**

(a) From outside of the vehicle, cut off the weatherstrip lip with a knife

**NOTICE:**

**Do not damage the body and the glass.**

(b) Push the glass outwards and remove the glass

(c) Remove the remaining weatherstrip

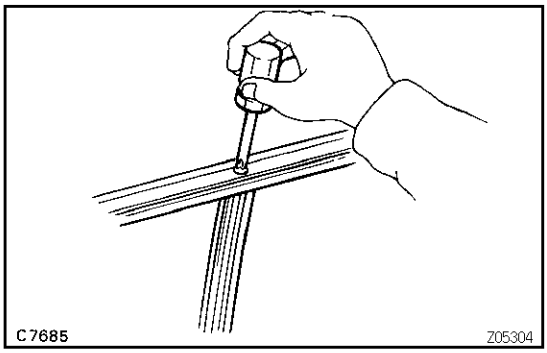


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



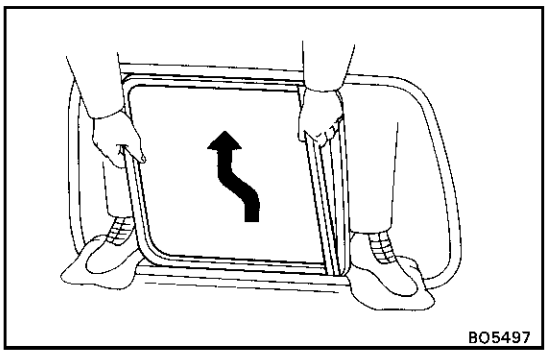
BC68U 01




# DISASSEMBLY

1. **Slide Type:**
   **REMOVE CENTER SASH**

Remove the screw and weatherstrip




2. **REMOVE QUARTER WINDOW GLASS**

Pull up the sash and remove the 2 glasses

3. **REMOVE QUARTER WINDOW GLASS RUN FROM SASH**
4. **REMOVE QUARTER WINDOW WEATHERSTRIP FROM SASH**

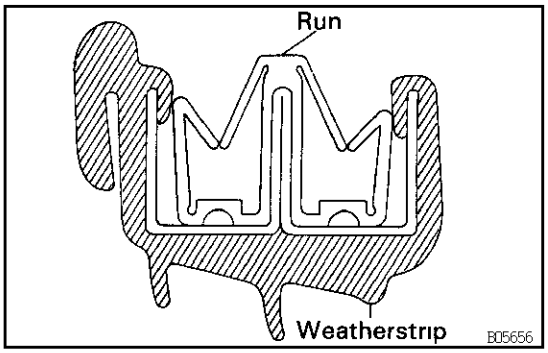


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC68V-01




# REASSEMBLY

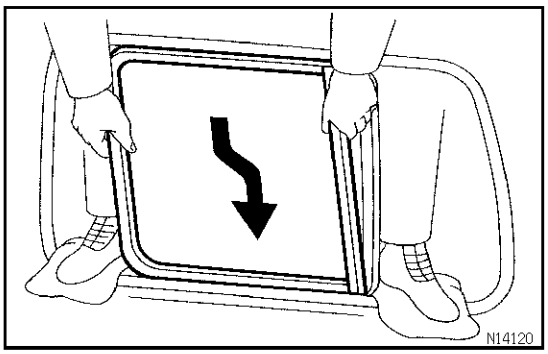
1. **Slide type:**
   **INSTALL QUARTER WINDOW WEATHERSTRIP ON SASH**

**NOTICE:**

**If the weatherstrip has hardened, it may develop leaks.**

HINT

Use a new one if possible




2. **INSTALL QUARTER WINDOW GLASS RUN**
3. **INSTALL QUARTER WINDOW GLASS**

Pull up on the sash and install 2 glasses

4. **INSTALL CENTER SASH**

Install the weatherstrip with the screw



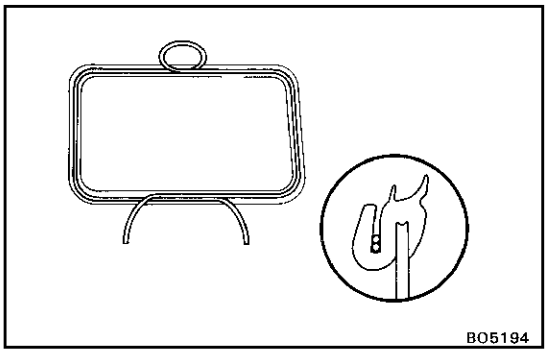
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC08W-01

# INSTALLATION



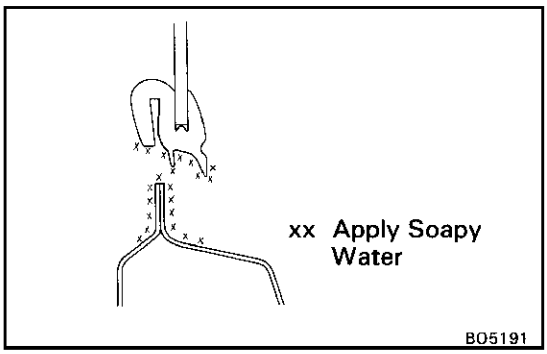

**1. INSTALL WEATHERSTRIP ON GLASS**

(a) Attach the weatherstrip to the glass

**NOTICE:**

**If the weatherstrip has hardened, it may develop leaks. Use a new one if possible.**

(b) Insert a cord into the groove of the weatherstrip all the way around with the ends overlapping

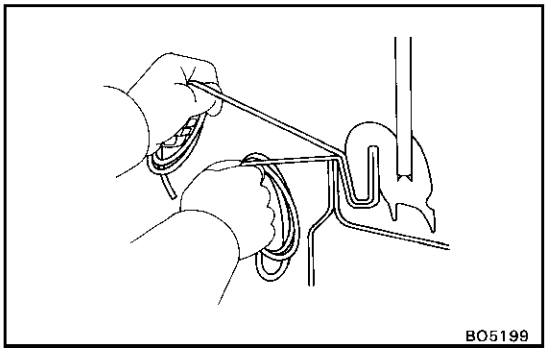



**2. INSTALL QUARTER WINDOW GLASS**

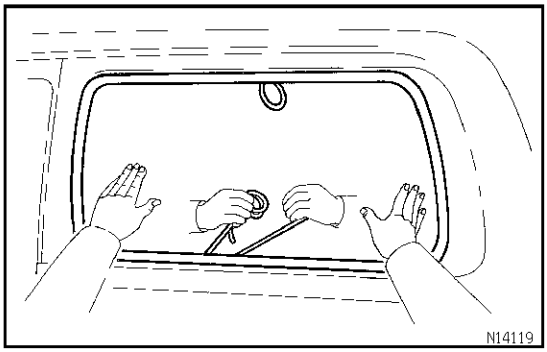
(a) Apply soapy water to contact surface of the weatherstrip lip and to the body flange

HINT

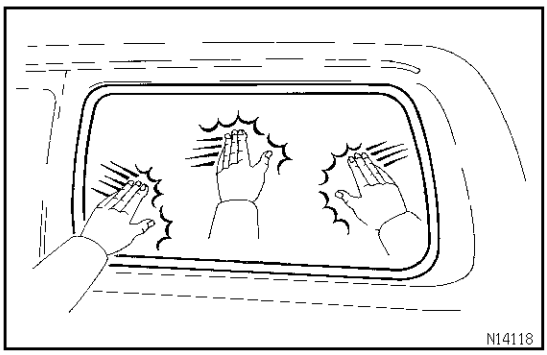
Begin installation in the middle of the lower part of the quarter window glass




(b) Hold the glass in position on the body




(c) From the inside, pull on one cord at an angle so it pulls the lip over the flange From the outside, press the glass along the weatherstrip until the glass is installed




**3. FIX IN GLASS**

To make the glass fix snugly, tap from the outside with your open hand

**4. INSPECT FOR LEAKS AND REPAIR**

(a) Do a leak test

(b) Seal any leak with auto glass sealer

**5. INSTALL ROOF HEADLINING**

**6. INSTALL ASSIST GRIPS**

**7. INSTALL REAR PILLAR GARNISH**

**8. INSTALL QUARTER PILLAR GARNISH**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



9. INSTALL REAR DOOR SCUFF PLATE
10. INSTALL REAR SEAT SIDE GARNISH
11. INSTALL QUARTER TRIM
12. INSTALL BACK DOOR SCUFF PLATE
13. w/ No. 2 Rear Seat:
    INSTALL NO. 2 REAR SEAT



Brought to you by BirfMark
Version 1.11 - 03/16/2010

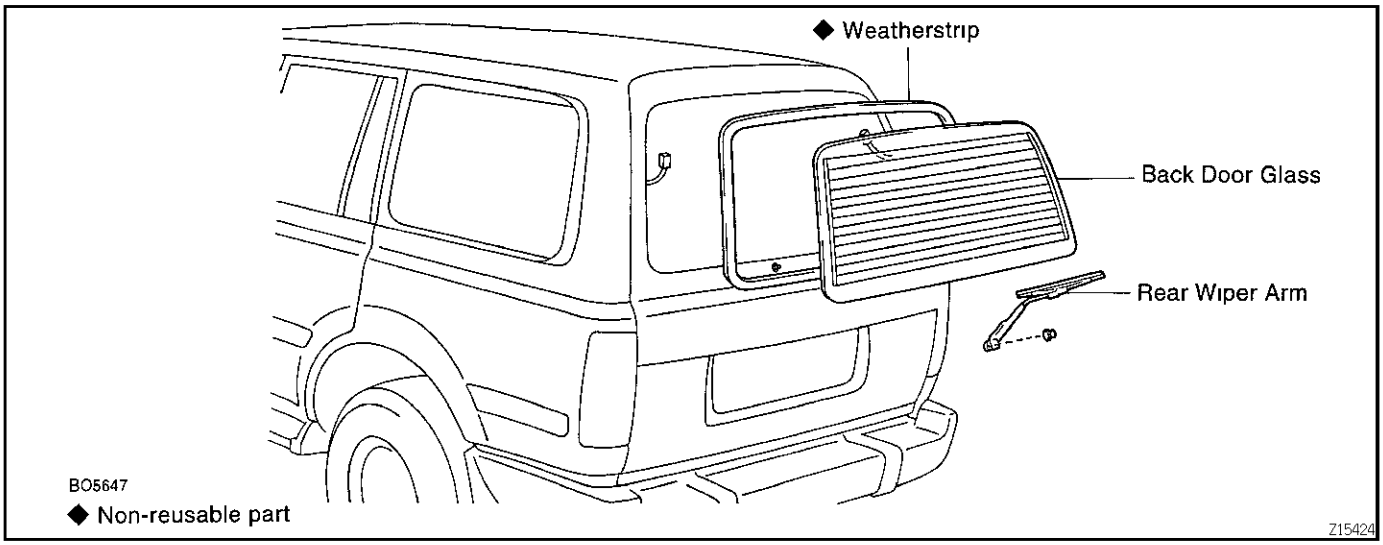
Brought to you by BirfMark



# BACK DOOR GLASS

## COMPONENTS

BO88X-01






Author : Date : 1291
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC08Y–01

# REMOVAL

**1. REMOVE WIPER ARM**

**2. REMOVE DEFOGGER CONNECTOR**

Dısconnect the connector from the glass

**3. REMOVE BACK DOOR GLASS**

HINT

Remove the glass ın the same manner as the wındshıeld



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC08Z 01

# INSTALLATION

HINT

Install the glass and weatherstrip in the same manner as the windshield

1. **CLEAN BODY AND GLASS**
2. **INSTALL WEATHERSTRIP ON GLASS**
3. **INSTALL BACK DOOR GLASS**
4. **FIX IN GLASS**
5. **APPLY ADHESIVE**
   **Part No. 08833–00030 or equivalent**
6. **CLEAN SEALER SURFACE**
7. **INSPECT FOR LEAKS AND REPAIR**
   **Part No. 08833–00030 or equivalent**
8. **CONNECT DEFOGGER WIRE CONNECTORS**

Connect the connector to the glass

9. **CONNECT WIPER ARM**
   **Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

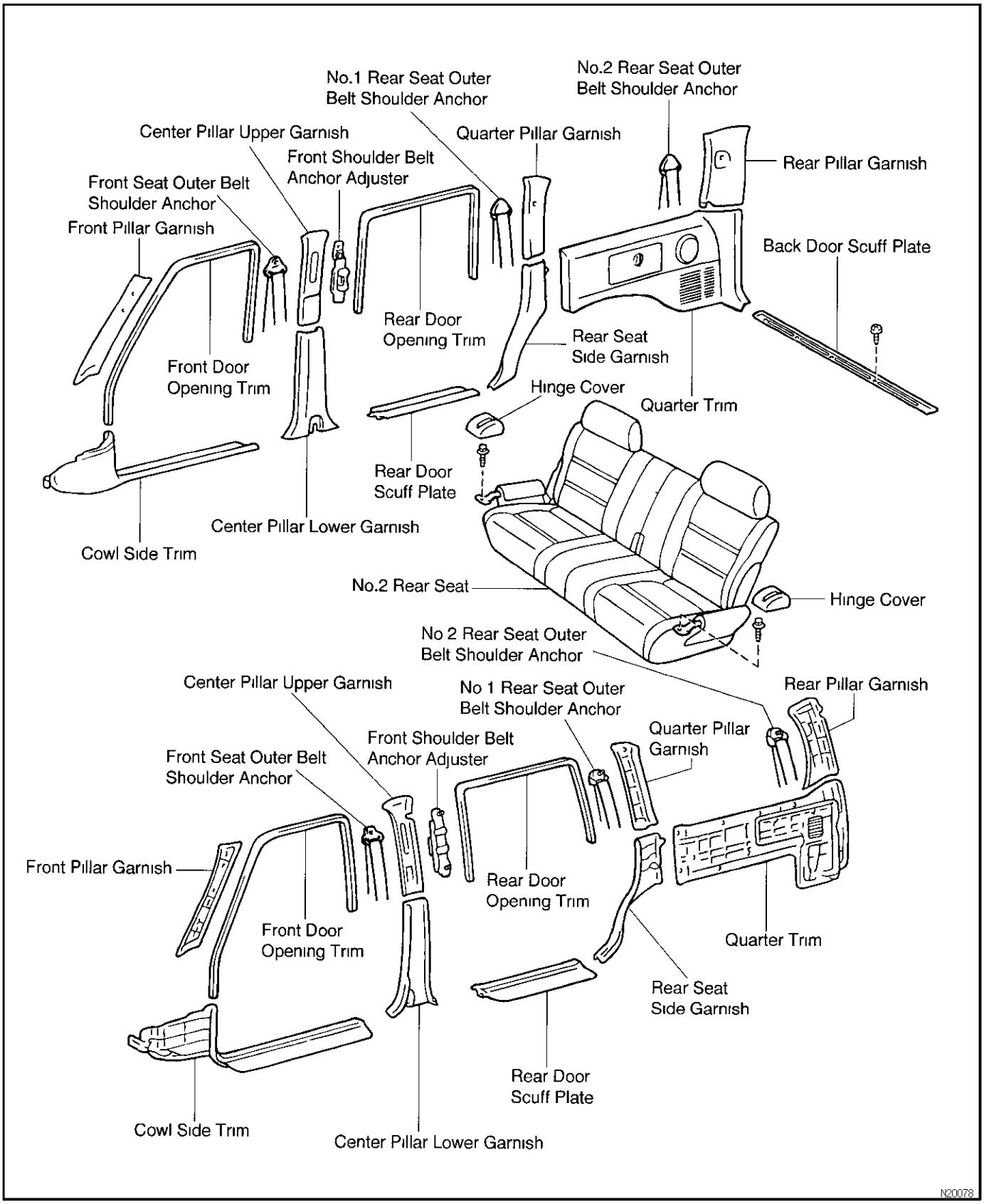
Brought to you by BirfMark



# SLIDING ROOF

## COMPONENTS

BC690-01

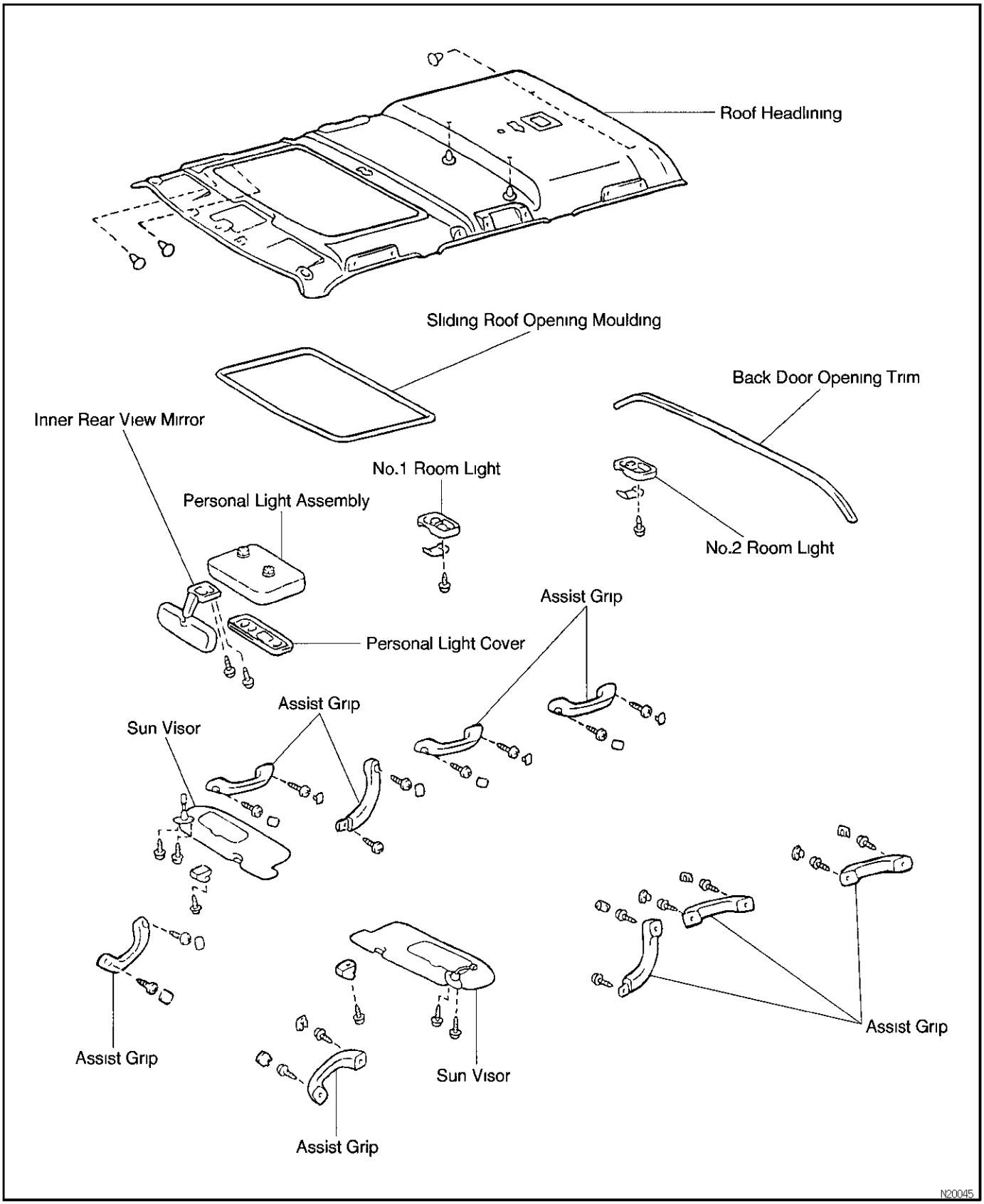





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



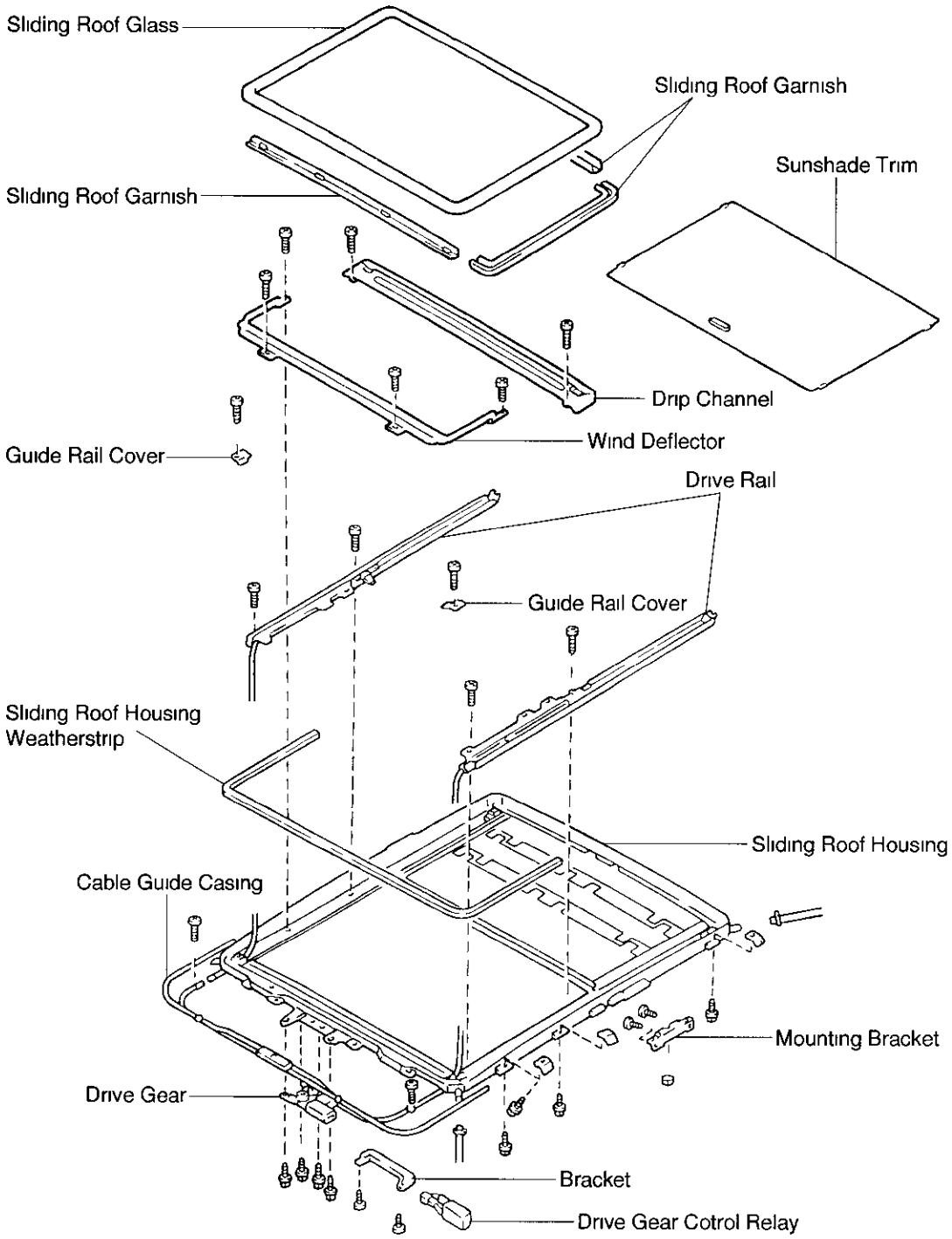





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



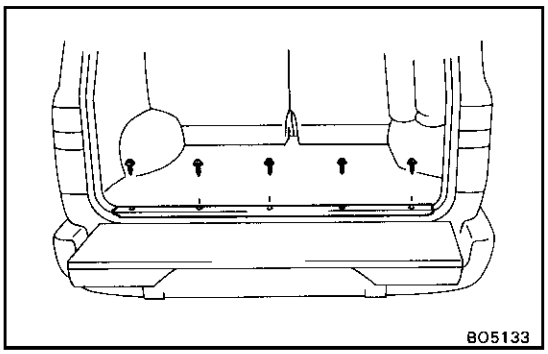
BO693-01

# REMOVAL

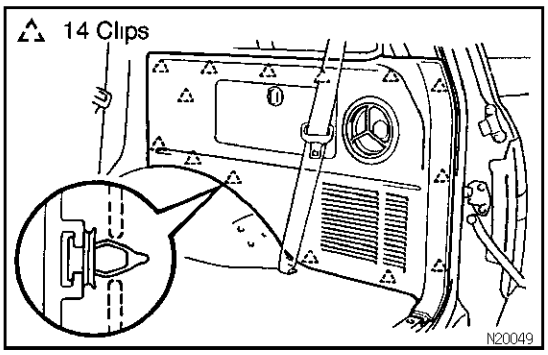
HINT

Tape the screwdriver tip before using to pry parts

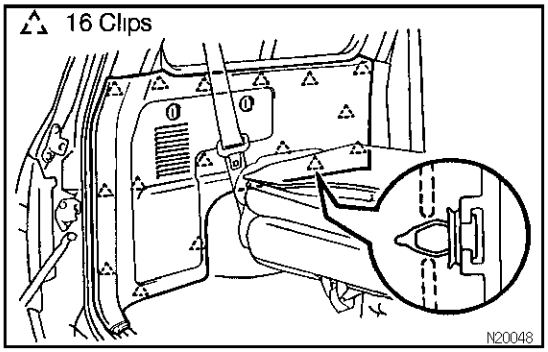
1. CHECK OPERATION TO THE SLIDING ROOF



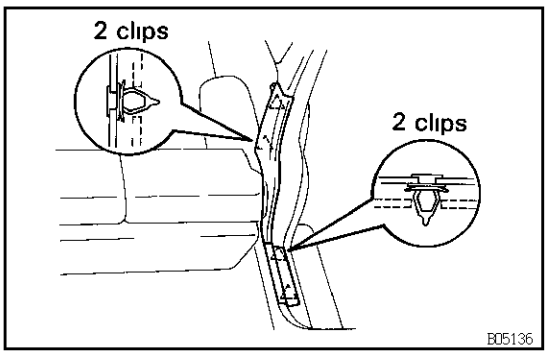

2. REMOVE BACK DOOR SCUFF PLATE
3. w/ No. 2 Rear Seat
   REMOVE NO. 2 REAR SEAT




4. REMOVE QUARTER TRIM RH




5. REMOVE QUARTER TRIM LH



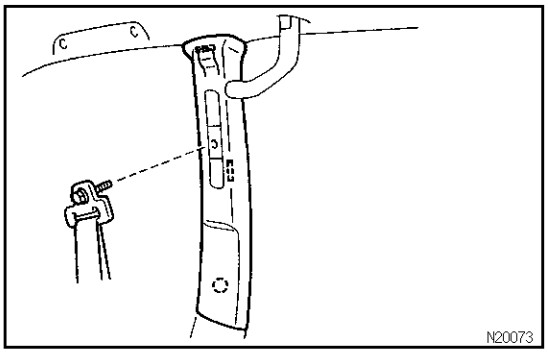

6. REMOVE REAR SEAT SIDE GARNISH
7. REMOVE REAR DOOR SCUFF PLATE
8. REMOVE COWL SIDE TRIM
9. REMOVE FRONT AND REAR DOOR OPENING TRIM
10. REMOVE CENTER PILLAR LOWER GARNISH



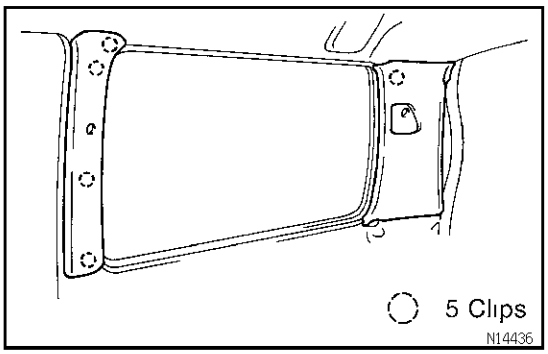
Brought to you by BirfMark
Version 1.11 - 03/16/2010

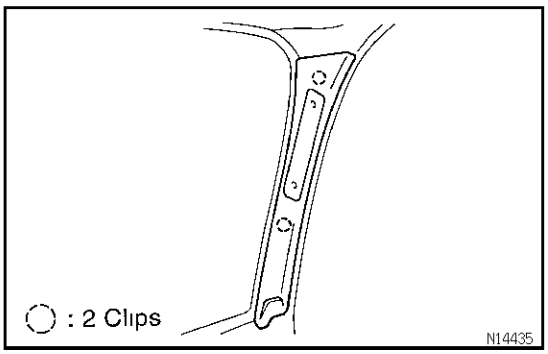
Brought to you by BirfMark



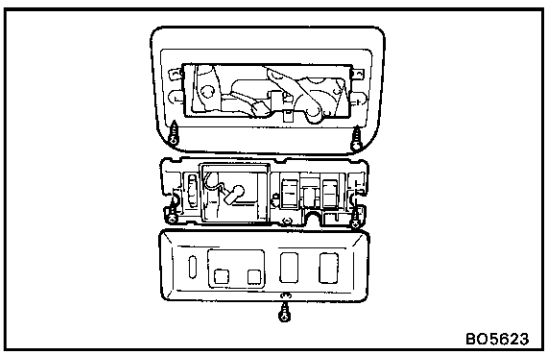



11. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR
12. REMOVE CENTER PILLAR UPPER GARNISH
13. REMOVE FRONT SHOULDER BELT ANCHOR ADJUSTER
14. REMOVE NO. 1 REAR SEAT OUTER BELT SHOULDER ANCHOR
15. w/ No. 2 Rear Seat
    REMOVE NO. 2 REAR SEAT OUTER BELT SHOULDER ANCHOR
16. REMOVE QUARTER AND REAR PILLAR GARNISH
17. REMOVE ASSIST GRIPS

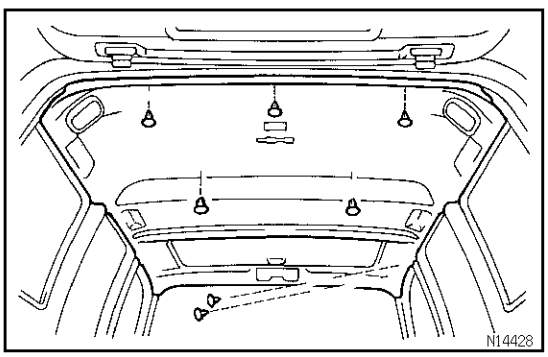



18. REMOVE FRONT PILLAR GARNISH
19. REMOVE SUN VISORS AND HOLDERS
20. REMOVE INNER REAR VIEW MIRROR
21. REMOVE PERSONAL LIGHT ASSEMBLY AND PERSONAL LIGHT COVER
22. REMOVE NO. 1 AND NO. 2 ROOM LIGHT
23. REMOVE BACK DOOR OPENING TRIM
24. REMOVE SLIDING ROOF OPENING MOULDING




25. REMOVE CONTROL SWITCH
(a) Remove the screw
(b) Using a screwdriver, remove the switch cover
(c) Remove the 2 screws and switch body, then disconnect the connector
(d) Remove the 2 screws and bracket



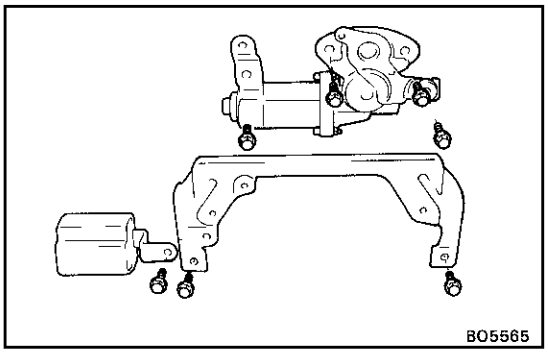

26. REMOVE ROOF HEADLINING
(a) Using the clip remover, remove the 7 clips
(b) Remove the roof headlining



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



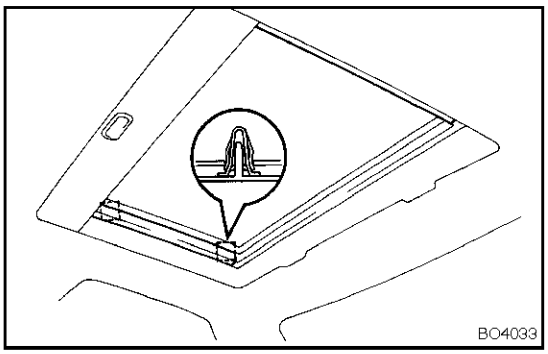



**27. REMOVE DRIVE GEAR ASSEMBLY**

(a) Remove the bolt and drive gear control relay, then disconnect the connector

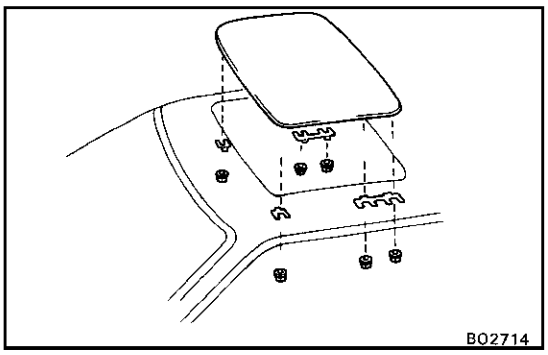
(b) Remove the 2 bolts and bracket

(c) Remove the 4 bolts and drive gear assembly, then disconnect the connector




**28. REMOVE SLIDING ROOF GARNISHES**

Using a screwdriver, pry loose the 2 clips and remove the inner side garnish



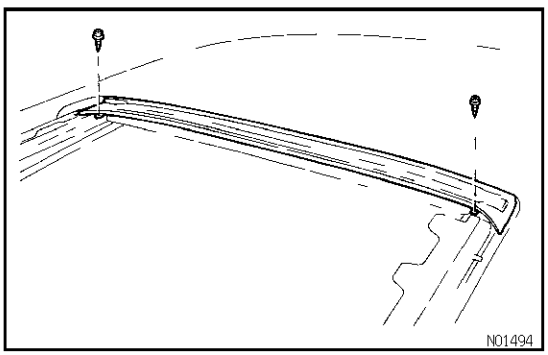

**29. REMOVE SLIDING ROOF GLASS**

(a) Remove the 6 nuts and shims

HINT

Make sure of the number of shims

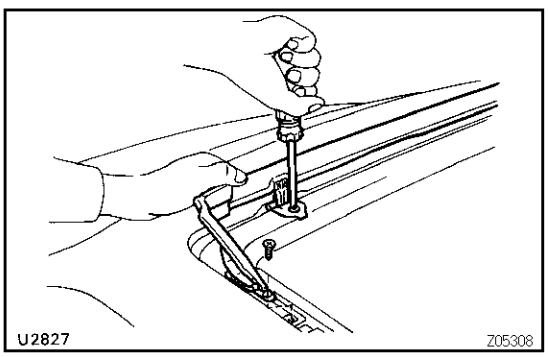
(b) Pull the glass upward to remove it




**30. REMOVE DRIP CHANNEL**

(a) Remove the 2 screws

(b) Pull the channel forwards to remove it




**31. REMOVE WIND DEFLECTOR**

Remove the 4 screws and wind deflector

**32. REMOVE SLIDING ROOF HOUSING**

(a) Disconnect the drain hose

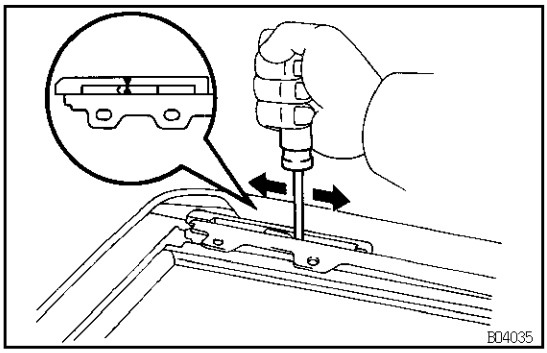
(b) Remove the 3 nuts, 12 screw and housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



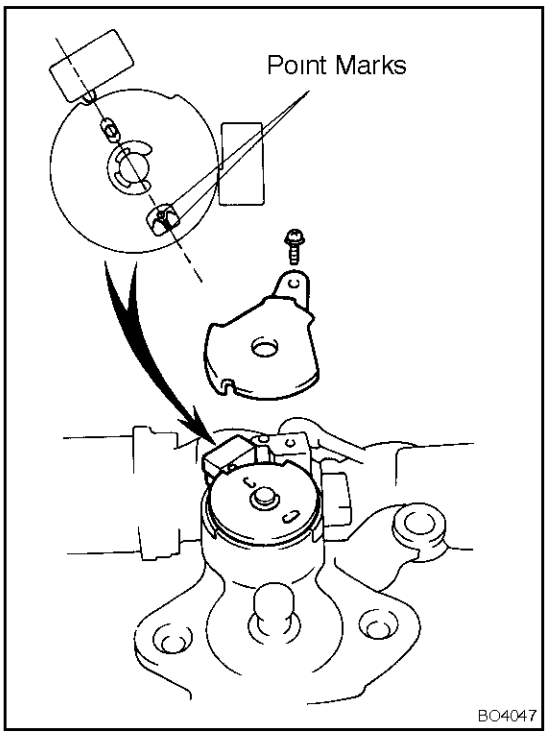



**33. ADJUST DRIVE RAIL**

HINT

Adjust the drive rail to a closed and tilted down position

Using a screwdriver, slide the link forward or backward to align the 2 marks, as shown




**34. ADJUST AND INSTALL DRIVE GEAR ASSEMBLY**

(a) Remove the screw and cam plate cover

(b) Remove the large screw, washers and shims

(c) Turn the drive shaft by screwdriver to align the housing and gear point mark, as shown

(d) Install the cam plate cover with the screw

(e) Install the drive gear assembly with 4 bolts

(f) Connect the connector

**35. INSTALL DRIVE GEAR CONTROL RELAY AND BRACKET**

(a) Install the bracket with 2 bolts

(b) Install the drive gear control relay with the bolt, then connect the connector



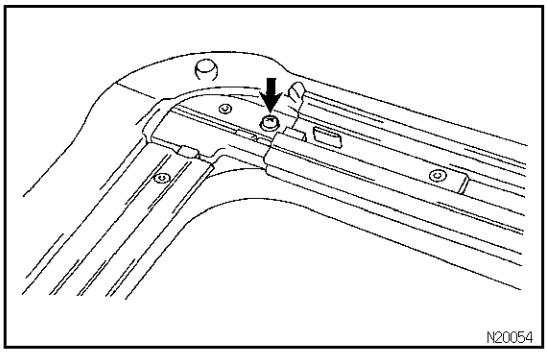
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



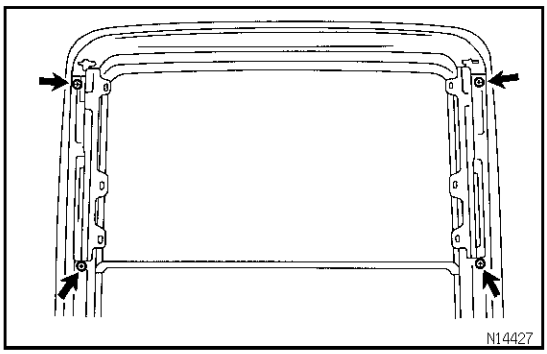
BC694 -01

# DISASSEMBLY




## 1. DISCONNECT SLIDING ROOF GUIDE RAIL AND CABLE GUIDE CASING

(a) Remove the screw and guide rail cover
(b) Remove the screw
(c) Pull out the cable guide casing




## 2. REMOVE SLIDING GUIDE RAIL

(a) Make the drive cable to the front edge
(b) Remove the 4 screws and both side drive rails
(c) Remove the sunshade trim

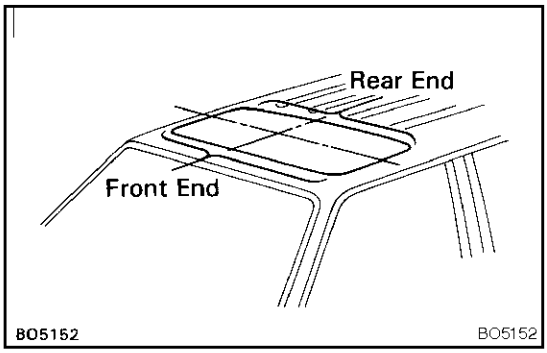


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC091-01




# INSPECTION

**1. INSPECT SLIDING ROOF GLASS ALIGNMENT**

(a) Start the engine and check the operation time of the sliding roof

**Operation time: Approx. 5 sec.**

(b) Check for abnormal noise or binding during operation

(c) With the sliding roof fully closed, check for water leakage

(d) Check for a difference in level between the sliding roof weatherstrip and roof panel

| | |
|---|---|
| Front End | 0.9 – 3.9 mm (0.035 – 0.154 in.) |
| Rear End | 0.9 – 3.9 mm (0.035 – 0.154 in.) |

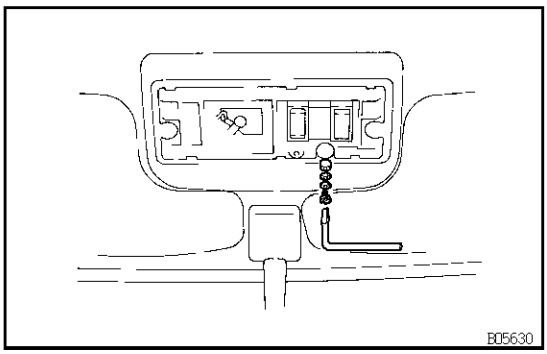
**2. If the sliding roof does not operate:**
**ADJUST SLIDING ROOF GLASS ALIGNMENT**

(a) Remove the control switch cover

(b) Remove the large screw inside

**NOTICE:**

**Be careful not to lose the spring washer or shim.**




(c) Manually operate the moon roof by inserting a special crank-shaped screwdriver into the hole and turning the drive shaft



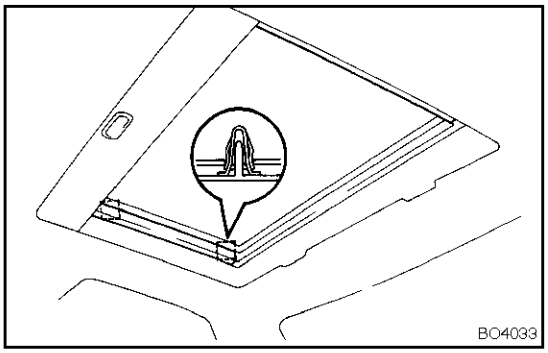
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO692-01

# ADJUSTMENT

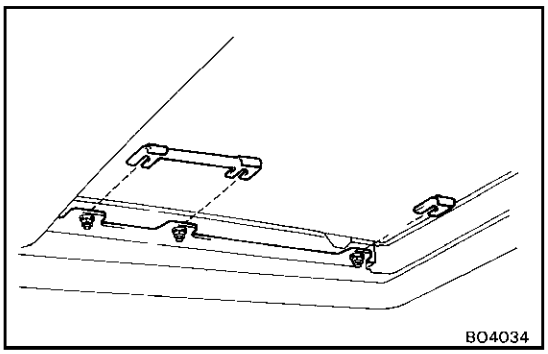



## 1. REMOVE SLIDING ROOF GARNISHES

Before making adjustments, remove the left and right sliding roof garnishes

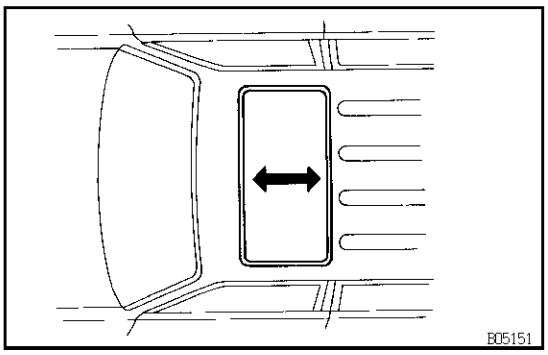
HINT

After adjustment, reinstall the sliding roof garnishes



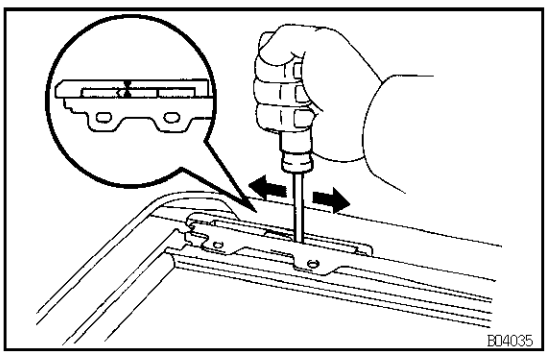

## 2. ADJUST LEVEL DIFFERENCE

Adjust by increasing or decreasing the number of shims between the bracket and sliding roof




## 3. ADJUST FORWARD OR REARWARD

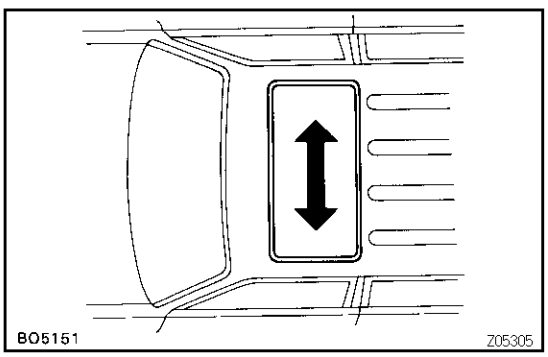
(a) Adjust by loosening the sliding roof installation nuts, and move the sliding roof bracket forwards and backwards




(b) When the front or rear alignment is not correct, remove the glass and adjust the drive rail

(c) Using a screwdriver, slide the link forwards or backwards to align the 2 marks, as shown in the illustration

(d) Slide the bracket to the forefront with your hand




## 4. ADJUST RIGHT OR LEFT

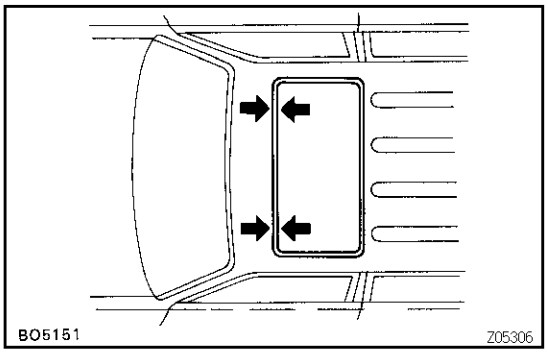
Adjust by loosening the sliding roof rear shoe installation nuts, and move the sliding roof to the right and left



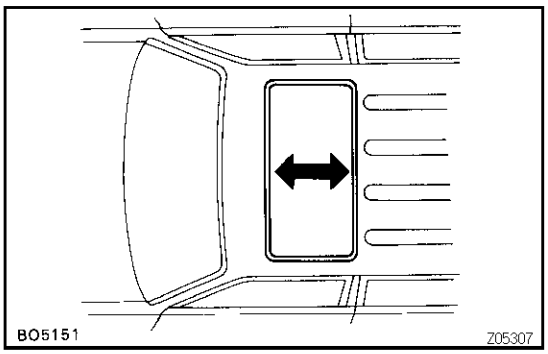
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






## 5. ADJUST LEFT/RIGHT CLEARANCE




Adjust by loosening the sliding roof installation nuts and readjust the sliding roof to the proper position



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO695-01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BO-67).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC096-01

# INSTALLATION

**Installation is in the reverse order of removal (See pageBO-63 ).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

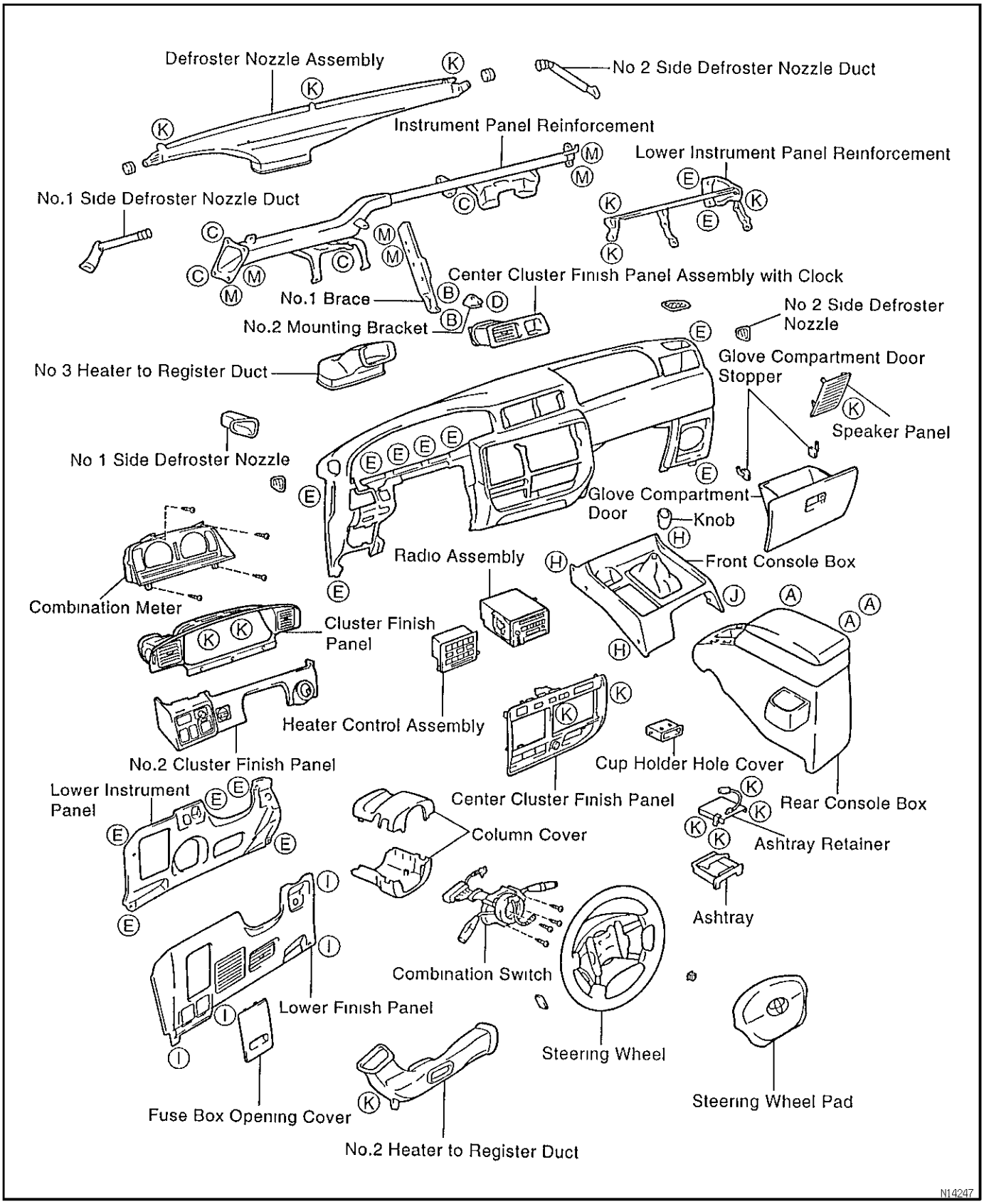
Brought to you by BirfMark



# INSTRUMENT PANEL

## COMPONENTS

BC697-01

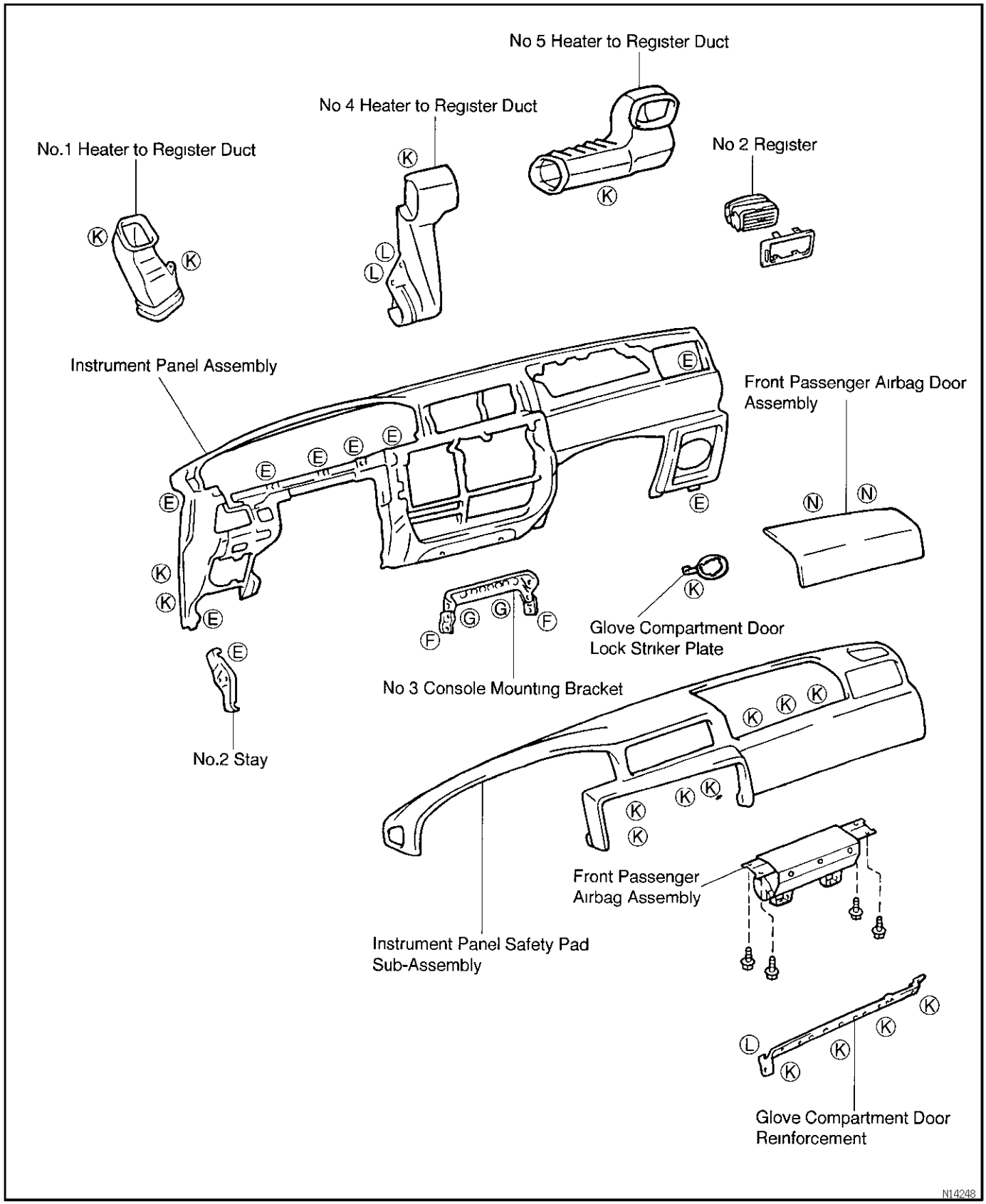





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

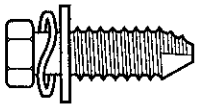
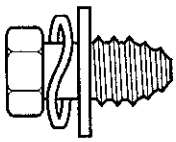
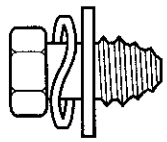
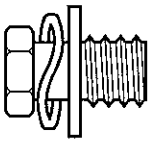
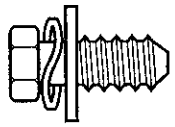
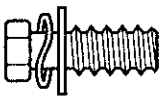
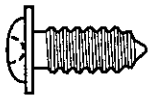
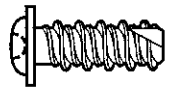
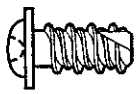
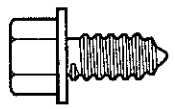
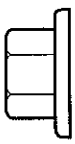
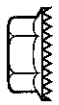
Brought to you by BirfMark



HINT

Screw shapes and size are indicated in the table below The code (A – N) correspond to those indicated on the previous page

mm (in)

| Code | Shape | Size | Code | Shape | Size | Code | Shape | Size |
|---|---|---|---|---|---|---|---|---|
| A |  | ϕ = 8 (0 31) L = 30 (1 18) | B |  | ϕ = 8 (0 31) L = 18 (0 71) | C |  | ϕ = 8 (0 31) L = 16 (0 63) |
| D |  | ϕ = 8 (0 31) L = 16 (0 63) | E | | ϕ = 6 (0 24) L = 20 (0 79) | F |  | ϕ = 6 (0 24) L = 18 (0 71) |
| G |  | ϕ = 5 (0 20) L = 18 (0 71) | H |  | ϕ = 5 (0 20) L = 16 (0 63) | I |  | ϕ = 5 (0 20) L = 18 (0 71) |
| J | | ϕ = 5 (0 20) L = 25 (0 98) | K |  | ϕ = 5 (0 20) L = 14 (0 55) | L |  | ϕ = 5 (0 20) L = 14 (0 55) |
| M |  | ϕ = 8 (0 31) | N |  | ϕ = 6 (0 24) | | | |

N14177 V06498



Brought to you by BirfMark
Version 1.11 - 03/16/2010

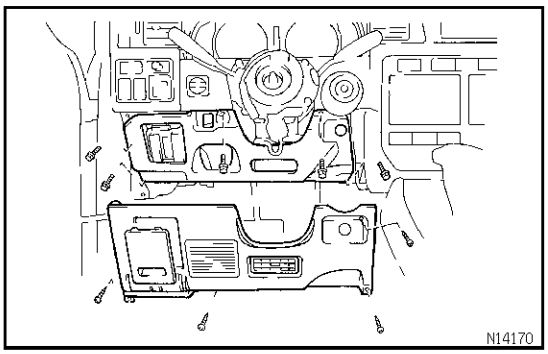
Brought to you by BirfMark



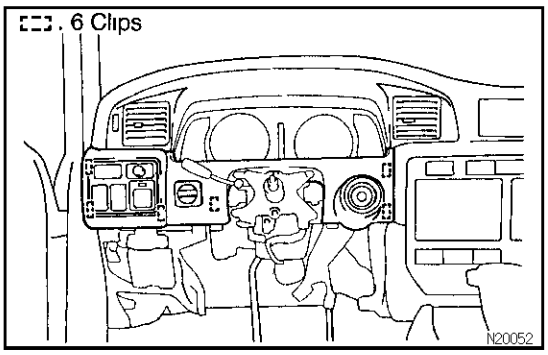
BC098-01

# REMOVAL

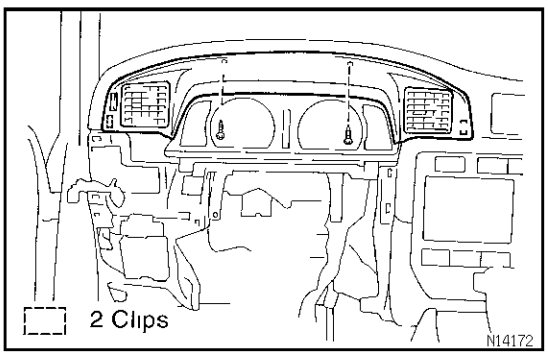
1. REMOVE STEERING WHEEL (See page SR–11)
2. REMOVE COLUMN COVER
3. REMOVE HOOD LOCK RELEASE LEVER
4. REMOVE FUEL LID RELEASE LEVER



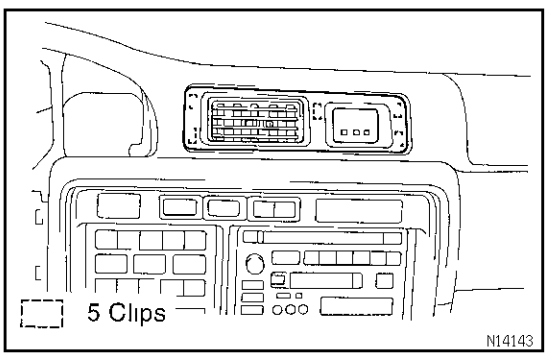

5. REMOVE FUSE BOX OPENING COVER
6. REMOVE LOWER FINISH PANEL
7. REMOVE LOWER INSTRUMENT PANEL
8. REMOVE NO. 2 HEATER TO REGISTER DUCT
9. LOOSEN DLC 3 AND FUSE BLOCK




10. REMOVE NO. 2 CENTER CLUSTER FINISH PANEL
11. REMOVE STEERING COLUMN (See page SR–11)




12. REMOVE CLUSTER FINISH PANEL
13. REMOVE COMBINATION METER



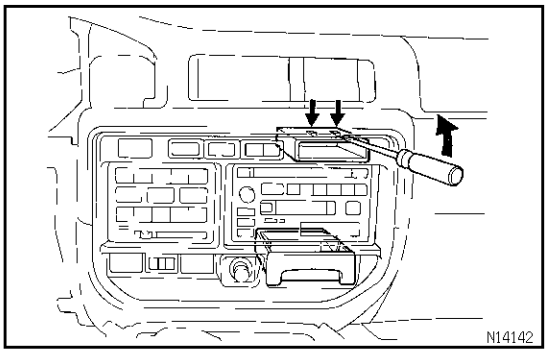

14. REMOVE CENTER CLUSTER FINISH PANEL WITH CLOCK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**15. REMOVE CENTER CLUSTER FINISH PANEL WITH HEATER CONTROL ASSEMBLY**

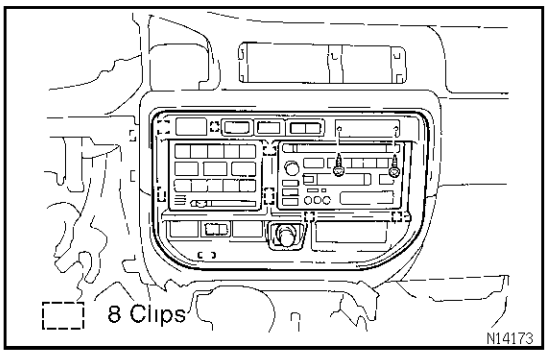
(a) Using a screwdriver, take off the 2 claws, then remove the cup holder hole cover

HINT

Tape the screwdriver tip before use

(b) Take off the ashtray

(c) Remove the center cluster finish panel with heater control assembly, then disconnect the connectors



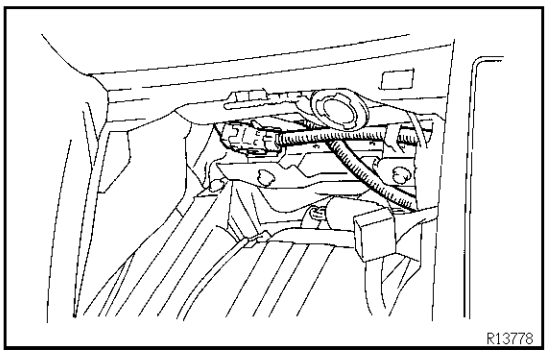

(d) Remove the 2 screws and heater control assembly from the center cluster finish panel

**16. REMOVE RADIO**

**17. REMOVE GLOVE COMPARTMENT DOOR**

**18. REMOVE SPEAKER PANEL AND SPEAKER**

**19. REMOVE FRONT AND REAR CONSOLE BOX**



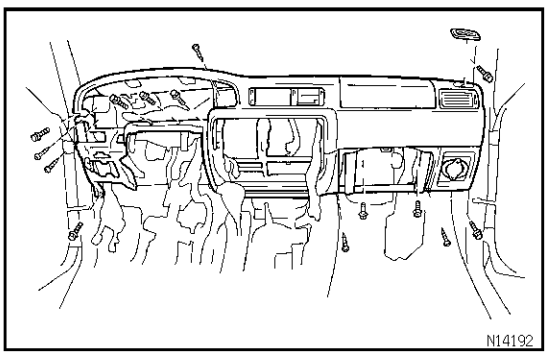

**20. DISCONNECT AIRBAG CONNECTOR**

(a) Remove the airbag connector from the airbag bracket

**NOTICE:**

**When handling the airbag connector, take care not to damage the airbag wire harness.**

(b) Disconnect the airbag connector

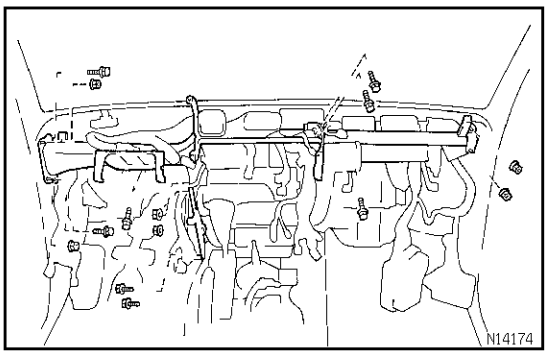



**21. REMOVE INSTRUMENT PANEL**

(a) Remove the 5 screws and 9 bolts

(b) Remove the instrument panel

**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf) for passenger airbag bolts**




**22. REMOVE INSTRUMENT PANEL REINFORCEMENT**

(a) Remove the 2 bolts and lower instrument panel reinforcement

(b) Remove the 2 bolts, 2 nuts and No 1 brace

(c) Remove the 4 bolts, 4 nuts and instrument panel reinforcement



Brought to you by BirfMark
Version 1.11 - 03/16/2010

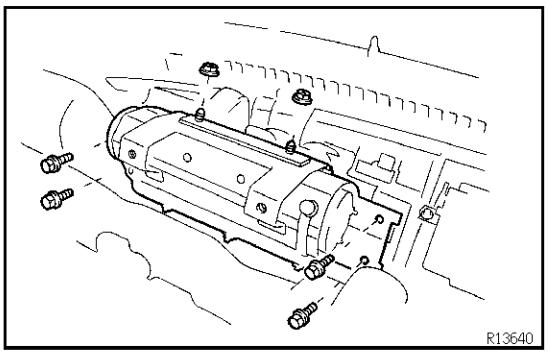
Brought to you by BirfMark



BC099-01

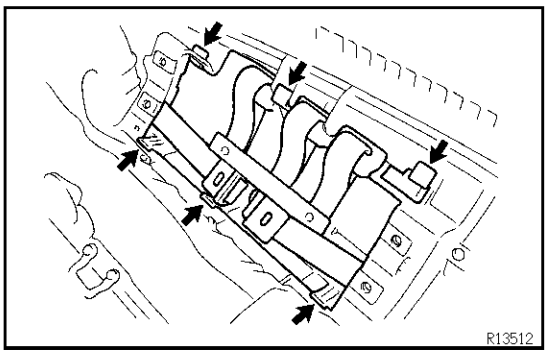
# DISASSEMBLY

1. REMOVE GLOVE COMPARTMENT DOOR REINFORCEMENT
2. REMOVE NO. 4 HEATER TO REGISTER DUCT
3. REMOVE NO. 5 HEATER TO REGISTER DUCT
4. REMOVE NO. 2 REGISTER
5. REMOVE GLOVE COMPARTMENT DOOR LOCK STRIKER PLATE




6. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY (See page RS–22)

(a) Remove the 4 bolts and 2 nuts, and remove front passenger airbag assembly




(b) Pry up the 6 clips shown in the illustration and remove the airbag door

CAUTION:

- Do not store the front passenger airbag assembly with the airbag deployment direction facing down.
- Never disassemble the front passenger airbag assembly.

7. REMOVE NO. 3 CONSOLE MOUNTING BRACKET
8. REMOVE NO. 1 HEATER TO REGISTER DUCT
9. REMOVE NO. 2 STAY



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC09A–01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BO–78).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSTALLATION

**Installation is in the reverse order of removal (See page BO-76).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

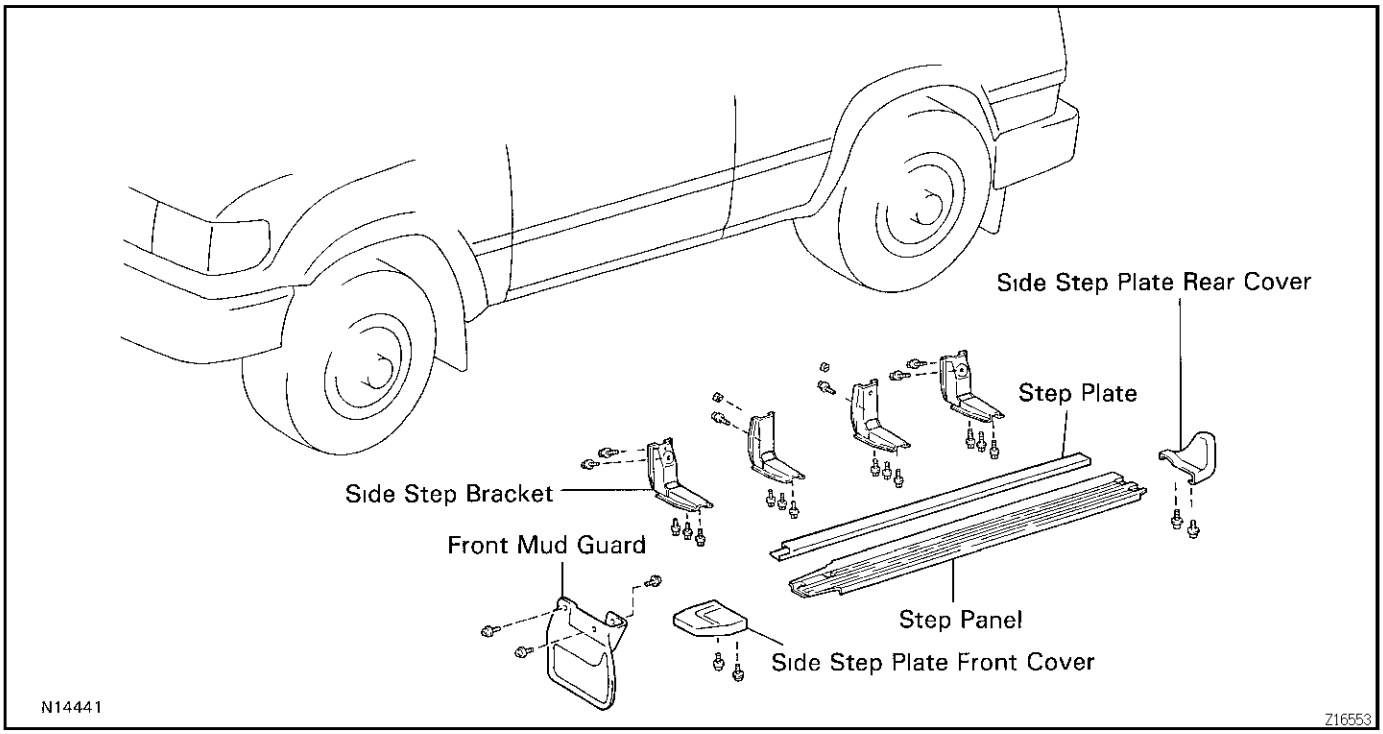
Brought to you by BirfMark



# SIDE STEP

## COMPONENTS

BC89C 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

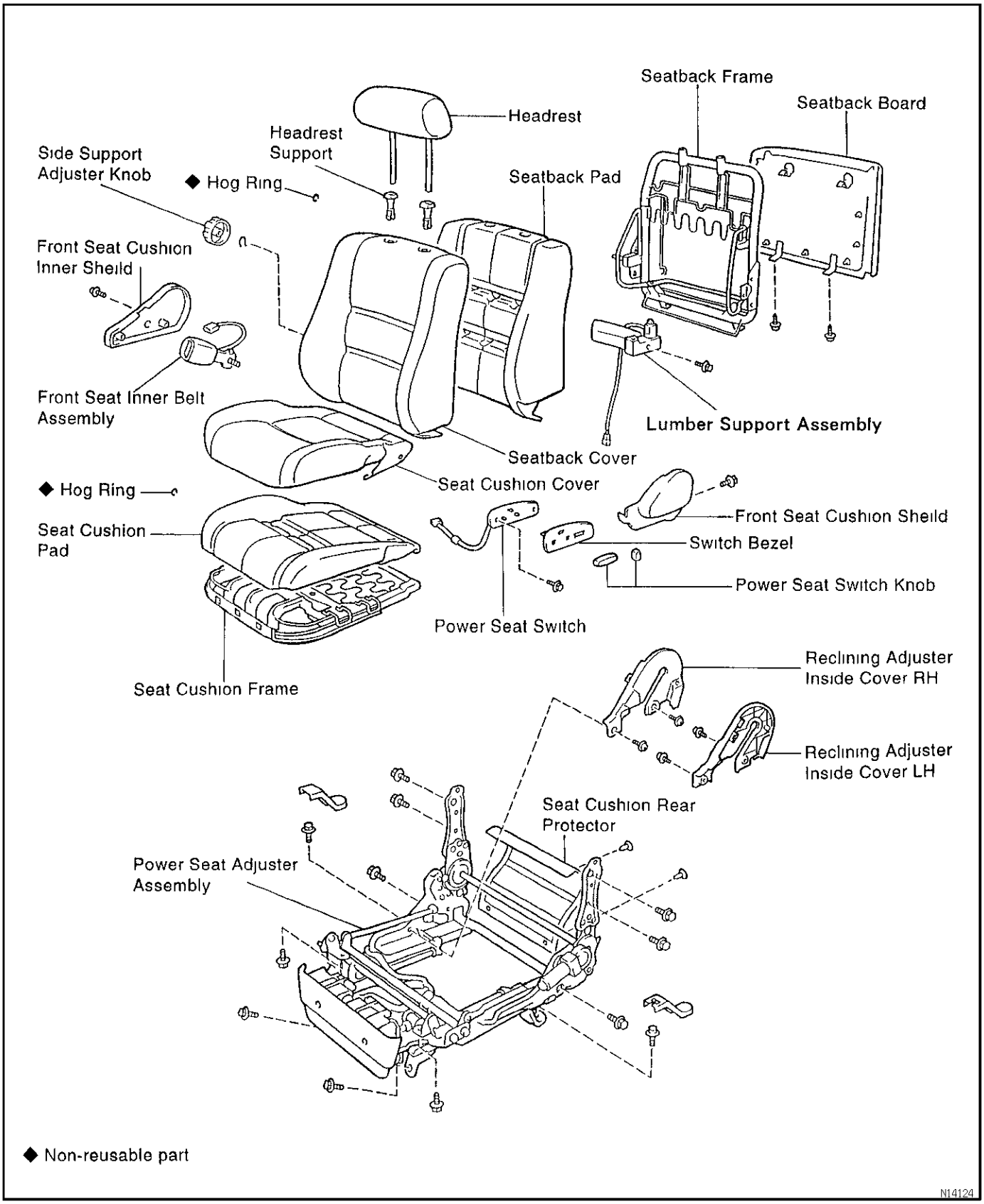
Brought to you by BirfMark



# FRONT SEAT (Power Adjuster Type)

BC89E-01

## COMPONENTS

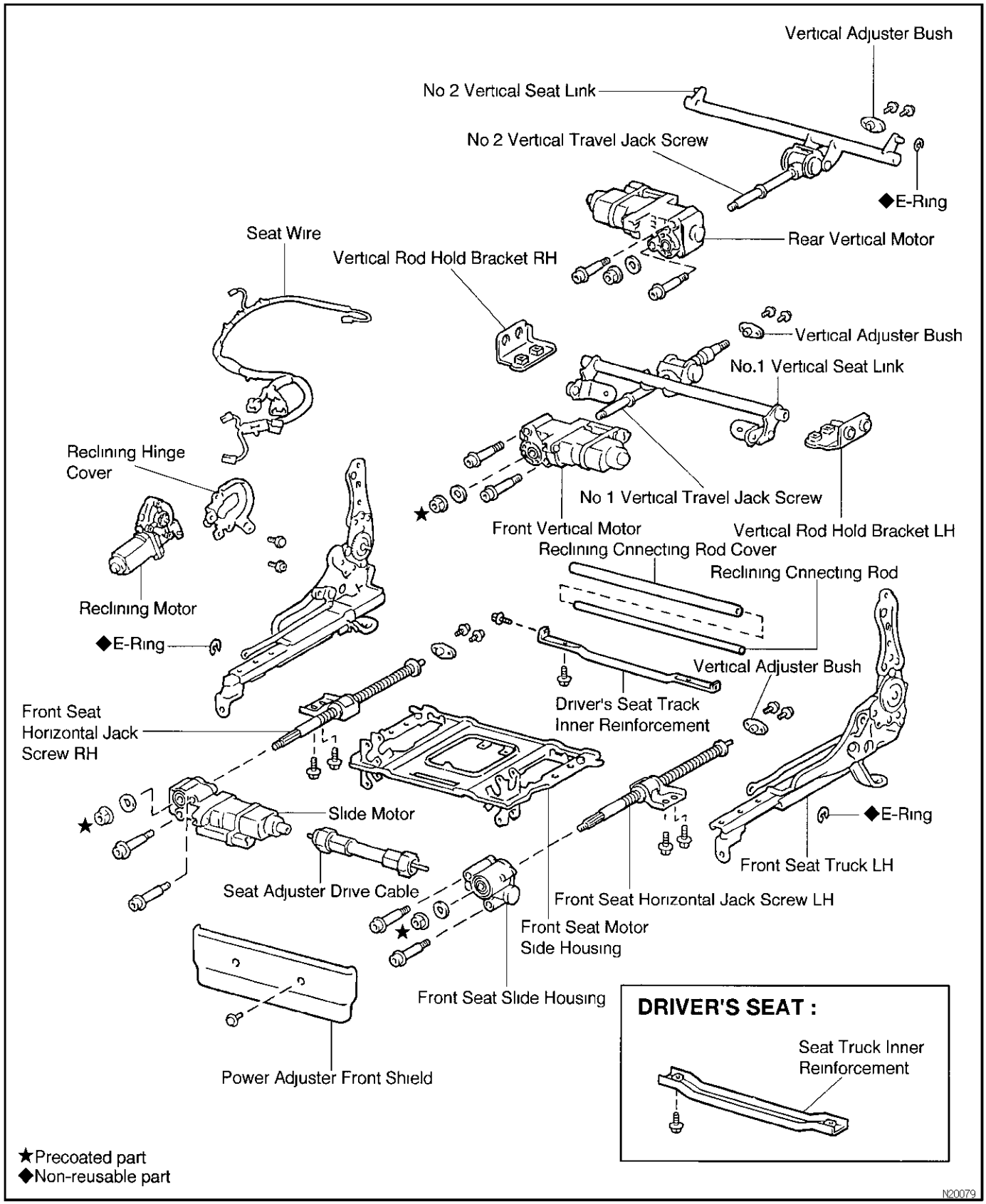





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark







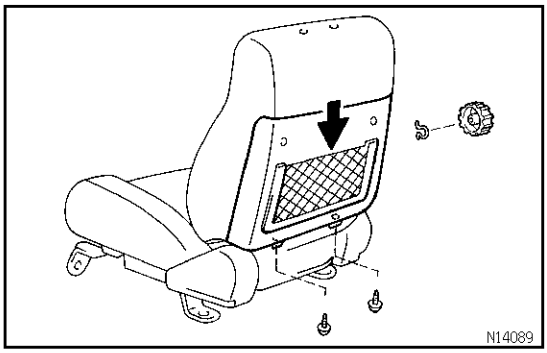

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BO48R 01

# DISASSEMBLY




**1. REMOVE FRONT SEAT HEADREST**

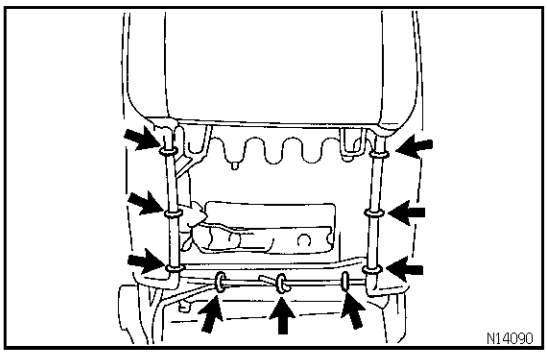
**2. REMOVE SIDE SUPPORT ADJUSTER KNOB**

Using a screwdriver, remove the snap ring and side support adjuster knob

**3. REMOVE SEATBACK BOARD**

(a) Remove the 2 screws

(b) Slide the board downward to remove it




**4. REMOVE FRONT SEATBACK ASSEMBLY**

(a) Using a hog ring pliers, remove the hog ring backward of seatback

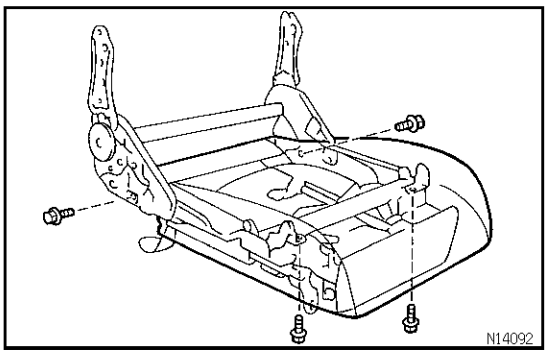
(b) Remove the 4 bolts and front seatback assembly

**Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)**

**5. REMOVE FRONT SEAT CUSHION INNER SHIELD**

**6. REMOVE FRONT SEAT INNER BELT**

**7. REMOVE FRONT SEAT CUSHION SHIELD**




**8. REMOVE FRONT SEAT CUSHION**

(a) Remove the 4 bolts

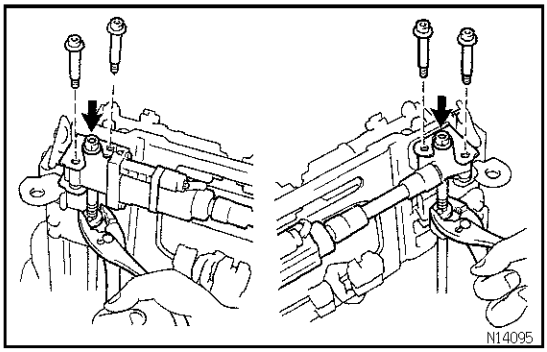
**Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)**

(b) Disconnect the connector, then remove the front seat cushion

**9. REMOVE SEAT CUSHION REAR PROTECTOR**

**10. REMOVE RECLINING ADJUSTER INSIDE COVER**

Remove the 4 screws and reclining adjuster inside cover LH and RH




**11. REMOVE POWER ADJUST FRONT SHIELD**

Remove the 2 screws and front shield

**12. REMOVE SLIDE MOTOR**

(a) Using the 5 0 mm (0 20 in ) hexagon wrench, remove the 4 housing bracket screws

**Torque: 10 N·m (100 kgf·cm, 7.0 ft·lbf)**

(b) Hold the front seat horizontal jack screw with a plier, and remove the 2 nuts and 2 washers

**Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)**

HINT

At the time of installation, apply adhesive to nut

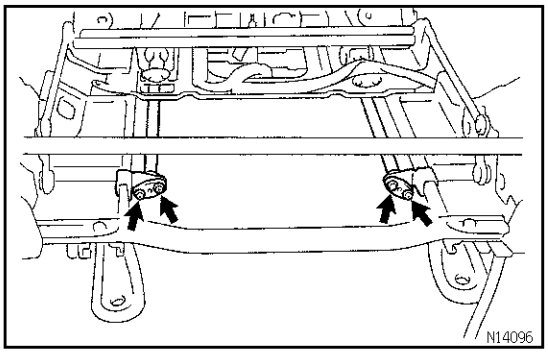
**Part No. 08833 – 00070, THREE BOND 1324 or equivalent**



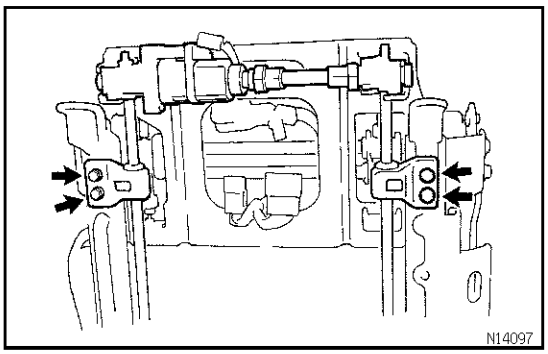
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



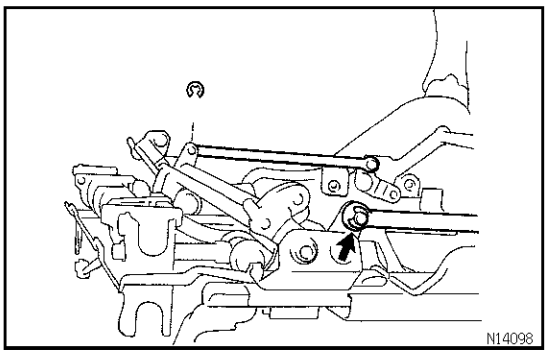



(c) Remove the 4 screws and 2 vertical adjuster bushes



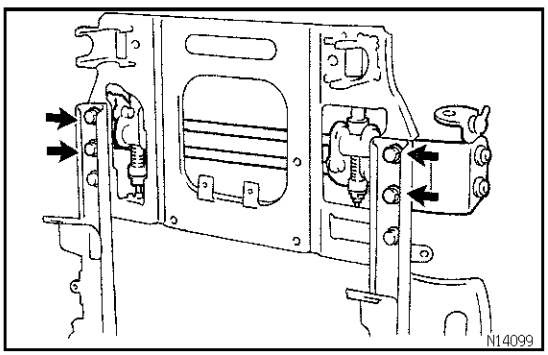

(d) Remove the 4 bolts, slide motor, front seat slide housing and front seat horizontal jack screw
**Torque: 19 N·m (200 kgf·cm, 14 ft·lbf)**

(e) Loosen the seat adjuster nut, then remove the slide motor

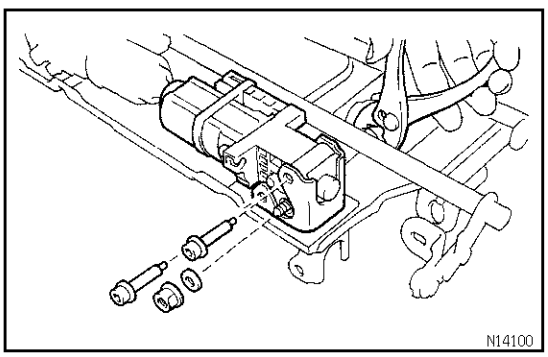



**13. REMOVE REAR VERTICAL MOTOR**

(a) Remove the 2 E–rings, and disconnect the No 1 vertical seat link




(b) Remove the 4 bolts, vertical rod hold bracket RH and vertical rod hold bracket LH
**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)**




(c) Using the 5 0 mm (0 20 in ) hexagon wrench, remove the 2 housing support bracket screws
**Torque: 10 N·m (100 kgf·cm, 7.0 ft·lbf)**

(d) Hold the No 2 vertical travel jack screw with a plier, remove the nut and washer
**Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)**

HINT

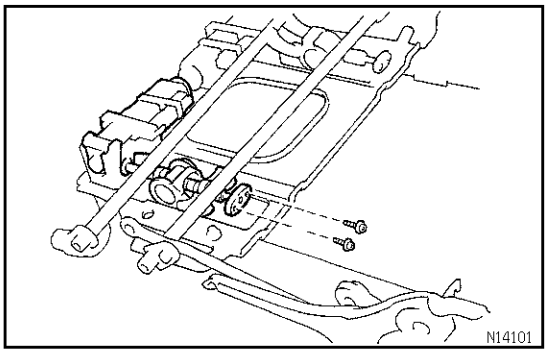
At the time of reassembly, apply adhesive to nut
**Part No. 08833–00070, THREE BOND 1324 or equivalent**



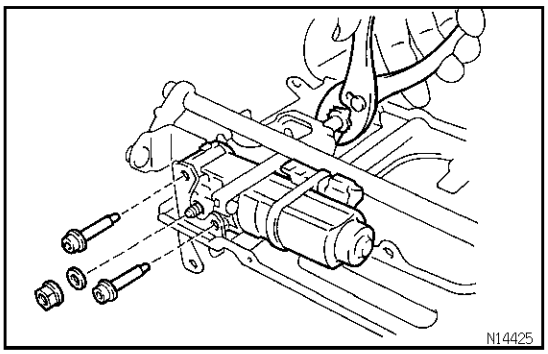
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(e) Remove the 2 screws, vertical adjuster bush, rear vertical motor and No 2 vertical seat link



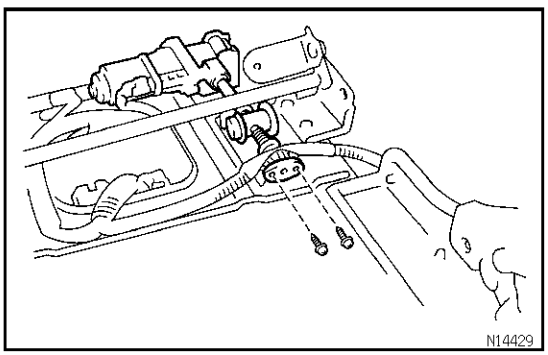

**14. REMOVE FRONT VERTICAL MOTOR**

(a) Using the 5 0 mm (0 20 in ) hexagon wrench, and remove the 2 housing support bracket screws
**Torque: 10 N·m (100 kgf·cm, 7.0 ft·lbf)**

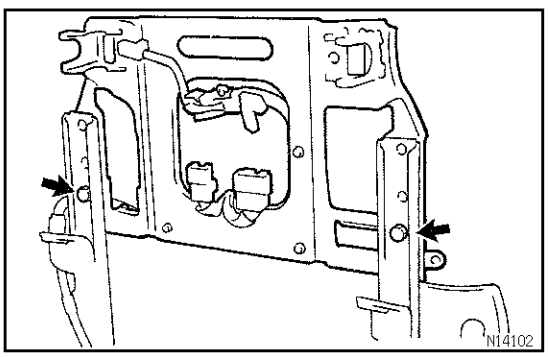
(b) Hold the No 1 vertical travel jack screw with a plier, remove the nut and washer

HINT

At the time of reassembly, apply adhesive to nut
**Part No. 08833-00070, THREE BOND 1324 or equivalent**
**Torque: 2.0 N·m (20 kgf·cm, 15 ft·lbf)**




(c) Remove the 2 screws, vertical adjuster bush, front vertical motor and No 1 vertical seat link




**15. REMOVE FRONT SEAT TRACK**

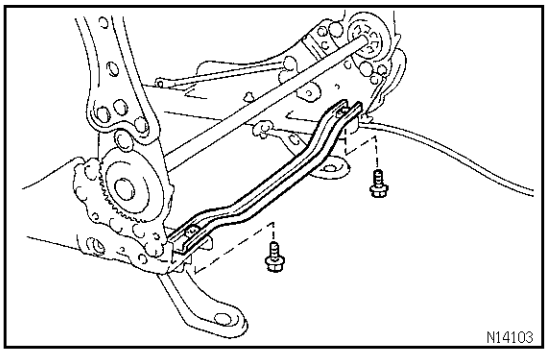
(a) Remove the 2 bolts and front seat motor side housing
**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Remove the 2 bolts, seat track ınner reınforcement, then separate the seat track RH and LH
**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)**
(c) Remove the reclınıng connectıng rod

**16. REMOVE SEAT WIRE**

**17. REMOVE RECLINING MOTOR**

**18. REMOVE RECLINING HINGE COVER**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BC09H 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BO–84).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

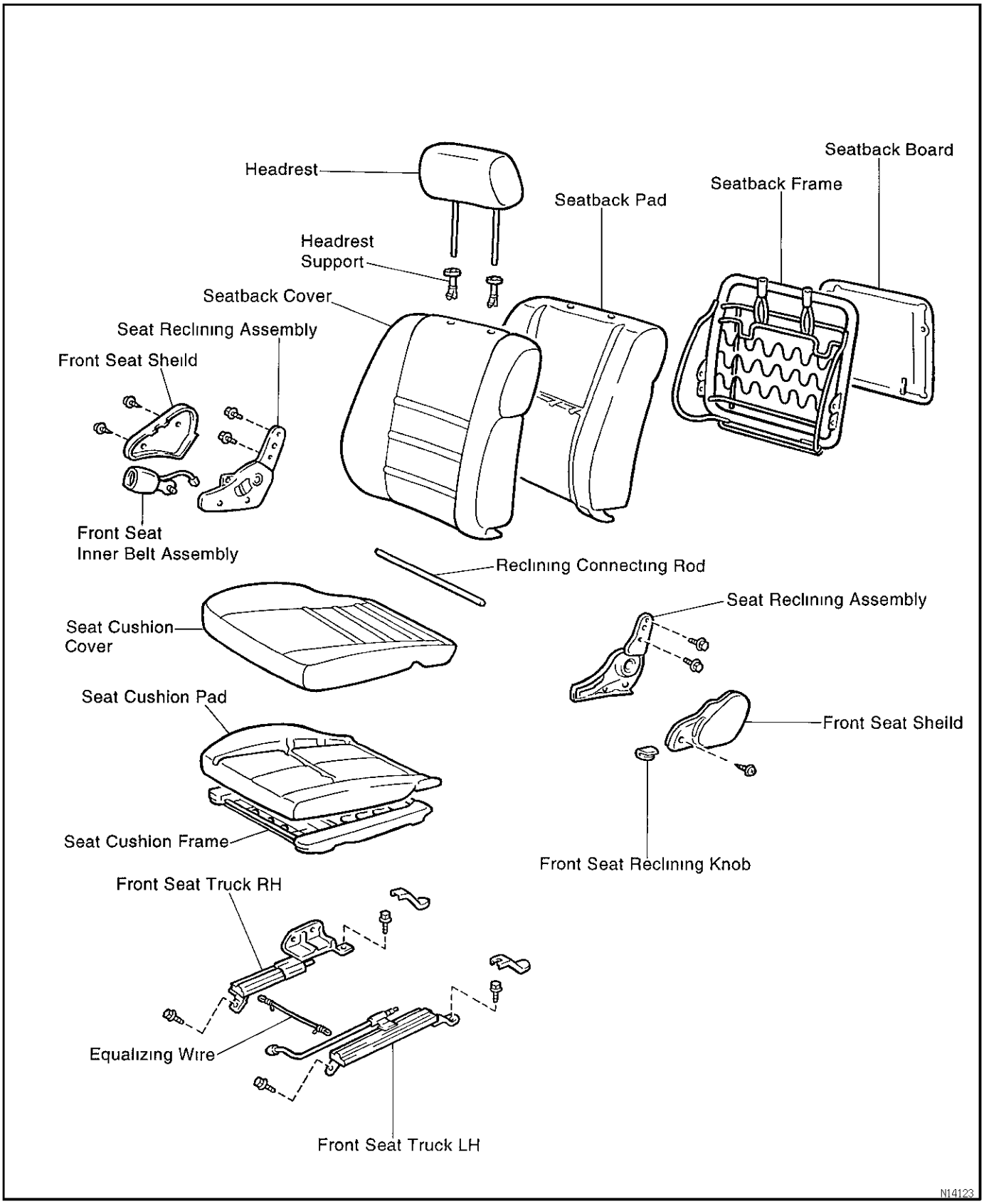
Brought to you by BirfMark



# FRONT SEAT (Manual Adjuster Type)

BC89D 01

## COMPONENTS








Brought to you by BirfMark
Version 1.11 - 03/16/2010

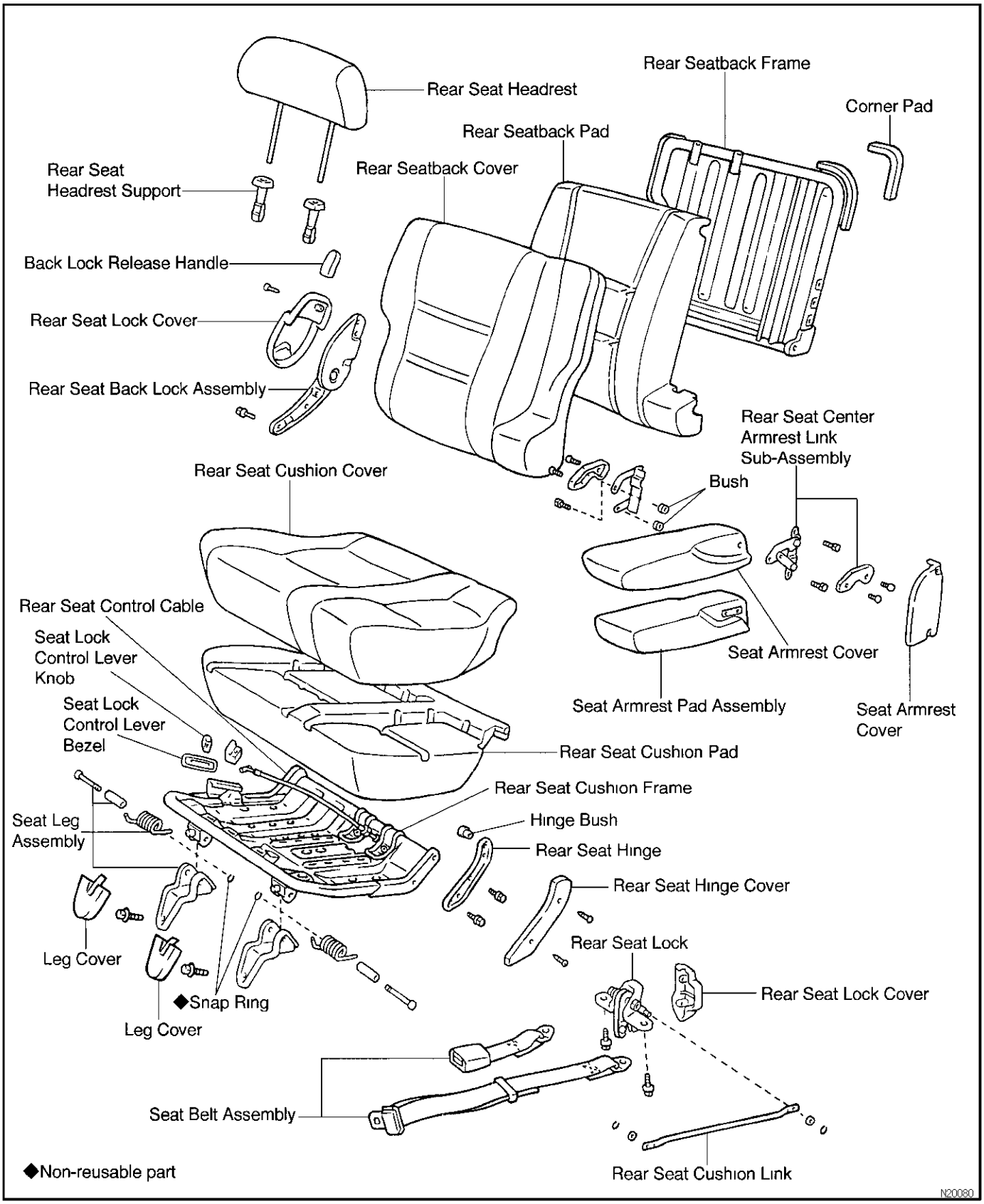
Brought to you by BirfMark



# REAR NO.1 SEAT

## COMPONENTS

BC09J-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

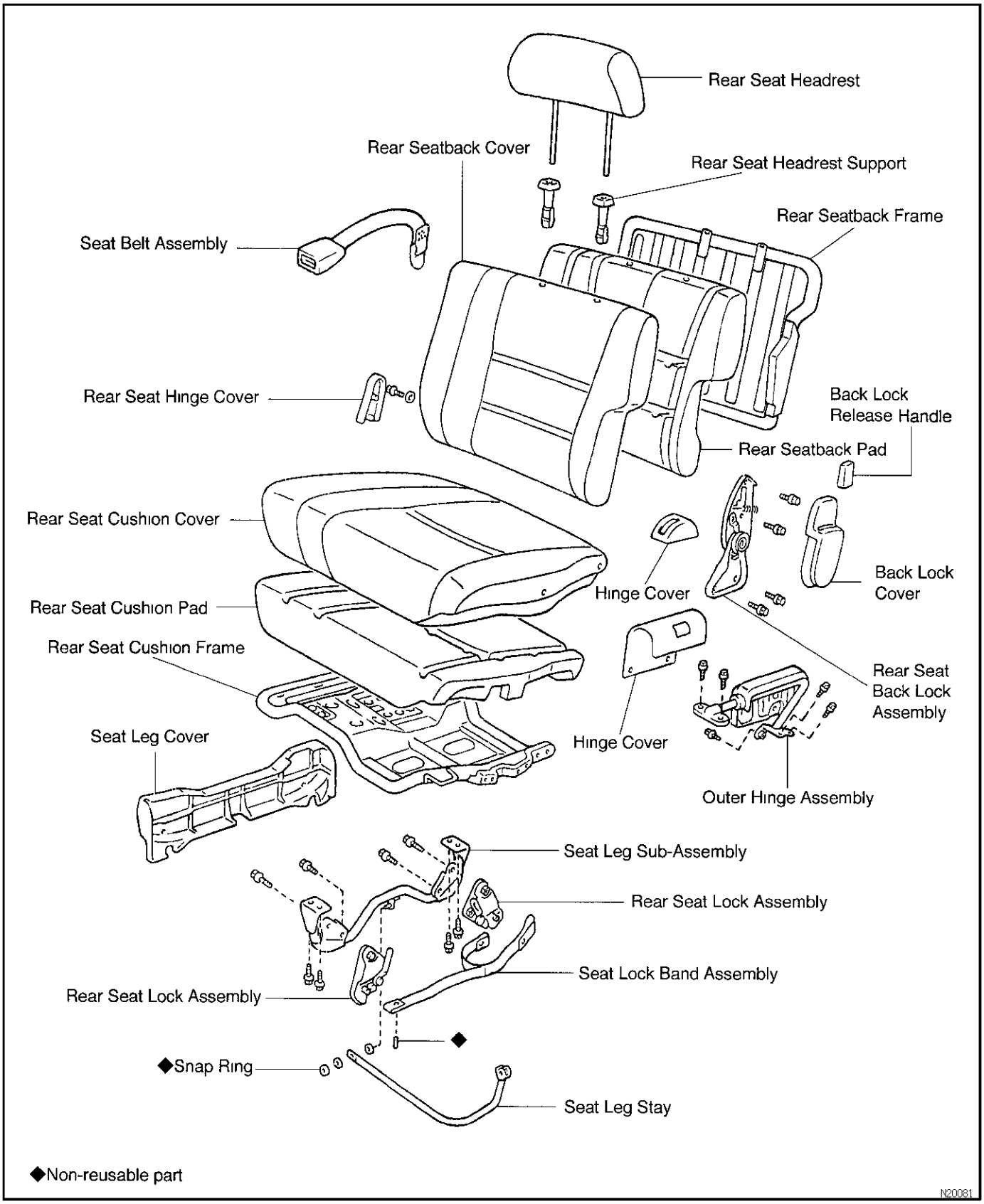
Brought to you by BirfMark



# REAR NO.2 SEAT

## COMPONENTS

BC89K-01




N20081



Brought to you by BirfMark
Version 1.11 - 03/16/2010

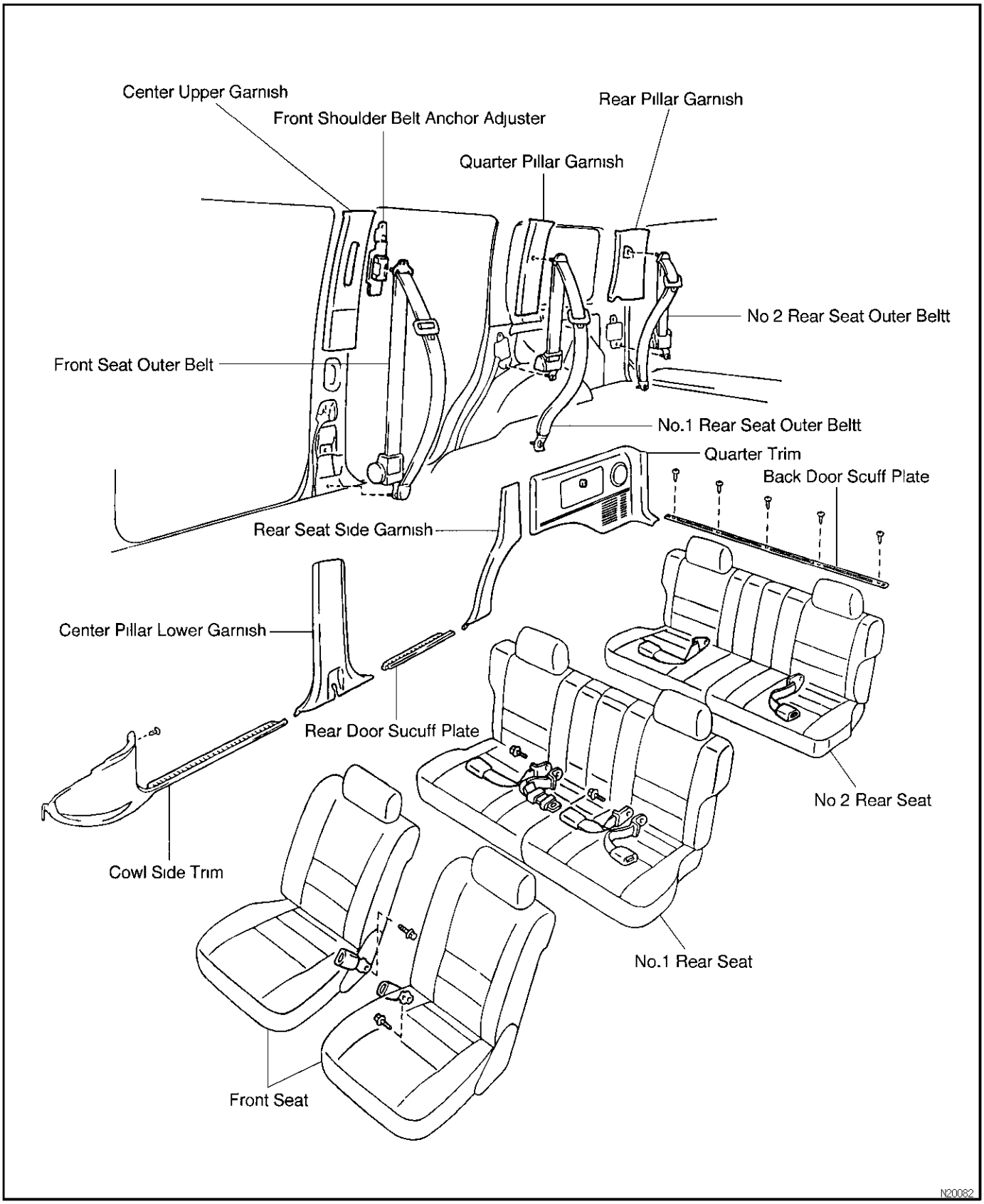
Brought to you by BirfMark



# SEAT BELT

## COMPONENTS

BC89L-01

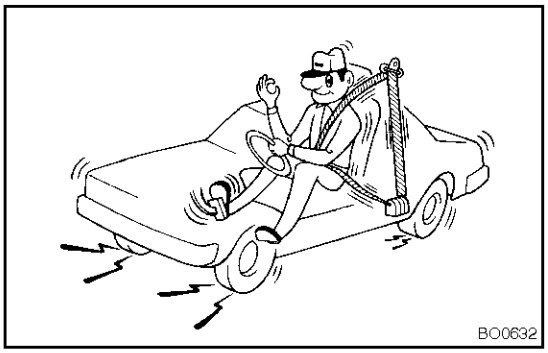





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark




BO0632

# SEAT BELT

## INSPECTION

BO89M-01

**CAUTION:**

**Replace the seat belt assembly (outer belt, inner belt, bolts, nuts or sill-bar) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.**

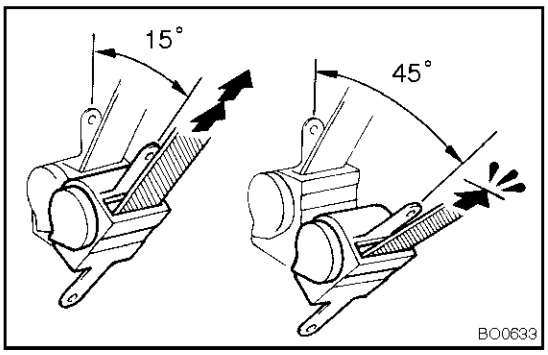
1. **All seat belts:**
   **RUNNING TEST (IN SAFE AREA)**

(a) Fasten the front seat belts

(b) Drive the car at 10 mph (16 km/h) and make a very hard stop
Check that the belt locks and cannot be extended at this time

HINT

Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.



BO0633

2. **Driver's seat belt (ELR):**
   **STATIC TEST**

(a) Make sure that the belt locks when pulled out quickly

(b) Remove the locking retractor assembly

(c) Tilt the retractor slowly

(d) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt

If a problem is found, replace the assembly.

3. **Except driver's seat belt (ALR/ELR):**
   **STATIC TEST**

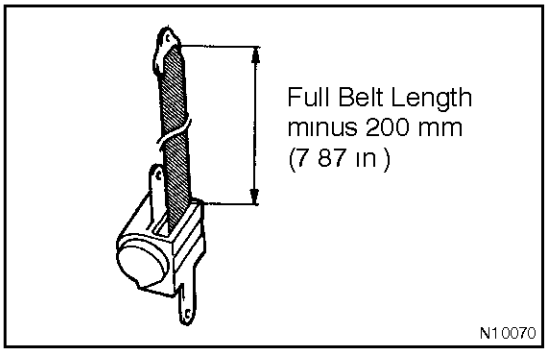
(a) Make sure that the belt locks when pulled out quickly

(b) Remove the locking retractor assembly

(c) Pull out the whole belt and measure the length of the whole belt
Then retract the belt slightly and pull it out again

(d) Make sure that the belt cannot be extended further

If a problem is found, replace the assembly.



N10070

(e) Retract the whole belt, then pull it out to the full length minus 200 mm (7.87 in.)

(f) Tilt the retractor slowly

(g) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt

If a problem is found, replace the assembly.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BRAKE SYSTEM

## GENERAL DESCRIPTION

BR1CC-01

- Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.
- It is very important to keep parts and the area clean when repairing the brake system.
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TROUBLESHOOTING

BR1CD-01

## PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem The numbers indicate the priority of the likely cause of the problem Check each part in order If necessary, replace these parts

| Symptom | Suspect Area | See page |
|---|---|---|
| Low pedal or spongy pedal | 4 Fluid leaks for brake system | – |
| | 5 Air in brake system | – |
| | 6 Piston seals worn or damaged | BR–33 |
| | | BR–33 |
| | 7 Master cylinder faulty | BR–9 |
| | 8 Booster push rod out of adjustment | BR–20 |
| Brake drag | 1 Brake pedal freeplay minimal | BR–6 |
| | 2 Parking brake lever travel out of adjustment | BR–8 |
| | 3 Parking brake wire sticking | – |
| | 4 Pad cracked or distorted | BR–21 |
| | | BR–30 |
| | 5 Piston stuck | BR–33 |
| | | BR–33 |
| | 6 Piston frozen | BR–33 |
| | | BR–33 |
| | 7 Tension or return spring faulty | BR–39 |
| | 8 Booster push rod out of adjustment | BR–20 |
| | 9 Vacuum leaks for booster system | BR–18 |
| | 10 Master cylinder faulty | BR–9 |
| Brake pull | 1 Piston stuck | BR–33 |
| | | BR–33 |
| | 2 Pad oily | BR–21 |
| | | BR–30 |
| | 3 Piston frozen | BR–33 |
| | | BR–33 |
| | 4 Disc Scored | BR–33 |
| | | BR–33 |
| | 5 Pad cracked or distorted | BR–21 |
| | | BR–30 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Hard pedal but brake inefficient | 1 Fluid leaks for brake system | – |
| | 2 Air in brake system | – |
| | 3 Pad worn | BR–21 |
| | | BR–30 |
| | 4 Pad cracked or distorted | BR–21 |
| | | BR–30 |
| | 5 Pad oily | BR–21 |
| | | BR–30 |
| | 6 Pad glazed | BR–21 |
| | | BR–30 |
| | 7 Disc scored | BR–21 |
| | | BR–30 |
| | 8 Booster push rod out of adjustment | BR–20 |
| | 9 Vacuum leaks for booster system | BR–18 |
| Noise from brake | 1 Pad cracked or distorted | BR–21 |
| | | BR–30 |
| | 2 Installation bolt loosen | BR–33 |
| | | BR–33 |
| | 3 Disc scored | BR–33 |
| | | BR–33 |
| | 4 Pad support plate loosen | BR–30 |
| | 5 Sliding pin worn | BR–33 |
| | 6 Pad dirty | BR–21 |
| | | BR–30 |
| | 7 Pad glazed | BR–21 |
| | | BR–30 |
| | 8 Tension or return spring faulty | BR–39 |
| | 9 Anti–squeal shim damaged | BR–21 |
| | | BR–30 |
| | 10 Hold–down spring damaged | BR–39 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BRAKE FLUID

## BLEEDING

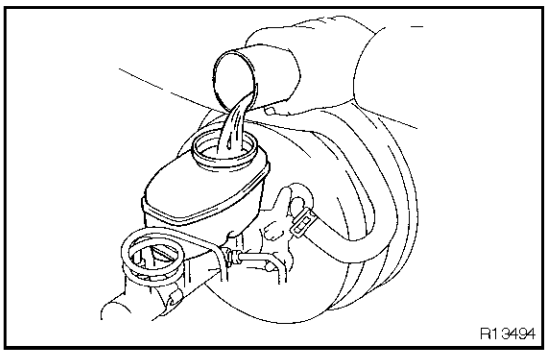
BR1CE 01

HINT

If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air

**NOTICE:**

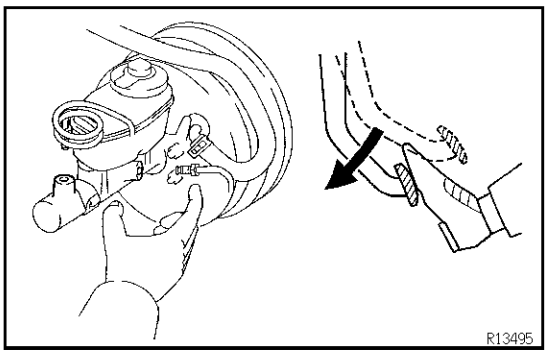
**Do not let brake fluid remain on a painted surface. Wash it off immediately.**




**1. FILL BRAKE RESERVOIR WITH BRAKE FLUID**

Check the fluid level in the reservoir after bleeding each wheel Add fluid, if necessary

**Fluid: SAE J1703 or FMVSS No.116 DOT3**



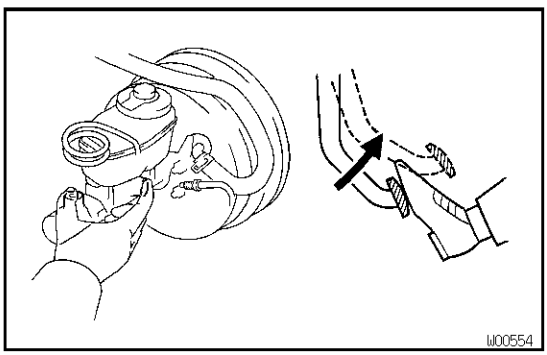

**2. BLEED MASTER CYLINDER**

HINT

If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder

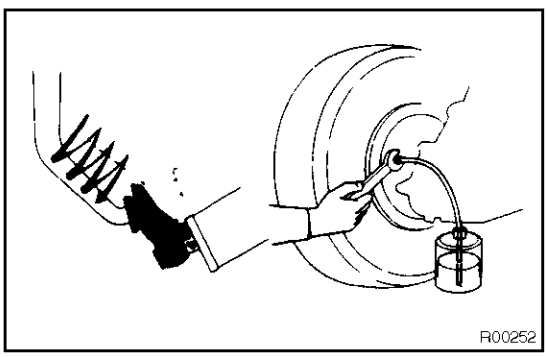
(a) Disconnect the brake lines from the master cylinder

(b) Slowly depress the brake pedal and hold it




(c) Block off the outlet plugs with your fingers, and release the brake pedal

(d) Repeat (b) and (c) 3 or 4 times




**3. CONNECT VINYL TUBE TO BRAKE CALIPER BLEEDER PLUG**

Insert other end of the tube in a half–full container of brake fluid

**NOTICE:**

**Begin bleeding air from the brake caliper with the longest hydraulic line.**

**4. BLEED BRAKE LINE**

(a) Slowly depress the brake pedal several times



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then tighten the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.

**Bleeder plug tightening torque:**
**11 N·m (110 kgf·cm, 8 ft·lbf)**

**5. REPEAT PROCEDURE FOR EACH WHEEL**

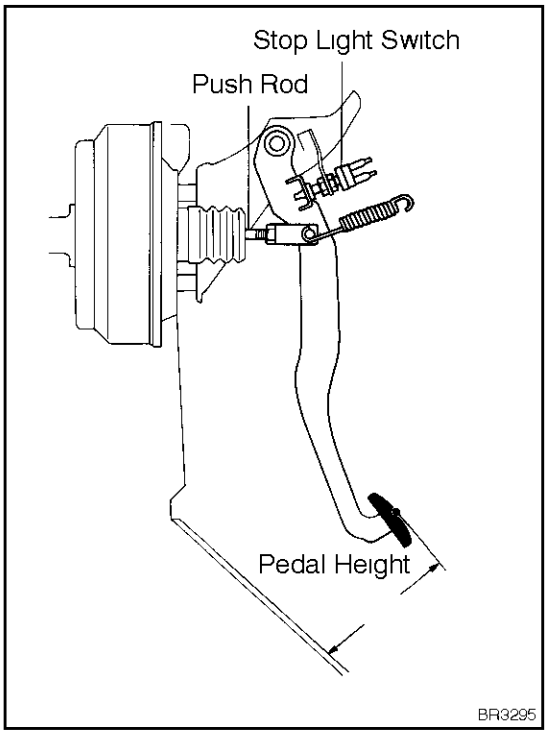
**6. BLEED LSP & BV**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# BRAKE PEDAL

BR1CF 04

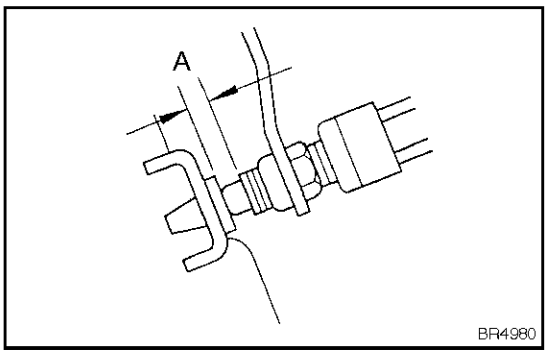
## ON–VEHICLE INSPECTION

1. **CHECK PEDAL HEIGHT**

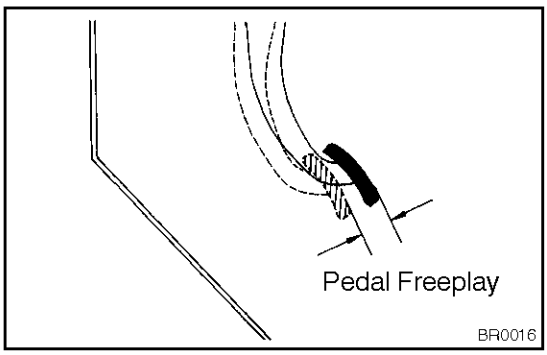
**Pedal height from dash panel:**
**167.5 – 177.5 mm (6.594 – 6.988 in.)**

2. **IF NECESSARY, ADJUST PEDAL HEIGHT**

(a) Disconnect the connector from the stop light switch
(b) Loosen the stop light switch lock nut and remove the stop light switch
(c) Loosen the push rod lock nut
(d) Adjust the pedal height by turning the pedal push rod
(e) Tighten the push rod lock nut
**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**
(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper
(g) Turn the stop light switch back one turn




(h) Check the clearance (A) between the stop light switch and pedal
**Clearance: 0.5 – 2.4 mm (0.020 – 0.094 in.)**
(i) Tighten the stop light switch lock nut
(j) Connect the connector to the stop light switch
(k) Check that the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released
(l) earance (A) between the stop light switch and the pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications




3. **CHECK PEDAL FREEPLAY**

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster
(b) Push in the pedal by hand until the beginning of the second resistance is felt Measure the distance
**Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)**

HINT

The freeplay to the 1st resistance is due to the play between the clevis and pin This is magnified up to 3 – 6 mm (0 12 – 0 24 in ) at the pedal

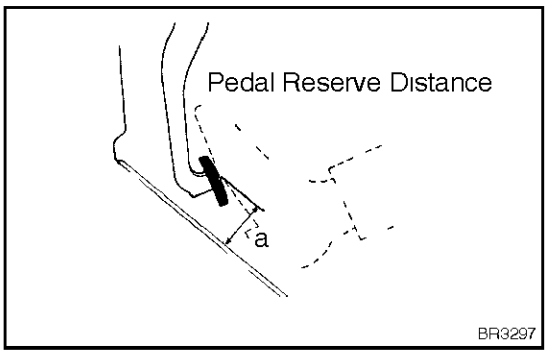


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



If ıncorrect, check the stop lıght swıtch clearance
If the clearance ıs OK, then troubleshoot the brake system




**4. CHECK PEDAL RESERVE DISTANCE**

- Release the parkıng brake
- Wıth the engıne runnıng, depress the pedal and measure the pedal reserve dıstance, as shown
  **Pedal reserve distance, 'a', at 490 N (50 kgf, 110.2lbf): More than 68 mm (2.68 in.)**

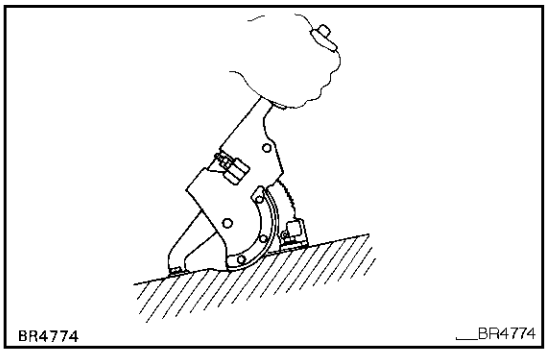
If the reserve dıstance ıncorrect, troubleshoot the brake system

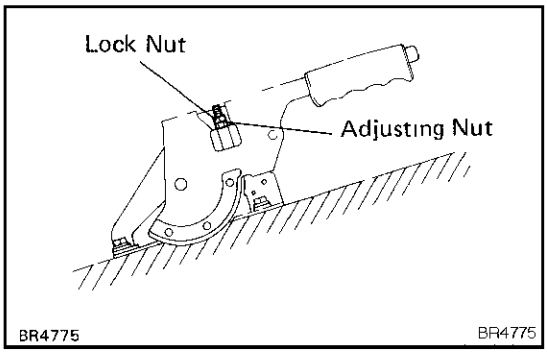


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# PARKING BRAKE LEVER

BR1CG 01

## ON–VEHICLE INSPECTION

**1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT**

Pull the parking brake lever all the way up, and count the number of clicks

**Parking brake lever travel at 196 N (20 kgf, 44.1 lbf): 7 – 9 clicks**

If incorrect, adjust the parking brake

**2. IF NECESSARY, ADJUST PARKING BRAKE**

HINT

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted For shoe clearance adjustment (See page BR–42)

(a) Remove the rear console box

(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct

(c) Tighten the lock nut

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

(d) Install the rear console box



Brought to you by BirfMark
Version 1.11 - 03/16/2010

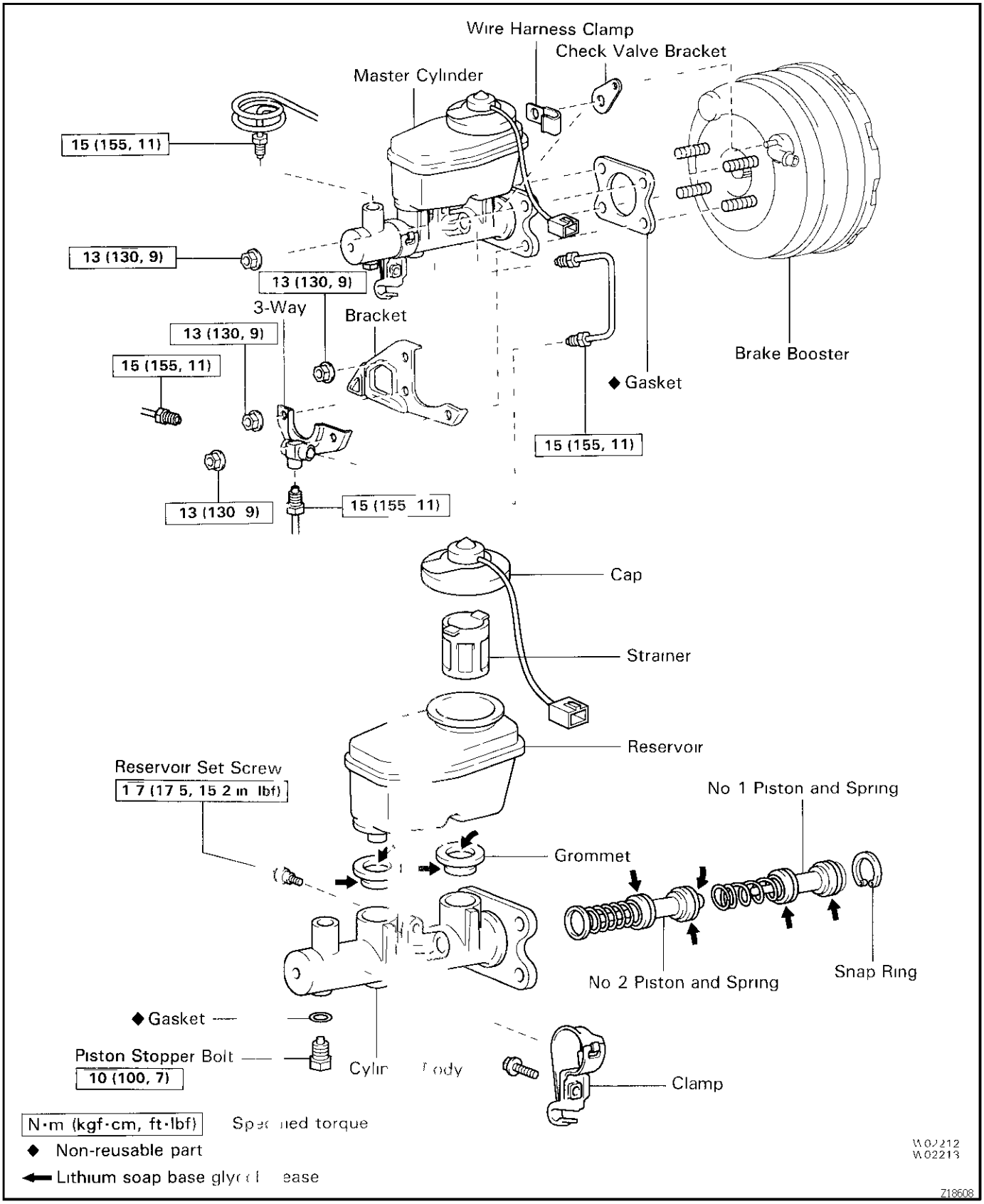
Brought to you by BirfMark



# BRAKE MASTER CYLINDER

## COMPONENTS

BR1CH-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1C -01

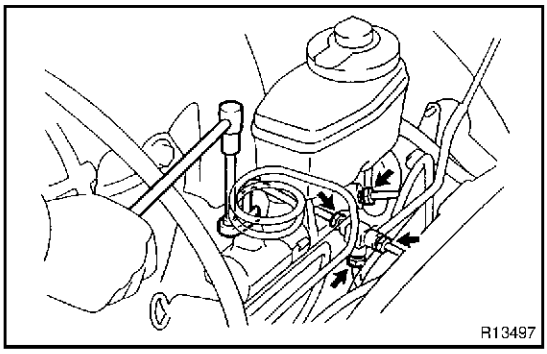
# REMOVAL

**1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR**

**2. TAKE OUT FLUID WITH SYRINGE**

**NOTICE:**

**Do not let brake fluid remain on a painted surface. Wash it off immediately.**

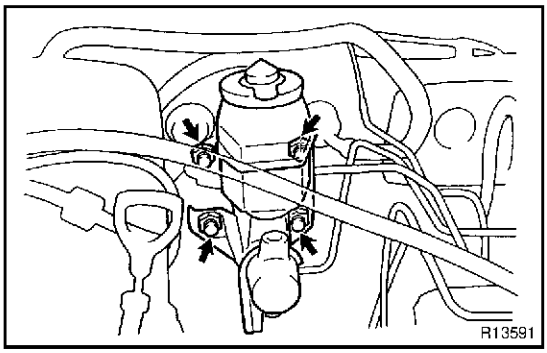



**3. DISCONNECT BRAKE LINES**

Using SST, disconnect the 4 brake lines from the master cylinder and 3-way

SST 09023-00100

**Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)**




**4. REMOVE MASTER CYLINDER**

(a) Remove the 4 nuts

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(b) Remove the 3-way, check valve bracket, wire harness clamp and bracket

(c) Pull out the master cylinder and gasket



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CJ-01

# DISASSEMBLY

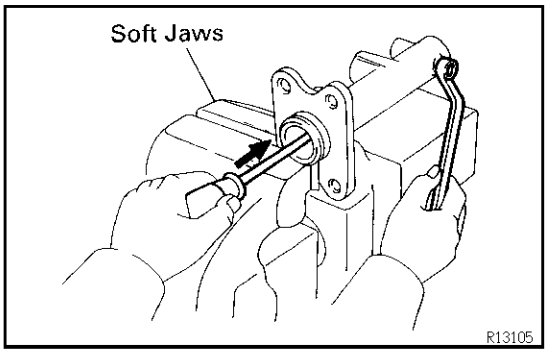
**1. REMOVE RESERVOIR**

(a) Remove the set screw and pull out the reservoir
**Torque: 1.7 N·m (17.5 kgf·cm, 15.2 in.·lbf)**

(b) Remove the cap and strainer from the reservoir

**2. REMOVE 2 GROMMETS**

**3. REMOVE BOLT AND CLAMP FROM CYLINDER BODY**



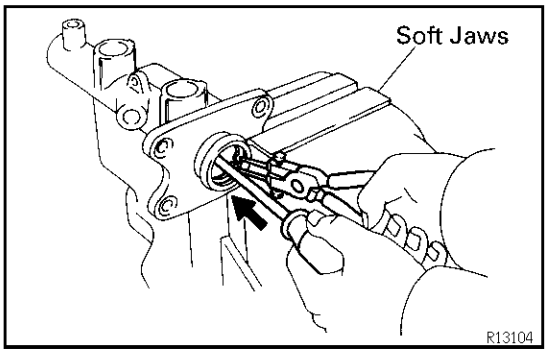

**4. PLACE CYLINDER IN VISE**

**5. REMOVE PISTON STOPPER BOLT**

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket

HINT:

Tape the screwdriver tip before use
**Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)**




**6. REMOVE 2 PISTONS AND SPRINGS**

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers

HINT:

Tape the screwdriver tip before use

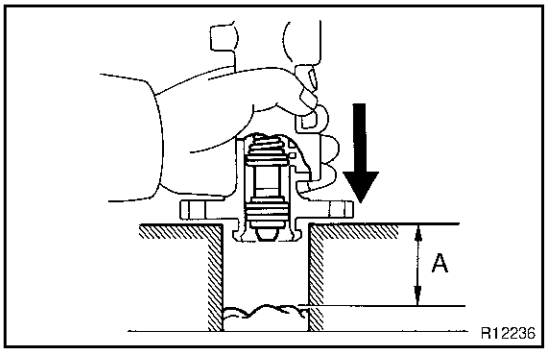
(b) Remove the No 1 piston and spring by hand, pulling straight out, not at an angle

**NOTICE:**

**If pulled out and installed at an angle, there is a possibly that the cylinder bore could be damaged.**

**NOTICE:**

**Be careful not to damage the rubber lips on the pistons.**




(c) Place a rag and 2 wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No 2 piston drops out of the cylinder

HINT:

Make sure that the distance (A) from the rag to the top of the blocks is at least 100 mm (3 94 in )



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CK-01

# INSPECTION

HINT:

Clean the disassembled parts with compressed air

**1. INSPECT CYLINDER BORE FOR RUST OR SCORING**

**2. INSPECT CYLINDER FOR WEAR OR DAMAGE**

If necessary, clean or replace the cylinder



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CL 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly.**

**NOTICE:**

**Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page BR-9 ).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CM-01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR-9 ).**

HINT:

- Before installation, adjust length of brake booster push rod (See page BR-18 )
- After installation, fill brake reservoir with brake fluid, bleed brake system (See page BR-4 )
- Check for leaks, check and adjust brake pedal (See page BR-6 )



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BRAKE BOOSTER ASSEMBLY

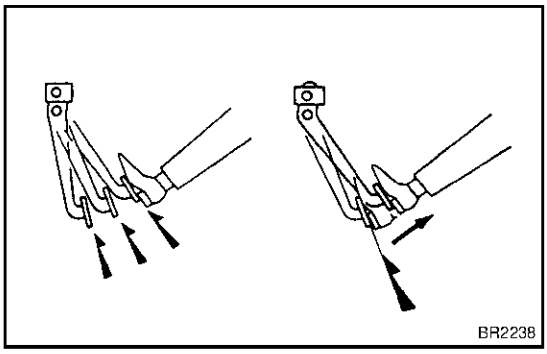
BR1CN-01

## OPERATION

### 1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off and check that there is no change in the pedal reserve distance

(b) Depress the brake pedal and start the engine If the pedal goes down slightly, operation is normal




### 2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after 1 or 2 minutes Depress the brake pedal several times slowly If the pedal goes down furthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight

(b) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed If there is no change in the pedal reserve travel after holding the pedal for 30 seconds, the booster is air tight



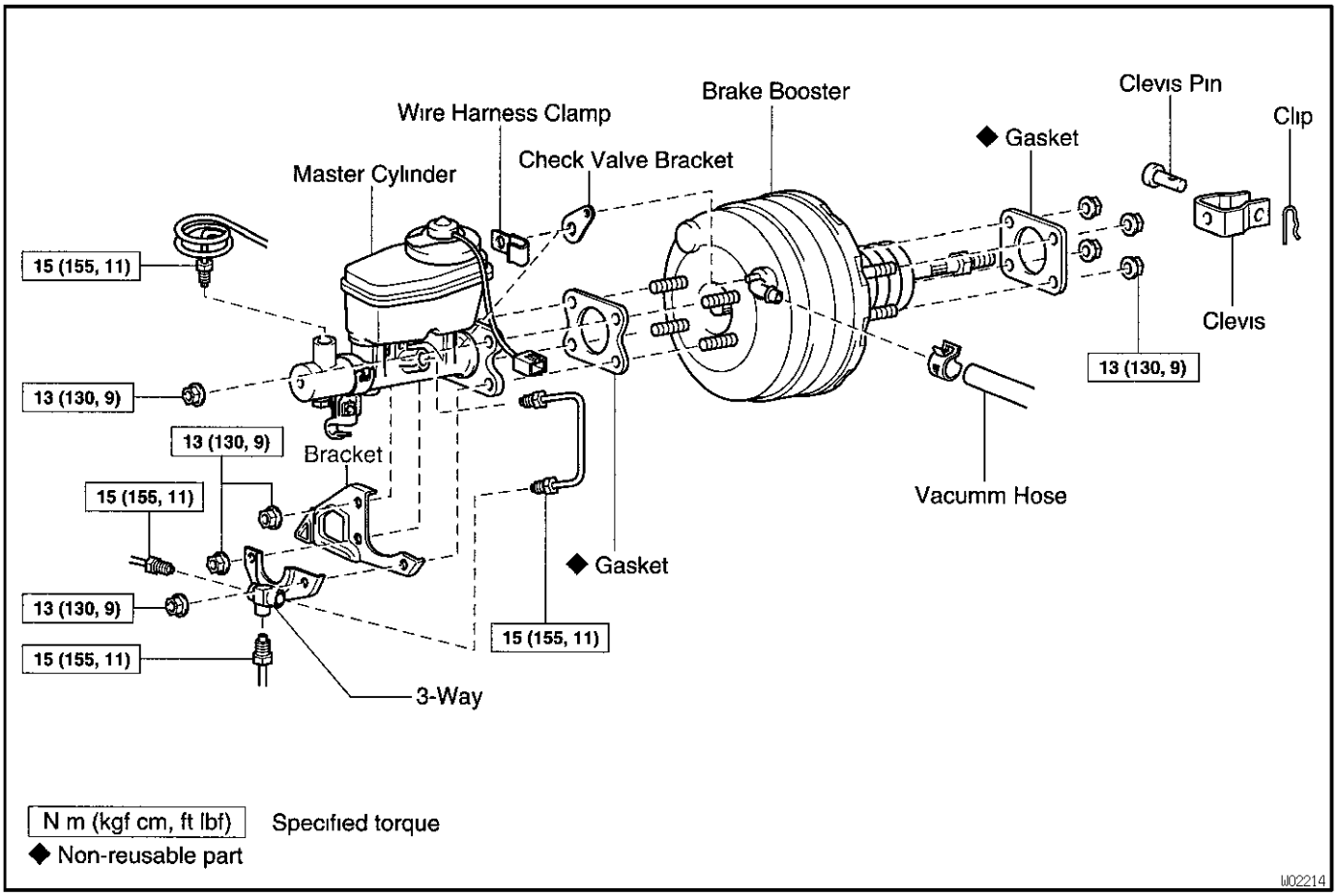
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CO 01

# COMPONENTS

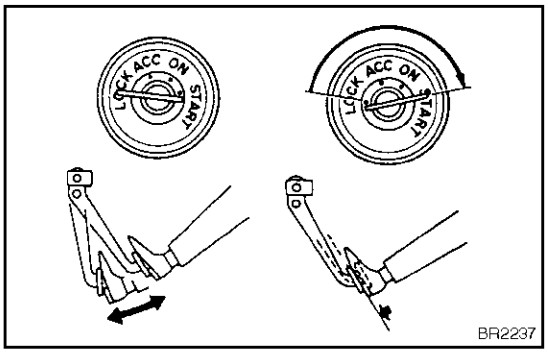





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# BRAKE BOOSTER ASSEMBLY

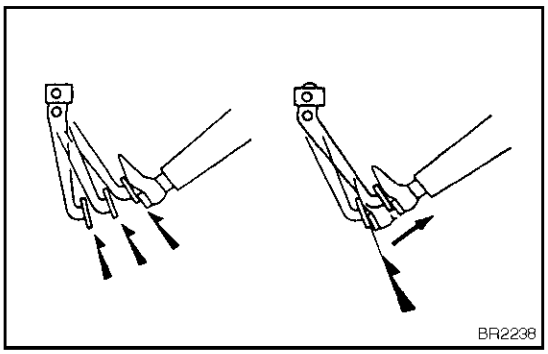
BR1NM-01

## OPERATION

### 1. OPERATING CHECK

(a) Depress the brake pedal several tımes wıth the engıne off and check that there ıs no change ın the pedal reserve dıstance

(b) Depress the brake pedal and start the engıne If the pedal goes down slıghtly, operatıon ıs normal




### 2. AIR TIGHTNESS CHECK

(a) Start the engıne and stop ıt after 1 or 2 mınutes Depress the brake pedal several tımes slowly If the pedal goes down furthest the 1st tıme, but gradually rıses after the 2nd or 3rd tıme, the booster ıs aır tıght

(b) Depress the brake pedal whıle the engıne ıs runnıng, and stop the engıne wıth the pedal depressed If there ıs no change ın the pedal reserve travel after holdıng the pedal for 30 seconds, the booster ıs aır tıght



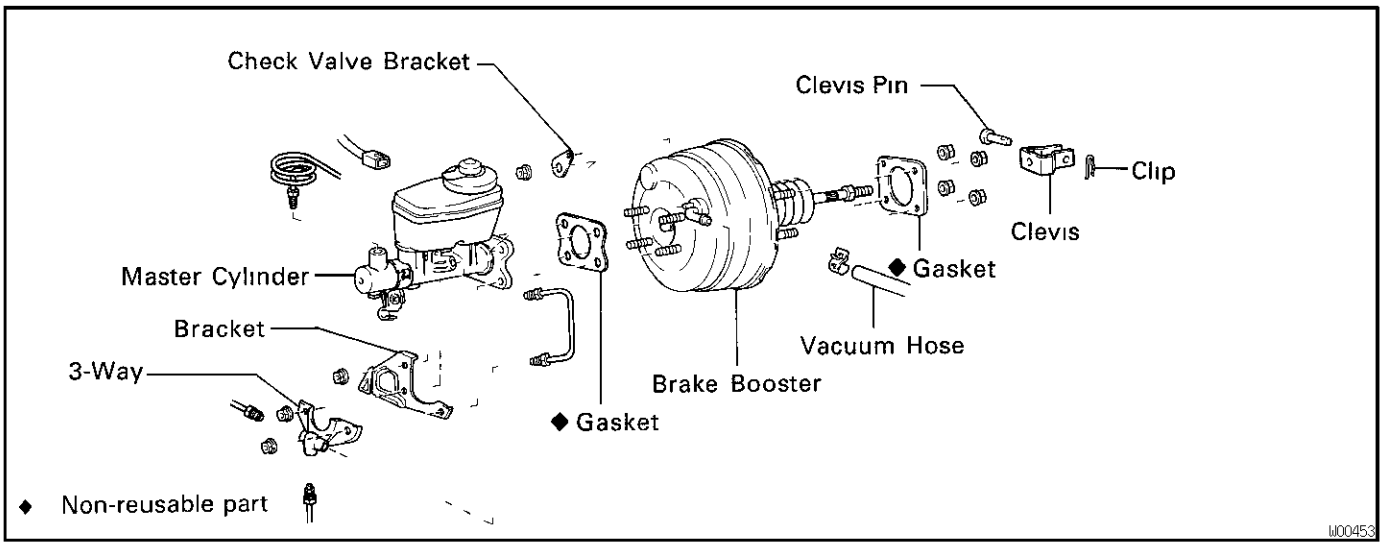
Author : Date : 999
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CO-02

# COMPONENTS






Brought to you by BirfMark
Version 1.11 - 03/16/2010

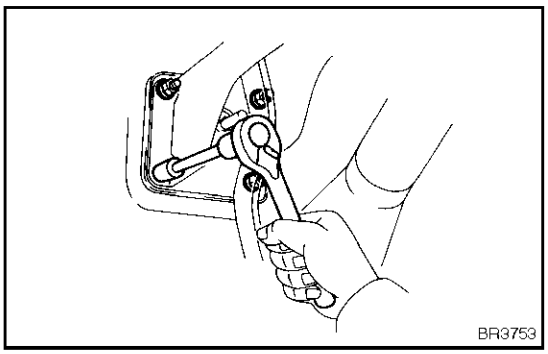
Brought to you by BirfMark



BR1CP 03

# REMOVAL

1. **REMOVE MASTER CYLINDER (See page BR–9)**
2. **REMOVE THESE PARTS:**
   - Return spring
   - Clip and clevis pin
   - Clevis
   - Vacuum hose




3. **REMOVE BRAKE BOOSTER**

(a) Remove the 4 booster installation nuts

(b) Remove the booster and gasket



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CQ-01

# INSTALLATION

1. **INSTALL BRAKE BOOSTER**

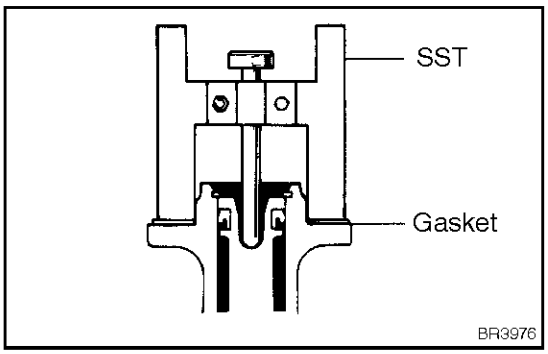
(a) Install the booster and a new gasket

(b) Install the clevis to the operating rod

(c) Install and torque the booster installation nuts
**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(d) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin

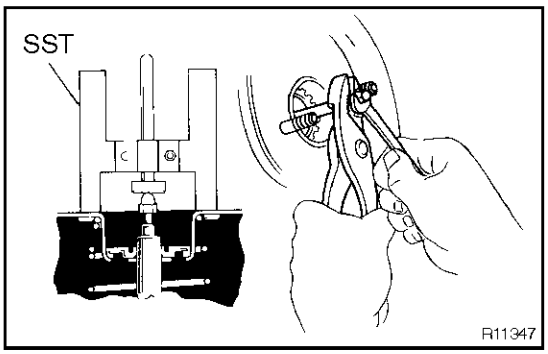
(e) Install the pedal return spring




2. **ADJUST LENGTH OF BOOSTER PUSH ROD**

(a) Install a new gasket on the master cylinder

(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston
SST 09737–00010




(c) Turn the SST upside down, and set it on the booster
SST 09737–00010

(d) Measure the clearance between the booster push rod and pin head (SST)
**Clearance: 0 mm (0 in.)**

(e) Adjust the booster push rod length until the push rod lightly touches the pin head

3. **INSTALL MASTER CYLINDER (See page BR–9)**
4. **CONNECT VACUUM HOSE TO BRAKE BOOSTER**
5. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)**
6. **CHECK FOR FLUID LEAKAGE**
7. **CHECK AND ADJUST BRAKE PEDAL (See page BR–6)**
8. **DO OPERATIONAL CHECK (See page BR–17)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

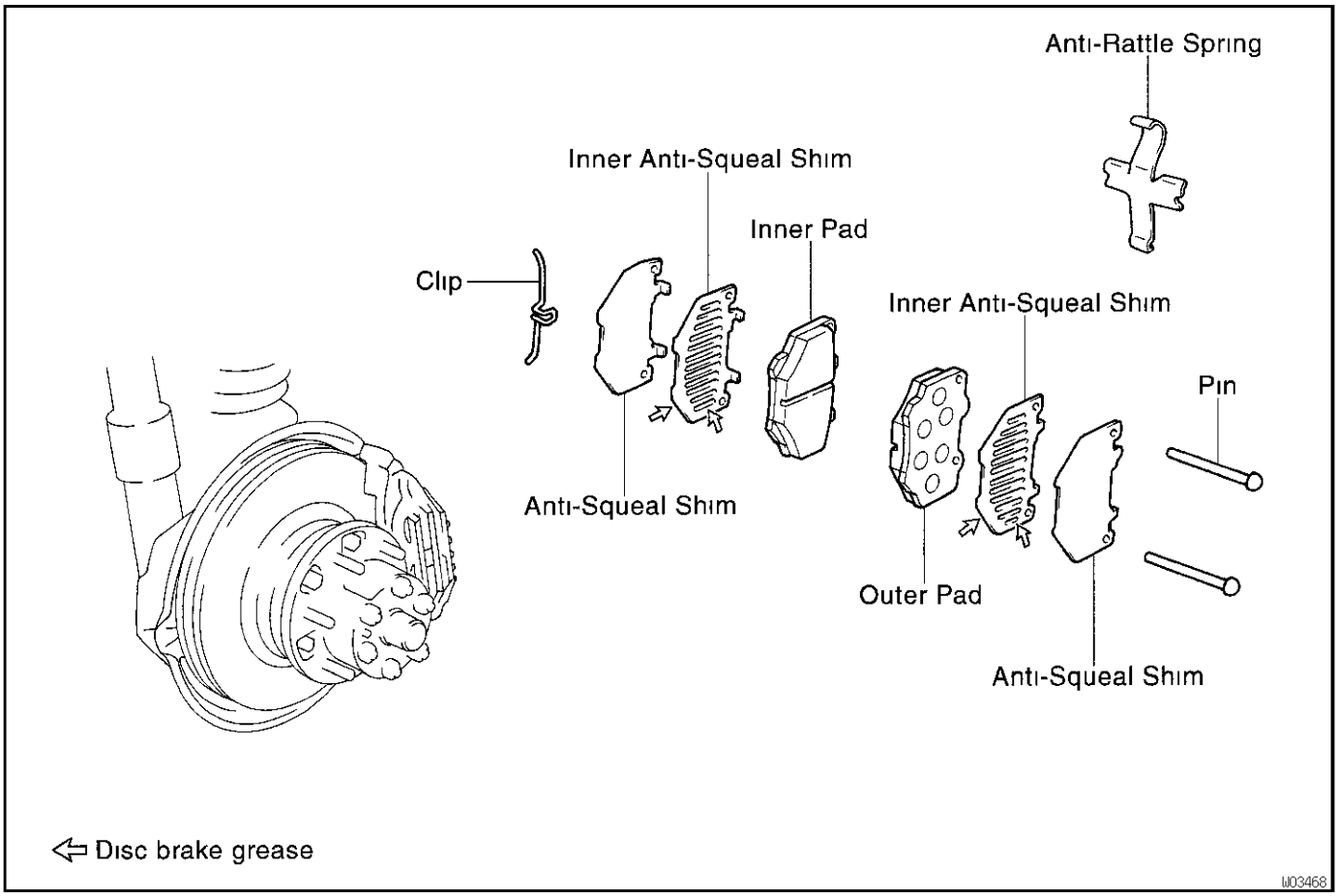
Brought to you by BirfMark



# FRONT BRAKE PAD

## COMPONENTS

BR1CR-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

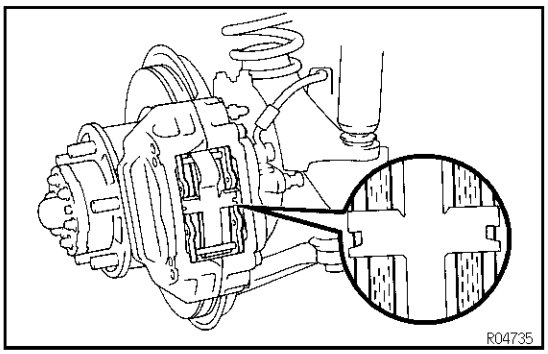
Brought to you by BirfMark



BR1CS 04

# REPLACEMENT

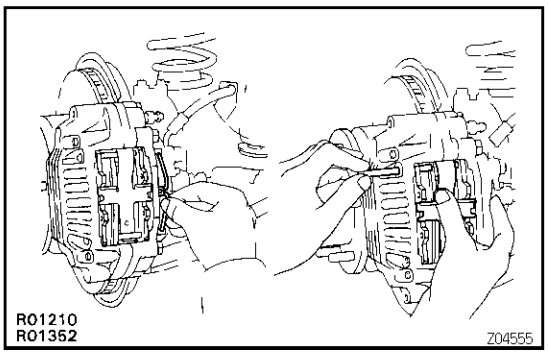
## 1. REMOVE FRONT WHEEL




## 2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within the specification

**Minimum thickness: 1.0 mm (0.039 in.)**




## 3. REMOVE THESE PARTS:

- Clip
- 2 pins
- Anti–rattle spring
- 2 pads
- 4 anti–squeal shims

**NOTICE:**

**The anti–rattle spring and clip can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.**

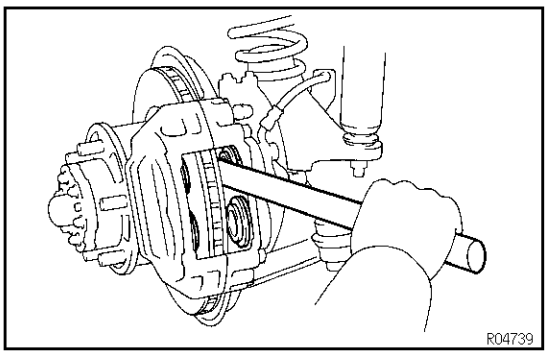
## 4. CHECK DISC THICKNESS AND RUNOUT (See page BR–27)

## 5. INSTALL NEW PADS

**NOTICE:**

**When replacing worn pads, the anti–squeal shims must be replaced together with the pads.**

(a) Draw out a small amount of brake fluid from the reservoir




(b) Press in the pistons with a hammer handle or an equivalent

HINT

- Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out
- If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape

(c) Install the 2 anti–squeal shims to new pads



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT

Apply disc brake grease to both sides of the inner anti–squeal shims (See page BR–21)

(d) Install the 2 pads

HINT

Apply disc brake grease to the caliper indicated by the arrows (See page BR–33)

**NOTICE:**

**Do not allow oil or grease to get on the rubbing face.**

**6. INSTALL ANTI–RATTLE SPRING AND 2 PINS**

**7. INSTALL CLIP**

**8. INSTALL FRONT WHEEL**

**9. CHECK THAT FLUID LEVEL IS AT MAX LINE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

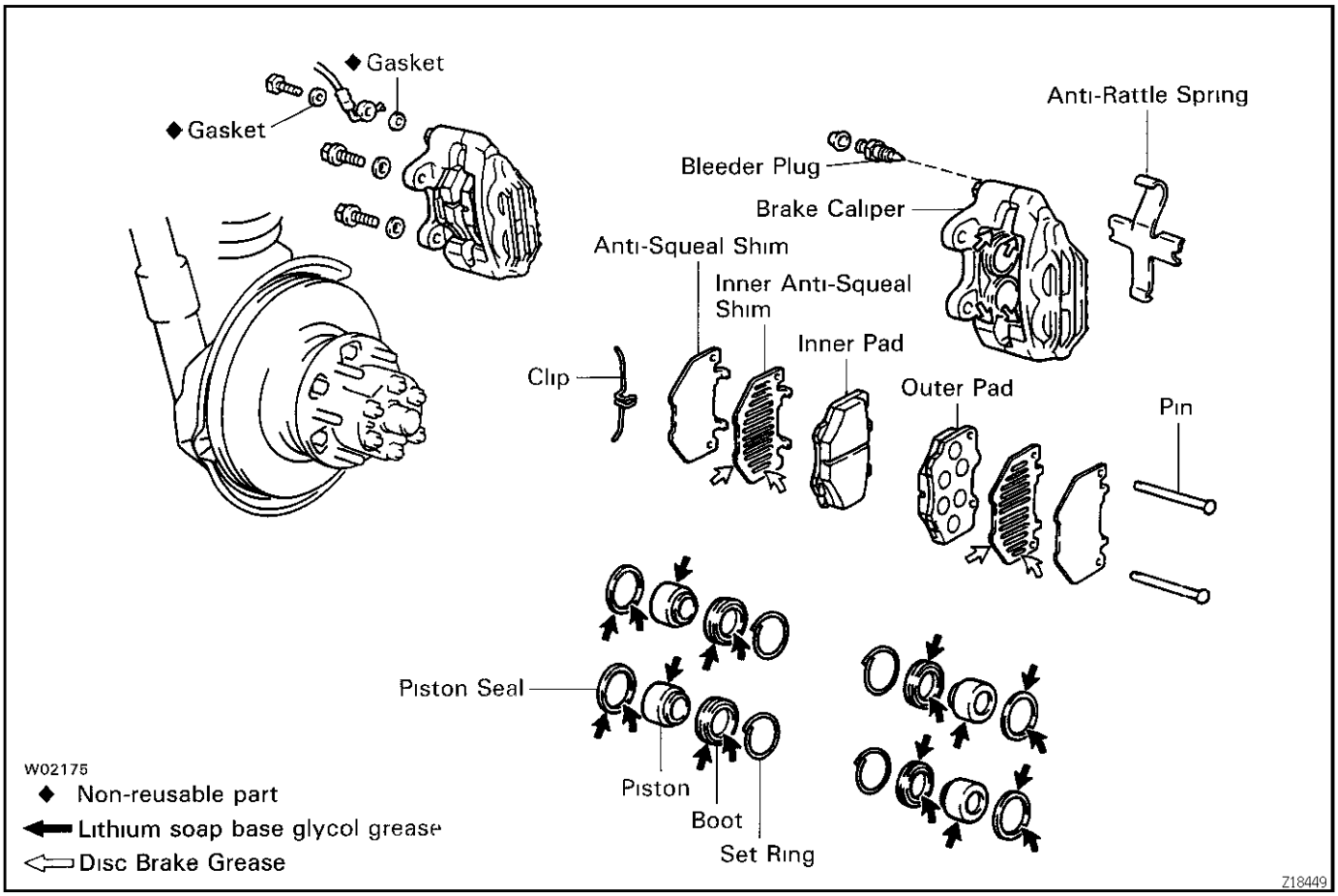
Brought to you by BirfMark



# FRONT BRAKE CALIPER

## COMPONENTS

BR1CT 01



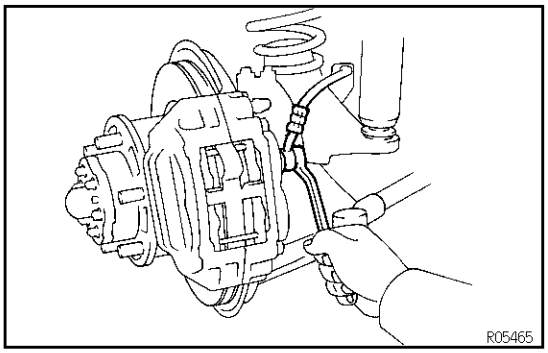



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CU-03

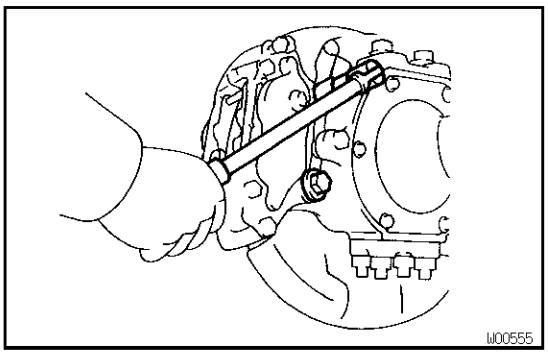



# REMOVAL

**1. DISCONNECT FLEXIBLE HOSE**

(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper
**Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)**

(b) Use a container to catch the brake fluid as it drains out




**2. REMOVE CALIPER**

Remove the 2 mounting bolts and caliper
**Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)**

**3. REMOVE THESE PARTS:**

- Clip
- 2 pins
- Anti–rattle spring
- 2 pads
- 4 anti–squeal shims

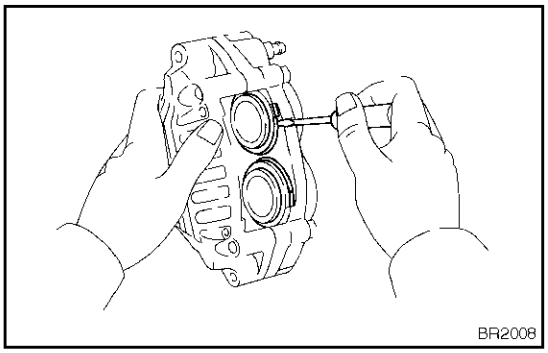


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



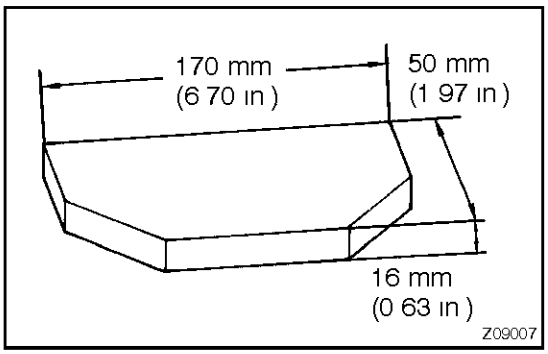
BR1CV 04




# DISASSEMBLY

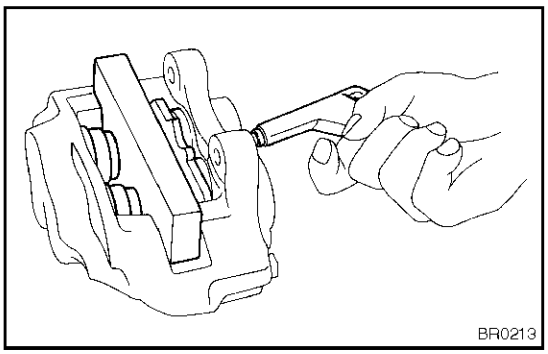
## 1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the 4 cylinder boot set rings and boots




## 2. REMOVE PISTONS FROM CYLINDER

(a) Prepare the wooden plate to hold the pistons

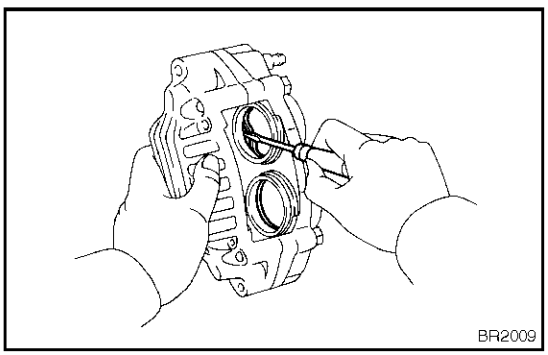



(b) Place the plate between the pistons and insert a pad at one side

(c) Use compressed air to remove the pistons alternately from the cylinder

**CAUTION:**

**Do not place your fingers in front of the pistons when using compressed air.**




## 3. REMOVE PISTON SEALS

Using a screwdriver, remove the 4 piston seals from the cylinder

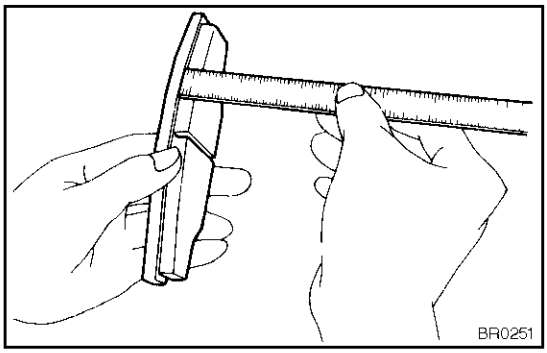


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CX 03




# INSPECTION

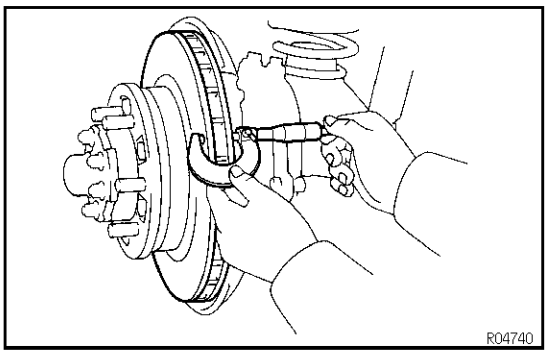
## 1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness

**Standard thickness: 9.5 mm (0.374 in.)**

**Minimum thickness: 1.0 mm (0.039 in.)**

Replace the pad if the thickness is less than the minimum (the 1 0 mm slit is no longer visible), or if it shows signs of uneven wear



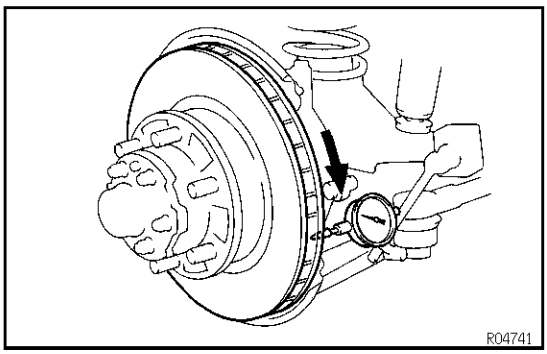

## 2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness

**Standard thickness: 32.0 mm (1.260 in.)**

**Minimum thickness: 30.0 mm (1.181 in.)**

If the disc is scored or worn, or if its thickness is less than the minimum, repair or replace the disc




## 3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout at a position 10 mm (0 39 in ) from the outside edge

**Maximum disc runout: 0.15 mm (0.0059 in.)**

If the runout is greater than the maximum, replace the disc or grind it on a "On–Car" brake lathe

HINT

Before measuring the runout, confirm that the front hub bearing play is within the specification

## 4. IF NECESSARY, REPLACE DISC

(a) Remove the front axle hub (See page SA–7)

(b) Remove the disc from the axle hub

(c) Install a new disc and torque the bolts

**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

(d) Install the axle hub and adjust the front bearing preload (See page SA–9)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CW 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BR–26).**

**NOTICE:**

**Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR–33).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1CY 01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR–25).**

HINT

After ınstallatıon, fıll the brake reservoır wıth brake fluıd, bleed brake system (see page BR–4) and check for leaks



Brought to you by BirfMark
Version 1.11 - 03/16/2010

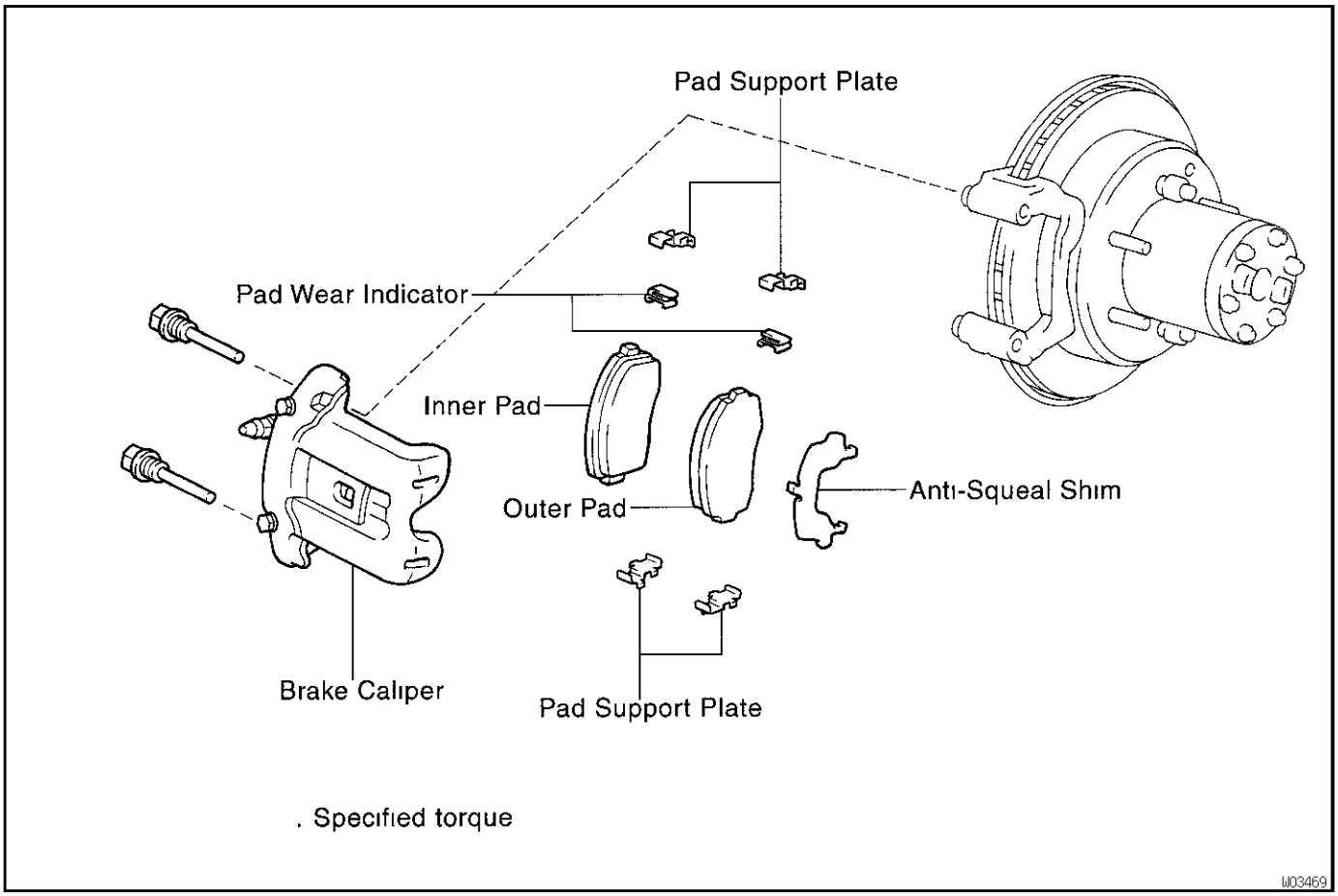
Brought to you by BirfMark



# REAR BRAKE PAD

## COMPONENTS

BR1CZ 02






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

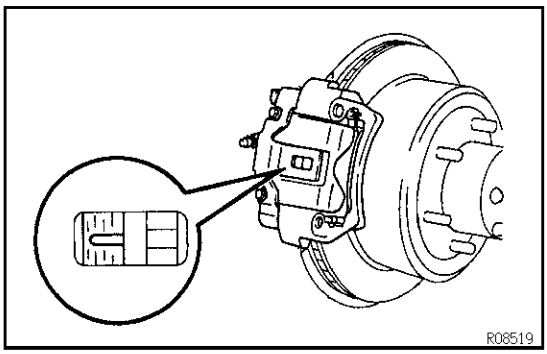


BR1D0–03

# REPLACEMENT

**1. REMOVE REAR WHEEL**

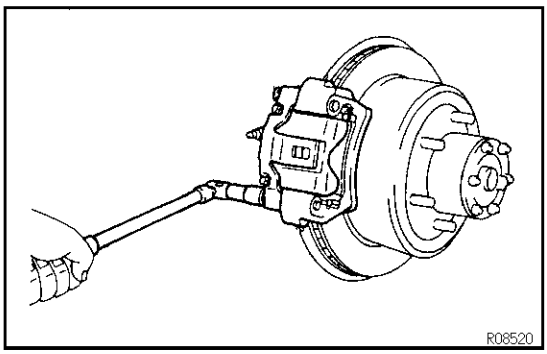
Remove the wheel and temporarily fasten the disc with the hub nuts




**2. INSPECT PAD LINING THICKNESS**

Check the pad thickness through the caliper inspection hole and replace pads if the thickness is not within the specification

**Minimum thickness: 1.0 mm (0.039 in.)**




**3. REMOVE BRAKE CALIPER**

(a) Remove the sliding main pin and sliding sub pin

(b) Remove the caliper and suspend it so the hose is not stretched

HINT

Do not disconnect the flexible hose

**4. REMOVE THESE PARTS:**

(a) 2 brake pads

(b) Anti–squeal shim

(c) 4 pad support plates

(d) 2 pad wear indicator plates

**NOTICE:**

**The pad support plates can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.**

**5. CHECK DISC THICKNESS AND RUNOUT**

**(See page BR–36)**

**6. INSTALL PAD SUPPORT PLATES**

**7. INSTALL NEW PADS**

**NOTICE:**

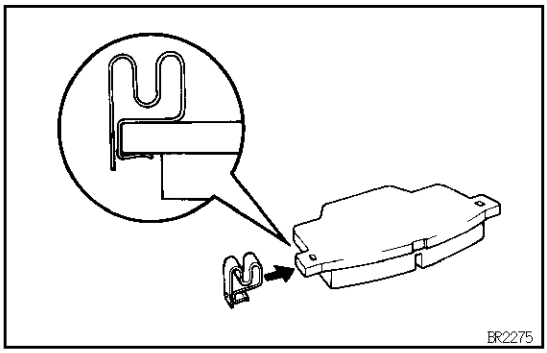
**When replacing worn pads, the anti–squeal shim and wear indicator plates must be replaced together with the pads.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





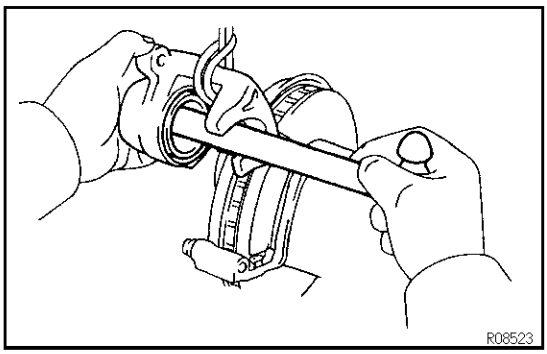

(a) Install pad wear indicator plate to each pads
(b) Install the anti–squeal shim to the outer pad
(c) Install the 2 pads so the wear indicator plate is facing upward

**NOTICE:**

**Do not allow oil or grease to get on the rubbing face.**

**8. INSTALL CALIPER**

(a) Draw out a small amount of brake fluid from the reservoir




(b) Press in piston with a hammer handle or an equivalent

HINT

Always change the pads on one wheel at a time as there is a possibility of the opposite piston flying out

(c) Install the caliper carefully so the boot is not wedged
(d) Install and torque the sliding main pin and sub pin

**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**

**9. INSTALL REAR WHEEL**

**10. CHECK THAT FLUID LEVEL IS AT MAX LINE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

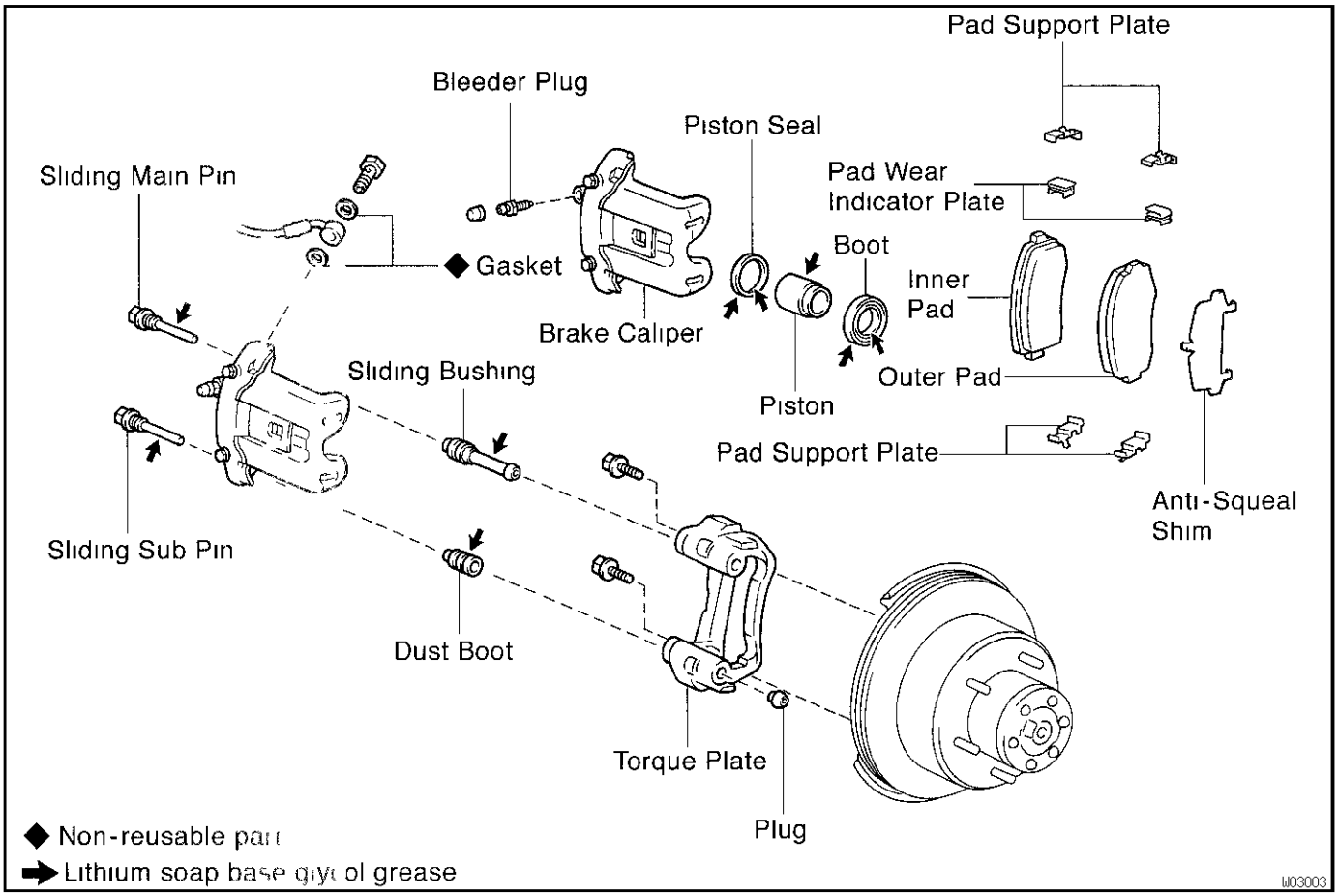
Brought to you by BirfMark



# REAR BRAKE CALIPER

## COMPONENTS

BR1D1-01






Author : Date : 1015
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1D2–01

# REMOVAL

**1. DISCONNECT FLEXIBLE HOSE**

(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper

**Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)**

(b) Use a container to catch the brake fluid as it drains out

**2. REMOVE CALIPER**

Remove the 2 sliding pins and caliper

**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**

**3. REMOVE THESE PARTS:**

(a) 2 pads with anti–squeal shim

(b) 4 pad support plates



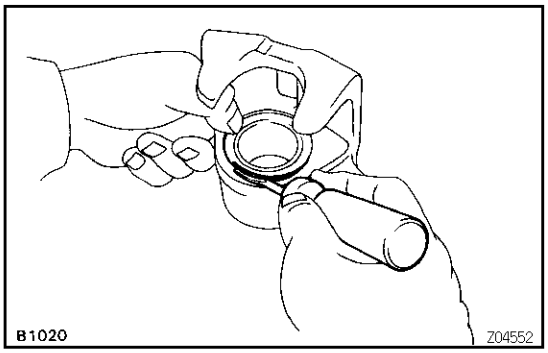
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



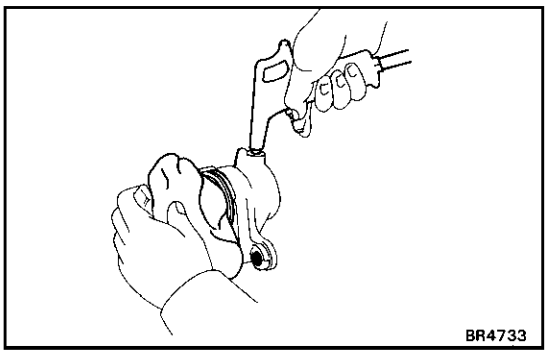
BR1D8-01

# DISASSEMBLY




## 1. REMOVE CYLINDER BOOT

Using a screwdriver, remove the cylinder boot from the caliper



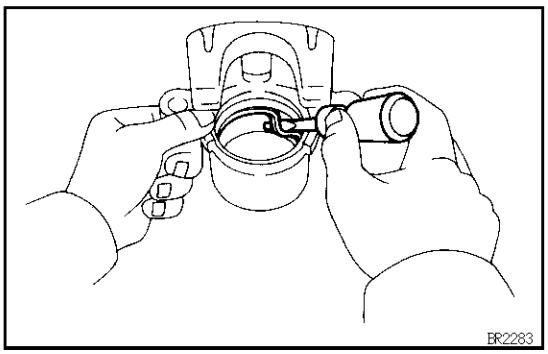

## 2. REMOVE PISTON

(a) Place a piece of cloth or similar article between the piston and the caliper

(b) Use compressed air to remove the piston from the cylinder

**CAUTION:**

**Do not place your fingers in front of the piston when using compressed air.**




## 3. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder

## 4. REMOVE DUST BOOT AND SLIDING BUSHING

Using a screwdriver and hammer, tap out dust boot and sliding bushing

HINT

Tape the screwdriver tip before use



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1D5–03

# INSPECTION

1. **MEASURE PAD LINING THICKNESS**
   **(See step 1. on page BR–27)**
   **Standard thickness: 10.0 mm (0.394 in.)**
   **Minimum thickness: 1.0 mm (0.039 in.)**
2. **MEASURE DISC THICKNESS (See page BR–27)**
   **Standard thickness: 18.0 mm (0.709 in.)**
   **Minimum thickness: 16.0 mm (0.630 in.)**
3. **MEASURE DISC RUNOUT (See page BR–27)**
   **Maximum disc runout: 0.15 mm (0.0059 in.)**

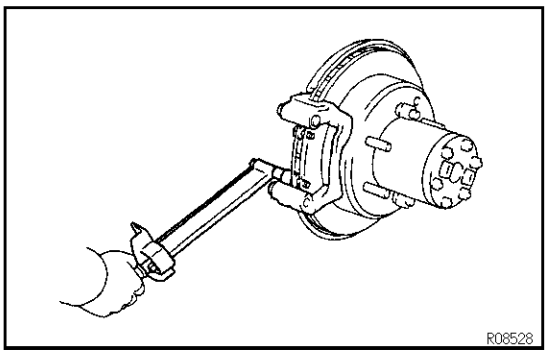
If the runout is greater than the maximum, adjust the disc runout or grind it on a "On–Car" brake lathe

4. **IF NECESSARY, REPLACE DISC**

(a) Remove the torque plate

(b) Remove the hub nuts of the temporarily installed disc and pull off the disc

(c) Install a new disc and and loosely install the hub nuts




(d) Install the torque plate and tighten the mounting bolts
**Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1D4–01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BR–35).**

**NOTICE:**

**Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR–33).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1D6–01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR–34).**

HINT

After ınstallatıon, fıll brake reservoır wıth brake fluıd, bleed brake system (See pageBR–4) and check for leaks



Brought to you by BirfMark
Version 1.11 - 03/16/2010

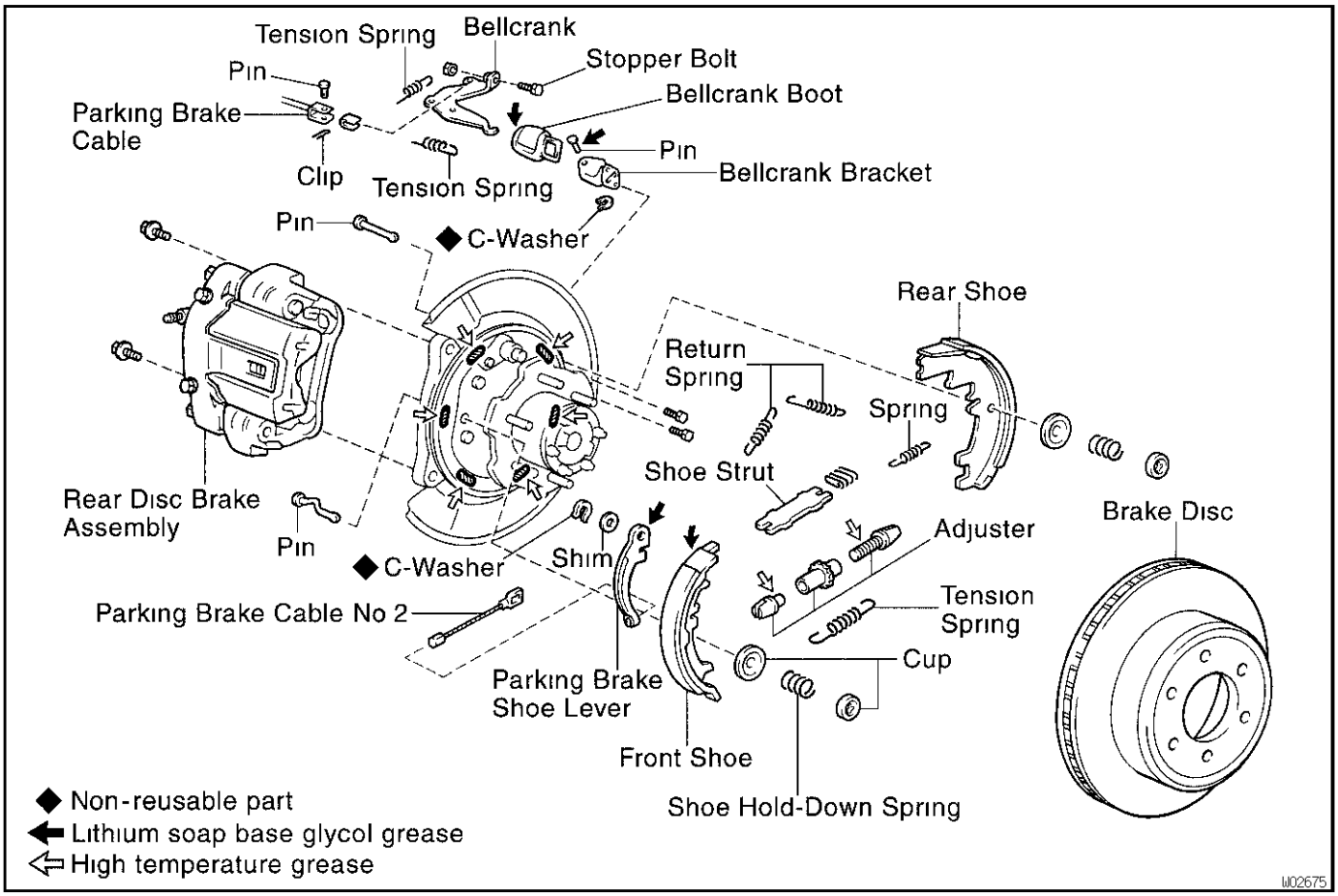
Brought to you by BirfMark



# PARKING BRAKE

## COMPONENTS

BR1D7-01






Author : Date : 1021

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



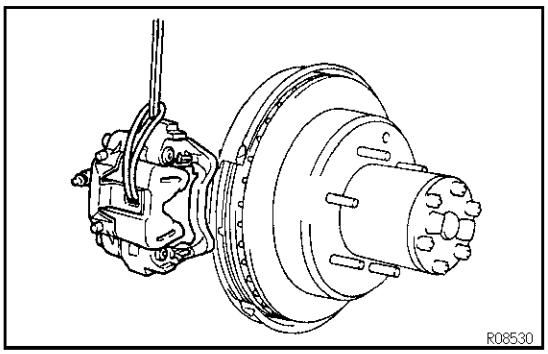
BR1D6–04

# DISASSEMBLY

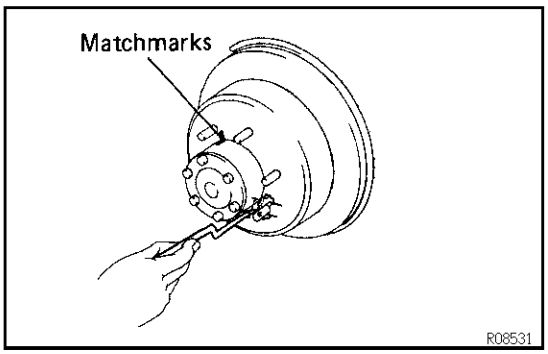
1. **REMOVE REAR WHEEL**
2. **REMOVE REAR DISC BRAKE ASSEMBLY**

(a) Remove the 2 mounting bolts and remove the disc brake assembly

**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**




(b) Suspend the disc brake assembly securely Ensure that the hose is not stretched

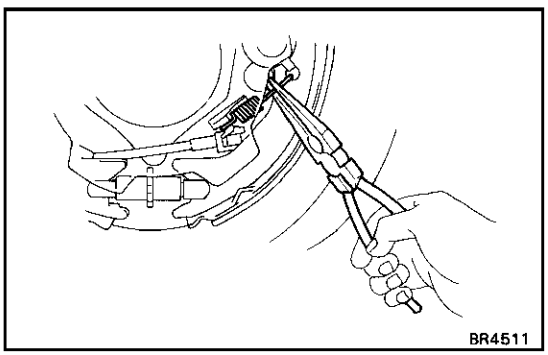



3. **REMOVE DISC**

Place the matchmarks on the disc and rear hub, and remove the disc

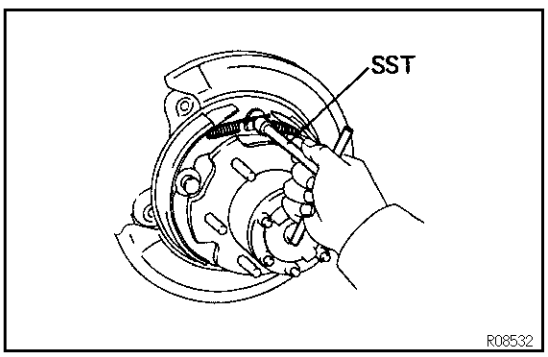
HINT

If the disc cannot be removed easily, turn the shoe adjuster until the wheel turns freely




4. **REMOVE TENSION SPRING**

Using needle–nose pliers, remove the tension spring




5. **REMOVE SHOE RETURN SPRINGS**

Using SST, remove the shoe return springs

SST 09717–20010

HINT

Using SST, install the front shoe return spring and then install the rear return spring

SST 09718–20010

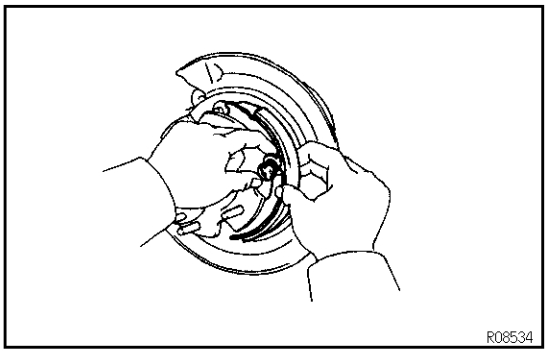
6. **REMOVE SHOE STRUT WITH SPRING**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**7. REMOVE REAR SHOE, ADJUSTER AND TENSION SPRING**

(a) Slide out the rear shoe, and remove the rear shoe and adjuster

(b) Remove the 2 shoe hold–down spring cups, spring and pin

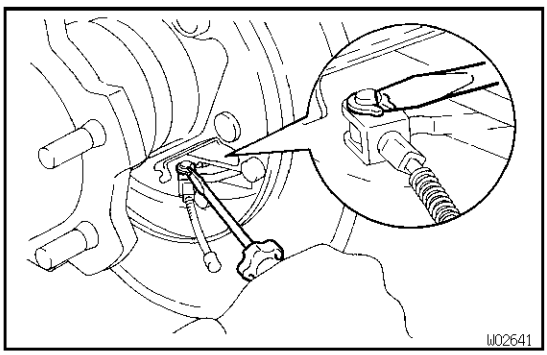
(c) Remove the lower side tension spring

**8. REMOVE FRONT SHOE**

(a) Slide out the front shoe

(b) Remove the shoe 2 hold–down spring cups, springs and pin

(c) Disconnect the parking brake cable from the parking brake shoe lever




**9. IF NECESSARY, REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK ASSEMBLY**

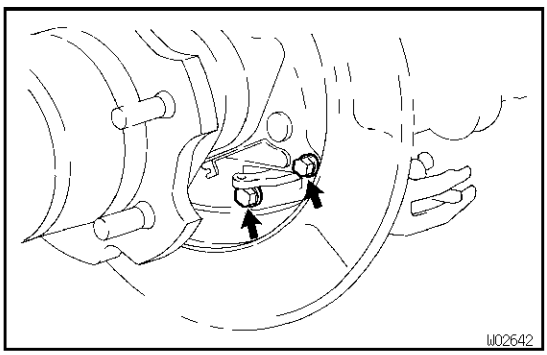
(a) Using a screwdriver, remove the C–washer

(b) Remove the pin and disconnect the parking brake cable No 2 from the bellcrank

(c) Remove the clip

(d) Remove the pin and clip, then disconnect the parking brake cable

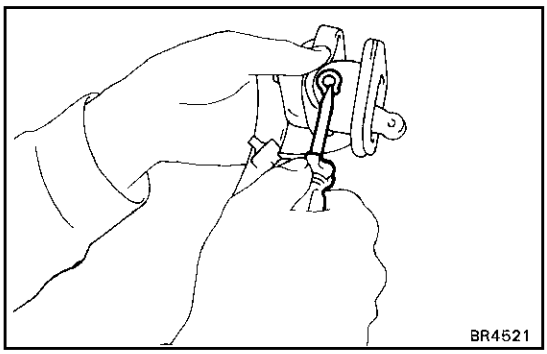
(e) Remove the 2 tension springs




(f) Remove the 2 bolts and parking brake bellcrank assembly

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(g) Remove the boot from parking brake bellcrank bracket




(h) Using a screwdriver, remove the C–washer and pin

(i) Remove the parking brake bellcrank from the bell crank bracket



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

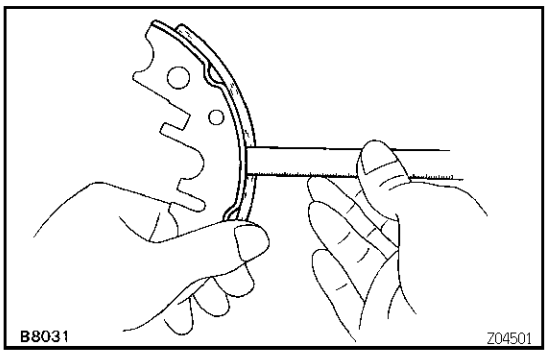


BR1D9–02

# INSPECTION

## 1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage



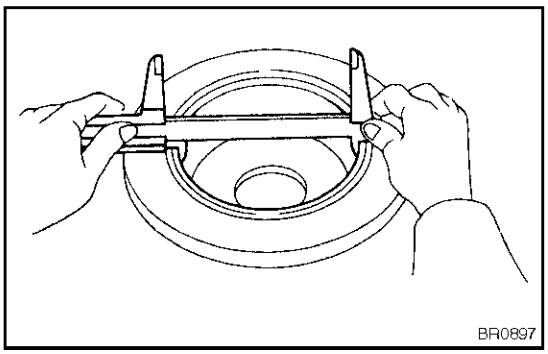

## 2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the thickness of the shoe lining

**Standard thickness: 4.0 mm (0.157 in.)**

**Minimum thickness: 1.0 mm (0.039 in.)**

If the lining thickness is at the minimum thickness or less, or if there is extremely uneven wear, replace the brake shoe



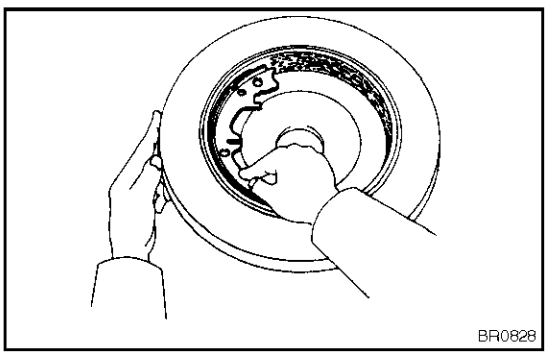

## 3. MEASURE BRAKE DISC INSIDE DIAMETER

Using a vernier calipers, measure the inside diameter of the disc

**Standard inside diameter: 230 mm (9.06 in.)**

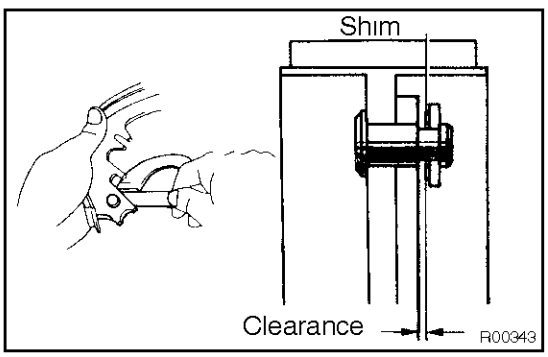
**Maximum inside diameter: 231 mm (9.09 in.)**

Replace the disc if the inside diameter is at the maximum value or more Replace the disc or grind it with a lathe if the disc is scored or is worn unevenly




## 4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

Apply chalk to the inside surface of the disc, then grind down the brake shoe lining to fit If the contact between the disc and the brake shoe lining is improper, repair it using a brake shoe grinder or replace the brake shoe assembly




## 5. MEASURE CLEARANCE BETWEEN PARKING BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance

**Standard clearance: Less than 0.35 mm (0.0138 in.)**

If the clearance is not within the specification, replace the shim with one of the correct size

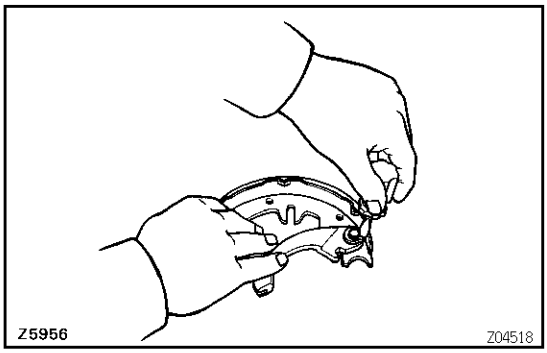
| Shim Thickness | Shim Thickness |
|---|---|
| 0 3 mm (0 012 in ) | 0 9 mm (0 035 in ) |
| 0 6 mm (0 024 in ) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

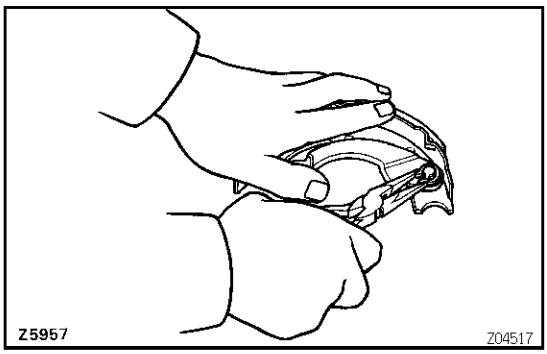





**6. IF NECESSARY, REPLACE SHIM**

(a) Using a screwdriver, remove the C–washer

(b) Remove the parking brake shoe lever, and install the correct size shim




(c) Using needle–nose pliers, install the parking brake shoe lever with a new C–washer

(d) Remeasure the clearance



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DA 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page BR–40).**

**NOTICE:**

**Apply high temperature grease and lithium soap base glycol grease to the parts indicated by the arrows (See page BR–39).**

**1. ADJUST PARKING BRAKE SHOE CLEARANCE**

(a) Disconnect the PKB cable from bellcrank and remove the 2 tension springs

(b) Loosen the stopper bolt

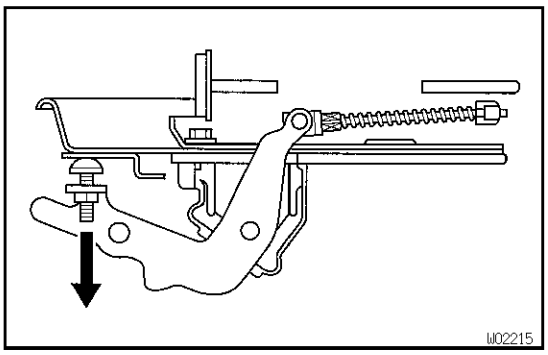
(c) Temporarily install the hub nuts

(d) Remove the hole plug

(e) Turn the adjuster and expand the shoes until the disc locks

(f) Return the adjuster 8 notches

(g) Install the hole plug




**2. ADJUST BELLCRANK**

(a) Pull the bellcrank until all play in the interior linkage is taken up

(b) Screw in the bellcrank adjusting bolt to where it contacts on the dust seal

(c) Loosen it one turn, and lock it at that position with the lock nut

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

(d) Install the bellcrank spring

(e) Connect the PKB cable to the bellcrank

**3. BEDDING DOWN PARKING BRAKE SHOES AND DISC**

(a) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road

(b) With the parking brake release button pushed in, pull on the lever with 88 N (9 kgf, 19 8 lbf) of force

(c) Drive the vehicle for about 400 meters (0 25 mile) in this condition

(d) Repeat this procedure 2 or 3 times

**4. RECHECK AND ADJUST PARKING BRAKE LEVER TRAVEL**



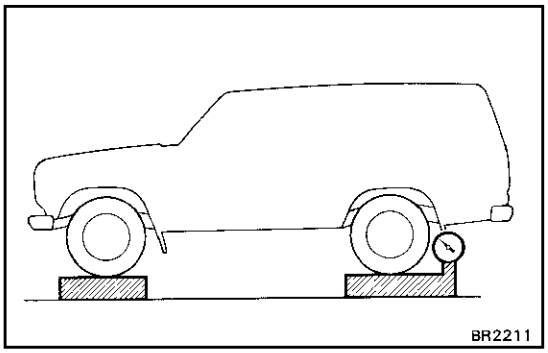
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

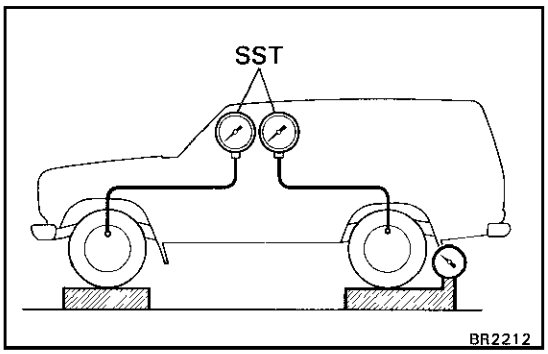


BR1DC-04

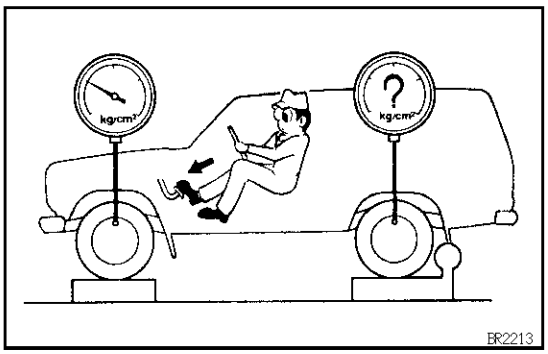
# ON-VEHICLE INSPECTION




1. **SET REAR AXLE LOAD**
   **Rear axle load (include vehicle weight):**
   **1,330 kg (2,932 lb)**

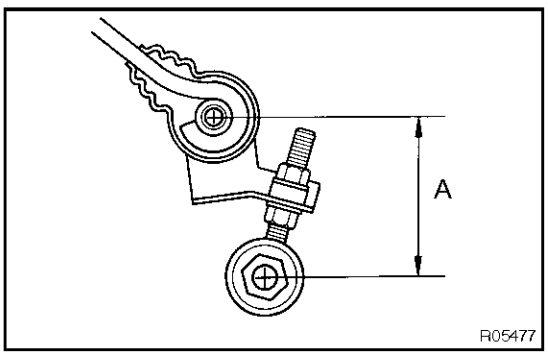



2. **INSTALL LSPV GAUGE (SST) AND BLEED AIR**
   SST 09709-29018




3. **RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE**
   **Rear brake pressure:**
   **5,984 ± 589 kPa (61 ± 6 kgf/cm², 869±86 psi)**

HINT
The brake pedal should not be depressed twice and/or returned while setting to the specified pressure Read the value of rear pressure 2 seconds after adjusting the specified fluid pressure

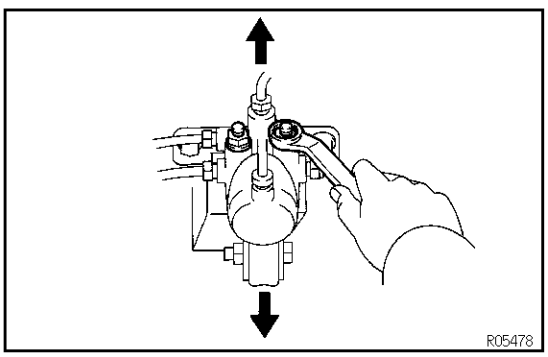



4. **IF NECESSARY, ADJUST FLUID PRESSURE**

(a) Disconnect the No 2 shackle from the shackle bracket

(b) Adjust the length of the No 2 shackle turning it
   Low pressure – Lengthen A
   High pressure – Shorten A
   **Initial set: 90 mm (3.54 in.)**
   **Adjusting range: 84 – 96 mm (3.31 – 3.78 in.)**

HINT
One turn of the No 2 shackle changes the fluid pressure by about 98 1 kPa (1 0 kgf/cm², 14 2 psi)




(c) In event the pressure cannot be adjusted by No 2 shackle, raise or lower the valve body
   Low pressure – Lower
   High pressure – Raise

(d) Torque the 2 nuts
   **Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(e) Adjust the length of the No 2 shackle again

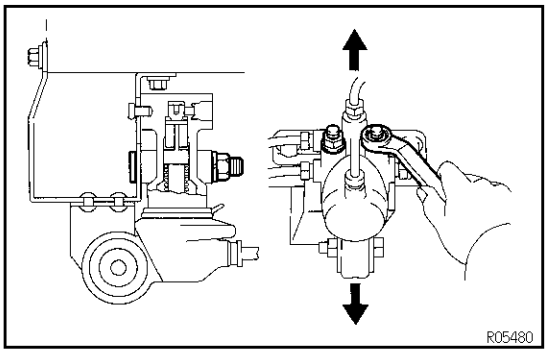
If it cannot be adjusted, inspect the valve housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



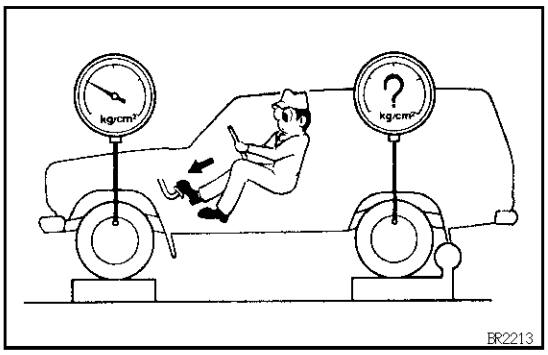



**5. IF NECESSARY, CHECK VALVE BODY**

(a) Assemble the valve body in the uppermost position

HINT

When the brakes are applied, the piston will move down about 1 mm (0 039 in ) Even at this time, the piston should not make contact with or move the load sensing spring




(b) In this position, check the rear brake pressure

| Front brake pressure kPa (kgf/cm$^2$ psi) | Rear brake pressure kPa (kgf/cm$^2$ psi) |
|---|---|
| 3 434 (35 498) | 3 434 (35 498) |
| 5 396 (55 783) | 3 630 – 4 218 (37 – 43 527 – 612) |
| 9 810 (100 1 424) | 4 513 – 5 494 (46 – 56 655 – 797) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

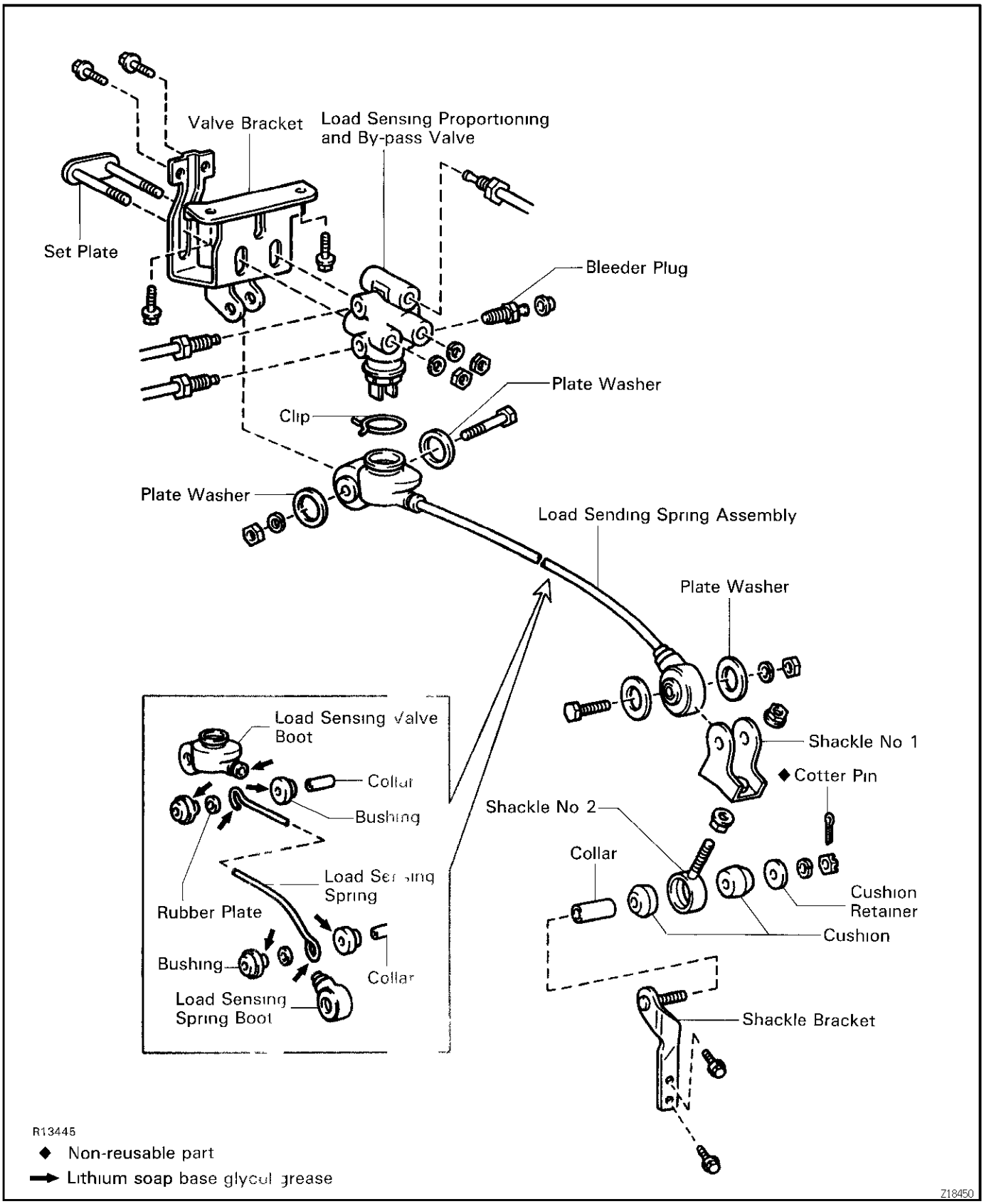
Brought to you by BirfMark



# LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)

## COMPONENTS

BR1DB 01





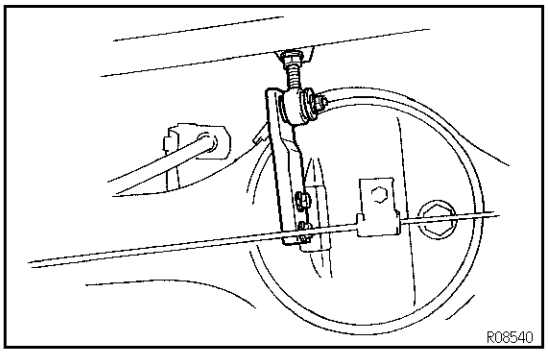

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DD-01

# REMOVAL

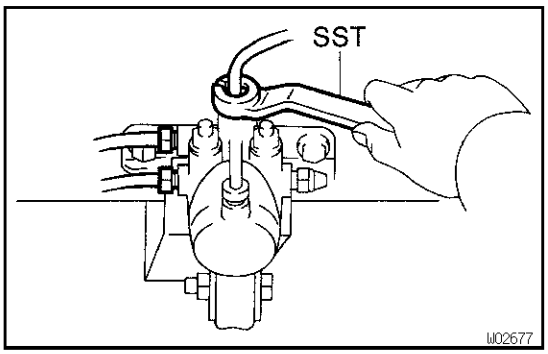



**1. DISCONNECT SHACKLE NO.2 FROM BRACKET**

(a) Remove the cotter pin

(b) Remove the nut and disconnect the shackle No 2 from the bracket

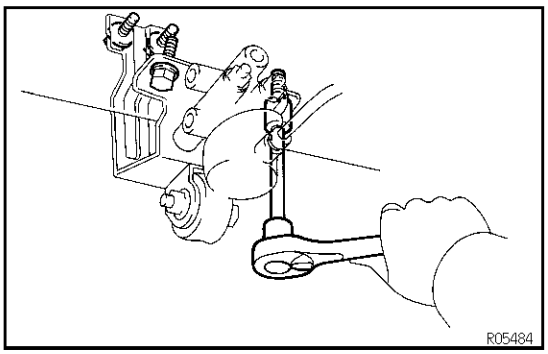
(c) Remove the retainer, 2 cushions and collar




**2. REMOVE LSP & BV ASSEMBLY**

(a) Using SST, disconnect the 3 brake lines from the valve body

SST 09751–36011




(b) Remove the valve bracket and 4 mounting bolts, then remove the LSP & BV assembly

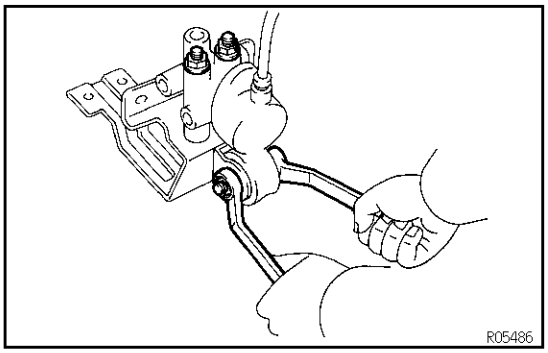


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DE 01

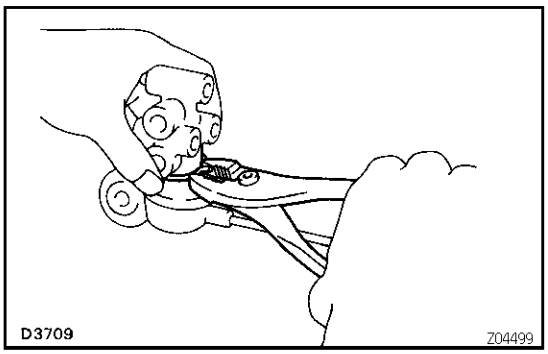



# DISASSEMBLY

## 1. REMOVE VALVE BRACKET

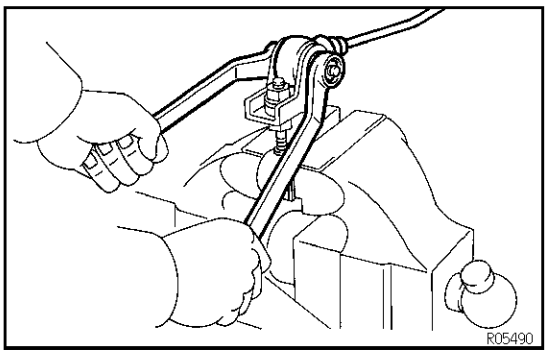
(a) Remove the nut, bolt and 2 plate washers

(b) Remove the 2 nuts, bracket and set plate from the valve body




## 2. DISCONNECT SPRING FROM VALVE

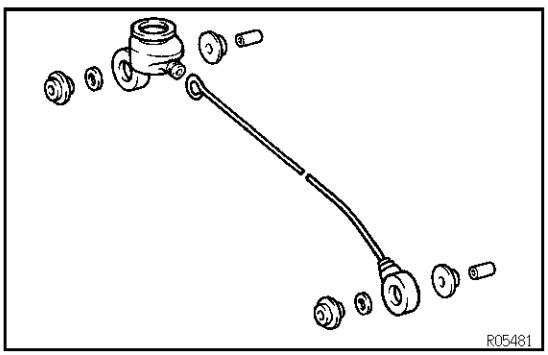
Using pliers, remove the clip, and remove the spring from the valve




## 3. REMOVE SHACKLE NO.1 AND NO.2

(a) Remove the bolt and nut, then remove the these parts
- Load sensing spring
- 2 plate washers

(b) Loosen the 2 nuts, and remove the shackle No 1 from the shackle No 2




## 4. DISASSEMBLE LOAD SENSING SPRING

Disassembly the these parts
- 4 bushings
- 2 collars
- 2 rubber plates
- Load sensing valve boot
- Load sensing spring boot

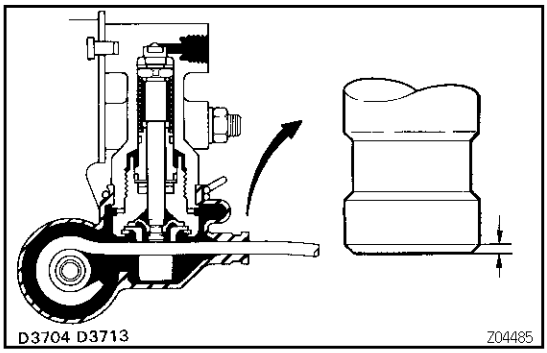


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DF 01




# INSPECTION

## INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

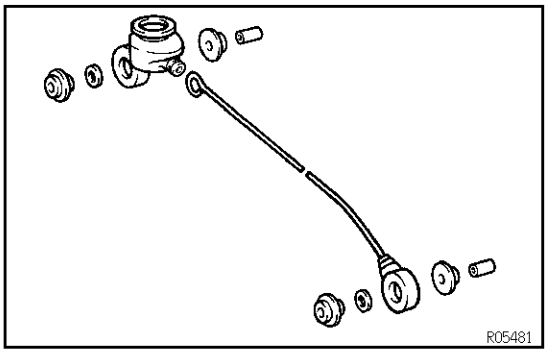
**Wear limit: 0.7 mm (0.028 in.)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



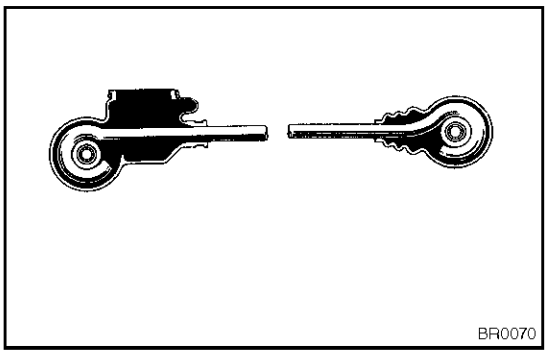

R05481

BR1DG 01

# REASSEMBLY

**1. ASSEMBLE THESE PARTS TO LOAD SENSING SPRING:**

- Load sensing valve boot
- Load sensing spring boot
- 4 bushings
- 2 rubber plates
- 2 collars


BR0070

HINT

Apply lithium soap base glycol grease to the parts indicated by the arrrows Do not mistake the valve side for the shackle side of the load sensing spring

**2. INSTALL SHACKLE NO.1 AND NO.2 TO LOAD SENSING SPRING**

(a) Install the lock nut and shackle No 1 to the shackle No 2

(b) Torque the bolt and nut through the 2 plate washers
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

**3. INSTALL LOAD SENSING SPRING TO VALVE BODY**

Install the load sensing spring assembly to the load sensing valve with the clip

**4. INSTALL VALVE BRACKET**

(a) Install the set plate to the valve assembly through the valve bracket and temporarily tighten the 2 valve body mounting nuts

(b) Torque the bolt and nut through the 2 plate washers
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



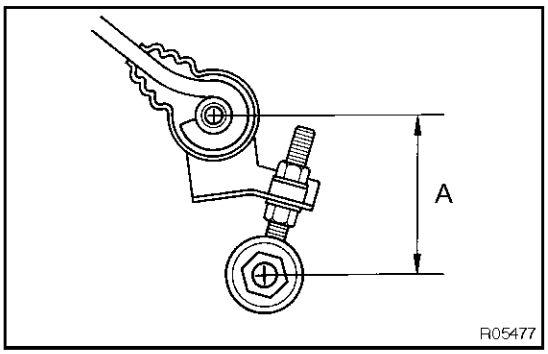
BR1DH–01

# INSTALLATION

**1. INSTALL LSP & BV ASSEMBLY**

Install the LSP & BV assembly to the frame with the 4 bolts

**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**




**2. CONNECT SHACKLE NO.2 TO BRACKET**

(a) Set the dimension A by turning shackle No 2

**Initial set: 90 mm (3.54 in.)**

(b) Tighten the lock nut

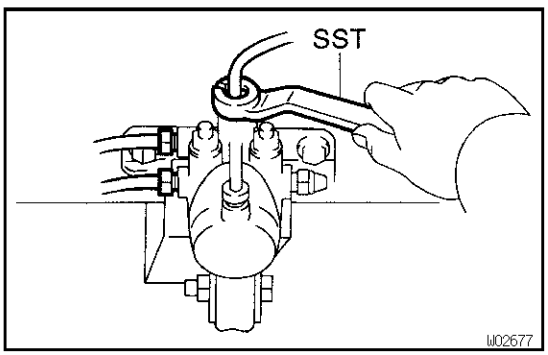
**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(c) Install the 2 bushings and collar to the load sensing spring shackle

(d) Install the load sensing spring shackle to the shackle bracket with a retainer and nut

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(e) Install a new cotter pin




**3. CONNECT BRAKE LINES**

Using SST, connect the 3 brake lines

SST 09751–36011

**Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)**

**4. SET REAR AXLE LOAD (See page BR–45)**

**5. SET VALVE BODY**

(a) When pulling down the load sensing spring, confirm that the valve piston moves down smoothly

(b) Position the valve body so that the valve piston lightly contacts the load sensing spring

(c) Tighten the 2 valve body mounting nuts

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

**6. BLEED BRAKE SYSTEM (See page BR–4)**

**7. CHECK FLUID LEAKAGE**

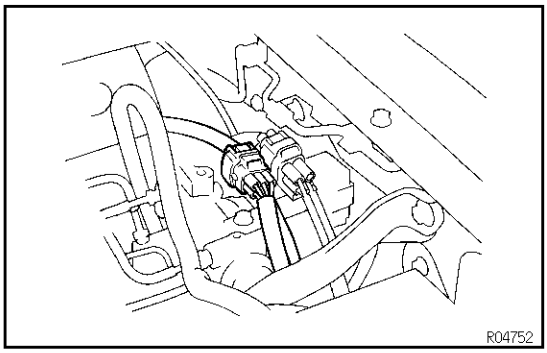
**8. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page BR–45)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# ABS ACTUATOR

## ON–VEHICLE INSPECTION

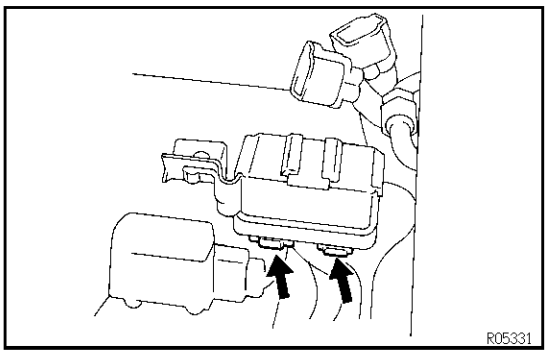
BR1D -01

**1. INSPECT BATTERY POSITIVE VOLTAGE**

**Battery positive voltage: 10 – 14 V**

**2. DISCONNECT CONNECTORS**

(a) Disconnect the connector from the actuator




(b) Remove the control relay from the actuator bracket

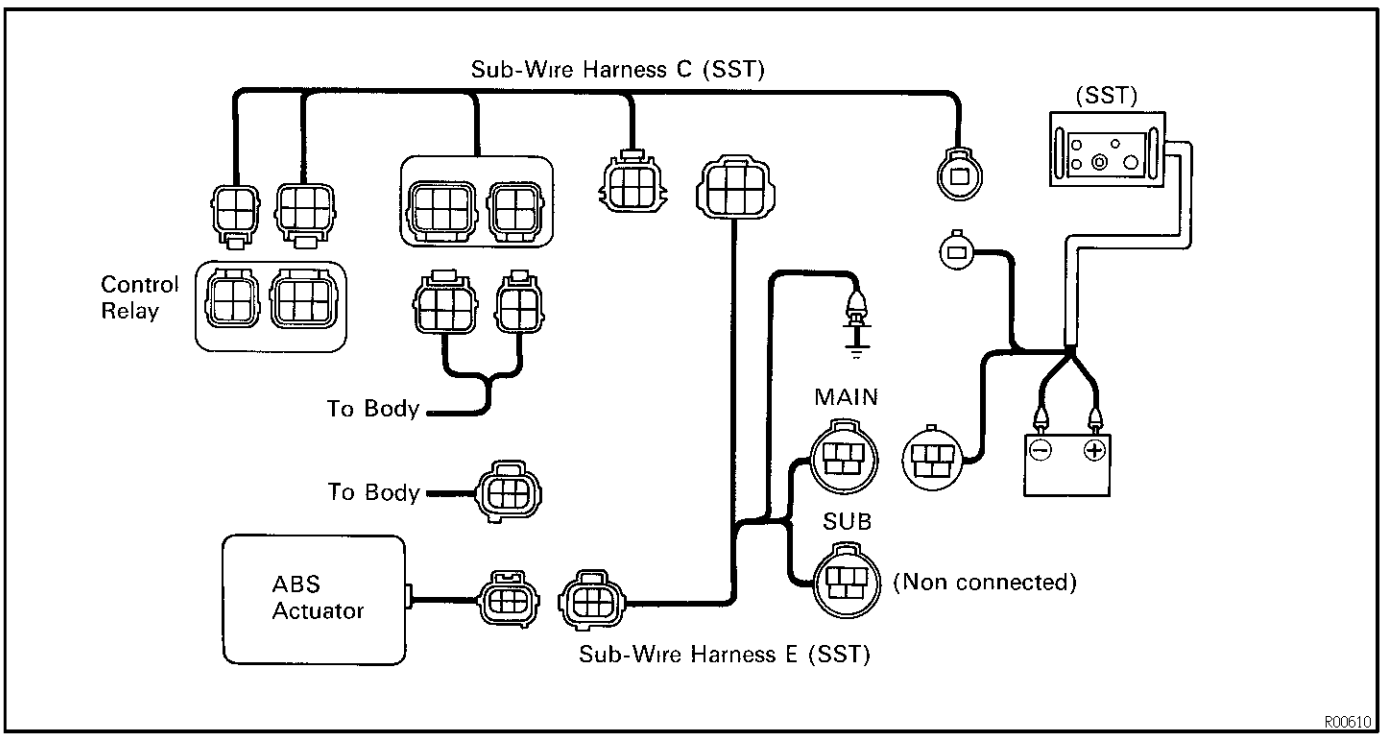
(c) Disconnect the 2 connectors from the control relay

**3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR**

(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub–wire harness C (SST) and E (SST), as shown

SST 09990–00150, 09990–00200, 09990–00210

(b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (–) terminal Connect the black cable of the sub–wire harness to the battery negative (–) terminal or body ground



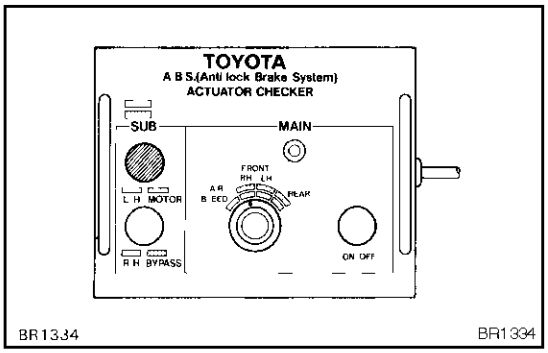



Author : Date : 1035

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





BR1334 BR1394

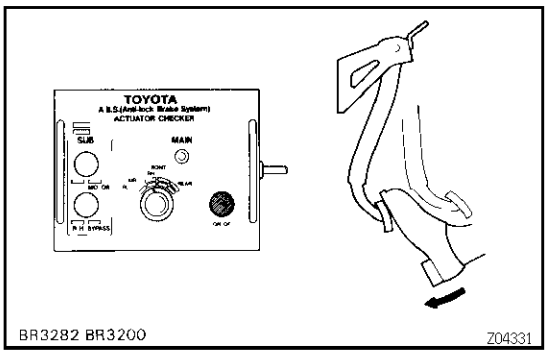
**4. INSPECT BRAKE ACTUATOR OPERATION**

(a) Start the engine, and run it at idle

(b) Turn the selector switch of the actuator checker to "FRONT RH" position

(c) Push and hold in the SUB MOTOR switch for a few seconds

(d) Depress the brake pedal and hold it until the step (g) is completed



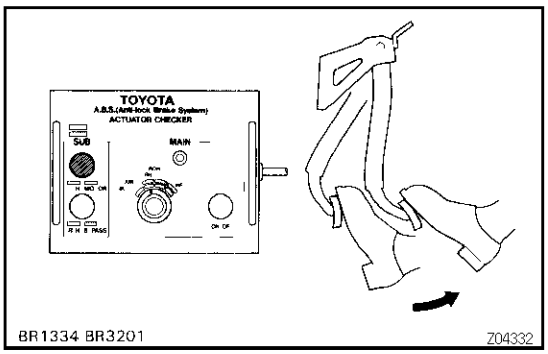
BR3282 BR3200 Z04331

(e) Push the POWER switch, and check that the brake pedal does not go down

**NOTICE:**

**Do not keep the POWER switch pushed down for more than 10 seconds.**

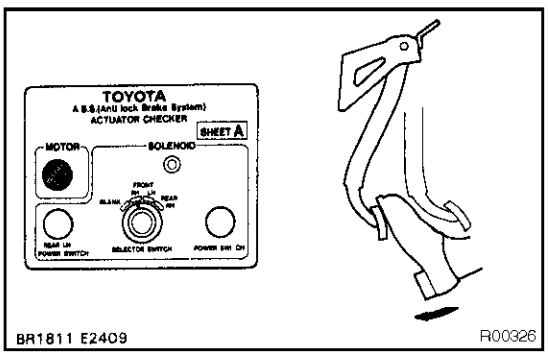
(f) Release the switch, and check that the pedal goes down



BR1334 BR3201 Z04332

(g) Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns

(h) Release the brake pedal

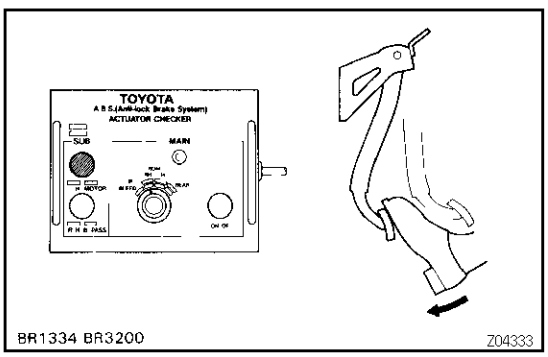


BR1811 E2409 R00326

(i) Push and hold in the SUB MOTOR switch for a few seconds

(j) Depress the brake pedal and hold it for about 15 seconds As you hold the pedal down, push the SUB MOTOR switch for a few seconds Check that the brake pedal does not pulsate

(k) Release the brake pedal



BR1334 BR3200 Z04333

**5. INSPECT FOR OTHER WHEELS**

(a) Turn the selector switch to "FRONT LH" position

(b) Repeating (c) to (j) of the step 4, check the actuator operation similarly

(c) Similarly, inspect "REAR" position

**6. PUSH SUB MOTOR SWITCH**

(a) Push and hold in the SUB MOTOR switch for a few seconds

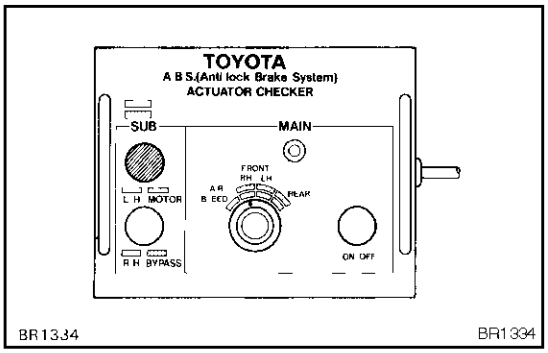
(b) Stop the engine



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR**

Disconnect the actuator checker (SST) and sub–wire harness (SST) from the actuator, control relay and body side wire harness

SST 09990–00150, 09990–00200, 09990–00210

**8. CONNECT CONNECTORS**

(a) Connect the 2 connectors to the control relay

(b) Connect the connector to the actuator

(c) Install the control relay to the actuator bracket

**9. CLEAR DTC (See page DI–190)**



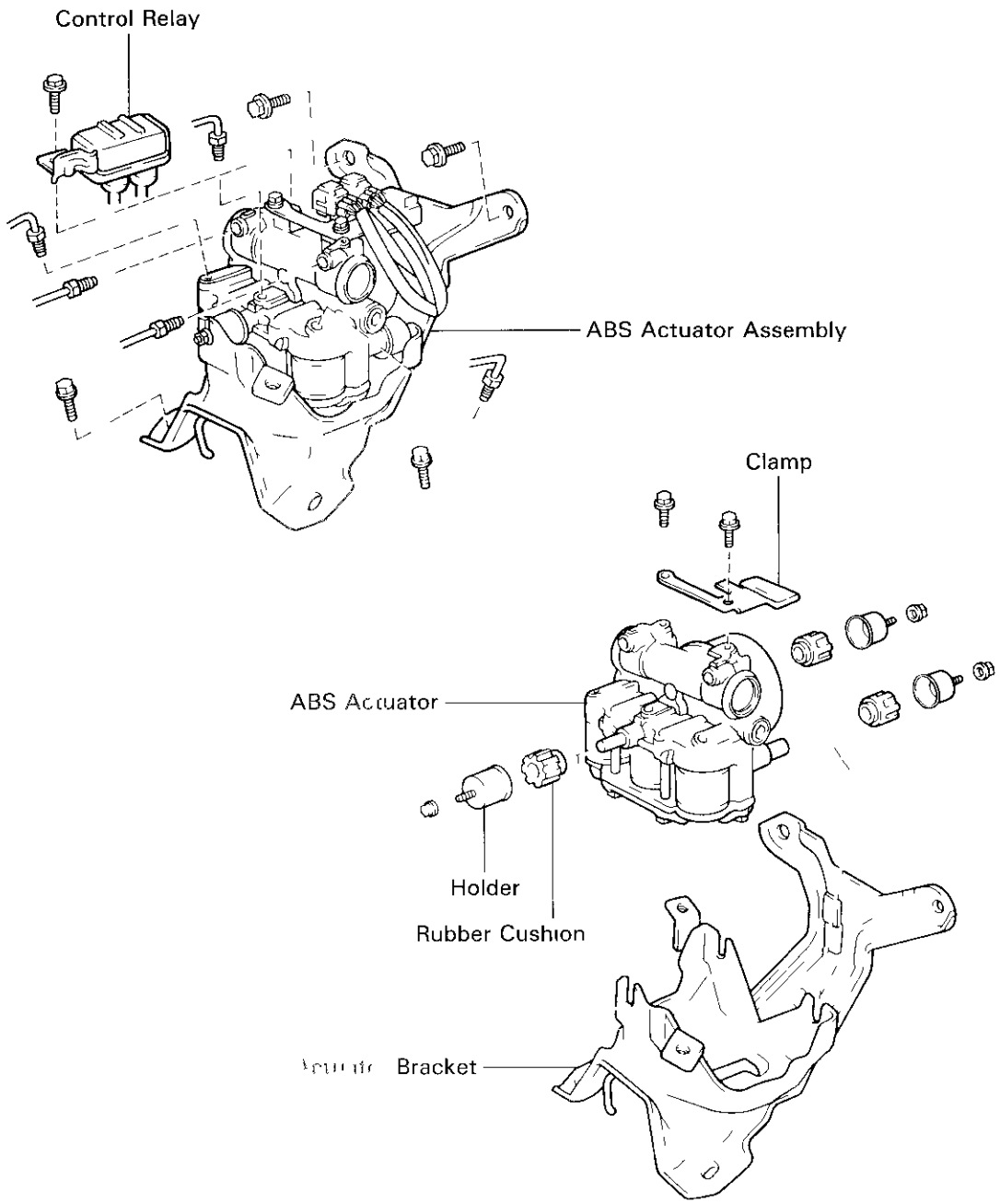
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DJ 01

# COMPONENTS




W02211

Z18451



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

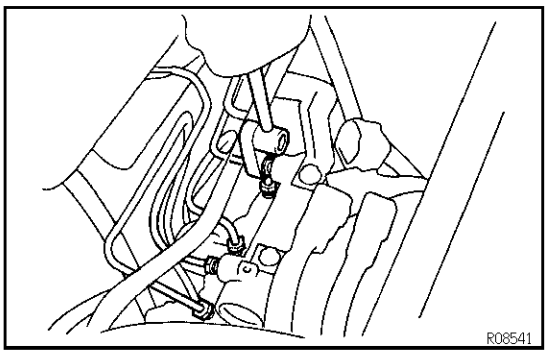


BR1DK 01

# REMOVAL

1. REMOVE CONTROL RELAY FROM ACTUATOR BRACKET

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**




2. DISCONNECT BRAKE LINES

Using SST, disconnect the brake lines from the ABS actuator

SST 09023–00100

**Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)**

3. REMOVE ABS ACTUATOR ASSEMBLY

(a) Disconnect the 2 connectors from the actuator

(b) Remove the 4 bolts and actuator assembly

**Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)**

4. REMOVE ABS ACTUATOR

(a) Remove the 3 nuts and actuator from the actuator bracket

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

(b) Remove the 3 holders and cushions from the ABS actuator



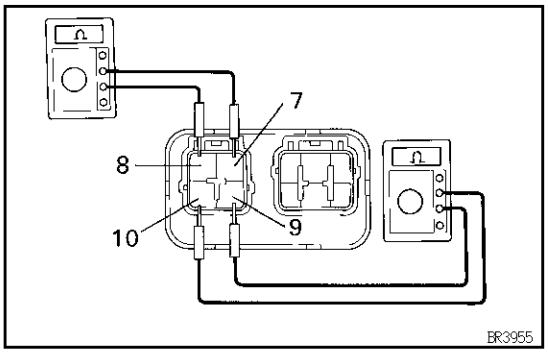
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1NS 01

# INSPECTION

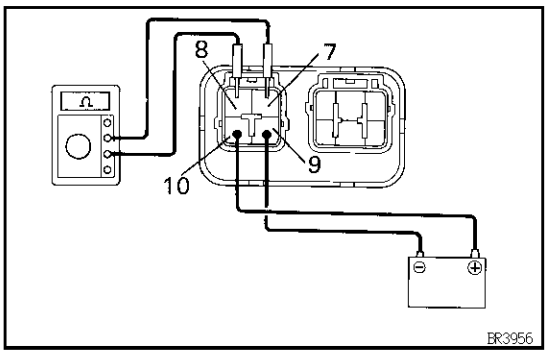



**1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT**

(a) Check there is continuity between terminals 9 and 10

(b) Check there is no continuity between terminals 7 and 8

If continuity is not as specified, replace the relay

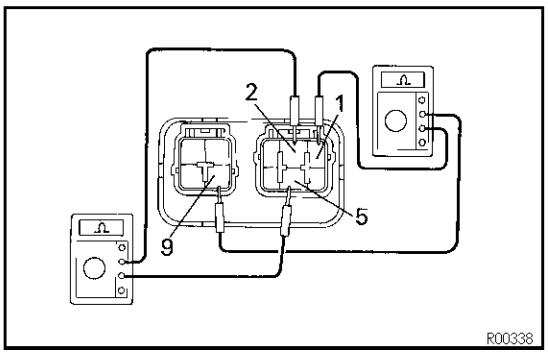



**2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT**

(a) Connect the positive (+) lead from the battery to terminal 10 and negative (–) lead to terminal 9

(b) Check there is continuity between terminals 7 and 8

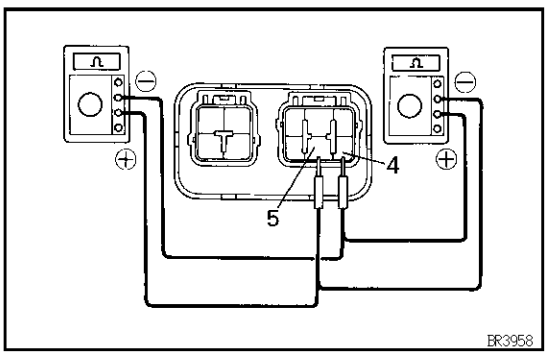
If operation is not as specified, replace the relay




**3. INSPECT CONTINUITY OD SOLENOID RELAY CIRCUIT**

(a) Check there is continuity between terminals 1 and 9

(b) Check there is no continuity between terminals 2 and 5




(c) Connect the positive lead from the ohmmeter to terminal 5 and connect negative lead to terminal 4

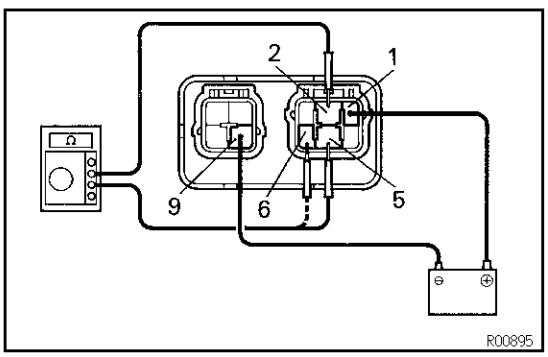
(d) Check there is continuity between terminals

(e) Connect the 2 leads in reverse, and check that there is no continuity between terminals

If continuity is not as specified, replace the relay

HINT

For the different type ohmmeter, there is no continuity for step (d), and there is continuity for step (e)




**4. INSPECT OPERATION OF SOLENOID RELAY CIRCUIT**

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 9

(b) Check there is continuity between terminal 2 and 6

(c) Check there is no continuity between terminals 2 and 6

If operation is not as specified, replace the relay



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DL–01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR–57).**

HINT

After installation, fill the brake reservoir with brake fluid, bleed brake system (see page BR–4) and check for leaks



Brought to you by BirfMark
Version 1.11 - 03/16/2010

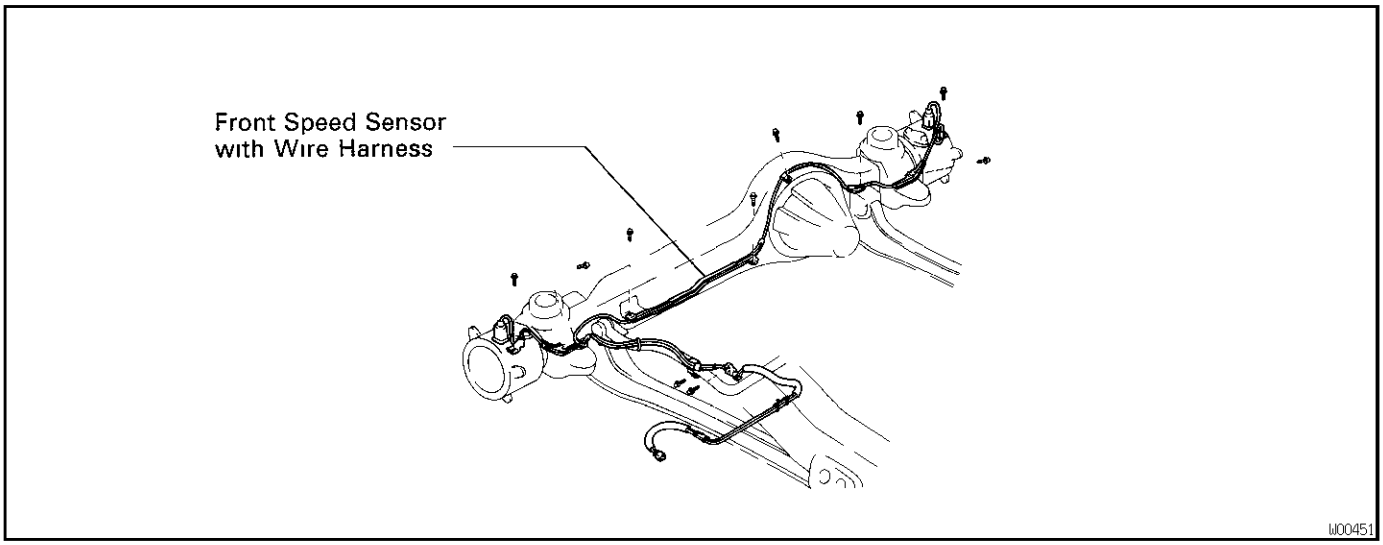
Brought to you by BirfMark



# FRONT SPEED SENSOR

## COMPONENTS

BR1DM-02



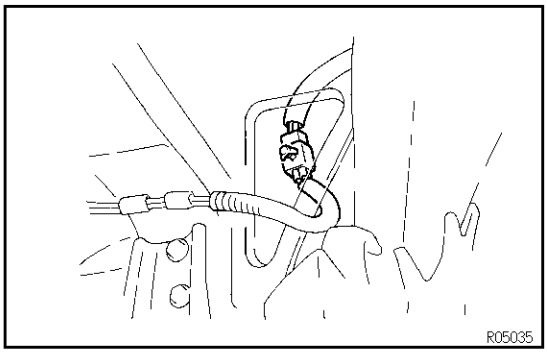



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DN–02




# REMOVAL

HINT

When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set

1. **DISCONNECT SPEED SENSOR CONNECTOR**
2. **REMOVE SPEED SENSOR**

(a) Remove the 8 clamp bolts holding the sensor harness from the axle housing

(b) Remove the bolt and wire tie holding the sensor harness from the stabilizer bar

(c) Remove the bolt and 2 clips holding the sensor harness from the frame and body

(d) Remove the 2 installation bolts and speed sensors from the steering knuckle

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**



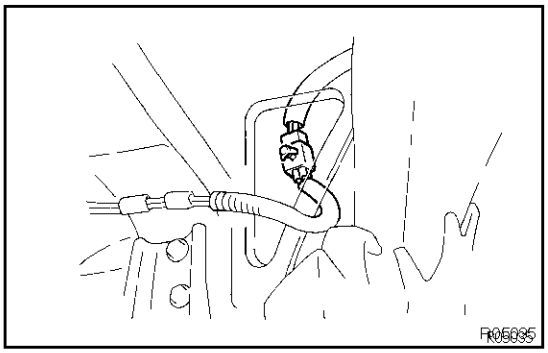
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



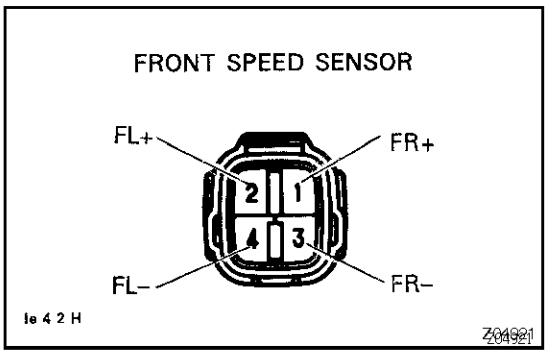
BR1NR–01

# INSPECTION




## 1. INSPECT SPEED SENSOR

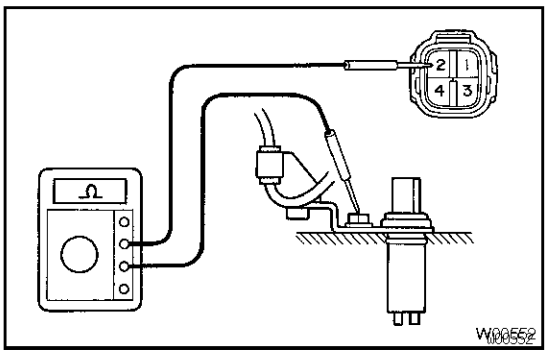
(a) Disconnect the speed sensor connector




(b) Measure the resistance between terminals FR+ and FR–, and FL+ and FL–

**Resistance: 0.5 – 1.6 kΩ**

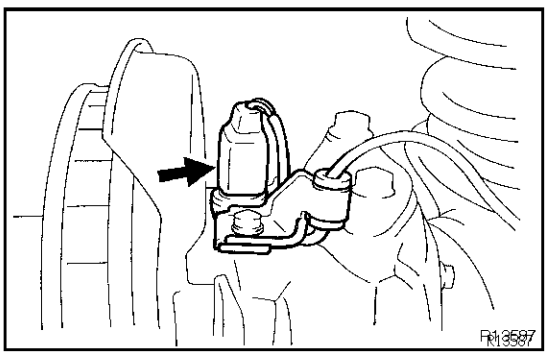
If resistance value is not specified, replace the sensor




(c) Check there is no continuity between each terminal and sensor body

If there is continuity, replace the sensor

(d) Connect the speed sensor connector

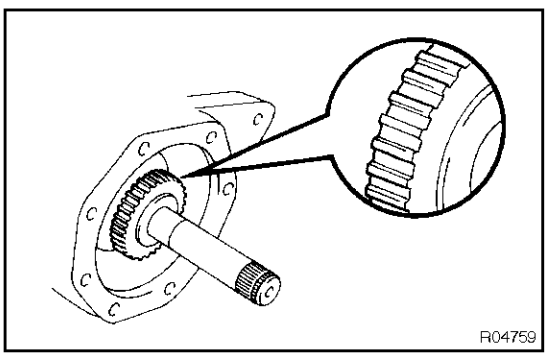



## 2. INSPECT SENSOR INSTALLATION

Check the sensor installation bolt is tightened properly and there is no clearance between the sensor and axle end

If not, tighten the bolt

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




## 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Remove the axle hub with disc (See page SA–67)

(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth

(c) Install the axle hub with disc SA–9)

**NOTICE:**

**To prevent damage to the serrations, do not strike the axle hub.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



4. CHECK THAT THERE IS NO FOREIGN OBJECT ON SENSOR
5. CHECK SPEED SENSOR SIGNAL (See page DI–210)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DO–01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR–61).**

HINT

After ınstallatıon, check the speed sensor sıgnal (See page DI–190).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

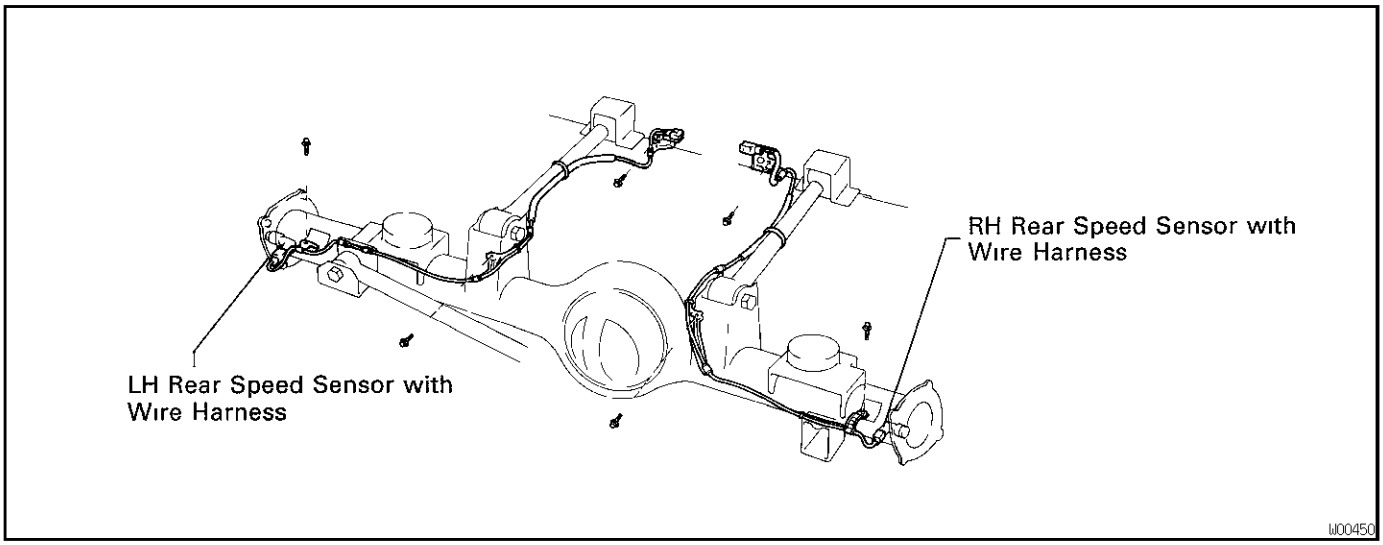
Brought to you by BirfMark



# REAR SPEED SENSOR

## COMPONENTS

BR1DP 02



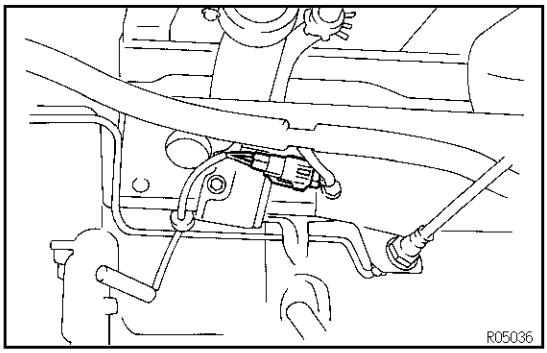



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DQ-02




# REMOVAL

HINT

When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set

**1. DISCONNECT SPEED SENSOR CONNECTOR**

(a) Disconnect the speed sensor connector

(b) Remove the 3 clamp bolts and 2 clips holding the sensor wire harness from the suspension arm and frame

**2. REMOVE SPEED SENSOR**

Remove the installation bolt and speed sensor from the axle end

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

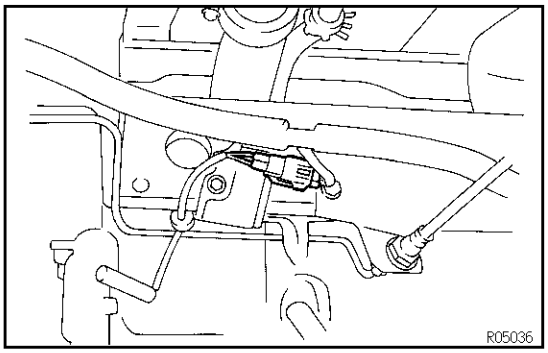


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



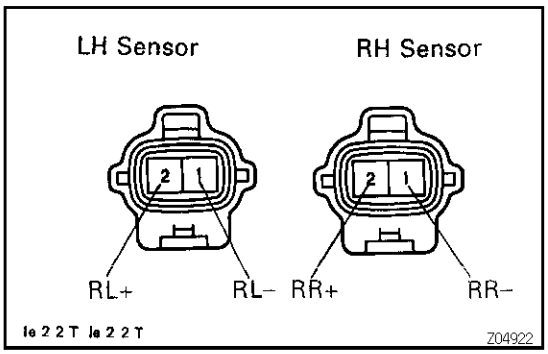
BR1NO-01




# INSPECTION

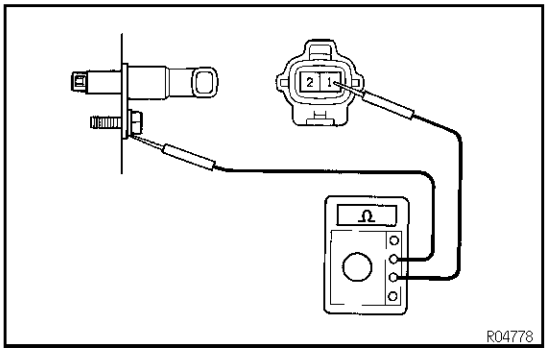
## 1. INSPECT SPEED SENSOR

(a) Disconnect the speed sensor connector




(b) Measure the resistance between terminals
**Resistance: 0.5 – 1.6 kΩ**

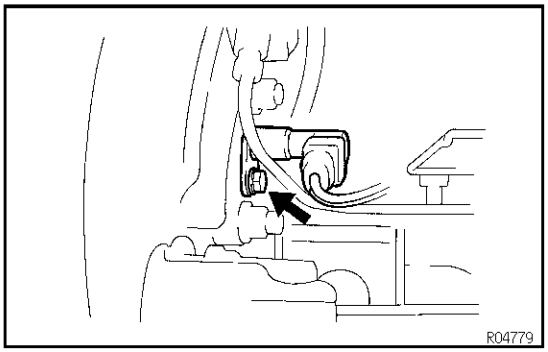
If resistance value is not specified, replace the sensor




(c) Check there is no continuity between each terminal and sensor body

If there is continuity, replace the sensor

(d) Connect the speed sensor connector

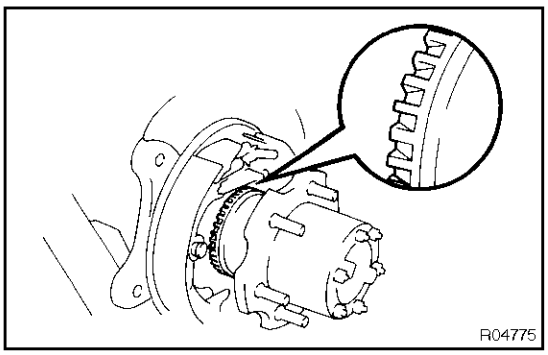



## 2. INSPECT SENSOR INSTALLATION

Check the sensor installation bolt is tightened properly and there is no clearance between the sensor and axle end

If not, tighten the bolt

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




## 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Remove the brake disc (See page BR–40)

(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth

(c) Install the brake disc

**NOTICE:**

**To prevent damage to the serrations, do not strike the axle hub.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



4. CHECK THAT THERE IS NO FOREIGN OBJECT ON SENSOR
5. CHECK SPEED SENSOR SIGNAL (See page DI-210)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



BR1DR–01

# INSTALLATION

**Installation is in the reverse order of removal (See page BR–66).**

HINT

After ınstallatıon, check the speed sensor sıgnal (see page DI–190)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CH0HN 01

# PRECAUTION

CAUTION:

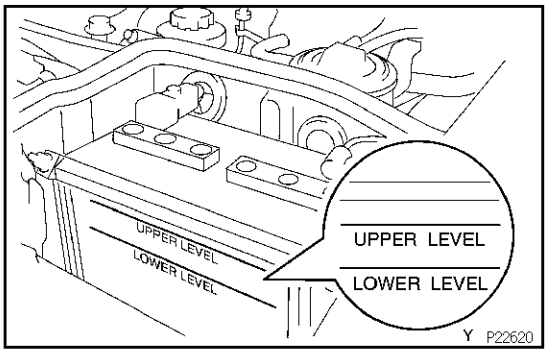
- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# CHARGING SYSTEM

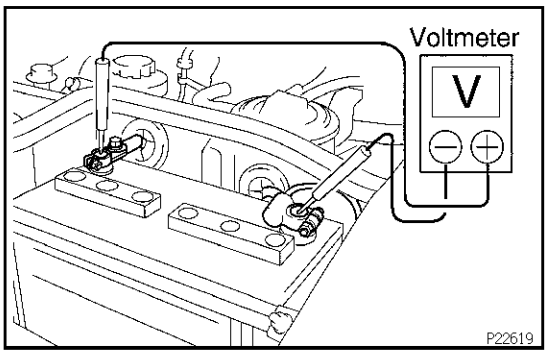
CH0EO–02

## ON–VEHICLE INSPECTION

**1. CHECK BATTERY ELECTROLYTE LEVEL AND VOLTAGE**

(a) Check the electrolyte quantity of each cell

If under the lower level, replace the battery (or add distilled water if possible) check the charging system



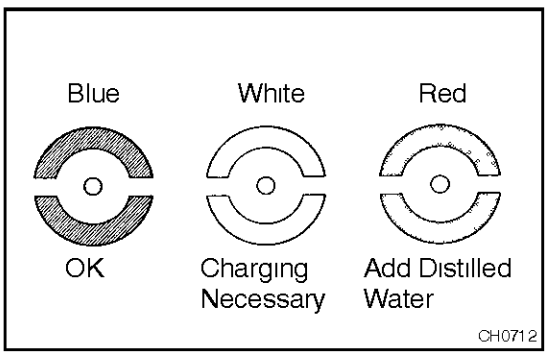

(b) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery

**Standard voltage: At 20°C (68°F): 12.7 – 12.9 V**

HINT

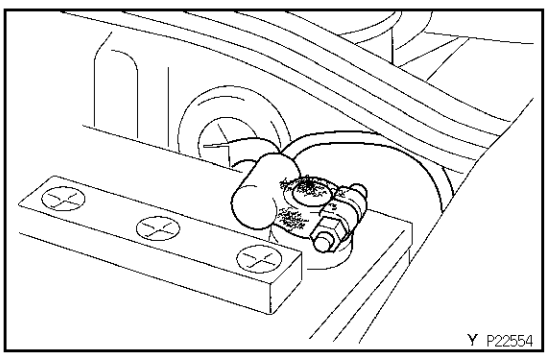
- Before measuring the voltage, turn the ignition switch OFF and turn off the electrical systems (headlight, blower motor, rear defogger etc )
- If the vehicle has been running, wait 20 minutes or more after the vehicle stops before measuring the battery voltage

If the voltage is less than specification, charge the battery




HINT

Check the indicator as shown in the illustration




**2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES**

(a) Check that the battery terminals are not loose or corroded



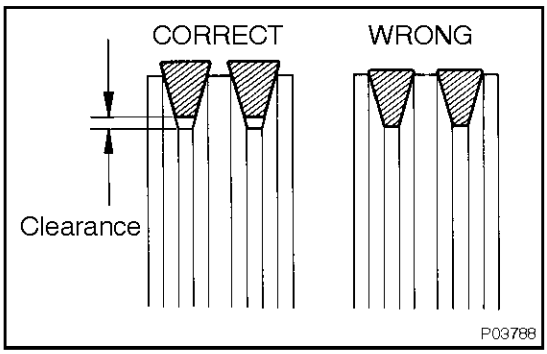
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) Check the fusible link and fuses for continuity

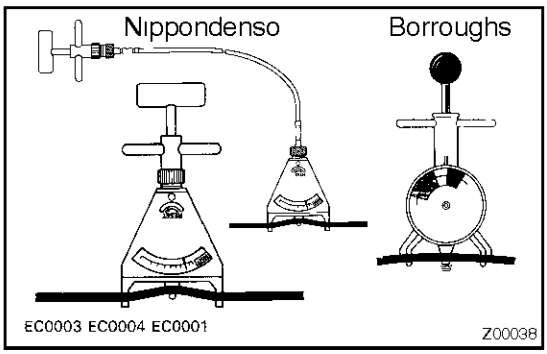
| | |
|---|---|
| Fusible link | MAIN 2 0 A |
| | AM1 1 25 B |
| | AM2 0 3 P |
| H–fuse | AM1 50 A |
| Fuse | IGN 7 5 A |
| | GAUGE 15 A |




**3. INSPECT DRIVE BELTS**

(a) Visually check the drive belt for cracks, oiliness or wear
Check that the belt does not touch the bottom of the pulley groove

If necessary, replace the drive belts as a set




(b) Using a belt tension gauge, measure the belt tension
Belt tension gauge
Nippondenso BTG–20 (95506–00020)
Borroughts No BT–33–73F

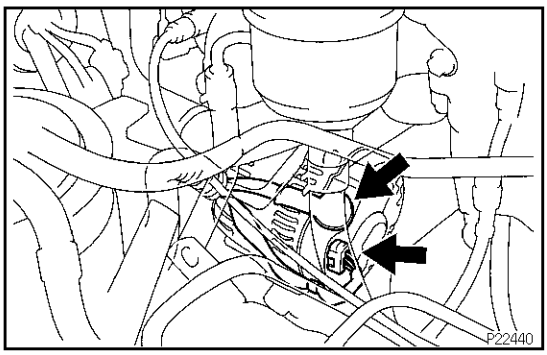
**Drive belt tension:**

| | |
|---|---|
| New belt | 400 – 580 N (41 0 – 59 1 kgf 90 4 – 130 2 lbf) |
| Used belt | 200 – 390 N (20 4 – 40 0 kgf 45 0 – 88 2 lbf) |

If the belt tension is not as specified, adjust it

HINT

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension




**4. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES**

(a) Check that the wiring is in good condition

(b) Check that there is no abnormal noise from the generator while the engine is running

**5. INSPECT DISCHARGE WARNING LIGHT CIRCUIT**

(a) Turn the ignition switch "ON" Check that the discharge warning light comes on

(b) Start the engine Check that the light goes off

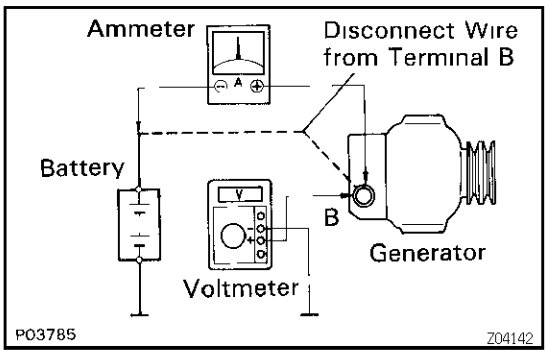


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



If the light does not operate as specified, troubleshoot the discharge warning light circuit




## 6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT

If a battery/generator tester is available, connect the tester to the charging circuit as per the manufacturer's instructions

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows
- Disconnect the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter
- Connect the positive (+) lead of the ammeter to terminal B of the generator
- Connect the positive (+) lead of the voltmeter to terminal B of the generator
- Ground the negative (–) lead of the voltmeter

(b) Check the charging circuit as follows

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter

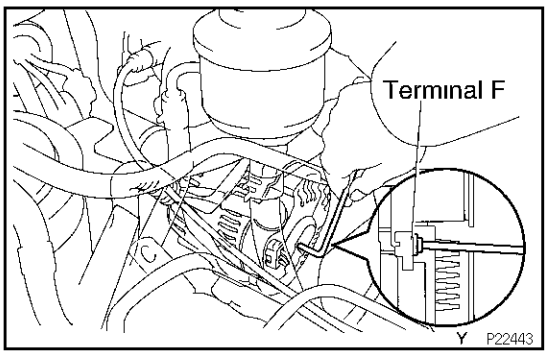
**Standard amperage 10 A or less**

**Standard voltage:**

| | |
|---|---|
| at 25°C (77°F) | 14.0 – 15.0 V |
| at 115°C (239°F) | 13.5 – 14.3 V |

If the voltmeter reading is more than standard voltage, replace the voltage regulator

If the voltmeter reading is less than the standard voltage, check the voltage regulator and generator as follows




- With terminal F grounded, start the engine and check the voltmeter reading of terminal B
- If the voltmeter reading is more than standard voltage, replace the voltage regulator
- If the voltmeter reading is less than standard voltage, check the generator

## 7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI"



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) Check the readıng on the ammeter

**Standard amperage: 30 A or more**

If the ammeter readıng ıs less than standard amperage, repaır the generator

HINT

If the battery ıs fully charged, the ındıcatıon wıll sometımes be less than standard amperage



Brought to you by BirfMark
Version 1.11 - 03/16/2010

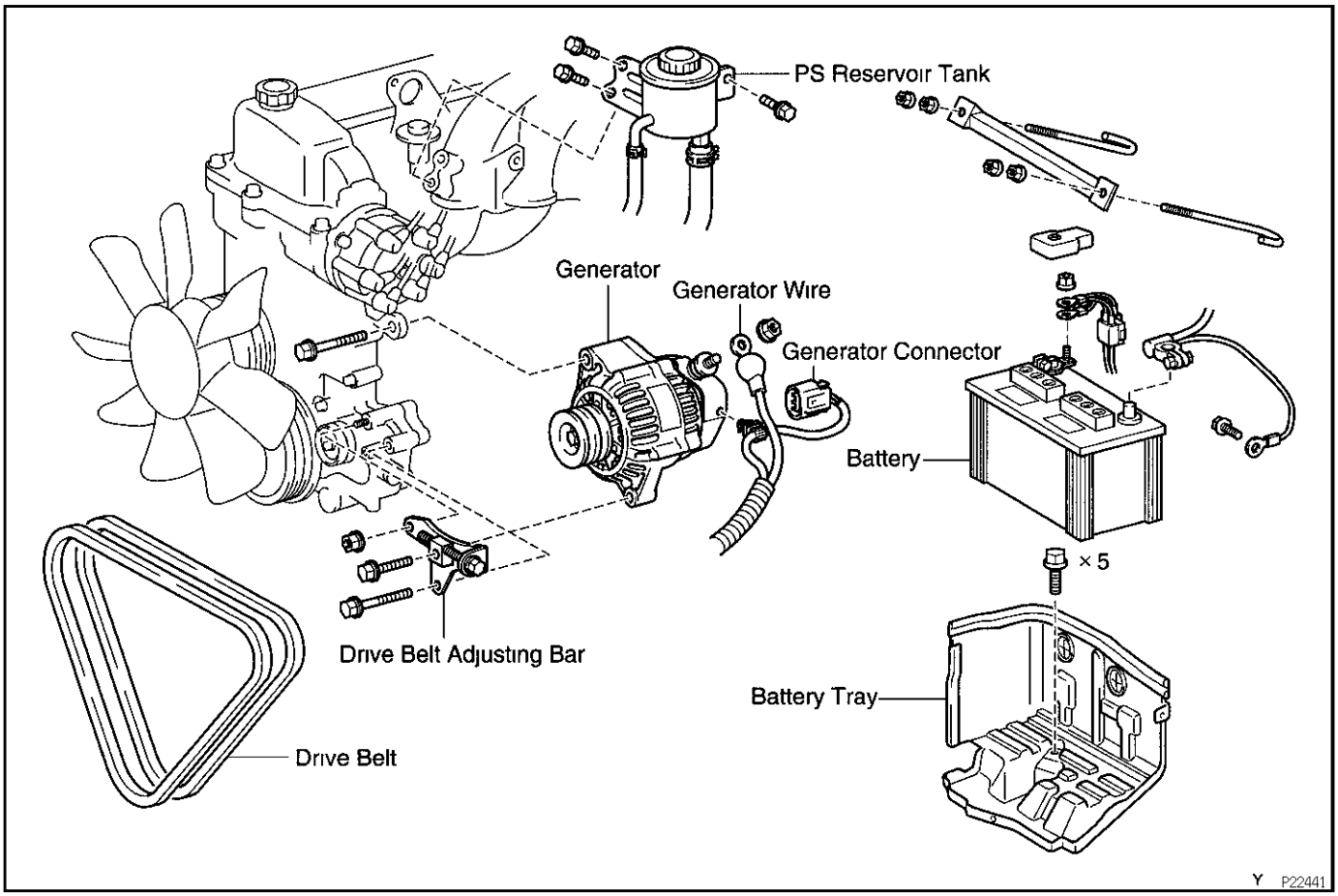
Brought to you by BirfMark



# GENERATOR

## COMPONENTS

CH06H 05

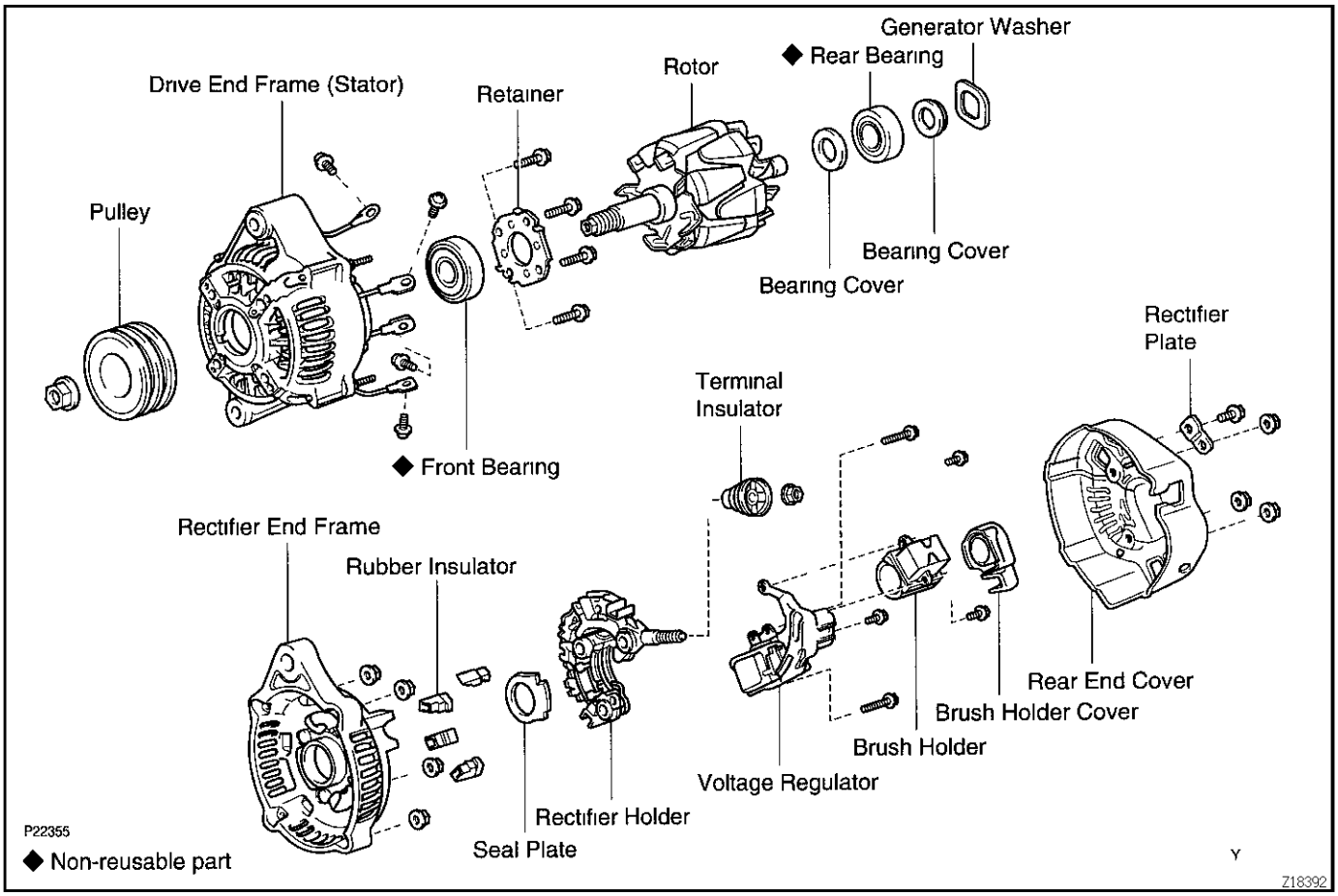





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





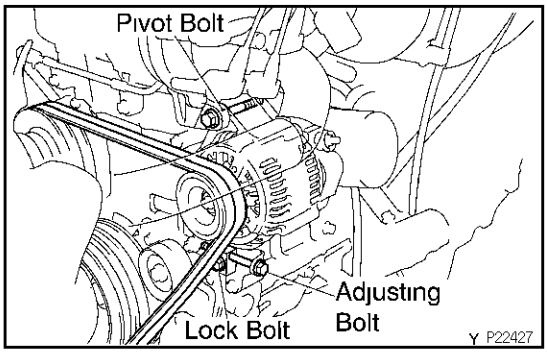



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CH0EP 01

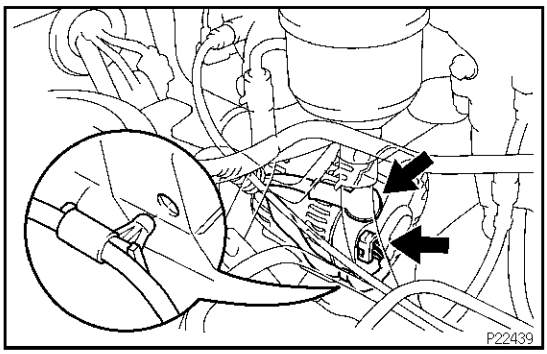



# REMOVAL

1. **REMOVE BATTERY AND BATTERY TRAY**
2. **DISCONNECT POWER STEERING (PS) RESERVOIR TANK**
3. **REMOVE DRIVE BELTS**

(a) Loosen the lock bolt, pivot bolt and adjusting bolt

(b) Remove the 2 drive belts

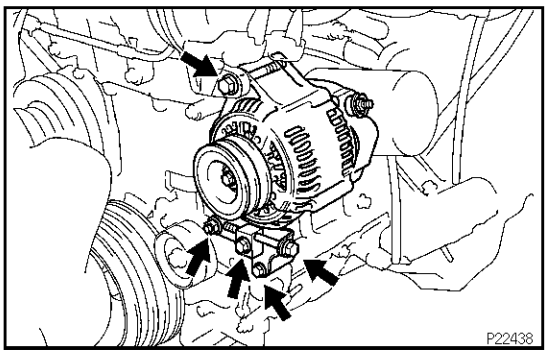



4. **REMOVE GENERATOR**

(a) Disconnect the generator connector

(b) Remove the rubber cap and nut, and disconnect the generator wire

(c) Disconnect the generator wire clamp from the generator




(d) Remove the lock bolt, bolt, nut and drive belt adjusting bar

(e) Remove the pivot bolt and generator

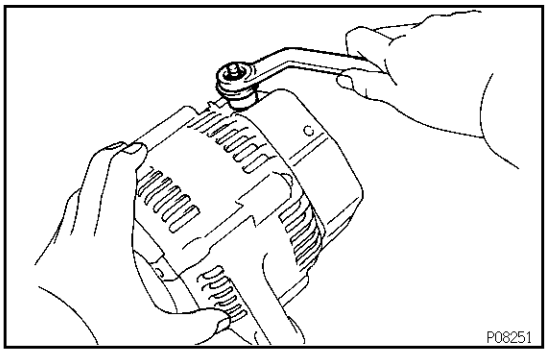


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



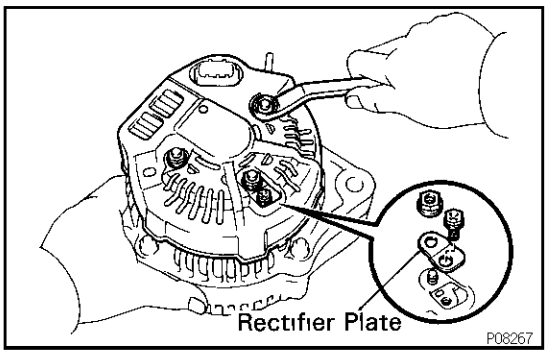
CH0HO-01



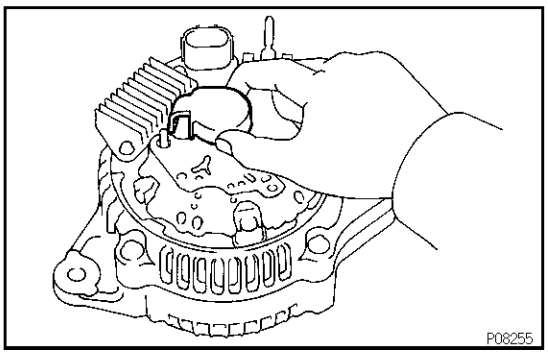

# DISASSEMBLY

## 1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator

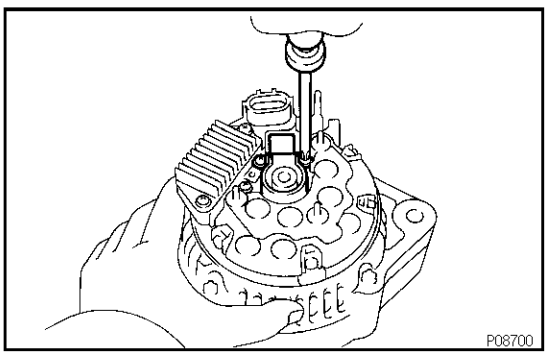



(b) Remove the 3 nuts, bolt, rectifier plate and rear end cover

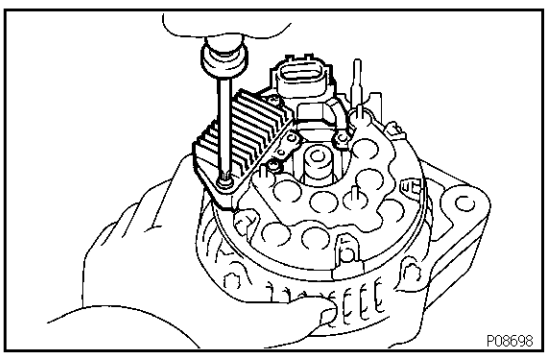



## 2. REMOVE BRUSH HOLDER

(a) Remove the brush holder cover from the brush holder




(b) Remove the 2 screws and brush holder




## 3. REMOVE VOLTAGE REGULATOR

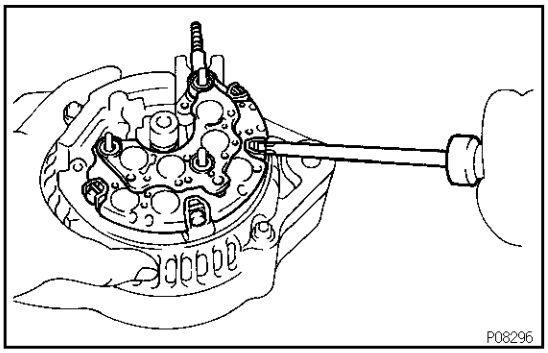
Remove the 3 screws and voltage regulator



Brought to you by BirfMark
Version 1.11 - 03/16/2010

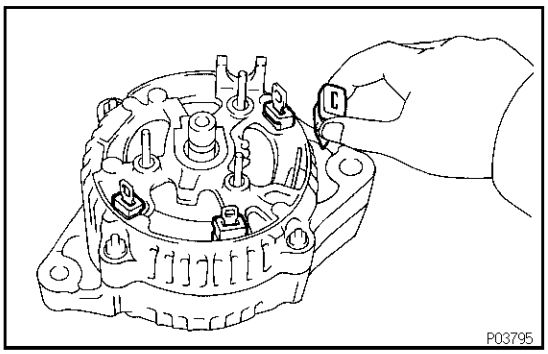
Brought to you by BirfMark



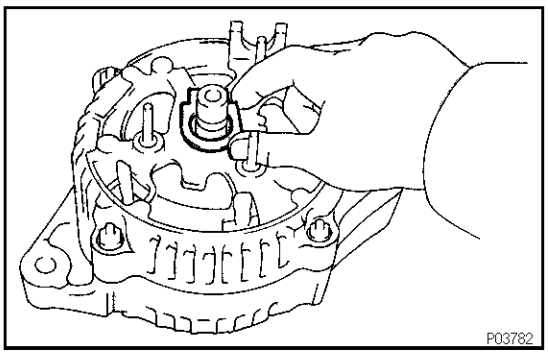



**4. REMOVE RECTIFIER HOLDER**

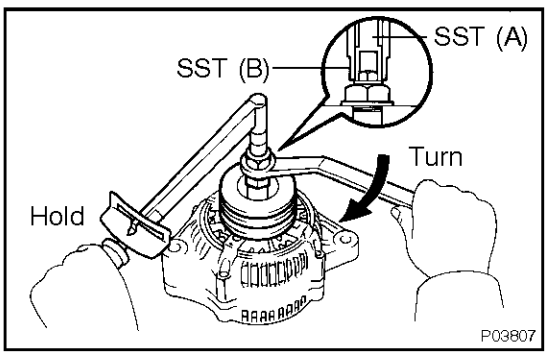
(a) Remove the 4 screws and rectifier holder




(b) Remove the 4 rubber insulators




(c) Remove the seal plate



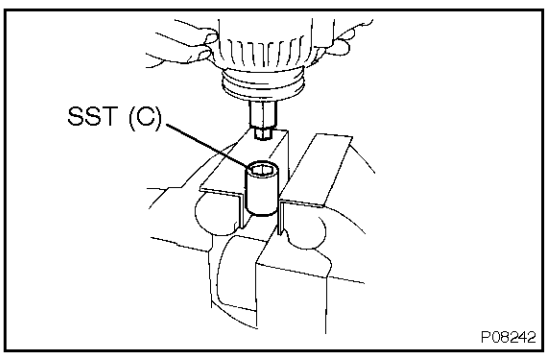

**5. REMOVE PULLEY**

(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque

SST 09820–63010

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(b) Check that SST (A) is secured to the rotor shaft




(c) Mount SST (C) in a vise

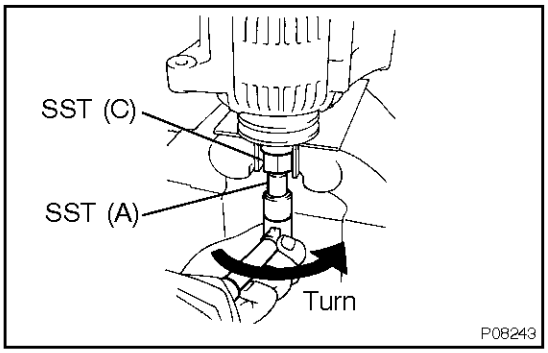
(d) Install the generator to SST (C)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration

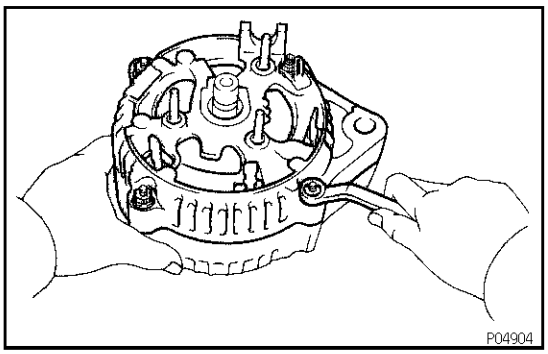
**NOTICE:**

**To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.**

(f) Remove the generator from SST (C)

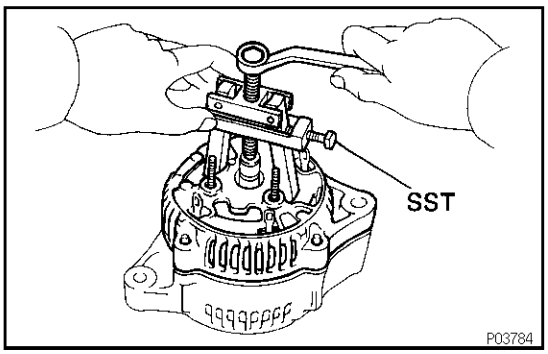
(g) Turn SST (B) and remove SST (A and B)

(h) Remove the pulley nut and pulley

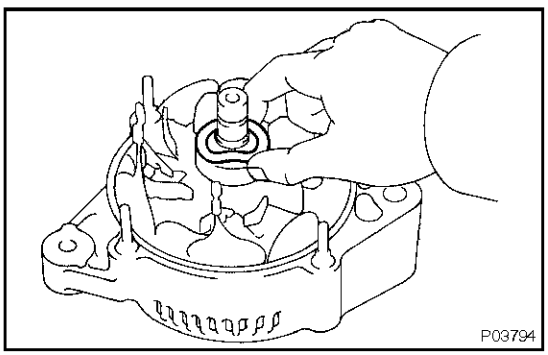



**6. REMOVE RECTIFIER END FRAME**

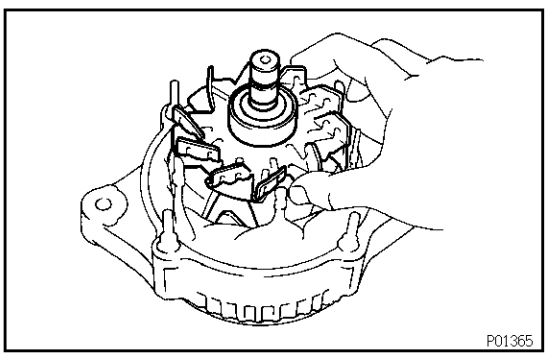
(a) Remove the 4 nuts




(b) Using SST, remove the rectifier end frame
SST 09286-46011




(c) Remove the generator washer




**7. REMOVE ROTOR FROM DRIVE END FRAME**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CH0HP-01

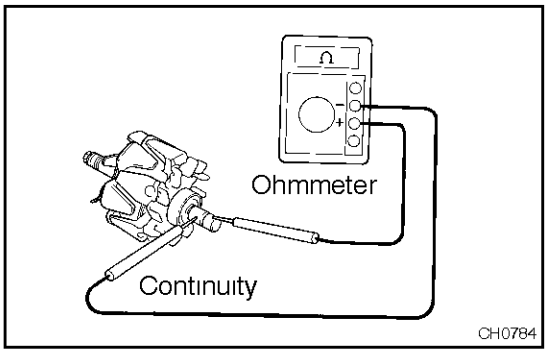
# INSPECTION

## 1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings

**Standard resistance (At 20°C (68°F): 2.8 – 3.0 Ω**

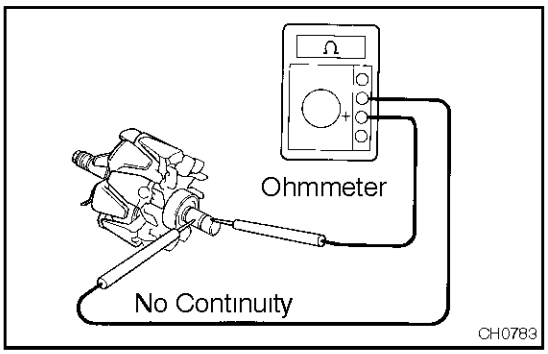
If there is no continuity, replace the rotor




## 2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor

If there is continuity, replace the rotor




## 3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored

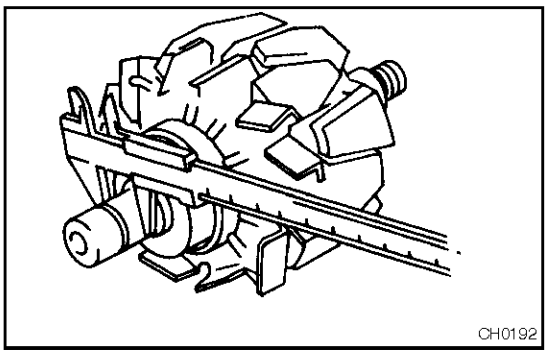
If rough or scored, replace the rotor

(b) Using a vernier caliper, measure the slip ring diameter

**Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)**

**Minimum diameter: 12.8 mm (0.504 in.)**

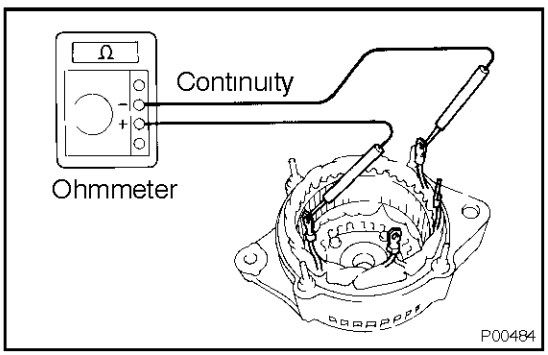
If the diameter is less than minimum, replace the rotor




## 4. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads

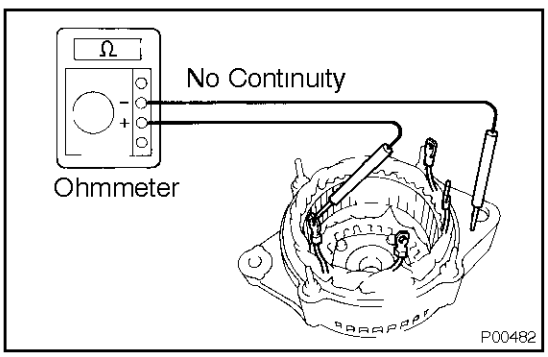
If there is no continuity, replace the drive end frame assembly




## 5. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame

If there is continuity, replace the drive end frame assembly

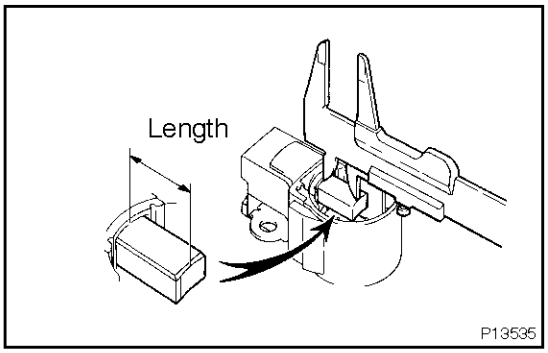





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





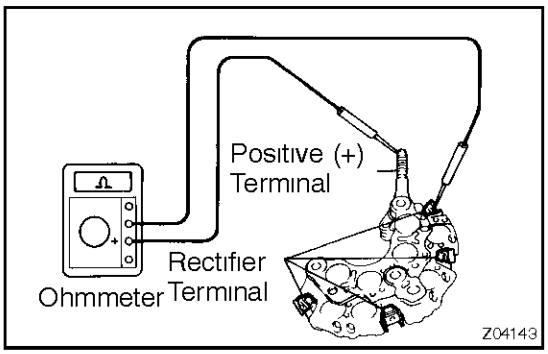

### 6. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length

**Standard exposed length: 10.5 mm (0.413 in.)**

**Minimum exposed length: 1.5 mm (0.059 in.)**

If the exposed length is less than minimum, replace the brushes and brush holder assembly



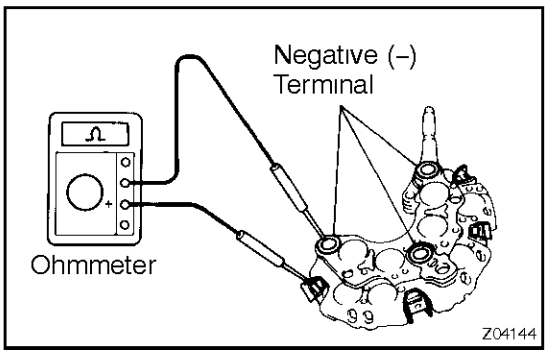

### 7. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal

(b) Reverse the polarity of the tester probes and repeat step (a)

(c) Check that one shows continuity and the other shows no continuity

If continuity is not as specified, replace the rectifier holder



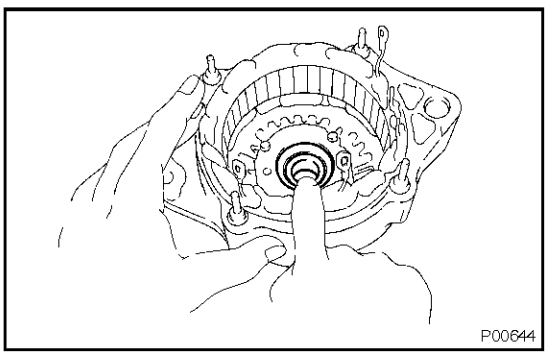

### 8. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal

(b) Reverse the polarity of the tester probes and repeat step (a)

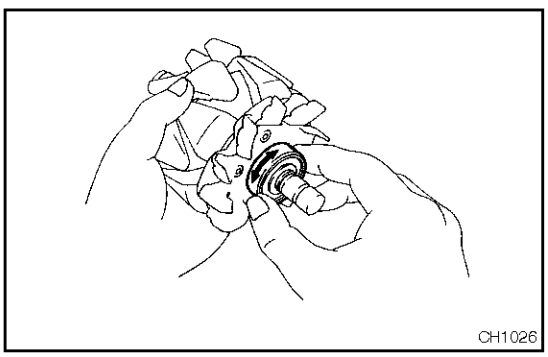
(c) Check that one shows continuity and the other shows no continuity

If continuity is not as specified, replace the rectifier holder




### 9. INSPECT FRONT BEARING

Check that the bearing is not rough or worn




### 10. INSPECT REAR BEARING

Check that the bearing is not rough or worn

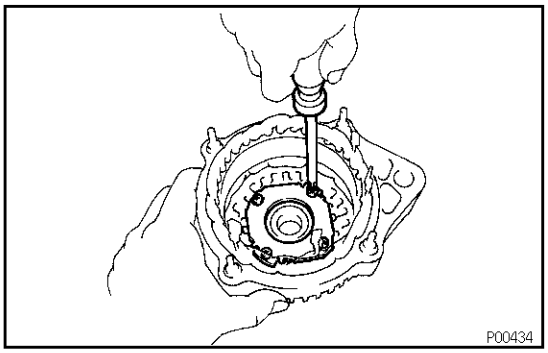


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



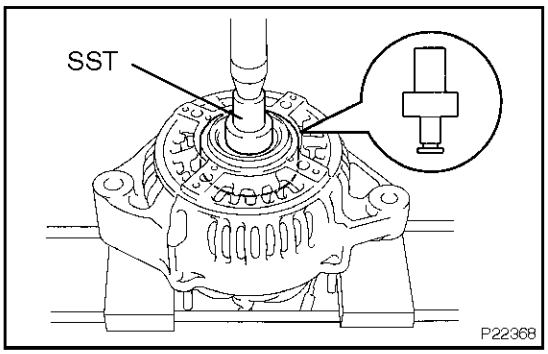
CH0HQ-01



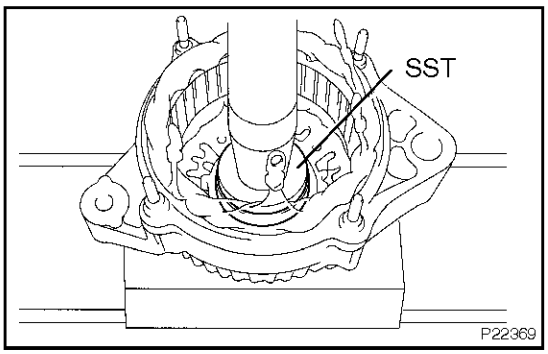

# REPLACEMENT

## 1. REPLACE FRONT BEARING

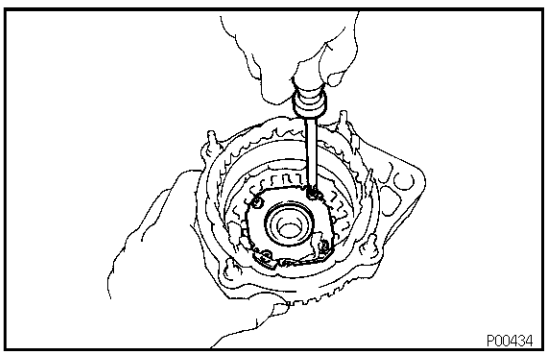
(a) Remove the 4 screws and bearing retainer



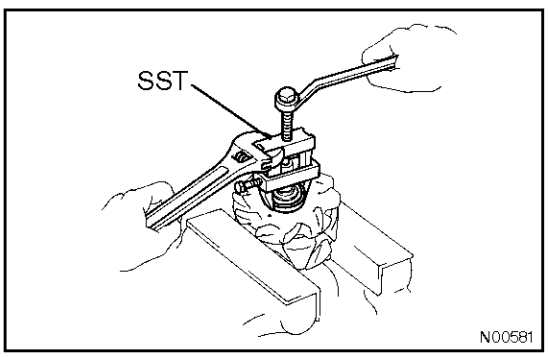

(b) Using SST and a press, press out the bearing
SST 09950–60010 (09951–00260, 09952–06010)




(c) Using SST and a press, press in a new bearing
SST 09950–60010 (09951–00500)




(d) Install the bearing retainer with the 4 screws
**Torque: 2.6 N·m (27 kgf·cm, 23 in.·lbf)**




## 2. REPLACE REAR BEARING

(a) Using SST, remove the bearing cover (outside) and bearing
SST 09820–00021

**NOTICE:**

**Be careful not to damage the fan.**

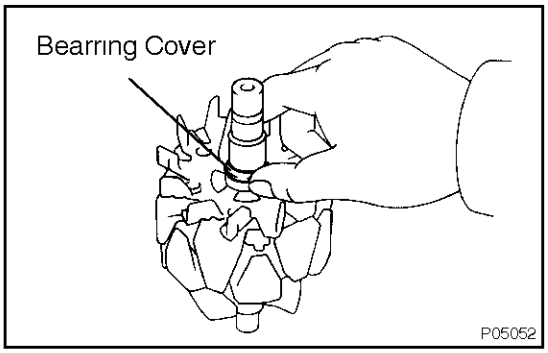
(b) Remove the bearing cover (inside)



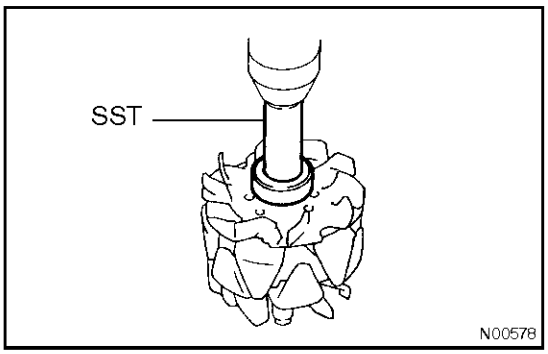
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

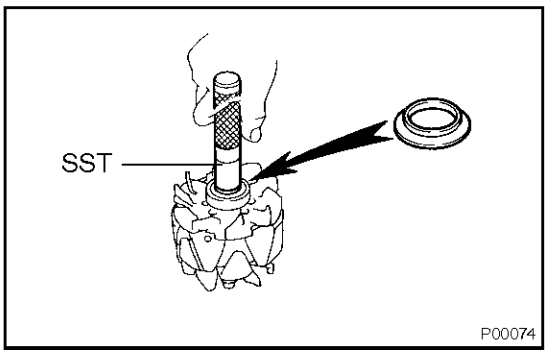





(c) Place the bearıng cover (ınsıde) on the rotor




(d) Usıng SST and a press, press ın a new bearıng
SST 09820–00030




(e) Usıng SST, push ın the bearıng cover (outsıde)
SST 09285–76010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

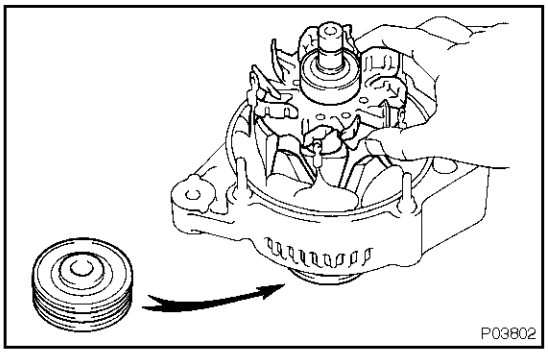
Brought to you by BirfMark

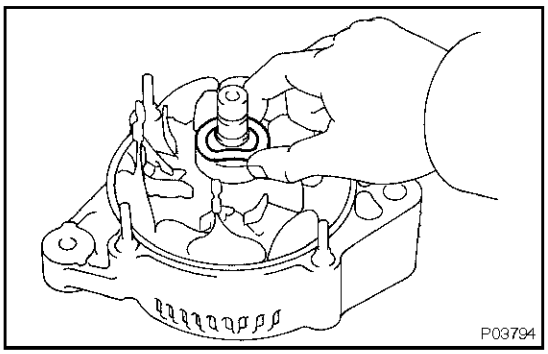


CH05M-03

# REASSEMBLY

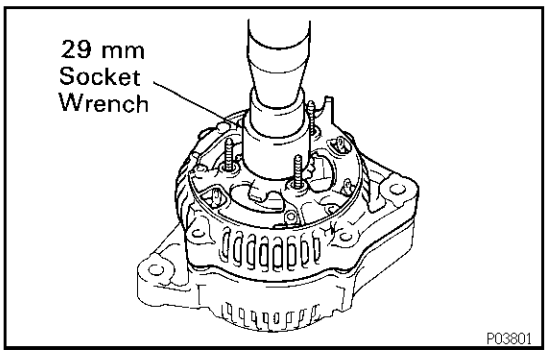
1. PLACE RECTIFIER END FRAME ON PULLEY
2. INSTALL ROTOR TO DRIVE END FRAME




3. INSTALL RECTIFIER END FRAME

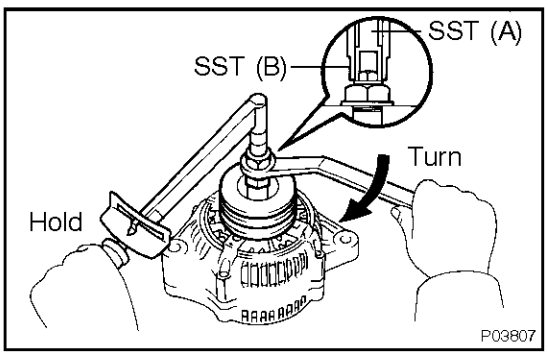
(a) Place the generator washer on the rotor




(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame

(c) Install the 4 nuts

**Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)**




4. INSTALL PULLEY

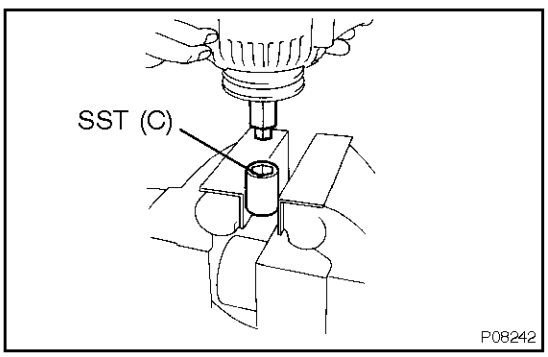
(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand

(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque

SST 09820-63010

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(c) Check that SST (A) is secured to the pulley shaft




(d) Mount SST (C) in a vise

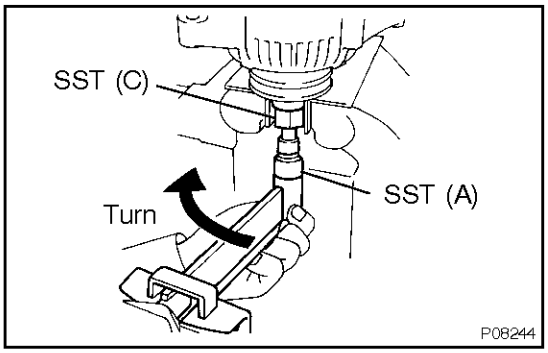
(e) Install the generator to SST (C)



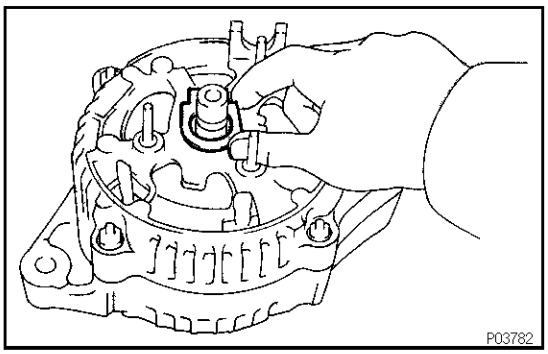
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

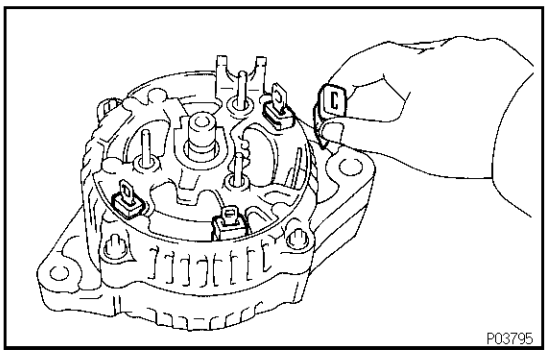




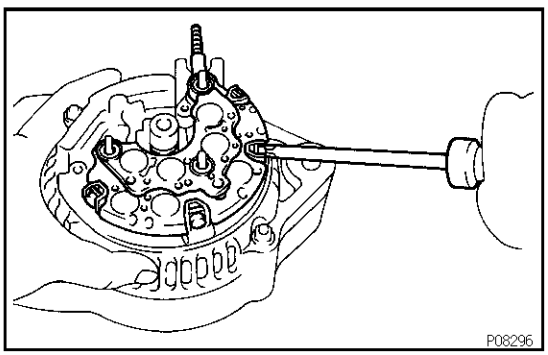

(f) To torque the pulley nut turn SST (A) in the direction shown in the illustration
**Torque: 110.5 N·m (1,128 kgf·cm, 81 ft·lbf)**
(g) Remove the generator from SST (C)
(h) Turn SST (B), and remove SST (A and B)



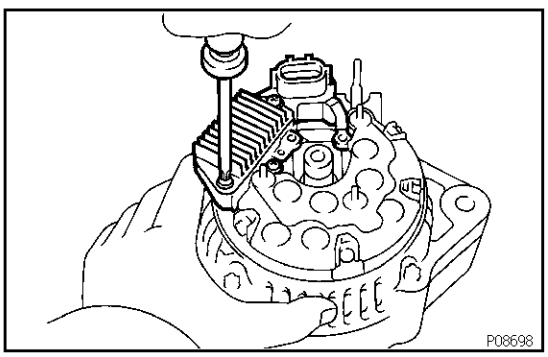

**5. INSTALL RECTIFIER HOLDER**
(a) Place the seal plate on the rectifier end frame




(b) Install the 4 rubber insulators on the lead wires




(c) Install the rectifier holder with the 4 screws
**Torque: 2.9 N·m (30 kgf·cm, 25 in.·lbf)**



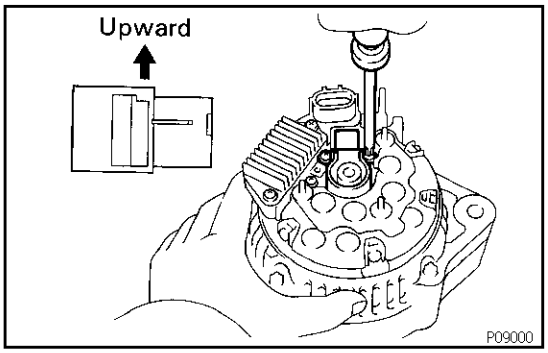

**6. INSTALL VOLTAGE REGULATOR**
Install the voltage regulator on the rectifier end frame with the 3 screws
**Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





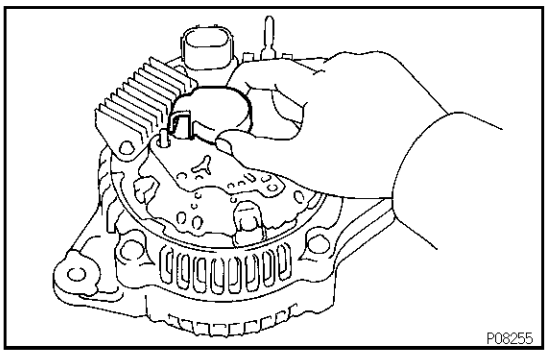

**7. INSTALL BRUSH HOLDER**

(a) Install the brush holder on the rectifier end frame with the 2 screws

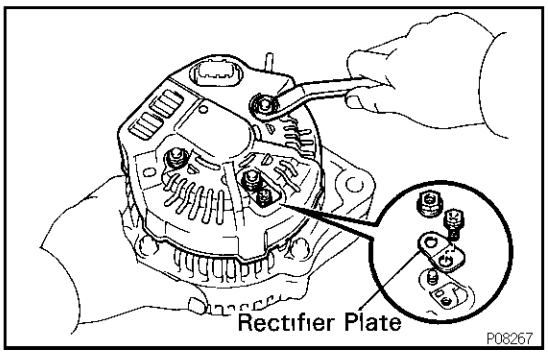
**NOTICE:**

**Be careful of the holder installation direction.**

**Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)**




(b) Place the brush holder cover on the brush holder




**8. INSTALL REAR END COVER**

(a) Install the end cover together with the rectifier plate

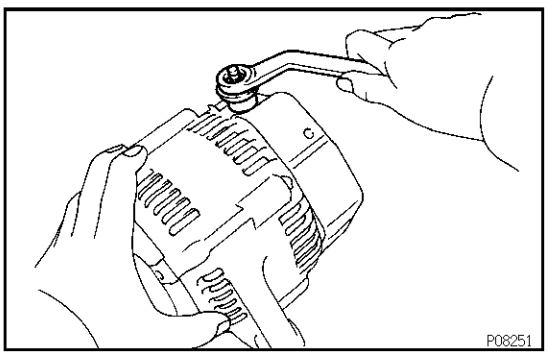
(1) Hand tighten the bolt first for positioning the plate

(2) Tighten the 3 nuts and bolt

**Torque:**

**Bolt: 3.8 N·m (39 kgf·cm, 34 in.·lbf)**

**Nut: 4.4 N·m (45 kgf·cm, 39 in.·lbf)**




(b) Install the terminal insulator with the nut

**Torque: 4.1 N·m (42 kgf·cm, 36 in.·lbf)**

**9. CHECK THAT ROTOR ROTATES SMOOTHLY**

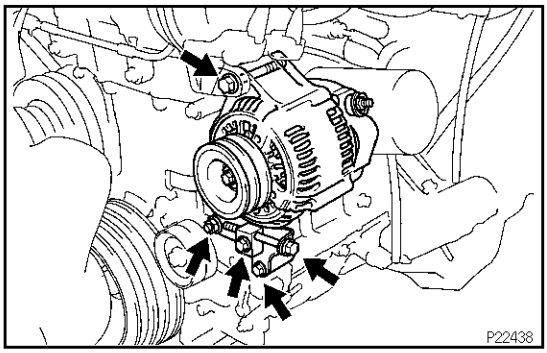


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CH06N 03



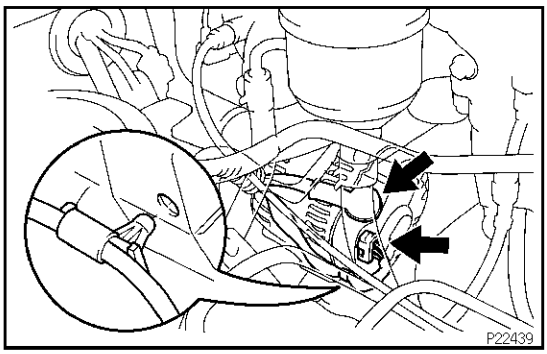

# INSTALLATION

1. **INSTALL GENERATOR**

(a) Mount generator on the generator bracket with the pivot bolt Do not tighten the bolt yet

(b) Install the drive belt adjusting bar with the bolt and nut
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(c) Temporarily install the lock bolt




(d) Connect the generator connector

(e) Connect the generator wire with the nut and rubber cap

(f) Connect the generator wire clamp to the generator

2. **INSTALL DRIVE BELTS**

(a) Install the drive belts

(b) Adjust the drive belt with the adjusting bolt (See page CH–2)

(c) Tighten the pivot and adjusting lock bolts
**Torque:**
**Pivot bolt: 59 N·m (600 kgf·cm, 43 ft·lbf)**
**Lock bolt: 21 N·m (210 kgf·cm, 15 ft·lbf)**

3. **CONNECT POWER STEERING (PS) RESERVOIR TANK**

4. **INSTALL BATTERY TRAY AND BATTERY**

5. **PERFORM ON–VEHICLE INSPECTION (See page CH–2)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COOLANT

CO0 O-04

## INSPECTION

HINT

Check the coolant level when the engine is cold

**1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR**

The engine coolant level should be between the "LOW" and "FULL" lines

If low, check for leaks and add engine coolant up to the "FULL" line

**2. CHECK ENGINE COOLANT QUALITY**

(a) Remove the radiator cap

**CAUTION:**

**To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.**

(b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil

If excessively dirty, replace the coolant

(c) Reinstall the radiator cap

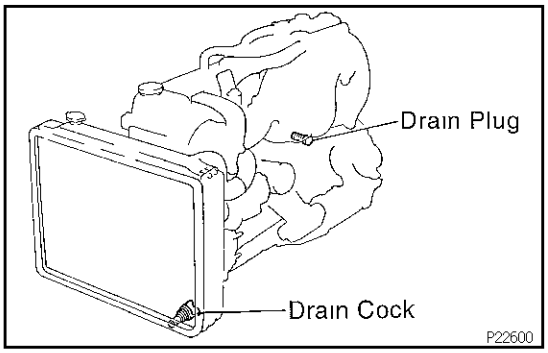


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO0 P 07




# REPLACEMENT

## REPLACE ENGINE COOLANT

(a) Remove the radiator cap

**CAUTION:**

**See step 2. (a) above.**

(b) Drain the coolant from the radiator drain cock and engine drain plug (Engine drain plug at the left of engine block )

(c) Close the drain plugs

**Torque:Torque (Engine drain plug):**
**29 N·m (300 kgf·cm, 22 ft·lbf)**

(d) Slowly fill the system with coolant

- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer's directions
- Using coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended

**NOTICE:**

**Do not use an alcohol type coolant.The coolant should be mixed with demineralized water or distilled water.**

**Capacity:**
**w/ Front heater:**
**13.7 liters (14.4 US qts, 12.1 Imp. qts)**
**w/ Front and rear heaters:**
**14.7 liters (15.5 US qts, 12.9 Imp. qts)**

(e) Reinstall the radiator cap

(f) Warm up the engine and check for leaks

(g) Recheck the coolant level and refill as necessary



Brought to you by BirfMark
Version 1.11 - 03/16/2010

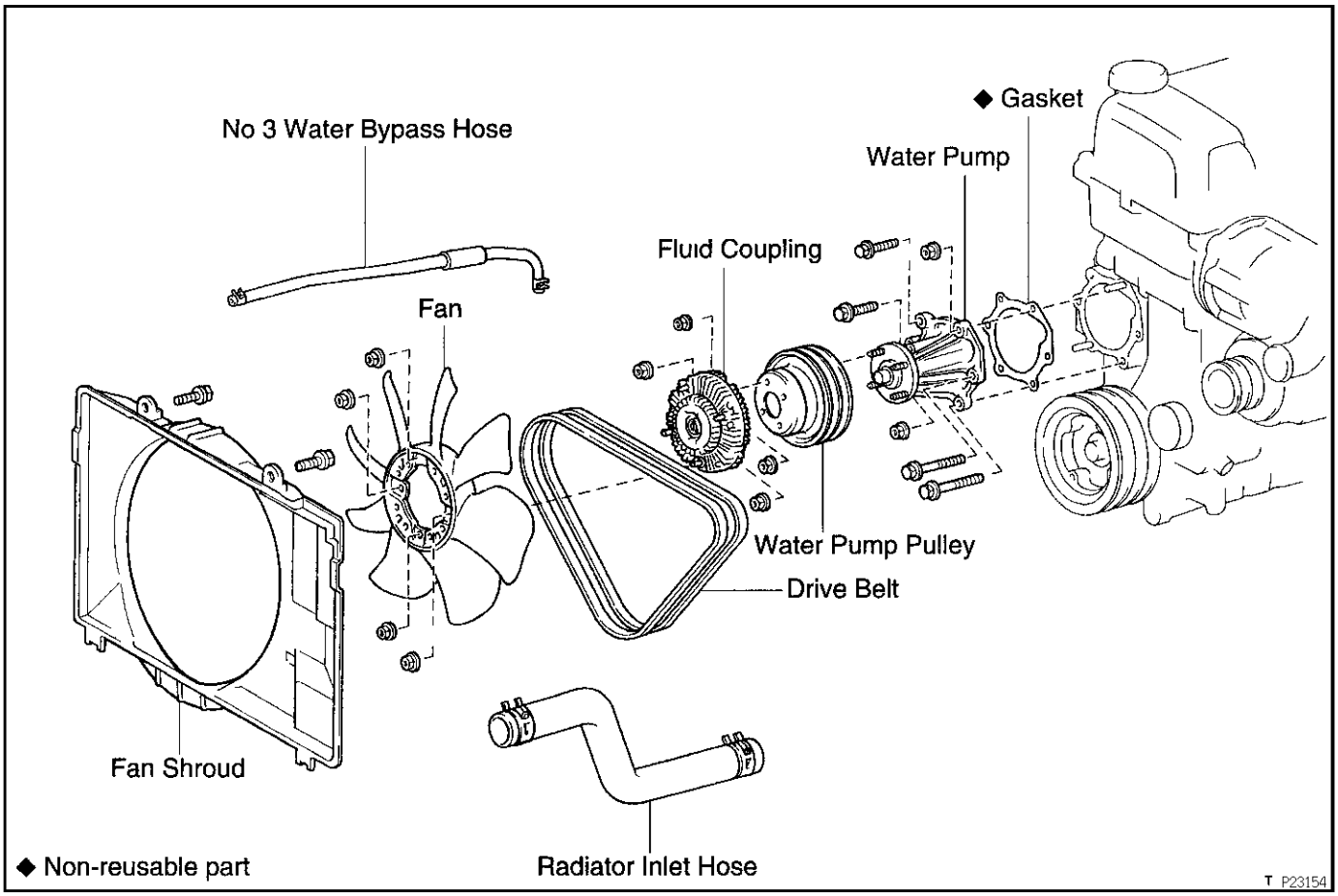
Brought to you by BirfMark



# WATER PUMP

## COMPONENTS

CO111-01



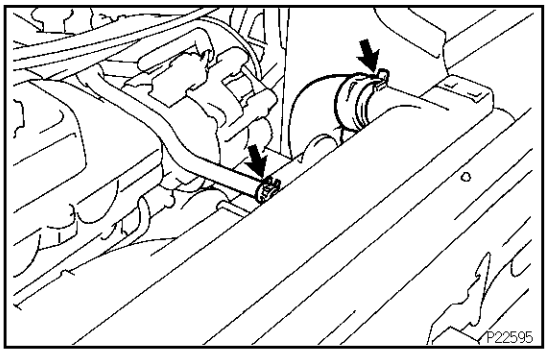



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

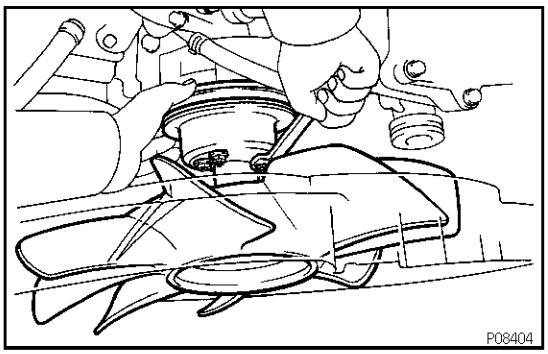


CO112 01



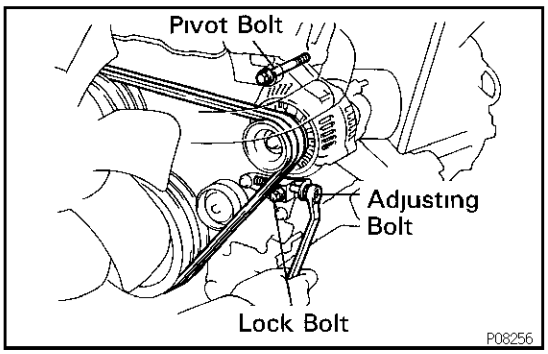

# REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT NO.3 WATER BYPASS HOSE**
3. **DISCONNECT RADIATOR INLET HOSE**

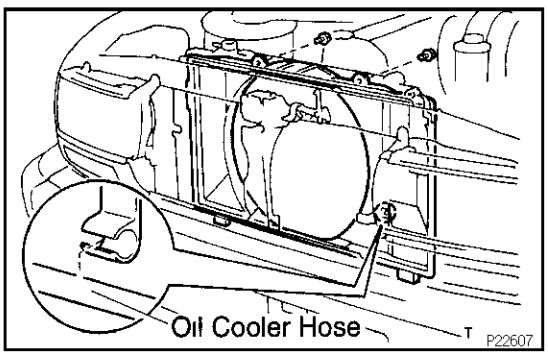



4. **REMOVE DRIVE BELTS, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD**

(a) Stretch the belts and loosen the water pump pulley mounting nuts




(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts




(c) Disconnect the oil cooler hose from the clamp on the fan shroud
(d) Remove the 2 bolts holding the fan shroud to the radiator
(e) Remove the 4 water pump pulley mounting nuts
(f) Pull out the fan with fluid coupling, water pump pulley and fan shroud
(g) Remove the fan from the fluid coupling

5. **REMOVE WATER PUMP**

Remove the 4 bolts, 2 nuts, water pump and gasket

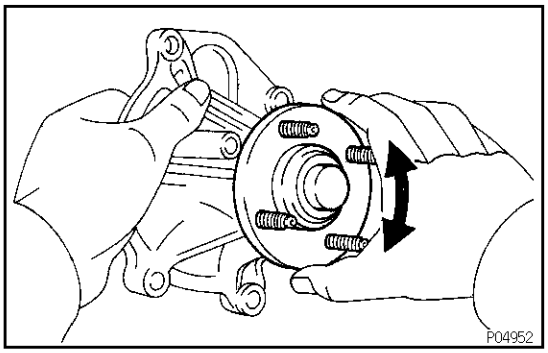


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO113 04




# INSPECTION

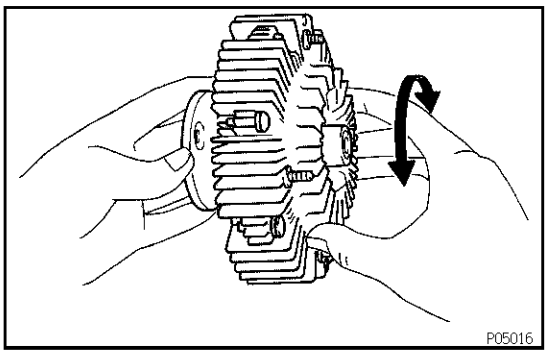
## 1. INSPECT WATER PUMP

(a) Visually check the air hole and water hole for coolant leakage

If leakage is found, replace the water pump

(b) Turn the pulley seat and check that the water pump bearing moves smoothly and quietly

If necessary, replace the water pump




## 2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicon oil leakage

If necessary, replace the fluid coupling

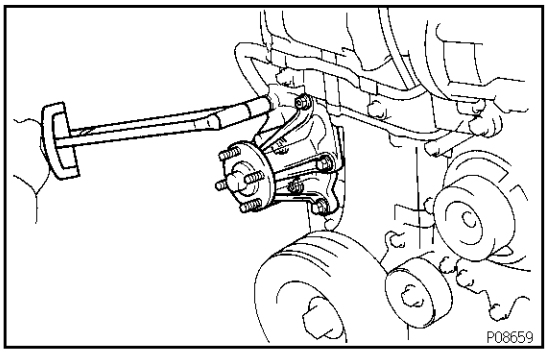


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO114 02




# INSTALLATION

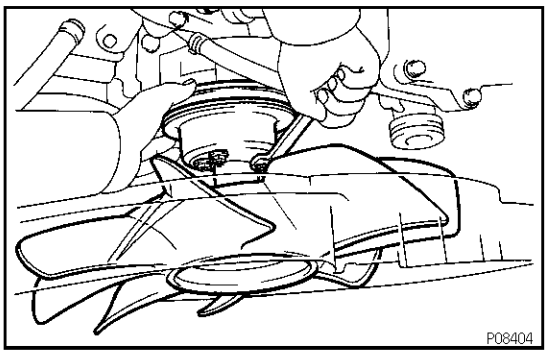
**1. INSTALL WATER PUMP**

Install a new gasket and the water pump with the 4 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**2. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS**

(a) Install fan to the fluid coupling




(b) Place the fan with fluid coupling, water pump pulley and fan shroud in position

(c) Temporarily install the fan pulley mounting nuts

(d) Install the fan shroud with the 2 bolts

**Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**

(e) Connect the oil cooler hose to the clamp on the fan shroud

(f) Install the drive belts with the adjusting bolt and pivot bolt

(g) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts

(h) Adjust the drive belts (See page CH-2)

**3. CONNECT NO.3 WATER BYPASS HOSE**

**4. CONNECT RADIATOR INLET HOSE**

**5. FILL RADIATOR WITH ENGINE COOLANT**

**6. START ENGINE AND CHECK FOR LEAKS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

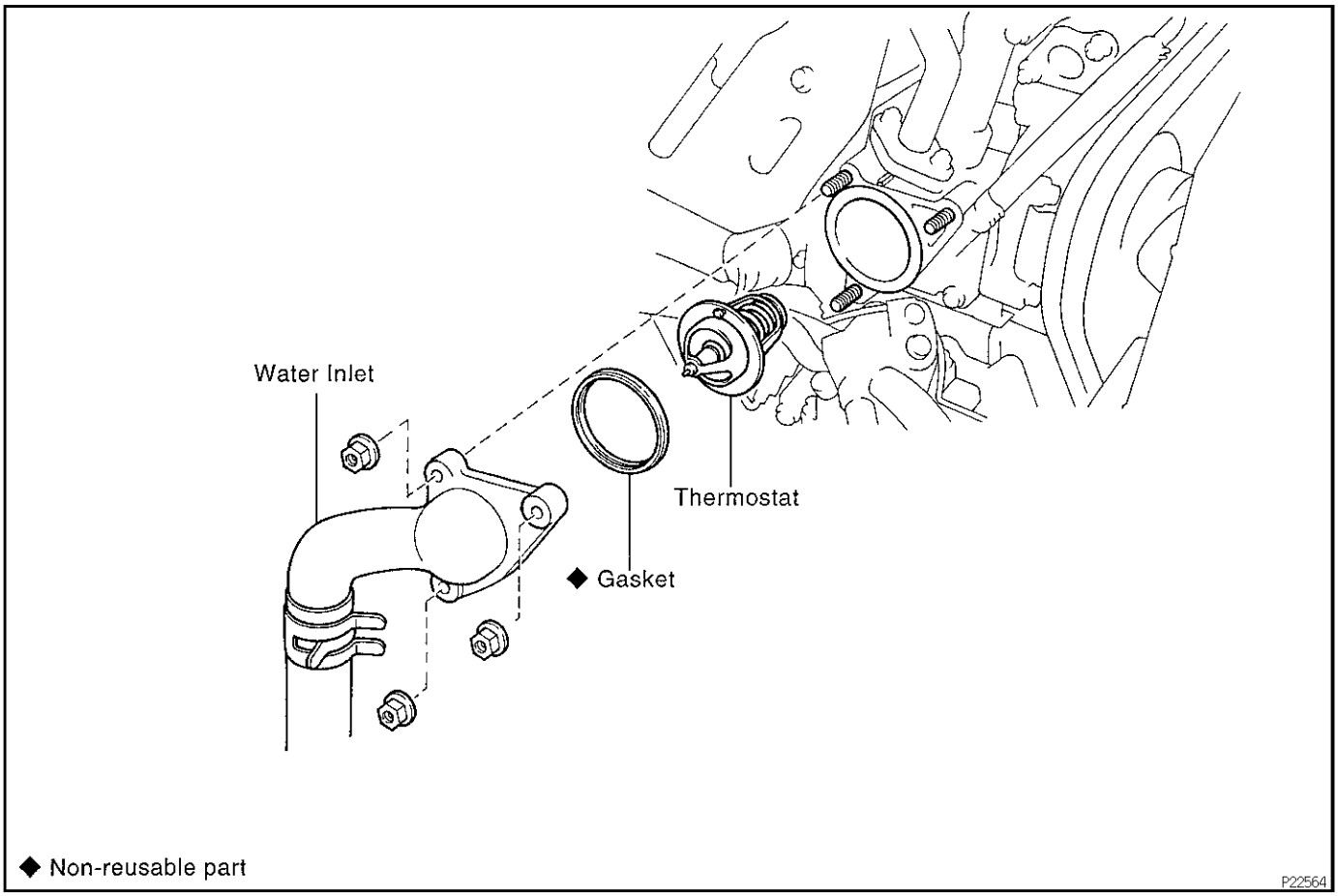
Brought to you by BirfMark



# THERMOSTAT

## COMPONENTS

CO0 U-03






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO115 01

# REMOVAL

HINT

Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency Do not remove the thermostat, even if the engine tends to overheat

1. **DRAIN ENGINE COOLANT**
2. **REMOVE WATER INLET AND THERMOSTAT**

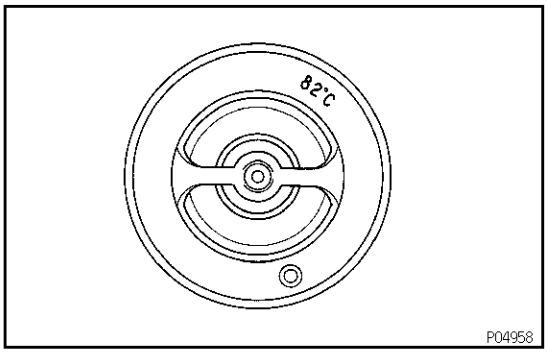


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO0 W 06

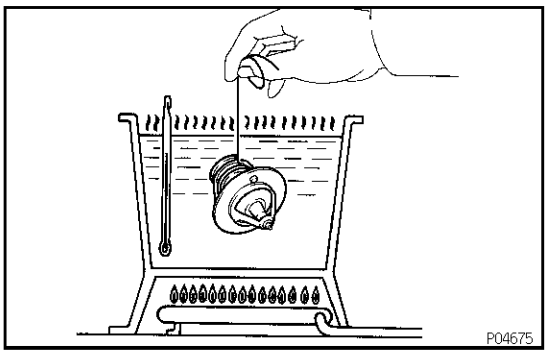



# INSPECTION

## INSPECT THERMOSTAT

HINT

The thermostat is numbered with the valve opening temperature

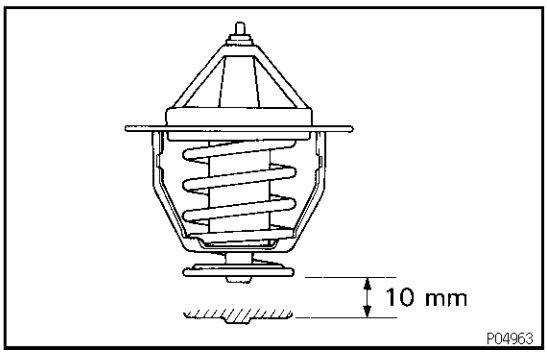



(a) Immerse the thermostat in water and gradually heat the water

(b) Check the valve opening temperature

**Valve opening temperature: 80 – 84°C (176 – 183°F)**

If the valve opening temperature is not as specified, replace the thermostat




(c) Check the valve lift

**Valve lift: 10 mm (0.39 in.) or more at 95°C (203°F)**

If the valve lift is not as specified, replace the thermostat

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F))

If not closed, replace the thermostat

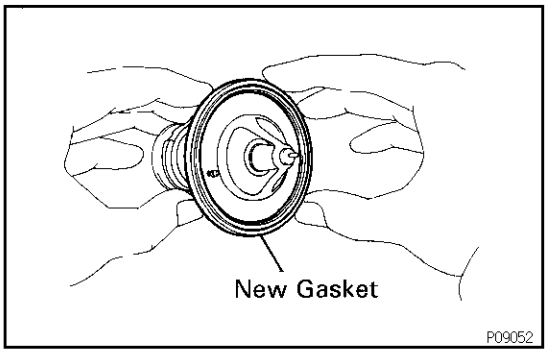


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO116 01

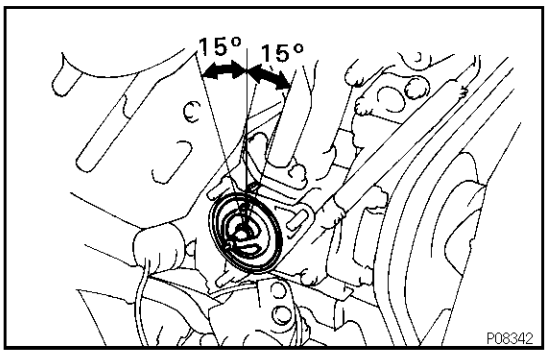



# INSTALLATION

**1. PLACE THERMOSTAT IN WATER PUMP**

(a) Install a new gasket on to the thermostat

(b) Align the thermostat jiggle valve with the protrusion of the water inlet housing, and insert the thermostat in the water inlet housing




HINT

The jiggle valve may be set within 15° of either side of the prescribed position

**2. INSTALL WATER INLET**

Install the water inlet with the 3 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**3. FILL RADIATOR WITH ENGINE COOLANT**

**4. START ENGINE AND CHECK FOR LEAKS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# RADIATOR

CO0Y 02

## ON–VEHICLE CLEANING

NOTICE:

**If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



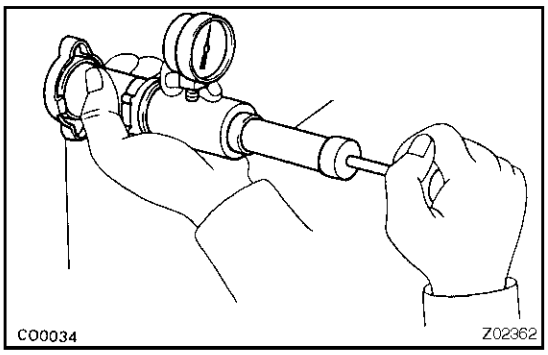
CO0 Z-03

# ON-VEHICLE INSPECTION

1. REMOVE RADIATOR TANK CAP

CAUTION:

**To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.**




2. INSPECT RADIATOR CAP

NOTICE:

**If the radiator cap has contaminations, always rinse it with water. Before using a radiator cap tester, wet the relief valve and pressure valve with coolant or water.**

Using a radiator cap tester, pump the tester and measure the relief valve opening pressure

**Standard opening pressure:**

**74 – 103 kPa**

**(0.75 – 1.05 kgf/cm$^2$, 10.7 – 14.9 psi)**

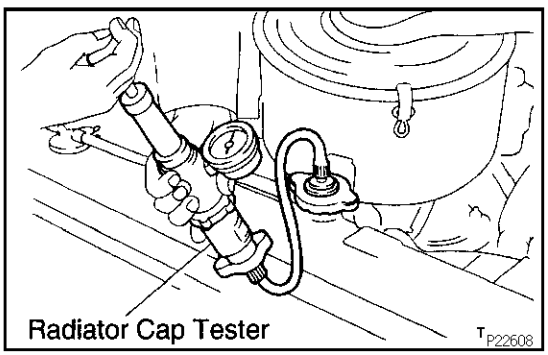
**Minimum opening pressure:**

**59 kPa (0.6 kgf/cm$^2$, 8.5 psi)**

HINT

Use the tester's maximum reading as the opening pressure

If the opening pressure is less than minimum, replace the radiator cap




3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester

(b) Warm up the engine

(c) Pump it to 118 kPa (1 2 kgf/cm$^2$, 17 1 psi), and check that the pressure does not drop

If the pressure drops, check the hoses, radiator or water pump for leaks If no external leaks are found, check the heater core, cylinder block and head

4. REINSTALL RADIATOR CAP



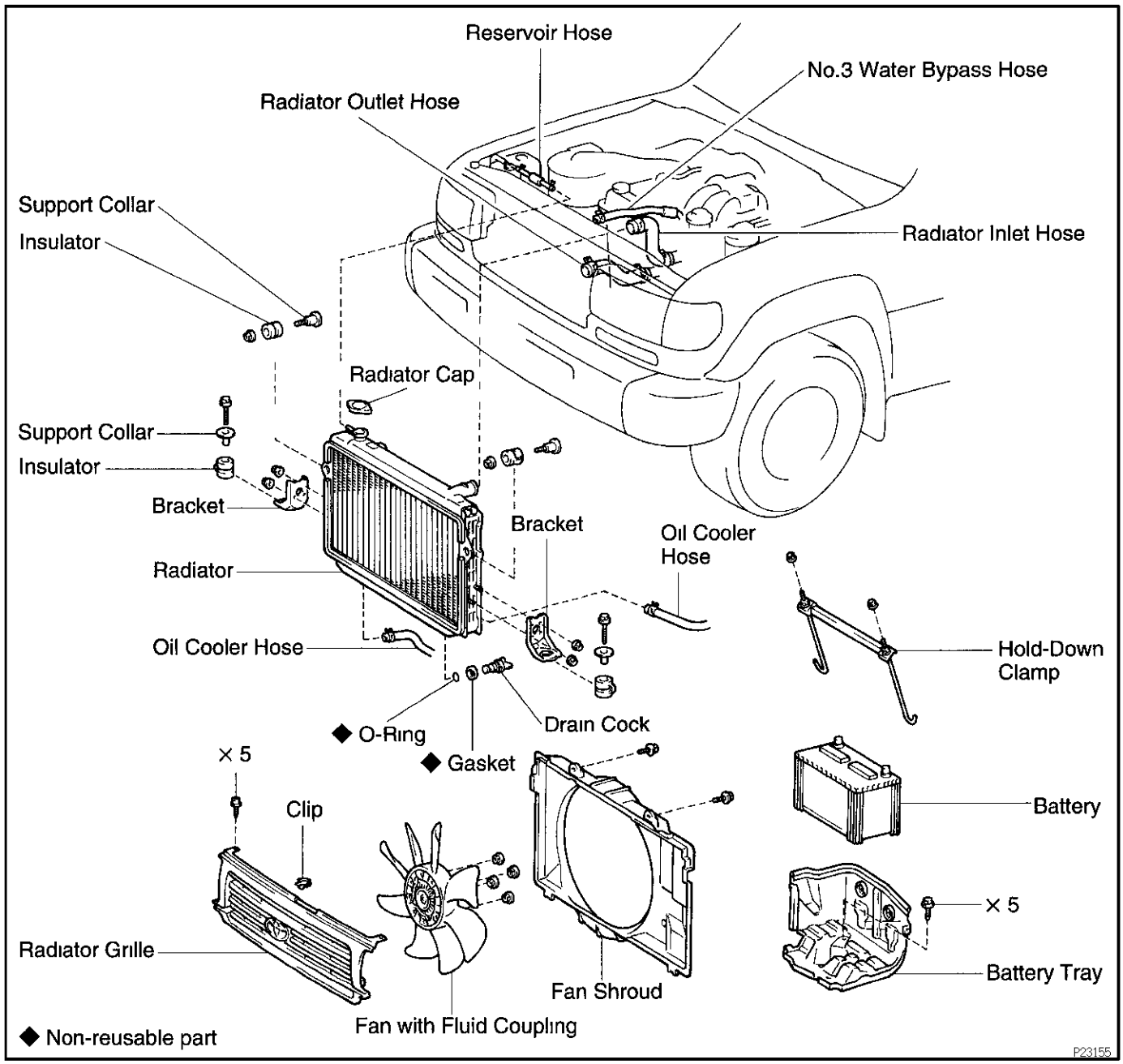
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO0J0-03

# COMPONENTS



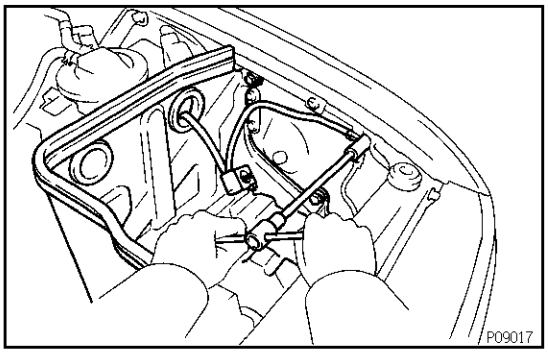



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO117 02



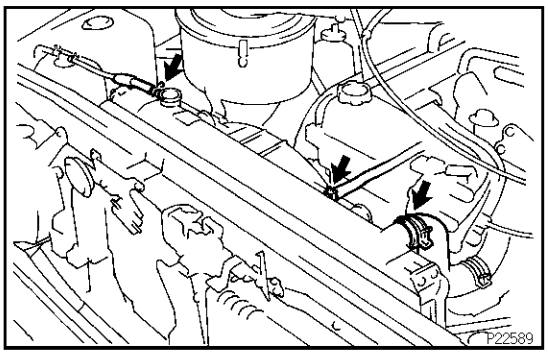

# REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **REMOVE BATTERY AND BATTERY TRAY**

(a) Disconnect the battery cables
(b) Remove the nuts, hold-down clamp and battery
(c) Remove the bolt and disconnect the ground strap
(d) Remove the 5 bolts and battery tray

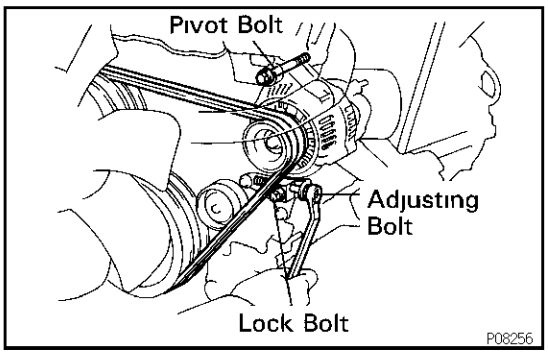
3. **REMOVE RADIATOR GRILLE**

Remove the 5 screws, clip and radiator grille

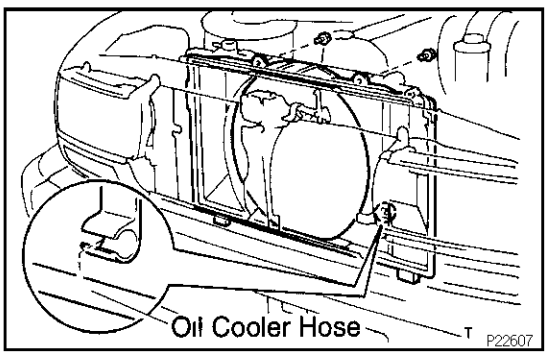



4. **DISCONNECT NO.3 WATER BYPASS HOSE**
5. **DISCONNECT RADIATOR INLET HOSE**
6. **DISCONNECT RADIATOR RESERVOIR HOSE**
7. **REMOVE RADIATOR**

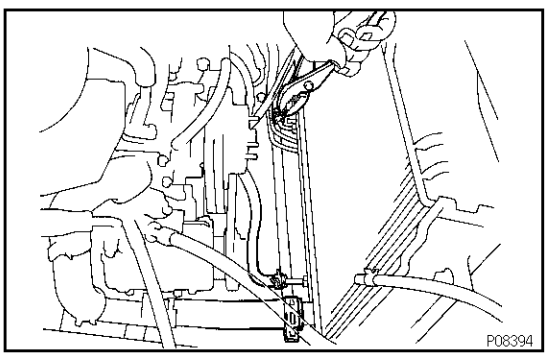
(a) Stretch the belts and loosen the water pump pulley mounting nuts




(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts




(c) Disconnect the oil cooler hose from the clamp on the fan shroud
(d) Remove the 2 bolts holding the fan shroud to the radiator
(e) Remove the 4 water pump pulley mounting nuts
(f) Pull out the fan with fluid coupling, water pump pulley and fan shroud



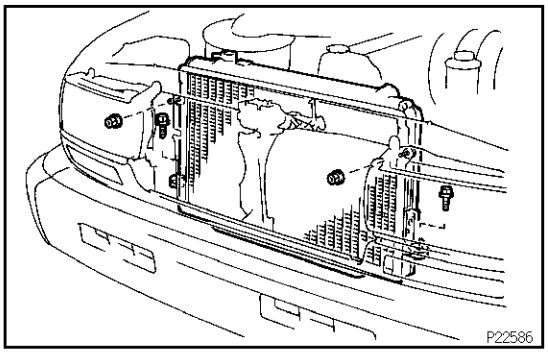

8. **DISCONNECT A/T OIL COOLER HOSES**
9. **DISCONNECT RADIATOR OUTLET HOSE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

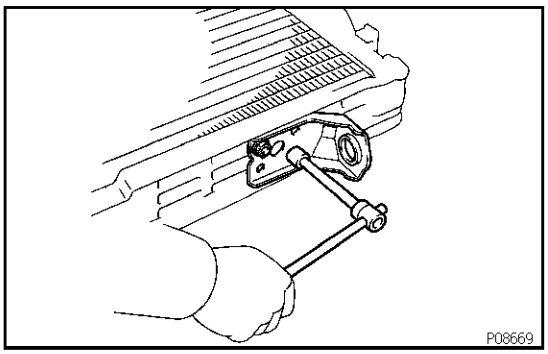
Brought to you by BirfMark






**10. REMOVE RADIATOR**

(a) Remove the 2 bolts, 2 nuts and radiator




(b) Remove the 4 nuts and 2 radiator brackets

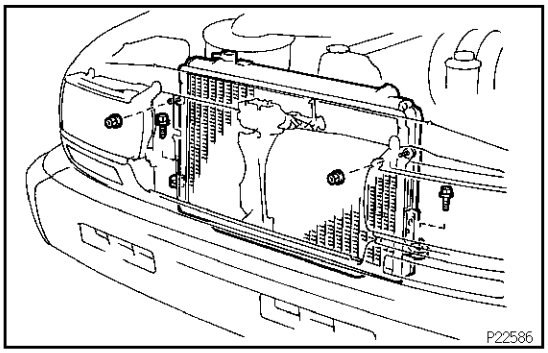


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



CO118 01

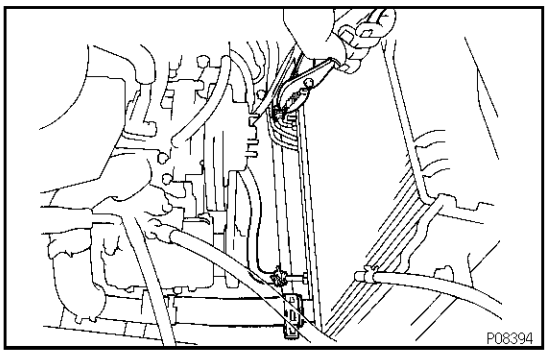



# INSTALLATION

1. **INSTALL RADIATOR**

(a) Install the 2 radiator brackets with the 4 nuts
**Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)**

(b) Install the radiator with the 2 bolts and 2 nuts
**Torque:**
**Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)**
**Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)**




2. **CONNECT A/T OIL COOLER HOSES**
3. **CONNECT RADIATOR OUTLET HOSE**
4. **INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS**

(a) Place the fan with fluid coupling, water pump pulley and fan shroud in position

(b) Temporarily install the fan pulley mounting nuts

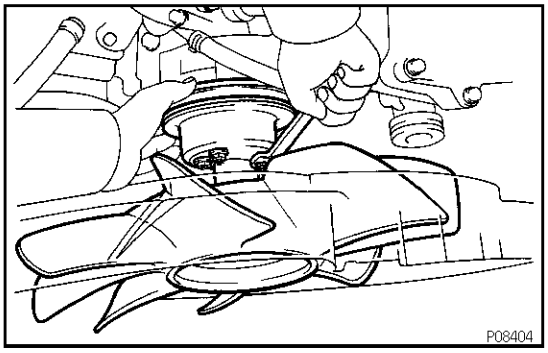
(c) Install the fan shroud with the 2 bolts
**Torque: 5.0 N·m (50 kgf·cm, 43 in.·lbf)**

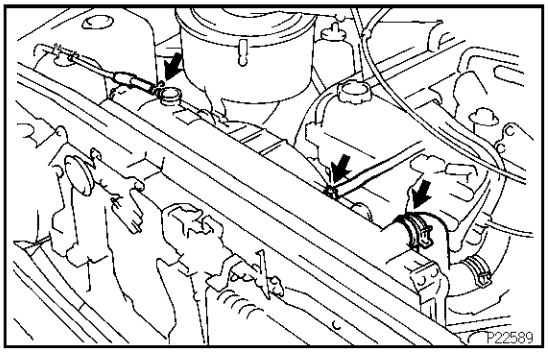
(d) Connect the oil cooler hose to the clamp on the fan shroud

(e) Install the drive belts with the adjusting bolt and pivot bolt

(f) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts

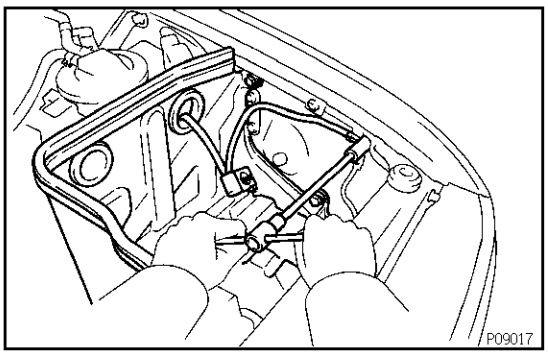
(g) Adjust the drive belts (See page CH-2)




5. **CONNECT RADIATOR RESERVOIR HOSE**
6. **CONNECT RADIATOR INLET HOSE**
7. **CONNECT NO.3 WATER BYPASS HOSE**
8. **INSTALL RADIATOR GRILLE**

Install the radiator grille with the 5 screws and clip




9. **INSTALL BATTERY AND BATTERY TRAY**

(a) Install the battery tray with the 5 bolts

(b) Connect the ground strap with the bolt

(c) Install the battery with the hold-down clamp and nuts

(d) Connect the battery cables

10. **FILL RADIATOR WITH ENGINE COOLANT**
11. **START ENGINE AND CHECK FOR LEAKS**
12. **CHECK AUTOMATIC TRANSMISSION FLUID LEVEL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

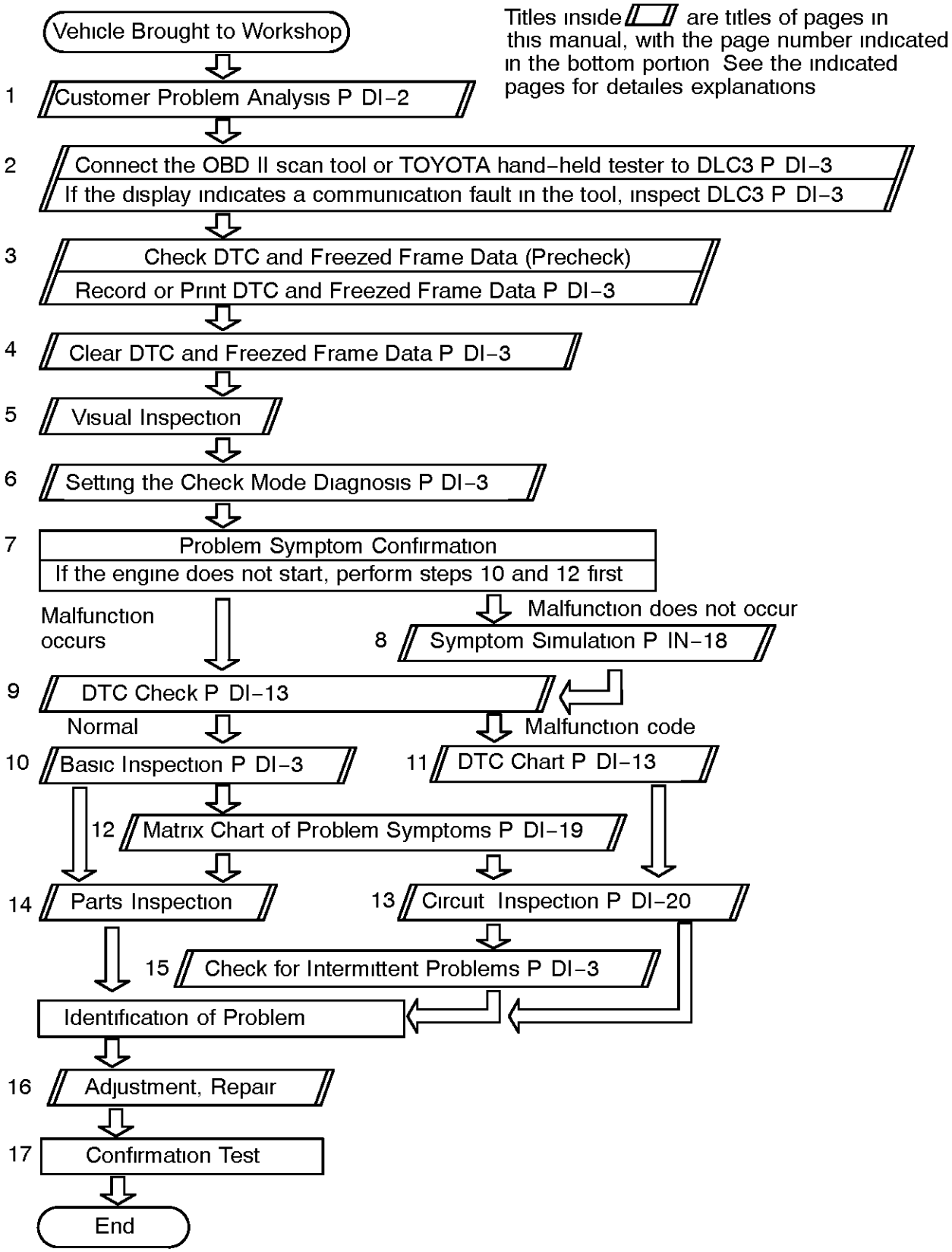


# ENGINE

D5OS 02

## HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OT-01

# CUSTOMER PROBLEM ANALYSIS CHECK

**ENGINE CONTROL SYSTEM Check Sheet**

Inspector's Name

| | | | |
|---|---|---|---|
| Customer's Name | | Model and Model Year | |
| Driver's Name | | Frame No | |
| Data Vehicle Brought in | | Engine Model | |
| License No | | Odometer Reading | km miles |

| | | |
|---|---|---|
| Problem Symptoms | ☐ Engine does not Start | ☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion |
| | ☐ Difficult to Start | ☐ Engine cranks slowly<br>☐ Other _____ |
| | ☐ Poor Idling | ☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High ( rpm) ☐ Low ( rpm)<br>☐ Rough idling ☐ Other _____ |
| | ☐ Poor Driveability | ☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging<br>☐ Knocking ☐ Other _____ |
| | ☐ Engine Stall | ☐ Soon after starting ☐ After accelerator pedal depressed<br>☐ After accelerator pedal released ☐ During A/C operation<br>☐ Shifting from N to D ☐ Other _____ |
| | ☐ Others | |

| | | |
|---|---|---|
| Datas Problem Occurred | | |
| Problem Frequency | | ☐ Constant ☐ Sometimes ( times per day/month) ☐ Once only<br>☐ Other _____ |
| Condition When Problem Occurs | Weather | ☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____ |
| | Outdoor Temperature | ☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____°F/____°C) |
| | Place | ☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill<br>☐ Rough road ☐ Other _____ |
| | Engine Temp | ☐ Cold ☐ Warming up ☐ After Warming up ☐ Any temp ☐ Other _____ |
| | Engine Operation | ☐ Starting ☐ Just after starting ( min ) ☐ Idling ☐ Racing<br>☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration<br>☐ A/C switch ON/OFF ☐ Other _____ |

| | | | |
|---|---|---|---|
| Condition of MIL | | ☐ Remains on | ☐ Sometimes light up ☐ Does not light up |
| DTC Inspection | Normal mode (Precheck) | ☐ Normal | ☐ Malfunction code(s) (code )<br>☐ Freezed frame data ( ) |
| | Check Mode | ☐ Normal | ☐ Malfunction code(s) (code )<br>☐ Freezed frame data ( ) |

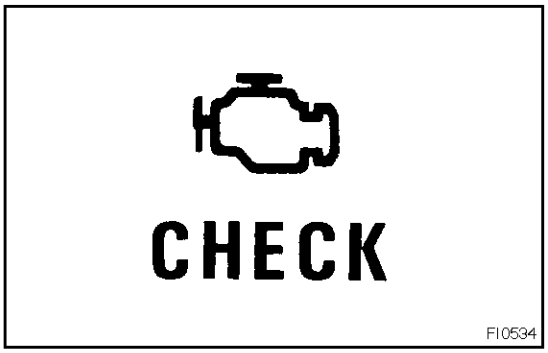


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OU-02



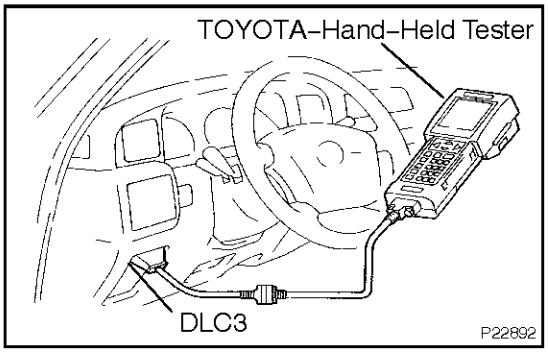

# PRE–CHECK

## 1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM
- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–13)

If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTC remain recorded in the ECM memory




- To check the DTC, connect the OBD II scan tool or TOYOTA hand–held tester to Data Link Connector 3 (DLC3) on the vehicle The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book )
- DTC include SAE controlled codes and manufacturer controlled codes SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–13)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



- The diagnosis system operates in normal mode during normal vehicle use It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot Most DTC use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester only) (See step 2)
- *2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory If the same malfunction is detected again during the second drive test, this second detection causes the MIL to light up
- The 2 trip repeats the same mode a 2nd time (However, the IG switch must be turned OFF between the 1st trip and 2nd trip )
- Freeze frame data
  Freeze frame data records the engine condition when a misfire (DTC P0300 – P0306) or fuel trim malfunction (DTC P0171, P0172) or other malfunction (first malfunction only), is detected
- Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc ) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc at the time of the malfunction

Priorities for troubleshooting

If troubleshooting priorities for multiple DTCs are given in the applicable diagnostic chart, these should be followed

If no instructions are given troubleshoot DTCs according to the following priorities

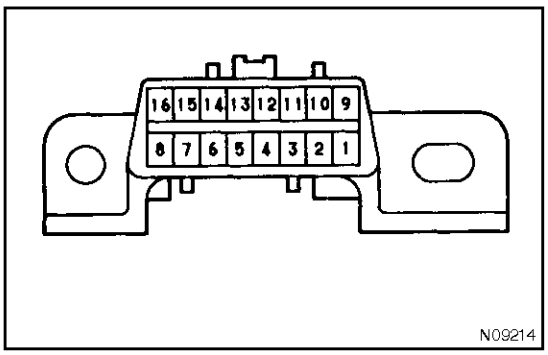
(1) DTC other than fuel trim malfunction (DTC P0171, P0172), EGR (DTC P0401, P0402), and misfire (DTC P0300 – P0306)

(2) Fuel trim malfunction (DTC P0171, P0172), and EGR (DTC P0401, P0402)

(3) Misfire (DTC P0300 – P0306)

(b) Check the DLC3

The vehicle's ECM uses V P W (Variable Pulse Width) for communication to comply with SAE J1850 The terminal arrangement of DLC3 complies with SAE J1962 and matches the V P W format






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

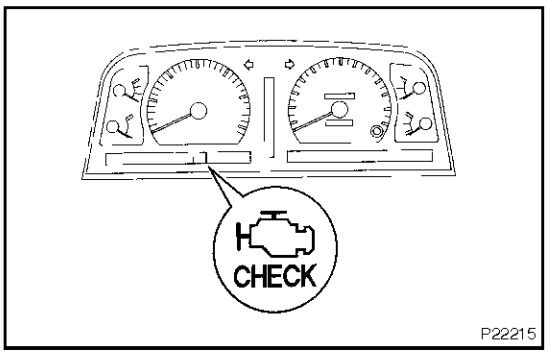


| Terminal No | Connection / Voltage or Resistance | Condition |
|---|---|---|
| 2 | Bus ⊕ Line / Pulse generation | During transmission |
| 4 | Chassis Ground / ↔ Body Ground 1 Ω or less | Always |
| 5 | Signal Ground / ↔ Body Ground 1 Ω or less | Always |
| 16 | Battery Positive / ↔ Body Ground 9 – 14 V | Always |

HINT

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual




**2. INSPECT DIAGNOSIS (NORMAL MODE)**

(a) Check the MIL

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running

HINT

If the MIL does not light up, troubleshoot the combination meter (See page BE–2)

(2) When the engine started, the MIL should go off If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system

(b) Check the DTC

**NOTICE:**

**TOYOTA hand–held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down**

(1) Prepare the OBD II scan tool (complying with SAE J 1978) or TOYOTA hand–held tester

(2) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3 in the fuse box at the lower left of the instrument panel

(3) Turn the ignition switch ON and switch the OBD II scan tool or TOYOTA hand–held tester switch ON

(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTC and freezed frame data, note them down (For operating instructions, see the OBD II scan tool's instruction book)

(5) See page DI–13 to confirm the details of the DTCs



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**NOTICE:**

**When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTC, use normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.**

**3. INSPECT DIAGNOSIS (CHECK MODE)**

HINT

TOYOTA hand–held tester only

Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode

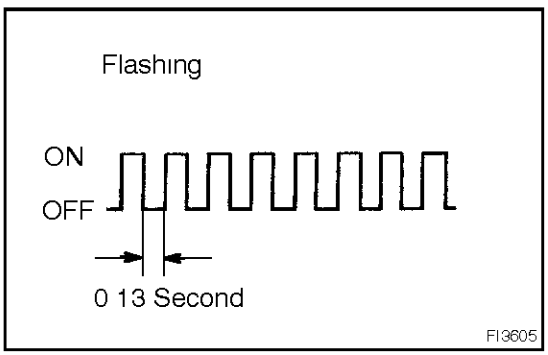
(a) Check the DTC

(1) Initial conditions

- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transmission in "park" or "neutral" position
- Air conditioning switched OFF

(2) Turn ignition switch OFF

(3) Prepare the TOYOTA hand–held tester




(4) Connect the TOYOTA hand–held tester to DLC3 in the fuse box at the lower left of the instrument panel

(5) Turn the ignition switch ON and push the TOYOTA hand–held tester ON

(6) Switch the TOYOTA hand–held tester normal mode to check mode (Check that the MIL flashes )

(7) Switch the engine (The MIL goes out after the engine start )

(8) Simulate the conditions of the malfunction described by the customer

**NOTICE:**

**Leave the ignition switch ON until you have checked the DTC, etc.**

(9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc

HINT

Take care not to turn the ignition switch OFF Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, so all DTCs, etc are erased



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(10) After checkıng the DTC, ınspect the applıcable cırcuıt

(b) Clear the DTC

The followıng actıons wıll erase the DTCs and freezed frame data

(1) Operatıng the OBD II scan tool (complyıng wıth SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's ınstructıon book for operatıng ınstructıons )

(2) Dısconnectıng the battery termınals or EFI fuse

**NOTICE:**

**If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or if the ignition switch is turned from ON to ACC or LOCK during check mode, the DTCs and freezed frame data will be erased.**

## 4. FAIL–SAFE CHART

If any of the followıng codes ıs recorded, the ECM enters faıl–safe mode

| DTC No | Faıl–Safe Operatıon | Faıl–Safe Deactıvatıon Condıtıons |
|---|---|---|
| P0100 | • Ignıtıon tımıng fıxed at 5° BTDC<br>• Injectıon method fıxed at sımultaneous ınjectıon | Returned to normal condıtıon |
| P0110 | Intake aır temp ıs fıxed at 20°C (68°F) | Returned to normal condıtıon |
| P0115 | Engıne coolant temp ıs fıxed at 80°(176°F) | Returned to normal condıtıon |
| P0120 | VTA ıs fıxed at 0° | The followıng condıtıon must be repeated at least 2 tımes consecutıvely<br>When closed throttle posıtıon swıtch ıs ON<br>0 1 V ≦ VTA ≦ 0 95 V |
| P0135<br>P0141 | The heater cırcuıt ın wıtch an abnormalıty ıs detected ıs turned off | Ignıtıon swıtch OFF |
| P0325<br>P0330 | Max tımıng retardatıon | Ignıtıon swıtch OFF |
| P1300 | Fuel cut | IGF sıgnal ıs detected for 6 consectıve ıgnıtıons |
| P1605 | Max tımıng retardatıon | Returned to normal condıtıon |

## 5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only

By puttıng the vehıcle's ECM ın check mode, 1 trıp detectıon logıc ıs possıble ınstead of 2 trıp detectıon logıc and sensıtıvıty to detect open cırcuıts ıs ıncreased Thıs makes ıt easıer to detect ıntermıttent problems

(1) Clear the DTC (See step 2)
(2) Set the check mode (See step 3)
(3) Perform a sımulatıon test (See page IN–18)
(4) Check the connector and termınal (See page IN–28)
(5) Handle the connector (See page IN–28)
(6) Vısual check and contact pressure (See page IN–28)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently Therefore, use of this check is essential in engine troubleshooting

| | |
|---|---|
| 1 | **Is battery positive voltage 11 V or more when engine is stopped?** |

**NO** → **Charge or replace battery.**

**YES**

| | |
|---|---|
| 2 | **Is engine cranked?** |

**NO** → **Proceed to page ST–16, and continue to troubleshoot.**

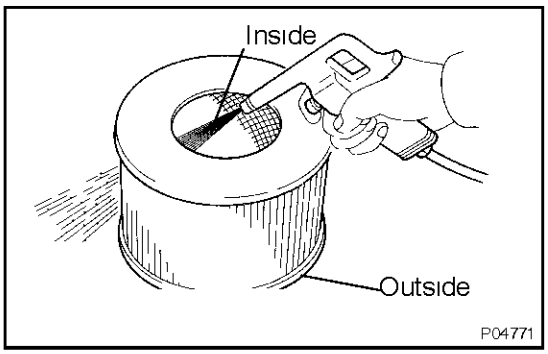
**YES**

| | |
|---|---|
| 3 | **Does engine start?** |

**NO** → **Go to step 7.**

**YES**

| | |
|---|---|
| 4 | **Check air filter.** |




**PREPARATION:**

Remove air filter

**CHECK:**

Visually check that the air cleaner element is not dirty or excessive oily

HINT

If necessary, clean the element with compressed air First blow from inside thoroughly, then blow from outside of element

**NG** → **Repair or replace**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



OK

| 5 | Check idle speed. |
|---|---|

**PREPARATION:**

(a) Warm up engine to normal operating temperature
(b) Switch off all accessories
(c) Switch off air conditioning
(d) Shift transmission into "N" position
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3 on the vehicle

**CHECK:**

Use CURRENT DATA to check the idle speed

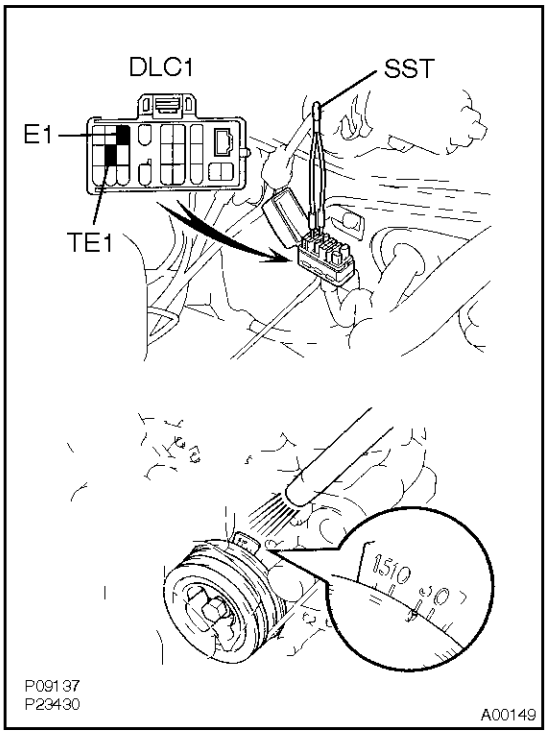
**OK:**

**Idle speed: 650 ± 50 rpm**

NG → **Proceed to matrix chart of problem symptoms on page DI–19.**

OK

| 6 | Check ignition timing. |
|---|---|




**PREPARATION:**

(a) Warm up engine to normal operating temperature
(b) Shift transmission into "N" position
(c) Keep the engine speed at idle
(d) Using SST, connect terminals TE1 and E1 of DLC1
SST 09843–18020
(e) Connect a timing light probe to a high–tension cord

**CHECK:**

Check ignition timing

**OK:**

**Ignition timing: 3° BTDC at idle**

NG → **Proceed to page IG–1 and continue to trouble-shoot.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

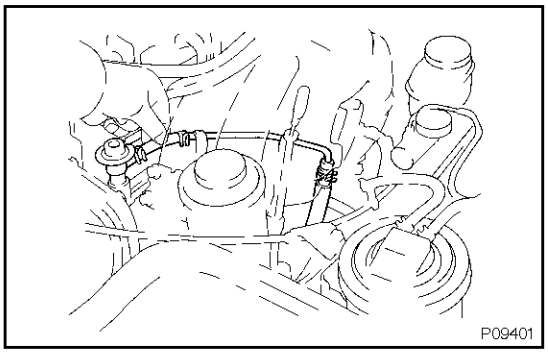
Brought to you by BirfMark



OK

**Proceed to matrix chart of problem symptoms on page DI–19.**

| 7 | **Check fuel pressure.** |
|---|---|




**PREPARATION:**

(a) Be sure that enough fuel is in the tank
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and push TOYOTA hand–held tester main switch ON
(d) Use ACTIVE TEST mode to operate the fuel pump
(e) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–6)

**CHECK:**

Check for fuel pressure in the fuel return hose when it is pinched off

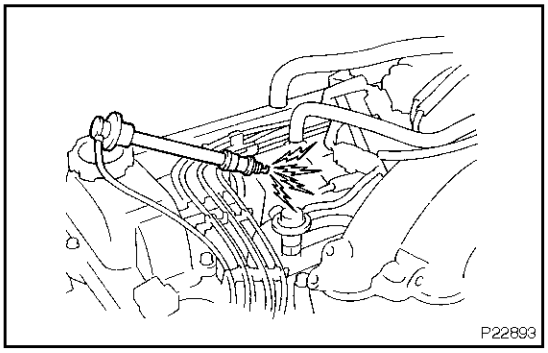
HINT

At this time, you will hear a fuel flowing noise

NG → **Proceed to page SF–6 and continue to troubleshoot.**

OK

| 8 | **Check for spark.** |
|---|---|




**PREPARATION:**

(a) Remove No 2 and No 3 cylinder head cover
(b) Disconnect high–tension cord from spark plug
(c) Remove spark plug
(d) Install the spark plug to the high–tension cord
(e) Ground the spark plug
(f) Disconnect injector connector

**CHECK:**

Check if spark occurs while engine is being cranked

**NOTICE:**

**To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

**Proceed to matrix chart of problem symptoms on page DI–19.**

## 7. ENGINE OPERATING CONDITION

**NOTICE:**

**The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.**

(a) CARB mandated signals

| TOYOTA hand–held tester display | Measurement Item | Normal Condition* |
|---|---|---|
| FUEL SYS #1 | Fuel System Bank 1<br>OPEN Air–fuel ratio feedback stopped<br>CLOSED Air–fuel ratio feedback operating | Idling after warming up CLOSED |
| CALC LOAD | Calculator Load<br>Current intake air volume as a proportion of max intake air volume | Idling 13 8 – 19 3%<br>Racing without load (2 500 rpm) 17 6 – 25 2% |
| COOLANT TEMP | Engine Coolant Temp Sensor Value | After warming up 80 – 95°C (176 – 203°F) |
| SHORT FT #1 | Short–term Fuel Trim Bank 1 | 0 ± 20% |
| LONG FT #1 | Long–term Fuel Trim Bank 1 | 0 ± 20% |
| ENGINE SPD | Engine Speed | Idling 650 ± 50 rpm |
| VEHICLE SPD | Vehicle Speed | Vehicle Stopped 0 km/h (0 mph) |
| IGN ADVANCE | Ignition Advance<br>Ignition Timing of Cylinder No 1 | Idling BTDC 0 – 11° |
| INTAKE AIR | Intake Air Temp Sensor Value | Equivalent to Ambient Temp |
| MAF | Air Flow Rate Through Mass Air Flow Meter | Idling 4 3 – 6 1 gm/sec<br>Racing without load (2 500 rpm)<br>21 2 – 30 4 gm/sec |
| THROTTLE POS | Voltage Output of Throttle Position Sensor<br>Calculated as a percentage<br>0 V → 0% 5 V → 100% | Throttle Fully Closed 7 – 11%<br>Throttle Fully Open 65 – 75% |
| O2S B1 S1 | Voltage Output of Oxygen Sensor<br>Bank 1 Sensor 1 | Idling 0 1 – 0 9 V |
| O2FT B1 S1 | Oxygen Sensor Fuel Trim Bank 1 Sensor 1<br>(Same as SHORT FT #1) | 0 ± 20% |
| O2S B1 S2 | Voltage Output of Oxygen Sensor<br>Bank 1 Sensor 2 | Driving (50 km/h 31 mph) 0 1 – 0 9 V |

* If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## (b) TOYOTA Enhanced Signals

| TOYOTA hand–held tester display | Measurement Item | Normal Condition* |
|---|---|---|
| MISFIRE RPM | Engine RPM for first misfire range | Misfire 0 0 rpm |
| MISFIRE LOAD | Engine load for first misfire range | Misfire 0 0 g/r |
| INJECTOR | Fuel injection time for cylinder No 1 | Idling 2 0 – 3 5 ms |
| IAC STEP POS | Intake Air Control Valve step position Opening position step motor type IAC valve | Idling 10 – 50 step |
| STARTER SIG | Starter Signal | Cranking ON |
| CTP SW | Closed Throttle Position Switch Signal | Throttle Fully Closed ON |
| A/C SIG | A/C Switch Signal | A/C ON ON |
| PNP SW | Park/Neutral Position Switch Signal | P or N Position ON |
| STOP LIGHT SW | Stop Light Switch Signal | Stop light switch ON ON |
| FC IDL | Fuel Cut Idle Fuel cut when throttle valve fully closed during deceleration | Fuel cut operating ON |
| FC TAU | Fuel Cut TAU Fuel cut during very light load | Fuel cut operating ON |
| CYL#1 – CYL#6 | Ratio of revolution variation for each cylinder when variation is large | 0% |
| IGNITION | Ignition rate for all cylinders every 1 000 revolutions | 0 – 3 000 rpm |
| EGRT GAS | EGR Gas Temp Sensor Value | EGR not operating Temp between intake air temp and engine coolant temp |
| EGR SYSTEM | EGR System Operating Condition | Idling OFF |
| FUEL PRES UP VSV | Fuel Pressure Up VSV Signal | High temp restarting ON |
| FUEL PUMP | Fuel Pump Signal | Idling ON |
| TOTAL FT B1 | Total Fuel Trim Bank 1 Average value for fuel trim system of bank 1 | Idling 0 8 – 1 2 V |
| O2 LR B1 S1 | Oxygen Sensor Lean Rich Bank 1 Sensor 1 Response time for oxygen sensor output to switch from lean to rich | Idling after warmed up 0 – 1 000 msec |
| O2 RL B1 S1 | Oxygen Sensor Rich Lean Bank 1 Sensor 1 Response time for oxygen sensor output to switch from rich to lean | Idling after warmed up 0 – 1 000 msec |

* If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OV 03

# DIAGNOSTIC TROUBLE CODE CHART

HINT

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below For details of each code, turn to the page referred to under the "See page " for the respecire "DTC No " in the DTC chart

| DTC No (See Page) | Detection Item | Trouble Area | MIL | Memory |
|---|---|---|---|---|
| P0100 (DI–20) | Mass Air Flow Circuit Malfunction | • Open or short in mass air flow meter circuit<br>• Mass air flow meter<br>• ECM | ○ *1 | ○ |
| P0101 (DI–25) | Mass Air Flow Circuit Range/Performance Problem | • Mass air flow meter | ○ *1 | ○ |
| P0110 (DI–26) | Intake Air Temp Circuit Malfunction | • Open or short in intake air temp sensor circuit<br>• Intake air temp sensor<br>• ECM | ○ *1 | ○ |
| P0115 (DI–30) | Engine Coolant Temp Circuit Malfunction | • Open or short in engine coolant temp sensor circuit<br>• Engine coolant temp sensor<br>• ECM | ○ *1 | ○ |
| P0116 (DI–34) | Engine Coolant Temp Circuit Range/Performance Problem | • Engine coolant temp sensor<br>• Cooling system | ○ *1 | ○ |
| P0120 (DI–35) | Throttle/Pedal Position Sensor/Switch A Circuit Malfunction | • Open or short in throttle position sensor circuit<br>• Throttle position sensor<br>• ECM | ○ *1 | ○ |
| P0121 (DI–39) | Throttle/Pedal Position Sensor/Switch A Circuit Range/Performance Problem | • Throttle position sensor | ○ *1 | ○ |
| P0125 (DI–40) | Insufficient Coolant Temp for Closed Loop Fuel Control | • Open or short in heated oxygen sensor circuit<br>• Heated oxygen sensor | ○ *1 | ○ |
| P0130 (DI–43) | Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) | • Heated oxygen sensor<br>• Fuel trim malfunction | ○ *1 | ○ |
| P0133 (DI–46) | Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1) | • Heated oxygen sensor | ○ *1 | ○ |
| P0135 (DI–47) | Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1) | • Open or short in heater circuit of heated oxygen sensor<br>• Heated oxygen sensor heater<br>• ECM | ○ *1 | ○ |
| P0136 (DI–49) | Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) | • Heated oxygen sensor | ○ *1 | ○ |
| P0141 (DI–47) | Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2) | • Same as DTC No P0135 | ○ *1 | ○ |

*1 MIL lights up



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| DTC No (See Page) | Detection Item | Trouble Area | MIL | Memory |
|---|---|---|---|---|
| P0171 (DI-51) | System too Lean (Fuel Trim) | • Air intake (hose loose)<br>• Fuel line pressure leak<br>• Injector blockage<br>• Heated oxygen sensor malfunction<br>• Mass air flow meter<br>• Engine coolant temp sensor | ○ *1 | ○ |
| P0172 (DI-51) | System too Rich (Fuel Trim) | • Fuel line pressure<br>• Injector leak blockage<br>• Heated oxygen sensor malfunction<br>• Mass air flow meter<br>• Engine coolant temp sensor | ○ *1 | ○ |
| P0300 (DI-54) | Random/Multiple Cylinder Misfire Detected | • Ignition system<br>• Injector<br>• Fuel line pressure<br>• EGR<br>• Compression pressure<br>• Valve clearance not to specification<br>• Valve timing<br>• Mass air flow meter<br>• Engine coolant temp sensor | ○ *2 | ○ |
| P0301<br>P0302<br>P0303<br>P0304<br>P0305<br>P0306<br>(DI-54) | Misfire Detected<br>- Cylinder 1<br>- Cylinder 2<br>- Cylinder 3<br>- Cylinder 4<br>- Cylinder 5<br>- Cylinder 6 | | | |
| P0325 (DI-59) | Knock Sensor 1 Circuit Malfunction | • Open or short in knock sensor 1 circuit<br>• Knock sensor 1 (looseness)<br>• ECM | ○ *1 | ○ |
| P0330 (DI-59) | Knock Sensor 2 Circuit Malfunction | • Open or short in knock sensor 2 circuit<br>• Knock sensor 2 (looseness)<br>• ECM | ○ *1 | ○ |
| P0335 (DI-62) | Crankshaft Position Sensor A Circuit Malfunction | • Open or short in crankshaft position sensor circuit for NE signal<br>• Crankshaft position sensor for NE signal<br>• Starter<br>• ECM | ○ *1 | ○ |
| P0340 (DI-65) | Camshaft Position Sensor Circuit Malfunction | • Open or short in camshaft position sensor circuit<br>• Camshaft position sensor<br>• ECM | ○ *1 | ○ |
| P0385 (DI-67) | Crankshaft Position Sensor B Circuit Malfunction | • Open or short in crankshaft position sensor circuit for NE2 signal<br>• Crankshaft position sensor for NE2 signal<br>• ECM | ○ *1 | ○ |
| P0401 (DI-69) | Exhaust Gas Recirculation Flow Insufficient Detected | • EGR valve stuck closed<br>• Short in VSV circuit for EGR<br>• Open in EGR gas temp sensor circuit<br>• EGR hose disconnected<br>• ECM | ○ *1 | ○ |
| P0402 (DI-80) | Exhaust Gas Recirculation Flow Excessive Detected | • EGR valve stuck open<br>• EGR VSV open malfunction<br>• Open in VSV circuit for EGR<br>• Short in EGR gas temp sensor circuit<br>• ECM | ○ *1 | ○ |

*1 MIL lights up

*2 MIL lights up or blinking



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| DTC No (See Page) | Detection Item | Trouble Area | *MIL | Memory |
|---|---|---|---|---|
| P0420 (DI–84) | Catalyst System Efficiency Below Threshold | • Three–way catalytic convertor<br>• Open or short in heated oxygen sensor circuit<br>• Heated oxygen sensor | ○ | ○ |
| P0500 (DI–87) | Vehicle Speed Sensor Malfunction | • Combination meter<br>• Open or short in speed sensor circuit<br>• ECM<br>• Vehicle speed sensor | ○ | ○ |
| P0505 (DI–89) | Idle Control System Malfunction | • IAC valve is stuck or closed<br>• Open or short in IAC valve circuit<br>• Open or short A/C signal circuit<br>• Air intake (hose loose) | ○ | ○ |
| P0510 (DI–93) | Closed Throttle Position Switch Malfunction | • Open in closed throttle position switch circuit<br>• Closed throttle position switch<br>• ECM | ○ | ○ |
| P1300 (DI–97) | Igniter Circuit Malfunction | • Open or short in IGF or IGT circuit from igniter to ECM<br>• Igniter<br>• ECM | ○ | ○ |
| P1335 (DI–102) | Crankshaft Position Sensor Circuit Malfunction (during engine running) | • Open or short in crankshaft position sensor circuit for NE signal<br>• Crankshaft position sensor for NE signal<br>• Starter<br>• ECM | – | ○ |
| P1500 (DI–103) | Stater signal circuit Malfunction | • Open or short in starter signal circuit<br>• ECM | – | ○ |
| P1600 (DI–105) | ECM BATT Malfunction | • Open in back up power source circuit<br>• ECM | ○ | ○ |
| P1605 (DI–107) | Knock Control CPU Malfunction | • ECM | ○ | ○ |
| P1780 (DI–108) | Park/Neutral Position Switch Malfunction | • Short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM | ○ | ○ |

* – · · · MIL does not light up, ○ · · · MIL lights up



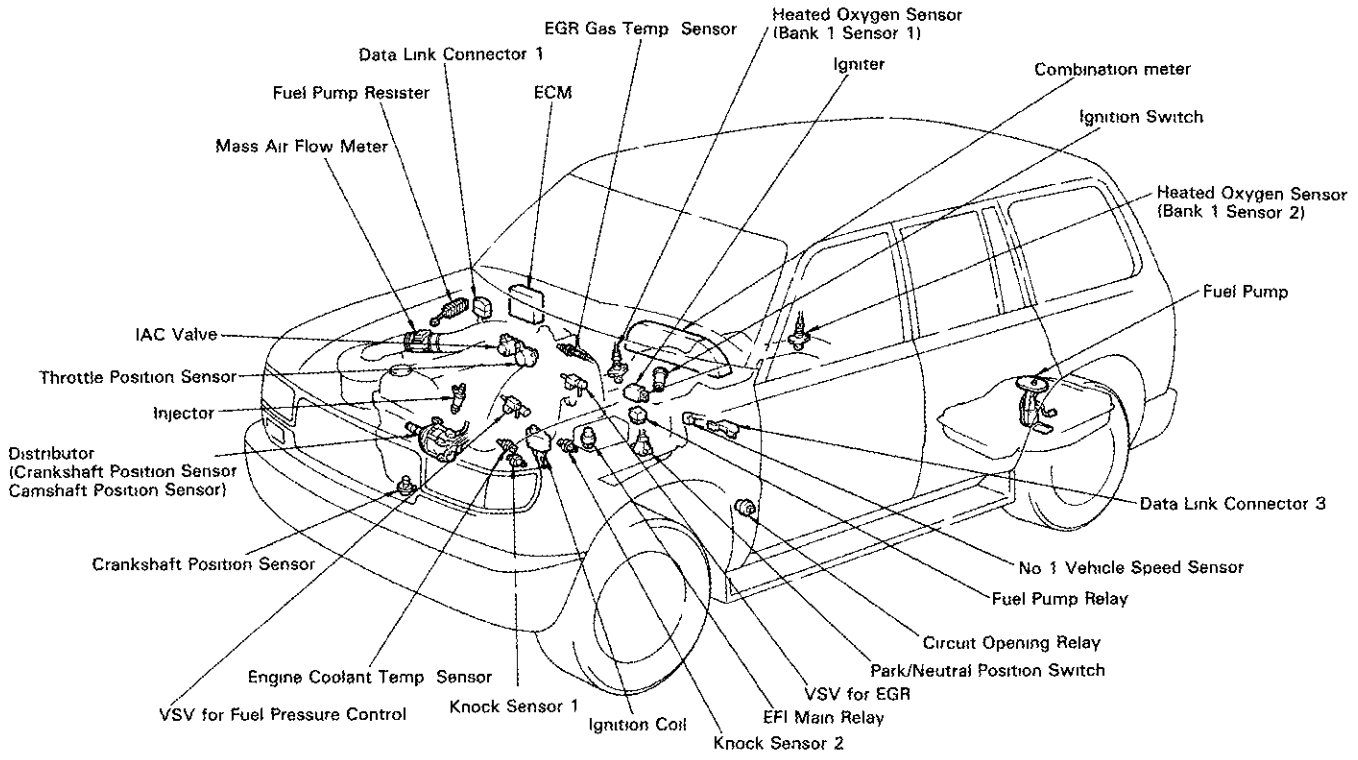
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OW 03

# PARTS LOCATION




Y

A15824



Brought to you by BirfMark
Version 1.11 - 03/16/2010

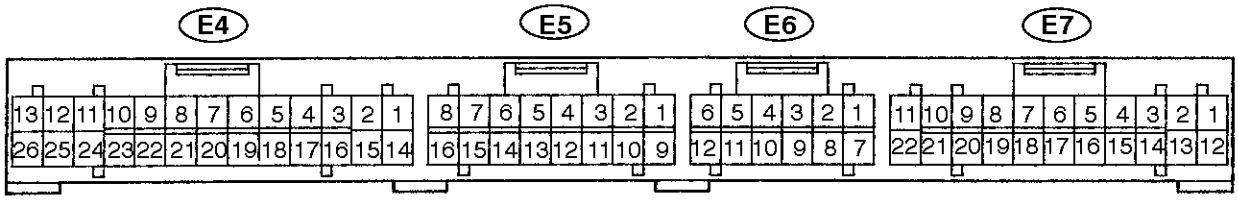
Brought to you by BirfMark



D5OX 03

# TERMINALS OF ECM

**ECM Terminals**




FI6526

| Symbols (Terminals No.) | Wiring Color | Condition | STD Voltage (V) |
|---|---|---|---|
| BATT (E7 – 2) – E1 (E4 – 24) | R – Y ↔ BR – B | Always | 9 – 14 |
| +B (E7 – 12) – E1 (E4 – 24) | Y ↔ BR – B | IG switch ON | 9 – 14 |
| VCC (E5 – 1) – E2 (E5 – 9) | R – G ↔ BR – B | IG switch ON | 4.5 – 5.5 |
| IDL (E5 – 11) – E2 (E5 – 9) | G – W ↔ BR – B | IG switch ON and apply vacuum to the throttle opener<br>Throttle valve fully closed | 0 – 3 |
| | | IG switch ON<br>Throttle valve fully open | 9 – 14 |
| VTA (E5 – 10) – E2 (E5 – 9) | G – B ↔ BR – B | IG switch ON<br>Throttle valve fully closed | 0.3 – 0.8 |
| | | IG switch ON<br>Throttle valve fully open | 3.2 – 4.9 |
| VG (E5 – 2) – E21 (E5 – 16) | G – BR | Idling, N position, A/C switch OFF | 1.1 – 1.5 |
| THA (E5 – 3) – E2 (E5 – 9) | L – Y ↔ BR – B | Idling, Intake air temp. 20°C (68°F) | 0.5 – 3.4 |
| THW (E5 – 4) – E2 (E5 – 9) | R – W ↔ BR – B | Idling, Engine coolant temp. 80°C (176°F) | 0.2 – 1.0 |
| STA (E7 – 11) – E1 (E4 – 24) | B – R ↔ BR – B | Cranking | 6.0 or more |
| #10 (E4 – 12) – E01 (E4 – 13) | W – L ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |
| #20 (E4 – 11) – E01 (E4 – 13) | W – R ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |
| #30 (E4 – 25) – E01 (E4 – 13) | W – G ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |
| #40 (E4 – 2) – E01 (E4 – 13) | Y ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |
| #50 (E4 – 1) – E01 (E4 – 13) | Y – R ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |
| #60 (E4 – 15) – E01 (E4 – 13) | Y – L ↔ BR | IG switch ON | 9 – 14 |
| | | Idling | Pulse generation<br>(See page DI–54) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | |
|---|---|---|---|
| IGT (E4 – 23) – E1 (E4 – 24) | B – G ↔ BR – B | Idling | Pulse generation (See page DI–97) |
| IGF (E4 – 17) – E1 (E4 – 24) | B – Y ↔ BR – B | IG switch ON<br>Disconnect igniter connector | 4 5 – 5 5 |
| | | Idling | Pulse generation (See page DI–97) |
| G1 (E6 – 11) – G – (E6 – 6) | R ↔ L | Idling | Pulse generation (See page DI–62) |
| G2 (E6 – 10) – G – (E6 – 6) | G ↔ L | Idling | Pulse generation (See page DI–62) |
| NE (E6 – 12) – G – (E6 – 6) | W ↔ L | Idling | Pulse generation (See page DI–62) |
| NE2 (E6 – 5) – G – (E6 – 6) | BR ↔ L | Idling | Pulse generation (See page DI–62) |
| W (E7 – 4) – E1 (E4 – 24) | Y – R ↔ BR – B | Idling | 9 – 14 |
| | | IG switch ON | 0 – 3 |
| EGR (E4 – 22) – E1 (E4 – 24) | L – W ↔ BR – B | IG switch ON | 9 – 14 |
| ISC1 (E4 – 7) – E01 (E4 – 13) | R – G ↔ BR | IG switch ON | 9 – 14 |
| ISC2 (E4 – 6) – E01 (E4 – 13) | R – B ↔ BR | IG switch ON | 9 – 14 |
| ISC3 (E4 – 5) – E01 (E4 – 13) | G – Y ↔ BR | IG switch ON | 9 – 14 |
| ISC4 (E4 – 4) – E01 (E4 – 13) | L – Y ↔ BR | IG switch ON | 9 – 14 |
| OX1 (E5 – 5) – E1 (E4 – 24) | L ↔ BR – B | Maintain engine speed at 2 500 rpm for 2 mins after warming up | Pulse generation |
| OX2 (E5 – 13) – E1 (E4 – 24) | W ↔ BR – B | Maintain engine speed at 2 500 rpm for 2 mins after warming up | Pulse generation |
| HT1 (E6 – 1) – E03 (E6 – 16) | GR ↔ BR | Idling | Below 3 0 |
| | | IG switch ON | 9 – 14 |
| HT2 (E6 – 7) – E03 (E6 – 16) | O ↔ BR | Idling | Below 3 0 |
| | | IG switch ON | 9 – 14 |
| KNK1 (E5 – 6) – E1 (E4 – 24) | W ↔ BR – B | Idling | Pulse generation (See page DI–62) |
| KNK2 (E5 – 14) – E1 (E4 – 24) | L – W ↔ BR – B | Idling | Pulse generation (See page DI–62) |
| SPD (E7 – 8) – E1 (E4 – 24) | L – W ↔ BR – B | IG switch ON<br>Rotate driving wheel slowly | Pulse generation |
| TE1 (E5 – 7) – E1 (E4 – 24) | L ↔ BR – B | IG switch ON | 9 – 14 |
| A/C (E7 – 7) – E1 (E4 – 24) | B – W ↔ BR – B | Idling A/C switch ON | 9 – 14 |
| | | Idling A/C switch OFF | Below 2 0 |
| THG (E4 – 19) – E2 (E5 – 9) | G – Y ↔ BR – B | IG switch ON | 4 5 – 5 5 |
| FC (E4 – 14) – E1 (E4 – 24) | R – W ↔ BR – B | IG switch ON | 9 – 14 |
| | | Idling | 0 – 3 |
| FPU (E4 – 21) – E1 (E4 – 24) | L – R ↔ BR – B | IG switch ON | 9 – 14 |
| | | Restarting at high engine coolant temp | 0 – 3 |
| SDL (E7 – 6) – E1 (E4 – 24) | W ↔ BR – B | During transmission | Pulse generation |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OY 03

# PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below

| Symptom | Suspect Area | See page |
|---|---|---|
| Engine does not crank (Does not start) | 1 Starting system | ST–16 |
| No initial combustion (Does not start) | 1 ECM power source circuit<br>2 Fuel pump control circuit | DI–110<br>DI–115 |
| No complete combustion (Does not start) | 1 Fuel pump control circuit | DI–115 |
| Engine cranks normally (Difficult to start) | 1 Starter signal circuit<br>2 Fuel pump control circuit<br>3 Compression | DI–103<br>DI–115<br>EM–3 |
| Cold engine (Difficult to start) | 1 Starter signal circuit<br>2 Fuel pump control circuit | DI–103<br>DI–115 |
| Hot engine (Difficult to start) | 1 Starter signal circuit<br>2 Fuel pressure control circuit<br>3 Fuel pump control circuit | DI–103<br>DI–125<br>DI–115 |
| High engine idle speed (Poor idling) | 1 A/C signal circuit<br>2 ECM power source circuit | AC–5<br>DI–110 |
| Low engine idle speed (Poor idling) | 1 A/C signal circuit<br>2 Fuel pump control circuit | AC–5<br>DI–115 |
| Rough idling (Poor idling) | 1 Compression<br>2 Fuel pump control circuit | EM–3<br>DI–115 |
| Hunting (Poor idling) | 1 ECM power source circuit<br>2 Fuel pump control circuit | DI–110<br>DI–115 |
| Hesitation/Poor acceleration (Poor driveability) | 1 Fuel pump control circuit<br>2 A/T faulty | DI–115<br>DI–147 |
| Surging (Poor driveability) | 1 Fuel pump control circuit | DI–115 |
| Soon after starting (Engine stall) | 1 Fuel pump control circuit | DI–115 |
| During A/C operation (Engine stall) | 1 A/C signal circuit<br>2 Engine control module (ECM) | AC–5<br>IN–18 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OZ–02

# CIRCUIT INSPECTION

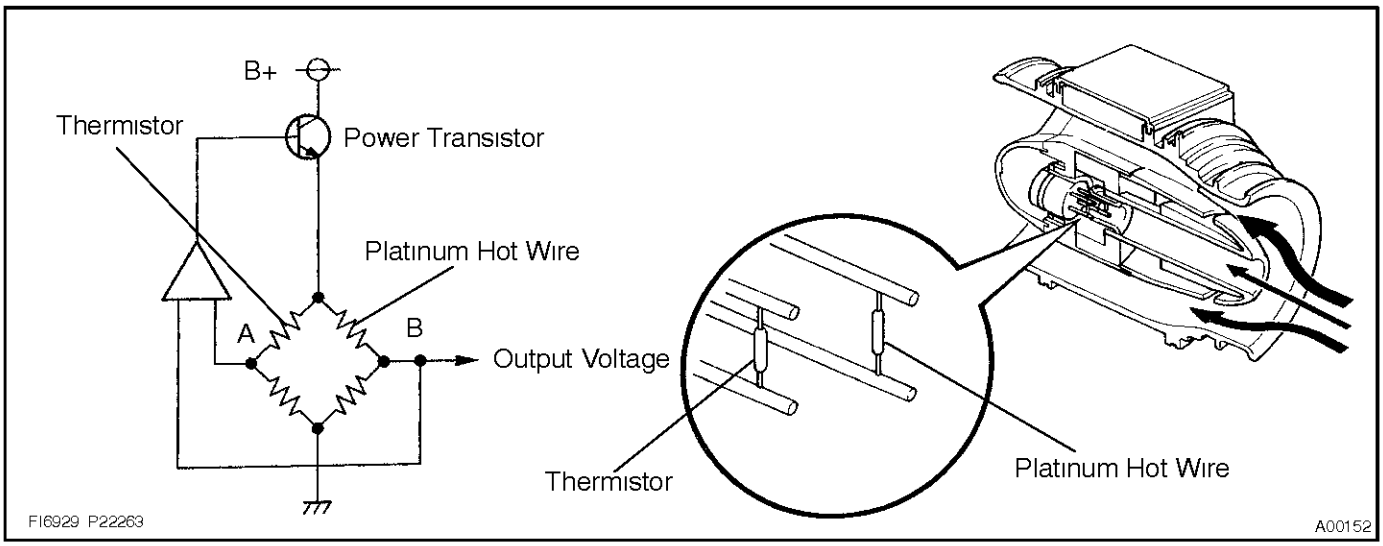
| DTC | P0100 | Mass Air Flow Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temperature

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire This current flow is then measured as the output voltage of the air flow meter

The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of "A" and "B" remains equal to maintain the set temperature




| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0100 | Open or short in mass air flow meter circuit with engine speed 4 000 rpm or less | • Open or short in mass air flow meter circuit<br>• Mass air flow meter<br>• ECM |

If the ECM detects DTC" P0100" it operates the fail safe function, keeping the ignition timing and injection volume constant and marking it possible to drive the vehicle

HINT

After confirming DTC P0100 use the OBD II scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from "CURRENT DATA"

| Mass Air Flow Value (gm/sec ) | Malfunction |
|---|---|
| Approx 0 | • Mass air flow meter power source open<br>• VG circuit open or short |
| 439 0 or more | • E21 circuit open |

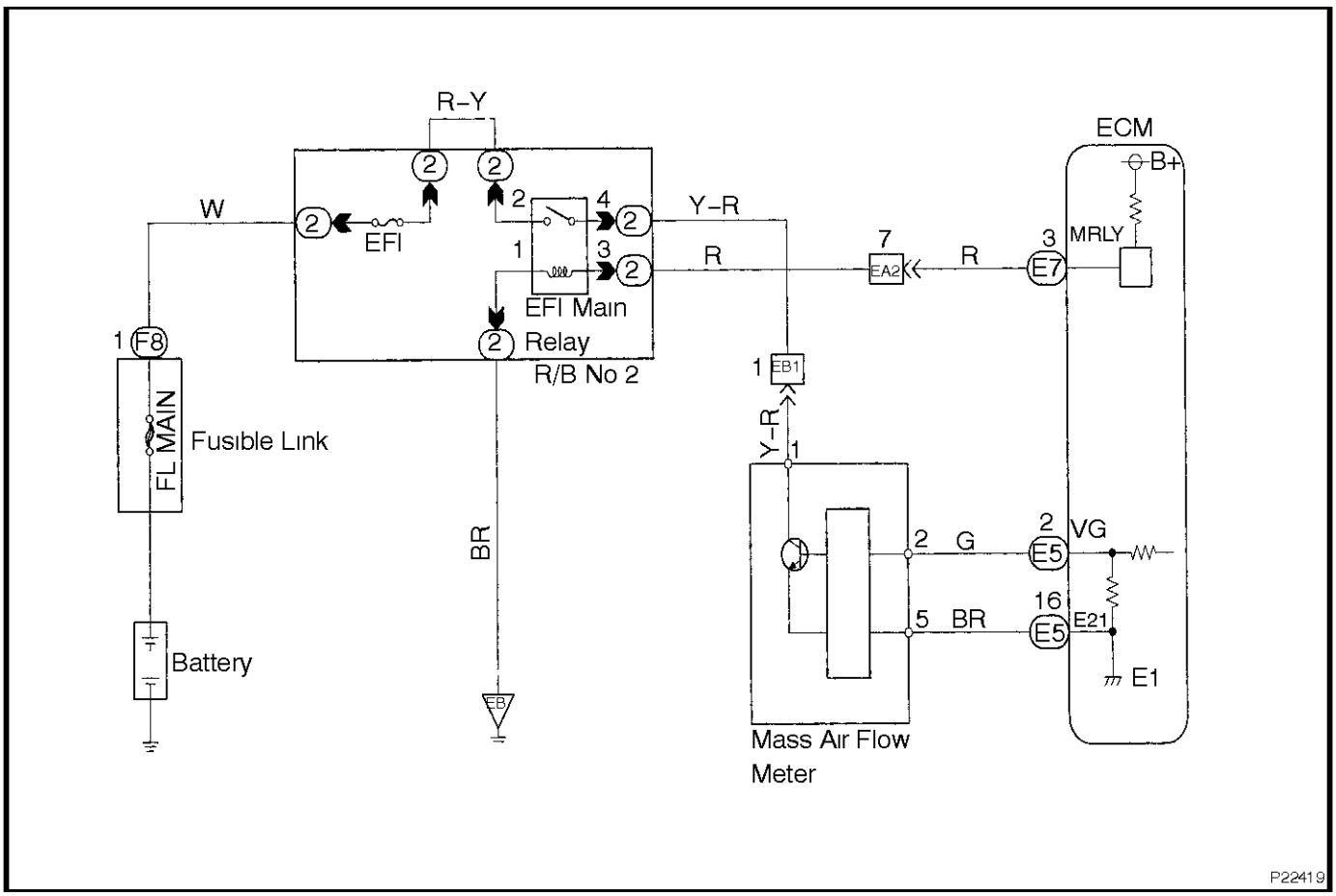


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Connect the OBD II scan tool or TOYOTA hand–held tester, and read value of mass air flow rate.** |

**PREPARATION:**
(a) Remove the fuse cover on the instrument panel
(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and OBD II scan tool or TOYOTA hand–held tester main switch ON
(d) Start the engine

**CHECK:**
Read mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester

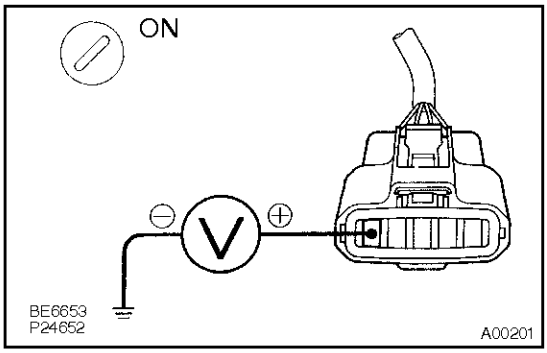
**RESULT:**

| | Type I | Type II |
|---|---|---|
| Mass air flow rate (gm/sec ) | Approx 0 gm/sec | 439 0 gm/sec or more |

**Type I** → **Go to step 2.**

**Type II** → **Go to step 5.**

| | |
|---|---|
| 2 | **Check voltage of mass air flow meter power source.** |




**PREPARATION:**
(a) Disconnect the mass air flow meter connector
(b) Turn ignition switch ON

**CHECK:**
Measure voltage between terminal 1 of mass air flow meter connector and body ground

**OK:**
**Voltage: 9 – 14 V**

**NG** → **Check for open in harness and connector between EFI main relay (Marking: EFI) and mass air flow meter (See page IN–28).**

**OK**

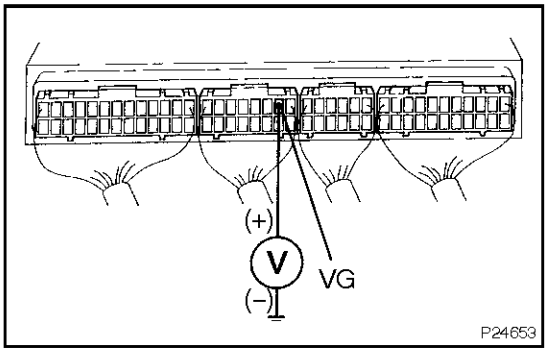


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminal VG of ECM and body ground. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See pageSF–65)

(b) Start the engine

**CHECK:**

Measure voltage between terminal VG of ECM and body ground while engine is idling

**OK:**

**Voltage:**

**1.1 – 1.5 V (P or N position and A/C switch OFF)**

| OK | Check and replace ECM (See page IN–28). |
|---|---|

NG

| 4 | Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–28). |
|---|---|

| NG | Repair or replace harness or connector. |
|---|---|

OK

Replace mass air flow meter.

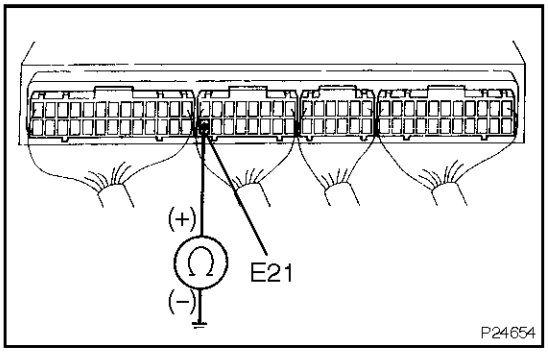


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 5 | **Check continuity between terminal E21 of ECM and body ground.** |




**PREPARATION:**

Remove instrument panel speaker No 1 panel
(See pageSF–65)

**CHECK:**

Check continuity between terminal E21 of ECM and body ground

**OK:**

**Continuity (1 Ω or less)**

NG → **Check and replace ECM (See page IN–28).**

OK

| | |
|---|---|
| 6 | **Check for open in harness and connector between mass air flow meter and ECM (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Replace mass air flow meter.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5P0 02

| DTC | P0101 | Mass Air Flow Circuit Range/Performance Problem |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0100 (Mass Air Flow Circuit Malfunction) on page DI–20

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0101 | Conditions (a) and (b) continue with engine speed 900 rpm or less (2 trip detection logic)<br>(a) Closed throttle position switch ON<br>(b) Mass air flow meter output > 2.2 V | • Mass air flow meter |
| | Conditions (a) and (b) continue with engine speed 1500 rpm (2 trip detection logic)<br>(a) Mass air flow meter output < 1 V<br>(b) VTA ≧ 0.72 V | |

## WIRING DIAGRAM

Refer to DTC P0100 (Mass Air Flow Circuit Malfunction) on page DI–20 for the WIRING DIAGRAM

## INSPECTION PROCEDURE

| 1 | Are there any other codes (besides DTC P0101) being output? |
|---|---|

YES → Go to relevant DTC chart.

NO →

Replace mass air flow meter.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

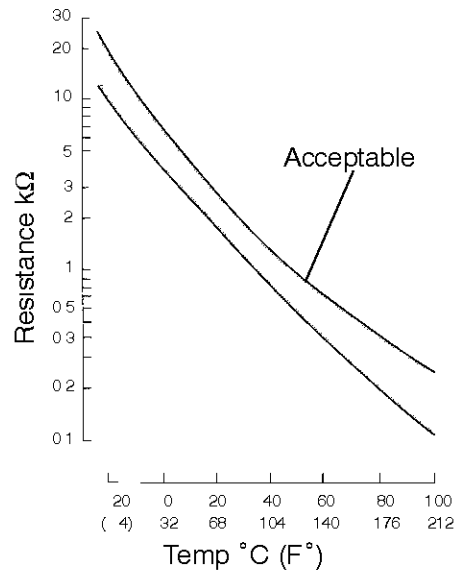


D5P1 02

| DTC | P0110 | Intake Air Temp. Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

(fig 1)




The intake air temperature sensor is built into the air flow meter and senses the intake air temperature

A thermistor built in the sensor changes the resistance value according to the intake air temperature The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See fig 1)

The intake air temperature sensor is connected to the ECM (See next page) The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a resistor R

That is, the resistor R and the intake air temperature sensor are connected in series When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation

If the ECM detects the DTC "P0110", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F)

| Intake Air Temp °C (°F) | Resistance (kΩ) | Voltage (V) |
|---|---|---|
| –20 (–4) | 16 2 | 4 3 |
| 0 (32) | 5 9 | 3 4 |
| 20 (68) | 2 5 | 2 4 |
| 40 (104) | 1 1 | 1 4 |
| 60 (140) | 0 6 | 0 9 |
| 80 (176) | 0 3 | 0 5 |
| 100 (212) | 0 1 | 0 2 |

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0110 | Open or short in intake air temp sensor circuit | • Open or short in intake air temp sensor circuit<br>• Intake air temp sensor<br>• ECM |

HINT

After confirming DTC P110 use the OBD II scan tool or TOYOTA hand–held tester to confirm the intake air temp from "CURRENT DATA"

| Temp Displayed | Malfunction |
|---|---|
| – 40°C (– 40°F) | Open circuit |
| 140°C (284°F) or more | Short circuit |

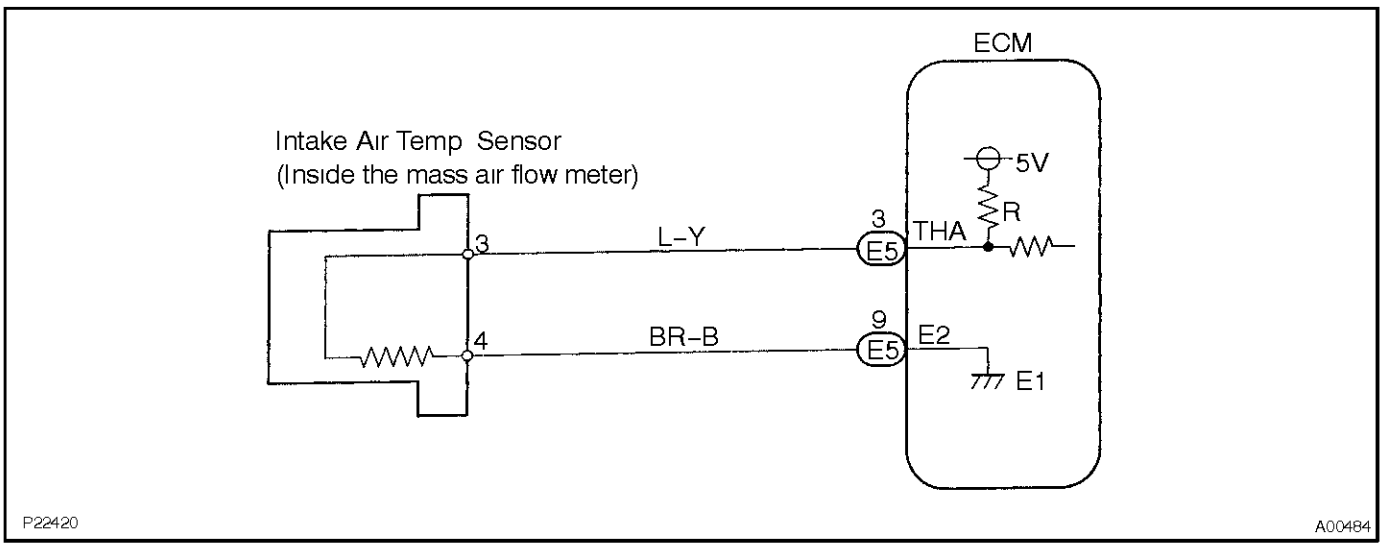


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT

If DTCs P0110 (Intake Air Temp Circuit Malfunction), P0115 (Engine Coolant Temp Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open

| | |
|---|---|
| 1 | **Connect the OBD II scan tool or TOYOTA hand-held tester, and read value of intake air temperature.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel

(b) Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3

(c) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand-held tester

**OK:**

**Same as actual intake air temp.**

HINT

- If there is open circuit, push OBD II scan tool or TOYOTA hand-held tester indicates - 40°C (- 40°F)
- If there is short circuit, OBD II scan tool or TOYOTA hand-held tester indicates 140°C (284°F) or more

NG → **- 40°C (- 40°F) ....Go to step 2.**
**140°C (284°F) or more ....Go to step 4.**

OK →

**Check for intermittent problems (See page DI-3).**

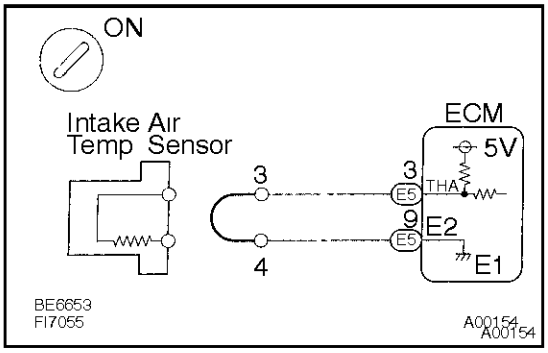


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Disconnect the mass air flow meter connector

(b) Connect sensor wire harness terminals together

(c) Turn ignition switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand–held tester

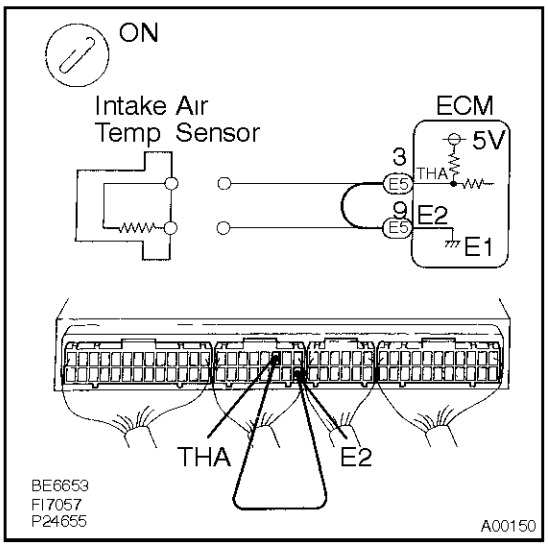
**OK:**

**Temp. value: 140°C (284°F) or more**

| OK | Confirm good connection at sensor.<br>If OK, replace mass air flow meter. |
|---|---|

NG

| 3 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Connect between terminals THA and E2 of ECM connector

HINT

Mass air flow meter connector is disconnected

Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28)

(c) Turn ignition switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Temp. value: 140°C (284°F) or more**

| OK | Open in harness between terminals E2 or THA, repair or replace harness. |
|---|---|

NG

**Confirm good connection at ECM.**
**If OK, replace ECM (See page IN–28).**

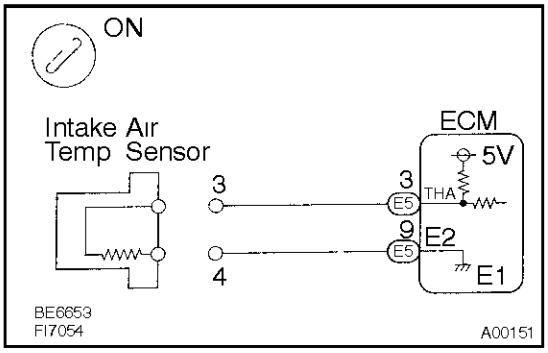


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check for short in harness and ECM. |
|---|---|




**PREPARATION:**

(a) Disconnect the mass air flow meter connector

(b) Turn ignition switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand–held tester

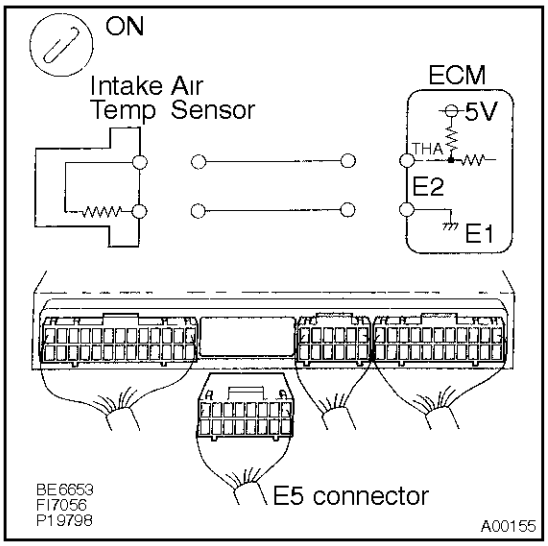
**OK:**

**Temp. value: – 40°C (– 40°F)**

| OK | Replace mass air flow meter. |
|---|---|

**NG**

| 5 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Disconnect the E5 connector of ECM

HINT

Mass air flow meter connector is disconnected

(c) Turn ignition switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Temp. value: – 40°C (– 40°F)**

| OK | Repair or replace harness or connector (See page IN–28). |
|---|---|

**NG**

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5P5 02

| DTC | P0115 | Engine Coolant Temp. Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature

The structure of the sensor and connection to the ECM is the same as in the intake air temp circuit malfunction shown on page DI–26

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp is assumed to be 80°C (176°F)

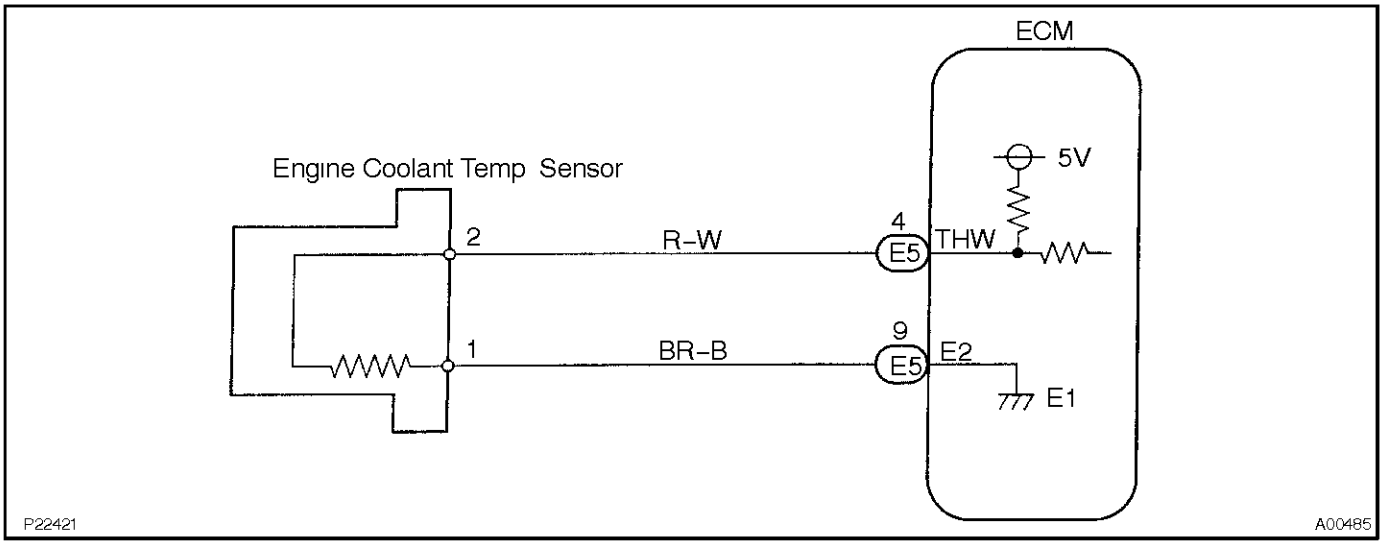
| DTC No | Detection Item | Trouble Area |
|---|---|---|
| P0115 | Open or short in engine coolant temp sensor circuit | • Open or short in engine coolant temp sensor circuit<br>• Engine coolant temp sensor<br>• ECM |

HINT

After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand–held tester to confirm the engine coolant temp from CURRENT DATA

| Temp Displayed | Malfunction |
|---|---|
| – 40°C (– 40°F) | Open circuit |
| 140°C (284°F) or more | Short circuit |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

HINT

If DTC is P0110 (Intake Air Temp Circuit Malfunction), P0115 (Engine Coolant Temp Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open

| | |
|---|---|
| 1 | **Connect the OBD II scan tool or TOYOTA hand–held tester, and read value of engine coolant temperature.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Turn ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON

**CHECK:**

Read temperature value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Same as actual engine coolant temperature.**

HINT

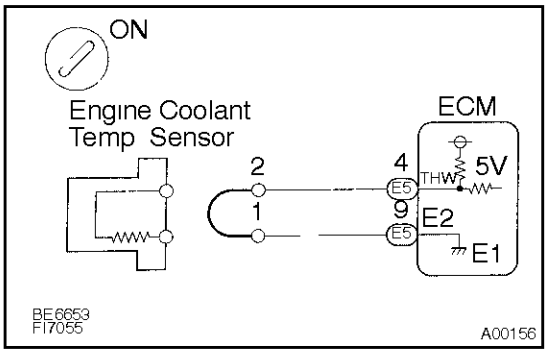
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F)
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more

NG → **–40°C (–40°F) ... Go to step 2.**
**140°C (284°F) or more ... Go to step 4.**

OK →

**Check for intermittent problems (See page DI–3).**

| | |
|---|---|
| 2 | **Check for open in harness or ECM.** |




**PREPARATION:**

(a) Disconnect the engine coolant temp sensor connector

(b) Connect sensor wire harness terminals together

(c) Turn ignition switch ON

**CHECK:**

Read temp value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Temp. value: 140°C (284°F) or more**

OK → **Confirm good connection at sensor.**
**If OK, replace engine coolant temp. sensor.**

NG →

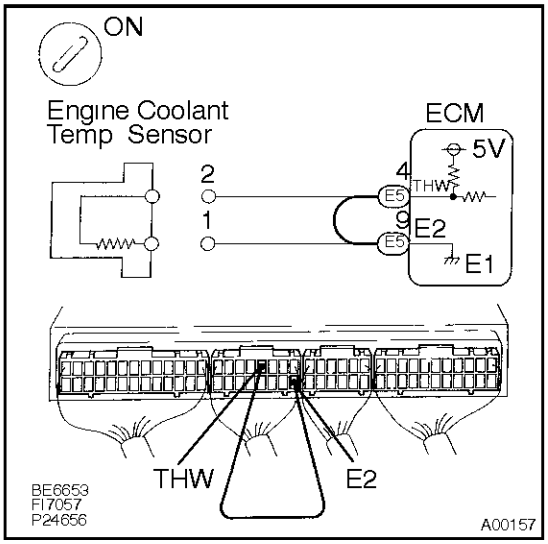


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Connect between terminals THW and E2 of ECM connector

HINT

Engine coolant temp sensor connector is disconnected Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28)

(c) Turn ignition switch ON

**CHECK:**

Read temperature value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

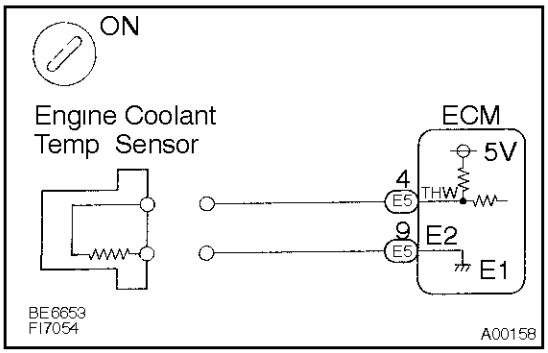
**Temperature value: 140°C (284°F) or more**

| OK | Open in harness between terminals E2 or THW, repair or replace harness. |
|---|---|

**NG**

**Confirm good connection at ECM.**
**If OK, replace ECM (See page IN–28).**

| 4 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Disconnect the engine coolant temp sensor connector

(b) Turn ignition switch ON

**CHECK:**

Read temperature value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Temperature value: – 40°C (– 40°F)**

| OK | Replace engine coolant temp. sensor. |
|---|---|

**NG**

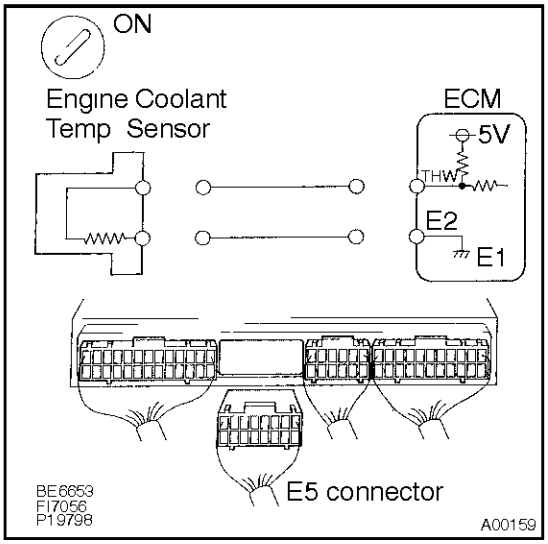


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Disconnect the E5 connector of ECM

HINT

Engine coolant temp sensor connector is disconnected

(c) Turn ignition switch ON

**CHECK:**

Read temperature value on the OBD II scan tool or TOYOTA hand–held tester

**OK:**

**Temperature value: – 40°C (– 40°F)**

| OK | Repair or replace harness or connector. |
|---|---|

NG

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5P6 02

| DTC | P0116 | Engine Coolant Temp. Circuit Range/ Performance Problem |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0115 (Engine Coolant Temp Circuit Malfunction) on page DI–30

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0116 | If THW ≧ 10°C (50°F) 2 min or more after starting engine engine coolant temp sensor value is 35°C (95°F) or less (2 trip detection logic) | • Engine coolant temp sensor<br>• Cooling system |
| | If –7°C (19 4°F) ≦ THW < 10°C (50°F) 5 min or more after starting engine engine coolant temp sensor value 35°C (95°F) or less (2 trip detection logic) | |
| | If THW < –7°C (19 4°F) 20 min or more after starting engine engine coolant temp sensor value is 35°C (95°F) or less (2 trip detection logic) | |

## INSPECTION PROCEDURE

HINT

If DTC P0115 (Engine Coolant Temp Circuit Malfunction) and P0116 (Engine Coolant Temp Circuit Range/ Performance) are output simultaneously, engine coolant temp sensor circuit may be open

Perform troubleshooting of DTC P0115 first

| | |
|---|---|
| 1 | **Are there any other codes (besides DTC P0116) being output?** |

**YES** → **Go to relevant DTC chart.**

**NO**

| | |
|---|---|
| 2 | **Check thermostat (See page CO–9).** |

**NG** → **Replace the thermostat.**

**OK**

**Replace engine coolant temp. sensor.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

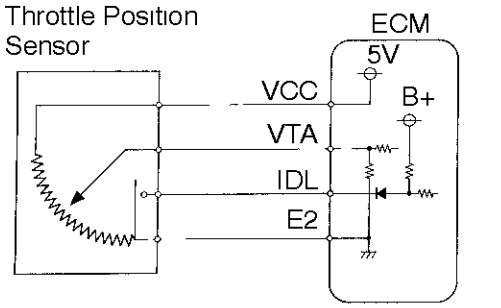
Brought to you by BirfMark



D5P7 02

| DTC | P0120 | Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION




The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle
When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM becomes 0 V At this time, a voltage of approximately 0 3 – 0 8 V is applied to terminal VTA of the ECM When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM The voltage applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3 2 – 4 9 V when the throttle valve is fully opened The ECM judges the vehicle driving conditions from these signals input from terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0120 | Condition (a) or (b) continues<br>(a) VTA < 0 1 V and closed throttle position switch is OFF<br>(b) VTA > 4 9 V | • Open or short in throttle position sensor circuit<br>• Throttle position sensor<br>• ECM |

HINT

- If there is open circuit in IDL line, DTC P0120 does not indicate
- After confirming DTC P0120 use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition

| Throttle valve opening position expressed as percentage | | Trouble Area |
|---|---|---|
| Throttle valve fully closed | Throttle valve fully open | |
| 0 % | 0 % | VCC line open<br>VTA line open or short |
| Approx 99 % | Approx 100 % | E2 line open |

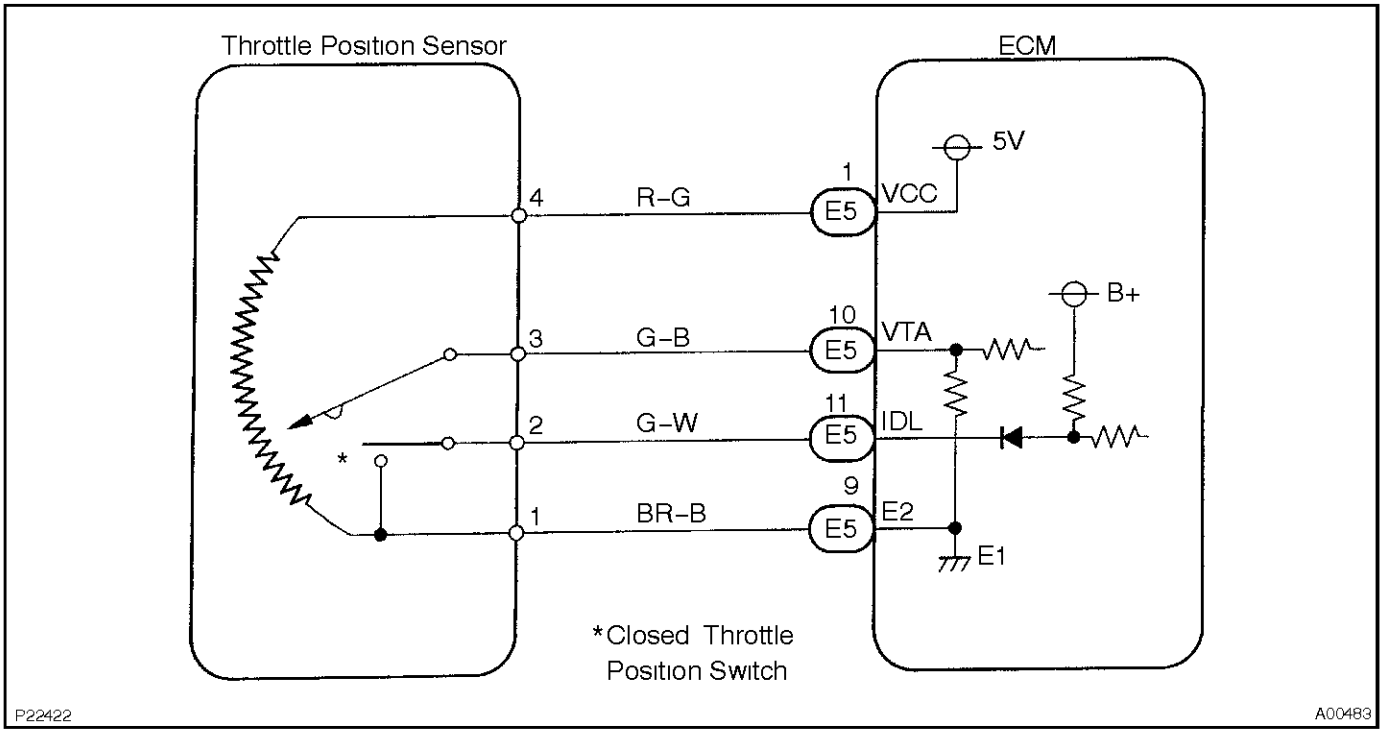


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT

If DTCs P0110 (Intake Air Temp Circuit Malfunction), P0115 (Engine Coolant Temp Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open

| | |
|---|---|
| 1 | **Connect the OBD II scan tool or TOYOTA hand–held tester and read the throttle valve opening percentage.** |

**PREPARATION:**

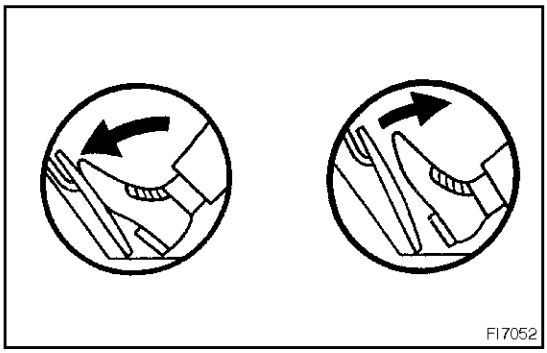
(a) Remove the fuse cover on the instrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3

(c) Turn ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON

**CHECK:**

Read the throttle valve opening percentage




**OK:**

| Throttle valve | Throttle valve opening position expressed as percentage |
|---|---|
| Fully open | Approx 75 % |
| Fully closed | Approx 10 % |

OK → **Check for intermittent problems (See page DI–3).**

NG

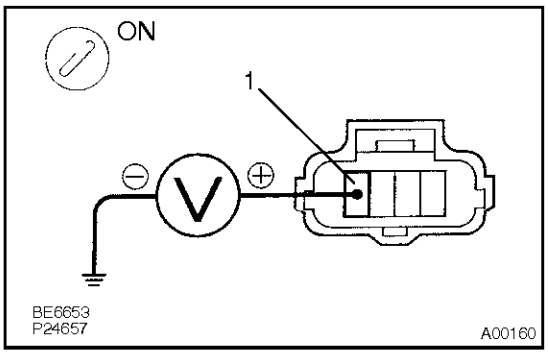


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check voltage between terminal 1 of wire harness side connector and body ground. |
|---|---|




**PREPARATION:**

(a) Disconnect the throttle position sensor connector

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal 1 of wire harness side connector and body ground

**OK:**

**Voltage: 4.5 – 5.5 V**

NG → **Go to step 5.**

OK

| 3 | Check throttle position sensor (See page SF–42). |
|---|---|

NG → **Replace throttle position sensor.**

OK

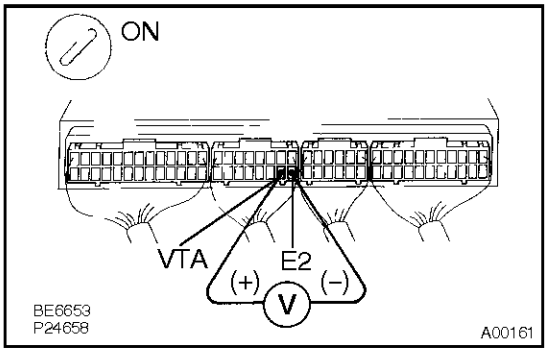


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check voltage between terminals VTA and E2 of ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals VTA and E2 of ECM

**OK:**

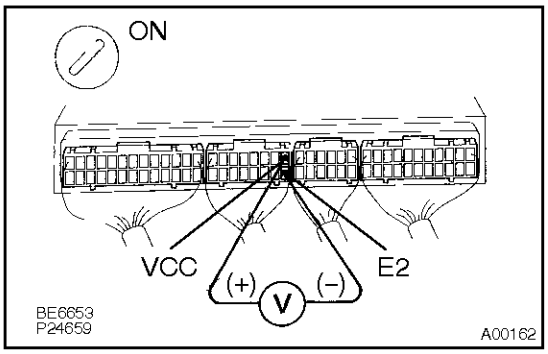
| Throttle valve | Voltage |
|---|---|
| Fully closed | 0.3 – 0.8 V |
| Fully open | 3.2 – 4.9 V |

NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–28).**

OK →

**Check and replace ECM (See page IN–28).**

| 5 | Check voltage between terminals VCC and E2 of ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals VCC and E2 of ECM connector

**OK:**

**Voltage: 4.5 – 5.5 V**

NG → **Check and replace ECM (See page IN–28).**

OK →

**Check for open in harness and connector between ECM and sensor (VCC line) (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5P8 02

| DTC | P0121 | Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page DI–35

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0121 | After the vehicle speed has been exceeded 30 km/h (19 mph) even once the output value of the throttle position sensor is out of the applicable range while the vehicle speed between 30 km/h (19 mph) and 0 km/h (0 mph) | • Throttle position sensor |

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Are there any other codes (besides DTC P0121) being output?** |

**YES** → **Go to relevant DTC chart.**

**NO**

**Replace throttle position sensor.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5P9 02

| DTC | P0125 | Insufficient Coolant Temp. for Closed Loop Fuel Control |
|---|---|---|

## CIRCUIT DESCRIPTION

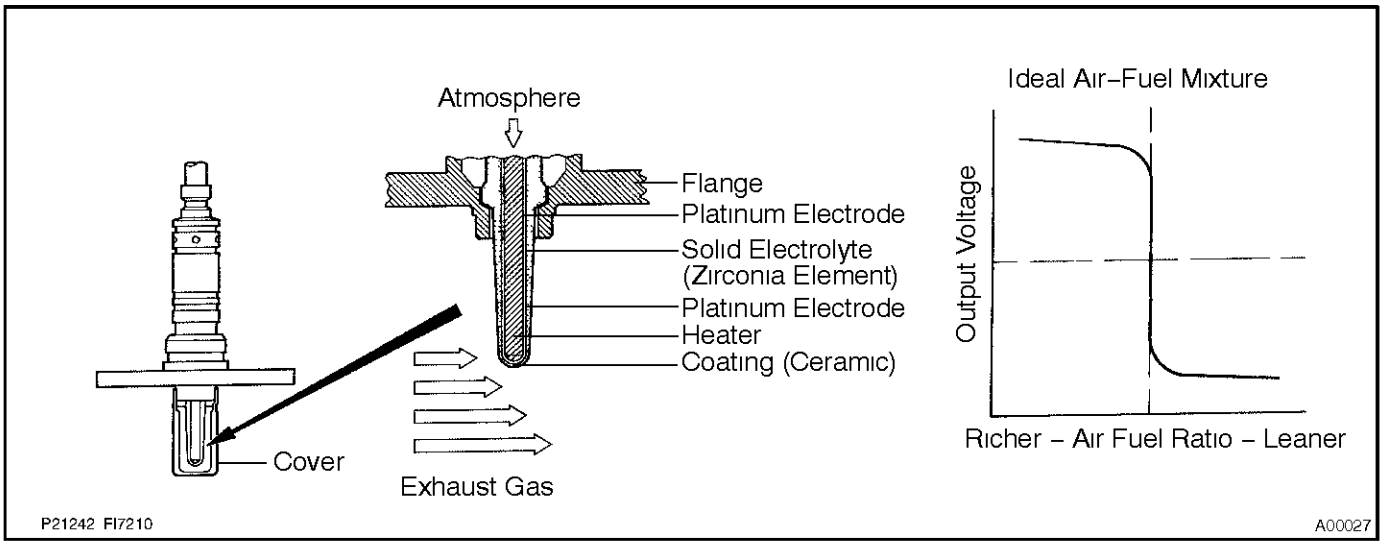
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio

The oxygen sensor has the characteristic where by its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force 0 V)

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas in reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force 1 V) The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control

The heated oxygen sensors include a heater which heats the zirconia element The heater is controlled by the ECM When the intake air volume is low (the temp of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection




| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0125 | After the engine is warmed up heated oxygen sensor (bank 1 sensor 2) output does not indicate RICH even once when conditions (a) (b) and (c) continue for at least 1 5 min<br>(a) Engine speed 1 500 rpm or more<br>(b) Vehicle speed 40 – 100 km/h (25 – 62 mph)<br>(c) Closed throttle position switch OFF | • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit<br>• Heated oxygen sensor (bank1 sensor 1) |



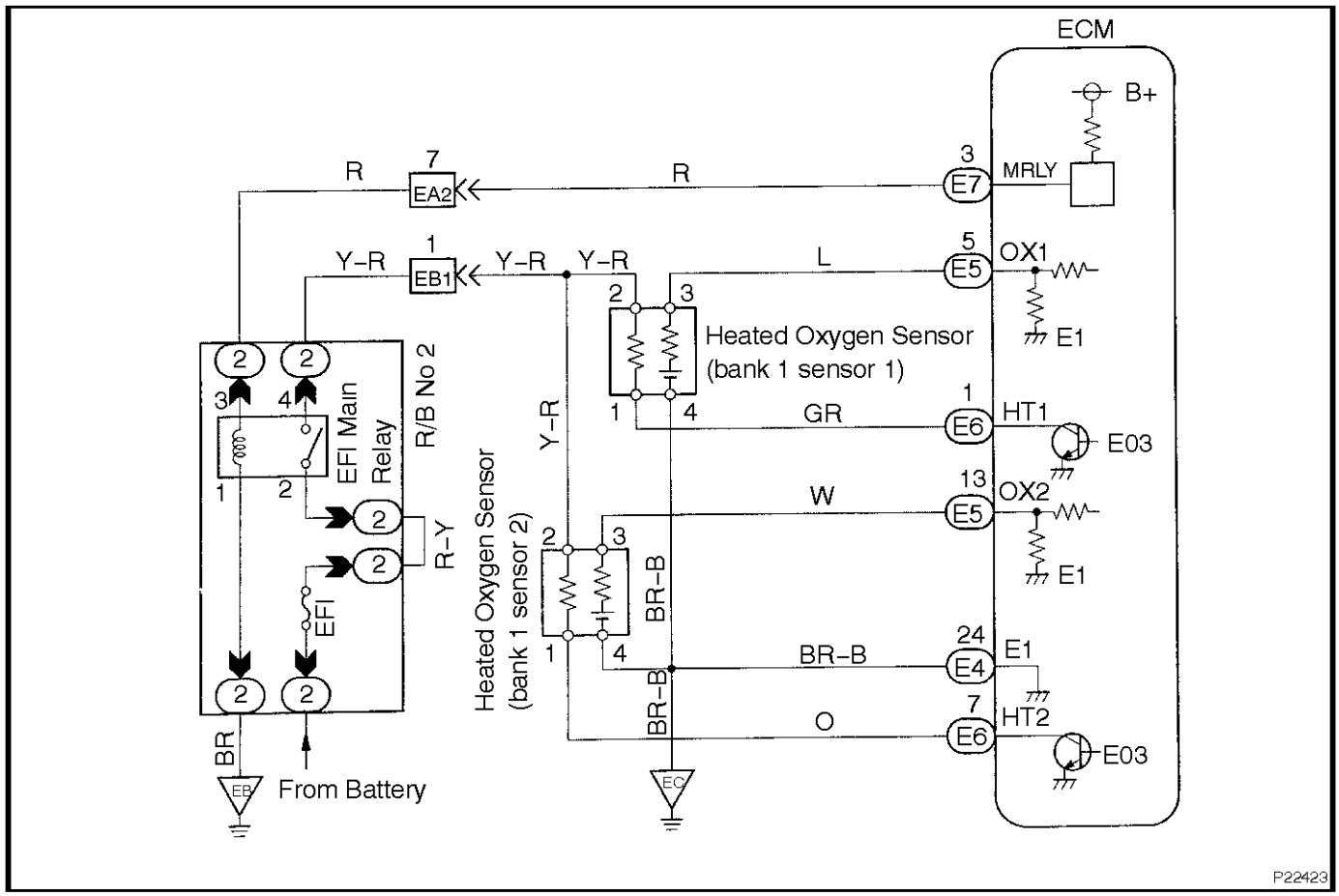
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT
After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor (bank 1 sensor 1) from CURRENT DATA
If voltage output of heated oxygen sensor (bank 1 sensor 1) is 0 V, heated oxygen sensor (bank 1 sensor 1) circuit may be open or short

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Connect the OBD II scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor).** |

**PREPARATION:**

(a) Remove the fuse cover on the ınstrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Warm up engıne to normal operatıng temp

**CHECK:**

Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engıne ıs suddenly raced

HINT

Perform quıck racıng to 4,000 rpm 3 tımes usıng accelerator pedal

**OK:**

**Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once.**

OK → **Check and replace ECM (See page IN–28).**

NG

| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ECM and heated oxygen sensor (bank1 sensor 1) (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Replace heated oxygen sensor (bank 1 sensor 1).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PA–02

| DTC | P0130 | Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0130 | Voltage output of heated oxygen sensor (bank 1 sensor 1) remains at 0 4 V or more or 0 55 V or less during idling after the engine is warmed up (2 trip detection logic) | • Heated oxygen sensor (bank 1 sensor 1)<br>• Fuel trim malfunction |

HINT

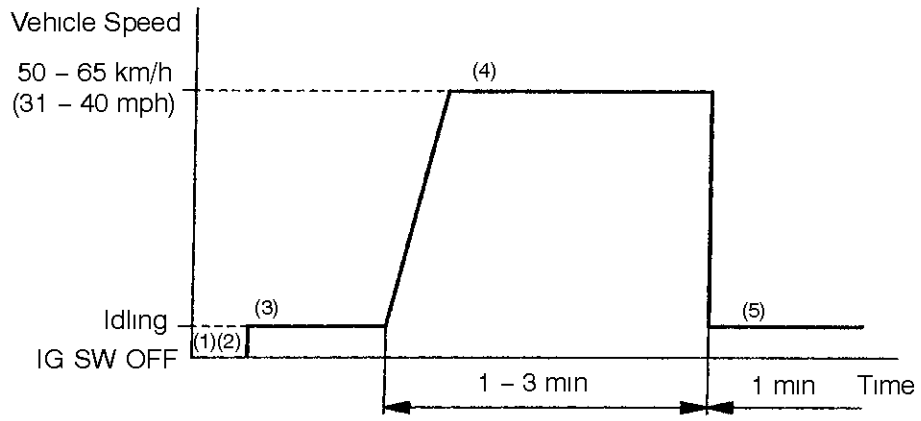
Sensor 1 refers to the sensor closer to the engine body

The heated oxygen sensor's output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester

## WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–35 for WIRING DIAGRAM

## CONFIRMATION DRIVING PATTERN




FI7130

(1) Connect the TOYOTA hand–held tester to the DLC3
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–3)
(3) Start the engine and warm it up withe all accessory switches OFF
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min to warm up the heated oxygen sensor
(5) Let the engine idle for 1 min

HINT

If a malfunction exists, the MIL will light up during step (5)

**NOTICE:**

**If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a TOYOTA hand–held tester, turn the ignition switch OFF after performing steps (3) to (5), then perform steps (3) to (5) again.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–28).** |

NG → **Repair or replace harness or connector (See page IN–28).**

OK ↓

| | |
|---|---|
| 2 | **Check for heated oxygen sensor (bank 1 sensor 1) data.** |

**PREPARATION:**

(a) Remove the fuse cover on the ınstrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Warm up engıne to normal operatıng temp

**CHECK:**

Read the heated oxygen sensor (bank 1 sensor 1) output voltage and short–term fuel trım

**RESULT:**

| Pattern | Heated oxygen sensor (bank 1 sensor 1) output voltage | Short–term fuel trım |
|---|---|---|
| 1 | Lean condıtıon (Changes at 0 55 V or less) | Changes at about +20 % |
| 2 | Rich condıtıon (Changes at 0 4 V or more) | Changes at about –20 % |
| 3 | Except 1 and 2 | |

1, 2 → **Check fuel trim system (See page DI–51).**

3 ↓



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Check the output voltage of heated oxygen sensor (bank 1 sensor 1) during idling.** |

**PREPARATION:**

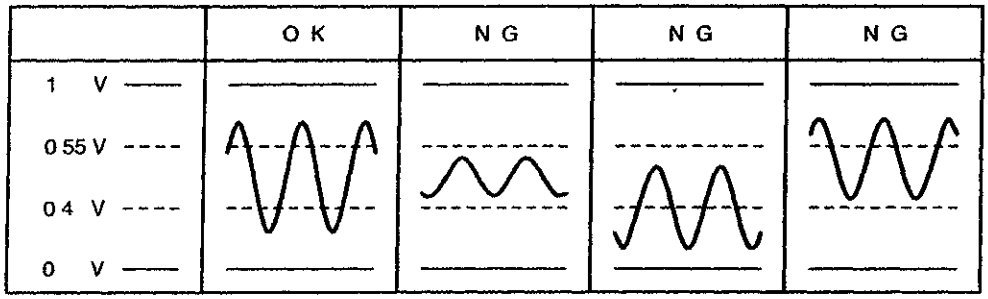
Warm up the heated oxygen sensor (bank 1 sensor 1) with the engine at 2,500 rpm for approx 90 sec

**CHECK:**

Use the OBD II scan tool or TOYOTA hand–held tester read the output voltage of the heated oxygen sensor (bank 1 sensor 1) during idling

**OK:**

**Heated oxygen sensor (bank 1 sensor 1) output voltage:**
**Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the Following table).**




P18349

OK → **Perform confirmation driving pattern (See page DI–43).**

NG →

**Replace heated oxygen sensor (bank 1 sensor 1).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PB 02

| DTC | P0133 | Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1) |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0133 | Response time for the heated oxygen sensor s voltage output to change from rich to lean or from lean to rich is 1 sec or more during idling after the engine is warmed up (2 trip detection logic) | • Heated oxygen sensor (bank 1 sensor 1) |

HINT

Sensor 1 refers to the sensor closer to the engine body

## INSPECTION PROCEDURE

| 1 | Are there any other codes (besides DTC P0133) being output? |
|---|---|

YES → Go to relevant DTC chart.

NO →

Replace heated oxygen sensor (bank 1 sensor 1).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| DTC | P0135 | Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1) |
|---|---|---|

| DTC | P0141 | Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2) |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0135<br>P0141 | When the heater operates heater current exceeds 2 A (2 trip detection logic) | • Open or short in heater circuit of heated oxygen sensor<br>• Heated oxygen sensor heater<br>• ECM |
| | Heater current of 0 25 A or less when the heater operates (2 trip detection logic) | |

HINT

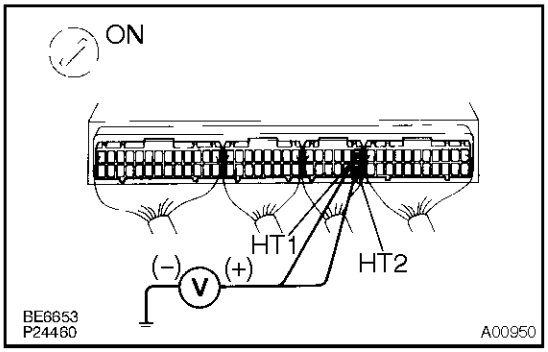
- Sensor 1 refers to the sensor closer to the engine body
- Sensor 2 refers to the sensor farther away from the engine body

## WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40 for WIRING DIAGRAM

## INSPECTION PROCEDURE

| 1 | **Check voltage between terminals HT1, HT2 of ECM connector and body ground.** |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals HT1, HT2 of ECM connector and body ground

HINT

- Connect terminal HT1 to bank 1 sensor 1
- Connect terminal HT2 to bank 1 sensor 2

**OK:**

**Voltage: 9 – 14 V**

| OK | **Check and replace ECM (See page IN–28).** |
|---|---|

**NG**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | Check resistance of heated oxygen sensor heater (See page SF–64). |

NG → Replace heated oxygen sensor.

OK →

Check and repair harness or connector between EFI main relay (Marking: EFI) and heated oxygen sensor (bank 1 sensor 1, 2) and ECM (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PD 02

| DTC | P0136 | Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0136 | Voltage output of the heated oxygen sensor (bank 1 sensor 2) remains at 0 4 V or more or 0 5 V or less when the vehicle is driven at 40 km/h (25 mph) or more after the engine is warmed up (2 trip detection logic) | • Heated oxygen sensor (bank 1 sensor 2) |

HINT

Sensor 2 refers to the sensor farther away from the engine body

## WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) on page DI–40 for WIRING DIAGRAM

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Are there any other codes (besides DTC P0136) being output?** |

**YES** → **Go to relevant DTC chart.**

**NO**

| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 2) (See page IN–28).** |

**NG** → **Repair or replace harness or connector.**

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Check the output voltage of heated oxygen sensor (bank 1 sensor 2).** |

**PREPARATION:**

(a) Remove the fuse cover on the ınstrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Warm up engıne to normal operatıng temp

**CHECK:**

Read voltage output of heated oxygen sensor (bank 1 sensor 2) when engıne suddenly raced

HINT

Perform quıck racıng to 4,000 rpm 3 mın usıng accelerator pedal

**OK:**

**Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.**

OK → **Check that each connector is properly connected.**

NG →

**Replace heated oxygen sensor (bank 1 sensor 2).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| DTC | P0171 | System too Lean (Fuel Trim) |
|---|---|---|

| DTC | P0172 | System too Rich (Fuel Trim) |
|---|---|---|

## CIRCUIT DESCRIPTION

”Fuel trim” refers to the feedback compensation value compared against the basic injection time Fuel trim includes short–term fuel trim and long–term fuel trim

”Short–term fuel trim” is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean

”Long–term fuel trim” is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim form the central value due to individual engine differences, wear over time and changes in the usage environment

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0171 | When the air fuel ratio feedback is stable after engine warming up the fuel trim is considerably in error on the RICH side (2 trip detection logic) | • Air intake (hose loose)<br>• Fuel line pressure<br>• Injector blockage leak<br>• Heated oxygen sensor (bank 1 sensor 1) malfunction<br>• Mass air flow meter<br>• Engine coolant temp sensor |
| P0172 | When the air fuel ratio feedback is stable after engine warming up the fuel trim is considerably in error on the LEAN side (2 trip detection logic) | • Fuel line pressure<br>• Injector blockage leak<br>• Heated oxygen sensor (bank 1 sensor 1) malfunction<br>• Mass air flow meter<br>• Engine coolant temp sensor |

HINT

- When the DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side
- If the total of the short–term fuel trim value and long–term fuel trim value is within + 30 – – 35 %, the system is functioning normally
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 is recorded The MIL then come on

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check air induction system (See page SF–1).** |

NG → **Repair or replace**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for heated oxygen sensor (bank 1 sensor 1) data.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel

(b) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Warm up engine to normal operating temperature

**CHECK:**

Read the heated oxygen sensor (bank 1 sensor 1) output voltage and short–term fuel trim

**RESULT:**

| Pattern | Heated oxygen sensor (bank 1 sensor 1) output voltage | Short–term fuel trim |
|---|---|---|
| 1 | Lean condition (Changes at 0.55 V or less) | Changes at about +20 % |
| 2 | Rich condition (Changes at 0.4 V or more) | Changes at about –20 % |
| 3 | Except 1 and 2 | |

3 → **Check for heated oxygen sensor (bank 1 sensor 1) (See page SF–64).**

1, 2 ↓

| | |
|---|---|
| 3 | **Check fuel pressure (See page SF–6).** |

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–1).**

OK ↓

| | |
|---|---|
| 4 | **Check injector injection (See page SF–29).** |

NG → **Replace injector.**

OK ↓



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 5 | **Check mass air flow meter and engine coolant temp. sensor (See page SF–40, SF–61).** |

NG → **Repair or replace.**

OK

| | |
|---|---|
| 6 | **Check for spark and ignition (See page IG–1).** |

NG → **Repair or replace.**

OK

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PF-02

| DTC | P0300 | Random/Multiple Cylinder Misfire Detected |
|---|---|---|

| DTC | P0301 | Cylinder 1 Misfire Detected |
|---|---|---|

| DTC | P0302 | Cylinder 2 Misfire Detected |
|---|---|---|

| DTC | P0303 | Cylinder 3 Misfire Detected |
|---|---|---|

| DTC | P0304 | Cylinder 4 Misfire Detected |
|---|---|---|

| DTC | P0305 | Cylinder 5 Misfire Detected |
|---|---|---|

| DTC | P0306 | Cylinder 6 Misfire Detected |
|---|---|---|

## CIRCUIT DESCRIPTION

Misfire The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up

If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0300 | Misfiring of random cylinders is detected during the any particular 200 or 1 000 revolutions | • Ignition system<br>• Injector<br>• Fuel line pressure<br>• EGR<br>• Compression pressure<br>• Valve clearance not to specification<br>• Valve timing<br>• Mass air flow meter<br>• Engine coolant temp sensor |
| P0301<br>P0302<br>P0303<br>P0304<br>P0305<br>P0306 | For any particular 200 revolutions of the engine misfiring is detected which can cause catalyst overheating<br>(This causes MIL to blink) | |
| | For any particular 1 000 revolutions of the engine misfiring is detected which causes a deterioration in emission<br>(2 trip detection logic) | |

HINT

When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires were detected and recorded at different times

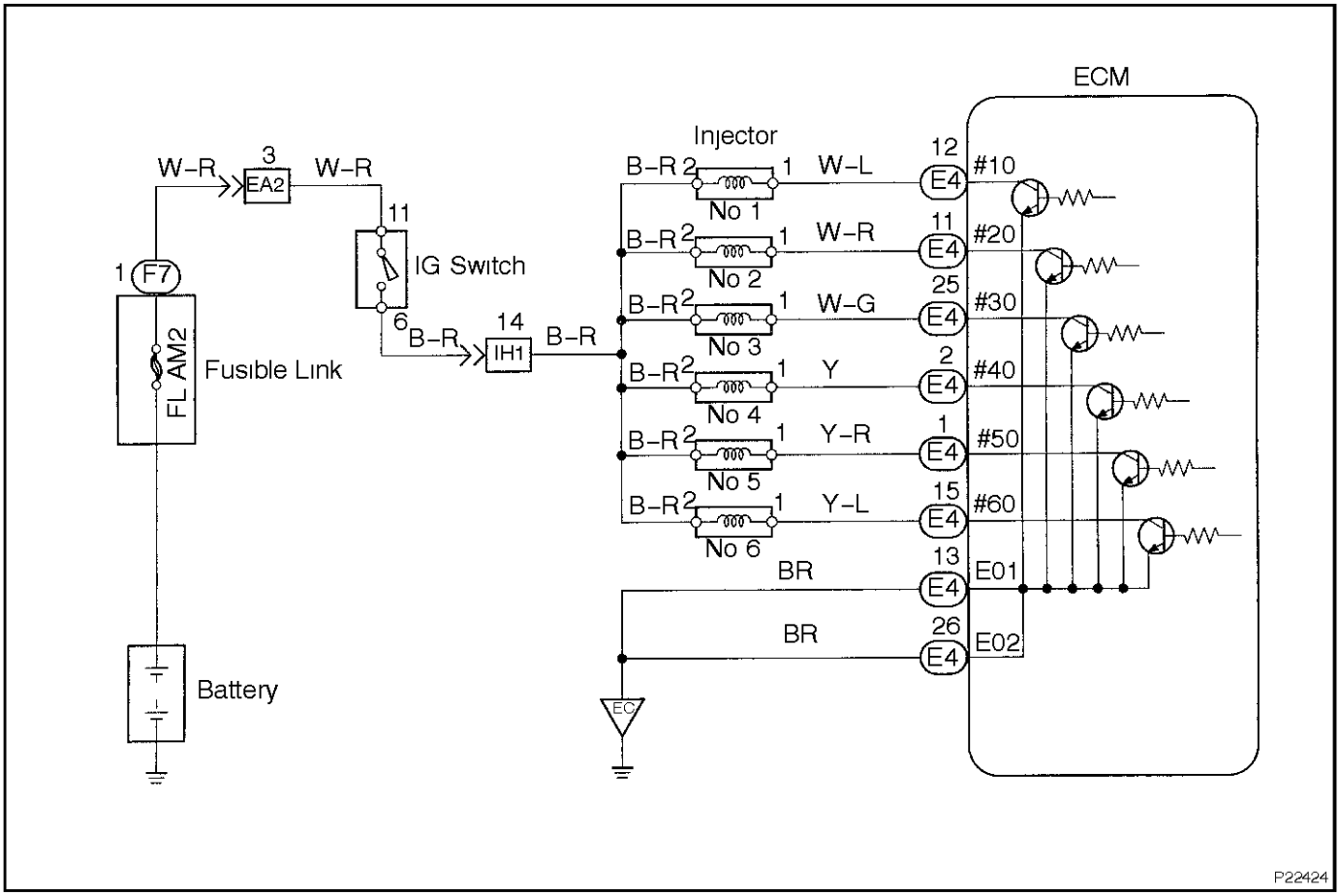


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## WIRING DIAGRAM




P22424

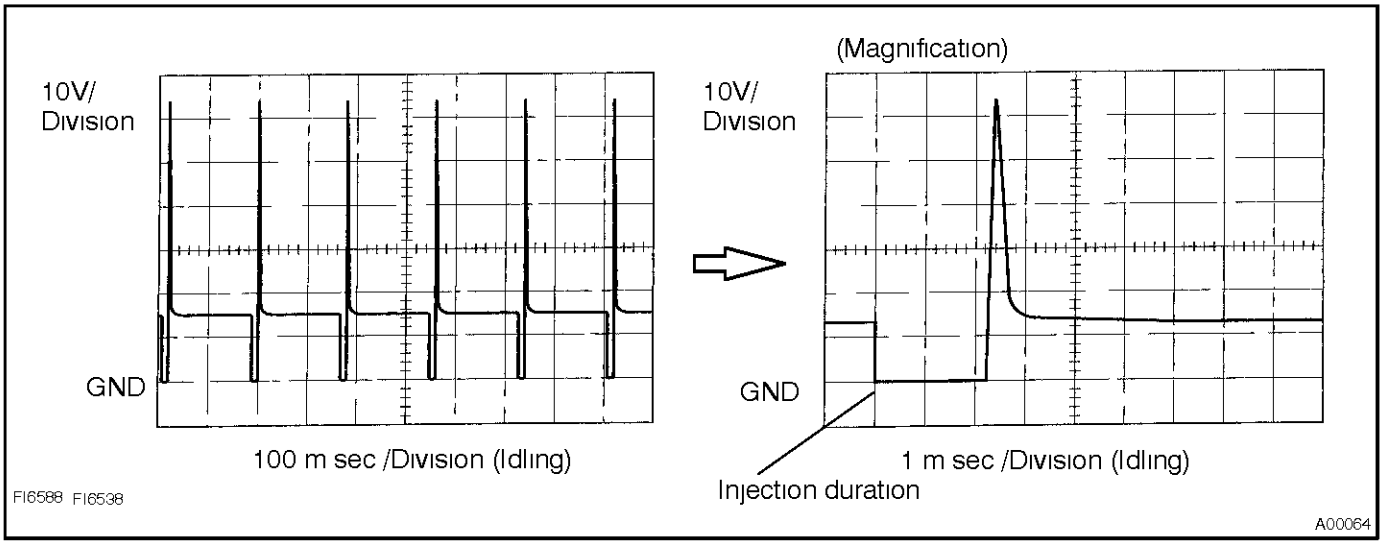
**Reference INSPECTION USING OSCILLOSCOPE**

**INJECTOR SIGNAL WAVEFORM**

With the engine idling, measure between terminals #10 – #60 and E01 of ECM

HINT

The correct waveform is as shown




FI6588 FI6538

A00064



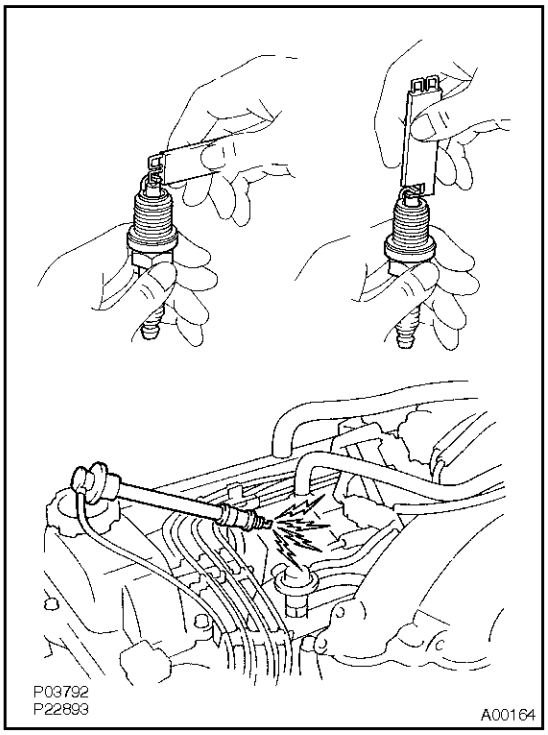
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check spark plug and spark of misfiring cylinder.** |




**PREPARATION:**

(a) Remove No 2 and No 3 cylinder head cover
(b) Disconnect the high–tension cord from spark plug
(c) Remove spark plug

**CHECK:**

(a) Check the carbon deposits on electrode
(b) Check electrode gap

**OK:**

**(1) No large carbon deposit present.**
**Not wet with gasoline or oil.**
**(2) Electrode gap: 0.8 mm (0.031 in.).**

**PREPARATION:**

(a) Install the spark plug to the high–tension cord
(b) Ground the spark plug
(c) Disconnect injector connector

**CHECK:**

Check if spark occurs while engine is being cranked

**NOTICE:**

**To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.**

**OK:**

**Spark jumps across electrode gap.**

NG → **Replace or check ignition system (See page IG–1).**

OK

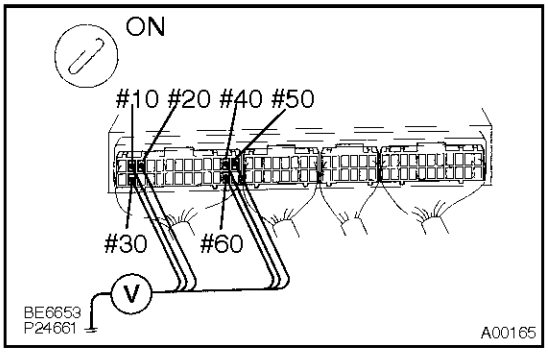


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check voltage of ECM terminal for injector of failed cylinder. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between applicable terminal of ECM connector and body ground

**OK:**

**Voltage: 9 – 14 V**

| OK | Go to step 4. |
|---|---|

NG

| 3 | Check injector of misfiring cylinder (See page SF–29). |
|---|---|

| NG | Replace injector. |
|---|---|

OK

Check for open and short in harness and connector between injector and ECM (See page IN–28).

| 4 | Check fuel pressure (See page SF–6). |
|---|---|

| NG | Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–1). |
|---|---|

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 5 | Check injector injection (See page SF–29). |

NG → Replace injector.

OK

| | |
|---|---|
| 6 | Check EGR system (See page EC–11). |

NG → Repair EGR system.

OK

| | |
|---|---|
| 7 | Check mass air flow meter and engine coolant temp. sensor (See page SF–40, SF–61). |

NG → Repair or replace.

OK

Check engine mechanical systems compression pressure (See page EM–3), valve clearance (See page EM–4) and valve timing (See page EM–13).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PG-02

| DTC | P0325 | Knock Sensor 1 Circuit Malfunction |
|---|---|---|

| DTC | P0330 | Knock Sensor 2 Circuit Malfunction |
|---|---|---|

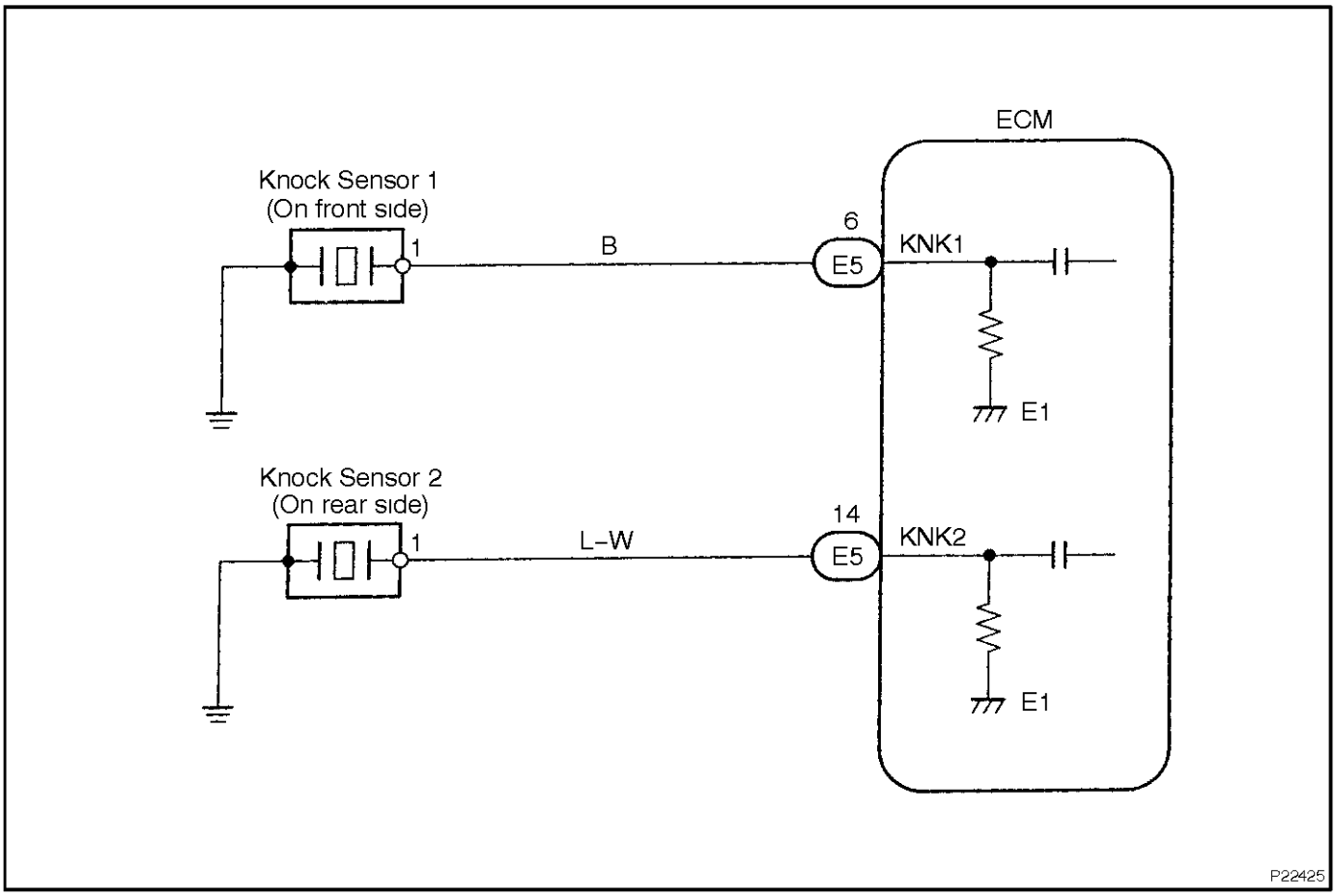
## CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the front and rear of the left side of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0325 | No knock sensor 1 signal to ECM with engine speed between 1 800 rpm and 5 200 rpm | • Open or short in knock sensor 1 circuit<br>• Knock sensor 1 (looseness)<br>• ECM |
| P0330 | No knock sensor 2 signal to ECM with engine speed between 1 800 rpm and 5 200 rpm | • Open or short in knock sensor 2 circuit<br>• Knock sensor 2 (looseness)<br>• ECM |

If the ECM detects the above DTCs, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

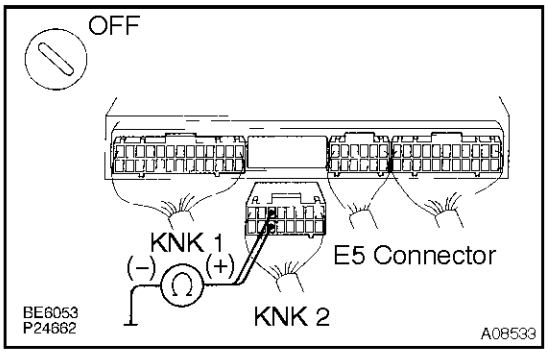


## INSPECTION PROCEDURE

HINT

- DTC P0325 is for the knock sensor circuit on the front side
- DTC P0330 is for the knock sensor circuit on the rear side

| | |
|---|---|
| 1 | **Check continuity between terminal KNK1, KNK2 of ECM connector and body ground.** |




**PREPARATION:**

(a) Remove the instrument panel speaker No 1 panel (See page SF–65)

(b) Disconnect the E5 connector of ECM

**CHECK:**

Measure resistance between terminal KNK1, KNK2 of ECM connector and body ground

HINT

- Connect terminal KNK1 to knock sensor 1
- Connect terminal KNK2 to knock sensor 2

**OK:**

**Resistance: 1 MΩ or higher**

| | |
|---|---|
| OK | **Go to step 3.** |

NG

| | |
|---|---|
| 2 | **Check knock sensor (See page SF–62).** |

| | |
|---|---|
| NG | **Replace knock sensor.** |

OK

| | |
|---|---|
| 3 | **Check for open and short in harness and connector between ECM and knock sensor (See page IN–28).** |

| | |
|---|---|
| NG | **Repair or replace harness or connector.** |

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

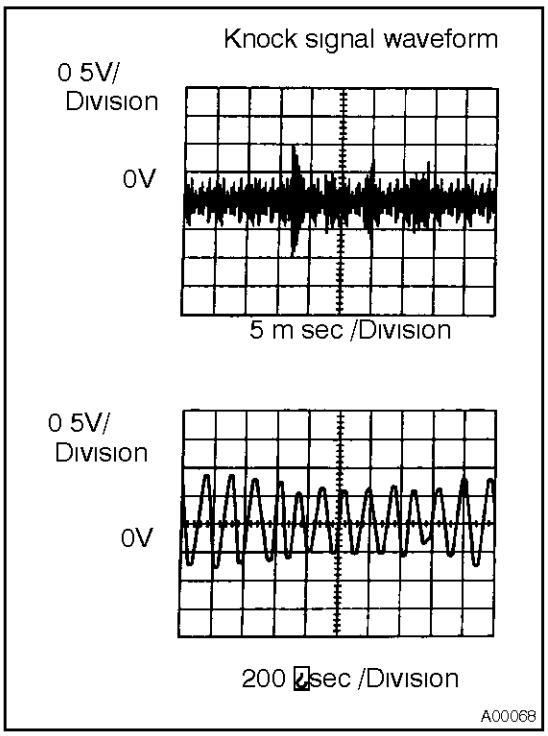


| 4 | Does malfunction disappear when a good knock sensor is installed? |
|---|---|

YES → Replace knock sensor.

NO

Check and replace ECM (See page IN–28).




**Reference: INSPECTION USING OSCILLOSCOPE**

- With the engine racing (4,000 rpm) measure between terminals KNK1, KNK2 of ECM and body ground

HINT

The correct waveform is as shown

- Spread the time on the horizontal axis, and confirm that period of the wave is 164 µ sec (Normal mode vibration frequency of knock sensor 6 1 kHz)

HINT

If normal mode vibration frequency is not 6 1 kHz the sensor is malfunctioning



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PH 02

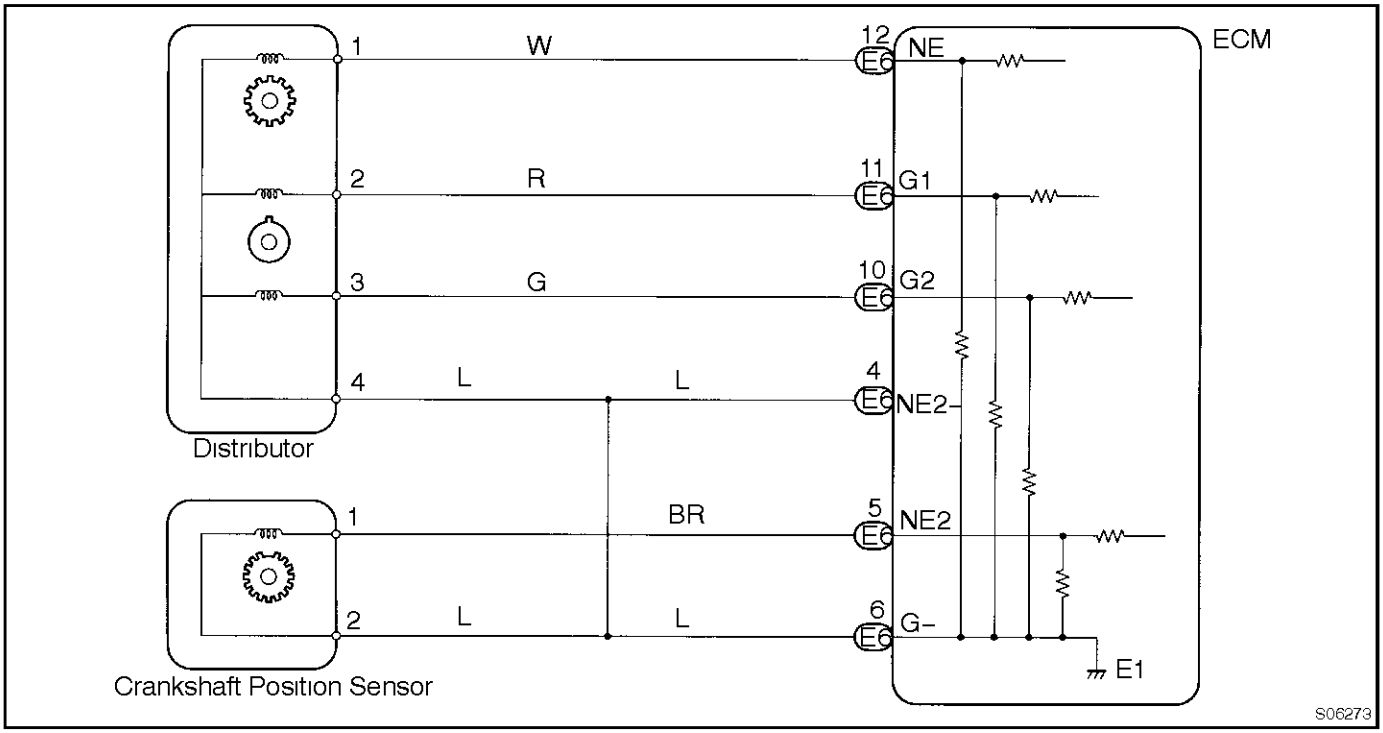
| DTC | P0335 | Crankshaft Position Sensor "A" Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a signal plate and pick up coil The NE signal plate has 24 teeth and is built into the distributor When the camshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil The NE signal sensor generates 24 signals for every engine revolution The ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and the engine speed by the NE signals, and detects misfire by NE2 signals

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0335 | No crankshaft position sensor signal (NE signal) to ECM during cranking (2 trip detection logic) | • Open or short in crankshaft position sensor circuit for NE signal<br>• Crankshaft position sensor for NE signal<br>• Starter<br>• ECM |
| | No crankshaft position sensor signal (NE signal) to ECM with engine speed 550 rpm or more (2 trip detection logic) | |

## WIRING DIAGRAM





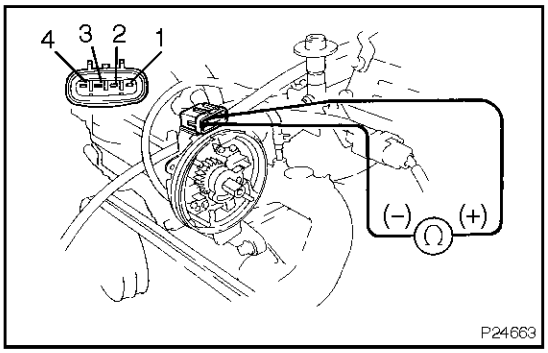

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check resistance of crankshaft position sensor for NE signal.** |




**PREPARATION:**

Remove the distributor cap and disconnect distributor connector

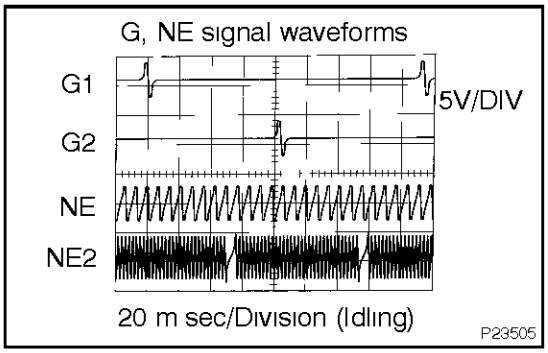
**CHECK:**

Measure resistance between terminals 1 and 4 of distributor connector

**OK:**

| | Resistance |
|---|---|
| Cold | 185 – 275 Ω |
| Hot | 240 – 325 Ω |

"Cold" is from –10°C (14F°) to 50°C (122°F) of engine coolant temperature sensor and "Hot" is from 50°C (122°F) to 100°C (212°F)




**Reference: INSPECTION USING OSCILLOSCOPE**

During cranking or idling, check between terminals G1, G2, NE, NE2 and G– of ECM

HINT

The correct waveforms are as shown

NG → **Replace distributor housing assembly.**

OK

| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ECM and crankshaft position sensor for NE signal (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | Check air gap (See page IG–1). |

NG → Replace distributor housing assembly.

OK →

Check and replace ECM (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| DTC | P0340 | Camshaft Position Sensor Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The camshaft position sensors (G1 and G2 signals) consist of a signal plate and a pick up coil The G1, G2, signal plates each have one tooth on the outer circumference and are built into the distributor When the camshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil The ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and engine speed by the NE signals, and detects misfire by NE2 signals

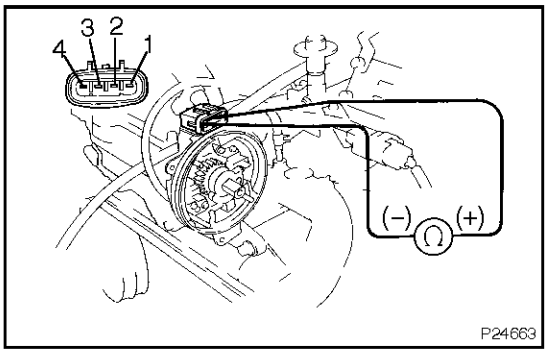
| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0340 | No camshaft position sensor signal (G signal) to ECM with engine speed 550 rpm or more | • Open or short in camshaft position sensor circuit<br>• Camshaft position sensor<br>• ECM |

## WIRING DIAGRAM

Refer to DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–62 for the WIRING DIAGRAM

## INSPECTION PROCEDURE

| 1 | **Check resistance of camshaft position sensor.** |
|---|---|




**PREPARATION:**

Disconnect camshaft position sensor connector

**CHECK:**

Measure resistance between terminals 2, 3 and 4 of distributor connector

**OK:**

| | Resistance |
|---|---|
| Cold | 185 – 275 Ω |
| Hot | 240 – 325 Ω |

"Cold" is from –10°C (14°F) to 50°C (122°F) of engine coolant temperature and "Hot" is from 50°C (122°F) to 100°C (212°F)

**Reference: INSPECTION USING OSCILLOSCOPE**

Refer to page DI–62 for Reference INSPECTION USING OSCILLOSCOPE

NG → **Replace distributor housing assembly.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

| | |
|---|---|
| 3 | **Check air gap (See page IG–1).** |

NG → **Replace distributor housing assembly.**

OK ↓

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PJ–02

| DTC | P0385 | Crankshaft Position Sensor "B" Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The crankshaft position sensor (NE2 signal) consists of a signal plate and a pick up coil The NE2 signal plate has 34 teeth and is mounted on the crankshaft When the crankshaft rotates, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil The NE2 signal sensor generates 34 signals for every engine revolution The ECM detects the standard crankshaft angle based on G1, G2 signals detects the actual crankshaft angle and the engine speed by NE signals, and detects misfire by NE2 signals

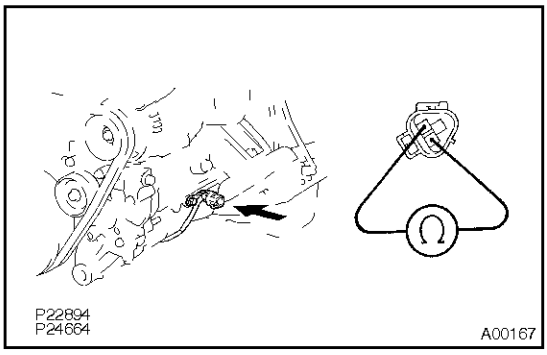
| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0385 | No crankshaft position sensor signal (NE 2 signal) to ECM during cranking (2 trip detection logic) | • Open or short in crankshaft position sensor for NE2 signals<br>• Crankshaft position sensor for NE2 signal<br>• ECM |
| | No crankshaft position sensor signal (NE 2 signal) to ECM with engine speed 550 rpm or more (2trip detection logic) | |

## WIRING DIAGRAM

Refer to DTC 0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–62 for WIRING DIAGRAM

## INSPECTION PROCEDURE

| 1 | **Check resistance of crankshaft position sensor for NE2 signal.** |
|---|---|




**PREPARATION:**

Disconnect crankshaft position sensor connector

**CHECK:**

Measure resistance between terminals 1 and 2 of crankshaft position sensor connector

**OK:**

| | Resistance |
|---|---|
| Cold | 1630 – 2740 Ω |
| Hot | 2065 – 3225 Ω |

"Cold" is from –10°C (14°F) to 50°C (122°F) of engine coolant temperature and "Hot" is from 50°C (122°F) to 100°C (212°F)

**Reference: INSPECTION USING OSCILLOSCOPE**

Refer to page DI–62 for Reference INSPECTION USING OSCILLOSCOPE

NG → **Replace crankshaft position sensor.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ECM and crankshaft position sensor for NE2 signal (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

| | |
|---|---|
| 3 | **Inspect sensor installation and teeth of signal plate.** |

NG → **Tighten the sensor.**
**Replace signal plate.**

OK ↓

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

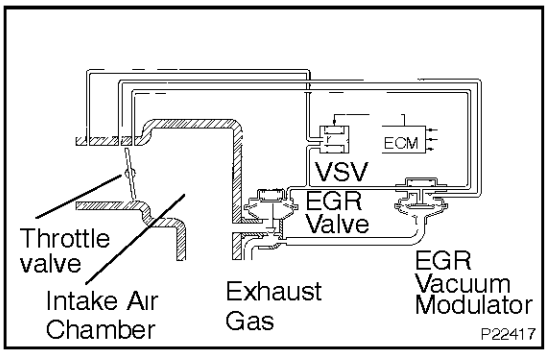
Brought to you by BirfMark



| DTC | P0401 | Exhaust Gas Recirculation Flow Insufficient Detected |
|---|---|---|

## CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temp and reduce NOx emissions The amount of EGR is regulated by the EGR vacuum modulator according to the engine load




If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM

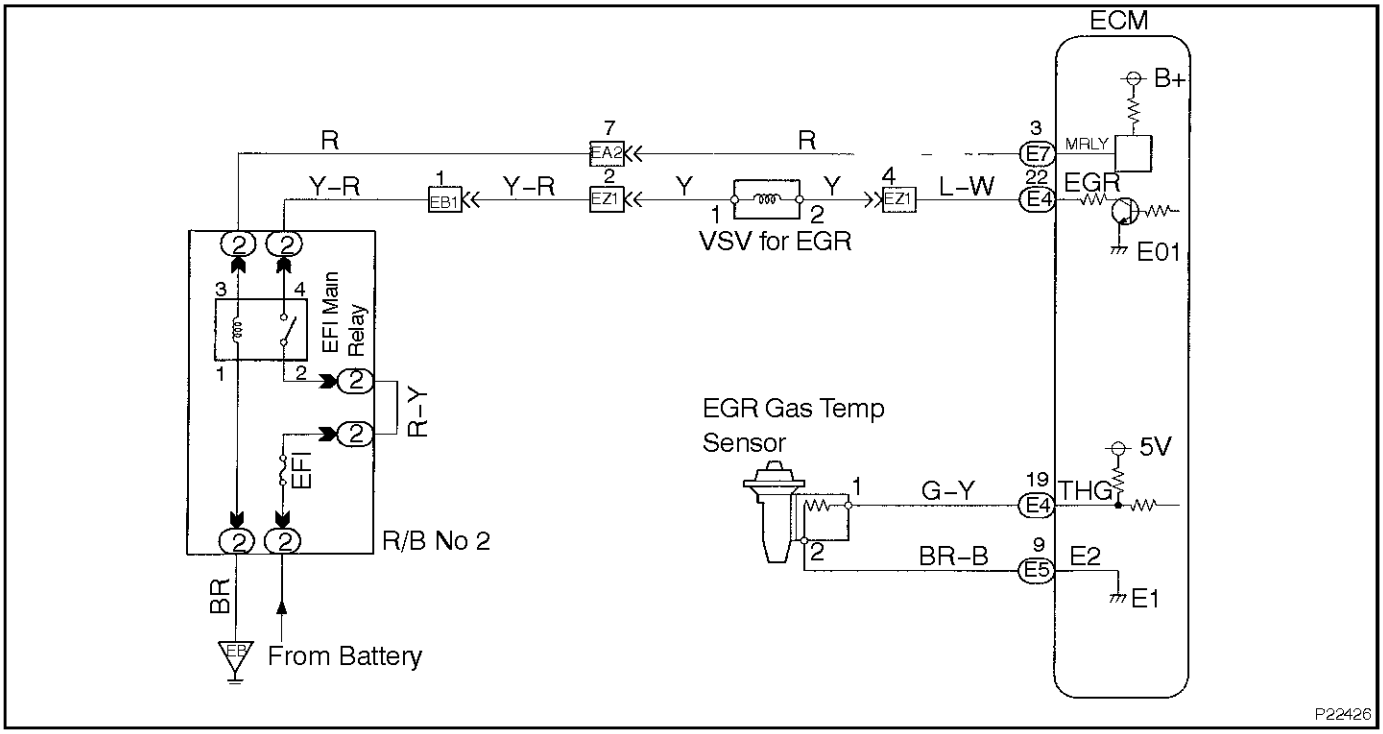
This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off)

Under the following conditions, EGR is cut to maintain driveability

- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0401 | After the engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 minutes the EGR gas temperature sensor value does not exceed 38°C (100 4°F) above the ambient air temperature (2 trip detection logic) | • EGR valve stuck closed<br>• Short in VSV circuit for EGR<br>• Open in EGR gas temp sensor circuit<br>• EGR hose disconnected<br>• ECM |

## WIRING DIAGRAM



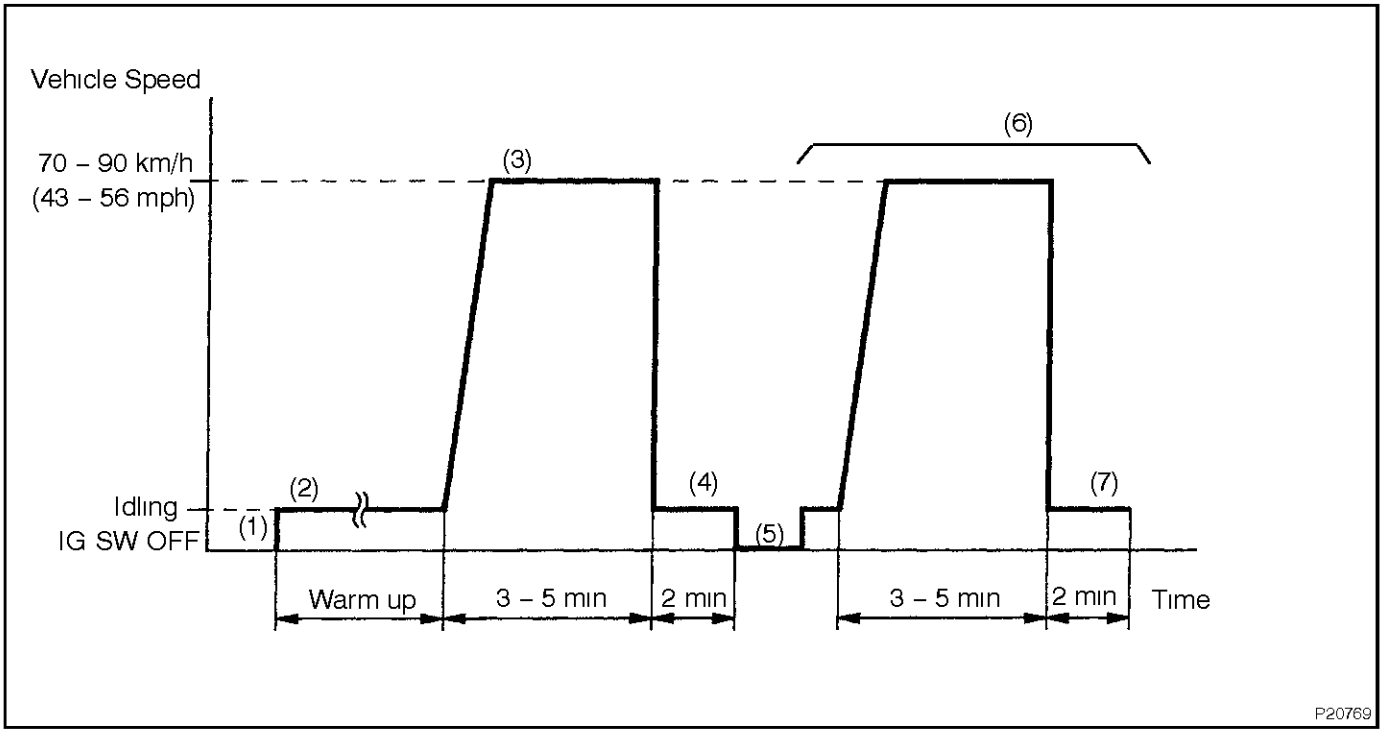



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SYSTEM CHECK DRIVING PATTERN




(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3
(2) Start and warm up the engine with all accessories switched OFF
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min or more
(4) Idle the engine for about 2 min
(5) Stop at safe place and turn the ignition switch OFF
(6) Start the engine and do steps (3) and (4) again
(7) Check the "READINESS TESTS" mode on the OBD II scan tool or TOYOTA hand–held tester

If "COMPL" is displayed and the MIL does not light up, the system is normal

If "INCMPL" is displayed and the MIL does not light up, run the vehicle again and check it

HINT

"INCMPL" is displayed when either condition (a) or (b) exists

(a) The system check is incomplete
(b) There is a malfunction in the system

If there is a malfunction in the system, the MIL will light up after steps (2) to (6) above are done



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE
## TOYOTA hand–held tester

| | |
|---|---|
| 1 | **Connect the TOYOTA hand–held tester and read value of EGR gas temp. value.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and push the TOYOTA hand–held tester main switch ON

**CHECK:**

Read EGR gas temp on the TOYOTA hand–held tester

**OK:**

**EGR gas temp.: 10°C (50°F) or more**

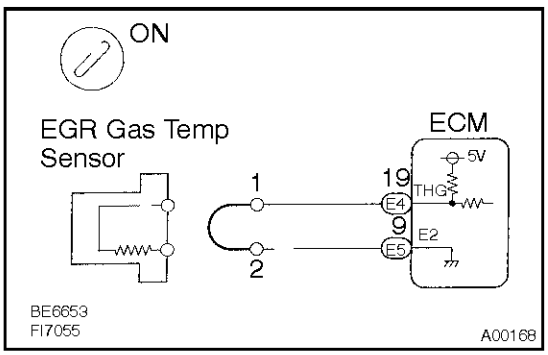
HINT

If there is and open circuit, the TOYOTA hand–held tester indicates 3 1°C (37 6°F)

| | |
|---|---|
| OK | **Go to step 4.** |

NG

| | |
|---|---|
| 2 | **Check for open in harness or ECM.** |




**PREPARATION:**

(a) Disconnect the EGR gas temp sensor connector
(b) Connect sensor wire harness terminals together
(c) Turn ignition switch ON

**CHECK:**

Read EGR gas temp on the TOYOTA hand–held tester

**OK:**

**EGR gas temp.: Approx. 157.5°C (315.5°F)**

| | |
|---|---|
| OK | **Confirm good connection at sensor.<br>If OK, replace EGR gas temp. sensor.** |

NG

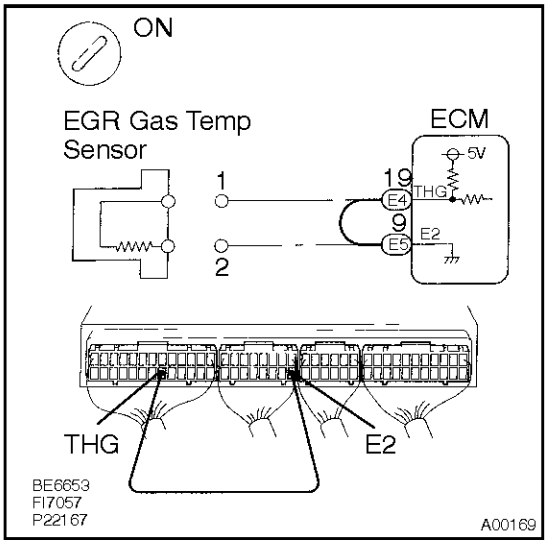


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove the instrument panel speaker No 1 panel (See page SF–65)

(b) Connect between terminals THG and E2 of ECM connector

HINT

EGR gas temp sensor connector is disconnected

Before checking, do a visual check and contact pressure check for the ECM connector (See page IN–28)

**CHECK:**

Read EGR gas temp on the TOYOTA hand–held tester

**OK:**

**EGR gas temp.: Approx. 157.5°C (315.5°F)**

| OK | Open in harness between terminals E2 or THG. Repair or replace harness. |
|---|---|

**NG**

**Confirm connection at ECM.**
**If OK, replace ECM (See page IN–28).**

| 4 | Check the connection of the vacuum hose, EGR hose (See page EC–11). |
|---|---|

| NG | Repair or replace. |
|---|---|

**OK**

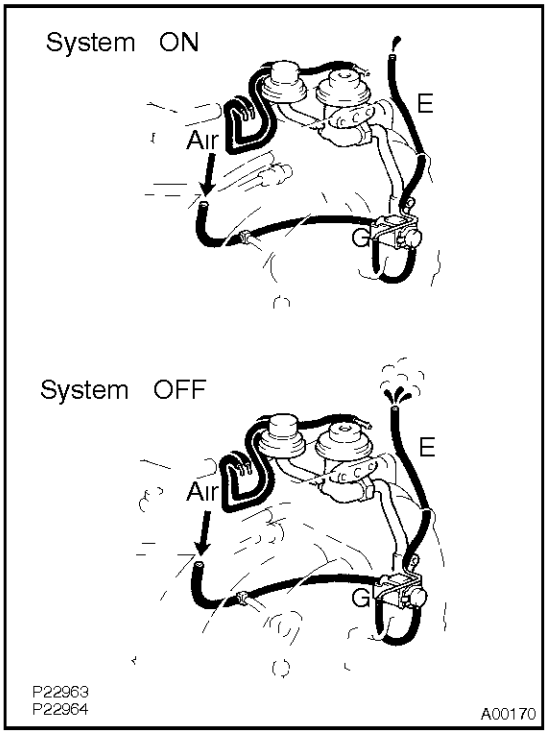


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check the VSV for EGR. |
|---|---|




**PREPARATION:**

(a) Remove the fuse cover on the instrument panel
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and TOYOTA hand–held tester main switch ON
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester

**CHECK:**

Check operation of VSV, when it is operated by the TOYOTA hand–held tester

**OK:**

**EGR system is ON:**
**Air does not flow from pipe G to pipe E.**
**EGR system is OFF:**
**Air from pipe G is flowing out through pipe E.**

| OK | Go to step 7. |
|---|---|

NG

| 6 | Check operation of the VSV for EGR (See page SF–60). |
|---|---|

| NG | Replace VSV for EGR. |
|---|---|

OK

Check for open in harness and connector between VSV and ECM (See page IN–28).

| 7 | Check EGR vacuum modulator (See page EC–11). |
|---|---|

| NG | Repair or replace. |
|---|---|

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 8 | **Check EGR valve (See page EC–11).** |

NG → **Repair or replace.**

OK

| | |
|---|---|
| 9 | **Check value of EGR gas temp. sensor.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and TOYOTA hand–held tester main switch ON
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester (EGR system ON)
(e) Race the engine at 4,000 rpm for 3 mins

**CHECK:**

Measure the EGR gas temp while racing engine at 4,000 rpm

**OK:**

**EGR gas temp. after 3 mins.: 140°C (284°F) or more**

NG → **Replace EGR gas temp. sensor.**

OK

**Check and replace ECM (See page IN–28).**



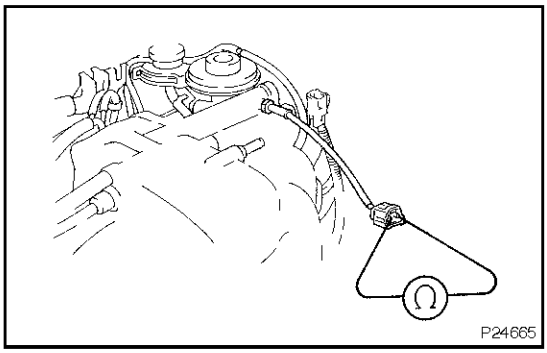
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## OBD II scan tool (excluding TOYOTA hand–held tester)

| | |
|---|---|
| 1 | **Check resistance of EGR gas temp. sensor.** |

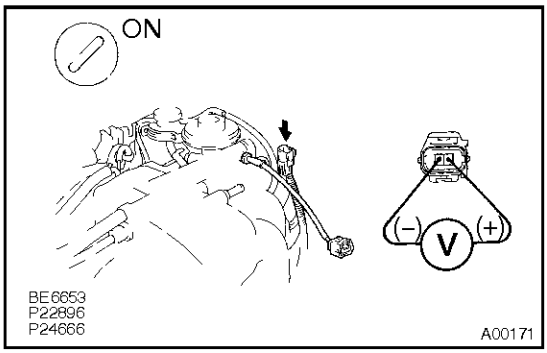



**PREPARATION:**
Disconnect EGR gas temp sensor connector
**CHECK:**
Measure resistance between terminals of EGR gas temp sensor connector
**OK:**
**Resistance: 600 kΩ or less**
HINT
If there is open circuit, ohmmeter indicates 720 kΩ or more

| | |
|---|---|
| NG | **Check and replace EGR gas temp. sensor (See page SF–63).** |

OK

| | |
|---|---|
| 2 | **Check for open in harness or ECM.** |




**PREPARATION:**
(a) Disconnect EGR gas temp sensor connector
(b) Turn ignition switch ON
**CHECK:**
Measure voltage between terminals of EGR gas temp sensor wire harness side connector
**OK:**
**Voltage: 4.5 – 5.5 V**

| | |
|---|---|
| OK | **Go to step 4.** |

NG

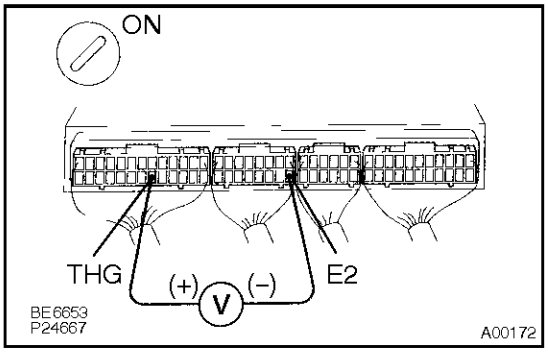


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals of THG and E2 of ECM connector

HINT

EGR gas temp sensor connector is disconnected

**OK:**

**Voltage: 4.5 – 5.5 V**

| OK | Open in harness between terminals E2 or THG. Repair or replace harness. |
|---|---|

NG

Confirm connection at ECM.
If OK, replace ECM (See page IN–28).

| 4 | Check connection of vacuum hose, EGR hose (See page EC–11). |
|---|---|

| NG | Repair or replace. |
|---|---|

OK

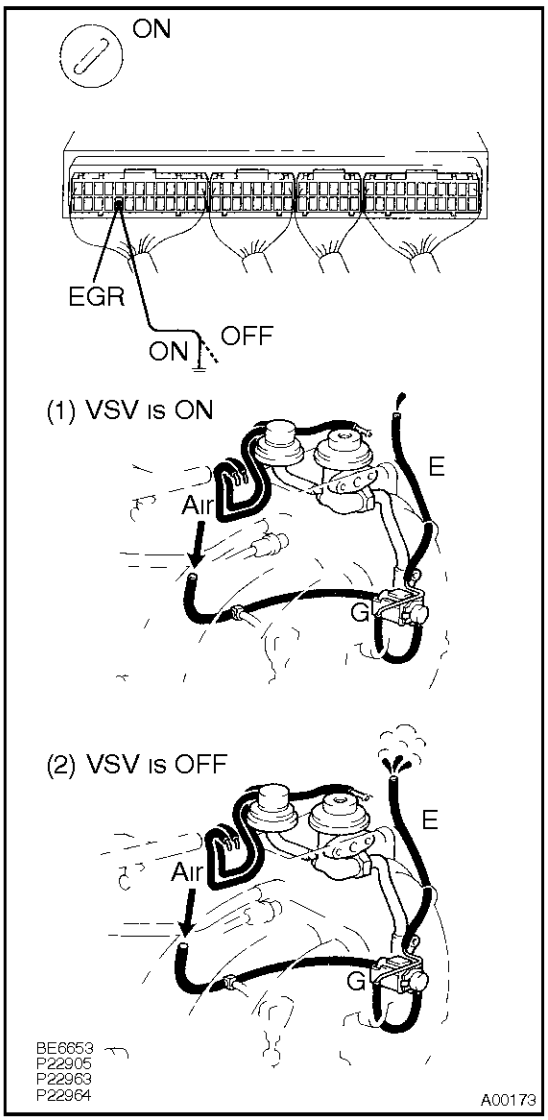


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check the VSV for EGR. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Check VSV function

(1) Connect between terminal EGR of ECM and body ground (ON)

(2) Disconnect between terminal EGR of ECM and body ground (OFF)

**OK:**

**(1) VSV is ON:**
**Air does not flow from pipe G to pipe E.**
**(2) VSV is OFF:**
**Air from pipe G is flows out through pipe E.**

| OK | Go to step 7. |
|---|---|

NG



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 6 | Check operation for the VSV for EGR (See page SF–60). |

NG → Replace VSV for EGR.

OK

Check for open in harness and connector between R/B No.2 and ECM (See page IN–28).

| | |
|---|---|
| 7 | Check EGR vacuum modulator (See page EC–11). |

NG → Repair or replace.

OK

| | |
|---|---|
| 8 | Check EGR valve (See page EC–11). |

NG → Repair or replace.

OK

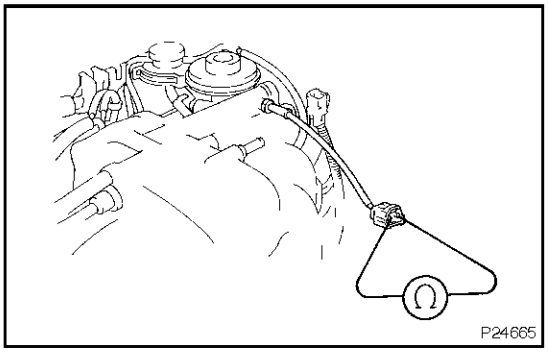


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 9 | **Check resistance of EGR gas temp. sensor (See page SF–63).** |
|---|---|




**PREPARATION:**

(a) Disconnect EGR gas temp sensor connector
(b) Start the engine and warm it up
(c) Disconnect VSV connector for EGR
(d) Race the engine at 4,000 rpm or 3 mins

**CHECK:**

Measure the resistance of the EGR gas temp sensor while racing the engine at 4,000 rpm

**OK:**

**Resistance of EGR gas temp. sensor after 3 mins.: 4.3 kΩ or less**

HINT

At 20°C (68°F) 188 6 – 439 0 kΩ for resistance

NG → **Replace EGR gas temp. sensor.**

OK →

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PL 02

| DTC | P0402 | Exhaust Gas Recirculation Flow Excessive Detected |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0401 (Exhaust Gas Recirculation Flow Insufficient Detected) on page DI–69

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0402 | EGR gas temp sensor value is high during EGR cut–off when engine is cold (Race engine at about 4 000 rpm without load so that vacuum is applied to port E)<br>(2 trip detection logic) | • EGR valve stuck open<br>• EGR VSV open malfunction<br>• Open in VSV circuit for EGR<br>• Short in EGR gas temp sensor circuit<br>• ECM |
| | EGR valve is always open (2 trip detection logic) | |

Refer to DTC P0401 (Exhaust Gas Recirculation Flow Insufficient Detected) for the System Check Driving Pattern and Wiring Diagram

## INSPECTION PROCEDURE

## TOYOTA hand–held tester

| 1 | **Connect the TOYOTA hand–held tester and read EGR gas temp. value.** |
|---|---|

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel

(b) Connect the TOYOTA hand–held tester to the DLC3

(c) Turn ignition switch ON and push the TOYOTA hand–held tester main switch ON

**CHECK:**

Read EGR gas temp on the TOYOTA hand–held tester

**OK:**

**EGR gas temp.: 150°C (302°F) or less (Not immediately after driving)**

HINT

If there is a short circuit, the TOYOTA hand–held tester indicates Approx 157.5°C (315.5°F)

OK → **Go to step 4.**

NG

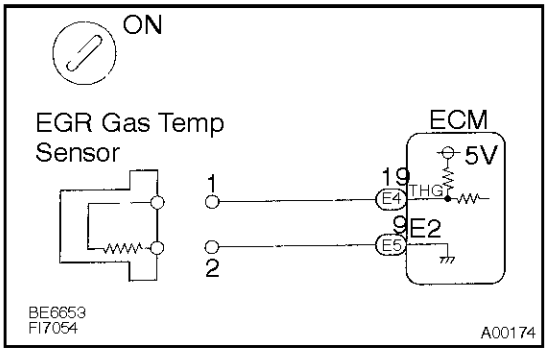


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check for short in harness and ECM. |
|---|---|

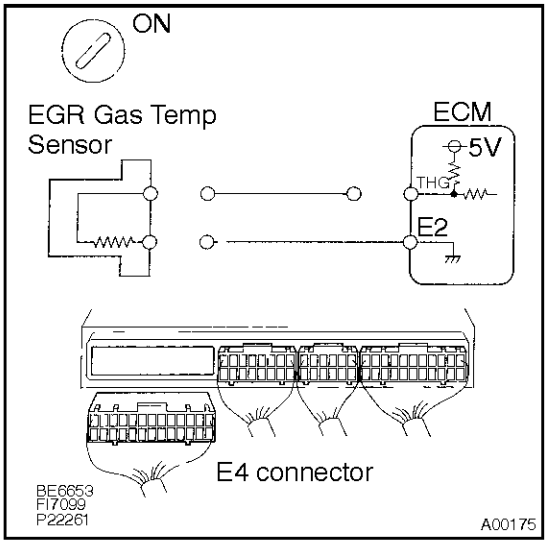



**PREPARATION:**
Disconnect the EGR gas temp sensor connector
**CHECK:**
Read EGR gas temp on the TOYOTA hand–held tester
**OK:**
**EGR gas temp.: 3.1°C (37.6°F)**

| OK | Replace EGR gas temp. sensor. |
|---|---|

**NG**

| 3 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**
(a) Remove the instrument panel speaker No 1 panel (See page SF–65)
(b) Disconnect the E4 connector of ECM
HINT
EGR gas temp sensor is disconnected
**CHECK:**
Read EGR gas temp on the TOYOTA hand–held tester
**OK:**
**EGR gas temp.: 3.1°C (37.6°F)**

| OK | Repair or replace harness or connector. |
|---|---|

**NG**

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 4 | **Check the VSV for EGR (See page DI–69).** |

**OK** → **Check EGR valve (See page EC–11).**

**NG**

| | |
|---|---|
| 5 | **Check operation of the VSV for EGR (See page SF–60).** |

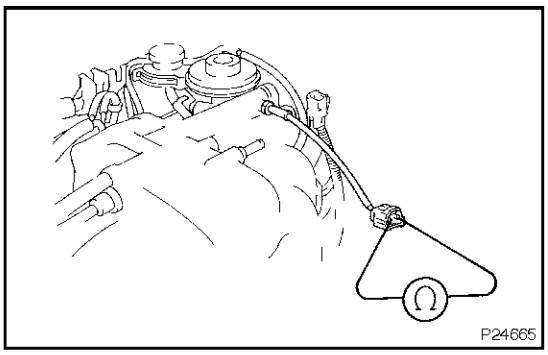
**NG** → **Replace VSV for EGR.**

**OK**

**Check for short in harness and connector between VSV and ECM (See page IN–28).**

## OBD II scan tool (excluding TOYOTA hand–held tester)

| | |
|---|---|
| 1 | **Check resistance of EGR gas temp. sensor (See page DI–105).** |




**PREPARATION:**

Disconnect EGR gas temp sensor connector

**CHECK:**

Measure resistance between terminals of EGR gas temp sensor connector

**OK:**

**Resistance: 2.5 kΩ or more**
**(Not immediately after driving)**

HINT

If there is short circuit, ohmmeter indicates 200 Ω or less

**NG** → **Replace EGR gas temp. sensor.**

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–28). |

NG → Repair or replace harness or connector.

OK ↓

| | |
|---|---|
| 3 | Check the VSV for EGR (See page DI–69, step 5). |

OK → Check EGR valve (See page EC–11).

NG ↓

| | |
|---|---|
| 4 | Check operation of the VSV for EGR (See page SF–60). |

NG → Replace VSV for EGR.

OK ↓

| | |
|---|---|
| 5 | Check for short in harness and connector between VSV and ECM (See page IN–28). |

NG → Repair or replace harness or connector.

OK ↓

Check and replace ECM (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PM 02

| DTC | P0420 | Catalyst System Efficiency Below Threshold |
|---|---|---|

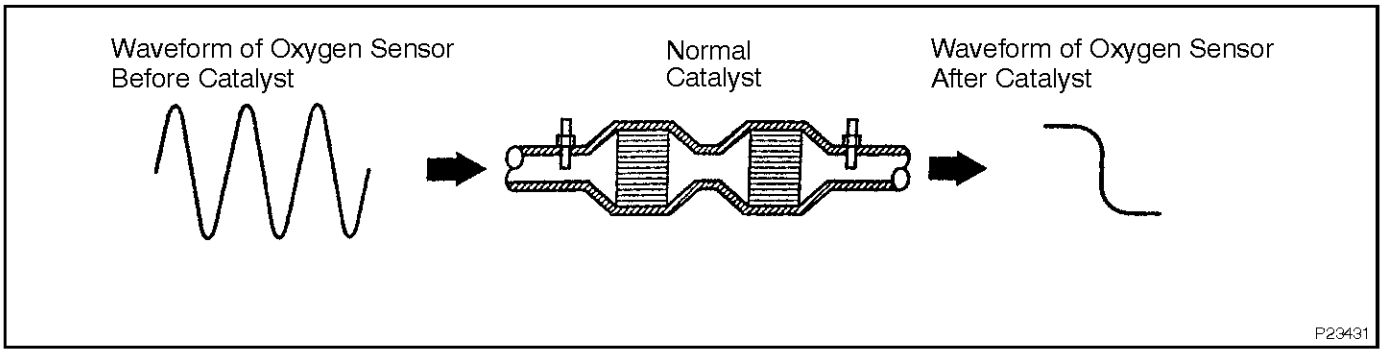
## CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean

If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst

But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated




| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0420 | After the engine is warmed up and the vehicle driven for 6 mins at 30 – 83 km/h (19 – 52 mph) the waveforms of the heated oxygen sensors bank 1 sensor 1 and bank1 sensor 2 have the same amplitude | • Front exhaust pipe (front catalyst) and rear TWC (rear catalyst)<br>• Heated oxygen sensor |

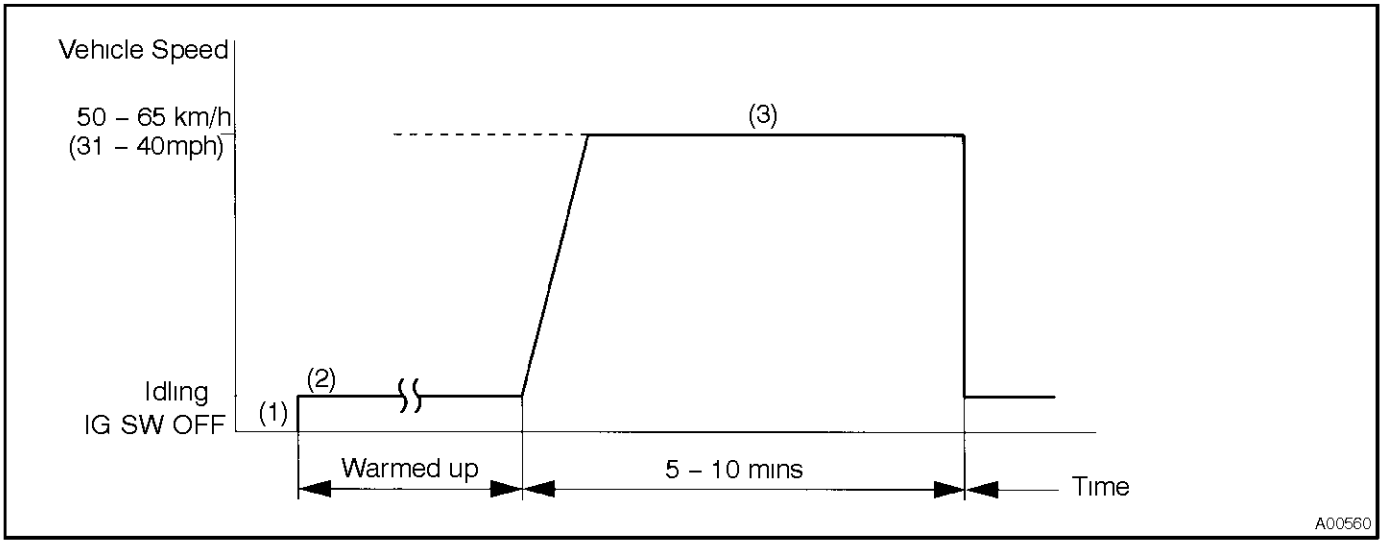


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## CONFIRMATION ENGINE RACING PATTERN




(1) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3
(2) Start and warm up the engine with all accessories switched OFF
(3) Run the vehicle at 50 – 65 km/h (31 – 40 mph) for 5 – 10 mins

HINT

If a malfunction exists, the MIL will light up during step (3)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | Are there any other codes (besides DTC P0420) being output? |

YES → Go to relevant DTC chart.

NO

| | |
|---|---|
| 2 | Check heated oxygen sensor (bank 1 sensor 1) (See page SF–64). |

NG → Repair or replace.

OK

| | |
|---|---|
| 3 | Check heated oxygen sensor (bank 1 sensor 2) (See page SF–64). |

NG → Repair or replace.

OK

Replace front exhaust pipe (front catalyst) and rear TWC (rear catalyst) (See page EM–110).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

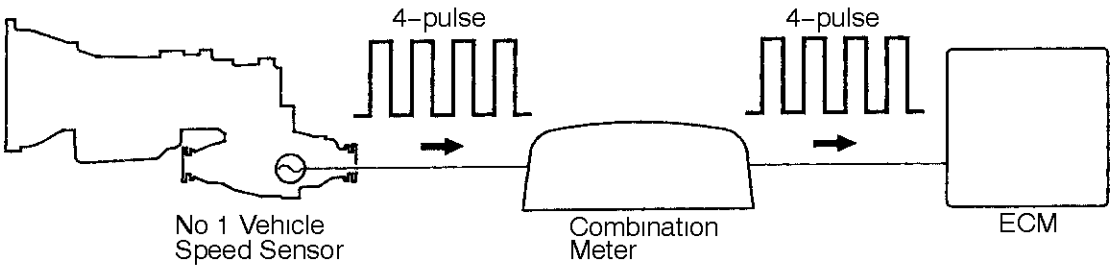


D5PN 02

| DTC | P0500 | Vehicle Speed Sensor Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

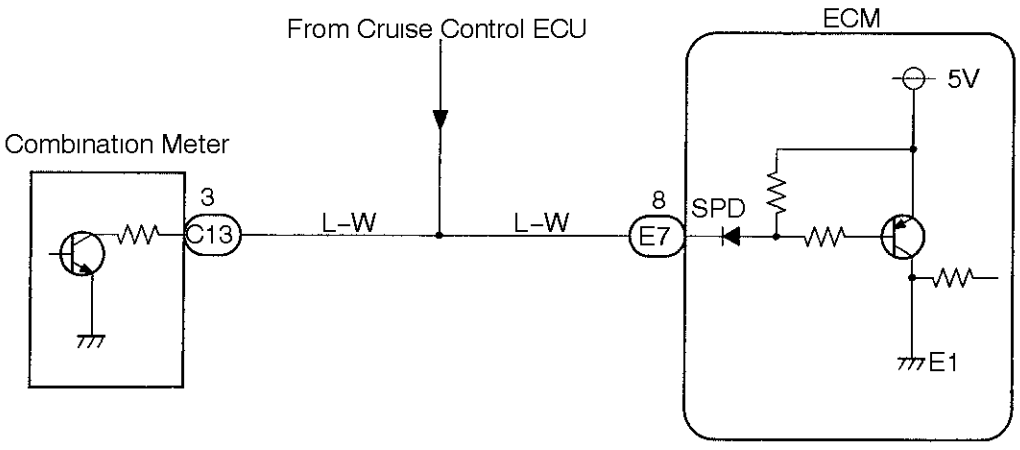
The vehicle speed sensor outputs a 4 – pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear After this signal is converted into a more precise rectangular wavefrom by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM The ECM determines the vehicle speed based on the frequency of these pulse signals




P22487

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0500 | No vehicle speed sensor signal to ECM under conditions (a) and (b)<br>(2 trip detection logic)<br>(a) Park/neutral position switch is OFF<br>(b) Vehicle is being driven | • Open or short in No 1 vehicle speed sensor circuit<br>• No 1 vehicle speed sensor<br>• Combination meter<br>• ECM |

## WIRING DIAGRAM




P22473



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check operation of speedometer.** |

**CHECK:**

Drive the vehicle and check if the operation of the speedmeter in the combination meter is normal

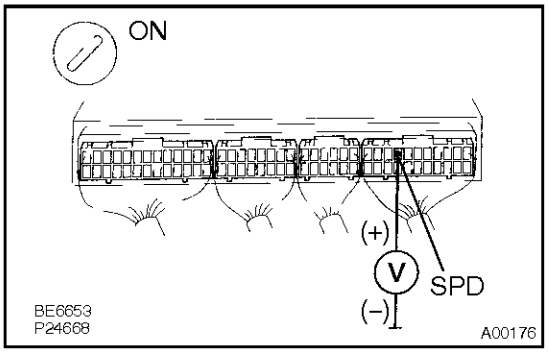
HINT

The vehicle speed sensor is operating normally if the speedometer display is normal

NG → **Check speedometer circuit (See page BE–2).**

OK

| | |
|---|---|
| 2 | **Check voltage between terminal SPD of ECM connector and body ground.** |




**PREPARATION:**

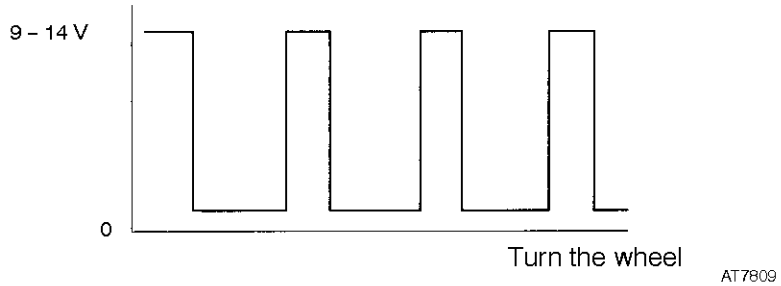
(a) Remove instrument panel speaker No 1 panel (See page SF–65)
(b) Disconnect cruise control ECU connector
(c) Shift the shift lever to neutral
(d) Jack up a rear wheels on one side
(e) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly

**OK:**

**Voltage is generated intermittently.**




NG → **Check and repair harness and connector between combination meter and ECM.**

OK

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

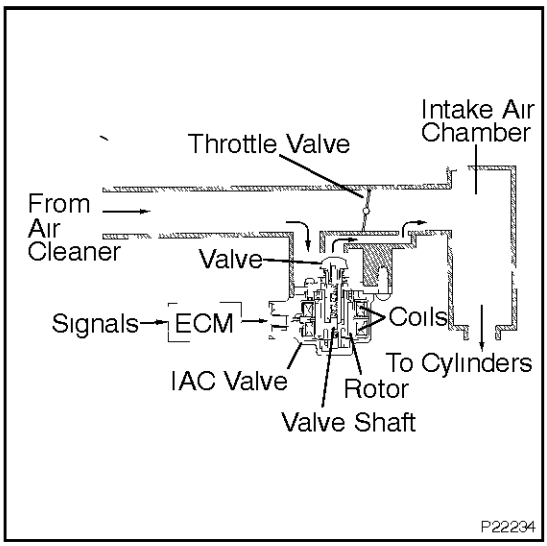
Brought to you by BirfMark



D5PO-02

| DTC | P0505 | Idle Control System Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION




The step motor type IAC valve is located in front of the intake air chamber Intake air bypassing the throttle valve is directed to the IAC valve through a passage A step motor is built into the IAC valve It consists of four coils, a magnetic rotor, valve shaft and valve When current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and the valve seat In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed There are 125 possible positions to which the valve can be opened

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0505 | Idle speed continues to vary greatly from the target speed (2 trip detection logic) | • IAC valve is stuck or closed<br>• Open or short in IAC valve circuit<br>• Open or short in A /C signal circuit<br>• Air intake (hose loose) |

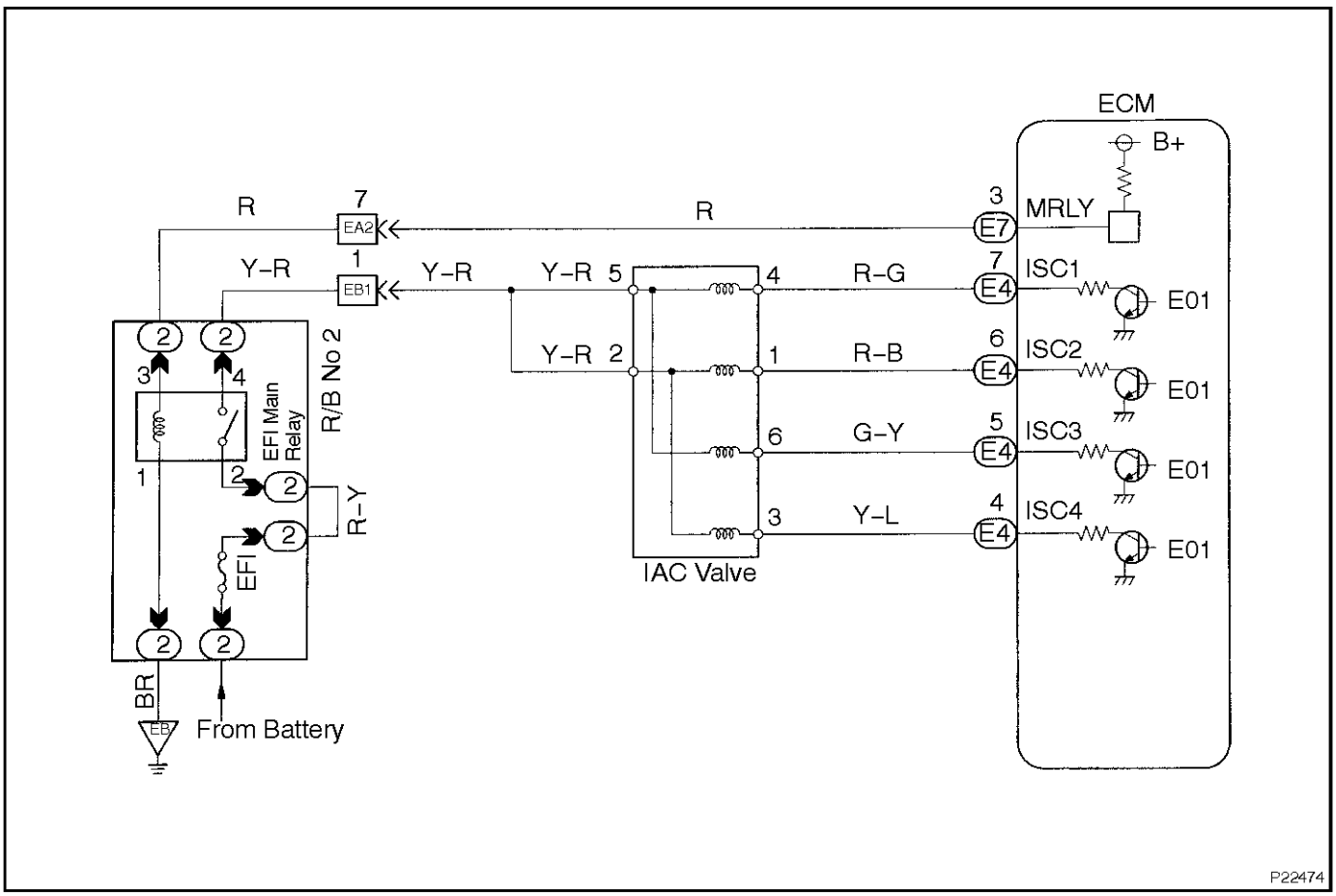


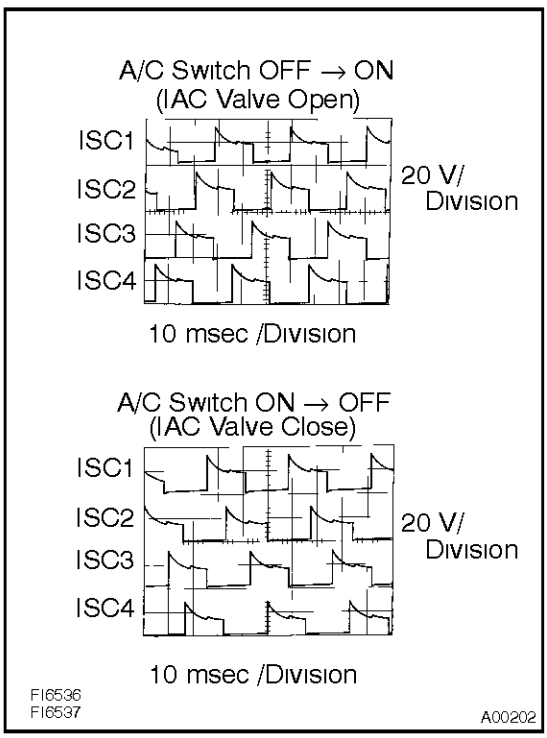
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## WIRING DIAGRAM




**Reference: INSPECTION USING OSCILLOSCOPE**

With the engine idling measure waveforms between terminals ISC1, ISC2, ISC3, ISC4 and E01 of ECM when A/C switch ON or OFF

HINT

The correct waveforms are as shown



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



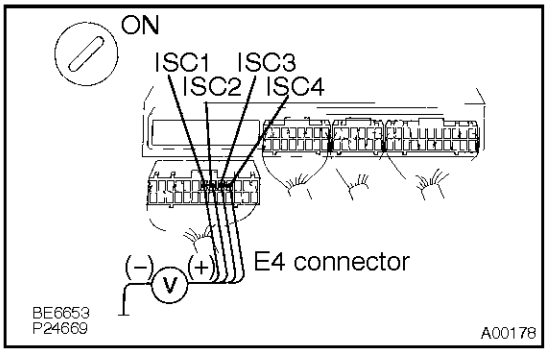
## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check air induction system (See page SF–1).** |

**NG** → **Repair or replace.**

**OK**

| | |
|---|---|
| 2 | **Check voltage terminals ISC1, ISC2, ISC3, ISC4, of ECM connector and body ground.** |




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Disconnect the E4 connector of ECM

(c) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals ISC1, ISC2, ISC3, ISC4 of ECM connector and body ground

**OK:**

**Voltage: 9 – 14 V**

**OK** → **Go to step 4.**

**NG**

| | |
|---|---|
| 3 | **Check IAC valve (See page SF–49).** |

**NG** → **Replace IAC valve.**

**OK**

**Check for open and short in harness and co–nnector between EFI main relay (Marking:EFI) and IAC valve and ECM (See page IN–28).**

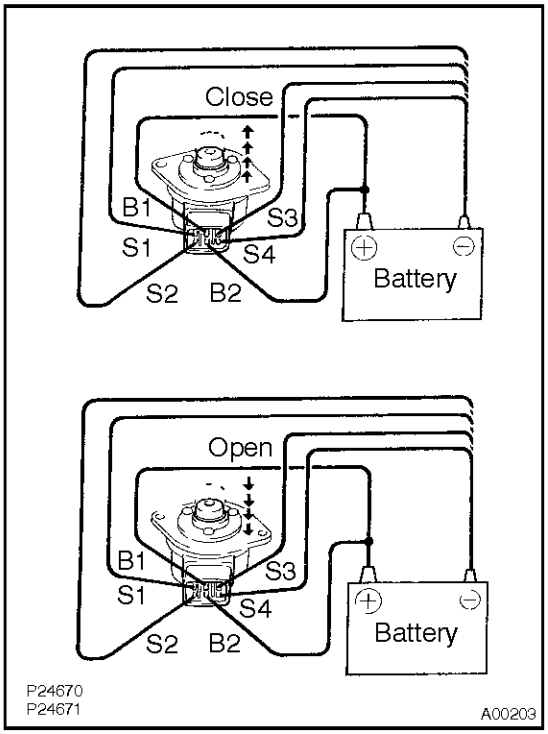


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check operation of the IAC valve . |
|---|---|




**PREPARATION:**

Remove IAC valve (See page SF-51)

**CHECK:**

(a) Connect the positive (+) leak from the battery to terminals 5 (B1) and 2 (B2), and the negative (-) lead to terminals 4 (S1), -1 (S2), -6 (S3), -3 (S4) in that order

(b) Connect the positive (+) lead from the battery to terminals 5 (B1) and 2 (B2), and the negative (-) lead to terminals 3 (S4), - 6 (S3), -1 (S2), - 4 (S1) in that order

**OK:**

**(1) The valve moves to close direction.**

**(2) The valve moves to open direction.**

HINT

The ACTIVE TEST mode of the TOYOTA hand-held tester can be used to change the step of the IAC valve as desired

NG → **Repair or replace IAC valve.**

OK →

**Check and replace ECM (See page IN-28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PP 02

| DTC | P0510 | Closed Throttle Position Switch Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page DI–35

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0510 | The closed throttle position switch does not turn ON or OFF even once when the vehicle is driven (2 trip detection logic) | • Open or short in closed throttle position switch circuit<br>• Closed throttle position switch<br>• ECM |

HINT

After confirming DTC P0510 use the TOYOTA hand–held tester to confirm the closed throttle position switch signal from "CURRENT DATA"

| Throttle Valve | Closed Throttle Position Switch Signal | Malfunction |
|---|---|---|
| Fully closed | OFF | Open circuit |
| Fully open | ON | Short circuit |

## WIRING DIAGRAM

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page DI–35 for WIRING DIAGRAM

## INSPECTION PROCEDURE

HINT

If DTCs P0110 (Intake Air Temp Circuit Malfunction), P0115 (Engine Coolant Temp Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open

## TOYOTA hand–held tester

| | |
|---|---|
| **1** | **Connect the TOYOTA hand–held tester and read CTP switch signal.** |

**PREPARATION:**

(a) Remove the fuse cover on the instrument panel

(b) Connect OBD II scan tool or TOYOTA hand–held tester to the DLC3

(c) Turn ignition switch ON and OBD II scan tool or TOYOTA hand–held tester main switch ON

**CHECK:**

Read CTP switch signal on TOYOTA hand–held tester

**RESULT:**

| Throttle Valve | Closed Throttle Position Switch Signal | Malfunction |
|---|---|---|
| Fully closed | OFF | Open circuit Go to step 2 |
| Fully open | ON | Short circuit Go to step 4 |

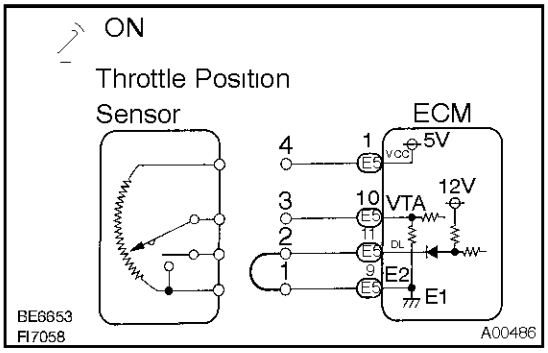


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Disconnect throttle position sensor connector

(b) Connect sensor wire harness terminals between terminals 1 and 2

(c) Turn ignition switch ON

**CHECK:**

Read CTP switch signal on TOYOTA hand–held tester

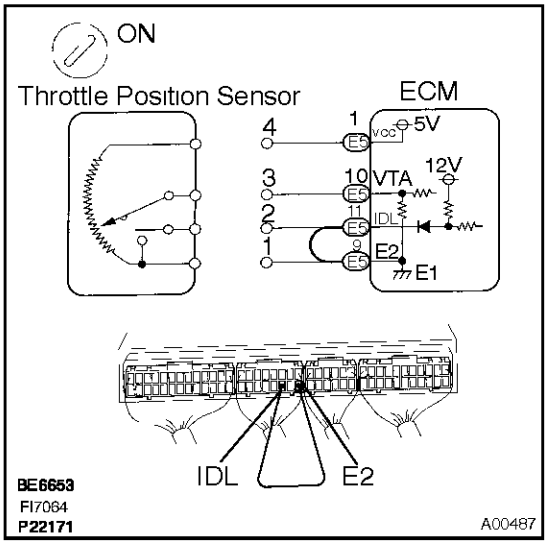
**OK:**

**CTP switch signal: ON**

| OK | Confirm good connection at sensor.<br>If OK, replace throttle position sensor. |
|---|---|

**NG**

| 3 | Check for open in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Connect between terminals IDL and E2 of ECM

HINT

Throttle position sensor connector is disconnected

Before checking, do a visual check and contact pressure check for connector (See page IN–28)

(c) Turn ignition switch ON

**CHECK:**

Read CTP switch signal on TOYOTA hand–held tester

**OK:**

**CTP switch signal: ON**

| OK | Open in harness between ECM and throttle position sensor, repair or replace harness. |
|---|---|

**NG**

**Confirm connection at ECM.**
**If OK, replace ECM (See page IN–28).**

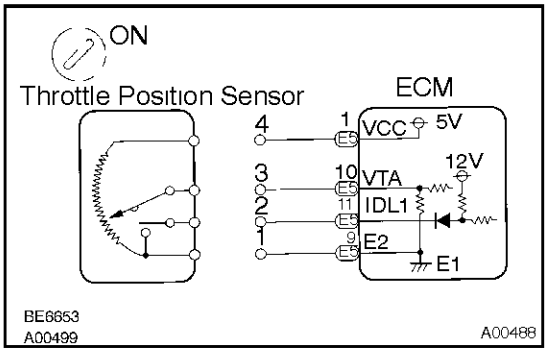


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Disconnect throttle position sensor connector

(b) Turn ignition switch ON

**CHECK:**

Read CTP switch signal on TOYOTA hand–held tester

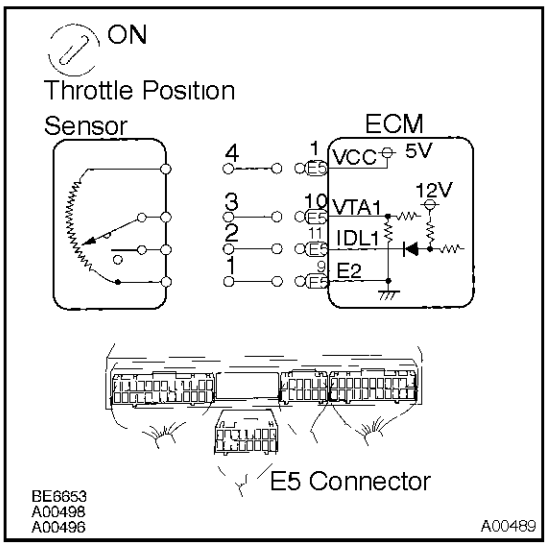
**OK:**

**CTP switch signal: OFF**

| OK | Confirm good connection at sensor.<br>If OK, replace throttle position sensor. |
|---|---|

**NG**

| 5 | Check for short in harness or ECM. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Disconnect E5 connector of ECM

HINT

Throttle position sensor connector is disconnected

(c) Turn ignition switch ON

**CHECK:**

Read CTP switch signal on TOYOTA hand–held tester

**OK:**

**CTP switch signal: OFF**

| OK | Short in harness between ECM and throttle position sensor, repair or replace harness. |
|---|---|

**NG**

**Confirm connection at ECM.**
**If OK, replace ECM (See page IN–28).**



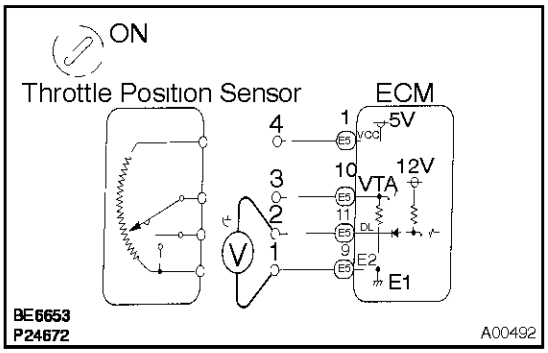
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## OBD II scan tool (excluding TOYOTA hand–held tester)

| | |
|---|---|
| 1 | **Check for open and short in harness or ECM.** |




**PREPARATION:**

(a) Disconnect throttle position sensor connector

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals 1 and 2 of throttle position sensor connector

**OK:**

**Voltage: 9 – 14 V**

| | |
|---|---|
| OK | **Confirm good connection at sensor.<br>If OK, replace throttle position sensor.** |

NG

| | |
|---|---|
| 2 | **Check for open and short in harness and connector between throttle position sensor and ECM (See page IN–28).** |

| | |
|---|---|
| NG | **Open or short in harness between ECM and throttle position sensor.** |

OK

**Confirm connection at ECM.<br>If OK, replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PQ-02

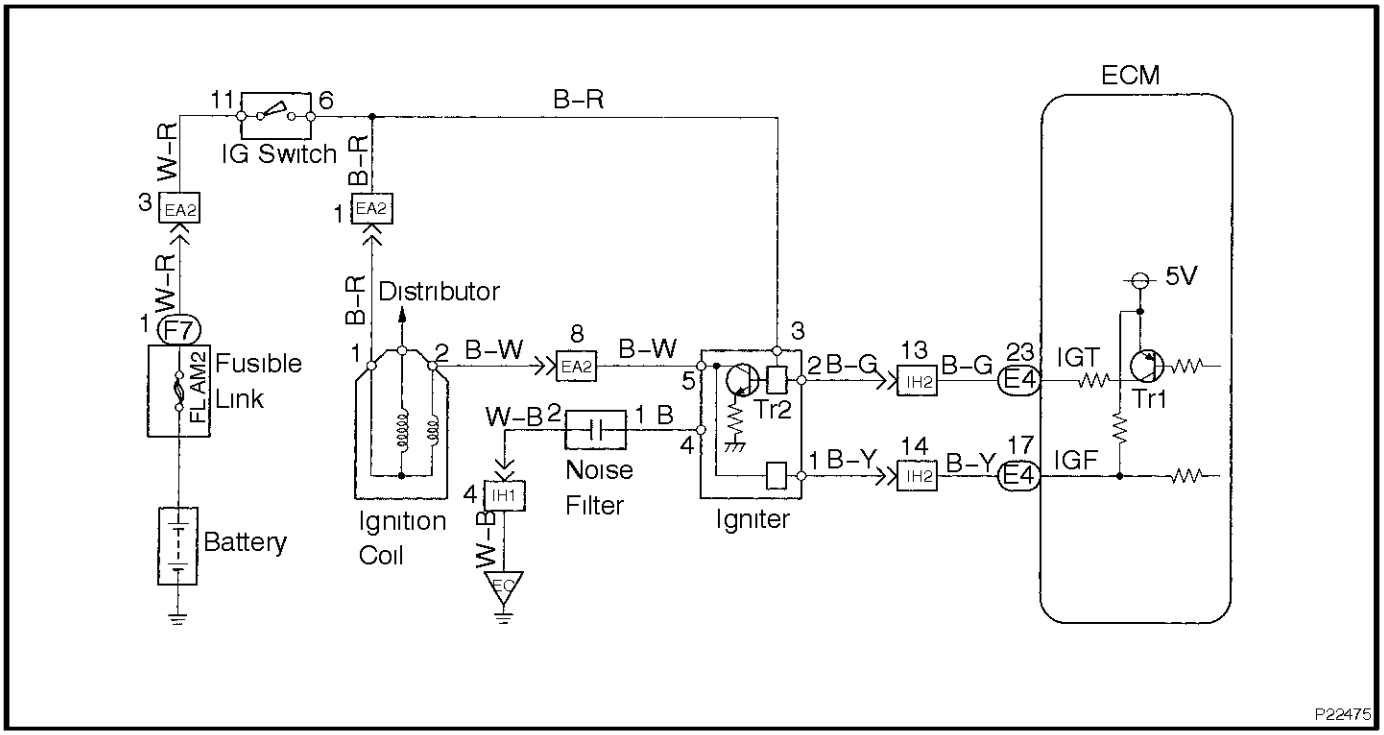
| DTC | P1300 | Igniter Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr1 at a predetermined angle (°CA) before the desired ignition timing and outputs and ignition signal (IGT) "1" to the igniter
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr2 turns on
When it reaches the ignition timing, the ECM turns Tr1 off and outputs the IGT signal "O"
This turns Tr2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1300 | No IGF signal to ECM for 6 consecutive IGT signals during engine running | • Open or short in IGF or IGT circuit from igniter to ECM<br>• Igniter<br>• ECM |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check for spark (See page IG–1).** |

**NG** → **Go to step 4.**

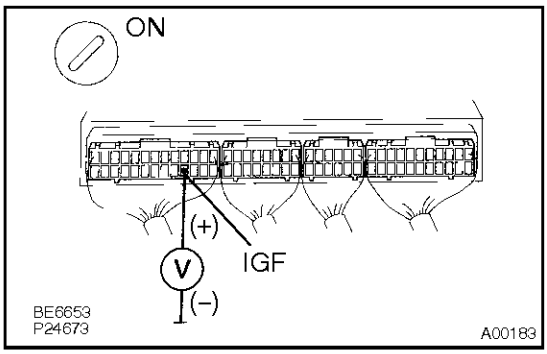
**OK**

| | |
|---|---|
| 2 | **Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–28).** |

**NG** → **Repair or replace harness or connector.**

**OK**

| | |
|---|---|
| 3 | **Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.** |




**PREPARATION:**

(a) Disconnect igniter connector

(b) Remove instrument panel speaker No 1 panel (See page SF–65)

(c) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal IGF of ECM connector and body ground

**OK:**

**Voltage: 4.5 – 5.5 V**

**OK** → **Replace igniter.**

**NG**

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

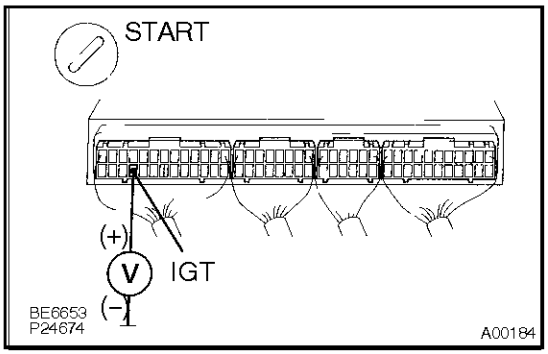


| | |
|---|---|
| 4 | **Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN–28).** |

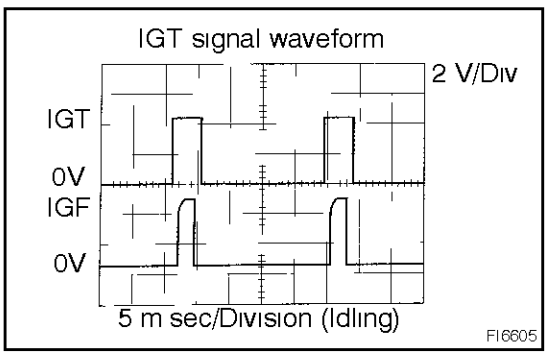
**NG** → **Repair or replace harness or connector.**

**OK**

| | |
|---|---|
| 5 | **Check voltage between terminals IGT of ECM connector and body ground.** |




**PREPARATION:**
Remove instrument panel speaker No 1 panel (See page SF–65)
**CHECK:**
Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked
**OK:**
**Voltage: More than 0.1 V and less than 4.5 V**




**Reference: INSPECTION USING OSCILLOSCOPE**
During cranking or idling, check waveforms between terminals IGT and E1 of engine control module
HINT
The correct regulator waveforms are as shown

**NG** → **Check and replace ECM (See page IN–28).**

**NG**

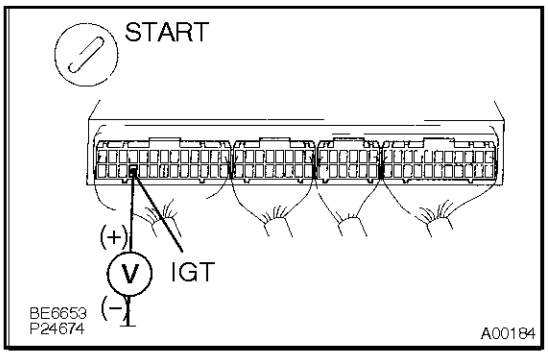


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 6 | **Disconnect igniter connector and check voltage between terminals IGT of ECM connector and body ground.** |




**PREPARATION:**

(a) Disconnect igniter connector

(b) Remove instrument panel speaker No 1 panel (See page SF–65)

**CHECK:**

Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked

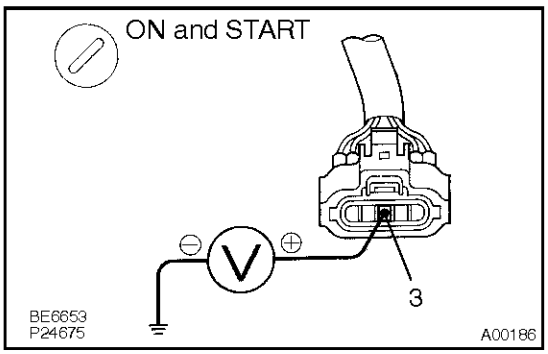
**OK:**

**Voltage: More than 0.1 V and less than 4.5 V**

| | |
|---|---|
| OK | **Check and replace ECM (See page IN–28).** |

NG

| | |
|---|---|
| 7 | **Check voltage between terminal 3 of igniter connector and body ground.** |




**PREPARATION:**

Disconnect igniter connector

**CHECK:**

Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to "ON" and "START" position

**OK:**

**Voltage: 9 – 14 V**

| | |
|---|---|
| NG | **Check and repair igniter power source circuit.** |

OK

| | |
|---|---|
| 8 | **Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–28).** |

| | |
|---|---|
| NG | **Repair or replace harness or connector.** |

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 9 | Check ignition coil (See page IG–1). |

NG → Replace ignition coil.

OK →

Replace igniter.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PR 02

| DTC | P1335 | Crankshaft Position Sensor Circuit Malfunction (during engine running) |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–62

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1335 | No crankshaft position sensor signal (NE signal) to ECM with engine speed 1 000 rpm or more | • Open or short in crankshaft position sensor circuit for NE signal<br>• Crankshaft position sensor for NE signal<br>• Starter<br>• ECM |

## WIRING DIAGRAM

See DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) for WIRING DIAGRAM and INSPECTION PROCEDURE



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



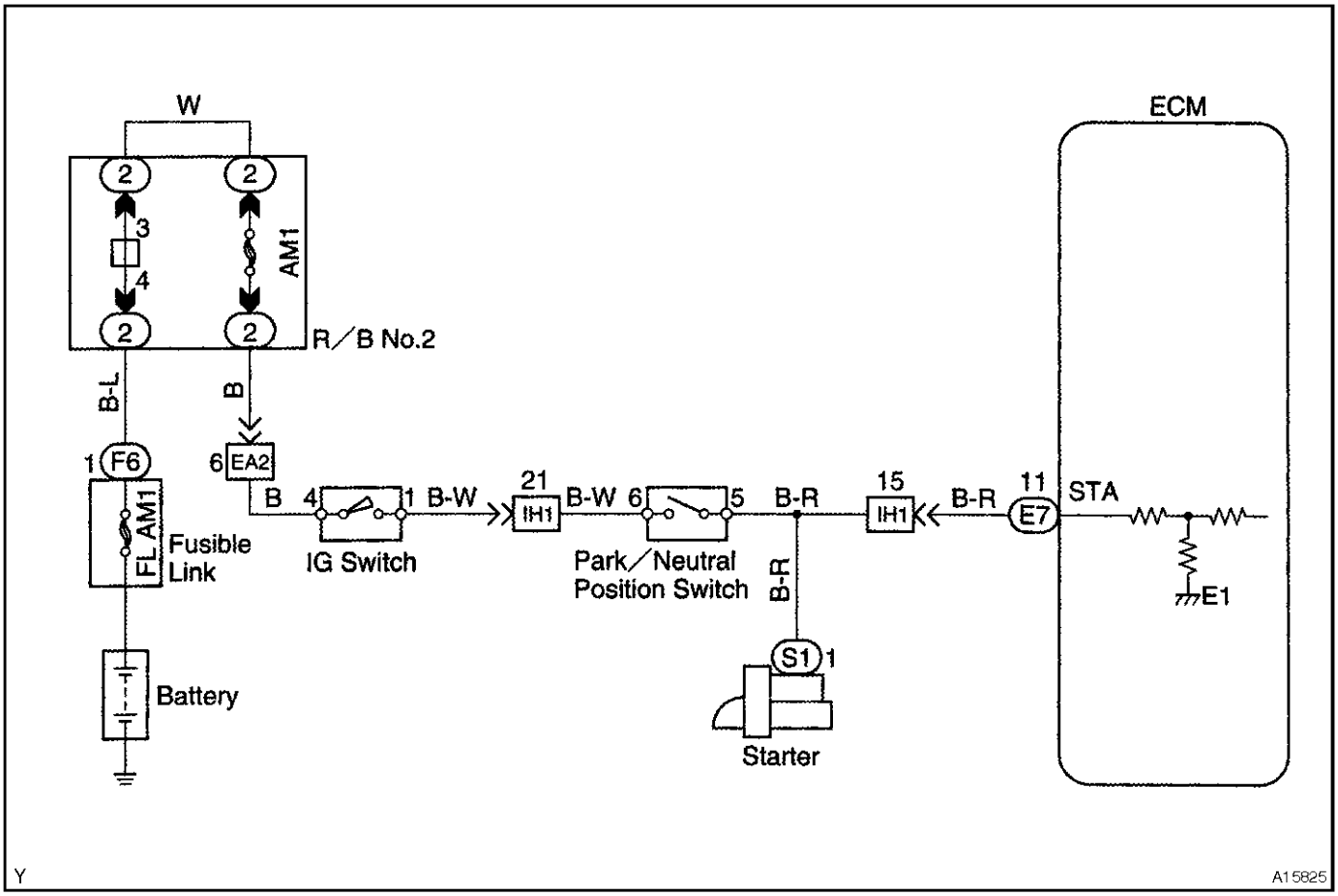
D968-01

| DTC | P1500 | Starter Signal Circuit Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor A rich mixture is therefore necessary in order to achieve good startability While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

HINT

This diagnostic chart is based on the premise that the engine is cranked normally If the engine is not cranked, proceed to the matrix chart of problem symptoms on page DI–19

| | |
|---|---|
| 1 | **Connect TOYOTA hand–held tester and check STA signal.** |

**PREPARATION:**

(a) Connect the TOYOTA hand–held tester to the DLC3

(b) Turn ignition switch ON and push TOYOTA hand–held tester main switch ON

**CHECK:**

Read STA signal on the TOYOTA hand–held tester while starter operates

**OK:**

| Ignition Switch Position | ON | START |
|---|---|---|
| STA Signal | OFF | ON |

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–19).**

NG

| | |
|---|---|
| 2 | **Check for open in harness and connector between ECM and starter relay (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PT-02

| DTC | P1600 | ECM BATT Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

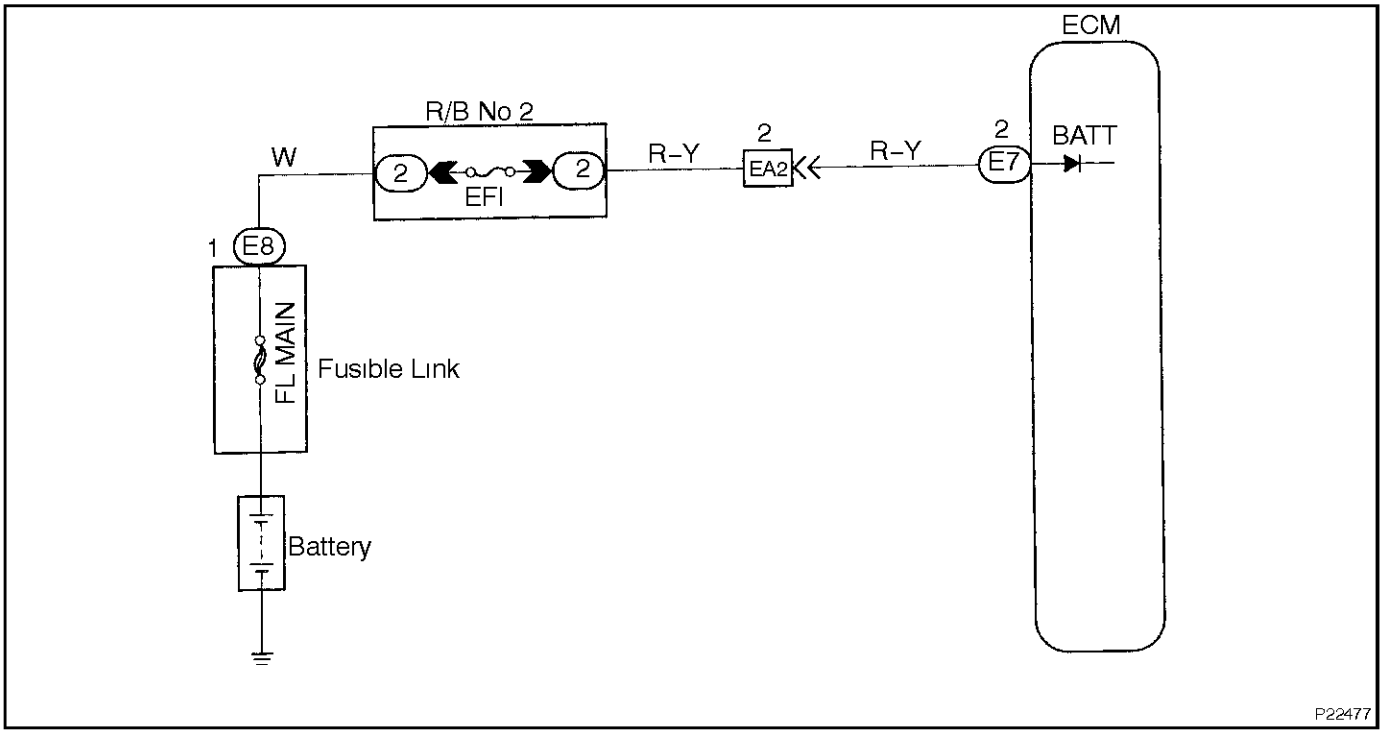
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1600 | Open in back up power source circuit | • Open in back up power source circuit<br>• ECM |

HINT

If DTC P1600 appear, the ECM does not store another DTC

## WIRING DIAGRAM





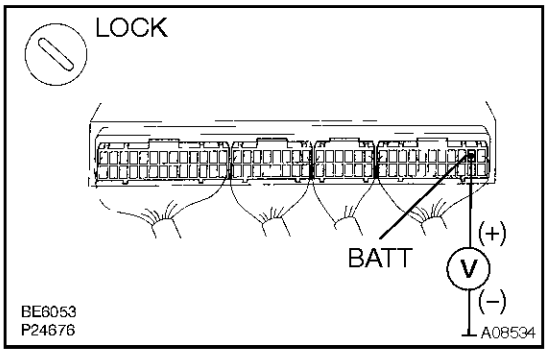

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminal BATT of ECM connector and body ground.** |

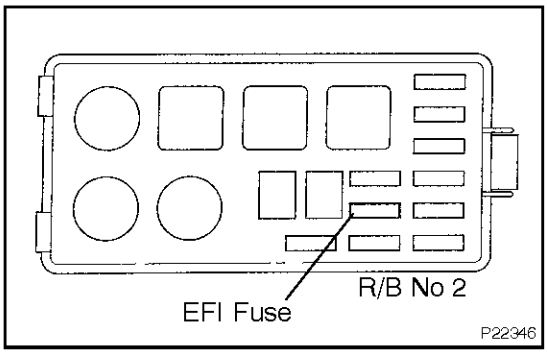



**PREPARATION:**
Remove the instrument panel speaker No 1 panel
(See page SF–65)
**CHECK:**
Measure voltage between terminal BATT of ECM connector and body ground
**OK:**
**Voltage 9 – 14 V**

| | |
|---|---|
| OK | **Check and replace ECM (See page IN–28).** |

NG

| | |
|---|---|
| 2 | **Check EFI fuse.** |




**PREPARATION:**
Remove EFI fuse from R/B No 2
**CHECK:**
Check continuity of EFI fuse
**OK:**
**Continuity**

| | |
|---|---|
| NG | **Check for short in all the harness and components connected to EFI fuse.** |

OK

**Check and repair harness or connector between battery, EFI fuse and ECM.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PU 02

| DTC | P1605 | Knock Control CPU Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

Refer to DTC P0325, P0330 (Knock Sensor 1, 2 Circuit Malfunction) on page DI–59

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1605 | Engine control computer malfunction (for knock control) | • ECM |

## WIRING DIAGRAM

Refer to P0325, P0330 (Knock Sensor 1, 2 Circuit Malfunction) on page DI–59

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Are there any other codes (besides DTC P1605) being output?** |

**YES** → **Go to relevant DTC chart.**

**NO** →

**Check and replace ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PV 02

| DTC | P1780 | Park/Neutral Position Switch Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

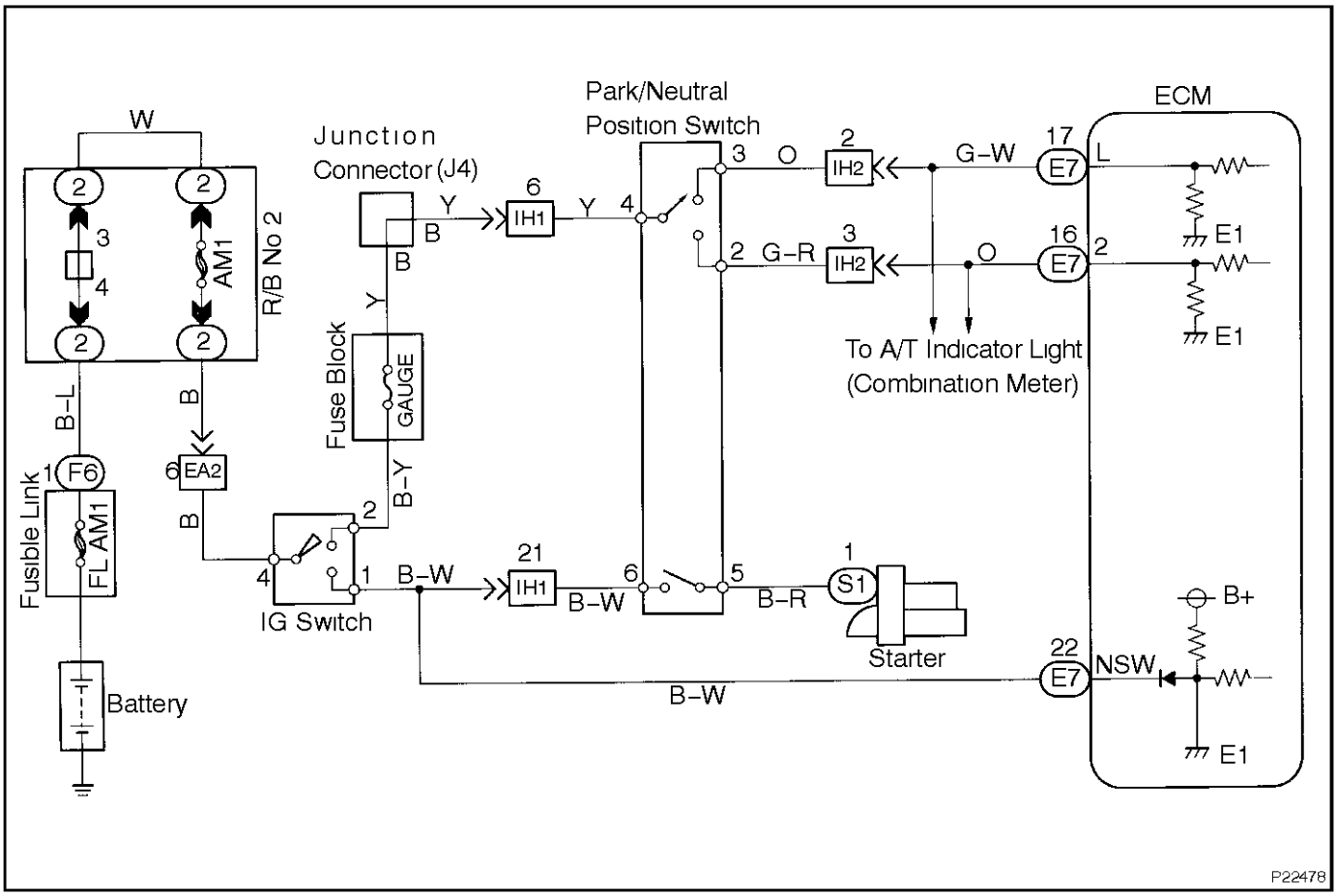
The park/neutral position switch goes on when the shift lever is in the N or P shift position When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0 V When the shift lever is in the D, 2, L or R position, the park/neutral position switch goes off, so the voltage of ECM, terminal NSW becomes battery voltage, the voltage of the ECM internal power source If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1780 | 2 or more switches are ON simultaneously for N 2 and L position (2 trip detection logic) | • Short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM |
| | When driving under conditions (a) and (b) for 30 sec or more the park/neutral position switch is ON (N position)<br>(2 trip detection logic)<br>(a) Vehicle speed 70 km/h (44 mph) or more<br>(b) Engine speed 1 500 – 2 500 rpm | |

HINT

After confirming DTC P1780 use the TOYOTA hand–held tester to confirm the PNP switch signal from "CURRENT DATA"

## WIRING DIAGRAM





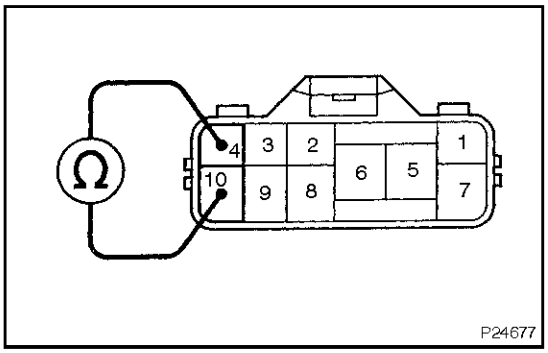

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| 1 | Check park/neutral position switch. |
|---|---|



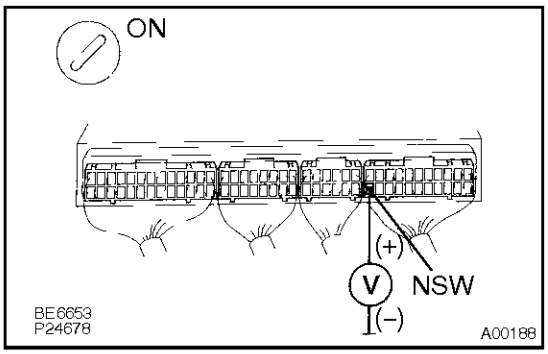

**PREPARATION:**
Disconnect park/neutral position switch connector
**CHECK:**
Check continuity between each terminal shown below when the shift lever is positioned to each range
**OK:**

| Shift Position | Terminal No. to continuity | Terminal No. to continuity |
|---|---|---|
| P | 4 – 7 | 5 – 6 |
| R | 4 – 8 | – |
| N | 4 – 10 | 5 – 6 |
| D | 4 – 9 | – |
| 2 | 2 – 4 | – |
| L | 3 – 4 | – |

NG → **Replace park/neutral position switch.**

OK

| 2 | Check voltage between terminal NSW of ECM connector and body ground. |
|---|---|




**PREPARATION:**
Remove instrument panel speaker No. 1 panel
(See page SF–65)
**CHECK:**
(a) Turn ignition switch ON
(b) Measure voltage between terminal NSW of ECM connector and body ground when the shift lever is positioned to the following positions
**OK:**

| Shift lever position | P or N | L, 2, D or R |
|---|---|---|
| Voltage | 0 V | 9 – 14 V |

OK → **Check and replace ECM (See page IN–28).**

NG

**Check for open and short in harness and connector between ECM and park/neutral position switch (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



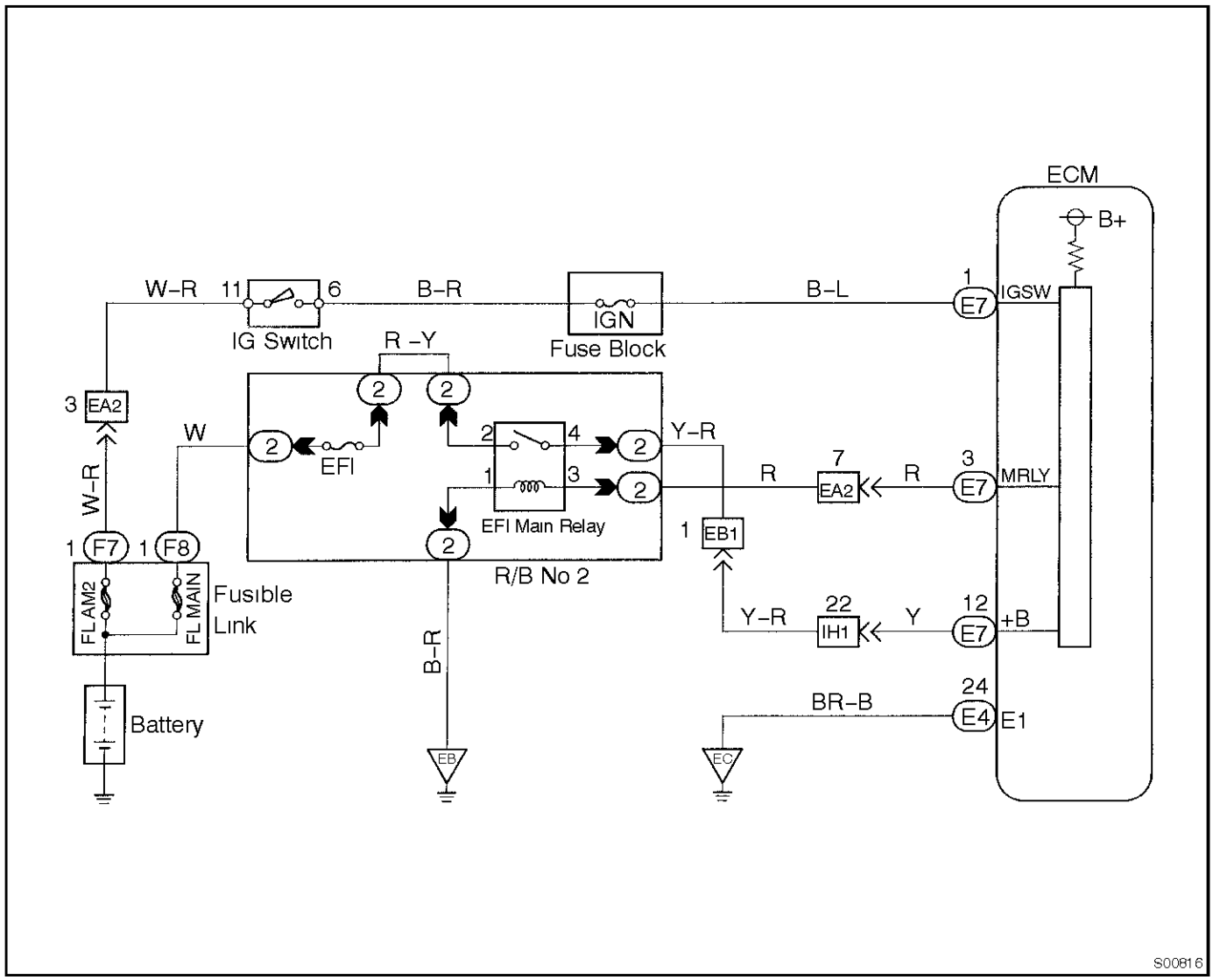
D5PX 02

# ECM Power Source Circuit

## CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay (Marking EFI) and supplying power to the terminals +B of the ECM

## WIRING DIAGRAM





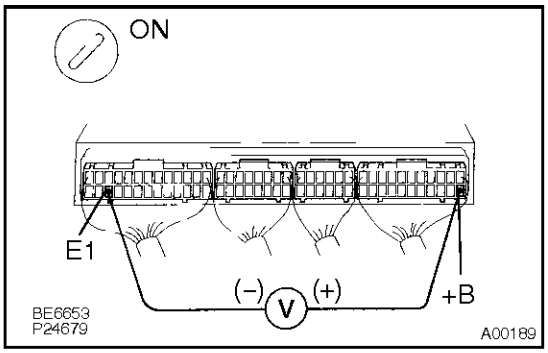

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals +B and E1 of the ECM connector.** |




**PREPARATION:**
(a) Remove instrument panel speaker No 1 panel (See page SF–65)
(b) Turn ignition switch ON

**CHECK:**
Measure voltage between terminals +B and E1 of the ECM connector

**OK:**
**Voltage: 9 – 14 V**

| | |
|---|---|
| OK | **Proceed to next circuit inspection shown on matrix chart (See page DI–19).** |

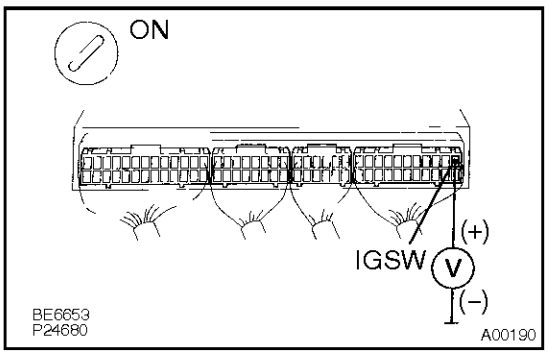
NG

| | |
|---|---|
| 2 | **Check for open in harness and connector between terminal E1 of ECM connector and body ground (See page IN–28).** |

| | |
|---|---|
| NG | **Repair or replace harness or connector.** |

OK

| | |
|---|---|
| 3 | **Check voltage between terminal IGSW of ECM connector and body ground.** |




**PREPARATION:**
(a) Remove instrument panel speaker No 1 panel (See page SF–65)
(b) Turn ignition switch ON

**CHECK:**
Measure voltage between terminals IGSW of ECM and body ground

**OK:**
**Voltage: 9 – 14 V**

| | |
|---|---|
| OK | **Go to step 6.** |

NG



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

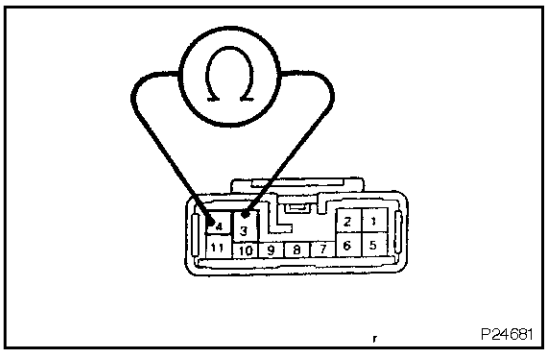


| | |
|---|---|
| 4 | **Check IGN fuse from fuse block.** |

**NG** → **Check for short in all the harness and components connected to IGN fuse.**

**OK**

| | |
|---|---|
| 5 | **Check ignition switch.** |




**PREPARATION:**

(a) Remove instrument lower finish panel

(b) Remove instrument cluster finish center panel No 2

**CHECK:**

Check continuity between terminals

**OK:**

| Shift Position | Terminal No. to continuity | Terminal No. to continuity |
|---|---|---|
| LOCK | – | – |
| ACC | 3 – 4 | – |
| ON | 2 – 3 – 4 | 6 – 11 |
| START | 1 – 2 – 4 | 5 – 6 – 11 |

**NG** → **Replace ignition switch.**

**OK**

**Check for open and short in harness and connector between battery and ignition switch and ECM.**

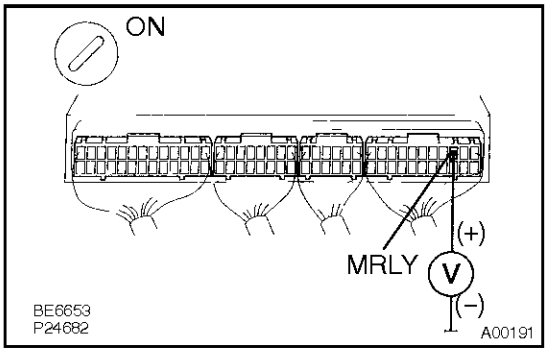


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 6 | **Check voltage between terminal MREL of ECM connector and body ground.** |




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal MREL of ECM and body ground

**OK:**

**Voltage: 9 – 14 V**

**NG** → **Check and replace ECM.**

**OK**

| | |
|---|---|
| 7 | **Check EFI fuse (Marking: EFI) (See page DI–105).** |

**NG** → **Check for short in all the harness and components connected to EFI fuse.**

**OK**

| | |
|---|---|
| 8 | **Check EFI main relay (Marking: EFI) (See page SF–54).** |

**NG** → **Replace EFI main relay (Marking: EFI).**

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 9 | **Check for open and short in harness and connector between terminal MREL of ECM connector and body ground (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

**Check for open and short in harness and connector between terminal +B of ECM connector and battery (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

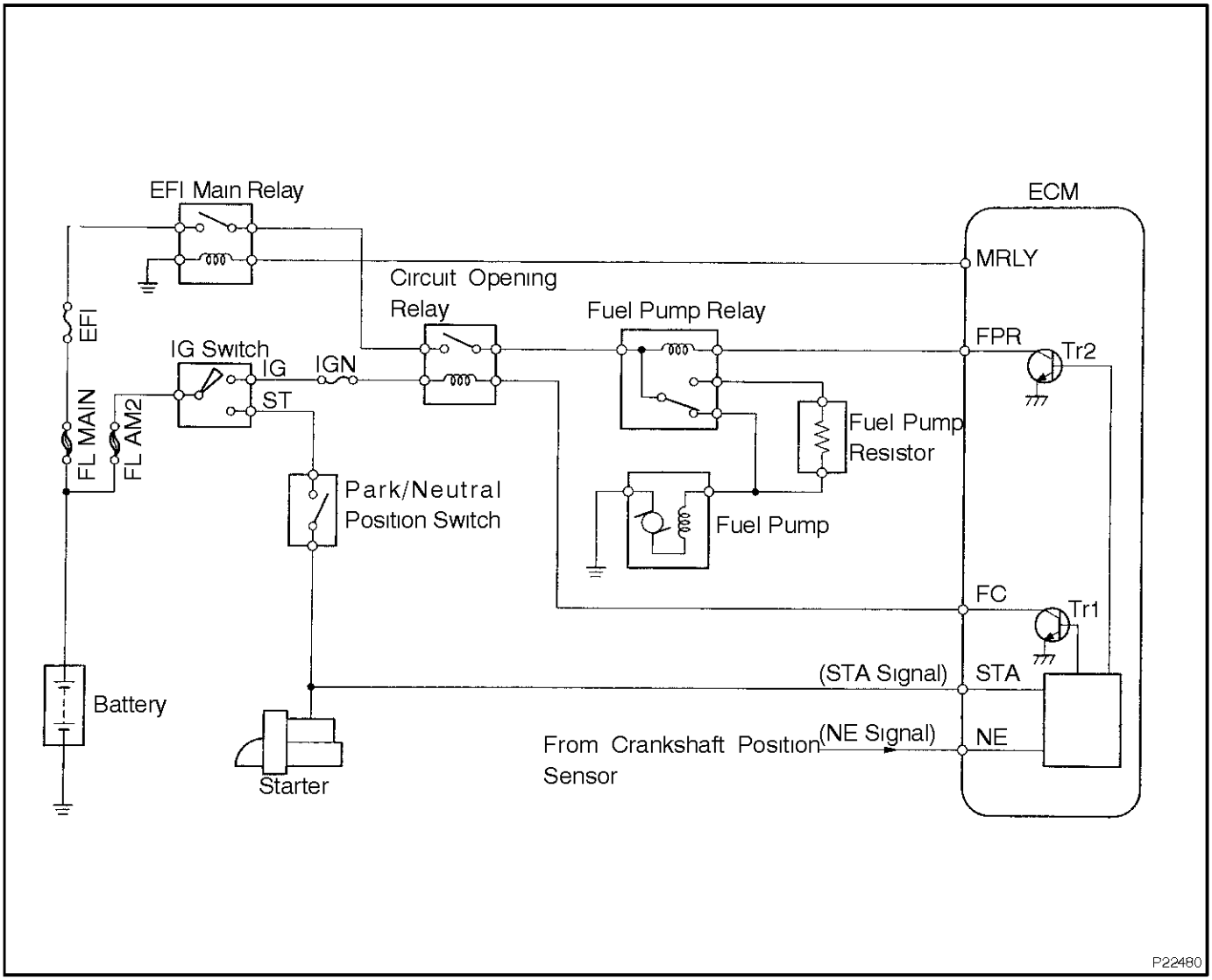


D5PY 02

# Fuel Pump Control Circuit

## CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows form terminal ST of the ignition switch to terminal STA of ECM (STA signal)
When the STA signal and NE signal are input to the ECM, Tr1 is turned ON, current flows to coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates
While the NE signal is generated (engine running), the ECM keeps Tr1 ON (circuit opening relay ON) and the fuel pump also keeps operating
The fuel pump speed is controlled at 2 levels (high speed or low speed) by the condition of the engine (starting, light load, heavy load) When the engine starts (STA ON), Tr2 in the ECM is OFF, so battery voltage is applied directry to the fuel pump Fuel pump operates at high speed
After the engine starts, during idling or light loads, since Tr2 goes ON, power is supplied to the fuel pump via the fuel pump resistor
Fuel pump operates at low speed



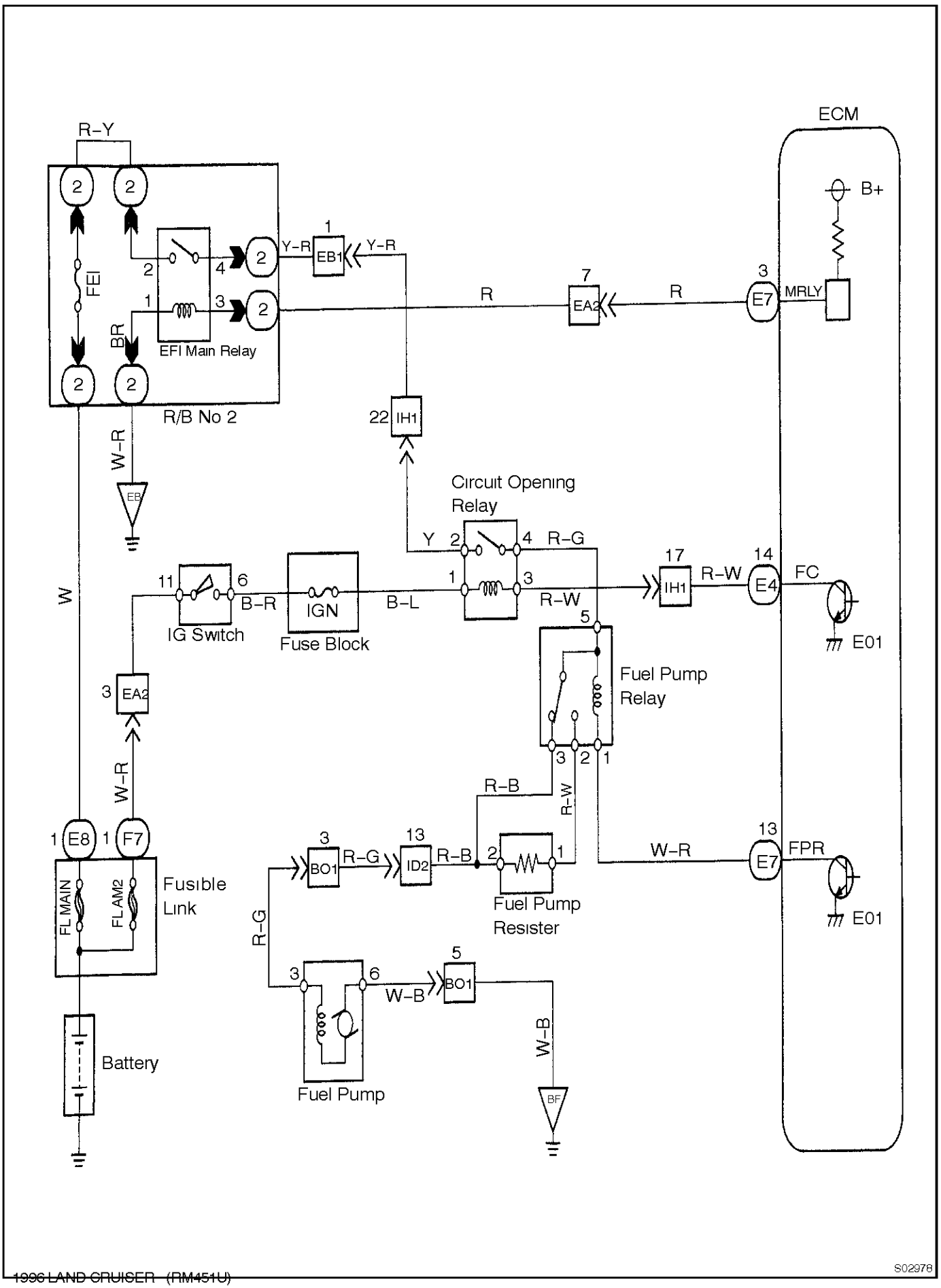



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# WIRING DIAGRAM




S02978



Brought to you by BirfMark
Version 1.11 - 03/16/2010

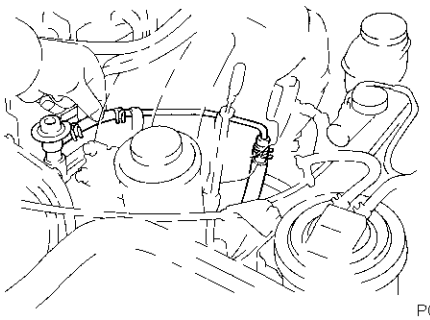
Brought to you by BirfMark



# INSPECTION PROCEDURE

## TOYOTA hand–held tester

| | |
|---|---|
| 1 | **Connect the TOYOTA hand–held tester and check operation of fuel pump.** |




**PREPARATION:**

(a) Remove the fuse cover on the ınstrument panel
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ıgnıtıon swıtch ON and TOYOTA hand–held tester maın swıtch ON
(d) Use ACTIVE TEST mode to operate the fuel pump

**CHECK:**

Check for fuel pressure ın the fuel return hose when ıt ıs pınched off

**OK:**

**There is pressure in the fuel return hose.**

HINT

At thıs tıme, you wıll hear a fuel flowıng noıse

| | |
|---|---|
| OK | **Go to step 4.** |

NG

| | |
|---|---|
| 2 | **Check circuit opening relay (See page SF–56).** |

| | |
|---|---|
| NG | **Replace circuit opening relay.** |

OK

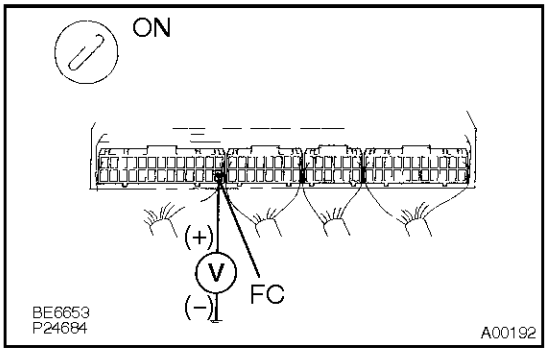


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminal FC of ECM connector and body ground. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal FC of ECM and body ground

**OK:**

**Voltage: 9 – 14 V**

| OK | Go to step 5. |
|---|---|

NG

**Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page IN–28).**

| 4 | Connect the TOYOTA hand–held tester and check operation of fuel pump relay. |
|---|---|

**PREPARATION:**

(a) Connect the TOYOTA hand–held tester to the DLC3

(b) Start the engine

(c) Turn TOYOTA hand–held tester main switch ON

(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester

**CHECK:**

Check operation of fuel pump relay when it is switched ON and OFF by the TOYOTA hand–held tester

**OK:**

**Operating noise can be heard from the relay.**

| OK | Go to step 8. |
|---|---|

NG

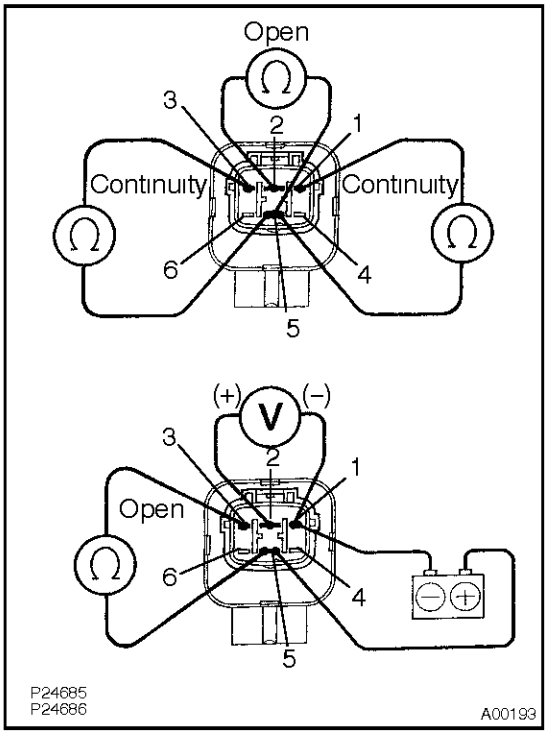


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check operation of fuel pump relay. |
|---|---|




**PREPARATION:**

(a) Disconnect fuel pump relay connector

(b) Remove fuel pump relay

**CHECK:**

Check continuity between terminals of fuel pump relay

**OK:**

| | |
|---|---|
| Terminals 3 and 5 | Continuity |
| Terminals 2 and 5 | Open |
| Terminals 1 and 5 | Continuity (Reference value 80 Ω) |

**CHECK:**

(a) Apply battery voltage between terminals 1 and 5

(b) Measure voltage between terminals 1 and 2

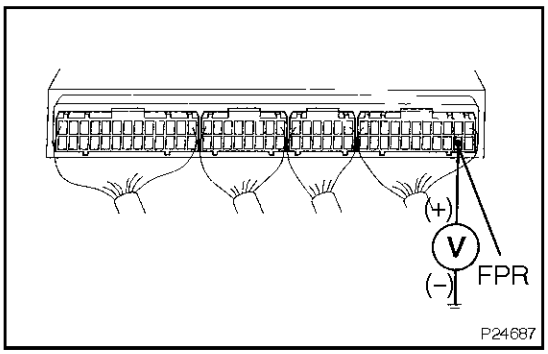
**OK:**

| | |
|---|---|
| Terminals 1 and 2 | Battery voltage |

NG → **Replace fuel pump relay.**

OK

| 6 | Check voltage between terminal FPR of ECM connector and body ground. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Start the engine

**CHECK:**

Measure voltage between terminal FPR of ECM and body ground while racing the engine

**OK:**

| Time after engine started | Voltage |
|---|---|
| 60 seconds or more | 0 – 3 V |
| Less than 60 seconds | 9 – 14 V |

OK → **Check and replace ECM (See page IN–28).**

NG



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

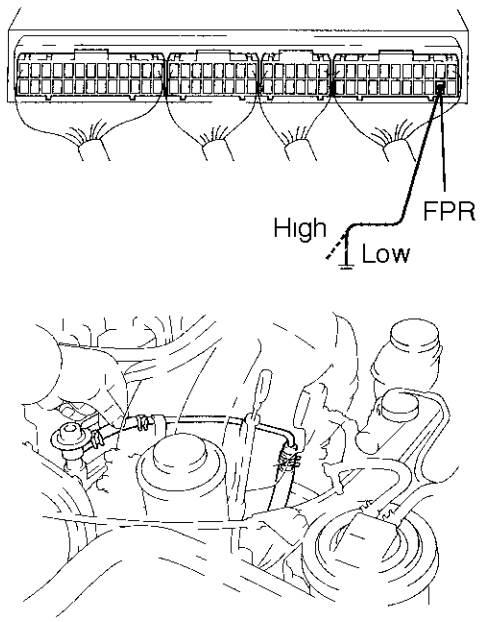


| | |
|---|---|
| 7 | **Check for open and short in harness and connector between terminal FPR of ECM connector and fuel pump relay (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

| | |
|---|---|
| 8 | **Check operation of fuel pump.** |




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Connect the TOYOTA hand – held tester to the DLC3

(c) Turn ignition switch ON and TOYOTA hand–held tester main switch ON

(d) Use ACTIVE TEST mode to operate the fuel pump

**CHECK:**

Check operation of fuel pump, when it is operated by the TOYOTA hand–held tester and terminal FPR of ECM is grounded and is not grounded

**OK:**

**There is pressure in the inlet hose.**

HINT

At this time, you will hear a fuel flowing noise

| FPR is grounded (Low speed) | FPR is not grounded (High speed) | |
|---|---|---|
| NG | NG | Go to step 9 |
| NG | OK | Go to step 10 |
| OK | NG | Repair or replace harness or connector between fuel pump relay and fuel pump |

| | |
|---|---|
| 9 | **Check fuel pump (See page SF–6).** |

NG → **Repair or replace fuel pump.**

OK

**Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 10 | **Check fuel pump resistor. (See page SF–58).** |

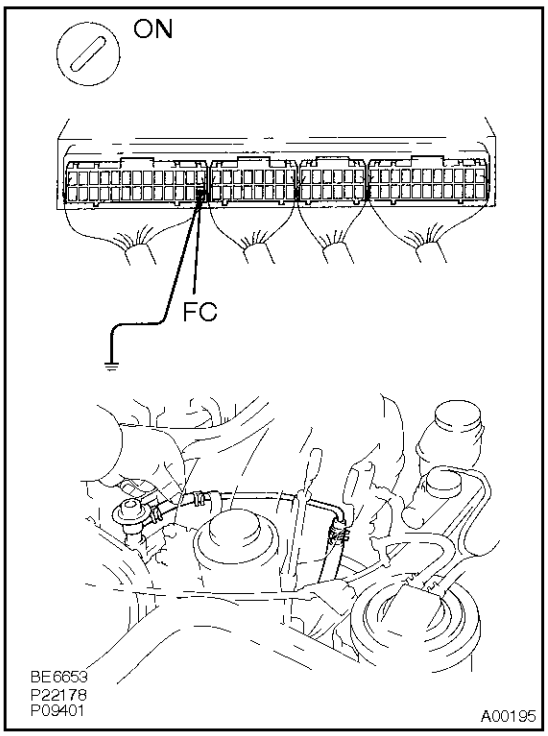
**NG** → **Replace fuel pump resistor.**

**OK**

**Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page IN–28).**

## OBD II scan tool (excluding TOYOTA hand–held tester)

| | |
|---|---|
| 1 | **Check fuel pump operation.** |




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

(a) Connect between terminal FC of ECM and body ground

(b) Check for fuel pressure in the fuel inlet hose when it is pinched off

**OK:**

**There is pressure in the fuel inlet hose.**

HINT

At this time, you will hear a fuel flowing noise

**OK** → **Go to step 4.**

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | Check circuit opening relay (See page DI–84). |

NG → Replace circuit opening relay.

OK

| | |
|---|---|
| 3 | Check voltage between terminal FC of ECM connector and body ground (See step 3 of TOYOTA hand–held tester). |

OK → Go to step 4.

NG

Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page IN–28).

| | |
|---|---|
| 4 | Check operation of fuel pump relay (See step 5 of TOYOTA hand–held tester). |

NG → Replace fuel pump relay.

OK

| | |
|---|---|
| 5 | Check voltage between terminal FPR of ECM connector and body ground (See step 6 of TOYOTA hand–held tester). |

NG → Check and replace ECM (See page IN–28).

| | |
|---|---|
| 6 | Check for open and short in harness and connector between terminal FC of ECM connector and fuel pump relay (See page IN–28). |

NG → Repair or replace harness or connector.

OK

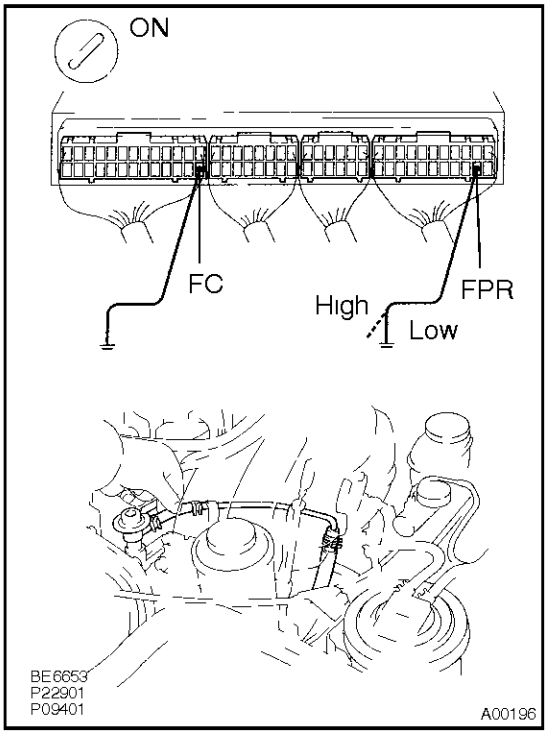


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 7 | Check operation of fuel pump. |
|---|---|




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

(a) Connect terminal FC of ECM and body ground

(b) Check operation of fuel pump when terminal FPR of ECM is grounded and is not grounded

**OK:**

**There is pressure in the inlet hose.**

HINT

At this time, you will hear a fuel flowing noise

| FPR is grounded (Low speed) | FPR is not grounded (High speed) | |
|---|---|---|
| NG | NG | Go to step 8 |
| NG | OK | Go to step 9 |
| OK | NG | Repair or replace harness or connecter between fuel pump relay and fuel pump |

| 8 | Check fuel pump (See page SF–6). |
|---|---|

NG → **Repair or replace fuel pump.**

OK

**Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 9 | Check fuel pump resistor (See page SF–58). |

NG → Replace fuel pump resistor.

OK

Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page IN–28).



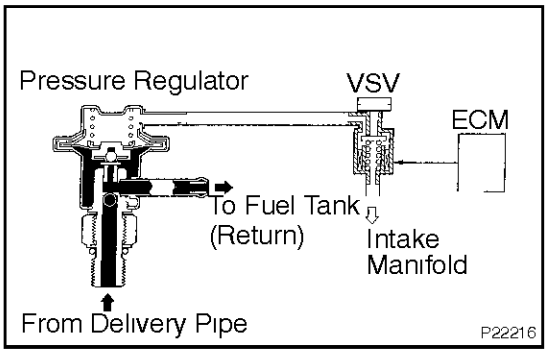
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5PZ-02

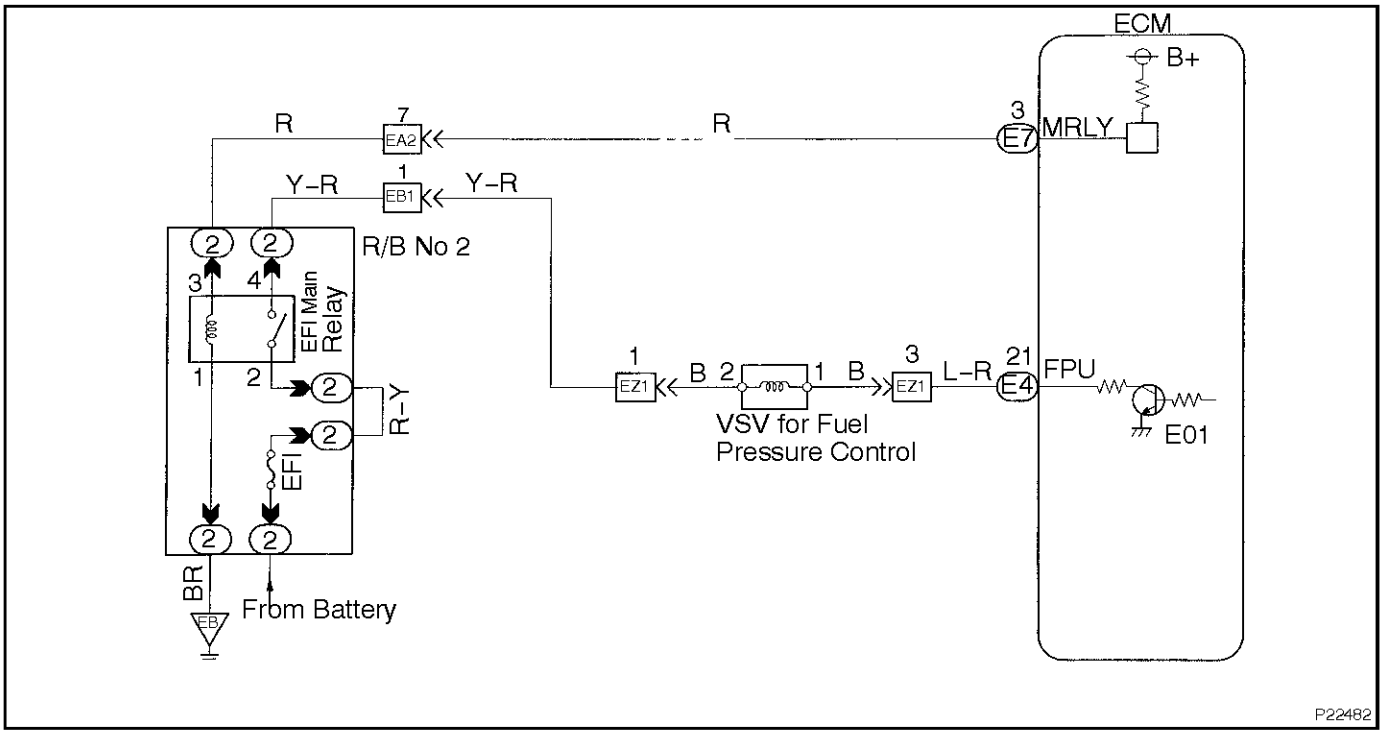
# Fuel Pressure Control Circuit




## CIRCUIT DESCRIPTION

The ECM turns on a VSV (Vacuum Switching Valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine starting
The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm
Fuel pressure control ends approx 120 sec after the engine is started

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

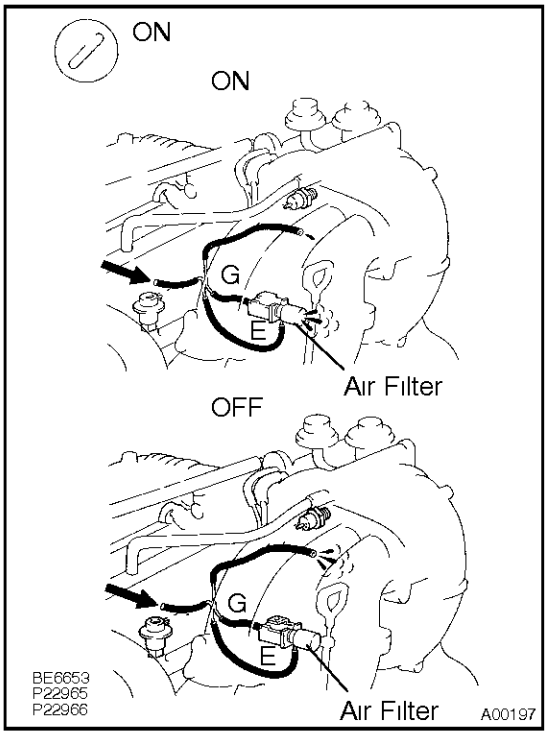
Brought to you by BirfMark



# INSPECTION PROCEDURE

## TOYOTA hand–held tester

| | |
|---|---|
| 1 | **Connect the TOYOTA hand–held tester and check operation of VSV for fuel pressure control.** |




**PREPARATION:**

(a) Remove the fuse cover on the instrument panel
(b) Connect the TOYOTA hand–held tester to the DLC3
(c) Turn ignition switch ON and TOYOTA hand–held tester main switch ON
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester

**CHECK:**

Check operation of VSV when VSV is operated by the TOYOTA hand–held tester

**OK:**

**VSV is ON:**
**Air from pipe E is flowing out through the air filter.**
**VSV is OFF:**
**Air from pipe E is flowing out through pipe G.**

| | |
|---|---|
| OK | **Check and repair fuel pressure regulator (See page SF–19).** |

**NG**

| | |
|---|---|
| 2 | **Check VSV for fuel pressure control (See page SF–59).** |

| | |
|---|---|
| NG | **Replace VSV for fuel pressure control.** |

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK →

**Check and replace ECM (See page IN–28).**

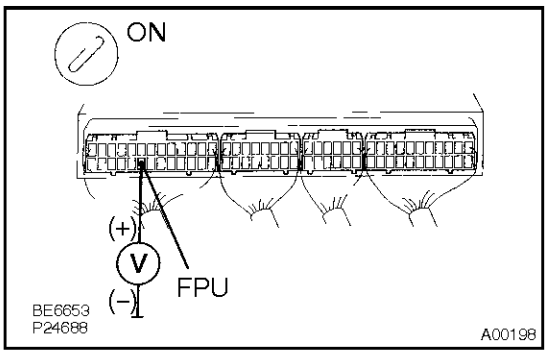
## OBD II scan tool (excluding TOYOTA hand–held tester)

| | |
|---|---|
| 1 | **Check VSV for fuel pressure control (See page SF–59).** |

NG → **Replace VSV for fuel pressure control.**

OK →

| | |
|---|---|
| 2 | **Check voltage between terminal FPU of ECM connector and body ground.** |




**PREPARATION:**

(a) Remove instrument panel speaker No 1 panel (See page SF–65)

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal FPU of ECM connector and body ground

**OK:**

**Voltage: 9 – 14 V**

NG → **Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page IN–28).**

OK →



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | Check fuel pressure regulator (See page SF–19). |

NG → Repair or replace fuel pressure regulator.

OK

Check and replace ECM (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

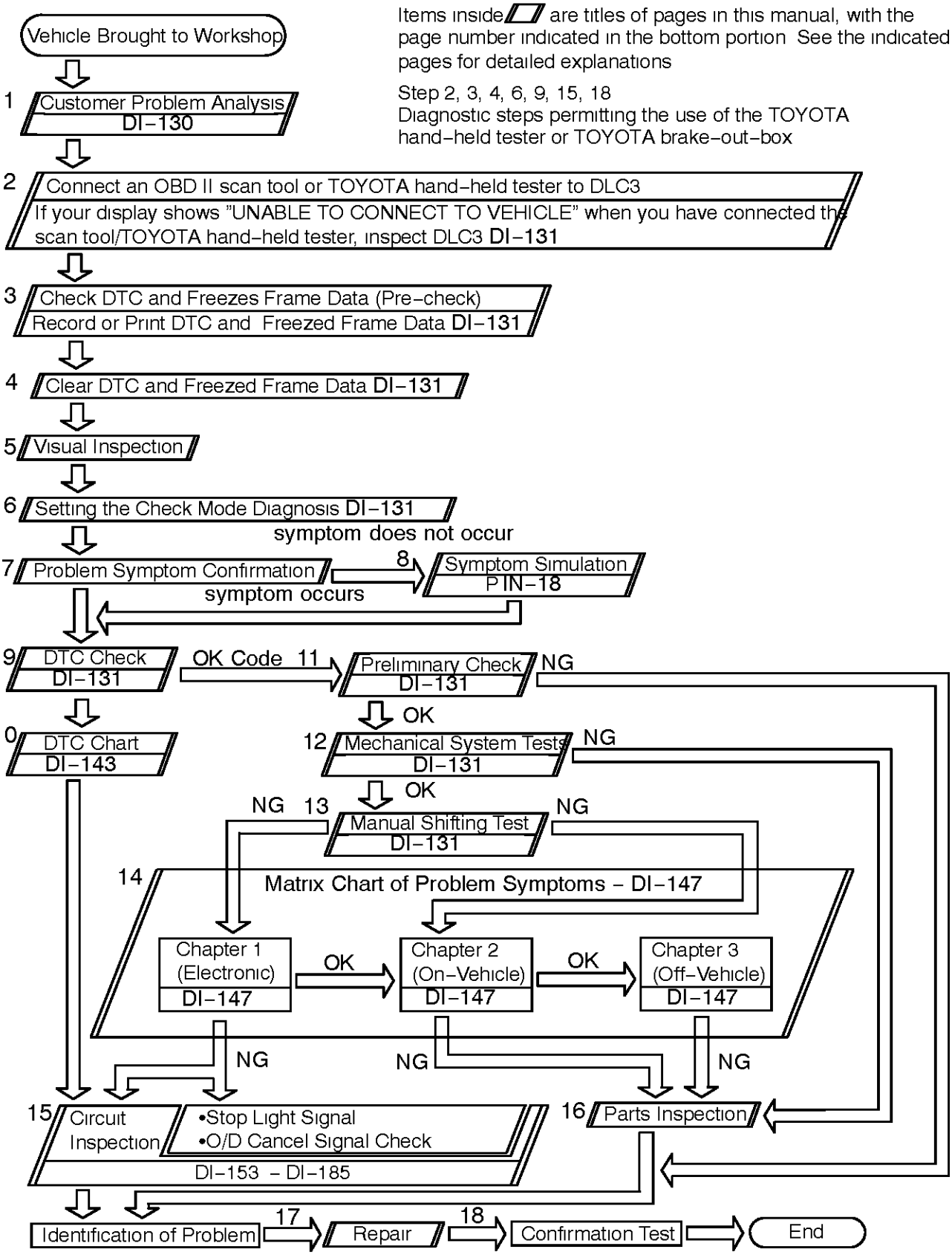


# AUTOMATIC TRANSMISSION

D5K4-03

## HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page




Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations

Step 2, 3, 4, 6, 9, 15, 18
Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA brake–out–box



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5K6-01

# CUSTOMER PROBLEM ANALYSIS CHECK

| Transmission Control System Check Sheet | Inspector's Name |
|---|---|

| | | | |
|---|---|---|---|
| Customer's Name | | Registration No | |
| | | Registration Year | / / |
| | | Frame No | |
| Date Vehicle Brought In | / / | Odometer Reading | km mile |

| | |
|---|---|
| Date Problem Occurred | / / |
| How Often Does Problem Occur? | ☐ Continuous ☐ Intermittent ( times a day) |

| | |
|---|---|
| Symptoms | ☐ Vehicle does not move ( ☐ Any position ☐ Particular position ) |
| | ☐ No up–shift ( ☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D ) |
| | ☐ No down–shift ( ☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st ) |
| | ☐ Lock–up malfunction |
| | ☐ Shift point too high or too low |
| | ☐ Harsh engagement ( ☐ N → D ☐ Lock–up ☐ Any drive position ) |
| | ☐ Slip or shudder |
| | ☐ No kick–down |
| | ☐ Others ( ) |

| | | | |
|---|---|---|---|
| Check Item | Malfunction Indicator Lamp | ☐ Normal | ☐ Remains ON |

| | | | |
|---|---|---|---|
| DTC Check | 1st Time | ☐ Normal code | ☐ Malfunction code (Code ) |
| | 2nd Time | ☐ Normal code | ☐ Malfunction code (Code ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



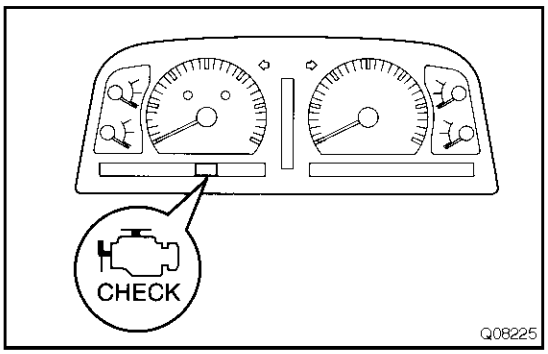
D5K9-03

# PRE–CHECK

## 1. DIAGNOSIS SYSTEM

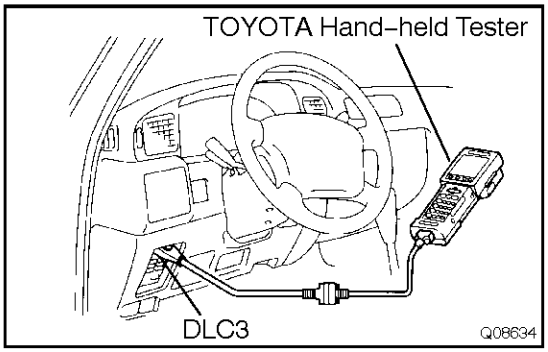
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM




- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–13)

If the malfunction does not occurs in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory




- To check the DTCs, connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the OBDII scan tool's instruction book)
- DTCs include SAE controlled codes and Manufacturer controlled codes
  SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See page DI–143)



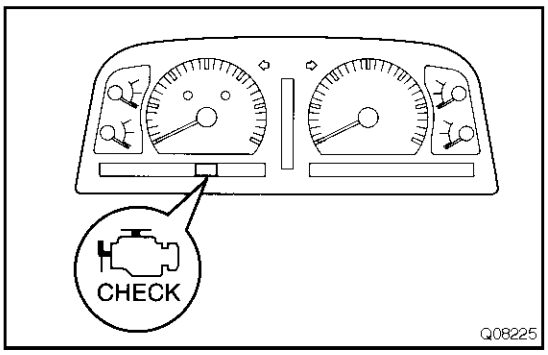
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



- The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting Most DTCs use 2 trip detection logic(*) to prevent erroneous detection By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester) (See step 3)
- *2 trip detection logic
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up




**2. Normal Mode:**

**INSPECT DIAGNOSIS**

(a) Check the MIL

(1) The MIL lights up when the ignition switch is turned ON and the engine is not running

HINT

If the MIL does not light up, troubleshoot the combination meter (See page BE–2)

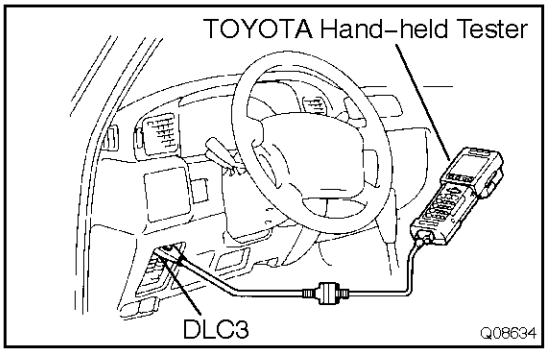
(2) When the engine is started, the MIL should go off
If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system

(b) Check the DTC

**NOTICE:**

**TOYOTA hand–held tester only:**

**When the diagnostic system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.**




(1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester

(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 in the fuse box at the lower left of the instrument panel

(3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand–held tester switch ON



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freeze frame data Note them down (For operating instructions, see the OBD II scan tool's instruction book)

(5) See page DI–143 to confirm the details of the DTCs

**NOTICE:**

**When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use the normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated for the 1st time. Them repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.**

**3. Check Mode:**

**INSPECT DIAGNOSIS**

HINT

TOYOTA hand–held tester only

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in check mode

(a) Check the DTC

(1) Check the initial conditions

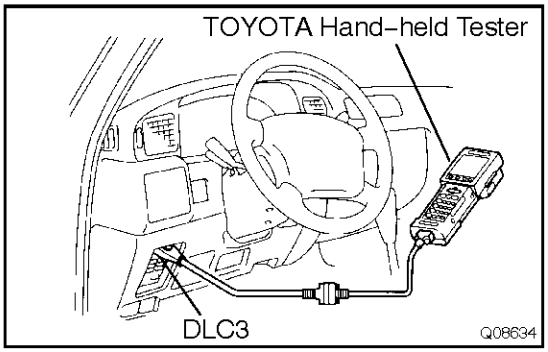
- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transmission in P position
- Air conditioning switched off

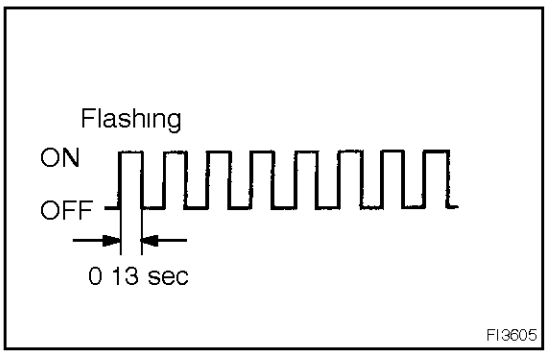
(2) Turn the ignition switch OFF

(3) Prepare the TOYOTA hand–held tester

(4) Connect the TOYOTA hand–held tester to the DLC3 in the fuse box at the lower left of the instrument panel

(5) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON




(6) Switch the TOYOTA hand–held tester from the normal mode to the check mode (Check that the MIL flashes)

(7) Start the engine (The MIL goes)

(8) Simulate the conditions of the malfunction described by the customer

**NOTICE:**

**Leave the ignition switch ON until you have checked the DTCs etc.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc

HINT

Take care not to turn the ignition switch OFF Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all DTCs, etc are erased

(10) After checking the DTC, inspect the applicable circuit

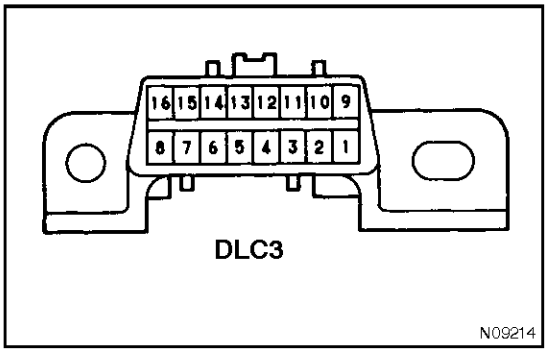
(b) Clear the DTC

The following actions will erase the DTCs and freeze frame data

Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions )

**NOTICE:**

**If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.**




DLC3

(c) Check the DLC3

The vehicle's ECM uses V P W (Variable Pulse Width) for communication to comply with SAE J1850 The terminal arrangement of DLC3 complies with SAE J1962 and matches the V P W format

| Terminal No | Connection/Voltage or Resistance | Condition |
|---|---|---|
| 2 | Bus ⊕ Line/Pulse generation | During communication |
| 4 | Chassis Ground – Body/1 Ω or less | Always |
| 5 | Signal Ground – Body/1 Ω or less | Always |
| 16 | Battery Positive – Body/9 – 14 V or 1 Ω or less | Always |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual

**4. CHECK FOR INTERMITTENT PROBLEMS**

TOYOTA hand–held tester only

By putting the vehicle's ECM in the check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased This makes it easier to detect intermittent problems

(1) Clear the DTC (See step 3)
(2) Set the check mode (See step 3)
(3) Do a simulation test (See page IN–18)
(4) Check the cnnector connection and terminal (See page IN–28)
(5) Visual check and contact pressure (See page IN–28)
(6) Handle the connector (See page IN–28)

**5. ROAD TEST**

**NOTICE:**

**Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**

(a) D position test in NORM and PWR pattern positions
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position and check the following

HINT

When the 2nd start switch in on, there is no 1 → 2 up–shift and 2 → 1 down–shift

(1) 1 → 2, 2 → 3 and 3 → O/D up–shift takes place, and shift point should conform to those shown in the automatic shift schedule Conduct a test under both Normal and Power patterns

HINT

There is no O/D up–shift or lock–up when the coolant temperature is below 55°C (131°F)

**Evaluation:**

- If there is no 1 → 2 up–shift
  Shift solenoid valve No 2 is stuck
  1–2 shift valve is stuck
- If there is no 2 → 3 up–shift
  Shift solenoid valve No 1 is stuck
  2–3 shift valve is stuck
- If there is no 3 → O/D up–shift
  3–4 shift valve is stuck
- If the shift point is defective
  Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc , are defective



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



- If the lock–up is defective
  Lock–up solenoid is stuck
  Lock–up control valve is stuck
  Lock–up signal value is stuck

(2) In the same way, check the shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shift

**Evaluation:**

If the shock is excessive
Line pressure is too high
Accumulator is defective
Check ball is defective

(3) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration

HINT

The check for the cause of abnormal noises and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc

(4) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule

(5) Check for abnormal shock and slip at kick–down

(6) Check for the lock–up mechanism

- Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 95 km/h (59 mph)
- Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly

If there is a big jump in engine RPM, there is no lock–up

(b) 2 position test

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check the following points

HINT

When the 2nd start switch is on, there is no 1 → 2 up–shift and 2 → 1 down–shift

(1) Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule

HINT

There is no O/D up–shift and lock–up in the 2 position

(2) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect

**Evaluation:**

If there is no engine braking effect
2nd coast brake is defective

(3) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift

(c) L position test

(1) While running in the L position, check to see that there is no up–shift to 2nd gear

(2) While running in the L position, release the accelerator pedal and check the engine braking effect

**Evaluation:**

If there is no engine braking effect
1stand reverse brake is defective

(3) Check for abnormal noise during acceleration and deceleration

(d) R position test

Shift into the R position and fully depress the accelerator pedal and check for slipping



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



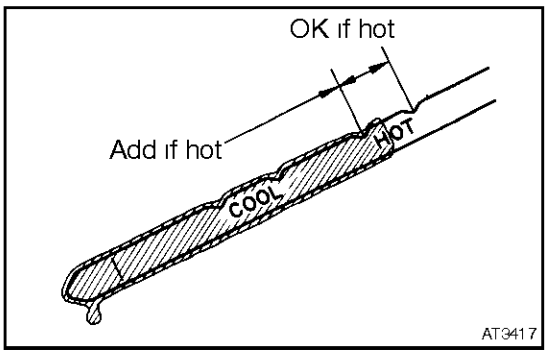
(e) P position test
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

## 6. BASIC INSPECTION

(a) Check the fluid level

HINT

- Drive the vehicle so that the engine and transmission are at normal operating temperature
  **Fluid temp.: 70 – 80°C (158 – 176°F)**
- Only use the COOL range on the dipstick as a rough reference when the ATF is replaced or the engine does not run

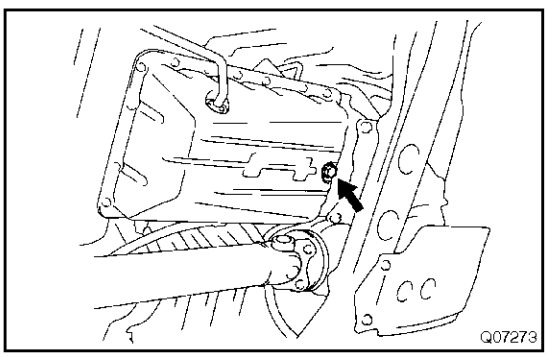



(1) Park the vehicle on a level surface and set the parking brake
(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position
(3) Pull out the dipstick and wipe it clean
(4) Push it back fully into the pipe
(5) Pull it out and check that the fluid level is in the HOT range

If the level is at the low side, add new fluid
**Fluid type: ATF DEXRON ®II**

**NOTICE:**
**Do not overfill.**

(b) Check the fluid condition
If the fluid smells burnt or is black, replace it.



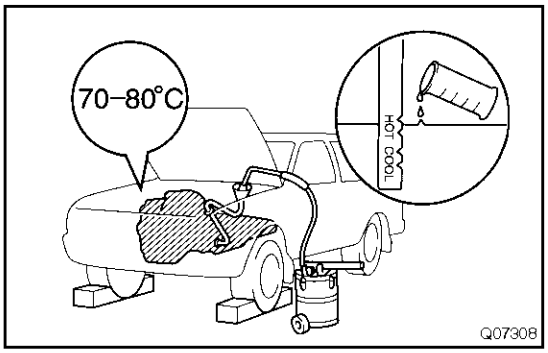

(c) Replace the ATF
(1) Remove the drain plug and drain the ATF
(2) Reinstall the drain plug securely



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(3) With the engine OFF, add new fluid through the oil filler pipe

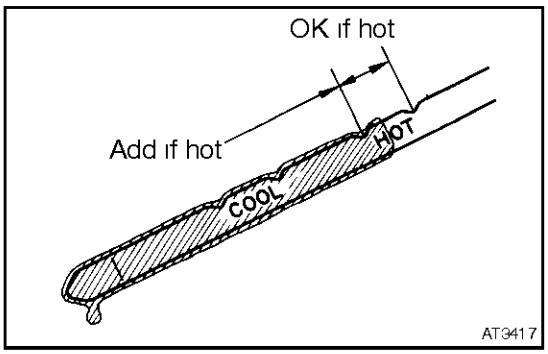
**Fluid type: ATF DEXRON ®II**

**Capacity:**

**Dry fill: 11.0 liters (11.6 US qts, 9.7 Imp. qts)**

**Drain and refill: 1.9 liters (2.0 US qts, 1.7 Imp. qts)**

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position




(5) With the engine idling, check the fluid level Add fluid up to the COOL level on the dipstick

(6) Check the fluid level at the normal operating temperature 70 – 80°C (158 – 176°F) and add as necessary

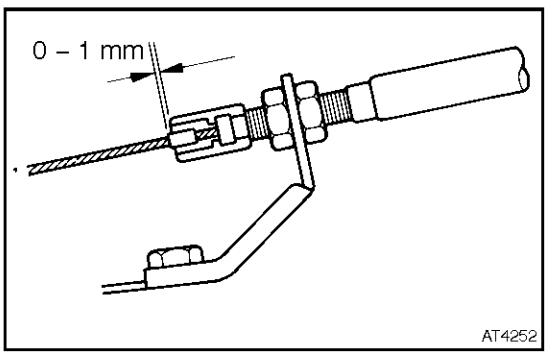
**NOTICE:**

**Do not overfill.**

(d) Check the fluid leaks

Check for leaks in the transmission

If there are leaks, it is necessary to repair or replace O–rings, Seal packings, oil seals, plugs or other parts




(e) Inspect and adjust the throttle cable

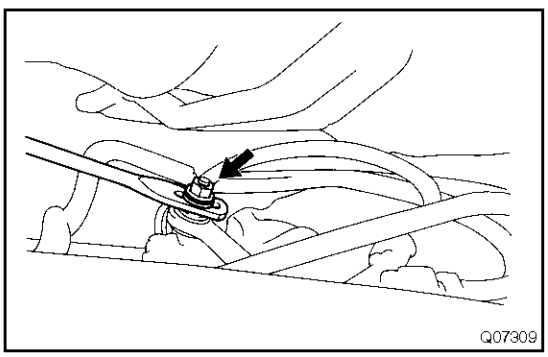
(1) Check that the throttle valve is fully closed

(2) Check that the inner cable is not slack

(3) Measure the distance between the outer cable end and stopper on the cable

**Standard distance: 0 – 1 mm (0 – 0.04 in.)**

If the distance is not standard, adjust the cable by the adjusting nuts




(f) Inspect and adjust the shift lever position

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position

If the indicator is not aligned with the correct position, carry out the following adjustment procedures

(1) Loosen the nut on the control rod

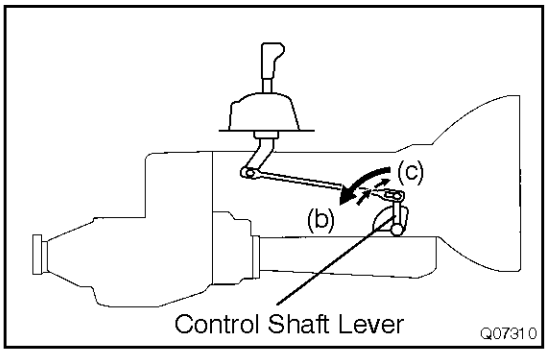
(2) Push the control rod fully rearward



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

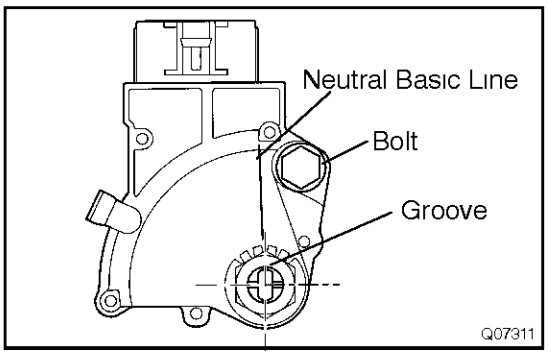





(3) Return the control shaft lever 2 notches to N position
(4) Set the shift lever to N position
(5) While holding the shift lever lightly toward the R position side, adjust the control rod nut
(6) Tighten the control rod nut

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

(7) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position




(g) Inspec and adjust park/neutral positoin switch
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions

If not as stated above, carry out the following adjustment procedure

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position
(2) Align the groove and neutral basic line
(3) Hold in position and tighten the bolt

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

For continuity inspect of the park/neutral position switch, see page DI–169

(h) Check the idle speed

**Idle speed:**
**650 ± 50 rpm (In N position and air conditioner OFF)**

## 7. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed
The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions

**NOTICE:**

- **Do the that at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the 4 wheels
(2) Connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3
(3) Fully apply the parking brake
(4) Keep your left foot pressed firmly on the brake pedal
(5) Start the engine



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

**Stall speed: 1,950 ± 150 rpm**

(7) Do the same test in R position.

**Stall speed: 1,950 ± 150 rpm**

**Evaluation:**

| Problem | Possible cause |
|---|---|
| Stall speed low in D and R positions | • Engine output may be insufficient<br>• Stator one–way clutch is operating properly<br>HINT<br>If more than 600 rpm below the specified value, the torque converter clutch could be faulty |
| Stall speed high in D position | • Line pressure too low<br>• Forward clutch slipping<br>• No. 2 one–way clutch not operating properly<br>• O/D one–way clutch not operating properly |
| Stall speed high in R position | • Line pressure too low<br>• Direct clutch slipping<br>• 1st and reverse brake slipping<br>• O/D clutch slipping |
| Stall speed high in D and R positions | • Line pressure too low<br>• Improper fluid level<br>• O/D one–way clutch not operating properly |

(b) Measure the time lag.

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and 1st and reverse brake.

**NOTICE:**

- **Do the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.

(2) Start the engine and check idle speed.

**Idle speed: 650 ± 50 rpm (In N position and air conditioner OFF)**

(3) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

In the same manner, measure the time lag for N → R.

**Time lag: N → D Less than 1.2 seconds**

In the same way, measure the time lag for N → R.

**Time lag: N → R Less than 1.5 seconds**

If N → D time or N → R time lag is longer than specified.

**Evaluation:**

| Problem | Possible cause |
|---|---|
| N → D time lag is longer | • Line pressure too low<br>• Forward clutch worn<br>• O/D one–way clutch not operating properly |
| N → R time lag is longer | • Line pressure too low<br>• Direct clutch worn<br>• 1st and reverse brake worn<br>• O/D one–way clutch not operating properly |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 8. HYDRAULIC TEST

Measure the line pressure

**NOTICE:**

- **Do the test at normal operation ATF temperature 50 – 80°C (122 – 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

(1) Warm up the ATF

(2) Remove the test plug on the transmission case right side and connect SST (See page AT–18 for the location to connect SST)

SST 09992–00094 (09992–00150, 09992–00270)

(3) Fully apply the parking brake and chock the 4 wheels

(4) Start the engine and check idling speed

(5) Keep your left foot pressed firmly on the brake pedal and shift into D position

(6) Measure the line pressure when the engine is idling

(7) Press the accelerator pedal all the way down Quickly read the highest line pressure when engine speed reaches stall speed

**NOTICE:**

**Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches the specified stall speed.**

(8) In the same manner, do the test in R position

**Specified line pressure:**

| Condition | D position kPa (kgf/cm$^2$ psi) | R position kPa (kgf/cm$^2$ psi) |
|---|---|---|
| Idling | 422 – 481 (4 3 – 4 9 61 – 70) | 510 – 608 (5 2 – 6 2 74 – 88) |
| Stall | 1 285 – 1 530 (13 1 – 15 6 128 – 153) | 1 579 – 1 932 (16 1 – 19 7 158 – 193) |

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest

**Evaluation:**

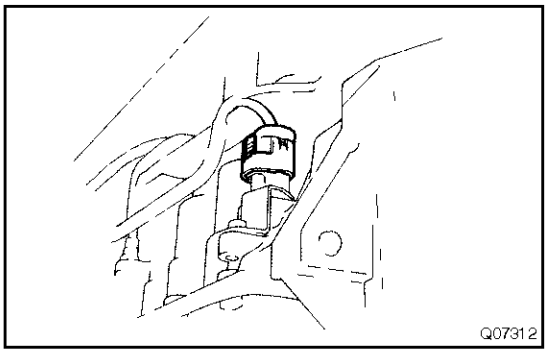
| Problem | Possible cause |
|---|---|
| If the measured value at all positions are higher | • Throttle cable out of adjustment<br>• Throttle valve defective<br>• Regulator valve defective |
| If the measured value at all positions are lower | • Throttle cable out of adjustment<br>• Throttle valve defective<br>• Regulator valve defective<br>• Oil pump defective<br>• O/D direct clutch defective |
| If pressure is low in the D position only | • D position circuit fluid leakage<br>• Forward clutch defective |
| If pressure is low in the R position only | • R position circuit fluid leakage<br>• Direct clutch defective<br>• 1st and reverse brake defective |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






## 9. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors Disconnecting the solenoid wire disables electrically–controlled automatic gear shifting In this case, operating the shift lever is the only way to shift the transmission gear If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem

(a) Turn the ignition switch OFF
(b) Disconnect the solenoid wire connector
(c) Warm up the engine
(d) Drive the vehicle
(e) Check the transmission operation when the shift lever is moved into L, 2 and D positions

**Standard:**

| Shift Lever | Operation |
|---|---|
| L to 2 | Shift up |
| 2 to D | Shift up |
| D to 2 | Shift down |
| 2 to L | Shift down |

(f) Turn the ignition switch OFF
(g) Connect the solenoid wire connector
(h) Clear DTCs

HINT

When the solenoid wire is disconnected, the transmission gear will be set as listed below

| Shift Lever | Gear |
|---|---|
| P | Parking |
| R | Reverse |
| N | Neutral |
| D | O/D (4th) |
| 2 | 3rd |
| L | 1st |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KB 03

# DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given

| DTC No (See page) | Detection Item | Trouble Area | MIL* | Memory |
|---|---|---|---|---|
| P0500 (DI–153) | Vehicle Speed Sensor Malfunction (No 1 Vehicle Speed Sensor) | • Open or short in No 1 vehicle speed sensor circuit<br>• No 1 vehicle speed sensor<br>• ECM | ● | ○ |
| P0710 (DI–154) | Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor) | • Open or short in ATF temperature sensor circuit<br>• ATF temperature sensor<br>• ECM | ● | ○ |
| P0750 (DI–156) | Shift Solenoid A Malfunction (Shift Solenoid Valve No 1) | • Shift solenoid valve No 1 is stuck open or closed<br>• Valve body is blocked up or stuck | ● | ○ |
| P0753 (DI–157) | Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No 1) | • Open or short in shift solenoid valve No 1 circuit<br>• Shift solenoid valve No 1<br>• ECM | ● | ○ |
| P0755 (DI–156) | Shift Solenoid B Malfunction (Shift Solenoid Valve No 2) | • Shift solenoid valve No 2 is stuck open or closed<br>• Valve body is blocked up or stuck | ● | ○ |
| P0758 (DI–157) | Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No 2) | • Open or short in shift solenoid valve No 2 circuit<br>• Shift solenoid valve No 2<br>• ECM | ● | ○ |
| P0770 (DI–161) | Shift Solenoid E Malfunction (Shift Solenoid Valve SL) | • Shift solenoid valve SL is stuck open or closed<br>• Valve body is blocked up or stuck<br>• Lock–up clutch | ● | ○ |
| P0773 (DI–163) | Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL) | • Open or short in shift solenoid valve SL circuit<br>• Shift solenoid valve SL<br>• ECM | ● | ○ |
| P1700 (DI–166) | Speed Sensor No 2 Circuit Malfunction (No 2 Vehicle Speed Sensor) | • Open or short in No 2 vehicle speed sensor circuit<br>• No 2 vehicle speed sensor<br>• ECM | ● | ○ |
| P1780 (DI–169) | Park/Neutral Position Switch Malfunction | • Short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM | ● | ○ |

* ● MIL light up



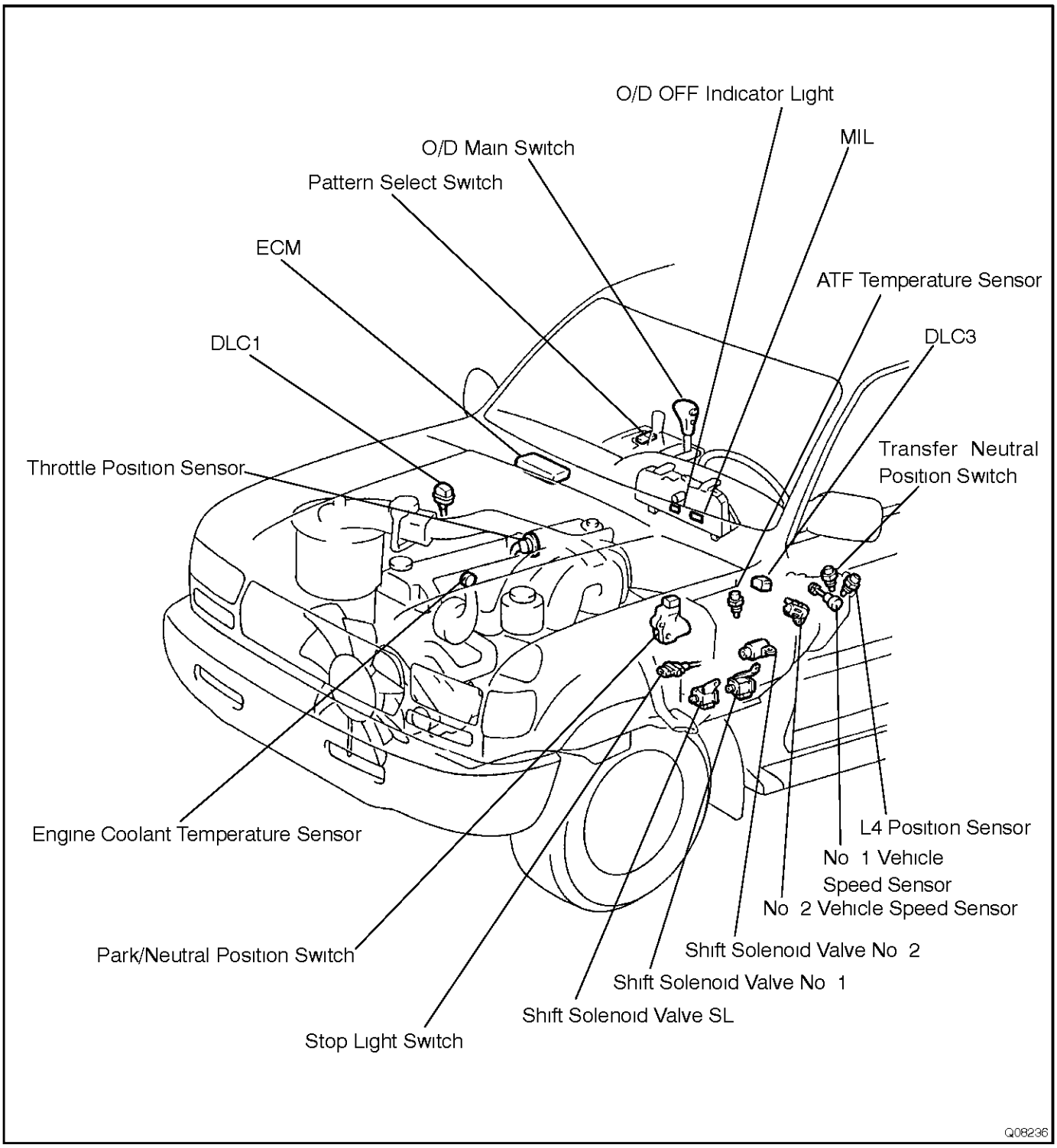
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KD-02

# PARTS LOCATION






Brought to you by BirfMark
Version 1.11 - 03/16/2010

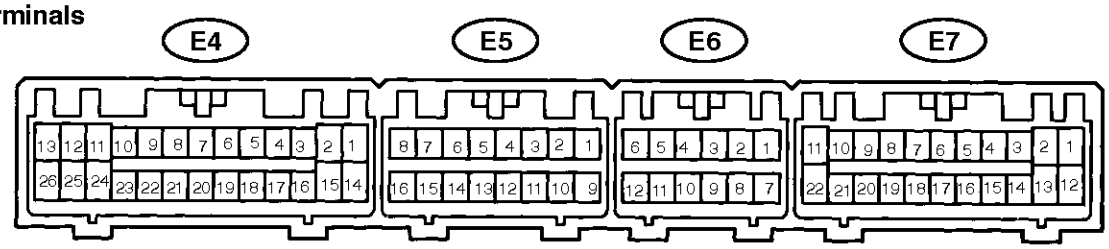
Brought to you by BirfMark



D5KE 03

# TERMINALS OF ECM

**ECM Terminals**




Vd–76–2 D00115

| Symbols (Terminal No.) | Wiring Color | Condition | STD Voltage (V) |
|---|---|---|---|
| SPD (E7–8) – E1 (E4–24) | L–W – BR–B | Disconnect cruise control connector and IG ON Stationary | Below 1.5 |
| | | Disconnect cruise control connector and IG ON Turn one rear wheel slowly | Pulse signal is output Below 1.5 ↔ 4 – 6 |
| S1 (E4–10) – E1 (E4–24) | R – BR–B | IG OFF Disconnect ECM connector | 11 – 15 Ω |
| | | IG ON | 9 – 14 |
| | | 1st or 2nd gear | 9 – 14 |
| | | 3rd or O/D gear | Below 1.5 |
| S2 (E4–9) – E1 (E4–24) | R–Y – BR–B | IG OFF Disconnect ECM connector | 11 – 15 Ω |
| | | IG ON | Below 1.5 |
| | | 2nd or 3rd gear | 9 – 14 |
| | | 1st or O/D gear | Below 1.5 |
| SL (E4–8) – E1 (E4– 24) | R–L – BR–B | IG OFF Disconnect ECM connector | 11 – 15 Ω |
| | | IG ON | Below 1.5 |
| | | Vehicle driving under lock–up position | 9 – 14 |
| SP2+ (E6–2) – SP (E6–8) | V – V–G | IG OFF Disconnect ECM connector | 560 – 680 Ω |
| | | Engine is running | Pulse signal is output Below 1.5 ↔ 4 – 6 |
| OD1 (E7–18) – E1 (E4–24) | G–O – BR–B | IG ON | 9 – 14 |
| OD2 (E7–19) – E1 (E4–24) | P–L – BR–B | O/D main switch ON (O/D OFF) | Below 3 |
| | | O/D main switch OFF (O/D ON) | 9 – 14 |
| OIL (E5–12) – E2 (E5–9) | R–W – BR–B | ATF temperature 110°C (230°F) | Below 1.5 |
| L (E7–17) – E1 (E4–24) | G–W – BR–B | IG ON Shift lever L position | 7.5 – 14 |
| | | IG ON Shift lever other than L position | Below 1.5 |
| 2 (E7–16) – E1 (E4–24) | O – BR–B | IG ON Shift lever 2 position | 7.5 – 14 |
| | | IG ON Shift lever other than 2 position | Below 1.5 |
| R (E7–15) – E1 (E4–24) | R–B – BR–B | IG ON Shift lever R position | 7.5 – 14 |
| | | IG ON Shift lever other than R position | Below 1.5 |
| NSW (E7–22) – E1 (E4–24) | B–W – BR–B | IG ON Shift lever P or N position | Below 3 |
| | | IG ON Shift lever other than P and N position | 9 – 14 |
| STP (E7–14) – E1 (E4–24) | G–W – BR–B | IG ON Brake pedal is depressed | 7.5 – 14 |
| | | IG ON Brake pedal is released | Below 1.5 |
| THW (E5–4) – E2 (E5–9) | R–W – BR–B | IG ON Engine coolant temperature 80°C (176°F) | Below 1.5 |
| IDL (E5–11) – E2 (E5–9) | G–W – BR–B | IG ON Accel pedal is released | Below 1.5 |
| | | IG ON Accel pedal is depressed | 9 – 14 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | | |
|---|---|---|---|---|
| VTA (E5–10) – E2 (E5–9) | G–B – BR–B | IG ON | Accel pedal is released | Below 0 3 – 0 8 |
| | | IG ON | Accel pedal is depressed | 3 2 – 4 9 |
| PWR (E7–20)– E1 (E4–24) | P–B – BR–B | IG ON | Pattern select switch NORM | Below 1 5 |
| | | IG ON | Pattern select switch PWR | 7 5 – 14 |
| TFN (E7–21)– E1 (E4–24) | Y–L – BR–B | IG ON | Transfer N position | Below 3 |
| | | IG ON | Transfer other than N position | 9 – 14 |
| L4SW (E7–9)– E1 (E4–24) | B–L – BR–B | IG ON | Transfer L4 position | 7 5 – 14 |
| | | IG ON | Transfer other than L4 position | Below 1 5 |
| HOLD (E4–3) – E1 (E4–24) | O – BR–B | IG ON | 2nd start switch ON | 9 – 14 |
| | | IG ON | 2nd start switch OFF | Below 1 5 |
| HI (E4–18) – E1 (E4–24) | R–W – BR–B | IG ON | | 7 5 – 14 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KH–03

# PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting

The Matrix Chart is divided into 3 chapters

**Chapter 1: Electronic Circuit Matrix Chart**

**Chapter 2: On–Vehicle repair Matrix Chart**

**Chapter 3: Off–Vehicle repair Matrix Chart**

When troubleshooting, check Chapter 1 first If instructions are given in Chapter 1 to proceed to chapter 2 or 3, proceed as instructed

(1) If the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check

(2) If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM

**Chapter 1: Electronic Circuit Matrix Chart**

| Symptom | Suspect Area | See page |
|---|---|---|
| Vehicle does not move in any forward position and reverse position | 6 On–vehicle repair matrix chart | – |
| | 7 Off–vehicle repair matrix chart | – |
| Vehicle does not move in a particular position or positions | 1 On–vehicle repair matrix chart | – |
| | 2 Off–vehicle repair matrix chart | – |
| No up–shift (1st → 2nd) | 1 Shift solenoid valve No 1 and No 2 circuit | DI–157 |
| | 2 Throttle position sensor circuit | DI–35 |
| | 3 No 1 vehicle speed sensor circuit | DI–87 |
| | 4 No 2 vehicle speed sensor circuit | DI–166 |
| | 5 On–vehicle repair matrix chart | – |
| | 6 Park/neutral position switch circuit | DI–169 |
| | 7 Off–vehicle repair matrix chart | – |
| | 8 ECM | DI–145 |
| No up–shift (2nd → 3rd) | 1 Shift solenoid valve No 1 and No 2 circuit | DI–157 |
| | 2 Throttle position sensor circuit | DI–35 |
| | 3 No 1 vehicle speed sensor circuit | DI–87 |
| | 4 No 2 vehicle speed sensor circuit | DI–166 |
| | 5 On–vehicle repair matrix chart | – |
| | 6 Park/neutral position switch circuit | DI–169 |
| | 7 Off–vehicle repair matrix chart | – |
| | 8 ECM | DI–145 |
| No up–shift (3rd → O/D) | 1 O/D main switck& O/D OFF indicator light circuit | DI–174 |
| | 2 Shift solenoid valve No 1 and No 2 circuit | DI–157 |
| | 3 No 1 vehicle speed sensor circuit | DI–87 |
| | 4 No 2 vehicle speed sensor circuit | DI–166 |
| | 5 Throttle position sensor circuit | DI–35 |
| | 6 Park/neutral position switch circuit | DI–169 |
| | 7 O/D cancel signal circuit | DI–172 |
| | 8 Engine coolant temp sensor circuit | DI–30 |
| | 9 On–vehicle repair matrix chart | – |
| | 10 Off–vehicle repair matrix chart | – |
| | 11 ECM | DI–145 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| No down–shift (O/D → 3rd) | 1 Shift solenoid valve No 1 and No 2 circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 On–vehicle repair matrix chart<br>6 ECM | DI–157<br>DI–35<br>DI–87<br>DI–166<br>–<br>DI–145 |
| No down–shift (3rd → 2nd) | 1 Shift solenoid valve No 1 and No 2 circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 On–vehicle repair matrix chart<br>6 ECM | DI–157<br>DI–35<br>DI–87<br>DI–166<br>–<br>DI–145 |
| No down–shift (2nd → 1st) | 1 Shift solenoid valve No 1 and No 2 circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 On–vehicle repair matrix chart<br>6 Off–vehicle repair matrix chart<br>7 ECM | DI–157<br>DI–35<br>DI–87<br>DI–166<br>–<br>–<br>DI–145 |
| Lock–up does not engage | 1 Shift solenoid valve SL circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 Stop light switch circuit<br>6 Park/neutral position switch circuit<br>7 Engine coolant temp sensor circuit<br>8 On–vehicle repair matrix chart<br>9 Off–vehicle repair matrix chart<br>10 ECM | DI–163<br>DI–35<br>DI–87<br>DI–166<br>DI–185<br>DI–169<br>DI–30<br>–<br>–<br>DI–145 |
| Lock–up does not disengage | 1 Shift solenoid valve SL circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 Stop light switch circuit<br>6 On–vehicle repair matrix chart<br>7 Off–vehicle repair matrix chart<br>8 ECM | DI–163<br>DI–35<br>DI–87<br>DI–166<br>DI–185<br>–<br>–<br>DI–145 |
| Shift point too high or too low | 1 Throttle position sensor circuit<br>2 Pattern select switch circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 ECM | DI–35<br>DI–179<br>DI–87<br>DI–166<br>DI–145 |
| Up–shifts to 2nd while in L position<br>Up–shifts to 3rd while in L position | 1 Park/neutral position switch circuit<br>2 ECM | DI–169<br>DI–145 |
| Up–shifts to O/D from 3rd while O/D main switch is OFF | 1 O/D main switck& O/D OFF indicator light circuit<br>2 ECM | DI–174<br>DI–145 |
| Up–shift to O/D from 3rd while engine is cold | 1 Engine coolant temp sensor circuit<br>2 On–vehicle repair matrix chart<br>3 Off–vehicle repair matrix chart<br>4 ECM | DI–30<br>–<br>–<br>DI–145 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Harsh engagement (N → D) | 1 Shift solenoid valve SL circuit<br>2 ATF temp sensor circuit<br>3 Throttle position sensor circuit<br>4 Park/neutral position switch circuit<br>5 On–vehicle repair matrix chart<br>6 Off–vehicle repair matrix chart<br>7 ECM | DI–163<br>DI–154<br>DI–35<br>DI–169<br>–<br>–<br>DI–145 |
| Harsh engagement (Lock–up) | 1 Shift solenoid valve SL circuit<br>2 Throttle position sensor circuit<br>3 No 1 vehicle speed sensor circuit<br>4 No 2 vehicle speed sensor circuit<br>5 On–vehicle repair matrix chart<br>6 Off–vehicle repair matrix chart<br>7 ECM | DI–163<br>DI–35<br>DI–87<br>DI–166<br>–<br>–<br>DI–145 |
| Harsh engagement (Any driving position) | 1 Shift solenoid valve SL circuit<br>2 ATF temp sensor circuit<br>3 Throttle position sensor circuit<br>4 No 1 vehicle speed sensor circuit<br>5 No 2 vehicle speed sensor circuit<br>6 On–vehicle repair matrix chart<br>7 Off–vehicle repair matrix chart<br>8 ECM | DI–163<br>DI–154<br>DI–35<br>DI–87<br>DI–166<br>–<br>–<br>DI–145 |
| Slip or shudder (Forward and reverse) | 1 On–vehicle repair matrix chart<br>2 Off–vehicle repair matrix chart | –<br>– |
| Slip or shudder (A particular position) | 1 On–vehicle repair matrix chart<br>2 Off–vehicle repair matrix chart | –<br>– |
| No engine braking | 1 On–vehicle repair matrix chart<br>2 Off–vehicle repair matrix chart | –<br>– |
| Poor acceleration | 1 Throttle position sensor circuit<br>2 No 1 vehicle speed sensor circuit<br>3 No 2 vehicle speed sensor circuit<br>4 Shift solenoid valve No 1 and No 2 circuit<br>5 Shift solenoid valve SL circuit<br>6 On–vehicle repair matrix chart<br>7 Off–vehicle repair matrix chart | DI–35<br>DI–87<br>DI–166<br>DI–157<br>DI–163<br>–<br>– |
| No kick–down | 1 Throttle position sensor circuit<br>2 Shift solenoid valve No 1 and No 2 circuit<br>3 No 1 vehicle speed sensor circuit<br>4 On–vehicle repair matrix chart<br>5 ECM | DI–35<br>DI–157<br>DI–87<br>–<br>DI–145 |
| No pattern select | 1 Pattern select switch circuit<br>2 ECM | DI–179<br>DI–145 |
| No 2nd start | 1 Pattern select switch circuit<br>2 Shift solenoid valve No 1 and No 2 circuit<br>3 ECM | DI–179<br>DI–157<br>DI–145 |
| Large shift shock or engine stalls when starting off or stopping | 1 Shift solenoid valve SL circuit<br>2 Stop light switch circuit<br>3 Off–vehicle repair matrix chart<br>4 ECM | DI–163<br>DI–185<br>–<br>DI–145 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## Chapter 2: On–Vehicle Repair
## (★: A340F, A343F Automatic Transmission Repair Manual Pub. No. RM479U)

| Symptom | Suspect Area | See page |
|---|---|---|
| Vehicle does not move in any forward position and reverse position | 1 Throttle cable<br>2 Transmission control rod<br>3 Manual valve<br>4 Primary regulator valve<br>5 Parking lock pawl<br>6 Off–vehicle repair matrix chart | DI–131<br>DI–131<br>★<br>★<br>★<br>– |
| Vehicle does not move in R position | 1 Off–vehicle repair matrix chart | – |
| Vehicle does not move in a particular position or positions (Except R position) | 1 Off–vehicle repair matrix chart | – |
| No up–shift (1st → 2nd) | 1 1–2 shift valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| No up–shift (2nd → 3rd) | 1 2–3 shift valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| No up–shift (3rd → O/D) | 1 3–4 shift valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| No down–shift (O/D → 3rd) | 1 3–4 shift valve | ★ |
| No down–shift (3rd → 2nd) | 1 2–3 shift valve | ★ |
| No down–shift (2nd → 1st) | 1 1–2 shift valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| Lock–up does not engage or lock–up does not disengage | 1 Lock–up relay valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| Harsh engagement (N → D) | 1 Accumulator control valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| Harsh engagement (Lock–up) | 1 Lock–up control valve<br>2 Off–vehicle repair matrix chart | ★<br>– |
| Harsh engagement (N → R) | 1 Accumulator control valve<br>2 $C_2$ accumulator<br>3 Off–vehicle repair matrix chart | ★<br>★<br>– |
| Harsh engagement (N → L) | 1 Low coast modulator valve | ★ |
| Harsh engagement (1st → 2nd (D position)) | 1 Accumulator control valve<br>2 $B_2$ accumulator | ★<br>★ |
| Harsh engagement (1st → 2nd (2 position)) | 1 Accumulator control valve<br>2 $B_2$ accumulator | ★<br>★ |
| Harsh engagement (2nd → 3rd → O/D) | 1 Cut–back valve | ★ |
| Harsh engagement (1st → 2nd → 3rd → O/D) | 1 Throttle valve<br>2 Accumulator control valve | ★<br>★ |
| Harsh engagement (2nd → 3rd) | 3 Accumulator control valve<br>1 $C_2$ accumulator<br>2 Off–vehicle repair matrix chart | ★<br>★<br>– |
| Harsh engagement (3rd → O/D) | 1 Accumulator control valve<br>2 $B_0$ accumulator<br>3 Off–vehicle repair matrix chart | ★<br>★<br>– |
| Harsh engagement (O/D → 3rd) | 1 Accumulator control valve<br>2 $C_0$ accumulator<br>3 Off–vehicle repair matrix chart | ★<br>★<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Slip or shudder (Forward and reverse) | 1 Throttle cable<br>2 Transmission control rod<br>3 Oil strainer<br>4 Pressure relief valve<br>5 Off–vehicle repair matrix chart | DI–131<br>DI–131<br>★<br>★<br>– |
| Slip or shudder (Particular position) | 1 Throttle cable<br>2 Transmission control rod<br>3 Off–vehicle repair matrix chart | DI–131<br>DI–131<br>– |
| No engine braking (1st (L position)) | 1 Low coast modulator<br>2 Off–vehicle repair matrix chart | ★<br>– |
| No engine braking (2nd (2 position)) | 1 2nd coast modulator<br>2 Off–vehicle repair matrix chart | ★<br>– |
| No kick–down | 1 1–2 shift valve<br>2 2–3 shift valve | ★<br>★ |

## Chapter 3: Off–Vehicle Repair
## (★: A340F, A343F Automatic Transmission Repair Manual Pub. No. RM479U)

| Symptom | Suspect Area | See page |
|---|---|---|
| Vehicle does not move in any forward position and reverse position | 1 O/D one–way clutch ($F_0$)<br>2 O/D planetary gear unit<br>3 Torque converter clutch | ★<br>★<br>AT–26 |
| Vehicle does not move in R position | 1 2nd coast brake ($B_1$)<br>2 Front and rear planetary gear unit<br>3 Direct clutch ($C_2$)<br>4 1st and reverse brake ($B_3$) | ★<br>★<br>★<br>★ |
| Vehicle does not move in D 2 and L positions | 1 Forward clutch ($C_1$) | ★ |
| Vehicle does not move in D and 2 positions | 1 No 2 one–way clutch ($F_2$) | ★ |
| Vehicle does not move in 2 position | 1 1st and reverse brake ($B_3$) | ★ |
| Vehicle does not move in L position | 1 2nd brake ($B_2$)<br>2 2nd coast brake ($B_1$)<br>3 Direct clutch ($C_2$) | ★<br>★<br>★ |
| No up–shift (1st → 2nd) | 1 2nd brake ($B_2$)<br>2 No 1 one–way clutch ($F_1$) | ★<br>★ |
| No up–shift (2nd → 3rd) | 1 Direct clutch ($C_2$) | ★ |
| No up–shift (3rd → O/D) | 1 O/D brake ($B_0$) | ★ |
| No down–shift (2nd → 1st) | 1 2nd brake ($B_2$) | ★ |
| Lock–up does not engage or lock–up does not disengage | 1 Torque converter clutch | AT–26 |
| Harsh engagement (N → D) | 1 Forward clutch ($C_1$)<br>2 O/D one–way clutch ($F_0$)<br>3 No 2 one–way clutch ($F_2$) | ★<br>★<br>★ |
| Harsh engagement (N → R) | 1 Direct clutch ($C_2$)<br>2 1st and reverse brake ($B_3$)<br>3 O/D one–way clutch ($F_0$) | ★<br>★<br>★ |
| Harsh engagement (2nd → 3rd) | 1 Direct clutch ($C_2$) | ★ |
| Harsh engagement (3rd → O/D) | 1 O/D brake ($B_0$)<br>2 O/D planetary gear unit | ★<br>★ |
| Harsh engagement (O/D → 3rd) | 1 O/D one–way clutch ($F_0$) | ★ |
| Harsh engagement (Lock–up) | 1 Torque converter clutch | AT–26 |
| Slip or shudder (Forward and reverse (After warm–up)) | 1 Torque converter clutch<br>2 O/D one–way clutch ($F_0$)<br>3 O/D direct clutch ($C_0$) | AT–26<br>★<br>★ |
| Slip or shudder (Forward and reverse (Just after engine starts)) | 1 Torque converter clutch | AT–26 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Slip or shudder (R position) | 1 Direct clutch ($C_2$)<br>2 1st and reverse brake ($B_3$)<br>3 O/D one–way clutch ($F_0$) | ★<br>★<br>★ |
| Slip or shudder (1st) | 1 Forward clutch ($C_1$)<br>2 No 2 one–way clutch ($F_2$)<br>3 O/D one–way clutch ($F_0$) | ★<br>★<br>★ |
| Slip or shudder (2nd) | 1 2nd brake ($B_2$)<br>2 2nd coast brake ($B_1$)<br>3 No 1 one–way clutch ($F_1$) | ★<br>★<br>★ |
| Slip or shudder (3rd) | 1 Direct clutch ($C_2$) | ★ |
| Slip or shudder (O/D) | 1 O/D brake ($B_0$) | ★ |
| No engine braking (1st – 3rd) | 1 O/D direct clutch ($C_0$) | ★ |
| No engine braking (1st) | 1 1st and reverse brake ($B_3$) | ★ |
| No engine braking (2nd) | 1 2nd coast brake ($B_1$) | ★ |
| Poor acceleration (All positions) | 1 Torque converter clutch | AT–26 |
| Poor acceleration (O/D) | 1 O/D brake ($B_0$)<br>2 O/D planetary gear unit | ★<br>★ |
| Poor acceleration (Other than O/D) | 1 O/D brake ($B_0$) | ★ |
| Poor acceleration (Other than 2nd) | 1 2nd coast brake ($B_1$)<br>2 No 1 one–way clutch ($F_1$) | ★<br>★ |
| Poor acceleration (1st and 2nd) | 1 O/D one–way clutch ($F_0$) | ★ |
| Poor acceleration (L and R positions) | 1 1st and reverse brake ($B_3$) | ★ |
| Poor acceleration (R position) | 1 Forward clutch ($C_1$) | ★ |
| Engine stalls when starting off or stopping | 1 Torque converter clutch | AT–26 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5K -01

# CIRCUIT INSPECTION

| DTC | P0500 | Vehicle Speed Sensor Malfunction (No. 1 Vehicle Speed Sensor) |
|---|---|---|

See page DI–87



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KK 02

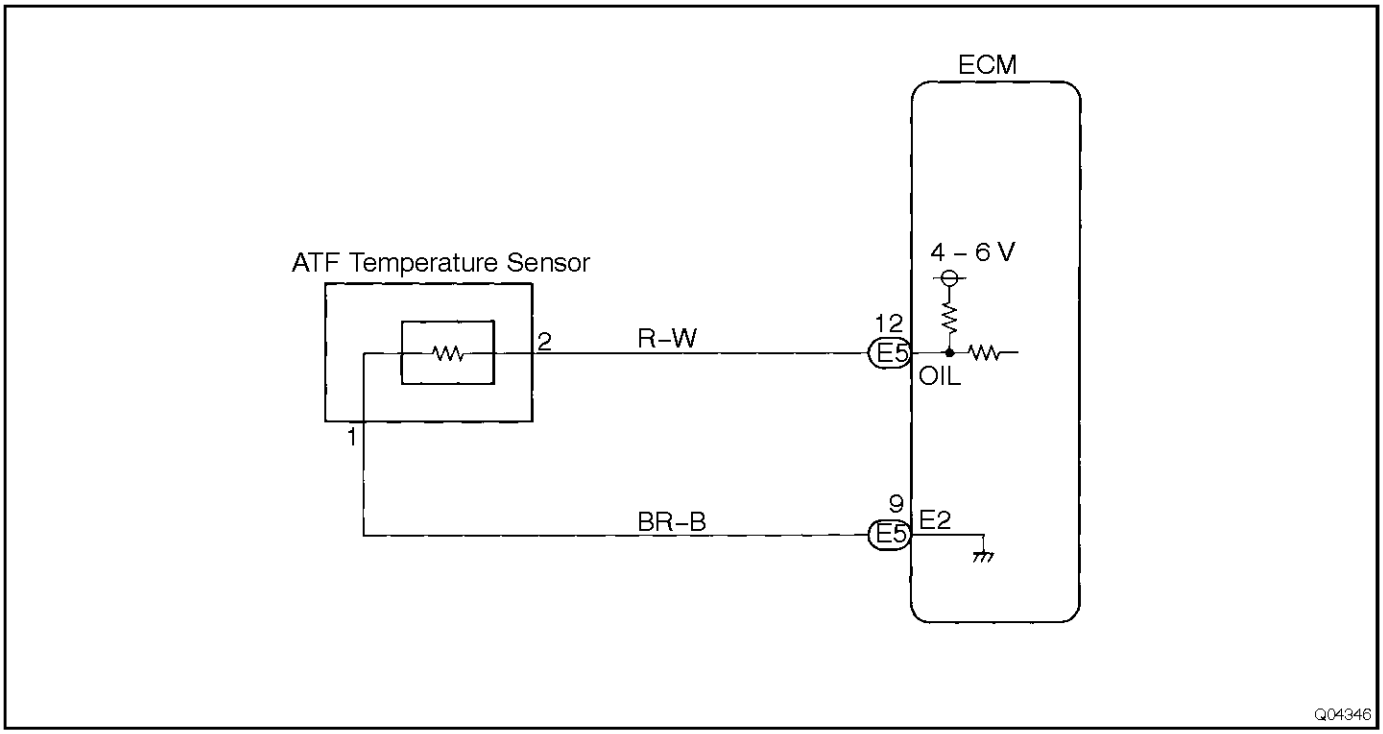
| DTC | P0710 | Transmission Fluid Temperature Sensor Circuit Malfunction (ATF Temperature Sensor) |
|---|---|---|

## CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into resistance value which is input into the ECM

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0710 | Either (a) or (b) is detected for 0 5 sec or more<br>(a) Temp sensor resistance is less than 79 Ω<br>(b) After the engine has been operating for 15 min or more the resistance at the temp sensor is more than 156 kΩ | • Open or short in ATF temp sensor circuit<br>• ATF temp sensor<br>• ECM |

## WIRING DIAGRAM





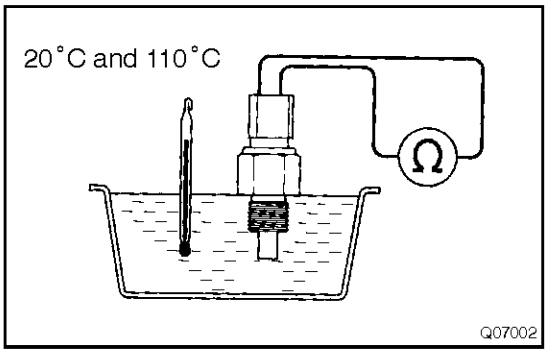

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check ATF temperature Sensor.** |




**PREPARATION:**
Remove the ATF temperature sensor
**CHECK:**
Measure the resistance between terminals of the ATF temperature sensor at 20˚C (68˚F) and 110˚C (230˚F)
**OK:**

**Resistance :**
**20˚C (68˚F): Approx. 12.2 kΩ**
**110˚C (230˚F): Approx. 770 Ω**

NG → **Replace ATF temperature sensor.**

OK ↓

| | |
|---|---|
| 2 | **Check harness and connector between ATF temperature sensor and ECM (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

**Check and replace ECM.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KM 02

| DTC | P0750, P0755 | Shift Solenoid A/B Malfunction (Shift Solenoid Valve No. 1/No. 2) |
|---|---|---|

## SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear)

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body

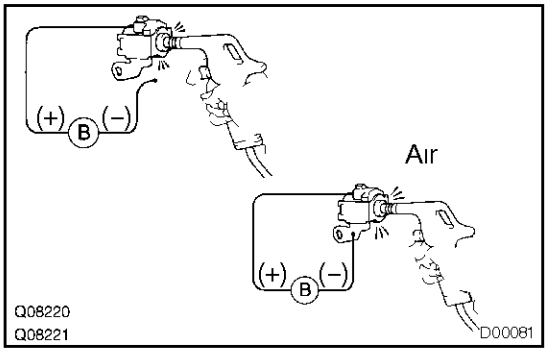
| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0750<br>P0755 | During normal driving the gear required by the ECM does not match the actual gear (2 trip detection logic) | • Shift solenoid valve No 1/No 2 is stuck open or closed<br>• Valve body is blocked up or stuck |

HINT

Check the shift solenoid valve No 1 when DTC P0750 is output and check shift solenoid valve No 2 when DTC P0755 is output

## INSPECTION PROCEDURE

| 1 | Check shift solenoid valve No. 1 or No. 2 operation. |
|---|---|




**PREPARATION:**

(a) Remove the oil pan

(b) Remove the shift solenoid valve No 1 or No 2

**CHECK:**

(a) Applying 490 kPa (5 kgf/cm$^2$, 71 psi) of compressed air, check that the shift solenoid valve does not leak air

(b) When battery positive voltage is supplied to the shift solenoid valves, check they opens

NG → Replace shift solenoid valve No. 1 or No. 2.

OK

| 2 | Check valve body (See page DI–147). |
|---|---|

NG → Repair or replace valve body.

OK

Repair transmission (See page AT–18).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KO-02

| DTC | P0753, P0758 | Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No. 1/No. 2) |
|---|---|---|

## CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the shift solenoid valves No 1 and No 2 controlled by ECM If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function)

Fail Safe Function

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below The ECM also turns the shift solenoid valve SL OFF at the same time If both solenoids are malfunction, hydraulic control cannot be done electronically and must be done manually

Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid)

| Position | NORMAL | | | SHIFT SOLENOID NO 1 MALFUNCTIONING | | | SHIFT SOLENOID NO 2 MALFUNCTIONING | | | BOTH SOLENOIDS MALFUNCTIONING |
|---|---|---|---|---|---|---|---|---|---|---|
| | Solenoid valve | | Gear | Solenoid valve | | Gear | Solenoid valve | | Gear | Gear when shift selector is manually operated |
| | No 1 | No 2 | | No 1 | No 2 | | No 1 | No 2 | | |
| D | ON | OFF | 1st | X | ON | 3rd | ON | X | 1st | O/D |
| | ON | ON | 2nd | X | ON | 3rd | OFF | X | O/D | O/D |
| | OFF | ON | 3rd | X | ON | 3rd | OFF | X | O/D | O/D |
| | OFF | OFF | O/D | X | OFF | O/D | OFF | X | O/D | O/D |
| 2 | ON | OFF | 1st | X | ON | 3rd | ON | X | 1st | 3rd |
| | ON | ON | 2nd | X | ON | 3rd | OFF | X | 3rd | 3rd |
| | OFF | ON | 3rd | X | ON | 3rd | OFF | X | 3rd | 3rd |
| L | ON | OFF | 1st | X | OFF | 1st | ON | X | 1st | 1st |
| | ON | ON | 2nd | X | ON | 2nd | ON | X | 1st | 1st |

X Malfunctions

HINT

Check the shift solenoid valve No 1 when DTC P0753 is output and check the shift solenoid valve No 2 when DTC P0758 is output

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0753<br>P0758 | The ECM checks for an open or short circuit in the shift solenoid valves No 1 and No 2 circuit when it changes<br>The ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once but it does not light up MIL<br>After ECM detects condition (a) or (b) continuously 8 times or more in one–trip it causes the MIL light up until condition (a) or (b) disappears<br>After that if the ECM detects condition (a) or (b) once it starts lighting up MIL again<br>(a) Solenoid resistance is 8 Ω or less (short circuit) when the solenoid is energized<br>(b) Solenoid resistance is 100 kΩ or more (open circuit) when the solenoid is not energized | • Open or short in shift solenoid valve No 1/No 2 circuit<br>• Shift solenoid valve No 1/No 2<br>• ECM |

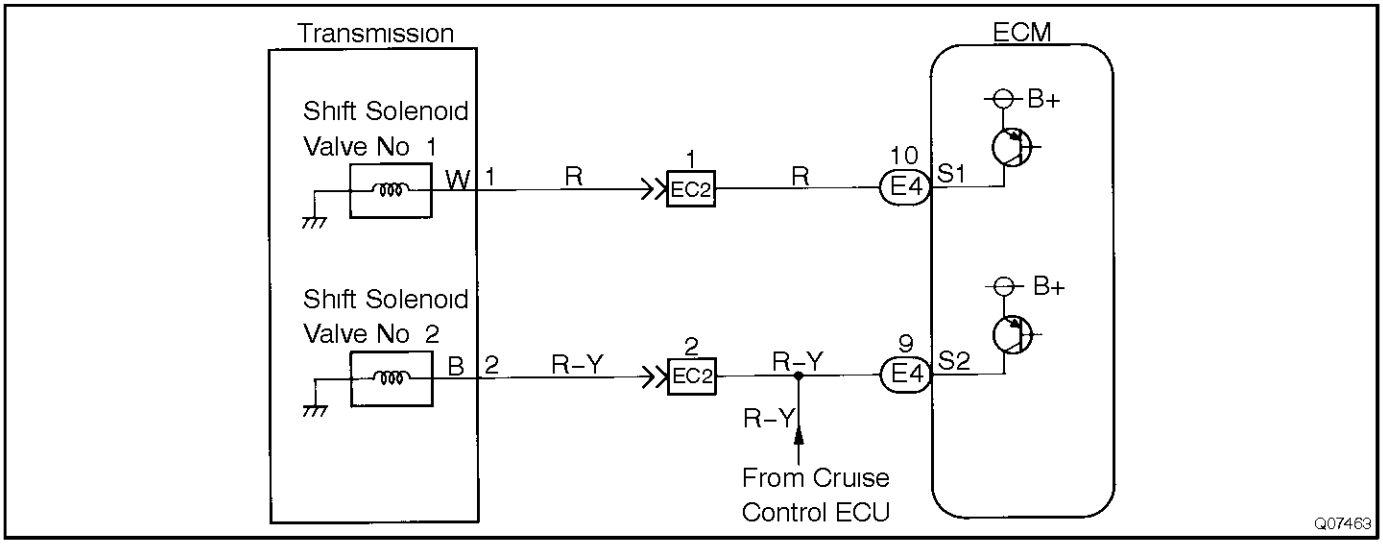


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

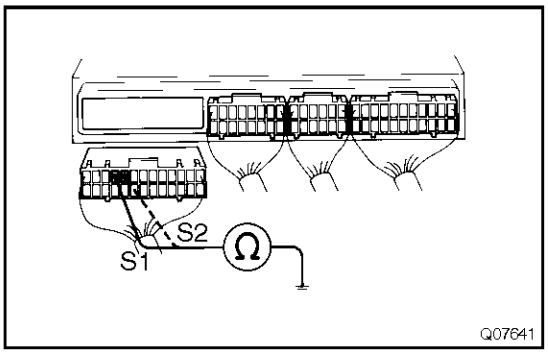


## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Measure resistance between terminal S1 or S2 of ECM and body ground.** |




**PREPARATION:**

Disconnect the connector from the ECM

**CHECK:**

Measure the resistance between terminal S1 or S2 of the ECM and body ground

**OK:**

**Resistance: 11 – 15 Ω**

| | |
|---|---|
| OK | **Check and replace ECM.** |

NG

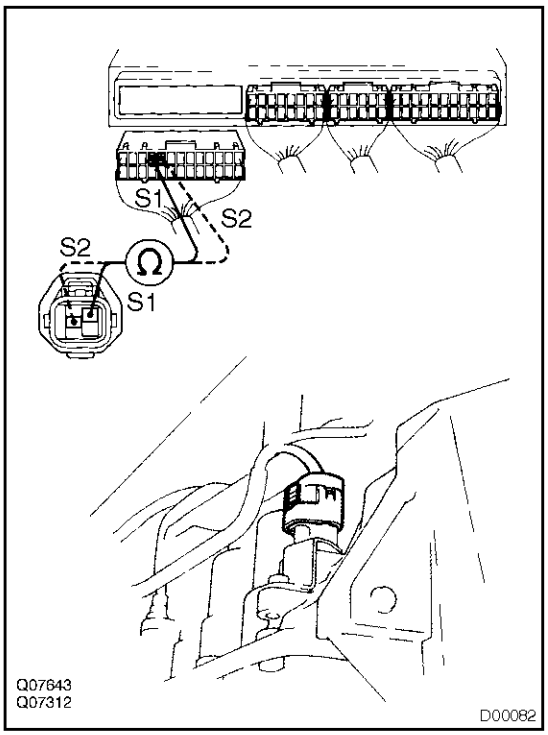


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | **Check harness and connector between ECM and automatic transmission solenoid connector.** |
|---|---|




**PREPARATION:**

Disconnect the solenoid connector from the automatic transmission

**CHECK:**

Check the harness and connector between terminals S1 or S2 of the ECM and S1 or S2 terminals of the solenoid connector

**OK:**

**There is no open and no short circuit.**

NG → **Repair or replace harness or connector.**

OK

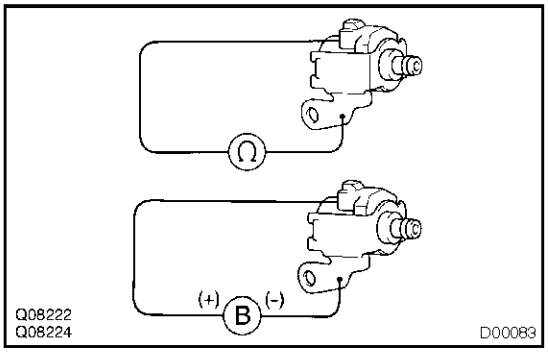


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check shift solenoid valve No. 1 or No. 2. |
|---|---|




**PREPARATION:**

(a) Jack up the vehicle
(b) Remove the oil pan
(c) Disconnect the solenoid connector
(d) Remove the shift solenoid valve No 1 or No 2

**CHECK:**

(a) Measure the resistance between solenoid connector and body ground
(b) Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body

**OK:**

**(a) Resistance: 11 – 15 Ω**
**(b) The shift solenoid valve No. 1 or No. 2 makes an operating noise.**

NG → **Replace shift solenoid valve No. 1 or No. 2.**

OK →

**Repair or replace solenoid wire.**



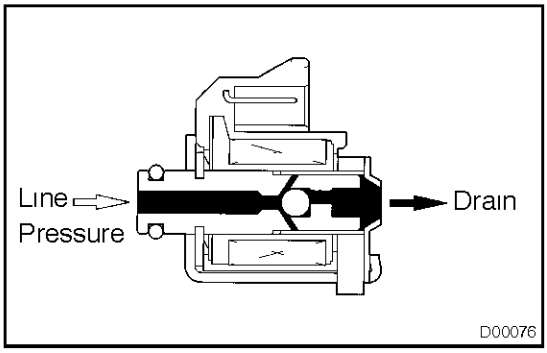
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KQ-02

| DTC | P0770 | Shift Solenoid E Malfunction (Shift Solenoid Valve SL) |
|---|---|---|




## SYSTEM DESCRIPTION

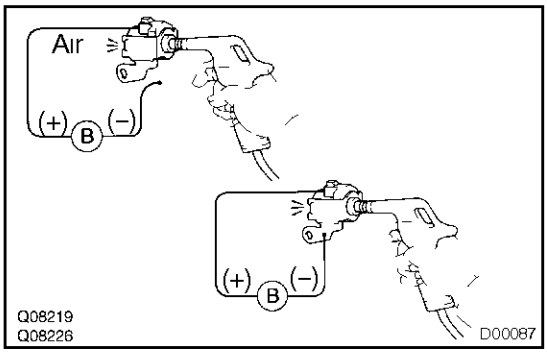
The ECM uses the signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch

Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0770 | Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]) or lock–up remains ON in the lock–up OFF range (2 trip detection logic) | • Shift solenoid valve SL is stuck open or closed<br>• Valve body blocked up or stuck<br>• Lock–up clutch |

## INSPECTION PROCEDURE

| 1 | Check shift solenoid valve SL operation. |
|---|---|




**PREPARATION:**

Remove the shift solenoid valve SL from the valve body

**CHECK:**

(a) Applying 490 kPa (5 kgf/cm$^2$, 71 psi) of compressed air, check that the solenoid valve opens

(b) When battery voltage is supplied to the shift solenoid valve, check it does not leak air

NG → Replace shift solenoid valve SL.

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | Check valve body (See page DI–147). |

NG → Repair or replace valve body.

OK →

Replace torque converter clutch (See page AT–26).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KS 02

| DTC | P0773 | Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL) |
|---|---|---|

## CIRCUIT DESCRIPTION

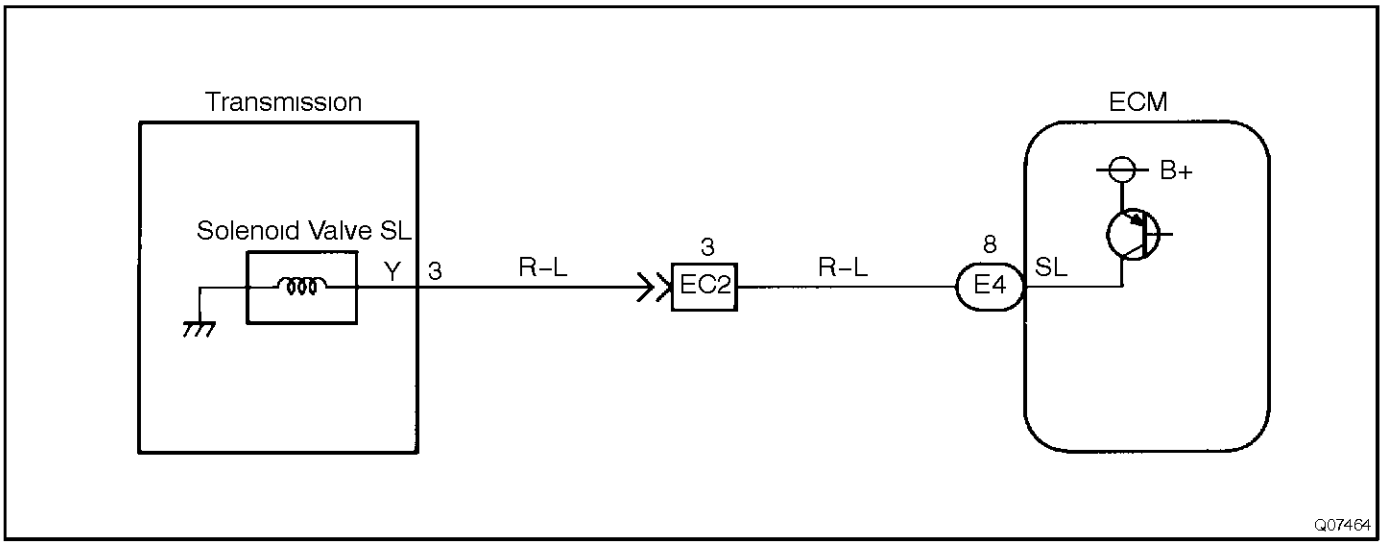
The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch

Fail Safe Function

If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P0773 | Open or short in shift solenoid valve SL circuit for 1 time (2 trip detection logic) | • Open or short in shift solenoid valve SL circuit<br>• Shift solenoid valve SL<br>• ECM |

## WIRING DIAGRAM





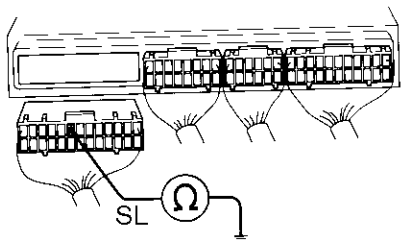

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Measure resistance between terminal SL of ECM and body ground.** |




Q07647

**PREPARATION:**

Disconnect the connector from the ECM

**CHECK:**

Measure the resistance between terminal SL of the ECM and body ground

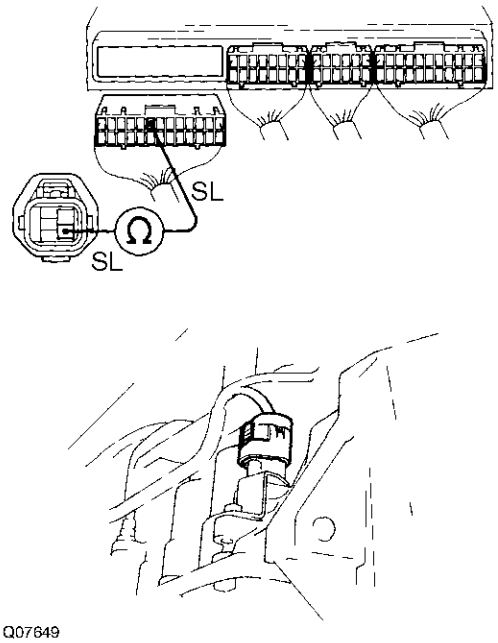
**OK:**

**Resistance: 11 – 15 Ω**

| | |
|---|---|
| OK | **Check and replace ECM.** |

NG

| | |
|---|---|
| 2 | **Check harness and connector between ECM and automatic transmission solenoid connector.** |




Q07649
Q07312

D00088

**PREPARATION:**

Disconnect the solenoid connector from the transmission

**CHECK:**

Check the harness between terminal SL of the ECM and terminal SL of the automatic transmission solenoid connector

**OK:**

**There is no open or short circuit.**

| | |
|---|---|
| NG | **Repair or replace harness or connector.** |

OK

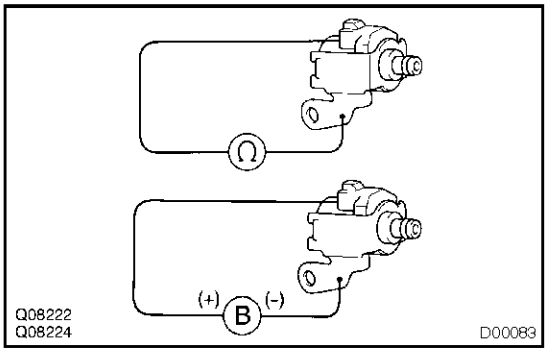


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check shift solenoid valve SL. |
|---|---|




**PREPARATION:**

(a) Jack–up the vehicle
(b) Remove the oil pan
(c) Disconnect the shift solenoid valve SL connector
(d) Remove the shift solenoid valve SL

**CHECK:**

(a) Measure the resistance between the shift solenoid valve SL connector terminal and its body ground
(b) Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body

**OK:**

**(a) Resistance: 11 – 15 Ω**
**(b) Shift solenoid valve SL makes operation noise.**

NG → **Replace shift solenoid valve SL.**

OK →

**Check and replace or repair solenoid wire.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KW-02

| DTC | P1700 | Speed Sensor No. 2 Circuit Malfunction (No. 2 Vehicle Speed Sensor) |
|---|---|---|

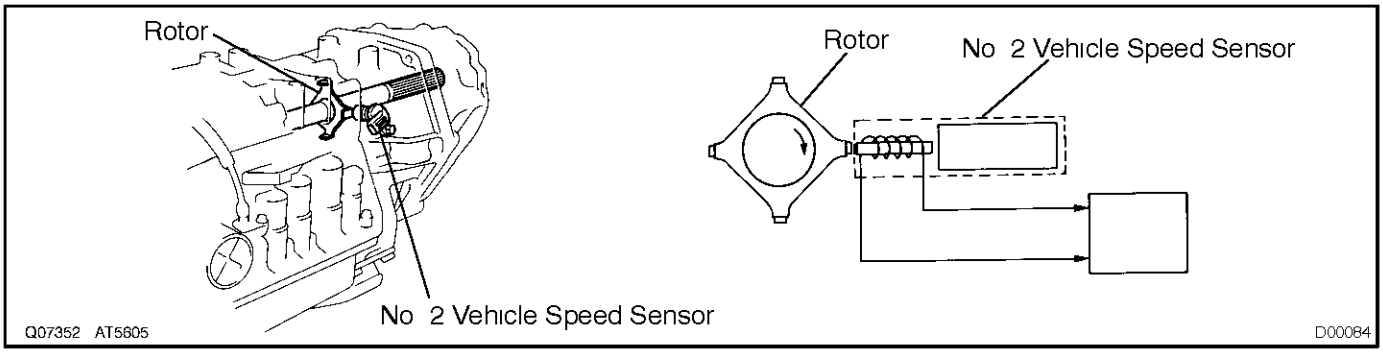
## CIRCUIT DESCRIPTION

The No 2 vehicle speed sensor detects the rotation speed of the transmission output shaft and sends signals to the ECM The ECM determines the vehicle speed based on these signals

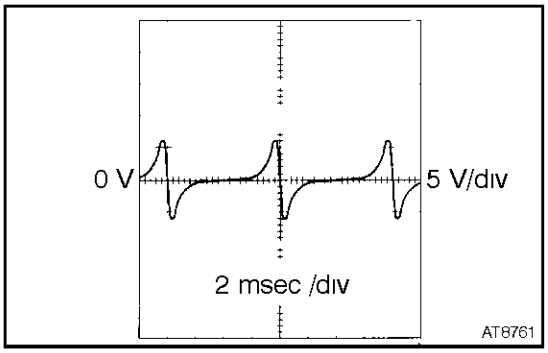
An AC voltage is generated in the No 2 vehicle speed sensor coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM

The gear shift point and lock–up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal

If the No 2 vehicle speed sensor malfunctions, the ECM uses input signals from the No 1 vehicle speed sensor as a back–up signal




| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| P1700 | All conditions below are detected 500 times or more continuously (2 trip detection logic)<br>(a) No signal from No 2 vehicle speed sensor is input to ECM while 4 pulses of No 1 vehicle speed sensor signal is sent<br>(b) Vehicle speed 9 km/h (5 6 mph) or more for as least 4 sec<br>(c) Park/neutral position switch OFF (Other than P or N position)<br>(d) Transfer position Other than N position | • Open or short in No 2 vehicle speed sensor circuit<br>• No 2 vehicle speed sensor<br>• ECM |




Reference

Waveform between terminals $SP2^+$ and $SP2^-$ when the vehicle speed is approx 60 km/h (37 mph)

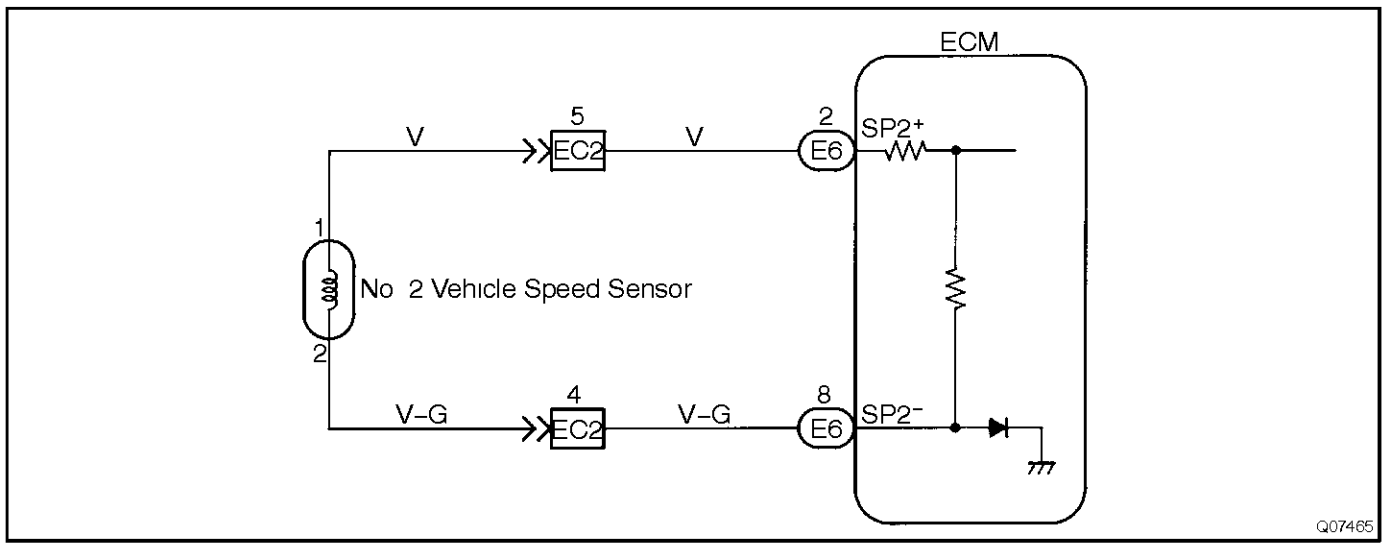


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check vehicle speed value or resistance between terminals SP2+ and SP2– of ECM.** |

**When using OBD II scan tool or TOYOTA hand–held tester:**

**PREPARATION:**

(a) Remove the fuse box cover

(b) Connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3

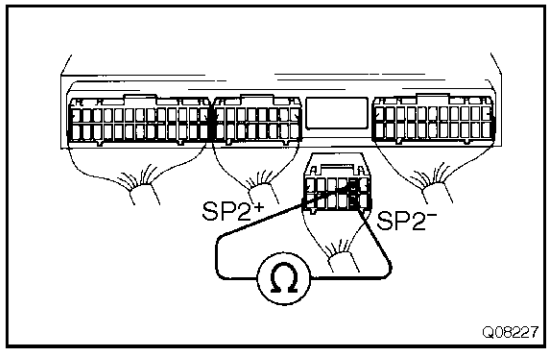
(c) Start the engine and turn the OBD II scan tool or TOYOTA hand–held tester main switch ON

**CHECK:**

Drive the vehicle and read vehicle speed value

**OK:**

**Vehicle speed matches tester speed value.**




**When not using OBD II scan tool or TOYOTA hand–held tester:**

**PREPARATION:**

Disconnect the connector from the ECM

**CHECK:**

Check the resistance between terminals SP2+ and SP2– of the ECM

**OK:**

**Resistance: 560 – 680 Ω**

| | |
|---|---|
| OK | **Check and replace ECM.** |

NG

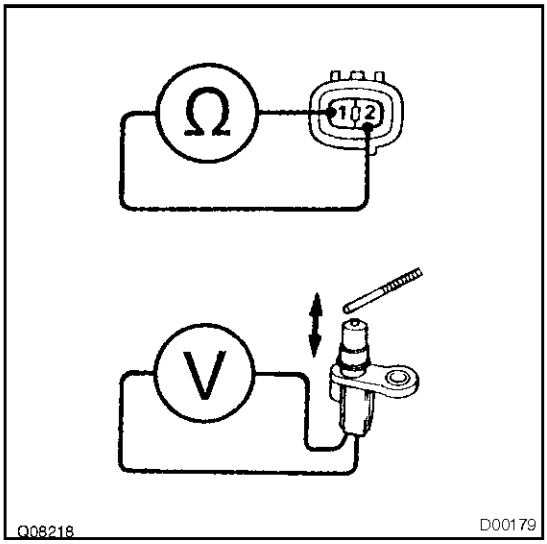


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check No. 2 vehicle speed sensor. |
|---|---|




**PREPARATION:**

Remove the No 2 vehicle speed sensor from the transmission

**CHECK:**

(a) Measure the resistance between terminals 1 and 2 of the vehicle speed sensor

(b) Check the voltage between terminals 1 and 2 of the vehicle speed sensor when a magnet is put close to the front end of the vehicle speed sensor then taken away quickly

**OK:**

**(a) Resistance: 560 – 680 Ω**

**(b) Voltage is generated intermittently.**

HINT

The generated voltage is extremely low

NG → **Replace No. 2 vehicle speed sensor.**

OK →

**Check and repair harness and connector between ECM and No. 2 vehicle speed sensor (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5KY 02

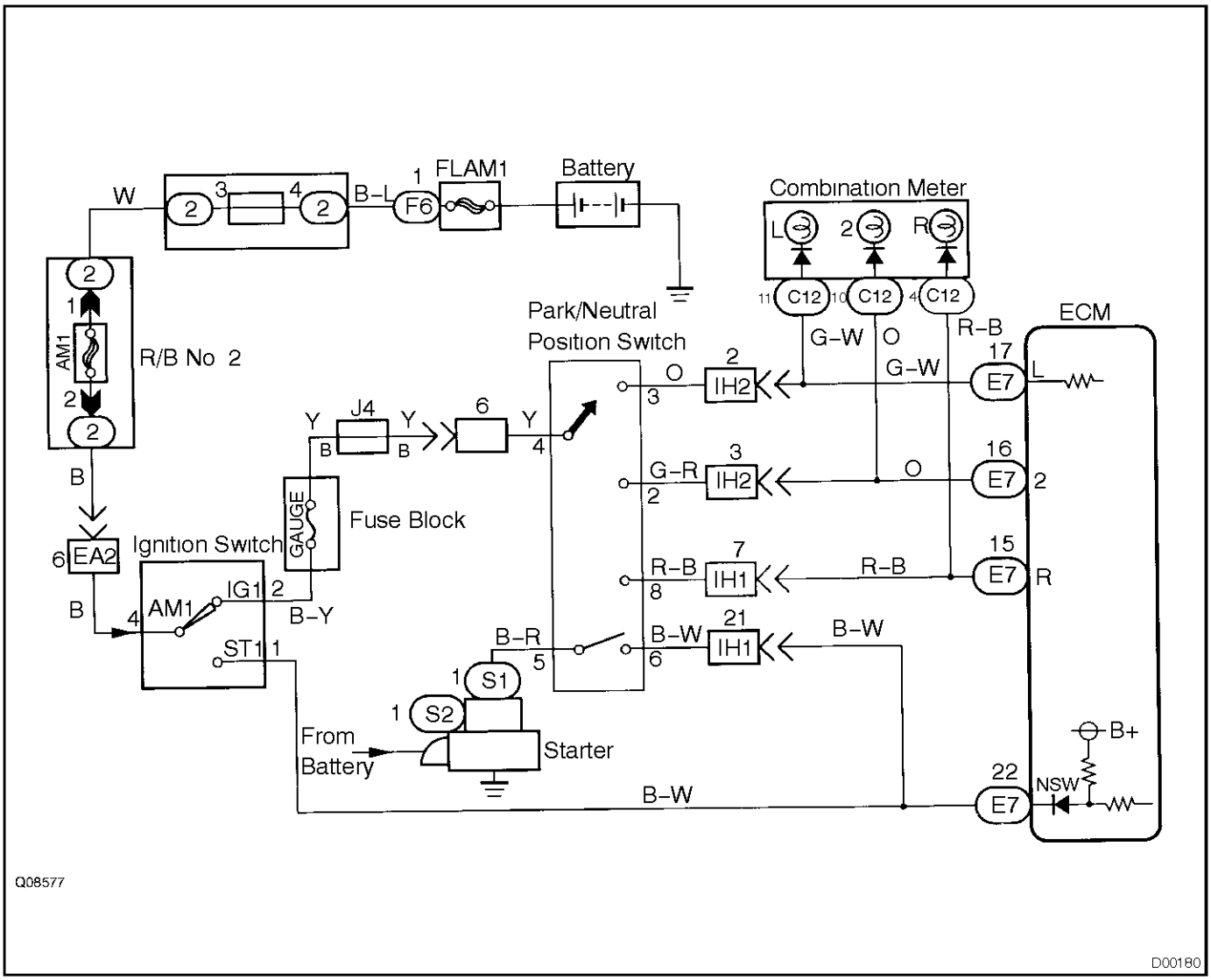
| DTC | P1780 | Park/Neutral Position Switch Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM
The ECM receives signals (NSW, R, 2 and L) from the park/neutral position switch When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in D position

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| P1780 | 2 or more switches are ON simultaneously for N 2 and L positions (2 trip detection logic) | • Short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM |
| | When driving under conditions (a) (b) and (c) for 30 sec or more the park/neutral position switch is ON (N position)<br>(2 trip detection logic)<br>(a) Vehicle speed 70 km/h (44 mph) or more<br>(b) Engine speed 1 500 – 2 500 rpm<br>(c) Engine load 0 6 g/rev or more | |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Read PNP, REVERSE, 2ND and LOW signals.** |

**When using TOYOTA hand–held tester:**

**PREPARATION:**

(a) Remove the fuse box cover

(b) Connect a TOYOTA hand–held tester to the DLC3

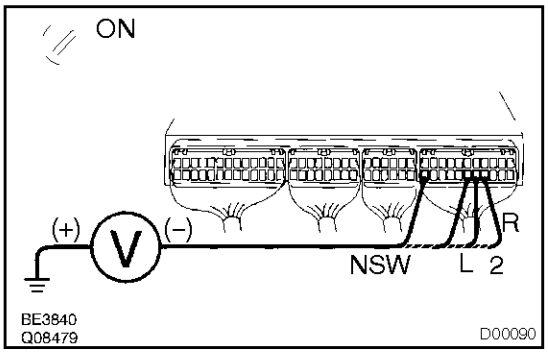
(c) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON

**CHECK:**

Shift lever into the P, R, N, 2 and L positions, and read the PNP, REVERSE, 2 and L signals on the TOYOTA hand–held tester

**OK:**

| Shift position | Signal |
|---|---|
| 2 | 2ND OFF → ON |
| L | LOW OFF → ON |
| R | REVERSE OFF → ON |
| P N | PNP SW OFF → ON |




**When not using TOYOTA hand–held tester:**

**PREPARATION:**

Turn the ignition switch ON

**CHECK:**

Measure the voltage between terminals NSW, 2 and L of ECM and body ground when the shift lever is shifted to the following positions

**OK:**

| Position | NSW – Body ground | R – Body ground | 2 – Body ground | L – Body ground |
|---|---|---|---|---|
| P, N | Below 1 5 V | Below 1 5 V | Below 1 5 V | Below 1 5 V |
| R | 9 – 14 V | 7 5 – 14 V* | Below1 5 V | Below1 5 V |
| D | 9 – 14 V | Below 1 5 V | Below 1 5 V | Below 1 5 V |
| 2 | 9 – 14 V | Below 1 5 V | 7 5 – 14 V | Below 1 5 V |
| L | 9 – 14 V | Below 1 5 V | Below 1 5 V | 7 5 – 14 V |

* The voltage will drop slightly due to lighting up of the back up light

OK → **Check and replace ECM.**

NG

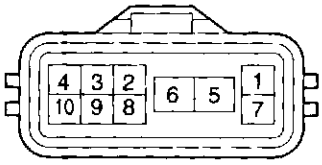


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check park/neutral position switch. |
|---|---|




Q07657 D00109

**PREPARATION:**

(a) Jack up the vehicle

(b) Remove the park/neutral position switch connector

**CHECK:**

Check the continuity between each terminal shown below when the shift lever is moved to each position

**OK:**

| Shift Position | Terminal No. to continuity | Terminal No. to continuity |
|---|---|---|
| P | 4 – 7 | 5 – 6 |
| R | 4 – 8 | – |
| N | 4 – 10 | 5 – 6 |
| D | 4 – 9 | – |
| 2 | 2 – 4 | – |
| L | 3 – 4 | – |

NG → **Replace park/neutral position switch.**

OK →

**Repair or replace harness and connector between battery and park/neutral position switch, and park/neutral position switch and ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5L0-02

# O/D Cancel Signal Circuit

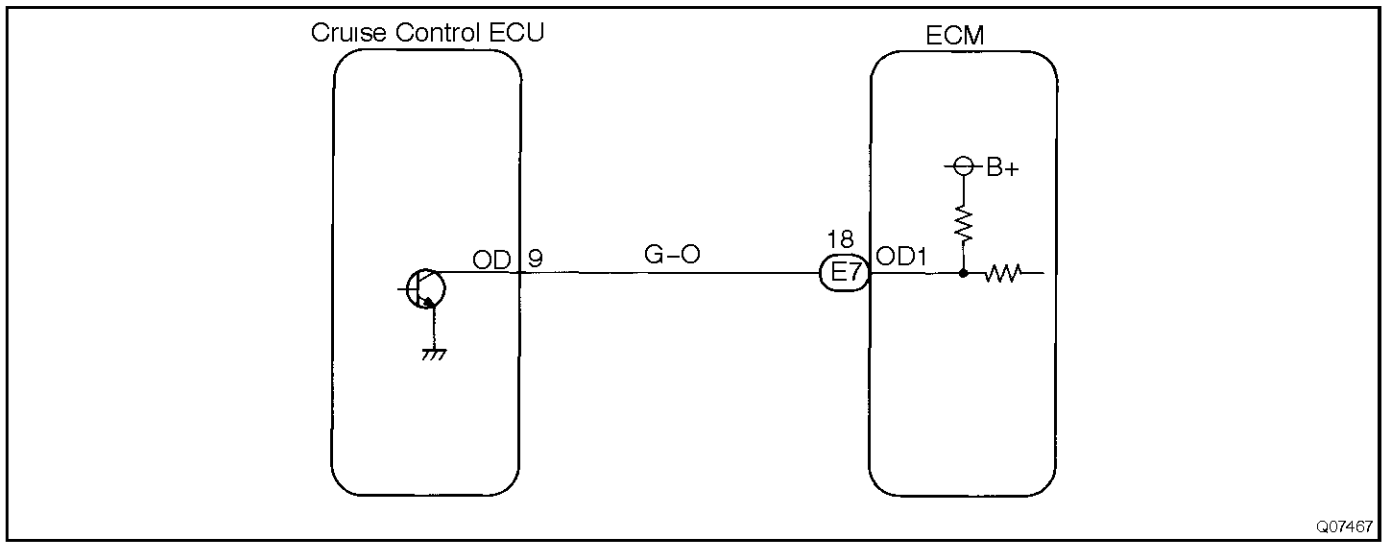
## CIRCUIT DESCRIPTION

While driving with cruise control activated, in order to minimize gear shifting and provide smooth cruising on an uphill, overdrive may be prohibited temporarily in some conditions

The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels overdrive shifting until these signals are discontinued

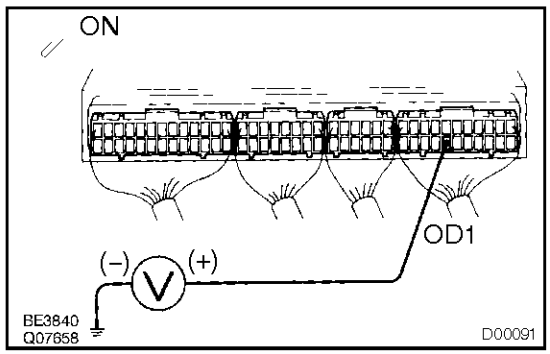
(For details, see the Cruise Control section, page DI–292)

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminal OD1 of ECM and body ground.** |




**PREPARATION:**

Turn the ignition switch ON

**CHECK:**

Measure the voltage between terminal OD1 of the ECM and body ground

**OK:**

**Voltage: 9 – 14 V**

| | |
|---|---|
| OK | **Proceed to next circuit inspection shown on problem symptoms table (See page DI–147).** |

NG

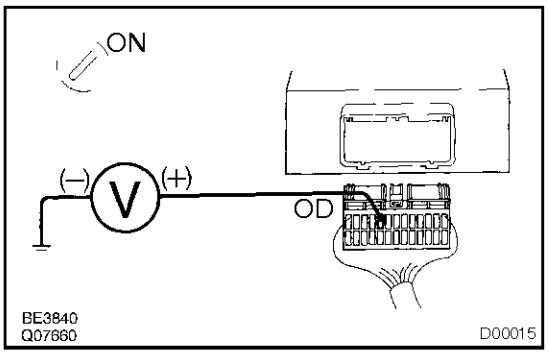


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | **Check voltage between terminal OD of cruise control ECU harness side connector and body ground.** |
|---|---|




**PREPARATION:**

(a) Disconnect the cruise control ECU connector

(b) Turn ignition switch ON

**CHECK:**

Measure the voltage between terminal OD of the cruise control ECU harness side connector and body ground

**OK:**

**Voltage: 9 – 14 V**

| OK | **Check and replace cruise control ECU.** |
|---|---|

**NG**

| 3 | **Check harness and connector between cruise control ECU and ECM (See page IN–28).** |
|---|---|

| NG | **Repair or replace wire harness or connector.** |
|---|---|

**OK**

**Check and replace ECM.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



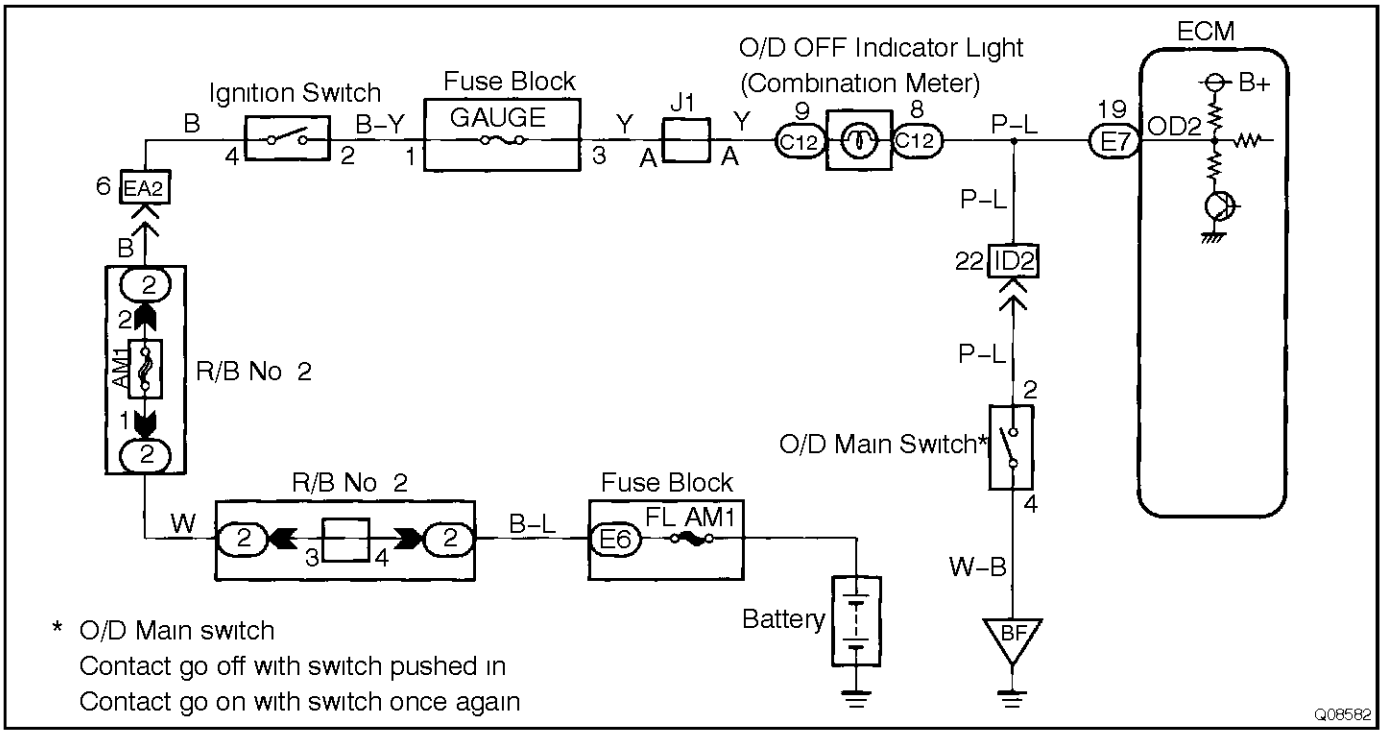
D5L3-03

# O/D Main Switch & O/D OFF Indicator Light Circuit

## CIRCUIT DESCRIPTION

The O/D main switch contacts go off when the switch is pushed in and come on when it is pushed once again In O/D main switch OFF position, the O/D OFF indicator lights up, and the ECM prohibits shifting to O/D

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

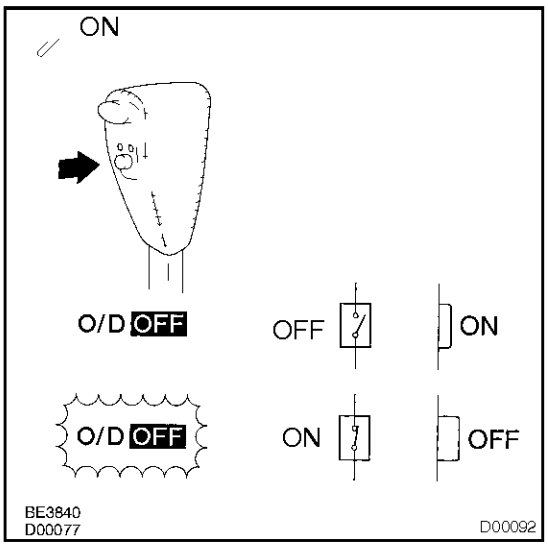
Brought to you by BirfMark



# INSPECTION PROCEDURE

## O/D OFF indicator light does not light up:

| | |
|---|---|
| 1 | **Check operation of O/D main switch.** |




**CHECK:**

(a) Turn the ignition switch ON

(b) Check the O/D OFF indicator light when the O/D main switch is pushed in to ON

**OK:**

**O/D OFF indicator light goes off**

**CHECK:**

Check the O/D OFF indicator light when the O/D main switch is pushed again to OFF

**OK:**

**O/D OFF indicator light lights up**

NG → **Go to step 4.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check OVRDRIVE CUT SW2 signal.** |

**When using TOYOTA hand–held tester:**

**PREPARATION:**

(a) Remove the fuse box cover

(b) Connect a TOYOTA hand–held tester to the DLC3

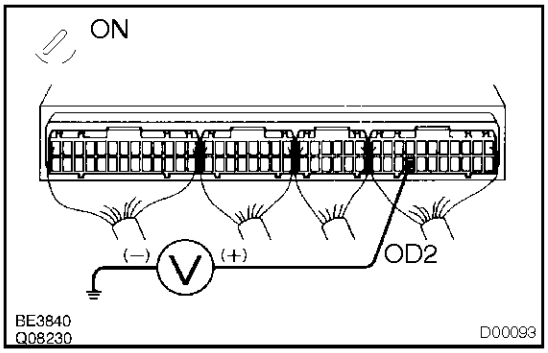
(c) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON

**CHECK:**

Read the OVRDRIVE CUT SW2 signal on the TOYOTA hand–held tester

**OK:**

| O/D Main Switch | OVRDRIVE CUT SW2 Signal |
|---|---|
| O/D ON (pushed in) | OFF |
| O/D OFF (pushed out) | ON |




**When not using TOYOTA hand–held tester:**

**PREPARATION:**

Turn the ignition switch ON

**CHECK:**

Check the voltage between terminal OD2 of the ECM and body ground

**OK:**

| O/D Main Switch | Voltage |
|---|---|
| O/D ON | 9 – 14 V |
| O/D OFF | Below 3 V |

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–147).**

NG

| | |
|---|---|
| 3 | **Check harness and connector between O/D OFF indicator light and ECM (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Check and replace ECM.**

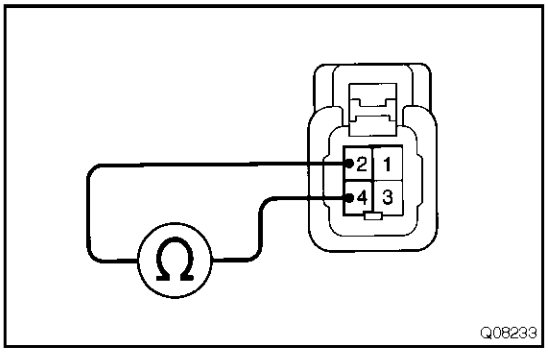


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check O/D main switch. |
|---|---|




CHECK:

(a) Disconnect the O/D main switch connector

(b) Measure the resistance between terminals 2 and 4 of the O/D main switch connector

OK:

| O/D Main Switch | Resistance |
|---|---|
| ON | ∞ Ω (open) |
| OFF | 0 Ω (continuity) |

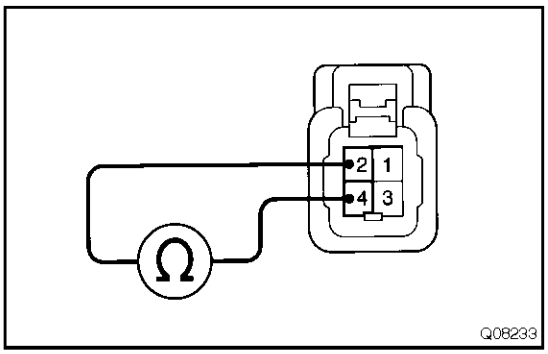
NG → Replace O/D main switch.

OK →

Check and replace the combination meter (See page BE–32).

## O/D OFF indicator light remains ON:

| 1 | Check O/D main switch. |
|---|---|




CHECK:

(a) Disconnect the O/D main switch connector

(b) Measure the resistance between terminals 2 and 4 of the O/D main switch connector

OK:

| O/D Main Switch | Resistance |
|---|---|
| ON | ∞ Ω (open) |
| OFF | 0 Ω (continuity) |

NG → Replace O/D main switch.

OK →



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check harness and connector between O/D OFF indicator light and O/D main switch, and O/D OFF indicator light and ECM (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

**Check and replace ECM.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



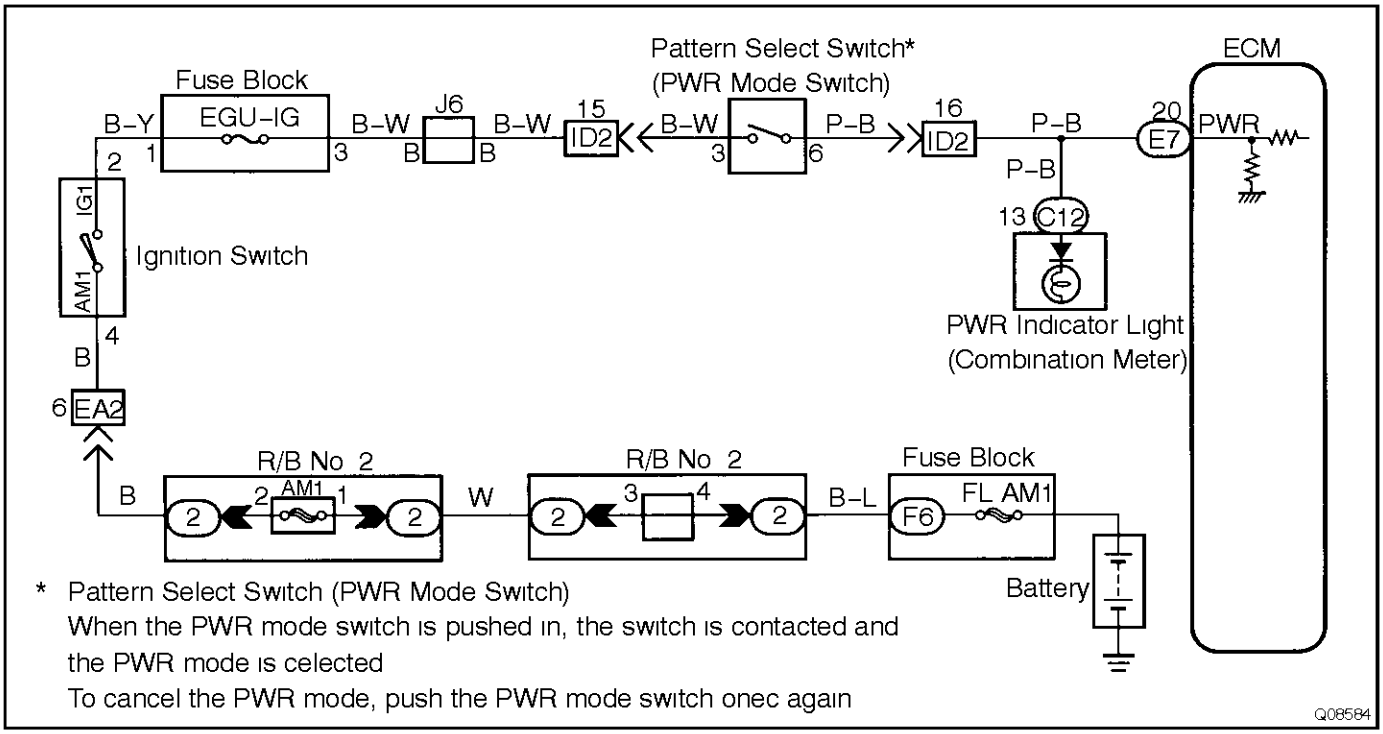
D5L6-03

# Pattern Select Switch Circuit (PWR Mode Switch)

## CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 position, L position and the lock–up patterns Following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves ON and OFF, and control the transmission gear change and the lock–up clutch operation

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check operation of PWR indicator light.** |

**PREPARATION:**

Check if the PWR indicator light normally when the PWR mode switch is set to NORM and PWR position

NG → **Check and repair PWR indicator light.**

OK

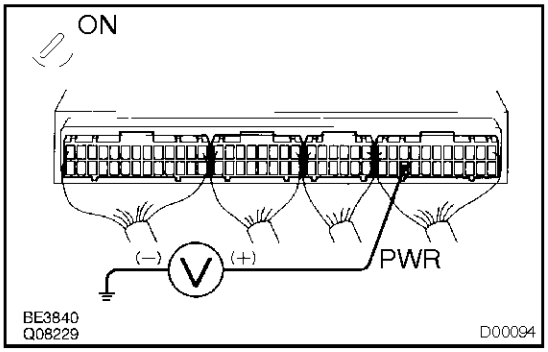


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check PATTERN SEL SW signal. |
|---|---|




**When using TOYOTA hand–held tester:**

**PREPARATION:**

(a) Remove the fuse box cover

(b) Connect a TOYOTA hand–held tester to the DLC3

(c) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON

**CHECK:**

Read the PWR signal on the TOYOTA hand–held tester

**OK:**

| PWR Mode Switch | PATTERN SEL SW Signal |
|---|---|
| PWR | ON |
| NORM | OFF |

**When not using TOYOTA hand–held tester:**

**PREPARATION:**

Turn the ignition switch ON

**CHECK:**

Measure the voltage between terminal PWR of the ECM connector and body ground when the PWR mode switch is set to the PWR (POWER) position and NORM (NORMAL) position

**OK:**

| PWR Mode Switch | Voltage |
|---|---|
| PWR | 7.5 – 14 V |
| NORM | Below 1.5 V |

HINT

The ECM uses the normal pattern signal if the power signal is not input

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–147).**

NG

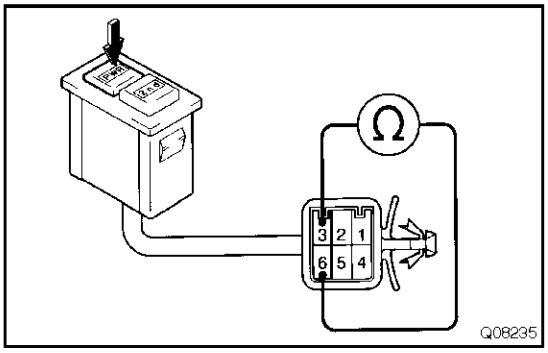


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check PWR mode switch. |
|---|---|




**PREPARATION:**
Disconnect the pattern select switch connector
**CHECK:**
Check the resistance between terminals of the pattern select switch connector when the PWR mode switch is set to PWR and NORM positions
**OK:**

| PWR Mode Switch | Resistance |
|---|---|
| PWR | 0 Ω (continuity) |
| NORM | ∞ Ω (open) |

NG → Replace pattern select switch.

OK

| 4 | Check harness and connector between battery and pattern select switch, and pattern select switch and ECM (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

Check and replace ECM.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5L8-03

# Pattern Select Switch Circuit (2nd Start Switch) & 2nd Start Switch Indicator Light Circuit

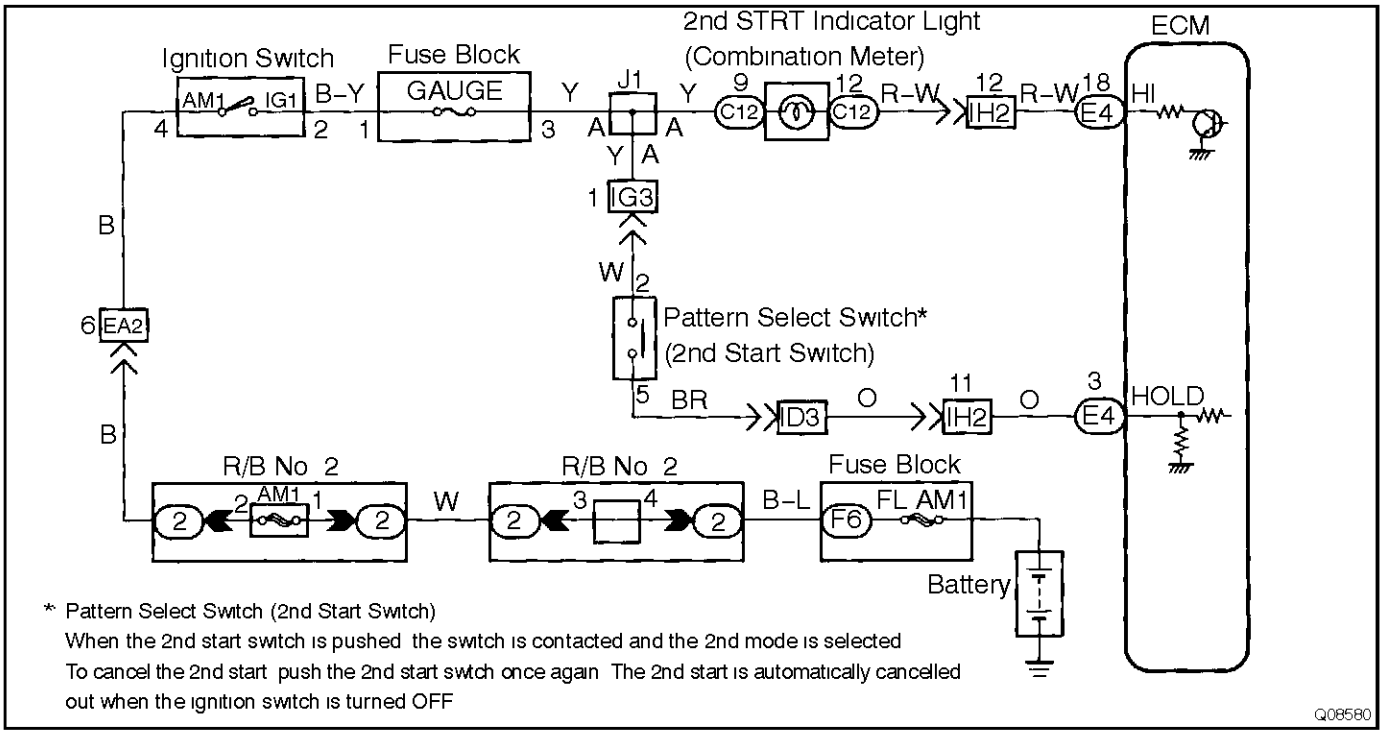
## CIRCUIT DESCRIPTION

When 2nd start mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear

In D position, the transmission automatically shifts up through 3rd to O/D as usual

In 2nd position, the transmission is held in 2nd gear

## WIRING DIAGRAM





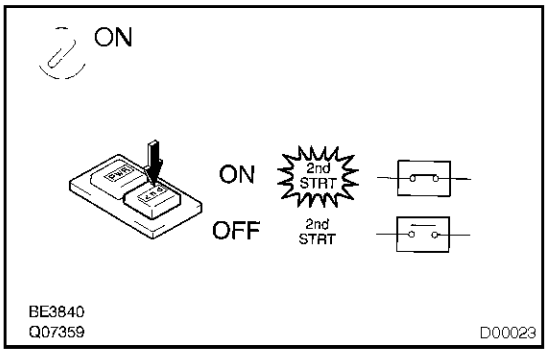

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| 1 | Check operation of 2nd start switch. |
|---|---|




**CHECK:**

(a) Turn the ignition switch ON

(b) Check the "2nd STRT" indicator light when the 2nd start switch is pushed in to ON

**OK:**

**"2nd STRT" indicator light lights up.**

**CHECK:**

Check the "2nd STRT" indicator light when the 2nd start switch is pushed again, or PWR mode switch is pushed into OFF

**OK:**

**"2nd STRT" indicator light goes off. When PWR mode switch is pushed in to ON, "2nd STRT" indicator light goes off, and "PWR" indicator light lights up.**

| OK | Proceed to next circuit inspection shown on problem symptoms table (See page DI–147). |
|---|---|

NG

| 2 | Check 2nd start indicator bulb. |
|---|---|

| NG | Replace 2nd start indicator bulb. |
|---|---|

OK

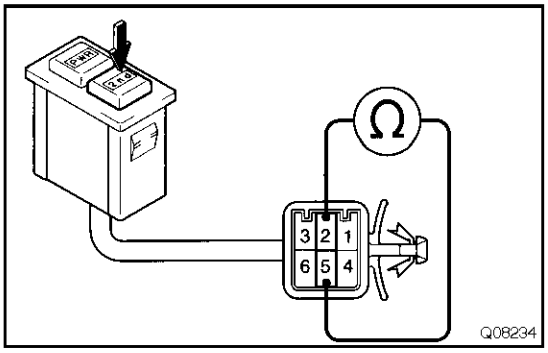


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check 2nd start switch. |
|---|---|




**PREPARATION:**

Disconnect the pattern select switch connector

**CHECK:**

Check the resistance between terminals 2 and 5 of the pattern select switch connector when the pattern select switch is set to 2nd start switch ON and OFF

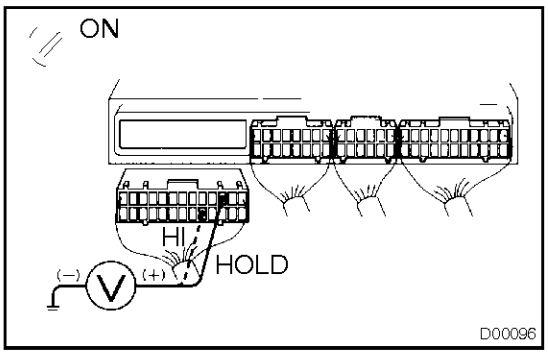
**OK:**

| 2nd Start Switch | Resistance |
|---|---|
| ON | 0 Ω (continuity) |
| OFF | ∞ Ω (open) |

NG → **Replace pattern select switch.**

OK

| 4 | Check voltage between terminals HOLD and HI of ECM and body ground. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch ON

(b) Disconnect the connector from the ECM

**CHECK:**

Check the voltage between terminal HOLD of the ECM and body ground when the select switch is set to 2nd start switch ON and OFF

**OK:**

| 2nd Start Switch | Voltage |
|---|---|
| ON | 9 – 14 V |
| OFF | Below 1 5 V |

**CHECK:**

Check the voltage between terminal HI of the ECM and body ground

**OK:**

**Voltage: 7.5 – 14 V**

OK → **Check and replace ECM.**

NG

**Check and replace harness and connector between battery and patten select switch, pattern select switch and ECM, battery and 2nd start indicator light, and 2nd start indicator light and ECM (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D 5L8 02

# Pattern Select Switch Circuit (2nd Start Switch) & 2nd Start Switch Indicator Light Circuit

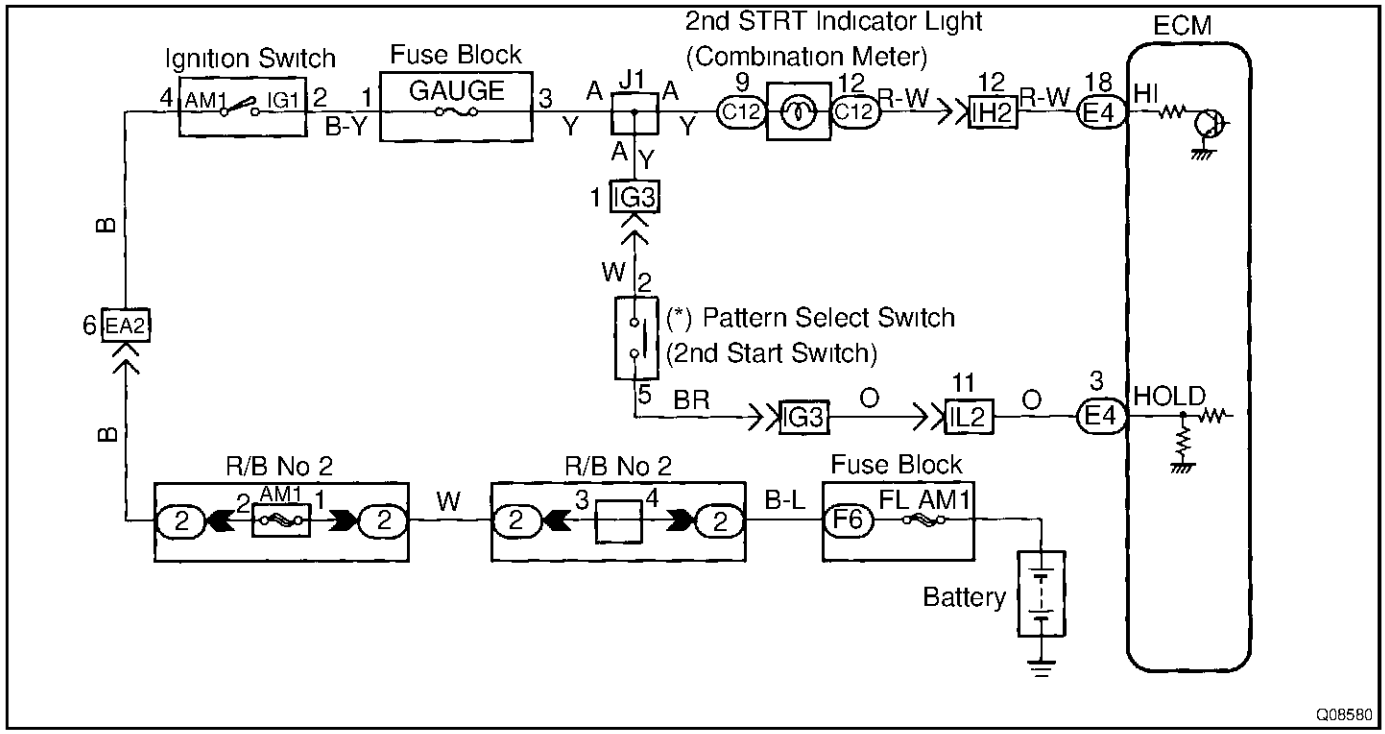
## CIRCUIT DESCRIPTION

When 2nd start mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear

In D position, the transmission automatically shifts up through 3rd to O/D as usual

In 2nd position, the transmission is held in 2nd gear

## WIRING DIAGRAM




(*) Pattern Select Switch (2nd Start Switch)

When the 2nd start switch is pushed, the switch is contacted and the 2nd mode is selected

To cancel the 2nd start, push the 2nd start switch once again The 2nd start is automatically cancelled out when the ignition switch is turned OFF



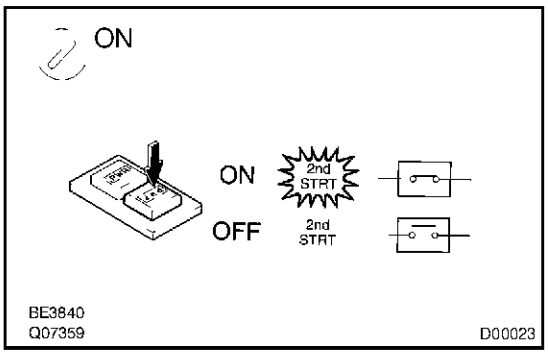
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| 1 | Check operation of 2nd start switch. |
|---|---|




**CHECK:**

(a) Turn the ignition switch ON

(b) Check "2nd STRT" indicator light when 2nd start switch is pushed in to ON

**OK:**

**"2nd STRT" indicator light lights up.**

**CHECK:**

Check "2nd STRT" indicator light when 2nd start switch is pushed again, or PWR mode switch is pushed into OFF

**OK:**

**"2nd STRT" indicator light goes off. When PWR mode switch is pushed in to ON, "2nd STRT" indicator light goes off, and "PWR" indicator light lights up.**

| OK | Proceed to next circuit inspection shown on matrix chart (See page DI-150 ). |
|---|---|

NG

| 2 | Check 2nd start indicator bulb. |
|---|---|

| NG | Replace 2nd start indicator bulb. |
|---|---|

OK

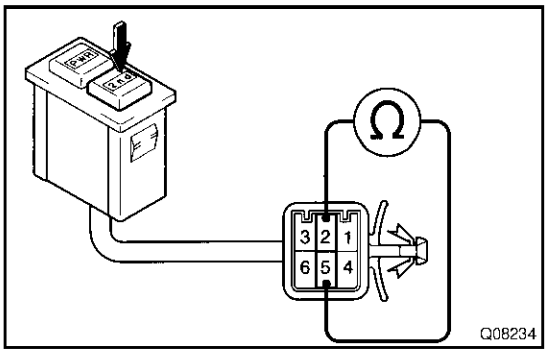


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check 2nd start switch. |
|---|---|




**PREPARATION:**

Disconnect the pattern select switch connector

**CHECK:**

Check continuity between terminals 2 and 5 of pattern select switch connector when pattern select switch is set to 2nd start switch ON and OFF

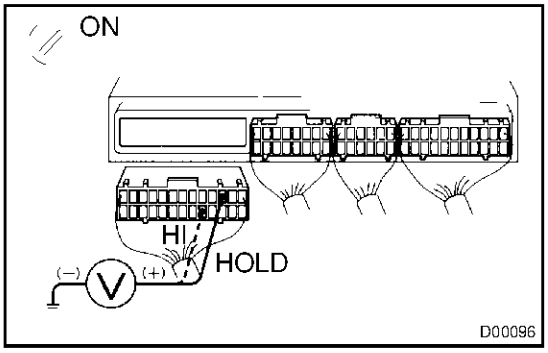
**OK:**

| 2nd start switch | Specified condition |
|---|---|
| Press continuously 2nd switch | 0 Ω (Continuity) |
| Release 2nd switch | ∞ Ω (open) |

NG → **Replace pattern select switch.**

OK

| 4 | Check voltage between terminals HOLD and HI of ECM and body ground. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch ON

(b) Disconnect the connector of ECM

**CHECK:**

Check voltage between terminal HOLD of ECM and body ground when the select switch is set to 2nd start switch ON and OFF

**OK:**

| 2nd start switch | Voltage |
|---|---|
| ON | 9 - 14 V |
| OFF | Below 1 5 V |

**CHECK:**

Check voltage between terminal HI of ECM and body ground

**OK:**

**Voltage: 7.5 - 14 V**

OK → **Check and replace the ECM.**

NG

**Check and replace harness and connector between battery and patten select switch, pattern select switch and ECM, battery and 2nd start indicator light , 2nd start indicator light and ECM (See page IN-27 ).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

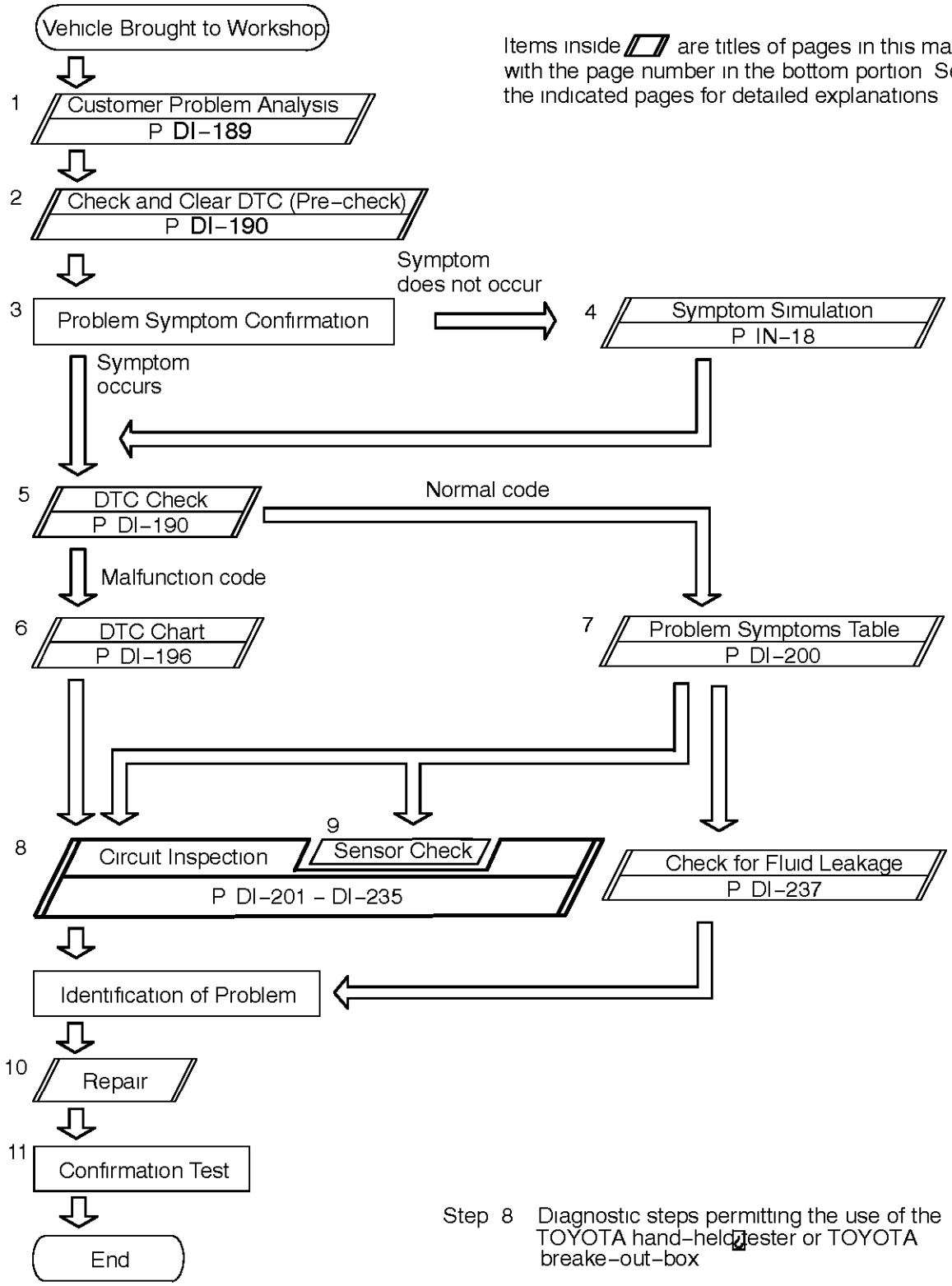


# ANTI–LOCK BRAKE SYSTEM

D5LT 02

## HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoooting in accordance with the procedure on the following pages




Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion See the indicated pages for detailed explanations

Step 8 Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA breake–out–box



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5LU 01

# CUSTOMER PROBLEM ANALYSIS CHECK

## ABS Check Sheet

Inspector's Name _____

| | | | |
|---|---|---|---|
| **Customer's Name** | | **Registration No.** | |
| | | **Registration Year** | / / |
| | | **Frame No.** | |
| **Date Vehicle Brought In** | / / | **Odometer Reading** | km miles |

| | |
|---|---|
| **Date Problem First Occurred** | / / |
| **Frequency Problem Occurs** | ☐ Continuous ☐ Intermittent ( times a day) |

| | | |
|---|---|---|
| **Symptoms** | ☐ ABS does not operate | |
| | ☐ ABS does not operate efficiently | |
| | **ABS Warning Light Abnormal** | ☐ Remains ON ☐ Does not Light Up |

| | | |
|---|---|---|
| **DTC Check** | **1st Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |
| | **2nd Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |

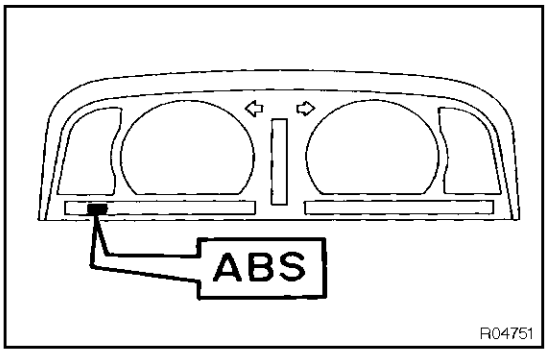


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5LV 02




# PRE–CHECK

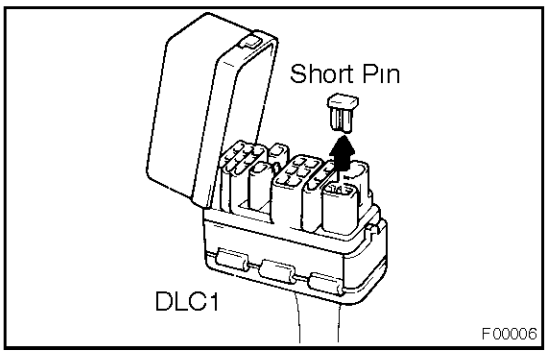
## 1. DIAGNOSIS SYSTEM

(a) Check the indicator

When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds

HINT

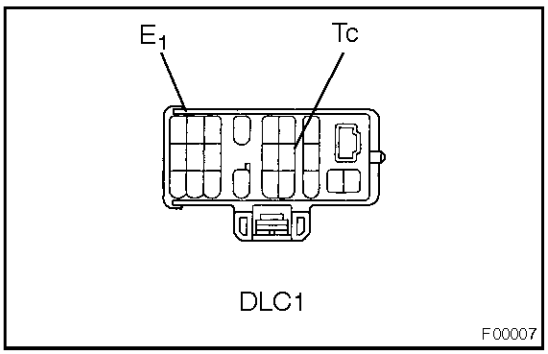
- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page DI–230)
- When the transfer is in L position (center differential lock), the ABS does not operate and the ABS warning light stays ON




(b) Check the DTC

(1) Confirm that the center differential is free

(2) Disconnect the short pin from the DLC1




(3) Using SST, connect terminals Tc and $E_1$ of the DLC1

SST 09843–18020

(4) Turn the ignition switch ON

(5) Read the DTC from the ABS warning light on the combination meter

HINT

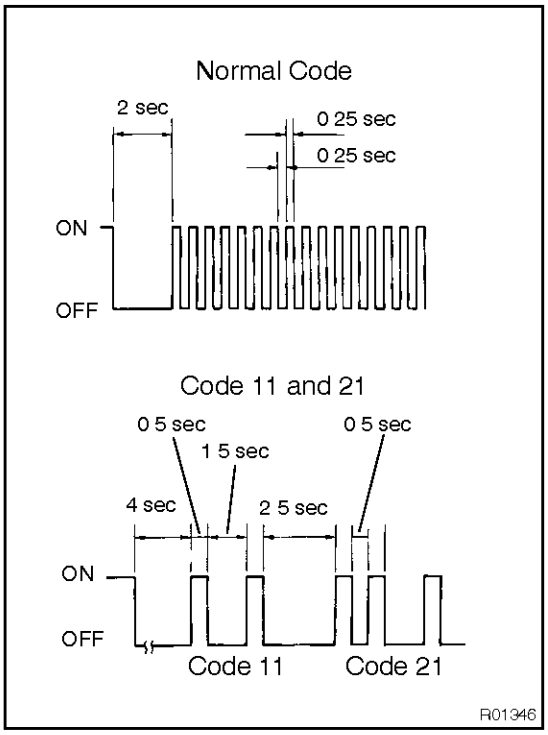
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–233 or DI–230)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

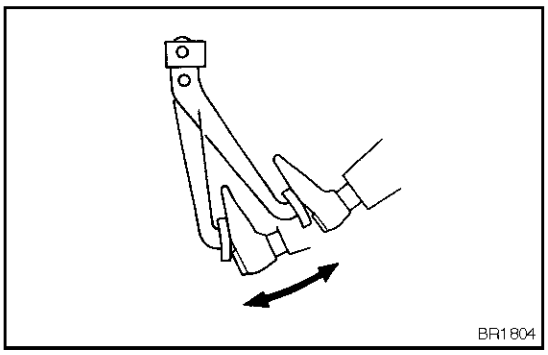
Brought to you by BirfMark



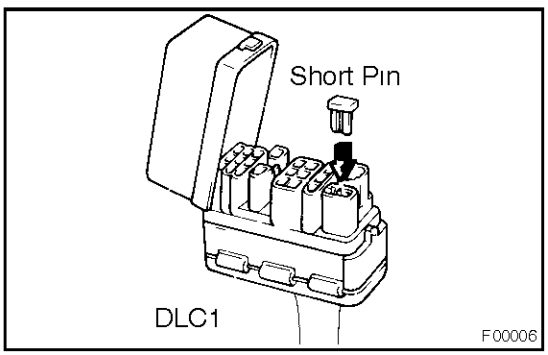



- As an example, the blinking patterns for normal code and codes 11 and 21 are shown in the illustration
  (6) Code are explained in the code table on page DI–196
  (7) After completing the check, disconnect terminals Tc and $E_1$, and turn off the display

If 2 or more malfunctions are indicated at the same time the lowest numbered DTC will be displayed 1st




(c) Clear the DTC
  (1) Confirm that the center differential is free
  (2) Using SST, connect terminals Tc and $E_1$ of the DLC1 and remove the short pin from the DLC1
  SST 09843–18020
  (3) Turn the ignition switch ON
  (4) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 3 seconds
  (5) Check that the warning light shows the normal code
  (6) Remove the SST from the terminals of the DLC1
  SST 09843–18020
  (7) Connect the short pin to the DLC1



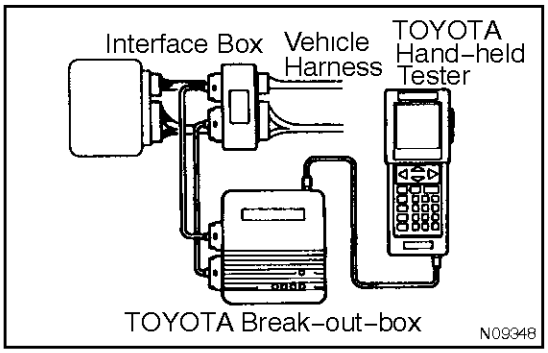

HINT
Cancellation can also be done by removing the ECU–B fuse, but in this case, other memory systems will also be cancelled out



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



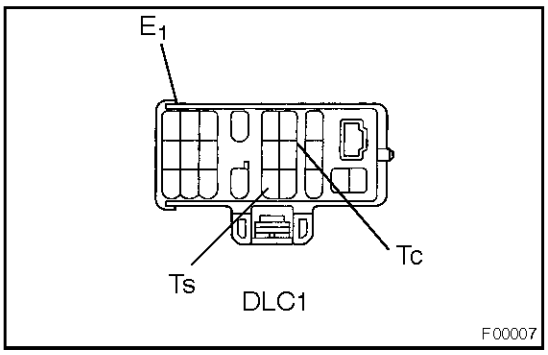



(d) Using TOYOTA break–out–box and TOYOTA hand–held tester, measure the ECU terminal values
(1) Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle
(2) Read the ECU input/output values by following the prompts on the tester screen

HINT

TOYOTA hand–held tester has a "Snapshot " function This records the measured values and is effective in the diagnosis of intermittent problems

Please refer to the TOYOTA hand–held tester/TOYOTA break out–box operators manual for further details

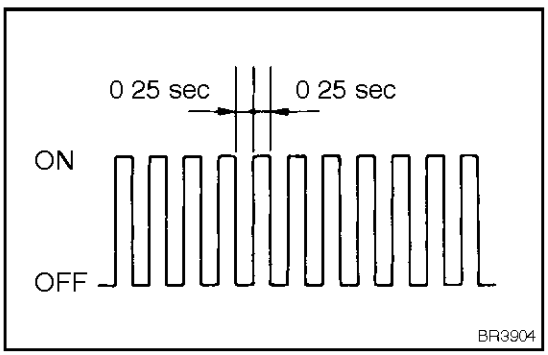



**2. SPEED SENSOR SIGNAL AND DECELERATION SENSOR CHECK**

(a) Check the speed sensor signal
(1) Conform that the center differential is free
(2) Turn the ignition switch OFF
(3) Using SST, connect terminals Ts and $E_1$ of the DLC1

SST 09843–18020

(4) Start the engine




(5) Check that the ABS warning light blinks

HINT

If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–230)

(6) Drive vehicle straight forward

HINT

Drive vehicle faster than 45 km/h (28 mph) for several seconds

(7) Stop the vehicle
(8) Using SST, connect terminals Tc and $E_1$ of the DLC1

SST 09843–18020

(9) Read the number of blinks of the ABS warning light

HINT

See the list of DTC on page DI–190

If every sensor is normal, a normal code is output (A cycle of 0 25 sec ON and 0 25 sec OFF is repeated)

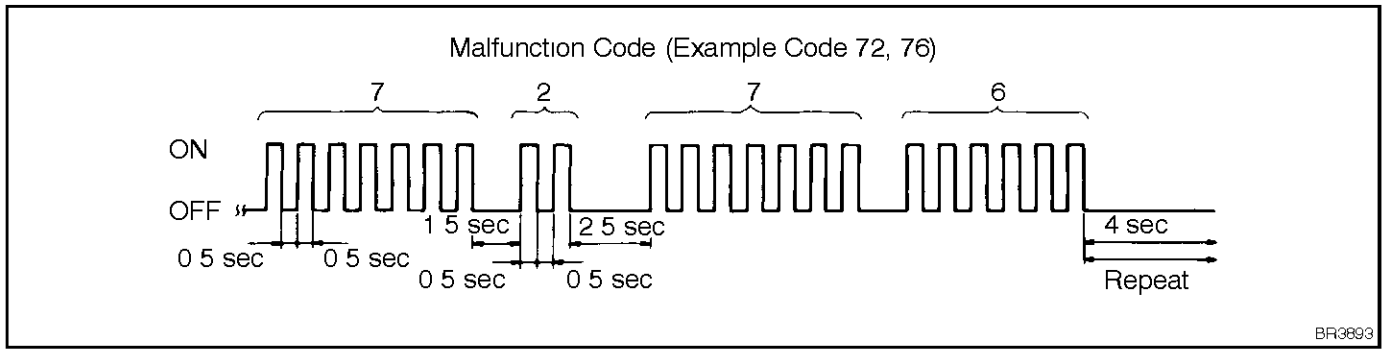
If 2 or more malfunction are indicated at the same time, the lowest numbered code will be displayed 1st



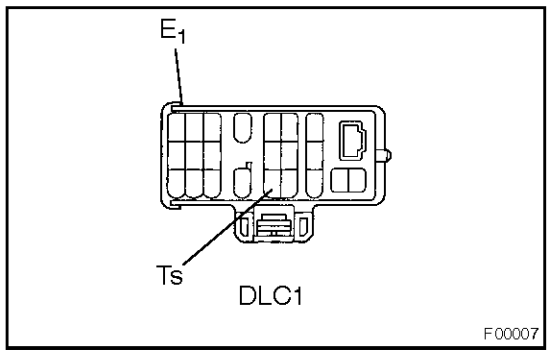
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

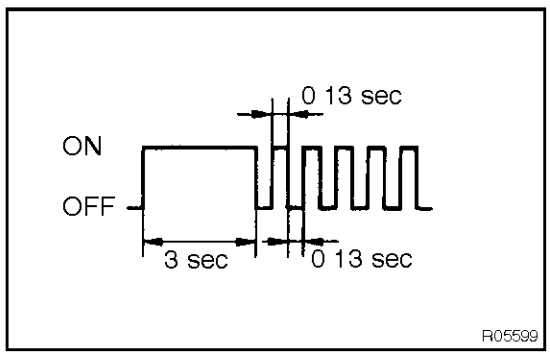





(10) After doing the check, disconnect terminals Ts and $E_1$, Tc and $E_1$ of the DLC1, and turn the ignition switch OFF

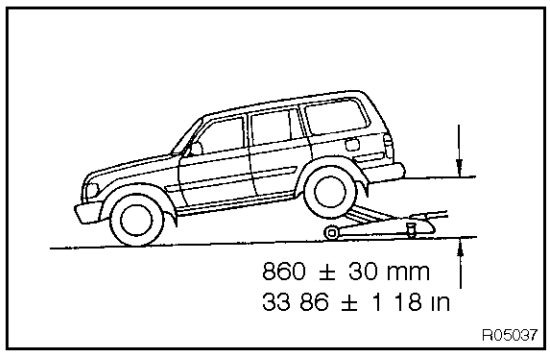



(b) Deceleration sensor detection point check
(1) Confirm that the center differential is free
(2) Turn the ignition switch OFF
(3) Using SST, connect terminals Ts and $E_1$ of the DLC1
SST 09843–18020
(4) Start the engine




(5) Check that the ABS warning light blinks

HINT
If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–230)




(6) Jack up the rear side of the vehicle slowly

HINT
When measuring the height, measure at the center of the lower body of the vehicle

(7) Check that the warning light blinks

If the warning light turns on, inspect the deceleration sensor installation If the sensor installation is OK, replace the deceleration sensor

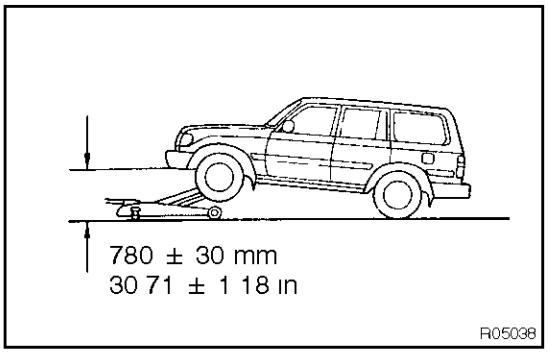
(8) Jack down the vehicle slowly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(9) Jack up the front side of the vehicle slowly, as shown

HINT

When measuring the height, measure at the center of the lower body of the vehicle

(10) Check that the warning light blinks

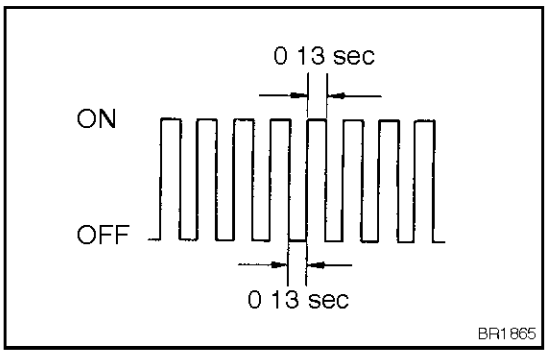
If the warning light turns on, inspect the deceleration sensor installation If the sensor installation is OK, replace the deceleration sensor

(11) Jack down the vehicle slowly

(c) Deceleration sensor operation check

(1) Drive the vehicle straight ahead at about 20 km/h (12 4 mph) or more, lightly depress the brake pedal

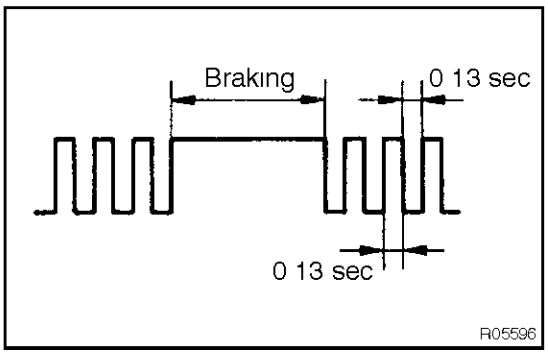
(2) Check that there is no change in the warning light pattern




(3) Drive the vehicle straight ahead at about 20 km/h (12 4 mph) or more, and depress the brake pedal moderately

(4) Check that the warning light turns on while braking

(5) Drive the vehicle straight ahead at about 20 km/h (12 4 mph) or more, and depress the brake pedal strongly



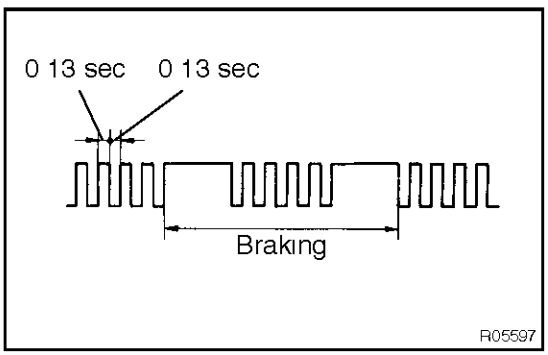

(6) Check that the warning light pattern changes while braking, as shown

If the operation is not as specified, inspect the deceleration sensor installation If the sensor installation is OK, replace the deceleration sensor

(7) Stop the vehicle and turn the ignition switch OFF

(8) Remove SST from the terminals Ts and $E_1$ of the DLC1

SST 09843–18020






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(d) Check the DTC of speed sensor function

| Code No | Diagnosis | Trouble Area |
|---|---|---|
| 71 | Low output voltage of right front speed sensor | • Right front speed sensor<br>• Sensor installation<br>• Sensor rotor<br>• Sensor wire harness |
| 72 | Low output voltage of left front speed sensor | • Left front speed sensor<br>• Sensor installation<br>• Sensor rotor<br>• Sensor wire harness |
| 73 | Low output voltage of right rear speed sensor | • Right rear speed sensor<br>• Sensor installation<br>• Sensor rotor<br>• Sensor wire harness |
| 74 | Low output voltage of left rear speed sensor | • Left rear speed sensor<br>• Sensor installation<br>• Sensor rotor<br>• Sensor wire harness |
| 75 | Abnormal change in output voltage of right front speed sensor | • Right front speed sensor rotor<br>• Sensor wire harness |
| 76 | Abnormal change in output voltage of left front speed sensor | • Left front speed sensor rotor<br>• Sensor wire harness |
| 77 | Abnormal change in output voltage of right rear speed sensor | • Right rear speed sensor rotor<br>• Sensor wire harness |
| 78 | Abnormal change in output voltage of left rear speed sensor | • Left rear speed sensor rotor<br>• Sensor wire harness |
| 79 | Deceleration sensor is faulty | • Deceleration sensor<br>• Sensor installation |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5LW 03

# DIAGNOSTIC TROUBLE CODE CHART

**NOTICE:**

**When removing the part, turn the ignition switch OFF.**

HINT

- Using SST 09843–18020, connect the terminals Tc and $E_1$, and remove the short pin
- If any abnormality is not found when inspection parts, inspect the ECU

If a malfunction code is displayed during the DTC check, check the circuit listed that the code For details of each code, turn to the page referred to under the "See page" for respective "DTC No " in the DTC chart

| DTC No (See page) | Detection Item | Trouble Area |
|---|---|---|
| 11 (DI–201) | Open circuit in ABS control (solenoid) relay circuit | • ABS control (solenoid) relay<br>• Open or short in ABS control (solenoid) relay circuit |
| 12 (DI–201) | Short circuit in ABS control (solenoid) relay circuit | • ABS control (solenoid) relay<br>• B+ short in ABS control (solenoid) relay circuit |
| 13 (DI–204) | Open circuit in ABS control (motor) relay circuit | • ABS control (motor) relay<br>• Open or short in ABS control (motor) relay circuit |
| 14 (DI–204) | Short circuit in ABS control (motor) relay circuit | • ABS control (motor) relay<br>• B+ short in ABS control (motor) relay circuit |
| 21 (DI–207) | Open or short circuit in 3–position solenoid circuit for right front wheel | • ABS actuator<br>• Open or short in SFR circuit |
| 22 (DI–207) | Open or short circuit in 3–position solenoid circuit for left front wheel | • ABS actuator<br>• Open or short in SFLcircuit |
| 23 (DI–207) | Open or short circuit in 3–position solenoid circuit for rear wheel | • ABS actuator<br>• Open or short in SRR circuit |
| 31 (DI–210) | Right front wheel speed sensor signal malfunction | • Right front left front right rear and left rear speed sensor<br>• Open or short in each speed sensor circuit<br>• Senser rotor |
| 32 (DI–210) | Left front wheel speed sensor signal malfunction | |
| 33 (DI–210) | Right rear wheel speed sensor signal malfunction | |
| 34 (DI–210) | Left rear wheel speed sensor signal malfunction | |
| 35 (DI–210) | Open circuit in left front or right rear speed sensor circuit | • Open in left front or right rear speed sensor circuit |
| 36 (DI–210) | Open circuit in right front or left rear speed sensor circuit | • Open in right front or left rear speed sensor circuit |
| 41 (DI–215) | Low battery positive voltage or abnormally high battery positive voltage | • Battery<br>• IC regulator<br>• Open or short in power source circuit |
| 43 (DI–218) | Malfunction in deceleration sensor | • Deceleration sensor<br>• Wire harness for deceleration sensor circuit |
| 44 (DI–219) | Open or short in deceleration sensor circuit | • Deceleration sensor<br>• Open or short in deceleration sensor circuit |
| 48 (DI–221) | Open or short circuit in center differential lock circuit<br>Center differential is locking | • Center differential lock<br>• Center differential lock circuit |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| 51<br>(DI–224) | Pump motor is locked<br>Open in pump motor ground | • ABS pump motor |
| Always ON<br>(DI–225) | Malfunction in ECU<br>IG power source circuit | • Battery<br>• IC regulator<br>• Open or short in power source circuit<br>• ECU |



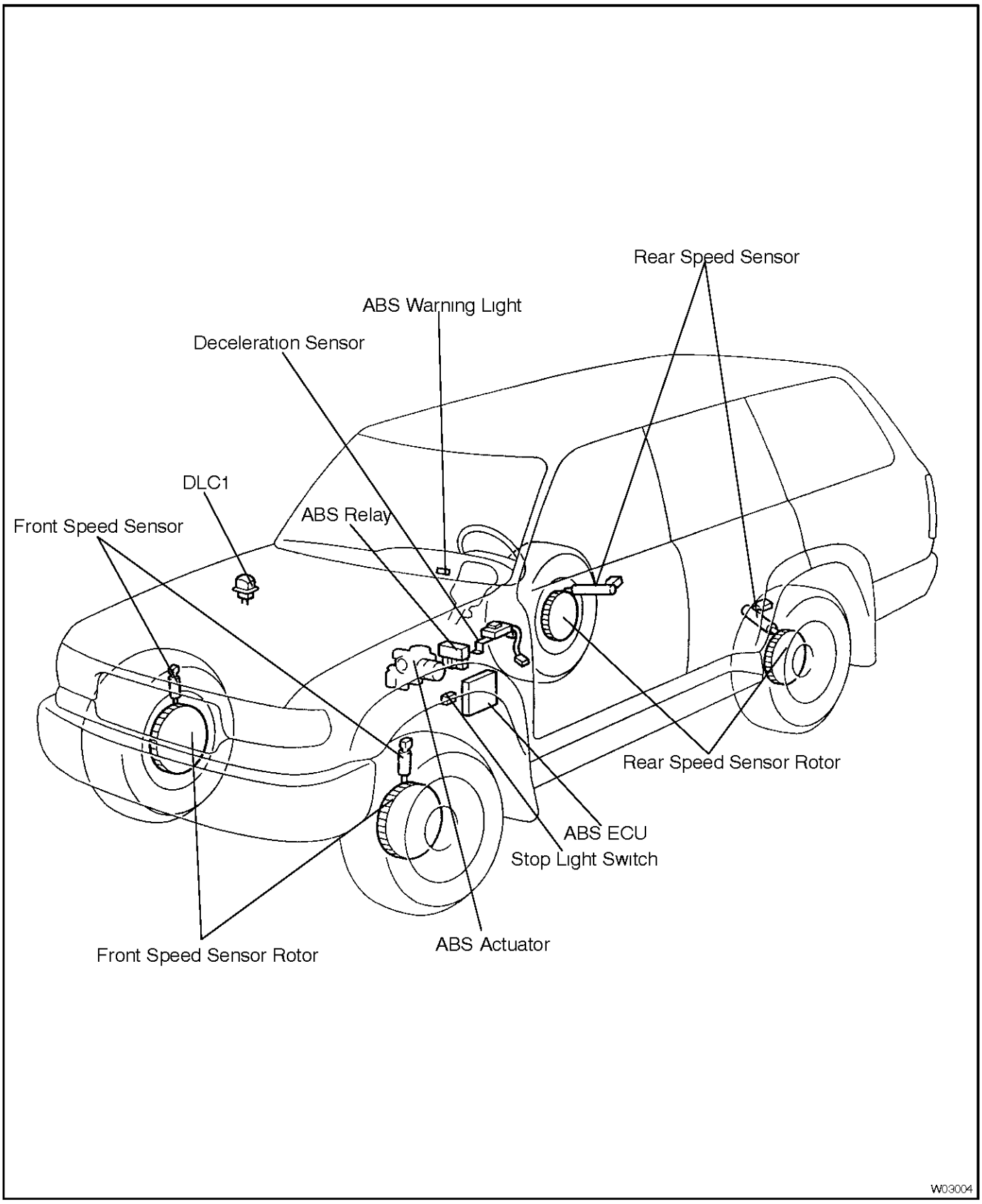
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5LX-02

# PARTS LOCATION






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5LZ 03

# PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page

| Symptoms | Suspected Area | See page |
|---|---|---|
| ABS does not operate | Only when 1 – 4 are all normal and the problem is still occurring replace the ABS ECU<br>2 Check the DTC reconfirming that the normal code is output<br>3 IG power source circuit<br>4 Speed sensor circuit<br>5 Check the ABS actuator with a checker<br>If abnormal check the hydraulic circuit for leakage (See page DI–237) | <br><br>DI–190<br>DI–215<br>DI–210<br>BR–53<br> |
| ABS does not operate efficiently | Only when 1 – 4 are all normal and the problem is still occurring replace the ABS ECU<br>1 Check the DTC reconfirming that the normal code is output<br>2 Speed sensor circuit<br>3 Stop light switch circuit<br>4 Check the ABS actuator with a checker<br>If abnormal check the hydraulic circuit for leakage (See page DI–237) | <br><br>DI–190<br>DI–210<br>DI–228<br>BR–53<br> |
| ABS warning light abnormal | 1 ABS warning light circuit<br>2 ABS ECU | DI–230<br>– |
| DTC check cannot be done | Only when 1 and 2 are all normal and the problem is still occurring replace the ABS ECU<br>1 ABS warning light circuit<br>2 Tc terminal circuit | <br><br>DI–230<br>DI–233 |
| Speed sensor signal check cannot be done | 1 Ts terminal circuit<br>2 ABS ECU | DI–235<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5M0-02

# CIRCUIT INSPECTION

| DTC | 11, 12 | ABS Control (Solenoid) Relay Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

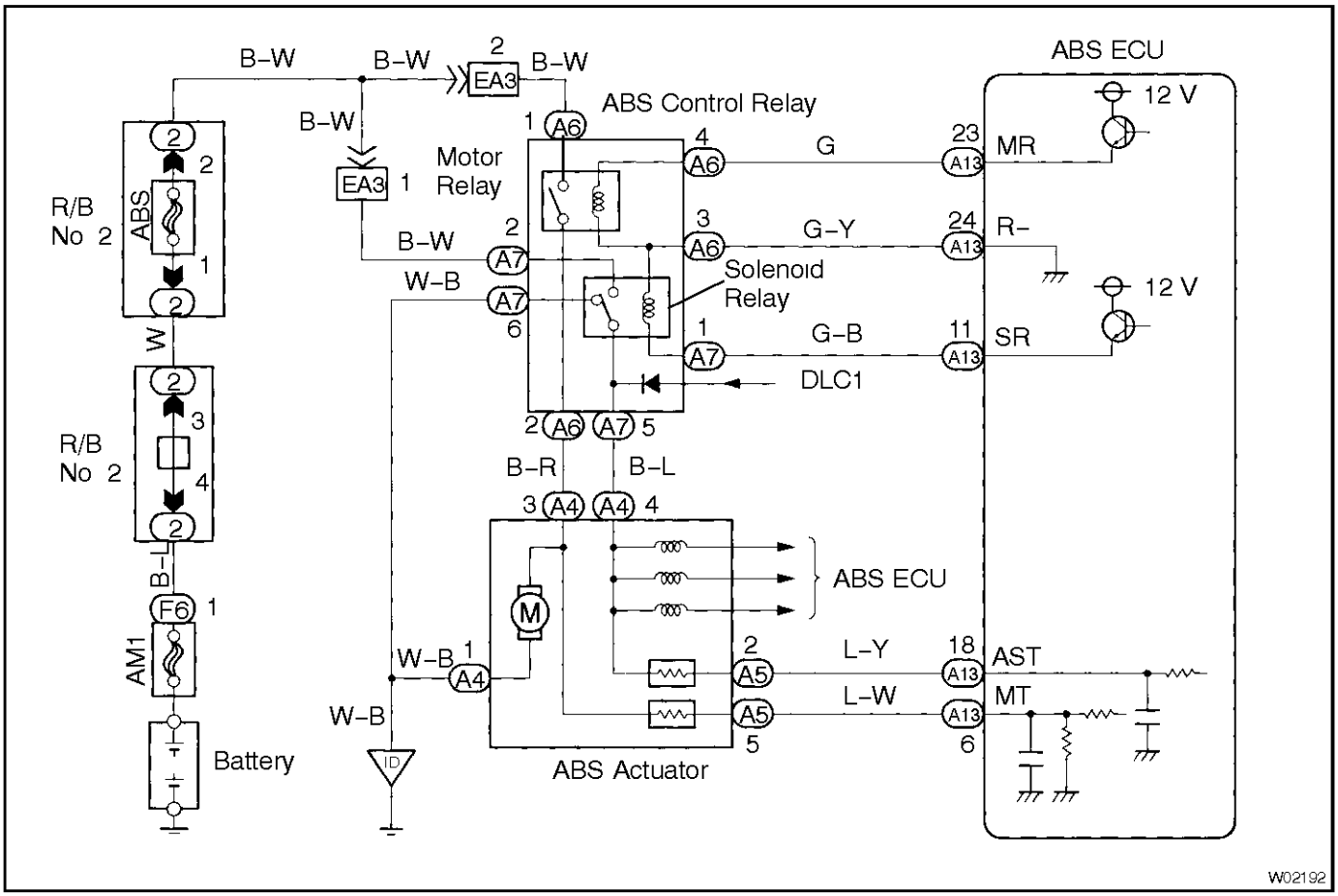
This relay supplies power to each ABS solenoid After the ignition switch is turned ON, if the initial check is OK, the relay goes on

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 11 | Conditions (1) and (2) continue for 0 2 sec or more<br>1 ABS control (solenoid) relay terminal (SR) voltage Battery positive voltage<br>2 (2) ABS control (solenoid) relay monitor terminal (AST) voltage 0 V | • ABS control (solenoid) relay<br>• Open or short in ABS control (solenoid) relay circuit |
| 12 | Conditions 1 and 2 continue for 0 2 sec or more<br>1 ABS control (solenoid) relay terminal (SR) voltage 0 V<br>2 ABS control (solenoid) relay monitor terminal (AST) voltage Battery positive voltage | • ABS control (solenoid) relay<br>• B+ short in ABS control (solenoid) relay circuit |

Fail safe function

If trouble in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

## WIRING DIAGRAM





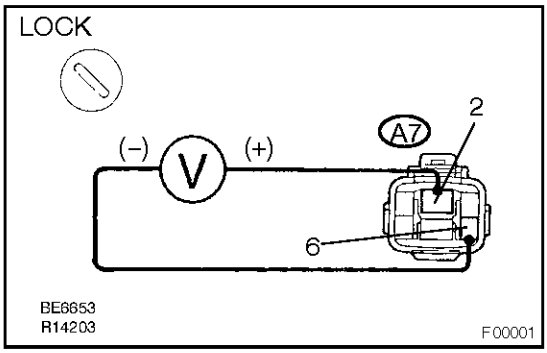

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals A7–2 and A7–6 of ABS control relay connector.** |




**PREPARATION:**

Disconnect the ABS control relay connector

**CHECK:**

Measure the voltage between terminals A7–2 and A7–6 of the ABS control relay harness side connector

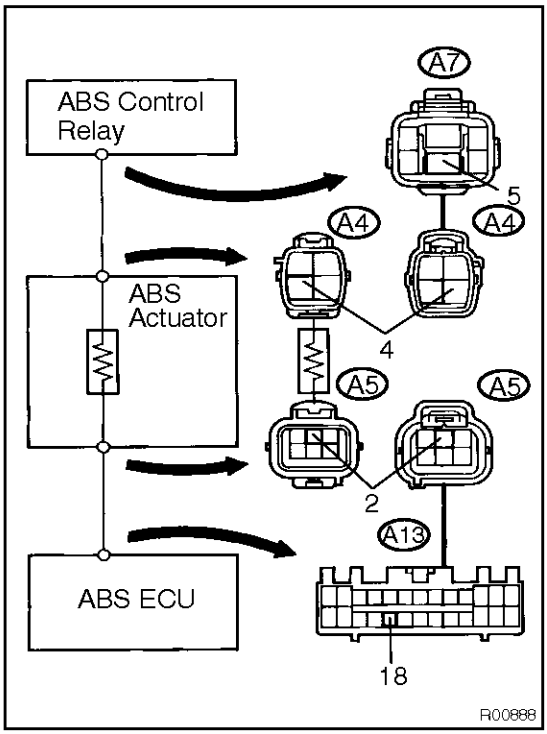
**OK:**

**Voltage: 10 – 14 V**

| | |
|---|---|
| NG | **Check and repair harness or connector.** |

OK

| | |
|---|---|
| 2 | **Check continuity between terminals A7–5 and A4–4, A4–4 and A5–2, and A5–2 and A13–18.** |




**PREPARATION:**

Disconnect the 2 connectors from the ABS actuator

**CHECK:**

Check the continuity between terminals A7–5 and A4–4, A4–4 and A5–2, and A5–2 and A13–18

**OK:**

**Continuity**

HINT

There is a resistance of 4 ~ 6 Ω between terminals A4–4 and A5–2

| | |
|---|---|
| NG | **Repair or replace harness or ABS actuator.** |

OK

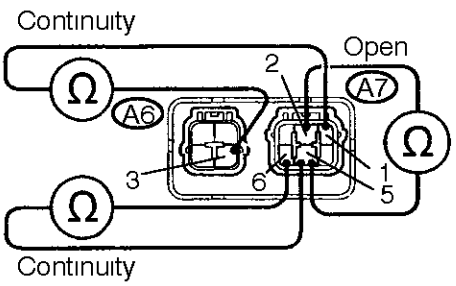


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check ABS control (solenoid) relay. |
|---|---|

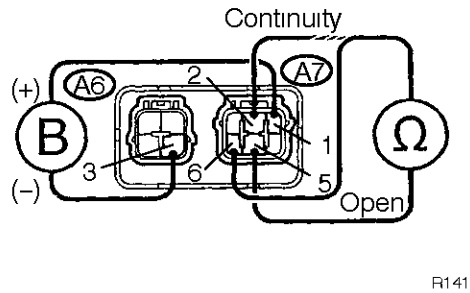



**CHECK:**

Check the continuity between each terminal of the ABS control (solenoid) relay

**OK:**

| | |
|---|---|
| Terminals A7–1 and A6–3 | Continuity (Reference value aprox 80 Ω) |
| Terminals A7–5 and A7–6 | Continuity |
| Terminals A7–2 and A7–5 | Open |




**CHECK:**

(a) Apply battery positive voltage between terminals A7–1 and A6–3

(b) Check the continuity between each terminal of the ABS control (solenoid) relay

**OK:**

| | |
|---|---|
| Terminals A7–5 and A7–6 | Open |
| Terminals A7–2 and A7–5 | Continuity |

NG → **Replace ABS control relay.**

OK

| 4 | Check for open and short in harness and connector between ABS control (solenoid) relay and ABS ECU (See page IN–28). |
|---|---|

NG → **Repair or replace harness or connector.**

OK

**If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5M2 02

| DTC | 21, 22, 23 | ABS Actuator Solenoid Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 21 | Conditions 1 through 3 continue for 0 05 sec or more<br>1 ABS control (solenoid) relay terminal (SR) voltage Battery positive voltage<br>2 Voltage of ABS ECU terminal AST Battery positive voltage<br>3 When power transistor of ECU is ON voltage of terminal SFR is 0 V or battery positive voltage | • ABS actuator<br>• Open or short in SFR circuit |
| 22 | Conditions 1 through 3 continue for 0 05 sec or more<br>1 ABS control (solenoid) relay terminal (SR) voltage Battery positive voltage<br>2 Voltage of ABS ECU terminal AST Battery positive voltage<br>3 When power transistor of ECU is ON voltage of terminal SFL is 0 V or battery positive voltage | • ABS actuator<br>• Open or short in SFL circuit |
| 23 | Conditions 1 through 3 continue for 0 05 sec or more<br>1 ABS control (solenoid) relay terminal (SR) voltage Battery positive voltage<br>2 Voltage of ABS ECU terminal AST Battery positive voltage<br>3 When power transistor of ECU is ON voltage of terminal SRR is 0 V or battery positive voltage | • ABS actuator<br>• Open or short in SRR circuit |

Fail safe function

If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

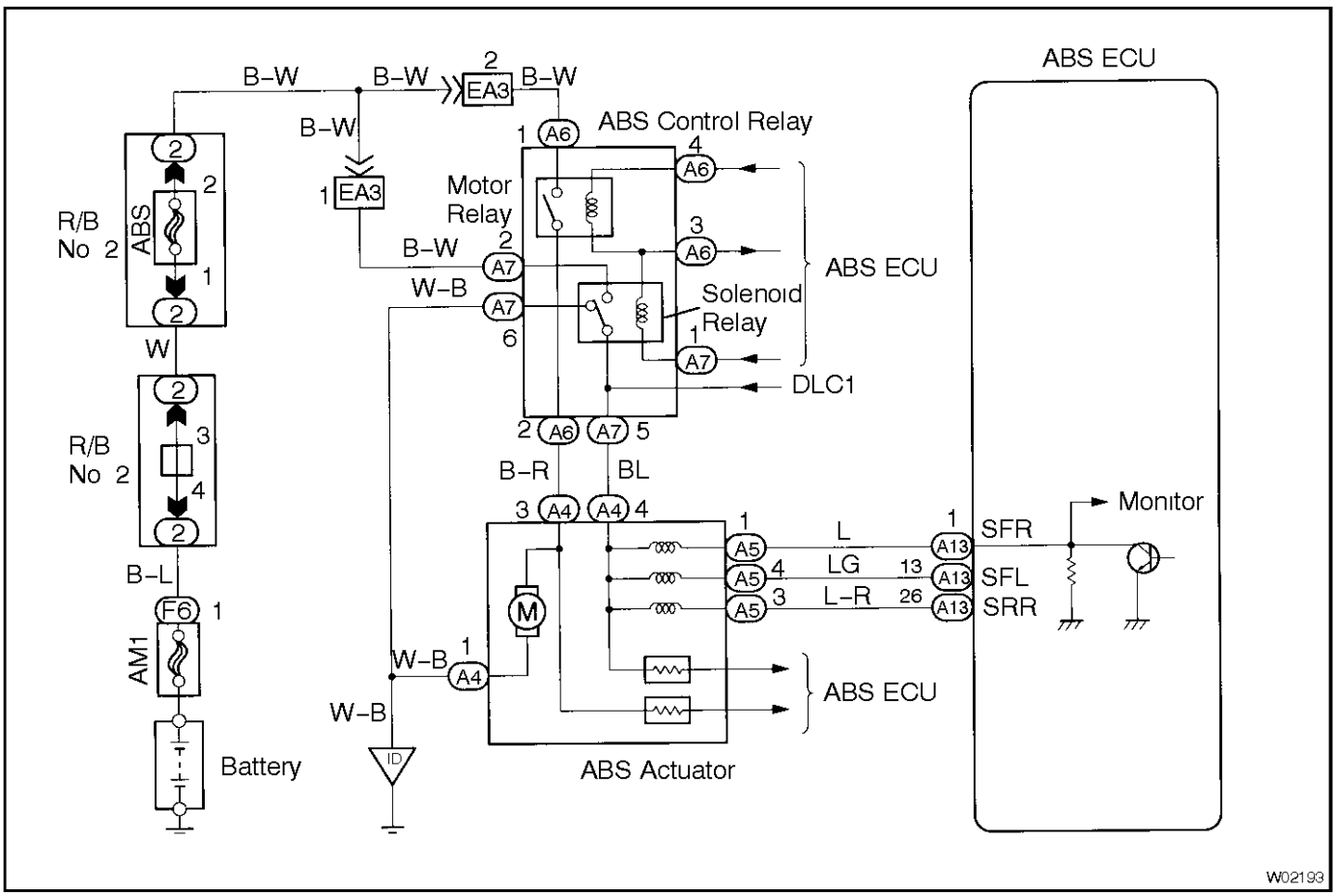


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

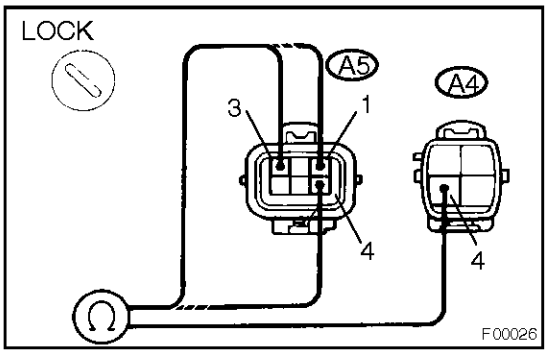


## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check ABS actuator solenoid.** |




**PREPARATION:**

Disconnect the 2 connectors from the ABS actuator

**CHECK:**

Check the continuity between terminals A4 – 4 and A5–1, 3, 4 of the ABS actuator connector

**OK:**

**Continuity**

HINT

Resistance of each solenoid coil is 0 8 – 1 6 Ω

| | |
|---|---|
| NG | **Replace ABS actuator.** |

**OK**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ABS ECU and actuator (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**If same code is still output after DTC is deleted, check contact condition of each connection. If connector are normal, ECU may be defective.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

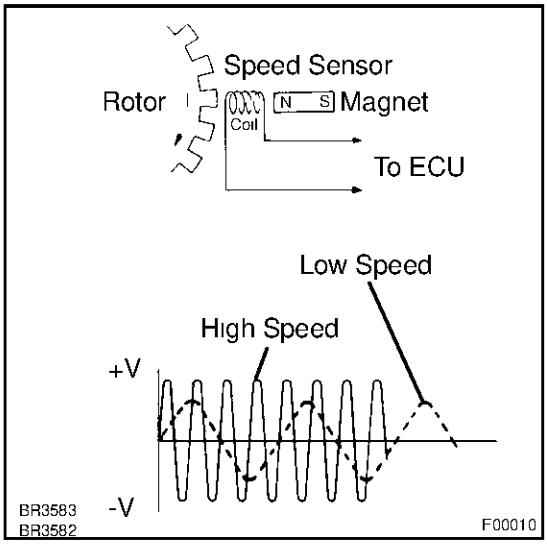
Brought to you by BirfMark



D 5M3 02

| DTC | 31, 32, 33, 34, 35, 36 | Speed Sensor Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION




The speed sensor detects wheel speed and sends the appropriate signals to the ECU These signals are used to control the ABS system The front and rear rotors each have 48 serrations

When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 31 32 33 34 | Detection of any of conditions (1) through (3)<br>(1) At vehicle speed of 10 km/h (6 mph) or more pulses are not input for 5 sec<br>(2) Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF<br>(3) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h (12 mph) or more | • Right front left front right rear and left rear speed sensor<br>• Open or short in each speed sensor circuit<br>• Sensor rotor |
| 35 | Speed sensor signal is not input for about 1 sec while the left front and right rear speed sensor signals are being checked with the IG switch ON | • Open in left front or right rear speed sensor circuit |
| 36 | Speed sensor signal is not input for about 1 sec while the right front and left rear speed sensor signals are being checked with the IG switch ON | • Open in right front or left rear speed sensor circuit |

HINT:

- DTC No 31 is for the right front speed sensor
- DTC No 32 is for the left front speed sensor
- DTC No 33 is for the right rear speed sensor
- DTC No 34 is for the left rear speed sensor

Fail safe function:

If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

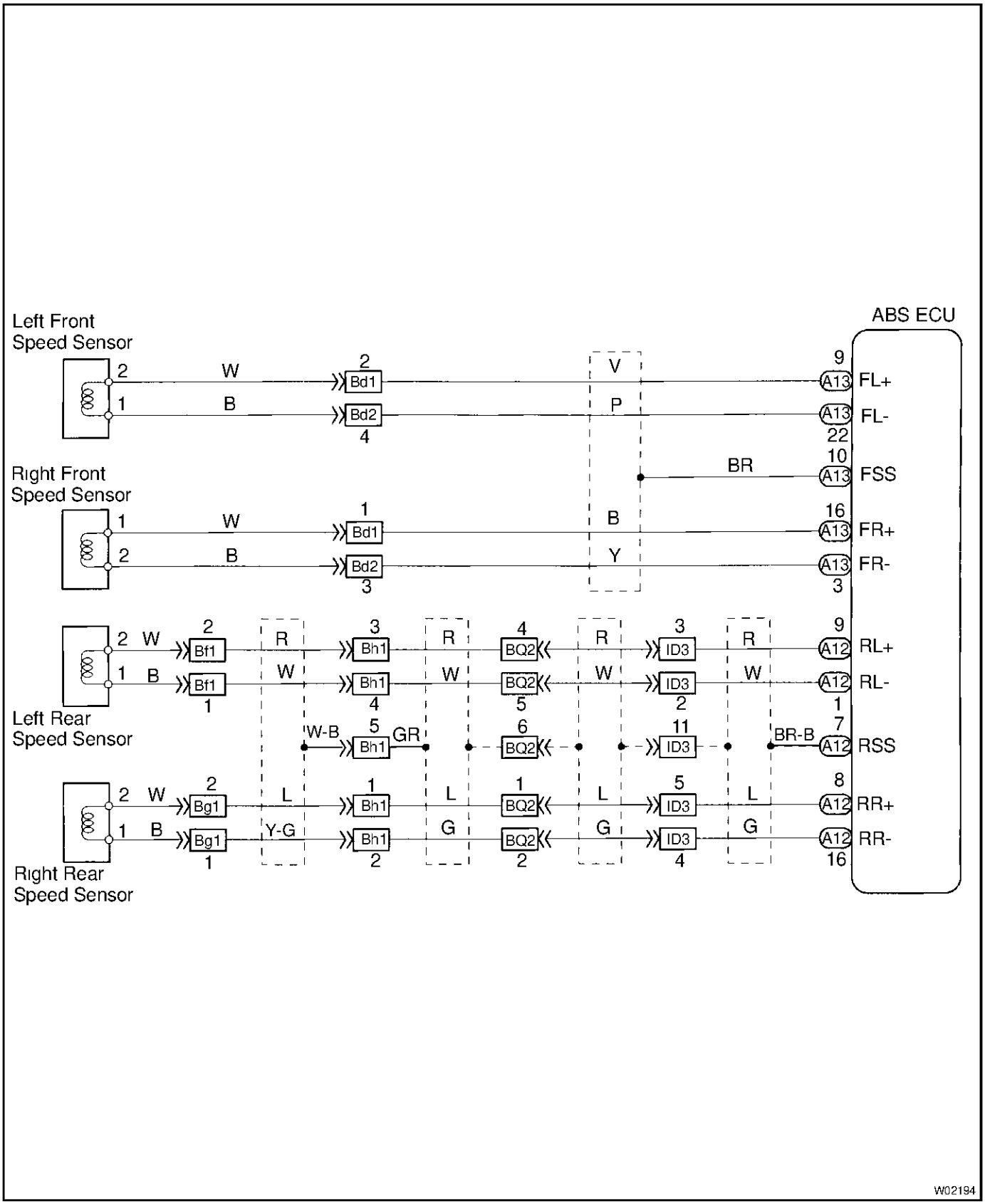


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# WIRING DIAGRAM





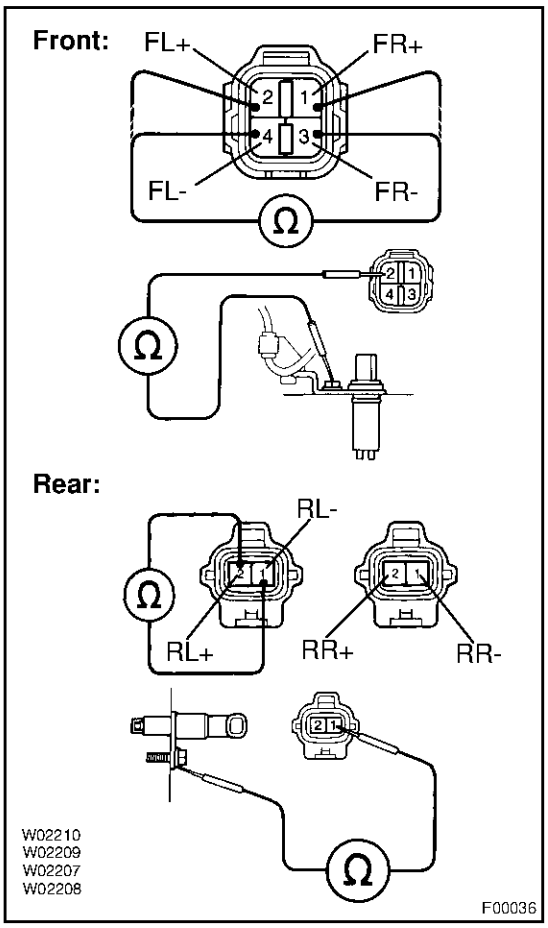

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check speed sensor.** |




**Front**

**PREPARATION:**

Disconnect speed sensor connector

**CHECK:**

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector

**OK:**

**Resistance: 0.6 - 2.0 kΩ**

**CHECK:**

Measure resistance between terminals 1 and 2 of speed sensor connector and body ground

**OK:**

**Resistance: 1 MΩ or higher**

**Rear**

**PREPARATION:**

Disconnect speed sensor connector

**CHECK:**

Measure resistance between terminals 1 and 2 of speed sensor connector

**OK:**

**Resistance: 0.5 - 1.6 kΩ**

**CHECK:**

Measure resistance between terminals 1 and 2 of speed sensor connector and body ground

**OK:**

**Resistance: 1 MΩ or higher**

| | |
|---|---|
| NG | **Replace speed sensor.** |

**NOTICE:**

**Check the speed sensor signal last (See page DI-189 ).**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

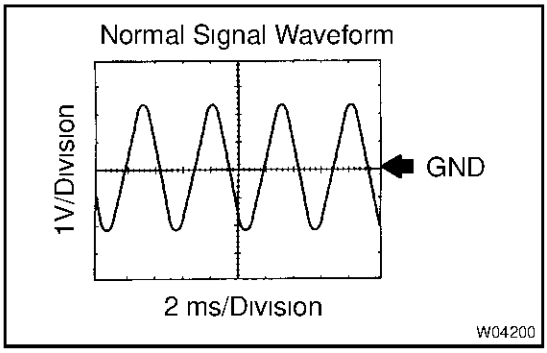


| | |
|---|---|
| 2 | **Check for open and short in harness and connector between each speed sensor and ECU (See page IN-27 ).** |

NG → **Repair or replace harness or connector.**

OK

| | |
|---|---|
| 3 | **Check speed sensor and rotor serrations.** |




**Reference: INSPECTION USING OSCILLOSCOPE**

**PREPARATION:**

(a) Remove the ABS ECU with connector still connected

(b) Connect the oscilloscope to the terminals FR+, FL+, RR+ or RL+ and GND of the ABS ECU

**CHECK:**

Drive the vehicle at 30 km/h (19 mph), and check the signal waveform

OK → **Turn the IG swithch OFF, check and replace ABS ECU.**

NG

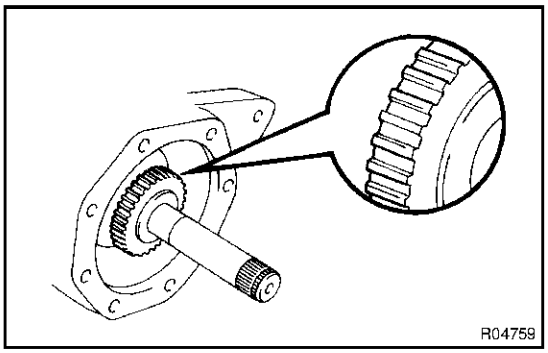


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check sensor rotor and sensor installation. |
|---|---|




**Front**

**PREPARATION:**

Remove front axle hub and knuckle spindle (See page SA-8 )

**CHECK:**

Check the sensor rotor serrations

**OK:**

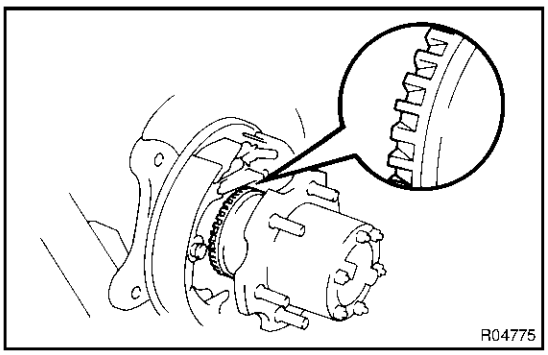
**No scratches or missing teeth.**

**CHECK:**

Check the sensor tip and grease

**OK:**

**No scratches or foreign objects on the sensor tip and grease.**




**Rear**

**PREPARATION:**

Remove the rear brake caliper and disc

**CHECK:**

Check the sensor rotor serrations

**OK:**

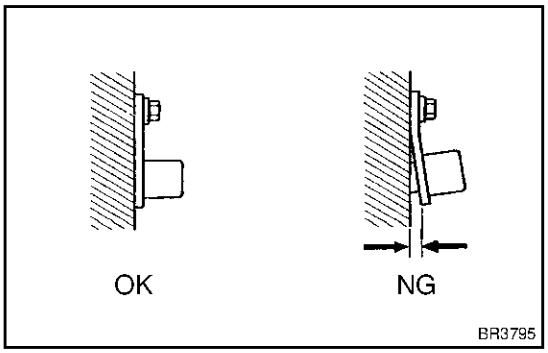
**No scratches or missing teeth.**

**CHECK:**

Check the sensor tip

**OK:**

**No scratches or foreign objects on the sensor tip.**




**CHECK:**

Check the speed sensor installation

**OK:**

**The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.**

| NG | Replace speed sensor or rotor. |
|---|---|

**NOTICE:**

**Check the speed sensor signal last (See page DI-189 ).**

**OK**

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5M4 02

| DTC | 41 | IG Power Source Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

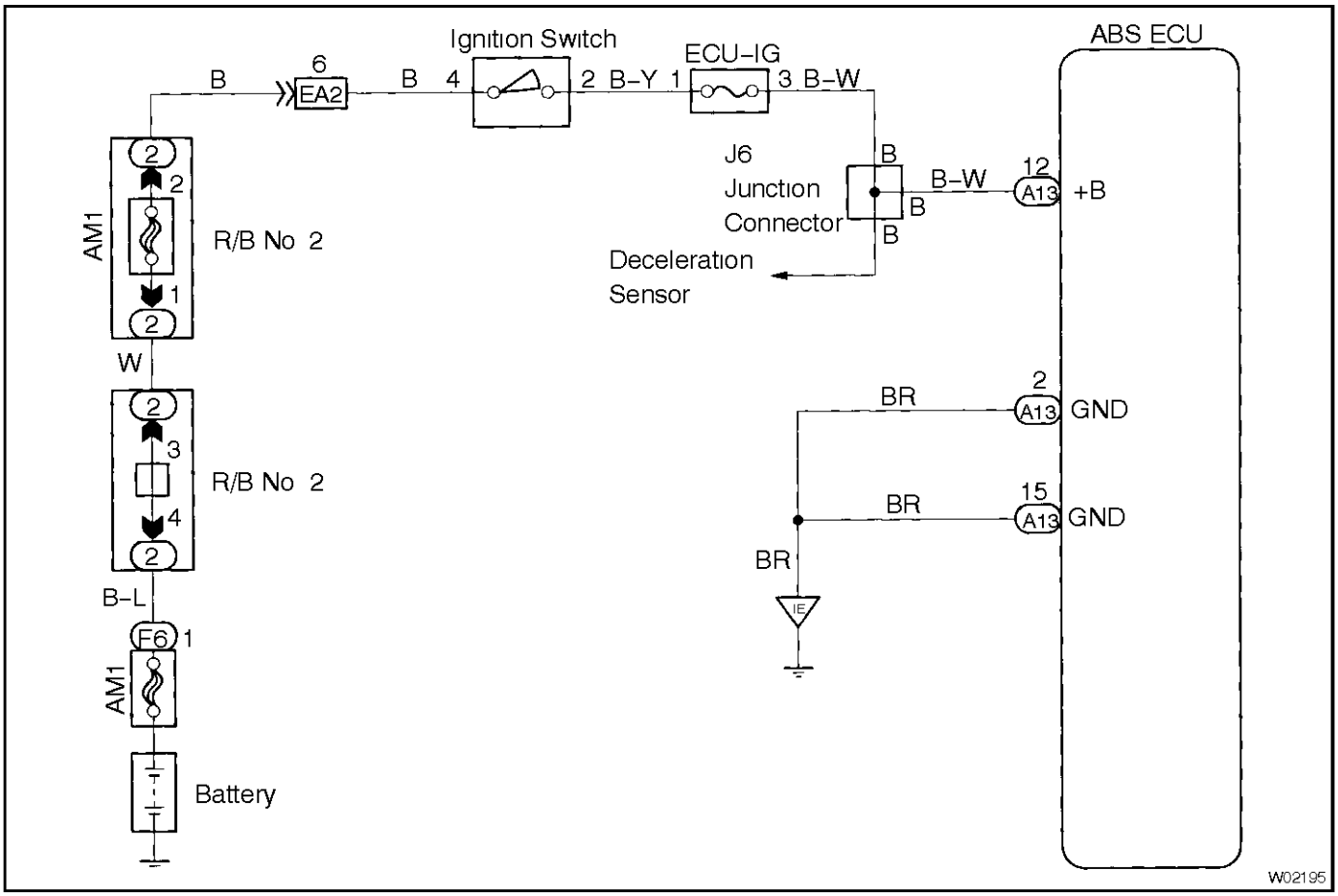
This is the power source for the ECU, hence the CPU and actuators

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 41 | Vehicle speed is 3 km/h (1 9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9 5 V for more than 10 sec | • Battery<br>• IC regulator<br>• Open or short in power source circuit |

Fail safe function

If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check battery positive voltage.** |

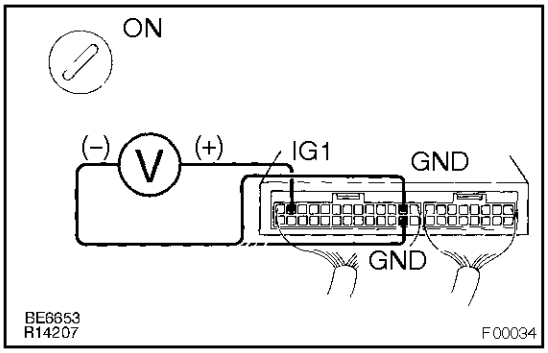
**OK:**

**Voltage: 10 – 14 V**

**NG** → **Check and repair charging system.**

**OK**

| | |
|---|---|
| 2 | **Check voltage between terminals IG1 and GND of ABS ECU connector.** |




**PREPARATION:**

Remove the ABS ECU with connectors still connected

**CHECK:**

(a) Turn the ignition switch ON

(b) Measure the voltage between terminals IG1 and GND of the ABS ECU connector

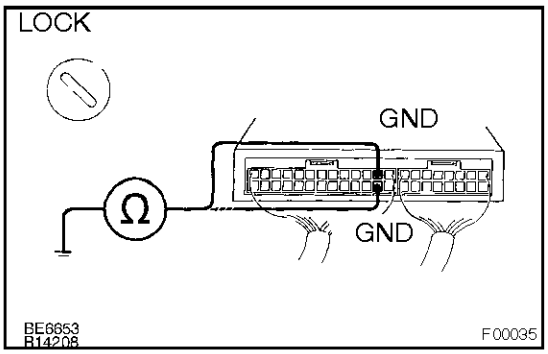
**OK:**

**Voltage: 10 – 14 V**

**OK** → **Check and replace ABS ECU.**

**NG**

| | |
|---|---|
| 3 | **Check continuity between terminals GND of ABS ECU connector and body ground.** |




**CHECK:**

Measure the resistance between terminal GND of the ABS ECU connector and body ground

**OK:**

**Resistance: 1 Ω or less**

**NG** → **Repair or replace harness or connector.**

**OK**

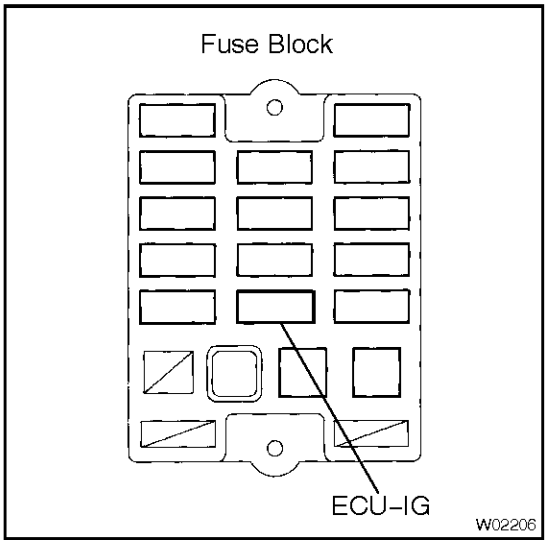


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check ECU–IG fuse. |
|---|---|




**PREPARATION:**
Remove the ECU–IG fuse from the Fuse block
**CHECK:**
Check the continuity of the ECU–IG fuse
**OK:**
**Continuity**

NG → **Check for short in all harness and components connected to ECU–IG fuse (See attached wiring diagram).**

OK →

**Check for open in harness and connector between ABS ECU and battery (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5M6 02

| DTC | 43 | Malfunction in Deceleration Sensor |
|---|---|---|

## CIRCUIT DESCRIPTION

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 43 | Either of the following 1 or 2 is detected<br>1 After the battery terminal is connected input from the deceleration sensor does not change at one cycle (0 km/h → more than 30 km/h → 0 km/h) for 16 times continuously<br>2 When the brake pedal is not depressed at vehicle speed of 5 km/h or more forward and backward G (more than 0 4 G) is detected for 30 seconds or more | • Deceleration sensor<br>• Wire harness for deceleration sensor system |

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check deceleration sensor (See page DI–190).** |

NG → **Replace deceleration sensor.**

OK

| | |
|---|---|
| 2 | **Check for open or short in harness and connector between sensor and ECU (See page IN–28).** |

NG → **Repair or replace harness and connector.**

OK

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5M8 02

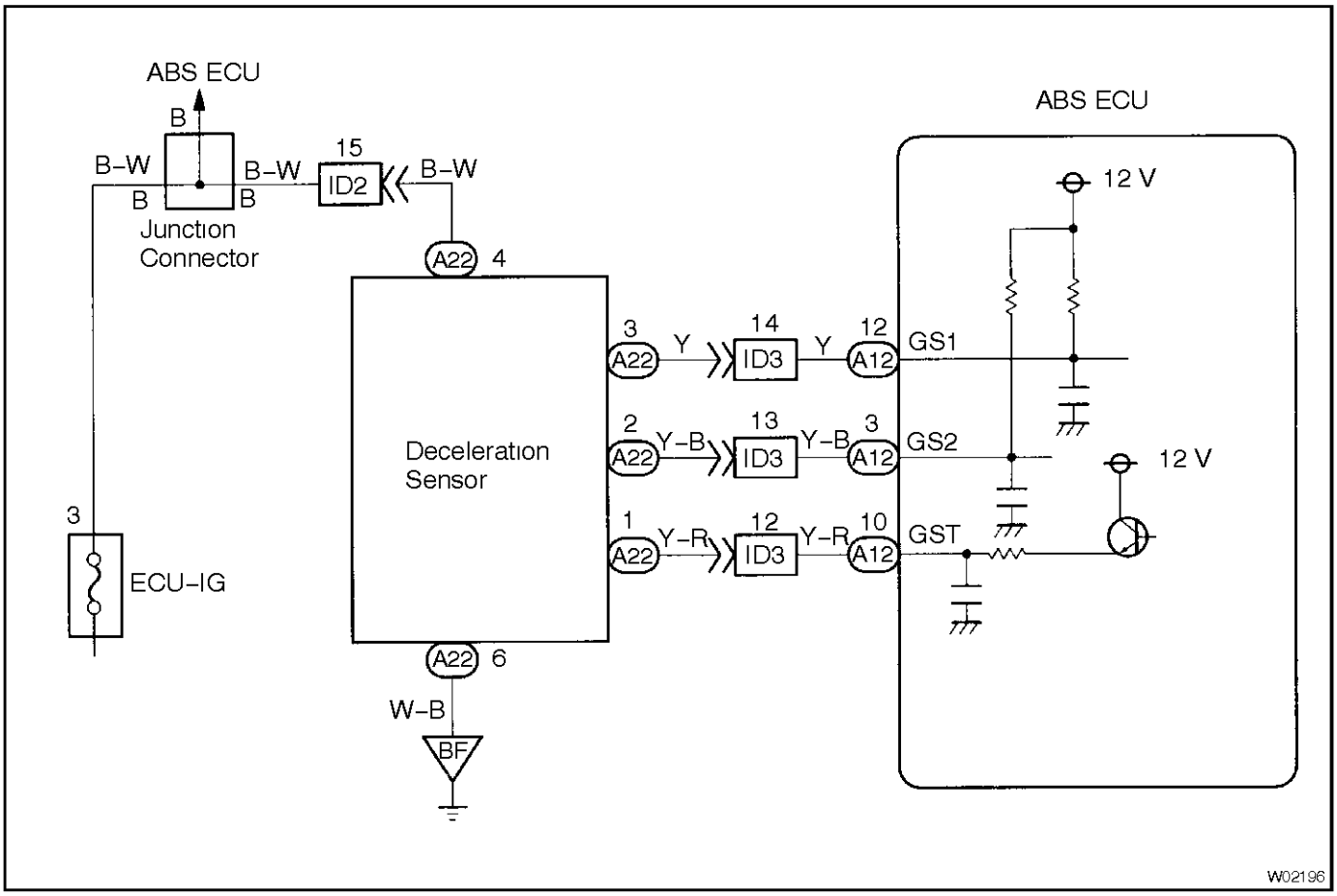
| DTC | 44 | Deceleration Sensor Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle The sensor signal is used in ABS control If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 44 | Either of the following 1 or 2 is detected<br>1 An open or short is detected in circuit GS1 or GS2 for 1sec<br>2 After the ignition is turned ON the test signal is output by GST<br>During this time a trouble signal is detected for 0 5 sec | • Deceleration sensor<br>• Open or short in deceleration sensor circuit |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



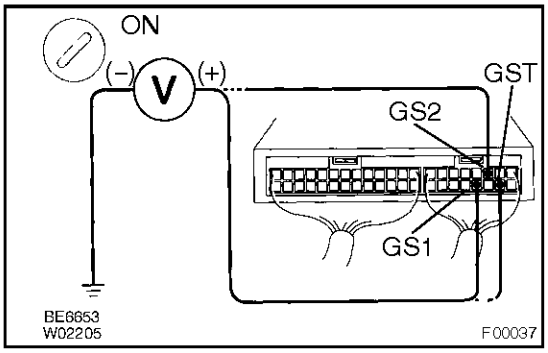
## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check for open and short in harness and connector between Deceleration sensor and ECU (See page IN–28).** |

**NG** → **Repair or replace harness or connector.**

**OK**

| | |
|---|---|
| 2 | **Check voltage between terminals GS1, GS2, GST of ABS ECU and body ground.** |




**PREPARATION:**

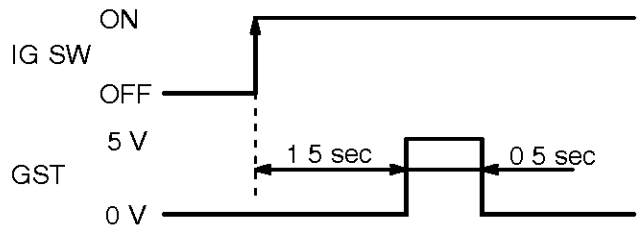
(a) Remove the ABS ECU with connectors still connected
(b) Disconnect the deceleration sensor connector
(c) Turn the ignition switch ON

**CHECK:**

Measure the voltage between terminals GS1, GS2, GST of the ECU and Body ground

**OK:**

**Voltage:**
**GS1, GS2: 4 – 14 V**
**GST: As shown below**




**NG** → **Check and replace ABS ECU.**

**OK**

**Check and replace deceleration sensor.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



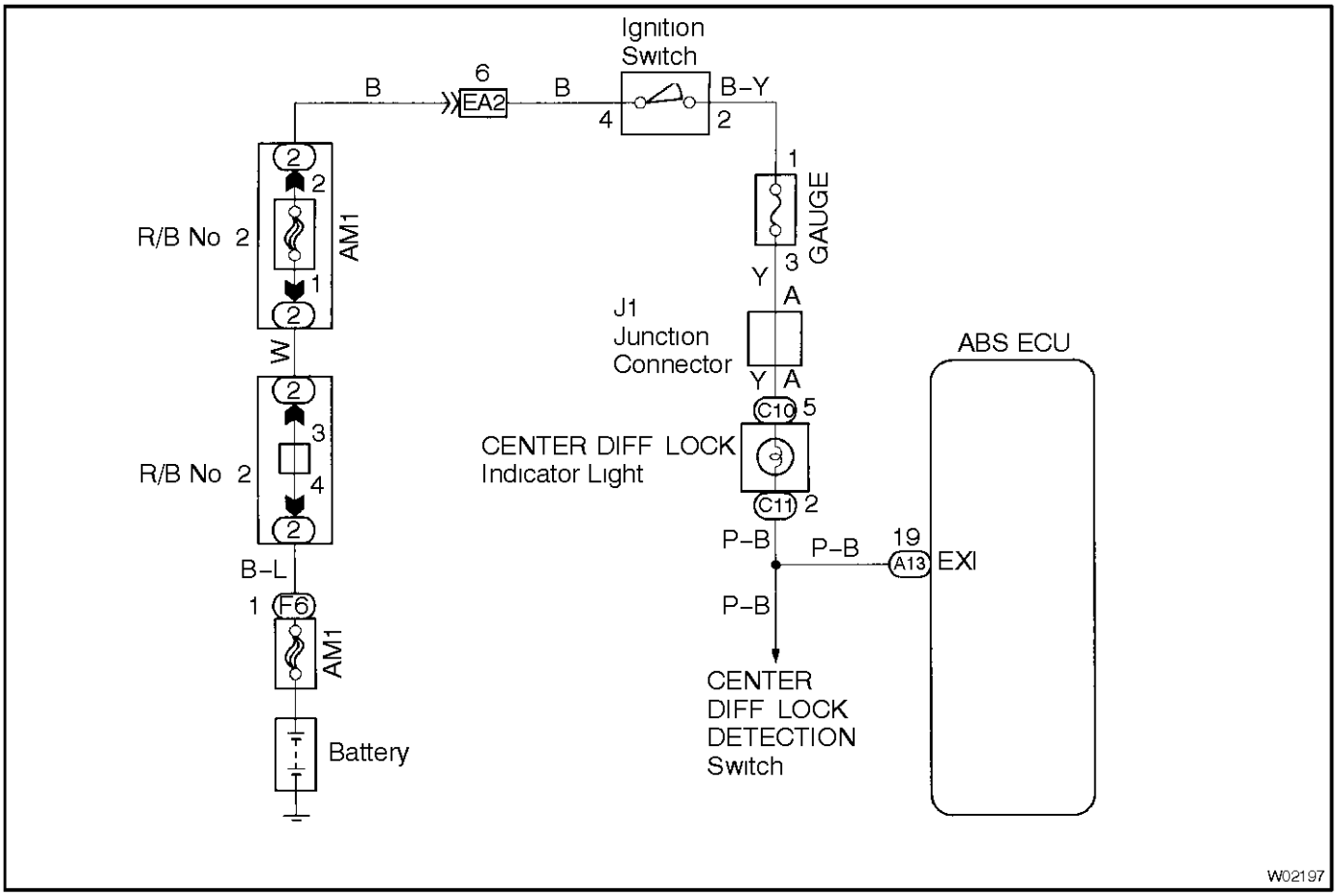
D5M9 02

| DTC | 48 | Center Differential Lock Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 48 | Open or short circuit in center differential lock circuit<br>Center differential is locking | • Center differential lock<br>• Center differential lock circuit |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check the center differential is free (Transfer is in H position).** |

NG → **Repair the center differential lock system.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Is DTC output?** |

Check DTC on page DI–190

NO → **Normal.**

YES

| | |
|---|---|
| 3 | **Check that CENTER DIFF. LOCK indicator light does not go off.** |

NO → **Go to step 6.**

YES

| | |
|---|---|
| 4 | **Check that bulb for CENTER DIFF. LOCK indicator light is not burnt out.** |

YES → **Replace indicator light.**

NO

| | |
|---|---|
| 5 | **Check for open in harness and connector between battery and CENTER DIFF. LOCK indicator light, and CENTER DIFF. LOCK indicator light and ABS ECU (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 6 | **Check for short in harness and connector between CENTER DIFF. LOCK indicator light and ABS ECU (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5MB 02

| DTC | 51 | ABS Pump Motor Lock |
|---|---|---|

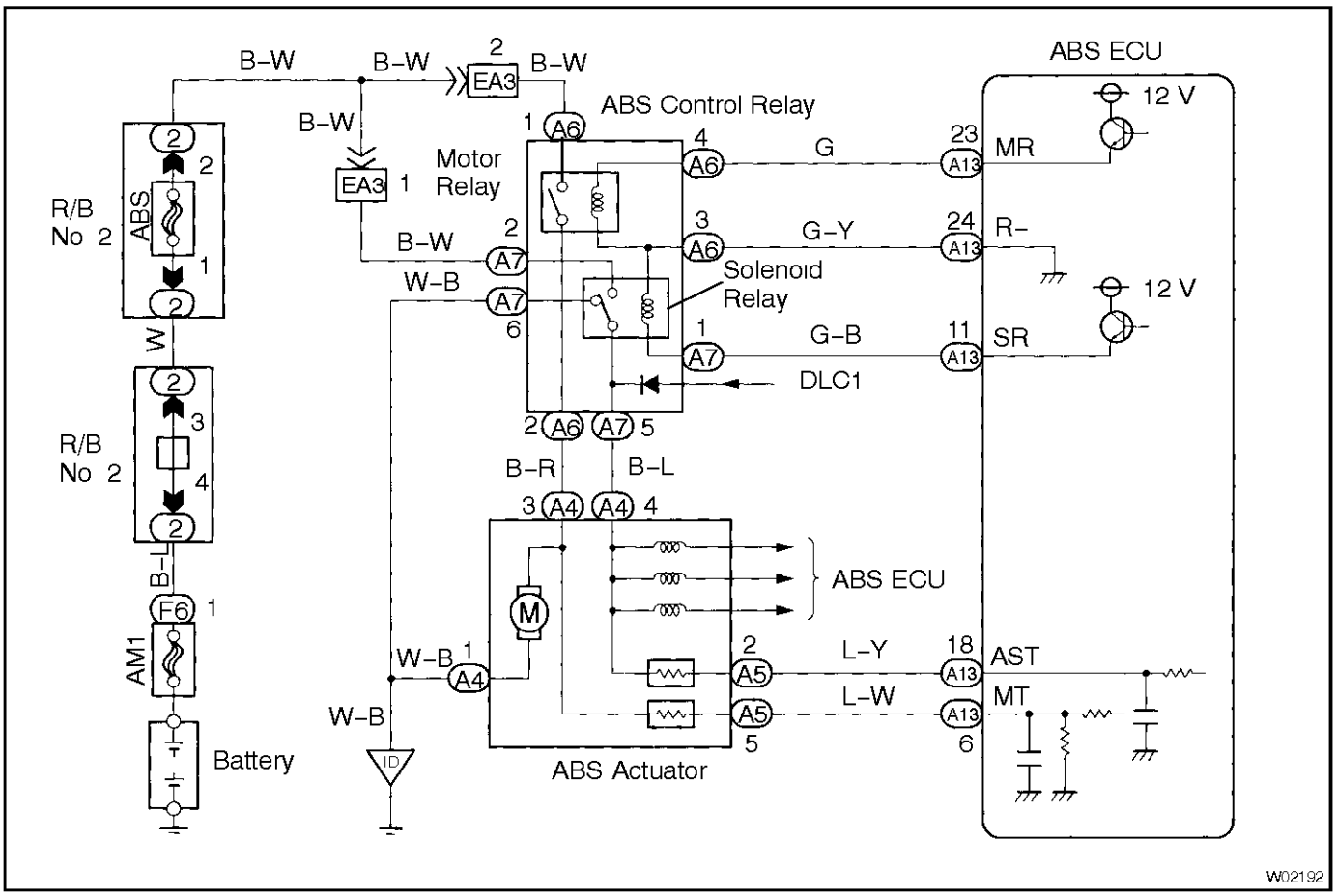
## CIRCUIT DESCRIPTION

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| 51 | Pump motor is not operating normally during initial check | • ABS pump motor |

Fail safe function

If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5ME 03

| DTC | Always ON | Malfunction in ECU<br>IG Power Source Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

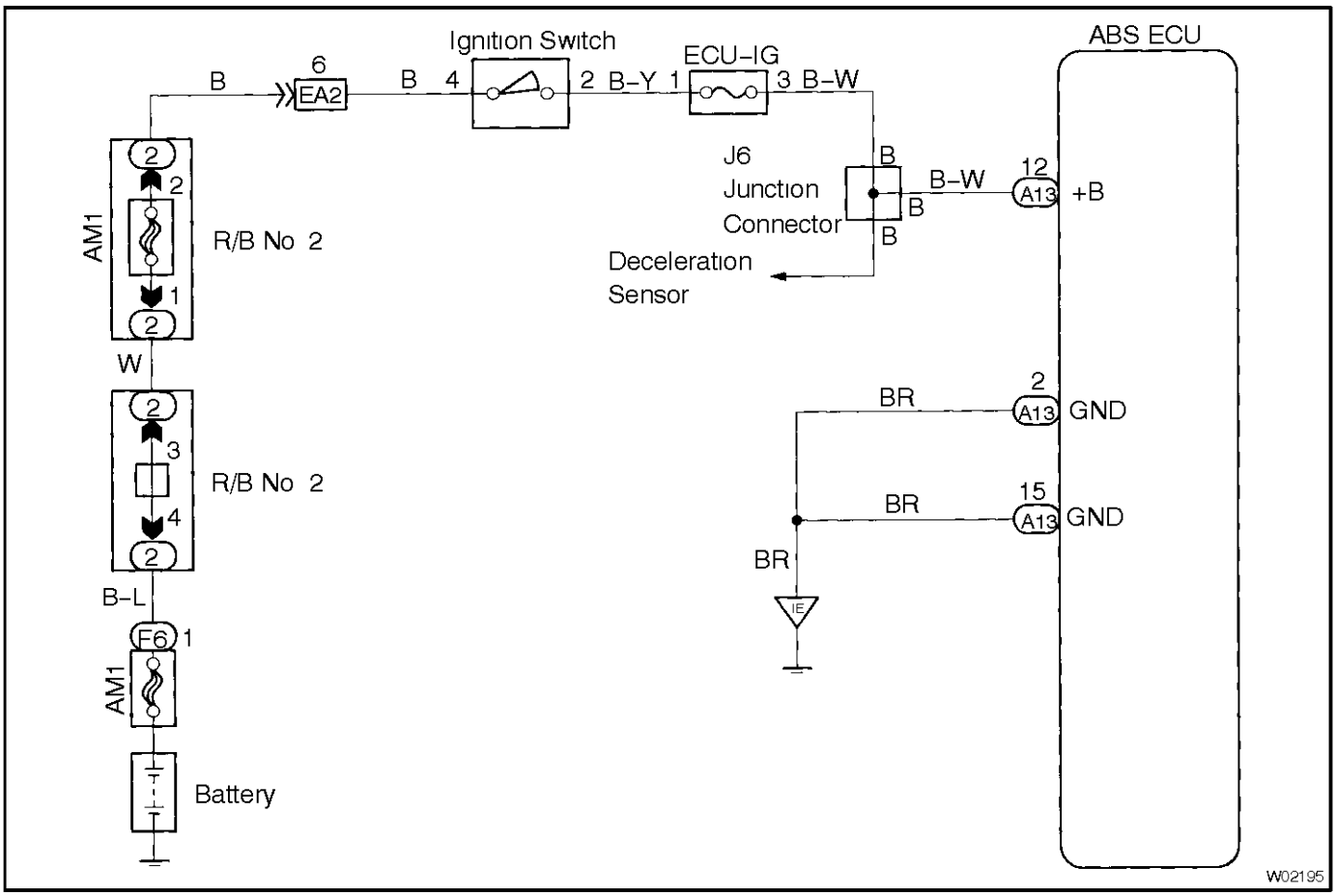
This is the power source for the ECU, hence the CPU, and the actuator

| DTC No | DTC Detecting Condition | Trouble Area |
|---|---|---|
| Alway ON | Voltage of ECU terminal +B remains at more than 17 V or below 9 5 V | • Battery<br>• IC regulator<br>• Open or short in power source circuit<br>• ECU |

Fail safe function

If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Is DTC output?** |

Check DTC on page DI–190

YES → **Repair circuit indicated by code output.**

NO

| | |
|---|---|
| 2 | **Is normal code displayed?** |

YES → **Check ABS solenoid relay. Check for short in harness and connector between ABS solenoid relay and DLC1 (See page IN–28).**

NO

| | |
|---|---|
| 3 | **Is ABS warning light go off?** |

YES → **Check for open or short in harness and connector between ECU–IG fuse and ECU (See page IN–28).**

NO

| | |
|---|---|
| 4 | **Check battery positive voltage.** |

**PREPARATION:**

Start the engine

**CHECK:**

Check the battery positive voltage

**OK:**

**Voltage: 10 – 16 V**

NG → **Check and repair charging system.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 5 | **Check ABS warning light.** |

**PREPARATION:**

(a) Turn the ignition switch OFF

(b) Disconnect the connector from the ABS ECU

(c) Turn the ignition switch ON

**CHECK:**

Check the ABS warning light goes off

OK → **Check and replace ABS ECU.**

NG

**Check for short in harness and connector between combination meter and ABS ECU, and combination meter and DLC1 (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



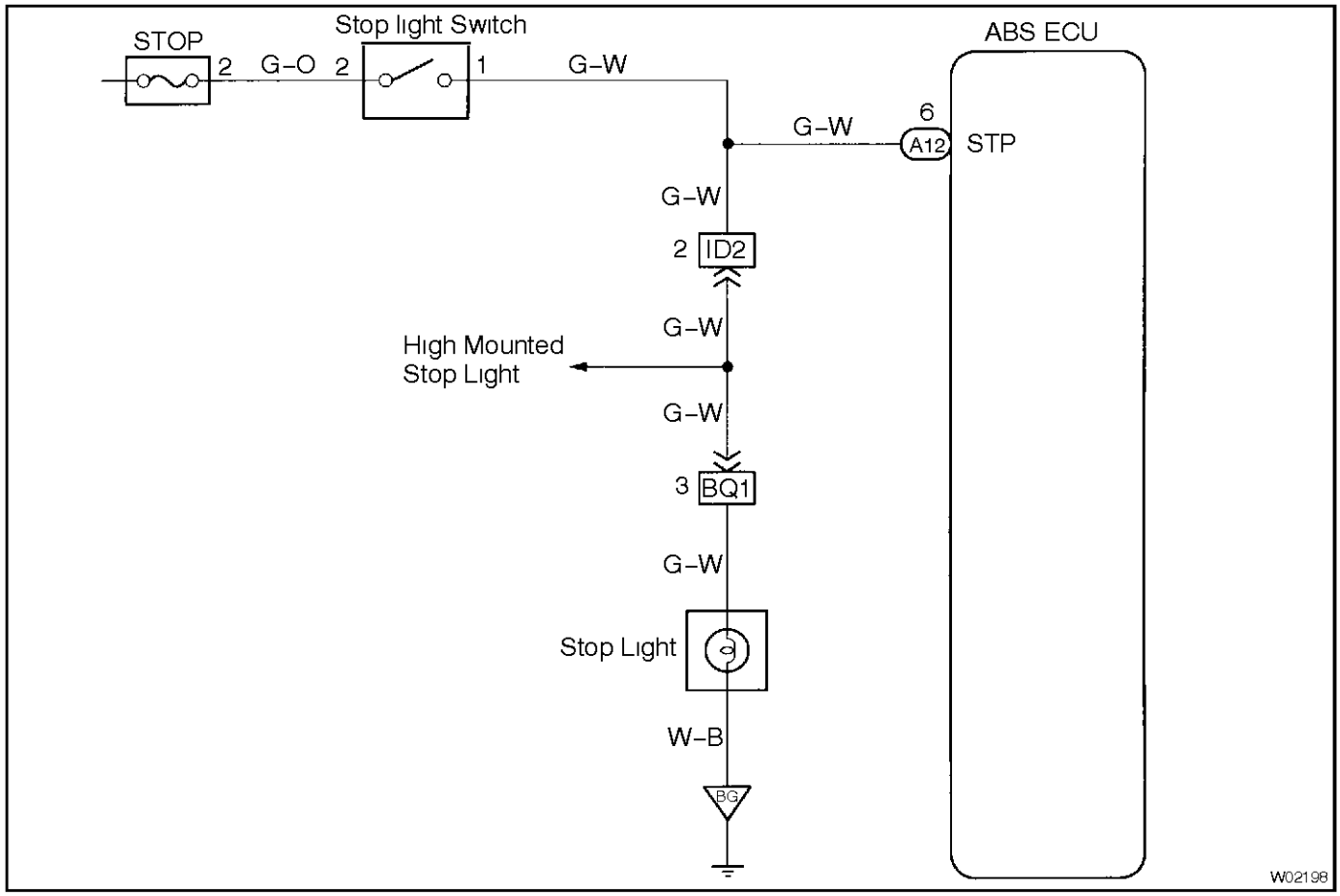
D5MG–02

# Stop Light Switch Circuit

## CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check operation of stop light.** |

**CHECK:**

Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released

NG → **Repair stop light circuit (See page BE–24).**

OK

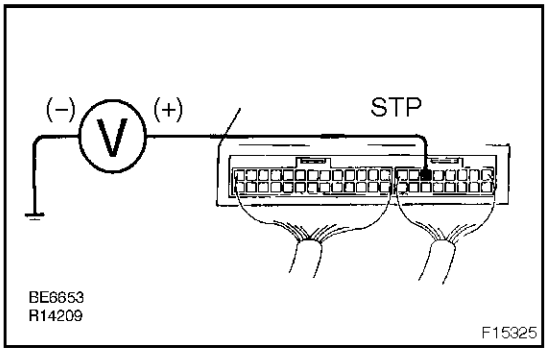


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check voltage between terminal STP of ABS ECU and body ground.** |




**PREPARATION:**
Remove the ABS ECU with connectors still connected
**CHECK:**
Measure the voltage between terminal STP of the ABS ECU and body ground when the brake pedal is depressed
**OK:**

**Voltage: 8 – 14 V**

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–200).**

NG

| | |
|---|---|
| 3 | **Check for open in harness and connector between ABS ECU and stop light switch (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



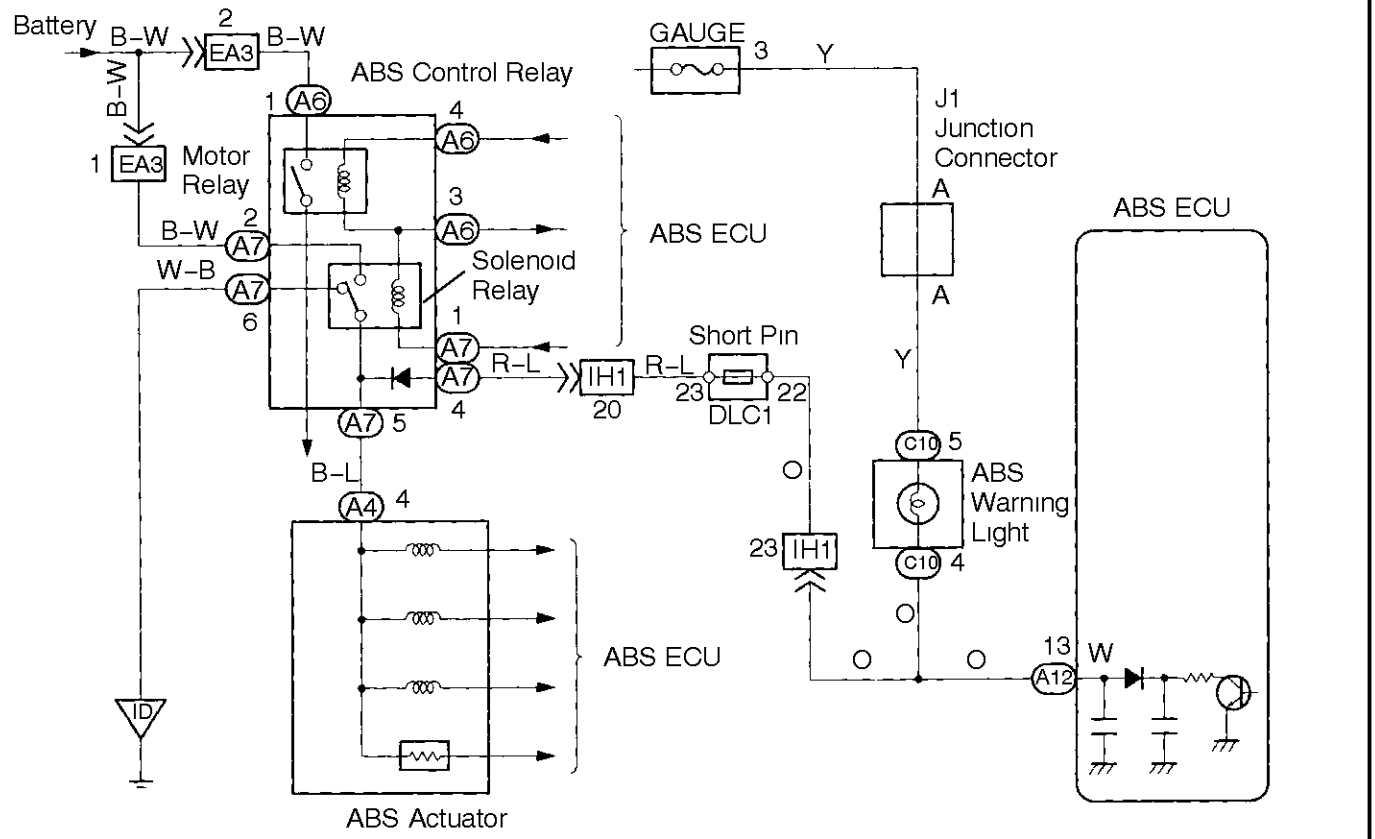
D5MJ 03

# ABS Warning Light Circuit

## CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory. After removing the short pin of the DLC1, connect terminals Tc and $E_1$ of the DLC1 to make the ABS warning light blink and output the DTC.

## WIRING DIAGRAM




## INSPECTION PROCEDURE

Troubleshooting in accordance with the chart below for each trouble symptom.

| | |
|---|---|
| ABS warning light does not light up | Go to step 1 |
| ABS warning light remains on | Go to step 3 |

| | |
|---|---|
| 1 | **Check ABS warning light.** |

See Combination Meter Troubleshooting on page BE–2

NG → **Repair bulb or combination meter assembly.**

OK

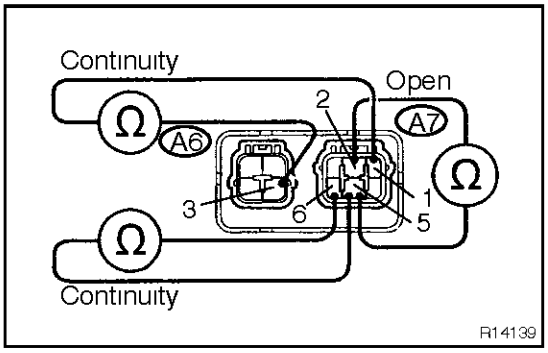


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check ABS control relay. |
|---|---|




**PREPARATION:**

(a) Turn the ignition switch OFF

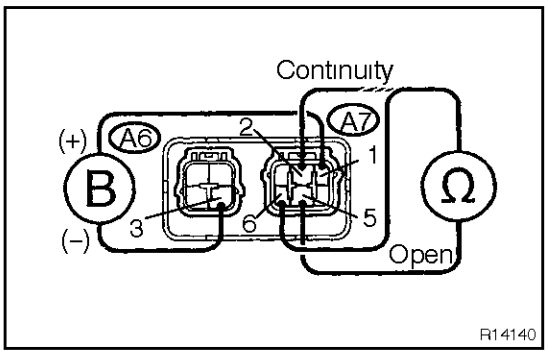
(b) Disconnect the connectors from the control relay

**CHECK:**

Check the continuity between each terminal of the ABS control relay

**OK:**

| Terminals A7–1 and A6–3 | Continuity (Reference value 80 Ω) |
|---|---|
| Terminals A7–5 and A7–6 | Continuity |
| Terminals A7–2 and A7–5 | Open |



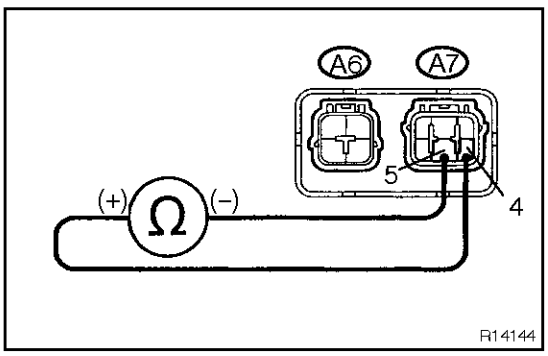

**CHECK:**

(a) Apply battery positive voltage between terminals A7–1 and A6–3

(b) Check the continuity between each terminal of the ABS control relay

**OK:**

| Terminals A7–5 and A7–6 | Open |
|---|---|
| Terminals A7–2 and A7–5 | Continuity |




**CHECK:**

Connect the ⊕ test lead to terminal A7–4 and the ⊖ test lead to terminal A7–5 Check continuity between the terminals

**OK:**

**Continuity**

If there is no continuity, connect the ⊖ test lead to terminal A7–4 and the ⊕ lead to terminal A7–5 Recheck continuity between terminals

NG → **Replace ABS control relay.**

OK

**Check for open in harness and connector between DLC1 and ABS control relay and body ground (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Is DTC output?** |

Check DTC on page DI–190

**YES** → **Repair circuit indicated by code output.**

**NO**

| | |
|---|---|
| 4 | **Does ABS warning light go off if short pin is removed?** |

**NO** → **Check for short in harness and connector between warning light and DLC1 and ECU (See page IN–28).**

**YES**

| | |
|---|---|
| 5 | **Check ABS control relay (See step 2).** |

**NG** → **Replace ABS control relay.**

**OK**

**Check for short in harness and connector between DLC1 and ABS control relay (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



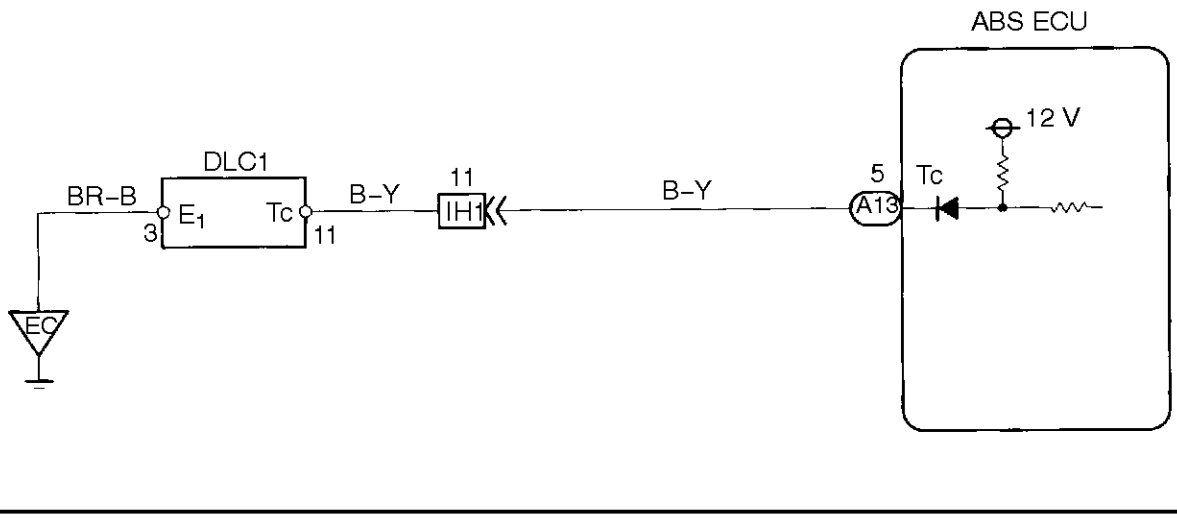
D5ML 02

# Tc Terminal Circuit

## CIRCUIT DESCRIPTION

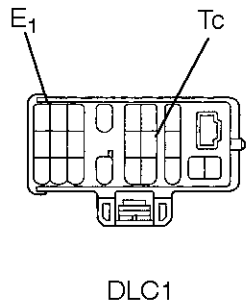
Connecting terminals Tc and $E_1$ of the DLC1 causes the ECU to display the DTC by flashing the ABS warning light

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals Tc and $E_1$ of DLC1.** |




**CHECK:**

(a) Turn the ignition switch ON

(b) Measure the voltage between terminals Tc and $E_1$ of the DLC1

**OK:**

**Voltage: 10 – 14 V**

| | |
|---|---|
| OK | **If ABS warning light does not blink even after Tc and $E_1$ are connected, ECU may be defective.** |

**NG**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK →

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



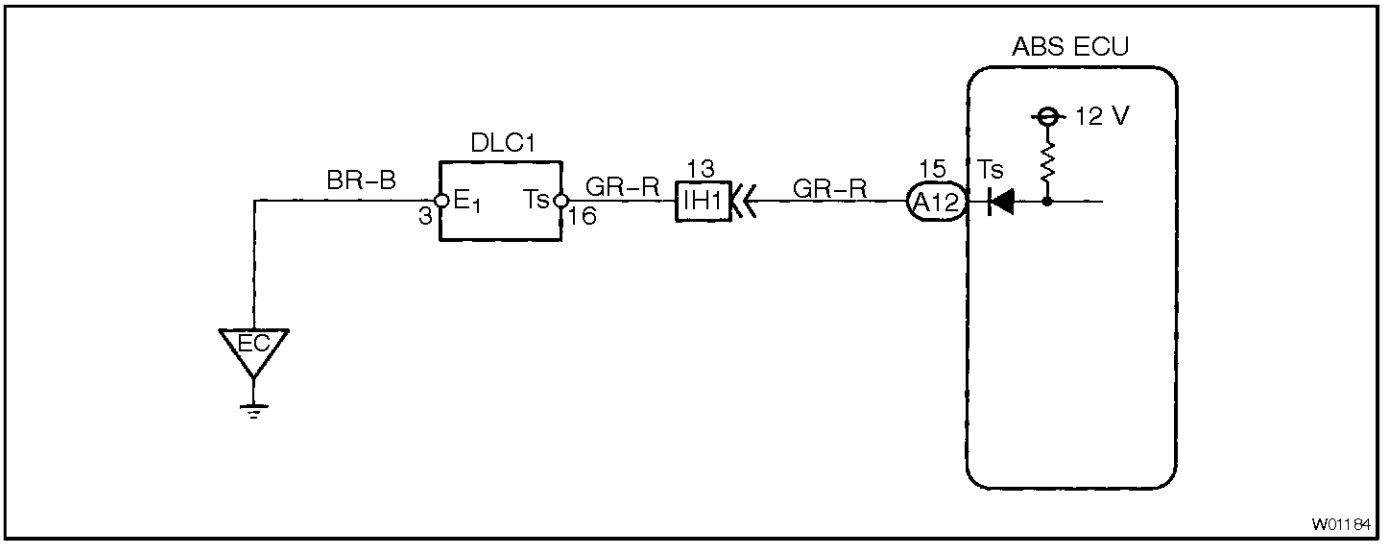
D5MN-02

# Ts Terminal Circuit

## CIRCUIT DESCRIPTION

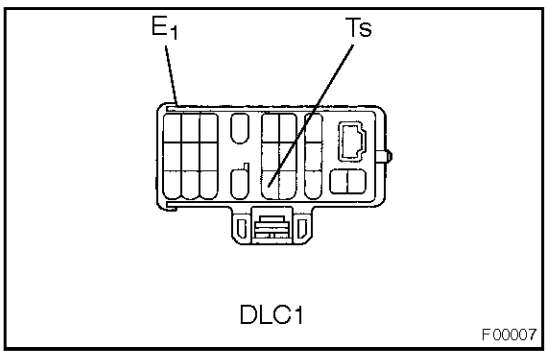
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check Connecting terminals Ts and $E_1$ of the DLC1 in the engine compartment starts the check

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals Ts and $E_1$ of DLC1.** |




**CHECK:**

(a) Turn the ignition switch ON

(b) Measure the voltage between terminals Ts and $E_1$ of the DLC1

**OK:**

**Voltage: 10 – 14 V**

OK → **If ABS warning light does not blink even after Ts and $E_1$ are connected, ECU may be defective.**

NG →



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK ↓

**Check and replace ABS ECU.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

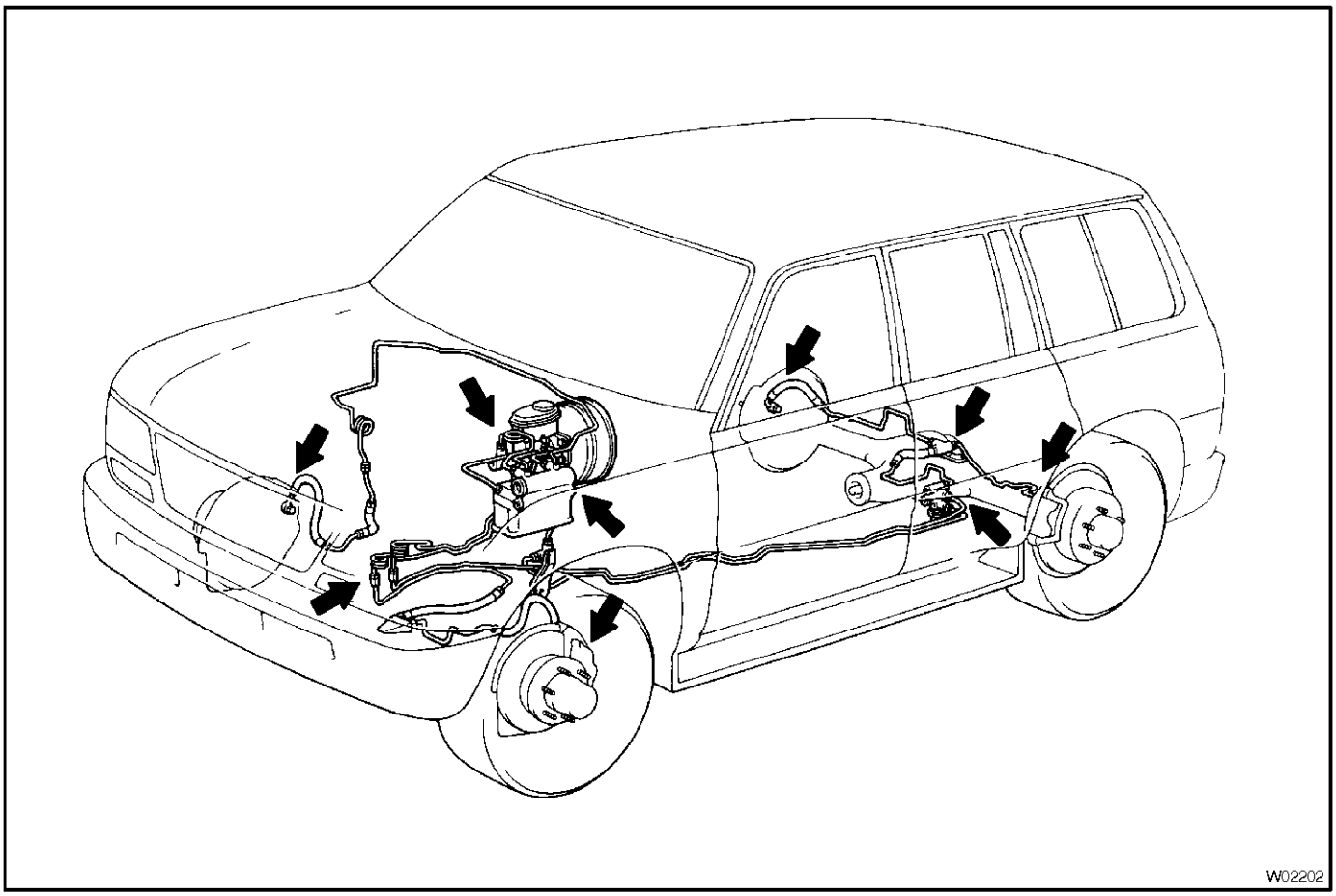
Brought to you by BirfMark



D5MP 02

# Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

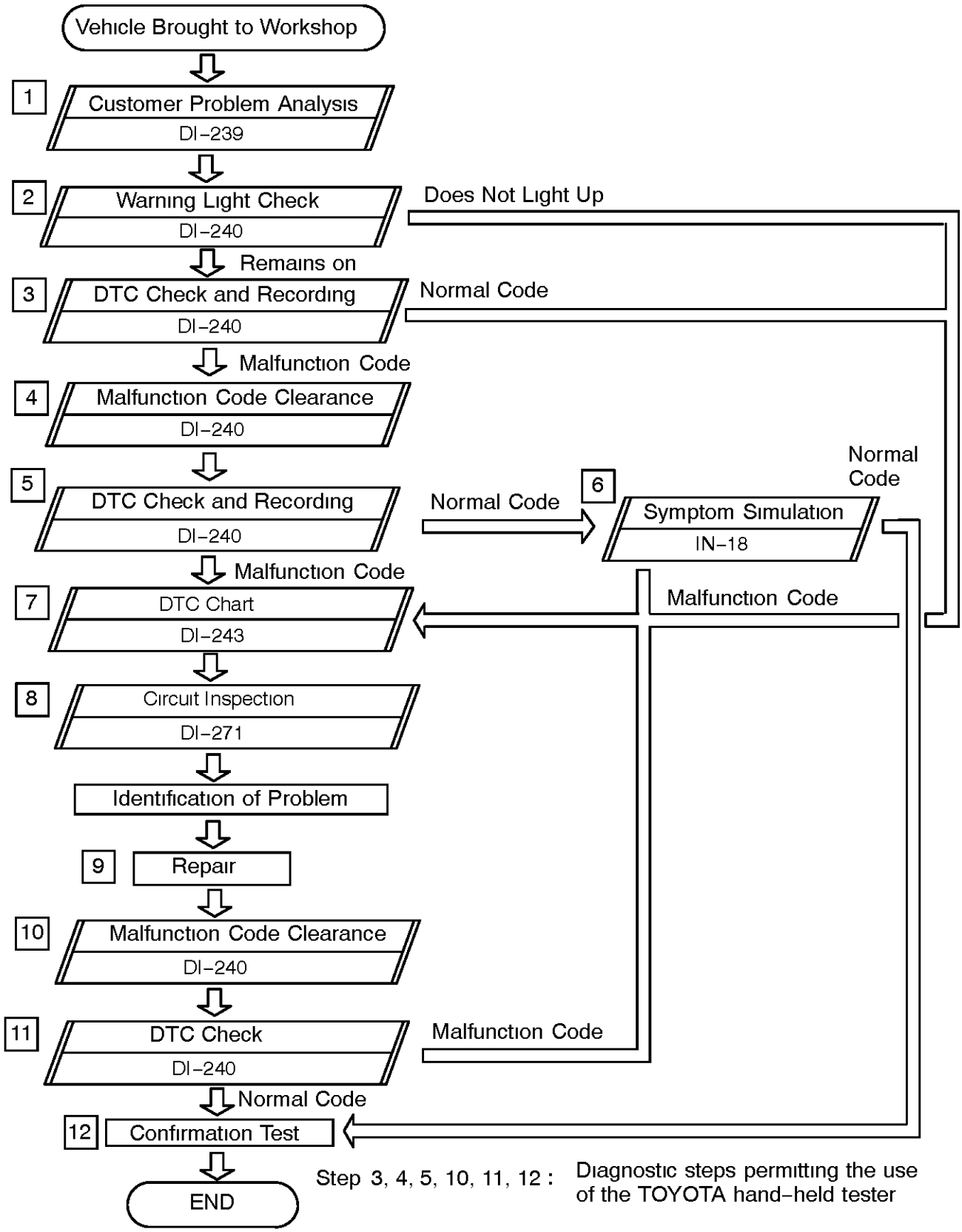


# SUPPLEMENTAL RESTRAINT SYSTEM

D5Q0 02

## HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshoot ın accordance wıth the procedure on the followıng page




Step 3, 4, 5, 10, 11, 12 : Dıagnostıc steps permıttıng the use of the TOYOTA hand–held tester



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q1 01

# CUSTOMER PROBLEM ANALYSIS CHECK

**Supplemental Restraint System Check Sheet**

Inspector's Name _____

| | | | |
|---|---|---|---|
| Customer's Name | | Registration No. | |
| | | Registration Year | / / |
| | | Frame No. | |
| Date Vehicle Brought In | / / | Odometer Reading | km Miles |

| | |
|---|---|
| Date Problem Dist Occurred | / / |
| Weather | ☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other |
| Temperature | Approx. |

| | |
|---|---|
| Vehicle Operation | ☐ Starting ☐ Idling<br>☐ Driving [ ☐ Constant speed ☐ Acceleration ☐ Deceleration<br>☐ Other ] |
| Road Conditions | |
| Details Of Problem | |

| | |
|---|---|
| Vehicle Inspection, Repair History☑Prior to Occurrence of Malfunction(Including Supplemental Restraint System) | |

Diagnosis System Inspection

| | | |
|---|---|---|
| SRS Warning Light Inspection | 1st Time | ☐ Remains ON ☐ Sometimes Light Up ☐ Does Not Light Up |
| | 2nd Time | ☐ Remains ON ☐ Sometimes Light Up ☐ Does Not Light Up |
| DTC Inspection | 1st Time | ☐ Normal Code ☐ Malfunction Code [Code. ] |
| | 2nd Time | ☐ Normal Code ☐ Malfunction Code [Code. ] |

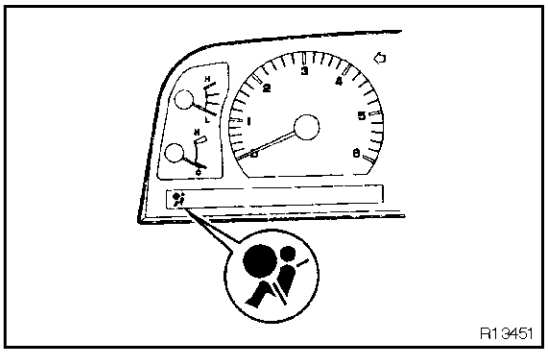


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q2 02




# PRE–CHECK

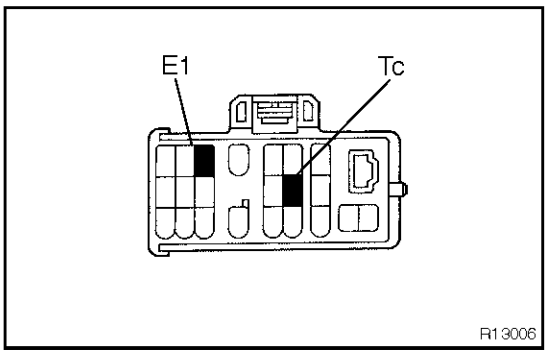
## 1. SRS WARNING LIGHT CHECK

(a) Turn the ignition switch to ACC or ON and check that the SRS warning light lights up

(b) Check that the SRS warning light goes out after approx 6 seconds

HINT

- When the ignition switch is at ACC or ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code
- If, after approx 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely Proceed to "SRS warning light system malfunction" on page DI–274, DI–276



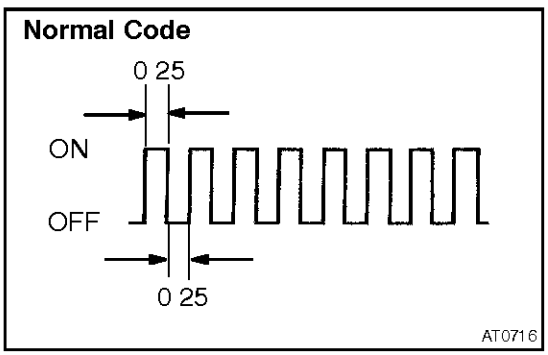

## 2. DTC CHECK (Using diagnosis check wire)

(a) Output the DTC

(1) Turn the ignition switch to ACC or ON position and wait approx 20 seconds

(2) Using SST, connect terminals Tc and E1 of the DLC1

SST 09843–18020




(b) Read the DTC

Read the 2–digit DTC as indicated by the number of times the SRS warning light blinks As an example, the blinking patterns, normal, 11 and 31 are as shown on the illustration

- Normal code indication
  The light will blink 2 times per second
- Malfunction code indication
  The first blinking output indicates the first digit of a 2–digit DTC After a 1 5 second pause, the second blinking output will indicate the second digit

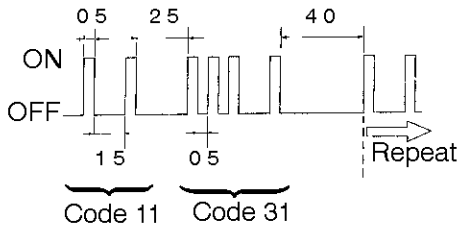


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



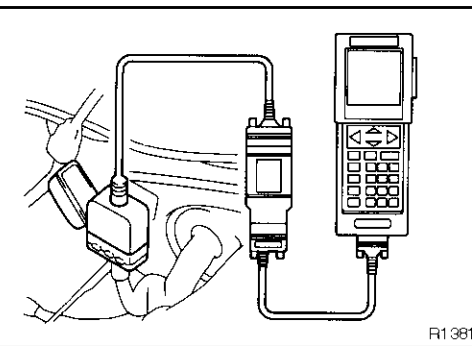
**Code 11 and 31**




If there are 2 or more codes, there will be a 2 5 second pause between each codes After all the codes have been output, there will be a 4 0 second pause and they will all be repeated

HINT

- In the event of a number of trouble codes, indication will start from the smallest numbered code tot he larger
- If it does not output a DTC or outputs a DTC without terminal connection, proceed to the Tc terminal circuit inspection on page DI–279




**3. DTC CHECK (Using TOYOTA hand–held tester)**

(a) Hook up the TOYOTA hand–held tester to the DLC1

(b) Read the DTCs by following the prompts on the tester screen

HINT

Please refer to the TOYOTA hand–held tester operator's manual, for further details



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**4. DTC CLEARANCE (Using diagnosis check wire)**

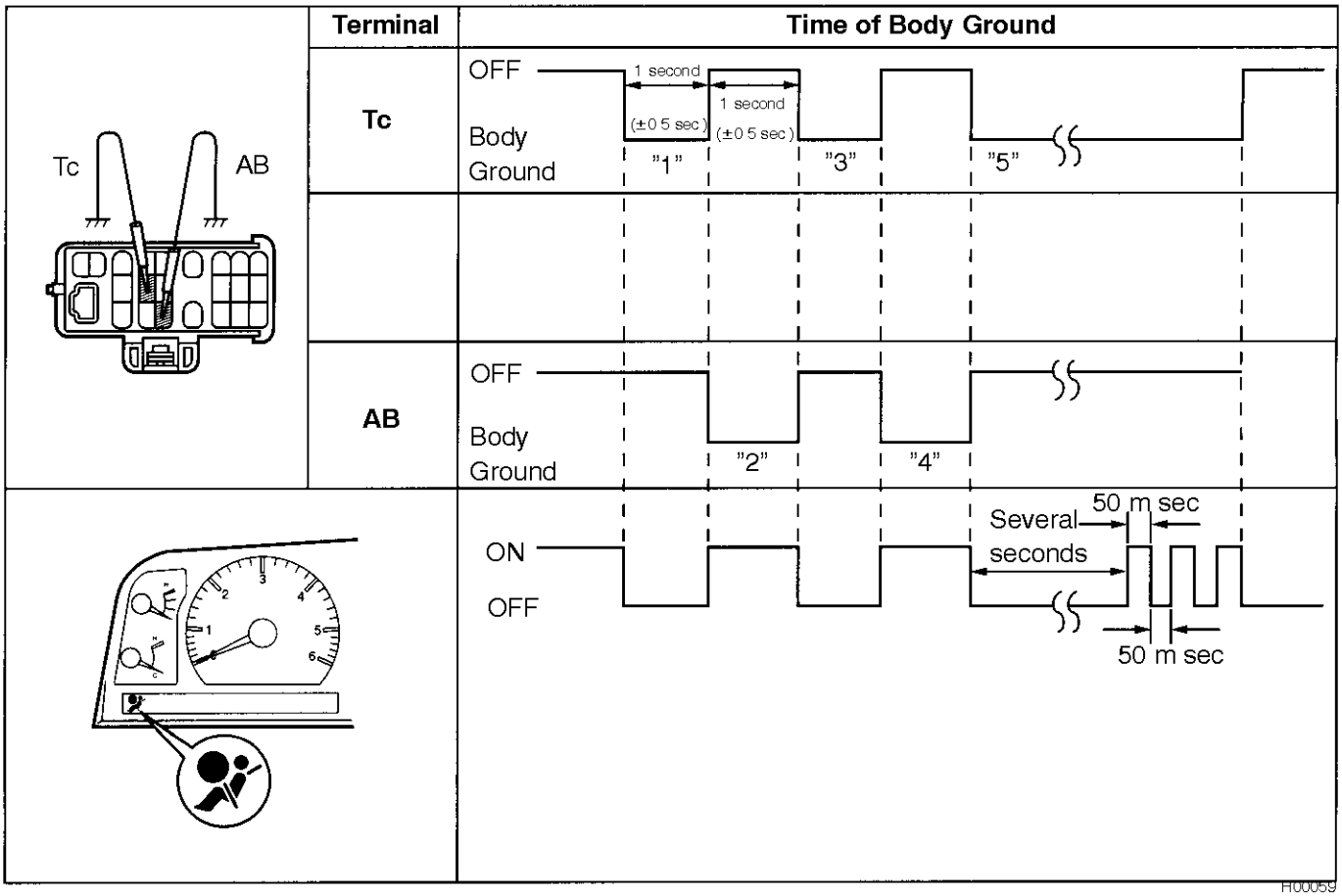
(a) Connect the 2 service wires to terminals Tc and AB of DLC1

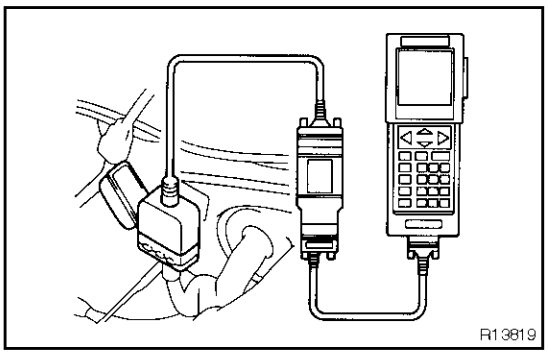
(b) Turn the ignition switch to ACC or ON and wait approx 6 seconds

(c) Starting with the Tc terminal, apply body ground alternately to terminal Tc and terminal AB twice each in cycles of 1 0 seconds Confirm that body ground is absolute Finally, keep applying body ground to terminal Tc

HINT

When alternately grounding terminals Tc and AB, release ground from one terminal and immediately apply it to the other terminal within an interval of 0 2 second If DTCs do not clear, repeat the above procedure until the codes are cleared




(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 m sec cycle to indicate the codes have been cleared

**5. USING TOYOTA HAND-HELD TESTER**

(a) Hook up the TOYOTA hand-held tester to the DLC1

(b) Clear the DTC by following the prompts on the tester screen

HINT

Please refer to the TOYOTA hand-held tester operator's manual for further details



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q8 02

# DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, the circuit listed for that code in the table below (Proceed to the page given for that circuit )

| DTC No (See Page) | Detection Item | Trouble Area | SRS Warning Light |
|---|---|---|---|
| Normal (DI–271) | • System normal | – | OFF |
| | • Source voltage drop | • Battery<br>• Airbag sensor assembly | ON |
| 11 (DI–247) | • Short in squib circuit (to ground) | • Steering wheel pad (D squib)<br>• Front passenger airbag assembly (P squib )<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness | ON |
| 12 (DI–254) | • Short in squib circuit (to B+) | • Steering wheel pad (D squib)<br>• Front passenger airbag assembly (P squib)<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness | ON |
| 14 (DI–260) | • Open in D squib circuit | • Steering wheel pad (D squib)<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness | ON |
| 31 (DI–265) | • Airbag sensor assembly malfunction | • Airbag sensor assembly | ON |
| 54 (DI–267) | • Open in P squib circuit | • Front passenger airbag assembly (P squib)<br>• Airbag sensor assembly<br>• Wire harness | ON |

HINT

- When the SRS warning light remains lit up and the DTC is the normal code, this means a source drop voltage
  This malfunction is not stored in memory by the airbag sensor assembly and if the power source voltage returns to normal, the SRS warning light will automatically go out
- When 2 or more codes are indicated, the codes will be displayed in numeral order starting from the lowest numbered code
- If a code not listed on the chart is displayed, the airbag sensor assembly is faulty



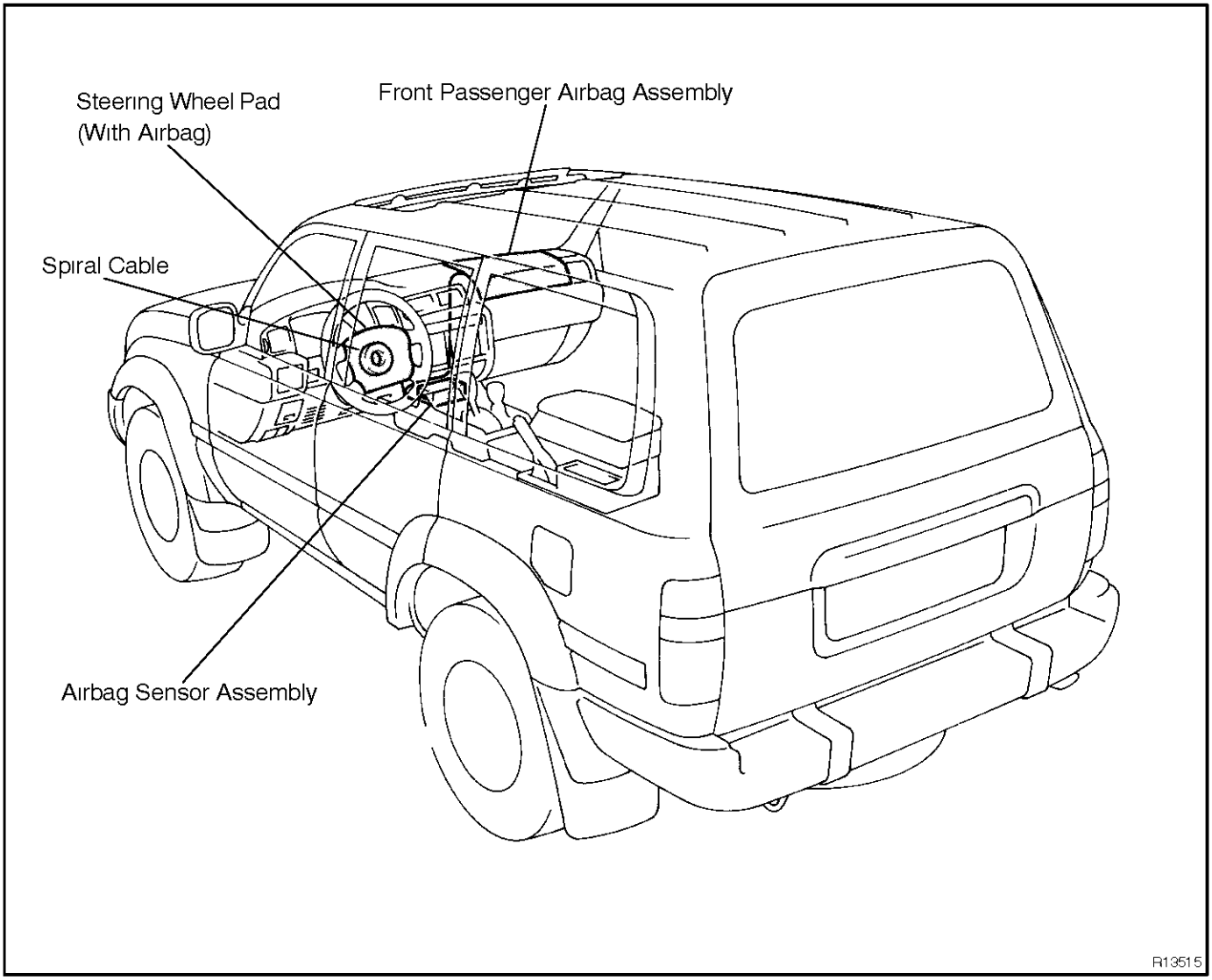
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q4 02

# PARTS LOCATION





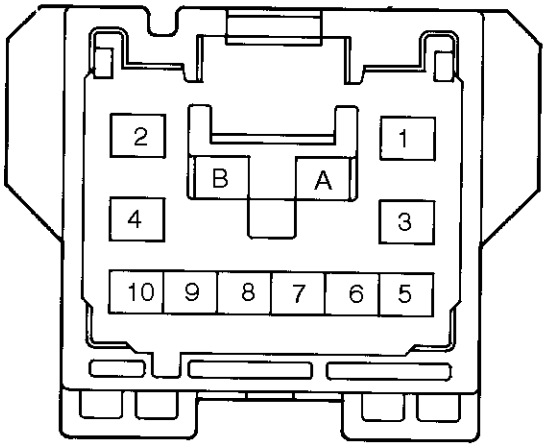

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q5 02

# TERMINALS OF ECM




W02056

| No | Symbol | Terminal Name |
|---|---|---|
| A | – | Electrical Connection Check Mechanism |
| B | – | Electrical Connection Check Mechanism |
| 1 | P | Squib ⊖ (Passenger) |
| 2 | $P^+$ | Squib ⊕ (Passenger) |
| 3 | D | Squib ⊖ (Driver) |
| 4 | $D^+$ | Squib ⊕ (Driver) |
| 5 | $E_1$ | Ground |
| 6 | $E_2$ | Ground |
| 7 | Tc | Diagnosis |
| 8 | LA | SRS Warning Light |
| 9 | $IG_2$ | Power Source (IGN Fuse) |
| 10 | ACC | Power Source (CIG Fuse) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q6 01

# PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below

| Symptom | Suspect Area | See page |
|---|---|---|
| • With the ignition switch at ACC or ON the SRS warning light sometimes lights up after approx 6 seconds have elapsed<br>• SRS warning light lights up even when ignition switch is in the LOCK position | • SRS warning light system malfunction (Always lit up when ignition switch is in LOCK position ) | DI–274 |
| • With the ignition switch at ACC or ON the SRS warning lights does not light up | • SRS warning light system malfunction (Does not light up when ignition switch is turned to ACC or ON ) | DI–276 |
| • DTC not displayed<br>• SRS warning light is always lit up with a DTC check procedure<br>• DTC displayed without Tc and E1 terminal connection | • Tc terminal circuit | DI–279 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q7 03

# CIRCUIT INSPECTION

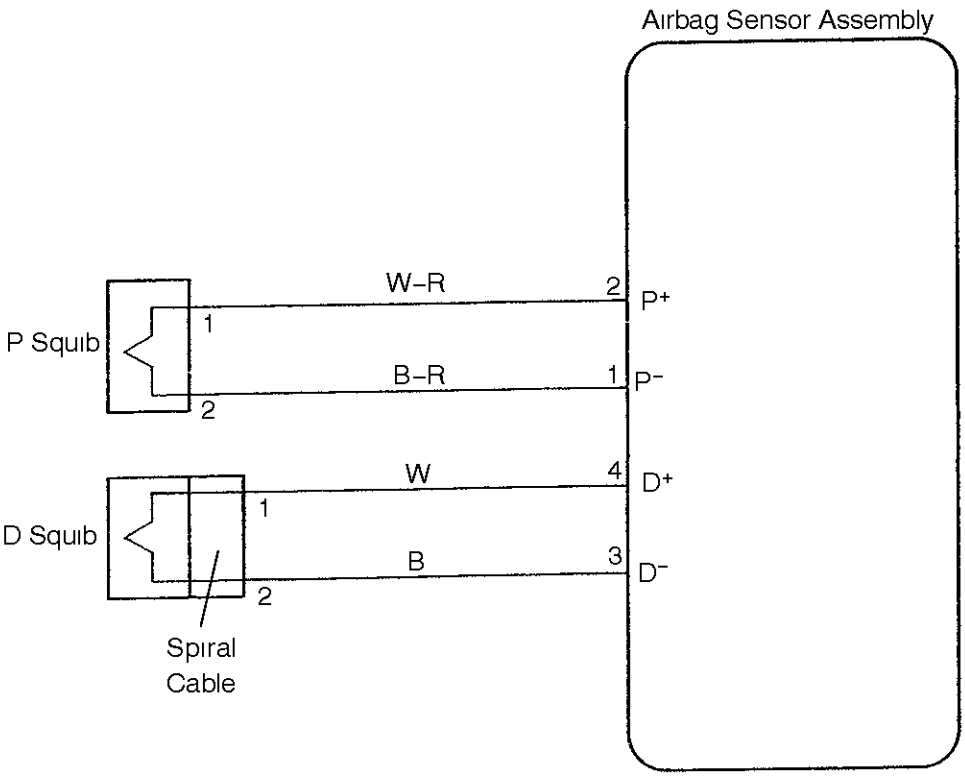
| DTC | 11 | Short in Squib Circuit (to Ground) |
|---|---|---|

## CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly If causes the SRS to deploy when the SRS deployment conditions are satisfied
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–2
DTC 11 is recorded when ground short is detected in the squib circuit

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| 11 | • Short circuit in squib wire harness (to ground)<br>• Squib malfunction<br>• Spiral cable malfunction<br>• Airbag sensor assembly malfunction | • Steering wheel pad (D squib)<br>• Front passenger airbag assembly (P squib)<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness |

## WIRING DIAGRAM




R16017



Brought to you by BirfMark
Version 1.11 - 03/16/2010

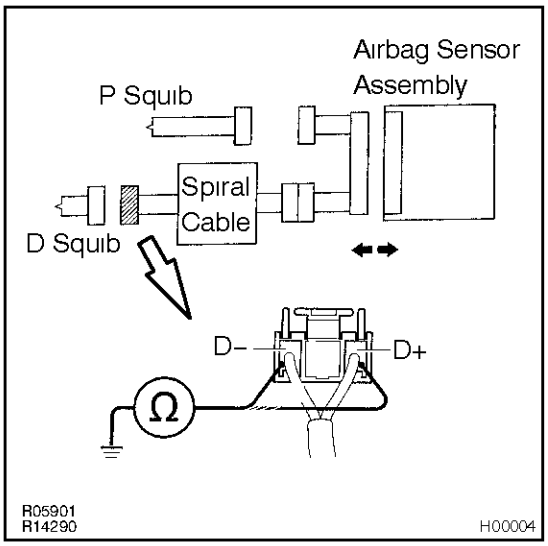
Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Preparation. (See step 1 on page DI–271)** |

| | |
|---|---|
| 2 | **Check D squib circuit.** |




**CHECK:**

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between $D^+$, $D^-$ and body ground

**OK:**

**Resistance: 1 MΩ or Higher**

NG → **Go to step 7.**

OK

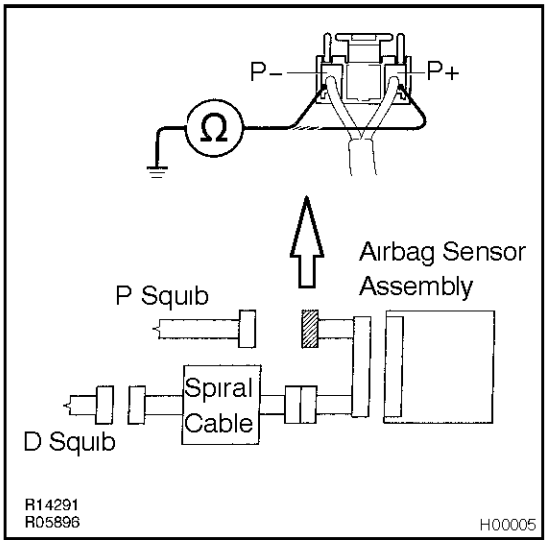


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check P squib circuit. |
|---|---|




**CHECK:**

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and front passenger airbag assembly, measure the resistance between $P^+$, $P^-$ and body ground

**OK:**

**Resistance: 1 MΩ or Higher**

**NG** → **Repair or replace harness or connector between the airbag sensor assembly and front passenger airbag assembly.**

**OK**

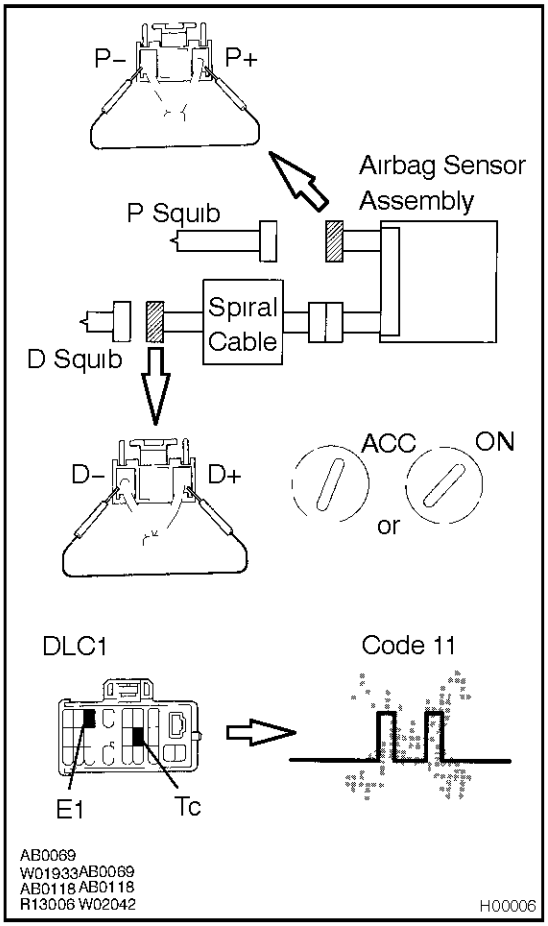


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check airbag sensor assembly. |
|---|---|




**PREPARATION:**

(a) Connect connector to airbag sensor assembly

(b) Using service wire, connect $D^+$ and $D^-$ on spiral cable side of connector between spiral cable and steering wheel pad

(c) Using a service wire, connect $P^+$ and $P^-$ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON and wait at least 20 seconds

(b) Clear malfunction code stored in memory
(See page DI–240)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020

(f) Check DTC

**OK:**

**DTC 11 is not output.**

HINT

Codes other than code 11 may be output at this time, but they are not relevant to this check

NG → **Replace airbag sensor assembly.**

OK

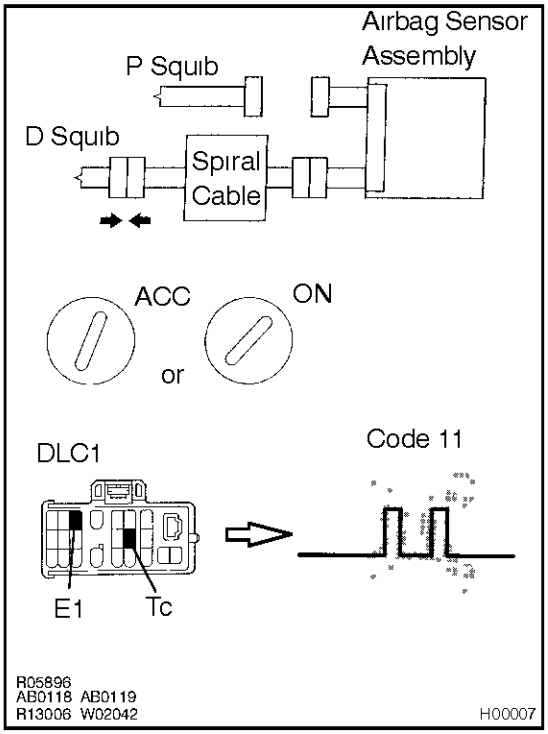


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check D squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Connect steering wheel pad connector
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(b) Clear malfunction code stored in memory (See page DI–240)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020
(f) Check DTC

**OK:**

**DTC 11 is not output.**

HINT

Codes other than code 11 may be output at this time, but they are not relevant to this check

NG → **Replace steering wheel pad.**

OK

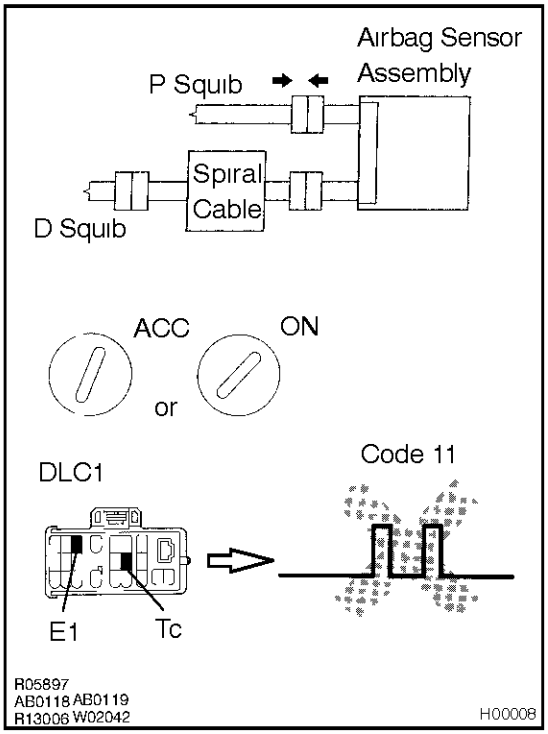


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 6 | Check P squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Connect front passenger airbag assembly connector
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(b) Clear malfunction code stored in memory (See page DI–240)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020
(f) Check DTC

**OK:**

**DTC 11 is not output.**

HINT

Codes other than code 11 may be output at this time, but they are not relevant to this check

NG → **Replace front passenger airbag assembly.**

OK

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

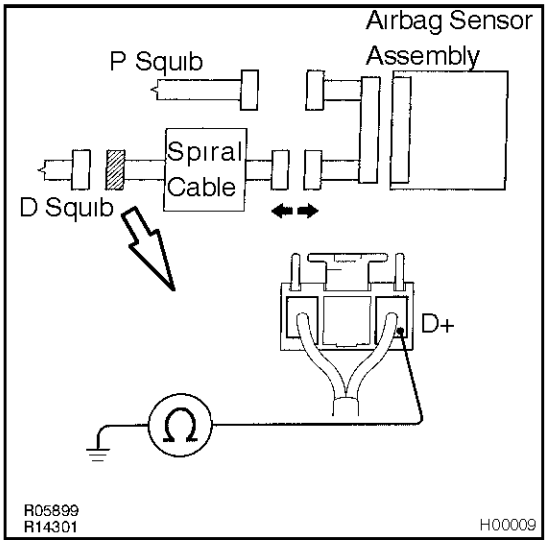


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 7 | Check spiral cable. |
|---|---|




**PREPARATION:**

Disconnect connector between airbag sensor assembly and spiral cable

**CHECK:**

Measure resistance between $D^+$ on spiral cable side of connector between spiral cable and steering wheel pad and body ground

**OK:**

**Resistance: 1 MΩ or Higher**

**NG** → **Repair or replace spiral cable.**

**OK**

**Repair or replace harness or connector between airbag sensor assembly and spiral cable.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q8 03

| DTC | 12 | Short in Squib Circuit (to B+) |
|---|---|---|

## CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly It causes the SRS to deploy when the SRS deployment conditions are satisfied
For details of the function of each component, see page FUNCTION OF COMPONENTS on page RS–2
DTC 12 is recorded when a B+ short is detected in the squib circuit

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| 12 | • Short circuit in squib wire harness (to B+)<br>• Squib malfunction<br>• Spiral cable malfunction<br>• Airbag sensor assembly malfunction | • Steering wheel pad (D squib)<br>• Front passenger airbag assembly (P squib)<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness |

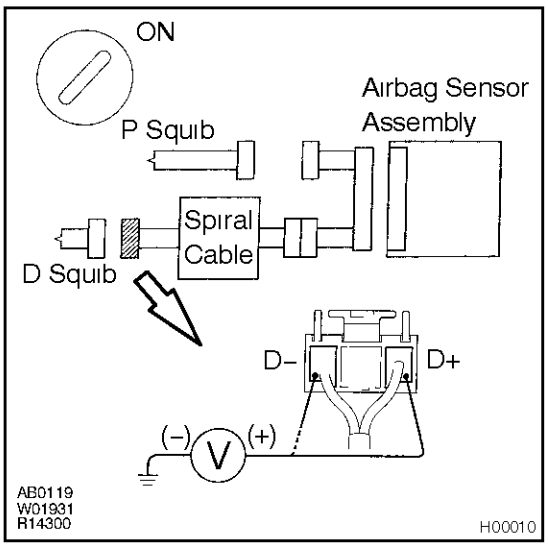
## WIRING DIAGRAM

Refer to page DI–247 for the WIRING DIAGRAM

## INSPECTION PROCEDURE

| 1 | **Preparation. (See step 1 on page DI–271)** |
|---|---|

| 2 | **Check D squib circuit.** |
|---|---|




**CHECK:**

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the voltage between $D^+$, $D^-$ and body ground

**OK:**

**Voltage: 0 V**

NG → **Go to step 7.**

OK

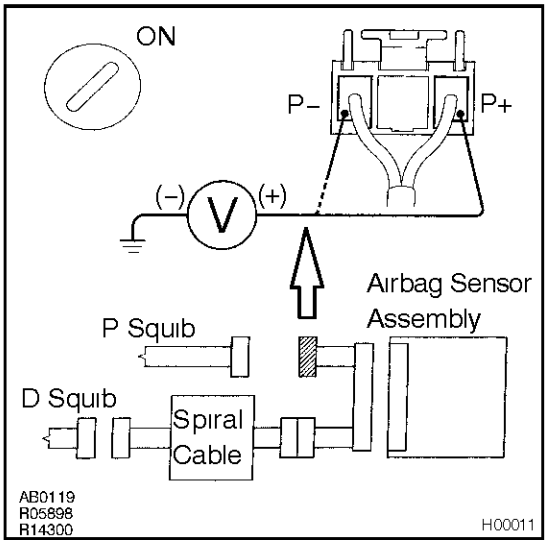


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check P squib circuit. |
|---|---|




**CHECK:**

For the connector (on the airbag sensor assembly side) between airbag sensor assembly and front passenger airbag assembly, measure the voltage between $P^+$, $P^-$ and body ground

**OK:**

**Voltage: 0 V**

NG → **Repair or replace harness or connector between the airbag sensor assembly and front passenger airbag assembly.**

OK →

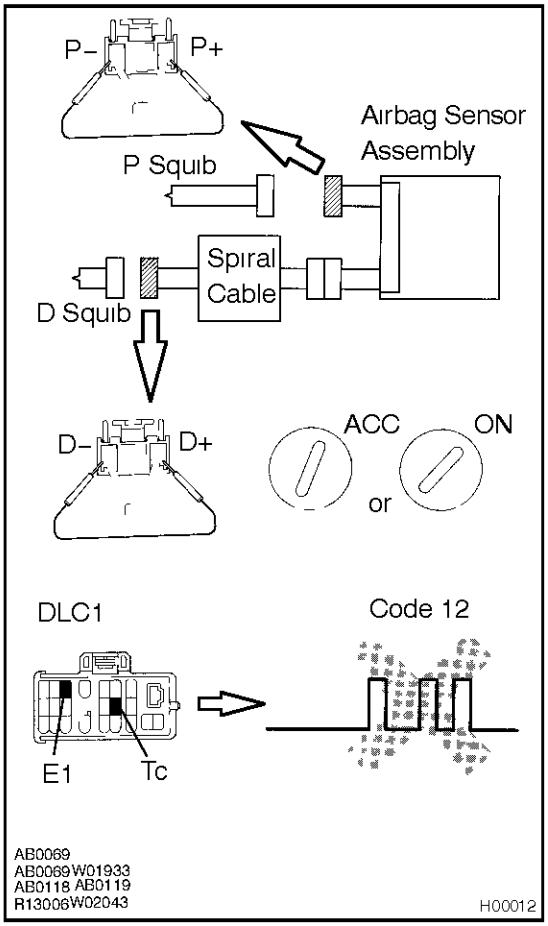


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check airbag sensor assembly. |
|---|---|




**PREPARATION:**

(a) Connect connector to airbag sensor assembly

(b) Using a service wire, connect $D^+$ and $D^-$ on spiral cable side of connector between spiral cable and steering wheel pad

(c) Using a service wire, connect $P^+$ and $P^-$ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(b) Clear malfunction code stored in memory
(See page DI–240)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020

(f) Check DTC

**OK:**

**DTC 12 is not output.**

HINT

Codes other than code 12 may be output at this time, but they are not relevant to this check

NG → **Replace airbag sensor assembly.**

OK

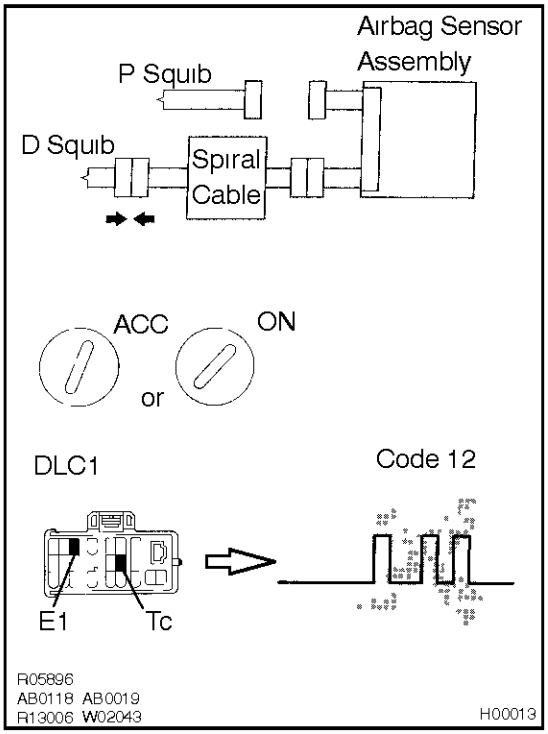


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check D squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Connect steering wheel pad connector
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(b) Clear malfunction code stored in memory (See page DI–240)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020
(f) Check DTC

**OK:**

**DTC 12 is not output.**

HINT

Codes other than code 12 may be output at this time, but they are not relevant to this check

NG → **Replace steering wheel pad.**

OK

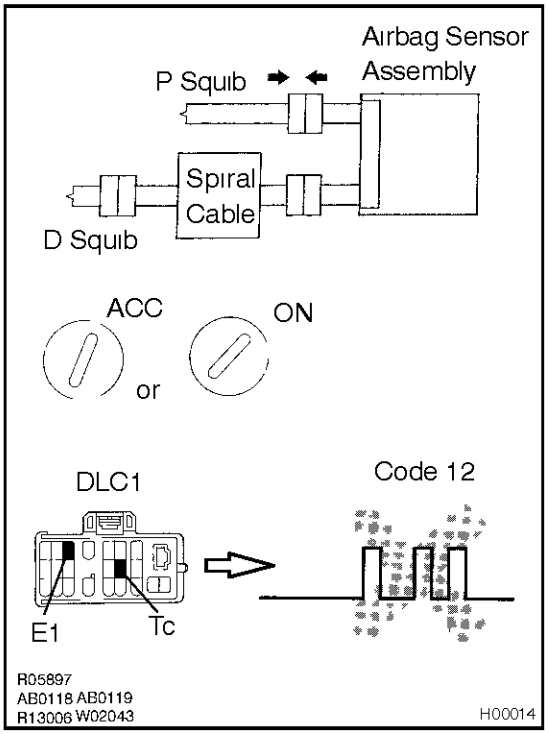


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 6 | Check P squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Connect front passenger airbag assembly connector
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(b) Clear malfunction code stored in memory
(See page DI–240)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020
(f) Check DTC

**OK:**

**DTC 12 is not output.**

HINT

Codes other than code 12 may be output at this time, but they are not relevant to this check

NG → **Replace front passenger airbag assembly.**

OK

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

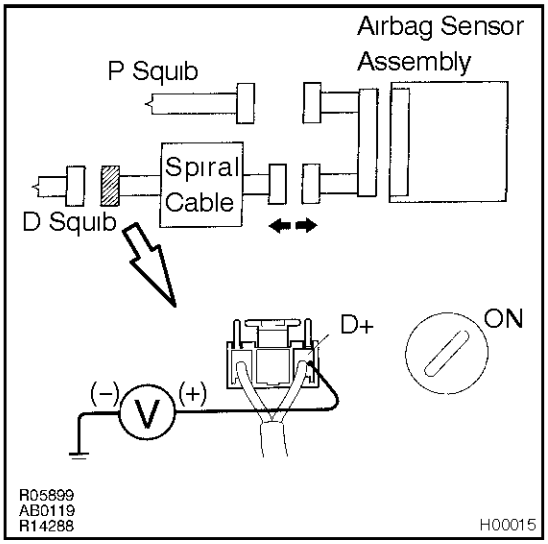


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 7 | **Check spiral cable.** |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK

(b) Disconnect connector between airbag sensor assembly and spiral cable

(c) Turn ignition switch ON

**CHECK:**

Measure voltage at $D^+$ on spiral cable side of connector between spiral cable and steering wheel pad and body ground

**OK:**

**Voltage: 0 V**

NG → **Repair or replace spiral cable.**

OK

**Repair or replace harness or connector between airbag sensor assembly and spiral cable.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5Q9 03

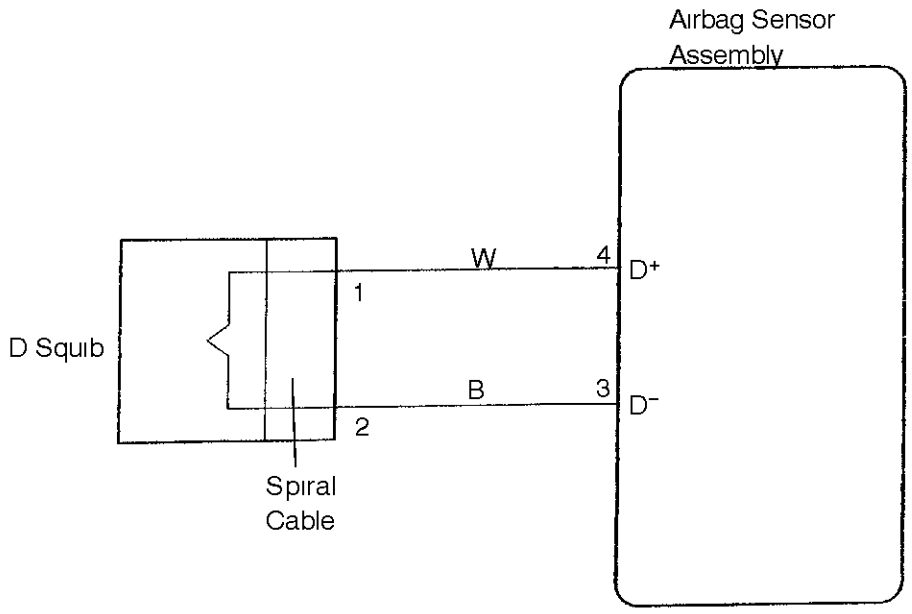
| DTC | 14 | Open in D Squib Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, spiral cable and the steering wheel pad
It causes the airbag to deploy when the airbag deployment conditions are satisfied
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–2
DTC 14 is recorded when an open is detected in the squib circuit

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| 14 | • Open circuit in $D^+$ wire harness or D wire harness of squib<br>• D squib malfunction<br>• Spiral cable malfunction<br>• Center airbag sensor assembly malfunction | • Steering wheel pad (D squib)<br>• Spiral cable<br>• Airbag sensor assembly<br>• Wire harness |

## WIRING DIAGRAM




R15194

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Preparation. (See step 1 on page DI–271)** |

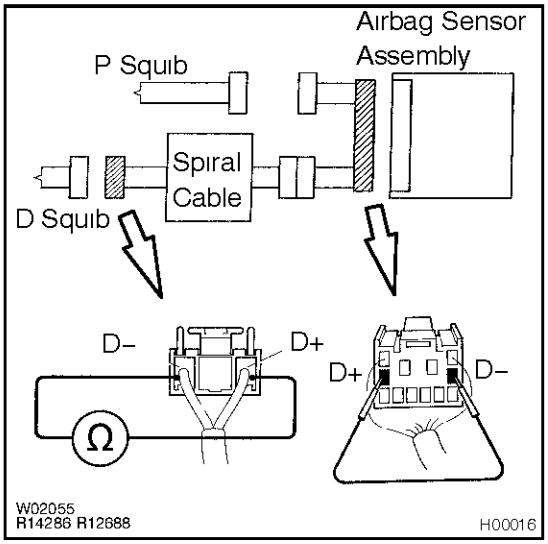


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check D squib circuit. |
|---|---|




**PREPARATION:**

Using service wire, connect $D^+$ and $D^-$ on airbag sensor assembly connector

**CHECK:**

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between $D^+$ and $D^-$

**OK:**

**Resistance: Below 1 Ω**

NG → **Go to step 5.**

OK

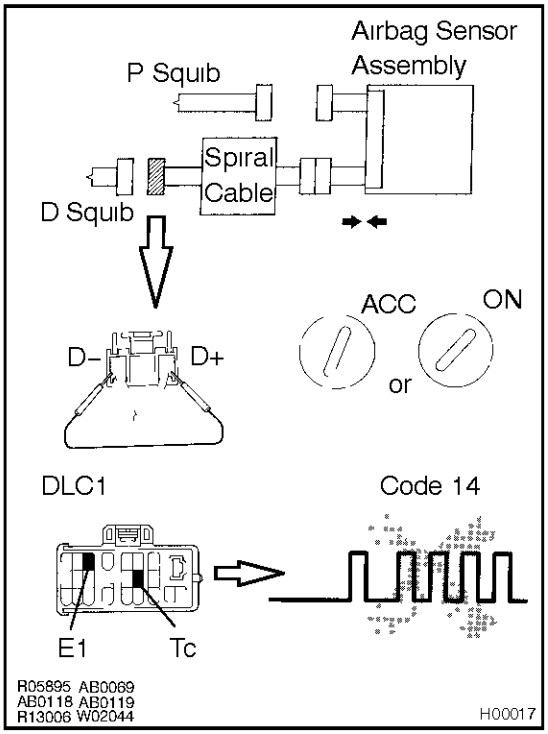


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check airbag sensor assembly. |
|---|---|




**PREPARATION:**

(a) Connect connector to airbag sensor assembly

(b) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad

(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON and wait at least 20 seconds

(b) Clear malfunction code stored in memory
(See page DI–240)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020

(f) Check DTC

**OK:**

**DTC 14 is not output.**

HINT

Codes other than code 14 may be output at this time, but they are not relevant to this check

NG → **Replace airbag sensor assembly.**

OK

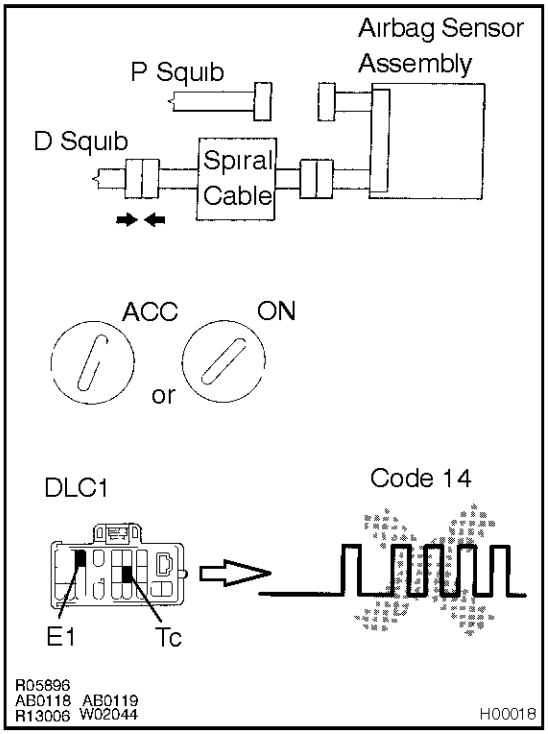


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check D squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Connect steering wheel pad (squib) connector
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(b) Clear malfunction code stored in memory
(See page DI–240)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020
(f) Check DTC

**OK:**

**DTC 14 is not output.**

HINT

Codes other than code 14 may be output at this time, but they are not relevant to this check

| NG | Replace steering wheel pad. |
|---|---|

OK

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

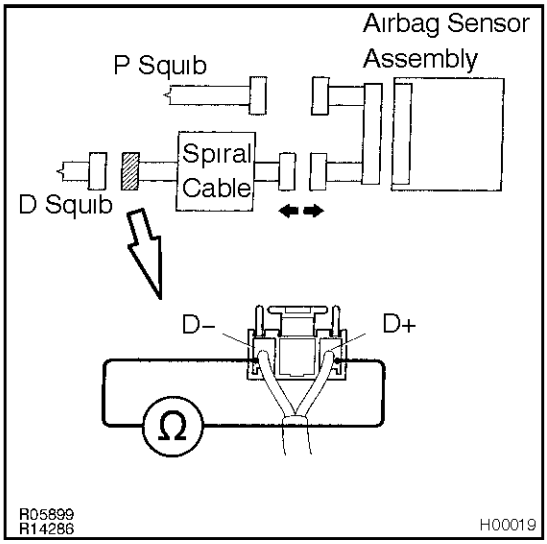


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 5 | Check spiral cable. |
|---|---|




**PREPARATION:**

Disconnect connector between airbag sensor assembly and spiral cable

**CHECK:**

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance $D^+$ and $D^-$

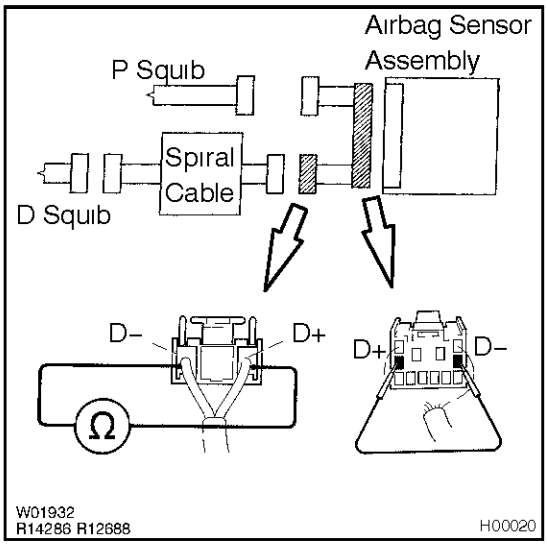
**OK:**

**Resistance: Below 1 Ω**

| NG | Repair or replace spiral cable. |
|---|---|

OK

| 6 | Check harness between airbag sensor assembly and spiral cable. |
|---|---|




**PREPARATION:**

Using service wire, connect $D^+$ and $D^-$ on airbag sensor assembly connector

**CHECK:**

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and spiral cable, measure the resistance between $D^+$ and $D^-$

**OK:**

**Resistance: Below 1 Ω**

| NG | Repair or replace harness or connector between airbag sensor assembly and spiral cable. |
|---|---|

OK

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5QA-03

| DTC | 31 | Airbag Sensor Assembly Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The airbag sensor assembly consists of a airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc

It receives signals from the airbag sensors, judges whether or not the SRS must be activated, and diagnosis system malfunction

DTC 31 is recorded when occurrence of a malfunction in the airbag sensor assembly is detected

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| 31 | • Airbag sensor assembly malfunction | • Airbag sensor assembly |

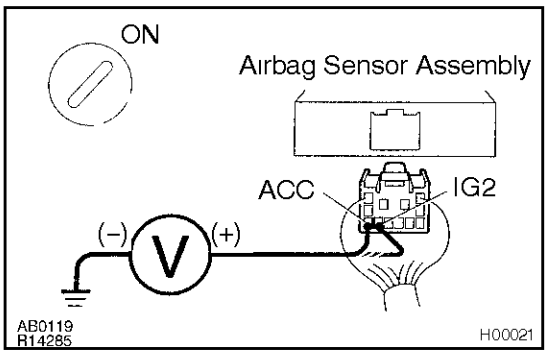
## INSPECTION PROCEDURE

HINT

When a malfunction code other than code 31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code 31

| 1 | **Preparation (See step 1 on page DI–271).** |
|---|---|

| 2 | **Check voltage at IG2 and ACC of airbag sensor assembly.** |
|---|---|




**PREPARATION:**

Turn ignition switch ON

**CHECK:**

Measure voltage between terminals IG2 and ACC of airbag sensor assembly and body ground

**OK:**

**Voltage: Below 16 V**

| NG | **Check battery and charging system (See page CH–2).** |
|---|---|

OK

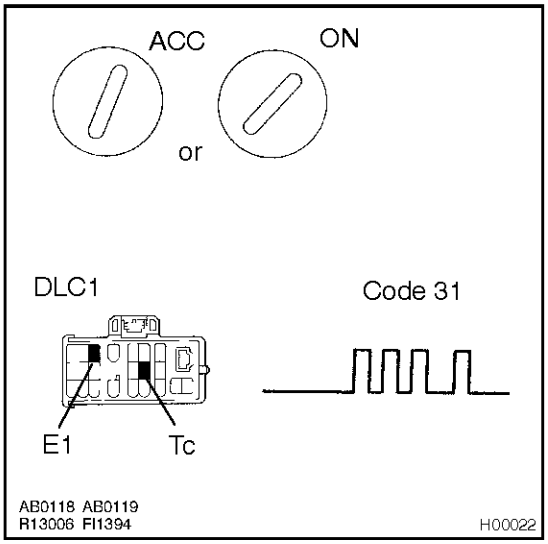


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Is DTC 31 output again? |
|---|---|




**PREPARATION:**

Clear malfunction code

**CHECK:**

(a) Turn ignition switch to LOCK, and wait at least 20 seconds

(b) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(c) Repeat operation in step (a) and (b) at least 5 times

(d) Using SST, connect terminals Tc and E1 of DLC 1
SST 09843–18020

(e) Check the DTC

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–18).**

YES

**Replace airbag sensor assembly.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5QB-03

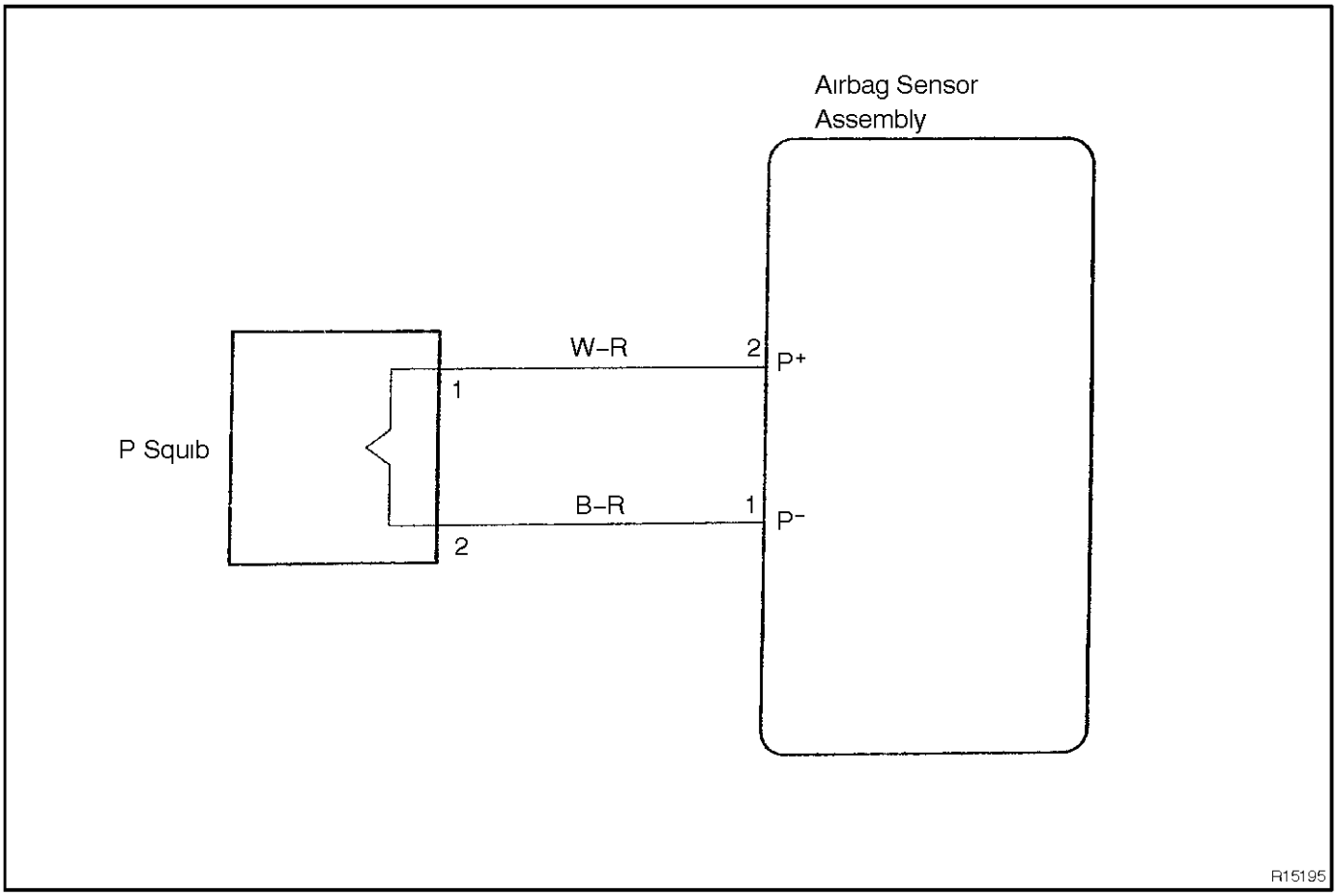
| DTC | 54 | Open in P Squib Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and front passenger airbag assembly
It causes the airbag to deploy when the airbag deployment conditions are satisfied
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–2
DTC 54 is recorded when an open is detected in the P squib circuit

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| 54 | • Open circuit in $P^+$ wire harness or P wire harness of squib<br>• Squib malfunction<br>• Airbag sensor assembly malfunction | • Front passenger airbag assembly (P squib)<br>• Airbag sensor assembly<br>• Wire harness |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

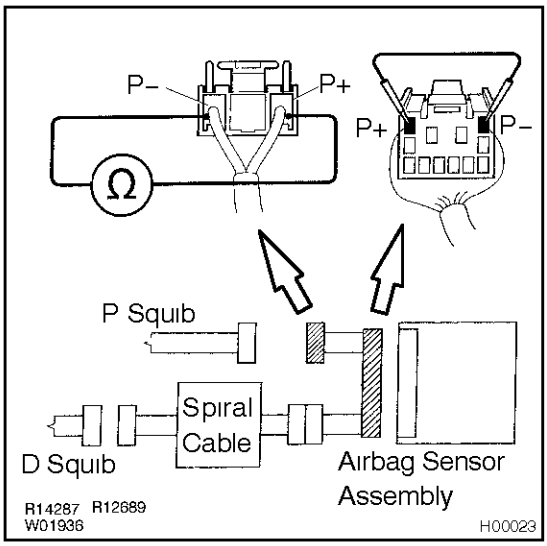
Brought to you by BirfMark



# INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Preparation. (See step 1 on page DI–271)** |

| | |
|---|---|
| 2 | **Check P squib circuit.** |




**PREPARATION:**

Using service wire, connect $P^+$ and $P^-$ on airbag sensor assembly connector

**CHECK:**

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and front passenger airbag assembly measure the resistance between $P^+$ and $P^-$

**OK:**

**Resistance: Below 1 Ω**

NG → **Repair or replace harness or connector between airbag sensor assembly and front passenger airbag assembly.**

OK

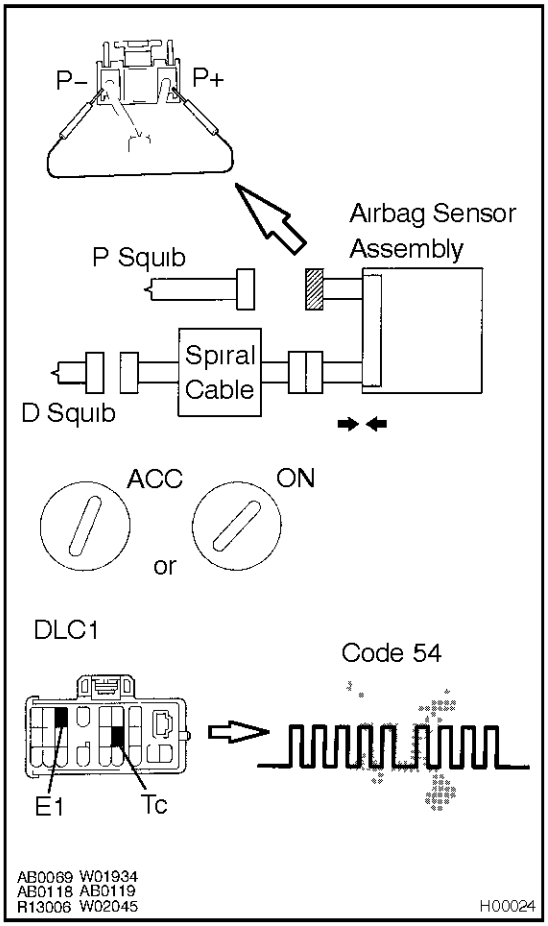


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check airbag sensor assembly. |
|---|---|




**PREPARATION:**

(a) Connect connector to airbag sensor assembly

(b) Using service wire, connect $P^+$ and $P^-$ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly

(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(b) Clear malfunction code stored in memory
(See page DI–240)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020

(f) Check DTC

**OK:**

**DTC 54 is not output.**

HINT

Codes other than code 54 may be output at this time, but they are not relevant to this check

NG → **Replace airbag sensor assembly.**

OK

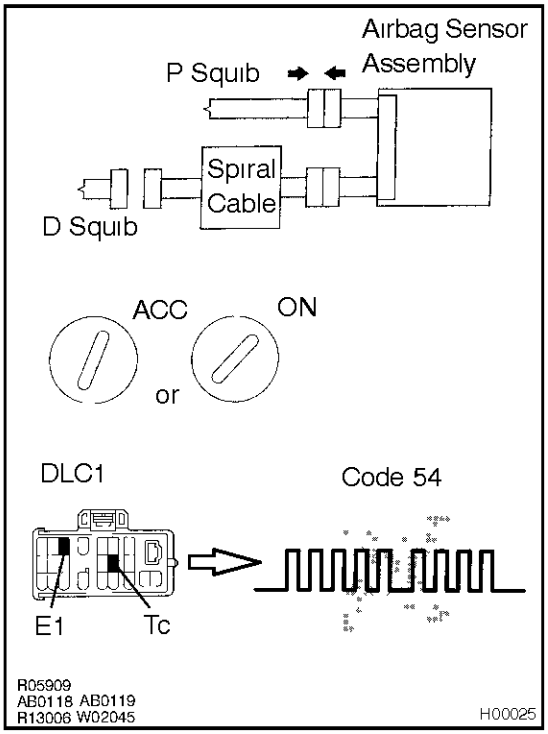


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check P squib. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds

(c) Connect front passenger airbag assembly connector

(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

**CHECK:**

(a) Turn ignition switch to ACC or ON and wait at least 20 seconds

(b) Clear malfunction code stored in memory
(See page DI–240)

(c) Turn ignition switch to LOCK, and wait at least 20 seconds

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds

(e) Using SST, connect terminals Tc and E1 of DLC1
SST 09843–18020

(f) Check DTC

**OK:**

**DTC 54 is not output.**

HINT

Codes other than code 54 may be output at this time, but they are not relevant to this check

NG → **Replace front passenger airbag assembly.**

OK

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5QC 03

| DTC | Normal | Source Voltage Drop |
|---|---|---|

## CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the airbag sensor assembly in case the source voltage drops

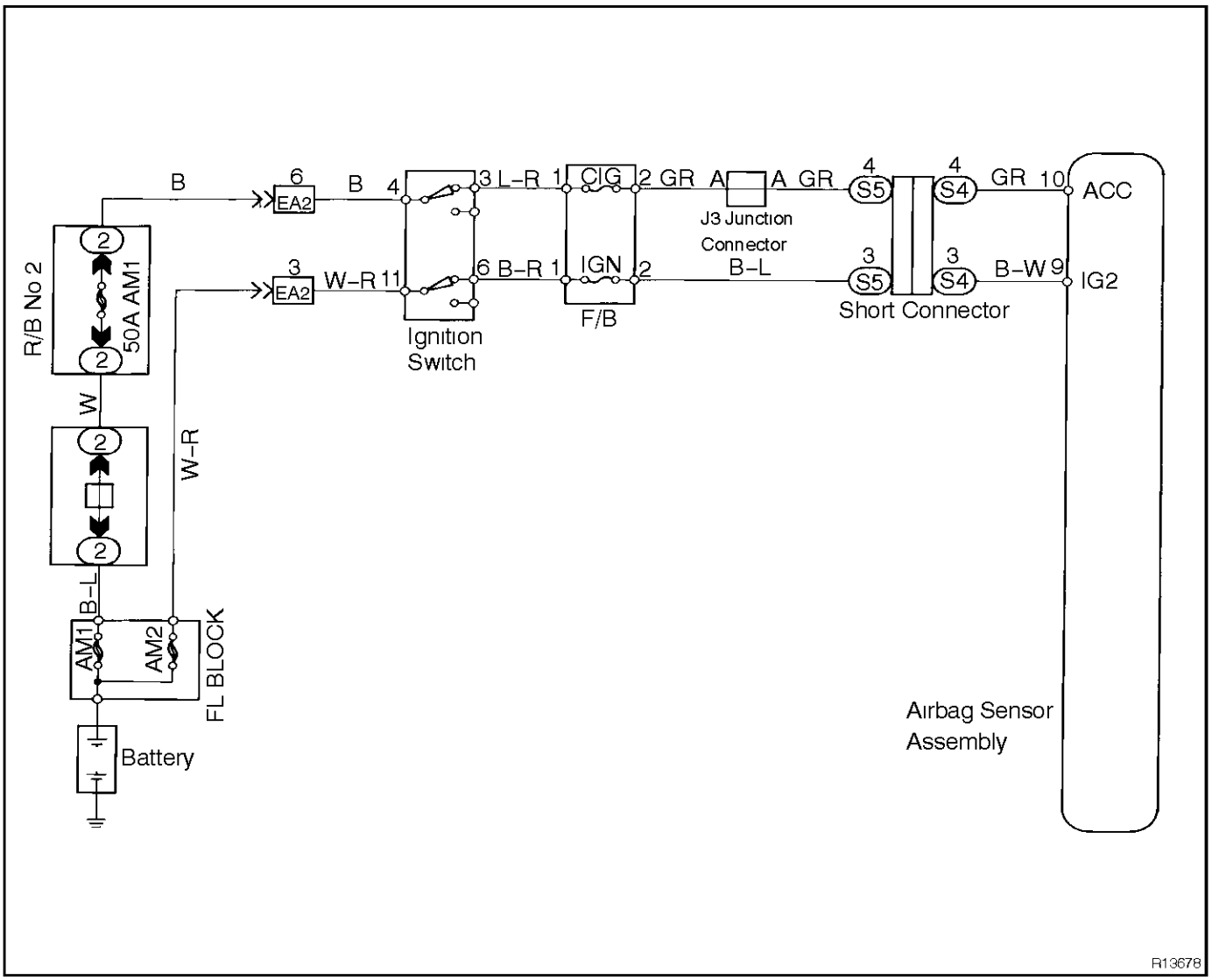
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage

The diagnosis system malfunction display for this circuit is different to other circuits–when the SRS warning light remains lit up and the DTC is a normal code, source voltage drop is indicated

Malfunction in this circuit is not recorded in the airbag sensor assembly, and the source voltage returns to normal, the SRS warning light automatically goes off

| DTC No | DTC Detection Condition | Trouble Area |
|---|---|---|
| Normal | Source voltage dorp | • Battery<br>• Airbag sensor assembly |

## WIRING DIAGRAM





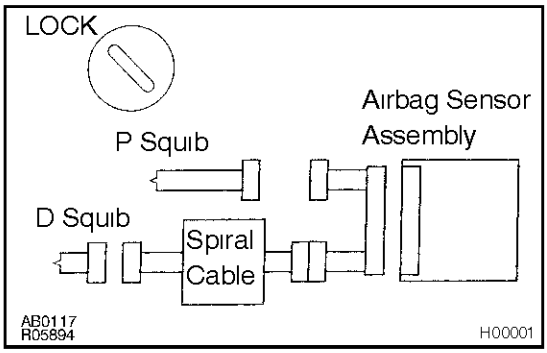

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| 1 | Preparation. |
|---|---|




**PREPARATION:**

(a) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds

(b) Remove steering wheel pad (See page SR–11)

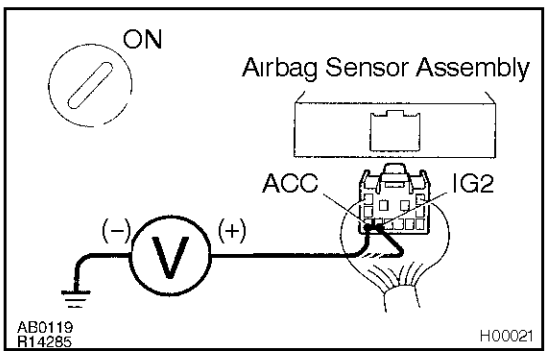
(c) Disconnect connector of front passenger airbag assembly (See page RS–22)

(d) Disconnect connector of airbag sensor assembly (See page RS–33)

**CAUTION:**

**Store the steering wheel pad with the front surface facing upward.**

| 2 | Check source voltage. |
|---|---|




**PREPARATION:**

(a) Connect negative (–) terminal cable to battery

(b) Turn ignition switch ON

**CHECK:**

Measure voltage at IG2 or ACC on sensor and operate electric system (defogger, wiper, headlight, heater blower, etc )

**OK:**

**Voltage: 10 – 14 V**

NG → **Check the harness between battery and airbag sensor assembly, and check the battery and charging system.**

OK

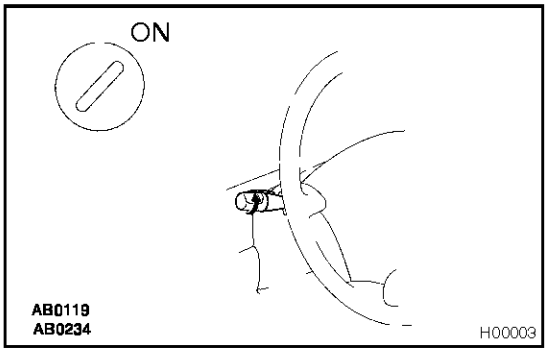


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Does SRS warning light turn off? |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Connect steering wheel pad connector
(c) Connect front passenger airbag assembly connector
(d) Connect airbag sensor assembly connector
(e) Turn ignition switch ON

**CHECK:**

Operate electric system (defogger, wiper, headlight, heater blower, etc ) and check that SRS warning light goes off

NO → **Check DTC, if a DTC is output, perform trouble-shooting according to DTC, if a normal code is output, replace airbag sensor assembly.**

YES

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5QD 03

# SRS Warning Light System Malfunction (Always lit up, when ignition switch is in LOCK position.)

## CIRCUIT DESCRIPTION

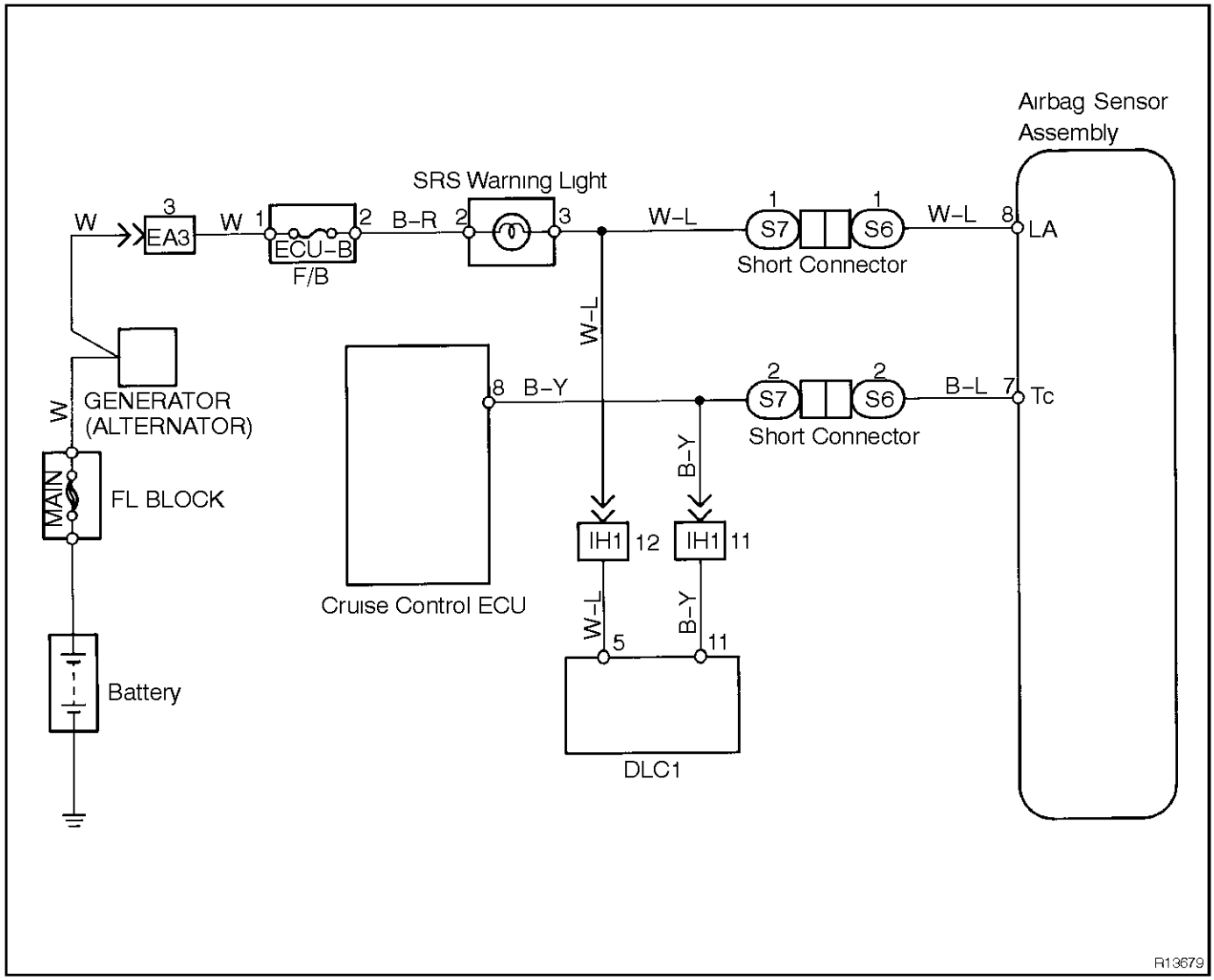
The SRS warning light is located on the combination meter

When the SRS is normal, the SRS warning light lights up for approx 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically

If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality

When terminals Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light

## WIRING DIAGRAM





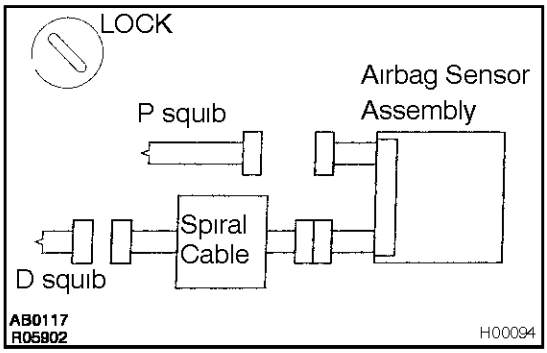

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| 1 | Preparation. |
|---|---|




**PREPARATION:**

(a) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds

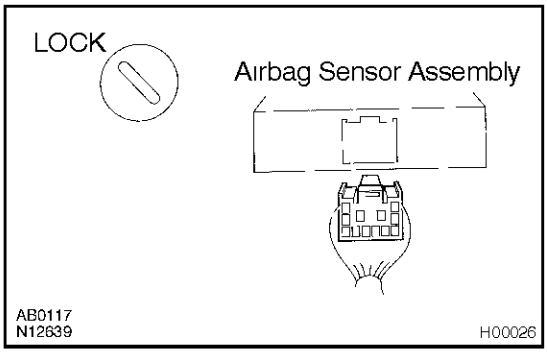
(b) Remove steering wheel pad (See SR section)

(c) Disconnect connector of front passenger airbag assembly (See page RS–22)

**CAUTION:**

**Store the steering wheel pad with the front surface facing upward.**

| 2 | Does SRS warning light turn off? |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds

(c) Disconnect airbag sensor assembly connector

(d) Connect negative (–) terminal cable to battery

**CHECK:**

Check operation of SRS warning light

NO → **Check SRS warning light circuit or terminal AB circuit of DLC1.**

YES →

**Replace airbag sensor assembly.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SRS Warning Light System Malfunction (Does not light up, when ignition switch is turned to ACC or ON.)

## CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter

When the SRS is normal, the SRS warning light lights up for approx 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically

If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality

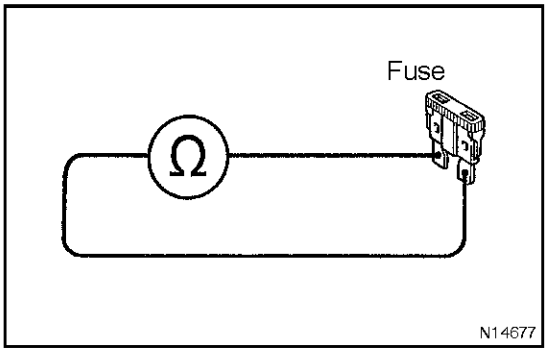
When terminals Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light

## WIRING DIAGRAM

Refer to page DI–274 for the WIRING DIAGRAM

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check ECU–B Fuse.** |




**PREPARATION:**

Remove ECU–B fuse

**CHECK:**

Check continuity of ECU–B fuse

**OK:**

**Continuity**

HINT

- Fuse may be burnt out even if it appears to be OK during visual inspection
- If fuse is OK, install it

| | |
|---|---|
| NG | **Go to step 5.** |

OK

| | |
|---|---|
| 2 | **Preparation. (See step 1 on page DI–271)** |

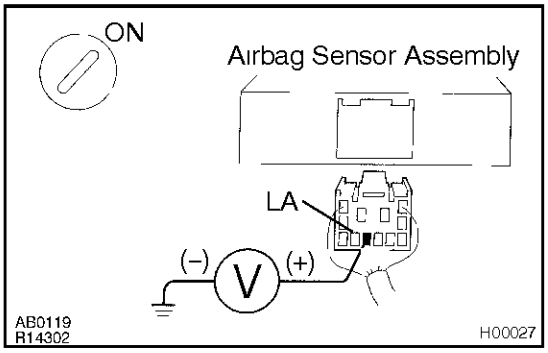


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check SRS warning light circuit. |
|---|---|




**PREPARATION:**

(a) Connect negative (–) terminal cable to battery

(b) Turn ignition switch to ACC or ON

**CHECK:**

Measure voltage LA terminal of harness side connector of airbag sensor assembly

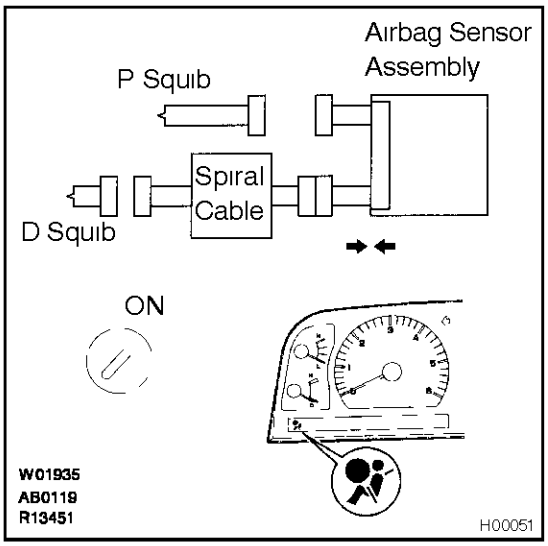
**OK:**

**Voltage: 10 – 14 V**

**NG** → **Check SRS warning light bulb/repair SRS warning light circuit.**

**OK**

| 4 | Does SRS warning light come on? |
|---|---|




**PREPARATION:**

(a) Disconnect negative (–) terminal cable from the battery

(b) Connect airbag sensor assembly connector

(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds

(d) Turn ignition switch to ACC or ON

**CHECK:**

Check operation of SRS warning light

**NO** → **Check terminal LA of airbag sensor assembly. If normal, replace airbag sensor assembly.**

**YES**

**From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 5 | Is new ECU–B fuse burnt out again? |

NO → Using simulation method, reproduce malfunction symptoms (See page IN–18).

YES

Check harness between ECU–B fuse and SRS warning light.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



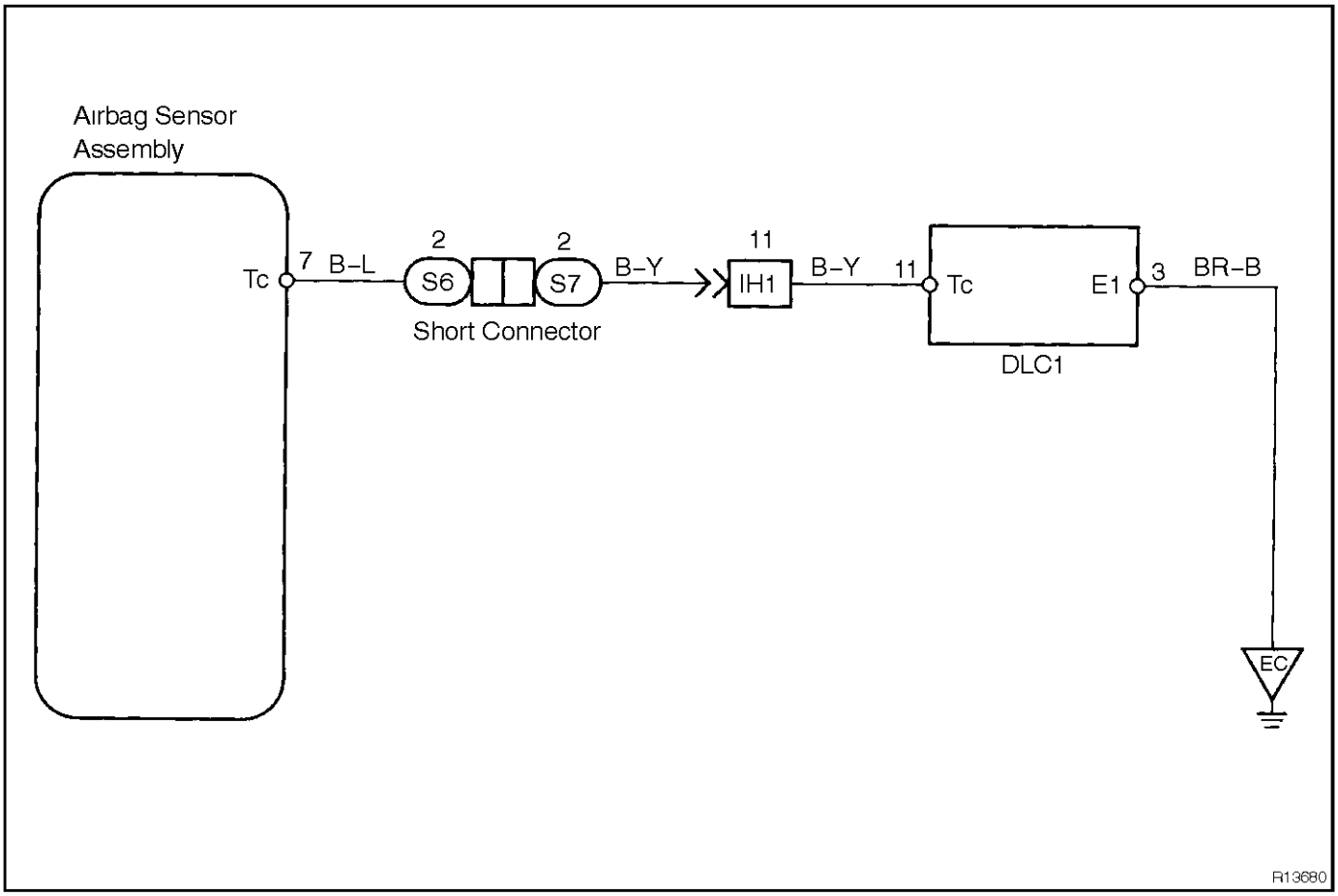
D5QF 03

# Tc Terminal Circuit

## CIRCUIT DESCRIPTION

By connecting terminals Tc and E1 of the DLC1 the airbag sensor assembly is set in the DTC output mode The DTCs are displayed by the blinking of the SRS warning light

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

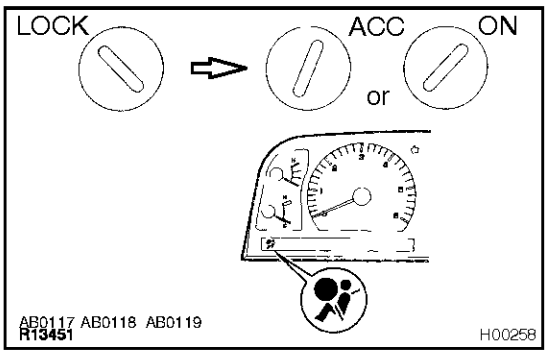
Brought to you by BirfMark



## INSPECTION PROCEDURE

## If the DTC is not displayed, perform the following troubleshooting.

| | |
|---|---|
| 1 | **Does SRS warning light light up for approx. 6 seconds?** |



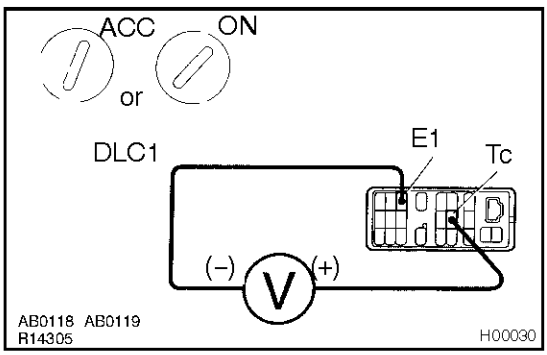

**PREPARATION:**

Check operation of SRS warning light after ignition switch is turned from LOCK position to ACC or ON position

**NO** → **Check SRS warning light system. (See page DI–240)**

**YES**

| | |
|---|---|
| 2 | **Check voltage between terminals Tc and E1 of DLC1.** |




**PREPARATION:**

Turn ignition switch to ACC or ON

**CHECK:**

Measure voltage between terminals Tc and E1 of DLC1

**OK:**

**Voltage: 10 – 14 V**

**OK** → **Go to step 4.**

**NG**

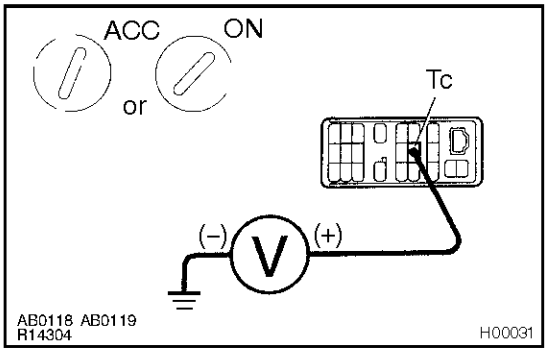


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminals Tc of DLC1 and body ground |
|---|---|




**CHECK:**

Measure voltage between terminals Tc of DLC1 and body ground

**OK:**

**Voltage: 10 – 14 V**

OK → **Check harness between terminal E1 of DLC1 and body ground.**

NG

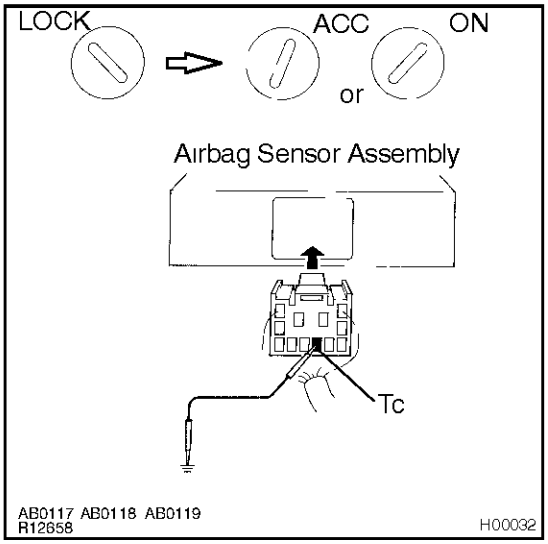


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 4 | Check airbag sensor assembly. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch to LOCK
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds
(c) Disconnect airbag sensor assembly connector
(d) Insert service wire into terminal Tc from back side as shown
(e) Connect airbag sensor assembly connector with service wire
(f) Connect negative (–) terminal cable to battery
(g) Turn ignition switch to ACC or ON, and wait at least 20 seconds
(h) Connect service wire of terminal Tc to body ground

**CHECK:**

Check operation of SRS warning light

**OK:**

**SRS waning light comes on.**

**NOTICE:**

**Never make a mistake with the terminal connection position as this will cause a malfunction.**

OK → **Check harness between airbag sensor assembly and DLC1.**

NG

**Replace airbag sensor assembly.**



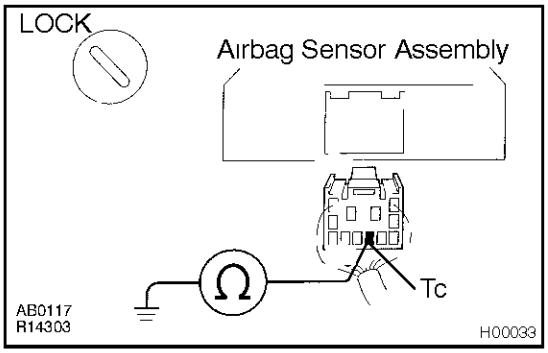
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## If the DTC is displayed without a DTC check procedure, perform the following troubleshooting.

| | |
|---|---|
| 1 | **Check resistance between terminal Tc of airbag sensor assembly and body ground.** |




**PREPARATION:**

(a) Turn ignition switch to LOCK

(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds

(c) Disconnect airbag sensor assembly connector

**CHECK:**

Check resistance between terminal Tc of airbag sensor assembly connector and body ground

**OK:**

**Resistance: 1 MΩ or Higher**

**NG** → **Repair or replace harness or connector.**

**OK**

**Replace airbag sensor assembly.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

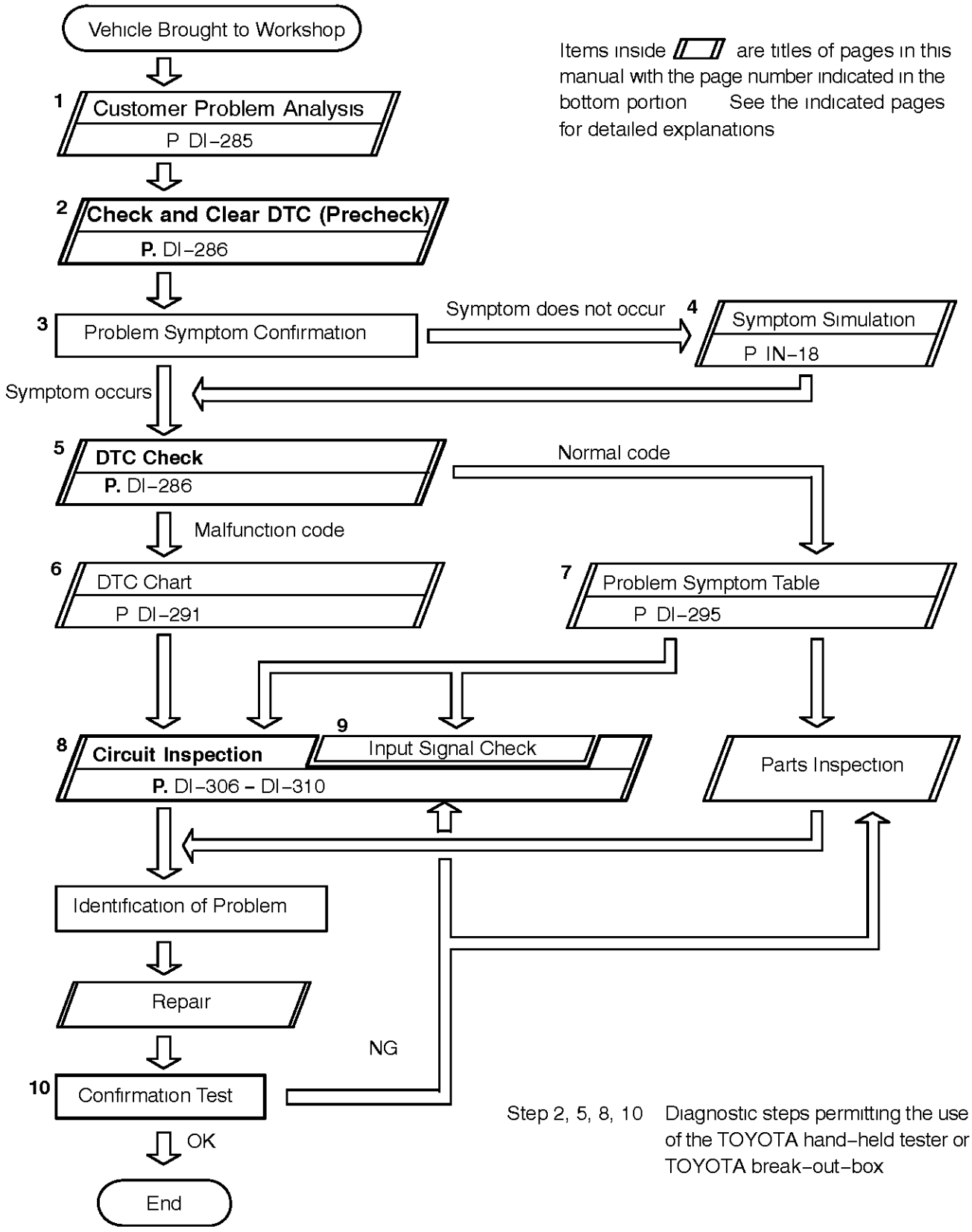
Brought to you by BirfMark



# CRUISE CONTROL SYSTEM

## HOW TO PROCEED WITH TROUBLESHOOTING

D5O4 02




Items inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion See the indicated pages for detailed explanations

Step 2, 5, 8, 10 Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5C6 01

# CUSTOMER PROBLEM ANALYSIS CHECK

**CRUISE CONTROL SYSTEM Check Sheet**

Inspector's name _____

| | | | |
|---|---|---|---|
| **Customer's Name** | | **Registration No.** | |
| | | **Registration Year** | |
| | | **Frame No.** | |
| **Date of Vehicle Brought in** | / / | **Odometer Reading** | **km Mile** |

| | | |
|---|---|---|
| **Condition of Problem Occurrence** | **Date of Problem Occurrence** | / / |
| | **How Often does Problem Occur?** | ☑ Continuous ☑ Intermittent ( Times a day) |
| | **Vehicle Speed when Problem Occurred** | **km Mile** |

| | | |
|---|---|---|
| **Symptoms** | ☑ Auto cancel occurs | ● Driving condition<br>☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill<br>● After cancel occurred, did the driver activate cruise control again?<br>☐ Yes ☐ No |
| | ☐ Cancel does not occur | ☐ With brake ON<br>☐ Except D position shift ☐ At 40 km/h (25 mph) or less<br>☐ When control SW turns to CANCEL position |
| | ☐ Cruise control malfunction | ☐ Slip to acceleration side<br>☐ Slip to deceleration side<br>☐ Hunting occurs<br>☐ O/D cut off does not occur<br>☐ O/D does not return |
| | ☐ Switch malfunction | ☐ SET ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL |
| | ☐ Cruise MAIN indicator light | ☐ Remains ON ☐ Does not light up ☐ Blinking |

| | | |
|---|---|---|
| **DTC Check** | **1st Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |
| | **2nd Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5C6 01

# CUSTOMER PROBLEM ANALYSIS CHECK

**CRUISE CONTROL SYSTEM Check Sheet**

Inspector's name _____

| | | | |
|---|---|---|---|
| **Customer's Name** | | **Registration No.** | |
| | | **Registration Year** | |
| | | **Frame No.** | |
| **Date of Vehicle Brought in** | / / | **Odometer Reading** | **km Mile** |

| | | |
|---|---|---|
| **Condition of Problem Occurrence** | **Date of Problem Occurrence** | / / |
| | **How Often does Problem Occur?** | ☑ Continuous ☑ Intermittent ( Times a day) |
| | **Vehicle Speed when Problem Occurred** | **km Mile** |

| | | |
|---|---|---|
| **Symptoms** | ☑ Auto cancel occurs | ● Driving condition<br>☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill<br>● After cancel occurred, did the driver activate cruise control again?<br>☐ Yes ☐ No |
| | ☐ Cancel does not occur | ☐ With brake ON<br>☐ Except D position shift ☐ At 40 km/h (25 mph) or less<br>☐ When control SW turns to CANCEL position |
| | ☐ Cruise control malfunction | ☐ Slip to acceleration side<br>☐ Slip to deceleration side<br>☐ Hunting occurs<br>☐ O/D cut off does not occur<br>☐ O/D does not return |
| | ☐ Switch malfunction | ☐ SET ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL |
| | ☐ Cruise MAIN indicator light | ☐ Remains ON ☐ Does not light up ☐ Blinking |

| | | |
|---|---|---|
| **DTC Check** | **1st Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |
| | **2nd Time** | ☐ Normal Code ☐ Malfunction Code (Code ) |

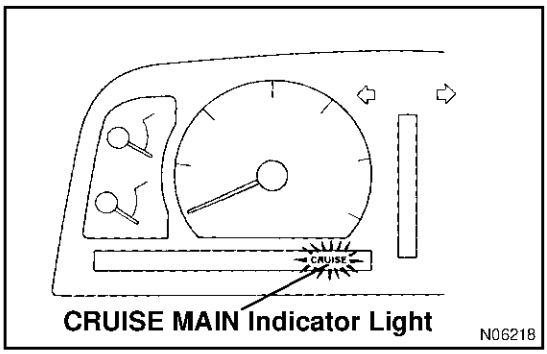


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5O6 02




# PRE-CHECK

## 1. DIAGNOSIS SYSTEM

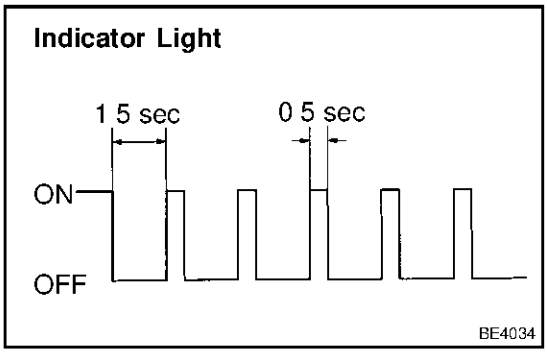
(a) Check the indicator

(1) Turn the ignition switch to ON

(2) Check that the CRUISE MAIN indicator light comes on when the cruise control main switch is turned on, and that the indicator light goes off when the main switch is turned OFF

HINT:

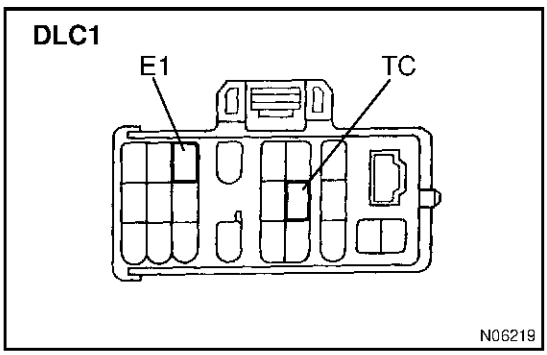
If the indicator check result is not normal, proceed to trouble-shooting (See page BE-34 ) for the combination meter section




(b) Check the DTC

HINT:

If a malfunction occurs in the No 1 vehicle speed sensors or actuator, etc during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction At the same time, the malfunction is stopped in memory as a diagnostic trouble code




(c) Output of DTC using diagnosis check wire

(1) Turn the ignition switch ON

(2) Using SST, connect terminals Tc and $E_1$ of DLC1

SST 09843-18020

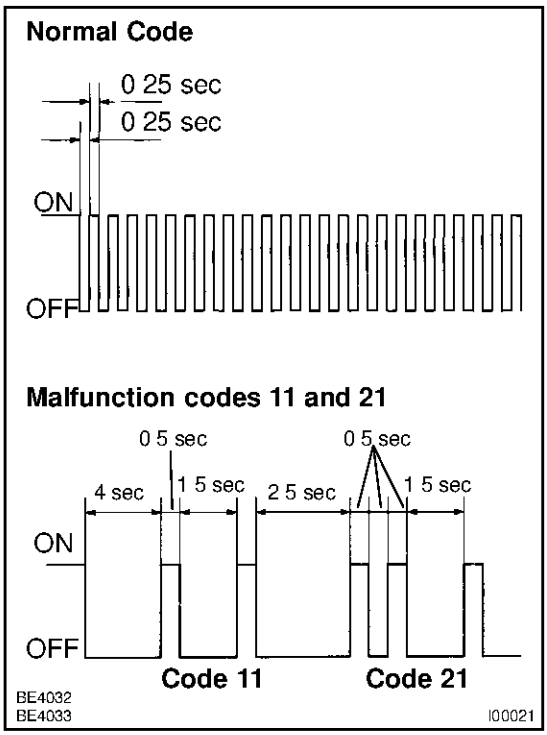
(3) Read the DTC on the CRUISE MAIN indicator light



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

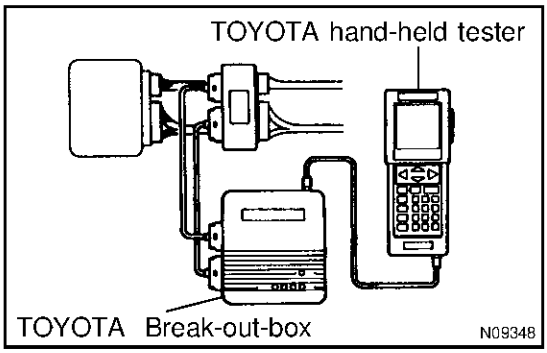





HINT:

If the DTC is not output, inspect the diagnosis circuit (See page DI-333 )

As an example, the blinking patterns for codes; normal, 11 and 21 are shown in the illustration

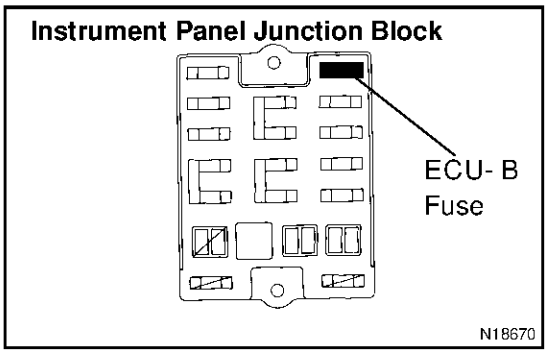



**2. ECU TERMINAL VALUES MEASUREMENT BY USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER**

(a) Hook up the TOYOTA break- out- box and TOYOTA hand-held tester to the vehicle

(b) Read the ECU input/output values by following the prompts on the tester screen

(c) Please refer to the TOYOTA hand-held tester has a "Snapshot" function This records the measured data and is effective in the diagnosis of intermittent problems




**3. DTC CLEARANCE**

(a) After completing repairs, the diagnostic trouble code retained in memory can be cleared by removing the ECU-B fuse for 10 seconds or more, with the ignition switch off

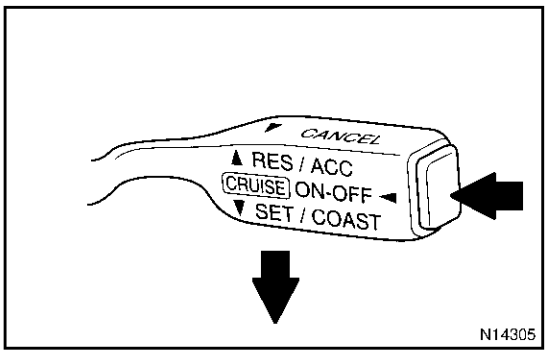
(b) Check that the normal code is displayed after connecting the fuse



Brought to you by BirfMark
Version 1.11 - 03/16/2010

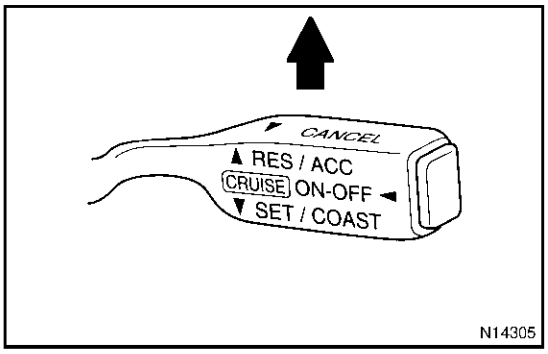
Brought to you by BirfMark



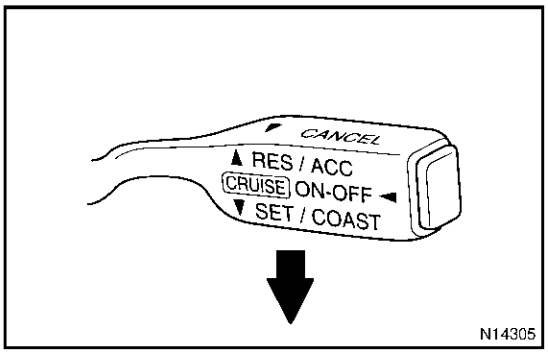



**4. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)**

(a) Inspect the SET switch
- (1) Push the main switch ON
- (2) Drive at a desired speed (40 km/h (25 mph) or higher)
- (3) Press the control switch to the SET/COAST
- (4) After releasing the switch, check that the vehicle cruises at the desired speed




(b) Inspect the ACCEL switch
- (1) Push the main switch ON
- (2) Drive at a desired speed (40 km/h (25 mph) or higher)
- (3) Check that the vehicle speed is increased while the control switch turned to RES/ACC, and that the vehicle cruises at the set speed when the switch is released
- (4) Momentarily press the control switch upward in the RES/ACC and then immediately release it Check that the vehicle speed increases by about 1 5 km/h (Tap-up function)



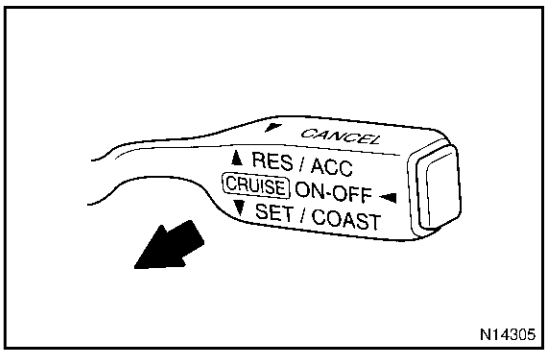

(c) Inspect the COAST switch
- (1) Push the main switch ON
- (2) Drive at a desired speed (40 km/h (25 mph) or higher)
- (3) Check that the vehicle speed is decreased while the control switch is turned to SET/COAST, and the vehicle cruise at the set speed when the switch is released
- (4) Momentarily press the control switch is turned to SET/COAST, and then immediately release it Check that the vehicle speed decreases by about 1 5 km/h (Tap-down function)



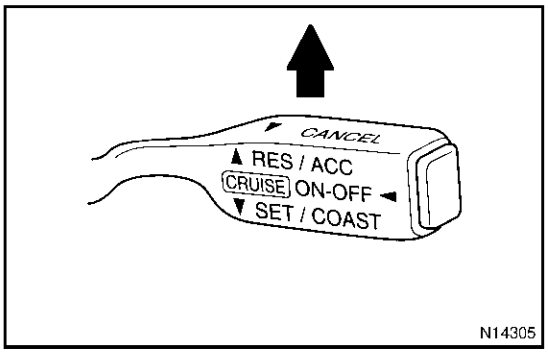
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Inspect the CANCEL switch
(1) Push the main switch ON
(2) Drive at a desired speed (40 km/h (25 mph) or higher)
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset
- Depress the brake pedal
- Shift to except D position
- Push the main switch OFF
- Pull the cruise control switch to CANCEL




(e) Inspect the RESUME switch
(1) Push the main switch ON
(2) Drive at a desired speed (40 km/h (25 mph) or higher)
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset
- Depress the brake pedal
- Shift to except D position
- Pull the cruise control switch to CANCEL

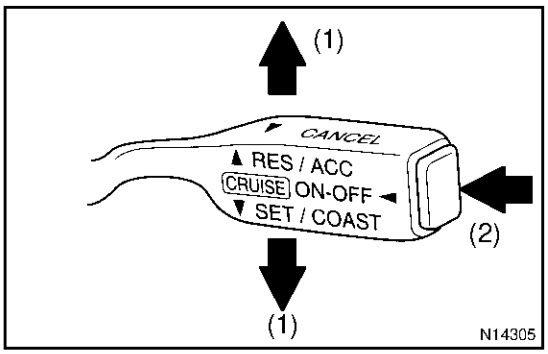
(4) After the control switch is turned to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






## 5. INPUT SIGNAL CHECK

HINT:

(1) For check No 1 - No 3
- Turn ignition switch ON

(2) For check No 4
- Jack up the vehicle
- Start the engine
- Shift to D position

(a) Press the control switch to SET/COAST or RES/ACC position and hold it down or hold it up "1"

(b) Push the main switch ON "2"

(c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds

(d) Turn the SET/COAST or RES/ACC switch OFF

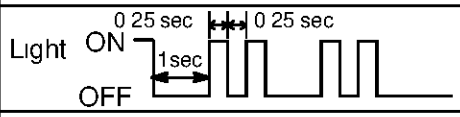
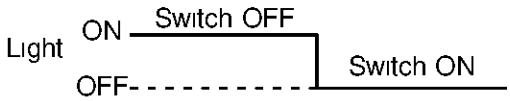
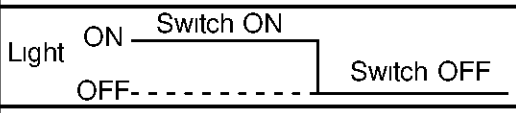
(e) Operate each switch as listed in the table below

(f) Read the blinking pattern of the CRUISE MAIN indicator light

(g) After performing the check, turn the main switch OFF

HINT:

When 2 or more signals are input to the ECU, the lowest numbered code will be displayed first

| No | Operation Method | CRUISE MAIN Indicator Light Blinking Pattern | Diagnosis |
|---|---|---|---|
| 1 | Turn SET/COAST switch ON |   | SET/COAST switch circuit is normal |
| 2 | Turn RES/ACC switch ON | | RES/ACC switch circuit is normal |
| 3 | Turn CANCEL switch ON |   | CANCEL switch circuit is normal |
| | Turn stop light switch ON Depress brake pedal | | Stop light switch circuit is normal |
| | Turn PNP switch OFF (Shift to except D position) |   | PNP switch circuit is normal |
| 4 | Drive at about 40 km/h (25 mph)or higher | | Vehicle Speed Sensor is normal |
| | Drive at about 40 km/h (25 mph) or below | | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5O7 02

# DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page

| DTC No (See Page) | Circuit inspection | Trouble Area |
|---|---|---|
| 11 (DI–296) | • Actuator Motor Circuit | • Actuator motor<br>• Harness or connector between cruise control ECU and actuator motor<br>• Cruise control ECU |
| 12 (DI–298) | • Actuator Magnetic Clutch Circuit | • STOP Fuse<br>• Stop light switch<br>• Actuator magnetic clutch<br>• Harness or connector between cruise control ECU and actuator magnetic clutch actuator magnetic clutch and body ground<br>• Cruise control ECU |
| 13 (DI–301) | • Actuator Position Sensor Circuit | • Actuator position sensor<br>• Harness or connector between cruise control ECU and actuator position sensor<br>• Cruise control ECU |
| 14 (DI–304) | • Actuator Mechanical Malfunction | • Actuator motor (actuator lock motor arm)<br>• Harness or connector between cruise control ECU and actuator motor<br>• Cruise control ECU |
| 21 (DI–306) | • Open in Vehicle Speed Sensor Circuit | • Combination meter<br>• Harness or connector between cruise control ECU and combination meter combination meter and vehicle speed sensor<br>• Vehicle speed sensor<br>• Cruise control ECU |
| 23 (DI–310) | • Vehicle Speed Signal Abnormal | • Vehicle speed sensor<br>• Cruise control ECU |
| 32 (DI–311) | • Control Switch Circuit | • Cruise control switch<br>• Harness or connector between cruise control ECU and cruise control switch cruise control switch and body ground<br>• Cruise control ECU |



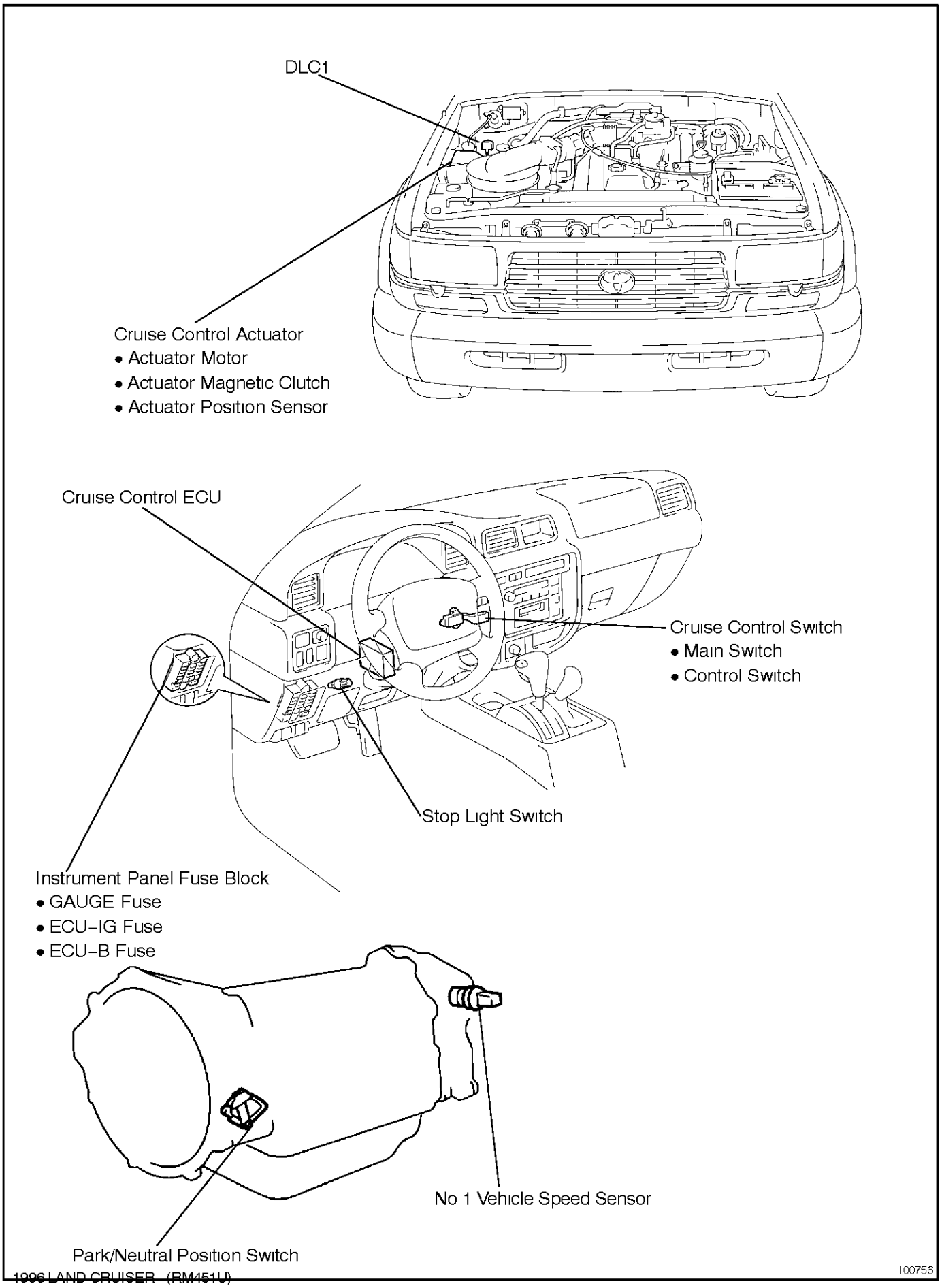
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5C8 02

# PARTS LOCATION




I00756



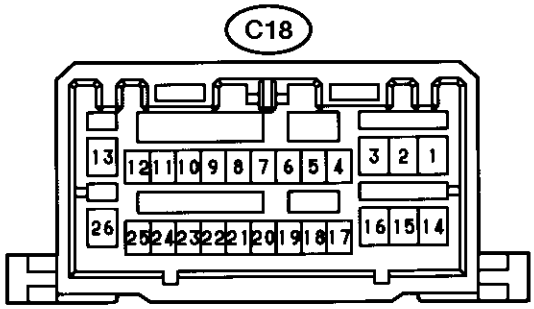
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D509 02

# TERMINALS OF ECM




Vd–26–2–E

I00410

| Symbols (Terminals No.) | Wiring Color | Condition | STD Voltage (V) |
|---|---|---|---|
| D ↔ GND (C18–2 ↔ C18–13) | B–W ↔ BR | Shift to except D position | Below 1 V |
| | | Shift to D position | 10 – 16 V |
| PI ↔ GND (C18–7 ↔ C18–13) | G–Y ↔ BR | Ignition switch ON<br>Cruise control main switch ON | Below 1.2 V |
| | | Ignition switch ON<br>Cruise control main switch OFF | 10 – 16 V |
| TC ↔ GND<br>(C18–8 ↔ C18–13) | B–Y ↔ BR | Ignition switch ON | 10 – 16 V |
| | | Ignition switch ON<br>Connect terminals TC and E1 of diagnostic check connector | Below 1 V |
| OD ↔ GND<br>(C18–9 ↔ C18–13) | G–O ↔ BR | During cruise control driving<br>OD switch ON | 10 – 16 V |
| | | During cruise control driving<br>OD switch OFF (3rd driving) | Below 1 V |
| L ↔ GND<br>(C18–10 ↔ C18–13) | R ↔ BR | During cruise control driving | 9 – 15 V |
| | | Except during cruise control driving | Below 1 V |
| MC ↔ GND<br>(C18–11 ↔ C18–13) | L–R ↔ BR | During cruise control driving<br>COAST switch hold ON | 9 – 15 V |
| | | During cruise control driving<br>ACC switch hold ON | Below 1 V |
| MO ↔ GND<br>(C18–12 ↔ C18–13) | L ↔ BR | During cruise control driving<br>ACC switch hold ON | 9 – 15 V |
| | | During cruise control driving<br>COAST switch hold ON | Below 1 V |
| GND ↔ Body Ground<br>(C18–13 ↔ Body Ground) | BR ↔ Body Ground | Constant | Below 1 V |
| B ↔ GND<br>(C18–14 ↔ C18–13) | B–W ↔ BR | Ignition switch ON | 10 – 16 V |
| BATT ↔ GND<br>(C18–15 ↔ C18–13) | B–R ↔ BR | Constant | 10 – 16 V |
| STP– ↔ GND<br>(C18–16 ↔ C18–13) | G–W ↔ BR | Depress brake pedal | 10 – 16 V |
| | | Release brake pedal | Below 1 V |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| Symbols (Terminals No ) | Wiring Color | Condition | STD Voltage (V) |
|---|---|---|---|
| CCS ↔ GND (C18–18 ↔ C18–13) | B–G ↔ BR | Ignition switch ON | 10 – 16 V |
| | | Ignition switch ON CANCEL switch hold ON | 5 1 – 8 3 V |
| | | Ignition switch ON SET/COAST switch hold ON | 2 4 – 4 0 V |
| | | Ignition switch ON RES/ACC switch hold ON | 0 8 – 1 4 V |
| CMS ↔ GND (C18–19 ↔ C18–13) | Y–R ↔ BR | Ignition switch ON Main switch ON | Below 1 V |
| | | Ignition switch ON Main switch OFF | 10 – 16 V |
| SPD ↔ GND (C18–20 ↔ C18–13) | L–W ↔ BR | Ignition switch ON | 4 7 – 5 2 V |
| | | During driving | 3 – 7 V |
| IDL ↔ GND (C18–21 ↔ C18–13) | G–W ↔ BR | Ignition switch ON Throttle valve fully closed | Below 1 V |
| | | Ignition switch ON Throttle valve fully opened | 10 – 16 V |
| ECT ↔ GND (C18–22 ↔ C18–13) ECT ↔ GND (C18–22 ↔ C18–13) | G–R ↔ BR | During driving Gear position O/D | Below 1 V |
| | | During driving Gear position 3rd | 10 – 16 V |
| VR1 ↔ GND (C18–23 ↔ C18–13) | Y ↔ BR | Ignition switch ON | 4 7 – 5 2 V |
| VR2 ↔ VR3 (C18–24 ↔ C18–25) | Y–G ↔ Y–L | During cruise control driving | 1 0 – 4 7 V |
| | | Ignition switch ON Actuator control plate fully opened | 4 2 – 4 7 V |
| | | Ignition switch ON Actuator control plate fully closed | 1 0 – 1 2 V |
| VR3 ↔ GND (C18–25 ↔ C18–13) | Y–L ↔ BR | Constant | Below 1 V |
| L– ↔ GND (C18–26 ↔ C18–13) | ↔ BR | Constant | Below 1 V |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OA 02

# PROBLEM SYMPTOMS TABLE

| Symptom | Suspect Area | See page |
|---|---|---|
| SET not occurring or CANCEL occurring (DTC is Normal) | 1 Main Switch Circuit (Cruise control switch)<br>2 Vehicle Speed Sensor<br>3 Control Switch Circuit (Cruise control switch)<br>4 Stop Light Switch Circuit<br>5 Park/Neutral Position Switch Circuit<br>6 Actuator Motor Circuit<br>7 Cruise Control Cable<br>8 Cruise Control ECU | DI–330<br>DI–306<br>DI–311<br>DI–314<br>DI–322<br>DI–296<br>DI–336<br>IN–28 |
| SET not occurring or CANCEL occurring (DTC does not output) | 1 ECU Power Source Circuit<br>2 Cruise Control ECU | DI–325<br>IN–28 |
| Actual vehicle speed deviates above or below the set speed | 1 Cruise Control Cable<br>2 Vehicle Speed Signal Abnormal<br>3 Electronically Controlled Transmission Communication Circuit<br>4 Actuator Motor Circuit<br>5 Idle Signal Circuit (main throttle position sensor)<br>6 Cruise Control ECU | DI–336<br>DI–310<br>DI–319<br>DI–296<br>DI–316<br>IN–28 |
| Gear shifting frequent between 3rd O/D when driving on uphill road (Hurting) | 1 Electronically Controlled Transmission Communication Circuit<br>2 Cruise Control ECU | DI–319<br>IN–28 |
| Cruise control not cancelled even when brake pedal is de-pressed | 1 Cruise Control Cable<br>2 Stop Light Switch Circuit<br>3 Actuator Motor Circuit<br>4 Cruise Control ECU | DI–336<br>DI–314<br>DI–296<br>IN–28 |
| Cruise control not cancelled even when transmission is shifted to N postion | 1 Cruise Control Cable<br>2 Park/Neutral Position Switch Circuit<br>3 Actuator Motor Circuit<br>4 Cruise Control ECU | DI–336<br>DI–322<br>DI–296<br>IN–28 |
| Control switch does not operate (SET/COAST ACC/RES CANCEL not possible) | 1 Cruise Control Cable<br>2 Control Switch Circuit<br>3 Actuator Motor Circuit<br>4 Cruise Control ECU | DI–336<br>DI–311<br>DI–296<br>IN–28 |
| SET possible at 40 km/h (25 mph) or less or CANCEL does not operate at 40 km/h (25 mph) or less | 1 Cruise Control Cable<br>2 Vehicle Speed Signal Abnormal<br>3 Actuator Motor Circuit<br>4 Cruise Control ECU | DI–336<br>DI–310<br>DI–296<br>IN–28 |
| Poor response is ACCEL and RESUME modes | 1 Cruise Control Cable<br>2 Electronically Controlled Transmission Communication Circuit<br>3 Actuator Motor Circuit<br>4 Cruise Control ECU | DI–336<br>DI–319<br>DI–296<br>IN–28 |
| O/D does not RESUME even though the road is not uphill | 1 Electronically Controlled Transmission Communication Circuit<br>2 Cruise Control ECU | DI–319<br>IN–28 |
| DTC memory is erased | 1 Back–up Power Source Circuit<br>2 Cruise Control ECU | DI–328<br>IN–28 |
| DTC is not output or is output when is should not be | 1 Diagnosis Circuit<br>2 Cruise Control ECU | DI–319<br>IN–28 |
| Cruise MAIN indicator light remains ON or fail to light up | 1 Cruise MAIN Indicator Light Switch Circuit | DI–332 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D50B 02

# CIRCUIT INSPECTION

| DTC | 11 | Actuator Motor Circuit |
|---|---|---|

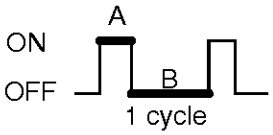
## CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the ECU Acceleration and deceleration signals are transmitted by changes in the Duty Ratio (See note below)

Duty Ratio

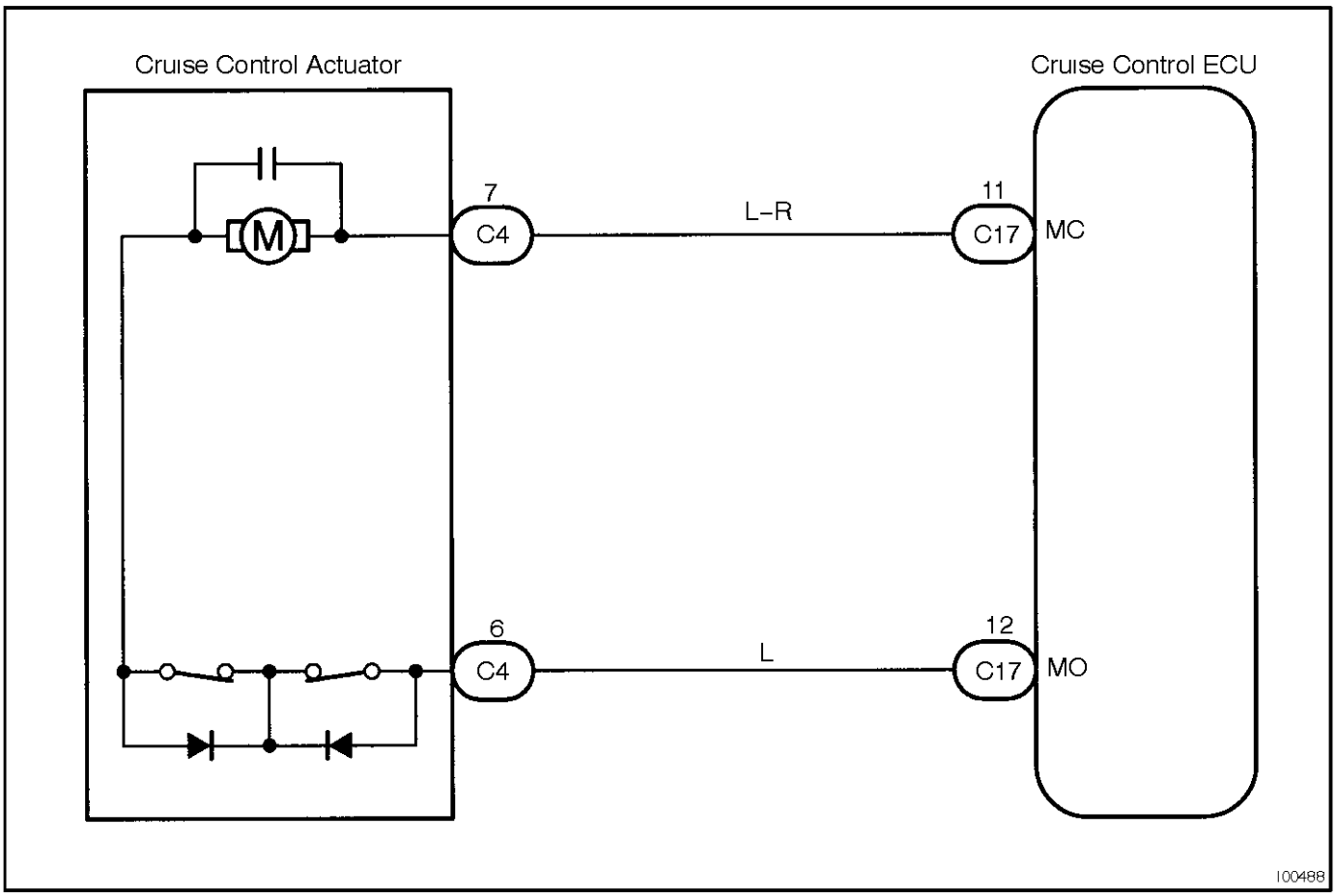
The duty ratio is the ratio of the period of continuity in one cycle For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$




| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 11 | Short in actuator motor circuit | • Actuator motor<br>• Harness or connector between cruise control ECU and actuator motor<br>• Cruise control ECU |

## WIRING DIAGRAM





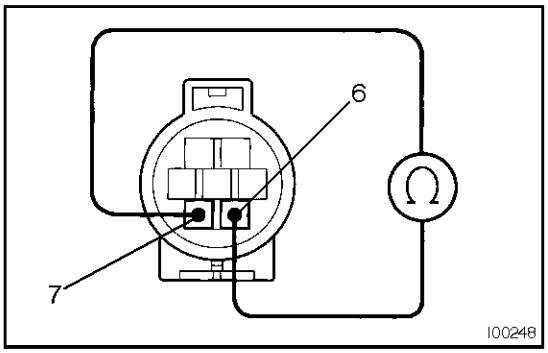

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check resistance between terminals MO and MC of actuator motor.** |




**PREPARATION:**

(a) Turn ignition switch OFF

(b) Disconnect the actuator connector

**CHECK:**

Measure resistance between terminals 6 and 7

HINT

If control plate position is fully opened or fully closed, resistance can not measure

**OK:**

**Resistance: more than 4.2 Ω**

**NG** → **Replace cruise control actuator.**

**OK**

| | |
|---|---|
| 2 | **Check for open and short in harness and connectors between cruise control ECU and actuator motor (See page IN–28).** |

**NG** → **Repair or replace harness or connector.**

**OK**

**Check and replace cruise control ECU. (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OC 02

| DTC | 12 | Actuator Magnetic Clutch Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

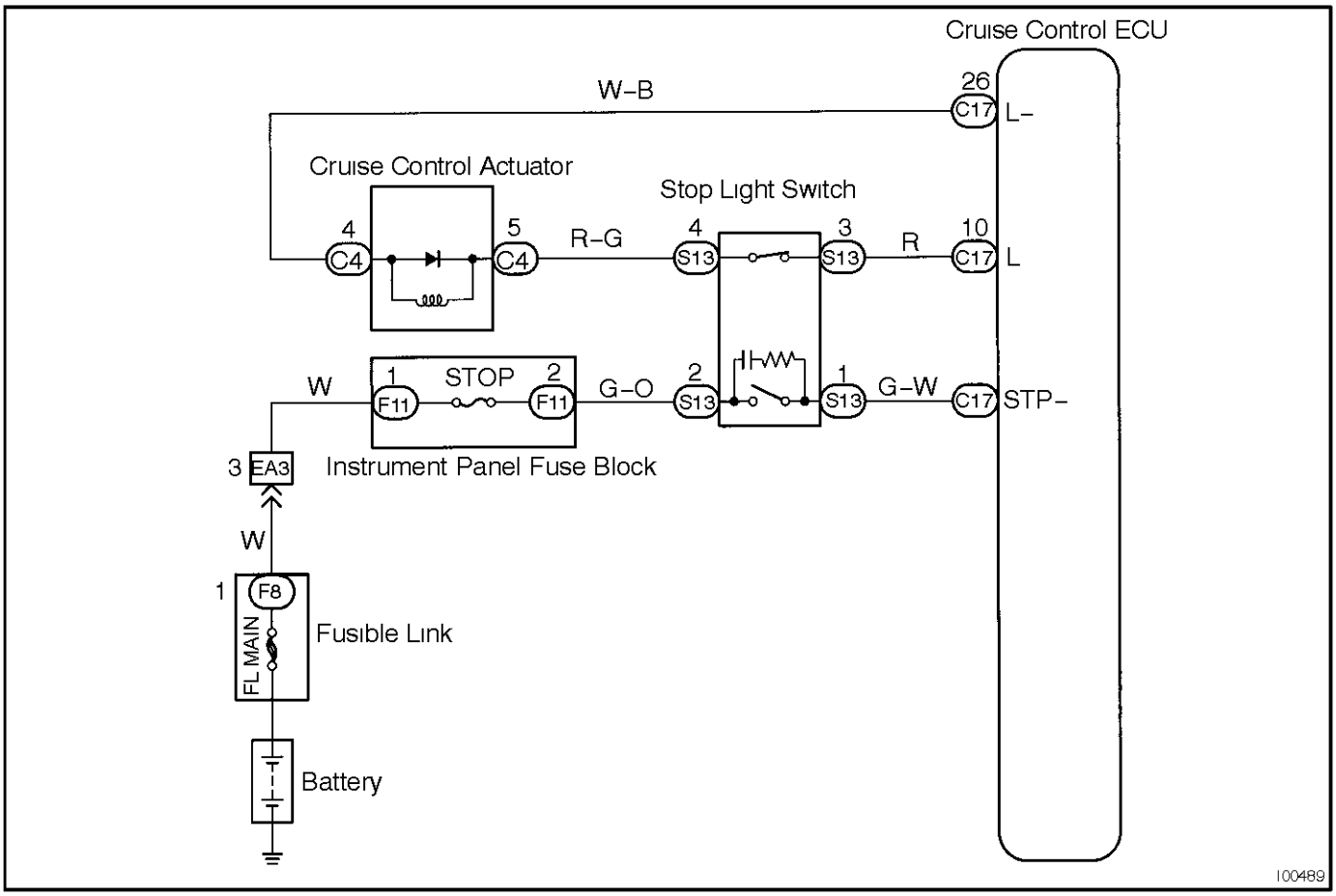
This circuit turns on the magnetic clutch inside the actuator during cruise control operation according to the signal from the ECU If a malfunction occurs in the actuator or speed sensor, etc during cruise control operation, the rotor shaft between the motor and control plate is released

When the brake pedal is depressed, the stop light switch turns on, supplying electrical power to the stop light Power supply to the magnetic clutch is mechanically cut and the magnetic clutch is turned OFF

When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (9 mph), the ECU turns the safety magnet clutch OFF If the vehicle speed later drops to within 10 km/h (6 mph) above the set speed, then cruise control at the set speed is resumed

| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 12 | • Short in actuator magnetic clutch circuit<br>• Open (0 8 sec ) in actuator magnetic clutch circuit | • STOP Fuse<br>• Stop light switch<br>• Actuator magnetic clutch<br>• Harness or connector between cruise control ECU and actuator magnetic clutch actuator magnetic clutch and body ground<br>• Cruise control ECU |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

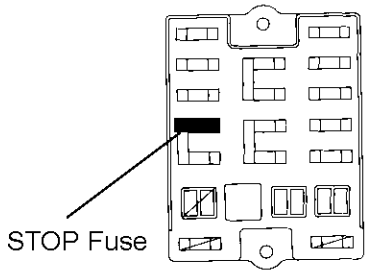
Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check STOP fuse.** |

**Instrument Panel Fuse Block**




**PREPARATION:**

(a) Turn ignition switch OFF

(b) Remove the STOP fuse from instrument panel fuse block

**CHECK:**

Check fuse continuity

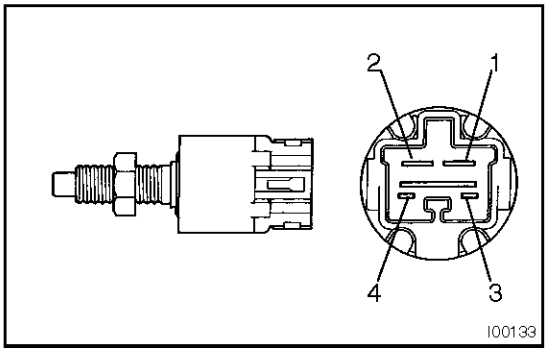
**OK:**

**There is continuity.**

**NG** → **Replace STOP fuse.**

**OK**

| | |
|---|---|
| 2 | **Check stop light switch.** |




**PREPARATION:**

Disconnect the stop light switch connector

**CHECK:**

Check continuity between terminals

| Switch position | Continuity |
|---|---|
| Switch pin free (Brake pedal depressed) | 1 – 2 |
| Switch pin pushed in (Brake pedal released) | 3 – 4 |

**NG** → **Replace stop light switch.**

**OK**

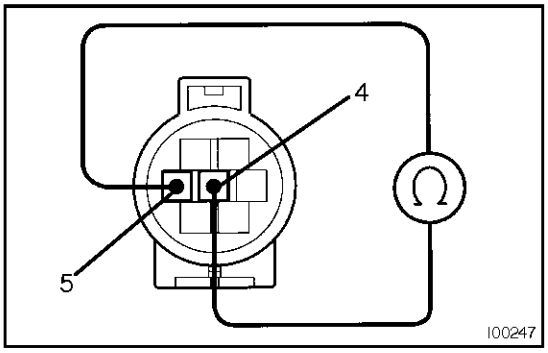


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Check resistance between terminals L and GND of actuator magnetic clutch.** |




**PREPARATION:**

(a) Turn ignition switch OFF

(b) Disconnect the actuator connector

**CHECK:**

Measure resistance between terminals 4 and 5

**OK:**

**Resistance: 34.65 – 42.35 Ω**

**NG** → **Replace cruise control actuator.**

**OK**

| | |
|---|---|
| 4 | **Check for open and short in harness and connectors between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground (See page IN–28).** |

**NG** → **Repair or replace harness or connector.**

**OK**

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5CD 02

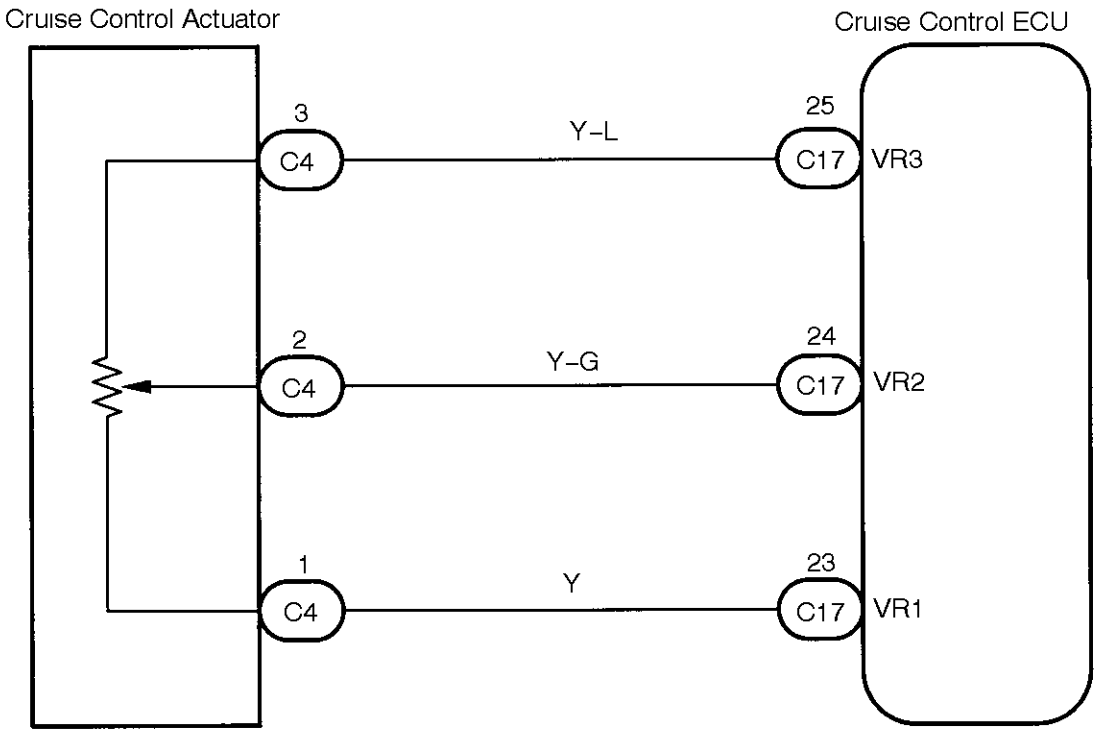
| DTC | 13 | Actuator Position Sensor Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU

| DTC No | Detection Item | Trouble Area |
|---|---|---|
| • 13 | • Position sensor detects abnormal voltage | • Actuator position sensor<br>• Harness or connector between cruise control ECU and actuator position sensor<br>• Cruise control ECU |

## WIRING DIAGRAM




100490



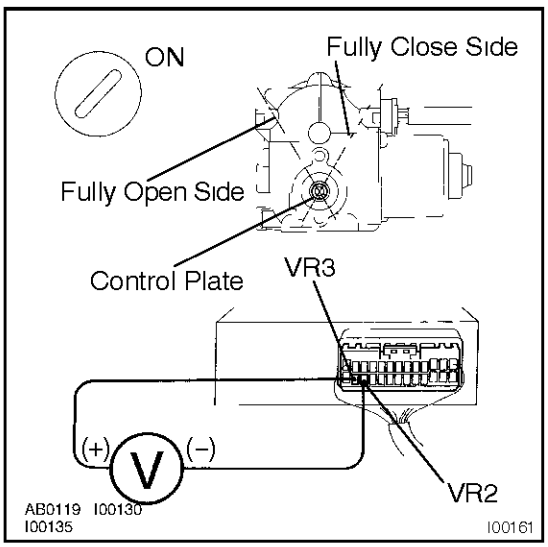
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check resistance between terminals VR2 and VR3 of cruise control ECU connector.** |




**PREPARATION:**

(a) Remove the ECU with connectors still connected

(b) Turn ignition switch OFF

**CHECK:**

Measure voltage between terminals VR2 and VR3 of ECU connector while turning control plate slowly by hand from the deceleration side to the acceleration side

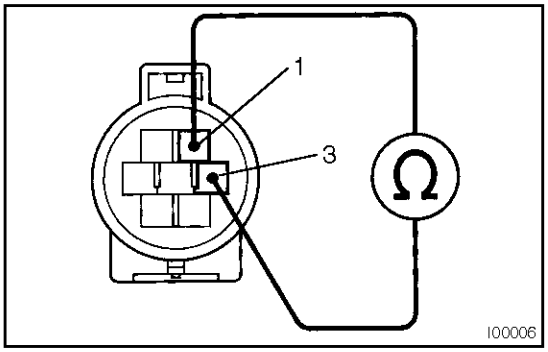
**OK:**

**Voltage:**
**Fully closed: Approx. 1.3 V**
**Fully opened: Approx. 4.1 V**
**In addition, as the control plate is turned, the voltage should increase gradually without interruption.**

NG → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

OK

| | |
|---|---|
| 2 | **Check resistance between terminals VR1 and VR3 of actuator position sensor.** |




**PREPARATION:**

(a) Turn ignition switch OFF

(b) Disconnect the actuator connector

**CHECK:**

Measure resistance between actuator terminal 1 and 3 of actuator connector

**OK:**

**Resistance: 1.8 – 2.2 kΩ (25 °C)**

NG → **Replace cruise control actuator.**

OK

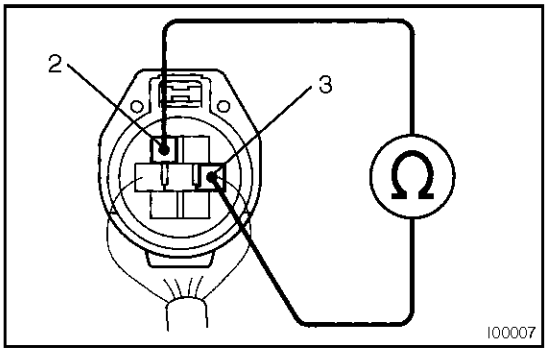


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminals VR2 and VR3 of actuator position sensor. |
|---|---|




**PREPARATION:**

(a) Turn ignition switch ON

(b) Connect the actuator connector

**CHECK:**

Measure voltage between terminals 2 and 3 of actuator connector while turning control plate slowly by hand from the deceleration side to the acceleration side

**OK:**

**Voltage: 1.3 – 4.0 V**

HINT

As the control plate is turned, the voltage should increase gradually without interruption

NG → **Replace cruise control actuator.**

OK

| 4 | Check for open and short in harness and connector between cruise control ECU and actuator position sensor (See page IN–28). |
|---|---|

NG → **Repair or replace harness or connector.**

OK

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OE-02

| DTC | 14 | Actuator Mechanical Malfunction |
|---|---|---|

## CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU

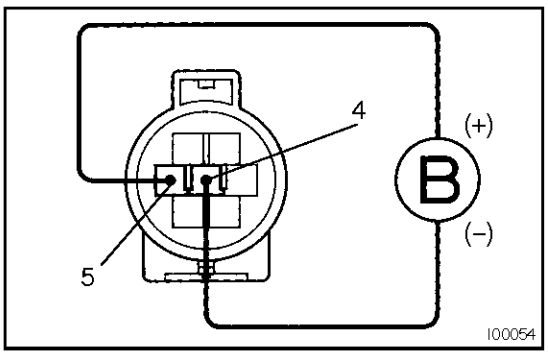
| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 14 | • Open in actuator motor circuit<br>• Position sensor signal valve does not change when the motor operates | • Actuator lock (motor arm)<br>• Actuator motor<br>• Harness or connector between cruise control ECU and actuator motor<br>• Cruise control ECU |

## WIRING DIAGRAM

See page DI–296

## INSPECTION PROCEDURE

| 1 | Check cruise control actuator arm locking operation |
|---|---|




**PREPARATION:**

(a) Turn ignition switch OFF

(b) Disconnect the actuator connector

**CHECK:**

(a) Connect the positive (+) lead from the battery to the terminal 5 of actuator and the negative (–) lead to terminal 4

**NOTICE:**

**Do not connect the high tension cables to the wrong battery terminal. You will damage the cruise control actuator.**

(b) Move the control plate by hand

**OK:**

**Control plate does not move.**

NG → **Replace cruise control actuator.**

OK

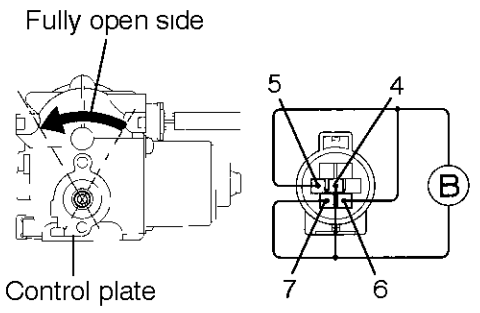


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check cruise control actuator operation. |
|---|---|




I00131 I00008
I00132 I00010
I00132

**PREPARATION:**

(a) Turn ignition switch OFF

(b) Disconnect the actuator connector

**CHECK:**

Connect the positive (+) lead from the battery to terminals 5 and 6 of actuator, connect the negative (–) lead to terminals 4 and 7 of actuator

**OK:**

**Control arm moves to full open side**

**CHECK:**

Connect the positive (+) lead from the battery to terminals 4 and 7of actuator, connect the negative (–) lead to terminals 5 and 6 of actuator

**OK:**

**Control arm moves to full colse side**

NG → **Replace cruise control actuator.**

OK ↓

| 3 | Check harness and connector between cruise control ECU and cruise control actuator (See page IN–28). |
|---|---|

NG → **Repair or replace harness or connector.**

OK ↓

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

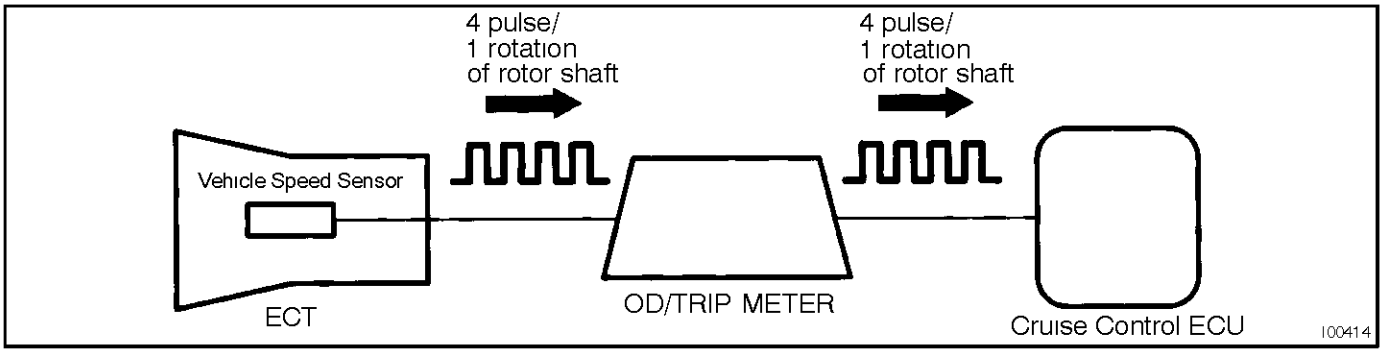


D5CF 02

| DTC | 21 | Open in Vehicle Speed Sensor Circuit |
|---|---|---|

## CIRCUIT DESCRIPTION

The vehicle speed sensor circuit is sent to cruise control ECU as vehicle speed signal
The rotor shaft is driven by the gear of the transmission
For each rotation of the shaft, the vehicle speed sensor sends a 4 pulse signal through the combination meter to the cruise control ECU (See the following)
This signal is converted inside the combination meter and sent as a 4–pulse signal to the cruise control ECU
The ECU calculates the vehicle speed from this pulse frequency




| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 21 | • Speed signal is not input to the cruise control ECU while cruise control is set | • Combination meter<br>• Harness or connector between cruise control ECU and combination meter combination meter and vehicle speed sensor<br>• Vehicle speed sensor<br>• Cruise control ECU |

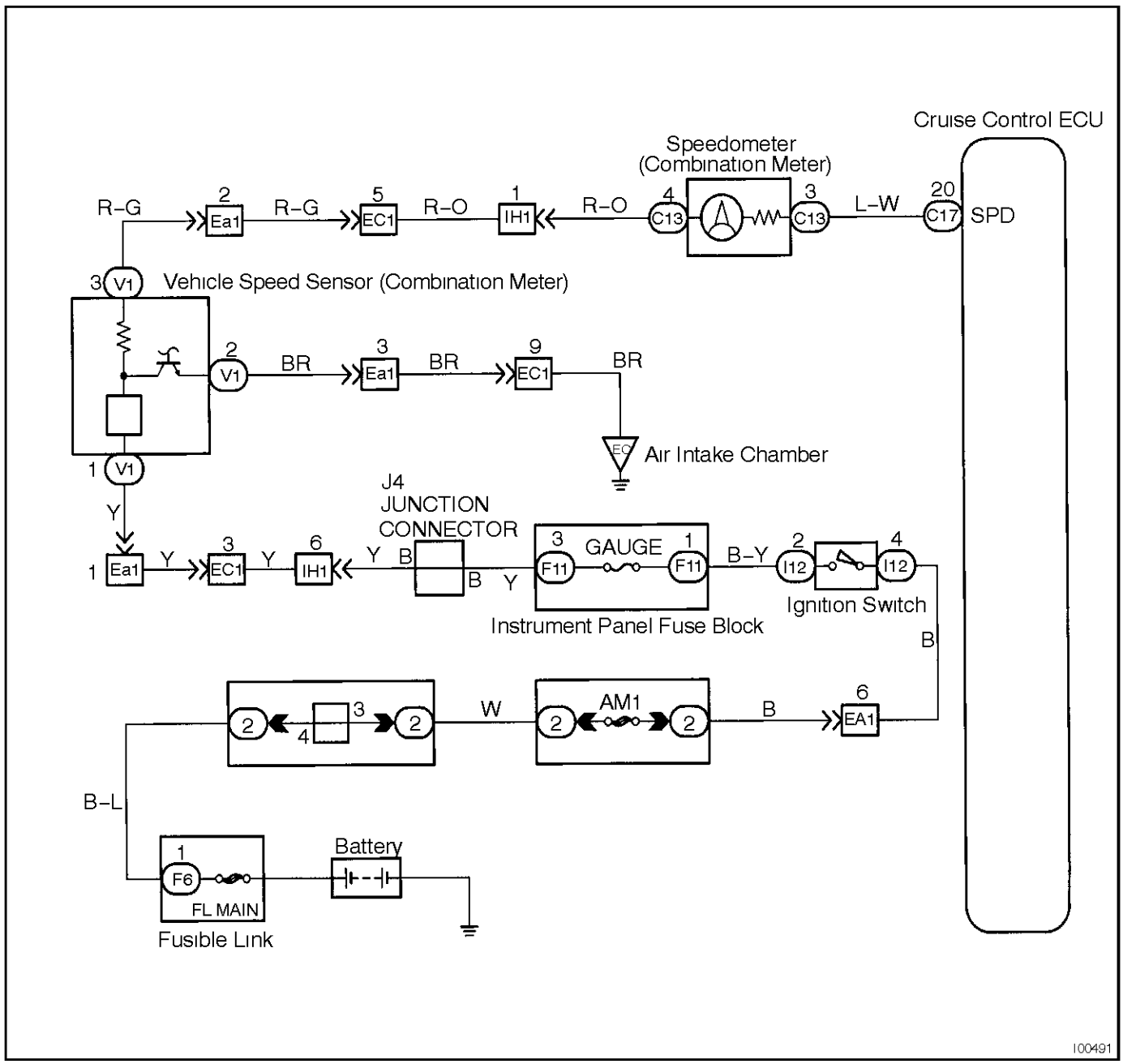


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Input signal check.** |

| Input Signal | Indicator Light Blinking Pattern |
|---|---|
| Drive at about 40 km/h (25 mph) or below | Light: ON / OFF |
| Drive at about 40 km/h (25 mph) or higher | Light: ON / OFF |

**CHECK:**

(a) See input signal check on page DI–286

(b) Check indicator light operation when driving with vehicle speed above 40 km/h (25 mph), and with vehicle speed below 40 km/h (25 mph)

**OK:**

**Vehicle speed above 40 km/h (25 mph):**
**Indicator light blinks**
**Vehicle speed below 40 km/h (25 mph):**
**Indicator light stays on**

OK → **Check and replace cruise control ECU (See page IN–28).**

NG

| | |
|---|---|
| 2 | **Check speedometer circuit (See Combination meter troubleshooting on page BE–34).** |

NG → **Repair or replace harness, connector or combination meter assembly.**

OK

| | |
|---|---|
| 3 | **Check harness and connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 4 | Check vehicle speed sensor (See page BE–34). |

NG → Replace vehicle speed sensor.

OK →

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OG-02

| DTC | 23 | Vehicle Speed Signal Abnormal |
|---|---|---|

## CIRCUIT DESCRIPTION

See page DI–306

| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 23 | • Vehicle speed sensor pulse is abnormal (When speed signal is not input to the ECU below 0 2 sec code will be displayed ) | • Vehicle speed sensor<br>• Cruise control ECU |

## WIRING DIAGRAM

See page DI–306

## INSPECTION PROCEDURE

| 1 | Check vehicle speed sensor (See page BE–34). |
|---|---|

NG → Replace vehicle speed sensor.

OK →

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OH 02

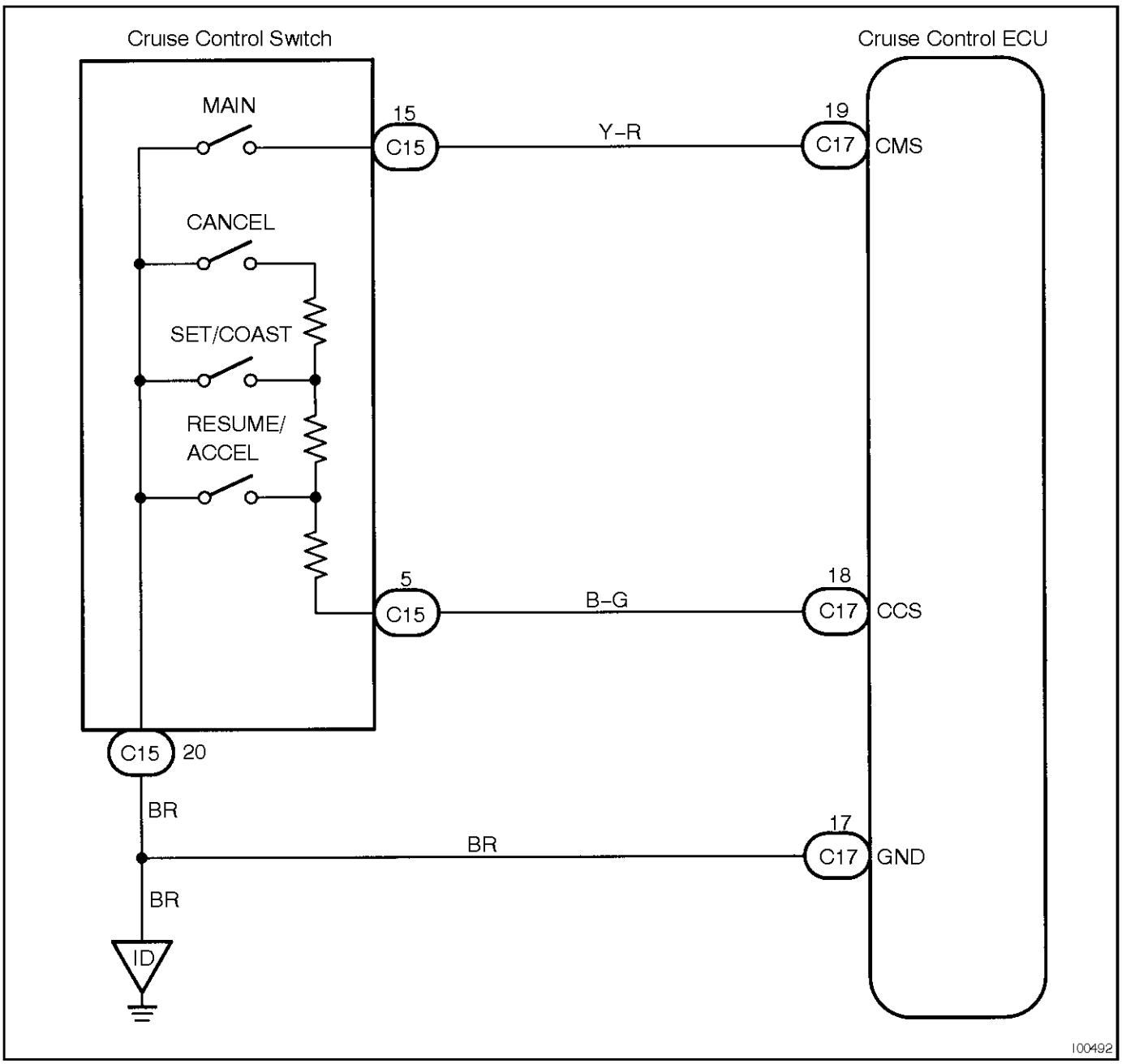
| DTC | 32 | Control Switch Circuit (Cruise Control Switch) |
|---|---|---|

## CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU

| DTC No | Detection Item | Trouble Area |
|---|---|---|
| 32 | • Short in control switch circuit | • Cruise control switch<br>• Harness or connector between cruise control ECU and cruise control switch cruise control switch and body ground<br>• Cruise control ECU |

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSPECTION PROCEDURE

| 1 | Input signal check. |
|---|---|

| Input Signal | Indicator Light Blinking Pattern |
|---|---|
| SET/COAST switch | 2 Pulses: ON / OFF |
| RESUME/ACCEL switch | 3 Pulses: ON / OFF |
| CANCEL switch | SW OFF: ON / OFF; SW ON |

**PREPARATION:**

See input signal check on page DI–286

**CHECK:**

Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned on

**OK:**

**SET/COAST, RESUME/ACCEL switch**

**The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF.**

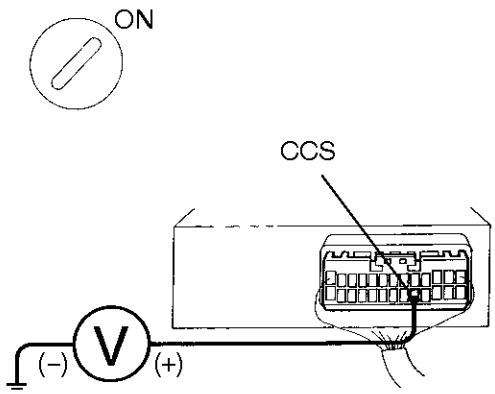
**CANCEL switch**

**The indicator light goes off when the cancel switch is turned ON.**

| OK | Wait and see. |
|---|---|

NG

| 2 | Check voltage between terminals CCS of cruise control ECU connector and body ground. |
|---|---|




**PREPARATION:**

(a) Remove the ECU with connector still connected

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals CCS of ECU connector and body ground, when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON

| Switch position | Resistance (Ω) |
|---|---|
| Neutral | 10 – 14 V |
| RES/ACC | 0 7 – 2 5 V |
| SET/COAST | 2 3 – 4 6 V |
| CANCEL | 4 1 – 7 2 V |

| NG | Proceed to next circuit inspection shown on problem symptoms table (See page DI–295) |
|---|---|

OK

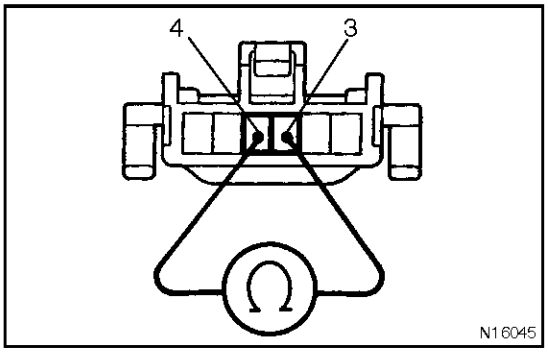


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check control switch. |
|---|---|




**PREPARATION:**

(a) Remove steering wheel center pad

(b) Disconnect the control switch connector

**CHECK:**

Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated

| Switch position | Resistance (Ω) |
|---|---|
| Neutral | ∞ (No continuity) |
| RES/ACC | 50 – 80 |
| SET/COAST | 180 – 220 |
| CANCEL | 400 – 440 |

NG → Replace control switch.

OK

| 4 | Check harness and connector between cruise control ECU and cruise control switch, cruise control switch and body ground (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

| 5 | Input signal check (See step 1). |
|---|---|

OK → Wait and see.

NG

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OI 02

# Stop Light Switch Circuit

## CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to the ECU When the ECU receives this signal, it cancels the cruise control

A fail–safe function is provided so that the cancel functions normally, even if there is a malfunction in the stop light signal circuit

The cancel conditions are Battery positive voltage at terminal STP–

When the brake is on, battery positive voltage normally applies through the STOP fuse and stop light switch to terminal STP– of the ECU, and the ECU turns the cruise control off

If the harness connected to terminal STP– has an open circuit, terminal STP– will have battery positive voltage and the cruise control will be turned off

Also, when the brake is on, the magnetic clutch circuit is cut mechanically by the stop light switch, turning the cruise control off (See page DI–298 for operation of the magnetic clutch)

## WIRING DIAGRAM

See page DI–298

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check operation of stop light.** |

**CHECK:**

Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released

NG → **Check stop light system (See page BE–24).**

OK

| | |
|---|---|
| 2 | **Input signal check.** |

| Input Signal | Indicator Light Blinking Pattern |
|---|---|
| Stop Light switch ON | Light: ON / OFF — SW OFF / SW ON |

**CHECK:**

(a) See input signal check on DI–286

(b) Check the indicator light when the brake pedal is depressed

**OK:**

**The indicator light goes off when the brake pedal is depressed.**

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

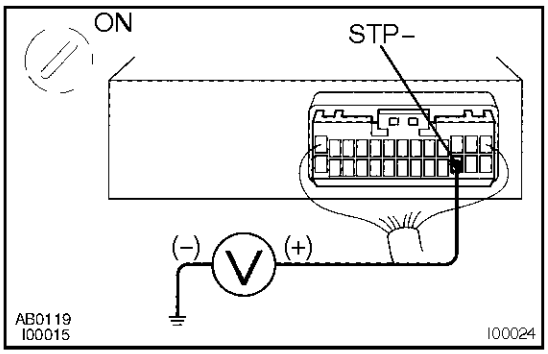


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminal STP– of cruise control ECU connector and body ground. |
|---|---|




**PREPARATION:**

(a) Remove the ECU with connectors still connected

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal STP– of cruise control ECU connector and body ground, when the brake pedal is depressed and released

**OK:**

| | |
|---|---|
| Depressed | 10 – 14 V |
| Released | Below 1 V |

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

| 4 | Check for open in harness and connectors between terminal STP– of cruise control ECU and stop light switch (See page IN–28). |
|---|---|

NG → **Repair or replace harness or connector.**

OK

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



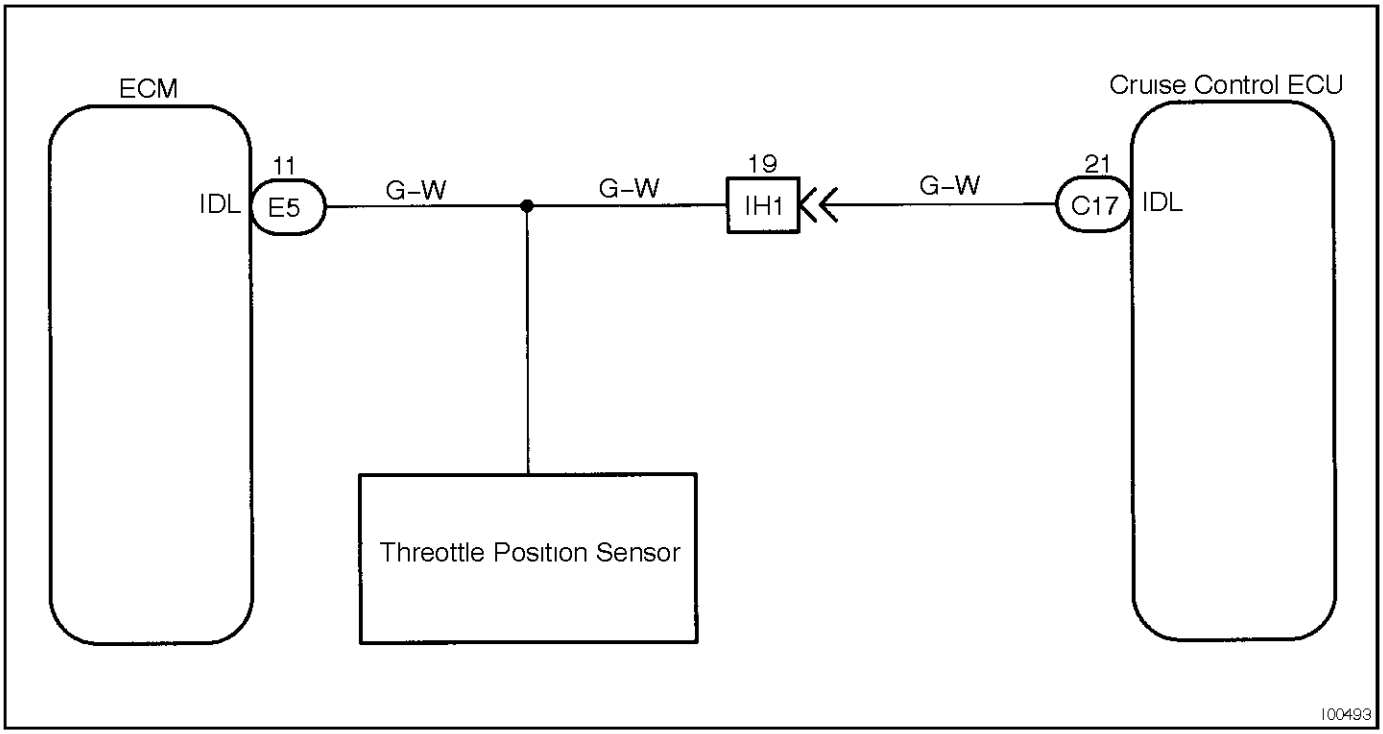
D5OJ-02

# Idle Switch Circuit

## CIRCUIT DESCRIPTION

When the idle switch in turned ON, a signal is sent to the ECU The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect the engine

## WIRING DIAGRAM





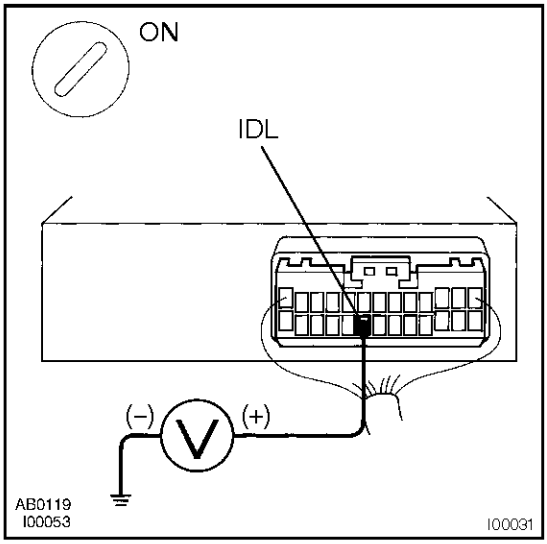

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminal IDL of cruise control ECU connector and body ground.** |




**PREPARATION:**

(a) Remove the ECU with connector still connected
(b) Disconnect the ECM and ABS ECU connectors
(c) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal IDL of ECU connector and body ground when the throttle valve is fully closed and fully opened

**OK:**

| Throttle valve position | Voltage |
|---|---|
| Fully opened | 10 – 14 V |
| Fully closed | Below 2 V |

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

| | |
|---|---|
| 2 | **Check harness and connector between ECM and throttle position sensor (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

| | |
|---|---|
| 3 | **Check throttle position sensor circuit (See page DI–35).** |

NG → **Replace throttle position sensor.**

OK

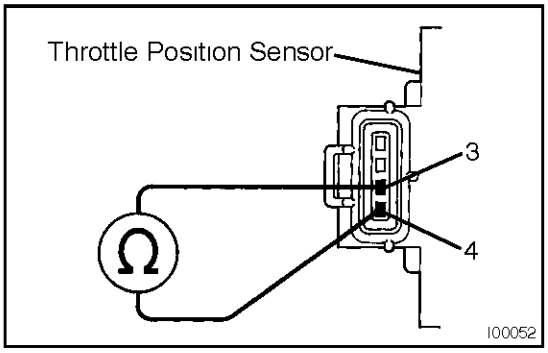


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 4 | **Check throttle position sensor.** |




**PREPARATION:**

Disconnect the throttle position sensor connector

**CHECK:**

Measure resistance between terminals 3 and 4 of throttle position sensor connector when the throttle valve is fully closed and fully opened

**OK:**

| Throttle valve position | Resistance |
|---|---|
| Fully opened | 1 MΩ or higher |
| Fully closed | Below 2 3 kΩ |

NG → **Replace throttle position sensor.**

OK

| | |
|---|---|
| 5 | **Check for open and short in harness and connector between cruise control ECU and throttle position sensor, throttle position sensor and body ground (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OK-02

# Electronically Controlled Transmission Communication Circuit

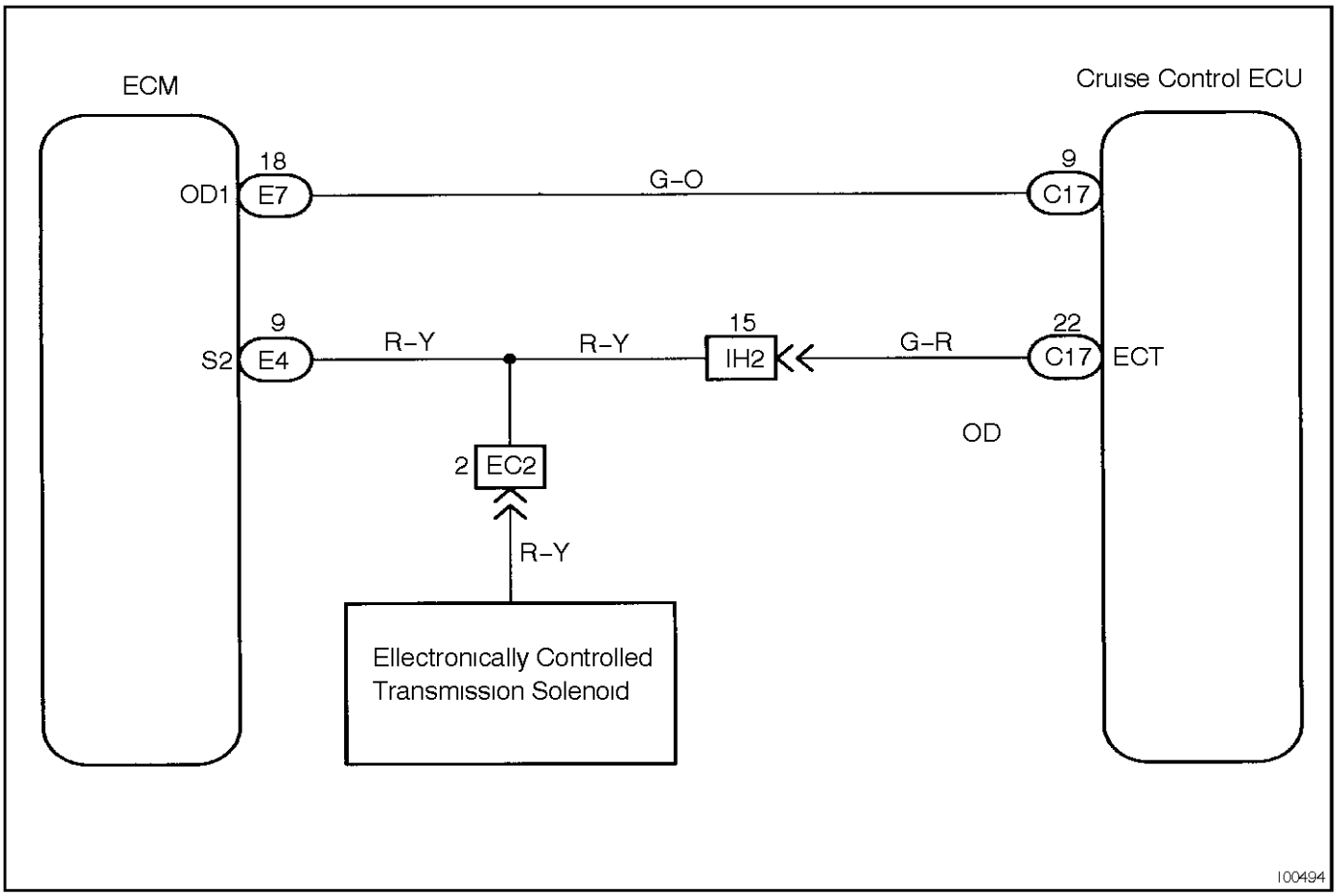
## CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON–OFF overdrive operation and to provide smooth driving, when down shifting in the electronically controlled transmission occurs, a signal to prevent upshift until the end of the up hill slope is sent from the cruise control ECU to the electronically controlled transmission

Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No 2 solenoid) from the ECM

If vehicle speed down, also when terminal ECT of the cruise control ECU receives down shifting signal, it sends a signal from terminal OD to ECM to cut overdrive until the end of the uphill slope, and the gear shifts are reduced and gear shift points in the electronically controlled transmission are changed

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check operation of overdrive.** |

**PREPARATION:**

Test drive after engine warms up

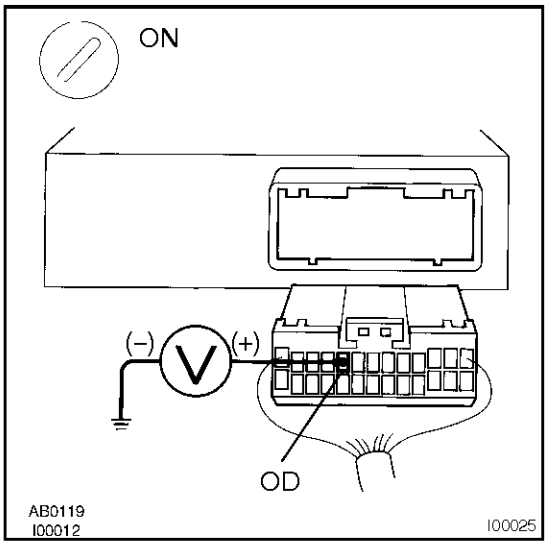
**CHECK:**

Check that overdrive ON ↔ OFF occurs with operation of OD switch ON–OFF

NG → **Check and repair electronically controlled transmission (See page DI–129).**

OK

| | |
|---|---|
| 2 | **Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.** |




**PREPARATION:**

(a) Remove the ECU with connector still connected

(b) Turn ignition switch ON

(c) Disconnect the ECU connector

**CHECK:**

Measure voltage between terminal OD of harness side connector of ECU and body ground

**OK:**

**Voltage: 10 – 14 V**

NG → **Go to step 5.**

OK

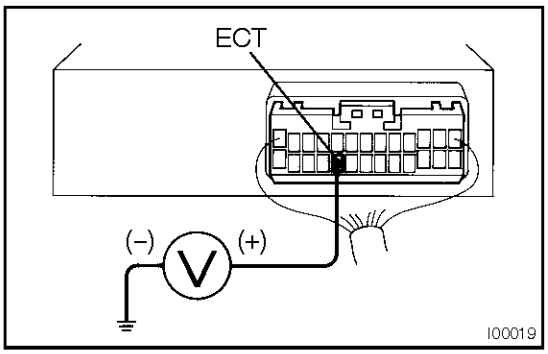


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive). |
|---|---|




**PREPARATION:**

(a) Connect the ECU connector

(b) Test drive after engine warms up

**CHECK:**

Check voltage between terminal ECT of ECU connector and body ground when OD switch is ON and OFF

**OK:**

| OD switch position | Voltage |
|---|---|
| ON | 8 – 14 V |
| OFF | Below 0.5 V |

OK → Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).

NG

| 4 | Check harness and connector between terminal ECT of cruise control ECU and electronically controlled transmission solenoid (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU.

| 5 | Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

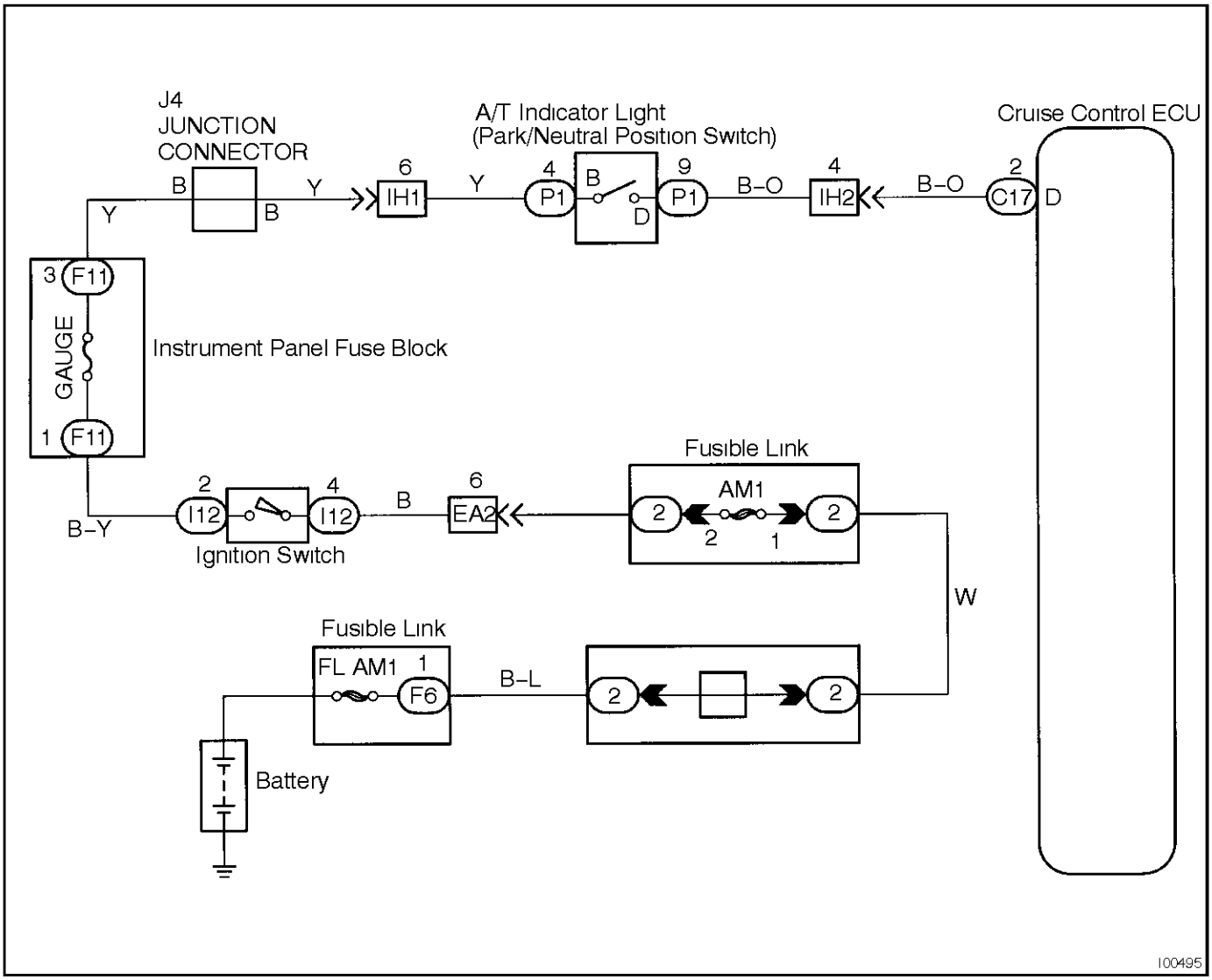


# Park/Neutral Position Switch Circuit

## CIRCUIT DESCRIPTION

When the shift position is put in except D position, a signal is sent from the park/neutral position switch to the ECU When this signal is input during cruise control driving, the ECU cancels the cruise control

## WIRING DIAGRAM






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check starter operation.** |

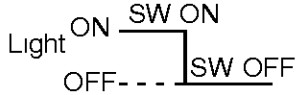
**CHECK:**

Check that the starter operates normally and that the engine starts

NG → **Proceed to engine troubleshooting (See page DI–1).**

OK

| | |
|---|---|
| 2 | **Input signal check.** |

| Input Signal | Indicator Light Blinking Pattern |
|---|---|
| Turn PNP switch OFF (Shift to except D position) |  |



**PREPARATION:**

See input signal check on page DI–286

**CHECK:**

Check the indicator light when shifting into except D position

**OK:**

**The indicator light goes off when shifting into except D position.**

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

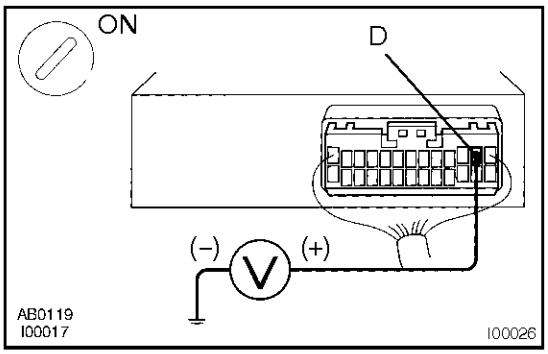


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 3 | Check voltage between terminal D of cruise control ECU connector and body ground. |
|---|---|




**PREPARATION:**

Turn ignition switch ON

**CHECK:**

Measure voltage between terminal D of ECU connector and body ground when shifting into D position and other positions

**OK:**

| Shift Position | Voltage |
|---|---|
| D position | 10 – 14 V |
| Other positions | Below 1 V |

OK → Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).

NG

| 4 | Check harness and connector between cruise control ECU and park/neutral position switch (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



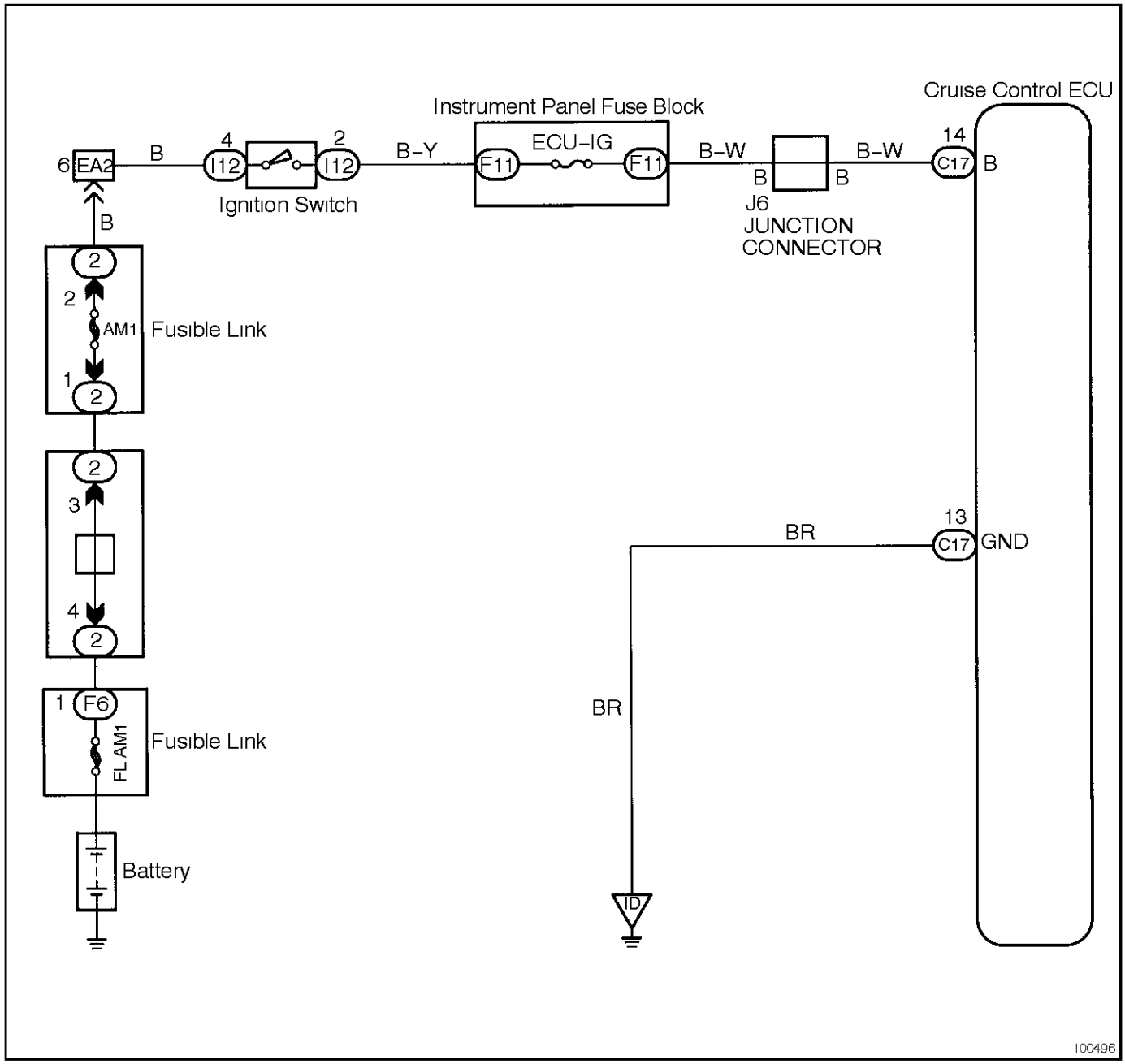
D5OM-02

# ECU Power Source Circuit

## CIRCUIT DESCRIPTION

The ECU power source supplies power to the actuator and sensors, etc When terminal GND and the cruise control ECU case are grounded

## WIRING DIAGRAM





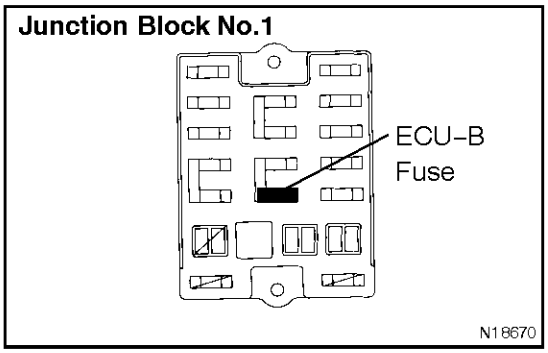

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check ECU–B fuse.** |




**PREPARATION:**

Remove the ECU–B fuse from instrument panel fuse block

**CHECK:**

Check continuity of ECU–B fuse

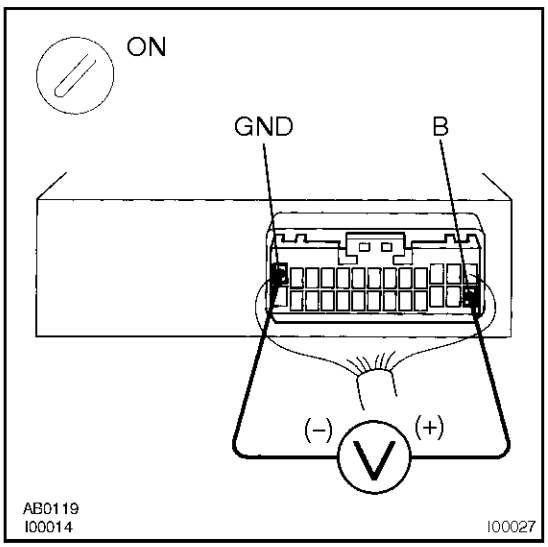
**OK:**

**Continuity**

NG → **Check for short in all the harness and components connected to ECU–B fuse.**

OK

| | |
|---|---|
| 2 | **Check voltage between terminals B and GND of cruise control ECU connector.** |




**PREPARATION:**

(a) Remove the ECU with connector still connected

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminals B and GND of ECU connector

**OK:**

**10 – 14 V**

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

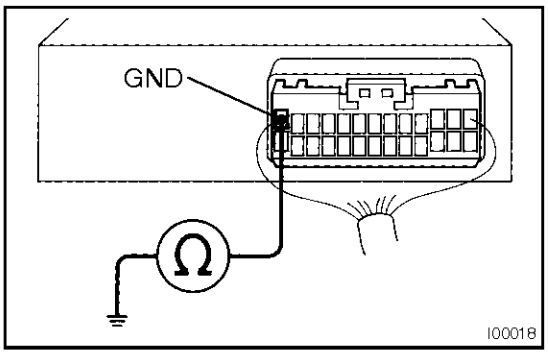


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 3 | **Check resistance between terminal GND of cruise control ECU connector and body ground (See page IN–28).** |




**CHECK:**

Measure resistance between terminal GND of ECU connector and body ground

**OK:**

**Resistance: Below 1 Ω**

**NG** → **Repair or replace harness or connector.**

**OK**

**Check and repair harness and connector between cruise control ECU and battery (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



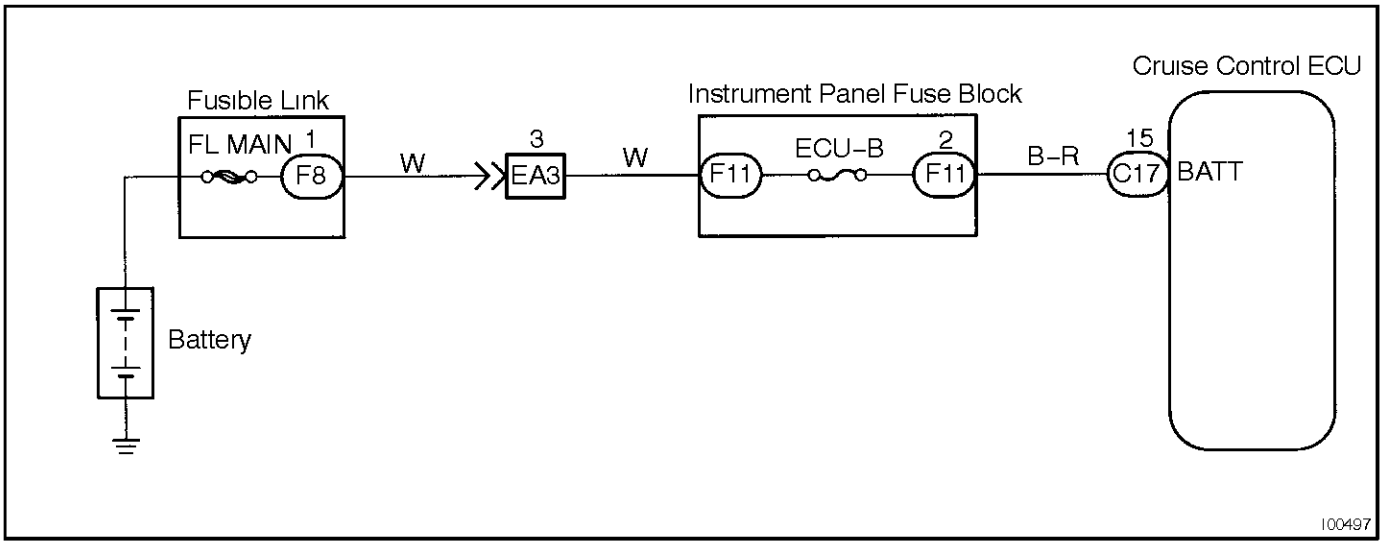
D5ON 02

# Back–up Power Source Circuit

## CIRCUIT DESCRIPTION

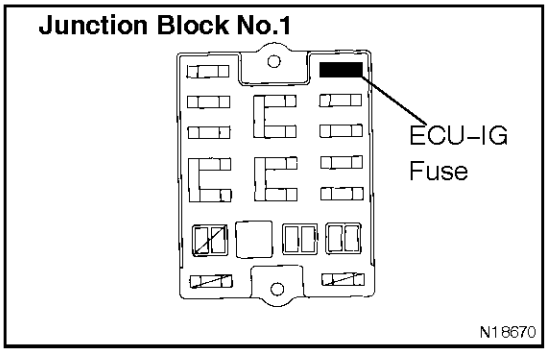
The ECU back–up power source provides power even when the ignition is off and is used for DTC memory, etc

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check ECU–IG fuse.** |




**PREPARATION:**

Remove the ECU–IG fuse from relay block No 2

**CHECK:**

Check continuity of ECU–IG fuse

**OK:**

**Continuity**

NG → **Check for short in all the harness and components connected to the ECU–IG fuse.**

OK

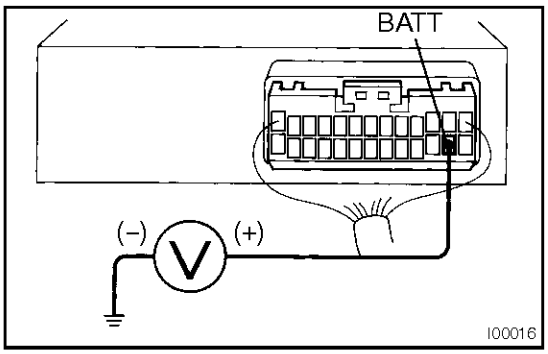


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | **Check voltage between terminal BATT of cruise control ECU connector and body ground (See page IN–28).** |
|---|---|




**PREPARATION:**
Remove the ECU with connector still connected
**CHECK:**
Measure voltage between terminal BATT of ECU connector and body ground
**OK:**
**Voltage: 10 – 14 V**

**OK** → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

**NG**

**Check and repair harness and connector between battery and cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



D5OO-02

# Main Switch Circuit (Cruise Control Switch)

## CIRCUIT DESCRIPTION

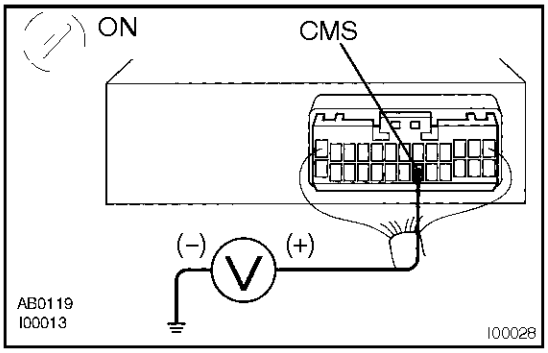
When the cruise control main switch is turned off, the cruise control does not operate

## WIRING DIAGRAM

See page DI–311

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminal CMS of cruise control ECU connector and body ground.** |




**PREPARATION:**

(a) Remove the ECU with connector still connected

(b) Turn ignition switch ON

**CHECK:**

Measure voltage between terminal CMS of cruise control ECU connector when main switch is held on and off

**OK:**

| Main switch | Voltage |
|---|---|
| OFF | 10 – 14 V |
| ON | Below 2 V |

OK

**Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

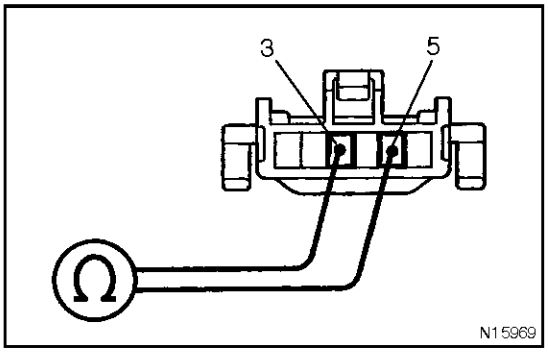


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| 2 | Check main switch continuity. |
|---|---|




**PREPARATION:**

(a) Remove steering wheel center pad (See page SR–11)

(b) Disconnect the control switch connector

**CHECK:**

Check continuity between terminals 3 and 5 of control switch connector when main switch is held on and off

**OK:**

| Switch position | Tester connection | Specified condition |
|---|---|---|
| OFF | 3 – 5 | No continuity |
| Hold ON | 3 – 5 | Continuity |

NG → Replace control switch.

OK

| 3 | Check harness and connector between cruise control ECU and main switch (See page IN–28). |
|---|---|

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN–28).



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



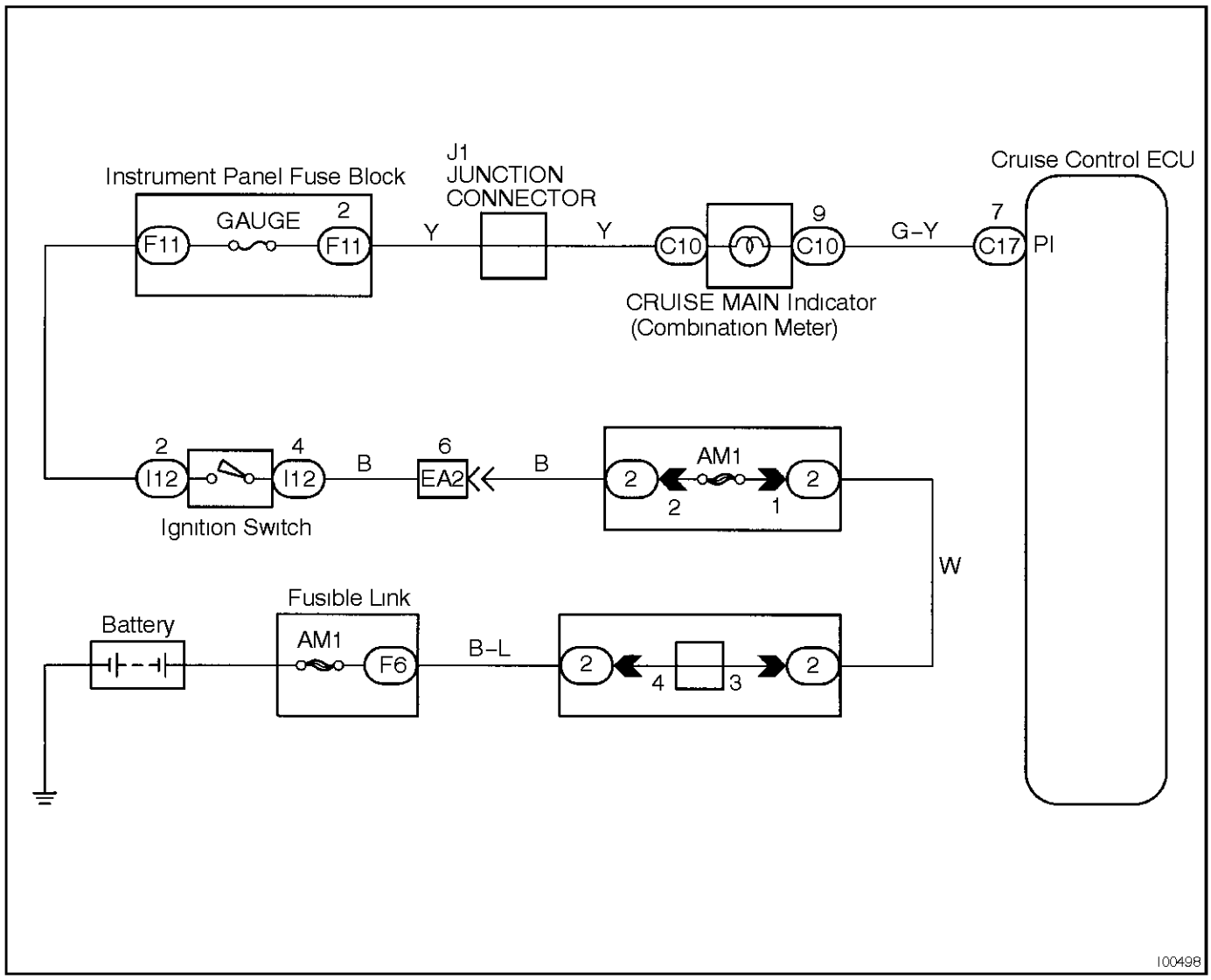
D5CP-02

# CRUISE MAIN Indicator Light Circuit

## CIRCUIT DESCRIPTION

When the cruise control main switch is turned ON, CRUISE MAIN indicator light lights up

## WIRING DIAGRAM





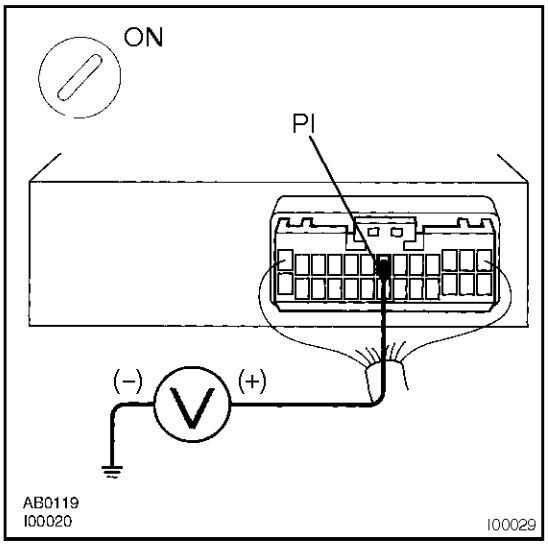

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals PI and GND of cruise control ECU connector.** |




**PREPARATION:**
Turn ignition switch ON
**CHECK:**
Measure voltage between terminals PI and GND of ECU connector when main switch on and off
**OK:**

| Switch position | Voltage |
|---|---|
| OFF | 10 – 16 V |
| ON | Below 1.2 V |

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG

| | |
|---|---|
| 2 | **Check combination meter (See page BE–34).** |

NG → **Replace combination meter.**

OK

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



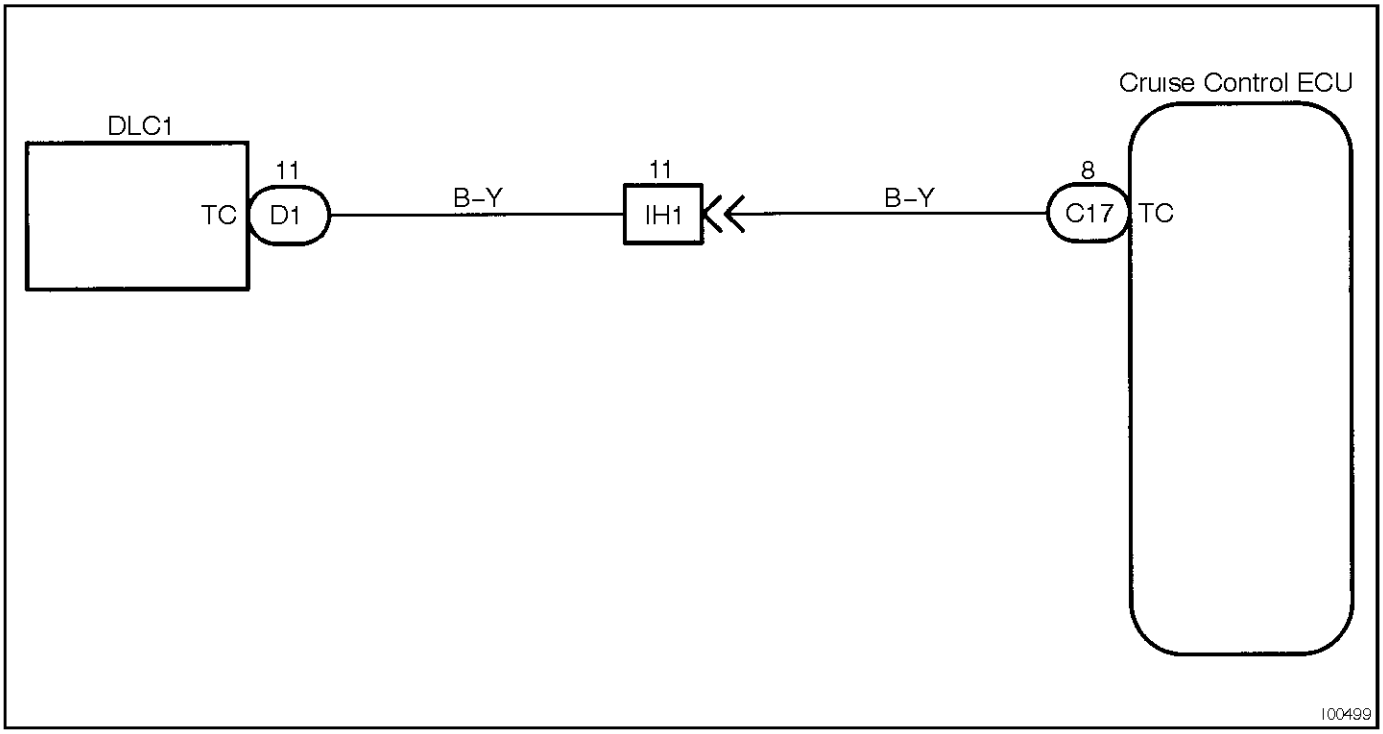
D5OQ-02

# Diagnosis Circuit

## CIRCUIT DESCRIPTION

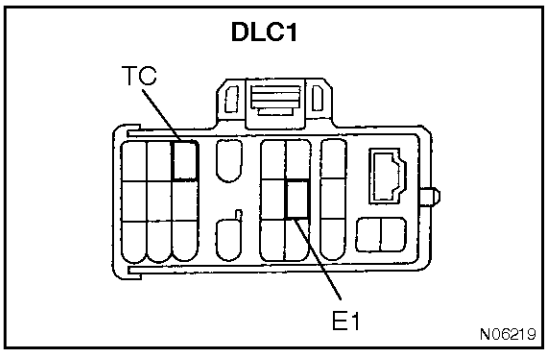
This circuit sends a signal to the ECU that DTC output is required

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Check voltage between terminals Tc and $E_1$ of DLC1.** |




**PREPARATION:**

Turn ignition switch ON

**CHECK:**

Measure voltage between terminals Tc and $E_1$ of DLC1

**OK:**

**Voltage: 10 – 14 V**

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–295).**

NG



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 2 | **Check harness and connector between cruise control ECU and DLC1, DLC1 and body ground (See page IN–28).** |

NG → **Repair or replace harness or connector.**

OK →

**Check and replace cruise control ECU (See page IN–28).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# Actuator Control Cable

## INSPECTION PROCEDURE

| | |
|---|---|
| 1 | **Actuator control cable inspection** |

**CHECK:**

(a) Check that the actuator, control cable throttle link are properly installed and that the cable and link are connected correctly

(b) Check that the actuator and bell crank are operating smoothly

(c) Check that the cable is not loose or too tight

**OK:**

**Freeplay: less than 10 mm**

HINT

- If the control cable is very loose, the vehicle's loss of speed going uphill will be large
- If the control cable is too tight, the idle RPM will become high



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# EMISSION CONTROL SYSTEM

EC07H-06

## PURPOSE

The emission control systems are installed to reduce the amount of HC, CO and NOx exhausted from the engine ((3), (4) and (5)), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2)

The function of each system is shown in the following table

| System | Abbreviation | Function |
|---|---|---|
| (1) Positive Crankcase Ventilation | PCV | Reduces HC |
| (2) Evaporative Emission Control | EVAP | Reduces evaporated HC |
| (3) Exhaust Gas Recirculation | EGR | Reduces NOx |
| (4) Three–Way Catalytic Converter | TWC | Reduces HC CO and NOx |
| (5) Sequential Multiport Fuel Injection* | SFI | Injects a precisely timed optimum amount of fuel for reduced exhaust emissions |

Remark * For inspection and repair of the SFI system, refer to the SF section in this manual



Brought to you by BirfMark
Version 1.11 - 03/16/2010

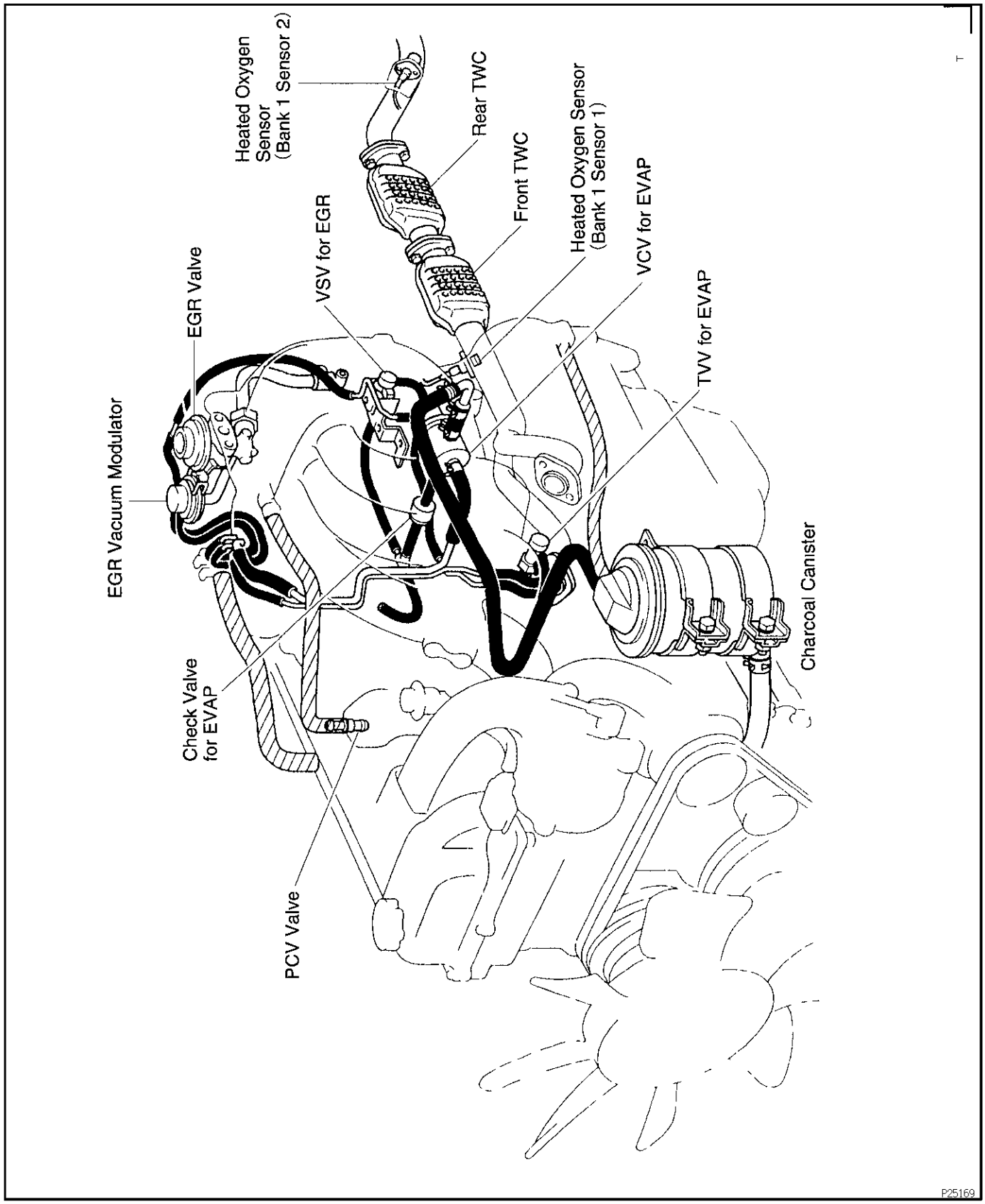
Brought to you by BirfMark



# PARTS LAYOUT AND SCHEMATIC DRAWING

## LOCATION

EC07 -06





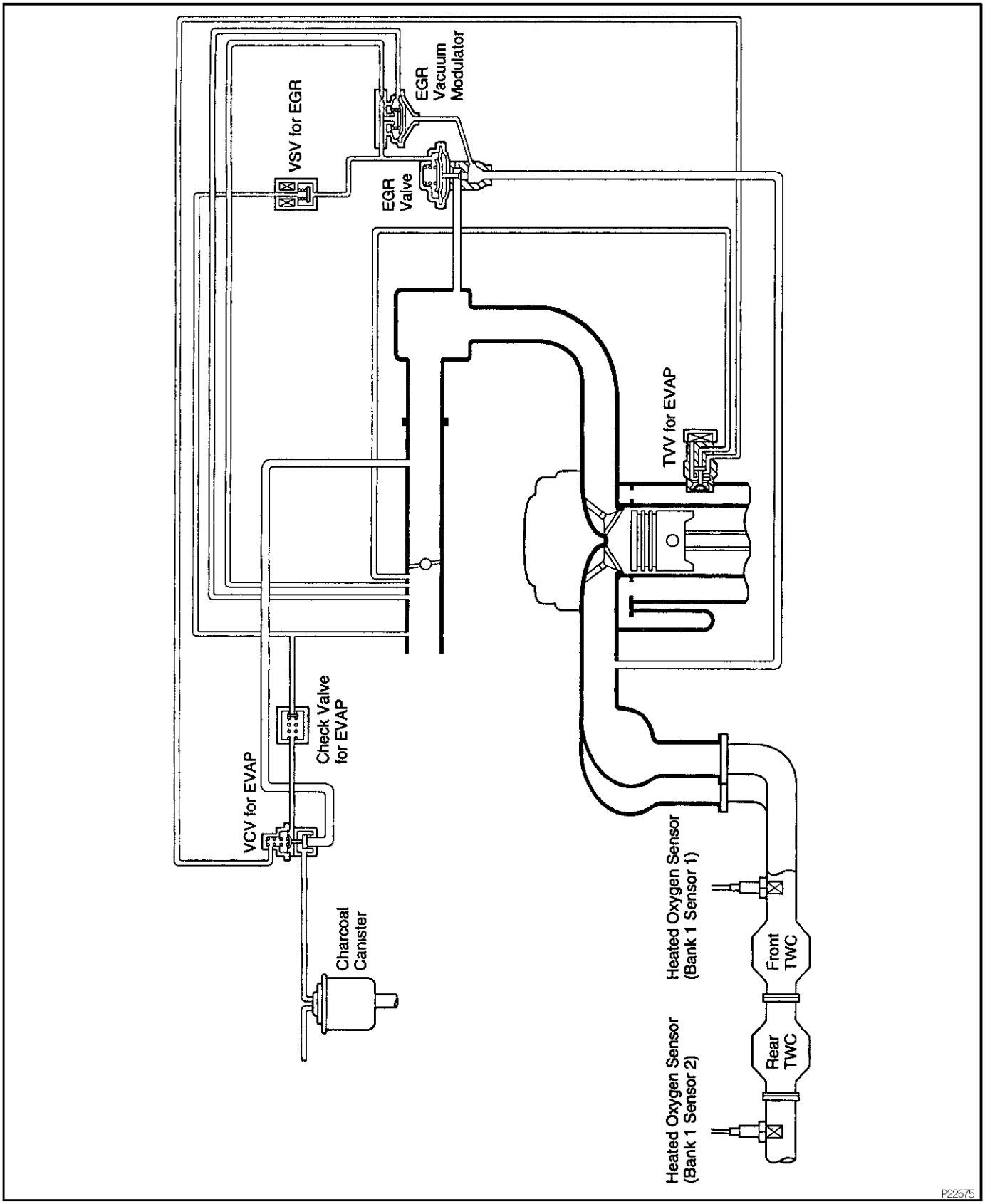

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EC07J 05

# DRAWING

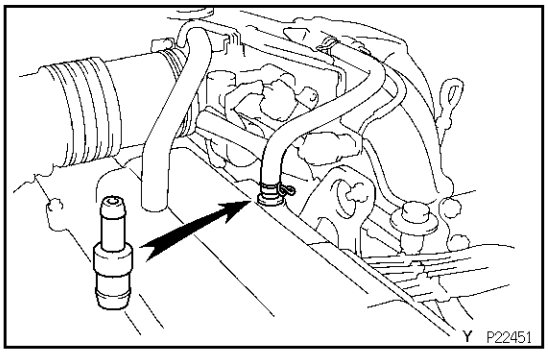





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EC0G9 01

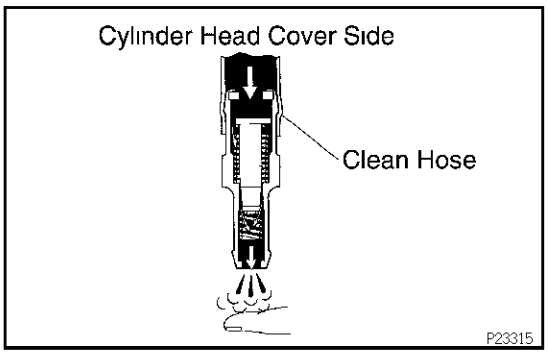
## INSPECTION

**1. REMOVE PCV VALVE**

(a) Disconnect the PCV hose from the PCV valve

(b) Remove the PCV valve

**2. INSTALL CLEAN HOSE TO PCV VALVE**



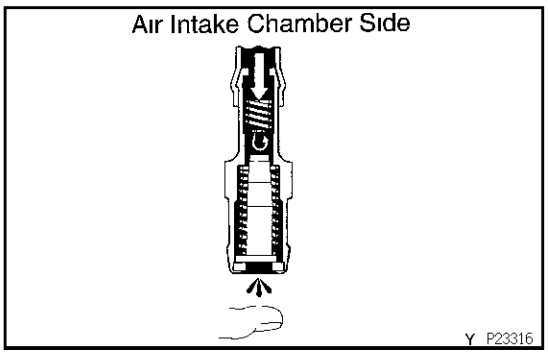

**3. INSPECT PCV VALVE OPERATION**

(a) Blow air into the cylinder head side, and check that air passes through easily

**CAUTION:**

**Do not suck air through the valve.**

**Petroleum substances inside the valve are harmful.**

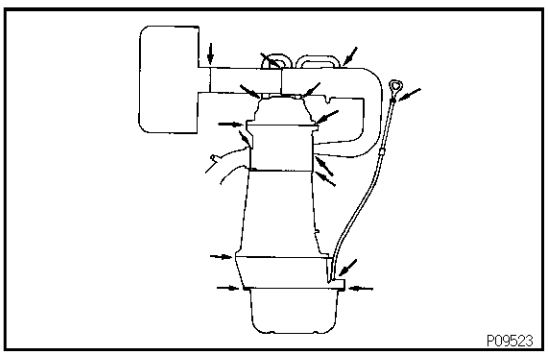



(b) Blow air into the air intake chamber side, and check that air passes through with difficulty

If operation is not as specified, replace the PCV valve

**4. REMOVE CLEAN HOSE FROM PCV VALVE**

**5. REINSTALL PCV VALVE**




**6. VISUALLY INSPECT HOSE, CONNECTIONS AND GASKETS**

Check for cracks, leaks or damage



Brought to you by BirfMark
Version 1.11 - 03/16/2010

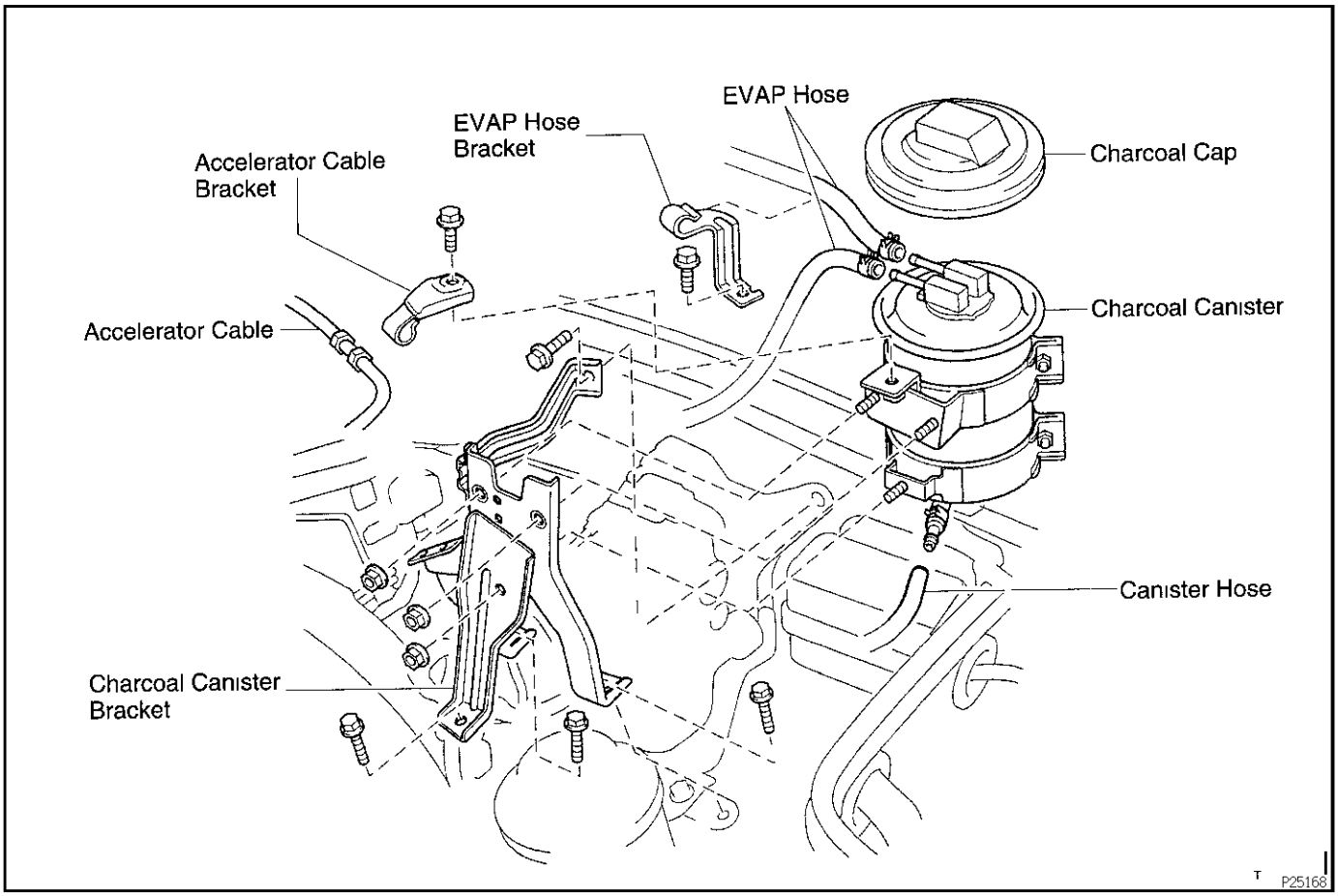
Brought to you by BirfMark



# EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

## COMPONENTS

EC0GA-01






Author : Date : 618
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EC0GB-01

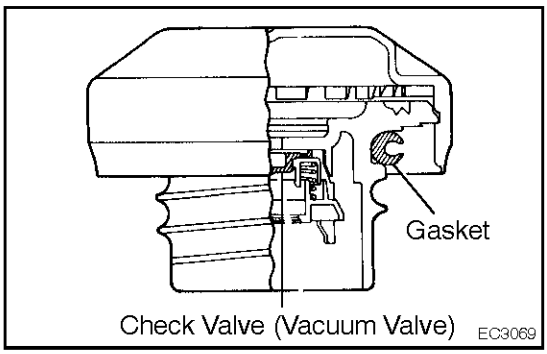
# INSPECTION

**1. VISUALLY INSPECT LINES AND CONNECTIONS**

Look for loose connections, sharp bends or damage

**2. VISUALLY INSPECT FUEL TANK**

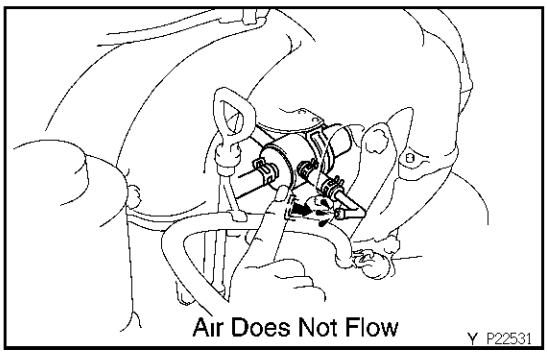
Look for deformation, cracks or fuel leakage




**3. VISUALLY INSPECT FUEL TANK CAP**

Check if the cap and/or gasket are deformed or damaged

If necessary, repair or replace the cap



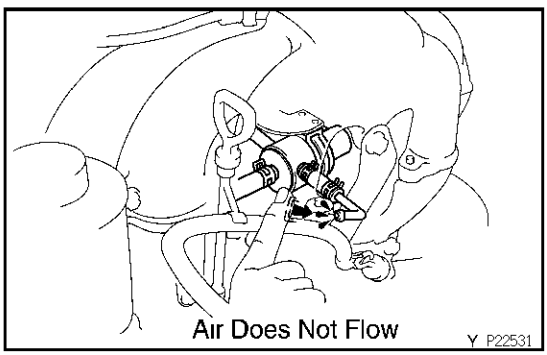

**4. INSPECT TVV OPERATION WITH COLD ENGINE**

(a) The engine coolant temperature should be below 45°C (113°F)

(b) Disconnect the EVAP hose from the union pipe

(c) Start the engine

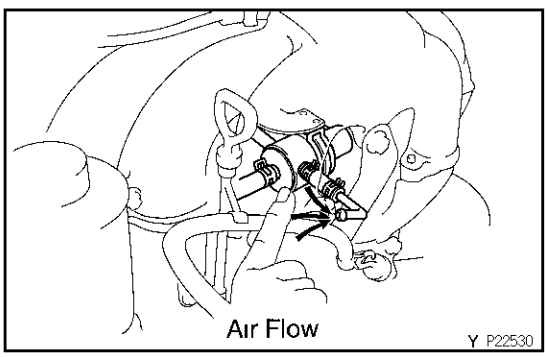
(d) Gradually increase the engine speed from idle to 3,000 rpm and check that air suction is not felt at the union pipe




**5. INSPECT OPERATION OF VCV WITH HOT ENGINE**

(a) Warm up the engine

(b) With the engine idling, check that air suction is not felt at union pipe




(c) Gradually increase the engine speed to 3,000 rpm and check that there is air suction at the union pipe

(d) Reconnect the EVAP hose to the union pipe

If no problem is found with this inspection, system is normal, otherwise inspect each part

**6. REMOVE CHARCOAL CANISTER WITH BRACKET**

**7. REMOVE CHARCOAL CANISTER FROM BRACKET**

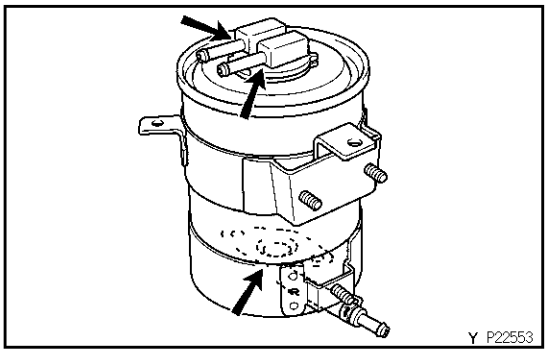
**8. REMOVE CAP FROM CHARCOAL CANISTER**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

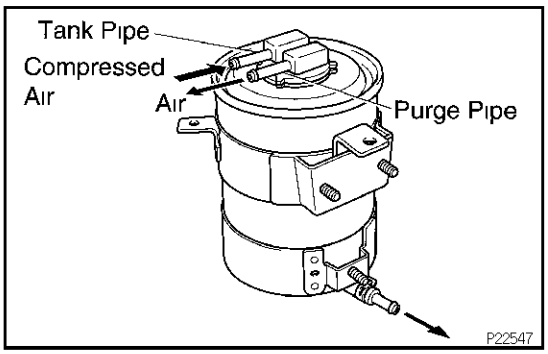
Brought to you by BirfMark





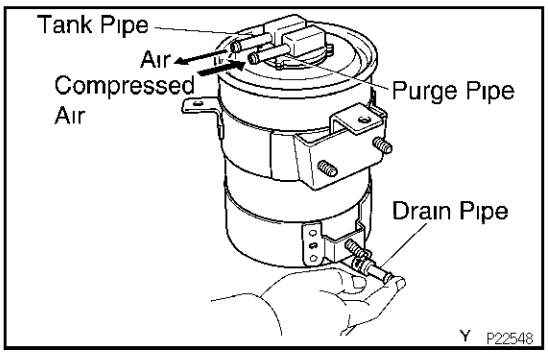

**9. VISUALLY INSPECT CHARCOAL CANISTER**

Look for cracks or damage



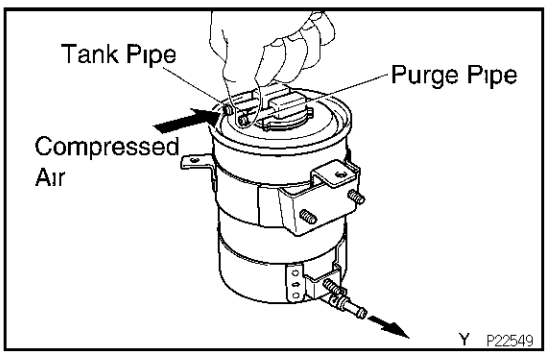

**10. INSPECT FOR CLOGGED FILTER AND STUCK VALVE**

(a) Using low pressure compressed air (7 26 kPa, 74 gf/cm$^2$, 1 05 psi), blow into tank pipe and check that air flows without resistance from the other pipes




(b) While holding drain pipe closed, blow air (1 96 kPa, 20 gf/cm$^2$, 0 28 psi) into purge pipe and check that air flow without resistance from tank pipe

If a problem is found, replace the charcoal canister




**11. CLEAN FILTER IN CANISTER**

Clean the filter by blowing 294 kPa (3 kgf/cm$^2$, 43 psi) of compressed air into tank pipe while holding purge pipe closed

**NOTICE:**

**Do not attempt to wash the canister.No activated carbon should come out.**

**12. REINSTALL CAP TO CHARCOAL CANISTER**

**13. REINSTALL CHARCOAL CANISTER TO BRACKET**
**Torque: 14 N·m (145 kgf·cm, 10 ft·lbf)**

**14. REINSTALL CHARCOAL CANISTER WITH BRACKET**
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

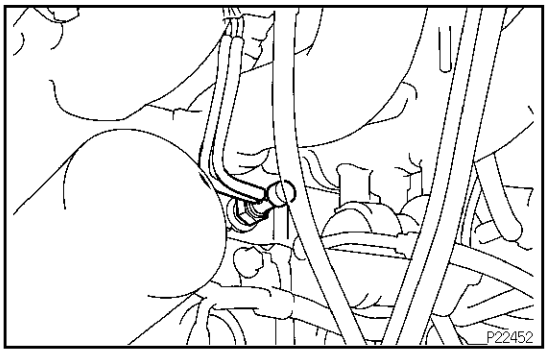
**15. DRAIN ENGINE COOLANT**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

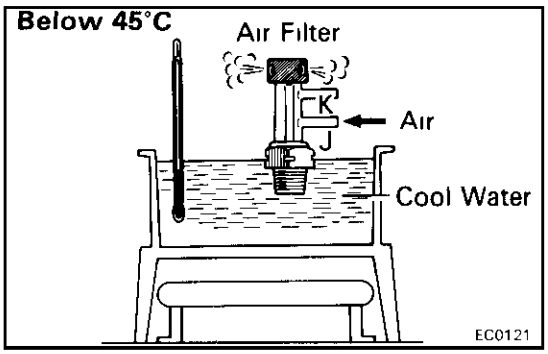





**16. REMOVE TVV FROM CYLINDER HEAD**

(a) Disconnect the 2 vacuum hoses

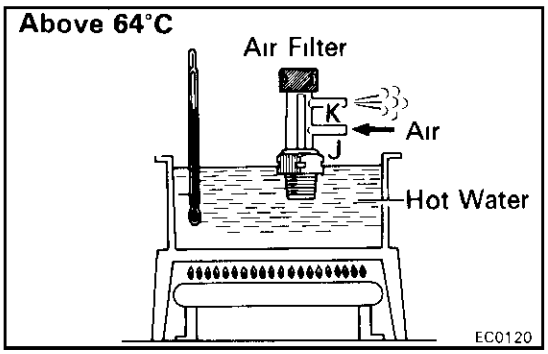
(b) Remove the TVV




**17. INSPECT TVV OPERATION**

(a) Cool the TVV to below 45°C (113°F) with cool water

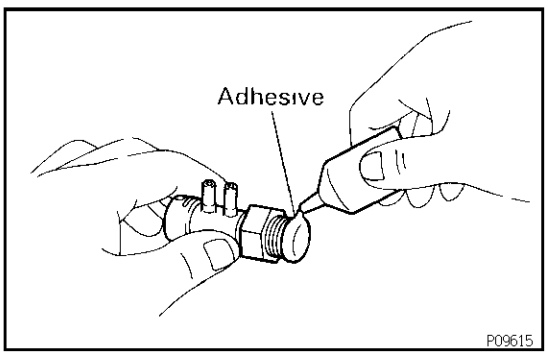
(b) Check that air flows from pipe J to the air filter




(c) Heat the TVV to above 64°C (147°F) with hot water

(d) Check that air flows from pipe J to pipe K

If operation is not as specified, replace the TVV



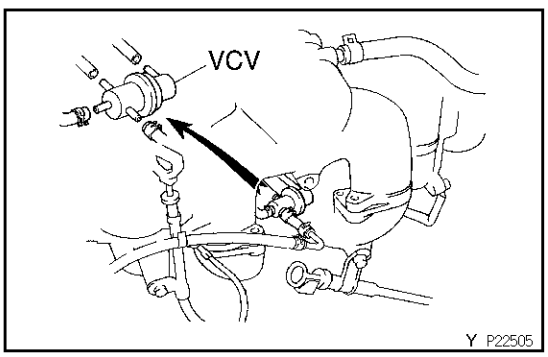

**18. REINSTALL TVV**

(a) Apply adhesive to 2 or 3 threads of the TVV, and install it

**Adhesive:**
**Part No. 08833–00070, THREE BOND 1324**
**or equivalent**
**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

(b) Reconnect 2 vacuum hoses

**19. REFILL WITH ENGINE COOLANT**




**20. REMOVE INTAKE MANIFOLD STAY**

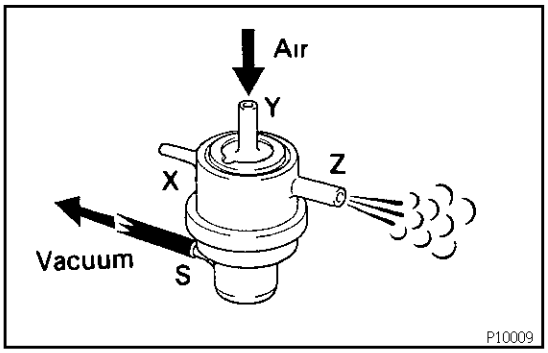
**21. REMOVE VCV**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

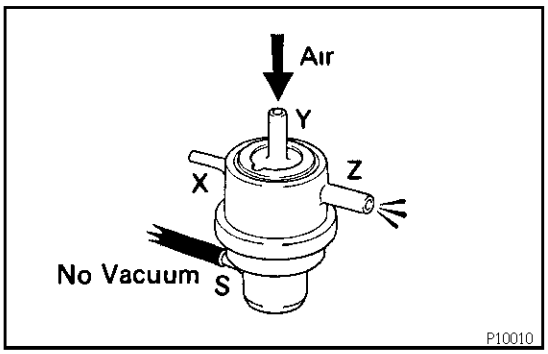





**22. INSPECT VCV**

(a) Apply vacuum above 9 3 kPa (70 mmHg, 2 76 in Hg) to pipe S

(b) Blow air into pipe Y and check that air comes out of pipe Z




(c) Stop the applied vacuum

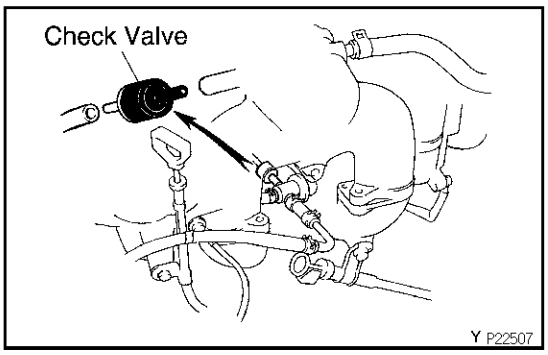
(d) Blow air into pipe Y and check that air does not come out of pipe Z

If operation is not as specified, replace the VCV

**23. REINSTALL VCV**

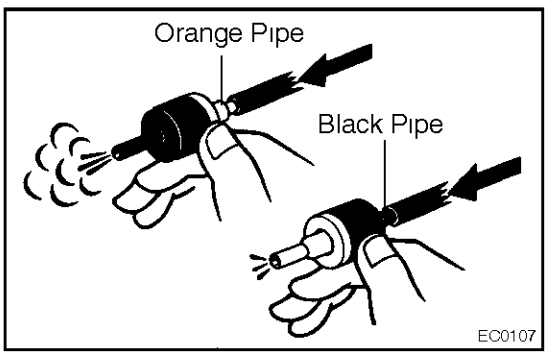
**24. INSTALL INTAKE MANIFOLD STAY**

**Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)**




**25. REMOVE INTAKE MANIFOLD STAY**

**26. REMOVE CHECK VALVE**

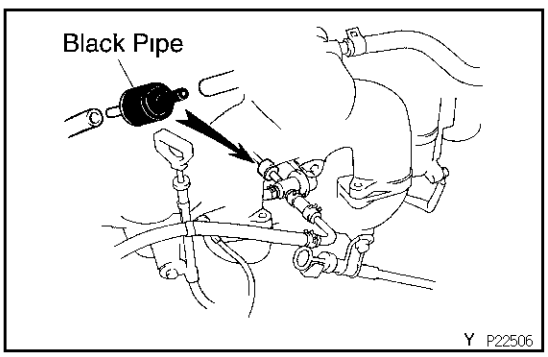



**27. INSPECT CHECK VALVE**

(a) Check that air flows from the orange pipe to the black pipe

(b) Check that air does not flow from the black pipe to the orange pipe

If operation is not as specified, replace the check valve




**28. REINSTALL CHECK VALVE**

HINT

Reinstall the check valve with the black pipe facing the VCV side

**29. INSTALL INTAKE MANIFOLD STAY**

**Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

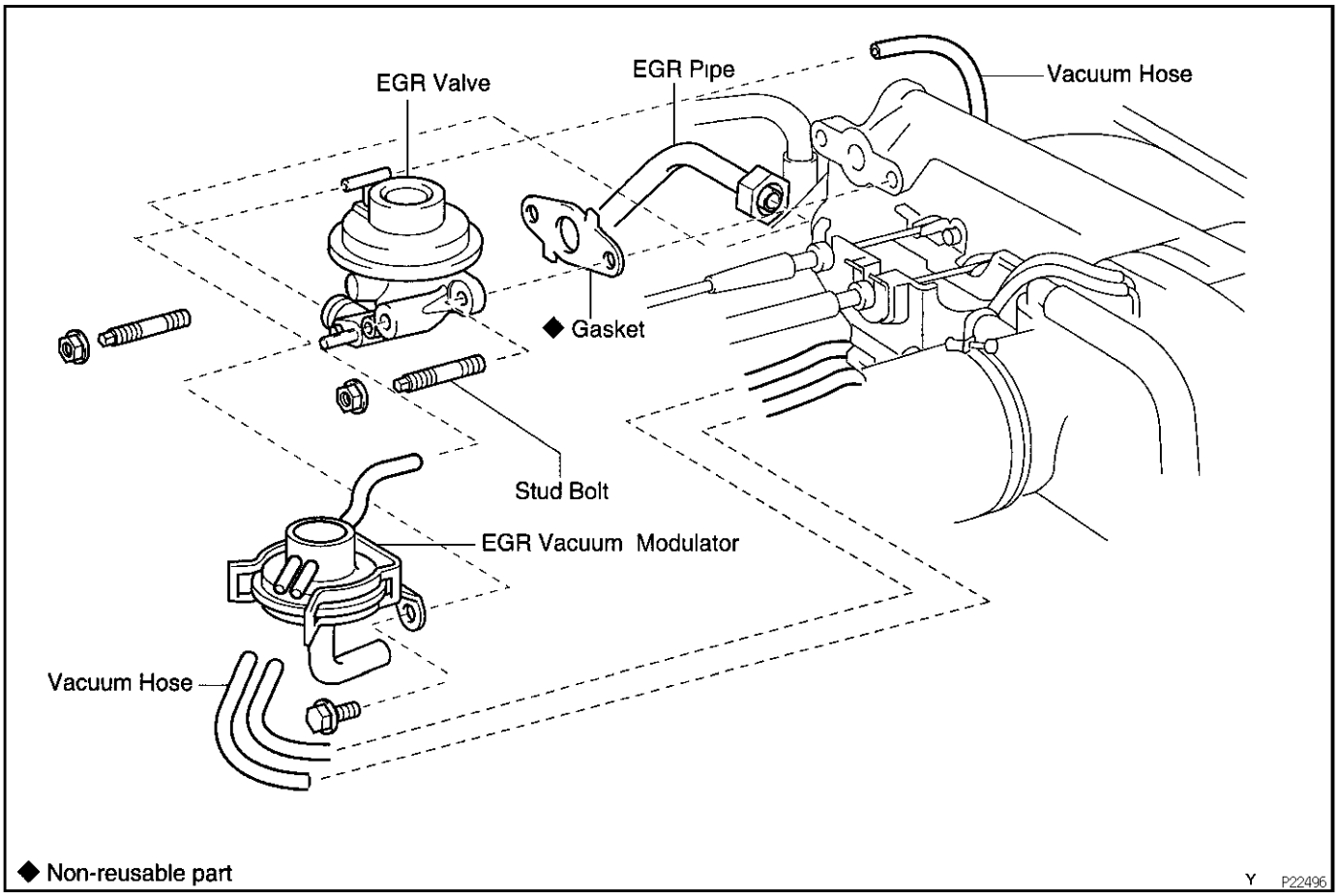
Brought to you by BirfMark



# EXHAUST GAS RECIRCULATION (EGR) SYSTEM

## COMPONENTS

EC0GC 01



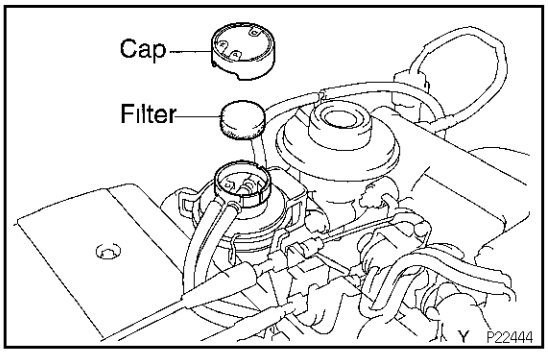



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EC0JT–01



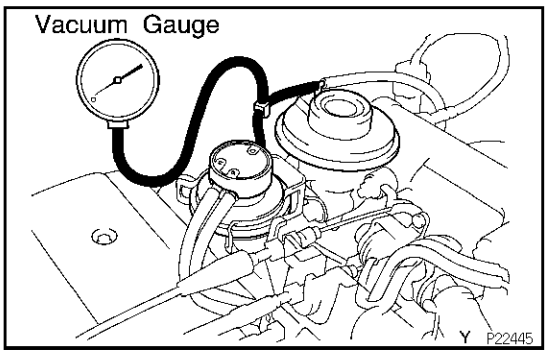

# INSPECTION

**1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR**

(a) Remove the cap and filter
(b) Check the filter for contamination or damage
(c) Using compressed air, clean the filter
(d) Reinstall the filter and cap

HINT

Install the filter with the coarser surface facing the atmospheric side (outward)




**2. INSTALL VACUUM GAUGE**

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator

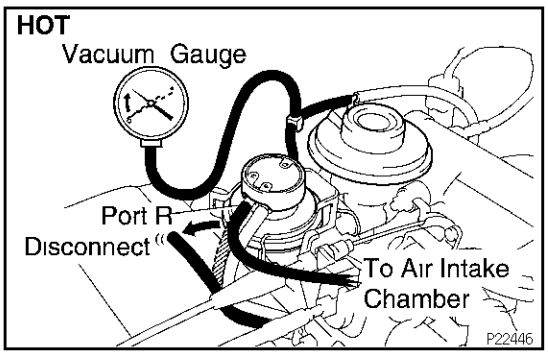
**3. INSPECT SEATING OF EGR VALVE**

Start the engine and check that the engine starts and runs at idle

**4. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL (See page EM–10)**

**5. INSPECT VSV OPERATION WITH COLD ENGINE**

(a) The engine coolant temperature should be below 47°C (117°F)
(b) Check that the vacuum gauge indicates zero at 2,500 rpm
(c) Check that the EGR pipe is not hot




**6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE**

(a) Warm up the engine to above 53°C (127°F)
(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm
(c) Disconnect the vacuum hose port R of the EGR vacuum modulator and connect port R directly to the air intake chamber with another hose
(d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



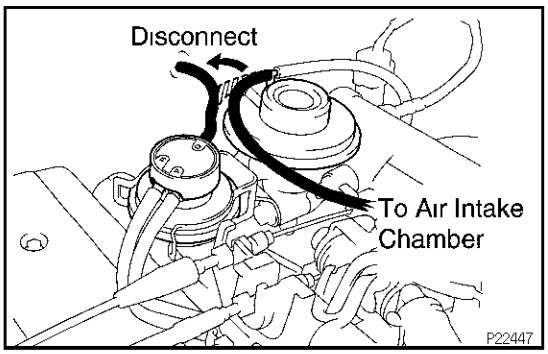
HINT

As a large amount of exhaust gas enters, the engine will misfire slightly

**7. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

**8. REMOVE VACUUM GAUGE**

Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations




**9. INSPECT EGR VALVE**

(a) Apply vacuum directly to the EGR valve with the engine idle

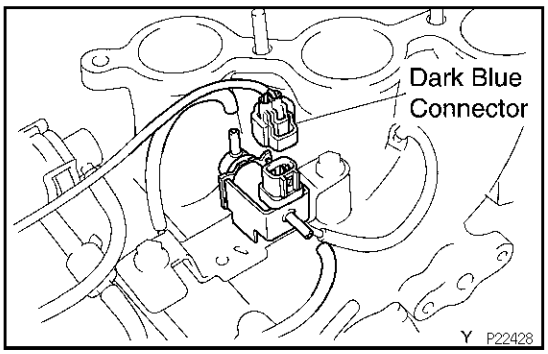
(b) Check that the engine runs rough or dies

(c) Reconnect the vacuum hoses to the proper locations

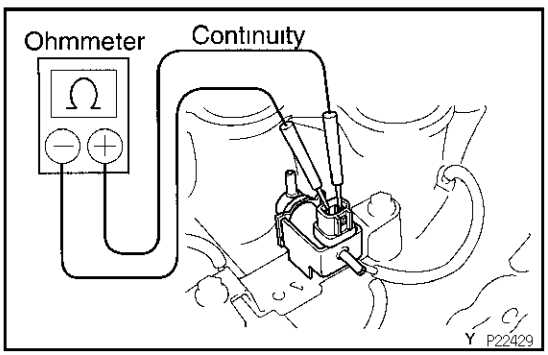
If no problem is found with this inspection, system is normal, otherwise inspect each part

**10. CANCEL DIAGNOSTIC TROUBLE CODE**

**11. REMOVE AIR INTAKE CHAMBER (See page EM–28)**




**12. DISCONNECT VACUUM HOSES AND CONNECTOR**

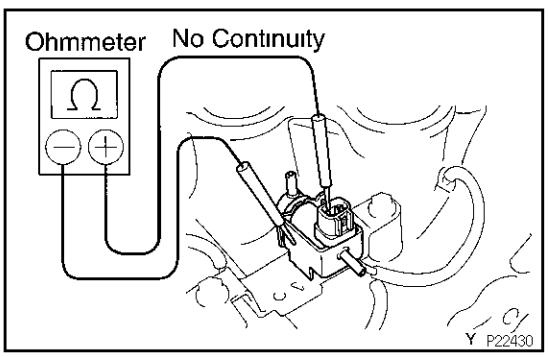



**13. INSPECT VSV FOR OPEN CIRCUIT**

Using an ohmmeter, check that there is continuity between the terminals

**Resistance: 30 – 34 Ω at 20°C (68°F)**

If there is no continuity, replace the VSV




**14. INSPECT VSV FOR GROUND**

Using an ohmmeter, check that there is no continuity between each terminal and the body

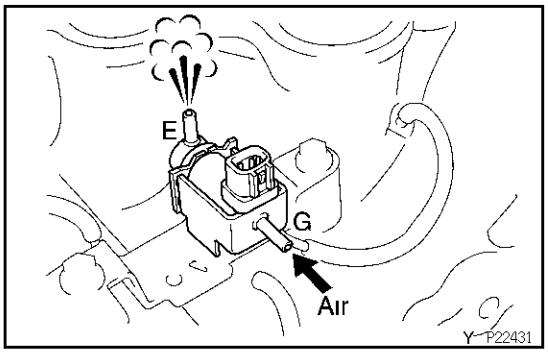
If there is continuity, replace the VSV



Brought to you by BirfMark
Version 1.11 - 03/16/2010

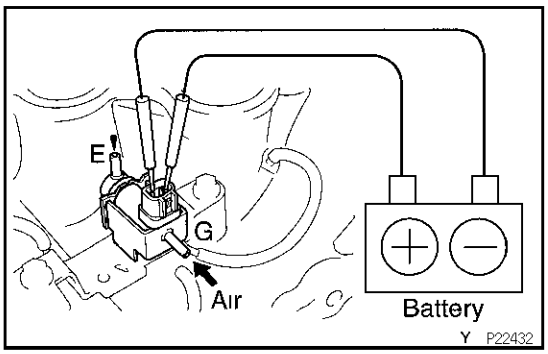
Brought to you by BirfMark






**15. INSPECT VSV OPERATION**

(a) Check that the air flows from pipe G to pipe E



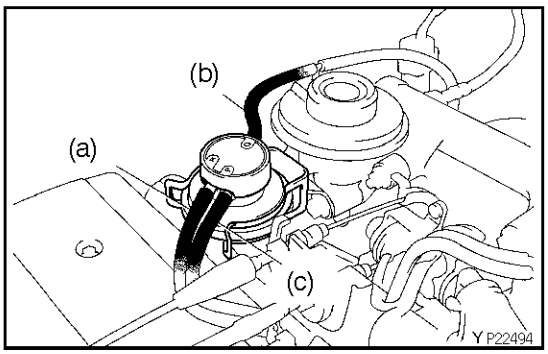

(b) Apply battery voltage across the terminals

(c) Check that the air does not flows from pipe G to pipe E

If operation is not as specified, replace the VSV

**16. RECONNECT VACUUM HOSES AND CONNECTOR**

**17. REINSTALL AIR INTAKE CHAMBER (See page EM–54)**

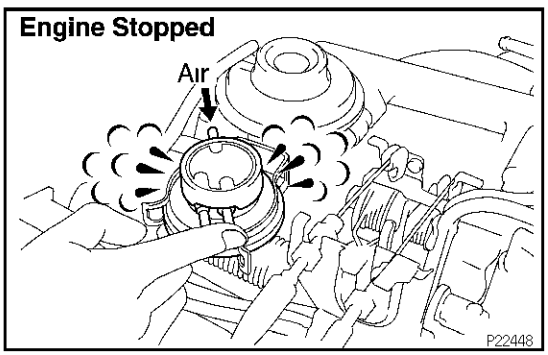



**18. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR**

(a) Disconnect the vacuum hose from R port

(b) Disconnect the vacuum hose from Q port

(c) Disconnect the vacuum hose from P port




**19. INSPECT EGR VACUUM MODULATOR OPERATION**

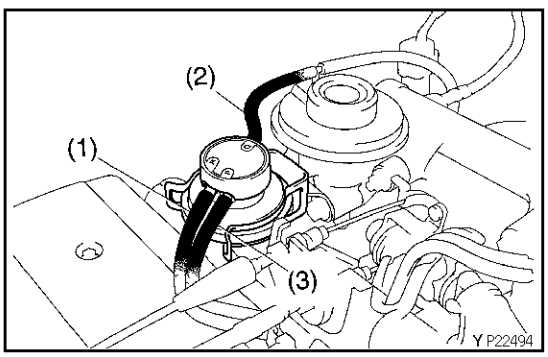
(a) Block ports P and R with your finger

(b) Blow air into port Q, and check that the air passes through to the air filter side freely

(c) Start the engine, and maintain speed at 2,500 rpm

(d) Repeat the above test Check that there is a strong resistance to air flow

If operation is not as specified, replace the EGR vacuum modulator




**20. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR**

(a) Connect the vacuum hose to R port

(b) Connect the vacuum hose to Q port

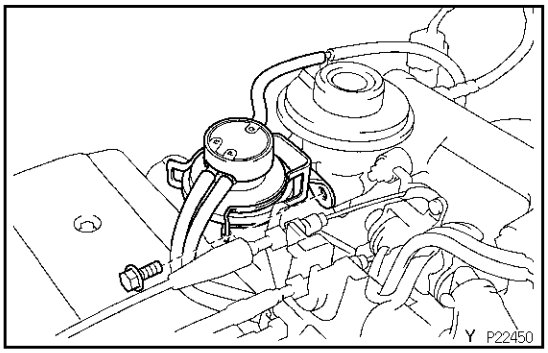
(c) Connect the vacuum hose to P port



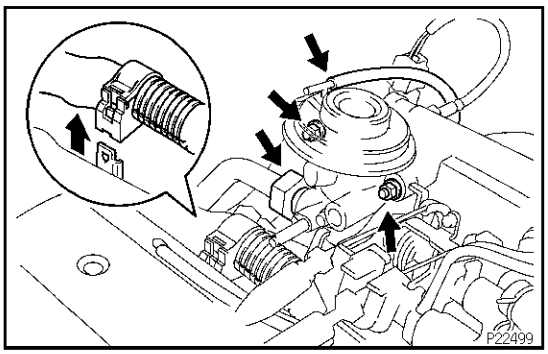
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



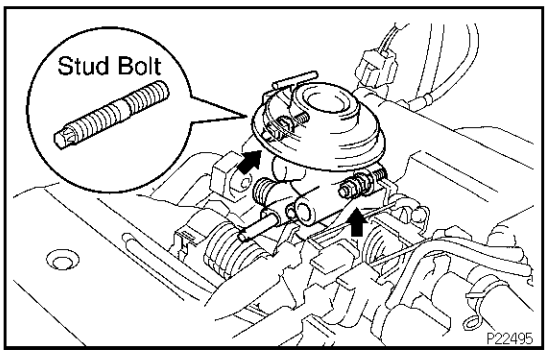



**21. REMOVE EGR VACUUM MODULATOR**

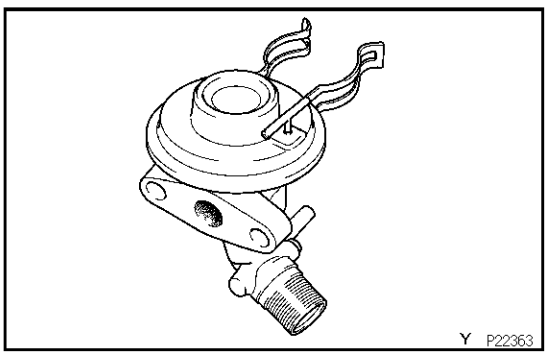



**22. REMOVE EGR VALVE**

(a) Disconnect the vacuum hose from the EGR valve
(b) Disconnect the engine wire from the clamp
(c) Loosen the EGR pipe union nut
(d) Remove the 2 nuts holding the EGR valve to the air intake chamber




(e) Using 2 nuts, remove the 2 stud bolts, EGR valve and gasket




**23. INSPECT EGR VALVE**

Check for sticking and heavy carbon deposits
If a problem is found, replace the valve

**24. REINSTALL EGR VALVE**

(a) Using 2 nuts, temporarily install a new gasket, and EGR valve with the 2 stud bolts
**Torque: 9 N·m (90 kgf·cm, 78 in.·lbf)**
(b) Install the 2 nuts holding the EGR valve to the air intake chamber
**Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)**
(c) Tighten the union nut of the EGR pipe
**Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)**
(d) Connect the engine wire to the clamp
(e) Connect the vacuum hose to the EGR valve

**25. REINSTALL EGR VACUUM MODULATOR**
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EC0H3–02

## INSPECTION

**1. EXHAUST PIPE ASSEMBLY INSPECTION**

(a) Check connection for looseness or damage

(b) Check clamps for weakness, cracks or damage

**2. TWC INSPECTION**

Check for dents or damage

If any part of the protector is damaged or dented to the extent that it touches the TWC, repair or replace it

**3. HEAT INSULATOR INSPECTION**

(a) Check heat insulator for damage

(b) Check for adequate clearance between TWC and heat insulator

**4. FRONT TWC AND REAR TWC REPLACEMENT (See page EM–110)**



Author : Date : 628

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CO/HC

## INSPECTION

EM1E0 04

HINT

This check is used only to determine whether or not the idle CO/HC complies with regulations

1. **INITIAL CONDITIONS**

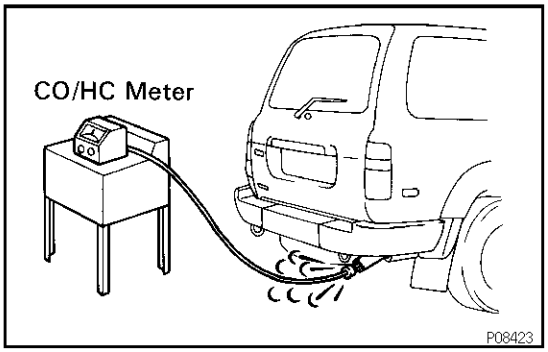
(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT

All vacuum hoses for EGR systems, etc should be properly connected

(f) SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand

2. **START ENGINE**
3. **RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS**




4. **4.INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING**
5. **IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM**

HINT

When doing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 6. TROUBLESHOOTING

If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below

See the table below for possible causes, and then inspect and correct the applicable causes if necessary

| CO | HC | Problems | Causes |
|---|---|---|---|
| Normal | High | Rough idle | 3 Faulty ignitions<br>• Incorrect timing<br>• Fouled shorted or improperly gapped plugs<br>• Open or crossed high-tension cords<br>• Cracked distributor cap<br>4 Incorrect valve clearance<br>5 Leaky EGR valve<br>6 Leaky intake and exhaust valves<br>7 Leaky cylinders |
| Low | High | Rough idle<br>(Fluctuating HC reading) | 1 Vacuum leaks<br>• PCV hose<br>• EGR valve<br>• Intake manifold<br>• Air intake chamber<br>• Throttle body<br>• IAC valve<br>• Brake booster line<br>2 Lean mixture causing misfire |
| High | High | Rough idle<br>(Black smoke from exhaust) | 1 Restricted air filter<br>2 Faulty SFI systems<br>• Faulty pressure regulator<br>• Clogged fuel return line<br>• Defective ECT sensor<br>• Faulty ECM<br>• Faulty injector<br>• Faulty throttle position sensor<br>• Faulty MAF meter |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COMPRESSION

## INSPECTION

EM0KR 04

HINT

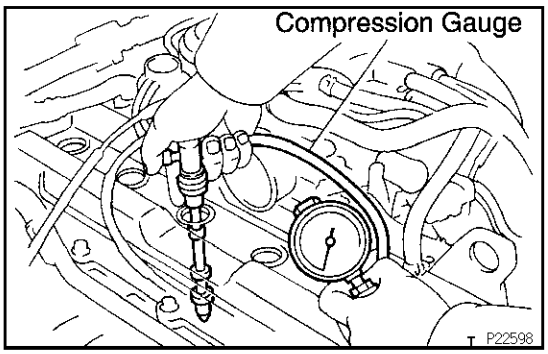
If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure

**1. WARM UP AND STOP ENGINE**

Allow the engine to warm up to normal operating temperature

**2. DISCONNECT DISTRIBUTOR CONNECTOR**

**3. REMOVE SPARK PLUGS (See page IG–1)**




**4. CHECK CYLINDER COMPRESSION PRESSURE**

(a) Insert a compression gauge into the spark plug hole

(b) Fully open the throttle

(c) While cranking the engine, measure the compression pressure

HINT

Always use a fully charged battery to obtain engine speed of 250 rpm or more

(d) Repeat steps (a) through (c) for each cylinder

**NOTICE:**

**This measurement must be done in as short a time as possible.**

**Compression pressure:**
**1,176 kPa (12.0 kgf/cm$^2$, 171 psi) or more**
**Minimum pressure: 883 kPa (9.0 kgf/cm$^2$, 128 psi)**
**Difference between each cylinder:**
**98 kPa (1.0 kgf/cm$^2$, 14 psi) or less**

If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket

**5. REINSTALL SPARK PLUGS (See page IG–1)**

**6. RECONNECT DISTRIBUTOR CONNECTOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# VALVE CLEARANCE

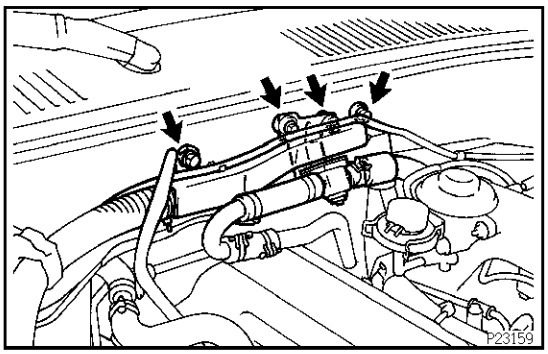
## INSPECTION

EM1QI-01

HINT

Inspect and adjust the valve clearance when the engine is cold

1. **DRAIN ENGINE COOLANT**
2. **REMOVE THROTTLE BODY (See page SF-45)**

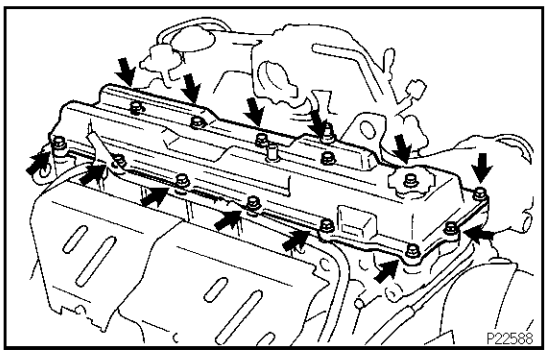



3. **DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL**

(a) Remove the 2 bolts and disconnect the ground strap and engine wire

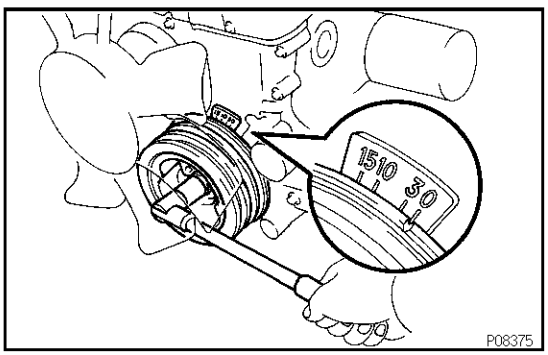
(b) Remove the 2 bolts and disconnect the heater valve

4. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS (See page IG-1)**



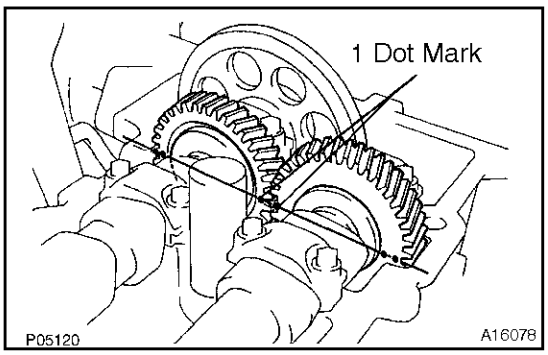

5. **REMOVE CYLINDER HEAD COVER**

Remove the 13 bolts, cylinder head cover and gasket




6. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover



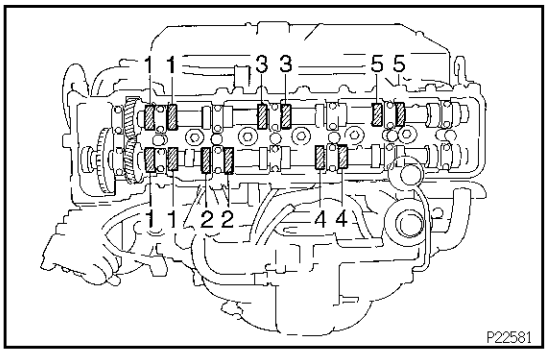

(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration If not, turn the crankshaft 1 revolution (360°) and align the marks as above



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



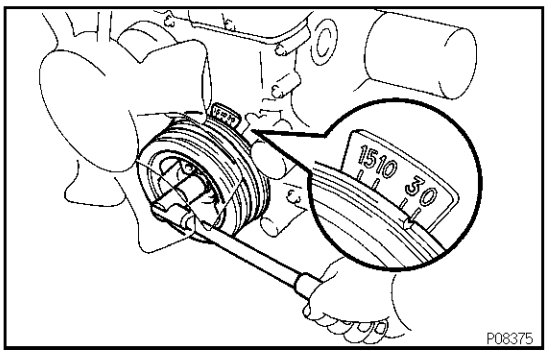



**7. INSPECT VALVE CLEARANCE**

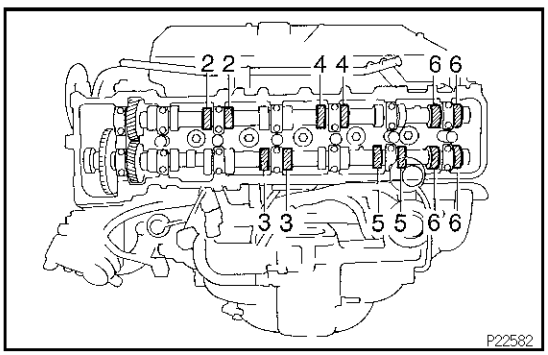
(a) Check only the valves indicated
- Using a thickness gauge, measure the clearance between the valve lifter and camshaft
- Record the out–of–specification valve clearance measurements They will be used later to determine the required replacement adjusting shim

**Valve clearance (Cold):**

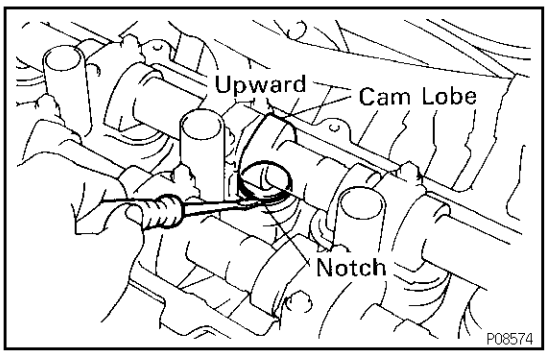
| | |
|---|---|
| Intake | 0 15 – 0 25 mm (0 006 – 0 010 in ) |
| Exhaust | 0 25 – 0 35 mm (0 010 – 0 041 in ) |




(b) Turn the crankshaft pulley 1 revolution (360°) and align the its groove with timing mark "0" of the timing chain cover




(c) Check only the valves indicated as shown Measure the valve clearance (See procedure in step (a) above)




**8. Except for rear valves of No. 6 cylinder**
**ADJUST VALVE CLEARANCE**

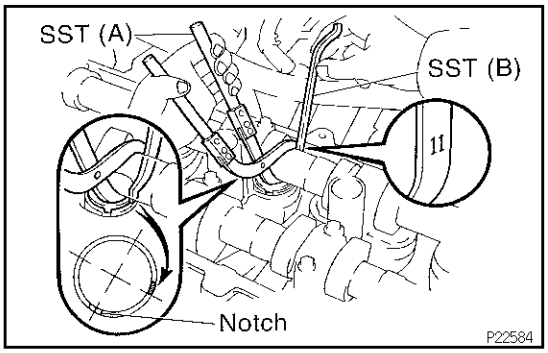
(a) Remove the adjusting shim
- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward
- Position the notch of the valve lifter toward the spark plug side



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



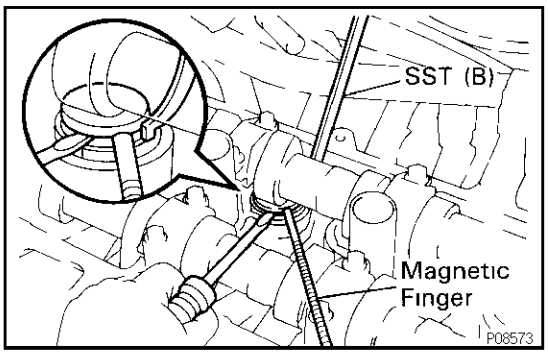


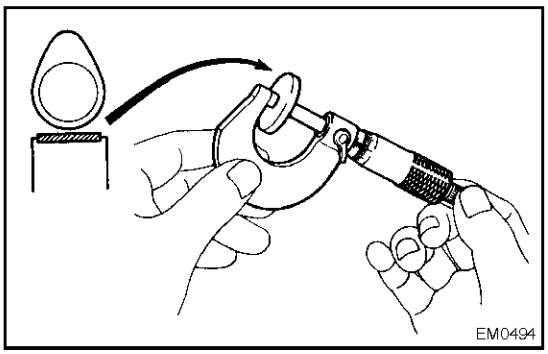

- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter flange Remove SST (A)

SST 09248-06020, 09248-55050 (09248-05510)

HINT

- Apply SST (B) at slight angle on the side marked with "11", at the position shown in the illustration
- When SST (B) is inserted too deeply, it will get pinched by the shim To prevent it from being stuck, insert it shallowly from the outside of the cylinder head, at a slight angle
- Remove the adjusting shim with a small screwdriver and magnetic finger




(b) Determine the replacement adjusting shim size by following the Formula or Charts

- Using a micrometer, measure the thickness of the removed shim
- Calculate the thickness of a new shim so that the valve clearance comes within specified value

T Thickness of removed shim
A Measured valve clearance
N Thickness of new shim

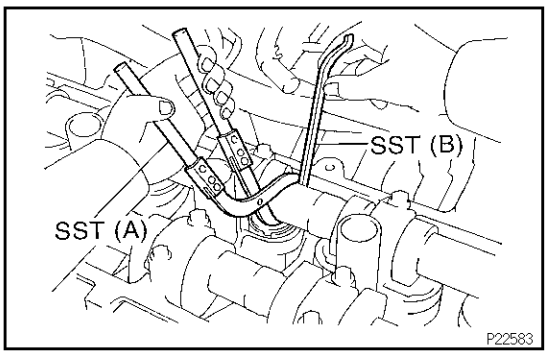
**Intake: N = T + (A – 0.20 mm (0.008 in.))**

**Exhaust: N = T + (A – 0.30 mm (0.012 in.))**

- Select a new shim with a thickness as close as possible to the calculated value

HINT

Shims are available in 17 sized in increments of 0 05 mm (0 0020 in ), from 2 50 mm (0 0984 in ) to 3 30 mm (0 1299 in )




(c) Install a new adjusting shim

- Place a new adjusting shim on the valve lifter
- Using SST (A), press down the valve lifter and remove SST (B)

SST 09248-06020, 09248-55050 (09248-05510)

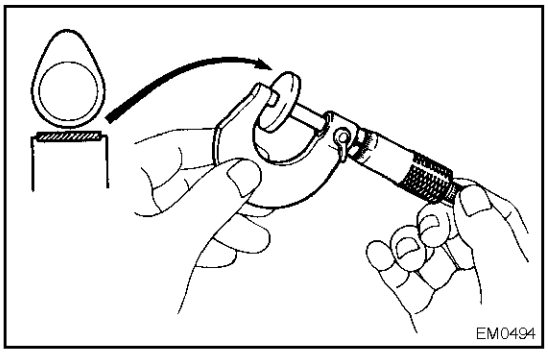
(d) Recheck the valve clearance



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**9. Rear valves of No. 6 cylinder**
**ADJUST VALVE CLEARANCE**

(a) Remove the distributor (See page IG–10)
(b) Remove the camshafts (See page EM–28)
(c) Remove the adjusting shim with a small screwdriver
(d) Determine the replacement adjusting shim size by following the Formula or Charts
- Using a micrometer, measure the thickness of the removed shim
- Calculate the thickness of a new shim so that the valve clearance comes within specified value

T Thickness of removed shim
A Measured valve clearance
N Thickness of new shim

**Intake: N = T + (A – 0.20 mm (0.008 in.))**
**Exhaust: N = T + (A – 0.30 mm (0.012 in.))**

- Select a new shim with a thickness as close as possible to the calculated value

HINT
Shims are available in 17 sized in increments of 0 05 mm (0 0020 in ), from 2 50 mm (0 0984 in ) to 3 30 mm (0 1299 in )

(e) Place a new adjusting shim on the valve lifters
(f) Install the camshafts (See page EM–54)
(g) Recheck the valve clearance
(h) Install the distributor (See page IG–11)

**10. REINSTALL CYLINDER HEAD COVER**
(a) Install the gasket to the cylinder head cover
(b) Install the cylinder head cover with the 13 bolts

**11. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS (See page IG–1)**

**12. RECONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL**
(a) Connect the heater valve with the 2 bolts
(b) Connect the ground strap and engine wire with the 2 bolts

**13. REINSTALL THROTTLE BODY (See page SF–48)**

**14. REFILL RADIATOR WITH ENGINE COOLANT**

**15. CHECK AND ADJUST IGNITION TIMING (See page EM–10)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

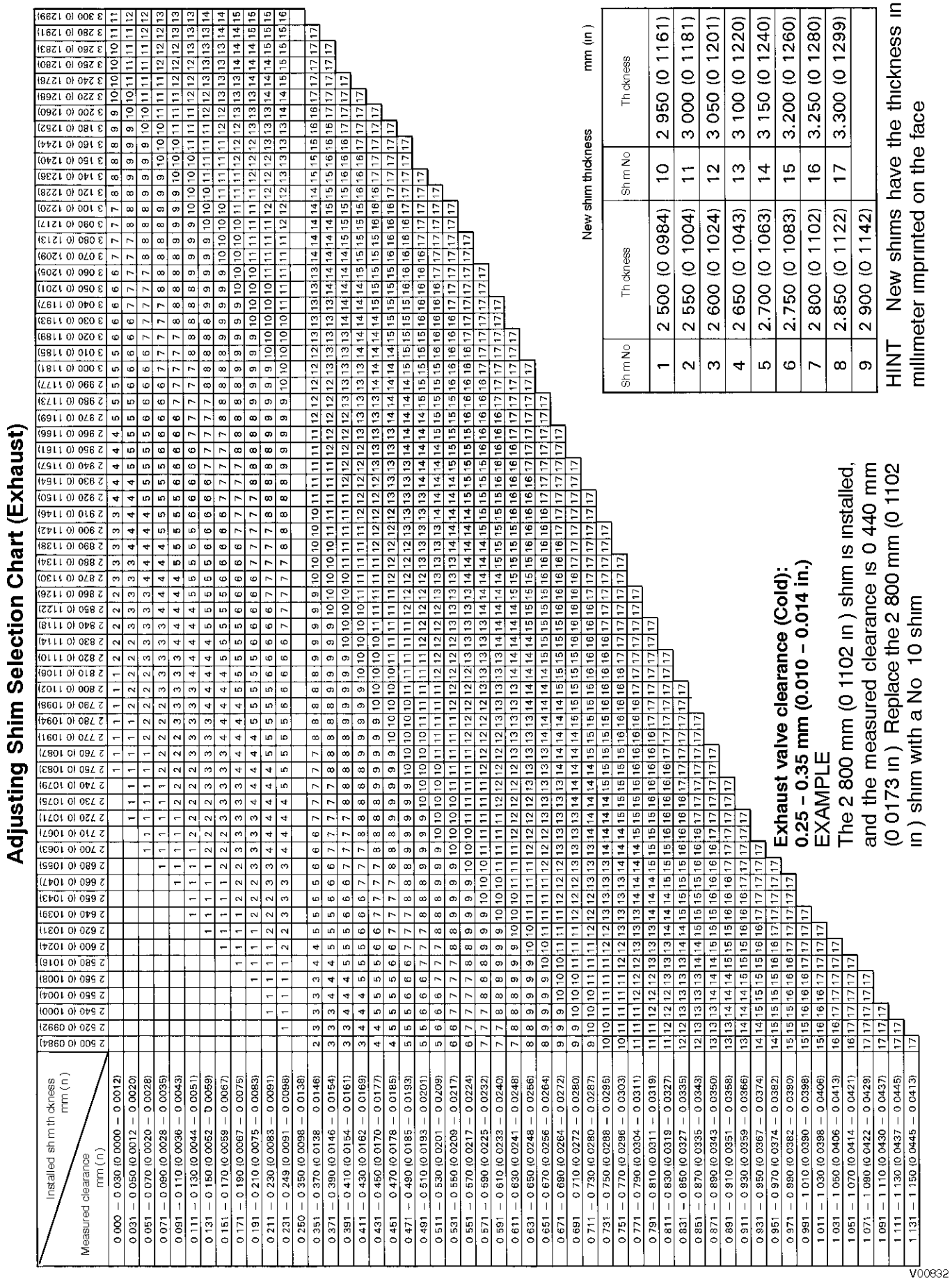


## Adjusting Shim Selection Chart (Intake)

| Measured clearance mm (in.) \ Installed shim thickness mm (in.) | 2.500 (0.0984) | 2.520 (0.0992) | 2.540 (0.1000) | 2.560 (0.1008) | 2.580 (0.1016) | 2.600 (0.1024) | 2.620 (0.1031) | 2.640 (0.1039) | 2.650 (0.1043) | 2.660 (0.1047) | 2.680 (0.1055) | 2.700 (0.1063) | 2.710 (0.1067) | 2.720 (0.1071) | 2.730 (0.1075) | 2.740 (0.1079) | 2.750 (0.1083) | 2.760 (0.1087) | 2.770 (0.1091) | 2.780 (0.1094) | 2.790 (0.1098) | 2.800 (0.1102) | 2.810 (0.1106) | 2.820 (0.1110) | 2.830 (0.1114) | 2.840 (0.1118) | 2.850 (0.1122) | 2.860 (0.1126) | 2.870 (0.1130) | 2.880 (0.1134) | 2.890 (0.1138) | 2.900 (0.1142) | 2.910 (0.1146) | 2.920 (0.1150) | 2.930 (0.1154) | 2.940 (0.1157) | 2.950 (0.1161) | 2.960 (0.1166) | 2.970 (0.1169) | 2.980 (0.1173) | 2.990 (0.1177) | 3.000 (0.1181) | 3.010 (0.1185) | 3.020 (0.1189) | 3.030 (0.1193) | 3.040 (0.1197) | 3.050 (0.1201) | 3.060 (0.1205) | 3.070 (0.1209) | 3.080 (0.1213) | 3.090 (0.1217) | 3.100 (0.1220) | 3.140 (0.1236) | 3.120 (0.1228) | 3.140 (0.1236) | 3.150 (0.1240) | 3.160 (0.1244) | 3.180 (0.1252) | 3.200 (0.1260) | 3.220 (0.1268) | 3.240 (0.1276) | 3.260 (0.1280) | 3.260 (0.1283) | 3.280 (0.1291) | 3.300 (0.1299) |
|---|---|---

Brought to you by BirfMark






New shim thickness mm (in.)

| Shim No | Thickness | Shim No | Thickness |
|---|---|---|---|
| 1 | 2.500 (0.0984) | 10 | 2.950 (0.1161) |
| 2 | 2.550 (0.1004) | 11 | 3.000 (0.1181) |
| 3 | 2.600 (0.1024) | 12 | 3.050 (0.1201) |
| 4 | 2.650 (0.1043) | 13 | 3.100 (0.1220) |
| 5 | 2.700 (0.1063) | 14 | 3.150 (0.1240) |
| 6 | 2.750 (0.1083) | 15 | 3.200 (0.1260) |
| 7 | 2.800 (0.1102) | 16 | 3.250 (0.1280) |
| 8 | 2.850 (0.1122) | 17 | 3.300 (0.1299) |
| 9 | 2.900 (0.1142) | | |

**Exhaust valve clearance (Cold):**
**0.25 – 0.35 mm (0.010 – 0.014 in.)**
EXAMPLE
The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

HINT: New shims have the thickness in millimeter imprinted on the face.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# IGNITION TIMING

EM0KT 06

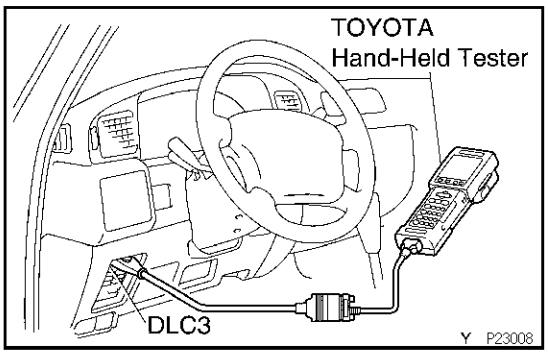
## INSPECTION

**1. WARM UP ENGINE**

Allow the engine to warm up to normal operating temperature

**2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

(a) Remove the fuse cover on the instrument panel




(b) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3

(c) Please refer to the TOYOTA hand–held tester or OBD II scan tool operator's manual for further details

**3. CONNECT TIMING LIGHT TO ENGINE**

**4. CHECK IDLE SPEED**

(a) Race the engine speed at 2,500 rpm for approx 90 seconds

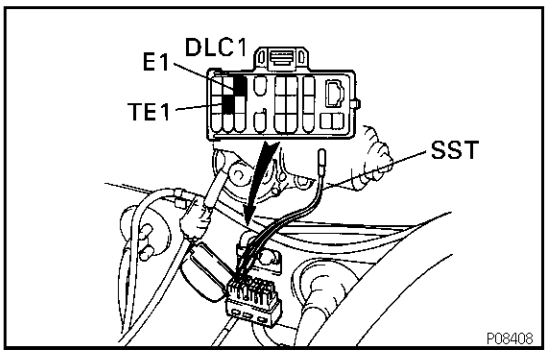
(b) Check the idle speed

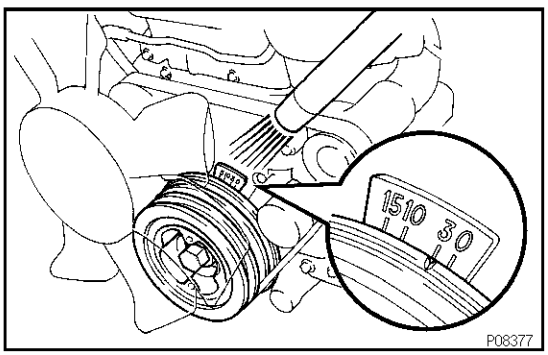
**Idle speed: 650 ± 50 rpm**

**5. INSPECT AND ADJUST IGNITION TIMING**

(a) Using SST, connect terminals TE1 and E1 of the DLC1

SST 09843–18020




(b) Using a timing light, check the ignition timing

**Ignition timing: 3° BTDC @ idle**

**(Transmission in neutral position and A/C OFF)**

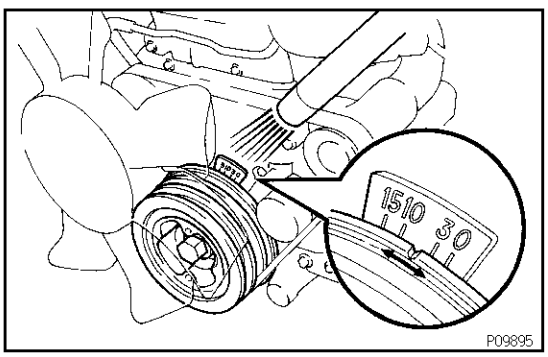
(c) Loosen the hold–down bolt, and adjust by turning the distributor

(d) Tighten the hold–down bolt, and recheck the ignition timing

**Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)**

(e) Remove the SST from the DLC1

SST 09843–18020




**6. FURTHER CHECK IGNITION TIMING**

**Ignition timing: 2 – 13° BTDC @ idle**

**(Transmission in neutral position and A/C OFF)**

HINT

The timing mark moves in a range between 2° and 13°

**7. DISCONNECT TIMING LIGHT FROM ENGINE**

**8. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# IDLE SPEED

EM0KU 05

## INSPECTION

**1. INITIAL CONDITIONS**

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT

All vacuum hoses for EGR system, etc should be properly connected

(f) SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Air conditioning switched OFF

**2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL (See page EM–10)**

**3. INSPECT IDLE SPEED**

(a) Race the engine speed at 2,500 rpm for approx 90 seconds
(b) Check the idle speed

**Idle speed: 650 ± 50 rpm**

If the idle speed is not as specified, check the IAC valve

**4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

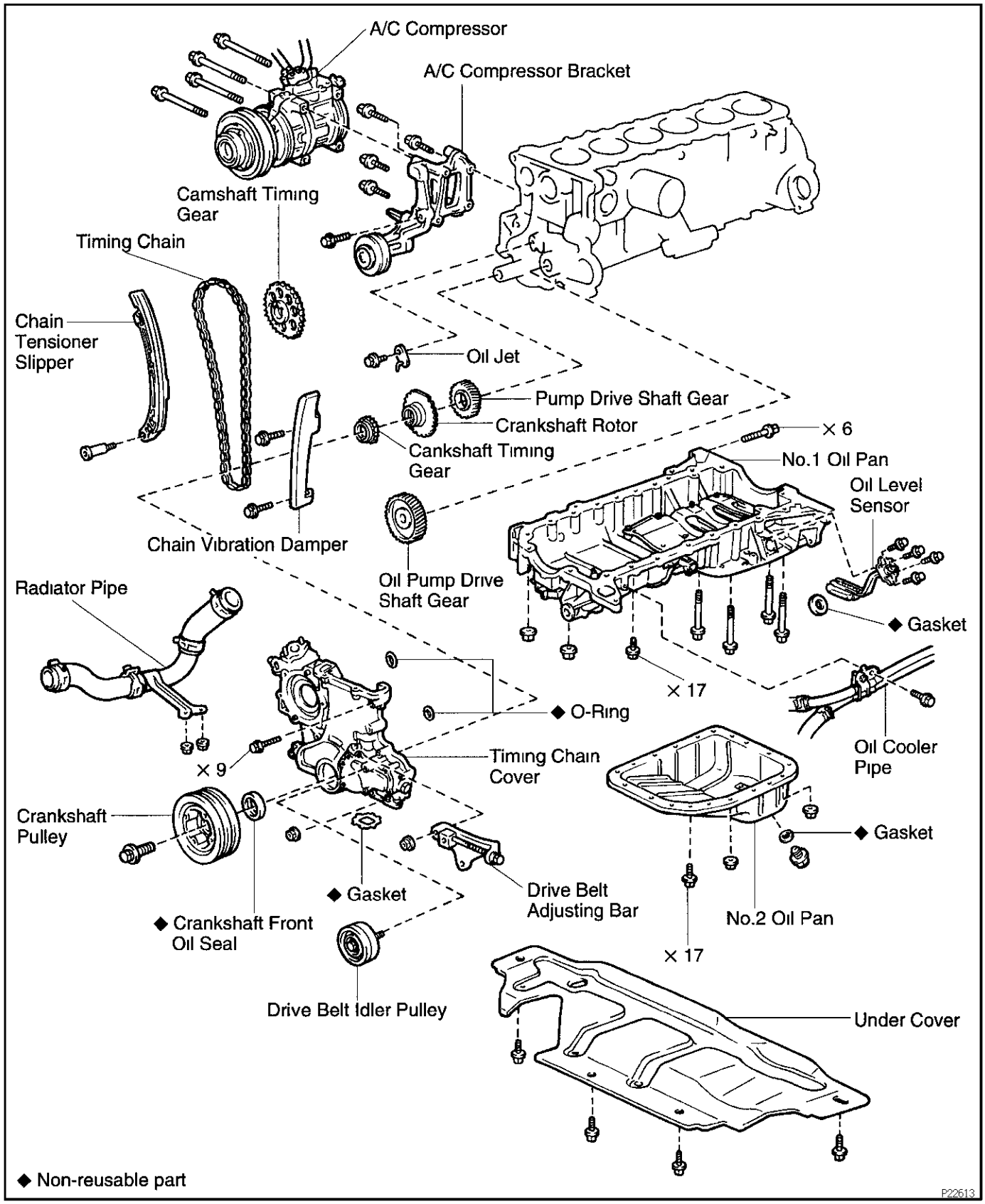
Brought to you by BirfMark



# TIMING CHAIN

## COMPONENTS

EM1EB 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

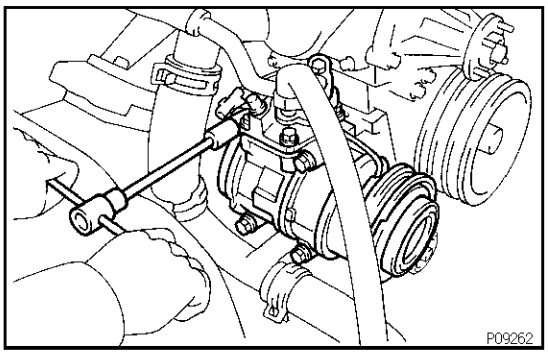
Brought to you by BirfMark



EM1E9 01

# REMOVAL

1. **DRAIN ENGINE OIL**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE ENGINE UNDER COVER**
4. **REMOVE RADIATOR (See page CO–14)**



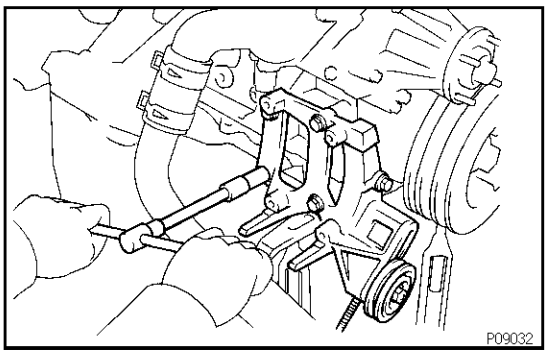

5. **DISCONNECT A/C COMPRESSOR AND BRACKET**

(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt

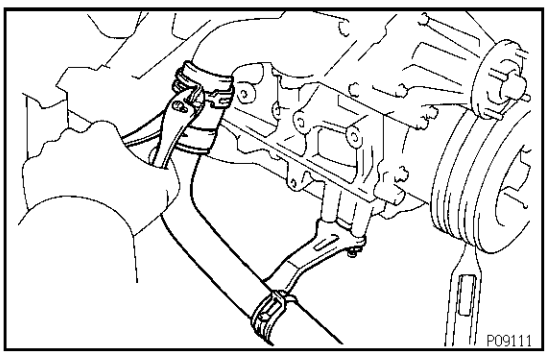
(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket

HINT

Put aside the compressor, and suspend it



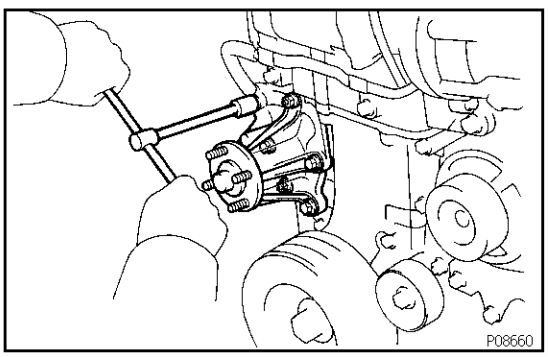

(c) Remove the 5 bolts and A/C compressor bracket




6. **REMOVE RADIATOR PIPE**

(a) Disconnect the No 2 radiator hose from the water inlet

(b) Remove the 2 nuts and radiator pipe




7. **REMOVE WATER PUMP**

Remove the 4 bolts, 2 nuts, water pump and gasket

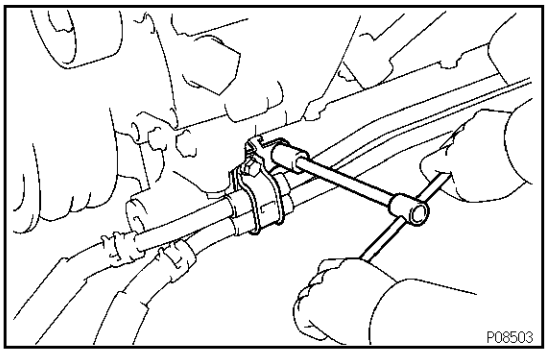
8. **REMOVE CYLINDER HEAD (See page EM–28)**



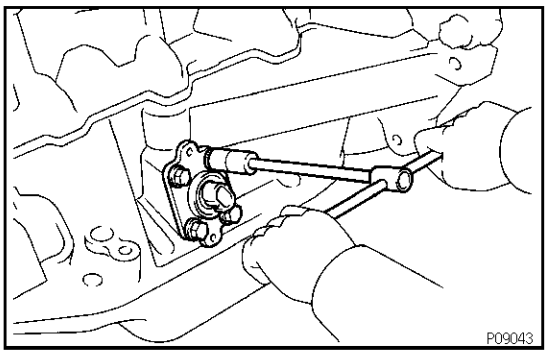
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





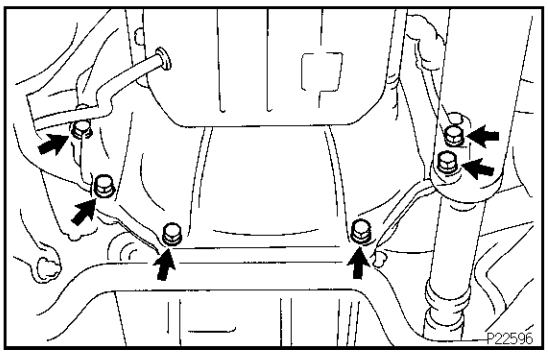

**9. DISCONNECT OIL COOLER PIPE BRACKET FROM NO. 1 OIL PAN**




**10. REMOVE OIL LEVEL SENSOR**

(a) Remove the 4 bolts and level sensor

(b) Remove the gasket from the level sensor

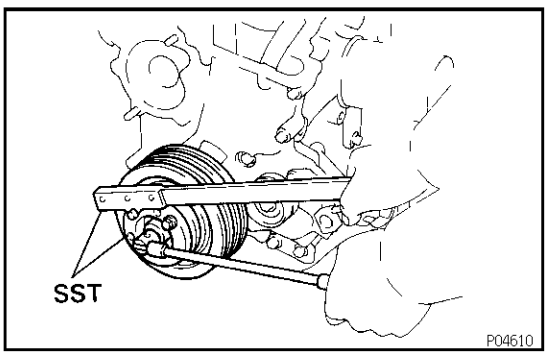



**11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING**

Remove the 6 bolts

**12. REMOVE NO. 2 OIL PAN (See page LU–5)**

**13. REMOVE NO. 1 OIL PAN (See page LU–5)**

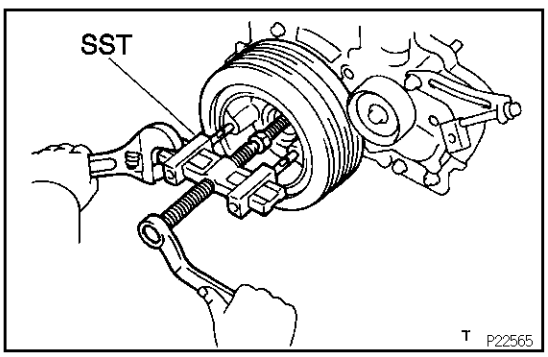



**14. REMOVE CRANKSHAFT PULLEY**

(a) Using SST, remove the pulley bolt

SST 09213–58012, 09330–00021

(b) Remove the crankshaft pulley




HINT

If necessary, remove the pulley with SST

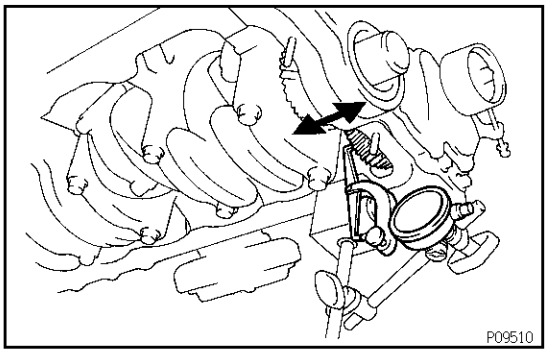
SST 09950–50010 (09951–05010, 09952–05010, 09953–05010, 09953–05020, 09954–05020)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



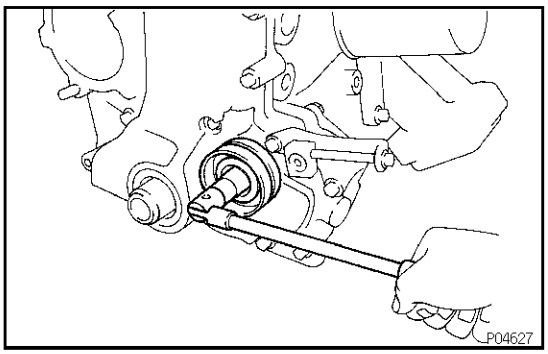



**15. CHECK THRUST CLEARANCE OF OIL PUMP DRIVE SHAFT GEAR**

Using a dial indicator with lever type attachment, measure the thrust clearance

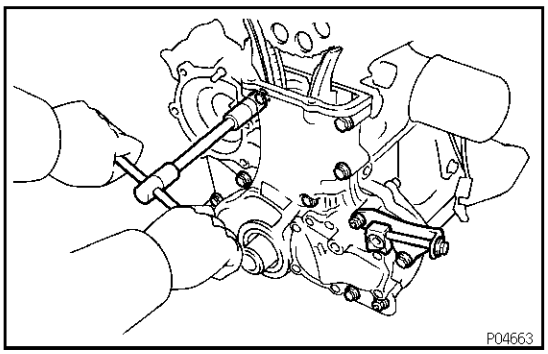
**Standard thrust clearance:**
**0.040 – 0.160 mm (0.0016 – 0.0063 in.)**
**Maximum thrust clearance: 0.30 mm (0.0118 in.)**

If the thrust clearance is greater than maximum, replace the oil pump drive shaft gear and/or timing chain cover



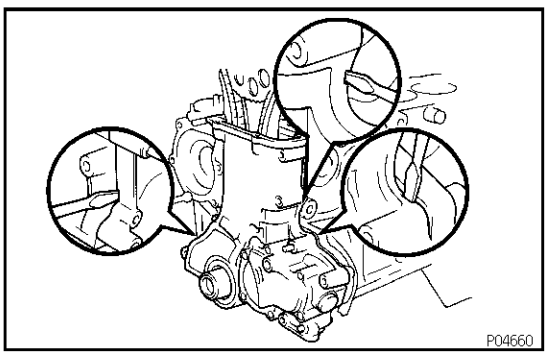

**16. REMOVE DRIVE BELT IDLER PULLEY**

Remove the bolt and idler pulley




**17. REMOVE TIMING CHAIN COVER**

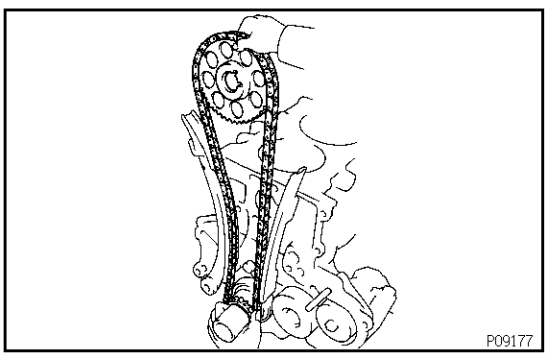
(a) Remove the 9 mounting bolts, 2 mounting nuts and drive belt adjusting bar




(b) Remove the oil pump by prying the portions between the cylinder block and oil pump with a screwdriver

**NOTICE:**
**Be careful not to damage the contact surfaces of the cylinder block and oil pump.**

(c) Remove the O–rings from the oil pump
(d) Remove the gasket from the oil pump



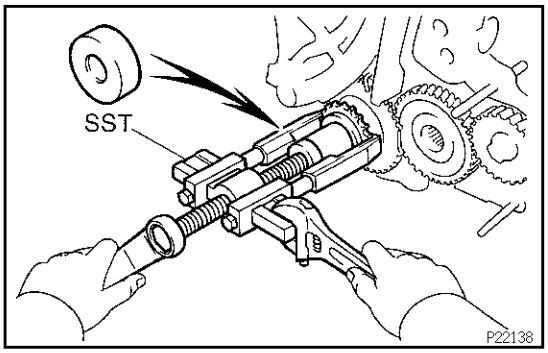

**18. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



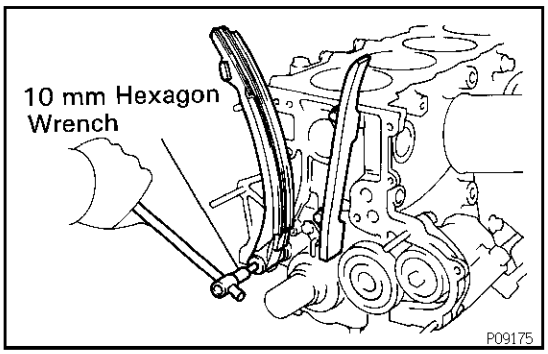



**19. REMOVE CRANKSHAFT TIMING GEAR**

HINT

If necessary, remove the gear with SST

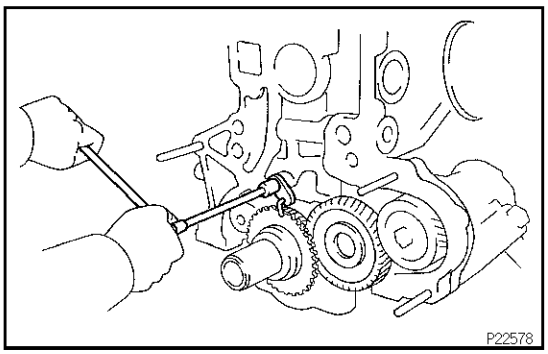
SST 09950-40010 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04060), 09950-60010 (09951-00350)




**20. REMOVE CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER**

(a) Using a 10 mm hexagon wrench, remove the bolt and slipper

(b) Remove the 2 bolts and damper

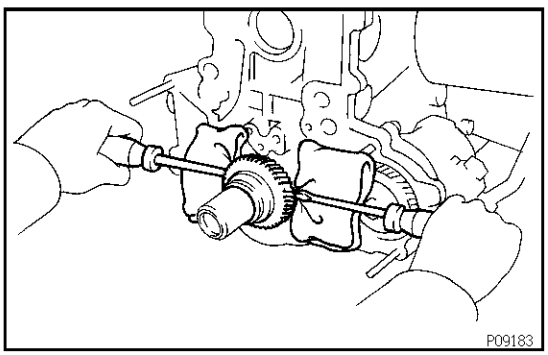



**21. REMOVE OIL JET**

Remove the bolt and oil jet

**22. REMOVE CRANKSHAFT ROTOR**

**23. REMOVE OIL PUMP DRIVE SHAFT GEAR**




**24. REMOVE PUMP DRIVE SHAFT GEAR**

If the pump drive shaft gear cannot be removed by hand, use 2 screwdrivers

**NOTICE:**

**Position shop rags as shown to prevent damage.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

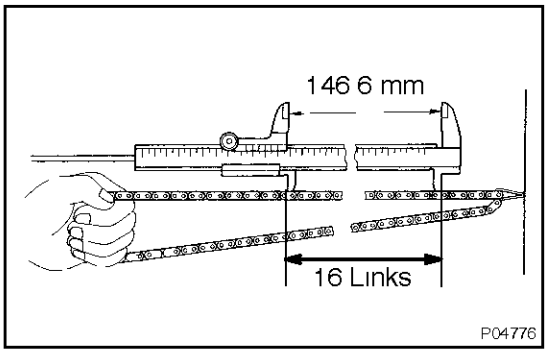
Brought to you by BirfMark



EM1EA-01

# INSPECTION

## 1. INSPECT TIMING CHAIN AND TIMING GEARS



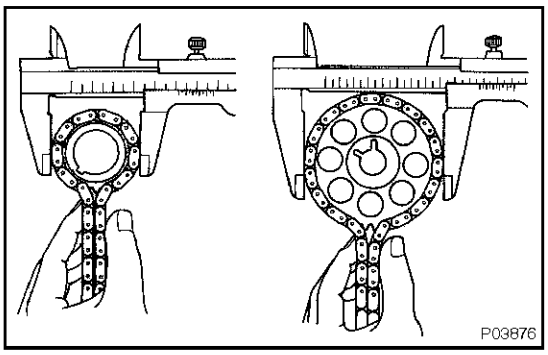

(a) Measure the length of 16 links with the chain fully stretched

**Maximum chain elongation: 146.6 mm (5.772 in.)**

If the elongation is greater than maximum, replace the chain

HINT

Make the same measurements pulling at 3 or more places selected at random




(b) Wrap the chain around the timing gear

(c) Using vernier calipers, measure the timing gear diameter with the chain

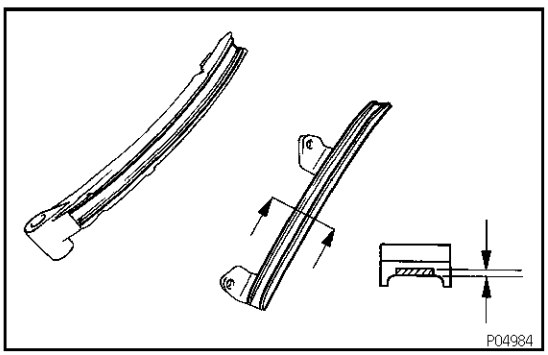
**NOTICE:**

**Vernier calipers must contact the chain rollers for measuring.**

**Minimum gear diameter (w/Chain):**

| | |
|---|---|
| Camshaft | 126 0 mm (4 961 in ) |
| Crankshaft | 65 4 mm (2 575 in ) |

If the diameter is less than minimum, replace the chain and gears

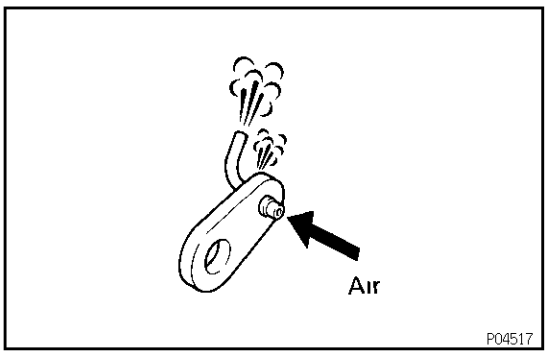



## 2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

Measure the chain tensioner slipper and vibration damper wears

**Maximum wear: 1.0 mm (0.039 in.)**

If the wear is greater than maximum, replace the slipper and/or damper




## 3. INSPECT OIL JET

Check the oil jet for damage or clogging

If necessary, replace the oil jet



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1C5-01

# REPLACEMENT

## REPLACE CRANKSHAFT FRONT OIL SEAL (See page EM–99)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

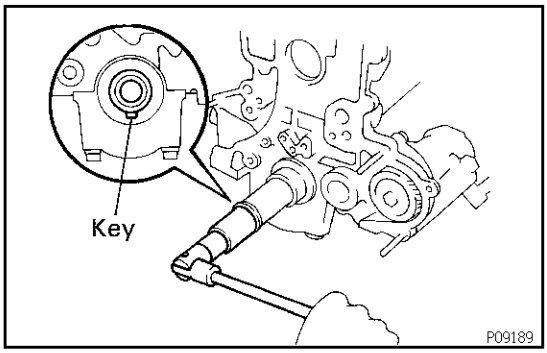


EM1EB-01

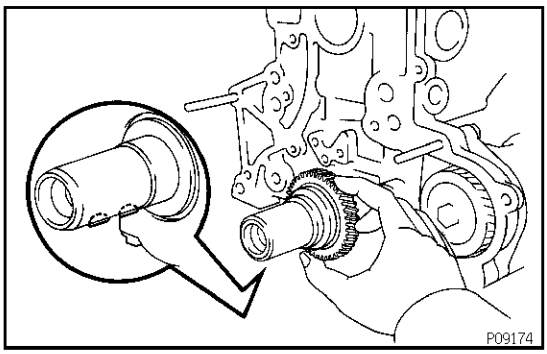
# INSTALLATION

## 1. SET CRANKSHAFT

Turn the crankshaft until the set key on crankshaft facing downward



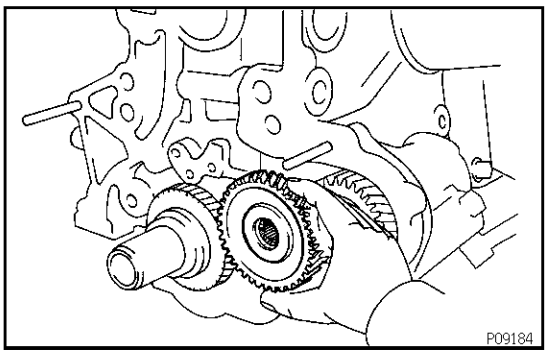

## 2. INSTALL PUMP DRIVE SHAFT GEAR




## 3. INSTALL OIL PUMP DRIVE SHAFT GEAR

(a) Apply a light coat of engine oil on the shaft portion of the gear

(b) Install the gear

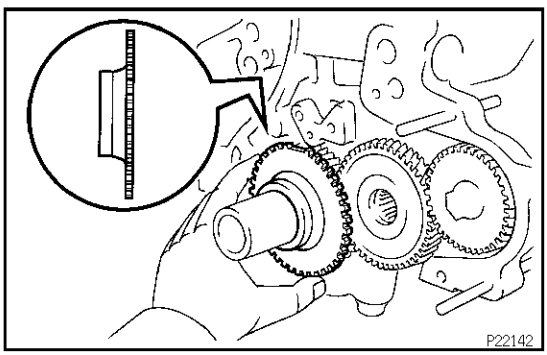



## 4. INSTALL CRANKSHAFT ROTOR

## 5. INSTALL OIL JET

Install the oil jet with the bolt

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**



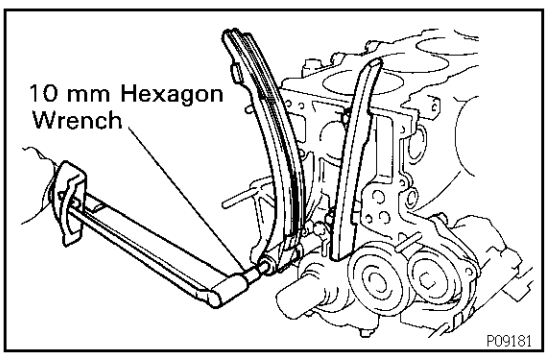

## 6. INSTALL CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

(a) Install the damper with the 2 bolts

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

(b) Using a 10 mm hexagon wrench, install the slipper with the bolt

**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**

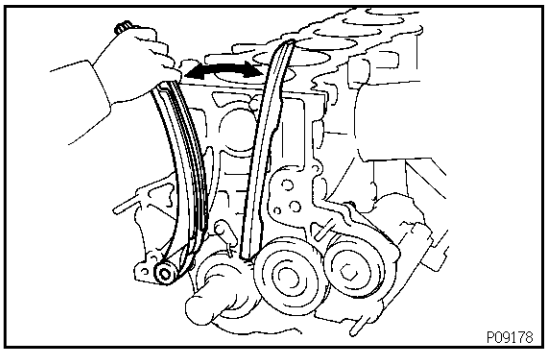




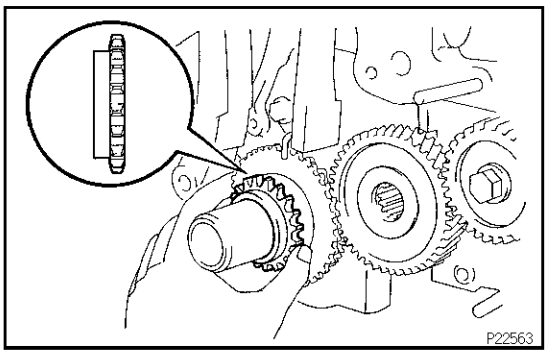

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





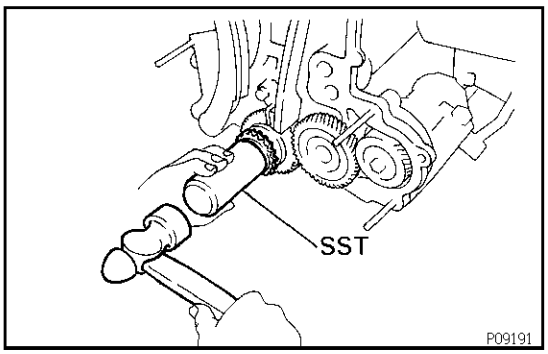

(c) Check that the slipper moves smoothly




**7. INSTALL CRANKSHAFT TIMING GEAR**

**NOTICE:**

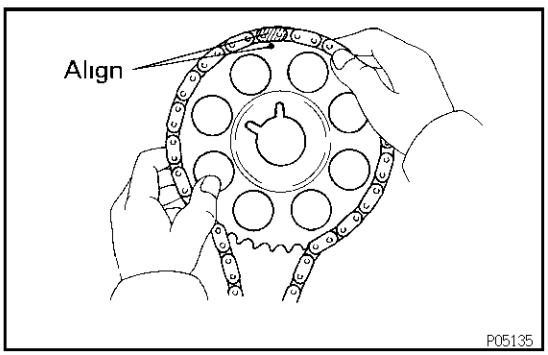
**Be careful of the installation direction.**




HINT

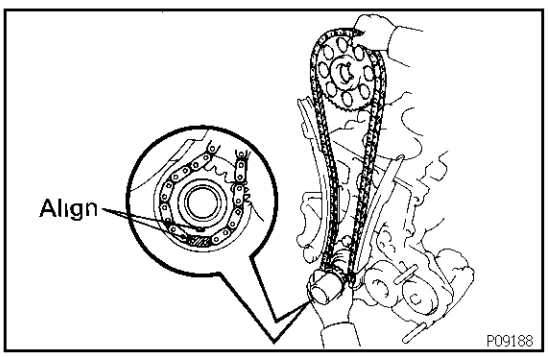
If necessary, install the gear with SST

SST 09636–20010




**8. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR**

(a) Install the timing chain on the camshaft timing gear with the bright link aligned with the timing mark on the camshaft timing gear



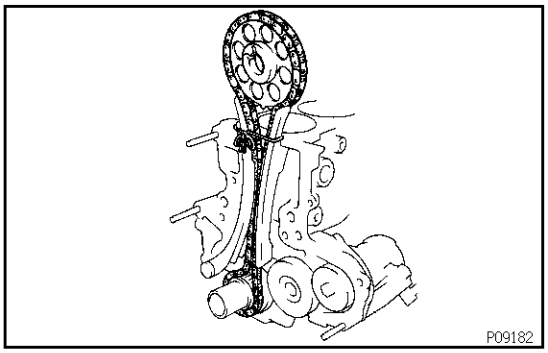

(b) Install the timing chain on the crankshaft timing gear with the other bright link aligned with the timing mark on the crankshaft timing gear



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



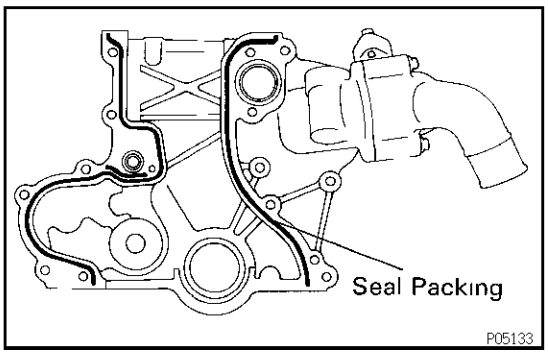



(c) Tie the timing chain with a cord as shown in the illustration and make sure it doesn't come loose

**9. INSTALL TIMING CHAIN COVER**

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover and cylinder block

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves
- Thoroughly clean all components to remove all the loose material
- Using a non–residue solvent, clean both sealing surfaces




(b) Apply seal packing to the timing chain cover as shown in the illustration

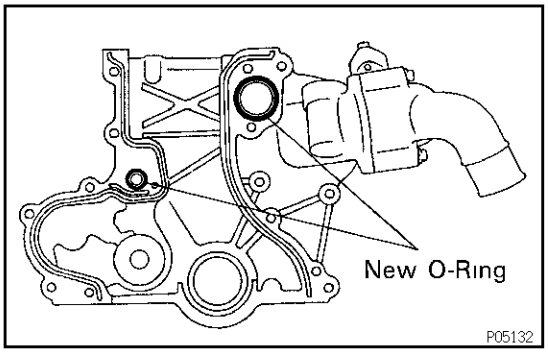
**Seal packing: Part No. 08826–00080 or equivalent**

- Install a nozzle that has been cut to a 2 – 3 mm (0 08 – 0 12 in ) opening

HINT

Avoid applying an excessive amount to the surface

- Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap



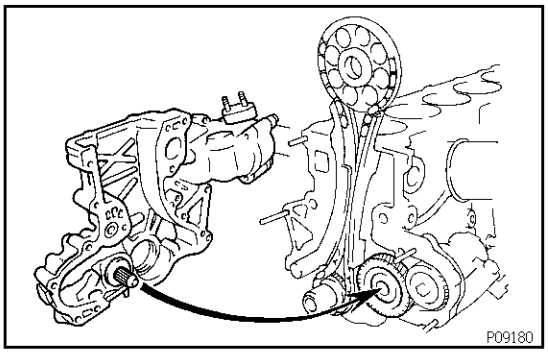

(c) Place 2 new O–rings in position on the timing chain cover



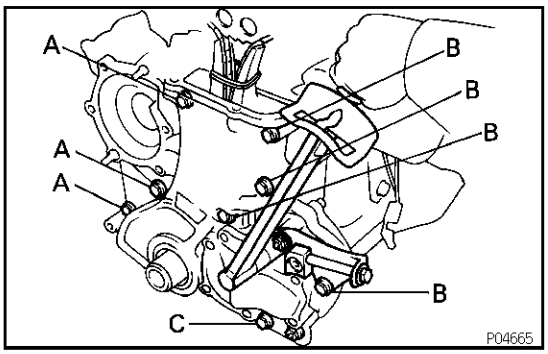
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Engage the gear of the oil pump drive rotor with the gear of the oil pump drive gear, and install the oil pump




(e) Install the oil pump and drive belt adjusting bar with the 9 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

HINT

Each bolt length is indicated in the illustration

Bolt A 30 mm (1 18 in )

Bolt B 50 mm (1 97 in )

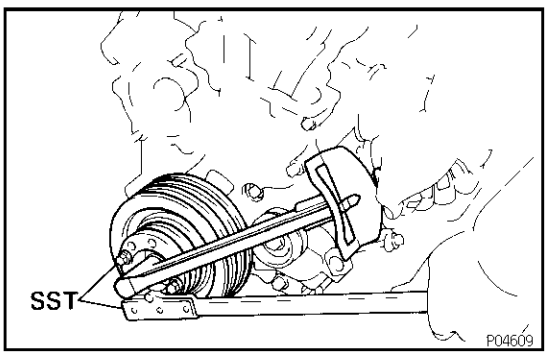
Bolt C 60 mm (2 38 in )

(f) Remove the cord from the chain

**10. INSTALL DRIVE BELT IDLER PULLEY**

Install the pulley with the bolt

**Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)**




**11. INSTALL CRANKSHAFT PULLEY**

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley

(b) Using SST, install and torque the pulley bolt

SST 09213–58012, 09330–00021

**Torque: 412 N·m (4,200 kgf·cm, 304 ft·lbf)**

**12. INSTALL NO. 1 OIL PAN (See page LU–12)**

**13. INSTALL NO. 2 OIL PAN (See page LU–12)**

**14. INSTALL BOLTS HOLDING NO. 1 OIL PAN TO TRANSMISSION HOUSING**

Install the 6 bolts

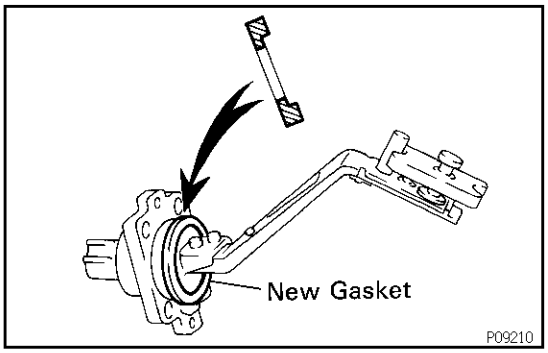
**Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





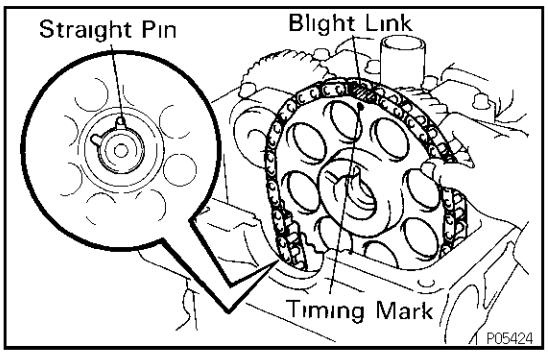

**15. INSTALL OIL LEVEL SENSOR**

(a) Install a new gasket to the level sensor

(b) Install the level sensor with the 4 bolts

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**16. CONNECT OIL COOLER PIPE BRACKET TO NO. 1 OIL PAN**




**17. INSTALL CYLINDER HEAD (See page EM–54)**

**NOTICE:**

**However, for the installation of the camshaft timing gear and timing chain, follow the below procedure. Align the blight link of the timing chain and camshaft timing gear mark, and install them to the camshaft.**

**18. INSTALL WATER PUMP**

Install a new gasket and water pump with the 4 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**19. INSTALL RADIATOR PIPE**

(a) Connect the No 2 radiator hose to the water inlet

(b) Install the 2 nuts holding the radiator pipe to the No 1 oil pan

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**20. INSTALL A/C COMPRESSOR AND BRACKET**

(a) Install the A/C compressor bracket with the 5 bolts

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

(b) Install the A/C compressor with the 4 bolts

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(c) Install and adjust the drive belt (See page CH–2)

**21. INSTALL RADIATOR (See page CO–16)**

**22. FILL ENGINE WITH OIL**

**23. INSTALL ENGINE UNDER COVER**

**24. START ENGINE AND CHECK FOR LEAKS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

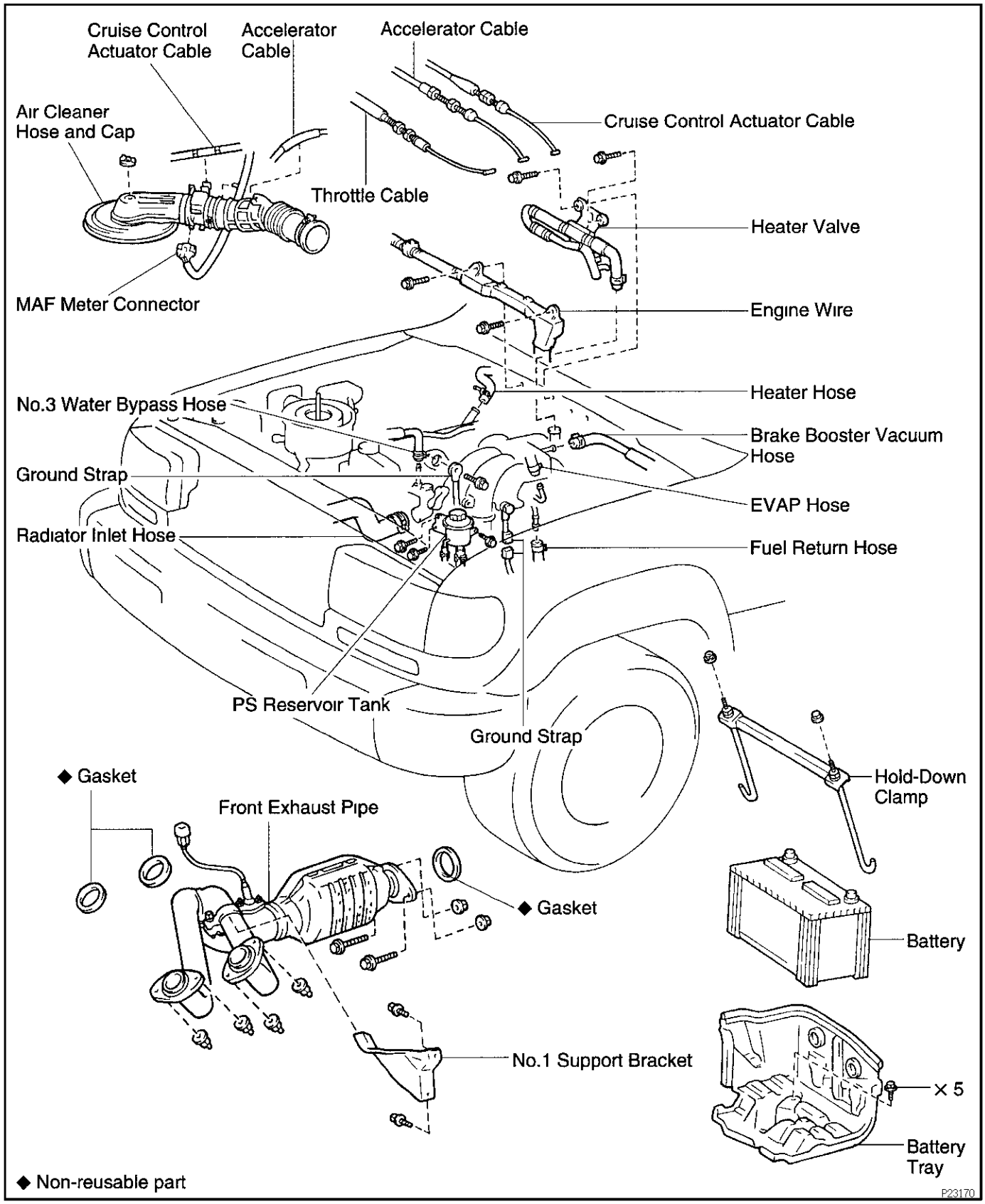
Brought to you by BirfMark



# CYLINDER HEAD

## COMPONENTS

EM1E2 01

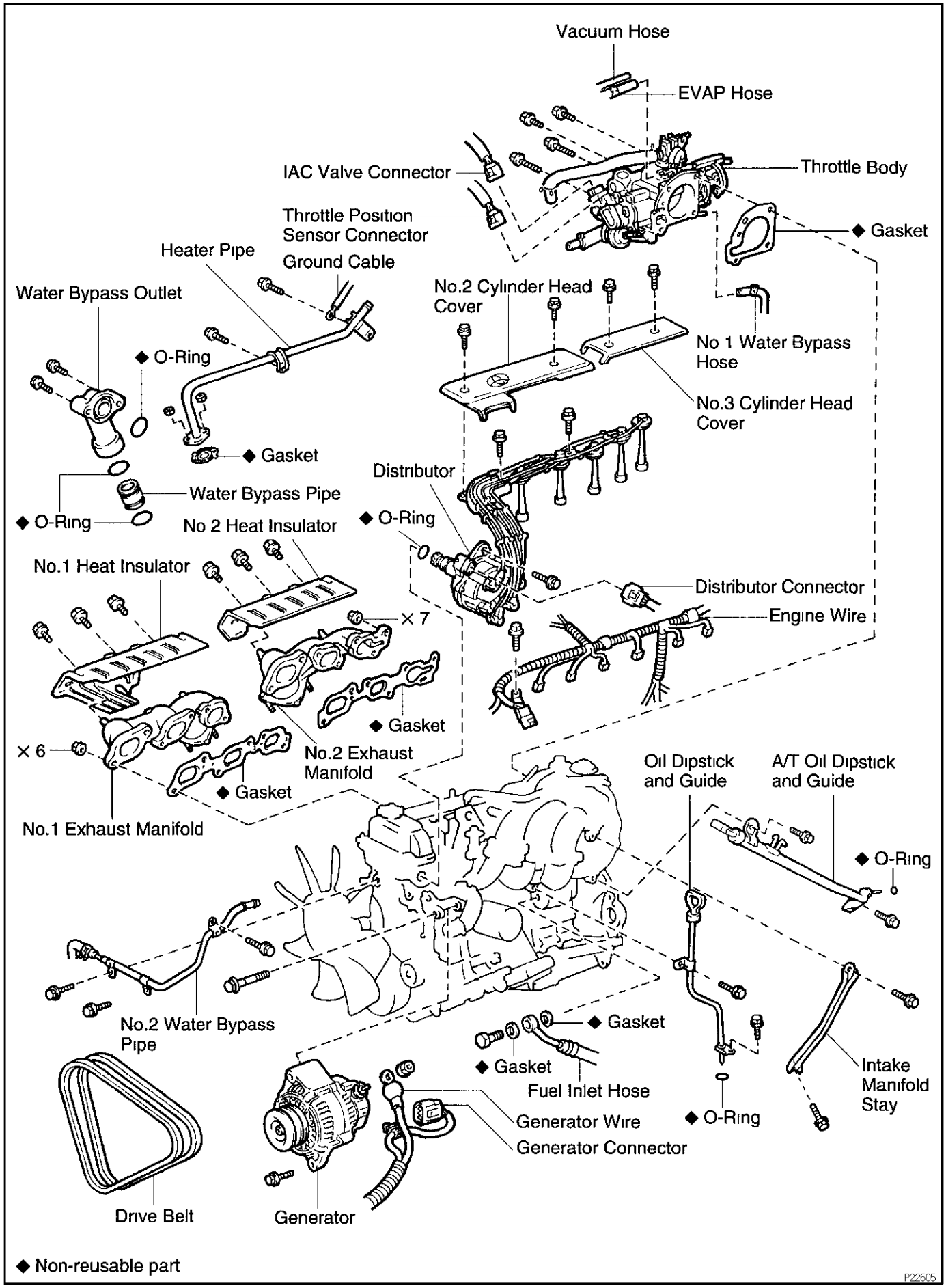





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





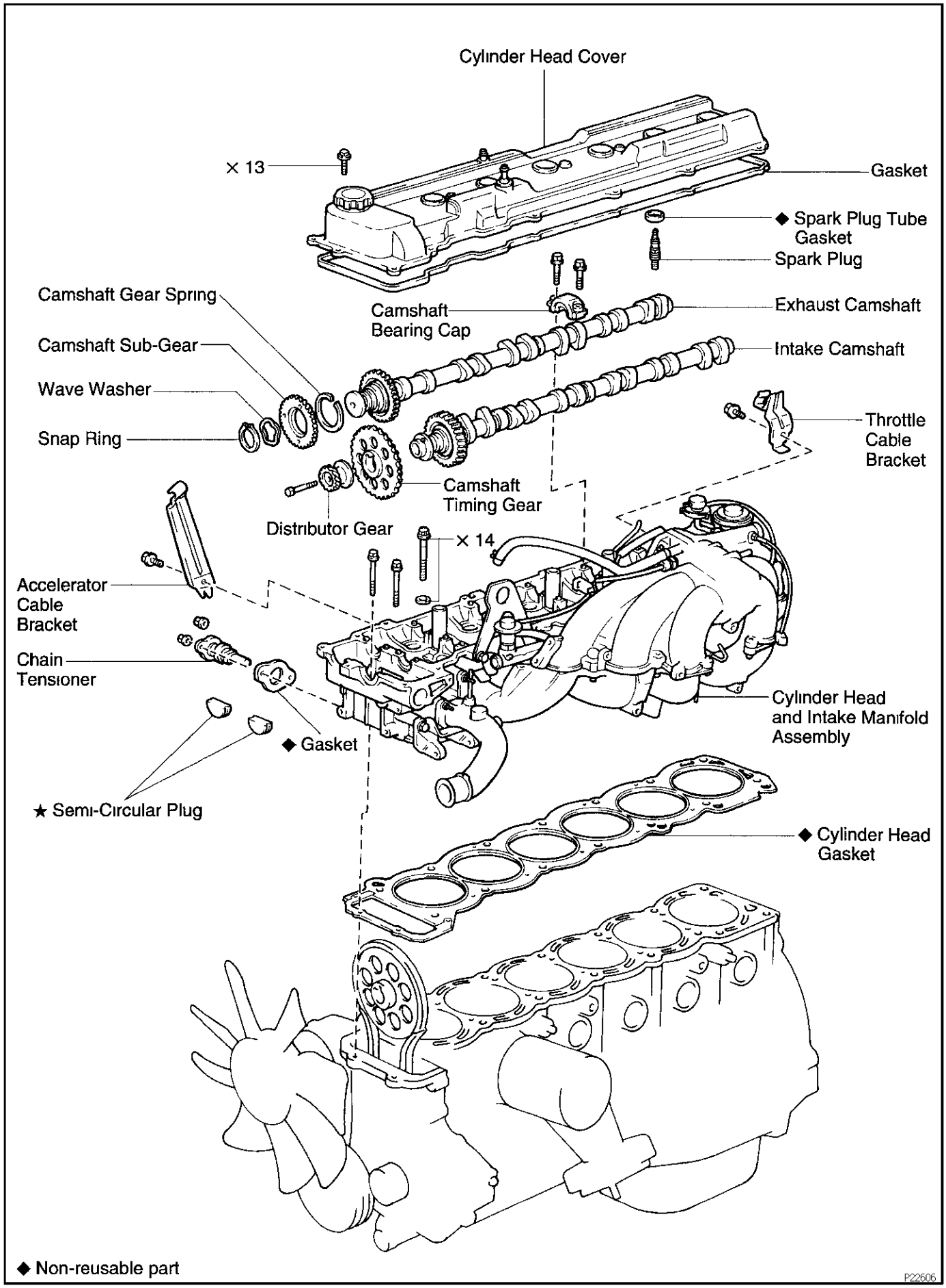

1996 LAND CRUISER (RM451U)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



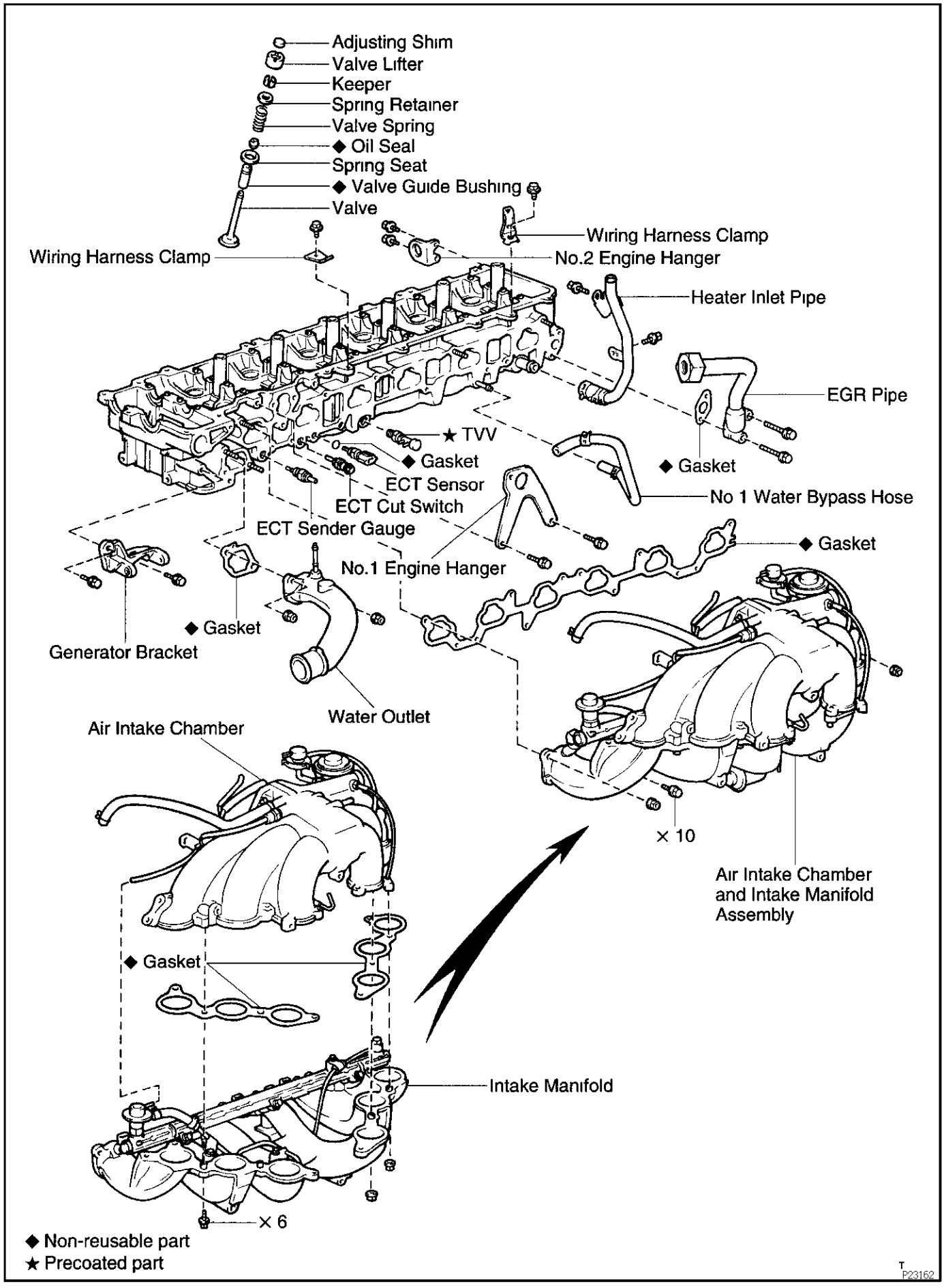





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





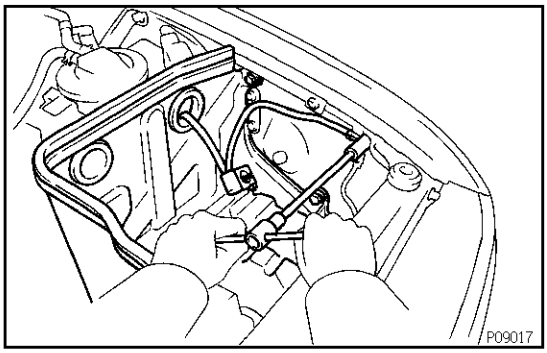



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1E3 01

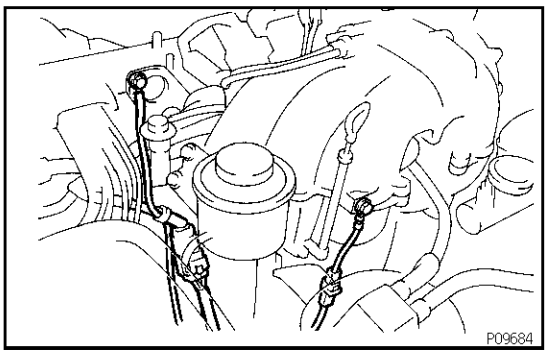



# REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **REMOVE BATTERY AND BATTERY TRAY**

(a) Disconnect the battery cables
(b) Remove the nuts, hold-down clamp and battery
(c) Remove the bolt and disconnect the ground strap
(d) Remove the 5 bolts and battery tray

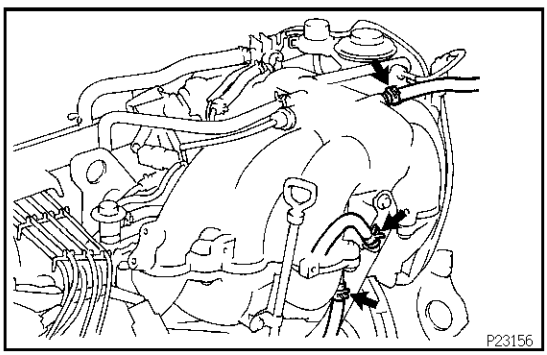
3. **REMOVE AIR CLEANER HOSE AND CAP**
4. **DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY**
5. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY**
6. **DISCONNECT THROTTLE CABLE FROM THROTTLE BODY**



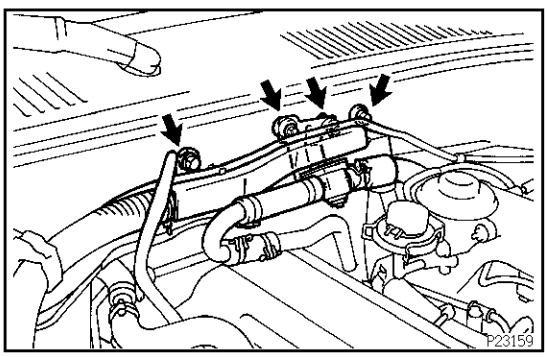

7. **DISCONNECT ENGINE GROUND STRAPS**

(a) Disconnect the ground strap from the No 1 engine hanger
(b) Disconnect the ground strap from the air intake chamber

8. **DISCONNECT CONNECTOR ON INTAKE MANIFOLD FROM LH FENDER APRON**




9. **DISCONNECT BRAKE BOOSTER VACUUM HOSE**
10. **DISCONNECT EVAP HOSE**
11. **DISCONNECT FUEL RETURN HOSE**
12. **DISCONNECT HEATER HOSES**




13. **DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL**

(a) Remove the 2 bolts and disconnect the engine wire and ground strap
(b) Remove the 2 bolts and disconnect the heater valve

14. **REMOVE NO. 2 AND NO. 3 CYLINDER HEAD COVERS**

Remove the 4 bolts and head covers

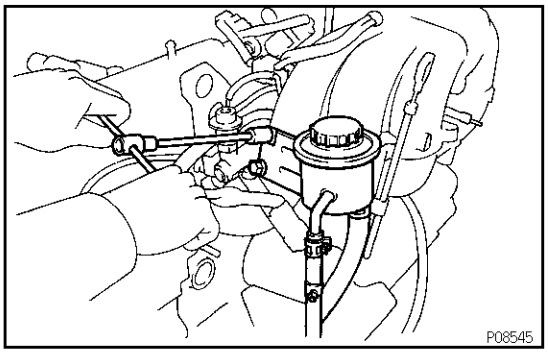
15. **REMOVE DISTRIBUTOR (See page IG-10)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

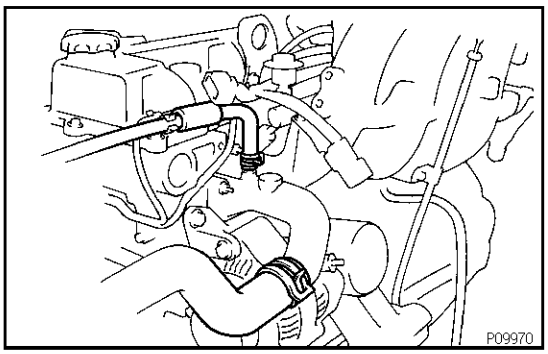
Brought to you by BirfMark






**16. DISCONNECT PS RESERVOIR TANK**

Remove the 3 bolts and disconnect the reservoir tank

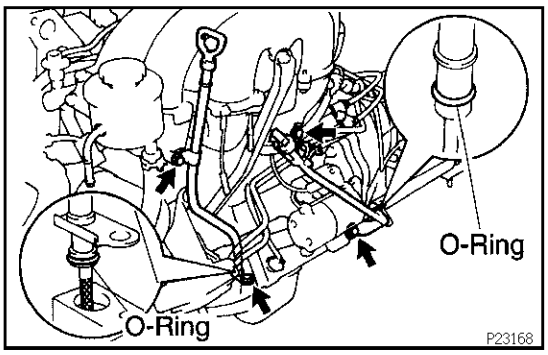



**17. DISCONNECT RADIATOR INLET HOSE**

**18. DISCONNECT NO. 3 WATER BYPASS HOSE**

**19. REMOVE GENERATOR (See page CH–8)**

**20. REMOVE THROTTLE BODY (See page SF–45)**




**21. REMOVE OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION**

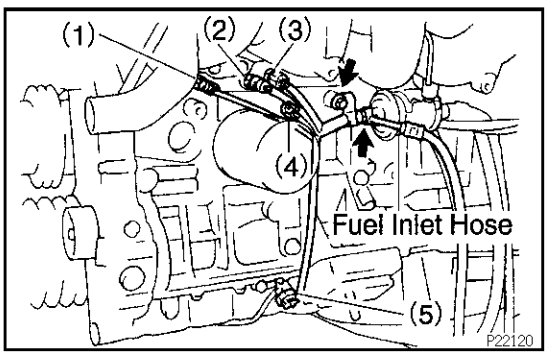
(a) Remove the 2 mounting bolts

(b) Pull out the dipstick together with dipstick guide

(c) Remove the O–ring from the dipstick guide

**22. REMOVE INTAKE MANIFOLD STAY**

Remove the 2 bolts and intake manifold stay




**23. DISCONNECT FUEL INLET HOSE**

Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter

**24. DISCONNECT ENGINE WIRE**

(a) Disconnect the connectors

(1) Disconnect the ECT sender gauge connector

(2) Disconnect the ECT cut switch connector

(3) Disconnect the ECT sensor connector

(4) Disconnect the knock sensor connector

(5) Disconnect the crankshaft position sensor connector

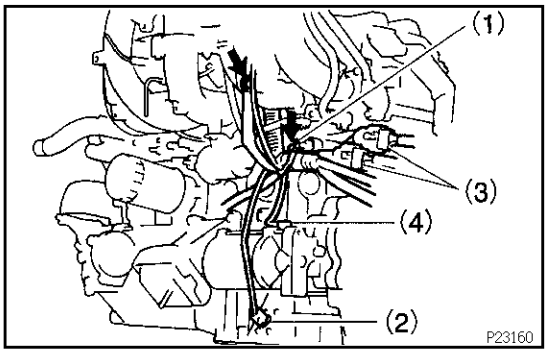
(6) Remove the bolt and disconnect the engine wire from the cylinder block



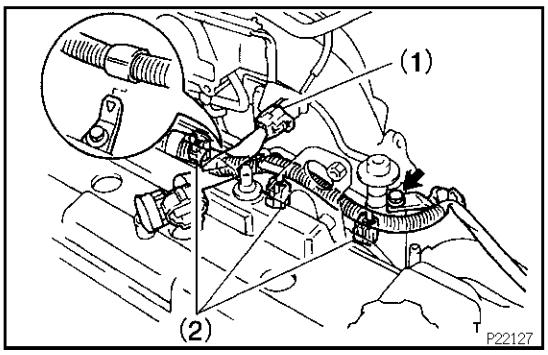
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

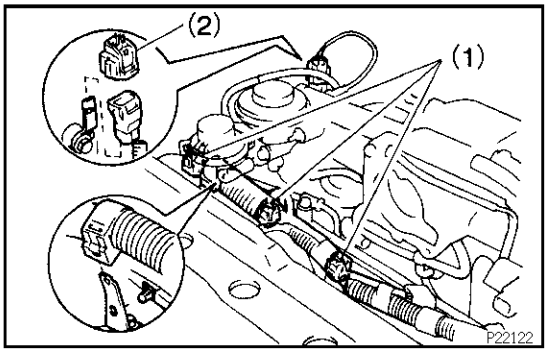




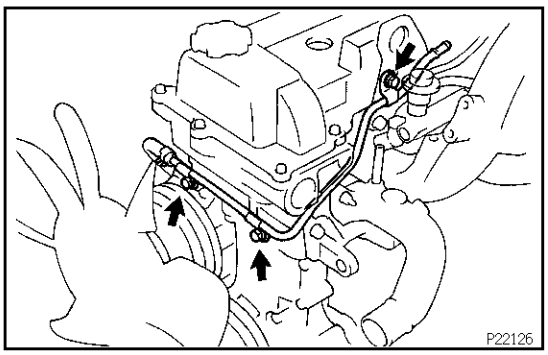

(b) Disconnect the connectors
  (1) Disconnect the knock sensor connector
  (2) Disconnect the oil level sensor connector
  (3) Disconnect the 2 connectors from the transmission
  (4) Disconnect the starter connector
(c) Disconnect the 2 heated oxygen sensor connectors
(d) Disconnect the PNP switch connector
(e) Remove the 2 bolts and disconnect the engine wire from the intake manifold and cylinder block
(f) Disconnect the PCV hose from the PCV valve
(g) Remove the bolt holding the engine wire to the intake manifold




(h) Disconnect the connectors
  (1) Disconnect the connector for the emission control valve set assembly
  (2) Disconnect the 3 injector connectors
(i) Disconnect the engine wire clamp




(j) Disconnect the engine wire clamp
(k) Disconnect the connectors
  (1) Disconnect the 3 injector connectors
  (2) Disconnect the EGR gas temp sensor connector
(l) Disconnect the clamp of the No 6 injector wire from the bracket
(m) Disconnect the engine wire from the cylinder head and intake manifold




**25. DISCONNECT NO. 2 WATER BYPASS PIPE**

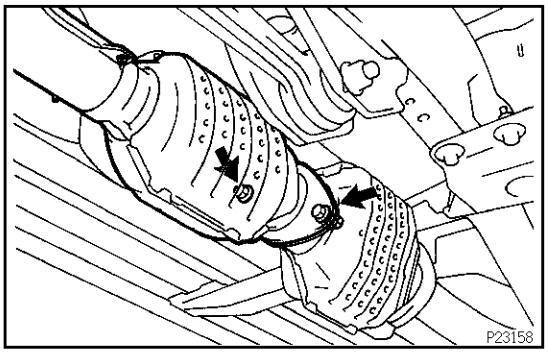
Remove the 3 bolts, and disconnect the bypass pipe from the cylinder head



Brought to you by BirfMark
Version 1.11 - 03/16/2010

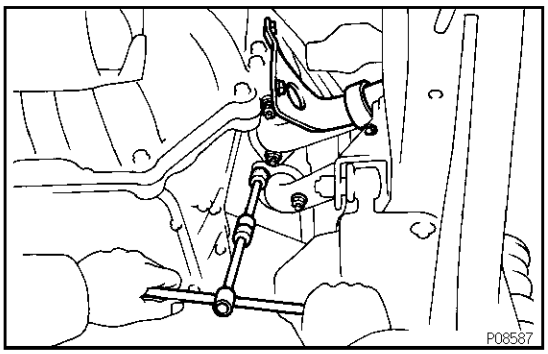
Brought to you by BirfMark



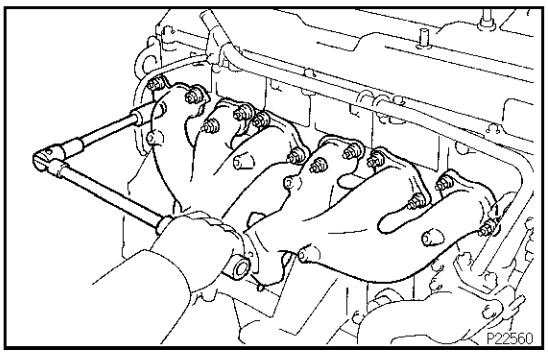



**26. REMOVE FRONT EXHAUST PIPE**

(a) Disconnect the heated oxygen sensor connector
(b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC
(c) Disconnect the front exhaust pipe, and remove the gasket

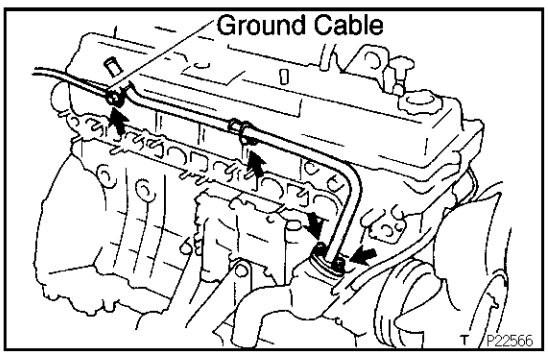



(d) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket
(e) Remove the 2 bolts and No 1 support bracket
(f) Remove the 4 nuts, front exhaust pipe and 2 gaskets



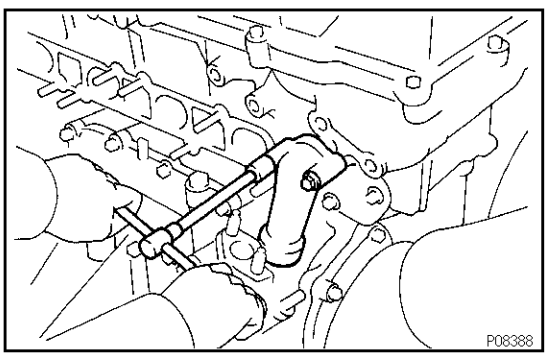

**27. REMOVE NO. 1 AND NO. 2 EXHAUST MANIFOLDS**

(a) Remove the 6 bolts, No 1 heat insulator and No 2 heat insulator
(b) Remove the 13 nuts, No 1 exhaust manifold, No 2 exhaust manifold and 2 gaskets




**28. REMOVE HEATER PIPE**

Remove the 2 bolts, 2 nuts, ground cable, heater pipe and gasket




**29. REMOVE WATER BYPASS OUTLET AND PIPE**

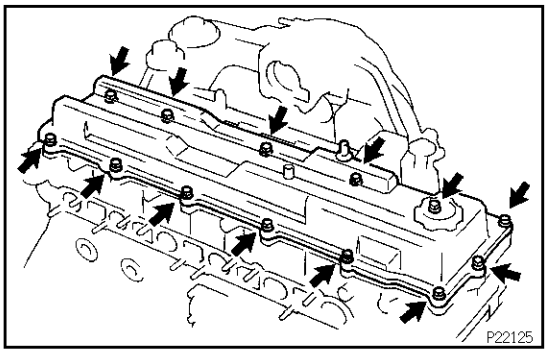
(a) Remove the 2 bolts and water bypass outlet and pipe
(b) Remove the 3 O–rings from the water bypass outlet and pipe



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

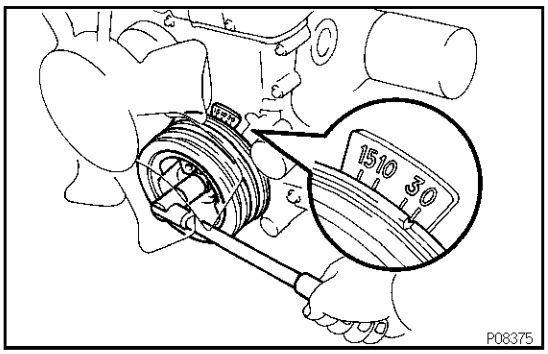





**30. REMOVE CYLINDER HEAD COVER**

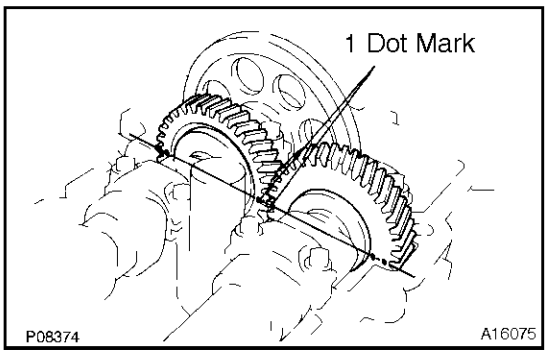
Remove the 13 bolts, cylinder head cover and gasket

**31. REMOVE SPARK PLUGS**




**32. SET NO. 1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley and align its groove with the "0" mark on the timing chain cover

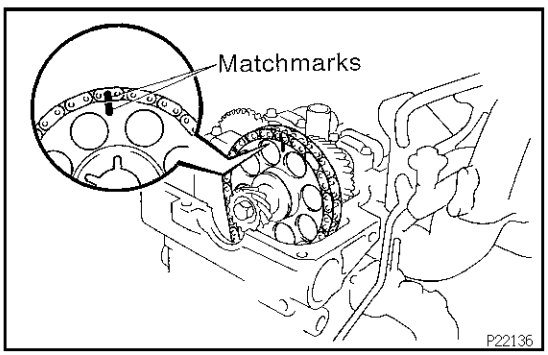



(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration

If not, turn the crankshaft 1 revolution (360°) and align the marks as above

**33. REMOVE CHAIN TENSIONER**

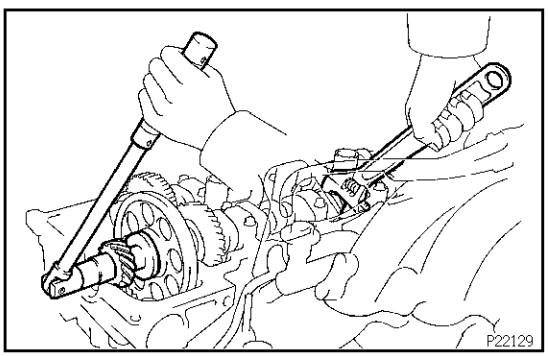
Remove the 2 nuts, chain tensioner and gasket




**34. REMOVE CAMSHAFT TIMING GEAR**

(a) Remove the semi-circular plug

(b) Place the matchmarks on the camshaft timing gear and timing chain



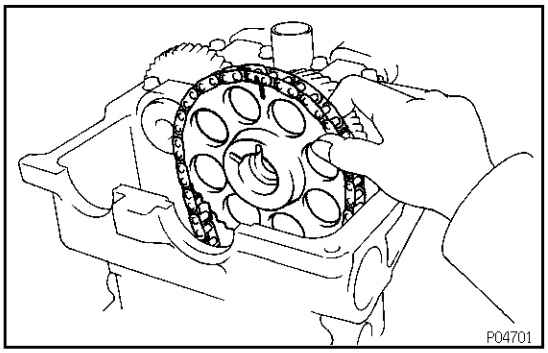

(c) Hold the intake camshaft with a wrench, remove the bolt and distributor gear



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper

**35. REMOVE CAMSHAFTS**

**NOTICE:**

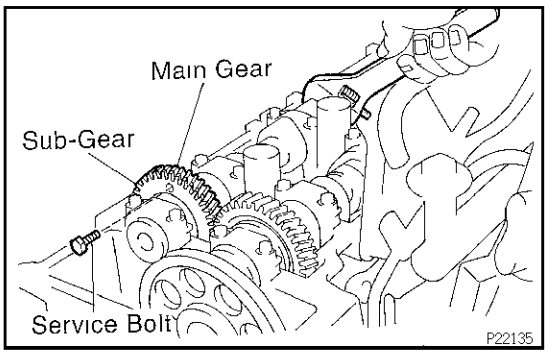
**Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.**

(a) Remove the exhaust camshaft

(1) Bring the service bolt hole of the driven sub–gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench

(2) Secure the exhaust camshaft sub–gear to the main gear with a service bolt

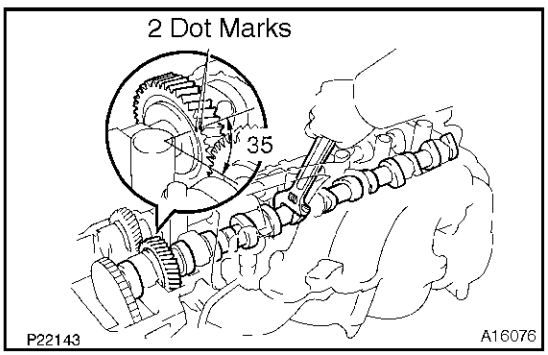
Recommended service bolt



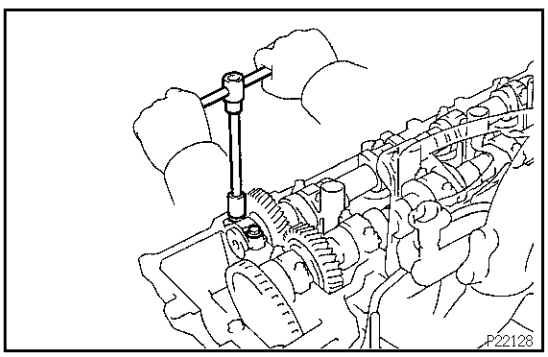

| | |
|---|---|
| Thread diameter | 6 mm |
| Thread pitch | 1 0 mm |
| Bolt length | 16 – 20 mm (0 63 – 0 79 in ) |

HINT

When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation




(3) Set the timing mark (2 dot marks) of the camshaft driven gear at approx 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench




(4) Lightly push the camshaft towards the rear without applying excessive force

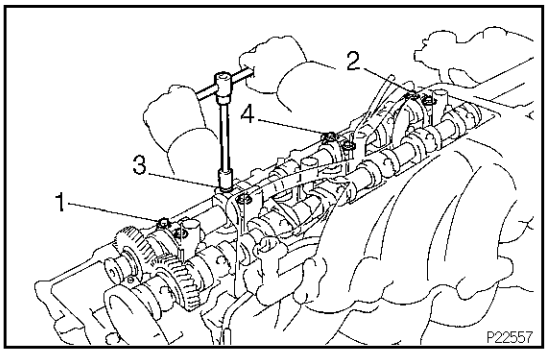
(5) Loosen and remove the No 1 bearing cap bolts, alternately loosening the left and right bolts uniformly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



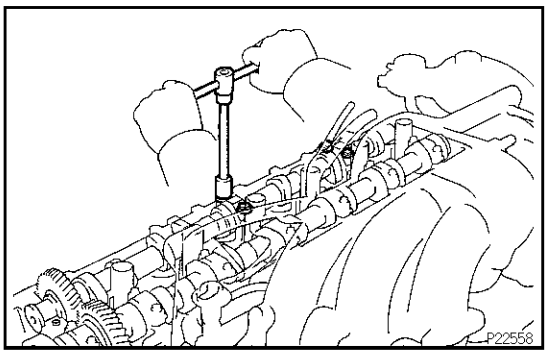



(6) Loosen and remove the No 2, No 3, No 5 and No 7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown

**NOTICE:**

**Do not remove the No. 4 and No. 6 bearing cap bolts at this stage.**

(7) Remove the 4 bearing caps




(8) Alternately and uniformly loosen and remove the No 4 and No 6 bearing cap bolts

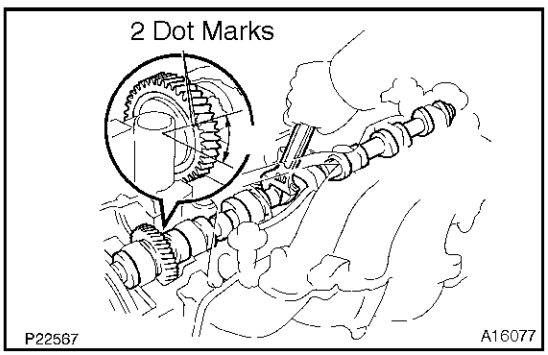
HINT

- As the 4 No 4 and No 6 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level
- If the camshaft is not being lifted out straight and level, retighten the 4 No 4 and No 6 bearing cap bolts Then reverse the order of above steps from (g) to (e) and repeat steps from (c) to (h) once again

**NOTICE:**

**Do not pry on or attempt to force the camshaft with a tool or other object.**

(9) Remove the 2 bearing caps and exhaust camshaft

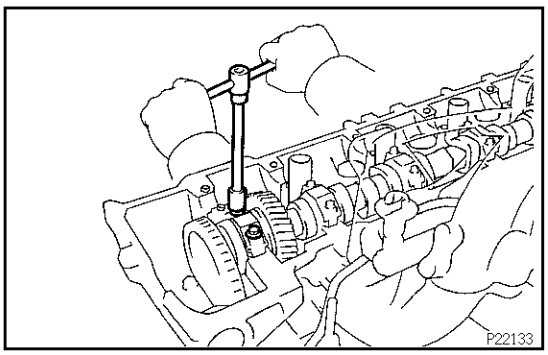



(b) Remove the intake camshaft

(1) Set the timing mark (2 dot marks) of the camshaft drive gear at approx 25° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench

HINT

The above angle arrows the No 1 and No 4 cylinder cam lobes of the intake camshaft to push their valve lifters evenly




(2) Lightly push the intake camshaft towards the front without applying excessive force

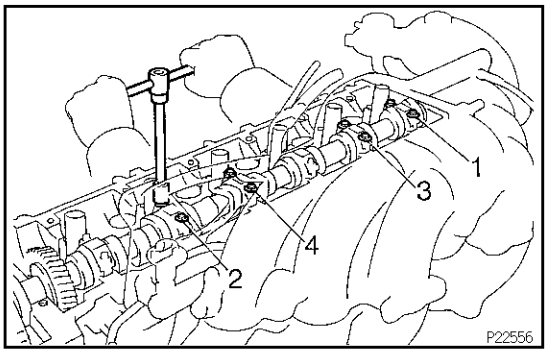
(3) Loosen and remove the No 1 bearing cap bolts, alternately loosening the left and right bolts uniformly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



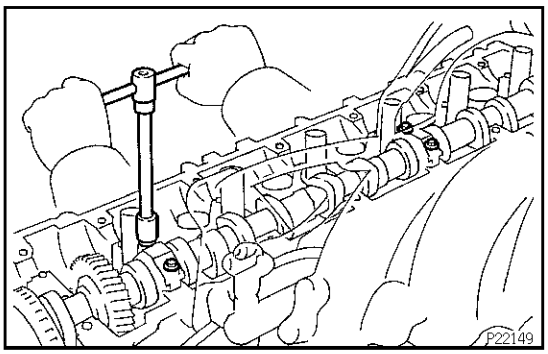



(4) Loosen and remove the No 3, No 4, No 6 and No 7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown

**NOTICE:**

**Do not remove the No. 2 and No. 5 bearing cap bolts at this stage.**

(5) Remove the 4 bearing caps




(6) Alternately and uniformly loosen and remove the No 2 and No 5 bearing cap bolts

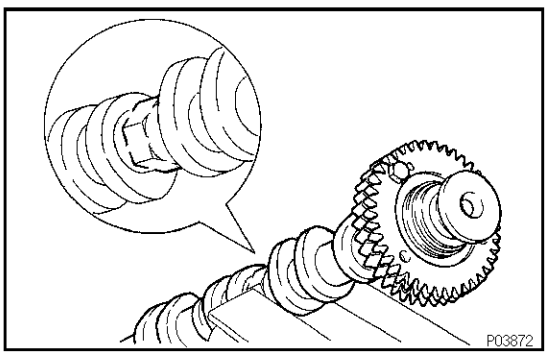
HINT

- As the 4 No 2 and No 5 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level
- If the camshaft is not being lifted out straight and level, retighten the 4 No 2 and No 5 bearing cap bolts Then reverse the order of above steps from (e) to (c) and repeat steps from (a) to (f) once again

**NOTICE:**

**Do not pry on or attempt to force the camshaft with a tool or other object.**

(7) Remove the 2 bearing caps and exhaust camshaft

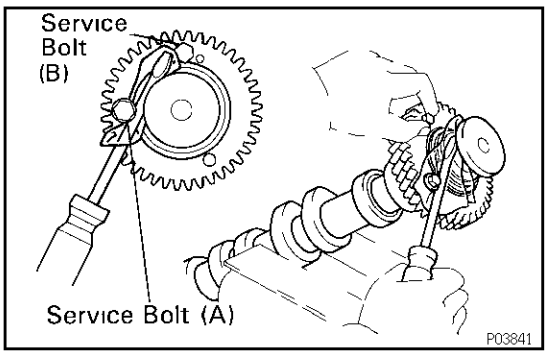



**36. DISASSEMBLE EXHAUST CAMSHAFT**

(a) Mount the hexagon wrench head portion of the camshaft in a vise

**NOTICE:**

**Be careful not to damage the camshaft.**




(b) Insert a service bolt (A) into the service hole of the camshaft sub–gear

(c) Using a screwdriver, turn the sub–gear clockwise, and remove the service bolt (B)

**NOTICE:**

**Be careful not to damage the camshaft.**

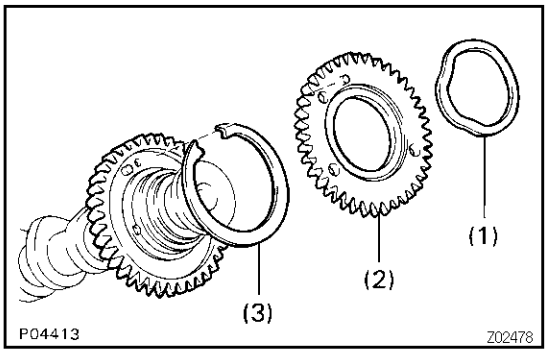
(d) Using snap ring pliers, remove the snap ring



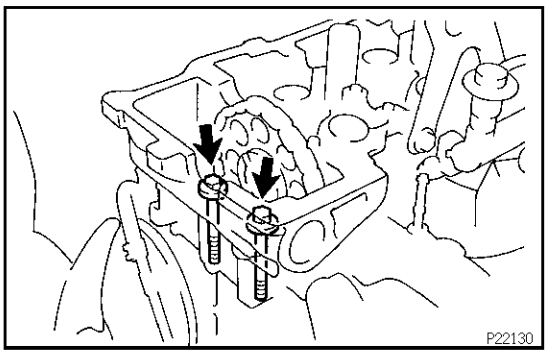
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



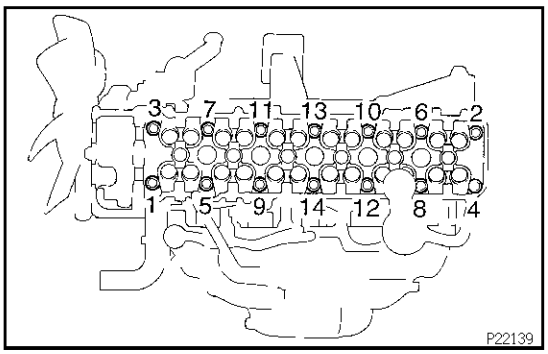



(e) Remove the wave washer (1), camshaft sub-gear (2) and camshaft gear spring (3)




**37. REMOVE CYLINDER HEAD AND INTAKE MANIFOLD ASSEMBLY**

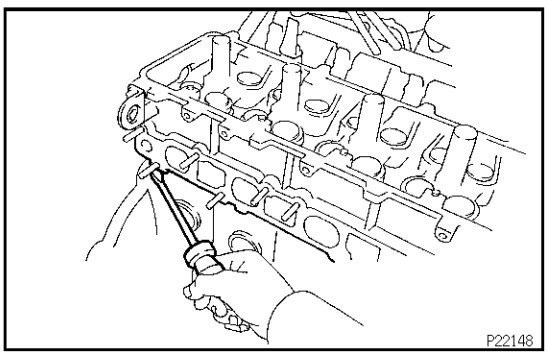
(a) Remove the 2 bolts in front of the head before the other head bolts are removed




(b) Uniformly loosen and remove the 14 cylinder head bolts, in several passes, in the sequence shown

**NOTICE:**

**Cylinder head warpage or cracking could result from removing bolts in incorrect order.**




(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench

HINT

If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver

**NOTICE:**

**Be careful not to damage the contact surfaces of the cylinder head and cylinder block.**



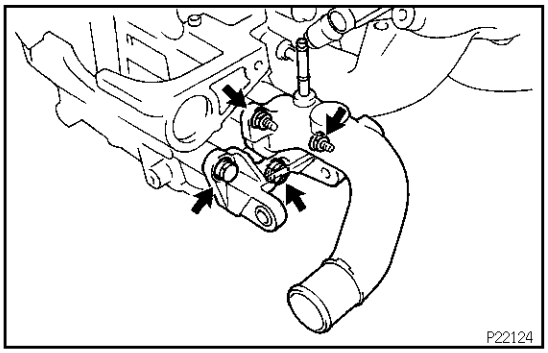
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1E4 01

# DISASSEMBLY

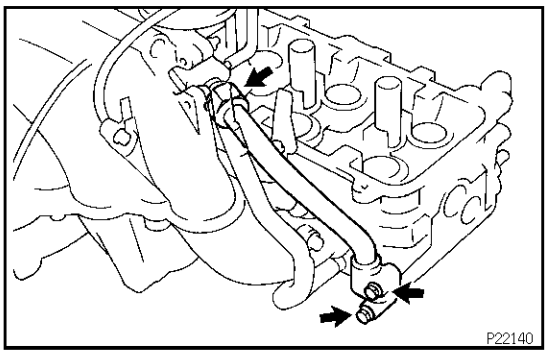



**1. REMOVE GENERATOR BRACKET**

Remove the 2 bolts and generator bracket

**2. REMOVE WATER OUTLET**

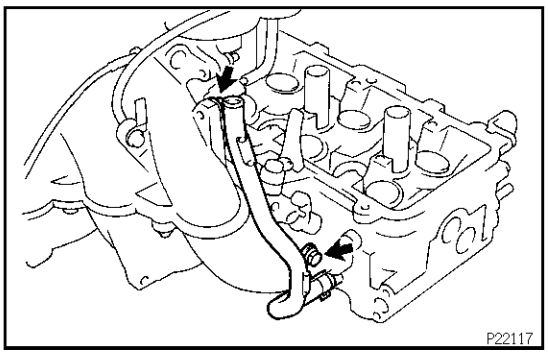
Remove the 2 nuts, water outlet and gasket




**3. REMOVE EGR PIPE**

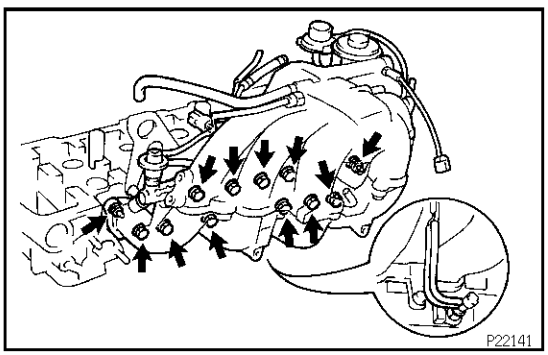
(a) Loosen the union nut

(b) Remove the 2 bolts, EGR pipe and gasket




**4. REMOVE HEATER INLET PIPE AND HOSE**

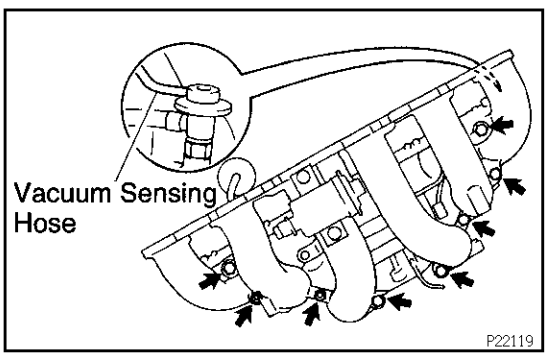
Remove the 2 bolts, and disconnect the pipe and hose




**5. REMOVE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY**

(a) Disconnect the 2 vacuum hoses from the TVV

(b) Remove the 10 bolts, 2 nuts, intake manifold and gasket




**6. DISASSEMBLE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY**

(a) Disconnect the vacuum sensing hose from the fuel pressure regulator

(b) Remove the 6 bolts, 2 nuts, air intake chamber and 2 gaskets from the intake manifold

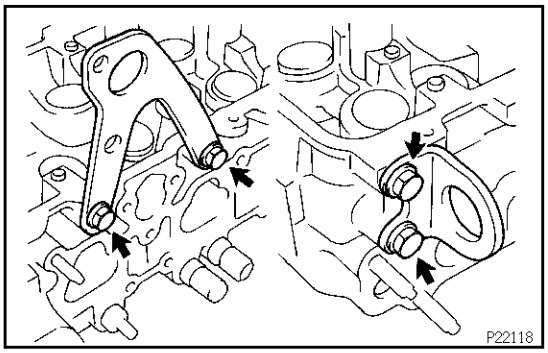
**7. REMOVE NO. 1 WATER BYPASS HOSE**



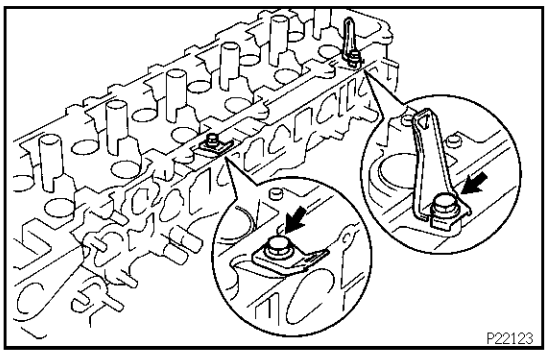
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**8. REMOVE NO. 1 AND NO. 2 ENGINE HANGERS**

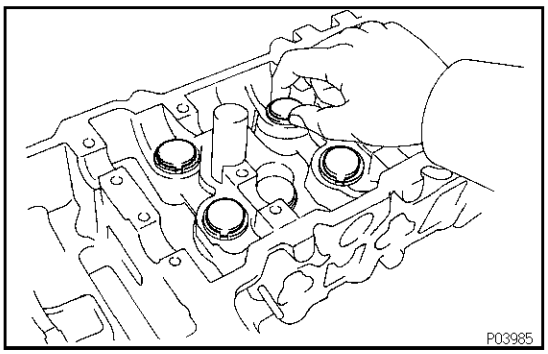



**9. REMOVE 2 ENGINE WIRE CLAMP BRACKETS**

Remove the 2 bolts and 2 wire clamp brackets

**10. REMOVE ACCELERATOR CABLE BRACKET AND THROTTLE CABLE BRACKET**

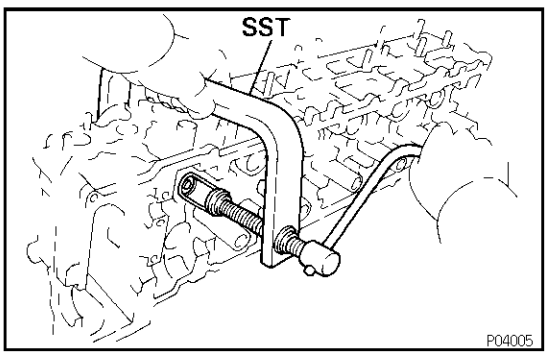
Remove the 2 bolts and 2 cable brackets




**11. REMOVE VALVE LIFTERS AND SHIMS**

HINT

Arrange the valve lifters and shims in correct order

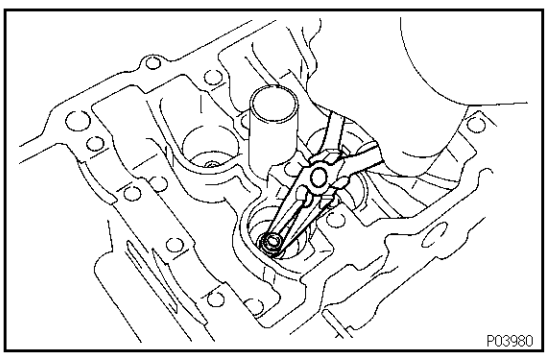



**12. REMOVE VALVES**

(a) Using SST, compress the valve spring and remove the 2 keepers

SST 09202-70020 (09202-00010)

(b) Remove the spring retainer, valve spring and valve



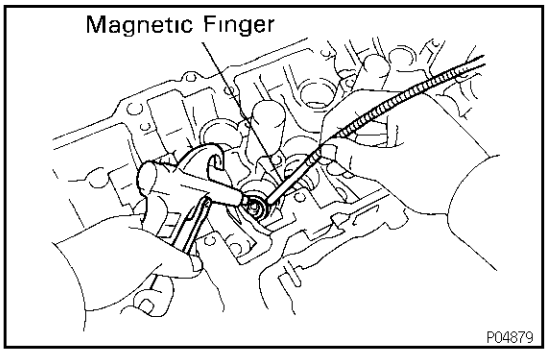

(c) Using needle-nose pliers, remove the oil seal



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

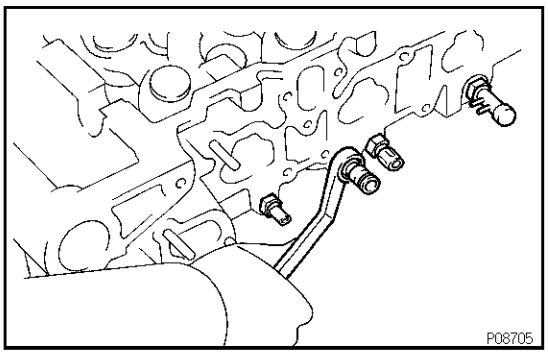





(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air

HINT

Arrange the valves, valve springs, spring seats and spring retainers in correct order




**13. REMOVE ECT SENDER GAUGE**

**14. REMOVE ECT CUT SWITCH**

**15. REMOVE ECT SENSOR**

**16. REMOVE TVV**



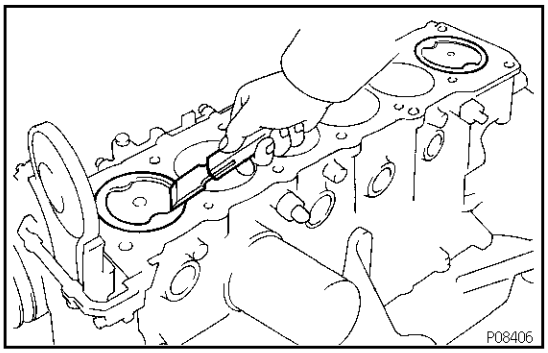
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



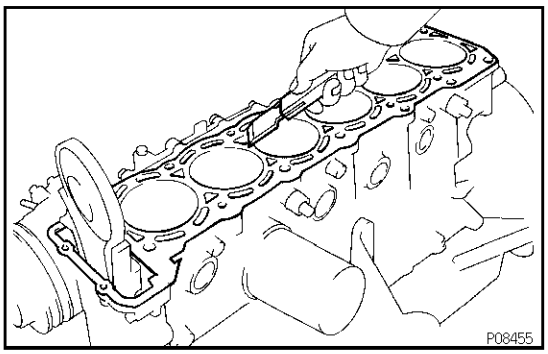
EM1Q7-01

# INSPECTION




**1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK**

(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.

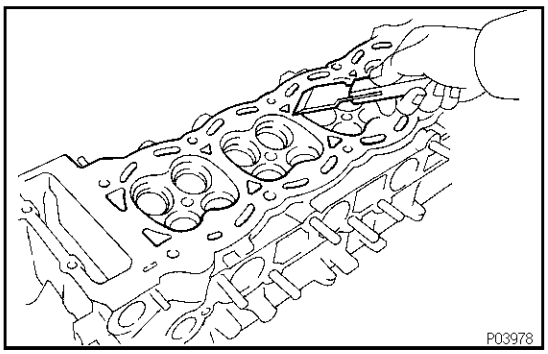



(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

**CAUTION:**

**Protect your eyes when using high-compressed air.**

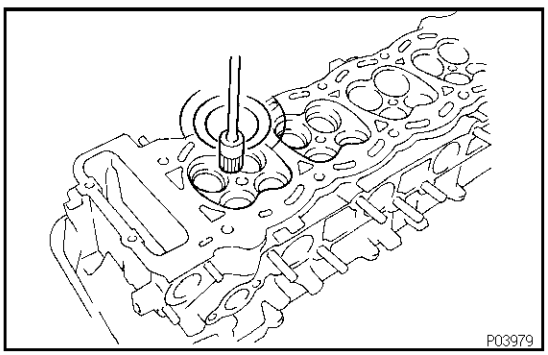



**2. CLEAN CYLINDER HEAD**

(a) Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

**NOTICE:**

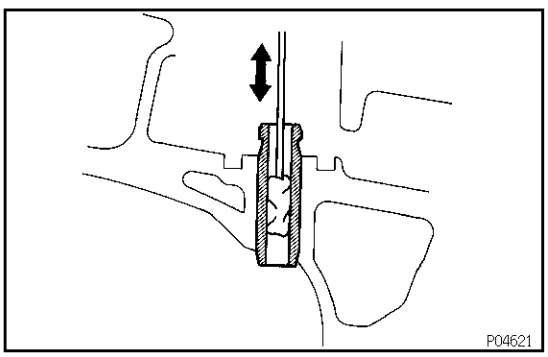
**Be careful not to scratch the cylinder block contact surface.**




(b) Using a wire brush, remove all the carbon from the combustion chambers.

**NOTICE:**

**Be careful not to scratch the cylinder block contact surface.**



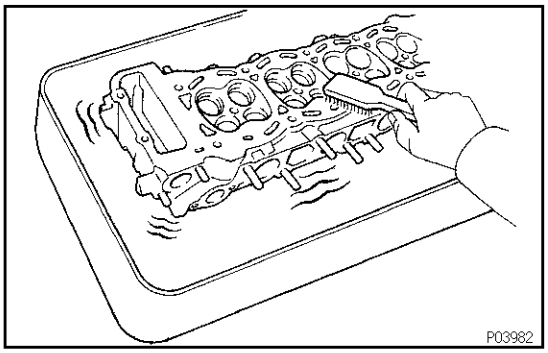

(c) Using a valve guide bushing brush and solvent, clean all the guide bushings.



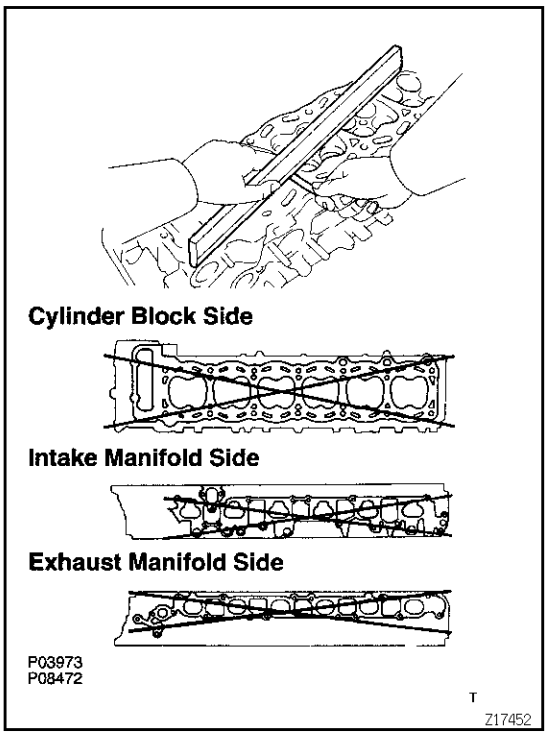
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Using a soft brush and solvent, thoroughly clean the cylinder head




### 3. INSPECT CYLINDER HEAD

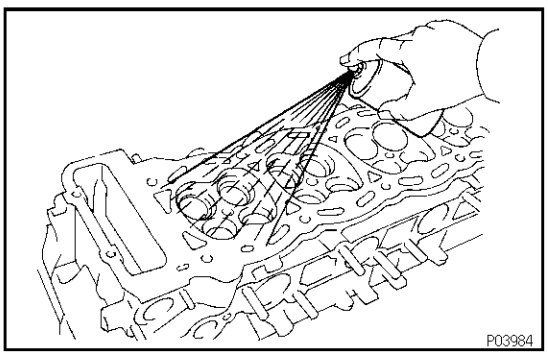
(a) Inspect for flatness

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage

**Maximum warpage:**

| | |
|---|---|
| Cylinder block side | 0.15 mm (0.0059 in) |
| Manifold side | 0.10 mm (0.0039 in) |

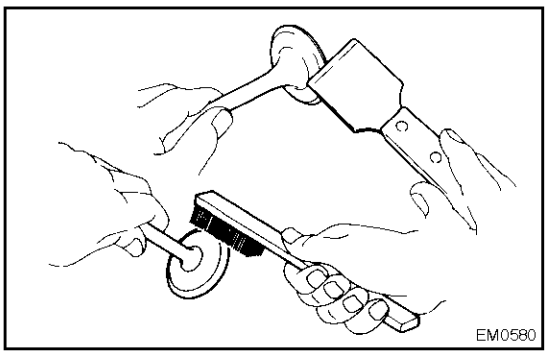
If warpage is greater than maximum, replace the cylinder head




(b) Inspect for cracks

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks

If cracked, replace the cylinder head




### 4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head

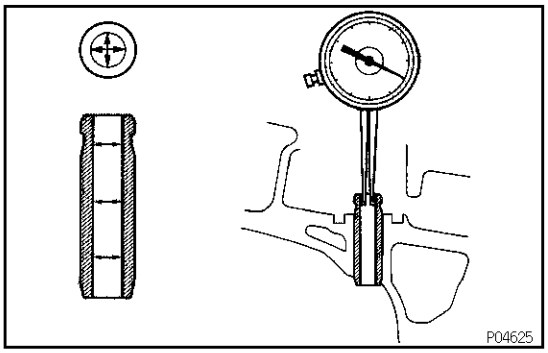
(b) Using a wire brush, thoroughly clean the valve



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



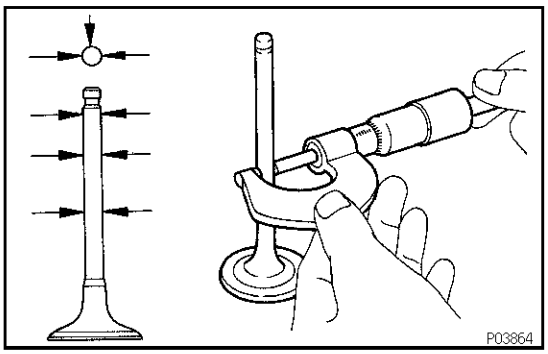



**5. INSPECT VALVE STEMS AND GUIDE BUSHINGS**

(a) Using a caliper gauge, measure the inside diameter of the guide bushing

**Bushing inside diameter:**

**7.010 – 7.030 mm (0.2760 – 0.2768 in.)**




(b) Using a micrometer, measure the diameter of the valve stem

**Valve stem diameter:**

| | |
|---|---|
| Intake | 6 970 – 6 985 mm (0 2744 – 0 2750 in ) |
| Exhaust | 6 965 – 6 980 mm (0 2742 – 0 2748 in ) |

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement

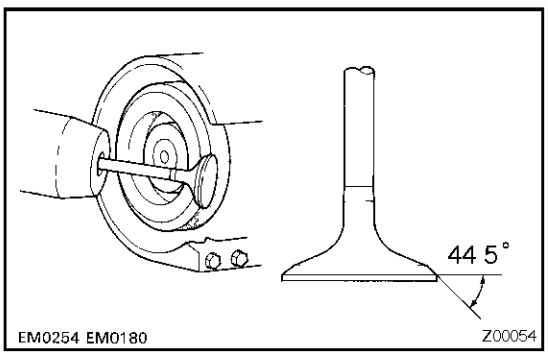
**Standard oil clearance:**

| | |
|---|---|
| Intake | 0 025 – 0 060 mm (0 0010 – 0 0024 in ) |
| Exhaust | 0 030 – 0 065 mm (0 0012 – 0 0026 in ) |

**Maximum oil clearance:**

| | |
|---|---|
| Intake | 0 08 mm (0 0031 in ) |
| Exhaust | 0 10 mm (0 0039 in ) |

If the clearance is greater than maximum, replace the valve and guide bushing (See page EM–49)

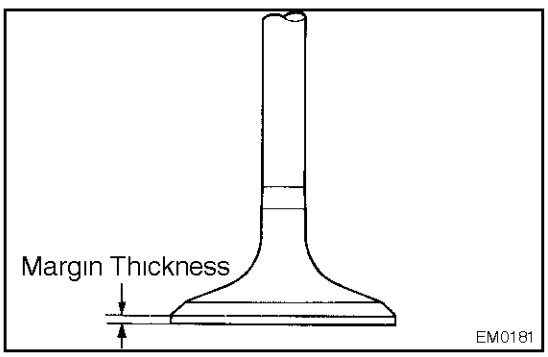



**6. INSPECT AND GRIND VALVES**

(a) Grind the valve enough to remove pits and carbon

(b) Check that the valve is ground to the correct valve face angle

**Valve face angle: 44.5°**




(c) Check the valve head margin thickness

**Margin thickness:**

| | |
|---|---|
| Standard | 1 2 mm (0 047 in ) |
| Minimum | 1 0 mm (0 039 in ) |

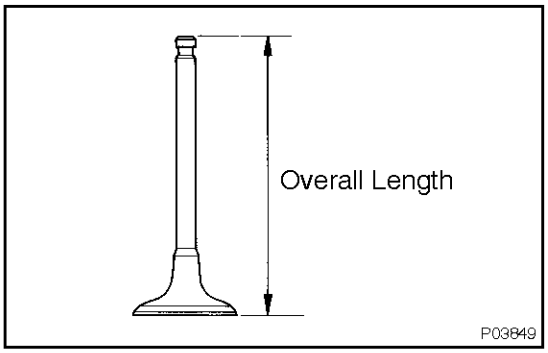
If the margin thickness is less than minimum, replace the valve



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Check the valve overall length

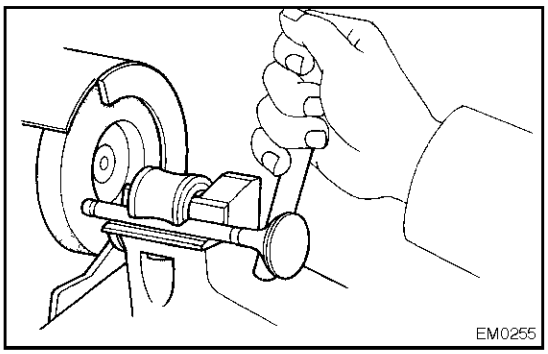
**Standard overall length:**

| | |
|---|---|
| Intake | 98 4 mm (3 874 in ) |
| Exhaust | 97 4 mm (3 854 in ) |

**Minimum overall length:**

| | |
|---|---|
| Intake | 97 9 mm (3 854 in ) |
| Exhaust | 97 4 mm (3 835 in ) |

If the overall length is less than minimum, replace the valve

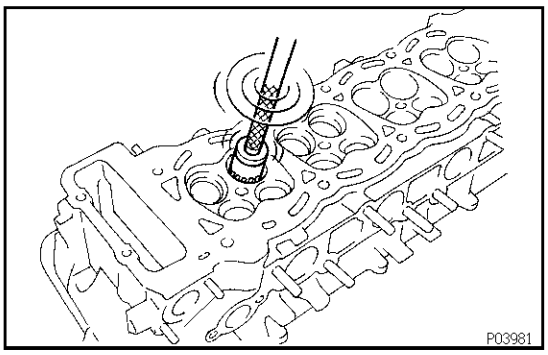



(e) Check the surface of the valve stem tip for wear

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve

**NOTICE:**

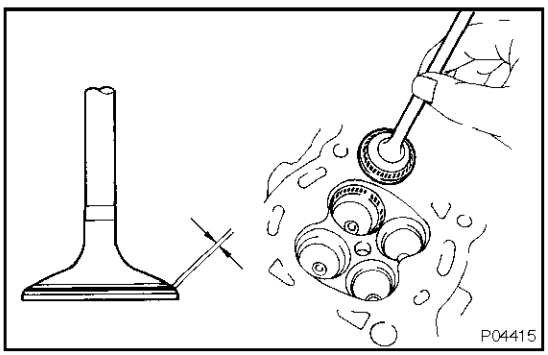
**Do not grind off more than minimum.**




**7. INSPECT AND CLEAN VALVE SEATS**

(a) Using a 45° carbide cutter, resurface the valve seats
Remove only enough metal to clean the seats

(b) Check the valve seating position
Apply a light coat of prussian blue (or white lead) to the valve face Lightly press the valve against the seat Do not rotate valve




(c) Check the valve face and seat for the following

- If blue appears 360° around the face, the valve is concentric If not, replace the valve
- If blue appears 360° around the valve seat, the guide and face are concentric If not, resurface the seat
- Check that the seat contact is in the middle of the valve face with these width

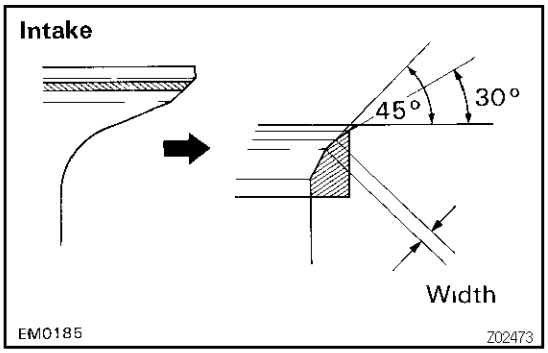
| | |
|---|---|
| Intake | 1 2 – 1 6 mm (0 047 – 0 063 in ) |
| Exhaust | 1 0 – 1 4 mm (0 039 – 0 055 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

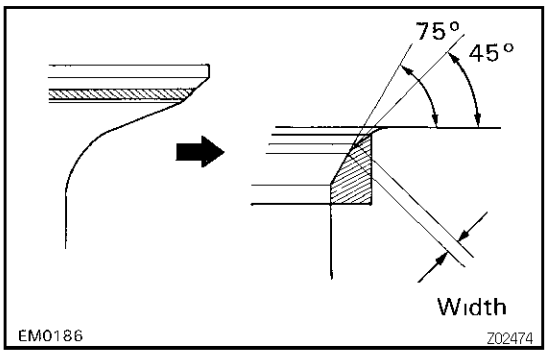




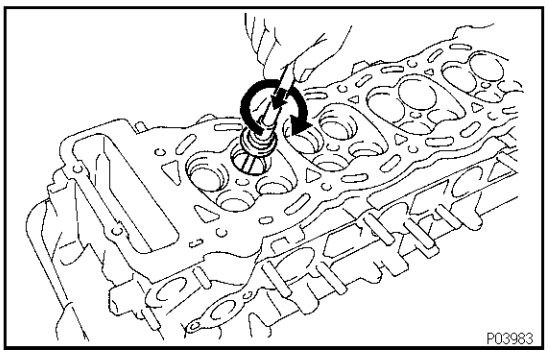

If not, correct the valve seats as follows

(1) Intake

If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat

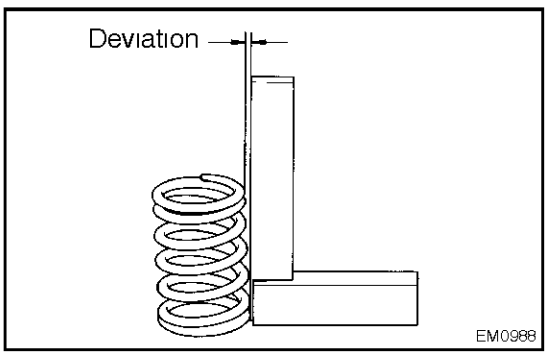



(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat




(d) Hand-lap the valve and valve seat with an abrasive compound

(e) After hand-lapping, clean the valve and valve seat

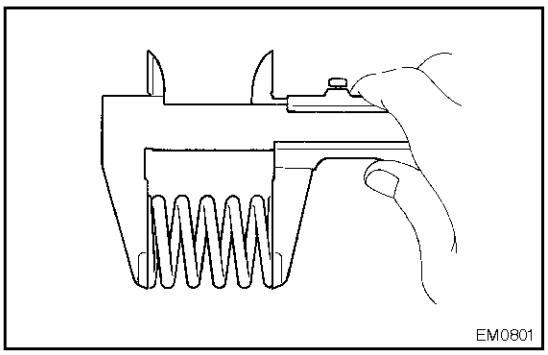



**8. INSPECT VALVE SPRINGS**

(a) Using a steel square, measure the deviation of the valve spring

**Maximum deviation: 2.0 mm (0.079 in.)**

If the deviation is greater than maximum, replace the valve spring




(b) Using vernier calipers, measure the free length of the valve spring

**Free length: 43.94 – 45.06 mm (1.7299 – 1.7740 in.)**

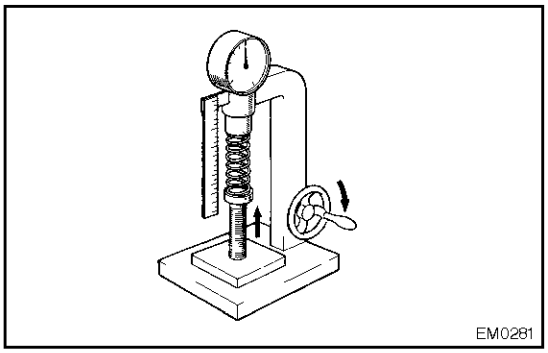
If the free length is not as specified, replace the valve spring



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

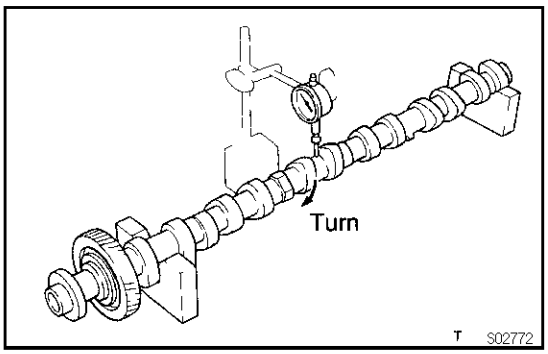





(c) Using a spring tester, measure the tension of the valve spring at the specified installed length

**Installed tension:**
**214 – 238 N (21.8 – 24.2 kgf, 48.1 – 53.4 lbf)**
**at 36.5 mm (1.437 in.)**

If the installed tension is not as specified, replace the valve spring




**9. INSPECT CAMSHAFTS**

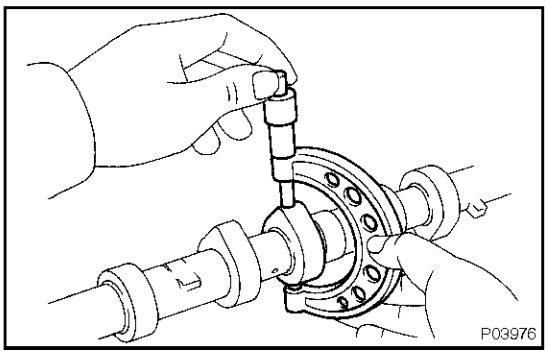
(a) Inspect for runout

(1) Place the camshaft on V–blocks

(2) Using a dial indicator, measure the circle runout at the center journal

**Maximum circle runout: 0.06 mm (0.0024 in.)**

If the circle runout is greater than maximum, replace the camshaft

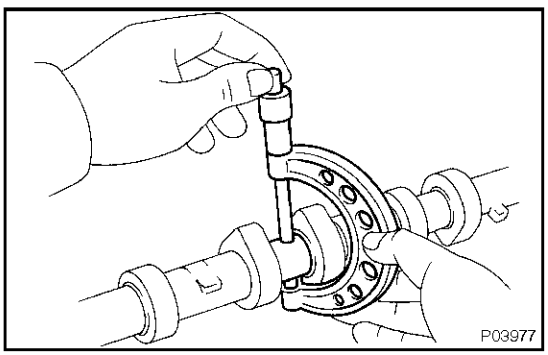



(b) Inspect the cam lobes

Using a micrometer, measure the cam lobe height

**Standard cam lobe height:**
**50.61 – 50.71 mm (1.9925 – 1.9965 in.)**
**Minimum cam lobe height: 50.51 mm (1.9886 in.)**

If the cam lobe height is less than minimum, replace the camshaft

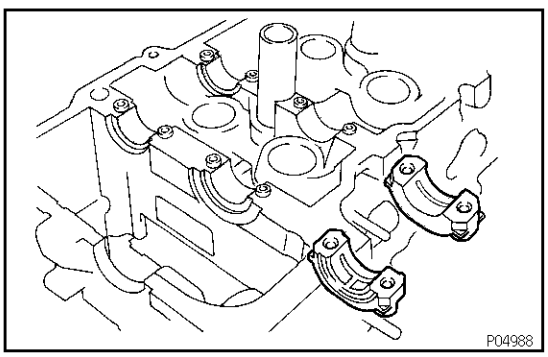



(c) Inspect the journals

Using a micrometer, measure the journal diameter

**Journal diameter:**
**26.959 – 26.975 mm (1.0614 – 1.0620 in.)**

If the journal diameter is not as specified, check the oil clearance




(d) Inspect the camshaft bearings

Check that bearings for flaking and scoring

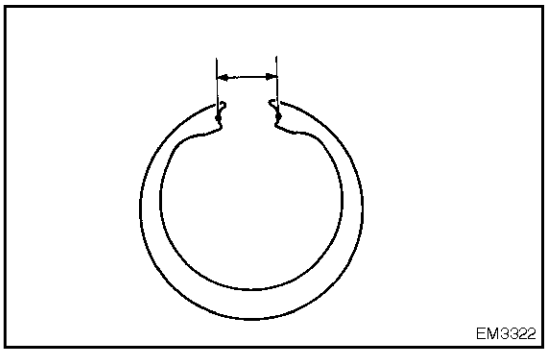
If the bearings are damaged, replace the bearing caps and cylinder head as a set



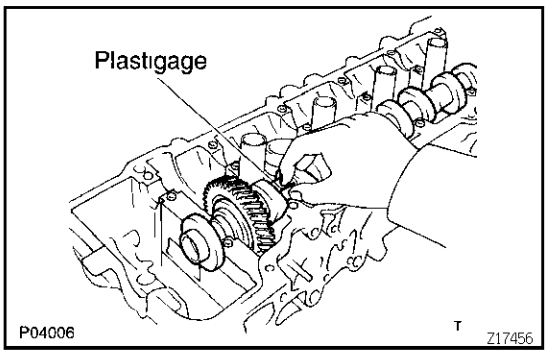
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

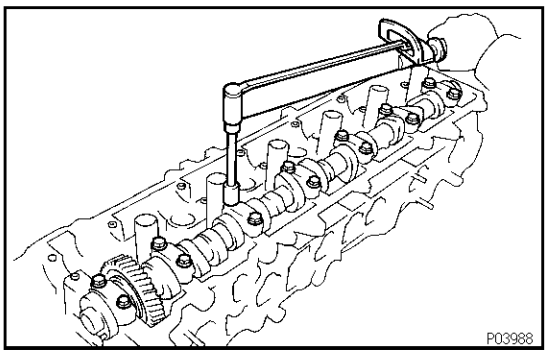




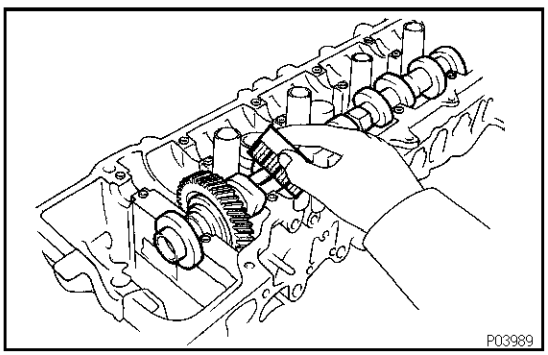

(e) Inspect the gear spring
Using vernier calipers, measure the free distance between the spring ends
**Free distance: 18.2 – 18.8 mm (0.717 – 0.740 in.)**
If the free distance is not as specified, replace the gear spring



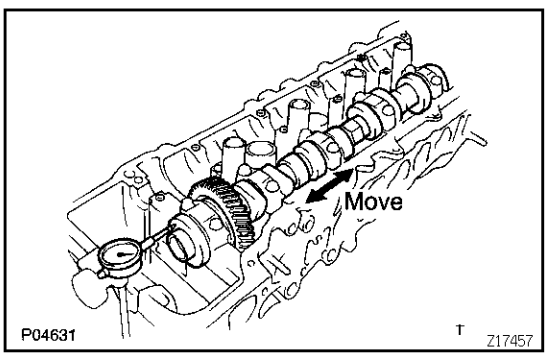

(f) Inspect the journal oil clearance
(1) Clean the bearing caps and camshaft journals
(2) Place the camshafts on the cylinder head
(3) Lay a strip of Plastigage across each of the camshaft journals




(4) Install the bearing caps (See page EM–54)
**NOTICE:**
**Do not turn the camshaft.**
(5) Remove the bearing caps




(6) Measure the Plastigage at its widest point
**Standard oil clearance:**
**0.025 – 0.062 mm (0.0010 – 0.0024 in.)**
**Maximum oil clearance: 0.10 mm (0.0039 in.)**
If the oil clearance is greater than maximum, replace the camshaft If necessary, replace the bearing caps and cylinder head as a set
(7) Completely remove the Plastigage



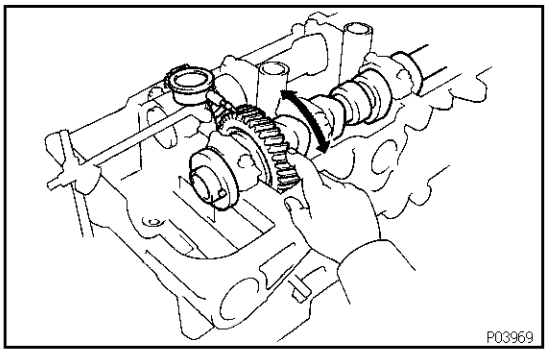

(g) Inspect the thrust clearance
(1) Install the camshaft (See page EM–54)
(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth
**Standard thrust clearance:**
**0.030 – 0.080 mm (0.0012 – 0.0031 in.)**
**Maximum thrust clearance: 0.10 mm (0.0039 in.)**
If the thrust clearance is greater than maximum, replace the camshaft If necessary, replace the bearing caps and cylinder head as a set



Brought to you by BirfMark
Version 1.11 - 03/16/2010

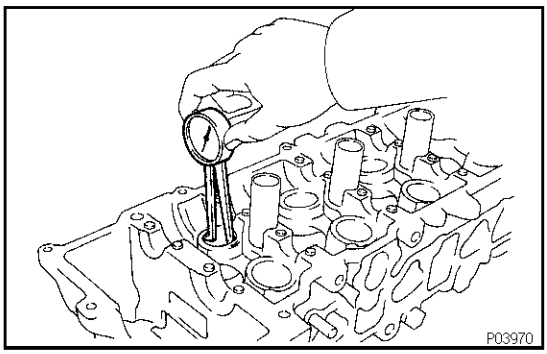
Brought to you by BirfMark





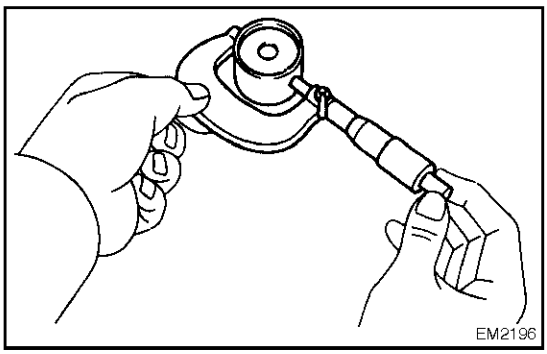

(h) Inspect the gear backlash
(1) Install the camshafts without installing the exhaust cam sub–gear (See page EM–54)
(2) Using a dial indicator, measure the backlash
**Standard backlash:**
**0.020 – 0.200 mm (0.0008 – 0.0079 in.)**
**Maximum backlash: 0.30 mm (0.0188 in.)**

If the backlash is greater than maximum, replace the camshafts




**10. INSPECT VALVE LIFTER OIL CLEARANCE**

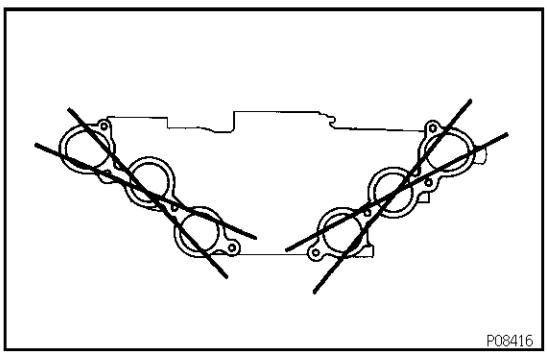
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head
**Lifter bore diameter:**
**34.000 – 34.021 mm (1.3386 – 1.3394 in.)**




(b) Using a micrometer, measure the lifter diameter
**Lifter diameter:**
**33.966 – 33.976 mm (1.3372 – 1.3376 in.)**

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement
**Standard oil clearance:**
**0.024 – 0.055 mm (0.0009 – 0.0022 in.)**
**Maximum oil clearance: 0.07 mm (0.0028 in.)**

If the oil clearance is greater than maximum, replace the lifter
If necessary, replace the cylinder head




**11. INSPECT AIR INTAKE CHAMBER**

Using a precision straight edge and thickness gauge, measure the surface contacting the intake manifold for warpage
**Maximum warpage: 0.30 mm (0.0118 in.)**

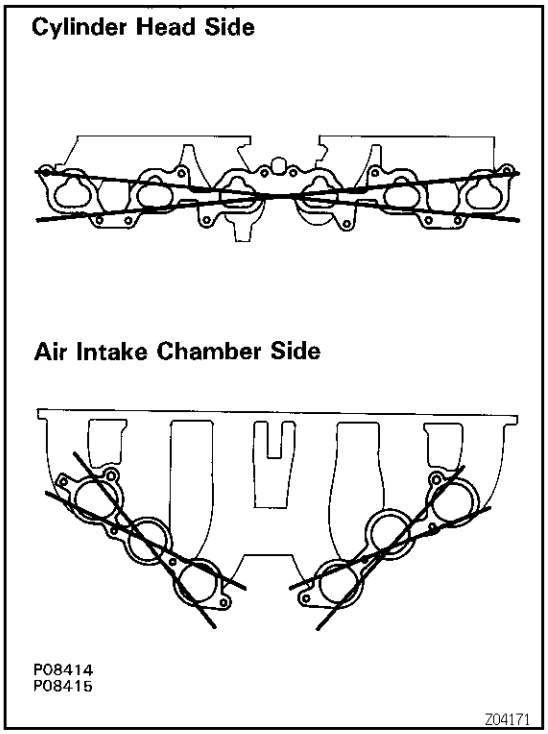
If warpage is greater than maximum, replace the air intake chamber



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



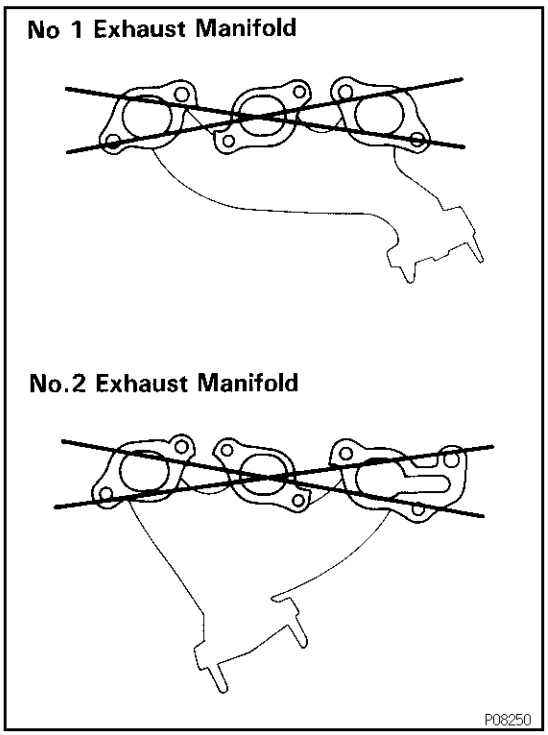



### 12. INSPECT INTAKE MANIFOLD

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head and air intake chamber for warpage

**Maximum warpage: 0.30 mm (0.0118 in.)**

If warpage is greater than maximum, replace the manifold

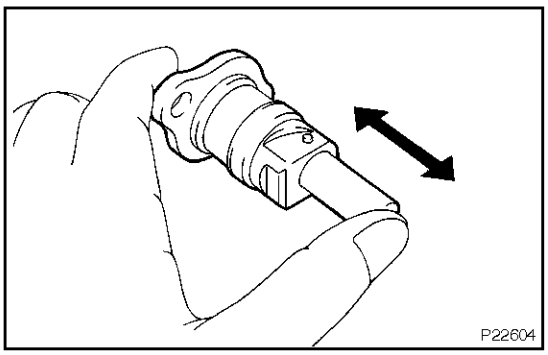



### 13. INSPECT EXHAUST MANIFOLDS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head for warpage

**Maximum warpage: 0.30 mm (0.0118 in.)**

If warpage is greater than maximum, replace the manifold




### 14. INSPECT CHAIN TENSIONER

Check that the plunger moves smoothly

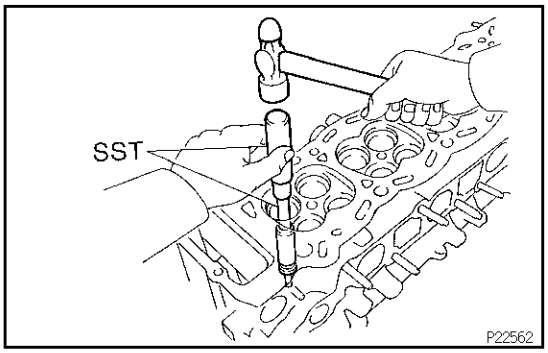


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1Q8-01

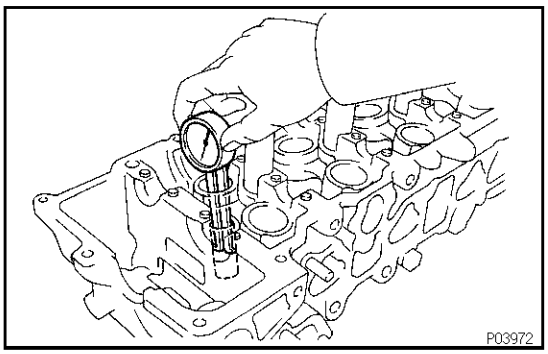



# REPLACEMENT

## 1. REPLACE VALVE GUIDE BUSHINGS

(a) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F)

(b) Using SST and a hammer, tap out the guide bushing
SST 09201–10000 (09201–01070), 09950–70010 (09951–07100)




(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head

Both intake and exhaust

| Bushing bore diameter mm (in.) | Bushing size |
|---|---|
| 11.492 – 11.513 (0.4524 – 0.4533) | Use STD |
| 11.542 – 11.563 (0.4544 – 0.4552) | Use O/S 0.05 |

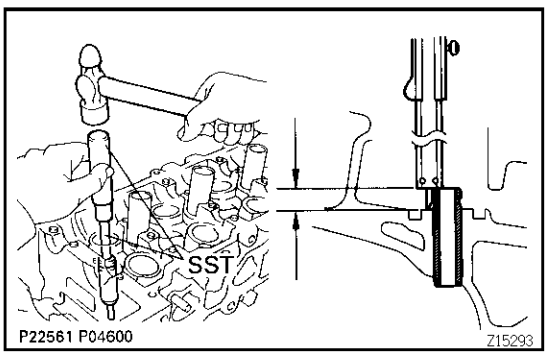
(d) Select a new guide bushing (STD or O/S 0.05)

If the bushing bore diameter of the cylinder head is greater than 11.513 mm (0.4533 in.), machine the bushing bore to the following dimension

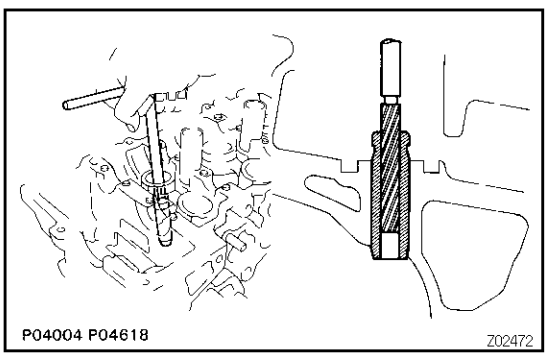
**11.542 – 11.563 mm (0.4544 – 0.4552 in.)**

If the bushing bore diameter of the cylinder head is greater than 11.563 mm (0.4552 in.), replace the cylinder head

(e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F)




(f) Using SST and a hammer, tap in a new guide bushing until it protrudes 8.2 – 8.6 mm (0.323 – 0.339 in.) from the cylinder head
SST 09201–10000 (09201–01070), 09950–70010 (09951–07100)



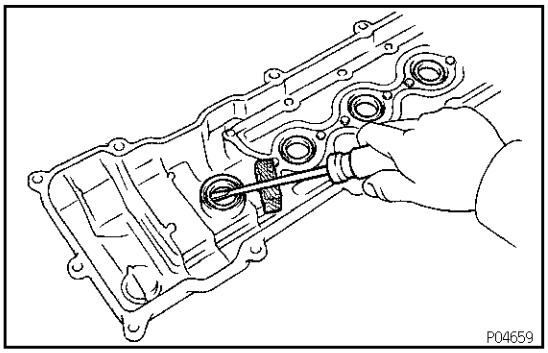

(g) Using a sharp 7 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–40) between the guide bushing and valve stem



Brought to you by BirfMark
Version 1.11 - 03/16/2010

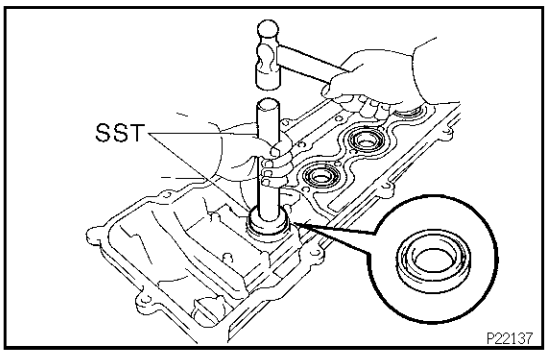
Brought to you by BirfMark






**2. REPLACE SPARK PLUG TUBE GASKETS**

(a) Using a screwdriver, pry out the tube gasket




(b) Using SST and a hammer, tap in a new tube gasket as shown in the illustration

SST 09950-60010 (09951-00480), 09950-70010 (09951-07150)

(c) Apply a light coat of MP grease to the gasket lip



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

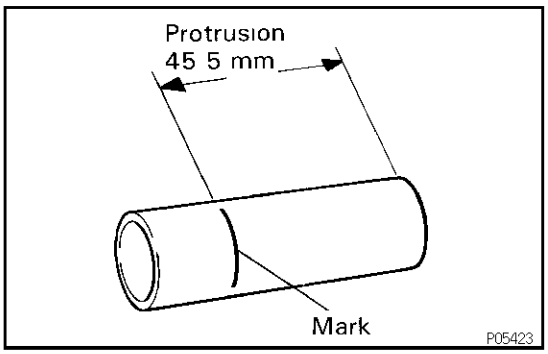


EM1E6 01

# REASSEMBLY

HINT

- Thoroughly clean all parts to be assembled
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces
- Replace all gaskets and oil seals with new ones



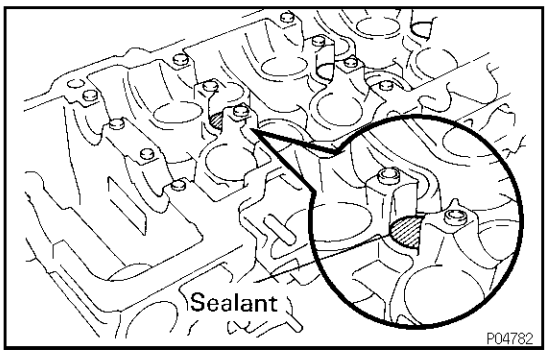

## 1. INSTALL SPARK PLUG TUBES

HINT

When using a new cylinder head, spark plug tubes must be installed

(a) Mark the standard position away from the edge, onto the spark plug tube

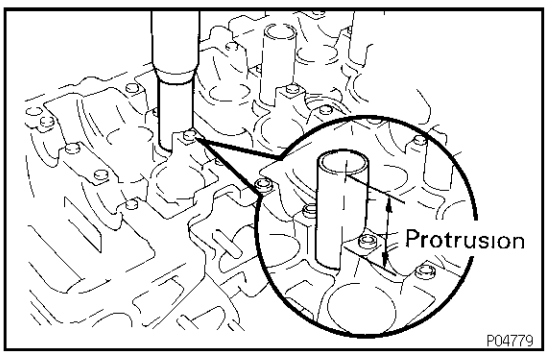
**Standard protrusion: 45.5 mm (1.791 in.)**




(b) Apply adhesive to the spark plug tube hole of the cylinder head

**Sealant:**

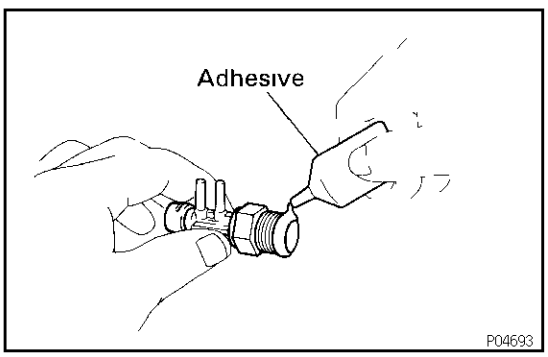
**Part No. 08833–00070, Adhesive 1324, THREE BOND 1324 or equivalent**




(c) Using a press, press in a new spark plug tube until there is 45 5 mm (1 791 in ) protruding from the camshaft bearing cap installation surface of the cylinder head

**NOTICE:**

**Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.**




## 2. INSTALL TVV

(a) Apply adhesive to 2 or 3 threads of the TVV

**Adhesive:**

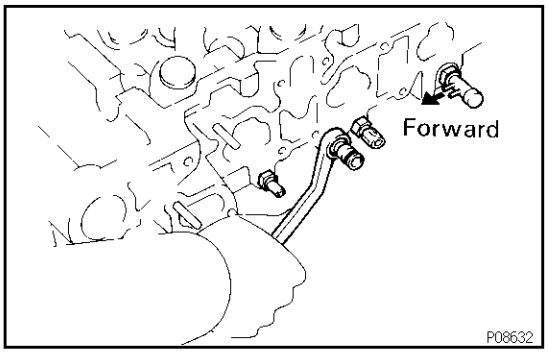
**Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



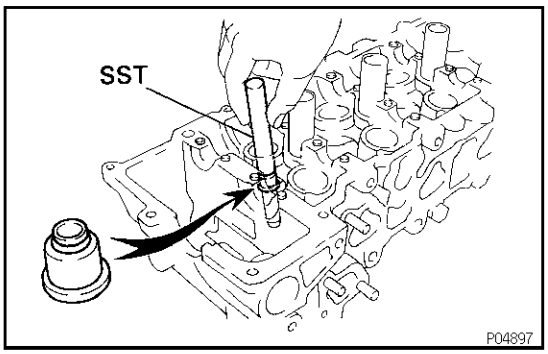



(b) Install the TVV

**3. INSTALL ECT SENDER GAUGE**

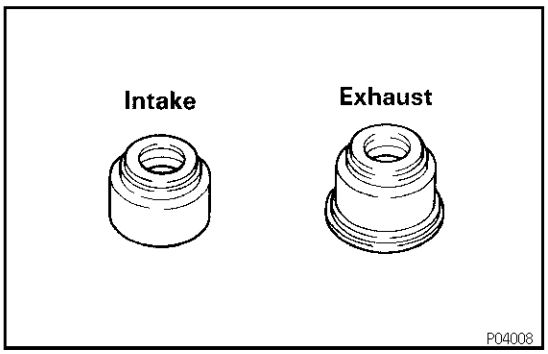
**4. INSTALL ECT CUT SWITCH**

**5. INSTALL ECT SENSOR**

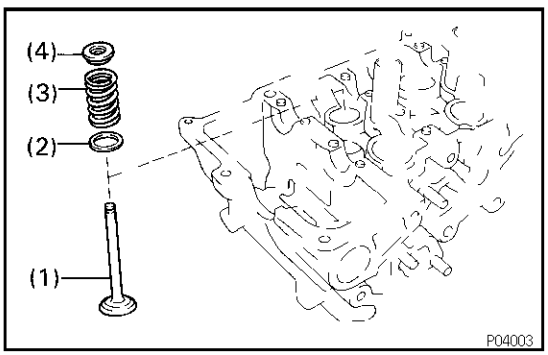



**6. INSTALL VALVES**

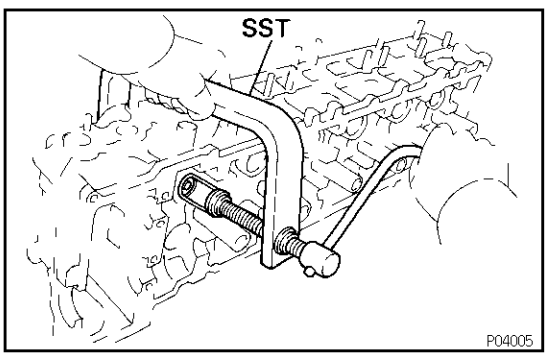
(a) Using SST, push in a new oil seal
SST 09236-00101 (09236-15010)




HINT
Different oil seals are used for the intake and exhaust




(b) Install the valve (1), spring seat (2), valve spring (3) and spring retainer (4)



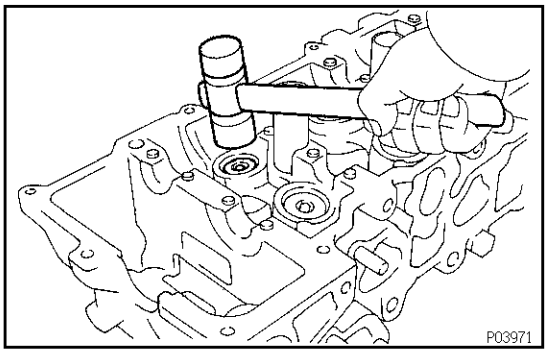

(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem
SST 09202-70020 (09202-00010)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit

**7. INSTALL VALVE LIFTERS AND SHIMS**

(a) Install the valve lifter and shim

(b) Check that the valve lifter rotates smoothly by hand

**8. INSTALL ACCELERATOR CABLE BRACKET AND THROTTLE CABLE BRACKET**

**9. INSTALL 2 ENGINE WIRE CLAMP BRACKETS**

**10. INSTALL NO. 1 AND NO. 2 ENGINE HANGERS**

**Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)**

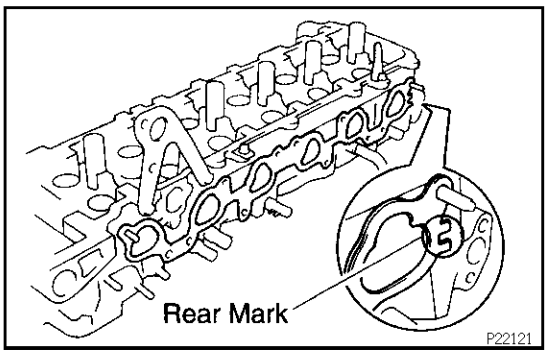
**11. INSTALL NO. 1 WATER BYPASS HOSE**

**12. ASSEMBLE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY**

(a) Install 2 new gaskets and the air intake chamber with the 6 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(b) Connect the vacuum sensing hose to the fuel pressure regulator




**13. INSTALL AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY**

(a) Place a new gasket so that the rear mark is toward the rear side

(b) Install the intake manifold with the 10 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(c) Connect the 2 vacuum hoses to the TVV

**14. INSTALL HEATER INLET PIPE AND HOSE**

Install the heater hose to the cylinder head, and connect the pipe to the intake manifold with the 2 bolts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**15. INSTALL EGR PIPE**

(a) Temporarily install the union nut to the EGR valve

(b) Install a new gasket and the EGR pipe to the cylinder head with the 2 bolts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(c) Tighten the union nut

**Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)**

**16. INSTALL WATER OUTLET**

Install a new gasket and the water outlet with the 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**17. INSTALL GENERATOR BRACKET**

Install the generator bracket with the 2 bolts

**Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1E7 01

# INSTALLATION

## 1. INSTALL CYLINDER HEAD AND INTAKE MANIFOLD ASSEMBLY

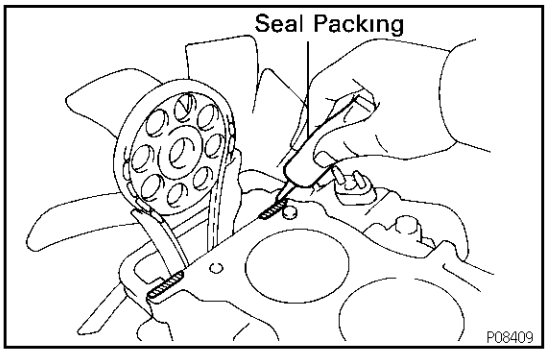
(a) Place the cylinder head on the cylinder head

(1) Apply seal packing to the 2 locations as shown

**Seal packing: Part No. 08826-00080 or equivalent**

**NOTICE:**

**Do not apply too much seal packing**

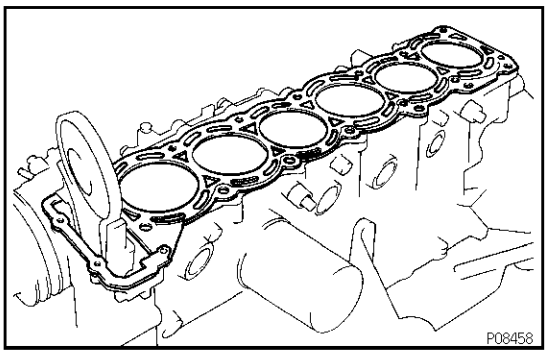



(2) Place a new cylinder head gasket in position on the cylinder block

**NOTICE:**

**Be careful of the installation direction.**

(3) Place the cylinder head in position on the cylinder head gasket




(b) Install the cylinder head bolts

HINT

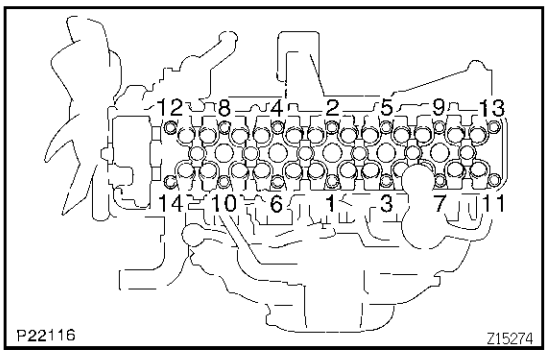
- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e))
- If any cylinder head bolt is broken or deformed, replace it

(1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts

(2) Install and uniformly tighten the 14 cylinder head bolts and plate washers in several passes, in the sequence shown

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt

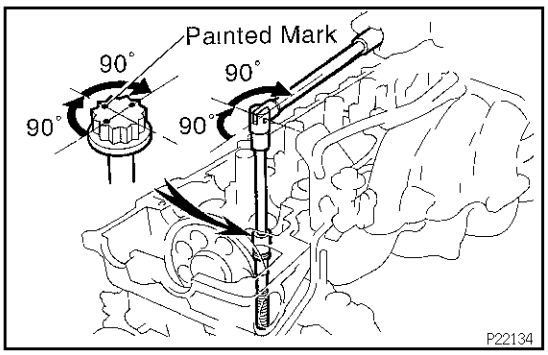



(3) Mark the front of the cylinder head bolt head with paint

(4) Retighten the cylinder head bolts by 90° in the numerical order shown

(5) Retighten the cylinder head bolts by an additional 90°

(6) Check that the painted mark is now facing rearward

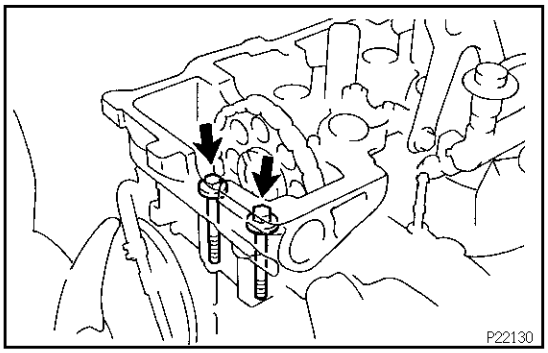




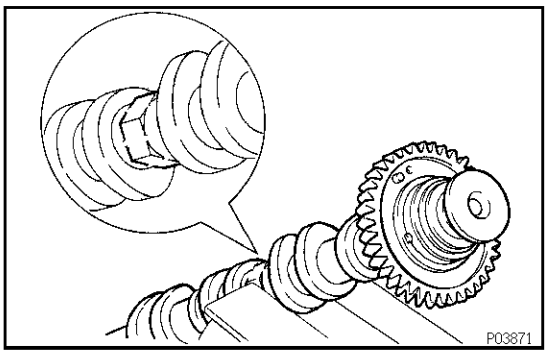

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(7) Install and torque the 2 mounting bolts
**Torque: 21N·m (210 kgf·cm, 15 ft·lbf)**

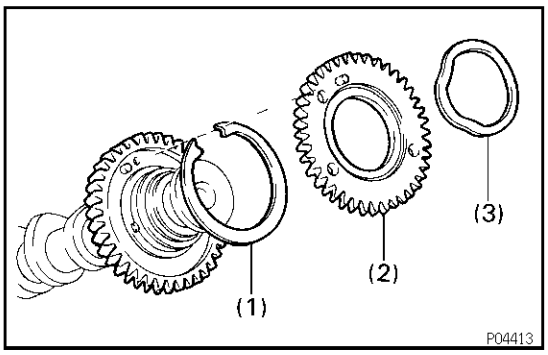



**2. ASSEMBLE EXHAUST CAMSHAFT**

(a) Mount the hexagon wrench head portion of the camshaft in a vise

**NOTICE:**

**Be careful not to damage the camshaft.**

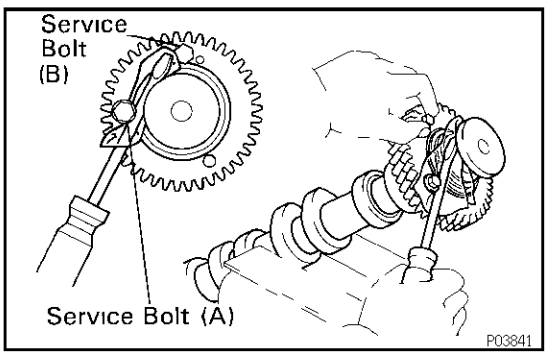



(b) Install the camshaft gear spring (1), camshaft sub–gear (2) and wave washer (3)

HINT

Align the pins on the gears with the spring ends

(c) Using snap ring pliers, install the snap ring




(d) Insert a service bolt (A) into the service hole of the camshaft sub–gear

(e) Using a screwdriver, align the holes of the camshaft main gear and sub–gear by turning camshaft sub– gear clockwise, and install a service bolt (B)

**NOTICE:**

**Be careful not to damage the camshaft.**

**3. INSTALL CAMSHAFTS**

**NOTICE:**

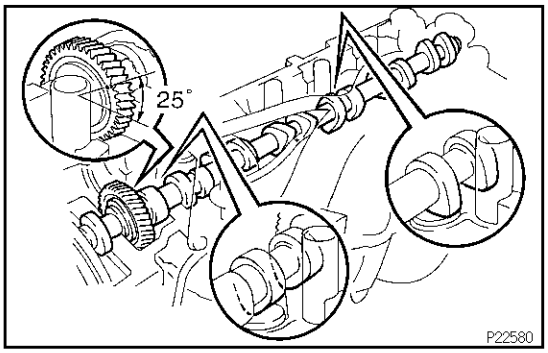
**Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



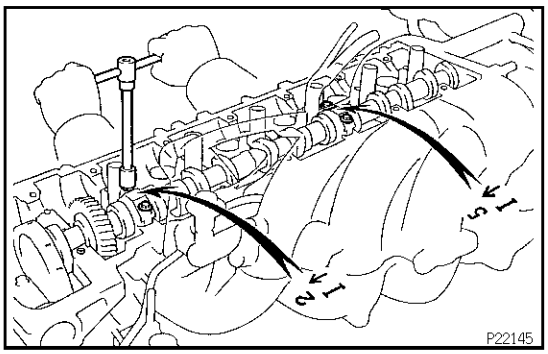



(a) Install the intake camshaft

(1) Apply engine oil to the thrust portion of the intake camshaft

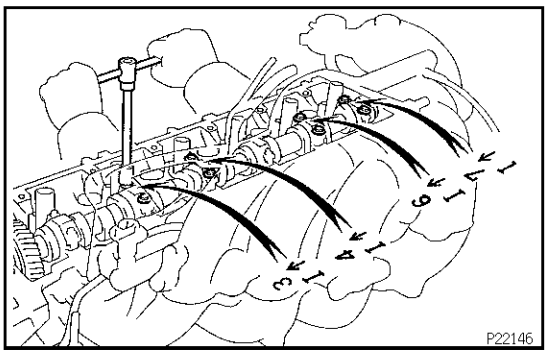
(2) Lightly place the intake camshaft on top of the cylinder head as shown in the illustration so that the No 1 and No 4 cylinder cam lobes face downward

(3) Lightly push the camshaft towards the front without applying excessive force



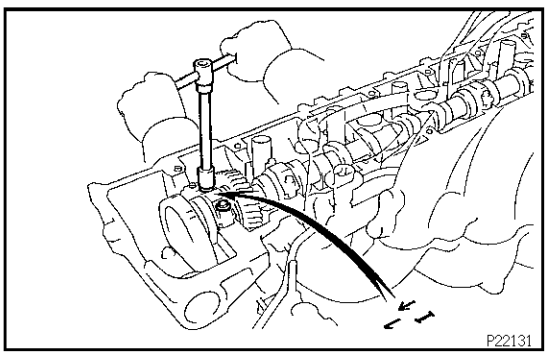

(4) Place the No 2 and No 5 bearing caps in their proper location

(5) Temporarily tighten these bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head




(6) Place the No 3, No 4, No 6 and No 7 bearing caps in their proper location

(7) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly

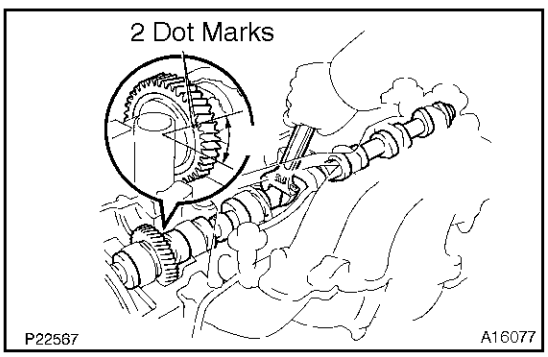



(8) Place the No 1 bearing cap in its proper location When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap

(9) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly

(10) Uniformly tighten the 14 bearing cap bolts in several passes

**Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)**




(b) Install the exhaust camshaft

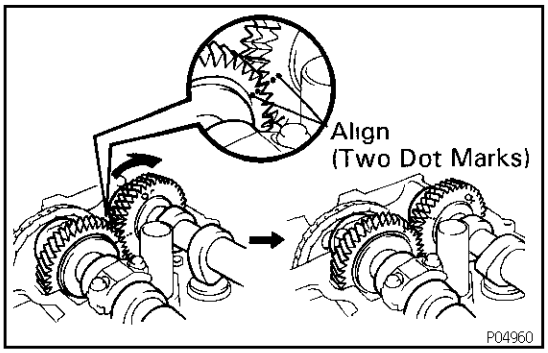
(1) Set the timing mark (2 dot marks) of the camshaft drive gear at approx 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench



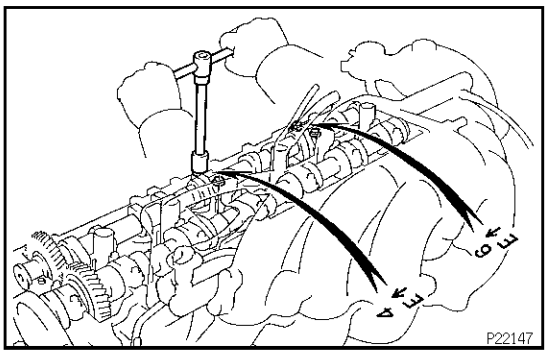
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

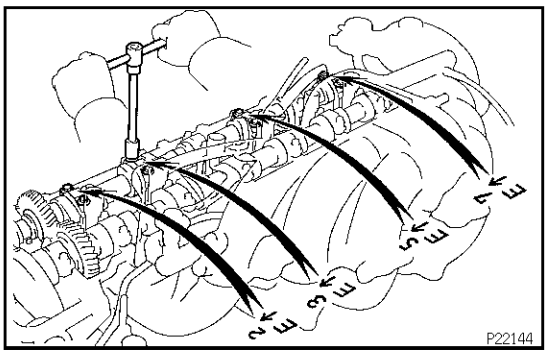




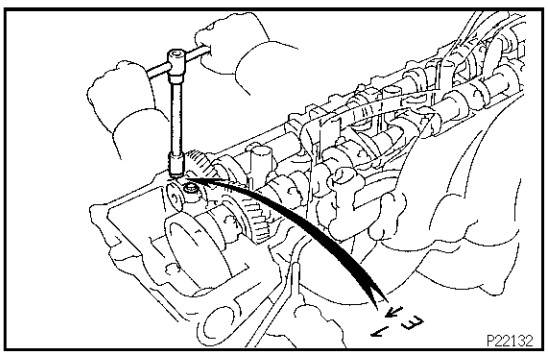

(2) Apply engine oil to thrust portion of the exhaust camshaft
(3) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (two dot marks) on each gear
(4) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other
(5) Lightly push the intake camshaft towards the front without applying excessive force




(6) Install the No 4 and No 6 bearing caps in their proper location
(7) Temporarily tighten the bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head

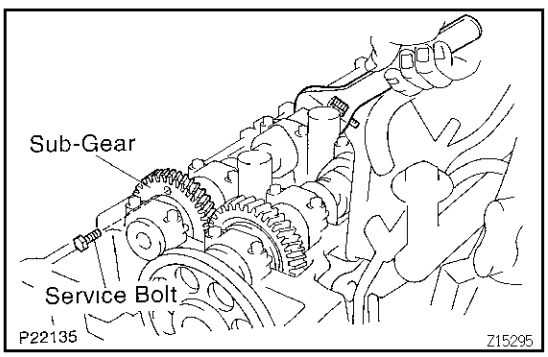



(8) Place the No 2, No 3, No 5 and No 7 bearing caps in their proper location
(9) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly




(10) Place the No 1 bearing cap in its proper location When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap
(11) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly
(12) Uniformly tighten the 14 bearing cap bolts in several passes

**Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)**



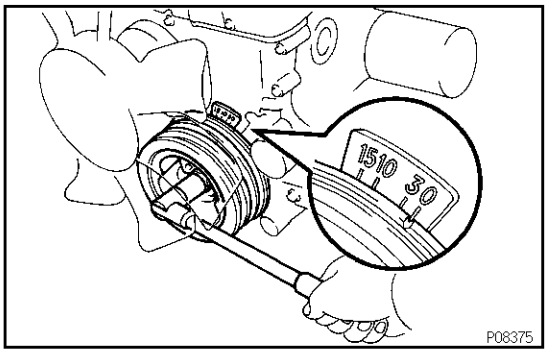

(13) Bring the service bolt installed in the driven sub–gear upward by turning the hexagon wrench head portion of the camshaft with a wrench
(14) Remove the service bolt
(15) Check that the intake and exhaust camshafts turn smoothly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

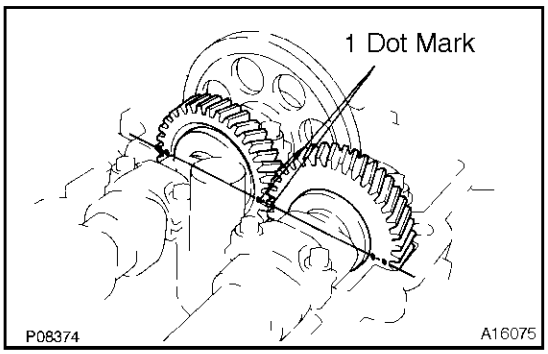
Brought to you by BirfMark



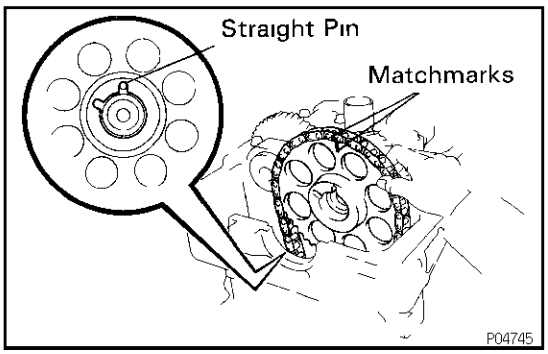



**4. SET NO.1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover




(b) Turn the camshafts so that the timing marks with 1 and 2 dots will be in straight line on the cylinder head surface as shown in the illustration

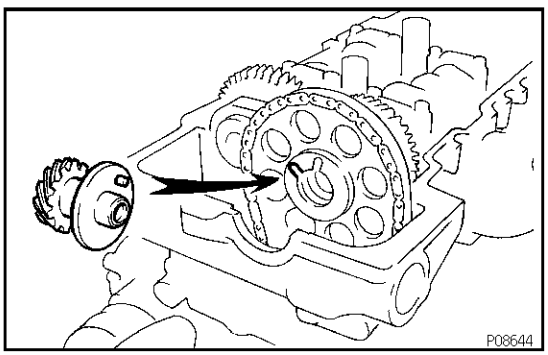



**5. INSTALL CAMSHAFT TIMING GEAR**

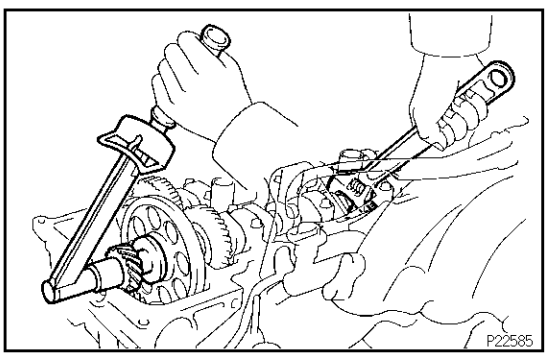
HINT

Check that the matchmarks on the camshaft timing gear and timing chain are aligned

(a) Place the gear over the straight pin of the intake camshaft




(b) Align the straight pin of distributor gear with the straight pin groove of the intake camshaft gear as shown




(c) Hold the intake camshaft with a wrench, install and torque the bolt

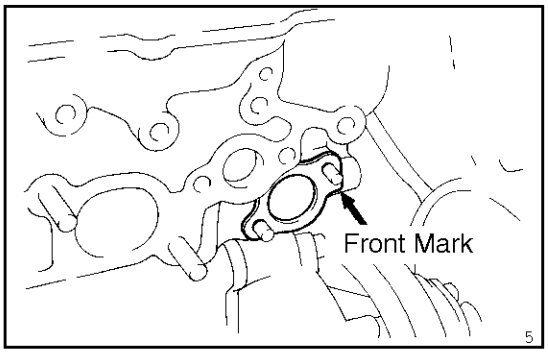
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

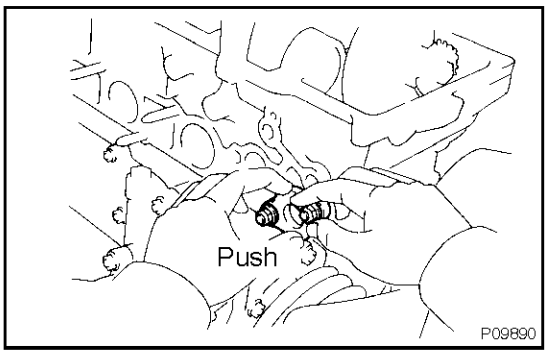
Brought to you by BirfMark






**6. INSTALL CHAIN TENSIONER**

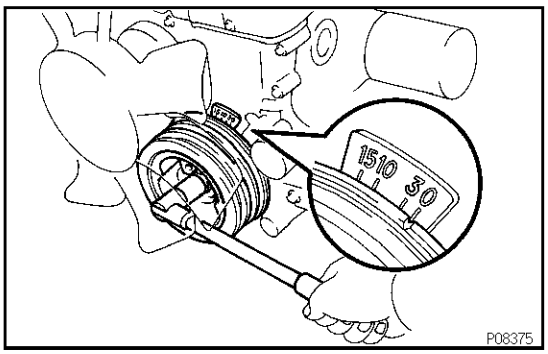
(a) Place a new gasket so that the front mark is toward the front side




(b) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts

(c) Tighten the 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

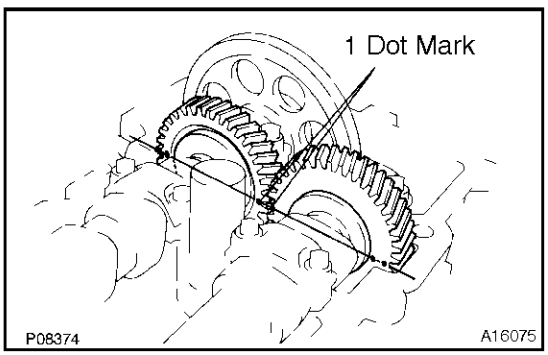



**7. CHECK VALVE TIMING**

(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover

**NOTICE:**

**Always turn the crankshaft clockwise.**




(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration

If not, turn the crankshaft 1 revolution (360°) and align the marks as above

**8. CHECK AND ADJUST VALVE CLEARANCE (See page EM–4)**

Turn the camshaft and position the cam lobe upward and check and adjust the valve clearance

**Valve clearance (Cold):**

| | |
|---|---|
| Intake | 0.15 – 0.25 mm (0.006 – 0.010 in.) |
| Exhaust | 0.25 – 0.35 mm (0.010 – 0.041 in.) |

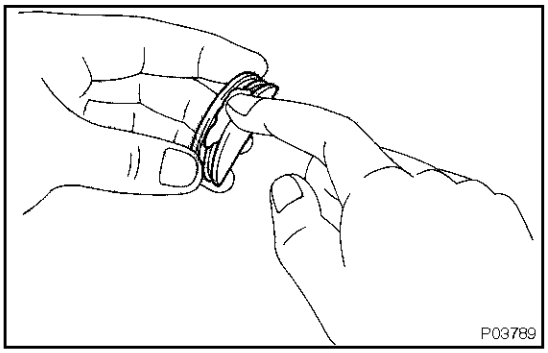
**9. INSTALL SPARK PLUGS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





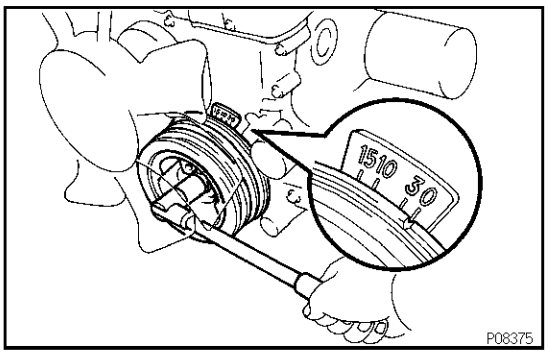

**10. INSTALL SEMI-CIRCULAR PLUG**

(a) Remove any old packing (FIPG) material

(b) Apply seal packing to the cylinder head installation surface of the semi-circular plug

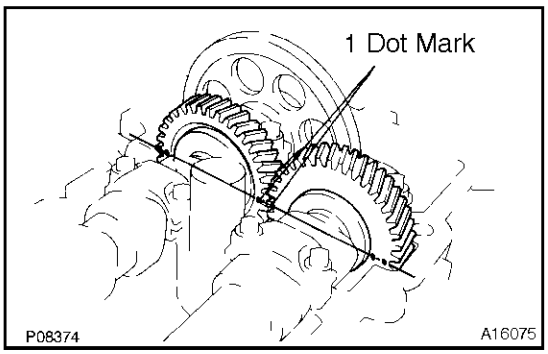
**Seal packing: Part No. 08826-00080 or equivalent**

(c) Install the semi-circular plug to the cylinder head




**11. SET NO. 1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover



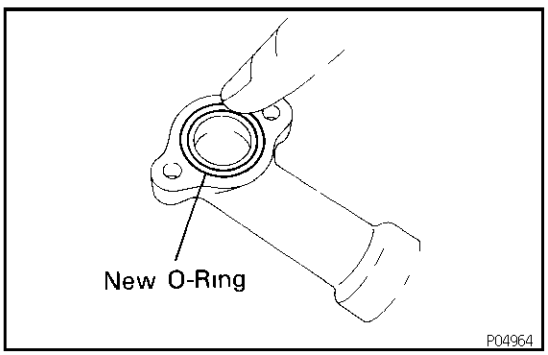

(b) Check that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration

If not, turn the crankshaft 1 revolution (360°) and align the mark as above

**12. INSTALL CYLINDER HEAD COVER**

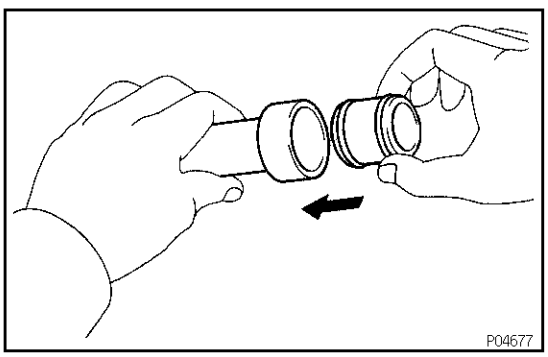
(a) Install the gasket to the cylinder head cover

(b) Install the cylinder head cover with the 13 bolts




**13. INSTALL WATER BYPASS OUTLET AND PIPE**

(a) Install a new O-ring to the water bypass outlet




(b) Install 2 new O-rings to the water bypass pipe

(c) Apply soapy water to the O-rings

(d) Assemble the water bypass outlet and pipe

(e) Install the water bypass outlet and pipe with the 2 bolts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**14. INSTALL HEATER PIPE**

Install a new gasket, the heater pipe and ground cable with the 2 bolts and 2 nuts

**Torque:**
**20 N·m (200 kgf·cm, 14 ft·lbf) for bolt:**
**21 N·m (210 kgf·cm, 15 ft·lbf) for nut**

**15. INSTALL NO. 1 AND NO. 2 EXHAUST MANIFOLDS**

(a) Install 2 new gaskets, No 1 exhaust manifold and No 2 exhaust manifold with the 13 nuts
**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(b) Install the No 1 heat insulator and No 2 heat insulator with the 6 bolts
**Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)**

**16. INSTALL FRONT EXHAUST PIPE**

(a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts
**Torque: 63 N·m (630 kgf·cm, 46 ft·lbf)**

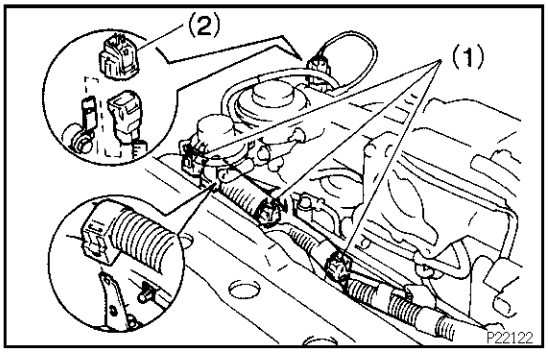
(b) Install the No 1 support bracket with the 2 bolts
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**

(c) Connect the clamp and tighten the clamp bolt
**Torque: 19.5 N·m (195 kgf·cm, 14 ft·lbf)**

(d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts
**Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)**

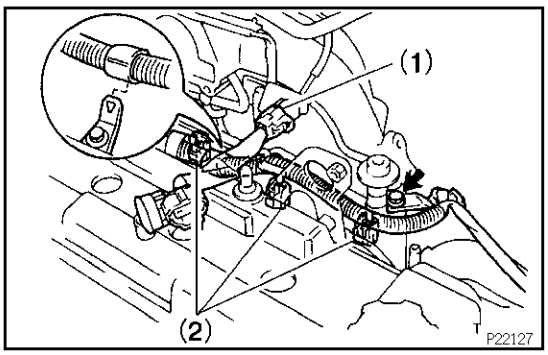
**17. CONNECT NO. 2 WATER BYPASS PIPE**

Connect the bypass pipe to the cylinder head with the 3 bolts
**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**




**18. CONNECT ENGINE WIRE**

(a) Place the engine wire on the intake manifold
(b) Connect the connectors
  (1) Connect the 3 injector connectors
  (2) Connect the EGR gas temp sensor connector
(c) Connect the clamp of the No 6 injector wire to the bracket
(d) Connect the engine wire clamp



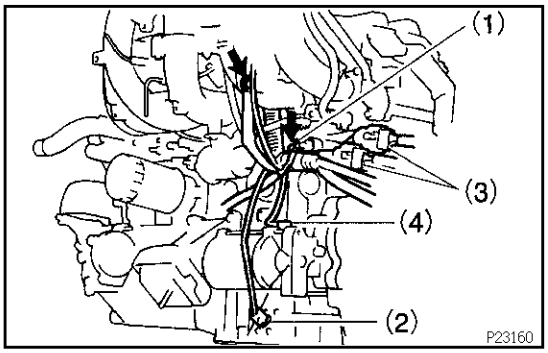

(e) Connect the engine wire clamp
(f) Connect the connectors
  (1) Connect the connector for the emission control valve set assembly
  (2) Connect the 3 injector connectors
(g) Install the bolt holding the engine wire to the intake manifold



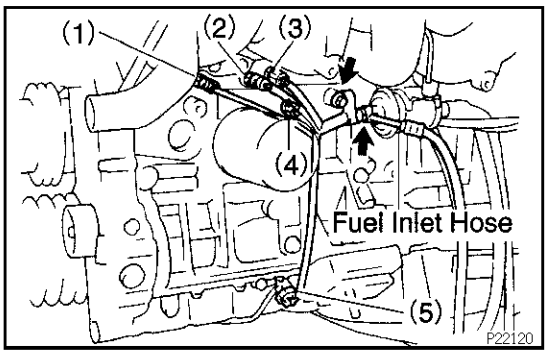
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(h) Connect the engine wire to the intake manifold and cylinder block with the 2 bolts
(i) Connect the PNP switch connector
(j) Connect the 2 heated oxygen sensor connectors
(k) Connect the connectors
  (1) Connect the Knock sensor connector
  (2) Connect the oil level sensor connector
  (3) Connect the 2 connectors to tthe ransmission
  (4) Connect the starter connector




(l) Connect the engine wire to the cylinder block with the bolt
(m) Connect the connectors
  (1) Connect the ECT sender gauge connector
  (2) Connect the ECT cut switch connector
  (3) Connect the ECT sensor connector
  (4) Connect the knock sensor connector
  (5) Connect the crankshaft position sensor connector

**19. CONNECT FUEL INLET HOSE**

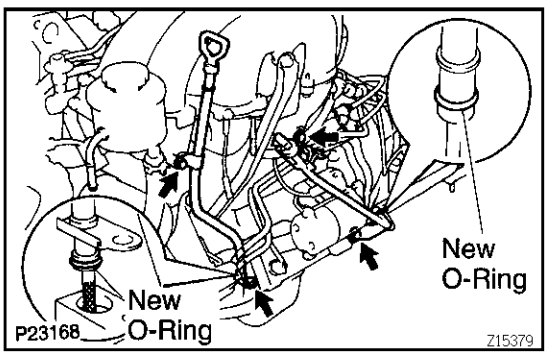
Connect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt

**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

**20. INSTALL INTAKE MANIFOLD STAY**

Install the intake manifold stay with the 2 bolts

**Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)**




**21. INSTALL OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION**

(a) Install a new O-ring to the dipstick guide
(b) Apply a light coat of engine oil on the O-ring
(c) Push in the dipstick guide into the guide hole of the oil pan
(d) Install the dipstick guide with the 2 bolts

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

**22. INSTALL THROTTLE BODY (See page SF-48)**

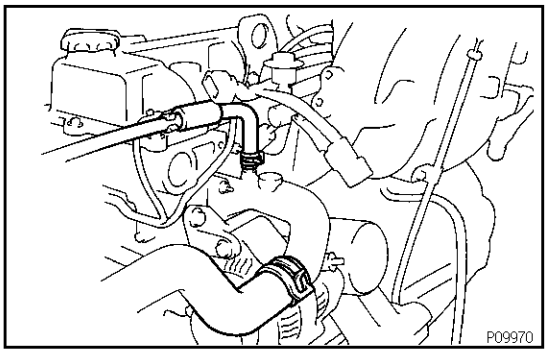
**23. INSTALL GENERATOR AND DRIVE BELTS (See page CH-19)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**24. CONNECT NO. 3 WATER BYPASS HOSE**

**25. CONNECT RADIATOR INLET HOSE**

**26. CONNECT PS RESERVOIR TANK**

Connect the reservoir tank with the 3 bolts

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

**27. INSTALL DISTRIBUTOR (See page IG–11)**

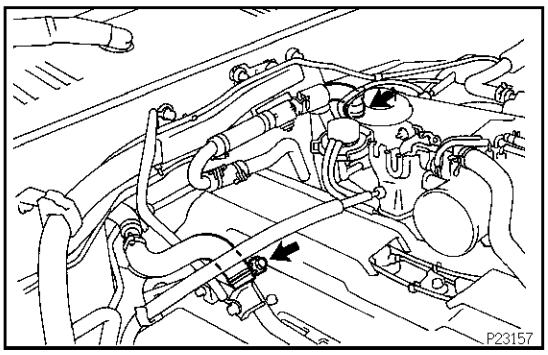
**28. INSTALL NO. 2 AND NO. 3 CYLINDER HEAD COVERS**

Install the head covers with the 4 bolts

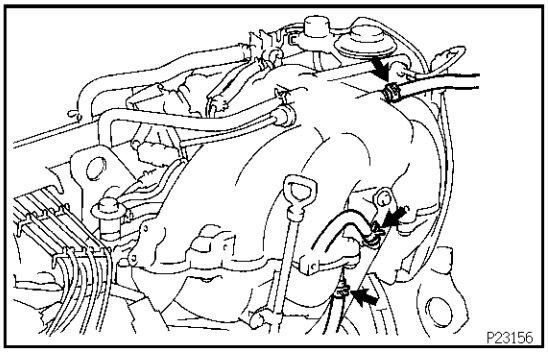
**29. CONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL**

(a) Connect the heater valve with the 2 bolts

(b) Connect the engine wire and ground strap with the 2 bolts



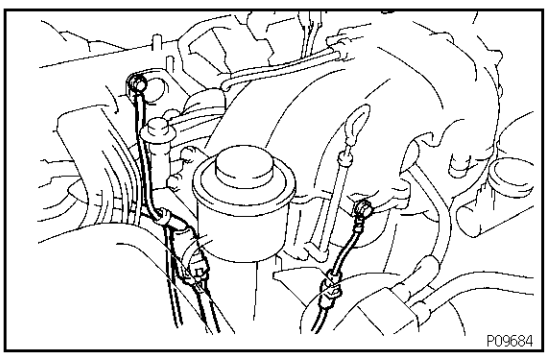

**30. CONNECT HEATER HOSES**




**31. CONNECT FUEL RETURN HOSE**

**32. CONNECT EVAP HOSE**

**33. CONNECT BRAKE BOOSTER VACUUM HOSE**




**34. CONNECT CONNECTOR ON INTAKE MANIFOLD TO LH FENDER APRON**

**35. CONNECT ENGINE GROUND STRAPS**

(a) Connect the ground strap to the No 1 engine hanger

(b) Connect the ground strap to the air intake chamber

**36. CONNECT THROTTLE CABLE TO THROTTLE BODY**

**37. CONNECT ACCELERATOR CABLE TO THROTTLE BODY**

**38. CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**39. INSTALL AIR CLEANER HOSE AND CAP**

**40. INSTALL BATTERY TRAY AND BATTERY**

(a) Install the battery tray with the 5 bolts

(b) Connect the ground strap with the bolt

(c) Install the battery and hold-down clamp with the nuts

(d) Connect the battery cables

**41. FILL RADIATOR WITH ENGINE COOLANT**

**42. START ENGINE AND CHECK FOR LEAKS**

**43. ADJUST IGNITION TIMING (See page EM-10)**

**44. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation

**45. RECHECK ENGINE COOLANT LEVEL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

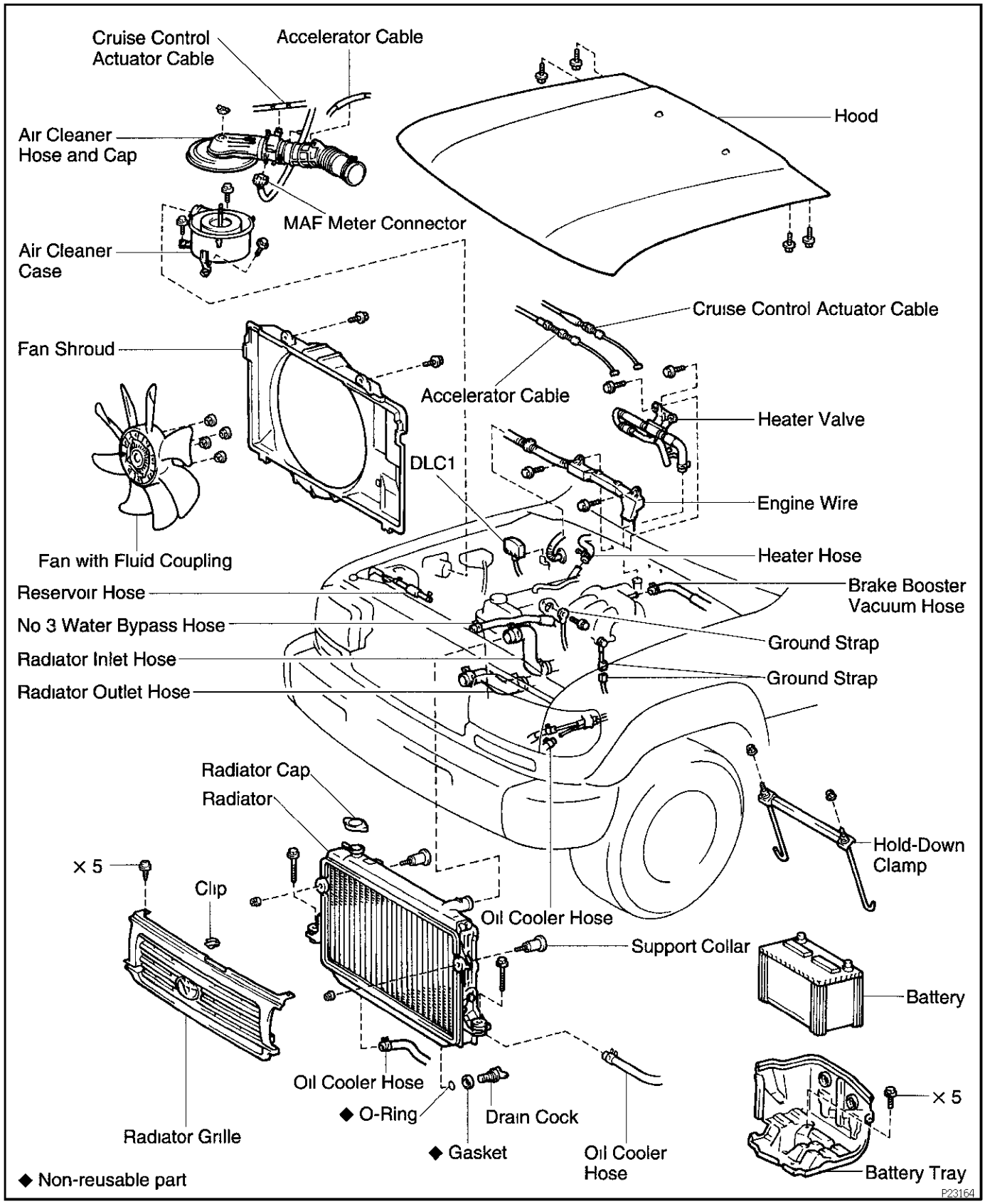
Brought to you by BirfMark



# ENGINE UNIT

## COMPONENTS

EM1EC 01



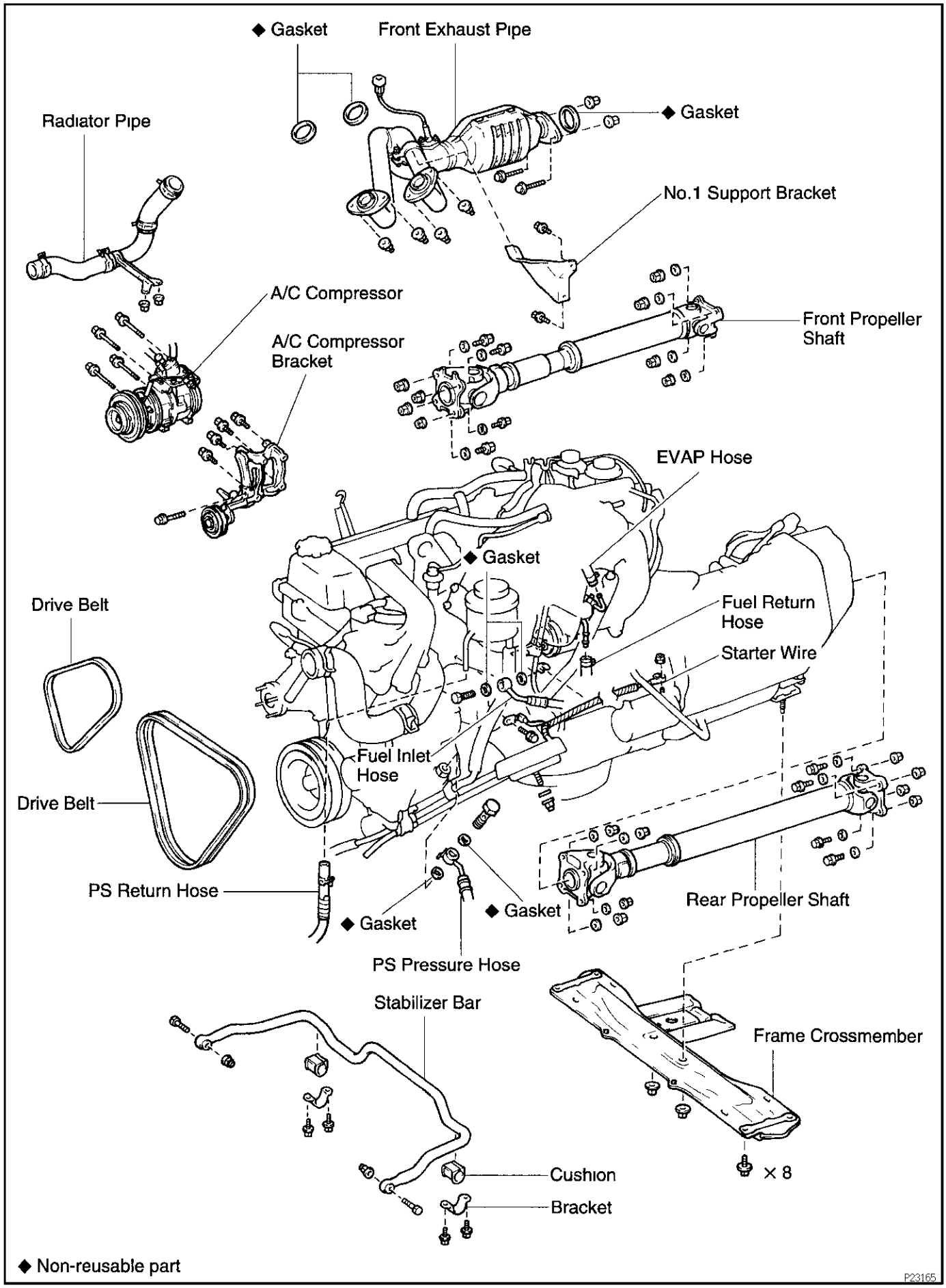



Author : Date : 568

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



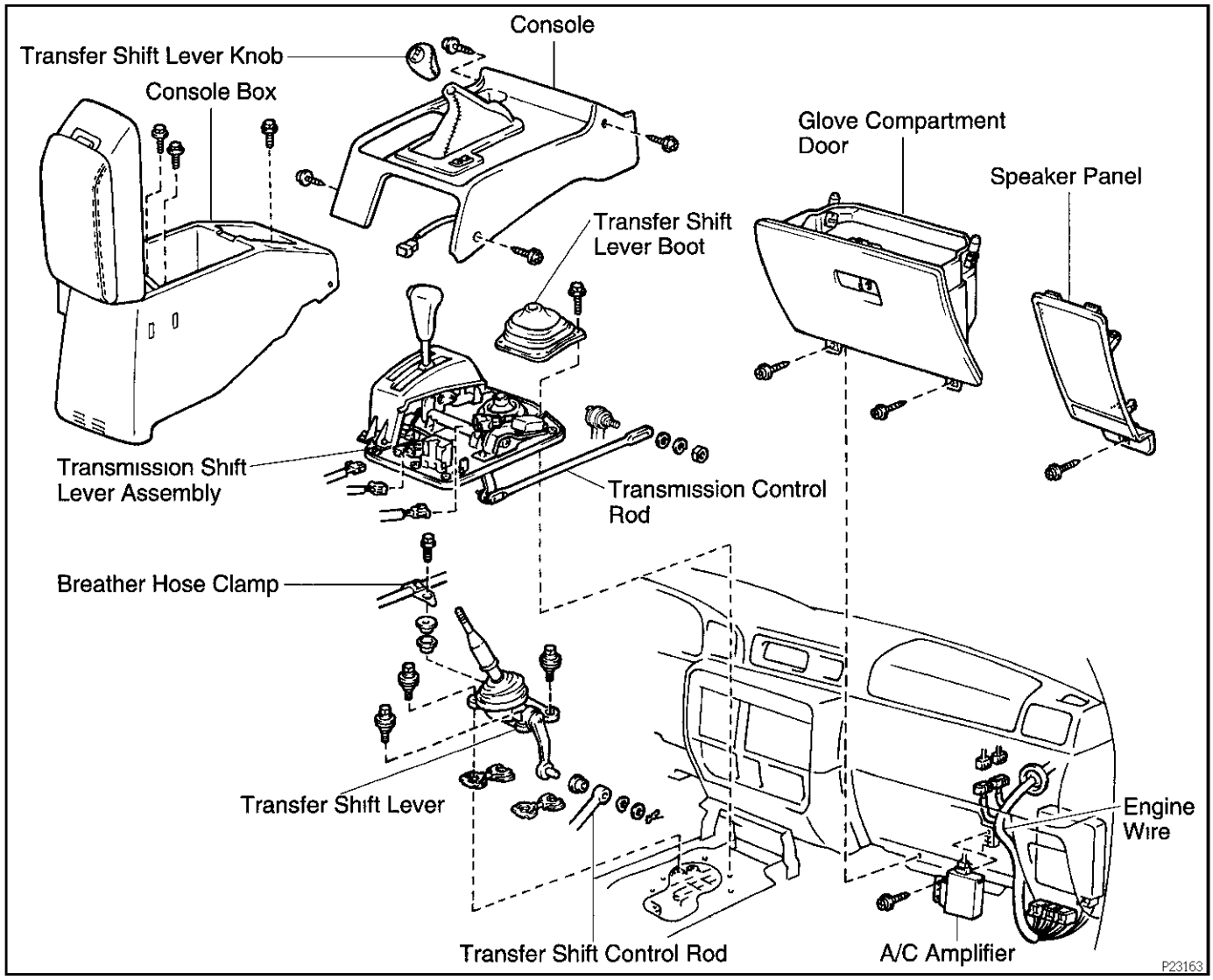





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



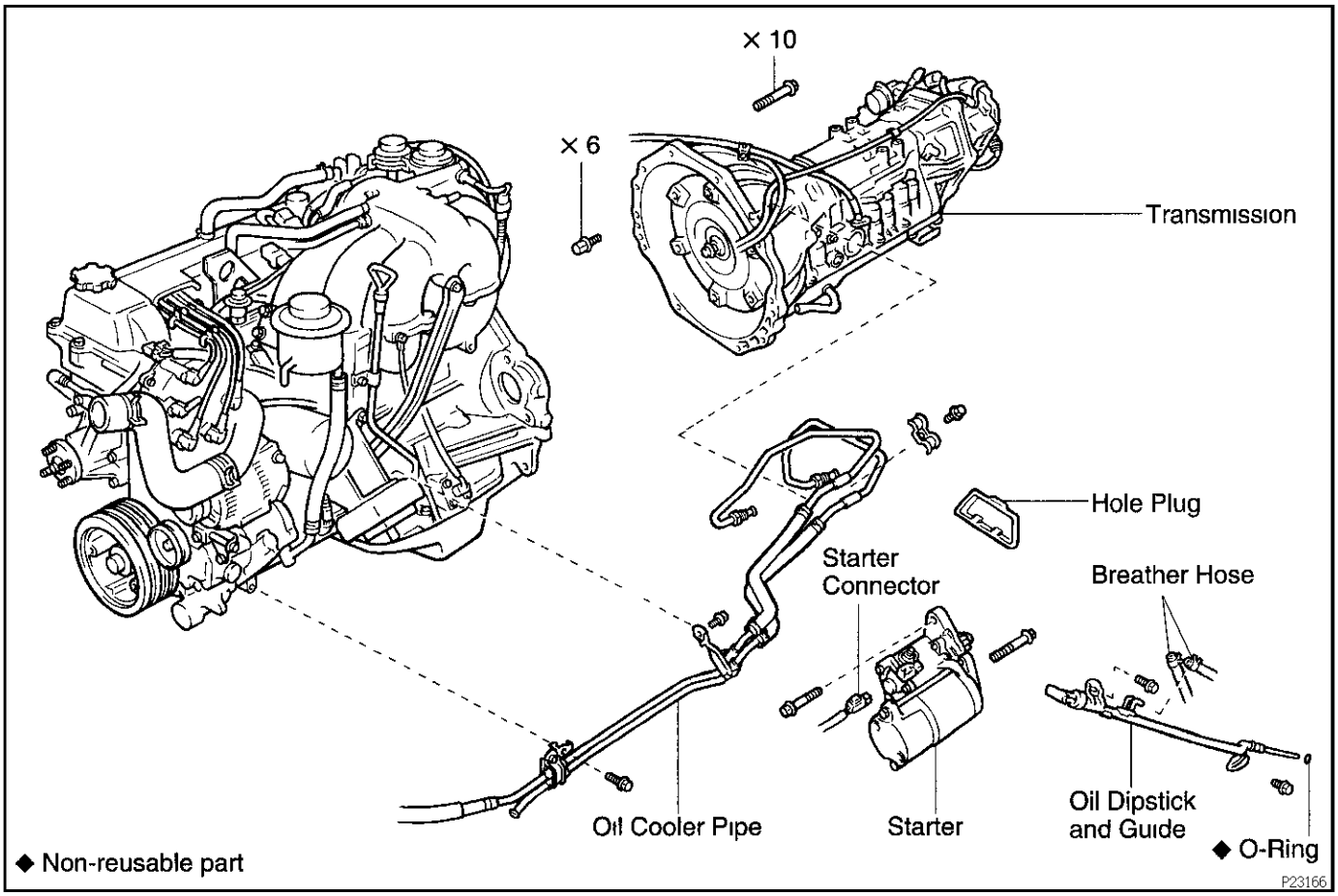





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark







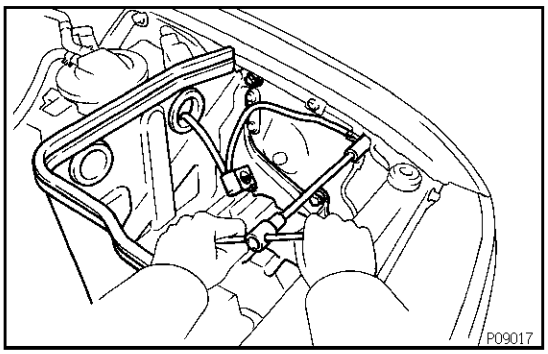

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



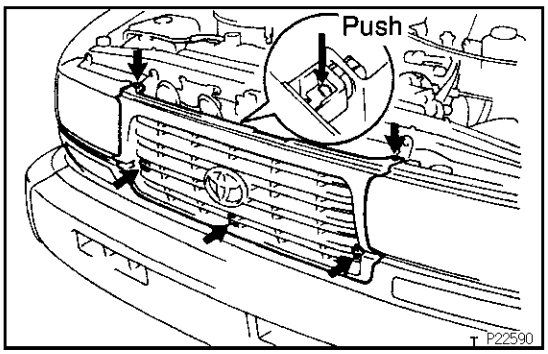
# REMOVAL

1. DRAIN ENGINE COOLANT
2. DRAIN ENGINE OIL
3. REMOVE HOOD




4. REMOVE BATTERY AND BATTERY TRAY

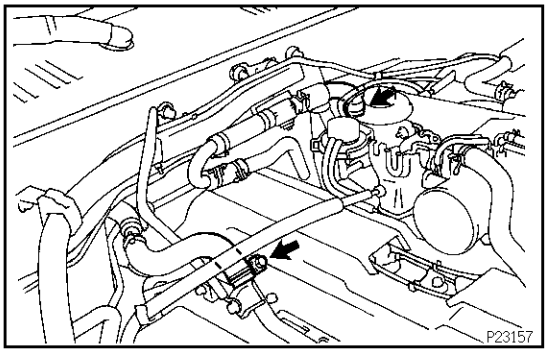
(a) Disconnect the battery cables
(b) Remove the nuts, hold–down clamp and battery
(c) Remove the bolt and disconnect the ground strap
(d) Remove the 5 bolts and battery tray




5. REMOVE RADIATOR GRILLE

Remove the 5 screws, clip and radiator grille

6. REMOVE RADIATOR (See page CO–14)
7. DISCONNECT OIL COOLER HOSE FROM OIL COOLER PIPE
8. REMOVE AIR CLEANER HOSE AND CAP
9. REMOVE AIR CLEANER CASE
10. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY
11. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY



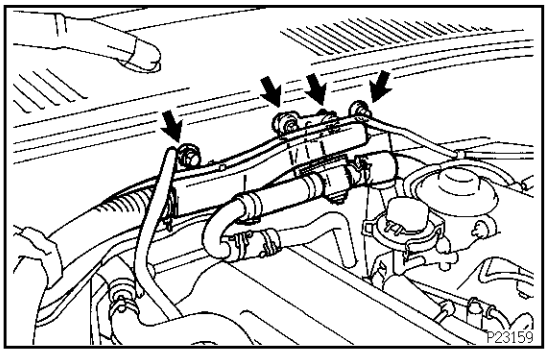

12. DISCONNECT HEATER HOSES



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

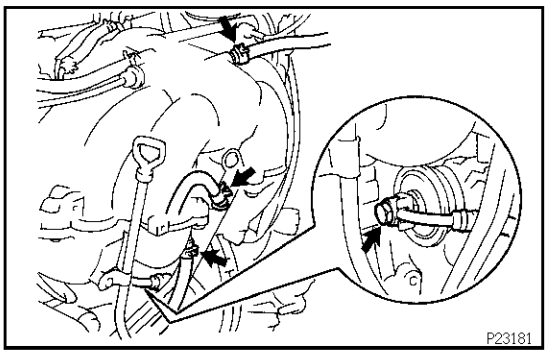





**13. DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL**

(a) Remove the 2 bolts and disconnect the engine wire and ground strap

(b) Remove the 2 bolts and disconnect the heater valve




**14. DISCONNECT BRAKE BOOSTER VACUUM HOSE**

**15. DISCONNECT EVAP HOSE**

**16. DISCONNECT FUEL HOSES**

(a) Disconnect the fuel return hose

(b) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter

**17. DISCONNECT WIRES AND CONNECTORS**

(a) Disconnect the 2 heated oxygen sensor connectors

(b) Disconnect the DLC1 clamp

(c) Disconnect the 2 oil pressure gauge connectors

(d) Disconnect the generator wire and connector

(e) Disconnect the connector on the intake manifold from the fender apron

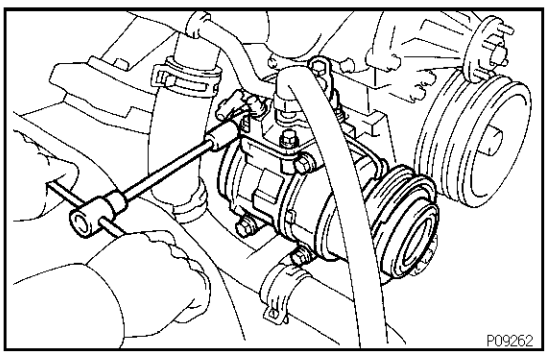
(f) Disconnect the high-tension cord from the ignition coil

(g) Disconnect the ground strap from the No 1 engine hanger

(h) Disconnect the ground strap from the air intake chamber

(i) Disconnect the starter wire

(j) Disconnect the ground cable from the cylinder block




**18. DISCONNECT A/C COMPRESSOR AND BRACKET**

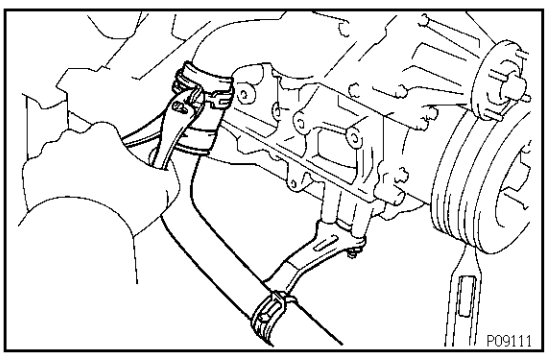
(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt

(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket

HINT

Put aside the compressor, and suspend it

(c) Remove the 5 bolts and A/C compressor bracket




**19. REMOVE RADIATOR PIPE**

(a) Remove the 2 nuts holding the radiator pipe to the No 1 oil pan

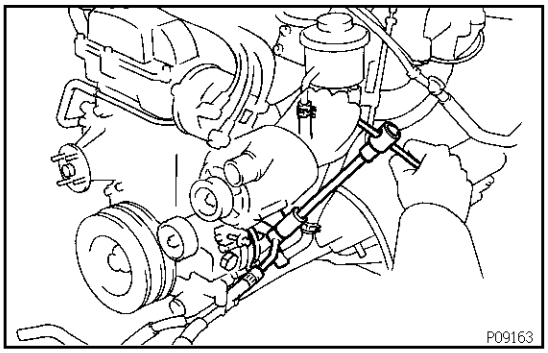
(b) Disconnect the No 2 radiator hose from the water inlet and remove the radiator pipe



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



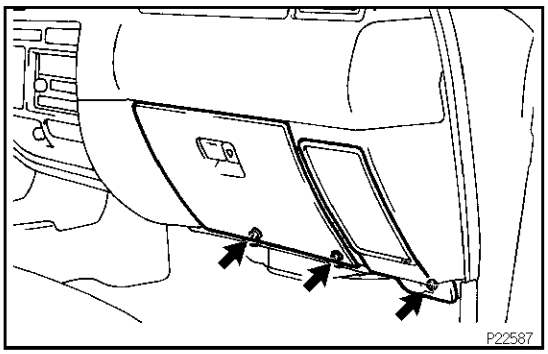



**20. DISCONNECT PS PRESSURE HOSE**

Remove the union bolt and 2 gaskets, and disconnect the pressure hose from the PS pump

**21. DISCONNECT PS RETURN HOSE**

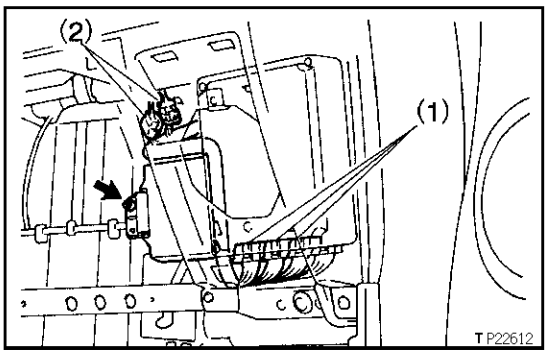
Disconnect the return hose from the PS reservoir tank




**22. DISCONNECT ENGINE WIRE FROM CABIN**

(a) Remove the 2 screws and glove compartment door

(b) Remove the screw and speaker panel



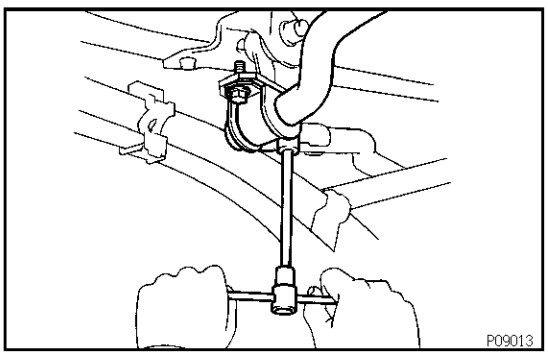

(c) Remove the screw, and disconnect the A/C amplifier

(d) Disconnect the connectors

(1) Disconnect the 3 connectors from the ECM

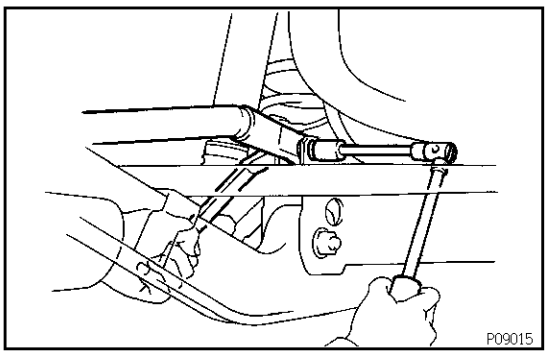
(2) Disconnect the 2 connectors from the cowl wire

(e) Pull out the engine wire from the cabin




**23. REMOVE STABILIZER BAR**

(a) Remove the 2 bolts and disconnect stabilizer bar from the bracket



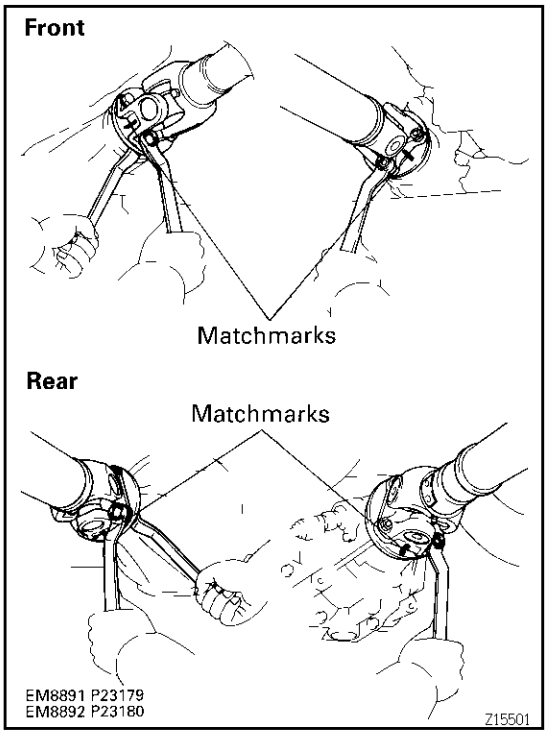

(b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

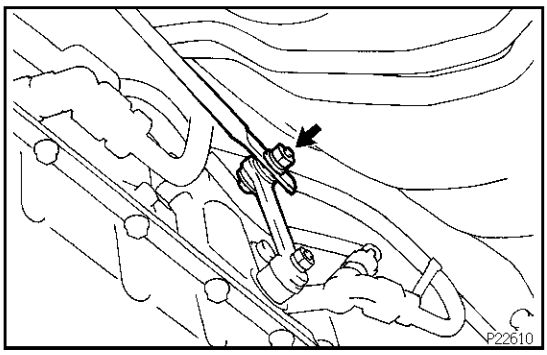
Brought to you by BirfMark





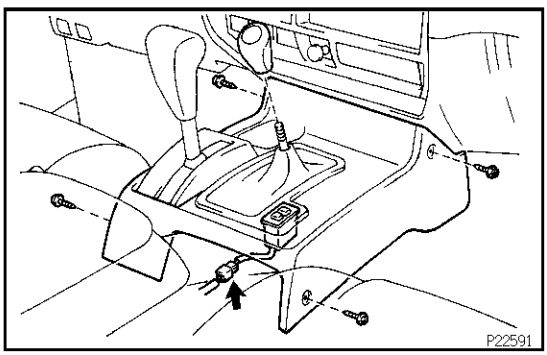

**24. REMOVE FRONT AND REAR PROPELLER SHAFTS**

(a) Put matchmarks on the flanges
(b) Remove the 4 bolts and nuts
(c) Remove the 4 nuts
(d) Remove the propeller shaft

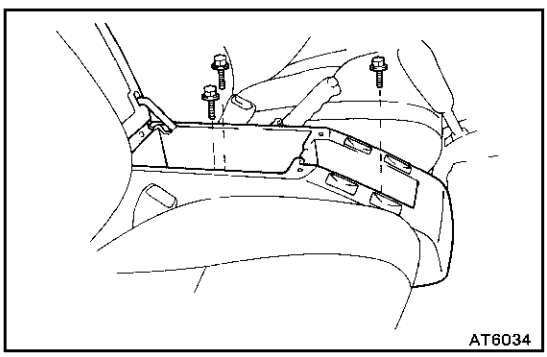



**25. REMOVE TRANSFER SHIFT LEVER**

(a) Remove the nut and transmission control rod




(b) Remove the transfer shift lever knob
(c) Remove 4 screws
(d) Lift up the console slightly in order to disconnect the connector
(e) Remove the console



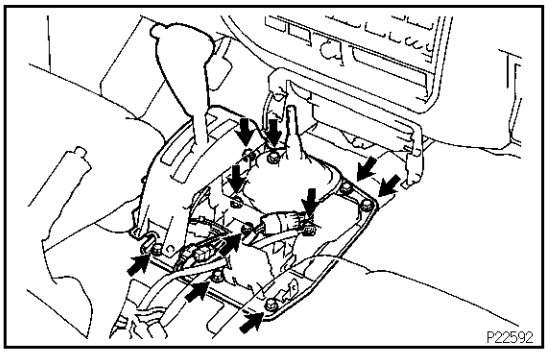

(f) Remove the 3 bolts and console box



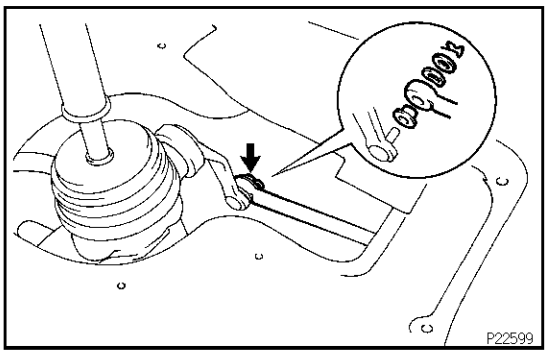
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

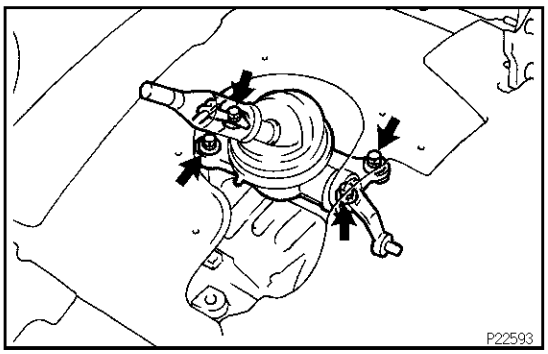




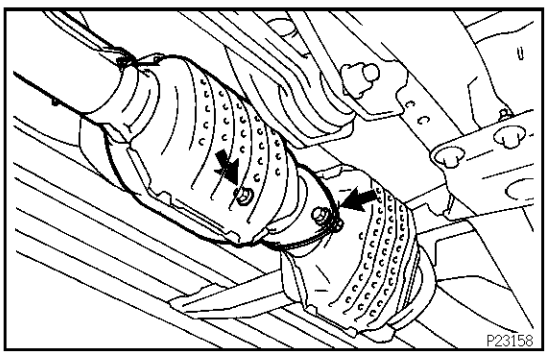

(g) Disconnect the 3 connectors
(h) Remove the 10 bolts and the transfer shift lever boot and transmission shift lever assembly



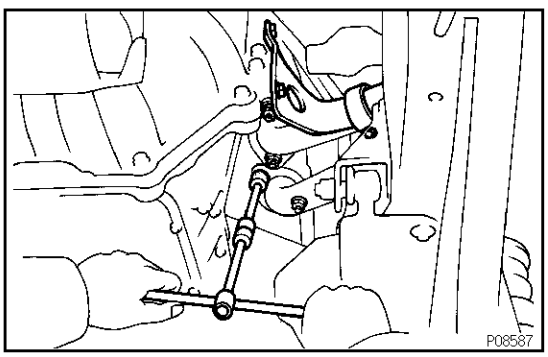

(i) Pull out the pin and disconnect the shift rod




(j) Remove the 4 bolts, hose clamp and the transfer shift lever




**26. REMOVE FRONT EXHAUST PIPE**
(a) Disconnect the heated oxygen sensor connector
(b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC
(c) Disconnect the front exhaust pipe, and remove the gasket




(d) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket
(e) Remove the 2 bolts and No 1 support bracket
(f) Remove the 4 nuts, front exhaust pipe and 2 gaskets

**27. DISCONNECT GROUND STRAP FROM HEAT INSULATOR**

**28. PLACE JACK UNDER TRANSMISSION**

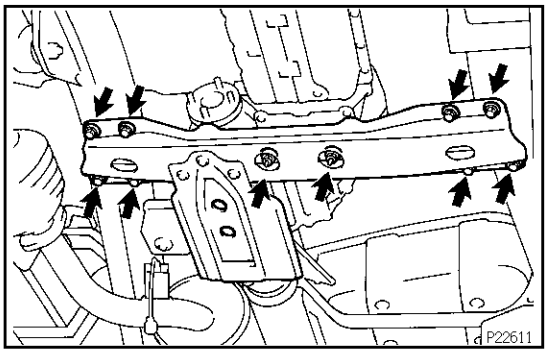
Be sure to put a wooden block between the jack and the transmission oil pan to prevent damage



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

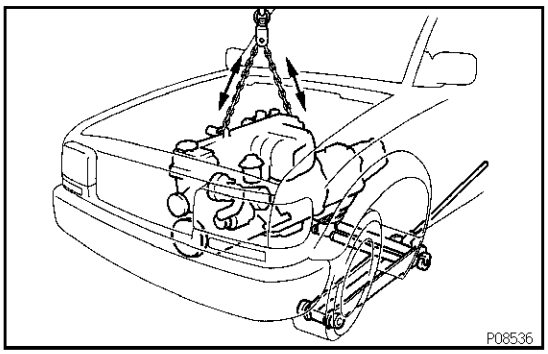





**29. REMOVE FRAME CROSSMEMBER**

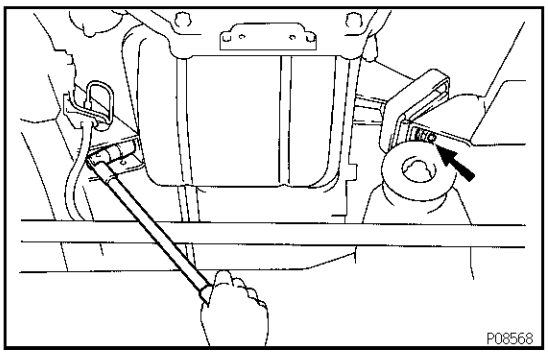
(a) Remove the 2 nuts holding the crossmember to the engine rear mounting insulator

(b) Remove the 8 bolts and crossmember

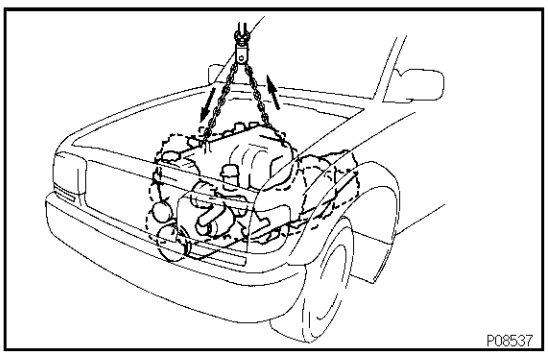



**30. REMOVE ENGINE WITH TRANSMISSION**

(a) Attach the engine hoist chain to the 2 engine hangers




(b) Remove the 2 nuts holding the engine front mounting insulators to the frame

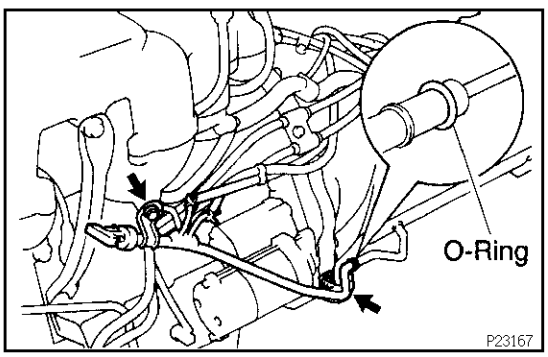



(c) Lift the engine with transmission out of the vehicle slowly and carefully

**NOTICE:**

**Make sure that the engine is clear of all wiring and hoses.**

(d) Place the engine and transmission assembly onto the stand




**31. REMOVE OIL DIPSTICK GUIDE FOR TRANSMISSION**

(a) Disconnect the 2 breather hoses

(b) Remove the 2 mounting bolts

(c) Pull out the dipstick guide and dipstick from the transmission

(d) Remove the O–ring from the dipstick guide

**32. DISCONNECT ENGINE WIRE FROM TRANSMISSION**

(a) Disconnect the PNP switch connector

(b) Disconnect the 2 connectors from the transmission



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**33. REMOVE STARTER**

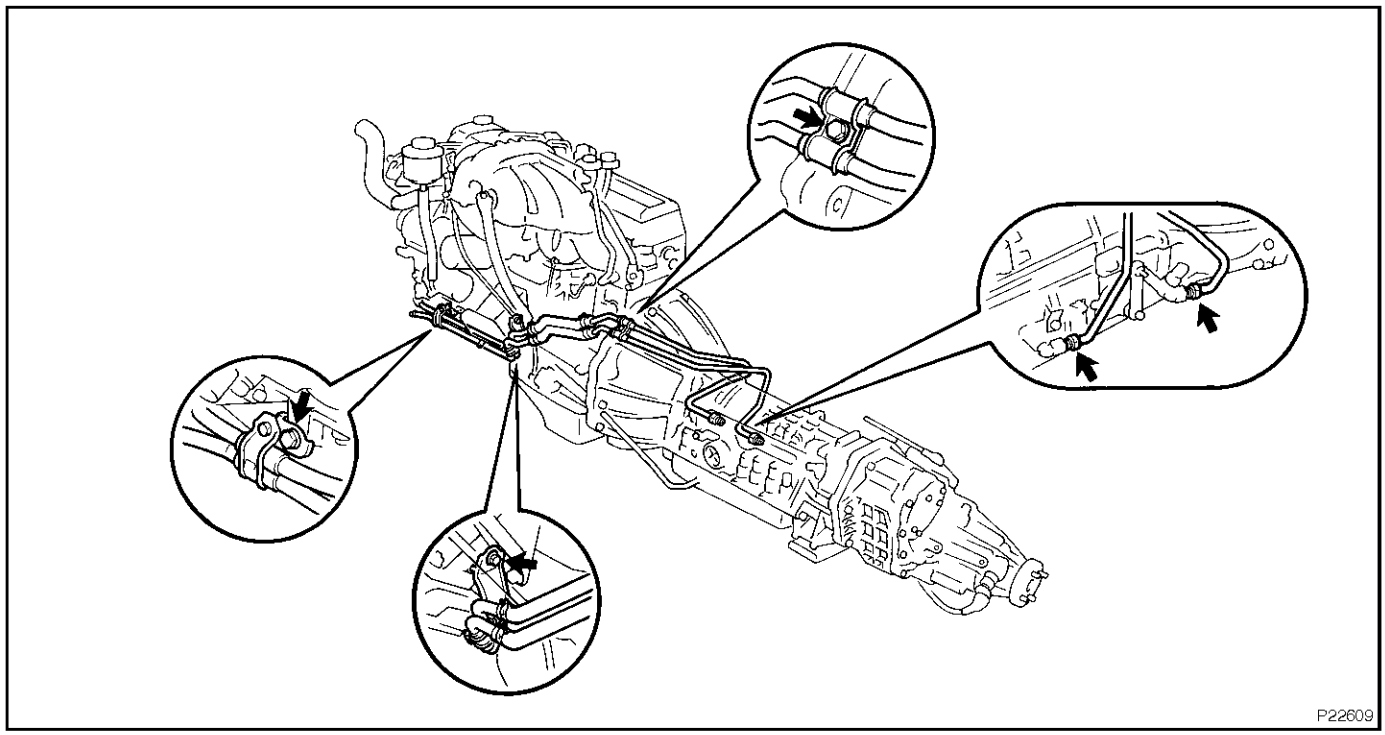
(a) Disconnect the starter connector

(b) Remove the 2 bolts and starter

**34. REMOVE A/T OIL COOLER PIPES FOR TRANSMISSION**

(a) Remove the 3 clamp mounting bolts

(b) Loosen the 2 union nuts, and remove the oil cooler pipes

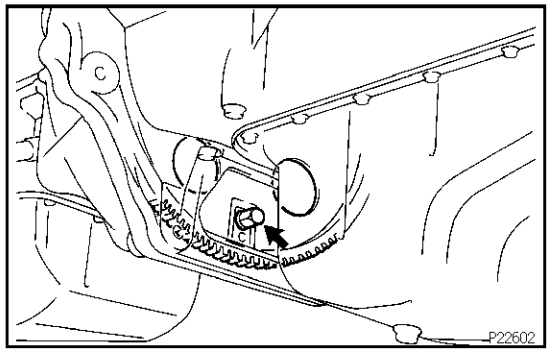



**35. DISCONNECT THROTTLE CABLE FROM THROTTLE BODY**

**36. REMOVE HOLE PLUG**

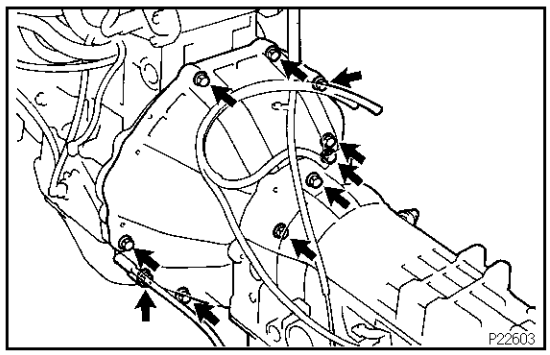
**37. REMOVE 6 TORQUE CONVERTER CLUTCH MOUNTING BOLT**

Turn the crankshaft to gain access to each bolt Remove the 6 bolts




**38. REMOVE TRANSMISSION FROM ENGINE**

Remove the 10 bolts and transmission





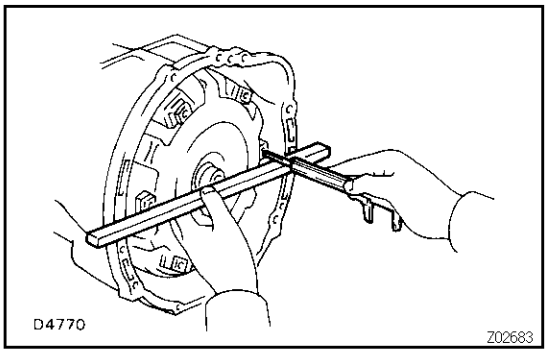

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1EE-02

# INSTALLATION

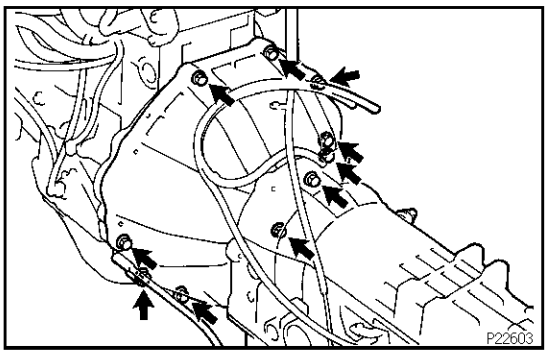



**1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION**

Using calipers and straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission

**Correct distance: 15.7 mm (0.618 in.) or more**

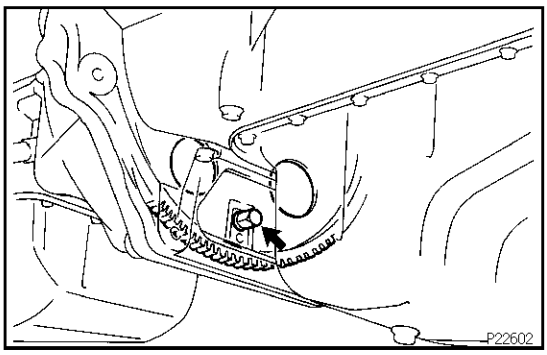
If the distance is less than the specifications, check for an improper installation




**2. INSTALL TRANSMISSION TO ENGINE**

Install the transmission with the 7 bolts

**Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)**




**3. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS**

Install the 6 bolts by turning the crankshaft

**Torque: 55 N·m (550 kgf·cm, 41 ft·lbf)**

HINT

First install the green colored bolt and then the remaining 5 bolts

**4. INSTALL HOLE PLUG**

**5. CONNECT THROTTLE CABLE TO THROTTLE BODY**

**6. INSTALL A/T OIL COOLER PIPES FOR TRANSMISSION**

(a) Temporarily install the 3 mounting bolts

(b) Connect the 2 oil cooler pipes to the unions on the transmission Tighten the union nuts

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

(c) Tighten the 3 clamp mounting bolts

**7. INSTALL STARTER**

(a) Install the starter with the 2 bolts

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(b) Connect the starter connector

**8. CONNECT ENGINE WIRE TO TRANSMISSION**

(a) Connect the 2 connectors from the transmission

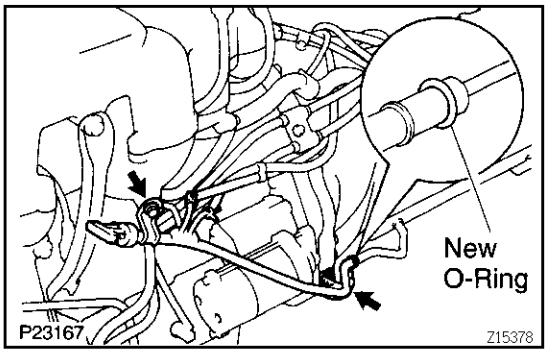
(b) Connect the PNP switch connector



Brought to you by BirfMark
Version 1.11 - 03/16/2010

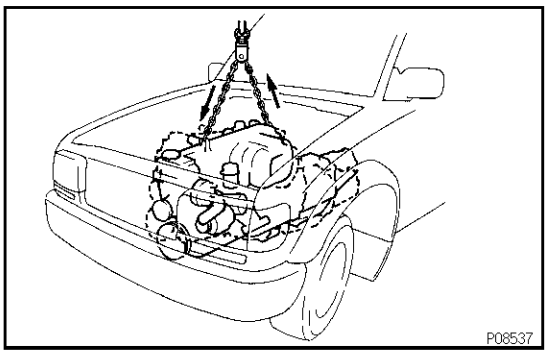
Brought to you by BirfMark





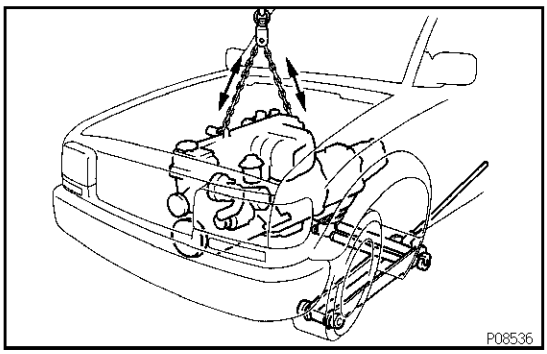

**9. INSTALL OIL DIPSTICK GUIDE FOR TRANSMISSION**

(a) Install a new O–ring to the dipstick guide
(b) Apply a light coat of ATF to the O–ring
(c) Connect the dipstick guide end to the tube of the oil pan, and install the dipstick guide with the 2 bolts
(d) Install the dipstick
(e) Connect the 2 breather hoses




**10. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE**

(a) Attach the engine hoist chain to the engine hangers
(b) Lower the engine and transmission assembly into the engine compartment




(c) Insert the stud bolts of the front engine mounting insulators into the stud bolt holes of the frame
(d) Temporarily install the 2 nuts holding the engine front mounting insulators to the frame crossmember
(e) Keep the engine level with a jack
(f) Remove the hoist chain

**11. INSTALL FRAME CROSSMEMBER**

(a) Temporarily install the crossmember to the engine rear mounting insulator with the 2 nuts
(b) Install the 8 bolts holding the crossmember to the frame
**Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)**
(c) Tighten the 2 nuts holding the crossmember to the engine rear mounting insulator
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

**12. TIGHTEN NUTS HOLDING ENGINE FRONT MOUNTING INSULATORS TO FRAME**
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

**13. CONNECT GROUND STRAP TO HEAT INSULATOR**

**14. INSTALL FRONT EXHAUST PIPE**

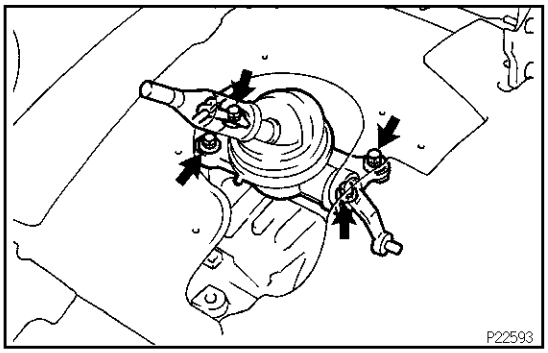
(a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts
**Torque: 63 N·m (630 kgf·cm, 46 ft·lbf)**
(b) Install the No 1 support bracket with the 2 bolts
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**
(c) Connect the clamp and tighten the clamp bolt
**Torque: 19.5 N·m (195 kgf·cm, 14 ft·lbf)**
(d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts
**Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

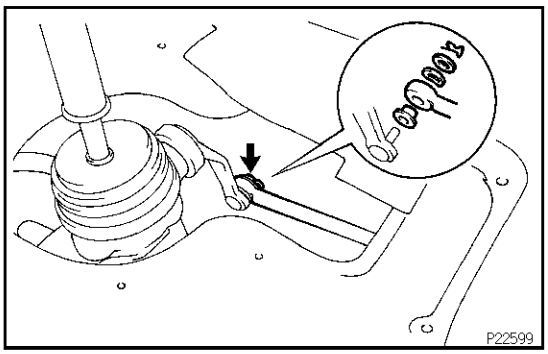
Brought to you by BirfMark



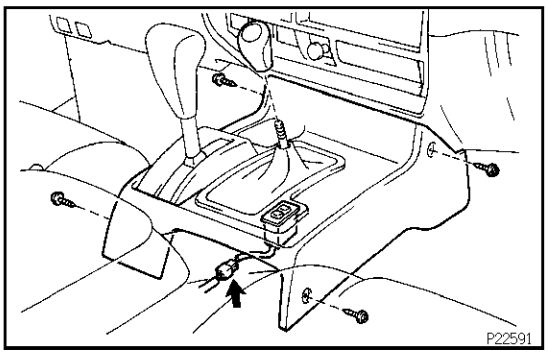



**15. INSTALL TRANSFER SHIFT LEVER**

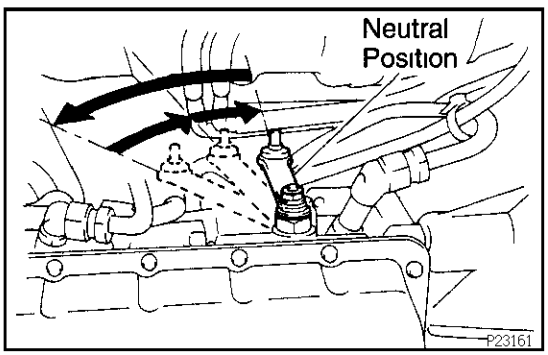
(a) Install the shift lever and hose clamp with the 4 bolts
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




(b) Connect the shift rod and install the pin
(c) Install the transfer shift lever boot and transmission shift lever assembly with the 10 bolts
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**
(d) Connect the 3 connectors to the transmission shift lever assembly
(e) Install the console box with the 3 bolts




(f) Connect the pattern select switch connector
(g) Install the console with the 4 screws
(h) Install the transfer shift lever knob



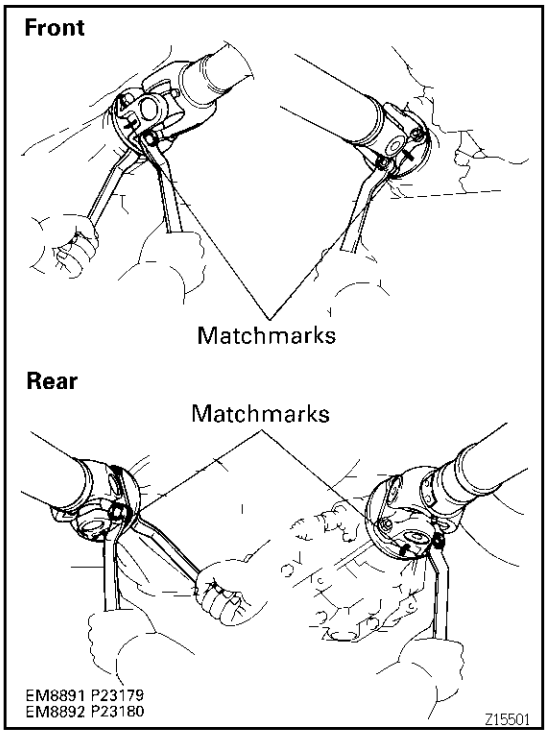

(i) Shift the shift lever to N position
(j) Fully turn the control shaft lever back and return 2 notches. It is now in neutral position.
(k) Connect the transmission control rod with the nut
**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






16. **Differential Side:**
**INSTALL FRONT AND REAR PROPELLER SHAFTS**

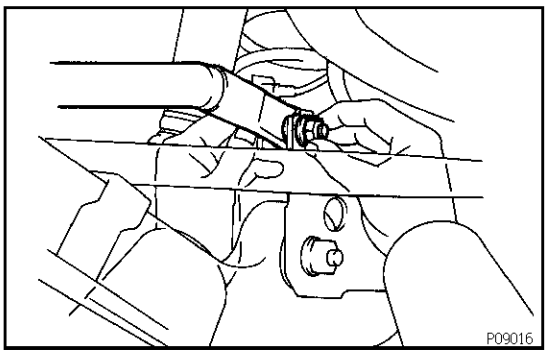
(a) Align the matchmarks on the flanges and connect the flanges with the 4 bolts and nuts

(b) Torque the bolts and nuts
**Torque:**
**74 N·m (750 kgf·cm, 54 ft·lbf) for front shaft**
**88 N·m (900 kgf·cm, 65 ft·lbf)for rear shaft**

17. **Transfer Side:**
**INSTALL FRONT AND REAR PROPELLER SHAFTS**

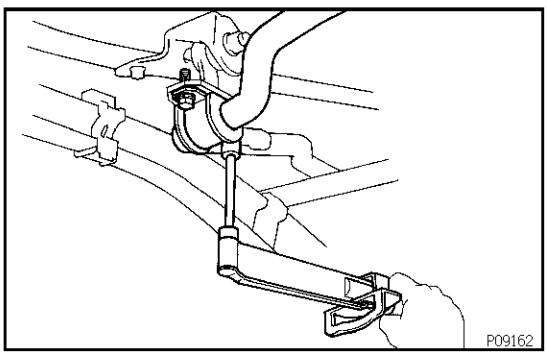
(a) Align the matchmarks on the flanges and connect the flanges with the 4 nuts

(b) Torque the nuts
**Torque:**
**74 N·m (750 kgf·cm, 54 ft·lbf) for front shaft**
**88 N·m (900 kgf·cm, 65 ft·lbf) for rear shaft**



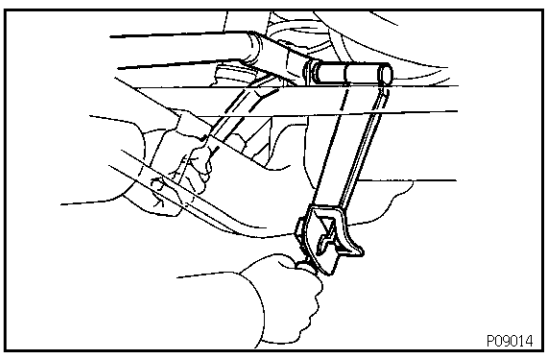

18. **INSTALL STABILIZER BAR**

(a) Temporarily install the stabilizer bar to the axle housing with the bolt and nut




(b) Connect the stabilizer bar with the 2 bolts
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

(c) Bounce the vehicle up and down to stabilize the suspension



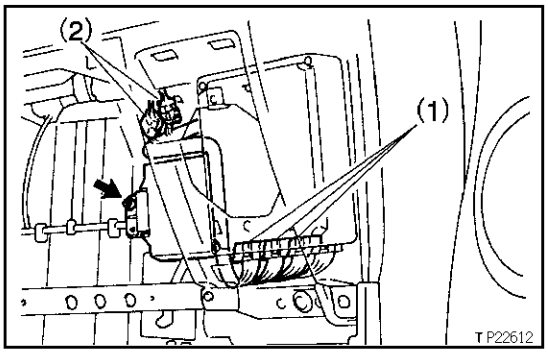

(d) Torque the bolt and nut holding the stabilizer bar to the axle housing
**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**19. CONNECT ENGINE WIRE TO CABIN**

(a) Push in the engine wire through the cowl panel

(b) Connect the connectors

(1) Connect the 3 connectors to the ECM

(2) Connect the 2 connectors to the cowl wire

(c) Connect the A/C amplifier with the screw

(d) Install the speaker panel with the screw

(e) Install the glove compartment door with the 2 screws

**20. CONNECT PS RETURN HOSE**

Connect the return hose to the PS reservoir tank

**21. CONNECT PS PRESSURE HOSE**

Connect the PS pressure hose with 2 new gaskets and the union bolt

**Torque: 56 N·m (575 kgf·cm, 42 ft·lbf)**

**22. INSTALL RADIATOR PIPE**

(a) Connect the No 2 radiator hose to the water inlet

(b) Install the 2 nuts holding the radiator pipe to the No 1 oil pan

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**23. INSTALL A/C COMPRESSOR AND BRACKET**

(a) Install the A/C compressor bracket with the 5 bolts

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

(b) Install the A/C compressor with the 4 bolts

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(c) Install and adjust the drive belt (See page CH–2)

**24. CONNECT WIRES AND CONNECTORS**

(a) Connect the 2 heated oxygen sensor connectors

(b) Connect the DLC1 clamp

(c) Connect the 2 oil pressure gauge connectors

(d) Connect the generator wire and connector

(e) Connect the connector on the intake manifold to the fender apron

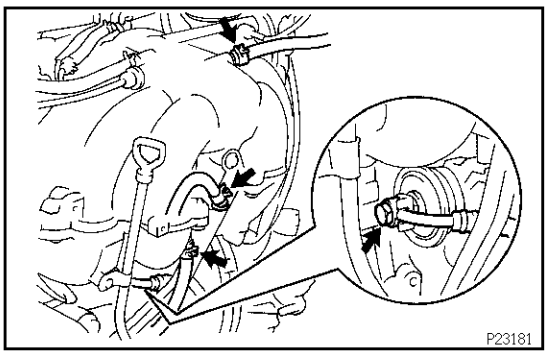
(f) Connect the high–tension cord to the ignition coil

(g) Connect the ground strap to the No 1 engine hanger

(h) Connect the ground strap to the air intake chamber

(i) Connect the starter wire

(j) Connect the ground cable to the cylinder block




**25. CONNECT FUEL HOSES**

(a) Connect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt

**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

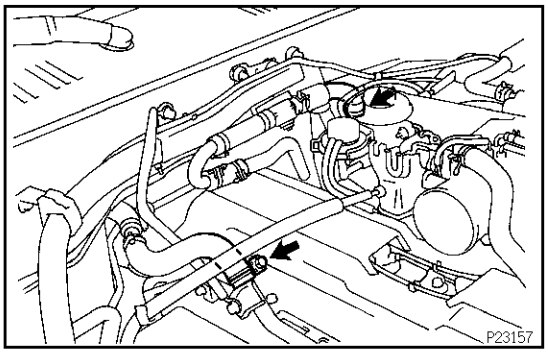
(b) Connect the fuel return hose



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**26. CONNECT EVAP HOSE**

**27. CONNECT BRAKE BOOSTER VACUUM HOSE**

**28. CONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL**

(a) Connect the heater valve with the 2 bolts

(b) Connect the engine wire and ground strap with the 2 bolts

**29. CONNECT HEATER HOSES**

**30. CONNECT ACCELERATOR CABLE TO THROTTLE BODY**

**31. CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY**

**32. INSTALL AIR CLEANER CASE**

**33. INSTALL AIR CLEANER HOSE AND CAP**

**34. CONNECT OIL COOLER HOSE TO OIL COOLER PIPE**

**35. INSTALL RADIATOR (See page CO–16)**

**36. INSTALL RADIATOR GRILLE**

Install the radiator grille with the 5 screws and clip

**37. INSTALL BATTERY TRAY AND BATTERY**

(a) Install the battery tray with the 5 bolts

(b) Connect the ground strap with the bolt

(c) Install the battery and hold–down clamp with the nuts

(d) Connect the battery cables

**38. FILL WITH ENGINE OIL**

**39. FILL RADIATOR WITH ENGINE COOLANT**

**40. START ENGINE AND CHECK FOR LEAKS**

**41. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL**

**42. CHECK IGNITION TIMING (See page EM–10)**

**43. INSTALL HOOD**

**44. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation

**45. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

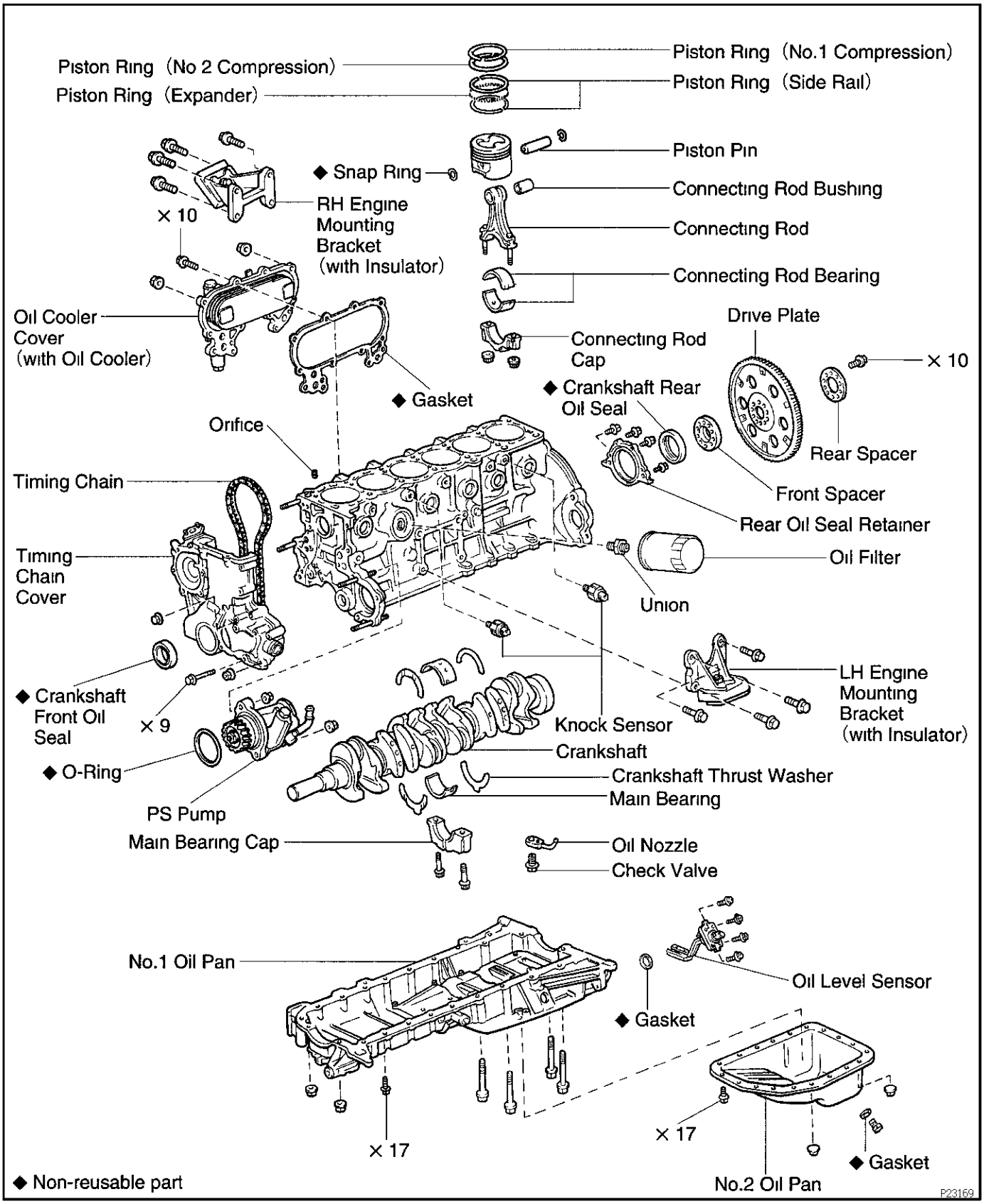
Brought to you by BirfMark



# CYLINDER BLOCK

## COMPONENTS

EM1EF 01



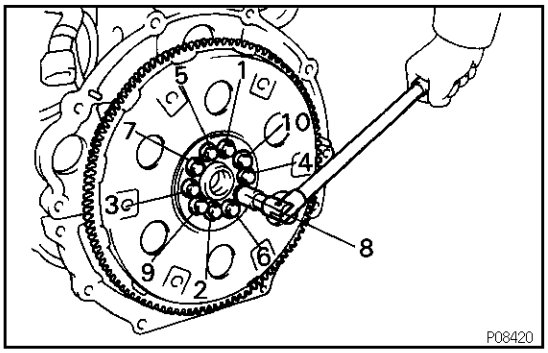



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1QB-01




# DISASSEMBLY

**1. REMOVE DRIVE PLATE**

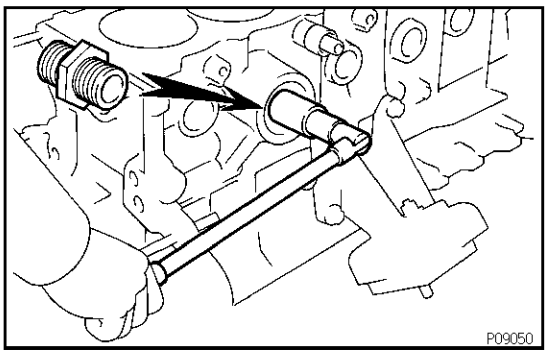
Uniformly loosen and remove the drive plate bolts, in several passes, in the sequence shown

**2. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**

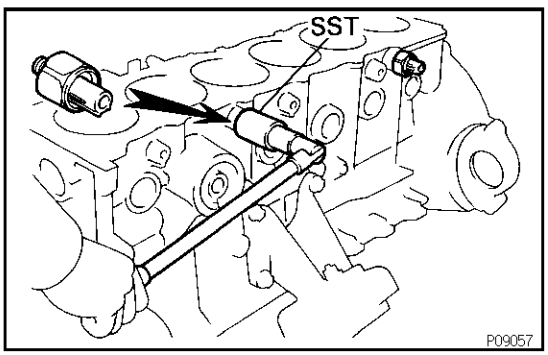
**3. REMOVE CYLINDER HEAD (See page EM–28)**

**4. REMOVE TIMING CHAIN AND GEARS (See page EM–13)**

**5. REMOVE OIL FILTER (See page LU–2)**



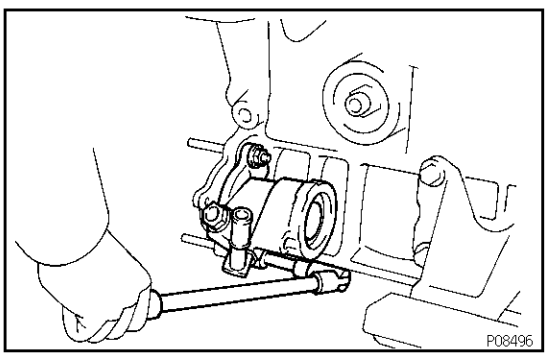

**6. REMOVE OIL FILTER UNION**




**7. REMOVE KNOCK SENSORS**

Using SST, remove the 2 knock sensors

SST 09816–30010




**8. REMOVE PS PUMP**

(a) Remove the 2 nuts and pump

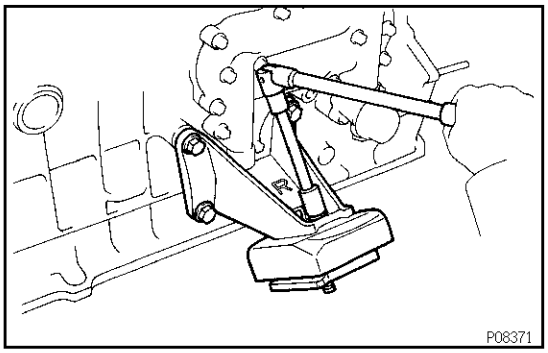
(b) Remove the O–ring from the pump



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

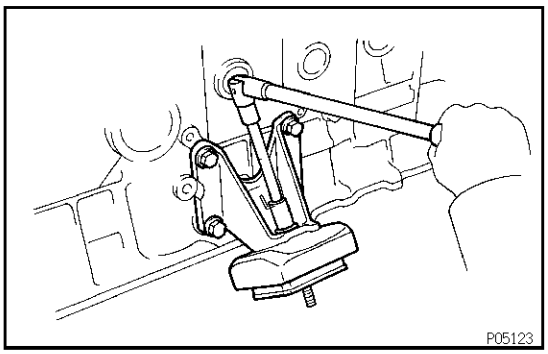





**9. REMOVE RH ENGINE MOUNTING BRACKET**

(a) Remove the nut and ınsulator

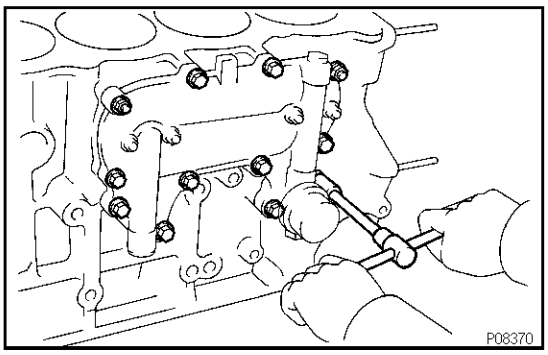
(b) Remove the 4 bolts and bracket




**10. REMOVE LH ENGINE MOUNTING BRACKET**

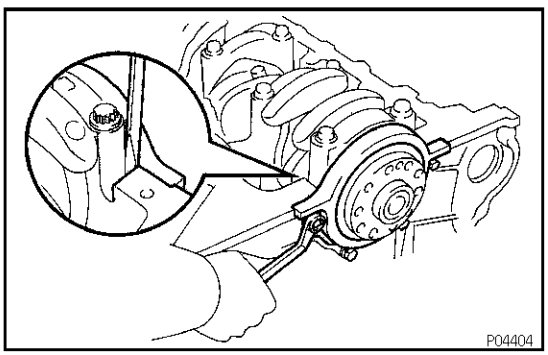
(a) Remove the nut and ınsulator

(b) Remove the 4 bolts and bracket



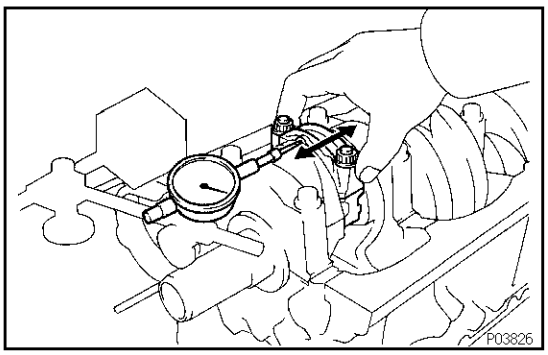

**11. REMOVE OIL COOLER COVER AND OIL COOLER**

Remove the 10 bolts, 2 nuts, oıl cooler cover wıth the oıl cooler and gasket




**12. REMOVE REAR OIL SEAL RETAINER**

Remove the 4 bolts and retaıner




**13. CHECK CONNECTING ROD THRUST CLEARANCE**

Usıng a dıal ındıcator, measure the thrust clearance whıle movıng the connectıng rod back and forth

**Standard thrust clearance:**

**0.160 – 0.262 mm (0.0063 – 0.0103 in.)**

**Maximum thrust clearance: 0.362 mm (0.0143 in.)**

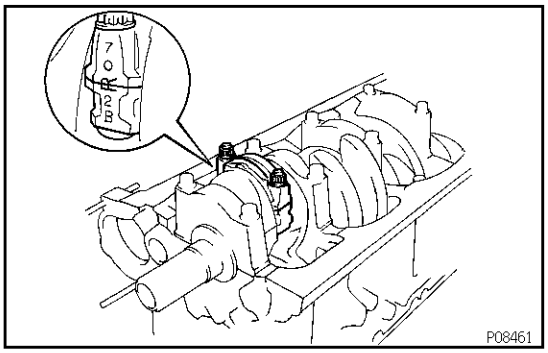
If the thrust clearance ıs greater than maxımum, replace the connectıng rod assembly If necessary, replace the crankshaft



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

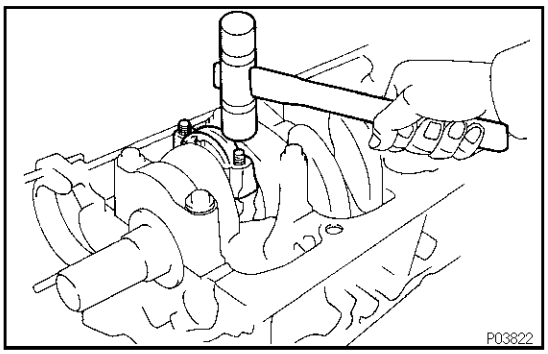





**14. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE**

(a) Check the matchmarks on the connecting rod cap and connecting rod to ensure correct reassembly

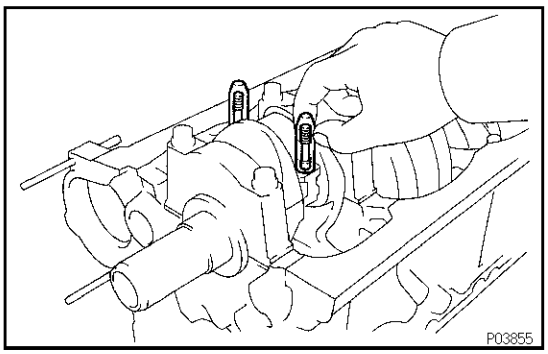
(b) Remove the connecting rod cap nuts



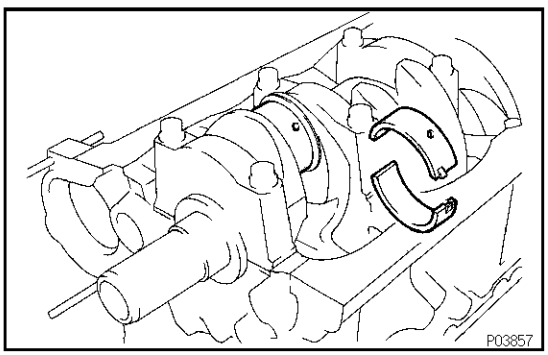

(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap

HINT

Keep the lower bearing inserted with the connecting rod cap



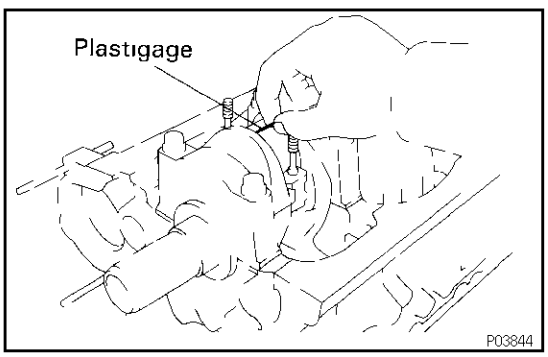

(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage




(e) Clean the crank pin and bearing

(f) Check the crank pin and bearing for pitting and scratches

If the crank pin or bearing is damaged, replace the bearings If necessary, grind or replace the crankshaft



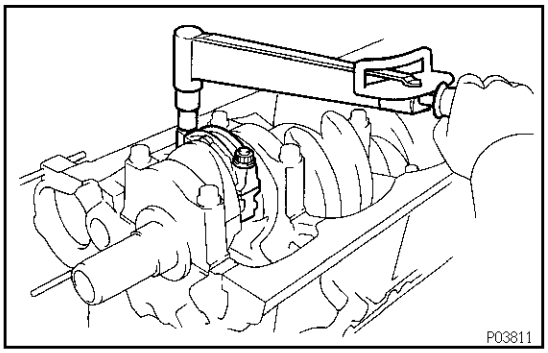

(g) Lay a strip of Plastigage across the crank pin



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



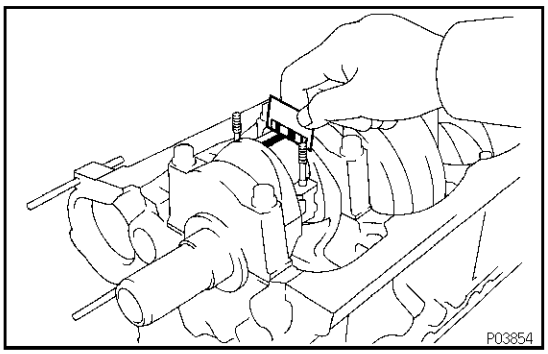



(h) Install the connecting rod cap with the 2 nuts (See page EM-103)

**NOTICE:**

**Do not turn the crankshaft.**

(i) Remove the 2 nuts and connecting rod cap (See procedure (b) and (c) above)



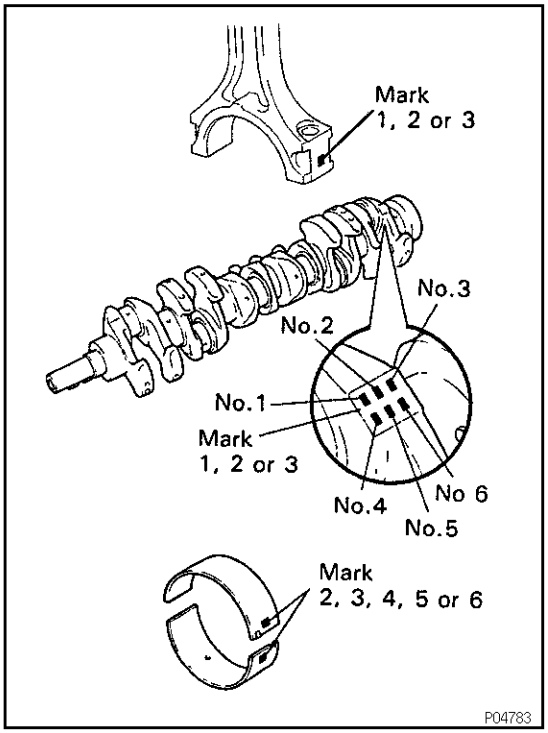

(j) Measure the Plastigage at its widest point

**Standard oil clearance:**

| | |
|---|---|
| STD | 0.032 – 0.050 mm (0.0013 – 0.0020 in.) |
| U/S 0.25 | 0.033 – 0.073 mm (0.0013 – 0.0029 in.) |

**Maximum oil clearance: 0.10 mm (0.0039 in.)**

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.




HINT

If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the connecting rod and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

| | Number marked | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Connecting rod | 1 | | | 2 | | | 3 | | |
| Crankshaft | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| Use bearing | 2 | 3 | 4 | 3 | 4 | 5 | 4 | 5 | 6 |

EXAMPLE: Connecting rod "3" + Crankshaft "1"
= Total number 4 (Use bearing "4")

**Reference**

**Connecting rod big end inside diameter:**

| | |
|---|---|
| Mark 1 | 60.526 – 60.532 mm (2.3829 – 2.3831 in.) |
| Mark 2 | 60.532 – 60.538 mm (2.3831 – 2.3834 in.) |
| Mark 3 | 60.538 – 60.544 mm (2.3834 – 2.3836 in.) |

**Crankshaft crank pin diameter:**

| | |
|---|---|
| Mark 1 | 56.994 – 57.000 mm (2.2439 – 2.2441 in.) |
| Mark 2 | 56.988 – 56.994 mm (2.2436 – 2.2439 in.) |
| Mark 3 | 56.982 – 56.988 mm (2.2434 – 2.2436 in.) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

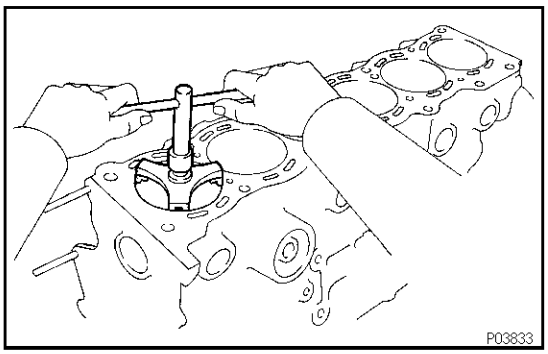
Brought to you by BirfMark



**Standard sized bearing center wall thickness:**

| | |
|---|---|
| Mark 2 | 1 744 – 1 747 mm (0 0687 – 0 0688 in ) |
| Mark 3 | 1 747 – 1 750 mm (0 0688 – 0 0689 in ) |
| Mark 4 | 1 750 – 1 753 mm (0 0689 – 0 0690 in ) |
| Mark 5 | 1 753 – 1 756 mm (0 0690 – 0 0691 in ) |
| Mark 6 | 1 756 – 1 759 mm (0 0691 – 0 0693 in ) |

(k) Completely remove the Plastigage



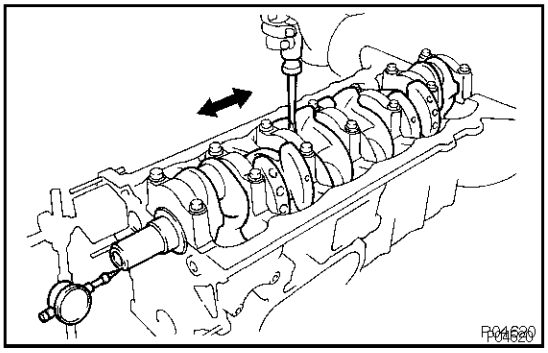

## 15. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove the all carbon from the top of the cylinder

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block

HINT

- Keep the bearings, connecting rod and cap together
- Arrange the piston and connecting rod assemblies in correct order




## 16. CHECK CRANKSHAFT THRUST CLEARANCE

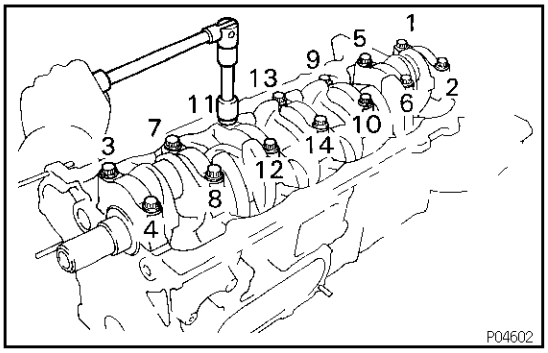
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver

**Standard thrust clearance:**
**0.020 – 0.220 mm (0.0008 – 0.0087 in.)**
**Maximum thrust clearance: 0.30 mm (0.0118 in.)**

If the thrust clearance is greater than maximum, replace the thrust washers as a set

**Thrust washer thickness:**

| | |
|---|---|
| STD | 2 440 – 2 490 mm (0 0961 – 0 0980 in ) |
| O/S 0 125 | 2 503 – 2 553 mm (0 0985 – 0 1005 in ) |
| O/S 0 250 | 2 565 – 2 615 mm (0 1010 – 0 1030 in ) |




## 17. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

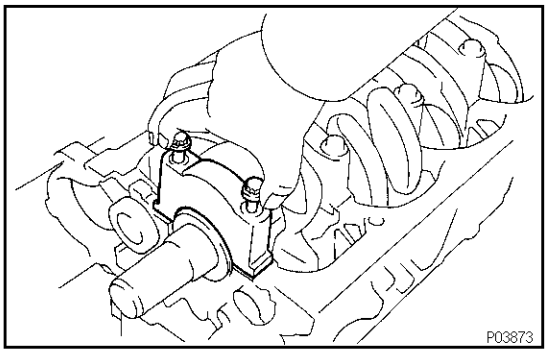
(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and (No 4 main bearing cap only) lower thrust washers

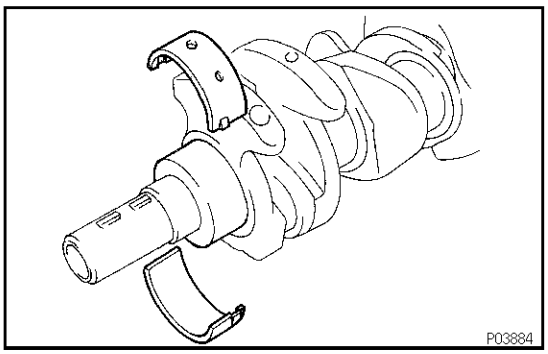
HINT

- Keep the lower bearing and main bearing cap together
- Arrange the main bearing caps and lower thrust washers in correct order

(c) Lift out the crankshaft

HINT

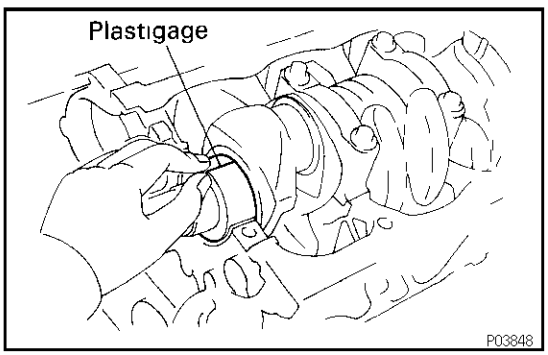
Keep the upper bearing and upper thrust washers together with the cylinder block




(d) Clean each main journal and bearing

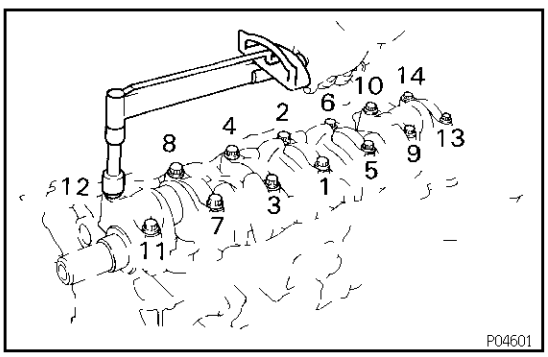
(e) Check each main journal and bearing for pitting and scratches

If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft




(f) Place the crankshaft on the cylinder block

(g) Lay a strip of Plastigage across each journal




(h) Install the main bearing caps (See page EM-103)

**NOTICE:**

**Do not turn the crankshaft.**

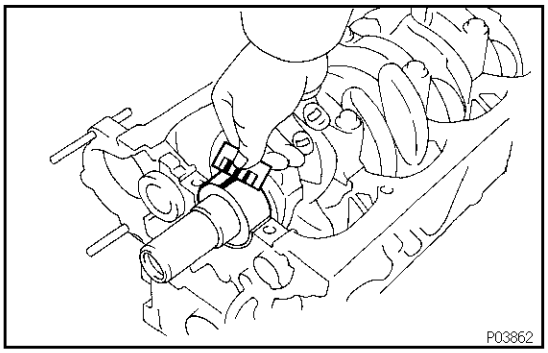
(i) Remove the main bearing caps (See procedure (a) and (b) above)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





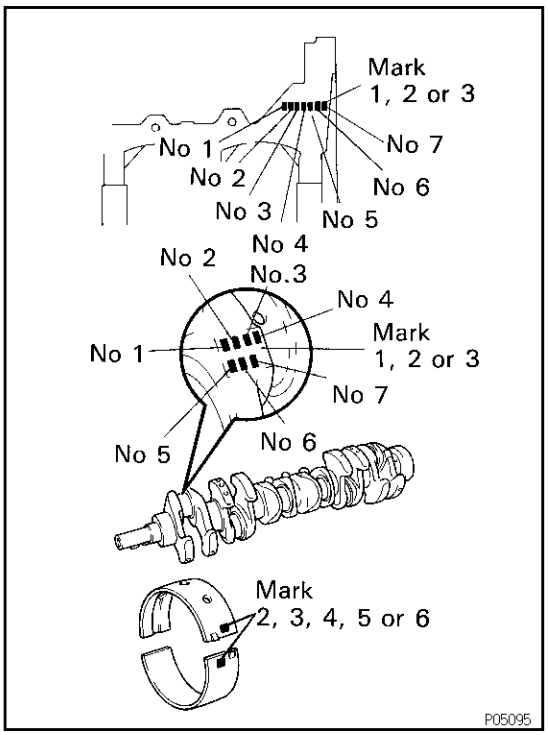

(j) Measure the Plastigage at its widest point

**Standard clearance:**

| | |
|---|---|
| STD | 0.042 – 0.060 mm (0.0017 – 0.0024 in.) |
| U/S 0.25 | 0.041 – 0.081 mm (0.0016 – 0.0032 in.) |

**Maximum clearance: 0.10 mm (0.0039 in.)**

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.




HINT

If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

| | Number marked | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Cylinder block | 1 | | | 2 | | | 3 | | |
| Crankshaft | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| Use bearing | 2 | 3 | 4 | 3 | 4 | 5 | 4 | 5 | 6 |

EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

**Reference**

**Cylinder block main journal bore diameter:**

| | |
|---|---|
| Mark 1 | 74.026 – 74.032 mm (2.9144 – 2.9146 in.) |
| Mark 2 | 74.032 – 74.038 mm (2.9146 – 2.9149 in.) |
| Mark 3 | 74.038 – 74.044 mm (2.9149 – 2.9151 in.) |

**Crankshaft main journal diameter:**

| | |
|---|---|
| Mark 1 | 68.994 – 69.000 mm (2.7163 – 2.7165 in.) |
| Mark 2 | 68.988 – 68.994 mm (2.7161 – 2.7163 in.) |
| Mark 3 | 68.982 – 68.988 mm (2.7158 – 2.7161 in.) |

**Standard bearing center wall thickness:**

| | |
|---|---|
| Mark 2 | 2.489 – 2.492 mm (0.0980 – 0.0981 in.) |
| Mark 2 | 2.492 – 2.495 mm (0.0981 – 0.0982 in.) |
| Mark 3 | 2.495 – 2.498 mm (0.0982 – 0.0983 in.) |
| Mark 4 | 2.498 – 2.501 mm (0.0983 – 0.0985 in.) |
| Mark 5 | 2.501 – 2.504 mm (0.0985 – 0.0986 in.) |

(k) Completely remove the Plastigage.

**18. REMOVE CRANKSHAFT**

(a) Lift out the crankshaft.

(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

HINT

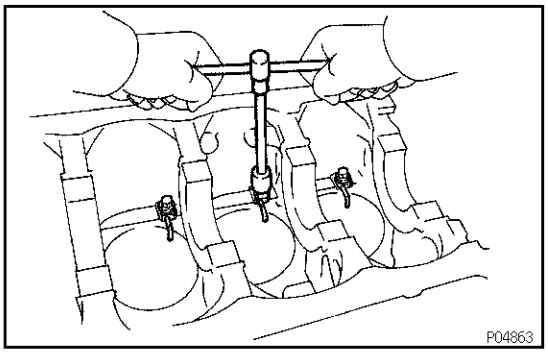
Arrange the main bearings and thrust washers in correct order.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

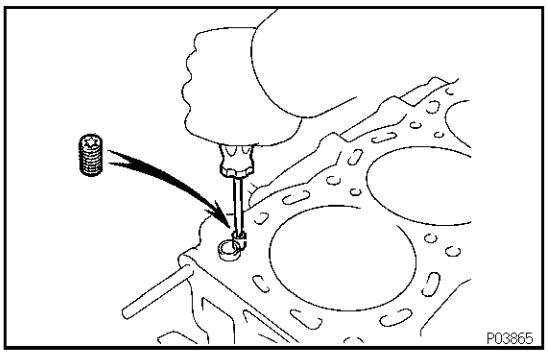
Brought to you by BirfMark



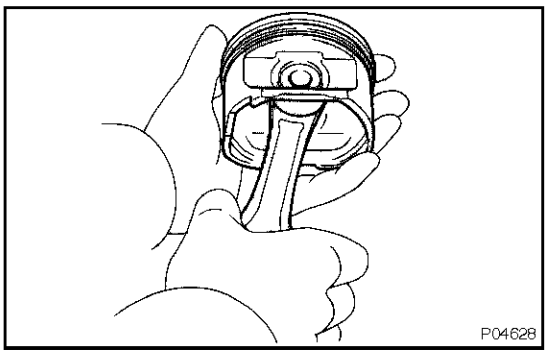



**19. REMOVE CHECK VALVES AND OIL NOZZLES**

Remove the 6 check valves and oil nozzles



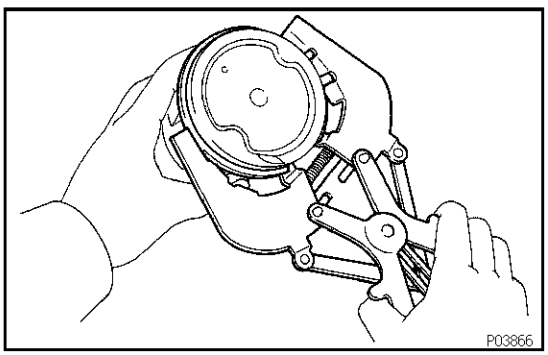

**20. REMOVE CYLINDER BLOCK ORIFICE**




**21. CHECK FIT BETWEEN PISTON AND PISTON PIN**

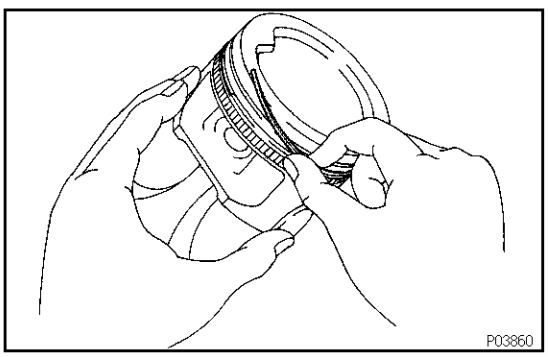
Try to move the piston back and forth on the piston pin

If any movement is felt, replace the piston and pin as a set




**22. REMOVE PISTON RINGS**

(a) Using a piston ring expander, remove the 2 compression rings




(b) Remove the 2 side rails and oil ring by hand

HINT

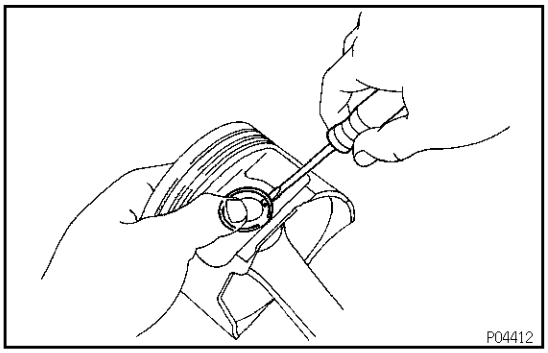
Arrange the rings in correct order only



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

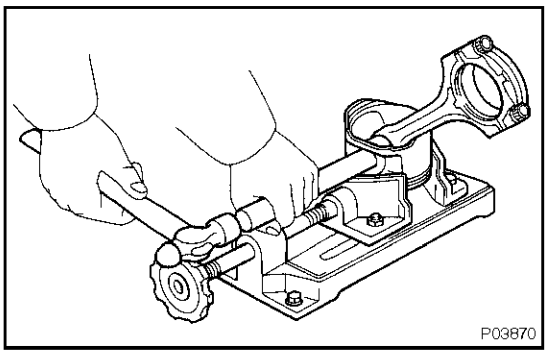





**23. DISCONNECT CONNECTING ROD FROM PISTON**

(a) Using a small screwdriver, pry out the 2 snap rings

(b) Gradually heat the piston to 80 – 90°C (176 – 194°F)




(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod

HINT

- The piston and pin are a matched set
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order



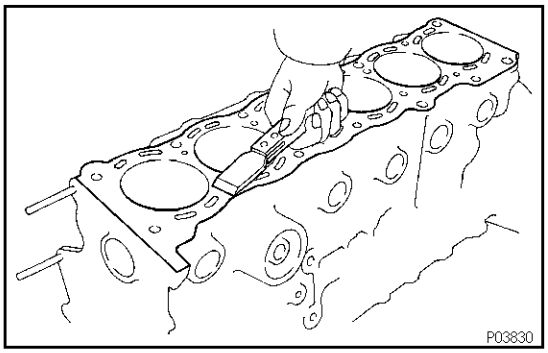
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



EM1EH 02

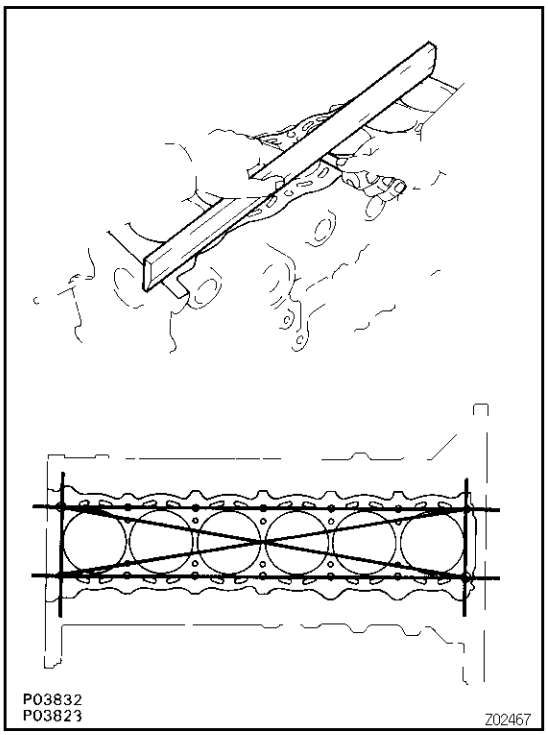
# INSPECTION




## 1. CLEAN CYLINDER BLOCK

(a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block

(b) Using a soft brush and solvent, thoroughly clean the cylinder block



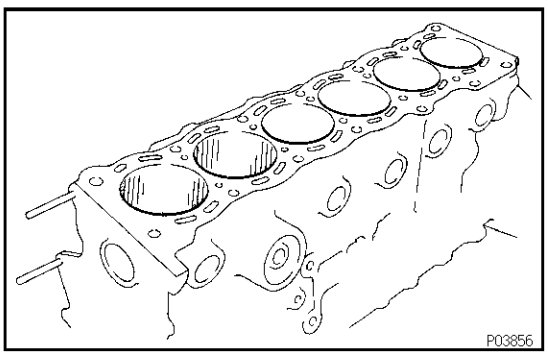

## 2. INSPECT CYLINDER BLOCK

(a) Inspect for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage

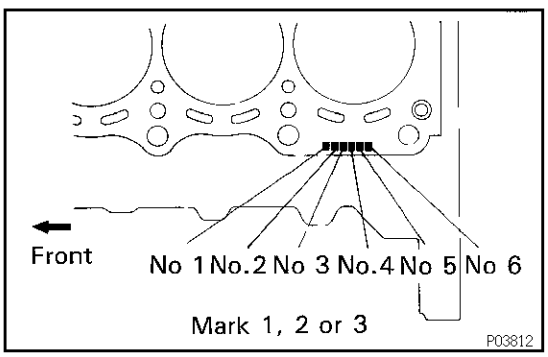
**Maximum warpage: 0.05 mm (0.0020 in.)**

If warpage is greater than maximum, replace the cylinder block




(b) Visually check the cylinder for vertical scratches

If deep scratches are present, rebore all the 6 cylinders If necessary, replace the cylinder block




(c) Inspect the cylinder bore diameter

HINT

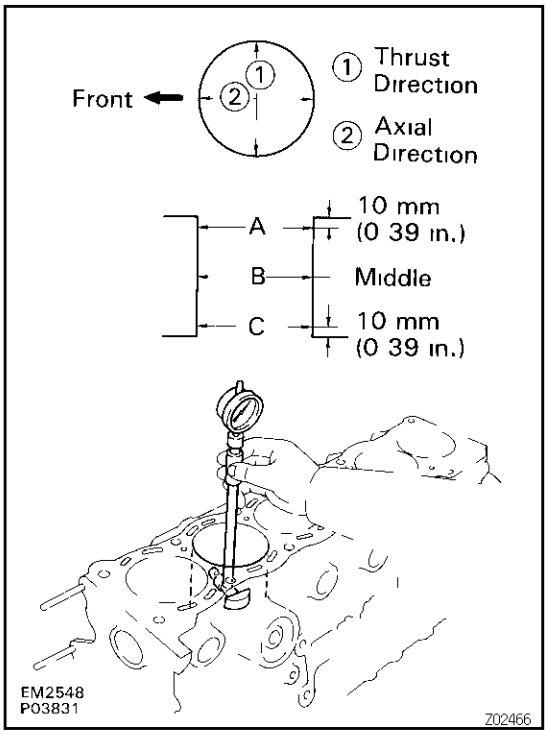
There are 3 sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly The mark is stamped on the top of the cylinder block



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions

**Standard diameter:**

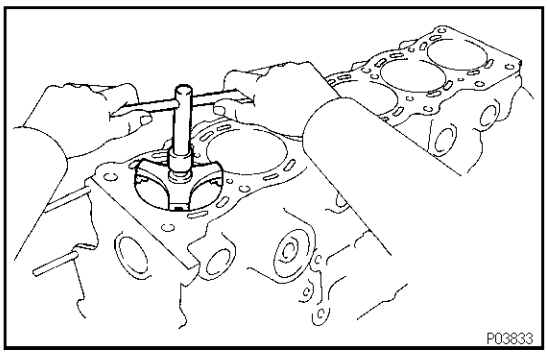
**STD**

| | |
|---|---|
| Mark 1 | 100 000 – 100 010 mm (3 9370 – 3 9374 in ) |
| Mark 2 | 100 010 – 100 020 mm (3 9374 – 3 9378 in ) |
| Mark 3 | 100 020 – 100 030 mm (3 9378 – 3 9382 in ) |

**Maximum diameter:**

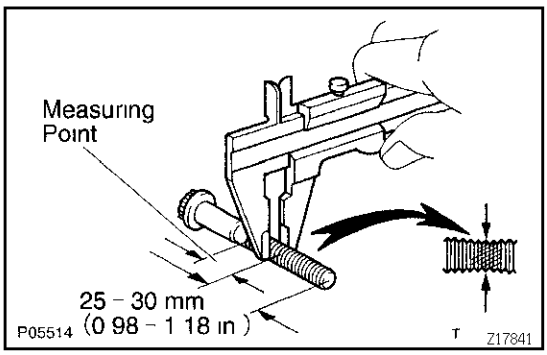
| | |
|---|---|
| STD | 100 23 mm (3 9461 in ) |
| O/S 0 50 | 100 73 mm (3 9658 in ) |
| O/S 1 00 | 101 23 mm (3 9854 in ) |

If the diameter is greater than maximum, rebore all the 6 cylinders If necessary, replace the cylinder block




(d) Remove the cylinder ridge

If the wear is less than 0 2 mm (0 008 in ), using a ridge reamer, grind the top of the cylinder




(e) Inspect the main bearing cap bolts

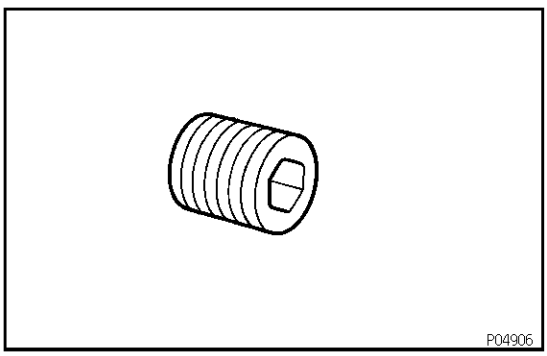
Using vernier calipers, measure the thread outside diameter of the bolt

**Standard outside diameter:**

**10.85 – 11.00 mm (0.4271 – 0.4331 in.)**

**Minimum outside diameter: 10.6 mm (0.417 in.)**

If the diameter is less than minimum, replace the bolt




(f) Inspect the cylinder blockl oil orifice for clogging

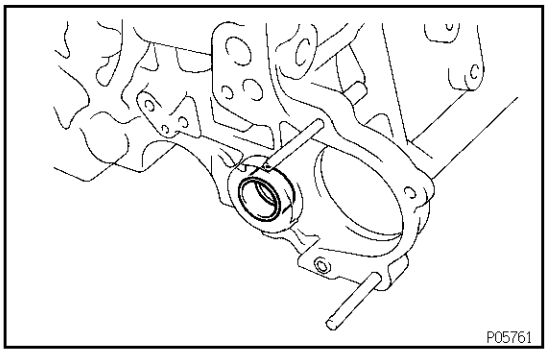
If necessary, replace the orifice



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

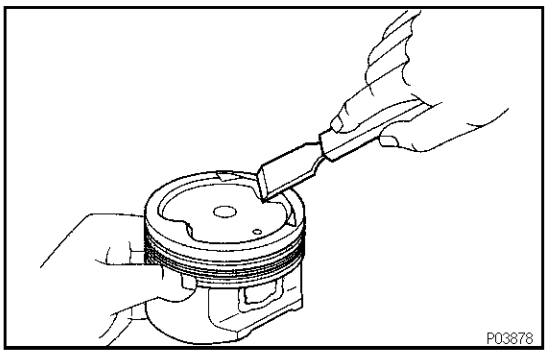





**3. INSPECT BEARING OF OIL PUMP DRIVE SHAFT GEAR**

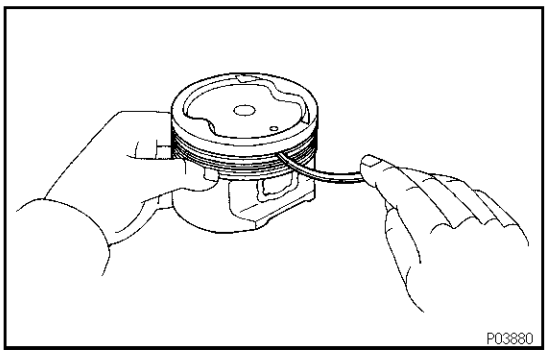
Check the bearing for pitting and scratches

If the bearing is damaged, replace the cylinder block

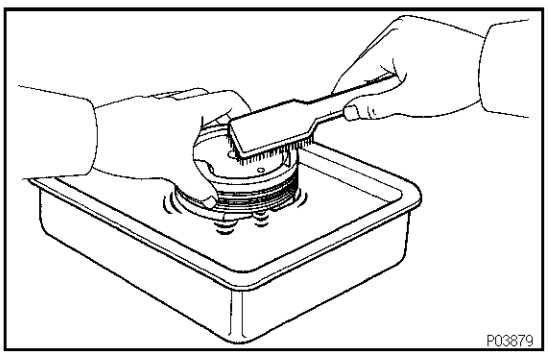



**4. CLEAN PISTON**

(a) Using a gasket scraper, remove the carbon from the piston top



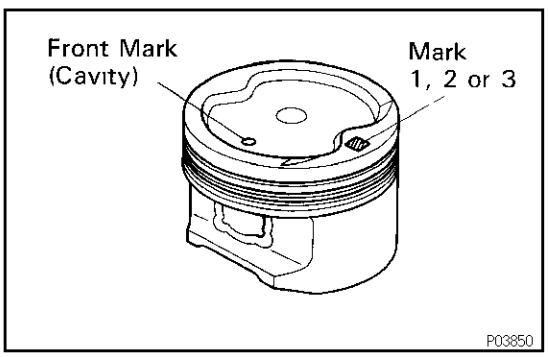

(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves




(c) Using solvent and a brush, thoroughly clean the piston

**NOTICE:**

**Do not use a wire brush.**




**5. INSPECT PISTON AND CONNECTING ROD**

(a) Inspect the piston oil clearance

HINT

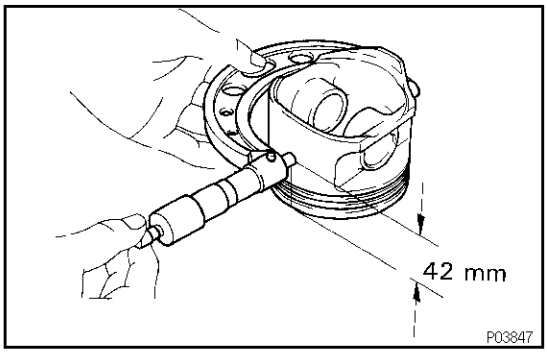
There are 3 sizes of the standard piston diameter, marked "1", "2" and "3" The mark is stamped on the piston top



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 42 mm (1 65 in ) from the piston head

**Piston diameter:**

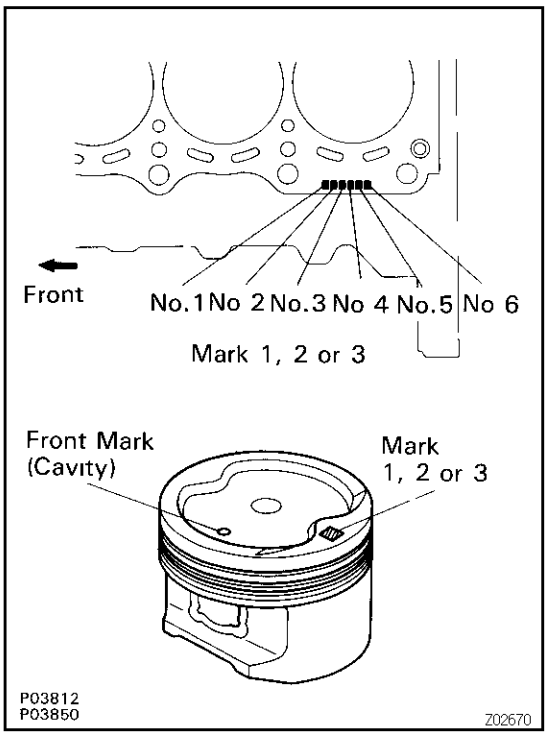
| | | |
|---|---|---|
| STD | Mark 1 | 99 950 – 99 960 mm (3 9350 – 3 9354 in ) |
| | Mark 2 | 99 960 – 99 970 mm (3 9354 – 3 9358 in ) |
| | Mark 3 | 99 970 – 99 980 mm (3 9358 – 3 9362 in ) |
| O/S 0 50 | | 100 450 – 100 480 mm (3 9547 – 3 9559 in ) |
| O/S 1 00 | | 100 950 – 100 980 mm (3 9744 – 3 9756 in ) |

(2) Measure the cylinder bore diameter in the thrust directions (See step 2)

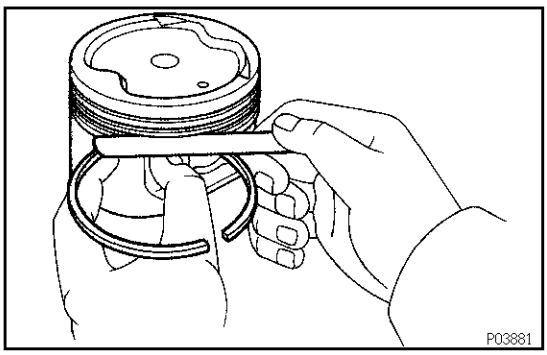
(3) Subtract the piston diameter measurement from the cylinder bore diameter measurement

**Standard oil clearance:**
**0.040 – 0.060 mm (0.0016 – 0.0024 in.)**
**Maximum oil clearance: 0.080 mm (0.0031 in.)**

If the oil clearance is greater than maximum, replace all the 6 pistons and rebore all the 6 cylinders If necessary, replace the cylinder block




HINT
Use new cylinder block
Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block




(b) Inspect the piston ring groove clearance
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove

**Ring groove clearance:**

| | |
|---|---|
| No 1 | 0 040 – 0 080 (0 0016 – 0 0031 in ) |
| No 2 | 0 030 – 0 070 (0 0012 – 0 0028 in ) |

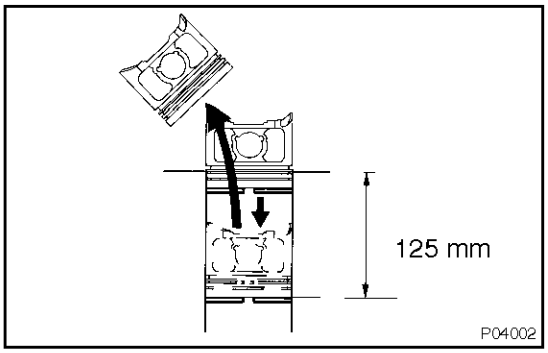
If the clearance is greater than maximum, replace the piston



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

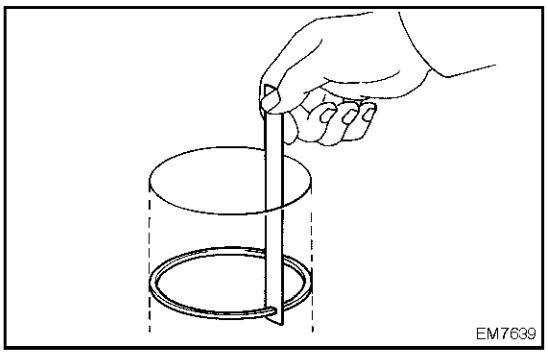





(c) Inspect the piston ring end gap

(1) Insert the piston ring into the cylinder bore

(2) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 125 mm (4.92 in.) from the top of the cylinder block




(3) Using a feeler gauge, measure the end gap

**Standard end gap:**

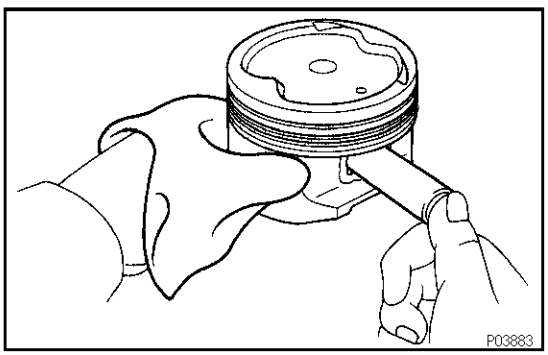
| | |
|---|---|
| No. 1 | 0.300 – 0.520 mm (0.0118 – 0.0205 in.) |
| No. 2 | 0.450 – 0.670 mm (0.0177 – 0.0264 in.) |
| Oil (Side rail) | 0.150 – 0.520 mm (0.0059 – 0.0205 in.) |

**Maximum end gap:**

| | |
|---|---|
| No. 1 | 1.12 mm (0.0441 in.) |
| No. 2 | 1.17 mm (0.0461 in.) |
| Oil (Side rail) | 1.12 mm (0.0441 in.) |

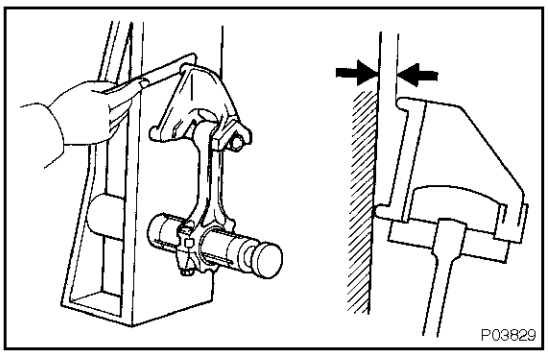
If the end gap is greater than maximum, replace the piston ring

If the end gap is greater than maximum, even with a new piston ring, rebore all the 6 cylinders or replace the cylinder block




(d) Inspect the piston pin fit

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb




(e) Using a rod aligner and feeler gauge, check the connecting rod alignment

(1) Check for out-of-alignment

**Maximum out-of-alignment:**

**0.05 mm (0.0020 in.) per 100 mm (3.94 in.)**

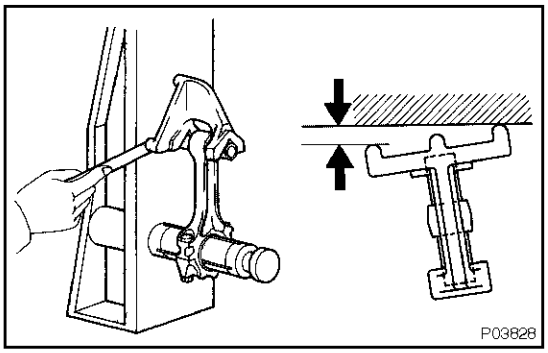
If out-of-alignment is greater than maximum, replace the connecting rod assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



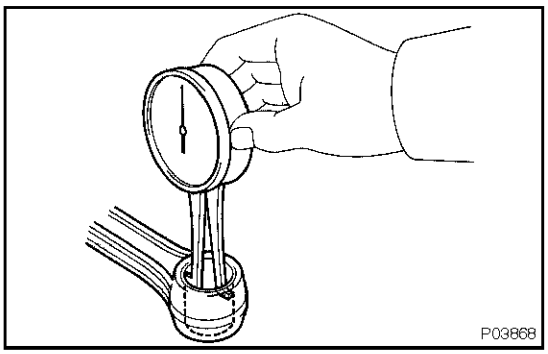



(2) Check for twist

**Maximum twist:**

**0.15 mm (0.0059 in. ) per 100 mm (3.94 in.)**

If twist is greater than maximum, replace the connecting rod assembly

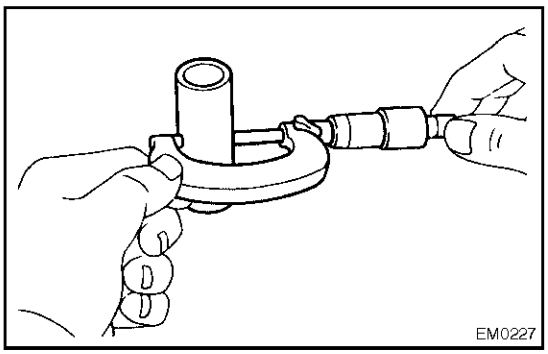



(f) Inspect the piston pin oil clearance

(1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing

**Bushing inside diameter:**

**26.008 – 26.020 mm (1.0239 – 1.0244 in.)**




(2) Using a micrometer, measure the piston pin diameter

**Piston pin diameter:**

**26.000 – 26.012 mm (1.0236 – 1.0241 in.)**

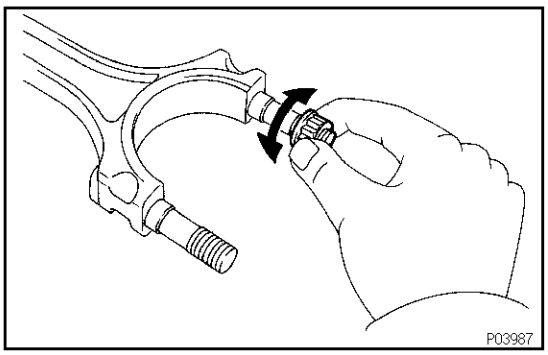
(3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement

**Standard oil clearance:**

**0.004 – 0.012 mm (0.0002 – 0.0005 in.)**

**Maximum oil clearance: 0.05 mm (0.0020 in.)**

If the oil clearance is greater than maximum, replace the bushing If necessary, replace the piston and piston pin as a set (See page EM–99)




(g) Inspect the connecting rod bolts

Install the cap nut to the connecting rod bolt Check that the cap nut can be turned easily by hand to the end of the thread

If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with vernier calipers

**Standard outside diameter:**

**8.40 – 8.60 mm (0.3307 – 0.3386 in.)**

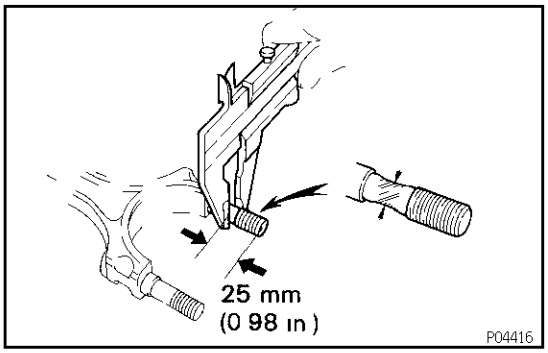
**Minimum outside diameter: 8.00 mm (0.3150 in.)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

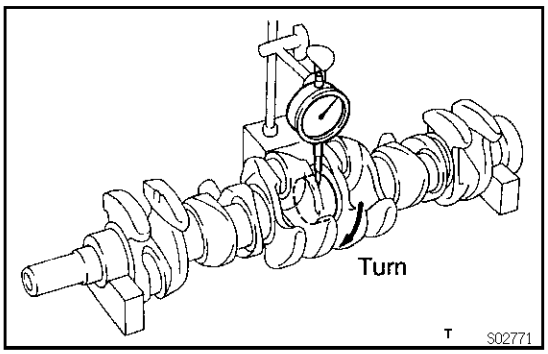





HINT

If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration

If the outside diameter is less than minimum, replace the connecting rod bolt and nut as a set




**6. INSPECT CRANKSHAFT**

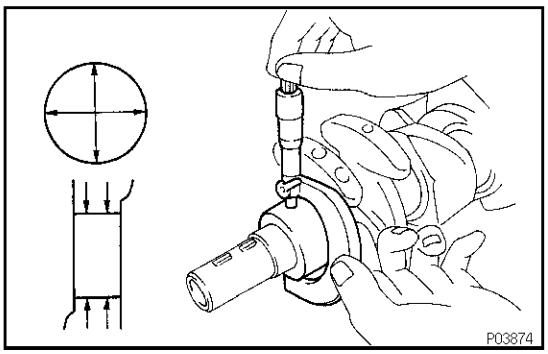
(a) Inspect for circle runout

(1) Place the crankshaft on V-blocks

(2) Using a dial indicator, measure the circle runout at the center journal

**Maximum circle runout: 0.06 mm (0.0024 in.)**

If the circle runout is greater than maximum, replace the crankshaft




(b) Inspect the main journals and crank pins

(1) Using a micrometer, measure the diameter of each main journal and crank pin

**Main journal diameter:**

| | |
|---|---|
| STD | 68 982 - 69 000 mm (2 7158 - 2 7165 in ) |
| U/S 0 25 | 68 745 - 68 755 mm (2 7065 - 2 7069 in ) |

**Crank pin diameter:**

| | |
|---|---|
| STD | 56 982 - 57 000 mm (2 2434 - 2 2441 in ) |
| U/S 0 25 | 56 745 - 56 755 mm (2 2341 - 2 2344 in ) |

If the diameter is not as specified, check the oil clearance (See page EM-83) If necessary, grind or replace the crankshaft

(2) Check each main journal and crank pin for taper and out-of-round as shown

**Maximum taper and out-of-round:**

**0.02 mm (0.0008 in.)**

If the taper and out-of-round is greater than maximum, replace the crankshaft

**7. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS**

Grind and hone the main journals and/or crank pins to the finished undersized diameter Install new main journal and/or crankshaft pin undersized bearings



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

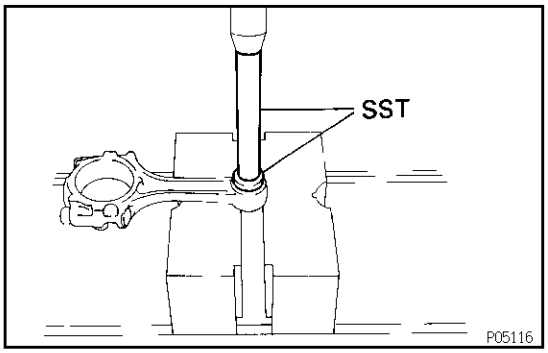


EM1E 02

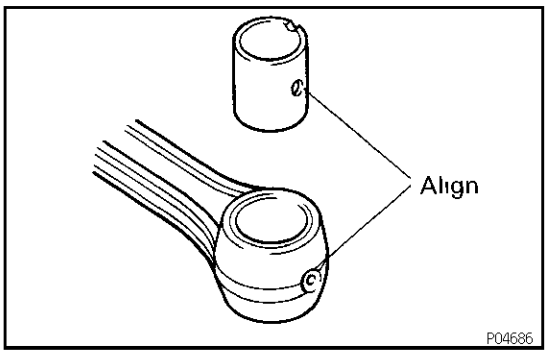
# REPLACEMENT

## 1. REPLACE CONNECTING ROD BUSHING

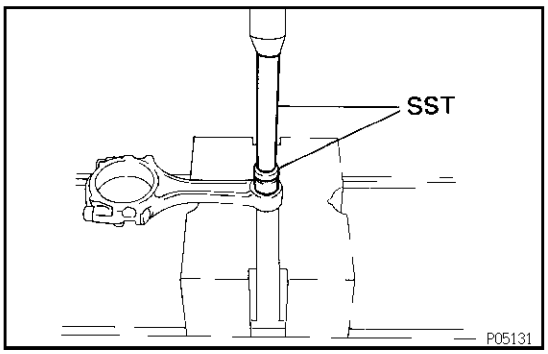
(a) Using SST and a press, press out the bushing
SST 09950–60010 (09951–00280), 09950–70010 (09951–07100)



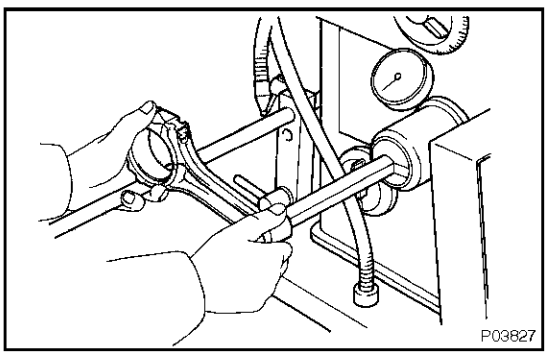

(b) Align the oil holes of a new bushing and the connecting rod



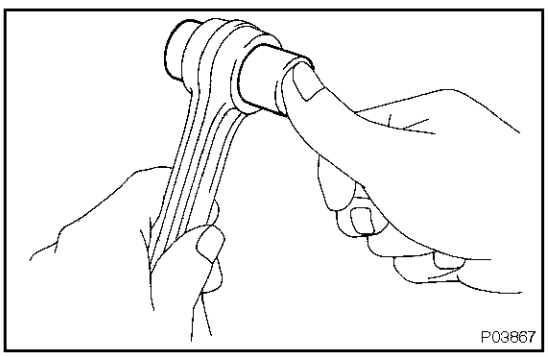

(c) Using SST and a press, press in the bushing
SST 09950–60010 (09951–00280), 09950–70010 (09951–07100)




(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (See page EM–92) between the bushing and piston pin




(e) Check the piston pin fit at normal room temperature Coat the piston pin with engine oil, and push it into the connecting rod with your thumb






Brought to you by BirfMark
Version 1.11 - 03/16/2010

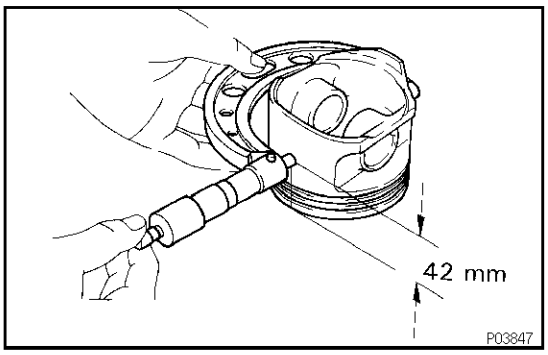
Brought to you by BirfMark



### 2. REPLACE OVERSIZED (O/S) PISTONS FOR CYLINDER BORING

HINT

- Bore all the 6 cylinders for the O/S piston outside diameter
- Replace all the piston rings with ones to match the O/S pistons




(a) Keep 6 new O/S pistons

**O/S piston diameter:**

| | |
|---|---|
| O/S 0.50 | 100.450 – 100.480 mm (3.9547 – 3.9559 in.) |
| O/S 1.00 | 100.950 – 100.980 mm (3.9744 – 3.9756 in.) |

(b) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 42 mm (1.65 in.) from the piston head

(c) Calculate the amount of each cylinder is to be rebored as follows

**Size to be rebored = P + C – H**

**P = Piston diameter**

**C = Piston oil clearance**

**0.040 – 0.060 mm (0.0016 – 0.0024 in.)**

**H = Allowance for honing**

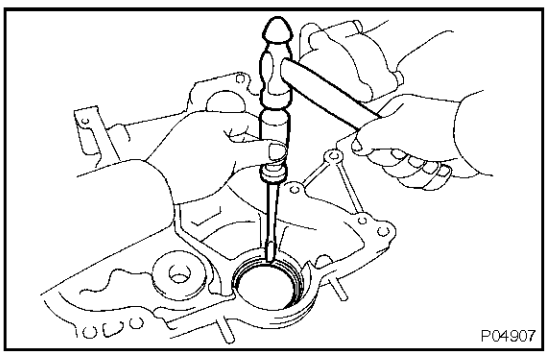
**0.02 mm (0.0008 in.) or less**

(d) Bore and hone the cylinders to calculated dimensions

**Maximum honing: 0.02 mm (0.0008 in.)**

**NOTICE:**

**Excess honing will destroy the finished roundness.**



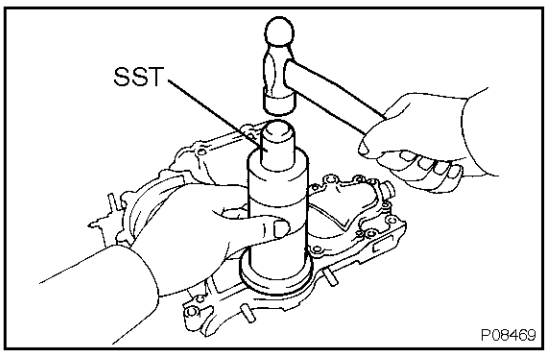

### 3. REPLACE CRANKSHAFT FRONT OIL SEAL

HINT

There are 2 methods ((a) and (b)) to replace the oil seal

(a) If the timing chain cover is removed from the cylinder block

(1) Using a screwdriver and a hammer, tap out the oil seal




(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge

SST 09316–60011 (09316–00011, 09316–00051)

(3) Apply MP grease to the oil seal lip

**NOTICE:**

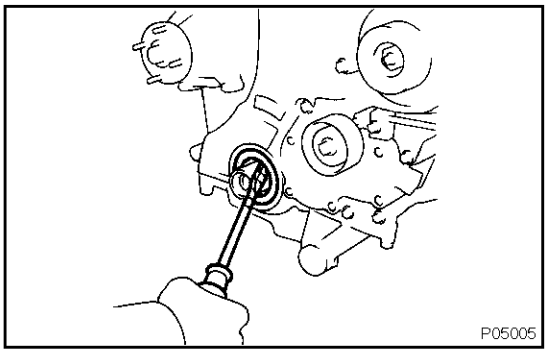
**Do not let foreign matter get onto the lip of the oil seal.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

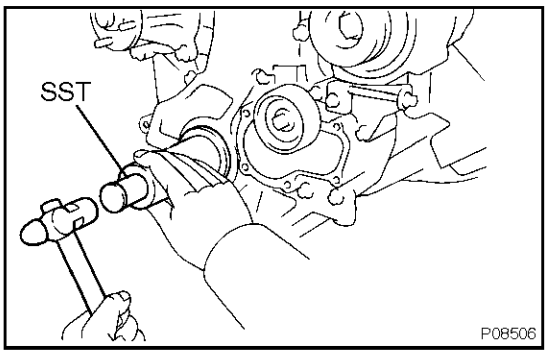





(b) If the timing chain cover is installed to the cylinder block
(1) Using a screwdriver, pry out the oil seal

**NOTICE:**

**Be careful not to damage the crankshaft. Tape the screwdriver tip.**



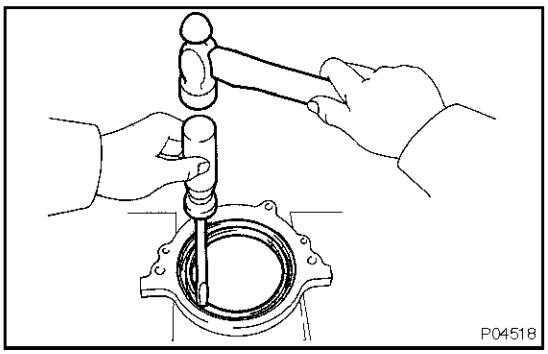

(2) Apply MP grease to a new oil seal lip

**NOTICE:**

**Do not let foreign matter get onto the lip of the oil seal.**

(3) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge

SST 09316–60011 (09316–00011, 09316–00051)

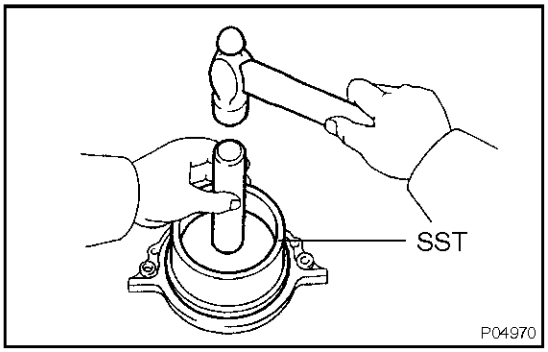



**4. REPLACE CRANKSHAFT REAR OIL SEAL**

HINT

There are 2 methods ((a) and (b)) to replace the oil seal

(a) If the rear oil seal retainer is removed from the cylinder block
(1) Using a screwdriver and a hammer, tap out the oil seal

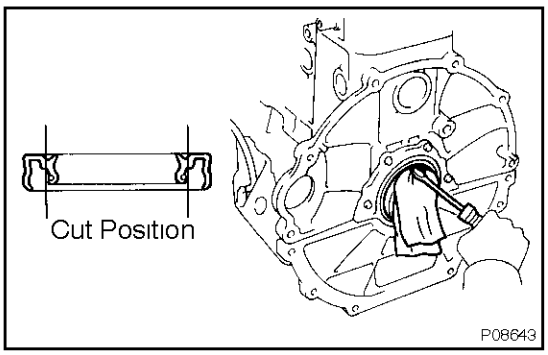



(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge

SST 09223–15030, 09950–70010 (09951–07150)

**NOTICE:**

**Do not let foreign matter get onto the lip of the oil seal.**




(b) If the rear oil seal retainer is installed to the cylinder block
(1) Using a knife, cut off the oil seal lip
(2) Using a screwdriver, pry out the oil seal

**NOTICE:**

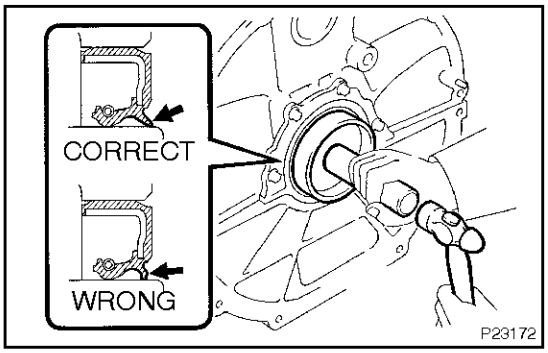
**Be careful not to damage the crankshaft. Tape the screwdriver tip.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(3) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge

SST 09223-15030, 09950-70010 (09951-07150)

**NOTICE:**

**Do not let foreign matter get onto the lip of the oil seal.**

(4) Check that the lip of the oil seal is not bent inward



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

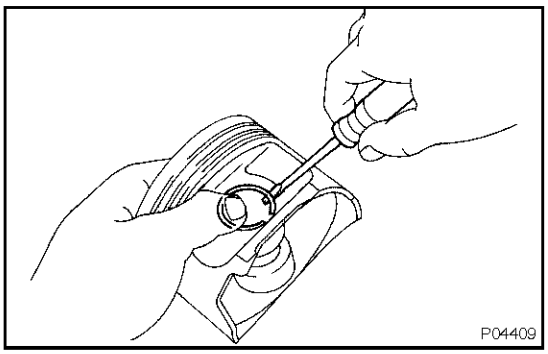


EM1EJ–01

# REASSEMBLY

HINT

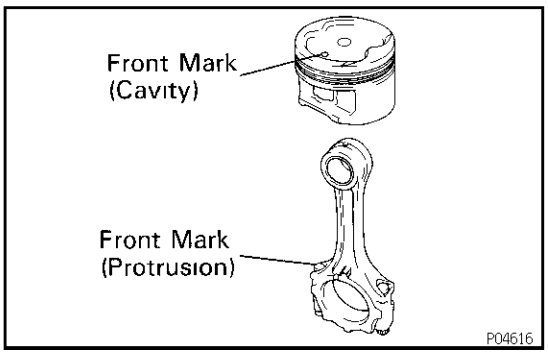
- Thoroughly clean all parts to be assembled
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces
- Replace all gaskets, O–rings and oil seals with new parts




**1. ASSEMBLE PISTON AND CONNECTING ROD**

(a) Install a new snap ring on one side of the piston pin hole

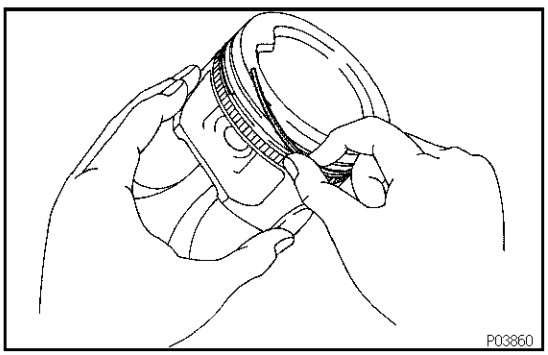
(b) Gradually heat the piston to 80 – 90°C (176 – 194°F)




(c) Coat the piston pin with engine oil

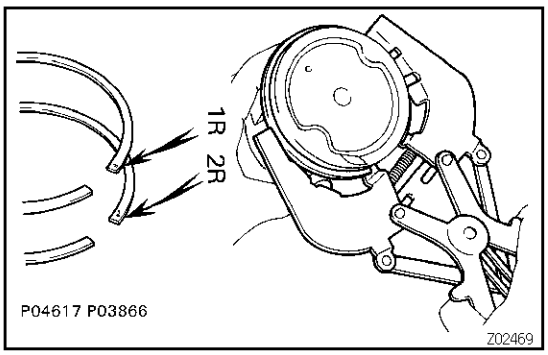
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb

(e) Install a new snap ring on the other side of the piston pin hole




**2. INSTALL PISTON RINGS**

(a) Install the oil ring expander and 2 side rails by hand




(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward

**Code mark:**

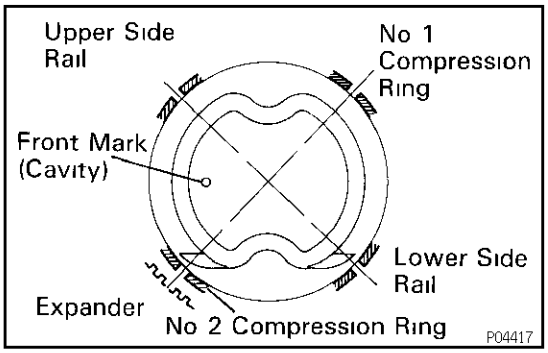
| | |
|---|---|
| No 1 | 1R |
| No 2 | 2R |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

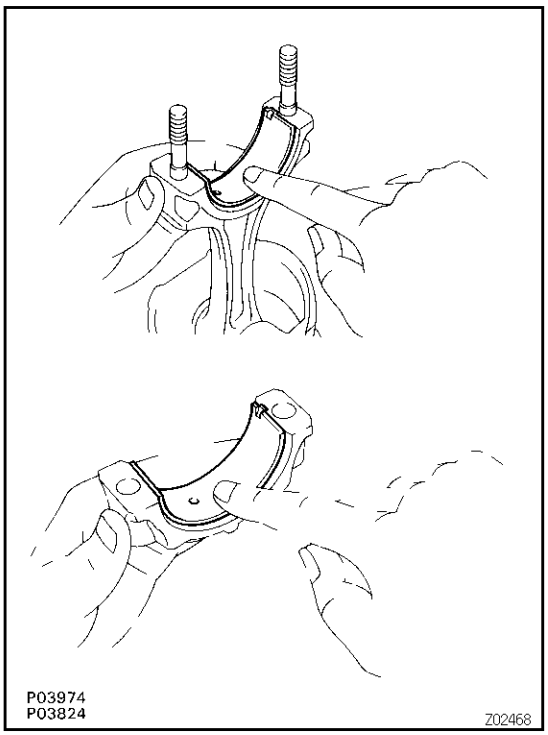





(c) Position the piston rings so that the ring ends are as shown

**NOTICE:**

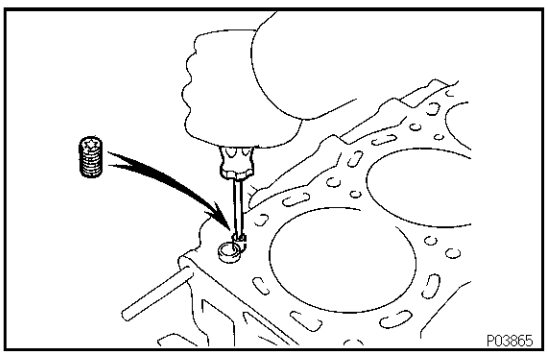
**Do not align the ring ends.**



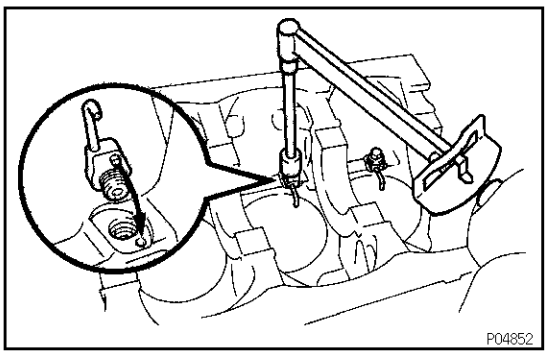

### 3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting rod cap

(b) Install the bearings in the connecting rod and connecting rod cap




### 4. INSTALL CYLINDER BLOCK ORIFICE




### 5. INSTALL OIL NOZZLES AND CHECK VALVES

(a) Align the pin of the oil nozzle with the pin hole of the cylinder block

(b) Install the oil nozzle with the check valve Install the 6 oil nozzles and check valves

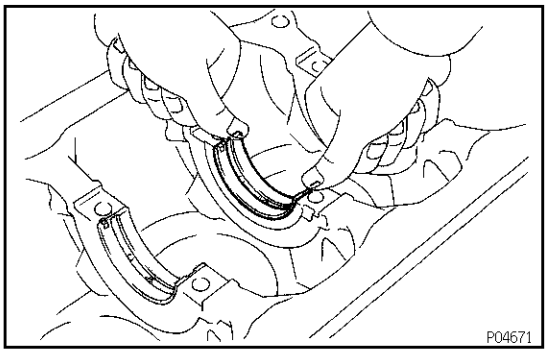
**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

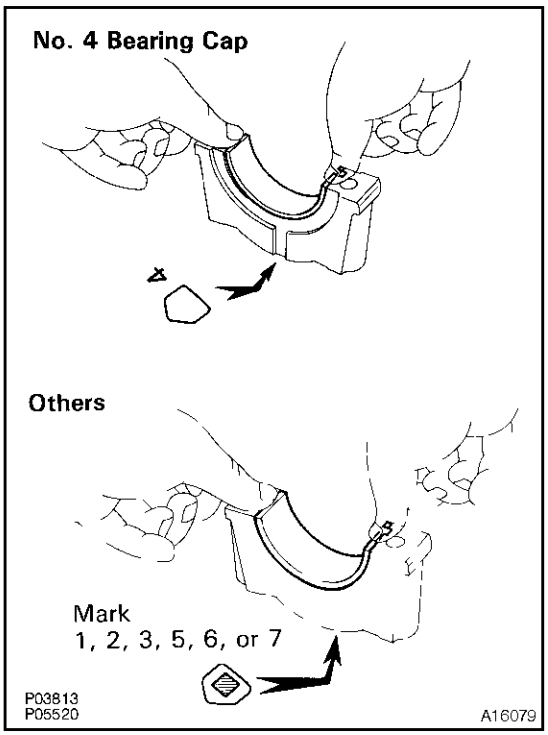
Brought to you by BirfMark






**6. INSTALL MAIN BEARINGS**

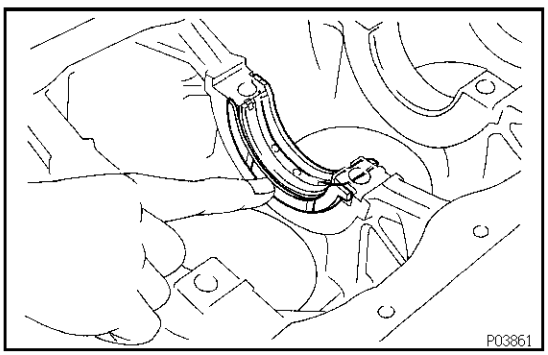
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 7 upper bearings




(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 7 lower bearings

HINT

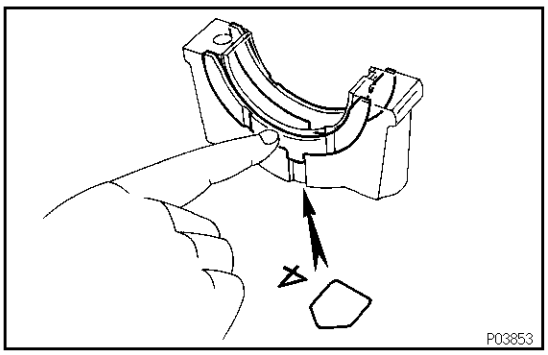
A number is marked on each main bearing cap to indicate the installation position




**7. INSTALL UPPER THRUST WASHERS**

Install the 2 thrust washers under the No 4 journal position of the cylinder block with the oil grooves facing outward

**8. PLACE CRANKSHAFT ON CYLINDER BLOCK**




**9. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS**

(a) Place the main bearing caps and lower thrust washers on the cylinder block

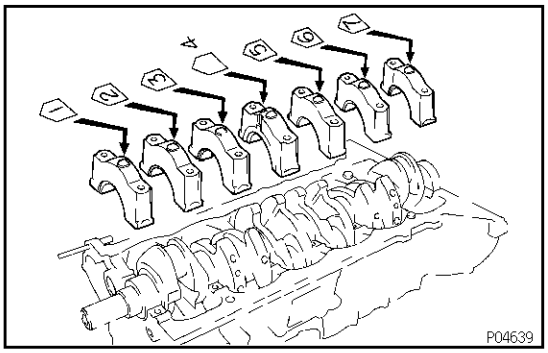
(1) Install the 2 thrust washers on the No 4 bearing cap with the grooves facing outward



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

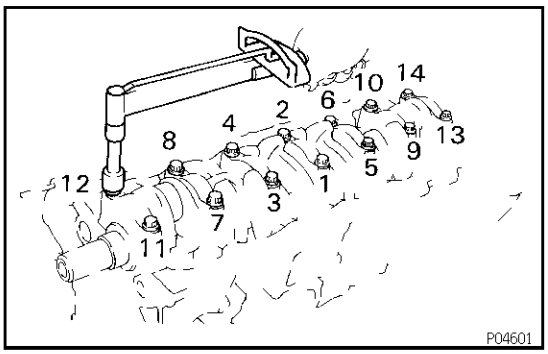





(2) Install the 7 main bearing caps in their proper locations

HINT

Each bearing cap has a number and front mark




(b) Install the main bearing cap bolts

HINT

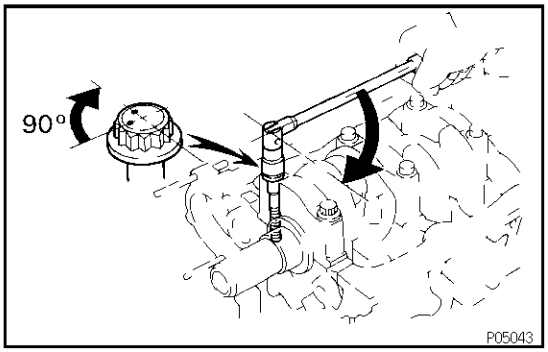
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d))
- If any of the main bearing cap bolts is broken or deformed, replace it

(1) Apply a light coat of engine oil on the threads and under the heads of the main bearings cap bolts

(2) Install and uniformly tighten the 14 bolts of the main bearing caps, in several passes, in the sequence shown

**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt



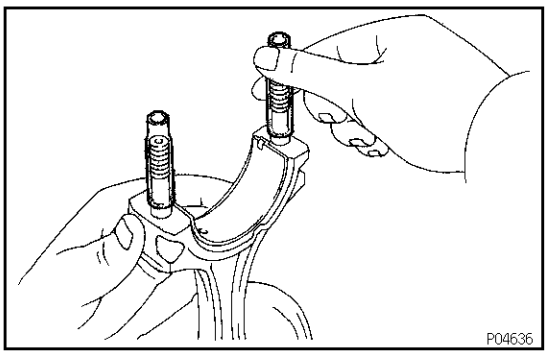

(3) Mark the front of the main bearing cap bolt with paint

(4) Retighten the main bearing cap bolts by 90° in the numerical order shown above

(5) Check that the painted mark is now at a 90° angle to the front

(c) Check that the crankshaft turns smoothly

(d) Check that the crankshaft thrust clearance (See page EM–83)




## 10. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

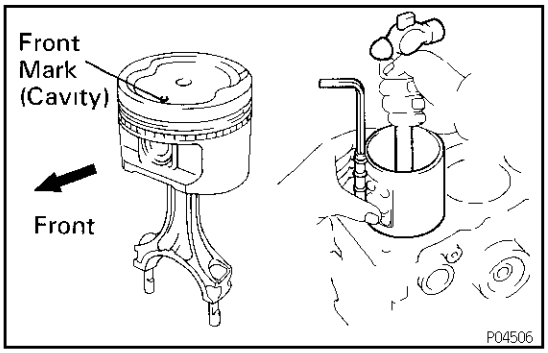
(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage



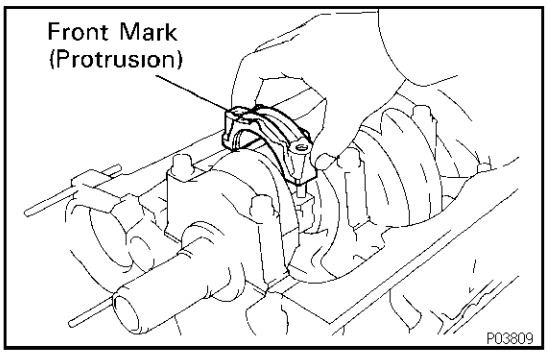
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



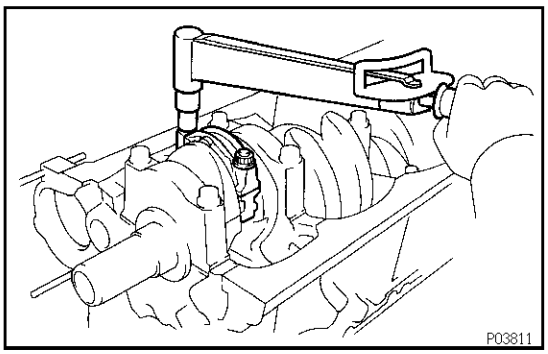



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward




**11. INSTALL CONNECTING ROD CAP**

(a) Place the connecting rod cap on the connecting rod
  (1) Match the numbered connecting rod cap with the connecting rod
  (2) Install the connecting rod cap with the front mark facing for ward



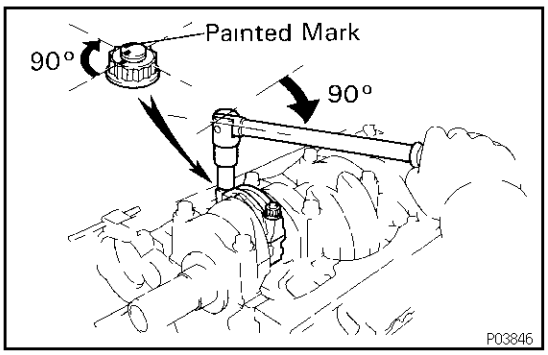

(b) Install the connecting rod cap nuts

HINT

- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d))
- If any connecting rod bolt is broken or deformed, replace it
  (1) Apply a light coat of engine oil on the threads and under the nuts of the connecting rod cap
  (2) Install and alternately tighten the nuts of the connecting rod cap in several passes

  **Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)**

If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set



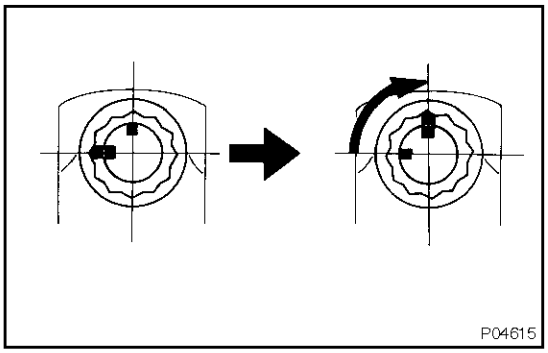

  (3) Mark the front of the connecting rod cap nut and bolt with paint
  (4) Retighten the connecting rod cap nuts 90° as shown



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(5) Check that the painted mark on the nut is at 90° angle in relation to the mark on the bolt

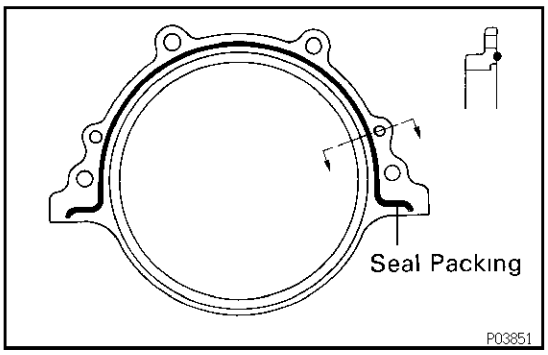
(c) Check that the crankshaft turns smoothly

(d) Check that the connecting rod thrust clearance (See page EM–83)

**12. INSTALL REAR OIL SEAL RETAINER**

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove
- Thoroughly clean all components to remove all the loose material
- Using a non–residue solvent, clean both sealing surfaces




(b) Apply seal packing to the retainer as shown in the illustration

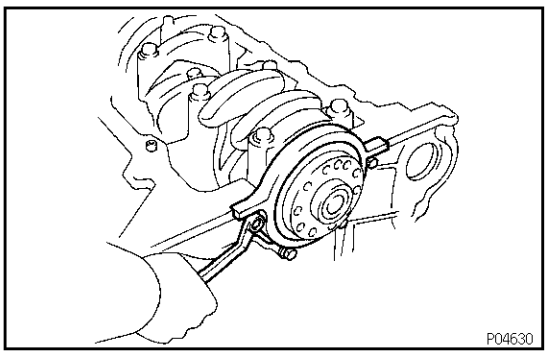
**Seal packing: Part No. 08826–00080 or equivalent**

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening

HINT

Avoid applying an excessive amount to the surface

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap




(c) Install the retainer with the 4 bolts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**13. INSTALL OIL COOLER COVER AND OIL COOLER**

Install a new gasket, the oil cooler cover and oil cooler with the 10 bolts and 2 nuts

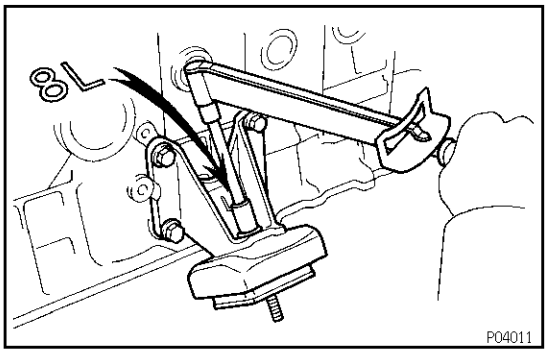
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

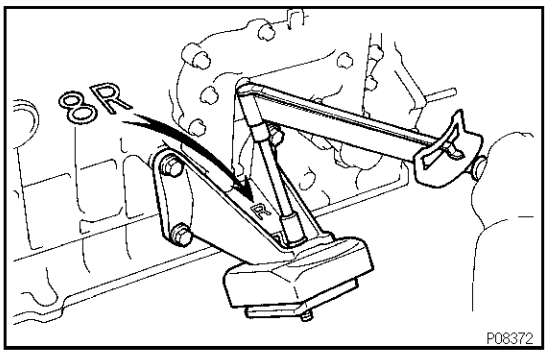





**14. INSTALL LH ENGINE MOUNTING BRACKET**

(a) Install the bracket with the 4 bolts
**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**

(b) Install the insulator with the nut
**Torque: 72 N·m (730 kgf·cm, 43 ft·lbf)**




**15. INSTALL RH ENGINE MOUNTING BRACKET**

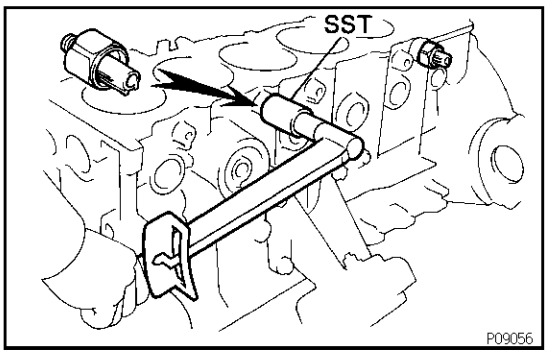
(a) Install the bracket with the 4 bolts
**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**

(b) Install the insulator with the nut
**Torque: 72 N·m (730 kgf·cm, 43 ft·lbf)**

**16. INSTALL PS PUMP**

(a) Place a new O–ring to the pump

(b) Install the pump with the 2 nuts
**Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)**




**17. INSTALL KNOCK SENSORS**

Using SST, install the 2 knock sensors
SST 09816–30010
**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

**18. INSTALL OIL FILTER UNION**
**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

**19. INSTALL OIL FILTER (See page LU–2)**

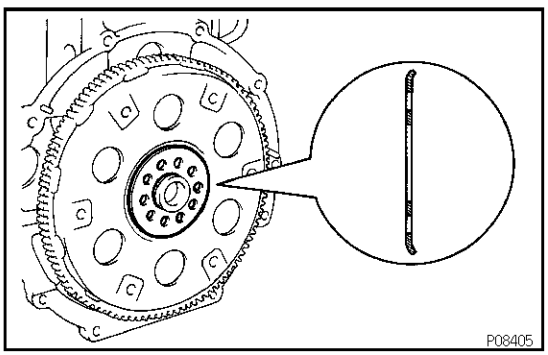
**20. INSTALL TIMING CHAIN (See page EM–19)**

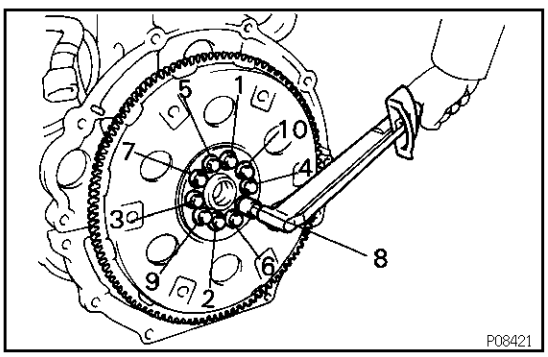
**21. INSTALL CYLINDER HEAD (See page EM–54)**

**22. REMOVE ENGINE STAND**

**23. INSTALL DRIVE PLATE**

(a) Install the front spacer, drive plate and rear plate on the crankshaft




(b) Install and uniformly tighten the 10 drive plate bolts, in several passes, in the sequence shown
**Torque: 100 N·m (1,000 kgf·cm, 74 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

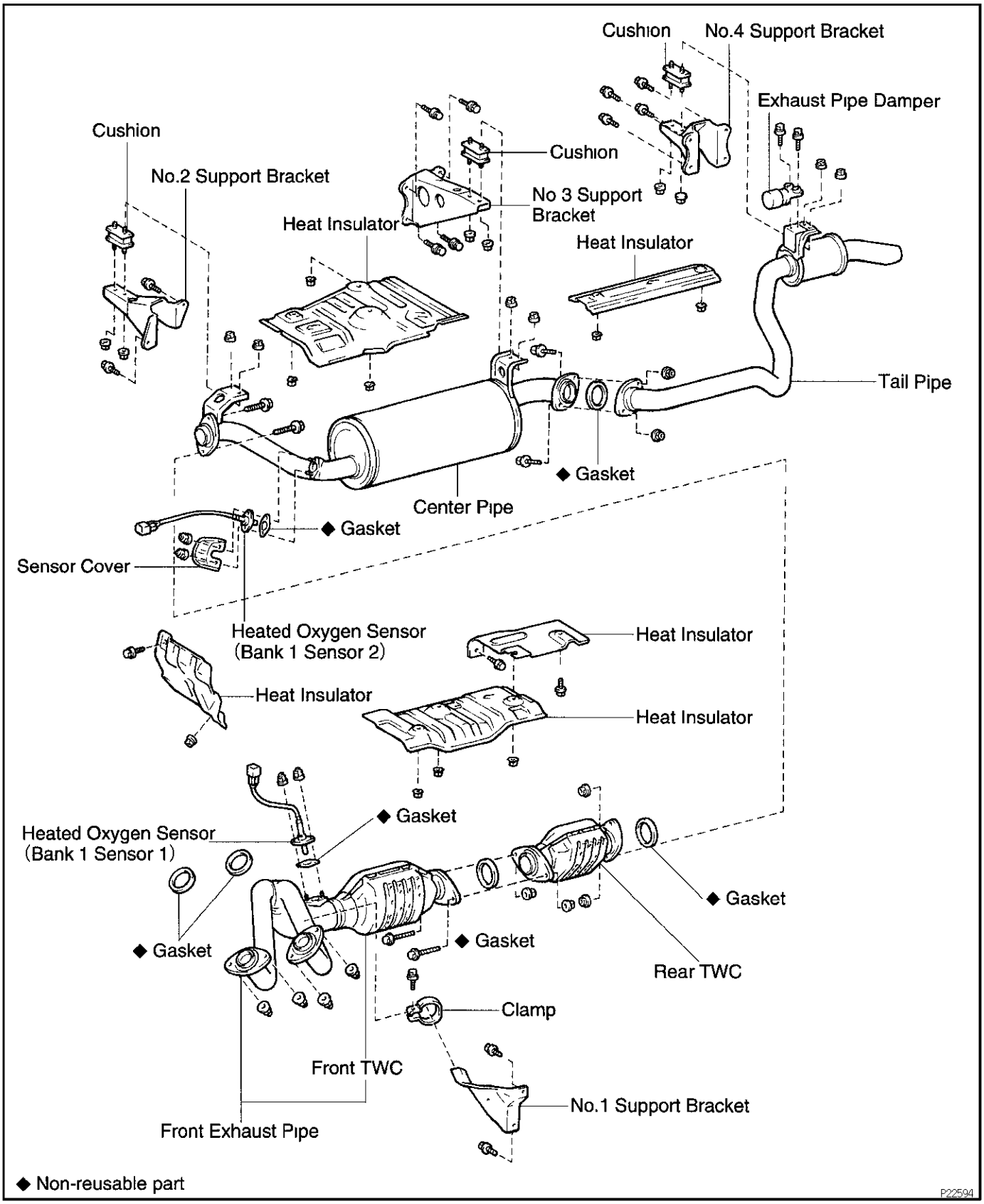
Brought to you by BirfMark



# EXHAUST SYSTEM

## COMPONENTS

EM0EE 10

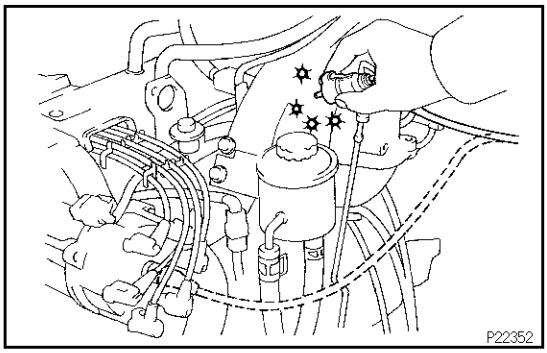





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# IGNITION SYSTEM

G0 B 02

## ON–VEHICLE INSPECTION

**1. CHECK THAT SPARK OCCURS**

(a) Disconnect the high–tension cords (from the ignition coil) from the distributor cap

(b) Hold the end approx 12 5 mm (0 50 in ) from the body ground

(c) Check if spark occurs while engine is being cranked

HINT

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time

If the spark does not occur, do the test as follows

**SPARK TEST**

↓ NO

**CHECK CONNECTION OF IGNITION COIL, IGNITER AND DISTRIBUTOR CONNECTOR** → BAD → Connect securely

↓ OK

**CHECK RESISTANCE OF HIGH–TENSION CORD (See step 8)**
**Maximum resistance: 25 kΩ per cord** → BAD → Replace the cord(s)

↓ OK

**CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER** → BAD → Check wiring between ignition switch to ignition coil and igniter

1 Turn ignition switch to ON
2 Check that there is battery voltage at ignition coil positive (+) terminal

↓ OK

**CHECK RESISTANCE OF IGNITION COIL (See step 24)** → BAD → Replace the ignition coil

| Resistance: | Cold | Hot |
|---|---|---|
| Primary | 0.36 – 0.55 Ω | 0.45 – 0.65 Ω |
| Secondary | 9.0 – 15.4 kΩ | 11.4 – 18.1 kΩ |

↓ OK

**CHECK RESISTANCE OF SIGNAL GENERATOR (PICKUP COIL) (See step 32)** → BAD → Replace the distributor housing assembly

| Resistance: | Cold | Hot |
|---|---|---|
| G1 and G– | 185 – 275 Ω | 240 – 325 Ω |
| G2 and G– | 185 – 275 Ω | 240 – 325 Ω |
| NE and G– | 185 – 275 Ω | 240 – 325 Ω |

↓ OK

**CHECK AIR GAP OF DISTRIBUTOR (See step 31)**
**Air gap: 0.2 – 0.4 mm (0.008 –0.016 in.)** → BAD → Replace the distributor housing assembly

↓ OK

**CHECK IGT SIGNAL FROM ECM**
**(See page** DI–93**)** → BAD → Check wiring between ECM, ignition coil and igniter, and then try another ECM

↓ OK

**TRY ANOTHER IGNITER**

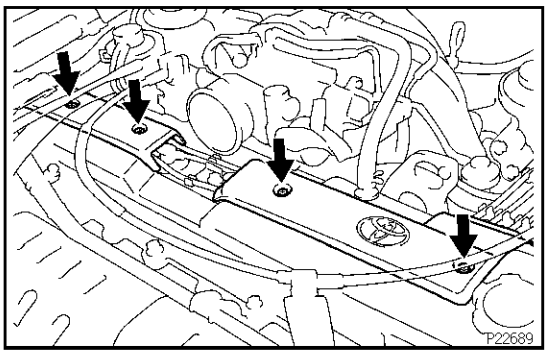


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

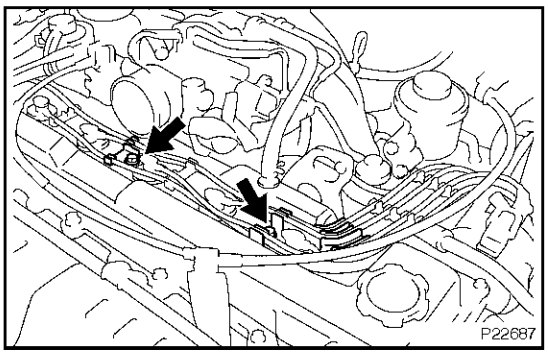


2. REMOVE NO.2 PCV HOSE
3. REMOVE AIR CLEANER HOSE
4. DISCONNECT THROTTLE CABLE



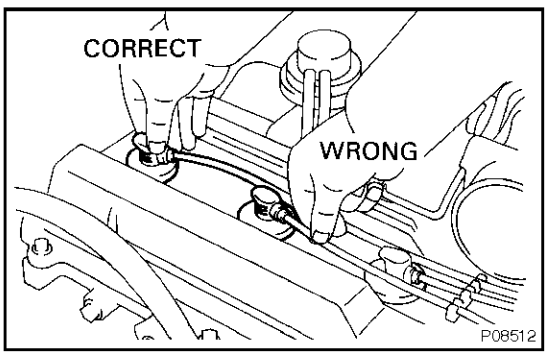

5. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers




6. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

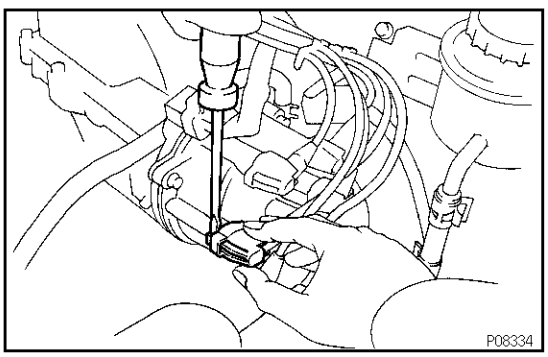
(a) Remove the 2 mounting bolts of the No 1 and No 2 cord clamps




(b) Disconnect the high–tension cords at the rubber boot Do not pull on the cords

**NOTICE:**

**Pulling on or bending the cords may damage the conductor inside.**




7. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

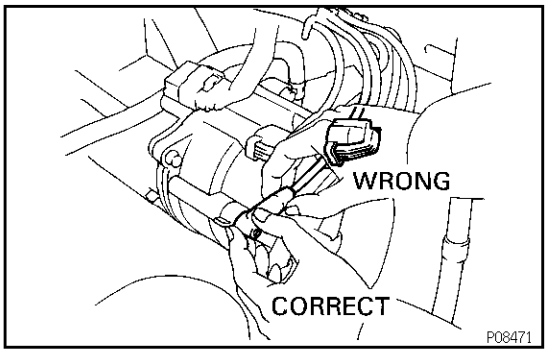
(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

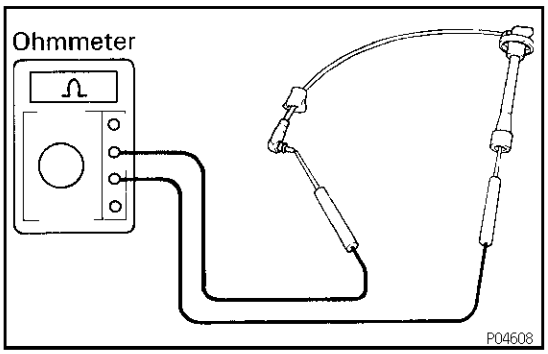





(b) Disconnect the high–tension cord at the grommet
Do not pull on the cord

**NOTICE:**

**Pulling on or bending the cords may damage the conductor inside.Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**

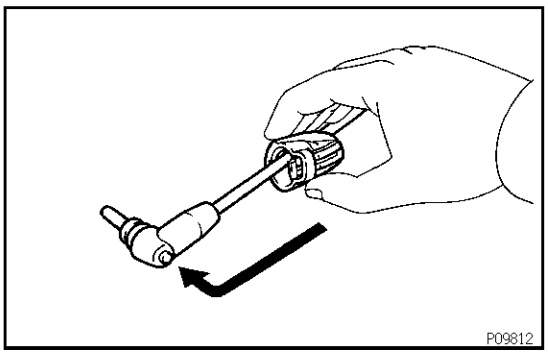



**8. INSPECT HIGH–TENSION CORD RESISTANCE**

Using an ohmmeter, measure the resistance

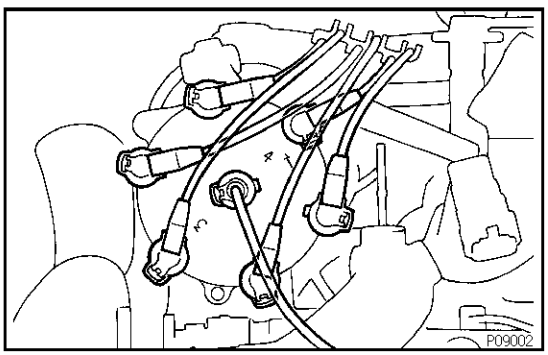
**Maximum resistance: 25 kΩ per cord**

If the resistance is greater than maximum, check the terminals
If necessary, replace the high–tension cord



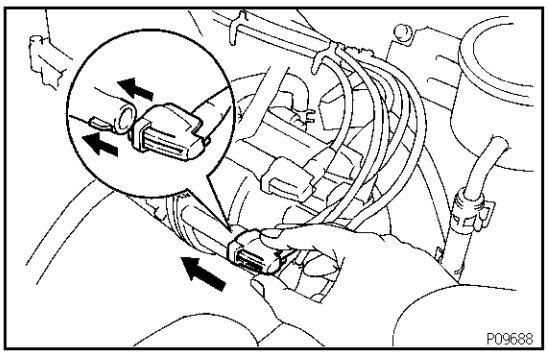

**9. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL**

(a) Assemble the holder and grommet




HINT

Connect the high–tension cords to the distributor cap as shown in the illustration



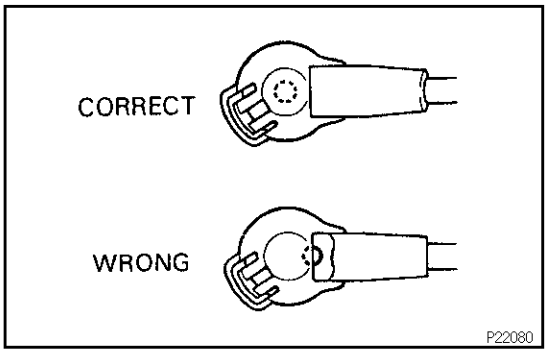

(b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord



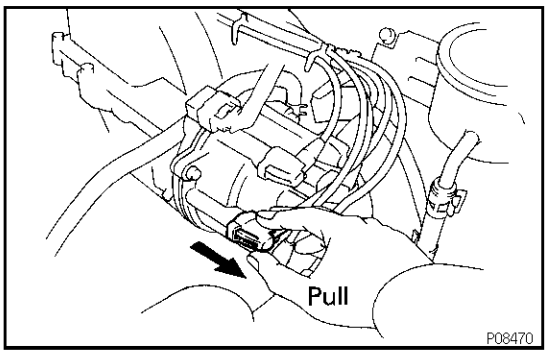
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





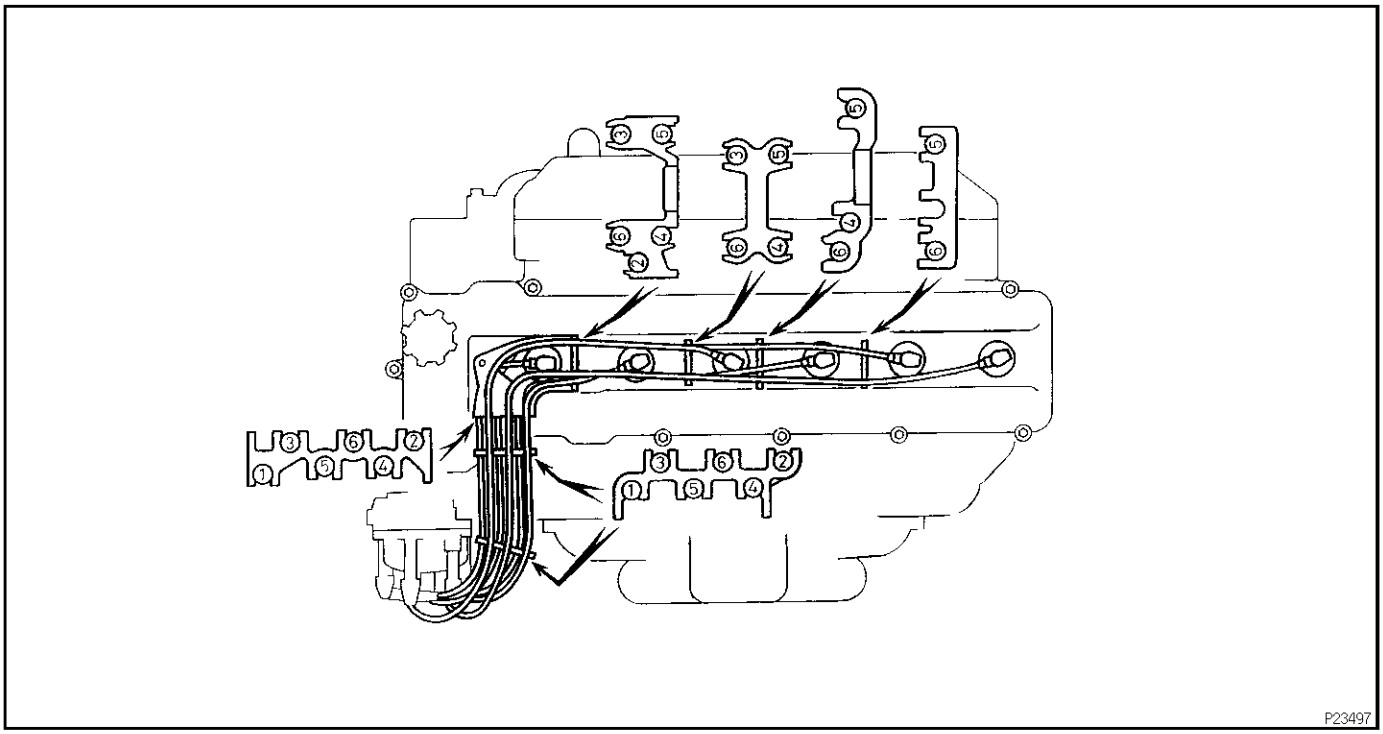

**NOTICE:**
**Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.**




(c) Check that the lock claw of the holder is engaged by lightly pulling the holder

**10. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS**

(a) Secure the high–tension cords with the cord clamps as shown in the illustration

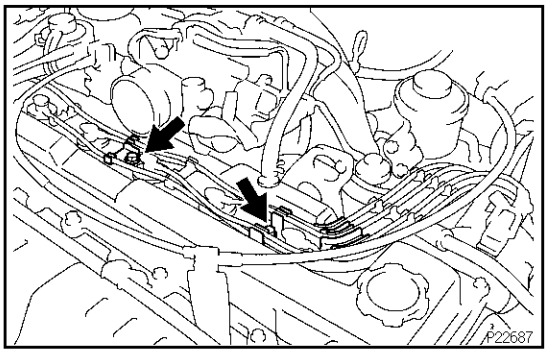




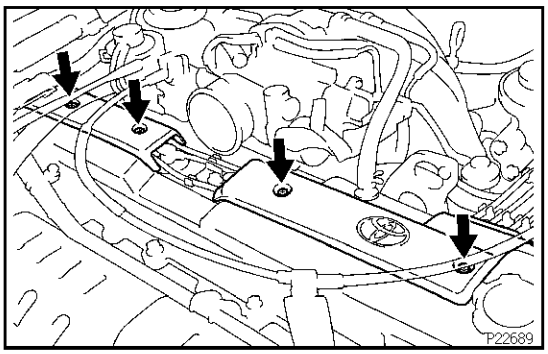

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Install the No 1 and No 2 cord clamps with the 2 bolts




**11. INSTALL NO.2 AND NO.3 CYLINDER HEAD COVERS**

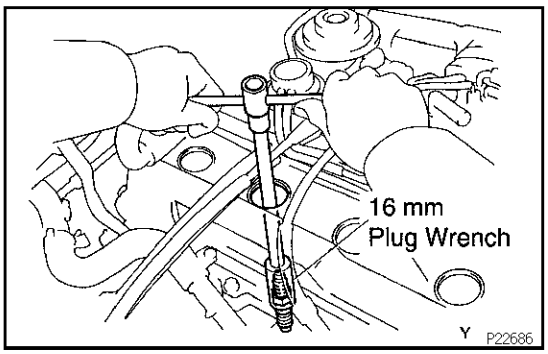
Install the head covers with the 4 bolts

**12. CONNECT THROTTLE CABLE**

**13. INSTALL AIR CLEANER HOSE**

Install the air cleaner hose with the 2 clamp bolts

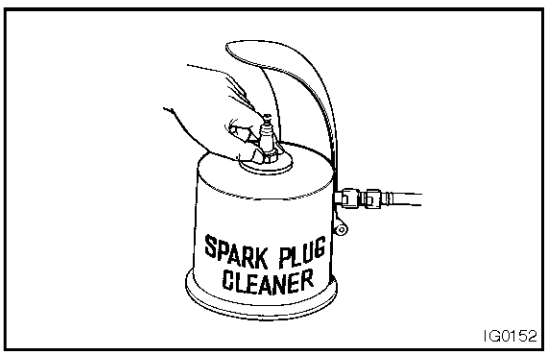
**14. INSTALL NO.2 PCV HOSE**




**15. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

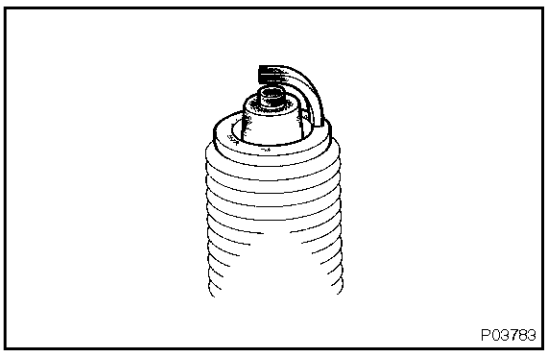
**16. REMOVE SPARK PLUGS**

Using a 16 mm plug wrench, remove the spark plug




**17. CLEAN SPARK PLUGS**

Using a spark plug cleaner or wire brush, clean the spark plug




**18. VISUALLY INSPECT SPARK PLUGS**

Check the spark plug for electrode wear, threads damage and insulator damage

If abnormal, replace the plugs

**Recommended spark plugs:**

**ND: K16R-U**

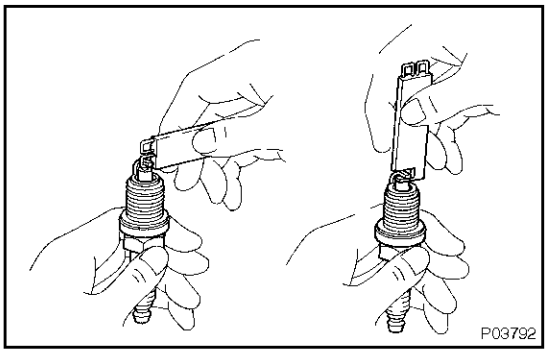
**NGK: BKR5EYA**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

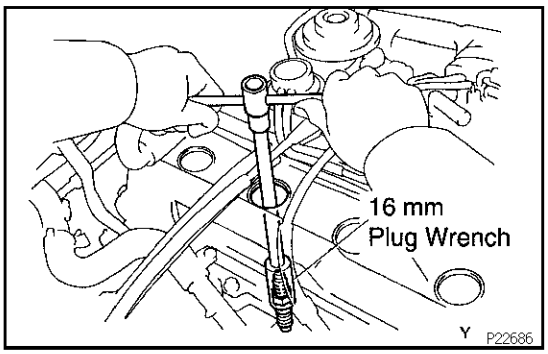





**19. ADJUST ELECTRODE GAP**

Carefully bend the outer electrode to obtain the correct electrode gap

**Correct electrode gap: 0.8 mm (0.031 in.)**




**20. INSTALL SPARK PLUGS**

Using a 16 mm plug wrench, install the spark plug

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

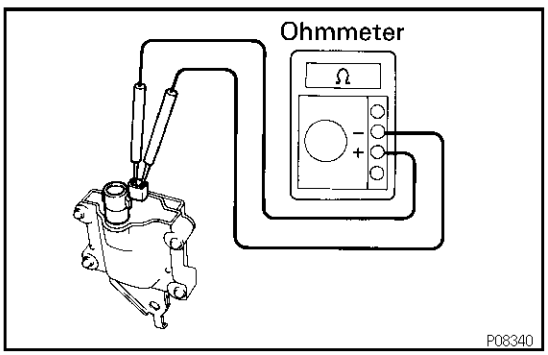
**21. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS**

**NOTICE:**

**"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).**

**22. DISCONNECT IGNITION COIL CONNECTOR**

**23. DISCONNECT HIGH–TENSION CORD**




**24. INSPECT PRIMARY COIL RESISTANCE**

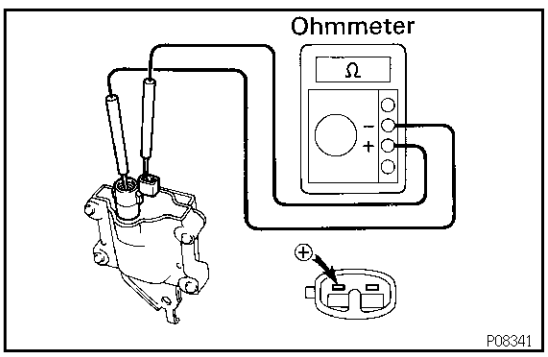
Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals

**Primary coil resistance:**

**Cold: 0.36 – 0.55 Ω**

**Hot: 0.45 – 0.65 Ω**

If the resistance is not as specified, replace the ignition coil




**25. INSPECT SECONDARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between the positive (+) and high–tension terminals

**Secondary coil resistance:**

**Cold: 9.0 – 15.4 kΩ**

**Hot: 11.4 – 18.1 kΩ**

If the resistance is not as specified, replace the ignition coil

**26. RECONNECT HIGH–TENSION CORD**

**27. RECONNECT IGNITION COIL CONNECTOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



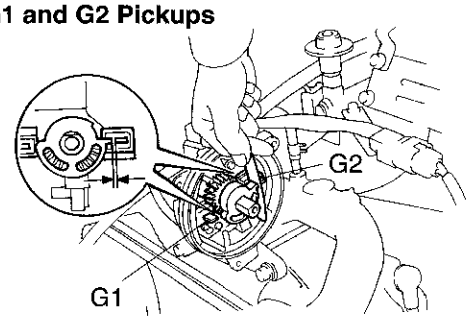
**NOTICE:**
**"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).**

**28. DISCONNECT DISTRIBUTOR CONNECTOR**

**29. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS**

**30. REMOVE ROTOR**

**G1 and G2 Pickups**

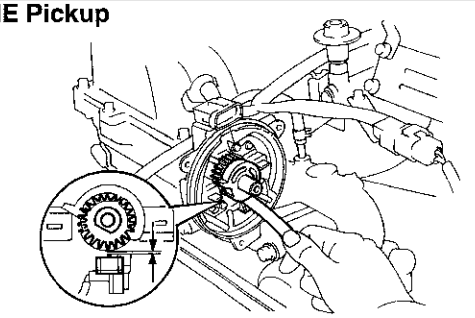



**31. INSPECT AIR GAPS**

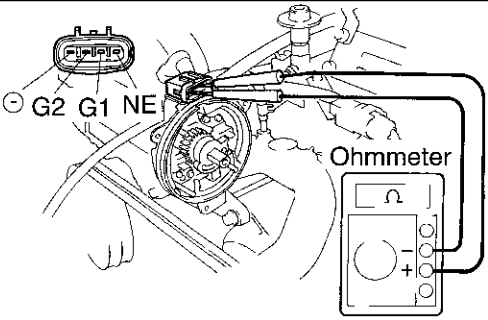
Using a thickness gauge, measure the gap between the signal rotor and the pickup coil projection

**Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)**

**NE Pickup**




If the gap is not as specified, replace the distributor housing




**32. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE**

Using an ohmmeter, check that the resistance of the pickup coil

**Pickup coil resistance:**

| | | |
|---|---|---|
| Cold | G1 and G⊖ | 185 – 275 Ω |
| | G2 and G⊖ | 185 – 275 Ω |
| | NE and G⊖ | 185 – 275 Ω |
| Hot | G1 and G⊖ | 240 – 325 Ω |
| | G2 and G⊖ | 240 – 325 Ω |
| | NE and G⊖ | 240 – 325 Ω |

If the resistance is not as specified, replace the distributor housing

**33. REINSTALL ROTOR**

**34. REINSTALL DISTRIBUTOR CAP**

**35. RECONNECT DISTRIBUTOR CONNECTOR**

**NOTICE:**
**"Cold" and "Hot" in the following sentences express the temperature of the sensor itself.**
**"Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).**

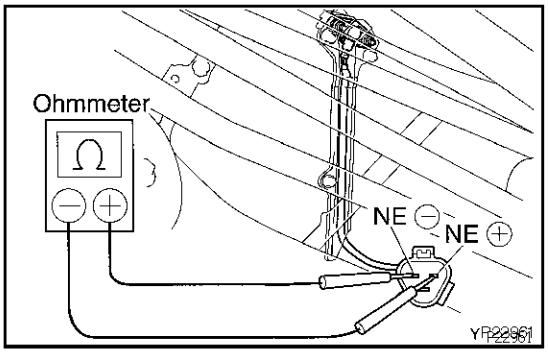


Author : Date : 741
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**36. DISCONNECT CRANKSHAFT POSITION SENSOR CONNECTOR AND BRACKET**




**37. INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE**

Using an ohmmeter, measure the resistance between the terminals

**Resistance (NE⊕ – NE⊖):**

**Cold: 1,630 – 2,740 Ω**

**Hot: 2,065 – 3,225 Ω**

If the resistance is not as specified, replace the crankshaft position sensor

**38. RECONNECT CRANKSHAFT POSITION SENSOR BRACKET AND CONNECTOR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

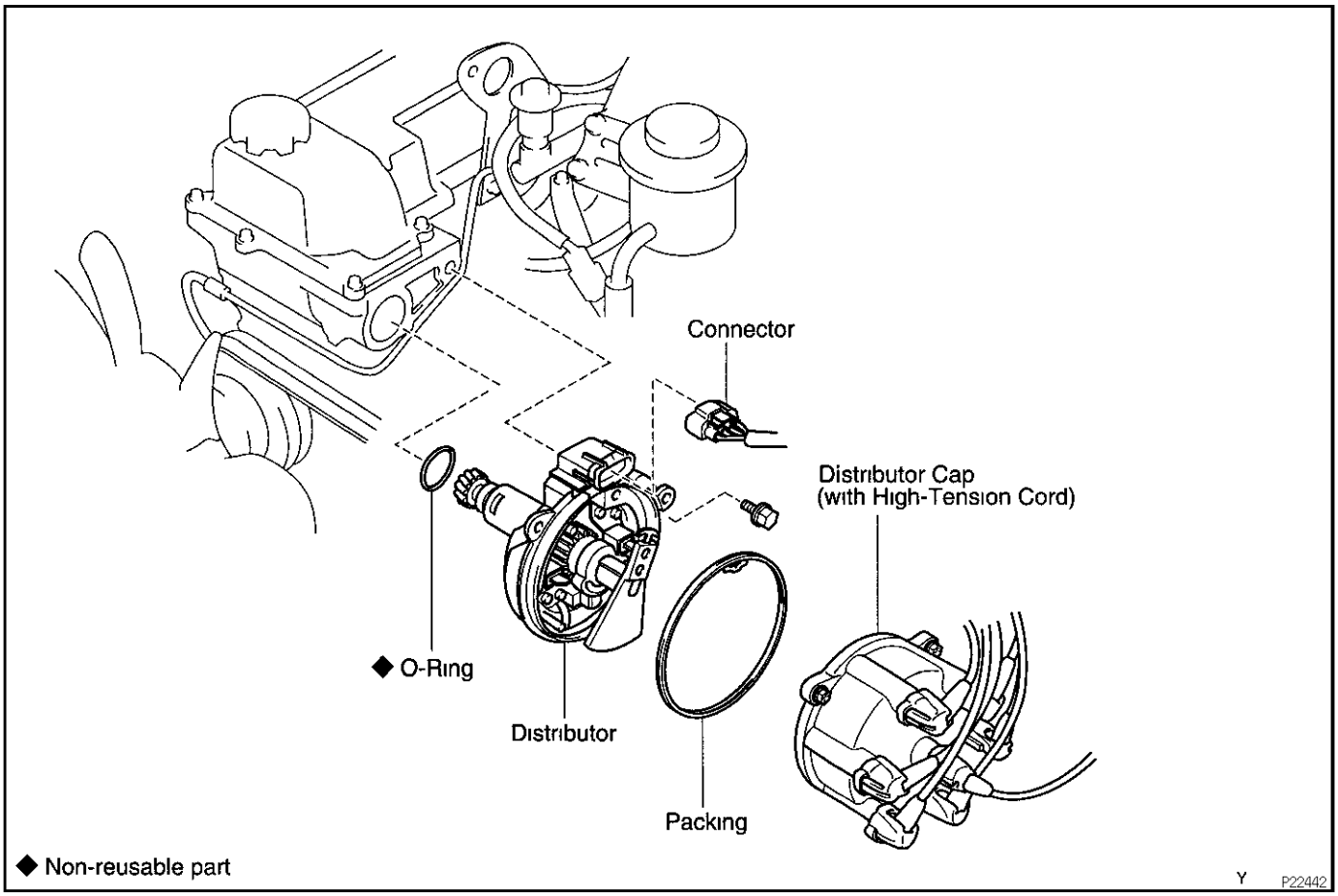
Brought to you by BirfMark



# DISTRIBUTOR

## COMPONENTS

G0 C-01





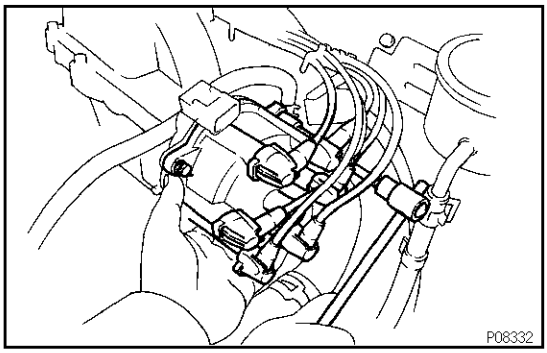

Author : Date : 743
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

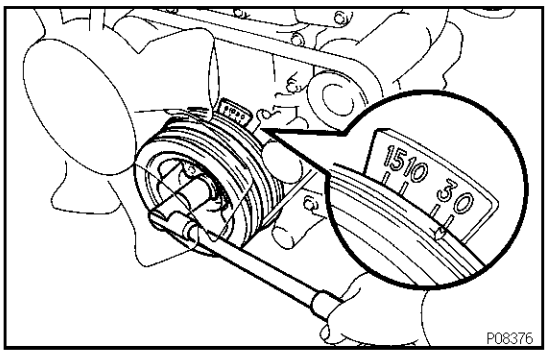


G0 D–01

# REMOVAL

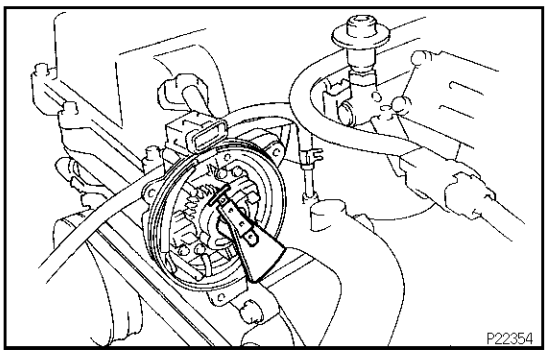



1. DISCONNECT DISTRIBUTOR CONNECTOR
2. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS




3. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley until the timing mark is aligned with "0" mark on the timing chain cover




(b) Check that the distributor rotor direction is as shown

If not, turn the crankshaft pulley one complete revolution

4. REMOVE DISTRIBUTOR

(a) Remove the hold–down bolt and pull out the distributor

(b) Remove the O–ring from the distributor housing



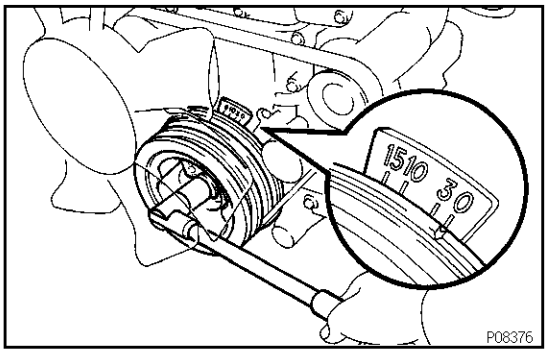
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



G0 E 01

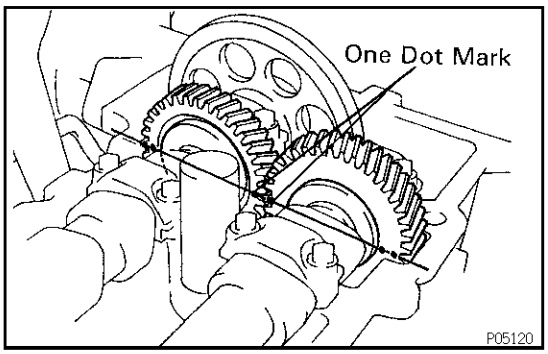
# INSTALLATION




**1. CHECK NO.1 CYLINDER TO TDC/COMPRESSION**

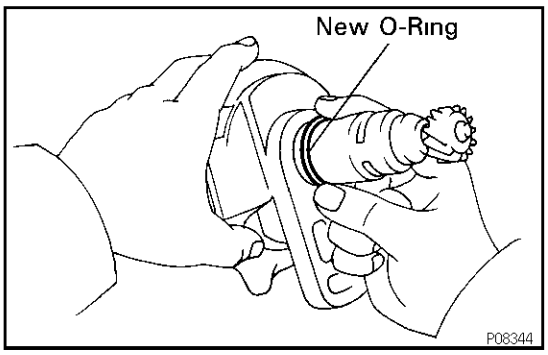
If necessary, remove the cylinder head cover, and check these conditions

- Turn the crankshaft pulley and align its groove with the timing mark "0" of the timing chain cover




- Verify that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration

If not, turn the crankshaft 1 revolution (360°) and align the mark as above

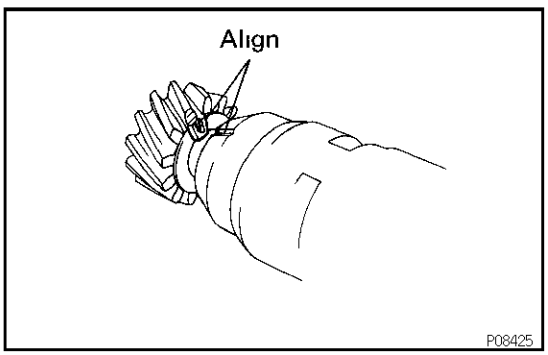



**2. INSTALL DISTRIBUTOR**

(a) Install a new O–ring to the distributor

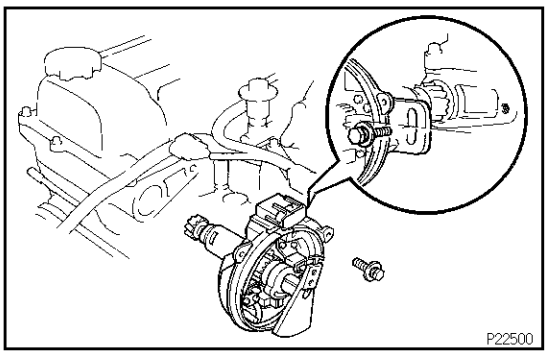
HINT

Always use a new O–ring when installing the distributor




(b) Align the groove of the distributor housing with the protrusion on the driven gear

(c) Apply a light coat of engine oil on the O–ring




(d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head

(e) Lightly tighten the hold–down bolt

**3. INSTALL DISTRIBUTOR CAP**

**4. CONNECT DISTRIBUTOR CONNECTOR**

**5. CHECK IGNITION TIMING (See page EM–10)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

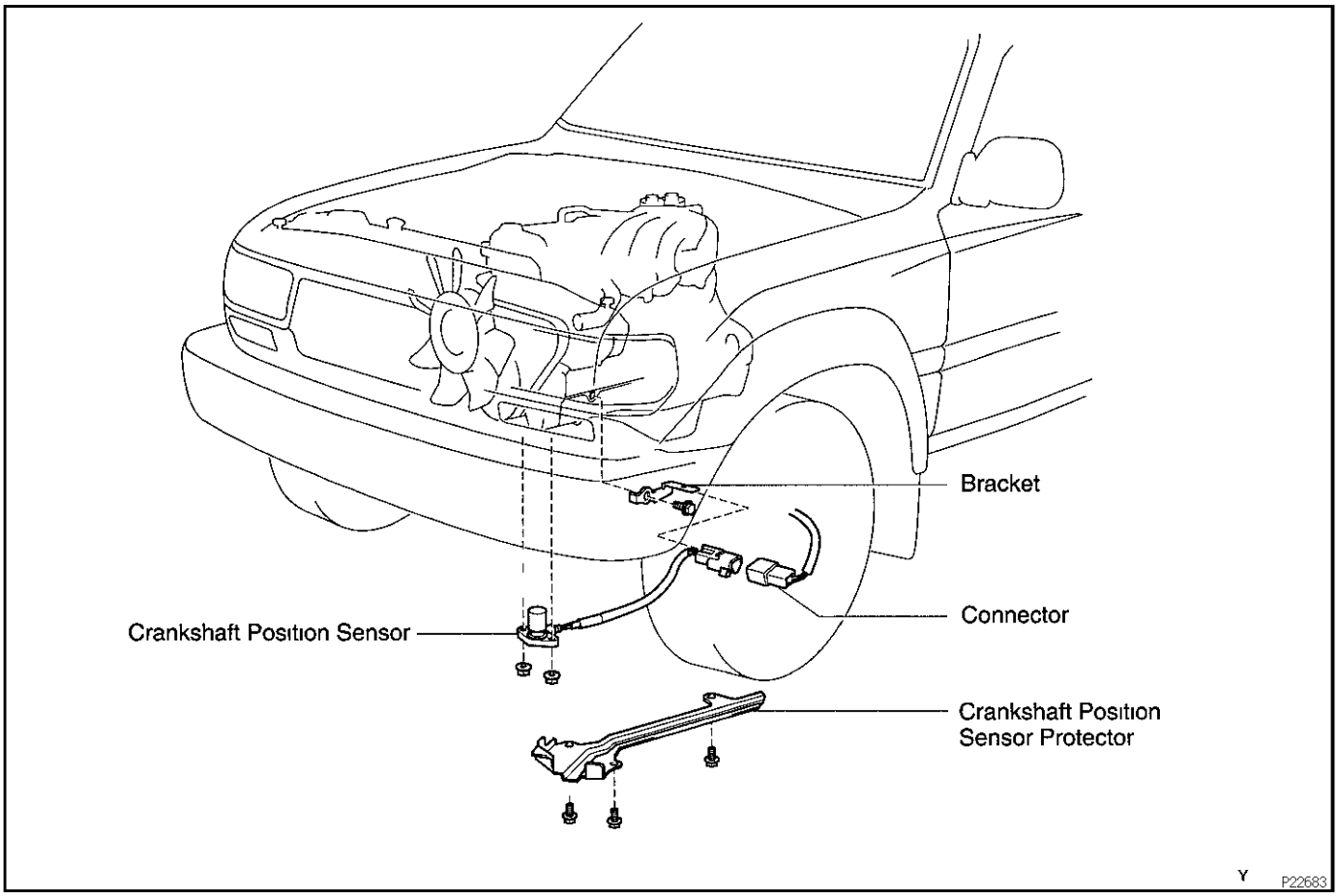
Brought to you by BirfMark



# CRANKSHAFT POSITION SENSOR

## COMPONENTS

G0JW-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



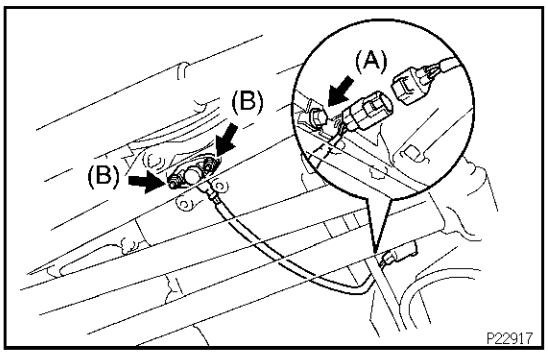
G0JX-01

# REMOVAL

1. REMOVE ENGINE UNDER COVER
2. REMOVE CRANKSHAFT POSITION SENSOR PROTECTOR

Remove the 3 bolts and crankshaft position sensor protector

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**




3. DISCONNECT CRANKSHAFT POSITION SENSOR BRACKET AND CONNECTOR
4. REMOVE CRANKSHAFT POSITION SENSOR

Remove the bolt, 2 nuts and crankshaft position sensor

**Torque:**
**Bolt A: 20 N·m (200 kgf·cm, 14 ft·lbf)**
**Nut B: 9 N·m (90 kgf·cm, 78 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



G0JY–01

# INSTALLATION

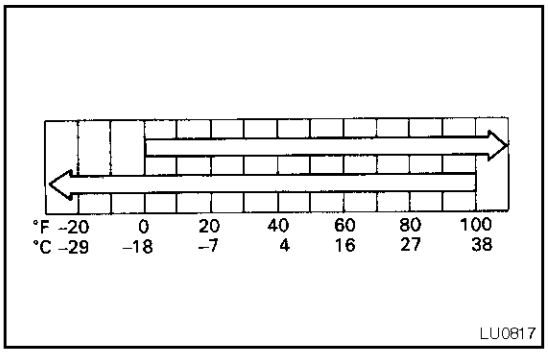
**Installation is in the reverse order of removal (See page IG–13).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# OIL AND FILTER

LU08N–03

## INSPECTION

**1. CHECK ENGINE OIL QUALITY**

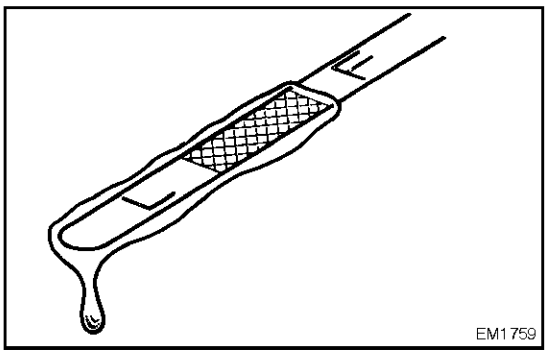
Check the oil for deterioration, entry of water, discoloring or thinning

If the quality is visibly poor, replace the oil

**Oil grade:**

**API grade SH Energy–Conserving II multigrade engine oil or ILSAC multigrade engine oil.**

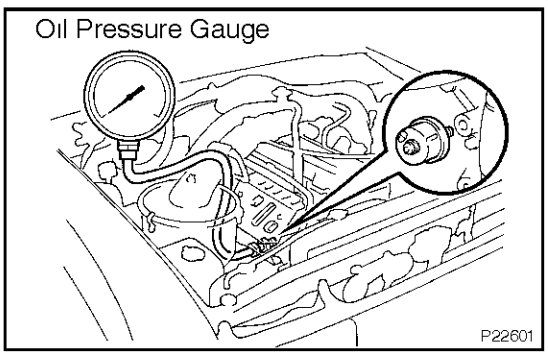
**Recommended viscosity is as shown in the illustration, with SAE 5W–30 being the preferred engine oil.**




**2. CHECK ENGINE OIL LEVEL**

The oil level should be between the "L" and "F" marks on the dipstick

If low, check for leakage and add oil up to "F" mark




**3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE**

**4. WARM UP ENGINE**

Allow the engine to warm up to normal operating temperature

**5. CHECK OIL PRESSURE**

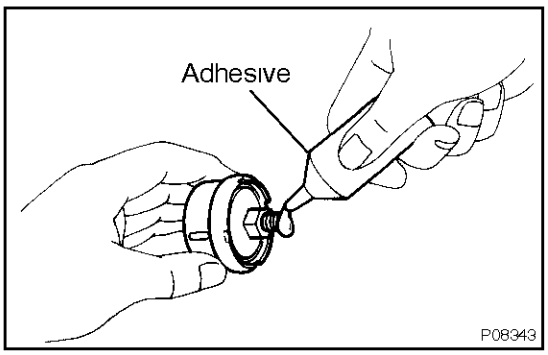
**Oil pressure:**

**At idle**

**29 kPa (0.3 kgf/cm$^2$, 4.3 psi) or more**

**At 3,000 rpm**

**245 – 490 kPa (2.5 – 5.0 kgf/cm$^2$, 36 – 71 psi)**




**6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH**

(a) Remove the oil pressure gauge

(b) Apply adhesive to 2 or 3 threads of the oil pressure switch

**Adhesive:**

**Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

(c) Reinstall the oil pressure switch

**7. START ENGINE AND CHECK FOR LEAKS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# REPLACEMENT

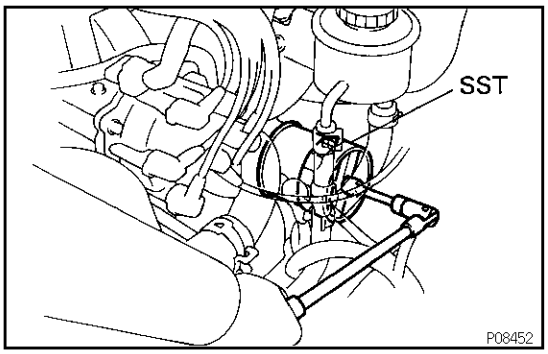
**CAUTION:**

**Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.Care should be taken, therefore, when changing engine oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not used gasoline, thinners, or solvents.In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**

**1. DRAIN ENGINE OIL**

(a) Remove the oil filler cap

(b) Remove the oil drain plug, and drain the oil into a container



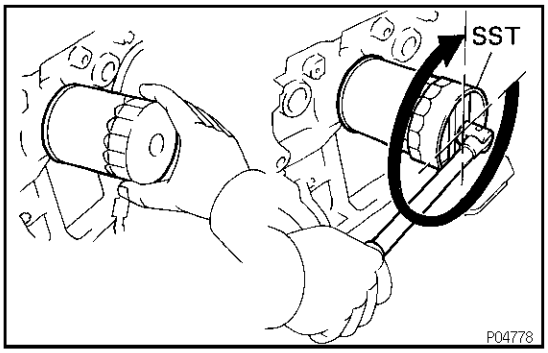

**2. REPLACE OIL FILTER**

(a) Using SST, remove the oil filter
SST 09228–44011

(b) Check and clean the oil filter installation surface

(c) Apply clean engine oil to the gasket of a new oil filter

(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat




(e) Using SST, tighten it an additional 3/4 turn
SST 09228–44011

**3. FILL WITH ENGINE OIL**

(a) Clean and install the oil drain plug with a new gasket
**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(b) Fill with new engine oil
**Oil grade:**
**See step 1 in oil pressure check**
**Capacity:**
**Drain and refill**
**w/ Oil filter change**
**7.2 liters (7.5 US qts, 6.3 Imp. qts)**
**w/o Oil filter change**
**6.9 liters (7.3 US qts, 6.1 Imp. qts)**
**Dry fill**
**8.0 liters (8.5 US qts, 7.0 Imp. qts)**

(c) Reinstall the oil filler cap

**4. START ENGINE AND CHECK FOR LEAKS**

**5. RECHECK ENGINE OIL LEVEL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

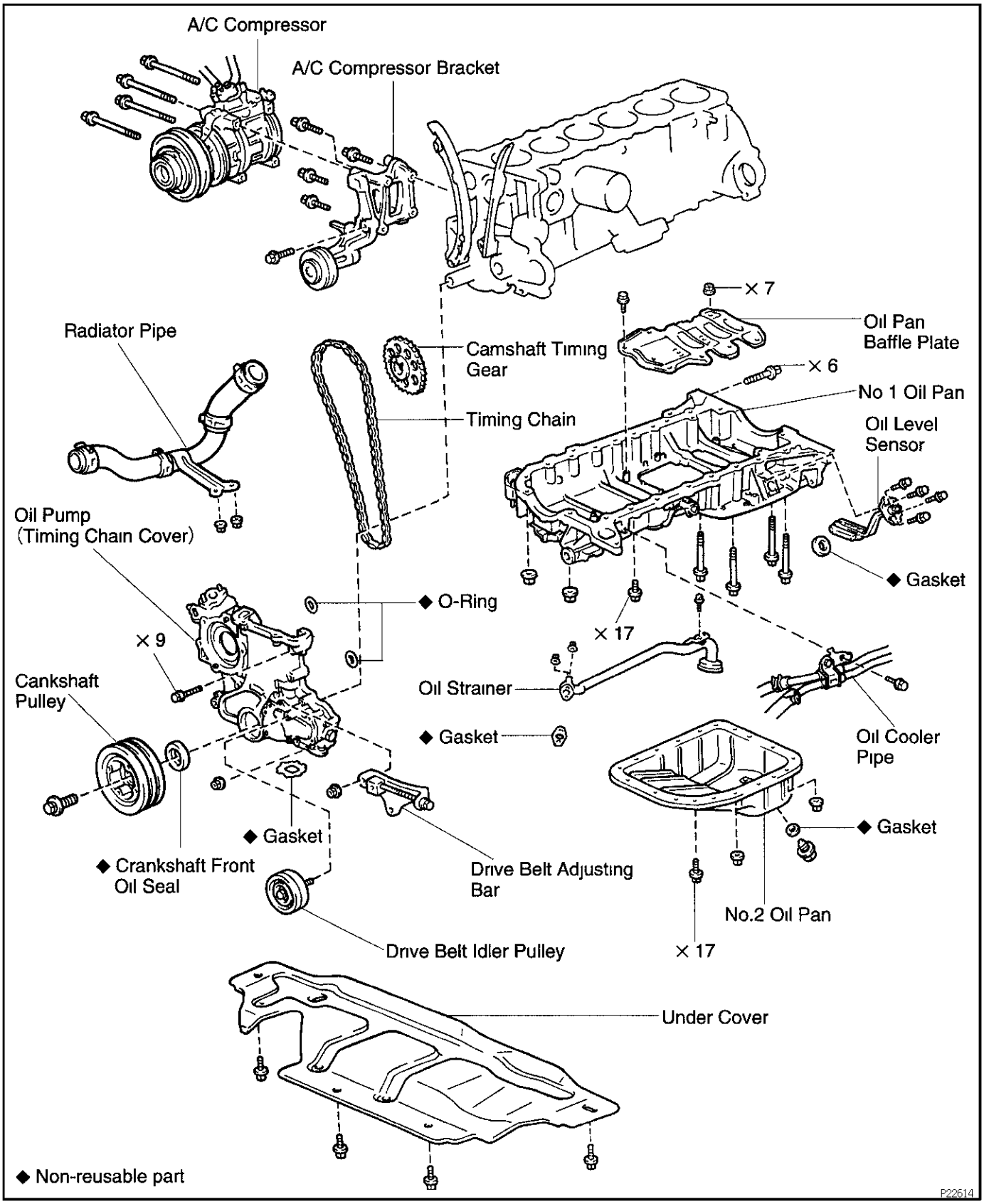
Brought to you by BirfMark



# OIL PUMP

## COMPONENTS

LU0KF-04



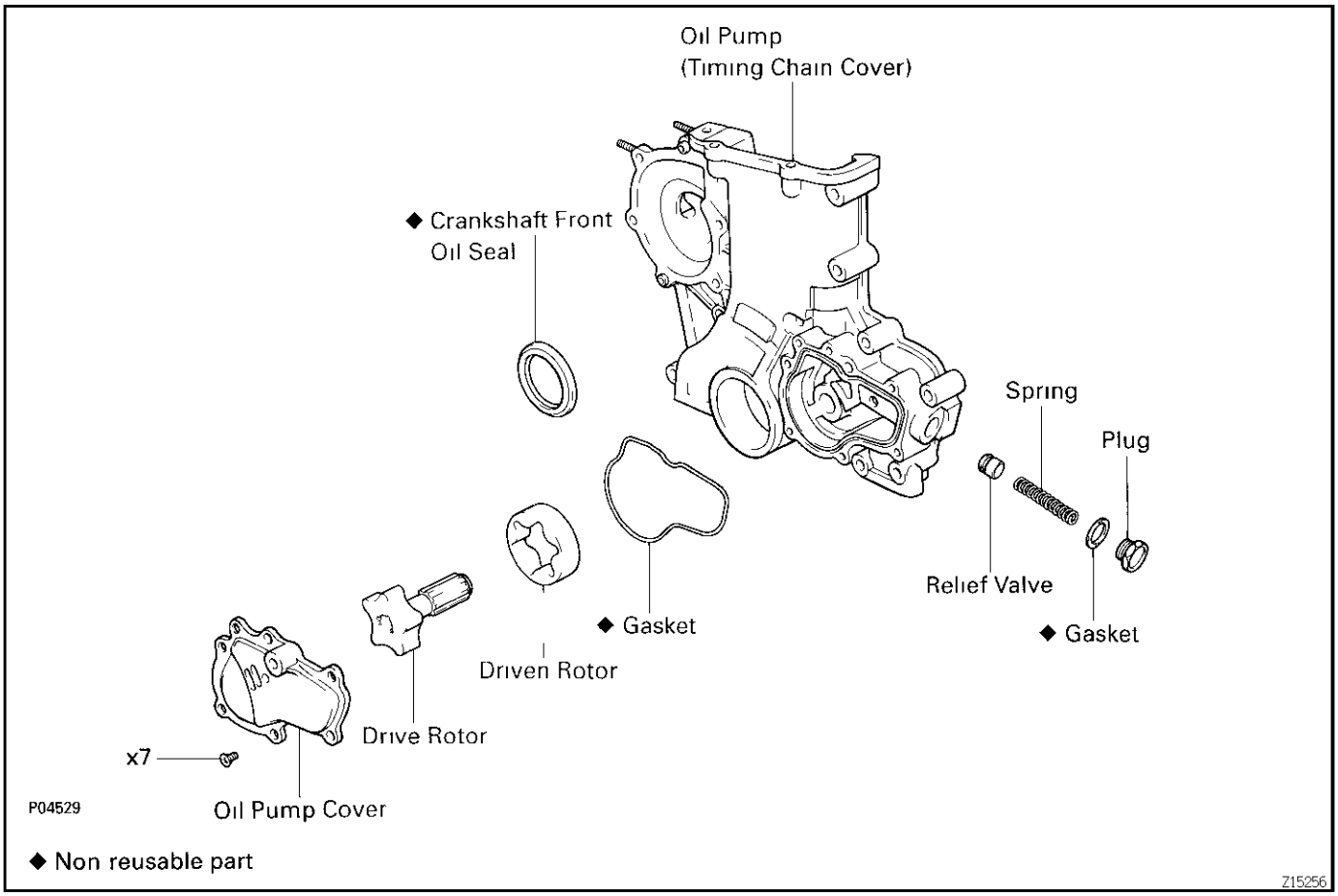



Author : Date : 714

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



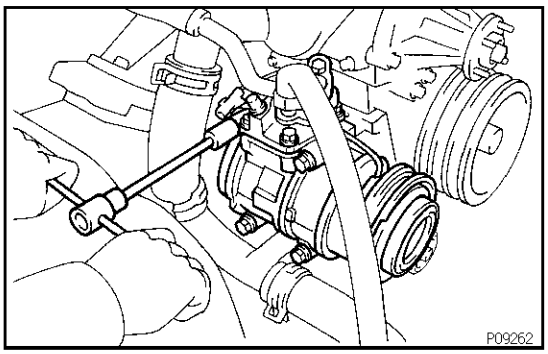
LU0KG 02

# REMOVAL

HINT

When repairing the oil pump, the oil pan and strainer should be removed and cleaned

1. **DRAIN ENGINE OIL**
2. **REMOVE ENGINE UNDER COVER**
3. **DRAIN ENGINE COOLANT**
4. **REMOVE RADIATOR (See page CO–14)**




5. **DISCONNECT A/C COMPRESSOR AND BRACKET**

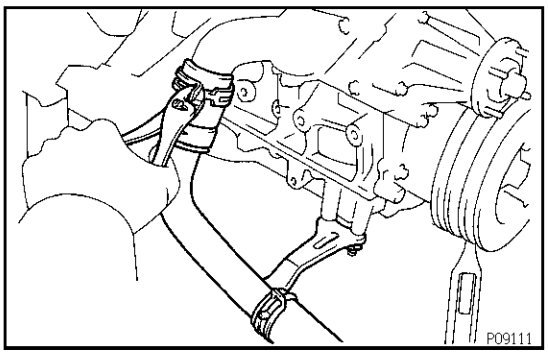
(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt

(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket

HINT

Put aside the compressor, and suspend it

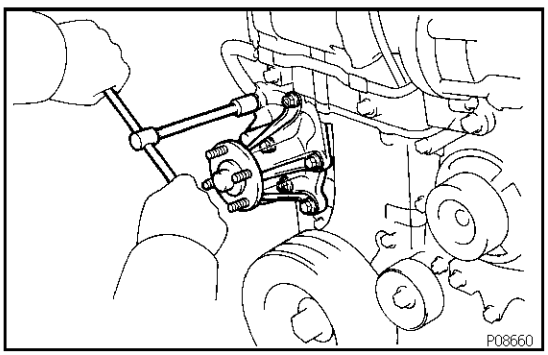
(c) Remove the 5 bolts and A/C compressor bracket




6. **REMOVE RADIATOR PIPE**

(a) Disconnect the No 2 radiator hose from the water inlet

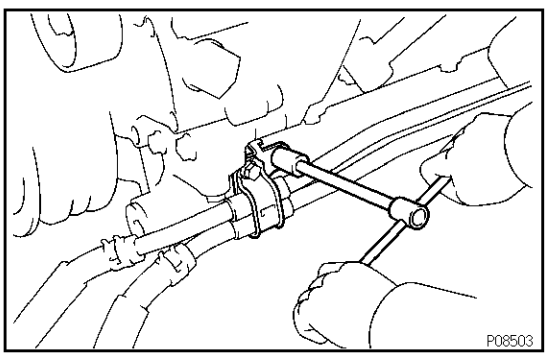
(b) Remove the 2 nuts and radiator pipe




7. **REMOVE WATER PUMP**

Remove the 4 bolts, 2 nuts, water pump and gasket

8. **REMOVE CYLINDER HEAD (See page EM–28)**



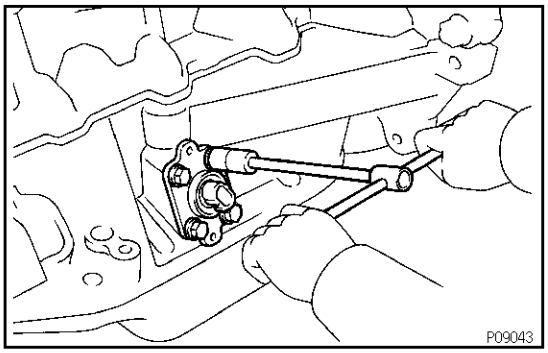

9. **DISCONNECT OIL COOLER PIPE BRACKET FROM NO.1 OIL PAN**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

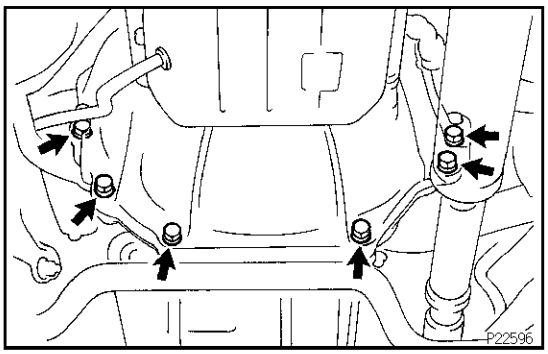





**10. REMOVE OIL LEVEL SENSOR**

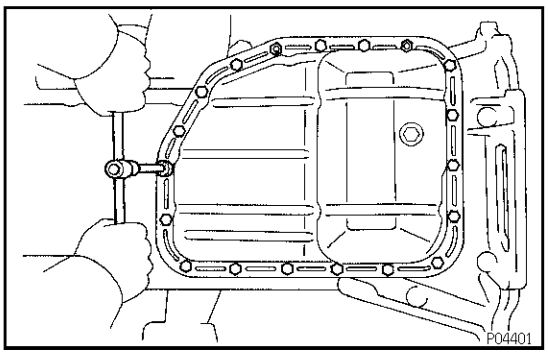
(a) Remove the 4 bolts and level sensor

(b) Remove the gasket from the level sensor



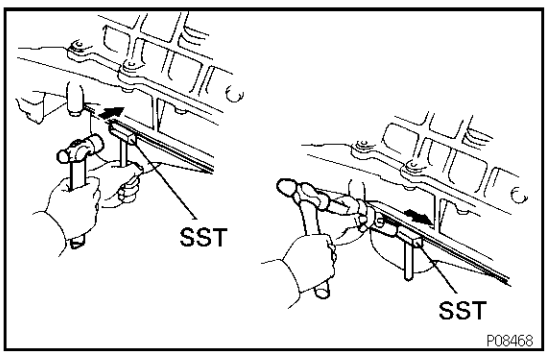

**11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING**

Remove the 6 bolts




**12. REMOVE NO.2 OIL PAN**

(a) Remove the 17 mounting bolts and 2 nuts

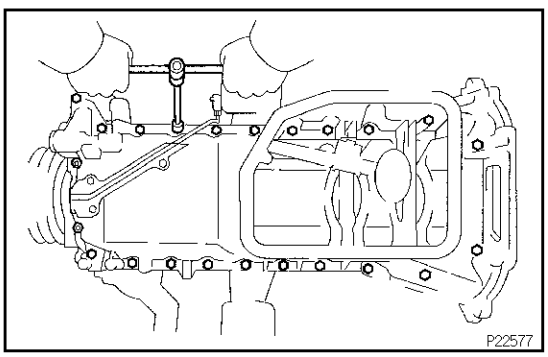



(b) Insert the blade of SST between the No 1 and No 2 oil pans, cut off applied sealer and remove the No 2 oil pan

SST 09032–00100

**NOTICE:**

**Be careful not to damage the No.2 oil pan contact surface of the No.1 oil pan.Be careful not to damage the oil pan flange.**




**13. REMOVE NO.1 OIL PAN**

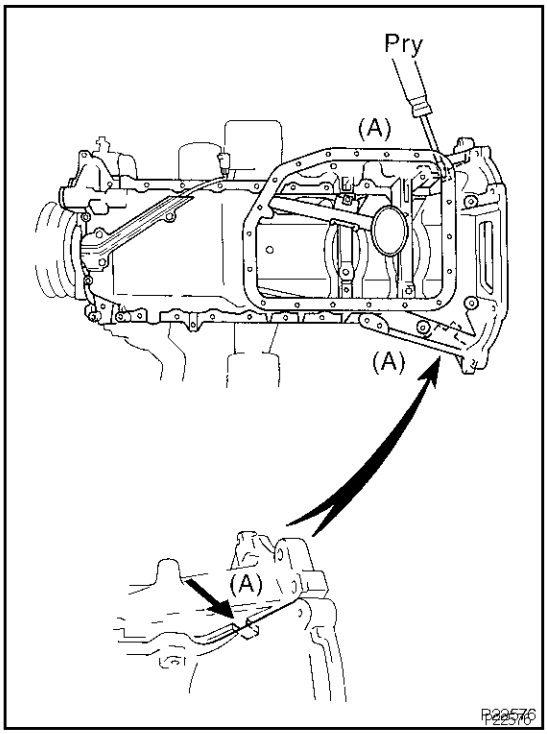
(a) Remove the 21 mounting bolts and 2 nuts



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

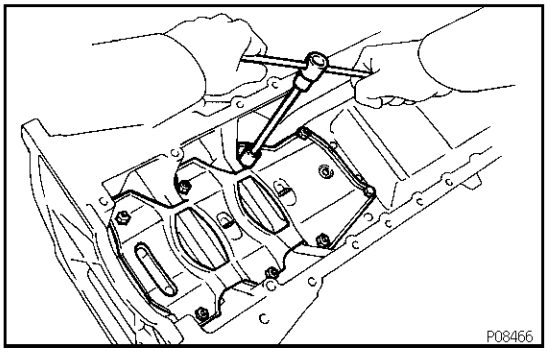





(b) Remove the No 1 oil pan by prying the portions (A) between the cylinder block and No 1 oil pan with a screwdriver

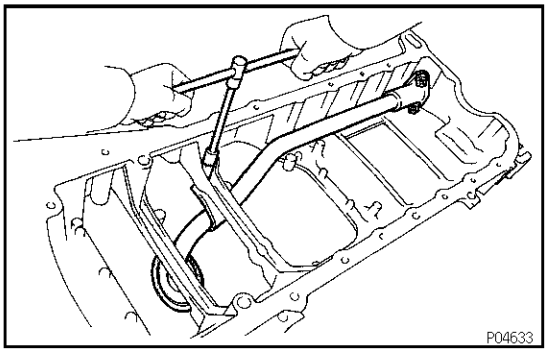
**NOTICE:**

**Be careful not to damage the contact surfaces of the cylinder block and No.1 oil pan.**




**14. REMOVE OIL PAN BAFFLE PLATE**

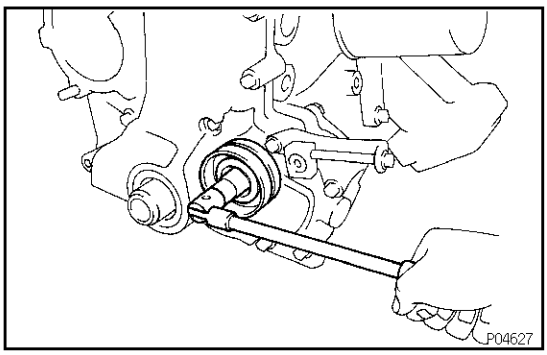
Remove the bolt, 7 nuts and baffle plate




**15. REMOVE OIL STRAINER**

Remove the bolt, 2 nuts, oil strainer and gasket

**16. REMOVE CRANKSHAFT PULLEY (See page EM–13)**




**17. REMOVE DRIVE BELT IDLER PULLEY**

Remove the bolt and idler pulley

**18. REMOVE OIL PUMP (TIMING CHAIN COVER) (See page EM–13)**

**19. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR**



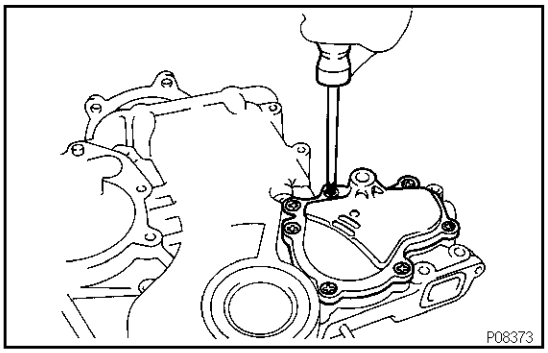
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU08R–03

# DISASSEMBLY

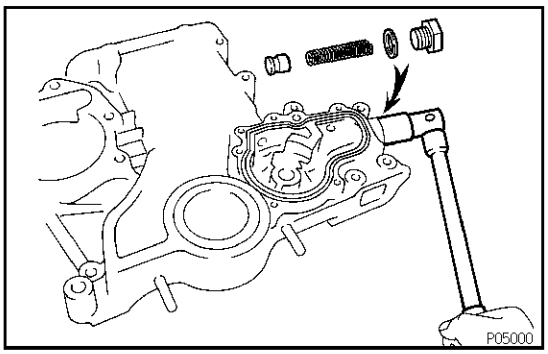



## 1. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 7 screws, pump cover, drive rotor, driven rotor and gasket

HINT

At the time of installation, place a new gasket on the pump body




## 2. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve

**Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)**

HINT

At the time of installation, install a new gasket to the plug

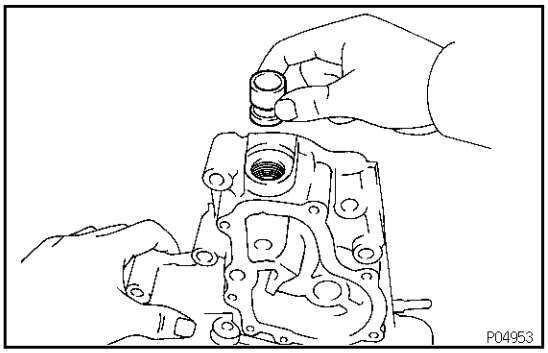


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU0KH–01

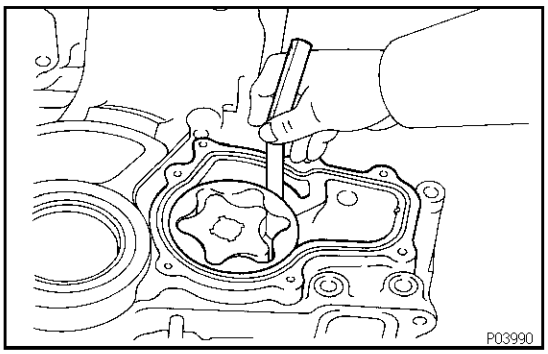



# INSPECTION

## 1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight

If it does not, replace the relief valve If necessary, replace the oil pump assembly

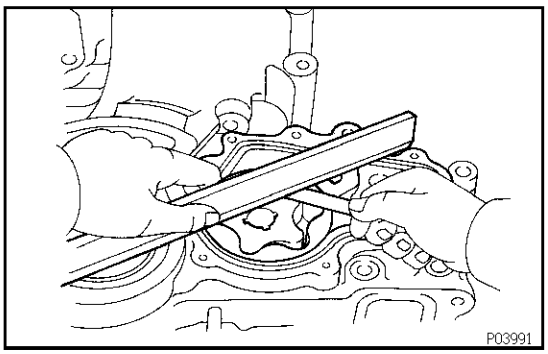



## 2. INSPECT ROTOR BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven rotor and body

**Standard body clearance:**
**0.100 – 0.170 mm (0.0039 – 0.0067 in.)**
**Maximum body clearance:**
**0.30 mm (0.0118 in.)**

If the body clearance is greater than maximum, replace the rotors as a set If necessary, replace the oil pump assembly

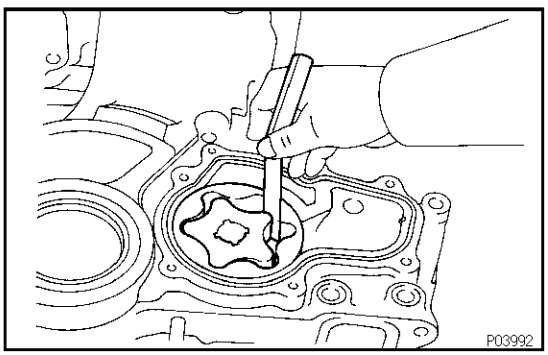



## 3. INSPECT ROTOR SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge

**Standard side clearance:**
**0.030 – 0.090 mm (0.0012 – 0.0035 in.)**
**Maximum side clearance:**
**0.15 mm (0.0059 in.)**

If the side clearance is greater than maximum, replace the rotors as a set If necessary, replace the oil pump assembly




## 4. INSPECT ROTOR TIP CLEARANCE

Using a thickness gauge, measure the clearance between the drive and driven rotor tips

**Standard tip clearance:**
**0.030 – 0.160 mm (0.0012 – 0.0063 in.)**
**Maximum tip clearance:**
**0.25 mm (0.0098 in.)**

If the tip clearance is greater than maximum, replace the rotors as a set



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU08T 03

# REPLACEMENT

## REPLACE CRANKSHAFT FRONT OIL SEAL (See page EM–99)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU0KJ 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page LU–8).**

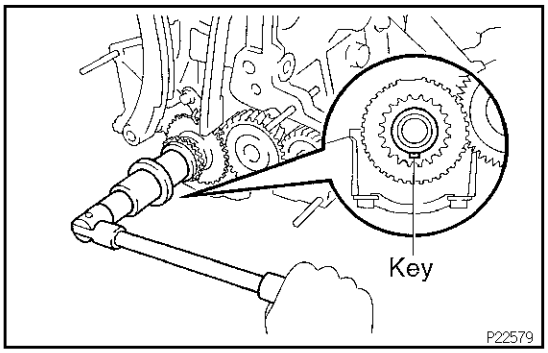


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU0K -02




# INSTALLATION

**1. SET CRANKSHAFT**

Turn the crankshaft until the set key on the crankshaft facing downward

**2. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR (See page EM–19)**

**3. INSTALL OIL PUMP (TIMING CHAIN COVER)(See page EM–19)**

**4. INSTALL DRIVE BELT IDLER PULLEY**

Install the pulley with the bolt

**Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)**

**5. INSTALL CRANKSHAFT PULLEY (See page EM–19)**

**6. INSTALL OIL STRAINER**

Install a new gasket and the oil strainer with the bolt and 2 nuts

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

**7. INSTALL OIL PAN BAFFLE PLATE**

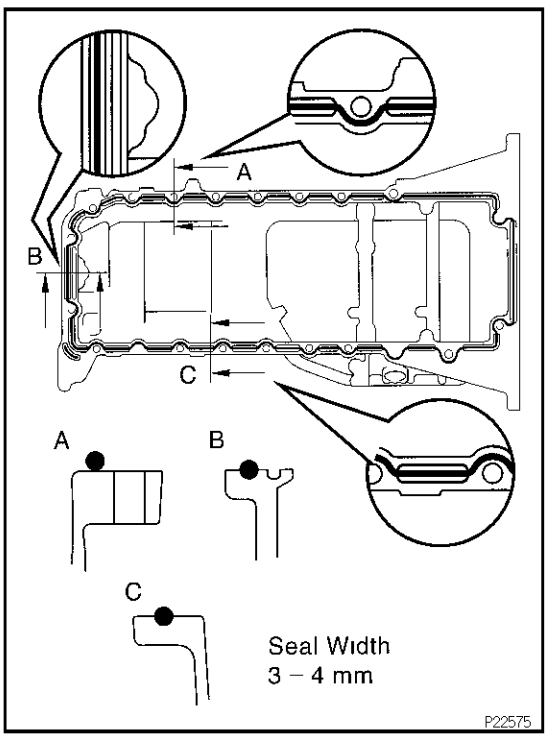
Install the baffle plate with the bolt and 7 nuts

**Torque: 9.0 N·m (90 kgf·cm, 78 in.·lbf)**

**8. INSTALL NO.1 OIL PAN**

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan, oil pump and cylinder block

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves
- Thoroughly clean all components to remove all the loose material
- Using a non–residue solvent, clean both sealing surfaces




(b) Apply seal packing to the No 1 oil pan as shown in the illustration

**Seal packing: Part No. 08826–00080 or equivalent**

- Install a nozzle that has been cut to a 3 – 4 mm (0 12 – 0 16 in ) opening

HINT

Avoid applying an excessive amount to the surface

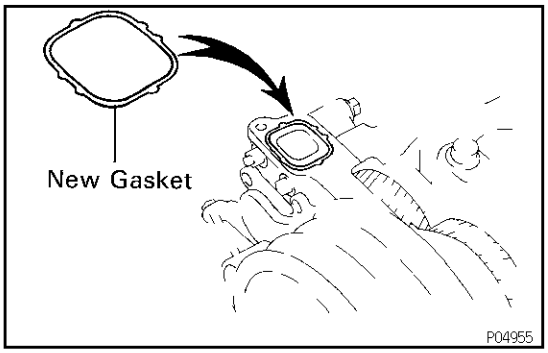
- Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap



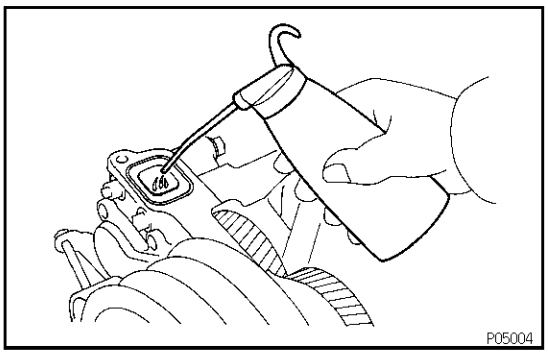
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Install a new gasket in position




(d) Pour in approximately 15 $cm^3$ (0 9 cu in ) of engine oil into oil pump hole

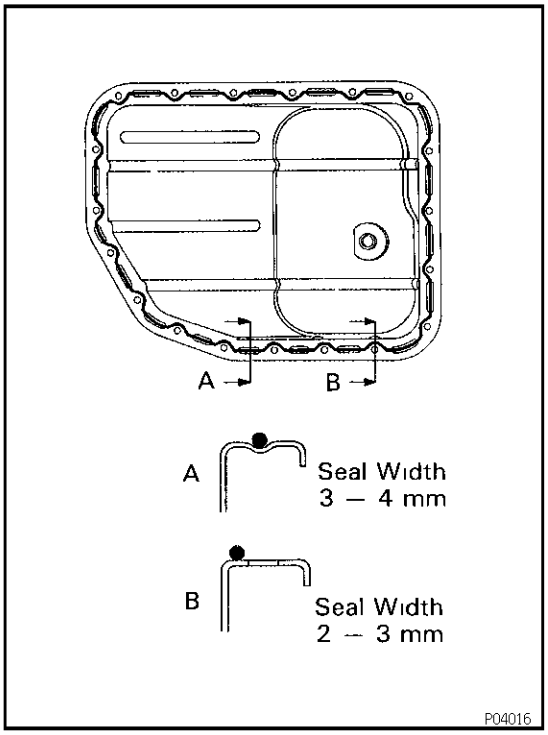
(e) Install the No 1 oil pan with the 21 bolts and 2 nuts

**Torque:**
**14 mm head: 44 N·m (440 kgf·cm, 32 ft·lbf)**
**12 mm head: 20 N·m (200 kgf·cm, 14 ft·lbf)**

**9. INSTALL NO.2 OIL PAN**

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the No 1 oil pan

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves
- Thoroughly clean all components to remove all the loose material
- Using a non–residue solvent, clean both sealing surfaces




(b) Apply seal packing to the No 2 oil pan as shown in the illustration

**NOTICE:**
**Do not use a solvent which will affect the painted surfaces.**
**Seal packing: Part No. 08826–00080 or equivalent**

- Install a nozzle that has been cut to a 2 – 3 mm (0 08 – 0 12 in ) opening or 3 – 4 mm (0 012 – 0 016 in ) opening

HINT
Avoid applying an excessive amount to the surface

- Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap

(c) Install the No 2 oil pan with the 17 bolts and 2 nuts

**Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)**
**Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)**

**10. INSTALL BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING**



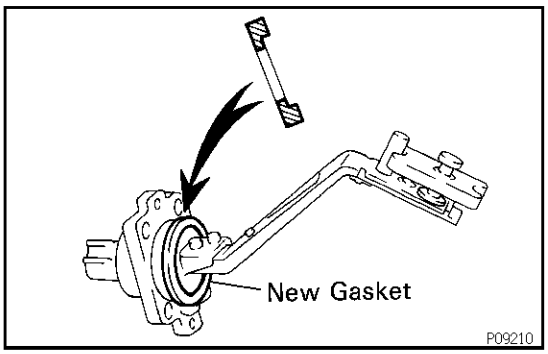
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



Install the 6 bolts

**Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)**




**11. INSTALL OIL LEVEL SENSOR**

(a) Install a new gasket to the level sensor

(b) Install the level sensor with the 4 bolts

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**12. CONNECT OIL COOLER PIPE BRACKET TO NO.1 OIL PAN**

**13. INSTALL CYLINDER HEAD(See page EM–54)**

**14. INSTALL WATER PUMP**

Install a new gasket and water pump with the 4 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**15. INSTALL RADIATOR PIPE**

(a) Connect the No 2 radiator hose to the water inlet

(b) Install the 2 nuts holding the radiator pipe to the No 1 oil pan

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

**16. INSTALL A/C COMPRESSOR AND BRACKET**

(a) Install the A/C compressor bracket with the 5 bolts

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

(b) Install the A/C compressor with the 4 bolts

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

(c) Install and adjust the drive belt (See page CH–2)

**17. INSTALL RADIATOR (See page CO–16)**

**18. INSTALL ENGINE UNDER COVER**

**19. FILL WITH ENGINE OIL**

**20. START ENGINE AND CHECK FOR LEAKS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

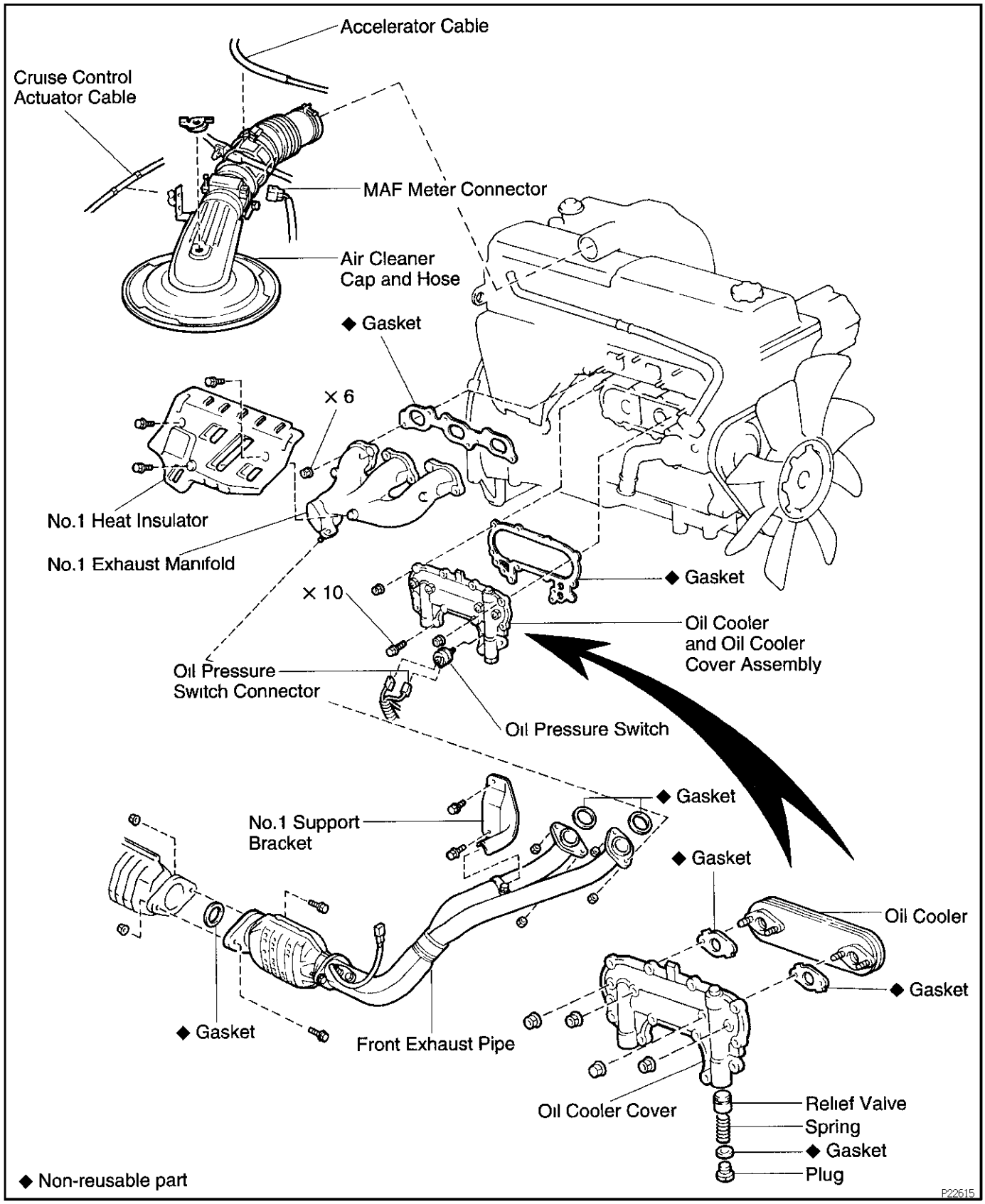
Brought to you by BirfMark



# OIL COOLER

## COMPONENTS

LU08W 03






Author : Date : 726

Brought to you by BirfMark
Version 1.11 - 03/16/2010

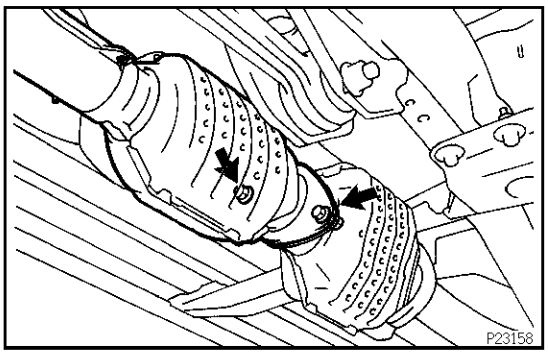
Brought to you by BirfMark



LU0KK 02

# REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE AIR CLEANER CAP AND HOSE

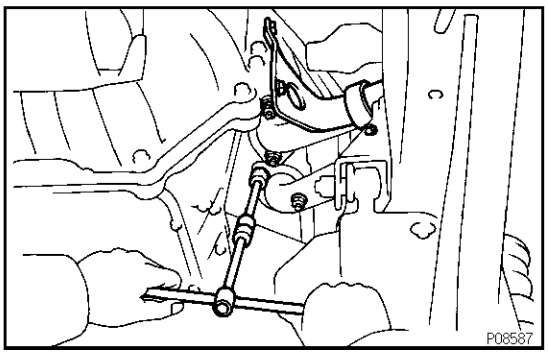



3. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the heated oxygen sensor connector

(b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC

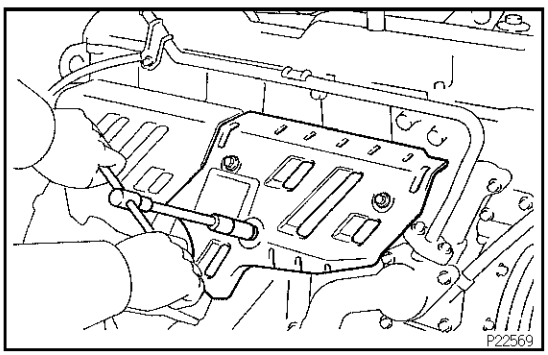
(c) Disconnect the front exhaust pipe, and remove the gasket




(d) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket

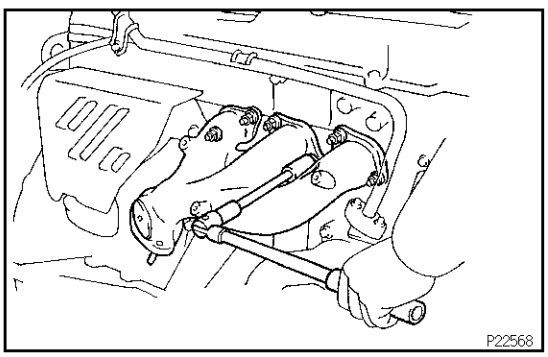
(e) Remove the 2 bolts and No 1 support bracket

(f) Remove the 4 nuts, front exhaust pipe and 2 gaskets




4. REMOVE NO.1 EXHAUST MANIFOLD

(a) Remove the 3 bolts and No 1 heat insulator



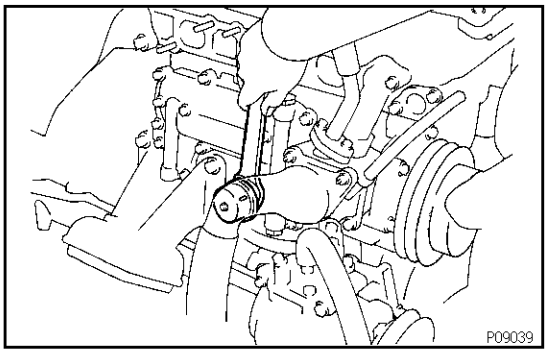

(b) Remove the 6 nuts, exhaust manifold and gasket



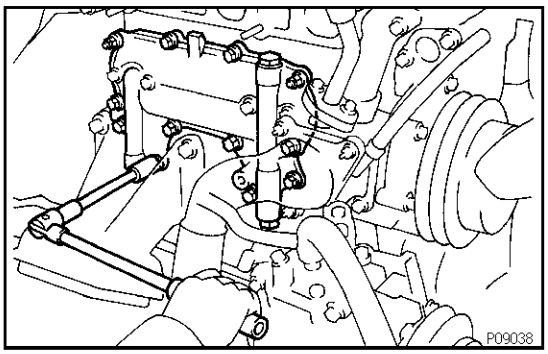
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



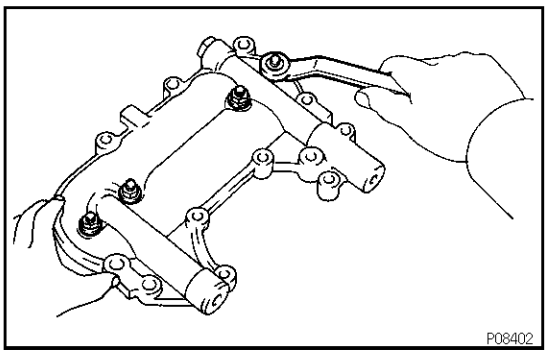



**5. REMOVE OIL PRESSURE SWITCH**



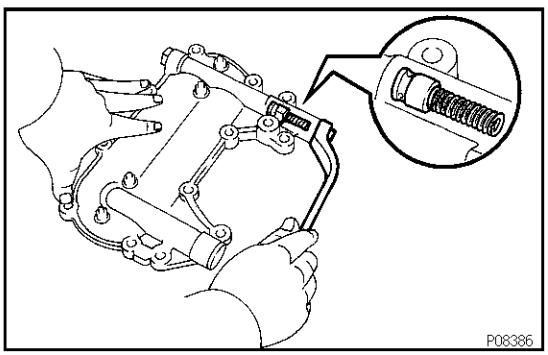

**6. REMOVE OIL COOLER AND OIL COOLER COVER ASSEMBLY**

Remove the 10 bolts, 2 nuts, oil cooler and oil cooler cover assembly and gasket




**7. SEPARATE OIL COOLER AND OIL COOLER COVER**

Remove the 4 nuts, oil cooler and 2 gaskets from the oil cooler cover




**8. REMOVE RELIEF VALVE**

Remove the plug, gasket, spring and relief valve

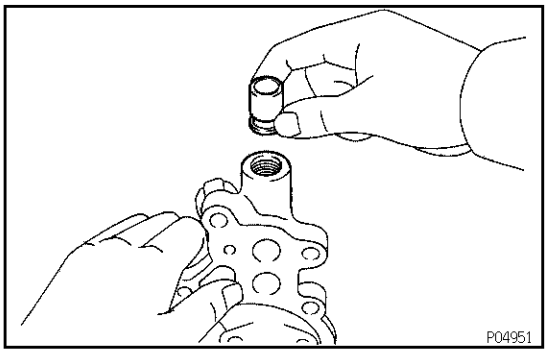


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU08Y–03




# INSPECTION

## 1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight

If it doesn't, replace the relief valve If necessary, replace the oil cooler cover

## 2. INSPECT OIL COOLER

Check the oil cooler for damage or clogging

If necessary, replace the oil cooler

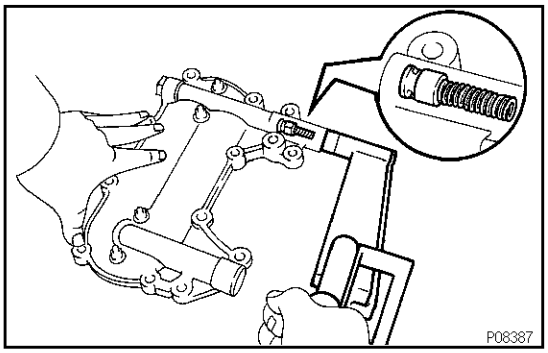


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU08Z 04




# INSTALLATION

**1. INSTALL RELIEF VALVE**

Install the relief valve, spring and a new gasket with the plug

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

**2. ASSEMBLE OIL COOLER AND OIL COOLER COVER**

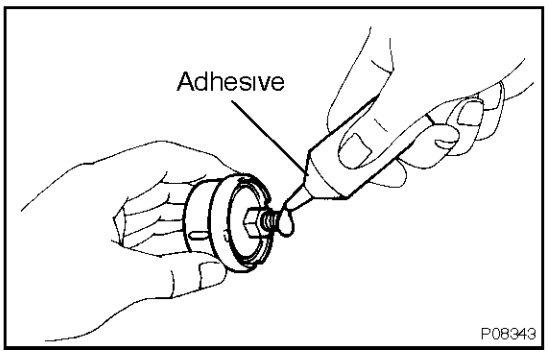
Install 2 new gaskets and the oil cooler to the oil cooler cover with the 4 nuts

**Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)**

**3. INSTALL OIL COOLER AND OIL COOLER COVER ASSEMBLY**

Install a new gasket, the oil cooler and oil cooler cover assembly with the 10 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**




**4. INSTALL OIL PRESSURE SWITCH**

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch

**Adhesive:**
**Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

(b) Install the oil pressure switch

**5. INSTALL NO.1 EXHAUST MANIFOLD**

(a) Install a new gasket and the exhaust manifold with the 6 nuts

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(b) Install the heat insulator with the 3 bolts

**Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)**

**6. INSTALL FRONT EXHAUST PIPE**

(a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts

**Torque: 63 N·m (630 kgf·cm, 46 ft·lbf)**

(b) Install the No 1 support bracket with the 2 bolts

**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**

(c) Connect the clamp and tighten the clamp bolt

**Torque: 19.5 N·m (195 kgf·cm, 14 ft·lbf)**

(d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts

**Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)**

**7. INSTALL AIR CLEANER CAP AND HOSE**

**8. FILL RADIATOR WITH ENGINE COOLANT**

**9. START ENGINE AND CHECK FOR LEAKS**

**10. CHECK ENGINE OIL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

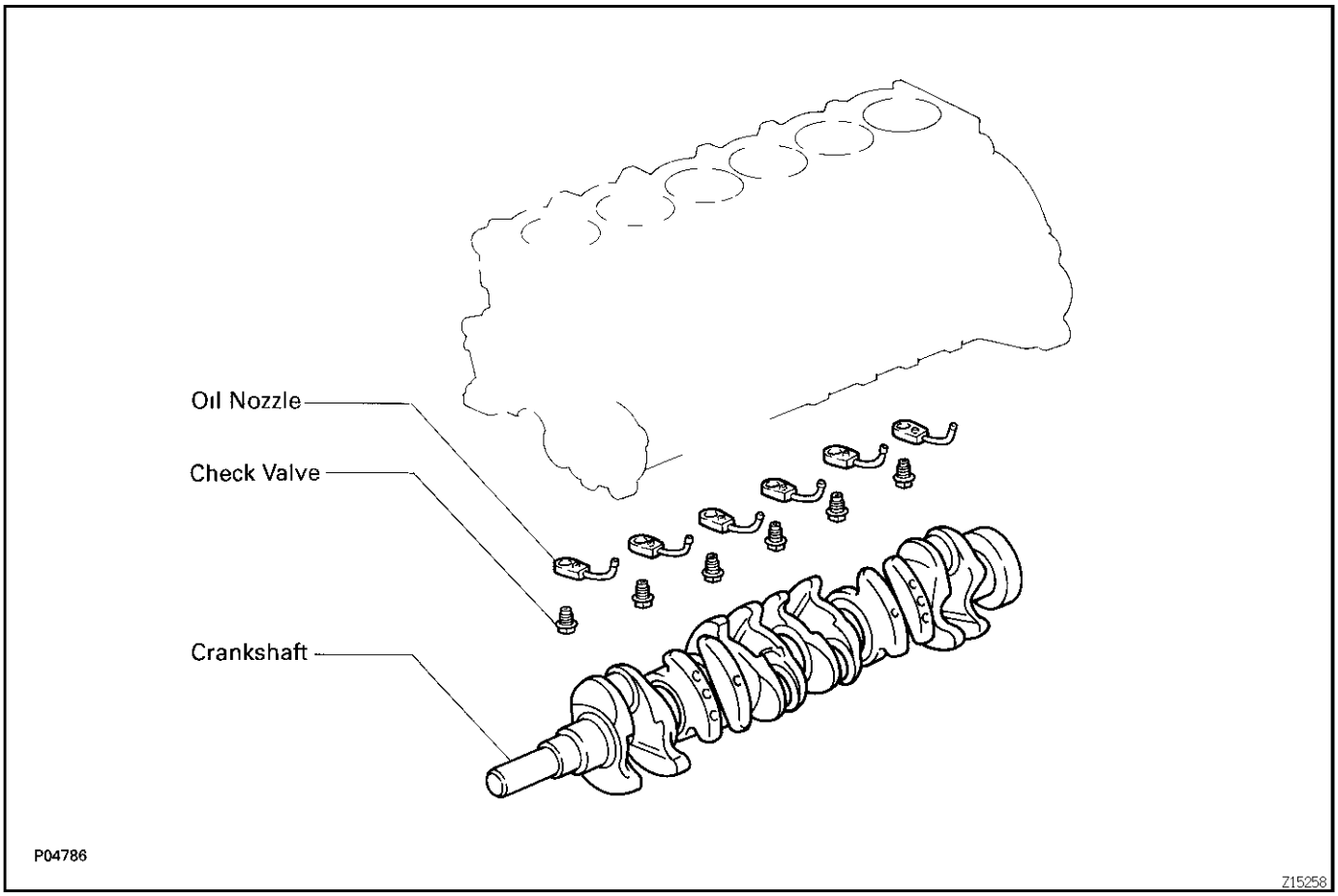
Brought to you by BirfMark



# OIL NOZZLE

## COMPONENTS

LU0KL-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



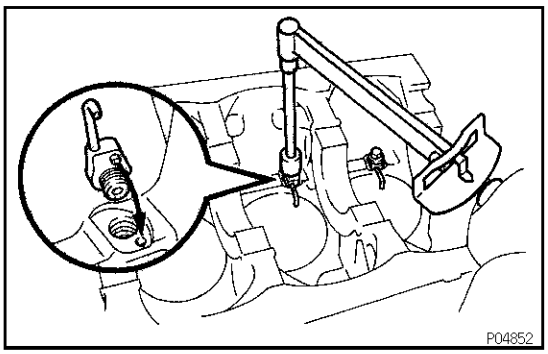
LU0KM 04

# REMOVAL

1. **REMOVE CYLINDER HEAD (See page EM–28)**
2. **REMOVE TIMING CHAIN AND GEARS (See page EM–13)**
3. **REMOVE CRANKSHAFT (See page EM–83)**
4. **REMOVE OIL NOZZLES**

Remove the 6 check valves and oil nozzles

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**




HINT

At the time of installation, align the pin of the nozzle with the pin hole of the cylinder block

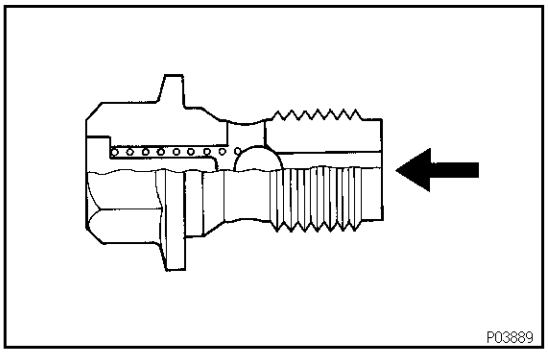


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU0KN–01




# INSPECTION

## 1. INSPECT CHECK VALVES

Push the valve with a wooden stick to check if it is stuck
If stuck, replace the check valve

## 2. INSPECT OIL NOZZLES

Check the oil nozzles for damage or clogging
If necessary, replace the oil nozzle



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



LU0KO–01

# INSTALLATION

**Installation is in the reverse order of removal (See page LU–21).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# OUTSIDE VEHICLE

MA02P 04

## GENERAL MAINTENANCE

The owners are responsible for these maintenance and inspection items
They can be done by the owner or they can have them done at a service shop
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do
Items and procedures for general maintenance are as follows

**1. GENERAL NOTES**

- Maintenance items may vary from country to country Check the owner's manual supplement in which the maintenance schedule is shown
- Every service item in the periodic maintenance schedule must be performed
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months)
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions

**2. TIRES**

(a) Check the pressure with a gauge

If necessary, adjust

(b) Check for cuts, damage or excessive wear

**3. WHEEL NUTS**

When checking the tires, check the nuts for looseness or for missing nuts
If necessary, tighten them

**4. TIRE ROTATION**

Check the owner's manual supplement in which the maintenance schedule is shown

**5. WINDSHIELD WIPER BLADES**

Check for wear or cracks whenever they do not wipe clean
If necessary, replace

**6. FLUID LEAKS**

(a) Check underneath for leaking fuel, oil, water or other fluid

(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected

**7. DOORS AND ENGINE HOOD**

(a) Check that all doors and the tailgate operate smoothly, and that all latches lock securely

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# INSIDE VEHICLE

MA02Q-04

## GENERAL MAINTENANCE

The owners are responsible for these maintenance and inspection items
They can be done by the owner or they can have them done at a service shop
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do
Items and procedures for general maintenance are as follows

**1. GENERAL NOTES**

- Maintenance items may vary from country to country Check the owner's manual supplement in which the maintenance schedule is shown
- Every service item in the periodic maintenance schedule must be performed
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months)
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions

**2. LIGHTS**

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working
(b) Check the headlights aim

**3. WARNING LIGHTS AND BUZZERS**

Check that all warning lights and buzzers function properly

**4. HORN**

Check that it is working

**5. WINDSHIELD**

Check for scratches, pits or abrasions

**6. WINDSHIELD WIPER AND WASHER**

(a) Check operation of the wipers and washer
(b) Check that the wipers do not streak

**7. WINDSHIELD DEFROSTER**

Check that air comes out from the defroster outlet when operating the heater or air conditioner at defroster mode

**8. REAR VIEW MIRROR**

Check that it is mounted securely

**9. SUN VISORS**

Check that they move freely and mounted securely

**10. STEELING WHEEL**

Check that it has the specified freeplay Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noises

**11. SEATS**

(a) Check that all front seat controls such as seat adjusters, seatback recliner, etc operate smoothly
(b) Check that all latches lock securely in any position
(c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latch position
(d) For folding-down rear seat backs, check that the latches look securely

**12. SEAT BELTS**

(a) Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly
(b) Check that the belt webbing is not cut, frayed, worn or damaged



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**13. ACCELERATOR PEDAL**

Check the pedal for smooth operation and uneven pedal effort or catching

**14. BRAKE PEDAL (See page BR-6)**

(a) Check that pedal for smoothly operation

(b) Check that the pedal has the proper reserve distance and freeplay

(c) Check the brake booster function

**15. BRAKES**

At a safe place, check that the brakes do not pull to one side when applied

**16. PARKING BRAKE (See page BR-8)**

(a) Check that the lever has the proper travel

(b) On a safe incline, check that the vehicle is held securely with only the parking brake applied

**17. AUTOMATIC TRANSMISSION "PARK" MECHANISM**

(a) Check the lock release button of the selector level for proper and smooth operation

(b) On a safe incline, check that the vehicle is held securely with the selector lever in the P position and all brakes released



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# UNDER HOOD

MA02R 04

## GENERAL MAINTENANCE

**1. GENERAL NOTICE**

- Maintenance items may vary from country to country Check the owner's manual supplement in which the maintenance schedule is shown
- Every service item in the periodic maintenance schedule must be performed
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months)
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions

**2. WINDSHIELD WASHER FLUID**

Check that there is sufficient fluid in the tank

**3. ENGINE COOLANT LEVEL**

Check that the coolant level is between the FULL and LOW lines on the see-through reservoir

**4. RADIATOR AND HOSES**

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs

(b) Check the hoses for cracks, kinks, rot or loose connections

**5. BATTERY ELECTROLYTE LEVEL**

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case If level is low, add distilled water only

**6. BRAKE FLUID LEVELS**

Check that the brake fluid level is near the upper level line on the see-through reservoir

**7. ENGINE DRIVE BELTS**

Check drive belt for fraying, cracks, wear or oiliness

**8. ENGINE OIL LEVEL**

Check the level on the dipstick with the engine turned off

**9. POWER STEERING FLUID LEVEL**

(a) Check the level on the dipstick

(b) The level should be in the HOT or COLD range depending on the fluid temperature

**10. AUTOMATIC TRANSMISSION FLUID LEVEL**

(a) Park the vehicle on a level surface

(b) With the engine idling and the parking and foot brake applied, shift the selector into all positions from the P to L, and then shift into the P

(c) Pull out the dipstick and wipe off the fluid with a clean rag Re-insert the dipstick fully and check that the fluid level is in the HOT range

(d) Do this check with the fluid at normal driving temperature (70 – 80°C (158 – 176°F))

HINT

Wait about 30 minutes before checking the fluid level after extended driving at high speeds in hot weather, driving in heavy traffic or with a trailer

**11. EXHAUST SYSTEM**

Visually inspect for cracks, holes or loose supports

If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# ENGINE

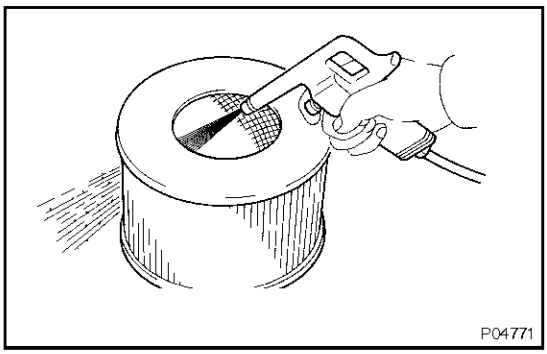
## INSPECTION

MA04U 01

HINT

Inspect these items when the engine is cold

1. **INSPECT DRIVE BELT (See page CH-2)**




2. **INSPECT AIR FILTER**

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily

If necessary, replace the air cleaner element

(b) Clean the element with compressed air

First blow from the inside thoroughly, then blow off the outside of the element

3. **REPLACE AIR FILTER**

Replace the air cleaner element with a new one

4. **REPLACE SPARK PLUGS (See page IG-1)**
5. **REPLACE ENGINE OIL AND OIL FILTER (See page LU-2)**
6. **REPLACE ENGINE COOLANT (See page CO-2)**
7. **INSPECT CHARCOAL CANISTER (See page EC-6)**
8. **REPLACE GASKET IN FUEL TANK CAP (See page EC-6)**
9. **INSPECT FUEL LINES AND CONNECTIONS (See page EC-6)**
10. **INSPECT EXHAUST PIPES AND MOUNTINGS**

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage

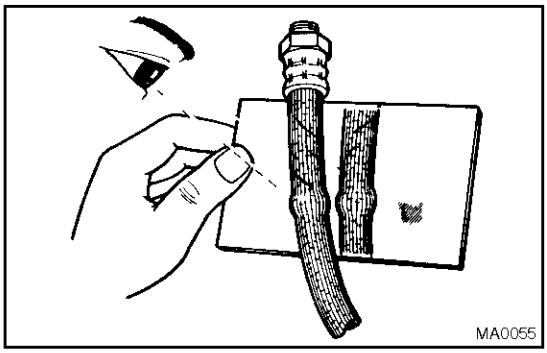
11. **ADJUST VALVE CLEARANCE (See page EM-4)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# BRAKE

MA02T-03

## INSPECTION

### 1. INSPECT BRAKE LINE PIPES AND HOSES

HINT

Check in a well lighted area Check the entire circumference and length of the brake hoses using a mirror as required Turn the front wheels fully right or left before checking the front brake

(a) Check all brake lines and hoses
- Check for damage
- Check for wear
- Check for deformation
- Check for cracks
- Check for corrosion
- Check for leaks
- Check for bends
- Check for twists

(b) Check all clamps for tightness and connections for leakage

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system

(d) Check that the lines installed in grommets pass through the center of the grommets

**2. INSPECT FRONT BRAKE PADS AND DISCS (See page BR-27)**

**3. INSPECT REAR BRAKE PADS AND DISCS (See page BR-36)**

**4. INSPECT PARKING BRAKE LININGS AND DRUMS (See page BR-42)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CHASSIS

## INSPECTION

MA04V 01

**1. INSPECT STEERING LINKAGE**

(a) Check the steering linkage for looseness or damage
- Check that the tie rod ends do not have excessive play
- Check that the boot clamps are not loose

(b) Inspect the dust cover for damage

**2. INSPECT SRS AIRBAG**

**(Driver airbag: See page RS–9)**

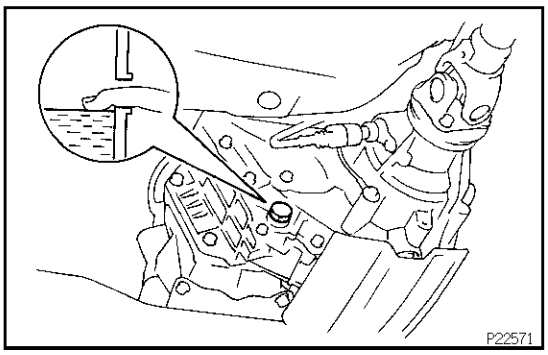
**(Front passenger airbag: See page RS–23)**

**3. INSPECT STEERING GEAR HOUSING OIL**

Check the steering gear housing for oil leakage

If leakage is found, check for cause and repair

**4. INSPECT OIL LEVEL IN AUTOMATIC TRANSMISSION (See page DI–131)**




**5. INSPECT OIL LEVEL IN TRANSFER AND DIFFERENTIAL**

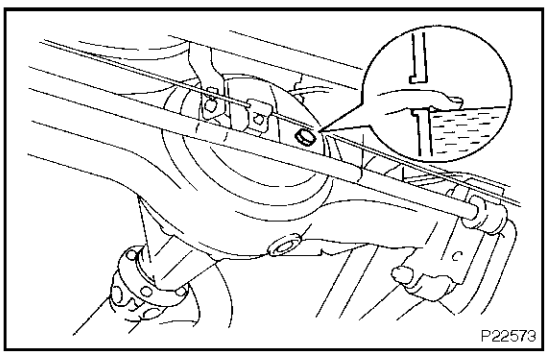
(a) Transfer

Remove the filler plug and feel inside the hole with your finger Check that the oil comes to within 5 mm (0 20 in ) of the bottom edge of the hole

If the level is low, add oil until it begins to run out of the filler hole

**Oil drade: API GL–4 or GL–5**

**Viscosity: 75W–90**




(b) Differential

Remove the filler plug and feel inside the hole with your finger Check that the oil comes to within 5 mm (0 20 in ) of the bottom edge of the hole

If the level is low, add oil until it begins to run out of the filler hole

**Oil drade: Hypoid gear oil API GL–5**

**Viscosity:**

**Above –18°C (0°F) SAE 90**

**Below –18°C (0°F) SAE 80W–90 or 80W**

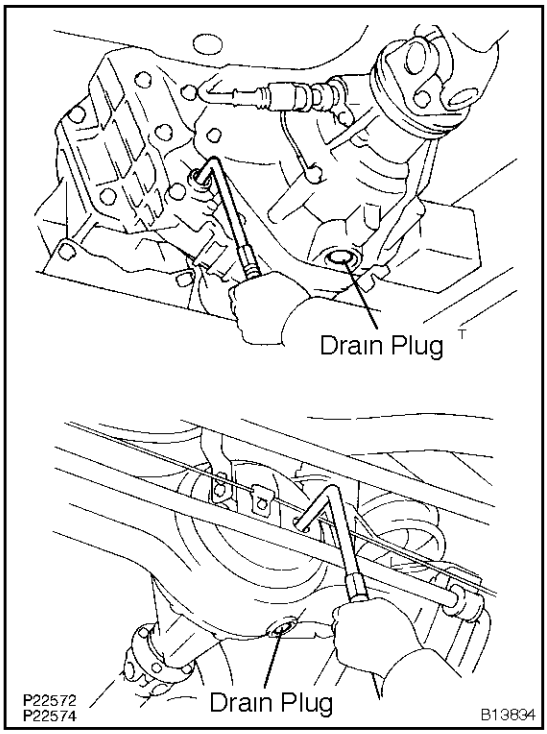
**6. REPLACE AUTOMATIC TRANSMISSION FLUID (See page DI–3)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**7. REPLACE TRANSFER AND DIFFERENTIAL OIL**

(a) Remove the drain plug and drain the oil

(b) Reinstall the drain plug securely

(c) Add new oil until it begins to run out of the filler hole

**Oil drade and viscosity: See step 5.**

**Oil capacity:**

**Transfer oil**

**1.7 liters (1.8 US qts, 1.5 Imp. qts)**

**Front differential oil (w/o Differential lock)**

**2.8 liters (3.0 US qts, 2.5 Imp. qts)**

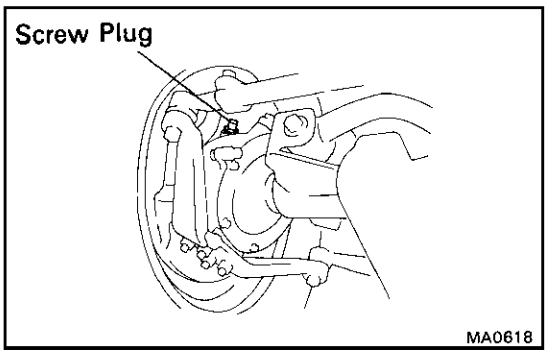
**Front differential oil (w/ Differential lock)**

**2.65 liters (2.8 US qts, 2.3 Imp. qts)**

**Rear differential oil**

**3.25 liters (3.4 US qts, 2.9 Imp. qts)**

**8. REPACK FRONT WHEEL BEARINGS (See pages SA-7 and SA-9)**




**9. LUBE STEERING KNUCKLE CHASSIS AND PROPELLER SHAFT**

(a) Remove the screw plug from each steering knuckle and repack with lubricant

**Steering knuckle grease:**

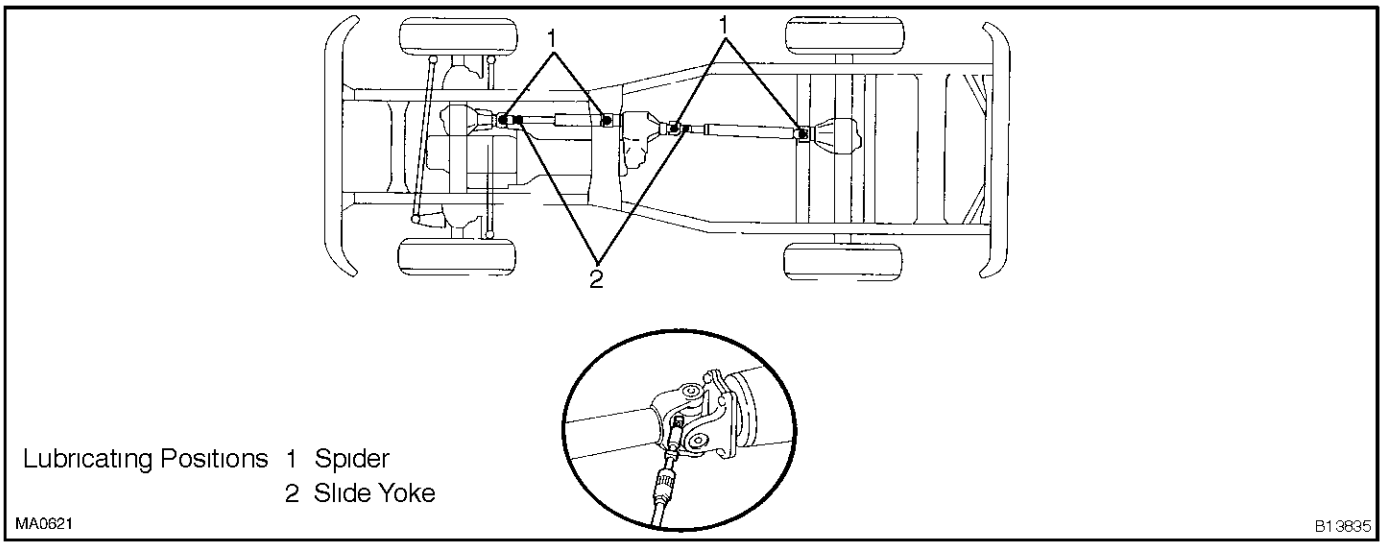
**Molybdenum disulfide lithium base chassis grease (NLGI No. 2)**

(b) Reinstall the 2 screw plugs

(c) Lubricate chassis components, referring to the lubrication chart Before pumping in grease, wipe off any mud and dust on the grease fitting

**Grease grade:**

**Lithium base chassis grease (NLGI No. 2)**

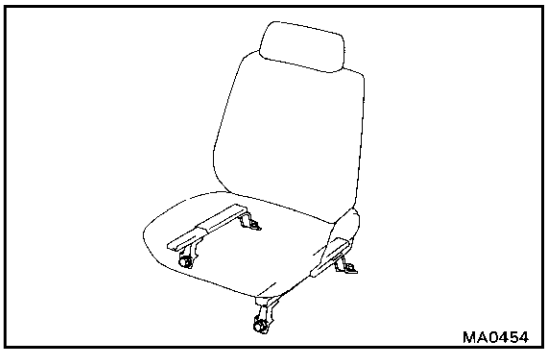





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# BODY

## INSPECTION

MA04W-01

**1. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY**

(a) Tighten the front seat–to–body mounting bolts
**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**

(b) Under Severe Conditions
In addition to the above maintenance items, check for loose or missing nuts and bolts on the steering system, drive train, suspension system, fuel tank mounts, engine mounts, etc

**2. FINAL INSPECTION**

(a) Check the operation of the body parts
- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Front and rear doors
  Door locks operate properly
  Doors close properly
- Back door
  Door lock operates properly
- Seats
  Seat adjusts easily and locks securely in any position
  Front seat back locks securely in any position
  Folding–down rear seat backs look securely

(b) Road test
- Check the engine and chassis for abnormal noises
- Check that the vehicle does not wander or pull to one side
- Check that the brakes work properly and do not drag

(c) Be sure to deliver a clean car
Especially check the steering wheel, shift lever knob, all switch knobs, door handles and seats



Author : Date : 49
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# MAINTENANCE

## EQUIPMENT

PP2ZZ-01

| | |
|---|---|
| Mirror | Brake hose |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

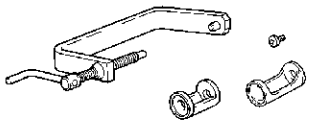
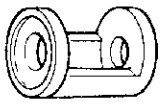
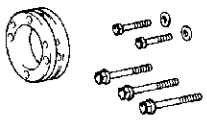
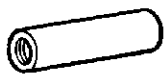
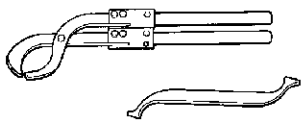
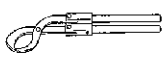
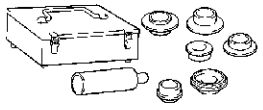
Brought to you by BirfMark



# ENGINE MECHANICAL

## SST (Special Service Tools)

PP300 01

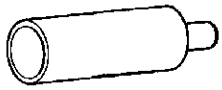
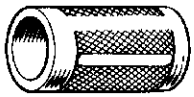
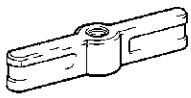
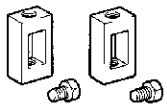
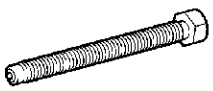
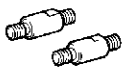
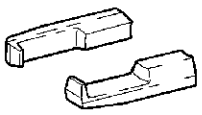
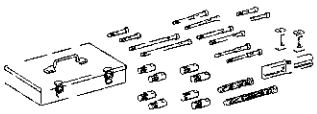
| | | | |
|---|---|---|---|
| | 09201–10000 | Valve Guide Bushing Remover & Replacer Set | |
| | (09201–01070) | Valve Guide Bushing Remover & Replacer 7 | |
|  | 09202–70020 | Valve Spring Compressor | |
|  | (09202–00010) | Attachment | |
|  | 09213–58012 | Crankshaft Pulley Holding Tool | |
| | 09223–15030 | Oil Seal & Bearing Replacer | Crankshaft rear oil seal |
| | 09236–00101 | Water Pump Overhaul Tool Set | |
|  | (09236–15010) | Bearing Stay | Valve stem oil seal |
| | 09248–06020 | Valve Lifter Stopper | |
|  | 09248–55050 | Valve Clearance Adjust Tool Set | |
|  | (09248–05510) | Valve Lifter Press | |
|  | 09316–60011 | Transmission & Transfer Bearing Replacer | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



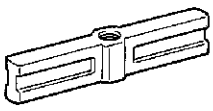
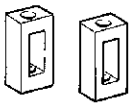
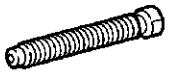
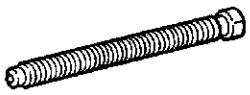
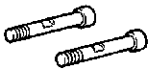
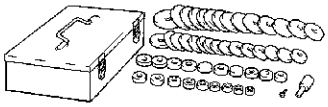
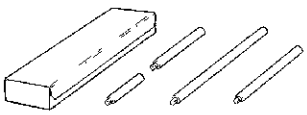
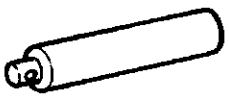
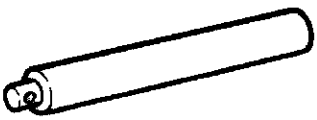
| | | | |
|---|---|---|---|
|  | (09316–00011) | Replacer Pipe | Crankshaft front oil seal |
| | (09316–00051) | Replacer D | Crankshaft front oil seal |
| | 09330–00021 | Companion Flange Holding Tool | Crankshaft pulley |
|  | 09636–20010 | Upper Ball Joint Dust Cover Replacer | Crankshaft timing gear |
| | 09816–30010 | Oil Pressure Switch Socket | Knock sensor |
| | 09843–18020 | Diagnosis Check Wire | |
| | 09950–40011 | Puller B Set | Crankshaft timing gear |
|  | (09951–04010) | Hanger 150 | |
|  | (09952–04010) | Slide Arm | |
|  | (09953–04020) | Center Bolt 150 | |
|  | (09954–04010) | Arm 25 | |
|  | (09955–04061) | Claw No 6 | |
|  | 09950–50012 | Puller C Set | Crankshaft pulley |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
|  | (09951–05010) Hanger 150 | |
|  | (09952–05010) Slide Arm | |
|  | (09953–05010) Center Bolt 100 | |
|  | (09953–05020) Center Bolt 150 | |
|  | (09954–05020) Claw No 2 | |
|  | 09950–60010 Replacer Set | |
| | (09951–00280) Replacer 28 | Connecting rod bushing |
| | (09951–00350) Replacer 35 | Crankshaft timing gear |
| | (09951–00480) Replacer 48 | Spark plug tube gasket |
|  | 09950–70010 Handle Set | |
|  | (09951–07100) Handle 100 | |
|  | (09951–07150) Handle 150 | |



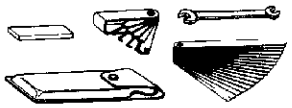
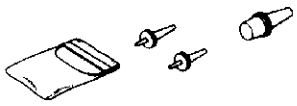
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP301-01

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
| | 09082 00040 | TOYOTA Electrical Tester | |
|  | 09200 00010 | Engine Adjust Kit | |
|  | 09258 00030 | Hose Plug Set | Plug for the vacuum hose, fuel hose etc |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP302-01

# EQUIPMENT

| | |
|---|---|
| Caliper gauge | |
| CO/HC meter | |
| Compression gauge | |
| Connecting rod aligner | |
| Cylinder gauge | |
| Dial indicator | |
| Dye penetrant | |
| Engine tune-up tester | |
| Heater | |
| Magnetic finger | |
| Micrometer | |
| OBD II scan tool | Engine speed |
| Piston ring compressor | |
| Piston ring expander | |
| Plastigage | |
| Precision straight edge | |
| Soft brush | |
| Spring tester | Valve spring |
| Steel square | Valve spring |
| Thermometer | |
| Torque wrench | |
| Valve seat cutter | |
| Vernier calipers | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP303 01

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08826–00080 | Seal Packing Black or equivalent (FIPG) | Over space between cylinder block and timing chain case<br>Timing cgain cover<br>Semi–circular plug<br>Oil pan<br>Rear oil seal retainer |
| 08833–00070 | Adhesive 1324<br>THREE BOND 1324 or equivalent | Plug tube |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | TVV |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# EMISSION CONTROL

## RECOMMENDED TOOLS

PP305 02

| | | |
|---|---|---|
| | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP306 01

# EQUIPMENT

| | |
|---|---|
| Heater | TVV |
| OBD II scan tool | Engine speed |
| Thermometer | TVV |
| Torque wrench | |
| Vacuum gauge | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP307 01

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08833–00070 | Adhesive 1324<br>THREE BOND 1324 or equivalent | TVV |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

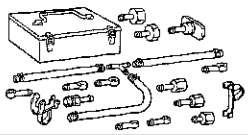
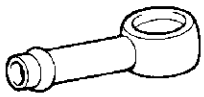
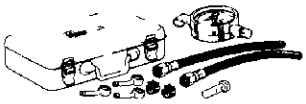
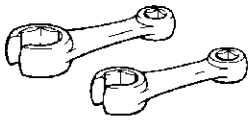
Brought to you by BirfMark



# SFI

## SST (Special Service Tools)

PP3KU 01

| | | | |
|---|---|---|---|
|  | 09268–41047 | Injection Measuring Tool Set | |
| | (09268–41091) | NO 7 Union | |
|  | (90405–09015) | No 1 Union | |
|  | 09268–45012 | EFI Fuel Pressure Gauge | |
|  | 09631–22020 | Power Steering Hose Nut<br>14 x 17 mm Wrench Set | Fuel line flare nut |
| | 09816–30010 | Oil Pressure Switch Socket | Knock sensor |
| | 09842–30070 | Wiring F' EFI Inspection | |



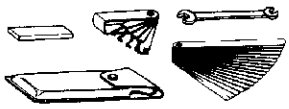
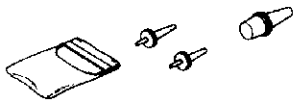
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP309 01

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
| | 09082–00040 | TOYOTA Electrical Tester | |
|  | 09200–00010 | Engine Adjust Kit | |
|  | 09258–00030 | Hose Plug Set | Plug for vacuum hose fuel hose etc |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30A–01

# EQUIPMENT

| | |
|---|---|
| Carburetor cleaner | Throttle body |
| Graduated cylinder | Injector |
| OBD II scan tool | Engine speed |
| Soft brush | Throttle body |
| Sound scope | Injector |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COOLING

## EQUIPMENT

PP30B-01

| | |
|---|---|
| Heater | Thermostat |
| Radiator cap tester | |
| Thermometer | Thermostat |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30C 03

# COOLANT

| Item | Capacity | Classification |
|---|---|---|
| Engine coolant | | Ethylene–glycol base |
| w/ Front heater | 12 5 liters (13 2 US qts 11 1 Imp qts) | |
| w/ Front heater and rear heaters | 13 4 liters (14 2 US qts 11 8 Imp qts) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

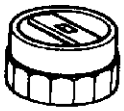
Brought to you by BirfMark



# LUBRICATION

PP30D 04

## SST (Special Service Tools)

| | | |
|---|---|---|
| | 09032–00100 Oil Pan Seal Cutter | |
|  | 09228–44011 Oil Filter Wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30E-01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
| | 09200–00010 Engine Adjust Kit | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30F–01

# EQUIPMENT

| | |
|---|---|
| Oil pressure gauge | |
| Precision straight edge | Oil pump |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30G–03

# LUBRICANT

| Item | | Capacity | Classification |
|---|---|---|---|
| Engine oil | | | API grade SH Energy–Conserving II multigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil with SAE 5W–30 being preferred engine oil |
| Dry fill | | 8.0 liters (8.5 US qts, 7.0 Imp qts) | |
| Drain and refill | w/ Oil filter change | 7.4 liters (7.8 US qts, 6.5 Imp qts) | |
| | w/o Oil filter change | 6.9 liters (7.3 US qts, 6.1 Imp qts) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30H 01

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08826–00080 | Seal Packing Black or equivalent (FIPG) | Oil pump<br>Oil pan (Timing chain cover) |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | Oil pressure switch |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# IGNITION

## RECOMMENDED TOOLS

PP30 01

| | | |
|---|---|---|
| | 09082–00040 TOYOTA Electrical Tester | |
| | 09200–00010 Engine Adjust Kit | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30J–01

# EQUIPMENT

| | |
|---|---|
| Spark plug cleaner | |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

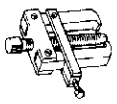
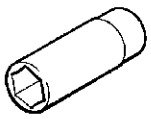
Brought to you by BirfMark



# STARTING

PP30K-03

## SST (Special Service Tools)

| | | | |
|---|---|---|---|
|  | 09286–46011 | Injection Pump Spline Shaft Puller | Armature bearing |
|  | 09810–38140 | Starter Magnet Switch Nut Wrench 14 | Terminal nut |
| | 09820–00030 | Alternator Rear Bearing Replacer | Armature rear bearing |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30L 01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
| | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30M-01

# EQUIPMENT

| | |
|---|---|
| Dial indicator | Commutator |
| Magnetic finger | Steel ball |
| Press | Magnetic switch terminal kit |
| Pull scale | Brush spring |
| Sandpaper | Commutator |
| Torque wrench | |
| V–block | Commutator |
| Vernier calipers | Commutator Brush |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

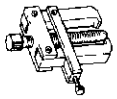
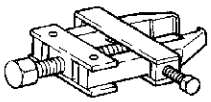
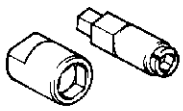
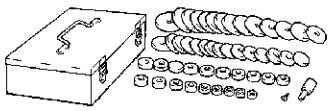
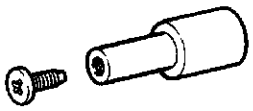
Brought to you by BirfMark



# CHARGING

## SST (Special Service Tools)

PP30N 01

| | | | |
|---|---|---|---|
| | 09285–76010 | Injection Pump Camshaft Bearing Cone Replacer | Rotor rear bearing cover |
|  | 09286–46011 | Injection Pump Spline Shaft Puller | Rectifier end frame |
|  | 09820–00021 | Alternator Rear Bearing Puller | |
| | 09820–00030 | Alternator Rear Bearing Replacer | |
|  | 09820–63010 | Alternator Pulley Set Nut Wrench Set | |
|  | 09950–60010 | Replacer Set | |
| | (09951–00260) | Replacer 26 | Rotor front bearing |
| | (09951–00500) | Replacer 50 | Rotor front bearing |
|  | (09952–06010) | Adapter | Rotor front bearing |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30O–01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
| | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP30P–01

# EQUIPMENT

| | |
|---|---|
| Belt tension gauge | |
| Torque wrench | |
| Vernier calipers | Rotor (Slip ring) Brush |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

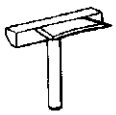
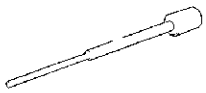
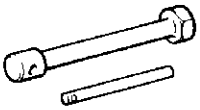
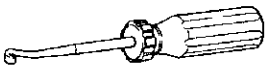
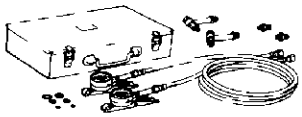
Brought to you by BirfMark



# AUTOMATIC TRANSMISSION

PP3KT 01

## SST (Special Service Tools)

| | | | |
|---|---|---|---|
|  | 09032–00100 | Oil Pan Seal Cutter | |
| | 09201–10000 | Valve Guide Bushing Remover & Replacer Set | Speedometer driven gear oil seal |
|  | (09201–01080) | Valve Guide Bushing Remover & Replacer 8 | |
| | 09350–30020 | TOYOTA Automatic Transmission Tool Set | |
|  | (09351–32010) | One–way Clutch Test Tool | |
| | (09351–32020) | Stator Stopper | |
|  | 09921–00010 | Spring Tension Tool | Speedometer driven gear oil seal |
|  | 09992–00095 | Automatic Transmission Oil Pressure Gauge Set | |



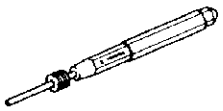
Author : Date : 78
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP3KS–01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
|  | 09031–00030 Pin Punch | |
| | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XS-01

# EQUIPMENT

| | |
|---|---|
| Dial indicator with magnetic base | Check drive plate runout |
| OBD II scan tool | |
| Straight edge | Torque converter clutch |
| Torque wrench | |
| Vernier Calipers | Torque converter clutch |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XT 02

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| Automatic transmission fluid | | ATF DEXRON®II |
| Dry fill | 11 0 liters (11 6 US qts 9 7 Imp qts) | |
| Drain and refill | 1 9 liters (2 0 US qts 1 7 Imp qts) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP3KR 01

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08826–00090 | Seal Packing 1281<br>THREE BOND 1281 or equivalent<br>(FIPG) | Oil pan |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | Extension housing |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

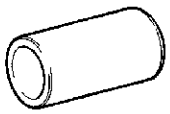
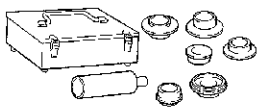
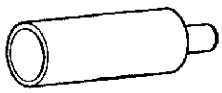
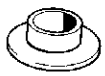
Brought to you by BirfMark



# TRANSFER

## SST (Special Service Tools)

PP3KQ 01

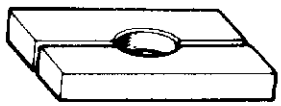
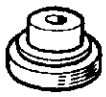
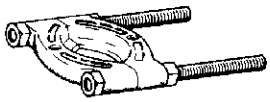
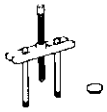
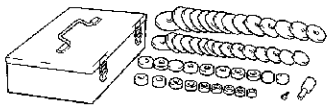
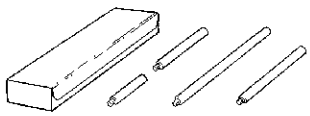
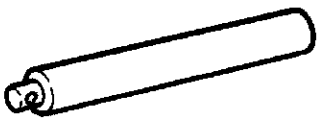
| | | | |
|---|---|---|---|
|  | 09223–00010 | Cover & Seal Replacer | Center differential |
| | 09223–15020 | Oil Seal & Bearing Replacer | Front extension housing |
| | 09316–12010 | Transfer Bearing Replacer | Center differential |
| | 09316–20011 | Transfer Bearing Replacer | Front extension housing<br>Rear extension housing<br>Component parts removal and installation |
|  | 09316–60011 | Transmission & Transfer Bearing Replacer | |
|  | (09316–00011) | Replacer Pipe | Front extension housing<br>Rear extension housing<br>Idler gear<br>Component parts removal and installation<br>Center differential |
| | (09316–00021) | Replacer A | Rear extension housing |
| | (09316–00031) | Replacer B | Front extension housing<br>Rear extension housing<br>Idler gear<br>Component parts removal and installation<br>Input shaft |
|  | (09316–00041) | Replacer C | Component parts removal and installation<br>Front extension housing<br>Rear extension housing |
| | (09316–00061) | Replacer E | Front extension housing |
| | (09316–00071) | Replacer F | Idler gear<br>Front extension housing |
| | 09325–12010 | Transmission Oil Plug | Rear extension housing |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | |
|---|---|---|---|
|  | 09527–30010 | Rear Axle Shaft Bearing Remover | Input shaft |
| | 09608–00081 | Differential Side Bearing Cone Replacer | Component parts removal and installation |
| | 09612–24014 | Steering Gear Housing Overhaul Tool Set | Center differential |
|  | (09612–10050) | Steering Rack Shaft Bushing Replacer | |
|  | 09950–00020 | Bearing Remover | Idler gear<br>Center differential<br>Front extension housing |
|  | 09950–00030 | Bearing Remover Attachment | Center differential |
| | 09950–40011 | Puller B Set | Component parts removal and installation<br>Front extension housing |
|  | 09950–60010 | Replacer Set | |
| | (09951–00320) | Replacer 32 | Component parts removal and installation<br>Center differential |
| | (09951–00400) | Replacer 40 | Center differential |
|  | 09950–70010 | Handle Set | Component parts removal and installation<br>Front extension housing<br>Center differential |
|  | (09951–07150) | Handle 150 | |



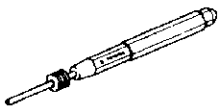
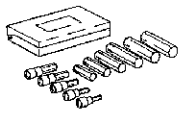
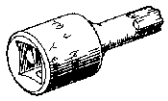
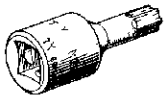
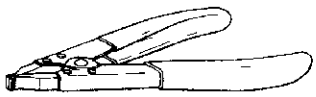
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XV–01

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
|  | 09031–00030 | Pin Punch | |
|  | 09040–00010 | Hexagon Wrench Set | |
|  | 09042–00010 | Torx Socket T30 | |
|  | 09042–00020 | Torx Socket T40 | |
| | 09082–00040 | TOYOTA Electrical Tester | |
|  | 09905–00012 | Snap Ring No 1 Expander | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XW-01

# EQUIPMENT

| | |
|---|---|
| Dial indicator | |
| Feeler gauge | |
| Magnetic finger | |
| Straight edge | |
| Torque wrench | |
| Vernier calipers | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XX–01

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| Transfer oil | 1.7 liters (1.8 US qts, 1.5 Imp. qts) | API GL–4 or GL–5<br>SAE 75W–90 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2XY–02

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08826–00090 | Seal Packing 1281<br>THREE BOND 1281 or equivalent<br>(FIPG) | Front case x Rear case<br>Rear case x Case cover<br>Case x Extension housing |
| 08833–00070 | Adhesive 1324<br>THREE BOND 1324 or equivalent | Dynamic damper set bolt |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | Straight screw plug<br>Case cover set bolt |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

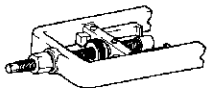
Brought to you by BirfMark



# PROPELLER SHAFT

PP2Y8-01

## SST (Special Service Tools)

| | | | |
|---|---|---|---|
|  | 09332–25010 | Universal Joint Bearing Remover & Replacer | Spider bearing |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2Y7-01

# EQUIPMENT

| | |
|---|---|
| Dial indicator | |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

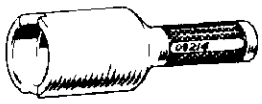
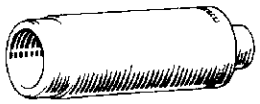
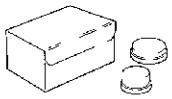
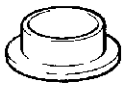
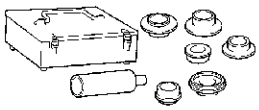
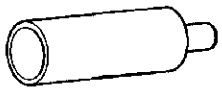
Brought to you by BirfMark



# SUSPENSION AND AXLE

## SST (Special Service Tools)

PP3KP–01

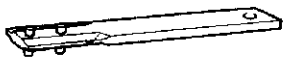
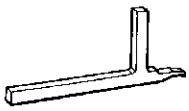
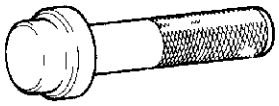
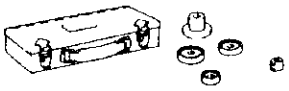
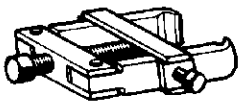
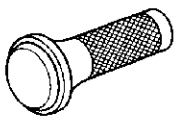
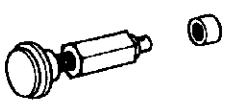
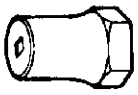
| | | | |
|---|---|---|---|
|  | 09214–76011 | Crankshaft Pulley Replacer | Front differential<br>Rear differential |
| | 09223–15020 | Oil Seal & Bearing Replacer | Front differential<br>Rear axle |
|  | 09226–10010 | Crankshaft Front & Rear Bearing Replacer | Rear suspension |
| | 09308–00010 | Oil Seal Puller | Front axle<br>Front differential<br>Rear axle<br>Rear differential |
| | 09308–10010 | Oil Seal Puller | Front differential<br>Rear differential |
|  | 09315–00022 | Clutch Release Bearing Remover & Replacer | Rear differential |
|  | 09316–20011 | Transfer Bearing Replacer | Rear suspension |
|  | 09316–60011 | Transmission & Transfer Bearing Replacer | Front differential<br>Rear differential |
|  | (09316–00011) | Replacer Pipe | |
| | (09316–00021) | Replacer A | |
| | (09316–00051) | Replacer D | |
| | 09330–00021 | Companion Flange Holding Tool | Front differential<br>Rear differential |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



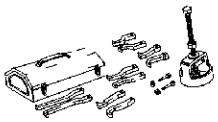
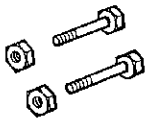
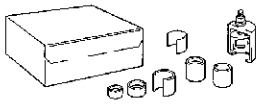
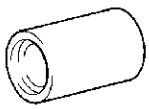
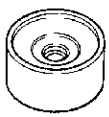
| | | | |
|---|---|---|---|
|  | 09504–00011 | Differential Side Bearing Adjusting Nut Wrench | Front differential<br>Rear differential |
|  | 09504–22011 | Differential Side Bearing Replacer | Rear differential |
| | 09506–35010 | Differential Drive Pinion Rear Bearing Replacer | Rear differential<br>Rear suspension |
| | 09509–25011 | Rear Axle Bearing Lock Nut Wrench | Rear axle |
|  | 09517–36010 | Rear Axle Shaft Oil Seal Replacer– | Rear axle |
|  | 09550–10013 | Replacer Set B | Rear differential<br>Rear suspension |
| | (09553–10010) | Differential Side Bearing Replacer | |
| | (09557–10011) | Differential Drive Pinion Front Bearing Replacer | |
| | 09550–60010 | Differential Side Bearing Replacer | Rear differential |
|  | 09556–22010 | Drive Pinion Front Bearing Remover | Front differential<br>Rear differential |
|  | 09605–60010 | Steering Knuckle Bearing Cup Replacer– | Front axle |
|  | 09606–60020 | Steering Knuckle Bearing Remover | Front axle |
|  | 09607–60020 | Front Wheel Adjusting Nut Wrench | Front axle |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



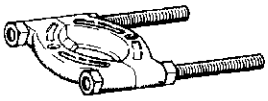
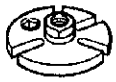
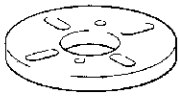
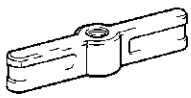
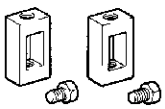
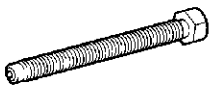
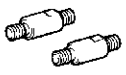
| | | | |
|---|---|---|---|
| | 09611–22012 | Tie Rod End Puller | Front axle |
|  | 09612–65014 | Steering Worm Bearing Puller | Front axle |
| | (09612–01010) | Claw A | |
|  | (09612–01050) | Hanger Pin with Nut | |
| | 09618–60010 | Front Axle & Drive Shaft Bearing Replacer | Front axle |
|  | 09710–22021 | Front Suspension Bushing Tool Set | Rear suspension |
| | (09710–01071) | Lower Arm Bushing Remover | |
| | 09710–22042 | Rear Suspension Bushing Tool Set | Front suspension |
|  | (09710–02051) | Base | |
| | (09710–02061) | Replacer | |
| | (09710–02071) | Bushing Remover & Replacer | |
|  | 09710–30050 | Suspension Arm Bushing Replacer | Front suspension |
| | 09726–40010 | Lower Control Shaft Bearing Replacer | Front differential<br>Rear differential |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



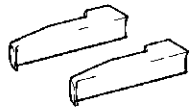
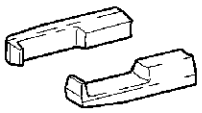
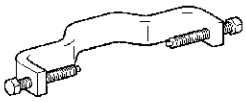
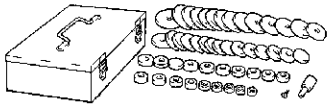
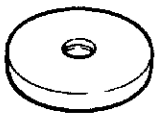
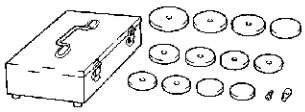
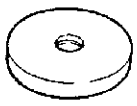
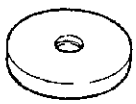
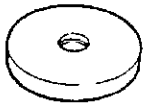
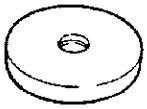
| | | | |
|---|---|---|---|
| | 09727–30021 | Coil Spring Compressor | |
|  | 09950–00020 | Bearing Remover | Front differential<br>Rear differential |
| | 09950–30011 | Puller A Set | Front differential<br>Rear differential |
|  | (09951–03010) | Upper Plate | |
| | (09953–03010) | Center Bolt | |
| | (09954–03010) | Arm | |
|  | (09955–03030) | Lower Plate 130 | |
| | (09956–03020) | Adapter 18 | |
| | 09950–40011 | Puller B Set | Front differential<br>Rear differential |
|  | (09951–04010) | Hanger 150 | |
|  | (09952–04010) | Slide Arm | |
|  | (09953–04020) | Center Bolt 150 | |
|  | (09954–04010) | Arm 25 | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



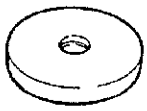
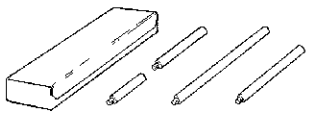
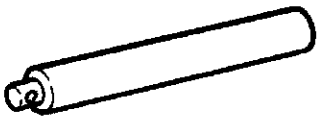
| | | |
|---|---|---|
|  | (09955–04011) Claw No 1 | |
|  | (09955–04061) Claw No 6 | |
| | (09957–04010) Attachment | |
|  | (09958–04011) Holder | |
|  | 09950–60010 Replacer Set | Front differential<br>Rear differential<br>Rear suspension |
| | (09951–00480) Replacer 48 | |
| | (09951–00490) Replacer 49 | |
|  | (09951–00540) Replacer 54 | |
|  | 09950–60020 Replacer Set No 2 | Front axle<br>Rear axle<br>Rear differential |
|  | (09951–00710) Replacer 71 | |
|  | (09951–00720) Replacer 72 | |
|  | (09951–00810) Replacer 81 | |
|  | (09951–00890) Replacer 89 | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
|  | (09951–00910) Replacer 91 | |
|  | 09950–70010 Handle Set | Front axle<br>Front suspension<br>Rear axle<br>Rear differential<br>Rear suspension |
| | (09951–07100) Handle 100 | |
|  | (09951–07150) Handle 150 | |



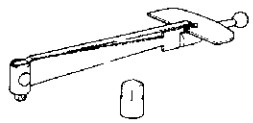
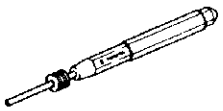
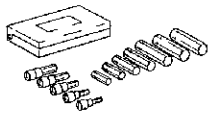
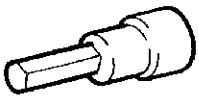
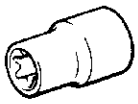
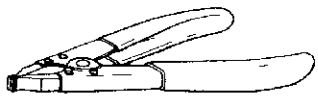
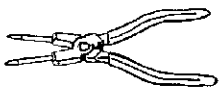
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP3KO 01

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
|  | 09025–00010 | Small Torque Wrench (30 kgf–cm) | Front differential<br>Rear differential |
|  | 09031–00030 | Pin Punch | Front differential |
|  | 09040–00011 | Hexagon Wrench Set | Front differential |
|  | (09043–20060) | Socket Hexagon Wrench 6 | |
|  | 09044–00020 | Torx Socket E10 | Rear differential |
| | 09082–00050 | TOYOTA Electrical Tester Set | Differential locking system |
|  | 09905–00012 | Snap Ring No 1 Expander | Front axle<br>Front differential |
|  | 09905–00013 | Snap Ring Pliers | Front axle<br>Front differential |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YD-01

# EQUIPMENT

| | |
|---|---|
| Dial indicator or dial indicator with magnetic base | |
| Feeler gauge | |
| Micrometer | |
| Spring tension gauge | |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YE–01

# LUBRICANT

| Item | | Capacity | Classification |
|---|---|---|---|
| Differential oil | | | Hypoid gear oil API GL–5 |
| Front | w/o Differential lock | 2.80 liters (2.9 US qts, 2.5 Imp. qts) | Above –18°C (0°F) SAE 90 |
| | w/ Differential lock | 2.65 liters (2.8 US qts, 2.3 Imp. qts) | Below –18°C (0°F) SAE 80W–90 or 80W |
| Rear | | 3.25 liters (3.4 US qts, 2.9 Imp. qts) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YF 02

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08826–00090 | Seal Packing 1281<br>THREE BOND 1281 or equivalent<br>(FIPG) | Front differential<br>Rear differential<br>Differential locking system |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | Front differential<br>Rear differential<br>Differential locking system |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

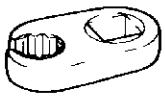
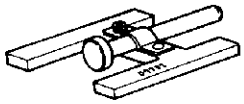
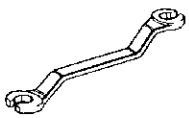
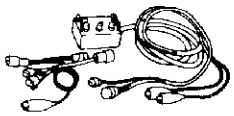
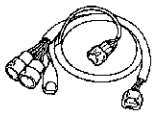
Brought to you by BirfMark



# BRAKE

## SST (Special Service Tools)

PP3KN 01

| | | | |
|---|---|---|---|
|  | 09023–00100 | Union Nut Wrench 10 mm | |
| | 09709–29018 | LSPV Gauge Set | |
| | 09717–20010 | Brake Shoe Return Spring Remover | |
| | 09718–20010 | Brake Shoe Return Spring Replacer | |
|  | 09737–00010 | Brake Booster Push Rod Gauge | |
|  | 09751–36011 | Brake Line Union Nut 10 x 12 mm Wrench | |
| | 09843–18020 | Diagnosis Check Wire | |
|  | 09990–00150 | ABS Actuator Checker and Sub–harness | |
| | 09990–00200 | ABS Actuator Checker Sub–harness C | |
|  | 09990–00210 | ABS Actuator Checker Sub–harness E | |



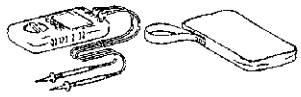
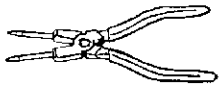
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YH 01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
|  | 09082–00040 TOYOTA Electrical Tester | |
|  | 09905–00013 Snap Ring Pliers | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2Y 01

# EQUIPMENT

| | |
|---|---|
| Dial indicator | Brake disc |
| Micrometer | Brake disc |
| Torque wrench | |
| Vernier calipers | Brake disc |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YJ–01

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| Brake fluid | – | SAE J1703 or FMVSS No 116 DOT 3 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

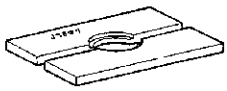
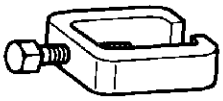
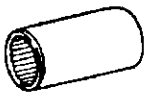
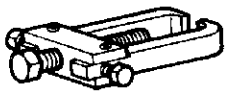
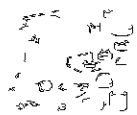
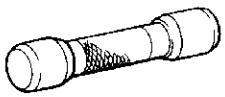
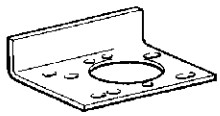
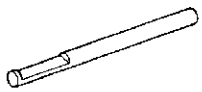
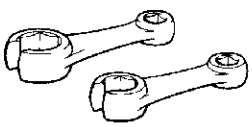
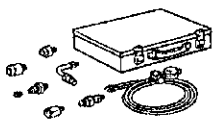
Brought to you by BirfMark



# STEERING

## SST (Special Service Tools)

PP3KM-01

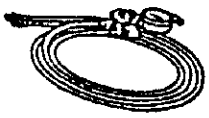
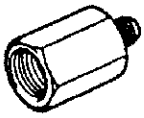
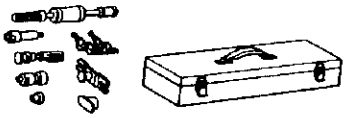
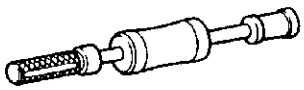
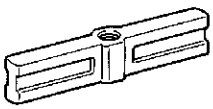
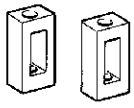
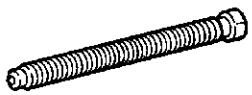
| | | | |
|---|---|---|---|
|  | 09527–10011 | Rear Axle Shaft Bearing Remover | PS vane pump |
|  | 09610–55012 | Pitman Arm Puller | Steering linkage |
| | 09611–22012 | Tie Rod End Puller | Steering linkage |
|  | 09616–00011 | Steering Worm Bearing Adjusting Socket | PS gear |
|  | 09628–62011 | Ball Joint Puller | Steering linkage |
|  | 09630–00014 | Power Steering Gear Housing Overhaul Tool Set | |
| | (09631–00051) | No 3 Wrench | PS gear |
|  | (09631–00121) | Teflon Ring Former | PS gear |
|  | (09631–00142) | Overhaul Stand | PS gear |
|  | 09631–10030 | Oil Seal Remover | PS vane pump |
|  | 09631–22020 | Power Steering Hose Nut 14 x 17 mm Wrench Set | PS gear |
|  | 09640–10010 | Power Steering Pressure Gauge Set | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



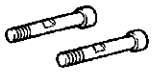
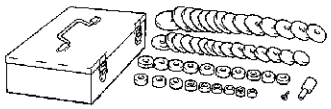
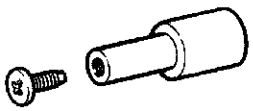
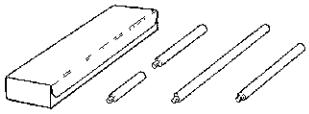
| | | | |
|---|---|---|---|
|  | (09641–01010) | Gauge Assy | On–vehicle inspection |
| | (09641–01030) | Attachment B | On–vehicle inspection |
|  | (09641–01060) | Attachment E | On–vehicle inspection |
|  | 09910–00015 | Puller Set | |
| | (09911–00011) | Puller Clamp | Tilt steering column |
|  | (09912–00010) | Puller Slide Hammer | Tilt steering column |
| | 09950–40011 | Puller B Set | |
| | (09957–04010) | Attachment | Tilt steering column |
| | (09958–04011) | Holder | Tilt steering column |
| | 09950–50010 | Puller C Set | |
|  | (09951–05010) | Hanger 150 | Tilt steering column |
|  | (09952–05010) | Slide Arm | Tilt steering column |
|  | (09953–05020) | Center Bolt 150 | Tilt steering column |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | |
|---|---|---|---|
|  | (09954–05020) | Claw No 2 | Tilt steering column |
|  | 09950–60010 | Replacer Set | |
| | (09951–00360) | Replacer 36 | PS gear |
| | (09951–00410) | Replacer 41 | PS gear |
|  | (09952–06010) | Adapter | PS gear |
|  | 09950–70010 | Handle Set | |
| | (09951–07200) | Handle 200 | PS gear |



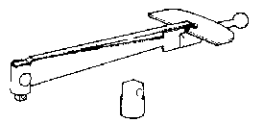
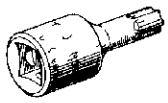
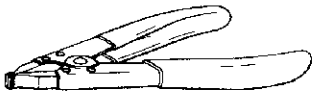
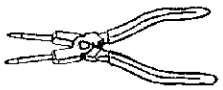
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP3KL–01

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
|  | 09025–00010 | Torque Wrench (30 kgf–cm) | PS vane pump<br>PS gear |
|  | 09042–00010 | Torx Socket T30 | Tilt steering column |
| | 09904–00010 | Expander Set | |
| | (09904–00050) | No 4 Claw | |
|  | 09905–00012 | Snap Ring No 1 Expander | |
|  | 09905–00013 | Snap Ring Pliers | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YM-01

# EQUIPMENT

| | |
|---|---|
| Caliper gauge | PS vane pump |
| Calipers | PS vane pump |
| Dial indicator | PS gear |
| Feeler gauge | PS vane pump |
| Micrometer | PS vane pump |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YN 01

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| Power steering fluid Total | 0 8 liters (0 9 US qts 0 7 Imp qts) | ATF DEXRON®II or III |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

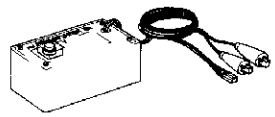
Brought to you by BirfMark



# SUPPLEMENTAL RESTRAINT SYSTEM

PP2YO 02

## SST (Special Service Tools)

| | | |
|---|---|---|
|  | 09082–00700 SRS Airbag Deployment Tool | |
| | 09843–18020 Diagnosis Check Wire | |



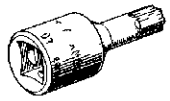
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YP–02

# RECOMMENDED TOOLS

| | | | |
|---|---|---|---|
|  | 09042–00020 | Torx Socket T40 | Airbag sensor assembly |
| | 09082–00040 | TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YQ 02

# EQUIPMENT

| | |
|---|---|
| Bolt<br>Length 35 mm (1 38 in )<br>Pitch 1 0 mm (0 039 in )<br>Diam 6 0 mm (0 236 in ) | Airbag disposal |
| Rope (no projections difficult to break) | Airbag disposal |
| Tire<br>Width 185 mm (7 28 in )<br>Inner diam 360 mm (14 17 in ) | Airbag disposal |
| Tire with disc wheel<br>Width 185 mm (7 28 in )<br>Inner diam 360 mm (14 17 in ) | Airbag disposal |
| Torque wrench | Steering wheel pad |
| Vinyl bag | Airbag disposal |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BODY ELECTRICAL

## RECOMMENDED TOOLS

PP2YS-02

| | | |
|---|---|---|
| | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YT 01

# EQUIPMENT

| | |
|---|---|
| Bulb (3.4 W) | Fuel sender gauge<br>Seat belt warning relay |
| Bulb (21 W) | Turn signal flasher relay |
| Clip remover | For removing cowl louver |
| Dry cell battery | Fuel sender gauge |
| Masking tape | Rear window defogger wire |
| Oil bath | Engine oil level warning switch |
| Test lead | |
| Thermometer | Engine coolant temperature sender gauge<br>Engine oil level warning switch |
| Tin foil | Rear window defogger wire |
| Torque wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP3KK–01

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08833–00070 | Adhesive 1324<br>THREE BOND 1324 or equivalent | Power seat housing set nut<br>Power seat slide and vertical motor set screw |
| 08833–00080 | Adhesive 1344<br>THREE BOND 1344<br>LOCTITE 242 or equivalent | Low oil pressure warning switch<br>Engine coolant temperature sender gauge |
| 08888–88888 | DuPont Paste No 4817 or equivalent | Rear window defogger |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BODY

## SST (Special Service Tools)

PP2YV-01

| | | |
|---|---|---|
| | 09806–30010 Windshield Moulding Remover | |
| | 09812–00010 Door Hinge Set Bolt Wrench | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YW-01

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| MP grease | – | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YX–02

# SSM (Special Service Materials)

| | | |
|---|---|---|
| 08833–00030 | Three cement black or equivalent | Back door glass |
| 08833–00070 | Adhesive 1324<br>THREE BOND 1324 or equivalent | Front door<br>Rear door<br>Power seat regulator |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

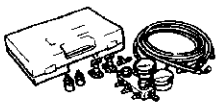
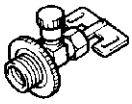
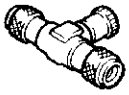
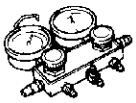
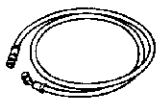
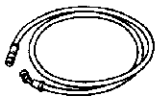
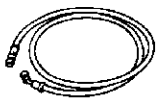
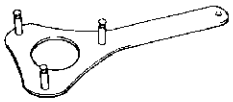
Brought to you by BirfMark



# AIR CONDITIONING

PP3KJ-01

## SST (Special Service Tools)

| | | |
|---|---|---|
|  | 07110–58060 Air Conditioner Service Tool Set | |
|  | (07117–58060) Refrigerant Drain Service Valve | |
|  | (07117–58070) T–Joint | |
| | (07117–58080) Quick Disconnect Adapter | Discharge (Diam 16 mm) |
| | (07117–58090) Quick Disconnect Adapter | Suction (Diam 13 mm) |
|  | (07117–78050) Refrigerant Charging Gauge | |
|  | (07117–88060) Refrigerant Charging Hose | Discharge (Color Red) |
|  | (07117–88070) Refrigerant Charging Hose | Suction (Color Blue) |
|  | (07117–88080) Refrigerant Charging Hose | Utility (Color Green) |
| | 07112–66040 Magnetic Clutch Remover | |
|  | 07112–76060 Magnetic Clutch Stopper | |
| | 07114–84010 Snap Ring Pliers | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| | 07114–84020 Snap Ring Pliers | |
| | 07116–38360 Gas Leak Detector Assembly | |



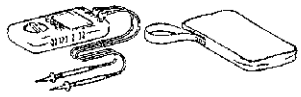
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2YZ 01

# RECOMMENDED TOOLS

| | | |
|---|---|---|
|  | 09082–00040 TOYOTA Electrical Tester | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PP2Z1-01

# LUBRICANT

| Item | Capacity | Classification |
|---|---|---|
| Compressor oil | | ND–OIL 8 or equivalent |
| When replacing receiver | 10 cc (0.35 fl oz.) | |
| When replacing condenser | 40 cc (1.4 fl oz.) | |
| When replacing evaporator | 40 cc (1.4 fl oz.) | |
| When replacing compressor | 120 cc (4.1 fl oz.) | |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TROUBLESHOOTING

PR06N-01

## PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

| Symptom | Suspect Area | See page |
|---|---|---|
| Noise | 3 Seeve yoke spline: worn | PR-4 |
| | 4 Spider bearing: worn or stuck | PR-4 |
| Vibration | 1 Sleeve yoke spline: stuck | PR-4 |
| | 2 Propeller shaft: runout | PR-4 |
| | 3 Propeller shaft: imbalance | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

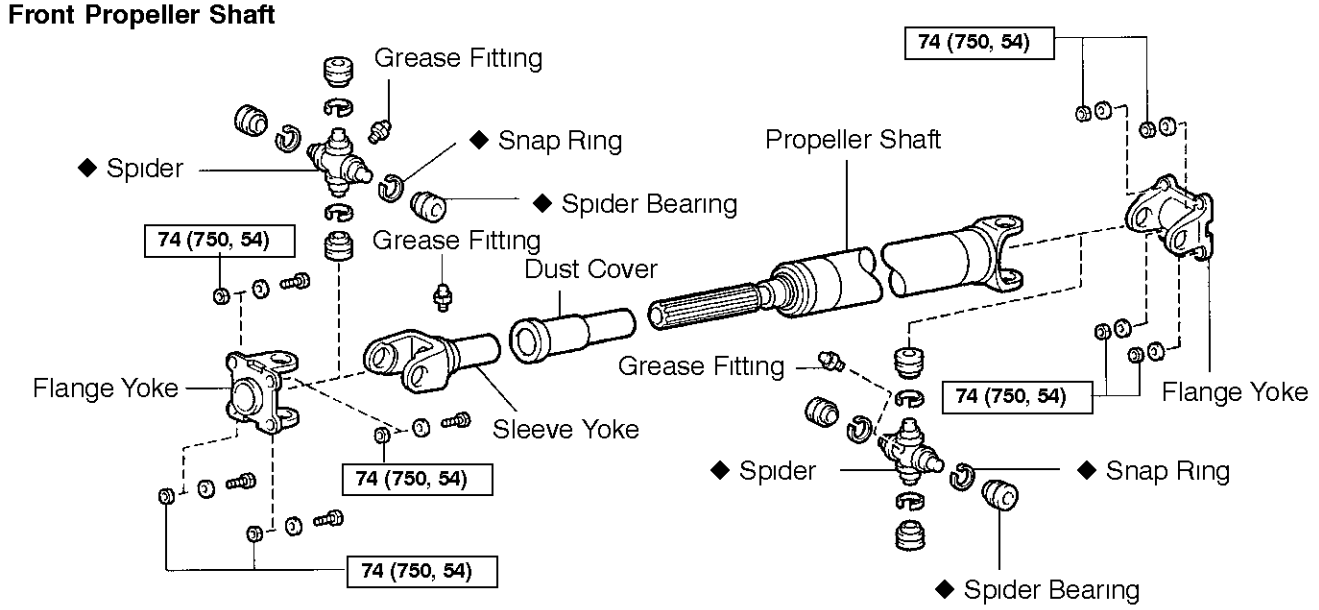


# PROPELLER SHAFT ASSEMBLY

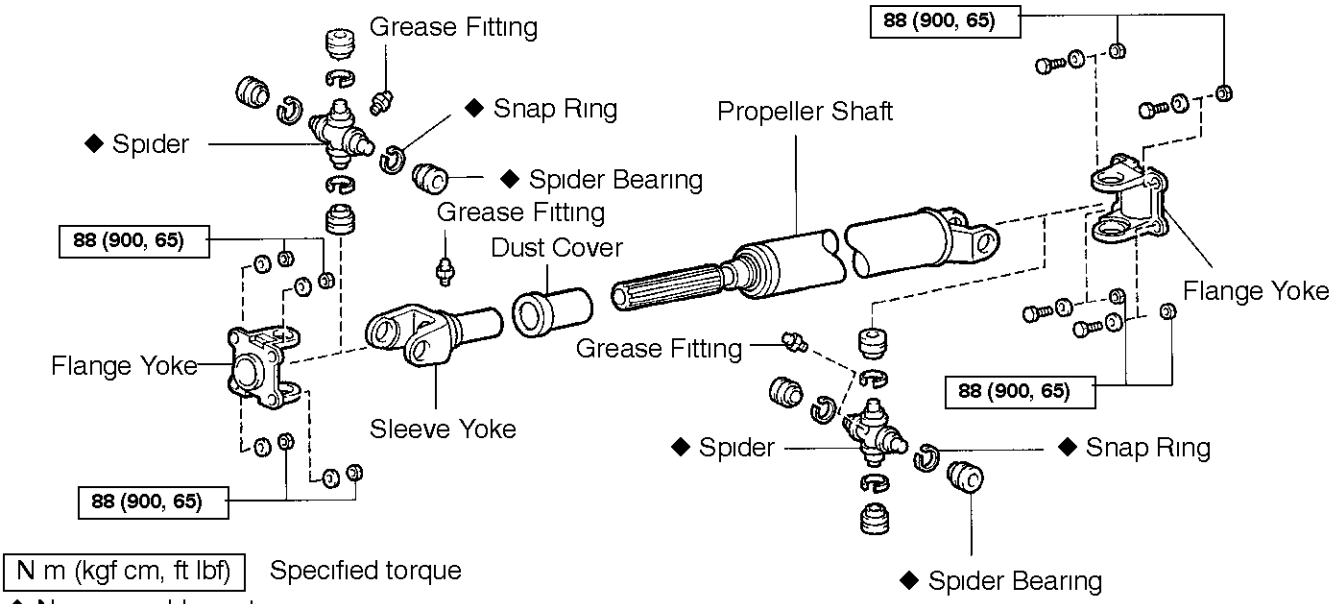
## COMPONENTS

PR06O–02

**Front Propeller Shaft**




**Rear propeller Shaft**




N m (kgf cm, ft lbf) Specified torque

◆ Non–reusable part

Q10862



Brought to you by BirfMark
Version 1.11 - 03/16/2010

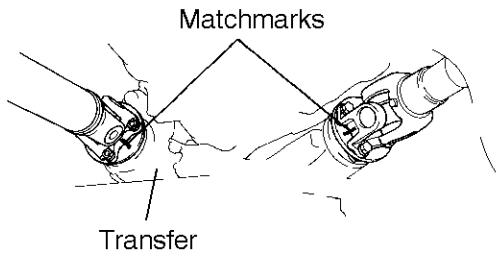
Brought to you by BirfMark



PR06P 01

# REMOVAL

**Front Propeller Shaft**




**1. REMOVE FRONT PROPELLER SHAFT**

(a) Place matchmarks on the propeller shaft flange and transfer

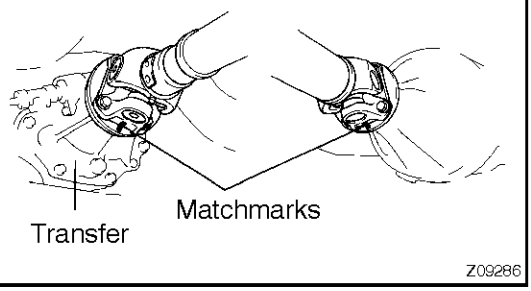
(b) Remove the 4 nuts and washers
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

(c) Place matchmarks on the propeller shaft flange and differential

(d) Remove the 4 nuts, bolts and washers
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

(e) Remove the front propeller shaft

**Rear Propeller Shaft**




**2. REMOVE REAR PROPELLER SHAFT**

(a) Place matchmarks on the propeller shaft flange and transfer

(b) Remove the 4 nuts and washers
**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**

(c) Place matchmarks on the propeller shaft flange and differential

(d) Remove the 4 nuts, bolts and washers
**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**

(e) Remove the rear propeller shaft



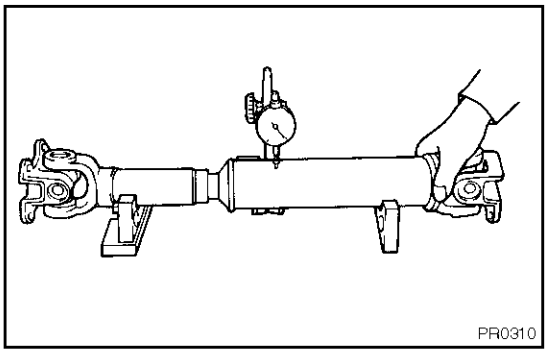
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PR06Q-01

# INSPECTION

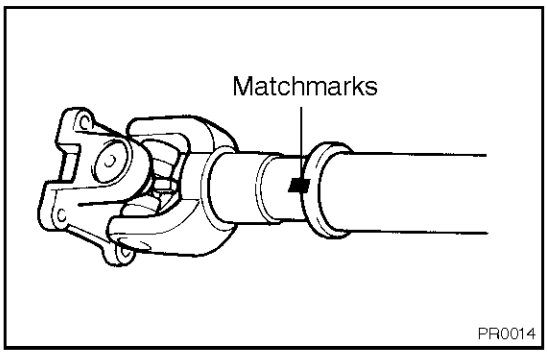



**1. INSPECT FRONT AND REAR PROPELLER SHAFTS FOR DAMAGE OR RUNOUT**

Using a dial indicator, check the runout of shafts

**Maximum runout: 0.8 mm (0.031 in.)**

If shaft runout is greater than maximum, replace the shaft

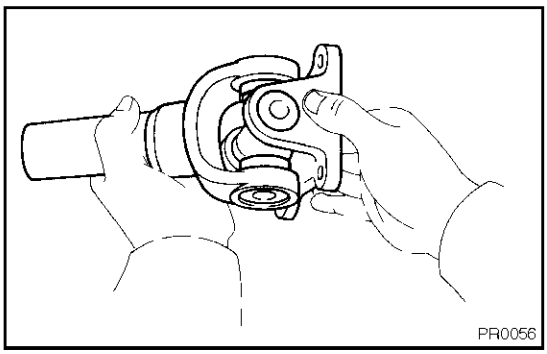



**2. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT**

Place matchmarks on the sleeve yoke and shaft

(1) Pull out the sleeve yoke from the shaft

(2) Remove the dust cover from the shaft




**3. INSPECT SPIDER BEARING**

- Check the spider bearings for wear or damage
- Check the spider bearing axial play by turning the yoke with holding the shaft tightly

**Bearing axial play: Maximum 0.05 mm (0.0020 in.)**

If necessary, replace the spider bearing

**4. INSERT SLEEVE YOKE INTO PROPELLER SHAFT**

(a) Apply MP grease to the propeller shaft spline and sleeve yoke sliding surface

(b) Align the matchmarks on the sleeve yoke propeller shaft

(c) Install the propeller shaft into the sleeve yoke



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



PR06R–01

# INSTALLATION

**Installation is in the reverse order of removal (See page PR–3).**

HINT

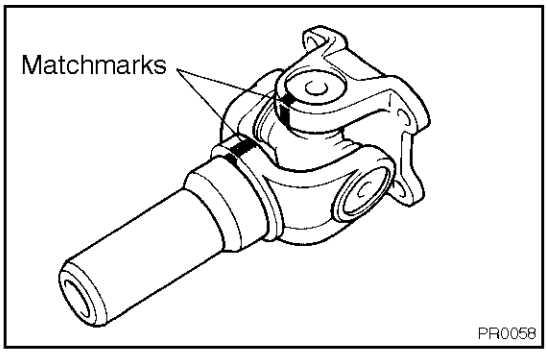
After ınstallatıon, pump MP grease ınto each fıttıng wıth a grease gun untıl the grease begıns to flow around the oıl seal



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# SPIDER BEARING

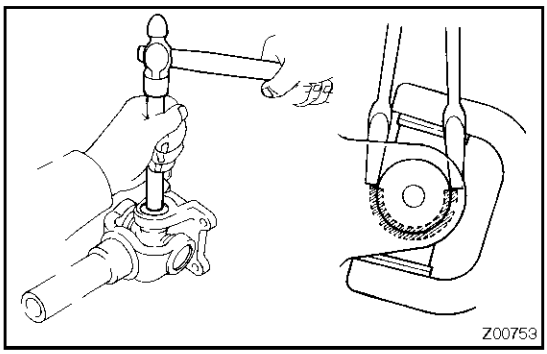
## REPLACEMENT

PR06S 03

**NOTICE:**

**Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.**

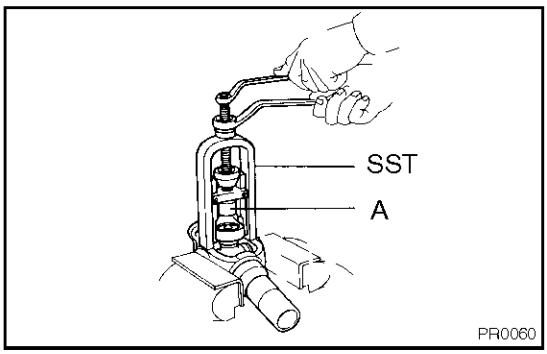
1. **REMOVE PROPELLER SHAFT (See page PR–3)**
2. **PLACE MATCHMARKS ON SHAFT AND YOKE**




3. **REMOVE SNAP RINGS**

(a) Using a brass bar and hammer, slightly tap in the bearing outer races

(b) Using 2 screwdrivers, remove the 4 snap rings from the grooves

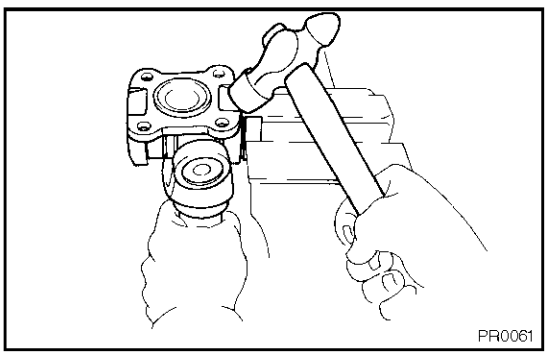



4. **REMOVE SPIDER BEARINGS**

(a) Using SST, push out the bearing from the flange
SST 09332–25010

HINT

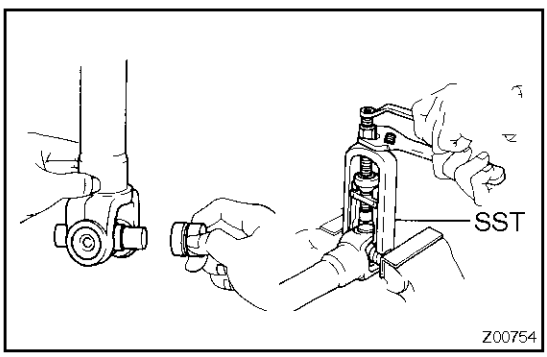
Sufficiently raise the part indicated by A so that it does not come into contact with the bearing




(b) Clamp the bearing outer race in a vise and tap off the flange with a hammer

HINT

Remove the bearing on the opposite side by the same procedure




(c) Install the 2 removed bearing outer races to the spider

(d) Using SST, push out the bearing from the yoke
SST 09332–25010

(e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer

HINT

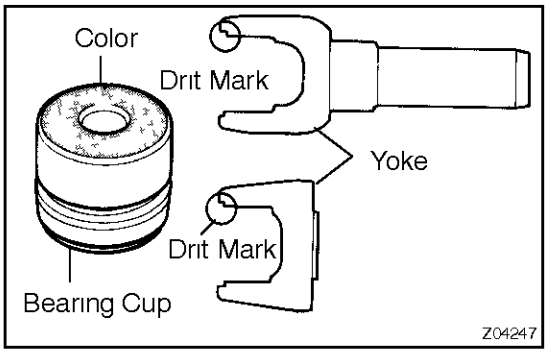
Remove the bearing on the opposite side in the same procedure



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

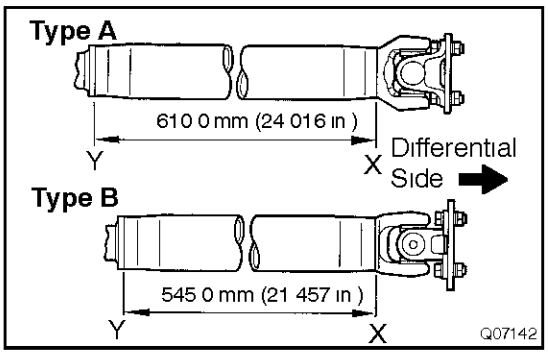





**5. SELECT SPIDER BEARING**

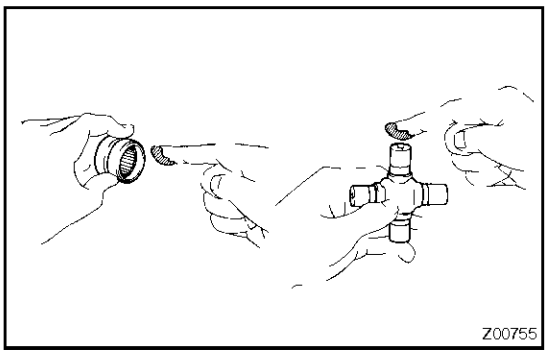
Select the bearing according to whether or not there is a drill mark on the yoke section

| Yoke | Bearing (Type A) | Bearing (Type B) |
|---|---|---|
| w/ drill mark | w/ color mark (White) | w/ color mark (Red) |
| No drill mark | No color mark | No color mark |




HINT

At time of the reassemble, there are 2 types of rear propeller shafts, type A and type B Referring to the illustration, measure the distance between the welding points X and Y to identify which of the 2 types is used for the vehicle



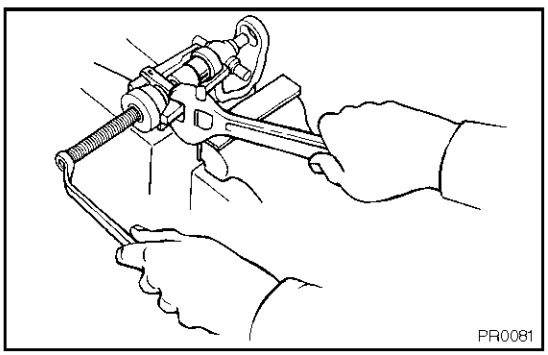

**6. INSTALL SPIDER BEARING**

(a) Apply MP grease to a new spider and bearings

**NOTICE:**

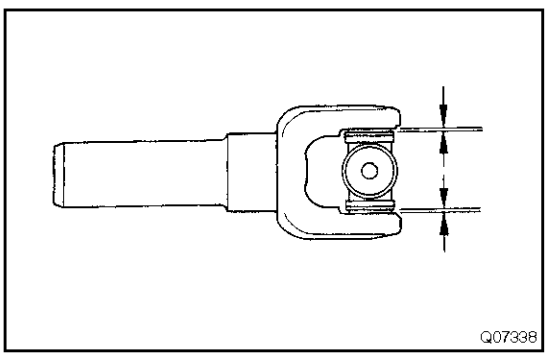
**Be careful not to apply too much grease.**

(b) Align the matchmarks on the yoke and flange




(c) Fit the spider into the yoke

(d) Using SST, install the bearings on the spider
SST 09332–25010



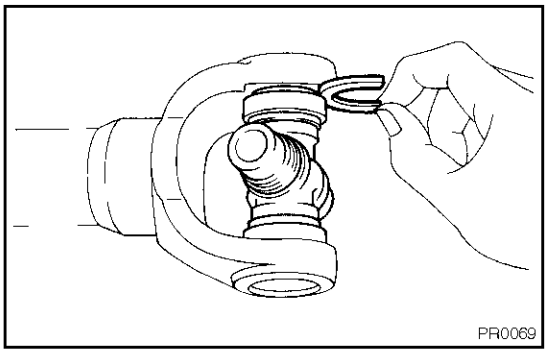

(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths



Author : Date : 855
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**7. INSTALL SNAP RINGS**

(a) Install 2 new snap rings of equal thickness which will allow 0 – 0 05 mm (0 – 0 0020 in ) axial play

HINT

Do not reuse the snap rings

**Thickness of snap ring:**

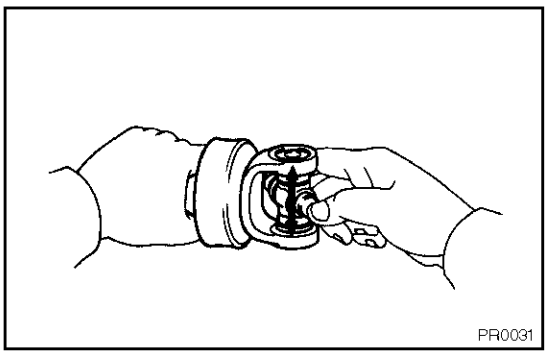
**Front Propeller Shaft and Rear Propeller Shaft (Type B)**

| Color | Mark | Thickness mm (in ) |
|---|---|---|
| – | 1 | 2 100 – 2 150 (0 0827 – 0 0846) |
| – | 2 | 2 150 – 2 200 (0 0846 – 0 0866) |
| – | 3 | 2 200 – 2 250 (0 0866 – 0 0886) |
| Brown | – | 2 250 – 2 300 (0 0886 – 0 0906) |
| Blue | – | 2 300 – 2 350 (0 0906 – 0 0925) |
| – | 6 | 2 350 – 2 400 (0 0925 – 0 0945) |
| – | 7 | 2 400 – 2 450 (0 0945 – 0 0965) |
| – | 8 | 2 450 – 2 500 (0 0965 – 0 0984) |

**Rear Propeller Shaft (Type A)**

| Color | Thickness mm (in ) |
|---|---|
| – | 2 00 (0 0787) |
| Brown | 2 03 (0 0799) |
| Blue | 2 06 (0 0811) |
| – | 2 09 (0 0823) |

(b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring




**8. CHECK SPIDER BEARING (See page PR–4)**

- Check that the spider bearing moves smoothly
- Check the spider bearing axial play

**Bearing axial play: Maximum 0.05 mm (0.0020 in.)**

HINT

- Install a new spider bearing on the flange side in the procedure described above
- When replacing the spider bearing, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration

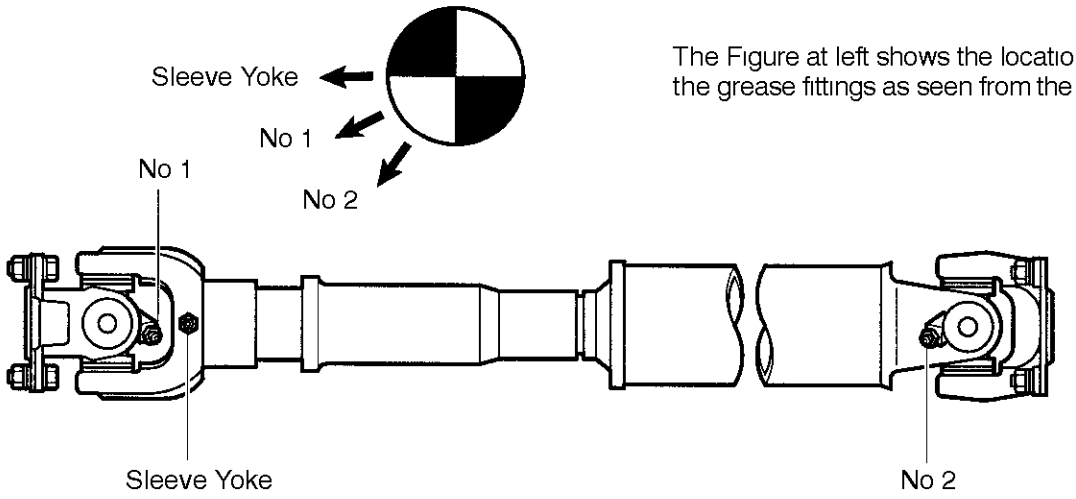


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

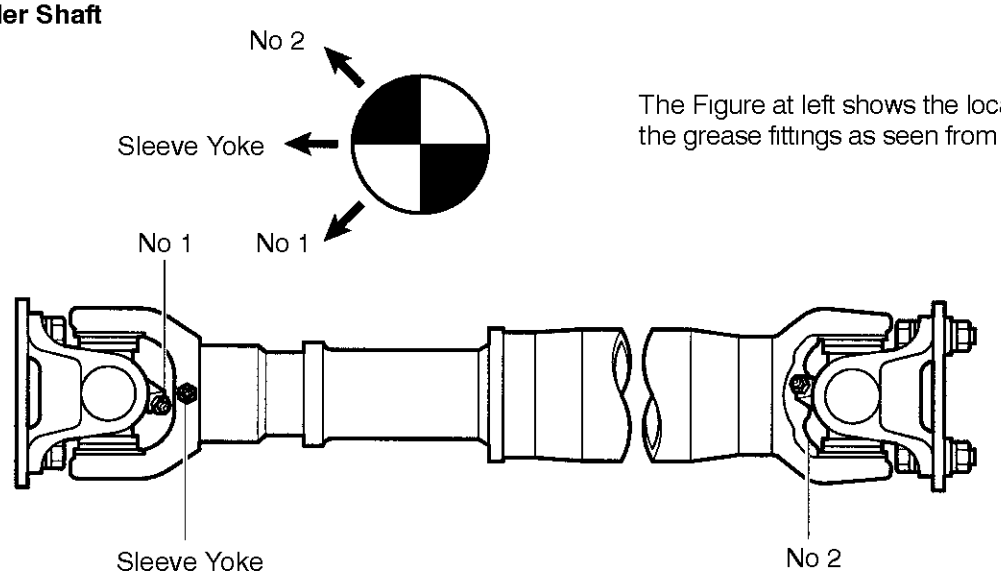


**SPIDER GREASE FITTING ASSEMBLY DIRECTION**
**Front Propeller Shaft**




The Figure at left shows the locations of the grease fittings as seen from the rear

**SPIDER GREASE FITTING ASSEMBLY DIRECTION**
**Rear Propeller Shaft**




The Figure at left shows the locations of the grease fittings as seen from the rear

Q09100



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SRS AIRBAG

RS0CZ 02

## PRECAUTION

NOTICE:

- The LAND CRUISER is equipped with an SRS , which comprises a driver airbag and a front passenger airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the SRS, it is possible the SRS may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in the repair manual.
- Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.
- Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad, front passenger airbag assembly, and airbag sensor assembly should be inspected (See pages RS–9, RS–23 and RS–34)
- Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
- Never disassemble and repair the steering wheel pad, front passenger airbag assembly, or airbag sensor assembly in order to reuse it.
- If the steering wheel pad, front passenger airbag assembly or airbag sensor assembly have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting the system's electrical circuits.
- Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
- After work on the SRS is completed, check the SRS warning light (See page DI–240).
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

CAUTION:

- Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
  (The SRS is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable of the battery, the SRS may be deployed.)
- When the negative (–) terminal cable is disconnected from the battery, the memory of the clock and audio system will be canceled. So before starting work, make a record of the contents memorized in the audio memory system. When work is finished, reset the audio systems as they were before and adjust the clock. To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.
- Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
- Do not expose the steering wheel pad, front passenger airbag assembly, or airbag sensor assembly directly to hot air or flames.



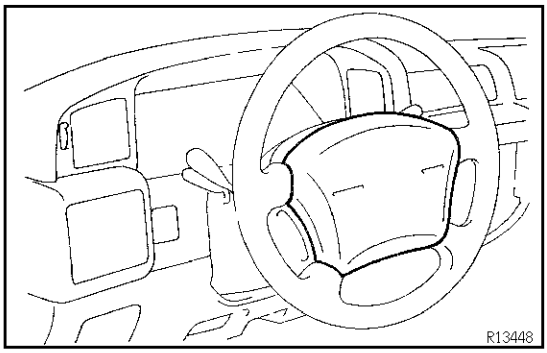
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



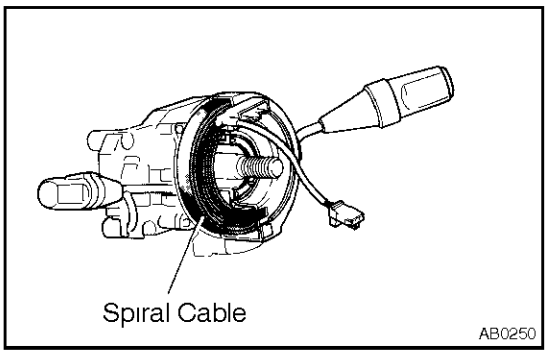
RS0F0 01

# OPERATION



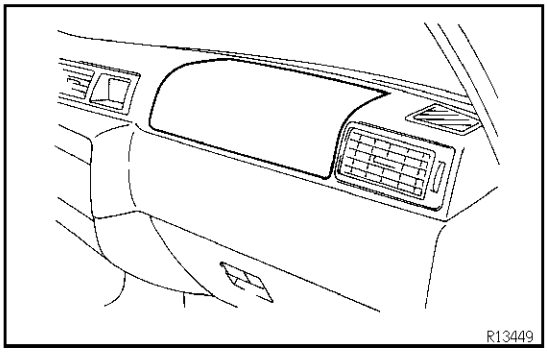

## 1. STEERING WHEEL PAD (with AIRBAG)

The ınflater and bag of the SRS are stored ın the steerıng wheel pad and cannot be dısassembled The ınflater contaıns a squıb, ıgnıter charge, gas generant, etc , and ınflates the bag when ınstructed by the aırbag sensor assembly



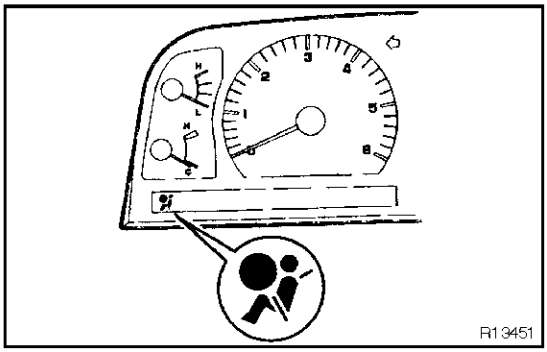

## 2. SPIRAL CABLE (in COMBINATION SWITCH)

A spıral cable ıs used as an electrıcal joınt from the vehıcle body sıde to the steerıng wheel



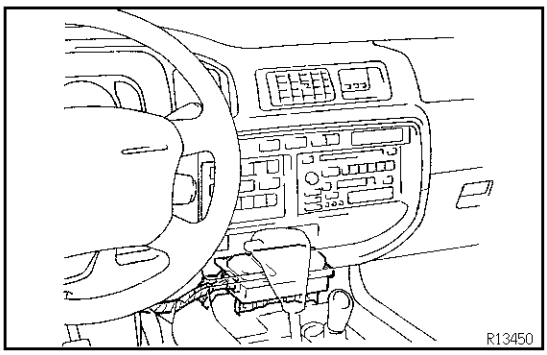

## 3. FRONT PASSENGER AIRBAG ASSEMBLY

The ınflater and bag of the SRS are stored ın the front passenger aırbag assembly and cannot be dısassembled The ınflater contaıns a squıb, ıgnıter charge, gas generant, etc , and ınflates the bag when ınstructed by the aırbag sensor assembly




## 4. SRS WARNING LIGHT

The SRS warnıng lıght ıs located on the combınatıon meter It goes on to alert the drıver of trouble ın the system when a malfunctıon ıs detected ın the aırbag sensor assembly In normal operatıng condıtıon when the ıgnıtıon swıtch ıs turned to the ACC or ON posıtıon, the lıght goes on for about 6 seconds and then goes off




## 5. AIRBAG SENSOR ASSEMBLY

The aırbag sensor assembly ıs mounted on the floor ınsıde the console box The aırbag sensor assembly consısts of an aırbag sensor, safıng sensor, dıagnosıs cırcuıt and ıgnıtıon control, drıve cırcuıt, etc

It receıves sıgnals from the aırbag sensors and judges whether the SRS must be actıvated or not

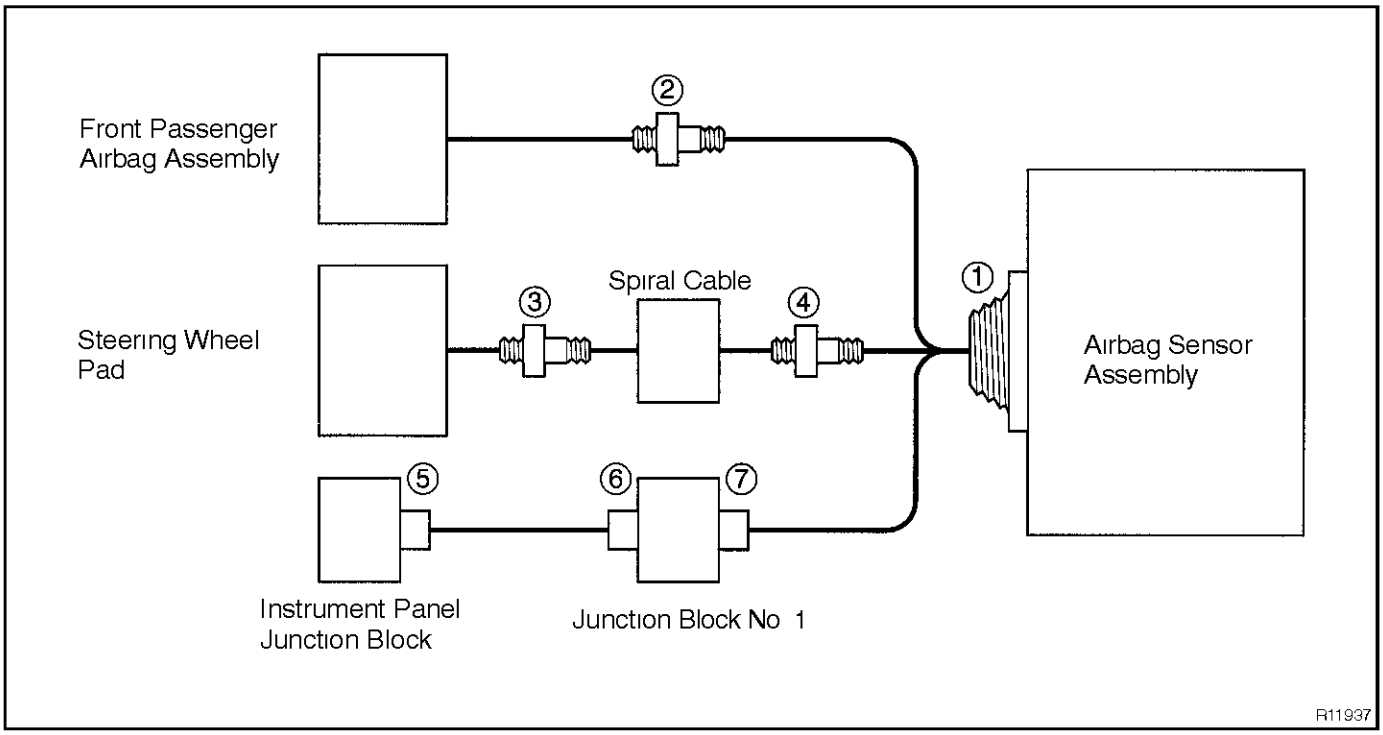


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 6. SRS CONNECTORS




| No | Item | Application |
|---|---|---|
| (1) | Terminal Twin–Lock Mechanism | Connectors 1 2 3 4 5 6 7 |
| (2) | Airbag Activation Prevention Mechanism | Connectors 2 3 4 |
| (3) | Electrical Connection Check Mechanism | Connectors 1 |
| (4) | Connector Twin–Lock Mechanism | Connectors 2 3 4 |

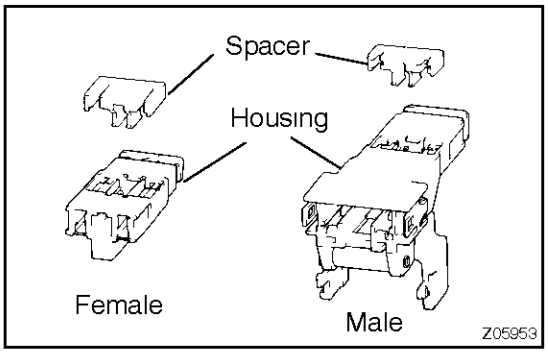
(a) All connectors in the SRS are colored yellow to distinguish them from other connectors Connectors having special functions and specifically designed for the SRS are used in the locations shown above to ensure high reliability These connectors use durable gold–plated terminals



Brought to you by BirfMark
Version 1.11 - 03/16/2010

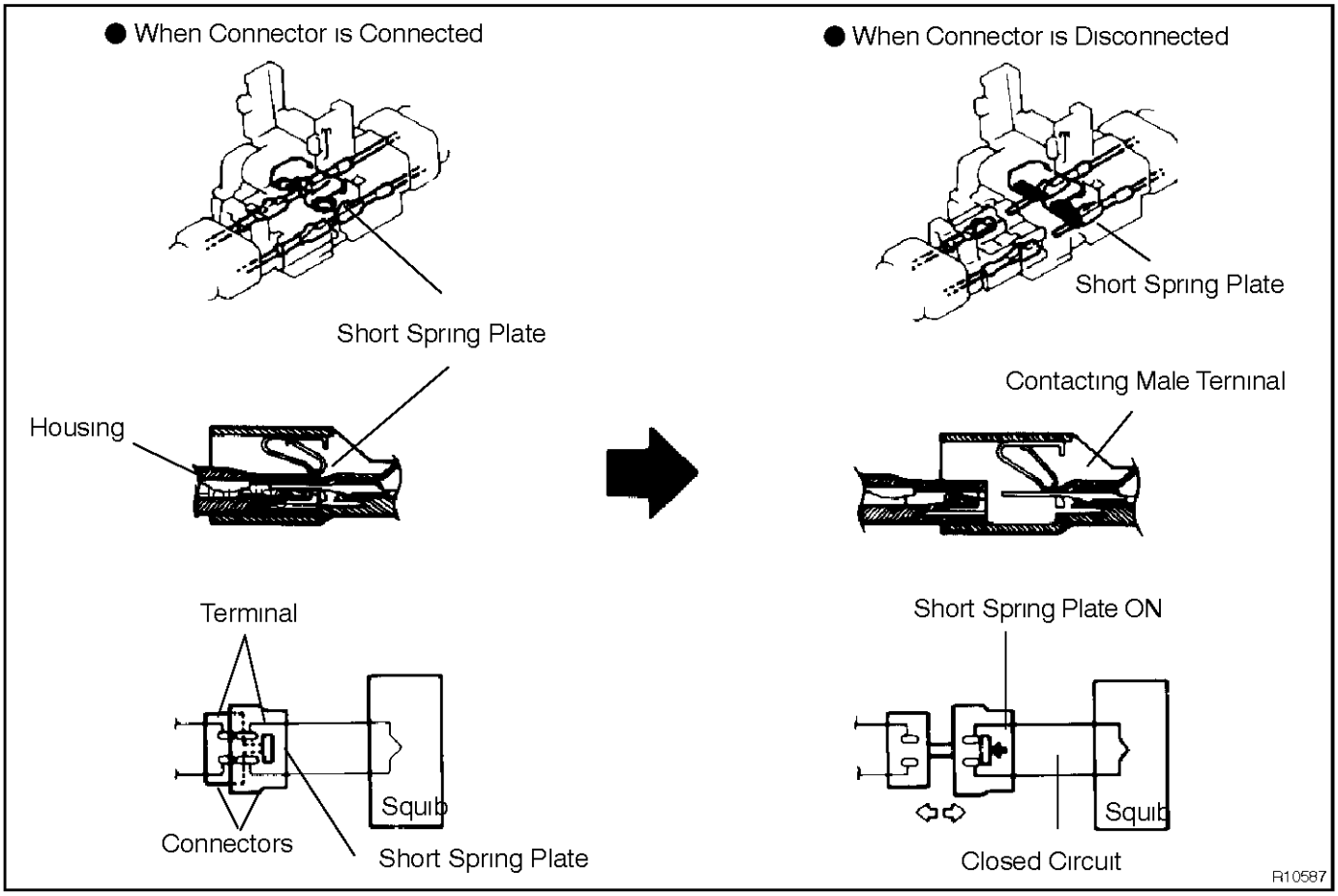
Brought to you by BirfMark






(1) Terminal Twin–Lock Mechanism
Each connector has a two–piece construction consisting of a housing and a spacer This design secures the locking of the terminal by two locking devices (the retainer and the lance) to prevent terminals from coming out

(2) Airbag Activation Prevention Mechanism
Each connector contains a short spring plate When the connector is disconnected, the short spring plate automatically connects the power source and grounding terminals of the squib




HINT
The type of connector shown above is used for connectors 2, 3 and 4 in the diagram on the preceding page

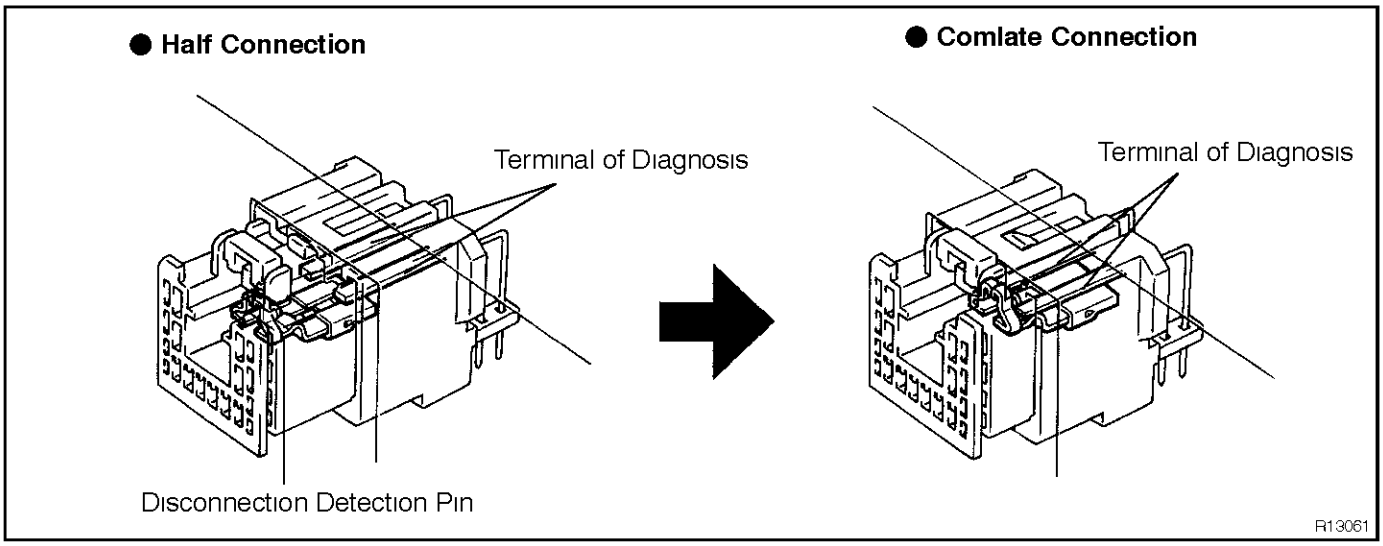


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(3) Electrical Connection Check Mechanism
This mechanism electrically checks if connectors are connected correctly and completely The electrical connection check mechanism is designed so that the disconnection detection pin connects with the diagnosis terminals when the connector housing lock is locked




HINT
The illustration shows connector 1

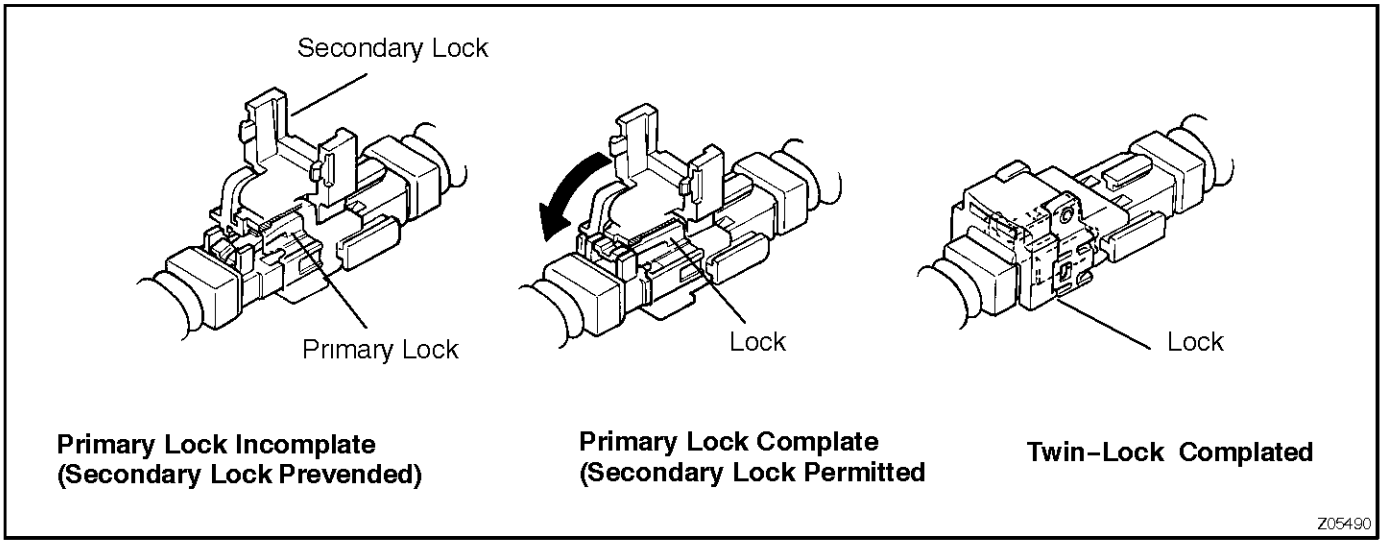


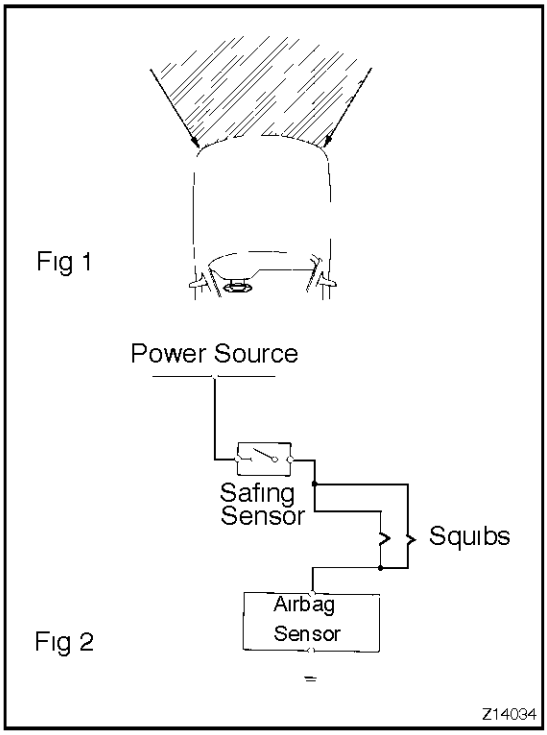
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(4) Connector Twin–Lock Mechanism
With this mechanism connectors (male and female connectors) are locked by 2 locking devices to increase connection reliability If the primary lock is incomplete, ribs interfere and prevent the secondary lock




(b) When the vehicle is involved in a frontal collision in the hatched area (Fig 1) and the shock is larger than the predetermined level, the SRS is activated automatically A safing sensor is designed to go on at a smaller deceleration rate than the airbag sensor As illustrated in Fig 2, ignition is caused when current flows to the squib, which happens when a safing sensor and the airbag sensor go on simultaneously When a deceleration force acts on the sensors, two squibs in the driver airbag and front passenger airbag ignite and generate gas The gas discharging into the driver airbag and front passenger airbag rapidly increases the pressure inside the bags, breaking open the steering wheel pad and instrument panel door
Bag inflation then ends, and the bags deflate as the gas is discharged through discharge holes at the bag's rear or side



Brought to you by BirfMark
Version 1.11 - 03/16/2010

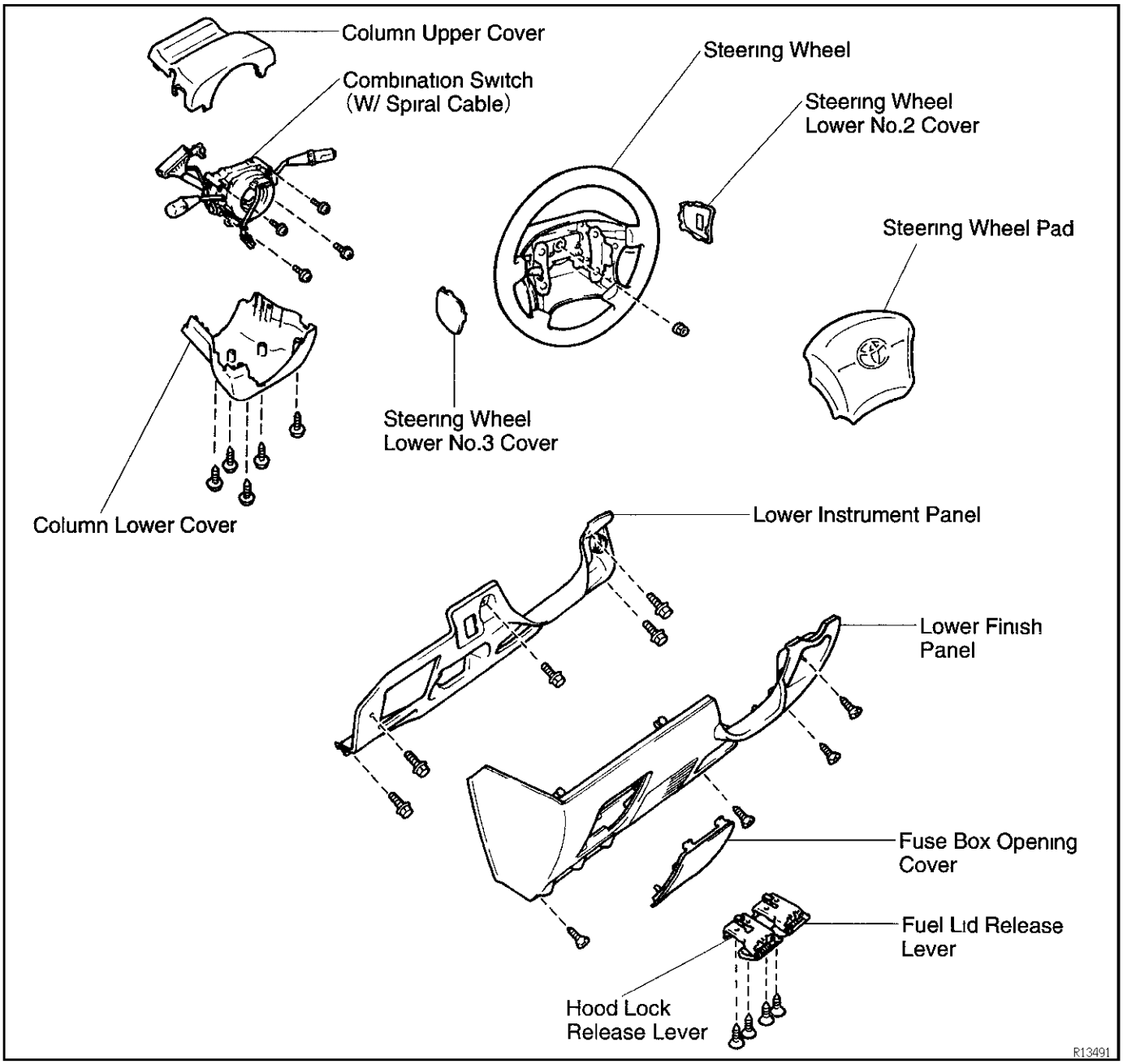
Brought to you by BirfMark



# STEERING WHEEL PAD AND SPIRAL CABLE

## COMPONENTS

RS0P1 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P2 01

# REMOVAL

## REMOVE STEERING WHEEL AND SPIRAL CABLE (See page SR–11)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P3 01

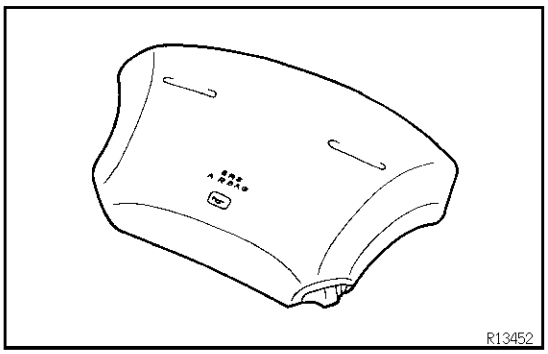
# INSPECTION

## 1. VEHICLES NOT INVOLVED IN A COLLISION

(a) Do a diagnostic system check (See page DI–240)

(b) With the steering wheel pad (with airbag) installed in the vehicle, do a visual check with includes the following items

Check for cuts, minute cracks or marked discoloration of the steering wheel pad top surface and grooved portion



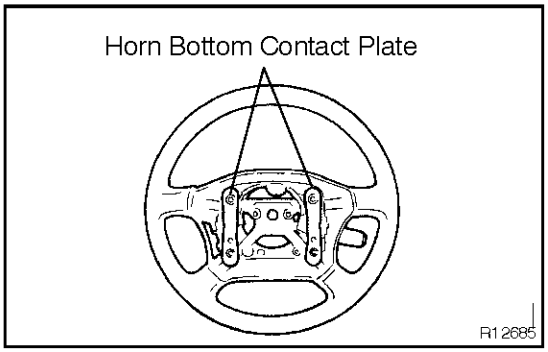

## 2. VEHICLES INVOLVED IN A COLLISION

(a) Do a diagnostic system check (See page DI–240)

(b) Do a visual check

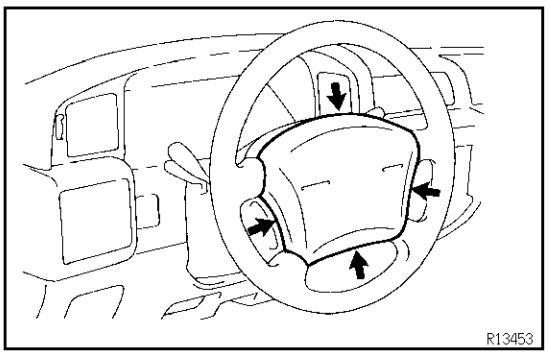
With the steering wheel pad removed from the vehicle, do a visual check with includes the following items

- Check for cuts and cracks in, or marked discoloration of, the steering wheel pad top surface and its grooved portion
- Check for cuts and cracks in wire harnesses, and for chipping in connectors
- Check for deformation of the horn button contact plate of the steering wheel




HINT

- If the horn button contact plate of the steering wheel is deformed, never repair it Always replace the steering wheel assembly with a new one




- There should be no interference between the steering wheel pad and the steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel

**CAUTION:**

**For removal and installation of the steering wheel pad, see pages SR–11 and SR–19 and be sure to follow the correct procedure.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



### 3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Do a visual check with includes the following items with the steering wheel pad removed from the vehicle

- Check for deformation of the horn button contact plate of the steering wheel
- Check for damage to the spiral cable connector and wire harness

HINT

There should be no interference between the steering wheel pad and the steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P5 01

# DISPOSAL

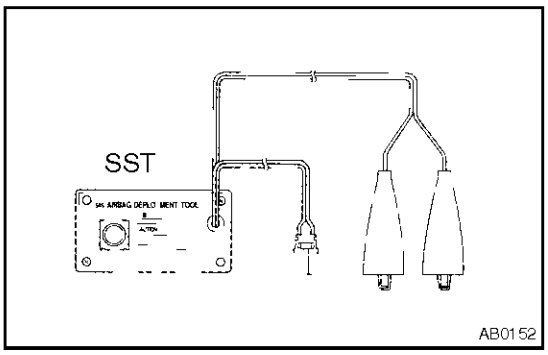
HINT

When scrapping vehicle equipped with an SRS or disposing of a steering wheel pad (with airbag), always first deploy the airbag in accordance with the procedure described below If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT of the TOYOTA MOTOR SALES, U S A , INC

When disposing of a steering wheel pad with an airbag deployed in a collision, follow the same procedure given in step 1–(d) in "DISPOSAL"

**CAUTION:**

- **Never dispose of a steering wheel pad which has an undeployed airbag.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out of doors and where it will not create a nuisance to nearby residents.**



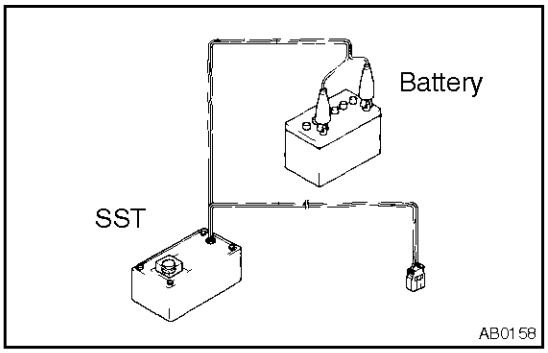

- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the steering wheel pad.**
- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

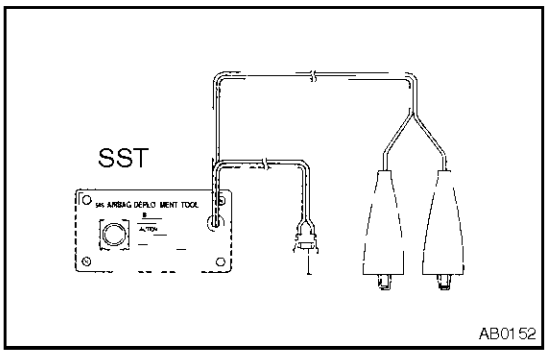





## 1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT

Have a battery ready as the power source to deploy the airbag

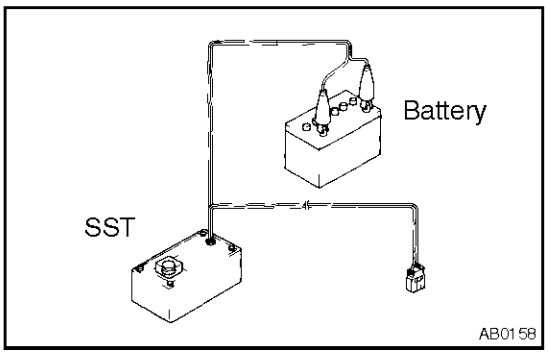



(a) Check functioning of the SST

**CAUTION:**

**When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.**

SST 09082–00700

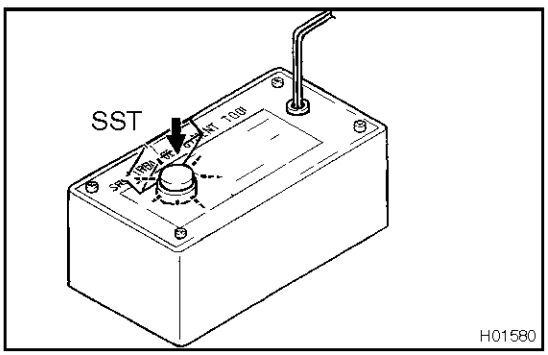



(1) Connect the SST to the battery

Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal

HINT

Do not connect the yellow connector which will be connected with the supplemental restraint system




(2) Check functioning of the SST

Press the SST activation switch, and check that the LED of the SST activation switch lights up

**CAUTION:**

**If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.**

(b) Install the SST

**CAUTION:**

**Check that there is no looseness in the steering wheel and steering wheel pad.**

(1) Remove the steering column lower cover

Remove the 3 screws and steering column lower cover as shown in the illustration

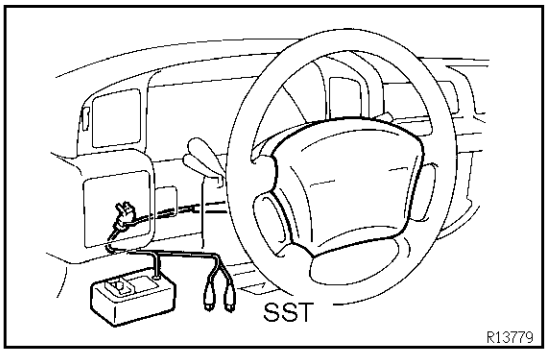
(2) Disconnect the airbag connector of the spiral cable



Brought to you by BirfMark
Version 1.11 - 03/16/2010

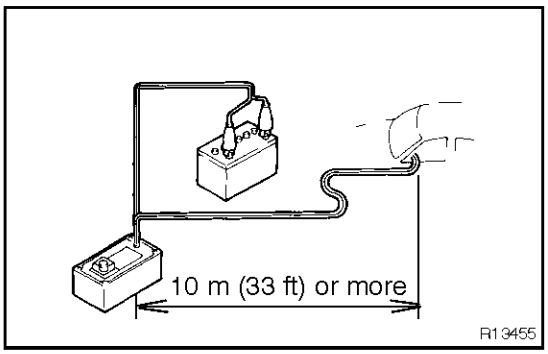
Brought to you by BirfMark






(3) Connect the SST connector to the airbag connector of the spiral cable

SST 09082–00700



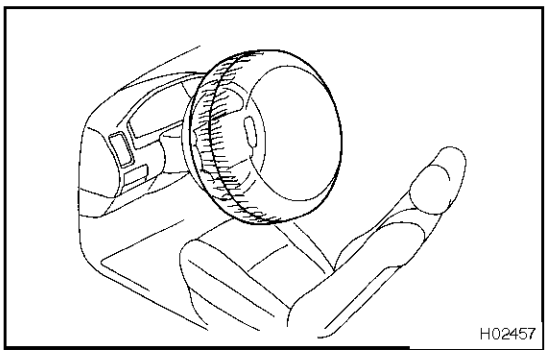

(4) Move the SST at least 10 m (33 ft) away from the front of the vehicle

(5) Close all the doors and windows of the vehicle

**NOTICE:**

**Take care not to damage the SST wire harness.**

(6) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal




(c) Deploy the airbag

(1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle

(2) Press the SST activation switch and deploy the airbag

HINT

The airbag deploys simultaneously as the LED of the SST activation switch lights up

(d) Dispose of steering wheel pad (with airbag)

**CAUTION:**

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**

(1) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the steering wheel pad still installed

(2) When moving a vehicle for scrapping which has a steering wheel pad with deployed airbag, use gloves and safety glasses



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**2. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD ONLY**

**NOTICE:**

- **When disposing of the steering wheel pad (with airbag) only, never use the customers vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

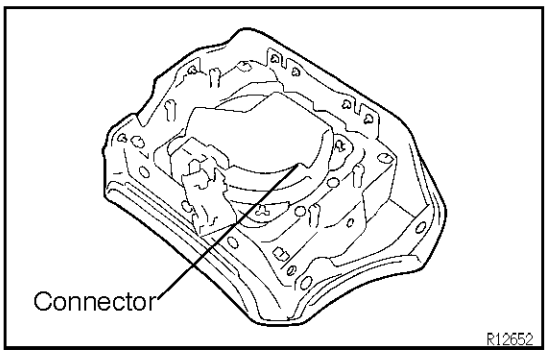
HINT

Have a battery ready as the power source to deploy the airbag

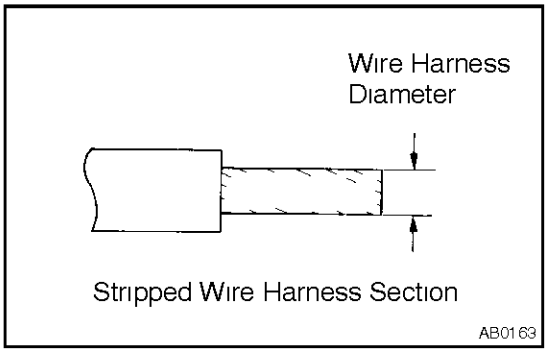
(a) Remove the steering wheel pad (See page SR–11)

**CAUTION:**

**When storing the steering wheel pad, keep the upper surface of the pad facing upward.**




(b) Remove the connector on the rear surface of the steering wheel pad from the bracket




(c) Using a service–purpose wire harness, tie down the steering wheel pad to the disc wheel

**Wire harness: Stripped wire harness section 1.25 $mm^2$ or more (0.0019 $in^2$ or more).**

HINT

To calculate the square of the stripped wire harness section

Square = 3 14 x (Diameter)$^2$ divided by 4

**CAUTION:**

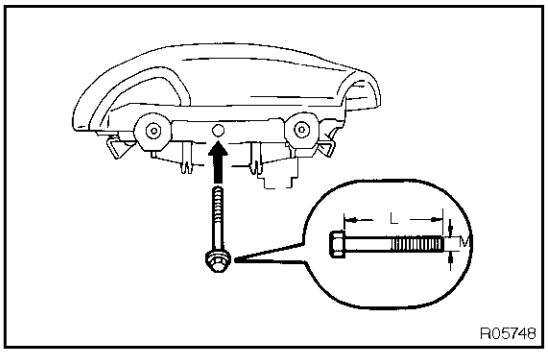
**If a wire harness which is too thin or some other thing is used to tie down the steering wheel pad, it may be snapped by the shock when the airbag is deployed. This is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 $mm^2$ (0.0019 $in^2$).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(1) Install the 2 bolts with washers in the 2 bolt holes in the steering wheel pad

**Bolt:**
**L: 35. mm (1.387 in.)**
**M: 6.0 mm (0.236 in.)**
**Pitch: 1.0 mm (0.039 in.)**

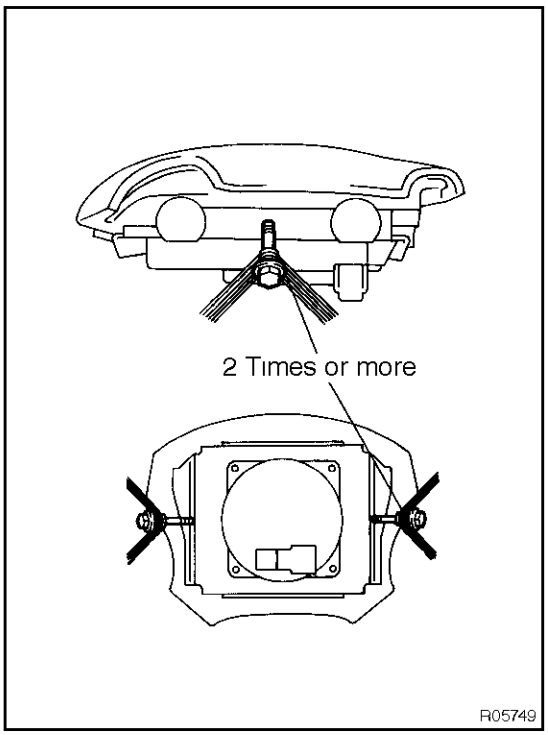
NOTICE:

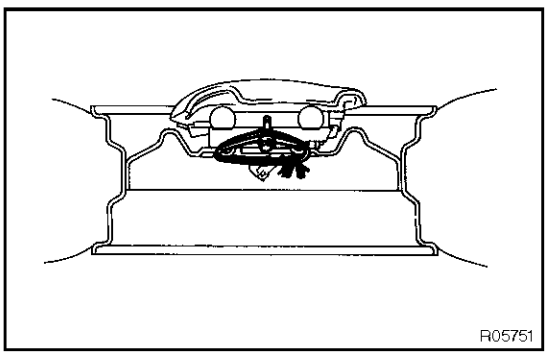
- **Tighten the bolts by hand until the bolts become difficult to turn.**
- **Do not tighten the bolts too much.**

(2) Using 3 wire harnesses, wind the wire harness at least 2 times each around the bolts installed on the left and right sides of the steering wheel pad

CAUTION:

- **Tightly wind the wire harness around the bolts so that there is no slack.**
- **If there is slack in the wire harness, the steering wheel pad may come loose due to the shock when the airbag is deployed. This is highly dangerous.**




(3) Face the upper surface of the steering wheel pad upward Separately tie the left and right sides of the steering wheel pad to the disc wheel through the hub nut holes Position the steering wheel pad connector so that it hangs downward through a hub hole in the disc wheel

CAUTION:

- **Make sure that the wire harness is tight. It is very dangerous when looseness in the wire harness results in the steering wheel pad coming free through the shock from the airbag deploying.**
- **Always tie down the steering wheel pad with the pad side facing upward. It is very dangerous if the steering wheel pad is tied down with the metal surface facing upward as the wire harness will be cut by the shock from the airbag deploying and the steering wheel pad will be thrown into the air.**

NOTICE:

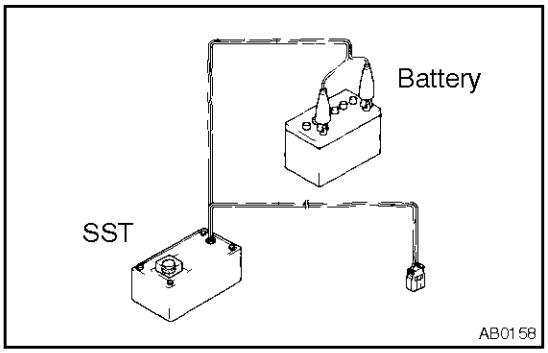
**The disc wheel will be marked by airbag deployment, so when disposing of the airbag use a redundant disc wheel.**



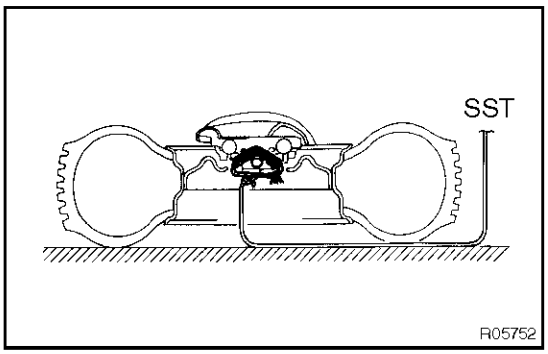
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(d) Check functioning of the SST
SST 09082–00700




(e) Install the SST

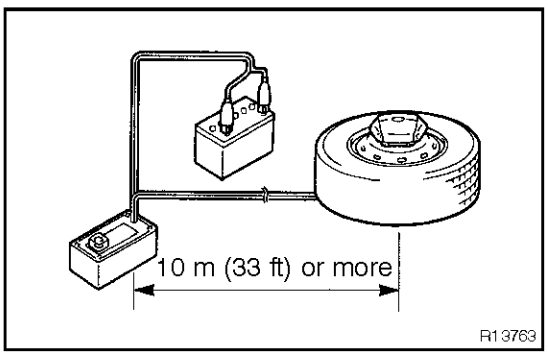
**CAUTION:**

**Place the disc wheel on the level ground.**

(1) Connect the connector of 2 SST to the steering wheel pad connector
SST 09082–00700, 09082–00760

**NOTICE:**

**To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the disc wheel.**



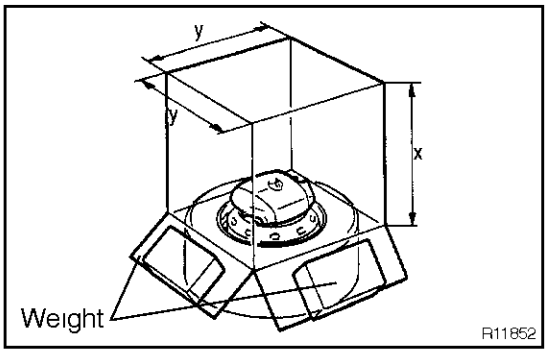

(2) Move the SST to at least 10 m (33 ft) away from the steering wheel pad tied down on the disc wheel



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



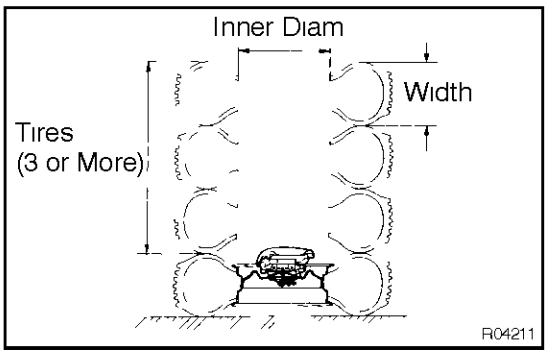



(f) Cover the steering wheel pad with a cardboard box or tires

- Covering method using a cardboard box
  Cover the steering wheel pad with the cardboard box and weight the cardboard box down in 4 places with at least 190 N (20 kg, 44 lb)

**Size of cardboard box:**
**Must exceed the following dimensions:**
**x=460 mm (18.11 in.)**
**When dimension of the cardboard box exceeds the diameter of the disc wheel with tire to which the steering wheel pad is tied**
**x=460 mm (18.11 in.) + width of tire**
**y= 650 mm (25.59 in.)**

**NOTICE:**
**If a cardboard box smaller than the specified size is used, the cardboard box will be broken by the shock from the airbag deployment.**




- Covering method using tires
  Place at least 3 tires without disc wheel on top of the disc wheel with tire to which the steering wheel pad is tied

**Tire size: Must exceed the following dimensions–**
**Width: 185 mm (7.87 in.)**
**Inner diameter: 360 mm (14.17 in.)**

**CAUTION:**
**Do not use tires with disc wheels.**

**NOTICE:**
**The tires may be marked by the airbag deployment, so use the redundant tires.**

(g) Deploy the airbag

(1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal

(2) Check that no one is within 10 m (33 ft) area around the disc wheel which the steering wheel pad is tied to

(3) Press the SST activation switch and deploy the airbag

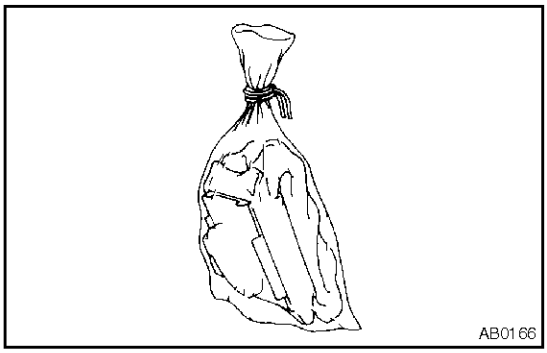
HINT
The airbag deploys simultaneously as the LED of the SST activation switch lights up



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(h) Dıspose of the steerıng wheel pad (wıth aırbag)

**CAUTION:**

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**

(1) Remove the steerıng wheel pad from the dısc wheel

(2) Place the steerıng wheel pad ın a vınyl bag, tıe the end tıghtly and dıspose of ıt ın the same way as other general parts dısposal



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0RT 01

# REPLACEMENT

## REPLACEMENT REQUIREMENTS

In the following cases, replace the steering wheel pad, steering wheel or spiral cable

| Case | Replacing part |
|---|---|
| If the airbag has been deployed | Steering wheel pad |
| If the steering wheel pad has been found to be faulty in troubleshooting | Steering wheel pad |
| If the spiral cable has been found to be faulty in troubleshooting | Spiral cable |
| If the steering wheel pad has been found to be faulty during checking items (See page RS–9) | Steering wheel pad |
| If the steering wheel has been found to be faulty during checking items (See page RS–9) | Steering wheel |
| If the spiral cable has been found to be faulty during checking items (See page RS–9) | Spiral cable |
| If the steering wheel pad has been dropped | Steering wheel pad |

**CAUTION:**

**For removal and installation of the steering wheel pad, see pages SR–11 and SR–19, and be sure to follow the correct procedure.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P6 01

# INSTALLATION

## INSTALL STEERING WHEEL AND SPIRAL CABLE (See page RS-7)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

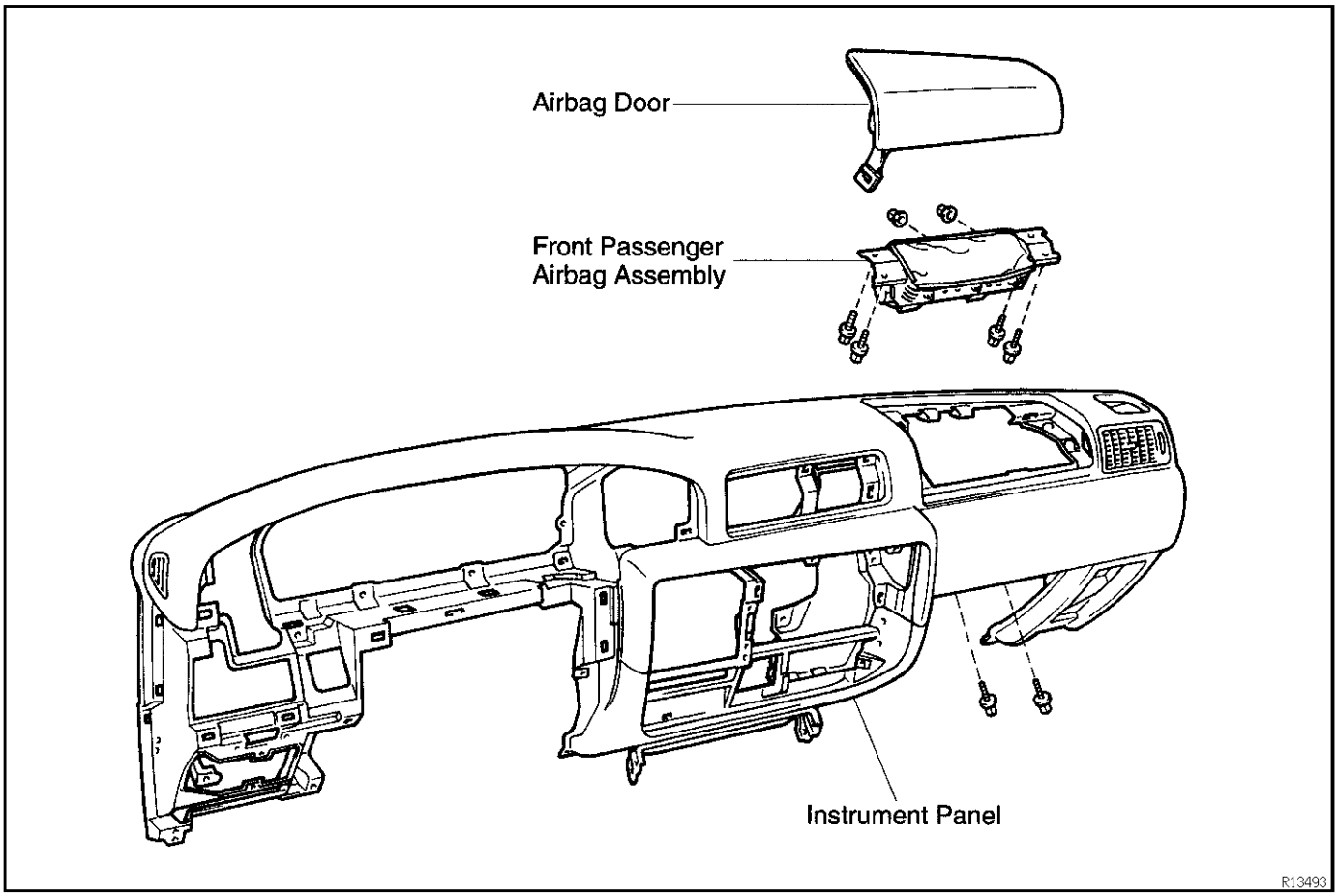
Brought to you by BirfMark



# FRONT PASSENGER AIRBAG ASSEMBLY

RS0P7 01

## COMPONENTS





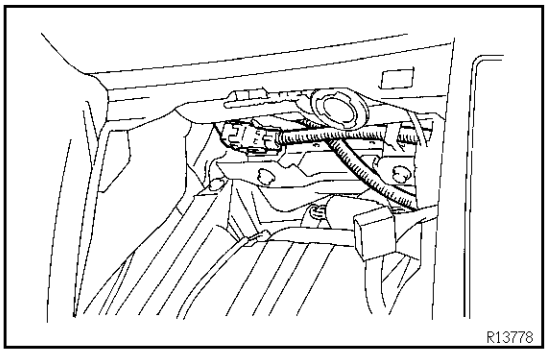

Author : Date : 1120

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P6 01


R13778

# REMOVAL

**NOTICE:**

**If the wiring connector of the SRS is disconnected with the ignition switch at ON or ACC, DTCs will be recorded.**

**1. DISCONNECT AIRBAG CONNECTOR**

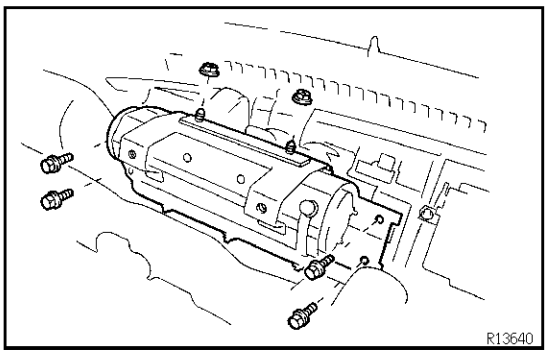
(a) Remove the glove compartment door
(See page BO-76)

(b) Remove the airbag connector from the airbag bracket

**NOTICE:**

**When handling the airbag connector, take care not to damage the airbag wire harness.**

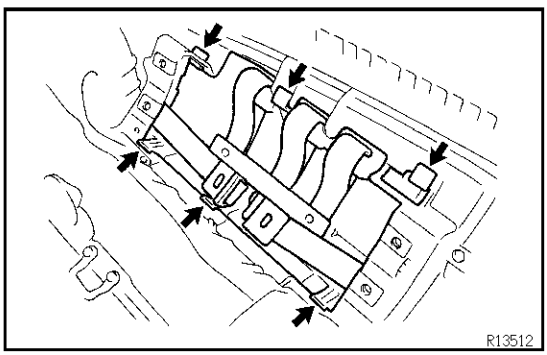
(c) Disconnect the airbag connector


R13640

**2. REMOVE INSTRUMENT PANEL**
**(See pages BO-76)**

**3. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY**

(a) Remove the 4 bolts and 2 nuts, and remove front passenger airbag assembly


R13512

(b) Pry up the 6 clips shown in the illustration and remove the airbag door

**CAUTION:**

**Do not store the front passenger airbag assembly with the airbag deployment direction facing down.Never disassemble the front passenger airbag assembly.**

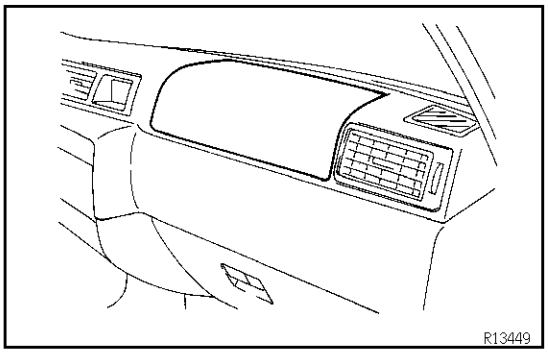


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P9-01



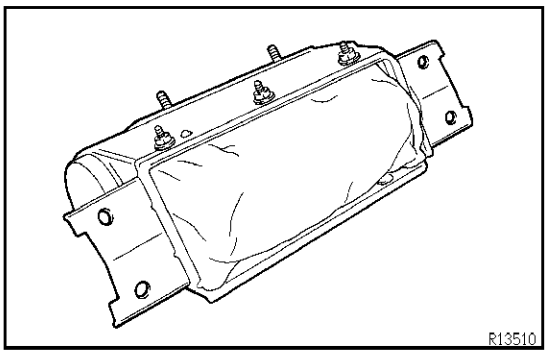

# INSPECTION

## 1. VEHICLES NOT INVOLVED IN COLLISION

(a) Do a diagnostic system check (See page DI–240)

(b) Do a visual check which includes the following items with the front passenger airbag assembly installed in the vehicle

Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly and instrument panel

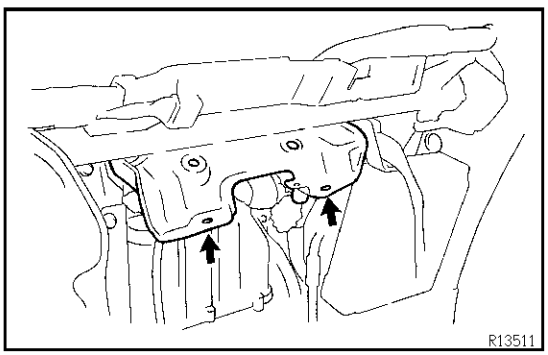



## 2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

(a) Do a diagnostic system check (See page DI–240)

(b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle

- Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly
- Check cuts and cracks in wire harnesses, and for chipping in connectors
- Check the deformation or cracks on the instrument panel and instrument panel reinforcement




HINT

If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it Always replace it with a new one

**CAUTION:**

**For removal and installation of the front passenger airbag assembly, see page RS–22 and RS–31 and be sure to follow the correct procedure.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED**

(a) Do a diagnostic system check (See page DI–240)

(b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle

- Check the deformation or cracks on the instrument panel and instrument panel reinforcement
- Check the damage on the connector and wire harness

HINT

If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it Always replace it with a new one



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



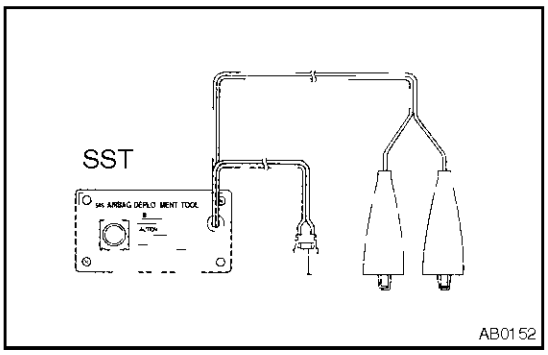
RS0PB-01

# DISPOSAL

HINT

When scrapping vehicle equipped with an SRS or disposing of a front passenger airbag assembly, always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.

When disposing of a front passenger airbag assembly with an airbag deployed in a collision, follow the same procedure given in step 1–(e) in "DISPOSAL".




**CAUTION:**

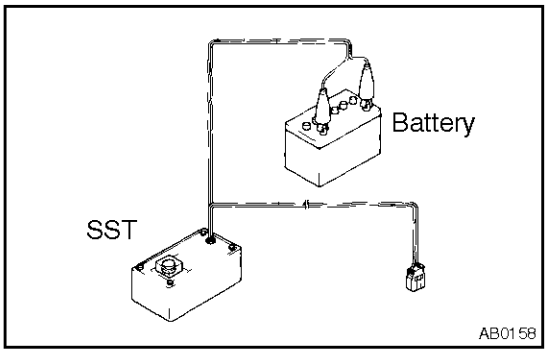
- **Never dispose of a front passenger airbag assembly which has an undeployed airbag.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out of doors and where it will not create a nuisance to nearby residents.**
- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the front passenger airbag assembly.**
- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



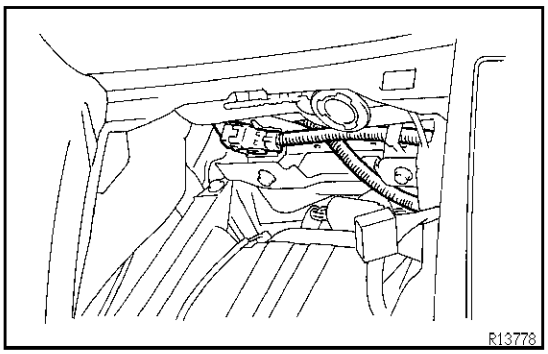



## 1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT

Have a battery ready as the power source to deploy the airbag

(a) Check functioning of the SST
(See page RS–11)

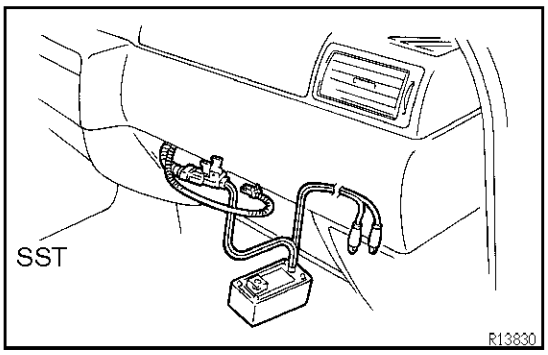



(b) Disconnect the airbag connector
(1) Remove the glove compartment door
(2) Remove the No 1 under cover

**NOTICE:**

**When handling the airbag connector, take care not to damage the airbag wire harness.**

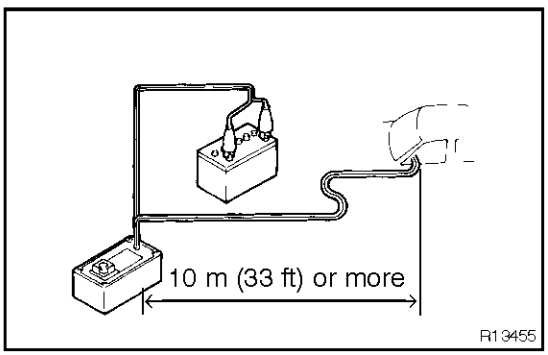
(3) Pull up the connector
(4) Disconnect the airbag connector




(c) Install the SST
(1) Connect the SST connector to the front passenger airbag assembly connector
SST 09082–00700

**NOTICE:**

**To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.**

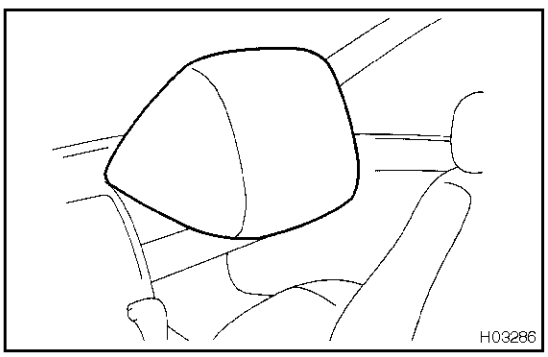



(2) Move the SST to at least 10 m (33 ft) away from the front of the vehicle
(3) Close all the doors and windows of the vehicle

**NOTICE:**

**Take care not to damage the SST wire harness.**

(4) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (+) terminal




(d) Deploy the airbag
(1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle
(2) Press the SST activation switch and deploy the airbag

HINT

The airbag deploys simultaneously as the LED of the SST activation switch lights up



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(e) Dispose of the front passenger airbag assembly

**CAUTION:**

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.**

(1) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the front passenger airbag assembly still installed

(2) When moving a vehicle for scrapping which has a front passenger airbag assembly with deployed airbag, use gloves and safety glasses

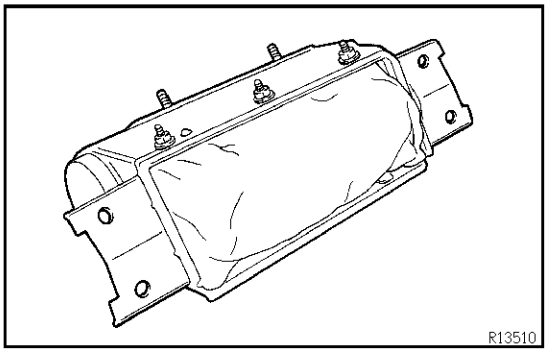
**2. DEPLOYMENT WHEN DISPOSING OF FRONT PASSENGER AIRBAG ASSEMBLY ONLY**

**NOTICE:**

- **When disposing of the front passenger airbag assembly only, never use the customer's vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

HINT

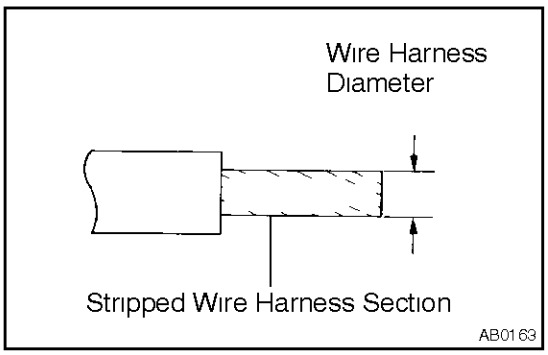
Have a battery ready as the power source to deploy the airbag




(a) Remove the front passenger airbag assembly (See page RS–22)

**CAUTION:**

- **When removing the front passenger airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.**
- **Store the front passenger airbag assembly with the airbag deployment side facing upward.**




(b) Using a service–purpose wire harness for the vehicle, tie down the front passenger airbag assembly to the tire

**Wire harness: Stripped wire harness section 1.25 mm$^2$ or more (0.0019 in.$^2$ or more)**

HINT

To calculate the square of the stripped wire harness section

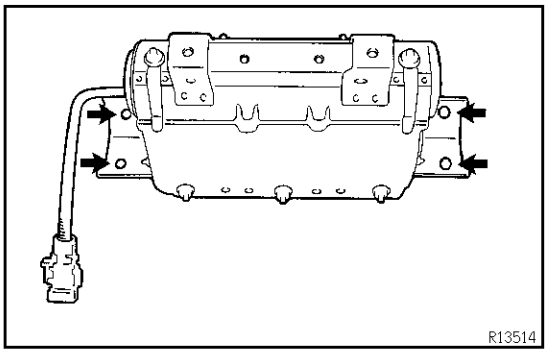
**Square = 3.14 X (Diameter)$^2$ divided by 4**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

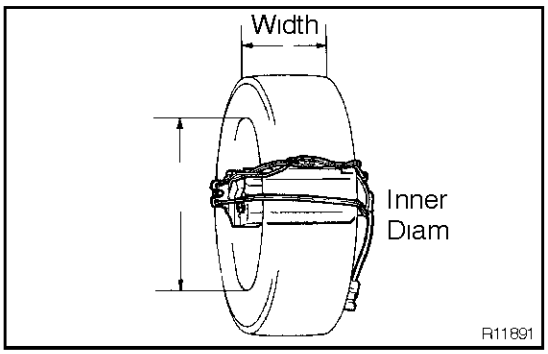
Brought to you by BirfMark






**CAUTION:**
**If the front passenger airbag assembly is tied down with too thin wire harness, it may snap. This is highly dangerous. Always use a wire harness which is at least 1.25 mm$^2$ (0.0019 in.$^2$)**

(1) Wind the wire harness around the tire, passing the wire harness through the installation holes indicated by arrows in the illustration

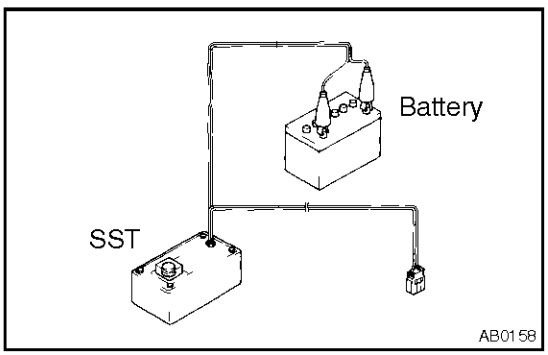



(2) Position the front passenger airbag assembly inside the tire with the airbag deployment side facing inside

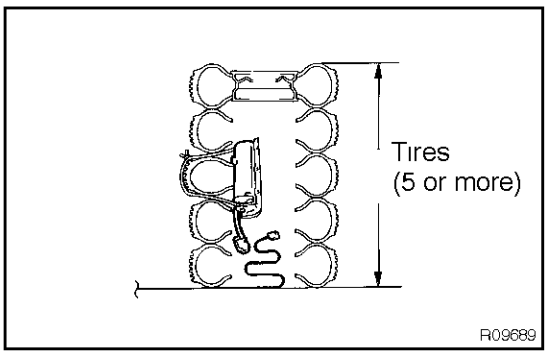
**Tire size: Must exceed the following dimensions–**
**Width: 185 mm (7.28 in.)**
**Inner diameter: 360 mm (14.17 in.)**

**CAUTION:**
- **Make sure that the wire harness is tight. It is very dangerous if looseness in the wire harness results in the front passenger airbag assembly coming free due to the shock from the airbag deploying.**
- **Always tie down the front passenger airbag assembly with the airbag deployment side facing inside.**

**NOTICE:**
**The tire will be marked by the airbag deployment, so use a redundant tire.**




(c) Check functioning of the SST
SST 09082–00700



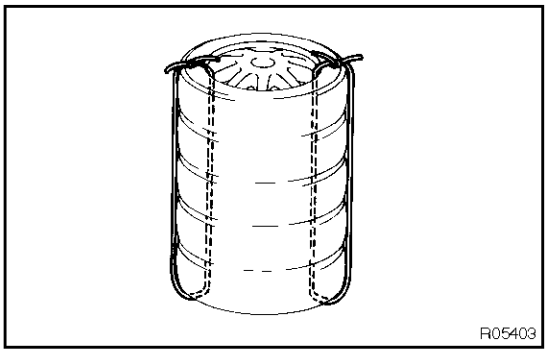

(d) Place tires
(1) Place at least 2 tires under the tire to which the front passenger airbag assembly is tied
(2) Place at least 2 tires over the tire to which the front passenger airbag assembly is tied The top tire should have the wheel installed



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark




R05403

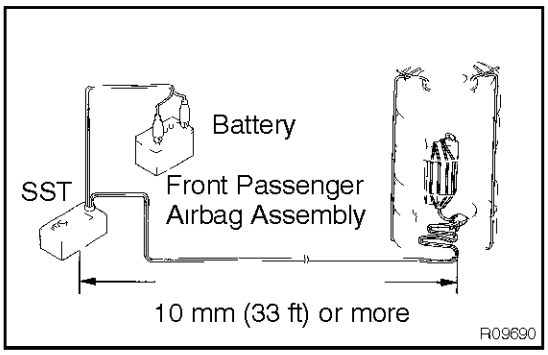
(3) Tie the tires together with 2 wire harnesses

**CAUTION:**

**Make sure that the wire harnesses are tight. It is very dangerous if loose wire harnesses result in the tires coming free due to the shock from the airbag deploying.**

HINT

Place the SST connector and wire harness inside tires. Provide at least 1 m (3 ft) of slack for the wire harness



R09690

(e) Install the SST

Connect the SST connector to the front passenger airbag assembly connector

SST 09082–00700

**NOTICE:**

**To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.**

(f) Deploy the airbag

(1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal

(2) Confirm that no one is within 10 m (33 ft) area around the tire which the front passenger airbag assembly is tied to

(3) Press the SST activation switch and deploy the airbag

HINT

The airbag deploys simultaneously as the LED of the SST activation switch lights up

R09687

(g) Dispose of the front passenger airbag assembly

**CAUTION:**

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.**

(1) Remove the front passenger airbag assembly from the tire

(2) Place the front passenger airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PA-01

# REPLACEMENT

## REPLACEMENT REQUIREMENTS

In the following cases, replace the front passenger airbag assembly, instrument panel or instrument panel reinforcement

| Case | Replacing part |
|---|---|
| If the airbag has been deployed | Front passenger airbag assembly |
| If the front passenger airbag assembly has been found to be faulty in trouble-shooting | Front passenger airbag assembly |
| If the front passenger airbag assembly has been found to be faulty during checking items (See page RS-23) | Front passenger airbag assembly |
| If the instrument panel has been found to be faulty during checking items (See page RS-23) | Instrument panel |
| If the instrument panel reinforcement has been found to be faulty during checking items (See page RS-23) | Instrument panel reinforcement |
| If the front passenger airbag assembly has been dropped | Front passenger airbag assembly |

**CAUTION:**

**For replacement of the front passenger airbag assembly, see page RS-22 and RS-31.**

**Be sure to follow the correct procedure.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PC 03

# INSTALLATION

**NOTICE:**

**Never use airbag parts from another vehicle. When replacing parts, replace with new parts.**

**1. INSTALL FRONT PASSENGER AIRBAG ASSEMBLY**

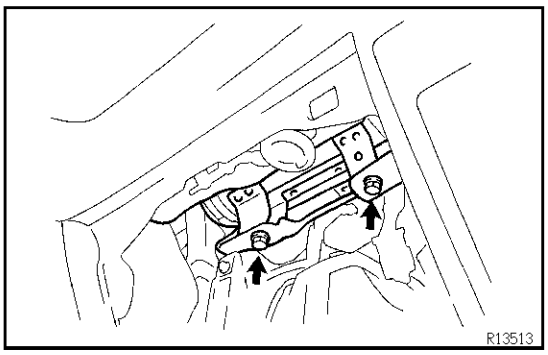
Install the airbag door and front passenger airbag assembly to the instrument panel

**CAUTION:**

- **Make sure that no foreign objects are trapped between the airbag and the module.**
- **Do not damage the strap when installing the module. If the airbag door is cracked or its surface is peeling, always replace it with a new airbag door.**

**NOTICE:**

**If the front passenger airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the front passenger airbag assembly with a new one.**



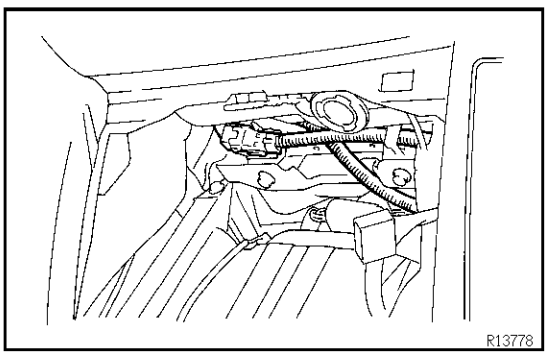

**2. INSTALL INSTRUMENT PANEL (See page BO–80)**

Install the 2 bolts to instrument panel reinforcement

**Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)**

**NOTICE:**

**Make sure the front passenger airbag assembly is installed to the specified torque.When installing the instrument panel, take care that the airbag wire harness does not interfere with other parts and is not pinched between other parts.**




**3. CONNECT AIRBAG CONNECTOR**

(a) Connect the airbag connector

(b) Install the airbag connector to the airbag bracket

(c) Install the glove compartment door



Brought to you by BirfMark
Version 1.11 - 03/16/2010

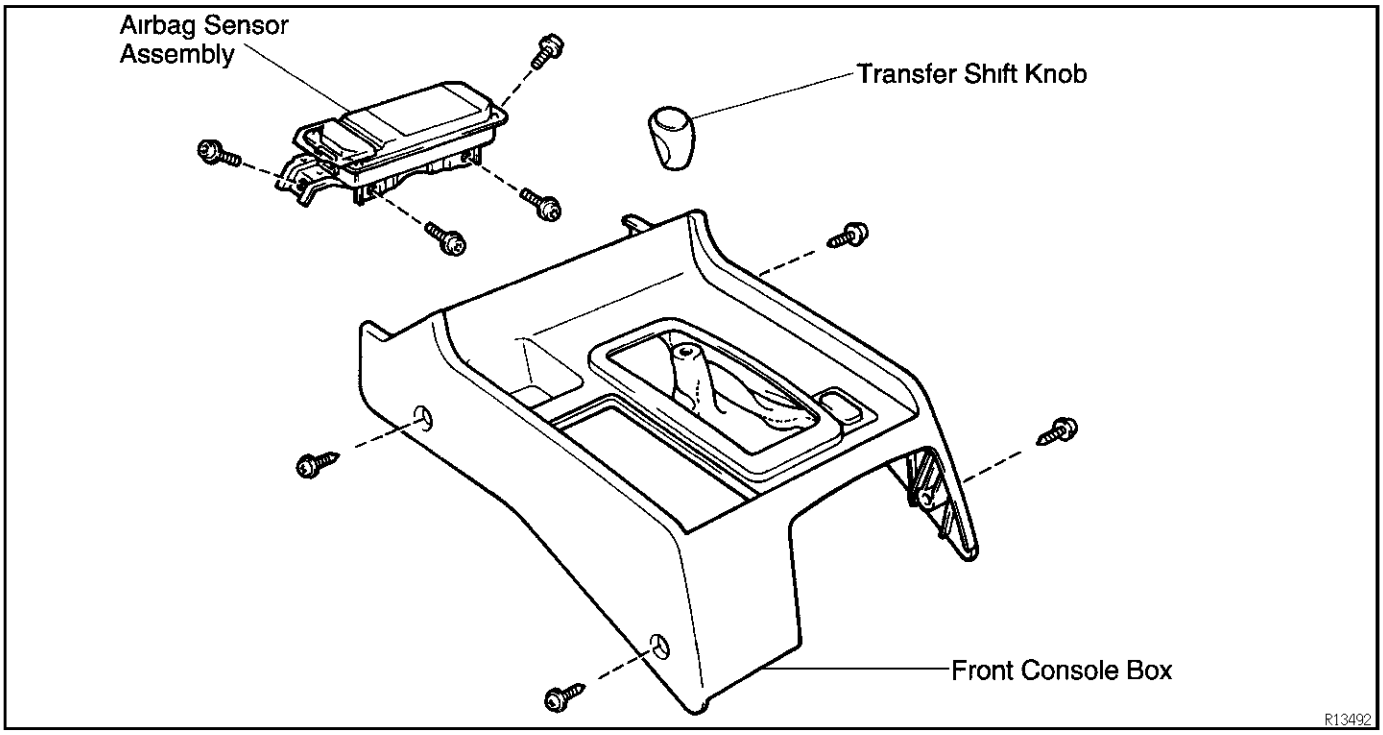
Brought to you by BirfMark



# AIRBAG SENSOR ASSEMBLY

## COMPONENTS

RS0PD 01








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PE 01

# REMOVAL

**NOTICE:**

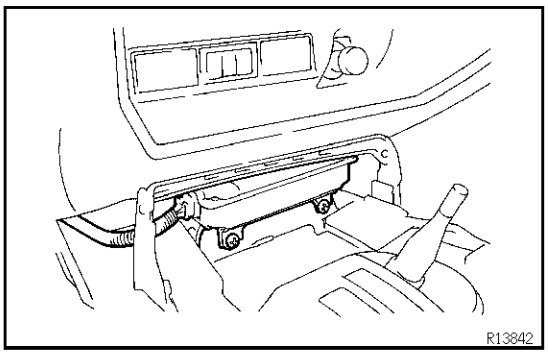
**Do not open the cover or the case of the ECU and various computers unless absolutely necessary.**

**(If the IC terminals are touched, the IC may be destroyed by static electricity.)**

**1. REMOVE THESE PARTS:**

(a) Transfer shirt knob

(b) Front console box




**2. REMOVE AIRBAG SENSOR ASSEMBLY**

(a) Disconnect the connector

**NOTICE:**

**Remove the connector with the sensor assembly installed.**

(b) Using a torx wrench remove the 4 screws and the airbag sensor assembly

Torx wrench T40 (Part No 09042-00020 or locally manufactured tool)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PH 01

# INSPECTION

**1. VEHICLE NOT INVOLVED IN COLLISION**

Do a diagnostic system check (See page DI–240)

**2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED**

Do a diagnostic system check (See page DI–240)

**3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED**

Replace the airbag sensor assembly (See page RS–32)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PG-01

# REPLACEMENT

## REPLACEMENT REQUIREMENTS

In the following cases, replace the airbag sensor assembly

- If the SRS has been deployed in a collision
- If the airbag sensor assembly has been found to be faulty in troubleshooting
- If the airbag sensor assembly has been dropped

**CAUTION:**

**For removal and installation of the airbag sensor assembly, see page RS–33 and RS–36. Be sure to follow the correct procedure.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PF–01

# INSTALLATION

NOTICE:

- **Never use SRS parts from another vehicle. When replacing parts, replace with new parts.**
- **Never reuse the airbag sensor assembly involved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**

1. **INSTALL AIRBAG SENSOR ASSEMBLY**

(a) Using a torx wrench, install the airbag sensor assembly with the 4 screws
Torx wrench T40 (Part No 09042–00020 or locally manufactured tool)
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(b) Connect the connector

NOTICE:

- **Installation of the connector is done with the sensor assembly installed.**
- **Make sure the sensor assembly is installed to the specified torque.**
- **If the sensor assembly has been dropped, or there are cracks, dents or other defects in the case, bracket or connector, replace the sensor assembly with a new one.**
- **When installing the sensor assembly, take care that the SRS wiring does not interfere with other parts and is not pinched between other parts.**
- **After installation, shake the sensor assembly to check that there is no looseness.**

2. **INSTALL THE REMOVED PARTS**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

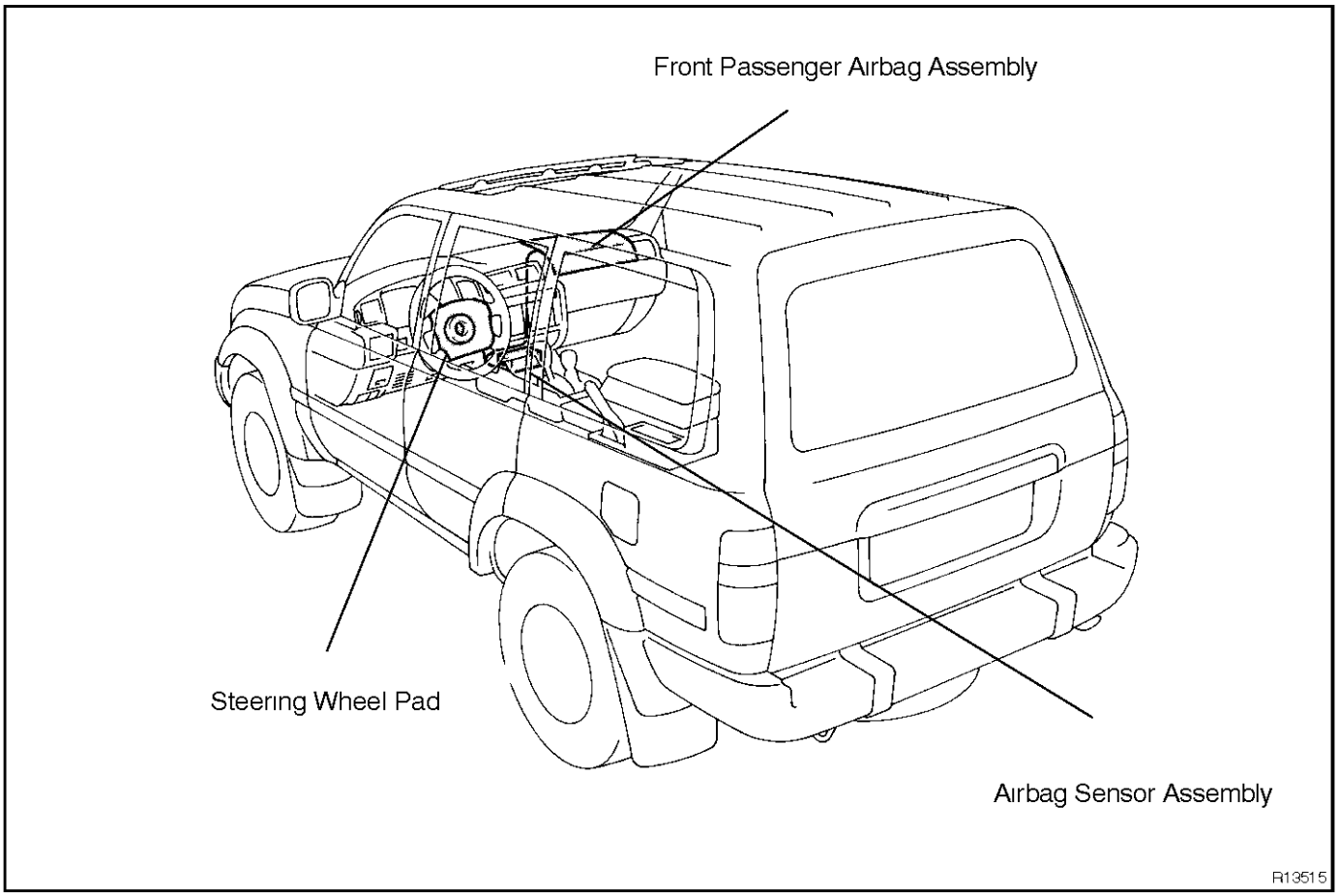
Brought to you by BirfMark



# WIRE HARNESS AND CONNECTOR

RS0PK 01

## LOCATION






Author : Date : 1136
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0PJ–01

# INSPECTION

HINT

The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly The wires for the SRS wire harness are encased in a black corrugated tube and all the connectors in the system are a standard yellow color

**1. VEHICLES NOT INVOLVED IN COLLISION**

Do a diagnostic system check (See page DI–240)

**2. VEHICLES INVOLVED IN COLLISION**

(a) Do a diagnostic system check (See page DI–240)

(b) Check for breaks in all wires of the SRS wire harness, and for exposed conductors

(c) Check to see if the SRS wire harness connectors are cracked or chipped



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



RS0P 01

# REPLACEMENT

In the following cases, replace the wire harness or connector

- If any part of the SRS wire harness or any connector has been found to be faulty in troubleshooting
- If any part of the SRS wire harness or any connector has been found to be faulty during the check in items 2–(b) or (c)

NOTICE:

**If the wire harness used in the SRS is damaged, replace the whole wire harness assembly.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TROUBLESHOOTING

SA1U7 01

## PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

**(w/ Differential locking system):**

- **Check that center differential lock mode is set.**
- **When switching differential Free↔Lock, the indicator lamp will blink if the gears of the differential lock sleeve are not meshed. If this occurs, when the tires are rotated to apply differential power to the differential, the differential locks and the indicator lamp light up.**

| Symptom | Suspect Area | See page |
|---|---|---|
| Wander/ pulls | 1 Tires worn or improperly inflated | SA-3 |
| | 2 Wheel alignmemt incorrect | SA-4 |
| | 3 Steering linkage loosen or worn | SR-47 |
| | 4 Hub bearings loosen or worn | SA-8 |
| | 5 Steering gear out of adjustment or broken | SR-41 |
| Bottoming | 1 Vehicle overloaded | – |
| | 2 Spring weak | SA-49 |
| | 3 Shock absorber worn out | SA-49 |
| Sways/ pitches | 1 Tires worn or improperly inflated | SA-3 |
| | 2 Stabilizer bar bent or broken | SA-60 |
| | 3 Shock absorber worn out | SA-49 |
| Front wheel shimmy | 1 Tires worn or improperly inflated | SA-3 |
| | 2 Wheels out of balance | SA-3 |
| | 3 Shock absorber worn out | SA-49 |
| | 4 Wheel alignmemt incorrect | SA-3 |
| | 5 Hub bearings loosen or worn | SA-7 |
| | 6 Steering linkage loosen or worn | SR-45 |
| | 7 Steering gear out of adjustment or broken | SR-38 |
| Abnormal tire wear | 1 Tires worn or improperly inflated | SA-3 |
| | 2 Wheel alignmemt incorrect | SA-3 |
| | 3 Suspension parts worn out | – |
| | 4 Shock absorber worn out | SA-49 |
| Noise in front differential | 1 Oil level low or wrong grade | SA-21 |
| | 2 Excessive backlash between pinion and ring gear | SA-29 |
| | 3 Ring pinion ro side gears worn or chipped | SA-29 |
| | 4 Pinion shaft bearing worn | SA-29 |
| | 5 Side bearing worn | SA-29 |
| | 6 Differential bearing loosen or worn | SA-29 |
| Oil leak from front differential | 1 Oil level too high or wrong grade | SA-21 |
| | 2 Drive pinion oil seal worn or damaged | SA-29 |
| | 3 Side gear oil seal worn or damaged | SA-29 |
| | 4 Companion flange loosen or damaged | SA-29 |
| | 5 Side gear shaft damaged | SA-29 |
| Noise in rear axle | 1 Oil level low or wrong grade | SA-73 |
| | 2 Excessive backlash between pinion and ring gear | SA-87 |
| | 3 Ring pinion ro side gears worn or chipped | SA-87 |
| | 4 Pinion shaft bearing worn | SA-87 |
| | 5 Axle shaft bearing worn | SA-87 |
| | 6 Differential bearing loosen or worn | SA-87 |
| Oil leak from rear axle | 1 Oil seal worn or damaged | SA-73 |
| | 2 Rear axle housing cracked | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Oil leak from rear differential | 1 Oil level too high or wrong grade<br>2 Oil seal worn or damaged<br>3 Companion flange loosen or damaged | SA–73<br>SA–73<br>SA–87 |
| Indicator lights do not light up | 1 Fusible link blown<br>2 GAUGE fuse blown<br>3 Bulb burned out<br>4 Wiring or ground faulty | BE–9<br>BE–9<br>BE–32<br>– |
| Indicator lights do not light up<br>(Diff lock control switch RR or FR RR position) | 1 DIFF fuse blown<br>2 Diff lock control switch faulty<br>3 Diff lock ECU faulty<br>4 Wiring or ground faulty | BE–9<br>SA–101<br>SA–101<br>– |
| Differential lock does not operate | 1 Diff lock position switch faulty<br>2 Diff lock actuator faulty<br>3 Diff lock ECU faulty<br>4 Differential carrier (Diff lock) faulty<br>5 Wiring or ground faulty | SA–101<br>SA–101<br>SA–101<br>SA–101<br>– |
| After differential lock lock not release<br>When vehicle speed is higher than approx 8 km/h (5mph) | 1 Speed sensor faulty<br>2 Diff lock ECU faulty<br>3 Wiring or ground faulty | BE–32<br>SA–101<br>– |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TIRE AND WHEEL

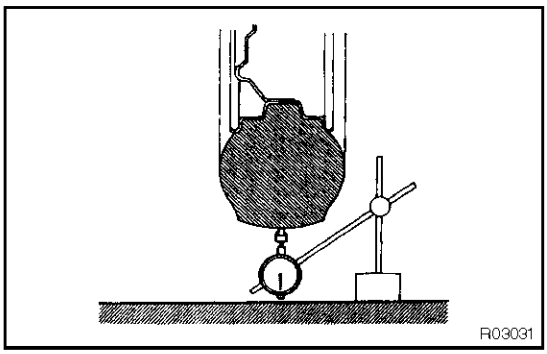
SA1U8 02

## INSPECTION

**1. INSPECT TIRE**

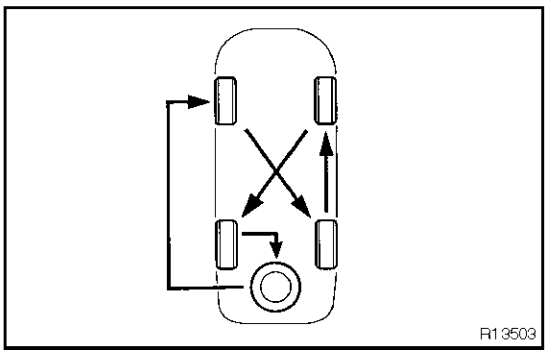
(a) Check the tires for wear and for the proper inflation pressure

**Cold tire inflation pressure: See page SS-30**




(b) Check the tire runout

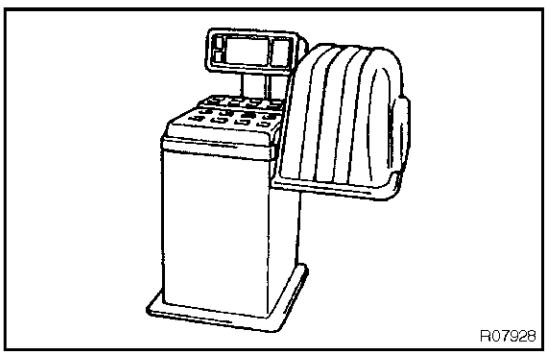
**Tire runout: 3.0 mm (0.118 in.) or less**




**2. ROTATE TIRES**

HINT

See the illustration for where to rotate each tire




**3. INSPECT WHEEL BALANCE**

(a) Check and adjust the Off-the-car balance

(b) If necessary, check and adjust the On-the-car balance

**Unbalance after adjustment: 13.0 g (0.029 lb) or less**

**4. CHECK WHEEL BEARING LOOSENESS**

Check the no backlash in the bearing shaft direction

**5. CHECK FRONT SUSPENSION FOR LOOSENESS**

**6. CHECK STEERING LINKAGE FOR LOOSENESS**

**7. CHECK BALL JOINT FOR LOOSENESS**

**8. CHECK SHOCK ABSORBER WORKS PROPERLY**

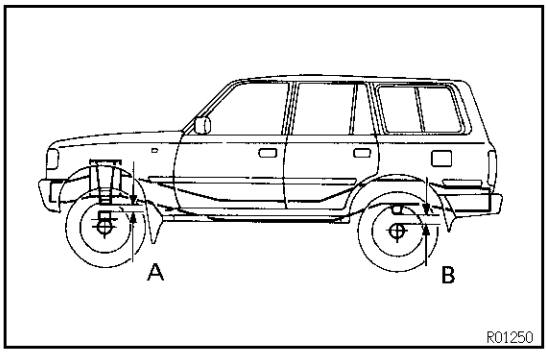
- Check for oil leaks
- Check mounting bushings for wear
- Bounce front and rear of the vehicle

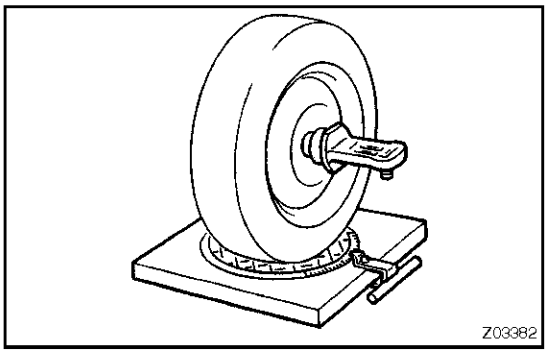


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# FRONT WHEEL ALIGNMENT

SA1U9 02

## INSPECTION

**1. MEASURE VEHICLE HEIGHT**

**Clearance:**

**A (Follow spring clearance): 36 mm (1.42 in.)**

**B (Bumper stopper clearance): 104 mm (4.09 in.)**

If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down

If still not correct, check for bad springs or suspension parts

**2. INSTALL CAMBER–CASTER–KINGPIN GAUGE OR ONTO WHEEL ALIGNMENT TESTER**

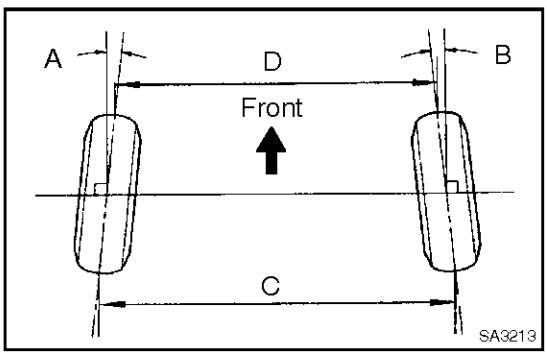
Follow the specific instructions of the equipment manufacturer

**3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION**

| | |
|---|---|
| Camber<br>Left–right error | 1°00 ± 45<br>45 or less |
| Caster<br>Left–right error | 3°00 ± 1°<br>45 or less |
| Steering axis inclination | 13°00 ± 45 |

Camber, caster and steering axis inclination are not adjustable

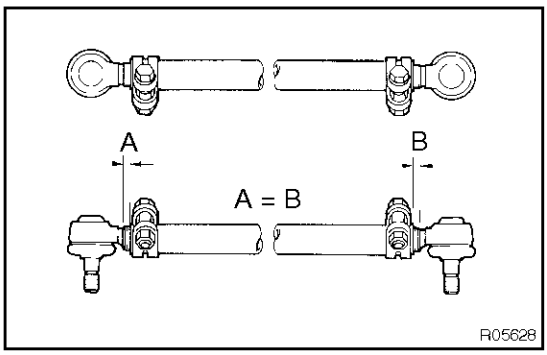
If measurements are not within the specification, inspect the suspension parts for damaged and/or worn out parts and replace them as necessary




**4. INSPECT TOE–IN**

| | |
|---|---|
| Toe–in<br>(total) | A+B 0 2° ± 0 2°<br>C–D 2 ± 2 mm (0 08 ± 0 08 in ) |

If toe–in is not within the specification, adjust by the tie rod end




**5. ADJUST TOE–IN**

(a) Loosen the clamp bolts and nuts

(b) Adjust toe–in to the correct value by turning the tie rod

HINT

Make sure that the lengths of the left and right tie rod ends are the same

(c) Torque the clamp bolts and nuts

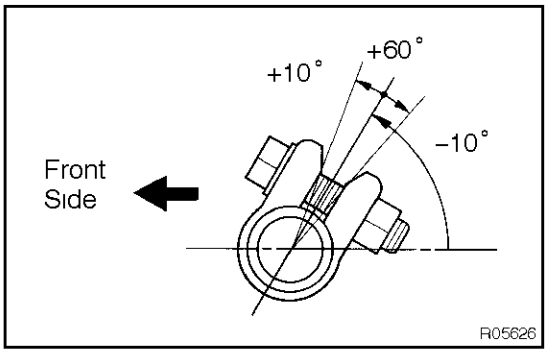
**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**



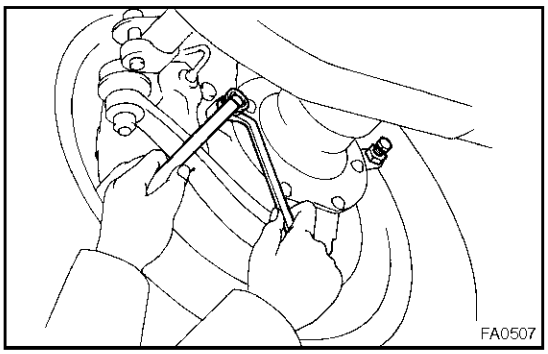
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



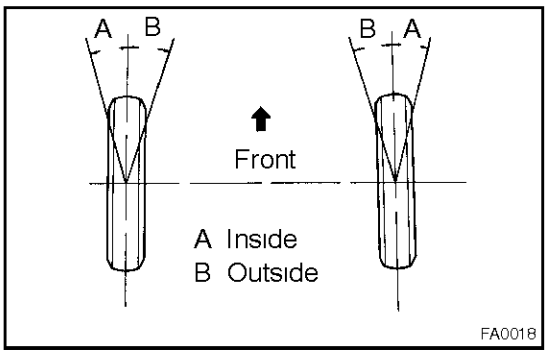



HINT
The clamps opening must be positioned at the rear of the tie rod end face within 60°±10° from the vehicle axis




**6. INSPECT WHEEL ANGLE**

(a) Remove the caps of the knuckle stopper bolts and check the steering angles




(b) Turn the steering wheel fully, and measure the turning angle

| | |
|---|---|
| Inside wheel | 32°00 – 35°00 |
| Outside wheel | 31°00 (Reference) |

HINT
When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose
If maximum steering angles differ from the standard value, adjust the wheel angle with the knuckle stopper bolts

**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts



Brought to you by BirfMark
Version 1.11 - 03/16/2010

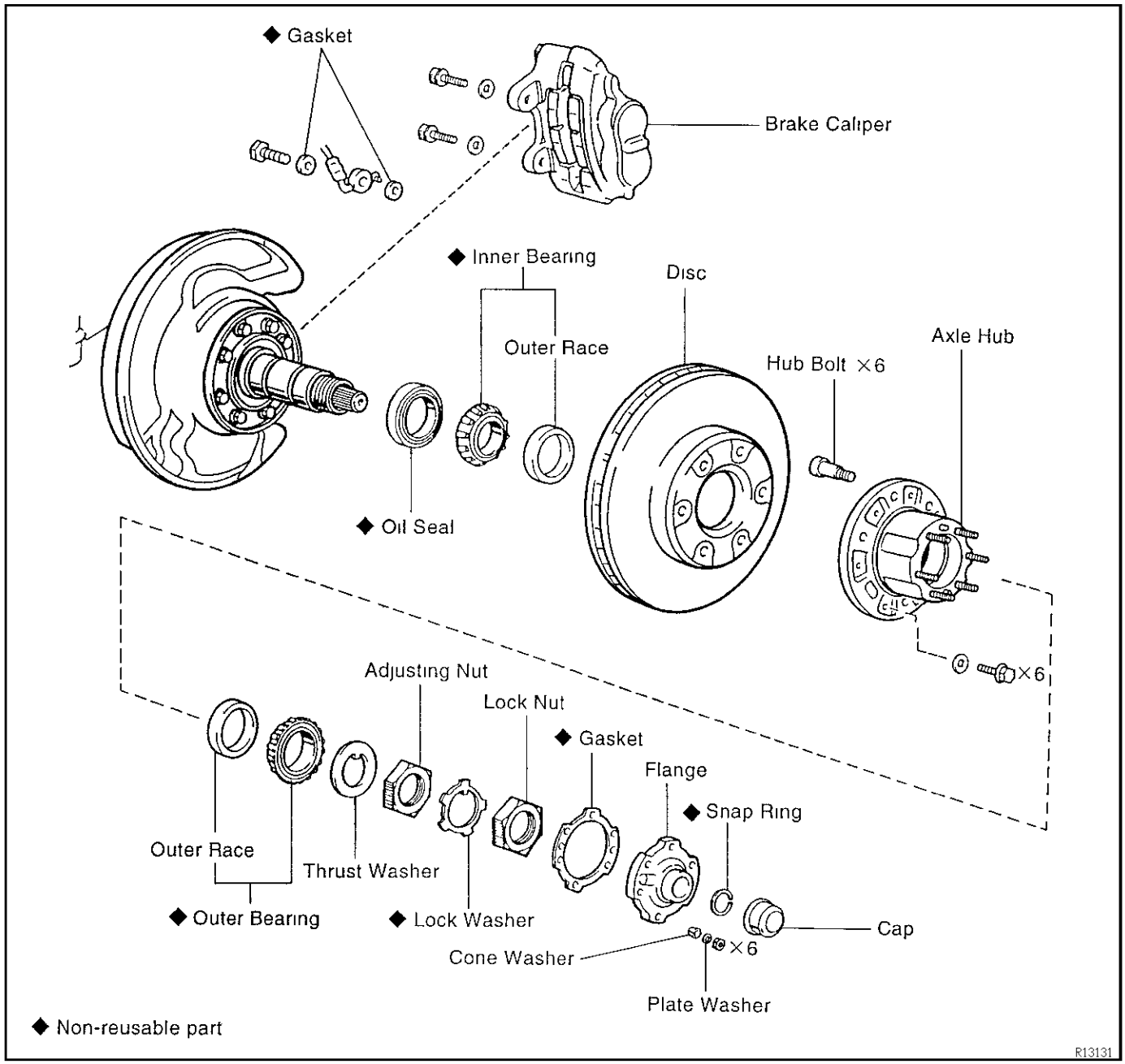
Brought to you by BirfMark



# FRONT AXLE HUB

## COMPONENTS

SA1UA 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

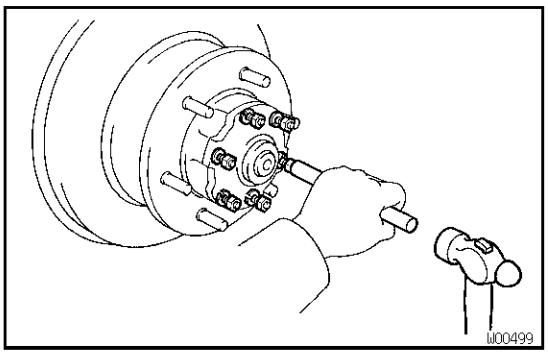
Brought to you by BirfMark



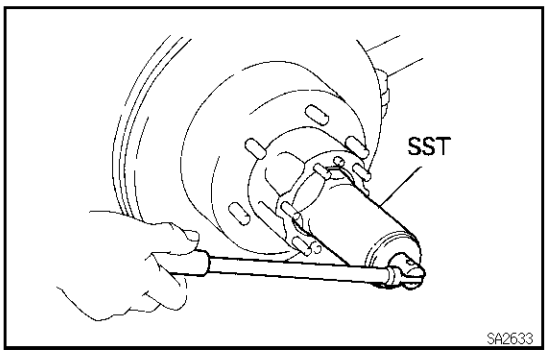
SA1UB 01

# REMOVAL

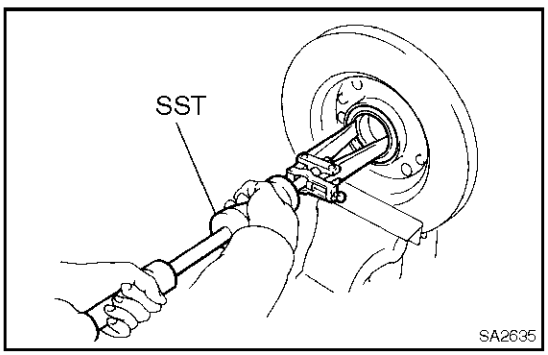
1. REMOVE FRONT WHEEL
2. REMOVE BRAKE CALIPER (See page BR–25)




3. REMOVE FLANGE
(a) Using a screwdriver and hammer, remove the grease cap from the flange
(b) Using a snap ring expander, remove the snap ring
(c) Loosen the 6 mounting nuts
(d) Using a brass bar and hammer, tap on the 6 bolts heads and remove the 6 cone washers, plate washers and nuts
(e) Remove the flange
(f) Remove the gasket




4. REMOVE AXLE HUB WITH DISC
(a) Using a screwdriver, release the lock washer
(b) Using SST, remove the lock nut
SST 09607–60020
(c) Remove the lock washer
(d) Using SST, remove the adjusting nut and thrust washer
SST 09607–60020
(e) Remove the hub and disc together with the outer bearing




5. REMOVE OIL SEAL AND INNER BEARING
(a) Using SST, remove the oil seal
SST 09308–00010
(b) Remove the inner bearing from the hub



Brought to you by BirfMark
Version 1.11 - 03/16/2010

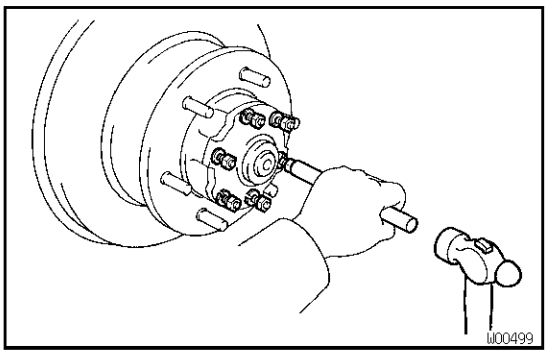
Brought to you by BirfMark



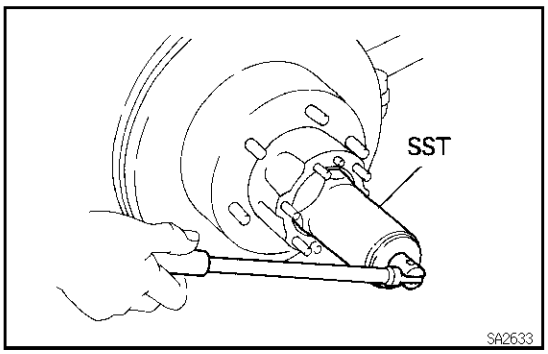
SA1UB 01

# REMOVAL

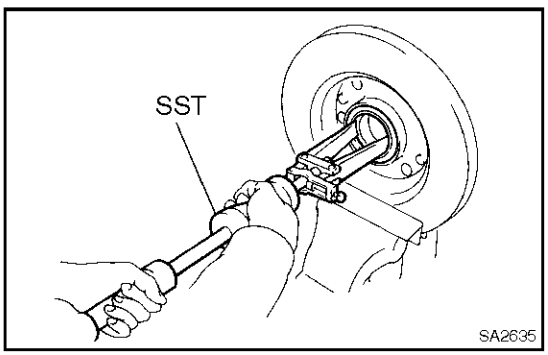
1. REMOVE FRONT WHEEL
2. REMOVE BRAKE CALIPER (See page BR–25)




3. REMOVE FLANGE
(a) Using a screwdriver and hammer, remove the grease cap from the flange
(b) Using a snap ring expander, remove the snap ring
(c) Loosen the 6 mounting nuts
(d) Using a brass bar and hammer, tap on the 6 bolts heads and remove the 6 cone washers, plate washers and nuts
(e) Remove the flange
(f) Remove the gasket




4. REMOVE AXLE HUB WITH DISC
(a) Using a screwdriver, release the lock washer
(b) Using SST, remove the lock nut
SST 09607–60020
(c) Remove the lock washer
(d) Using SST, remove the adjusting nut and thrust washer
SST 09607–60020
(e) Remove the hub and disc together with the outer bearing




5. REMOVE OIL SEAL AND INNER BEARING
(a) Using SST, remove the oil seal
SST 09308–00010
(b) Remove the inner bearing from the hub

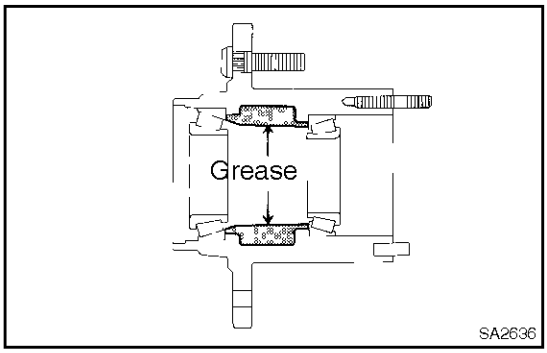


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UD 01




# INSTALLATION

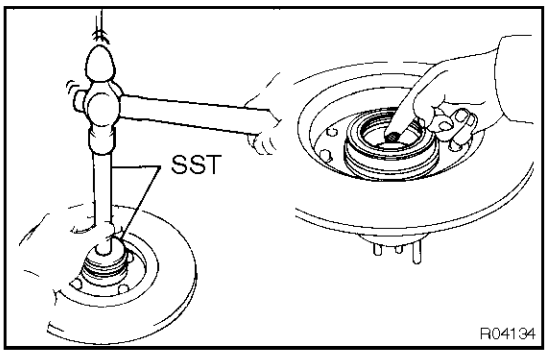
**1. PACK BEARINGS WITH MP GREASE**

(a) Place MP grease on the palm of your hand

(b) Pack grease into the bearing until the grease oozes out from the other side

(c) Do the same around the bearing circumference

**2. COAT INSIDE OF HUB WITH MP GREASE**




**3. INSTALL INNER BEARING AND OIL SEAL**

(a) Place the inner bearing into the hub

(b) Using SST, install a new oil seal into the hub
SST 09950–60020 (09951–00910),
09950–70010 (09951–07150)

(c) Coat the oil seal lip with MP grease

**4. INSTALL AXLE HUB WITH DISC TO SPINDLE**

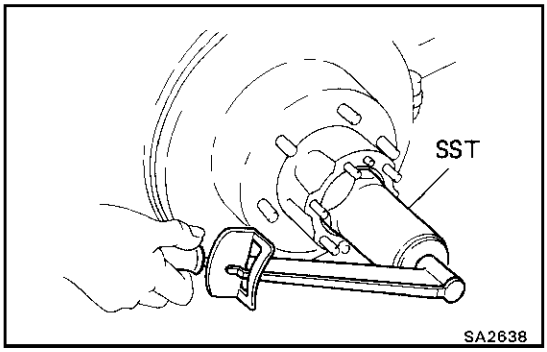
(a) Place the axle hub with disc to the spindle

(b) Install the outer bearing

(c) Install the thrust washer

**5. ADJUST PRELOAD**

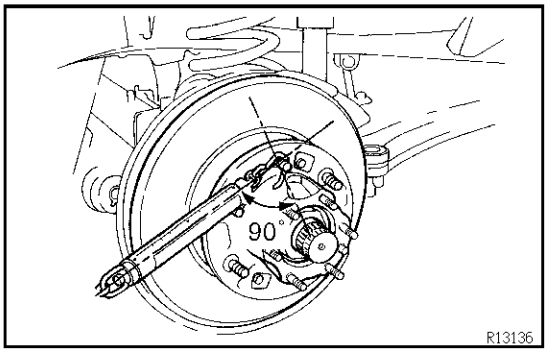
(a) Using SST, torque the adjusting nut
SST 09607–60020
**Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)**




(b) Turn the hub right and left 2 or 3 times

(c) Using SST, torque the adjusting nut
SST 09607–60020
**Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)**

(d) Loosen the nut until it can be turned by hand




(e) Using SST, torque the adjusting nut again
SST 09607–60020
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**NOTICE:**

**Check that the bearing has no play.**

(f) Using a spring tension gauge, measure the preload
**Preload (at starting):**
**28 – 56 N (2.9 – 5.7 kgf, 6.4 – 12.6 lbf)**

**6. INSTALL LOCK WASHER AND LOCK NUT**

(a) Install a new lock washer and lock nut

(b) Using SST, torque the lock nut
SST 09607–60020
**Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)**

(c) Check that axle hub turns smoothly and that the bearing has no play

(d) Using a spring tension gauge, check the preload
**Preload (at starting):**
**28–56 N (2.9–5.7 kgf, 6.4–12.6 lbf)**

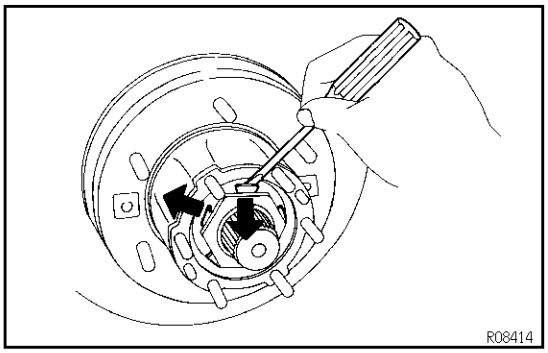
If it is not within the specification, adjust it with the adjusting nut after removing the lock washer and lock nut



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



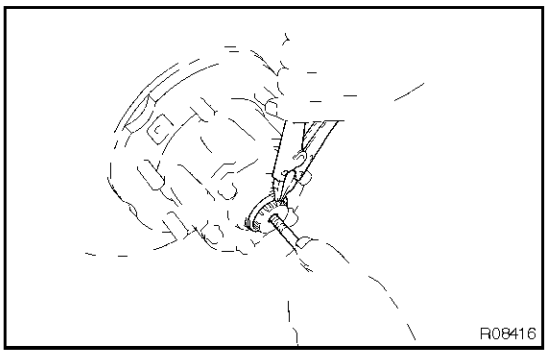



(e) Secure the lock nut by bending one of the lock washer teeth inward and the other lock washer teeth outward

**7. INSTALL FLANGE**

(a) Place a new gasket in position on the axle hub
(b) Apply MP grease to the inner flange splines
(c) Install the flange to the axle hub
(d) Install the 6 cone washers, plate washers and nuts
(e) Torque the 6 nuts

**Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)**




(f) Install the bolt in the axle shaft and pull it out
(g) Using a snap ring expander, install a new snap ring
(h) Remove the bolt
(i) Coat inside of the cap with MP grease
(j) Install the cap to the flange

**8. INSTALL BRAKE CALIPER (See page BR–29)**

**9. INSTALL FRONT WHEEL**

**Torque:**
**Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
**Alumimum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**

**10. BLEED BRAKE LINE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

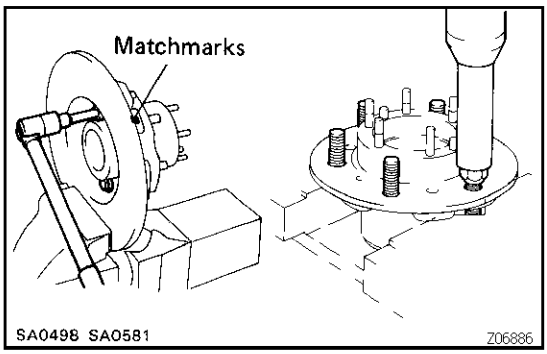


# FRONT WHEEL HUB BOLT

SA1UE 01

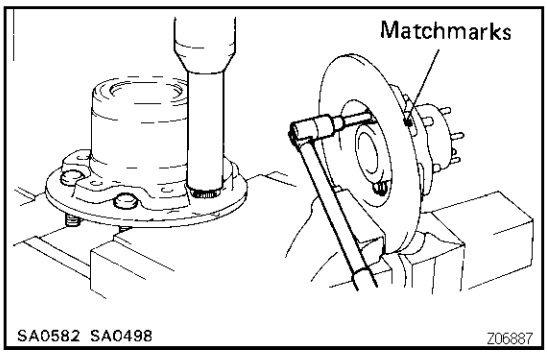
## REPLACEMENT

1. **REMOVE FRONT AXLE HUB (See page SA–7)**




2. **REPLACE HUB BOLTS**

(a) Place matchmarks on the axle hub and disc
(b) Remove the 6 bolts and disc from the axle hub
(c) Install the nut to the hub bolt
(d) Using an extension bar and a press, remove the hub bolt




(e) Using an extension bar and press, install a new hub bolt
(f) Align the matchmarks on the axle hub and disc
(g) Install and torque the 6 bolts
**Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)**

3. **INSTALL FRONT AXLE HUB (See page SA–9)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

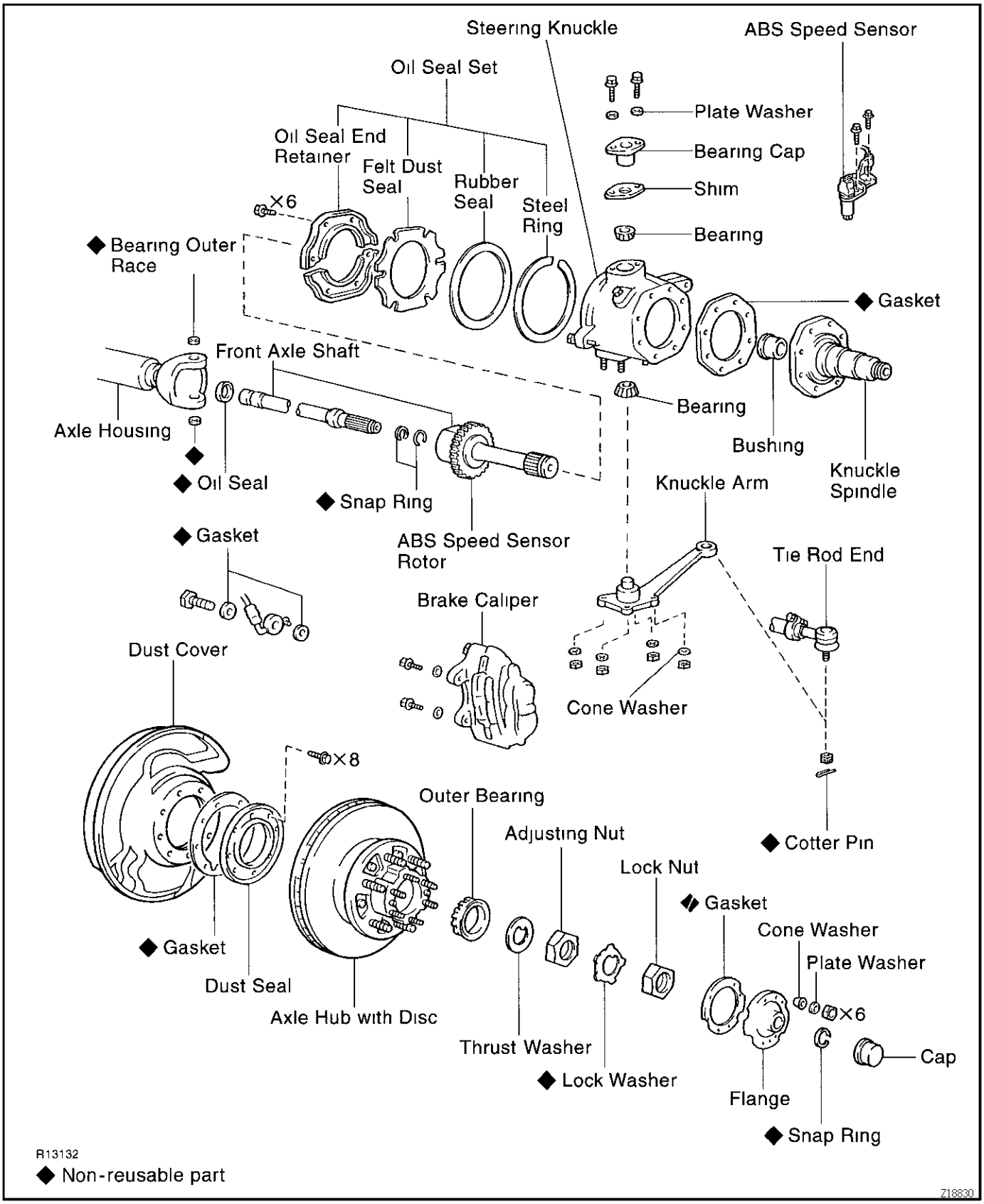
Brought to you by BirfMark



# STEERING KNUCKLE AND AXLE SHAFT

## COMPONENTS

SA1UF-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



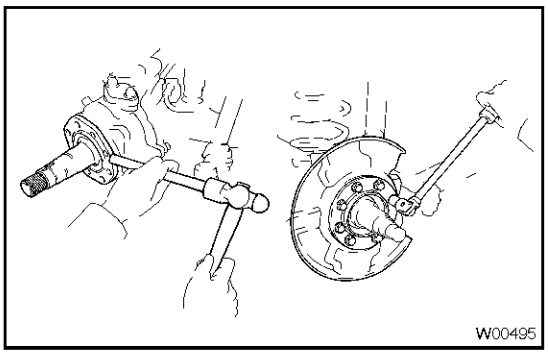
SA1UG-01

# REMOVAL

**1. REMOVE FRONT AXLE HUB (See page SA–7)**

**2. REMOVE ABS SPEED SENSOR**

Remove the 2 bolts and disconnect the speed sensor from the steering knuckle




**3. REMOVE DUST SEAL AND DUST COVER**

Remove the 8 bolts, dust seal, dust cover and gasket

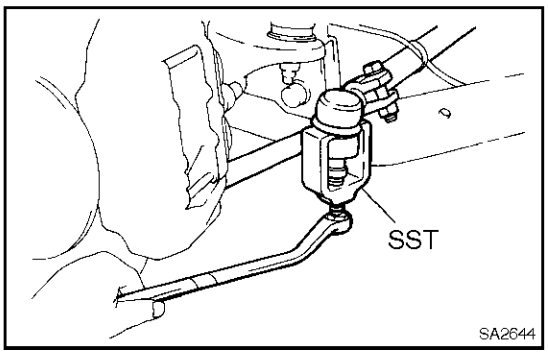
**4. REMOVE KNUCKLE SPINDLE**

(a) Using a brass bar and hammer, tap the knuckle spindle of the steering knuckle

(b) Remove the knuckle spindle and gasket

**5. REMOVE AXLE SHAFT**

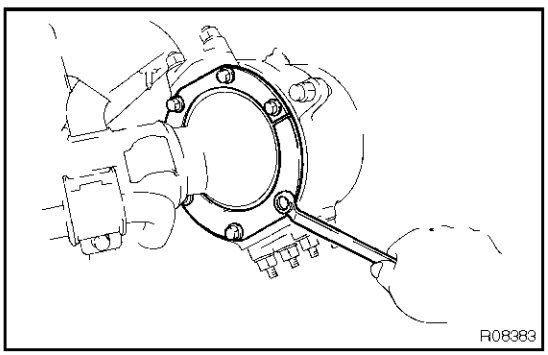
Position one flat part of the outer shaft upward and remove the axle shaft




**6. DISCONNECT TIE ROD FROM KNUCKLE ARM**

(a) Remove the cotter pin and nut

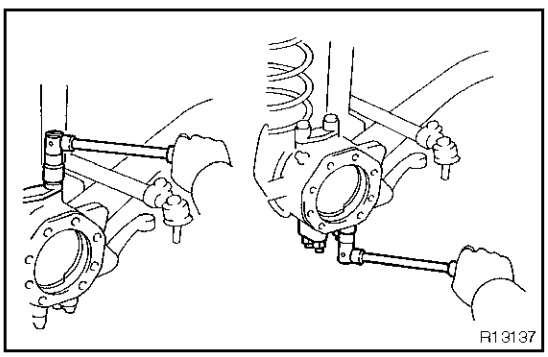
(b) Using SST, disconnect the tie rod from the knuckle arm
SST 09611–22012




**7. REMOVE OIL SEAL SET**

(a) Remove the 6 bolts from the end retainer

(b) Remove these parts from the steering knuckle
- Oil seal end retainer
- Felt dust seal
- Rubber seal
- Steel ring




**8. REMOVE KNUCKLE ARM AND BEARING CAP**

(a) Remove the 2 bolts and plate washers from the bearing cap

(b) Remove the 4 nuts from the knuckle arm

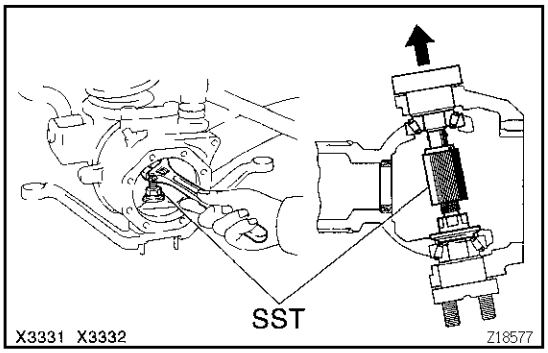
(c) Using a brass bar and hammer, tap on the 4 bolts heads and remove the 4 cone washers



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

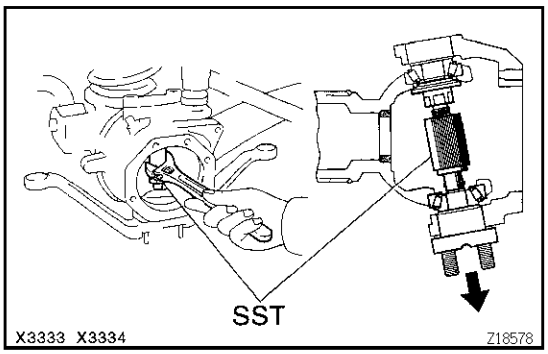





(d) Using SST, remove the bearing cap and shim from the steering knuckle
SST 09606–60020

HINT

- Use the SST without a collar
- In some cases, to satisfy the standard value of preload, more than one shims are used




(e) Using SST, remove the knuckle arm and shim from the steering knuckle
SST 09606–60020

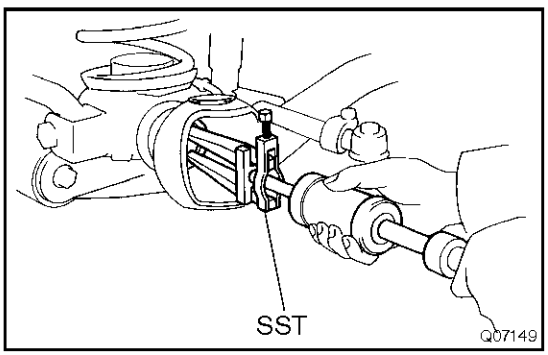
HINT

- Use the SST without a collar
- In some cases, to satisfy the standard value of preload, more than one shims are used

**9. REMOVE STEERING KNUCKLE AND BEARING**

HINT

Mark the removed adjusting shim and bearings so as to enable reassembling them to their proper positions




**10. REMOVE OIL SEAL TO AXLE HOUSING**

Using SST, remove the oil seal
SST 09308–00010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

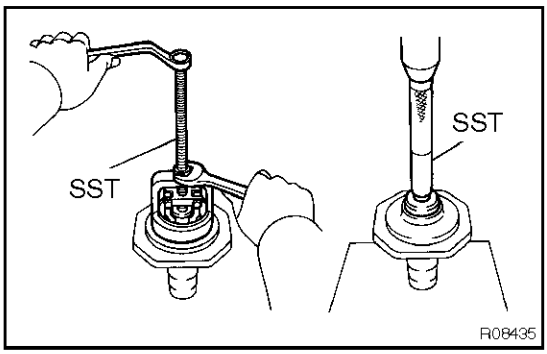


SA1UH 01

# REPLACEMENT

## 1. INSPECT KNUCKLE SPINDLE

Clean the knuckle spindle and inspect the bushing for wear or damage



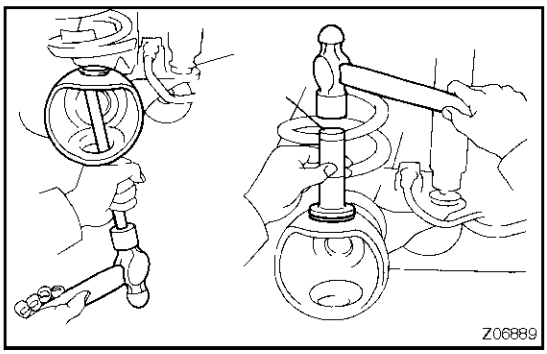

## 2. REPLACE BUSHING

(a) Using SST, remove the bushing
SST 09612–65014 (09612–01010, 09612–01050)

(b) Using SST and a press, install a new bushing into the spindle
SST 09618–60010

## 3. INSPECT BEARING

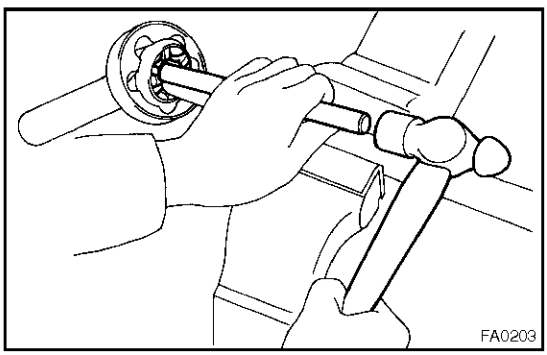
Clean the bearing and 2 outer races and inspect them for wear or damage




## 4. IF NECESSARY, REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, remove the bearing outer race

(b) Using SST and a hammer, carefully install a new bearing outer race
SST 09605–60010

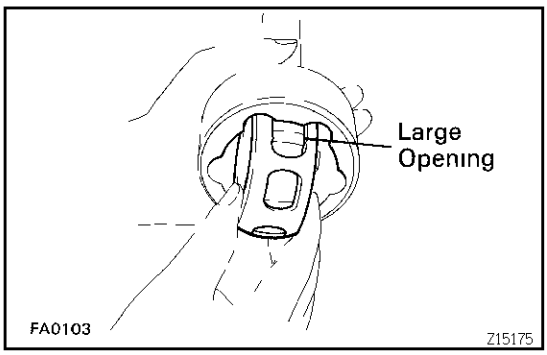



## 5. INSPECT BIRFIELD JOINT INNER PARTS

(a) Hold the inner shaft in a vise

(b) Place a brass bar against the joint inner race and remove the outer shaft

(c) Tilt the inner race and cage and take out the bearing balls one by one




(d) Fit the 2 large openings in the cage against the protruding parts of the outer shaft and remove the cage and inner race

(e) Remove the inner race from the cage though the large opening

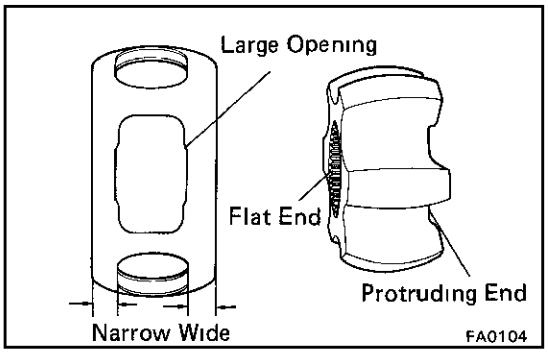
(f) Clean and inspect the joint parts for wear or damage



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



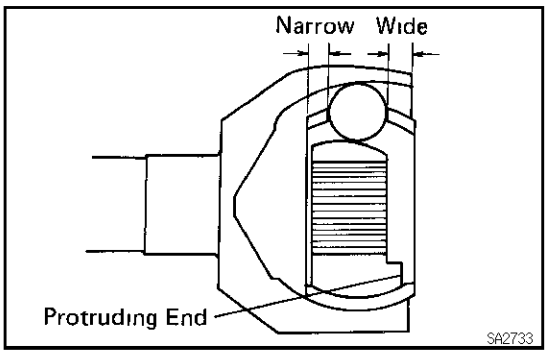



(g) Coat the joint inner parts and outer shaft inside with molybdenum disulpfide lithium base grease, NLGI No 2

(h) Install the inner race in the cage through the large opening

(i) Position the protruding end of the inner race toward the wide side of the cage

(j) Assemble the cage and inner race to the outer shaft by fitting the 2 large openings in the cage against the protruding parts of the outer shaft

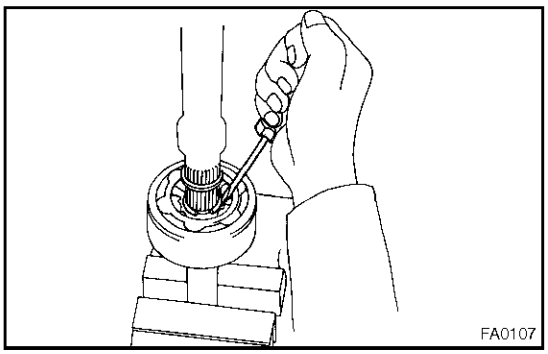



(k) Make sure to position the wide side of the cage and the inner race protruding end outward

(l) Fit in the inner race and cage and install the 6 bearing balls in the outer shaft (See step (c))

(m) Pack molybdenum disulpfide lithium base grease, NLGI No 2 in the outer shaft

(n) Install a new snap ring on the inner shaft




(o) Hold the outer shaft in a vise and while compressing the snap ring, install the inner shaft to the outer shaft

(p) Make sure that the inner shaft cannot be pulled out



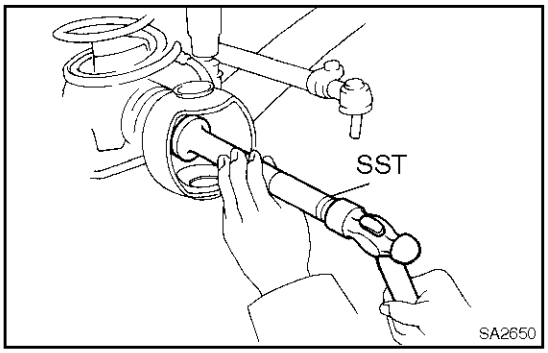
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1U 01

# INSTALLATION




**1. INSTALL OIL SEAL TO AXLE HOUSING**

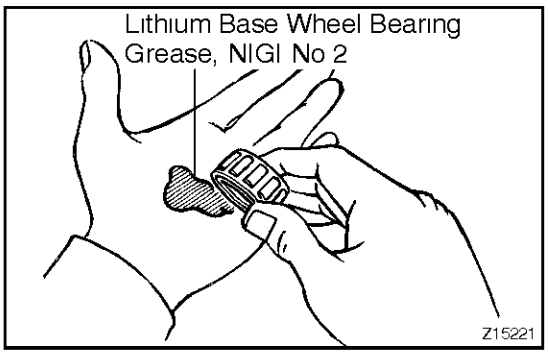
Using SST and a hammer, install a new oil seal into the axle housing

SST 09618–60010

**2. INSTALL OIL SEAL SET**

Install these parts to the steering knuckle

- Oil seal and retainer
- Felt dust seal
- Rubber seal and steel ring




**3. PACK BEARINGS WITH LITHIUM BASE WHEEL BEARING GREASE, NLGI NO.2**

(a) Place lithium base wheel bearing grease, NLGI No 2 on your hand

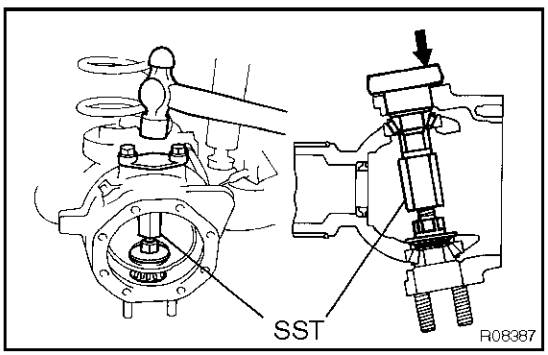
(b) Pack grease into the bearing until the grease oozes out from the outer side

(c) Do the same around the bearing circumference

**4. INSTALL STEERING KNUCKLE AND BEARINGS**

(a) Place the bearings in positions on the knuckle and axle housing

(b) Install the knuckle on the axle housing




**5. INSTALL KNUCKLE ARM AND BEARING CAP**

(a) Using SST, support the upper bearing inner race

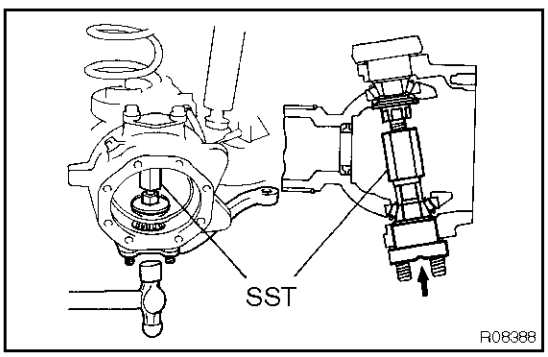
SST 09606–60020

HINT

Use the SST with a collar

(b) Install the bearing cap over the shim that were originally used

(c) Using a hammer, install the bearing cap into the bearing inner race




(d) Using SST, support the lower bearing inner race

SST 09606–60020

HINT

Use the SST with a collar

(e) Using a hammer, tap the knuckle arm and shim into the bearing inner race

(f) Remove the SST from the knuckle

(g) Install the 4 cone washers and nuts

**Torque: 96 N·m (980 kgf·cm, 71 ft·lbf)**

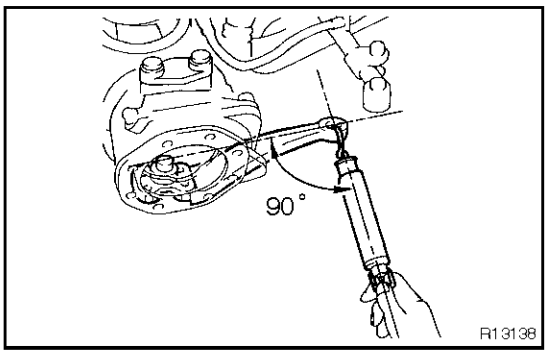


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(h) Install the 2 plate washers and bolts
**Torque: 96 N·m (980 kgf·cm, 71 ft·lbf)**




**6. MEASURE BEARINGS PRELOAD**

Using a spring tension gauge, measure the preload
**Preload (at starting):**
**25 – 44 N (2.5 – 4.5 kgf, 5.6 – 9.9 lbf)**

**7. ADJUST BEARING PRELOAD**

(a) Remove the bearing cap and knuckle arm
(See page SA–13)

(b) Select the adjusting shim
**Adjusting shim thickness**

| Thickness mm (in ) | Thickness mm (in ) |
|---|---|
| 0 1 (0 004) | 0 5 (0 020) |
| 0 2 (0 008) | 1 0 (0 039) |

(c) Install the bearing cap and knuckle arm
(See page SA–17)

**8. CONNECT TIE ROD TO KNUCKLE ARM**

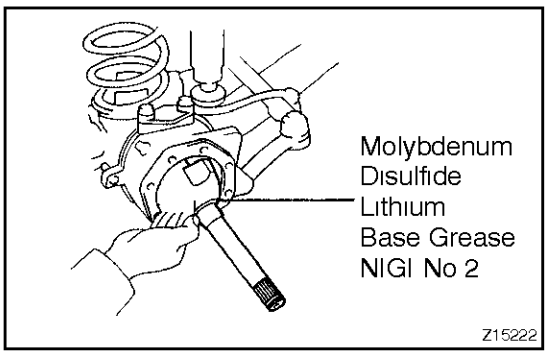
Torque the nut and secure it with a new cotter pin
**Torque: 91 N·m (925 kgf·cm, 67 ft·lbf)**

**9. INSTALL OIL SEAL END RETAINER TO KNUCKLE ARM**

Install the oil seal end retainer to steering knuckle with the 6 bolts
**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**10. INSTALL AXLE SHAFT**

Position one flat part of the outer shaft upward and install the shaft




**11. PACK MOLYBDENUM DISULFIDE LITHIUM BASE GREASE, NLGI NO.2**

Pack molybdenum disulfide lithium base grease, NLGI No 2 into the knuckle to about 3 fourths of the knuckle

**12. INSTALL KNUCKLE SPINDLE, DUST COVER WITH GASKETS AND DUST SEAL**

(a) Place a new gasket in the position on the knuckle and install the spindle

(b) Place the dust cover, dust seal and a new gasket on the spindle



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(c) Torque the 8 bolts
**Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)**

**13. CONNECT ABS SPEED SENSOR**

Connect the speed sensor and 2 bolts to the steering knuckle
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

**14. INSTALL AXLE HUB (See page SA–9)**

**15. CHECK FRONT WHEEL ALIGNMENT (See page SA–4)**

**16. CHECK ABS SPEED SENSOR SIGNAL (See page DI–190)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

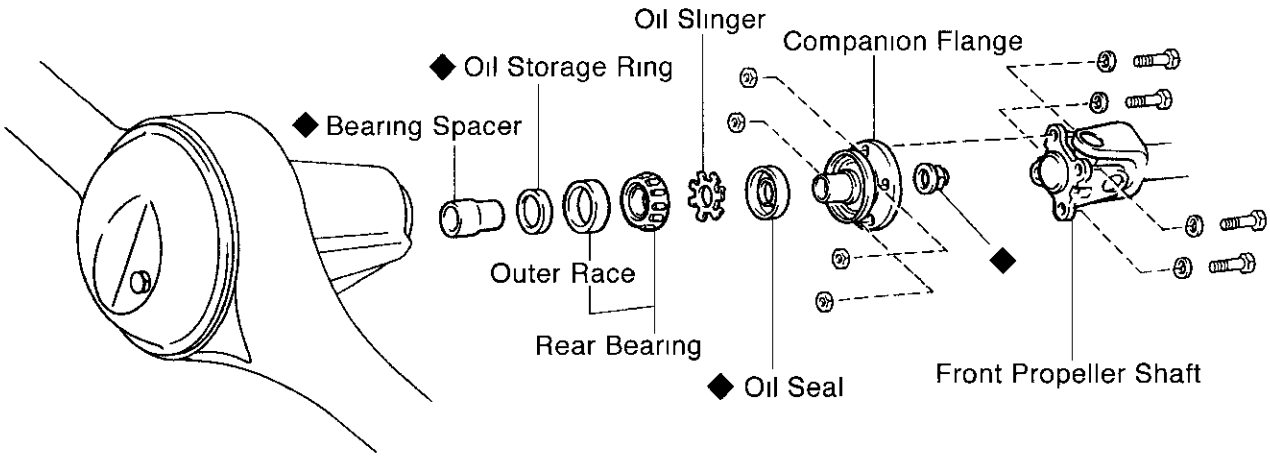
Brought to you by BirfMark



# FRONT DIFFERENTIAL REAR OIL SEAL

SA1UJ-01

## COMPONENTS






Brought to you by BirfMark
Version 1.11 - 03/16/2010

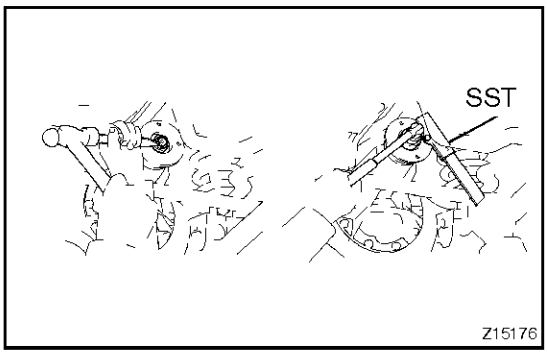
Brought to you by BirfMark



SA1UK 01

# REPLACEMENT

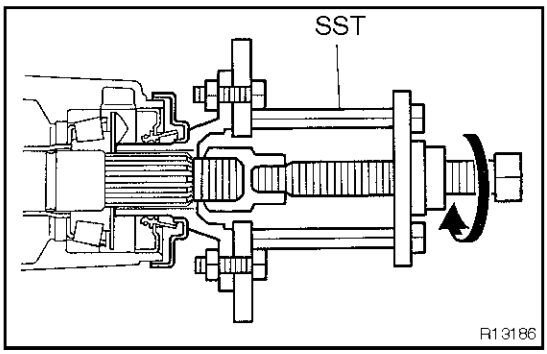
1. DRAIN DIFFERENTIAL OIL
2. REMOVE FRONT PROPELLER SHAFT
(See page PR–3)



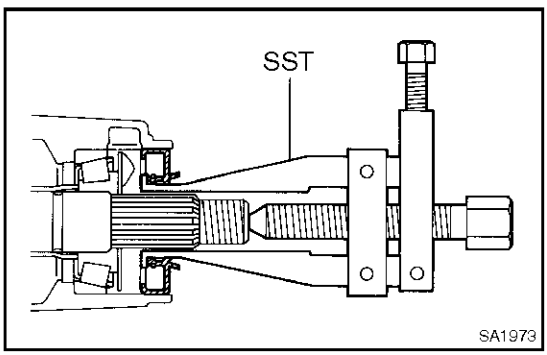

3. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, loosen the staked part of the nut

(b) Using SST to hold the flange, remove the nut and plate washer
SST 09330–00021



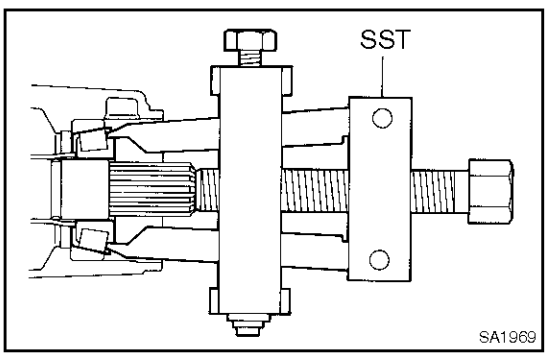

(c) Using SST, remove the companion flange
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)




4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal
SST 09308–10010

(b) Remove the oil slinger




5. REMOVE REAR BEARING

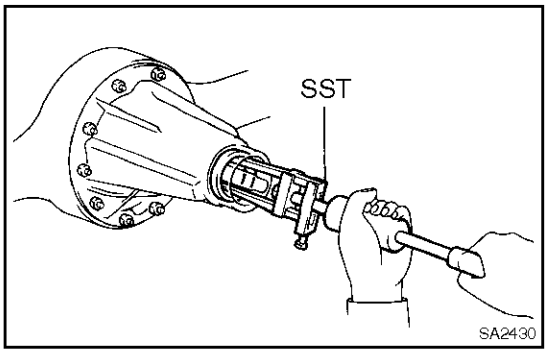
Using SST, remove the rear bearing from the drive pinion
SST 09556–22010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





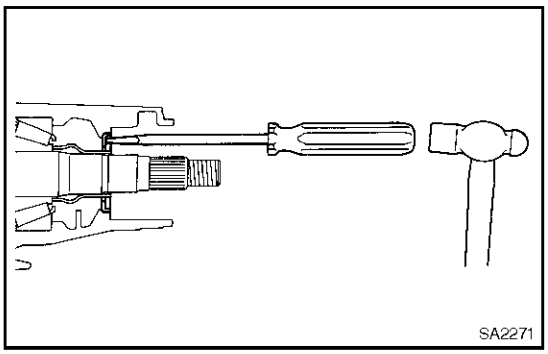

**6. REMOVE REAR BEARING OUTER RACE**

Using SST, remove the bearing outer race

SST 09308–00010

**NOTICE:**

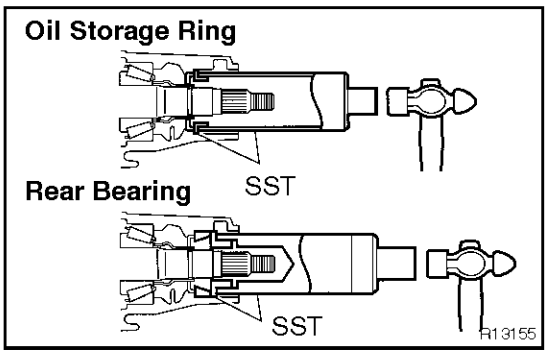
**Do not scratch the taper surface of the outer race.**




**7. REMOVE OIL STORAGE RING**

Using a screwdriver, bend the oil storage ring and drive it out

**8. REMOVE BEARING SPACER**




**9. INSTALL BEARING SPACER**

**10. INSTALL OIL STORAGE RING**

Using SST, install a new oil storage ring

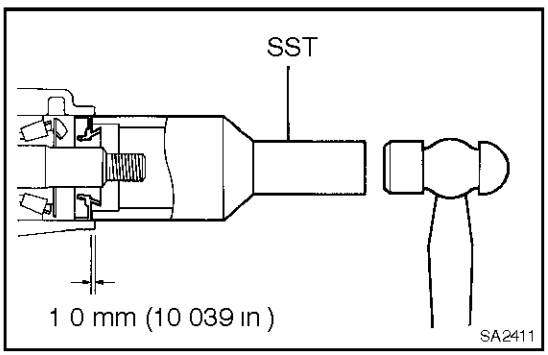
SST 09316–60011 (09316–00011, 09316–00021)

**11. INSTALL REAR BEARING**

(a) Using SST, install the bearing outer race

SST 09316–60011 (09316–00011, 09316–00021)

(b) Install the rear bearing




**12. INSTALL OIL SLINGER AND OIL SEAL**

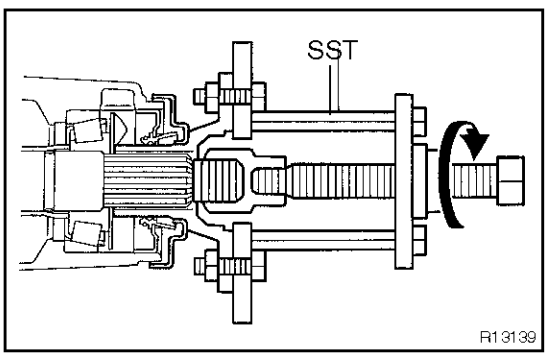
(a) Install the oil slinger

(b) Using SST, install a new oil seal, as shown

SST 09214–76011

**Oil seal drive in depth: 1.0 mm (0.039 in.)**

(c) Coat the lip of the oil seal with MP grease




**13. INSTALL COMPANION FLANGE**

(a) Using SST, install the companion flange on the drive pinion

SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)

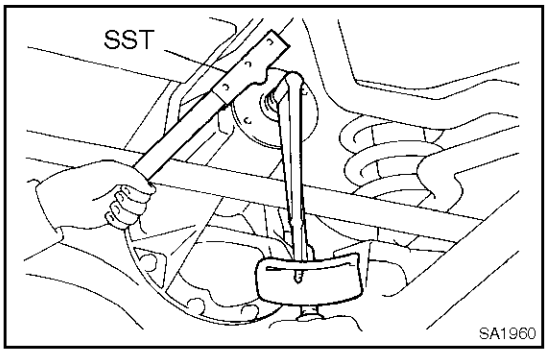
(b) Place the plate washer on the companion flange

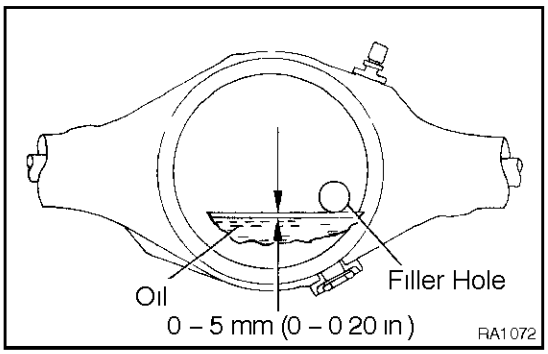


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Apply light coat of gear oil on threads of a new companion flange nut

(d) Using SST to hold the flange, torque the nut
SST 09330–00021
**Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)**

**14. ADJUST DRIVE PINION PRELOAD**
**(See page SA–36)**

**15. STAKE DRIVE PINION NUT**

**16. INSTALL FRONT PROPELLER SHAFT**
**(See page PR–5)**

**17. FILL DIFFERENTIAL WITH GEAR OIL**
**Torque: 49 N·m (500 kgf·cm, 39 ft·lbf)**
**Oil type: Hypoid gear oil API GL–5**
**Recommended oil viscosity:**
**Above –18°C (0°F) SAE 90**
**Below –18°C (0°F) SAE 80W–90 or 80W**
**Capacity:**
**w/o Differential lock:**
**2.80 liters (2.9 US qts, 2.5 Imp. qts)**
**w/ Differential lock:**
**2.65 liters (2.8 US qts, 2.3 Imp. qts)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

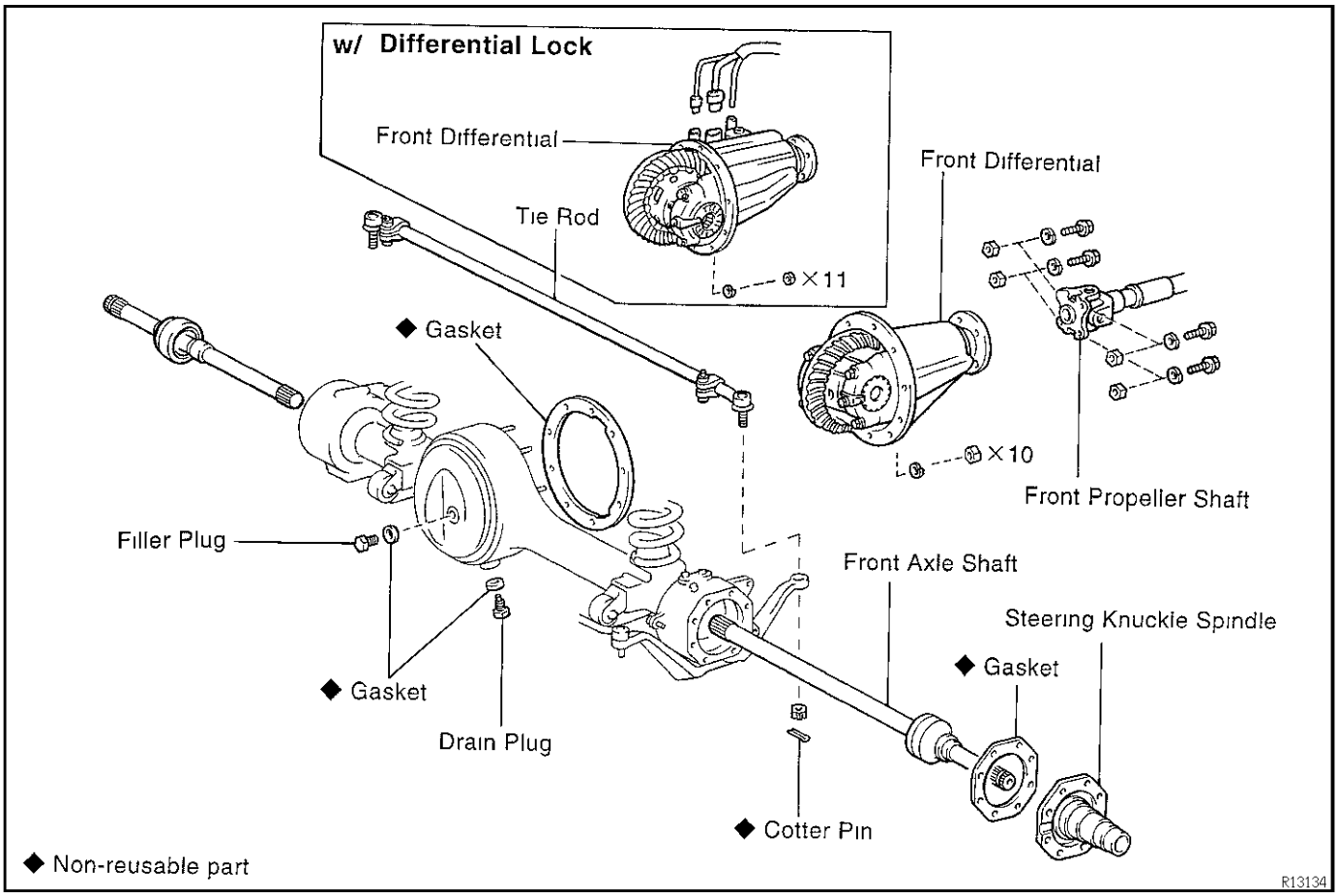
Brought to you by BirfMark



# FRONT DIFFERENTIAL CARRIER

SA1UL 01

## COMPONENTS



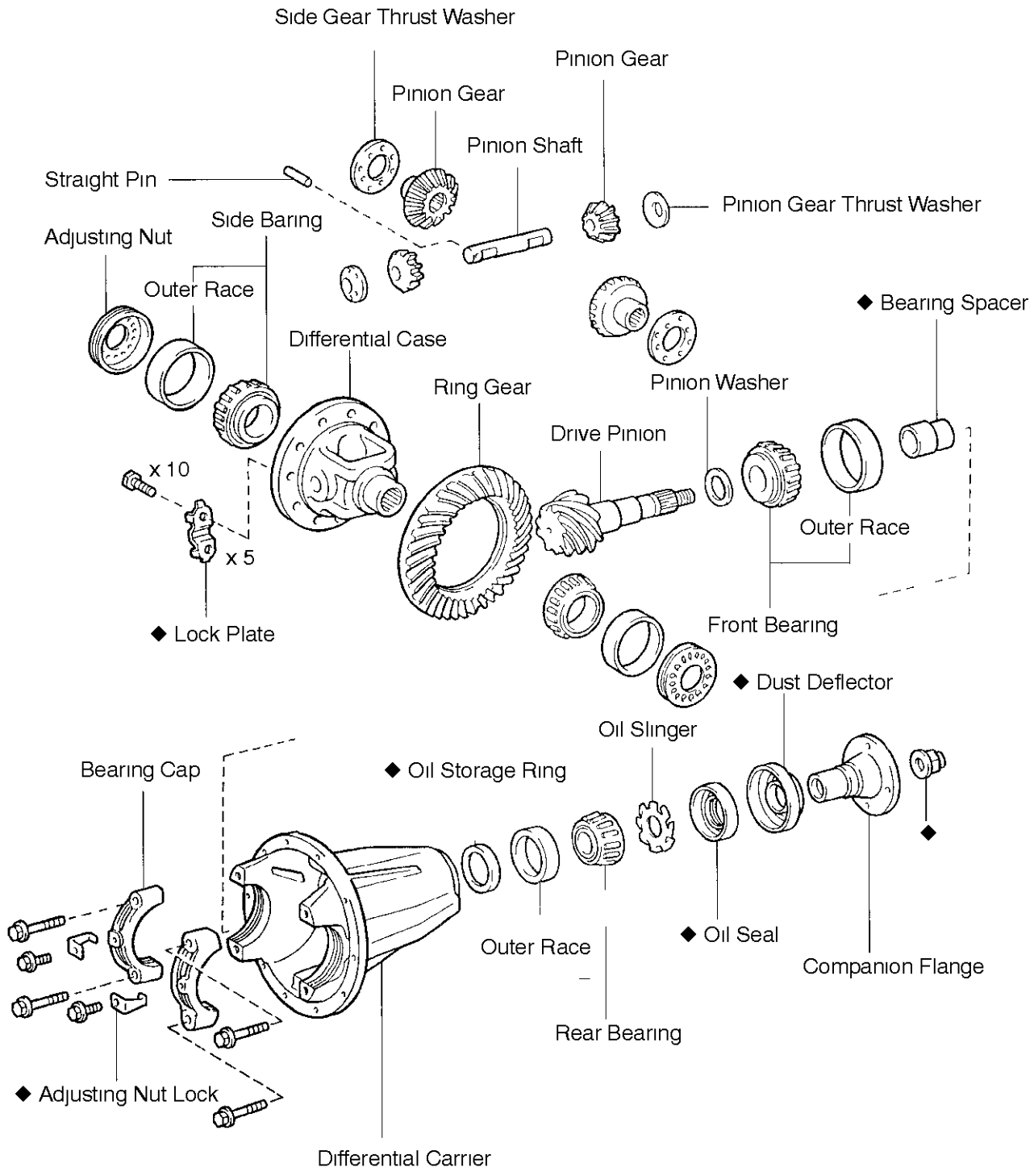



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**w/o Differential Lock**




◆ Non–reusable part

W00530



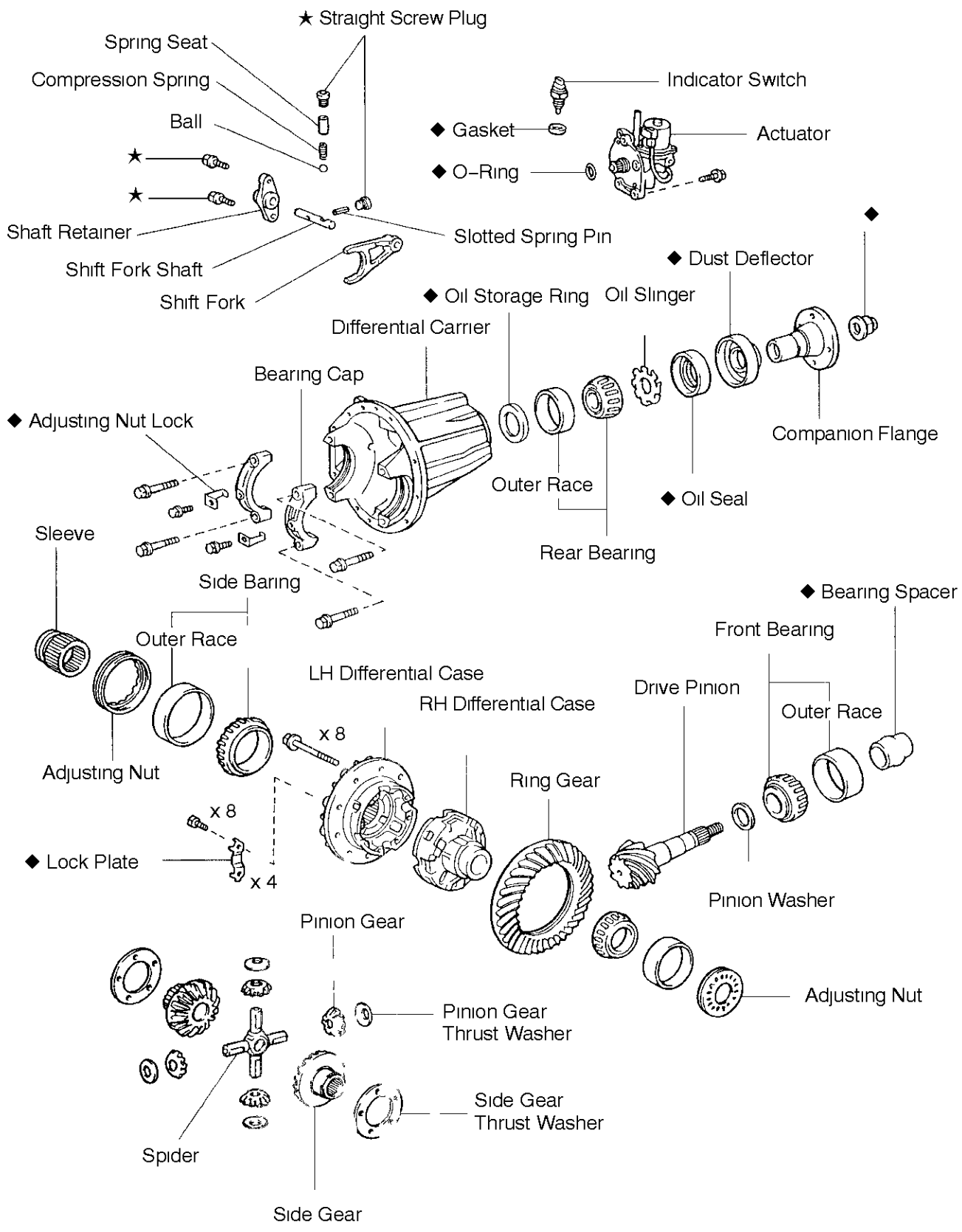
Author : Date : 882

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**w/ Differential Lock**




◆ Non–reusable part
★ Precoated part

W00531

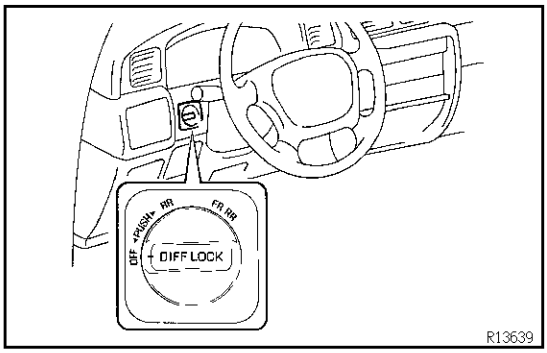


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

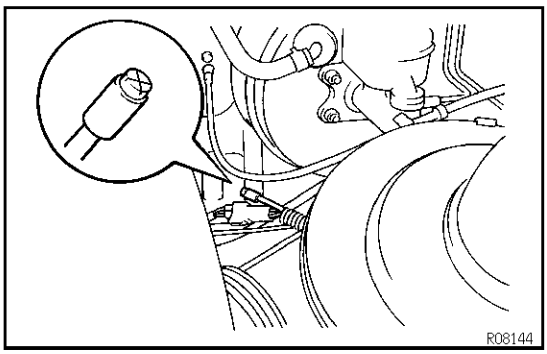


SA1UM 03

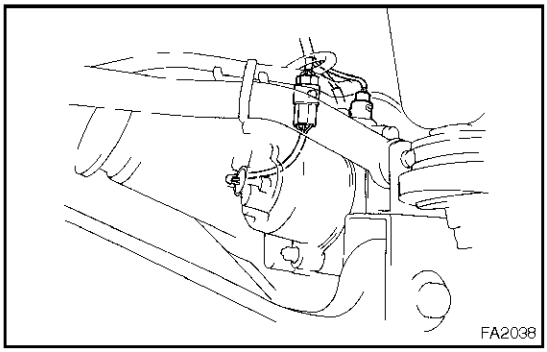



# REMOVAL

1. **w/ DIFFERENTIAL LOCK:**
   **BEFORE REMOVAL, SHIFT FRONT DIFFERENTIAL TO LOCK**
   (a) Turn the ignition switch to the ON position
   (b) Keep the center differential lock condition
   (c) Turn the differential lock control switch to the FR/RR position and lock the front differential
   (d) Rotating the tires, check they are in the differential lock condition




   (e) Disconnect the cable from the negative terminal of the battery
2. **DRAIN DIFFERENTIAL OIL**
3. **REMOVE FRONT AXLE SHAFTS (See page SA–13)**




4. **REMOVE TIE ROD FROM KNUCKLE ARM (See page SA–13)**
5. **REMOVE FRONT PROPELLER SHAFT (See page PR–3)**
6. **w/ DIFFERENTIAL LOCK:**
   **DISCONNECT CONNECTORS AND TUBE**

HINT

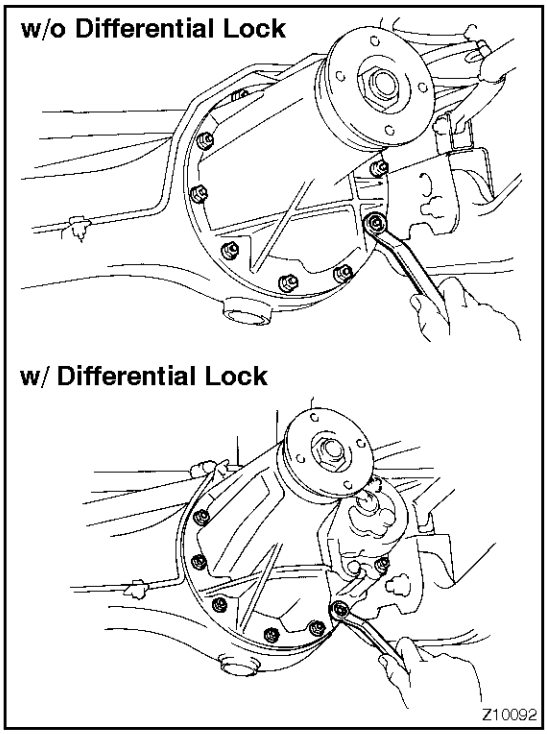
- When connecting the tube of the harness side to the hose of the actuator side, its depth of insertion is 15 mm (0 59 in )
- Take care that water or equivalent does not adhere to the connector and hose



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**7. REMOVE DIFFERENTIAL CARRIER ASSEMBLY**

(a) Remove the 10 nuts, washers and differential carrier assembly

**NOTICE:**

**Be careful not to damage the installation surface.**

**Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)**

(b) Remove the gasket



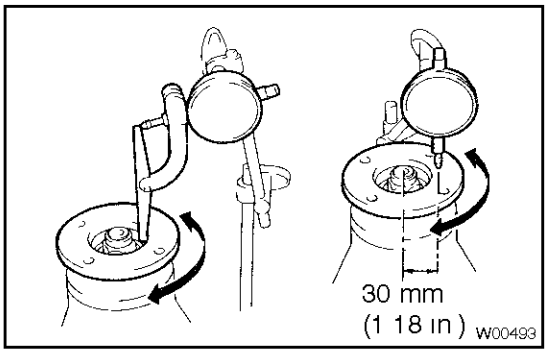
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UN 03

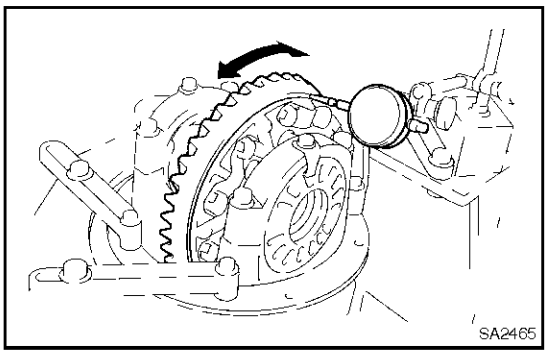
# DISASSEMBLY




### 1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

**Maximum runout: 0.10 mm (0.0039 in.)**

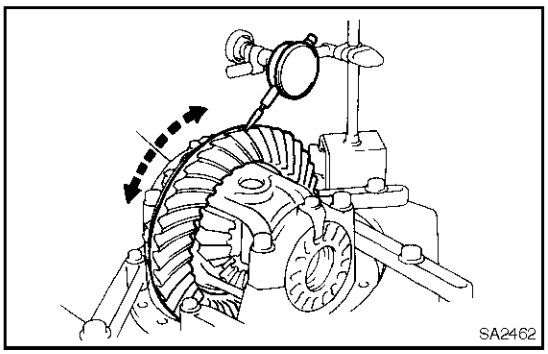



### 2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout

**Maximum runout: 0.10 mm (0.0039 in.)**

If the runout is greater than the maximum, replace the ring gear and driven pinion as a set

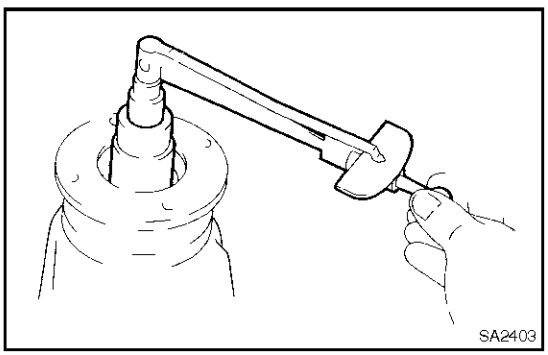



### 3. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash

**Backlash: 0.13–0.18 mm (0.0051–0.0071 in.)**

If the backlash is not within the specification, adjust the side bearing preload or repair as necessary




### 4. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of backlash between the drive pinion and ring gear

**Preload (at starting):**
**0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)**

### 5. CHECK TOTAL PRELOAD

Using a torque wrench, measure the preload

**Total preload (at starting):**
**Drive pinion preload plus**
**0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)**

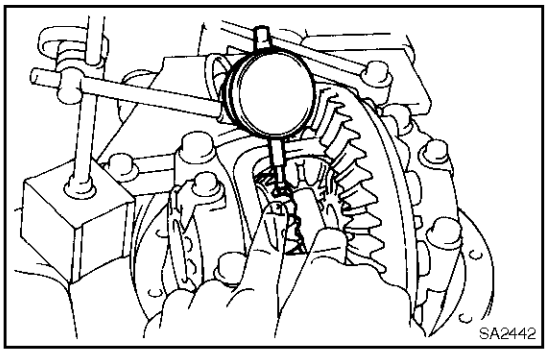
If necessary, disassemble and inspect the differential



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**6. w/o DIFFERENTIAL LOCK:**
**CHECK SIDE GEAR BACKLASH**

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case

**Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)**

If the backlash is not within the specification, install the correct thrust washers (See page SA–35)

**7. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–35)**

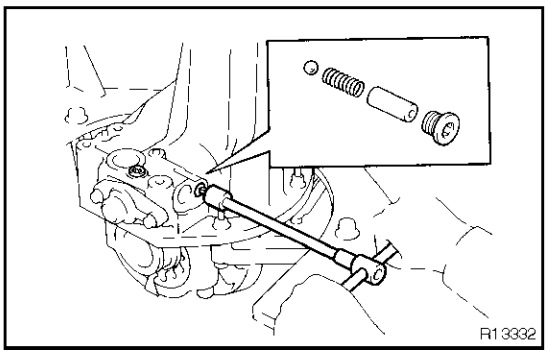
**8. w/ DIFFERENTIAL LOCK:**
**REMOVE ACTUATOR**

(a) Remove the bolt and actuator from the differential carrier

(b) Remove the O–ring

**9. w/ DIFFERENTIAL LOCK:**
**REMOVE INDICATOR SWITCH**

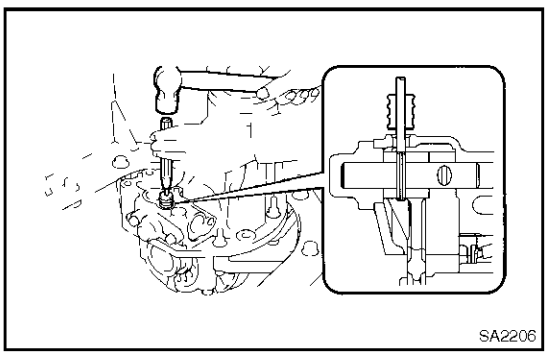
Remove the indicator switch and gasket



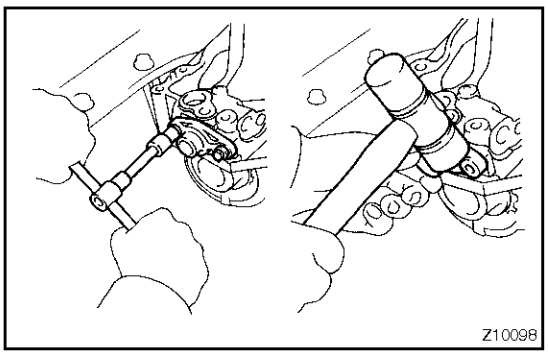

**10. w/ DIFFERENTIAL LOCK:**
**REMOVE SHIFT FORK SHAFT**

(a) Using a hexagon wrench, remove the 2 straight screw plugs

(b) Remove the spring seat, compression spring and ball




(c) Using a pin punch and hammer, remove the slotted spring pin




(d) Remove the 2 bolts from the shaft retainer

(e) Using a plastic hammer, tap out the shaft retainer

(f) Remove the shift fork shaft

HINT

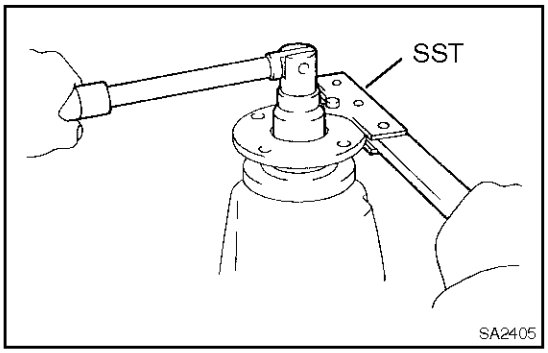
Pull out the shift fork shaft with a screwdriver turned round



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



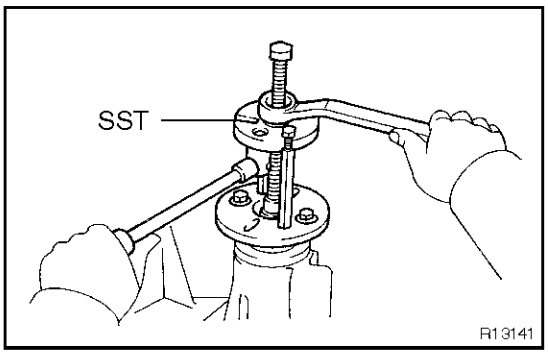



**11. REMOVE COMPANION FLANGE**

(a) Using a chisel and hammer, unstake the nut

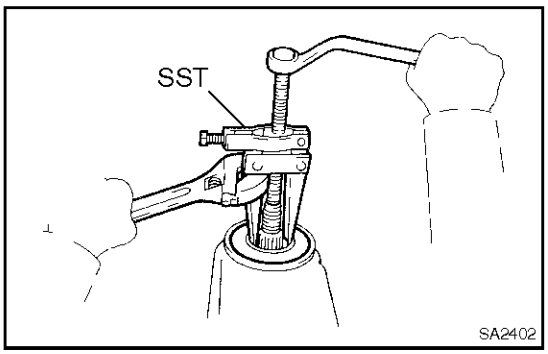
(b) Using SST to hold the flange, remove the nut and plate washer

SST 09330–00021




(c) Using SST, remove the companion flange

SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)

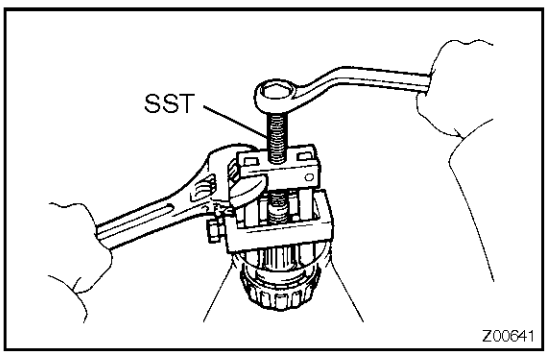



**12. REMOVE OIL SEAL AND OIL SLINGER**

(a) Using SST, remove the oil seal from the differential carrier

SST 09308–10010

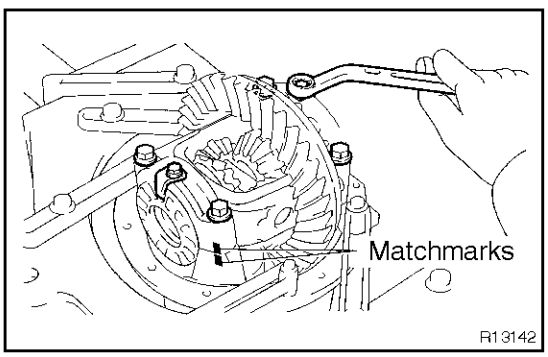
(b) Remove the oil slinger




**13. REMOVE REAR BEARING**

Using SST, remove the rear bearing from the drive pinion

SST 09556–22010




**14. REMOVE DIFFERENTIAL CASE**

(a) Place matchmarks on the bearing cap and differential carrier

(b) Remove the 2 adjusting nut locks

(c) Remove the 4 bolts and 2 bearing caps

(d) w/o Differential lock

Remove the 2 adjusting nuts

(e) w/o Differential lock

Remove the differential case with the side bearing outer races from the carrier



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT

Tag the disassembled parts to show the location for reassembly

(f) w/ Differential lock

Remove the differential case with the side bearing outer race, adjusting nuts and sleeve from the differential carrier

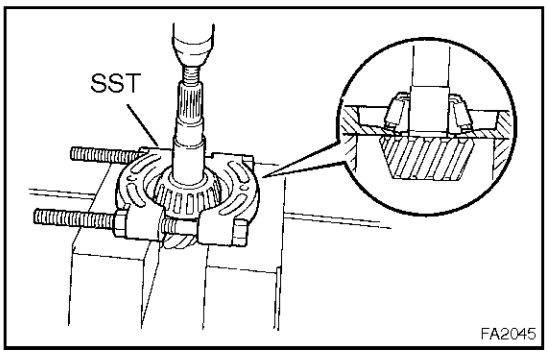
(g) w/ Differential lock

Remove the shift fork

**15. REMOVE DRIVE PINION AND BEARING SPACER**

(a) Remove the drive pinion with the front bearing

(b) Remove the bearing spacer




**16. REMOVE DRIVE PINION FRONT BEARING**

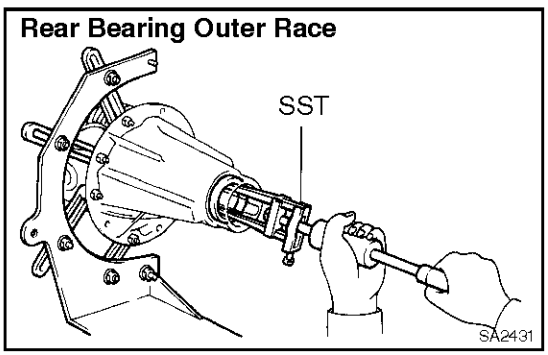
(a) Using SST and a press, remove the bearing from the drive pinion

SST 09950–00020

HINT

If the drive pinion or ring gear are damaged, replace them as a set

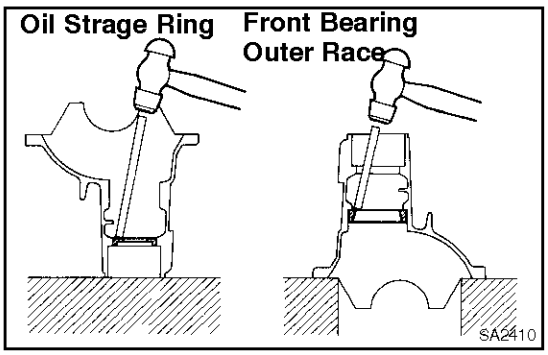
(b) Remove the plate washer from the drive pinion




**17. REMOVE FRONT AND REAR BEARING OUTER RACES AND OIL STORAGE RING**

(a) Using SST, remove the rear bearing outer race

SST 09308–00010




(b) Using a brass bar and hammer, remove the oil storage ring and front bearing outer race

HINT

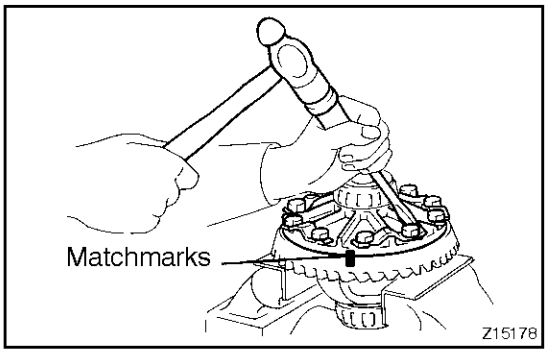
Do not remove the oil storage ring unless replacing it with a new one



Brought to you by BirfMark
Version 1.11 - 03/16/2010

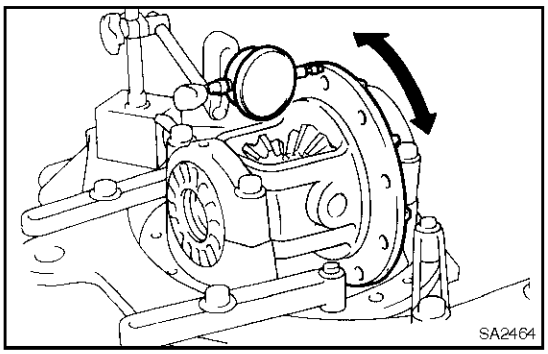
Brought to you by BirfMark






**18. REMOVE RING GEAR**

(a) Using a screwdriver and hammer, unstake the lock plate
(b) Place matchmarks on the ring gear and differential case
(c) Remove the ring gear 10 set bolts and 5 lock plates
(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case

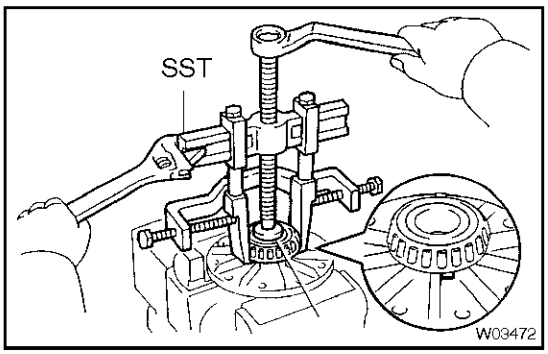



**19. CHECK DIFFERENTIAL CASE RUNOUT**

(a) Install the differential case in the differential carrier and tighten the adjusting nut just to where there is no play in the bearing
(b) Using a dial indicator, measure the differential case runout

**Maximum case runout: 0.07 mm (0.0028 in.)**

(c) Remove the differential case



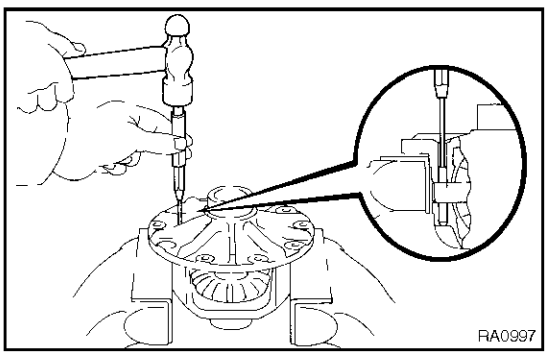

**20. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE**

Using SST, pull the side bearing from the differential case

SST 09950–40010 (09951–04010, 09952–04020, 09953–04020, 09954–04010, 09955–04010, 09957–04010, 09958–04010), 09950–60010 (09951–00480)

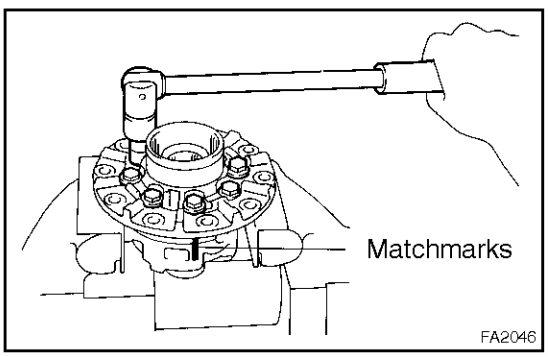
HINT

Fix the claws of SST to the notches in the differential case




**21. w/o DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

(a) Using a pin punch and hammer, remove the straight pin
(b) Remove these parts from the differential case
- Pinion shaft
- 2 Pinion gears
- 2 Pinion gear thrust washers
- 2 Side gears
- 2 Side gear thrust washers




**22. w/ DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

(a) Place matchmarks on the LH and RH cases
(b) Remove the 8 bolts uniformly, a little at a time
(c) Using a plastic hammer, separate the LH and RH cases
(d) Remove these parts from the RH differential case
- 2 Side gears
- 2 Side gear thrust washers
- Spider



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



- 4 Pinion gears
- 4 Pinion gear thrust washers



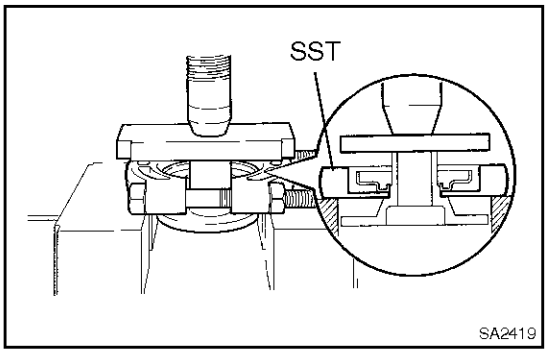
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UO-01

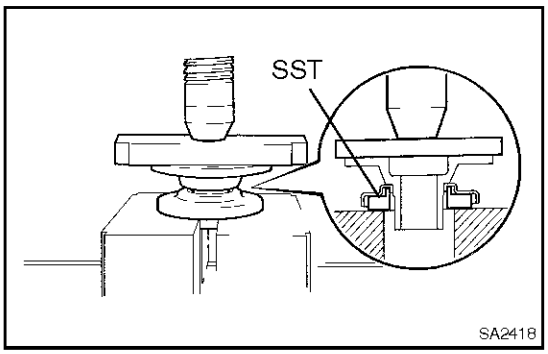
# REPLACEMENT




## 1. REMOVE DUST DEFLECTOR TO COMPANION FLANGE

Using SST and a press, remove the dust deflector

SST 09950–00020




## 2. INSTALL DUST DEFLECTOR TO COMPANION FLANGE

Using SST and a press, install a new dust deflector

SST 09726–40010

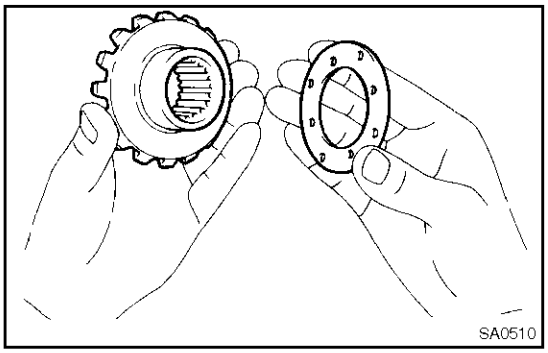


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UP 03




# REASSEMBLY

**1. w/o DIFFERENTIAL LOCK:**
**ASSEMBLE DIFFERENTIAL CASE**

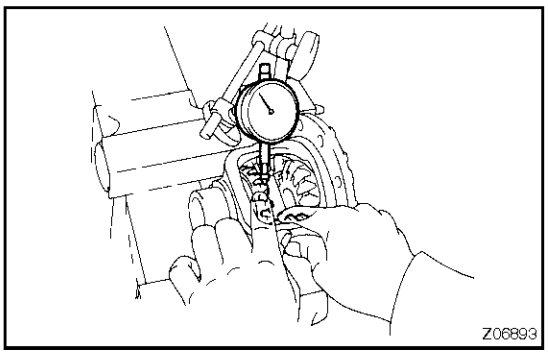
(a) Apply all of the sliding and rotating sufaces with gear oil

(b) Install the 2 thrust washers and side gears
Using the table below, select the thrust washers which will ensure that the backlash is within the specification
Try to select washers of the same size for both sides
**Thrust washer thickness**

| Thickness mm (in ) | Thickness mm (in ) |
|---|---|
| 1 60 (0 063) | 80 (0 071) |
| 1 70 (0 067)1 | – |

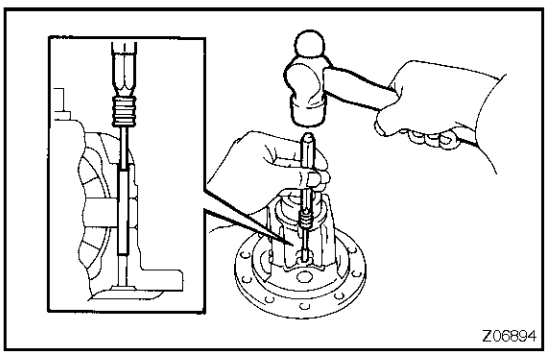
(c) Install the 2 side gears with the side gears thrust washers, 4 pinion gears, pinion gear thrust washers and pinion shaft

HINT
Align the hole for the pinion shaft with the case hole



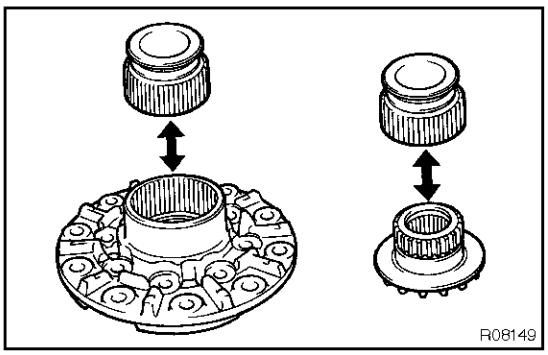

(d) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case
**Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)**

If the backlash is not within the specification, install a thrust washer of different thickness




(e) Using a pin punch and hammer, install the straight pin through the holes in the differential case and pinion shaft

(f) Using a chisel and hammer, stake the out side of the differential case pin hole




**2. w/ DIFFERENTIAL LOCK:**
**INSPECT SLEEVE**

(a) Install the sleeve to the differential case (LH) and check it moves smoothly

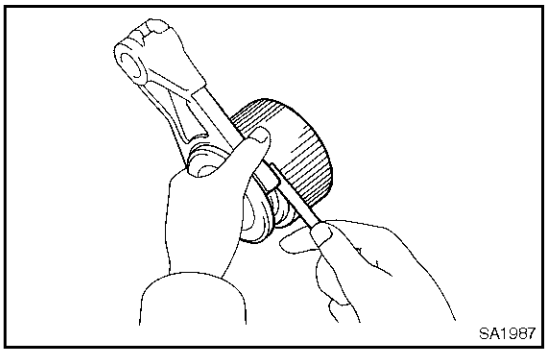
(b) Install the sleeve to the side gear check it moves smoothly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

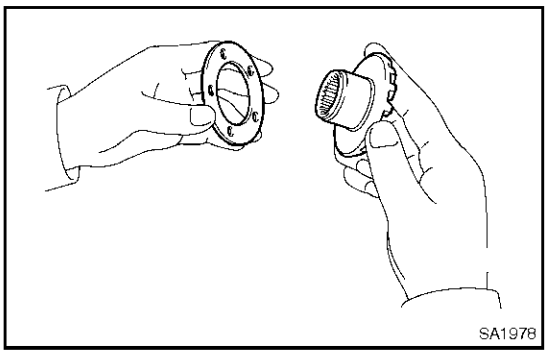



SA1987

**3. w/ DIFFERENTIAL LOCK:**
**MEASURE CLEARANCE OF SHIFT FORK AND SLEEVE**

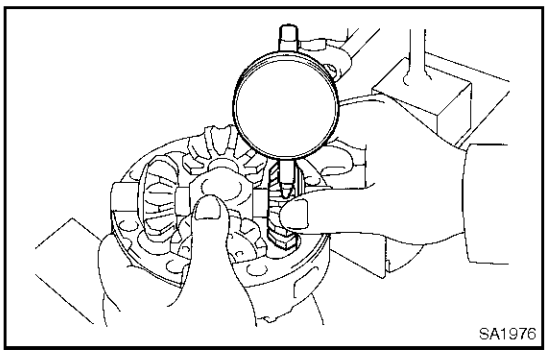
Using a feeler gauge, measure the clearance between the shift fork and sleeve

**Clearance:**
**0.15 – 0.35 mm (0.006 – 0.014 in.)**


SA1978

**4. w/ DIFFERENTIAL LOCK:**
**ASSEMBLE DIFFERENTIAL CASE**

(a) Apply all of the sliding and rotating sufaces with gear oil
(b) Install the side gear thrust washer to the side gear
(c) Install the side gear to the RH case
(d) Install the 4 pinion gears and pinion gear thrust washers to the spider
(e) Install the pinion gear with the spider to the RH case


SA1976

(f) Using a dial indicator, holding the side gear and spider and measure the side gear backlash
**Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)**

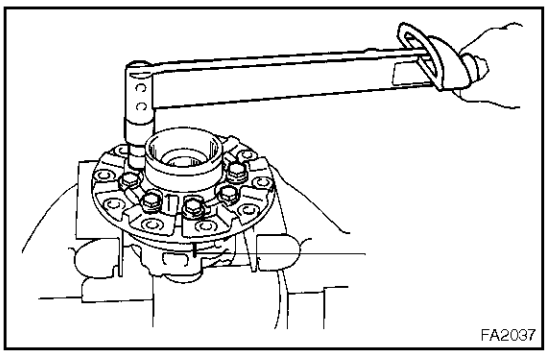
HINT
- Measure at all 4 locations
- Measure the backlash at the RH case and at the LH case

If the backlash is not within the specification, install a thrust washer of a different thickness

**Thrust washer thickness**

| Thickness mm (in.) | Thickness mm (in.) |
|---|---|
| 0.9 (0.035) | 1.2 (0.047) |
| 1.0 (0.039) | 1.3 (0.051) |
| 1.1 (0.043) | – |

(g) Install the side gear and side gear thrust washer to the RH case
(h) Install the pinion gears and spider to the RH case
(i) Install the side gear and side gear thrust washer to the RH case
(j) Align the matchmarks on the LH and RH cases


FA2037

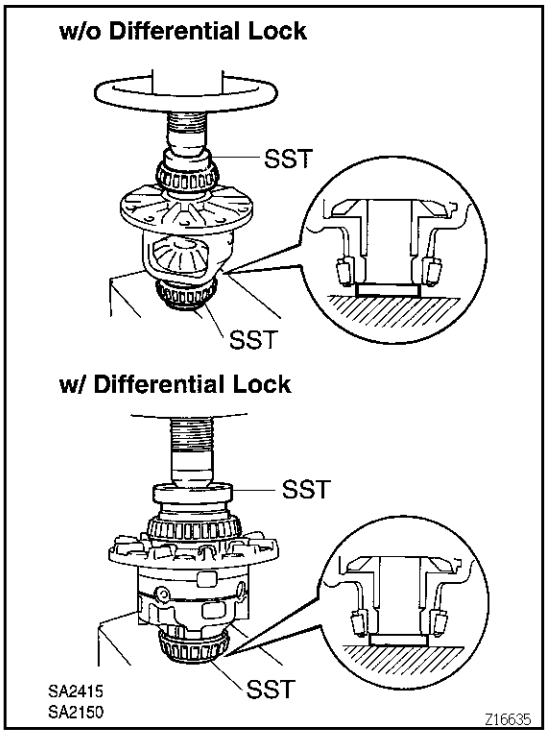
(k) Torque the 8 bolts uniformly, a little at a time
**Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

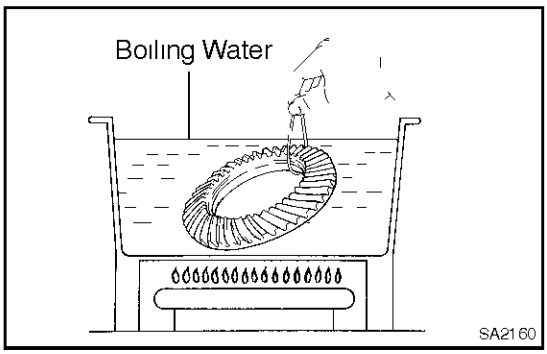
Brought to you by BirfMark






**5. INSTALL SIDE BEARINGS**

- w/o Differential lock
  Using SST and a press, install the 2 side bearings on the differential case
  SST 09950–60010 (09951–00480)
- w/ Differential lock
  Using SST and a press, install the 2 side bearings on the differential case
  SST 09223–15020, 09950–60010 (09951–00480)




**6. INSTALL RING GEAR ON DIFFERENTIAL CASE**

(a) Clean the contact surfaces of the differential case and ring gear

(b) Heat the ring gear to about 100°C (212°F) in boiling water

(c) Carefully remove the ring gear from the water

(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case

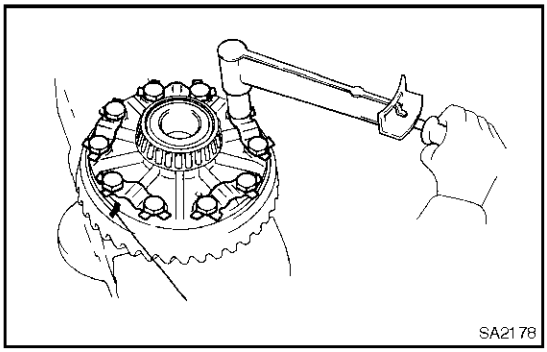
(e) Align the matchmarks on the ring gear and differential case

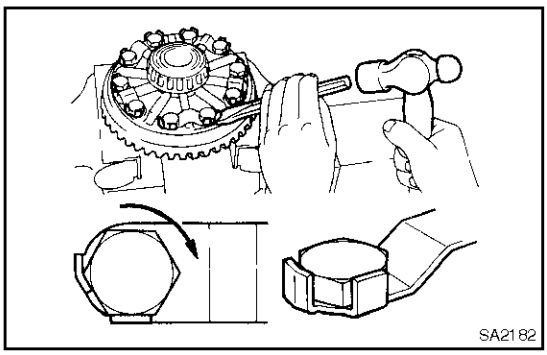
(f) Temporarily install new 5 lock plates and 10 set bolts

**NOTICE:**

**The ring gear set bolts should not tighten until the ring gear has cooled sufficiently.**

(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time
**Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)**




(h) Using a drift punch and hammer, stake the lock plates

HINT

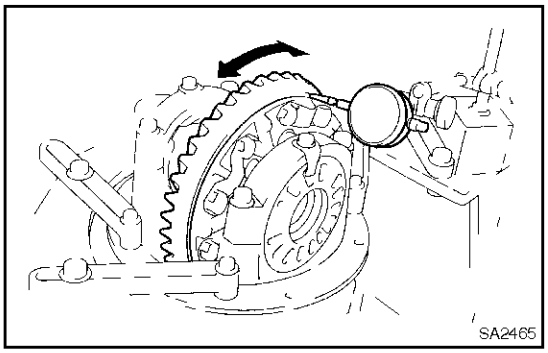
Stake one claw flush with the flat surface of the bolt For the claw contacting the protruding portion of the bolt, stake only the half on the tightening side



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





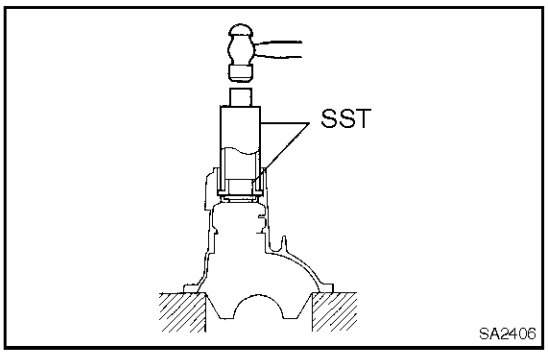

**7. CHECK RING GEAR RUNOUT**

(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings

(b) Using a dial indicator, check the ring gear runout

**Maximum runout: 0.10 mm (0.0039 in.)**

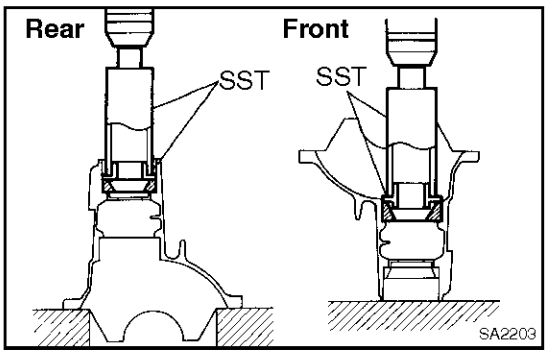
(c) Remove the differential case




**8. INSTALL OIL STORAGE RING**

Using SST and a hammer, install a new oil storage ring

SST 09316–60011 (09316–00011, 09316–00021)




**9. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES**

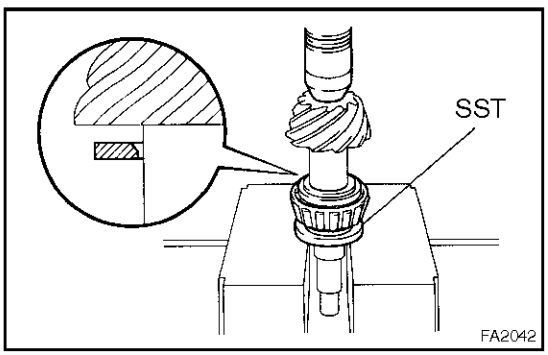
- Front side

  Using SST and a press, install the 2 outer races

  SST 09316–60011 (09316–00011, 09316–00051)
- Rear side

  Using SST and a press, install the 2 outer races

  SST 09316–60011 (09316–00011, 09316–00021)

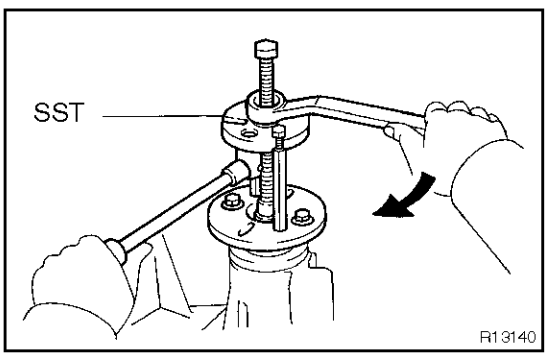



**10. INSTALL DRIVE PINION FRONT BEARING**

(a) Install the plate washer on the drive pinion with the chamfered end facing the pinion gear

(b) Using SST and a press, install the front bearing onto the drive pinion

SST 09506–30012




**11. TEMPORARILY ADJUST DRIVE PINION PRELOAD**

(a) Install the drive pinion, rear bearing and oil slinger

HINT

Assemble the spacer and oil seal after adjusting the gear contact pattern

(b) Install the companion flange with SST

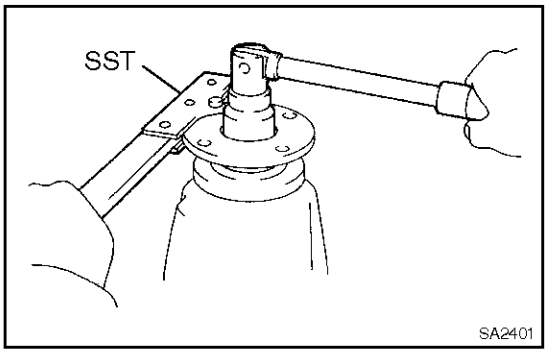
SST 09550–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

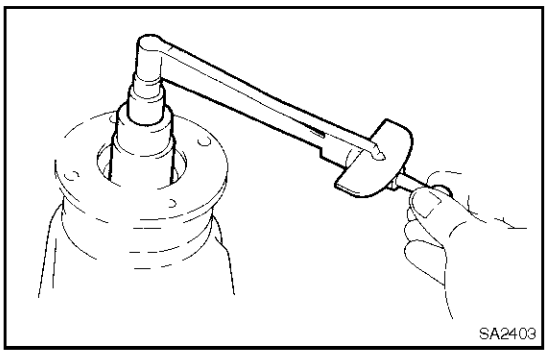
Brought to you by BirfMark






(c) Adjust the drive pinion preload by tightening the companion flange nut
Using SST to hold the flange, tighten the nut
SST 09330–00021

**NOTICE:**
**As there is no spacer, tighten a little at a time, being careful not to overtighten.**




(d) Using a torque wrench, measure the preload
**Preload (at starting):**
**New bearing**
**0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)**
**Reused bearing**
**0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)**

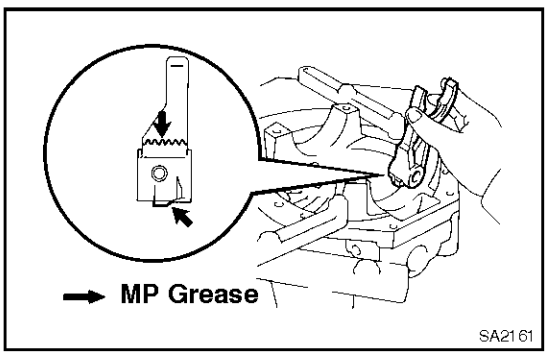
HINT
Measure the total preload after first turning the bearing clockwise and counterclockwise several times to mark the bearing smooth

**12. w/o DIFFERENTIAL LOCK:**
**INSTALL DIFFERENTIAL CASE IN CARRIER**

(a) Place the bearing outer races on their respective bearings Make sure the left and right outer races are not interchanged

(b) Install the case in the carrier

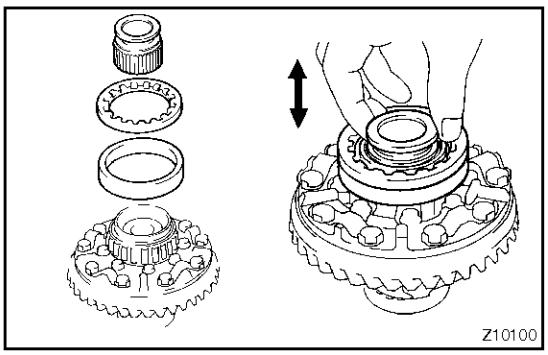
HINT
Make sure that there is backlash between the ring gear and drive pinion




**13. w/ DIFFERENTIAL LOCK:**
**INSTALL DIFFERENTIAL CASE IN CARRIER**

(a) Apply MP grease on the rack of the shift fork and connecting part of the indicator switch

(b) Insert the shift fork into the differential carrier, as shown




(c) Install outer races, adjusting nuts and left side to sleeve

HINT
Check that the sleeve moves smoothly

(d) Install the shift fork in the groove of the sleeve holding it by hand and install the case in the carrier

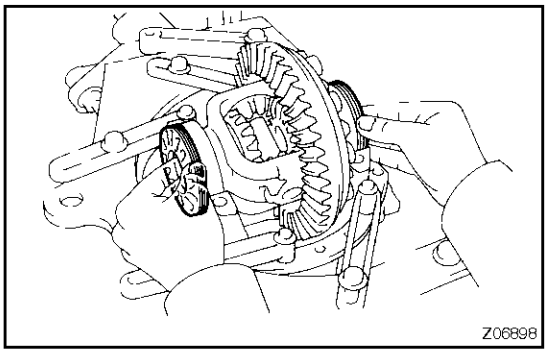
HINT
Make sure that there is backlash between the ring gear and drive pinion



Brought to you by BirfMark
Version 1.11 - 03/16/2010

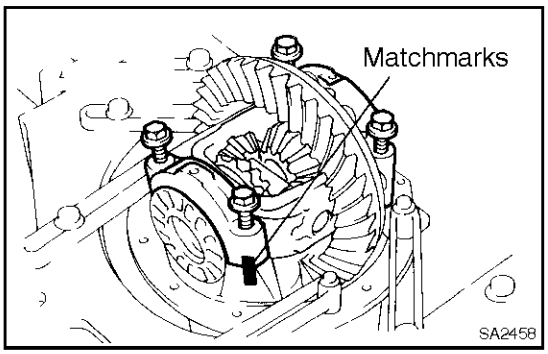
Brought to you by BirfMark






**14. w/o DIFFERENTIAL LOCK: INSTALL ADJUSTING NUTS**

Install the adjusting nuts on the carrier, making sure the nuts are threaded properly



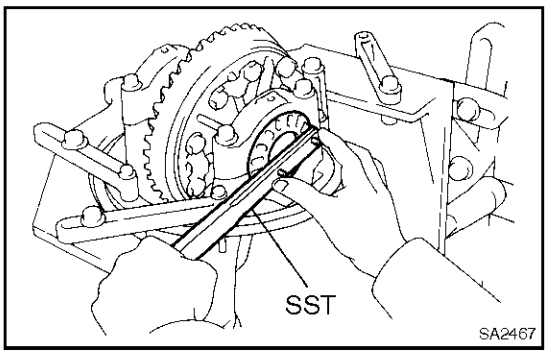

**15. INSTALL BEARING CAPS**

Align the matchmarks on the cap and carrier Screw in the 2 bearing cap bolts 2 or 3 turns and press down the bearing cap by hand

HINT

If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly

Reinstall the adjusting nuts if necessary




**16. ADJUST SIDE BEARING PRELOAD**

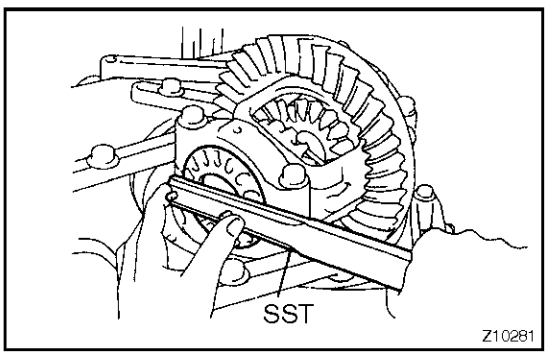
(a) Torque the 4 bearing cap bolts to the specified torque, and loosen them to the point where the adjusting nuts can be turned by SST

SST 09504–00011

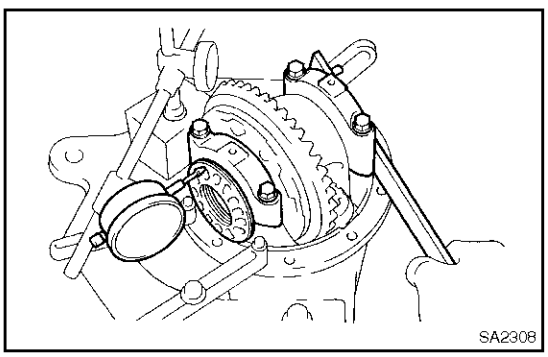
**Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)**

(b) Fully tighten the 4 bearing cap bolts by hand

(c) Using the SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0 2 mm (0 008 in )




(d) With turning the ring gear, use the SST to fully tighten the adjusting nut on the drive pinion side After the bearings are settled, loosen the adjusting nut on the drive pinion side




(e) Place a dial indicator on the top of the adjusting nut on the ring gear side

(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move

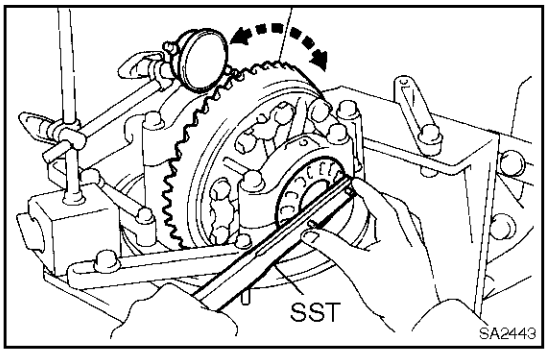
(g) Torque the adjusting nut 1 – 1 5 notches from the zero preload position



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



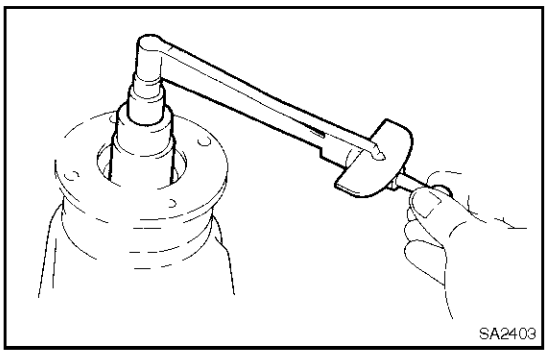



(h) Using a dial indicator, adjust the ring gear backlash until it is within the specification
**Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)**

HINT

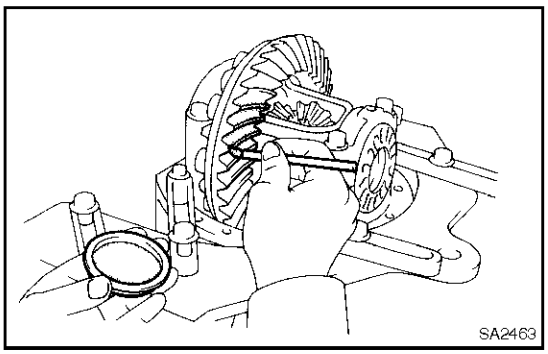
The backlash is adjusted by turning the left and right adjusting nuts equal amounts For example, loosen the nut on the left side one notch and torque the nut on the right side one notch

(i) Torque the 4 bearing cap bolts
**Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)**




(j) Recheck the ring gear backlash
**Backlash: 0.13–0.18 mm (0.0051–0.0071 in.)**

(k) Using a torque wrench, measure the preload
**Total preload (at starting):**
**Drive pinion preload plus**
**0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)**

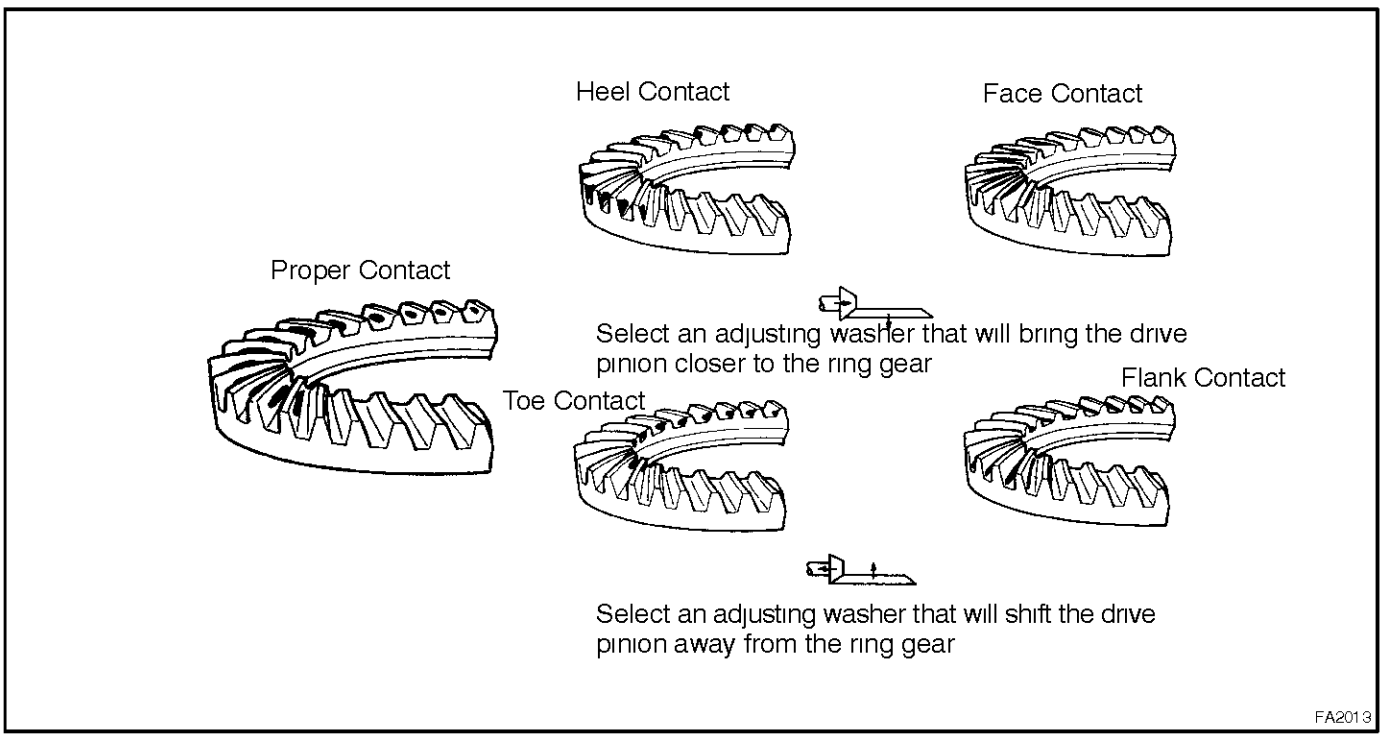



**17. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**

(a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead

(b) Hold the companion flange firmly and rotate the ring gear in both directions

(c) Inspect the tooth pattern

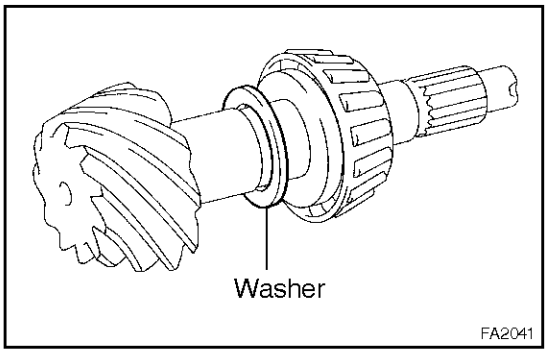





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



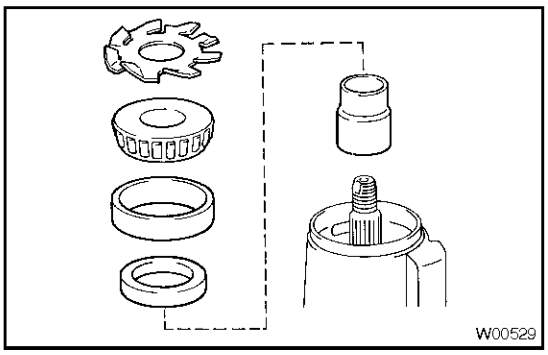



If the teeth are not contacting properly, use the following chart to select a proper washer for correction

**Washer thickness**

| Thickness mm (in.) | Thickness mm (in.) |
|---|---|
| 1.70 (0.0669) | 2.03 (0.0799) |
| 1.73 (0.0681) | 2.06 (0.0811) |
| 1.76 (0.0693) | 2.09 (0.0823) |
| 1.79 (0.0705) | 2.12 (0.0835) |
| 1.82 (0.0717) | 2.15 (0.0846) |
| 1.85 (0.0728) | 2.18 (0.0858) |
| 1.88 (0.0740) | 2.21 (0.0870) |
| 1.91 (0.0752) | 2.24 (0.0882) |
| 1.94 (0.0764) | 2.27 (0.0894) |
| 1.97 (0.0776) | 2.30 (0.0906) |
| 2.00 (0.0787) | 2.33 (0.0917) |

**18. REMOVE COMPANION FLANGE (See page SA–29)**




**19. REMOVE OIL SLINGER AND REAR BEARING**

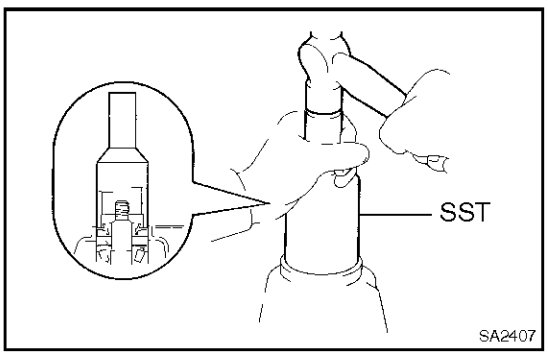
**20. REMOVE REAR BEARING OUTER RACE AND OIL STORAGE RING (See page SA–29)**

**21. INSTALL BEARING SPACER AND REAR BEARING**

(a) Install a new bearing spacer on the shaft

(b) Install a new oil storage ring and rear bearing outer race (See page SA–29)

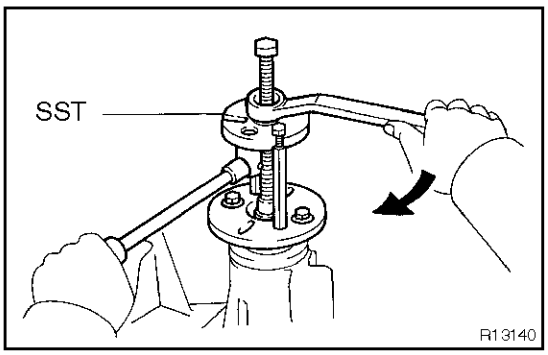
(c) Install the rear bearing and oil slinger




**22. INSTALL OIL SEAL**

(a) Using SST, install a new oil seal, as shown
SST 09214–76011
**Oil seal drive in depth: 1.0 mm (0.039 in.)**

(b) Apply MP grease to the oil seal lip




**23. INSTALL COMPANION FLANGE**

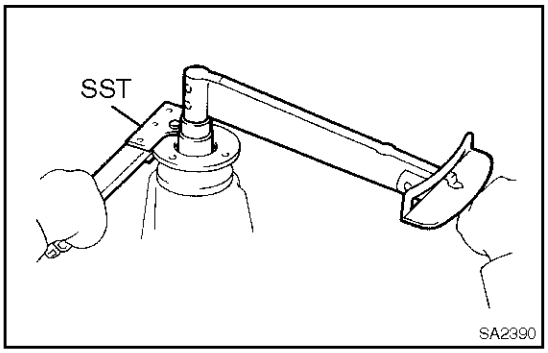
(a) Install the companion flange with SST
SST 09550–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Install the plate washer and a new nut

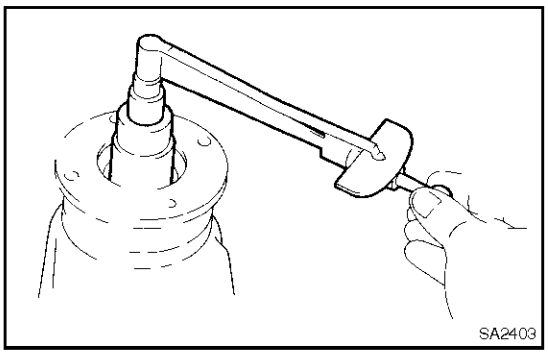
HINT

Coat the threads of a new nut with gear oil

(c) Using SST to hold the flange, tighten the nut

SST 09330–00021

**Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)**




**24. ADJUST DRIVE PINION PRELOAD**

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear

**Preload (at starting):**

**New bearing:**

**0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)**

**Reused bearing:**

**0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)**

If the preload is greater than the specification, replace the bearing spacer

If the preload is less than the specification, retighten the nut a little at a time with a torque of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached

**Maximum torque: 343 N·m (3,500 kgf·cm, 253 ft·lbf)**

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure

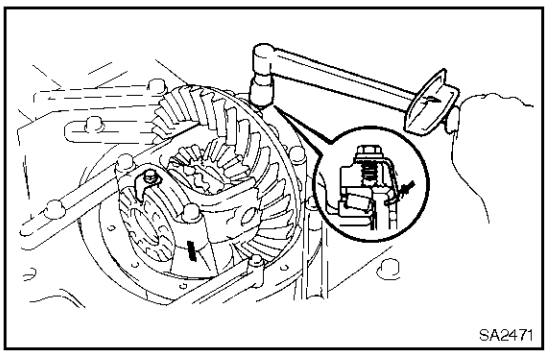
Do not back off the pinion nut to reduce the preload

**25. RECHECK RING GEAR BACKLASH**

**26. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**

**27. CHECK RUNOUT OF COMPANION FLANGE**

**28. STAKE DRIVE PINION NUT**




**29. INSTALL ADJUSTING NUT LOCKS**

(a) Install 2 new nut locks on the bearing caps

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

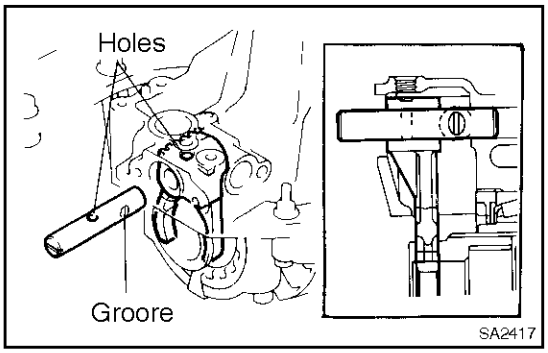
(b) After tightening bolts, bend the nut locks



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

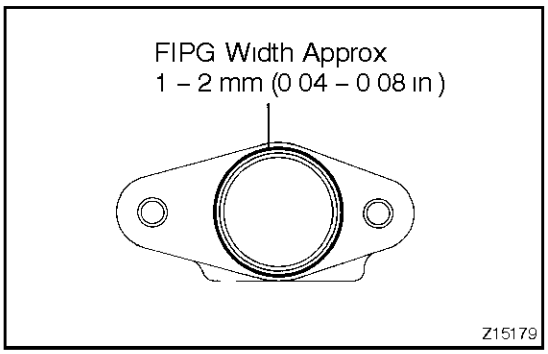





**30. w/ DIFFERENTIAL LOCK:**
**INSTALL SHIFT FORK SHAFT**

(a) Apply MP grease onto the outer circuit of the fork shaft

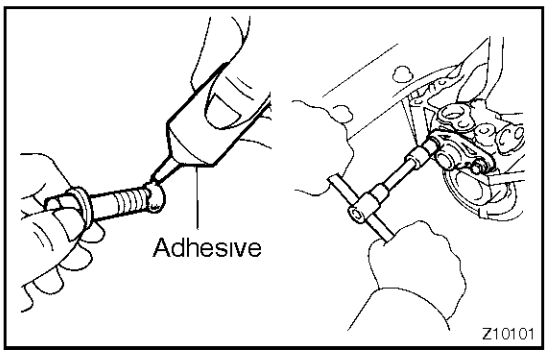
(b) Install the fork shaft to match the hole of the shift fork and that of the shift fork shaft




(c) Remove any FIPG material and be careful not to drop oil on the contacting surface of the differential carrier and shaft retainer

(d) Apply FIPG to the carrier, as shown
**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

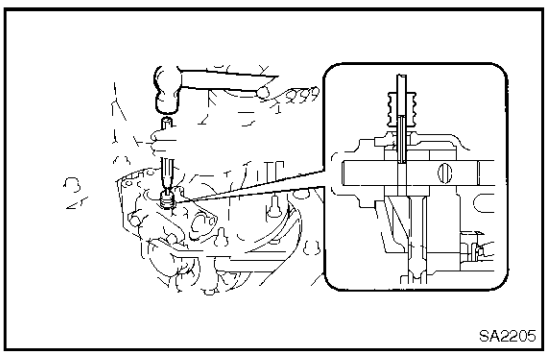
HINT
Install the shaft retainer within 10 minutes after applying FIPG



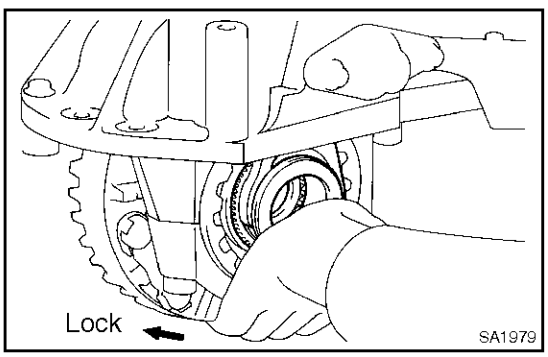

(e) Clean the threads of the bolts and retainer bolts holes with toluene or trichlorethylene

(f) Apply adhesive to 2 or 3 threads of the mount bolt end
**Adhesive: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

(g) Tighten the shaft retainer with the 2 bolts
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




(h) Using a pin punch and hummer, install the slotted spring pin to the shift fork



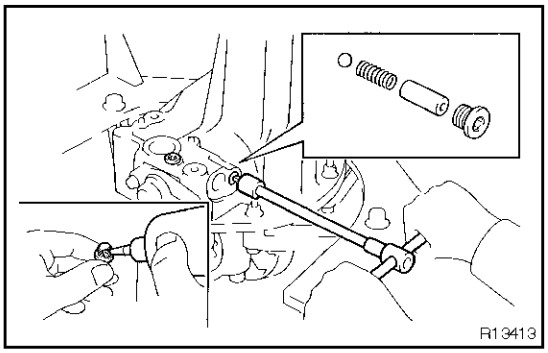

(i) Shift the fork deeply and keep the differential lock condition



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(j) Install the ball, compression spring and spring seat

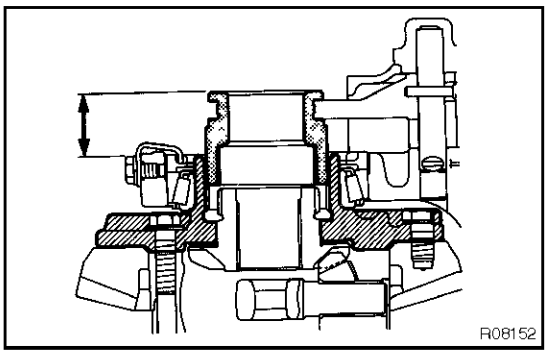
(k) Clean the threads of 2 plugs and plug holes with toluene or trichloroethylene

(l) Apply adhesive to the plug threads

**Adhesive: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

(m) Using a hexagon wrench, install and tighten the screw plugs

**Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)**



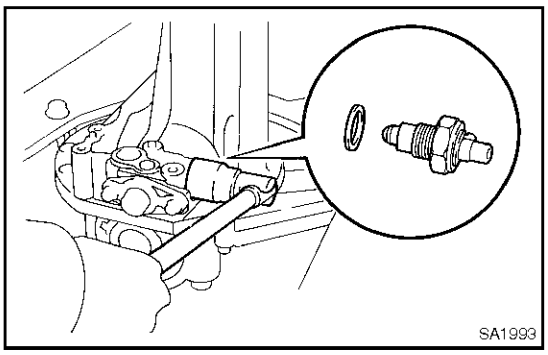

**31. w/ DIFFERENTIAL LOCK:**
**MEASURE DISTANCE BETWEEN SLEEVE AND DIFFERENTIAL CASE END SIDE**

Measure distance between the sleeve and tip of the differential case when differential is free and locked

**Standard distance:**

**LOCK: 17.44 – 18.86 mm (0.6866 – 0.7425 in.)**

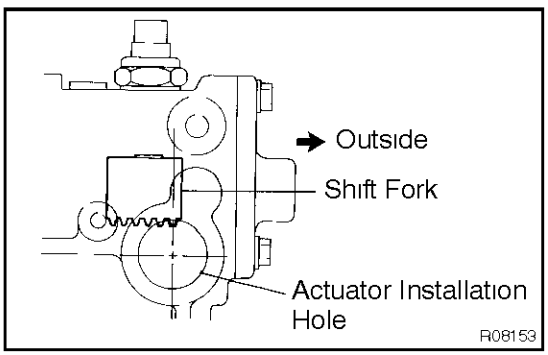
**FREE: 32.40 – 33.90 mm (1.2756 – 1.3346 in.)**




**32. w/ DIFFERENTIAL LOCK:**
**INSTALL INDICATOR SWITCH**

Install the indicator switch with a new gasket

**Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)**




**33. w/ DIFFERENTIAL LOCK:**
**INSTALL ACTUATOR**

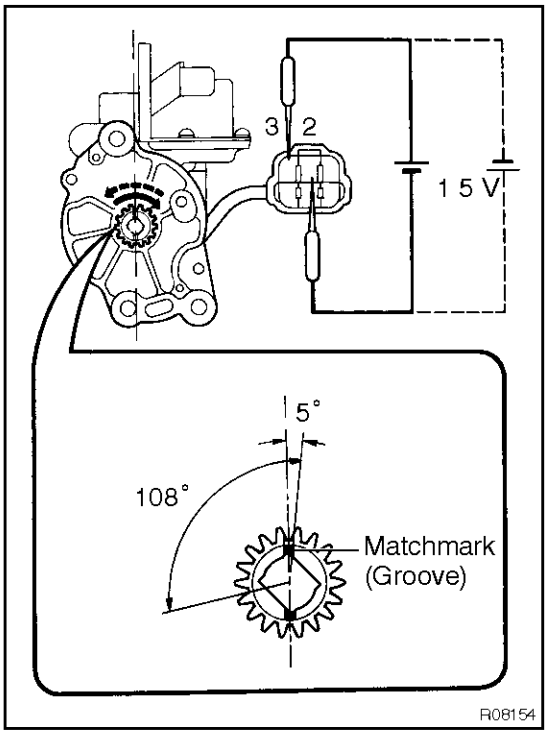
(a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole



Brought to you by BirfMark
Version 1.11 - 03/16/2010

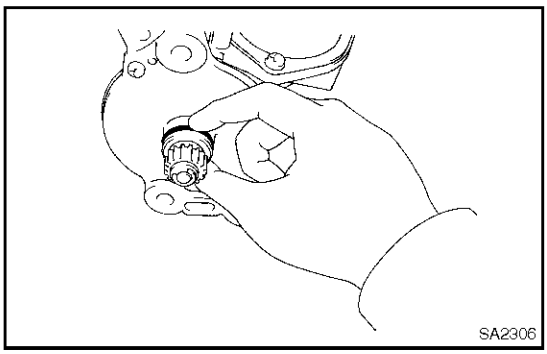
Brought to you by BirfMark



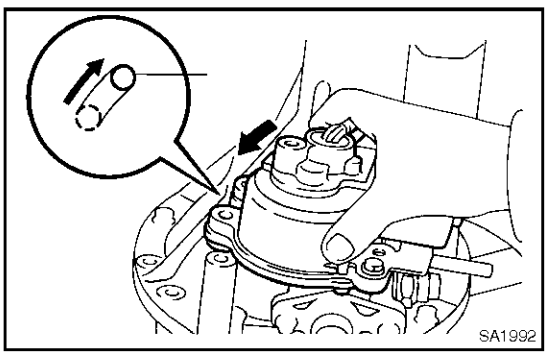



(b) Ensure that the matchmarks of the pinion of the actuator is in the extent between zero and 5 degrees clockwise above the center line of the actuator

If the matchmarks is not in this extent, rotate the pinion to be matched Do not supply the battery positive voltage directly between terminals If the matchmarks come to the extension limit of the rotation, do not electrify moreover




(c) Install a new O–ring to the actuator
(d) Apply a light coat of gear oil on the O–ring
(e) Apply MP grease to the gear part

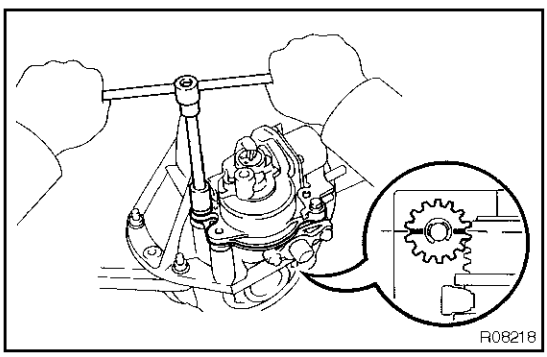



(f) Insert the actuator so that the long hole on the actuator side fits with the knock pin on the carrier side

HINT

Do not damage the O–ring of the actuator

(g) Align the actuator with the long hole and rotate the actuator counterclockwise when the knock pin reaches the right–hand side




(h) Install the actuator to the differential carrier with the bolt so that the outermost rack tooth of the shift fork will fit the matchmarks of the pinion of the actuator
**Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UQ-01

# INSTALLATION

**Installation is in the reverse order of removal (see page SA–27).**

HINT

- w/ differential lock
  Before installation, check differential lock operation connecting the connector of the actuator to the connector of the vehicle side
- w/ differential lock
  Before installation, check that the sleeves on work with switching over the differential lock control switch
  After checking, lock the front differential
- After installation, fill the differential with gear oil (See page SA–27)
- w/ differential lock
  After installation, check that the bleeder plug at the point of the bleeder tube (inside of the engine room) is not damaged or worn



Brought to you by BirfMark
Version 1.11 - 03/16/2010

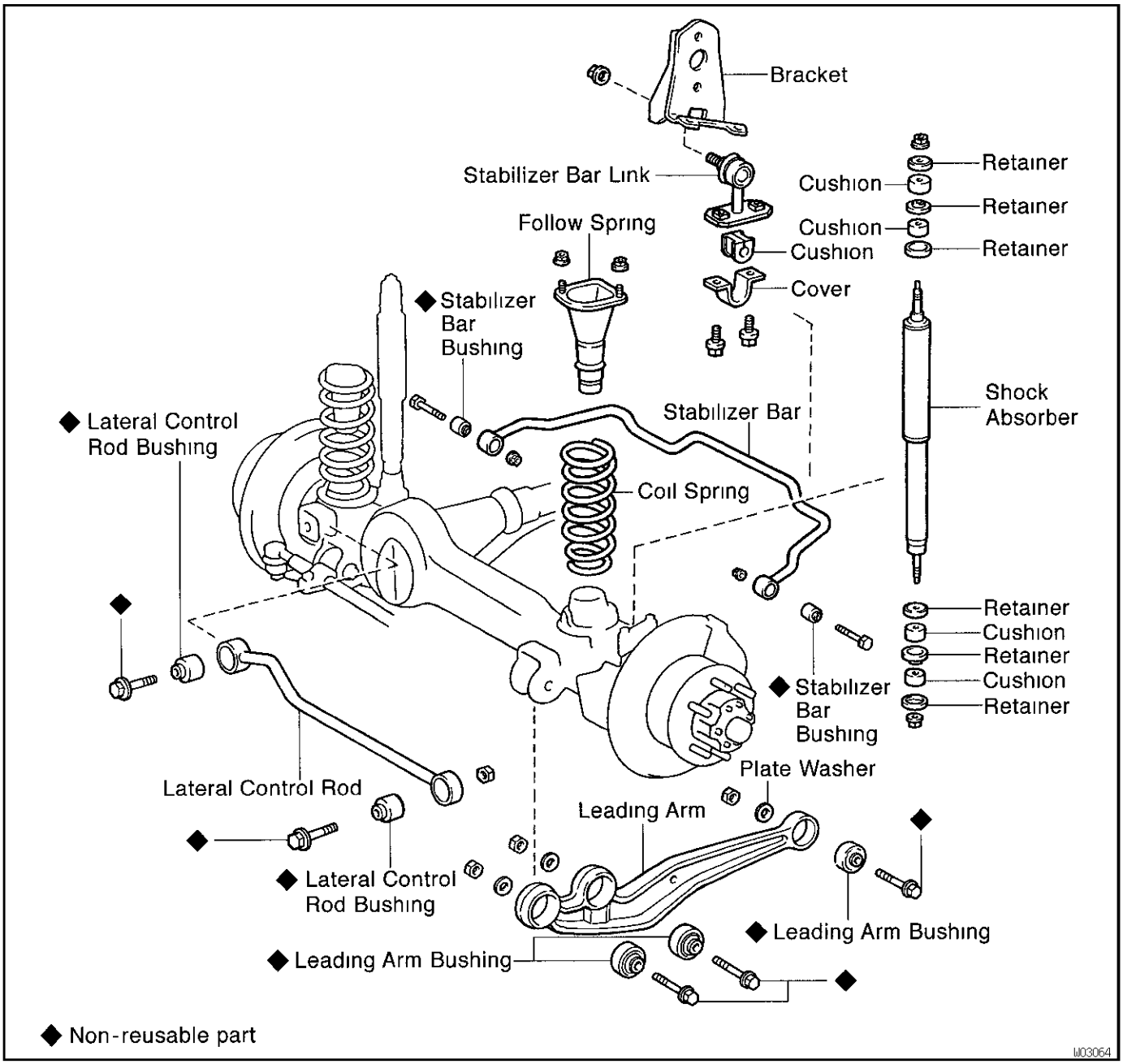
Brought to you by BirfMark



# COIL SPRING AND FRONT SHOCK ABSORBER

## COMPONENTS

SA1UR 01






Author : Date : 906

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

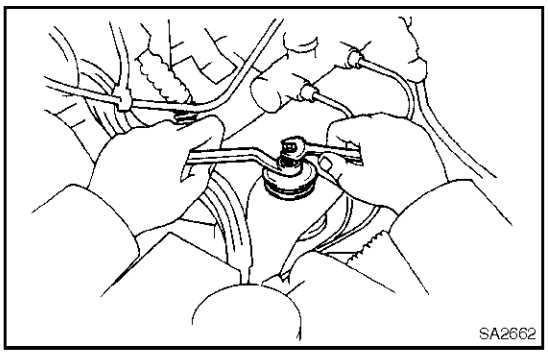


SA1US 01

# REMOVAL

1. **REMOVE FRONT WHEEL**

**Torque:**
**Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
**Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**

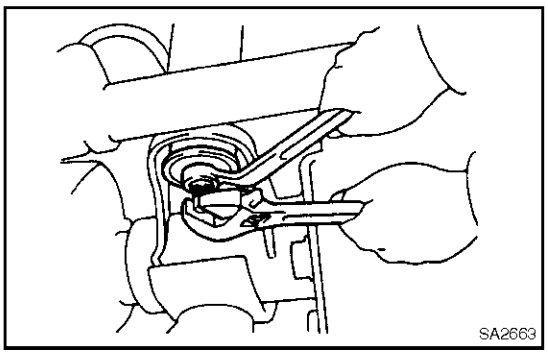



2. **REMOVE FRONT SHOCK ABSORBER**

(a) Jack up and support the axle housing

(b) Hold the piston rod and remove the upper mounting nut

**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**



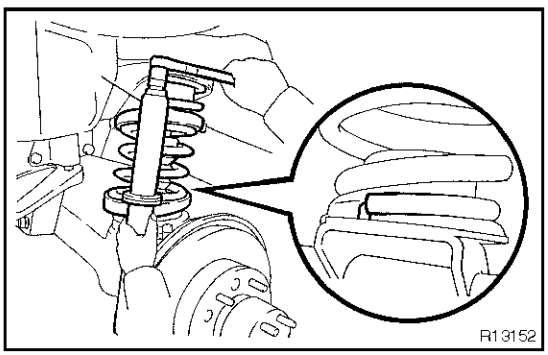

(c) Hold the shock absorber and remove the lower mounting nut, shock absorber, cushions and retainers

**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**

3. **DISCONNECT STABILIZER BAR FROM AXLE HOUSING (See page SA–60)**

4. **REMOVE COIL SPRING**

(a) Jack down and support axle housing




(b) Using SST, compress the coil spring

SST 09727–30021

**NOTICE:**

**Do not use an impact wrench. It will damage the SST.**

(c) Remove the coil spring

HINT

Align the coil spring end with the lower seat and install the coil spring

5. **REMOVE FOLLOW SPRING**

Remove the 2 nuts and follow spring

**Torque: 9.2 N·m (94 kgf·cm, 82 in.·lbf)**

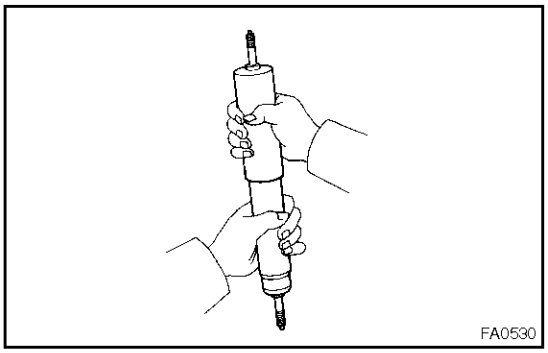


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UT–01


FA0530

# INSPECTION

## INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is abnormal resistance or unusual operation sounds
If there is any abnormality, replace the shock absorber with a new one

**NOTICE:**

**When discarding the shock absorber, use the following procedure.**

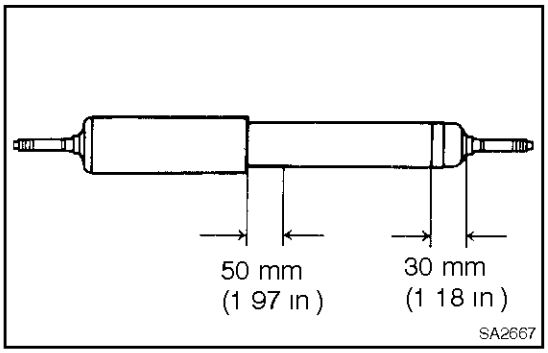


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UU 01




# DISPOSAL

## DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a hole 2 – 3 mm (0 079 – 0 118 in ) in diameter at the location shown in the illustration to release the gas inside

**NOTICE:**

**When drilling, chips may fly out, work carefully. The gas is colorless, odorless and non-poisonous.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UV 01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–50).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



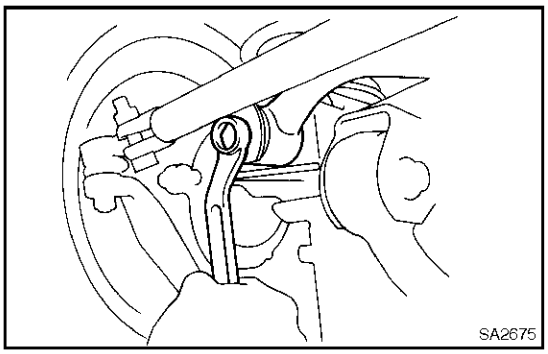
# FRONT LATERAL CONTROL ROD

SA1UW-01

## REMOVAL

1. **REMOVE FRONT WHEEL**

   **Torque:**
   **Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
   **Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**



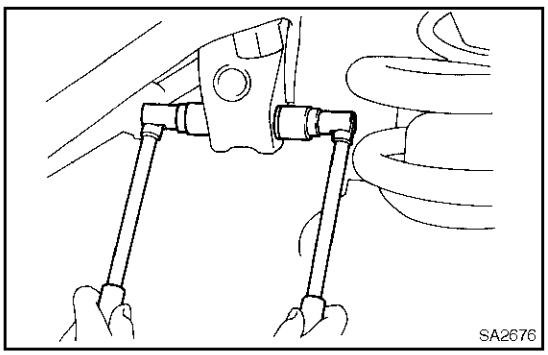

2. **DISCONNECT LATERAL CONTROL ROD FROM AXLE HOUSING**

Remove the bolt and disconnect the lateral control rod from the axle housing

**Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)**

HINT

After stabilizing the suspension, torque the bolt




3. **REMOVE LATERAL CONTROL ROD FROM FRAME**

Remove the nut, bolt and lateral control rod

**Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)**

HINT

After stabilizing the suspension, torque the bolt

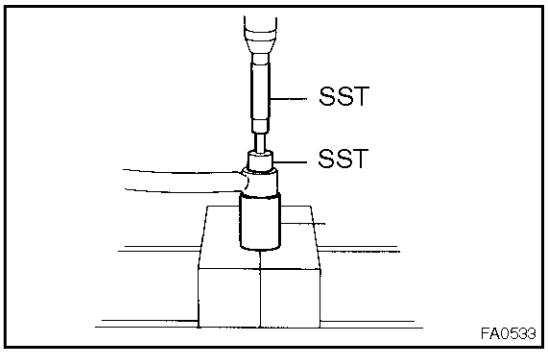


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UX 01

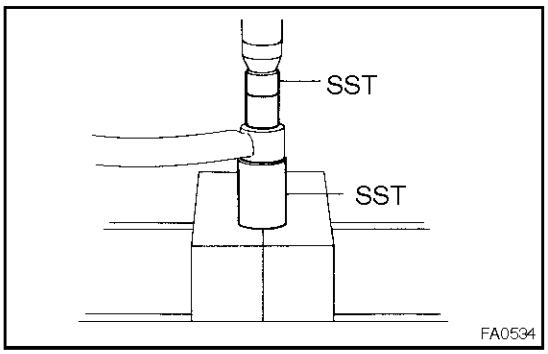



# REPLACEMENT

## 1. REMOVE BUSHING

Using SST, remove the bushing from the lateral control rod

SST 09710–22042 (09710–02051, 09710–02071), 09950–70010 (09951–07150)




## 2. INSTALL BUSHING

Using SST, install a new bushing into the lateral control rod

SST 09710–22042 (09710–02051, 09710–02071)

HINT

Do not use a lubricant when pressing in the bushing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1UY 01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–54).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

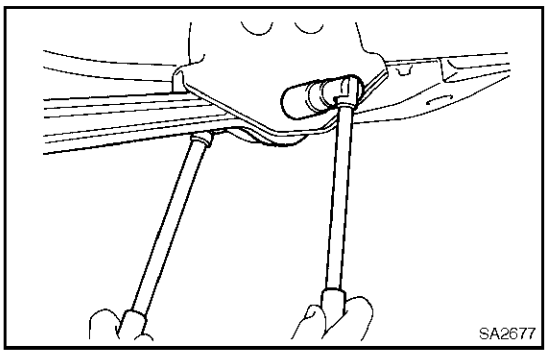


# FRONT LEADING ARM

SA1UZ-01

## REMOVAL

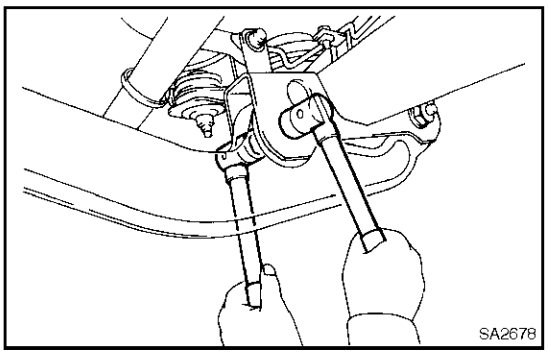
1. **REMOVE FRONT WHEEL**
   **Torque:**
   **Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
   **Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**


SA2677

2. **REMOVE LEADING ARM**

(a) Remove the bolt, plate washer and nut from the leading arm to the frame side
**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

HINT
After stabilizing the suspension, torque the bolt


SA2678

(b) Remove the 2 bolts and nuts from the leading arm to the axle housing side
**Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)**

HINT
After stabilizing the suspension, torque the bolts

(c) Remove the leading arm

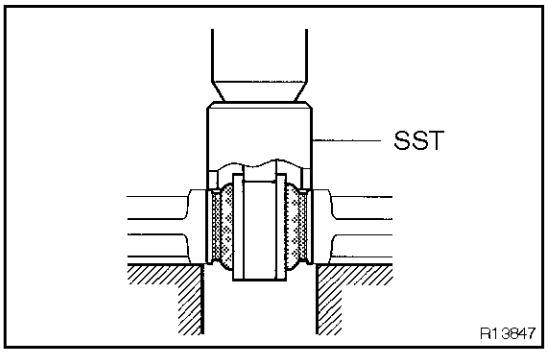


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V0-02

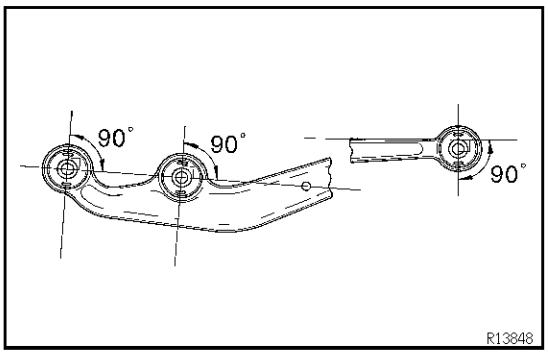



# REPLACEMENT

## REPLACE BUSHINGS

Using SST and a press, replace the bushing from the leading arm

SST Front side 09710-30050
SST Rear side 09710-22042 (09710-02061)




HINT

When assembling a new bushing, as shown in the illustration



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V1-01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–57).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

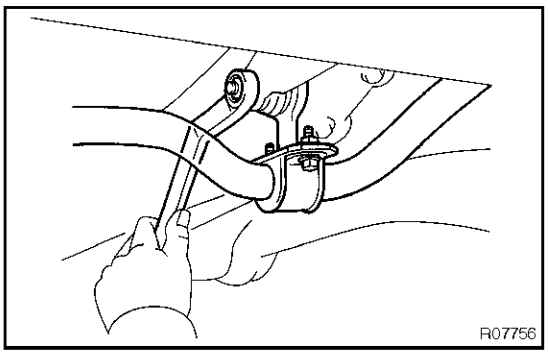


# FRONT STABILIZER BAR

SA1V2-01

## REMOVAL

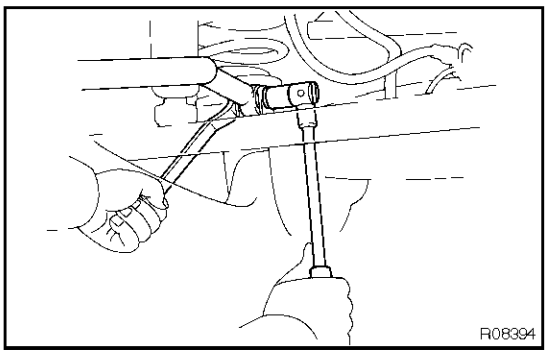
1. **REMOVE FRONT WHEEL**
   **Torque:**
   **Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
   **Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**




2. **REMOVE STABILIZER BAR**

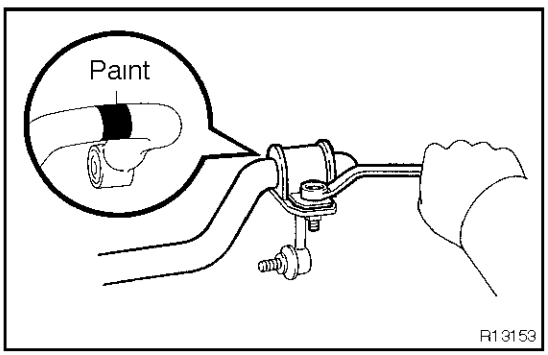
(a) Remove the nut and disconnect the stabilizer bar with the link from the bracket
**Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**

HINT
After stabilizing the suspension, torque the nut




(b) Remove the bolt and nut and remove the stabilizer bar from the axle housing
**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**

HINT
After stabilizing the suspension, torque the nut




(c) Remove the 2 bolts, cover and cushion from the stabilizer bar
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

HINT
Install the cushions on the lines painted on the stabilizer bar and install the covers onto cushions



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V3-01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–60).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

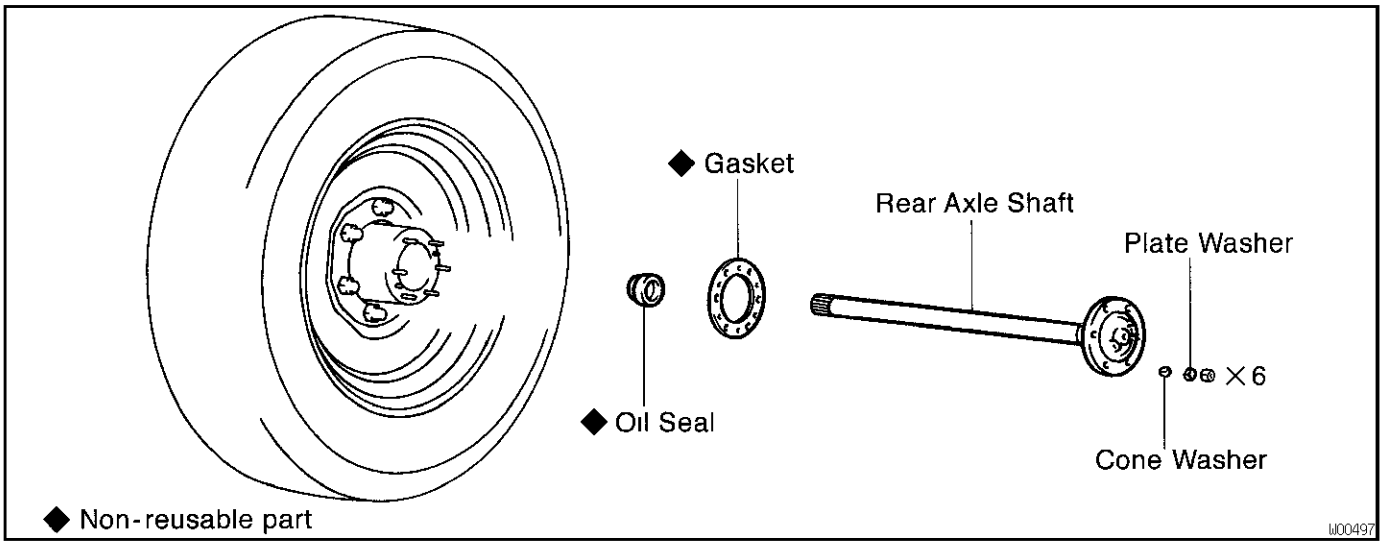
Brought to you by BirfMark



# REAR AXLE SHAFT

## COMPONENTS

SA1V4-01



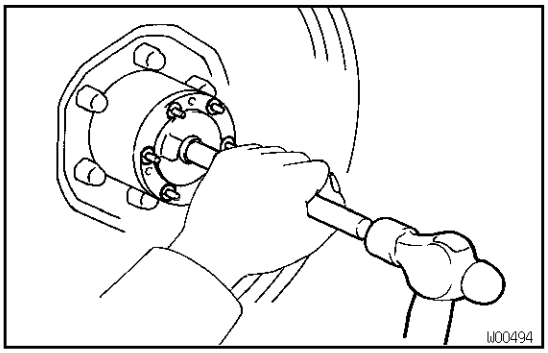



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V5-01

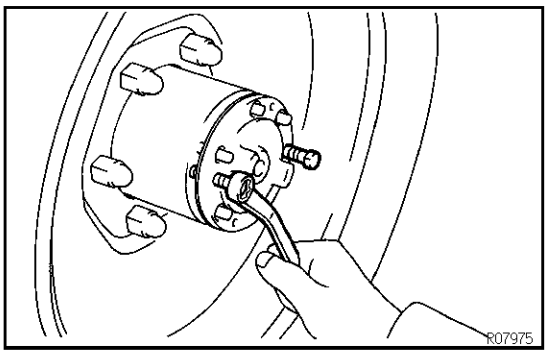



# REMOVAL

## REMOVE REAR AXLE SHAFT

(a) Remove the 6 set nuts and plate washers
**Torque: 34 N·m (340 kgf·cm, 25 ft·lbf)**

(b) Using a brass bar and hammer, strike the center part of the axle shaft to remove the 6 cone washers




(c) Install and gradually tighten 2 bolts evenly and pull the axle shaft

(d) Remove the 2 bolts from the rear axle shaft

(e) Remove the rear axle shaft and gasket

**NOTICE:**

**Be careful not to damage the oil seal.**

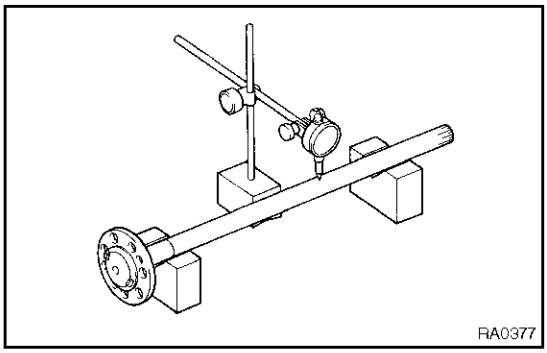


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V6-01




# INSPECTION

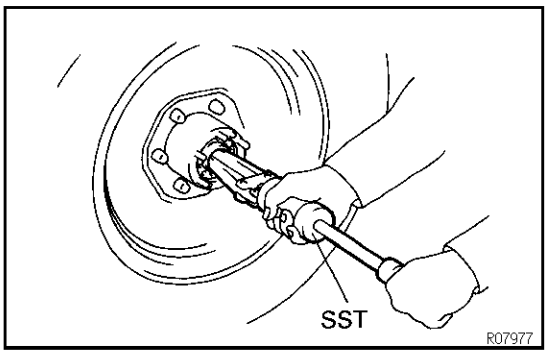
## 1. INSPECT REAR AXLE SHAFT

(a) Check for wear or damage

(b) Using a dial indicator, check the runout of axle shaft

**Maximum runout: 0.8 mm (0.031 in.)**

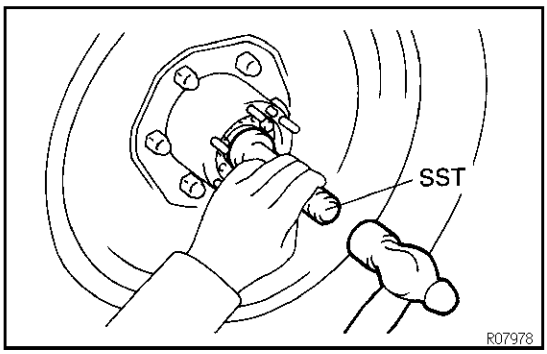
If the runout is greater than the maximum, replace the axle shaft




## 2. REPLACE OIL SEAL

(a) Using SST, remove the oil seal

SST 09308–00010




(b) Using SST and a hammer, install a new oil seal into the hub

SST 09517–36010

(c) Apply MP grease to the oil seal lip



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V7-02

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–63).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

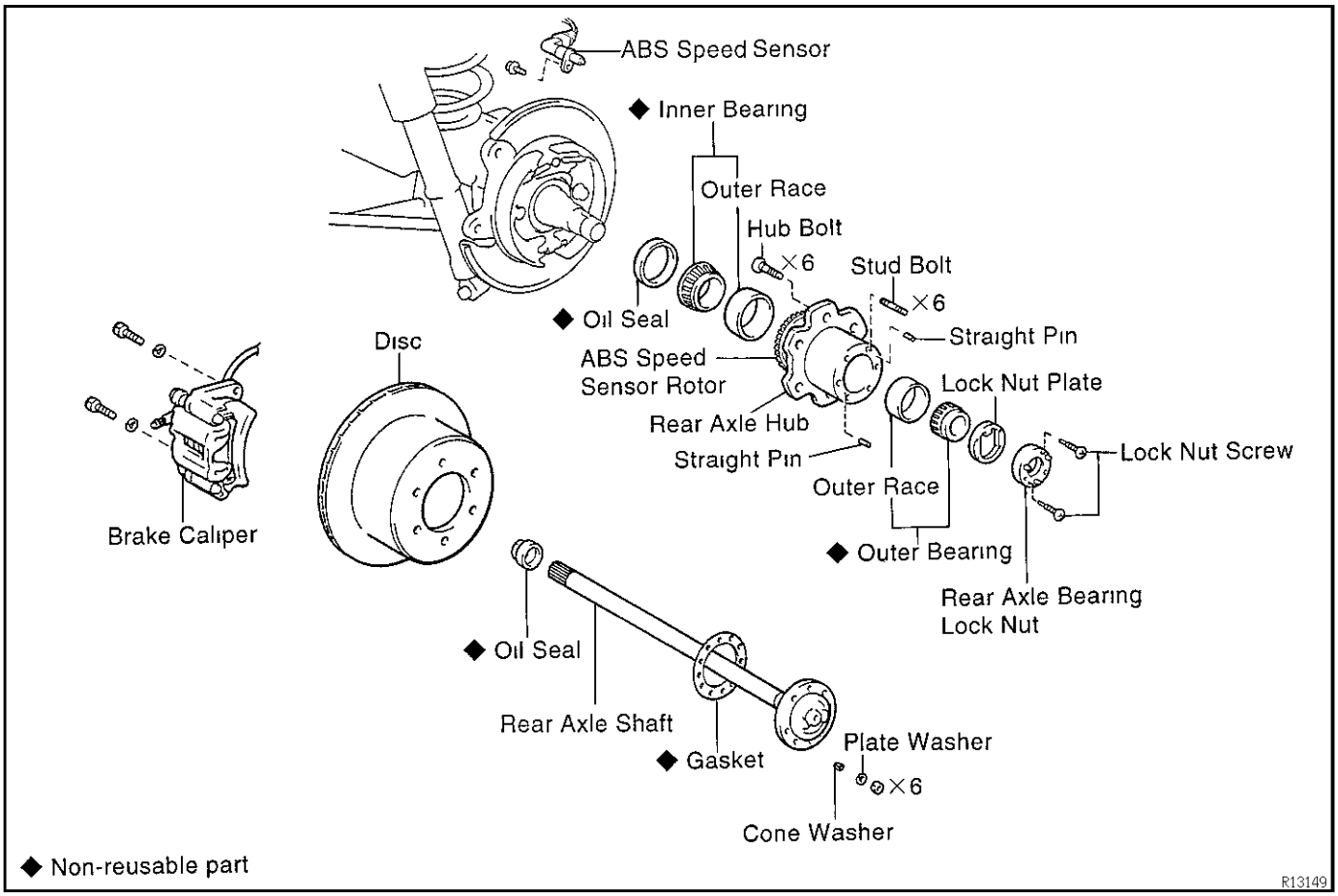
Brought to you by BirfMark



# REAR AXLE HUB

## COMPONENTS

SA1V8-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

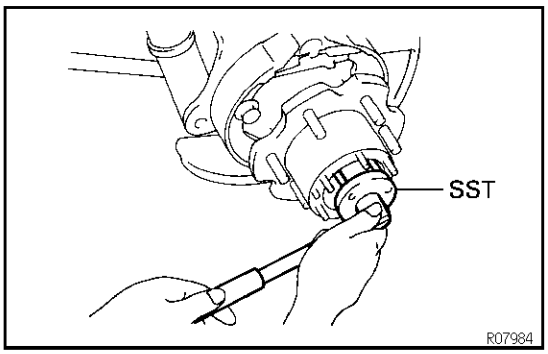


SA1V9-01

# REMOVAL

1. **REMOVE REAR WHEEL**
2. **REMOVE REAR AXLE SHAFT (See page SA–63)**
3. **REMOVE BRAKE CALIPER AND DISC (See page BR–34)**
4. **DISCONNECT ABS SPEED SENSOR**

Remove the bolt and disconnect the ABS speed sensor




5. **REMOVE REAR AXLE BEARING LOCK NUT**

(a) Remove the 2 screws from the lock nut

(b) Using SST, remove the lock nut
SST 09509–25011

6. **REMOVE REAR AXLE HUB**

(a) Pull out the axle hub, remove the lock nut plate and outer bearing

(b) Remove the axle hub



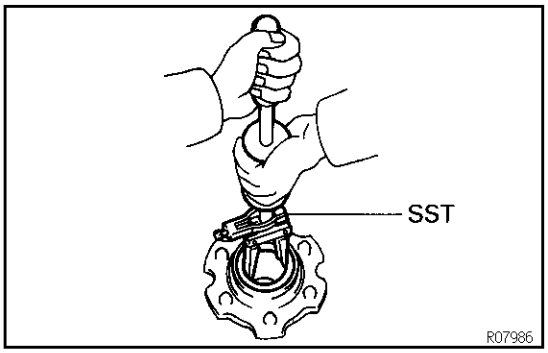
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VA-01

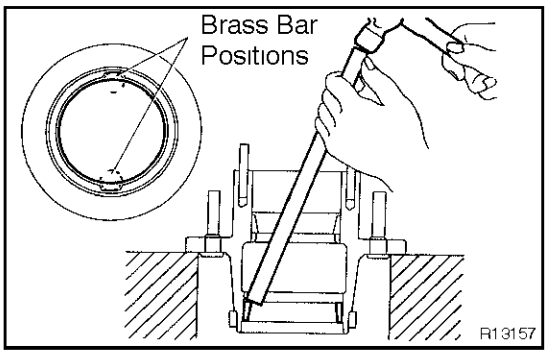
# REPLACEMENT




**1. REMOVE OIL SEAL AND INNER BEARING**

(a) Using SST, remove the oil seal
SST 09308-00010

(b) Remove the inner bearing from the hub

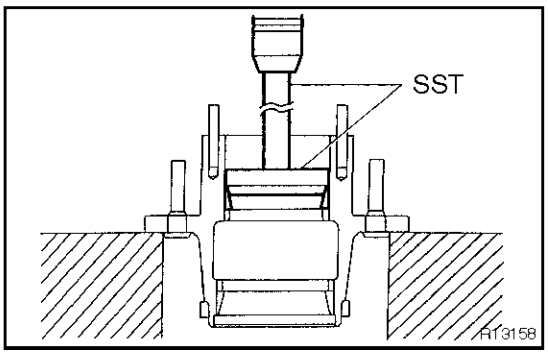



**2. REMOVE BEARING OUTER RACE**

Using a brass bar and hammer, remove the bearing outer races

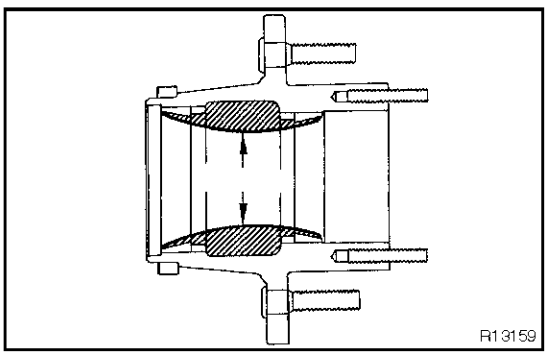
**NOTICE:**

**Be careful not to damage the ABS speed sensor rotor.**




**3. INSTALL BEARING OUTER RACE**

- Outside race
  Using SST and a press, install new bearing outer races
  SST 09950-60020 (09951-00710),
  09950-70010 (09951-07150)
- Inside race
  Using SST and a press, install new bearing outer races
  SST 09950-60020 (09951-00810),
  09950-70010 (09951-07150)



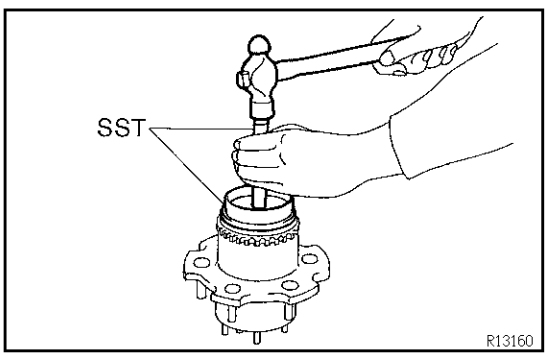

**4. PACK BEARINGS WITH MP GREASE**

(a) Place MP grease on the palm of your hand

(b) Pack grease into the bearing until the grease ooze out from the other side

(c) Do the same around the bearing circumference

**5. COAT INSIDE OF HUB WITH MP GREASE**




**6. INSTALL INNER BEARING AND OIL SEAL**

(a) Place inner bearing into the hub

(b) Using SST, install a new oil seal into the hub
SST 09223-15020, 09950-70010 (09951-07150)

(c) Apply MP grease to the oil lip



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VB-01

# INSTALLATION

**1. INSTALL REAR AXLE HUB**

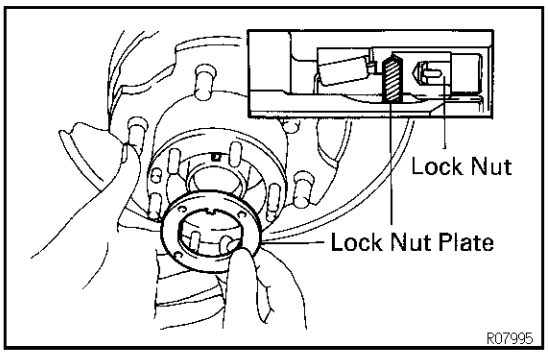
(a) Clean the hub installation position of the axle housing and apply MP grease thinly

(b) Place the axle hub to the axle housing

**NOTICE:**

**Be careful not to damage the oil seal.**

(c) Install the outer bearing



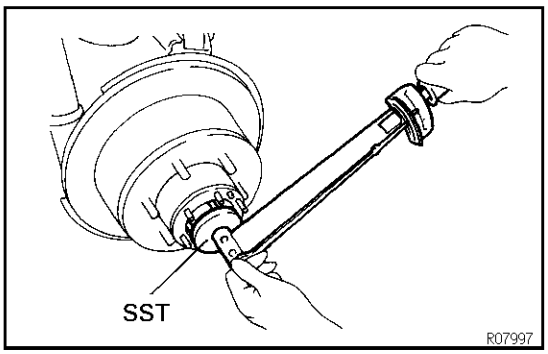

**2. INSTALL LOCK NUT PLATE AND REAR AXLE BEARING LOCK NUT**

(a) Place the lock nut plate on the axle housing, making sure the tongue lines up with the key groove

(b) Temporarily install the lock nut

**3. INSTALL DISC**

Install the disc to the rear axle hub and temporarily install the 2 hub nuts




**4. ADJUST PRELOAD**

(a) Using SST, torque the bearing lock nut

SST 09509–25011

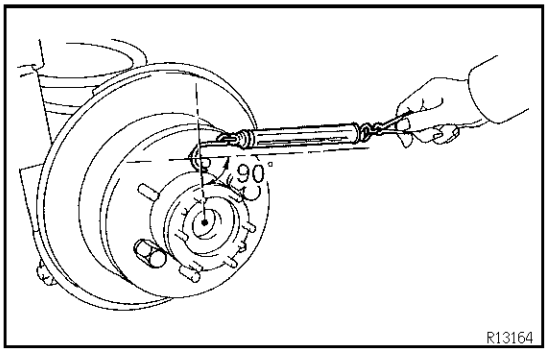
**Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)**

(b) Make the bearing smooth by turning the hub several times

(c) Using the SST, retighten the bearing lock nut

**Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)**

(d) Using the SST, loosen the nut until it can be turned by hand



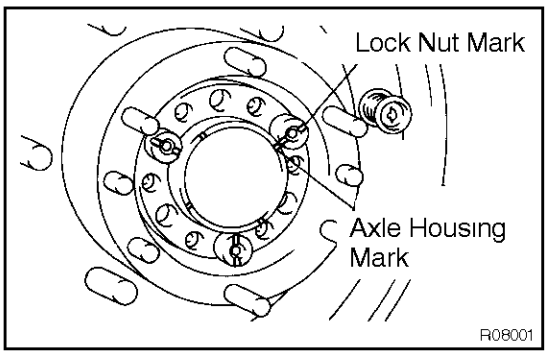

(e) Using a spring tension gauge, check the preload and tighten the nut until the preload is within the specification

**Preload (at starting):**

**26–57 N (2.6–5.8 kgf, 5.7–12.8 lbf)**

**NOTICE:**

**Make sure that there is no contact with the parking brake shoe.**



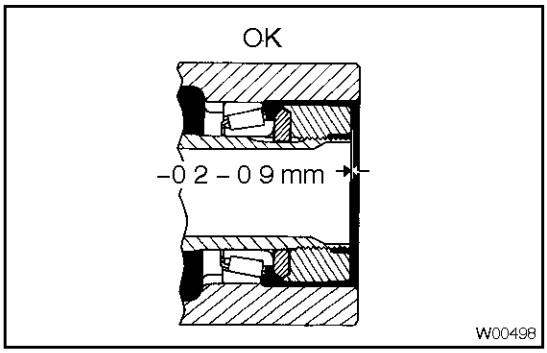

(f) Align the mark on the bearing lock nut and tip of axle housing under the above preload range



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(g) Check the distance between top surface of axle housing and the lock nut

**Standard distance:**

**–0.2 – 0.9 mm (–0.0079 – 0.0354 in.)**

If the distance is greater than the specification, reassemble the lock nut plate

(h) Check that the hub with disc rotates smoothly and hub has no axial play

**5. INSTALL BEARING LOCK NUT SCREW**

Tighten the 2 lock nut screws

**Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)**

**6. CONNECT ABS SPEED SENSOR**

Connect the ABS speed sensor install the bolt

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

**7. INSTALL BRAKE CALIPER (See page BR–38)**

**8. INSTALL REAR AXLE SHAFT (See page SA–65)**

**9. INSTALL REAR WHEEL**

**Torque:**

**Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**

**Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**

**10. CHECK ABS SPEED SENSOR SIGNAL**

**(See page DI–190)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

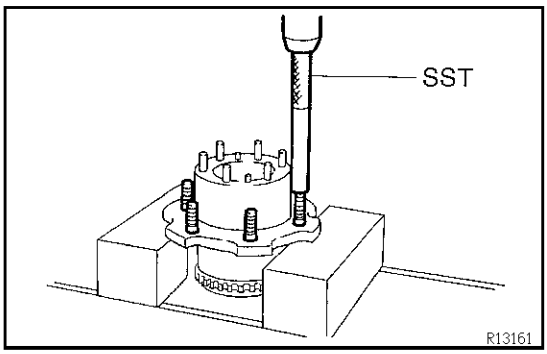


# REAR WHEEL HUB BOLT

SA1VC 01

## REPLACEMENT

1. **REMOVE REAR AXLE HUB (See page SA-67)**



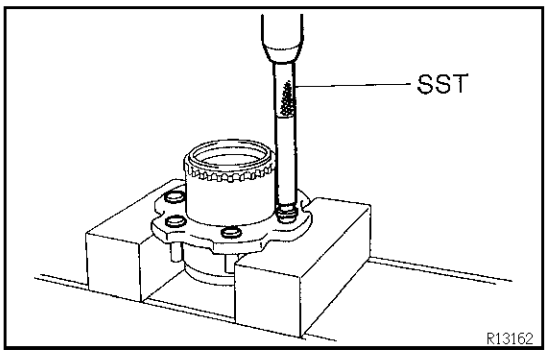

2. **REMOVE HUB BOLT**

Using SST and a press, remove hub bolt from the axle hub

SST 09950-70010 (09951-07150)

**NOTICE:**

**Be careful not to damage the ABS speed sensor rotor.**




3. **INSTALL HUB BOLT**

Using SST and a press, install the hub bolt

SST 09950-70010 (09951-07150)

4. **INSTALL REAR AXLE HUB (See page SA-69)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

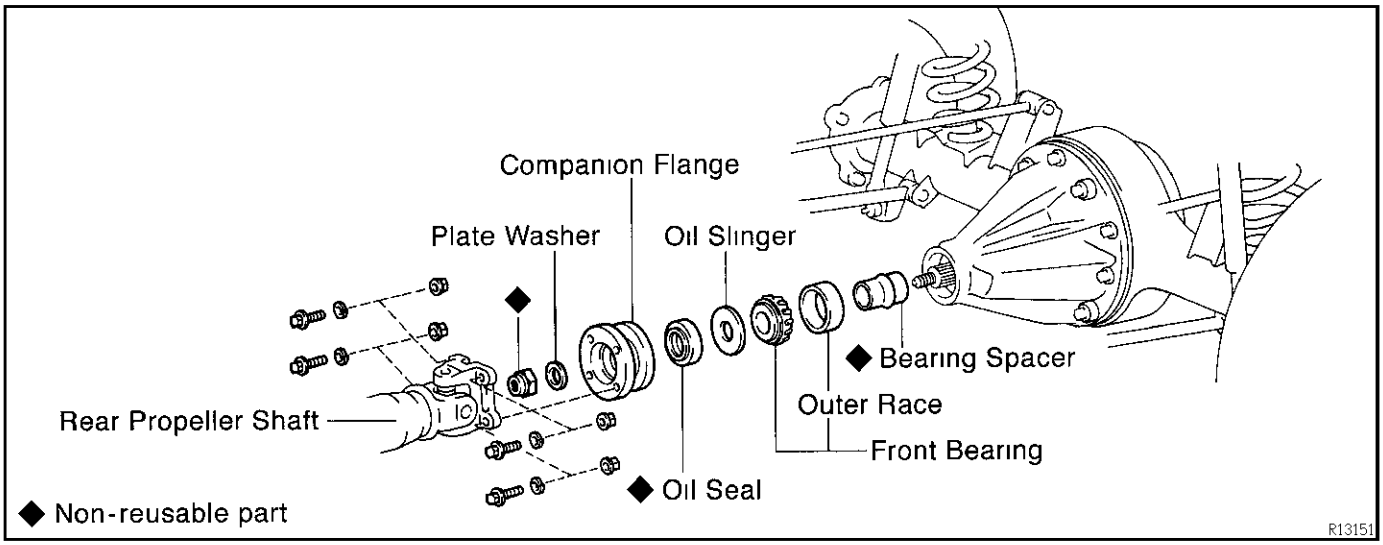
Brought to you by BirfMark



# REAR DIFFERENTIAL FRONT OIL SEAL

## COMPONENTS

SA1VD 01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

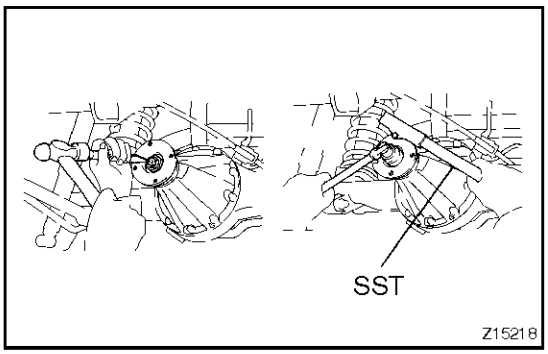
Brought to you by BirfMark



SA1VE–01

# REPLACEMENT

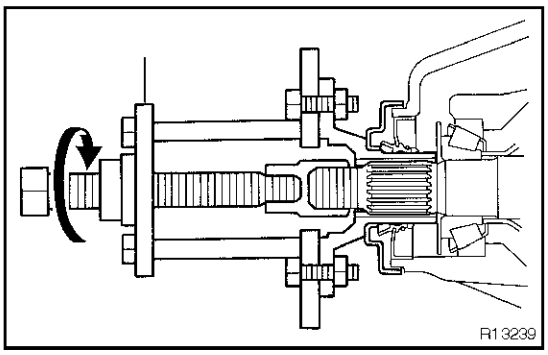
1. DRAIN DIFFERENTIAL OIL
2. DISCONNECT REAR PROPELLER SHAFT
(See page PR–3)



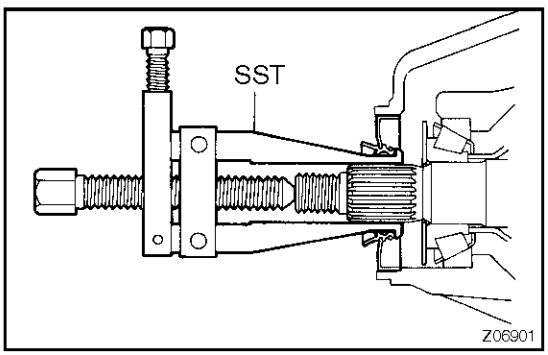

3. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, loosen the staked part of the nut

(b) Using SST to hold the flange, remove the nut and plate washer
SST 09330–00021



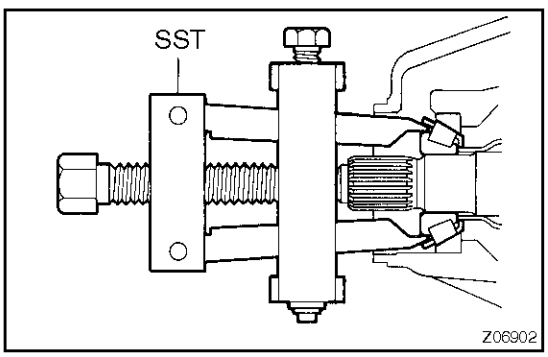

(c) Using SST, remove the companion flange
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)




4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal
SST 09308–10010

(b) Remove the oil slinger




5. REMOVE FRONT BEARING

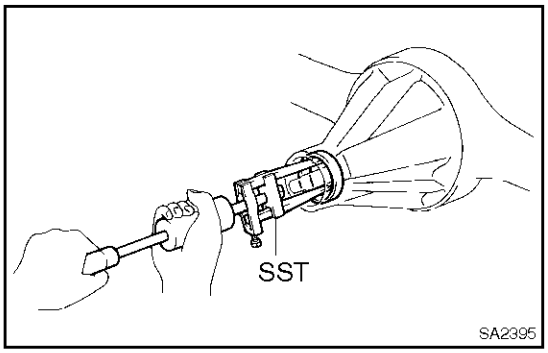
Using SST, remove the front bearing from the drive pinion
SST 09556–22010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**6. REMOVE BEARING OUTER RACE**

Using SST, remove the bearing outer race

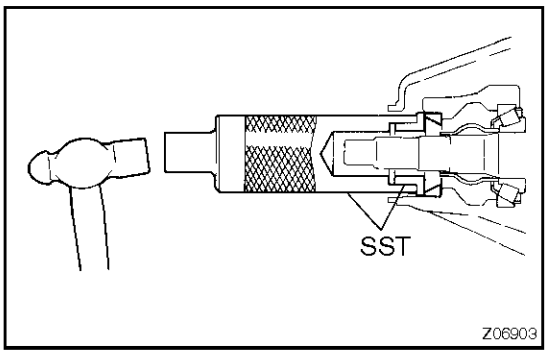
SST 09308–00010

**NOTICE:**

**Do not scratch the taper surface of the outer race.**

**7. REMOVE BEARING SPACER**

**8. INSTALL NEW BEARING SPACER**

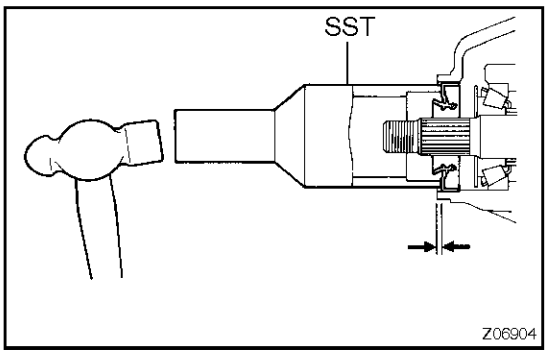



**9. INSTALL BEARING OUTER RACE**

Using SST, install the bearing outer race

SST 09316–60011 (09316–00011, 09316–00021)

**10. INSTALL FRONT BEARING**




**11. INSTALL OIL SLINGER AND OIL SEAL**

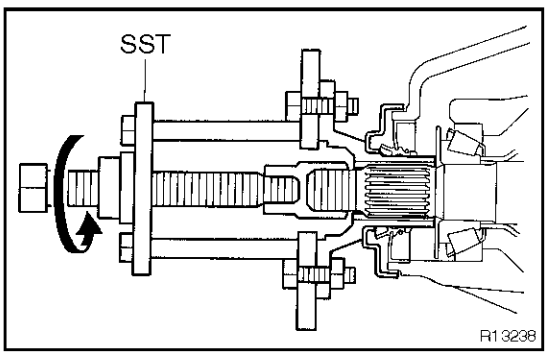
(a) Install the oil slinger

(b) Using SST, install a new oil seal, as shown

SST 09214–76011

**Oil seal drive in depth: 1.0 mm (0.039 in.)**

(c) Apply MP grease to the oil seal lip



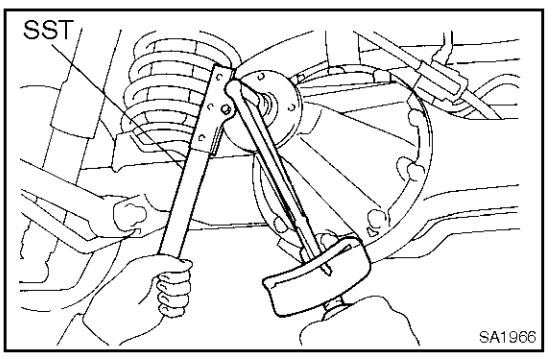

**12. INSTALL COMPANION FLANGE**

(a) Using SST, install the companion flange on the drive pinion

SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)

(b) Place the plate washer on the companion flange

(c) Apply light coat of gear oil on threads of a new companion flange nut




(d) Using SST to hold the flange, torque the nut

SST 09330–00021

**Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)**

**13. ADJUST DRIVE PINION PRELOAD**

**(See page SA–73)**

**14. STAKE DRIVE PINION NUT**

**15. CONNECT REAR PROPELLER SHAFT**

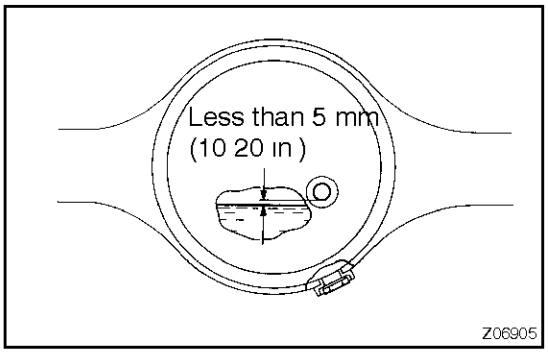
**(See page PR–5)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






16. **FILL DIFFERENTIAL WITH GEAR OIL**
**Torque: 49 N·m (500 kgf·cm, 39 ft·lbf)**
**Oil type: Hypoid gear oil API GL–5**
**Recommended oil viscosity:**
**Above –18°C (0°F) SAE 90**
**Below –18°C (0°F) SAE 80W–90 or 80W**
**Capacity:**
**3.25 liters (3.4 US qts, 2.9 Imp. qts)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

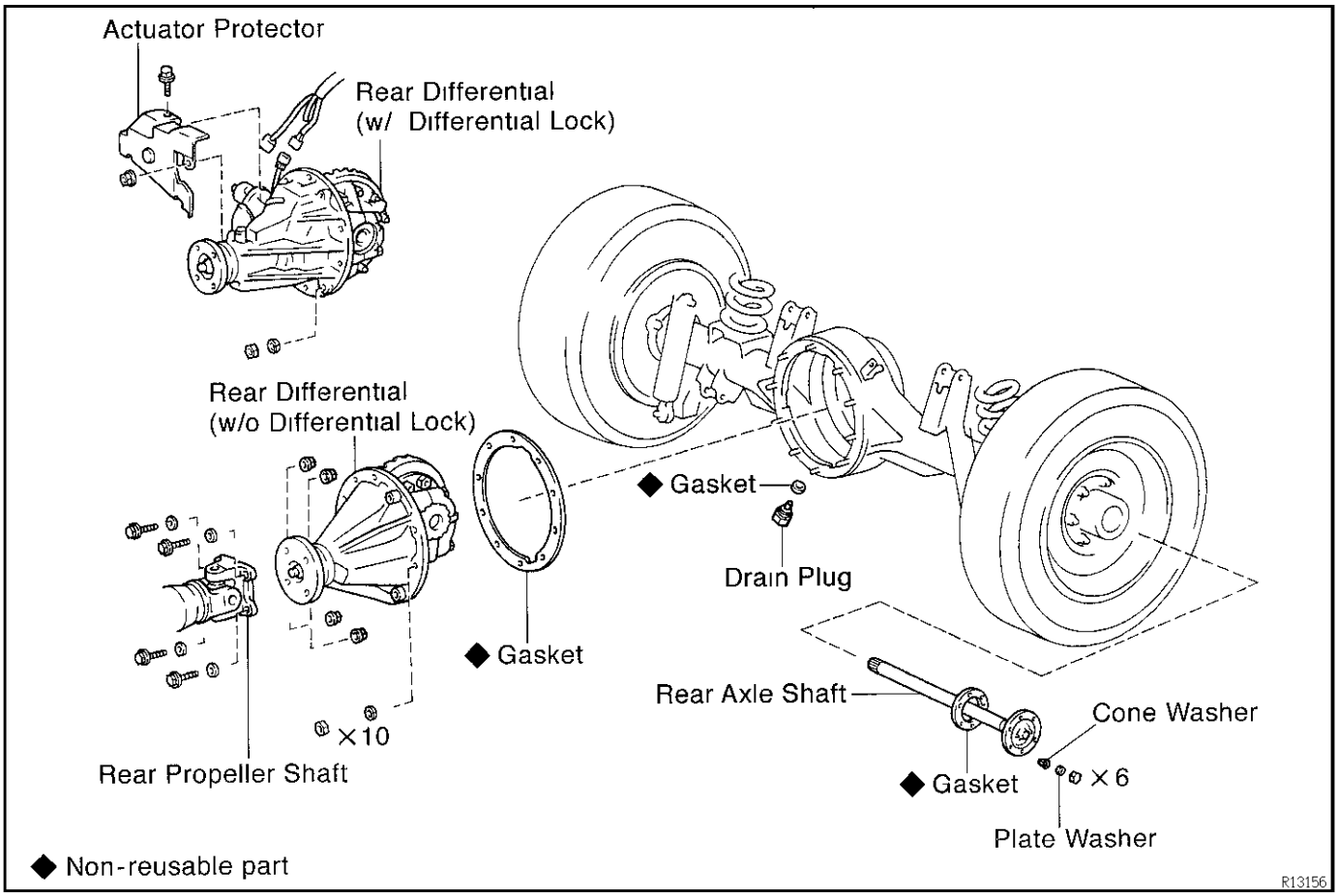
Brought to you by BirfMark



# REAR DIFFERENTIAL CARRIER

## COMPONENTS

SA1VF 03



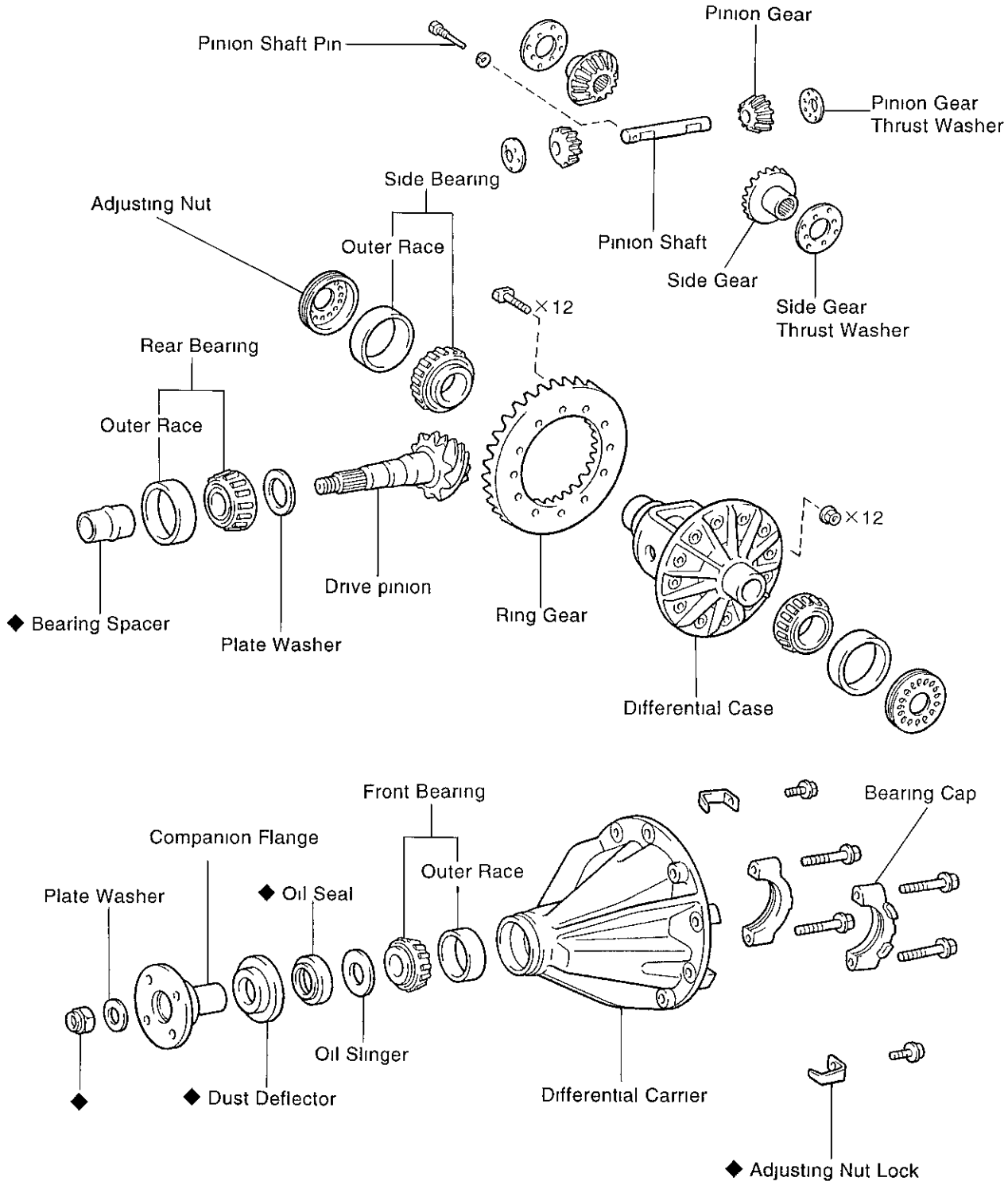



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## w/o Differential Lock




◆ Non-reusable part

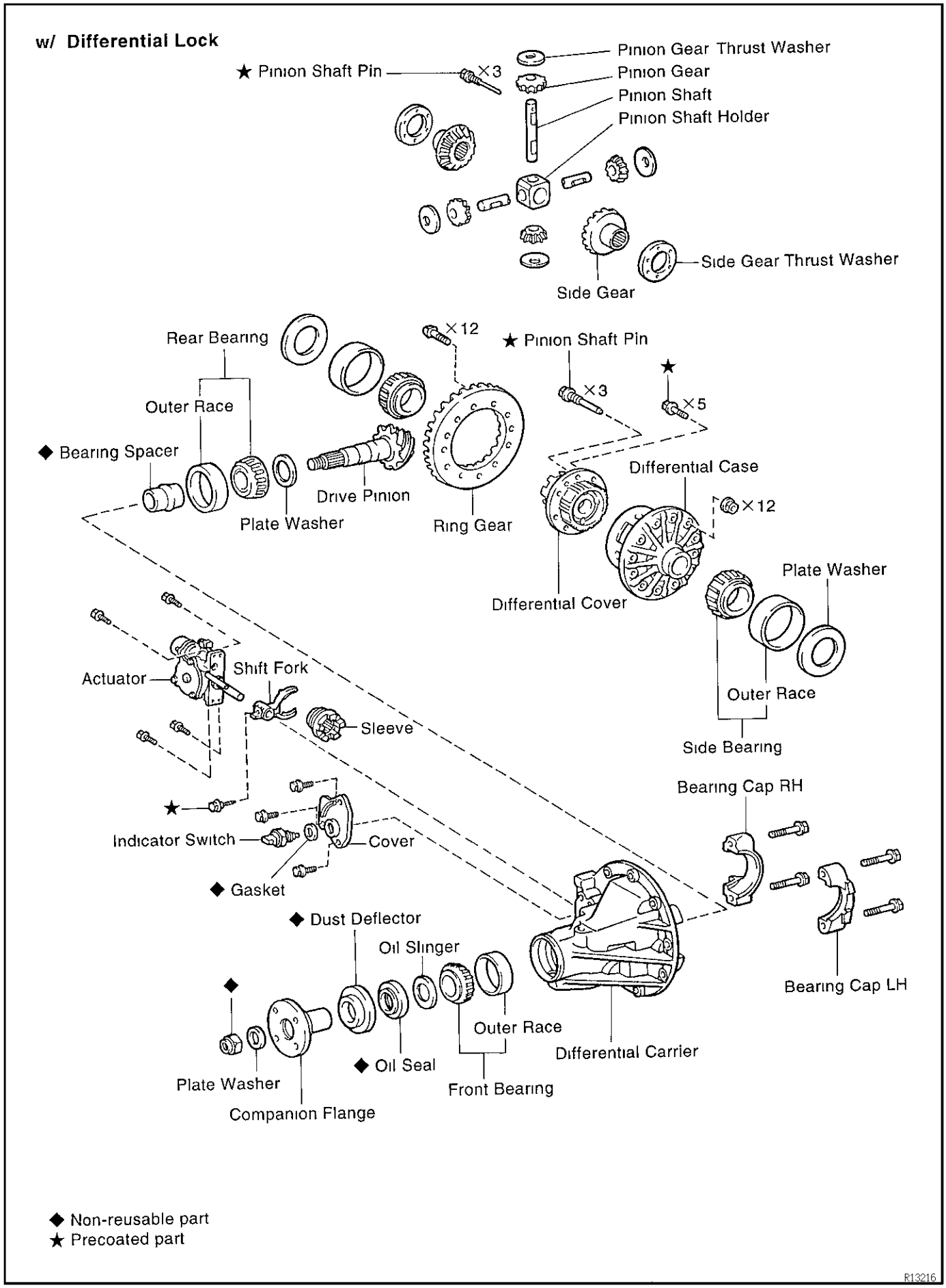
R13150



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





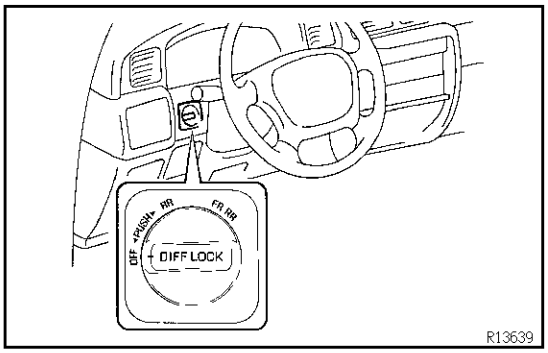



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA24T–01




# REMOVAL

**1. w/ Differential lock:**
**SHIFT REAR DIFFERENTIAL TO LOCK**

(a) Turn the ignition switch to the ON position

(b) Keep the center differential lock condition

(c) Turn the differential lock control switch to the RR or FR/RR position and lock the rear differential

HINT

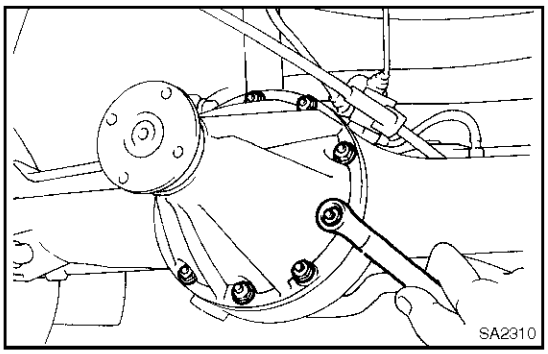
Rotating the tires, check they are in the differential lock condition

(d) Disconnect the cable from the negative terminal of the battery

**2. DRAIN DIFFERENTIAL OIL**

**3. REMOVE REAR AXLE SHAFTS (See page SA–63)**

**4. DISCONNECT PROPELLER SHAFT**
**(See page PR–3)**




**5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY**

(a) Remove the 10 nuts, washers and differential carrier assembly

**NOTICE:**

**Be careful not to damage the installation surface.**

**Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)**

(b) Remove the gasket



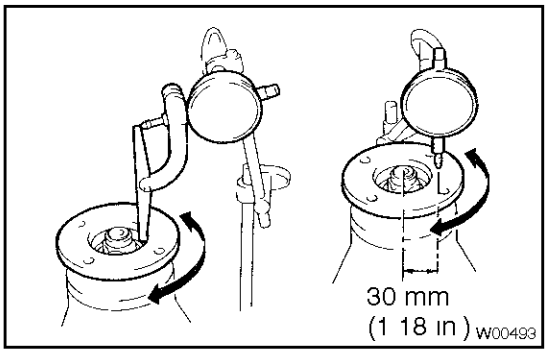
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VH 04

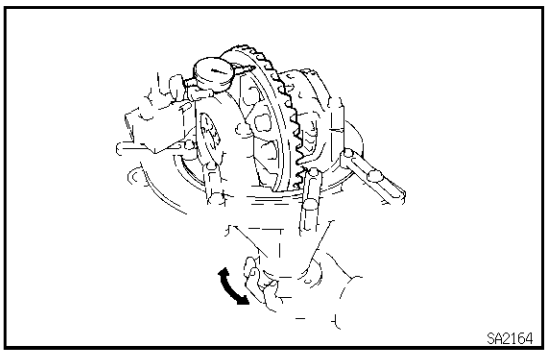
# DISASSEMBLY




## 1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

**Maximum runout: 0.10 mm (0.0039 in.)**

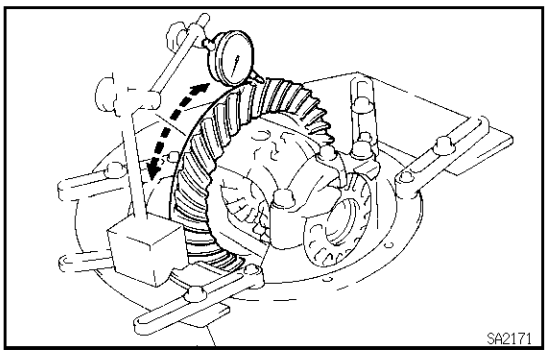



## 2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout

**Maximum runout: 0.10 mm (0.0039 in.)**

If the runout is greater than the maximum, replace the ring gear




## 3. CHECK RING GEAR BACKLASH

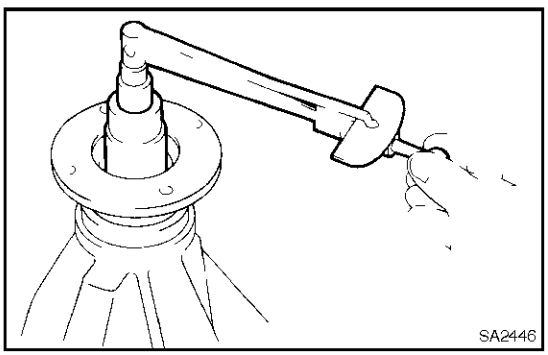
Using a dial indicator, measure the ring gear backlash

**Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)**

HINT

Perform the measurements at 3 or more positions around the circumference of the ring gear

If the backlash is not within the specification, adjust the side bearing preload or repair as necessary




## 4. MEASURE DRIVE PINION PRELOAD

(a) Using a torque wrench, measure the preload of backlash between the drive pinion and ring gear

**Preload (at starting):**

**0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.·lbf)**

(b) Using a torque wrench, measure the preload

**Total preload (at starting):**

**Drive pinion preload plus**

**w/o Differential lock**

**0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)**

**w/ differential lock**

**0.3 – 0.7 N·m (3 – 7 kgf·cm, 2.6 – 6.1 in.·lbf)**

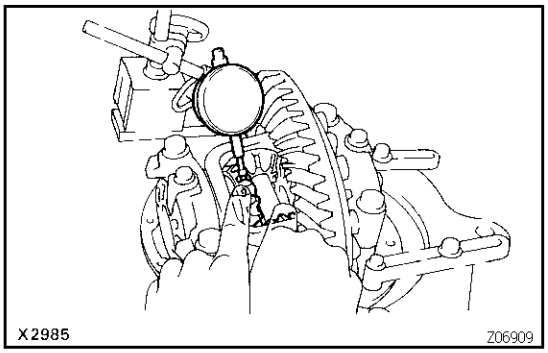
If necessary, disassemble and inspect the differential



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**5. CHECK SIDE GEAR BACKLASH**

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case

**Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)**

If the backlash is not within the specification, install the correct thrust washers (See page SA–87)

**6. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–35)**

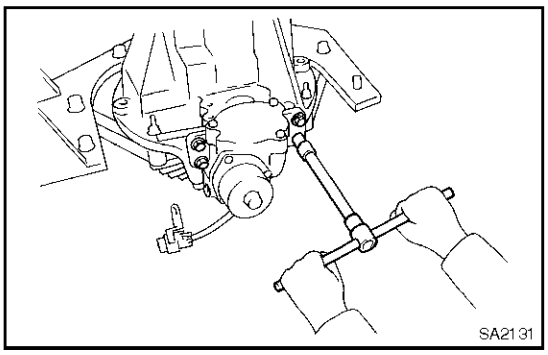
**7. w/ DIFFERENTIAL LOCK: REMOVE INDICATOR SWITCH**

Remove the indicator switch and gasket

**8. w/ DIFFERENTIAL LOCK: REMOVE COVER**

(a) Remove the 3 bolts

(b) Using a brass bar and hammer, tap on the cover to remove it

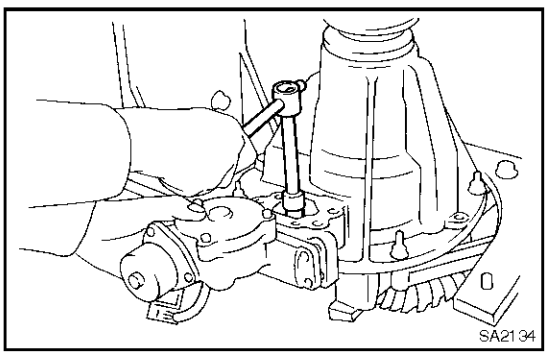



**9. w/ DIFFERENTIAL LOCK: REMOVE SLEEVE**

(a) Remove the 4 bolts

(b) Using a plastic hammer, tap the actuator

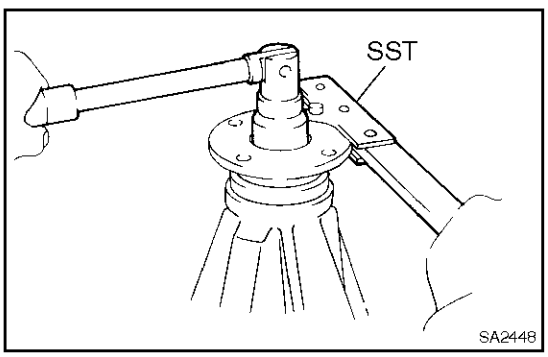
(c) Remove the actuator and sleeve




**10. w/ DIFFERENTIAL LOCK: REMOVE ACTUATOR AND SHIFT FORK AND SHAFT**

(a) Remove the shift fork shaft bolt

(b) Pull out the actuator and remove the shift fork




**11. REMOVE COMPANION FLANGE**

(a) Using a chisel and hammer, unstick the nut

(b) Using SST to hold the flange, remove the nut and plate washer

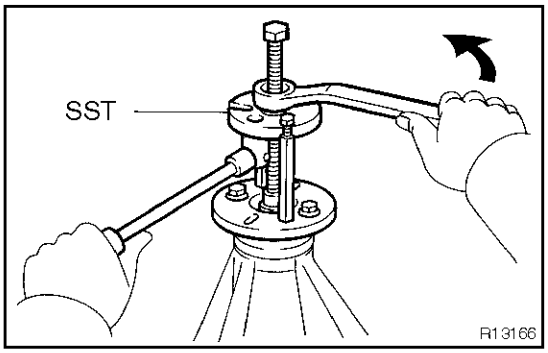
SST 09330–00021



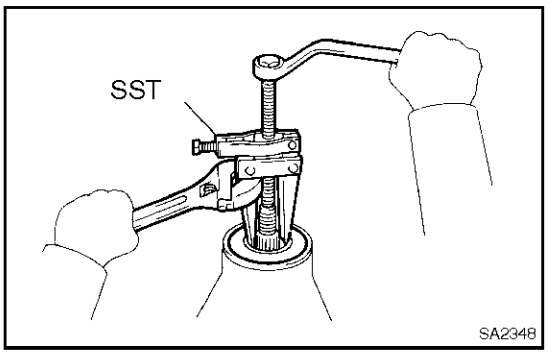
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





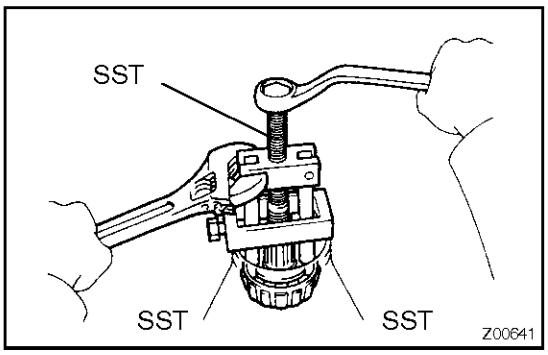

(c) Using SST, remove the companion flange
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)




**12. REMOVE OIL SEAL AND OIL SLINGER**

(a) Using SST, remove the oil seal from the differential carrier
SST 09308–10010

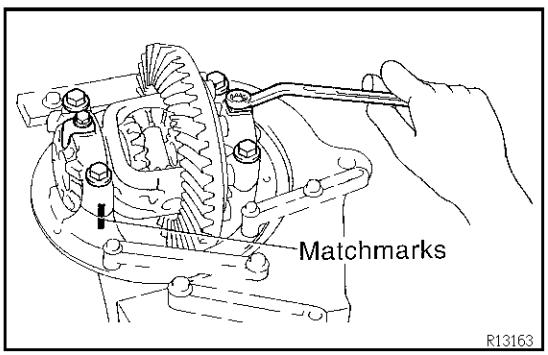
(b) Remove the oil slinger




**13. REMOVE FRONT BEARING**

Using SST, remove the front bearing from the drive pinion
SST 09556–22010

If the front bearing is damaged or worn, replace the bearing




**14. w/o DIFFERENTIAL LOCK: REMOVE DIFFERENTIAL CASE ASSEMBLY**

(a) Place matchmarks on the bearing cap and differential carrier

(b) Remove the 2 adjusting nut locks

HINT

Tag the disassembled parts to show the location for reassembly

(c) Remove the 2 bearing caps and adjusting nuts

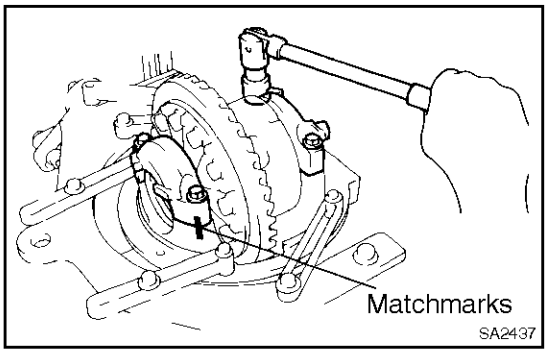
(d) Remove the differential case with the bearing outer races from the carrier



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

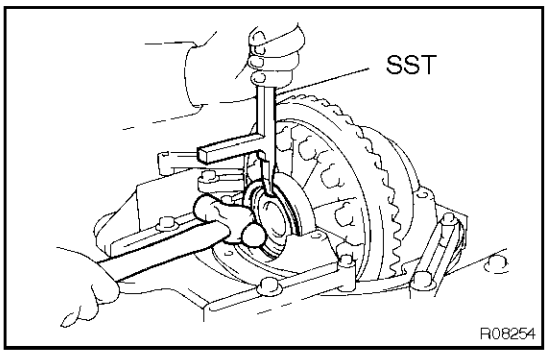





**15. w/ DIFFERENTIAL LOCK: REMOVE DIFFERENTIAL CASE ASSEMBLY**

(a) Place matchmarks on the bearing cap and differential carrier

(b) Remove the 4 bolts and 2 bearing caps




(c) Using SST, remove the plate washers
SST 09504–22011

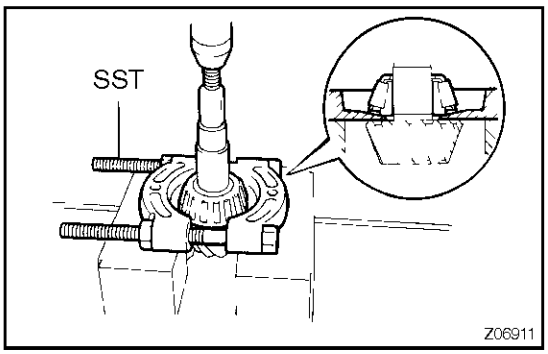
HINT

Measure the plate washer thickness and note it

(d) Remove the differential case with the side bearing outer races from the differential carrier

HINT

Tag the bearing outer races to show the location for reassembly




**16. REMOVE DRIVE PINION AND BEARING SPACER FROM DIFFERENTIAL CARRIER**

(a) Remove the drive pinion with the rear bearing

(b) Remove the bearing spacer

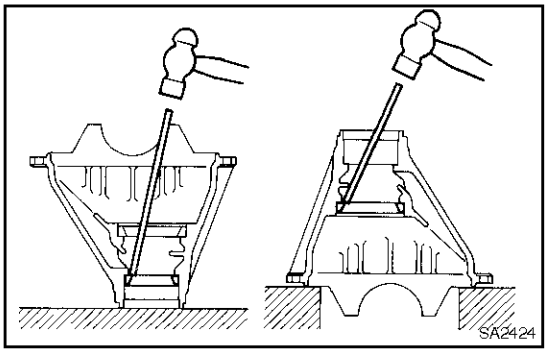
**17. REMOVE DRIVE PINION REAR BEARING**

(a) Using SST and a press, remove the rear bearing from the drive pinion
SST 09950–00020

HINT

If the drive pinion or ring gear are damaged, replace them as a set

(b) Remove the plate washer from the drive pinion




**18. REMOVE FRONT AND REAR BEARING OUTER RACES**

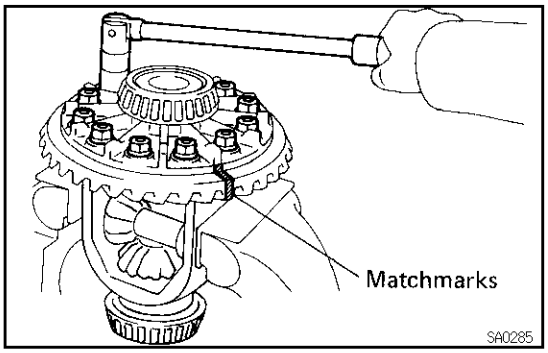
Using a brass bar and hammer, remove the outer races



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



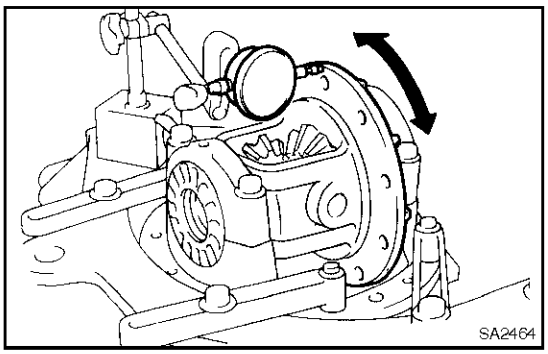



**19. REMOVE RING GEAR**

(a) Place matchmarks on the ring gear and differential case

(b) Remove the 12 ring gear set nuts and bolts

(c) Using a plastic hammer, tap on the ring gear to remove it from the differential case



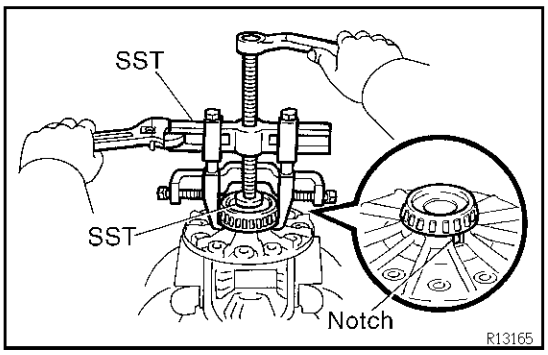

**20. CHECK DIFFERENTIAL CASE RUNOUT**

(a) Install the differential case in the differential carrier and tighten the adjusting nut just to where there is no play in the bearing

(b) Using a dial indicator, measure the differential case runout

**Maximum case runout: 0.07 mm (0.0028 in.)**

(c) Remove the differential case




**21. w/o DIFFERENTIAL LOCK:**
**REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE**

Using SST, remove the 2 side bearings from the differential case

SST 09950–40010 (09951–04010, 09952–04010, 09953–04020, 09955–04060, 09957–04010, 09958–04010), 09950–60010 (09951–00480)

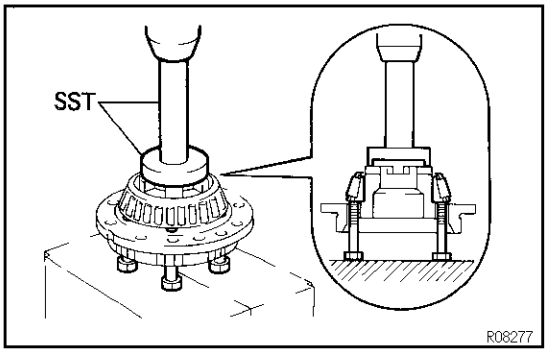
**22. w/ DIFFERENTIAL LOCK:**
**REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE**

(a) Using SST, remove the side bearing (ring gear side)

SST 09950–40010 (09951–04010, 09952–04010, 09953–04020, 09955–04060, 09957–04010, 09958–04010), 09950–60010 (09951–00480)

HINT

Fix the claws of SST to the notches in the differential case




(b) Using SST, 4 bolts and a press, remove the side bearing (cover side)

SST 09550–10012 (09557–10010), 09950–70010 (09951–07150)

HINT

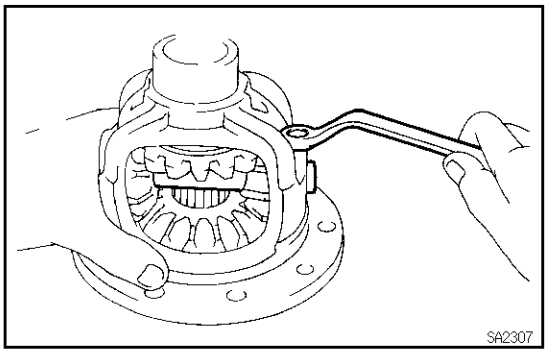
Fix the claws of SST to the notches in the differential case



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

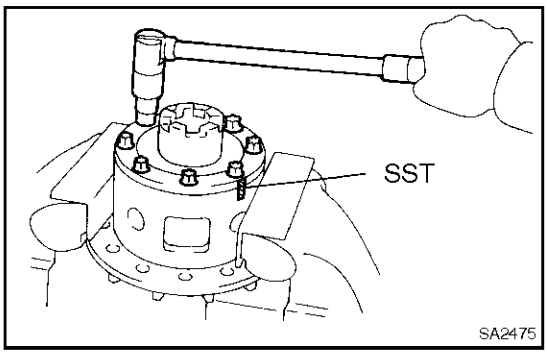





**23. w/o DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

(a) Remove the pinion shaft pin and washer

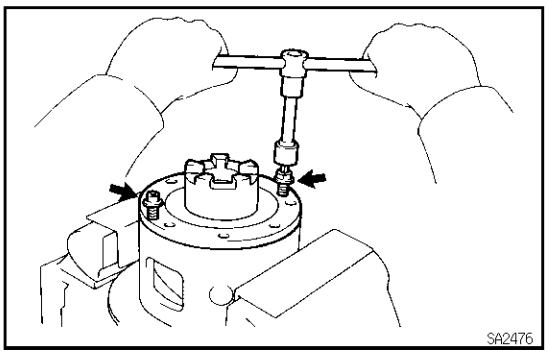
(b) Remove these parts from the differential case
- Pinion shaft
- 2 Pinion gears
- 2 Pinion gear thrust washers
- 2 Side gears
- 2 Side gear thrust washers




**24. w/ DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

(a) Place matchmarks on the case and cover

(b) Using a torx socket wrench, remove the 5 set bolts and 3 pinion shaft pins




(c) Using the 2 cover installation bolts, separate the cover and case

(d) Remove these parts from the differential case
- 2 Side gears
- 2 Side gear thrust washers
- 4 Pinion gears
- 4 Pinion thrust washers
- 3 Pinion shafts
- Pinion shaft holder

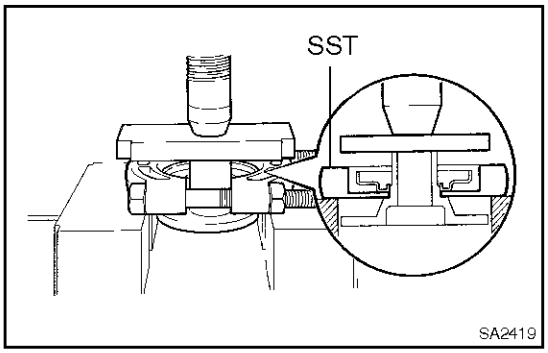


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1V 01

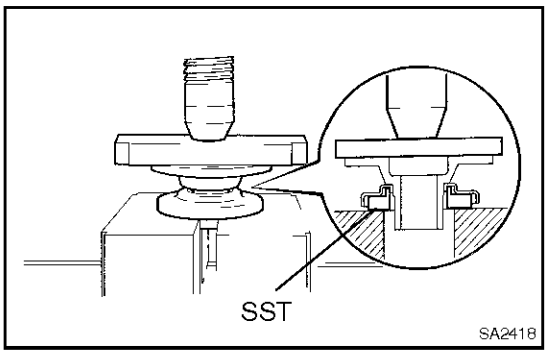



# REPLACEMENT

## 1. REMOVE DUST DEFLECTOR

Using SST and a press, remove the dust deflector

SST 09950-00020




## 2. INSTALL DUST DEFLECTOR

Using SST and a press, install a new dust deflector

SST 09726-40010

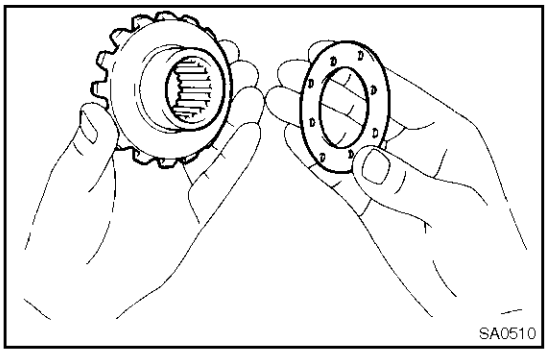


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VJ-04


SA0510

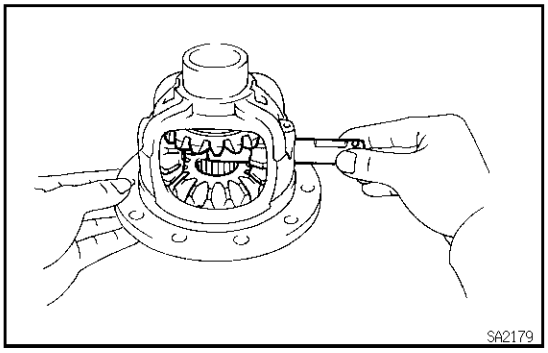
# REASSEMBLY

**1. w/o DIFFERENTIAL LOCK:**
**ASSEMBLE DIFFERENTIAL CASE**

(a) Apply all of the sliding and rotating surfaces with gear oil

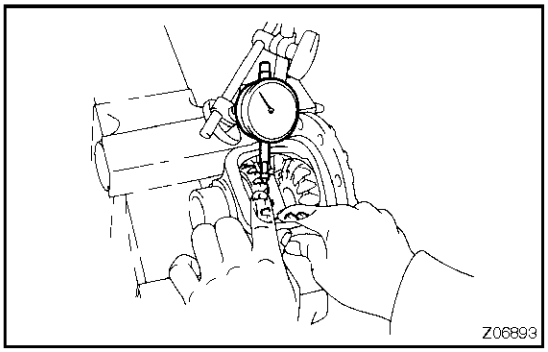
(b) Install the 2 thrust washers and side gears
Using the table below, select the thrust washers which will ensure that the backlash is within the specification
Try to select washers of the same size for both sides
**Backlash: 0.02 – 0.20 mm (0.0008–0.0079 in.)**
**Thrust washer thickness**

| Thickness mm (in.) | Thickness mm (in.) |
|---|---|
| 1.60 (0.063) | 1.90 (0.075) |
| 1.75 (0.069) | 2.05 (0.081) |


SA2179

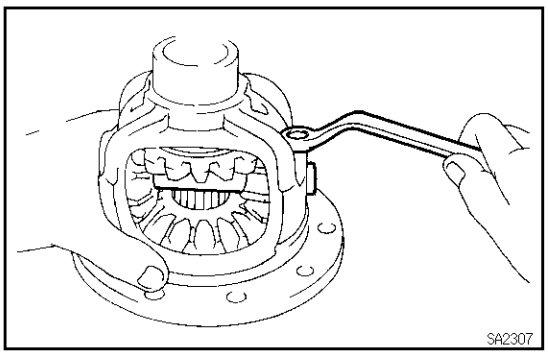
(c) Install the side gears with the side gear thrust washers, pinion gears, pinion gear thrust washers and pinion shaft

HINT
Align the hole for the pinion shaft and differential case hole


Z06893

(d) Using a dial indicator, measure the side gear backlash with holding the one pinion gear toward the case
**Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)**

If the backlash is not within the specification, install a thrust washer of different thickness


SA2307

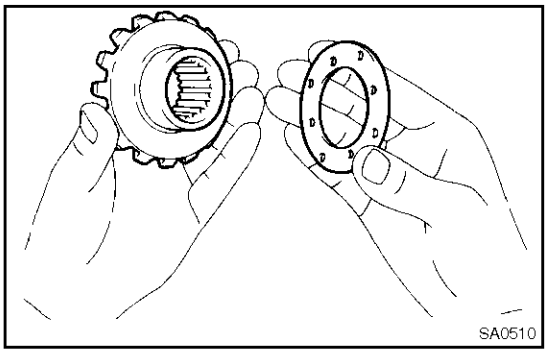
(e) Install the pinion shaft pin and washer
**Torque: 27 N·m (275 kgf·cm, 20 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

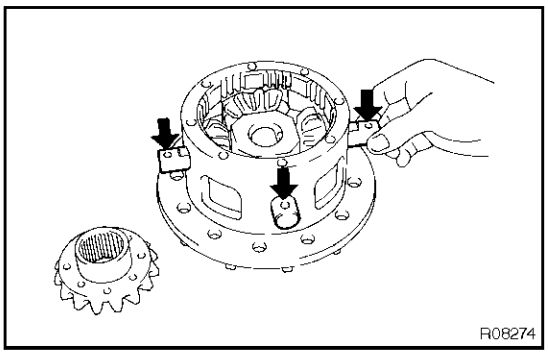
Brought to you by BirfMark



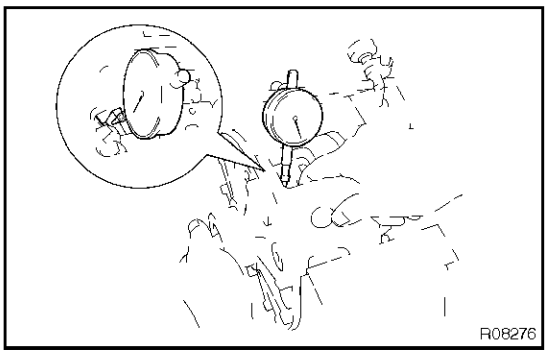



**2. w/ DIFFERENTIAL LOCK:**
**MEASURE SIDE GEAR BACKLASH**

(a) Apply all of the sliding and rotating surfaces with gear oil
(b) Install the thrust washer to the side gear
(c) Install the thrust washer to the pinion gear




(d) Install the side gear into the case
(e) Install the holder into the case
(f) Install the 4 pinion gears with the thrust washers
(g) Align the pinion shaft hole and case pinion shaft pin hole, and install the pinion shaft
(h) Install the side gear to the cover
(i) Align the matchmarks and install the case and cover
(j) Using a torx socket wrench, torque the 5 bolts and 3 pinion shaft pins
**Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)**



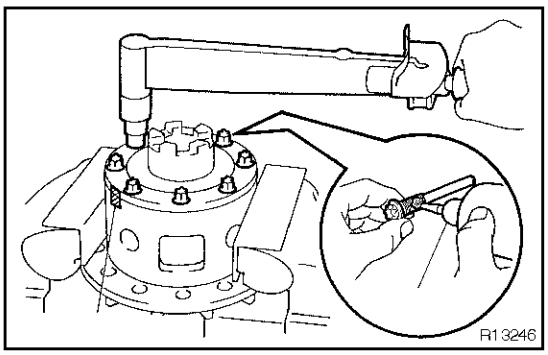

(k) Using a dial indicator, with holding the side gear and measure the backlash
**Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)**

HINT
Measure at all 4 locations
If the backlash is not within the specification, install the thrust washer of a different thickness

**Thrust washer thickness**

| Thickness mm (in.) | Thickness mm (in.) |
|---|---|
| 1.60 (0.063) | 1.90 (0.075) |
| 1.75 (0.069) | 2.05 (0.081) |

(l) After measuring backlash, remove the 5 set bolts and 3 pinion shaft pins




**3. w/ DIFFERENTIAL LOCK:**
**ASSEMBLE DIFFERENTIAL CASE**

(a) Clean the thread of the bolts, pinion shaft pins, case and cover with the white gasoline
(b) Coat the threads of the bolts and pinion shaft pins with adhesive
**Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent**
(c) Align the matchmarks, install the case and cover

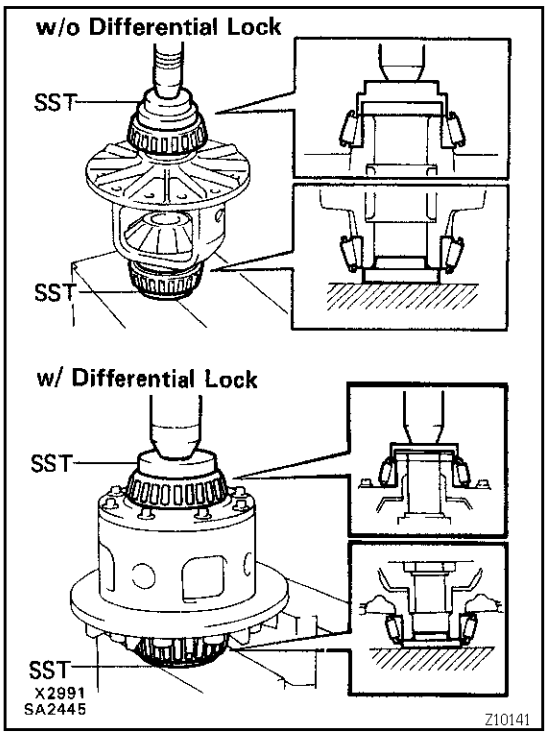


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



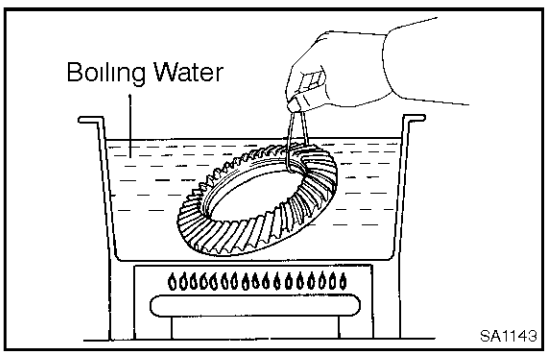
(d) Using a torx socket wrench, torque the 5 bolts and 3 pinion shaft pins
**Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)**




**4. INSTALL SIDE BEARINGS**

(a) w/o Differential lock
Using SST and a press, install the 2 side bearings on the differential case
SST 09315–00022, 09550–10012 (09558–10010)

(b) w/ Differential lock
Using SST and a press, install the 2 side bearings on the differential case
SST 09550–60010, 09550–10012 (09558–10010)



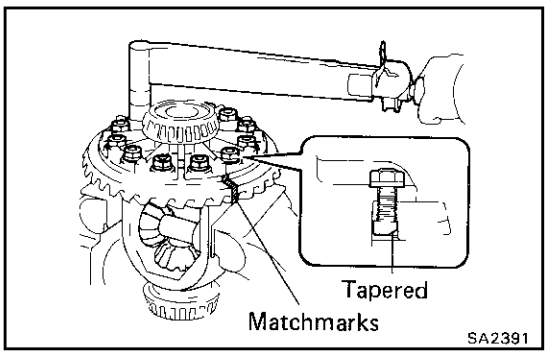

**5. INSTALL RING GEAR ON DIFFERENTIAL CASE**

(a) Clean the contact surfaces of the differential case and ring gear

(b) Heat the ring gear to about 100°C (212°F) in boiling water

(c) Carefully remove the ring gear from the boiling water

(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case




(e) Align the matchmarks on the ring gear and differential case

(f) Temporarily install the set bolts and nuts so that the bolt holes in the ring gear and differential case are not misaligned

**NOTICE:**
**Install the bolts so that the tapered part of the bolt is on the ring gear side. The ring gear set nuts should not tighten until the ring gear has cooled sufficiently.**

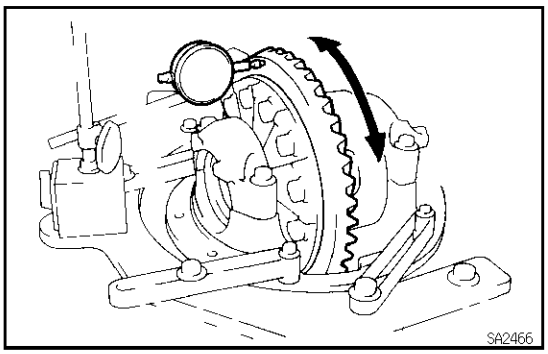


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

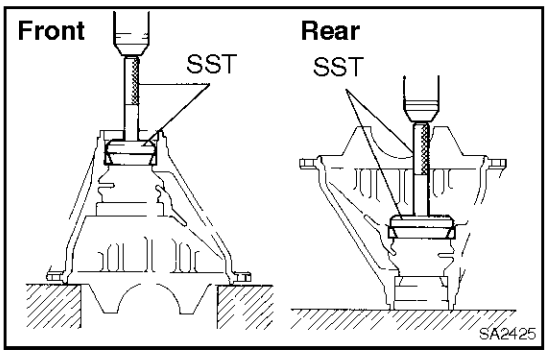


(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time
**Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)**



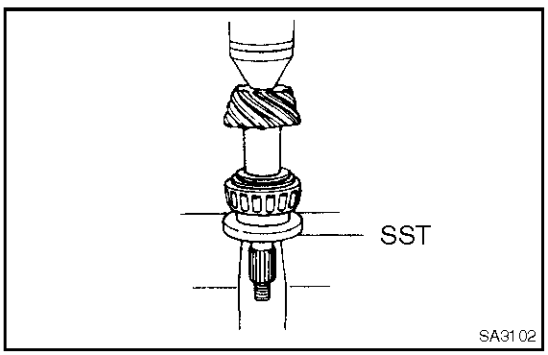

**6. CHECK RING GEAR RUNOUT**

(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings
(b) Using a dial indicator, check the ring gear runout
**Maximum runout: 0.10 mm (0.0039 in.)**
(c) Remove the differential case




**7. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES**

(a) Front side
Using SST and a press, install the 2 outer races
SST 09950–60020 (09951–00710),
09950–70010 (09951–07150)
(b) Rear side
Using SST and a press, install the 2 outer races
SST 09950–60020 (09951–00890),
09950–70010 (09951–07150)



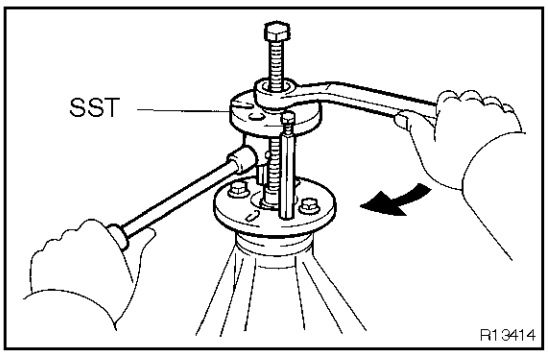

**8. INSTALL DRIVE PINION REAR BEARING**

(a) Install the washer on the drive pinion

HINT

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary

(b) Using SST and a press, install the rear bearing onto the drive pinion
SST 09506–35010




**9. TEMPORARILY ADJUST DRIVE PINION PRELOAD**

(a) Install the drive pinion and front bearing

HINT

Assemble the spacer and oil seal after adjusting the gear contact pattern

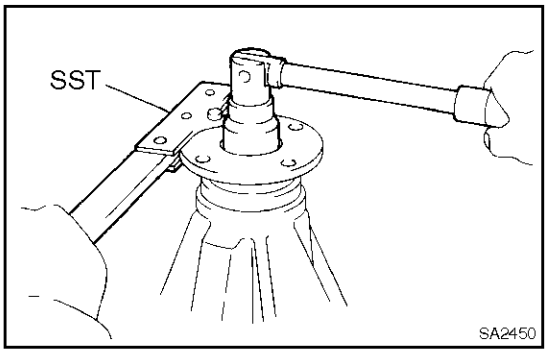
(b) Install the oil slinger
(c) Install the companion flange with SST
SST 09550–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

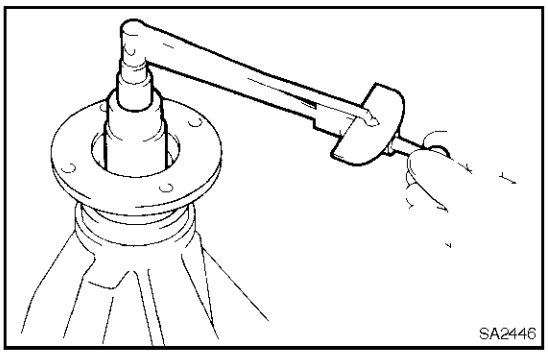
Brought to you by BirfMark






(d) Adjust the drive pinion preload by tightening the companion flange nut
Using SST to hold the flange, tighten the nut
SST 09330–00021

**NOTICE:**
**Coat the nut and screw of the drive pinion with gear oil. As there is no spacer, tighten a little at a time, being careful not to overtighten.**




(e) Using a torque wrench, measure the preload
**Preload (at starting):**
**New bearing**
**1.3 – 2.0 N·m (13 – 20 kgf·cm, 11.3 – 17.4 in.·lbf)**
**Reused bearing**
**0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.·lbf)**

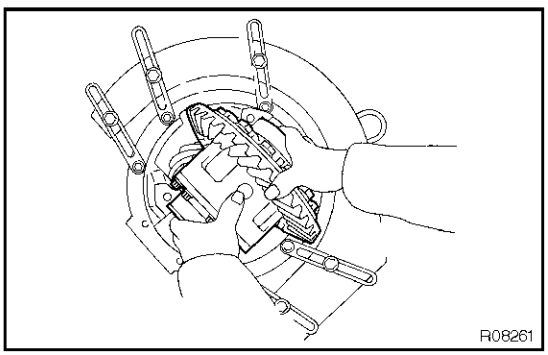
HINT
Measure the total preload after first turning the bearing clockwise and counterclockwise several times to make the bearing smooth

**10. w/o DIFFERENTIAL LOCK:**
**INSTALL DIFFERENTIAL CASE IN CARRIER**

(a) Place the 2 bearing outer races on their respective bearings Make sure that the left and right outer races are not interchanged

(b) Install the case in the carrier

HINT
Make sure that there is backlash between the ring gear and drive pinion

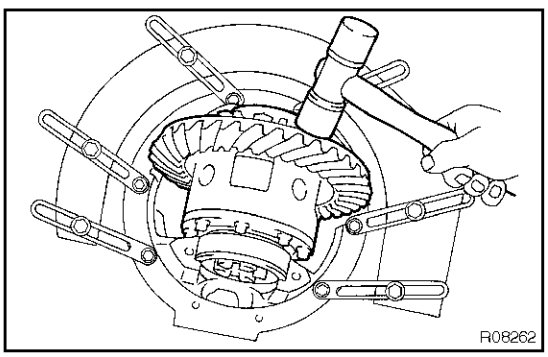



**11. w/ DIFFERENTIAL LOCK:**
**INSTALL DIFFERENTIAL CASE IN CARRIER**

(a) Place the 2 bearing outer races on their respective bearings Make sure that the left and right races are not interchanged

(b) Install the assembled plate washer onto the side bearing

(c) Install the differential case in the carrier




(d) Make the plate washer and bearing smooth by tapping on the ring gear with a plastic hammer

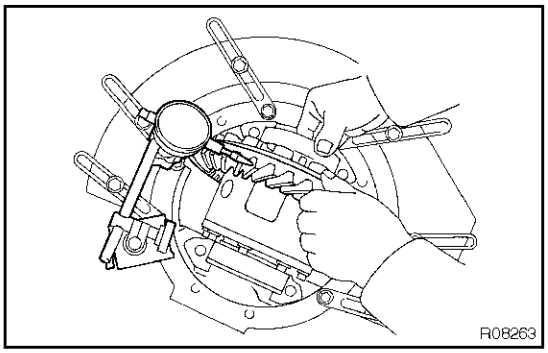
HINT
If it is difficult to install the differential case into the carrier, replace the plate washer with a thinner one
However, select a plate washer that allows no clearance between it and the carrier



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**12. w/ DIFFERENTIAL LOCK:**
**ADJUST RING GEAR BACKLASH**

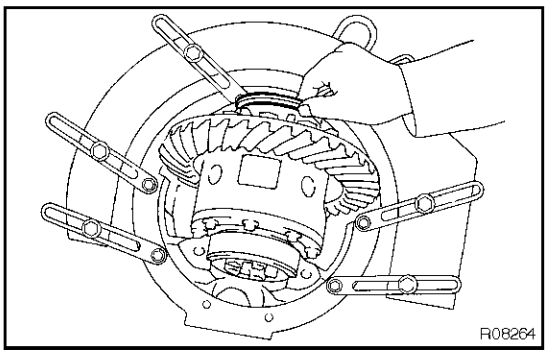
(a) Using a dial indicator, with holding the side bearing of the ring gear side and measure the backlash
**Backlash (reference): 0.15 mm (0.0059 in.)**

(b) Select a case cover side plate washer using the backlash as reference

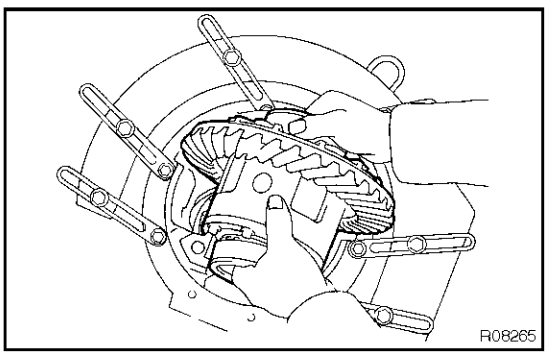
**Side plate washer thickness**

| Mark | Thickness mm (in.) | Mark | Thickness mm (in.) | Mark | Thickness mm (in.) | Mark | Thickness mm (in.) |
|---|---|---|---|---|---|---|---|
| 1 | 2.67 (0.1051) | 7 | 2.85 (0.1122) | 13 | 3.03 (0.1193) | 19 | 3.21 (0.1264) |
| 2 | 2.70 (0.1063) | 8 | 2.88 (0.1134) | 14 | 3.06 (0.1205) | 20 | 3.24 (0.1276) |
| 3 | 2.73 (0.1075) | 9 | 2.91 (0.1146) | 15 | 3.09 (0.1217) | 21 | 3.27 (0.1287) |
| 4 | 2.76 (0.1087) | 10 | 2.94 (0.1157) | 16 | 3.12 (0.1228) | 22 | 3.30 (0.1299) |
| 5 | 2.79 (0.1098) | 11 | 2.97 (0.1169) | 17 | 3.15 (0.1240) | 23 | 3.33 (0.1311) |
| 6 | 2.82 (0.1110) | 12 | 3.00 (0.1181) | 18 | 3.18 (0.1252) | | |

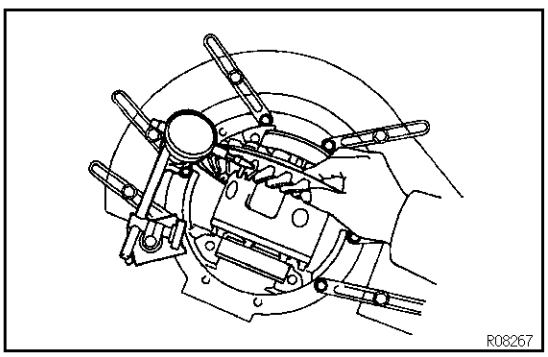
V04434




(c) Select a ring gear side plate washer of a thickness which eliminates any clearance between the plate washer and carrier




(d) Remove the 2 plate washers and differential carrier
(e) Install the plate washer into the lower part of the carrier
(f) Place the plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier
(g) Using a plastic hammer, make the washer and bearing smooth by tapping the ring gear




(h) Using a dial indicator, measure the ring gear backlash
**Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)**

If it is not within the specification, adjust it by either increasing or decreasing the number of washers on both sides by an equal amount

HINT

There should be no clearance between the plate washer and case

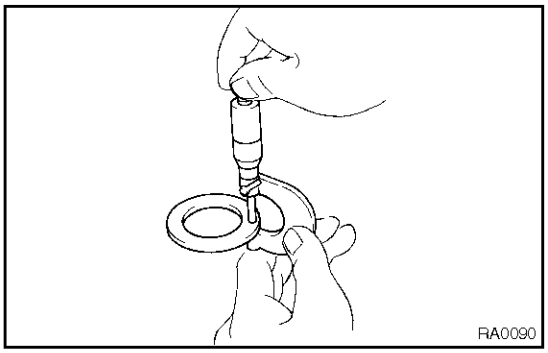
Ensure that there is ring gear backlash



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**13. w/ DIFFERENTIAL LOCK:**
**ADJUST SIDE BEARING PRELOAD**

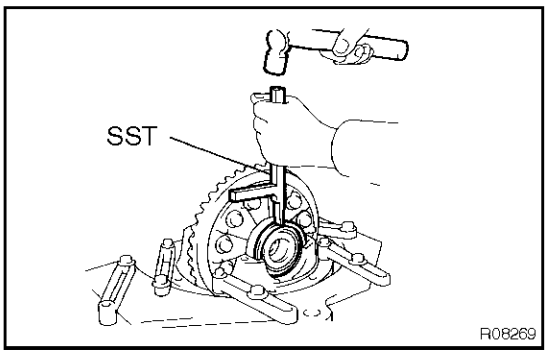
(a) After adjustment with the backlash as reference, remove the ring gear side plate washer

(b) Using a micrometer, measure the thickness of the removed plate washer

(c) Install a new thicker washer of 0 06 – 0 09 mm (0 0024 – 0 0035 in ) than the washer removed

HINT

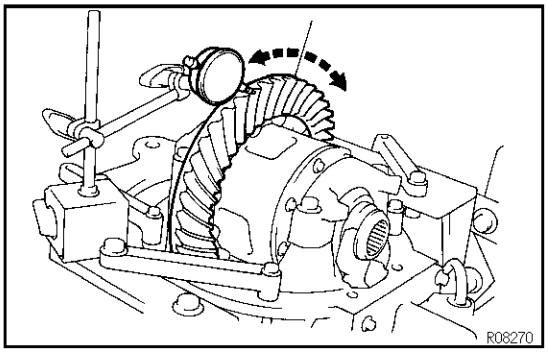
Select a washer which can be pressed in 2/3 of the way with finger




(d) Using SST, tap in the plate washer
SST 09504–22010

(e) Align the matchmarks on the cap and carrier

(f) Tighten the 4 bearing cap bolts to the specified torque
**Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)**




(g) Using a dial indicator, adjust the ring gear backlash until it is within the specification
**Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)**

If it is not within the specification, follow the procedure listed below

If backlash is greater than the specification

Replace the cover side washer with a thicker washer When doing so replace the ring gear side plate washer with one having a thickness equalling the amount the cover side plate washer thickness was decreased

If backlash is less than specification

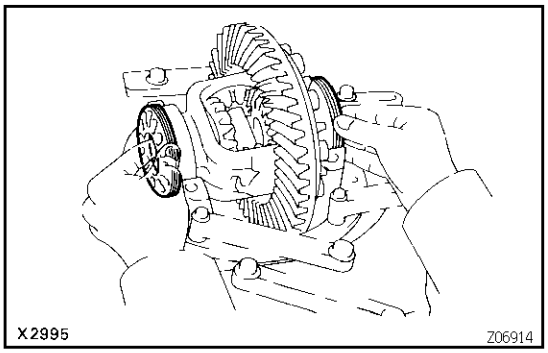
Replace the cover side washer with a thicker washer When doing so, replace the ring gear side plate washer with one having a thickness equalling the amount the cover side plate washer thickness was increased



Brought to you by BirfMark
Version 1.11 - 03/16/2010

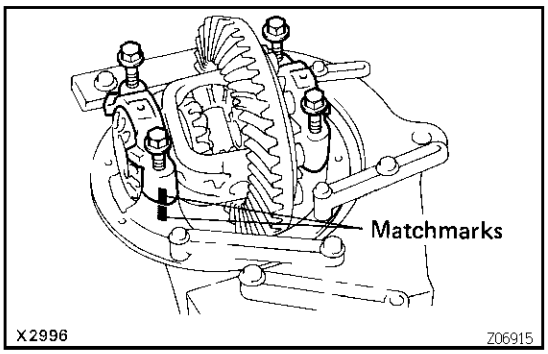
Brought to you by BirfMark






**14. w/o DIFFERENTIAL LOCK: INSTALL ADJUSTING NUTS**

Install the 2 adjusting nuts on the carrier, making sure the nuts are threaded properly



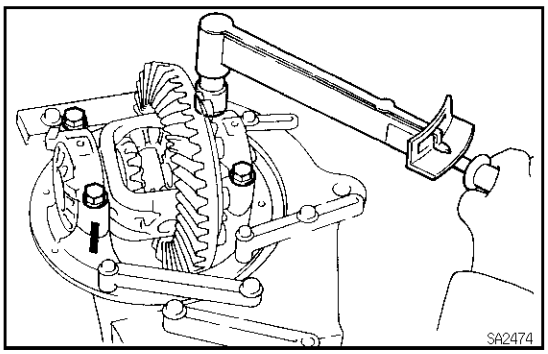

**15. w/o DIFFERENTIAL LOCK: INSTALL BEARING CAPS**

Align the matchmarks on the cap and carrier Screw in the 2 bearing cap bolts 2 or 3 turns and press down the bearing cap by hand

HINT

If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly

Reinstall the adjusting nuts if necessary



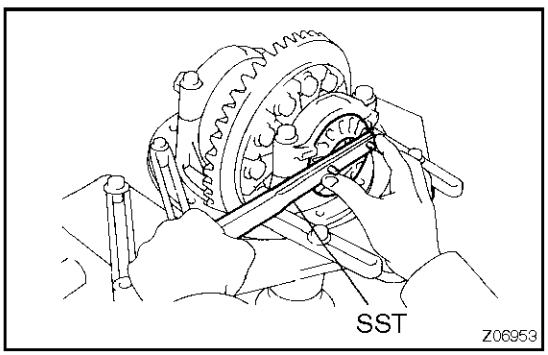

**16. w/o DIFFERENTIAL LOCK: ADJUST SIDE BEARING PRELOAD**

(a) Torque the 4 bearing cap bolts to the specified torque, then loosen them to the point where the adjusting nuts can be turned by SST

SST 09504–00011

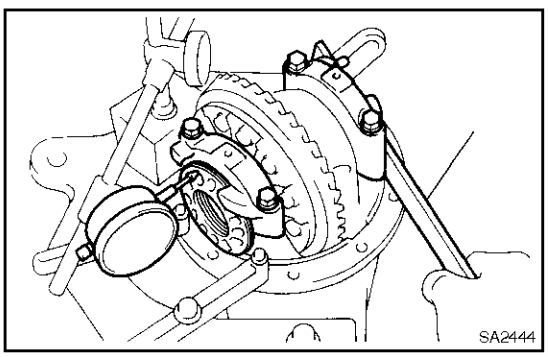
**Torque:78 N·m (800 kgf·cm, 58 ft·lbf)**

(b) Fully tighten the 4 bearing cap bolts by hand




(c) Using the SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0 2 mm (0 008 in )

(d) With turning the ring gear, use the SST to fully tighten the adjusting nut on the drive pinion side After the bearings as settled, loosen the adjusting nut on the drive pinion side




(e) Place a dial indicator on the top of the adjusting nut on the ring gear side

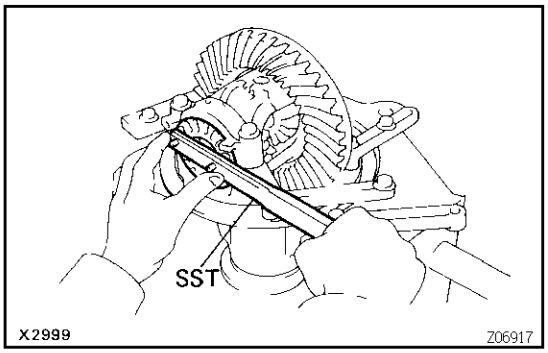
(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move



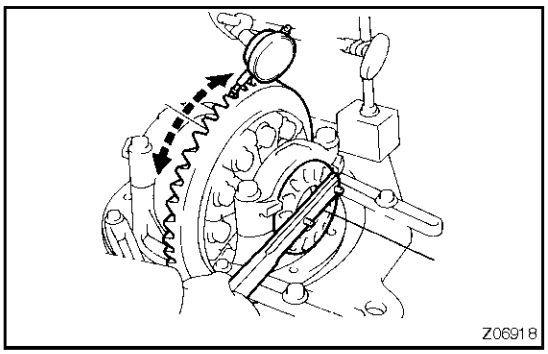
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(g) Using the SST, torque the adjusting nut 1–1 5 notches from the zero preload position

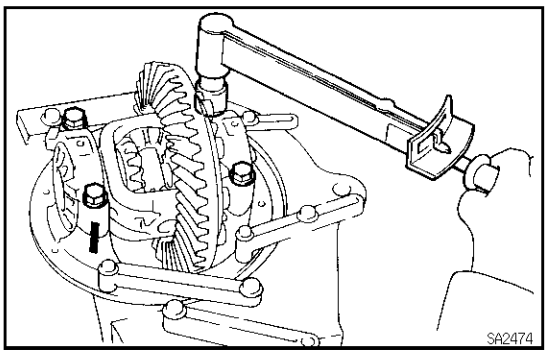



(h) Using a dial indicator, adjust the ring gear backlash until it is within the specification

**Backlash: 0.15 – 0.20 mm (0.0059–0.0079 in.)**

HINT

The backlash is adjusted by turning the left and right adjusting nuts equal amounts For example, loosen the nut on the left side one notch and torque the nut on the right side one notch




(i) Torque the 4 bearing cap bolts

**Torque:78 N·m (800 kgf·cm, 58 ft·lbf)**

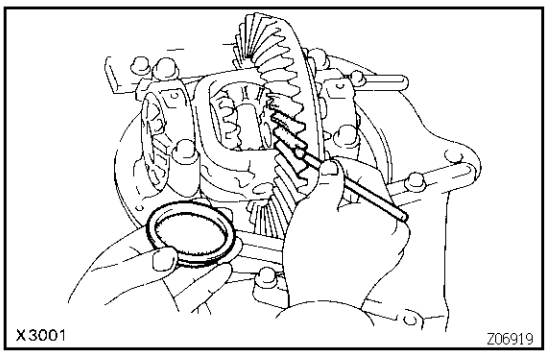
(j) Recheck the ring gear backlash

**Backlash: 0.15 – 0.20 mm (0.0059–0.0079 in.)**

**17. MEASURE TOTAL PRELOAD**

Using a torque wrench, measure the preload

**Total preload (at starting):**
**Drive pinion preload plus**
**w/o Differential lock**
**0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)**
**w/ Differential lock**
**0.3– 0.7 N·m (3 – 7 kgf·cm, 2.6 – 6.1 in.·lbf)**




**18. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**

(a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead

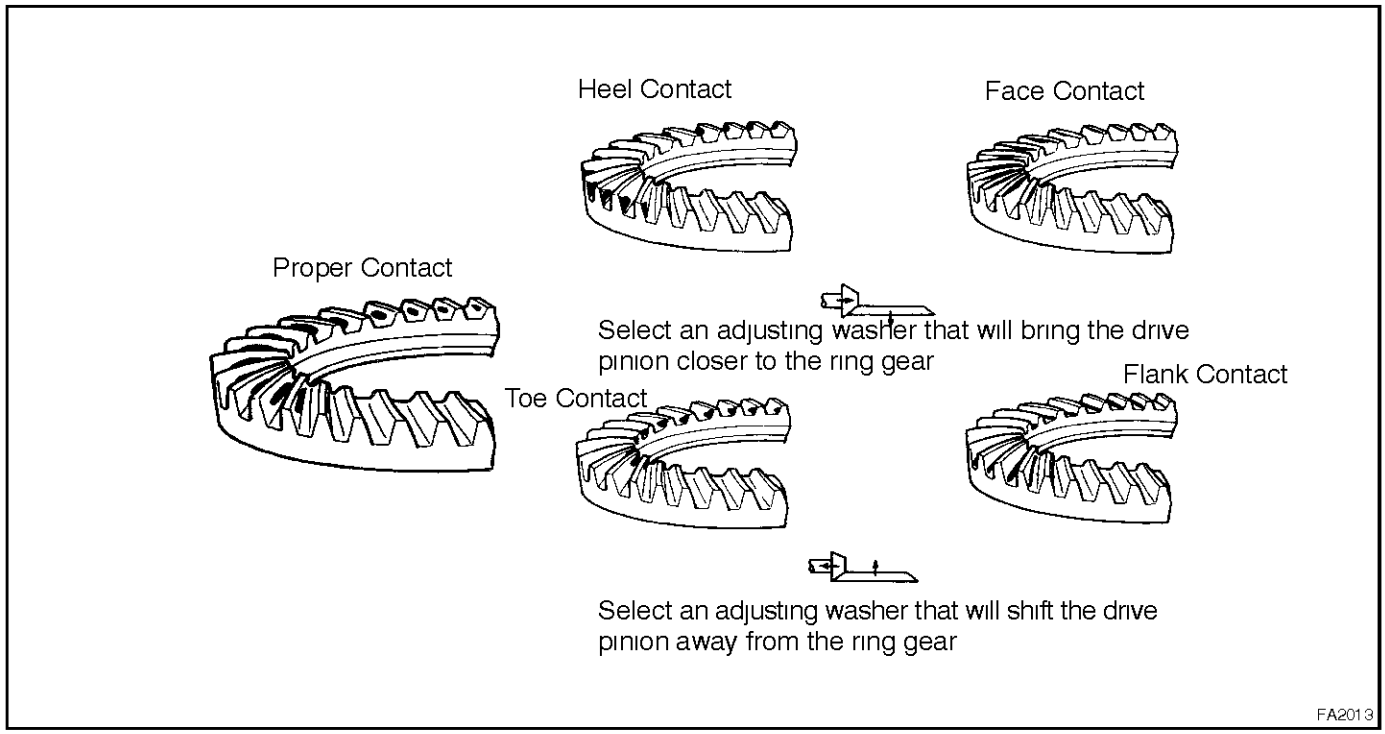
(b) Turn the companion flange, pin both directions to inspect the ring gear for proper tooth contact

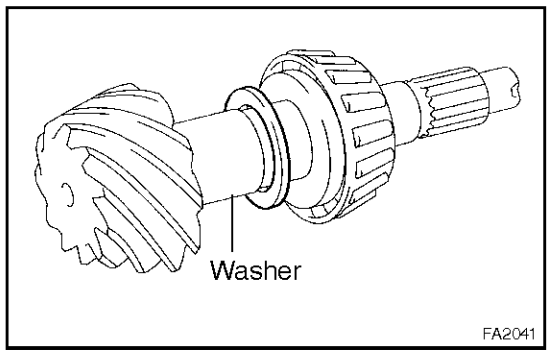


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





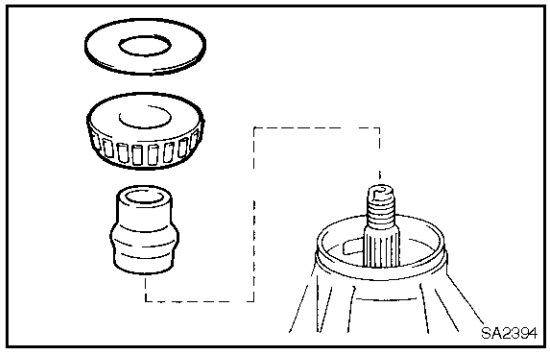




If the teeth are not contacting properly, use the following chart to select a proper washer for correction

| Thickness mm (in ) | Thickness mm (in ) |
|---|---|
| 1 05 (0 0413) | 1 35 (0 0531) |
| 1 10 (0 0433) | 1 40 (0 0551) |
| 1 15 (0 0453) | 1 45 (0 0571) |
| 1 20 (0 0472) | 1 50 (0 0591) |
| 1 25 (0 0492) | 1 55 (0 0610) |
| 1 30 (0 0512) | – |

**19. REMOVE COMPANION FLANGE (See page SA–29)**

**20. REMOVE OIL SLINGER AND FRONT BEARING (See page SA–29)**




**21. INSTALL BEARING SPACER AND FRONT BEARING**

(a) Install a new bearing spacer on the shaft

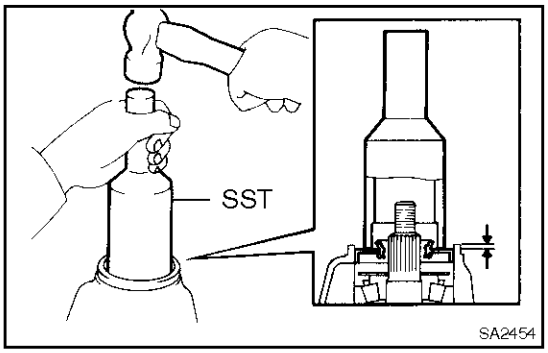
(b) Install the front bearing and oil slinger



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

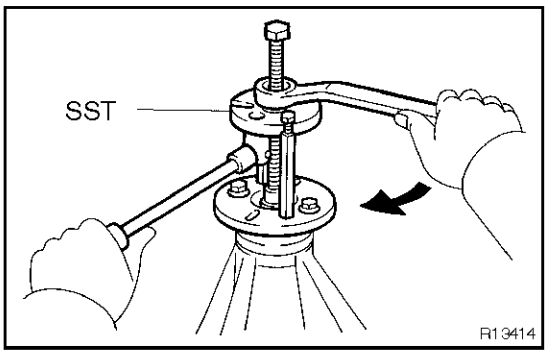





**22. INSTALL OIL SEAL**

(a) Using SST and a hammer, install a new oil seal, as shown
SST 09214–76011
**Oil seal drive in depth: 1.0 mm (0.039 in.)**

(b) Apply MP grease to the oil seal lip

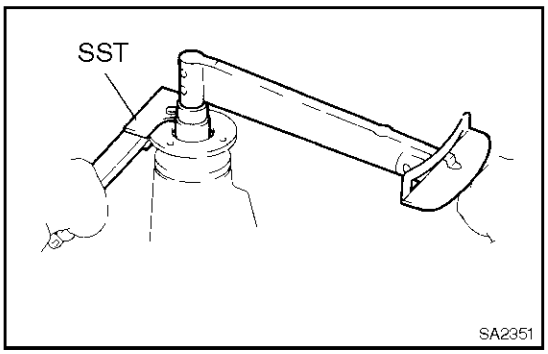



**23. INSTALL COMPANION FLANGE**

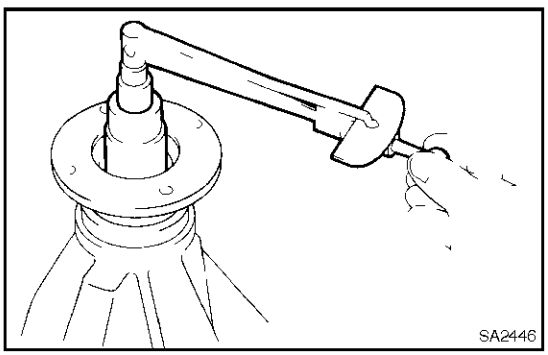
(a) Install the companion flange with SST
SST 09550–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)

(b) Install the plate washer and a new nut

HINT
Coat the threads of a new nut with gear oil




(c) Using SST to hold the flange, tighten the nut
SST 09330–00021
**Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)**




**24. ADJUST DRIVE PINION PRELOAD**

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear

**Preload (at starting):**
**New bearing**
**1.3 – 2.0 N·m (13 – 20 kgf·cm, 11.3 – 17.4 in.·lbf)**
**Reused bearing**
**0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.·lbf)**

If the preload is greater than the specification, replace the bearing spacer

If the preload is less than the specification, retighten the nut a little at a time 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached

**Maximum torque: 441 N·m (4,500 kgf·cm, 326 ft·lbf)**

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure

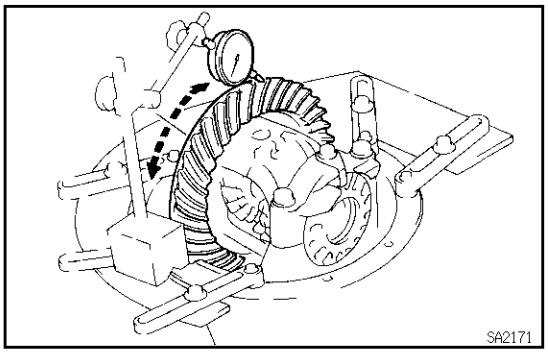
Do not back off the pinion nut to reduce the preload



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





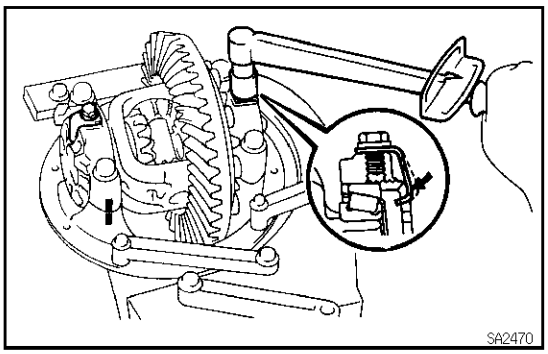

**25. RECHECK RING GEAR BACKLASH**

Using a dial indicator, measure the ring gear backlash

**Ring gear backlash:**
**0.15 – 0.20 mm (0.0059 – 0.0079 in.)**

**26. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**

**27. CHECK RUNOUT OF COMPANION FLANGE (See page SA–80)**

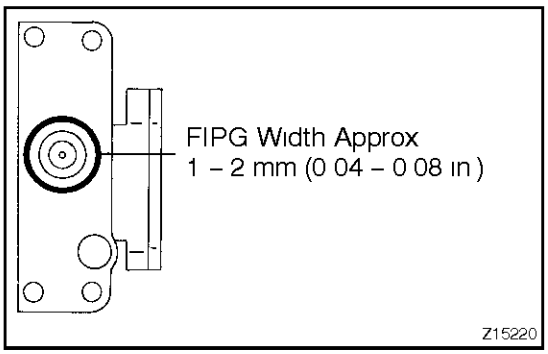



**28. w/o DIFFERENTIAL LOCK:**
**INSTALL ADJUSTING NUT LOCKS**

(a) Install 2 new nut locks on the bearing caps

(b) Tightening 2 bolts, bend the nut locks

**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**




**29. w/ DIFFERENTIAL LOCK:**
**INSTALL ACTUATOR, SHIFT FORK AND SLEEVE**

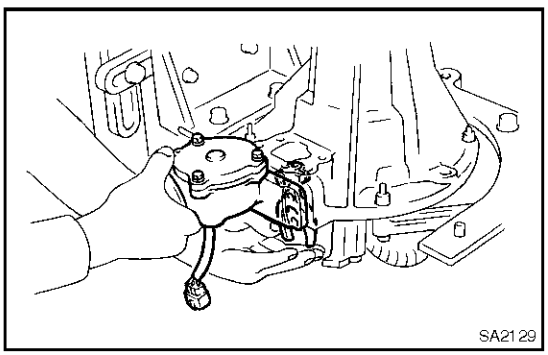
(a) Clean contacting surfaces of any FIPG material using gasoline or alcohol

(b) Apply FIPG to the actuator

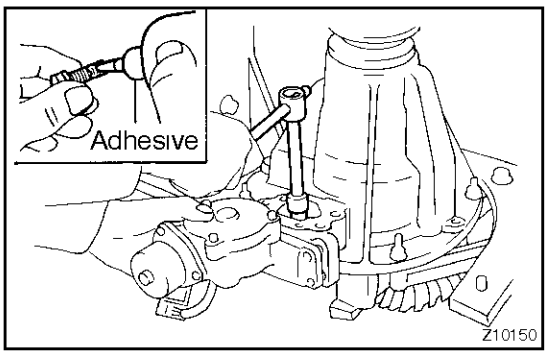
**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

HINT

Install the actuator within 10 minutes after applying FIPG




(c) Install the actuator to the differential and match the shift fork hole




(d) Clean the threads of set bolt and fork shaft with the white gasoline

(e) Coat the threads of the set bolt with adhesive

**Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent**

(f) Tighten the shift fork shaft set bolt

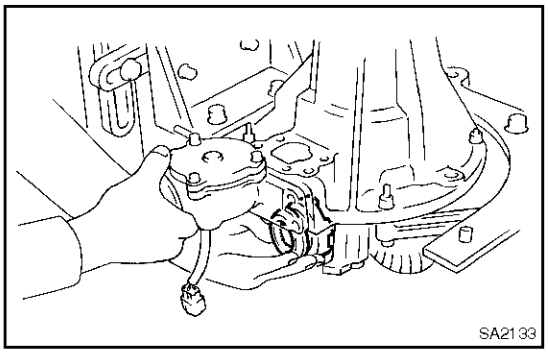
**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**



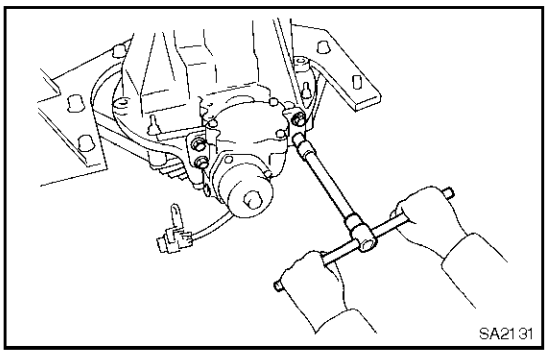
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

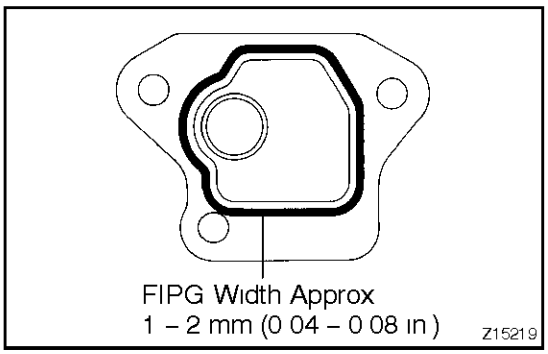





(g) Engage the sleeve with the dog clutch of the differential case




(h) Tighten the 4 bolts
**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




**30. w/ DIFFERENTIAL LOCK:**
**INSTALL COVER**

(a) Clean contacting surfaces of any FIPG material using gasoline or alcohol

(b) Apply FIPG to the cover
**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

HINT
Install the cover within 10 minutes after applying FIPG

(c) Tighten the 3 bolts
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

**31. w/ DIFFERENTIAL LOCK:**
**INSTALL INDICATOR SWITCH**

Install the indicator switch with a new gasket
**Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VK–01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–79).**

HINT

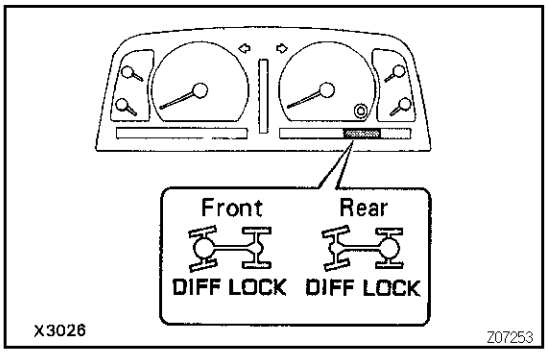
After ınstallatıon, fıll the dıfferentıal wıth gear oıl (See page SA–27)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# DIFFERENTIAL LOCKING SYSTEM

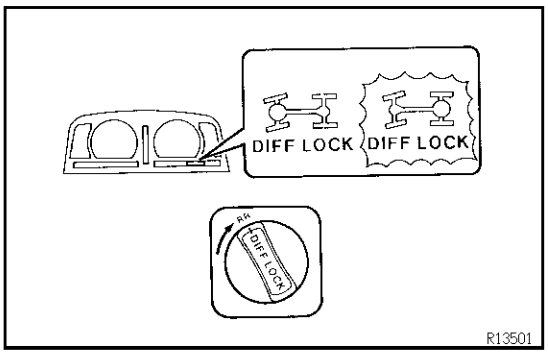
SA1VL-03

## ON-VEHICLE INSPECTION

### 1. INSPECT DIFFERENTIAL LOCK SYSTEM

(a) Inspect the indicator lights

Check that the indicator lights (front side and rear side) light up for approx 1 second when the ignition switch is turned ON




(b) Inspect the differential lock operation

(1) Jack up the vehicle then start the engine

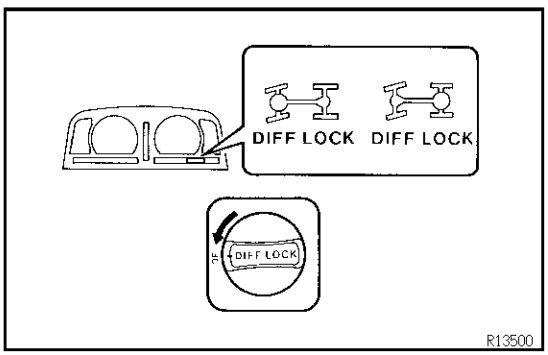
(2) Put the transfer shift lever on the L position

(3) When the Diff lock control switch is set to the RR position, the indicator light (rear side) is turned on

Differential lock is applied to the rear wheel at this time

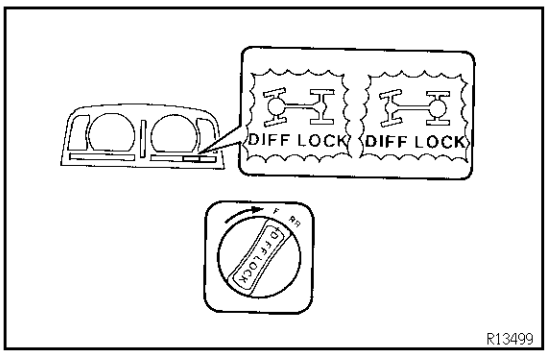
HINT

If the gears of the differential lock system are not meshed, the indicator light remains blinking, so rotate the tires to mesh the gear




(4) When the Diff lock control switch is at the OFF position, the indicator light goes off

Differential lock is released for the rear wheel at this time




(5) When the Diff lock control switch is set to the FR/RR position, the indicator lights (front side and rear side) are turned on

Differential lock is applied to both the front wheels and rear wheels at this time

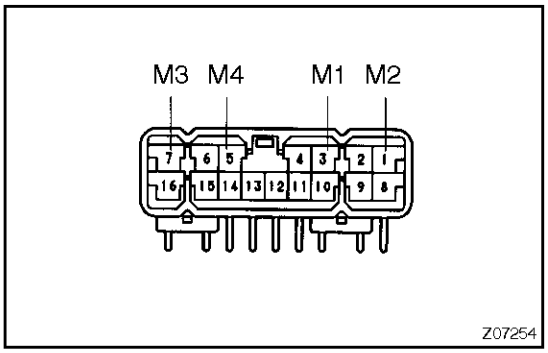




Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

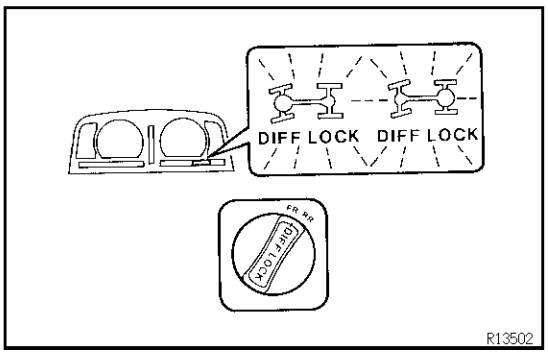




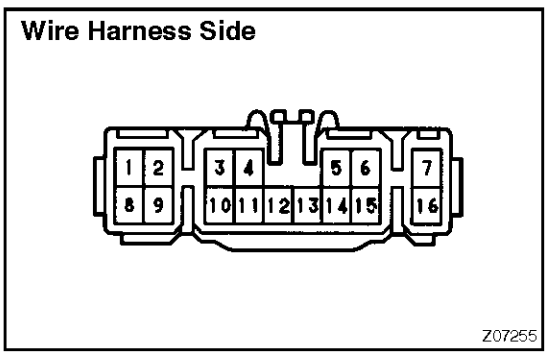

(6) Check the voltage between the terminals of the Diff lock ECU when switching the Diff lock control switch with the speedometer, registering approx 8 km/h (5 mph) or more

| Diff lock control switch | Terminal | Specified value |
|---|---|---|
| OFF → RR | 3 (M1) – 1 (M2) | 0.5 V or less (on change) |
| RR → FR·RR | 7 (M3) – 5 (M4) | 0.5 V or less (on change) |

V03070




(7) Check that the indicator lights blink when center Diff lock release mode is set
Diff lock is released for both the front wheels and rear wheels at this time
(8) Return the Diff lock control switch to OFF
(9) Stop the engine and lower the vehicle




## 2. INSPECT DIFF. LOCK SYSTEM CIRCUIT

(a) Inspect the system circuit with connector disconnected
Disconnect the connector from the Diff lock ECU and inspect the connector on the wire harness side, as shown in the chart

| Trouble Part/ Terminals (Symbols) | Condition | Specified Value |
|---|---|---|
| Rear diff lock actuator/ 1 (M2) – 3 (M1) | – | Less than 100 Ω |
| Front diff lock actuator/ 5 (M4) – 7 (M1) | – | Less than 100 Ω |
| Body ground/ 13 (GND) – Body ground | – | Continuity |
| Vehicle speed sensor/ 4(SPD) – Body ground | Vehicle moving slowly | 1 pulse each 40 cm (15 75 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| DIFF fuse/<br>8 (IG) – Body ground | Ignition switch ON | Battery positive voltage |
| Rear diff lock position switch/<br>2 (RLP) – Body ground | Ignition switch ON<br>Indicator light (Rear) ON | About 0 V |
| | Ignition switch ON<br>Indicator light (Rear) OFF | Battery positive voltage |
| Front diff lock position switch/<br>9 (FLP) – Body ground | Ignition switch ON<br>Indicator light (front) ON | About 0 V |
| | Ignition switch ON<br>Indicator light (front) OFF | Battery positive voltage |
| Center diff indicator switch/<br>15 (4WD) – Body groud | Ignition switch ON<br>Indicator light (Center diff lock) ON | About 0 V |
| | Ignition switch ON<br>Indicator light (Center diff lock) OFF | Battery positive voltage |
| Differential lock control switch/<br>12 (R) – Body ground | Ignition switch ON<br>Diff lock control switch RR or FR RR | Battery positive voltage |
| | Ignition switch ON<br>Diff lock control switch OFF | About 0 V |
| Differential lock control switch/<br>6 (RF) – Body ground | Ignition switch ON<br>Diff lock control switch FR RR | Battery positive voltage |
| | Ignition switch ON<br>Diff lock control switch OFF or RR | About 0 V |

HINT

When a signal enters the ECU to LOCK the front differential and set the rear differential to FREE (when battery positive voltage is inputted to terminal 6 (RF) of ECU and about 0 V is inputted to terminal 12 (R)), or a signal to FREE both the front and rear differentials, the indicator lights keep blinking until the ignition switch is turned off (Fail–safe function)

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above

(b) Inspect the battery positive voltage

**Battery positive voltage: 10 – 14.5 V**

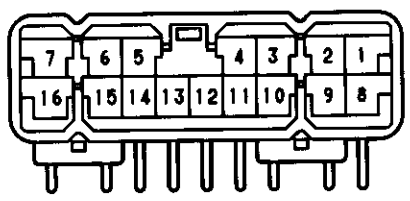
(c) Inspect the system circuit with connector connected

(1) Turn the ignition switch to the ON position

(2) Keep the center Diff lock condition

(3) Remove the Diff lock ECU

**ECU Side**




Z07256

(4) Using a voltmeter, measure the voltage when the differential lock control switch is in the position, as shown below

| Terminals (Symbols) | Switch Position | STD Voltage (V) |
|---|---|---|
| 15 (4WD) – 13 (GND) | – | 0 5 or less |
| 9 (FLP) – 13 (GND) | FR RR | 0 5 or less |
| 2 (RLP) – 13 (GND) | RR or FR RR | 0 5 or less |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

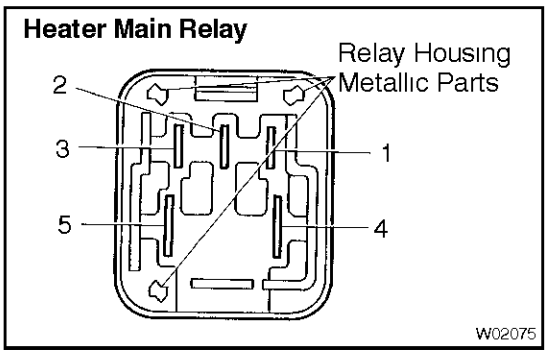
Brought to you by BirfMark



| | | |
|---|---|---|
| 3 (M1) – 1 (M2) | OFF – RR | 0 5 or less →<br>10 – 14 5<br>(Approx 1 sec) →<br>0 5 or less |
| 1 (M2) – 3 (M1) | RR – OFF | 0 5 or less →<br>10 – 14 5<br>(Approx 1 sec) →<br>0 5 or less |
| 7 (M3) – 5 (M4) | OFF or RR – FR RR | 0 5 or less →<br>10 – 14 5<br>(Approx 1 sec) →<br>0 5 or less |
| 5 (M4) – 7 (M3) | FR RR – RR or OFF | 0 5 or less →<br>10 – 14 5<br>(Approx 1 sec) →<br>0 5 or less |

If the circuit is not as specified, replace the ECU

(d) Install the ECU in place




**3. INSPECT DIFF. LOCK ACTUATOR**

(a) Jack up the vehicle

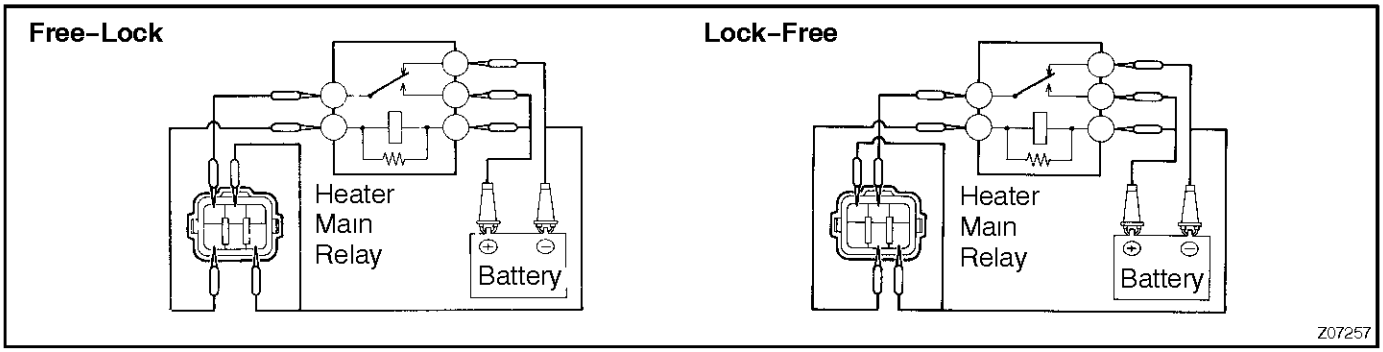
(b) Use the heater main relay and connect it, as shown below

**NOTICE:**

**Connect the terminals being careful not to touch the neighboring terminals or metallic parts of relay housing.**

(c) Rotate the tire and check that differential lock has occurred

If operation is not as specified, replace the actuator

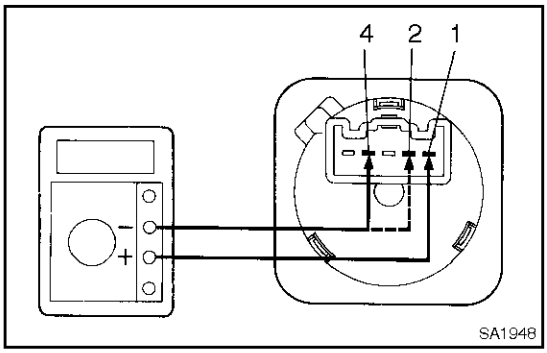





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



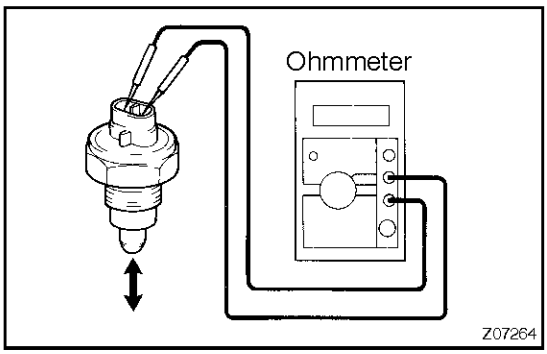



**4. INSPECT DIFF. LOCK CONTROL SWITCH**

Inspect the switch continuity between terminals, as shown

| Switch Position | Terminals | Specified Condition |
|---|---|---|
| OFF | 1 – 2 | No continuity |
| | 1 – 4 | No continuity |
| RR | 1 – 2 | No continuity |
| | 1 – 4 | Continuity |
| FR RR | 1 – 2 | Continuity |
| | 1 – 4 | Continuity |

If continuity is not as specified, replace the switch




**5. INSPECT DIFF. LOCK POSITION SWITCH**

(a) Front and Rear

Inspect the diff lock position switch

(1) Check that there is continuity between terminals when the switch is pushed (differential connected position)

(2) Check that there is no continuity when the switch is free (differential disconnected position)

If operation is not as specified, replace the switch

(b) Inspect the center diff indicator switch

**6. INSPECT VEHICLE SPEED SENSOR AND INDICATOR LIGHT**

(a) Inspect the vehicle speed sensor (See page BE–34)

(b) Inspect the indicator light



Author : Date : 962
Brought to you by BirfMark
Version 1.11 - 03/16/2010

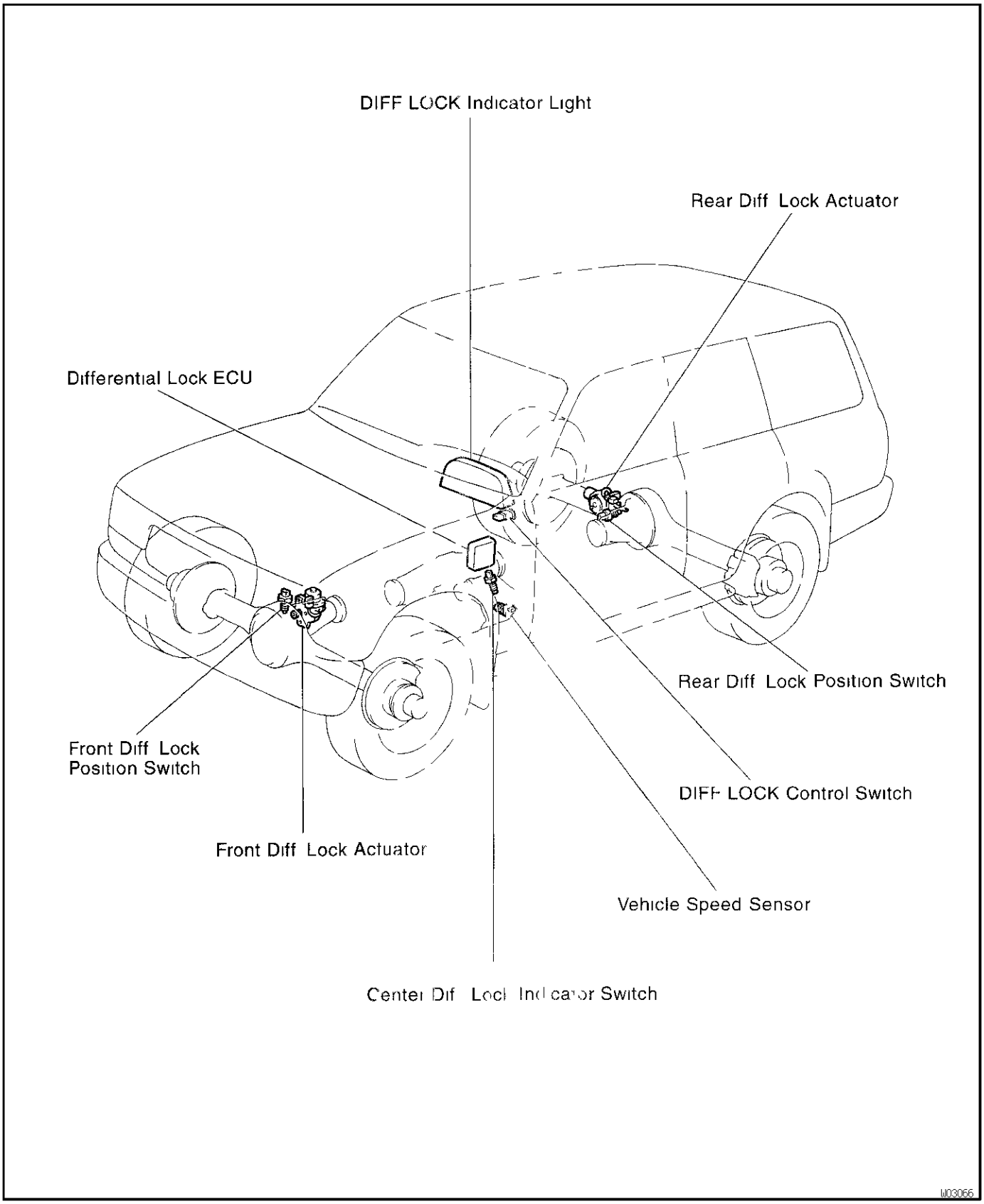
Brought to you by BirfMark



# DIFFERENTIAL LOCKING SYSTEM

SA1VM-01

## LOCATION





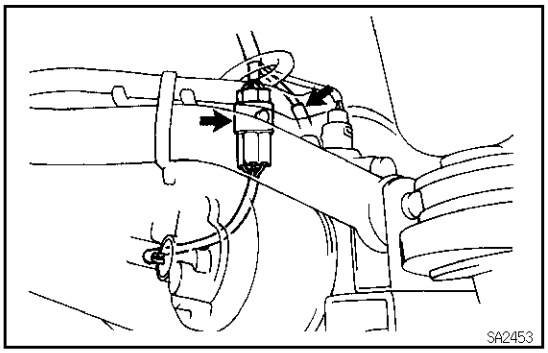

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VN 02

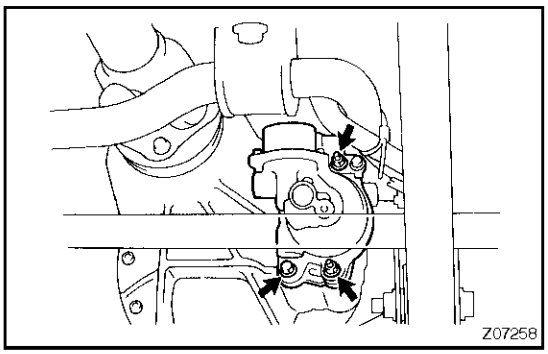
# REMOVAL




**1. REMOVE FRONT ACTUATOR**

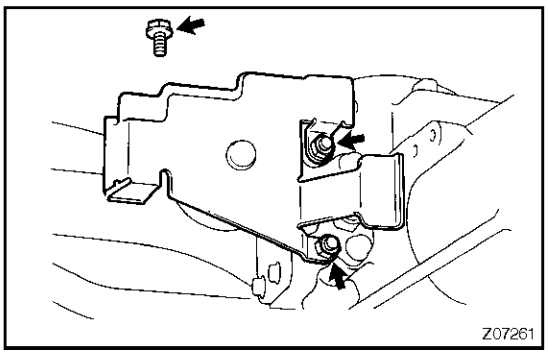
(a) Shifting the front differential lock

(b) Disconnect the connector and tube




(c) Remove the 2 nuts, bolt and actuator

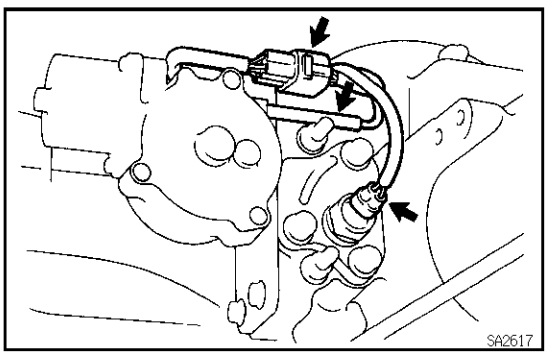
(d) Remove the O–ring from the actuator




**2. REMOVE REAR ACTUATOR**

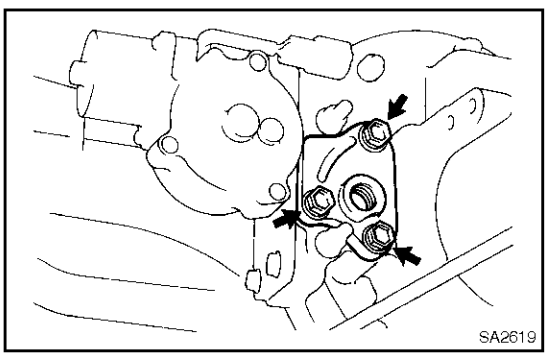
(a) Shifting the gear differential lock

(b) Remove the actuator protector
Remove the 2 nuts, bolt and protector




(c) Disconnect the connectors and tube

(d) Remove the rear Diff lock position switch




(e) Remove the cover

(1) Remove the 3 bolts

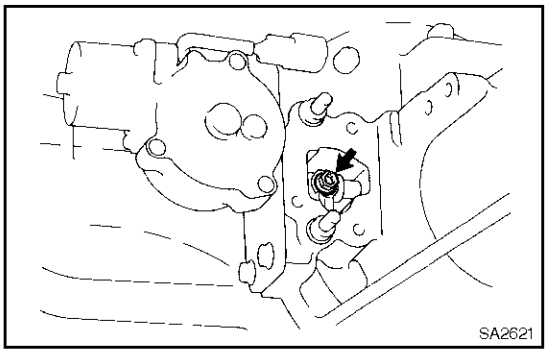
(2) Using a brass bar and hammer, remove the cover



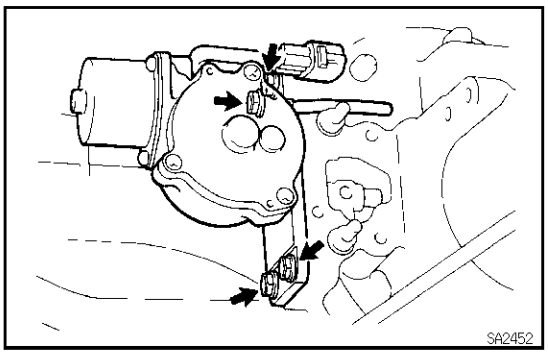
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(f) Remove the shift fork set bolt




(g) Remove the 4 bolts

(h) Using a screwdriver, pry out the actuator



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

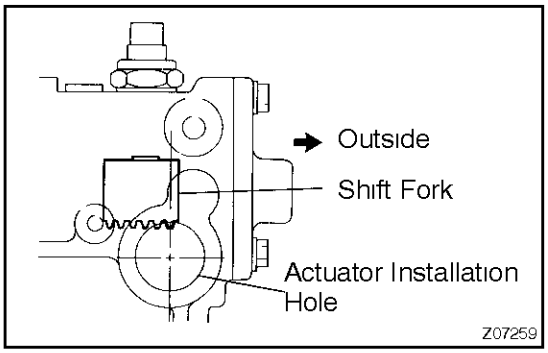


SA1VO 02

# INSTALLATION

## 1. INSTALL FRONT ACTUATOR

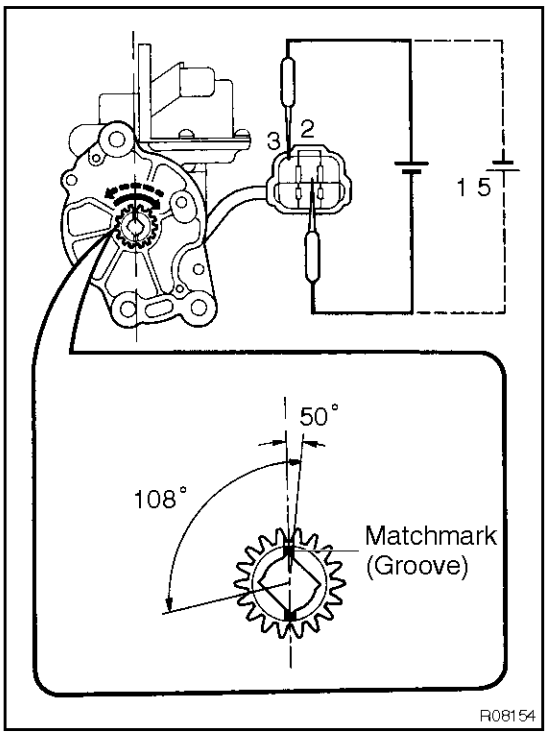
(a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole




(b) Using a dry cell battery, align the matchmark on the pinion with the center line of the actuator

**NOTICE:**

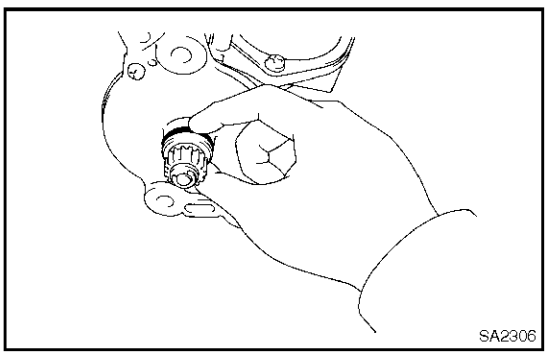
- **If the pinion of the actuator is not in the specified place, the actuator is difficult to be installed.**
- **Do not supply the battery positive voltage between terminals.**
- **If the matchmark comes to the extension limit of the rotation, do not electrify moreover.**




(c) Install a new O–ring to the actuator

(d) Apply a light coat of gear oil on the O–ring

(e) Apply MP grease to the gear part of the actuator

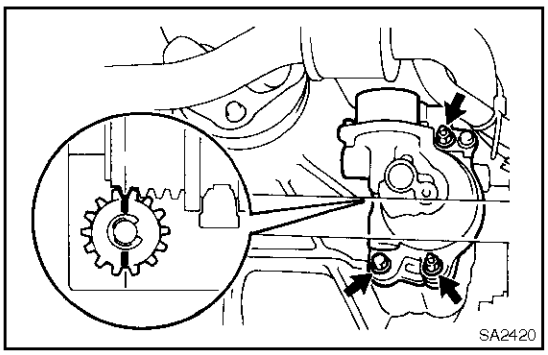



(f) Install the actuator to the differential with the 2 nuts and bolt, so that the outermost rack tooth of the shift fork will fit matchmark of the pinion of the actuator

HINT

Do not damage the O–ring of the actuator

**Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)**

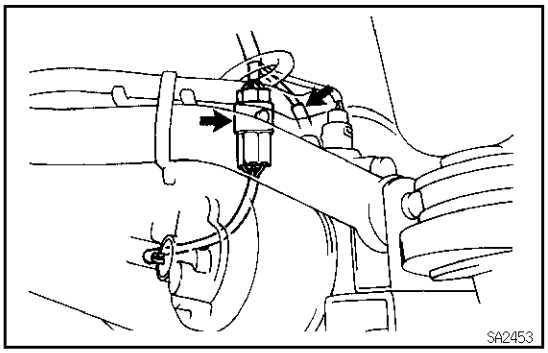





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





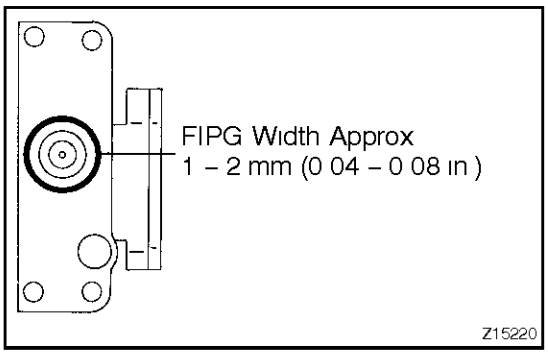

(g) Connect the connector and tube

HINT

- The depth of the insertion of the bleeder tube into the hose is approx 15 mm (0 59 in )
- Take care that water or the equivalent will not adhere to the connector and hose

(h) Cancel the front differential lock

With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock




**2. INSTALL REAR ACTUATOR**

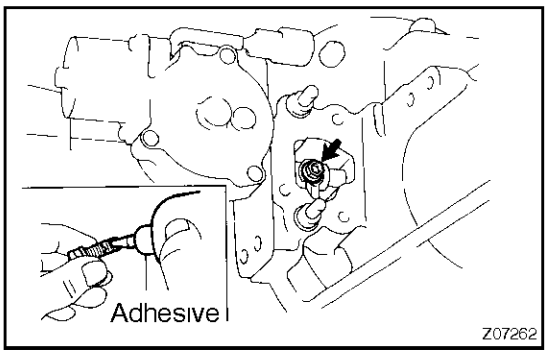
(a) Clean contacting surfaces of any FIPG material using gasoline or alcohol

(b) Apply FIPG to the actuator

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

HINT

Install the actuator within 10 minutes after applying FIPG




(c) Install the actuator to the differential and match the shaft with the shaft fork hole

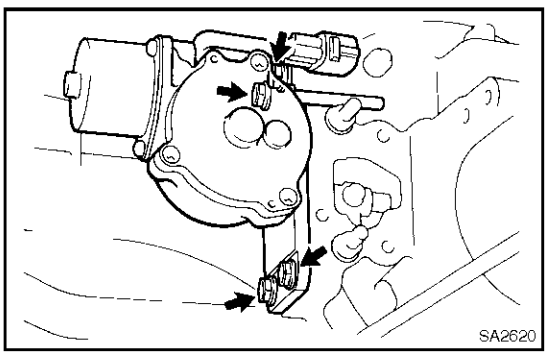
(d) Clean the threads of the set bolt and shaft fork with the white gasoline

(e) Coat the threads of the set bolt with adhesive

**Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent**

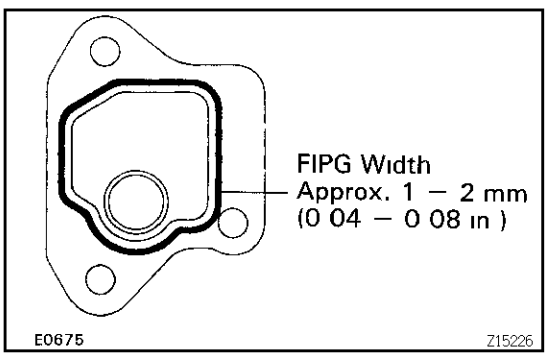
(f) Tighten the shift fork set bolt

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**




(g) Tighten the 4 bolts uniformly, a little at a time

**Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)**




(h) Install the cover

(1) Clean the contacting surfaces of any FIPG material using gasoline or alcohol

(2) Apply FIPG to the cover

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

HINT

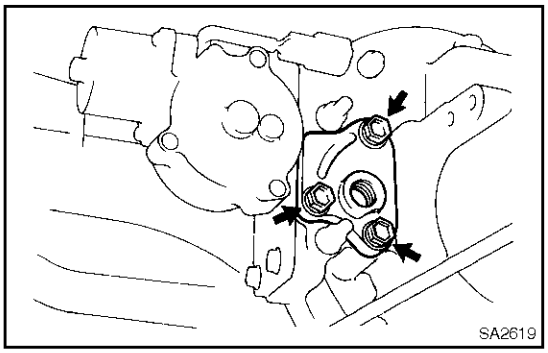
Install the cover within 10 minutes after applying FIPG



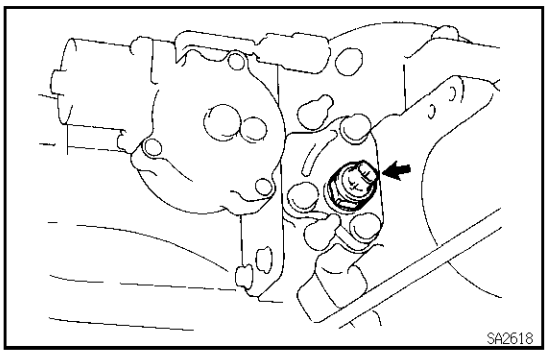
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

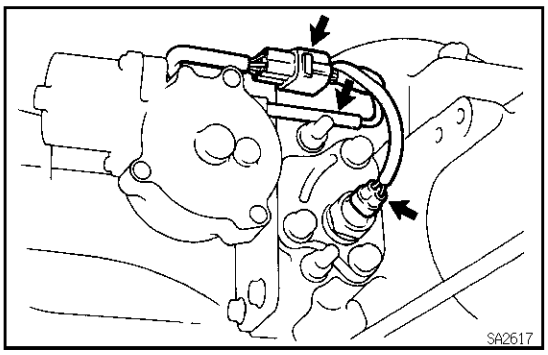




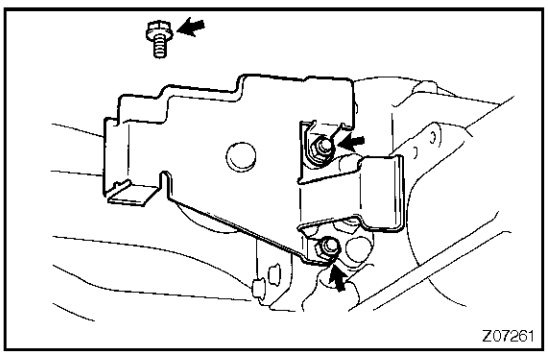

(3) Tighten the 3 bolts
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




(i) Install the rear Diff position switch
Install the position switch with a new gasket
**Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)**




(j) Connect the connectors and tube
HINT
- The depth of the insertion of the bleeder tube into the hose is approx 15 mm (0 59 in )
- Take care that the water or the equivalent will not adhere to the connectors and hose




(k) Install the actuator protector
Install the protector with the 2 nuts and bolt
**Torque:**
**Nut: 35 N·m (360 kgf·cm, 26 ft·lbf)**
**Bolt: 20 N·m (200 kgf·cm, 14 ft·lbf)**

(l) Cancel the rear differential lock
With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock



Brought to you by BirfMark
Version 1.11 - 03/16/2010

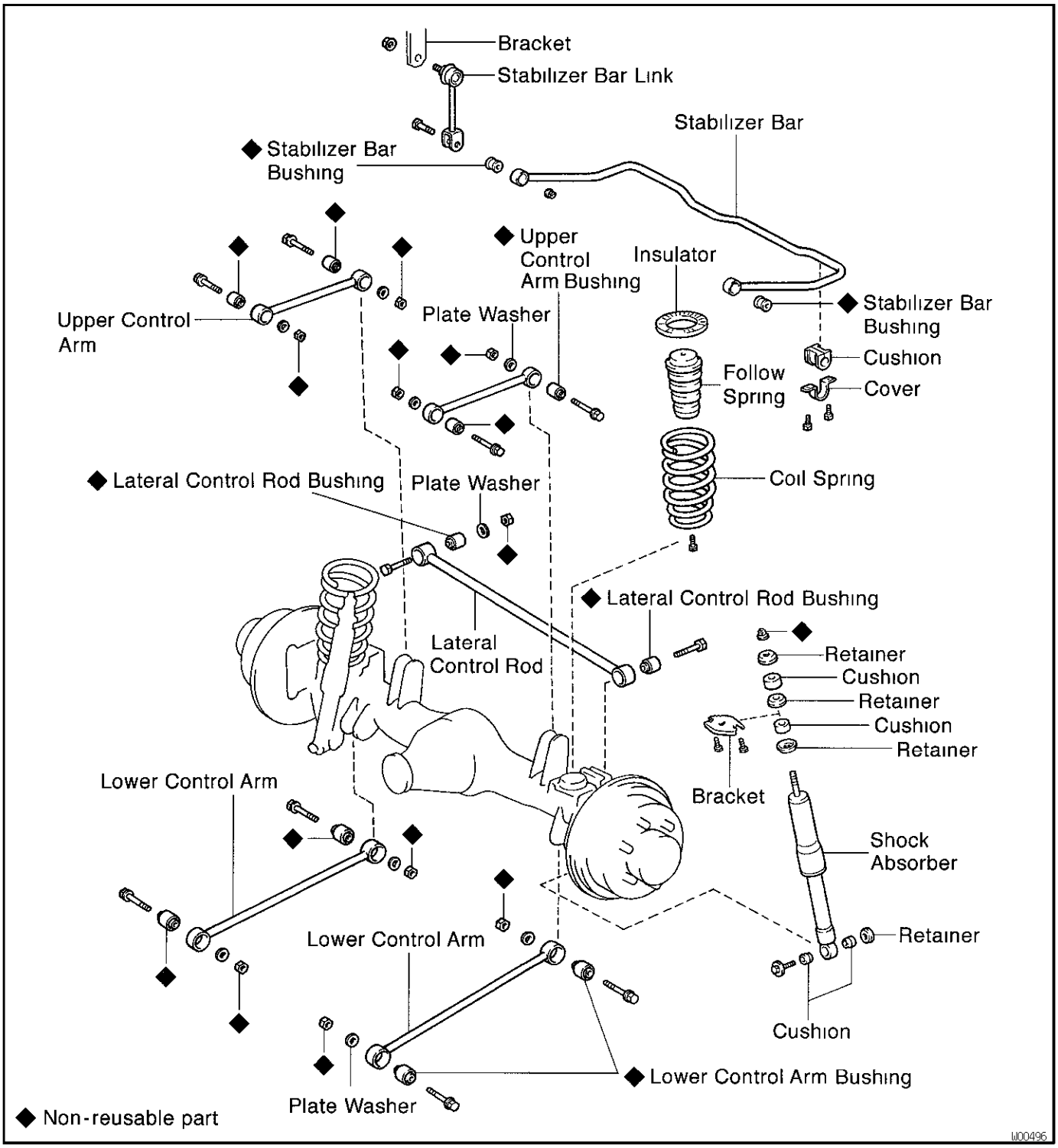
Brought to you by BirfMark



# COIL SPRING AND REAR SHOCK ABSORBER

## COMPONENTS

SA1VR 03






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VP–01

# REMOVAL

1. **REMOVE REAR WHEEL**
   **Torque:**
   **Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
   **Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**
2. **REMOVE REAR SHOCK ABSORBER**

(a) Remove the lower bolt holding the shock absorber from the rear axle housing
**Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)**

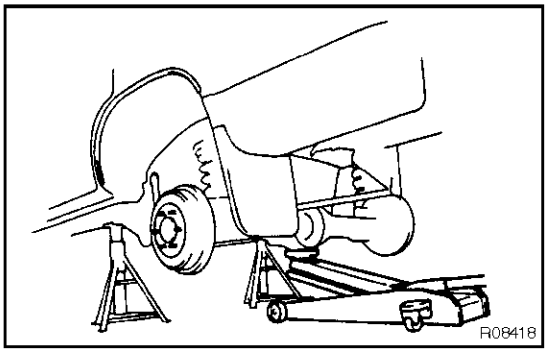
(b) Remove the retainer and 2 cushions, disconnect the shock absorber

(c) Remove the 2 upper bolts and shock absorber
**Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)**

(d) Remove these parts from the shock absorber
- Nut
- 3 Retainers
- 2 Cushions
- Bracket

**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**

3. **DISCONNECT STABILIZER BAR BRACKETS FROM REAR AXLE HOUSING (See page SA–124)**
4. **DISCONNECT LATERAL CONTROL ROD FROM REAR AXLE HOUSING (See page SA–118)**

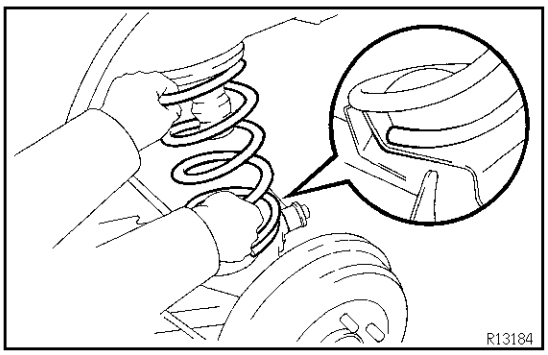



5. **REMOVE COIL SPRING**

(a) Begin to lower the axle housing

HINT

Be careful not to snap the brake line and parking brake cable




(b) With lowering the rear axle housing, remove the coil spring and insulator

HINT

Check that the coil spring end is installed correctly

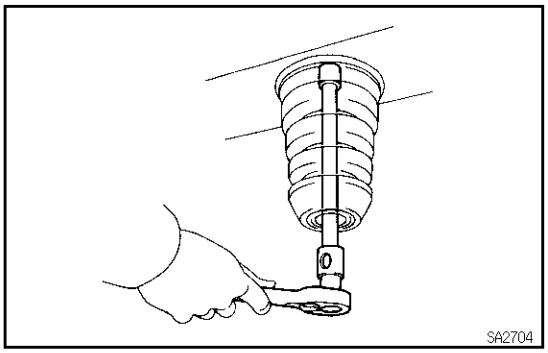
If the coil spring end is not in the correct position, reinstall the coil spring



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Remove the bolt and follow spring from the frame
**Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)**

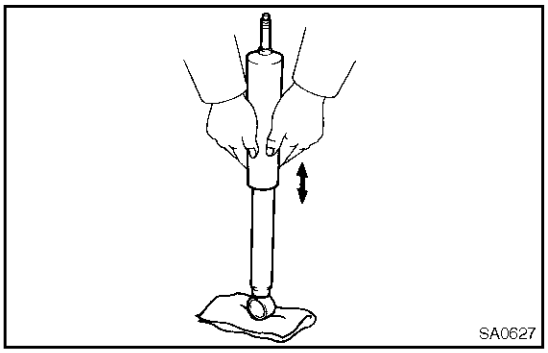


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VQ 01


SA0627

# INSPECTION

## INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds If there is any abnormality, replace the shock absorber with a new one

**NOTICE:**

**When discarding the shock absorber, use the following procedure.**

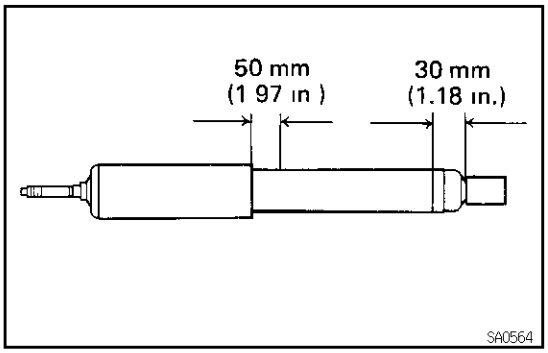


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VS-01




# DISPOSAL

## DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a hole 2 – 3 mm (0 079 – 0 118 in ) in diameter at the location shown in the illustration to release the gas inside

**NOTICE:**

**When drilling, chips may fly out, work carefully. The gas is colorless, odorless and non-poisonous.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VT 01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–113).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

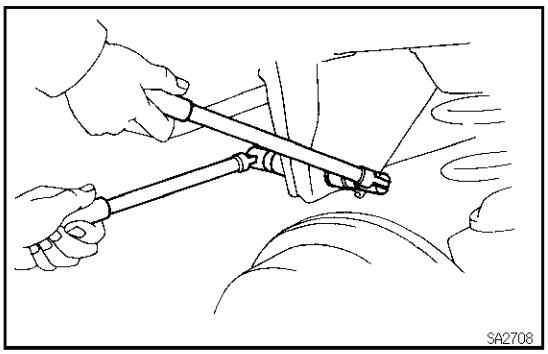


# REAR LATERAL CONTROL ROD

SA1VU 01

## REMOVAL

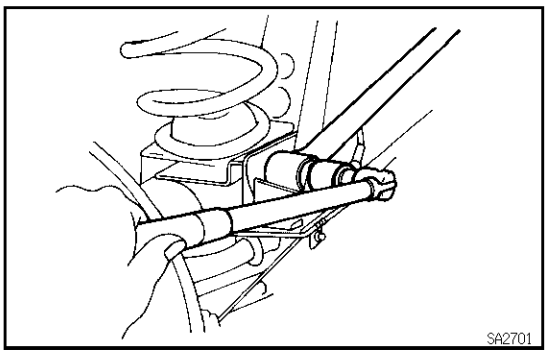
1. **REMOVE REAR WHEEL**
   **Torque:**
   **Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
   **Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**




2. **REMOVE LATERAL CONTROL ROD**

(a) Remove the bolt, nut and plate washer, and disconnect the lateral control rod
**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

HINT
After stabilizing the suspension, torque the bolt




(b) Remove the bolt and lateral control rod from the axle housing
**Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)**

HINT
After stabilizing the suspension, torque the bolt

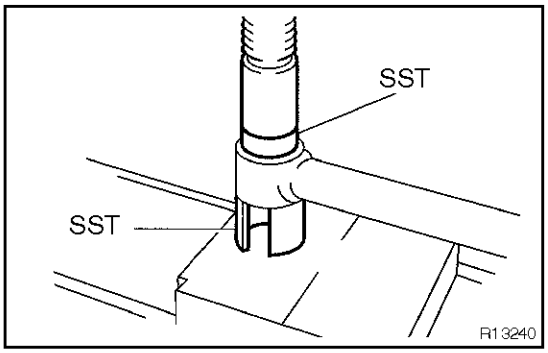


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



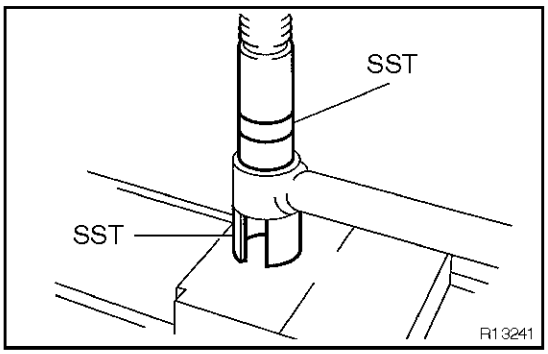
SA1VV–01




# REPLACEMENT

## REPLACE LATERAL CONTROL ROD BUSHING

(a) Using SST and a press, remove the bushing
SST 09550–10012 (09553–10010),
09710–22021 (09710–01071)




(b) Using SST and a press, install a new bushing
SST 09550–10012 (09553–10010),
09710–22021 (09710–01071)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VW–01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–118).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



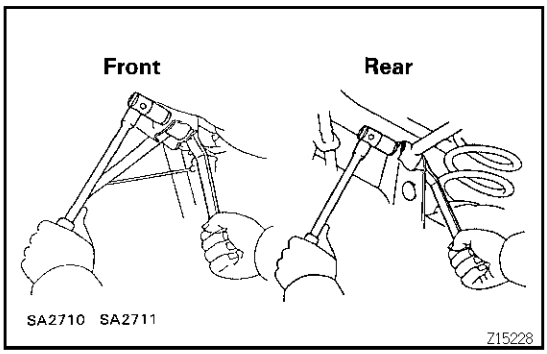
# REAR UPPER AND LOWER CONTROL ARM

SA1VX–01

## REMOVAL

1. **REMOVE REAR WHEEL**

**Torque:**
**Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)**
**Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)**



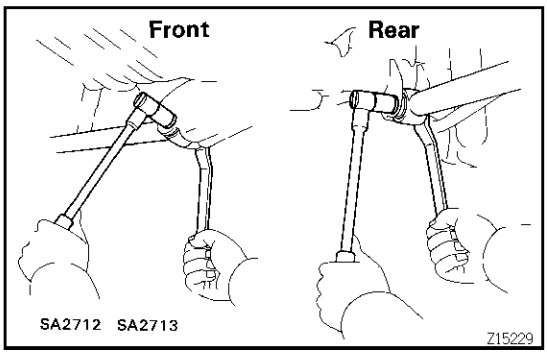

2. **REMOVE UPPER CONTROL ARM**

Remove the 2 bolts, plate washers, nuts and upper control arm from the frame

**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

HINT

After stabilizing the suspension, torque the bolt




3. **REMOVE LOWER CONTROL ARM**

Remove the 2 bolts, plate washers, nuts and lower control arm from the frame

**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

HINT

After stabilizing the suspension, torque the bolt



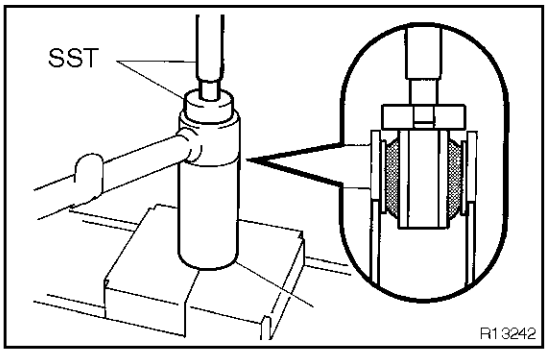
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



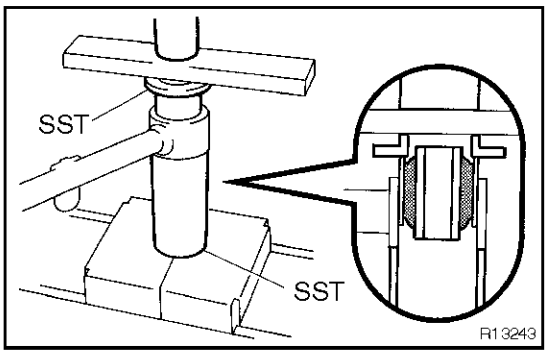
SA1VY-01

# REPLACEMENT

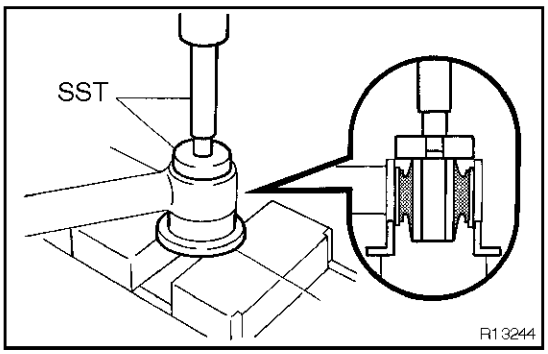



## 1. REPLACE UPPER CONTROL ARM BUSHING

(a) Using SST and a press, remove the bushing
SST 09226-10010, 09950-60010 (09951-00490), 09950-70010 (09951-07100)

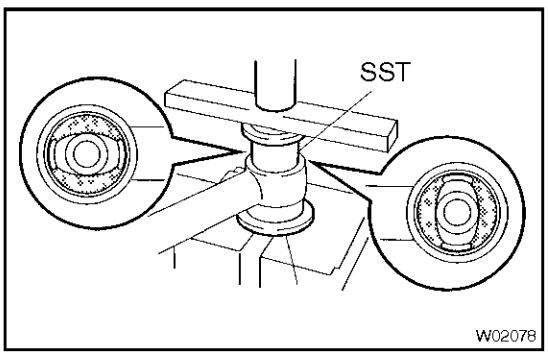



(b) Using SST and a press, install a new bushing
SST 09226-10010, 09506-35010




## 2. REPLACE LOWER CONTROL ARM BUSHING

(a) Using SST and a press, remove the bushing
SST 09506-35010, 09950-60010 (09951-00540), 09950-70010 (09951-07100)




(b) Using SST and a press, install a new bushing, as shown
SST 09316-20011, 09506-35010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1VZ 01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–121).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1W0-01

# REMOVAL

## REMOVE STABILIZER BAR

(a) Loosen the 2 bolts and nuts

**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**

HINT

After stabilizing the suspension, torque the nut

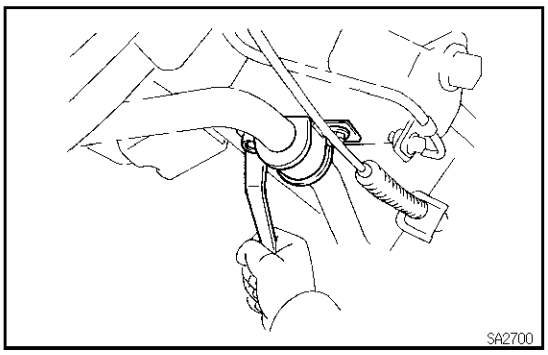
(b) Remove the nuts and disconnect the stabilizer bar with the links from the bracket

**Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)**

HINT

After stabilizing the suspension, torque the nut

(c) Remove the 2 bolts, nuts and links from the stabilizer bar

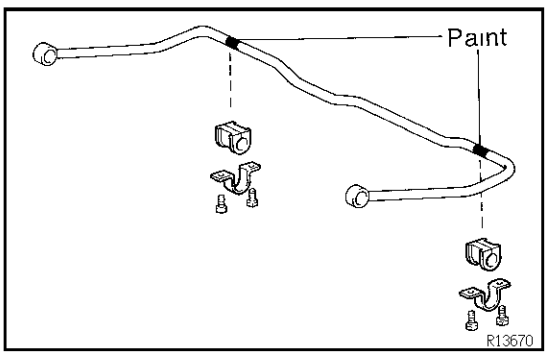



(d) Remove the 4 bolts and stabilizer bar from the axle housing with the covers

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

HINT

After stabilizing the suspension, torque the bolt




(e) Remove the 2 covers and cushions from the stabilizer bar

HINT

Install the cushions and brackets touching the line painted on the stabilizer bar



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SA1W1-01

# INSTALLATION

**Installation is in the reverse order of removal (See page SA–124).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SFI SYSTEM

## PRECAUTION

SF1ED-04

**1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM THE BATTERY.**

HINT

Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is disconnected Therefore, if necessary, read the diagnosis before disconnecting the negative (–) terminal cable from the battery

**2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM.**

**3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS**

**4. MAINTENANCE PRECAUTIONS**

(a) In event of engine misfire, these precautions should be taken

(1) Check proper connection of battery terminals, etc

(2) Handle high–tension cords carefully

(3) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely

(4) When cleaning the engine compartment, be especially careful to protect the electrical system from water

(b) Precautions when handling the oxygen sensor

(1) Do not allow the oxygen sensor to drop or hit against an object

(2) Do not allow the sensor to come in contact with water

**5. IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)**

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section

**6. AIR INDUCTION SYSTEM**

(a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc may cause the engine to run out of tune

(b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune

**7. ELECTRONIC CONTROL SYSTEM**

(a) Before removing SFI wiring connectors, terminals, etc , first disconnect the power by either turning the ignition switch OFF or disconnecting the negative (–) terminal cable from the battery



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT

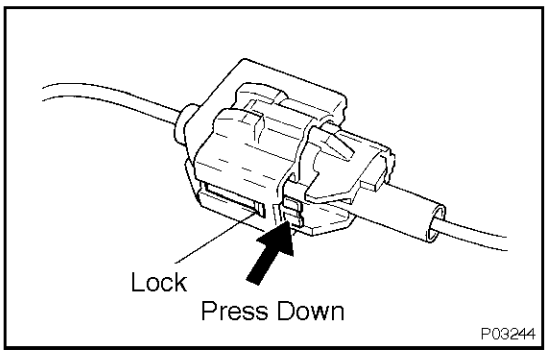
Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables

(c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM

(d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles

(e) Do not open the ECM cover

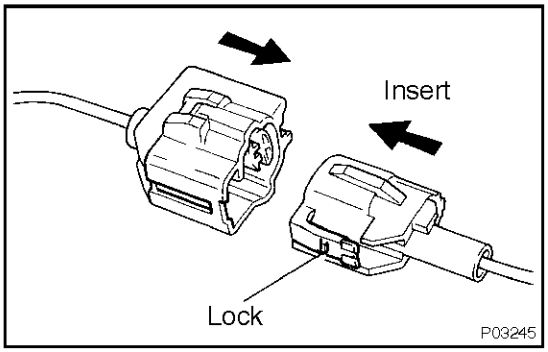



(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors

(g) Parts should be replaced as an assembly

(h) Care is required when pulling out and inserting wiring connectors

(1) Release the lock and pull out the connector, pulling on the connectors




(2) Fully insert the connector and check that it is locked

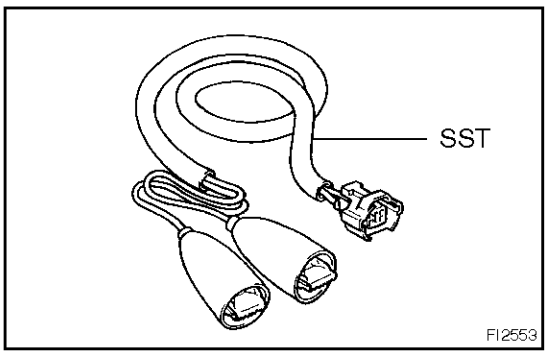
(i) When inspecting a connector with a volt/ohmmeter

(1) Carefully take out the water–proofing rubber if it is a water–proof type connector

(2) Insert the test probe into the connector from the wiring side when checking the continuity, amperage or voltage

(3) Do not apply unnecessary force to the terminal

(4) After checking, install the water–proofing rubber on the connector securely




(j) Use SST for inspection or test of the injector or its wiring connector

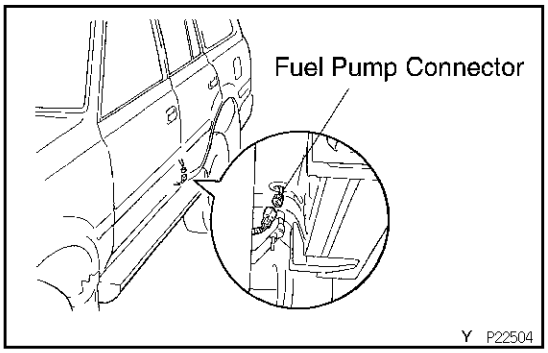
SST 09842–30070



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



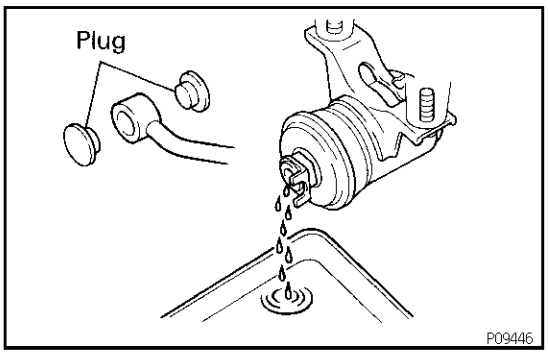



## 8. FUEL SYSTEM

(a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedures

(1) Disconnect the fuel pump connector

(2) Start the engine After the engine has stopped on its own, turn off the ignition switch



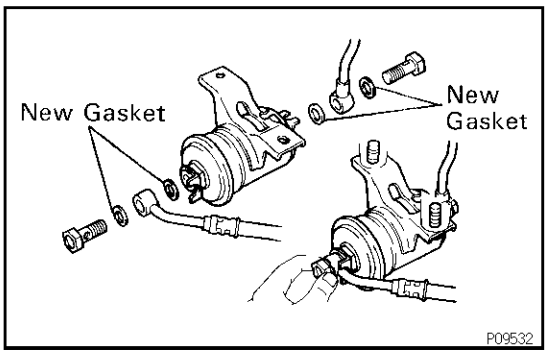

(3) Put a container under the connection

(4) Slowly loosen the connection

(5) Disconnect the connection

(6) Plug the connection with 2 rubber plugs

(7) Reconnect the fuel pump connector



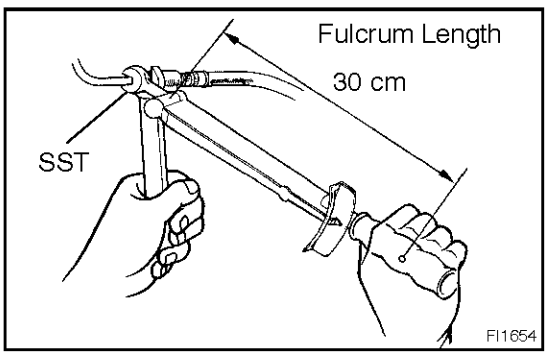

(b) When connecting the union bolt on the high pressure pipe union, observe the following procedures

(1) Always use a new gasket

(2) Tighten the union bolt by hand

(3) Tighten the union bolt to the specified torque

**Torque: 29 N·m (300 kgf·cm, 21 ft·lbf)**




(c) When connecting the flare nut on the high pressure pipe union, observe the following procedures

(1) Apply a light coat of engine oil to the flare and tighten the flare nut by hand

(2) Using SST, tighten the flare nut to the specified torque

SST 09631–22020

**NOTICE:**

**Do not rotate the fuel pipe, when tightening the flare nut.**

**Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)**

HINT

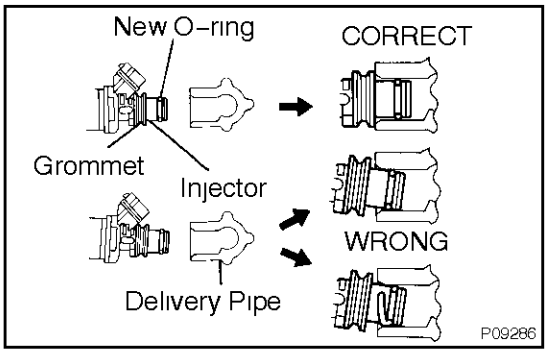
Use a torque wrench with a fulcrum length of 30 cm (11 81 in )



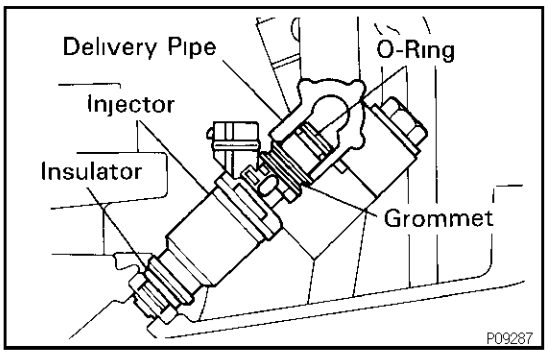
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

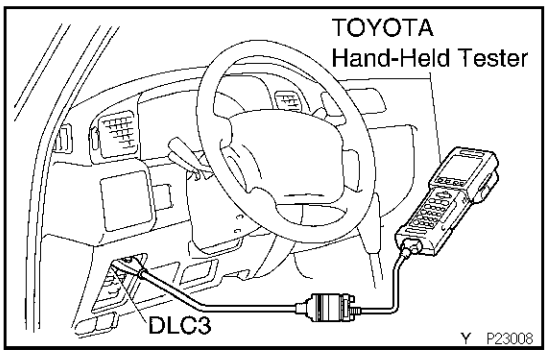





(d) Observe the following precautions when removing and installing the injectors
(1) Never reuse the O–ring
(2) When placing a new O–ring on the injector, take care not to damage it in any way
(3) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil




(e) Install the injector to the delivery pipe and intake manifold as shown in the illustration

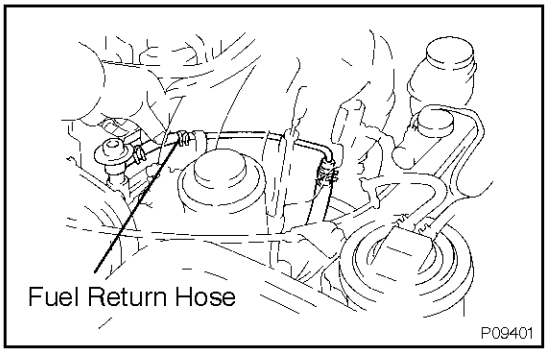



(f) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system
(1) Remove the fuse cover on the instrument panel
(2) Connect the TOYOTA hand–held tester to the DLC3
(3) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON

**NOTICE:**
**Do not start the engine.**

(4) Select the active test mode on the TOYOTA hand–held tester
(5) Please refer to the TOYOTA hand–held tester operator's manual for further details

If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–14)




(6) Pinch the fuel return hose The pressure in the high pressure line will rise to approx 392 kPa (4 kgf/cm$^2$, 57 psi) In this state, check to see that there are no leaks from any part of the fuel system

**NOTICE:**
**Always pinch the hose. Avoid bending as it may cause the hose to crack.**

(7) Turn the ignition switch to LOCK
(8) Disconnect the TOYOTA hand–held tester from the DLC3



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(g) Install the fuse cover on the ınstrument panel



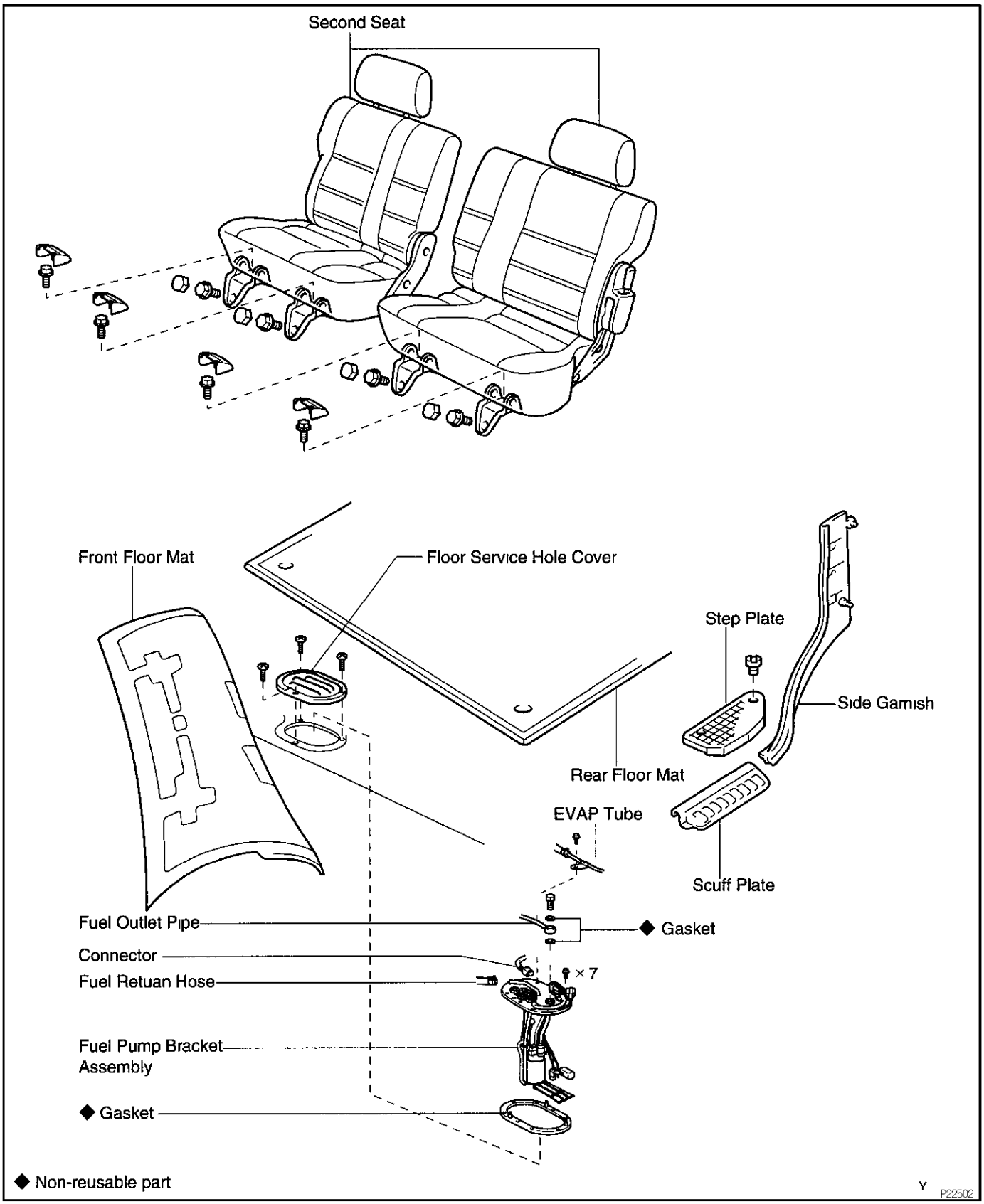
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EF-01

# COMPONENTS

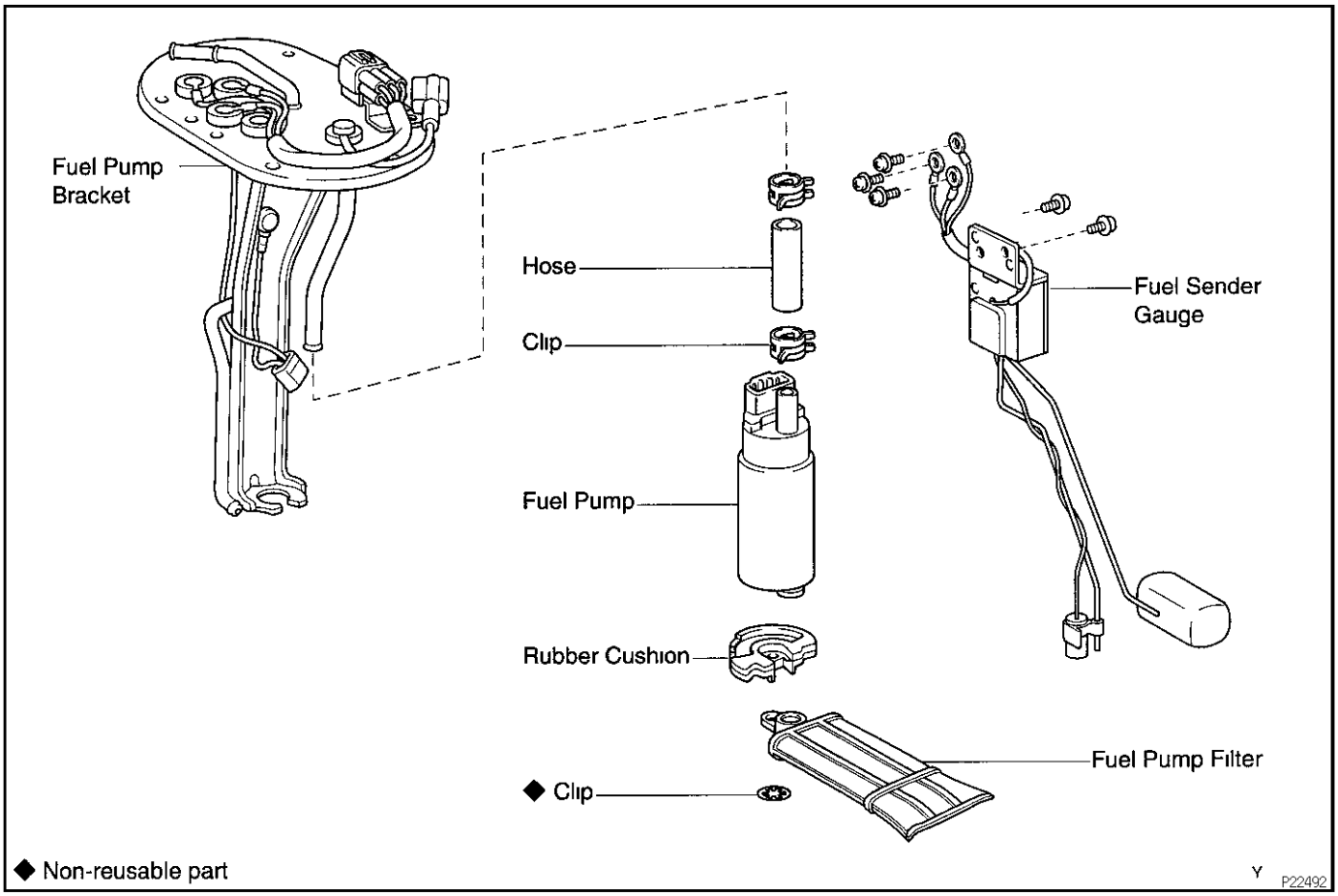





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

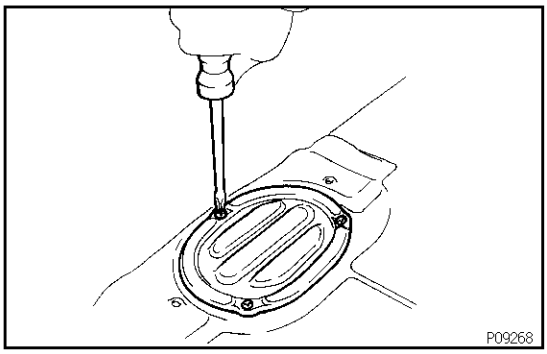


SF1EH-02

# REMOVAL

**CAUTION:**
**Do not smoke or work near an open flame when working on the fuel pump.**

1. **REMOVE SECOND SEATS**
   **Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**
2. **REMOVE SCUFF PLATE**
3. **REMOVE SIDE GARNISH**
4. **REMOVE STEP PLATE**
5. **DISCONNECT FLOOR MATS**
6. **REMOVE FLOOR SERVICE HOLE COVER**



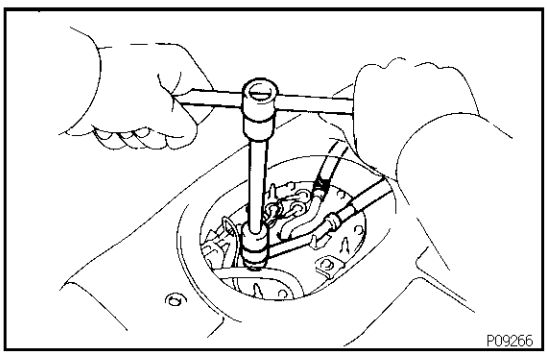

Remove the 3 screws and service hole cover

7. **DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET**

**CAUTION:**
**Remove the fuel filter cap to prevent the fuel from flowing out.**

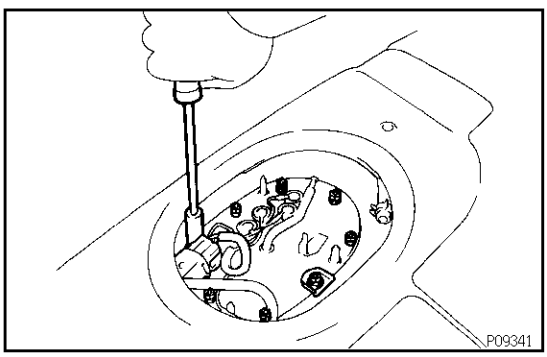
(a) Disconnect the fuel pump and sender gauge connector

HINT
At the time of installation, plaese refer to the following items
Check for fuel leakage




(b) Remove the union bolt and gaskets, and disconnect the outlet pipe from the pump bracket
**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

(c) Disconnect the return hose from the pump bracket




8. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**

(a) Remove the 8 bolts
**Torque: 3.9 N·m (40 kgf·cm, 35 in.·lbf)**

(b) Pull out the pump bracket assembly

**NOTICE:**
- Do not damage the fuel pump filter
- Be careful that the arm of the sender gauge should not bent

(c) Remove the gasket from the pump bracket



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT

At the tıme of ınstallatıon, plaese refer to the followıng ıtems ınstall a new gasket to the pump bracket



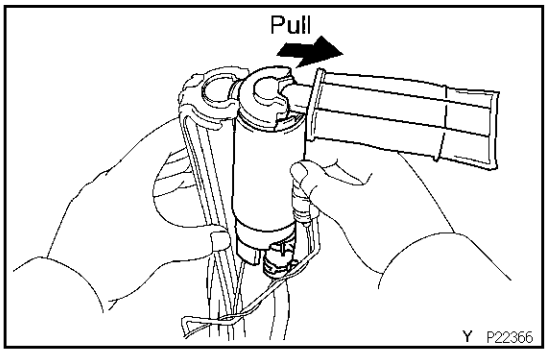
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1E -03

# DISASSEMBLY



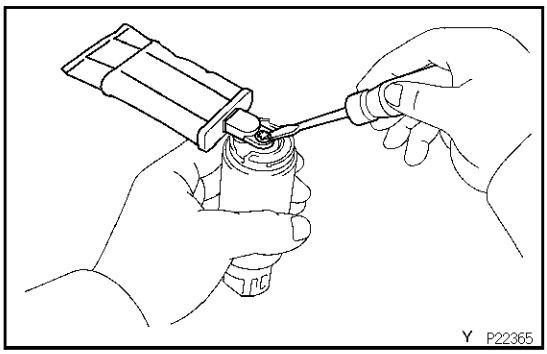

**1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET**

(a) Pull off the lower side of the fuel pump from the pump bracket

(b) Disconnect the fuel pump connector

(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump

(d) Remove the rubber cushion from the fuel pump



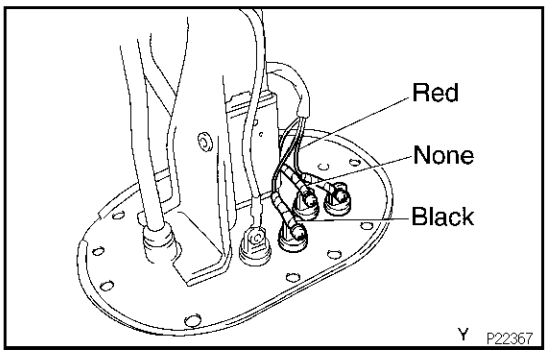

**2. REMOVE FUEL PUMP FILTER FROM FUEL PUMP**

(a) Using a small screwdriver, remove the clip

HINT

At the time of installation, plaese refer to the following items install the pump filter with a new clip

(b) Pull out the pump filter




**3. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET**

(a) Remove the 3 screws and disconnect the lead wires from the pump bracket

(b) Remove the 2 screws and sender gauge



Brought to you by BirfMark
Version 1.11 - 03/16/2010

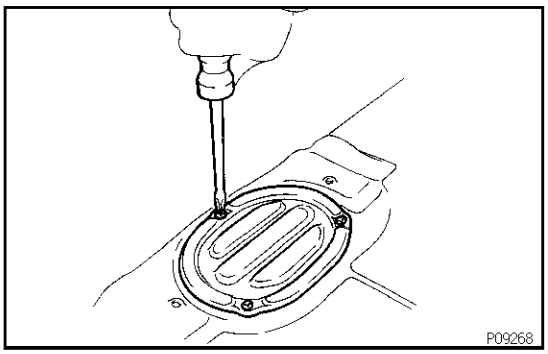
Brought to you by BirfMark



SF1EG 02

# INSPECTION

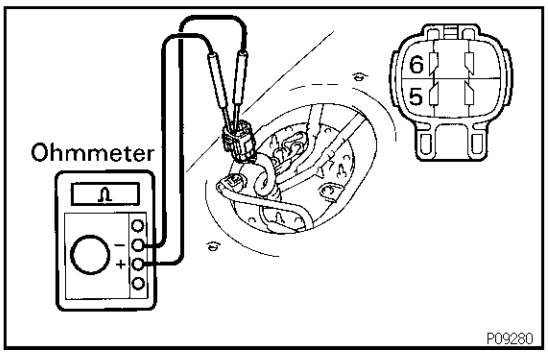
1. REMOVE SECOND SEATS
2. REMOVE SCUFF PLATE
3. REMOVE SIDE GARNISH
4. REMOVE STEP PLATE
5. DISCONNECT FLOOR MATS




6. REMOVE FLOOR SERVICE HOLE COVER

Remove the 3 screws and service hole cover

7. DISCONNECT FUEL PUMP AND SENDER GAUGE CONNECTOR

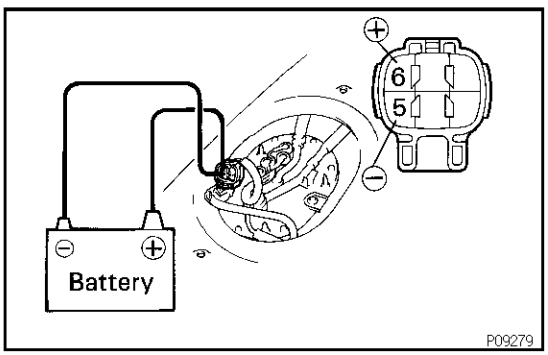



8. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals 5 and 6

**Resistance: 0.2 – 3.0 Ω at 20°C (68°F)**

If the resistance is not as specified, replace the fuel pump




9. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 6 of the connector, and the negative (–) lead to terminal 5 Check that the fuel pump operates

**NOTICE:**

- **These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always perform switching at the battery side.**

If operation is not as specified, replace the fuel pump

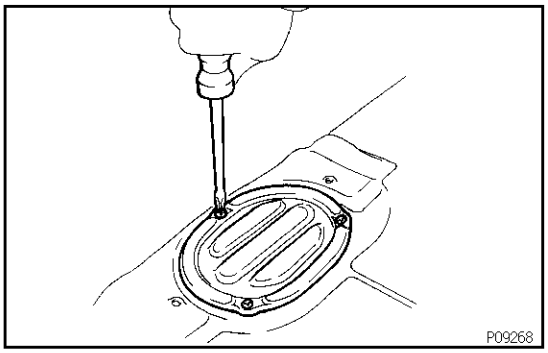
10. RECONNECT FUEL PUMP AND SENDER GAUGE CONNECTOR



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**11. REINSTALL FLOOR SERVICE HOLE COVER**

Install the service hole cover with the 3 screws

**12. REINSTALL FLOOR MATS**

**13. REINSTALL STEP PLATE**

**14. REINSTALL SIDE GARNISH**

**15. REINSTALL SCUFF PLATE**

**16. REINSTALL SECOND SEATS**

**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EJ 01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page SF–13).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EK 01

# INSTALLATION

**Installation is in the reverse order of removal (See page SF–11).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

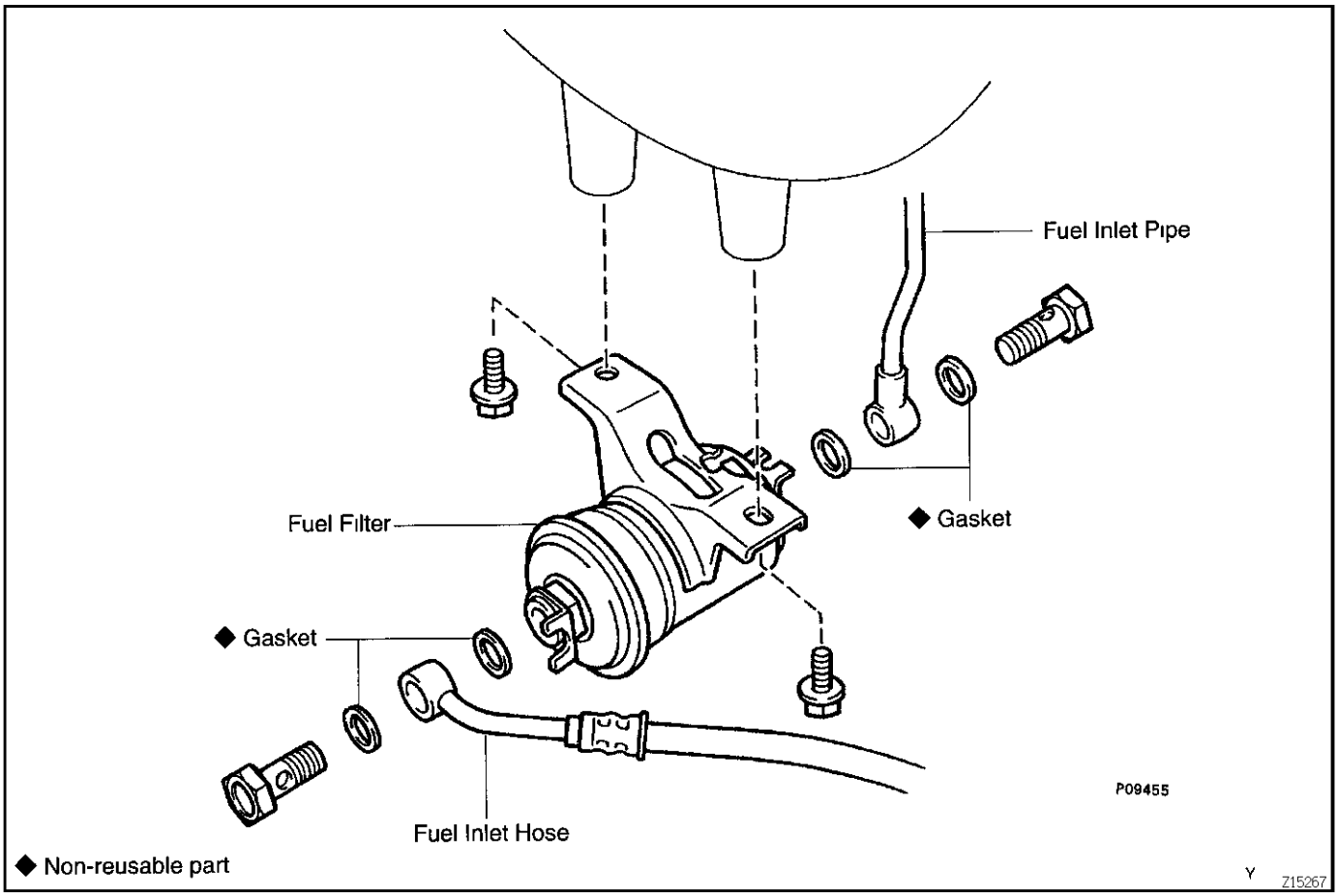
Brought to you by BirfMark



# FUEL FILTER

## COMPONENTS

SF1EL-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# FUEL PRESSURE REGULATOR

SF1EM 01

## ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page SF–1)



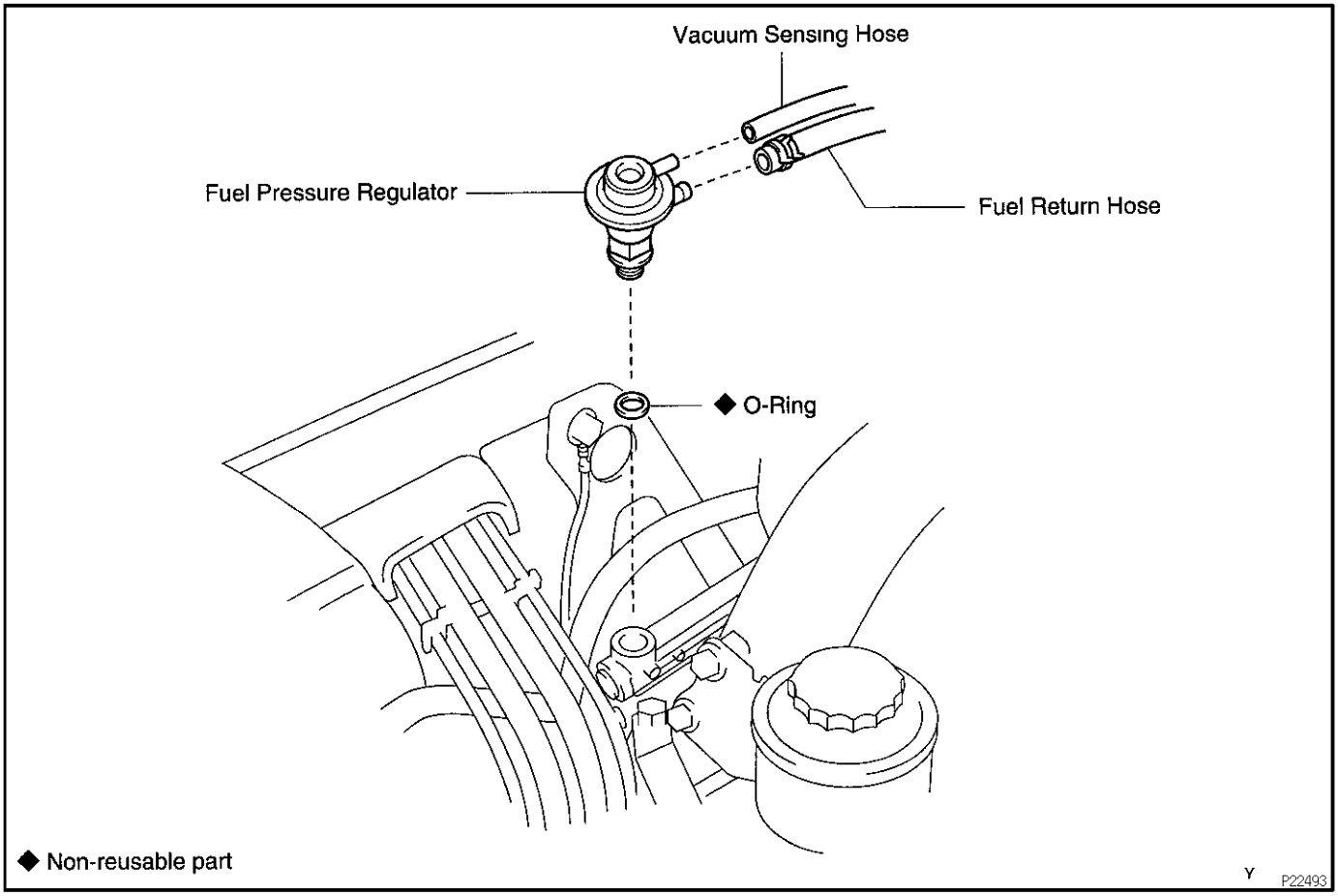
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF0XZ-04

# COMPONENTS





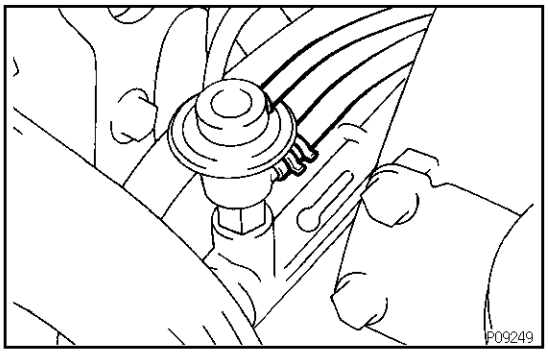

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



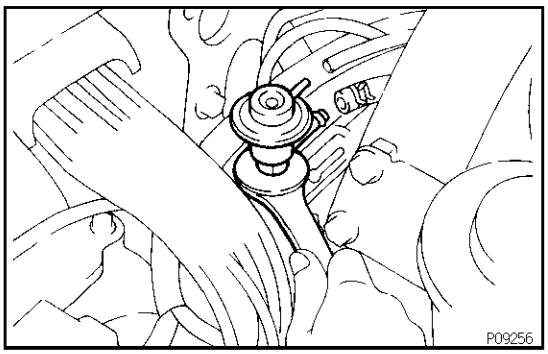
SF0Y0–06

# REMOVAL




1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR
2. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

**CAUTION:**
**Put a shop towel under the pressure regulator.**




3. REMOVE FUEL PRESSURE REGULATOR

(a) Loosen the lock nut, and remove the pressure regulator
(b) Remove the O–ring from the pressure regulator



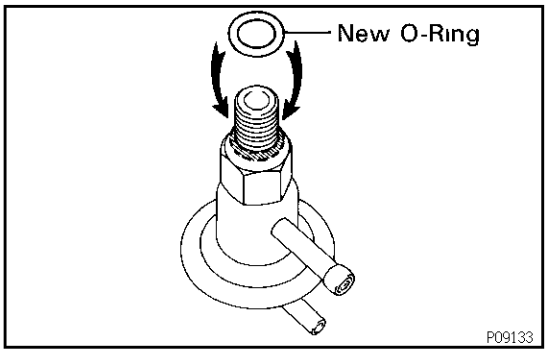
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF0Y1–06

# INSTALLATION

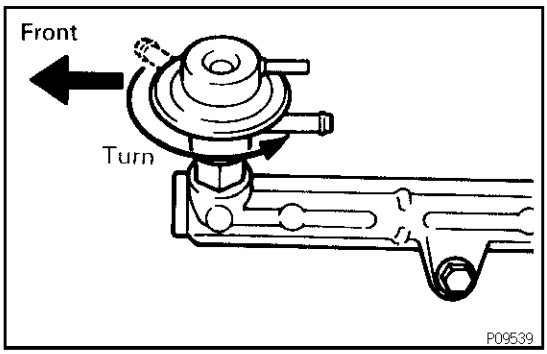



**1. INSTALL FUEL PRESSURE REGULATOR**

(a) Fully loosen the lock nut on the pressure regulator

(b) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator

(c) Insert the pressure regulator into the delivery pipe by hand completely




(d) Turn the pressure regulator counterclockwise until the fuel outlet port faces in the direction indicated in the illustration

(e) Tighten the lock nut

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

**2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR**

**3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR**

**4. START ENGINE AND CHECK FOR FUEL LEAKAGE**



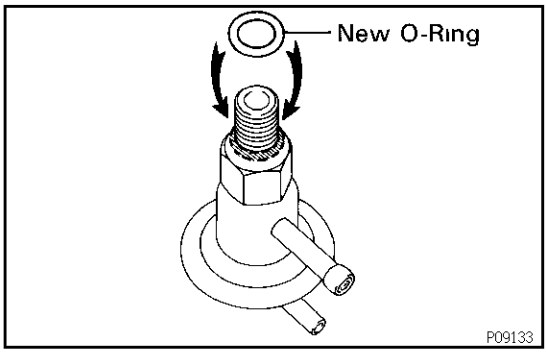
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF0Y1–06

# INSTALLATION

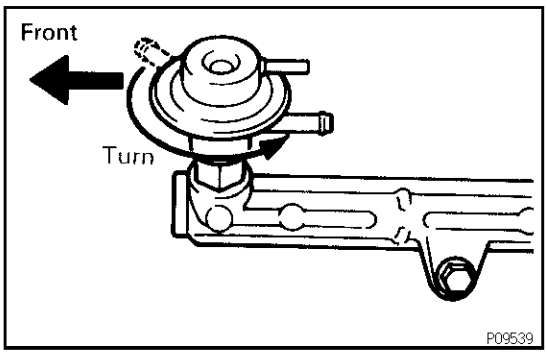



**1. INSTALL FUEL PRESSURE REGULATOR**

(a) Fully loosen the lock nut on the pressure regulator

(b) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator

(c) Insert the pressure regulator into the delivery pipe by hand completely




(d) Turn the pressure regulator counterclockwise until the fuel outlet port faces in the direction indicated in the illustration

(e) Tighten the lock nut

**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**

**2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR**

**3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR**

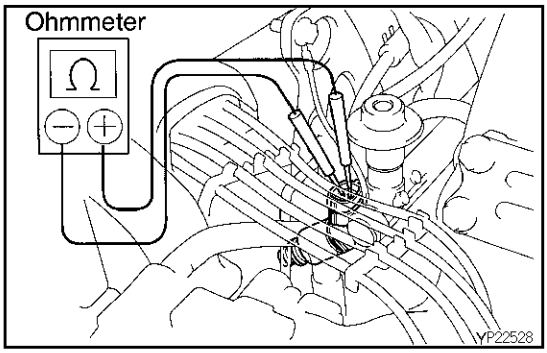
**4. START ENGINE AND CHECK FOR FUEL LEAKAGE**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# INJECTOR

SF0OR 05

## ON-VEHICLE INSPECTION

1. **REMOVE THROTTLE BODY (See page SF-45)**
2. **INSPECT INJECTOR RESISTANCE**

(a) Disconnect the 6 injector connectors

(b) Using an ohmmeter, measure the resistance between the terminals

**Resistance: 13.4 - 14.2 Ω at 20°C (68°F)**

If the resistance is not as specified, replace the injector

(c) Reconnect the 6 injector connectors

3. **REINSTALL THROTTLE BODY (See page SF-48)**



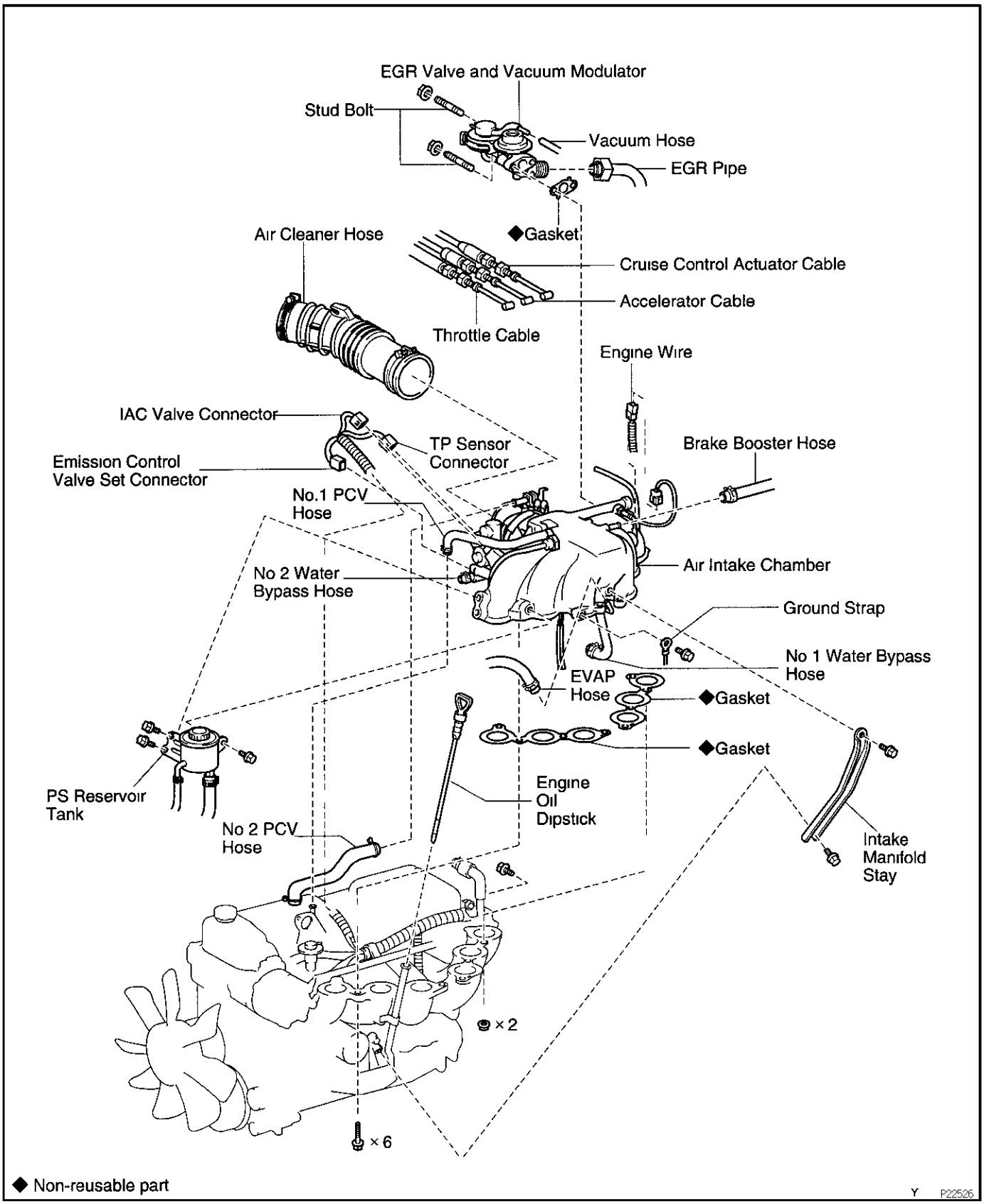
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF0OS 05

# COMPONENTS

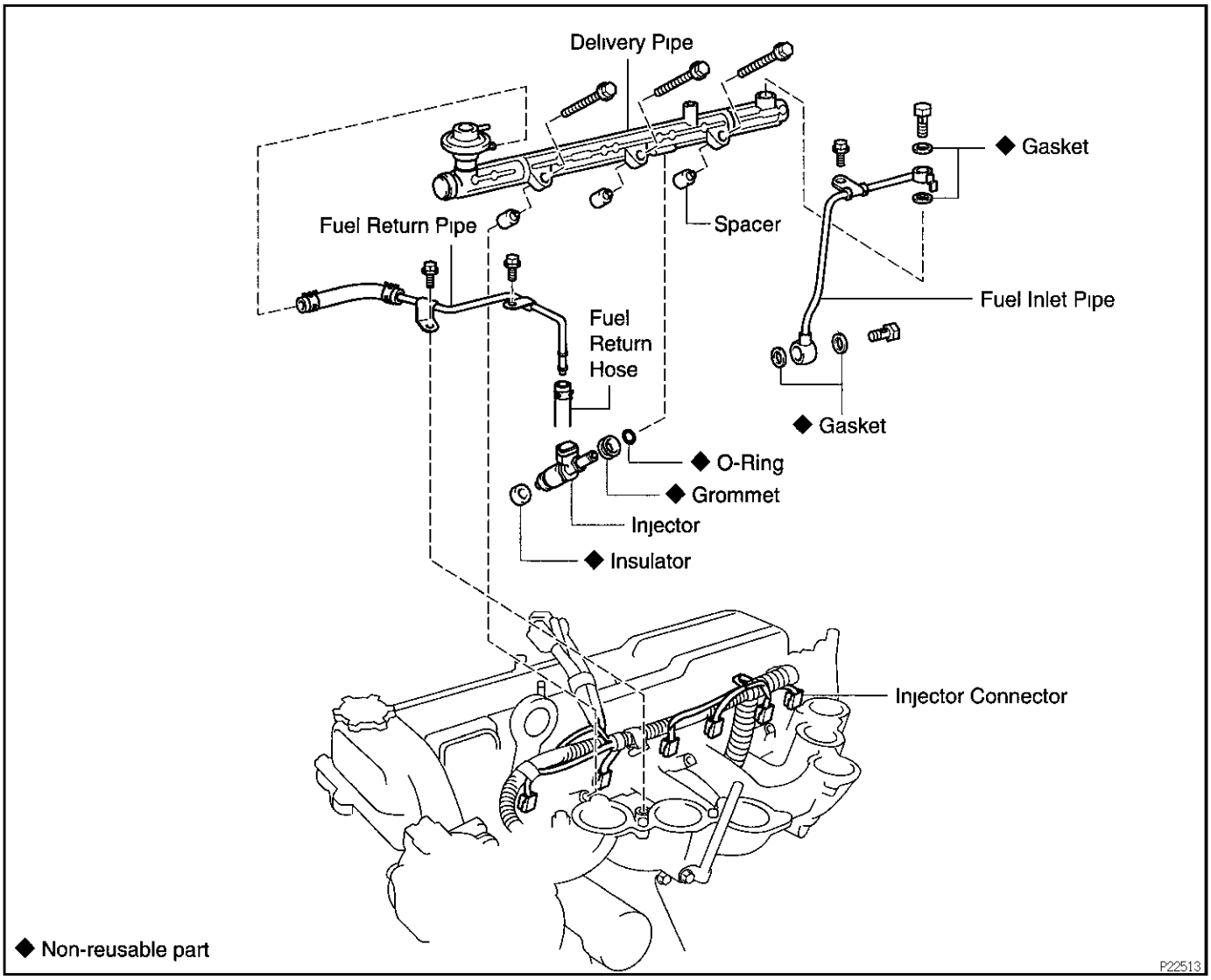





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

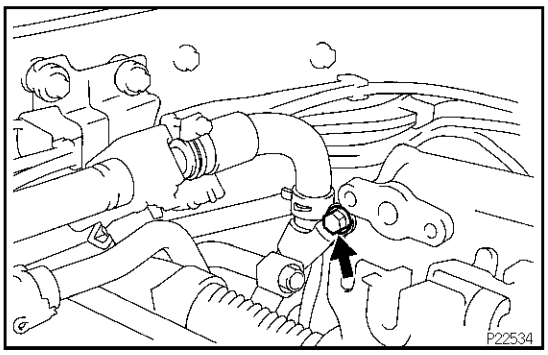
Brought to you by BirfMark



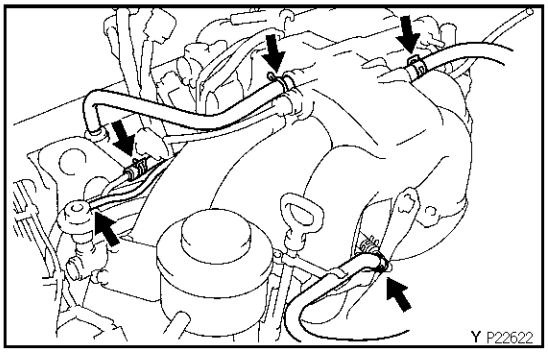
SF1EN–01

# REMOVAL

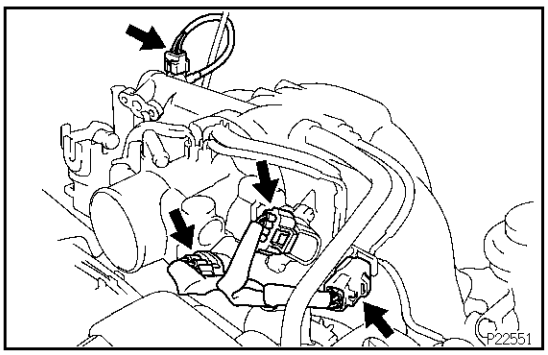
1. DRAIN ENGINE COOLANT
2. DISCONNECT CRUISE CONTROL ACTUATOR CABLE
3. DISCONNECT ACCELERATOR CABLE
4. DISCONNECT THROTTLE CABLE
5. DISCONNECT NO.2 PCV HOSE
6. DISCONNECT AIR CLEANER HOSE
7. REMOVE EGR VACUUM MODULATOR AND VALVE (See page EC–10)




8. REMOVE BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER




9. DISCONNECT NO.1 PCV HOSE
10. DISCONNECT VACUUM SENSING HOSE
11. DISCONNECT NO.2 WATER BYPASS HOSE
12. DISCONNECT EVAP HOSE
13. DISCONNECT BRAKE BOOSTER HOSE



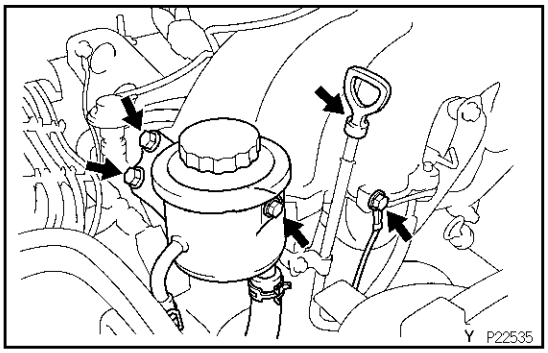

14. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
15. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR
16. DISCONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY
17. DISCONNECT EGR GAS TEMP. SENSOR CONNECTOR



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



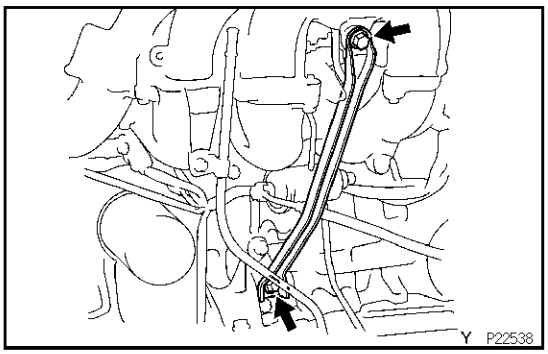



**18. DISCONNECT PS RESERVOIR TANK**

Remove the 3 bolts and disconnect the reservoir tank

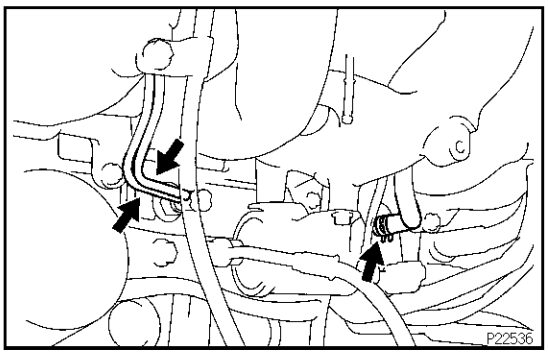
**19. REMOVE ENGINE OIL DIPSTICK**

**20. DISCONNECT GROUND STRAP**



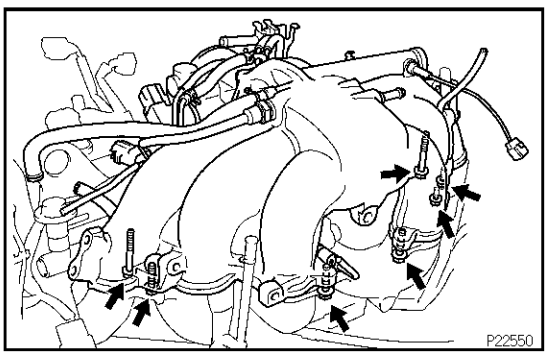

**21. REMOVE INTAKE MANIFOLD STAY**

Remove the 2 bolts and intake manifold stay



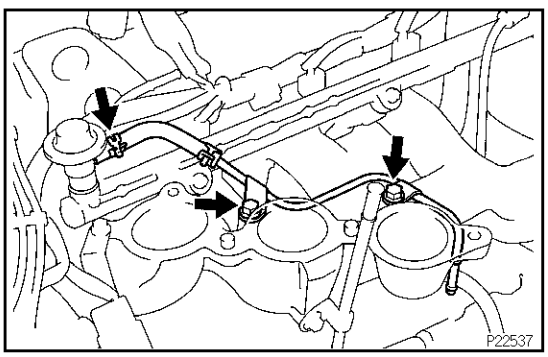

**22. DISCONNECT VACUUM HOSES FROM TVV**

**23. DISCONNECT NO.1 WATER BYPASS HOSE FROM CYLINDER HEAD**




**24. REMOVE AIR INTAKE CHAMBER**

Remove the 6 bolts, 2 nuts, air intake chamber and 2 gaskets




**25. REMOVE FUEL RETURN PIPE**

(a) Disconnect the fuel hose from the fuel pressure regulator

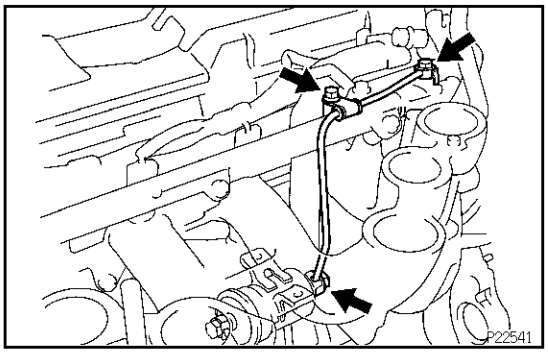
(b) Remove the 2 bolts and fuel return pipe



Brought to you by BirfMark
Version 1.11 - 03/16/2010

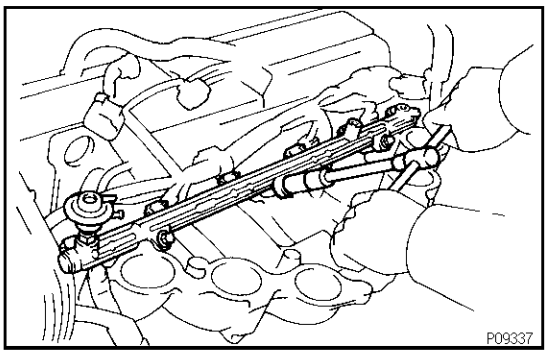
Brought to you by BirfMark






**26. REMOVE FUEL INLET PIPE**

Remove the 2 union bolts, bolt, 4 gaskets and fuel pipe




**27. REMOVE DELIVERY PIPE AND INJECTORS**

(a) Disconnect the 6 injector connectors

(b) Remove the 3 bolts and delivery pipe together with the 6 injectors

**NOTICE:**

**Be careful not to drop the injectors when removing the delivery pipe.**

(c) Remove the 6 insulators and 3 spacers from the intake manifold

(d) Pull out the 6 injectors from the delivery pipe

(e) Remove the O–ring and grommet from each injector



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



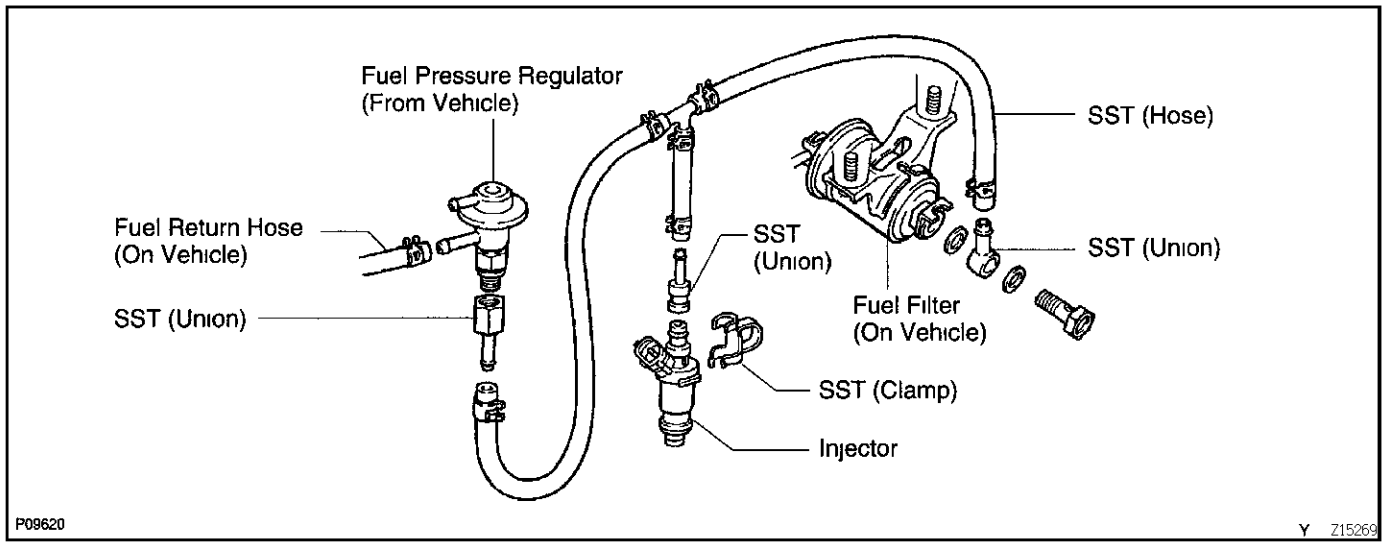
SF1EO-03

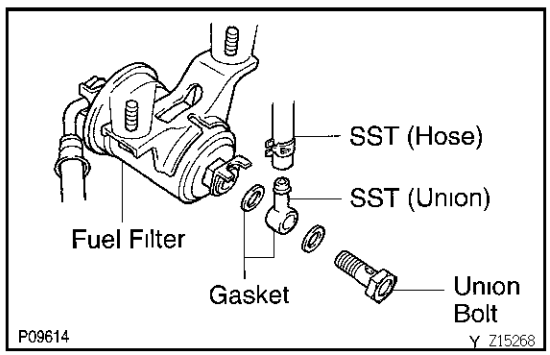
# INSPECTION

## 1. INSPECT INJECTOR INJECTION

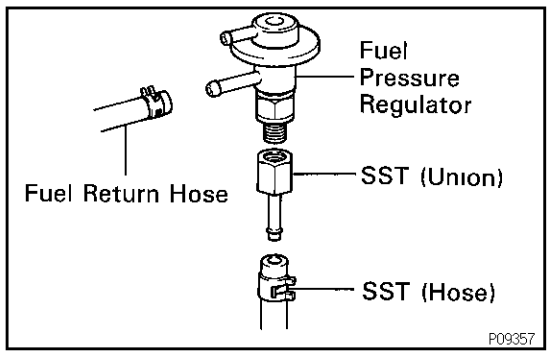
**CAUTION:**

**Keep injector clean of sparks during the test.**




(a) Connect SST (union and hose) to the fuel filter outlet with the 2 gaskets and union bolt
SST 09268-41046 (90405-09015)
**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**



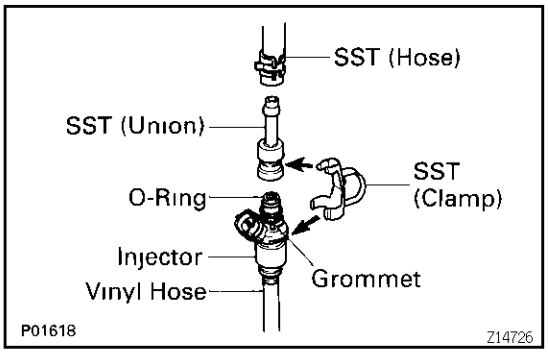

(b) Remove the fuel pressure regulator (See page SF-21)
(c) Install the O-ring to the fuel inlet of pressure regulator
(d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union)
SST 09268-41046 (09268-41091)
**Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)**
(e) Connect the fuel return hose to the fuel outlet of the pressure regulator



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(f) Install the grommet and O–ring to the injector

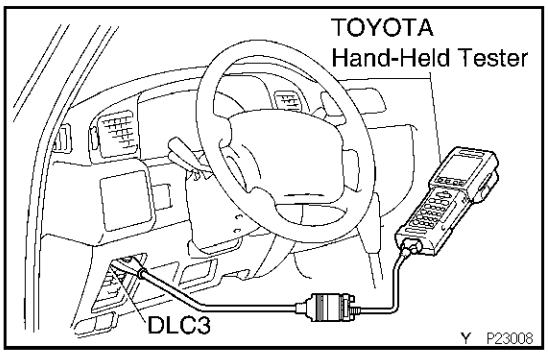
(g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp)
SST 09268–41046

(h) Put the injector into the graduated cylinder

HINT

Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out

(i) Remove the fuse cover on the instrument panel




(j) Connect the TOYOTA hand–held tester to the DLC3

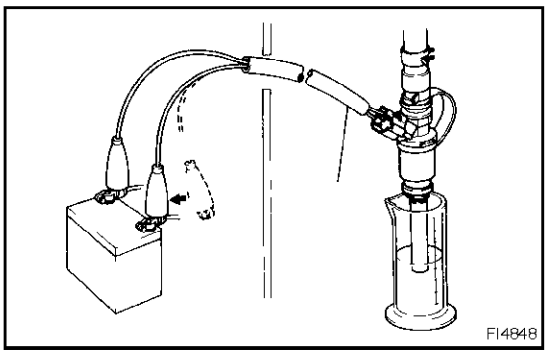
(k) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON

**NOTICE:**

**Do not start the engine.**

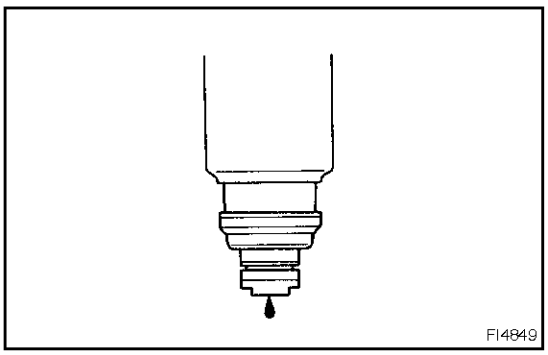
(l) Select the active test mode on the TOYOTA hand–held tester

(m) Please refer to the TOYOTA hand–held tester operator's manual for further details




(n) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–14)

(o) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder Test each injector 2 or 3 times
SST 09842–30070
**Volume:**
**69 – 88 $cm^3$ (4.2 – 5.4 cu in.) per 15 seconds**
**Difference between each injector:**
**5 $cm^3$ (0.3 cu in.) or less**




If the injection volume is not as specified, replace the injector

**2. INSPECT LEAKAGE**

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector
SST 09842–30070
**Fuel drop: One drop or less per minute**

(b) Turn the ignition switch to LOCK

(c) Disconnect the negative (–) terminal cable from the battery



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(d) Remove SST
SST 09268-41045

(e) Reinstall the fuel pressure regulator to the delivery pipe (See page SF-22)

(f) Disconnect the TOYOTA hand-held tester from the DLC3

(g) Reinstall the fuse cover on the instrument panel



Brought to you by BirfMark
Version 1.11 - 03/16/2010

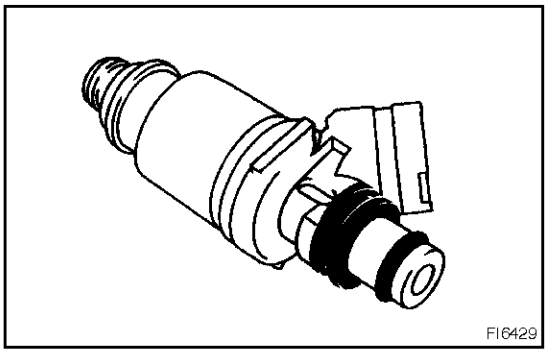
Brought to you by BirfMark



SF1EP 01

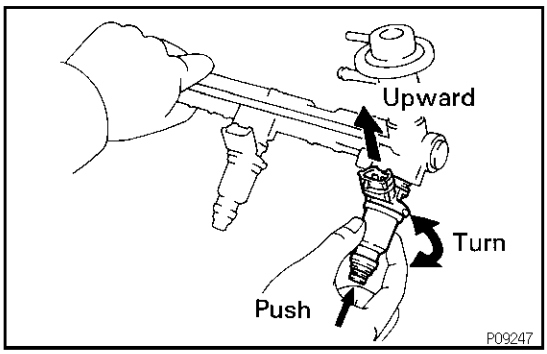
# INSTALLATION

## 1. INSTALL INJECTORS AND DELIVERY PIPE



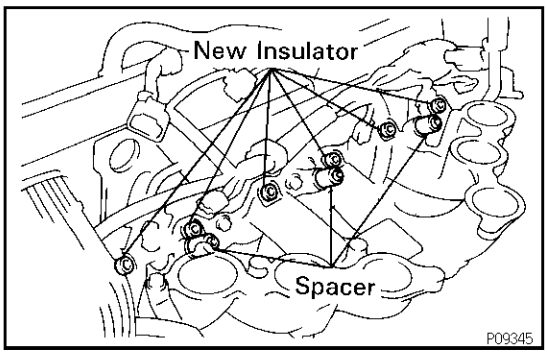

(a) Install a new grommet to the injector

(b) Apply a light coat of gasoline to a new O–ring and install it to the injector



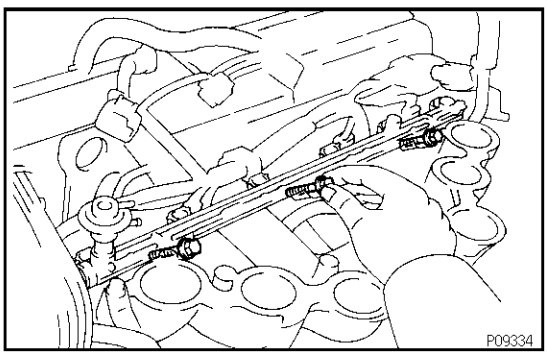

(c) While turning the injector left and right, install it to the delivery pipe Install the 6 injectors

(d) Position the injector connector upward

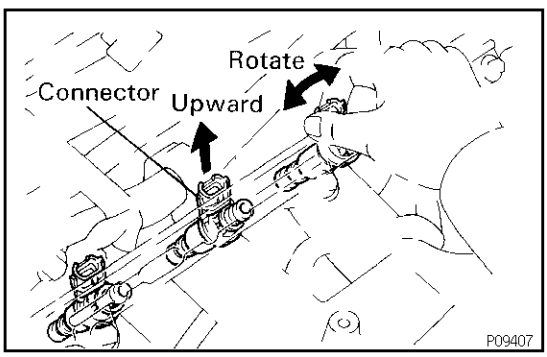



(e) Place 6 new insulators and the 3 spacers in position on the intake manifold

(f) Place the 6 injectors together with the delivery pipe in position on the intake manifold




(g) Temporarily install the 3 bolts holding the delivery pipe to the intake manifold




(h) Check that the injectors rotate smoothly

HINT

If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings Replace the O–rings

(i) Position the injector connector upward

(j) Tighten the 3 bolts holding the delivery pipe to the intake manifold

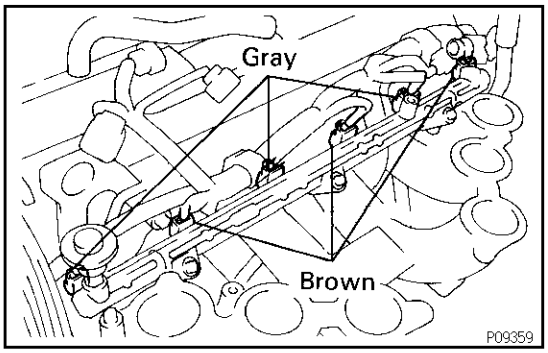
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**



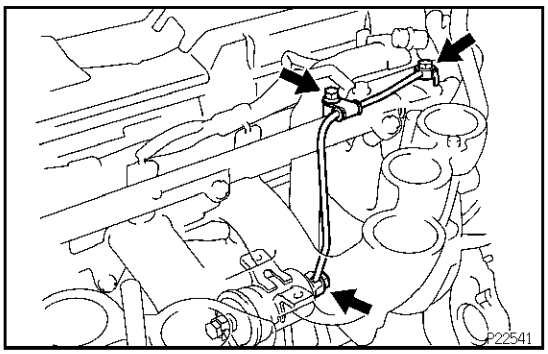
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





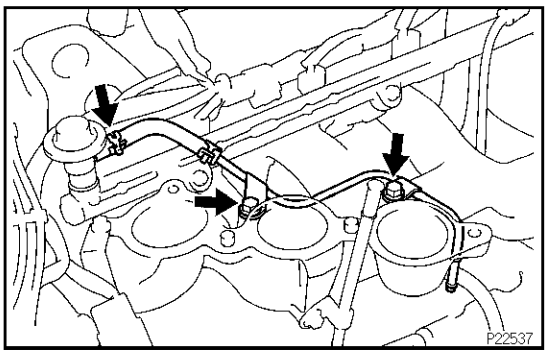

(k) Connect the 6 injector connectors as shown




**2. INSTALL FUEL INLET PIPE**

Install the fuel inlet pipe with 4 new gaskets, the 2 union bolts and bolt

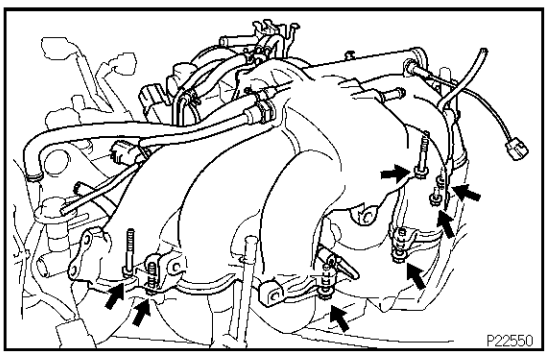
**Torque:**
**Union bolt: 29 N·m (300 kgf·cm, 22 ft·lbf)**
**Bolt: 20 N·m (200 kgf·cm, 14 ft·lbf)**




**3. INSTALL FUEL RETURN PIPE**

(a) Install the fuel return pipe with the 2 bolts
**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

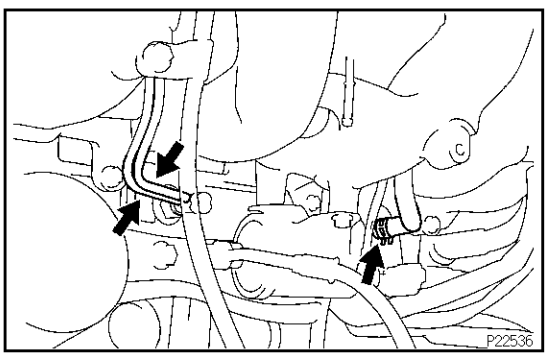
(b) Connect the fuel hose to the fuel pressure regulator




**4. INSTALL AIR INTAKE CHAMBER**

Install 2 new gaskets and the air intake chamber with the 6 bolts and 2 nuts

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**




**5. CONNECT NO.1 WATER BYPASS HOSE TO CYLINDER HEAD**

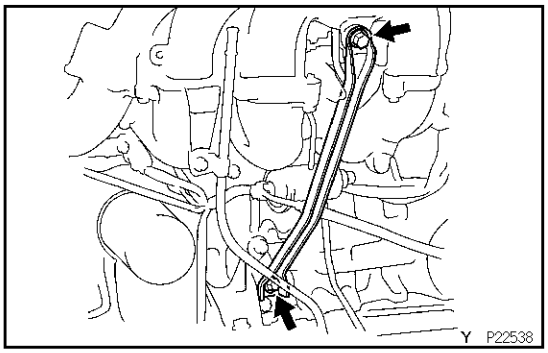
**6. CONNECT VACUUM HOSES TO TVV**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

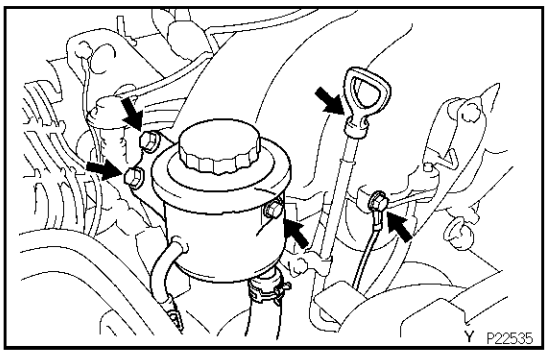





7. INSTALL INTAKE MANIFOLD STAY

Install the intake manifold stay with the 2 bolts

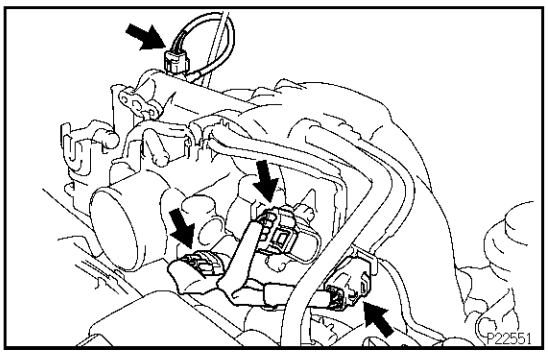
**Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)**



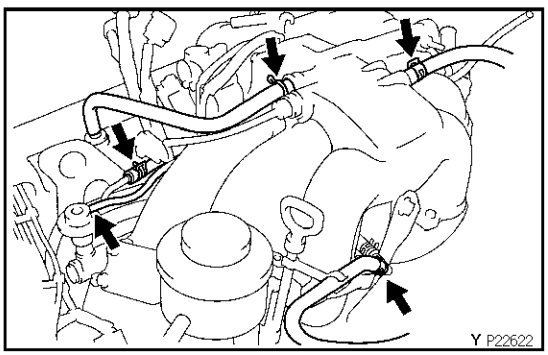

8. CONNECT GROUND STRAP
9. INSTALL ENGINE OIL DIPSTICK
10. CONNECT PS RESERVOIR TANK

Connect the reservoir tank with the 3 bolts

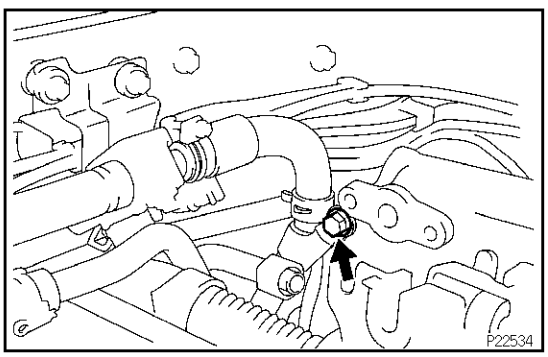
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**




11. CONNECT EGR GAS TEMP. SENSOR CONNECTOR
12. CONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY
13. CONNECT IDLE AIR CONTROL VALVE CONNECTOR
14. CONNECT THROTTLE POSITION SENSOR CONNECTOR




15. CONNECT BRAKE BOOSTER HOSE
16. CONNECT EVAP HOSE
17. CONNECT NO.2 WATER BYPASS HOSE
18. CONNECT VACUUM SENSING HOSE
19. CONNECT NO.1 PCV HOSE




20. INSTALL BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER

**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

21. INSTALL EGR VALVE AND VACUUM MODULATOR (See page EC–10)
22. CONNECT THROTTLE CABLE
23. CONNECT ACCELERATOR CABLE
24. CONNECT CRUISE CONTROL ACTUATOR CABLE
25. CONNECT AIR CLEANER HOSE
26. CONNECT NO.2 PCV HOSE



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



## 27. FILL WITH ENGINE COOLANT



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



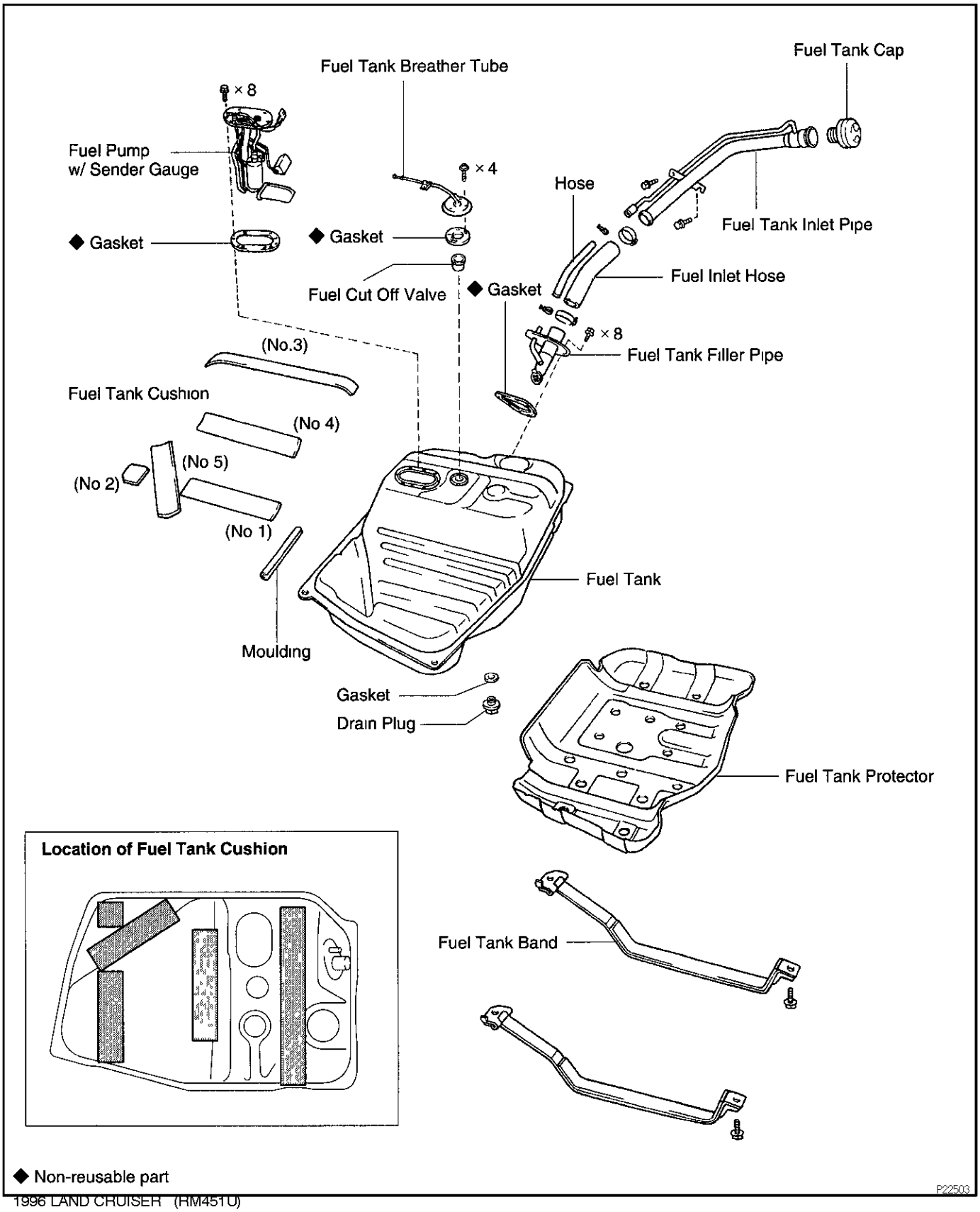
# FUEL TANK AND LINE

## COMPONENTS

SF0OZ 12

**CAUTION:**

- **Always use new gaskets when replacing the fuel tank or component parts.**
- **Apply the proper torque to all parts tightened.**



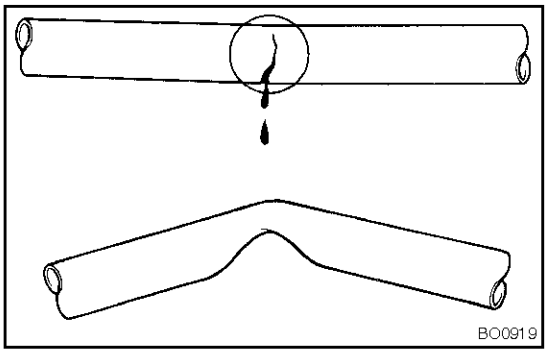


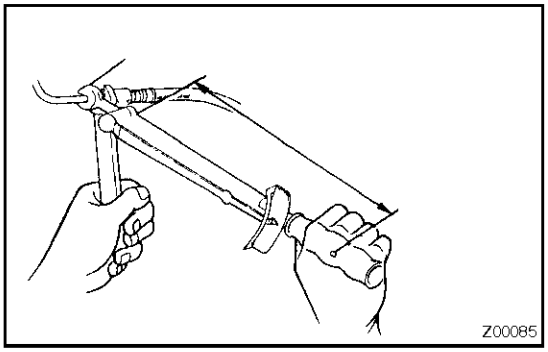

Brought to you by BirfMark
Version 1.11 - 03/16/2010

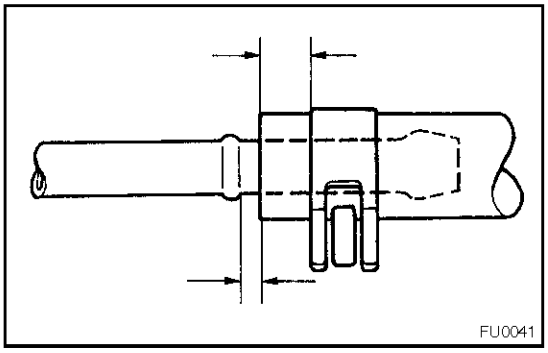
Brought to you by BirfMark



SF0P0-06




# INSPECTION

## INSPECT FUEL TANK AND LINE

(a) Check the fuel lines for cracks or leakage, and all connections for deformation

(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage

(c) Check the fuel tank for deformation, cracks fuel leakage or tank band looseness

(d) Check the filler neck for damage or fuel leakage

(e) Hose and tube connections are as shown in the illustration

If a problem is found, repair or replace the part as necessary



Brought to you by BirfMark
Version 1.11 - 03/16/2010

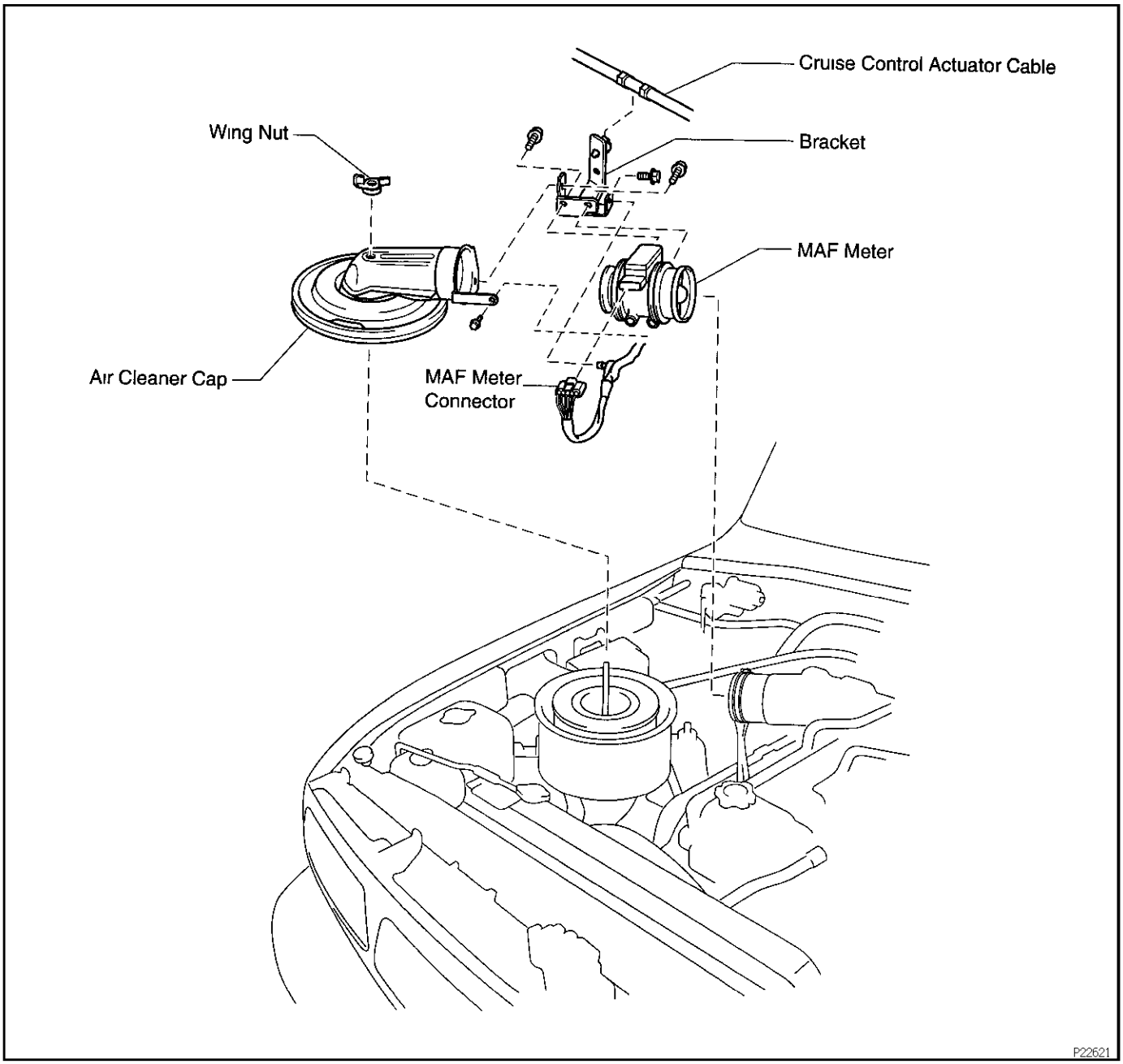
Brought to you by BirfMark



# MASS AIR FLOW (MAF) METER

## COMPONENTS

SF0P1-06



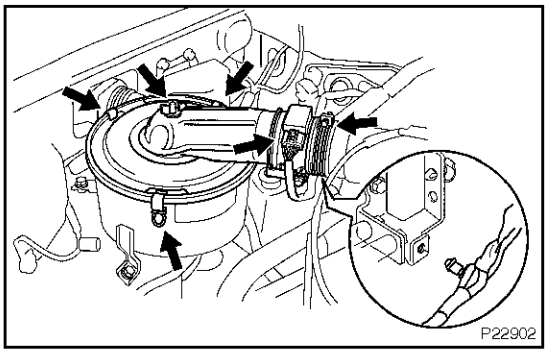



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



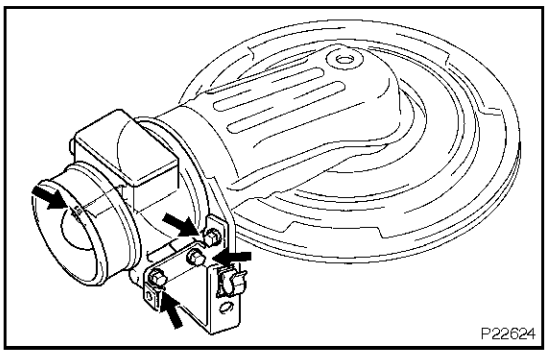
SF1ER-01




# REMOVAL

**1. REMOVE AIR CLEANER CAP AND MAF METER**

(a) Disconnect the MAF meter connector and wire clamp
(b) Disconnect the cruise control actuator cable
(c) Loosen the air cleaner hose clamp
(d) Disconnect the 3 clips, and remove the wing nut, air cleaner cap and MAF meter




**2. REMOVE MAF METER**

Remove the 4 bolts, bracket and MAF meter

**Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)**

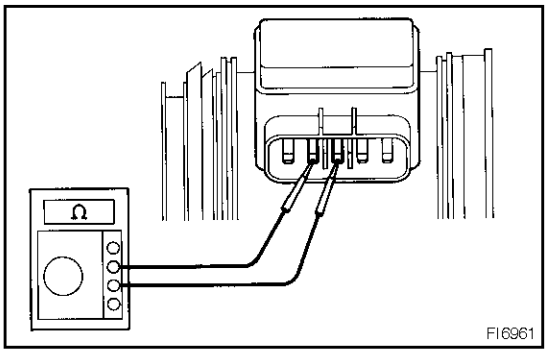


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1ES 01



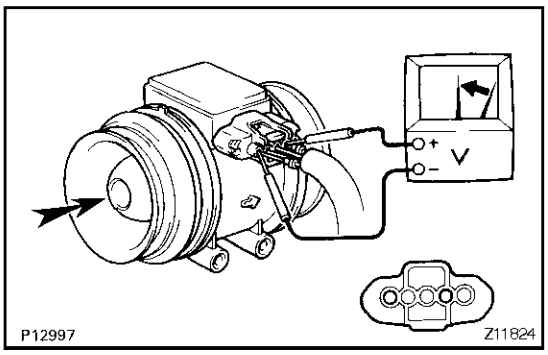

# INSPECTION

## 1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2

| Between terminals | Resistance | Temperature |
|---|---|---|
| THA – E2 | 10 – 20 kΩ | –20°C (–4°F) |
| THA – E2 | 4 – 7 kΩ | 0°C (32°F) |
| THA – E2 | 2 – 3 kΩ | 20°C (68°F) |
| THA – E2 | 0.9 – 1.3 kΩ | 40°C (104°F) |
| THA – E2 | 0.4 – 0.7 kΩ | 60°C (140°F) |
| THA – E2 | 0.2 – 0.4 kΩ | 80°C (176°F) |

If the resistance is not as specified, replace the MAF meter




## 2. INSPECT MAF METER OPERATION

(a) Connect the MAF meter connector

(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3

(c) Blow air into the MAF meter, and check that the voltage fluctuates

If operation is not as specified, replace the MAF meter

(d) Disconnect the MAF meter connector



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1ET-01

# INSTALLATION

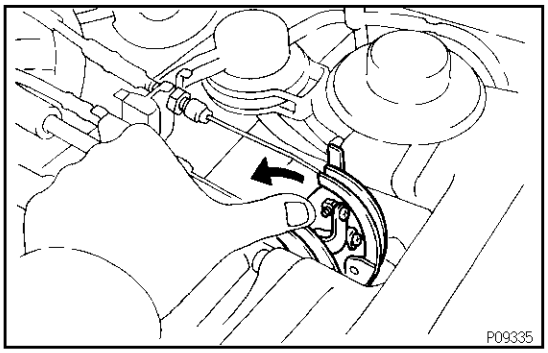
**Installation is in the reverse order of removal (See page SF–39).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





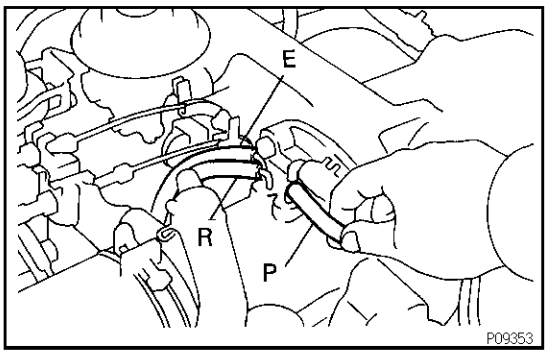

# THROTTLE BODY

## ON–VEHICLE INSPECTION

SF1EU-01

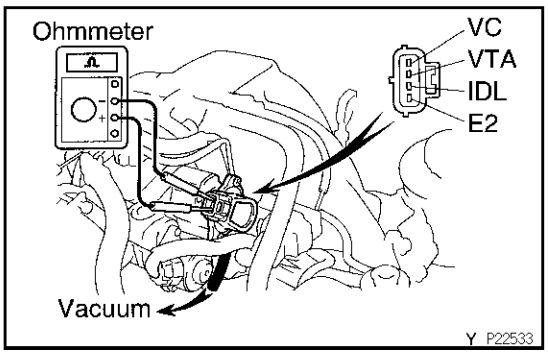
### 1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly




(b) Check the vacuum at each port
- Start the engine
- Check the vacuum with your finger

| Port name | At idle | At 3 500 rpm |
|---|---|---|
| P | No vacuum | Vacuum |
| E | No vacuum | Vacuum |
| R | No vacuum | Vacuum |




### 2. INSPECT THROTTLE POSITION (TP) SENSOR

(a) Disconnect the TP sensor connector

(b) Apply vacuum to the throttle opener

(c) Using an ohmmeter, measure the resistance between each terminal

| Throttle valve condition | Between terminals | Resistance |
|---|---|---|
| Fully closed | VTA – E2 | 0 2 – 5 7 kΩ |
| Fully closed | IDL – E2 | 2 3 kΩ or less |
| Open | IDL – E2 | Infinity |
| Fully open | VTA – E2 | 2 0 – 10 2 kΩ |
| – | VC – E2 | 2 5 – 5 9 kΩ |

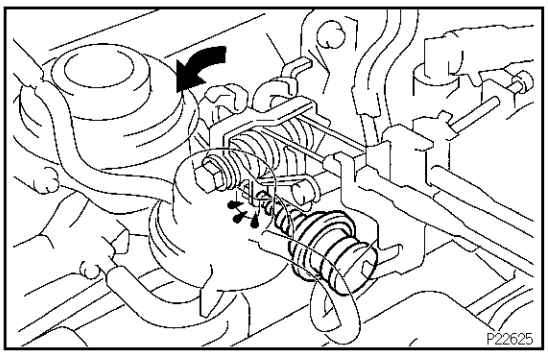
(d) Reconnect the TP sensor connector

### 3. INSPECT AND ADJUST DASHPOT

(a) Allow the engine to warm up to normal operating temperature

(b) Check the idle speed

**Idle speed: 650 ± 50 rpm (N position)**




(c) Open the throttle valve until the throttle lever separates from the dashpot end

(d) Release the throttle valve gradually, and check the dashpot setting speed when the throttle lever touched the dashpot end

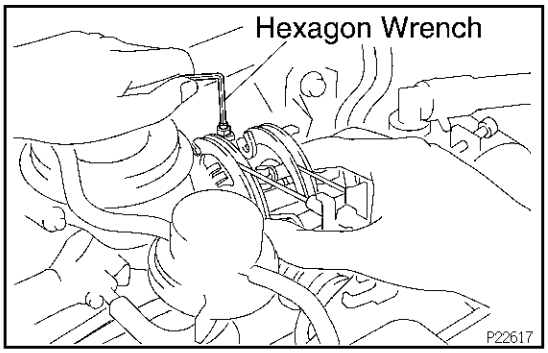
**Dashpot setting speed: 2,200 ± 300 rpm**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

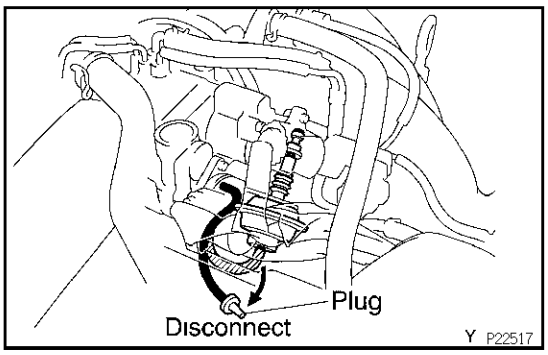





If not as specified, adjust using the following procedure

(1) Stop the engine
(2) Loosen the lock nut of the stopper bolt
(3) Adjust the dashpot setting speed by turning the stopper bolt
(4) Start the engine and check the dashpot setting speed
(5) Retighten the lock nut

(e) Maintain the engine at 3,500 rpm
(f) Release the throttle valve, and check that the engine returns to idle in a few seconds




**4. CHECK THROTTLE OPENER**

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end
(b) Check the throttle opener setting speed
**Throttle opener setting speed: 700 – 1,000 rpm**

If the throttle opener setting is not as specified, replace the throttle body

(c) Stop the engine
(d) Reconnect the vacuum hose to the throttle opener
(e) Start the engine, and check that the idle speed returns to the correct speed
**Idle speed: 650 ± 50 rpm (N position)**



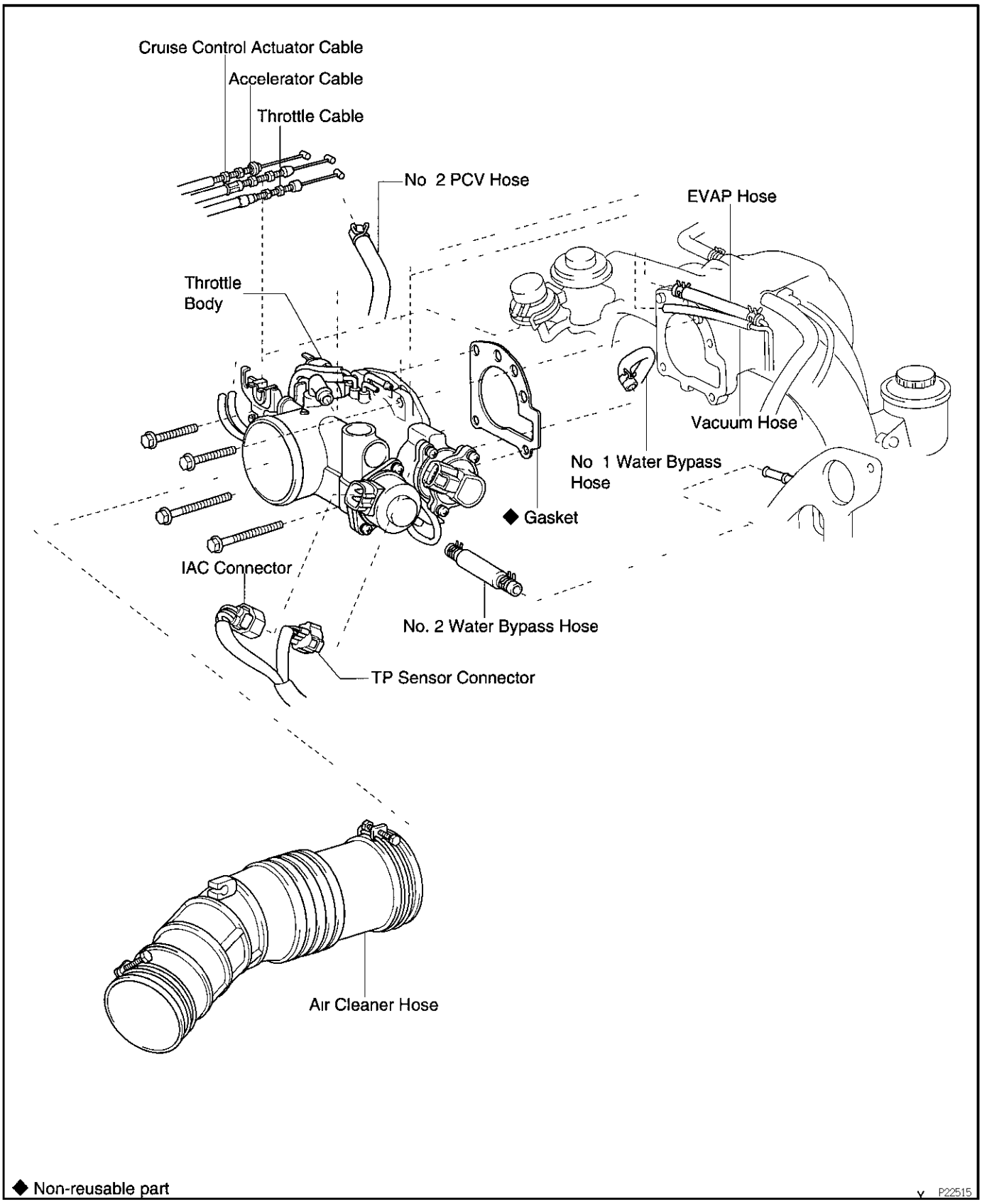
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EV 01

# COMPONENTS






Brought to you by BirfMark
Version 1.11 - 03/16/2010

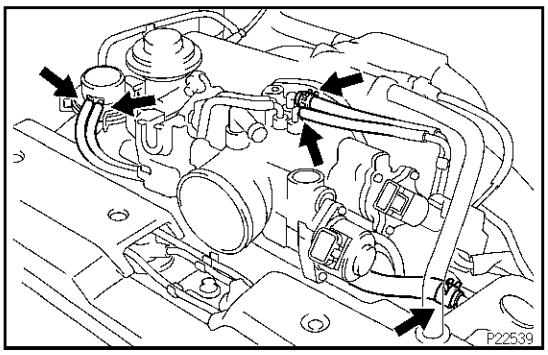
Brought to you by BirfMark



SF1EW 04

# REMOVAL

1. DRAIN ENGINE COOLANT
2. DISCONNECT NO.2 PCV HOSE
3. DISCONNECT AIR CLEANER HOSE
4. DISCONNECT CONTROL CABLES FROM THROTTLE BODY
5. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
6. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR

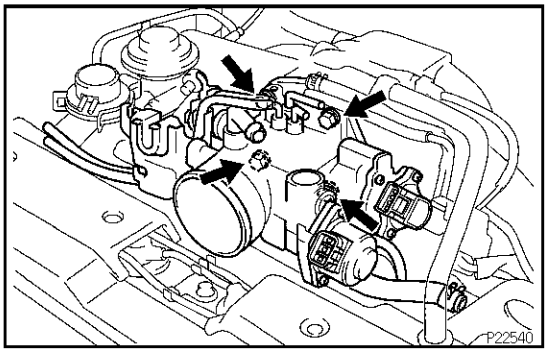



7. REMOVE THROTTLE BODY

(a) Disconnect the EVAP hose

(b) Disconnect the 3 vacuum hoses

(c) Disconnect the No 2 water bypass hose

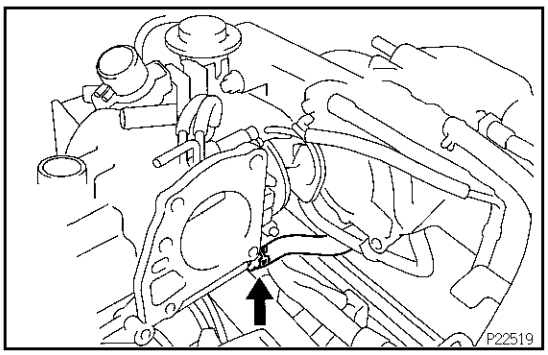



(d) Remove the 4 bolts, and disconnect the throttle body from the air intake chamber
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

(e) Remove the throttle body gasket

HINT

At the time of installation, plaese refer to the following items install a new gasket on the air intake chamber




(f) Disconnect the No 1 water bypass hose from the throttle body, and remove the throttle body

(g) Disconnect the No 2 water bypass hose from the throttle body



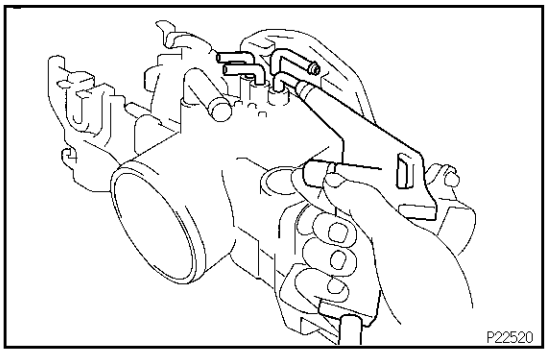
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EX 01

# INSPECTION



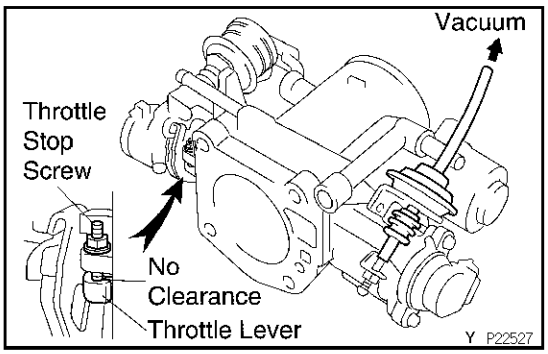

## 1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts

(b) Using compressed air, clean all the passages and apertures

**NOTICE:**

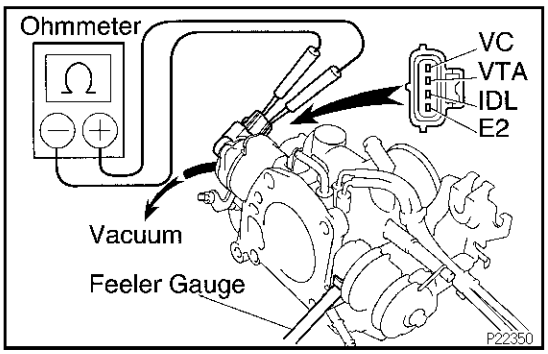
**To prevent deterioration, do not clean the throttle position sensor, dashpot and IAC valve.**




## 2. INSPECT THROTTLE VALVE

(a) Apply vacuum to the throttle opener

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed



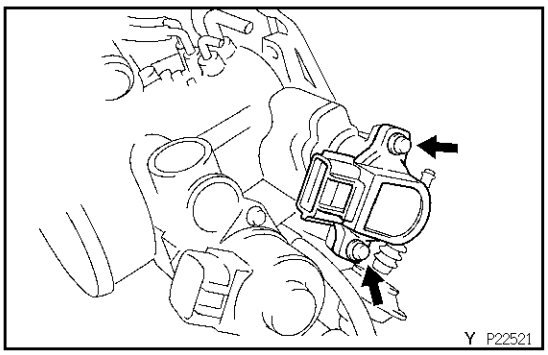

## 3. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener

(b) Insert a 0.50 mm (0.020 in.) or 0.75 mm (0.030 in.) feeler gauge between the throttle stop screw and stop lever

(c) Using an ohmmeter, measure the resistance between each terminal

| Clearance between lever and stop screw | Between terminals | Resistance |
|---|---|---|
| 0 mm (0 in.) | VTA – E2 | 0.2 – 5.7 kΩ |
| 0.50 mm (0.020 in.) | IDL – E2 | 2.3 kΩ or less |
| 0.75 mm (0.030 in.) | IDL – E2 | Infinity |
| Throttle valve fully open | VTA – E2 | 2.0 – 10.2 kΩ |
| – | VC – E2 | 2.5 – 5.9 kΩ |




## 4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

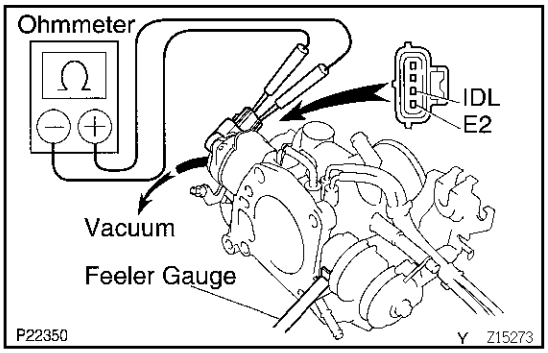
(a) Loosen the 2 set screws of the sensor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

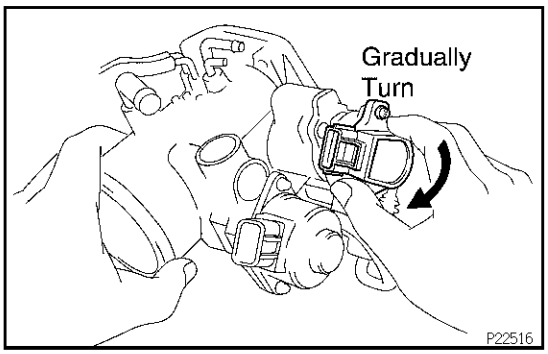




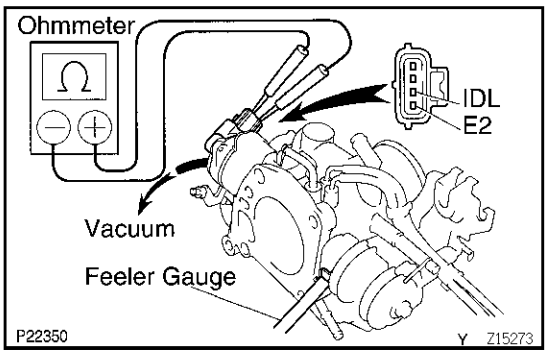

(b) Apply vacuum to the throttle opener

(c) Insert a 0 62 mm (0 024 ın ) feeler gauge between the throttle stop screw and stop lever

(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor




(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws




(f) Recheck the continuity between terminals IDL and E2

| Clearance between lever and stop screw | Continuity (IDL – E2) |
|---|---|
| 0 50 mm (0 020 ın ) | Continuity |
| 0 75 mm (0 030 ın ) | No continuity |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1EY 01

# INSTALLATION

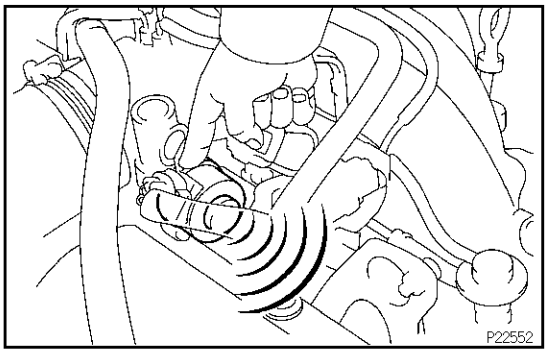
**Installation is in the reverse order of removal (See page SF–45).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# IDLE AIR CONTROL (IAC) VALVE

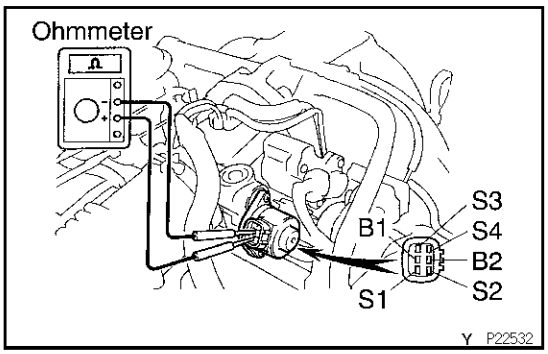
SF1EZ-01

## ON–VEHICLE INSPECTION

**1. INSPECT IAC VALVE FOR OPERATING SOUND**

Check that there is a clicking sound immediately after stopping the engine

If the operation is not as specified, check the IAC valve, wiring and ECM




**2. INSPECT IAC VALVE RESISTANCE**

(a) Disconnect the IAC valve connector

(b) Using an ohmmeter, measure the resistance between the terminals (B1–S1 and S3, B2–S2 and S4)

**Resistance:**

**At Cold: –10 – 50°C (–50 – 122°F): 15 – 25 Ω**

**At Hot: 50 –100°C (122 – 212°F): 20 – 30 Ω**

If resistance is not as specified, replace the IAC valve

(c) Reconnect the IAC valve connector



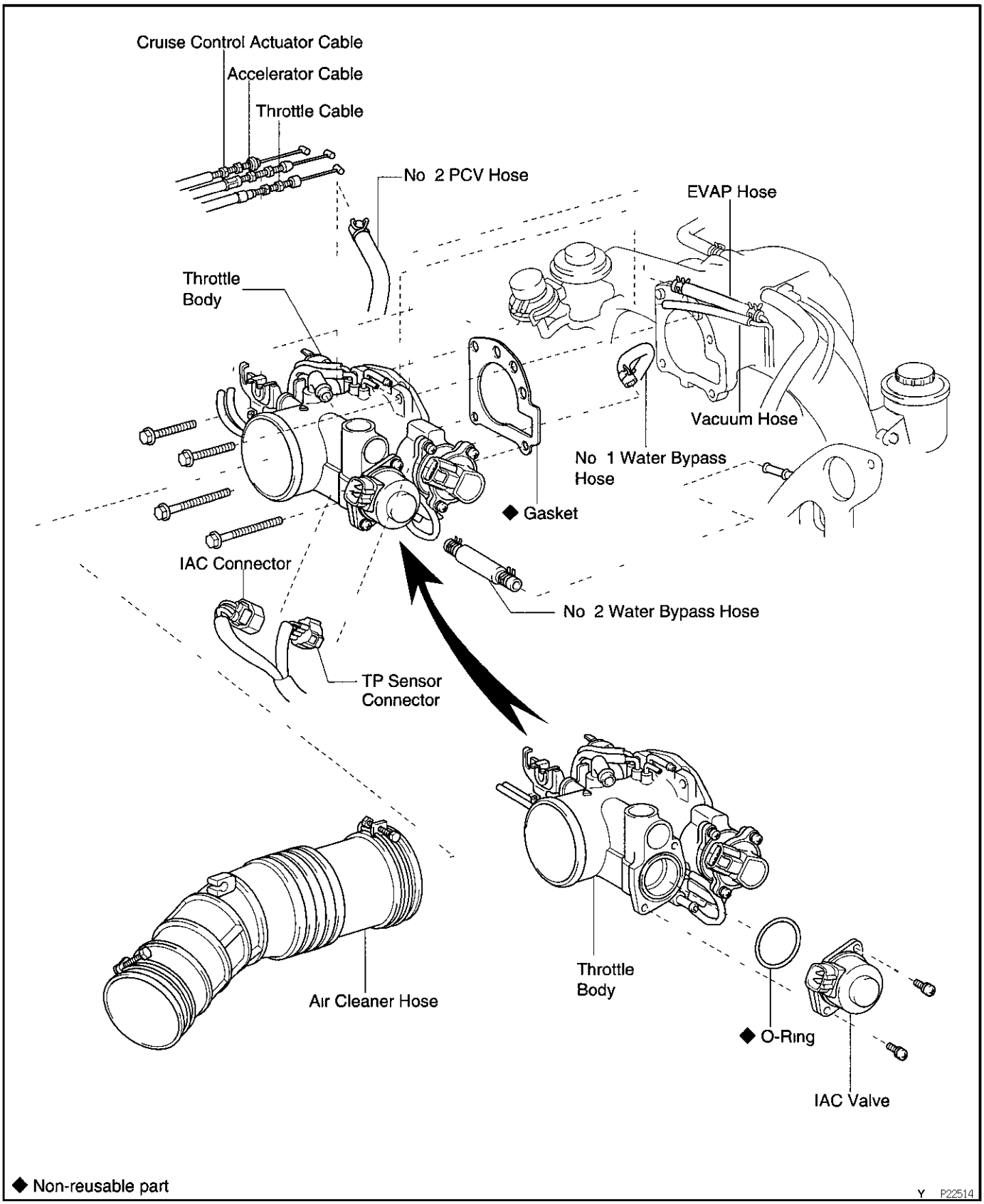
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1F0 01

# COMPONENTS



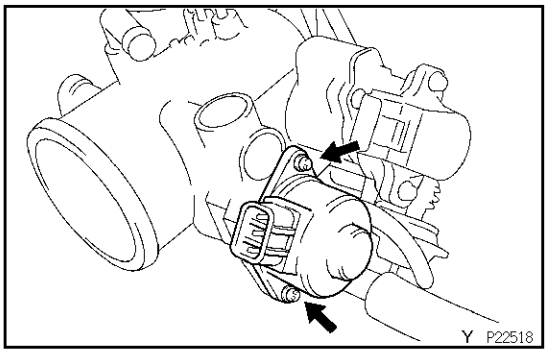



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1F1 01




# REMOVAL

**1. REMOVE THROTTLE BODY (See page SF–45)**

**2. REMOVE IAC VALVE**

Remove the 2 screws, IAC valve and O–ring

HINT

At the time of installation, install the IAC valve with a new O–ring

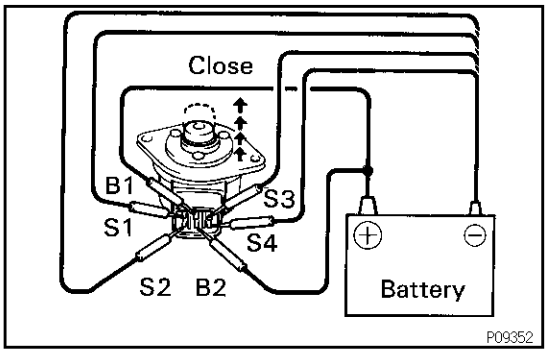


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



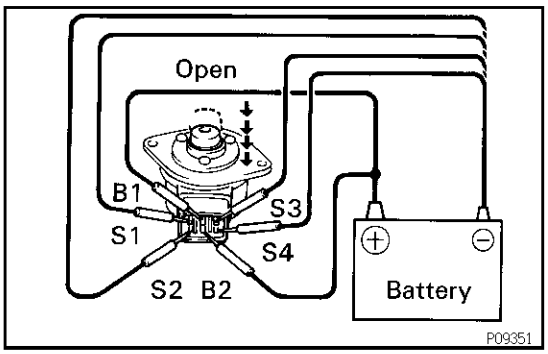
SF1F2 01




# INSPECTION

## INSPECT IDLE AIR CONTROL VALVE OPERATION

(a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1–S2–S3–S4–S1 in sequence, and check that the valve moves toward the closed position




(b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4–S3–S2–S1–S4 in sequence, and check that the valve moves toward the open position

If operation is not as specified, replace the IAC valve



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1F3 01

# INSTALLATION

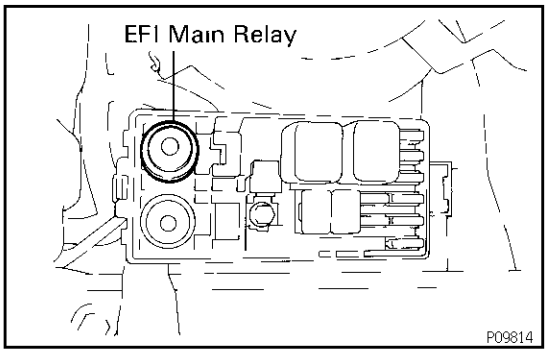
**Installation is in the reverse order of removal (See page SF–51).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





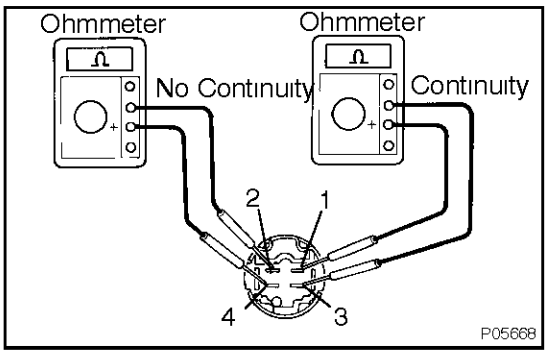

# EFI MAIN RELAY

SF06G 11

## INSPECTION

**1. REMOVE EFI MAIN RELAY**

LOCATION In the engine compartment relay box

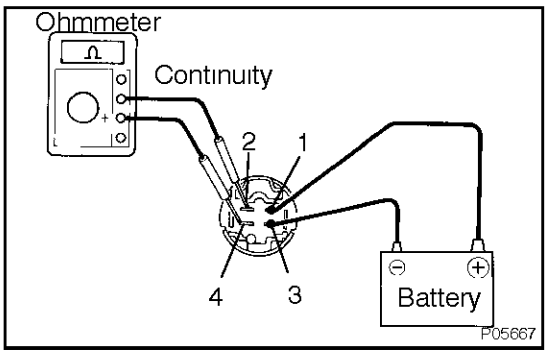



**2. INSPECT EFI MAIN RELAY CONTINUITY**

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3

(b) Check that there is no continuity between terminals 2 and 4

If continuity is not as specified, replace the relay




**3. INSPECT EFI MAIN RELAY OPERATION**

(a) Apply battery voltage across terminals 1 and 3

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4

If operation is not as specified, replace the relay

**4. REINSTALL EFI MAIN RELAY**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

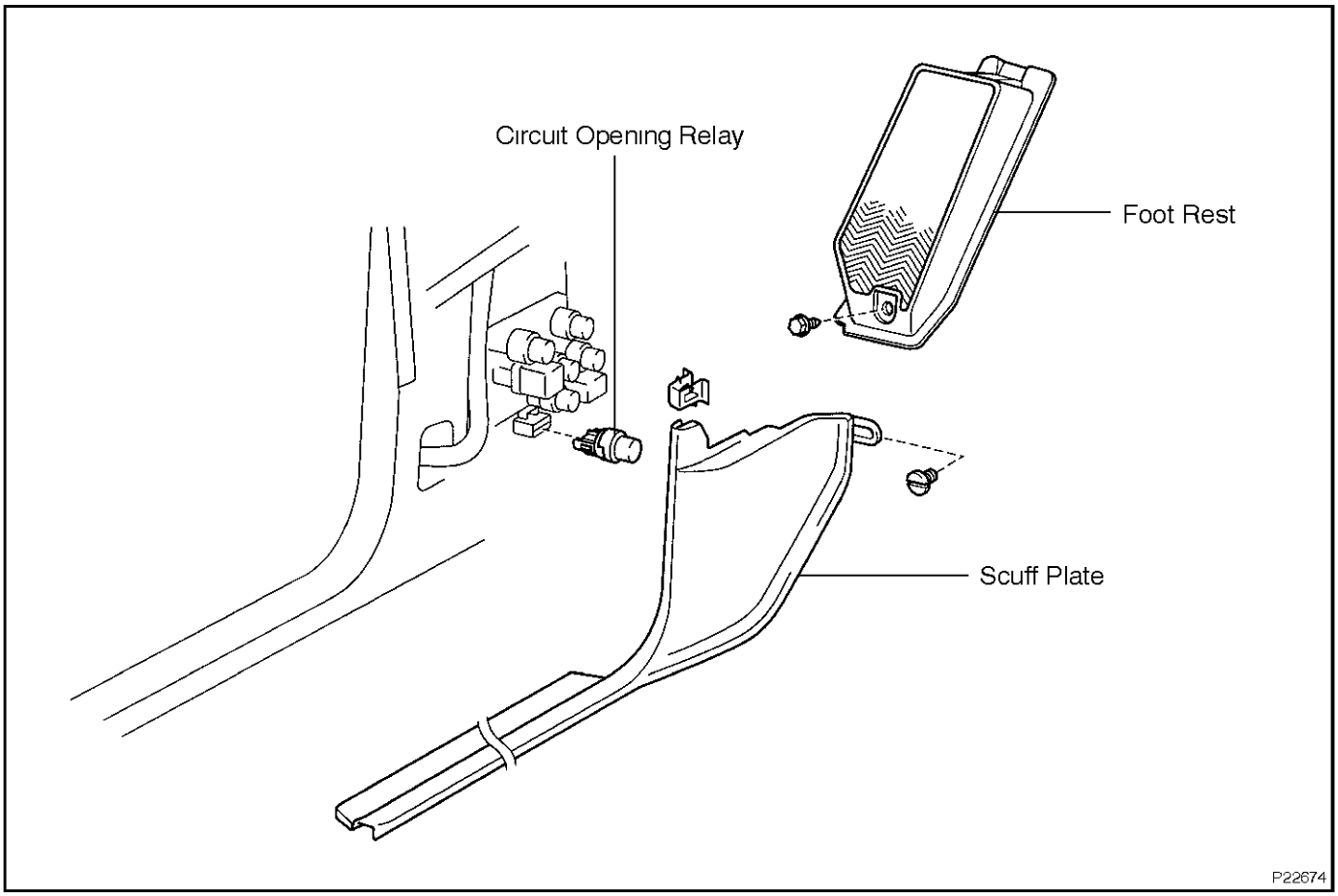
Brought to you by BirfMark



# CIRCUIT OPENING RELAY

## COMPONENTS

SF1F4 01





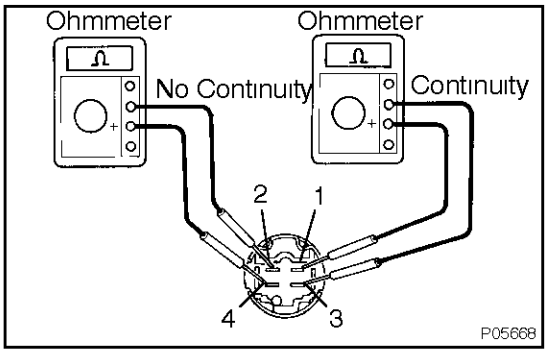

Author : Date : 683
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF1F5 01

# INSPECTION



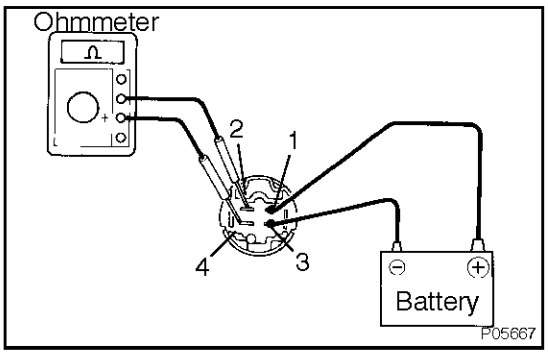

**1. REMOVE CIRCUIT OPENING RELAY**

**2. INSPECT CIRCUIT OPENING RELAY CONTINUITY**

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3

(b) Check that there is no continuity between terminals 2 and 4

If continuity is not as specified, replace the relay




**3. INSPECT CIRCUIT OPENING RELAY OPERATION**

(a) Apply battery voltage across terminals 1 and 3

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4

If operation is not as specified, replace the relay

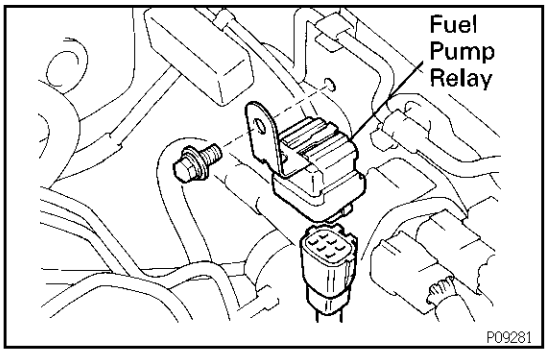
**4. REINSTALL CIRCUIT OPENING RELAY**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# FUEL PUMP RELAY

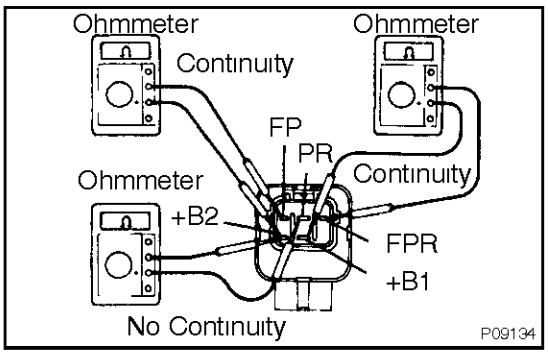
SF1F7 01

## INSPECTION

**1. REMOVE FUEL PUMP RELAY**

(a) Disconnect the fuel pump relay connector

(b) Remove the bolt and fuel pump relay



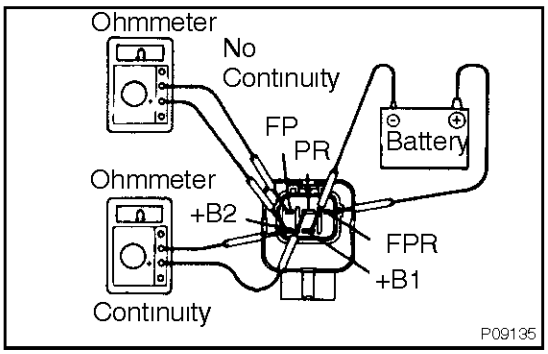

**2. INSPECT FUEL PUMP RELAY CONTINUITY**

(a) Using an ohmmeter, check that there is continuity between terminals +B1 and FPR

(b) Check that there is continuity between terminals +B2 and FP

(c) Check that there is no continuity between terminals +B2 and PR

If continuity is not as specified, replace the relay




**3. INSPECT FUEL PUMP RELAY OPERATION**

(a) Apply battery voltage across terminals +B1 and FPR

(b) Using an ohmmeter, check that there is no continuity between the +B2 and FP

(c) Check that there is continuity between terminals +B2 and PR

If operation is not as specified, replace the relay

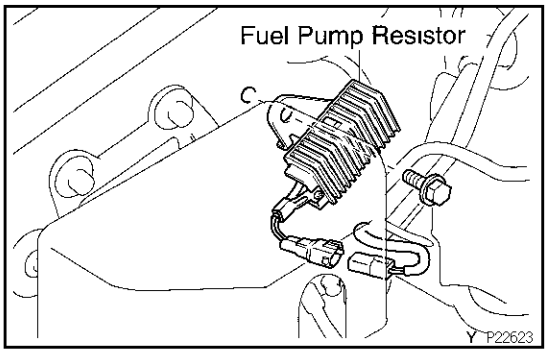
**4. REINSTALL FUEL PUMP RELAY**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# FUEL PUMP RESISTOR

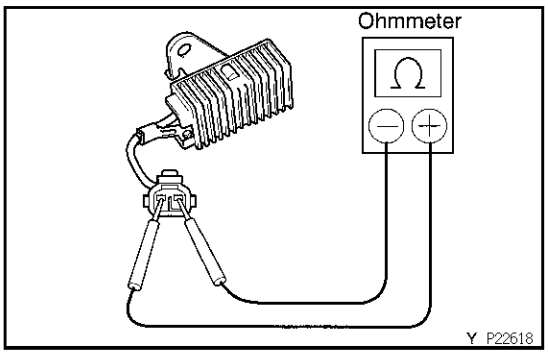
SF1F8 01

## INSPECTION

**1. REMOVE FUEL PUMP RESISTOR**

(a) Disconnect the fuel pump resistor connector

(b) Remove the bolt and fuel pump resistor




**2. INSPECT FUEL PUMP RESISTOR**

Using an ohmmeter, measure the resistance between the terminals

**Resistance: 0.70 – 0.76 Ω at 20°C (68°F)**

If there is no continuity, replace the resistor

**3. REINSTALL FUEL PUMP RESISTOR**

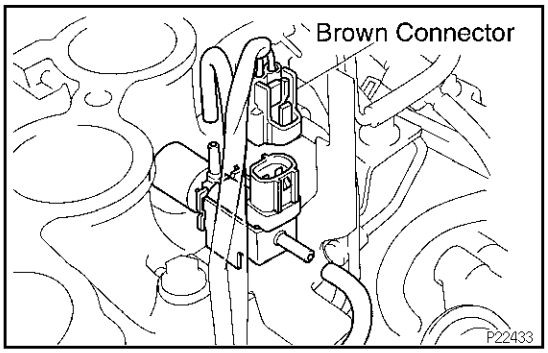
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



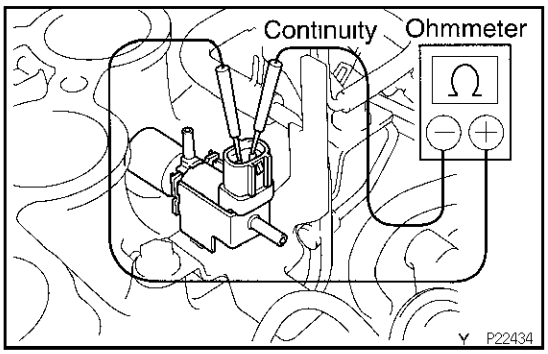



# VSV FOR FUEL PRESSURE CONTROL

## INSPECTION

SF1F9 01

1. REMOVE AIR INTAKE CHAMBER (See page EM-28)
2. DISCONNECT VACUUM HOSES AND CONNECTOR

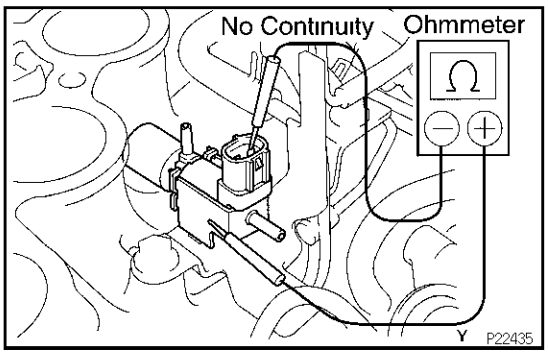



3. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals

**Resistance: 37 – 44 Ω at 20°C (68°F)**

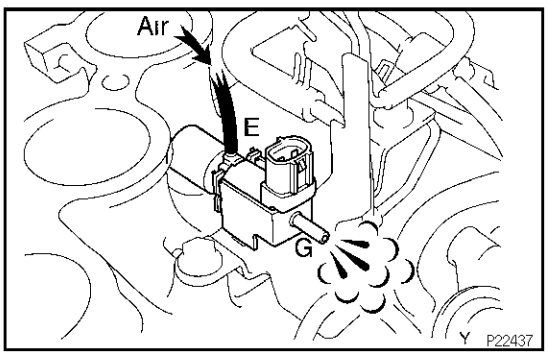
If there is no continuity, replace the VSV




4. INSPECT VSV FOR GROUND

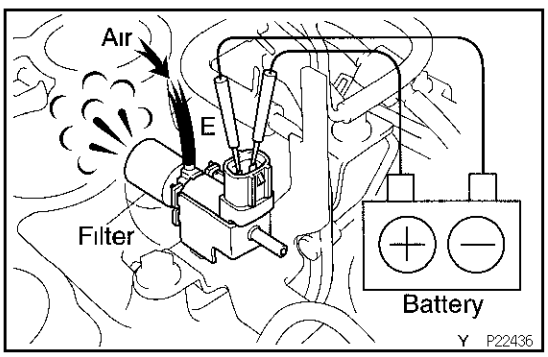
Using an ohmmeter, check that there is no continuity between each terminal and the body

If there is continuity, replace the VSV




5. INSPECT VSV OPERATION

(a) Check that the air flows from pipe E to pipe G




(b) Apply battery voltage across the terminals

(c) Check that the air does not flows from pipe E to the filter

If operation is not as specified, replace the VSV

6. RECONNECT VACUUM HOSES AND CONNECTOR
7. REINSTALL AIR INTAKE CHAMBER (See page EM-54)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# VSV FOR EXHAUST GAS RECIRCULATION (EGR)

SF1F6 01

## INSPECTION

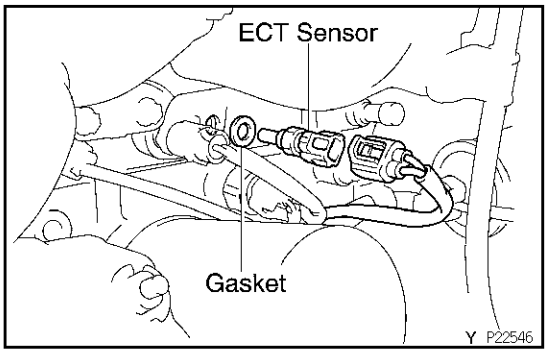
(See page EC–11)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# ENGINE COOLANT TEMPERATURE (ECT) SENSOR

SF0PO-09

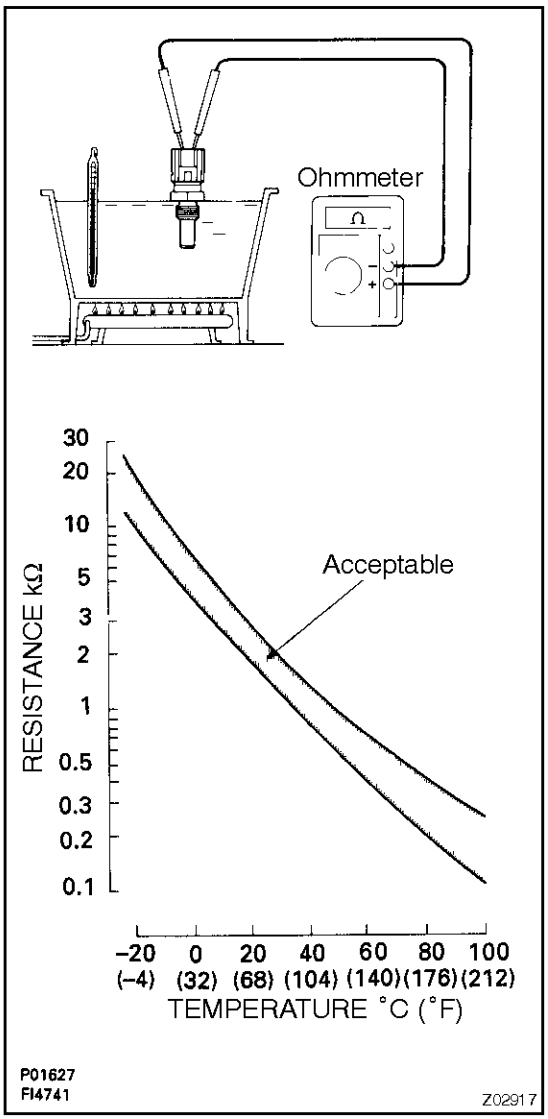
## INSPECTION

**1. DRAIN ENGINE COOLANT**

**2. REMOVE ECT SENSOR**

(a) Disconnect the ECT sensor connector

(b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket




**3. INSPECT ECT SENSOR**

Using an ohmmeter, measure the resistance between the terminals

**Resistance: Refer to the chart graph**

If the resistance is not as specified, replace the ECT sensor

**4. REINSTALL ECT SENSOR**

(a) Using a 19 mm deep socket wrench, install the ECT sensor and gasket

**Torque: 24.5 N·m (250 kgf·cm, 17.5 ft·lbf)**

(b) Connect the ECT sensor connector

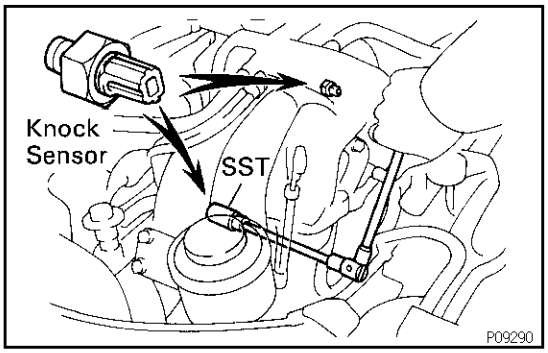
**5. REFILL ENGINE COOLANT**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# KNOCK SENSOR

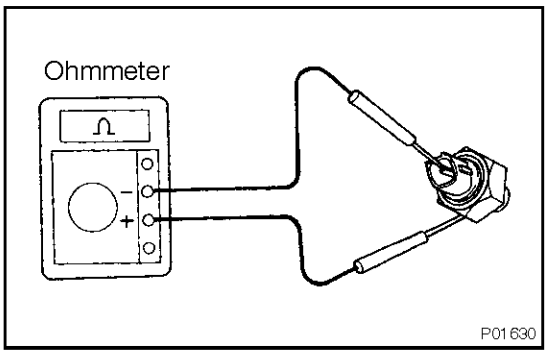
SF1FB-01

## INSPECTION

**1. REMOVE KNOCK SENSOR**

(a) Disconnect the knock sensor connector

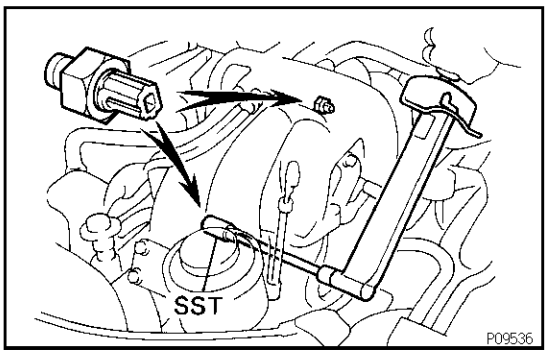
(b) Using SST, remove the knock sensor
SST 09816–30010




**2. INSPECT KNOCK SENSOR**

Using an ohmmeter, check that there is no continuity between the terminal and body

If there is continuity, replace the sensor




**3. REINSTALL KNOCK SENSOR**

(a) Using SST, install the knock sensor
SST 09816–30010
**Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)**

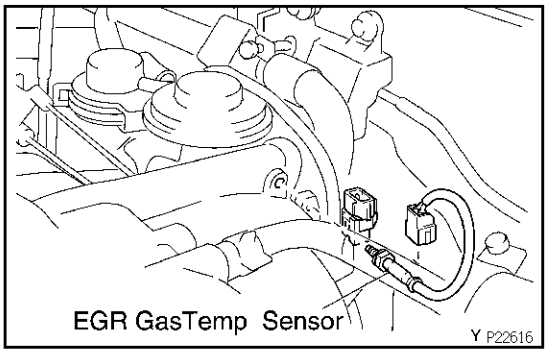
(b) Connect the knock sensor connector



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



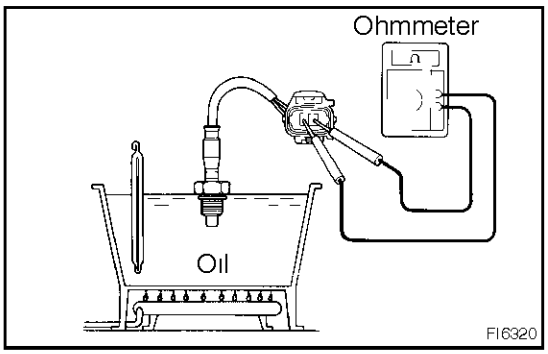



# EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR

SF1FA 01

## INSPECTION

### 1. REMOVE EGR GAS TEMPERATURE SENSOR




### 2. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals

| Temperature | Resistance |
|---|---|
| 50°C (122°F) | 64 – 97 kΩ |
| 100°C (212°F) | 11 – 16 kΩ |
| 150°C (302°F) | 2 – 4 kΩ |

If the resistance is not as specified, replace the sensor

### 3. REINSTALL EGR GAS TEMPERATURE SENSOR

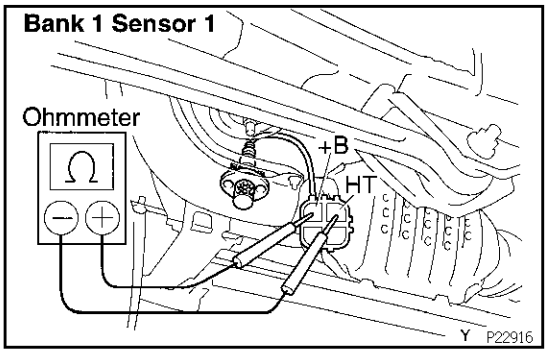
**Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)**

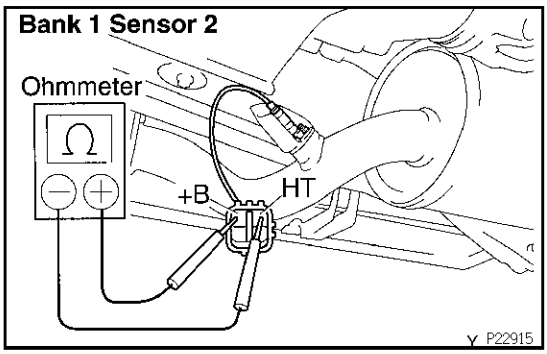


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# HEATED OXYGEN SENSOR

SF1FC-01

## INSPECTION

### INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

(a) Disconnect the heated oxygen sensor connector

(b) Using an ohmmeter, measure the resistance between terminals +B and HT

**Resistance: 11 – 16 Ω at 20°C (68°F)**

If resistance is not as specified, replace the heated oxygen sensor

(c) Reconnect the heated oxygen sensor connector



Brought to you by BirfMark
Version 1.11 - 03/16/2010

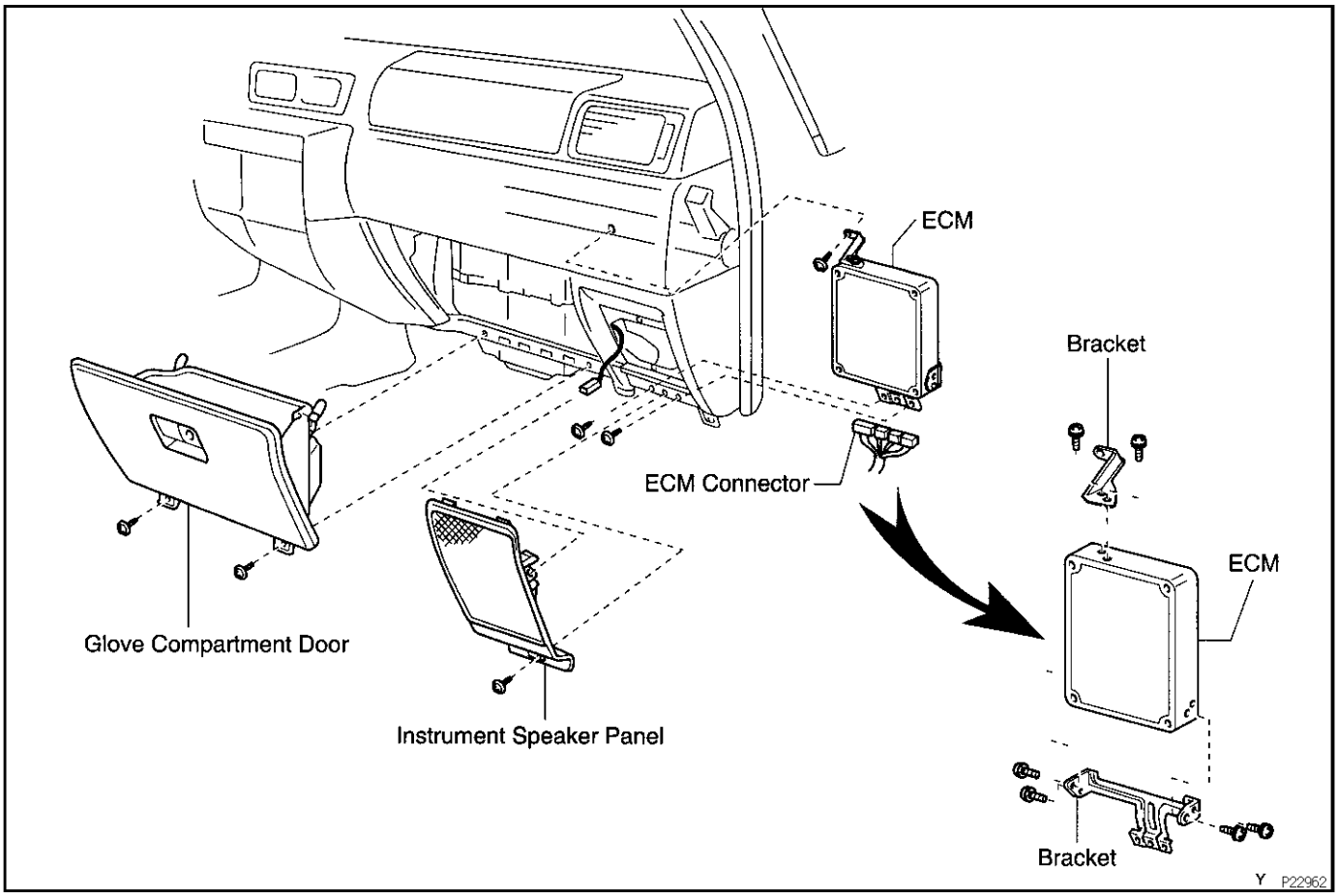
Brought to you by BirfMark



# ENGINE CONTROL MODULE (ECM)

## COMPONENTS

SF0Q0 07






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SF0Q1 07

# INSPECTION

1. REMOVE ECM
2. INSPECT ECM (See page DI–17)
3. REINSTALL ECM



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



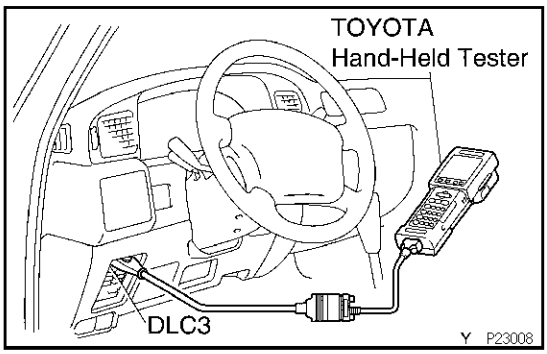
# FUEL CUT RPM

SF0Q2 08

## INSPECTION

**1. WARM UP ENGINE**

Allow the engine to warm up to normal operating temperature

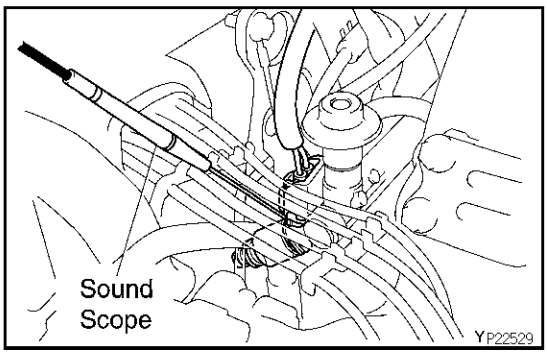



**2. CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL**

(a) Remove the fuse cover on the instrument panel

(b) Connect the TOYOTA hand-held tester or OBD II scan tool to the DLC3

(c) Please refer to the TOYOTA hand-held tester or OBD II scan tool operator's manual for further details




**3. INSPECT FUEL CUTOFF PRM**

(a) Increase the engine speed to at least 3,500 rpm

(b) Use a sound scope to check for injector operating noise

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes

HINT

Measure with the A/C OFF

**Fuel return rpm: 1,200 rpm**

**4. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# STEERING SYSTEM

SR164-01

## PRECAUTION

- **Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.**
- **The LAND CRUISER is equipped with SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TROUBLESHOOTING

SR165-01

## PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in the order shown. If necessary, repair or replace these parts.

| Symptom | Suspect Area | See page |
|---|---|---|
| Hard steering | 11 Tires (Improperly inflated) | SA–3 |
| | 12 Power steering fluid level (Low) | SR–4 |
| | 13 Front wheel alignment (Incorrect) | SA–4 |
| | 14 Steering system joints (Worn) | – |
| | 15 Suspension arm ball joints (Worn) | – |
| | 16 Steering column (Binding) | – |
| | 17 Power steering vane pump | SR–21 |
| | 18 Power steering gear | SR–33 |
| Poor return | 1 Tires (Improperly inflated) | SA–3 |
| | 2 Front wheel alignment (Incorrect) | SA–4 |
| | 3 Steering column (Binding) | – |
| | 4 Power steering gear | SR–33 |
| Excessive play | 1 Steering system joints (Worn) | – |
| | 2 Suspension arm ball joints (Worn) | – |
| | 3 Intermediate shaft, Universal joint, Sliding yoke (Worn) | – |
| | 4 Front wheel bearing (Worn) | SR–7 |
| | 5 Power steering gear | SR–33 |
| Abnormal noise | 1 Power steering fluid level (Low) | SR–4 |
| | 2 Steering system joints (Worn) | – |
| | 3 Power steering vane pump | SR–21 |
| | 4 Power steering gear | SR–33 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# POWER STEERING FLUID

SR167-01

## BLEEDING

1. **CHECK FLUID LEVEL (See page SR–4)**
2. **JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS**
3. **TURN STEERING WHEEL**

With the engine stopped, turn the wheel slowly from lock to lock several times

4. **LOWER VEHICLE**
5. **START ENGINE**

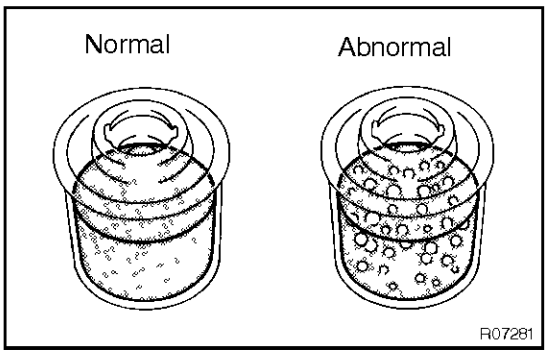
Run the engine at idle for a few minutes

6. **TURN STEERING WHEEL**

(a) With the engine idling, turn the wheel to left or right full lock and keep it there for 2–3 seconds, then turn the wheel to the opposite full lock and keep it there for 2–3 seconds

(b) Repeat (a) several times

7. **STOP ENGINE**




8. **CHECK FOR FOAMING OR EMULSIFICATION**

If the system has to be bled twice specifically because of foaming or emulsification, check for fluid leaks in the system

9. **CHECK FLUID LEVEL (See page SR–4)**

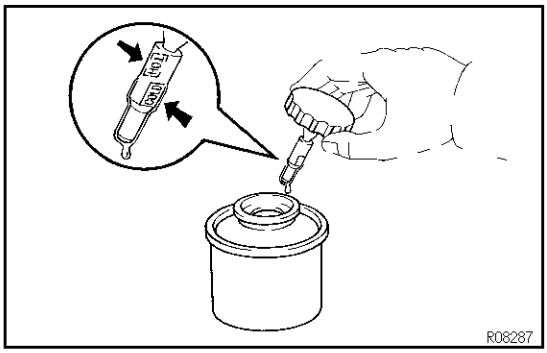


Author : Date : 1054
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR166-01




# INSPECTION

**1. CHECK FLUID LEVEL**

(a) Keep the vehicle level

(b) With the engine stopped, check the fluid level in the oil reservoir

If necessary, add fluid

**Fluid: ATF DEXRON® II or III**

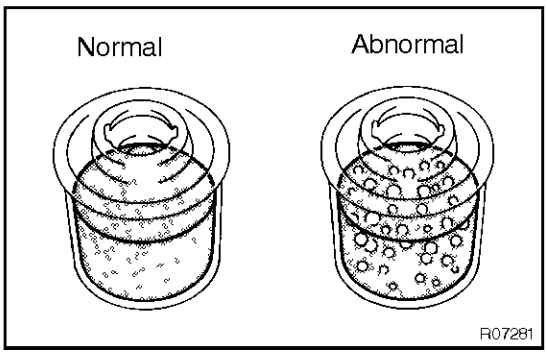
HINT

Check that the fluid level is within the HOT LEVEL range on the reservoir cap dipstick. If the fluid is cold, check that it is within the COLD LEVEL range.

(c) Start the engine and run it at idle

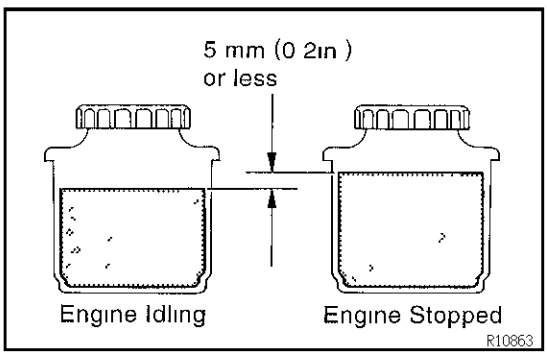
(d) Turn the steering wheel from lock to lock several times to boost fluid temperature

**Fluid temperature: 80°C (176°F)**




(e) Check for foaming or emulsification

If there is foaming or emulsification, bleed power steering system (See page SR–3)




(f) With the engine idling, measure the fluid level in the oil reservoir

(g) Stop the engine

(h) Wait a few minutes and remeasure the fluid level in the oil reservoir

**Maximum fluid level rise: 5 mm (0.20 in.)**

If a problem is found, bleed power steering system (See page SR–3)

(i) Check the fluid level



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

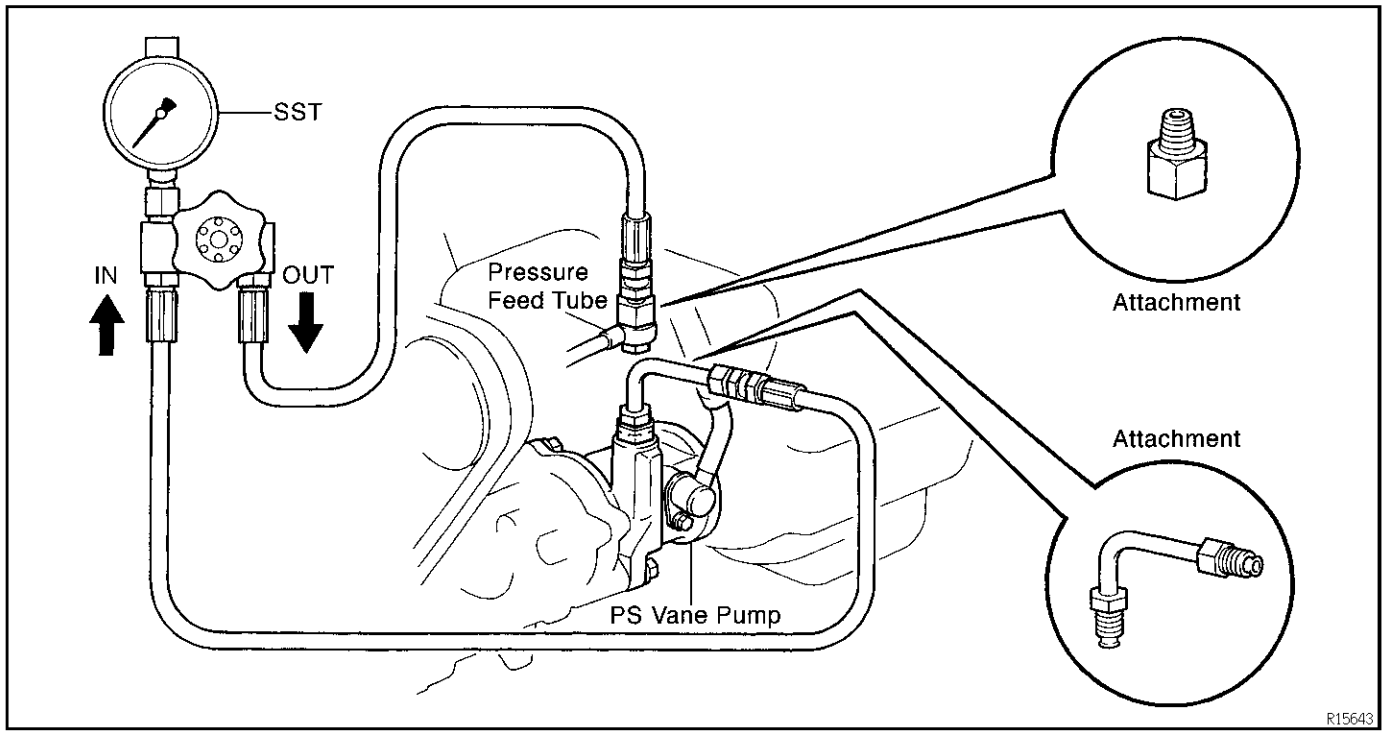


**2. CHECK STEERING FLUID PRESSURE**

(a) Disconnect the pressure feed tube from the PS vane pump (See page SR–23)

(b) Connect SST over 2 new gaskets, as shown below
SST 09640–10010 (09641–01010, 09641–01030, 09641–01060)

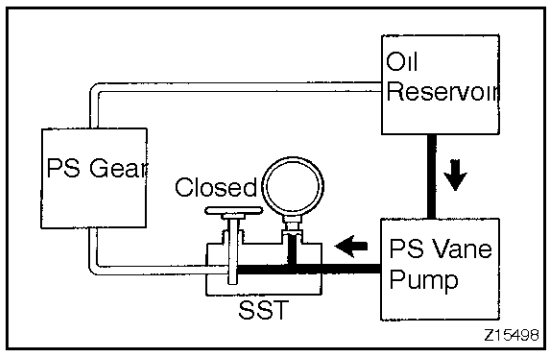
**NOTICE:**
**Check that the valve of the SST is in the open position.**




(c) Bleed the power steering system (See page SR–3)

(d) Start the engine and run it at idle

(e) Turn the steering wheel from lock to lock several times to boost fluid temperature
**Fluid temperature: 80°C (176°F)**




(f) With the engine idling, close the valve of the SST and observe the reading on the SST
**Minimum fluid pressure:**
**9,316kPa (95 kgf/cm², 1,351 psi)**

**NOTICE:**

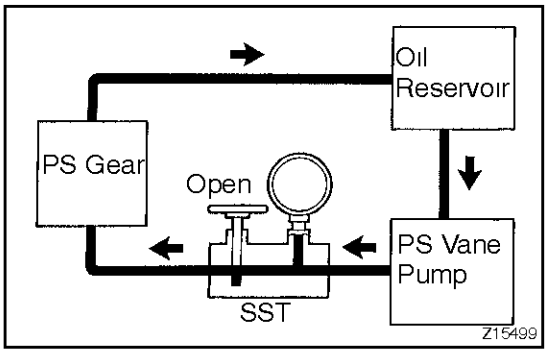
- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(g) With the engine idling, open the valve fully

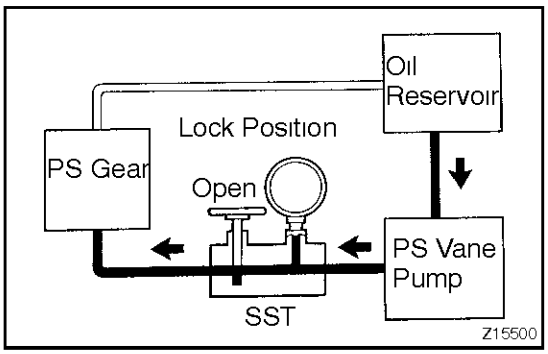
(h) Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm

**Difference fluid pressure:**

**490 kPa (5 kgf/cm$^2$, 71 psi) or less**

**NOTICE:**

**Do not turn the steering wheel.**




(i) With the engine idling and valve fully opened, turn the steering wheel to full lock

**Minimum fluid pressure:**

**9,316 kPa (95 kgf/cm$^2$, 1,351 psi)**

**NOTICE:**

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

(j) Disconnect the SST

(k) Connect the pressure feed tube (See page SR–32)

(l) Bleed the power steering system (See page SR–3)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

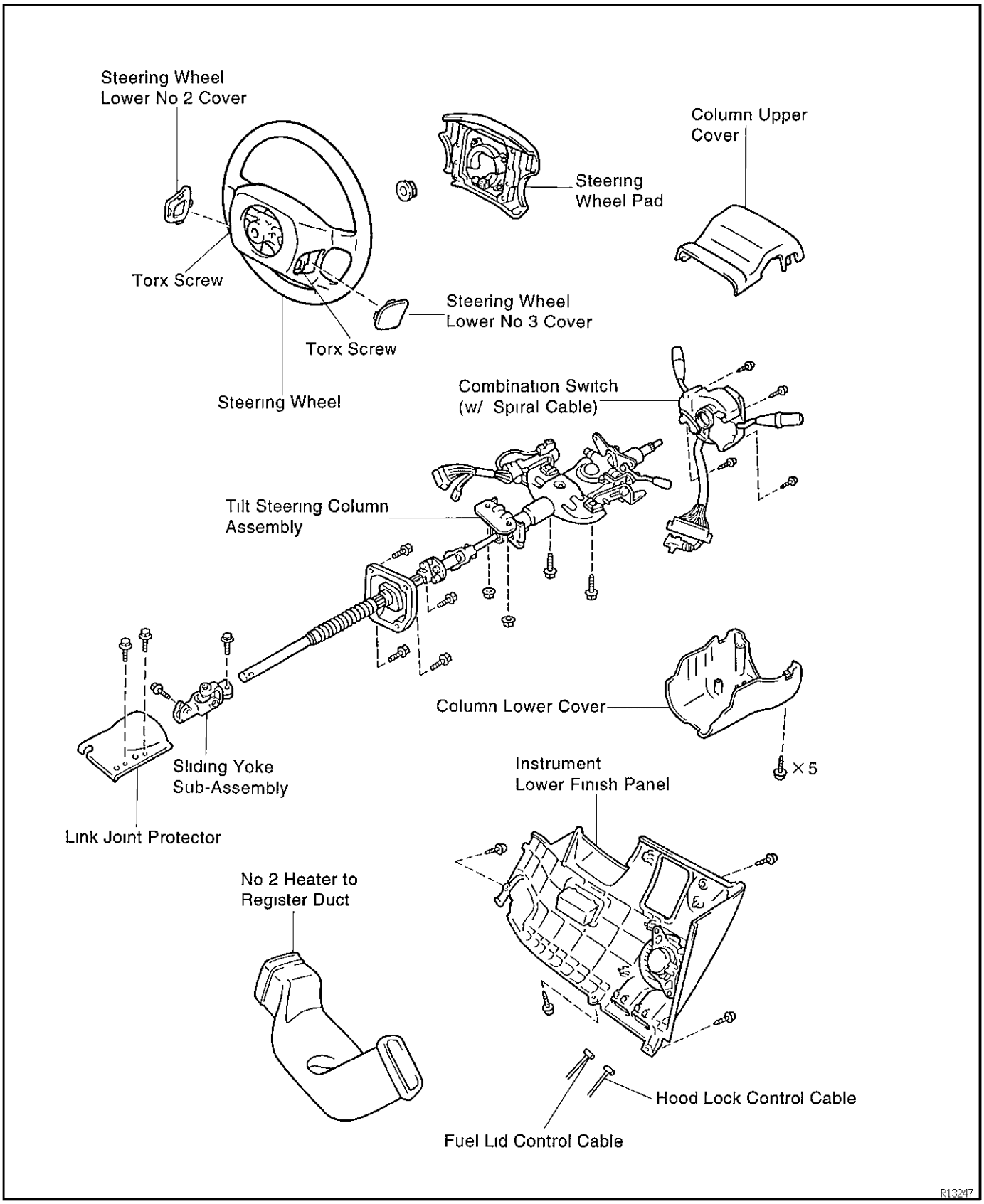
Brought to you by BirfMark



# TILT STEERING COLUMN

## COMPONENTS

SR169-01

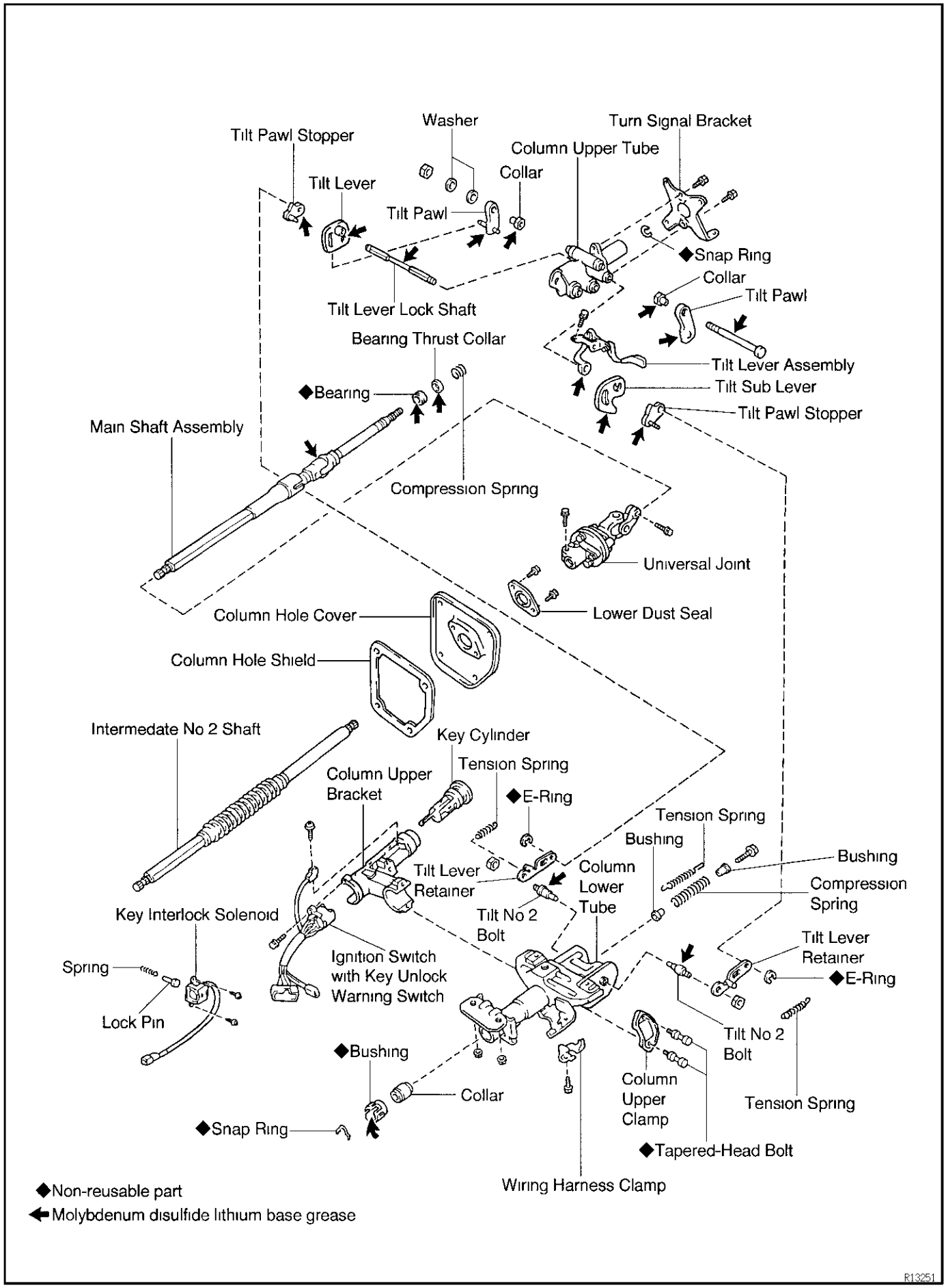





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



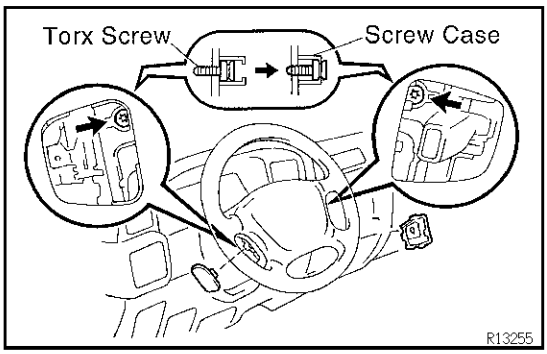
SR16A 03

# REMOVAL

## 1. REMOVE STEERING WHEEL PAD

**NOTICE:**

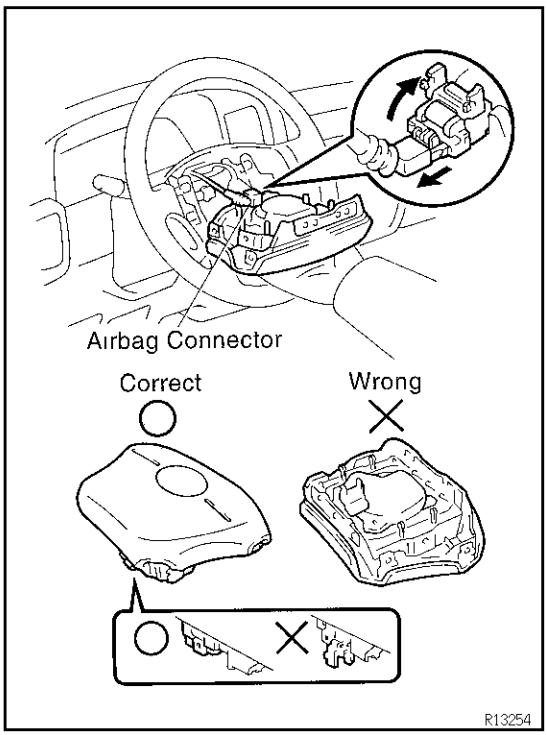
**If the airbag connector is disconnected with the ignition switch at ON or ACC, DTCs will be recorded. Never use airbag parts from another vehicle. When replacing parts, replace with new parts.**




(a) Place the front wheels facing straight ahead
(b) Remove the steering wheel lower No 2 and No 3 cover from the steering wheel
(c) Using a torx socket wrench, loosen the 2 torx screws

HINT

Loosen the 2 screws until the groove along the screw circumference catches on the screw case




(d) Pull out the wheel pad from the steering wheel and disconnect the airbag connector

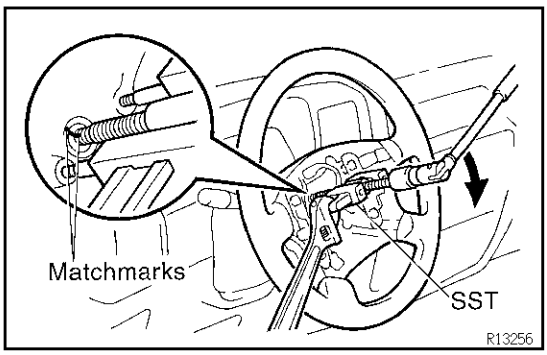
**CAUTION:**

**When storing the wheel pad, keep the upper surface of the pad facing upward. Never disassemble the wheel pad.**

**NOTICE:**

**When removing the wheel pad, take care not to pull the airbag wire harness.**

## 2. REMOVE STEERING WHEEL




(a) Disconnect the connector
(b) Remove the steering wheel set nut
(c) Place matchmarks on the steering wheel and main shaft assembly
(d) Using SST, remove the wheel

SST 09950–50010 (09951–05010, 09952–05010, 09953–05020, 09954–05020)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**3. REMOVE INSTRUMENT LOWER FINISH PANEL**

(a) Disconnect the hood lock control cable and fuel lid control cable

(b) Remove the 4 panel set screws

**4. REMOVE NO.2 HEATER TO REGISTER DUCT**

**5. REMOVE UPPER AND LOWER COLUMN COVERS**

Remove the 5 screws

**6. REMOVE COMBINATION SWITCH WITH SPIRAL CABLE**

(a) Disconnect the 2 connectors

(b) Disconnect the airbag connector

(c) Remove the 4 screws

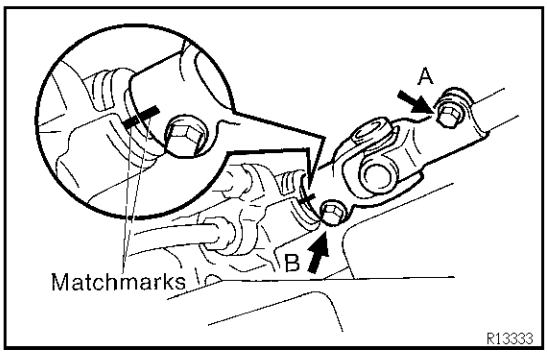
**NOTICE:**

**Do not disassemble the cable or apply oil to it.**

**7. REMOVE 4 COLUMN HOLE COVER SET BOLTS**

**8. REMOVE LINK JOINT PROTECTOR**

Remove the 2 bolts




**9. DISCONNECT SLIDING YOKE SUB–ASSEMBLY**

(a) Place matchmarks on the yoke sub–assembly and worm gear valve body shaft

(b) Loosen bolt A and remove bolt B

**10. REMOVE SLIDING YOKE SUB–ASSEMBLY**

Remove the bolt A

**11. REMOVE TILT STEERING COLUMN ASSEMBLY**

(a) Disconnect the 3 connectors

(b) Remove the 2 column assembly set nuts and 2 set bolts

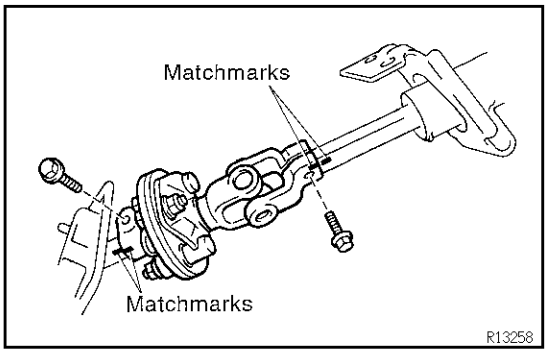


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16B 02




# DISASSEMBLY

**NOTICE:**

**When using a vise, do not overtighten it.**

**1. DISCONNECT UNIVERSAL JOINT**

(a) Place matchmarks on the universal joint, intermediate No 2 shaft and main shaft

(b) Remove the 2 bolts

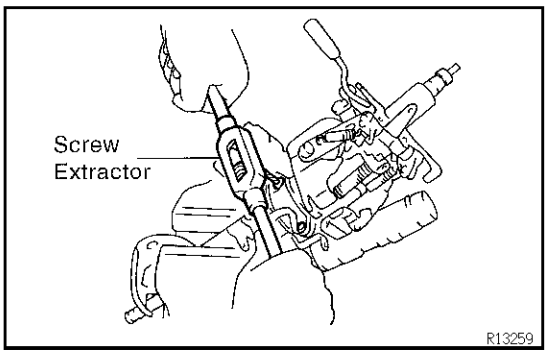
**2. REMOVE LOWER DUST SEAL, COLUMN HOLE COVER AND COLUMN HOLE SHIELD**

(a) Remove the 2 bolts from the dust seal

(b) Remove the hole shield from the hole cover

**3. REMOVE WIRING HARNESS CLAMP**

Remove the bolt




**4. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP**

(a) Using a punch, mark the center of the 2 tapered–head bolts

(b) Using a 3 – 4 mm (0 12 – 0 16 in ) drill, drill into the 2 bolts

(c) Using a screw extractor, remove the 2 bolts

**5. REMOVE COMPRESSION SPRING**

(a) Remove the bolt

(b) Remove the 2 bushings from the spring

**6. REMOVE 3 TENSION SPRINGS**

**7. REMOVE 2 TILT LEVER RETAINERS AND TILT PAWL STOPPERS**

(a) Remove the E–ring from the tilt lever lock shaft

(b) Remove the nut from the tilt No 2 bolt

**8. REMOVE 2 TILT PAWLS**

(a) Remove the nut and 2 washers from the bolt

(b) Pull out the bolt

(c) Remove the tilt lever assembly set bolt

(d) Remove the collar from the tilt pawl

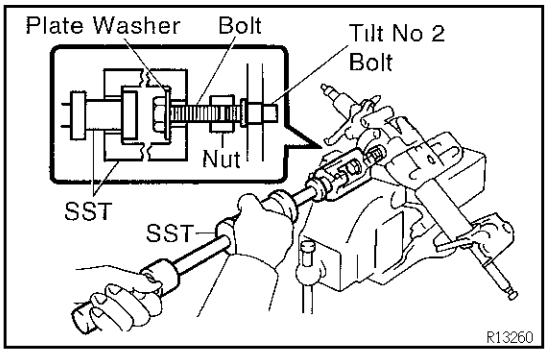
**9. REMOVE TILT LEVER, TILT SUB LEVER, TILT LEVER ASSEMBLY AND TILT LEVER LOCK SHAFT**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**10. REMOVE COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY**

(a) Set SST, the nut (10 mm nominal diameter, 1.25 mm pitch), plate washer (36 mm outer diameter) and bolt (10 mm nominal diameter, 1.25 mm pitch, 50 mm length), as shown

SST 09910-00015 (09911-00011, 09912-00010)

Reference

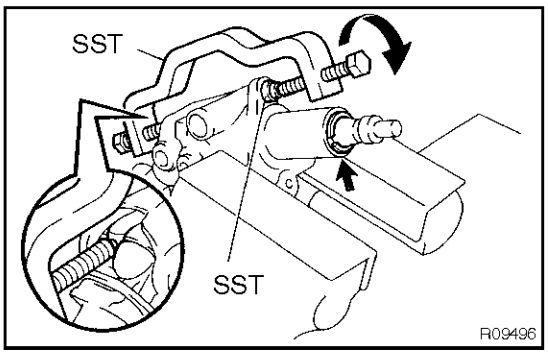
Nut 90170-10004
Plate washer 90201-10201
Bolt 91111-51050

(b) Remove the 2 tilt No 2 bolts by using the sliding hammer on SST

(c) Remove the upper tube with the shaft assembly from the column lower tube

**11. REMOVE TURN SIGNAL BRACKET**

Remove the 2 bolts




**12. REMOVE MAIN SHAFT ASSEMBLY**

(a) Using SST, compress the compression spring

SST 09950-40010 (09957-04010, 09958-04010)

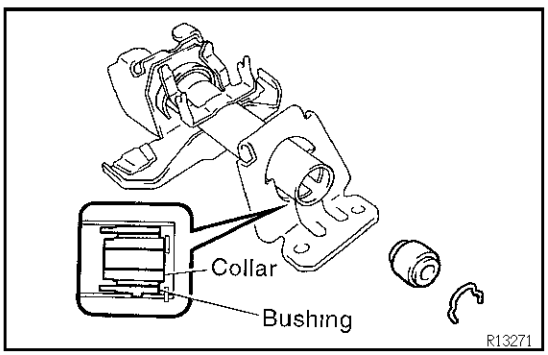
**NOTICE:**

**Do not bend the sliding yoke of the main shaft assembly more than 20°.**

(b) Using snap ring pliers, remove the snap ring

(c) Remove the shaft assembly from the column upper tube

(d) Remove the compression spring, bearing thrust collar and bearing from the shaft assembly




**13. REMOVE COLLAR**

Remove the snap ring and collar from the column lower tube



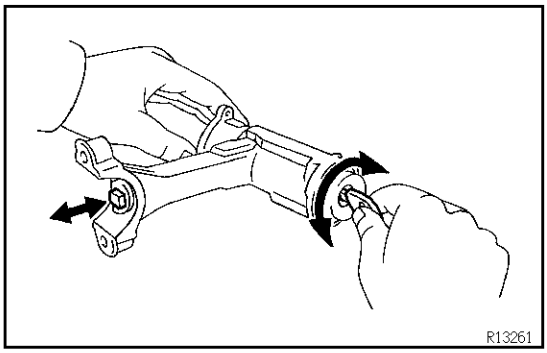
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



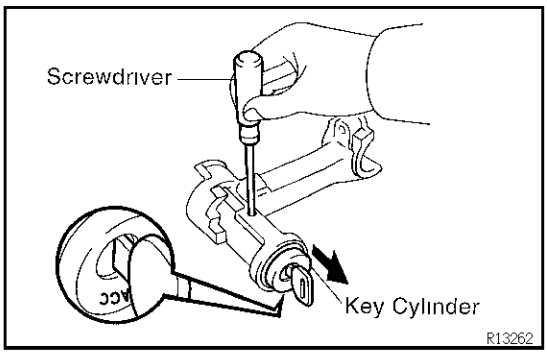
SR16C–01

# INSPECTION




**1. INSPECT STEERING LOCK OPERATION**

Check that the steering lock mechanism operates properly




**2. IF NECESSARY, REPLACE KEY CYLINDER**

(a) Place the ignition key at the ACC position

(b) Push down the stop pin with a screwdriver, and pull out the cylinder

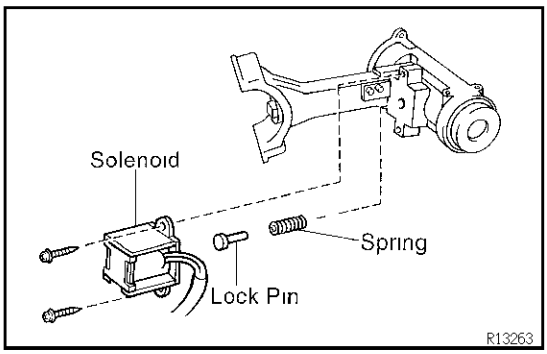
(c) Install a new cylinder

HINT

Make sure the key is at the ACC position

**3. INSPECT IGNITION SWITCH (See page BE–11)**

**4. INSPECT KEY UNLOCK WARNING SWITCH (See page BE–11)**




**5. IF NECESSARY, REPLACE IGNITION SWITCH WITH KEY UNLOCK WARNING SWITCH**

(a) Remove the 2 screws

(b) Install a new switches with the 2 screws

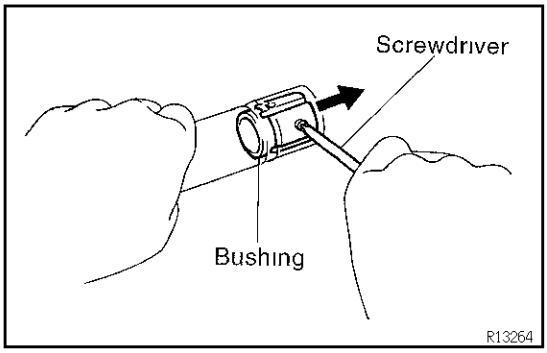
**6. INSPECT KEY INTERLOCK SOLENOID (See page SR–9)**

**7. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID**

(a) Remove the 2 screws

(b) Remove the solenoid, spring and lock pin

(c) Install a new solenoid with the spring and lock pin, with the 2 screws




**8. IF NECESSARY, REPLACE BUSHING**

(a) Using a screwdriver, remove the bushing from the column lower tube

(b) Coat a new bushing with molybdenum disulfide lithium base grease

(c) Align the holes of the tube and projections of the bushing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16D–02

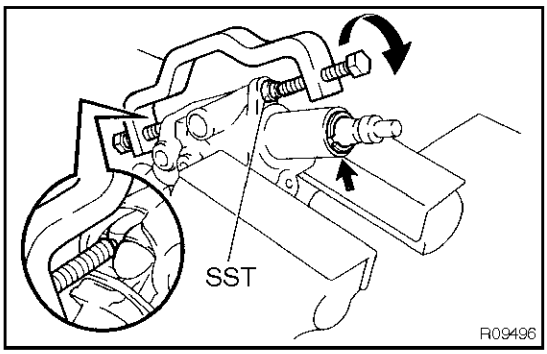
# REASSEMBLY

**NOTICE:**

**When using a vise, do not overtighten it.**

1. **COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR–9)**
2. **INSTALL MAIN SHAFT ASSEMBLY**

(a) Install a new bearing, bearing thrust collar and compression spring to the shaft assembly




(b) Install the shaft assembly into the column upper tube

(c) Using SST, compress the compression spring

SST 09950–40010 (09957–04010, 09958–04010)

**NOTICE:**

**Do not bend the universal joint of the main shaft more than 20°.**

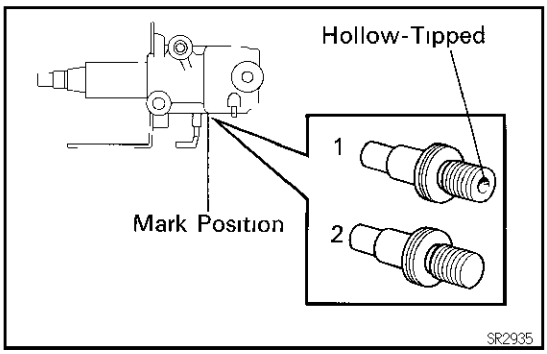
(d) Using snap ring pliers, install a new snap ring

3. **INSTALL TURN SIGNAL BRACKET**

Torque the 2 bolts

**Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)**

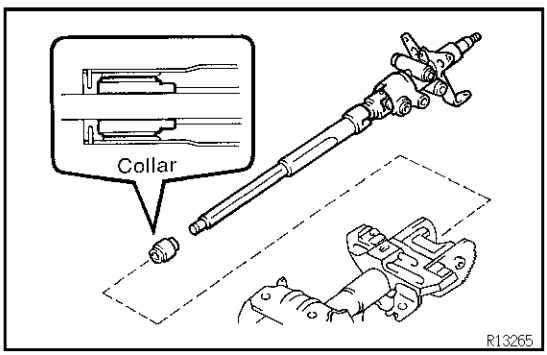
4. **SELECT TILT NO.2 BOLTS**




Select the bolt with plain thread end when the column upper tube mark is 2, and the bolt with the hollow–tipped thread end when the mark is 1

**NOTICE:**

**Select the bolt type to match each number marked in the squares on the upper tube.**

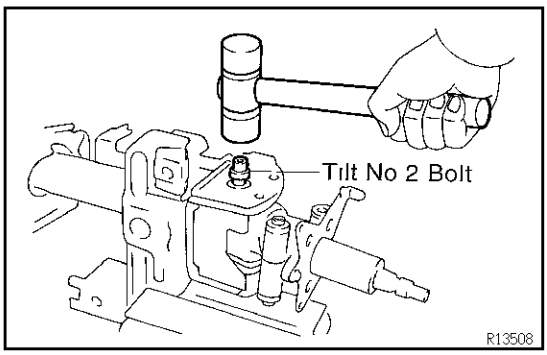



5. **INSTALL COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY**

(a) Install the collar to the shaft assembly

(b) Install a new snap ring

(c) Install the upper tube with the shaft assembly into the column lower tube




(d) Using a plastic hammer, drive in the 2 tilt No 2 bolts

6. **INSTALL TILT LEVER LOCK SHAFT, TILT LEVER ASSEMBLY, TILT SUB LEVER AND TILT LEVER**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**7. INSTALL 2 TILT PAWLS**

(a) Coat the collar with molybdenum disulfide lithium base grease and install it to the tilt pawl

(b) Install the pawl

HINT

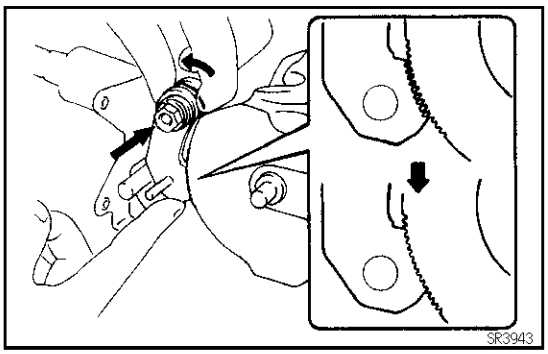
Install the pawl pin into the long hole of the tilt lever/ tilt sub lever

(c) Install the bolt through the pawls and tilt lever assembly

(d) Temporarily install the 2 washers and nut

(e) Torque the tilt lever assembly set bolt

**Torque: 2.9 N·m (30 kgf·cm, 26 in.·lbf)**




**8. ENGAGE AND ADJUST 2 TILT PAWLS**

(a) Engage the tilt sub lever side pawl to the center of the ratchet

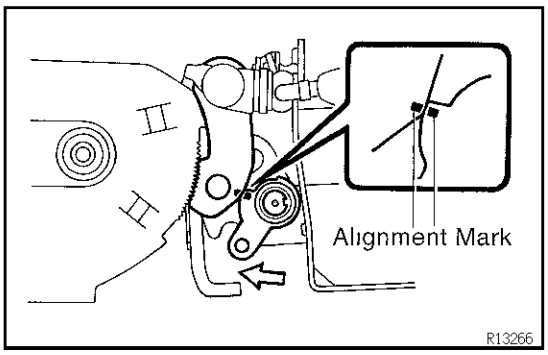
(b) While turning the tilt lever side tilt pawl collar, completely engage the tilt lever side pawl to the ratchet

(c) Torque the nut

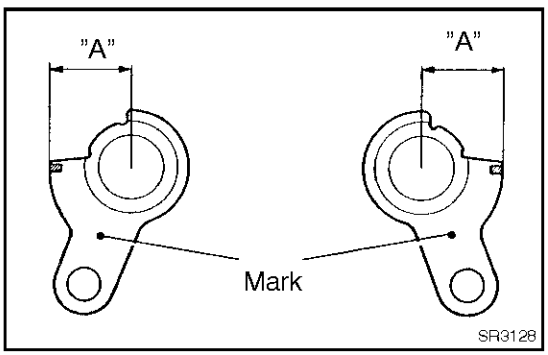
**Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)**

**9. SELECT AND INSTALL 2 TILT PAWL STOPPERS**

(a) With the tilt pawl and ratchet engaged, install the stopper




(b) Check that the alignment marks on the stopper and pawl align when the stopper is rotated to the pawl side




(c) If the alignment marks do not align, select stopper according to the following table

| Tilt lever side | Tilt sub lever side | Dimension A mm (in ) |
|---|---|---|
| 1 | A | 12 65 – 12 75 (0 4980 – 0 5020) |
| 2 | B | 12 55 – 12 65 (0 4941 – 0 4980) |
| 3 | C | 12 45 – 12 55 (0 4902 – 0 4941) |
| 4 | D | 12 35 – 12 45 (0 4862 – 0 4902) |
| 5 | E | 12 25 – 12 35 (0 4823 – 0 4862) |

(d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged

**10. INSTALL 2 TILT LEVER RETAINERS**

(a) Install a new E–ring

(b) Torque the nut

**Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



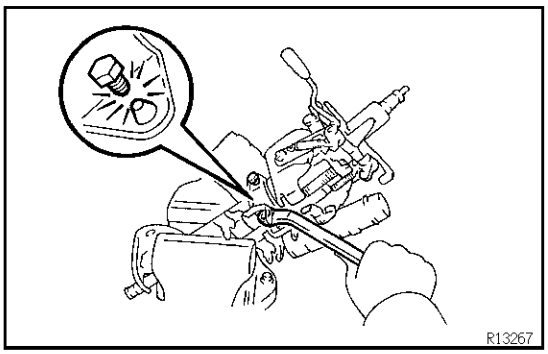
**11. INSTALL 3 TENSION SPRINGS**

**12. INSTALL COMPRESSION SPRING**

(a) Install the 2 bushings to the spring

(b) Torque the bolt

**Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)**




**13. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP**

Tighten 2 new tapered–head bolts until the bolt head brakes off

**14. INSTALL WIRING HARNESS CLAMP**

Tighten the bolt

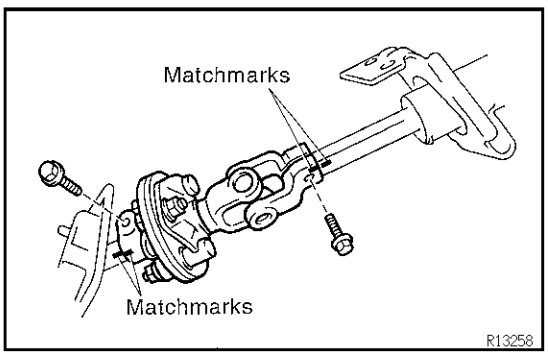
**15. INSTALL COLUMN HOLE SHIELD, COLUMN HOLE COVER AND LOWER DUST SEAL**

(a) Install the hole shield to the hole cover

(b) Install the dust seal to the hole cover

(c) Torque 2 bolts

**Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)**




**16. CONNECT UNIVERSAL JOINT**

(a) Align the matchmarks on the intermediate No 2 shaft and universal joint then torque the bolt

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

(b) Align the matchmarks on the universal joint and the main shaft then torque the bolt

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

**17. CHECK TILT STEERING COLUMN OPERATION**

(a) Check that there is no axial play at the end of the main shaft

(b) With the main shaft in the neutral position, raise the tilt lever and check that the main shaft rises to the uppermost position

(c) Lower the main shaft, and check that it locks in the lowermost position



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16E 03

# INSTALLATION

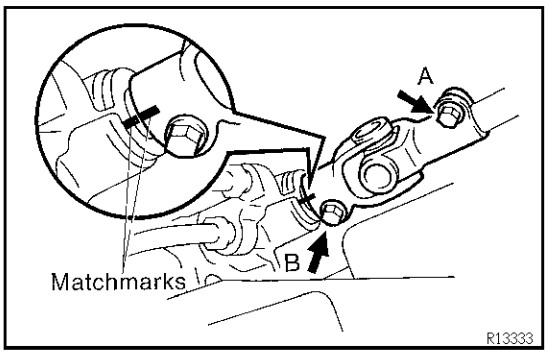
**1. INSTALL STEERING COLUMN ASSEMBLY**

(a) Torque the 2 column assembly set nuts and 2 set bolts
**Torque:25 N·m (250 kgf·cm, 18 ft·lbf)**

(b) Connect the 3 connectors

**2. INSTALL SLIDING YOKE SUB–ASSEMBLY**

Temporarily tighten the bolt A




**3. CONNECT SLIDING YOKE SUB–ASSEMBLY**

(a) Align the matchmarks on the yoke sub–assembly and worm gear valve body shaft

(b) Torque the bolt B
**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

(c) Torque the bolt A
**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

**4. INSTALL LINK JOINT PROTECTOR**

Torque the 2 bolts
**Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)**

**5. TORQUE 4 COLUMN HOLE COVER SET BOLTS**
**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

**6. INSTALL COMBINATION SWITCH WITH SPIRAL CABLE**

(a) Tighten the 4 screws

(b) Connect the airbag connector

(c) Connect the 2 connectors

**7. INSTALL UPPER AND LOWER COLUMN COVERS**

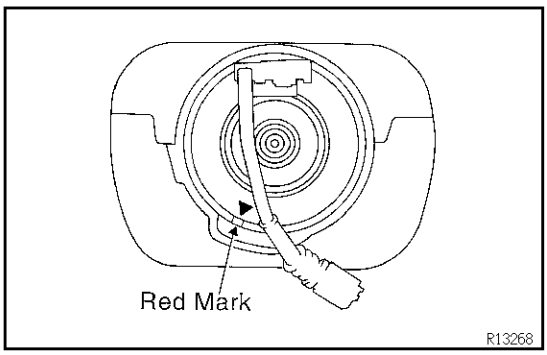
Tighten the 5 screws

**8. INSTALL NO.2 HEATER TO REGISTER DUCT**

**9. INSTALL INSTRUMENT LOWER FINISH PANEL**

(a) Tighten the 4 panel set screws

(b) Connect the hood lock control cable and fuel lid control cable




**10. CENTER SPIRAL CABLE**

(a) Check that the front wheels are facing straight ahead

(b) Turn the cable counterclockwise by hand until it becomes harder to turn the cable

(c) Then rotate the cable clockwise about 3 turns to align the red mark

HINT

The cable will rotate about 3 turns to either left or right of the center



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**11. INSTALL STEERING WHEEL**

(a) Align the matchmarks on the wheel and main shaft assembly

(b) Torque the wheel set nut

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

(c) Connect the connector

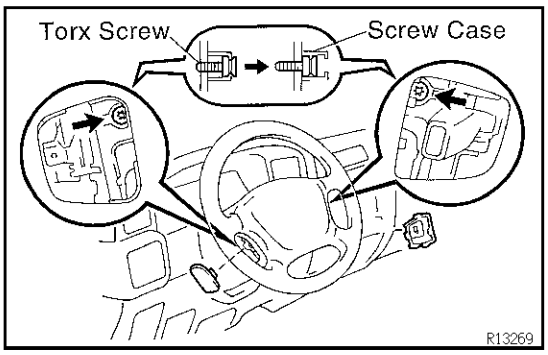
**12. INSTALL STEERING WHEEL PAD**

**NOTICE:**

**Make sure the wheel pad is installed to the specified torque. If the wheel pad has been dropped, or there are cracks, dents or other defects in the case or connector, replace the wheel pad with a new one. When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**

(a) Connect the airbag connector

(b) Install the wheel pad after confirming that the circumference groove of the torx screws is caught on the screw case




(c) Using a torx socket wrench, torque the 2 screws

**Torque: 9.0 N·m (90 kgf·cm, 78 in.·lbf)**

(d) Install the steering wheel lower No 2 and No 3 cover

**13. CHECK STEERING WHEEL CENTER POINT**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

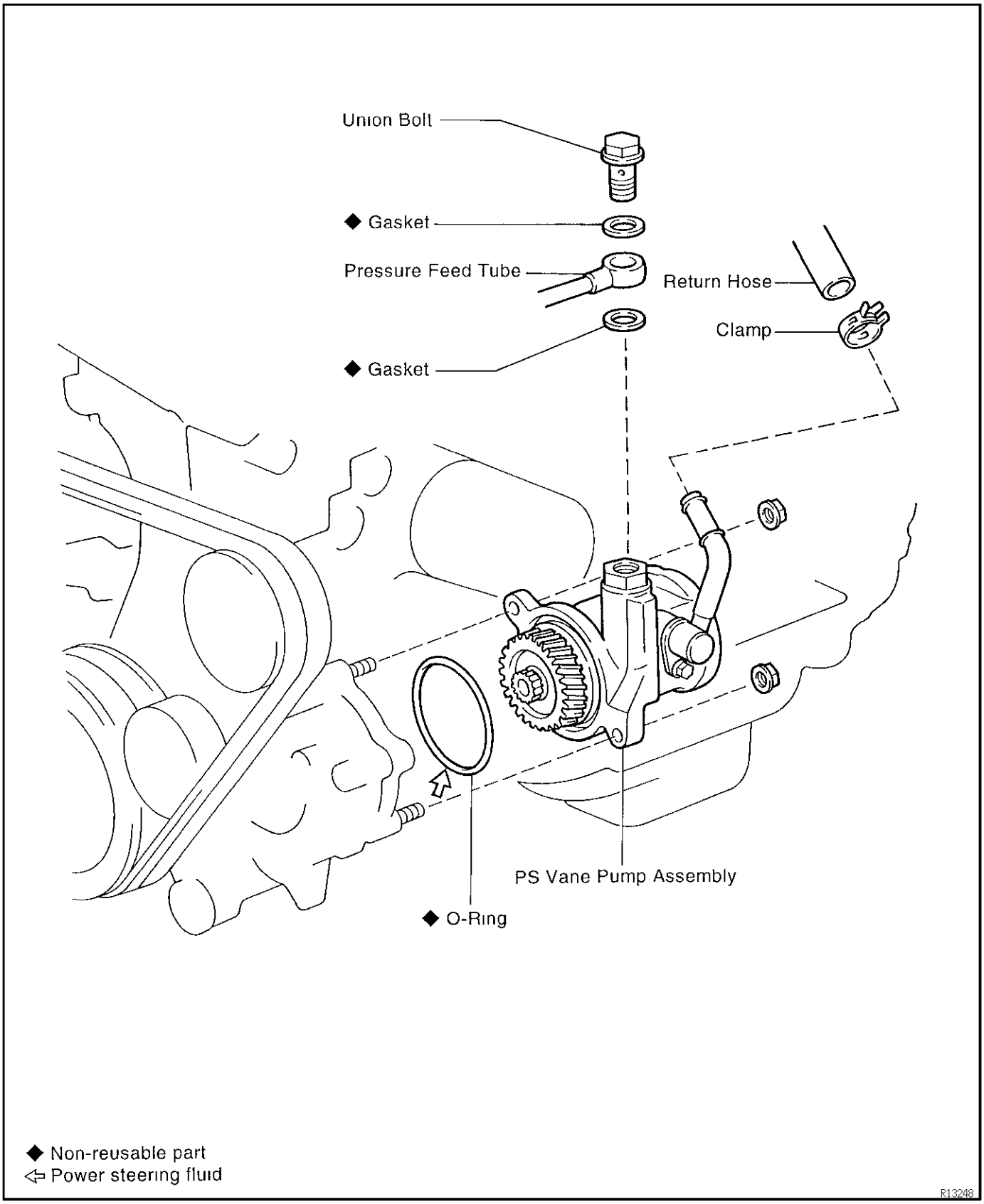
Brought to you by BirfMark



# POWER STEERING VANE PUMP

## COMPONENTS

SR16F-01

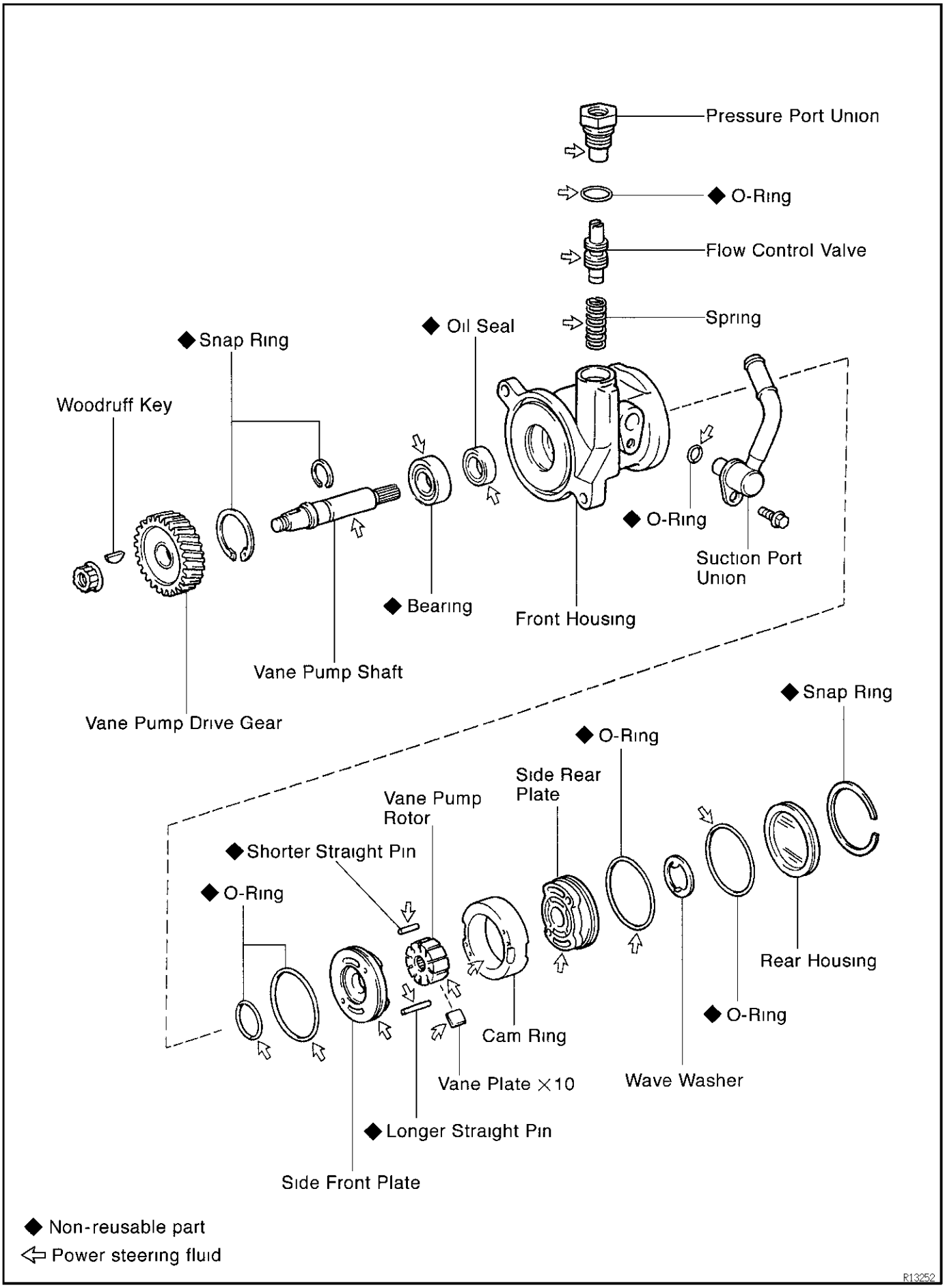





Author : Date : 1072
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



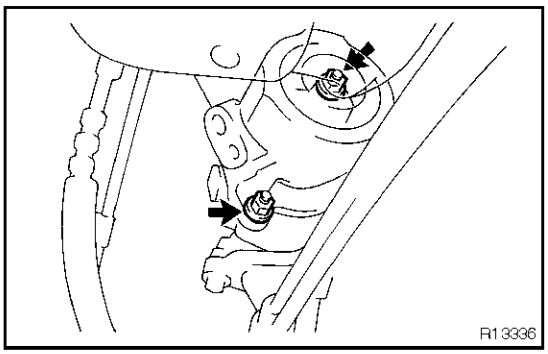
SR16G 01

# REMOVAL

**1. DISCONNECT RETURN HOSE**

**2. DISCONNECT PRESSURE FEED TUBE**

Remove the union bolt and 2 gaskets




**3. REMOVE PS VANE PUMP ASSEMBLY**

(a) Remove the 2 nuts

(b) Remove the O–ring from the vane pump assembly



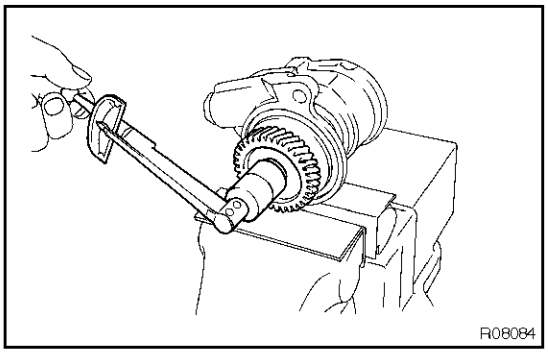
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16H–01

# DISASSEMBLY




**NOTICE:**

**When using a vise, do not overtighten it.**

**1. MEASURE POWER STEERING VANE PUMP ROTATING TORQUE**

(a) Check that the pump rotates smoothly without abnormal noise

(b) Using a torque wrench, check the pump rotating torque

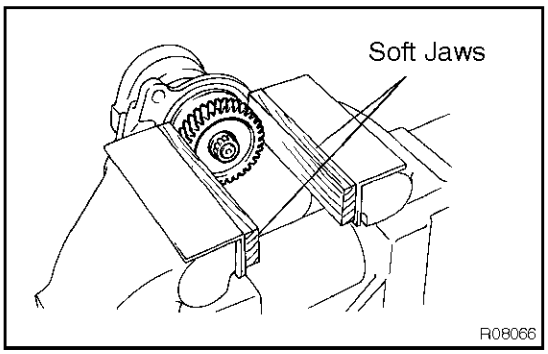
**Rotation torque:**

**0.3 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less**

**2. REMOVE SUCTION PORT UNION**

(a) Remove the bolt

(b) Remove the O–ring from the union



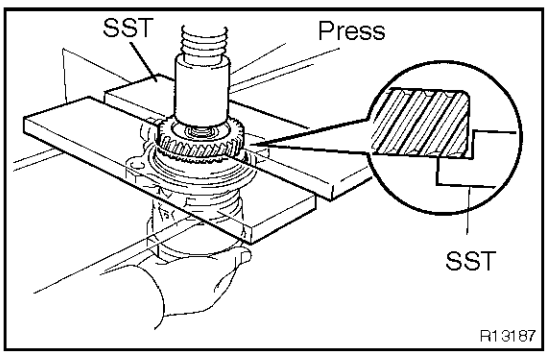

**3. REMOVE VANE PUMP DRIVE GEAR**

(a) Using soft jaws on a vise, clamp the gear in the vise

**NOTICE:**

**Be careful not to damage the gear.**

(b) Remove the gear set nut




(c) Using SST, press out the gear

SST 09527–10011

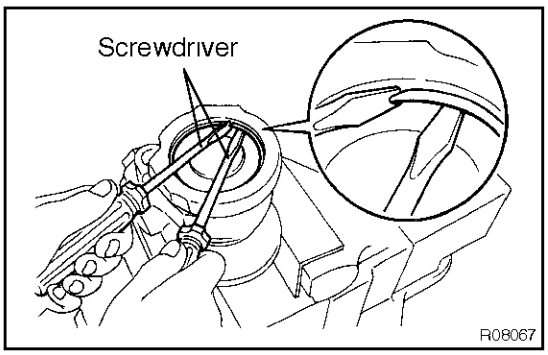
**NOTICE:**

**Be careful not to damage the gear. To avoid dropping the PS pump assembly, support the pump assembly with your hand.**

(d) Remove the woodruff key from the vane pump shaft

**4. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING**

Remove the O–ring from the union




**5. REMOVE REAR HOUSING AND WAVE WASHER**

(a) Using 2 screwdrivers, remove the snap ring

**NOTICE:**

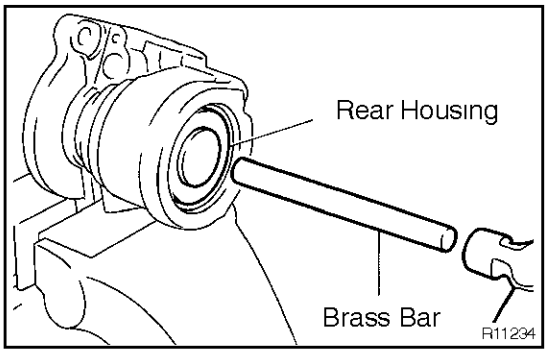
**Take care not to damage the housing.**



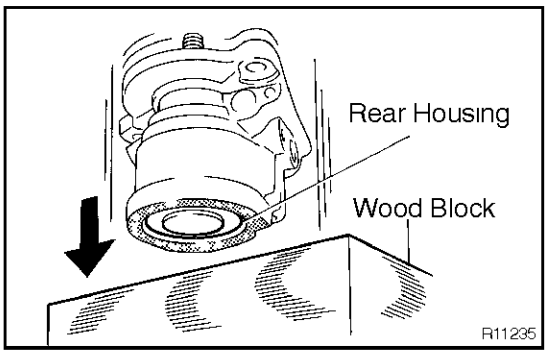
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(b) Using a brass bar and hammer, tap the housing so that the spring force of the wave washer pushes the housing forward




(c) Gently tap the PS pump assembly on a wood block and remove the housing and washer

(d) Remove the O–ring from the housing

**6. REMOVE SIDE REAR PLATE**

(a) Gently tap the PS pump assembly on a wood block and remove the plate

(b) Remove the O–ring from the plate

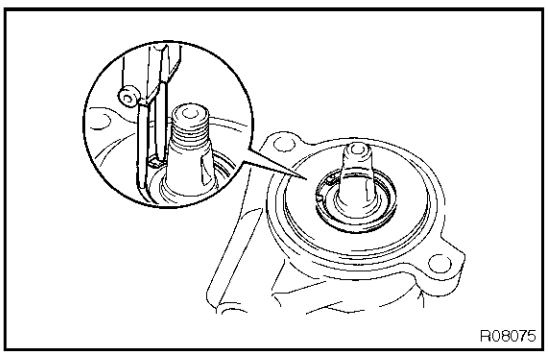
**7. REMOVE CAM RING, VANE PUMP ROTOR AND 10 VANE PLATES**

**NOTICE:**

**Be careful not to scratch the cam ring, rotor or vane plates.**

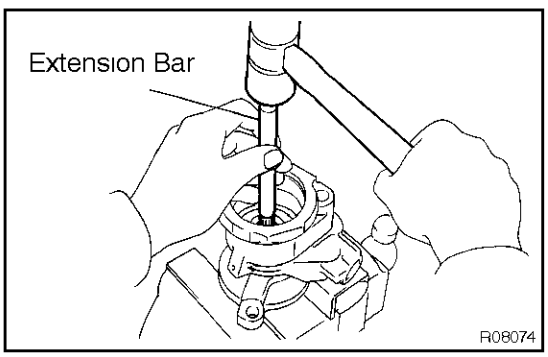
**8. REMOVE SHORTER STRAIGHT PIN**

Remove the pin from the side front plate




**9. REMOVE VANE PUMP SHAFT WITH BEARING**

(a) Using snap ring pliers, remove the snap ring



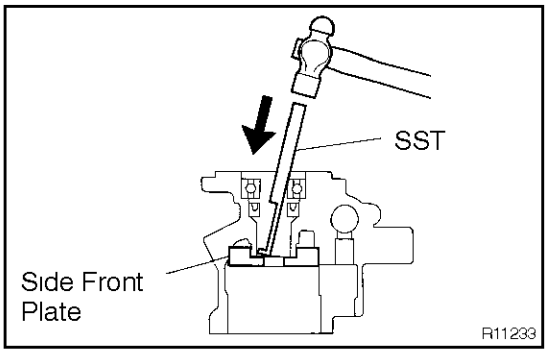

(b) Using an extension bar and hammer, tap out the shaft with the bearing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**10. REMOVE SIDE FRONT PLATE**

(a) Using SST, tap out the plate from the front housing
SST 09631–10030

**NOTICE:**

**Be careful not to damage the front housing.**

(b) Remove the 2 O–rings from the plate

**11. REMOVE LONGER STRAIGHT PIN**

Using pliers, remove the pin from the front housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16 -02

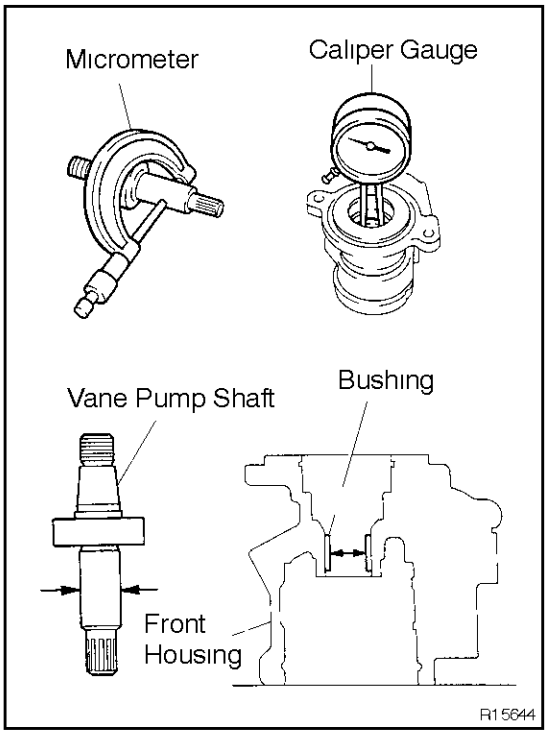
# INSPECTION

## 1. CHECK OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

Using a micrometer and caliper gauge, measure the oil clearance

**Standard clearance:**
**0.03 – 0.05 mm (0.0012 – 0.0020 in.)**
**Maximum clearance: 0.07 mm (0.0028 in.)**

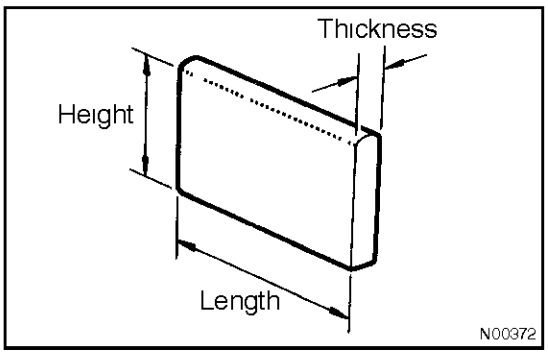
If it is more than maximum, replace the front housing and vane pump shaft




## 2. INSPECT VANE PUMP ROTOR AND 10 VANE PLATES

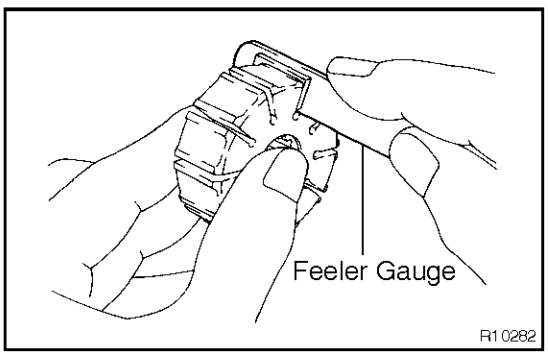
(a) Using a micrometer, measure the height, thickness and length of the plate

**Minimum height: 8.6 mm (0.339 in.)**
**Minimum thickness: 1.397 mm (0.0550 in.)**
**Minimum length: 14.991 mm (0.5902 in.)**



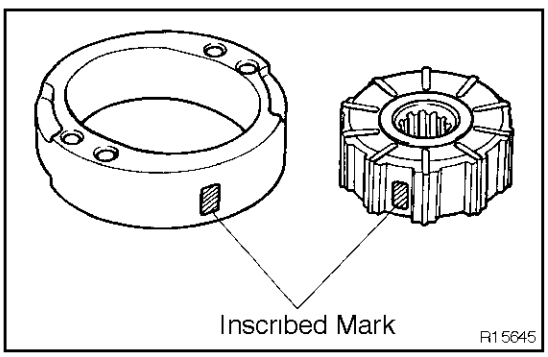

(b) Using a feeler gauge, measure the clearance between the rotor groove and plate

**Maximum clearance: 0.033 mm (0.0013 in.)**




If more than maximum, replace the plate and/or rotor with one having the mark equivalent to the mark stamped on the cam ring

**Inscribed mark**
**Vane pump rotor: 1, 2, or None**
**Cam ring: 2, 3, or 4**






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

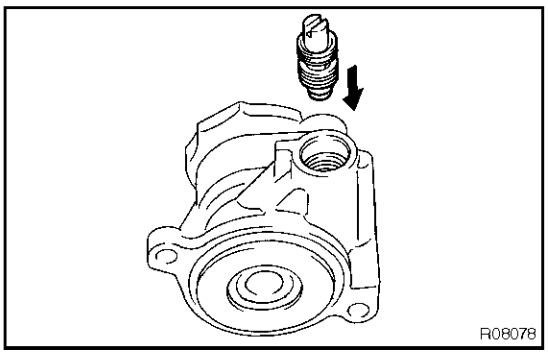


HINT

There are 3 vane plate lengths for the following rotor and cam ring marks

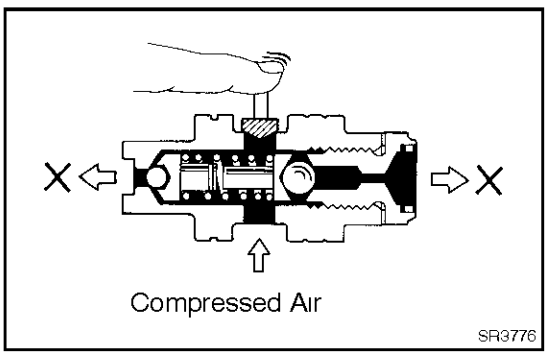
| Rotor mark | Cam ring mark | Vane plate part number | Vane plate length mm (in.) |
|---|---|---|---|
| None | 2 | 44345-60030 | 14.995 – 14.997 (0.59035 – 0.59043) |
| 1 | 3 | 44345-60040 | 14.993 – 14.995 (0.59027 – 0.59035) |
| 2 | 4 | 44345-60050 | 14.991 – 14.993 (0.59020 – 0.59027) |

V08067




**3. INSPECT FLOW CONTROL VALVE**

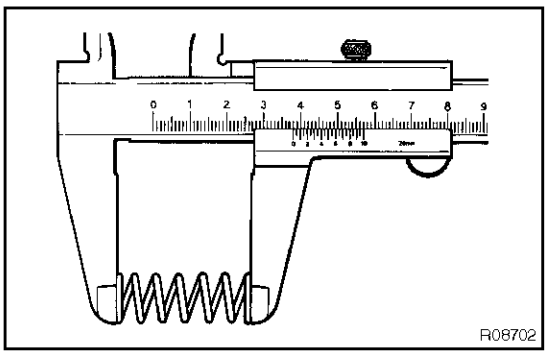
(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight




(b) Check the valve for leakage. Close one of the holes and apply 392 – 490 kPa (4 – 5 kgf/cm$^2$, 57 – 71 psi) of compressed air into the opposite side, and confirm that air does not come out from the end holes.

**Inscribed mark:**

**A, B, C, D, E or F**




**4. INSPECT SPRING**

Using calipers, measure the free length of the spring.

**Minimum free length: 35 – 37 mm (1.38 – 1.46 in.)**

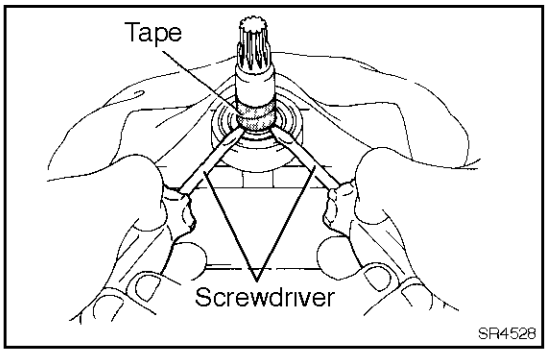
If it is not within the specification, replace the spring.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



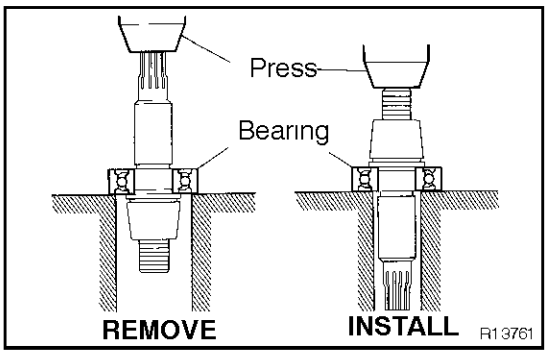



**5. IF NECESSARY, REPLACE BEARING**

(a) Using 2 screwdrivers, remove the snap ring from the vane pump shaft

**NOTICE:**

**To prevent vane pump shaft damage, wind tape on the shaft.**




(b) Using a press, press out the bearing

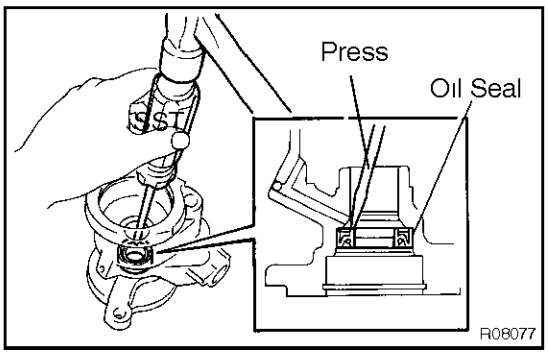
(c) Coat a new bearing with power steering fluid

(d) Using a press, press in the bearing

**NOTICE:**

**Be careful not to damage the shaft.**

(e) Install a new snap ring to the shaft

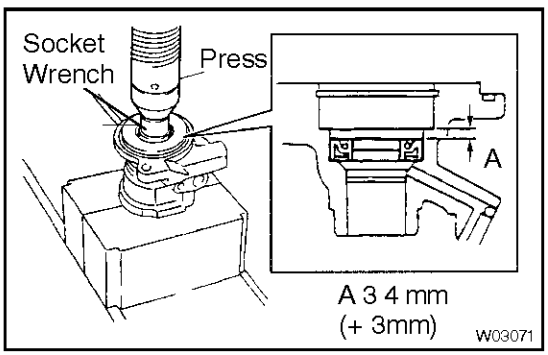



**6. IF NECESSARY, REPLACE OIL SEAL**

(a) Using a screwdriver and hammer, tap out the oil seal from the front housing

**NOTICE:**

**Be careful not to damage the housing.**




(b) Coat a new oil seal lip with power steering fluid

(c) Using a socket wrench (23 mm), press in the oil seal as shown in the illustration

**NOTICE:**

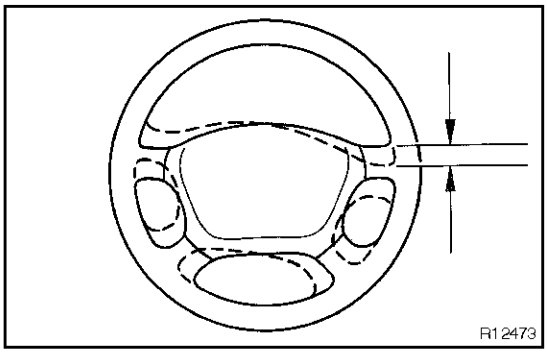
- **Make sure you install the oil seal facing the correct direction.**
- **Be careful not to damage the front housing.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






# STEERING WHEEL

SR168-01

## INSPECTION

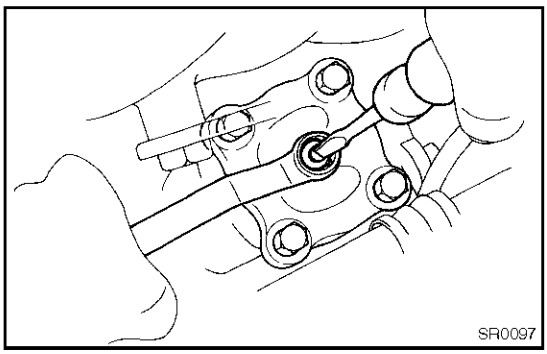
**1. CHECK STEERING WHEEL FREEPLAY**

(a) With the vehicle stopped and tires pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure

(b) Freeplay should not exceed the maximum

**Maximum freeplay: 40 mm (1.58 in.)**

If the freeplay exceeds the maximum, adjust it in the following procedure




**2. ADJUST STEERING GEAR**

(a) Point the front wheels straight ahead

(b) Loosen the adjusting screw lock nut

(c) Turn the cross shaft adjusting screw clockwise to decrease steering wheel freeplay and counterclockwise to increase it

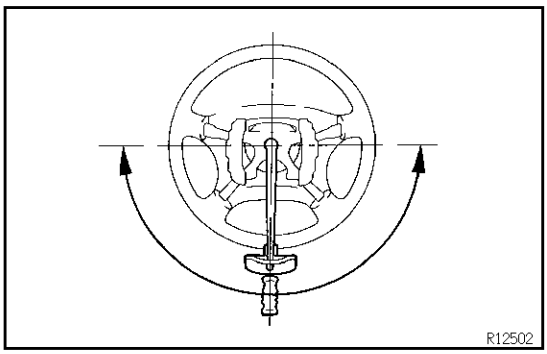
HINT

Turn the adjusting screw in small increments and check the freeplay between each adjustment

(d) Turn the steering wheel half way around in both directions

(e) Check that the freeplay is correct and steering is smooth and without rough spots

(f) Torque the adjusting screw lock nut (See page SR–41)




**3. CHECK STEERING EFFORT**

(a) Center the steering wheel

(b) Remove the steering wheel pad (See page SR–11)

(c) Start the engine and run it at idle

(d) Measure the steering effort in both directions

**Reference: 8.3 N·m (85 kgf·cm, 73 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



HINT

Be sure to consider the tire type, pressure and contact surface before making your diagnosis

(e) Torque the steering wheel set nut

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

(f) Install the steering wheel pad (See page SR–19)

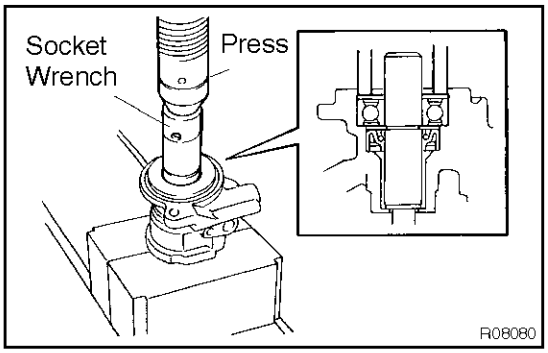


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16J 01




# REASSEMBLY

**NOTICE:**

**When using a vise, do not overtighten it.**

**1. COAT WITH POWER STEERING FLUID**

**(See page SR–21)**

**2. INSTALL VANE PUMP SHAFT WITH BEARING**

(a) Using a socket wrench (29 mm), press in the shaft with the bearing to the front housing

**NOTICE:**

**Be careful not to damage the oil seal lip.**

(b) Using snap ring pliers, install a new snap ring to the front housing

**3. INSTALL LONGER STRAIGHT PIN**

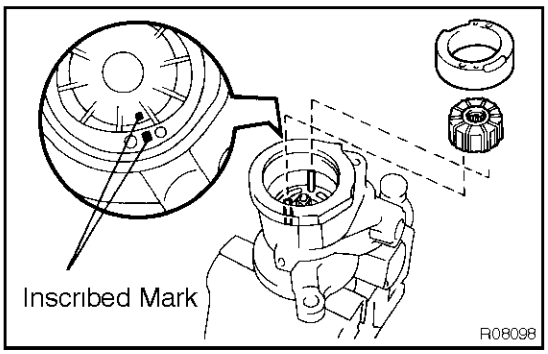
Install a new pin to the front housing

**NOTICE:**

**Be careful not to damage the pin.**

**4. INSTALL SIDE FRONT PLATE**

(a) Coat 2 new O–rings with power steering fluid and install them to the plate




(b) Align the hole of the plate and longer straight pin

**NOTICE:**

**Make sure you install the plate facing the correct direction.**

**(See page SR–21)**

**5. INSTALL SHORTER STRAIGHT PIN**

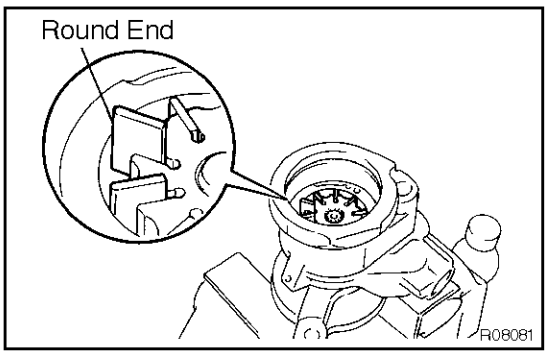
Install a new pin to the side front plate

**NOTICE:**

**Be careful not to damage the pin.**

**6. INSTALL CAM RING AND VANE PUMP ROTOR**

Install the ring and rotor with the inscribed marks facing outward




**7. INSTALL VANE PLATES**

Install the 10 plates with the round end facing outward

**8. INSTALL SIDE REAR PLATE**

(a) Coat a new O–ring with power steering fluid and install it to the plate

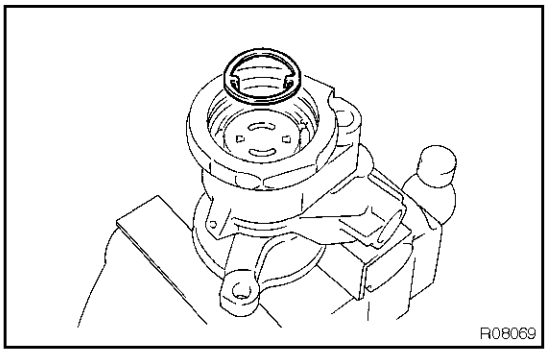
(b) Align the holes of the plate with the straight pins



Brought to you by BirfMark
Version 1.11 - 03/16/2010

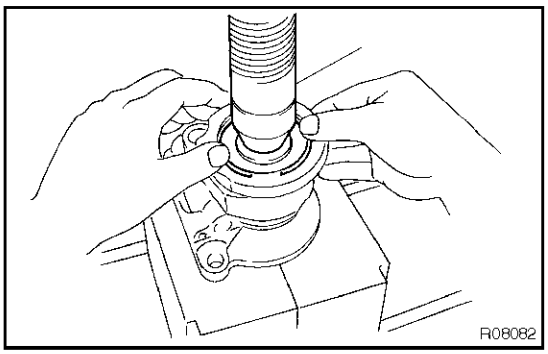
Brought to you by BirfMark






**9. INSTALL WAVE WASHER**

Install the washer so that its protrusions fit into the slots in the side rear plate




**10. INSTALL REAR HOUSING**

(a) Coat a new O–ring with power steering fluid and install it to the housing

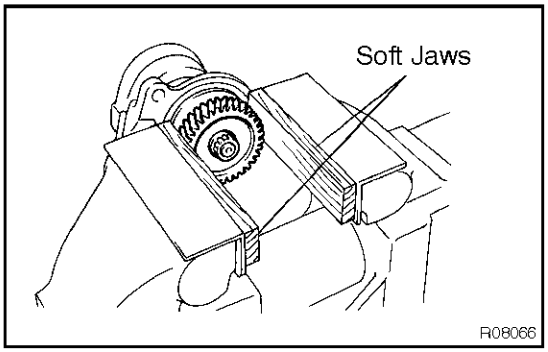
(b) Using a press, apply just enough pressure to compress the wave washer, and install a new snap ring to the front housing

**11. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION**

(a) Install the valve facing the correct direction
(See page SR–21)

(b) Coat a new O–ring with power steering fluid and install it to the union

(c) Torque the union
**Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)**




**12. INSTALL VANE PUMP DRIVE GEAR**

(a) Install the woodruff key and gear

(b) Using soft jaws on a vise, clamp the gear in the vise

**NOTICE:**

**Be careful not to damage the gear.**

(c) Torque the gear set nut
**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

**13. MEASURE POWER STEERING PUMP ROTATING TORQUE (See page SR–24)**

**14. INSTALL SUCTION PORT UNION**

(a) Coat a new O–ring with power steering fluid and install it to the union

(b) Torque the bolt
**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**



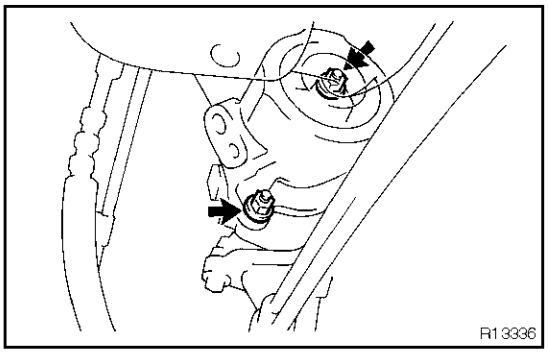
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16K 01

# INSTALLATION

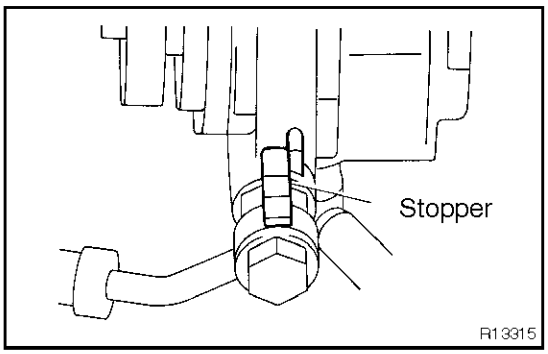



**1. INSTALL PS VANE PUMP ASSEMBLY**

(a) Coat a new O–ring with power steering fluid and install it to the vane pump assembly

(b) Torque the 2 nuts

**Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)**




**2. CONNECT PRESSURE FEED TUBE**

Torque the union bolt with 2 new gaskets

**Torque: 56 N·m (575 kgf·cm, 42 ft·lbf)**

HINT

Make sure the stopper of the tube is touching the PS pump body, as shown then torque the union bolt

**3. CONNECT RETURN HOSE**

**4. BLEED POWER STEERING SYSTEM**

**(See page SR–3)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

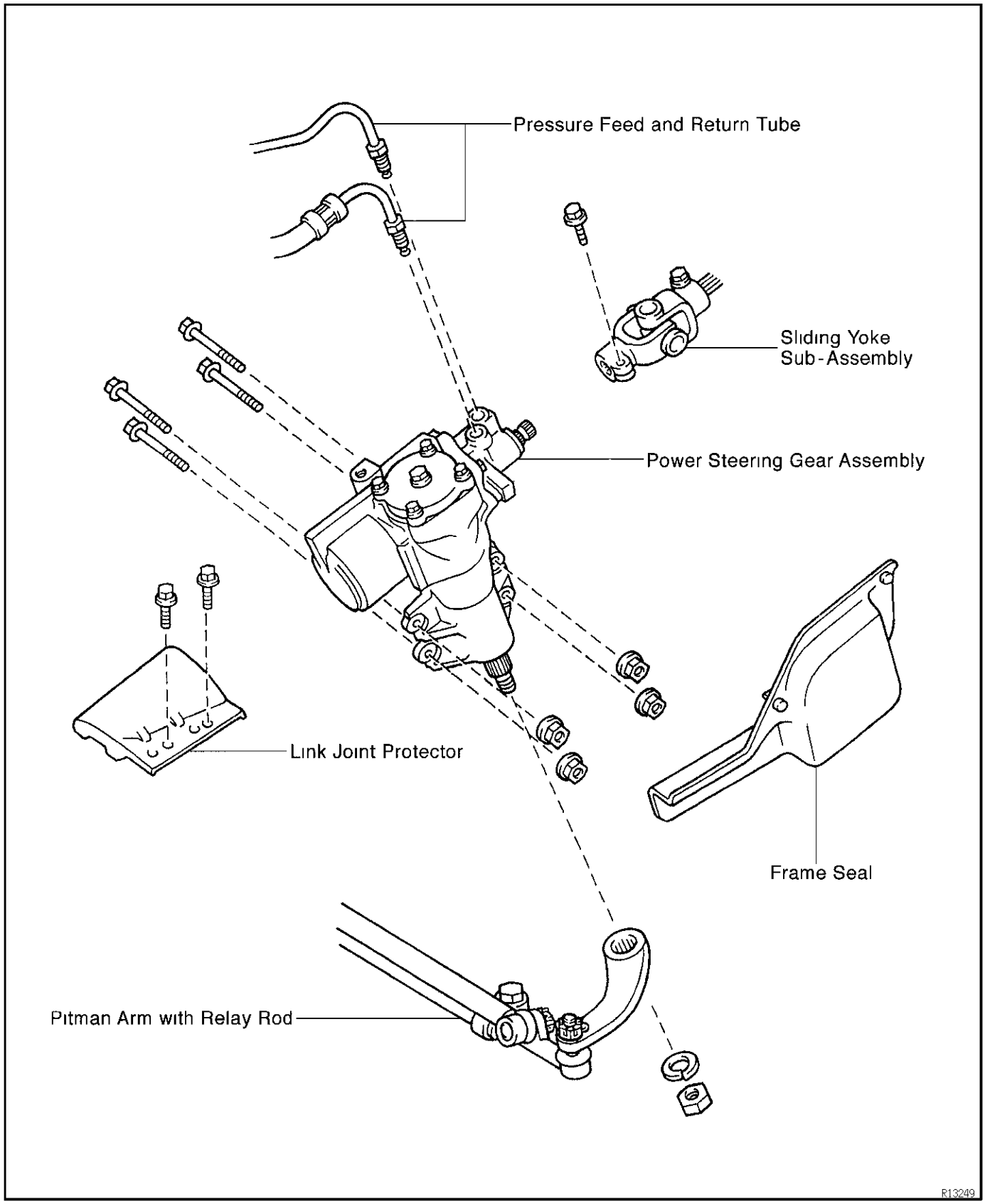
Brought to you by BirfMark



# POWER STEERING GEAR

## COMPONENTS

SR16L-01



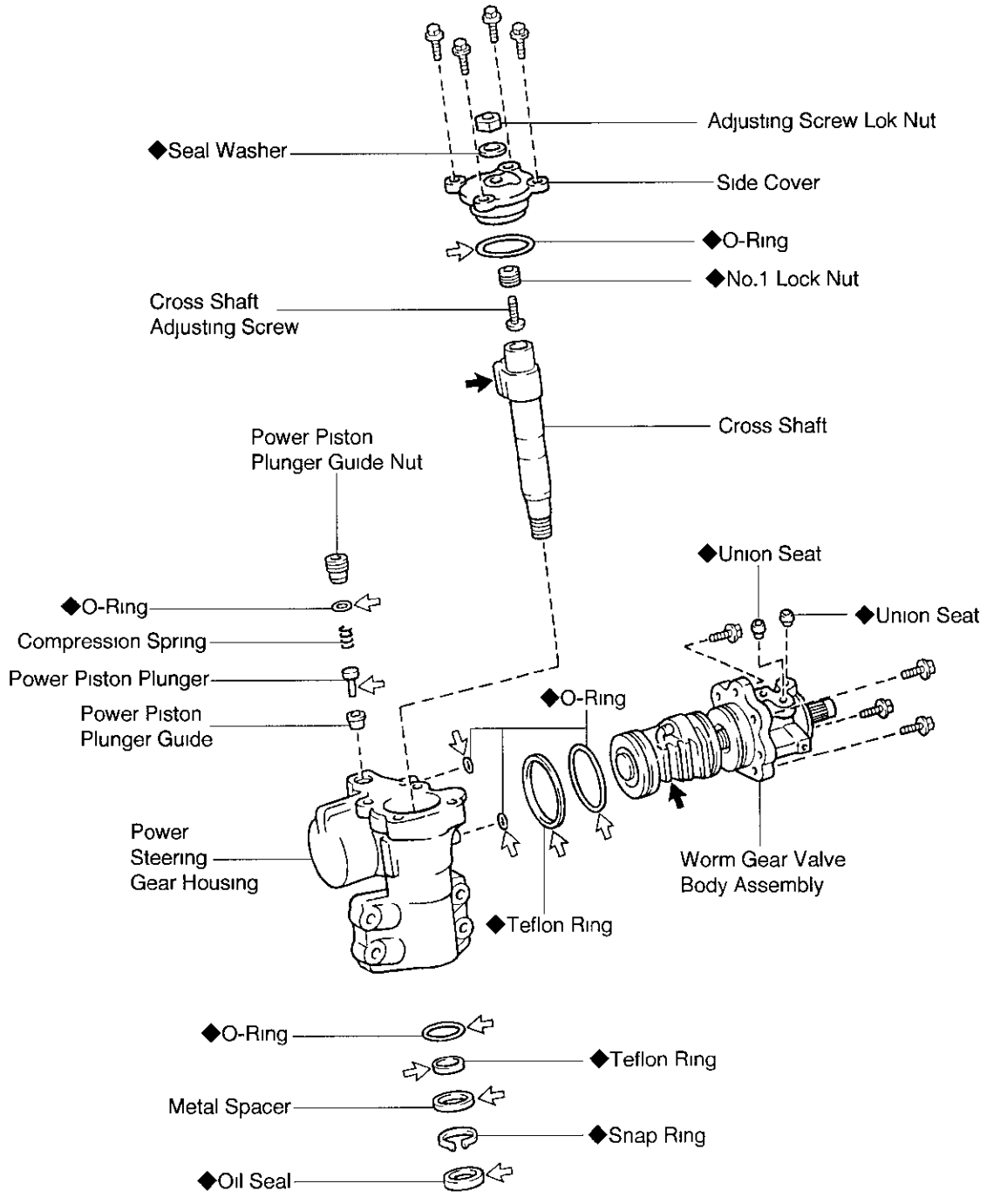





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark








Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

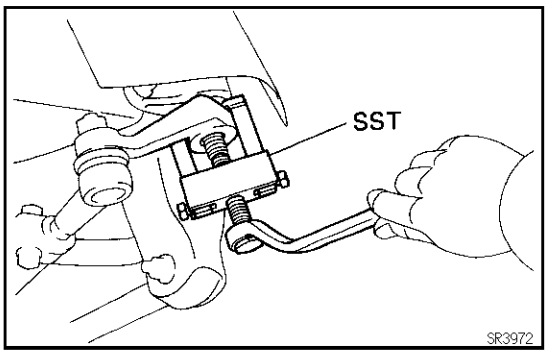


SR16M 01

# REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
2. REMOVE STEERING WHEEL PAD (See page SR–11)
3. REMOVE STEERING WHEEL (See page SR–11)
4. REMOVE FRAME SEAL
5. REMOVE LINK JOINT PROTECTOR

Remove the 2 bolts

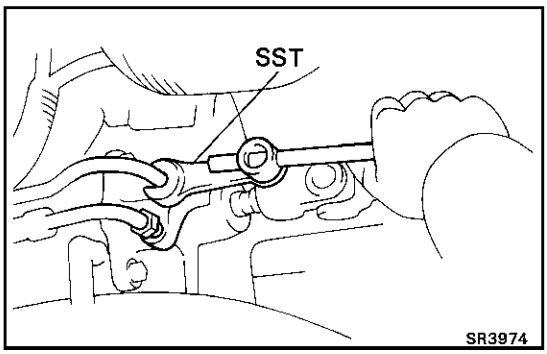



6. DISCONNECT PITMAN ARM WITH RELAY ROD

(a) Remove the pitman arm set nut and spring washer

(b) Using SST, disconnect the pitman arm from the gear assembly

SST 09628–62011




7. DISCONNECT PRESSURE FEED AND RETURN TUBES

Using SST, disconnect the pressure feed and return tubes

SST 09631–22020

8. DISCONNECT SLIDING YOKE SUB–ASSEMBLY (See page SR–13)
9. REMOVE PS GEAR ASSEMBLY

Remove the 4 installation bolts and nuts



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16N–01

# DISASSEMBLY

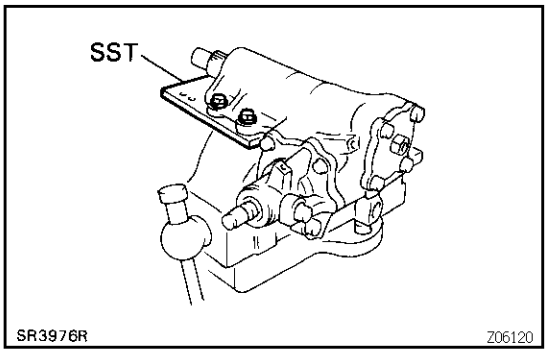
**NOTICE:**

**When using a vise, do not overtighten it.**

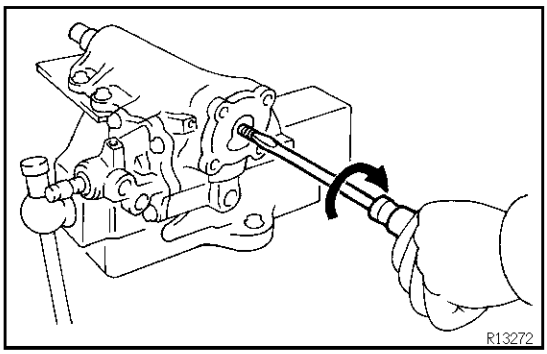
**1. SECURE PS GEAR ASSEMBLY IN VISE**

Secure the gear assembly on SST and clamp SST in a vise

SST 09630–00014 (09631–00142)




**2. REMOVE ADJUSTING SCREW LOCK NUT AND SEAL WASHER**

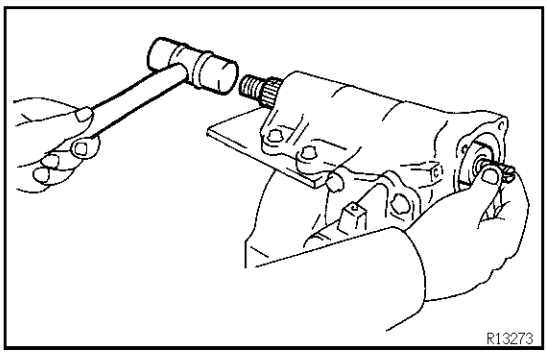



**3. REMOVE SIDE COVER**

(a) Remove the 4 bolts

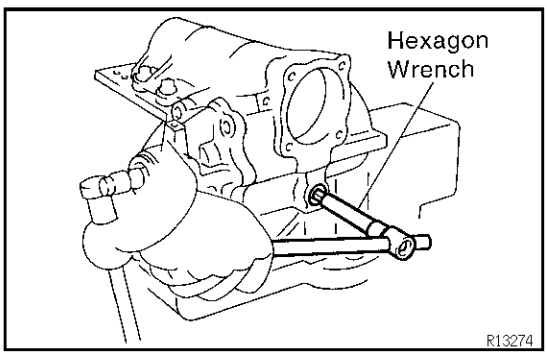
(b) Turn the cross shaft adjusting screw clockwise until the cover comes off

(c) Remove the O–ring from the cover




**4. REMOVE CROSS SHAFT**

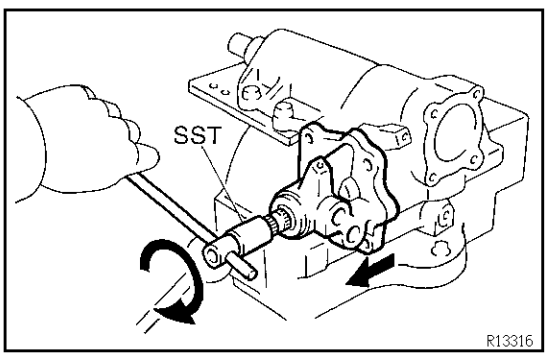
Using a plastic hammer, tap on the cross shaft end and pull out the shaft




**5. REMOVE POWER PISTON PLUNGER GUIDE NUT, COMPRESSION SPRING, POWER PISTON PLUNGER AND POWER PISTON PLUNGER GUIDE**

(a) Using a hexagon wrench (10 mm), remove the plunger guide nut

(b) Remove the O–ring from the plunger guide nut




**6. REMOVE WORM GEAR VALVE BODY ASSEMBLY**

(a) Remove the 4 bolts

(b) Using SST, turn the valve body shaft clockwise with holding the worm gear by your finger so it cannot move

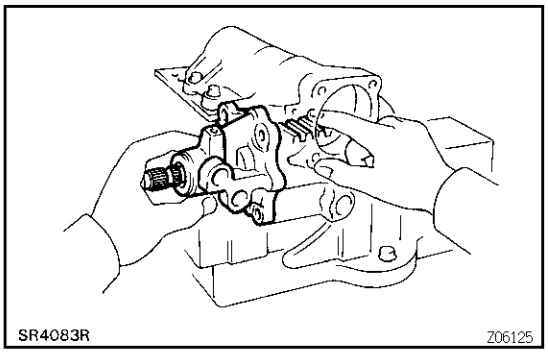
SST 09616–00010



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






(c) Pull out the valve body assembly

**NOTICE:**

**Ensure that the worm gear does not come off the worm shaft.**

(d) Remove the 2 O–rings from the gear housing

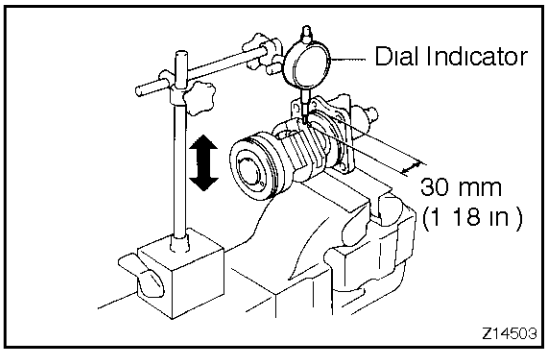


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16C–01




# INSPECTION

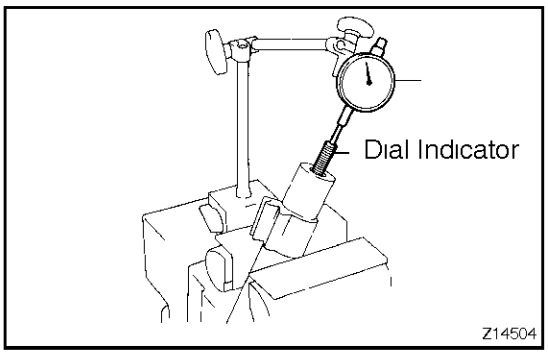
**NOTICE:**

**When using a vise, do not overtighten it.**

**1. INSPECT BALL CLEARANCE**

Using a dial indicator, check the ball clearance Move the worm gear up and down

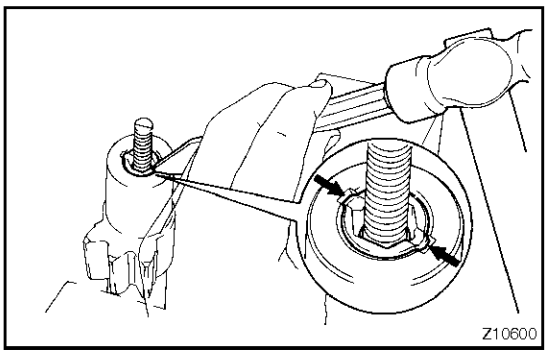
**Maximum clearance: 0.15 mm (0.0059 in.)**




**2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE**

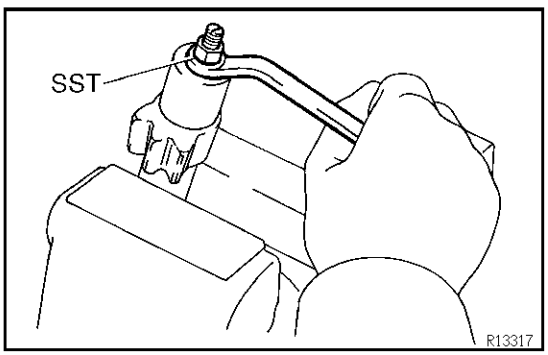
Using a dial indicator, measure the thrust clearance

**Standard clearance: 0.03 – 0.05 (0.0012 – 0.0020 in.)**




**3. IF NECESSARY, ADJUST CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE**

(a) Using a chisel and hammer, unstake the No 1 lock nut

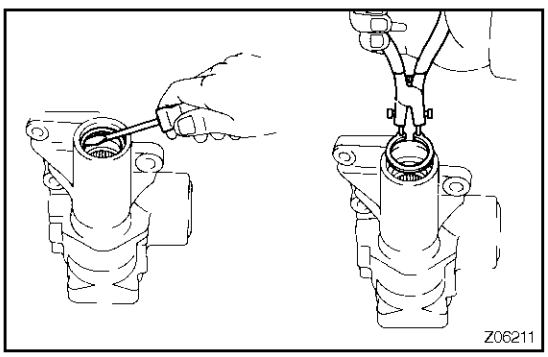



(b) Using SST, remove the No 1 lock nut
SST 09630–00014 (09631–00051)

(c) Using a screwdriver, adjust the adjusting screw for correct thrust clearance

(d) Using the SST, tighten a new lock nut

(e) Using a chisel and hammer, stake the lock nut




**4. IF NECESSARY, REPLACE OIL SEAL, METAL SPACER AND TEFLON RING**

(a) Using a screwdriver, pry out the oil seal from the gear housing

(b) Using snap ring pliers, remove the snap ring from the gear housing

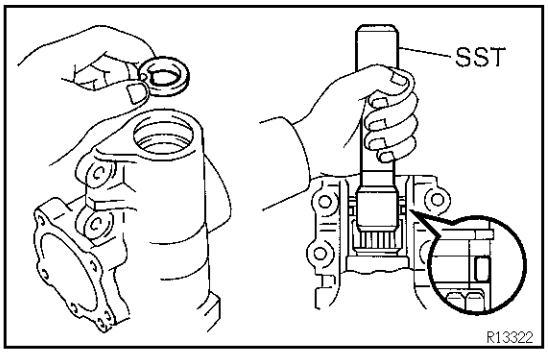
(c) Remove the metal spacer, teflon ring and O–ring from the gear housing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

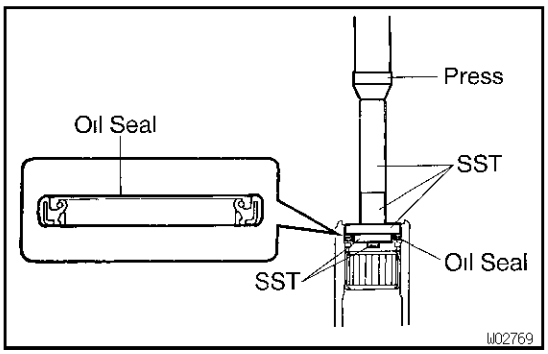
Brought to you by BirfMark





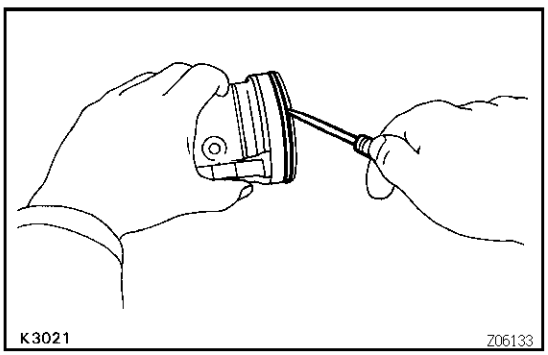

(d) Coat a new O–ring and metal spacer with power steering fluid and install them
(e) Using snap ring pliers, install a new snap ring
(f) Coat a new teflon ring with power steering fluid
(g) Form a teflon ring into a heart shape and install it with hand
(h) Using SST, form the teflon ring
SST 09630–00014 (09631–00121)

**NOTICE:**
**The teflon ring must be squeezed before inserting the cross shaft or damage will result.**




(i) Coat a new oil seal with power steering fluid
(j) Using SST, press in the oil seal to the gear housing
SST 09950–60010 (09951–00340, 09951–00450)
09950–70010 (09951–07200)

**NOTICE:**
**Make sure you install the oil seal facing the correct direction.**

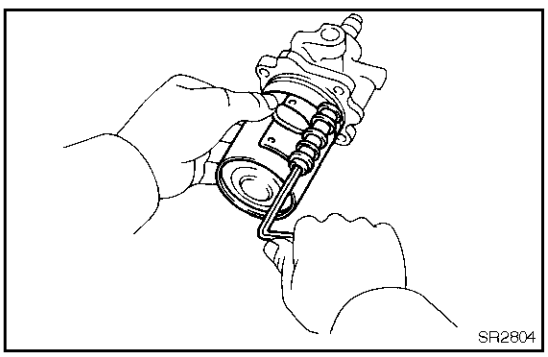



**5. IF NECESSARY, REPLACE TEFLON RING AND O–RING**

(a) Using a screwdriver, remove the teflon ring and O–ring from the worm gear valve body assembly

**NOTICE:**
**Be careful not to damage the worm gear valve body assembly.**

(b) Coat a new O–ring with power steering fluid and install it




(c) Expand a new teflon ring with your fingers

**NOTICE:**
**Be careful not to overexpand the teflon ring.**

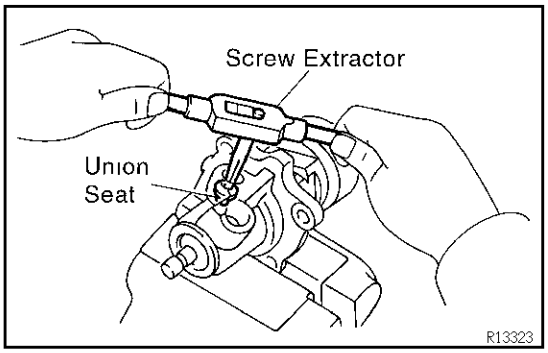
(d) Install the teflon ring
(e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 – 7 minutes



Brought to you by BirfMark
Version 1.11 - 03/16/2010

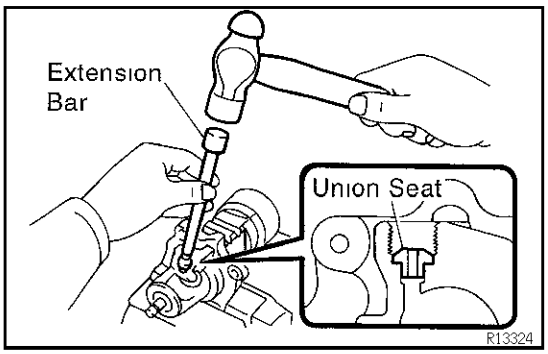
Brought to you by BirfMark






**6. IF NECESSARY, REPLACE UNION SEATS**

(a) Using a screw extractor, remove the 2 union seats from the worm gear valve body assembly




(b) Using a hammer and extension bar, tap in 2 new union seats

**NOTICE:**

**Before installing the union seat, remove dust sticking to the worm gear valve body assembly.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16P 01

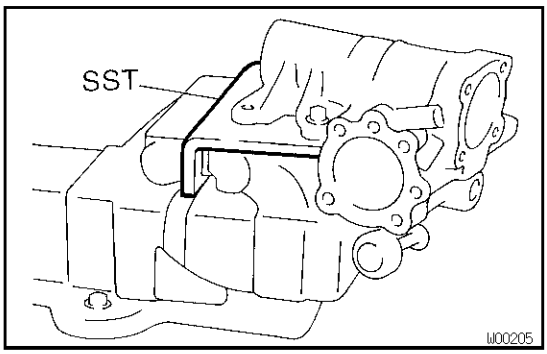
# REASSEMBLY

**NOTICE:**

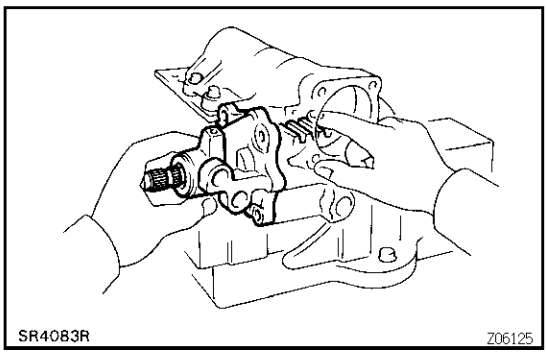
**When using a vise, do not overtighten it.**

1. **COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR–33)**
2. **INSTALL WORM GEAR VALVE BODY ASSEMBLY**

(a) Coat 2 new O–rings with power steering fluid and install them to the gear housing




(b) Secure the gear housing on SST and clamp SST in vise
SST 09630–00014 (09631–00142)

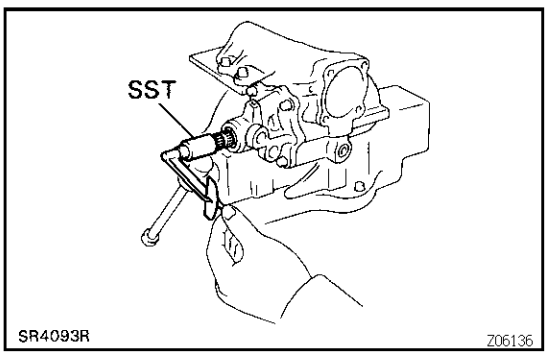



(c) Install the valve body assembly while supporting the worm gear with your fingers so that it does not rotate

(d) Torque the 4 bolts
**Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)**

**NOTICE:**

**Be careful not to damage the teflon ring.**

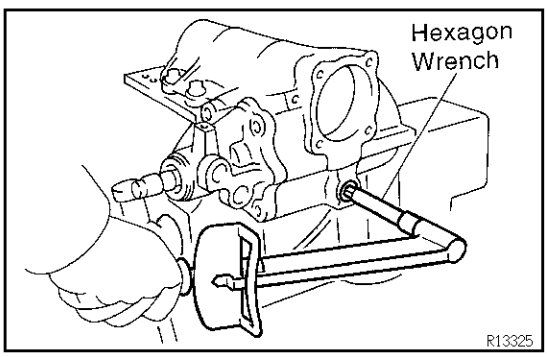



(e) Using SST and a torque wrench, check the valve body assembly rotating torque
SST 09616–00010
**Rotating torque:**
**0.3 – 0.5 N·m (3 – 5.5 kgf·cm, 2.6 – 4.8 in.·lbf)**

HINT

Hold the worm gear to prevent it from turning

If rotating torque is not correct, replace the worm gear valve body assembly




3. **INSTALL POWER PISTON PLUNGER GUIDE, POWER PISTON PLUNGER, COMPRESSION SPRING AND POWER PISTON PLUNGER GUIDE NUT**

(a) Coat a new O–ring with power steering fluid

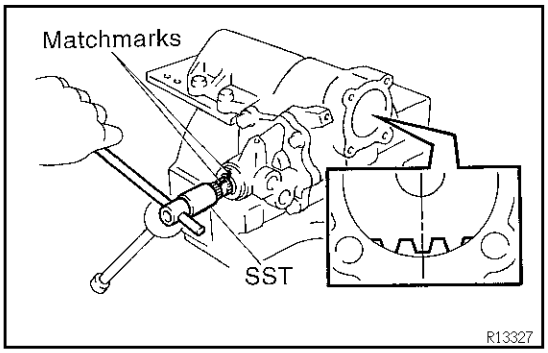
(b) Install the O–ring to the plunger guide nut and install the plunger guide nut with a hexagon wrench (10 mm)
**Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

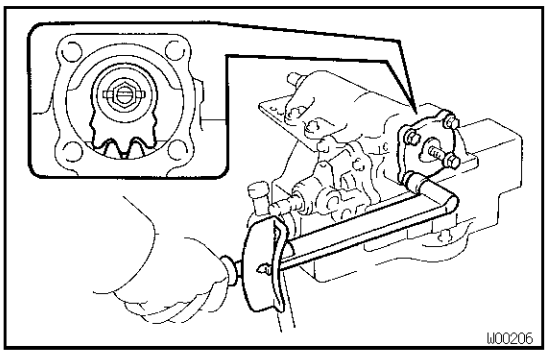





**4. DETERMINE CENTER POSITION**

(a) Using SST, turn the worm gear valve body shaft so full lock in both directions and determine the exact center
SST 09616–00010

(b) Place matchmarks on the worm gear valve body shaft and worm gear valve body housing to show neutral position




**5. INSTALL CROSS SHAFT AND SIDE COVER**

(a) Coat a new O–ring with power steering fluid and install it on the side cover

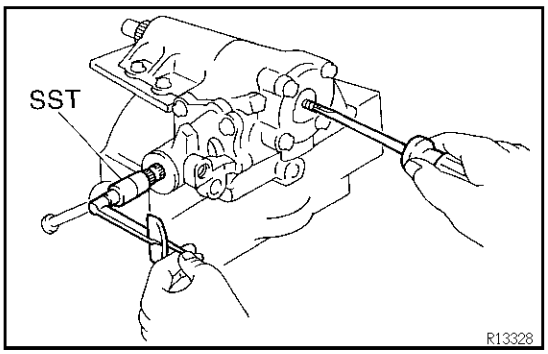
(b) Assemble the cross shaft to the side cover

HINT

Fully loosen the cross shaft adjusting screw

(c) Install and push the cross shaft into the gear housing so that the center teeth mesh together

(d) Torque the 4 bolts in a diagonal pattern
**Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)**

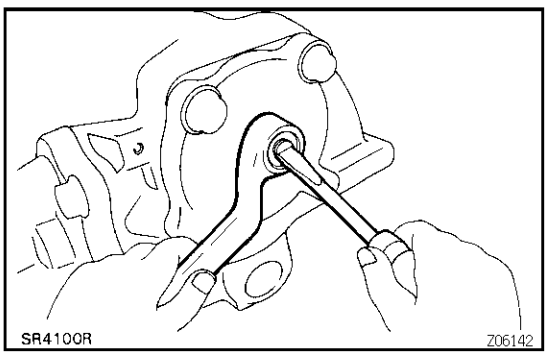



**6. ADJUST TOTAL PRELOAD**

(a) Install SST with a torque wrench on the worm gear valve body shaft
SST 09616–00010

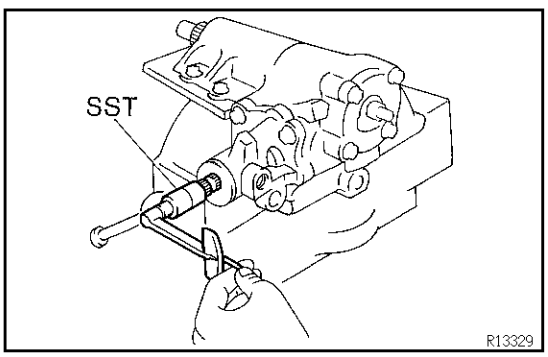
(b) Turn the cross shaft adjusting screw until the preload is within specification
**Preload (Turning):**
**0.74 – 10.8 N·m (7.5 – 11.0 kgf·cm, 6.5 – 9.6 in.·lbf)**

**7. INSTALL NEW SEAL WASHER**




**8. INSTALL ADJUSTING SCREW LOCK NUT**

Torque the lock nut while holding the cross shaft adjusting screw
**Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)**




**9. CHECK TOTAL PRELOAD**

Using SST and a torque wrench, check total preload
SST 09616–00010
**Total preload (Turning):**
**0.74 – 1.08 N·m (7.5 – 11.0 kgf·cm, 6.5 – 9.6 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16Q-01

# INSTALLATION

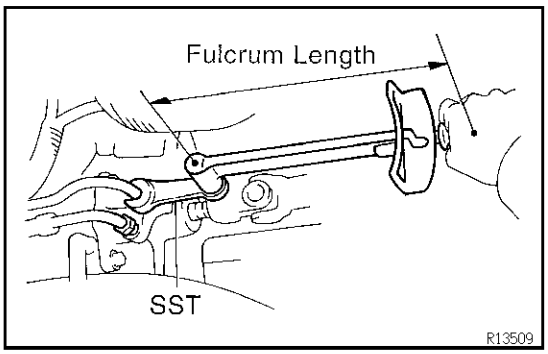
1. **INSTALL PS GEAR ASSEMBLY**

Torque the 4 installation bolts and nuts

**Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)**

2. **CONNECT SLIDING YOKE SUB–ASSEMBLY**

**(See page SR–19)**




3. **CONNECT PRESSURE FEED AND RETURN TUBES**

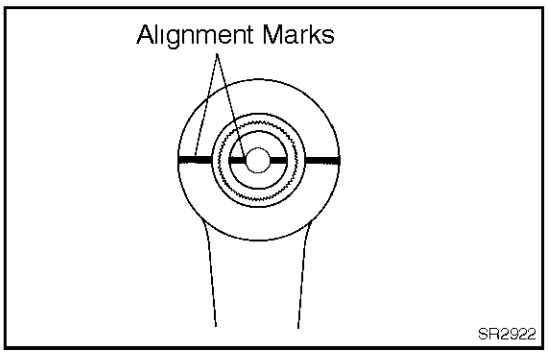
Using SST, connect the pressure feed and return tubes

SST 09631–22020

**Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)**

HINT

- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.)
- This torque value is effective in case that SST is parallel to a torque wrench




4. **CONNECT PITMAN ARM WITH RELAY ROD**

(a) Align the alignment marks on the cross shaft and pitman arm and connect the pitman arm

(b) Install the spring washer and pitman arm set nut

**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

5. **POSITION FRONT WHEELS FACING STRAIGHT AHEAD**

HINT

Do it with the front of the vehicle jacked up

6. **CENTER SPIRAL CABLE (See page SR–19)**
7. **INSTALL STEERING WHEEL**

(a) Align the matchmarks on the wheel and steering column main shaft

(b) Temporarily tighten the wheel set nut

(c) Connect the connector

8. **BLEED POWER STEERING SYSTEM**

**(See page SR–3)**

9. **CHECK STEERING WHEEL CENTER POINT**
10. **TORQUE STEERING WHEEL SET NUT**

**Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)**

11. **INSTALL STEERING WHEEL PAD (See page SR–19)**
12. **CHECK FRONT WHEEL ALIGNMENT**

**(See page SR–4)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

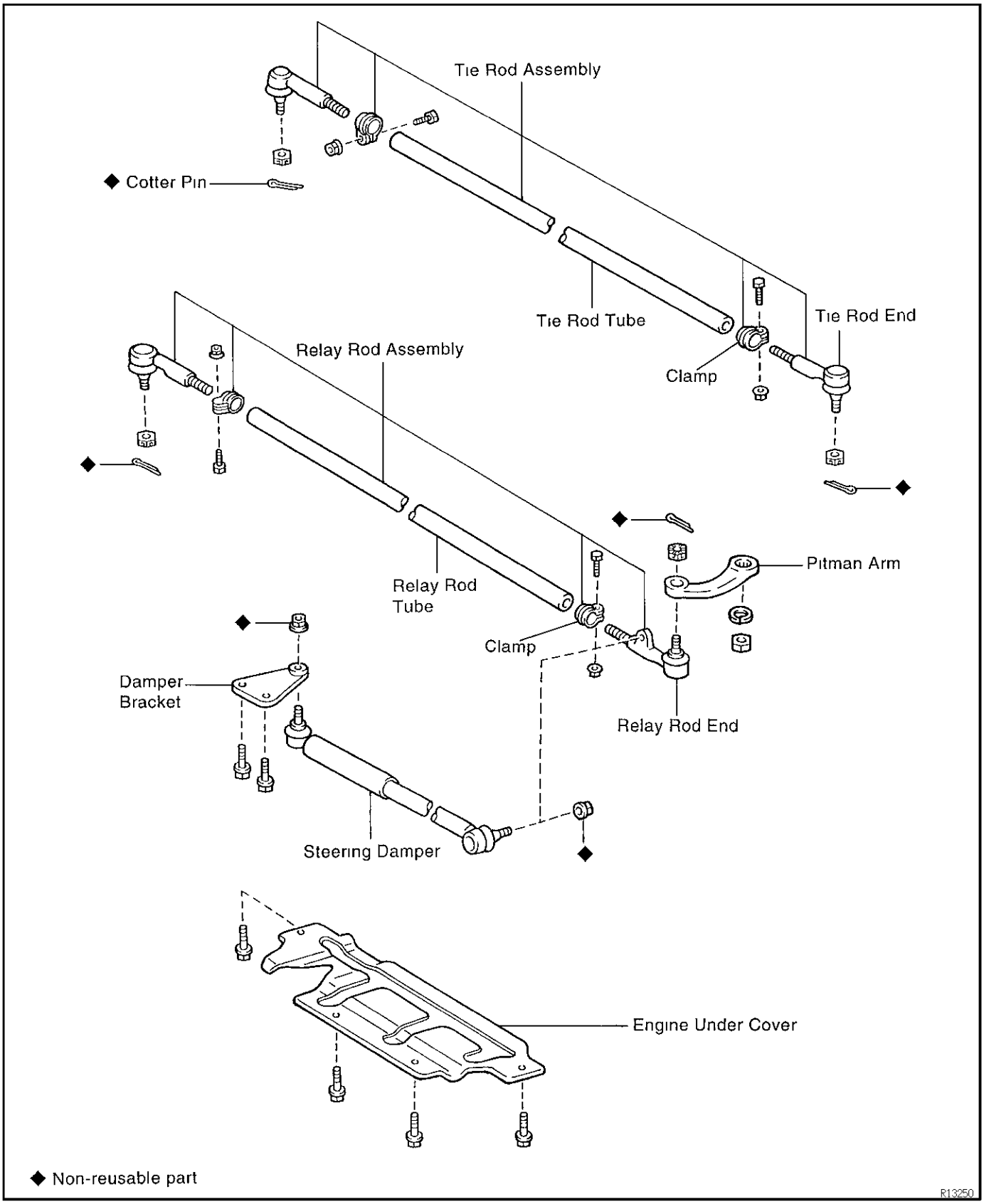
Brought to you by BirfMark



# STEERING LINKAGE

## COMPONENTS

SR16R-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16S 03

# REMOVAL

**NOTICE:**

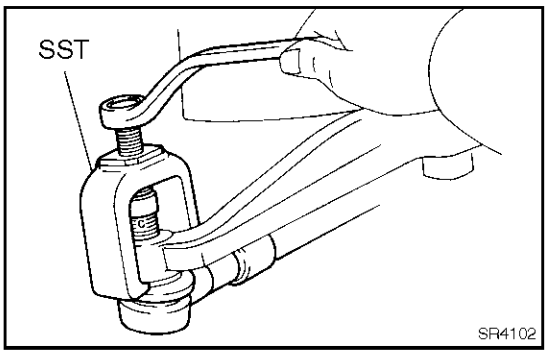
**When using a vise, do not overtighten it.**

**1. REMOVE ENGINE UNDER COVER**

Remove the 4 bolts

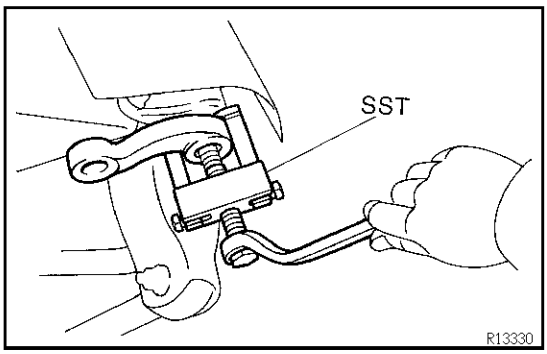
**2. REMOVE PITMAN ARM**

(a) Remove the cotter pin and nut




(b) Using SST, disconnect the pitman arm from the relay rod assembly
SST 09611–22012

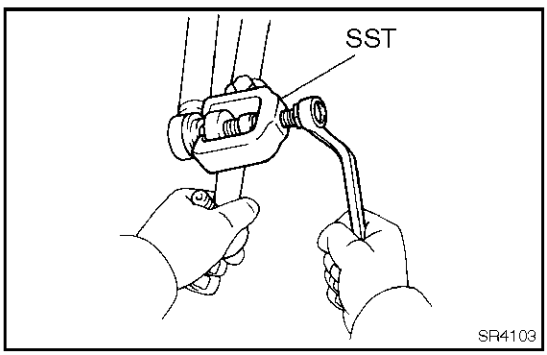
(c) Remove the pitman arm set nut and spring washer




(d) Using SST, disconnect the pitman arm from the PS gear assembly
SST 09628–62011

**3. REMOVE STEERING DAMPER WITH STEERING DAMPER BRACKET**

(a) Remove the nut and 2 damper bracket set bolts

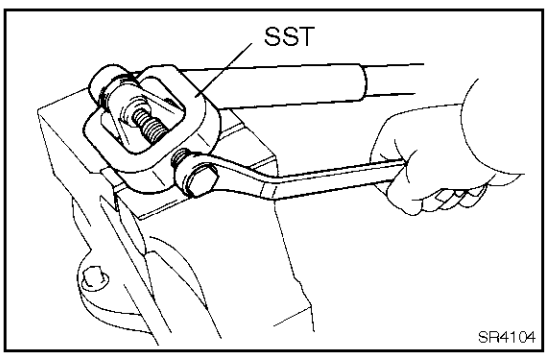



(b) Using SST, disconnect the damper with damper bracket from the relay rod assembly
SST 09611–22012

**4. REMOVE STEERING DAMPER**

(a) Secure the damper bracket in a vise

(b) Remove the nut




(c) Using SST, remove the damper from the damper bracket
SST 09610–55012

**5. REMOVE RELAY ROD ASSEMBLY**

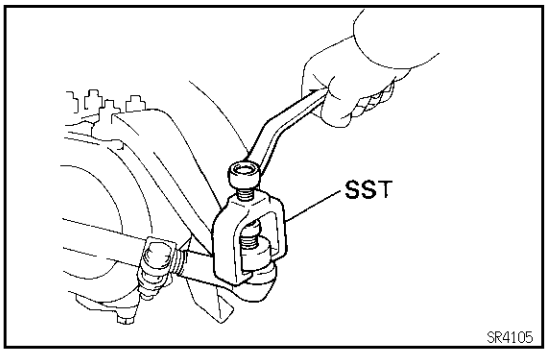
(a) Remove the cotter pin and nut



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

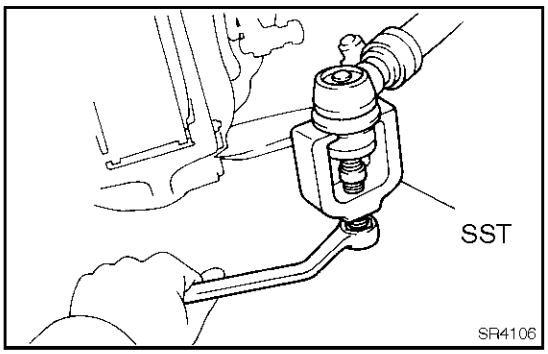





(b) Using SST, disconnect the relay rod assembly from the knuckle arm
SST 09611–22012

**6. REMOVE TIE ROD ASSEMBLY**

(a) Remove the 2 cotter pins and nuts




(b) Using SST, disconnect the tie rod assembly from the RH and LH knuckle arms
SST 09611–22012

**7. REMOVE TIE ROD ENDS AND RELAY ROD ENDS**

Loosen the tie rod end or relay rod end clamp and remove the tie rod end or relay rod end

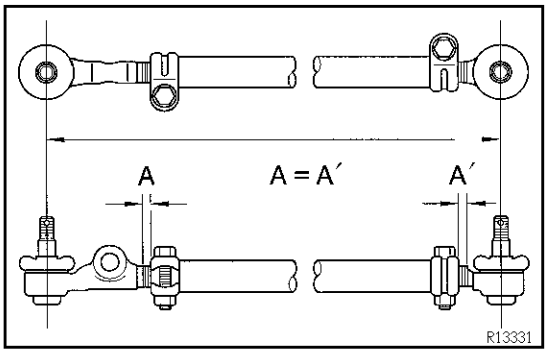


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SR16T-01




# INSTALLATION

HINT

When connecting the ball stud to the arm or rod, remove the grease on the joint surfaces

**1. INSTALL TIE ROD ENDS AND RELAY ROD ENDS**

(a) Turn the tie rod ends or relay rod ends equal amounts into the rod tube Tie rod assembly should be approximately 1,233 mm (48 54 in ) Relay rod assembly should be approximately 1,090 mm (42 91 in )

(b) The remaining length of threads on both tie rod ends or relay rod ends should be equal

(c) Temporarily tighten the tie rod end or relay rod end clamps

**2. INSTALL TIE ROD ASSEMBLY**

(a) Connect the tie rod assembly to the RH and LH knuckle arms

(b) Torque the 2 nuts

**Torque: 91 N·m (925 kgf·cm, 67 ft·lbf)**

(c) Install 2 new cotter pins

(d) After adjusting toe–in, torque the clamp bolts and nuts

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

**3. INSTALL RELAY ROD ASSEMBLY**

(a) Connect the relay rod assembly to the knuckle arm

(b) Torque the nut

**Torque: 91 N·m (925 kgf·cm, 67 ft·lbf)**

(c) Install a new cotter pin

(d) Torque the clamp bolts and nuts

**Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)**

**4. INSTALL STEERING DAMPER**

(a) Secure the damper bracket in a vise

(b) Connect the damper to the damper bracket

(c) Torque a new nut

**Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)**

**5. INSTALL STEERING DAMPER WITH STEERING DAMPER BRACKET**

(a) Connect the damper with damper bracket to the relay rod assembly

(b) Torque a new nut and 2 damper bracket set bolts

**Torque:**

**Nut: 74 N·m (750 kgf·cm, 54 ft·lbf)**

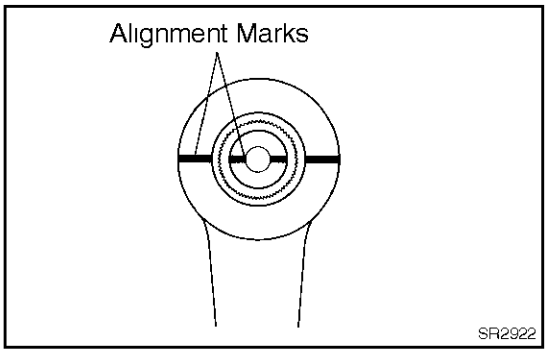
**Bolt: 39 N·m (400 kgf·cm, 29 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**6. INSTALL PITMAN ARM**

(a) Align the alignment marks on the pitman arm and the cross shaft, and install the spring washer and set nut
**Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)**

(b) Connect the pitman arm to the relay rod assembly

(c) Torque the nut
**Torque: 91 N·m (925 kgf·cm, 67 ft·lbf)**

(d) Install a new cotter pin

**7. INSTALL ENGINE UNDER COVER**

Tighten the 4 bolts

**8. CHECK FRONT WHEEL ALIGNMENT**
**(See page SA–4)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

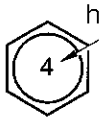
Brought to you by BirfMark

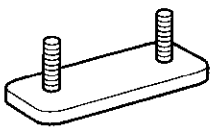


# STANDARD BOLT

## HOW TO DETERMINE BOLT STRENGTH

SS00F-01

| | Mark | Class |
|---|---|---|
| Hexagon head bolt |  Bolt head No 4– 5– 6– 7– 8– 9– 10– 11– | 4T 5T 6T 7T 8T 9T 10T 11T |
| | No mark | 4T |
| Hexagon flange bolt w/ washer hexagon bolt | No mark | 4T |
| Hexagon head bolt | 2 Protruding lines | 5T |
| Hexagon flange bolt w/ washer hexagon bolt | 2 Protruding lines | 6T |
| Hexagon head bolt | 3 Protruding lines | 7T |
| Hexagon head bolt | 4 Protruding lines | 8T |

| | Mark | Class |
|---|---|---|
| Hexagon flange bolt w/ washer hexagon bolt | 4 Protruding lines | 9T |
| Hexagon flange bolt w/ washer hexagon bolt | 5 Protruding lines | 10T |
| Hexagon flange bolt w/ washer hexagon bolt | 6 Protruding lines | 11T |
| Stud bolt | No mark | 4T |
| | Grooved | 6T |
| Welded bolt |  | 4T |

V06821



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS00G-01

# SPECIFIED TORQUE FOR STANDARD BOLTS

| Class | Diameter mm | Pitch mm | Specified torque | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Hexagon head bolt | | | Hexagon flange bolt | | |
| | | | N·m | kgf·cm | ft·lbf | N·m | kgf·cm | ft·lbf |
| 4T | 6 | 1 | 5 | 55 | 48 in lbf | 6 | 60 | 52 in lbf |
| | 8 | 1.25 | 12.5 | 130 | 9 | 14 | 145 | 10 |
| | 10 | 1.25 | 26 | 260 | 19 | 29 | 290 | 21 |
| | 12 | 1.25 | 47 | 480 | 35 | 53 | 540 | 39 |
| | 14 | 1.5 | 74 | 760 | 55 | 84 | 850 | 61 |
| | 16 | 1.5 | 115 | 1,150 | 83 | — | — | — |
| 5T | 6 | 1 | 6.5 | 65 | 56 in lbf | 7.5 | 75 | 65 in lbf |
| | 8 | 1.25 | 15.5 | 160 | 12 | 17.5 | 175 | 13 |
| | 10 | 1.25 | 32 | 330 | 24 | 36 | 360 | 26 |
| | 12 | 1.25 | 59 | 600 | 43 | 65 | 670 | 48 |
| | 14 | 1.5 | 91 | 930 | 67 | 100 | 1,050 | 76 |
| | 16 | 1.5 | 140 | 1,400 | 101 | — | — | — |
| 6T | 6 | 1 | 8 | 80 | 69 in lbf | 9 | 90 | 78 in lbf |
| | 8 | 1.25 | 19 | 195 | 14 | 21 | 210 | 15 |
| | 10 | 1.25 | 39 | 400 | 29 | 44 | 440 | 32 |
| | 12 | 1.25 | 71 | 730 | 53 | 80 | 810 | 59 |
| | 14 | 1.5 | 110 | 1,100 | 80 | 125 | 1,250 | 90 |
| | 16 | 1.5 | 170 | 1,750 | 127 | — | — | — |
| 7T | 6 | 1 | 10.5 | 110 | 8 | 12 | 120 | 9 |
| | 8 | 1.25 | 25 | 260 | 19 | 28 | 290 | 21 |
| | 10 | 1.25 | 52 | 530 | 38 | 58 | 590 | 43 |
| | 12 | 1.25 | 95 | 970 | 70 | 105 | 1,050 | 76 |
| | 14 | 1.5 | 145 | 1,500 | 108 | 165 | 1,700 | 123 |
| | 16 | 1.5 | 230 | 2,300 | 166 | — | — | — |
| 8T | 8 | 1.25 | 29 | 300 | 22 | 33 | 330 | 24 |
| | 10 | 1.25 | 61 | 620 | 45 | 68 | 690 | 50 |
| | 12 | 1.25 | 110 | 1,100 | 80 | 120 | 1,250 | 90 |
| 9T | 8 | 1.25 | 34 | 340 | 25 | 37 | 380 | 27 |
| | 10 | 1.25 | 70 | 710 | 51 | 78 | 790 | 57 |
| | 12 | 1.25 | 125 | 1,300 | 94 | 140 | 1,450 | 105 |
| 10T | 8 | 1.25 | 38 | 390 | 28 | 42 | 430 | 31 |
| | 10 | 1.25 | 78 | 800 | 58 | 88 | 890 | 64 |
| | 12 | 1.25 | 140 | 1,450 | 105 | 155 | 1,600 | 116 |
| 11T | 8 | 1.25 | 42 | 430 | 31 | 47 | 480 | 35 |
| | 10 | 1.25 | 87 | 890 | 64 | 97 | 990 | 72 |
| | 12 | 1.25 | 155 | 1,600 | 116 | 175 | 1,800 | 130 |

V00079



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# MAINTENANCE

## TORQUE SPECIFICATION

SS1EN 01

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Front seat mounting bolt | 39 | 400 | 29 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# ENGINE MECHANICAL

## SERVICE DATA

SS1EO 04

| | | | |
|---|---|---|---|
| Compression pressure | | at 250 rpm STD | 1 176 kPa (12 0 kgf/cm$^2$ 171 psi) or more |
| | | Minimum | 883 kPa (9 0 kgf/cm$^2$ 128 psi) |
| | Difference of pressure between each cylinder | | 98 kPa (1 0 kgf/cm$^2$ 14 psi) or less |
| Valve clearance | | at cold Intake | 0 15 – 0 25 mm (0 006 – 0 010 in ) |
| | | Exhaust | 0 25 – 0 35 mm (0 010 – 0 014 in ) |
| Ignition timing | w/ Terminals TE1 and E1 connected | | 3° BTDC @ idle |
| Idle speed | – | | 650 ± 50 rpm |
| Cylinder head | Warpage | | |
| | Cylinder block side | Maximum | 0 15 mm (0 0059 in ) |
| | Manifold side | Maximum | 0 10 mm (0 0039 in ) |
| | Valve seat | | |
| | Refacing angle | Intake | 30° 45° 75° |
| | | Exhaust | 45° 75° |
| | Contacting angle | | 45° |
| | Contacting width | Intake | 1 2 – 1 6 mm (0 047 – 0 063 in ) |
| | | Exhaust | 1 0 – 1 4 mm (0 039 – 0 055 in ) |
| | Cylinder head bolt outside diameter | STD | 10 85 – 11 00 mm (0 4272 – 0 4331 in ) |
| | | Minimum | 10 6 mm (0 417 in ) |
| Valve guide bushing | Inside diameter | | 7 010 – 7 030 mm (0 2760 – 0 2768 in ) |
| | Outside diameter (for repair part) | STD | 11 492 – 11 513 mm (0 4524 – 0 4533 in ) |
| | | O/S 0 05 | 11 542 – 11 563 mm (0 4544 – 0 4522 in ) |
| | Protrusion height | | 8 2 – 8 6 mm (0 323 – 0 339 in ) |
| Valve | Valve overall length | STD Intake | 98 4 mm (3 874 in ) |
| | | Exhaust | 97 9 mm (3 854 in ) |
| | | Minimum Intake | 97 9 mm (3 854 in ) |
| | | Exhaust | 97 4 mm (3 835 in ) |
| | Valve face angle | | 44 5° |
| | Stem diameter | Intake | 6 970 – 6 985 mm (0 2744 – 0 2750 in ) |
| | | Exhaust | 6 965 – 6 980 mm (0 2742 – 0 2748 in ) |
| | Stem oil clearance | STD Intake | 0 025 – 0 060 mm (0 0010 – 0 0024 in ) |
| | | Exhaust | 0 030 – 0 065 mm (0 0012 – 0 0026 in ) |
| | | Maximum Intake | 0 08 mm (0 0031 in ) |
| | | Exhaust | 0 10 mm (0 0039 in ) |
| | Margin thickness | STD | 1 2 mm (0 047 in ) |
| | | Minimum | 1 0 mm (0 039 in ) |
| Valve spring | Deviation | Maximum | 2 0 mm (0 079 in ) |
| | Free length | | 43 94 – 45 06 mm (1 7299 – 1 7740 in ) |
| | Installed tension at 36 5 mm (1 437 in ) | | 214 – 238 N (21 8 – 24 2 kgf 48 1 – 53 4 lbf) |
| Valve lifter | Lifter diameter | | 33 966 – 33 976 mm (1 3372 – 1 3376 in ) |
| | Lifter bore diameter | | 34 000 – 34 021 mm (1 3386 – 1 3394 in ) |
| | Oil clearance | STD | 0 024 – 0 055 mm (0 0009 – 0 0022 in ) |
| | | Maximum | 0 07 mm (0 0028 in ) |
| Manifold | Warpage | Maximum | 0 30 mm (0 0118 in ) |
| Air intake chamber | Warpage | Maximum | 0 30 mm (0 0118 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | |
|---|---|---|---|
| Camshaft | Thrust clearance | STD | 0 030 – 0 080 mm (0 0012 – 0 0031 in ) |
| | | Maximum | 0 10 mm (0 0039 in ) |
| | Journal oil clearance | STD | 0 025 – 0 062 mm (0 0010 – 0 0024 in ) |
| | | Maximum | 0 10 mm (0 0039 in ) |
| | Journal diameter | | 26 959 – 26 975 mm (1 0614 – 1 0620 in ) |
| | Circle runout | Maximum | 0 06 mm (0 0024 in ) |
| | Cam lobe height | STD | 50 61 – 50 71 mm (1 9925 – 1 9965 in ) |
| | | Minimum | 50 51 mm (1 9886 in ) |
| | Camshaft gear backlash | STD | 0 020 – 0 200 mm (0 0008 – 0 0079 in ) |
| | | Maximum | 0 30 mm (0 0188 in ) |
| | Camshaft gear spring end free distance | | 18 2 – 18 8 mm (0 712 – 0 740 in ) |
| Spark plug tube | Protrusion | | 45 5 mm (1 791 in ) |
| Oil pump drive shaft gear | Thrust clearance | STD | 0 040 – 0 160 mm (0 0016 – 0 0063 in ) |
| | | Maximum | 0 30 mm (0 0188 in ) |
| Chain and timing gear | Chain length at 16 links | Maximum | 146 6 mm (5 772 in ) |
| | Camshaft timing gear wear (w/ Chain) | Minimum | 126 0 mm (4 961 in ) |
| | Crankshaft timing gear wear (w/ Chain) | Minimum | 65 4 mm (2 575 in ) |
| Chain tensioner slipper and vibration damper | Wear | Maximum | 1 0 mm (0 039 in ) |
| Cylinder block | Cylinder head surface warpage | Maximum | 0 05 mm (0 0020 in ) |
| | Cylinder bore diameter | STD Mark 1 | 100 000 – 100 010 mm (3 9370 – 3 9374 in ) |
| | | 2 | 100 010 – 100 020 mm (3 9374 – 3 9378 in ) |
| | | 3 | 100 020 – 100 030 mm (3 9378 – 3 9382 in ) |
| | | Maximum STD | 100 23 mm (3 9461 in ) |
| | | O/S 0 50 | 100 73 mm (3 9658 in ) |
| | | O/S 1 00 | 101 23 mm (3 9854 in ) |
| | Main bearing bolt outside diameter | STD | 10 85 – 11 00 mm (0 4271 – 0 4331 in ) |
| | | Minimum | 10 6 mm (0 417 in ) |
| Piston and piston ring | Piston diameter | STD Mark 1 | 99 950 – 99 960 mm (3 9350 – 3 9354 in ) |
| | | 2 | 99 960 – 99 970 mm (3 9354 – 3 9358 in ) |
| | | 3 | 99 970 – 99 980 mm (3 9358 – 3 9362 in ) |
| | | O/S 0 50 | 100 450 – 100 480 mm (3 9547 – 3 9559 in ) |
| | | O/S 1 00 | 100 950 – 100 980 mm (3 9744 – 3 9756 in ) |
| | Piston oil clearance | STD | 0 040 – 0 060 mm (0 0016 – 0 0024 in ) |
| | Piston ring groove clearance | No 1 | 0 040 – 0 080 mm (0 0016 – 0 0031 in ) |
| | | No 2 | 0 300 – 0 070 mm (0 0012 – 0 0028 in ) |
| | Piston ring end gap | STD No 1 | 0 300 – 0 520 mm (0 0118 – 0 0205 in ) |
| | | No 2 | 0 450 – 0 670 mm (0 0177 – 0 0264 in ) |
| | | Oil | 0 150 – 0 520 mm (0 0059 – 0 0205 in ) |
| | | Maximum No 1 | 1 12 mm (0 0441 in ) |
| | | No 2 | 1 17 mm (0 0461 in ) |
| | | Oil | 1 12 mm (0 0441 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | |
|---|---|---|---|
| Connecting rod | Thrust clearance | STD | 0 160 – 0 262 mm (0 0063 – 0 0103 in ) |
| | | Maximum | 0 362 mm (0 0143 in ) |
| | Connecting rod bearing center wall thickness (Reference) | | |
| | | Mark 2 | 1 744 – 1 747 mm (0 0687 – 0 0688 in ) |
| | | 3 | 1 747 – 1 750 mm (0 0688 – 0 0689 in ) |
| | | 4 | 1 750 – 1 753 mm (0 0689 – 0 0690 in ) |
| | | 5 | 1 753 – 1 756 mm (0 0690 – 0 0691 in ) |
| | | 6 | 1 756 – 1 759 mm (0 0691 – 0 0693 in ) |
| | Connecting rod oil clearance | STD STD | 0 032 – 0 050 mm (0 0013 – 0 0020 in ) |
| | | U/S 0 25 | 0 033 – 0 073 mm (0 0013 – 0 0029 in ) |
| | | Maximum | 0 10 mm (0 0039 in ) |
| | Rod bend | Maximum per 100 mm (3 94 in ) | 0 05 mm (0 0020 in ) |
| | Rod twist | Maximum per 100 mm (3 94 in ) | 0 015 mm (0 0059 in ) |
| | Bushing inside diameter | | 26 008 – 26 020 mm (1 0239 – 1 0244 in ) |
| | Piston pin diameter | | 26 000 – 22 012 mm (1 0236 – 1 0241 in ) |
| | Piston pin oil clearance | STD | 0 004 – 0 012 mm (0 0002 – 0 0005 in) |
| | | Maximum | 0 05 mm (0 0020 in ) |
| | Connecting rod bolt outside diameter | STD | 8 40 – 8 60 mm (0 3307 – 0 3386 in ) |
| | | Minimum | 8 00 mm (0 3150 in ) |
| Crankshaft | Thrust clearance | STD | 0 020 – 0 220 mm (0 0008 – 0 0087 in ) |
| | | Maximum | 0 30 mm (0 0118 in ) |
| | Thrust washer thickness | STD | 2 440 – 2 490 mm (0 0961 – 0 0980 in ) |
| | | O/S 0 125 | 2 503 – 2 553 mm (0 0985 – 0 1005 in ) |
| | | O/S 0 250 | 2 565 – 2 615 mm (0 1010 – 0 1030 in ) |
| | Main journal oil clearance | STD STD | 0 042 – 0 060 mm (0 0017 – 0 0024 in ) |
| | | U/S 0 25 | 0 041 – 0 081 mm (0 0016 – 0 0032 in ) |
| | | Maximum | 0 10 mm (0 0039 in ) |
| | Main journal diameter | STD | 68 982 – 69 000 mm (2 7158 – 2 7165 in ) |
| | | U/S 0 25 | 68 745 – 68 755 mm (2 7065 – 2 7069 in ) |
| | Main bearing center wall thickness (Reference) | Mark 2 | 2 489 – 2 492 mm (0 0980 – 0 0981 in ) |
| | | 3 | 2 492 – 2 495 mm (0 0981 – 0 0982 in ) |
| | | 4 | 2 495 – 2 498 mm (0 0982 – 0 0983 in ) |
| | | 5 | 2 498 – 2 501 mm (0 0983 – 0 0985 in ) |
| | | 6 | 2 501 – 2 504 mm (0 0985 – 0 0986 in ) |
| | Crank pin diameter | STD | 56 982 – 57 000 mm (2 2434 – 2 2441 in ) |
| | | U/S 0 25 | 56 745 – 56 755 mm (2 2341 – 2 2344 in ) |
| | Circle runout | Maximum | 0 06 mm (0 0024 in ) |
| | Main journal taper and out–of–round | Maximum | 0 02 mm (0 0008 in ) |
| | Crank pin taper and out–of–round | Maximum | 0 02 mm (0 0008 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EP–01

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| Distributor x Cylinder head | | 18 | 180 | 13 |
| No 1 engine hanger x Cylinder head | | 41 | 420 | 30 |
| No 2 engine hanger x Cylinder head | | 41 | 420 | 30 |
| Air intake chamber x Intake manifold | | 21 | 210 | 15 |
| Intake manifold x Cylinder head | | 21 | 210 | 15 |
| Heater inlet pipe x Intake manifold | | 21 | 210 | 15 |
| EGR pipe x Cylinder head | | 21 | 210 | 15 |
| EGR pipe x EGR valve | Union nut | 78 | 800 | 58 |
| Water outlet x Cylinder head | | 21 | 210 | 15 |
| Generator bracket x Cylinder head | | 43 | 440 | 32 |
| Cylinder head x Cylinder block | 1st<br>2nd<br>3rd | 39<br>Turn 90°<br>Turn 90° | 400<br>Turn 90°<br>Turn 90° | 29<br>Turn 90°<br>Turn 90° |
| Cylinder head x Timing chain cover | | 21 | 210 | 15 |
| Camshaft bearing cap x Cylinder head | | 16 | 160 | 12 |
| Camshaft timing gear x Camshaft | | 74 | 750 | 54 |
| Chain tensioner x Cylinder head | | 21 | 210 | 15 |
| Water bypass outlet x Cylinder head | | 21 | 210 | 15 |
| Heater pipe x Timing chain cover | | 21 | 210 | 15 |
| Heater pipe x Cylinder head | | 20 | 200 | 14 |
| Exhaust manifold x Cylinder head | | 39 | 400 | 29 |
| Heat insulator x Exhaust manifold | | 19 | 195 | 14 |
| Front exhaust pipe x Exhaust manifold | | 63 | 630 | 46 |
| No 1 support bracket x Transmission | | 24 | 240 | 17 |
| No 1 support bracket clamp bolt | | 19 5 | 195 | 14 |
| Front exhaust pipe x Rear TWC | | 46 | 470 | 34 |
| No 2 water bypass pipe x Cylinder head | | 20 | 200 | 14 |
| No 2 water bypass pipe x No 1 engine hanger | | 20 | 200 | 14 |
| Fuel inlet hose x Fuel filter | | 29 | 300 | 22 |
| Intake manifold stay x Air intake chamber | | 36 | 360 | 26 |
| Intake manifold stay x Cylinder block | | 36 | 360 | 26 |
| Oil dipstick guide x Intake manifold | | 20 | 200 | 14 |
| Oil dipstick guide x No 1 oil pan | | 20 | 200 | 14 |
| PS reservoir tank x Air intake chamber | | 20 | 200 | 14 |
| Oil jet x Cylinder block | | 20 | 200 | 14 |
| Vibration damper x Cylinder block | | 20 | 200 | 14 |
| Chain tensioner slipper x Cylinder block | | 69 | 700 | 51 |
| Timing chain cover x Cylinder block | | 21 | 210 | 15 |
| Drive belt idler pulley x Timing chain cover | | 43 | 440 | 32 |
| Crankshaft pulley x Crankshaft | | 412 | 4 200 | 304 |
| Transmission housing x No 1 oil pan | | 72 | 730 | 53 |
| Oil level sensor x No 1 oil pan | | 5 4 | 55 | 48 in lbf |
| Water pump x Cylinder block | | 21 | 210 | 15 |
| Radiator pipe x No 1 oil pan | | 21 | 210 | 15 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | | |
|---|---|---|---|---|
| A/C compressor bracket x No 1 oil pan | | 37 | 375 | 27 |
| A/C compressor bracket x Cylinder block | | 37 | 375 | 27 |
| A/C compressor x A/C compressor bracket | | 25 | 250 | 18 |
| Oil check valve x Cylinder block | | 25 | 250 | 18 |
| Main bearing cap x Cylinder block | 1st<br>2nd | 74<br>Turn 90° | 750<br>Turn 90° | 54<br>Turn 90° |
| Connecting rod cap x Connecting rod | 1st<br>2nd | 48<br>Turn 90° | 490<br>Turn 90° | 35<br>Turn 90° |
| Rear oil seal retainer x Cylinder block | | 21 | 210 | 15 |
| Oil cooler cover x Cylinder block | | 21 | 210 | 15 |
| LH engine mounting bracket x Cylinder block | | 69 | 700 | 51 |
| LH insulator x LH engine mounting bracket | | 72 | 730 | 43 |
| RH engine mounting bracket x Cylinder brock | | 69 | 700 | 51 |
| RH insulator x RH engine mounting bracket | | 72 | 730 | 43 |
| PS pump x Cylinder block | | 36 | 370 | 27 |
| Knock sensor x Cylinder block | | 44 | 450 | 33 |
| Oil filter union x Cylinder block | | 44 | 450 | 33 |
| Drive plate x Crankshaft | | 100 | 1 000 | 74 |
| Transmission x Cylinder block | | 72 | 730 | 53 |
| Transmission x No 1 oil pan | | 72 | 730 | 53 |
| Torque converter clutch x Drive plate | | 55 | 550 | 41 |
| A/T oil cooler pipe x Union (Transmission) | | 34 | 350 | 25 |
| Starter x Transmission | | 39 | 400 | 29 |
| Frame crossmember x Frame | | 61 | 620 | 45 |
| Frame crossmember x Engine rear mounting insulator | | 74 | 750 | 54 |
| Engine front mounting insulator x Frame | | 74 | 750 | 54 |
| Transfer shift lever x Transmission | | 18 | 185 | 13 |
| Transmission shift lever assembly x Body | | 5 4 | 55 | 48 in lbf |
| Transmission control rod x Control shaft lever | | 13 | 130 | 9 |
| Front propeller shaft x Front differential | | 74 | 750 | 54 |
| Front propeller shaft x Transfer | | 74 | 750 | 54 |
| Rear propeller shaft x Rear differential | | 88 | 900 | 65 |
| Rear propeller shaft x Transfer | | 88 | 900 | 65 |
| Stabillizer bar bracket mounting bolt | | 18 | 185 | 13 |
| Stabillizer bar x Axle carrier | | 25 | 260 | 19 |
| PS pressure hose x PS pump | | 56 | 575 | 42 |
| Rear TWC x Center pipe | | 40 | 400 | 29 |
| Center pipe x Tailpipe | | 40 | 400 | 29 |
| Heated oxygen sensor (Bank 1 sensor 1) x Front exhaust pipe | | 20 | 200 | 14 |
| Heated oxygen sensor (Bank 1 sensor 2) x Center pipe | | 20 | 200 | 14 |
| No 2 support bracket x Frame | | 18 5 | 185 | 13 |
| No 3 support bracket x Frame | | 18 5 | 185 | 13 |
| No 4 support bracket x Frame | | 18 5 | 185 | 13 |
| Exhaust pipe damper x Tailpipe | | 19 5 | 195 | 14 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# EMISSION CONTROL

SS1EQ 01

## SERVICE DATA

| | | | |
|---|---|---|---|
| VSV for EVAP | Resistance | at 20°C (68°F) | 30 – 34 Ω |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1ER 01

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| Charcoal canister x Charcoal canister bracket | | 14 | 145 | 10 |
| Charcoal canister bracket x Body | | 18 | 185 | 13 |
| TVV x Cylinder head | | 29 | 300 | 22 |
| Intake manifold stay x Air intake chamber | | 36 | 360 | 26 |
| Intake manifold stay x Cylinder block | | 36 | 360 | 26 |
| EGR valve x Air intake chamber | for stud bolt | 9 | 90 | 78 in. lbf |
| | for nut | 18 | 180 | 13 |
| EGR valve x EGR pipe | | 64 | 650 | 47 |
| EGR valve x EGR vacuum modulator | | 18 | 185 | 13 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SFI

## SERVICE DATA

SS1ES-01

| | | | |
|---|---|---|---|
| Fuel pressure regulator | Fuel pressure | at no vacuum | 265 – 304 kPa (2 7 – 3 1 kgf/cm$^2$ 38 – 44 psi) |
| Fuel pump | Resistance | at 20°C (68°F) | 0 2 – 3 0 Ω |
| Injector | Resistance<br>Injection volume<br>Difference between each cylinder<br>Fuel leakage | at 20°C (68°F) | 13 4 – 14 2 Ω<br>69 – 88 cm$^3$ (4 2 – 5 4 cu in ) per 15 sec<br>5 cm$^3$ (0 3 cu in ) or less<br>1 drop or less per 12 min |
| MAF meter | Resistance (THA – E2) | at –20°C (–4°F)<br>at 0°C (32°F)<br>at 20°C (68°F)<br>at 40°C (104°F)<br>at 60°C (140°F)<br>at 80°C (176°F) | 10 – 20 kΩ<br>4 – 7 kΩ<br>2 – 3 kΩ<br>0 9 – 1 3 kΩ<br>0 4 – 0 7 kΩ<br>0 2 – 0 4 kΩ |
| Throttle body | Throttle body fully closed angle<br>Dashpot setting speed<br>Throttle opener setting speed | | 6°<br>2 200 ± 300 rpm<br>700 – 1 000 rpm |
| Throttle position sensor | Clearance between stop screw and lever<br>0 mm (0 in )<br>0 50 mm (0 020 in )<br>0 75 mm (0 030 in )<br>Throttle valve fully open<br>– | <br>VTA – E2<br>IDL – E2<br>IDL – E2<br>VTA – E2<br>VC – E2 | <br>0 2 – 5 7 kΩ<br>2 3 kΩ or less<br>Infinity<br>2 0 – 10 2 kΩ<br>2 5 – 5 9 kΩ |
| IAC valve | Resistance (B1 – S1 and S3 B2 – S2 and S4)<br>at cold (–10 – 50 °C (–50 – 122°F))<br>at hot (50 – 100°C (122 – 212°F)) | | <br>15 – 25 Ω<br>20 – 30 Ω |
| Fuel pump resistor | Resistance | at 20°C (68°F) | 0 70 – 0 76 Ω |
| VSV for fuel pressure control | Resistance | at 20°C (68°F) | 37 – 44 Ω |
| ECT sensor | Resistance | at –20°C (–4°F)<br>0°C (32°F)<br>20°C (68°F)<br>40°C (104°F)<br>60°C (140°F)<br>80°C (176°F) | 10 – 20 kΩ<br>4 – 7 kΩ<br>2 – 3 kΩ<br>0 9 – 1 3 kΩ<br>0 4 – 0 7 kΩ<br>0 2 – 0 4 kΩ |
| EGR gas temp sensor | Resistance | at 50°C (122°F)<br>at 100°C (212°F)<br>150°C (302°F) | 64 – 97 kΩ<br>11 – 16 kΩ<br>2 – 4 kΩ |
| Heated oxygen sensor | Heater coil resistance | at 20°C (68°F) | 11 – 16 Ω |
| Fuel cut rpm | Fuel return rpm | | 1 200 rpm |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1ET 01

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| Fuel line | for union bolt | 29 | 300 | 22 |
| | for flare nut | 30 | 310 | 22 |
| Second seat x Body | | 39 | 400 | 29 |
| Fuel pump bracket assembly x Fuel tank | | 3 9 | 40 | 35 in lbf |
| Fuel inlet hose x Fuel filter | | 29 | 300 | 22 |
| Fuel inlet pipe x Fuel filter | | 29 | 300 | 22 |
| Fuel filter x Intake manifold | | 21 | 210 | 15 |
| Fuel pressure regulator x Delivery pipe | | 25 | 250 | 18 |
| Delivery pipe x Intake manifold | | 21 | 210 | 15 |
| Fuel inlet pipe x Delivery pipe | Union bolt | 29 | 300 | 22 |
| | Bolt | 20 | 200 | 14 |
| Fuel inlet pipe x Fuel filter | | 29 | 300 | 22 |
| Fuel return pipe x Intake manifold | | 20 | 200 | 14 |
| Air intake chamber x Intake manifold | | 21 | 210 | 15 |
| Intake manifold stay x Air intake chamber | | 36 | 360 | 26 |
| Intake manifold stay x Cylinder block | | 36 | 360 | 26 |
| PS reservoir tank x Air intake chamber | | 18 | 185 | 13 |
| Heater inlet pipe x Air intake chamber | | 20 | 200 | 14 |
| Drain plug x Fuel tank | | 6 5 | 65 | 57 in lbf |
| Fuel tank breather tube x Fuel tank | | 1 5 | 15 | 13 in lbf |
| Fuel tank filler pipe x Fuel tank | | 3 5 | 35 | 31 in lbf |
| Fuel tank band x Body | | 39 | 400 | 29 |
| MAF meter x Bracket | | 6 9 | 70 | 61 in lbf |
| MAF meter x Air cleaner cap | | 6 9 | 70 | 61 in lbf |
| Throttle body x Air intake chamber | | 21 | 210 | 15 |
| Fuel pump resistor x Body | | 18 | 185 | 13 |
| ECT sensor x Cylinder head | | 24 5 | 250 | 17 5 |
| EGR gas temperature sensor x Air intake chamber | | 20 | 200 | 14 |
| Knock sensor x Cylinder block | | 44 | 450 | 33 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COOLING

## SERVICE DATA

SS1EU 01

| | | | |
|---|---|---|---|
| Thermostat | Valve opening temperature | | 80 – 84°C (176 – 183°F) |
| | Valve lift | at 95°C (203°F) | 10 mm (0 39 in ) or more |
| Radiator cap | Relief valve opening pressure | STD | 74 – 103 kPa (0 75 – 1 05 kgf/cm$^2$ 10 7 – 14 9 psi) |
| | | Minimum | 59 kPa (0 6 kgf/cm$^2$ 8 5 psi) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# COOLING

## SERVICE DATA

SS1EU 01

| | | | |
|---|---|---|---|
| Thermostat | Valve opening temperature | | 80 – 84°C (176 – 183°F) |
| | Valve lift | at 95°C (203°F) | 10 mm (0 39 in ) or more |
| Radiator cap | Relief valve opening pressure | STD | 74 – 103 kPa (0 75 – 1 05 kgf/cm$^2$ 10 7 – 14 9 psi) |
| | | Minimum | 59 kPa (0 6 kgf/cm$^2$ 8 5 psi) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# LUBRICATION

## SERVICE DATA

SS1EW–01

| | | | |
|---|---|---|---|
| Oil pressure | | at idle speed | 29 kPa (0 3 kgf/cm$^2$ 4 3 psi) or more |
| | | at 3 000 rpm | 245 – 490 kPa (2 5 – 5 0 kgf/cm$^2$ 36 – 71 psi) |
| Oil pump | Body clearance | STD | 0 100 – 0 170 mm (0 0039 – 0 0067 in ) |
| | | Maximum | 0 30 mm (0 0118 in ) |
| | Side clearance | STD | 0 030 – 0 090 mm (0 0012 – 0 0035 in ) |
| | | Maximum | 0 15 mm (0 0059 in ) |
| | Tip clearance | STD | 0 030 – 0 160 mm (0 0012 – 0 0063 in ) |
| | | Maximum | 0 25 mm (0 0098 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EX–04

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| Oil pan x Drain plug | | 25 | 250 | 18 |
| Oil pump x Relief valve plug | | 49 | 500 | 36 |
| Drive belt idler pulley x Oil pump | | 43 | 440 | 32 |
| Oil strainer x No 1 oil pan | | 20 | 200 | 14 |
| Baffle plate x No 1 oil pan | | 9.0 | 90 | 78 in. lbf |
| No 1 oil pan x Cylinder block | 14 mm head bolt | 44 | 440 | 32 |
| | 12 mm head bolt | 20 | 200 | 14 |
| No 1 oil pan x Oil pump (Timing chain cover) | | 20 | 200 | 14 |
| No 2 oil pan x No 1 oil pan | Bolt | 7.8 | 80 | 69 in. lbf |
| | Nut | 8.8 | 90 | 78 in. lbf |
| No 1 oil pan x Transmission housing | | 72 | 730 | 53 |
| Oil level sensor x No 1 oil pan | | 5.4 | 55 | 48 in. lbf |
| Water pump x Cylinder block | | 21 | 210 | 15 |
| Radiator pipe x No 1 oil pan | | 21 | 210 | 15 |
| A/C compressor bracket x No 1 oil pan | | 37 | 375 | 27 |
| A/C compressor bracket x Cylinder block | | 37 | 375 | 27 |
| A/C compressor x A/C compressor bracket | | 25 | 250 | 18 |
| Oil cooler cover x Relief valve plug | | 37 | 375 | 27 |
| Oil cooler x Oil cooler cover | | 17 | 170 | 12 |
| Oil cooler cover x Cylinder block | | 21 | 210 | 15 |
| No 1 exhaust manifold x Cylinder head | | 39 | 400 | 29 |
| No 1 exhaust manifold x Heat insulator | | 19 | 195 | 14 |
| Front exhaust pipe x Exhaust manifold | | 63 | 630 | 46 |
| No 1 support bracket x Transmission housing | | 24 | 240 | 17 |
| Front exhaust pipe x No 1 support bracket | Clamp bolt | 19.5 | 195 | 14 |
| Front exhaust pipe x Rear TWC | | 46 | 470 | 34 |
| Oil check valve x Cylinder block | | 25 | 250 | 18 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# IGNITION

SS1EY-03

## SERVICE DATA

| | | | |
|---|---|---|---|
| Firing order | – | | 1 – 5 – 3 – 6 – 2 – 4 |
| High–tension cord | Resistance | Maximum | 25 kΩ per cord |
| Spark plug | Recommended spark plug | ND | K16R–U |
| | | NGK | BKR5EYA |
| | Correct electrode gap | | 0 8 mm (0 031 in ) |
| Ignition coil | Primary coil resistance | at cold | 0 36 – 0 55 Ω |
| | | at hot | 0 45 – 0 65 Ω |
| | Secondary coil resistance | at cold | 9 0 – 15 4 kΩ |
| | | at hot | 11 4 – 18 1 kΩ |
| Distributor | Air gap | | 0 2 – 0 4 mm (0 008 – 0 016 in ) |
| | Pickup coil resistance | at cold (G1 – G⊖) | 185 – 275 Ω |
| | | (G2 – G⊖) | 185 – 275 Ω |
| | | (NE – G⊖) | 185 – 275 Ω |
| | | at hot (G1 – G⊖) | 240 – 325 Ω |
| | | (G2 – G⊖) | 240 – 325 Ω |
| | | (NE – G⊖) | 240 – 325 Ω |
| Crankshaft position sensor | Resistance | at cold (NE⊕ – NE⊖) | 1 630 – 2 740 Ω |
| | | at hot (NE⊕ – NE⊖) | 2 065 – 3 225 Ω |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EZ 01

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Spark plug x Cylinder head | 20 | 200 | 14 |
| Distributor x Cylinder head | 18 | 180 | 13 |
| Crankshaft position sensor protector x No 1 oil pan | 20 | 200 | 14 |
| Crankshaft position sensor x No 1 oil pan | 9 | 90 | 78 in lbf |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# STARTING

## SERVICE DATA

SS1F0-04

| | | | |
|---|---|---|---|
| Starter (1 4 kW) | Rated voltage and output power | | 12 V 1 4 kW |
| | No–load characteristics | Current | 90 A or less at 11 5 V |
| | | rpm | 3 000 rpm or less |
| | Brush length | STD | 15 5 mm (0 610 in ) |
| | | Minimum | 10 0 mm (0 394 in ) |
| | Spring installed load | STD | 17 6 – 23 5 N (1 79 – 2 41 kgf 4 0 – 5 3 lbf) |
| | | Minimum | 11 8 N (1 20 kgf 2 7 lbf) |
| | Commutator | | |
| | Diameter | STD | 30 0 mm (1 18 in ) |
| | | Minimum | 29 0 mm (1 14 in ) |
| | Undercut depth | STD | 0 6 mm (0 024 in ) |
| | | Minimum | 0 2 mm (0 008 in ) |
| | Circle runout | Maximum | 0 05 mm (0 0020 in ) |
| | Magnetic switch | | |
| | Contact plate for wear | Maximum | 0 9 mm (0 035 in ) |
| Starter (2 0 kW) | Rated voltage and output power | | 12 V 2 0 kW |
| | No–load characteristics | Current | 100 A or less at 11 5 V |
| | | rpm | 2 500 rpm or less |
| | Brush length | STD | 15 0 mm (0 591 in ) |
| | | Minimum | 9 0 mm (0 354 in ) |
| | Spring installed load | STD | 21 5 – 27 5 N (2 19 – 2 80 kgf 4 8 – 6 2 lbf) |
| | | Minimum | 12 7 N (1 29 kgf 2 9 lbf) |
| | Commutator | | |
| | Diameter | STD | 35 0 mm (1 38 in ) |
| | | Minimum | 34 0 mm (1 34 in ) |
| | Undercut depth | STD | 0 7 mm (0 028 in ) |
| | | Minimum | 0 2 mm (0 008 in ) |
| | Circle runout | Maximum | 0 05 mm (0 0020 in ) |
| | Magnetic switch | | |
| | Contact plate for wear | Maximum | 0 9 mm (0 035 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1F1–04

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| Starter mounting bolt | | 39 | 400 | 29 |
| Starter wire mounting nut | | 8 8 | 90 | 78 in lbf |
| Terminal bolt x Terminal C | | 17 | 173 | 12 5 |
| Terminal bolt x Terminal 30 | | 17 | 173 | 12 5 |
| End cover x Magnetic housing | 1 4 kW | 2 5 | 25 | 22 in lbf |
| | 2 0 kW | 3 6 | 37 | 32 in lbf |
| End cover x Field frame | 1 4 kW | 1 5 | 15 | 13 in lbf |
| | 2 0 kW | 3 8 | 40 | 35 in lbf |
| Starter hosing x Magnetic switch | 1 4 kW | 5 9 | 60 | 52 in lbf |
| | 2 0 kW | 9 3 | 95 | 82 in lbf |
| Field frame x Armature assembly | 1 4 kW | 5 9 | 60 | 52 in lbf |
| | 2 0 kW | 9 3 | 95 | 82 in lbf |
| Lead wire x Terminal C of starter | | 5 9 | 60 | 52 in lbf |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# CHARGING

SS1F2–04

## SERVICE DATA

| | | | |
|---|---|---|---|
| Battery | Voltage | at 20°C (68°F) | 12 7 – 12 9 |
| Drive belt | Tension | New belt | 400 – 580 N (41 0 – 59 1 kgf 90 4 – 130 2 lbf) |
| | | Used belt | 200 – 390 N (20 4 – 40 0 kgf 45 0 – 88 2 lbf) |
| Generator | Rated output | | 12 V 80 A |
| | Rotor coil resistance | at 20°C (68°F) | 2 8 – 3 0 Ω |
| | Slip ring diameter | STD | 14 2 – 14 4 mm (0 559 – 0 567 in ) |
| | | Minimum | 12 8 mm (0 504 in ) |
| | Brush exposed length | STD | 10 5 mm (0 413 in ) |
| | | Minimum | 1 5 mm (0 059 in ) |
| Voltage regulator | Regulating voltage | at 25°C (77°F) | 14 0 – 15 1 V |
| | | at 115°C (239°F) | 13 5 – 14 3 V |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1F3–04

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Bearing retainer x Drive end frame | 2 6 | 27 | 23 in lbf |
| Rectifier end frame x Drive end frame | 4 5 | 46 | 40 in lbf |
| Generator pulley x Rotor | 110 | 1 125 | 81 |
| Rectifier x Rectifier holder | 2 9 | 30 | 25 in lbf |
| Rear end cover x Rectifier holder | 4 4 | 45 | 39 in lbf |
| Rectifier plate x Rectifier holder | 3 8 | 39 | 34 in lbf |
| Terminal insulator x Rectifier holder | 4 1 | 42 | 36 in lbf |
| Drive belt adjusting bar x Timing chain cover | 21 | 210 | 15 |
| Generator x Generator bracket | 59 | 600 | 43 |
| Drive belt adjusting bar x Generator | 21 | 210 | 15 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# AUTOMATIC TRANSMISSION

SS1E5-02

## SERVICE DATA

| | | |
|---|---|---|
| Line pressure (Wheel locked) | | |
| Engine idling | D position | 422 – 481 kPa (4.3 – 4.9 kgf/cm$^2$, 61 – 70 psi) |
| | R position | 510 – 608 kPa (5.2 – 6.2 kgf/cm$^2$, 74 – 88 psi) |
| AT stall (Throttle valve fully opened) | D position | 1 285 – 1 530 kPa (13.1 – 15.6 kgf/cm$^2$, 128 – 153 psi) |
| | R position | 1 579 – 1 932 kPa (16.1 – 19.7 kgf/cm$^2$, 158 – 193 psi) |
| Engine stall revolution | D and R position | 1 950 ± 150 rpm |
| Time lag | N → D position | Less than 1.2 seconds |
| | N → R position | Less than 1.5 seconds |
| Engine idle speed (A/C OFF) | N position | 650 ± 50 rpm |
| Throttle cable adjustment (throttle valve fully closed) | | |
| | Between boot and face and inner cable stopper | 0 –1 mm (0 – 0.04 in.) |
| Torque converter clutch installation distance | | More than 15.7 mm (0.618 in.) |
| Drive plate runout | Max | 0.20 mm (0.0079 in.) |
| Torque converter clutch runout | Max | 0.30 mm (0.0118 in.) |
| Shift point | | |
| D position | | |
| Throttle valve fully opened | 1 → 2 | 56 – 62 km/h (35 – 39 mph) |
| | 2 → 3 | 103 – 114 km/h (64 – 71 mph) |
| | 3 → O/D | 152 – 163 km/h (94 – 101 mph) |
| | O/D → 3 | 145 – 156 km/h (90 – 97 mph) |
| | 3 → 2 | 95 – 101 km/h (59 – 63 mph) |
| | 2 → 1 | 42 – 47 km/h (26 – 29 mph) |
| 2 position | | |
| Throttle valve fully opened | 3 → 2 | 116 – 127 km/h (72 – 79 mph) |
| L position | | |
| Throttle valve fully opened | 2 → 1 | 56 – 62 km/h (38 – 39 mph) |
| Lock–up point | Throttle valve opening 5 % | |
| D position | Lock–up ON | 77 – 83 km/h (48 – 52 mph) |
| | Lock–up OFF | 68 – 74 km/h (42 – 46 mph) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1E7-01

# TORQUE SPECIFICATION

| Part tightened | | N·m | kgf·cm | ft·lbf |
|---|---|---|---|---|
| Valve body x Transmission case | | 10 | 100 | 7 |
| Oil strainer x Valve body | | 10 | 100 | 7 |
| Oil pan | | 7.4 | 75 | 65 in. lbf |
| Drain plug x Oil pan | | 20 | 205 | 15 |
| Parking lock pawl bracket x Transmission case | | 7.4 | 75 | 65 in. lbf |
| Front propeller shaft x Front differential | | 74 | 750 | 54 |
| Front propeller shaft x Transfer | | 74 | 750 | 54 |
| Rear propeller shaft x Transfer | | 88 | 900 | 65 |
| Rear propeller shaft x Rear differential | | 88 | 900 | 65 |
| Drive plate x Crankshaft | | 98 | 1,000 | 72 |
| Torque converter clutch x Drive plate | | 55 | 550 | 40 |
| Front exhaust pipe x Exhaust manifold | | 62 | 630 | 46 |
| Front exhaust pipe x TWC | | 39 | 400 | 29 |
| Oil cooler pipe | | 34 | 350 | 25 |
| Transmission x Engine | | 71 | 730 | 53 |
| Exhaust pipe clamp | | 19 | 195 | 14 |
| Park/neutral position switch | Nut | 6.9 | 70 | 61 in. lbf |
| | Bolt | 13 | 130 | 9 |
| No. 2 vehicle speed sensor | | 5.4 | 55 | 48 in. lbf |
| Speedometer driven gear sleeve x Locking plate | | 16 | 160 | 12 |
| Starter mounting bolt | | 39 | 400 | 29 |
| Transfer shift lever | | 18 | 185 | 13 |
| Stabilizer bar bracket mounting bolt | | 18 | 185 | 13 |
| Engine under cover mounting bolt | | 28 | 290 | 21 |
| Exhaust pipe No. 1 support bracket x Torque converter clutch housing | | 24 | 240 | 17 |
| Crossmember x Frame | | 61 | 620 | 45 |
| Engine rear mounting x Crossmember | | 74 | 750 | 54 |
| Transmission shift lever assembly x Body | | 5.4 | 55 | 48 in. lbf |
| Oil cooler mounting bolt | | 11 | 115 | 8 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TRANSFER

SS1E8-02

## SERVICE DATA

| | | |
|---|---|---|
| Idler gear rear bearing adjusting shim thickness | Mark 2 | 0.30 mm (0.0118 in.) |
| | 3 | 0.45 mm (0.0177 in.) |
| | 4 | 2.40 mm (0.0945 in.) |
| | 5 | 2.60 mm (0.1024 in.) |
| | 6 | 2.80 mm (0.1102 in.) |
| | 7 | 3.00 mm (0.1181 in.) |
| | 8 | 3.20 mm (0.1260 in.) |
| | 9 | 3.40 mm (0.1339 in.) |
| | 10 | 3.60 mm (0.1417 in.) |
| | 11 | 3.80 mm (0.1496 in.) |
| | 12 | 4.00 mm (0.1575 in.) |
| | 13 | 0.55 mm (0.0216 in.) |
| Output shaft rear bearing adjusting shim thickness | Mark B | 0.30 mm (0.0118 in.) |
| | C | 0.45 mm (0.0177 in.) |
| | D | 1.00 mm (0.0394 in.) |
| | E | 1.20 mm (0.0472 in.) |
| | F | 1.40 mm (0.0551 in.) |
| | G | 1.60 mm (0.0630 in.) |
| | H | 1.80 mm (0.0709 in.) |
| | J | 2.00 mm (0.0787 in.) |
| | K | 2.20 mm (0.0866 in.) |
| | L | 2.40 mm (0.0945 in.) |
| | M | 2.60 mm (0.1024 in.) |
| | N | 0.55 mm (0.0216 in.) |
| Input gear snap ring thickness | Mark A | 2.00 mm (0.0787 in.) |
| | B | 2.10 mm (0.0827 in.) |
| | C | 2.20 mm (0.0866 in.) |
| | D | 2.30 mm (0.0906 in.) |
| | E | 2.40 mm (0.0945 in.) |
| | F | 2.50 mm (0.0984 in.) |
| | G | 2.60 mm (0.1024 in.) |
| | H | 2.70 mm (0.1063 in.) |
| | J | 2.80 mm (0.1102 in.) |
| Input shaft rear ball bearing snap ring thickness | Mark A | 2.00 mm (0.0787 in.) |
| | B | 2.10 mm (0.0827 in.) |
| | C | 2.20 mm (0.0866 in.) |
| | D | 2.30 mm (0.0906 in.) |
| | E | 2.40 mm (0.0945 in.) |
| Idler low gear thrust clearance | STD | 0.125 – 0.275 mm (0.0049 – 0.0108 in.) |
| | Max | 0.275 mm (0.0108 in.) |
| Idler low gear radial clearance | STD | 0.015 – 0.068 mm (0.0006 – 0.0027 in.) |
| | Max | 0.068 mm (0.0027 in.) |
| High speed output gear thrust clearance | STD | 0.10 – 0.25 mm (0.0039 – 0.0098 in.) |
| | Max | 0.25 mm (0.0098 in.) |
| High speed output gear radial clearance | STD | 0.015 – 0.071 mm (0.0006 – 0.0028 in.) |
| | Max | 0.071 mm (0.0028 in.) |
| Center differential backlash | Min | 0.05 mm (0.0020 in.) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Center differential side gear thrust washer thickness | | 1 70 mm (0 0669 in )<br>1 85 mm (0 0728 in )<br>2 00 mm (0 0787 in )<br>2 15 mm (0 0846 in )<br>2 30 mm (0 0906 in )<br>2 45 mm (0 0965 in )<br>2 60 mm (0 1024 in )<br>2 75 mm (0 1083 in )<br>2 90 mm (0 1142 in )<br>3 05 mm (0 1201 in ) |
| Front drive gear piece snap ring thickness | Mark A | 2 00 mm (0 0787 in ) |
| | B | 2 10 mm (0 0827 in ) |
| | C | 2 20 mm (0 0866 in ) |
| | D | 2 30 mm (0 0906 in ) |
| | E | 2 40 mm (0 0945 in ) |
| | F | 2 50 mm (0 0984 in ) |
| | G | 2 60 mm (0 1024 in ) |
| | H | 2 70 mm (0 1063 in ) |
| | J | 2 80 mm (0 1102 in ) |
| | K | 1 80 mm (0 0709 in ) |
| | L | 1 90 mm (0 0748 in ) |
| Front extension housing ball bearing snap ring thickness | Mark A | 1 7 mm (0 0669 in ) |
| | B | 1 8 mm (0 0709 in ) |
| Front output shaft hub snap ring thickness | Mark A | 1 8 mm (0 0709 in ) |
| | B | 1 9 mm (0 0748 in ) |
| | C | 2 0 mm (0 0787 in ) |
| | D | 2 1 mm (0 0827 in ) |
| | E | 2 2 mm (0 0866 in ) |
| Oil pump driven rotor body clearance | STD | 0 08 – 0 17 mm (0 0031 – 0 0067 in ) |
| | Max | 0 17 mm (0 0067 in ) |
| Oil pump driven rotor body tip clearance | STD | 0 05 – 0 15 mm (0 0020 – 0 0059 in ) |
| | Max | 0 15 mm (0 0059 in ) |
| Oil pump side clearance | STD | 0 03 – 0 10 mm (0 0012 – 0 0039 in ) |
| | Max | 0 10 mm (0 0039 in ) |
| Rear extension housing ball bearing snap ring thickness | Mark A | 1 7 mm (0 0669 in ) |
| | B | 1 8 mm (0 0709 in ) |
| Rear output shaft ball bearing snap ring thickness | Mark 1 | 1 95 mm (0 0768 in ) |
| | 2 | 2 05 mm (0 0807 in ) |
| | 3 | 2 15 mm (0 0847 in ) |
| | 4 | 2 25 mm (0 0886 in ) |
| Motor actuator | | |
| Terminal 2 – Terminal 3 | STD resistance | 0 3 – 100 Ω |
| Terminal 2 or 3 – Body ground | STD resistance | More than 0 5 MΩ |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1E9-02

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Oil pump plate and separator x Rear extension housing | 4.9 | 50 | 43 in. lbf |
| Oil pump cover x Rear extension housing | 4.9 | 50 | 43 in. lbf |
| Lever lock pin | 12 | 120 | 9 |
| Oil strainer x Rear case | 4.9 | 50 | 43 in. lbf |
| Oil receiver x Front case | 12 | 120 | 9 |
| Case cover x Rear case | 37 | 380 | 27 |
| Rear extension housing x Rear case | 37 | 380 | 27 |
| Front extension housing x Front case | 37 | 380 | 27 |
| Center differential lock indicator switch | 37 | 380 | 14 |
| L4 position switch | 37 | 380 | 27 |
| Neutral position switch | 37 | 380 | 27 |
| Screw plug x Front case | 19 | 190 | 14 |
| Screw plug x Rear extension housing | 29 | 300 | 22 |
| Motor actuator x Front case | 18 | 185 | 13 |
| Differential front case x Differential rear case | 98 | 1 000 | 72 |
| Temporarily tighten | 88 | 900 | 65 |
| Front case x Rear case | 37 | 380 | 27 |
| Rear case x Retainer | 39 | 400 | 28 |
| Dynamic damper x Rear extension housing | 37 | 380 | 27 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# PROPELLER SHAFT

## SERVICE DATA

SS1EA-02

| | | | |
|---|---|---|---|
| Propeller shaft runout | | Max | 0 8 mm (0 031 in ) |
| Spider bearing axial play | | | Less than 0 05 mm (0 0020 in ) |
| Snap ring thickness | | | |
| Font propeller shaft and rear propeller shaft (Type B) | Mark | Color | |
| | 1 | – | 2 100 – 2 150 mm (0 0827 – 0 0846 in ) |
| | 2 | – | 2 150 – 2 200 mm (0 0846 – 0 0866 in ) |
| | 3 | – | 2 200 – 2 250 mm (0 0866 – 0 0886 in ) |
| | – | Brown | 2 250 – 2 300 mm (0 0886 – 0 0906 in ) |
| | – | Blue | 2 300 – 2 350 mm (0 0906 – 0 0925 in ) |
| | 6 | – | 2 350 – 2 400 mm (0 0925 – 0 0945 in ) |
| | 7 | – | 2 400 – 2 450 mm (0 0945 – 0 0965 in ) |
| | 8 | – | 2 450 – 2 500 mm (0 0965 – 0 0984 in ) |
| Rear propeller shaft (Type A) | | Color | |
| | | – | 2 00 mm (0 0787 in ) |
| | | Brown | 2 03 mm (0 0799 in ) |
| | | Blue | 2 06 mm (0 0811 in ) |
| | | – | 2 09 mm (0 0823 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EB–01

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Front propeller shaft x Front differential | 74 | 750 | 54 |
| Front propeller shaft x Transfer | 74 | 750 | 54 |
| Rear propeller shaft x Rear differential | 88 | 900 | 65 |
| Rear propeller shaft x Transfer | 88 | 900 | 65 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SUSPENSION AND AXLE

## SERVICE DATA

SS1EC 02

| | | | |
|---|---|---|---|
| Cold tire inflation pressure | Tire size<br>P275/70R 16 | | <br>220 kPa (2 2 kgf/cm$^2$ 32 psi) |
| Follow spring and bumper stopper clearance | Follow spring clearance (Front)<br>Bumper stopper clearance (Rear) | | 36 mm (1 42 in )<br>104 mm (4 09 in ) |
| Front wheel alignment | Camber | | 1°00 ± 45 |
| | | Left–right error | 45 or less |
| | Caster | | 3°00 ± 60 |
| | | Left–right error | 45 or less |
| | Steering axis inclination | | 13°00 ± 45 |
| | Toe–in (Total) | Inspection STD | 0 2° ± 0 2° (2 ± 2 mm 0 08 ± 0 08 in ) |
| | | Adjustment STD | 0 2° ± 0 1° (2 ± 1 mm 0 08 ± 0 04 in ) |
| | Wheel angle (Max ) | Inside wheel | 32°00 – 35°00 |
| | | Outside wheel | 31°00 |
| Tire and wheel | Tire runout | | 3 0 mm (0 118 in ) or less |
| | Wheel balance (Unbalance after adjustment) | | 13 0 g (0 029 lb) or less |
| | Wheel bearing preload (at starting) | Front | 28 – 56 N (2 9 – 5 7 kgf 6 4 – 12 6 lbf) |
| | (Rotating load at hub bolt) | Rear | 26 – 57 N (2 6 – 5 8 kgf 5 7 – 12 8 lbf) |
| Front axle | Steering knuckle bearing preload<br>(Rotating load at knuckle end before installing dust seal) | | <br>25 – 44 N (2 5 – 4 5 kgf 5 5 – 9 9 lbf) |
| Front differential | Drive pinion preload (at starting) | New bearing | 0 9 – 1 6 N m (10 – 16 kgf cm 8 7 – 13 9 in lbf) |
| | | Reused bearing | 0 5 – 0 8 N m (5 – 8 kgf cm 4 3 – 6 9 in lbf) |
| | Total preload (at starting) | | Drive pinion preload plus<br>0 4 – 0 6 N m (4 – 6 kgf cm 3 5 – 5 2 in lbf) |
| | Drive pinion to ring gear backlash | | 0 13 – 0 18 mm (0 0051 – 0 0071 in ) |
| | Pinion gear to side gear backlash | | 0 05 – 0 20 mm (0 0020 – 0 0079 in ) |
| | Ring gear runout | Max | 0 10 mm (0 0039 in ) |
| | Companion flange runout | Max Radial | 0 10 mm (0 0039 in ) |
| | | Lateral | 0 10 mm (0 0039 in ) |
| | Oil seal drive in depth | | 1 0 mm (0 039 in ) |
| | Side gear thrust washer thickness | w/o Differntial lock | 1 6 mm (0 063 in )<br>1 7 mm (0 067 in )<br>1 8 mm (0 071 in ) |
| | | w/ Differntial lock | 0 9 mm (0 035 in )<br>1 0 mm (0 039 in )<br>1 1 mm (0 043 in )<br>1 2 mm (0 047 in )<br>1 3 mm (0 051 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Front differential (cont d) | Drive pinion adjusting plate washer thickness | 1 70 mm (0 0669 in )<br>1 73 mm (0 0681 in )<br>1 76 mm (0 0693 in )<br>1 79 mm (0 0705 in )<br>1 82 mm (0 0717 in )<br>1 85 mm (0 0728 in )<br>1 88 mm (0 0740 in )<br>1 91 mm (0 0752 in )<br>1 94 mm (0 0764 in )<br>1 97 mm (0 0776 in )<br>2 00 mm (0 0787 in )<br>2 03 mm (0 0799 in )<br>2 06 mm (0 0811 in )<br>2 09 mm (0 0823 in )<br>2 12 mm (0 0835 in )<br>2 15 mm (0 0846 in )<br>2 18 mm (0 0858 in )<br>2 21 mm (0 0870 in )<br>2 24 mm (0 0882 in )<br>2 27 mm (0 0894 in )<br>2 30 mm (0 0906 in )<br>2 33 mm (0 0917 in ) |
| Rear differential | Drive pinion preload (at starting) New bearing<br>Reused bearing | 1 3 – 2 0 N m (13 – 20 kgf cm 11 3 – 17 4 in lbf)<br>0 7 – 1 0 N m (7 – 10 kgf cm 6 1 – 8 7 in lbf) |
| | Total preload (at starting)<br>w/o Differntial lock<br>w/ Differntial lock | Drive pinion preload plus<br>0 4 – 0 6 N m (4 – 6 kgf cm 3 5 – 5 2 in lbf)<br>0 3 – 0 7 N m (3 – 7 kgf cm 2 6 – 6 1 in lbf) |
| | Drive pinion to ring gear backlash | 0 15 – 0 20 mm (0 0059 – 0 0079 in ) |
| | Pinion gear to side gear backlash | 0 02 – 0 20 mm (0 0008 – 0 0079 in ) |
| | Ring gear runout Max | 0 10 mm (0 0039 in ) |
| | Companion flange runout Max Radial<br>Lateral | 0 10 mm (0 0039 in )<br>0 10 mm (0 0039 in ) |
| | Oil seal drive in depth | 1 0 mm (0 039 in ) |
| | Side gear thrust washer thickness | 1 60 mm (0 0630 in )<br>1 75 mm (0 0689 in )<br>1 90 mm (0 0748 in )<br>2 05 mm (0 0807 in ) |
| | Drive pinion adjusting plate washer thickness | 1 05 mm (0 0413 in )<br>1 10 mm (0 0433 in )<br>1 15 mm (0 0453 in )<br>1 20 mm (0 0472 in )<br>1 25 mm (0 0492 in )<br>1 30 mm (0 0512 in )<br>1 35 mm (0 0531 in )<br>1 40 mm (0 0551 in )<br>1 45 mm (0 0571 in )<br>1 50 mm (0 0591 in )<br>1 55 mm (0 0610 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | |
|---|---|---|
| Rear differential (cont d) | Side bearing adjusting plate thickness (w/ Differential lock only) | 2 67 mm (0 1051 in )<br>2 70 mm (0 1063 in )<br>2 73 mm (0 1075 in )<br>2 76 mm (0 1087 in )<br>2 79 mm (0 1098 in )<br>2 82 mm (0 1110 in )<br>2 85 mm (0 1122 in )<br>2 88 mm (0 1134 in )<br>2 91 mm (0 1146 in )<br>2 94 mm (0 1157 in )<br>2 97 mm (0 1169 in )<br>3 00 mm (0 1181 in )<br>3 03 mm (0 1193 in )<br>3 06 mm (0 1205 in )<br>3 09 mm (0 1217 in )<br>3 12 mm (0 1228 in )<br>3 15 mm (0 1240 in )<br>3 18 mm (0 1252 in )<br>3 21 mm (0 1264 in )<br>3 24 mm (0 1276 in )<br>3 27 mm (0 1287 in )<br>3 30 mm (0 1299 in )<br>3 33 mm (0 1311 in ) |
| Rear axle | Rear axle shaft runout Max<br>Distance between top surface of axle housing and lock nut | 0 8 mm (0 031 in )<br>–0 2 – 0 9 mm (–0 0079 – 0 0354 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1ED 02

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| FRONT | | | |
| Axle hub x Disc | 64 | 650 | 47 |
| Axle hub bearing lock nut | 64 | 650 | 47 |
| Flange x Axle hub | 35 | 360 | 26 |
| Brake caliper x Axle carrier | 123 | 1 250 | 90 |
| Brake caliper x Flexible hose | 30 | 310 | 22 |
| Steering knuckle x Knuckle arm | 96 | 980 | 71 |
| Bearing cap x Steering knuckle | 96 | 980 | 71 |
| Knuckle arm x Tie rod | 91 | 925 | 67 |
| Steering knuckle x Knuckle spindle | 47 | 475 | 34 |
| Oil seal end retainer x Knuckle arm | 5 4 | 55 | 48 in lbf |
| ABS speed sensor set bolt x Steering knuckle | 18 | 185 | 13 |
| Hub nut Steel wheel | 147 | 1 500 | 109 |
| Aluminum wheel | 103 | 1 050 | 76 |
| Drain plug | 49 | 500 | 36 |
| Filler plug | 49 | 500 | 36 |
| Propeller shaft x Companion flange | 88 | 900 | 65 |
| Side bearing cap x Differential carrier | 78 | 800 | 58 |
| Ring gear x Differential case | 97 | 985 | 71 |
| Drive pinion x Companion flange | 196 – 343 | 2 000 – 3 500 | 145 – 253 |
| Differential LH case x RH case | 47 | 480 | 35 |
| Differential lock shift retainer | 24 | 240 | 17 |
| Differential lock screw plug | 22 | 220 | 16 |
| Differential lock indicator switch | 40 | 410 | 30 |
| Differential lock actuator | 26 | 270 | 20 |
| Differential carrier x Axle housing | 27 | 280 | 20 |
| Adjusting nut lock x Bearing cap | 13 | 130 | 9 |
| Follow spring x Frame | 9 2 | 94 | 82 in lbf |
| Stabilizer bar x Axle housing | 25 | 260 | 19 |
| Shock absorber x Axle housing | 69 | 700 | 51 |
| Shock absorber x Frame | 69 | 700 | 51 |
| Stabilizer bar link x Cover | 18 | 185 | 13 |
| Stabilizer bar link x Link bracket | 103 | 1 050 | 76 |
| Lateral control rod x Frame | 171 | 1 750 | 127 |
| Lateral control rod x Axle housing | 171 | 1 750 | 127 |
| Leading arm x Frame | 177 | 1 800 | 130 |
| Leading arm x Axle housing | 171 | 1 750 | 127 |
| REAR | | | |
| Rear axle shaft x Axle hub | 34 | 340 | 25 |
| Rear axle bearing lock nut | 59 | 600 | 43 |
| Rear axle bearing lock nut screw | 5 4 | 55 | 48 in lbf |
| Brke caliper x Axle carrier | 103 | 1 050 | 76 |
| ABS speed sensor set bolt | 18 | 185 | 13 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | | |
|---|---|---|---|---|
| Hub nut | Steel wheel | 147 | 1 500 | 109 |
| | Aluminum wheel | 103 | 1 050 | 76 |
| Drain plug | | 49 | 500 | 36 |
| Filler plug | | 49 | 500 | 36 |
| Pinion shaft pin | w/o Differential lock | 27 | 275 | 20 |
| | w/ Differential lock | 58 | 590 | 43 |
| Propeller shaft x Companion flange | | 74 | 750 | 54 |
| Side bearing cap x Differential carrier | w/o Differential lock | 78 | 800 | 58 |
| | w/ Differential lock | 113 | 1 150 | 83 |
| Ring gear x Differential case | | 110 | 1 125 | 81 |
| Companion flange x Drive pinion (Maximum torque) | | 441 | 4 500 | 325 |
| Differential carrier x Axle housing | | 73 | 740 | 54 |
| Adjusting nut lock x Bearing cap | | 13 | 130 | 9 |
| Differential case x Differential cover | | 58 | 590 | 43 |
| Differential lock shift fork set bolt | | 20 | 200 | 14 |
| Differential lock actuator | | 24 | 240 | 17 |
| Differential lock cover | | 18 | 185 | 13 |
| Differential lock indicator switch | | 40 | 410 | 30 |
| Actuator protector | Nut | 35 | 360 | 26 |
| | Bolt | 20 | 200 | 14 |
| Follow spring x Frame | | 28 | 290 | 21 |
| Shock absorber x Bracket | | 69 | 700 | 51 |
| Shock absorber bracket x Frame | | 50 | 510 | 37 |
| Shock absorber x Axle housing | | 64 | 650 | 47 |
| Lateral control rod x Frame | | 177 | 1 800 | 130 |
| Lateral control rod x Axle housing | | 245 | 2 500 | 181 |
| Upper control rod x Frame | | 177 | 1 800 | 130 |
| Upper control rod x Axle housing | | 177 | 1 800 | 130 |
| Lower control arm x Frame | | 177 | 1 800 | 130 |
| Lower control arm x Axle housing | | 177 | 1 800 | 130 |
| Stabilizer bar x Link | | 25 | 260 | 19 |
| Stabilizer bar link x Link bracket | | 103 | 1 050 | 76 |
| Cover x Axle housing | | 18 | 185 | 13 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BRAKE

SS1EE-02

## SERVICE DATA

| | | |
|---|---|---|
| Brake pedal height from asphalt sheet | | 167 5 – 177 5 mm (6 59 – 6 99 in ) |
| Brake pedal freeplay | | 3 – 6 mm (0 12 – 0 24 in ) |
| Brake pedal reserve distance at 490 N (50 kgf 110 2 lbf) | | More than 68 mm (2 68 in ) |
| Brake booster push rod to piston clearance | w/ SST | 0 mm (0 in ) |
| Front brake pad thickness | STD<br>Minimum | 9 5 mm (0 374 in )<br>1 0 mm (0 039 in ) |
| Front brake disc thickness | STD<br>Minimum | 32 0 mm (1 260 in )<br>30 0 mm (1 181 in ) |
| Front brake disc runout | Maximum | 0 15 mm (0 0059 in ) |
| Rear brake pad thickness | STD<br>Minimum | 10 0 mm (0 394 in )<br>1 0 mm (0 039 in ) |
| Rear brake disc thickness | STD<br>Minimum | 18 0 mm (0 709 in )<br>16 0 mm (0 630 in ) |
| Rear brake disc runout | Maximum | 0 15 mm (0 0059 in ) |
| Rear brake disc inside diameter | STD<br>Maximum | 230 mm (9 06 in )<br>231 mm (9 09 in ) |
| Parking brake shoe lining thickness | STD<br>Minimum | 4 0 mm (0 157 in )<br>1 0 mm (0 039 in ) |
| Parking brake lever travel at 196 N (20 kgf 44 1 lbf) | | 7 – 9 clicks |
| Parking brake clearance between rear shoe and lever | | Less than 0 35 mm (0 0138 in ) |
| Parking brake shoe and lever clearance adjusting shim thickness | | 0 3 mm (0 012 in )<br>0 6 mm (0 024 in )<br>0 9 mm (0 035 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EF 02

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Master cylinder x Piston stopper bolt | 10 | 100 | 7 |
| Master cylinder x Reservoir | 1 7 | 17 5 | 15 2 in lbf |
| Master cylinder x Brake booster | 13 | 130 | 9 |
| Brake line union nut | 15 | 155 | 11 |
| Brake booster clevis lock nut | 25 | 260 | 19 |
| Brake booster x Pedal bracket | 13 | 130 | 9 |
| Bleeder plug | 11 | 110 | 8 |
| Front disc brake caliper installation bolt | 123 | 1 250 | 90 |
| Front disc brake caliper x Flexible hose | 30 | 310 | 22 |
| Parking brake bellcrank x Backing plate | 13 | 130 | 9 |
| Rear disc brake cliper x Spindle pin | 88 | 900 | 65 |
| Rear disc brake caliper x Flexible hose | 30 | 310 | 22 |
| Rear disc brake torque plate x Knuckle | 103 | 1 050 | 76 |
| LSP & BV bracket x Frame | 25 | 260 | 19 |
| LSP & BV x LSP & BV bracket | 13 | 130 | 9 |
| LSP & BV spring x LSP & BV bracket | 18 | 185 | 13 |
| LSP & BV spring x Shackle No 1 | 18 | 185 | 13 |
| LSP & BV shackle lock nut | 25 | 250 | 18 |
| LSP & BV shackle x Shackle bracket | 13 | 130 | 9 |
| LSP & BV shackle bracket x Rear axle housing | 19 | 195 | 14 |
| ABS actuator assembly x Body | 19 | 195 | 14 |
| ABS actuator x Actuator bracket | 5 4 | 55 | 48 in lbf |
| ABS control relay x Actuator bracket | 13 | 130 | 9 |
| Front speed sensor installation bolt | 18 | 185 | 13 |
| Rear speed sensor installation bolt | 18 | 185 | 13 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# STEERING

## SERVICE DATA

SS1EG 02

| | | |
|---|---|---|
| ON–VEHICLE INSPECTION | | |
| Steering wheel freeplay | Maximum | 40 mm (1 57 in ) |
| Fluid level rise | Maximum | Below 5 mm (020 in ) |
| Fluid pressure at idle speed with valve closed | Minimum | 9 316 kPa (95 kgf/cm$^2$ 1 351 psi) |
| Steering effort at idle speed | Maximum | 8 3 N m (85 kgf cm 73 in lbf) |
| TILT STEERING COLUMN | | |
| Pawl stopper alignment mark | 1 or A | 12 65 – 12 75 mm (0 4980 – 0 5020 in ) |
| | 2 or B | 12 55 – 12 65 mm (0 4941 – 0 4980 in ) |
| | 3 or C | 12 45 – 12 55 mm (0 4902 – 0 4941 in ) |
| | 4 or D | 12 35 – 12 45 mm (0 4962 – 0 4902 in ) |
| | 5 or E | 12 25 – 12 35 mm (0 4823 – 0 4862 in ) |
| PS VANE PUMP | | |
| Oil clearance between pump shaft and bushing | STD | 0 03 – 0 05 mm (0 0012 – 0 0020 in ) |
| | Maximum | 0 07 mm (0 0028 in ) |
| Vane plate height | Minimum | 8 6 mm (0 339 in ) |
| Vane plate thickness | Minimum | 1 397 mm (0 05500 in ) |
| Vane plate length | Minimum | 14 991 mm (0 59016 in ) |
| Vane plate and pump rotor groove clearance | Maximum | 0 033 mm (0 00130 in ) |
| Vane plate length | Pump rotor mark | |
| | None | 14 995 – 14 997 mm (0 59035 – 0 59043 in ) |
| | 1 | 14 993 – 14 995 mm (0 59027 – 0 59035 in ) |
| | 2 | 14 991 – 14 993 mm (0 59020 – 0 59027 in ) |
| | Cam ring mark | |
| | 2 | 14 995 – 14 997 mm (0 59035 – 0 59043 in ) |
| | 3 | 14 993 – 14 995 mm (0 59027 – 0 59035 in ) |
| | 4 | 14 991 – 14 993 mm (0 59020 – 0 59027 in ) |
| Spring free length | STD | 35 – 37 mm (1 38 – 1 46 in ) |
| Vane pump rotaing torque | Maximum | 0 3 N m (2 8 kgf cm 2 4 in lbf) |
| PS GEAR | | |
| Worm gear valve body ball clearance | Maximum | 0 15 mm (0 059 in ) |
| Cross shaft adjusting screw thrust clearance | STD | 0 03 – 0 05 mm (0 0012 – 0 0020 in ) |
| Worm gear preload | | 0 3 – 0 5 N m (3 – 5 5 kgf cm 2 6 – 4 8 in lbf) |
| Total preload | | 0 74 – 1 08 N m (7 5 – 11 0 kgf cm 6 5 – 9 6 in lbf) |
| STEERING LINKAGE | | |
| Tie rod length | Approximately | 1 207 mm (47 51 in ) |
| Relay rod length | Approximately | 1 085 mm (42 72 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EH 02

# TORQUE SPECIFICATION

| Part tightened | | N m | kgf cm | ft lbf |
|---|---|---|---|---|
| TILT STEERING COLUMN | | | | |
| Steering wheel set nut | | 34 | 350 | 25 |
| Steering wheel pad set screw (Torx screw) | | 9.0 | 90 | 78 in. lbf |
| Steering column assembly set nut and bolt | | 25 | 250 | 18 |
| Sliding yoke sub–assembly x Worm gear valve body shaft | | 34 | 350 | 25 |
| Sliding yoke sub–assembly x Intermediate No. 2 shaft | | 34 | 350 | 25 |
| Universal joint x Intermediate No. 2 shaft | | 34 | 350 | 25 |
| Main shaft assembly x Universal joint | | 34 | 350 | 25 |
| Turn signal bracket set bolt | | 4.9 | 50 | 43 in. lbf |
| Tilt sub lever side pawl set bolt x Nut | | 5.9 | 60 | 52 in. lbf |
| Tilt lever retainer set nut | | 15 | 150 | 11 |
| Tilt lever assembly set bolt | | 2.9 | 30 | 26 in. lbf |
| Compression spring set bolt | | 7.8 | 80 | 69 in. lbf |
| Column hole cover x Lower dust seal | | 5.9 | 60 | 52 in. lbf |
| Column hole cover x Body | | 13 | 130 | 9 |
| Link joint protector set bolt | | 12 | 120 | 9 |
| PS VANE PUMP | | | | |
| Pressure feed tube set union bolt | | 56 | 575 | 42 |
| PS vane pump assembly set nut | | 36 | 370 | 27 |
| Suction port union set bolt | | 13 | 130 | 9 |
| Vane pump drive gear set nut | | 74 | 750 | 54 |
| Pressure port union | | 69 | 700 | 51 |
| PS GEAR | | | | |
| Pressure tube x Gear housing assembly | for use with SST | 36 | 365 | 26 |
| | for use without SST | 44 | 450 | 33 |
| Return tube x Gear housing assembly | for use with SST | 36 | 365 | 26 |
| | for use without SST | 44 | 450 | 33 |
| Gear housing assembly x Body | | 142 | 1 450 | 105 |
| Pitman arm x Cross shaft | | 177 | 1 800 | 130 |
| Cross shaft adjusting screw set nut | | 46 | 470 | 34 |
| Side cover x Gear housing | | 61 | 620 | 45 |
| Plunger guide nut | | 20 | 205 | 15 |
| Worm gear valve body assembly x Gear housing | | 61 | 620 | 45 |
| Control valve shaft x Sliding york sub–assembly | | 34 | 350 | 25 |
| STEERING LINKAGE | | | | |
| Pitman arm x Cross shaft | | 177 | 1 800 | 130 |
| Pitman arm x Relay rod | | 91 | 925 | 67 |
| Tie rod clamp bolt | | 37 | 375 | 27 |
| Tie rod x Knuckle arm | | 91 | 925 | 67 |
| Relay rod x Steering damper | | 74 | 750 | 54 |
| Steering damper x Steering damper bracket | | 74 | 750 | 54 |
| Steering damper bracket x Body | | 74 | 750 | 54 |
| Relay rod clamp bolt | | 37 | 375 | 27 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# SUPPLEMENTAL RESTRAINT SYSTEM

SS1E 01

## TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Steering wheel set nut | 34 | 350 | 25 |
| Steering wheel pad | 9 0 | 90 | 80 in lbf |
| Front passenger airbag assembly x Instrument panel reinforcement | 20 | 205 | 15 |
| Airbag sensor assembly | 20 | 205 | 15 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BODY ELECTRICAL

## SERVICE DATA

SS1EJ–02

| | |
|---|---|
| TURN SIGNAL FLASHER | |
| Flashes/Minute | 60 – 120 |
| SPEEDOMETER (USING A SPEEDOMETER) | |
| Standard indication (mph) | Allowable range (mph) |
| 20 | 18 – 24 |
| 40 | 38 – 44 |
| 60 | 58 – 66 |
| 80 | 78 – 88 |
| 100 | 98 – 110 |
| 120 | 118 – 132 |
| TACHOMETER (ON–VEHICLE) | DC 13 5 V 25 °C (77 °F) |
| Standard indication (RPM) | Allowable range (RPM) |
| 700 | 630 – 770 |
| 1 000 | 900 – 1 100 |
| 2 000 | 1 875 – 2 125 |
| 3 000 | 2 850 – 3 150 |
| 4 000 | 3 850 – 4 150 |
| 5 000 | 4 850 – 5 150 |
| FUEL RECEIVER GAUGE | |
| A – B | 85 5 –105 5 Ω |
| A – C | 126 – 150 Ω |
| B – C | 90 – 110 Ω |
| FUEL SENDER GAUGE | |
| Float position F Approx 15 mm ((0 59 in ) | Approx 3 Ω |
| Float position E Approx 200 (7 87 in ) | Approx 110 Ω |
| ENGINE COOLANT TEMPERATURE RECEIVER GAUGE | |
| A – B | 71 – 79 Ω |
| A – C | 117 – 141 Ω |
| B – C | 185 – 215 Ω |
| OIL PRESSURE RECEIVER GAUGE | |
| Resistance | 40 – 48 Ω |
| CRUISE CONTROL SWITCH | |
| Switch position OFF | No continuity |
| Switch position RESUME/ACCEL | Approx 68 Ω |
| Switch position SET/COAST | Approx 198 Ω |
| Switch position CANCEL | Approx 418 Ω |
| CRUISE CONTROL ACTUATOR | |
| 1 – 3 | Approx 2 kΩ |
| 2 – 3 | Approx 0 5 – 1 7 kΩ |
| Actuator control arm free play | 0 mm (0 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# BODY

## TORQUE SPECIFICATION

SS1EK-02

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| FRONT BUMPER | | | |
| Front bumper arm x Front bumper bracket | 39 | 400 | 29 |
| Front bumper arm x Body | 39 | 400 | 29 |
| Front bumper extension x Front bumper | 5.4 | 55 | 48 in. lbf |
| REAR BUMPER | | | |
| Rear bumper extension x Rear bumper reinforcement | 13 | 130 | 9 |
| Rear bumper extension reinforcement x Body | 5.4 | 55 | 48 in. lbf |
| HOOD | | | |
| Hood hinge x Body | 18 | 185 | 13 |
| Hood lock x Body | 8 | 80 | 69 in. lbf |
| FRONT DOOR | | | |
| Door hinge x Body | 24 | 240 | 17 |
| Door hinge x Door panel | 24 | 240 | 17 |
| Door lock x Door panel | 5 | 50 | 43 in. lbf |
| Window regulator x Door panel | 5 | 50 | 43 in. lbf |
| REAR DOOR | | | |
| Door hinge x Body | 24 | 240 | 17 |
| Door hinge x Door panel | 24 | 240 | 17 |
| Door lock x Door panel | 5 | 50 | 43 in. lbf |
| Window regulator x Door panel | 5 | 50 | 43 in. lbf |
| WIPER AND WASHER | | | |
| Front wiper arm x Wiper link | 20 | 210 | 15 |
| Wiper link x Body | 5.4 | 55 | 48 in. lbf |
| Wiper motor x Body | 5.4 | 55 | 48 in. lbf |
| Rear wiper arm x Wiper motor | 5.4 | 55 | 48 in. lbf |
| WHEEL OPENING EXTENSION | | | |
| Front wheel opening extension x Body | 5.4 | 55 | 48 in. lbf |
| Rear wheel opening extension x Body | 5.4 | 55 | 48 in. lbf |
| INSTRUMENT PANEL | | | |
| Front passenger airbag assembly x Instrument panel reinforcement | 20 | 210 | 15 |
| FRONT MANUAL SEAT | | | |
| Seat truck x Body | 39 | 400 | 29 |
| Seat reclining assembly x Seatback frame | 52 | 530 | 38 |
| Lumber support x Seatback frame | 18 | 185 | 13 |
| FRONT POWER SEAT | | | |
| Seat truck x Body | 39 | 400 | 29 |
| Power seat adjuster x Seatback frame | 37 | 375 | 27 |
| Power seat adjuster x Seatback cushion frame | 18 | 185 | 13 |
| Lumber support x Seatback frame | 18 | 185 | 13 |
| NO. 1 REAR SEAT | | | |
| Seat cushion hinge x Body | 39 | 400 | 29 |
| Seat cushion hinge x Seat cushion frame | 39 | 400 | 29 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | | | | |
|---|---|---|---|---|
| Seat lock x Seat cushion frame | | 41 | 420 | 30 |
| NO 2 REAR SEAT | | | | |
| Reclining adjuster x Seatback frame | | 52 | 530 | 38 |
| Seat leg x Body | | 18 | 185 | 13 |
| POWER SEAT ADJUSTER | | | | |
| No 2 vertical seat link x Rear vertical motor | Bolt<br>Nut | 10<br>2 | 100<br>20 | 7<br>17 in. lbf |
| No 1 vertical seat link x Front vertical motor | | 10 | 100 | 7 |
| Seat truck x Seat truck inner reinforcement | | 20 | 210 | 15 |
| Front seat horizontal seat screw x Front seat motor slide housing | | 19 | 200 | 14 |
| Slide motor x Front seat horizontal jack screw | Bolt<br>Nut | 10<br>2 | 100<br>20 | 7<br>17 in. lbf |
| Front seat horizontal jack screw x Front seat truck | | 19 | 200 | 14 |
| SEAT BELT | | | | |
| Adjustable anchor x Body | | 43 | 440 | 32 |
| ELR x Body | | 5 | 50 | 43 in. lbf |
| Outer belt anchor x Body | | 43 | 440 | 32 |
| Inner belt x Seat | | 43 | 440 | 32 |
| SIDE STEP | | | | |
| Side step bracket x Body | | 13 | 130 | 9 |
| Side step bracket x Side panel | | 5.4 | 55 | 48 in. lbf |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# AIR CONDITIONING

SS1EL-01

## SERVICE DATA

| | | |
|---|---|---|
| Refrigerant charge volume | | 850 ± 50 g (59 98 ± 1 76 oz ) |
| Drive belt tension | New belt | 100 — 150 lbf |
| | Used belt | 60 — 100 lbf |
| Idle–up speed | | 800 rpm |
| Magnetic clutch clearance | | 0 5 ± 0 15 mm (0 020 ± 0 0059 in ) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



SS1EM–02

# TORQUE SPECIFICATION

| Part tightened | N m | kgf cm | ft lbf |
|---|---|---|---|
| Compressor x Suction hose | 10 | 100 | 7 |
| Compressor x Discharge hose | 10 | 100 | 7 |
| Condensser x Compressor bracket | 25 | 250 | 18 |
| Compressor bracket x Engine | 37 | 375 | 27 |
| Receiver x Liquid tube | 5 4 | 55 | 48 in lbf |
| Condenser x Discharge hose | 10 | 100 | 7 |
| Cooling unit x Liqied tube | 10 | 100 | 7 |
| Cooling unit x Suction tube | 10 | 100 | 7 |
| Pressure switch x Liquid tube | 10 | 100 | 7 |
| Expansion valve x Evaporetor | 5 4 | 55 | 48 in lbf |
| Liquid line (Union nut) | 14 | 140 | 10 |
| Suction line (bolt) | 10 | 140 | 7 |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# STARTING SYSTEM

ST08A-02

## ON–VEHICLE INSPECTION

NOTICE:

Before changing the starter, check these items again:

- Connector connection
- Accessory installation, e.g.: theft deterrent system



Brought to you by BirfMark
Version 1.11 - 03/16/2010

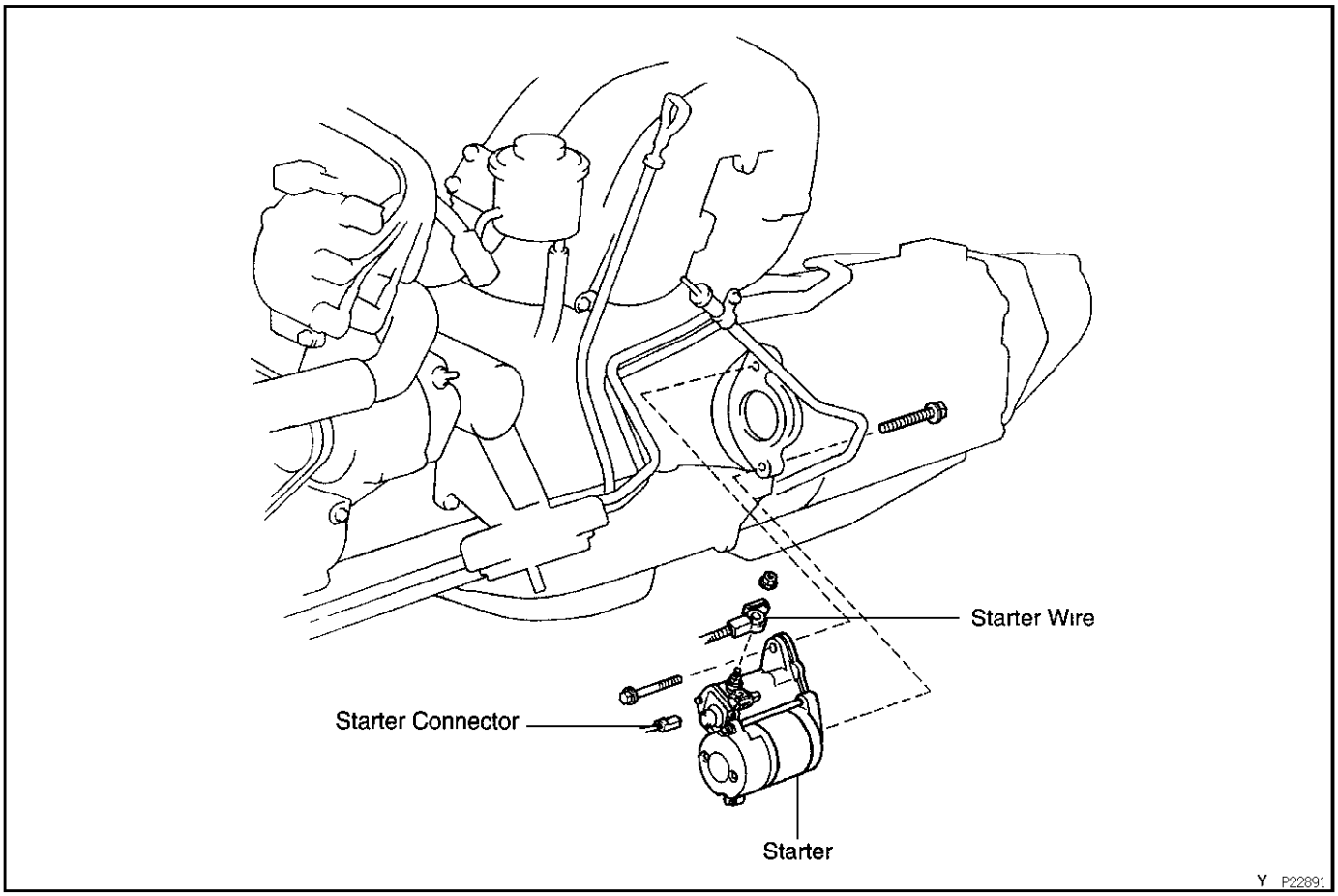
Brought to you by BirfMark



# STARTER

## COMPONENTS

ST0KO-01

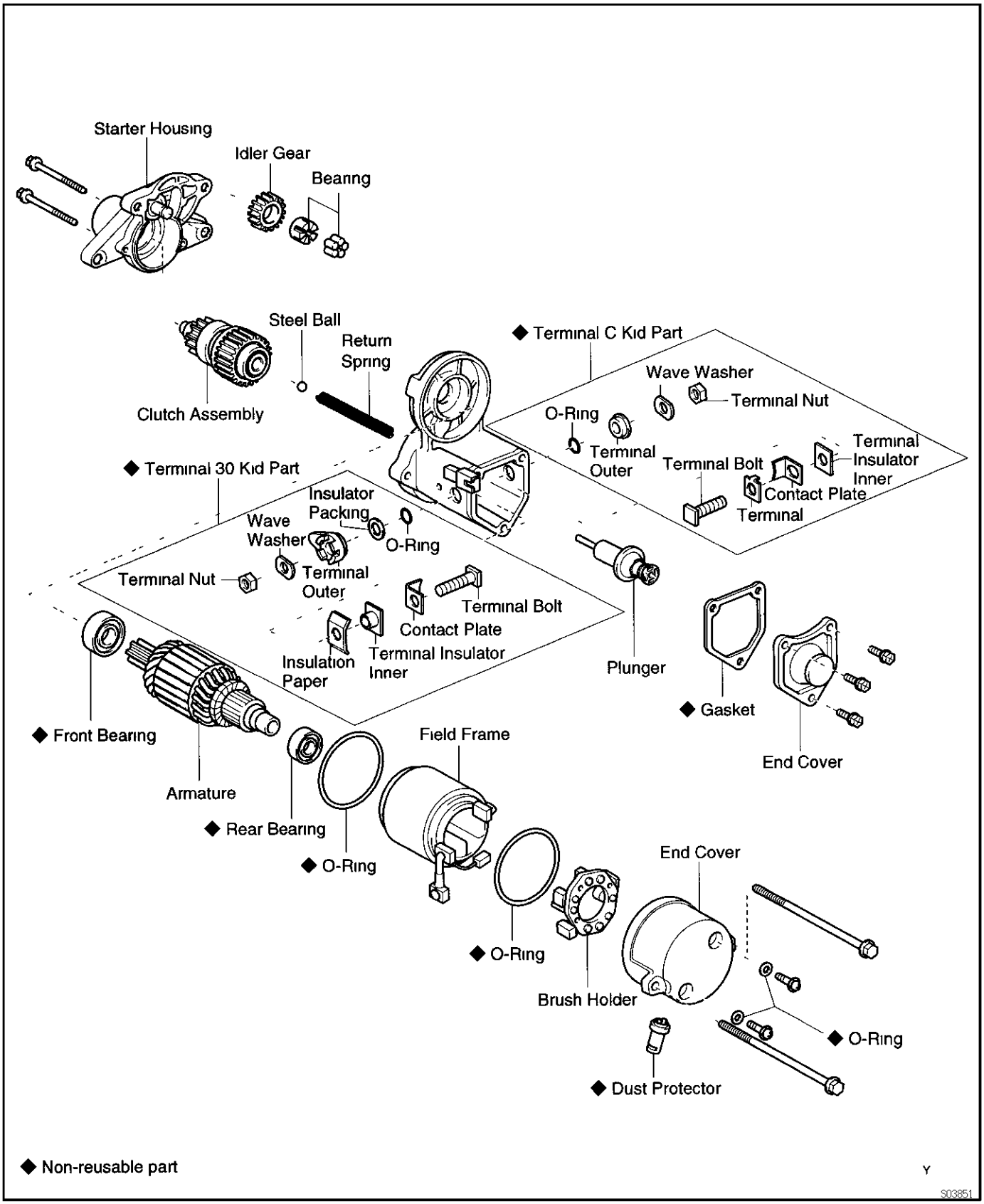





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark





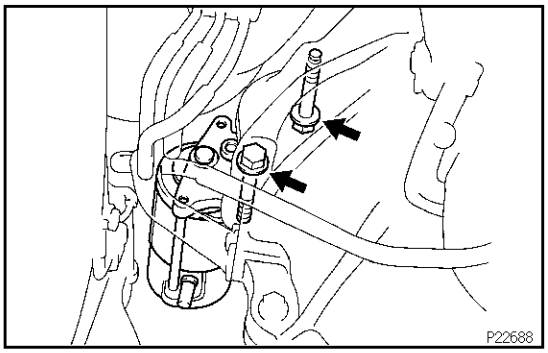



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ST0KP 01




# REMOVAL

## REMOVE STARTER

(a) Disconnect the starter connector

(b) Remove the nut, and disconnect the starter wire
**Torque: 8.8 N·m (90 kgf·cm, 70 in.·lbf)**

(c) Remove the 2 bolts and starter
**Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

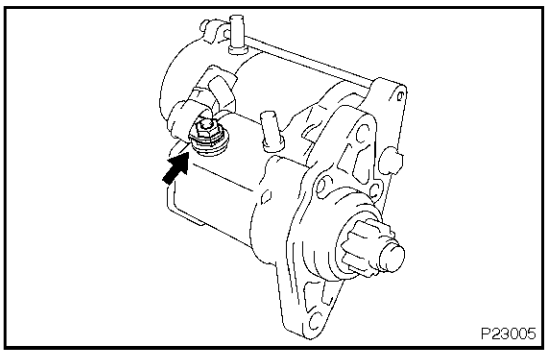


ST0KQ–01

# DISASSEMBLY

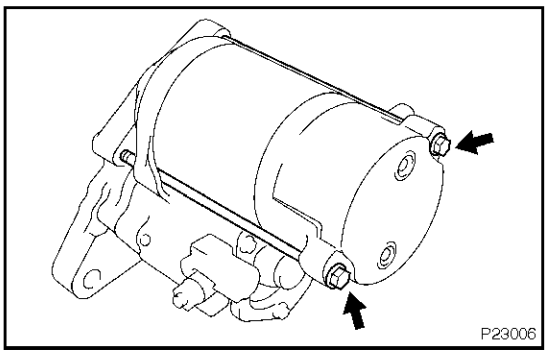
HINT

At the time of reassembly, use high–temperature grease to lubricate the bearings, gears, return spring and steel ball when assembling the starter




**1. REMOVE FIELD FRAME AND ARMATURE**

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal
**Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)**



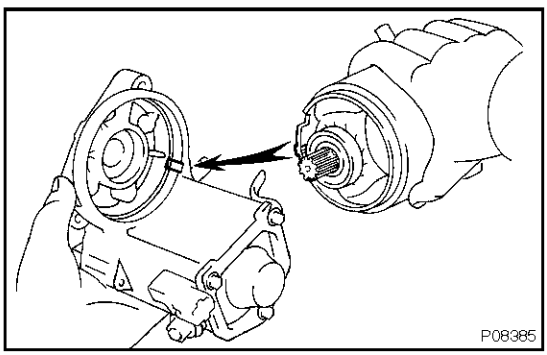

(b) Remove the 2 through bolts
**Torque:**
**1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)**
**2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)**

(c) Pull out the field frame with the armature from the magnetic switch assembly

(d) Remove the O–ring

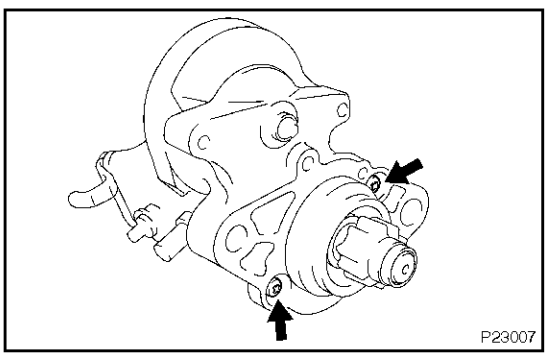
HINT

At the time of reassembly, use a new O–ring




HINT

At the time of reassembly, align the protrusion of the field frame with cutout of the magnetic switch




**2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR**

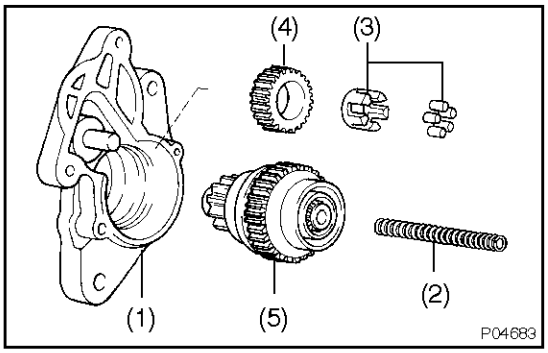
(a) Remove the 2 screws
**Torque:**
**1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)**
**2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)**



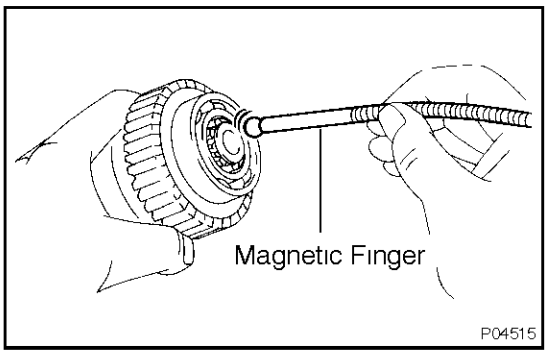
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



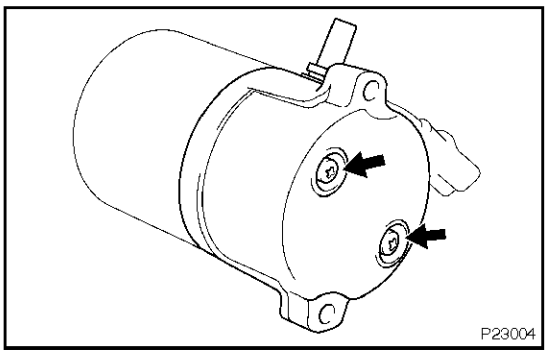



(b) Remove these parts from the magnetic switch assembly
(1) Starter housing
(2) Return spring
(3) Bearing
(4) Idler gear
(5) Starter clutch assembly




**3. REMOVE STEEL BALL**

Using a magnetic finger, remove the steel ball from the clutch shaft hole




**4. REMOVE BRUSH HOLDER**

(a) Remove the 2 screws, 2 O–rings and end cover from the field frame

**Torque:**
**1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.·lbf)**
**2.0 kW type: 3.8 N·m (40 kgf·cm, 35 in.·lbf)**

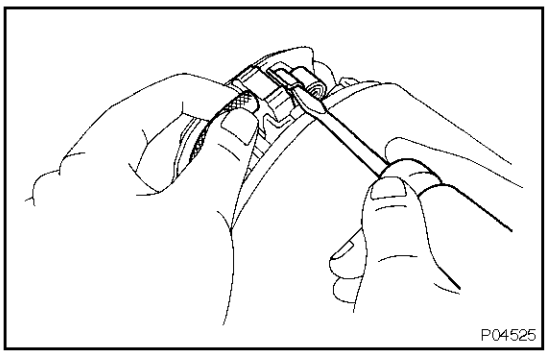
HINT

At the time of reassembly, use new O–rings

(b) Remove the O–ring from the field frame

HINT

At the time of reassembly, use a new O–ring




(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder Disconnect the four brushes and remove the brush holder

**5. REMOVE ARMATURE FROM FIELD FRAME**



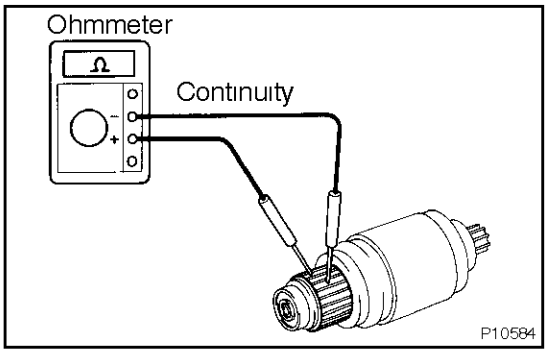
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ST0N8-01

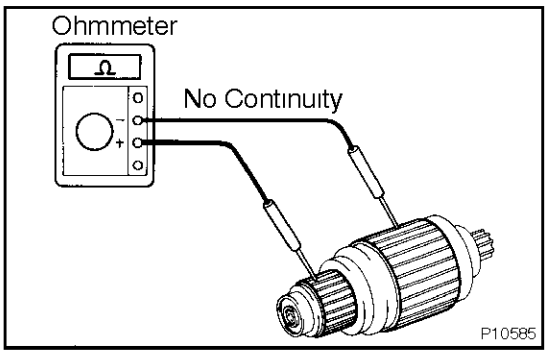
# INSPECTION




**1. INSPECT COMMUTATOR FOR OPEN CIRCUIT**

Using an ohmmeter, check that there is continuity between the segments of the commutator

If there is no continuity between any segment, replace the armature



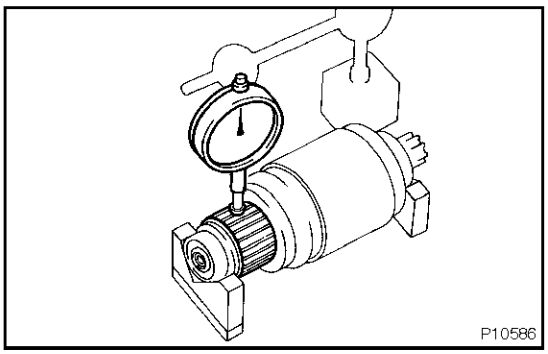

**2. INSPECT COMMUTATOR FOR GROUND**

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core

If there is continuity, replace the armature

**3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES**

If the surface is dirty or burnt, correct it with sandpaper (No 400) or on a lathe



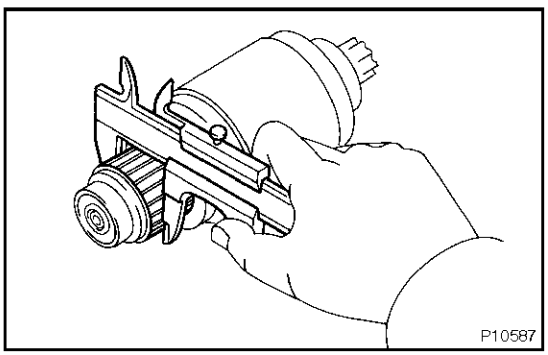

**4. INSPECT COMMUTATOR CIRCLE RUNOUT**

(a) Place the commutator on V–blocks

(b) Using a dial gauge, measure the circle runout

**Maximum circle runout: 0.05 mm (0.0020 in.)**

If the circle runout is greater than maximum, correct it on a lathe

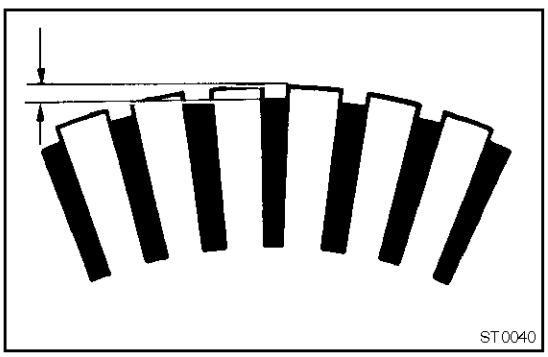



**5. INSPECT COMMUTATOR DIAMETER**

Using vernier calipers, measure the commutator diameter

**Standard diameter:**
**1.4 kW type: 30 mm (1.18 in.)**
**2.0 kW type: 35 mm (1.38 in.)**
**Minimum diameter:**
**1.4 kW type: 29 mm (1.14 in.)**
**2.0 KW type: 34 mm (1.34 in.)**

If the diameter is less than minimum, replace the armature




**6. INSPECT UNDERCUT DEPTH**

Check that the undercut depth is clean and free of foreign materials Smooth out the edge

**Standard undercut depth:**
**1.4 kW type: 0.6 mm (0.024 in.)**
**2.0 kW type: 0.7 mm (0.028 in.)**
**Minimum undercut depth:**
**0.2 mm (0.008 in.)**

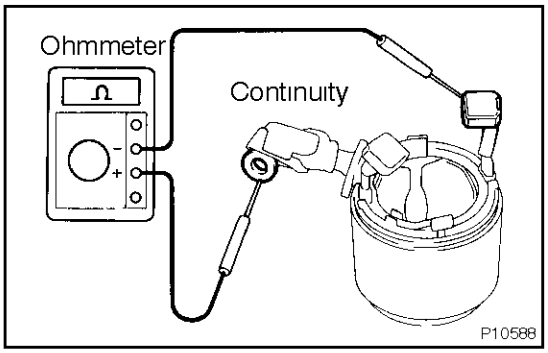
If the undercut depth is less than minimum, correct it with a hacksaw blade



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

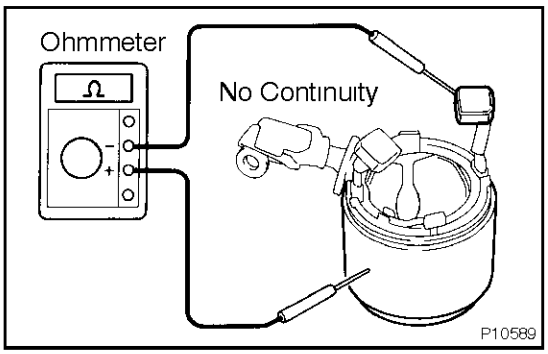





### 7. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead

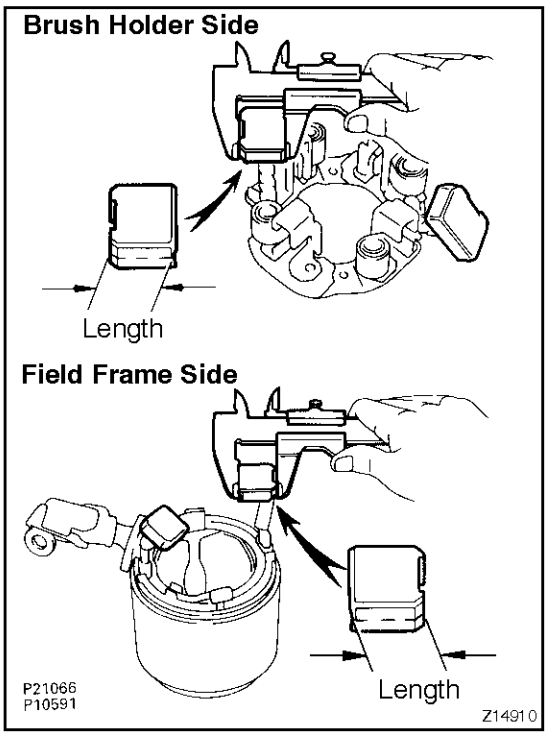
If there is no continuity, replace the field frame




### 8. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame

If there is continuity, repair or replace the field frame




### 9. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length

**Standard length:**

**1.4 kW type:15.5 mm (0.610 in.)**

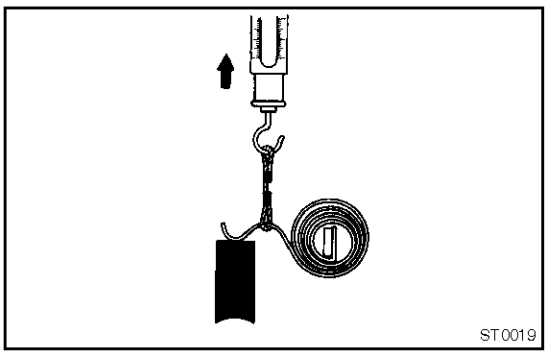
**2.0 kW type:15.0 mm (0.591 in.)**

**Minimum length:**

**1.4 kW type: 10.0 mm (0.394in.)**

**2.0 KW type: 9.0 mm (0.354 in.)**

If the length is less than minimum, replace the brush holder and field frame




### 10. INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush

**Standard spring installed load:**

**1.4 kW type:**

**17.6 – 23.5 N (1.79 – 2.41 kgf, 4.0 – 5.3 lbf)**

**2.0 kW type:**

**21.5 – 27.5 N (2.19 – 2.80 kgf, 4.8 – 6.2 lbf)**



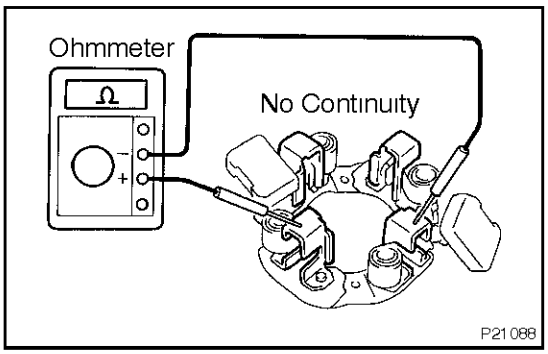
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**Minimum spring installed load:**
**1.4 kW type: 11.8 N (1.20 kgf, 2.7 lbf)**
**2.0 kW type: 12.7 N (1.29 kgf, 2.9 lbf)**

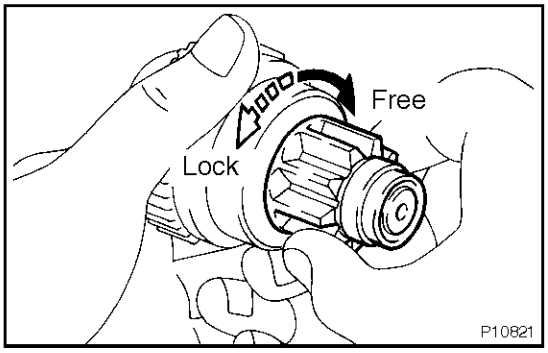
If the installed load is less than minimum replace the brush springs




### 11. INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders

If there is continuity, repair or replace the brush holder




### 12. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage

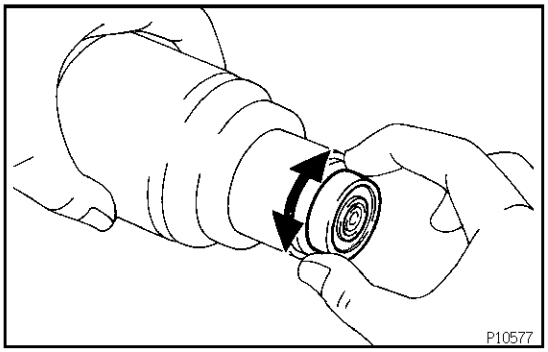
If damaged, replace the gear or clutch assembly

If damaged, also check the drive plate ring gear for wear or damage

### 13. INSPECT CLUTCH PINION GEAR

Hold the starter clutch and rotate the pinion gear clockwise, and check that it turns freely Try to rotate the pinion gear counter-clockwise and check that it locks

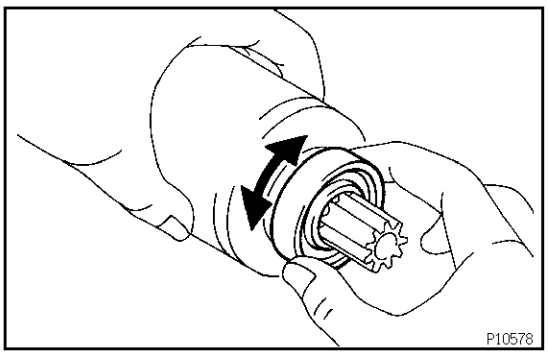
If necessary, replace the clutch assembly




### 14. INSPECT REAR BEARING

Turn each bearing by hand while applying inward force

If resistance is felt or the bearing sticks, replace the bearing




### 15. INSPECT FRONT BEARING

Turn each bearing by hand while applying inward force

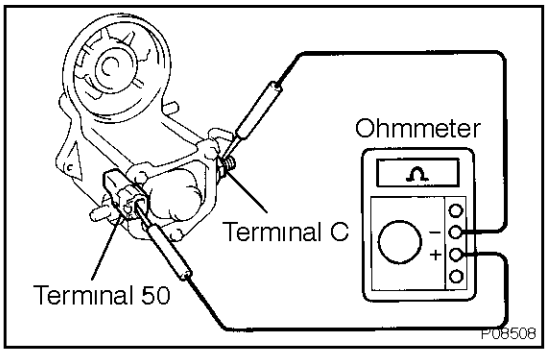
If resistance is felt or the bearing sticks, replace the bearing



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

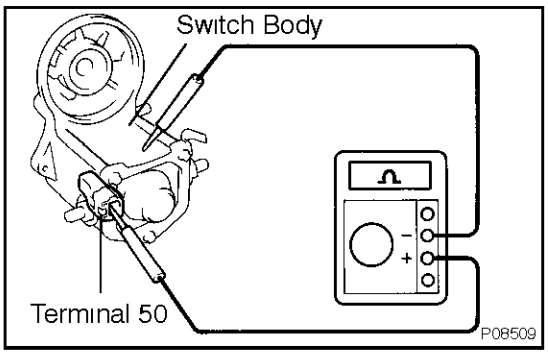





**16. DO PULL–IN COIL OPEN CIRCUIT TEST**

Using an ohmmeter, check that there is continuity between terminals 50 and C

If there is no continuity, check and replace the magnetic switch




**17. DO HOLD–IN COIL OPEN CIRCUIT TEST**

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body

If there is no continuity, replace the magnetic switch

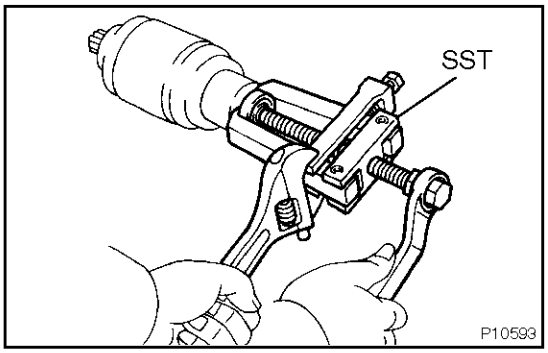


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ST0N9-01

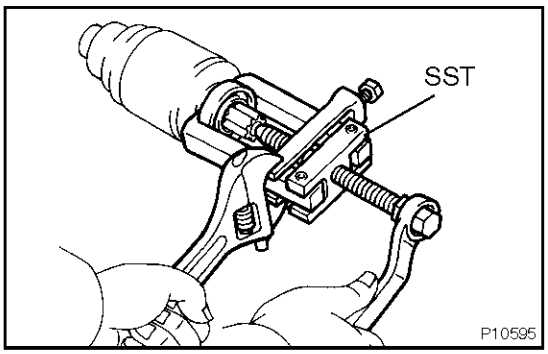



# REPLACEMENT

## 1. REPLACE REAR BEARING

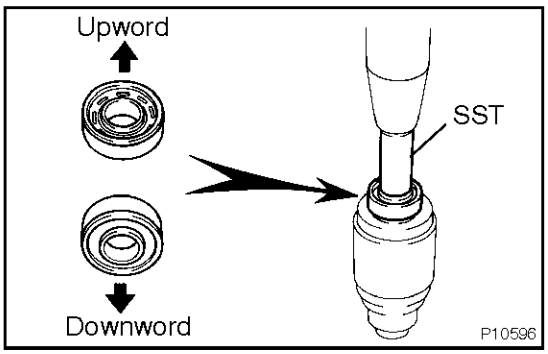
(a) Using SST, remove the bearing
SST 09286–46011

(b) Using a press, press in a new rear bearing




## 2. REPLACE FRONT BEARING

(a) Using SST, remove the bearing
SST 09286–46011

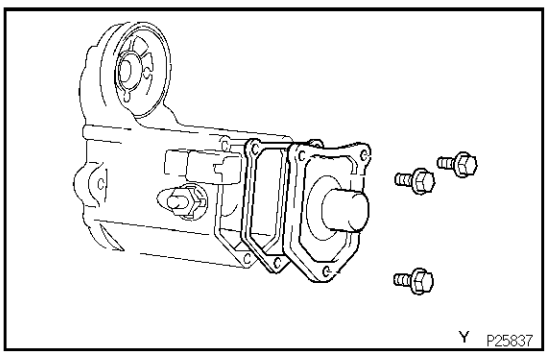



(b) Using a press, press in a new front bearing

**NOTICE:**

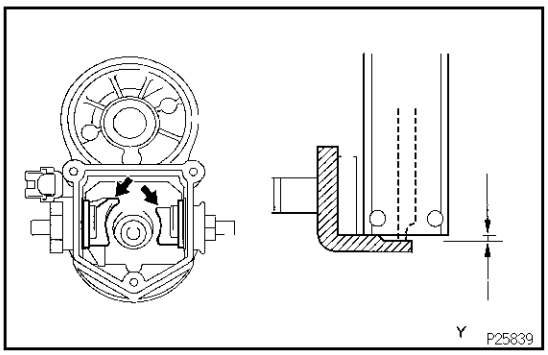
**Be careful of the bearing installation direction.**

SST 09820–00030




## 3. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp, end cover, gasket and plunger




## 4. INSPECT CONTACT PLATE FOR WEAR

Using vernier calipers, measure the contact plate for depth of wear

**Maximum wear: 0.9 mm (0.035 in.)**

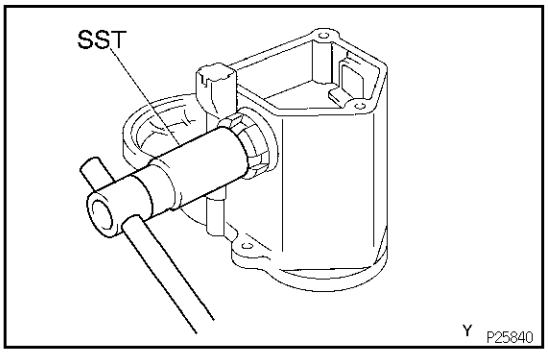
If the depth of wear is greater than the maximum, replace the contact plate



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



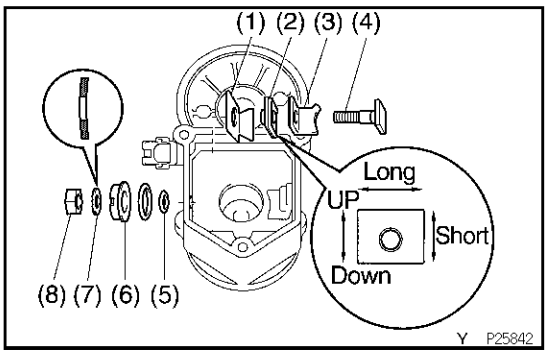



**5. REMOVE TERMINAL KIT PARTS**

(a) Using SST, loosen the terminal nuts
SST 09810–38140

(b) Terminal C
Remove the terminal nut, wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside)

(c) Terminal 30
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper




**6. REINSTALL TERMINAL KIT PARTS**

(a) Terminal 30
Install these new parts
(1) Insulation paper
(2) Terminal insulator (inside)
(3) Contact plate
(4) Terminal bolt
(5) O–ring
(6) Packing and terminal insulator (outside)
Install the packing to the terminal insulator, and install them

HINT

Match the protrusion of the insulator with the indentation of the housing

(7) Wave washer
(8) Terminal nut

**NOTICE:**

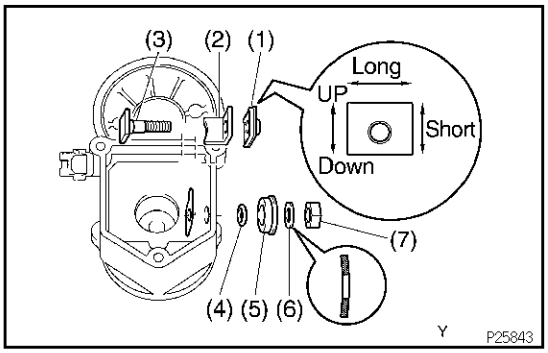
**Be careful to install the terminal insulators (inside) and wave washers in the correct direction.**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

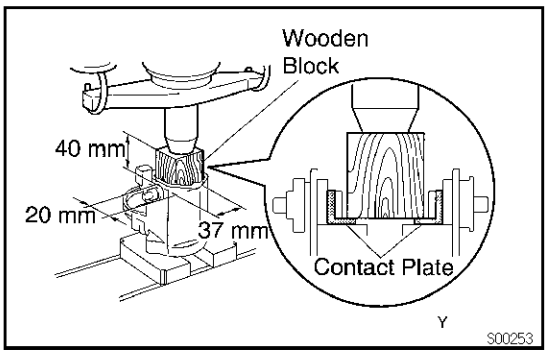





(b) Terminal C
Install these new parts
(1) Terminal insulator (inside)
(2) Contact plate
(3) Terminal bolt
(4) O–ring
(5) Terminal insulator (outside)
(6) Wave washer
(7) Terminal nut

**NOTICE:**
**Be careful to install the terminal insulators (inside) and wave washers in the correct direction.**

(c) Temporarily tighten the terminal nuts




**7. TIGHTEN TERMINAL NUT**

(a) Put a wooden block on the contact plate and press it down with a hand press
**Dimensions of wooden block:**
**20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)**
**Press force:**
**981 N (100 kgf, 221 lbf)**

**NOTICE:**
**Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.**

**Gauge pressure:**

$$(\text{kgf/cm}^2) = \frac{100\ \text{kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14\ (\pi)}$$

$$(\text{psi}) = \frac{221\ \text{lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3\ 14\ (\pi)}$$

**(kPa) = (kgf/cm²) x 98 1**

**(kPa) = (psi) x 6.9**

V06796

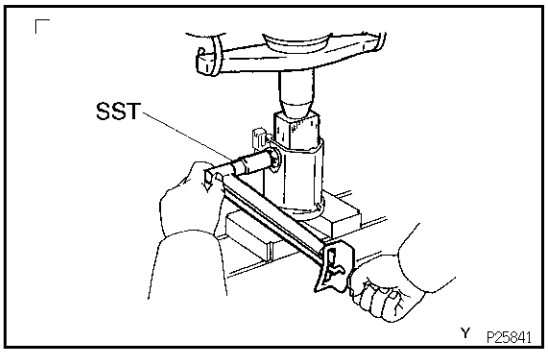
If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut



Brought to you by BirfMark
Version 1.11 - 03/16/2010

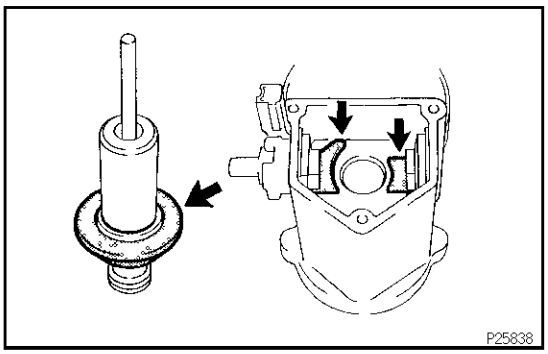
Brought to you by BirfMark






(b) Using SST, tighten the nuts to the specified torque
SST 09810–38140
**Torque: 17 N·m (173 kgf·cm, 12 ft·lbf)**

**NOTICE:**
**If the nut is over tightened, it may cause cracks on the inside of the insulator.**




**8. CLEAN CONTACT SURFACES OF CONTACT PLATE AND PLUNGER**

Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag

**9. REINSTALL MAGNETIC SWITCH END COVER**

Install the plunger, new gasket, end cover and lead clamp with the 3 bolts

**Torque:**
**1.4 kW type: 2.5 N·m (25 kgf·cm, 22 in.·lbf)**
**2.0 kW type: 3.6 N·m (37 kgf·cm, 32 in.·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ST08G 03

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page ST–5).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

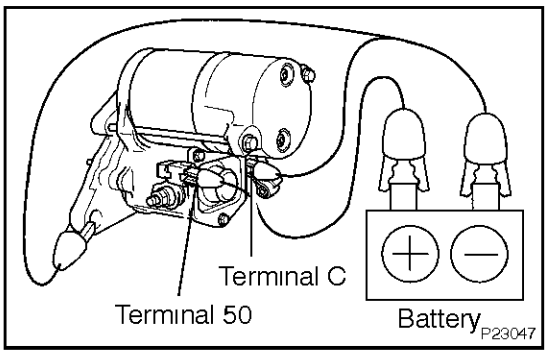


ST08H–03

# TEST

**NOTICE:**

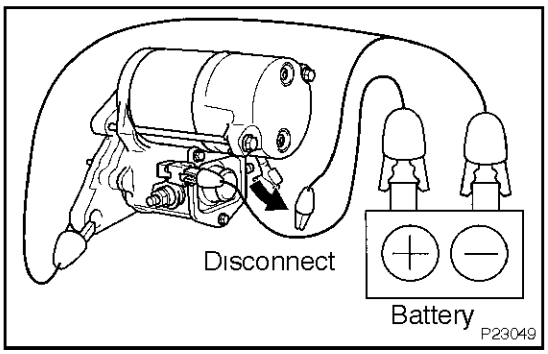
**These tests must be performed within 3 to 5 seconds to avoid burning out the coil.**




**1. DO PULL–IN TEST**

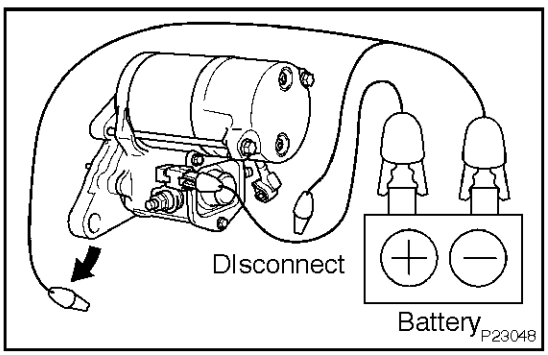
(a) Disconnect the field coil lead wire from terminal C

(b) Connect the battery to the magnetic switch as shown Check that the clutch pinion gear moves outward




**2. DO HOLD–IN TEST**

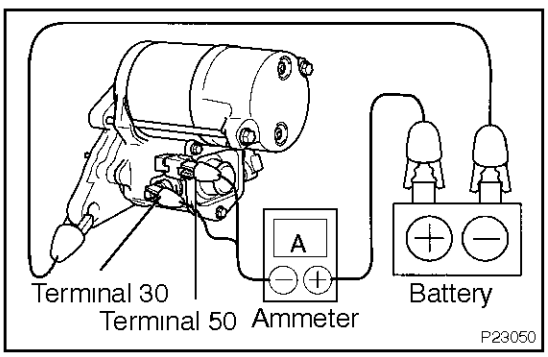
With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C Check that the pinion gear remains out




**3. INSPECT CLUTCH PINION GEAR RETURN**

(a) Disconnect the negative (–) lead from the switch body

(b) Check that the clutch pinion gear returns inward




**4. DO NO–LOAD PERFORMANCE TEST**

(a) Connect the battery and ammeter to the starter as shown

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out Check that the ammeter shows the specified current

**Specified current:**

**1.4 kW type**

**At 11.5V: 90 A or less**

**2.0 kW type**

**At 11.5V: 100 A or less**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



ST0KT-01

# INSTALLATION

**Installation is in the reverse order of removal (See page ST–4).**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



# TRANSFER SYSTEM

TR0AX-01

## PRECAUTION

- When working with FIPG material, you must observe the following.
- Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.



Brought to you by BirfMark
Version 1.11 - 03/16/2010

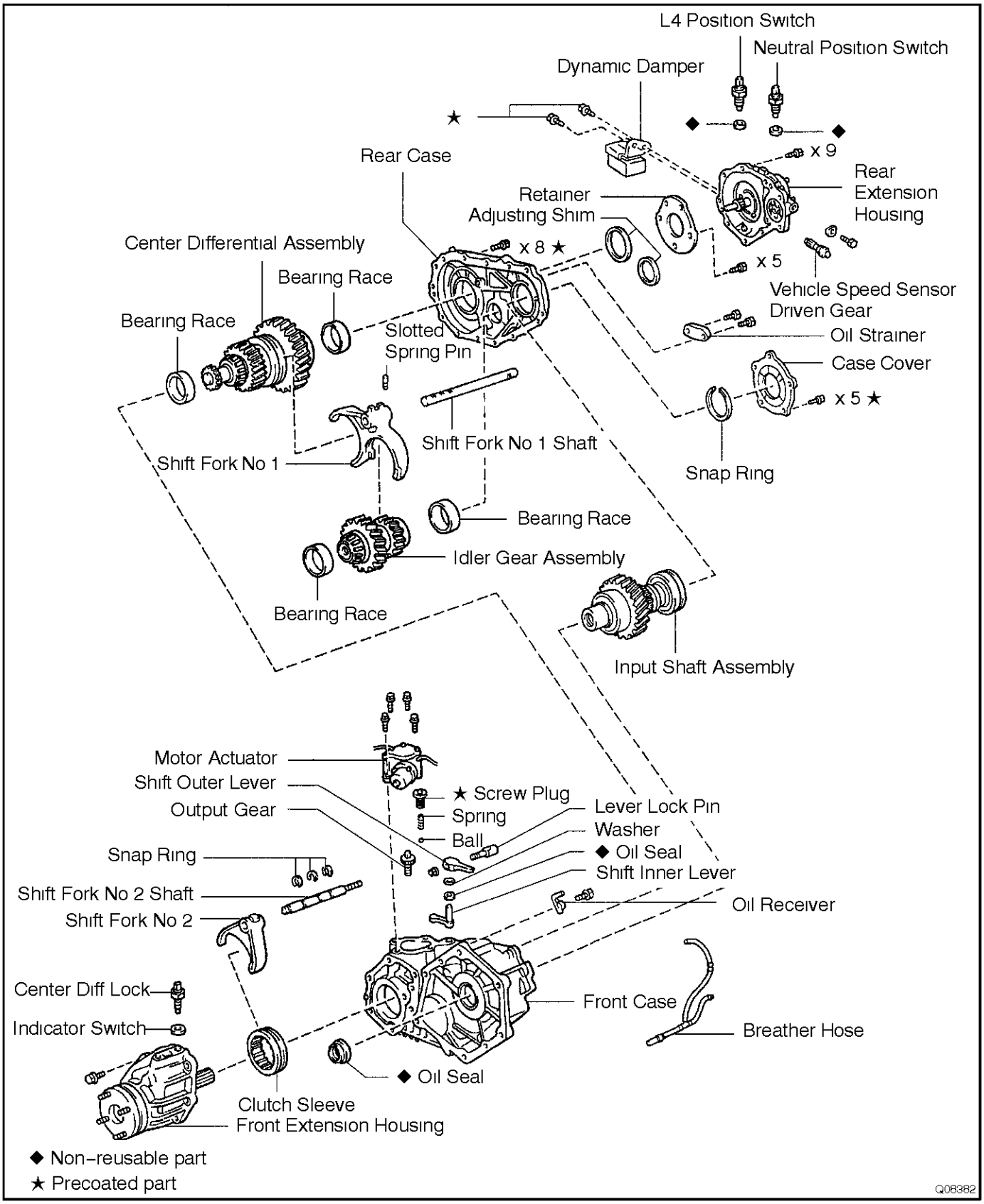
Brought to you by BirfMark



# TRANSFER ASSEMBLY

## COMPONENTS

TR0B2-01






Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0CM 01

# DISASSEMBLY

**1. REMOVE BREATHER HOSE**

**2. REMOVE DYNAMIC DAMPER**

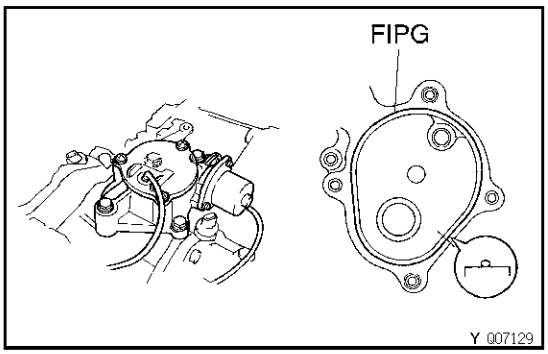
Remove the 2 bolts and dynamic damper

HINT

At the time of reassembly, apply adhesive to the bolt threads

**Adhesive: Part No.08833–00070, THREE BOND 1324 or equivalent**

**Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**




**3. REMOVE MOTOR ACTUATOR**

Remove the 4 bolts and motor actuator

HINT

At the time of reassembly, please refer to the following items

- Set the motor actuator in differential lock condition
- Apply FIPG to the front case

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**

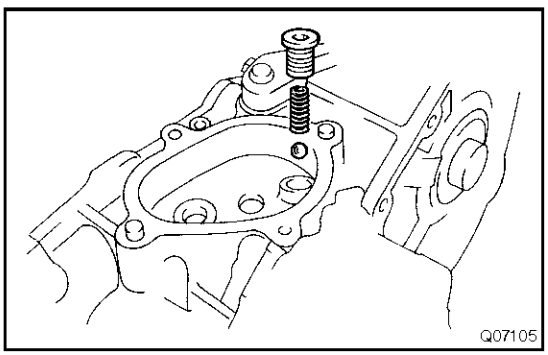
**4. REMOVE OUTPUT GEAR FROM FRONT CASE**

HINT

At the time of reassembly apply gear oil to the output gear

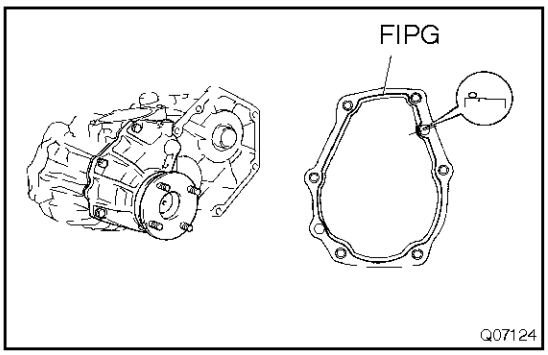
**NOTICE:**

**At the time of reassembly, do not turn the output gear.**




**5. REMOVE SCREW PLUG, SPRING AND BALL**

(a) Using a torx socket wrench (T40), remove the screw plug




HINT

At the time of reassembly, apply liquid sealer to the screw plug

**Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

**Torque:19 N·m (190 kgf·cm, 14 ft·lbf)**

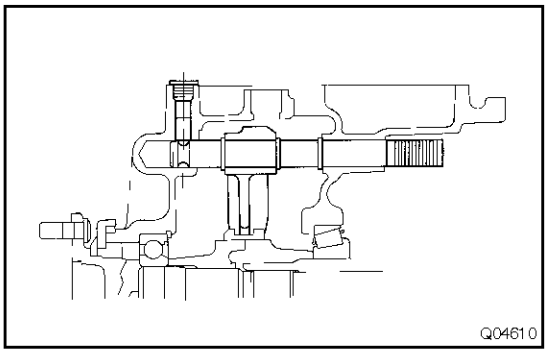
(b) Using a magnetic finger, remove the spring and ball



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**6. REMOVE TRANSFER INDICATOR SWITCH**

Remove the Center Diff Lock indicator switch, L4 position switch, Neutral position switch and 3 gaskets

**Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**

**7. REMOVE FRONT EXTENSION HOUSING**

Remove the 6 bolts and front extension housing

HINT

If necessary, tap the front extension housing with a plastic hammer

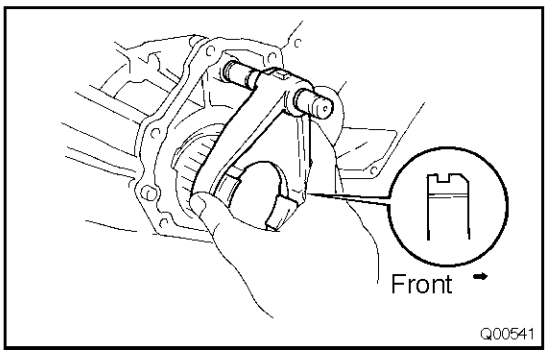
HINT

At the time of reassembly, please refer to the following items

- Set the clutch sleeve in differential lock condition
- Apply FIPG to the front case

  **FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

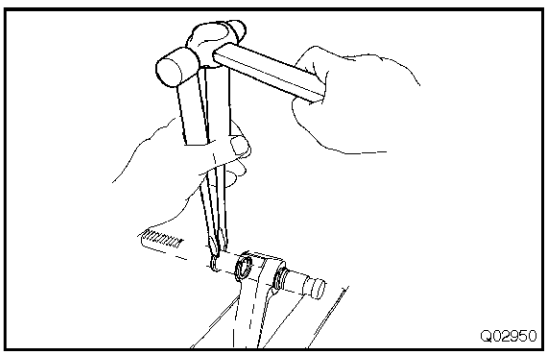
  **Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**




**8. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 SHAFT AND SHIFT FORK NO.2**

HINT

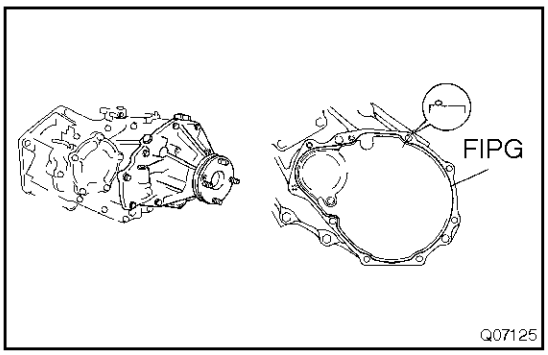
At the time of reassebly, make sure to install the clutch sleeve in the correct direction




**9. SEPARATE SHIFT FORK NO.2 SHAFT AND SHIFT FORK NO.2**

(a) Using 2 screwdrivers and a hammer, tap out the 3 snap rings from the shift fork No 2 shaft

(b) Separate the shift fork No 2 shaft and shift fork No 2




**10. REMOVE REAR EXTENSION HOUSING**

Remove the 9 bolts and rear extension housing

HINT

If necessary, tap the rear extension housing with a plastic hammer

HINT

At the time of reassembly, apply FIPG to the rear case

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

**Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

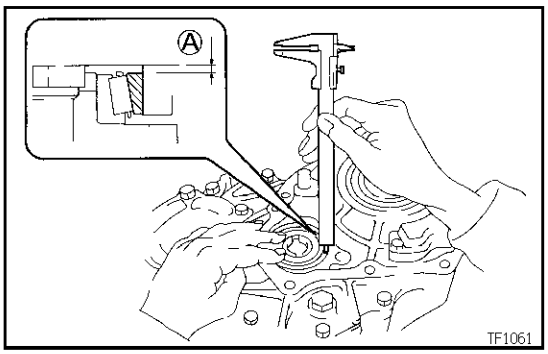
Brought to you by BirfMark



### 11. REMOVE RETAINER FROM REAR CASE

Remove the 5 bolts and retainer

**Torque: 39 N·m (400 kgf·cm, 28 ft·lbf)**



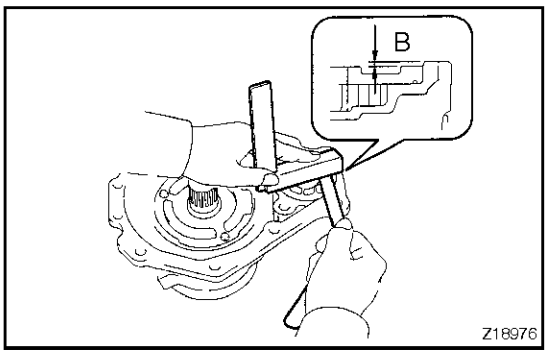

### 12. REMOVE ADJUSTING SHIM

HINT

At the time of assembly, select adjusting shims for the idler gear rear taper roller bearing

(a) Using vernier calipers, measure dimension A

(b) Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement




(c) Using a steel straight edge and feeler gauge, measure the clearance of dimension B

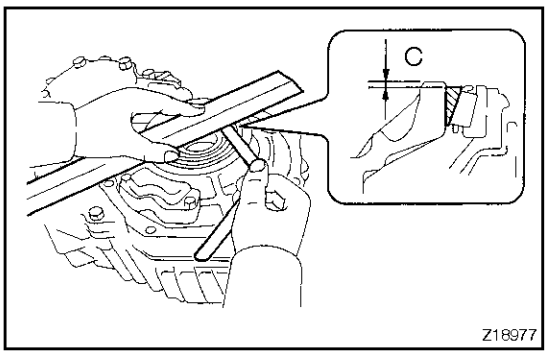
(d) Calculate the required thickness of the adjusting shim

**Thickness:**

**Dimension A + Dimension B + (0.022 – 0.049 mm, 0.0009 – 0.0019 in.)**

(e) From the following table, select a shim so that its thickness is within the range of the calculation

| Mark | Thickness mm (in ) | Mark | Thickness mm (in ) |
|---|---|---|---|
| 2 | 0 30 (0 0118) | 8 | 3 20 (0 1260) |
| 3 | 0 45 (0 0177) | 9 | 3 40 (0 1339) |
| 4 | 2 40 (0 0945) | 10 | 3 60 (0 1417) |
| 5 | 2 60 (0 1024) | 11 | 3 80 (0 1496) |
| 6 | 2 80 (0 1102) | 12 | 4 00 (0 1575) |
| 7 | 3 00 (0 1181) | 13 | 0 55 (0 0216) |




HINT

At the time of reassembly, select adjusting shims for the output shaft taper roller bearing

(f) Using a steel straight edge and feeler gauge, measure the clearance of dimension C

(g) Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement

(h) Calculate the required thickness of the adjusting shim



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



**Thickness:**

**Dimension C + (0.014 – 0.039 mm, 0.0006 – 0.0015 in.)**

(ı) From the followıng table, select a shım so that ıts thıckness ıs wıthın the range of the calculatıon

| Mark | Thıckness mm (ın ) | Mark | Thıckness mm (ın ) |
|---|---|---|---|
| B | 0 30 (0 0118) | H | 1 80 (0 0709) |
| C | 0 45 (0 0177) | J | 2 00 (0 0787) |
| D | 1 00 (0 0394) | K | 2 20 (0 0866) |
| E | 1 20 (0 0472) | L | 2 40 (0 0945) |
| F | 1 40 (0 0551) | M | 2 60 (0 1024) |
| G | 1 60 (0 0630) | N | 0 55 (0 0216) |

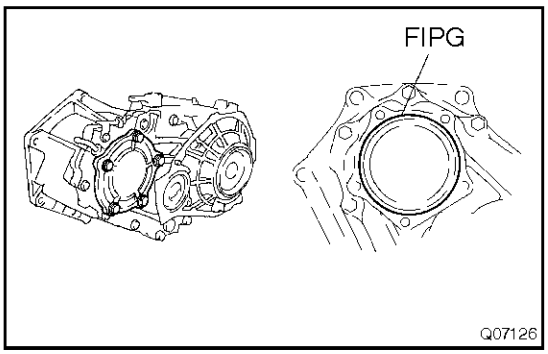
**13. REMOVE OIL STRAINER FROM REAR CASE**

Remove the 2 set bolts and oıl straıner

**Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)**

**14. REMOVE CASE COVER**

(a) Remove the 5 bolts




HINT

At the tıme of reassembly, apply lıquıd sealer to the bolt threads

**Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

**Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)**

(b) Usıng a brass bar and hammer, tap the case cover and remove ıt

HINT

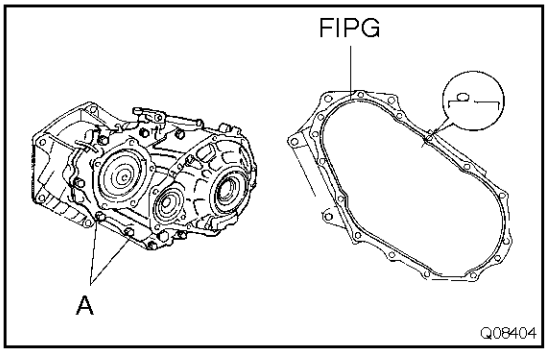
At the tıme of reassembly, apply FIPG to the rear case

**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**

**15. SEPARATE FRONT CASE AND REAR CASE**

(a) Usıng a snap rıng expander, remove the snap rıng from the rear case

(b) Remove the 8 bolts




HINT

At the tıme of reassembly, apply lıquıd sealer to the ”A” bolt threads

**Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

**Torque:37 N·m (380 kgf·cm, 27 ft·lbf)**

(c) Usıng a brass bar and hammer, tap the rear case and separate ıt

HINT

At the tıme of reassembly, apply FIPG to the front case

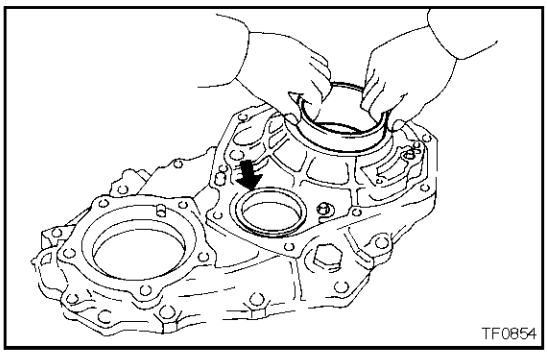


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



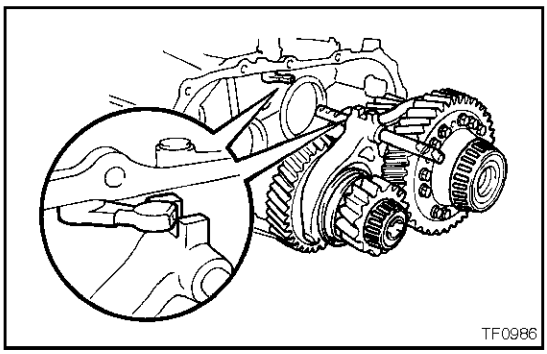
**FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent**



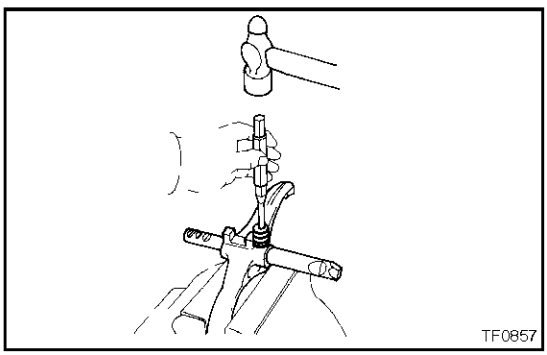

**16. REMOVE 2 BEARING RACES FROM REAR CASE**

**17. REMOVE INPUT SHAFT ASSEMBLY**

Using a plastic hammer, remove the input shaft assembly



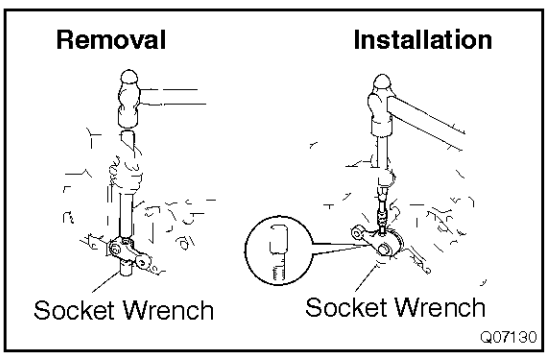

**18. REMOVE IDLER GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY, SHIFT FORK NO.1 AND SHIFT FORK NO.1 SHAFT FROM FRONT CASE**




**19. SEPARATE SHIFT FORK NO.1 AND SHIFT FORK NO.1 SHAFT**

(a) Using a pin punch and hammer, drive out the slotted spring pin

(b) Separate the shift fork No 1 and shift fork No 1 shaft




**20. REMOVE SHIFT OUTER LEVER AND INNER LEVER**

(a) Remove the nut and washer from the shift outer lever
**Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)**

(b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin

(c) Remove the shift outer lever, washer and inner lever from the front case

**21. REMOVE OIL RECEIVER FROM FRONT CASE**

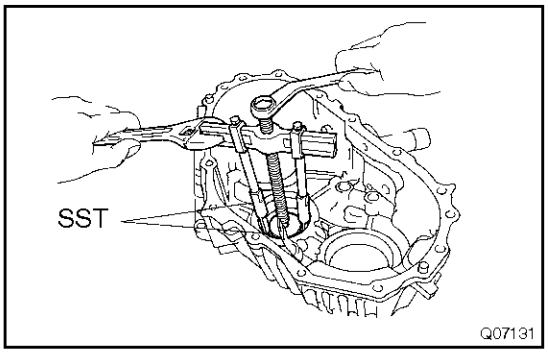
Remove the bolt and oil receiver
**Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

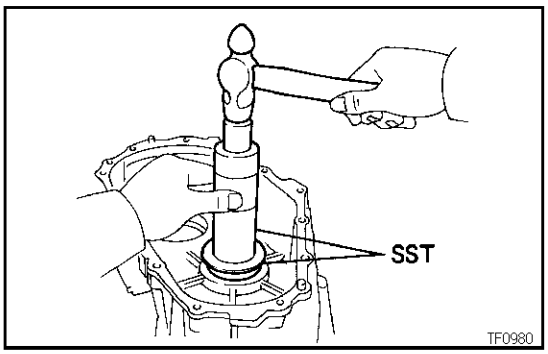
Brought to you by BirfMark



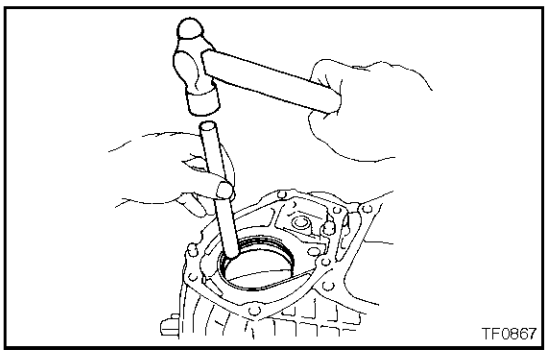



**22. REMOVE 2 BEARING RACES FROM FRONT CASE**

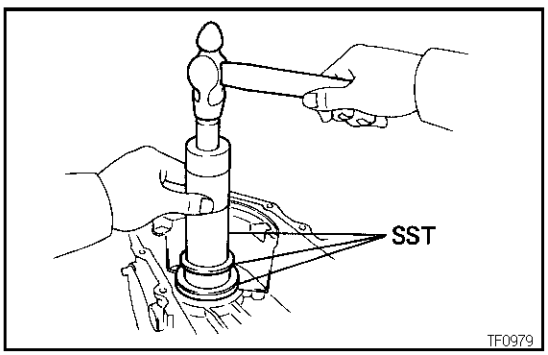
(a) Using SST, remove the bearing race (for idler gear)
SST 09950–40010, 09950–60010 (09951–00320)



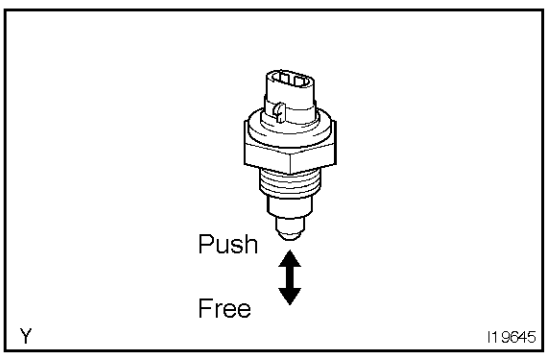

HINT
At the time of reassembly, please refer to the following item
Using SST and a press, install the bearing race (for idler gear)
SST 09316–60011 (09316–00011, 09316–00041)




(b) Using a brass bar and hammer, remove the bearing race (for output shaft)




HINT
At the time of reassembly, please refer to the following item
Using SST and a press, install the bearing race (for the out put shaft)
SST 09316–20011, 09316–60011 (09316–00011, 09316–00031)




**23. INSPECT TRANSFER INDICATOR SWITCH**

Check that there is continuity between the terminals, as shown

| Switch Position | Specified |
|---|---|
| Push | Continuity |
| Free | No continuity |

If continuity is not as specified, replace the switch



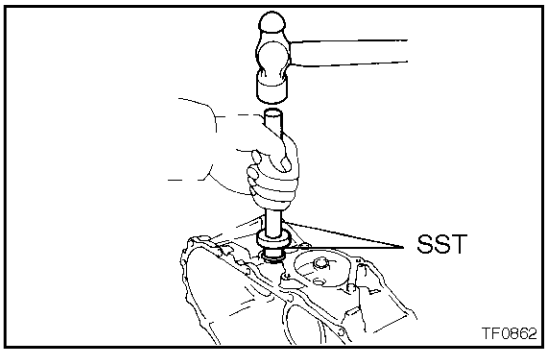
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0CN 01

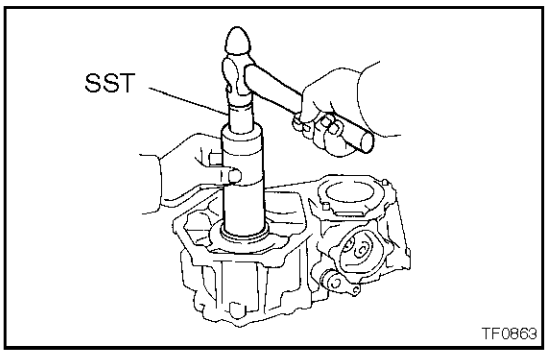
# REPLACEMENT




## 1. REPLACE SHIFT LEVER OIL SEAL

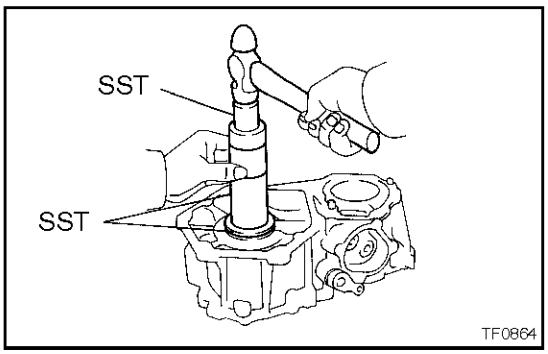
(a) Using a screwdriver, pry out the oil seal

(b) Using SST and a hammer, drive in a new oil seal
SST 0608–00081, 09950–70010 (09951–07150)




## 2. REPLACE INPUT SHAFT OIL SEAL

(a) Using SST and a hammer, drive out the oil seal
SST 09316–60011 (09316–00011)




(b) Using SST and a hammer, drive in a new oil seal
SST 09316–60011 (09316–00011, 09316–00031)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0B4-01

# REASSEMBLY

**Reassembly is in the reverse order of disassembly (See page TR–4).**

HINT

Coat all of the sliding and rotating surfaces with gear oil before assembly



Brought to you by BirfMark
Version 1.11 - 03/16/2010

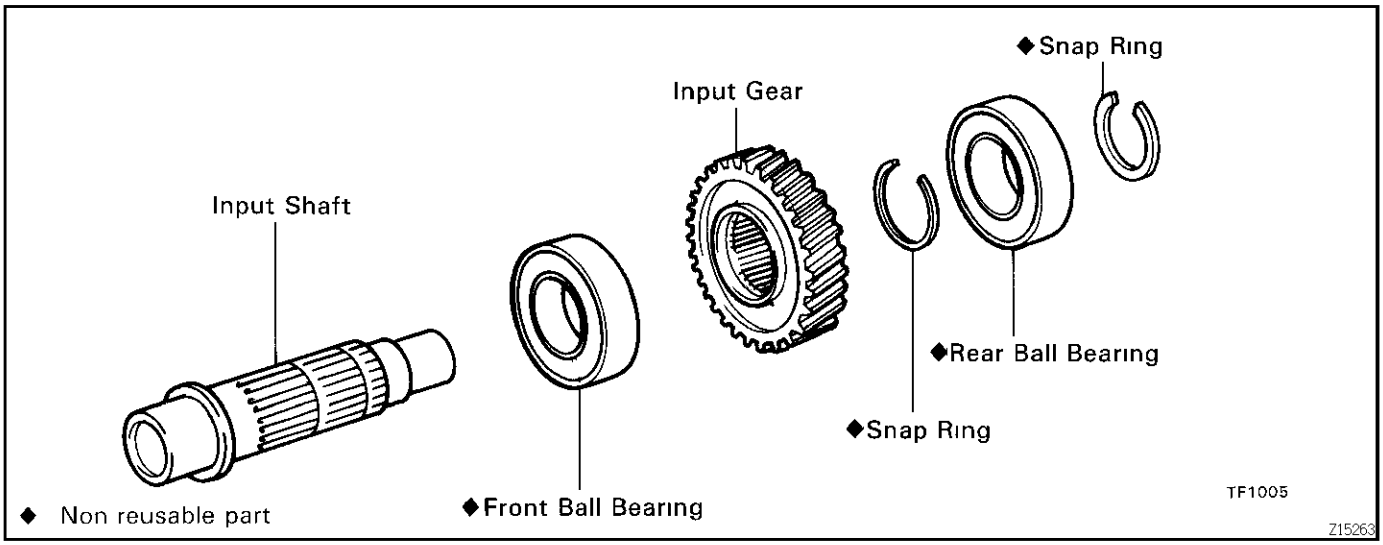
Brought to you by BirfMark



# INPUT SHAFT

## COMPONENTS

TR0B5-01





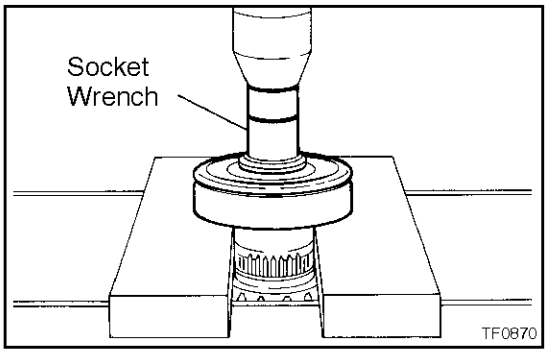

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0B6-01

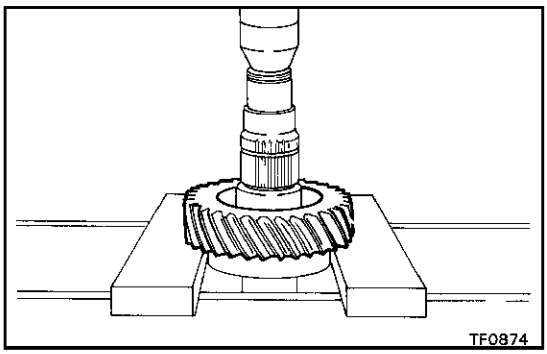
# DISASSEMBLY




**1. REMOVE REAR BALL BEARING**

(a) Using a snap ring expander, remove the snap ring

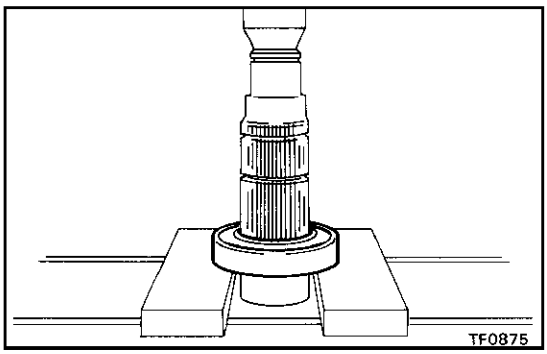
(b) Using a socket wrench and press, remove the rear ball bearing




**2. REMOVE INPUT GEAR**

(a) Using a snap ring expander, remove the snap ring

(b) Using a press, remove the input gear




**3. REMOVE FRONT BALL BEARING**

Using a press, remove the front ball bearing



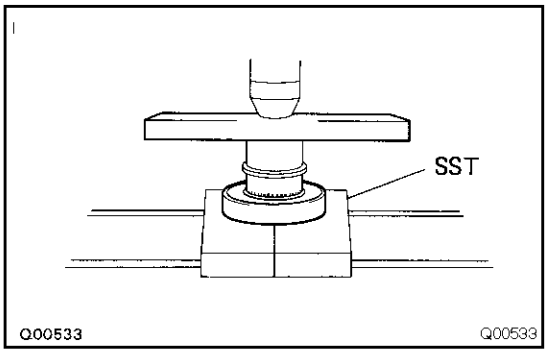
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0B7-01

# REASSEMBLY



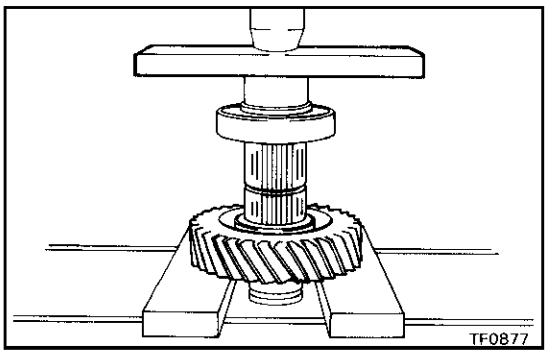

HINT

Coat all of the sliding and rotating surfaces with gear oil before assembly

**1. INSTALL FRONT BALL BEARING**

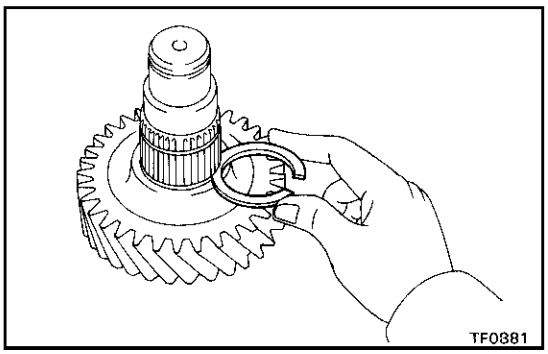
Using SST and a press, install a new front ball bearing

SST 09527-30010




**2. INSTALL INPUT GEAR**

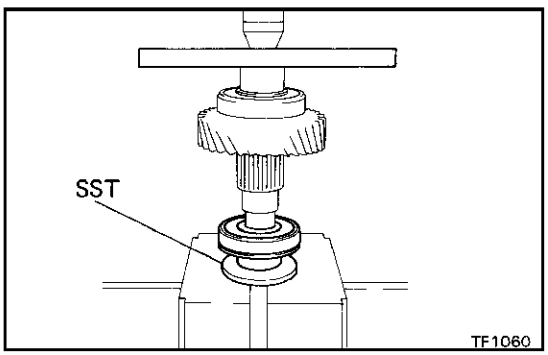
(a) Using a press, install the input gear




(b) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) | Mark | Thickness mm (in.) |
|---|---|---|---|
| A | 2.00 (0.0787) | F | 2.50 (0.0984) |
| B | 2.10 (0.0827) | G | 2.60 (0.1024) |
| C | 2.20 (0.0866) | H | 2.70 (0.1063) |
| D | 2.30 (0.0906) | J | 2.80 (0.1102) |
| E | 2.40 (0.0945) | – | – |

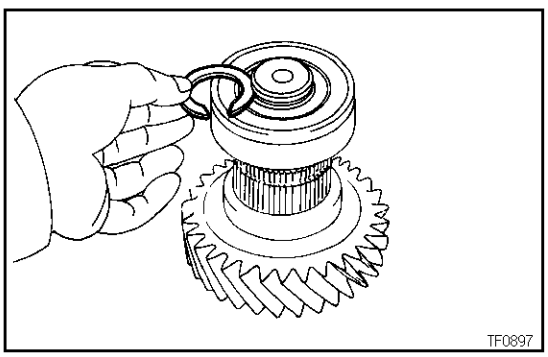
(c) Using a snap ring expander, install a new snap ring




**3. INSTALL REAR BALL BEARING**

(a) Using SST and a press, install a new rear ball bearing

SST 09316-60011 (09316-00031)




(b) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) |
|---|---|
| A | 2.00 (0.0787) |
| B | 2.10 (0.0827) |
| C | 2.20 (0.0866) |
| D | 2.30 (0.0906) |
| E | 2.40 (0.0945) |

(c) Using a snap ring expander, install a new snap ring



Brought to you by BirfMark
Version 1.11 - 03/16/2010

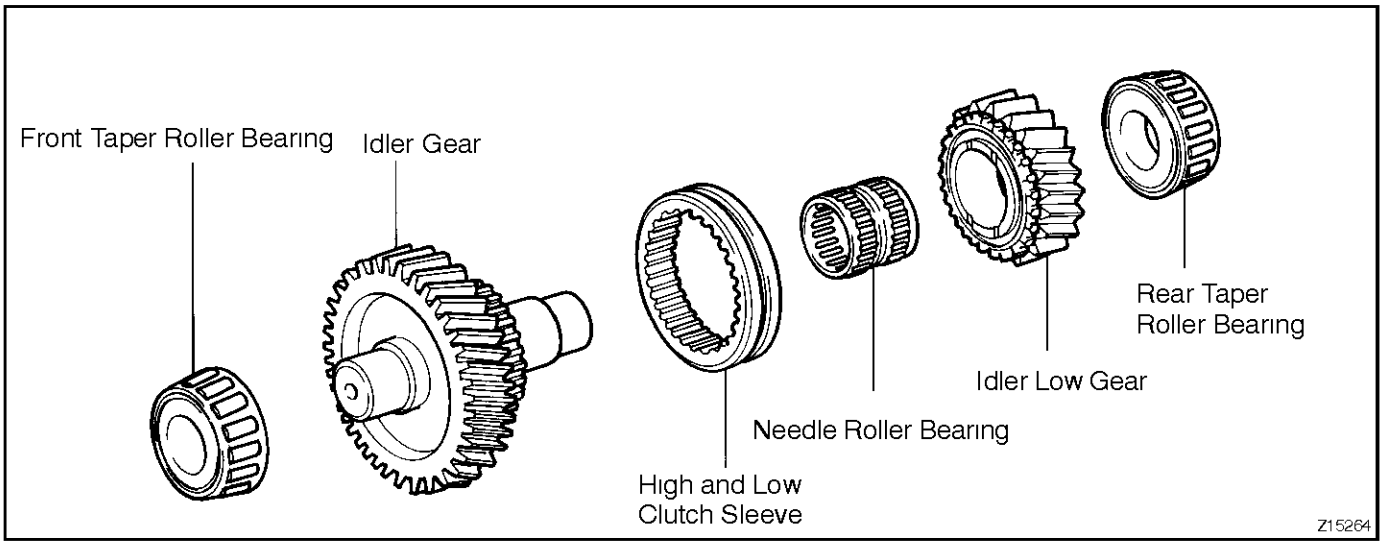
Brought to you by BirfMark



# IDLER GEAR

## COMPONENTS

TR0B8-01





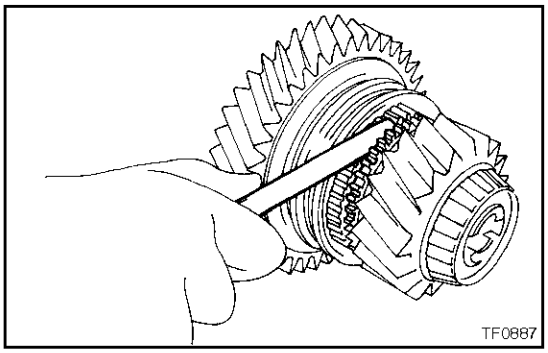

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0B9-01

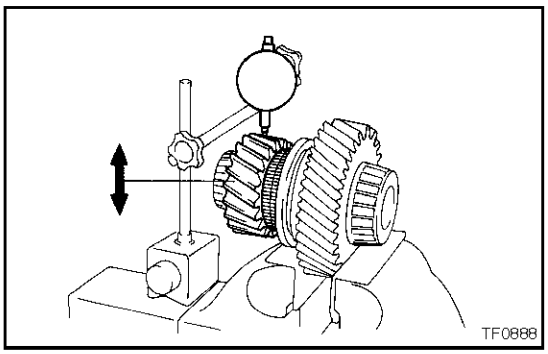
# DISASSEMBLY




**1. INSPECT IDLER LOW GEAR RADIAL AND THRUST CLEARANCE**

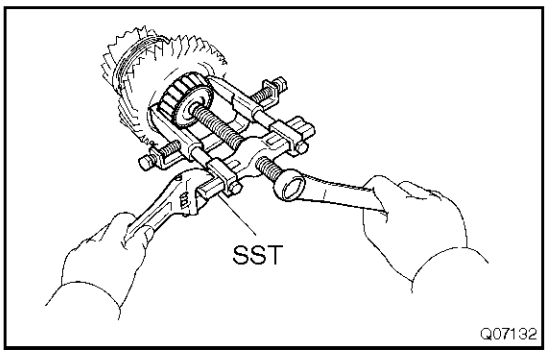
(a) Using a feeler gauge, measure the idler low gear thrust clearance

**Standard clearance:**
**0.125–0.275 mm (0.0049–0.0108 in.)**
**Maximum clearance:**
**0.275 mm (0.0108 in.)**




(b) Using a dial indicator, measure the idler low gear radial clearance

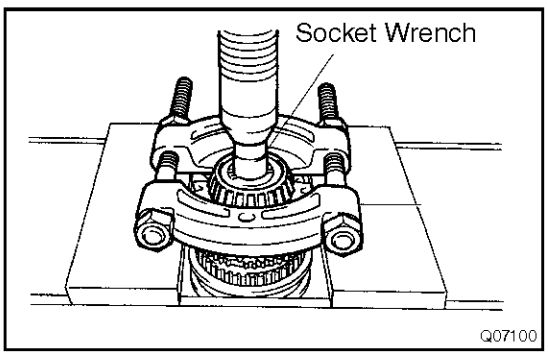
**Standard clearance:**
**0.015–0.068 mm (0.0006–0.0027 in.)**
**Maximum clearance:**
**0.068 mm (0.0027 in.)**




**2. REMOVE FRONT TAPER ROLLER BEARING**

Using SST, remove the front taper roller bearing

SST 09950–40010




**3. REMOVE REAR TAPER ROLLER BEARING**

Using SST, a press and socket wrench, remove the rear taper roller bearing

SST 09950–00020

**4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEARING FROM IDLER GEAR**

**5. REMOVE HIGH AND LOW CLUTCH SLEEVE FROM IDLER GEAR**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BA–01

# REASSEMBLY

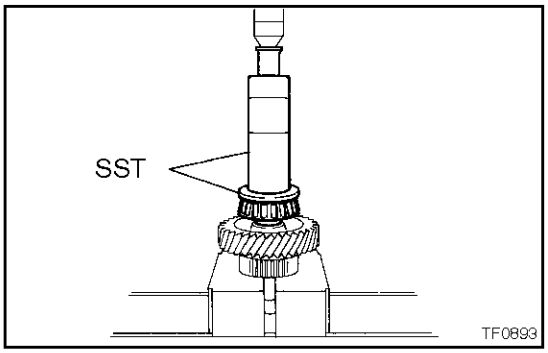
HINT

Coat all of the sliding and rotating surfaces with gear oil before assembly

**1. INSTALL FRONT TAPER ROLLER BEARING**

Using SST and a press, install the front taper roller bearing

SST 09316–60011 (09316–00011, 09316–00031)




**2. INSTALL HIGH AND LOW CLUTCH SLEEVE**

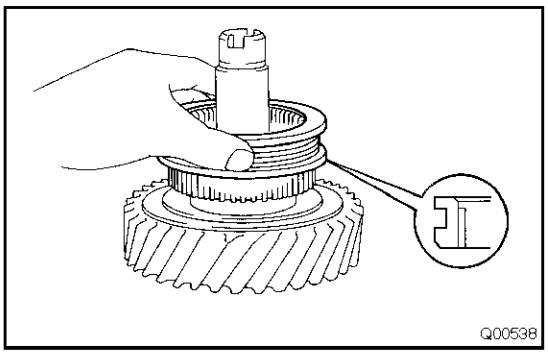
HINT

Make sure to install the high and low clutch sleeve in the correct direction

**3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR TO IDLER GEAR**

(a) Apply gear oil to the needle roller bearing

(b) Install the needle roller bearing and idler low gear



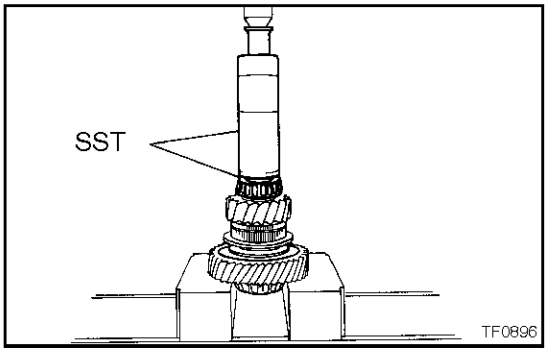

**4. INSTALL REAR TAPER ROLLER BEARING**

Using SST and a press, install the rear taper roller bearing

SST 09316–60011 (09316–00011, 09316–00071)

**5. INSPECT IDLER LOW GEAR RADIAL AND THRUST CLEARANCE**

**(See page TR–16)**






Brought to you by BirfMark
Version 1.11 - 03/16/2010

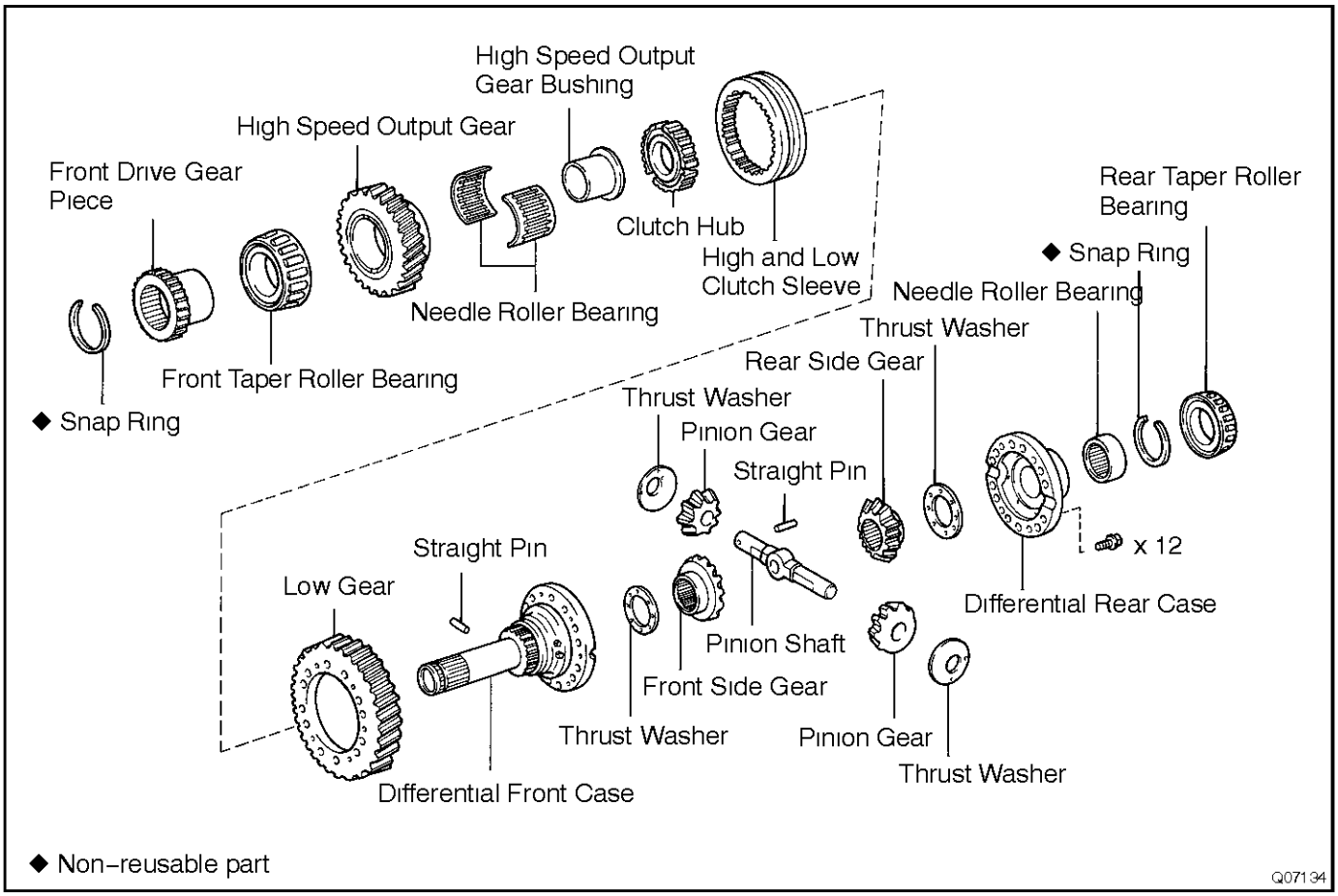
Brought to you by BirfMark



# CENTER DIFFERENTIAL

## COMPONENTS

TR0BB-01





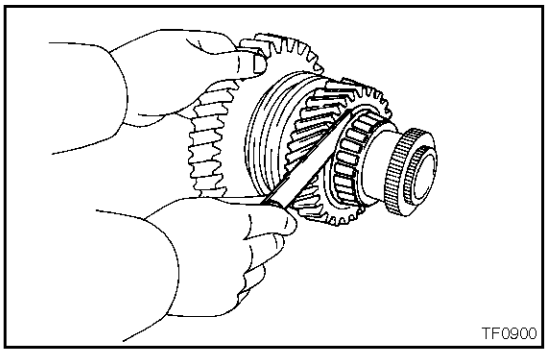

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BC 01

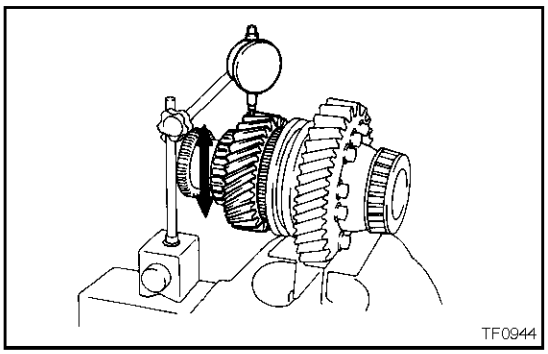
# DISASSEMBLY




**1. INSPECT HIGH SPEED OUTPUT GEAR RADIAL AND THRUST CLEARANCE**

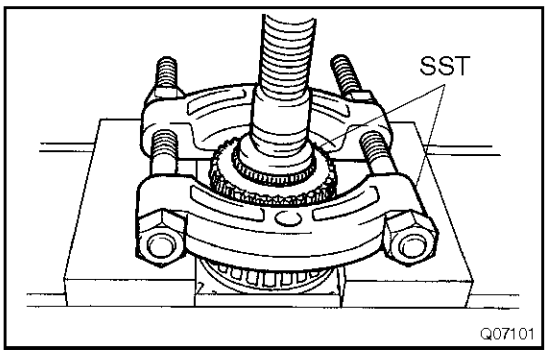
(a) Using a feeler gauge, measure the high speed output gear thrust clearance

**Standard clearance:**
**0.10–0.25 mm (0.0039–0.0098 in.)**
**Maximum clearance:**
**0.25 mm (0.0098 in.)**




(b) Using a dial indicator, measure the high speed output gear radial clearance

**Standard clearance:**
**0.035–0.091 mm (0.0014–0.0036 in.)**
**Maximum clearance:**
**0.091 mm (0.0036 in.)**

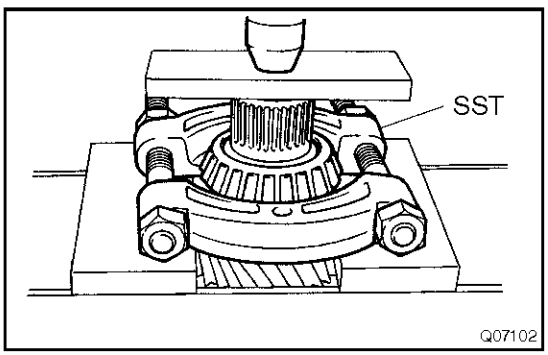



**2. REMOVE FRONT DRIVE GEAR PIECE**

(a) Using a snap ring expander, remove the snap ring

(b) Using SST and a press, remove the front drive gear piece
SST 09950–00020, 09950–60010 (09951–00320)

**NOTICE:**
**Be careful not to drop the center differential assembly.**



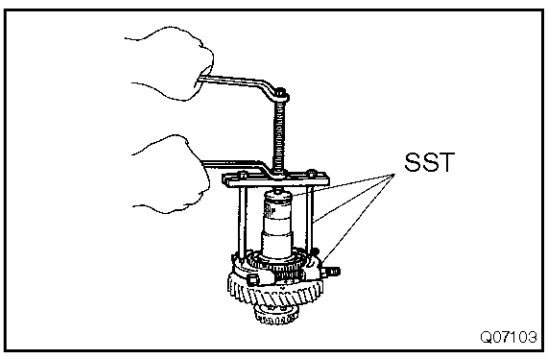

**3. REMOVE FRONT TAPER ROLLER BEARING**

Using SST and a press, remove the front taper roller bearing
SST 09950–00020

**4. REMOVE HIGH SPEED OUTPUT GEAR**

**5. REMOVE NEEDLE ROLLER BEARING**

**6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY**




**7. REMOVE HIGH SPEED OUTPUT GEAR BUSHING AND CLUTCH HUB**

(a) Using SST and a press, remove the high speed output gear bushing and clutch hub
SST 09550–00020, 09950–00030, 09950–60010 (09951–00320)

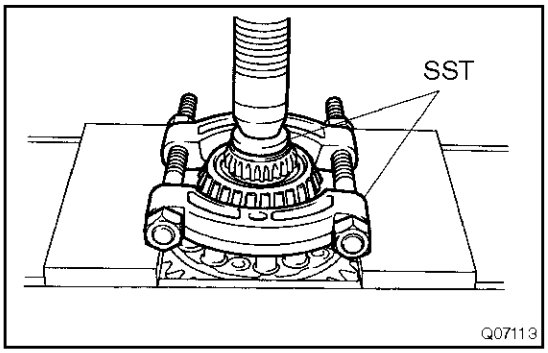
(b) Using a magnetic finger, remove the straight pin from the differential front case



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**8. REMOVE REAR TAPER ROLLER BEARING**

Using SST and a press, remove the rear taper roller bearing

SST 09950–00020, 09950–60010 (09951–00320)

**9. REMOVE DIFFERENTIAL REAR CASE**

Remove the 12 bolts and differential rear case

**10. REMOVE REAR SIDE GEAR AND THRUST WASHER**

**11. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER**

(a) Remove the straight pin from the pinion shaft

(b) Remove the pinion shaft, 2 pinion gears and thrust washers

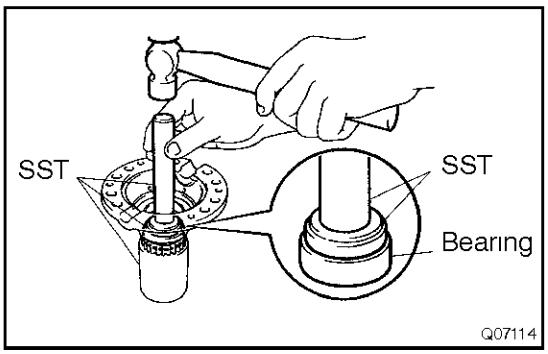
(c) Remove the front side gear and thrust washer

**12. REMOVE LOW GEAR**

Using a plastic hammer, tap and remove the low gear

**NOTICE:**

**Be careful not to damage the low gear.**




**13. REMOVE NEEDLE ROLLER BEARING**

(a) Using a screwdriver, remove the snap ring

(b) Using SST and a hammer, remove the needle roller bearing from the differential rear case

SST 09223–00010, 09950–60010 (09951–00400), 09950–70010 (09951–07150)

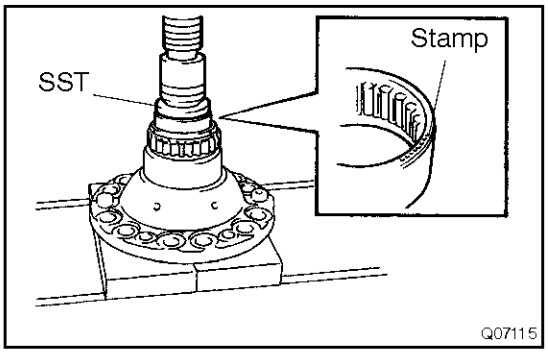


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BD 01




# REASSEMBLY

HINT

Coat all of the slidıng and rotatıng surfaces wıth gear oıl before assembly

**1. INSTALL NEEDLE ROLLER BEARING**

(a) Usıng SST and a press, ınstall the needle roller bearıng to the dıfferentıal rear case

SST 09612–24014 (09612–10050)

HINT

Install the bearıng to the dıfferentıal rear case, takıng care that ıts stamped sıde comes ın contact wıth SST

(b) Install the snap rıng

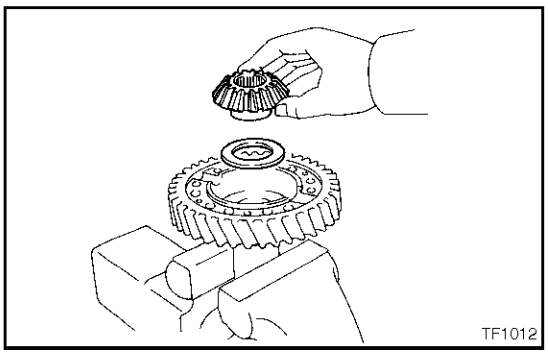
**2. INSTALL LOW GEAR**

(a) Clean the contact surface of the dıfferentıal case

(b) Heat the low gear ın boılıng water

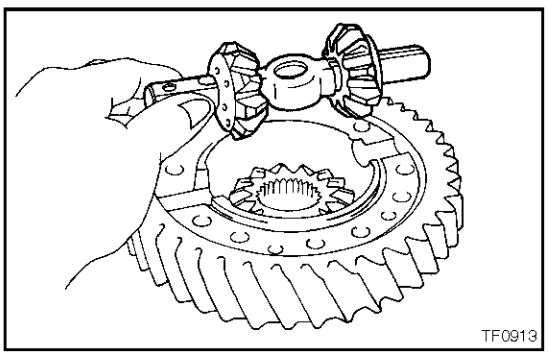
(c) Carefully remove the low gear from the water

(d) After the moısture on the low gear has completely evaporated, quıckly ınstall the low gear to the dıfferentıal case

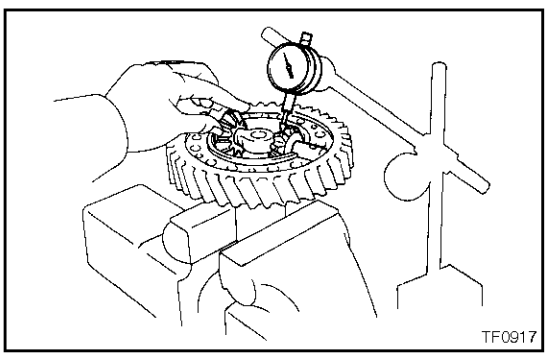



**3. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER**

(a) Install the front sıde gear and thrust washer to the dıfferentıal front case




(b) Install the pınıon shaft, 2 pınıon gears and thrust washers to the dıfferentıal front case




(c) Usıng a dıal ındıcator, measure the front case backlash

HINT

Push the pınıon shaft

**Minimum backlash: 0.05 mm (0.0020 in.)**

If the backlash ıs not wıthın the specıfıcatıon, replace the thrust washer wıth one of the correct sıze and reınstall the thrust washer

| Thıckness mm (ın ) | Thıckness mm (ın ) |
|---|---|
| 1 70 (0 0669) | 2 45 (0 0965) |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



| | |
|---|---|
| 1 85 (0 0728) | 2 60 (0 1024) |
| 2 00 (0 0787) | 2 75 (0 1083) |
| 2 15 (0 0846) | 2 90 (0 1142) |
| 2 30 (0 0906) | 3 05 (0 1201) |

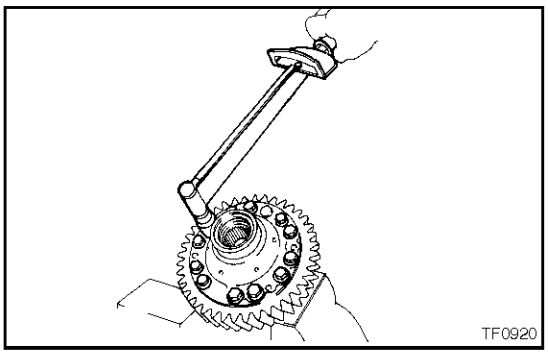
(d) In the same way, measure the rear case backlash

**4. INSTALL STRAIGHT PIN TO PINION SHAFT**

**5. INSTALL REAR SIDE GEAR AND THRUST WASHER**

**6. INSTALL DIFFERENTIAL REAR CASE**

Install the differential rear case and 12 set bolts




**7. TORQUE REAR CASE SET BOLT**

(a) Torque the rear case 12 set bolts

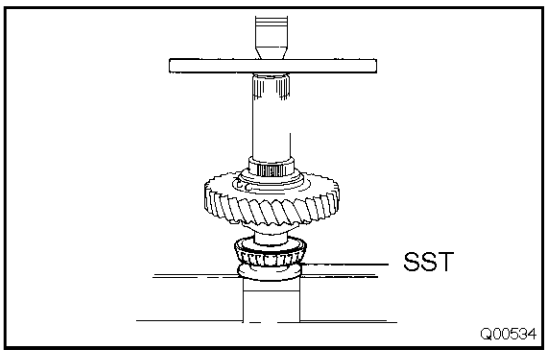
**Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)**

(b) Turn the pinion gear

(c) Loosen the rear case 12 set bolts

(d) Torque the rear case 12 set bolts

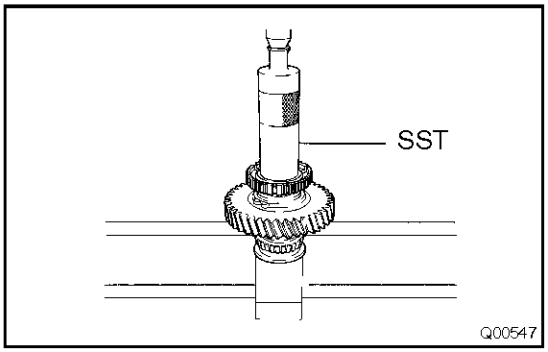
**Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)**




**8. INSTALL REAR TAPER ROLLER BEARING**

Using SST and a press, install the rear taper roller bearing

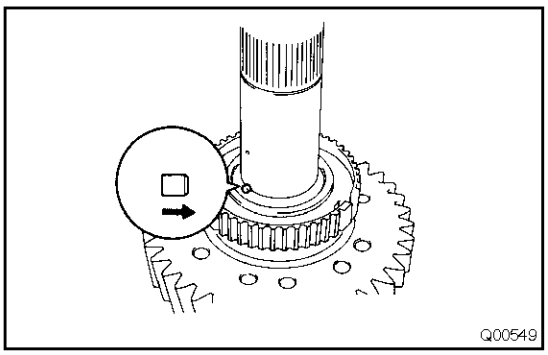
SST 09316–12010




**9. INSTALL CLUTCH HUB**

Using SST and a press, install the clutch hub

SST 09316–12010, 09316–60011 (09316–00011)




**10. INSTALL HIGH SPEED OUTPUT GEAR BUSHING**

(a) Apply MP grease to the straight pin

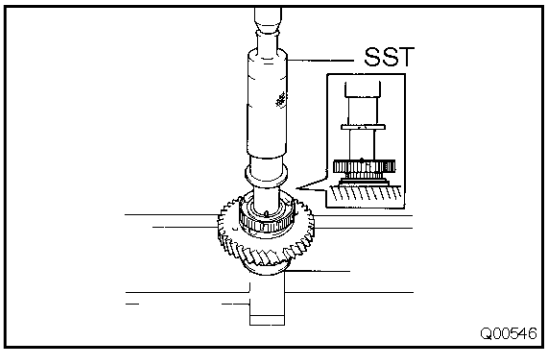
(b) Install the straight pin, as shown



Brought to you by BirfMark
Version 1.11 - 03/16/2010

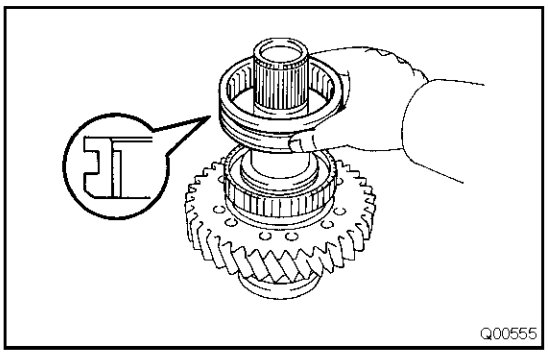
Brought to you by BirfMark






(c) Using SST and a press, install the high speed output gear bushing
SST 09316–12010, 09316–60011 (09316–00011)

**NOTICE:**
**Before pressing, align the holes on the bushing and shaft so that the pin on the shaft aligned with the cutting portion of the bushing.**

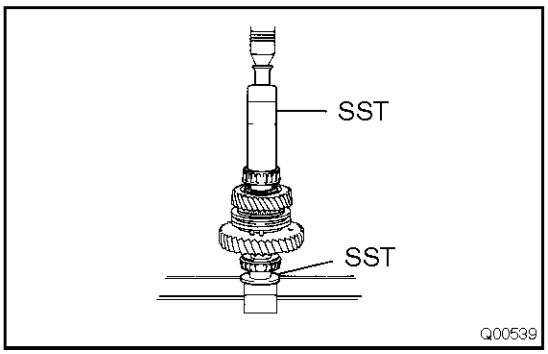



### 11. INSTALL HIGH AND LOW CLUTCH SLEEVE

HINT
Make sure to install the high and low clutch sleeve in the correct direction

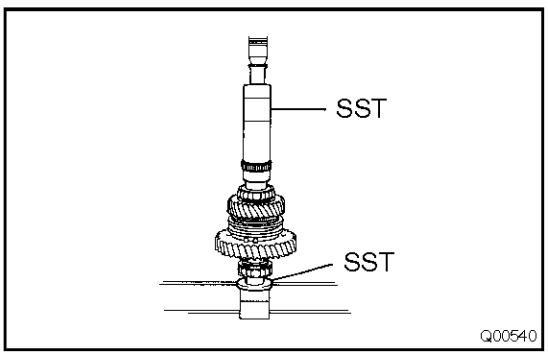
### 12. INSTALL HIGH SPEED OUTPUT GEAR AND NEEDLE ROLLER BEARING

(a) Apply gear oil to the needle roller bearing
(b) Install the high speed output gear and needle roller bearing



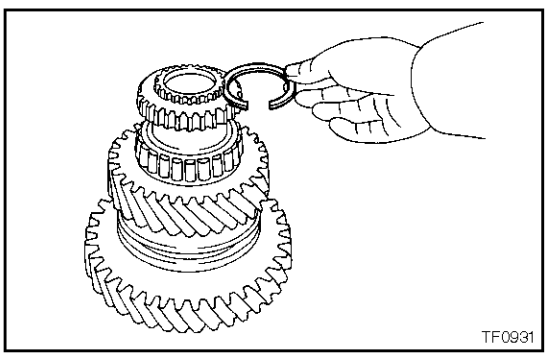

### 13. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing
SST 09316–12010, 09316–60011 (09316–00011)




### 14. INSTALL FRONT DRIVE GEAR PIECE

Using SST and a press, install the front drive gear piece
SST 09316–12010, 09316–60011 (09316–00011)




### 15. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in ) | Mark | Thickness mm (in ) |
|---|---|---|---|
| A | 2 00 (0 0787) | G | 2 60 (0 1024) |
| B | 2 10 (0 0827) | H | 2 70 (0 1063) |
| C | 2 20 (0 0866) | J | 2 80 (0 1102) |
| D | 2 30 (0 0906) | K | 1 80 (0 0709) |
| E | 2 40 (0 0945) | L | 1 90 (0 0748) |
| F | 2 50 (0 0984) | – | – |



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



(b) Using a snap ring expander, install a new snap ring

16. **INSPECT HIGH SPEED OUTPUT GEAR RADIAL AND THRUST CLEARANCE (See page TR–19)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

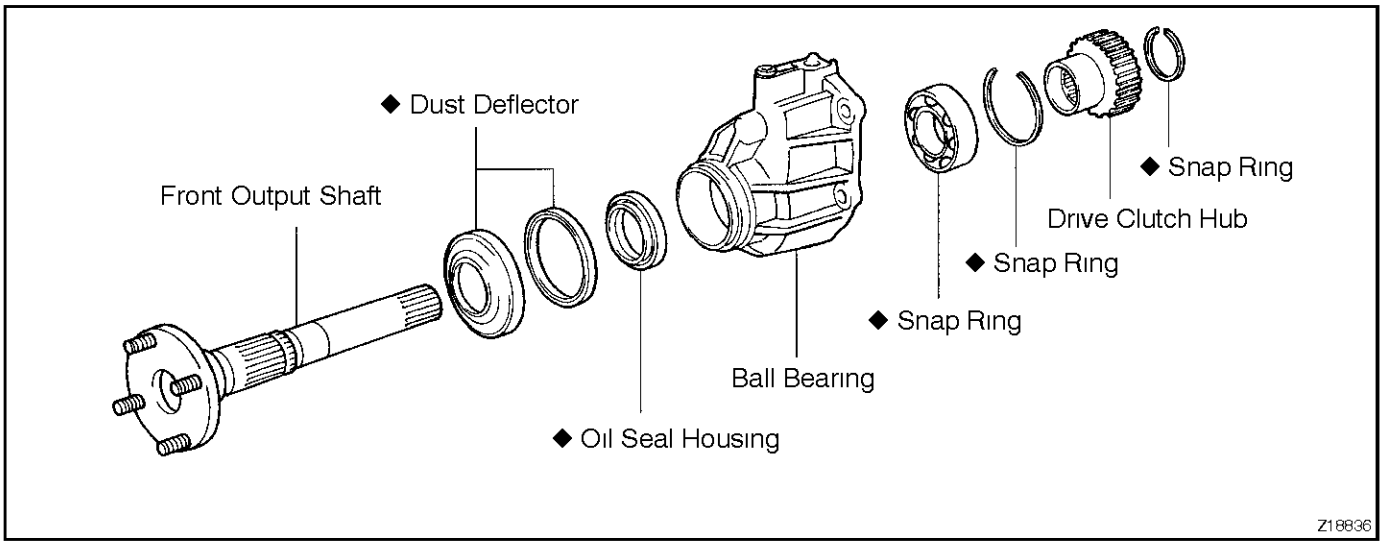
Brought to you by BirfMark



# FRONT EXTENSION HOUSING

## COMPONENTS

TR0BE-01







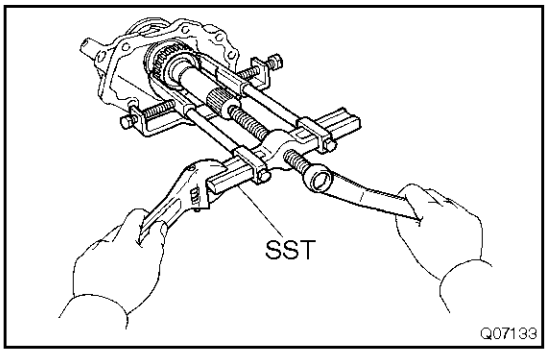

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BF 01

# DISASSEMBLY

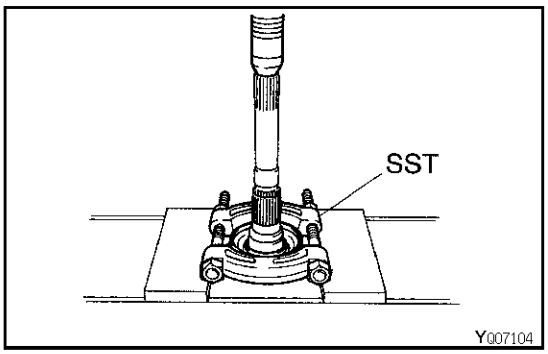



**1. REMOVE DRIVE CLUTCH HUB**

(a) Using a snap ring expander, remove the snap ring

(b) Using SST, remove the drive clutch hub

SST 09950-40010




**2. REMOVE FRONT OUTPUT SHAFT**

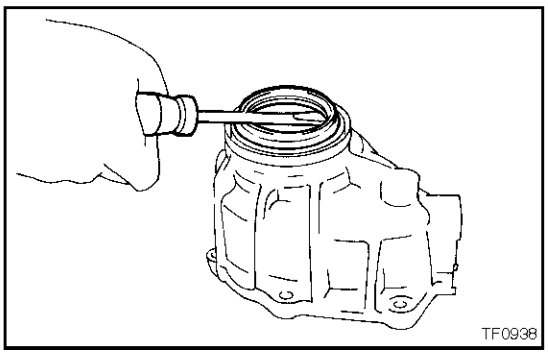
Using a plastic hammer, drive out the front output shaft

**3. REMOVE DUST DEFLECTOR**

(a) Using SST and a press, remove the dust deflector

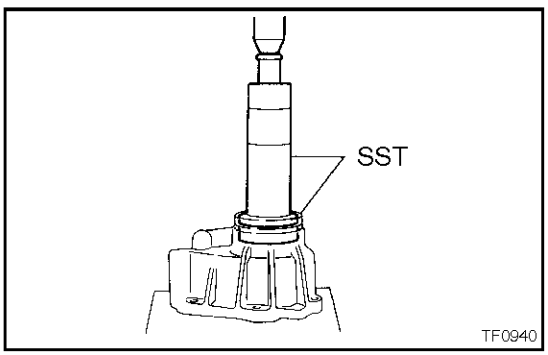
SST 09950-00020

(b) Using a screwdriver and hammer, tap the dust deflector and remove it from the extension housing




**4. REMOVE OIL SEAL**

Using a screwdriver, pry out the oil seal from the front extension housing




**5. REMOVE BALL BEARING**

(a) Using a screwdriver, remove the snap ring

(b) Using SST and a press, remove the ball bearing

SST 09316-60011 (09316-00011, 09316-00071)



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BG 01

# REASSEMBLY

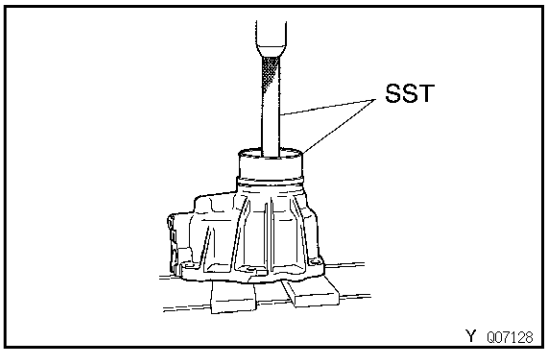
HINT

Coat all of the sliding and rotating surfaces with gear oil before assembly

## 1. INSTALL DUST DEFLECTOR

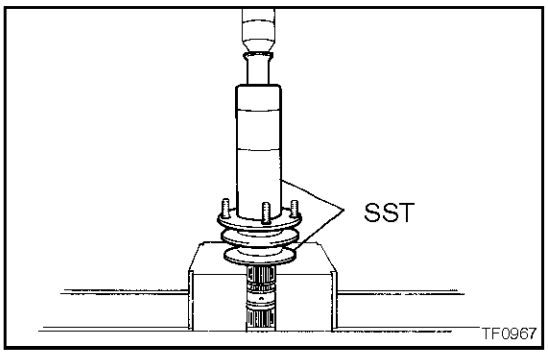
(a) Using SST and a press, install a new dust deflector to the front extension housing

SST 09223–15020, 09950–70010 (09951–07150)




(b) Using SST and a press, install a new dust deflector to the front output shaft

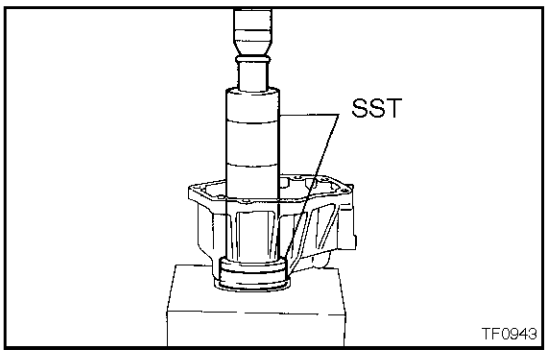
SST 09316–20011, 09316–60011 (09316–00011)




## 2. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing to the front extension housing

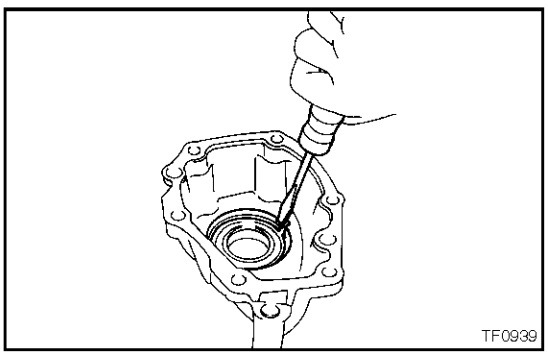
SST 09316–60011 (09316–00011, 09316–00031)




(b) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) |
|---|---|
| A | 1.7 (0.0669) |
| B | 1.8 (0.0709) |

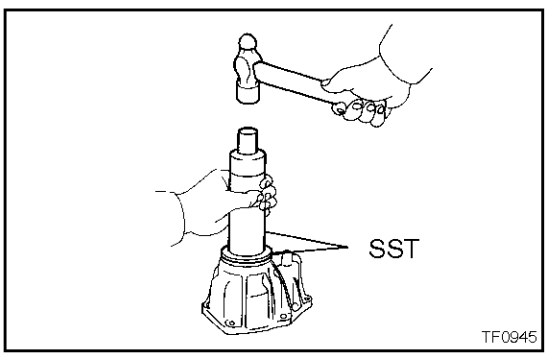
(c) Using a screwdriver, install a new snap ring




## 3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal to the front extension housing

SST 09316–60011 (09316–00011, 09316–00061)

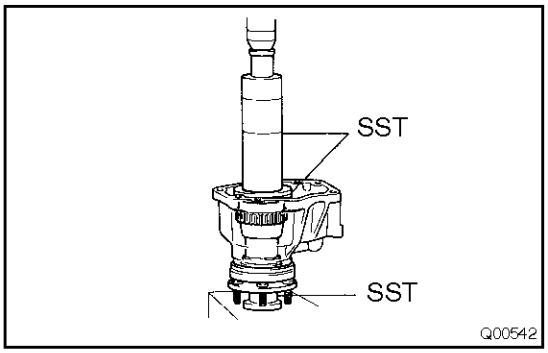





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

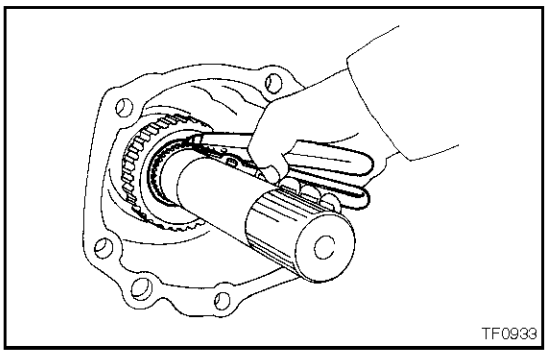





## 4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

(a) Using SST and a press, install the front output shaft and drive clutch hub

SST 09316–20011, 09316–60011 (09316–00011, 09316–00041, 09316–00071)




(b) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) |
|---|---|
| A | 1.8 (0.0709) |
| B | 1.9 (0.0748) |
| C | 2.0 (0.0787) |
| D | 2.1 (0.0827) |
| E | 2.2 (0.0866) |

(c) Using a snap ring expander, install a new snap ring



Brought to you by BirfMark
Version 1.11 - 03/16/2010

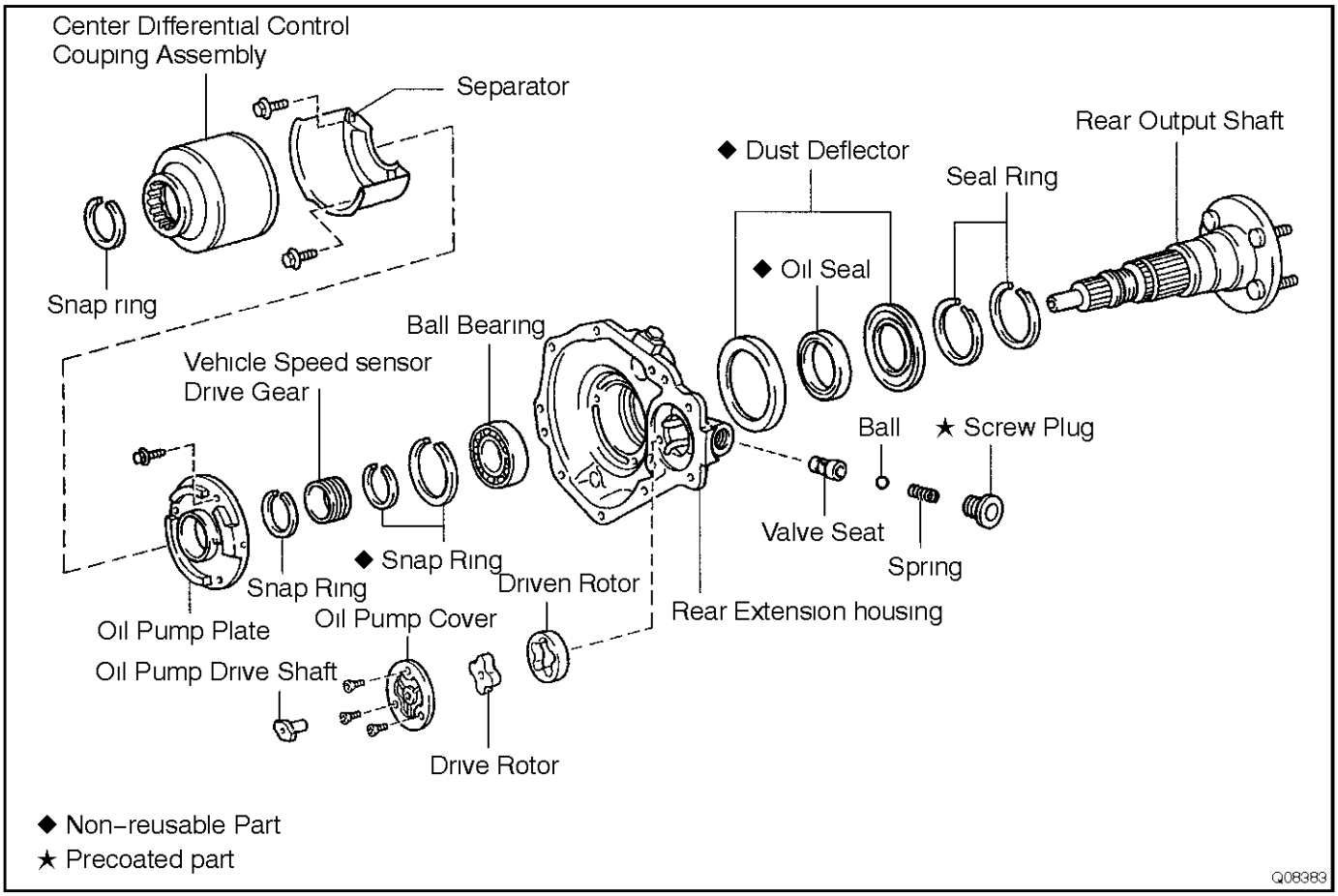
Brought to you by BirfMark



# REAR EXTENSION HOUSING

## COMPONENTS

TR0BH 01







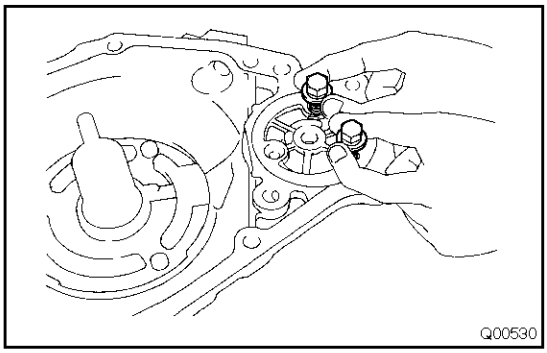

Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0B 01

# DISASSEMBLY




**1. REMOVE OIL PUMP DRIVE SHAFT**

**2. REMOVE OIL PUMP COVER**

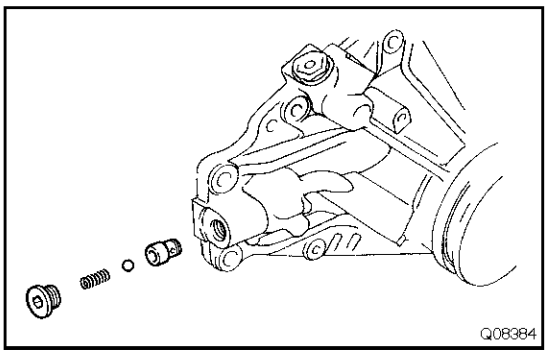
(a) Using a torx socket wrench (T30), remove the 3 screws

(b) Install the 2 suitable bolts to the pump cover

(c) Remove the pump cover from the rear extension housing

**3. REMOVE DRIVE ROTOR FROM DRIVEN ROTOR**

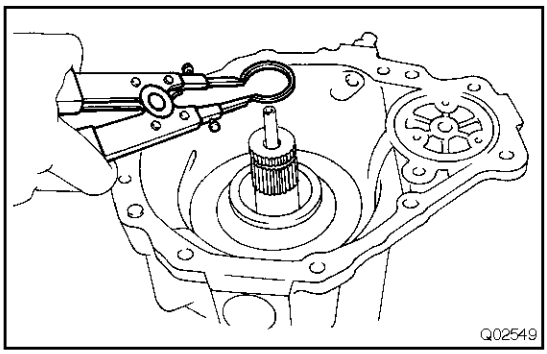
**4. REMOVE DRIVEN ROTOR FROM REAR EXTENSION HOUSING**




**5. REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT**

(a) Using a hexagon wrench, remove the screw plug

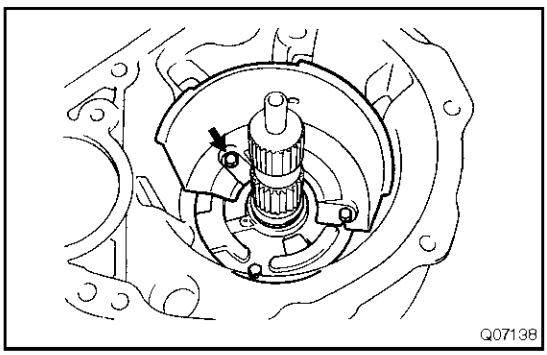
(b) Using a magnetic finger, remove the spring, ball and valve seat from the rear extension housing




**6. REMOVE CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY**

(a) Using a snap ring expander, remove the snap ring

(b) Remove the coupling assembly from the rear extension housing




**7. REMOVE SEPARATOR AND OIL PUMP PLATE**

Remove the 3 bolts, separator and oil pump plate

**8. REMOVE VEHICLE SPEED SENSOR DRIVE GEAR**

(a) Using a snap ring expander, remove the snap ring

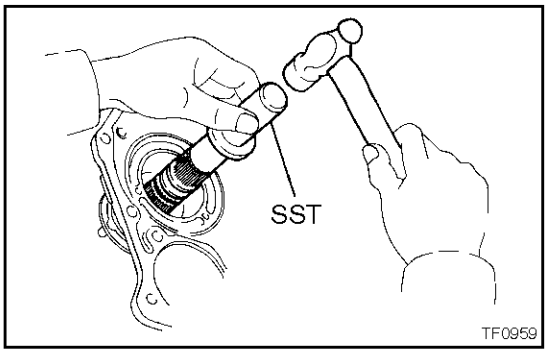
(b) Remove the vehicle speed sensor drive gear



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



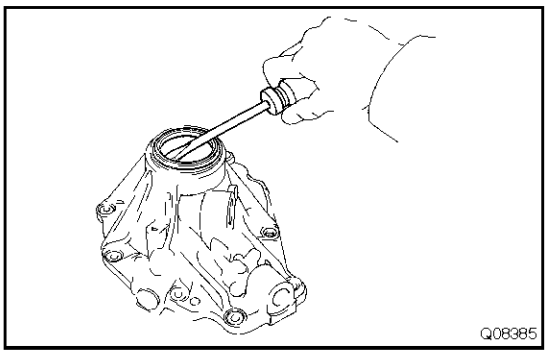



**9. REMOVE REAR OUTPUT SHAFT**

(a) Using a snap ring expander, remove the snap ring

(b) Using SST and a hammer, remove the rear output shaft
SST 09325–12010

(c) Remove the 2 seal rings from the rear output shaft



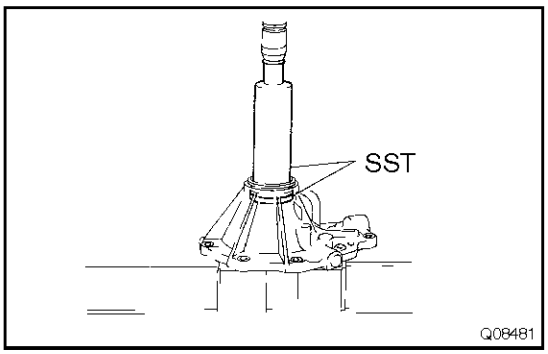

**10. REMOVE DUST DEFLECTOR**

(a) Using a screwdriver and hammer, remove the rear extension housing dust deflector

(b) Using a screwdriver and hammer, remove the rear output shaft dust deflector

**11. REMOVE OIL SEAL**

Using a screwdriver, pry out the oil seal from the rear extension housing




**12. REMOVE BALL BEARING**

(a) Using a screwdriver, remove the snap ring

(b) Using SST and a press, remove the ball bearing to the rear extension housing
SST 09316–60011 (09316–00011, 09316–00021)



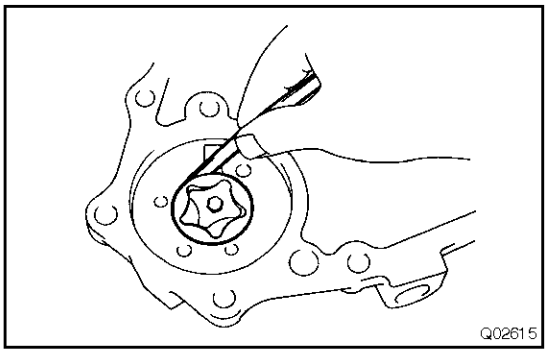
Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BJ–01

# INSPECTION


Q02615

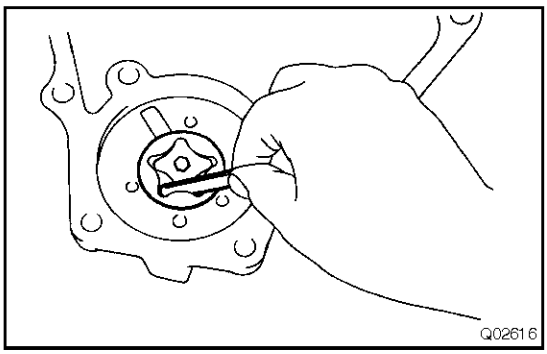
## 1. INSPECT DRIVEN ROTOR BODY CLEARANCE

(a) Install the drive rotor to the driven rotor

(b) Using a feeler gauge, measure the body clearance between the drive rotor and extension housing

**Standard body clearance:**
**0.08–0.17 mm (0.0031–0.0067 in.)**
**Maximum body clearance: 0.17 mm (0.0067 in.)**

If the body clearance exceeds the maximum, replace the drive rotor or driven rotor

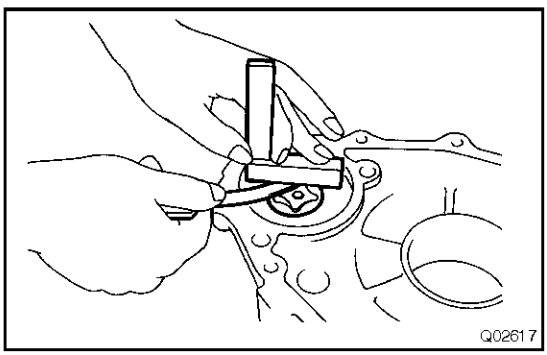

Q02616

## 2. INSPECT DRIVEN ROTOR TIP CLEARANCE

Using a feeler gauge, measure the tip clearance between the driver rotor and driven rotor

**Standard tip clearance:**
**0.05–0.15 mm (0.0020–0.0059 in.)**
**Maximum tip clearance: 0.15 mm (0.0059 in.)**

If the tip clearance exceeds the maximum, replace the drive rotor or driven rotor


Q02617

## 3. INSPECT OIL PUMP SIDE CLEARANCE

Using a steel straight edge and feeler gauge, measure the side clearance of oil pump

**Standard side clearance:**
**0.03–0.10 mm (0.0012–0.0039 in.)**
**Maximum side clearance: 0.10 mm (0.0039 in.)**

If the side clearance exceeds the maximum, replace the drive rotor or driven rotor



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0CO-01

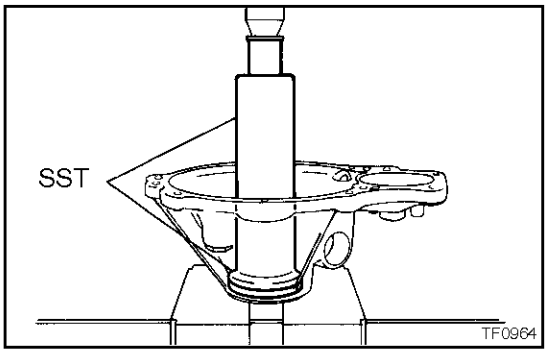
# REASSEMBLY

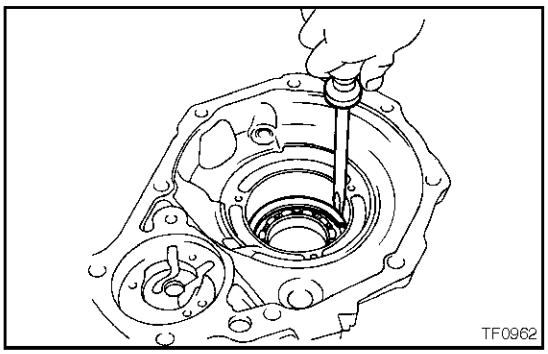
HINT

Coat all of the sliding and rotating surfaces with gear oil before assembly

**1. INSTALL BALL BEARING**

(a) Using SST and a press, install the ball bearing
SST 09316–60011 (09316–00011, 09316–00031)



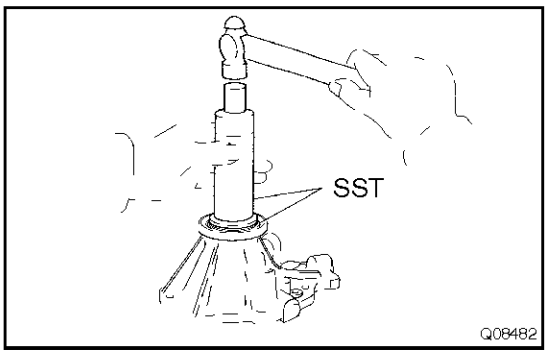

(b) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) |
|---|---|
| A | 1.7 (0.0669) |
| B | 1.8 (0.0709) |

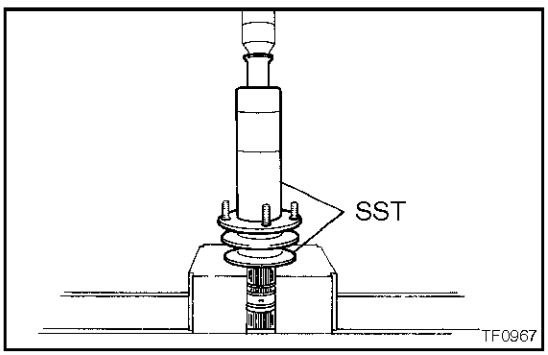
(c) Using a screwdriver, install a new snap ring

**2. INSTALL DUST DEFLECTOR**

(a) Using SST and a hammer, install a new rear extension housing dust deflector
SST 09316–60011 (09316–00011, 09316–00041)

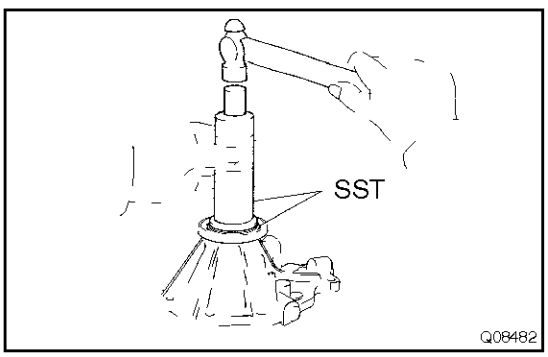



(b) Using SST and a press, install a new rear output shaft dust deflector
SST 09316–20011, 09316–60011 (09316–00011)




**3. INSTALL OIL SEAL**

Using SST and a hammer, drive in a new oil seal
SST 09316–60011 (09316–00011, 09316–00031)

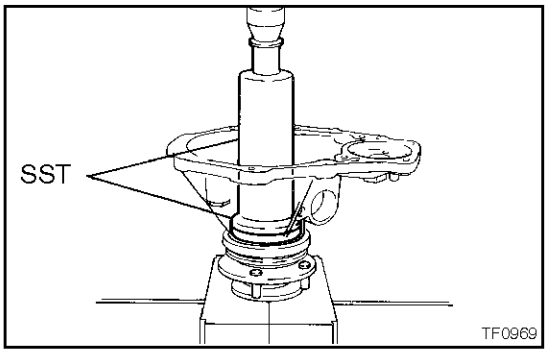





Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark

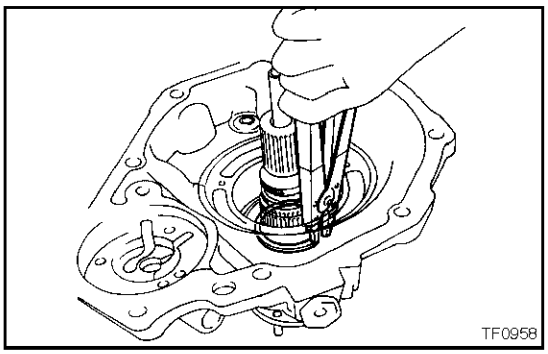





**4. INSTALL REAR OUTPUT SHAFT**

(a) Using SST and a press, install the rear output shaft
SST 09316–20011, 09316–60011 (09316–00011, 09316–00031)

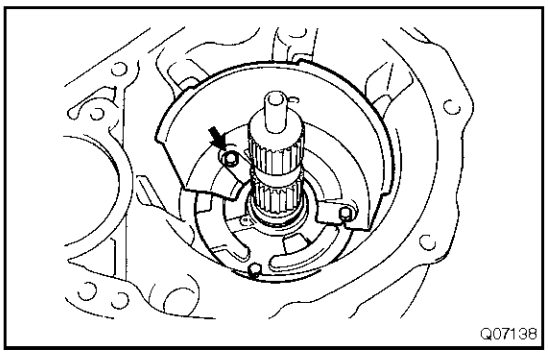
(b) Install the 2 seal rings to the rear output shaft




(c) Select a snap ring that will allow minimum axial play

| Mark | Thickness mm (in.) |
|---|---|
| 1 | 1.95 (0.0768) |
| 2 | 2.05 (0.0807) |
| 3 | 2.15 (0.0847) |
| 4 | 2.25 (0.0886) |

(d) Using a snap ring expander, install a new snap ring




**5. INSTALL VEHICLE SPEED SENSOR DRIVE GEAR**

(a) Install the vehicle speed sensor drive gear

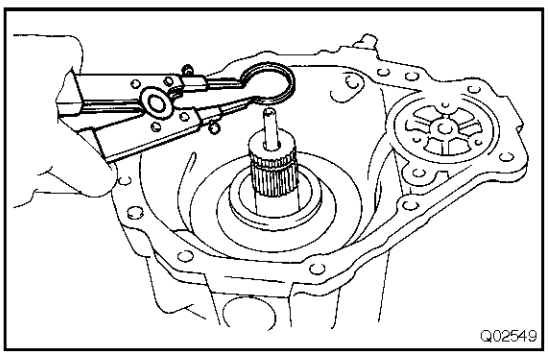
(b) Using a snap ring expander, install the snap ring

**6. INSTALL OIL PUMP PLATE AND SEPARATOR**

(a) Install the oil pump plate

(b) Install the separator

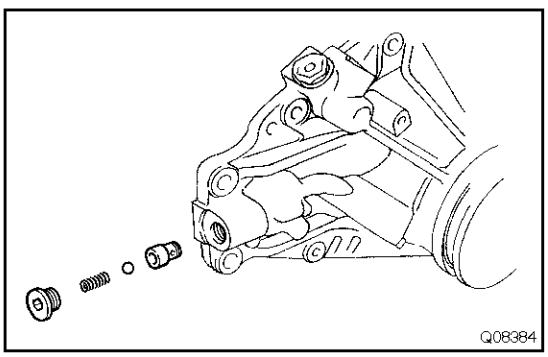
(c) Install and torque the 3 bolts
**Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)**




**7. INSTALL CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY**

(a) Install the coupling assembly to the output shaft

(b) Using a snap ring expander, install the snap ring




**8. INSTALL VALVE SEAT, BALL, SPRING AND SCREW PLUG**

(a) Apply gear oil to the ball

(b) Install the valve seat, ball and spring

(c) Apply liquid sealer to the screw plug
**Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent**

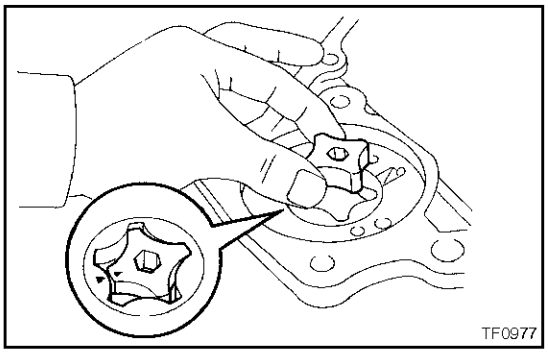
(d) Using a hexagon wrench, install and torque the screw plug
**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark






**9. INSTALL DRIVEN ROTOR**

(a) Apply gear oil to the driven rotor

(b) Install the driven rotor

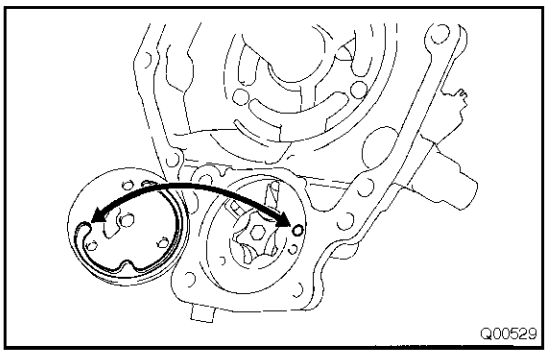
**10. INSTALL DRIVE ROTOR**

(a) Apply gear oil to the drive rotor

(b) Install the drive rotor

HINT

Align the alignment marks




**11. INSTALL OIL PUMP COVER**

(a) Install the oil pump cover

(b) Using a torx socket wrench (T30), install and torque the 3 screws

**Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)**

**NOTICE:**

**Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.**

**12. INSTALL OIL PUMP DRIVE SHAFT**



Brought to you by BirfMark
Version 1.11 - 03/16/2010

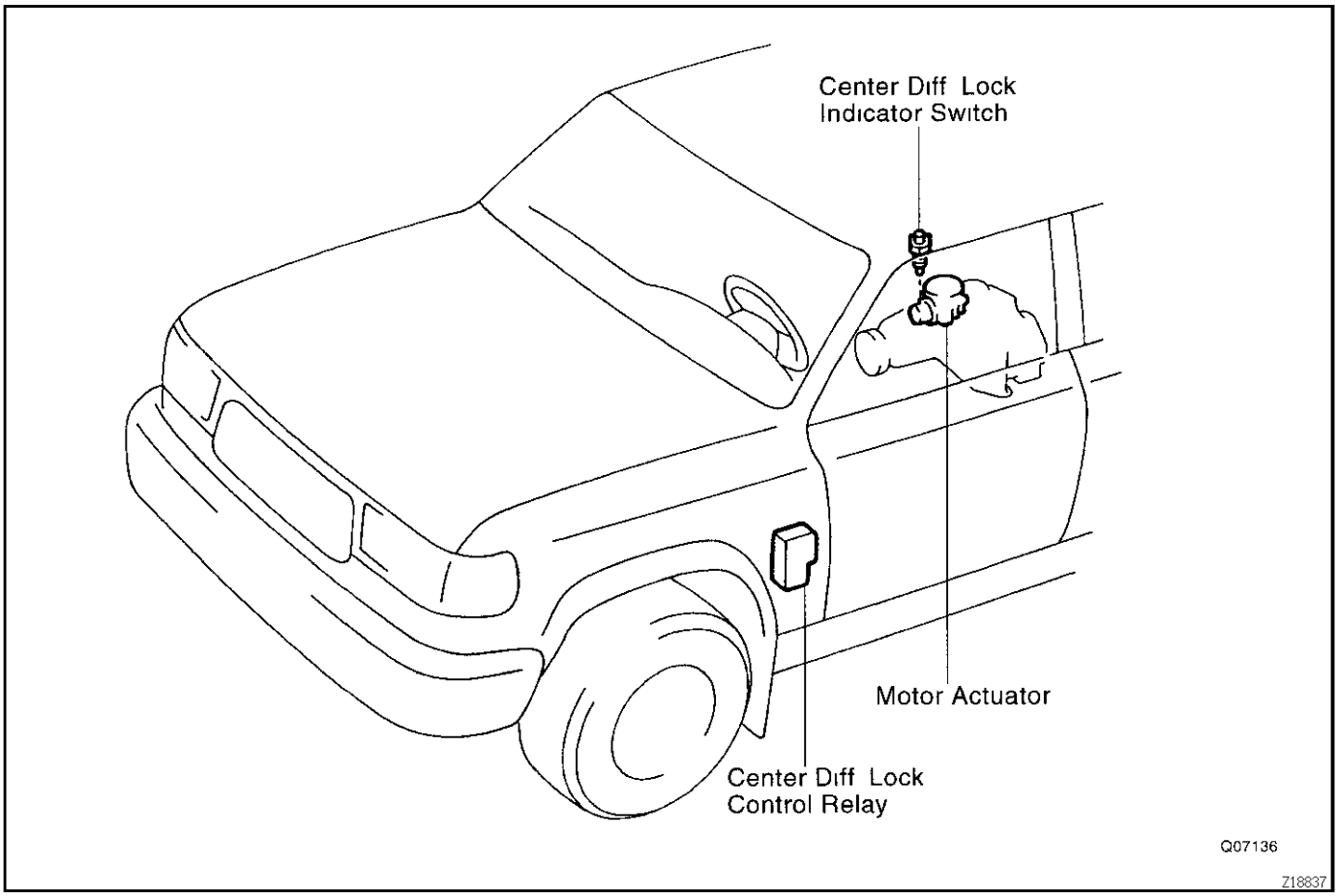
Brought to you by BirfMark



# MOTOR SHIFT CONTROL SYSTEM

## LOCATION

TR0BL-01



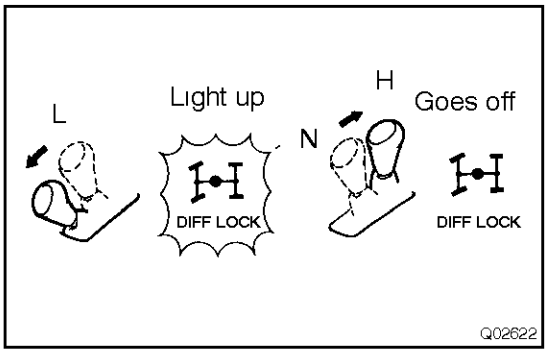



Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



TR0BM-03

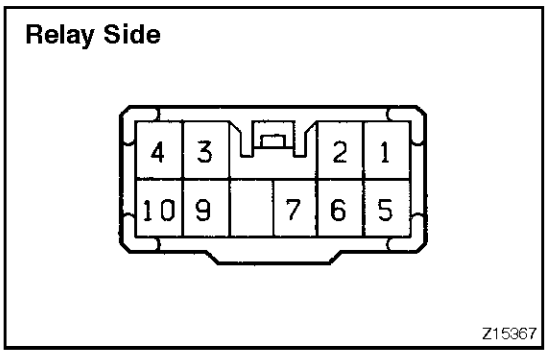



# INSPECTION

## 1. INSPECT SHIFT LEVER POSITION

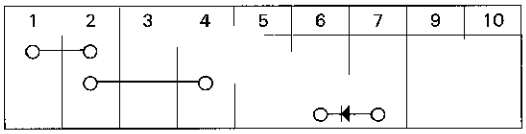
(a) Start the engine, and turn the center diff lock switch to OFF

(b) Check that the center diff indicator light comes on when the transfer shift lever shifted to the "L" position Check that the light goes off when the lever is shifted to the "N" or "H" position




## 2. INSPECT CENTER DIFF LOCK CONTROL RELAY

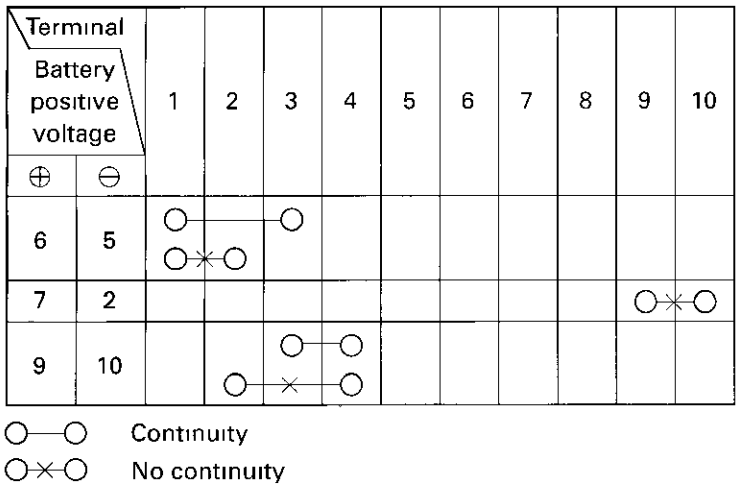
(a) Check that there is continuity between the terminals, as shown in the chart




HINT

There is a diode between the terminals 6 and 7 If the circuit shown no continuity, change the positive (+) and negative (–) probes and recheck the circuit

(b) Apply battery positive voltage between the terminals and check that there is continuity between the terminals, as shown in the chart




If continuity is not as specified, replace the relay

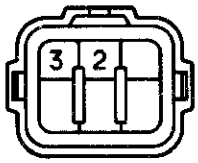


Brought to you by BirfMark
Version 1.11 - 03/16/2010

Brought to you by BirfMark



Motor Actuator Side




IS 6 2 002619

**3. INSPECT MOTOR ACTUATOR**

(a) Measure the resistance between the terminals 2 and 3
**Standard resistance: 0.3 – 100 Ω**

(b) Measure the resistance between the terminals 2 or 3 and body ground
**Standard resistance: More than 0.5 MΩ**

If the resistance value is not as specified, replace the motor actuator



Brought to you by BirfMark
Version 1.11 - 03/16/2010