FOREWORD

This supplement has been prepared to provide information covering general service repairs for the 1FZ-FE engine in the TOYOTA LAND CRUISER.

Applicable model: FZJ75, 80 series

For basic engine service repair, refer to the following repair manual.

1FZ-F, 1FZ-FE Engine Repair Manual (Pub. No. RM321E)

Please note that the publications below have also been prepared as relevant service manuals to the components and systems in this engine.

Manual Name	Pub No
* 1FZ-FE Engine Emission Control Repair Manual	ERM096E

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

Please Note!
This is not an interactive manual..
Goto Pages need to be selected

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HOW TO USE THIS MANUAL

IN002-10

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.

GENERAL DESCRIPTION

At the beginning of each section, a General Description (Precautions) is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

TROUBLESHOOTING

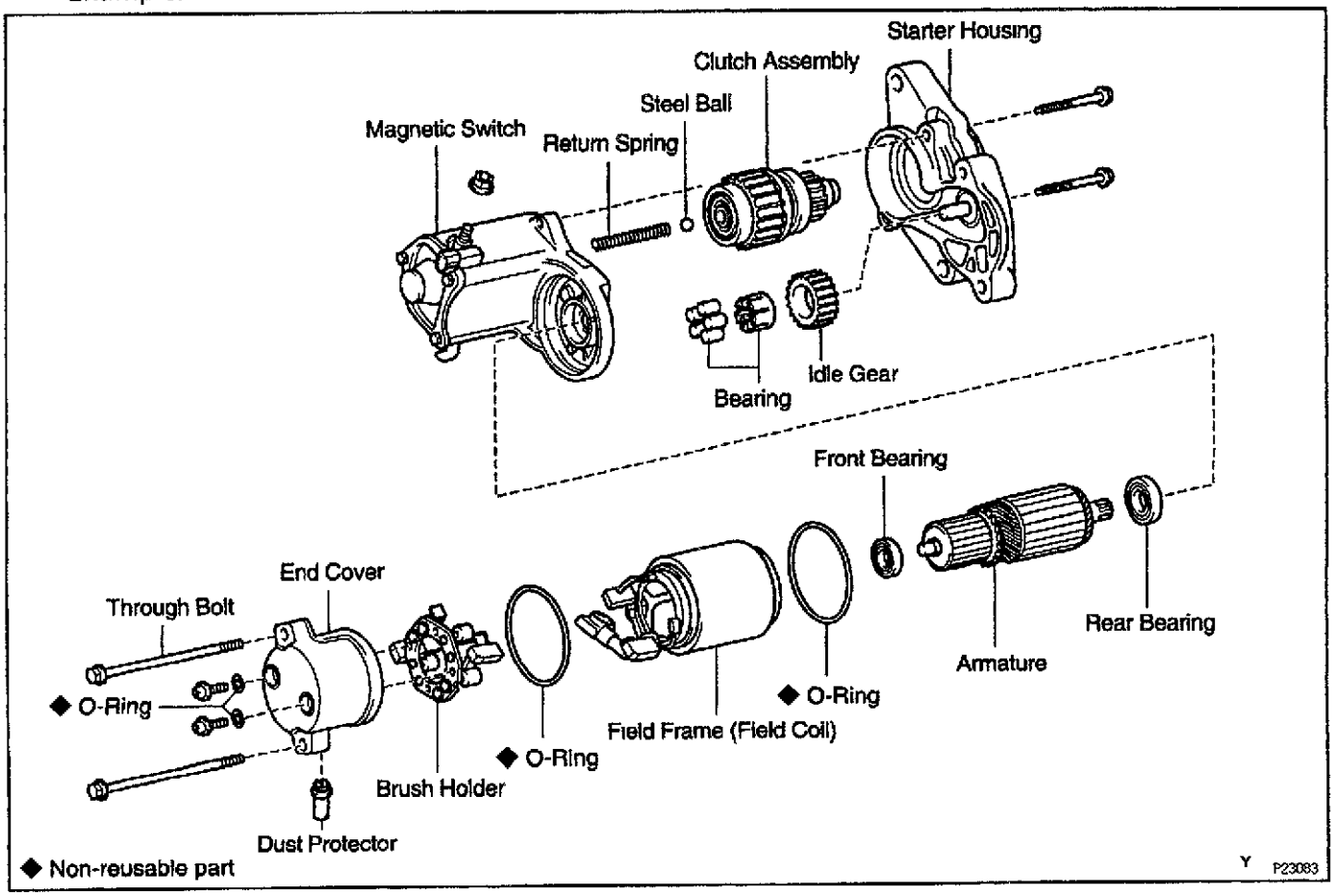
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

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.

REPAIR PROCEDURES

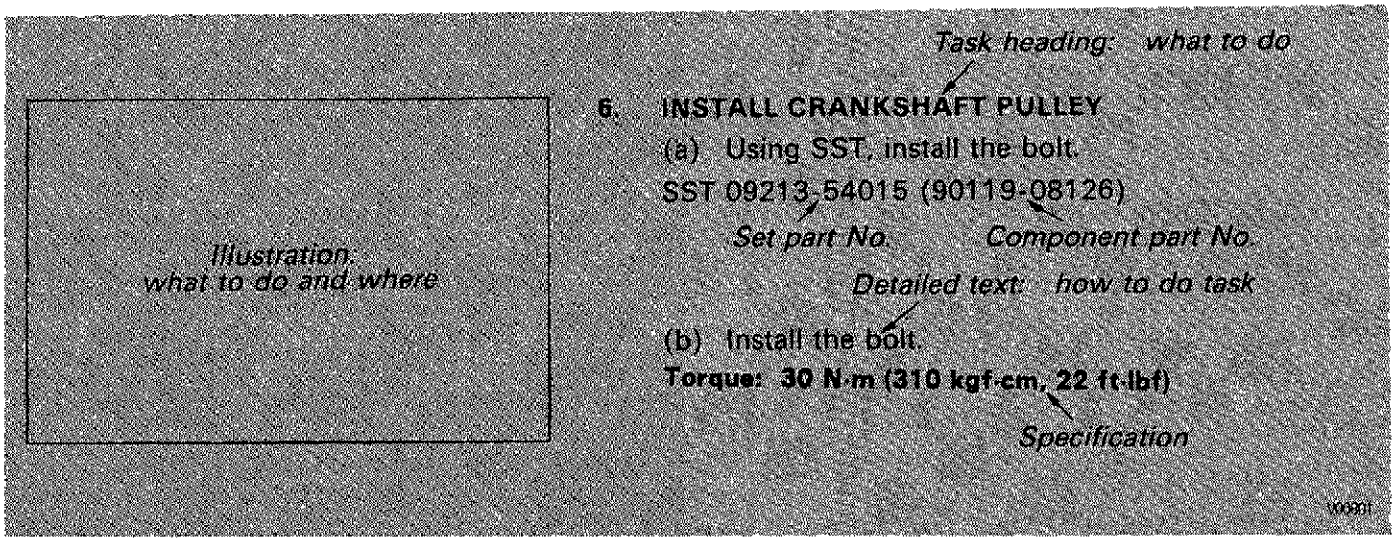
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



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:



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.

REFERENCES

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

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 at the end of each section, for quick reference.

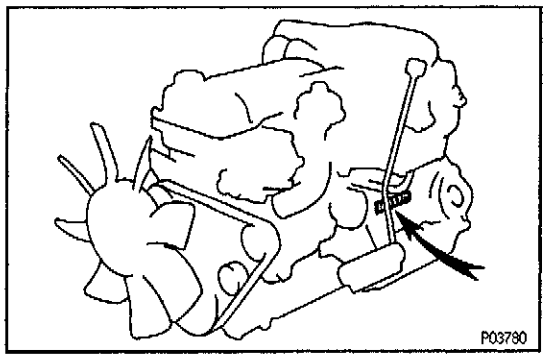
CAUTIONS, NOTICES, HINTS:

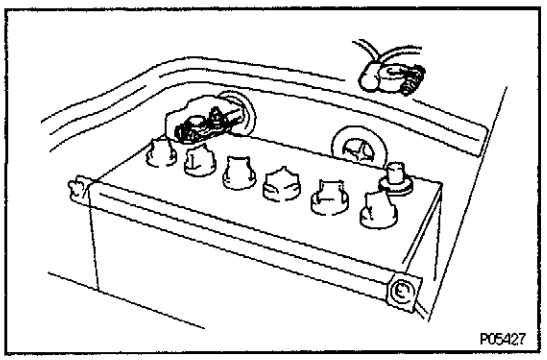
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide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

SI UNIT

The UNIT given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
Example:
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

IN





IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:

(a) Before performing electrical work, disconnect the negative (−) terminal cable from the battery.

(b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (−) terminal which is grounded to the vehicle body.

(c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.

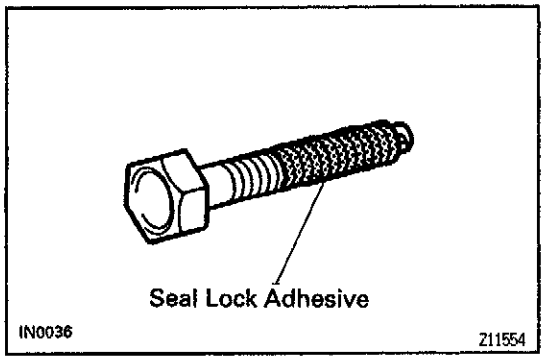
(d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive objects.

(e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.

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

4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non−reusable parts.

(a) Always replace cotter pins, gaskets, O−rings and oil seals etc. with new ones.



(b) Non—reusable parts are indicated in the component illustrations by the "◆" symbol.

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

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

(b) 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.

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

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

9. 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 the preparation part at the front of each section in this manual.

10. 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.

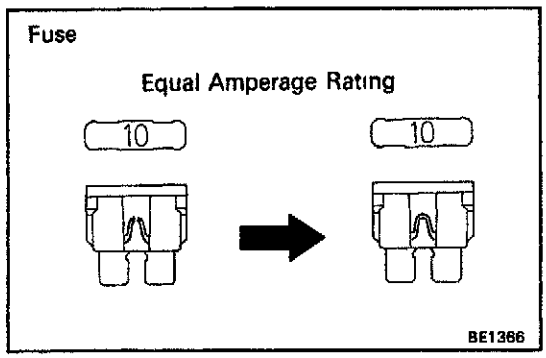
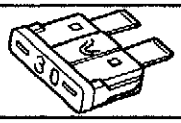
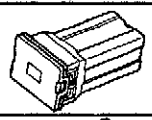
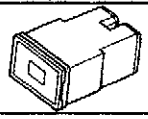
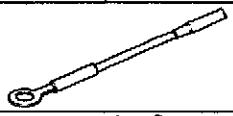
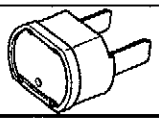
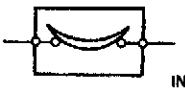
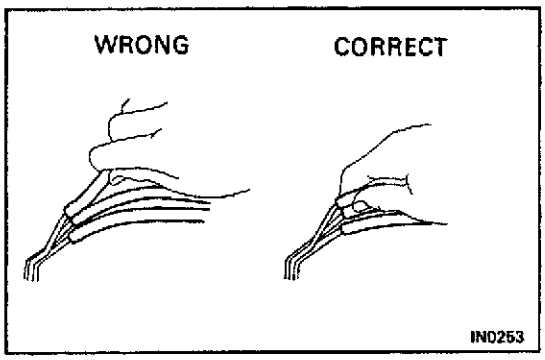
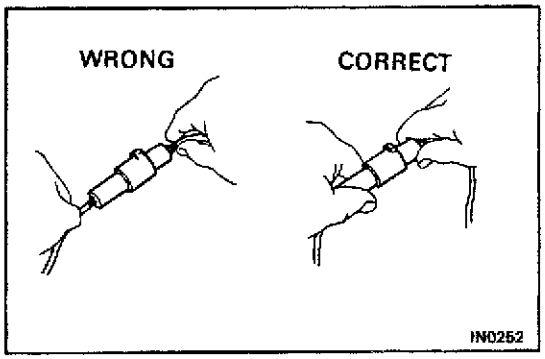
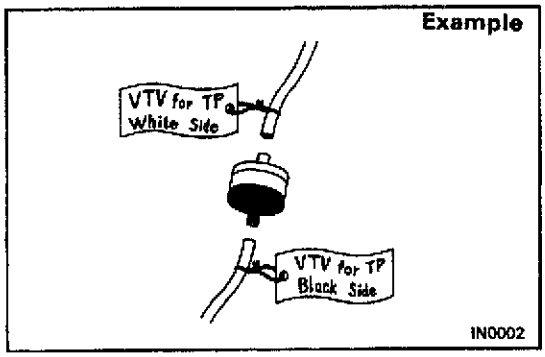


Illustration	Symbol	Part Name	Abbreviation
 BE5594	IN0365	FUSE	FUSE
 BE5595	IN0366	MEDIUM CURRENT FUSE	M-FUSE
 BE5596	IN0367	HIGH CURRENT FUSE	H-FUSE
 BE5597	IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

IN







11. Care must be taken when jacking up and supporting the vehicle . Be sure to lift and support the vehicle at the proper locations.
(a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
(b) After the vehicle is jacked up, be sure to support it on stands. 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.
12. Observe the following precautions to avoid damage to the parts:
(a) 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.)
(b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
(c) To pull apart electrical connectors, pull on the connector itself, not the wires.
(d) 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.
(e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
(f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
(g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
(h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.
13. Tag hoses before disconnecting them:
(a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
(b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.
14. 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, measurements should be made when the engine has cooled down.

PRECAUTION

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

IN00T–07

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

1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**
   Avoid running the engine at idle speed for more than 20 minutes.
3. **Avoid spark jump test.**

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
(b) While testing, never race the engine.

4. **Avoid prolonged engine compression measurement.**
   Engine compression tests must be done as rapidly as possible.
5. **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.
6. **Avoid coasting with ignition turned off and prolonged braking.**
7. **Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**

IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

IN02R–0C

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 electronics systems. For details about ECU and sensors locations, refer to the section on the applicable component.
(3) Do not wind the antenna feeder together with the other wiring. As much as possible, also avoid running the antenna feeder parallel with other wire harnesses.
(4) Confirm that the antenna and feeder are correctly adjusted.
(5) Do not install powerful mobile communications system.

ABBREVIATIONS USED IN THIS MANUAL

IN024–02

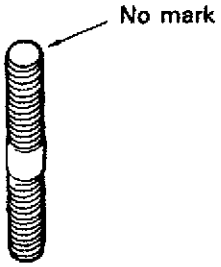
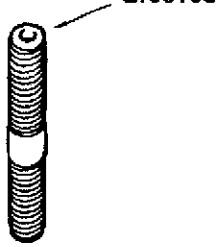
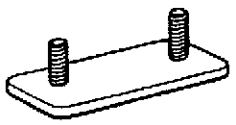
A/C	Air Conditioner
A/T	Automatic Transmission
ECT	Electronic Controlled Transmission
ECU	Electronic Control Unit
FL	Fusible Link
IC	Integrated Circuit
IG	Ignition
MP	Multipurpose
SST	Special Service Tools
TEMP.	Temperature
TP	Throttle Positioner
VCV	Vacuum Control Valve
w/	With
w/o	Without

STANDARD BOLT TORQUE SPECIFICATIONS

IN00V-02

IN

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	Bolt head No. 4— 5— 6— 7— 8— 9— 10— 11—	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt	 No mark	4T
	No mark	4T		 Grooved	6T
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	Welded bolt		4T
Hexagon head bolt	3 protruding lines	7T			
Hexagon head bolt	4 protruding lines	8T			

V00078

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

MAINTENANCE OPERATIONS

ENGINE

Cold Engine Operations

1. 3VZ–E ENGINE:

REPLACE TIMING BELT

(a) Remove the timing belt

(See timing belt removal in timing belt in Engine Mechanical)

(b) Install the timing belt

(See timing belt installation in timing belt in Engine Mechanical)

2. INSPECT DRIVE BELTS

(a) Visually check the belt for excessive wear, frayed cords etc

HINT

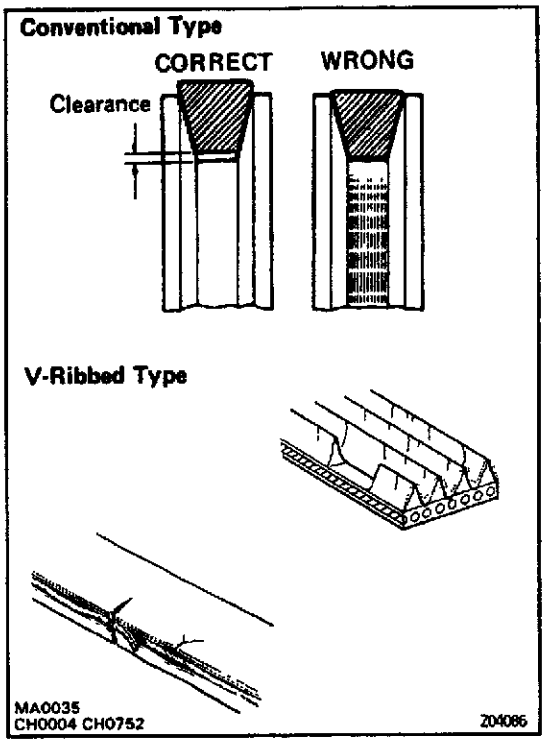
Conventional type

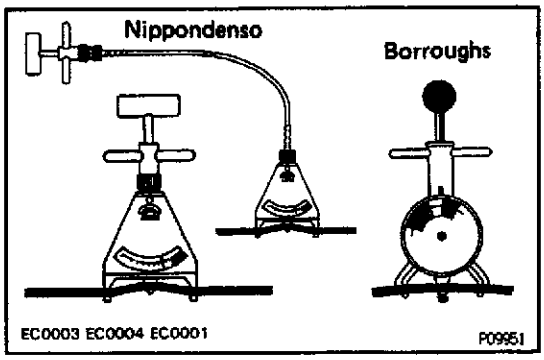
- Check that the belt does not touch the bottom of the pulley groove If necessary, replace the drive belt

V –Ribbed type

- Cracks on the rib side of the belt are considered acceptable

  If the belt has chunks missing from the ribs, it should be replaced





(b) Using a belt tension gauge, check the drive belt tension

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E

Used belt

80 ± 20 lbf

Now belt

125 ± 25 lbf

3vz – E

Generator

Used belt

100 ± 20 lbf

Now belt

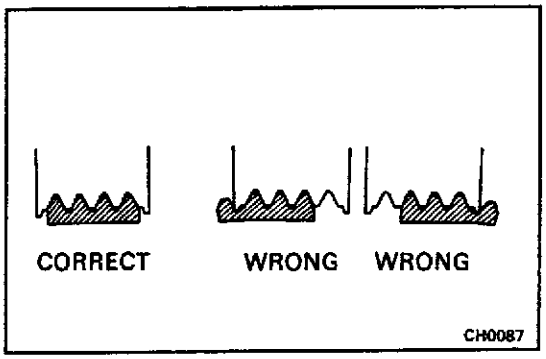
160 ± 20 lbf

PS and A/C
Used belt
80 ± 205 lbf
Now belt
125 ± 25 lbf

If necessary, adjust the drive belt tension

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 replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley
- After installing a new belt, run the engine for approx 5 minutes and then recheck the tension

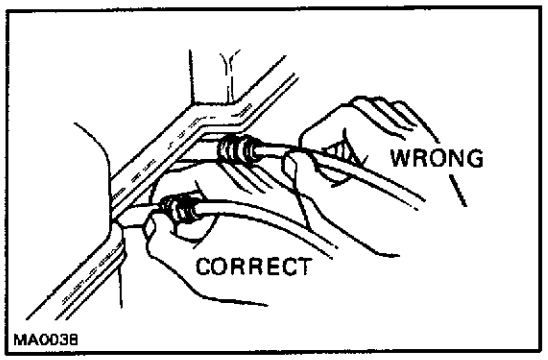


3. REPLACE SPARK PLUGS

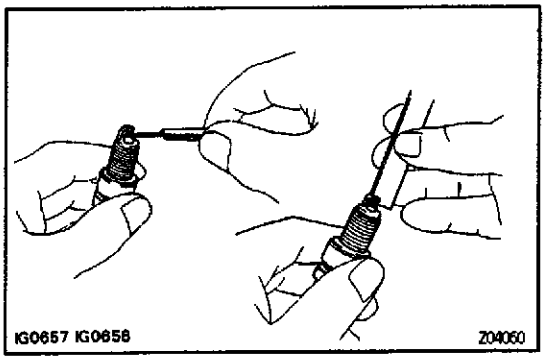
(a) Disconnect the high–tension cords at the boot
Do not pull on the cords

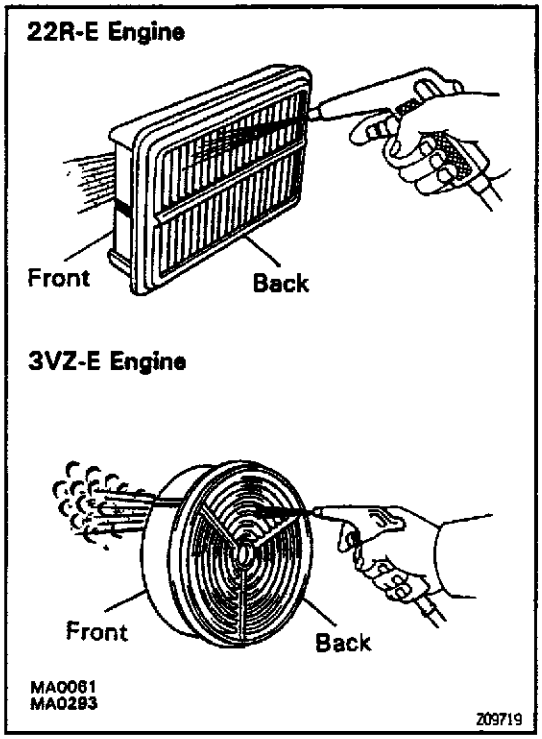
(b) 22R–E
Remove the spark plugs
3VZ–E

Using plug wrench (16 mm), remove the spark plugs



(c) Check the electrode gap of new spark plugs
Correct electrode gap:
0.8 mm (O.031 in.)
Recommended spark plugs:
22R–E
ND
W 16EXR– U
NGK
BPRSEY
3VZ–E
ND
K16R–U
NGK
BPRSEYA





4. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily

HINT Oiliness may indicate a stuck PCV valve

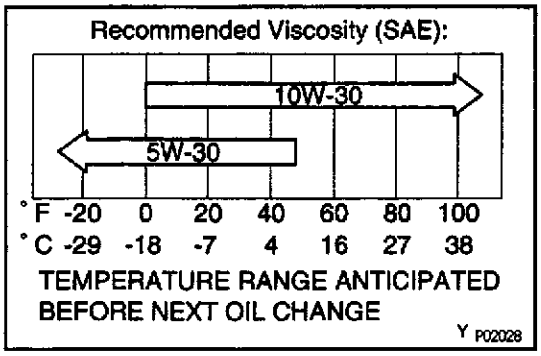
If necessary, replace the air cleaner element

(b) Clean the element with compressed air

First blow from back side thoroughly, then blow off the front side of the element

5. REPLACE AIR FILTER

Replace the used air cleaner element with a new one



6. REPLACE ENGINE OIL AND OIL FILTER

22R–E: (See oil and filter replacement in Lubrication System)

3VZ– E: (See oil and filter replacement in Lubrication System)

Oil grade:

API grade SH, Energy–Conserving II or ILSAC mul. tigrade engine oil. Recommended viscosity is as shown, in the illustration.

Engine oil capacity:

22R–E

Drain and refill

w/o Oil filter change

3.8 liters (4.0 US qts, 3.3 imp. qts)

w/ Oil filter change

4.3 liters (4.5 US qts, 3.8 imp. qts)

3VZ – E

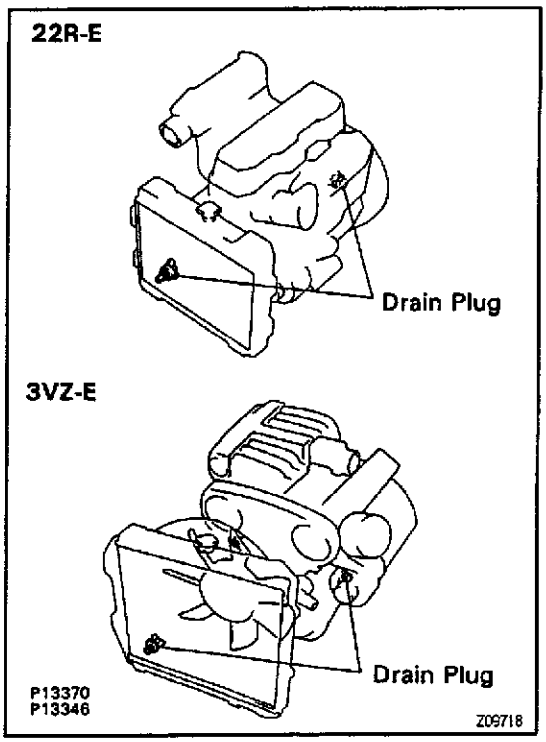
Drain and refill

w/o Oil filter change

4.2 liters (4.4 US qts, 3.7 Imp. qts)

w/ Oil filter change

4.5 liters (4.8 US qts, 4.0 Imp. qts)



7. REPLACE ENGINE COOLANT

(a) Drain the coolant from the radiator and engine drain plugs

(b) Close the drain plugs

(c) Fill system with coolant

Coolant capacity (w/ Heater or air conditioner):

22R–E

Except 4WD A/T

8.4 liters (8.9 US qts, 7.4 Imp. qts)

4WD A/T

9.1 liters (9.6 US qts, 7.0 Imp. qts)

3VZ–E

M/T

10.0 liters (10.6 US qts, 8.8 Imp. qts)

A/T

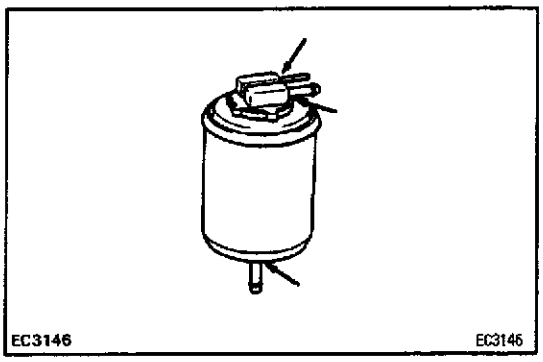
9.8 liters (10.4 US qts, 8.6 imp. qts)

HINT

- Use a good brand of ethylene – glycol base engine coolant, mixed according to the manufacturer's instructions
- Using engine coolant which has more than 50 96 ethylene–glycol (but not more than 70 96) is recommended

NOTICE:

- **Do not use an alcohol type coolant.**
- **The engine coolant should be mixed with demineralized water or. distilled water.**

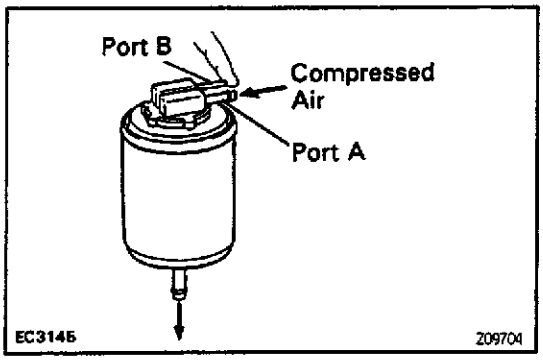


8. CALIFORNIA. MASSACHUSETTS AND NEW YORK: INSPECT CHARCOAL CANISTER

(a) Remove charcoal canister

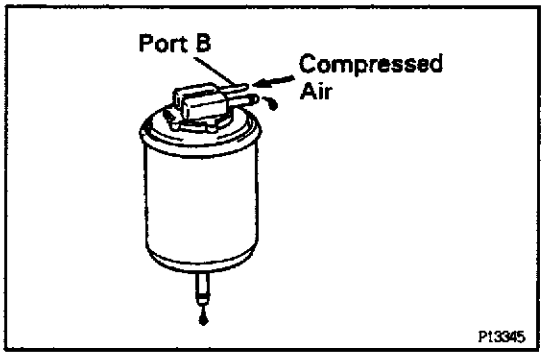
HINT Label hoses for correct installation

(b) Visually inspect canister case

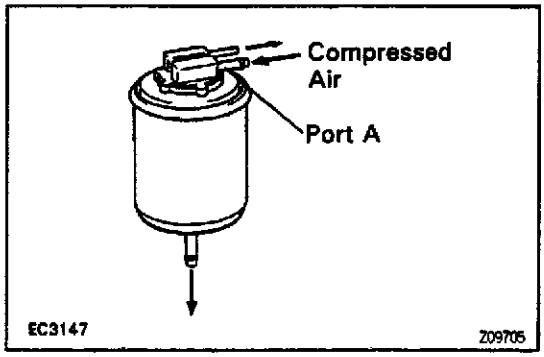


(c) Check for clogged filter and stuck check valve

- Using low pressure compressed air 4 71 kPa (48 gf/cm2, 0 68 psi), blow into port A and check that air flows without resistance from the other ports



- Blow low pressure compressed air 4 71 kPa (48 gf/cm2, 0 68 psi) into port B and check that air does not flow from the other ports
  If a problem is found, replace the charcoal canister

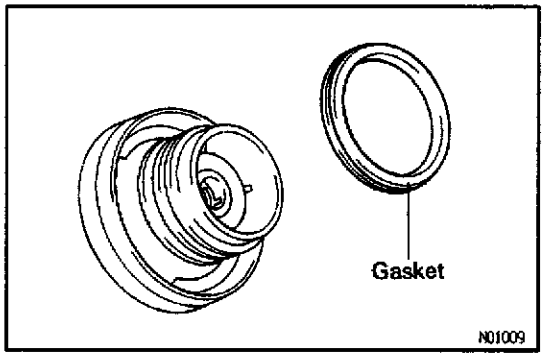


(d) Clean filter in canister
Clean the filter by blowing 294 kPa (3 kgf/cmt, 43 psi) of compressed air into port A while holding port B closed

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

(e) Install the charcoal canister

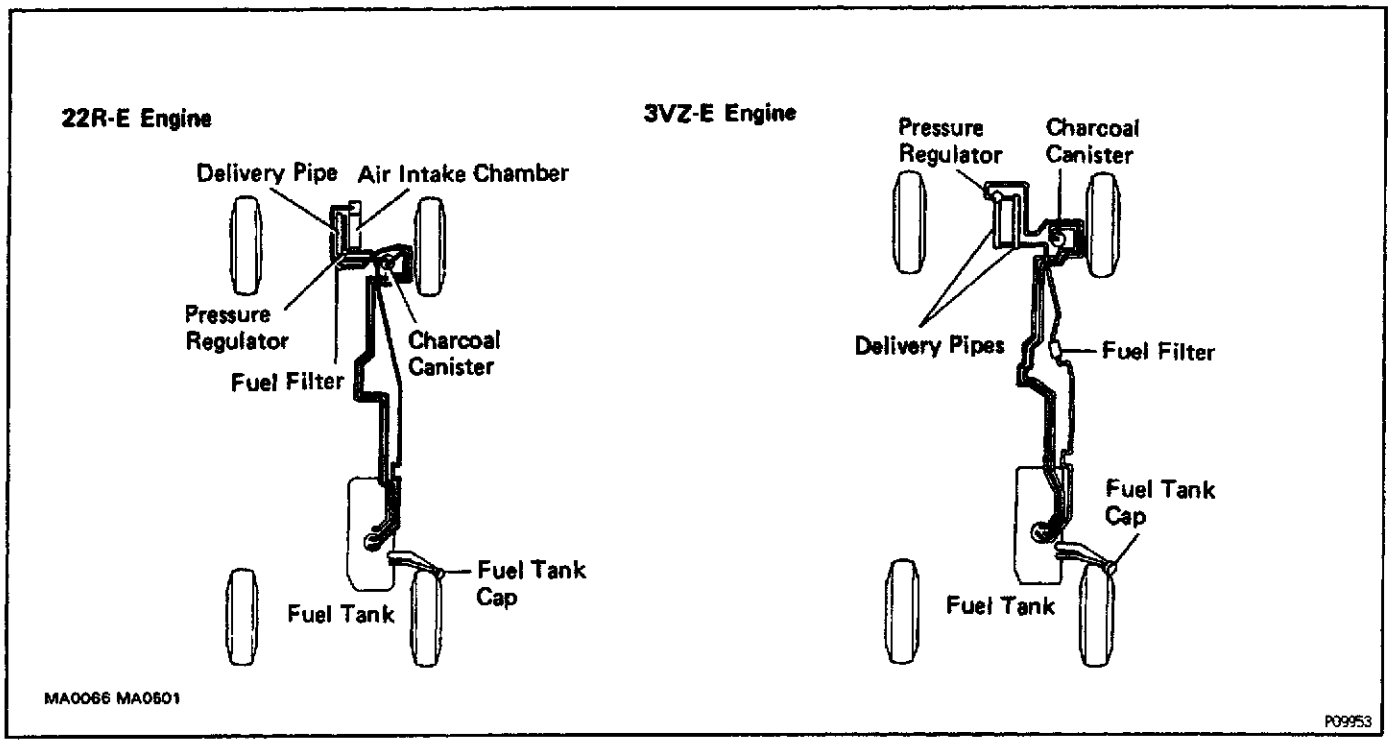


9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (0–ring) from the tank cap
Do not damage the cap
(b) Install a new gasket by hand
(c) Inspect the cap for damage or cracks
(d) Install the cap and check the torque limiter

10. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness



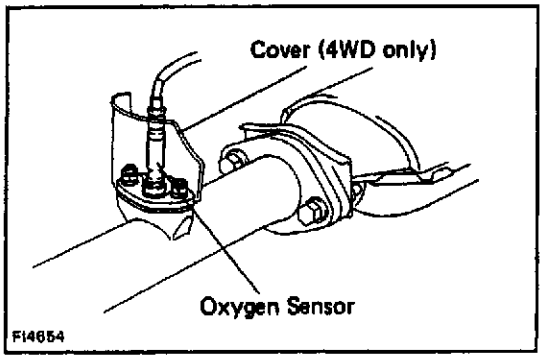
11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage

12. 3VZ– E ENGINE:

ADJUST VALVE CLEARANCE

(See valve clearance inspection and adjustment in tune–up in Engine Mechanical)



13. EXCEPT CALIFORNIA, MASSACHUSETTS AND NEW YORK

REPLACE HEATED OXYGEN SENSOR

(a) Disconnect the heated oxygen sensor wiring connector

(b) Remove the cover (4WD), heated oxygen sensor and gasket from the exhaust pipe

(c) Install a new gasket, heated oxygen sensor and cover (4WD) to the exhaust pipe

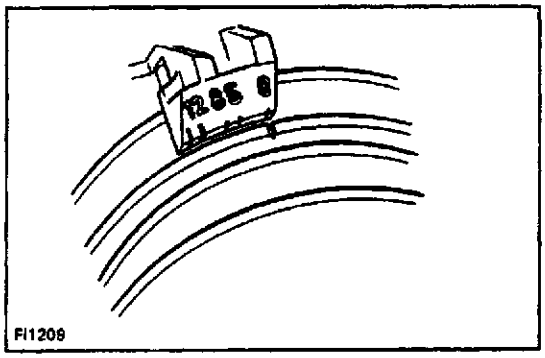
Torque: 20 N–m (200 kgf–cm, 74 ft–lbf)

(d) Inspect heated oxygen sensor operation

Inspect feedback control

22R–E (See heated oxygen sensor in MFI System)

3VZ–E (See heated oxygen sensor in MFI System)


FI1209

Hot Engine Operations

14. 22R–E ENGINE:

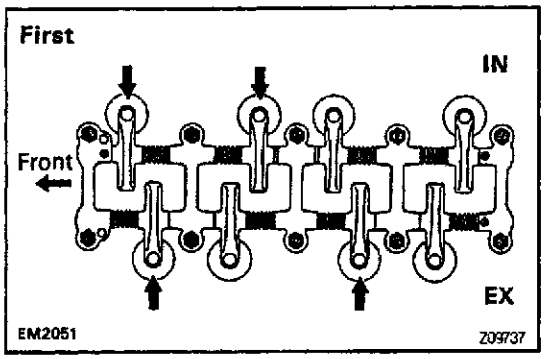
ADJUST VALVE CLEARANCE

(a) Warm up the engine to normal operating temperature

(b) Stop the engine and remove the cylinder head cover

(c) Set No 1 cylinder to TD C/com press ion

- Turn the crankshaft with a wrench to align the timing marks at TDC Set the groove on the pulley to the '0' position
- Check that the rocker arms on No 1 cylinder are loose and rocker arms on No 4 cylinder are tight If not, turn the crankshaft one complete revolution and align marks as above



(d) Adjust the clearance of half of the valves.

- **Adjust only the valves indicated by arrows.**

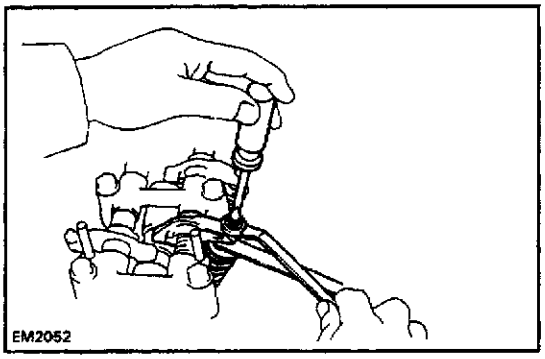
Volvo clearance:

Intake

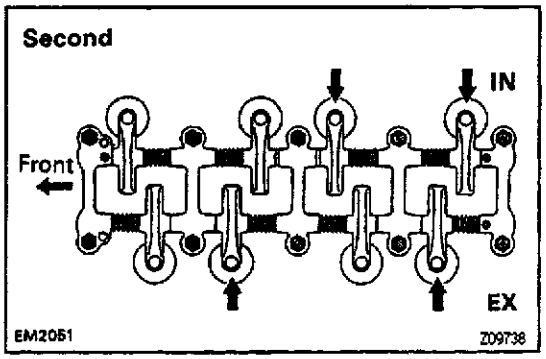
0.20 mm (0.008 in.)

Exhaust

0.30 mm (0.012 in.)


EM2052

- Use a thickness gauge to measure between the valve stern and rocker arm Loosen the lock nut and turn the adjusting screw to set the proper clearance Hold the adjusting screw in position, and tighten the lock nut
- Recheck the clearance The thickness gauge should move with a very slight drag



(e) Turn the crankshaft one complete revolution (360°) and align timing marks in the manner mentioned above Adjust only the valves indicated by arrows

(f) Reinstall the cylinder head cover

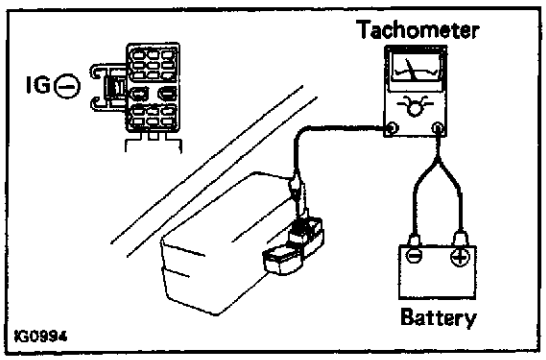
15. ADJUST IDLE SPEED

(a) Preparation

- Install air cleaner
- Connect all pipes and hoses of air intake system
- Connect all vacuum lines (EVAP, EGR system, etc)
- Make sure all MFI system wiring connectors are fully connected
- Engine should be at normal operating temperature
- Switch OFF accessories
- Set transmission in neutral position

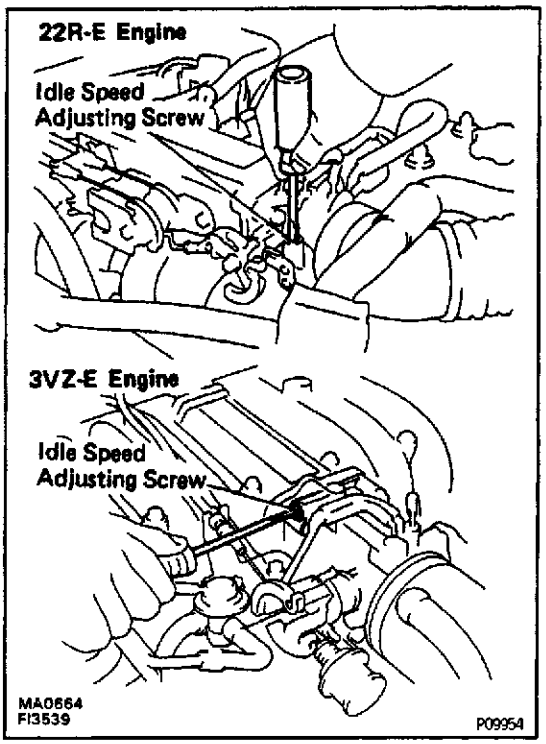
(b) Connect a tachometer to the engine

Connect the tachometer test probe to the IG E) terminal of the DLC1



NOTICE:

- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this Ignition system, we recommend that you confirm the compatibility of your unit before use.**



(c) Race the engine at 2,500 rpm for approx 2 minutes

(d) Set the idle speed by turning the idle speed adjusting screws

Idle speed:

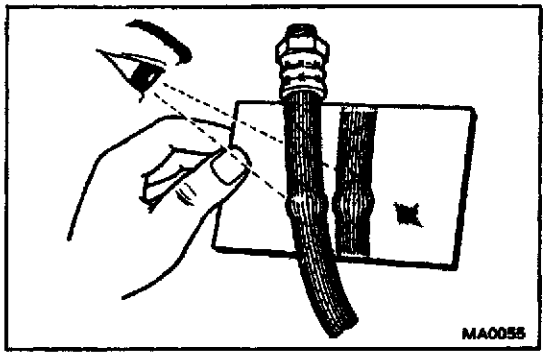
22R–E

750 rpm

3VZ–E

800 rpm

(e) Remove the tachometer



BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

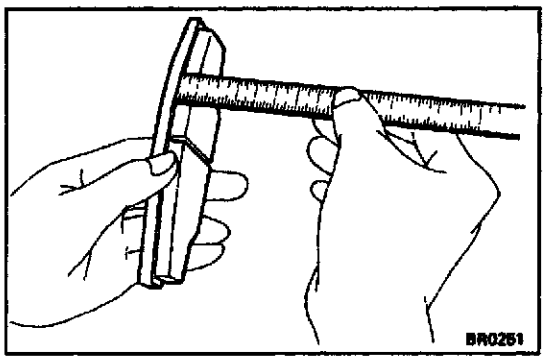
HINT Inspect in a well – lighted area Inspect the entire circumference and length of the brake hoses using a mirror as required Turn the front wheels fully right or left before inspecting the front brake

(a) Check all brake lines and hoses for
- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- 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

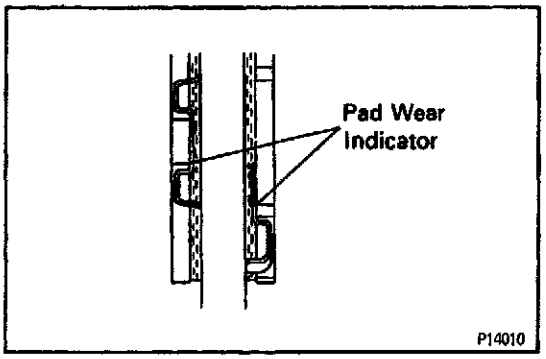
(d) Check that the fines installed in grommets pass through the center of the grommets



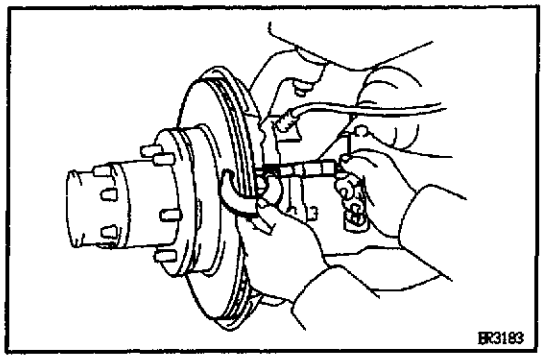
17. INSPECT FRONT BRAKE PADS AND DISCS (See front brake in Brake System)

(a) Check the thickness of the disc brake pad and check for irregular wear

Minimum lining thickness:
1.0 mm (0.039 in.)



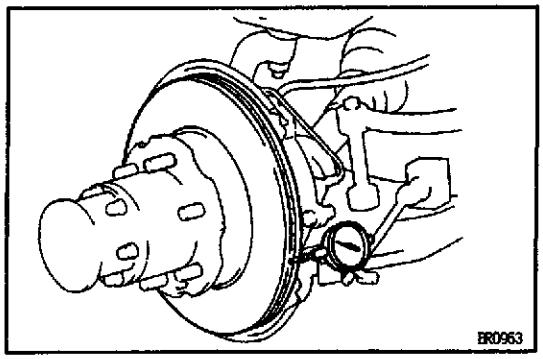
HINT If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced



(b) Check the disc for wear

Minimum disc thickness:

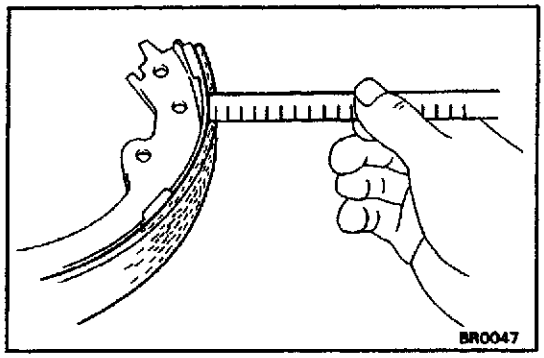
20.0 mm (0.787 in.)



(c) Check the disc for runout

Minimum disc runout:

0.09 mm (0.0035 in.)

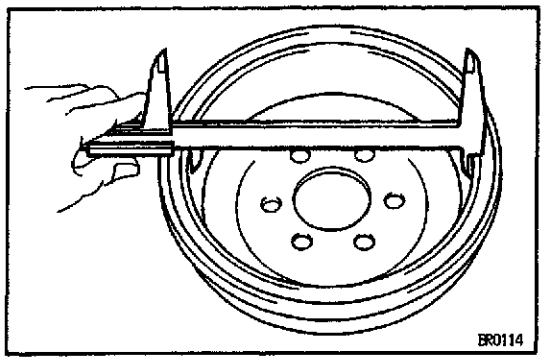


18. INSPECT REAR BRAKE LININGS AND DRUMS
(See rear brake in Brake System)

(a) Check the lining – to – drum contact condition and lining wear

Minimum lining thickness:

1.0 mm (0.0039 in.)



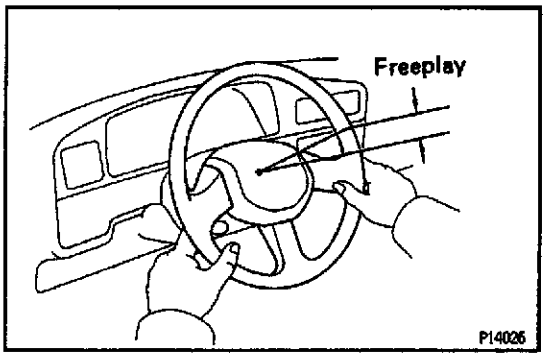
(b) Check the brake drum for scoring or wear

Maximum drum inside diameter:

297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth

NOTICE: Do not use compressed air to clean the brake parts.



CHASSIS

19. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay

Maximum:

30 mm (1.18 In.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure

If incorrect, adjust or repair

(b) Check the steering linkage for looseness or damage

Check that

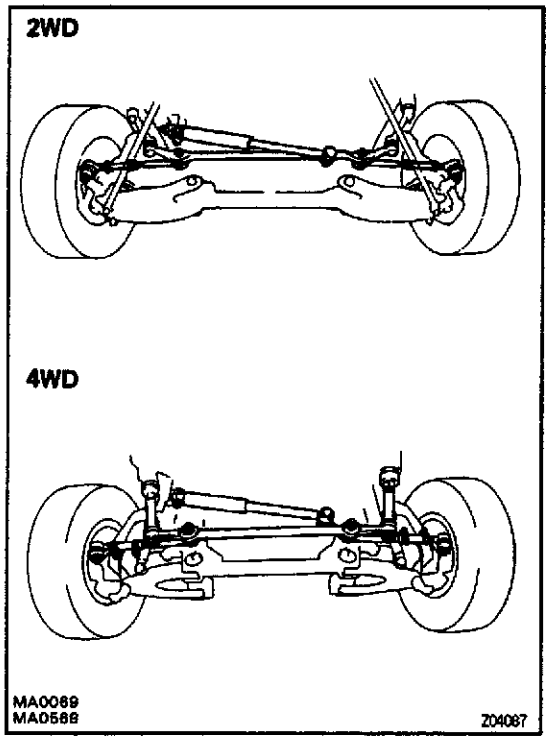
- Tie rod ends and relay rod ends do not have excessive play
- Dust seals are not damaged
- 4WD

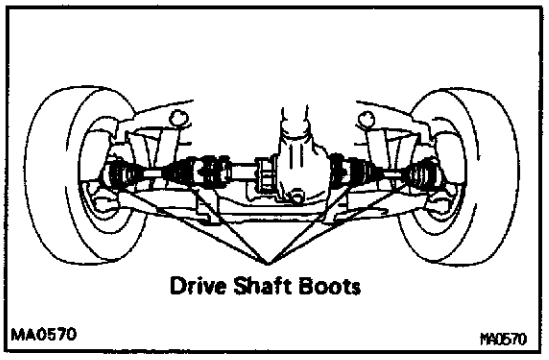
  Boot clamps are not loose

20. INSPECT STEERING GEAR HOUSING

Check the steering gear housing for oil leaks

If leakage is found, check for cause and repair

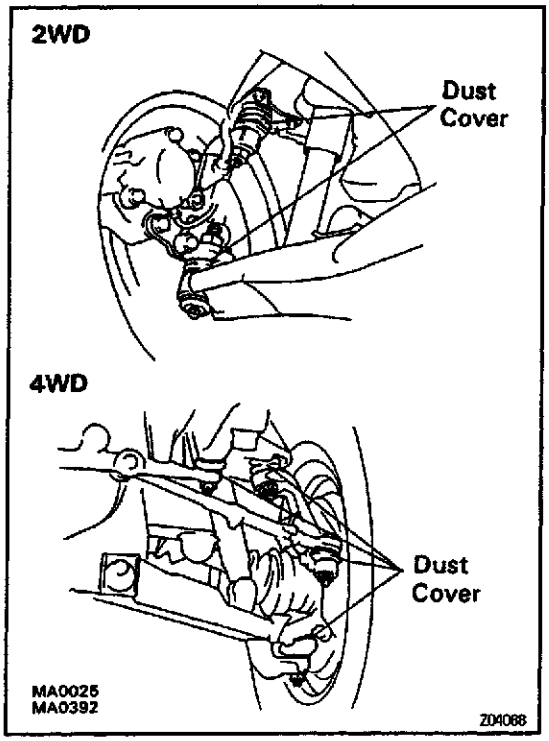




21. 4WD:

INSPECT DRIVE SHAFT BOOTS

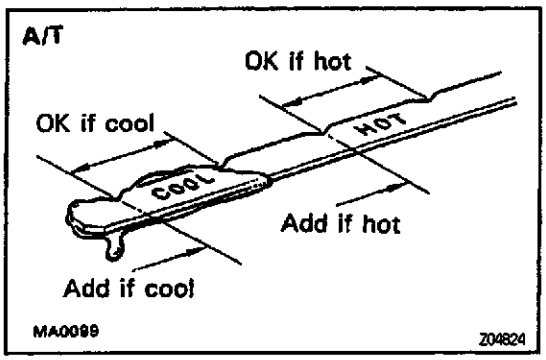
Inspect the drive shaft boots for clamp looseness, grease leakage or damage



22. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness
(See upper and lower ball joint in front suspension in Suspension and Axle)

(b) Inspect the dust cover for damage



23. 2WD:

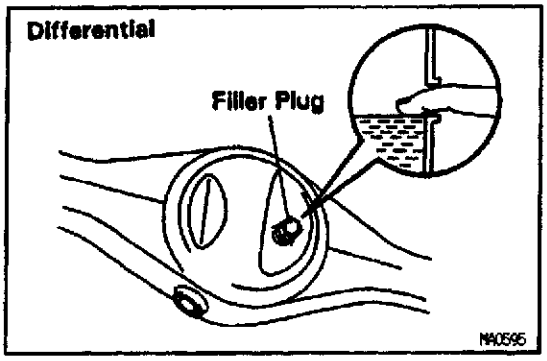
CHECK OIL LEVEL IN AUTOMATIC TRANSMISSION AND DIFFERENTIAL

(a) Automatic transmission

Check the automatic transmission for oil leakage
If leakage is found, check for cause and repair

Transmission fluid (A/T):

ATF DEXRON®II



(b) Differential

Remove the filler plug and feel inside the hole with your finger Check that the oil comes to within 5 mm (Q 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

Differential oil:

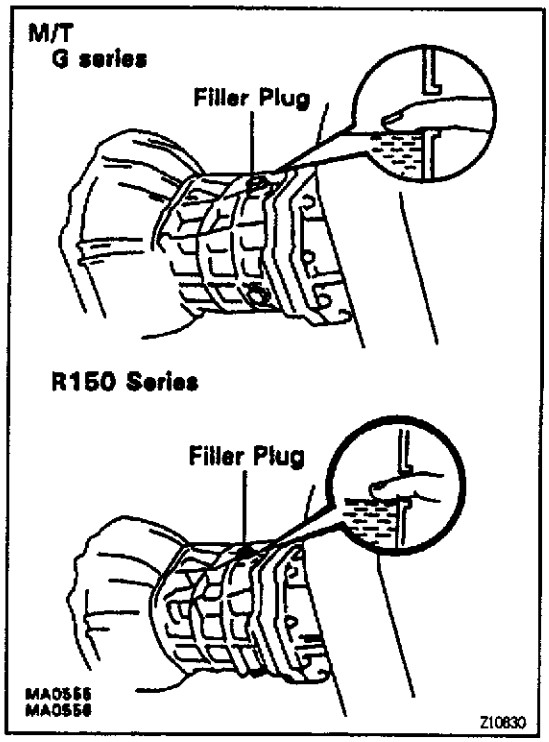
Oil grade

AN GL–5 hypoid gear oil

Viscosity

Above – 18° C (0° F) SAE 90

Below – 1s° C (0° F) SAE 8ow – 90 or 80w



24. 4WD:

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

(a) Manual transmission

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.

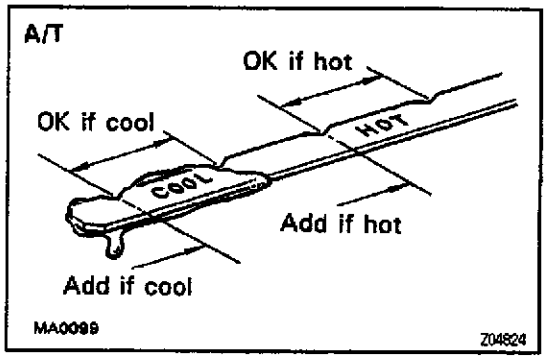
Transmission oil (M/T):

Oil grade:

API GL–4 or GL–5

Viscosity:

SAE 75W–90

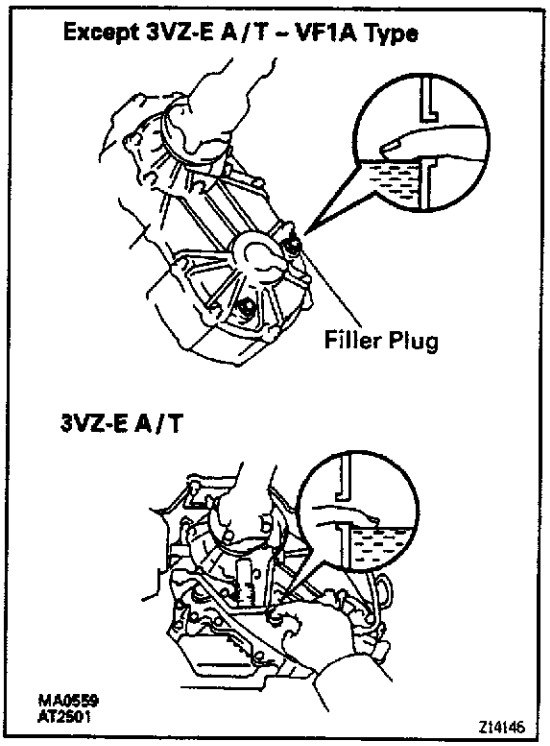


(b) Automatic transmission

Check the automatic transmission for oil leakage. If leakage is found, check for cause and repair.

Transmission fluid (A/T):

ATF DEXRON®II



(c) 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.

Transfer oil (Except 3VZ–E A/T):

Oil grade

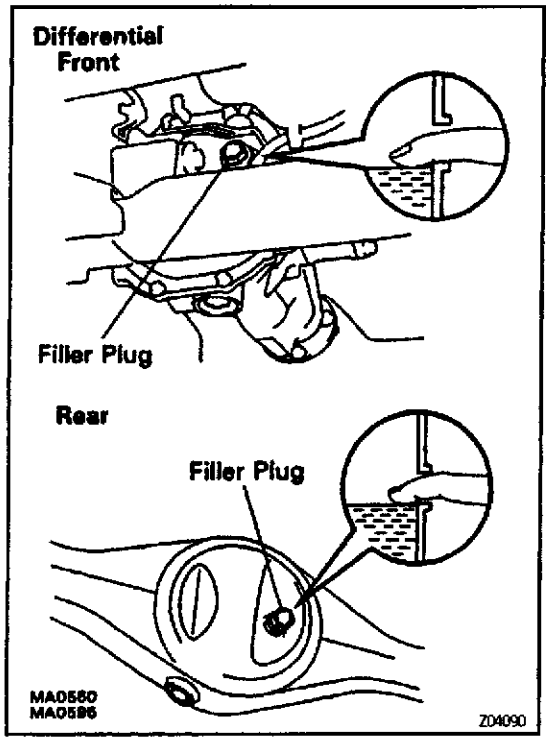
AN GL–4 or GL–5

Viscosity

SAE 75W–80

Transfer fluid (3VZ–E A/T):

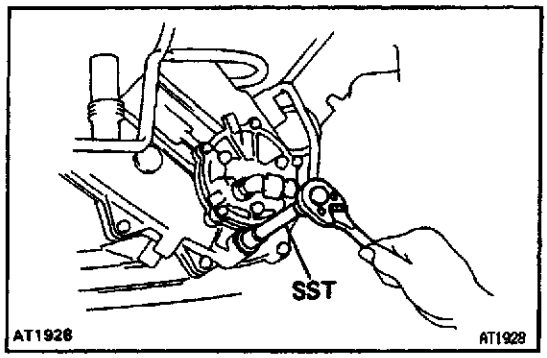
ATP DEXRON®II



(d) 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 filter hole

Differential oil:
Standard differential
Oil grade
API GL–5 hypoid gear oil
Viscosity:
Above –18 ° C (0° F) SAE 90
Below –18 ° C (0° F) SAE 80W – 90 or 80W
A.D.D.
Oil grade
Toyota 'GEAR OIL SUPER" oil or hypoid gear oil API GL – 5
Viscosity:
SAE 75W – 90



25. REPLACE MANUAL TRANSMISSION, TRANSFER (4WD) AND DIFFERENTIAL OIL

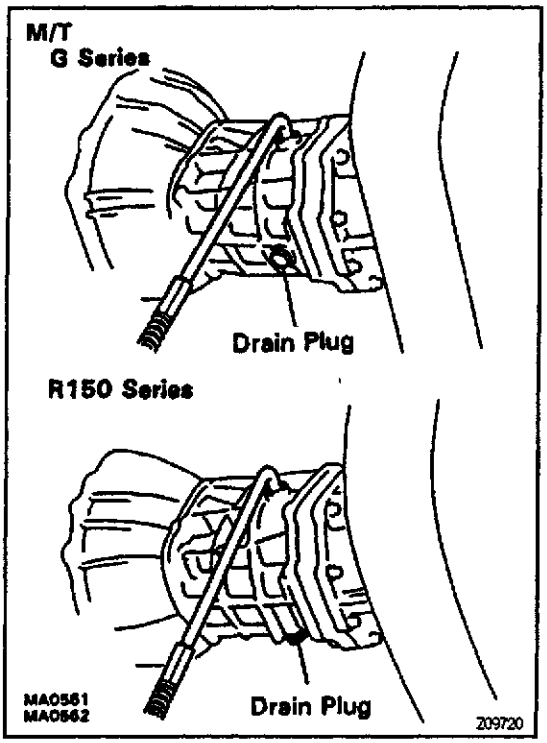
(a) Transfer

Remove the transfer cover

(b) Using SST (A340H transfer), remove the drain plug and drain the oil

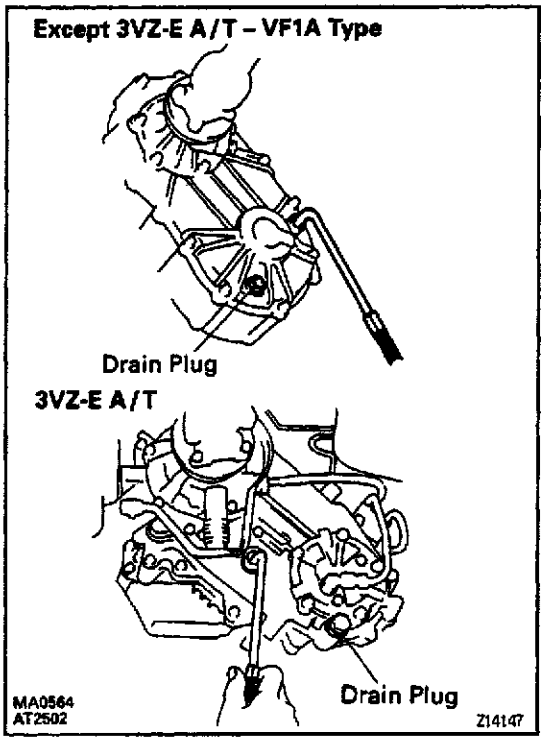
SST 09043–38100

(c) Reinstall drain plug securely

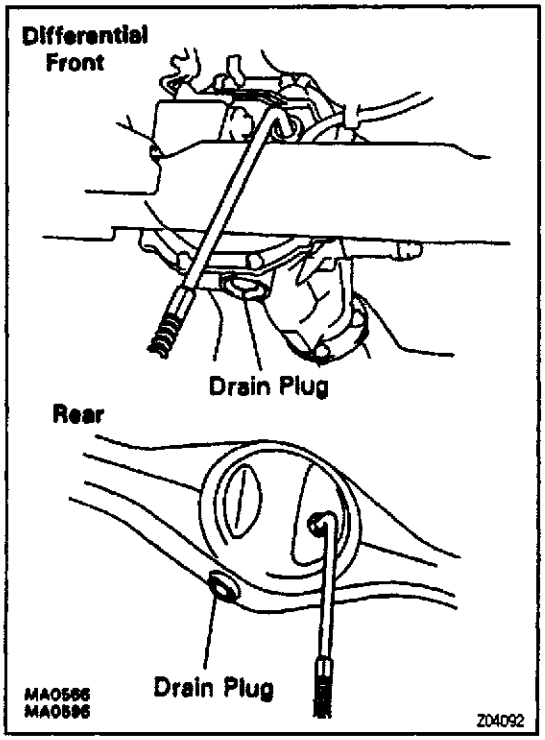


(d) Add new oil until it begins to run out of the filler hole

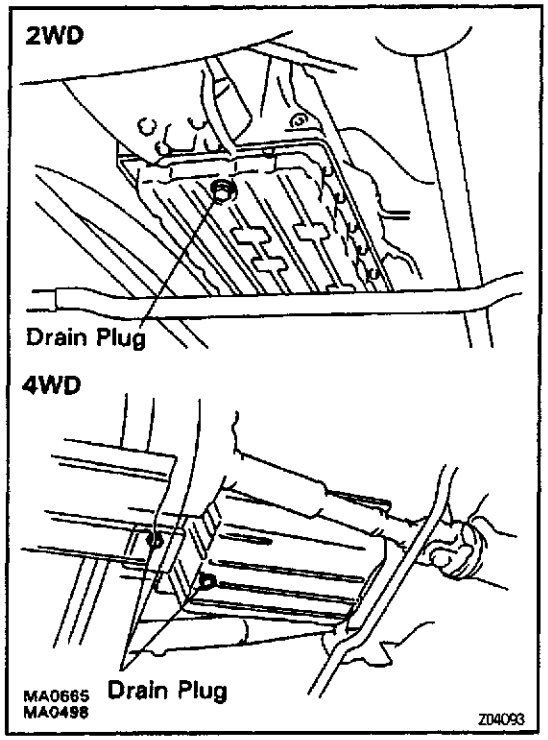
Oil grade and viscosity:
See steps 23 and 24
Oil capacity:
Transmission
G58
3.9 liters (4.1 US qts, 3.4 Imp. qts)
R150F
3.0 liters (3.2 US qts. 2.6 Imp. qts)



Transfer
Except 3 VZ – E A/T (VF1A type)
1.1 liters (1.2 US qts, 1.0 Imp. qts)
3VZ – E A/T (A340 H)
0.8 liters (0.8 US qts, 0.7 Imp. qts)



Differential
2WD
1.8 liters (1.9 us qts, 1.s Imp. qts)
4WD
Front standard differential
1.6 liters (1.7 US qts, 1.4 Imp. qts)
A.D.D.
1.86 liters (2.o US qts, 1.6 Imp. qts)
Rear
2.2 liters (2.3 US qts, 1.9 Imp. qts)



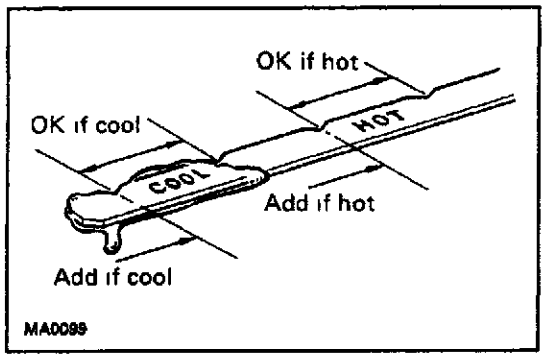
26. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid

(b) Reinstall the drain plug(s) securely

(c) With the engine OFF, add new fluid through the dipstick tube

Fluid:
ATF DEXRON®II
Drain and refill capacity:
2WD
A340E
1.8 liters (1.7 US qts. 1.4 Imp. qts)
4WD
A340H
4.5 liters (4.8 US qts. 4.0 Imp. qts)
A340F
2.0 liters (2.1 US qts, 1.8 Imp. qts)



(d) Start the engine and shift the selector into all positions from "P" through "L" and then shift into "P"

(e) A340 H
Shift the transfer lever position H2–H4–L4 and L4 –H4–H2

(f) With the engine idling, check the fluid level
Add fluid up to the cool level on the dipstick

(g) Check that the fluid level is in the "HOT" range at the normal operating temperature (70 – 80* C or 158 – 176° F) and add as necessary

NOTICE: Do not overfill.

27. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

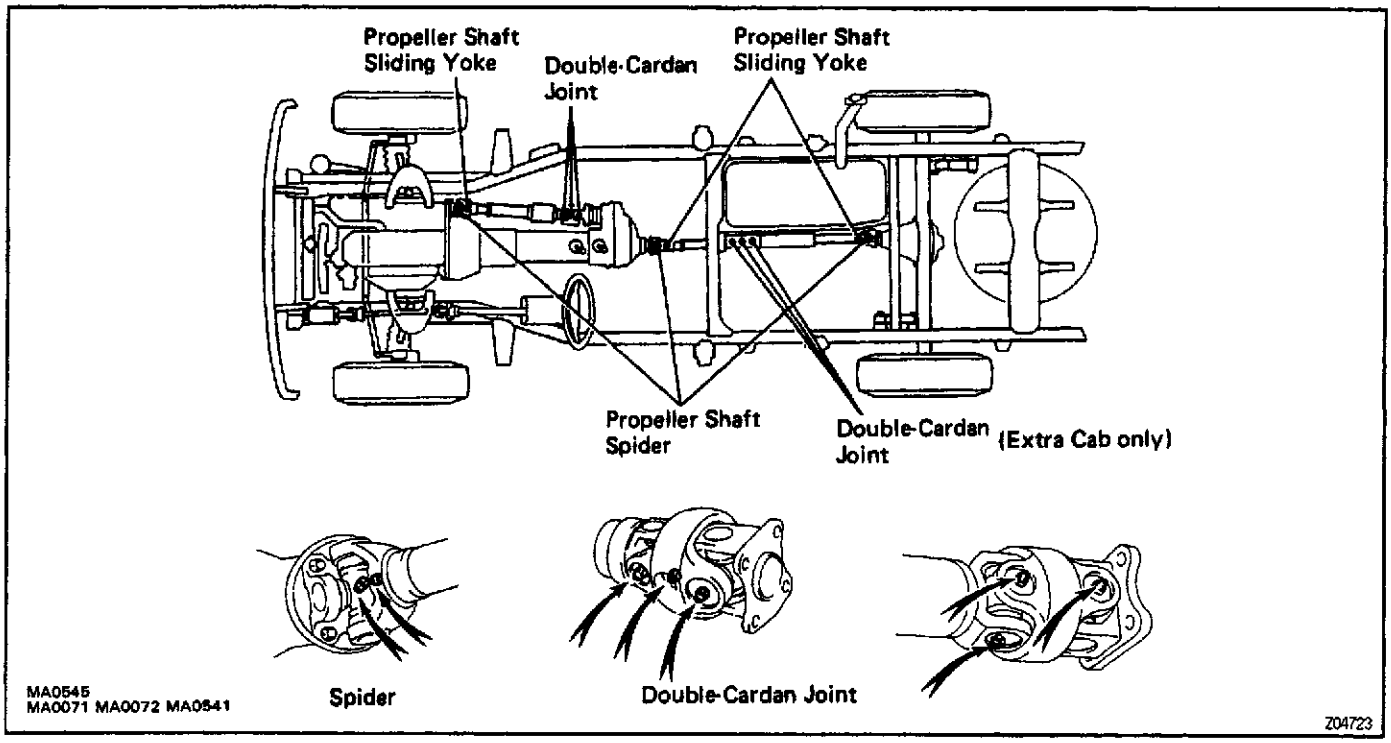
(a) Change the front wheel bearing grease
(See front axle in Suspension and Axle)
Grease grade:
Lithium base multipurpose grease (NLGI No.2) Wheel bearing friction preload (at starting):
28 – 56 N (2.9 – 5.7 kgf, 6.4 – 12.6 lbf)

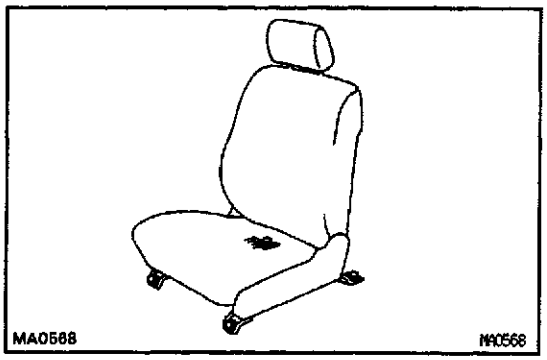
(b) Repack the drive shaft thrust bush grease
(See Suspension and Axle)

28. 4WD:
LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart
Before pumping in grease, wipe off any mud and dust on the grease fitting
Grease grade:
Propeller shaft (Except Double–cardan joint)
Lithium base chassis grease (NLGI No.2)

Double–cardan Joint
Molybdenum disulphide lithium base chassis gross* (NLGI No.2)





29. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten these parts

- Seat mounting bolts
  Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)

Under Severe Conditions

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following '

- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc

30. FINAL INSPECTION

(a) Check operation of body parts

- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Doors
  Door locks operate properly
  Doors close properly
- Seats
  Seat adjusts easily and locks securely in any positions
  Seat backs lock securely at any angle
  Fold–down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises
- Vehicle does not wander or pull to one side
  Brakes work properly and do not drag

(c) Be sure to deliver a clean vehicle and especially check

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

AUTOMATIC TRANSMISSION

DESCRIPTION

ATDPB--06

PRECAUTIONS

When working with FIPG material, you must be observe the following

- **Using a razor blade and gasket scraper, remove all the old packing (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 the FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembly within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

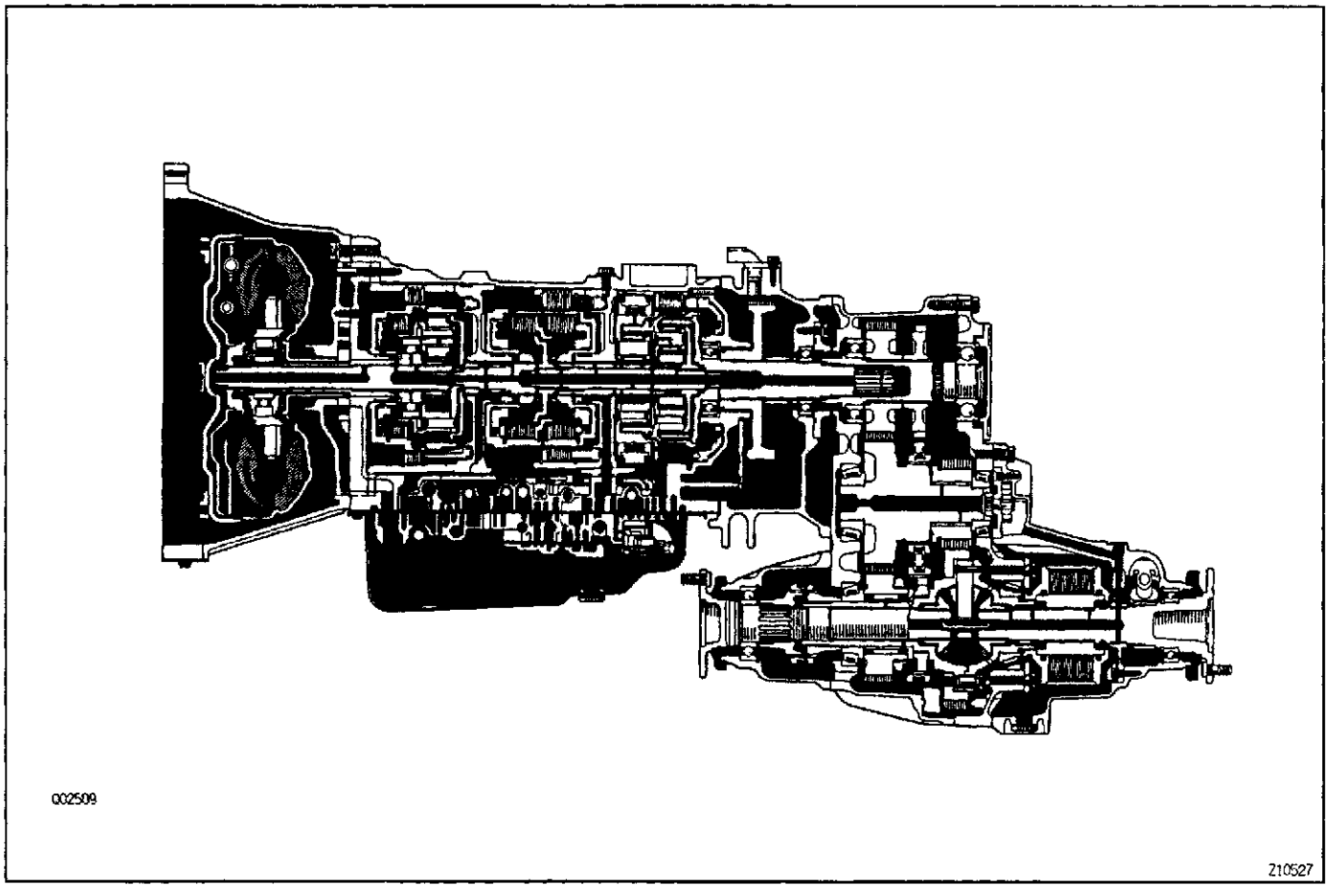
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section

GENERAL DESCRIPTION

ATDRB--01

The A442F automatic transmission is the four-speed automatic transmission with a two-speed transfer, developed with the aim of producing an easy-driving 4WD vehicle A lock-up mechanism is built into the torque converter clutch

The A442F transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called 0/D) planetary gear unit, 3-speed planetary gear unit, 2-speed transfer, the hydraulic control system and the electronic control system



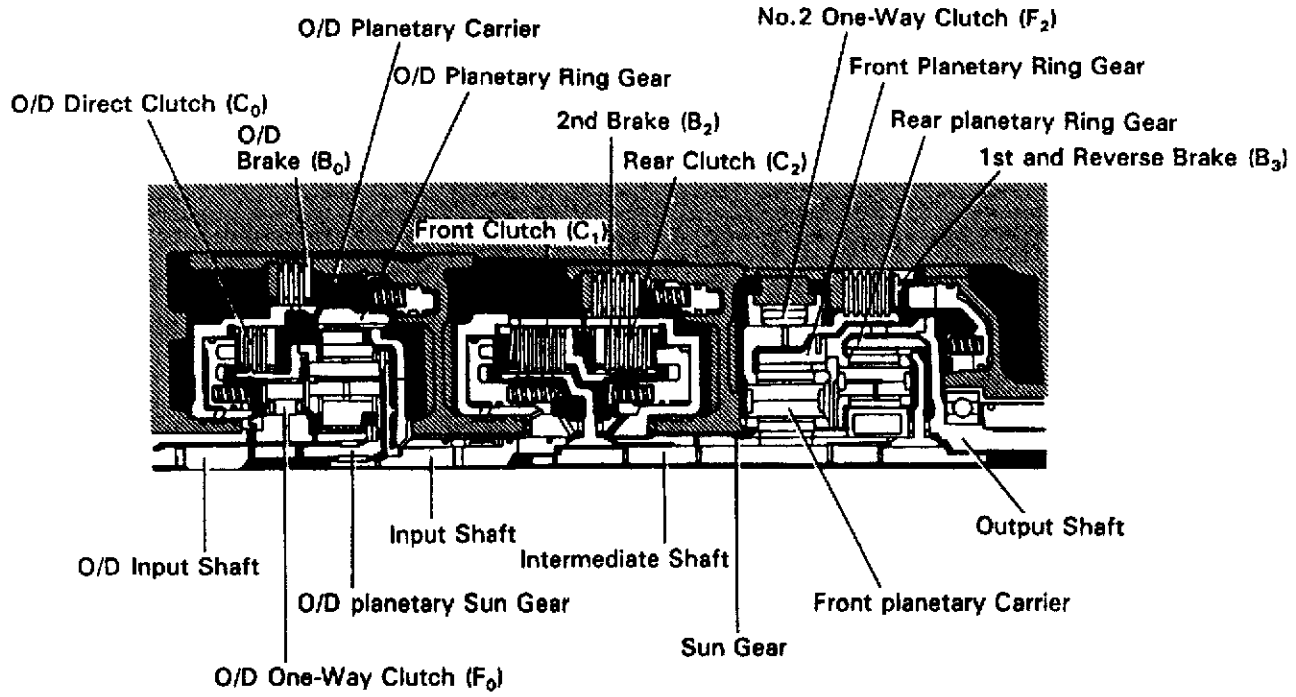
GENERAL SPECIFICATIONS

Type of Transmission		A442F
Type of Engine		1 FZ-FE
Torque Converter Clutch Stall Torque Ratio		1 8 1
Lock-up Mechanism		Equipped
Gear Ratio	1 st Gear	2 950
	2nd Gear	1 530
	3rd Gear	1 000
	O/D Gear	0 765
	Reverse Gear	2 678
Number of Discs and Plate (Disc and Plate)		6/6
	Front Clutch (C_1)	5/5
	Rear Clutch (C_2)	3/3
	0/D Direct Clutch (C_0)	5/5
	2nd Brake (B_2)	6/6
	1 st and Reverse Brake (B_3)	3/3
	O/D Brake (B_0)	
ATF Type		ATF DEXRON® II
Capacity	Liter (US qts Imp qts)	
	Total	15 4 (16 3 13 6)
	Drain and Refill	6 0 (6 3 5 3)

OPERATION

OPERATION

AT09D-02



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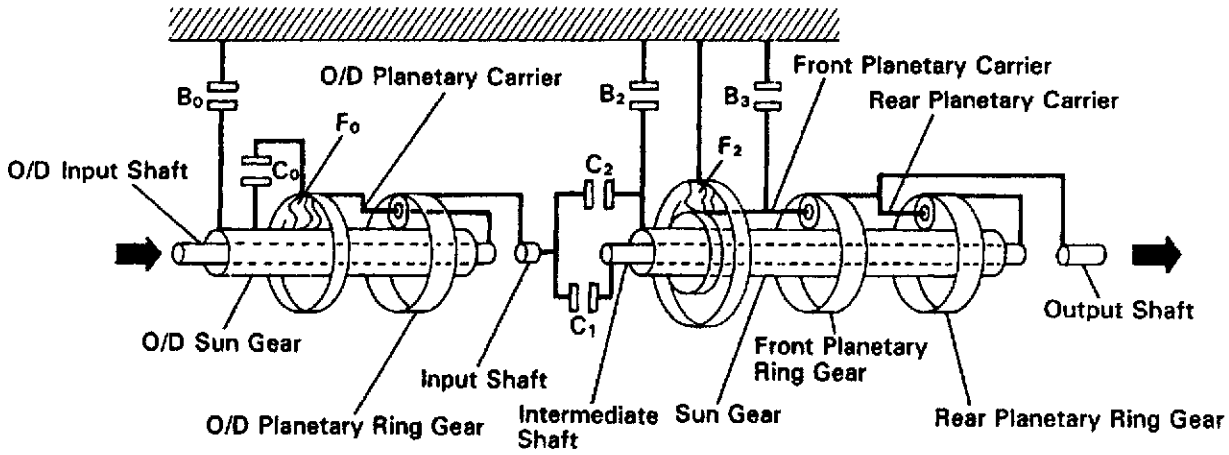
○ .... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_2	B_3	F_0	F_2
P	Parking	○						○	
R	Reverse	○		○			○	○	
N	Neutral	○						○	
D	1 st	○	○					○	○
	2nd		○			○		○	
	3rd	○	○	○				○	
	O/D		○	○	○				
2	2nd	○	○			○		○	
L	1 st	○	○				○	○	○

V01579

1. FUNCTION OF COMPONENTS

NOMENCLATURE	OPERATION
O/D Direct Clutch (Co)	Connects overdrive sun gear and overdrive carrier
O/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One-Way Clutch (Fo)	When transmission is being driven by engine connects overdrive sun gear and overdrive carrier
Front Clutch (C_1)	Connects input shaft and intermediate shaft
Rear Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
2nd Brake (B_2)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
1st & Reverse Brake (B_3)	Prevents front planetary carrier from turning either clockwise or counterclockwise
No 2 One-Way Clutch (F_2)	Prevents front planetary carrier from turning counterclockwise

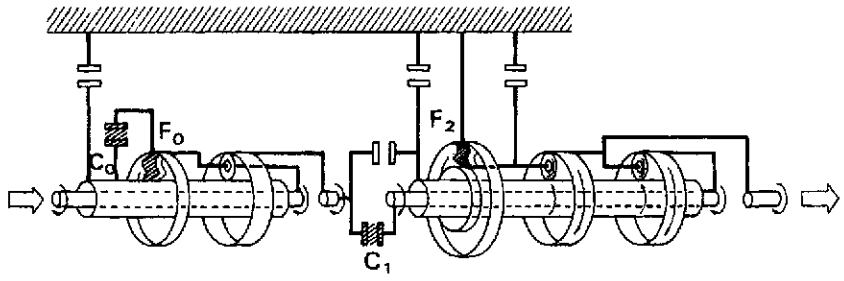


AT3917

V01580

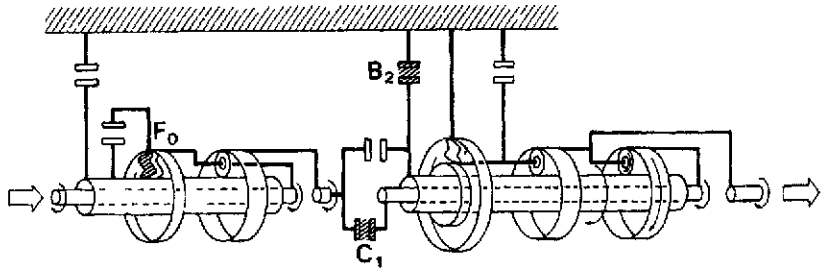
The conditions of operation for each gear position are shown on the following illustration

D Position 1st Gear



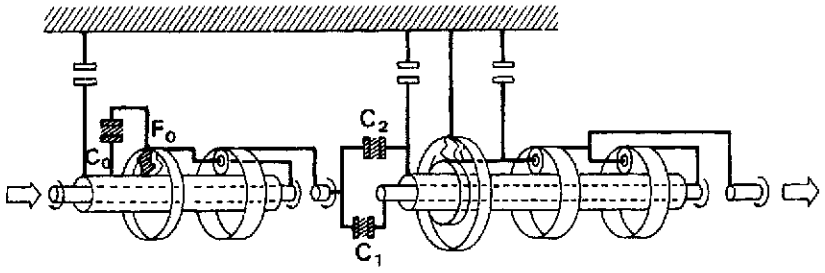
AT5949

D Position 2nd Gear



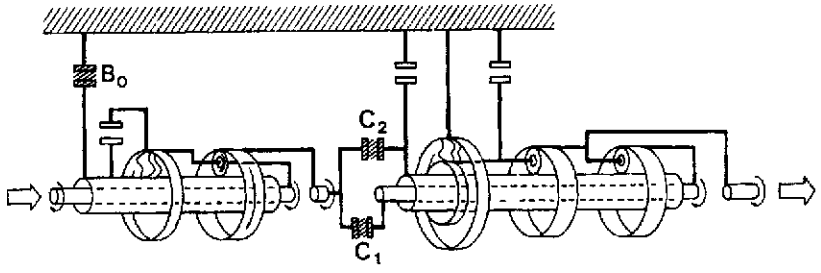
AT5950

D Position 3rd Gear



AT5951

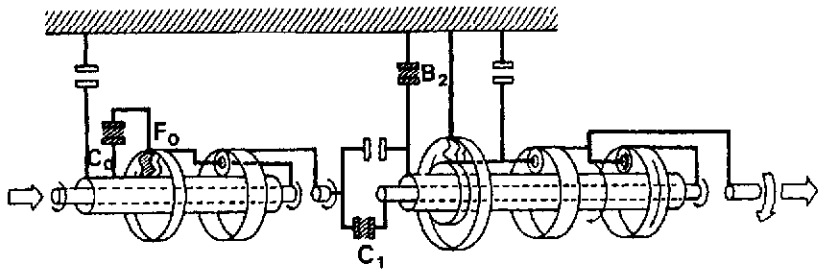
D Position O/D



AT5952

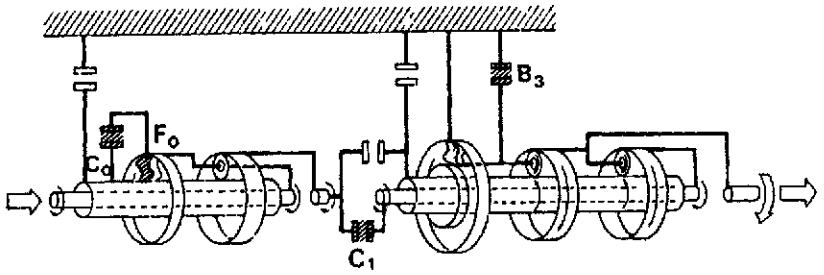
V01581

2 Position 2nd Gear



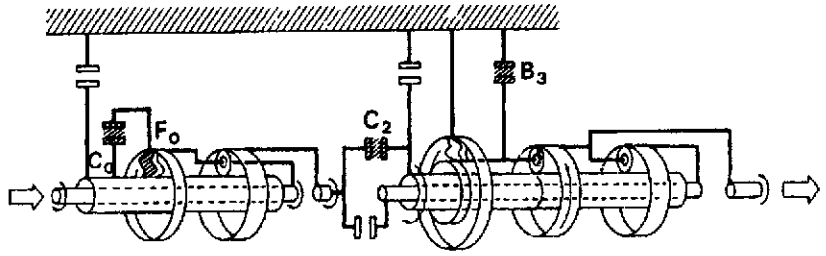
AT5953

L Position 1st Gear



AT5954

R Position Reverse Gear



AT5955

V01582

2. HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes, as well as the fluid passages which connect all of these components

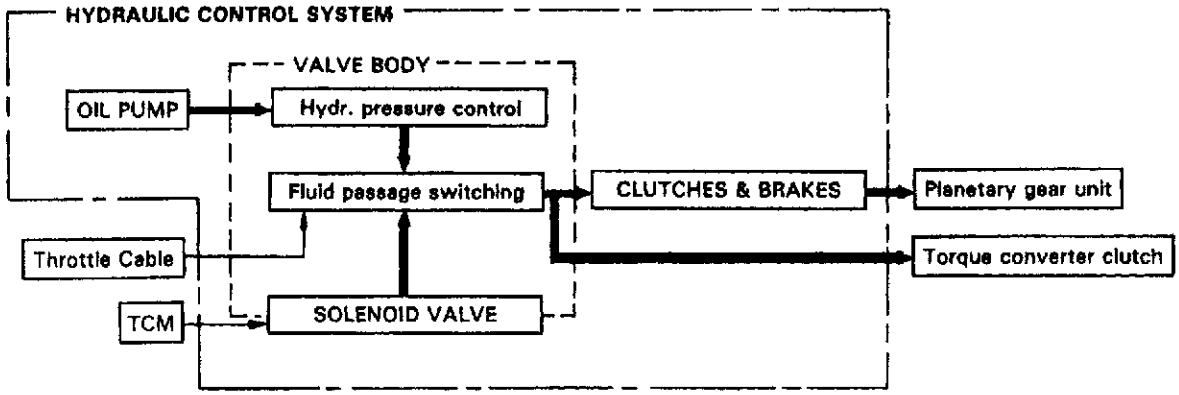
Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving condition

There are four solenoid valves on the valve body

These solenoid valves are turned on and off by signals from TCM to operate the shift valves

These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units

(Except for the solenoid valves, the hydraulic control system of the electronically controlled transmission is basically the same as that of the fully hydraulic controlled automatic transmission)



V01583

3. ELECTRONIC CONTROL SYSTEM

The electronic control system for the A442F automatic transmission provide extremely precise control of the gear shift timing and lock-up timing in response to driving conditions as sensed by various sensors located throughout the vehicle and in response to the engine's running condition

At the same time, the TCM control reduces vehicle squat when the vehicle starts out and gear shift shock

The electronic control system for controlling the shift timing and the operation of the lock-up clutch is composed of the following three parts

Sensers:

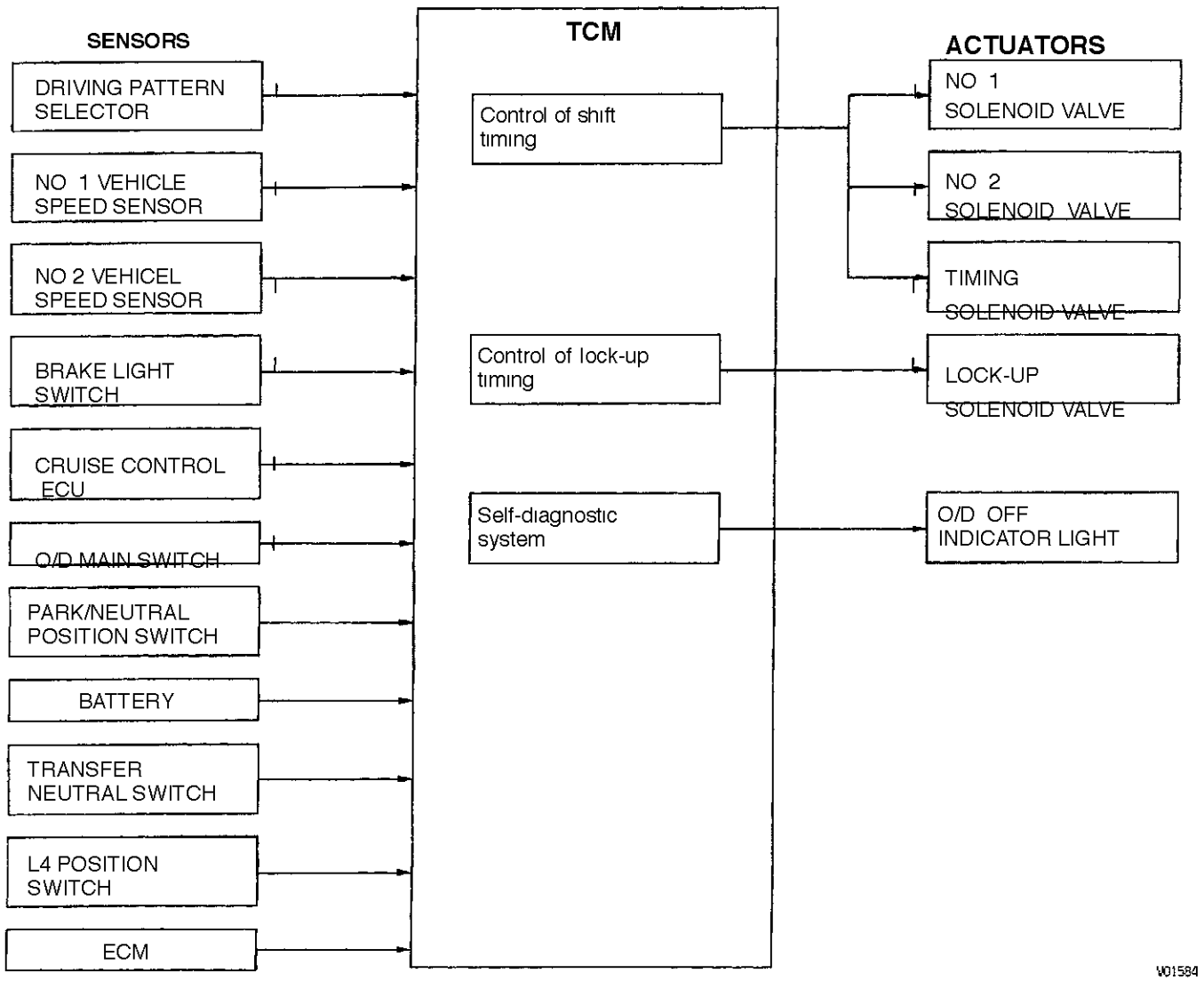
These sense the vehicle speed and throttle position and send this data to the TCM in the form of electronic signals

TCM:

This determines the shift and lock-up timing based upon the signals from the sensors

Actuators:

Solenoid valves divert hydraulic pressure from one circuit of the hydraulic control unit to another thus controlling shifting and lock-up timing



4. FUNCTION OF TCM

- **Control of Shift Timing**

The TCM has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L positions) and driving mode (Normal or Power)

Based on the appropriate shift pattern, the TCM turns No 1, No 2 and timing solenoid valves on or off in accordance with the vehicle speed signal from the vehicle speed sensor and the throttle opening signal from the throttle position sensor In this manner, the TCM operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up-shift or down-shift of the transmission

HINT The electronic control system provides shift timing and lock-up control only while the vehicle is traveling forward In REVERSE, and NEUTRAL, the transmission is mechanically, not electronically controlled

- Control of Overdrive

Driving in overdrive is possible if the 0/D main switch is on and the shift lever is in the D position However, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the TCM to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory

On this model, if the coolant temperature falls below 55* C (131 ° F), the ECM sends a signal to the TCM, preventing the transmission from up-shifting into overdrive

Control of Lock-Up System

The TCM has programmed in its memory a lock-up clutch operation pattern for each driving mode (Normal or Power) Based on this lock-up pattern, the TCM turns lock-up solenoid valve on or off in accordance with the vehicle speed signals received from the vehicle speed sensor and the throttle opening signals from the throttle position sensor

Depending on whether lock-up solenoid valve is on or off, the lock-up relay valve performs changeover of the fluid passages for the converter pressure acting on the torque converter clutch to engage or disengage the lock-up clutch

Mandatory Cancellation of Lock-Up System:

If any of the following conditions exist, the TCM turns off lock-up solenoid valve to disengage the lock-up clutch

(1) The brake light switch comes on (during braking)

(2) The IDL points of the throttle position sensor close (throttle valve fully closed)

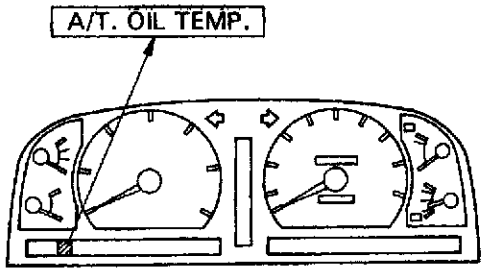
(3) The vehicle speed drops 4 km/h (2mph) or more below the set speed while the cruise control system is operating

(4) The coolant temperature falls below 70°C (158°F)

The purpose of (1) and (2) above is to prevent the engine from stalling if the rear wheels lock up The purpose of (3) is to cause the torque converter clutch to operate to obtain torque multiplication The purpose of (4) is both to improve general driveability, and to speed up engine warm -up Also, while the lock-up system is in operation, the TCM will temporarily turn it off during up-shift or down-shift in order to decrease shifting shock

5. A/T. FLUID TEMPERATURE WARNING SYSTEM

The TCM detects the A/T fluid temperature by means of a fluid temperature sensor fitted to the union The A/T fluid may become extremely hot when the vehicle is under an extreme load, as when driving on sand or climbing uphill Should the fluid temperature increase above 150°C (302° F), the TCM lights the warning light located in the combination meter The light goes off when temperature falls below 120° C (248° F)



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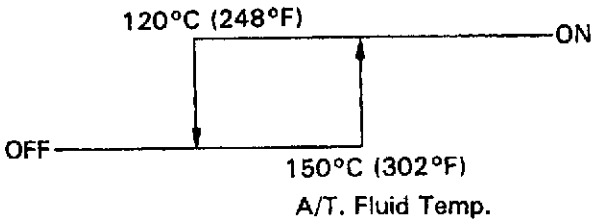
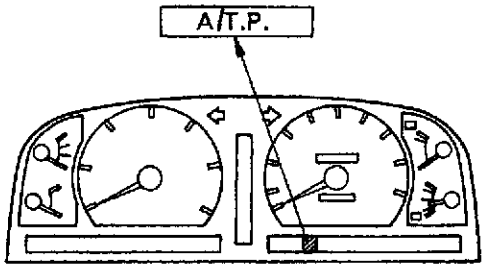


V01585

6. A/T.P.(Automatic Transmission Parking) INDICATOR

The propeller shaft and wheels are free even when the transmission shift lever is set to "P" as long as the transfer shift lever is in "neutral" position The A/T P indicator lights up to warn the driver that the propeller shaft and wheels are not locked If the A/T P indicator light goes on, the transfer shift lever should be shifted out of "N" position



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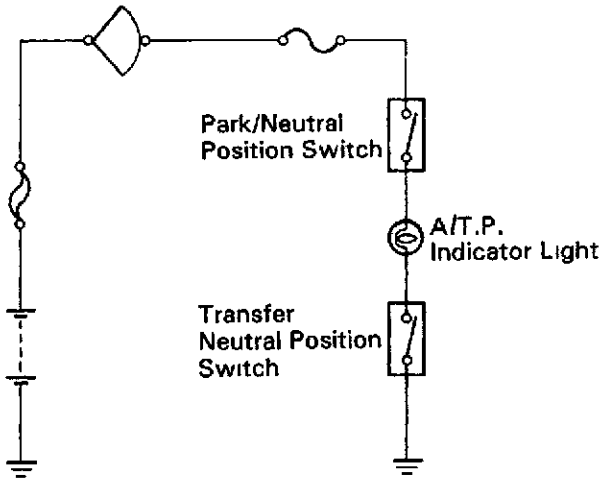


V01586

TROUBLESHOOTING

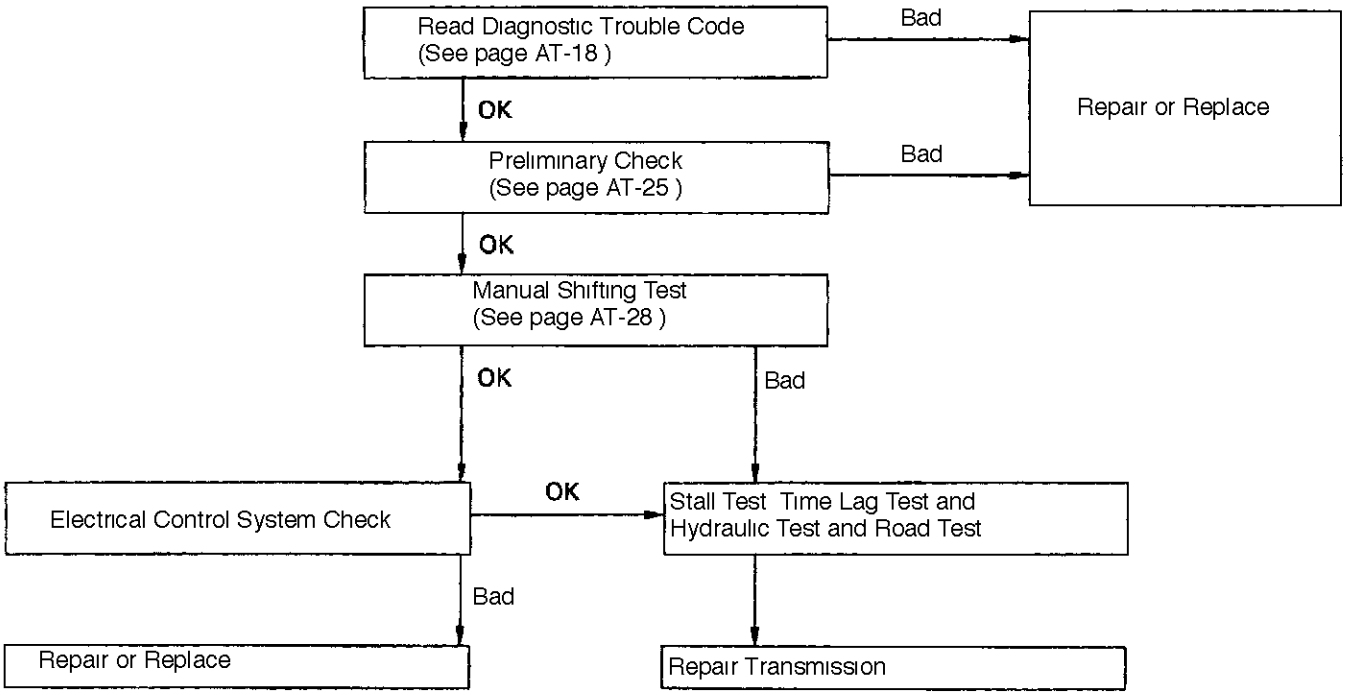
Trouble occurring in the electronically controlled transmission can stem from one of three sources the engine, the electronically controlled transmission electronic control unit or the transmission itself Before troubleshooting, determine in which these three sources the problem lies, and begin troubleshooting with the simplest operation, gradually working up in order of difficulty

BASIC TROUBLESHOOTING

AT06F-03

Before troubleshooting an electronically controlled transmission, first determine whether the problem is electrical or mechanical To do this, just refer to the basic troubleshooting flow-chart provided below

If the cause is already known, using the basic troubleshooting chart below a long with the general troubleshooting chart on the following pages should speed the procedure



W01587

NOTICE: Refer to '94 A442F Automatic Transmission Repair Manual when * mark appears in the column for page numbers.

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT-25 AT-70 *
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT-26 * * AT-70 AT-71 * *
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT-26 * *
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT-26 * * * *
Delayed 1-2 2-3 or 3-0/13 up-shift or down-shift from OID-3 or 3-2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT-29 * AT-38 39
Slips on 1-2 2-3 or 3-0/1) up-shift or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT-26 AT-26 * AT-38 39 *
Drag binding or tie-up on 1-2 2-3 or 3-OID up-shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT-26 * *

V01539

NOTICE: Refer to '94 A442F Automatic Transmission Repair Manual when * mark appears in the column for page numbers

Problem	Possible cause	Remedy	Page
No lock-up in 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT-29 * AT-38 39
Harsh dawn-shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT-26 AT-26
No down-shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	AT-38 39 AT-29
Down-shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect- electronic control	AT-26 AT-38 39 AT-29
No 0/0-3 3-2 or 2-1 kick-down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT-38 39 AT-29
No engine braking 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT-38 39 AT-29 *
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT-26 AT-26

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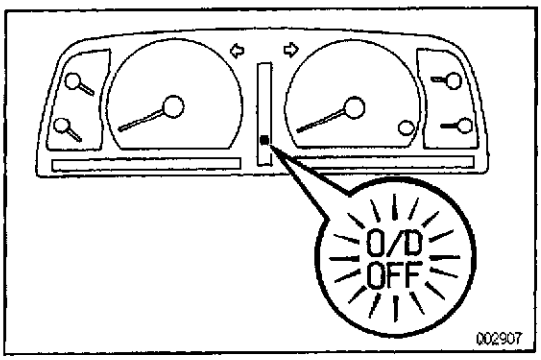
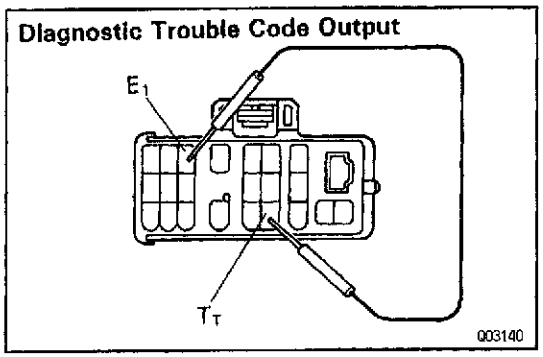
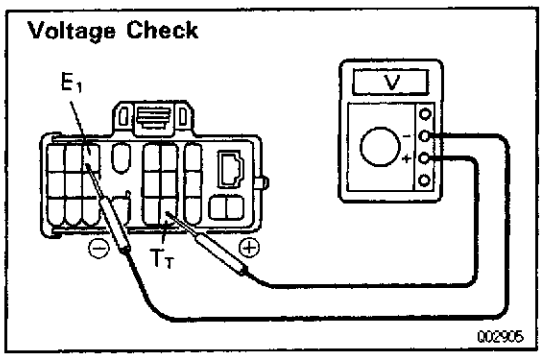
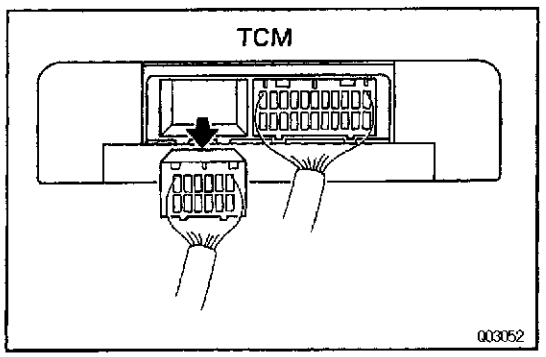
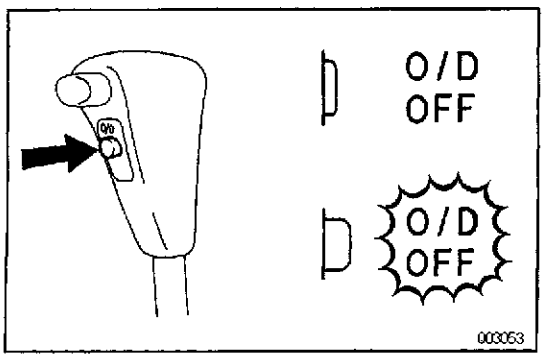










ATOR8--01

DIAGNOSIS SYSTEM

DESCRIPTION

1 A self-diagnosis function is built into the electrical control system Warning is indicated by the overdrive OFF indicator light

HINT Warning and diagnostic trouble codes can be read only when the overdrive switch is ON If OFF, the overdrive OFF light is lit continuously and will not blink

(a) If a malfunction occurs within the vehicle speed sensors (No 1 or 2), solenoids (No 1 or 2), throttle sensor or engine speed signal, the overdrive OFF indicator light will blink to warn the driver

However, there will be no warning of a malfunction with lock-up solenoid

(b) The diagnostic trouble code can be read by the number of blinks of the overdrive OFF indicator light when terminals TT and E, are connected (See page AT -18)

(c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1

(d) The signals to each gear can be checked by measuring the voltage at terminal TT of the data link connector 1 while driving

2 The diagnostic trouble code is retained in memory by the TCM and due to back-up voltage, is not canceled out when the engine is turned off Consequently, after repair, it is necessary to turn the ignition switch off and remove the DOME fuse (10A) or disconnect the TCM connector to cancel out the diagnostic trouble code (See page AT-20)

HINT

- Low battery positive voltage will cause faulty operation of the diagnosis system Therefore, always check the battery first
- Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/V

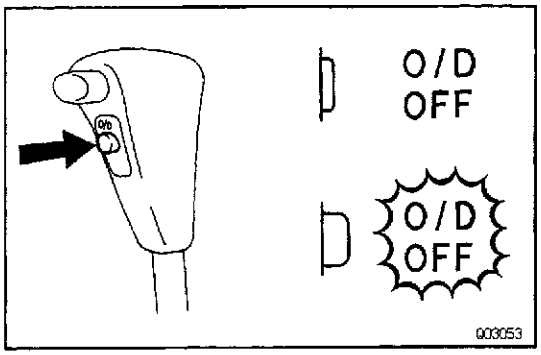
CHECK "O/D OFF" INDICATOR LIGHT

1 Turn the ignition switch ON

2 The "0/D OFF" light will come on when the O/D switch is placed at OFF

3 When the O/D switch is set to ON, the "0/D OFF" light should go out

If the "O/D OFF" light flashes when the 0/D switch is set to ON, the electronic control system is faulty

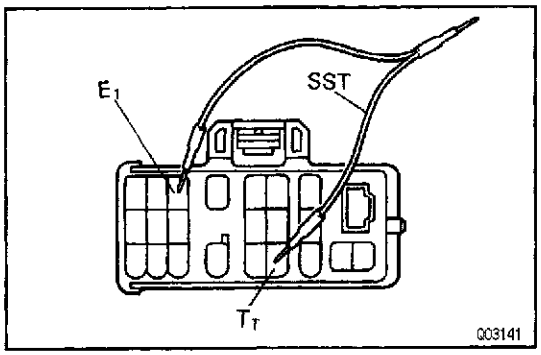


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine

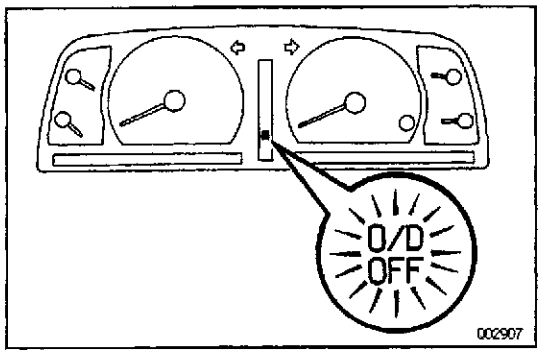
HINT Warning and diagnostic trouble codes can be read only when the overdrive switch is ON If OFF, the overdrive OFF light will light continuously and will not blink



2. CONNECT T_T AND E_1, TERMINALS OF CHECK CONNECTOR

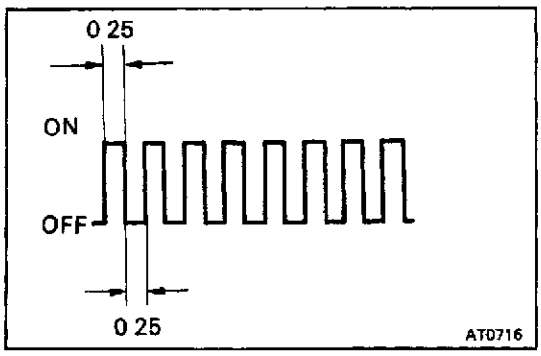
Using SST, connect terminals TT and E, of the data link connector 1

SST 09843-18020



3. READ DIAGNOSTIC TROUBLE CODE

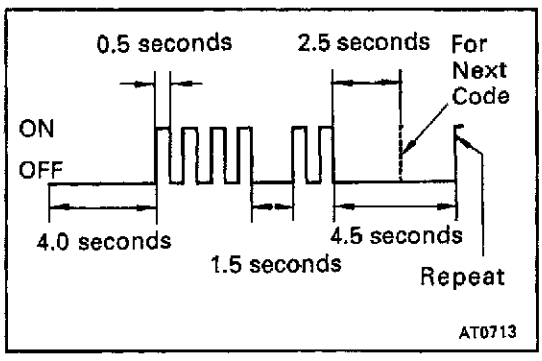
Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes



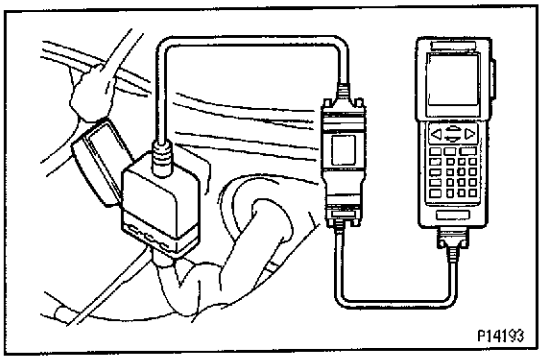
Diagnostic Trouble Code Indication:

- If the system is operating normally, the light will flash 2 times per second
- In the event of a malfunction, the light will flash 1 time per second The number of blinks will equal the first number and, after 1 5 seconds pause, the second number of the 2 digit diagnostic trouble code If there are 2 or more codes, there will be a 2 5 seconds pause between each

HINT In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger



4. REMOVE SST



ECM DATA MONITOR USING TOYOTA

HAND-HELD-TESTER

1 Hook up the TOYOTA hand-held-tester to the DLC 1
2 Monitor the ECM data by following the prompts on the tester screen
HINT TOYOTA hand -hsld-tester has a "Snapshot" function which records the monitored data
Please refer to the TOYOTA hand - held - tester operator's manual

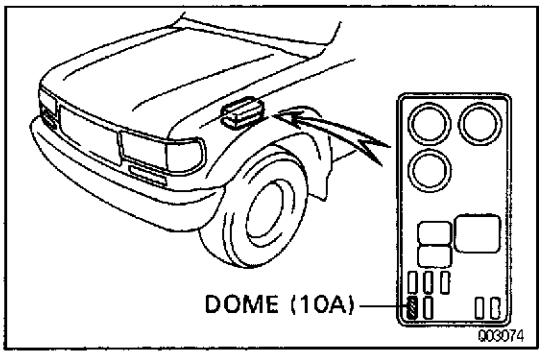
DIAGNOSTIC TROUBLE CODES

Code No	Light Pattern	Diagnosis System
–		Normal
41		Severed throttle position sensor or short circuit-severed wire harness or short circuit
42		Defective No 1 vehicle speed sensor (in combination meter)-severed wire harness or short circuit
61		Defective No 2 vehicle speed sensor (in ATM) -severed wire harness or short circuit
62		Severed No 1 solenoid or short circuit-severed wire harness or short circuit
63		Severed No 2 solenoid or short circuit-severed wire harness or short circuit
64		Severed lock-up solenoid or short circuit-severed wire harness or short circuit
65		Severed timing solenoid or short circuit-severed wire harness or short circuit
86		Severed engine speed sensor or short circuit-severed wire harness or short circuit
88		Severed ECM and TCM or short circuit-severed wire harness or short circuit

Q03076

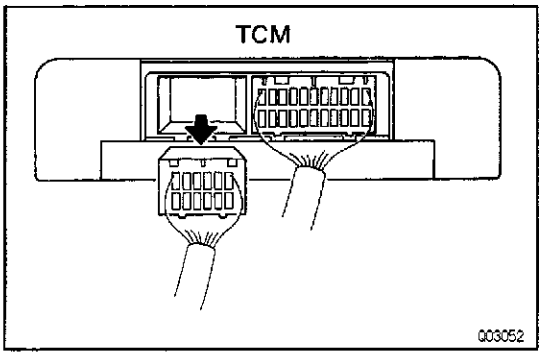
V02070

HINT If codes 62, 63, 64, or 65 appear, there is an electrical malfunction in the solenoid
Causes due to mechanical failure, such as a stuck valve, will not appear



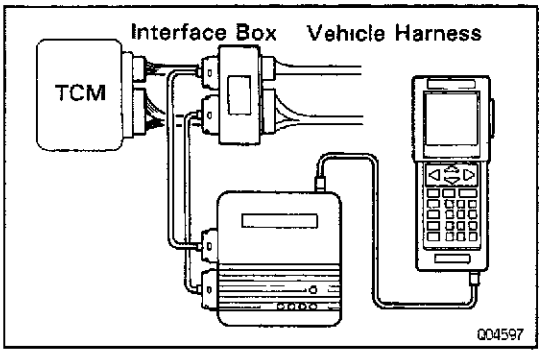
CANCEL OUT DIAGNOSTIC TROUBLE CODE

1 After repair of the trouble area, the diagnostic trouble code retained in memory by the TCM must be canceled by removing the DOME fuse (11 0A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF
HINT



- Cancellation can be also done by removing the battery negative (-) terminal, but in this case other memory systems will be also canceled out
- The diagnostic trouble code can be also canceled out by disconnecting the TCM connector
- If the diagnostic trouble code is not canceled out, it will be retained by the TCM and appear along with a new code in event of future trouble

2 After cancellation, perform a road test to confirm that a "normal code" is now read on the O/D OFF light



TCM TERMINALS STANDARD VALUE

TCM TERMINAL VALUES
MEASUREMENT BY USING TOYOTA BREAK-OUT -BOX AND TOYOTA HAND-HELD-TESTER

1 Hook up the TOYOTA brake-out-box and TOYOTA hand-held-tester to the vehicle
2 Read the TCM input/output values by following the prompts on the tester screen
HINT TOYOTA hand-held-tester has "Snapshot" function This record the measured values and is effective in the diagnosis of intermittent problems
Please refer to the TOYOTA hand - held - tester/ TOYOTA break - out - box operator's manual for furher details

TROUBLESHOOTING FLOW-CHART

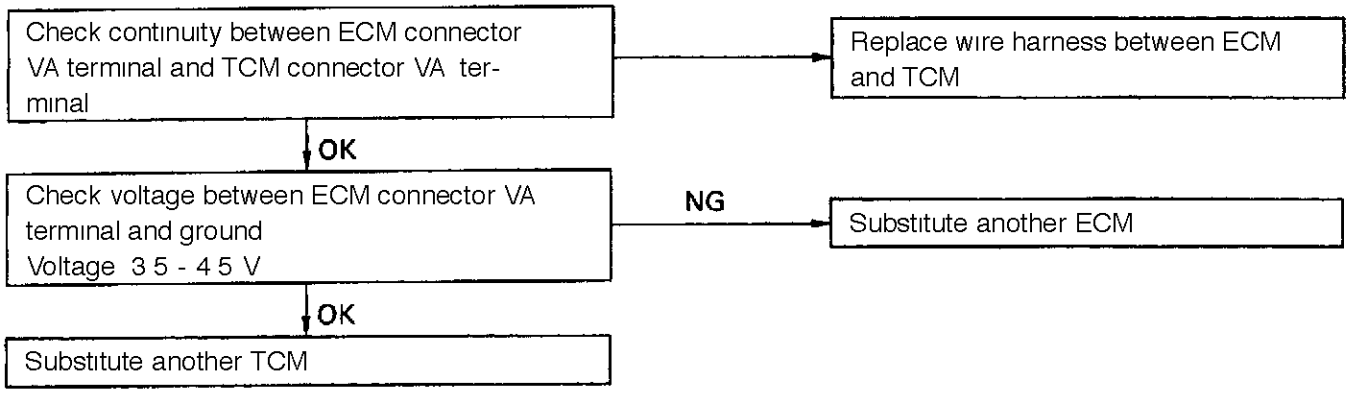
AT09H-02

HINT

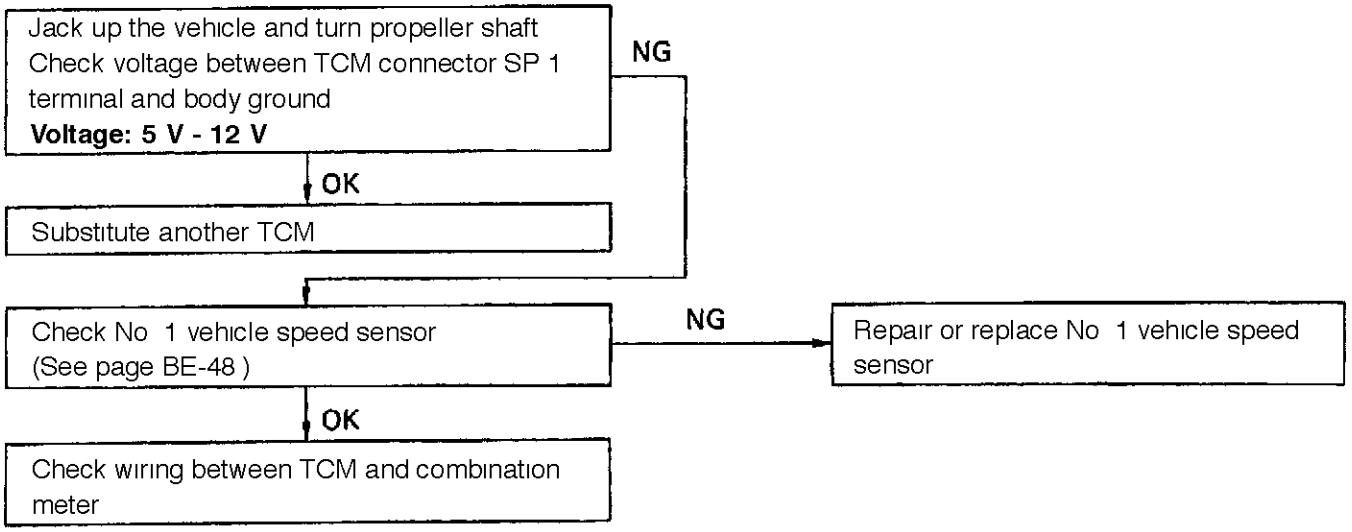
- If diagnostic trouble code Nos 41, 42, 61, 62, 63, 64, 65, 86, 88 and are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver However, an impact or shock may cause the blinking to stop, but the code will still be retained in the TCM memory until canceled out
- There is no warning for diagnostic trouble code No 64 and 65
- In the event of a simultaneous malfunction of both No 1 and No 2 vehicle speed sensors, no diagnostic trouble code will appear and the fail-safe system will not function However, when driving in the D position, the transmission will not up-shift from first gear, regardless of the vehicle speed

Diagnostic trouble Code 41 (Throttle position sensor circuitry)

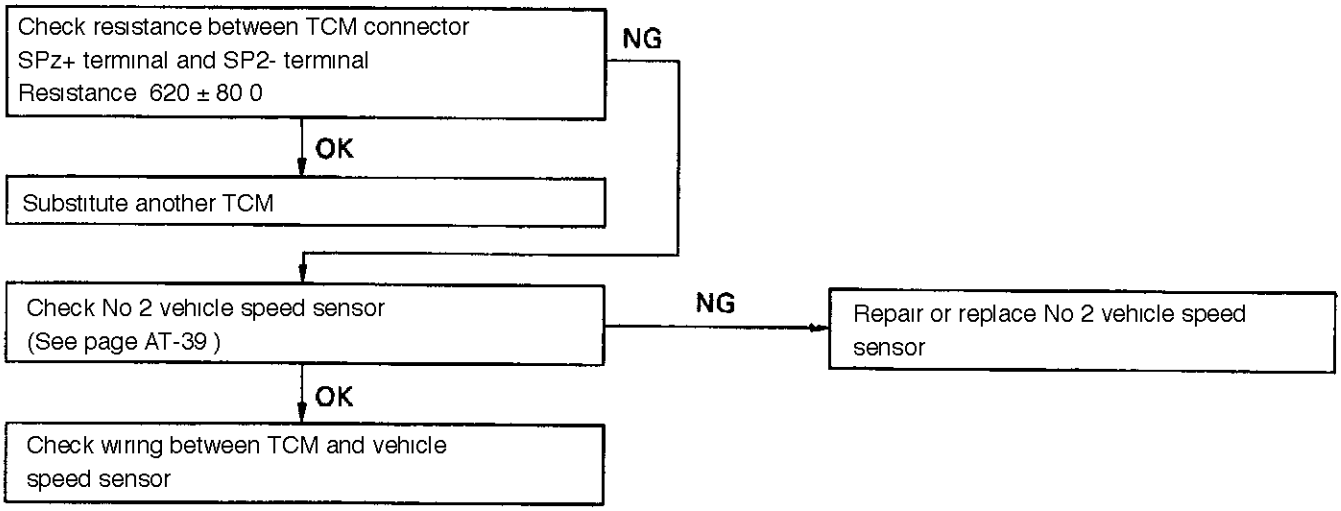
Check continuity between ECM connector NG



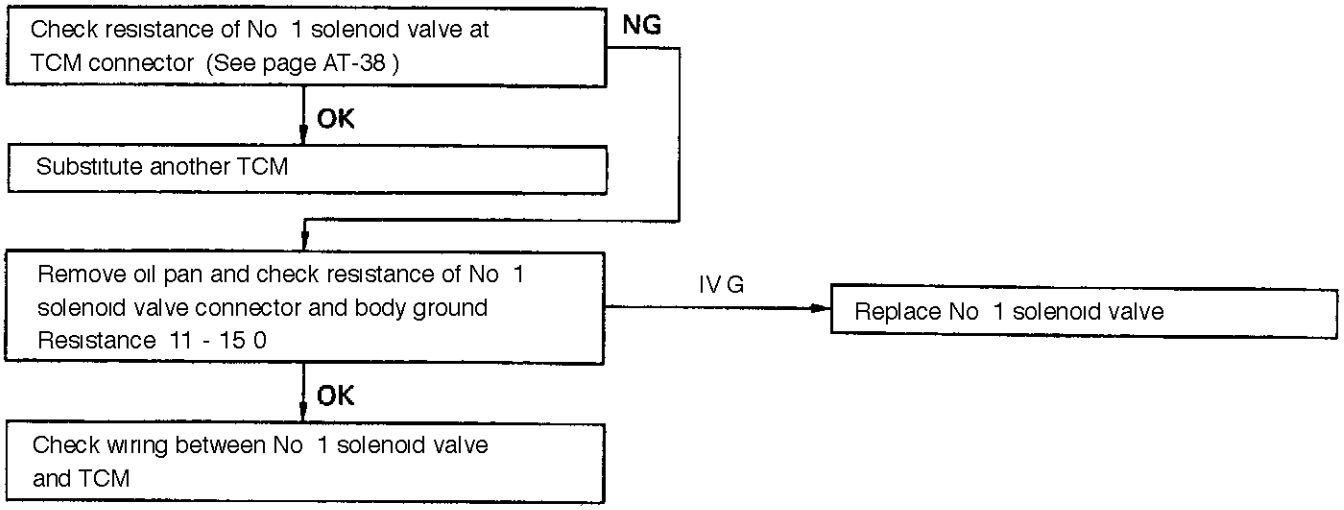
Diagnostic trouble Code 42 (No. 1 vehicle speed sensor circuitry)



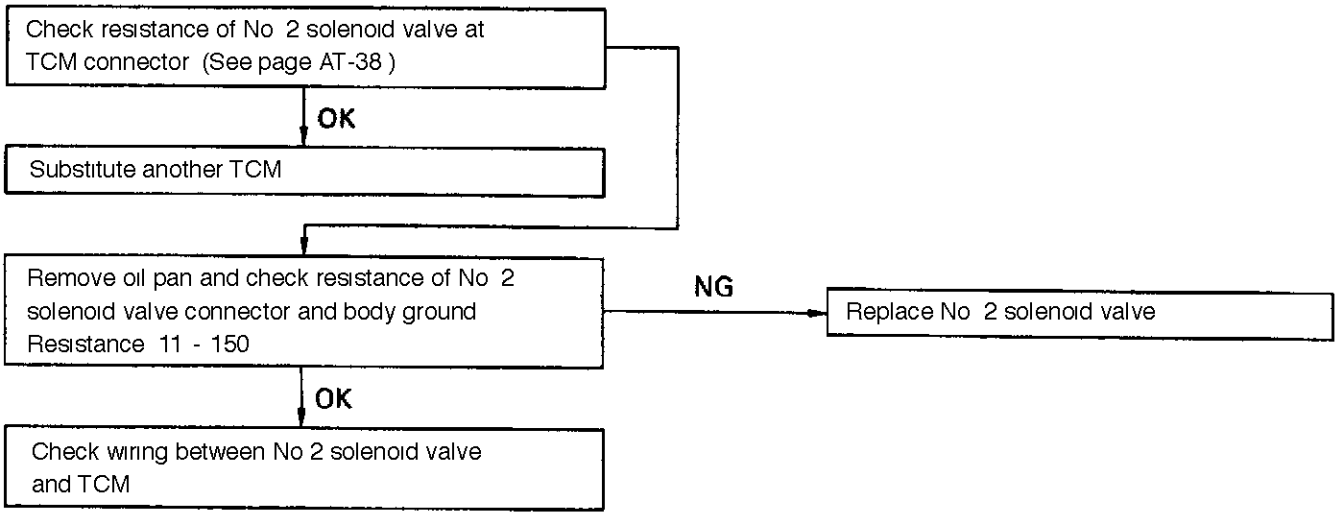
Diagnostic trouble Code 61 (No.2 vehicle speed sensor circuitry)



Diagnostic trouble Code 62 (No 1 solenoid valve circuitry)

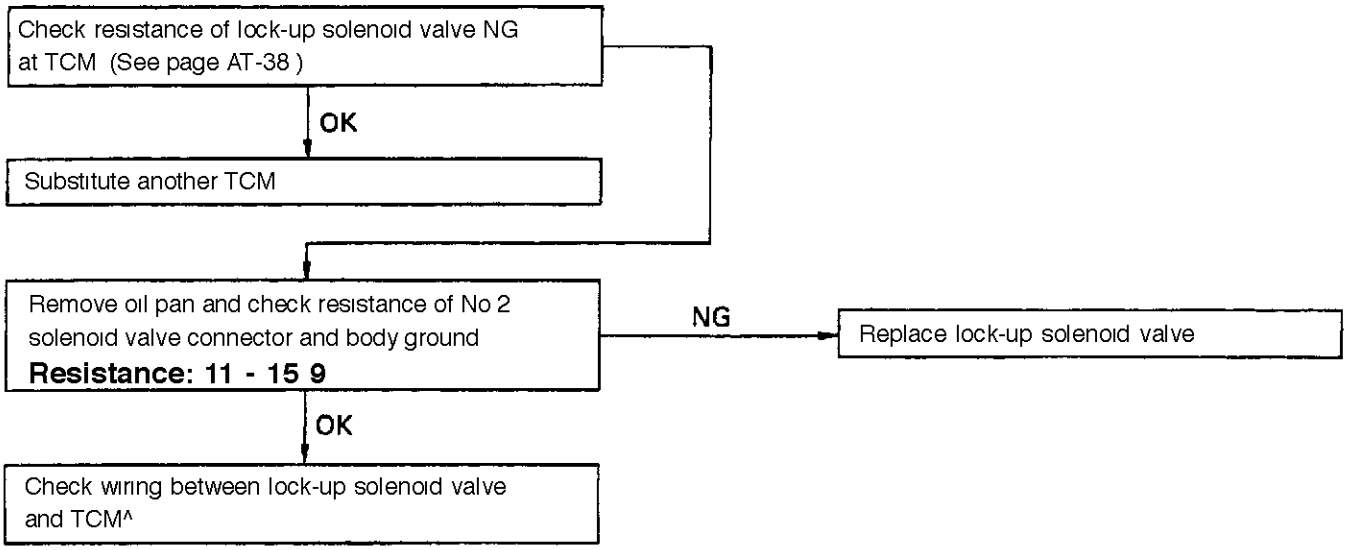


Diagnostic trouble Code 63 (No 2 solenoid valve circuitry)

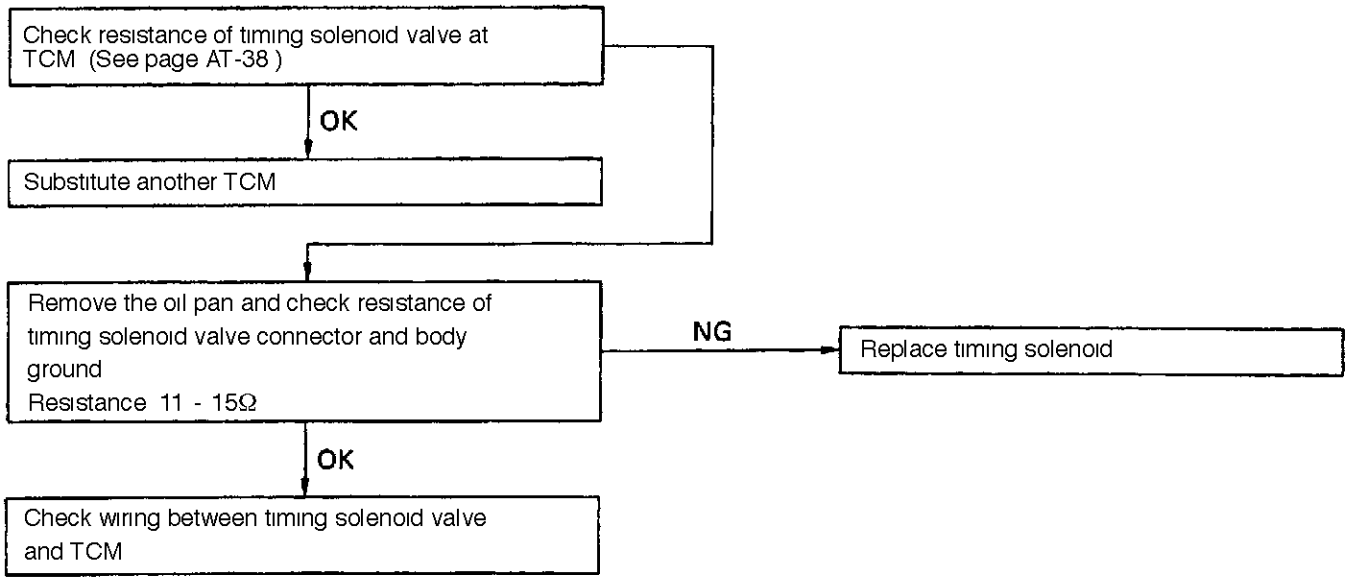


V02072

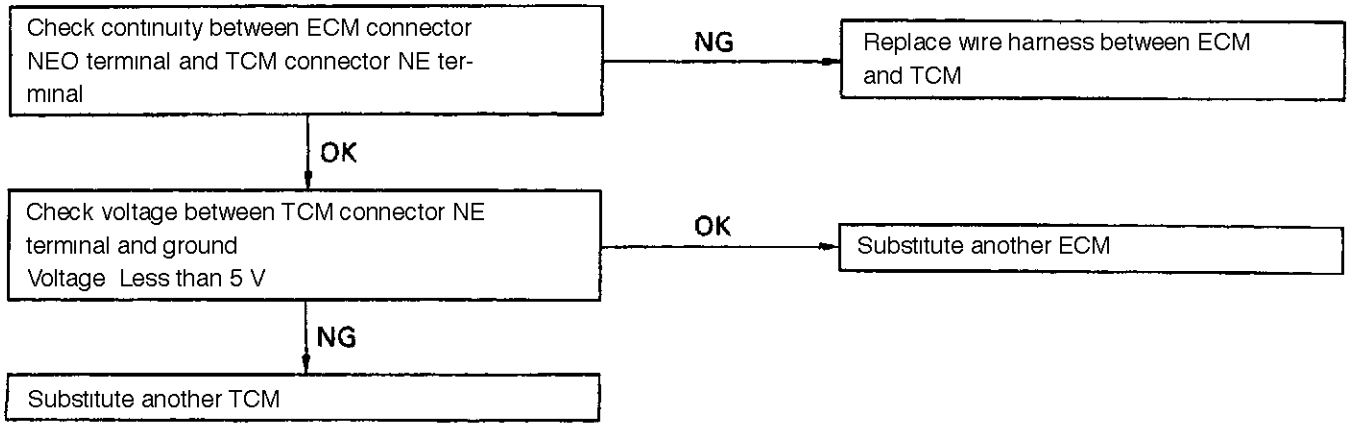
Diagnostic trouble Code 64 (Lock-up solenoid valve circuitry)



Diagnostic trouble Code 65 (Timing solenoid valve circuitry)

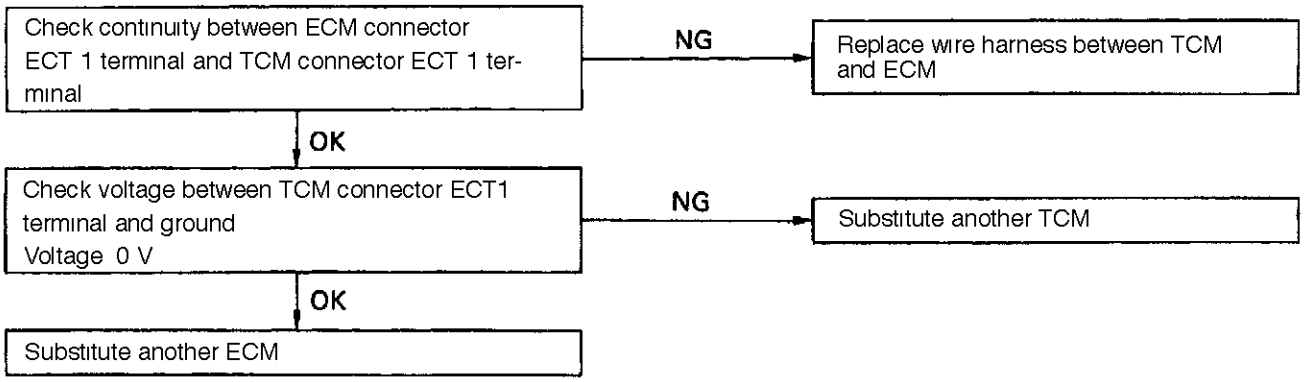


Diagnostic trouble Code 86 (Engine speed sensor circuitry)

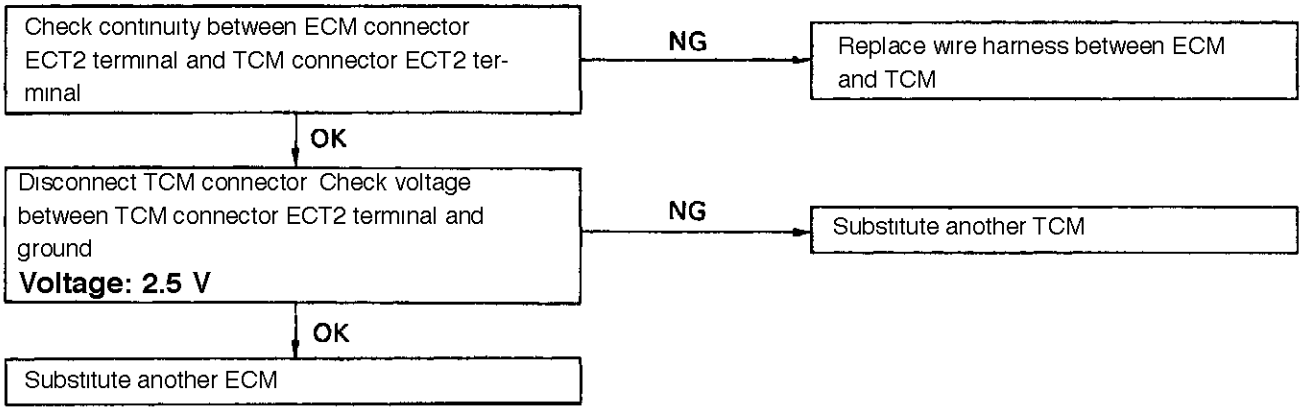


V02073

Timing retard demand signal



Fail safe signal



V02076

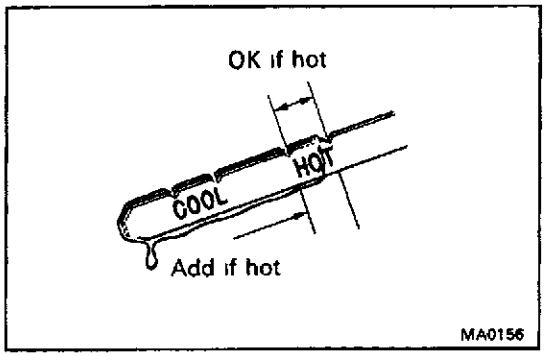
AT0BJ-02

PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT

- The vehicle must have driven so that the engine and transmission are at normal operating temperature
- Fluid temperature 70-80°C (158-176°F)
  Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run



(a) Park the vehicle on a level surface, set the parking brake

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position

(c) Pull out the transmission dipstick and wipe it clean

(d) Push it back fully into the tube

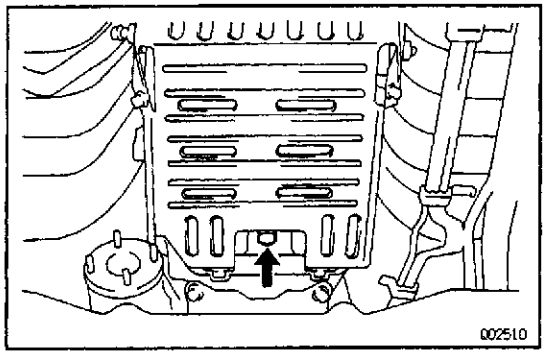
(e) Pull it out and check that the fluid level is on the HOT range.

If the level is at the low side, add fluid.

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as every manual follows

(a) Remove the drain plug and drain the fluid

(b) Reinstall the drain plug securely

Torque 27 N-m (280 kgf-cm, 20 ft bf)

(c) With the engine OFF, add new fluid through the oil filler tube

Fluid type

ATF DEXRON® II

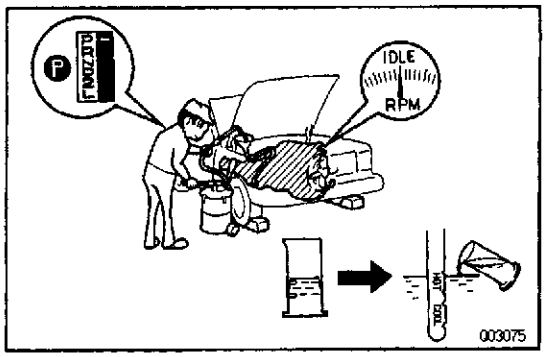
Capacity:

Total

15.4 liters (16.3 US qts, 13.6 Imp.qts)

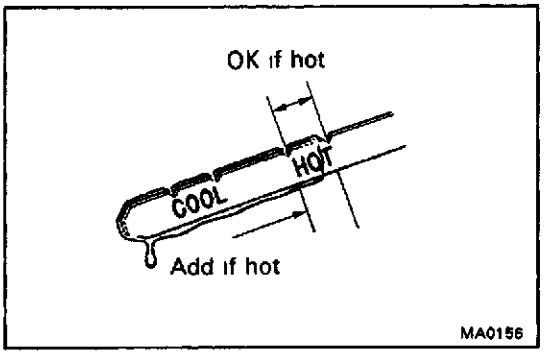
Drain and refill

6.0 liters (6.3 US qts, 5.3 Imp.qts)

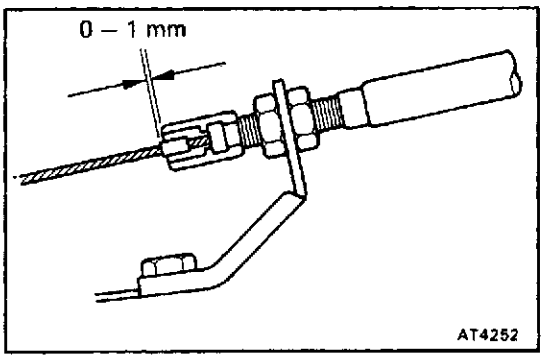


(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position

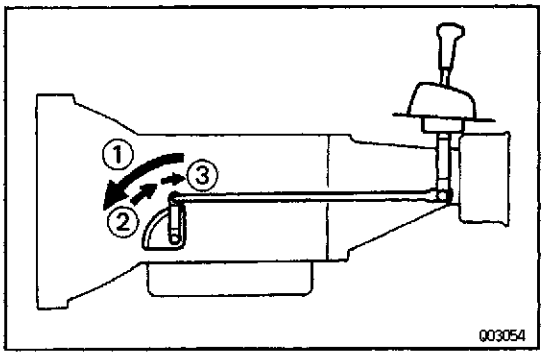
(e) With the engine idling, check the fluid level Add fluid up to the COOL level on the dipstick



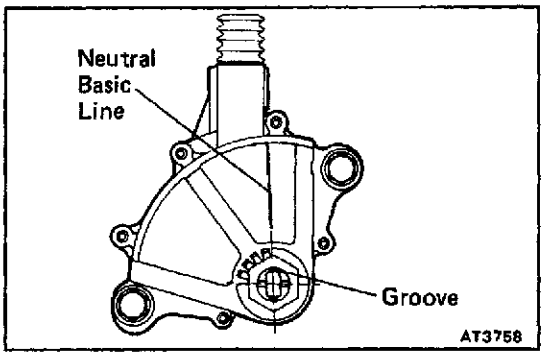
(f) Check the fluid level with the normal operating temperature 70 - 80° C (158 -176° F) and add as necessary
NOTICE: Do not overfill.



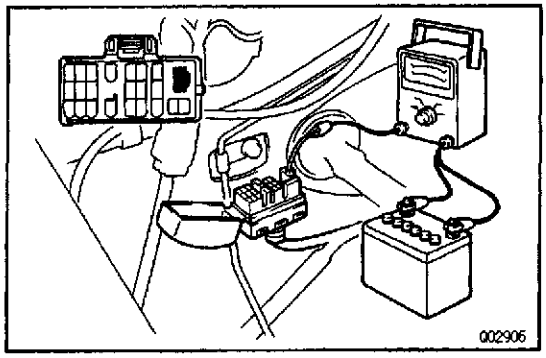
3. INSPECT THROTTLE CABLE
(a) Check that the throttle cable is installed correctly and not bent
(b) With the throttle valve fully closed measure the distance between the end of the boot and stopper on the cable
Standard distance
0 - 1 mm (0 - 0 04 in)
If the distance is not standard adjust the cable by the adjusting nuts



4. INSPECT TRANSMISSION 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
(a) Loosen the nut on the control rod
(b) Push the control shaft lever fully toward the rear of the vehicle
(c) Return the control shaft lever 2 notches to N position
(d) Set the shift lever to N position
(e) While holding the shift lever lightly toward the R position side tighten the control rod nut
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position



5. INSPECT PARK/NEUTRAL POSITION 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 started above carry out the following adjustment procedures
(a) Loosen the park/neutral position switch bolts and set the shift lever to the N position
(b) Align the groove and neutral basic line
(c) Hold in position and tighten the bolts
Torque: 13 N-m (130 kgf-cm, 9ft.lbf)

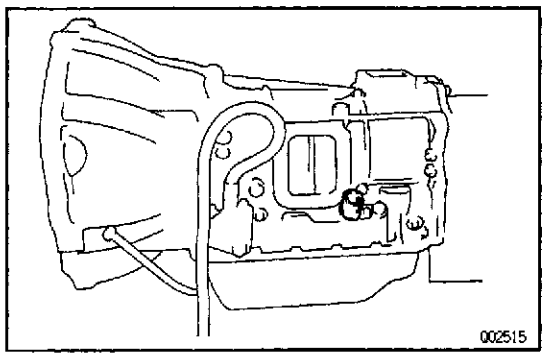


6. INSPECT IDLE SPEED (N POSITION)

Connect tachometer test probe to the check connector terminal IG , inspect the idle speed

Idle speed:

650 rpm



MANUAL SHIFTING TEST

AT99K-02

HINT With this test, it can be determine whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear position correspond with the table below

HINT If the L, 2 and D position gear position are difficult to distinguish, perform the following road test

- While driving, shift through the L, 2 and D positions

Check that the gear change corresponds to the shift position

- If any abnormality is found in the above test, the problem lies in transmission itself

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT-20)

REFERENCE Possible gear position in accordance with solenoid operating conditions

Position	NORMAL			NO 1 SOLENOID MALFUNCTIONING			NO 2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No 1	No 2		No 1	No 2		No 1	No 2		No 1	No 2	
D positon	ON	OFF	1 st	×	ON (OFF)	3rd (O/D)	ON	×	1st	×	×	O/D
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	O/D t 1 SO	×	×	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	ON	OFF	1st	×	ON (OFF)	3rd (O/D)	ON	×	1st	×	×	3rd
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	3rd (1 SO	×	×	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	×	3rd	×	×	3rd
L position	ON	OFF	1 st	×	OFF	1st	ON	×	1st	×	×	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1st	×	×	1st

( ) No fail-safe function x Malfunctions

V01542

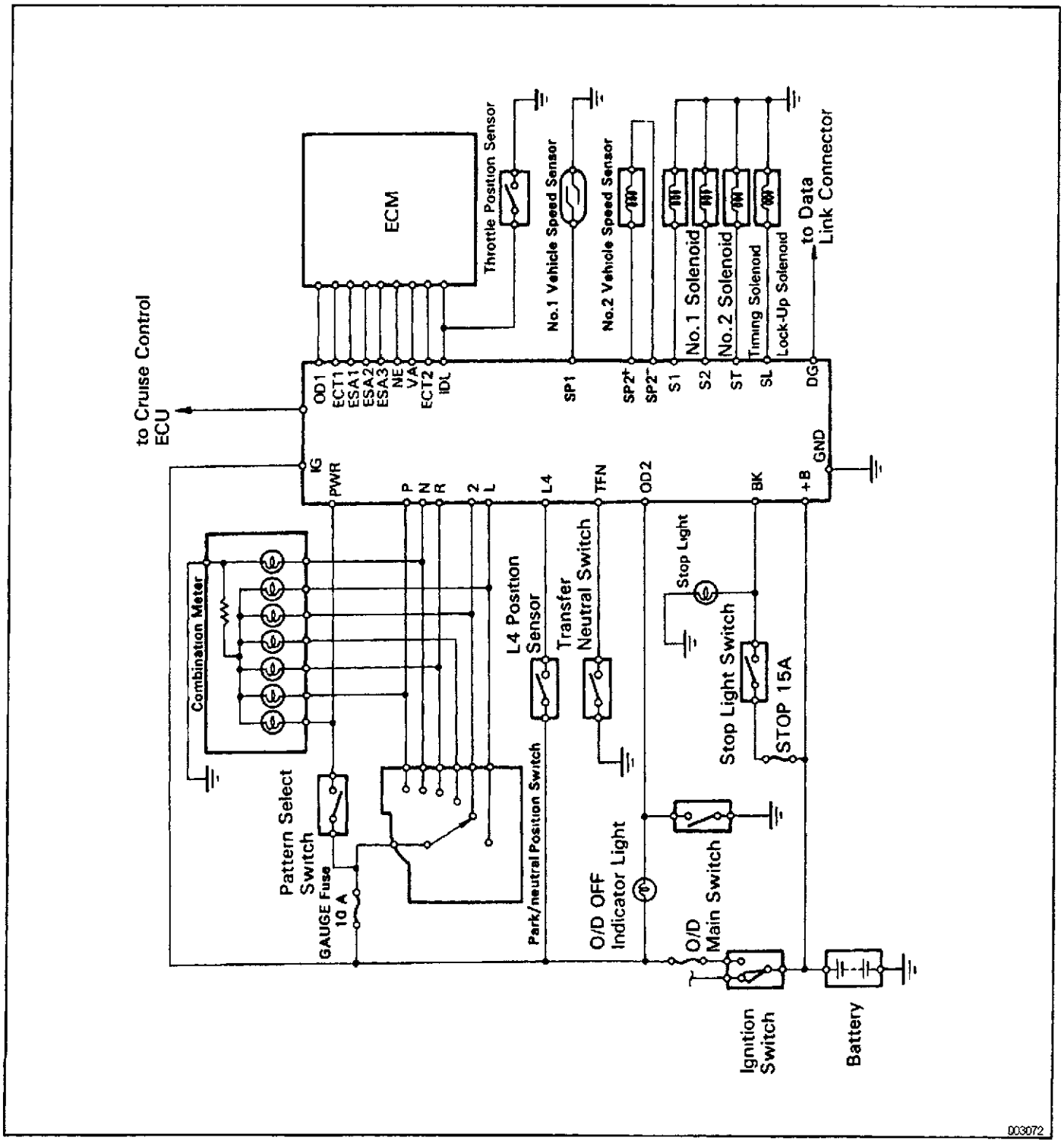
AT09L-03

ELECTRONIC CONTROL SYSTEM

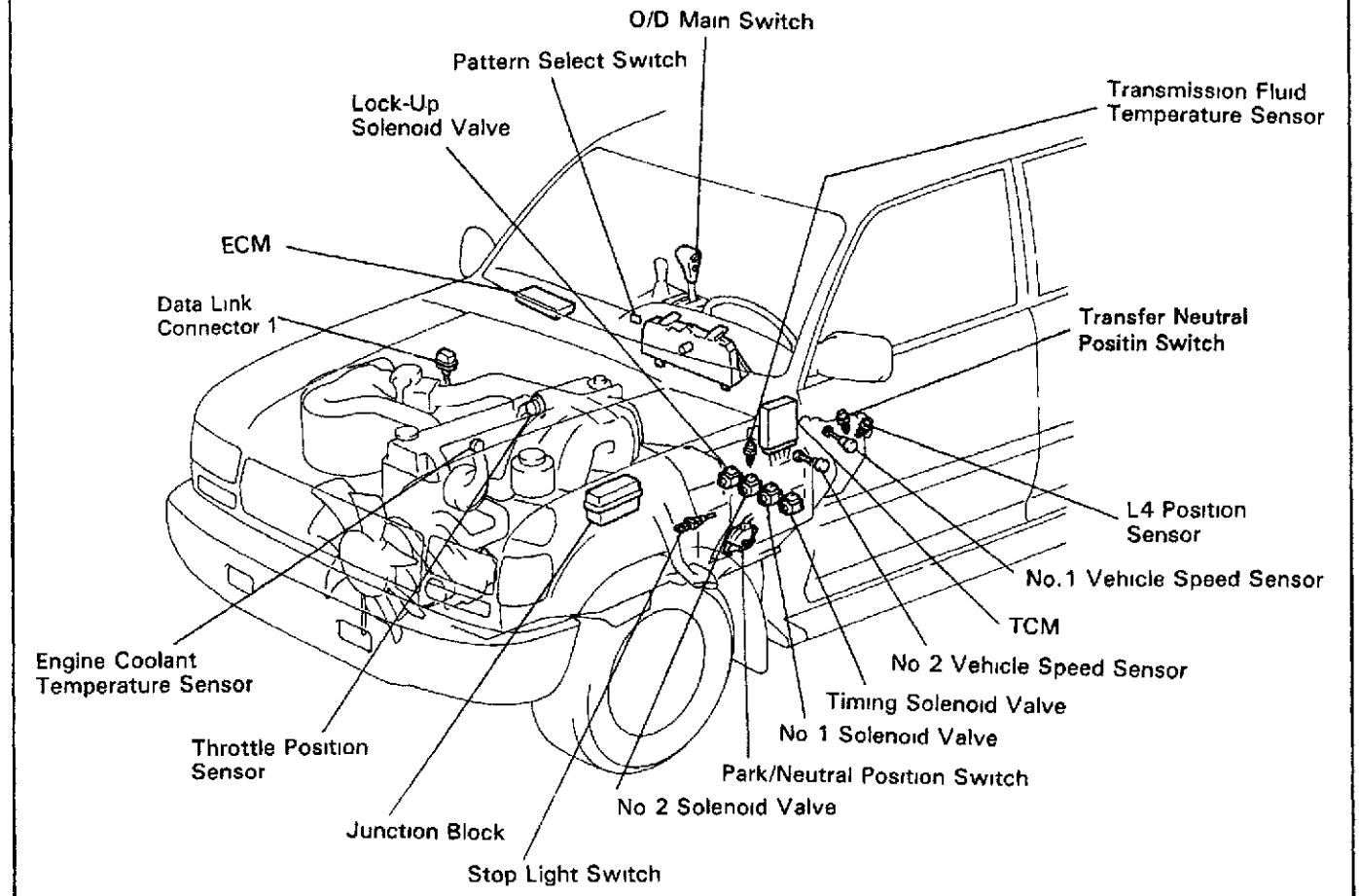
PRECAUTION

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

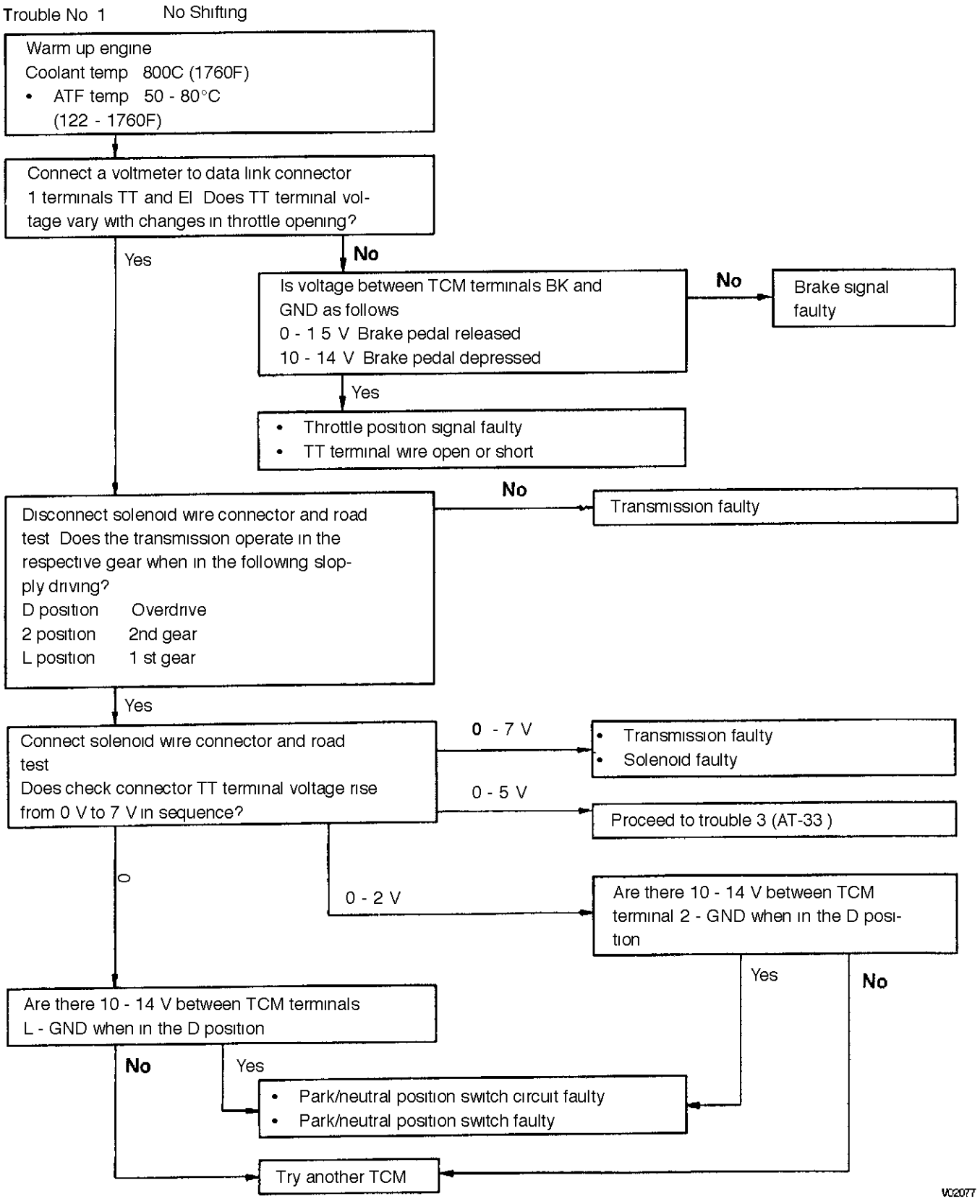
ELECTRONIC CONTROL CIRCUIT



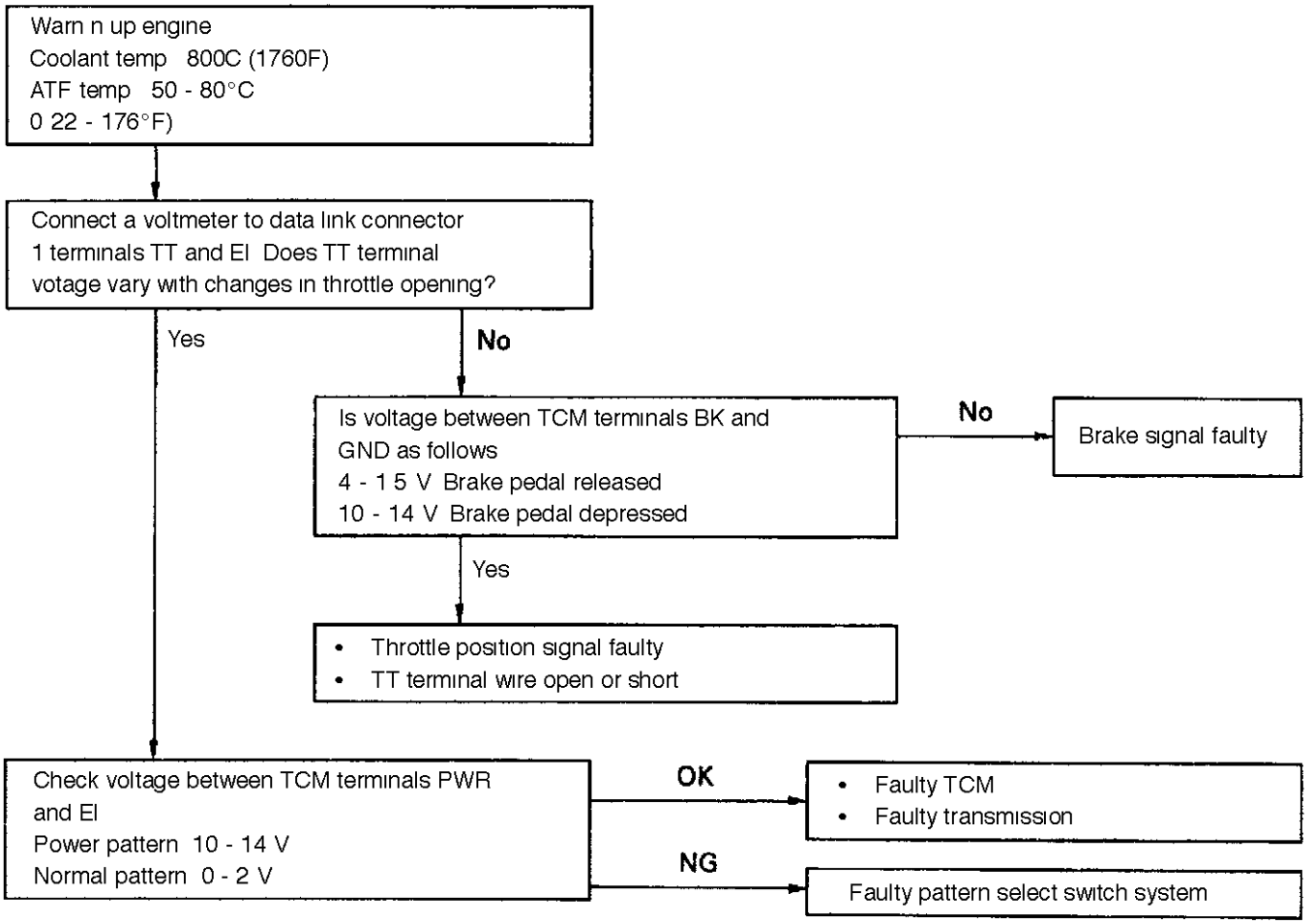
ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW-CHART

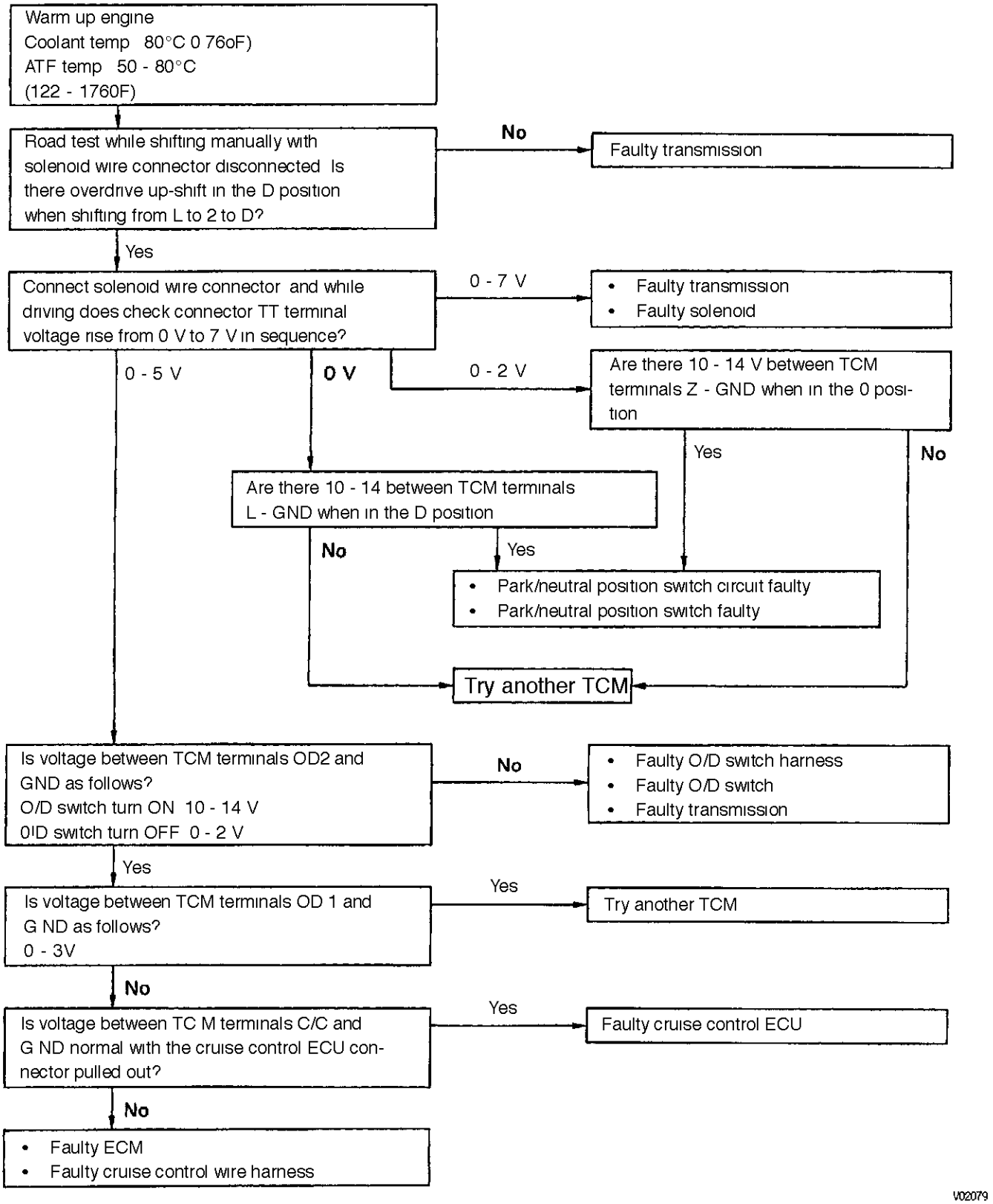


Trouble No.2 Shift point too high or too low



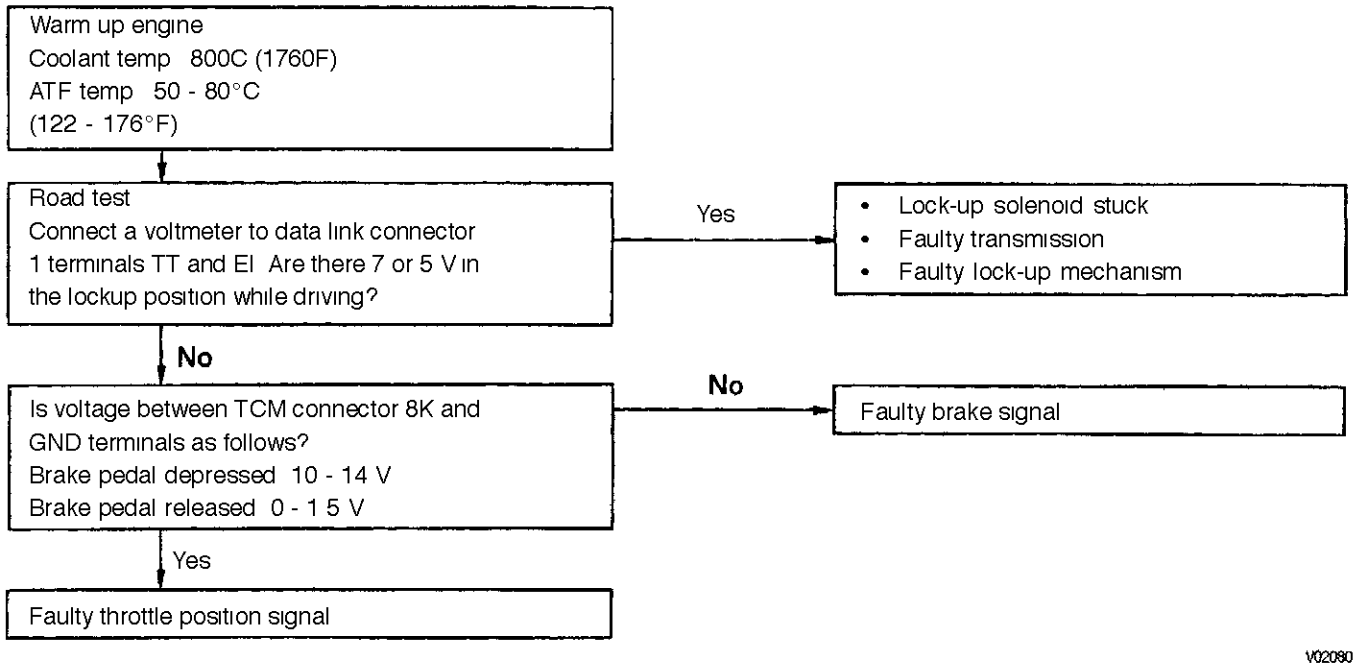
V02078

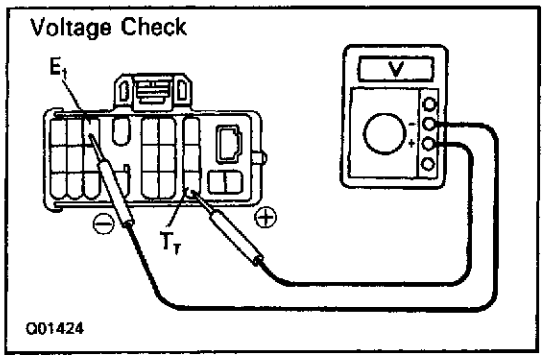
Trouble No 3 No up-shift to overdrive (After warm-up)



V02079

Trouble No 4 No lock-up (After warm-up)



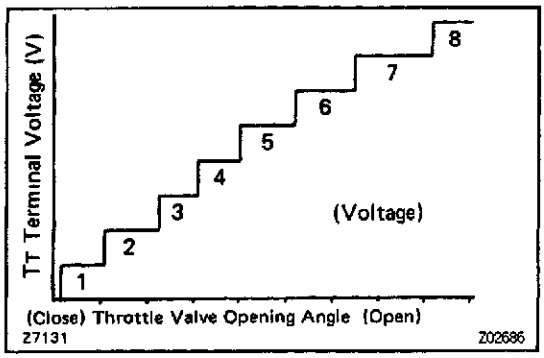


TERMINAL VOLTAGE INSPECTION

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON Do not start the engine

(b) Connect a voltmeter to data link connector 1 terminals TT and E,



(c) While slowly depressing the accelerator pedal, check that Tt terminal voltage rises in sequence

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit

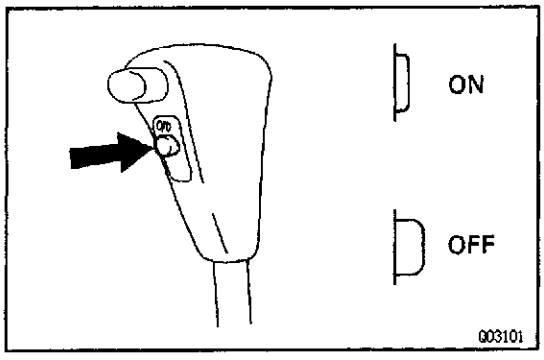
2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the TT terminal indicates 8 V

(b) Depress the brake pedal and check the voltage reading from the TT terminal

Brake pedal depressed	0 V
Brake pedal released	8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit



3. INSPECT EACH UP-SHIFT POSITION

(a) Warm up the engine

Coolant temperature:
80°C (1760 F)

(b) Turn the O/D switch to 'ON'

(c) Place the pattern select switch in "Normal" and the shift lever into the D position

(d) During a road test (about 10 km/h or 6 mph) check that voltage at the TT terminal is as indicated below for each up-shift position

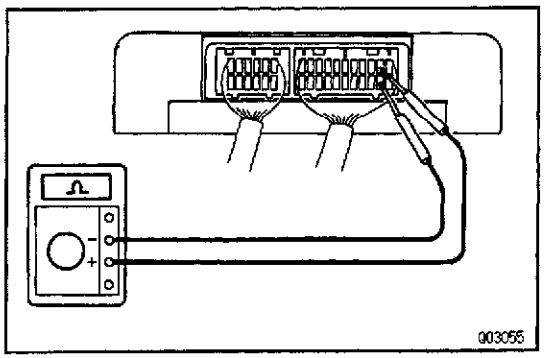
If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay

The chart on the left shows the voltmeter reading and corresponding gears

T_T Terminal (V)	Gear Position
0	1st
2	2nd
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

V02384

HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock-up clutch will turn ON only infrequently during normal 3rd and O/D gear operation. To trigger this action press the accelerator pedal to 50% or more of its stroke. At more than 50%, the voltage may change in the sequence 2 V-4 V-6 V-7 V.

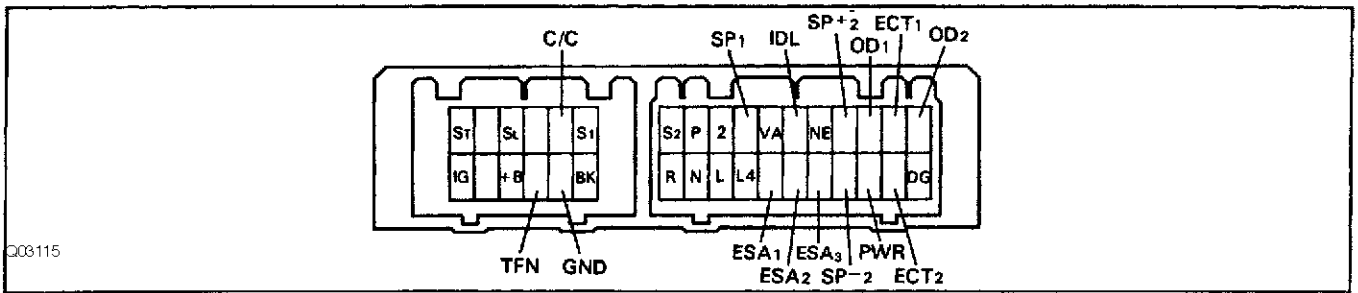


ELECTRONIC CONTROL COMPONENTS INSPECTION

1. INSPECT VOLTAGE OF TCM

(a) Turn on the ignition switch

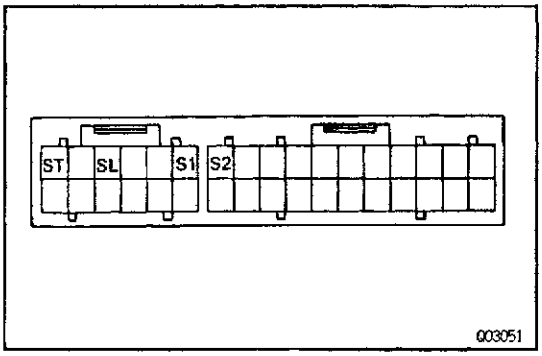
(b) Measure the voltage at each terminal



Terminal	Measuring condition		Voltage (V)
SI - GND	Stop Vehicle	N position	9 - 14
		D position	9 - 14
S2 - GND	Stop Vehicle	N position	9 - 14
		D position	o - 1
SL - GND	Stop vehicle		0 -5 1 5
ST - GND	Stop vehicle		o - 1 5
BK - GND	Brake pedal is depressed		7 5 - 14
	Brake pedal is released		0 - 1 5
TFN - GND	Transfer position is N position		o -3
	Transfer position is except N position		9 - 14
+B - GND	Stop engine and ignition switch ON		9 - 14
IG - GND	Stop engine and ignition switch ON		9 - 14
OD2 - GND	**O/D** main switch turned ON		0 - 3
	O/D main switch turned OFF		9 - 14
CIC - G ND	Stop engine and ignition switch ON		9 - 14
ECT1 - GND	Stop engine and ignition switch ON		9 - 14
OD1 - GND	Engine coolant temperature 55°C 0 31 °F) more than		9 - 14
	Engine coolant temperature 550C (131 °F) or less		0 -3
SP2+ - SP2-	Vehicle moving		Pulse generation
SP1 - GND	Vehicle moving		Pulse generation
NE - GND	Engine idling speed		Pulse generation
IDL - GND	Throttle valve fully closed		0 - 3
	Throttle valve fully open		9 - 14
V A - G ND	Throttle valve fully closed		3 5 - 4 5
	Throttle valve fully open		2 5 - 3 5

Terminal	Measuring condition	Voltage (V)
2 - GND	2 position	7 5 - 14
	Except 2 position	0 - 1 5
P - GND	P position	7 5 - 14
	Except P position	0 - 1 5
L - GND	L position	7 5- 14
	Except L position	0 - 1 5
N - GND	N position	7 5 - 14
	Except N position	o - 1 5
R - GND	R position	7 5 - 14
	Except R position	0 - 1 5
DG - GND	Engine stop and place ignition key at ON position	o - 1 5
ECT2 - GND	Engine coolant temperature 80°C 1176°F1 more than	2-3
PWR - GND	PWR pattern	7 5 - 14
	NORM pattern	0 - 1 5
ESA 1 - GND	Engine idling speed (Engine start after 10 second)	4 5 - 5 5
ESA2 - GND	Engine idling speed (Engine start after 10 second)	4 5 - 5 5
ESA3 - GND	Engine idling speed (Engine start after 10 second)	4 5-5 5
L4 - G N D	Transfer position is L4 position	7 5 - 14
	Transfer position is except L4 position	0 - 1 5

V02082



2. INSPECT SOLENOID

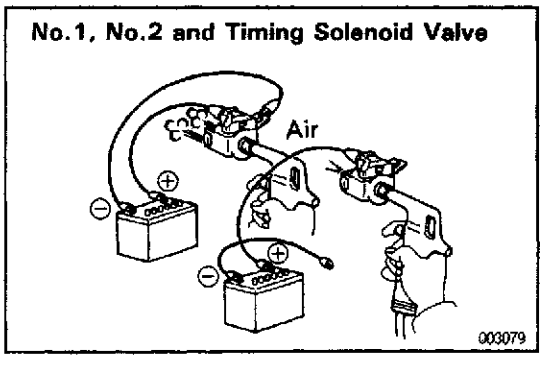
(a) Disconnect the connector from TCM

(b) Measure the resistance between S,, S2, SL, ST and ground

Resistance

11-150

(c) Apply battery positive voltage to each terminal Check that an operation noise can be heard from the solenoid



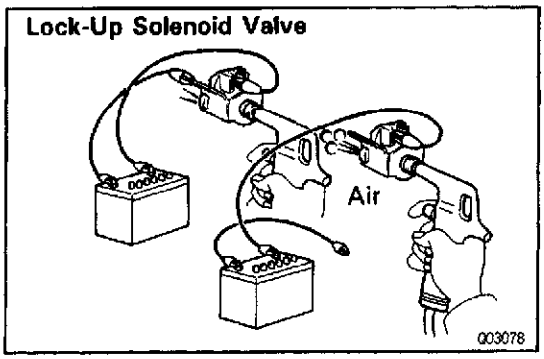
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation

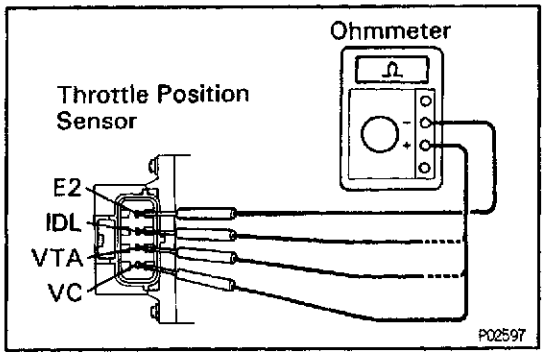
(a) Check No 1, No 2 and timing solenoid valves

Check that the solenoid valves do not leak when low-pressure compressed air is applied

When supply battery positive voltage to the solenoids, check that the solenoid valves open



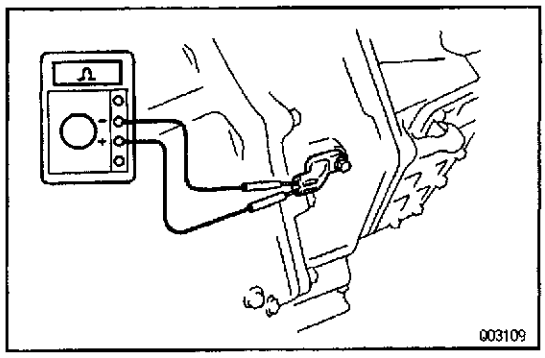
(b) Check the lock -up solenoid valve
e Apply 490 kPa (5 kgf/crn2, 71 psi) of compressed air, check that the solenoid valve opens
Apply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air
If malfunction is found during voltage inspection (step 1), inspect the components listed below



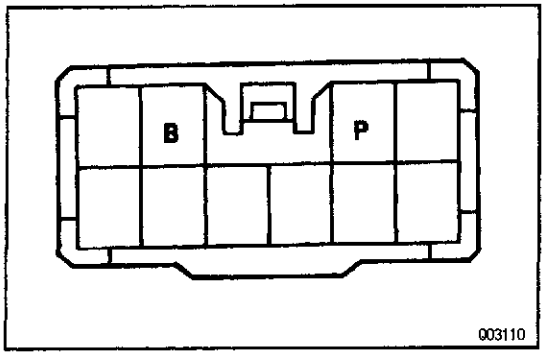
4 INSPECT THROTTLE POSITION SENSOR
Using an ohmmeter, check the resistance between terminals

Terminal	Throttle valve condition	Resistance (kQ)
IDL - E2	Fully closed	2 3 kS2 or less
	Open	Infinity
VC - E2	—	2 5- 5 9
VTA - E2	Fully closed	0 2 - 5 7
	Fully open	2 0- 10 2

V02103



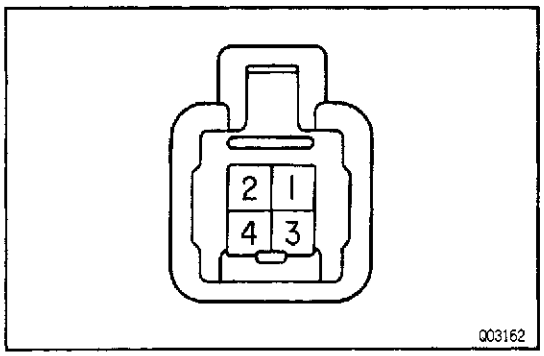
5. INSPECT NO.2 VEHICLE SPEED SENSOR
(a) Jack up the rear wheel on one side
(b) Connect an ohmmeter between the terminals
(c) Spin the wheel and check that the meter needle deflects from 0 to ^Ω
6. INSPECT NO.1 VEHICLE SPEED SENSOR
(SEE PAGE BE-48)



7. INSPECT PATTERN SELECT SWITCH
Using an ohmmeter, check the continuity of terminals for each switch position
HINT As there are diodes inside, be careful of the tester probe polarity

Pattern / T	B	P
PWR	○	○
NORM		

V02104

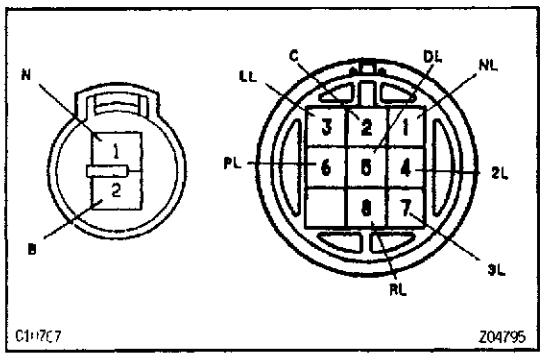


8. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position

Switch position	2	4
ON		
OFF	○—○	○—○

V02105



9. INSPECT PARK/NEUTRAL POSITION SWITCH

Check that there is continuity between terminals

Continuity ○—○

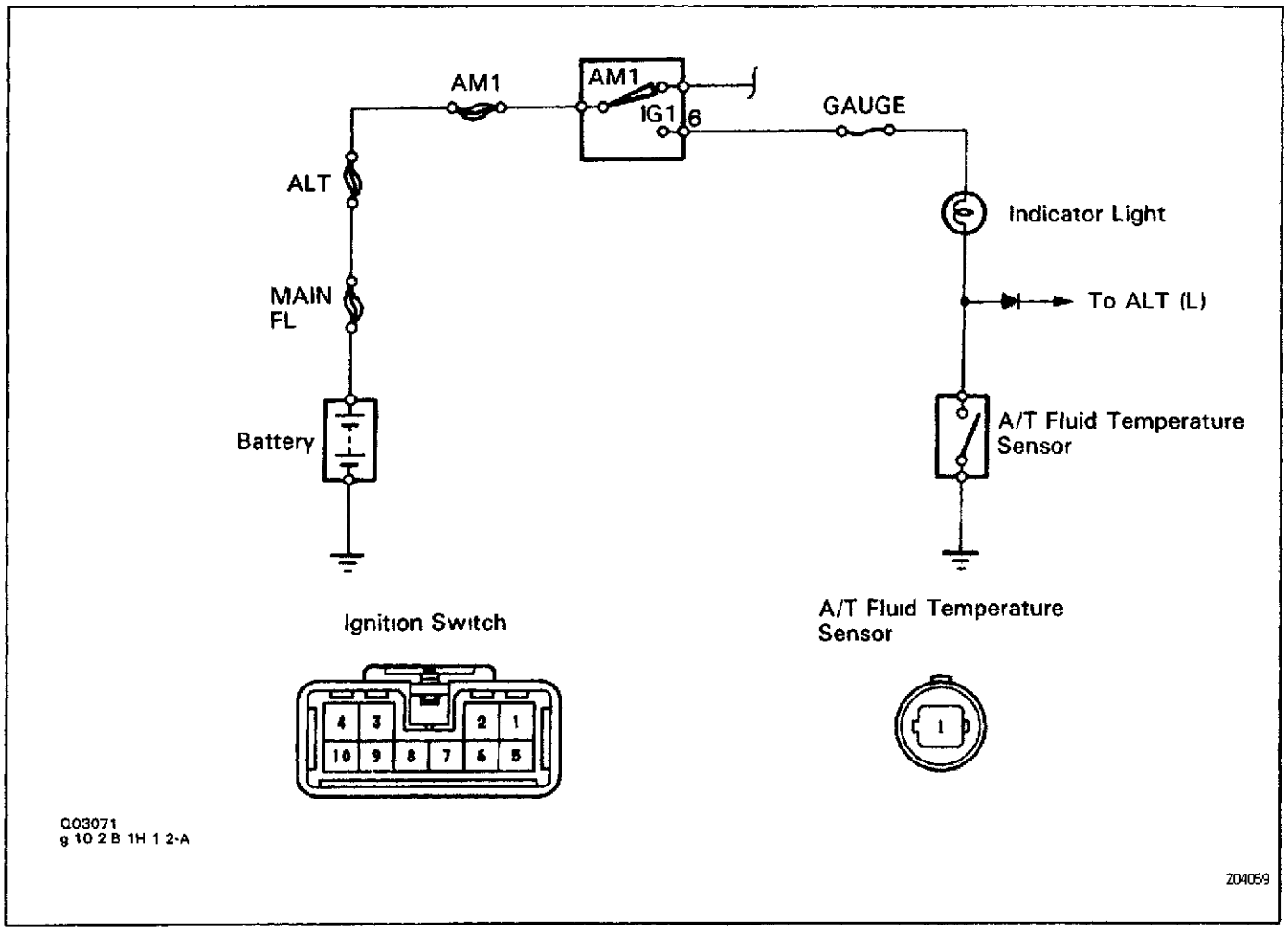
Shift position	B	N	C	PL	RL	NL	DL	3L	2L
P	○—○		○—○						
R			○—	—○					
N	○—○		○—	—	—○				
D			○—	—	—	—	—○		
2			○—	—	—	—	—	—○	
L			○—	—	—	—	—	—	—○

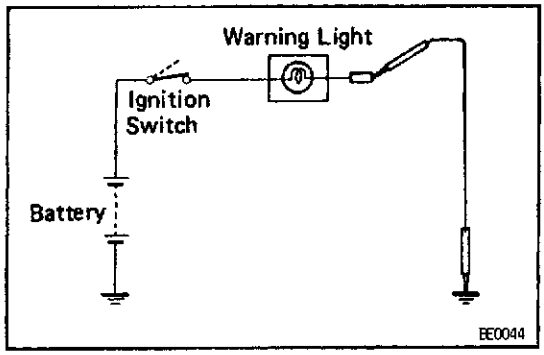
V02106

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(See page EG-300)

A / T FLUID TEMPERATURE WARNING SYSTEM CIRCUIT



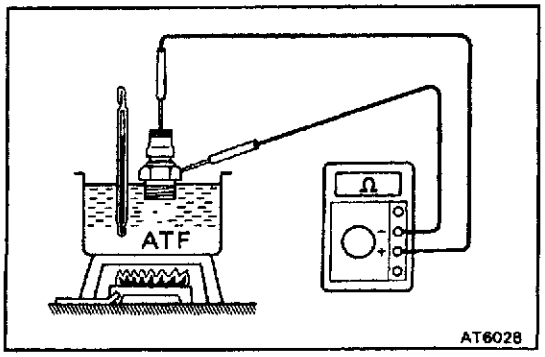


11. INSPECT A / T FLUID TEMPERATURE WARNING LIGHT

(a) Disconnect the connector from the temperature sensor Connect terminal of the wire harness side connector and body ground

(b) Turn the ignition switch ON, check that the light goes on

If warning light does not light, test the bulb



12. INSPECT A/T FLUID TEMPERATURE SENSOR

Check that there is continuity at the temperature of 145° C -155° C (325° F - 343° F)

If continuity is not as specified, replace the sensor

STALL TEST

AT027-09

The objective 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

- Perform the test at normal operating fluid temperature 50-$0°C (122-116°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 should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test

MEASURE STALL SPEED

(a) Warm up the transmission fluid

(b) Chock the front and rear wheels

(c) Connect a tachometer to the engine

(d) Fully apply the parking brake

(e) Keep your left foot pressed firmly on the brake pedal

(f) Start the engine

(g) Shift into the D position Step all the way down on the accelerator pedal with your right foot

Quickly read the stall speed at this time

NOTICE Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed

Stall speed

2,150±150 rpm

(g) Perform the same test in R position

Quickly read the stall speed at this time

Stall speed

2,150±150 rpm

EVALUATION

(a) If the stall speed is the same for both positions but lower than specified value

- Engine output may be insufficient
- Stator one-way clutch is not operating properly

HINT If more than 600 RPM below the specified value the torque converter clutch could be faulty

(b) If the stall speed in D position is higher than specified

- Line pressure too low
- Forward clutch slipping
- No 2 one-way clutch not operating properly
- 0/D one-way clutch not operating properly

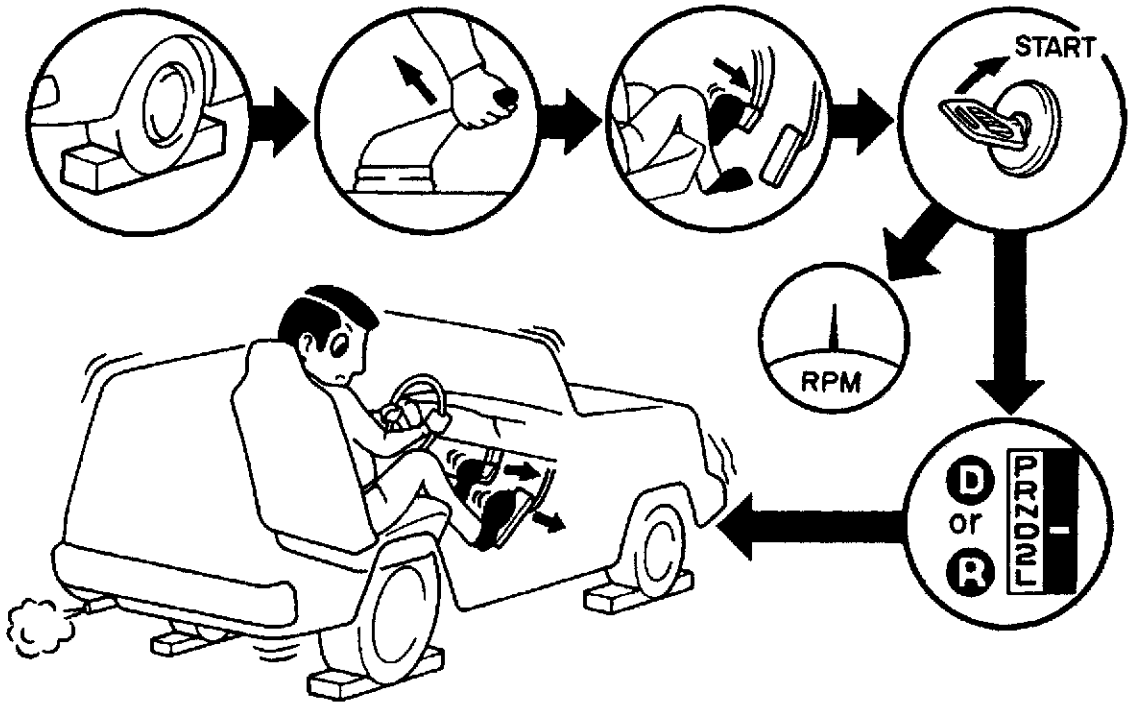
(c) If the stall speed in R position is higher than specified

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- 0/D one-way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified

- Line pressure too low
- Improper fluid level
- 0/D one-way clutch not operating properly

STALL TEST



003057

TIME LAG TEST

AT0S8-09

When the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt This is used for checking the condition of the 0/D direct clutch, forward clutch, direct clutch and first and reverse brake

NOTICE

- Perform the test at normal operating fluid temperature 50-80°C (122-176°F)
- Be sure to allow one minute interval between tests
- Make three measurements and take the average value

MEASURE TIME LAG

(a) Fully apply the parking brake

(b) Start the engine and check the idle speed

Idle speed

650 RPM (N position)

(c) 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

Time lag

Less than 0 7 seconds

(d) In same manner, measure the time lag for N-iR

Time lag

Less than 1 2 seconds

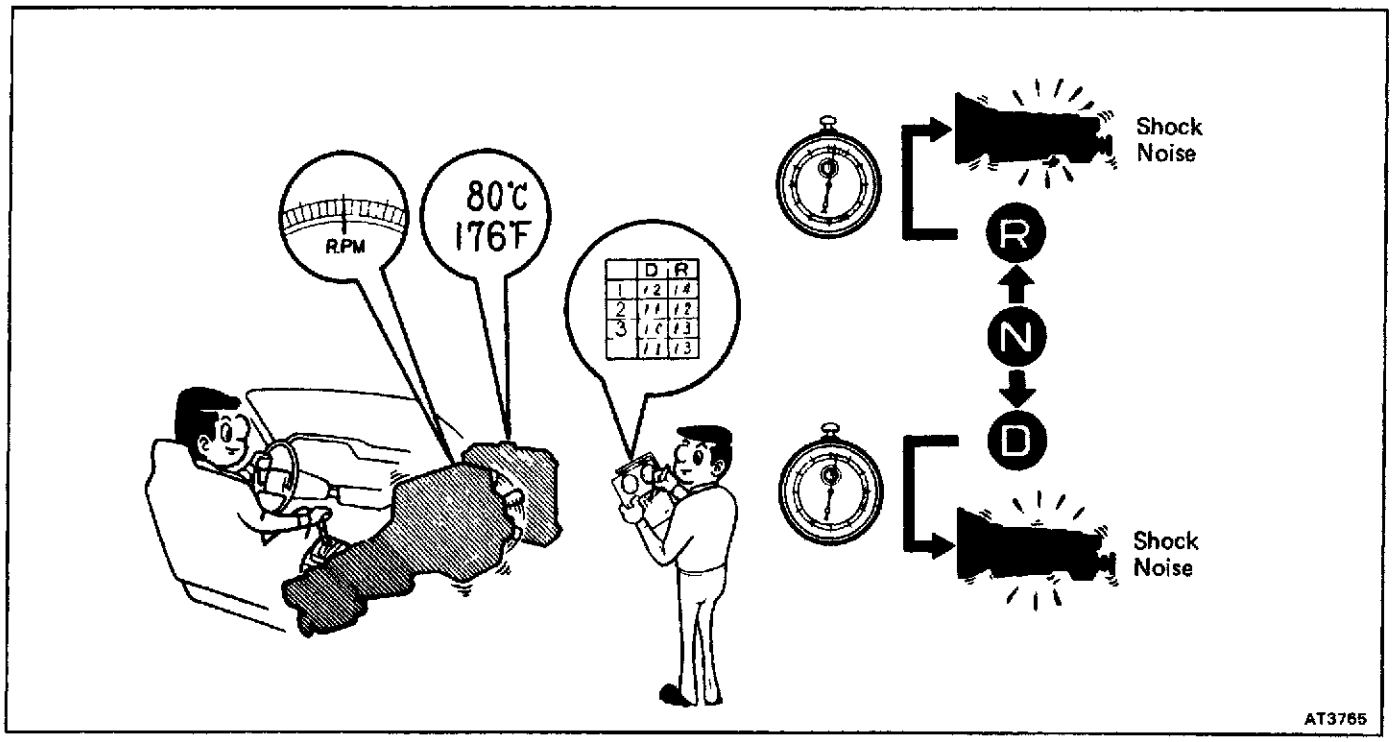
EVALUATION

(a) If N-iD time lag is longer than specified

- Line pressure too low
- Forward clutch worn
- 0/D one-way clutch not operating properly

(b) If N-iR time lag is longer than specified

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- 0/D one-way clutch not operating properly


R.P.M
80°C
176°F
D
R
1
2
3
Shock
Noise
R
N
D
Shock
Noise
AT3765

HYDRAULIC TEST

ATORC-01

PREPARATION

(a) Warm up the transmission fluid

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge

SST 09992-00094 (Oil pressure gauge)

NOTICE:

- Perform the test at normal operating fluid temperature 50-$0° C (122-176° F)
- The line pressure test should always be carried out in pairs One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the 4 wheels

(b) Start the engine and check idling RPM

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position

(d) Measure the line pressure when the engine is idling

(e) 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 specified stall speed.

(f) In the same manner, perform the test in R position

Line pressure

Condition	D position	R position
Idling	461- 520 kPa (4 7-5 3 kgf/cm2 68-77 psi)	657- 843 kPa (6 7- 8 6 kgf/cml 97- 125 psi)
Stall	971 -1 225 kPa (9 9-12 5 kgf/emt 144-181 psi)	1 618-1 853 kPa (16 5-18 9 kgf/cm2 235-274 psi)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest

EVALUATION

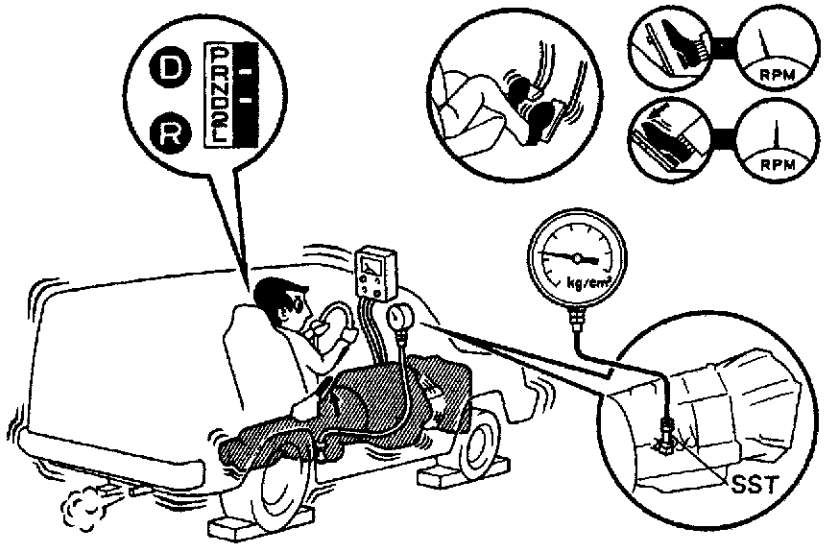
(a) If the measured values at all positions are higher than specified
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified
- Throttle valve defective
- Throttle cable out of adjustment
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



003100

ROAD TEST

AT03A-04

NOTICE Perform the test at normal operating fluid temperature 50 - 80° C (122 -176° F)

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS

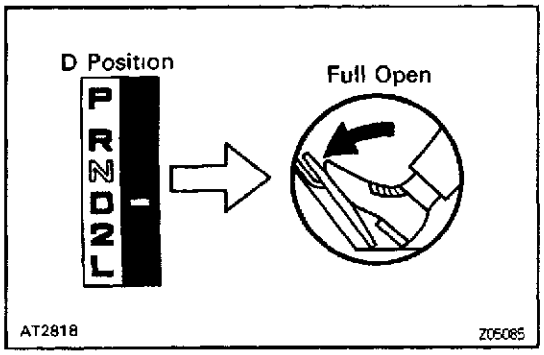
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position

Check the following

(a) 1 -2, 2-3 and 3-O/D up-shifts should take place, and shift points 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

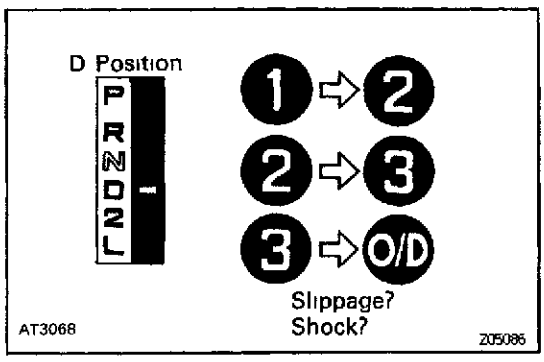
(1) If there is no 1-2 up-shift
- No 2 solenoid is stuck
- 1-2 shift valve is stuck

(2) If there is no 2-3 up-shift
- No 1 solenoid is stuck
- 2-3 shift valve is stuck

(3) If there is no 3-0/D up-shift
- 3-4 shift valve is stuck

(4) If the shift point is defective
- Throttle valve, 1 - 2 shift valve, 2-3 shift valve,
- 3-4 shift valve etc , are defective

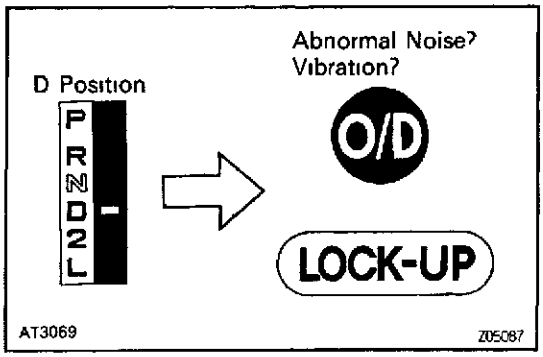
(5) If the lock-up is defective
- Lock-up solenoid is stuck
- Lock-up control valve is stuck
- Lock-up signal value is stuck



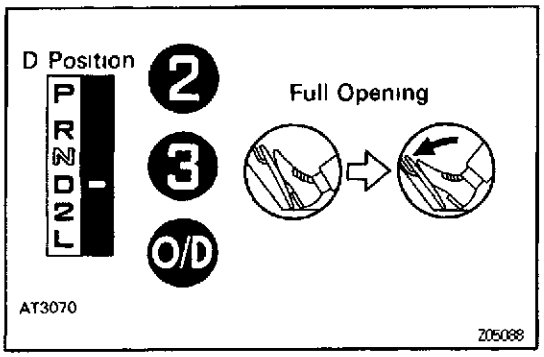
(b) In the same manner, check the shock and slip at the -2, 2-3, and 3-O/D up-shifts

EVALUATION

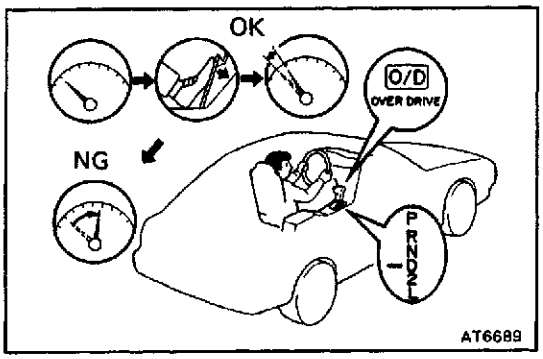
If the shock is excessive
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



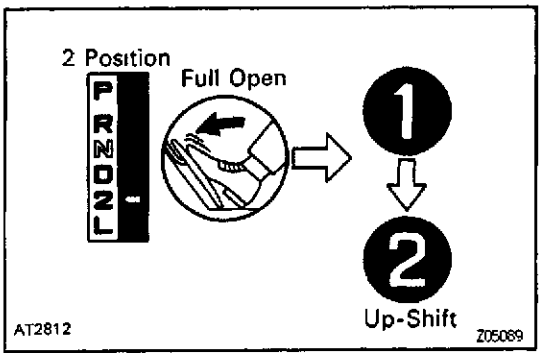
(c) Run at the D position lock -up or O/D gear and check for abnormal noise and vibration
HINT The check for the cause of ahnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc



(d) 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
(e) Check for abnormal shock and slip at kick-down



(f) Check for the lock-up mechanism
(1) Drive in D position, 0/D gear, at a steady speed (lock-up ON) of about 95 km/h (59 mph)
(2) 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

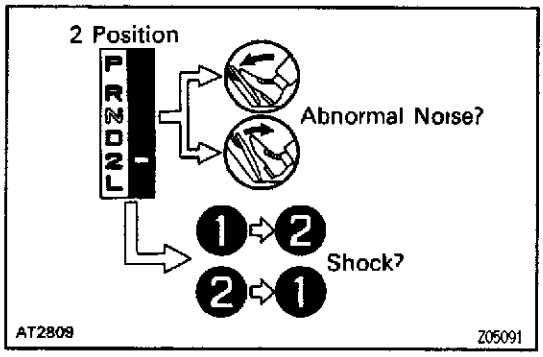


2. 2 POSITION TEST

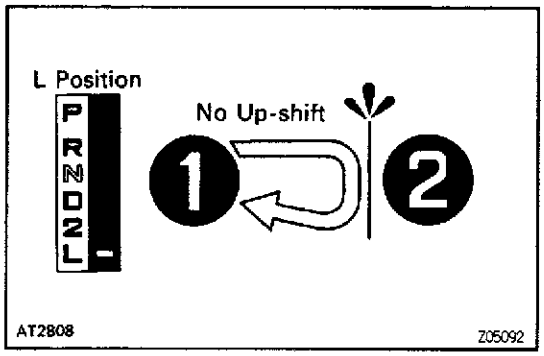
Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points
(a) Check to see that the 1-2 up-shift takes place and that the shift point conforms to that shown on the automatic shift schedule
HINT There is no 0/D up-shift and lock-up in the 2 position
(b) 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
- Second coast brake is defective

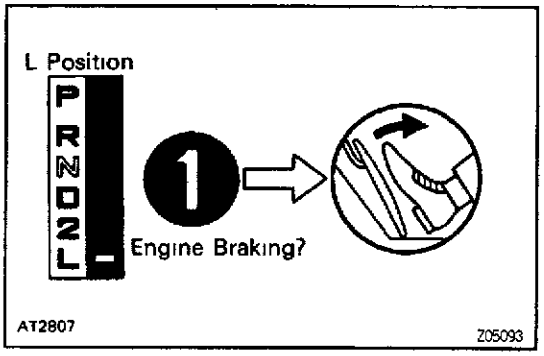


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up-shift and down-shift



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up-shift to 2nd gear

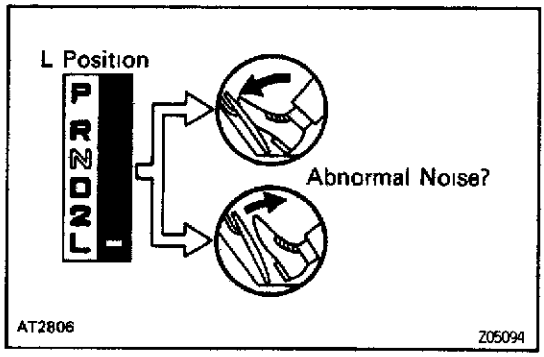


(b) While running in the L position, release the accelerator pedal and check the engine braking effect

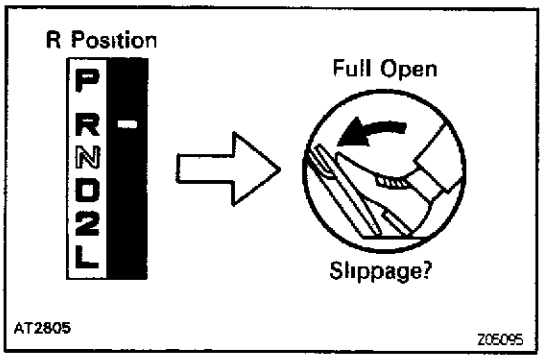
EVALUATION

If there is no engine braking effect

- First and reverse brake is defective

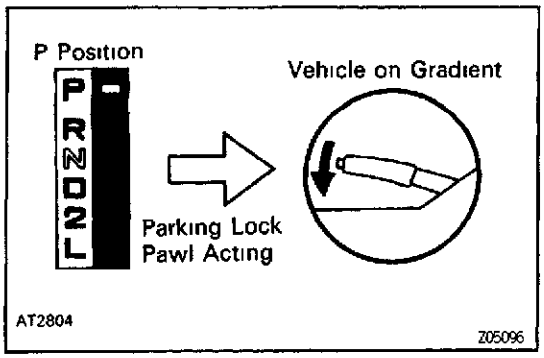


(c) Check for abnormal noise during acceleration and deceleration



4. R POSITION TEST

Shift into the R position and, while starting at full throttle, check for slipping



5. P POSITION TEST

Stop the vehicle on a gradient (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

AUTOMATIC SHIFT SCHEDULE

AT06N-01

km/h (mph)

Throttle valve opening		100%			5%		100%		
Gear position		1 -2	2- 3	3- O/D	Lock-up ON	Lock-up OFF	O/D- 3	3 - 2	2 - 1
D position	Normal mode	52-58 (32-36)	106-117 (ss-73)	152-163 (94-101)	so-s6 (37-41)	55-80 (34-37)	145-15fi (90-97)	98-104 (61-65)	42-47 t26-29t
	Power mode	52-58 (32-36)	106-117 (66-73)	152-163 (94-101)	88-94 (55-58)	68-74 (42-46)	145-156 (90-97)	98-104 (61-65)	42-47 (2fi-29)
2 position	Normal mode Power mode	52-58 (32-36)	—	—	—	—	—	116-127 (72-79)	56-65 (37-40)
L position	Normal mode Power mode	—	—	—	—	—	—	—	

V01873

TROUBLESHOOTING MATRIX CHART

AT09P-03

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
Remark * Refer to '94 A442F Automatic Transmission Repair Manual (ON-VEHICLE)

See page / Parts Name / Trouble		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	AT-54	*	*	*
		1 - 2 shift valve	2 - 3 shift valve	3 - 4 shift valve	Low coast modulator valve	Reverse control valve	Manual valve	No 1 solenoid	No 2 solenoid	Timing solenoid	Lock-up solenoid	Co exhaust valve	Bo accumulator	C accumulator	B 1 accumulator	C2 accumulator	2 - 3 shift timing valve	Modulator valve	Accumulator control valve	Lock-up signal valve	Lock-up control valve	OFF-vehicle repair matrix chart	TC M	Throttle cable	Check ball
Does not move in any forward position						3		2	2													1			
Does not move in reverse							2															3	1		
Does not move in any position																						4	1		
No up-shift	1rst - 2rd	3							2													4	1		
	2nd - 3rd		3					2														4	1		
	3rd - O/D			3					2													4	1		
No down-shift	O/D - 3rd			3					2													4	1		
	3rd - 2nd		3					2														4	1		
	2rd - 1rst	3							2			4											1		
Shift point too high or too low																							1	2	
Harsh engagement	N - R															1						2			
	N - D													1								3			
	N - D , N - R														4							3			
	1rst - 2rd									3						5	4					5	1	2	3
	2nd - 3rd												4									6	1	2	3
	3rd - O/D																					2		1	
	1rst - 2nd - 3rd - O/D																					4	1	2	3
	O/D - 3rd									3					6		5		7			8	1	2	4
	3rd - 2nd																					1			
Slip	Forward & Reverse																					1			
	R position																					1			
	1rst																					1			
	2nd																					1			
	3rd																					1			
	O/D																					1			
No engine braking	1st (L position)				4				2	3								5				6	1		
	2nd (2 position)																					1			
No kick-down		4	4	4				3	3														1	2	
Poor acceleration									2			3										4	1		
No lock-up											2									3	4	5	1		

V02264

Remark★ Refer to 94 A442F Automatic Transmission Repair Manual

(OFF-VEHICLE)

See page / Parts Name / Trouble		AT-69	★	★	★	★	★	★	★	★	★	★	AT-53	★	★
		Torque converter clutch	Oil Pump	O/D brake (Bo)	2nd brake (B2)	1st and reverse brake (B3)	O/D direct clutch (Co)	Front clutch (C1)	Rear clutch (C2)	O/D one-way clutch (Fo)	No 2 one-way clutch (F2)	ON-Vehicle matrix chart	Front planetary gear	Rear planetary gear
Does not move in any forward position								1				1		
Does not move in reverse position						3			2			1		
Does not move in any position		1	3				2			4			5	6
No up-shift	1St-2nd				2						3	1		
	2nd-3rd						2		3			1		
	3rd - O/D			2								1		
No down-shift	O/D→3rd						2			3		1		
	3rd-2nd				2							1		
	2nd -1 st						2				3	1		
Shift point too high or too low												1		
Harsh engagement	N → R					3			2			1		
	N → D							2			3	1		
	N → D N → R						2			3		1		
	1 st-2nd				2							1		
	2nd→3rd						3		2			1		
	3rd→O/D			2								1		
	1 st →2nd→3rd →OID							2				1		
	O/D→3rd						2			3		1		
	3rd-2nd				2							1		
Slip	Forward & Reverse	2	3							4		1		
	R position					2			1					
	1 st							1			2			
	2nd				1			2						
	3rd							1	2					
	O/D			3				1	2					
No engine braking	1st (L position)					2						1		
	2nd (2 position)						2					1		
No kick-down												1		
Poor acceleration		2					3					1		
No lock-up		2										1		

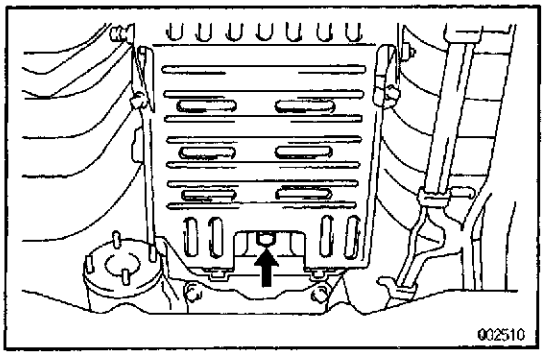
V04560

VALVE BODY

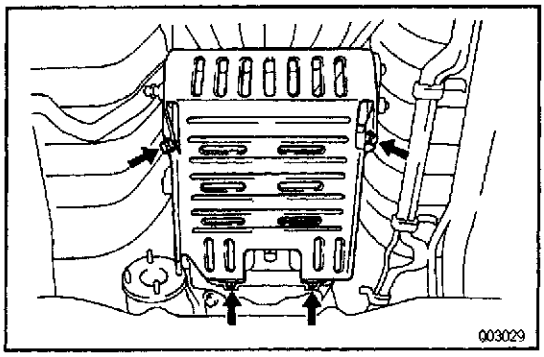
AT09Q-02

VALVE BODY REMOVAL

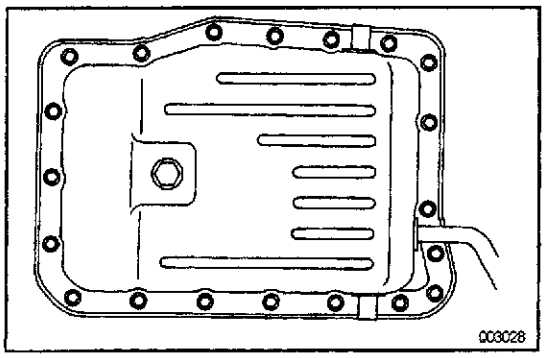
1. **REMOVE TRANSMISSION AND TRANSFER UNDER COVER**
2. **CLEAN TRANSMISSION EXTERIOR**
   To prevent contamination, clean the exterior transmission.



3. DRAIN TRANSMISSION FLUID
Remove the drain plug and drain fluid into a suitable container



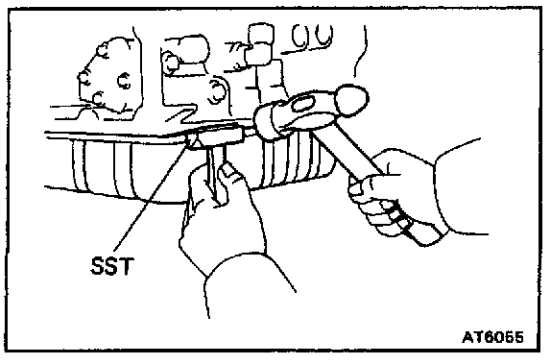
4. REMOVE OIL PAN PROTECTOR
Remove the 4 bolts and the oil pan protector



6. REMOVE OIL PAN AND GASKET

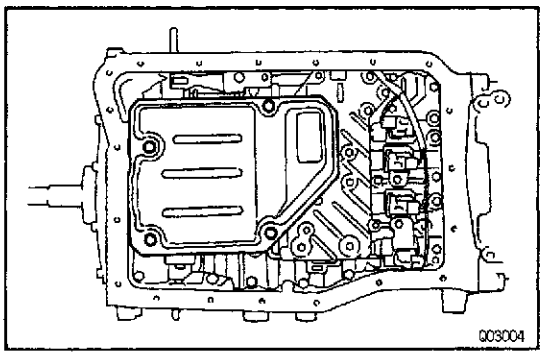
NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube.

(a) Remove the 20 bolts



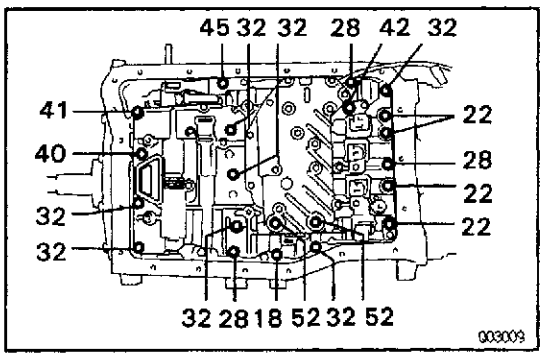
(b) Insert the blade off SST between the transmission and oil pan, cut-off applied sealer
SST 09302-00100

NOTICE: Be careful not to damage the oil pan flange



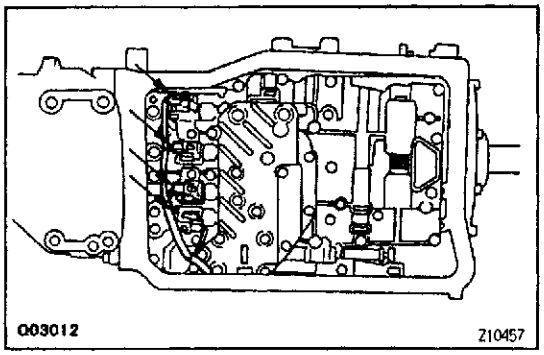
6. REMOVE OIL STRAINER

Remove the 4 bolts and oil strainer

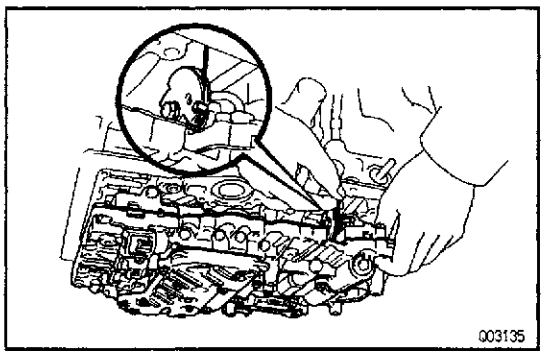


7. REMOVE VALVE BODY

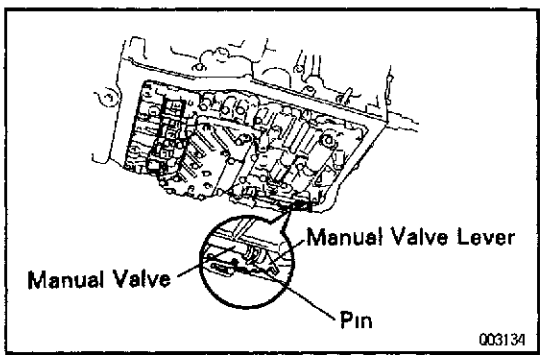
(a) Remove the 21 bolts



(b) Disconnect the 4 connectors from the solenoids



(c) Remove the throttle cable from the cam and remove the valve body

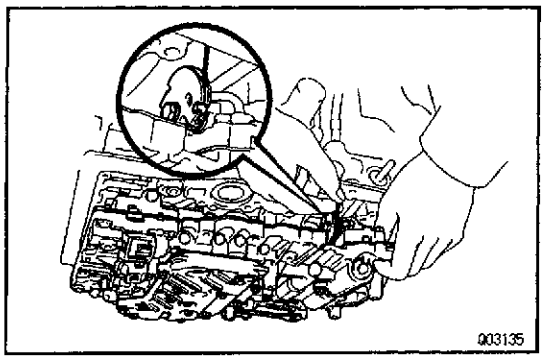


VALVE BODY INSTALLATION

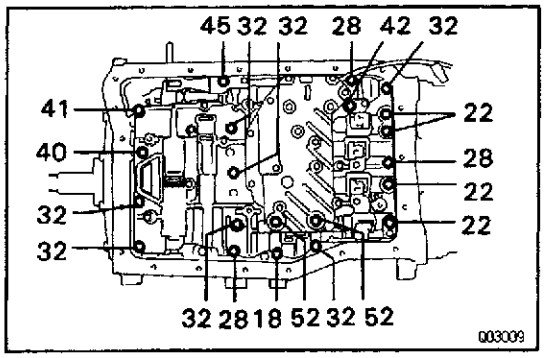
AT08R-02

1. INSTALL VALVE BODY

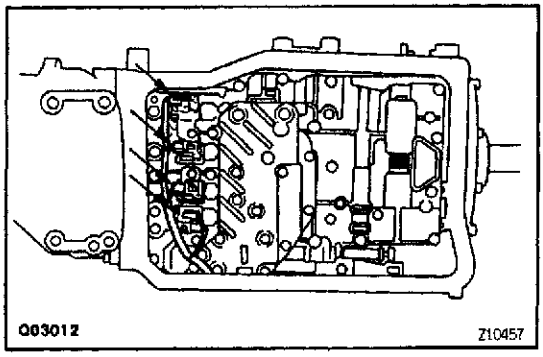
(a) Align the groove of the manual valve with the pin of the manual valve lever



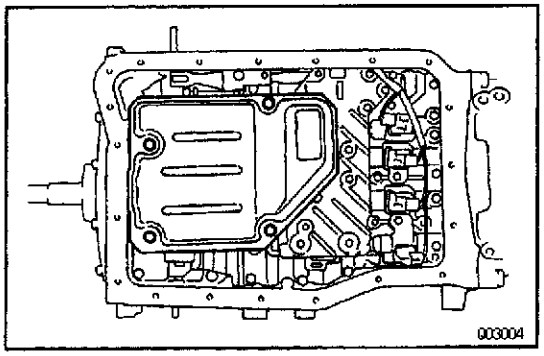
(b) Connect the throttle cable to the cam



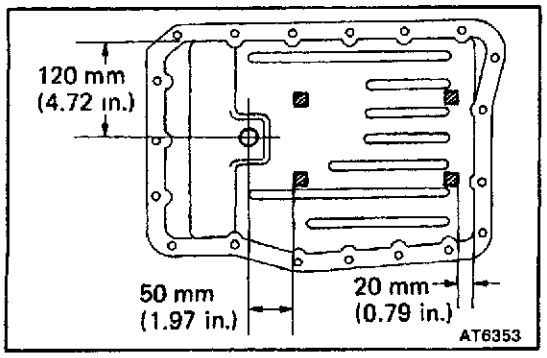
(c) Install the other bolts, as shown in the illustration
(d) Check that the manual valve lever contacts the center of the roller at the tip of the detente spring
(e) Tighten the bolts
Torque: 10 N-m (100 kgf-cm, 7 ft-lbf)



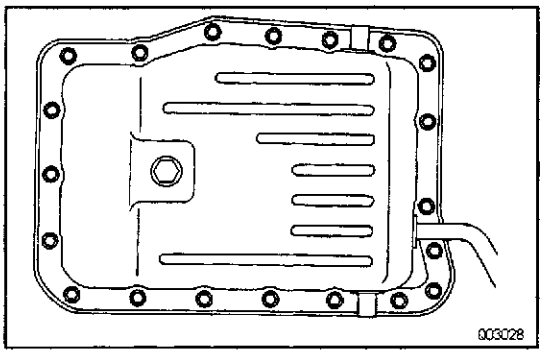
2. CONNECT 4 SOLENOID CONNECTORS



3. INSTALL OIL STRAINER
Install a new gasket and the oil strainer with 4 bolts
Torque 10 N-m (100 kgf-cm, 7 ft-lbf)
Each bolt length is indicated below
Bolt length:
16 mm (0.63 in.)



4. INSTALL MAGNETS IN PAN
Install the 4 magnets in the oil pan, as shown in the illustration



5. INSTALL OIL PAN

(a) Remove any FIPG and be careful not to drop oil on the contacting surface of the transmission case and oil pan

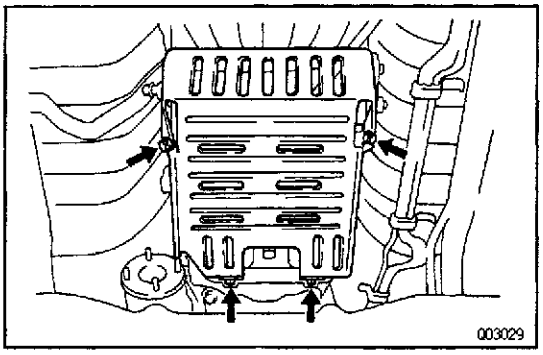
(b) Apply FIPG to the oil pan

FIPG

Part No 08826-00090, THREE BOND 1281B or equivalent

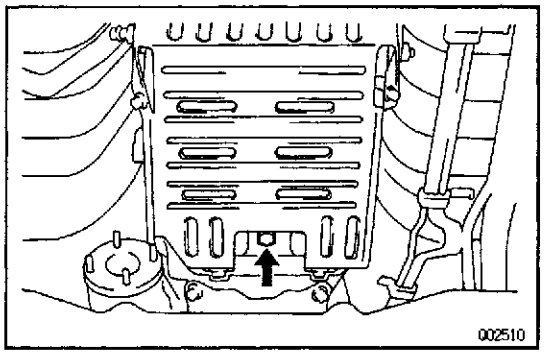
(c) Install and tighten the 20 bolts

Torque: 6.9 N-m (70 kgf-cm, 61 in.¿lbf)



6. INSTALL OIL PAN PROTECTOR

Install the protector with the 4 bolts



7. INSTALL DRAIN PLUG

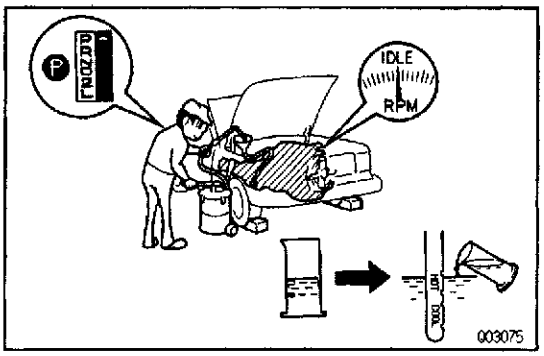
(a) Install the drain plug with a new gasket

(b)

Torque the drain plug.

Torque: 27 N-m (280 kgf-cm, 20 ft-lbf)

8. INSTALL TRANSMISSION UNDER COVER AND TRANSFER UNDER COVER



9. FILL TRANSMISSION WITH ATF

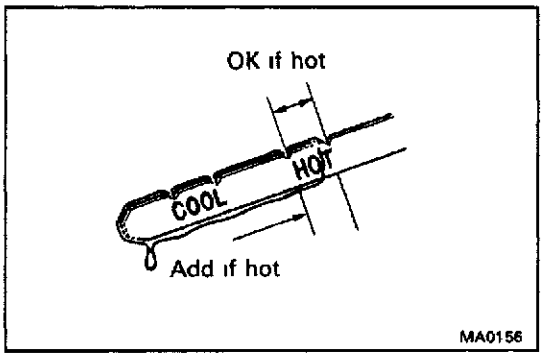
CAPACITY:

6.0 LITERS (6.3 US QTS, 5.3 IMP.QTS)

NOTICE: Do not overfill.

Fluid type

ATF DEXRON□ n



10. CHECK FLUID LEVEL

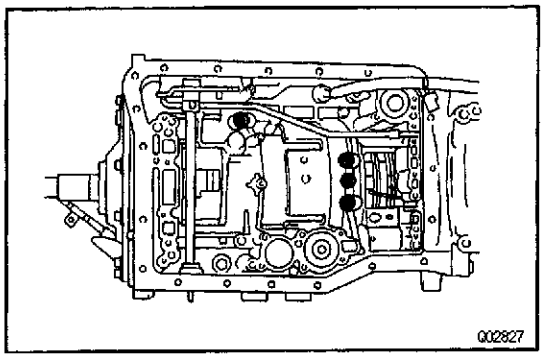
(SEE PAGE AT-25)

THROTTLE CABLE

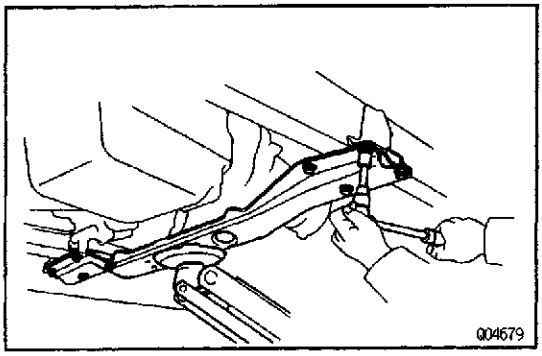
AT0QS-02

THROTTLE CABLE REMOVAL

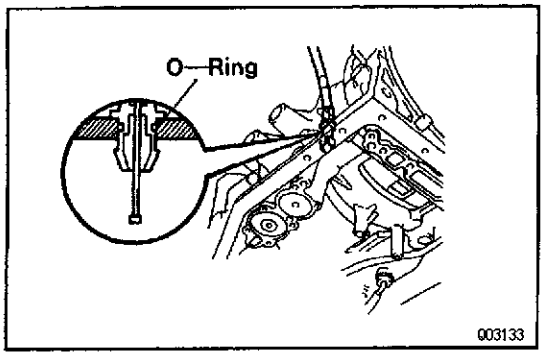
1 REMOVE FRONT PROPELLER SHAFT
(See page PR-6)
2 DISCONNECT THROTTLE CABLE
(a) Disconnect the cable housing from the bracket
(b) Disconnect the cable from the throttle linkage
(c) Disconnect the cable from the torque converter clutch housing
3 REMOVE VALVE BODY
(See page AT-55)



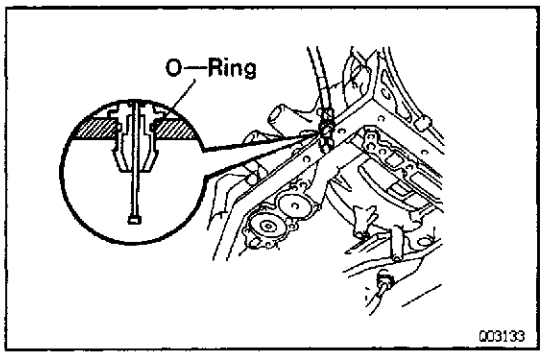
4. REMOVE 4 CENTER SUPPORT APPLY GASKETS



5. REMOVE FRAME CROSSMEMBER SET BOLTS
(a) Support the frame crossmember with a jack
(b) Remove the 8 set bolts
6. REMOVE THROTTLE CABLE CLAMP
(a) Lower the jack
(b) Remove the cable clamp from the transmission housing



7. REMOVE THROTTLE CABLE
Using 10 mm socket driver, remove the throttle cable by pushing the retainer portion of the throttle cable



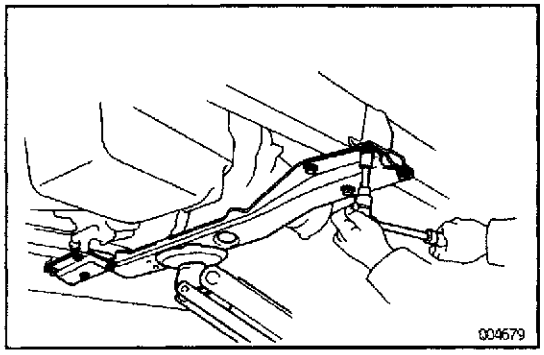
THROTTLE CABLE INSTALLATION

1 INSTALL CABLE IN TRANSMISSION CASE

(a) Coat a new 0-ring with ATF, and install it to the cable

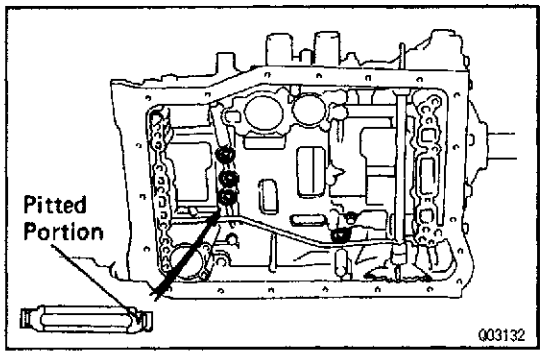
(b) Install the cable to the transmission case

2 INSTALL THROTTLE CABLE CLAMP TO TRANSMISSION HOUSING



3. INSTALL FRAME CROSSMEMBER SET BOLTS

Torque 61 N-m (620 kgf-cm, 45 ft-lbf)



4. INSTALL 4 CENTER SUPPORT APPLY GASKET

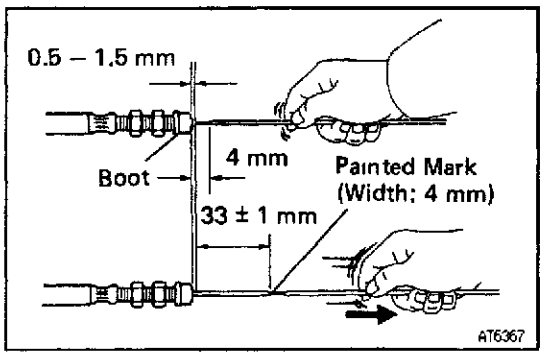
Install 4 new gaskets, facing the pitted side toward the transmission case

5. INSTALL VALVE BODY

(SEE PAGE AT-56)

6. INSTALL FRONT PROPELLER SHAFT

(SEE PAGE PR-12)



7. IF THROTTLE CABLE IS NEW, PAINT MARK ON INNER CABLE

HINT: New cable does not have a cable stopper installed

Therefore to mark adjustment possible, paint a mark as described below

(a) Connect the throttle cable to the throttle cam of valve body

(b) Pull the inner cable lightly until resistance is felt, and hold it

(c) Paint a mark as shown, about 4 mm (0 16 in) in width

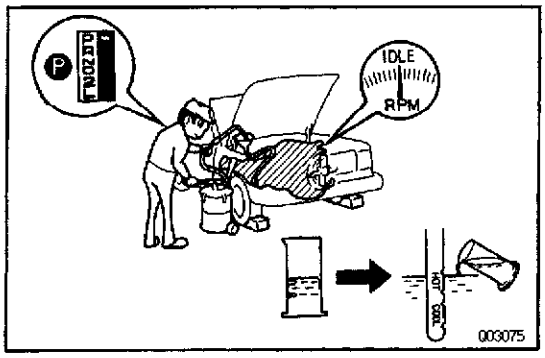
Cable stroke

33 ± 1 mm (1 30 ± 0 04 in)

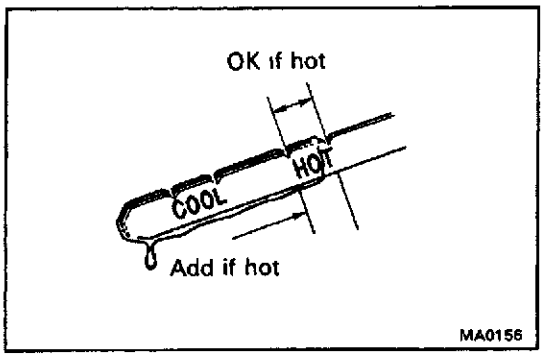
8. CONNECT THROTTLE CABLE

(a) Connect the cable to the throttle linkage

(b) Connect the cable housing to the bracket on the valve cover



9. ADJUST THROTTLE CABLE
(SEE PAGE AT-26)
10. FILL TRANSMISSION WITH ATF
CAPACITY:
6.0 LITERS (6.3 US QTS, 5.3 IMP.QTS)
NOTICE: Do not overfill.
Fluid type
ATF DEXRON®II

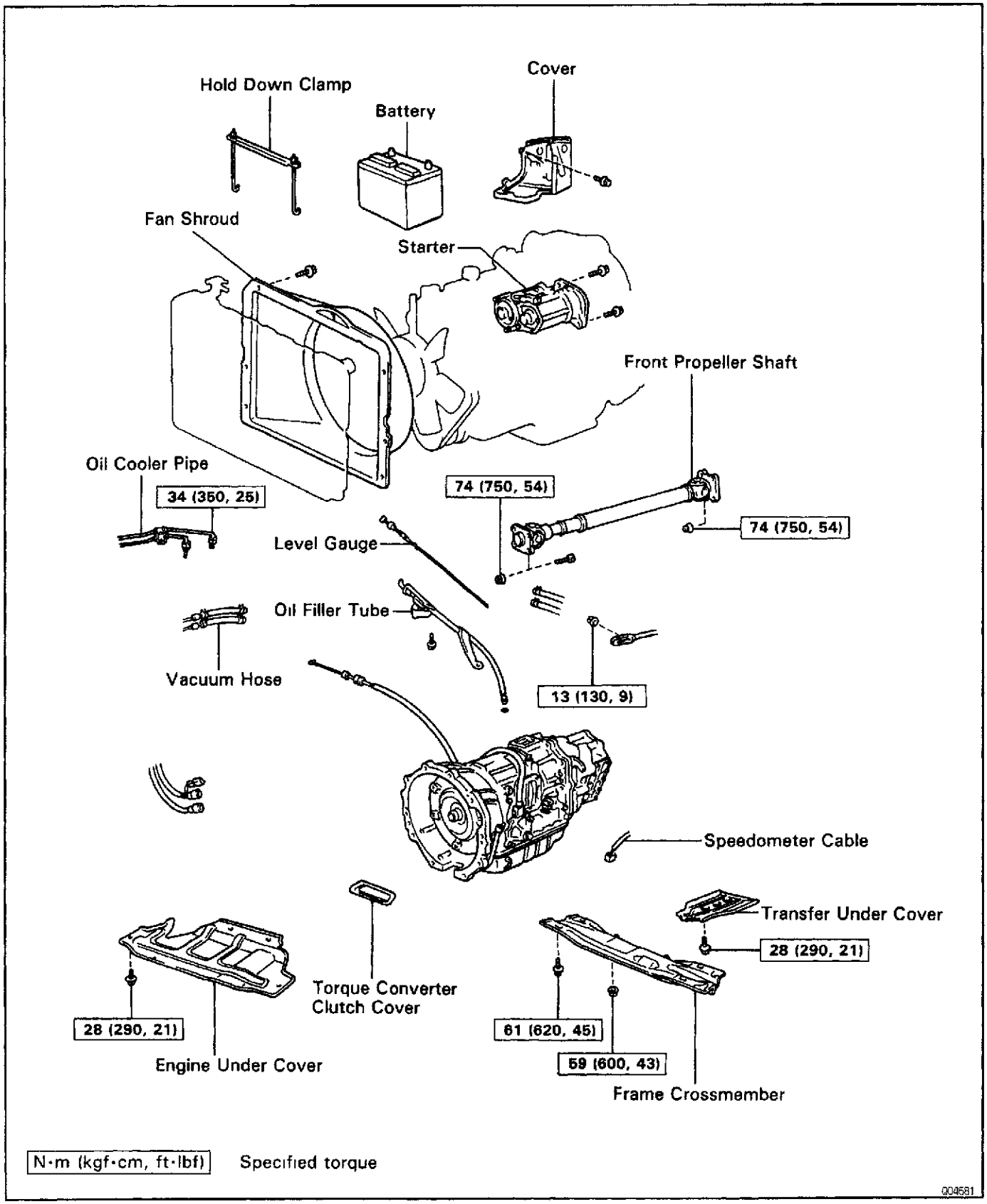


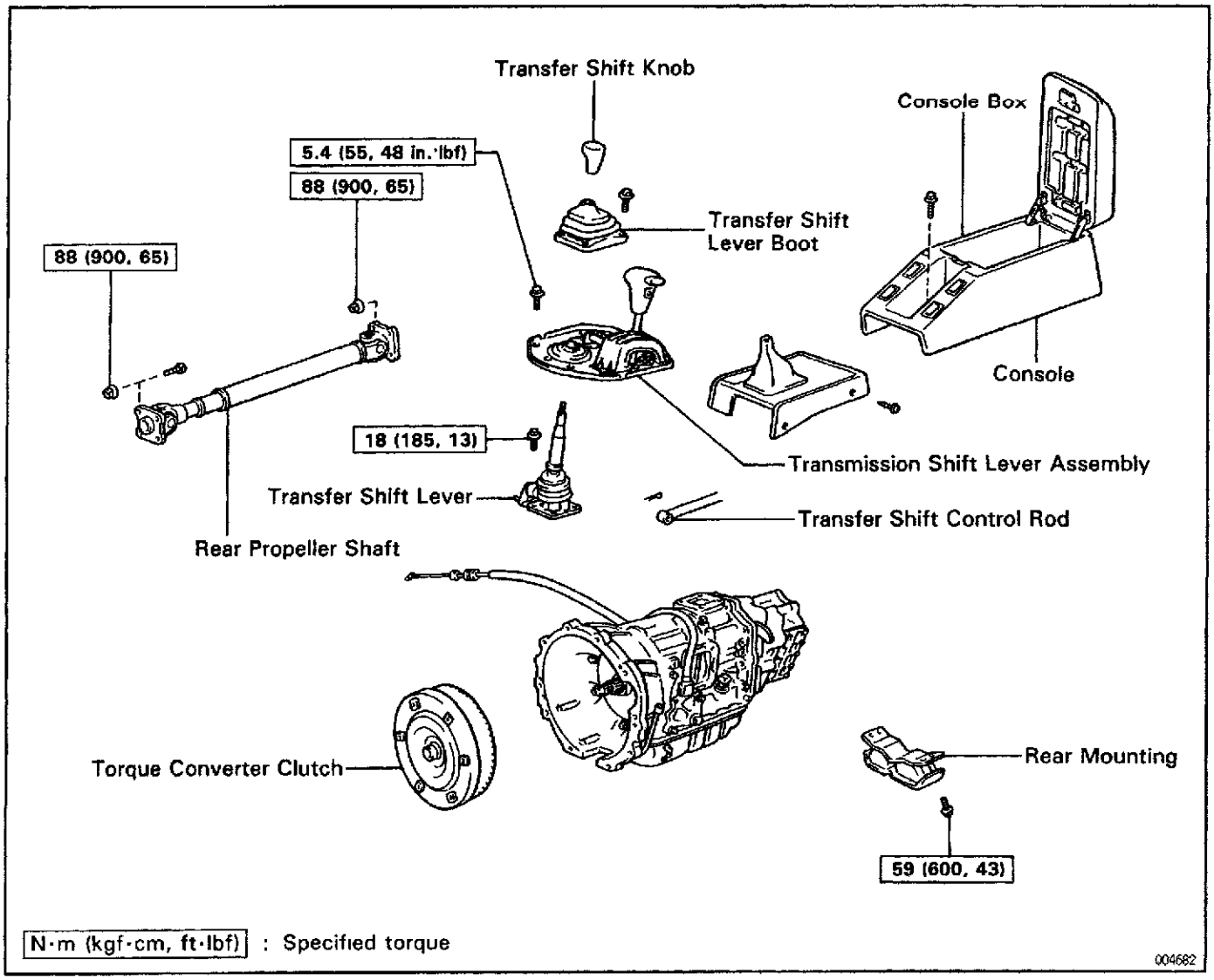
11. CHECK FLUID LEVEL
(SEE PAGE AT-25)

ASSEMBLY REMOVAL AND INSTALLATION

COMPONENTS

AT06U-02

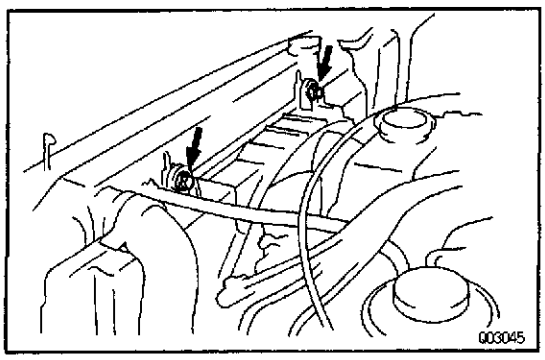




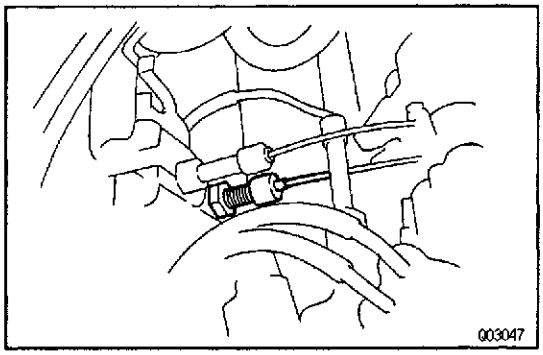
TRANSMISSION REMOVAL

AT66V-03

1. DISCONNECT BATTERY CABLE FROM NEGATIVE (-) TERMINAL
2. REMOVE BATTERY AND COVER



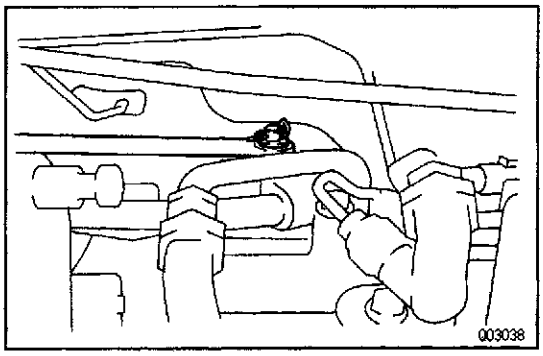
3. LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN



4. DISCONNECT THROTTLE CABLE

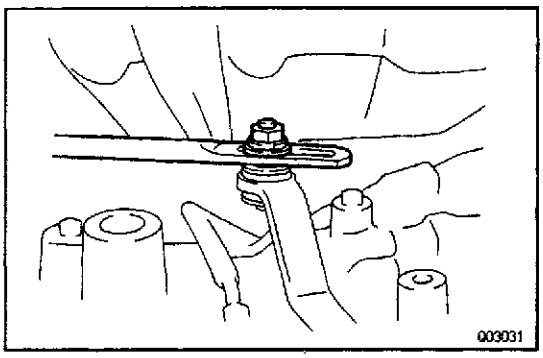
(a) Loosen the adjusting nut and disconnect the cable housing from the bracket

(b) Disconnect the cable from the linkage

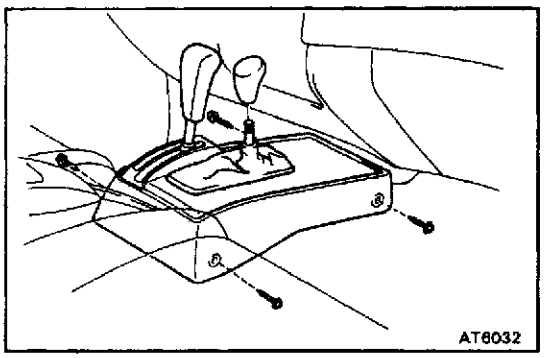


5. REMOVE TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER

(a) Remove the clip, washer and wave washer, and disconnect the link

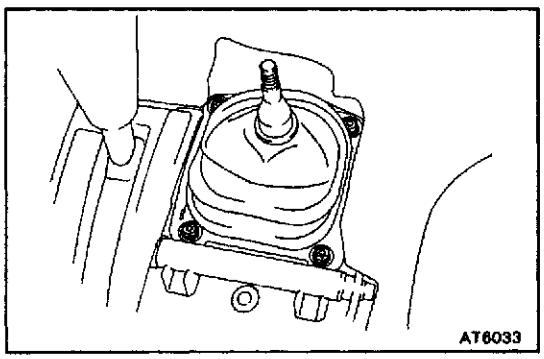


(b) Remove the nut and washer, disconnect the link

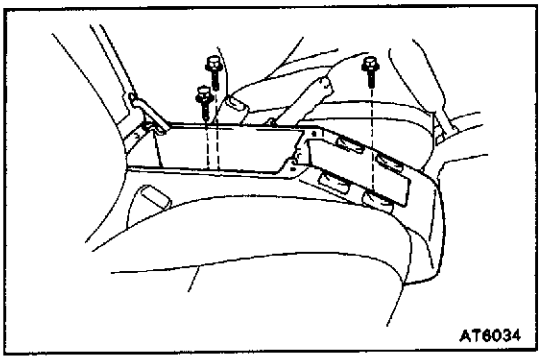


(c) Remove the transfer shift lever knob

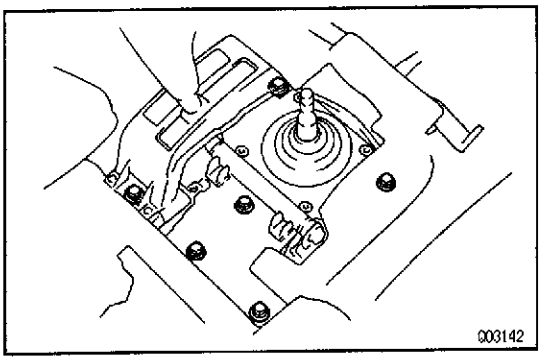
(d) Remove the 4 screws and console



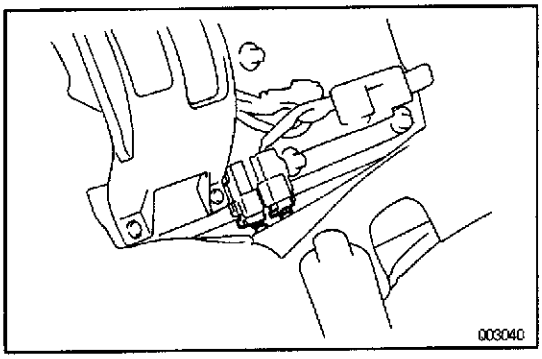
(e) Remove the 4 bolts and transfer shift lever boot



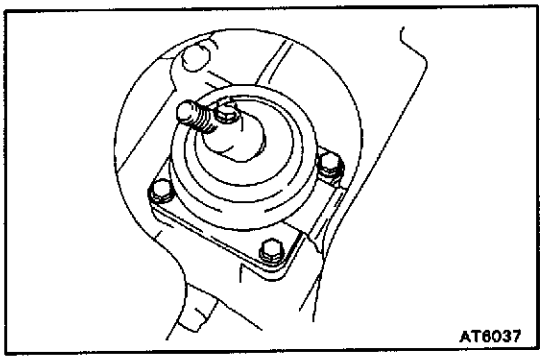
(f) Remove the 3 bolts and console box



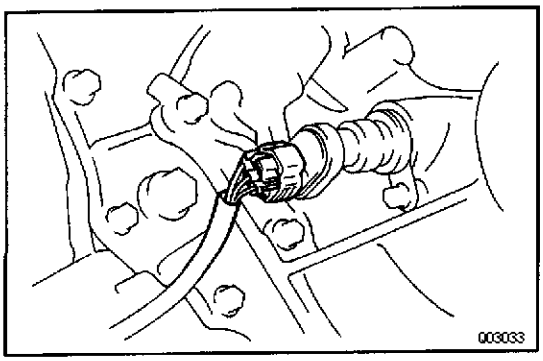
(g) Remove the 6 bolts



(h) Disconnect the connectors
(i) Remove the transmission shift lever assembly

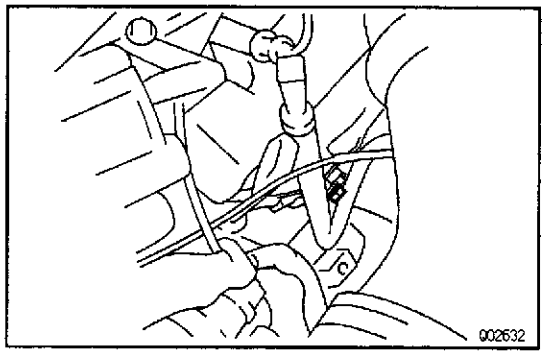


(j) Remove the 4 bolts and transfer shift lever

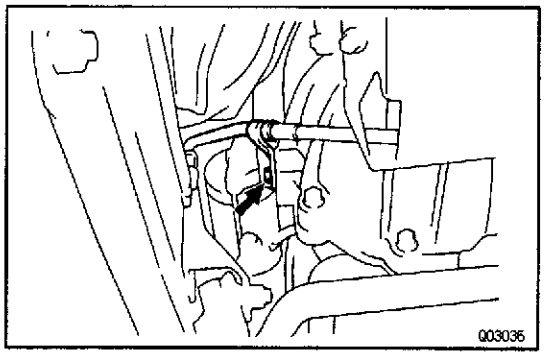


6. REMOVE NO.1 VEHICLE SPEED SENSOR CONNECTOR

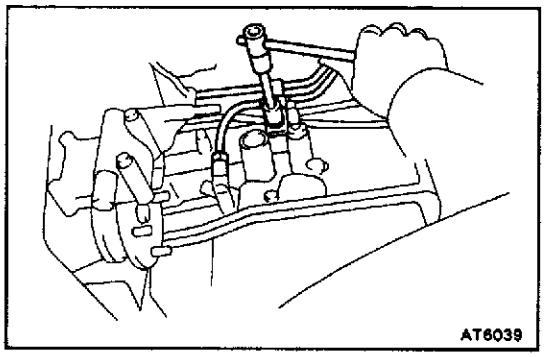
7. REMOVE FRONT AND REAR PROPELLER SHAFT (SEE PAGES PR-6)



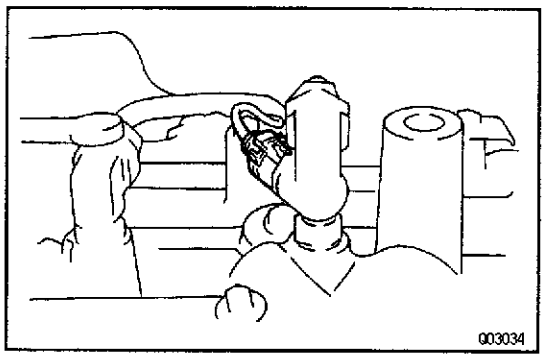
8. REMOVE OIL FILLER TUBE
(a) Remove the level gauge
(b) Remove the bolt



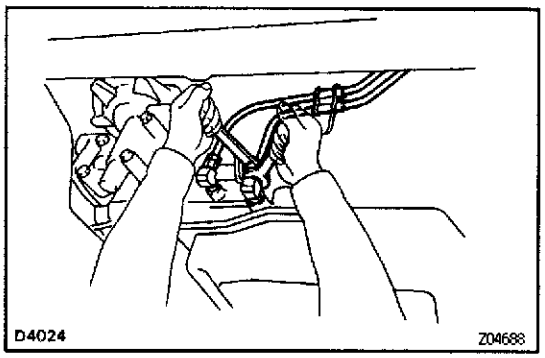
(c) Remove the bolt and filler tube



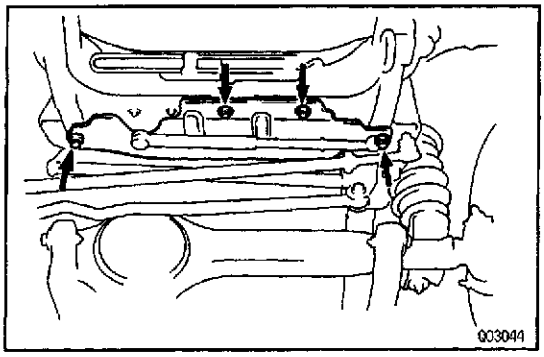
9. DISCONNECT OIL COOLER TUBES
(a) Remove the bolt and clamp



(b) Disconnect the temperature sensor connector

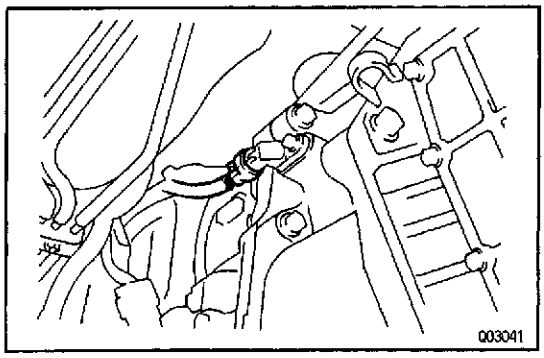


(c) Disconnect the 2 oil cooler tubes

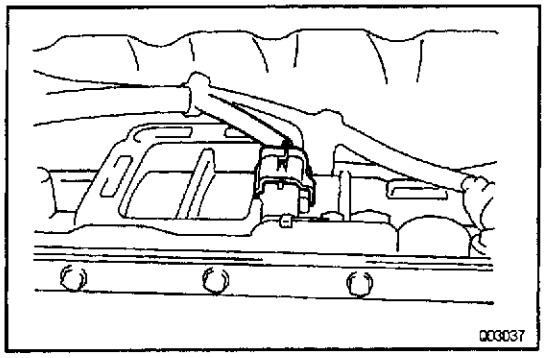


10. REMOVE ENGINE UNDER COVER

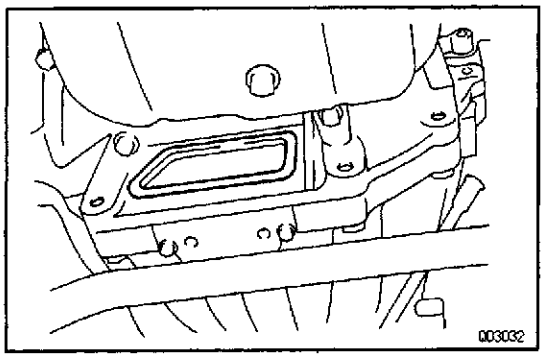
Remove the 4 bolts and cover



11. DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR

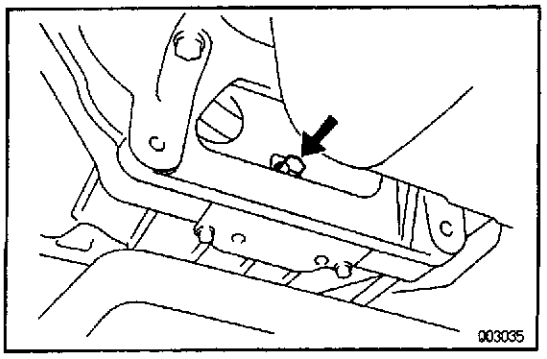


12. DISCONNECT SOLENOID CONNECTOR

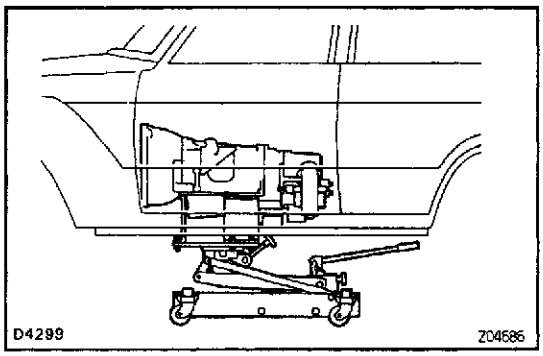


13. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS

(a) Remove the converter hole plug

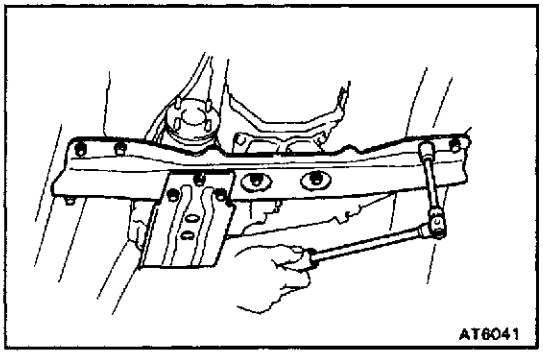


(b) Turn the crankshaft to gain access to each bolt
Remove the 6 bolts

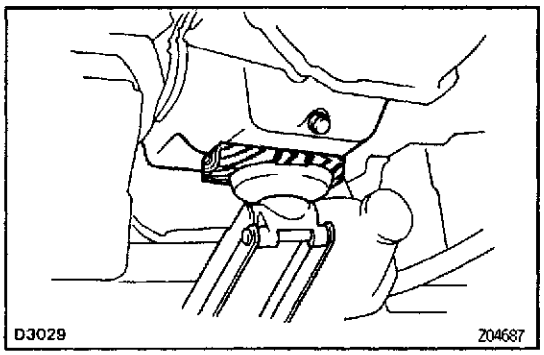


14. REMOVE CROSSMEMBER

(a) Support the transmission with the transmission jack



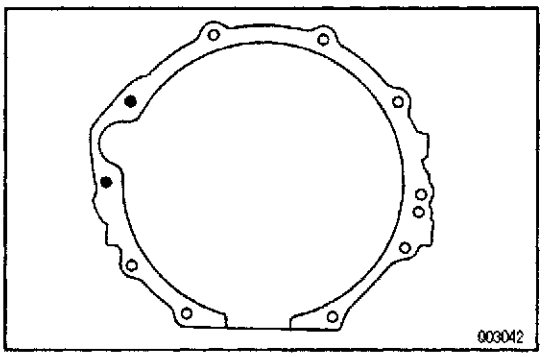
(b) Remove the 8 bolts and 2 nuts, and then remove the frame crossmember



15. REMOVE TRANSMISSION ASSEMBLY

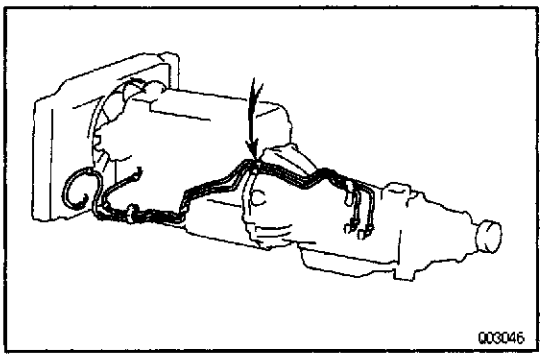
(a) Be sure to out a wooden block or equivalent between the jack and oil pan to prevent damage Support the oil pan with a jack

(b) Lower the rear end of transmission



(c) Remove the nut and disconnect the connectors from the starter

(d) Remove the 2 bolts and starter

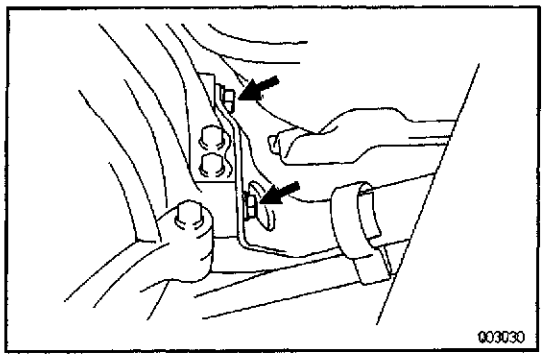


(e) Disconnect the park/neutral position switch connectors

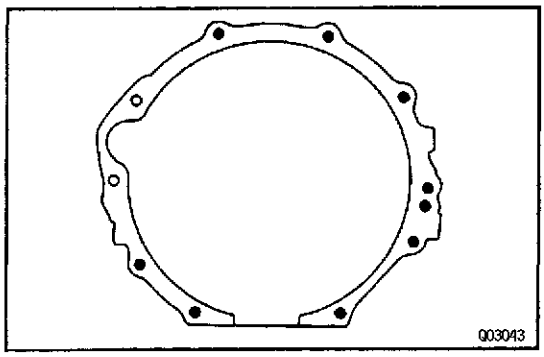
(f) Remove the bolt and disconnect the oil cooler tube clamp from the converter clutch housing

(g) Disconnect the connectors from the transfer

(h) Remove the clamp and disconnect the wire harness from the transmission and transfer



(i) Remove the 2 bolts and disconnect the exhaust pipe bracket from the converter clutch housing

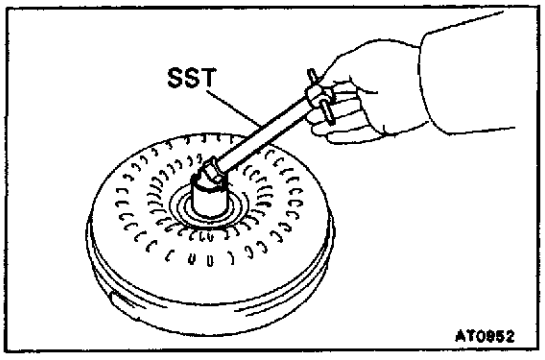


(j) Remove the bolts and transmission

AT01W-M

TORQUE CONVERTER CLUTCH CLEANING

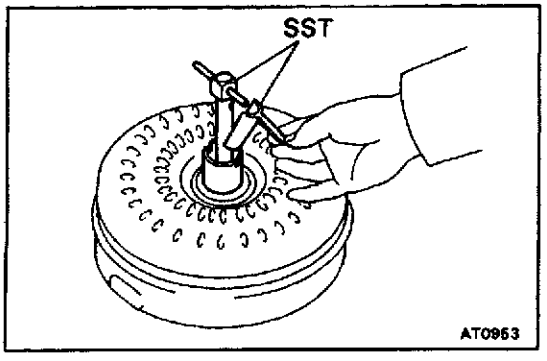
If the transmission is contaminated, the torque converter clutch and transmission cooler should be thoroughly flushed with ATF



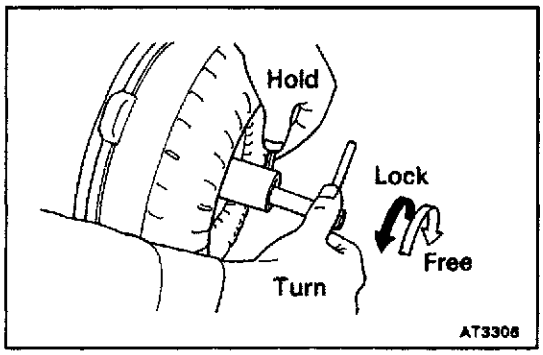
TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION AT09X-01

1. INSPECT ONE-WAY CLUTCH

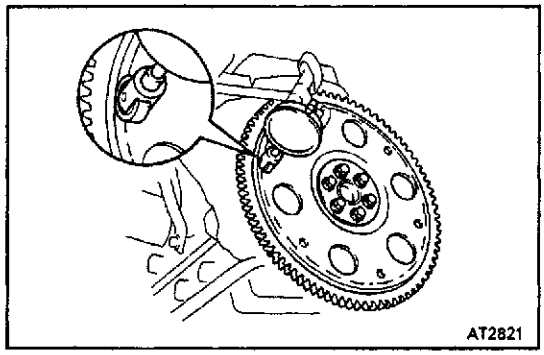
(a) Install SST in the inner race of one-way clutch
SST 09350-30020 (09351 -32010)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch
SST 09350-30020 (09351-32010)



(c) With the torque converter clutch made stand, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise
If necessary, clean the converter clutch and retest the clutch Replace the converter if the clutch still fails the test



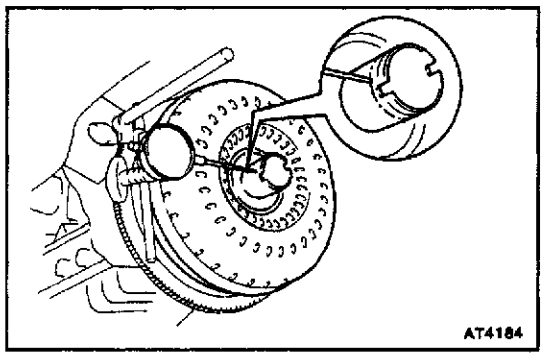
2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout If runout exceeds 0 20 mm (0 0079 in) or if the ring gear is damaged, replace the drive plate If installing a new drive plate, note the orientation of spacers and tighten the bolts

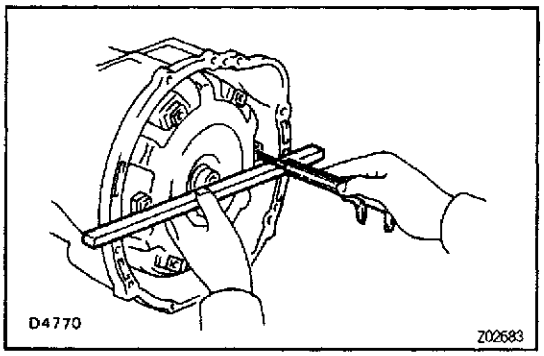
Torque: 100 N-m (1,000 kgf-cm, 72 ft-fbf)

3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE runout

(a) Temporarily mount the torque converter clutch to the drive plate Set up a dial indicator
If runout exceeds 0 30 mm (0 0118 in), try to correct by reorienting the installation of the converter clutch
If excessive runout cannot be corrected, replace the torque converter clutch
HINT Mark the position of the converter clutch to ensure correct installation



(b) Remove the torque converter clutch



AT00Y–03

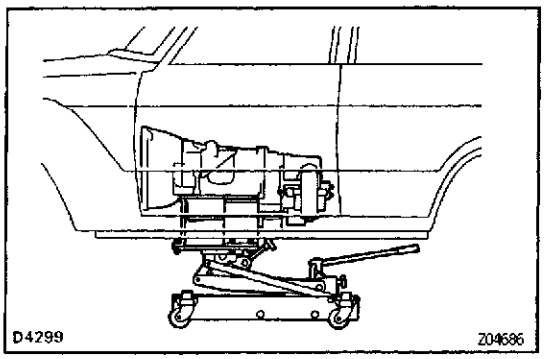
TRANSMISSION INSTALLATION

1. INSTALL TORQUE CONVERTER CLUTCH IN TRANSMISSION

If the torque converter clutch has been drained and washed, refill with new ATF
Fluid type
ATF DEXRON®II

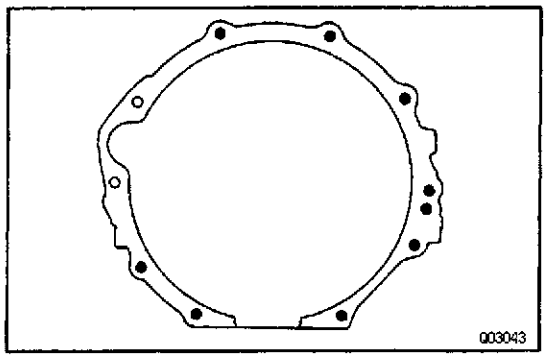
2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

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



3. PLACE TRANSMISSION AT INSTALLATION POSITION

Jack up and push the transmission fully into position



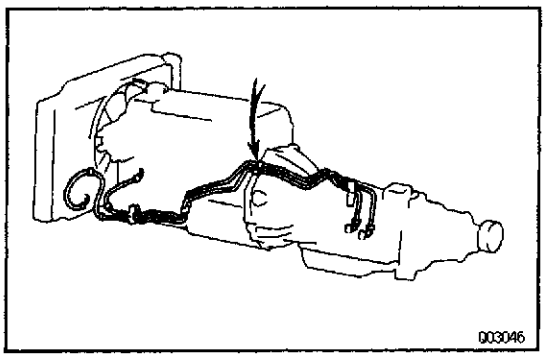
4. INSTALL TRANSMISSION BOLTS

(a) Install the transmission with the bolts

Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)

(b) Connect the wire harness to the transmission and transfer with the clamp

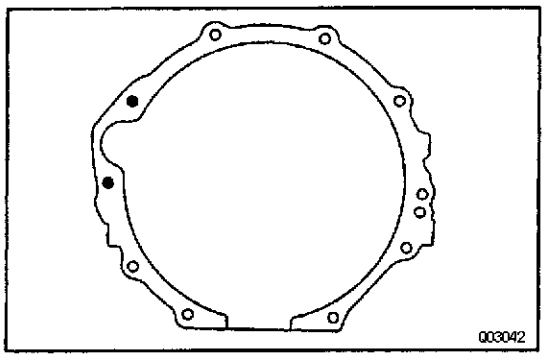
(c) Connect the connectors to the transfer



(d) Connect the oil cooler tube clamp to the converter clutch housing with the bolt

Torque: 10 N .m (100 kgf-cm, 7 ft-lbf)

(e) Connect the park/neutral position switch connector.

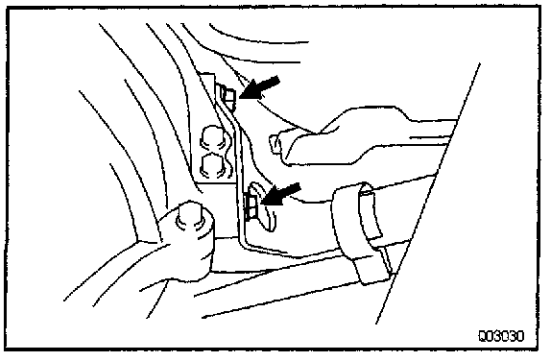


(f) Install the starter with the 2 bolts

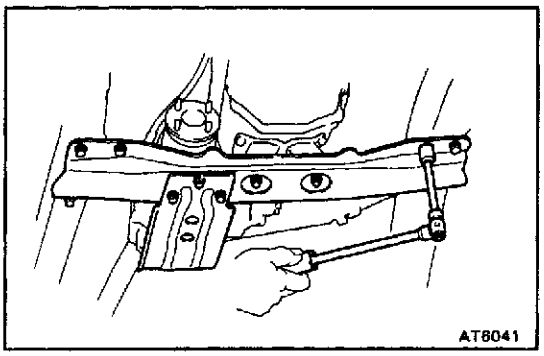
Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)

(g) Connect the connectors to the starter

(h) Install the nut to the starter



(i) Connect the exhaust pipe bracket to the converter clutch housing with the 2 bolts



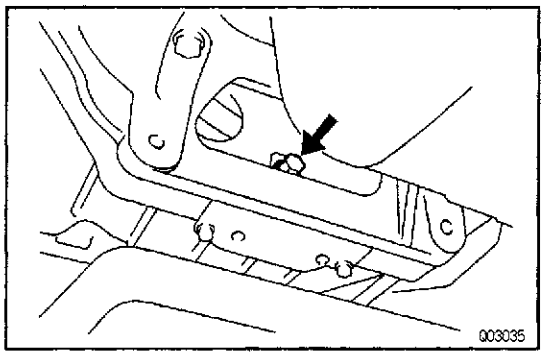
5. INSTALL CROSSMEMBER

Install the crossmernber wıth 8 bolts and 2 nuts

Torque

Bolt 61 N-m (620 kgf-cm, 45 ft-lbf)

Nut 59 N-m t600 kgf-cm, 43 ft-lbf

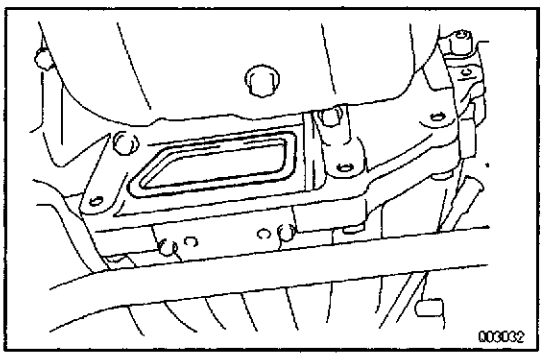


6. INSTALL

TORQUE CONVERTER CLUTCH MOUNTING BOLTS

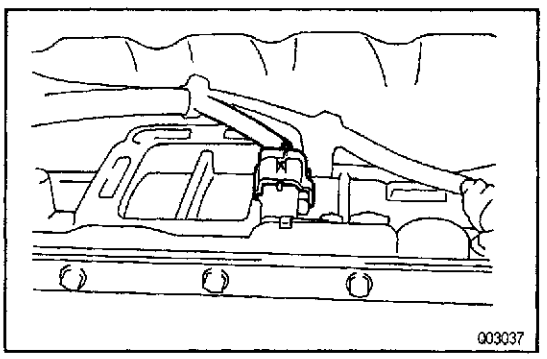
(a) ınstall the 6 bolts whıle turnıng the crankshaft

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

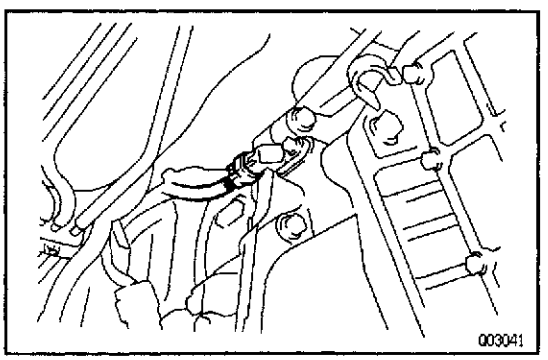


(b) Seal the converter hole plug wıth adhesıve

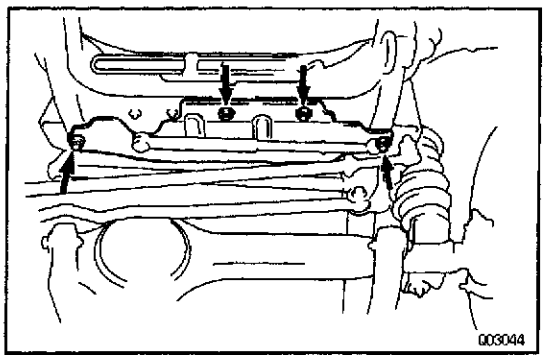
(c) Install the converter hole plug



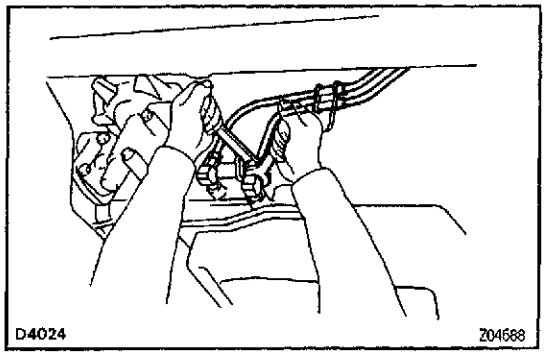
7. CONNECT SOLENOID CONNECTOR



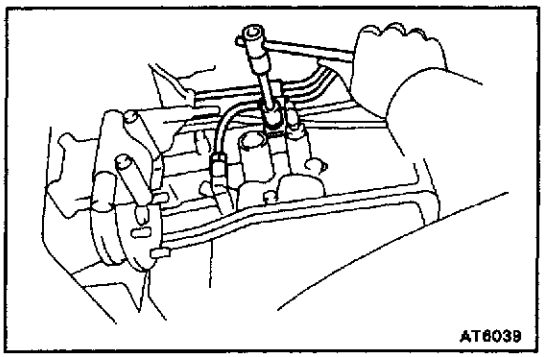
8. CONNECT NO. 2 VEHICLE SPEED SENSOR CONNECTOR



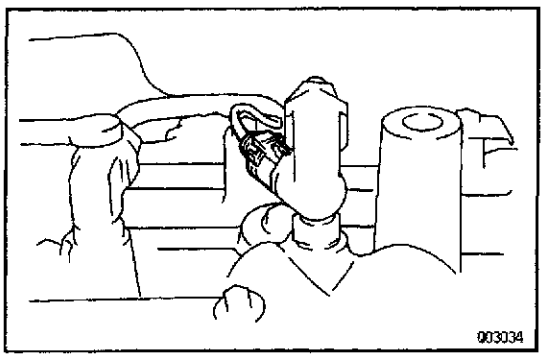
9. INSTALL ENGINE UNDER COVER
Install the cover with the 4 bolts
Torque: 28 N-m (290 kgf-cm, 21 ft-lbf)



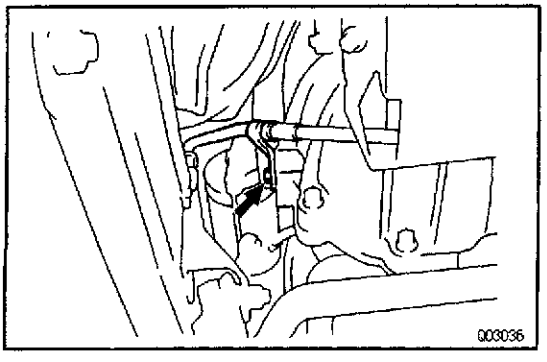
10. CONNECT OIL COOLER TUBES
(a) Connect the 2 oil cooler tubes
Torque: 34 N-m (350 kgf-cm, 25 ft.lbf)



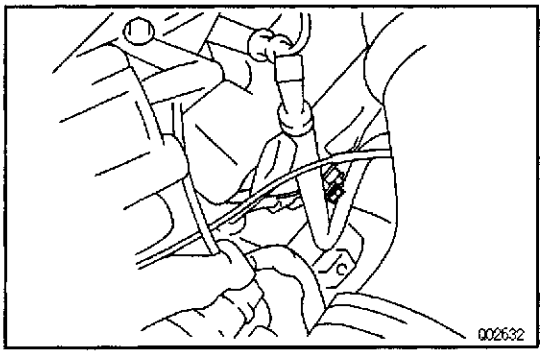
(b) Install the cooler tube clamp
Torque: 10 N-m (100 kgf-cm. 7 ft¿lbf)



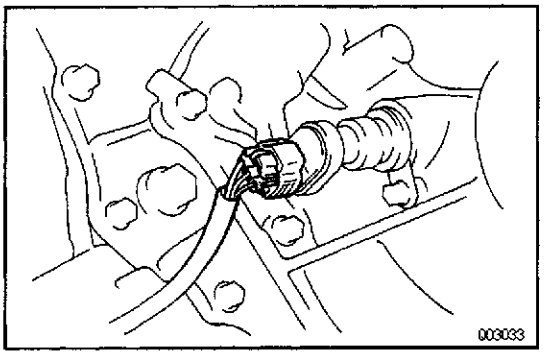
(c) Connect the oil temperature sensor connector



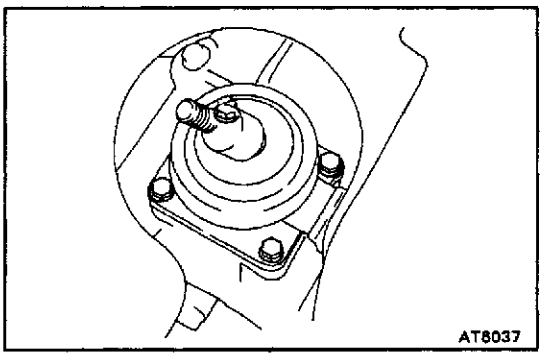
11. INSTALL OIL FILLER TUBE
(a) Install the filler tubes with the bolt



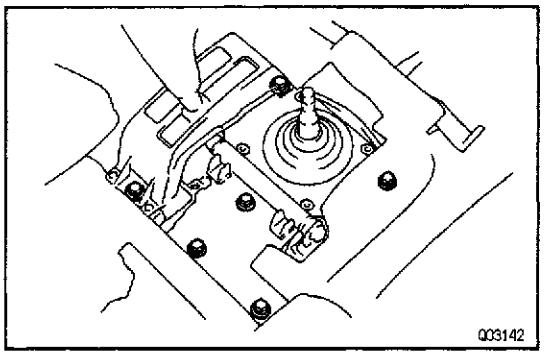
(b) Install the bolt
(c) Install the level gauge



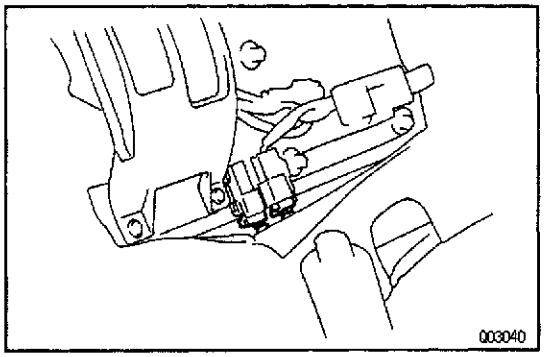
12. CONNECT NO. 1 VEHICLE SPEED SENSOR CONNECTOR
13. INSTALL FRONT AND REAR PROPELLER SHAFTS
(SEE PAGES PR-12)



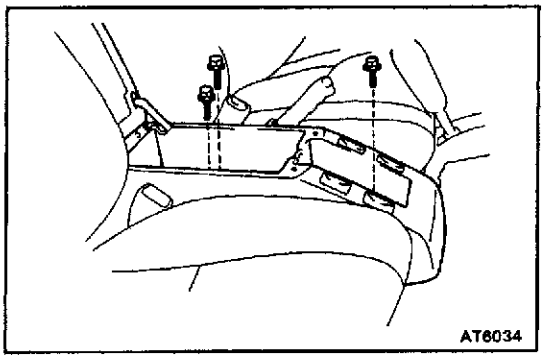
14. INSTALL TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER
(a) Remove the 4 bolts and transfer shift lever



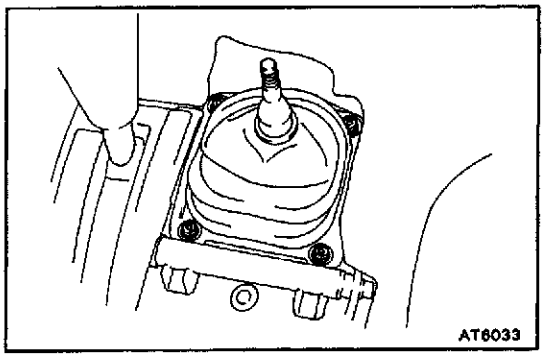
(b) Install the transmission shift lever assembly with the 6 bolts



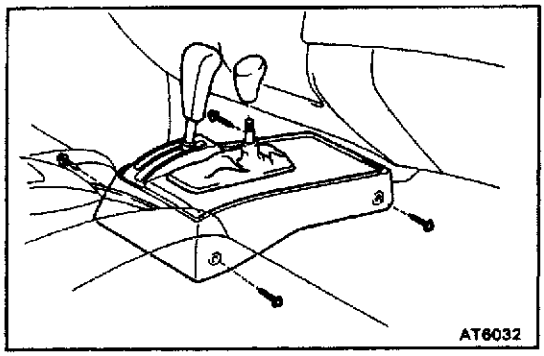
(c) Connect the connectors



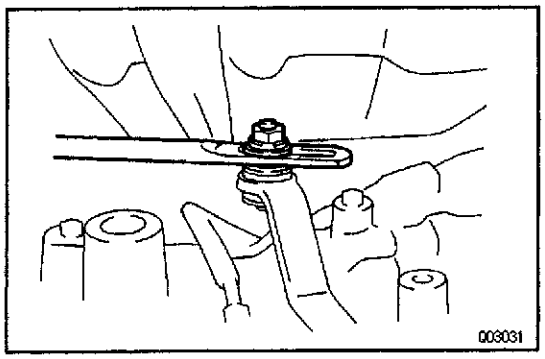
(d) Install the console box with the 3 bolts



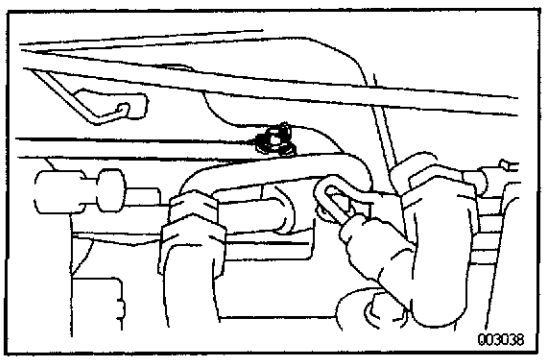
(e) Install the transfer shift lever boot with the 4 bolts



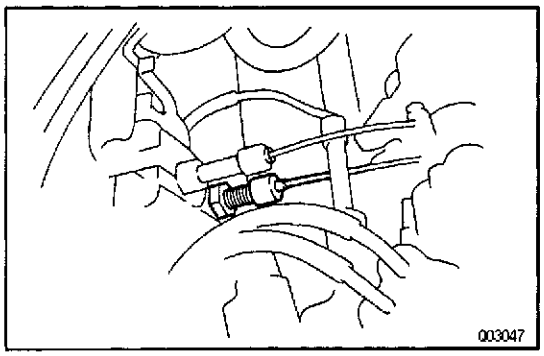
(f) Install the 4 screws and the console
(g) Install the transfer shift lever knob



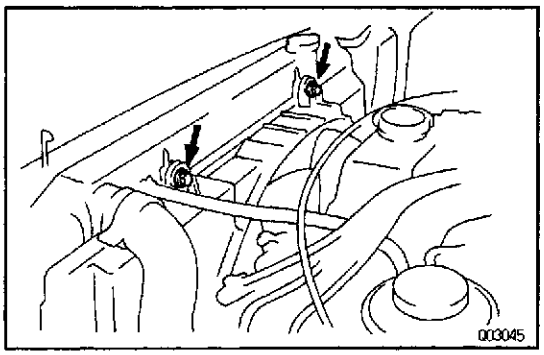
(h) Connect the link with the washer and nut



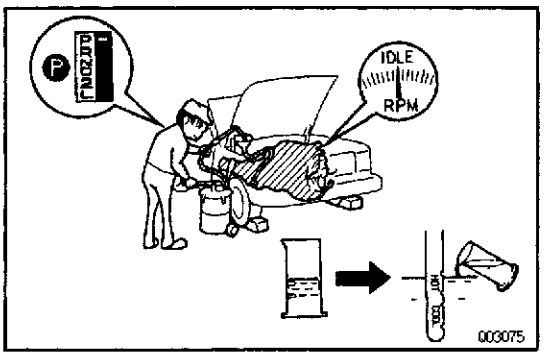
(i) Connect the link with the wave washer, washer and clip



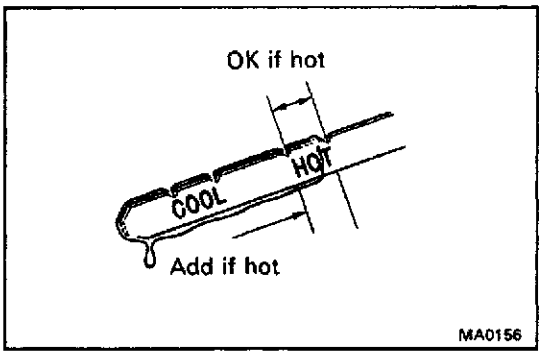
15. CONNECT THROTTLE CABLE
(a) Connect the cable from the throttle linkage
(b) Tighten the adjusting nuts and connect the cable housing from the bracket
16. ADJUST THROTTLE CABLE
(SEE PAGE AT-26)



17. TIGHTEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN
18. INSTALL BATTERY AND COVER
19. CONNECT BATTERY CABLE TO NEGATIVE (-) TERMINAL
20. ADJUST SHIFT CONTROL ROD
(SEE PAGE AT-26)



21. FILL SHIFT CONTROL ROD
FLUID TYPE:
ATF DEXRON®II
Capacity
6 0 liters (6 3 US qts 5 3 Ir» p qts)

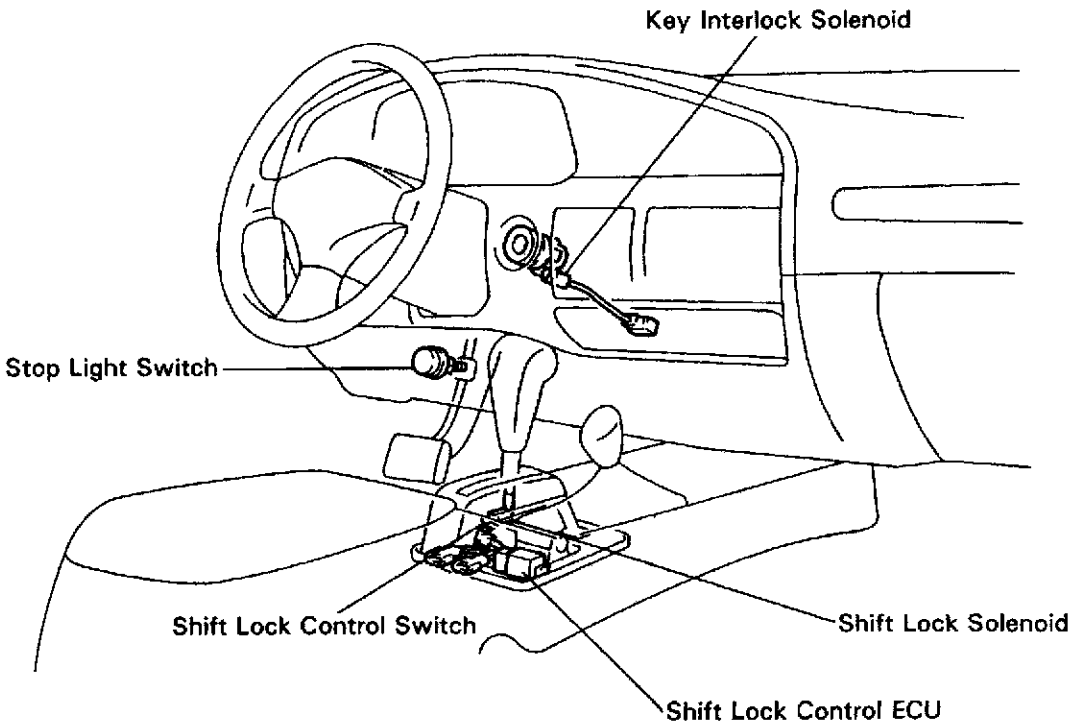


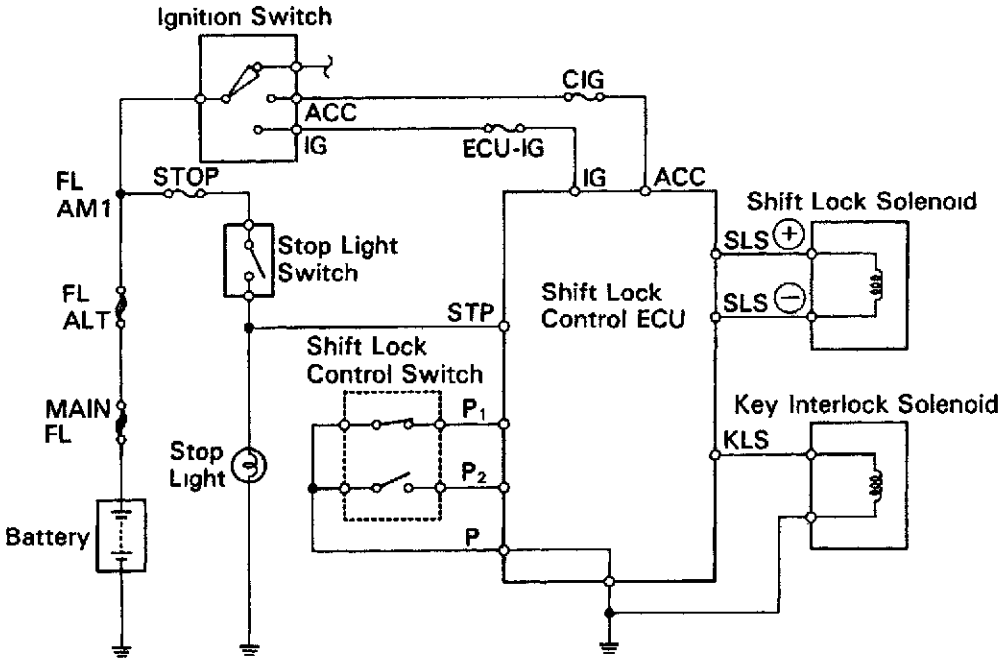
22. CHECK FLUID LEVEL
(SEE PAGE AT-25)

SHIFT LOCK SYSTEM

AT00Z 02

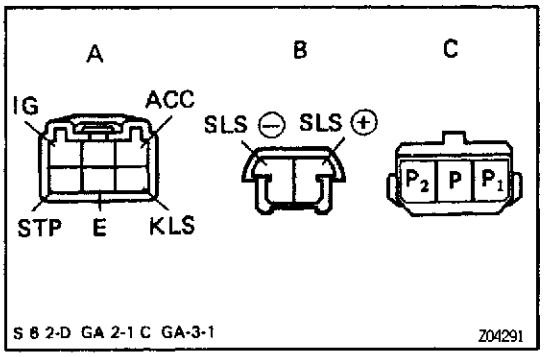
COMPONENTS AND CIRCUIT





Q04680
Q03116

Z10284



AT0A0-02

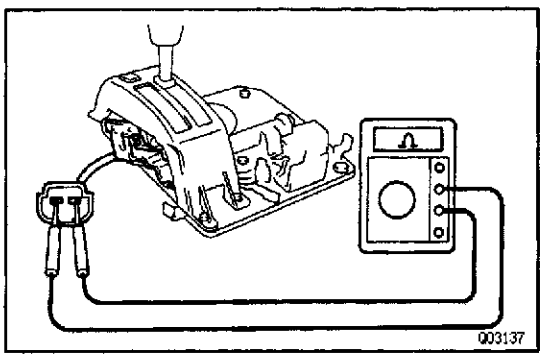
ELECTRIC CONTROL COMPONENTS INSPECTION

1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminal

Connector	Terminal	Measuring Condition	Voltage IVI
A	ACC - E	IG SW ACC position	10- 14
	IG - E	IG SW ON position	10- 14
	STP - E	Depress brake pedal	10- 1
	K LS - E	① IG SW ACC position and P position	4 0
		② P -¿ R N positions	10-14
		③ (Approx after one second)	s-9
B	SLS (D - SLS o	① IG SW ON position and P position	0
		② Depress brake pedal	8 5 - 13 5
		③ (Approx after 20 seconds)	5 5 - 9 5
		④ P -Y R N D 2 L release brake pedal	0
C	P¿ - P	IG SW ON, P positions and depress brake pedal	0
		② P - R N D 2 L positions	9 - 13 5
	P 2 - P	IG SW ACC position and P position	9 - 13 5
		② P - R N D 2 L positions	0

V01865



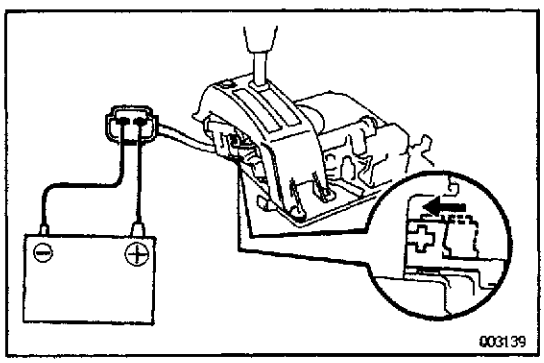
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector

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

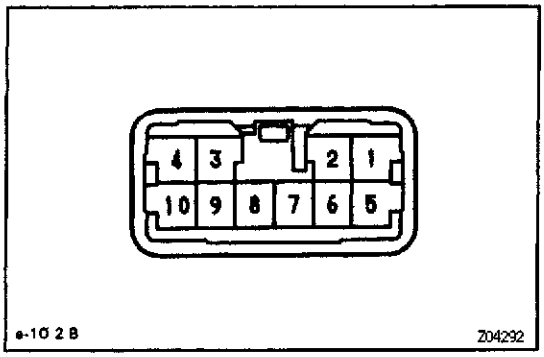
Standard resistance:

20 -28Ω



(c) Apply the battery positive voltage between terminals.

At this time, confirm that solenoid operate



3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector

(b) Using an ohmmeter, measure the resistance between terminals 1 and 5

STANDARD RESISTANCE:

12 -17Ω

SERVICE SPECIFICATIONS

AT0A1-02

SERVICE DATA

Line pressure (whell locked)	Engine idling D position R position AT stall D position R position	461 -520 kPa 657-843 kPa 971 -1 255 kPa 1 618-1 853 kPa	4 7 - 5 3 kgf/cm2 6 7 - 8 6 kgf/em2 9 9 -12 5 kgf/cm2 16 5 -18 9 kgf/cm2	68-77 psi 97-125 psi 144-181 psi 235-274 psi
Engine stall revolution		2 150±150 rpm		
Time lag	N position - D position N position - R position	Less than 0 7 seconds Less than 1 2 seconds		
Engine idle speed (Cooling fan and A/C OFF) N position		650 rpm		
Torque converter clutch Torque converter clutch runout Drive plate runout	Limit Limit	15 7 mm (0 618 in) or more 0 30 m m 0 20 mm		0 0118 in 0 0079 in
Throttle cable adjustment Throttle cable fully closed Throttle cable fully opened		Between boot end and inner cable stopper 0-1 mm 0 04 in 32-34 mm 1 26-1 34 in		

AUTOMATIC SHIFT SCHEDULE

km/h (mph)

Throttle valve opening		100%					100%		
Gear position		1 - 2	2 -Y 3	3 - O/D	Lock-up ON	Lock-up OFF	O/D- 3	3 - 2	2 -¿ 1
D position	Normal mode	52-58 (32-36)	1o6-1 17 (66-73)	152-163 (94-101)	60-66 (37-41)	55-60 (34-37)	145-156 (90-97)	98-104 61-65	42-47 (26-29)
	Power mode	52-58 (32-36)	1o6-1 17 (66-73)	152-163 (94- 101)	88-94 (55-58)	68-74 (42-46)	145-156 (90-97)	98-104 (61-65)	42-47 (26-29)
2 position	Normal mode Power mode	52-58 (32-36)	—	—	—	—	—	116-127 (72-79)	—
L position	Normal mode Power mode	—	—	—	—	—	—	—	59-65 (37-40)

V01873

TORQUE SPECIFICATION

ATOAZ-01

Part tightened	N-m	kgf-cm	ft-lbf
Engine x Transmission 14 mm (0.55 in.) head bolt	**37**	380	**27**
Engine x Transmission 17 mm (0.67 in.) head bolt	**72**	730	**53**
Torque converter clutch x Drive plate	**55**	550	**40**
Frame crossmember set bolt	**61**	620	**45**
Frame crossmember set nut	**59**	600	**43**
Oil cooler pipe union nut	**34**	350	**25**
Oil cooler pipe tube clamp x Transmission	**10**	100	**7**
Front differentail x Front propeller shaft	**74**	750	**54**
Transfer x Front propeller shaft	**74**	750	**54**
Transfer x Rear propeller shaft	**88**	900	**65**
Rear differentail x Rear propeller shaft	**88**	900	**65**
Crank shaft x Drive plate	100	1 ooo	**72**
Engine under cover x Frame	**28**	290	**21**
Transfer shift lever x Transmission	**18**	185	**13**
Oil pan set bolt	6.9	**70**	61 in.-lbf
Drain plug	**27**	280	**20**
Valve body x Transmission case	**10**	100	**7**
Transfer under cover x Frame	**28**	290	**21**

SERVICE SPECIFICATIONS

SERVICE DATA

Oil Pump	Body Clearance	STD	0 07 - 0 15 mm	0 0028 - 0 0059 in
		Limit	0 3 mm	0 012 in
	Tip clearance	STD	0 11 - 0 24 mm	0 0043 - 0 0094 in
		Limit	0 3 mm	0 012 in
	Side clearance	STD	0 02 - 0 05 mm	0 0008 - 0 0020 in
		Limit	0 1 mm	0 004 in
	Drive and driven gear thickness		11 967 - 11 982 mm	0 4711 - 0 4717 in
			11 983 - 11 998 mm	0 4718 - 0 4724 in
			11 999 - 12 014 mm	0 4724 - 0 4730 in
	Pump body bushing inside diameter	STD	42 050 - 42 075 mm	1 6555 - 1 6565 in
		Limit	42 13 mm	1 6587 in
	Pump cover bushing inside diameter			
	Front	STD	24 000 - 24 021 mm	0 9449 - 0 9457 in
		Limit	24 070 mm	1 9476 in
	Rear	STD	26 500 - 26 521 mm	1 0433 - 1 0441 in
		Limit	26 57 mm	1 0461 in
O/D Planetary Gear and O/D Direct Clutch	O/D input shaft thrust clearance			
	(O/D planetary gear)	STD	0 40 - 0 90 mm	0 0157 - 0 0354 in
		Limit	0 90 mm	0 0345 in
	O/D input shaft thrust bearing race thickness		0 8 mm	0 031 in
			1 0 mm	0 039 in
			1 4 mm	0 055 in
	Piston stroke		1 80 - 2 00 mm	0 0709 - 0 0787 in
	O/D direct clutch drum bushing inside diameter	STD	26 500 - 26 521 mm	1 0433 - 1 0441 in
		Limit	26 57 mm	1 0461 in
	O/D planetary gear bushing inside diameter	STD	12 000 - 12 018 mm	0 4724 - 0 4731 in
		Limit	12 07 mm	0 4752 in
	Planetary pinion gear thrust clearance	STD	0 20 - 0 59 m	0 0079 - 0 0232 in
		Limit	0 80 mm	0 315 in
O/D Brake	Piston stroke		1 25 - 1 85 mm	0 0492 - 0 0728 in
	O/D case bushing inside diameter	STD	33 100 - 33 500 mm	1 3031 - 1 3189 in
		Limit	33 20 mm	1 3071 in
Front Clutch	Input shaft thrust clearance			
	(forward clutch hub)	STD	0 30 - 0 70 mm	0 0118 - 0 0276 in
		Limit	0 70 mm	0 0276 in
	Input shaft spacer thickness		0 9 mm	0 035 in
			1 2 mm	0 047 in
			1 5 mm	0 059 in
			1 8 mm	0 071 in
			2 1 mm	0 083 in
	Piston stroke		3 93 - 4 23 mm	0 1547 - 0 1665 in
	Front clutch plate thickness		1 8 mm	0 071 mm
			2 0 mm	0 079 in
			2 2 mm	0 087 in
			2 4 mm	0 094 in

Rear Clutch	Piston stroke		2 00 - 2 20 mm	0 0790 - 0 0866 in
	Rear clutch flange thickness		4 6 mm	0 181 in
			4 8 mm	0 189 in
			5 0 mm	0 197 in
			5 2 mm	0 205 in
Second Brake	Center support thrust clearance	STD	0 30 - 0 70 mm	0 0118 - 0 0276 in
		Limit	0 90 mm	0 0354 in
	Center support thrust washer thickness		1 5 mm	0 059 in
			1 8 mm	0 071 in
			2 1 mm	0 083 in
			2 4 mm	0 094 in
			2 7 mm	0 106 in
	Piston stroke		1 86 - 2 06 mm	0 0732 - 0 0811 in
	Center support bushing inside diameter	STD	35 000 - 35 025 mm	1 3780 - 1 3789 in
		Limit	35 08 mm	1 3811 in
	Front planetary sun gear bushing inside diameter	STD	25 000 - 25 021 mm	0 9842 - 0 9851 in
		Limit	25 07 mm	0 9851 in
	Second brake flange thickness		5 0 mm	0 197 in
			5 2 mm	0 205 in
			5 4 mm	0 213 in
			5 5 mm	0 220 in
Planetary Gears and Output Shaft	Output shaft bushing inside diameter	STD	17 000 - 17 021 mm	0 6693 - 0 6701 in
		Limit	17 07 mm	0 6720 in
	Planetary pinion gear thrust clearance	STD	0 20 - 0 59 mm	0 0079 - 0 0232 in
		Limit	0 75 mm	0 0295 in
1st and Reverse Brake	Piston stroke		3 3 - 3 8 mm	0 130 - 0 150 in
	1st and reverse brake flange thickness		6 65 mm	0 2618 in
			7 05 mm	0 2776 in
			7 45 mm	0 2933 in
Transmission Case	Bushing inside diameter	STD	64 000 - 64 050 mm	2 5197 - 2 5216 in
		Limit	64 10 mm	2 5236 in
Parking Lock Pawl	Parking lock pawl bracket distance		47 5 - 47 6 mm	1 870 - 1 874 in

UPPER VALVE BODY
Spring Specifications

Mark	Name (Colas)	Free length / Outer Diameter mm (in)	Total No of coils
Ⓐ	2 - 3 Shift Valve (Orange)	37 23 / 8 7 (1 466 / 0 343)	18 0
Ⓑ	Reverse Inhibiter Valve (Light Blue)	29 3 / 6 5 (1 154 × 0 256)	20 0
Ⓒ	Modulator Valve (Brown)	31 6 / 7 6 (1 244 × 0 299)	16 0
Ⓓ	Throttle Valve (White)	25 3 / 9 2 (0 996 / 0 362)	9 5
Ⓔ	Throttle Valve (Blue)	26 85 / 8 97 (1 057 / 0 353)	10 5
Ⓕ	Secondary Regulator Valve (Red)	27 96 / 11 3 / (1 090 / 0 445)	9 6
Ⓖ	Cut-back Valve (Purple)	30 44 / 7 3 (1 198 / 0 287)	16 0
Ⓗ	Lock-up Signal Valve (Purple)	30 44 / 7 3 (1 198 / 0 287)	16 0
Ⓘ	Accumulator Control Valve (Blue)	24 8 / 10 5 (0 976 / 0 413)	10 0
Ⓙ	Low Coast Modulator Valve (Beige)	30 7 / 7 3 (1 209 / 0 287)	16 0
Ⓚ	Orifice Control Valve (Yellow Green)	22 5 / 7 5 (0 886 / 0 295)	12 0
Ⓛ	Low Inhibiter Valve (Purple)	30 44 / 7 3 (1 198 / 0 287)	16 0

Retainers and Pins Specifications

Mark	Name	Length / Width / Thickness or diameter mm (in)
Ⓐ	Retainer for Modulator Valve Plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)
Ⓑ	Retainer for Reverse Inhibiter Valve Sleeve Plug	13 5 / 5 0 / 3 2 (0 531 / 0 197 / 0 126)
Ⓒ	Retainer for Check Valve Sleeve Plug	13 5 / 5 0 / 3 2 (0 531 / 0 197 / 0 126)
Ⓓ	Retainer for Low Coast Modulator Valve Plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)
Ⓔ	Retainer for Low Inhibiter Valve Plug	13 5 / 5 0 / 3 2 (0 531 / 0 197 / 0 126)
Ⓕ	Retainer for 2 - 3 Shift Valve Plug	13 5 / 5 0 / 3 2 (0 531 / 0 197 / 0 126)
Ⓖ	Retainer for Orifice Control Valve plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)
Ⓗ	Retainer for Accumulator Control Valve Plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)
Ⓘ	Retainer for Lock-up Signal Valve Plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)
Ⓙ	Stopper for Throttle Valve	—
Ⓚ	Retainer for Secondary Regulator Valve Plug	18 0 / 5 0 / 3 2 (0 709 / 0 197 / 0 126)
Ⓛ	Pin for Throttle Valve Sleeve	23 8 / 3 0 (0 937 / 0 118)
Ⓜ	Retainer for Cut-back Valve Plug	16 0 / 5 0 / 3 2 (0 630 / 0 197 / 0 126)

Check Balls Specifications

Mark	Name	Diameter mm (in)
Ⓐ	Check Ball	6 4 (0 252)

LOWER VALVE BODY
Springs Specifications

Mark	Name (Color)	Free length / Outer Diameter mm (in)	Total No of coils
Ⓐ	1 - 2 Shift Valve (Orange)	37 23 / 8 7 (1 466 / 0 343)	18 0
Ⓑ	3 - 4 Shift Valve (Orange)	37 23 / 8 7 (1 466 / 0 343)	18 0
Ⓒ	Check Ball (Pink)	14 0 / 9 8 (0 551 / 0 386)	8 0
Ⓓ	Pressure Relief Valve (White)	24 0 / 8 2 (0 945 / 0 323)	12 0
Ⓔ	Primary Regulator Valve (Red)	58 2 / 20 9 (2 291 / 0 823)	11 0
Ⓕ	Lock-up Control Valve (White)	26 95 / 9 8 (1 061 / 0 386)	13 0
Ⓖ	C_0 Exhaust Valve (Yellow)	33 3 / 8 2 (1 311 / 0 323)	14 0

Ⓗ	2 - 3 Timing Valve (Green)	38.97 / 8.6 (1.534 / 0.339)	18.0

Retainers and Pins Specifications

Mark	Name	Length / Diameter mm (in)
Ⓐ	Pin for 2 - 3 Timing Valve Sleeve	19.8 / 2.5 (0.780 / 0.098)

Mark	Name	Length / Width / Thickness mm (in)
Ⓐ	Retainer for Primary Regulator Valve Plunger Sleeve	18.0 / 5.0 / 3.2 (0.709 / 0.197 / 0.126)
Ⓑ	Retainer for C_0 Exhaust Valve	12.0 / 5.0/ 3.2 (0.472 / 0.197 / 0.126)
Ⓒ	Retainer for 3 - 4 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)
Ⓓ	Retainer for 1 - 2 Shift Valve Plug	12.0 / 5.0 / 3.2 (0.472 / 0.197 / 0.126)

Mark	Name	Length / Diameter mm (in)
Ⓔ	Pin for Lock-up control Valve Plug	23.8 / 2.5 (0.937 / 0.098)

Check Valve. Ball and Springs Specifications

Mark	Name	Diameter mm (in)
Ⓐ	Check Ball	10.0 (0.394)

Mark	Name (Color)	Free length / Outer Diameter mm (in)	Total No. of coils
Ⓑ	Check Ball (Pink)	14.0 / 9.8 (0.551 / 0.386)	8.0
Ⓒ	Pressure Relief Valve (White)	24.0 / 8.2 (0.945 / 0.323)	12.0

ACCUMULATOR

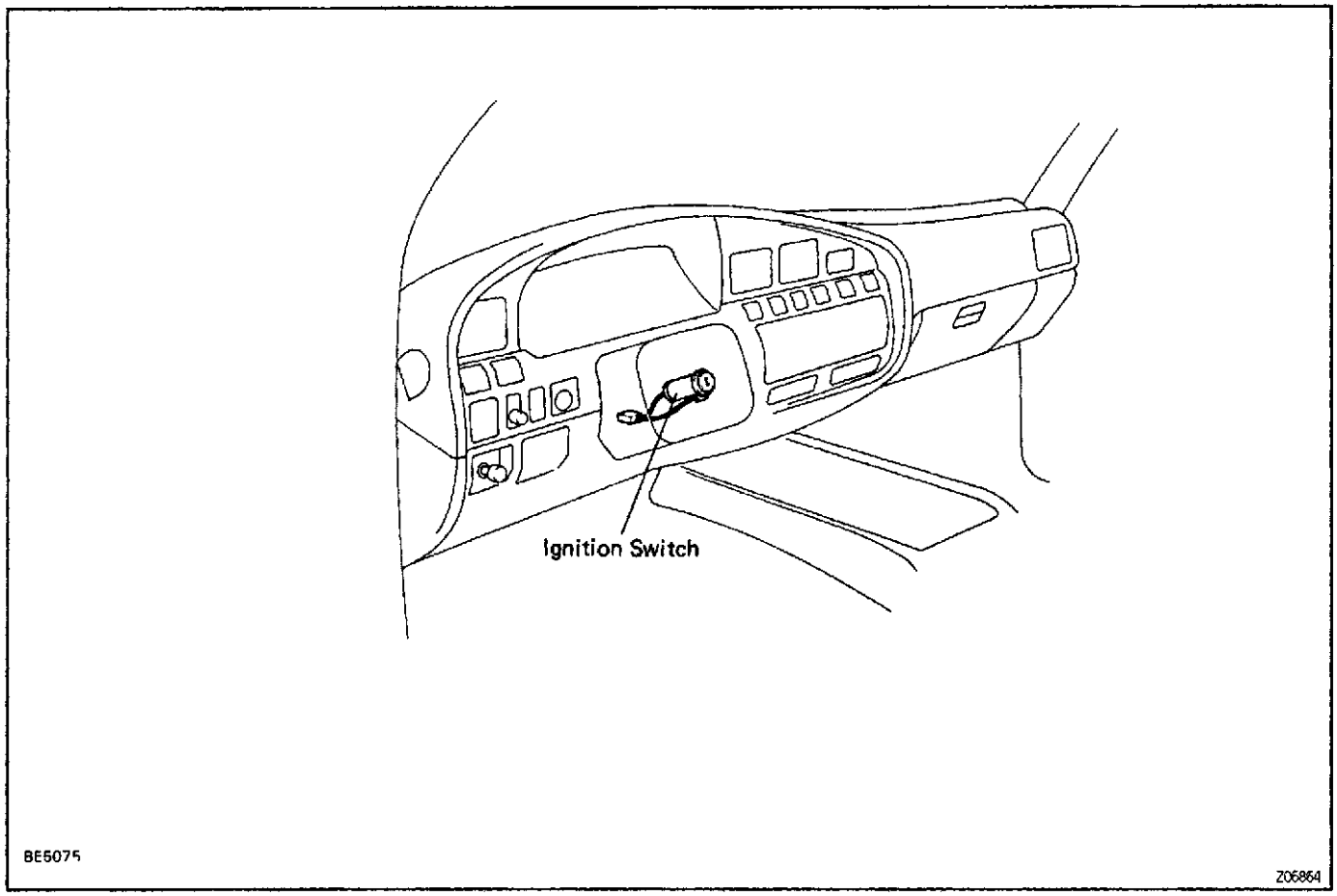
	Piston Diameter mm (in)	Spring Free length / Outer Diameter mm (in)	Spring Color
B_0	35.9 (1.413)	63.1 / 20.7 (2.484 / 0.815)	Light Green
B_2	43.9 (1.728)	65.0 / 25.1 (2.559 / 0.988)	Blue
C_1	29.9 (1.413)	91.5 / 17.7 (3.602 / 0.697)	Green
C_2	39.9 (1.571)	83.5 / 21.7 (3.287 / 0.854)	Green

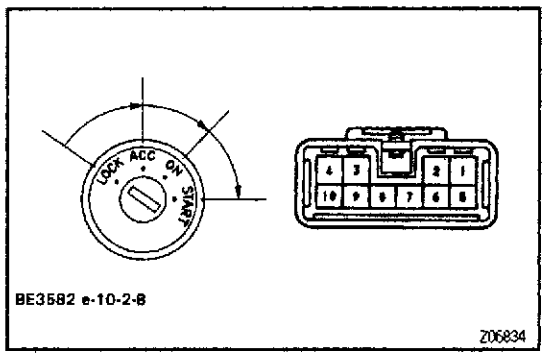
TORQUE SPECIFICATIONS

Part tightened		N-m	kgf-cm	ft-lbf
Oil pump cover × oil pump body	10 mm head bolt	8 8	90	78 in -lbf
	12 mm head bolt	21	210	15
Lower valve body cover × Lower valve body		5 4	55	48 in -lbf
Upper valve body × Lower valve body		5 4	55	48 in -lbf
Manual detent spring × Lower valve body		5 4	55	48 in -lbf
Parking lock pawl × Transfer adaptor		19	195	14
Transmission rear cover × Transmission case		7 8	80	69 in -lbf
C_1 accumulator cover × Transmission case		7 8	80	69 in -lbf
Transfer Adaptor × Transmission case		37	380	27
Center support set bolt		25	250	18
Oil pan × Transmission case		6 9	70	61 in -lbf
Transmission housing × Transmission case		64	650	47
Fluid Temp sensor Transmission case		34	350	25
Oil cooler union × Transmission case		32	330	24
Park/neutral position switch × Transmission case		13	130	9
Park/neutral position switch × Manual valve shaft		6 9	70	61 in -lbf
Control shaft × Transmission case		13	130	9
Oil pump × Transmission case		21	210	15
Valve body × Transmission case		10	100	7 ft-lbf
Solenoid valve × Valve body		10	100	7 ft-lbf
Oil strainer × Valve body		10	100	7 ft-lbf

IGNITION SWITCH

PARTS LOCATION





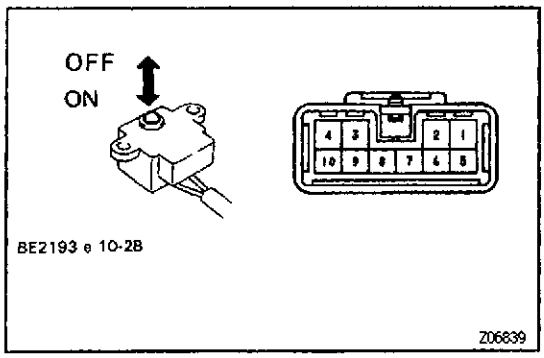
IGNITION SWITCH INSPECTION

INSPECT IGNITION SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
LOCK	–	No continuity
ACC	7-9	Continuity
ON	3-4 6-7-9	Continuity
START	2-3-4 6-9- 10	Continuity

If continuity is not as specified, replace the switch



BE0HK-01

KEY CONFINE PREVENTION SYSTEM INSPECTION

INSPECT KEY UNLOCK WARNING SWITCH

Continuity

Condition	Tester connection to terminal number	Specified value
Switch OFF (Key removed)	–	No continuity
Switch ON (Key set)	1 - 5	Continuity

If continuity is not as specified, replace the switch

DOOR COURTESY SWITCH INSPECTION

INSPECT DOOR COURTESY SWITCH

See page BE-28 .

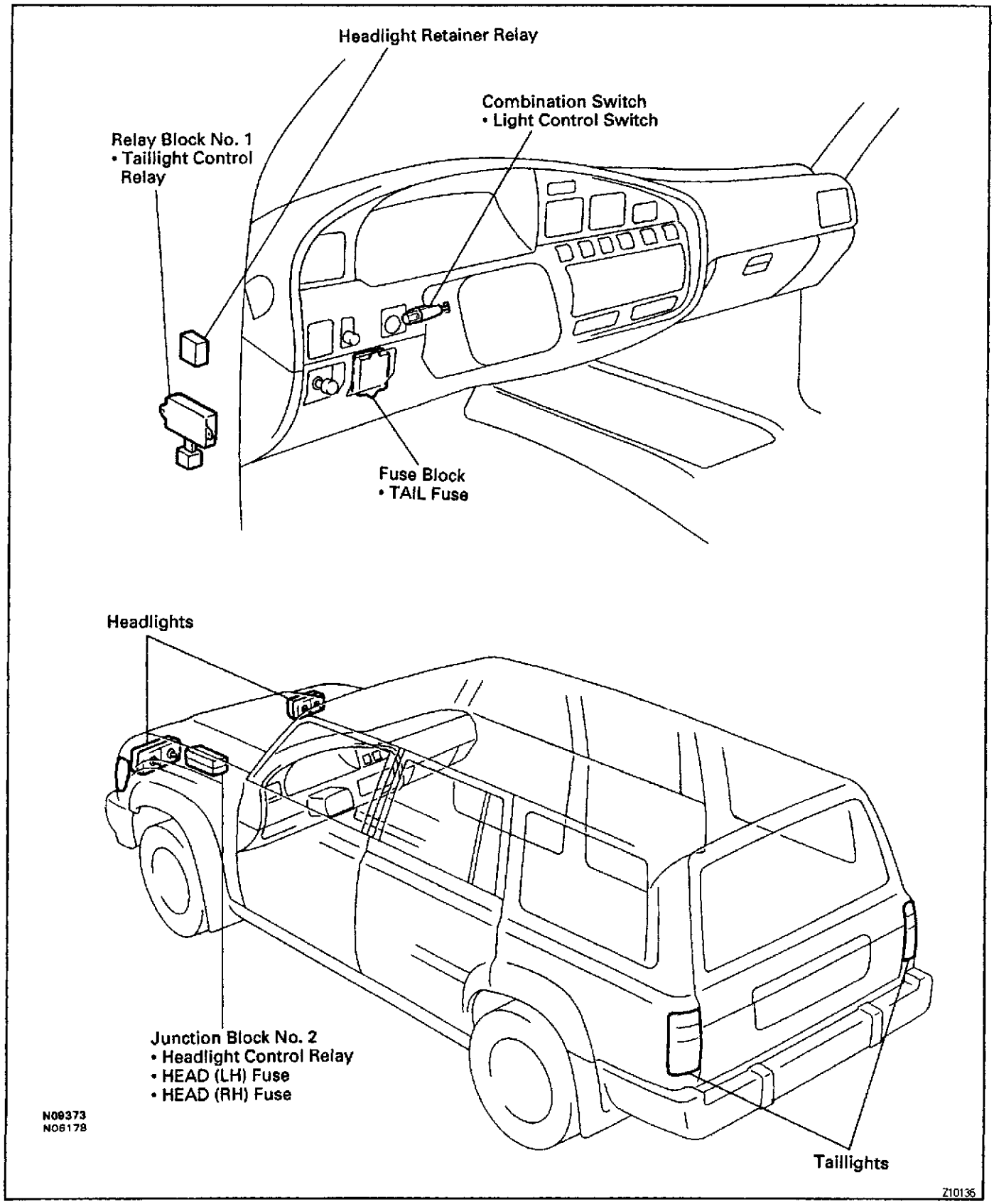
SEAT BELT WARNING RELAY INSPECTION

INSPECT SEAT BELT WARNING RELAY

See page BE-55 .

HEADLIGHT AND TAILLIGHT SYSTEM

PARTS LOCATION



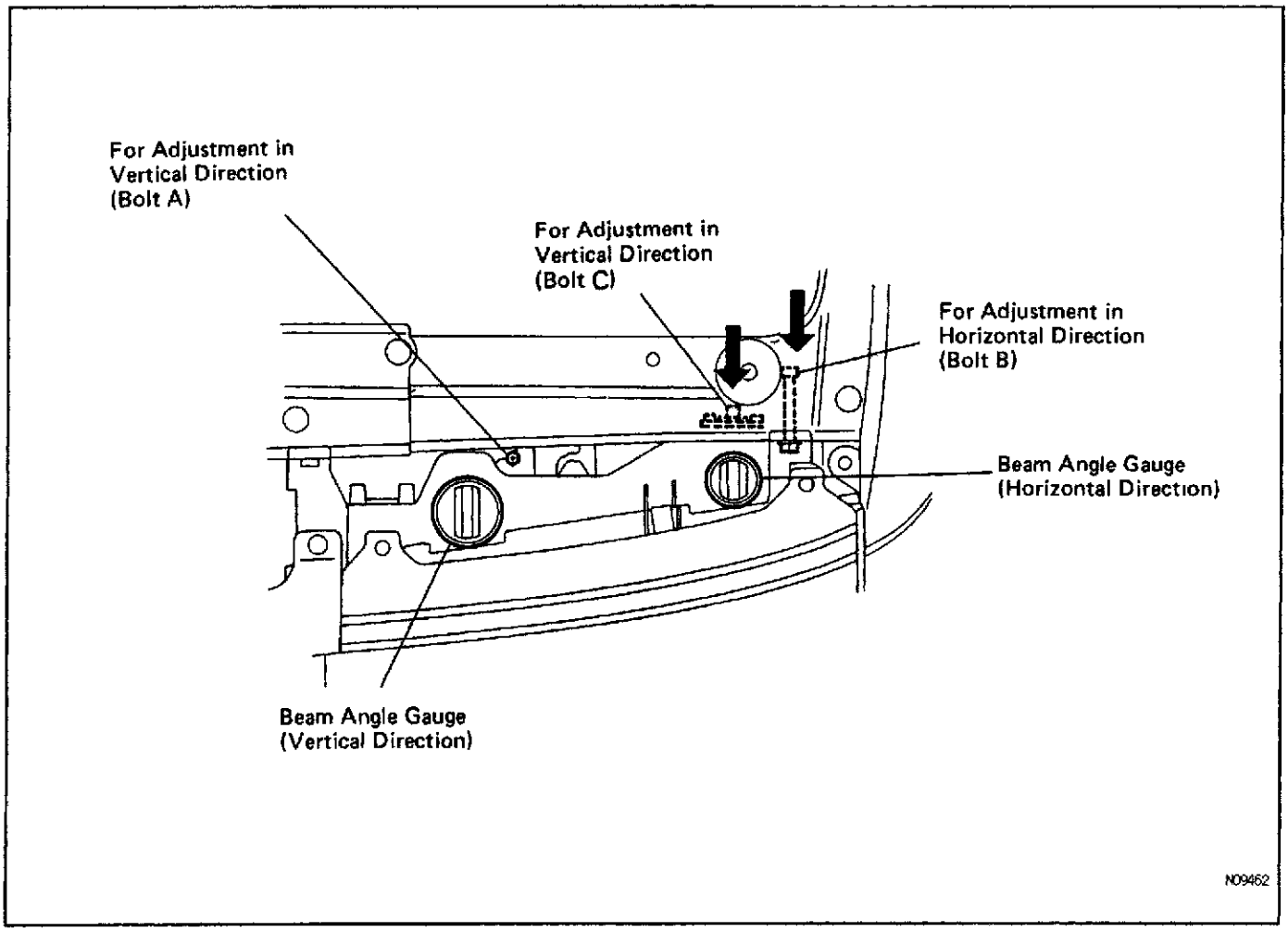
BE0KU--02

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Headlight does not light up (Taillight is normal)	1 Headlight Bulb 2 MAIN FL 3 HEAD Fuse 4 Light Control Switch 5 Headlight Dimmer Switch 6 Wire Harness	 (BE-4) (BE-21) (BE-21)
Headlight does not light up (Taillight does not light up)	1 Headlight Bulb 2 Light Control Switch 3 Headlight Dimmer Switch 4 Wire Harness	 (BE-21) (BE-21)
Only one light comes ON	1 Headlight Bulb 2 HEAD Fuse 3 Wire Harness	 (BE-4)
LO- Beam does not light up	1 Headlight Bulb 2 Headlight Control Relay 3 Headlight Dimmer Switch 4 Wire Harness	 (BE-22) (BE-21)
Hi-Beam does not light up	1 Headlight Bulb 2 Headlight Control Relay 3 Headlight Dimmer Switch 4 Wire Harness	 (BE-22) (BE-21)
Flash does not light up	1 Headlight Bulb 2 Headlight Control Relay 3 Headlight Dimmer Switch 4 Wire Harness	 (BE-22) (BE-21)
Taillight does not light up (Headlight is normal)	1 Taillight Bulb 2 TAIL Fuse 3 Light Control Switch 4 Taillight Control Relay 5 Wire Harness	 (BE-4) (BE-21) (BE-22)
Taillight does not light up (Headlight does not light up)	1 Taillight Bulb 2 MAIN FL 3 TAIL Fuse 4 Light Control Switch 5 Wire Harness	 (BE-4) (BE-21)

HEADLIGHT AIM ADJUSTMENT

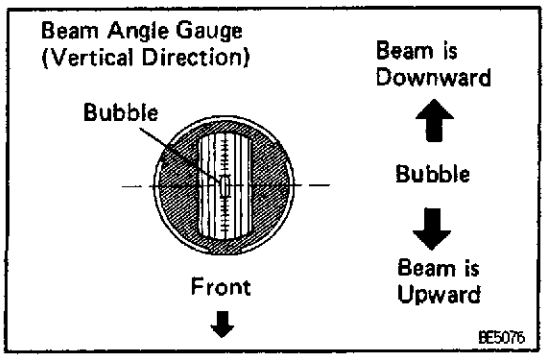


Adjusting headlight aim only

1. INSPECT HEADLIGHT AIM

Do the following before inspection

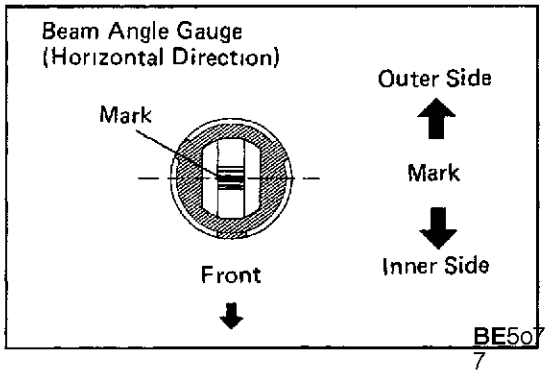
- Make sure the body around the headlight is not deformed
- Park the vehicle on a level spot
- The driver gets into the driver's seat and puts the vehicle in a state ready for driving (with a full tank)
- Bounce the vehicle several times



2. ADJUST HEADLIGHT IN VERTICAL ALIGNMENT

If the 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



3. 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

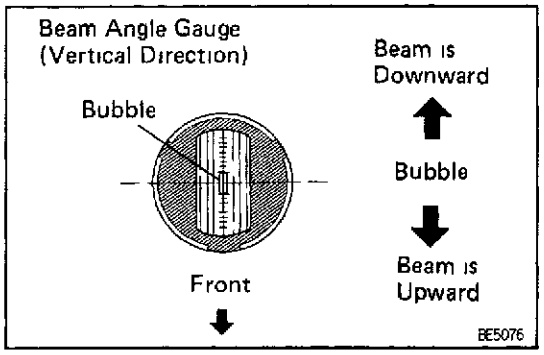
HINT The beam angle will change about 0° 23' with one mark

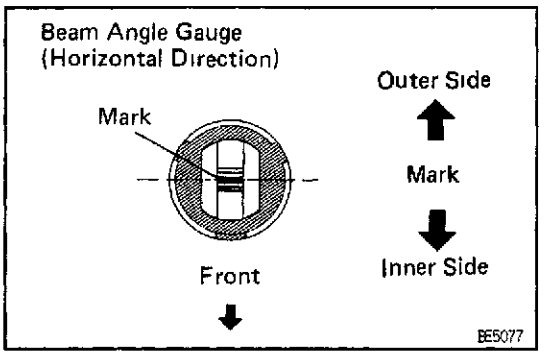
Replacing headlight

1. REPLACE HEADLIGHT

2. INSPECT 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 tan k)
- Bounce the vehicle several times





3. ADJUST HEADLIGHT IN VERTICAL ALIGNMENT

(a) Using adjusting screw A, adjustment the headlight aim to within the specifications

HINT The beam angle will change about 0"11' with one mark

(b) 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 spot Readjust the headlight aim after parking the vehicle on a level spot

4. ADJUST HEADLIGHT IN HORIZONTAL ALIGNMENT

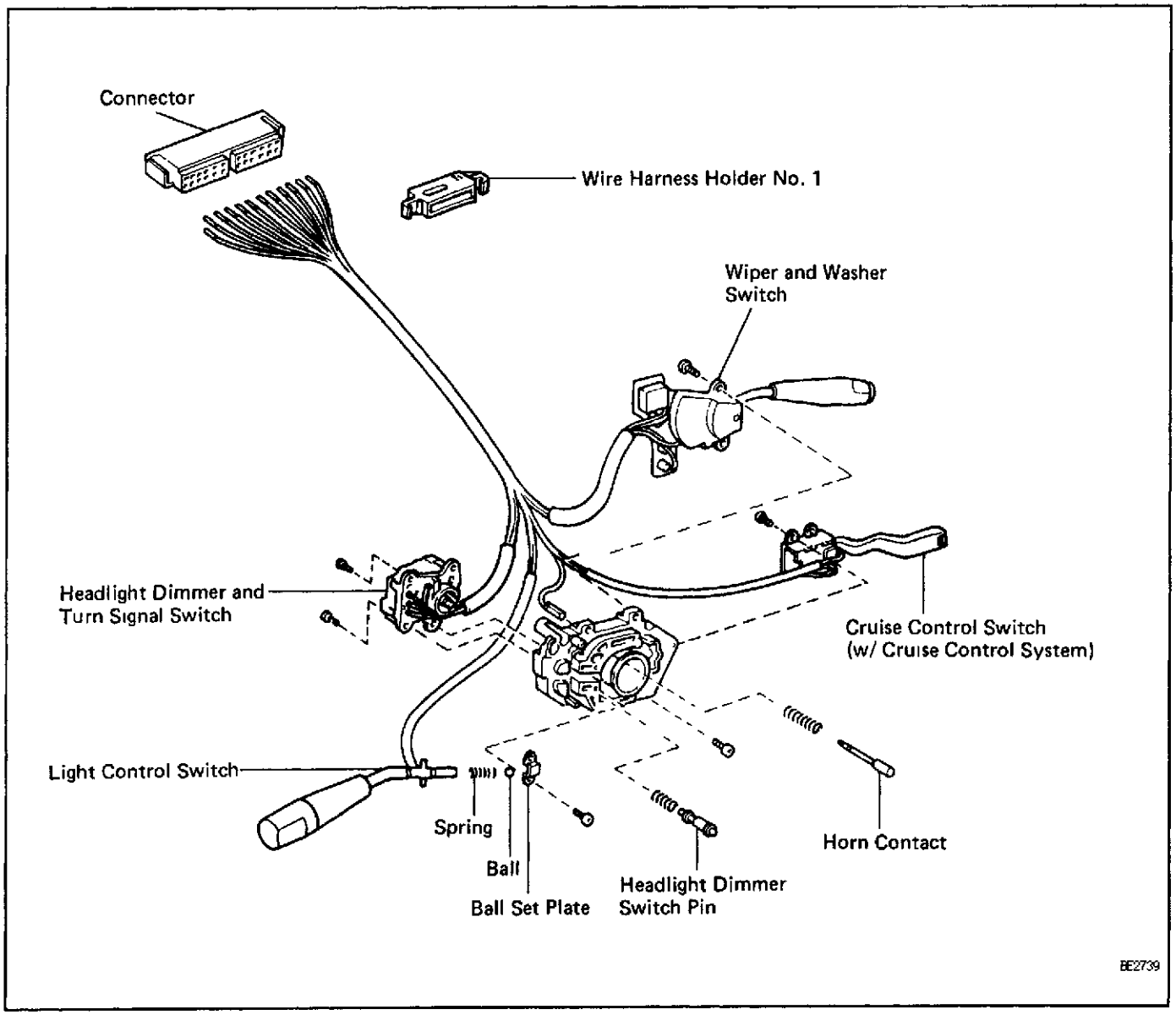
(a) Using adjusting screw B, adjust the headlight aim to within the specifications

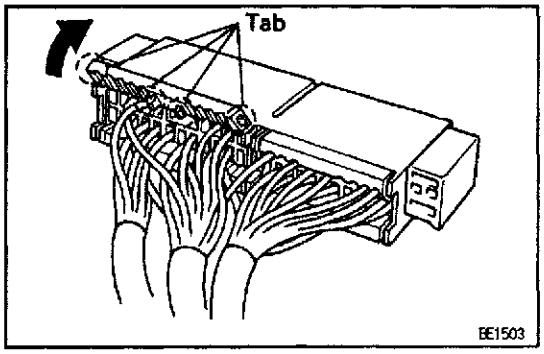
HINT The beam angle will change about 0° 23' with one mark

(b) Using adjusting nut C, adjust the "0" back to the mark

HINT For adjustment, pull nut C to the rear vehicle to free it After adjustment, check that the nut C is locked in

COMBINATION SWITCH DISASSEMBLY



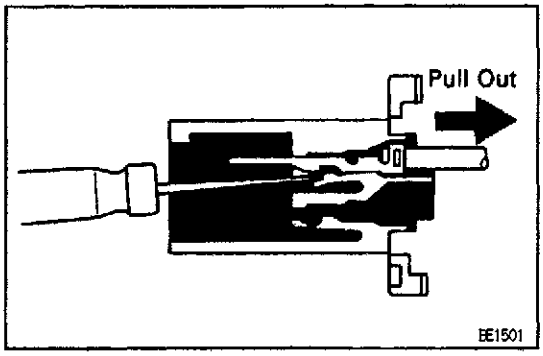


1. REMOVE WIRE HARNESS CLAMP FROM WIRE HARNESS

Pry loose 2 locking lugs and remove the clamp from the wire harness

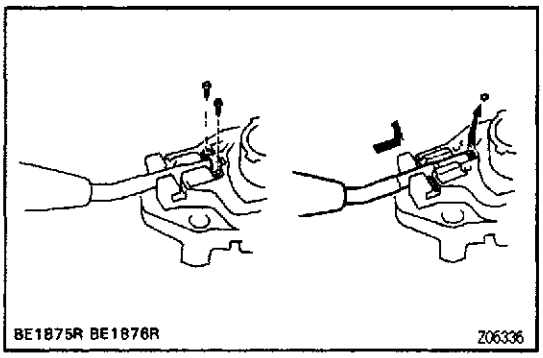
2. REMOVE TERMINALS FROM CONNECTOR

(a) Release the 4 tabs and open the terminal cover



(b) From the open end, insert a miniature screwdriver between the locking lug and terminal

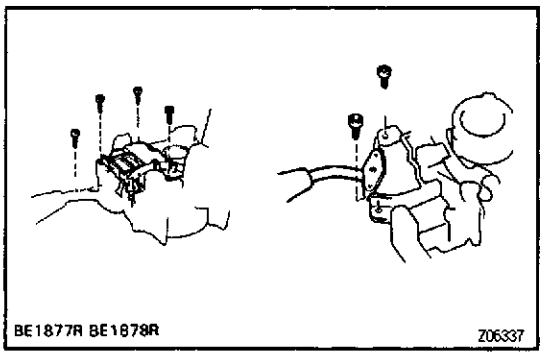
(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear



3. REMOVE LIGHT CONTROL SWITCH

(a) Remove the 2 screws and the ball set plate from the switch body

(b) Remove the ball and slide out the switch from the switch body with the spring

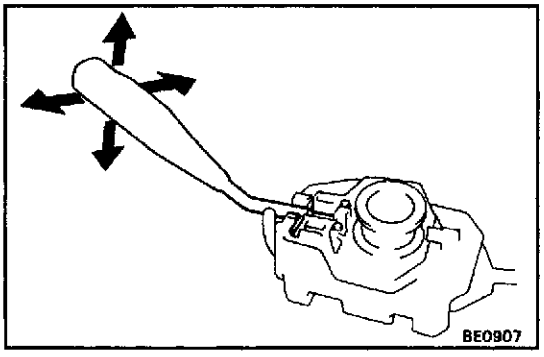


4. REMOVE HEADLIGHT DIMMER AND TURN SIGNAL SWITCH

Remove the 4 screws and the switch from the switch body

5. REMOVE WIPER AND WASHER SWITCH

Remove the 2 screws and the switch from the switch body

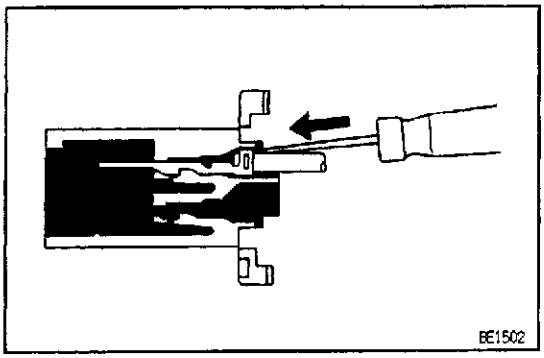


COMBINATION SWITCH ASSEMBLY

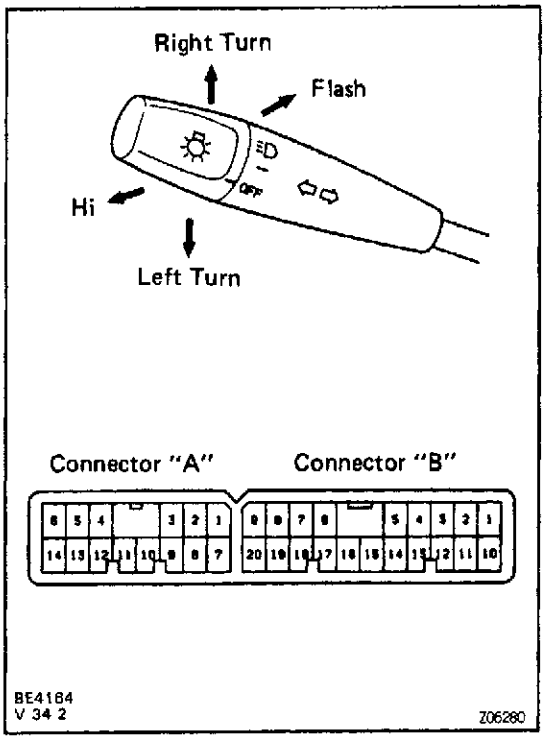
INSTALL PARTS OF COMBINATION SWITCH IN REVERSE SEQUENCE OF REMOVAL

HINT

- After installing the switch to the switch body, insert that the switch operates in smoothly



- Push in the terminal until it is securely locked in the connector lug



COMBINATION SWITCH INSPECTION

LIGHT CONTROL SWITCH/Continuity

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
TAIL	A2 (W) - A1 1 (W)	Continuity
HEAD	A2 -All - A13 Iwl - (w) - (R)	Continuity

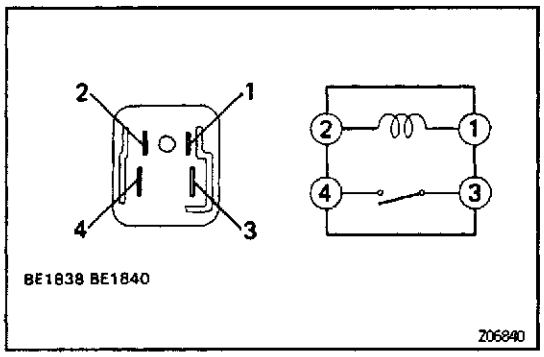
HEADLIGHT DIMMER SWITCH/Continuity

Switch position	Tester connection to terminal number	Specified value
Flash	A9 - A12 - A14 (WB)-(R Y)-(R W)	Continuity
Low beam	A3 - A9 (RG) - (W6)	Continuity
High beam	A9 - A12 (WB) - (RY)	Continuity

TURN SIGNAL SWITCH/Continuity

Switch position	Tester connection to terminal number	Specified value
Left turn	A 1 - A5 (GW) - (GB)	Continuity
Neutral	–	No continuity
Right turn	A 1 - A8 (GW) - (GY)	Continuity

If continuity is not as specified, replace the switch



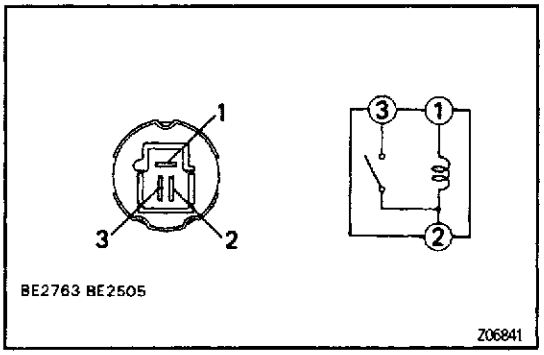
HEADLIGHT CONTROL RELAY INSPECTION

INSPECT HEADLIGHT CONTROL RELAY

Continuity

Condition	Tester connection to terminal number	Specified value
Constant	1-2	Continuity
Apply B + between terminals 1 and 2	3-4	Continuity

If continuity is not as specified, replace the relay



TAILLIGHT CONTROL RELAY INSPECTION

INSPECT TAILLIGHT CONTROL RELAY

Continuity

Condition	Tester connection to terminal number	Specified value
Constant	1 - 2	Continuity
Apply B + between terminals 1 and 2	2-3	Continuity

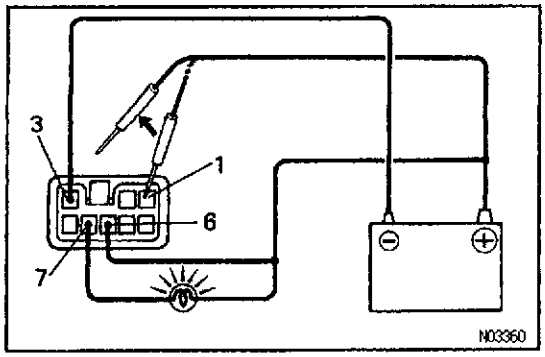
If continuity is not as specified, replace the relay

BE0J6-01

HEADLIGHT RETAINER RELAY INSPECTION

INSPECT HEADLIGHT RETAINER RELAY

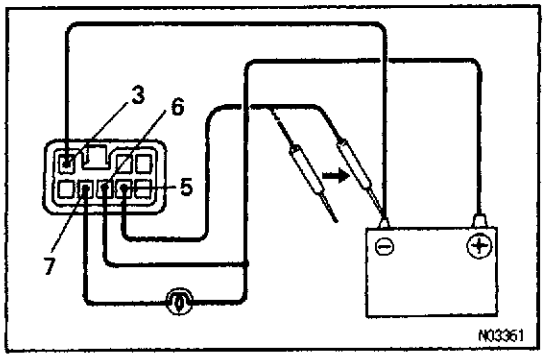
Headlight Circuit Operation



(a) Connect the positive (+) leads from the battery to terminals 1 and 6, and the negative (-) lead to terminal 3

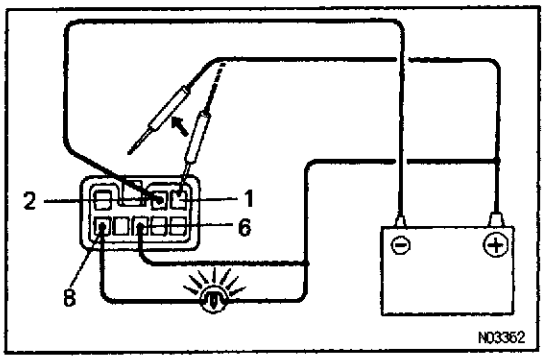
(b) Connect the 3 4 W test bulb between terminal 7 and the positive (+) lead from the battery

(c) Disconnect the positive (+) lead from terminal 1, check that the test bulb is lighting



(d) Connect the negative (-) lead to terminal 5, check that the test bulb goes out
If operation is not as specified, replace the relay

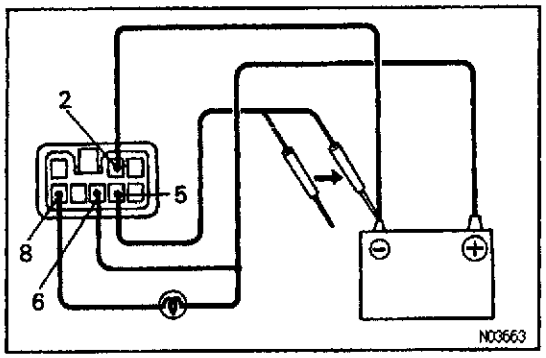
Taillight Circuit Operation



(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, check that the test bulb is lighting

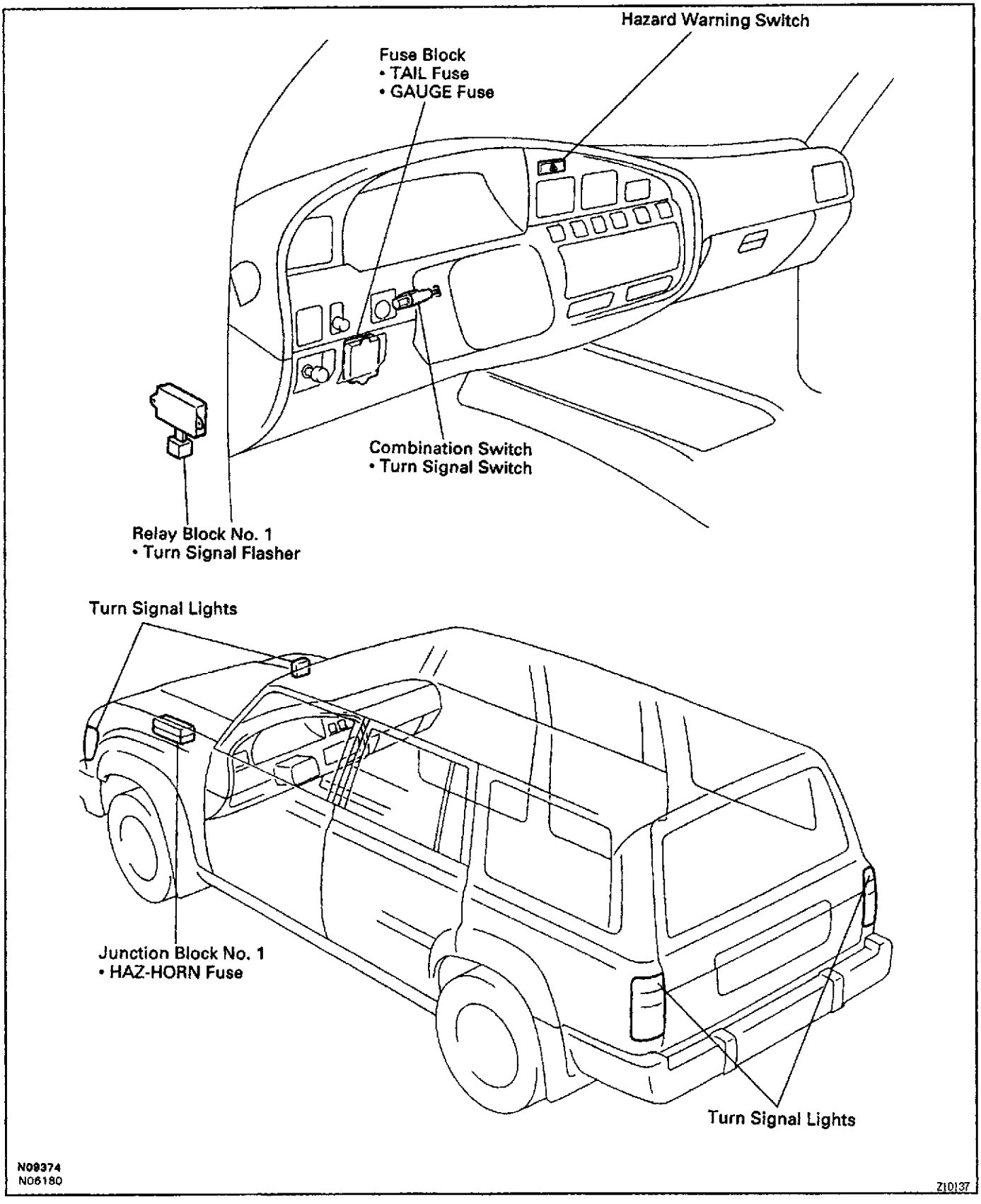


(d) Connect the negative (-) lead to terminal 5, check that the test bulb goes out
If operation is not as specified, replace the relay

TURN SIGNAL AND HAZARD WARNING SYSTEM

BE0JA-03

PARTS LOCATION



BE0JC--01

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

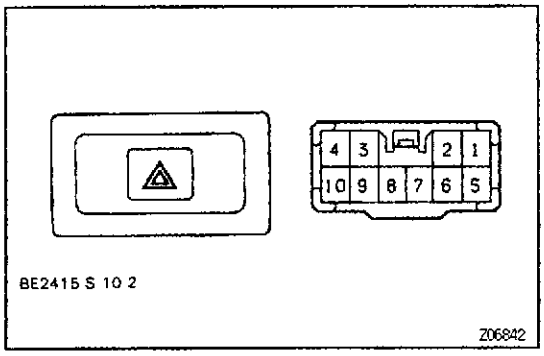
Trouble	Parts name	(See page)
Hazard and Turn do not light up	1 Hazard Warning Switch 2 Turn Signal Flasher 3 Wire Harness	(BE-21) (BE-2 s)
No of blinks for Hazard (Turn is normal)	1 Bulb 2 Turn Signal Flasher 3 Wire Harness	(BE-26)
Hazard warning light does not light up (Turn is normal)	1 HAZ-HORN Fuse 2 Wire Harness	(BE-4)
Hazard warning light on one side only does not light up	1 Hazard Warning Switch 2 Wire Harness	(BE-26)
Turn signal on one side only does not light up	1 Turn Signal Switch 2 Wire Harness	(BE-21)
Only one bulb does not light up for hazard turn	1 Bulb 2 Wire Harness	
*1Turn signal does not light up	1 Ignition Switch 2 TURN Fuse 3 Turn Signal Switch 4 Wire Harness	(BE- 13) (BE-4) (BE-21)
*2 Turn signal does not light up	1 TURN Fuse 2 Turn Signal Switch 3 Wire Harness	(BE-4) (BE-21)

* 1 Combination Meter, Wiper and Washer do not operate
* 2 Combination Meter, Wiper and Washer are normal

TURN SIGNAL SWITCH INSPECTION

INSPECT TURN SIGNAL SWITCH

See headlight and taillight system on page BE-21



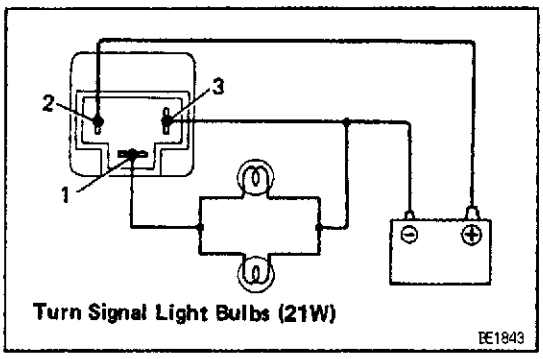
HAZARD WARNING SWITCH INSPECTION

INSPECT HAZARD WARNING SWITCH

Continuity

Condition	Tester connection to terminal number	Specified value
Switch OFF	7- 10	Continuity
Switch ON	7 -8 4 - 5 - 6 - 9	Continuity
Illumination circuit	2-3	Continuity

If continuity is not as specified, replace the switch



TURN SIGNAL FLASHER INSPECTION

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, check that the bulbs flash

HINT The turn signal lights should flash 60 to 120 times per minute

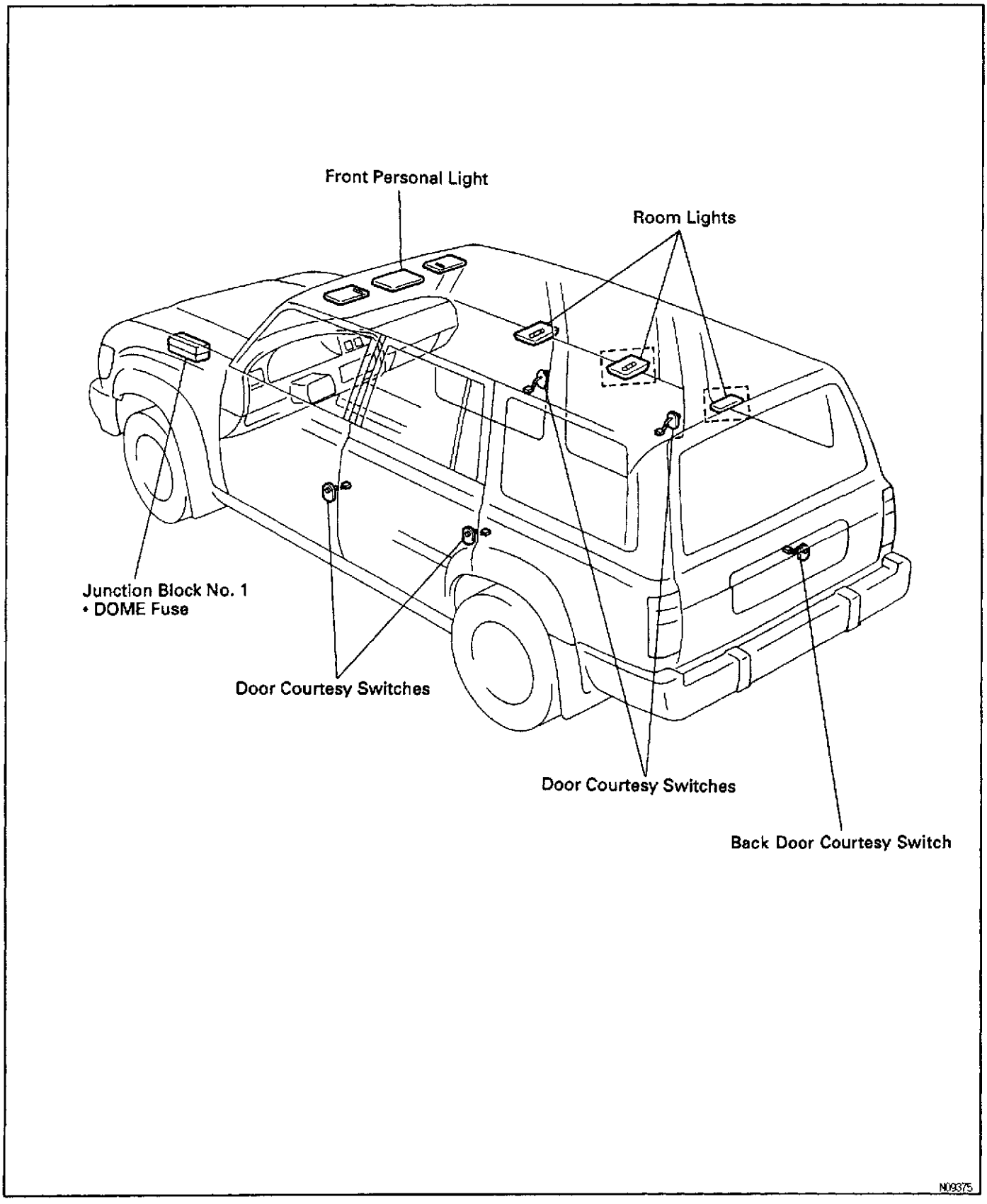
If one of the front or rear turn signal lights has an open circuit, the number of flash rata will be more than 140 per minute

If operation is not as specified, replace the flasher

INTERIOR LIGHT SYSTEM

B8OJL-02

PARTS LOCATION

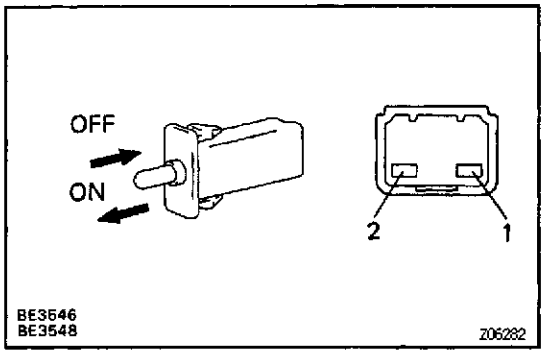


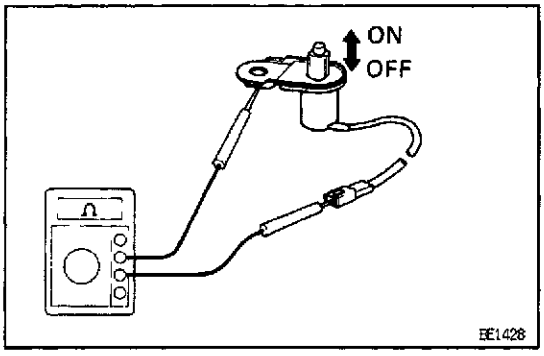
BEWJR-01

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Room light does not light up	1 DOME Fuse 2 Door Courtesy Switch 3 Front Personal Light 4 Room Light Assembly 5 Wire Harness 6 Bulb	(BE-4) (BE-28) (BE-29) (BE-29)
Room Light remains always on	I Door Courtesy Switch 2 Wire Harness	(BE-28)





GLOVE BOX LIGHT SWITCH INSPECTION

INSPECT GLOVE BOX LIGHT SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
OFF (Closed)	–	No continuity
ON (Opened)	1-2	Continuity

If continuity is not as specified, replace the switch

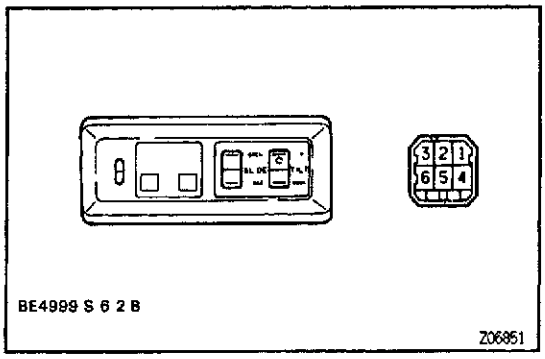
DOOR COURTESY SWITCH INSPECTION

INSPECT DOOR COURTESY SWITCH

(a) Check that there is continuity between terminal and the switch body with the ON (switch pin released opened door)

(b) Check that there is no continuity between terminal and the switch body with the OFF (switch pin pushed in closed door)

If operation is not as specified, replace the switch



FRONT PERSONAL LIGHT INSPECTION

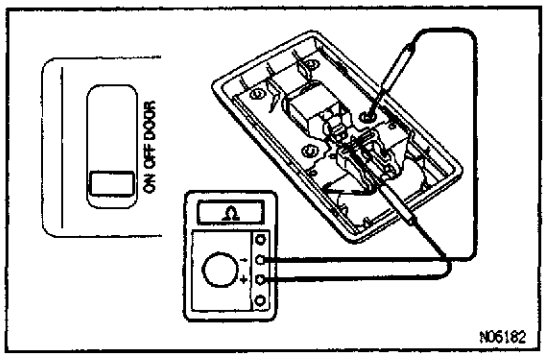
INSPECT FRONT PERSONAL LIGHT

Continuity

w/ Sliding Roof:

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
ON	5 -6	Continuity

If continuity is not as specified, replace the personal light

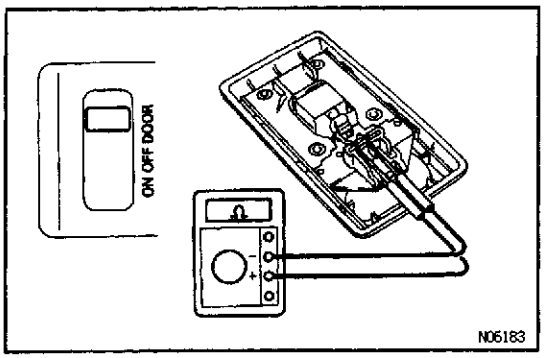


ROOM LIGHT INSPECTION

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

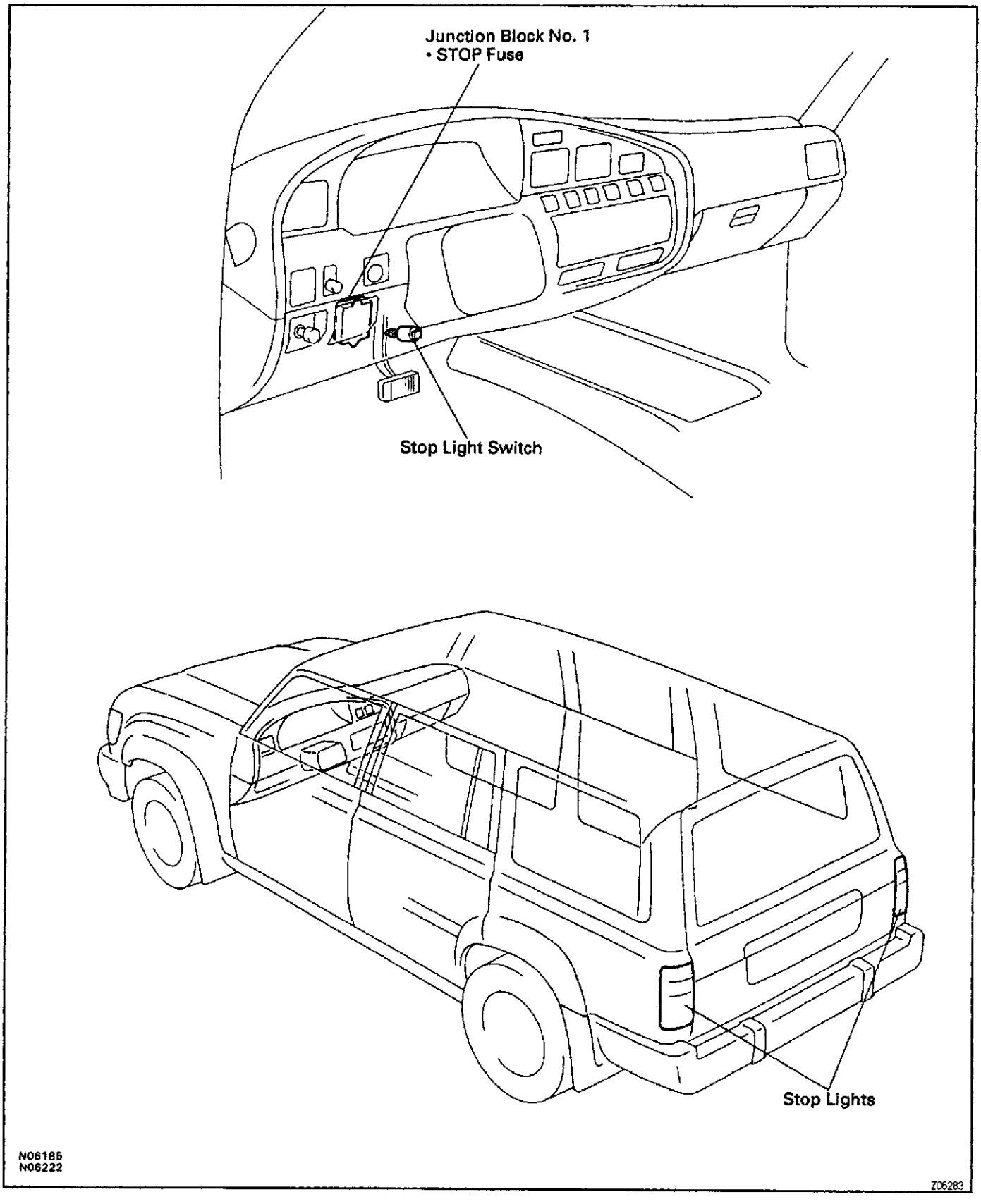


(c) Turn the room light switch DOOR, check that there is continuity between terminal 1 and 2

If operation is not as specified, replace the switch

STOP LIGHT SYSTEM

PARTS LOCATION

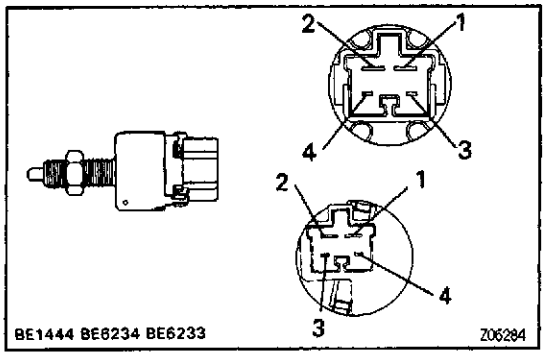


BE0K7-01

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely cause of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Stop light does not light up	1 STOP Fuse 2 Stop Light Switch 3 Wire Harness 4 Bulb	(BE-4) (BE-33)
Stop light remains always on	1 Stop Light Switch 2 Wire Harness	(BE-33)
Only one light does not light	1 Wire Harness 2 Bulb	



BE0K8-01

STOP LIGHT SWITCH INSPECTION

INSPECT STOP LIGHT SWITCH

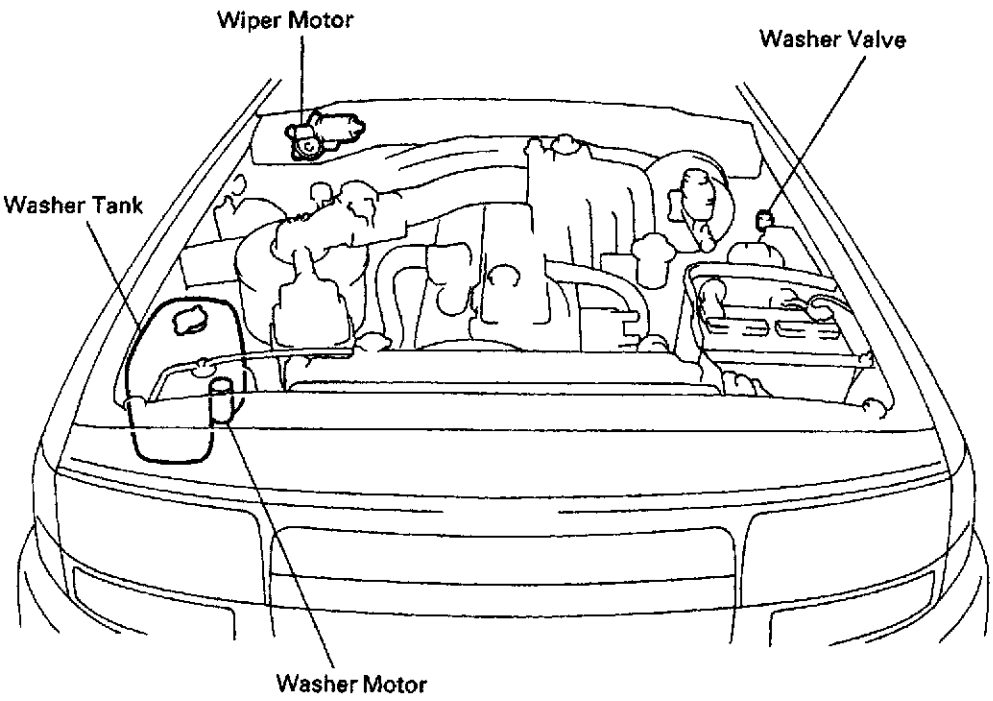
Continuity

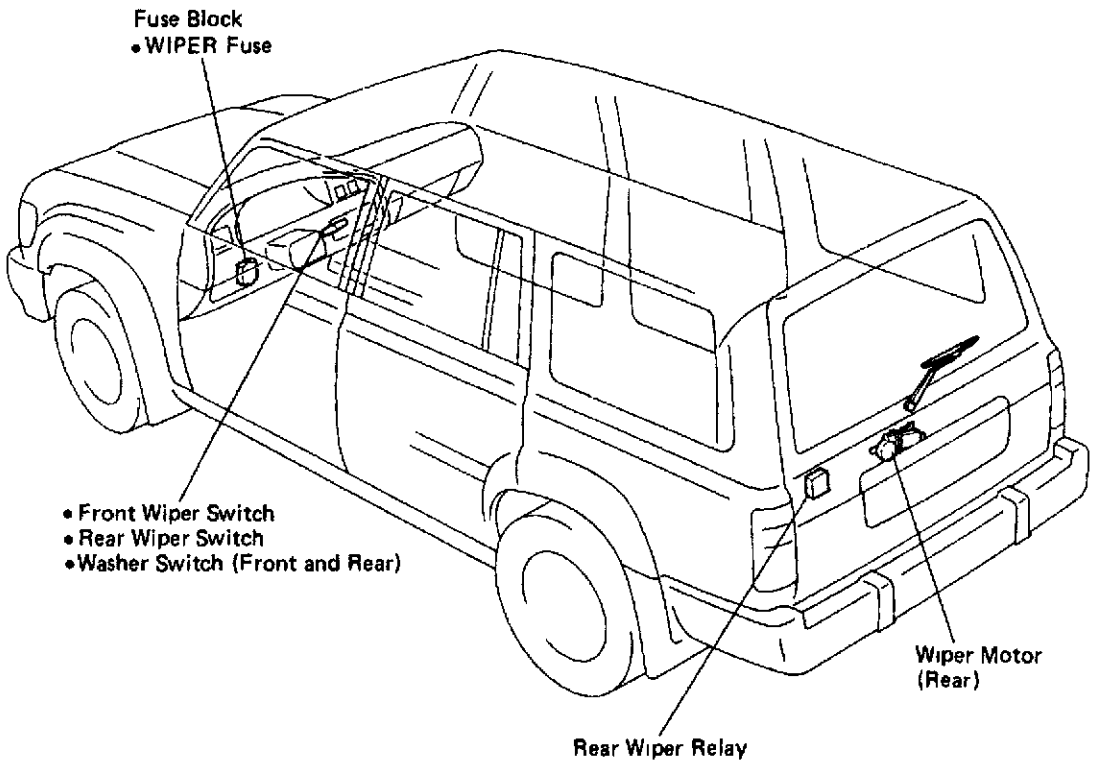
Switch position	Tester connection to terminal number	Specified value
Switch pin free	1 -2	Continuity
Switch pin pushed in	–	No continuity

If continuity is not as specified, replace the switch

WIPER AND WASHER SYSTEM

PARTS LOCATION





N08187
BE5080

Z06285

BE0K0-01

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page) (Front) (Rear)
Wiper do not operate or return to off position	1 WIPER Fuse 2 Wiper Switch 3 Wiper Motor 4 Wiper Relay 5 Wire Harness	(BE-4) (BE-4) (BE-36) (BE-36) (BE-38) (BE-39) (BE-37) (BE-38)
Wiper do not operate in MIST	1 Wiper Switch 2 Wiper Motor 3 Wiper Relay 4 Wire Harness	(BE-36) (BE-36) (BE-38) (BE-39) (BE-37) (BE-38)
Wiper do not operate in INT	1 Wiper Switch 2 Wiper Motor 3 Wiper Relay 4 Wire Harness	(BE-36) (BE-36) (BE-38) (BE-39) (BE-37) (BE-38)
Washer does not operate	1 Washer Hose or Nozzle Clogged 2 Washer Switch 3 Washer Motor 4 Wire Harness	(BE-36) (BE-40) (BE-40)

COMBINATION SWITCH REMOVAL

BE0K6-02

REMOVE FRONT WIPER AND WASHER SWITCH

See page BO-61 .

COMBINATION SWITCH INSTALLATION

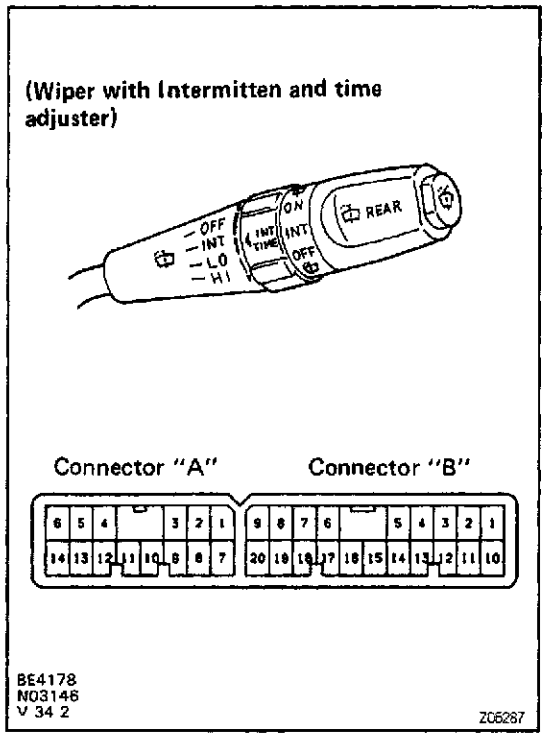
INSTALL FRONT WIPER AND WASHER SWITCH

See page BO-61 .

COMBINATION SWITCH INSPECTION

INSPECT FRONT WIPER AND WASHER SWITCH

Continuity



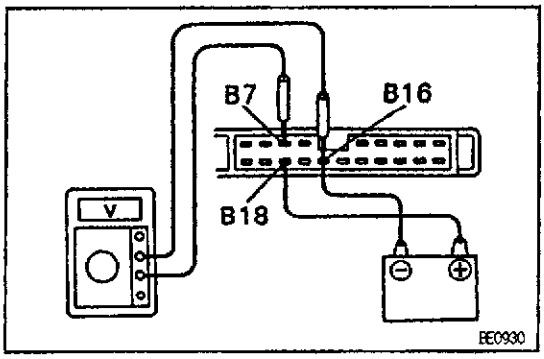
Switch position	Tester connection to terminal number	Specified value
Wiper OFF	B4-B7 (L-R) - (L-B)	Continuity
Wiper INT	B4 - B7 (L - R) - (L - B)	Continuity
Wiper LO	B7-B18 (L-B) - (L-W)	Continuity
Wiper HI	B13 - B18 (L-0) - (L-W)	Continuity
Washer OFF	–	No continuity
Washer ON	B8-B16 (L) - (B)	Continuity

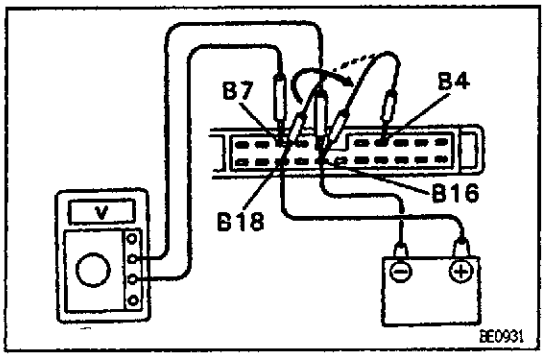
INSPECT REAR WIPER AND WASHER SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
Washer ON	B2 B16 (v) - (6)	Continuity
Wiper OFF	–	No continuity
Wiper INT	B10 - 816 (0) - (B)	Continuity
Wiper ON	B1 - B16 (G) - (B)	Continuity
Washer ON	B1 B2 B16 (G) - (V) - (B)	Continuity

If continuity is not as specified, replace the switch





FRONT WIPER RELAY INSPECTION

INSPECT FRONT WIPER RELAY

Operation at Intermittent

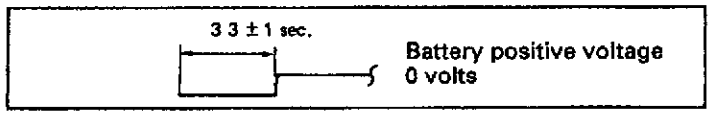
(a) Turn the wiper switch to INT position

(b) Turn the intermittent time control switch to FAST position

(c) Connect the positive (+) lead from the battery to terminal 1318 and the negative (-) lead to terminal B 16

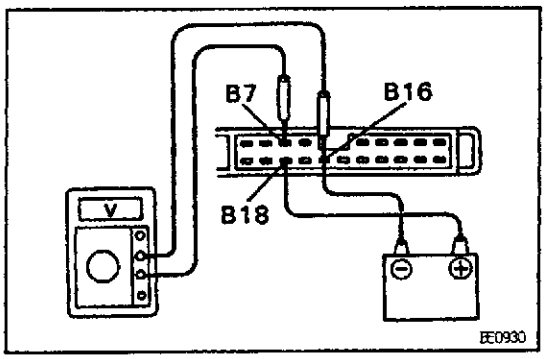
(d) Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (-) lead to terminal B1 6, check that the meter needle indicates battery positive voltage

(e) After connecting terminal B4 to terminal B18, connect to terminal B 16
Then, check that the voltage rises from O volt to battery positive voltage within the times, as shown in the table



If operation is not as specified, replace the switch

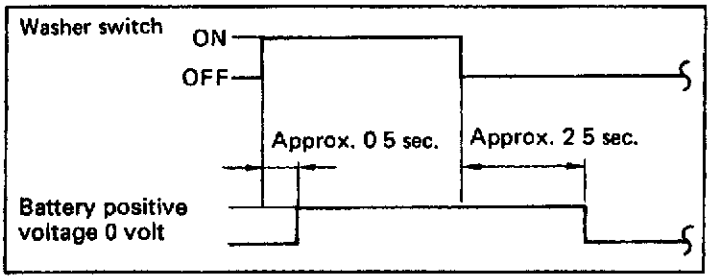
Operation as Washer Linked



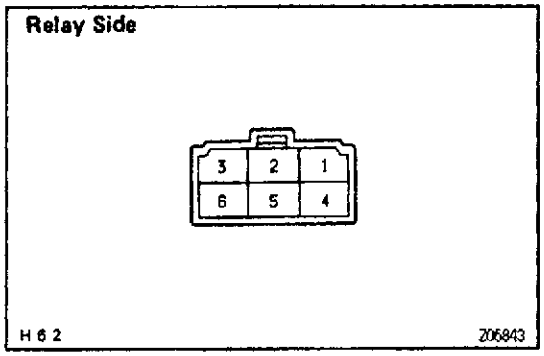
(a) Connect the positive (+) lead from the battery to terminal B18 and the negative (-) lead to terminal B 16

(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



REAR WIPER RELAY INSPECTION

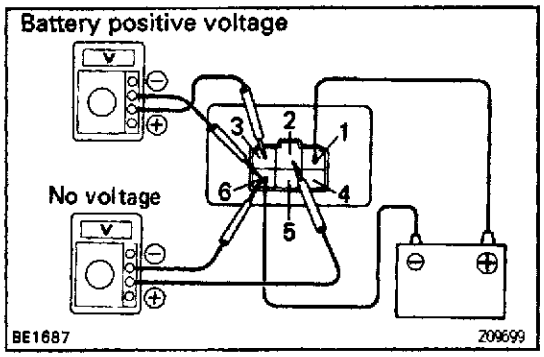
INSPECT REAR WIPER RELAY

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



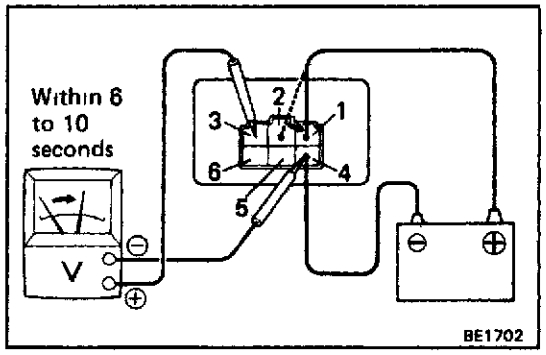
Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 6

(b) Conneppct the positive (+) lead from the voltmeter to terminal 2 and the negative (-) lead to terminal 6, check that the meter needle indicates to O volts

(c) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (-) lead to terminal 6, check that the meter needle indicates to battery positive voltage

If operation is not as specified, replace the relay



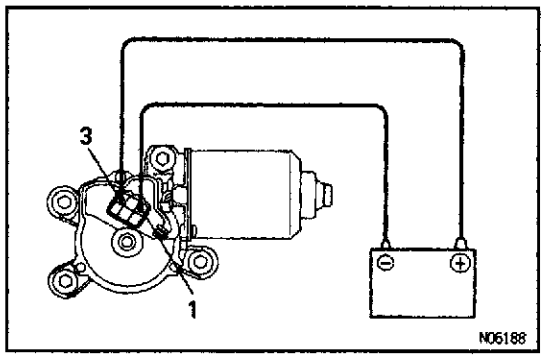
Intermittent Operation

(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 volts to battery positive voltage within 6 to 10 seconds

If operation is not as specified, replace the relay



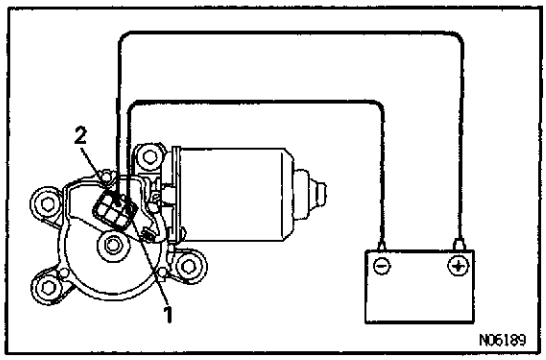
FRONT WIPER MOTOR INSPECTION

INSPECT FRONT WIPER MOTOR

Operation at Low Speed

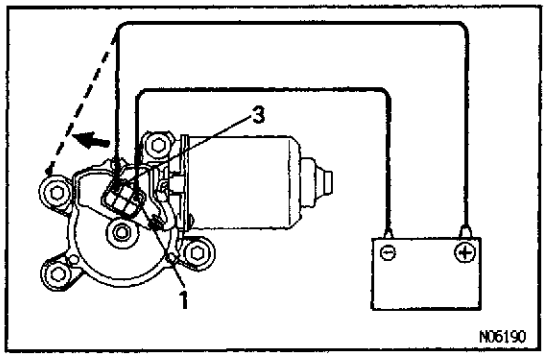
Connect the positive (+) lead from the battery to terminal 3 and negative (-) lead to terminal 1 check that the motor operates at low speed

If operation is not as specified, replace the motor



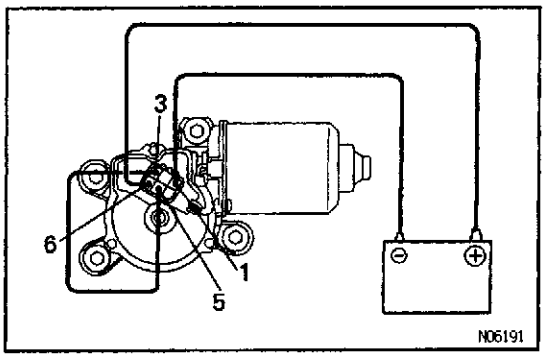
Operation at High Speed

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1 check that the motor operates at high speed
If operation is not as specified, replace the motor



Operation, Stopping at Stop Position

(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



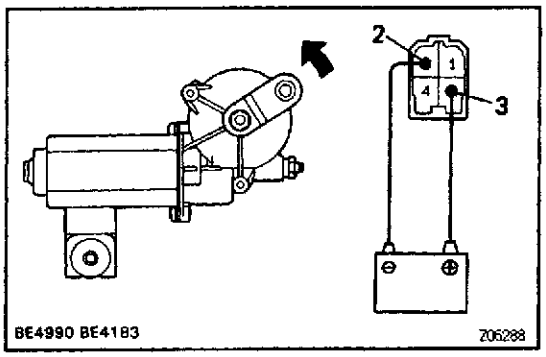
(b) Connect terminal 3 and 5
(c) Connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 1, check that the motor stops running at the stop position after the motor operates again
If operation is not as specified, replace the motor

REAR WIPER MOTOR INSPECTION

INSPECT REAR WIPER MOTOR

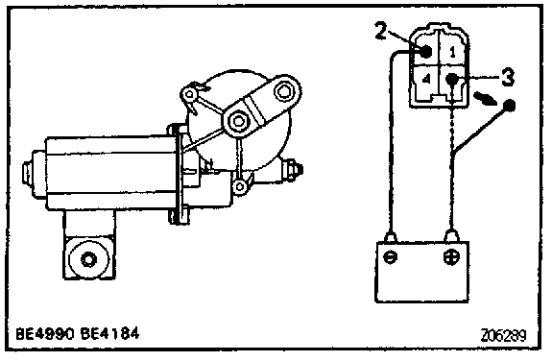
Operation at Low Speed

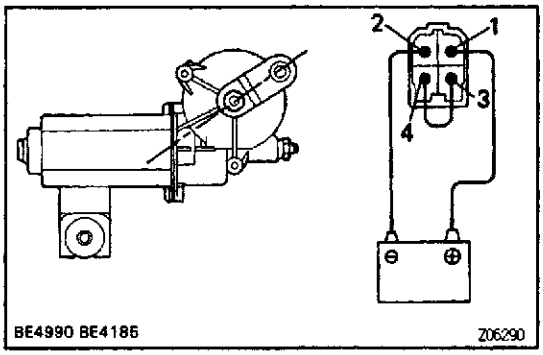
Connect the positive (+) lead from the battery to terminal 3 and negative (-) lead to terminal 2, check that the motor operates at low speed
If operation is not at specified, replace the motor



Operation. Stopping at Stop Position

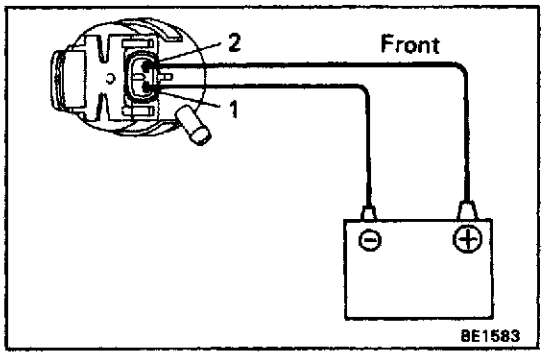
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3

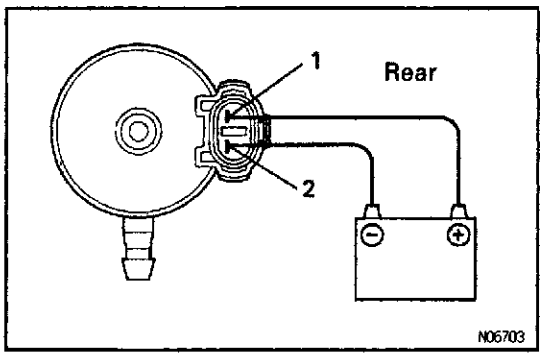




(b) Connect terminal 3 and 4

(c) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor stops running at the stop position after the motor operates again
If operation is not as specified, replace the motor





WASHER MOTOR INSPECTION

INSPECT WASHER MOTOR

Front:

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, 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

Rear

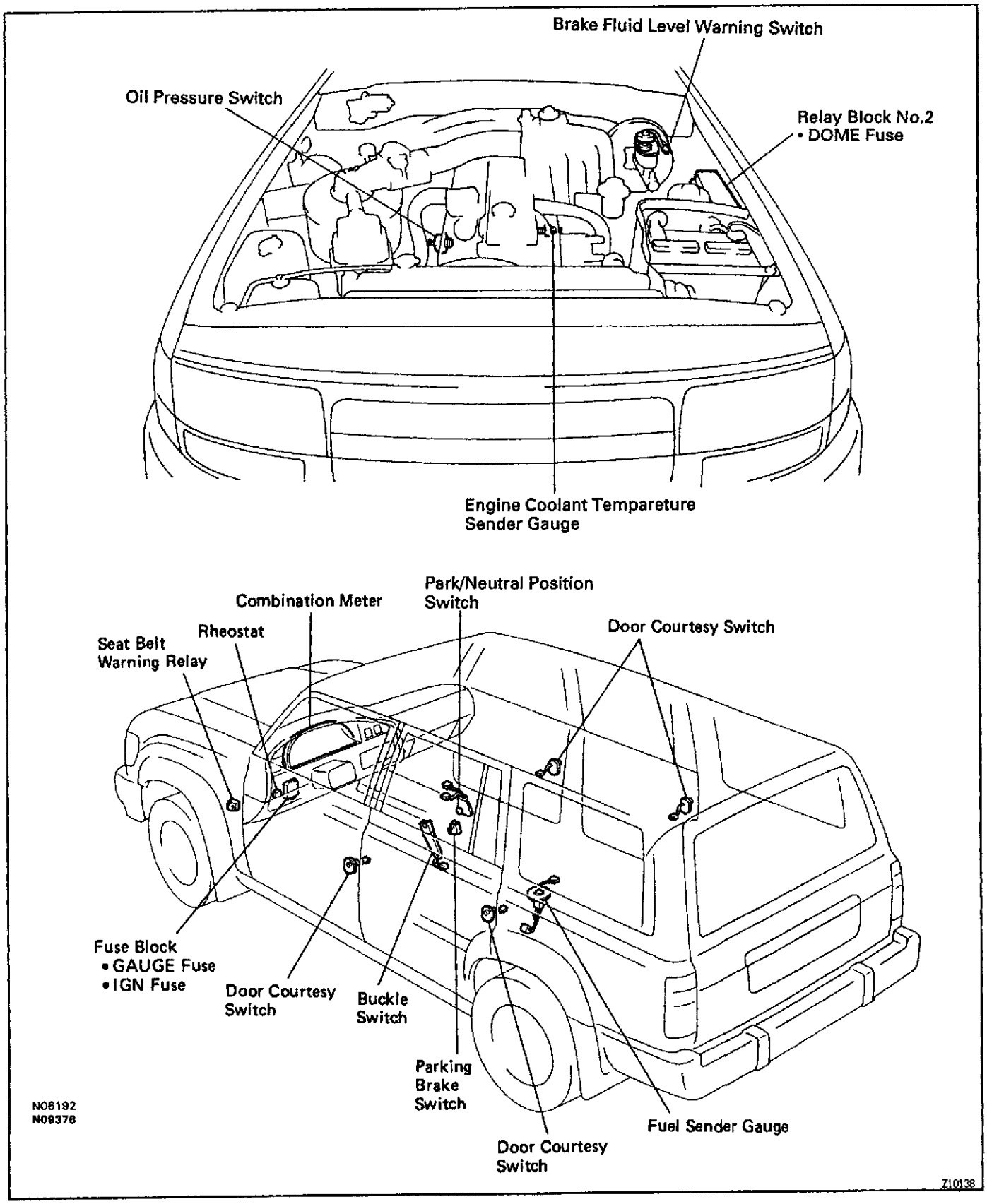
Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor operates

NOTICE: These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

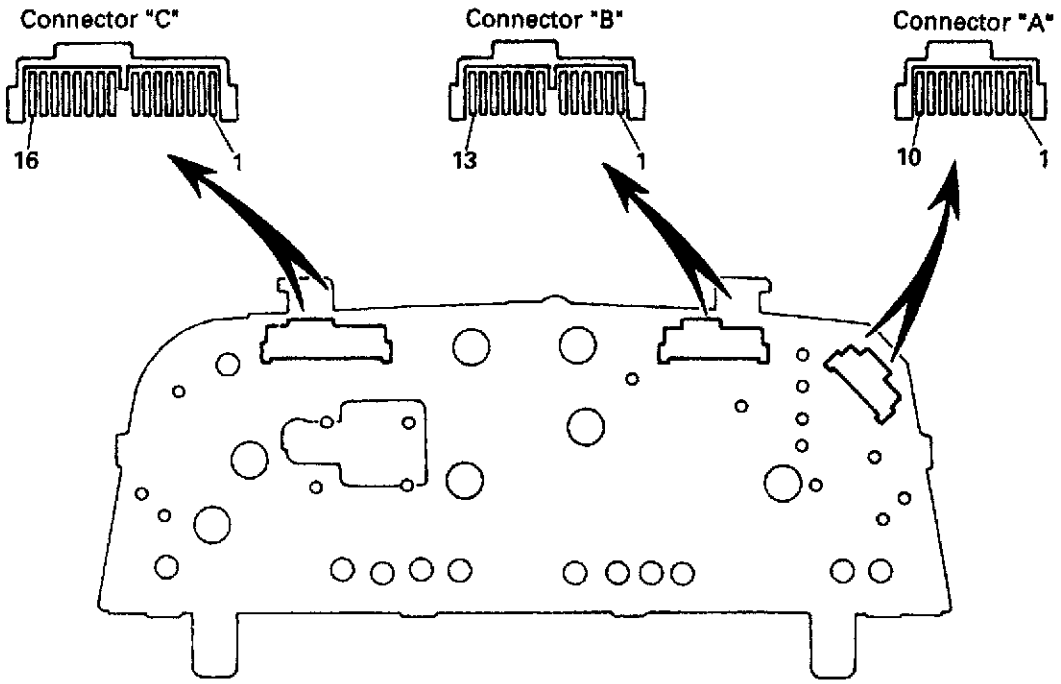
If operation is not as specified, replace the motor

COMBINATION METER

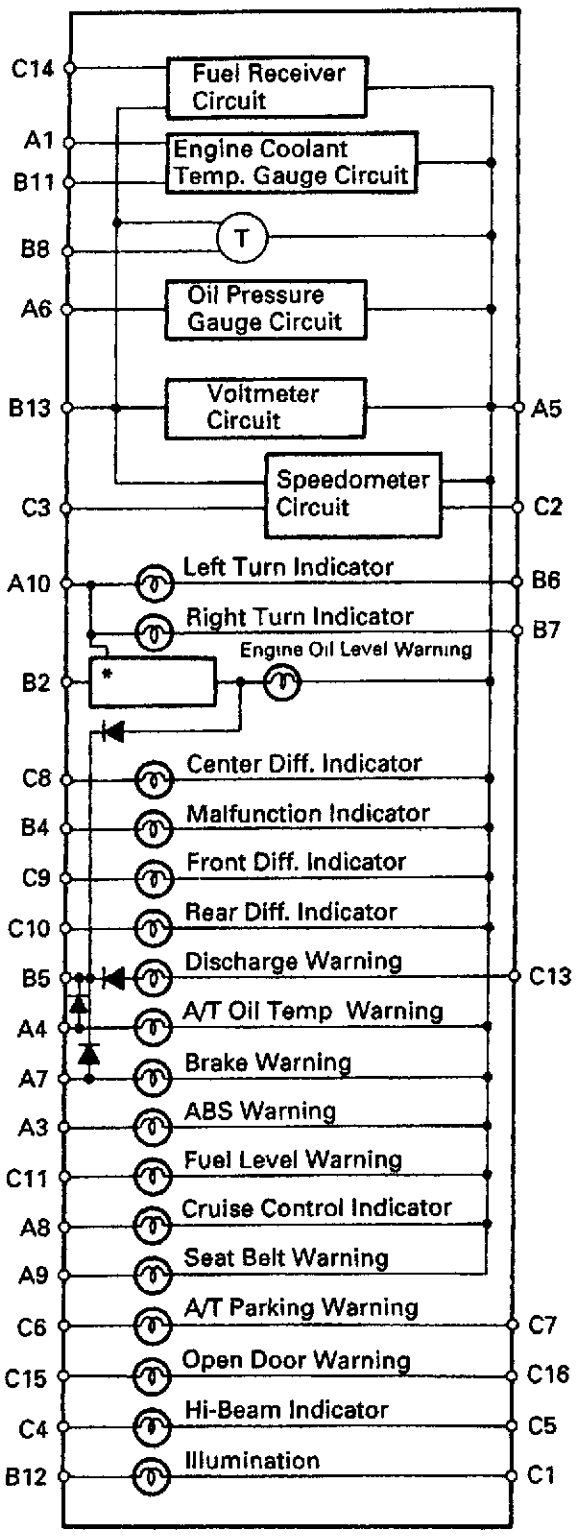
PARTS LOCATION



METER CIRCUIT



N09377

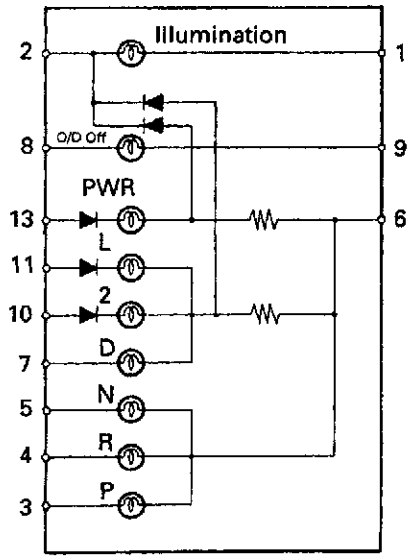


Ⓣ : Tacho Meter
Diff. : Differential
Temp. : Temperature
* : Engine Oil Level Circuit

No.		Wiring connector side
A	1	Ground
	3	ABS ECU
	4	A/T Fluid Temperature Sensor
	5	GAUGE Fuse
	6	Oil Pressure Sender Gauge
	7	Brake Warning Switch
	8	Cruise Control ECU
	9	Seat Belt Warning Relay
	10	Ground
B	2	Engine Oil Level Sensor
	4	ECM
	5	Charge Light Relay
	6	Light Control Switch (Left)
	7	Light Control Switch (Right)
	8	Igniter
	11	Engine Coolant Temperature Gauge
	12	Light Control Rheostat
	13	Ground
C	1	TAIL Fuse
	2	Speed Control Unit
	3	No.1 Vehicle Speed Sensor
	4	Headlight
	5	Headlight Dimmer Switch
	6	Transfer Neutral Position Switch
	7	Park/Neutral Position Switch
	8	Center Diff. Lock Indicator 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

N09378

• SHIFT POSITION INDICATOR



BE1267
N06733

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	IGN Fuse
9	O/D OFF Switch
10	Park/Neutral Position Switch—terminal 3
11	Park/Neutral Position Switch—terminal 8
13	Pattern Select Switch

V02747

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part -in the order shown, and replace the part when it is found to be faulty

METER, GAUGES AND ILLUMINATION

Trouble	Parts name	(See page)
Tachometer Voltmeter Fuel Gauge and Engine Coolant Temperature Gauge do not operate	1 GAUGE Fuse 2 Combination Meter Wiring Circuit 3 Wire Harness 4 Meter Circuit Plate	(BE-4) (BE-43) (BE-42)
Speedometer does not operate	1 No 1 vehicle speed Sensor 2 Speedometer Driven Gear and Drive Gear	(BE-48)
Tachometer does not operate	1 Combination Meter Wiring Circuit 2 Wire Harness 3 Igniter 4 Meter Circuit Plate	(BE-43) (IG-15) (BE-42)
Voltmeter does not operate	1 Voltmeter Receiver Gauge 2 Wire Harness	(BE-53)
Fuel Gauge does not operate or abnormal operation	1 Fuel Receiver Gauge 2 Fuel Sender Gauge 3 Combination Meter Wiring Circuit 4 Wire Harness	(BE-49) (BE-50) (BE-43)
Engine Coolant Temperature Gauge does not operate or abnormal operation	1 Engine Coolant Temperature Receiver Gauge (BE-51) 2 Engine Coolant Temperature Sender Gauge (BE-51) 3 Combination Meter Wiring Circuit (BE-43) 4 Wire Harness	
Oil Pressure Gauge does not operate or abnormal operation	1 Oil Pressure Receiver Gauge 2 Oil Pressure Sender Gauge 3 Combination Meter Wiring Circuit 4 Wire Harness	(BE-52) (BE-53) (BE-43)
All illumination lights do not light up	1 TAIL Fuse 2 Light Control Rheostat 3 Wire Harness	(BE-4) (BE-56)
Brightness does not change even when rheostat turned	1 Bulb 2 Wire Harness	
Only one illumination light does not light up	1 Bulb 2 Wire Harness	

WARNING LIGHTS

Trouble	Parts name	(See page)
Warning light do not light up (Except Discharge)	1 GAUGE Fuse 2 Combination Meter Wiring Circuit 3 Wire Harness	(BE-4) (BE-43)
Fuel Level warning light does no light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Fuel Level Warning Switch	 (BE-43) (BE-51)
Malfunction warning light does not light up	1 Bulb 2 ECM 3 Fuel Level Warning Switch	 (EG-317) (BE-51)
Seat Belt warning light does not light up	1 Bulb 2 Seat Belt Warning Relay 3 Seat Belt Buckle Switch 3 Wiring Harness	 (BE-55) (BE-54)
Discharge warning light does not light up	1 IG N Fuse 2 Bulb 3 Wire Harness 4 Generator	(BE-4) (CH -14)
Brake warning light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Parking Brake Switch 4 Brake Fluid Level Warning Switch	 (BE-43) (BE-53) (BE-54)
Open Door warning light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Door Courtesy Switch	 (BE-43) (BE-54)
Engine Oil Level warning light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Engine Oil Level Sensor	 (BE-43) (BE-55)

INDICATOR LIGHTS

Trouble	Parts name	(See page)
O/D OFF indicator light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 O/D OFF Switch 4 Wire Harness	(BE-43) (AT-41)
High beam indicator light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Wire Harness 4 Headlight System	(BE-43) (BE- 15)
Turn indicator light does not light up	1 Bulb 2 Combination Meter Wiring Circuit 3 Wire Harness 4 Turn Signal and Hazard Warning System	(BE-43) (BE-24)
Shift indicator lights do not light up (All)	1 Bulb 2 Combination Meter Wiring Circuit 3 Park / Neutral Position Switch 4 Wire Harness	(BE-43) (AT-41)
Shift indicator lights do not light up (L 2 D)	1 Bulb 2 Combination Meter Wiring Circuit 3 Park / Neutral Position Switch 4 Light Control Rheostat 5 Wire Harness	(BE-43) (AT-41) (BE-56)
Only one shift indicator does not light up	1 Bulb 2 Combination Meter Wiring Circuit	(BE-43)
Indicator lights do not light up (Except Turn Hi-beam)	1 GAUGE Fuse 2 Wire Harness	(BE-4)

SPEEDOMETER INSPECTION

BE01H4-02

INSPECT SPEEDOMETER (ON-VEHICLE)

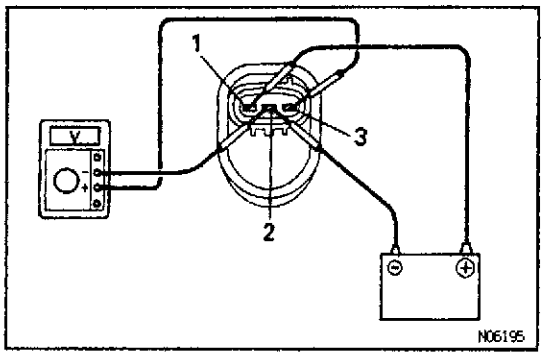
(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer

HINT Tire wear and tire over or under inflation will increase the indication error

(b) Check the speedometer for pointer vibration and abnormal noise

HINT Pointer vibration can be caused by a loose speedometer cable

Standard indication	Allowable range
20	18-24
40	38-44
60	58 -66
80	78 -88
100	98- 110
120	118 - 132



INSPECT NO.1 VEHICLE SPEED SENSOR

(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 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 terminal 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

TACHOMETER INSPECTION

ON-VEHICLE

(a) Connect a tune-up test tachometer, and start the engine

NOTICE:

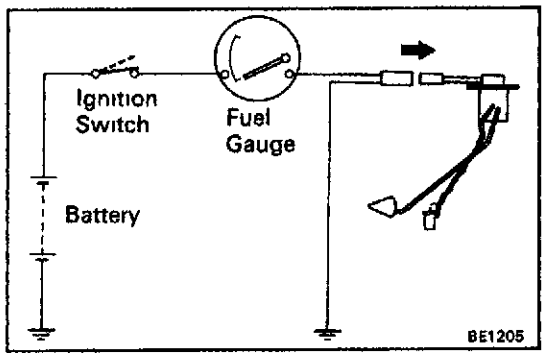
- **Reversing the connection of the tachometer will damage the transistors and diodes inside.**
- **When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.**

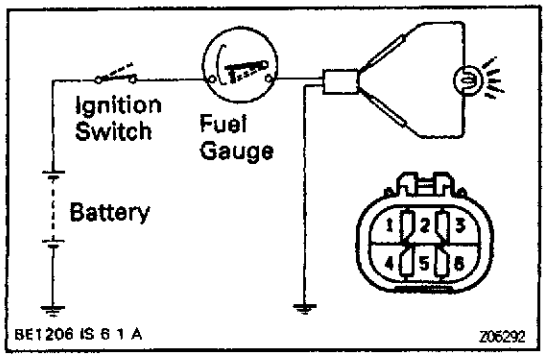
(b) Compare the tester and tachometer indications

If error is excessive replace the tachometer

DC 13.5 V, 25 ° C (770F)/ RPM

Standard indication	Allowable range
700	630-770
1000	900- 1 100
2000	1 875 - 2 125
3000	2 850 - 3 150
4000	3 850 - 4 150
5000	4 850 - 5 150





FUEL RECEIVER GAUGE INSPECTION

OPERATION

(a) Disconnect the connector from the sender gauge

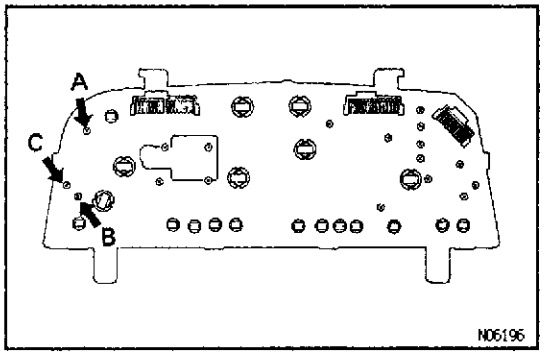
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY

(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, 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

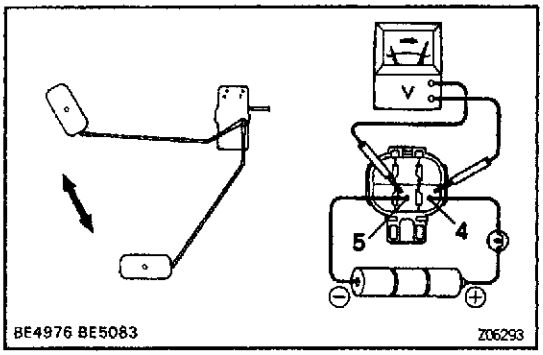
If operation is not as specified, inspect the receiver gauge resistance



RESISTANCE

Between terminals	Resistance (Ω)
A-B	85 5 - 105 5
A-C	126 - 150
B-C	90 - 110

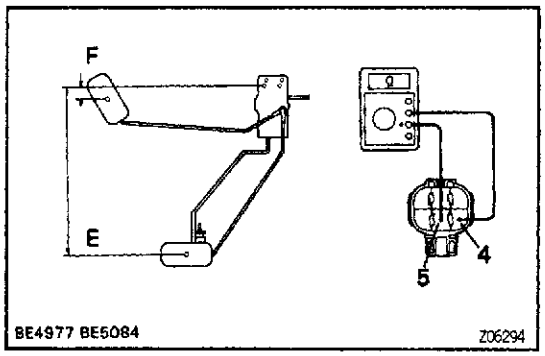
Include voltmeter resistance
If resistance value is not as specified, replace the fuel receiver gauge



FUEL SENDER GAUGE INSPECTION

OPERATION

(a) Connect a series of three 1 5 volts 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

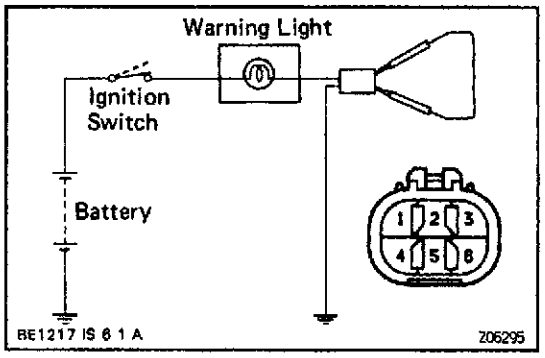


RESISTANCE

Measure the resistance between terminals 4 and 5

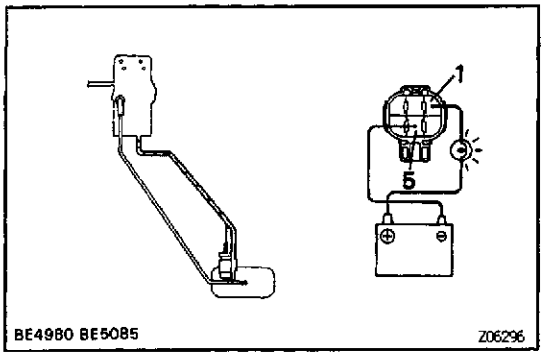
Float position mm (in)	Resistance (Ω)
F Approx 15 (0 59)	Approx 3
E Approx 200 (7 87)	Approx 110

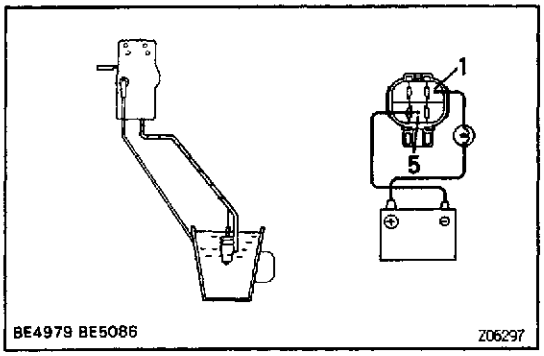
If resistance value is not as specified, replace the sender gauge



FUEL LEVEL WARNING INSPECTION

(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, check that the warning light lights up
If the warning light does not light up, test the bulb

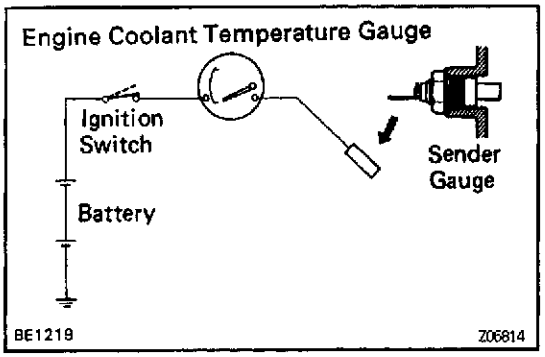


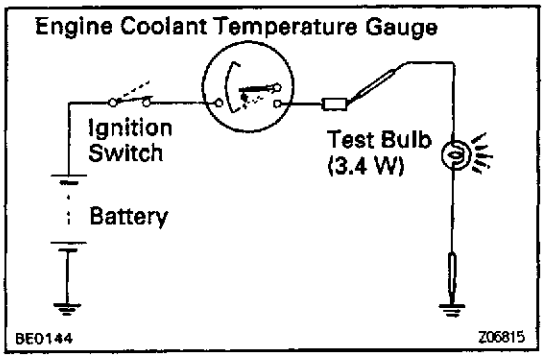


FUEL LEVEL WARNING SWITCH INSPECTION

(a) Apply battery positive voltage between terminals 1 and 5 through a 3 4 W test bulb, 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, check that the bulb goes out
If operation is not as specified, replace the sender gauge



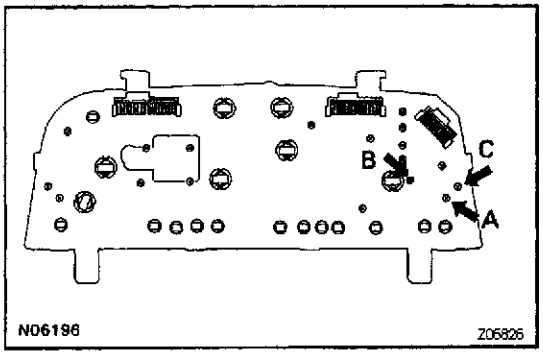


ENGINE COOLANT TEMPERATURE RECEIVER AND SENDER GAUGE INSPECTION

OPERATION

(a) Disconnect the connector from the sender gauge
(b) Turn the ignition switch ON, 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, 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



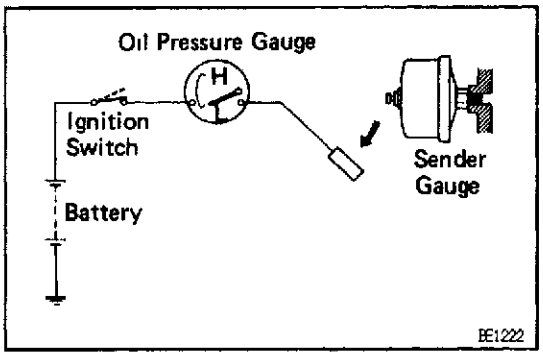
RESISTANCE

Measure the resistance between terminals

Between terminals	Resistance (Ω)
A-B	71 - 79
A-C	117 - 141
8 -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

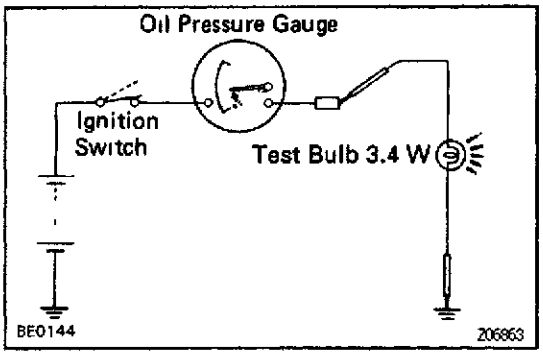


OIL PRESSURE RECEIVER GAUGE INSPECTION

OPERATION

(a) Disconnect the connector from the sender gauge

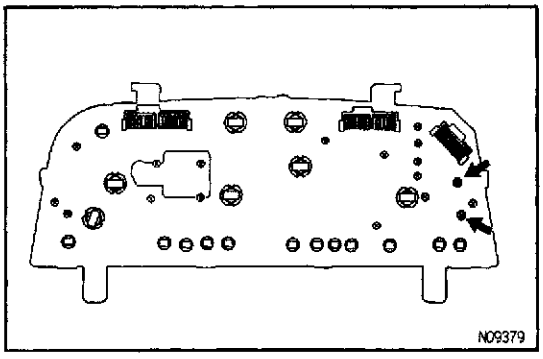
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates LOW



(c) Ground terminal on the wire harness side through a 3 4 W test bulb

(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle, moves to the high side

If operation is not as specified, measure the receiver gauge resistance



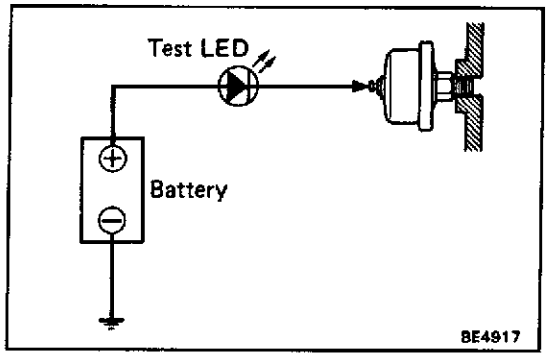
RESISTANCE

Measure the receiver gauge resistance between terminals

Resistance:

40-48 Ω.

If resistance value is not as specified, replace the receiver gauge



OIL PRESSURE SENDER GAUGE INSPECTION

(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

VOLTMETER INSPECTION (ON-VEHICLE)

Compare the tester and voltmeter indications
If error is excessive, replace the voltmeter

RESISTANCE

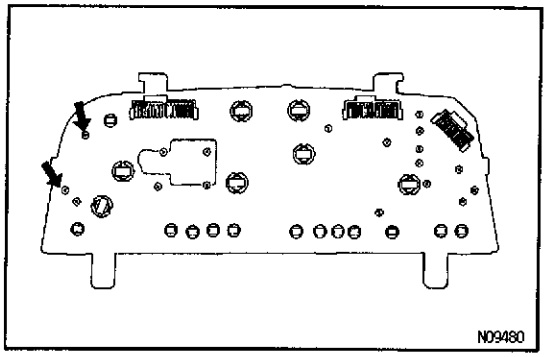
Measure the receiver gauge resistance between terminals.

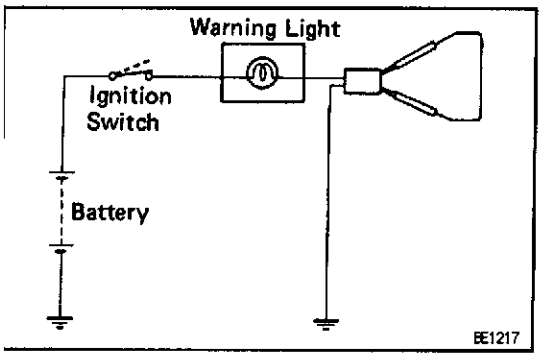
Resistance:

126- 1500

If resistance value is not as specified, replace the receiver gauge

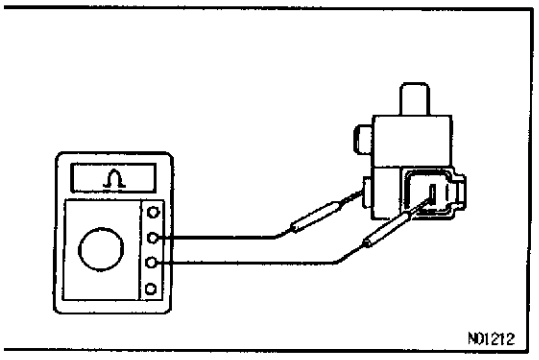
HINT This resistance include fuel receiver gauge resistance





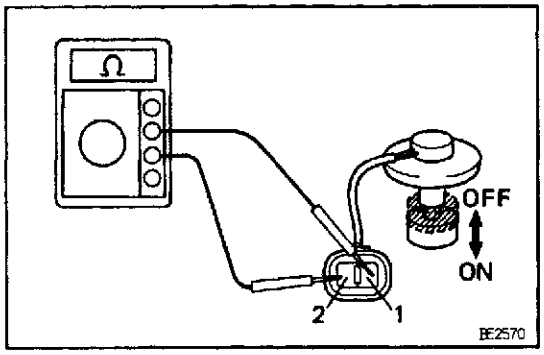
BRAKE WARNING LIGHT INSPECTION

(a) Disconnect the connectors from the level warning switch, parking brake switch
(b) Connect terminals on the wire harness side connector of the level warning switch connector
(c) Turn the ignition switch ON, check that the warning light lights up



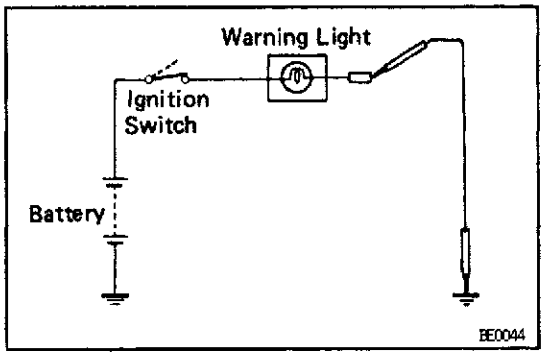
PARKING BRAKE SWITCH INSPECTION

(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



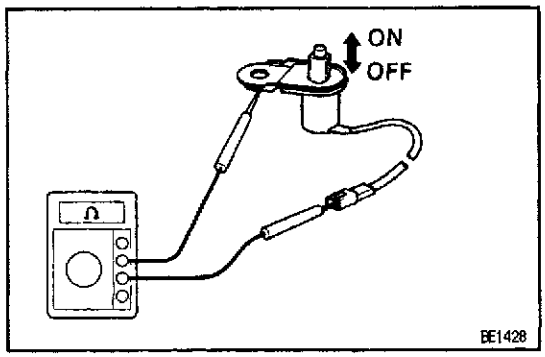
BRAKE FLUID LEVEL WARNING SWITCH INSPECTION

(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



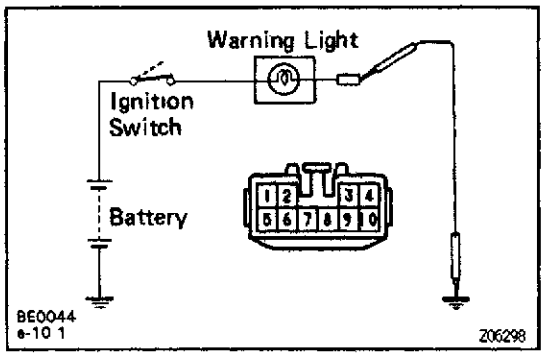
OPEN DOOR WARNING INSPECTION

(a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side connector
(b) Turn the ignition switch ON, check that the warning light lights up
If the warning light does not light up, test the bulb



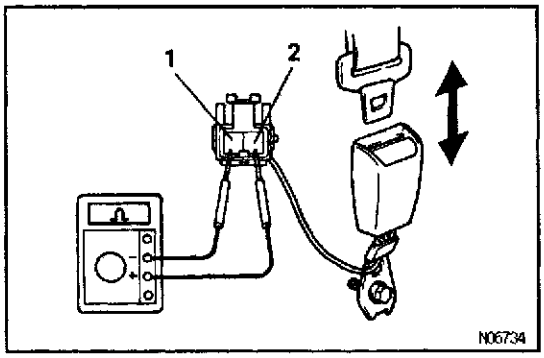
DOOR COURTESY SWITCH INSPECTION

(a) Check that there is continuity between terminal and the switch body with the ON (switch pin released opened door)
(b) Check that there is no continuity between terminal and the switch body with the OFF (switch pin pushed in closed door)
If operation is not as specified, replace the switch



SEAT BELT WARNING INSPECTION

(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, check that the warning light lights up
If the warning light does not light, test the bulb



SEAT BELT BUCKLE SWITCH INSPECTION

(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

DOOR COURTESY SWITCH INSPECTION

INSPECT DOOR COURTESY SWITCH

See page BE-54 .

KEY UNLOCK WARNING SWITCH INSPECTION

BE0JO-01

INSPECT KEY UNLOCK WARNING SWITCH

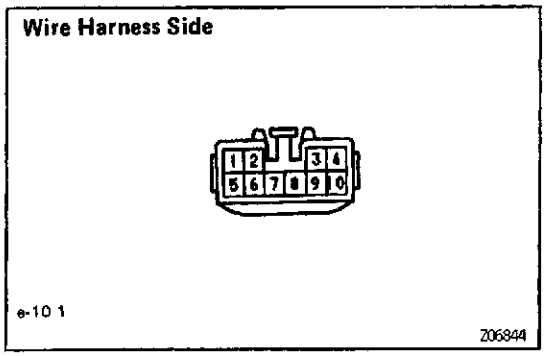
See page BE-14 .

SEAT BELT WARNING RELAY INSPECTION

INSPECT SEAT BELT WARNING RELAY

Relay Circuit

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart



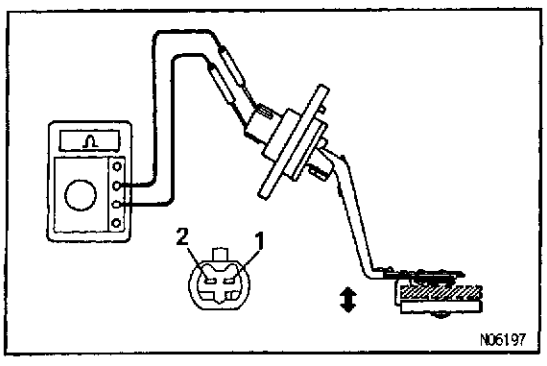
Tester connection to terminal number	Condition	Specified value (Voltage)
5 - Ground	Ignition switch position ON	Battery positive voltage
5 - Ground	Ignition switch position LOCK or ACC	No voltage
9 - Ground	Constant	Battery positive voltage
Tester connection to terminal number	**Condition**	**Specified value (Continuity)**
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

If circuit is as specified, try another relay

If the circuit is not as specified, refer to BE-43 wiring diagram and inspect the circuits connected to other parts

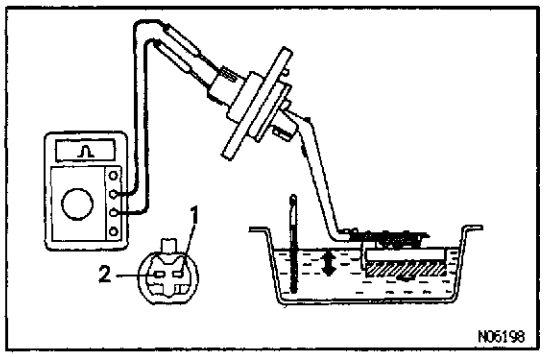
BEGJ7-01

ENGINE OIL LEVEL WARNING SENSOR INSPECTION

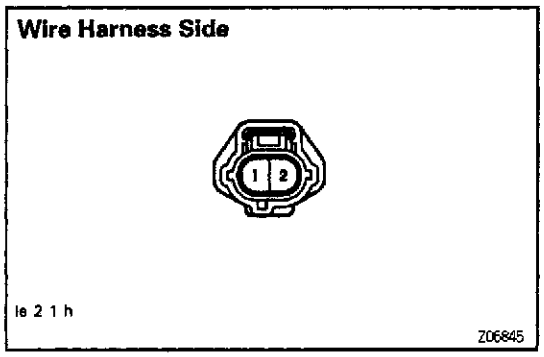


(a) Check that there is continuity between terminal with the switch each position

(b) Heat the switch to above 60°C (140°F) in an oil bath



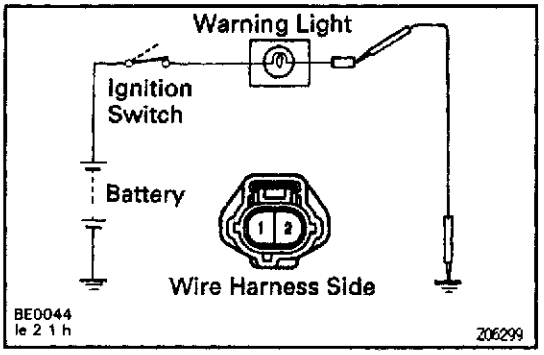
(c) Check that there is continuity between terminals with the switch ON (float up)
(d) Check that there is no continuity between terminals with the switch OFF (float down)
If operation is not as specified, replace the switch



Circuit
Disconnect the switch connector and inspect the connector on wire harness side, as shown

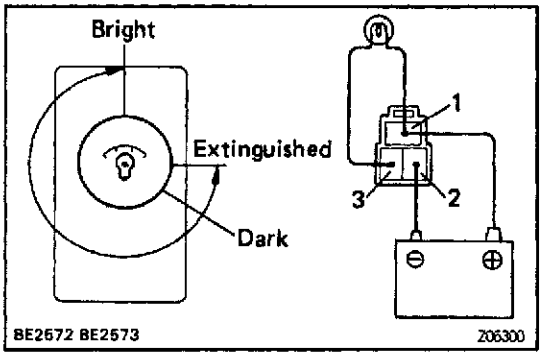
Tester connection to terminal number	Condition	Specified value
2 - Ground	Constant	Continuity

If continuity is not as specified, inspect the wire harness or ground point



ENGINE OIL LEVEL WARNING INSPECTION

(a) Disconnect the connector from the switch.
(b) Ground terminal 1 on the wire harness connector.
(c) Turn the ignition switch ON, check that the warning light lights up approximately 40 seconds later.
If the warning light does not light up, inspect bulb or wire harness.



LIGHT CONTROL RHEOSTAT INSPECTION

(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, check that the test bulb goes out

(d) Gradually turn the rheostat knob to clockwise, check that the test bulb brightness changes from dark to bright

If operation is not as specified, replace the rheostat

HINT Illumination lights with adjustable brightness

Cigarette Lighter

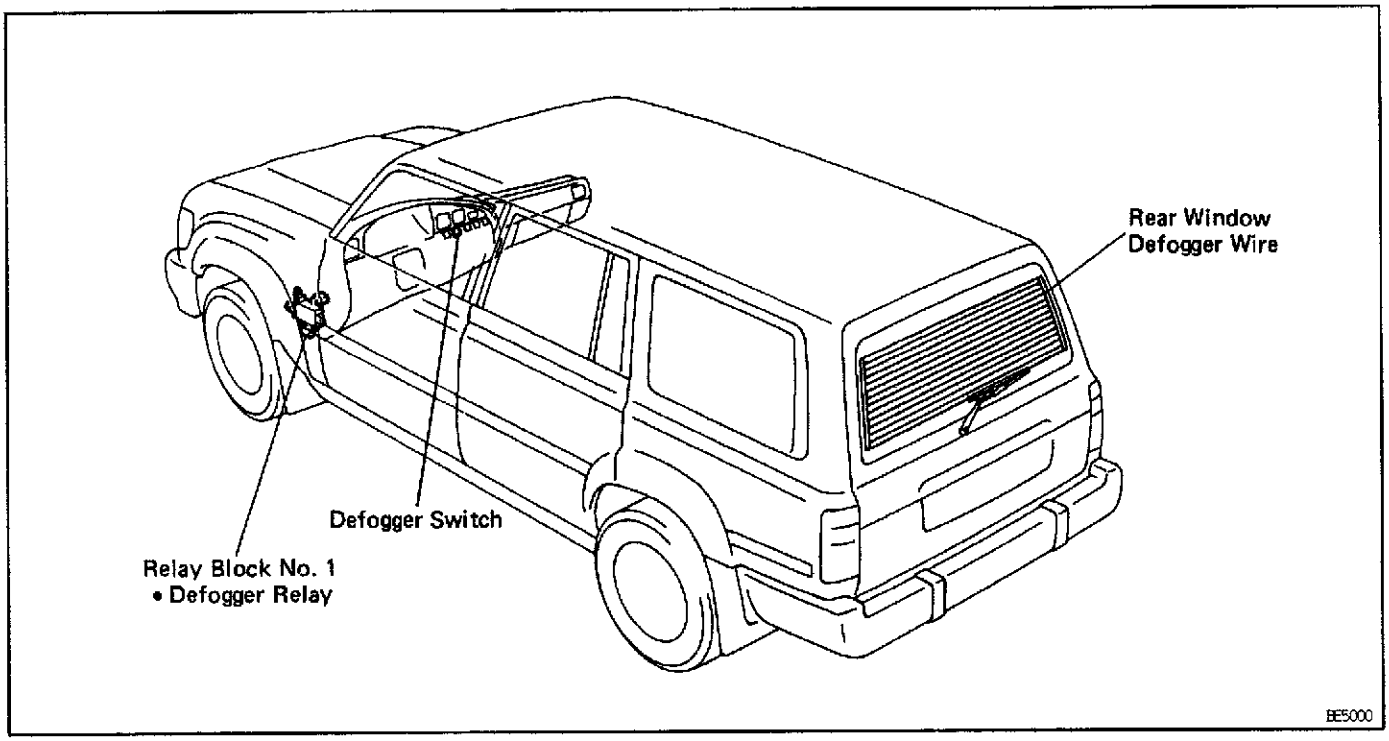
Ash Receptacle

- Antenna Switch
- Defogger Switch
- Headlight Cleaner Switch
- Audio
- A/C Control Assembly
- Center Diff Lock Switch
- Hazard Warning Light Switch
- Shift Lever

DEFOGGER SYSTEM

B6GJB--01

PARTS LOCATION

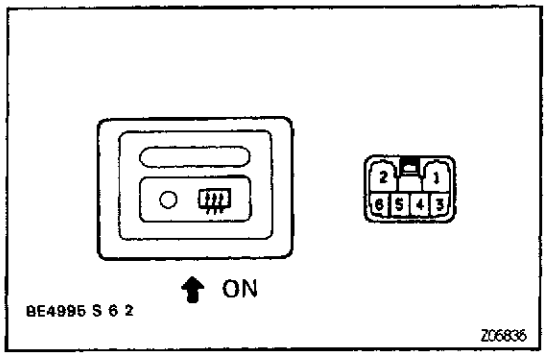


B60JD 02

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Rear window defogger do not operate	1 DEFOG Fuse	(BE-4)
	2 GAUGE Fuse	(BE-4)
	3 Defogger Relay	(BE-69)
	4 Defogger Switch	(BE-59)
	5 Defogger Wire	(BE-60)
	6 Wire Harness	



B60JF-01

DEFOGGER SWITCH INSPECTION

INSPECT DEFOGGER SWITCH

Continuity

Condition	Tester connection to terminal number	Specified value
Switch OFF	–	No continuity
Switch ON	2-3-6	Continuity
Illumination circuit	1-4	Continuity

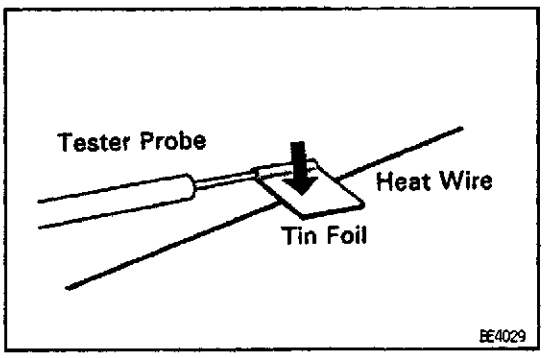
If continuity is not as specified, check the bulb or replace the switch

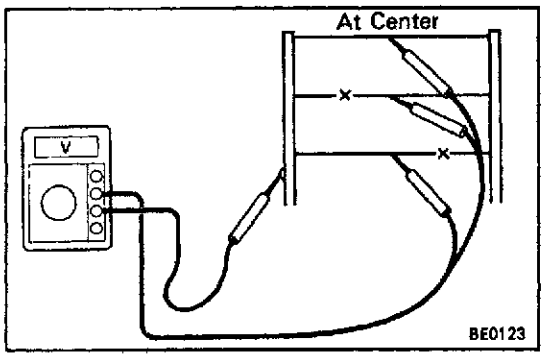
B60JH-01

DEFOGGER RELAY INSPECTION

INSPECT DEFOGGER RELAY

See power main relay on page BE-69 .





DEFOGGER WIRES

BE0JK-02

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.**

WIRE BREAKAGE

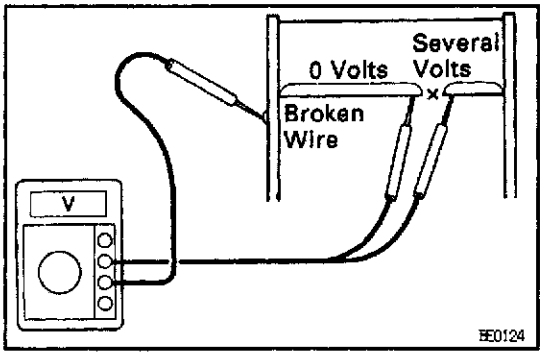
(a) Turn the ignition switch ON

(b) Push in the defogger switch

(c) Inspect the voltage at the center of each heat wire, as shown

Voltage	Criteria
Approx 5 V	Okay (No break in wire)
Approx 10 V or 0 V	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



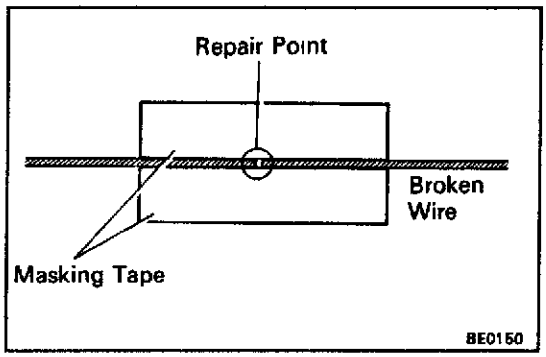
WIRE BREAKAGE POINT

(a) Place the voltmeter positive (+) lead against the defogger positive (+) terminal

(b) 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

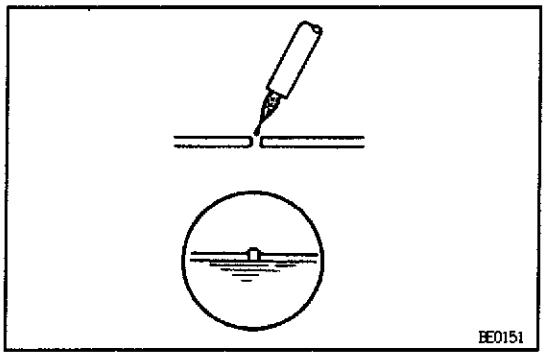
(c) The point where the voltmeter deflects from zero to several volts is the place where the heat wire is broken

HINT If the heat wire is not broken, the voltmeter indicates O volts at the positive (+) end of the heat wire but gradually increases to about 12 volts as the meter probe is moved to the other end



REPAIR DEFOGGER WIRES

(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

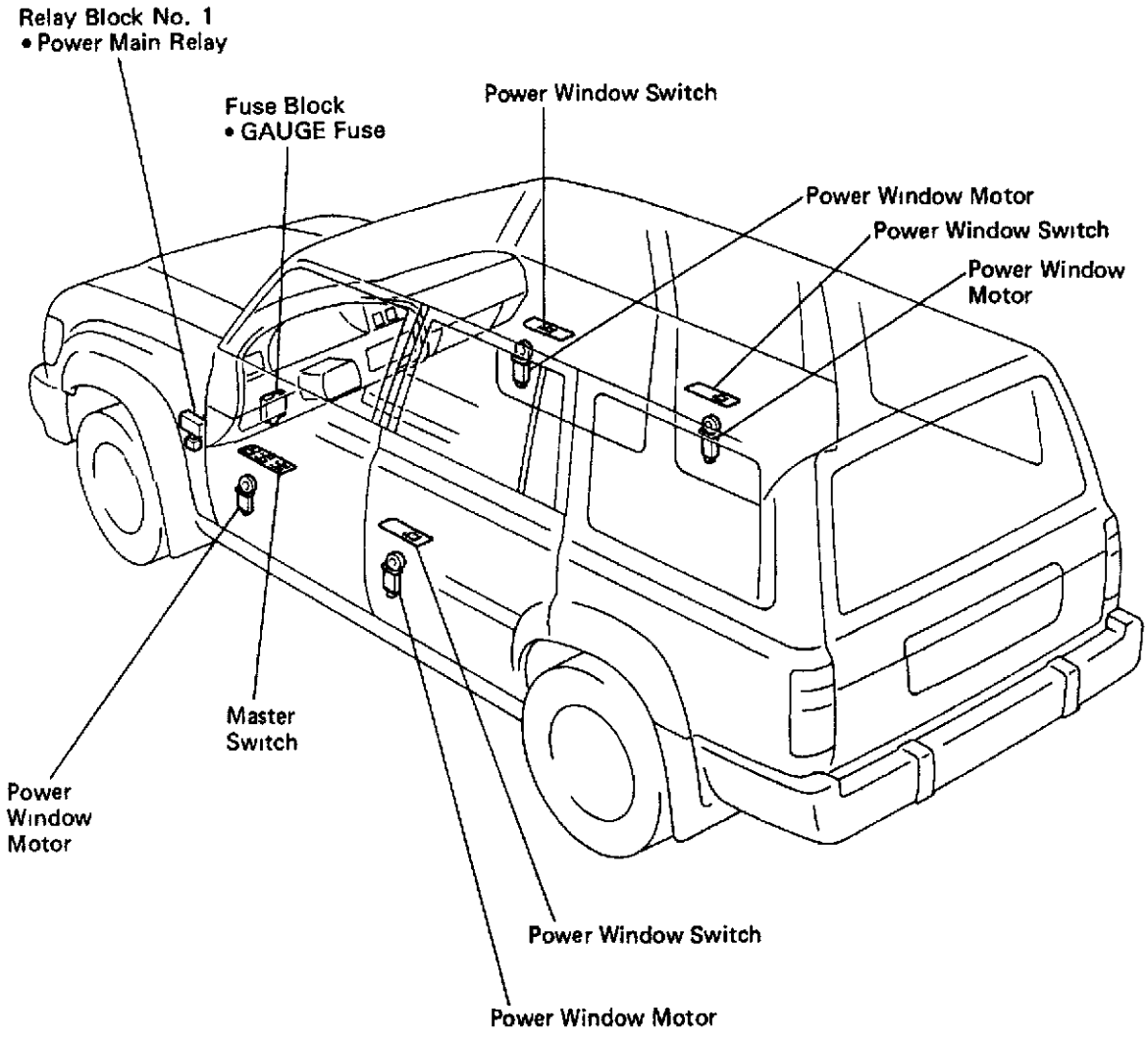


(c) Thoroughly mix the repair agent (Dupont paste No 4817 or equivalent)
(d) Using a fine tip brush, apply a small amount to the wire
(e) After a few minutes, remove the masking tape
(f) Allow the repair to stand at least 24 hours

POWER WINDOW SYSTEM

BE0JM-02

PARTS LOCATION



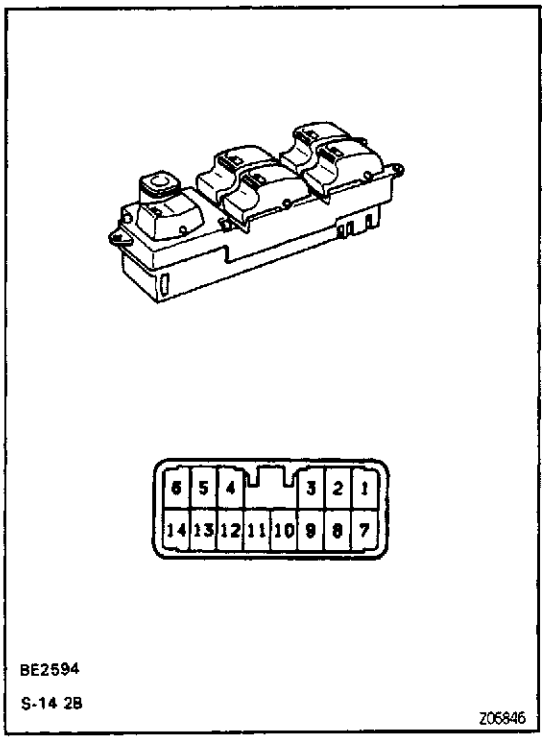
N09380

BE0JP-01

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Power window does not operate at all	1 GAUGE Fuse 2 POWER Fuse 3 Power Main Relay 4 Wire Harness	(BE-4) (BE-4) (BE-69)
One Touch Power Window System does not operate	1 Power Window Master Switch	(BE-63)
Only one window does not operate	1 Power Window Switch 2 Power Window Motor 3 Wire Harness	(BE-66) (BE-67)



POWER WINDOW MASTER SWITCH INSPECTION

BE0JR-02

INSPECT POWER WINDOW MASTER SWITCH

Front Driver's Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1 or 2 - 13 6 -7or8	Continuity
OFF	1 or 2-6- 13	Continuity
DOWN	1or2-6 7 or 8 - 13	Continuity

Front Driver's Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1 or 2 - 13 6 -7or$	Continuity
OFF	1 or 2 -6- 13	Continuity
DOWN	1 or 2-6 7or8 - 13	Continuity

Front Passenger's Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1 or 2-5 7or8 - 12	Continuity
OFF	1or2-5-12	Continuity
DOWN	lor2-12 5 - 7or8	Continuity

Front Passenger's Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7 or 8 - 12	Continuity
OFF	5- 12	Continuity
DOWN	5-7or8	Continuity

Rear Left Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1 or 2 - 9 7or8 - 10	Continuity
OFF	1 or 2- 9 - 10	Continuity
DOWN	1 or 2-10 7 or 8-9	Continuity

Rear Left Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7 or 8 - 10	Continuity
OFF	9- 10	Continuity
DOWN	7 or 8-9	Continuity

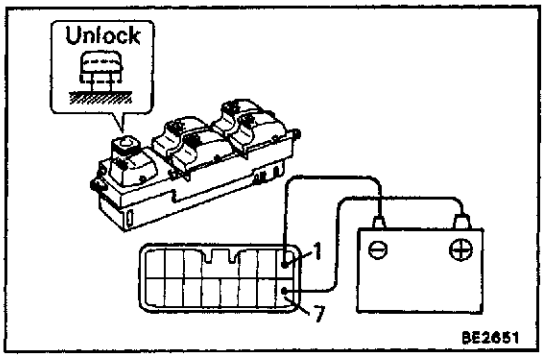
Rear Right Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1 or 2 - 14 7or8 - 11	Continuity
OFF	1 or 2-11 -14	Continuity
DOWN	1 or 2- 11 7 or 8 - 14	Continuity

Rear Right Switch (Window lock)/ Continuity

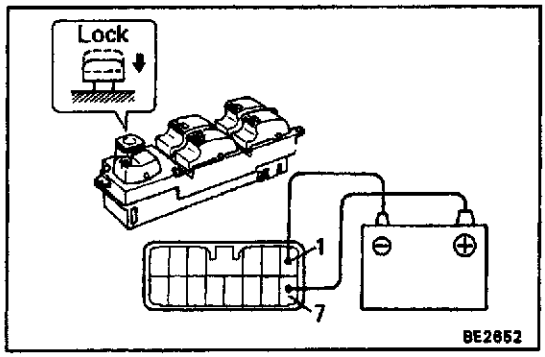
Switch position	Tester connection to terminal number	Specified value
UP	7 or 8 - 11	Continuity
OFF	11 - 14	Continuity
DOWN	7 or 8 - 14	Continuity

If continuity is not as specified, replace the master switch

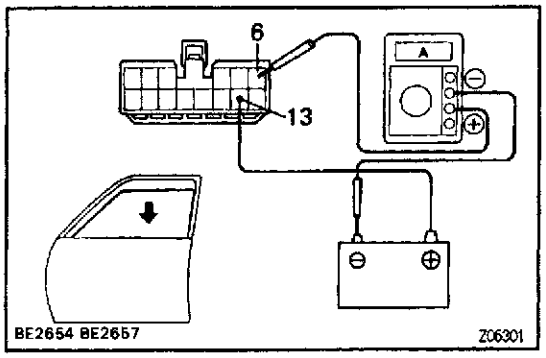


Illumination

(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, check that all the illuminations light up



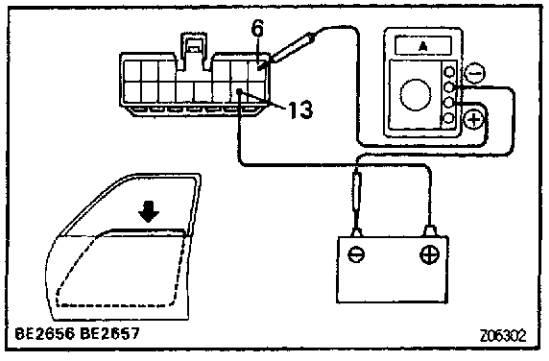
(c) Set the window lock switch to the lock position, check that all the passenger's power window switch illuminations go out
If operation is not as specified, replace the master switch

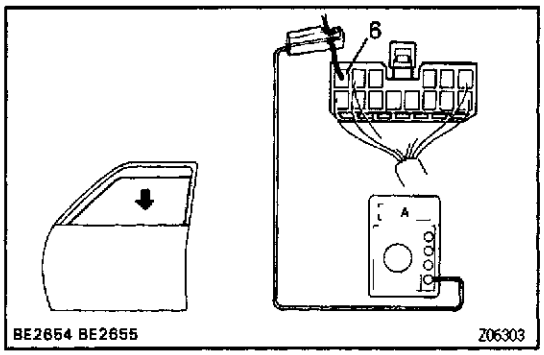


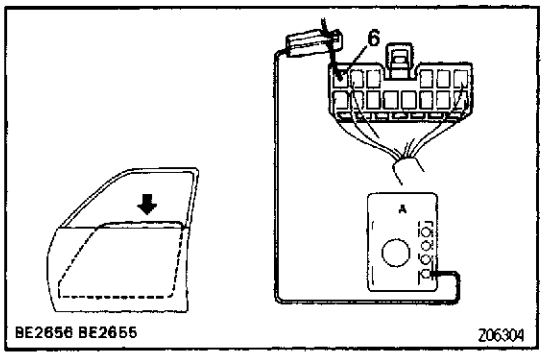
ONE TOUCH POWER WINDOW SYSTEM/ CURRENT OF CIRCUIT

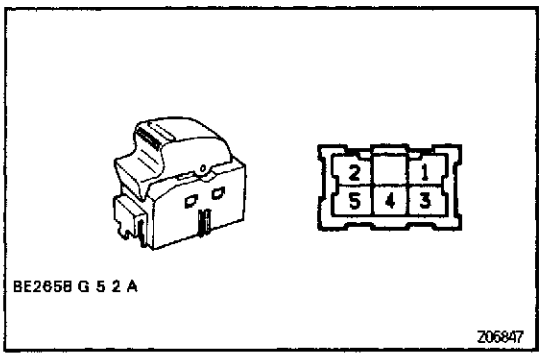
INSPECTION USING AN AMMETER

(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 flows approximately 7 amperes
(e) Check that the current increases approximately 14 5 amperes 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









INSPECTION USING AN AMMETER WITH A CURRENT-MEASURING PROBE

(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 flows approximately 7 amperes

(e) Check that the current increases approximately 14 5 amperes 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 operation is as specified, replace the master switch

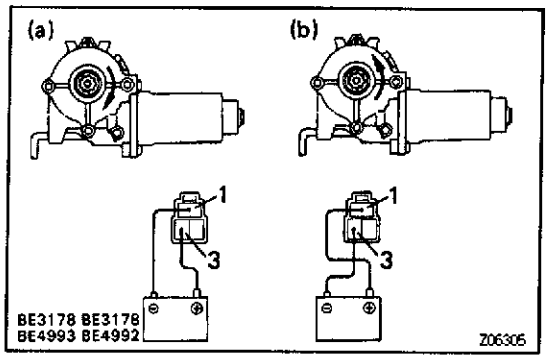
POWER WINDOW SWITCH INSPECTION

INSPECT POWER WINDOW SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
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



POWER WINDOW MOTOR INSPECTION

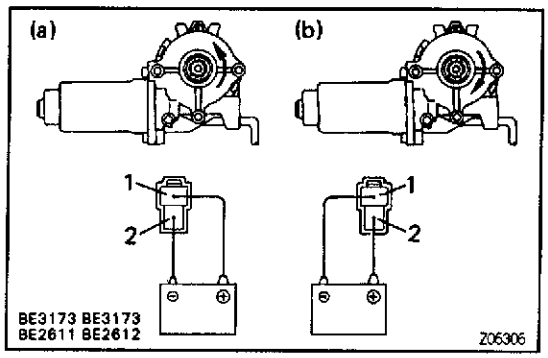
LEFT SIDE DOOR MOTOR/MOTOR OPERATION

Front Door:

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 1, check that the motor turns clockwise

(b) Reverse the polarity, check that the motor turns counterclockwise

If operation is not as specified, replace the motor

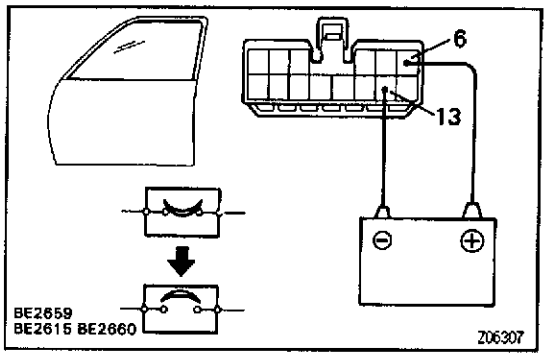


Rear Door:

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor turns counterclockwise

(b) Reverse the polarity, check that the motor turns clockwise

If operation is not as specified, replace the motor



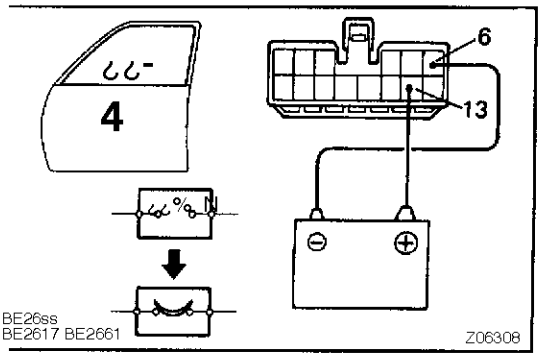
LEFT SIDE MOTOR/ CIRCUIT BREAKER OPERATION

Driver's Door:

(a) Disconnect the connector from the master switch

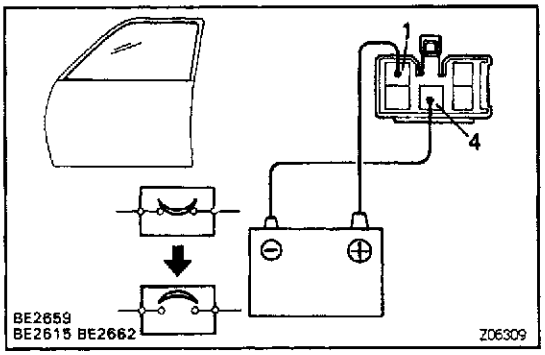
(b) Connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 13 on the wire harness side connector and raise the window to full closed position

(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds



(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds

If operation is not as specified, replace the motor



Passenger's Door:

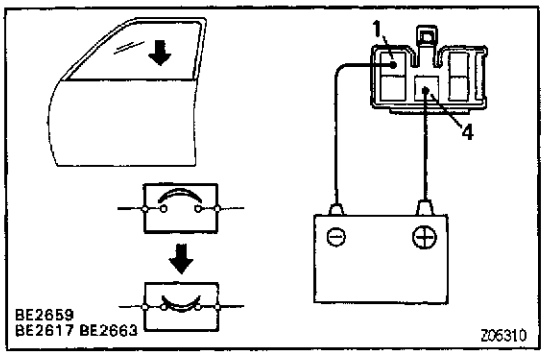
(a) Disconnect the connector from the power window switch

(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) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds

If operation is not as specified, replace the motor

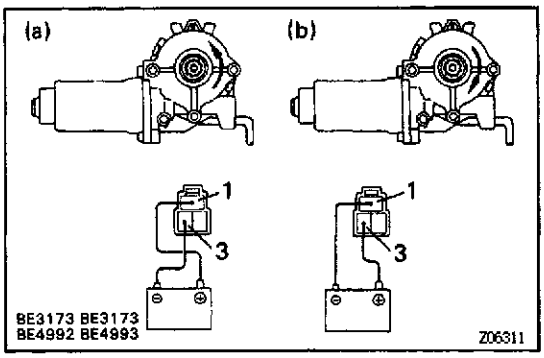


RIGHT SIDE DOOR MOTOR/MOTOR OPERATION

Front Door:

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3, check that the motor turns clockwise

(b) Reverse the polarity, check that the motor turns counterclockwise

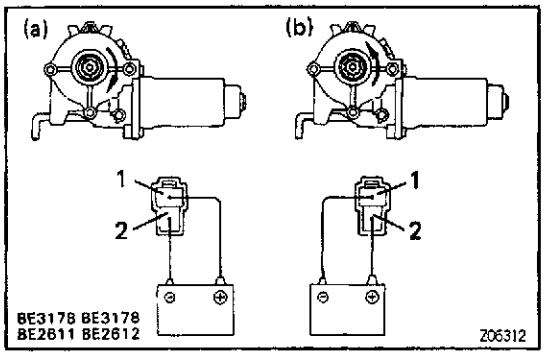


Rear Door:

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, check that the motor turns counterclockwise

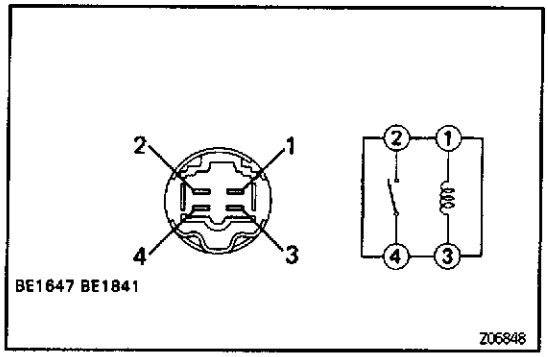
(b) Reverse the polarity, check that the motor turns clockwise

If operation is not as specified, replace the motor



RIGHT SIDE DOOR MOTOR/CIRCUIT BREAKER OPERATION

See step of left side motor on page BE-67 .



POWER MAIN RELAY INSPECTION

INSPECT POWER MAIN RELAY

Continuity

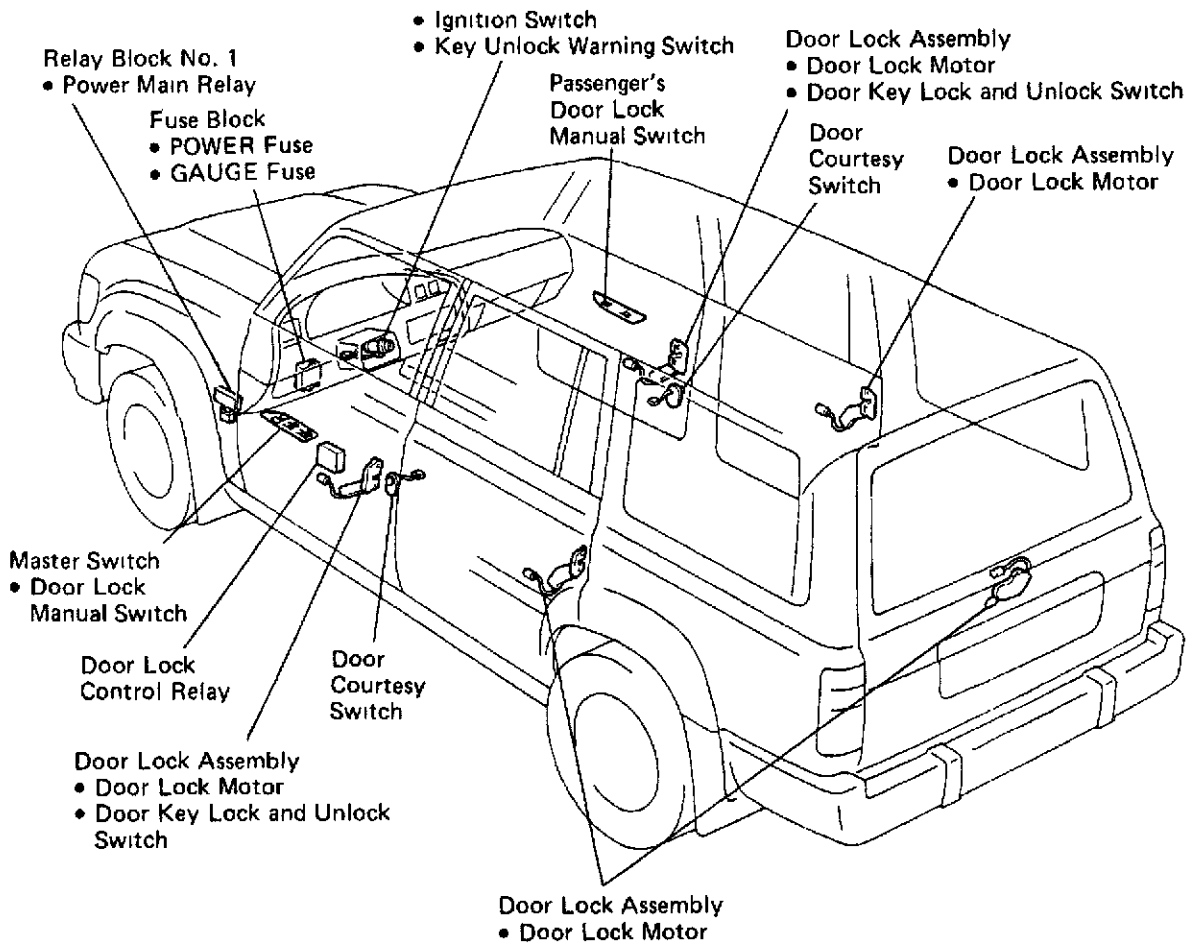
Condition	Tester connection to terminal number	Specified value
Constant	1-3	Continuity
Apply B + between terminals 1 and 3	2-4	Continuity

If continuity is not as specified, replace the relay

POWER DOOR LOCK CONTROL SYSTEM

BEGJZ-02

PARTS LOCATION



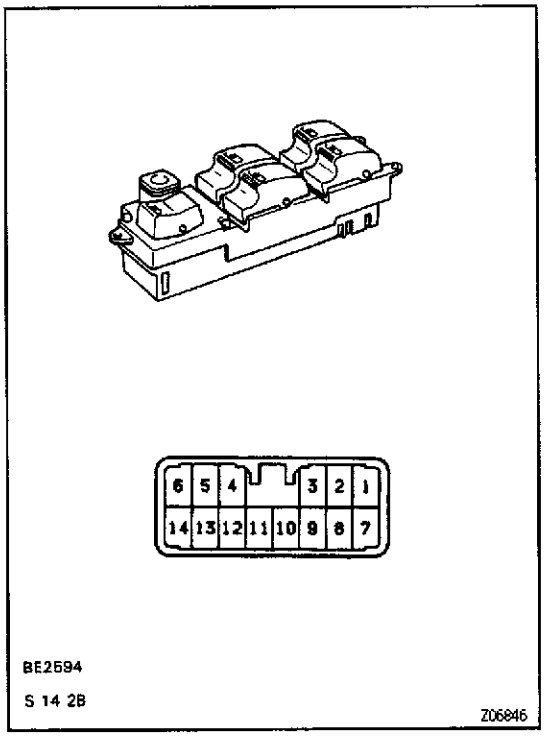
N09381

BE5K1-02

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Door lock system does not operate at all	1 POWER Fuse 2 Door Lock Motor 3 Door Lock Control Relay 4 Wire Harness	(BE-4) (BE-73) (BE-75)
Door lock system does not operate by manual switch	1 Door Lock Manual Switch 2 Door Lock Control Relay 3 Wire Harness	(BE-72) (BE-75)
Door lock system does not operate by door key	1 Door Key Lock and Unlock Switch 2 Door Lock Control Relay 3 Wire Harness 4 Door Lock Link Disconnected	(BE-72) (BE-75)
Fault in key confine prevention operate	1 Door Lock Control Relay 2 Key Unlock Warning Switch 3 Door Courtesy Switch 4 Wire Harness	(BE-75) (BE-14) (BE-28)



POWER WINDOW MASTER SWITCH INSPECTION

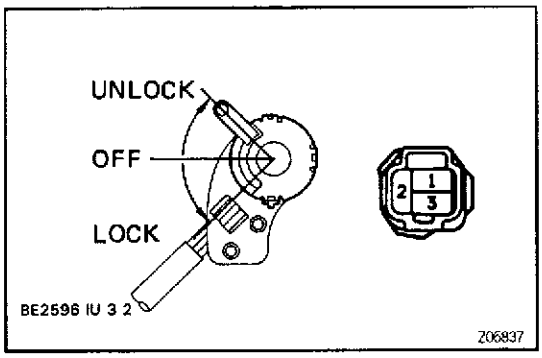
BE0K3-02

INSPECT POWER WINDOW MASTER SWITCH

Master Switch: Driver's Door Lock Manual Switch/ Continuity

Switch position	Tester connection to terminal number	Specified value
LOCK	1 or 2 - 4	Continuity
OFF	–	No continuity
UNLOCK	1 or 2-3	Continuity

If continuity is not as specified, replace the switch



DOOR KEY LOCK AND UNLOCK SWITCH INSPECTION

INSPECT DOOR KEY LOCK AND UNLOCK SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
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

KEY UNLOCK WARNING SWITCH INSPECTION

BE0K6-02

INSPECT KEY UNLOCK WARNING SWITCH

See key confine prevention system on page BE-14 .

DOOR COURTESY SWITCH INSPECTION

INSPECT DOOR COURTESY SWITCH

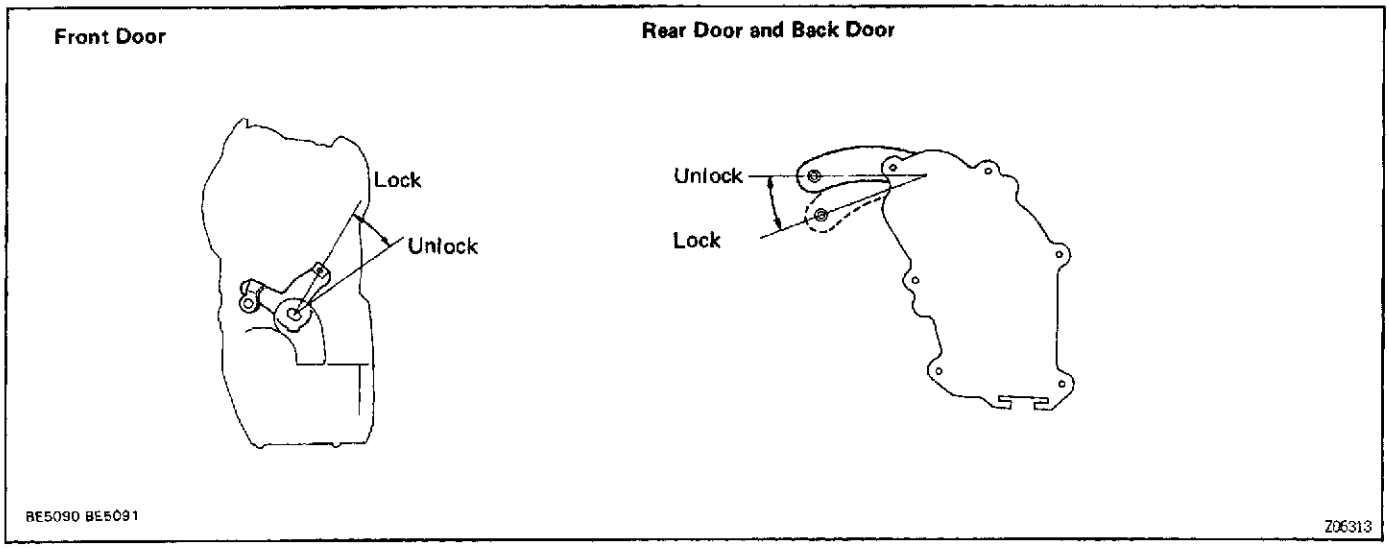
See open door warning system on page BE-54 .

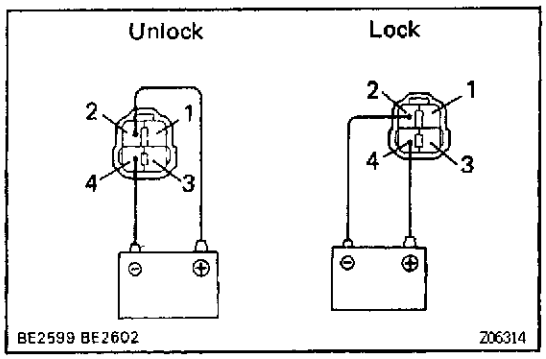
DOOR LOCK MOTOR INSPECTION

BE0KA-02

INSPECT DOOR LOCK MOTOR

Motor Operation

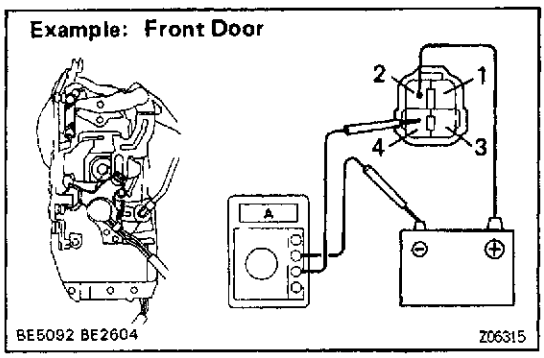




(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 4, check that the door lock link moves to UNLOCK position

(b) Remove the polarity, check that the door lock link move to LOCK position

If operation is not as specified, replace the door lock assembly



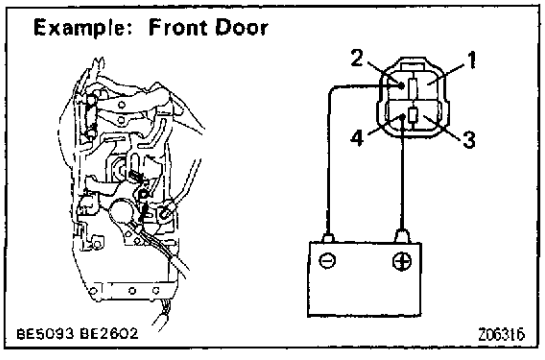
PTC THERMISTOR OPERATION

INSPECTION USING AN AMMETER

(a) Connect the positive (+) lead from the battery to terminal 2

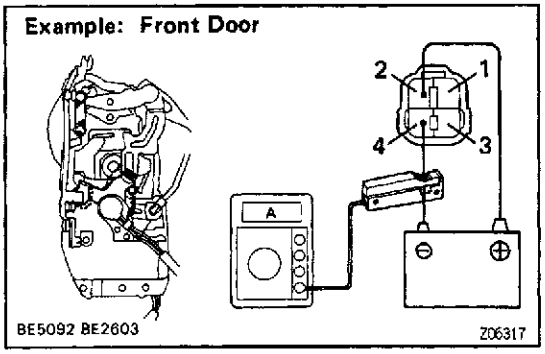
(b) Connect the positive (+) lead from the ammeter to terminal 4 and the negative (-) lead to battery negative (-) terminal, check that the current changes from approximately 3 2 ampere to less than 0 5 ampere with 20 to 70 seconds

(c) Disconnect the leads from terminals



(d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 2, check that the door lock moves to LOCK position

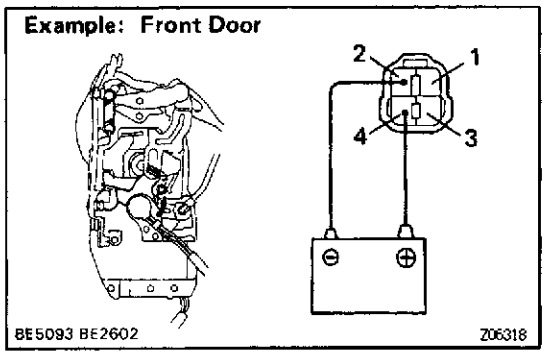
If operation is not as specified, replace the door lock assembly



INSPECTION USING AN AMMETER WITH A CURRENT-MEASURING PROBE

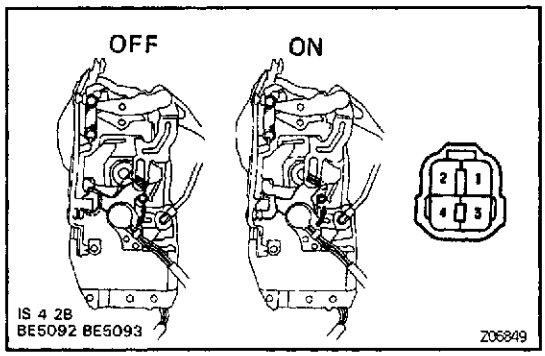
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 4

(b) Attach a current-measuring probe to either the positive (+) lead or the negative (-) lead, check that the current changes from approximately 3 2 ampere to less than 0 5 ampere within 20 to 70 seconds



(c) Disconnect the leads from terminals

(d) Approximately 60 seconds later, reverse the polarity, check that the door lock moves to LOCK position
If operation is not as specified, replace the door lock assembly



BE0K8-01

DOOR UNLOCK DETECTION SWITCH INSPECTION

INSPECT DOOR UNLOCK DETECTION SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
OFF (Door lock set to LOCK)	–	No continuity
ON (Door lock set to UNLOCK)	1-3	Continuity

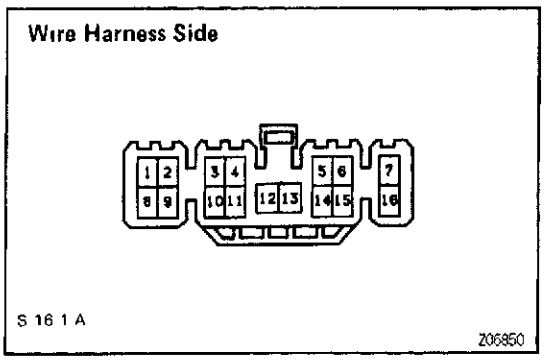
If continuity is not as specified, replace the door lock assembly

BE0KD-01

POWER MAIN RELAY INSPECTION

INSPECT POWER MAIN RELAY

See power main relay on page BE-69 .



DOOR LOCK CONTROL RELAY INSPECTION

BE0KF-01

INSPECT DOOR LOCK CONTROL RELAY

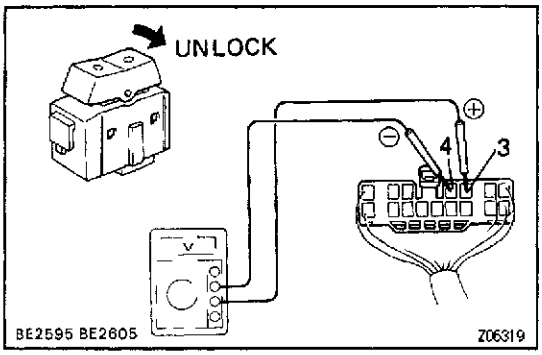
Relay Circuit

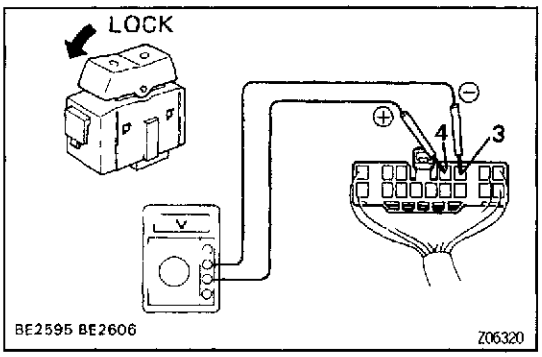
Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart

Tester connection to terminal number	Condition	Specified value (Continuity)
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 or turned to lock)	No continuity
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
1 1 - Ground	Door Lock Manual Switch Position OFF or LOCK	No continuity
1 1 - Ground	Door Lock Manual Switch Position UNLOCK	Continuity
12 - Ground	Passenger s Door Key Lock and Unlock Switch Position OFF or UNLOCK (Door key free or turned to unlock)	No continuity
12 - Ground	Passenger s Door Key Lock and Unlock Switch Position LOCK (Door key turned to lock)	Continuity

Tester connection to terminalnumber	Condition	Specified value (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
Tester connection to terminal number	Condition	Specified value (Voltage)
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





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, check that the voltage rises from 0 volts to battery positive voltage for approximately 0 2 seconds

(d) Reverse the polarity of the voltmeter leads

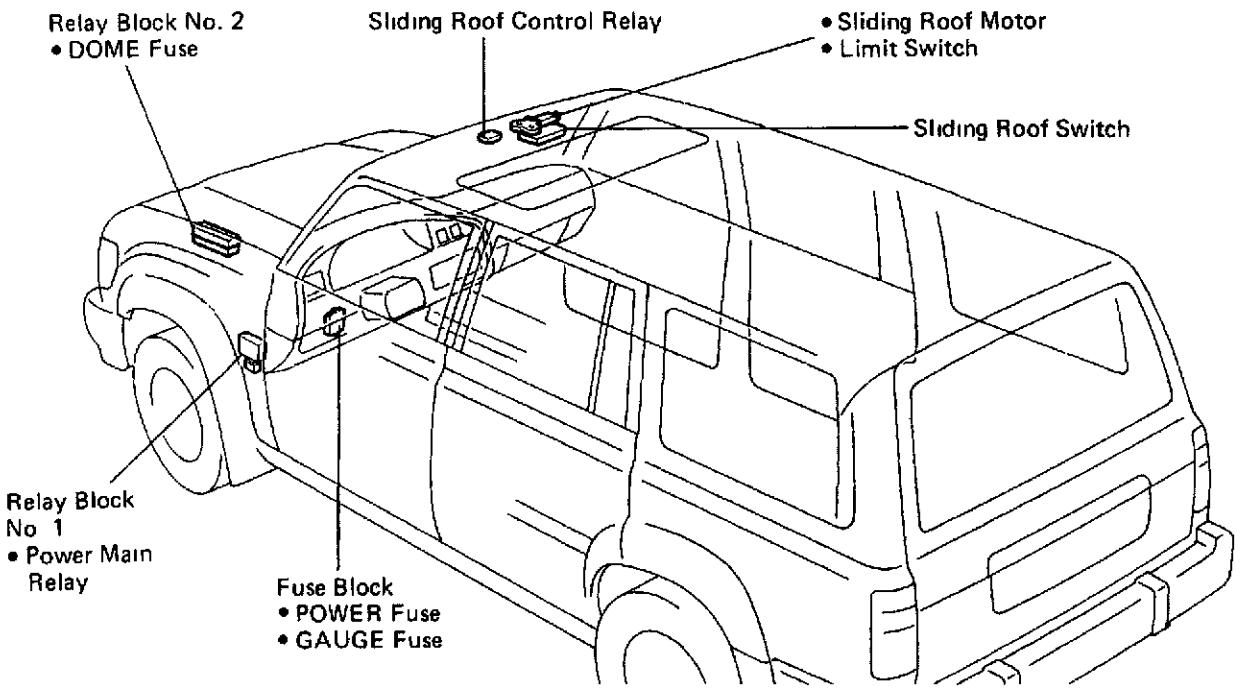
(e) Set the door lock manual switch to LOCK, check that the voltage rises from 0 volts to battery positive voltage for approximately 0 2 seconds

If operation is not as specified, replace the relay

B50LJ-02

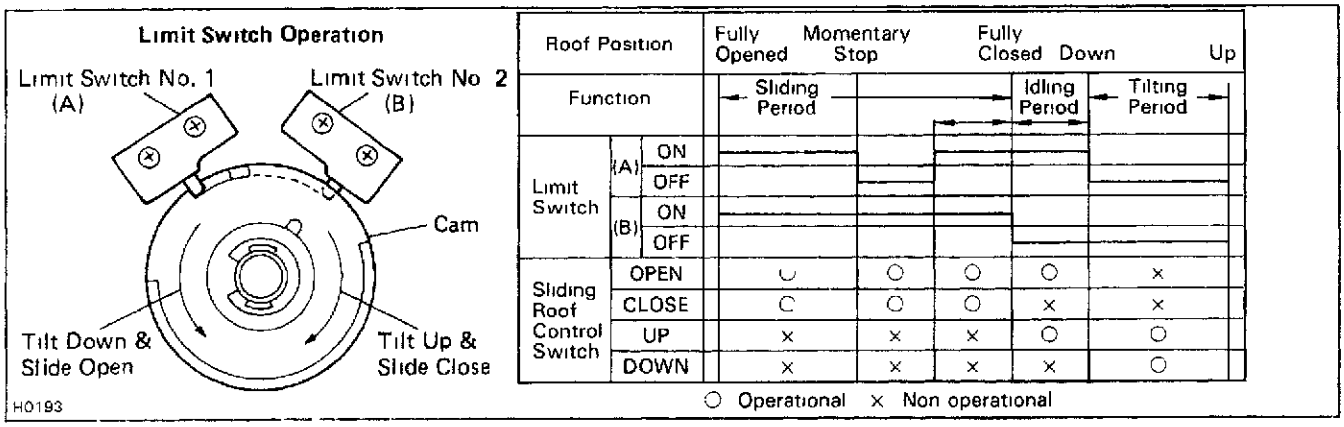
SLIDING ROOF SYSTEM

PARTS LOCATION



N09382

B60LK-02



Roof Position			Fully Opened	Momentary Stop		Fully Closed	Down	Up
Function			← Sliding Period →			Idling Period	← Tilting Period →	
Limit Switch	(A)	ON						
		OFF						
	(B)	ON						
		OFF						
Sliding Roof Control Switch	OPEN		○	○	○	○	×	
	CLOSE		○	○	○	×	×	
	UP		×	×	×	○	○	
	DOWN		×	×	×	×	○	

○ Operational × Non operational

V02749

SYSTEM DESCRIPTION

STANDBY OPERATION

- Current flows from the DOME fuse to terminal 12 of the Sliding Roof Relay (hereafter called relay)
- When the ignition switch is on, the current flows from the POWER fuse to terminal 6 of the relay

OPERATION

1. OPEN operation

When the switch on the "OPEN" side of the control switch is pushed, continuity is produced between terminal 1 of the relay and body ground Then, the relay operates, the current flows through terminal 6 of the relay -ı terminal 5 - terminal 1 of the sliding roof motor - terminal 3 -ı terminal 4 of the relay - terminal 11 -ı the body ground, and the motor starts to run in order to open the sliding roof

2. CLOSE operation

When the switch on the "CLOSE" side of the control switch is pushed, continuity is produced between terminal 2 of the relay and body ground Then, the relay operates, the current flows through terminal 6 of the relay - terminal 4 - terminal 3 of the sliding roof motor - terminal 1 - terminal 5 of the relay - terminal 11 - the body ground, and the motor starts to run in order to close the sliding roof

Momentary Stop

When the sliding roof reaches about 100 mm (3 94 in) short of the fully closed position, limit switch A is turned from ON to OFF, so there is no continuity between terminal 8 of the relay and the body ground As a result, because the relay ceases to operate, the sliding roof of stops at that position Release the control switch, then press the "CLOSE" side of the control switch again Then the sliding will then roof move to fully closed position

3. Tilt up operation (Fully close position)

When the switch on the "UP" side of the control switch is pushed, continuity is produced between terminal 3 of the relay and body ground Then, the relay operates, the current flows through terminal 6 of the relay -ı terminal 4 -ı terminal 3 of the sliding roof motor -) terminal 1 -) terminal 5 of the relay -ı terminal 11 -ı the body ground, and the motor starts to run in order to tilt up sliding roof

4. Tilt Down operation (Fully close position)

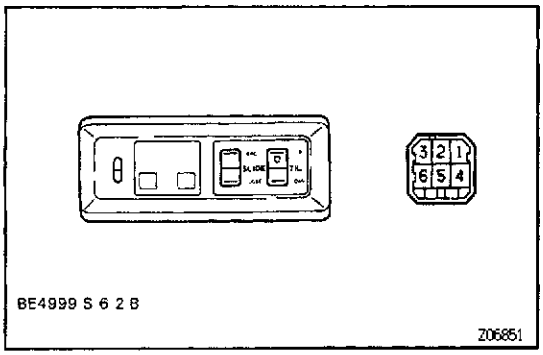
When the switch on the "DOWN" side of the control switch is pushed, continuity is produced between terminal 7 of the relay and body ground Then the relay operates, the current flows through terminal 6 of the relay -I terminal 5 -I terminal 1 of the sliding roof motor -I terminal 3 - terminal 4 of the relay -I terminal 11 -) the body ground, and the motor starts to run in order to tilt down the sliding roof

TROUBLESHOOTING

BE0LL-01

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Sliding roof system does not operate	1 GAUGE Fuse	(BE-4)
	2 Ignition Switch	(BE- 13)
	3 POWER Fuse	(BE-4)
	4 Power Main Relay	(BE-69)
	5 Sliding Roof Control Switch	(BE-80)
	6 Sliding Roof Limit Switch	(BE-80)
	7 Sliding Roof Motor	(BE-81)
	8 Sliding Roof Control Relay	(BE-82)
	9 Wire Harness	



BE0LM--02

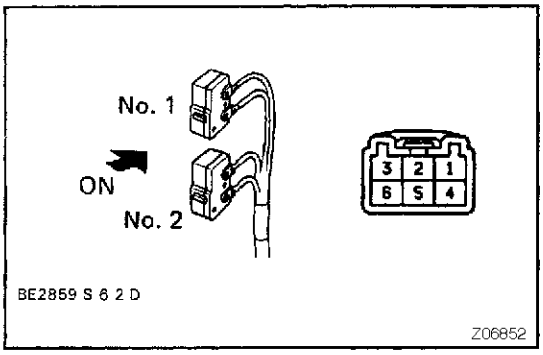
SLIDING ROOF CONTROL SWITCH INSPECTION

INSPECT SLIDING ROOF CONTROL SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
SLIDE OPEN	3-4	Continuity
SLIDE OFF	–	No continuity
SLIDE CLOSE	6-4	Continuity
TILT DOWN	2-4	Continuity
TILT OFF	–	No continuity
TILT UP	5-4	Continuity

If continuity is not as specified, replace the switch



BE0LN--01

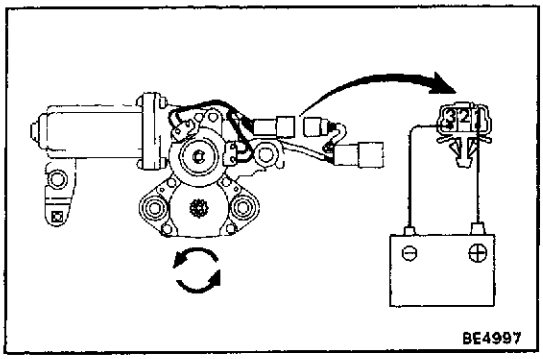
SLIDING ROOF LIMIT SWITCH INSPECTION

INSPECT SLIDING ROOF LIMIT SWITCH

Continuity

Switch position	Tester connection to terminal number	Specified value
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



SLIDING ROOF MOTOR INSPECTION

BE0LF-02

INSPECT SLIDING ROOF MOTOR

Motor Operation

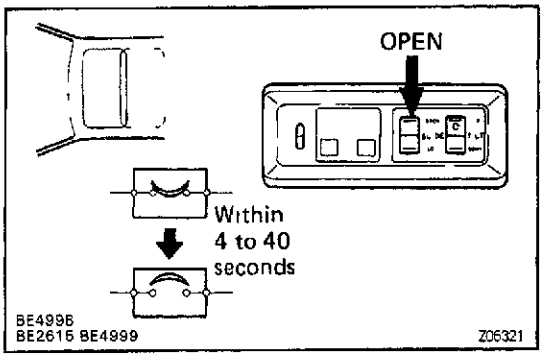
(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3, check that the motor turns to clockwise

(b) Reverse the polarity, check that the motor turns to clockwise

If operation is not as specified, replace the motor

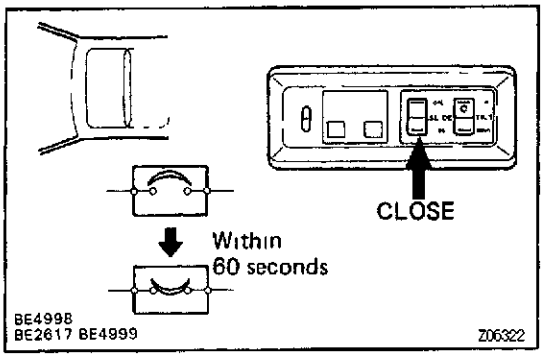
Circuit Breaker Operation

(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



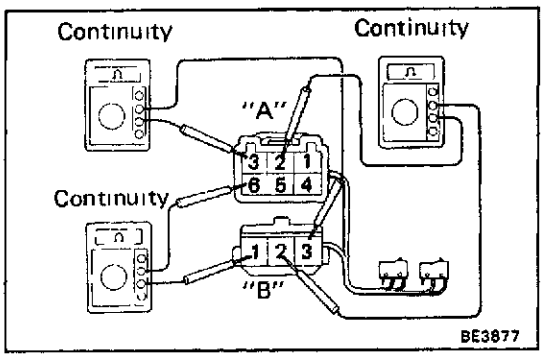
MOTOR WIRE CIRCUIT

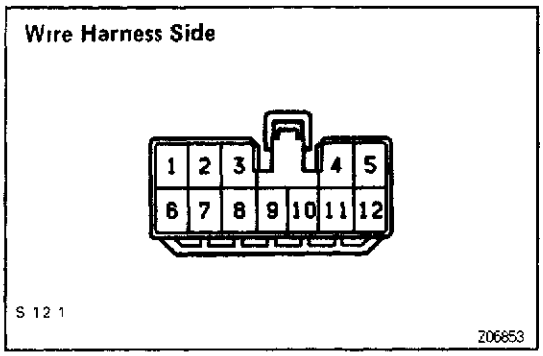
(a) Check that there is continuity between terminals A2 and B2

(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





SLIDING ROOF RELAY INSPECTION

B50LQ-01

INSPECT SLIDING ROOF RELAY

Relay Circuit

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart

Tester connection to terminal number	Condition	Specified value (Continuity)
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
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	* Continuity
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

Tester connection to terminal number	Condition	Specified value (Voltage)
6 - Ground	Ignition switch position LOCK or ACC	No voltage
6 - Ground	Ignition switch position ON	Battery positive voltage
12 - Ground	Constant	Battery positive voltage

* There is resistance because this circuit is include motor

If circuit is as specified, replace the relay

If circuit is not as specified, inspect the circuits connected to other parts

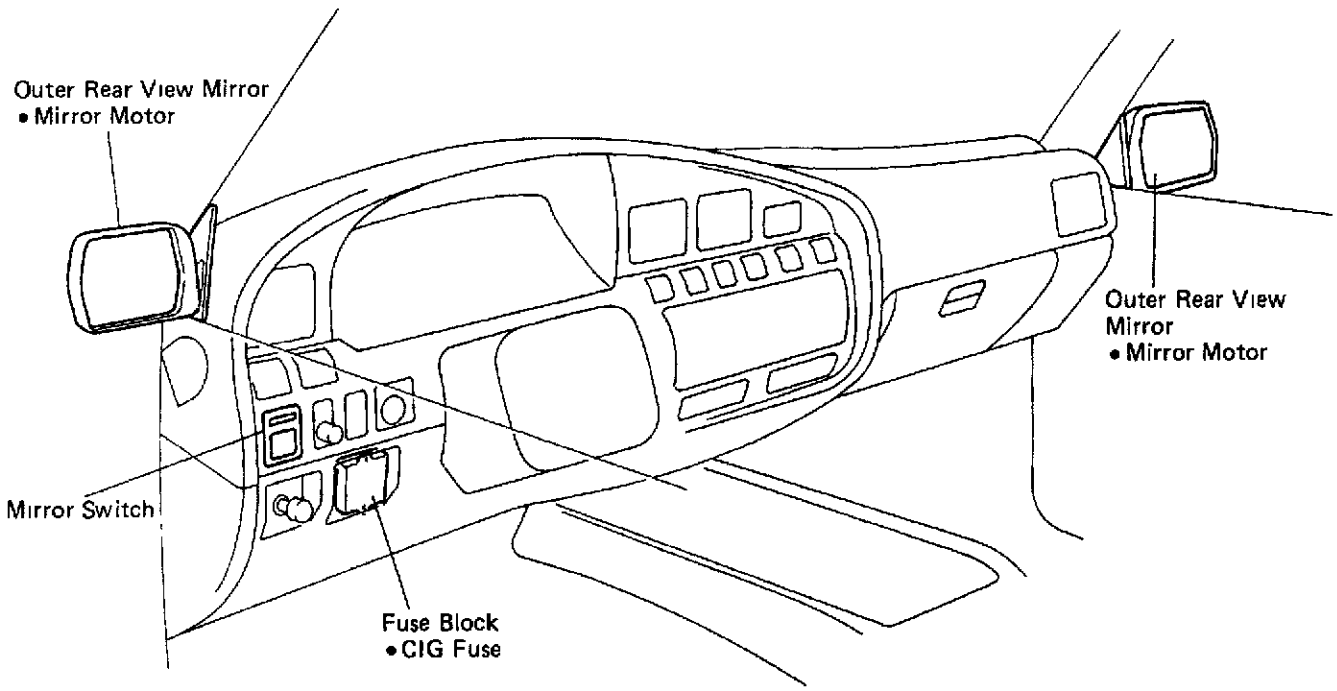
POWER MAIN RELAY INSPECTION BEDLR-01

INSPECT POWER MAIN RELAY

See power main relay on page BE-69 .

POWER MIRROR CONTROL SYSTEM

PARTS LOCATION



BE5095

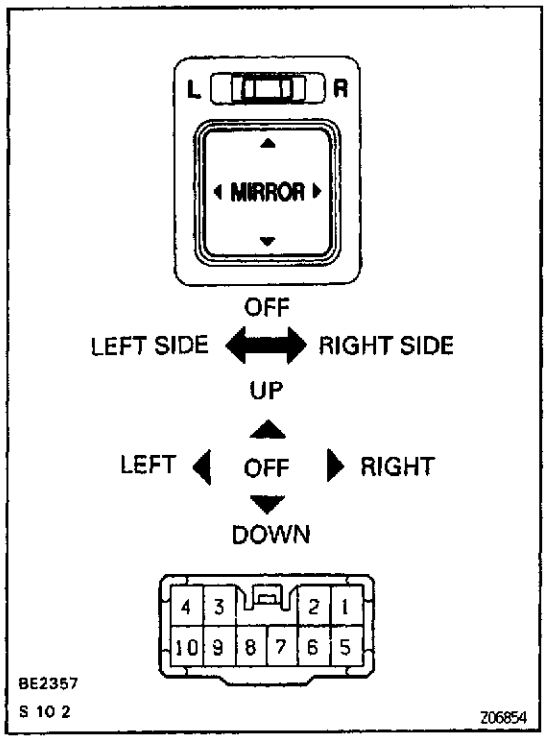
Z05813

BE0KL-02

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Remote Control Mirror does not operate	1 CIG Fuse	(BE-4)
	2 Mirror Switch	(BE-85)
	3 Mirror Motor	(BE-86)
	4 Wire Harness	



BE0KM-01

MIRROR SWITCH INSPECTION

INSPECT MIRROR SWITCH

Continuity

LEFT SIDE

Switch position	Tester connection to terminal number	Specified value
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

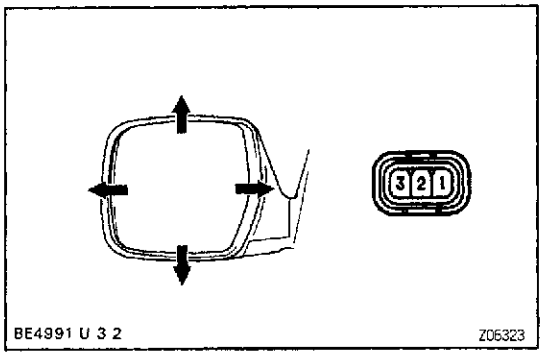
OFF

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
UP	3-4	Continuity
DOWN	1-3	Continuity
LEFT	3-4	Continuity
RIGHT	1-3	Continuity

RIGHT SIDE

Switch position	Tester connection to terminal number	Specified value
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



MIRROR MOTOR INSPECTION

BE0KP–01

INSPECT MIRROR MOTOR

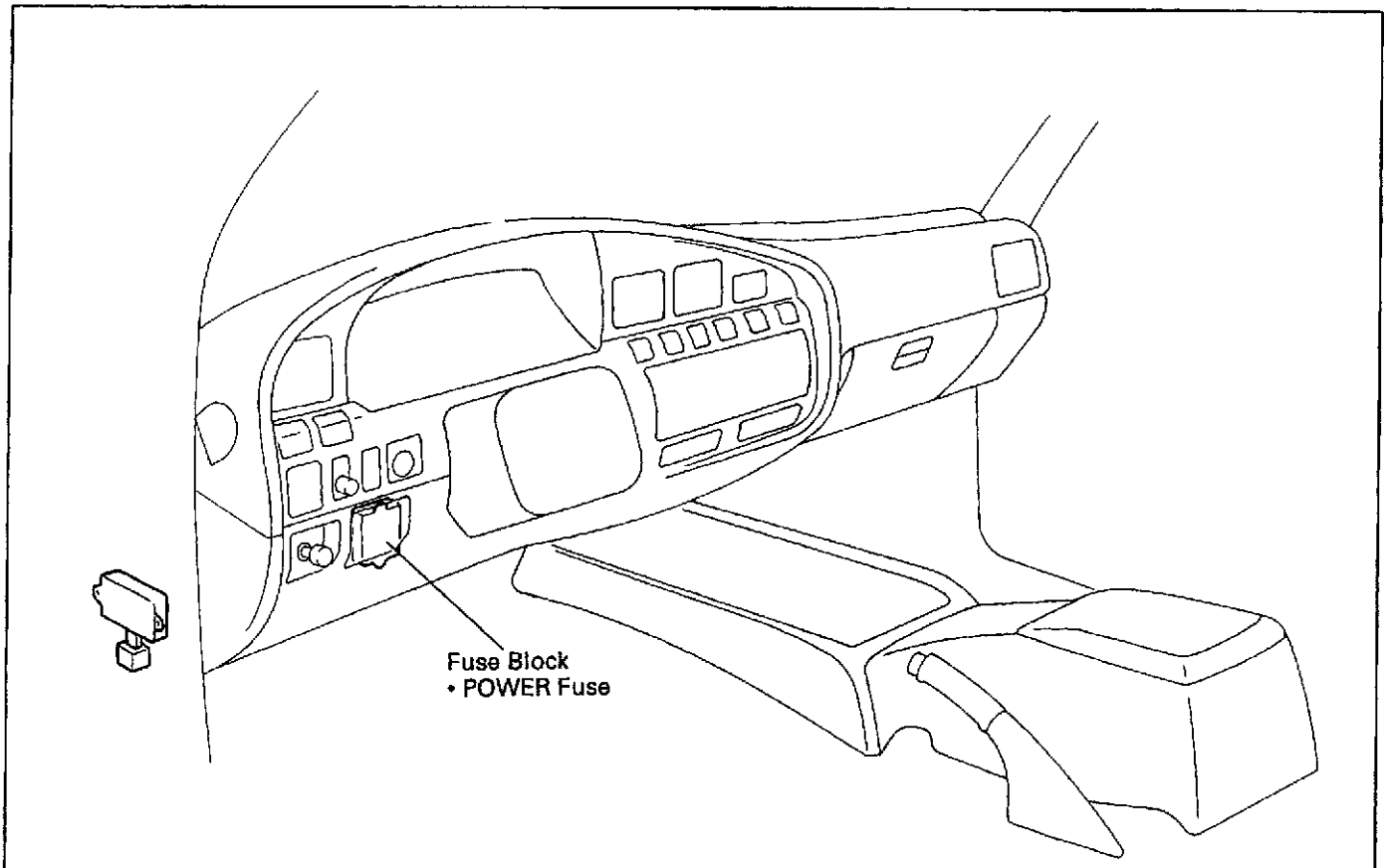
Connect the positive (+) lead from the battery to terminal in column "A" and the negative (-) lead to terminal in column "B", check that the mirror operates in column "C"

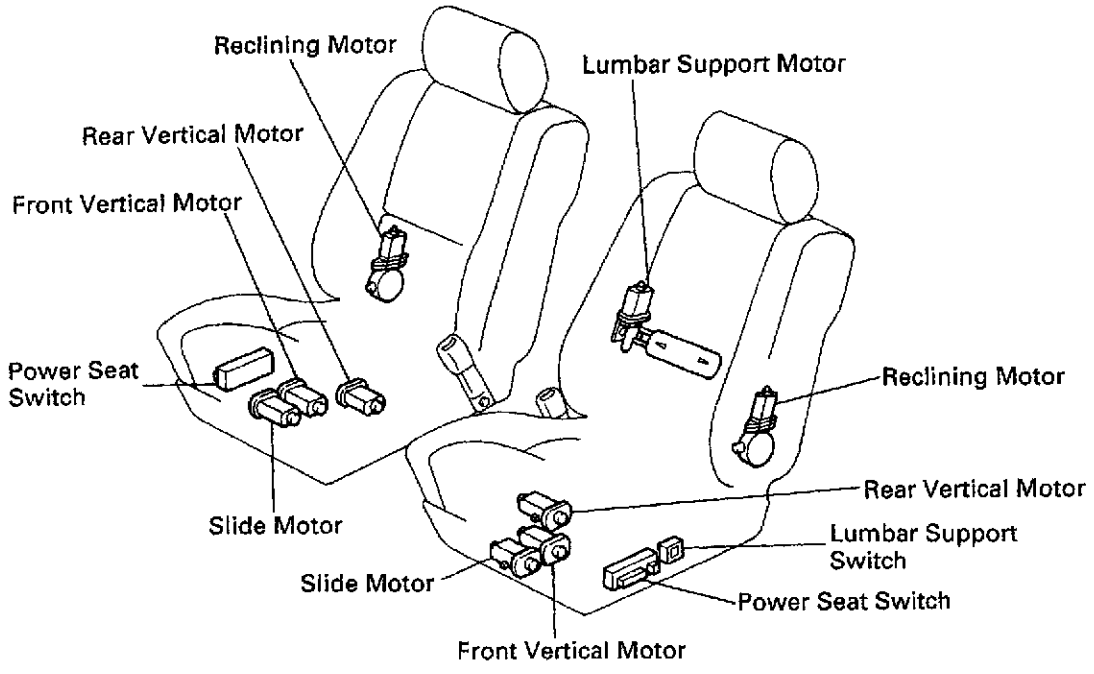
Switch position	Tester connection to terminal number	Specified value
A (+)	B (-)	C (Operation)
2	3	Mirror turns upward
3	2	Mirror turns downward
1	3	Mirror turns to left side
3	1	Mirror turns to right side

If operation is not as specified, replace the mirror assembly

POWER SEAT CONTROL SYSTEM BE0KR-02

PARTS LOCATION





N09371
N06200

Z10139

BE0KT-01

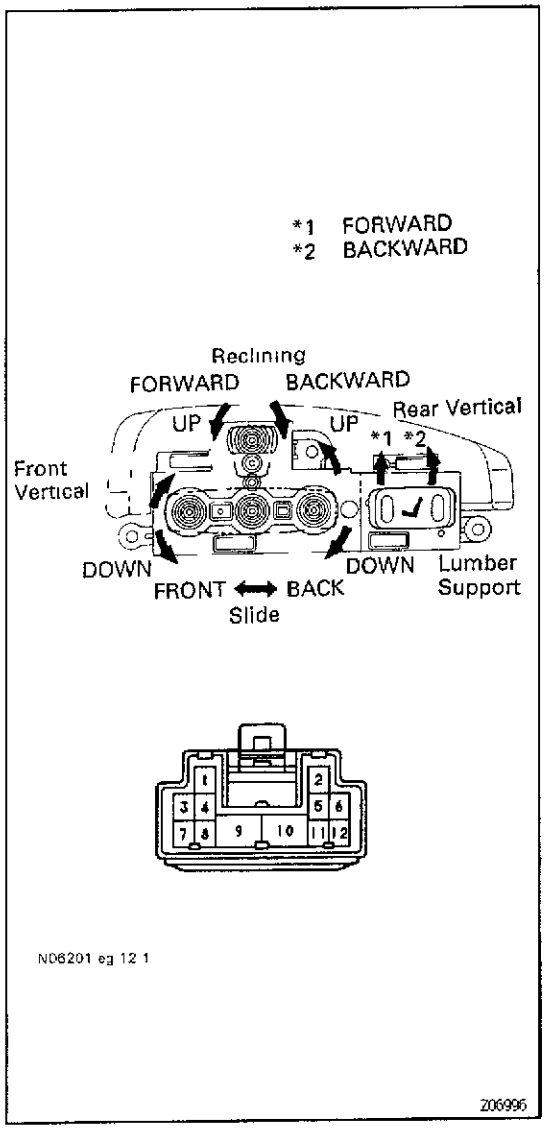
TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems The most likely causes of the malfunction are shown in the order of their probability Inspect each part in the order shown, and replace the part when it is found to be faulty

Trouble	Parts name	(See page)
Power seat does not operate (Door Lock does not operate)	1 FL AM 1 2 POWER Fuse 3 Wire Harness 4 Power Seat Switch (D) 4 Power Seat Switch (P)	(BE-4) (BE-4) (BE-89) (BE-90)
Driver s seat does not operate	1 Power Seat Switch (D) 2 Wire Harness	(BE-89)
Passenger s seat does not operate	1 Power Seat Switch (P) 2 Wire Harness	(BE-90)
Slide operation does not operate	1 Power Seat Switch (D) 1 Power Seat Switch (P) 2 Wire Harness 3 Slide Motor (D P)	(BE-89) (BE-90) (BE-91)
Front Vertical Operation does not operate	1 Power Seat Switch (D) 2 Wire Harness 3 Front Vertical Motor (D)	(BE-91) (BE-91)
Rear Vertical Operation does not operate	1 Power Seat Switch (D) 2 Wire Harness 3 Rear Vertical Motor (D)	(BE-92) (BE-92)
Reclining Operation does not operate	1 Power Seat Switch (D) 1 Power Seat Switch (P) 2 Wire Harness 3 Reclining Motor (D P)	(BE-89) (BE-90) (BE-93)

(D) Driver's Seat
(P) Passenger's Seat

BE0KV-02



POWER SEAT SWITCH INSPECTION

INSPECT POWER SEAT SWITCH

DRIVER'S SIDE:

Continuity

Inspect the switch continuity between terminals

SLIDE SWITCH

Switch position	Tester connection to terminal number	Specified value
FORWARD	5 - 10 8-9	Continuity
OFF	5-8-9	Continuity
BACKWARD	5 - 9 8- 10	Continuity

FRONT VERTICAL SWITCH

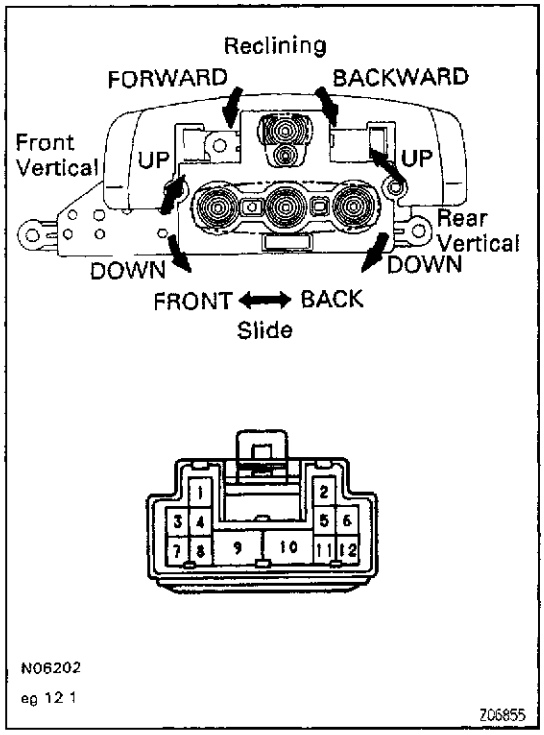
Switch position	Tester connection to terminal number	Specified value
UP	4- 11 10 - 12	Continuity
OFF	4 - 11 - 12	Continuity
DOWN	4- 12 10 - 11	Continuity

REAR VERTICAL SWITCH

Switch position	Tester connection to terminal number	Specified value
UP	2- 10 6 - 7	Continuity
OFF	2 - 6 - 7	Continuity
DOWN	2 - 7 6- 10	Continuity

RECLINING SWITCH

Switch position	Tester connection to terminal number	Specified value
FORWARD	4 - 10 7-9	Continuity
OFF	4 - 7 - 9	Continuity
BACKWARD	4-9 7-10	Continuity



LUMBAR SUPPORT SWITCH

Switch position	Tester connection to terminal number	Specified value
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

PASSENGER'S SIDE:

Continuity

Inspect the switch continuity between terminals

SLIDE SWITCH

Switch position	Tester connection to terminal number	Specified value
FORWARD	5 - 10 8-9	Continuity
OFF	5-8-9	Continuity
BACKWARD	5-9 8- 10	Continuity

FRONT VERTICAL SWITCH

Switch position	Tester connection to terminal number	Specified value
UP	4- 11 10 - 12	Continuity
OFF	4- 11 - 12	Continuity
DOWN	4- 12 10- 11	Continuity

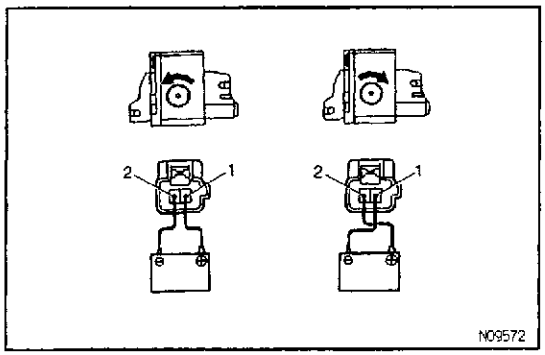
REAR VERTICAL SWITCH

Switch position	Tester connection to terminal number	Specified value
UP	2 - 10 6-7	Continuity
OFF	2 - 6 - 7	Continuity
DOWN	2 - 7 6 - 10	Continuity

RECLINING SWITCH

Switch position	Tester connection to terminal number	Specified value
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



POWER SEAT MOTOR INSPECTION

INSPECT SLIDE MOTOR

Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor turns counterclockwise

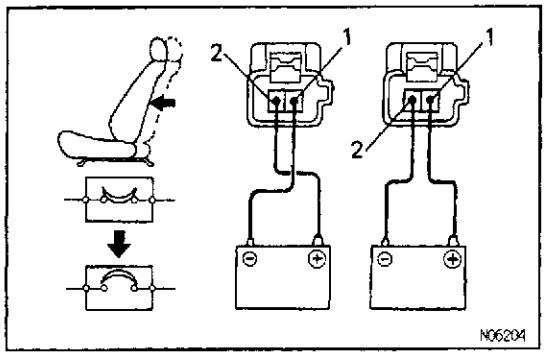
(b) Reverse the polarity, check that the motor turns clockwise

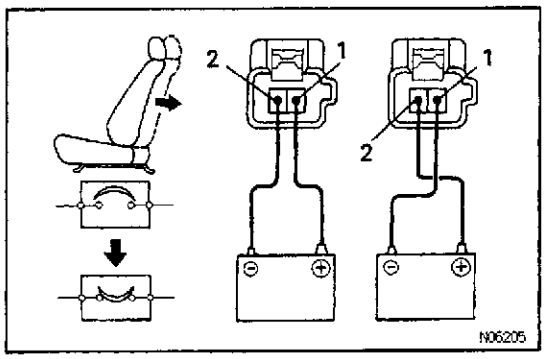
If operation is not as specified, replace the motor

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

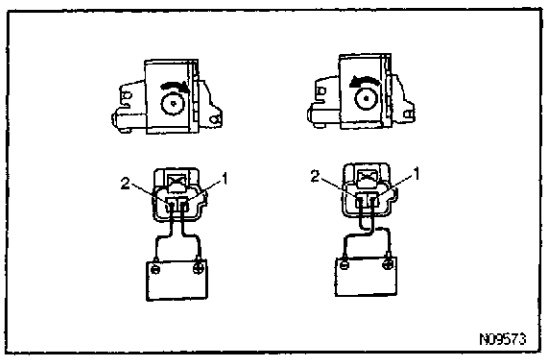
(b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds





(c) Reverse the polarity, check that the seat begins to move backwards within approximately 60 seconds

If operation is not as specified, replace the motor



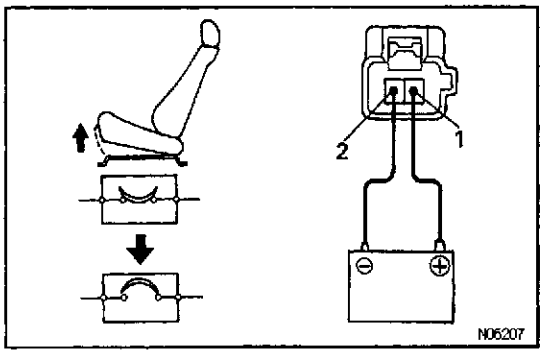
INSPECT FRONT VERTICAL MOTOR

Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor turns clockwise

(b) Reverse the polarity, check that the motor turns counterclockwise

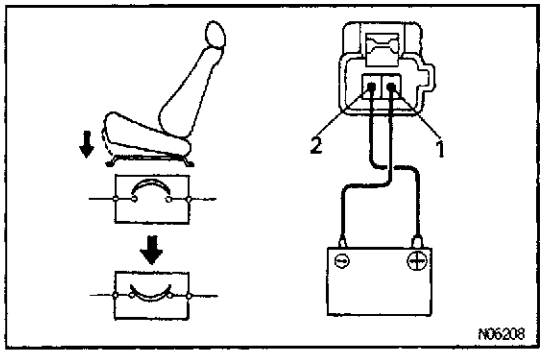
If operation is not as specified, replace the motor



Circuit Breaker Operation

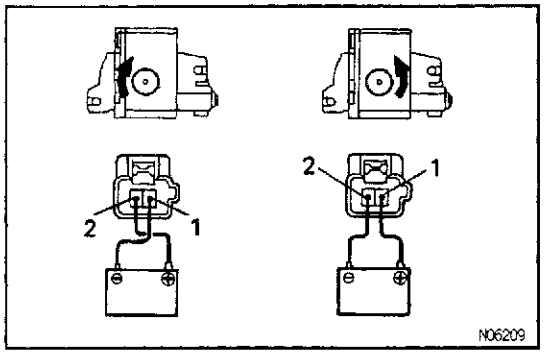
(a) Connect the positive (+) lead and the negative (-) lead from the battery to the front vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position

(b) Continue to apply voltage, 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



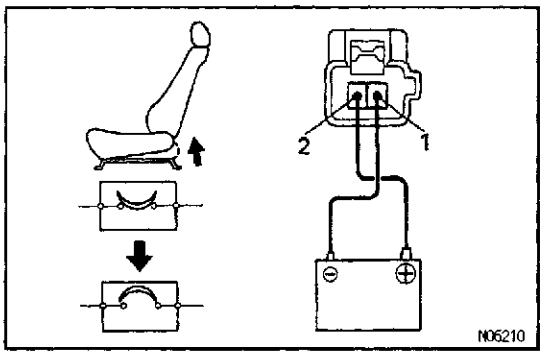
INSPECT REAR VERTICAL MOTOR

Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, check that the motor turns clockwise

(b) Reverse the polarity, check that the motor turns counterclockwise

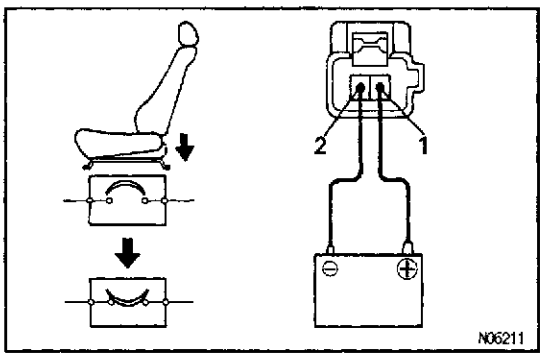
If operation is not as specified, replace the motor



Circuit Breaker Operation

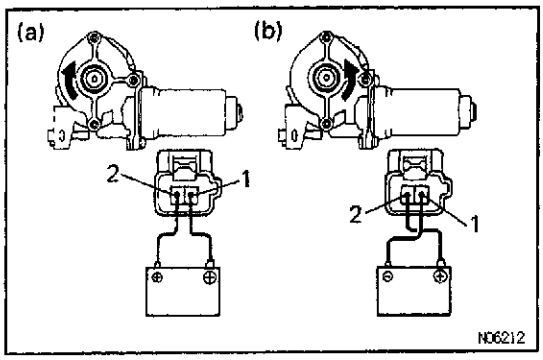
(a) Connect the positive (+) lead and the negative (-) lead from the battery to the rear vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position

(b) Continue to apply voltage, 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

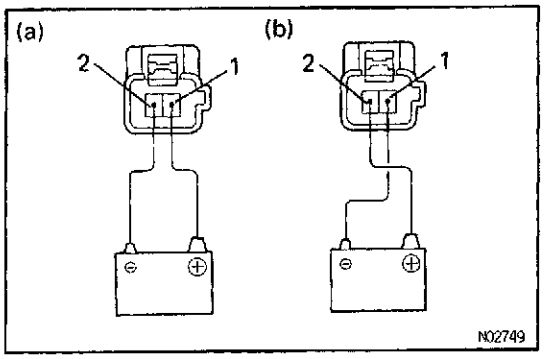
If operation is not as specified replace the motor



INSPECT RECLINING MOTOR

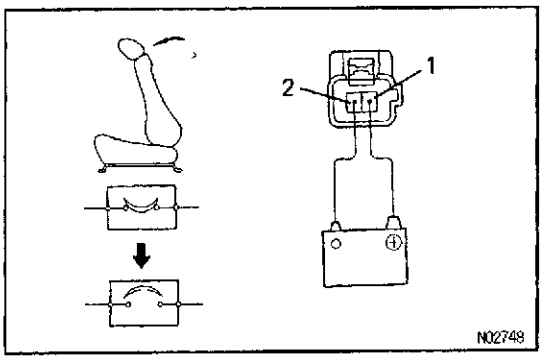
Motor Operation Driver's Seat

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor turns clockwise
(b) Reverse the polarity, check that the motor turns counterclockwise
If operation is not as specified, replace the motor



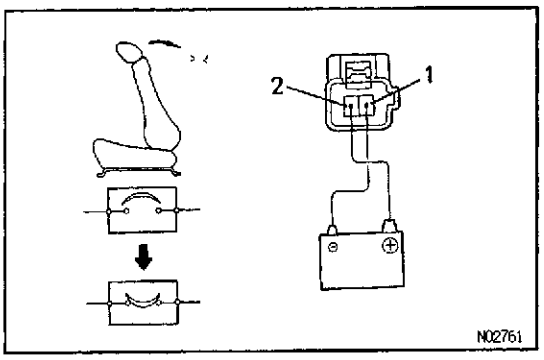
Motor Operation Passenger's Seat

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the motor turns counterclockwise
(b) Reverse the polarity, check that the motor turns clockwise
If operation is not as specified, replace the motor

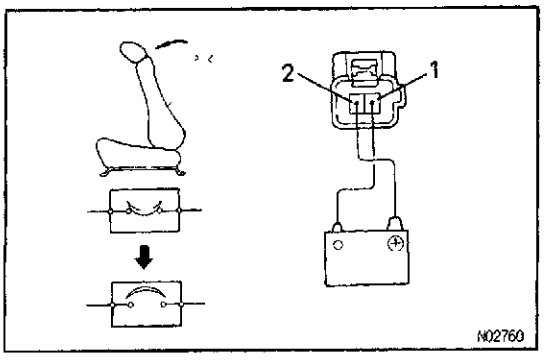


Circuit Breaker Operation Driver's Seat

(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

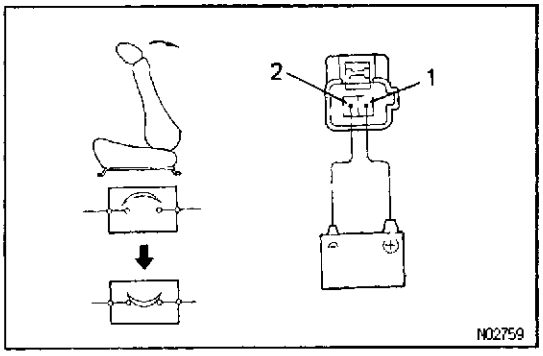


(b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 40 seconds
(c) Reverse the polarity, check that the seat back starts to fall backwards within approximately 60 seconds
If operation is not as specified, replace the motor

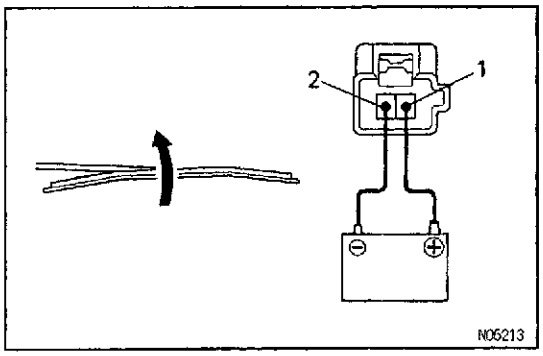


Circuit Breaker Operation Passenger's Seat

(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, check that there is a circuit breaker operation noise within 4 to 40 seconds



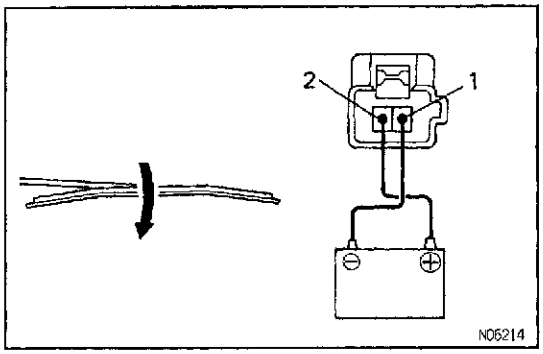
(c) Reverse the polarity, check that the seat back starts to fall backwards within approximately 60 seconds
If operation is not as specified, replace the motor



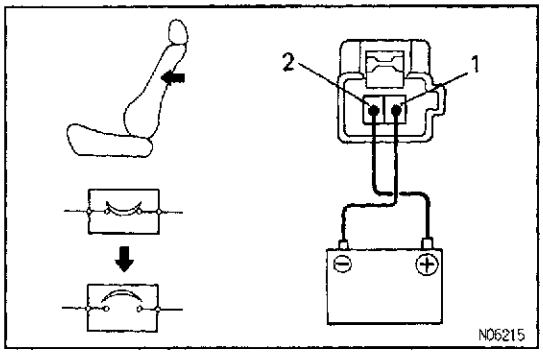
INSPECT LUMBAR SUPPORT MOTOR

Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, check that the lumbar support moves release side

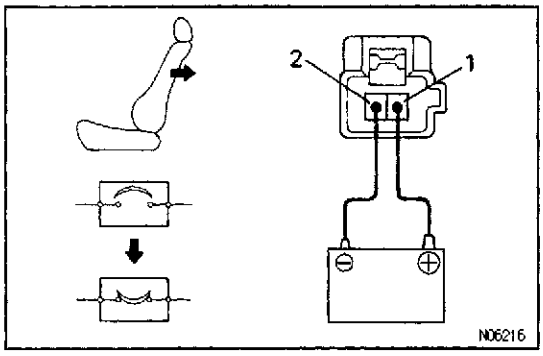


(b) Reverse the polarity, check that the lumbar support moves forward
If operation is not as specified, replace the motor



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, check that there is a circuit breaker operation noise within 4 to 60 seconds

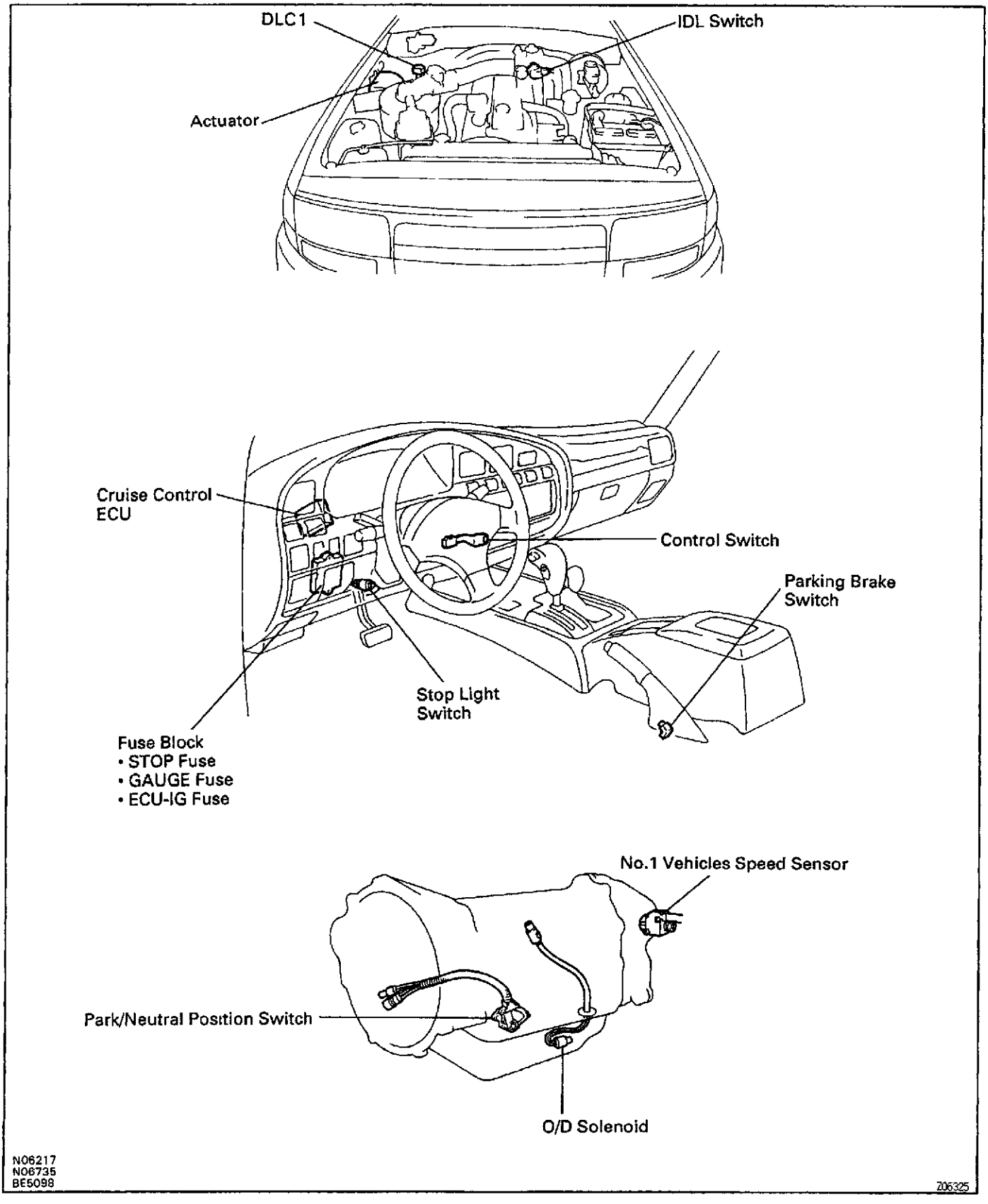


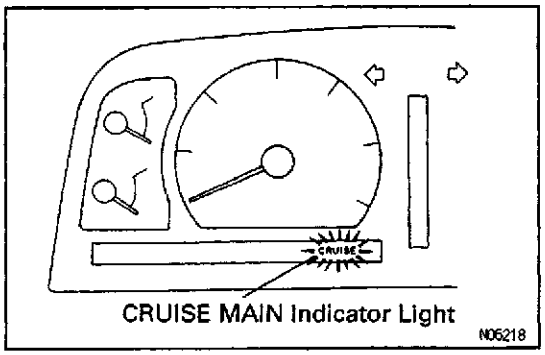
(c) Reverse the polarity, check that the lumber support begins to move release side within approximately 60 seconds
If operation is not as specified, replace the motor

CRUISE CONTROL SYSTEM

BE0KZ-01

PARTS LOCATION





DIAGNOSIS SYSTEM

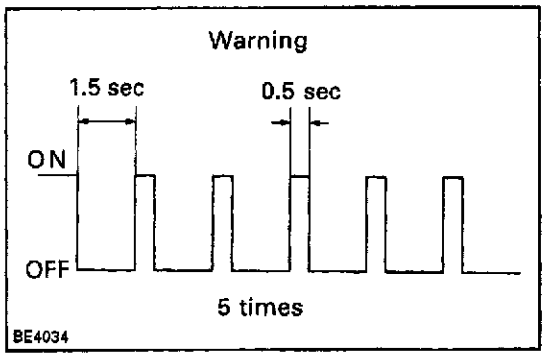
BE1LG-01

INDICATOR CHECK

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 tight goes off when the main switch is turned OFF
HINT If the indicator check result is not normal, proceed to troubleshooting (See page BE-47) for the combination meter section

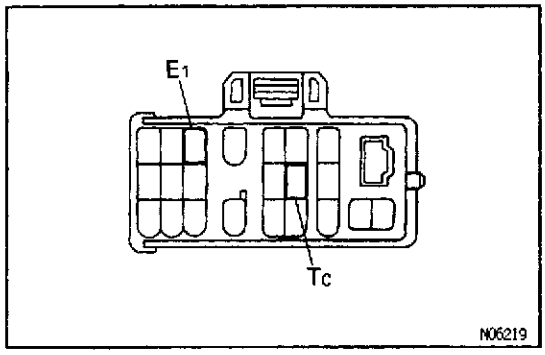
DIAGNOSTIC TROUBLE CODE CHECK

HINT If a malfunction occurs in the speed sensors or actuator, etc during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and blinks the CRUISE MAIN indicator light 5 times to inform the driver of a malfunction At the same time, the malfunction is stored in memory as a diagnostic trouble code

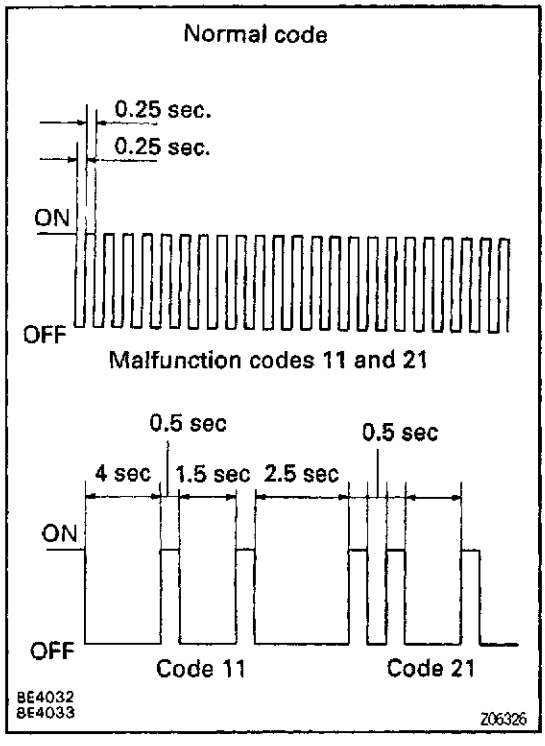


OUTPUT OF DIAGNOSTIC TROUBLE CODE

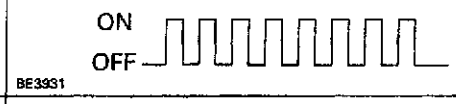
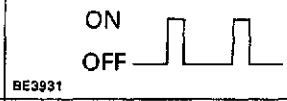
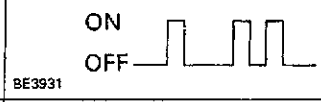
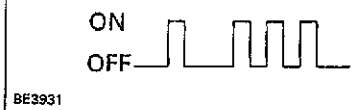
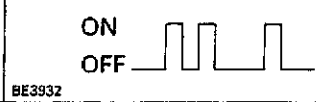
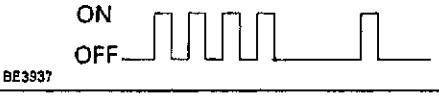
1 Turn the ignition switch ON
2 Using SST, connect terminal Tc and E, of DLC 1
SST 09843-18020
3 Read the diagnostic trouble code on the CRUISE MAIN indicator light
HINT If the diagnostic trouble code is not output, inspect the Tc circuit



As an example, the blinking patterns for codes, normal, 1 1 and 21 are shown in the illustration
4 Check for the problem using the diagnostic trouble code table on the next page
5 After completing the check, disconnect terminals Tc and E,, and turn off the display

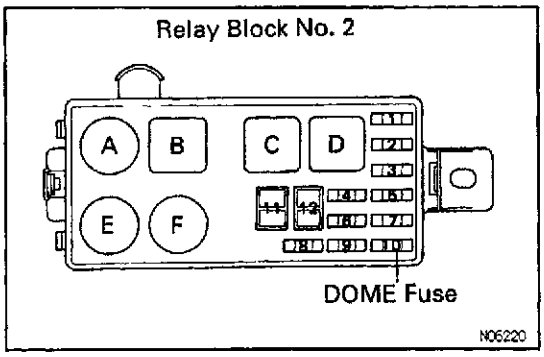


DIAGNOSTIC TROUBLE CODE

Code No	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
–		Normal
11		• Duty ratio of 100% output to motor acceleration side • Overcurrent (short) in motor circuit
12		• Overcurrent (short) in magnet clutch circuit • Open in magnet clutch circuit for 0 8 sec
13		• Open in actuator motor circuit • Position sensor detects abnormal voltage • Position sensor signal value does not change when the motor operates
21		• Speed signal is not input to -the ECU while cruise control is set
*23		• Actual vehicle speed has dropped by 16 km/h (10 mph) or more below the set speed
32		• Short in control switch circuit
34		• Voltage abnormality in control switch
41		• When 41 code is indicated replace the cruise control ECU

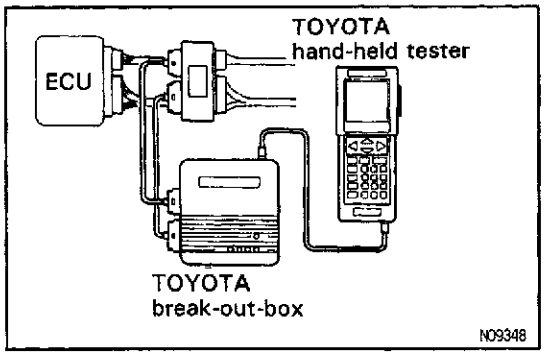
V04380

HINT When 2 or more codes are indicated, the lowest numbered code will be displayed first
(*) When the vehicle speed is reduced on uphill roads, the speed can be set again and driving continued (This is not a malfunction)



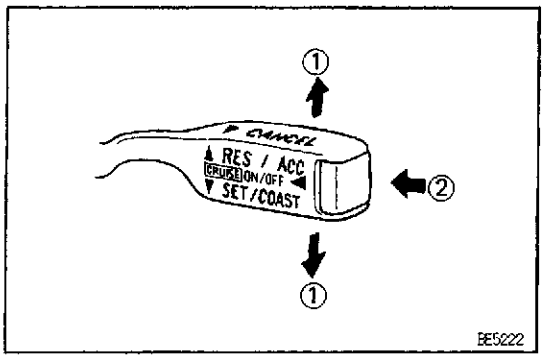
DIAGNOSTIC TROUBLE CODE CLEARANCE

1 After completing repairs the diagnostic code retained in memory can be cleared by removing the DOME fuse for 10 seconds or more, with the ignition switch off
2 Check that the normal code is displayed after connecting the fuse



ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK-OUT-BOX-AND TOYOTA HAND-HELD-TESTER

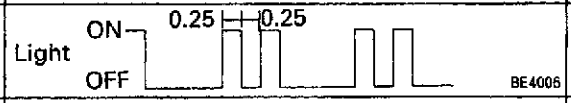
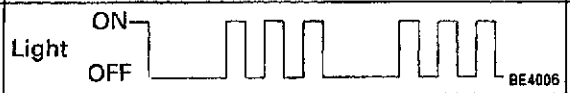
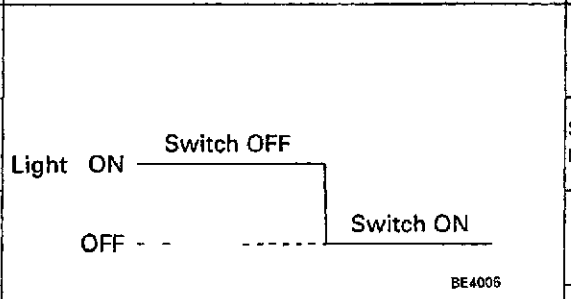
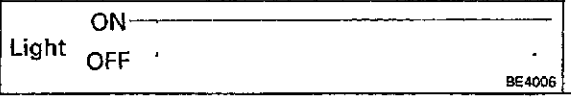
1 Hook up the TOYOTA hand - held - tester and TOYOTA break-out-box to the vehicle
2 Read the ECU input/output values by following the prompts on the tester screen
HINT TOYOTA hand-held-tester has a "Snapshot" function This records the measured values and is effective in the diagnosis of intermittent problems Please refer to the TOYOTA hand -held -tester/ TOYOTA break-out-box operators manual for further details



INPUT SIGNAL CHECK

Output of Code

1 (a) For check No 1 ^- No 2
Turn the ignition switch on
(b) For check No 3 -v No 7
(1) Turn the ignition switch on
(2) Shift to D position
(c) For check No 8 ^- No 9
(1) Jack up the vehicle
(2) Start the engine (3) Shift to D position
2 Press the control switch to SET/COAST or RES/ACC position and hold it down¿¿
3 Push the main switch on (Z
4 Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds
5 Turn the SET/COAST or RES/ACC switch off
6 Operate each switch as listed in the table below
7 Read the blinking pattern of the CRUISE MAIN indicator light
8 After performing the check, turn the main switch off
HINT When 2 or more signals are input to the ECU, only the lowest-numbered code is displayed

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
4	Turn stop light switch ON (Depress brake pedal)		Stop light switch circuit is normal
5	Turn parking brake switch ON		Parking brake switch circuit is normal
6	Turn park/neutral position switch ON (Shift to N or P range)		Park/Neutral position switch circuit is normal
7	Drive at 40 km/h (25 mph) or higher		No 1 Vehicle speed sensor is normal
8	Drive at 40 km/h (25 mph) or below		

TROUBLESHOOTING

BE1LH-01

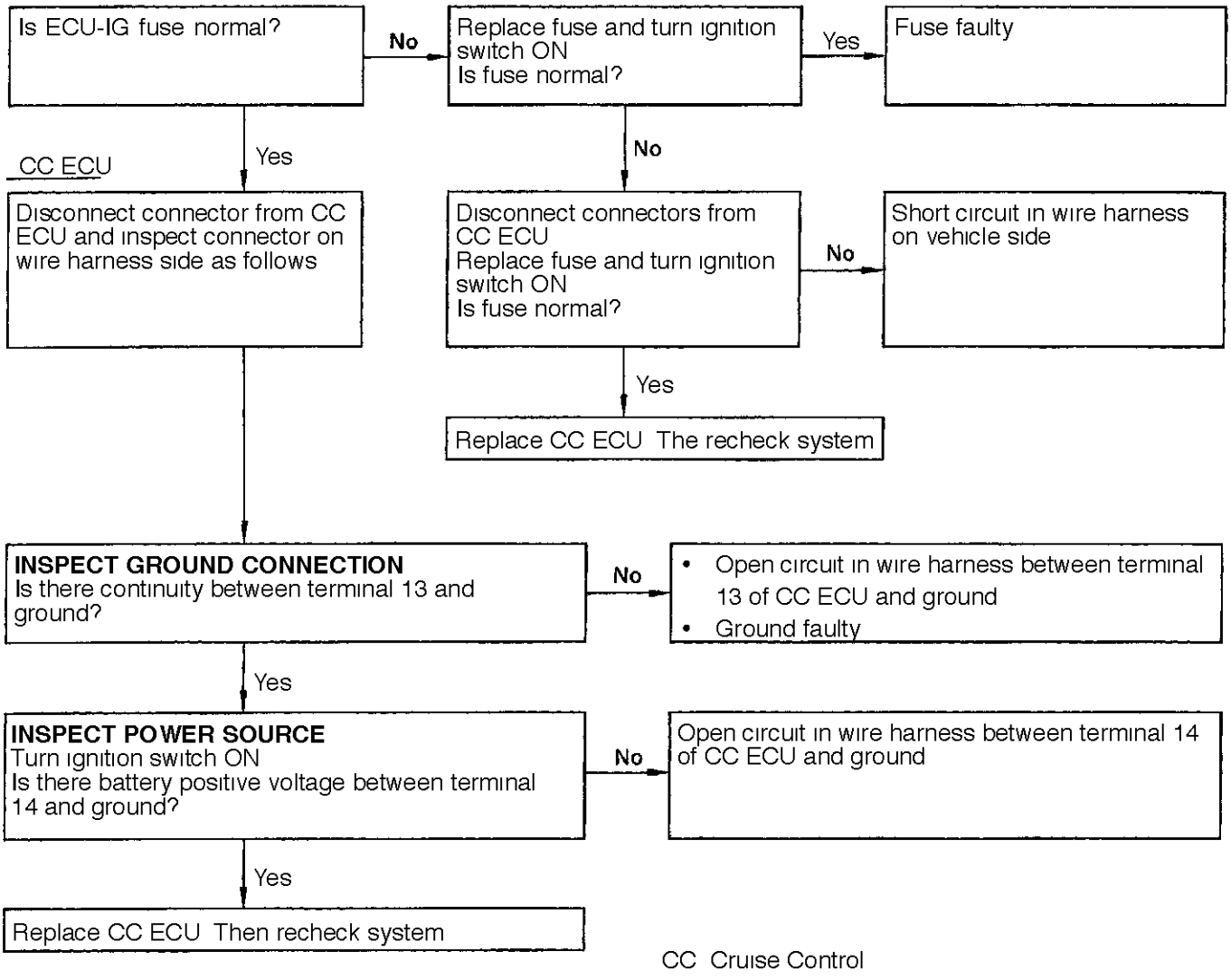
You will find the source of the trouble more easily by properly using the table shown below In this table, the numbers indicate the order of priority of the causes of trouble Check each part in the order shown

Chart No					C	D	D	F	H I	G	E	I	J		
Inspection Item / DTC / Problem	Type A	Type B		CC ECU	Actuator	Main Switch (In Control Switch	Control Switch	Stop Light Switch	Park/Neutral Position Switch	Parking Brake Switch	No 1 Vehicle Speed Sensor	No-2 Solenoid	Throttle Position Sensor (ILD)	Speed Control Cable Control Link	Other Parts
• CRUISE indicator light blinks 5 times • Cruise control system does not set • Cruise control system does not operate		11		2	1										
		12		3	1			2							
		13		2	1										
		21		2							1				
		23			3						2			1	
		32		2			1								
		34		2			1								
		41		1											
	Normal	4	OK	8	7	1	2	3	4	5				6	9*
			NG	2							1				
Set speed deviates on high or low side				4	3						1			2	
Large speed increase or speed drop when control switch turned to SET				3	2								1		
Vehicle speed fluctuates when speed control switch turned to SET				4	3						1			2	
Set speed does not cancel when brake pedal depressed		3	OK	3	1			2							
			NG	2				1							
Set speed does not cancel when parking brake lever pulled		3	OK	2	1										
			NG	2						1					
Set speed does not cancel when shifted to N range		3	OK	2	1										
			NG	2					1						
Vehicle speed does not decrease when speed control switch turned to COAST		1	OK	4	1						3			2	
			NG	2			1								
Vehicle speed does not accelerate when speed control switch turned to ACCEL		2	OK		1						3	4	5	2	
			NG	2			1								
Vehicle speed does not return to memorized speed when control switch turned on RESUME		2	OK	4	1						3			2	
			NG	2			1								
Set speed does not cancel when speed control switch turned to CANCEL		3	OK	2	1										
			NG	2			1								
Speed can be set below about 40 km/h (25 mph)		4	OK	2	1										
			NG	2							1				
Cruise control will not disengage even at about 40 km/h (25 mph)		4	OK	2	1										
			NG	2							1				
Acceleration response in sluggish when speed control switch turned to ACCEL or RESUME				6	3		1					4	5	2	

* Inspect wire harness

A POWER SOURCECIRCUIT

HINT while carrying out the following inspection make certain that the connectors and terminals are properly connected

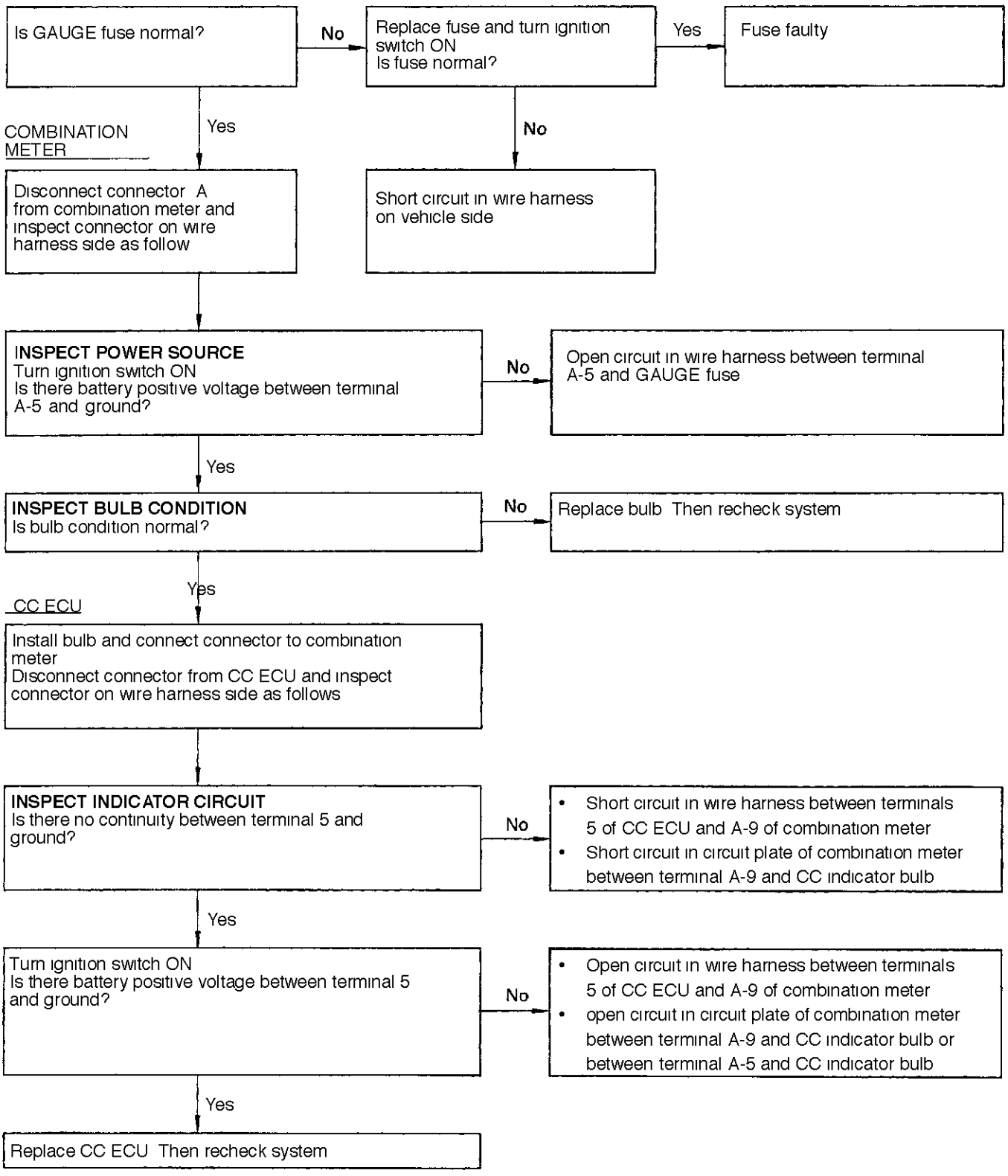


CC Cruise Control

V04394

B CRUISE CONTROL INDICATOR CIRCUIT

HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected



CC Cruise Control

V04395

C ACTUATOR CIRCUIT

HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected

ACTUATOR

Disconnect connector from actuator and inspect connector on wire harness side as follows

INSPECT GROUND CONNECTION
Is there continuity between terminal 4 and ground?

No → • Open circuit in wire harness between terminal 4 of actuator and ground
• Ground faulty

Yes

INSPECT ACTUATOR (See page BE-1 14)
Is actuator operation normal?

No → Replace actuator Then recheck system

Yes

STOP LIGHT SWITCH

INSPECT STOP LIGHT SWITCH INSTALLATION
Is stop light switch installed properly?

No → Reinstall stop light switch properly Then recheck system

Yes

Connect connector to actuator
Disconnect connector from stop light switch and inspect connector on wire harness side as follows

INSPECT MAGNET CLUTCH CIRCUIT
Is there approx 38 5Ω between terminal 4 and ground?

No → Open or short circuit in wire harness between terminals 4 of stop light and 5 of actuator

Yes

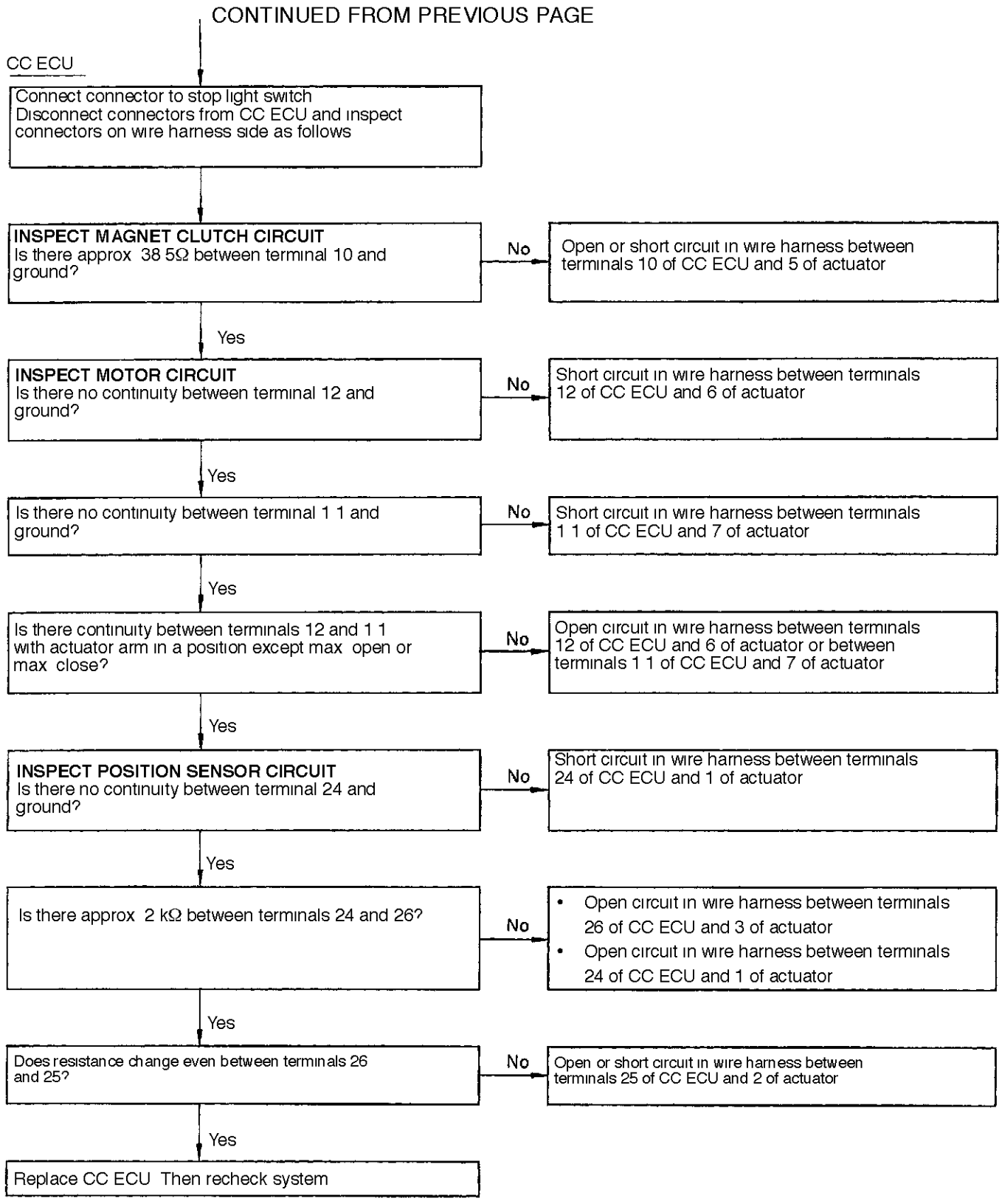
INSPECT STOP LIGHT SWITCH (See page BE-1 13)
Is stop light switch operation normal?

No → Replace stop light switch Then recheck system

Yes

CONTINUED ON NEXT PAGE

CC Cruise Control



CC Cruise Control

V04397

D CONTROL SWITCH CIRCUIT

HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected,

CONTROL SWITCH

Disconnect connector from control switch and inspect connector on wire harness side as follows

INSPECT GROUND CONNECTION
Is there continuity between terminal 3 and ground?

No →
- Open circuit in wire harness between terminal 3 of control switch and ground
- Ground faulty

Yes

INSPECT CONTROL SWITCH (See page BE-1 13)
Is control switch operation normal?

No → Replace control switch Then recheck system

Yes

CC ECU

Connect connector to control switch
Disconnect connectors from CC ECU and inspect connectors on wire harness side as follows

INSPECT MAIN SWITCH CIRCUIT
Is there no continuity between terminal 4 and ground with main switch OFF?

No → Short circuit in wire harness between terminals 4 of CC ECU and 5 of control switch

Yes

Is there continuity between terminal 4 and ground with main switch ON?

No → Open circuit in wire harness between terminals 4 of CC ECU and 5 of control switch

Yes

INSPECT CONTROL SWITCH CIRCUIT
Is there no continuity between terminal 1$ and ground with control switch OFF?

No → Short circuit in wire harness between terminals 18 of CC ECU and 4 of control switch

Yes

Is there resistance as shown in table below between terminal 18 and ground when control switch is turned to each position?

Position	Resistance (Ω)
R ES/ACC	Approx 68
SET/COAST	Approx 198
CANCEL	Approx 418

No → Open circuit in wire harness between terminals 18 of CC ECU and 4 of control switch

Yes

Replace CC ECU Then recheck system

V04398

E NO. 1 VEHICLE SPEED SENSOR CIRCUIT

HINT While carrying out the following inspection make certain that the connectors and terminals are properly connected

NO 1 VEHICLE SPEED SENSOR

Disconnect connector from No 1 vehicle speed sensor and inspect connector on wire harness side as follows

INSPECT GROUND CONNECTION
Is there continuity between terminal 3 and ground?

No →
- Open circuit in wire harness between terminal 3 of No 1 vehicle speed sensor and ground
- Ground faulty

Yes ↓

INSPECT NO 1 VEHICLE SPEED SENSOR
(See page BE-1 14)
Is No 1 vehicle speed sensor operation normal?

No → Replace No 1 vehicle speed sensor Then recheck system

Yes ↓

CC ECU

Connect connector to No 1 vehicle speed sensor
Disconnect connector from CC ECU and inspect connector on wire harness side as follows

INSPECT NO 1 VEHICLE SPEED SENSOR CIRCUIT
Is there continuity repeatedly between terminal 20 and ground?

No →
- Open or short circuit in wire harness between terminals 20 of CC ECU and 2 of No 1 vehicle speed sensor

Yes ↓

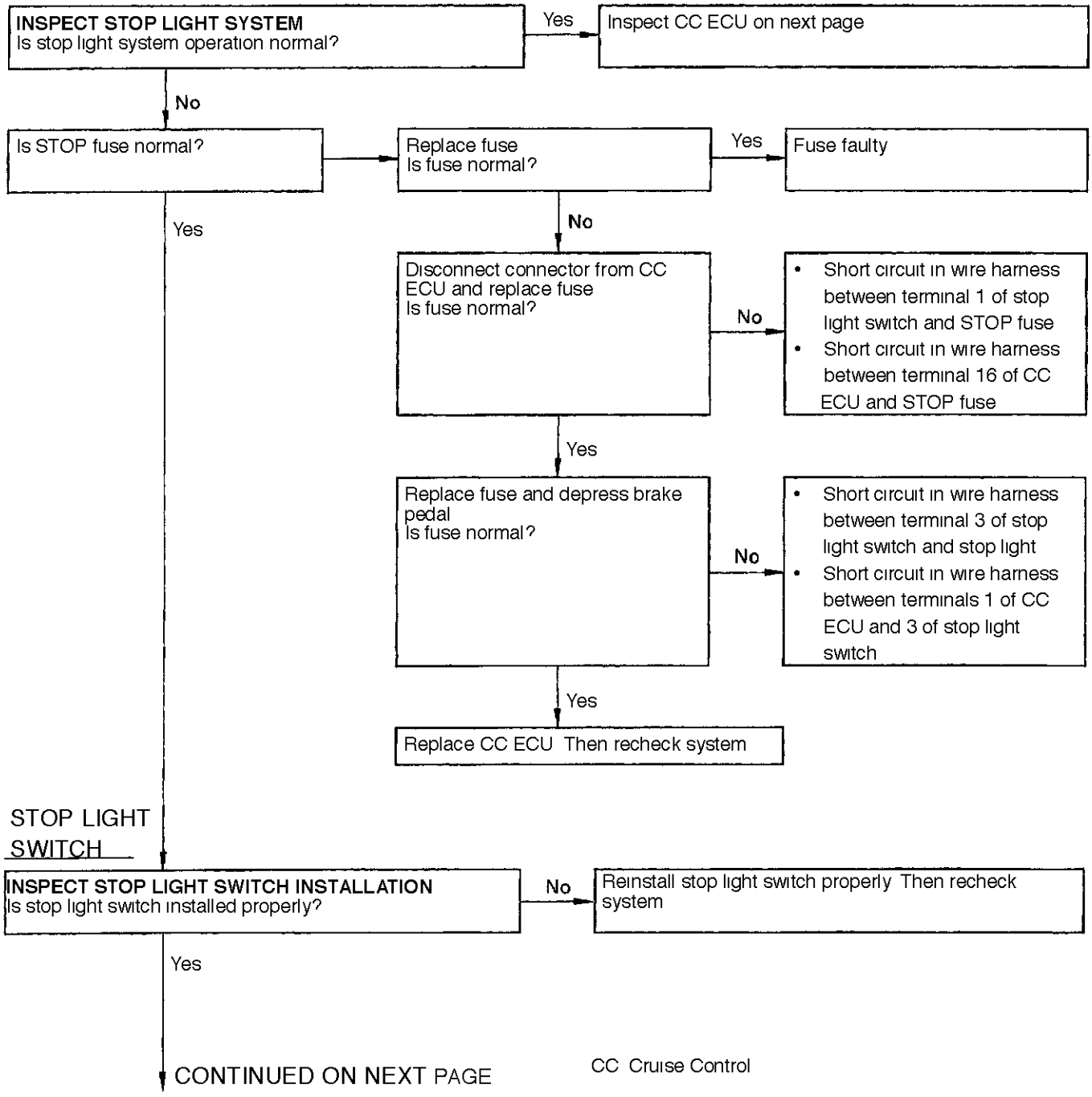
Replace CC ECU Then recheck system

CC Cruise Control

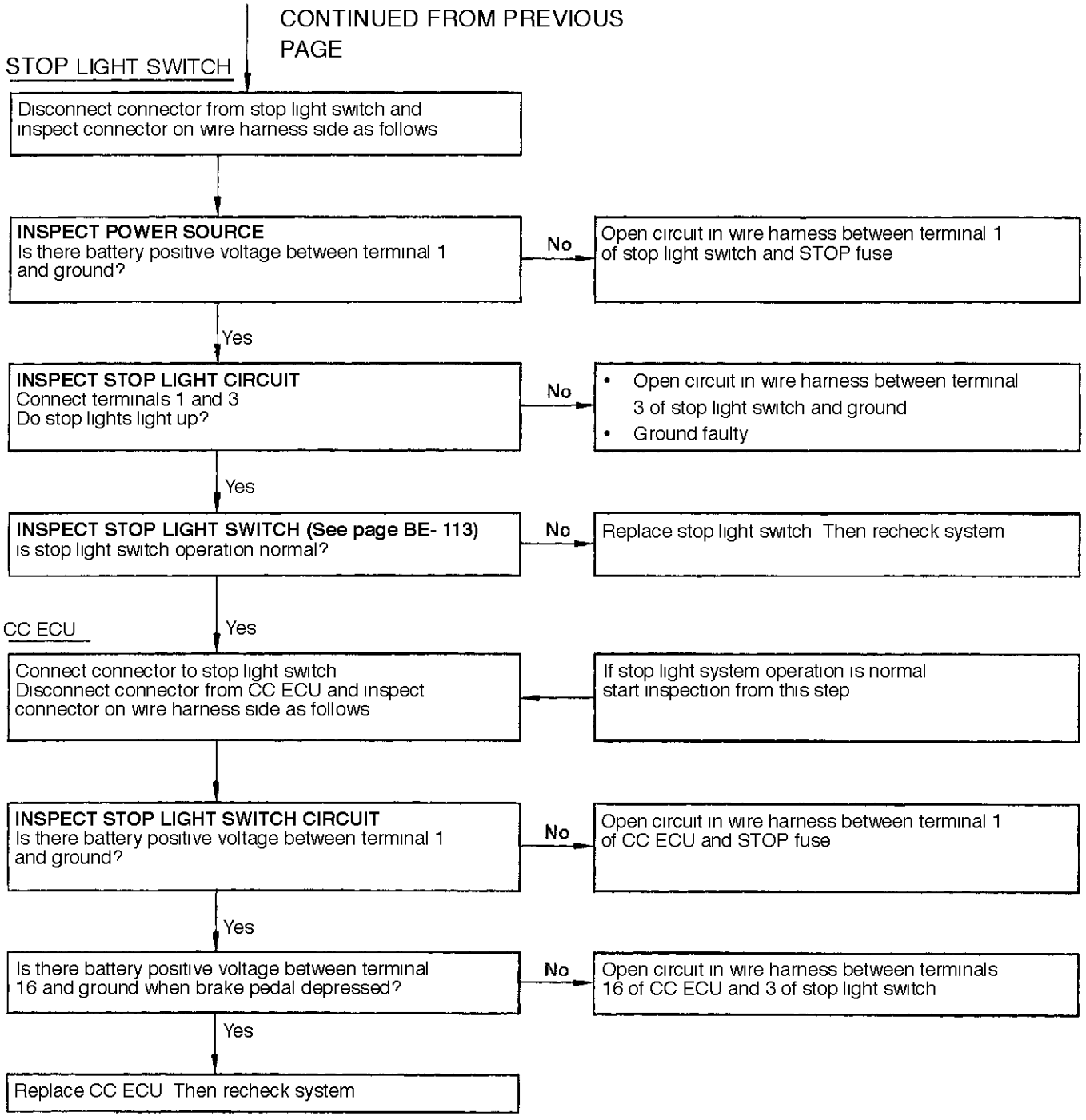
V04399

F STOP LIGHT SWITCH CIRCUIT

HINT- while carrying out the following inspection, make certain that the connectors and terminals are properly connected



CC Cruise Control

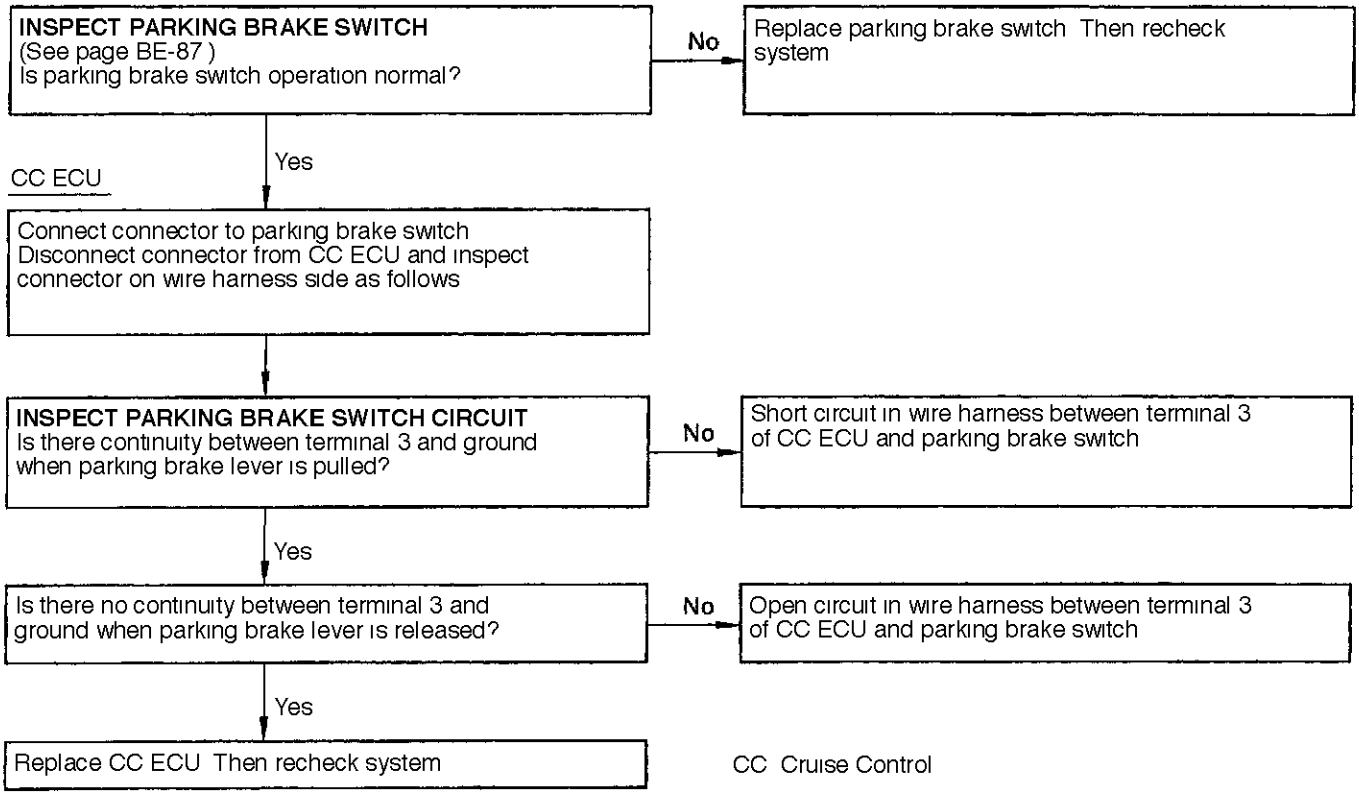


CC Cruise Control

V04401

G PARKING BRAKE SWITCH CIRCUIT

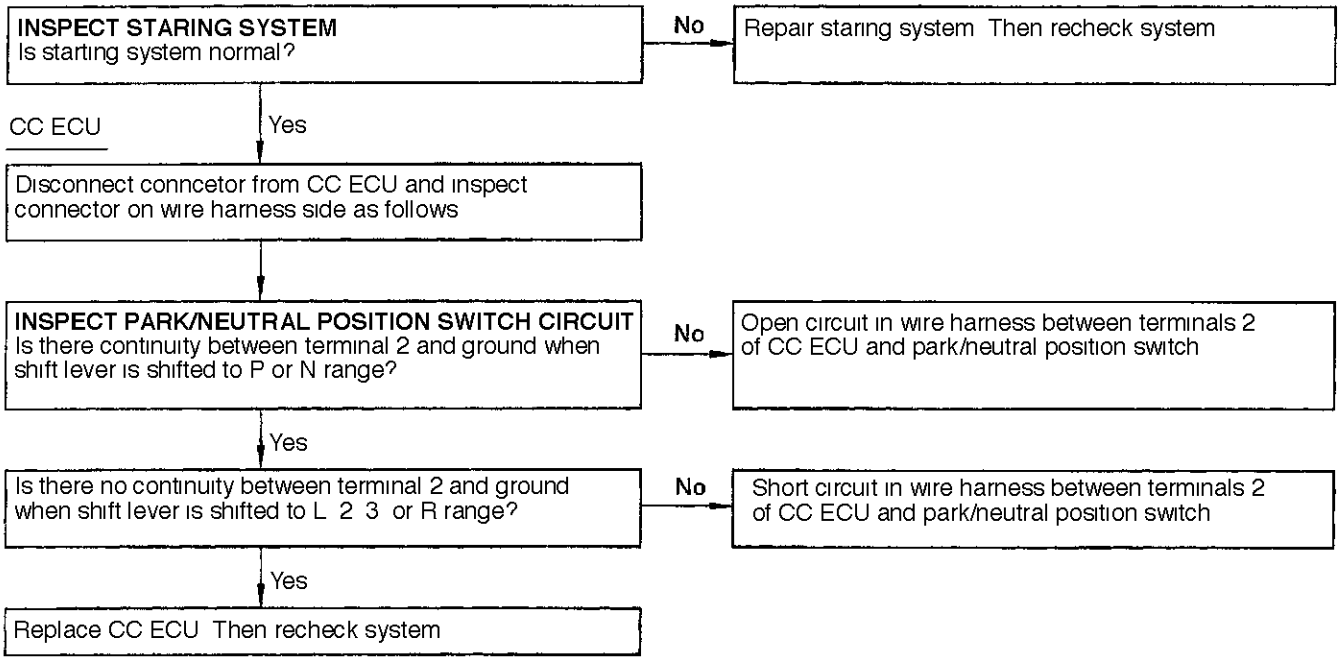
HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected



CC Cruise Control

H PARK/NEUTRAL POSITION SWITCH CIRCUIT

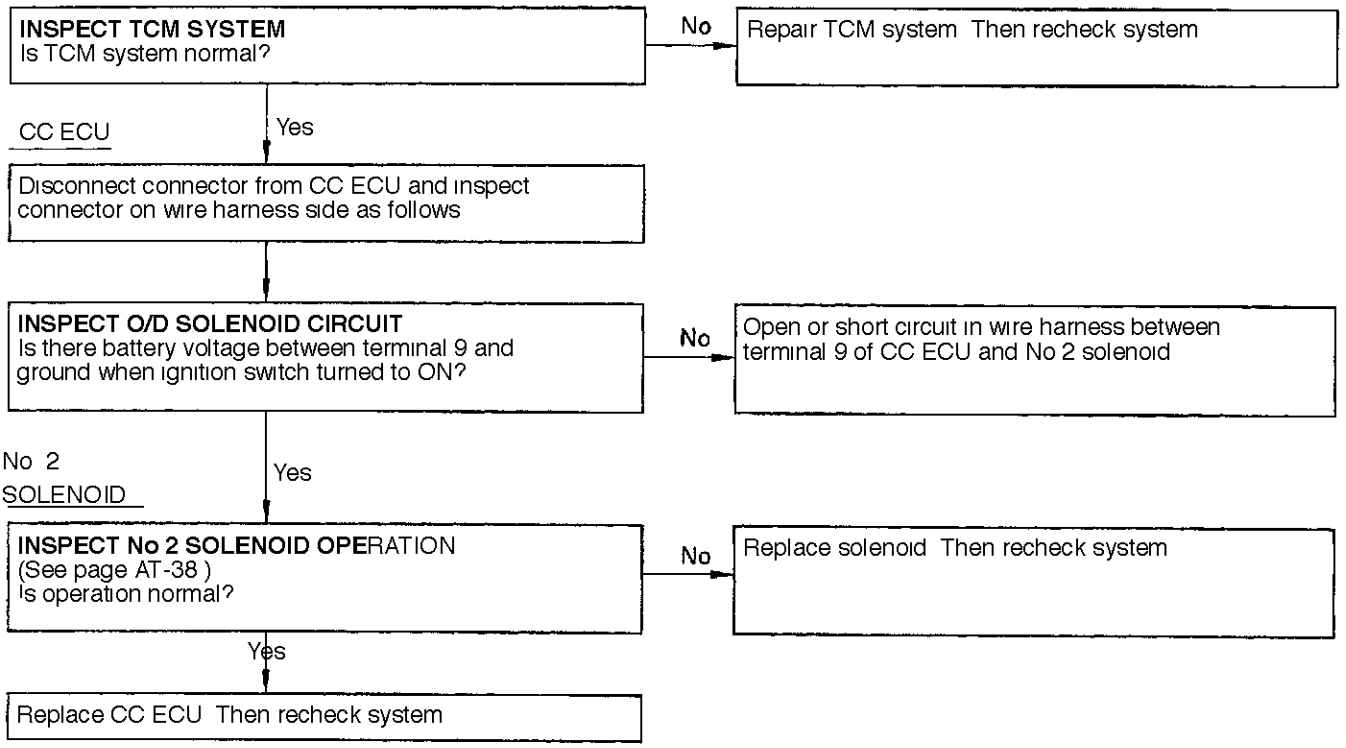
HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected



CC Cruise Control

I No.2 SOLENOID CIRCUIT

HINT While carrying out the following inspection make certain that the connectors and terminals are properly connected



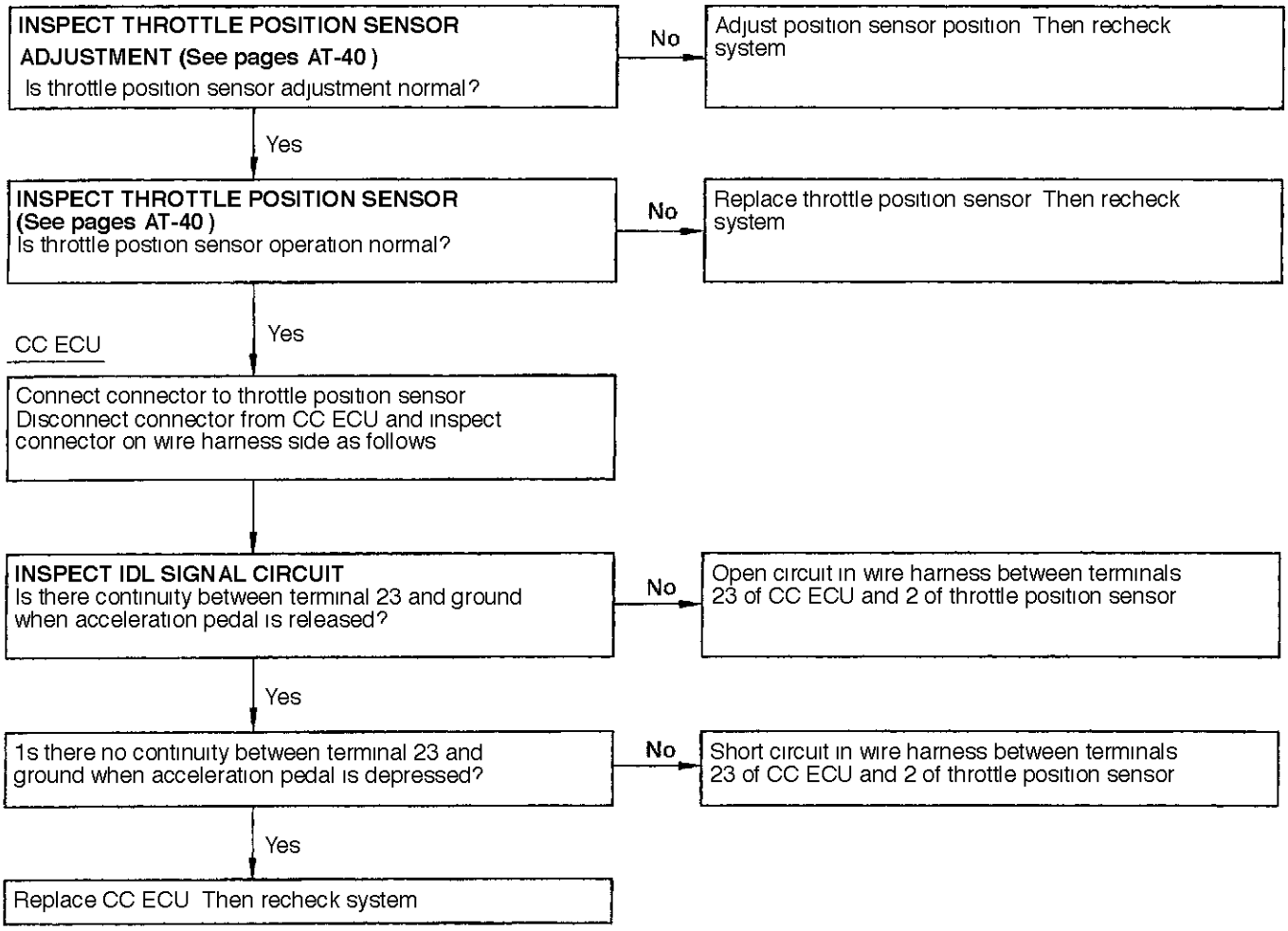
CC Cruise Control

V04403

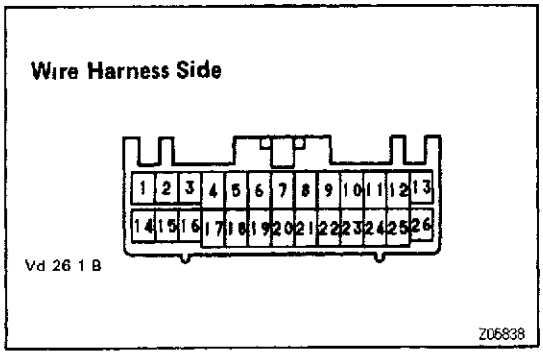
J IDL SIGNAL CIRCUIT

HINT While carrying out the following inspection, make certain that the connectors and terminals are properly connected,

THROTTLE POSITION SENSOR



CC Cruise Control



CRUISE CONTROL ECU INSPECTION BE04A-02

INSPECT CRUISE CONTROL ECU

Continuity

Disconnect connector and inspect connector on wire harness side, as shown in the chart

Check for	Measured item	Tester connection	Condition		Specified value
Continuity	Park/Neutral position switch	2 - ground	Shift lever position	N or P	Continuity
				L 2 D or R	No continuity
	Parking brake switch	3 - ground	Parking brake lever position	released	No continuity
				pulled	Continuity
	Control switch	4 - ground	Main switch position	OFF	No continuity
				ON	Continuity
	Ground connection	13 - ground	Constant		Continuity
	Control switch	18 - ground	Control switch position	RES/ACC	680
			Control switch position	SET/COAST	1980
			Control switch position	CANCEL	4180
	Actuator (motor)	*11 - 12	Actuator arm position	max OPEN	(12 - 11) Continuity
				max CLOSE	(11 - 12) Continuity
				any position except above position	(12 - 11) Continuity
	DLC 1 Circuit	8 - ground	Constant		No continuity
			Terminals Tc and E 1 connected		Continuity
	Throttle position sensor (IDL)	23 - ground	Acceleration pedal position	released	Continuity
				depressed	No continuity
	No 1 vehicle speed sensor	20 - ground	With ignition switch ON speedometer shaft or No 1 vehicle speed sensor shaft turned		Continuity No continuity
Resistance	Actuator (position sensor)	24 - 26	Constant		Approx 2 kΩ
		24 - 2 5	Actuator arm turned		Resistance change even
	Actuator (magnet clutch)	10 - ground	Brake pedal position	released	Approx 38 5 0
				depressed	No continuity
Voltage	Power source	14 - ground	Ignition switch position	LOCK or ACC	No voltage
				ON	Battery post ve voltage
	STOP fuse	1 - ground	Constant		Battery post ve voltage
	Stop light	16 - ground	Brake pedal position	released	No voltage
				depressed	Battery post ve voltage
	No 2 solenoid	9 - ground	Ignition switch position	LOCK or ACC	No voltage
				ON	Battery post ve voltage

* This circuit include the diode

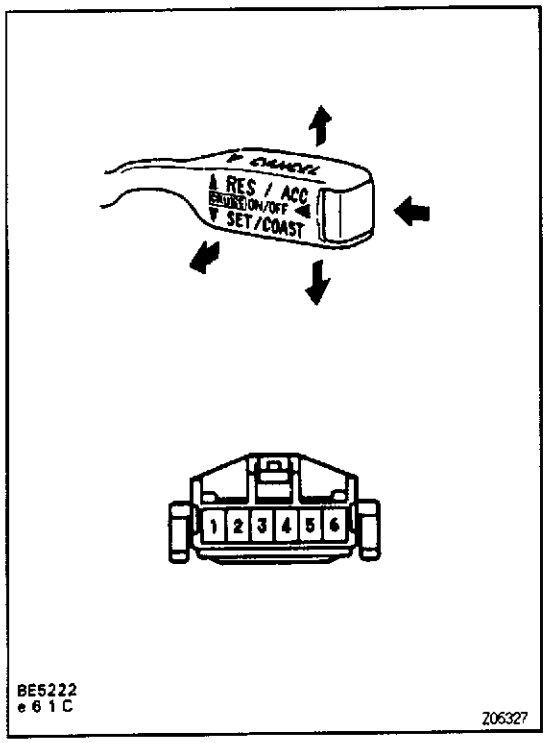
V02757

If circuit is as specified, try another ECU
If circuit is not as specified, inspect the circuits connected to other parts

CRUISE CONTROL SWITCH INSPECTION

INSPECT CRUISE CONTROL SWITCH

Continuity



(a) Check continuity between terminals 3 and 5

Control Switch Position	Condition
OFF	No continuity
ON (pushed)	Continuity

(b) Measure resistance between terminals 3 and 4

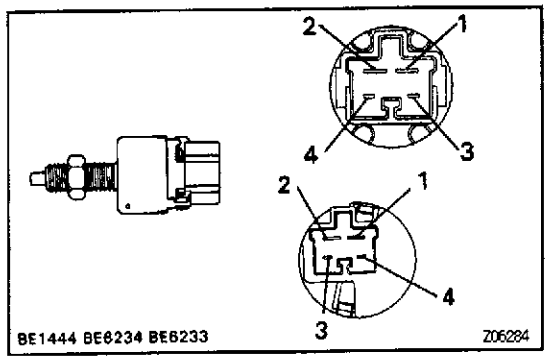
Control Switch Position	ResistanceΩ
OFF	∞ (No continuity)
RES / ACC	Approx 68Ω
SET / COAST	Approx 198Ω
CANCEL	Approx 418Ω

If resistance value is not as specified, replace the control switch

STOP LIGHT SWITCH INSPECTION

INSPECT STOP LIGHT SWITCH

Continuity



Switch position	Tester connection to terminal number	Specified value
Switch pin free (Brake pedal depressed)	1 -2	Continuity
Switch pin pushed in (Brake pedal released)	3-4 (w/ CCS)	Continuity

If continuity is not as specified, replace the switch

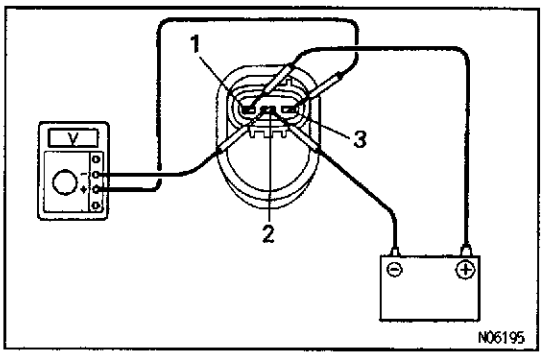
PARK/NEUTRAL POSITION SWITCH INSPECTION

BE0LA-01

INSPECT PARK/NEUTRAL POSITION SWITCH
See page AT-41 .

PARKING BRAKE SWITCH INSPECTION

INSPECT PARKING BRAKE SWITCH
See page BE-53 .

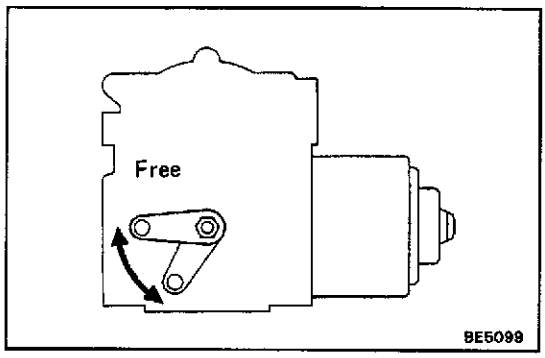


NO.1 VEHICLE SPEED SENSOR INSPECTION

BE0LB-01

INSPECT NO.1 VEHICLE SPEED SENSOR

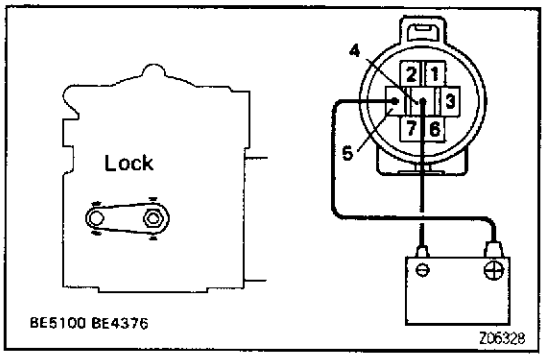
(a) Connect the positive (+) lead from battery to terminal 1 and negative (-) lead to terminal 2
(b) Connect the positive (+) lead from tester to terminal 3 and negative (-) lead to terminal 2
(c) Revolve shaft
(d) Check that there is voltage changer from approx O V to 1 1 V or more between terminal 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



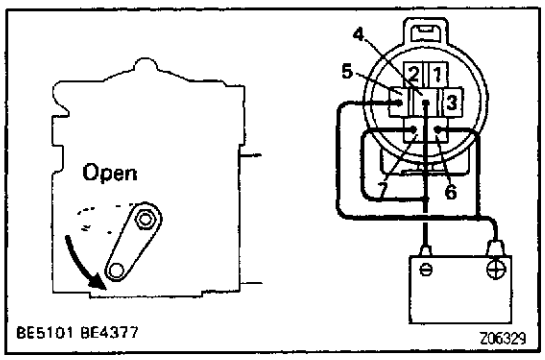
ACTUATOR INSPECTION

BE0-02

INSPECT ACTUATOR
Magnet Clutch
(a) Check that the arm moves smoothly by hand



(b) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 4 (Magnet clutch turned ON)
(c) Check that the arm does not move by hand
If operation is not as specified, replace the motor



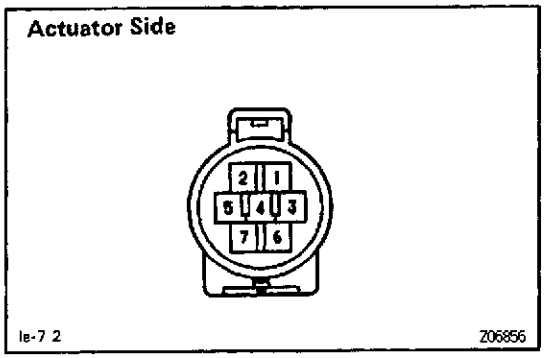
MOTOR

(a) With the magnet clutch ON, connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 7, check that the arm moves to the open side

(b) When the arm reached to the open position, check that the motor operation stops

(c) With the magnet clutch ON, connect the positive (+) lead from the battery to terminal 7 and the negative (-) lead to terminal 6, check that the arm moves to the close side

(d) When the arm reaches to the closed position, check that the motor operation stops

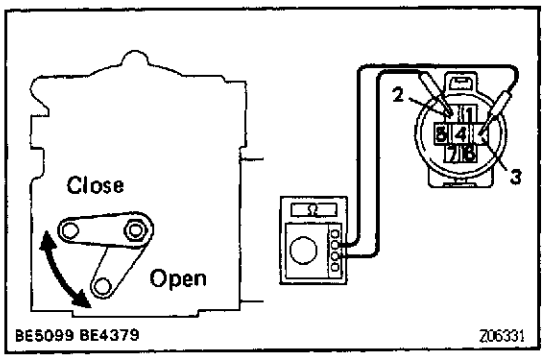


Position Sensor

(a) Measure the resistance between terminals 1 and 3

Resistance:

Approx. 2 kΩ



(b) When the arm is moving form the closed to open position, check that resistance between terminals 2 and 3 increases form approx 0 5 to 1 7 kΩ

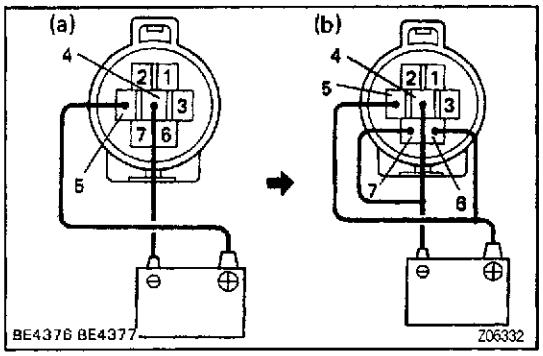
If operation is not as specified, replace the motor

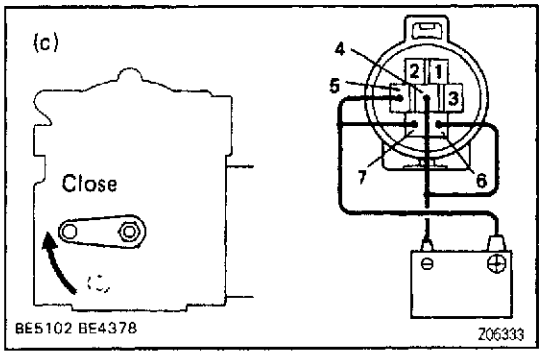
BE0LG 01

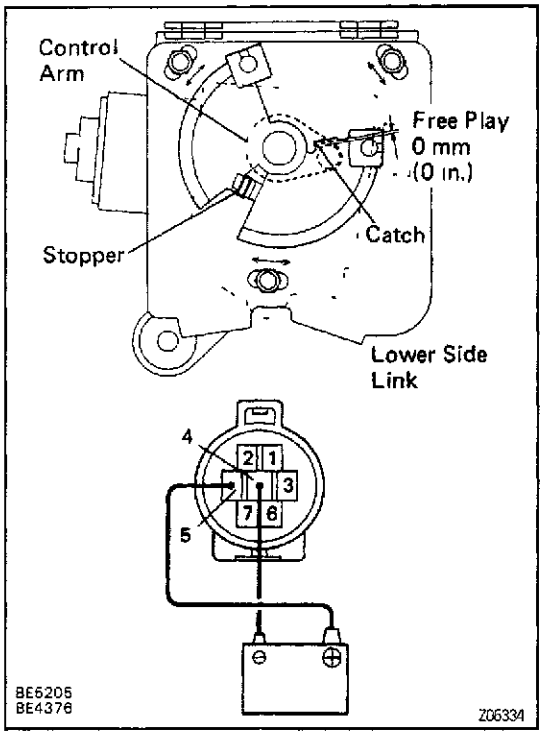
THROTTLE POSITION SWITCH INSPECTION

INSPECT THROTTLE POSITION SWITCH

See page AT-40 .







BE0LH--02

CONTROL LINK ADJUSTMENT

ASSEMBLY ADJUST CONTROL LINK

(a) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 4 of the actuator
(Magnet clutch turned ON)
NOTICE: Keep the magnet clutch ON until adjustment of control link assembly is completed.

(b) With the magnet clutch ON, connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 7
(Arm moves to the open side)

(c) With the magnet clutch ON, connect the positive (+) lead from the battery to terminal 7 and the negative (-) lead to terminal 6
(Arm moves to the close side)

(d) Install the control link assembly to the actuator

(e) Rotate the control link assembly so that the catch of the control link assembly's lower side comes in contact with the actuator control arm (Free play 0)

Free play:

0 mm (0 in.)

NOTICE: Rotate the lower side link to the right until it touches the stopper.

(f) In condition

(d), install and torque the three nuts

(g) Disconnect lead wire from the actuator

CLOCK

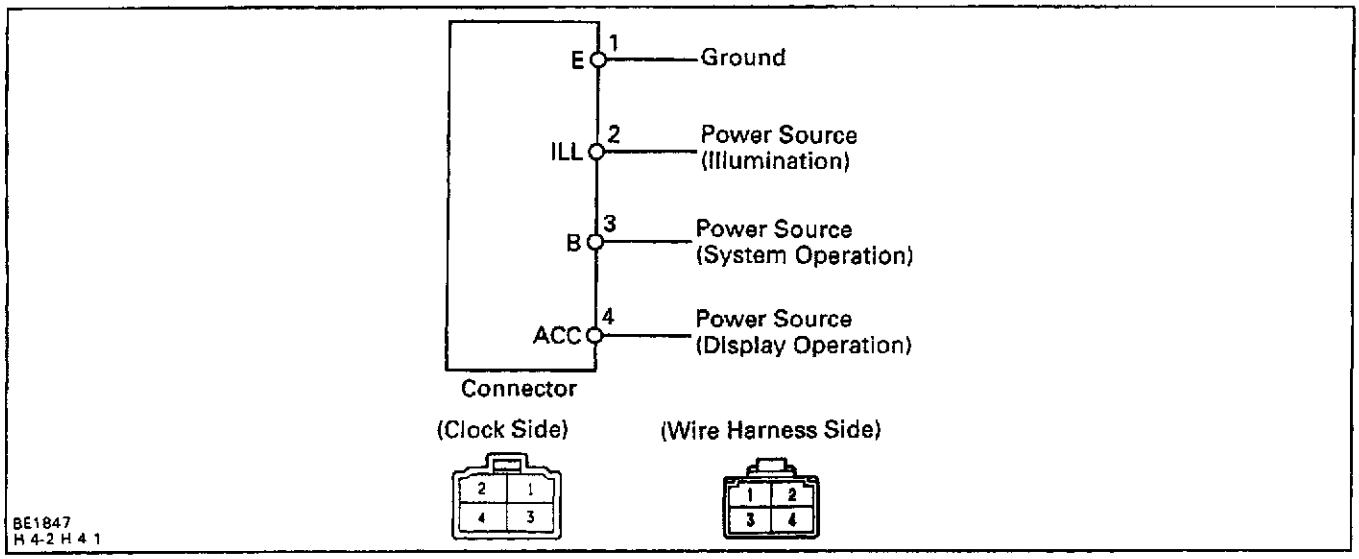
BE1LR-01

TROUBLESHOOTING

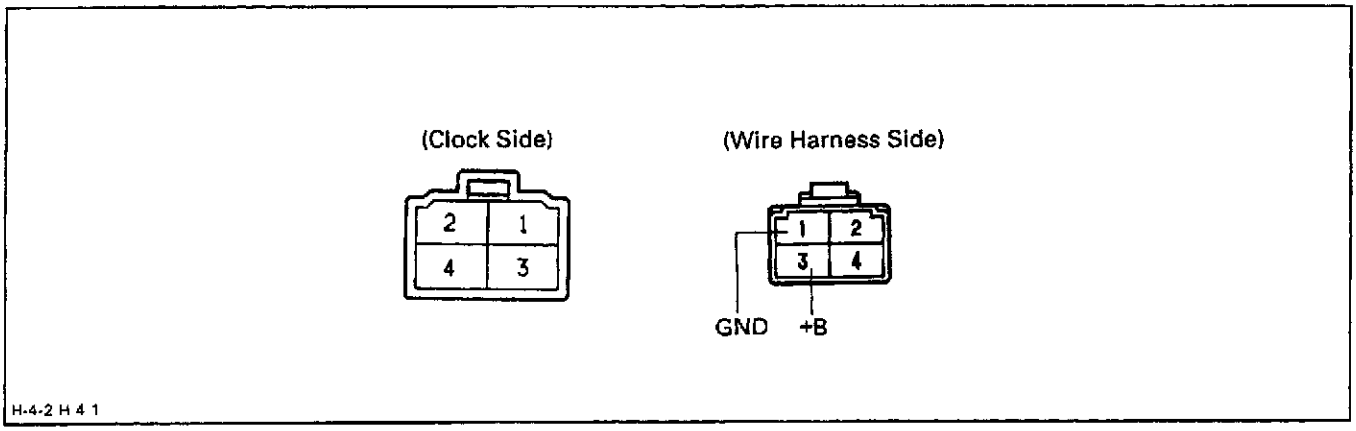
HINT Troubleshoot the clock according to the table below

Clock will 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

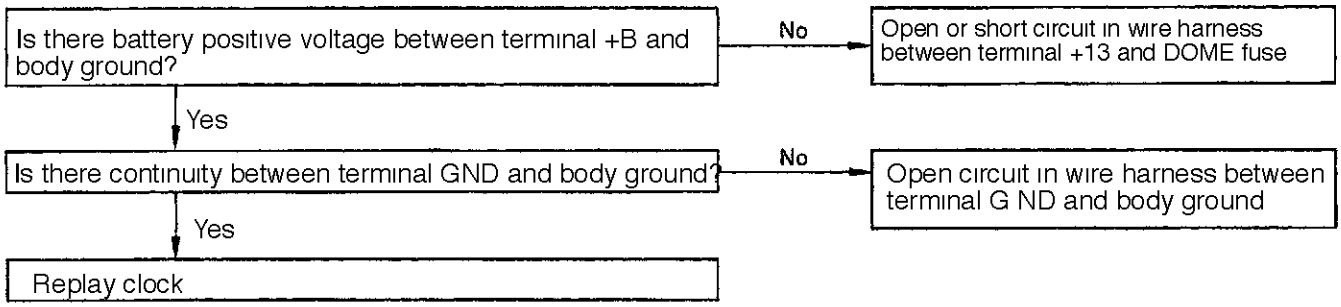
(b) Check that the DOME fuse is not blown

If the fuse is blown replace the fuse and check for short

(c) Troubleshoot the clock as follows

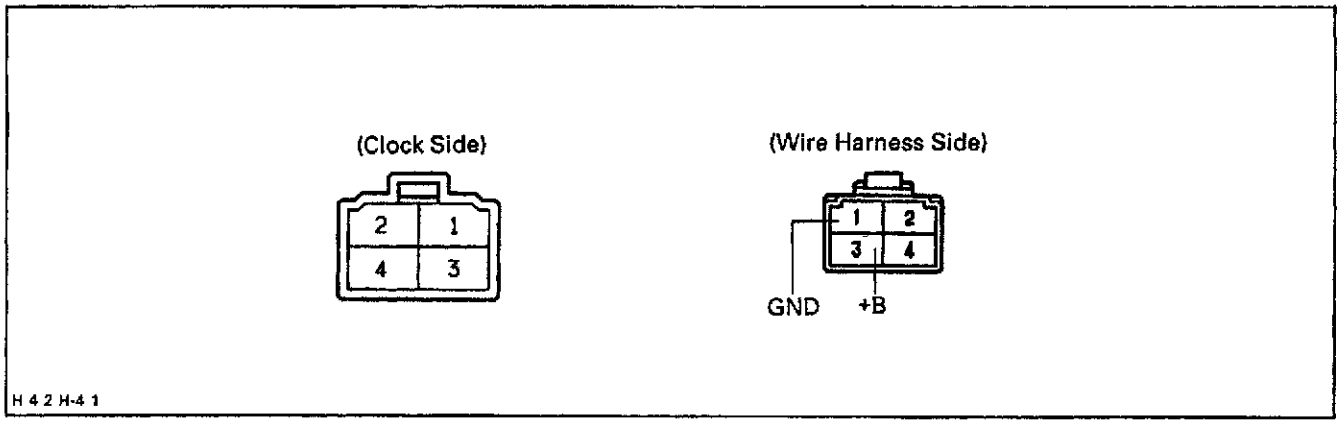
HINT Inspect the connector on the wire harness side

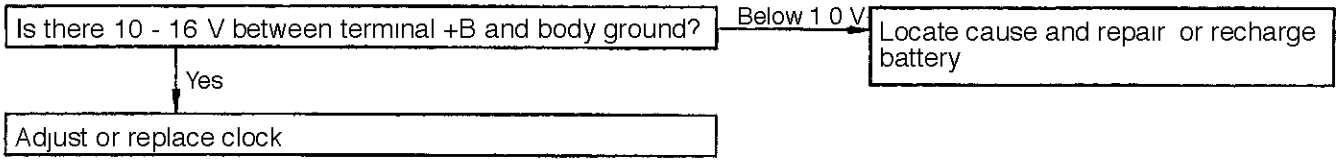
V04345

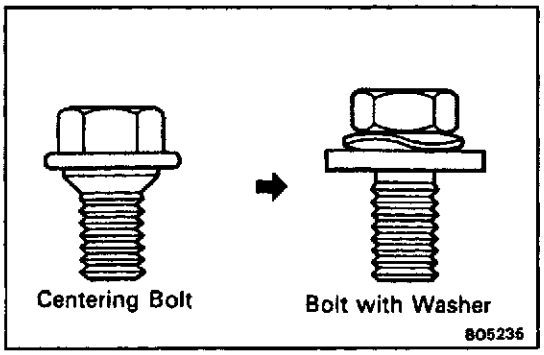


2 CLOCK LOSES OR GAINS TIME

(a) Check that 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 error (per day) ± 1 5 seconds
If the error exceeds the allowable error replace the clock
(c) Check that the clock adjusting button is sticking in position and has failed to return
1f 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





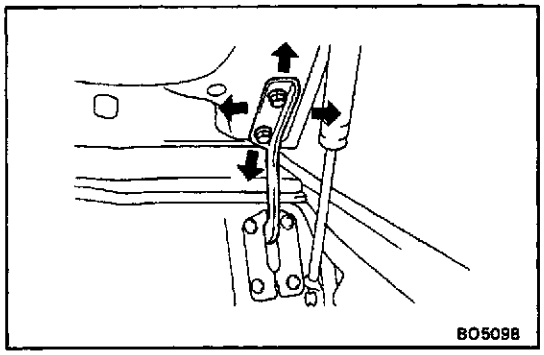


HOOD

BO010-03

HOOD ADJUSTMENT

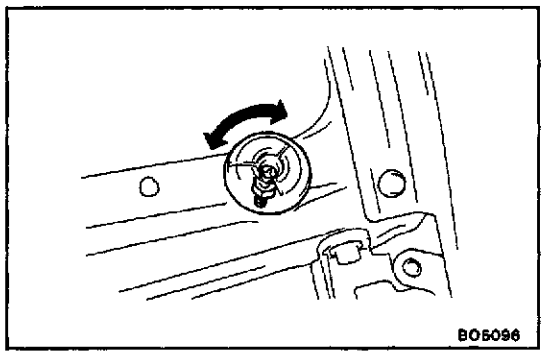
HINT Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on Substitute the bolt with washer for the centering bolt



1. ADJUST HOOD IN FORWARD / REARWARD AND LEFT /RIGHT DIRECTIONS

Adjust the hood by loosening the hood side hinge bolts

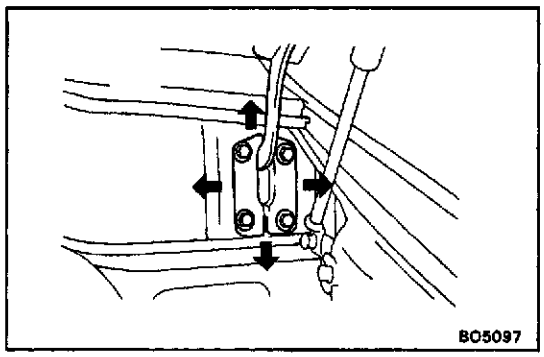
Torque: 18 N-m (185 kgf-cm, 13 ft



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTIONS

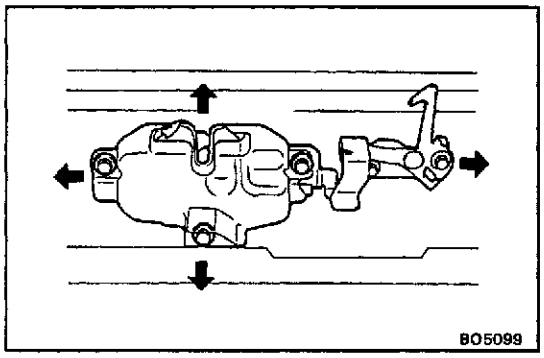
(a) Loosen the lock nut

(b) Adjust the hood by turning the cushions



3. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTIONS

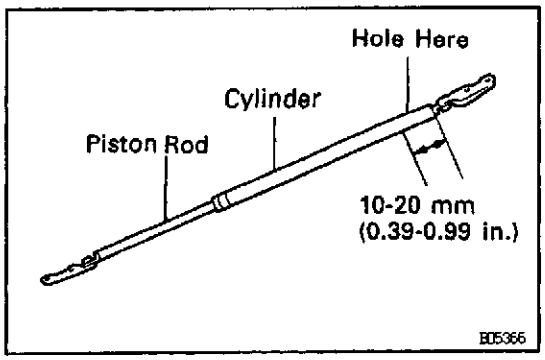
Adjust the hood by loosening the body side hinge bolts



4. ADJUST HOOD LOCK

Adjust the hood lock by loosening the mounting bolts

Torque: 8 N-m (80 kgf-cm. 69in..lbf)



HOOD DAMPER STAY

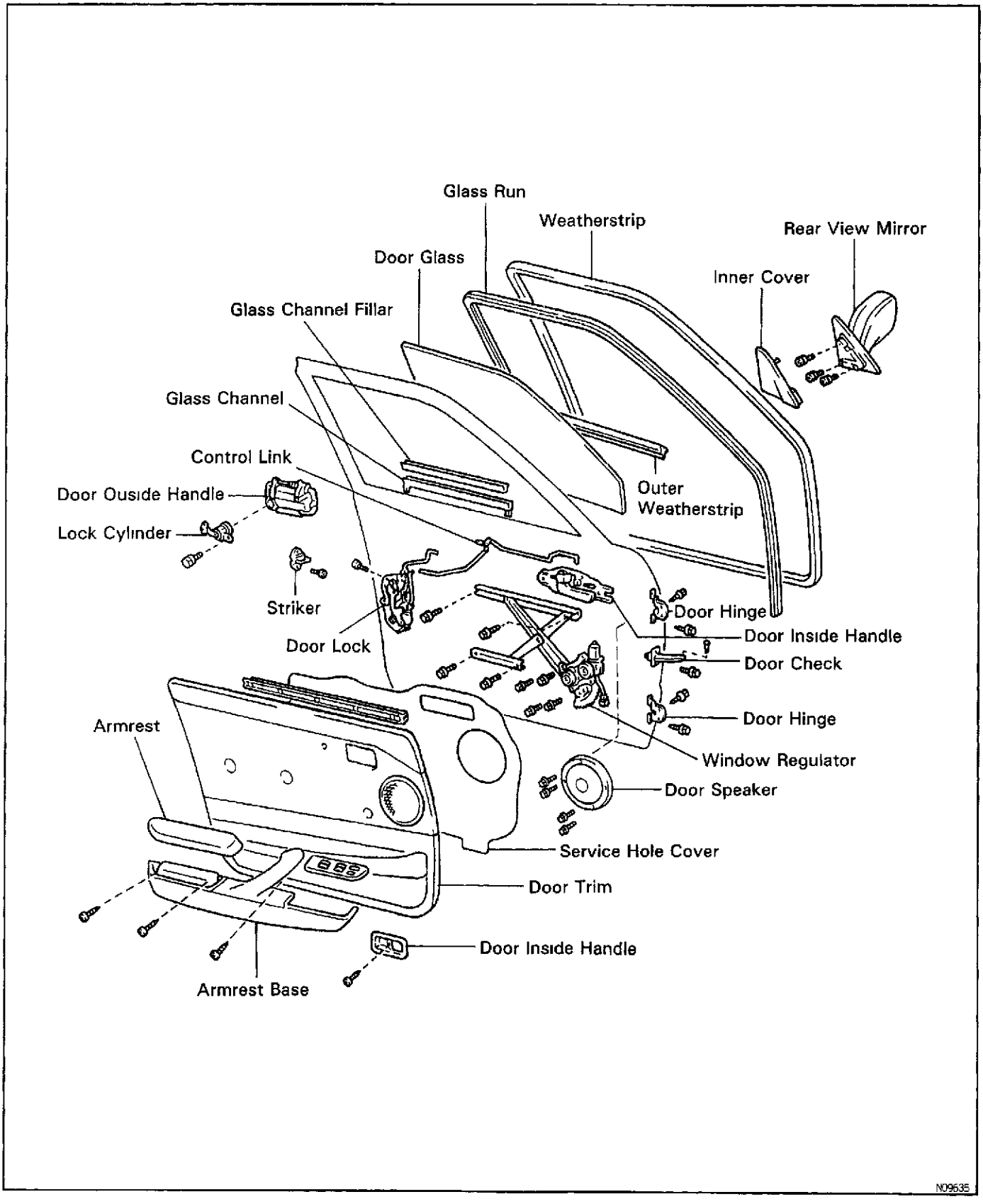
B00D8-02

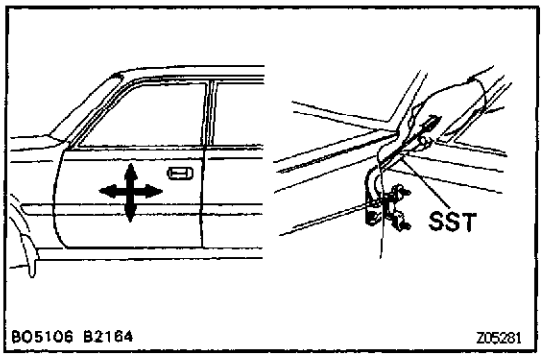
NOTICE: Handling the damper.

- Do not dissassemble the damper because the cylinder is filled with pressurized gas.
- If the damper is to be replaced, drill a 2.0 - 3.0 mm (0.079 - 0.118 in.) hole in the bottom of the removed damper cylinder 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 carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to got on it.
- Do not turn the piston rod and cylinder with the damper fully extended.

FRONT DOOR
COMPONENTS

BO0T8--01





FRONT DOOR ADJUSTMENT

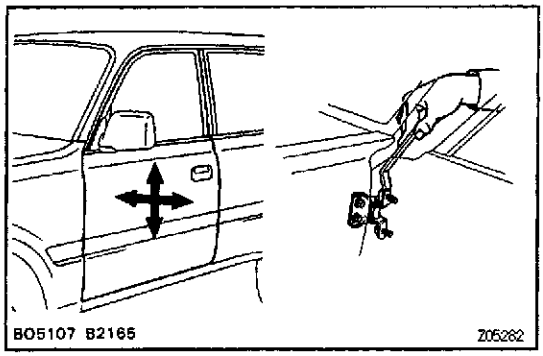
BO03T-03

1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts

SST 09812-00010

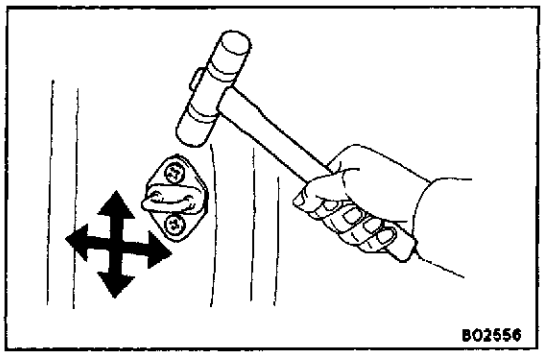
Torque: 24 N-m (240 kgf-cm, 17 ft-lbf)



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)

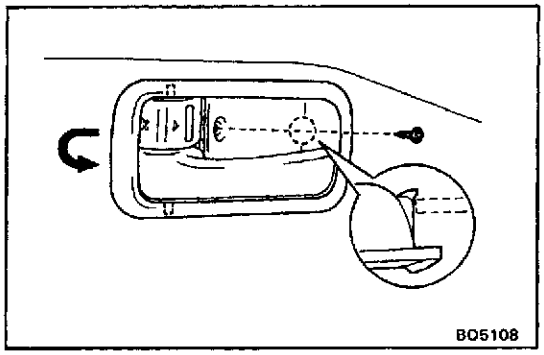


3. ADJUST DOOR LOCK STRIKER

(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

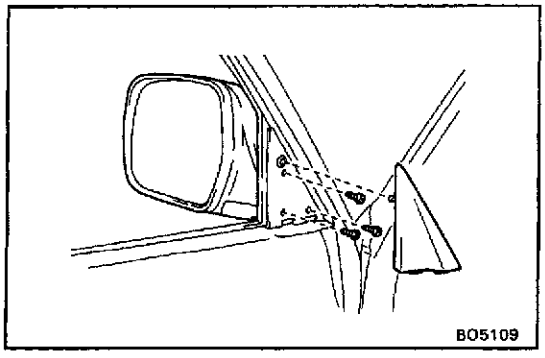


FRONT DOOR DISASSEMBLY

BO18U-01

1. REMOVE DOOR INSIDE HANDLE

Remove the screw and pull the inside handle bezel



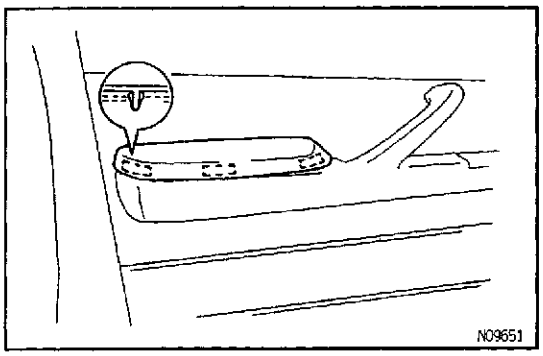
2. REMOVE REAR VIEW MIRROR

(a) Remove the cover

(b) (w/ Remote Control Mirror)

Disconnect the connector from the mirror

(c) Remove 3 screws and the rear view mirror

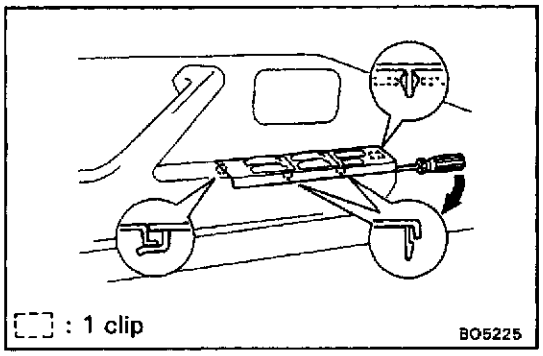


3. REMOVE ARMREST PANEL BASE

(a) Insert the screwdriver between the armrest and the armrest panel base to pry out

HINT Tape the screwdriver tip before use

(b) Remove the armrest

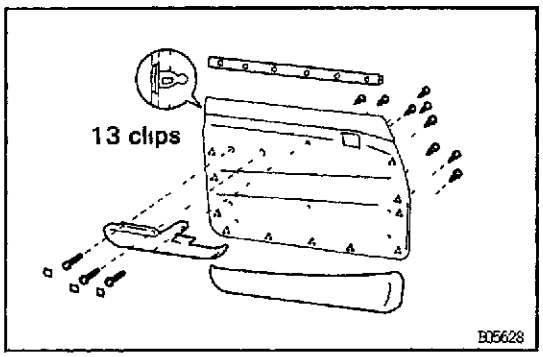


4. REMOVE ARMREST PANEL BASE UPPER

(a) Insert the screwdriver between the armrest panel base and the armrest panel base upper to pry out

HINT Tape the screwdriver tip before use

(b) Slide the armrest panel base upper forward to remove it, then disconnect the connectors



5. REMOVE DOOR TRIM

(a) Remove 3 screws from the inside door panel

(b) Insert a screwdriver between the retainers and the door trim to pry it loose

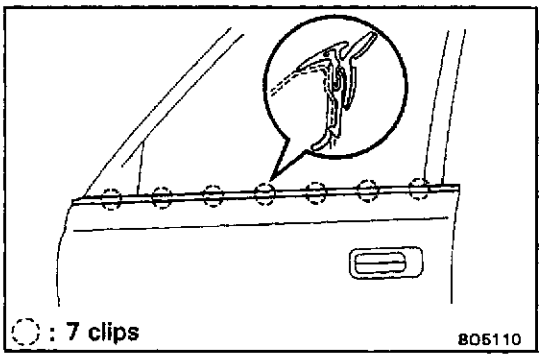
HINT Tape the screwdriver tip before use

(c) Remove the door trim

(d) Remove 11 screws and the armrest base from the door trim

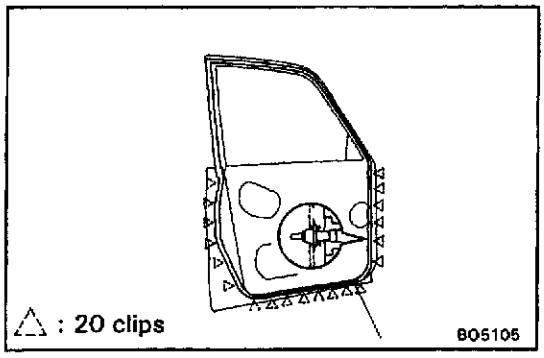
(e) Remove the inner weatherstrip from the door trim

(f) Remove 8 screws and the door pocket from the door trim



6. REMOVE DOOR BELT MOULDING

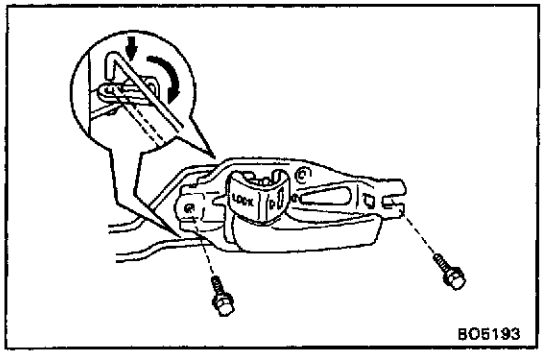
Pry out the clip from the edge of the panel, and remove the moulding



7. REMOVE DOOR WEATHERSTRIP

While pulling the weatherstrip by hand, remove 20 clips using a clip remover

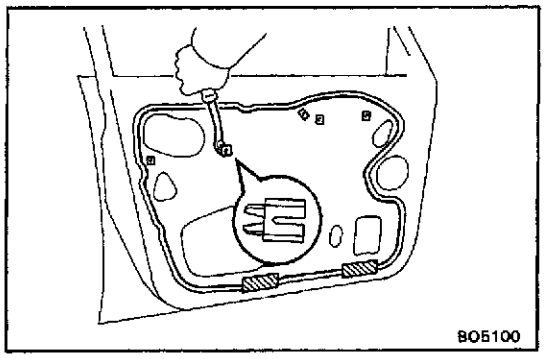
NOTICE: Do not pull strongly on the weatherstrip as it may tear.



8. REMOVE DOOR INSIDE HANDLE

(a) Remove 2 bolts

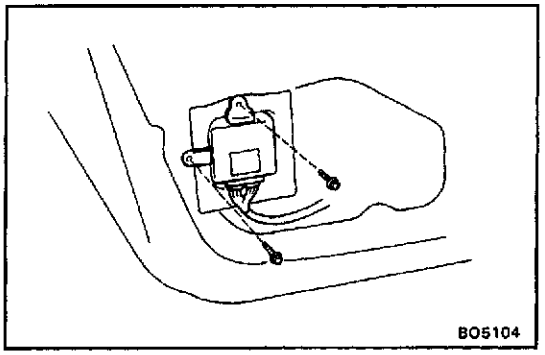
(b) Disconnect 2 links from the inside handle



9. REMOVE SERVICE HOLE COVER

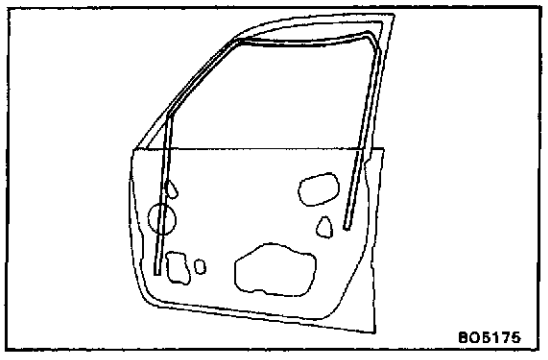
(a) Using the clip remover, remove 5 screw grommets

(b) Remove service hole cover



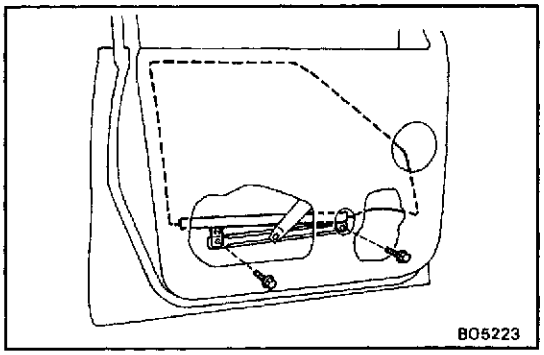
10. REMOVE DOOR LOCK CONTROL RELAY

Remove 2 bolts and the relay, then disconnect the connector

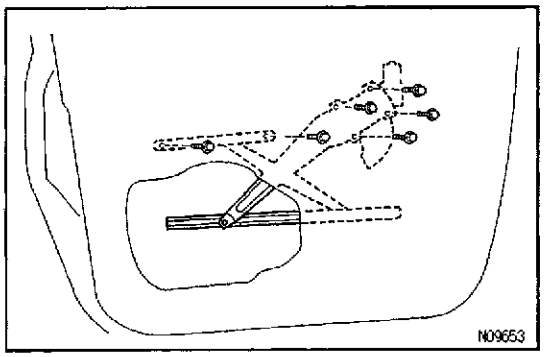


11. REMOVE DOOR GLASS RUN

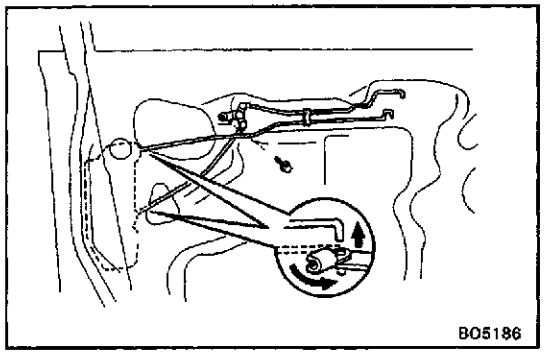
Pull out the glass run from the door frame



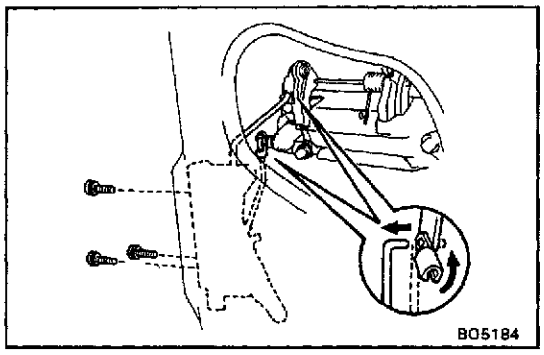
12. REMOVE DOOR GLASS
(a) Remove 2 glass mounting bolts
(b) Remove the door glass by pulling it upward



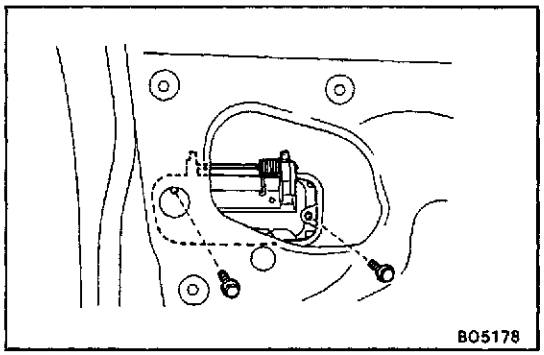
13. REMOVE WINDOW REGULATOR
(a) Disconnect the connector
(b) Remove 2 equalizer arm bracket mounting bolts
(c) Remove 4 regulator mounting bolts
(d) Remove the regulator through the service hole



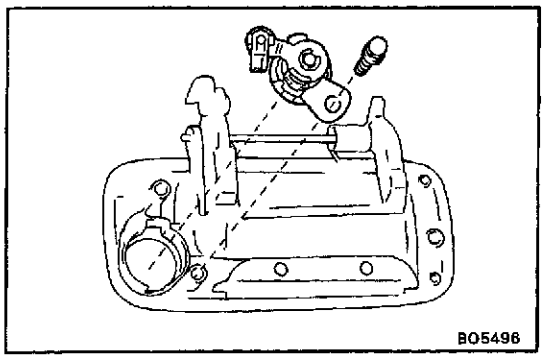
14. REMOVE LOCKING AND OPENING CONTROL LINK
(a) Remove the bolt and the locking link
(b) Disconnect 2 links from the door lock



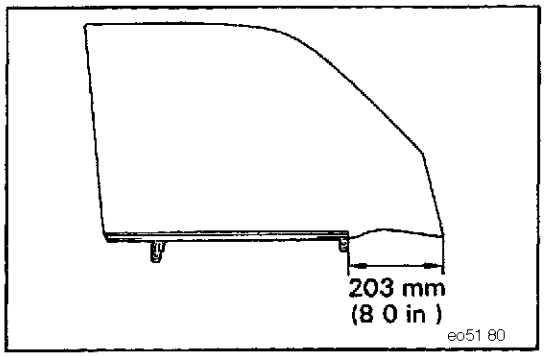
15. REMOVE DOOR LOCK
(a) Disconnect 2 links from outside handle and the door lock cylinder
(b) Disconnect the connector
(c) Remove 3 screws
(d) Remove the door lock through the service hole



16. REMOVE OUTSIDE HANDLE WITH DOOR LOCK
Remove 2 bolts and the outside handle with the lock cylinder



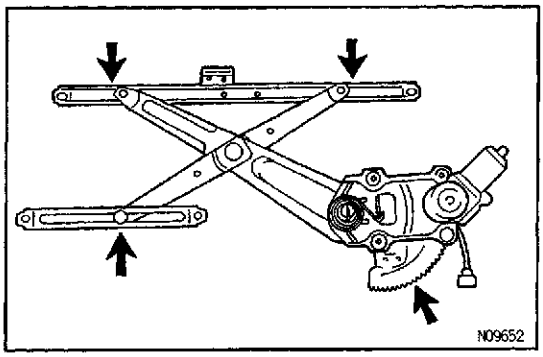
17. REMOVE DOOR LOCK CYLINDER
(a) Remove the bolt from the outside handle
(b) Turn the lock cylinder clockwise until it stops turning, then pull the lock cylinder straight out
18. REMOVE SPEAKER
Remove 3 screws and the speaker, then disconnect the connector



BO03Z-02

FRONT DOOR GLASS REPLACEMENT

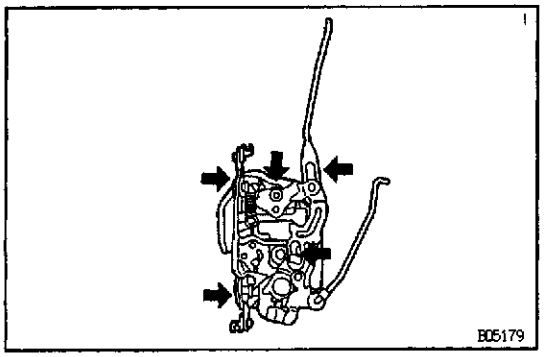
1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2 APPLY SOAPY WATER TO INSIDE OF WEATHER-STRIP
3 INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



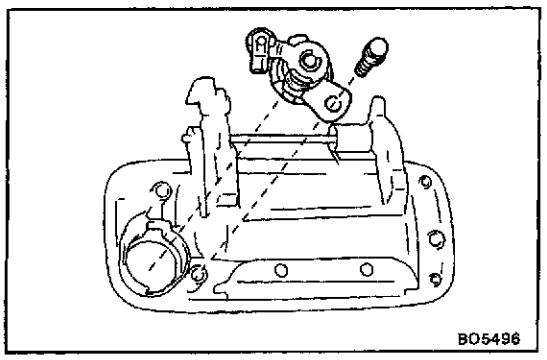
BO18Q-01

FRONT DOOR ASSEMBLY

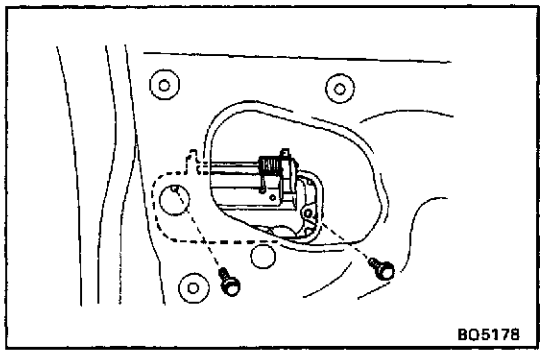
1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE
(a) Apply MP grease to the sliding surface and gears of the window regulator
NOTICE: Do not apply grease to the spring of the window regulator.



(b) Apply MP grease to the sliding surface of the door lock
2. INSTALL SPEAKER
Connect the connect and install speaker with 3 screws

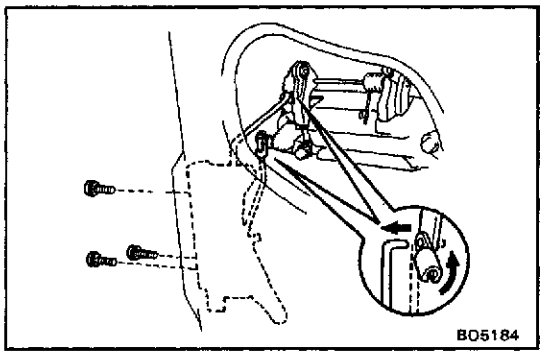


3. INSTALL DOOR LOCK CYLINDER
Install the lock cylinder to the outside handle, turn the lock cylinder counterclockwise until it stops with the bolt



4. INSTALL OUTSIDE HANDLE WITH DOOR LOCK CYLINDER

Install the outside handle with lock cylinder with 2 bolts



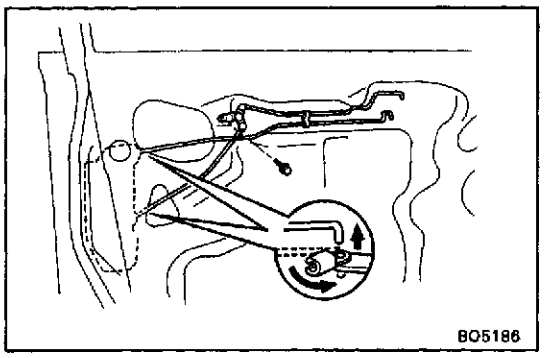
5. INSTALL DOOR LOCK

(a) Install the door lock with 3 screws

Torque: 5 N-m (50 kgf-cm, 43 in.lbf)

(b) Connect the connector

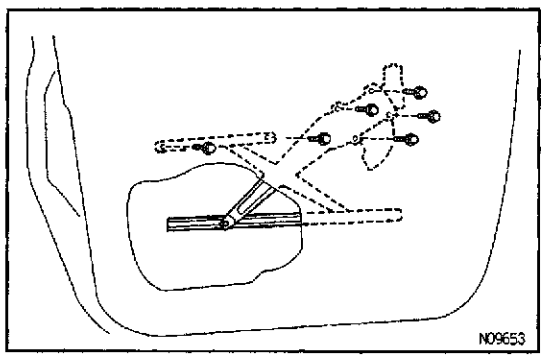
(c) Connect 2 links to the outside handle and the door lock cylinder



6. INSTALL LOCKING AND OPENING CONTROL LINK

(a) Connect 2 links to the door lock

(b) Install the locking link with the bolt



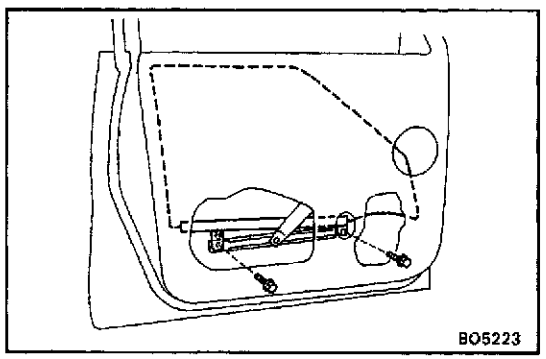
7. INSTALL WINDOW REGULATOR

(a) Place the regulator through the service hole

(b) Install 4 regulator mounting bolts

(c) Temporarily tighten 2 equalizer arm bracket bolts

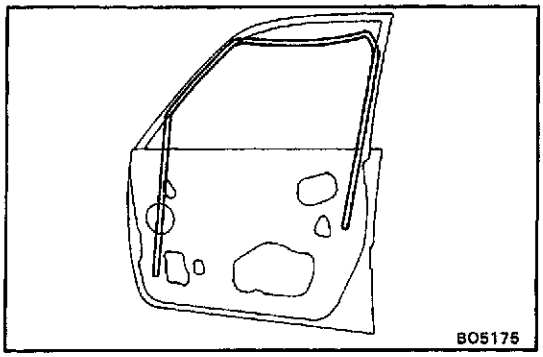
(d) Connect the connector



8. INSTALL DOOR GLASS

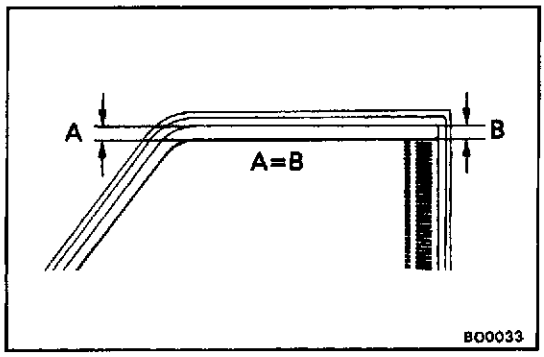
(a) Insert the glass to the glass guide

(b) Install the glass to the regulator with 2 mounting bolts



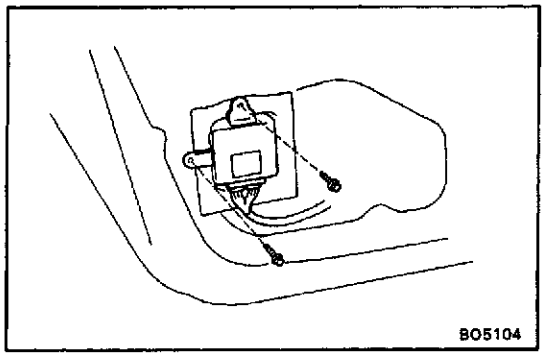
9. INSTALL DOOR GLASS RUN

Install the glass run to the door frame



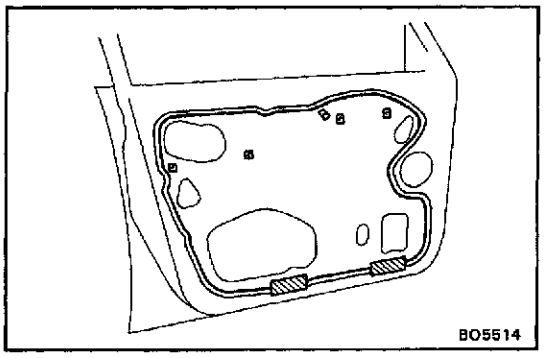
10. ADJUST DOOR GLASS

Adjust the equalizer arm up to down and tighten if where dimensions A and B, as shown are equal



11. INSTALL DOOR LOCK CONTROL RELAY

Install the relay with 2 bolts, then connect the connector



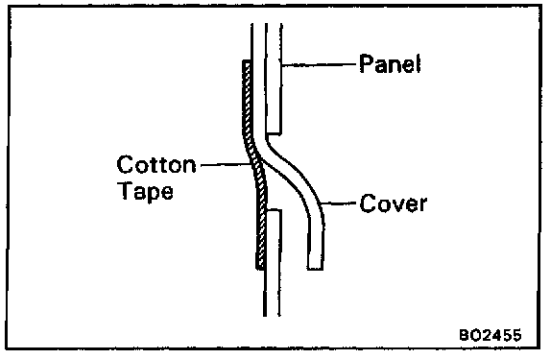
12. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive

HINT Bring out the links through the service hole cover

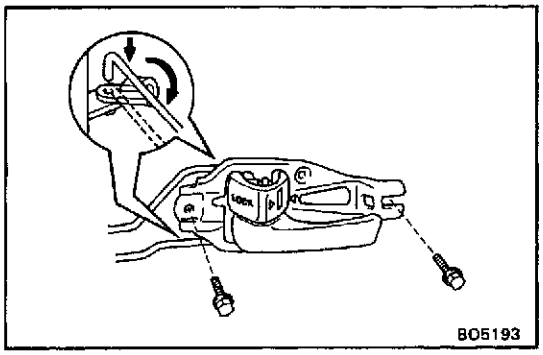
(b) Insert the lower edge of the cover into the panel slit

(c) Install 5 screw grommets



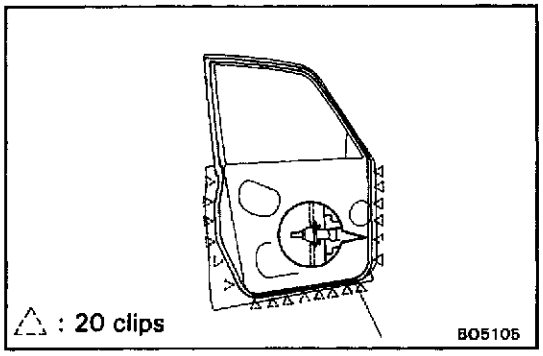
(d) Seal the panel slit with cotton tape

NOTICE: Do not block the trim clip sealing with the tape



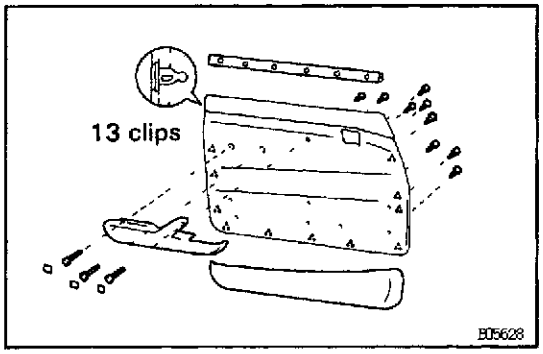
13. INSTALL DOOR INSIDE HANDLE

(a) Connect 2 links to the inside handle
(b) Install the inside handle with 2 bolts



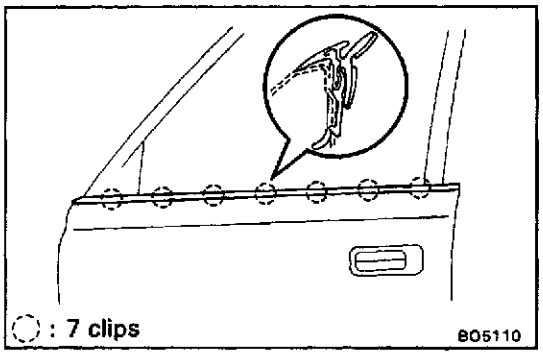
14. INSTALL DOOR WEATHERSTRIP

Install the weatherstrip with clips to the panel



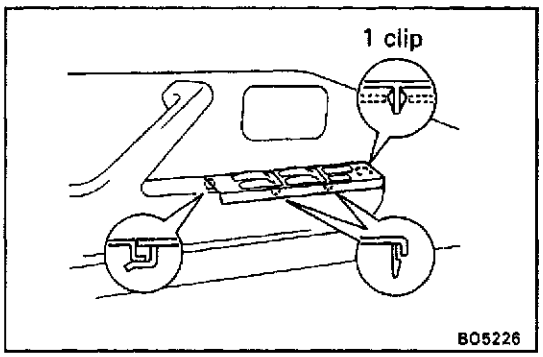
15. INSTALL DOOR TRIM

(a) Install the door pocket with 8 screws to the door trim
(b) Install the inner weatherstrip to the door trim
(c) Install the armrest base with 11 screws to the door trim
(d) Install the door trim with retainers to the inside door panel by tapping
(e) Install the armrest with the 3 screws to the inside door panel



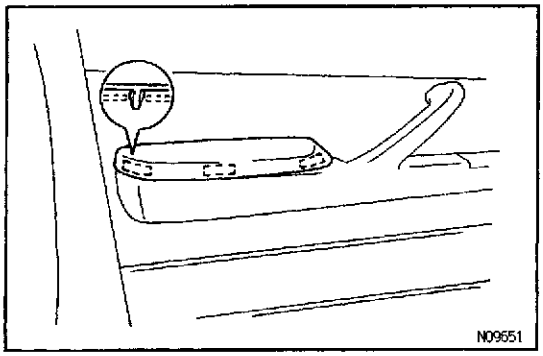
16. INSTALL DOOR BELT MOULDING

Insert the claw of the clips into the upper panel slit and push the moulding onto the panel



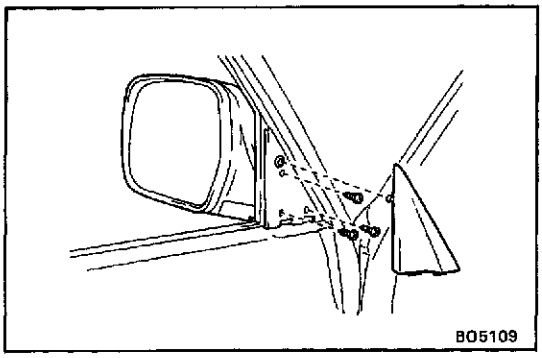
17. INSTALL ARMREST PANEL BASE UPPER

(a) Connect the connector
(b) Slide the panel rearward and tap the panel to install it



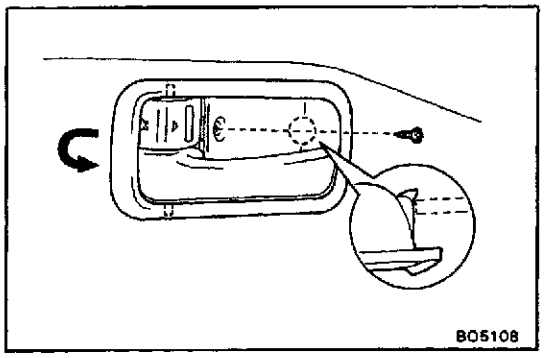
18. INSTALL ARMREST

Install the armrest to the armrest panel base by tapping



19. INSTALL REAR VIEW MIRROR

(a) Install the rear view mirror with 3 screws
(b) (w/ Remote Control Mirror)
Connect the connector
(c) Install the cover

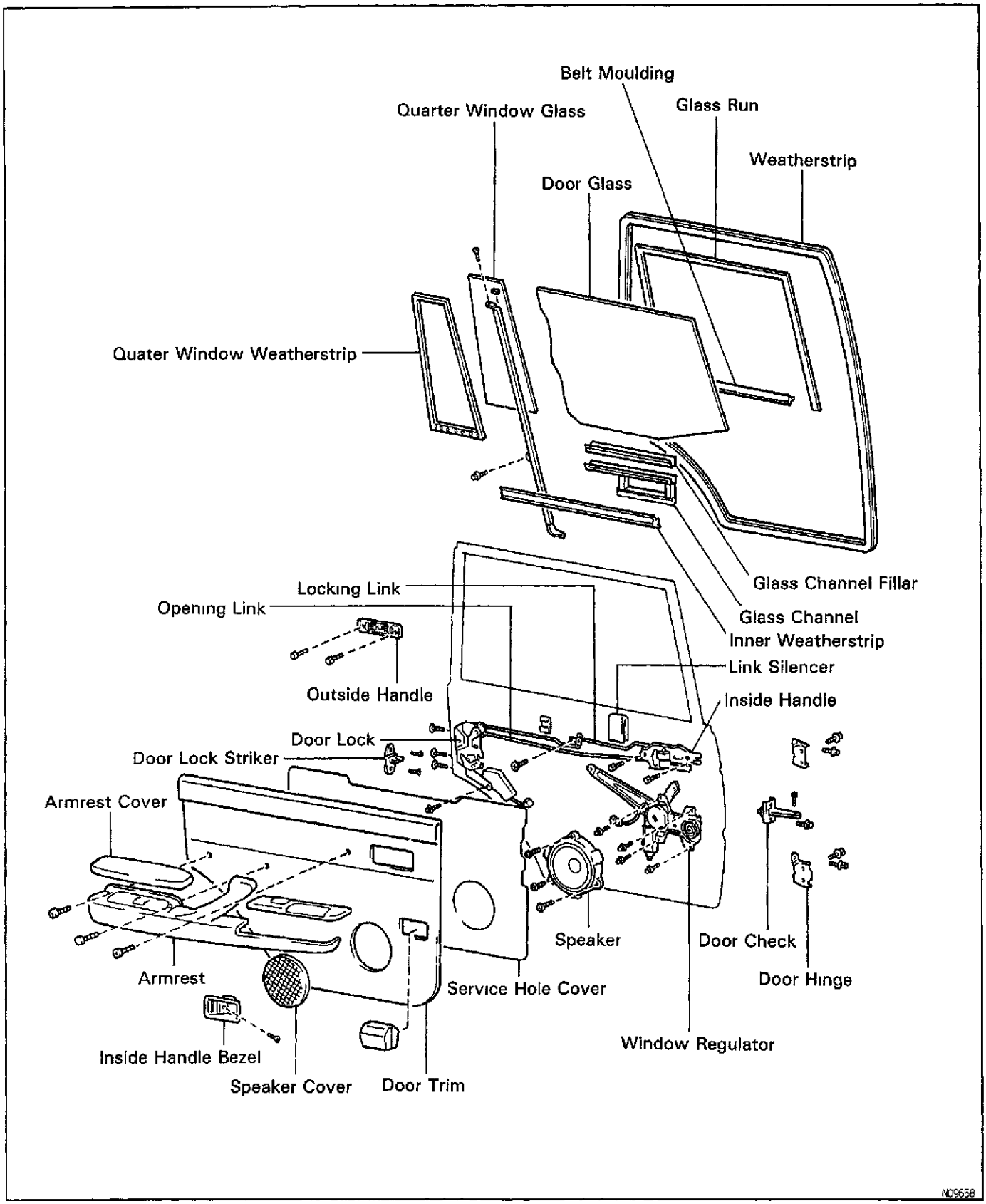


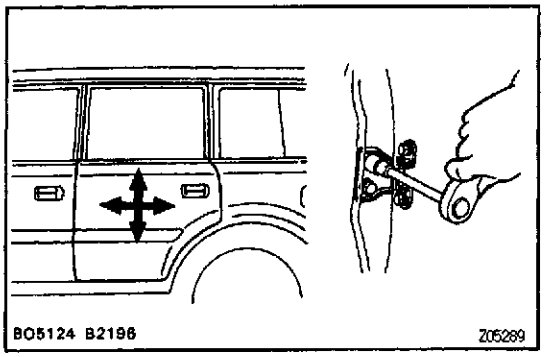
20. INSTALL DOOR INSIDE HANDLE BEZEL

(a) Push in the bezel to install it
(b) Install the screw

REAR DOOR
COMPONENTS

BO03W-01





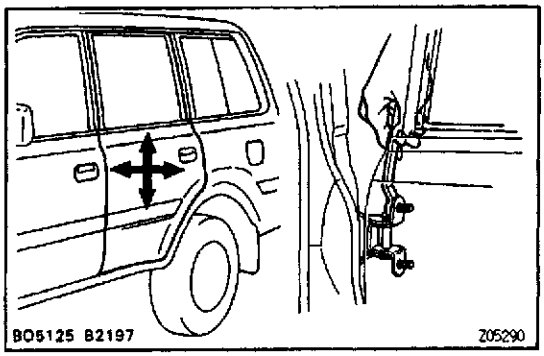
BO08X-03

REAR DOOR ADJUSTMENT

1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts

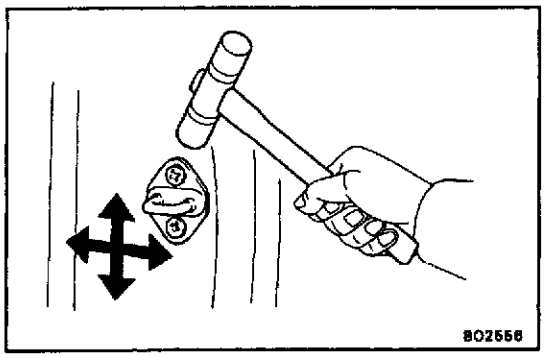
Torque: 24 N-m (240 kgf.cm, 17 ft-lbf)



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)

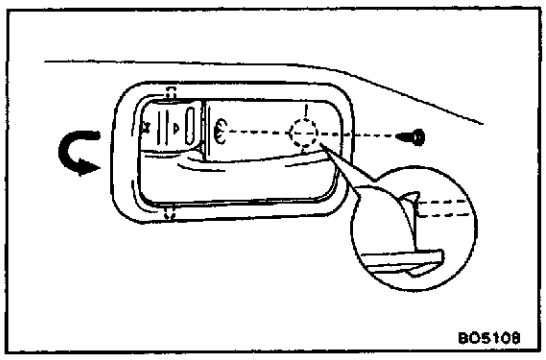


3. ADJUST DOOR LOCK STRIKER

(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

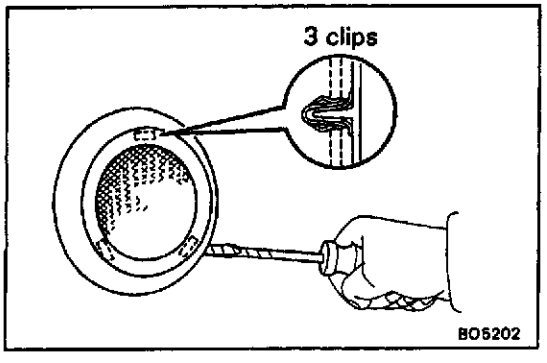


BO19R-01

REAR DOOR DISASSEMBLY

1. REMOVE DOOR INSIDE HANDLE

Remove the screw and pull the inside handle bezel

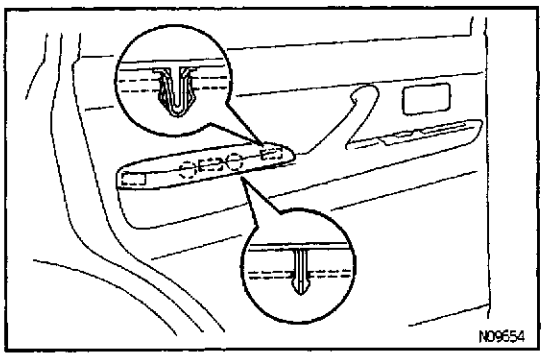


2. REMOVE SPEAKER COVER

(a) Insert the screwdriver between the door trim and the speaker cover to pry out

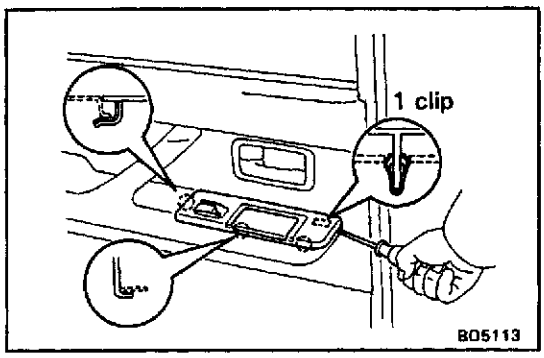
HINT Tape the screwdriver tip before use

(b) Remove the speaker cover



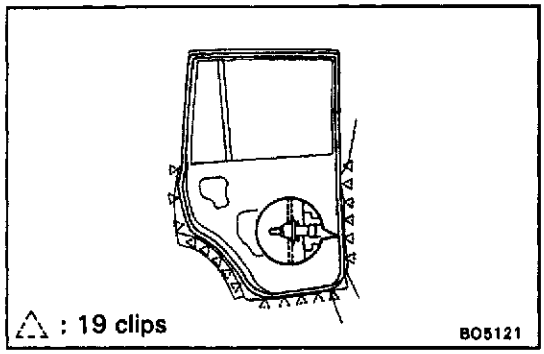
3. REMOVE ARMREST

(a) Insert the screwdriver between the armrest and the armrest panel base to pry out
HINT Tape the screwdriver tip before use
(b) Remove the armrest



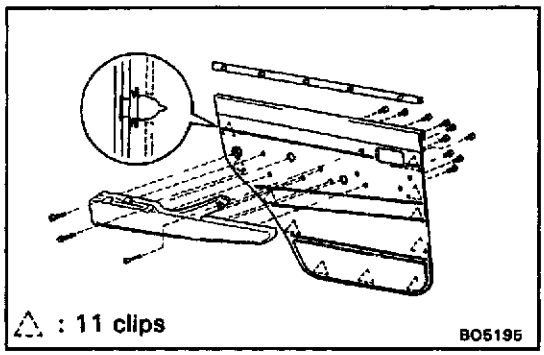
4. REMOVE ARMREST PANEL BASE UPPER

(a) Remove the ash try
(b) Insert the screwdriver between the armrest panel base and the armrest panel base upper to pry out
HINT Tape the screwdriver tip before use
(c) Slide the armrest panel base upper forward to remove it, then disconnect the connector



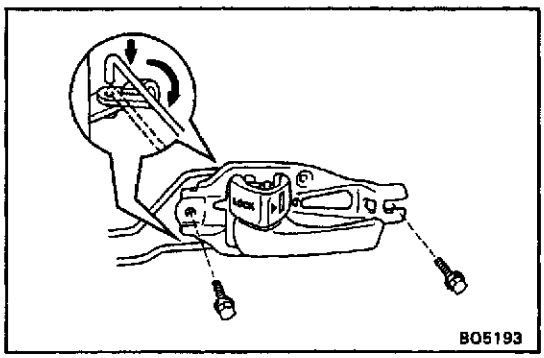
5. REMOVE DOOR WEATHERSTRIP

While pulling the weatherstrip by hand, remove nineteen clips using a clip remover
NOTICE: DO NOT PUFF STRONGLY ON THE WEATHER STRIP AS IT MAY TEAR



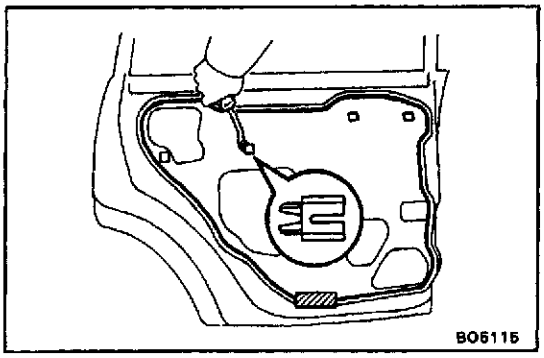
6. REMOVE DOOR TRIM

(a) Remove 3 screws from the inner door panel
(b) Insert the screwdriver between the trim and the door panel to pry out, and the trim by pull it upward
(c) Remove the inner weatherstrip from the door trim
(d) Remove 11 screws and the armrest panel base from the door trim

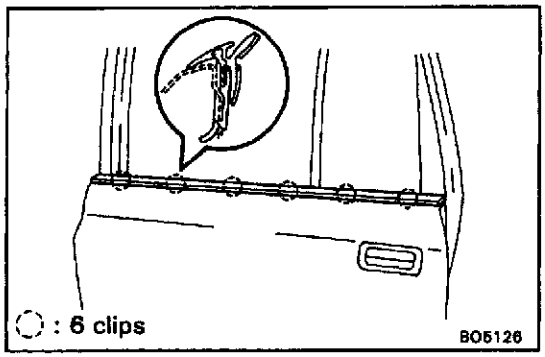


7. REMOVE DOOR INSIDE HANDLE

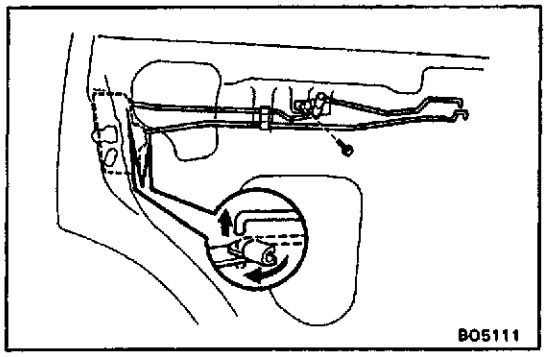
(a) Remove 2 bolts
(b) Disconnect 2 links from the inside handle



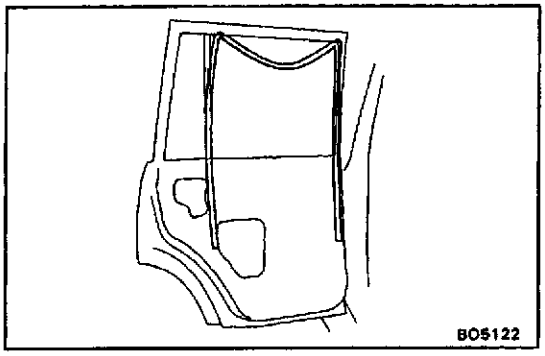
8. REMOVE SERVICE HOLE COVER
(a) Using the clip remover, remove 5 screw grommets
(b) Remove service hole cover



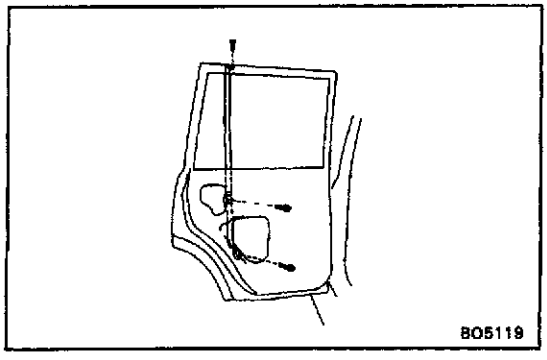
9. REMOVE DOOR BELT MOULDING
Pry out the clips form the edge of the panel, and remove the moulding



10. REMOVE LOCKING LINK AND DOOR OPENING LINK
Remove the bolt and disconnect 2 links

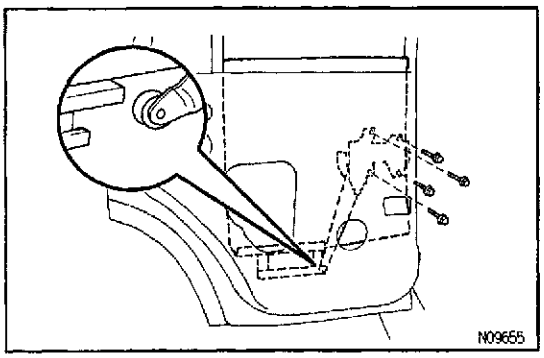


11. REMOVE DOOR GLASS RUN
Pull out the glass run from the door frame

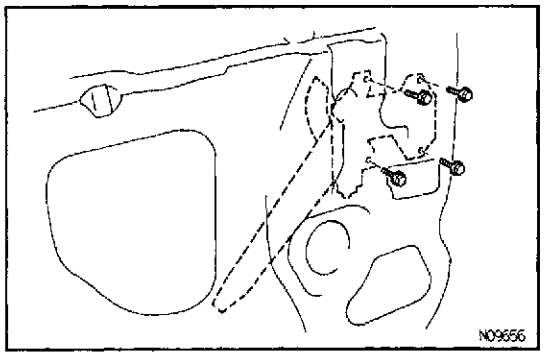


12. REMOVE DIVISION BAR
(a) Remove the screw from the door frame
(b) Remove 2 bolts from the door panel
(c) Pull out the division bar from the door panel

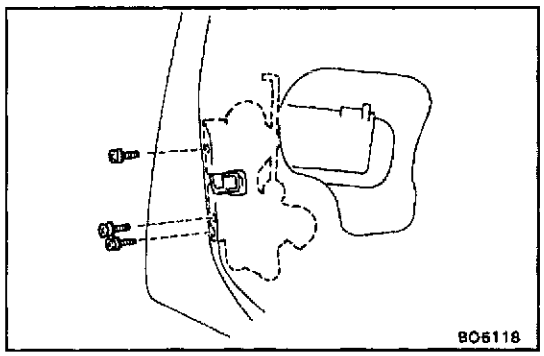
13. REMOVE QUARTER WINDOW GLASS WITH WEATHERSTRIP
Remove the quarter window glass together with the weatherstrip by pulling it forward



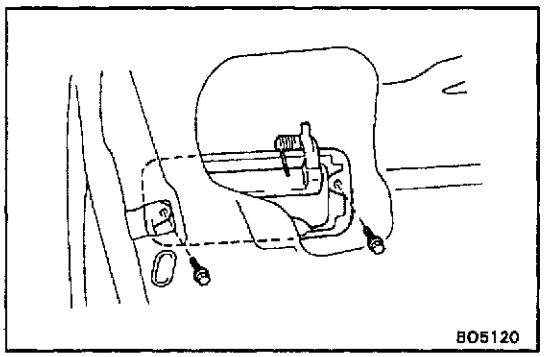
14. REMOVE DOOR GLASS
(a) Remove the glass mounting nuts
(b) Remove the door glass by pulling it upward



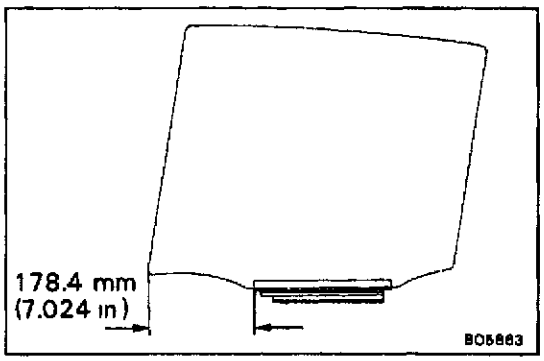
15. REMOVE WINDOW REGULATOR
(a) Disconnect the connector
(b) Remove 4 regulator mounting bolts
(c) Remove the regulator through the service hole



16. REMOVE DOOR LOCK
(a) Remove the link from outside handle
(b) Disconnect the connectors
(c) Remove 3 screws and the door lock



17. REMOVE OUTSIDE HANDLE
Remove 2 bolts and the outside handle
18. REMOVE SPEAKER
Remove 3 screws and speaker, then disconnect the connector

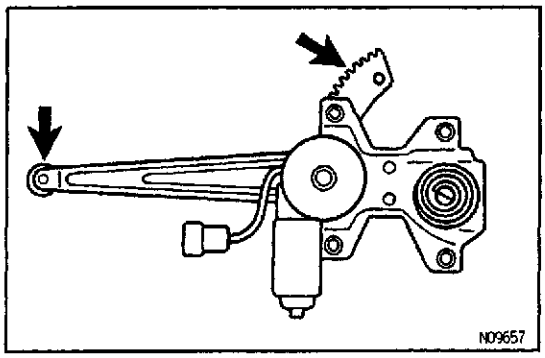


REAR DOOR GLASS REPLACEMENT

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHER-STRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER

BO168-01

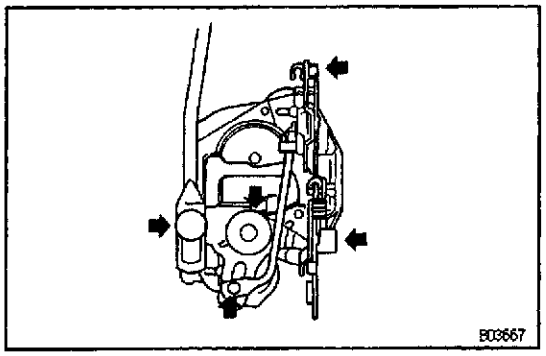
REAR DOOR ASSEMBLY



1. BEFORE INSTALLING PARTS. COAT THEM WITH MP GREASE

(a) Apply MP grease to the sliding surface and gears of the window regulator

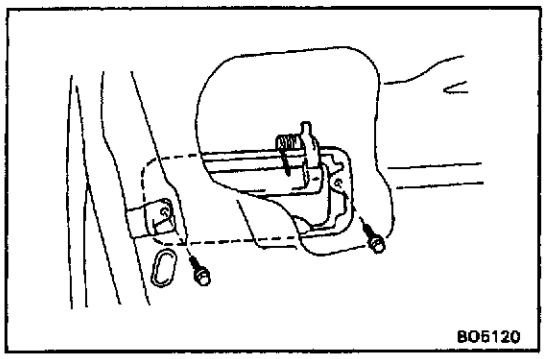
NOTICE: Do not apply grease to the spring.



(b) Apply MP grease to the sliding surface of the door lock

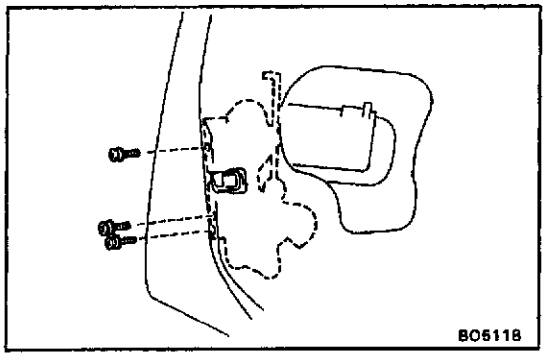
2. INSTALL SPEAKER

Connect the connector and install speaker with 3 screws



3. INSTALL OUTSIDE HANDLE

Install the outside handle with 2 bolts



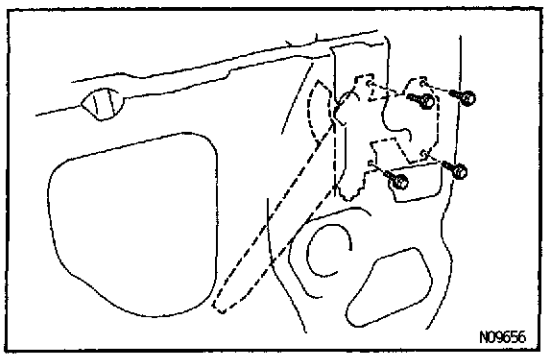
4. INSTALL DOOR LOCK

(a) Install the door lock with 3 screws

Torque: 5 N-m (50 kgf-cm, 43 MAW)

(b) Connect the connector

(c) Connect the link to the outside handle

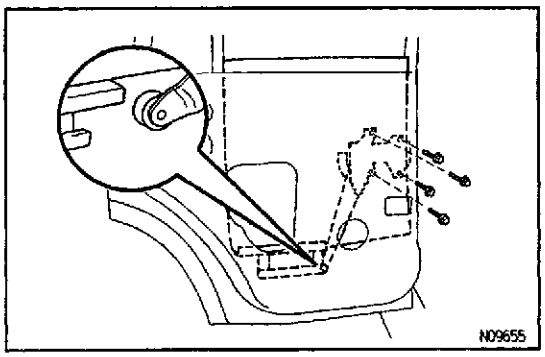


5. INSTALL WINDOW REGULATOR

(a) Place the regulator through the service hole

(b) Install 4 regulator mounting bolts

(c) Connect the connector

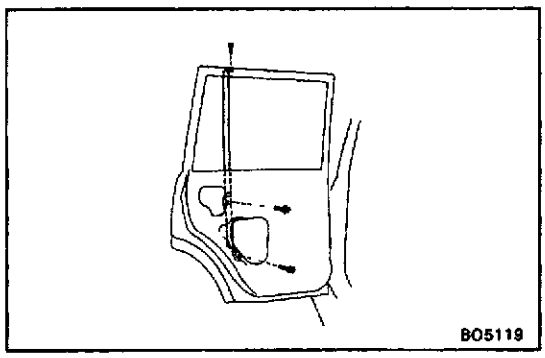


6. INSTALL DOOR GLASS

(a) Place the glass in the door cavity

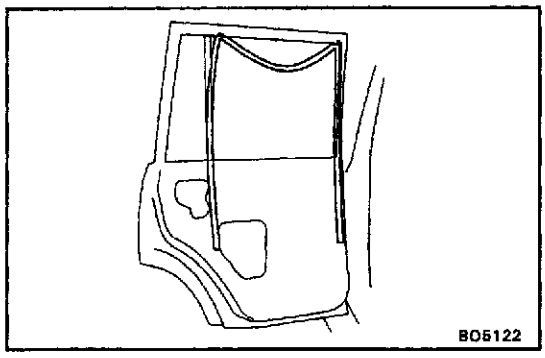
(b) Attach the glass to the window regulator arm

7. INSTALL QUARTER WINDOW GLASS WITH WEATHERSTRIP



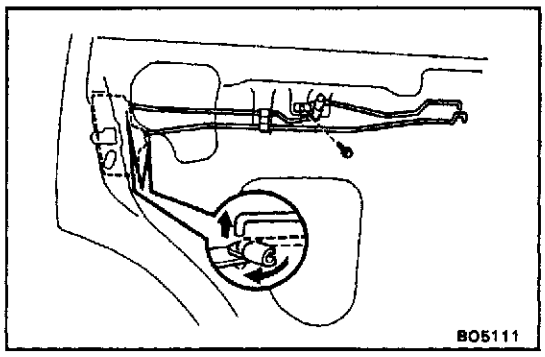
8. INSTALL DIVISION BAR

Install division bar with the screw and 2 bolts



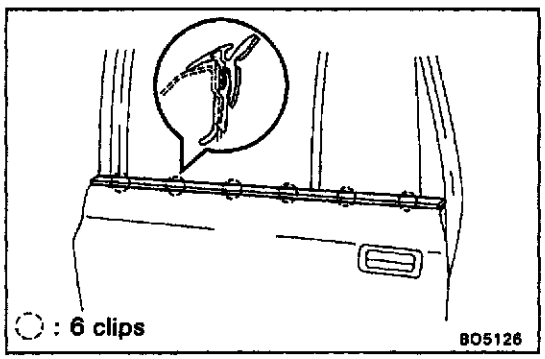
9. INSTALL DOOR GLASS RUN

Install the glass run to the door frame



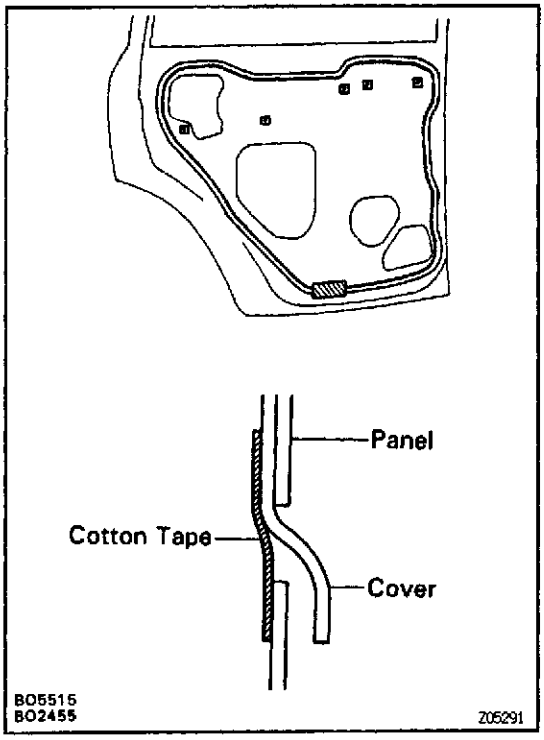
10. INSTALL LOCKING LINK AND DOOR OPENING LINK

Connect 2 links and install the bolt



11. INSTALL DOOR BELT MOULDING

Insert the claw of the clips into the upper panel slit and push the moulding onto the panel



12. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive

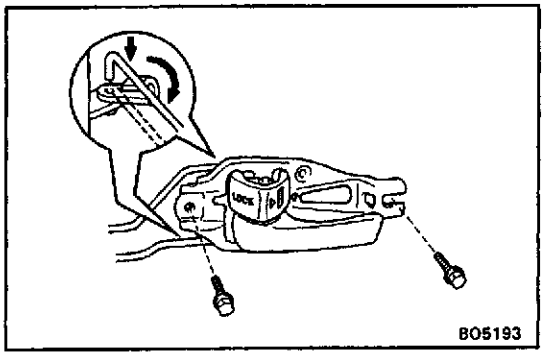
HINT Bring out the link through the service hole cover

(b) Insert the lower edge of the service hole cover into the panel slit

(c) Install 5 screw grommets

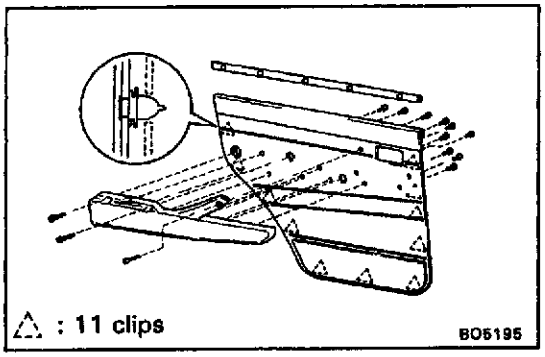
(d) Seal the panel slit with the cotton tape

NOTICE: Do not block the trim clip sealing with the tape.



13. INSTALL DOOR INSIDE HANDLE

Connect 2 links to the inside handle and install 2 bolts



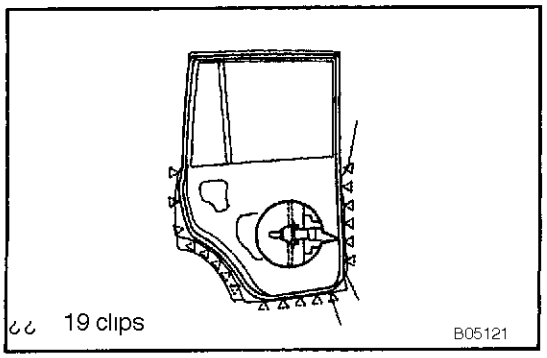
14. INSTALL DOOR TRIM

(a) Install the armrest panel base with 11 screws to the door trim

(b) Install the inner weatherstrip to the door trim

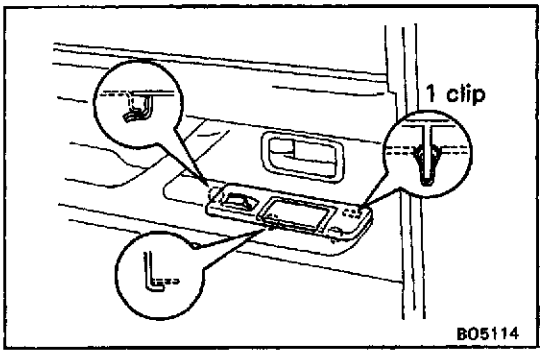
(c) Install the upper edge of the trim from above, tap the trim by hand fix it in place with the retainers

(d) Install the armrest with 3 screws to the door panel



15. INSTALL DOOR WEATHERSTRIP

Install the weatherstrip with clips to the panel

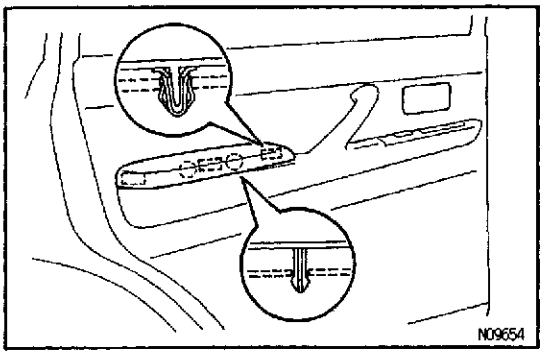


16. INSTALL ARMREST PANEL BASE UPPER

(a) Connect the connector

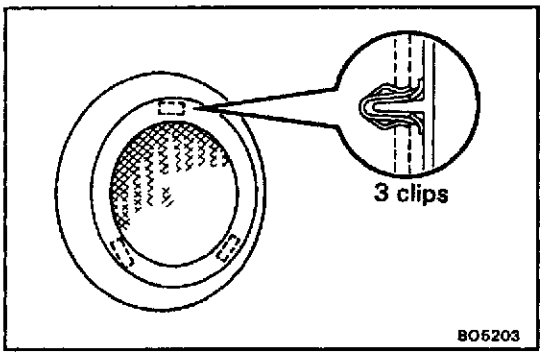
(b) Slide the armrest panel base upper rearward and tap the panel to install it

(c) Install the ash tray



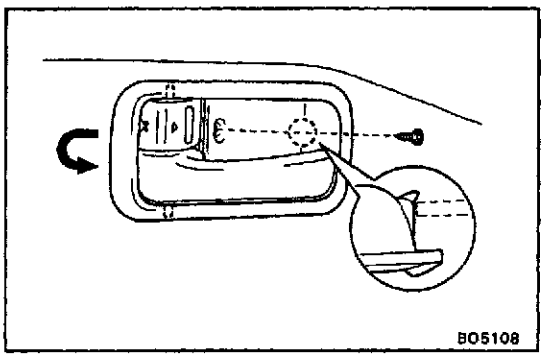
17. INSTALL ARMREST

Install the armrest to the armrest panel base by tapping



18. INSTALL SPEAKER COVER

Install the speaker cover to the door panel



19. INSTALL DOOR INSIDE HANDLE BEZEL

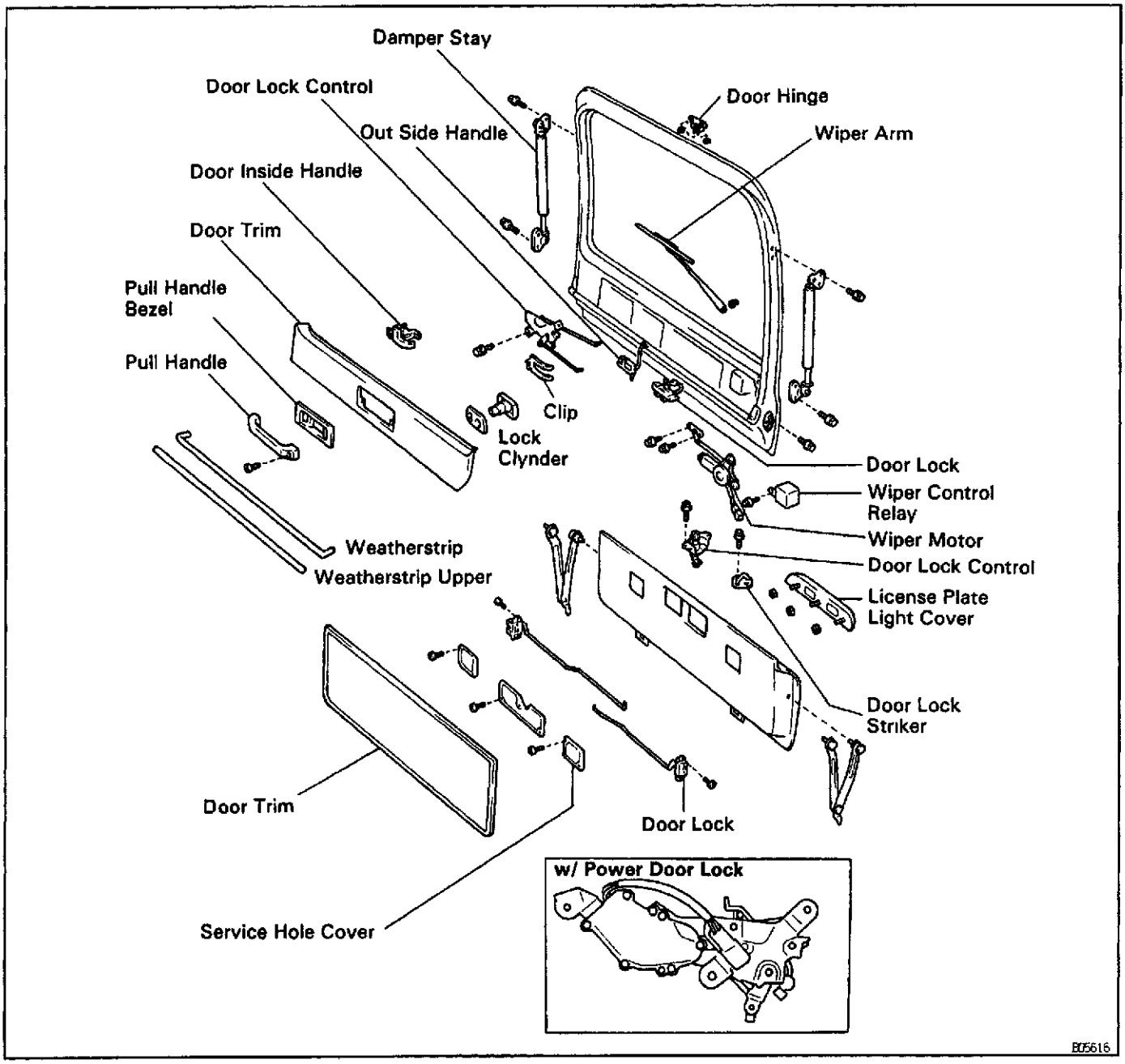
(a) Push in the bezel to install it

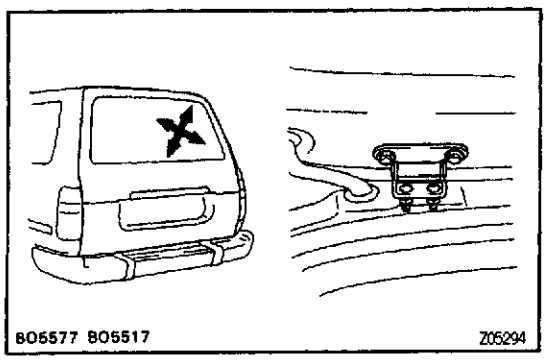
(b) Install the screw

BACK DOOR

BO0HQ-01

COMPONENTS



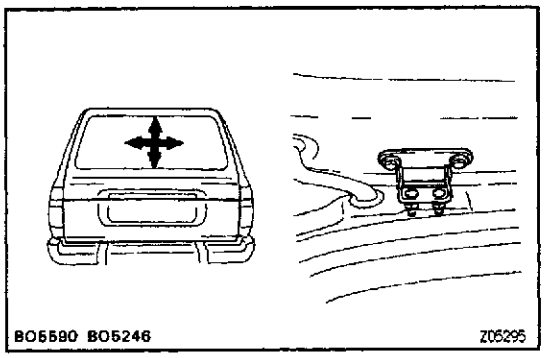


UPPER BACK DOOR ADJUSTMENT

BO0HR-02

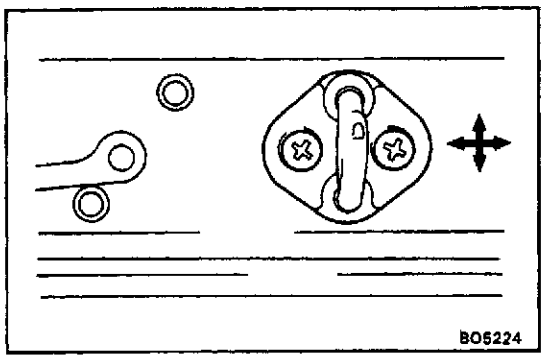
1. ADJUST DOOR IN FORWARD /REARWARD AND LEFT /RIGHT DIRECTIONS

Adjust the door by loosening the door side hinge bolts



2. ADJUST DOOR IN LEFT /RIGHT AND VERTICAL DIRECTIONS

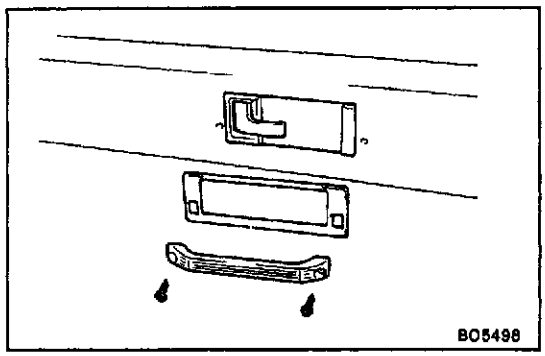
Adjust the door by loosening the body side hinge bolts



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkage are adjusted correctly

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer Tighten the striker mounting screw again

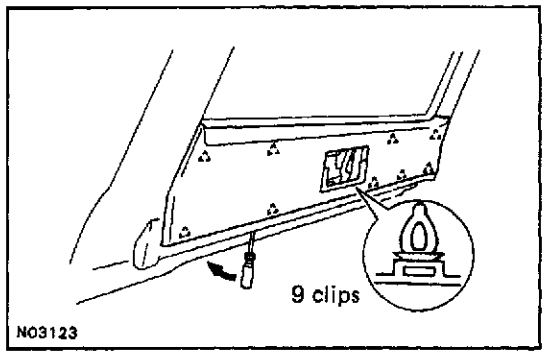


800TX-02

UPPER BACK DOOR DISASSEMBLY

1. REMOVE PULL HANDLE AND PULL HANDLE BEZEL

Remove 2 screws and pull handle, then remove the bezel

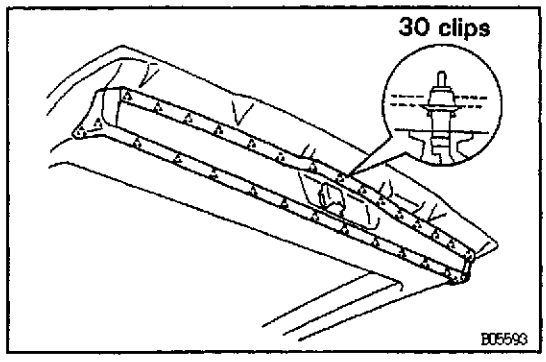


2. REMOVE DOOR TRIM

(a) Insert a screwdriver, between the retainers and the door trim to pry it loose

HINT Tape the screwdriver tip before use

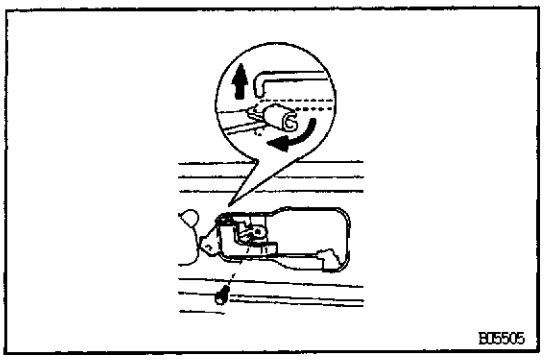
(b) Remove the door trim



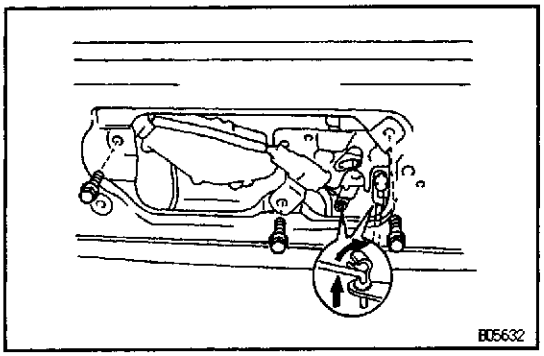
3. REMOVE DOOR WEATHERSTRIP AND WEATHER-STRIP UPPER

While pulling the weatherstrips by hand, remove the clips using the clip remover

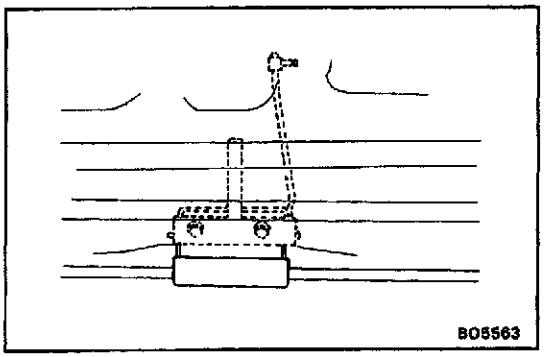
NOTICE: Do not pull strongly on the weatherstrips as it may tear.



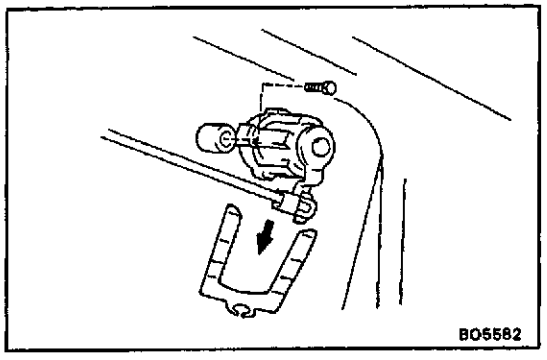
4. REMOVE DOOR INSIDE HANDLE
Remove the bolt and the handle, then disconnect the link



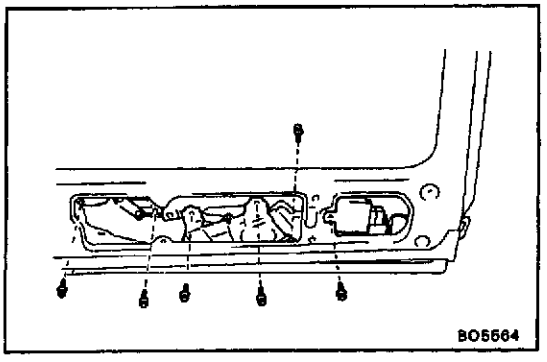
5. REMOVE DOOR LOCK CONTROL
(w/o Power Door Lock)
Remove 2 bolts and the lock control, then disconnect 2 links
(w/ Power Door Lock)
Remove 3 bolts and the lock control, then disconnect 2 links and the connector



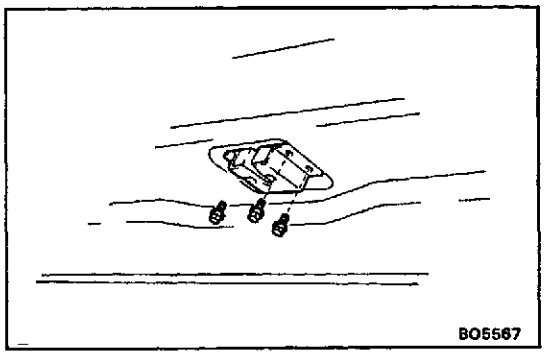
6. REMOVE OUTSIDE HANDLE
Remove 2 bolts and the outside handle



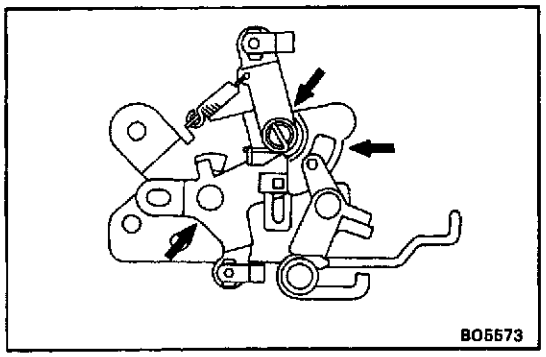
7. REMOVE DOOR LOCK CYLINDER
(a) Disconnect the link from the cylinder
(b) Remove retainer from the cylinder



8. (w/ Rear Wiper)
REMOVE WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY
(a) Open the cap
(b) Remove the nut and the wiper arm
(c) Remove 5 bolts and the motor, then disconnect the connector
(d) Remove the bolts and the rear wiper control relay, then disconnect the connector



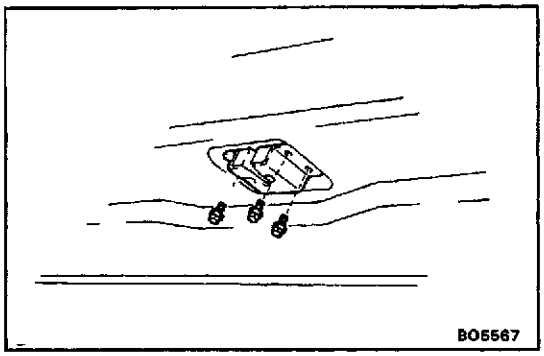
9. REMOVE DOOR LOCK
Remove 3 bolts and the door lock, then disconnect the connector



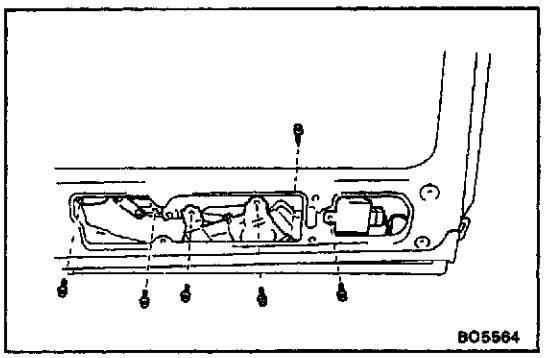
UPPER BACK DOOR ASSEMBLY

BODTY—02

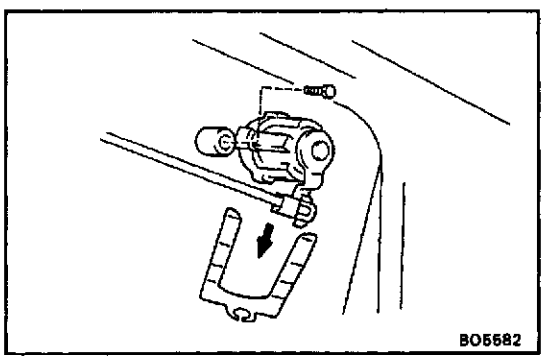
1. APPLY MP GREASE TO LOCK CONTROL
Apply MP grease to the sliding surface of the lock control



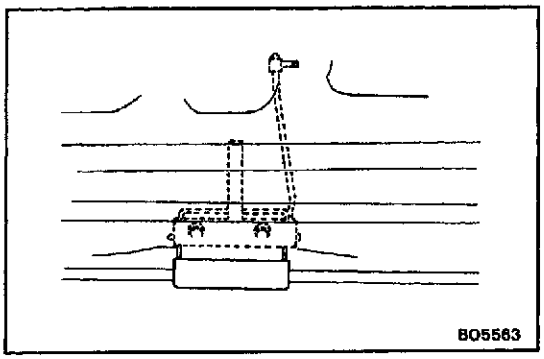
2. INSTALL DOOR LOCK
Install the door lock with 3 bolts, then connect the connector



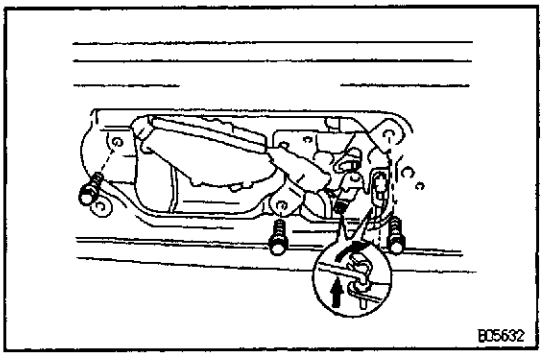
3. (w/ Rear Wiper)
INSTALL WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY
(a) Connect the connector, then install the rear wiper control relay with the bolt
(b) Connect the connector
(c) Install the motor with 5 bolts
(d) Install the wiper arm with the nut



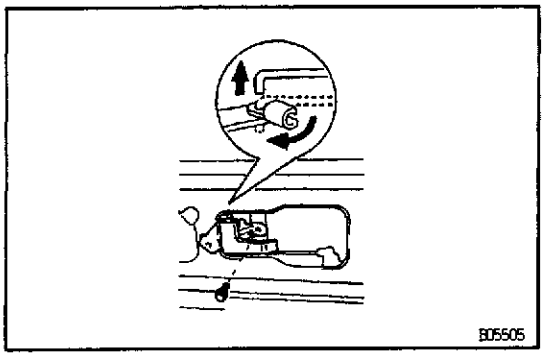
4. INSTALL DOOR LOCK CYLINDER
(a) Install the cylinder with retainer
(b) Connect the link to the cylinder



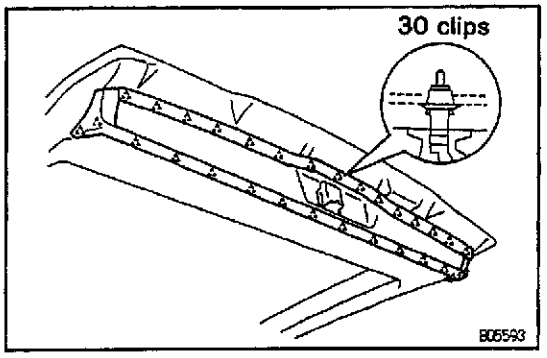
5. INSTALL OUTSIDE HANDLE
Install the outside handle and the handle with 2 bolts



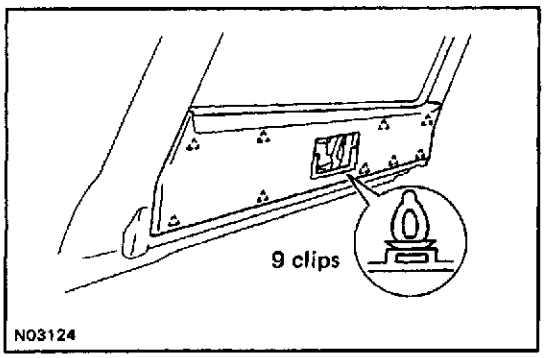
6. INSTALL DOOR LOCK CONTROL
(w/ Power Door Lock)
Install the lock control with 2 bolts, then connect 2 links
(w/o Power Door Lock)
Install the lock control with 3 bolts, then connect 2 links and the connector



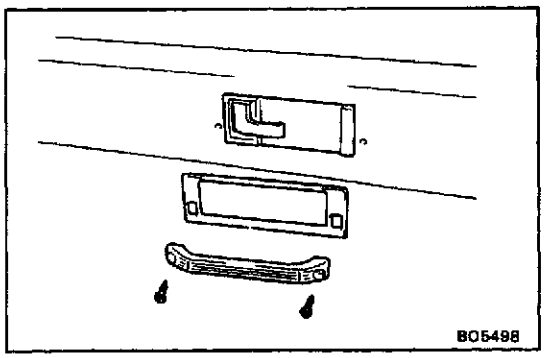
7. INSTALL DOOR INSIDE HANDLE
(a) Connect the link
(b) Install the handle with the bolt



8. INSTALL DOOR WEATHERSTRIP AND WEATHERSTRIP UPPER
Install the weatherstrips with clips to the door-

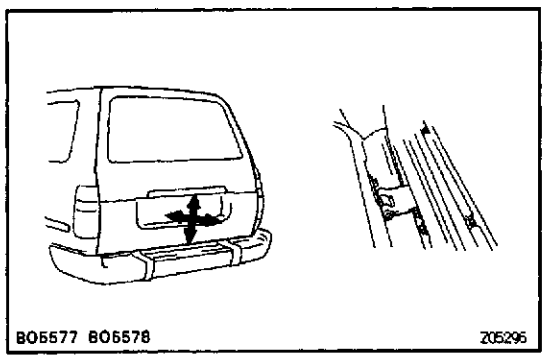


9. INSTALL DOOR TRIM
Install the door trim with retainers to the door panel by tapping



10. INSTALL PULL HANDLE AND PULL HANDLE BEZEL

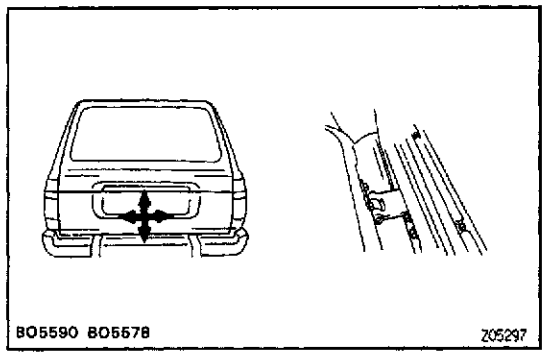
Install the bezel and the pull handle with 2 screws



LOWER BACK DOOR ADJUSTMENT

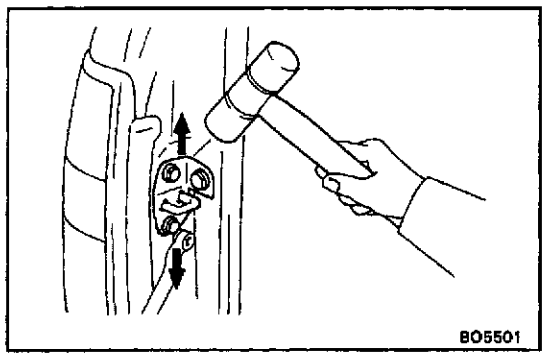
1. ADJUST DOOR IN FORWARD /REARWARD AND LEFT /RIGHT DIRECTIONS

Adjust the door by loosening the door side hinge bolts



2. ADJUST DOOR IN LEFT /RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts

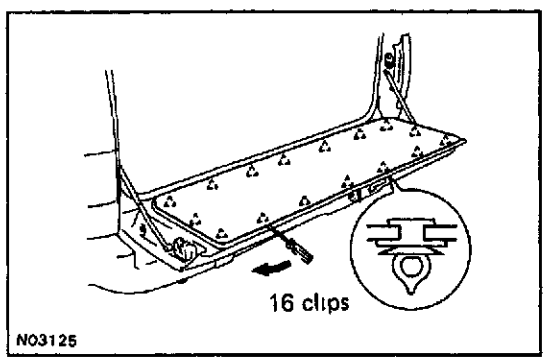


3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer

(c) Tighten the striker mounting screws again



LOWER BACK DOOR DISASSEMBLY

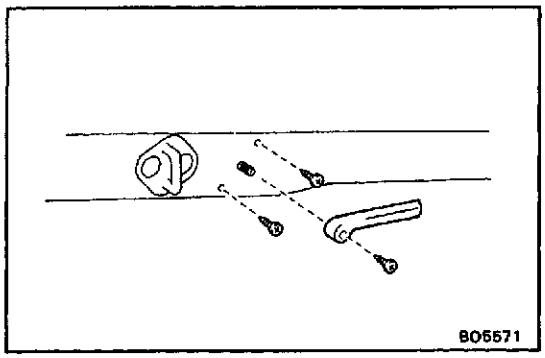
1. REMOVE DOOR TRIM

(a) Insert a screwdriver, between the retainers and the door trim to pry it loose

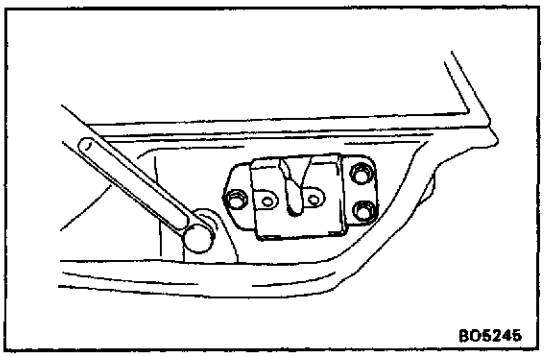
HINT Tape the screwdriver tip before use

(b) Remove the door trim

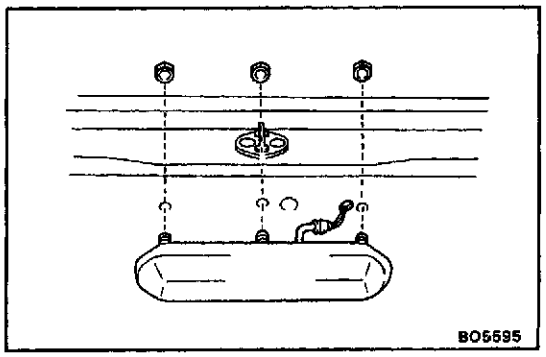
2. REMOVE SERVICE HOLE COVER



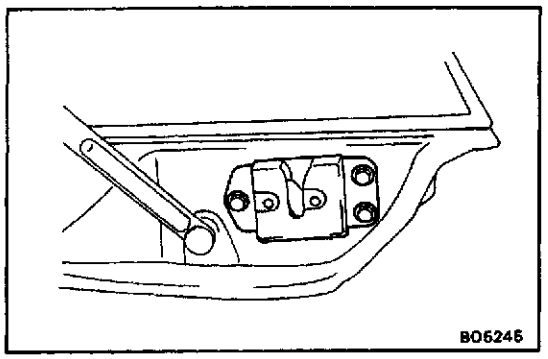
3. REMOVE DOOR LOCK CONTROL
(a) Disconnect 2 links from the door lock control
(b) Remove the screw and the inside handle
(c) Remove 2 screws, bush and the door lock control



4. REMOVE DOOR LOCK
Remove 3 bolts and the door lock

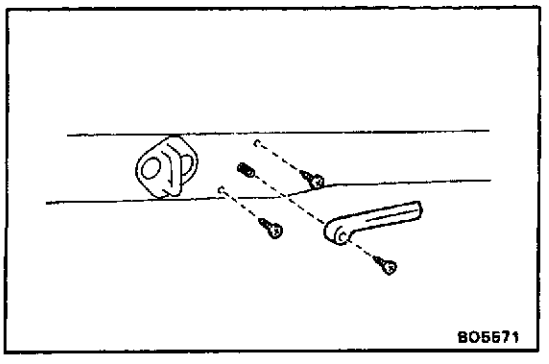


5. REMOVE LICENSE PLATE LIGHT COVER
Remove 3 nuts and the light cover, then disconnect the connector

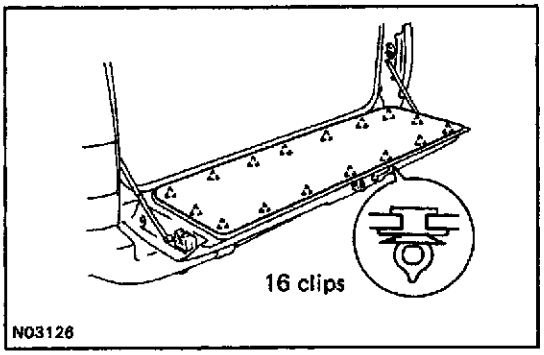


LOWER BACK DOOR ASSEMBLY

1. INSTALL LICENSE PLATE LIGHT COVER
Connect the connector and install the light cover with 3 nuts
2. INSTALL DOOR LOCK
Install the door lock with 3 bolts

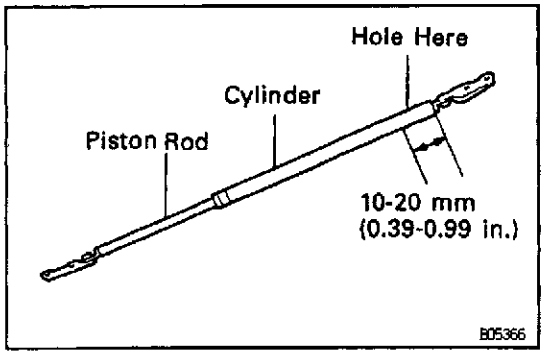


3. INSTALL DOOR LOCK CONTROL
(a) Install the door lock control with 2 screws
(b) Install the bush and the inside handle with the screw
(c) Connect 2 links to the door lock control
4. INSTALL SERVICE HOLE COVER



5. INSTALL DOOR TRIM

Install the door trim with clips to the inside door panel by tapping

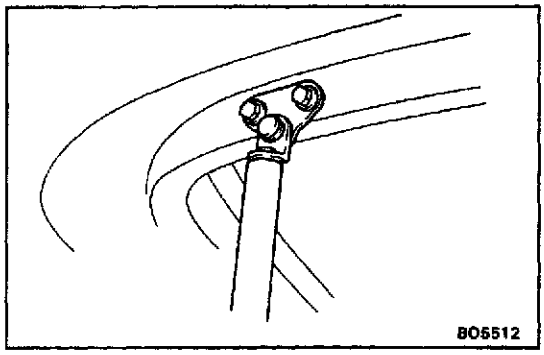


BACK DOOR DAMPER STAY

BO0D8-01

NOTICE: Handling the damper.

- **Do not disassemble the damper because the cylinder is filled with pressurized gas.**
- **If the damper is to be replaced, drill a 2.0 - 3.0 mm (0.079 - 0.118 in.) hole in the bottom of the removed damper cylinder 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 carefully. Never score or scatch 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 fully extended.**



DAMPER STAY REMOVAL

BO0U1-02

REMOVE DAMPER STAY

(a) Remove 2 bolt and the damper stay upper and from back door

(b) Remove 2 bolts and the damper stay lower end from body

DAMPER STAY INSTALLATION

BO0U2-02

INSTALL DAMPER STAY

(a) Install damper stay upper end to back door with 2 bolts

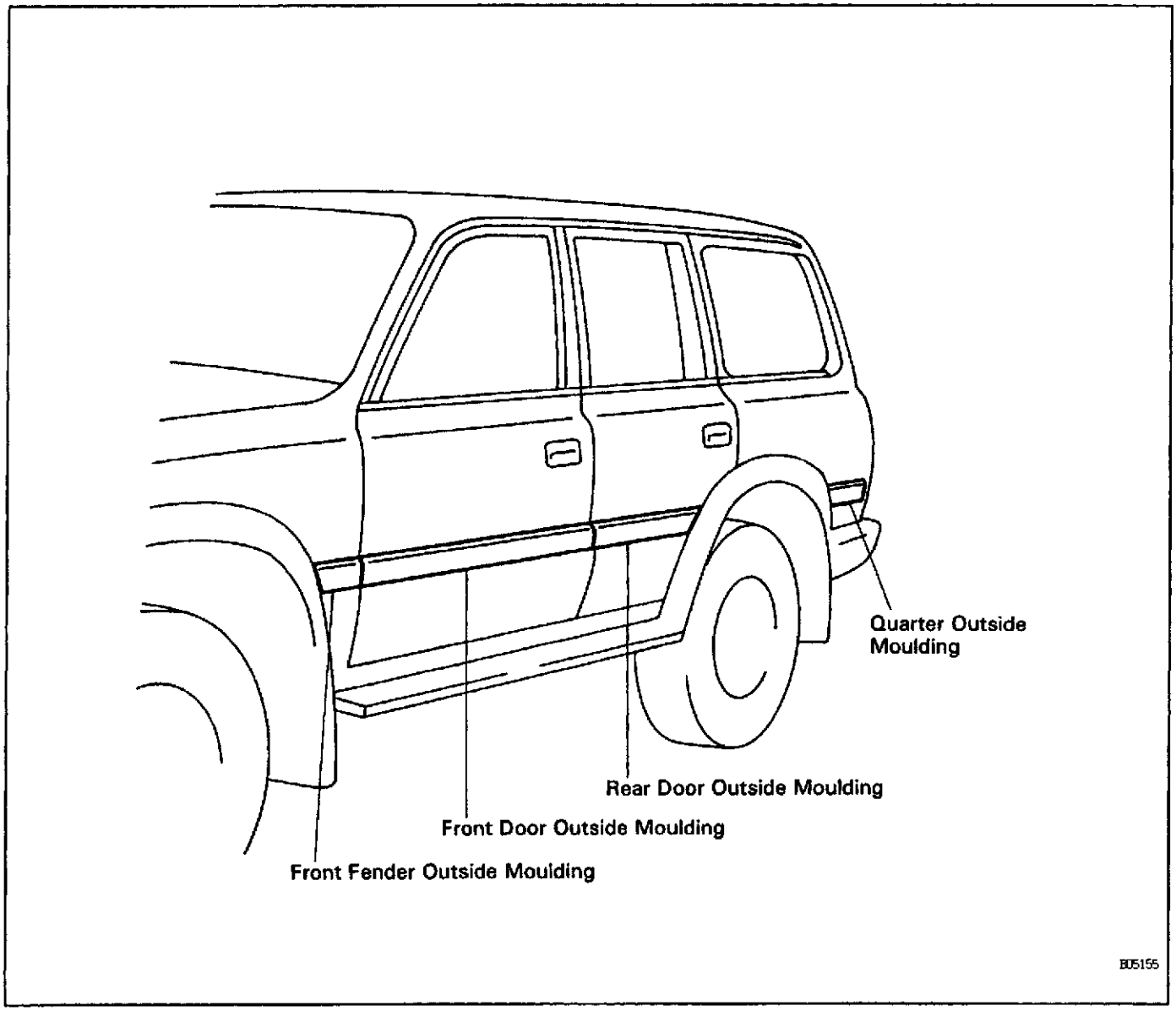
(b) Install damper stay lower end to body with 2 bolts

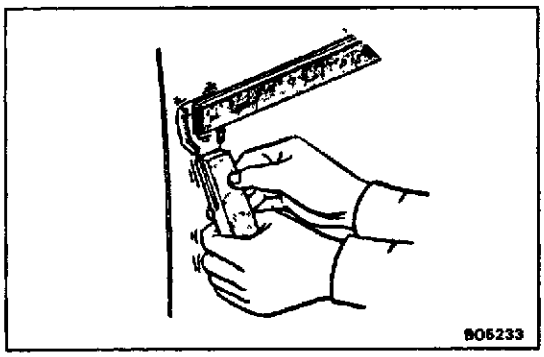
SIDE PROTECTION MOULDING

Precautions for storing moulding materials B001D-01

- 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

COMPONENTS B001E-01



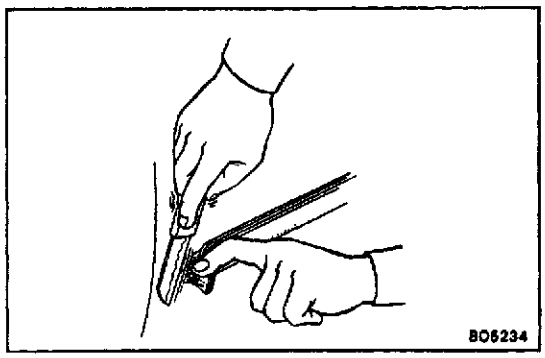


SIDE PROTECTION MOULDING REMOVAL

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



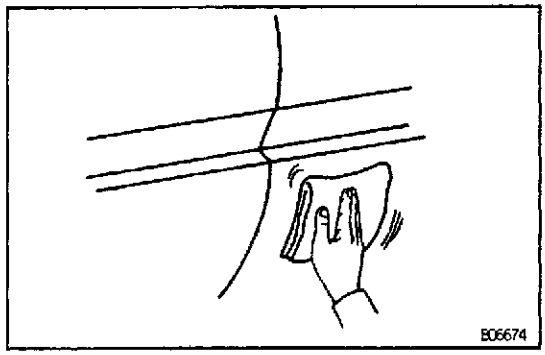
2. REMOVE MOULDING AND ADHESIVE

(a) Pull off the moulding by cutting the adhesive with a knife

(b) Scrape off adhesive from the body with a cutter or sandpaper

NOTICE:

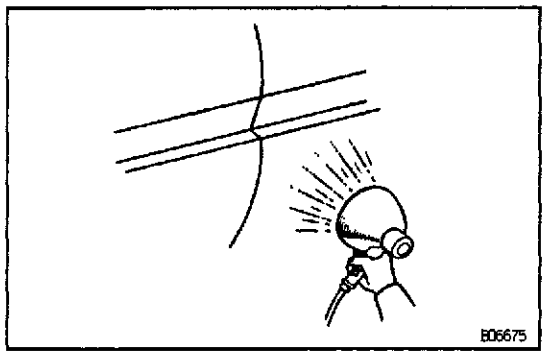
- **Remember that 30-80 mm (1.18-3.15 in.) of the ends of the moulding are glued tightly with s strong**
- **Do not reuse moulding.**



SIDE PROTECTION MOULDING INSTALLATION

1. CLEAN MOULDING MOUNTING SURFACE

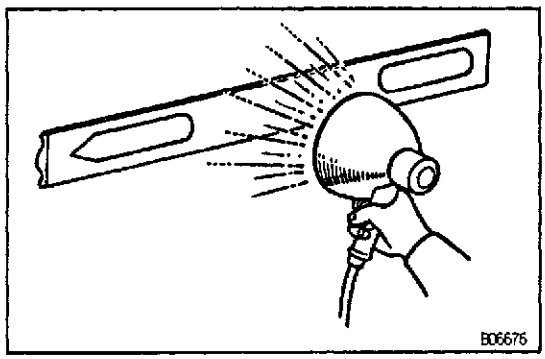
Wipe off stains with cleaner



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

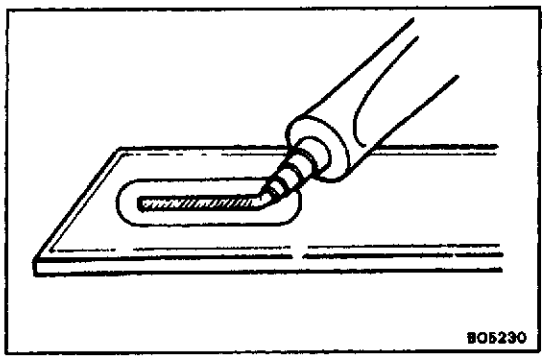


3. HEAT MOULDING

Using a heat light, heat the moulding to 30-60 ° C (86-140 -F)

NOTICE: Do not heat the moulding excessively.

The temperature should not be higher than 80 ° C (176 ° F)



4. APPLY ADHESIVE TO MOULDING

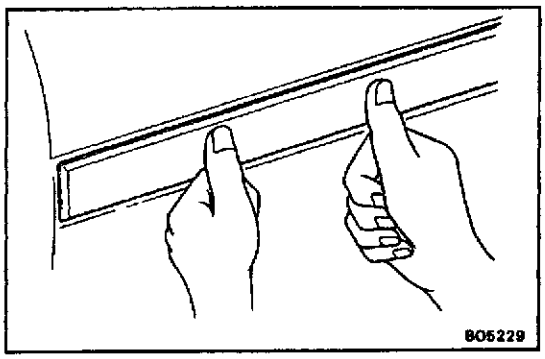
Apply adhesive to both punched out ends of the moulding

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

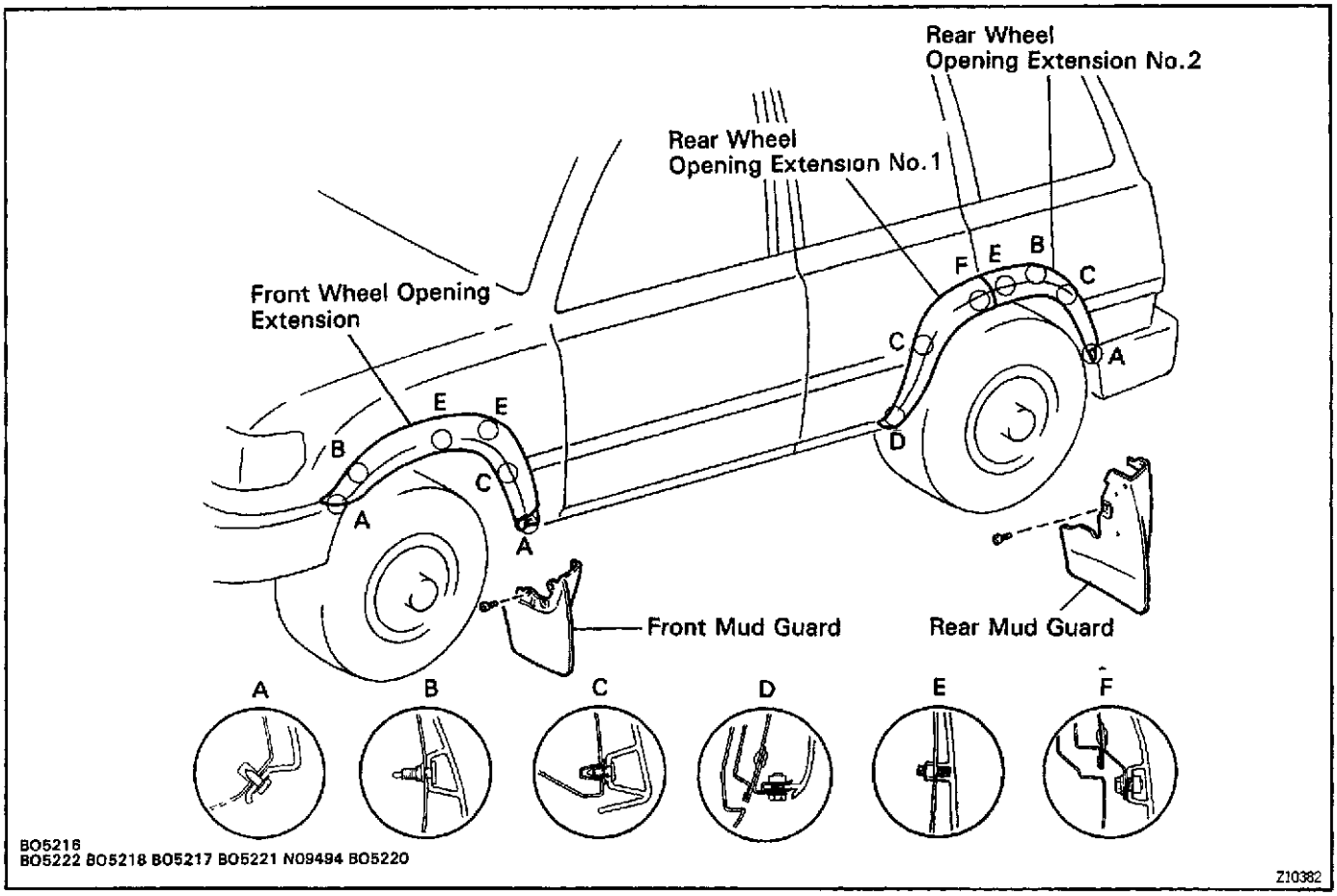
NOTICE:

- **Be sure that the body and moulding are heated to the proper temperature.**
- **Do not depress the adhesive - coated parts excessively 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.**

WHEEL OPENING EXTENSION

BO02K-08

COMPONENTS



FRONT WHEEL OPENING EXTENSION

BO0U4-03

1. REMOVE FRONT MUD GUARD

Remove 6 screws and the mud guard

2. REMOVE FRONT WHEEL OPENING EXTENSION

(a) Remove 2 bolts and 2 nuts

(b) Remove the extension by pulling

REAR WHEEL OPENING EXTENSION NO. 1

REMOVAL

REMOVE REAR WHEEL OPENING EXTENSION NO. 1

(a) Remove 2 bolts

(b) Remove the extension by pulling

REAR WHEEL OPENING EXTENSION NO. 2 REMOVAL

1. REMOVE REAR MUD GUARD

Remove 8 screws and the mud guard

2. REMOVE REAR WHEEL OPENING EXTENSION NO. 2

(a) Remove 2 bolts and the nut

(b) Remove the extension by pulling

FRONT WHEEL OPENING EXTENSION INSTALLATION

1. INSTALL FRONT WHEEL OPENING EXTENSION

(a) Tap the extension to install it

(b) Install 2 bolts and 2 nuts

2. INSTALL FRONT MUD GUARD

Install the mud guard with 6 screws

REAR WHEEL OPENING EXTENSION NO. 1 INSTALLATION

INSTALL REAR WHEEL OPENING EXTENSION NO. 1

(a) Tap the extension to install it

(b) Install 2 bolts

REAR WHEEL OPENING EXTENSION NO. 2 INSTALLATION

1. INSTALL REAR WHEEL OPENING EXTENSION NO. 2

(a) Tap the extension to install it

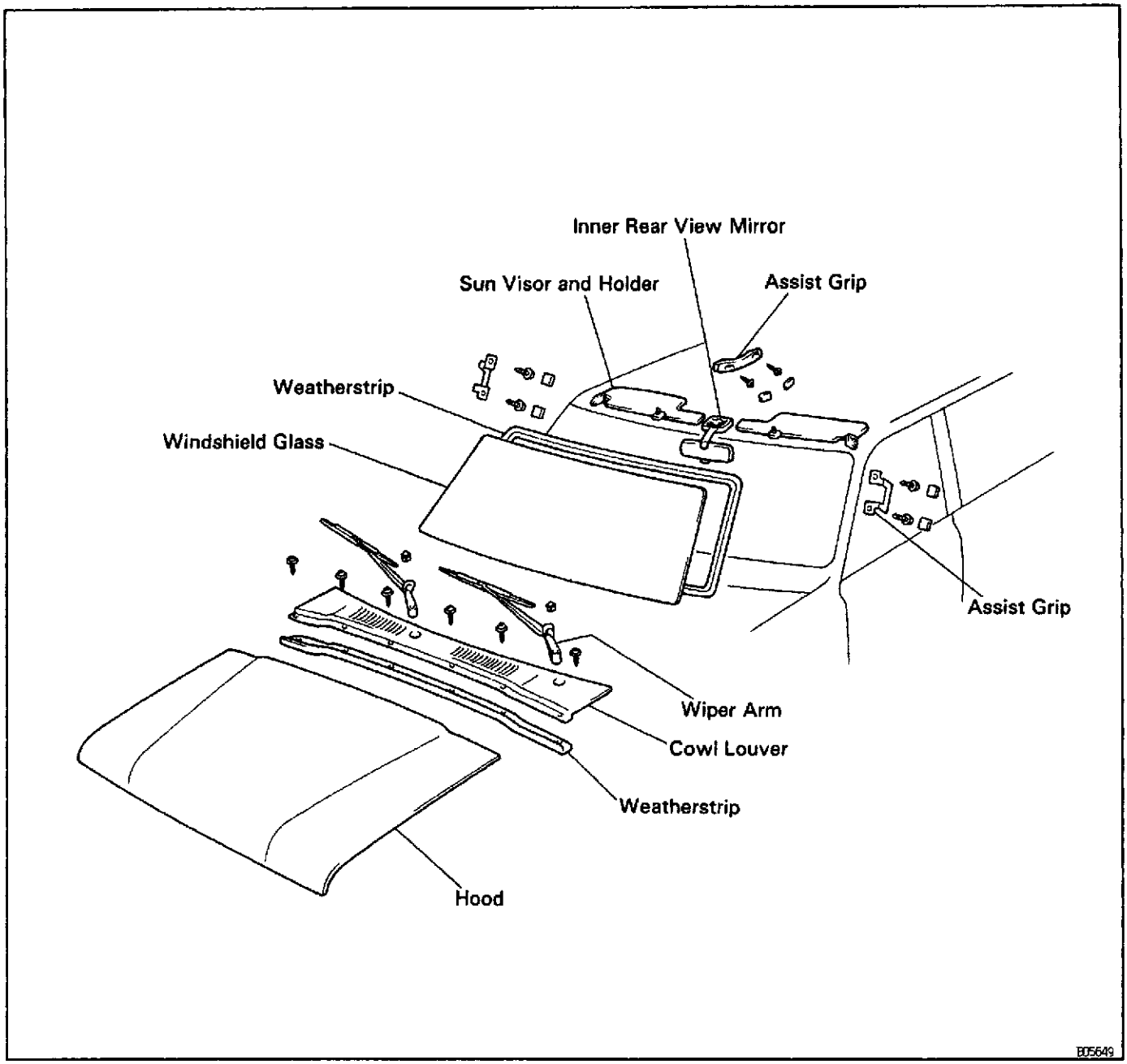
(b) Instal 2 bolt, and the nut

2. INSTALL MUD GUARD

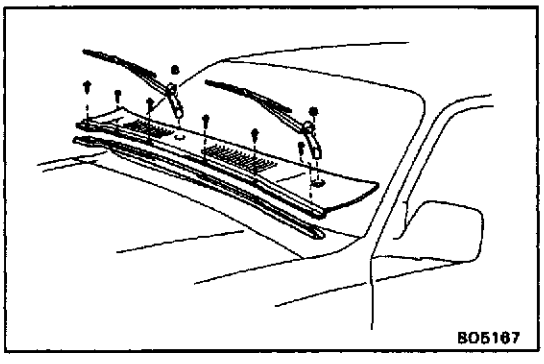
Install the mud guard with 8 screws

WINDSHIELD
COMPONENTS

B0032V-01



B00UA-02



WINDSHIELD REMOVAL

1. REMOVE FRONT HOOD

2. REMOVE WIPER ARMS

(a) Open 2 caps

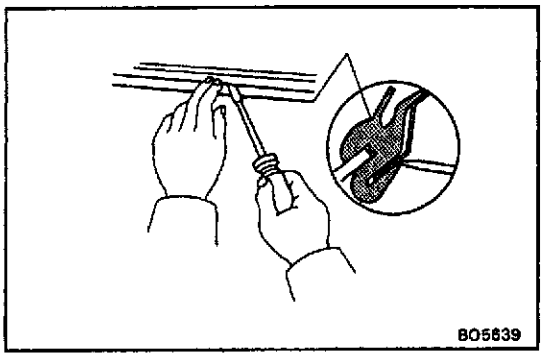
(b) Remove 2 nuts and wiper arms

3. REMOVE COWL LOUVER

Remove 6 screws, cowl louver and weatherstrip

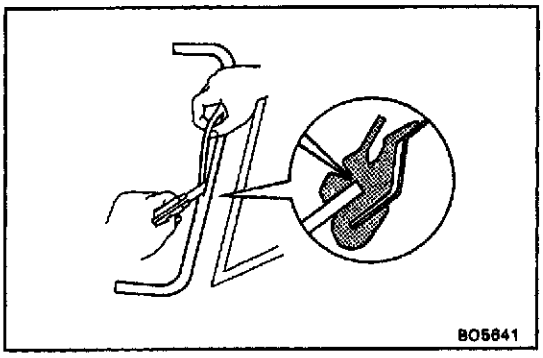
4. REMOVE FOLLOWING PARTS:
- Inner rear view mirror
- Sunvisors and holders
  Assist grips

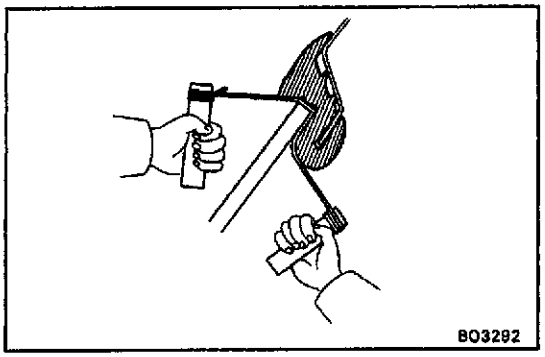
5. (w/ Windshield Moulding)
REMOVE WINDSHIELD MOULDING



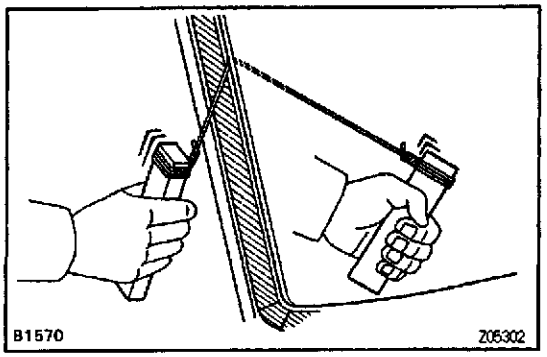
6. REMOVE WINDSHIELD GLASS
If reusing the weatherstrip:
(a) Using a screwdriver, loosen the weatherstrip from the body
NOTICE: Be careful not to damage the body.
(b) Pry the lip of the weatherstrip, outward from the interior part of the body flange
(c) Pull the glass outward and remove it with the weather-strip
If using a new weatherstrip:
(a) From the outside of the vehicle, cut off the weatherstrip

NOTICE: DO NOT DAMAGE THE BODY AND THE GLASS.

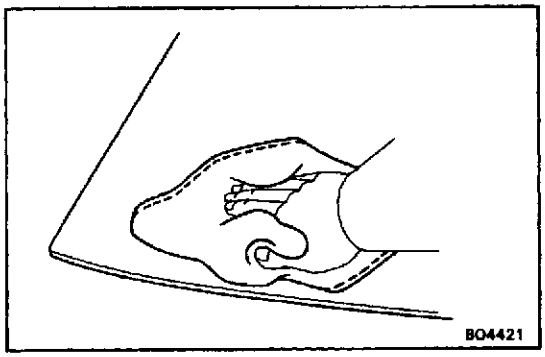




(b) Push piano wire through from the interior
(c) Tie both wire ends to the wooden blocks or equivalent
NOTICE: When separating, take care not to damage the paint or interior ornaments.
To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.



(d) Cut the adhesive by pulling the piano wire around it
(e) Remove the glass

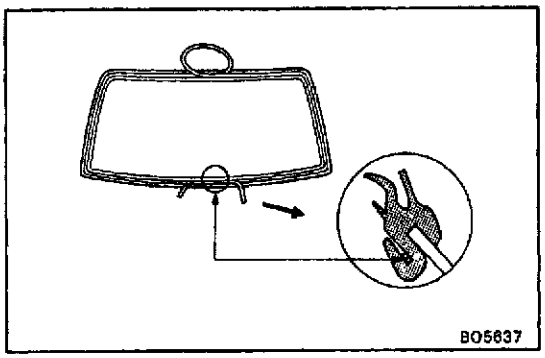


BO0UB-02

WINDSHIELD INSTALLATION

1. CLEAN BODY AND GLASS

Using cleaner, clean the weatherstrip contacting surface of the body and the glass

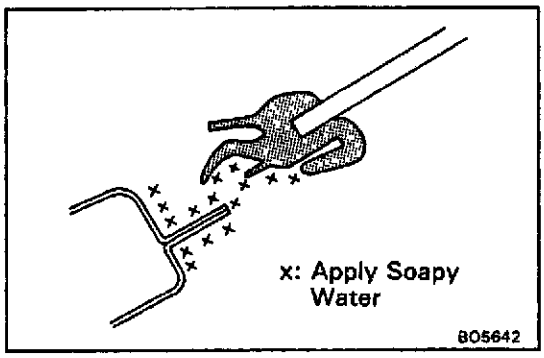


2. INSTALL WEATHERSTRIP ON GLASS

(a) Attach the weatherstrip to the glass

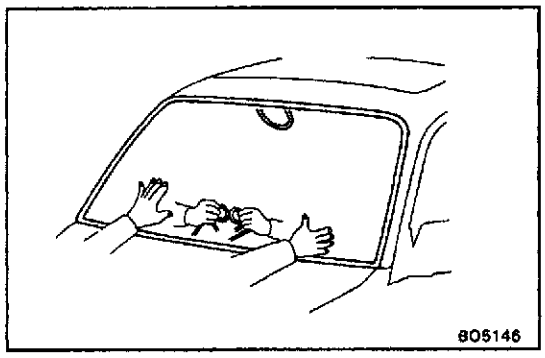
NOTICE: If the weatherstrip has hardened, it way develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove, as shown



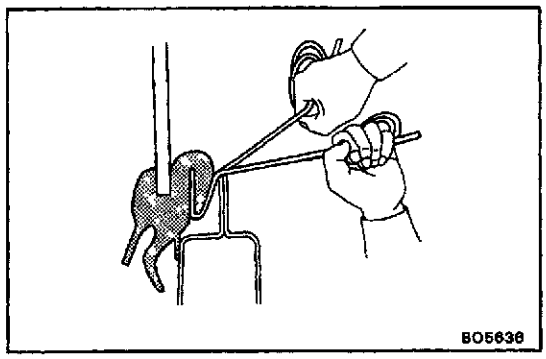
3. INSTALL GLASS

(a) Apply soapy water to the contact surface of the weatherstrip lip and to the body flange

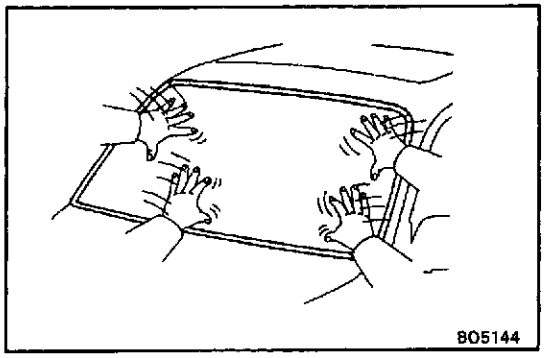


HINT: Begin installation in the middle of the lower- part of the glass

(b) Hold the glass in position on the body

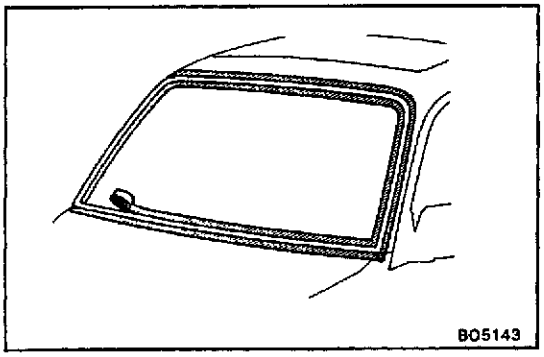


(c) From the inside, pull on one cord at an angle so it pulls the lip over the flange From the outside, press the glass along the weatherstrip until the glass is installed



4. SNUG DOWN GLASS

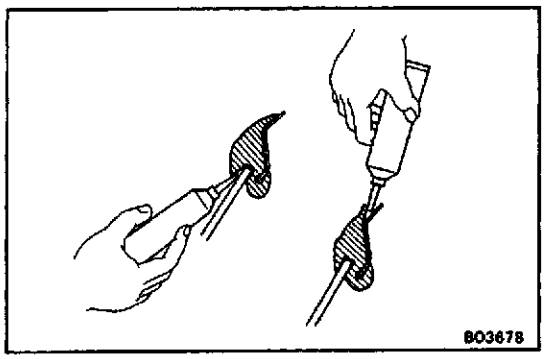
To snug down the glass, tap from the outside with your open hand



5. APPLY ADHESIVE

(a) Put masking tape around the weatherstrip to protect the paint and the glass

Part No 08833-00030 or equivalent



(b) Apply auto glass sealer to the weatherstrip lip, as shown

Part No. 08833-00030 or equivalent

6. CLEANING SEALER SURFACE

(a) After auto glass sealer dry, remove the masking tape

HINT The auto glass sealer will harden in about 15 hours

(b) Clean off the sealer oozing out from the masking tape with a clean rag saturated in cleaner

7. INSPECT FOR LEAKS AND REPAIR

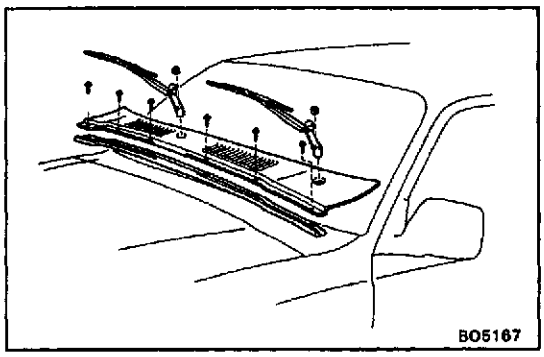
(a) Perform a leak test

(b) Seal any leaks with auto glass sealer

Part No. 08833-00030 or equivalent

8. (w/ Windshield Moulding)

INSTALL WINDSHIELD MOULDINGS



9. INSTALL COWL LOUVERS

Install the weatherstrip, the cowl louver with 6 screws

10. INSTALL WIPER ARMS

(a) Install wiper arms with 2 nuts

(b) Close 2 caps

11. INSTALL HOOD

12. ADJUST HOOD

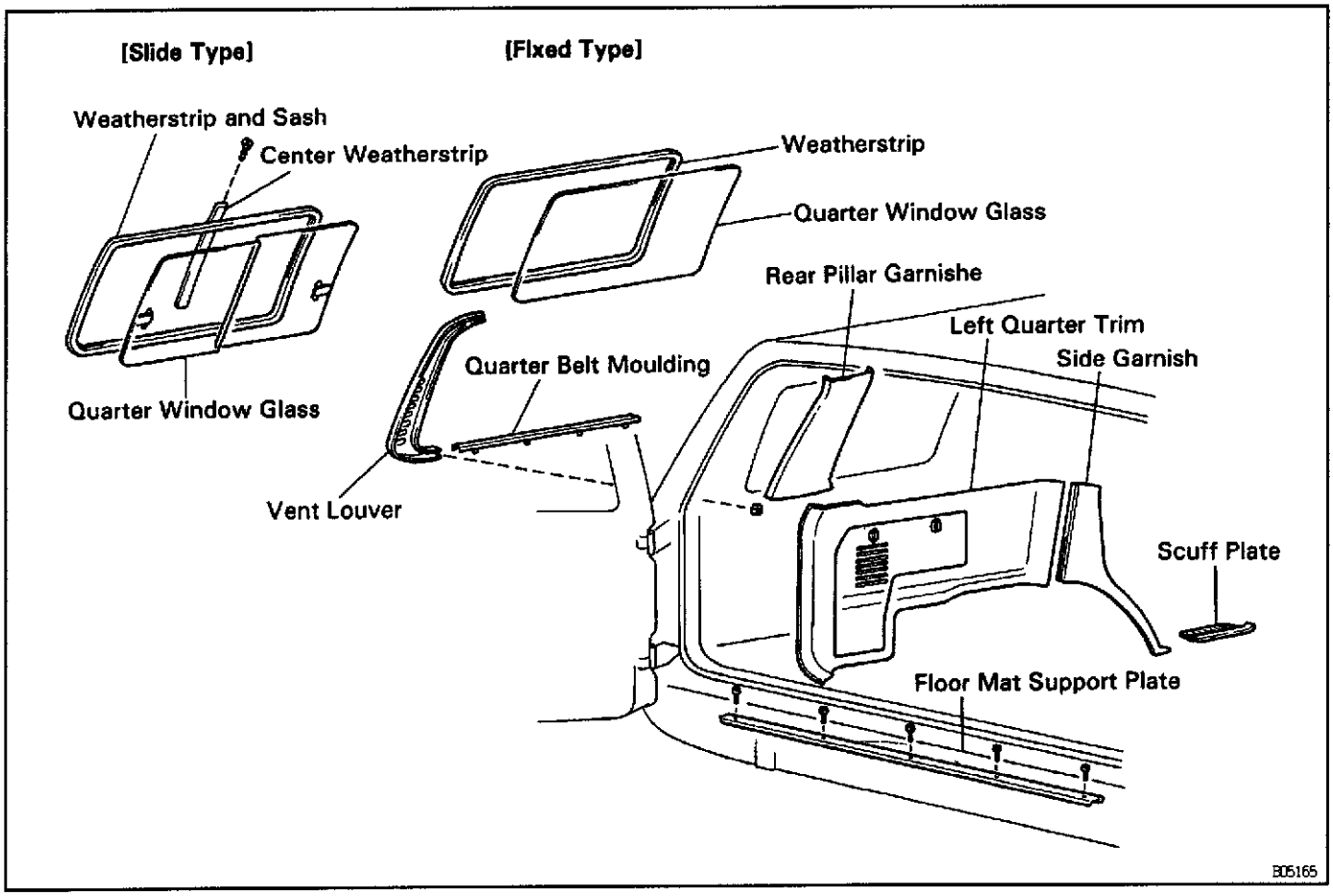
13. INSTALL FOLLOWING PARTS:

- Sunvisors and holders
- Inner rear view mirror
- Assist grips

QUARTER WINDOW GLASS

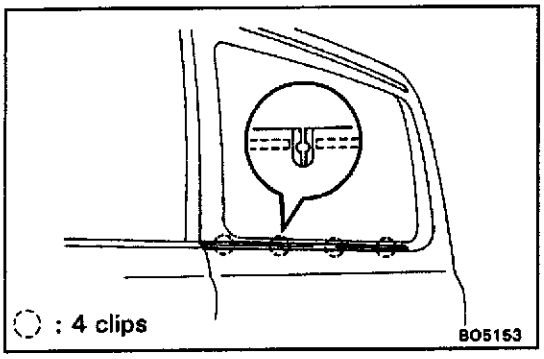
BOOG1-01

COMPONENTS



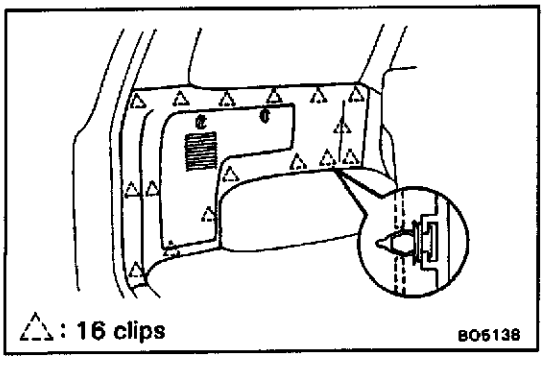
BOOUC-02

QUARTER WINDOW GLASS REMOVAL



1. REMOVE FLOOR MAT SUPPORT PLATE

Remove 5 screws and the plate

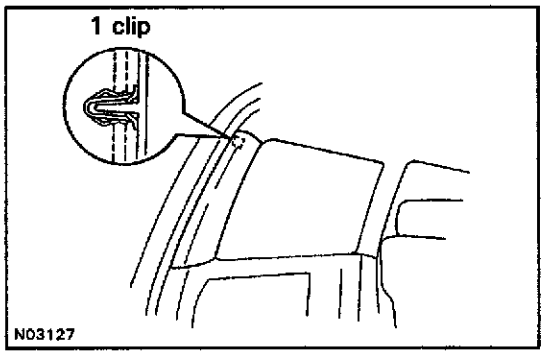


2. REMOVE QUARTER TRIM

(a) Insert a screwdriver between the retainers and quarter trim to pry it loose

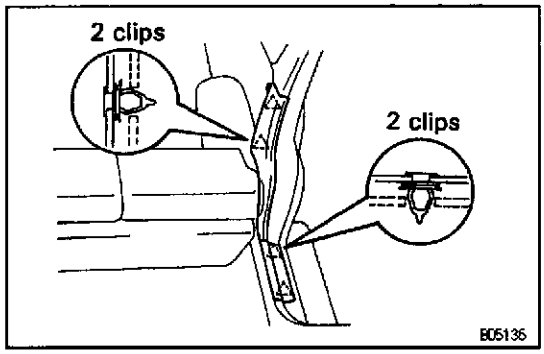
HINT Tape the screwdriver tip before use

(b) Remove the quarter trim



3. REMOVE REAR PILLAR GARNISH

(a) Insert a screwdriver between the retainers and the quarter trim to pry it loose

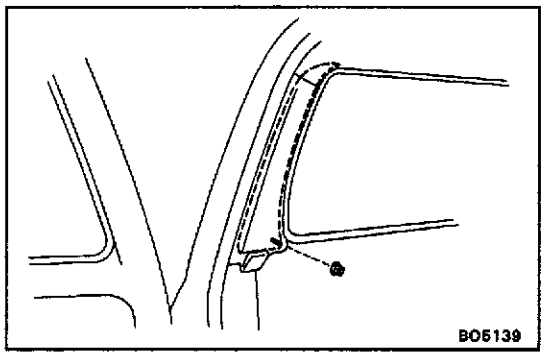


4. REMOVE REAR SEAT SIDE GARNISHES AND SCUFF PLATE

(a) Insert a screwdriver between the retainers and the body to pry it loose

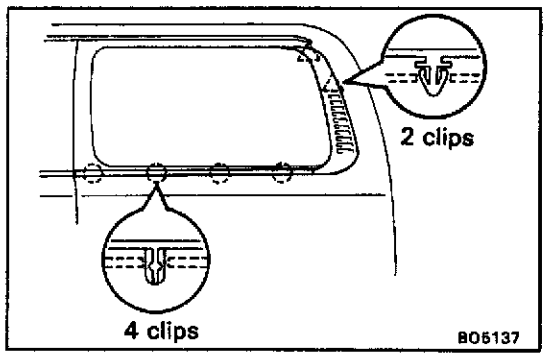
HINT Tape the screwdriver tip before use

(b) Pull out the side garnish



5. REMOVE VENT LOUVER AND QUARTER BELT MOULDING

(a) Remove the nut from the vent louver

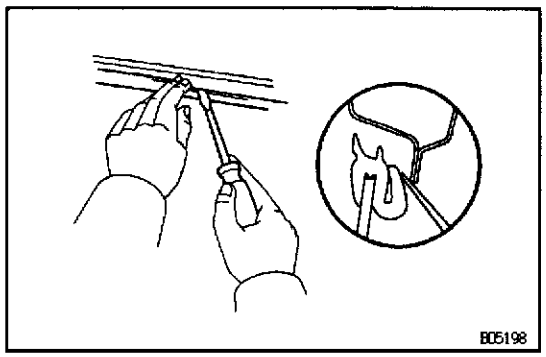


(b) Insert a screwdriver between the retainers and body to pry it loose

HINT Tape the scrwedriver tip before use

(c) Pull out vent louver

(d) Pull out the clips from the edge of the panel, and remove the moulding



6. REMOVE QUARTER WINDOW GLASS

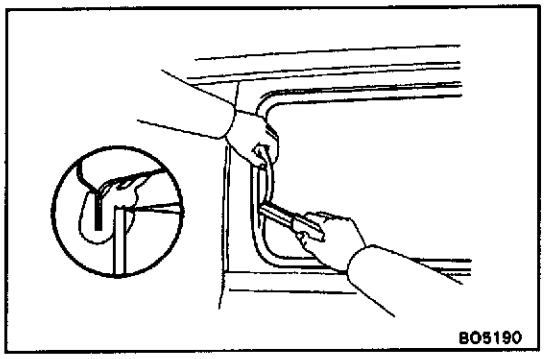
IF REUSING THE WEATHERSTRIP:

(a) Using a screwdriver loosen the weatherstrip from the body

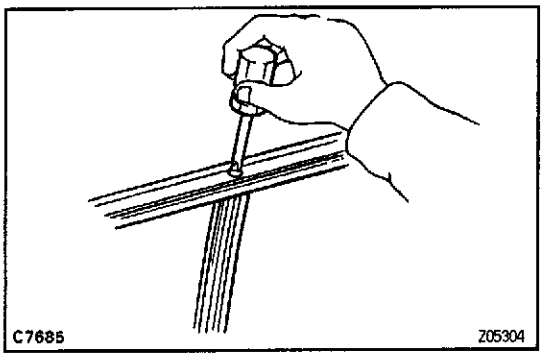
NOTICE: Be careful not to damage the body.

(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

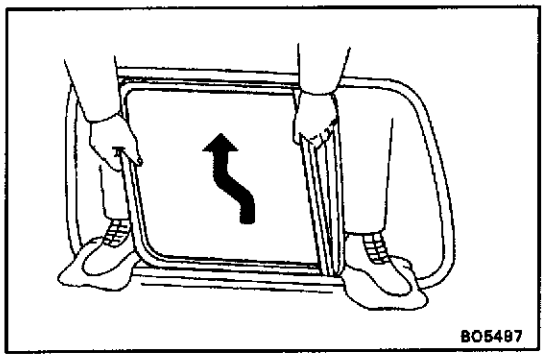


If using a new weatherstrip:
(a) From outside of the vehicle, cut off the weatherstrip lip with a knife
NOTICE: Do not damage the body and the glass.
(b) Push the glass outwards and remove the glass
(c) Remove the remaining weatherstrip

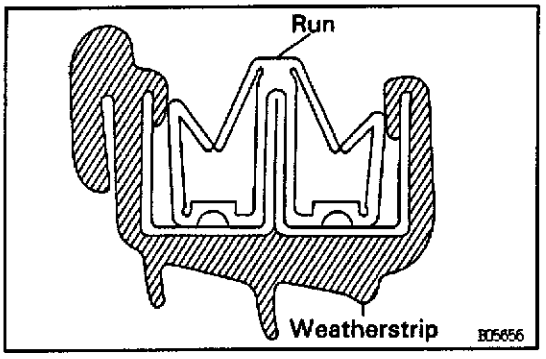


QUARTER WINDOW GLASS DISASSEMBLY (Slide Type)

1. REMOVE CENTER WEATHERSTRIP
Remove the screw and the weatherstrip

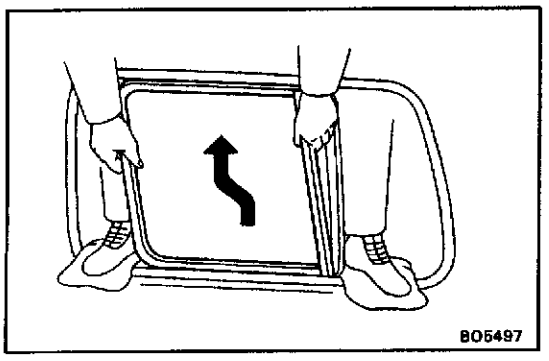


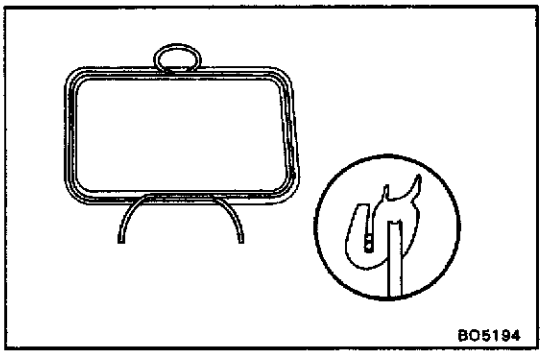
2. REMOVE QUARTER WINDOW GLASS
Pull up the sash and remove the 2 glasses
3. REMOVE QUARTER WINDOW GLASS RUN FROM SASH
4. REMOVE QUARTER WINDOW WEATHERSTRIP FROM SASH



QUARTER WINDOW GLASS ASSEMBLY (Slide Type)

1. INSTALL QUARTER WINDOW WEATHERSTRIP ON SASH, AS SHOWN
NOTICE: If the weatherstrip has hardened, it may develop leaks
Use a new one if possible
2. INSTALL QUARTER WINDOW GLASS RUN, AS SHOWN
3. INSTALL QUARTER WINDOW GLASS
Pull up on the sash and install 2 glasses
4. INSTALL CENTER WEATHERSTRIP
Install the weatherstrip with the screw




BO5194

BO0UF-01

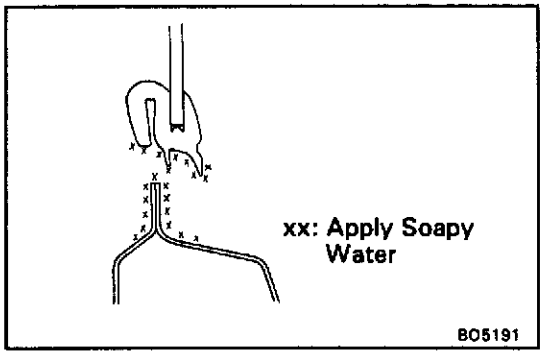
QUARTER WINDOW GLASS INSTALLATION

1. INSTALL WEATHERSTRIP ON GLASS

(a) Attach the weatherstrip to the glass

NOTICE: If the westherstrip has hardened, it may develop leaks. Use a new one of possible.

(b) Insert a cord into the groove of the weatherstrip all the way around with the ends overlapping

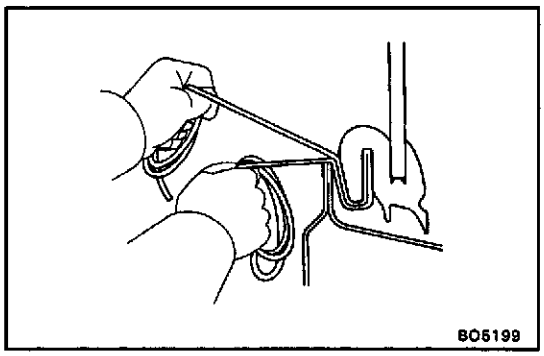


BO5191

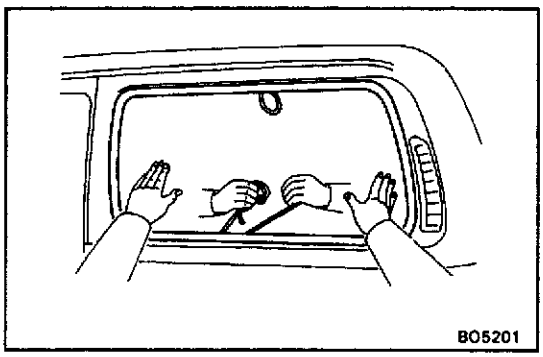
2. INSTALL QUARTER WINDOW GLASS

(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


BO5199

(b) Hold the glass in position on the body


BO5201

(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. SNUG DOWN GLASS

To snug down the glass, tap from the outside with your open hand

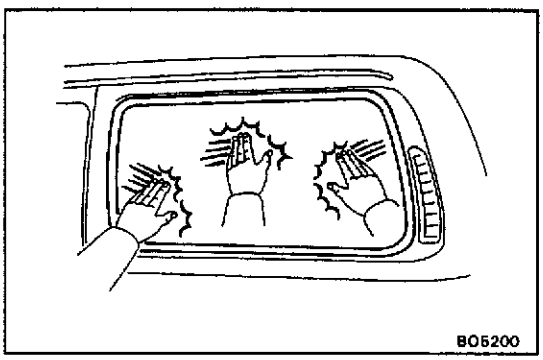
4. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test

(b) Seal any leak with auto glass sealer

5. INSTALL FOLLOWING PARTS:

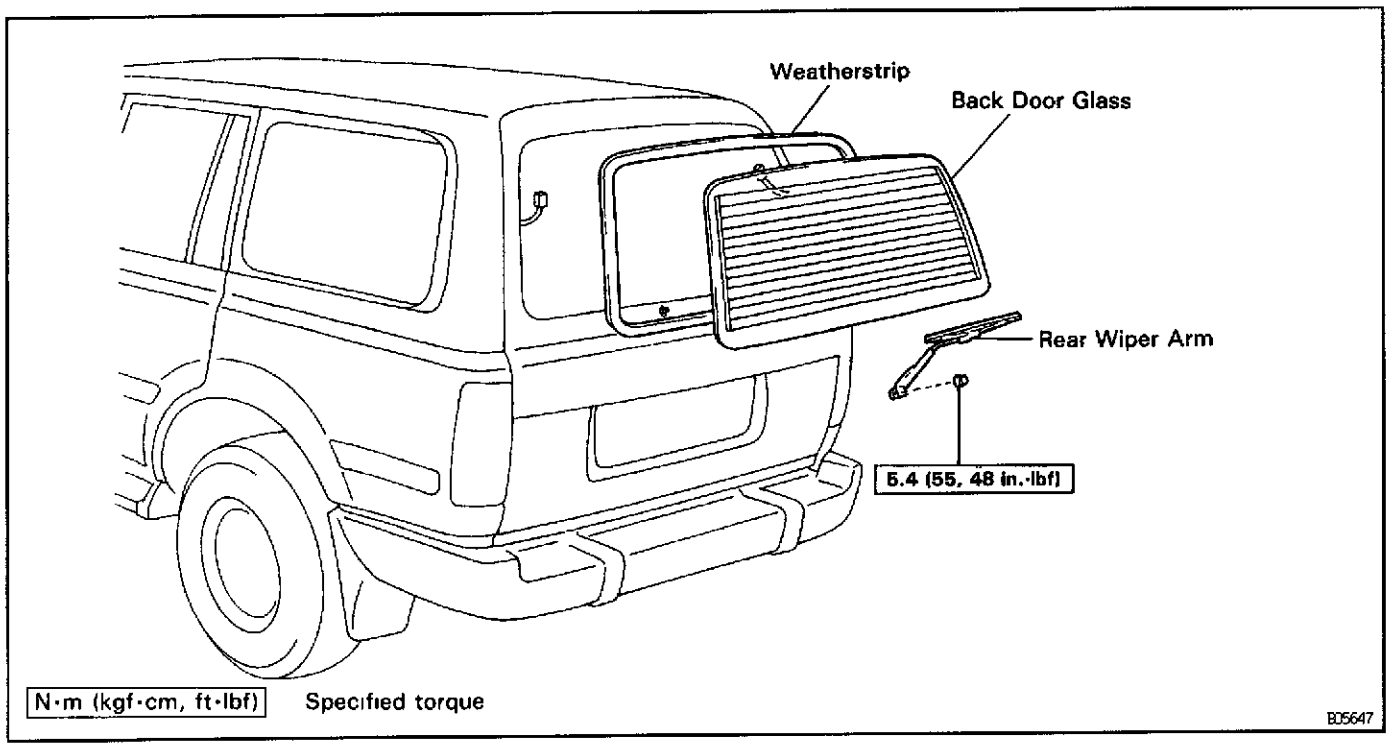
- Pillar garnishes
- Quarter trim
- Floor mat support plate
- Side garnishes and scuff plate


BO5200

BACK DOOR GLASS

B002Y-01

COMPONENTS



B00UQ-02

BACK DOOR GLASS REMOVAL

1. REMOVE REAR WIPER ARM

2. (w/ Defogger)

REMOVE DEFOGGER CONNECTOR

Disconnect the connector from the glass

3. REMOVE BACK DOOR GLASS

HINT Remove the glass in the same manner as the windshield

BACK DOOR GLASS INSTALLATION B00UH-02

1. CLEAN BODY AND GLASS

2. INSTALL WEATHERSTRIP ON GLASS

3. INSTALL BACK DOOR GLASS

HINT Install the glass in the same manner as the windshield

4. SNUG DOWN GLASS

5. APPLY ADHESIVE

6. CLEANING SEALER SURFACE

7. INSPECT FOR LEAKS AND REPAIR

8. (w/ Defogger)

CONNECT DEFOGGER WIRE CONNECTORS

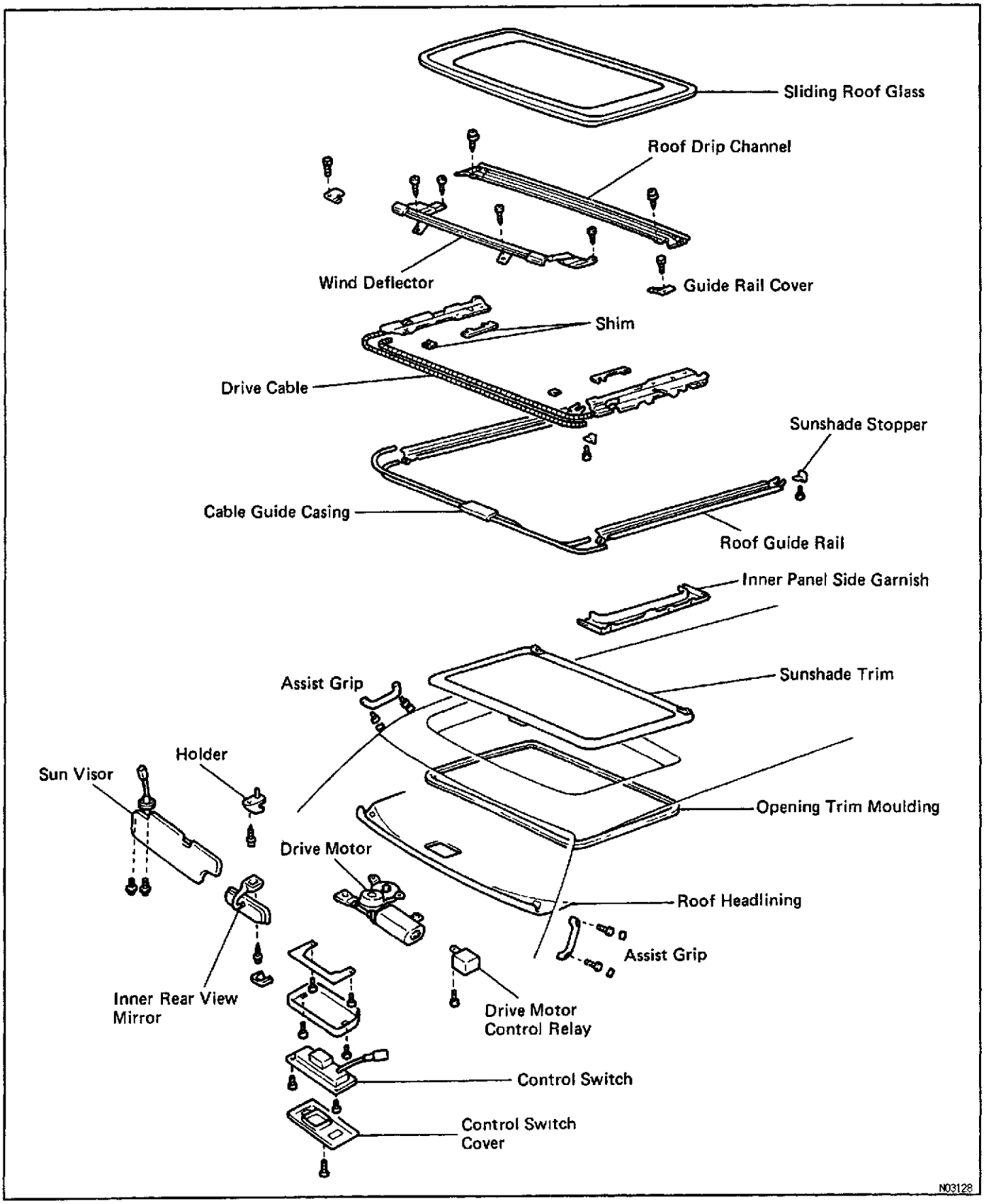
Connect the connector to the glass

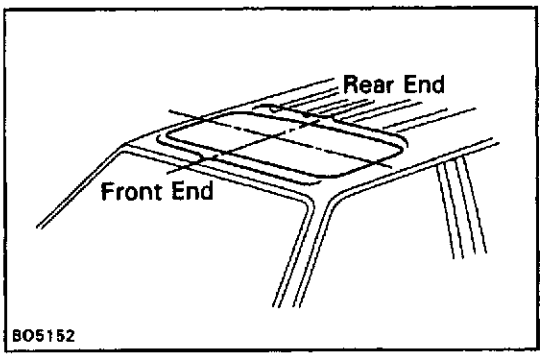
9. CONNECT REAR WIPER ARM

SLIDING ROOF

COMPONENTS

B0081-01





ON-VEHICLE INSPECTION

BO032-03

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

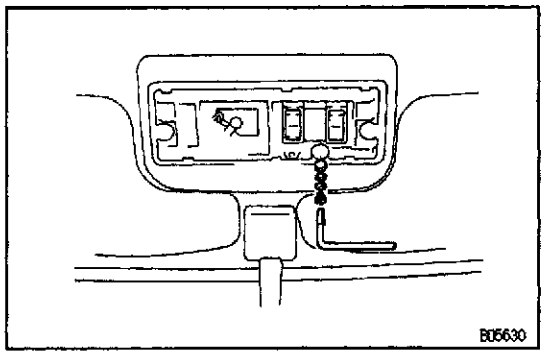
(d) Check for a difference in level between the sliding roof weatherstrip and roof panel

Front end:

0.9 - 3.9 mm (0.035 - 0.154 in.)

Rear end:

0.9 - 3.9 mm (0.035 - 0.154 in.)



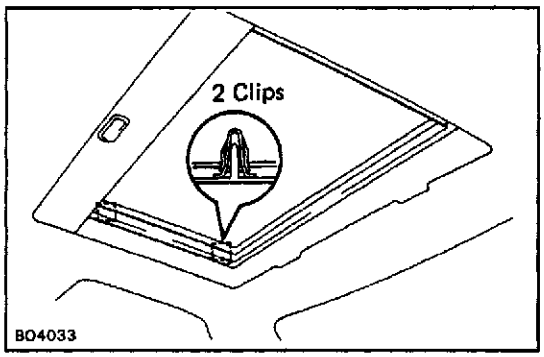
If the sliding roof does not operate:

(e) Remove the control switch cover

(f) Remove the large screw inside

NOTICE: Be careful not to lose the spring washer or shim.

(g) Manually operate the moon roof by inserting a special crank-shaped screwdriver into the hole and turning the drive shaft



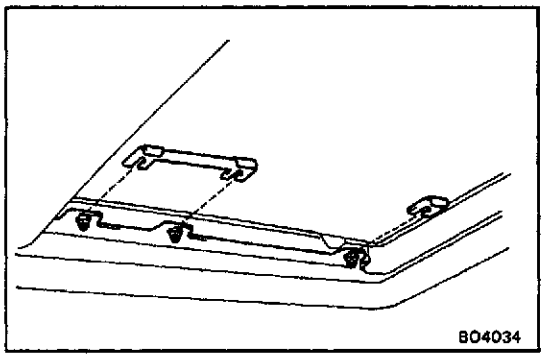
SLIDING ROOF ADJUSTMENT

BO0UJ-02

1. REMOVE SLIDING ROOF GARNISHES

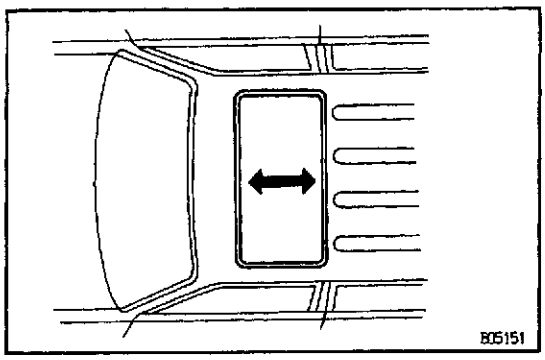
Before making adjustments, remove the left and right sliding roof garnishes

HINT After adjustment, reinstall the sliding roof garnishes



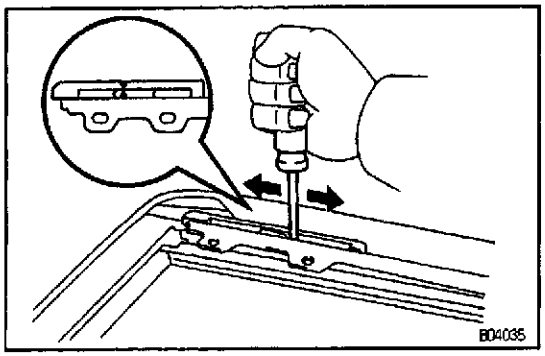
2. TO ADJUST LEVEL DIFFERENCE

Adjust by increasing or decreasing the number of shims between the bracket and sliding roof

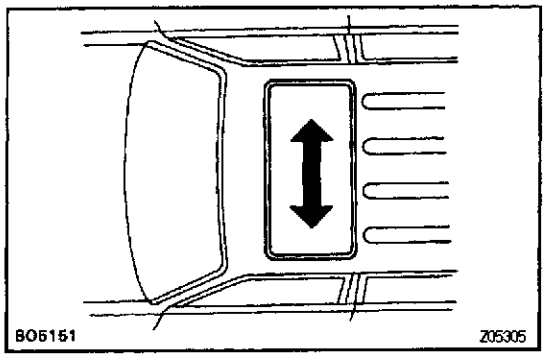


3. TO ADJUST FORWARD OR REARWARD

(a) Adjust by loosening the sliding roof installation nuts, and move the sliding roof bracket forwards and backwards

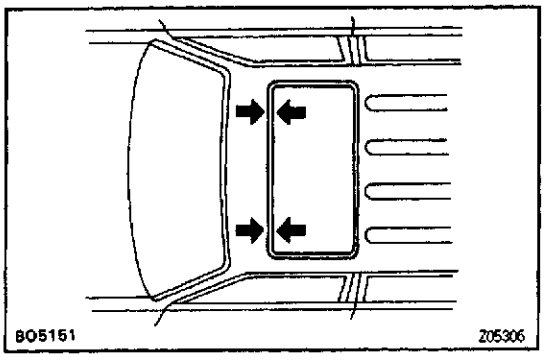


(b) When the front or rear alignment is not correct, remove the glass and adjust the drive rail
(c) Using a screwdriver, slide the link forwards or backwards to align the 2 marks, as shown
(d) Slide the bracket to the forefront with your hand

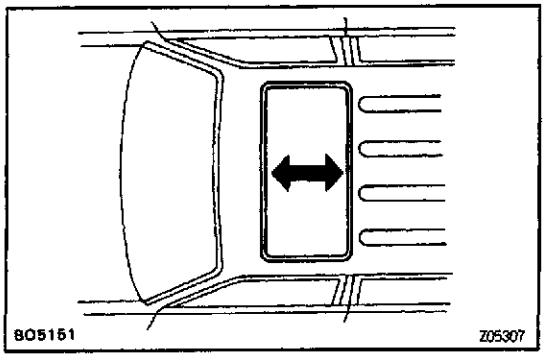


4. TO ADJUST RIGHT OR LEFT

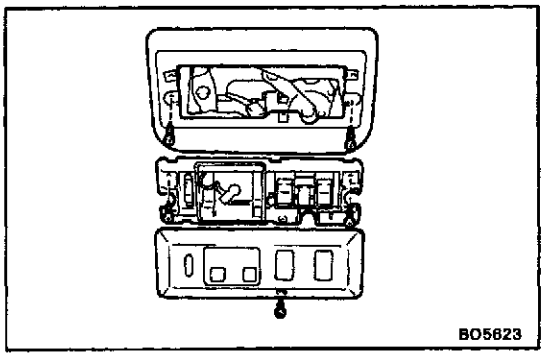
Adjust by loosening the sliding roof rear shoe installation nuts, and move the sliding roof to the right and left



5. TO ADJUST CLEARANCE
(Difference in left and right clearance)



Adjust by loosening the sliding roof installation nuts and readjust the sliding roof to the proper position



BO0UK-02

SLIDING ROOF REMOVAL

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE CONTROL SWITCH

(a) Remove the screw and the switch cover

(b) Remove 2 screws and the switch body , then disconnect the connector

(c) Remove 2 screws and the bracket

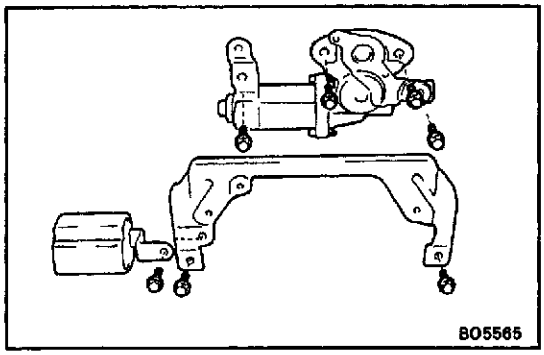
3. REMOVE FOLLOWING PARTS:

- Assist grip
- Sunvisors and holders
- Inner rear view mirror
- Opening trim moulding

4. PULL DOWN FRONT SLIDE OF ROOF HEADLINING

Pull down the headlining by hand

NOTICE: Do not damage the roof headlining.

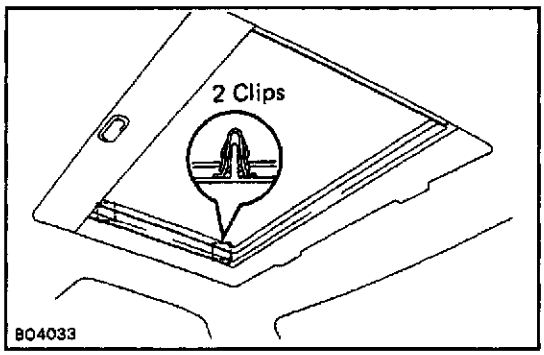


5. REMOVE DRIVE GEAR ASSEMBLY

(a) Remove the bolt and the sliding roof control relay, then disconnect the connector

(b) Remove 2 bolts and the bracket

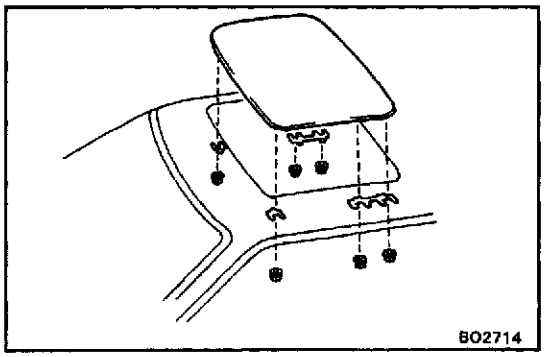
(c) Remove 4 bolts and the gear assembly, then disconnect the connector



6. REMOVE SLIDING ROOF GARNISHES

Using a screwdriver, pry loose 2 clips and remove the inner side garnish

HINT Tape the screwdriver tip before use

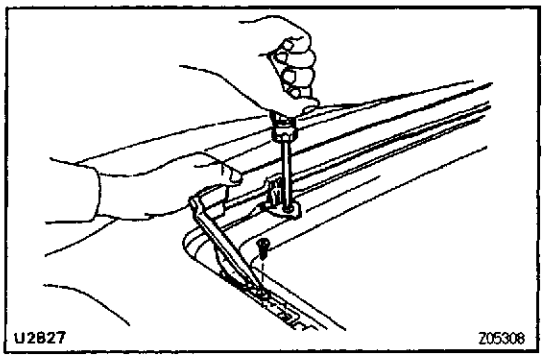


7. REMOVE SLIDING ROOF GLASS

(a) Remove 6 nuts and shims

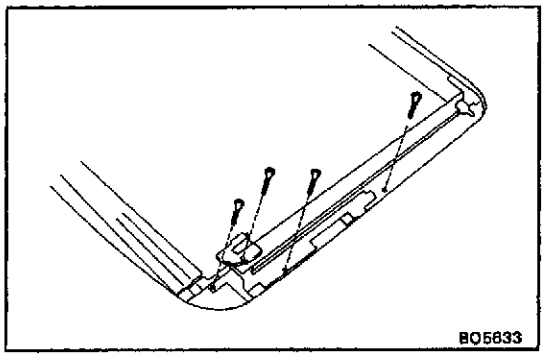
HINT Make sure of the number of shims

(b) Pull the glass upward to remove it



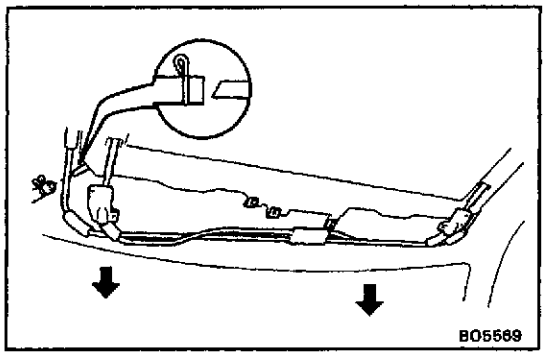
8. REMOVE WIND DEFLECTOR

Remove 4 screws and the wind deflector

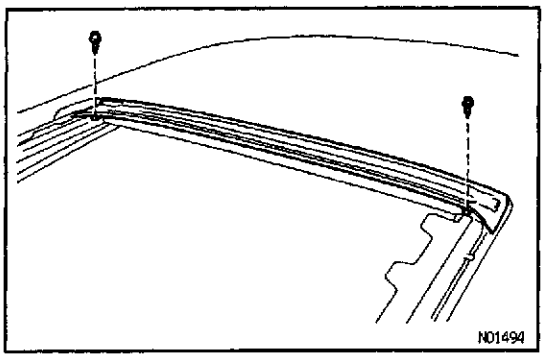


9. REMOVE CABLE GUIDE CASING

(a) Remove the screw and the guide rail cover
(b) Remove 3 screws from the drive rail
(c) Slide the drive cable forward

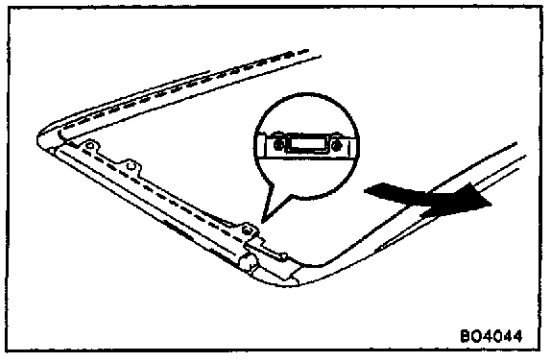


(d) Disconnect front side of the drain hose
HINT Disconnect the drain hose from the sliding roof housing side
(e) Remove the cable guide casing gradually from both sides
NOTICE: Be careful that the oily cable doesn't fall off.



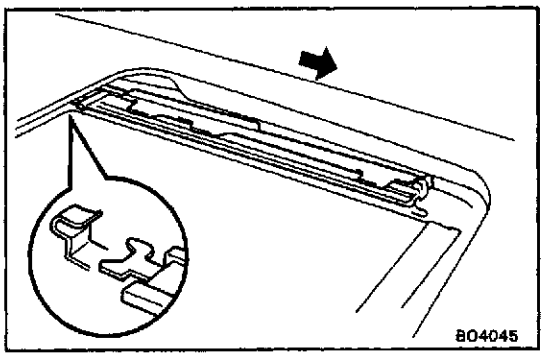
10. REMOVE ROOF DRIP CHANNEL

(a) Remove 2 screws
(b) Pull the channel forwards to remove it



11. REMOVE SUNSHADE TRIM

While raising the drive rail, pull the trim forward to remove it



12. REMOVE DRIVE RAIL

(a) Slide the drive cable forwards

(b) Slide the rail forward and disconnect the clamp, then remove it

SLIDING ROOF INSTALLATION

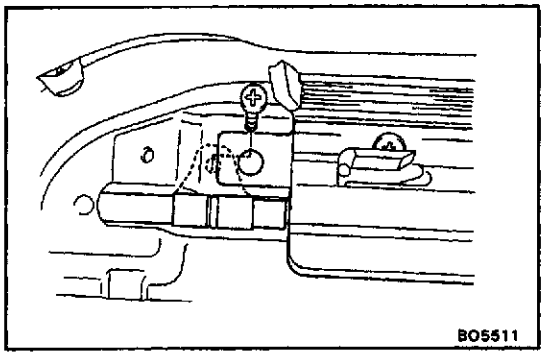
BO6UL-02

1. INSTALL FOLLOWING PARTS:

(a) Drive rail

(b) Sunshade trim

(c) Roof drip channel



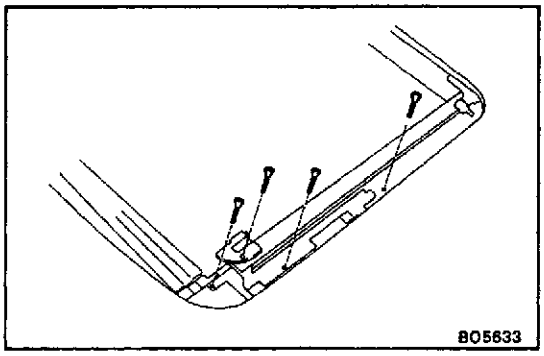
2. INSTALL CABLE GUIDE CASING

(a) Insert the cable to the casing and install the cable guide gradually to both sides

(b) Insert the casing to the drive rail, as shown

(c) Connect the front side of drain hose

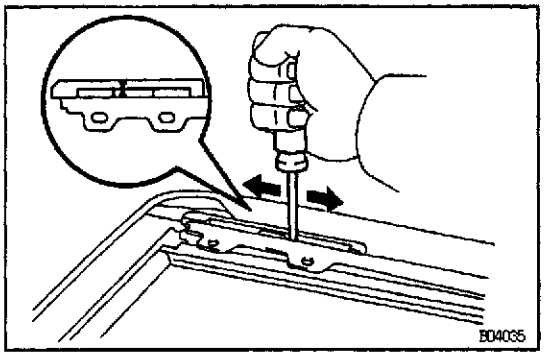
HINT Place the knobs of clips to upper side



(d) Install 3 screws to the drive rail

(e) Install the screw to the guide rail cover

3. INSTALL WIND DEFLECTOR

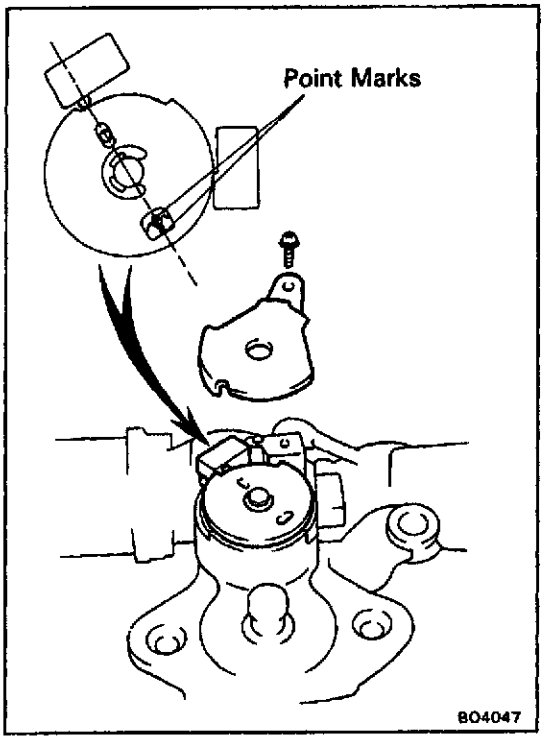


4. ADJUST DRIVE RAIL

HINT Adjust the drive rail to a closed and tilted down position

(a) Using a screwdriver, slide the link forward or backward to align the 2 marks, as shown

(b) Slide the bracket to the forefront with your hand



5. 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 cam plate cover with the screw

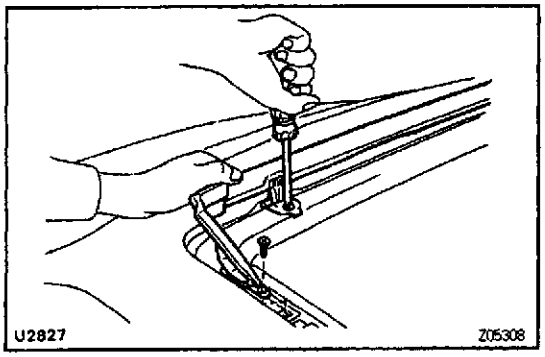
(e) Install the drive gear assembly with 4 bolts

(f) Connect the connectors

6. INSTALL SLIDING ROOF CONTROL RELAY AND BRACKET

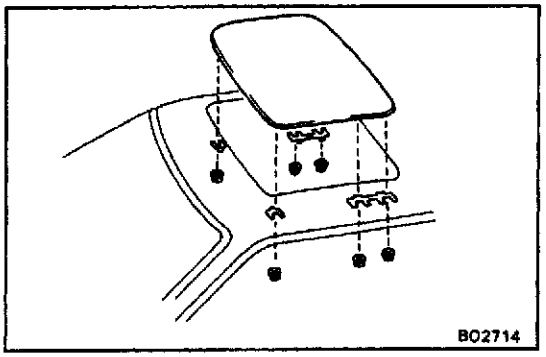
(a) Install the bracket with 2 bolts

(b) Install the sliding roof control relay with the bolt, then connect the connector



7. INSTALL WIND DEFLECTOR

Install the wind deflector with 4 screws



8. INSTALL SLIDING GLASS

HINT:

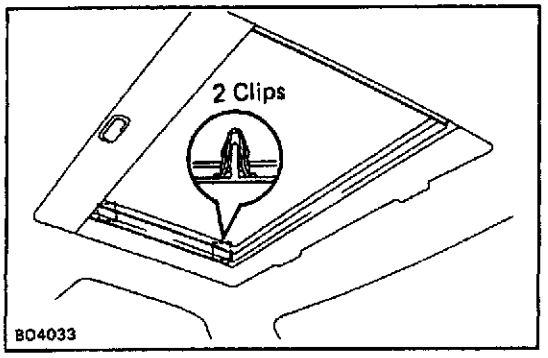
- Confirm that the lip part of the weatherstrip housing is not twisted
- Confirm that the clearance between the left and right of the sliding roof glass and roof panel are equal

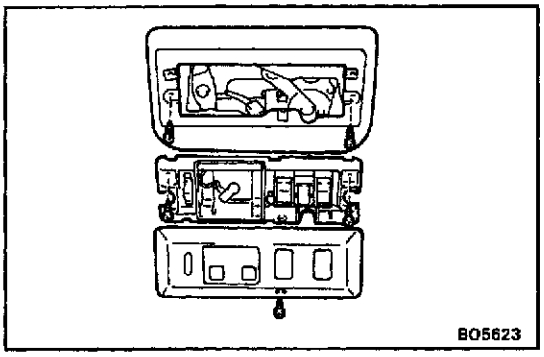
  Install6 nuts and shims

9. INSPECT SLIDING ROOF GLASS ALIGNMENT

10. INSTALL SLIDING ROOF GARNISHES

Install the inner panel side garnish with retainers to the sliding roof glass by tapping





11. INSTALL CONTROL SWITCH

(a) Install the bracket with 2 screws

(b) Install the switch body with 2 screws, then connect the connectors

(c) Install the switch cover with the screw

12. INSTALL FOLLOWING PARTS:

- Assist grip
- Sunvisors and holders
- Inner rear view mirror
- Opening trim moulding

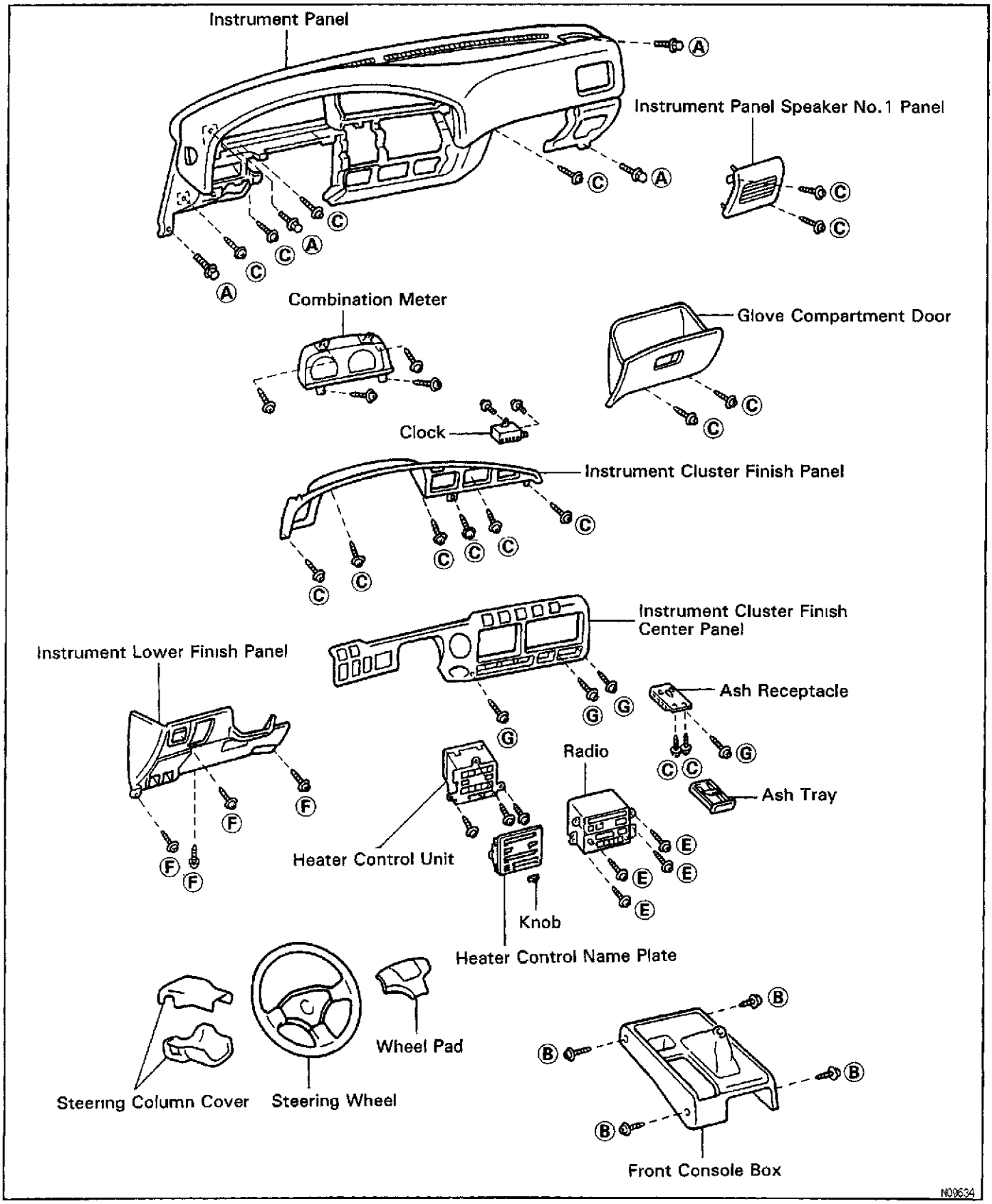
13. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL

14. CHECK OPERATION TO THE SLIDING ROOF

INSTRUMENT PANEL

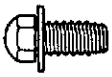
BO0L1M-02

COMPONENTS



HINT: Screw sizes in the illustration on the previous page are indicated using the code below for removal and installation of instrument panel

mm(in)

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
Ⓐ		= 6 (0 24) L = 25 (0 98)	Ⓑ		^ = 5 (0 20) L = 25 (0 98)	Ⓒ		0 = 5 22 (0 2055) L = 14 (0 55)
Ⓓ		^ = 8 (0 31) L=30(1 18)	Ⓔ		^ = 5(0 20) L = 16 (0 62)	Ⓕ		^ = 5 22 (0 2055) L = 18 (0 71)
Ⓖ		^ = 5 (0 20) L = 16 (0 62)						

N09558

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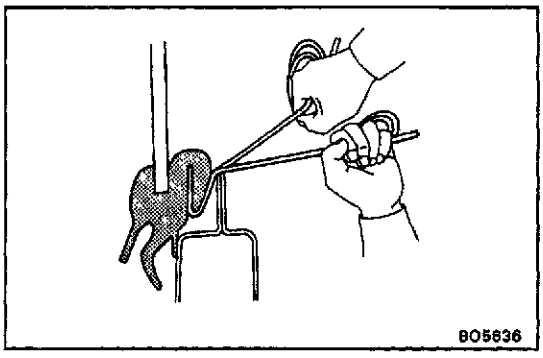
BODUN–02

INSTRUMENT PANEL REMOVAL

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE STEERING WHEEL

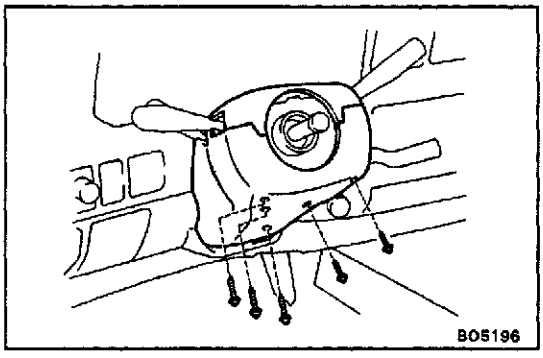
(See page SR-5)



BO5636

3. APPLY PROTECTION TAPE

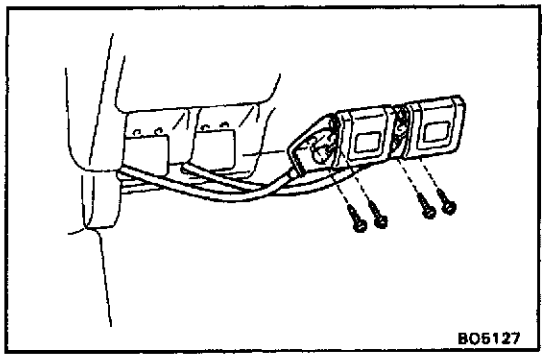
Before removing the instrument panel, apply protection tape to the pillars



BO5196

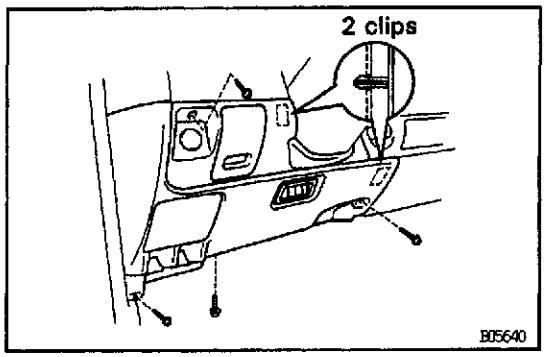
4. REMOVE STEERING COLUMN COVER

Remove 5 screws and column covers



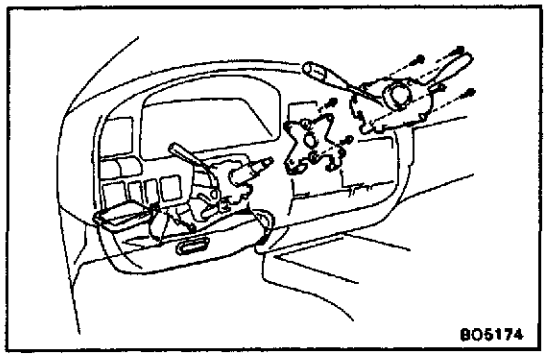
5. REMOVE ENGINE HOOD AND FUEL LID RELEASE LEVER

Remove 4 screws and the levers



6. REMOVE LOWER FINISH PANEL

Remove 4 screws and the panel



7. REMOVE DUCT HEATER TO REGISTER NO. 2

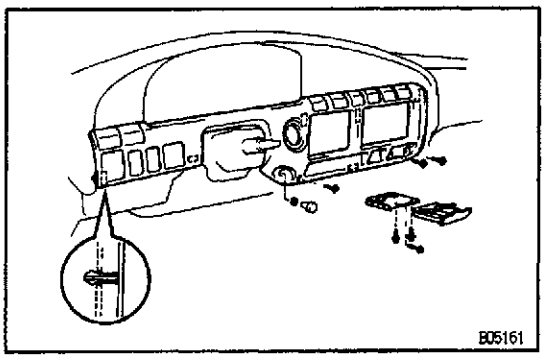
Remove the screw and the duct

8. REMOVE COMBINATION SWITCH

Remove 4 screws and the combination switch, then disconnect the connectors

9. REMOVE TURN SIGNAL BRACKET

Remove 2 bolts and the bracket



10. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL

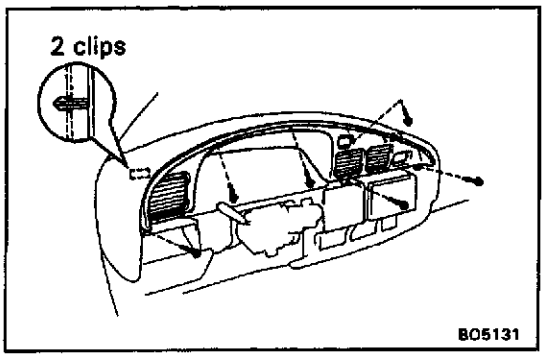
(a) (w/ Manual Choke)

Remove the choke knob by pulling

(b) Remove the ash tray

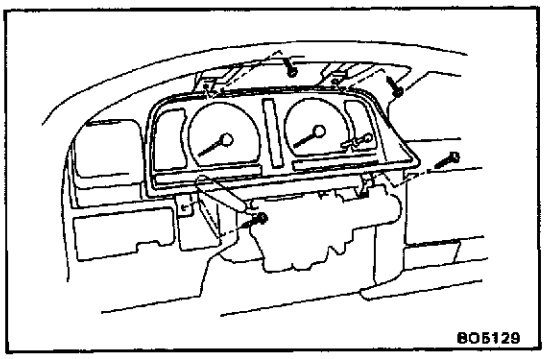
(c) Remove 3 screws and the ash receptacle

(d) Remove the instrument cluster finish center panel then disconnect the connectors

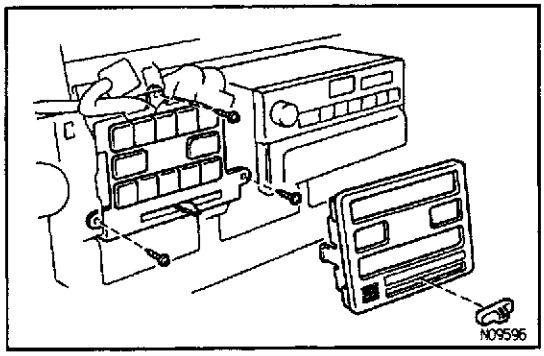


11. REMOVE INSTRUMENT CLUSTER FINISH PANEL

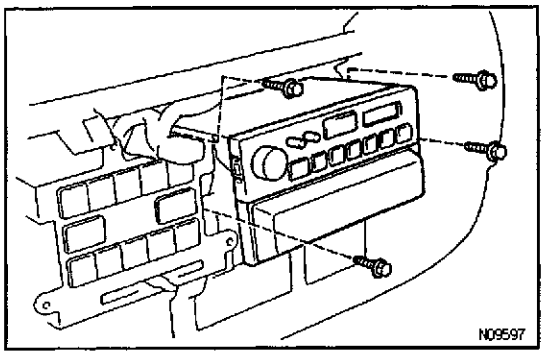
Remove 6 screws and the instrument cluster finish panel



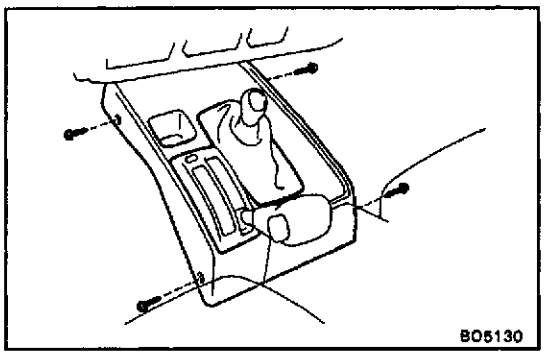
12. REMOVE COMBINATION METER
(a) Remove 4 screws
(b) Disconnect the connectors and the meter



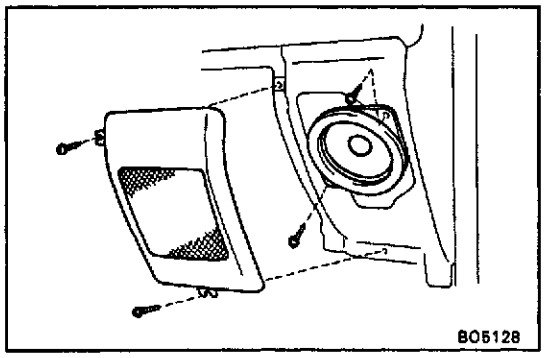
13. REMOVE HEATER CONTROL UNIT
(a) Remove the heater control knob
(b) Using a screwdriver, remove the heater control name plate
(c) Remove 3 screws and the heater control
HINT Tape the screwdriver tip before use



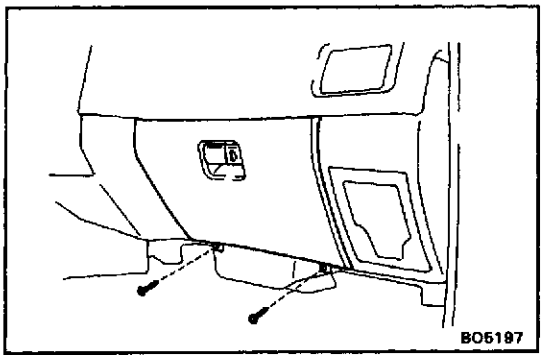
14. REMOVE RADIO
Remove 4 bolts and the radio then disconnect the connectors



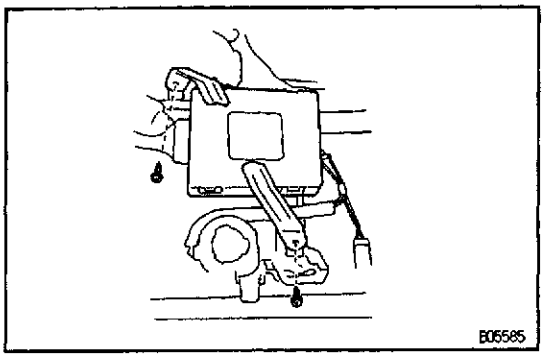
6. REMOVE FRONT CONSOLE BOX
Remove 4 screws and the console box



16. REMOVE INSTRUMENT PANEL SPEAKER
(a) Remove 2 screws and the speaker No 1 panel
(b) Remove 2 screws and speaker, then disconnect the connector

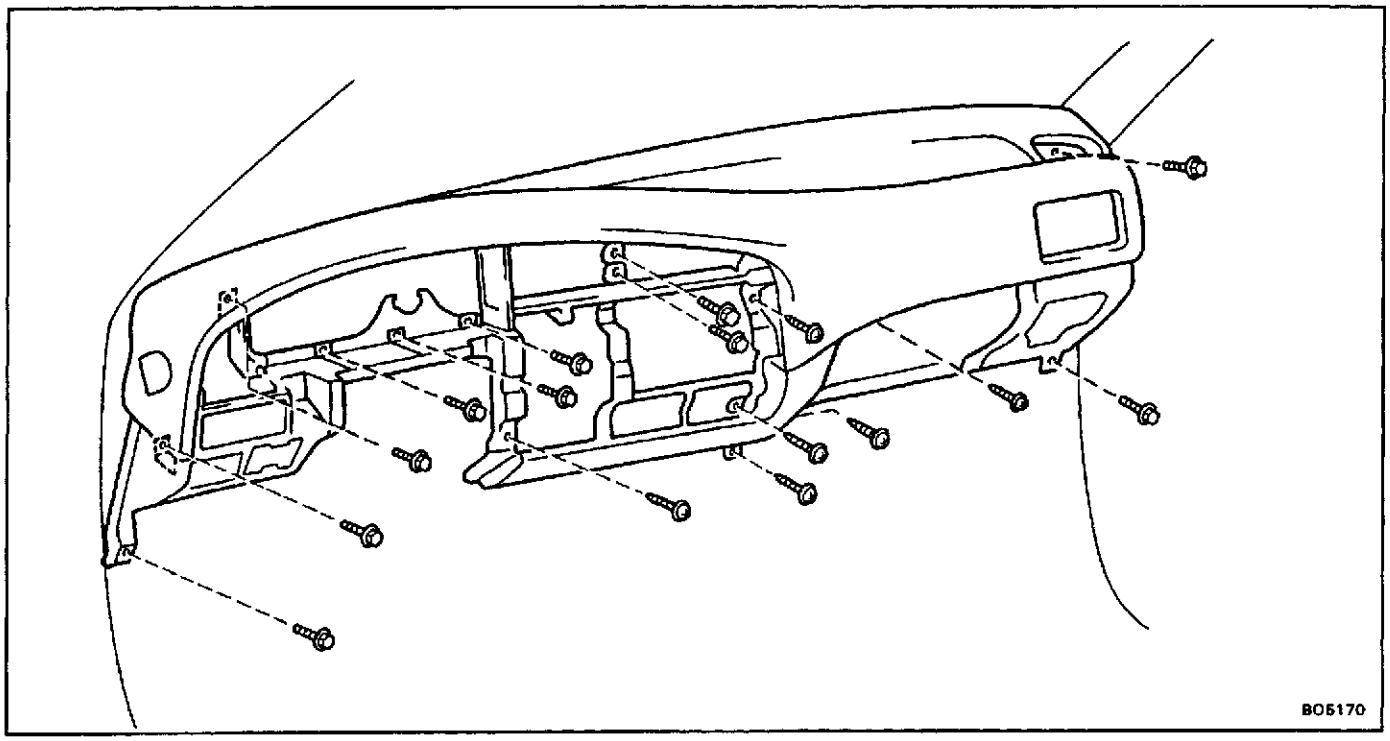


17. REMOVE GLOVE COMPARTMENT DOOR
Remove 2 screws and the compartment door



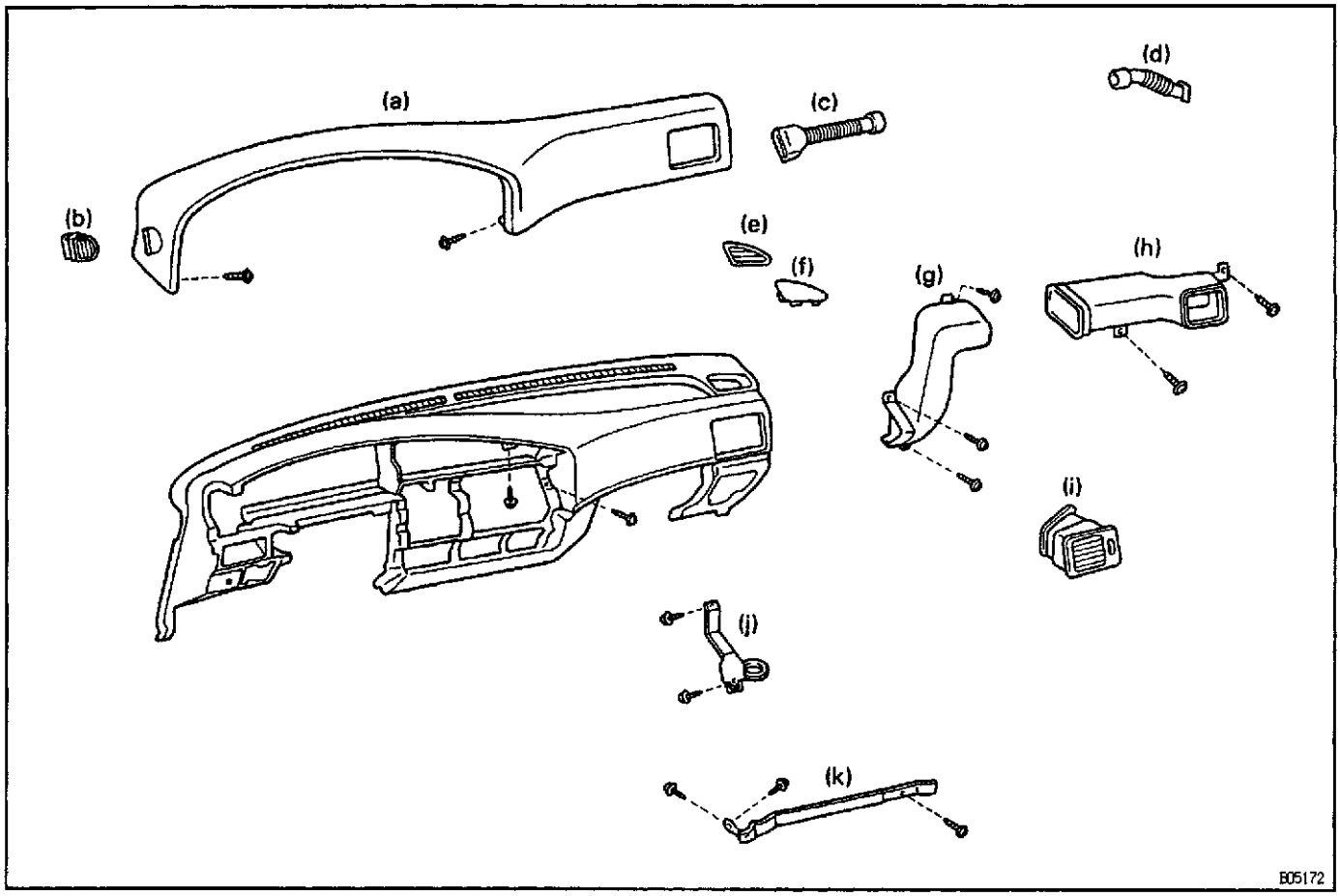
18. REMOVE ECM
Remove 2 screws and the ECM, then disconnect the connector

19. REMOVE INSTRUMENT PANEL
Remove 10 bolts, 6 screws and the instrument panel



20. REMOVE FOLLOWING PARTS FROM INSTARUMENT PANEL

(a) Safety pad
(b) Side defroster No 1 nozzle
(c) Side defroster nozzle No 1 duct
(d) Side defroster nozzle No 2 duct
(e) Side defroster No 2 nozzle
(f) Defroster nozzle plate
(g) No 4 heater register duct
(h) No 5 heater register duct
(i) Instrument panel No 2 register
(j) Glove compartment door lock striker plate
(k) Glove compartment door reinforcement



INSTRUMENT PANEL INSTALLATION

B0039C-0A

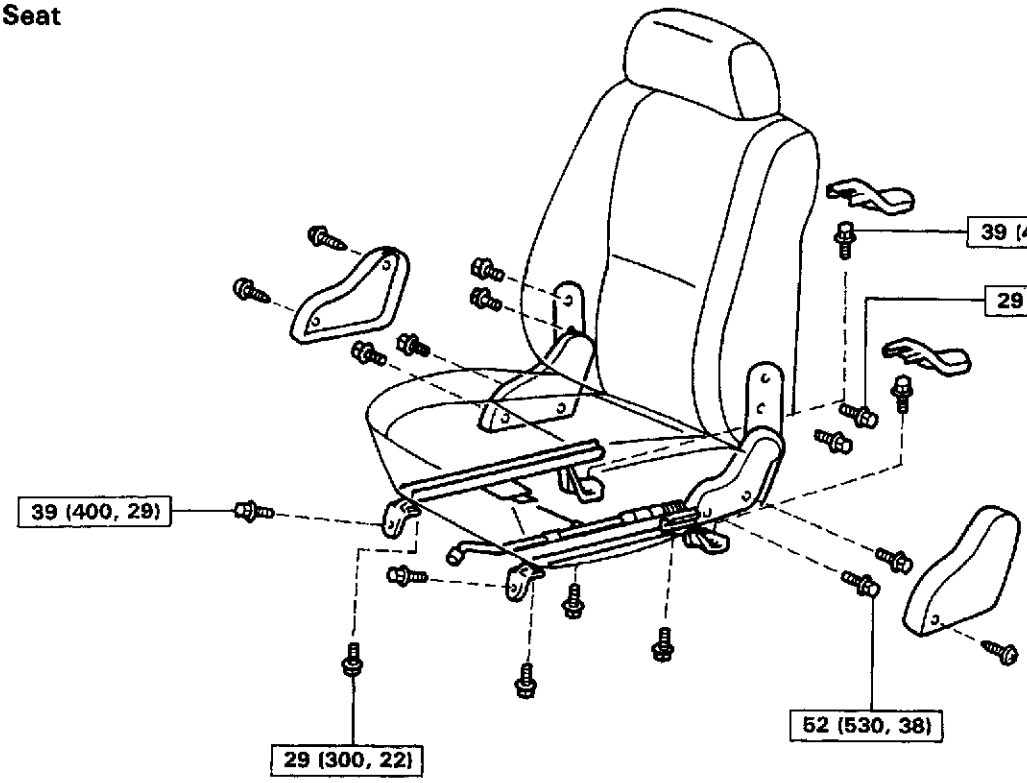
INSTALL INSTRUMENT PANEL PARTS BY FOLLOWING REMOVAL SEQUENCE IN REVERSE

SEAT

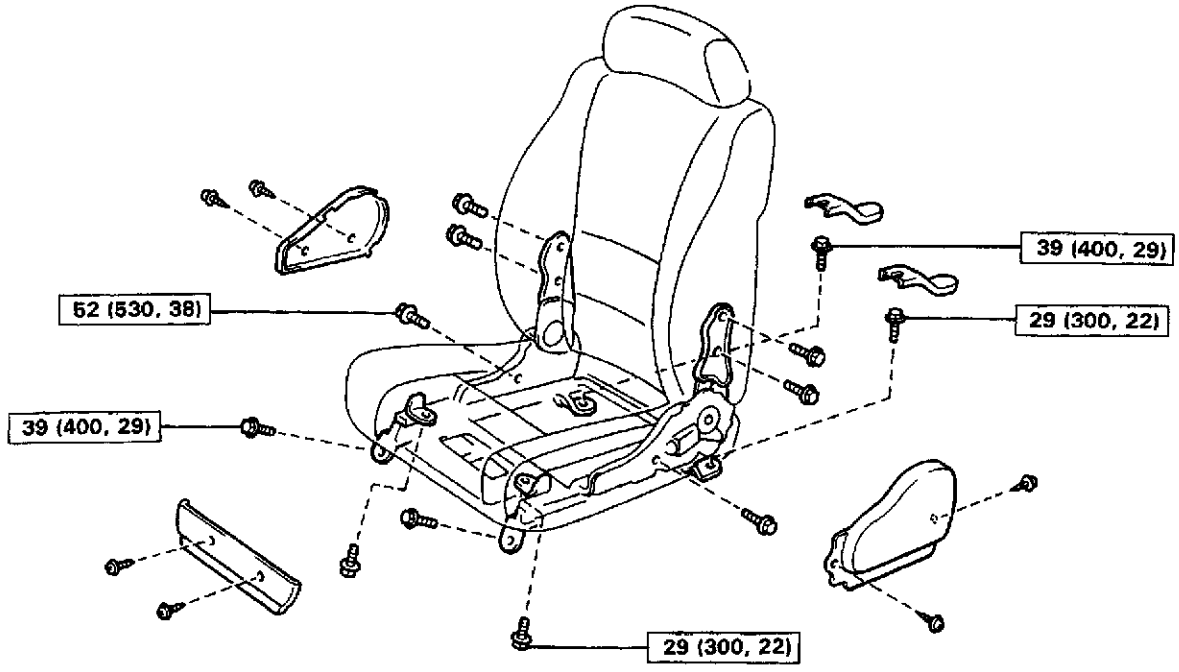
COMPONENTS

20048726

Manual Seat



Power Seat



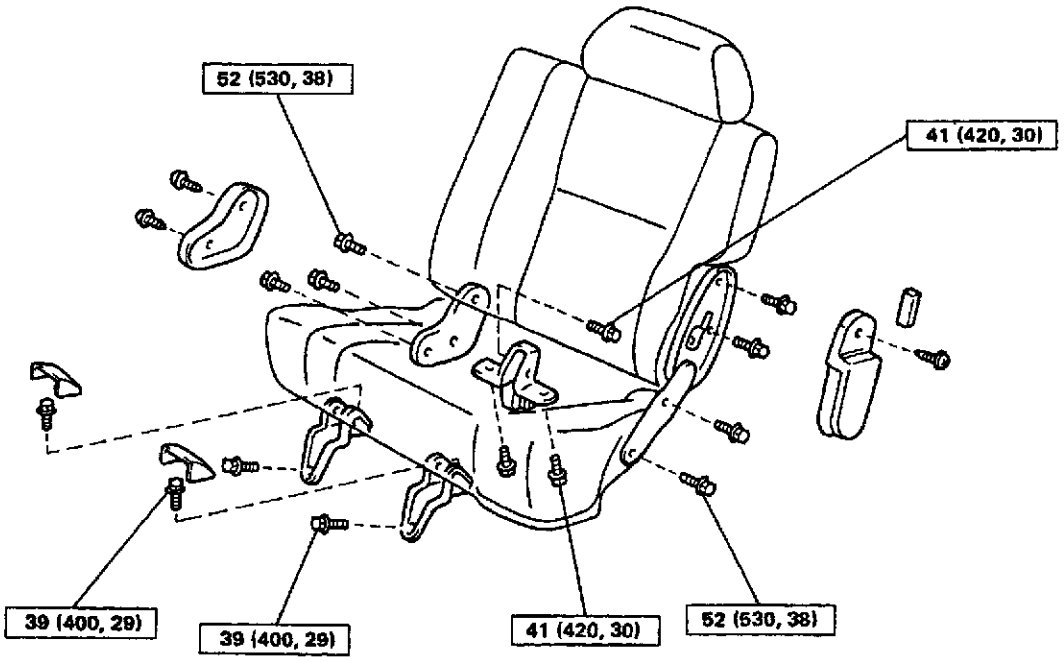
N·m (kgf·cm, ft·lbf) . Specified torque

N03131
N09633

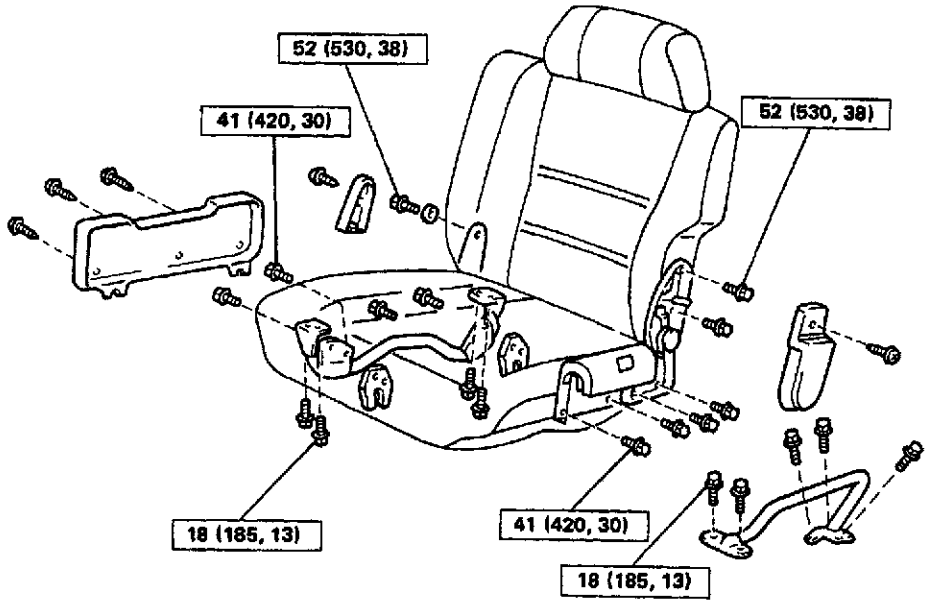
Z10306

COMPONENTS (Cont'd)

Second Seat



Third Seat



N·m (kgf·cm, ft·lbf) : Specified torque

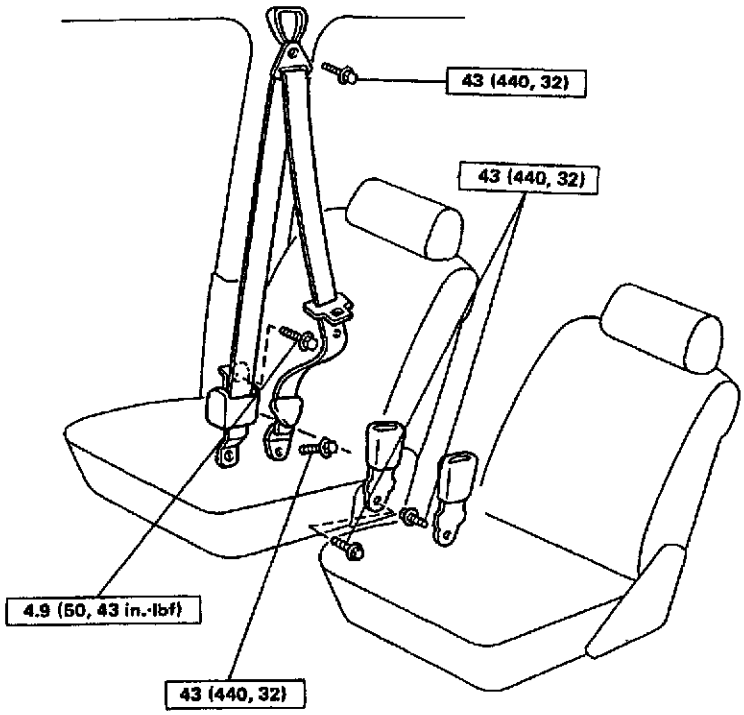
Z10305

SEAT BELT

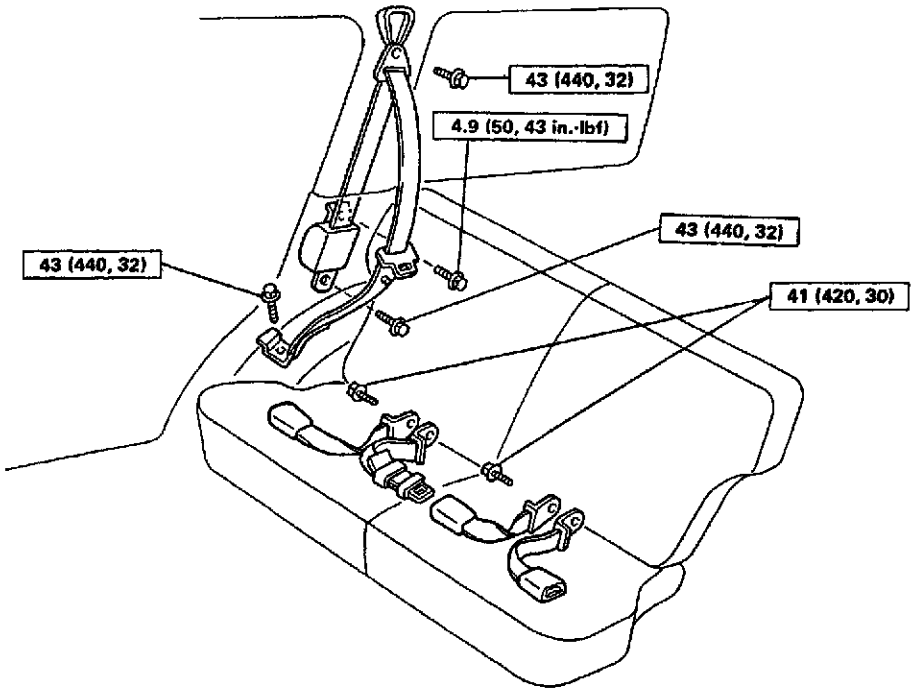
COMPONENTS

BO046-05

Front Seat Belt



Second Seat Belt



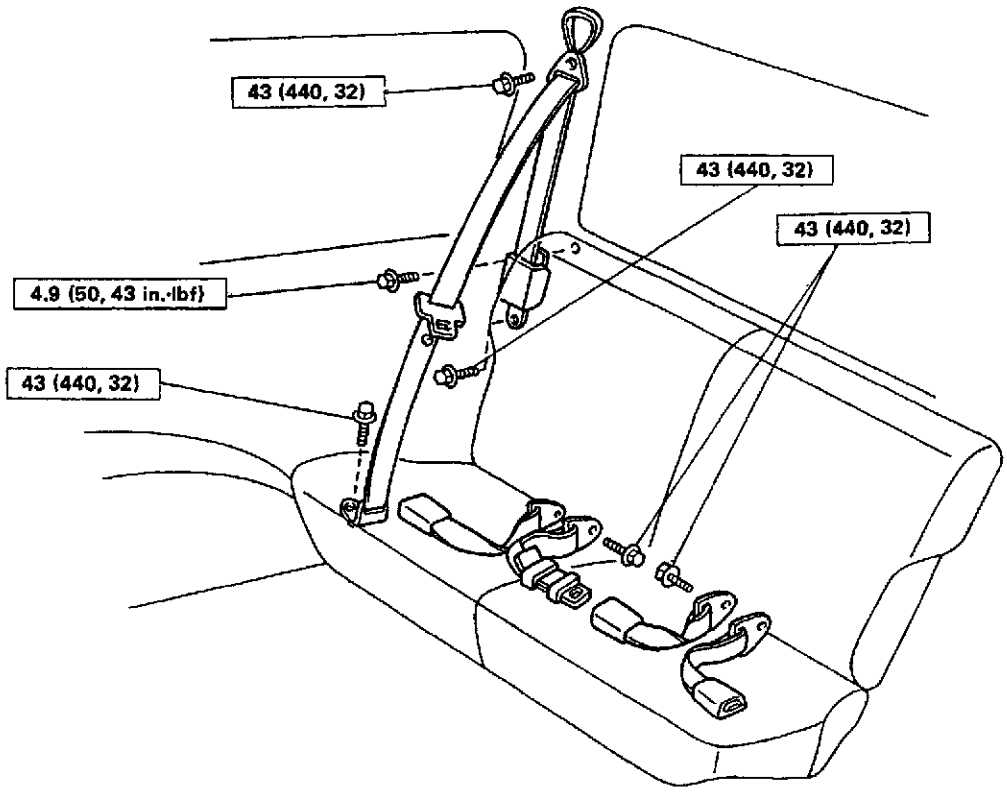
N09532
N09533

N·m (kgf·cm, ft·lbf) : Specified torque

Z10227

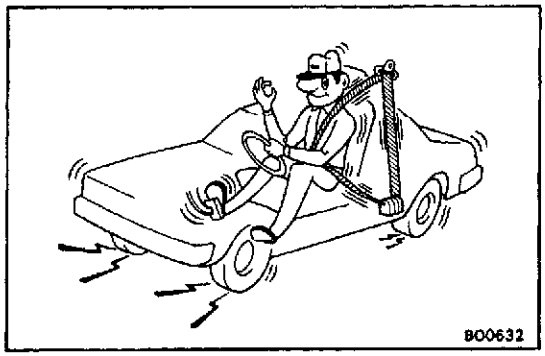
COMPONENTS (Cont'd)

Third Seat Belt



N·m (kgf·cm, ft·lbf) · Specified torque

N09534



B003F-07

SEAT BELT INSPECTION

Emergency Locking Retractor (ELR) and Automatic Locking Retractor (ALR) type

1. RUNNING TEST (IN SAFE AREA)

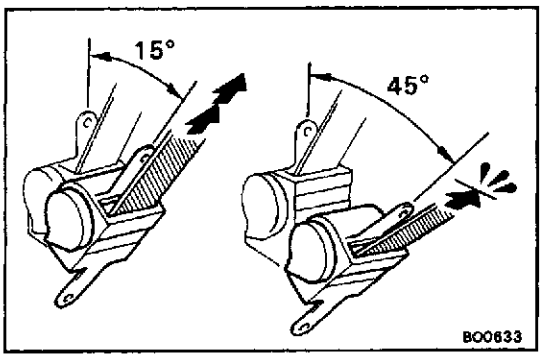
for all seats:

(a) Fasten the front seat belts

(b) Drive the car at 10 mph (16 km/h) and make a very hard stop

(c) Check that the belt is locked 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



2. STATIC TEST

for all seats

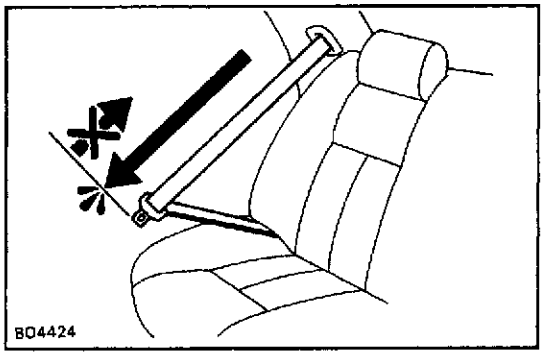
(a) Verify that the belt locks when pulled out quickly

(b) Remove the locking retractor assembly

(c) Tilt the retractor slowly

(d) Verify 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



except for driver's seat:

(e) Pull out the whole belt, release it slightly and then pull it out again

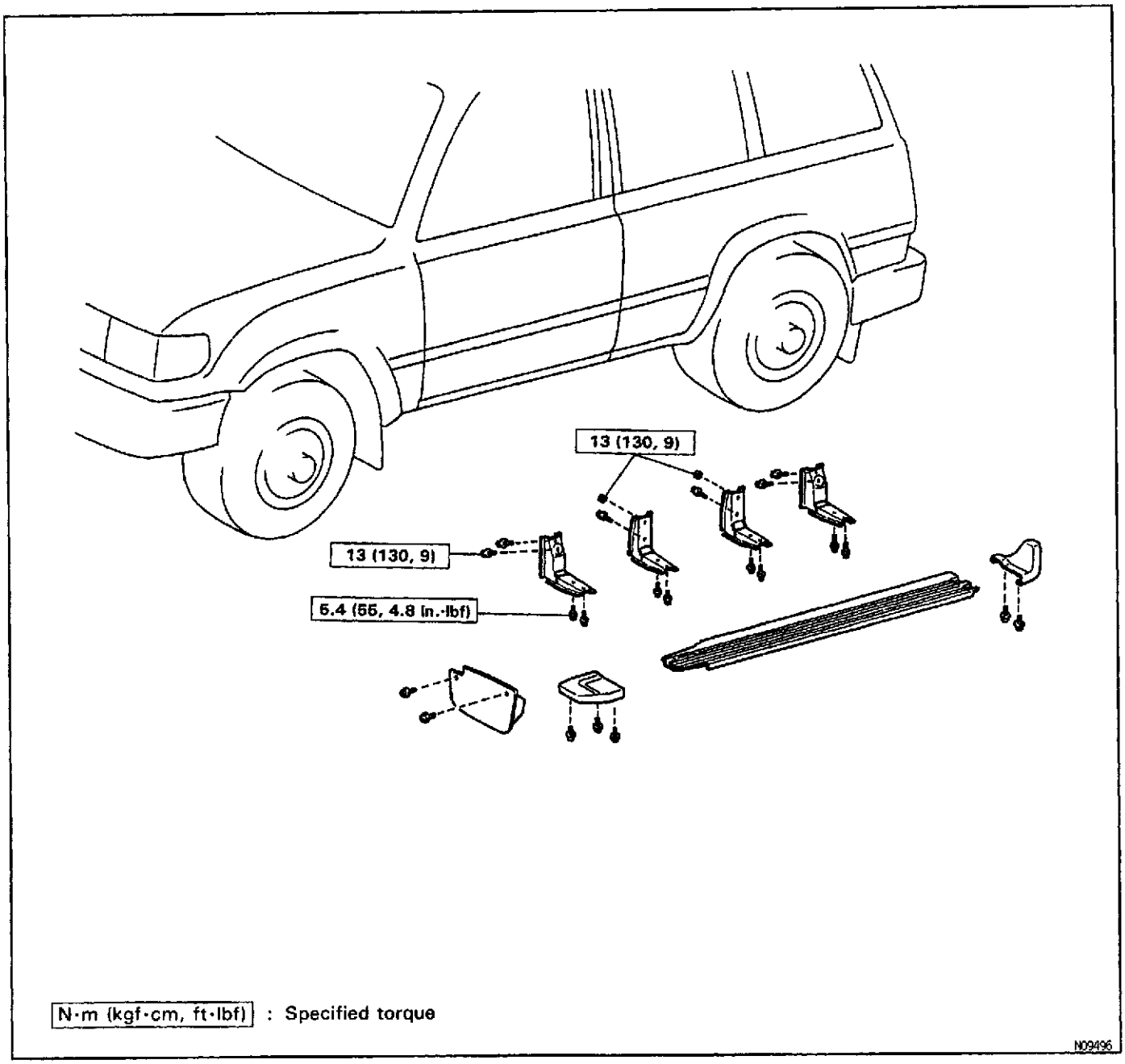
(f) Verify that the belt cannot be extended further

If a problem is found, replace the assembly

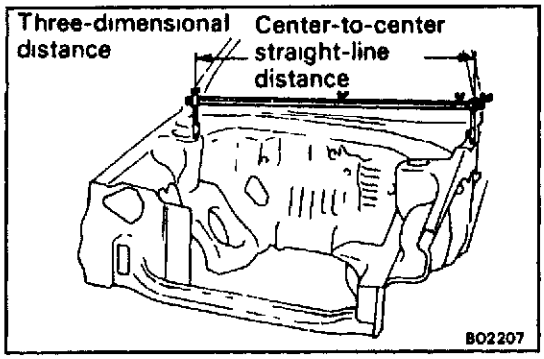
SIDE STEP

B0048-04

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque



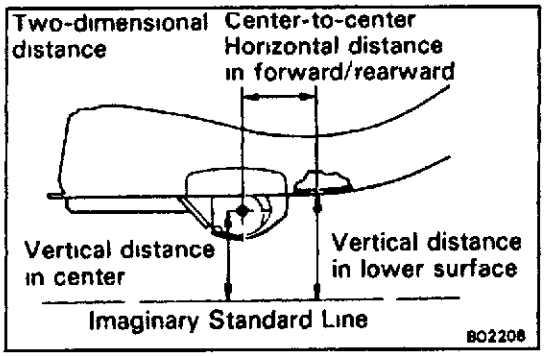
BODY DIMENSIONS

B0036-01

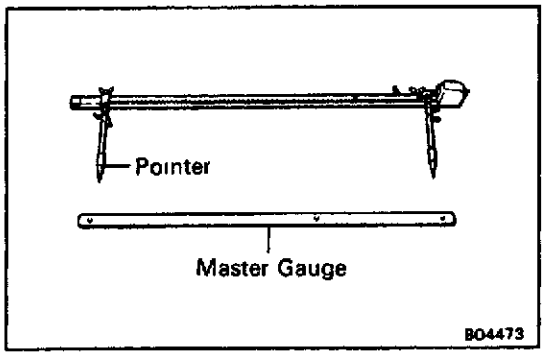
GENERAL INFORMATION

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram
(Three-dimensional distance)
Straight-line distance between the centers of two measuring points

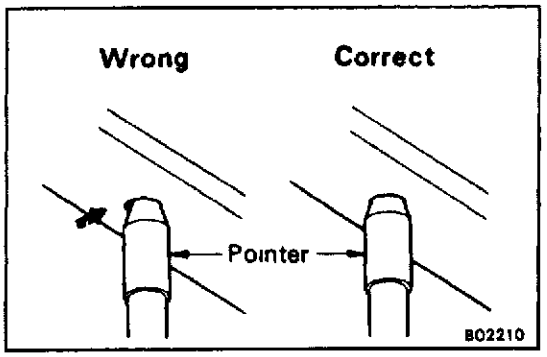


(Two-dimensional distance)
Horizontal distance in forward / rearward between the centers of two measuring points
The height format imaginary standard line
(b) In cases in which only one dimension is given, left and right are symmetrical
(c) The dimensions in the following drawings indicate actual distance Therefore, please use the dimensions as a reference



2. MEASURING

(a) Basically, all measurements are to be done with a tacking gauge For portions where it is not possible to use a tracking gauge, a tape measure should be used
(b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers

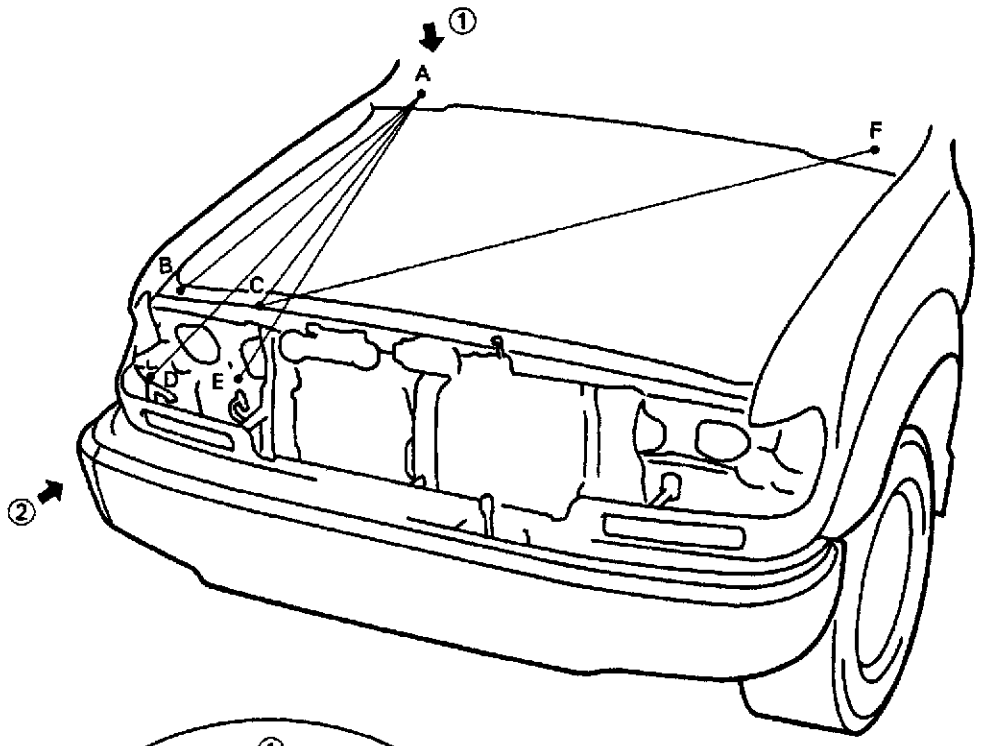


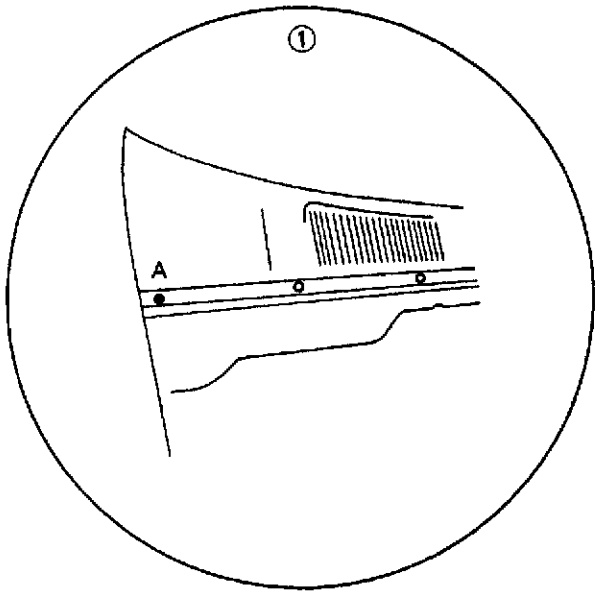
HINT
1 The height of the left and right pointers must be equal
2 Always calibrate the tracking gauge before measuring or after adjusting the pointer height
3 Take care not to drop the tracking gauge or otherwise shock it
4 Confirm that the pointers are securely in the holes

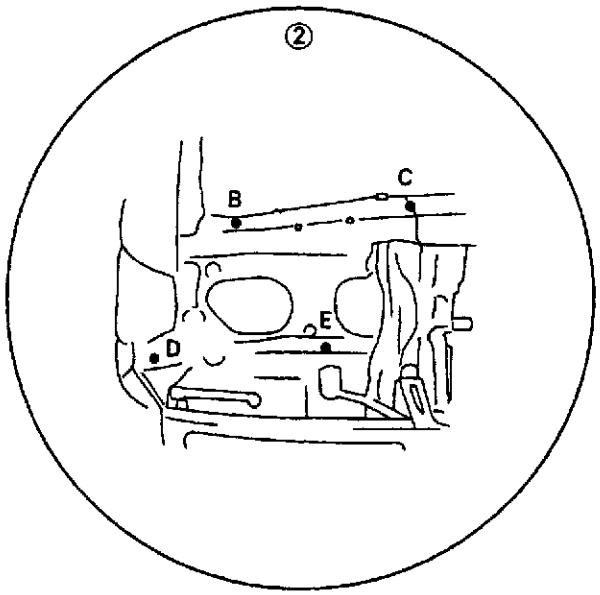
(c) When using a tape measure, avoid twists and bends in the tape
(d) When tracking a diagonal measurement from the front spring support inner hole to the suspension member upper rear installation hole, measure along the front spring support panel surface

BO0UG-01

BODY DIMENSIONS
ENGINE COMPARTMENT







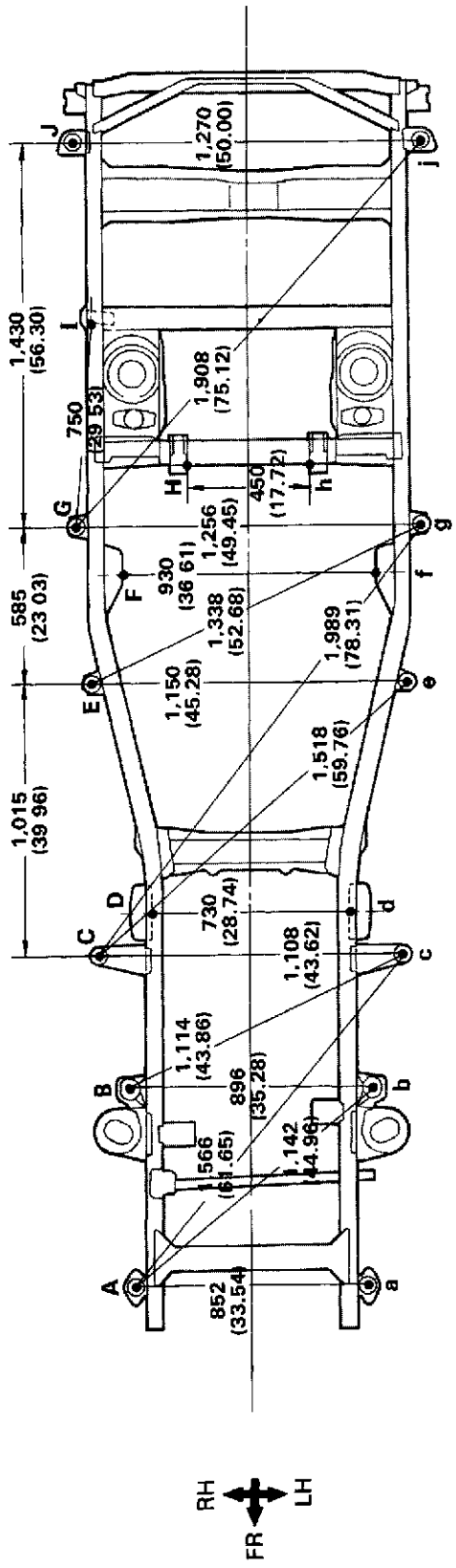
Point	Distance mm (in.)
A – B	1,054 (41.50)
A – C	1,075 (42.32)
A – D	1,060 (41.73)
A – E	1,079 (42.48)
C – F	1,567 (61.69)

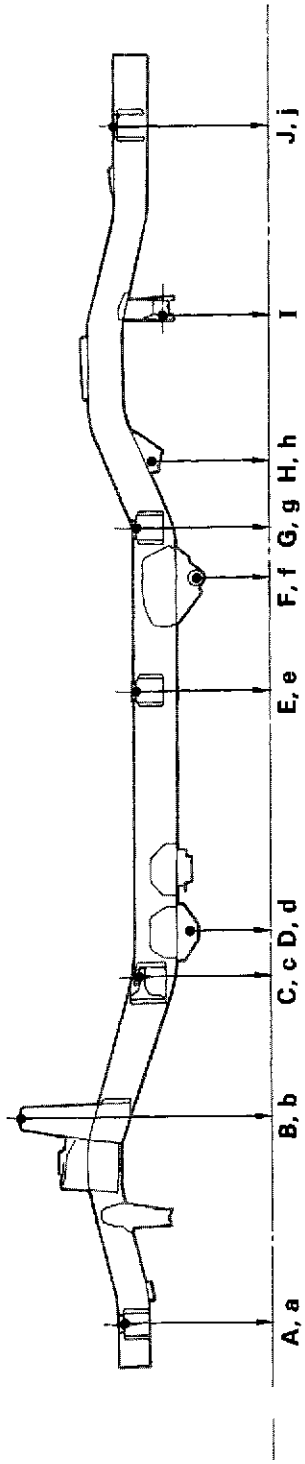
BO5564
BO5591 BO5583

Z05312

Frame Dimensions

THREE-DIMENSIONAL DISTANCE



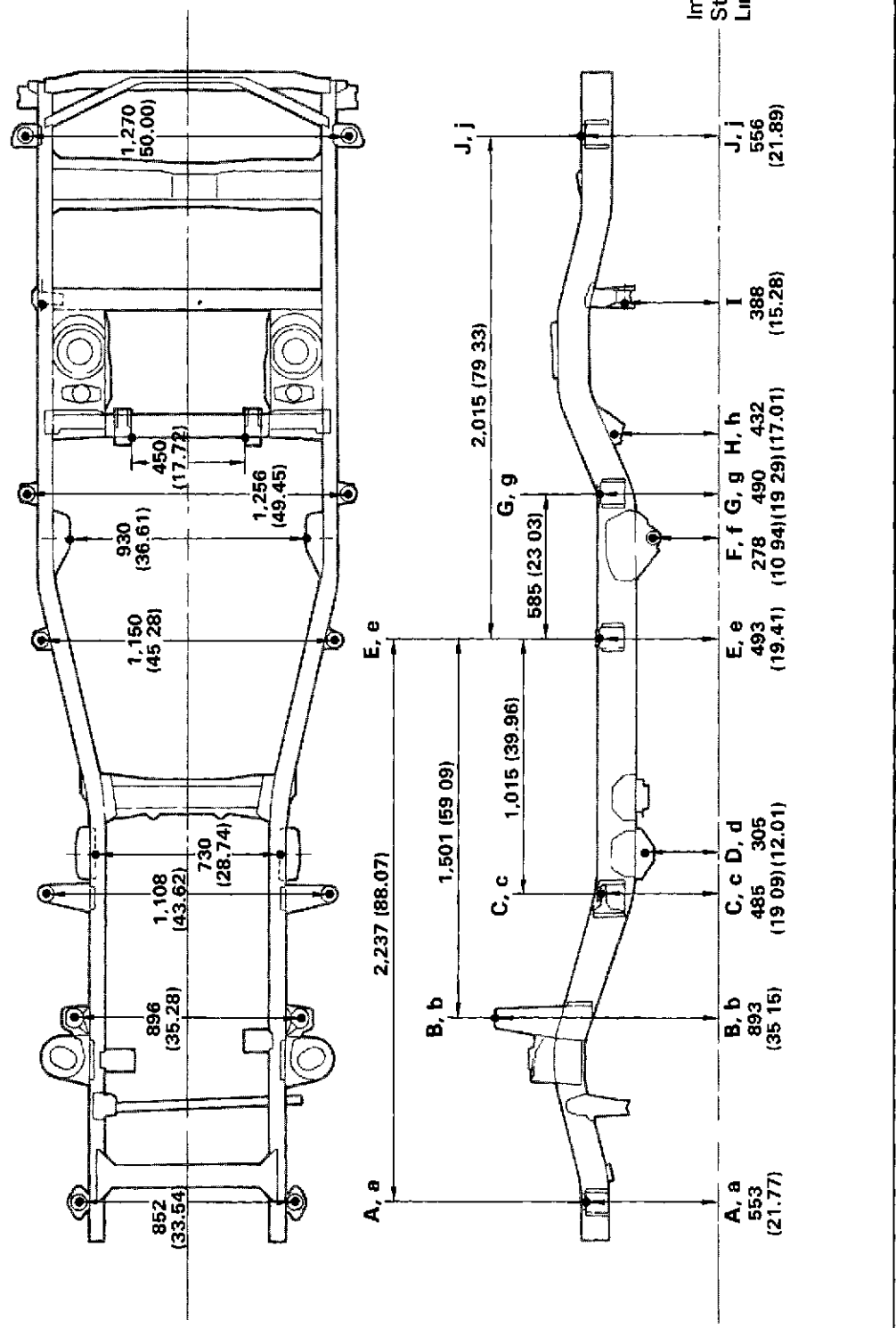


mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Body mounting hole	60 (2.36)	F,f	Lower control link installation hole	18.5 (0.73)
B,b	Shock absorber installation hole	24 (0.94)	G,g	Body mounting hole	24 (0.94)
C,c	Body mounting hole	28 (1.10)	H,h	Upper control arm installation hole	18 5 (0.728)
D,d	Leading arm installation hole	18.5 (0.728)	I	Lateral control rod installation hole	18.5 (0.73)
E,e	Body mounting hole	24 (0.94)	J,j	Body mounting hole	60 (2.36)

BO5177

TWO-DIMENSIONAL DISTANCE



mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Body mounting hole	60 (2.36)	F,f	Lower control link installation hole	18.5 (0.73)
B,b	Shock absorber installation hole	24 (0.94)	G,g	Body mounting hole	24 (0.94)
C,c	Body mounting hole	28 (1.10)	H,h	Upper control arm installation hole	18.5 (0.728)
D,d	Leading arm installation hole	18.5 (0.728)	I	Lateral control rod installation hole	18.5 (0.73)
E,e	Body mounting hole	24 (0.94)	J,j	Body mounting hole	60 (2.36)

BO5177

BRAKE SYSTEM

GENERAL DESCRIPTION

1 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

2 It is very important to keep parts and the area clean when repairing the brake system

DESCRIPTION

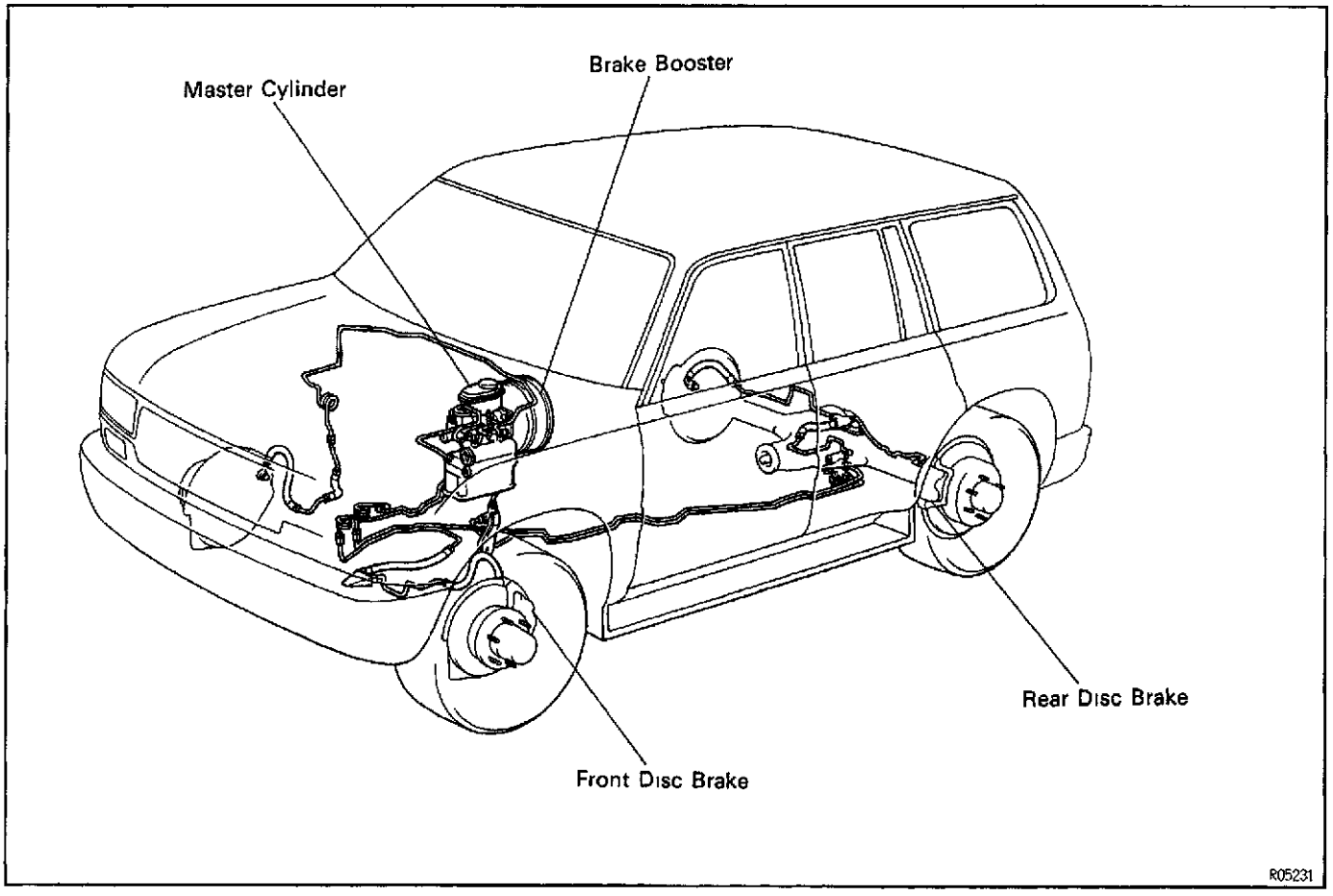
The service brakes consist of a foot brake which changes rotational energy to thermal energy to stop the vehicle while it is being driven and a parking brake to keep the vehicle from moving while it is parked

OPERATION

FOOT BRAKE

BR014-00

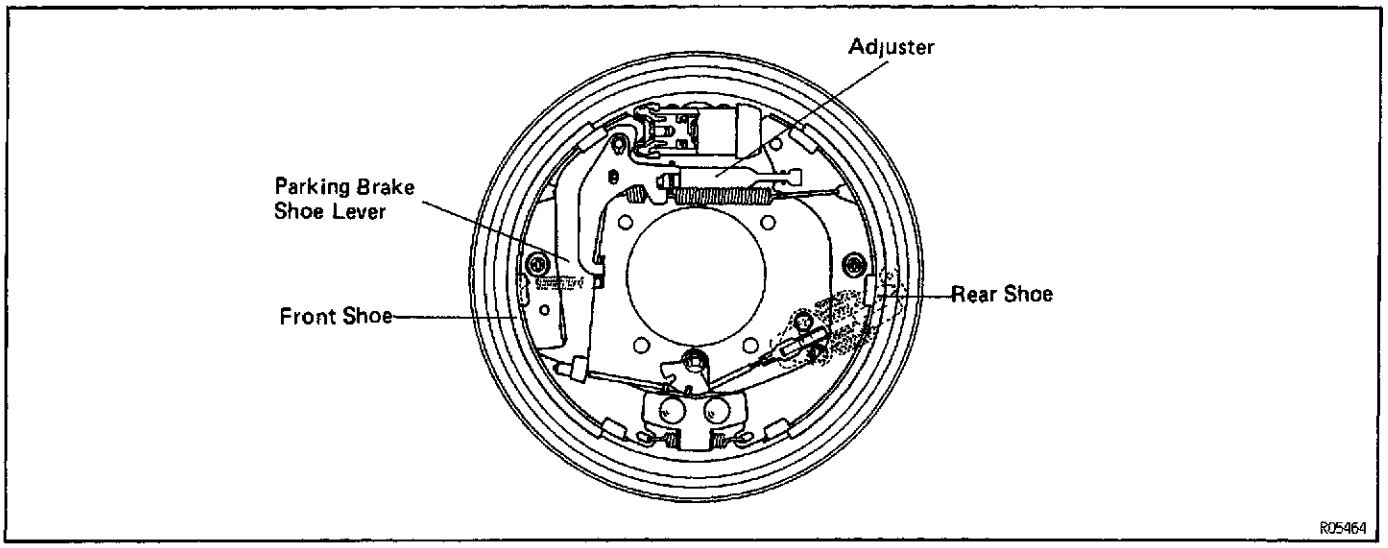
When the brake pedal is depressed, a vacuum builds up in the booster which amplifies the pedal force, pressing on the piston in the master cylinder The piston movement raises the hydraulic pressure in the cylinder This hydraulic pressure is then applied to each front brake caliper and rear brake cylinder (or rear wheel cylinder), and acts to press the front brake pads and rear brake pads (or rear brake shoes) against the rotating discs (or brake drums) The resulting friction converts the rotational energy to thermal energy, stopping the vehicle



BR015-06

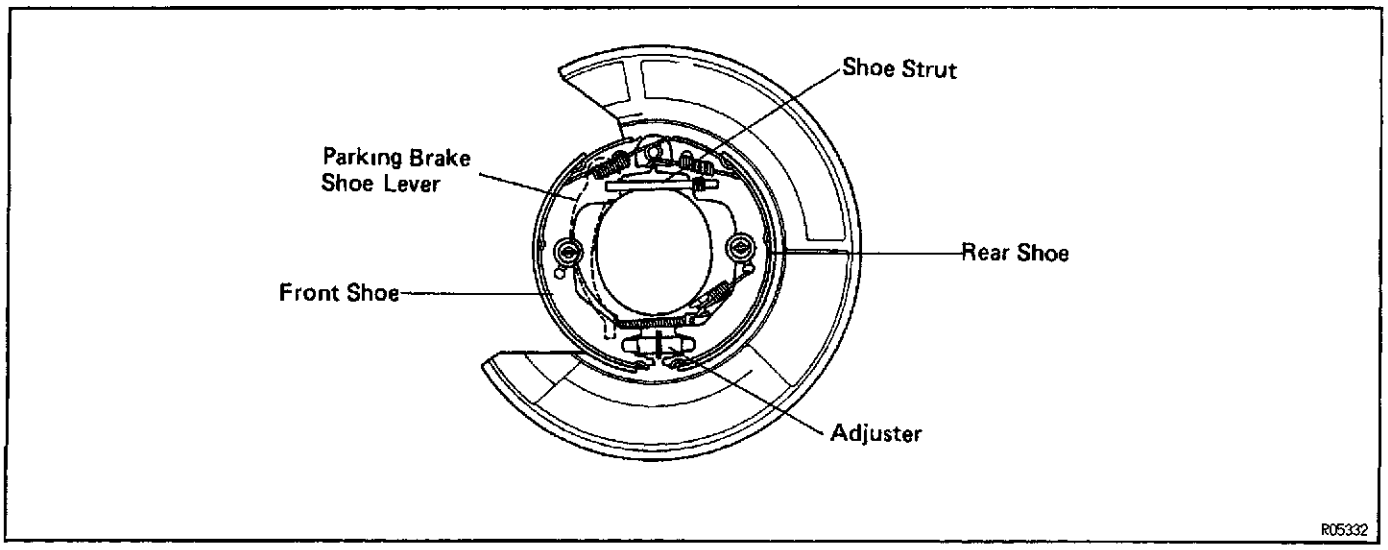
PARKING BRAKE
(Rear Drum Brake)

When the parking brake lever is pulled, the parking brake shoe lever is pulled via the parking brake wire. This causes the adjuster to push the front shoe, which expands and is pressed against the brake drum. If the parking brake lever continues to be pulled, the contact point of the parking brake shoe lever and adjuster then becomes the fulcrum so that the parking brake shoe lever causes the rear shoe to expand. This results in the brake drum being locked by the front shoe and rear shoe.



PARKING BRAKE
(Rear Disc Brake)

When the parking brake lever is pulled, the parking brake shoe lever is pulled via the parking brake wire. This causes the shoe strut to push the front shoe, which expands and is pressed against the disc. If the parking brake lever continues to be pulled, the contact point of the parking brake shoe lever and shoe strut then becomes the fulcrum so that the parking brake shoe lever causes the rear shoe to expand. This results in the disc being locked by the front shoe and rear shoe.

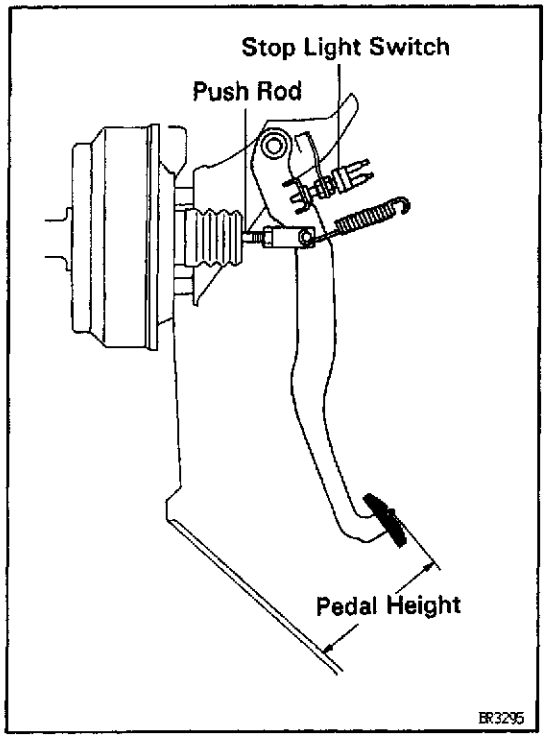


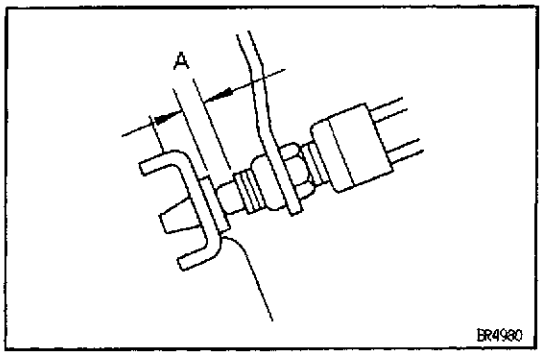
TROUBLESHOOTING

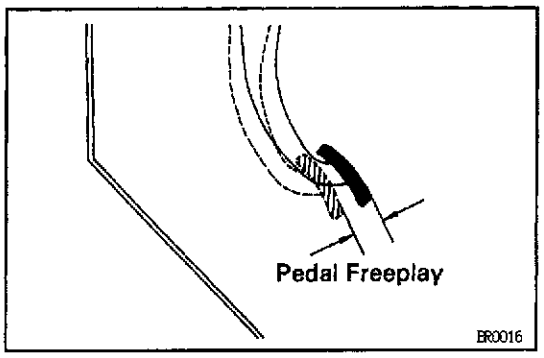
Use the table below to help you find the cause of the problem The numbers indicate the priority of the likely cause of the problem Check each part in order If necessary, replace these parts

See page	–	–	BR-20 27 39	BR-20 27	BR-7	BR-11	BR-27 39	BR-10	–	BR-19	BR-27	BR-20 27 39	BR-20 27 39	BR-24 27 39	BR-20 27 39	BR-8	BR-2o 39	BR-20 27 39	BR-20 39	BR-20 39	BR-20 27 39	BR-20 27 39	BR-20 39	BR-27
Part Name (Trouble)	Brake system (Fluid leaks)	Brake system (Air in)	Brake pad or lining (Worn)	Piston seal (Worn or damaged)	Brake pedal (Freeplay minimal)	Master cylinder (Faulty)	Rear brake (Shoe clearance out of adjustment	Parking brake (Lever travel out of adjustment)	Parking brake wire (Sticking)	Booster push rod (Out of adjustment)	Anchor or return spring (Faulty)	Pad or lining (Cracked or distorted)	Piston (Stuck)	Pad or lining (Oily)	Piston (Frozen)	Booster system (Vacuum teaks)	Pad support plate (Loose)	Installation bolt (Loose)	Sliding pin (Worn)	Disc (Scored)	Pad or lining (Dirty)	Pad or lining (Hardened)	Anti-squeal shim (Damaged)	Hold-down spring (Damaged)
Low pedal or spongy pedal	1	2		3		5	4			6														
Brake drag					1	11	4	2	3	9	8	5	6		7	10								
Brake pull												5	1	2	3					4				
Hard pedal but brake inefficient	1	2	3				5			9		4		6		10				8		7		
Noise from brakes											8	1					4	2	5	3	6	7	9	10

V02151







CHECK AND ADJUSTMENT

BRAKE PEDAL CHECK AND ADJUSTMENT

1. CHECK THAT PEDAL HEIGHT IS CORRECT, AS SHOWN

Pedal height from asphalt sheet:

167.5-177.5 mm (6.59-6.99 in.)

If the pedal height is incorrect, adjust it

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 clearance (A) between the stop light switch and pedal

Clearance:

0.5-2.4 mm (0.02-0.09 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) After adjusting the pedal height, check the pedal free-play

HINT If clearance (A) between the stop light switch and the brake pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications

3. CHECK THAT PEDAL FREEPLAY IS CORRECT, AS SHOWN

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster

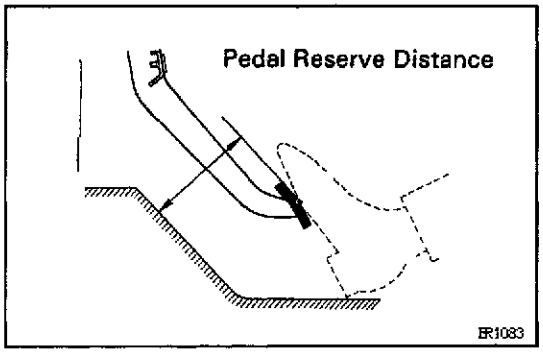
(b) Push in the pedal by hand until the beginning of the resistance is felt, then measure the distance, as shown

Pedal freeplay:

3-6 mm (0.12-0.24 in.)

HINT The freeplay to the 1st point of resistance is due to the play between the clevis and pin It is 3-6 mm (0 12-0 24 in) on the pedal

If incorrect, check the stop light switch clearance And if the clearance is OK, then troubleshoot the brake system



4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT, AS SHOWN

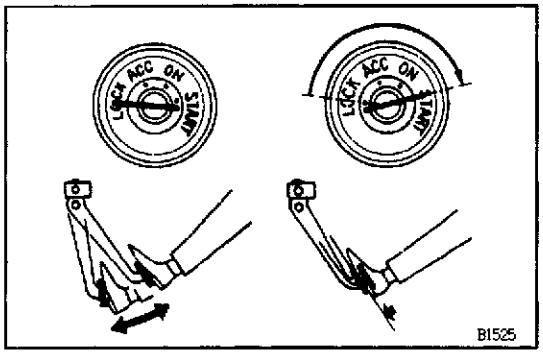
Release the parking brake

With the engine running, depress the pedal and measure the pedal reserve distance, as shown

Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):

More than 68 mm (2.68 in.)

If the reserve distance is incorrect, troubleshoot the brake system

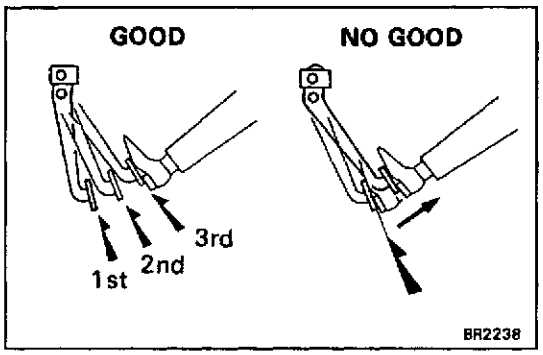


BRAKE BOOSTER OPERATIONAL TEST

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

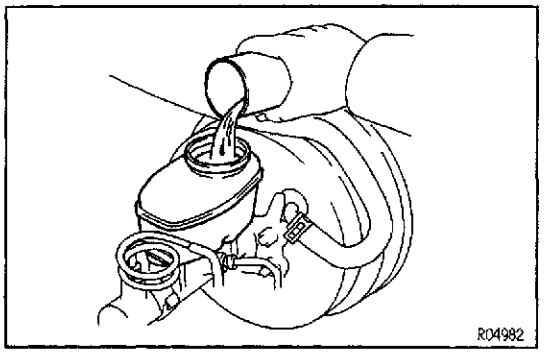
(b) Depress the brake pedal and start the engine If the pedal goes down slightly, operation is normal



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 reverse travel after holding the pedal for 30 seconds, the booster is air tight



BR01C-08

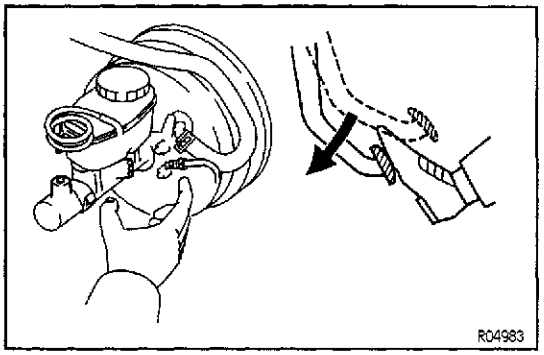
BRAKE SYSTEM BLEEDING

HINT If any work is done on the brake system or if air in the brake lines is suspected, 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

Fluid: SAE J1703 or FMVSS No. 116 DOT3

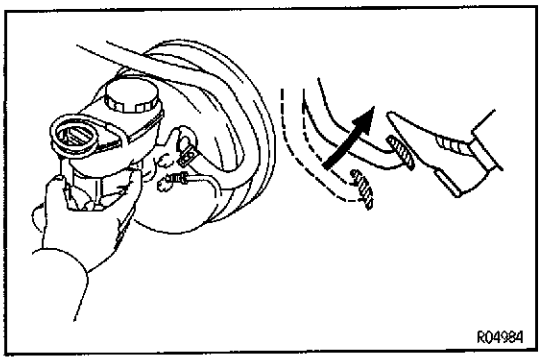


2. BLEED MASTER CYLINDER

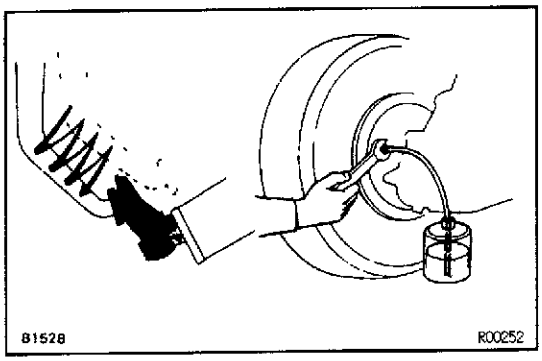
HINT: If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder

(a) Disconnect the brake lines from the master cylinder

(b) Slowly depress the brake pedal and hold it



(c) Block off the outer holes with your fingers, and release the brake pedal
(d) Repeat
(b) and
(c) 3 or 4 times
(e) Connect the brake lines to the master cylinder
Torque: 15 N-m (155 kgf-cm, 11 ft-lbf)



3. BLEED BRAKE LINE
(a) Connect the vinyl tube to the brake caliper or wheel cylinder

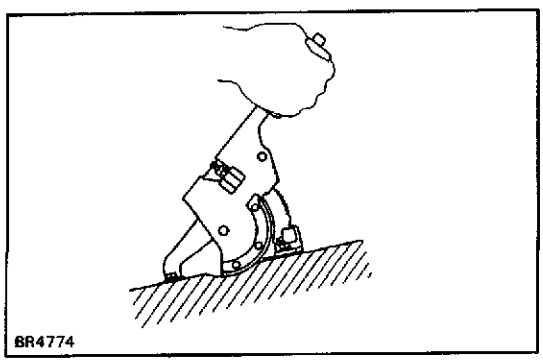
NOTICE:

- **Begin bleeding air from the brake caliper or wheel cylinder with the longest hydraulic line.**
- **Bleed air from the bypass pipe (w/ LSP & BV).**

(b) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down
(c) At the point when fluid stops coming out, tighten the bleeder plug, then release the brake pedal
(d) Repeat (b) and (c) until all the air in the fluid has been bled out
(e) Tighten the bleeder plug
Torque: 11 N-m (110 kgf-cm, 8 ft-lbf)
(f) Repeat the above procedure to bleed the air out of the brake line for each wheel

NOTICE: Do not allow brake fluid to remain on painted surfaces. Wash it off immediarely.

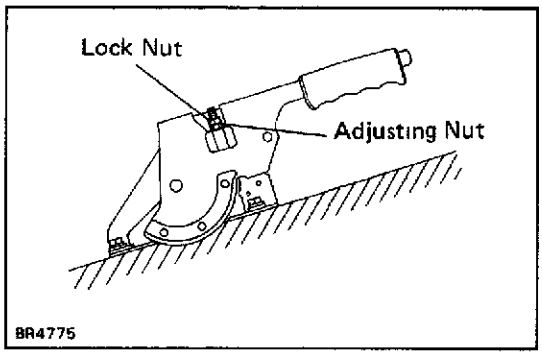
4. CHECK FLUID LEVEL IN RESERVOIR
Check the fluid level and add fluid if necessary
Fluid SAE J1703 or FMVSS No 116 DOT3



BR01D-06

PARKING BRAKE CHECK AND ADJUSTMENT

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 lbf):
7-9 clicks



If incorrect, adjust the parking brake lever travel

2. IF NECESSARY, ADJUST PARKING BRAKE LEVER TRAVEL

HINT Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted For shoe clearance adjustment, see step 9 on page BR -35 or step 1 1 on page BR-52

(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

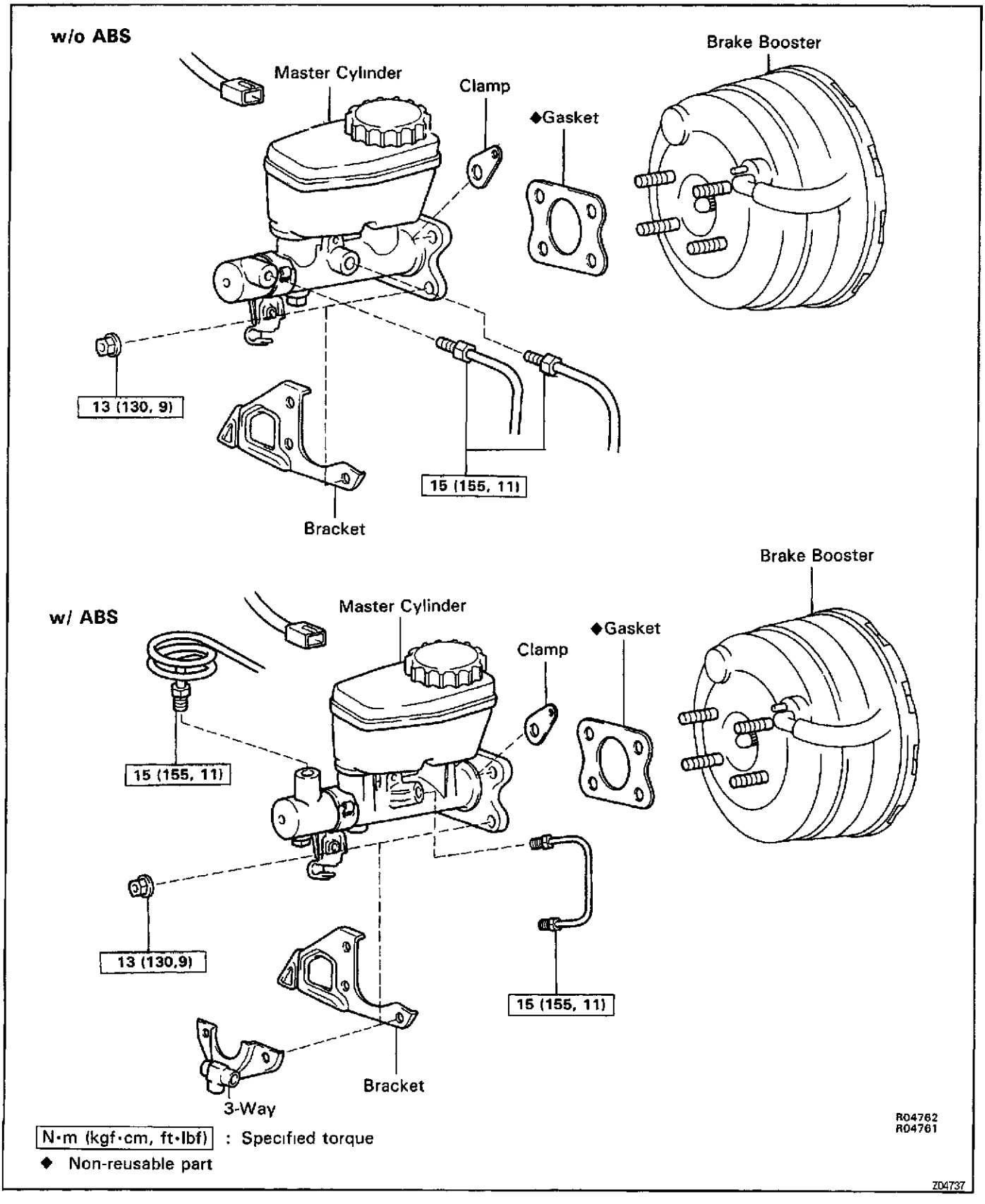
Torque: 5.4 N-m (55 kgf-cm, 48 in.-IM)

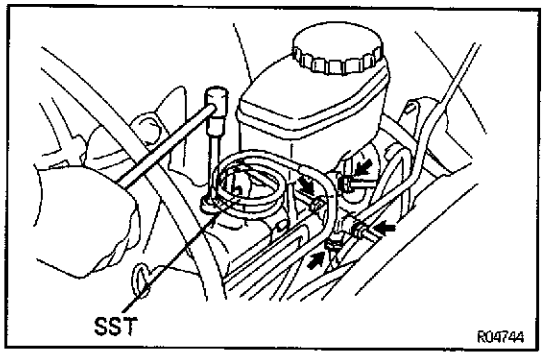
(d) Install the rear console box

MASTER CYLINDER

BR01F-07

MASTER CYLINDER REMOVAL





1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

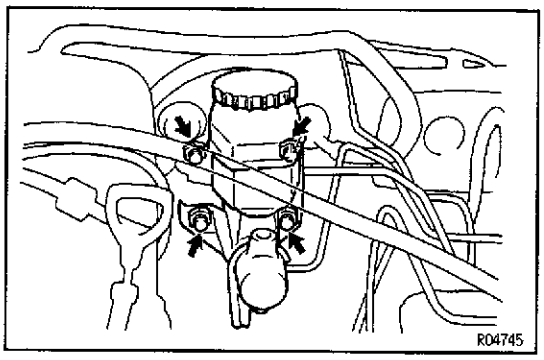
2. TAKE OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE LINES

Using SST, disconnect brake lines from the master cylinder

SST 09023-00100



4. REMOVE MASTER CYLINDER

(a) Remove the mounting nuts

(b) w/ABS

Remove the 3-way, clamp and the bracket

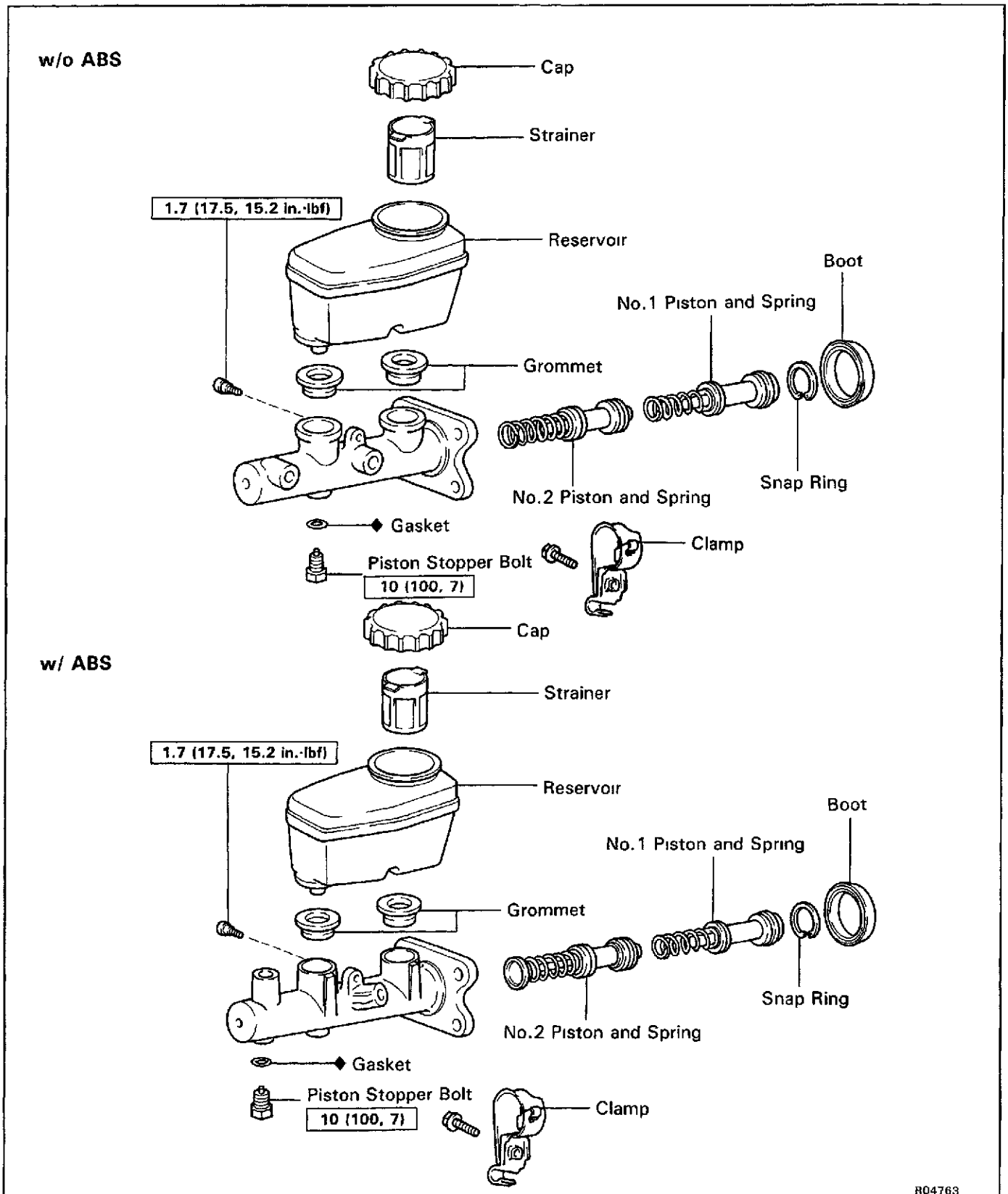
w/o ABS

Remove the clamp and the bracket

(c) Pull out the master cylinder and gasket

BR01G-06

COMPONENTS

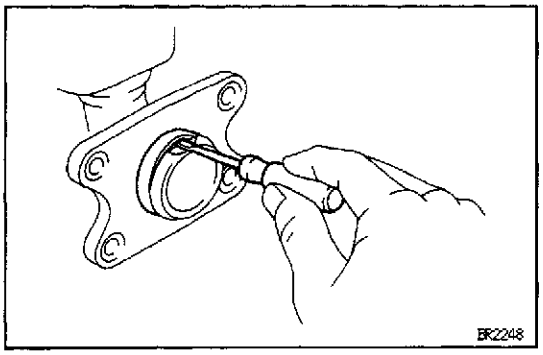


R04763
R04764

N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Z04736

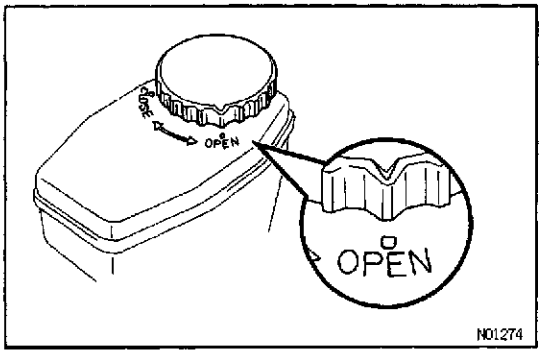


MASTER CYLINDER DISASSEMBLY

BROFF-02

1. REMOVE MASTER CYLINDER BOOT

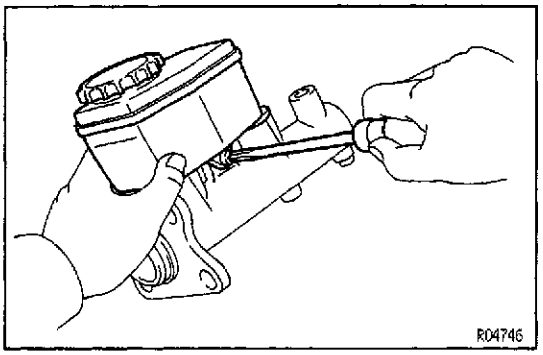
Using a screwdriver, remove the master cylinder boot



2. REMOVE RESERVOIR CAP AND STRAINER

(a) Turn the reservoir cap to the "open" side and remove it

(b) Remove the strainer

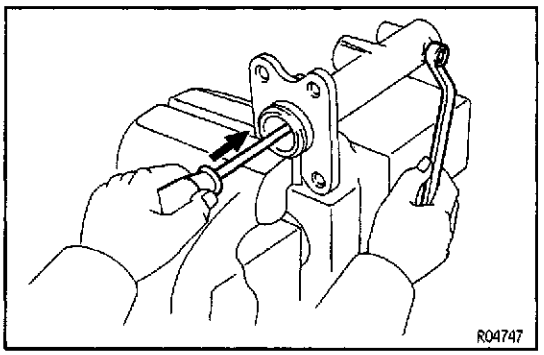


3. REMOVE RESERVOIR

Remove the set screw and pull out the reservoir

4. REMOVE 2 GROMMETS

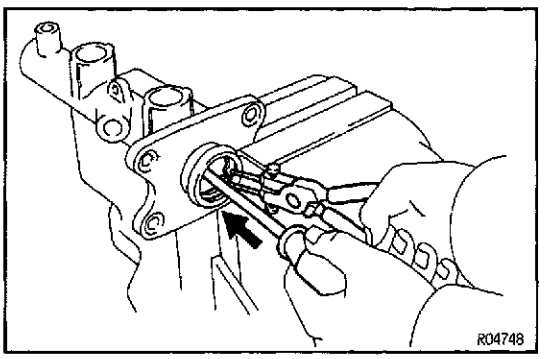
5. PLACE CYLINDER IN VISE



6. REMOVE NO. 2 PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the No 2 piston stopper bolt and gasket

HINT Tape the screwdriver tip before use

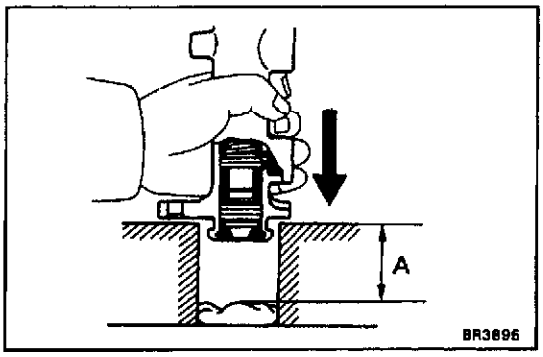


7. REMOVE PISTONS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers

(b) Remove the No 1 piston and spring by hand, pulling straight out, not at an angle

NOTICE: If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.



(c) Place a rag and 2 wooden blocks on the work table and lightly tap the cylinder flange against the blocks and until the No 2 piston drops out of the cylinder
HINT Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3 94 in)

MASTER CYLINDER INSPECTION

BR01J-03

HINT Clean the disassembled parts with compressed air

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

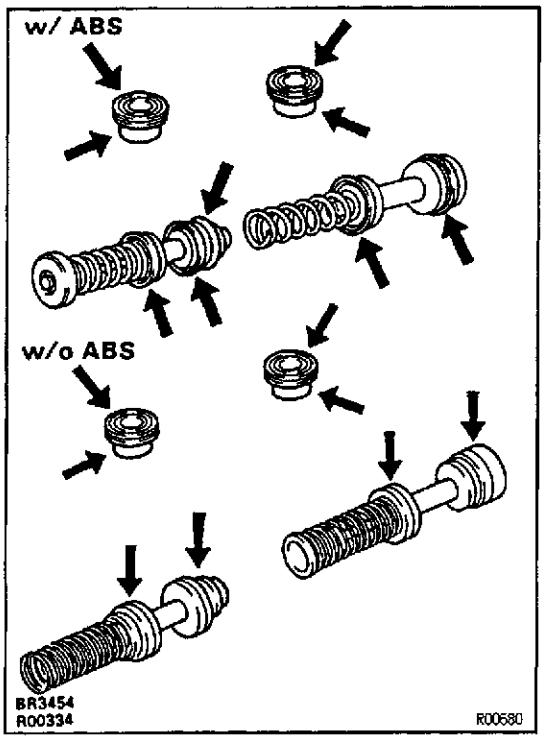
2. INSPECT CYLINDER FOR WEAR OR DAMAGE

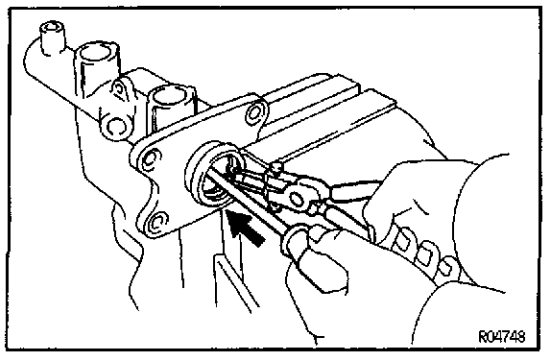
If necessary, clean or replace the cylinder

MASTER CYLINDER ASSEMBLY

BR01K-04

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS





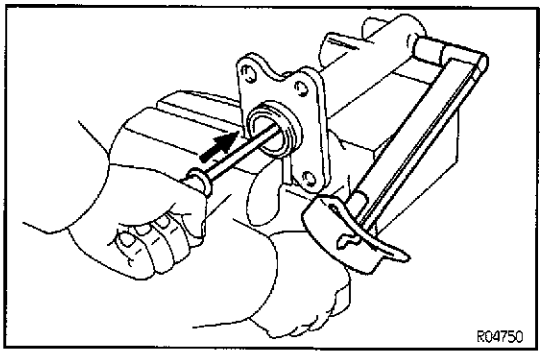
2. INSTALL PISTONS

NOTICE: Be careful not to damage the rubber lips on the pistons

(a) Install the 2 springs and pistons straight in, not at an angle

NOTICE: If insert at an angle, there is a possibility of damaging the cylinder bore.

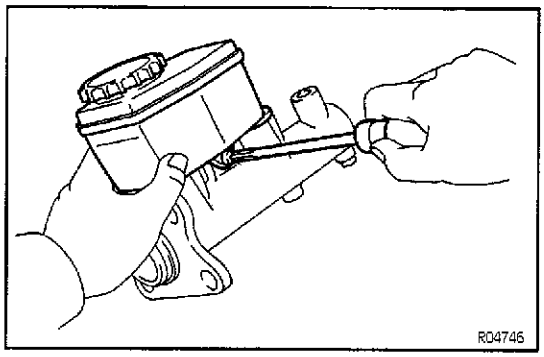
(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers
HINT Tape the screwdriver tip before use



3. INSTALL No.2 PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the No 2 piston stopper bolt over a new gasket

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



4. INSTALL 2 GROMMETS

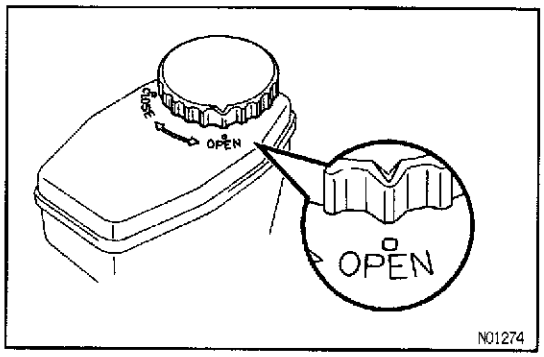
5. INSTALL RESERVOIR

(a) Install the strainer to the reservoir

(b) Push the reservoir onto the cylinder

(c) Install the set screw while pushing on the reservoir

Torque: 1.7 N-m (17.5 kgf-cm, 15.2 in..lbf)

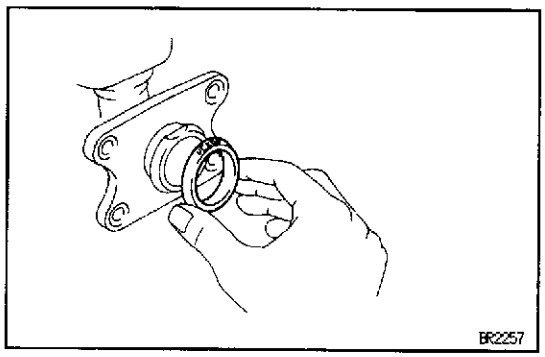


6. INSTALL RESERVOIR CAP

(a) Align the matchmark on the reservoir cap with the matchmark on the "open" side of reservoir

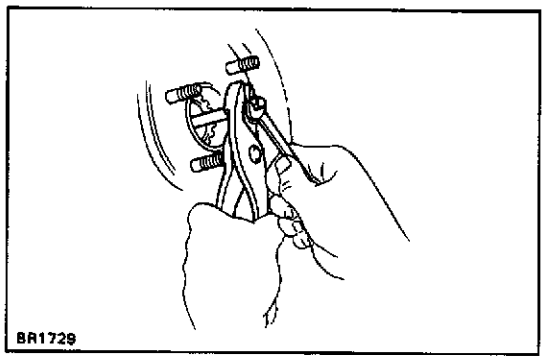
(b) Push down on the reservoir cap and turn it clockwise until it locks

(c) Check that the matchmark on the reservoir cap is now aligned with the matchmark on the "close" side of the reservoir



7. INSTALL MASTER CYLINDER BOOT

With the UP mark on the master cylinder boot facing upwards, install the cylinder boot on the master cylinder

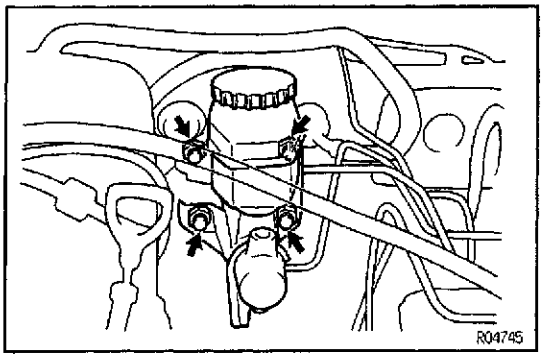


BR01L-07

MASTER CYLINDER INSTALLATION

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER

(See page BR-19)



2. INSTALL MASTER CYLINDER

(a) w/ A BS

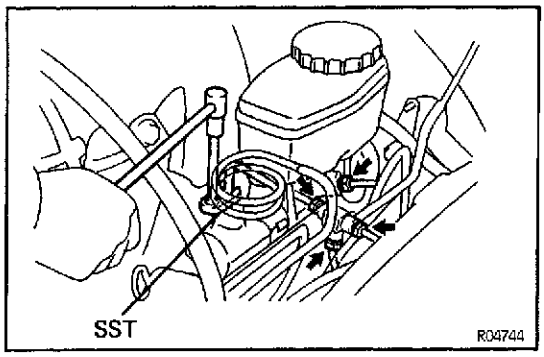
Install the master cylinder, gasket, 3-way, clam 0 and bracket on the brake booster with the 4 nuts

w/o ABS

Install the master cylinder, gasket, clamp and bracket on the brake booster with the 4 nuts

(b) Tighten the mounting nuts

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)



3. CONNECT BRAKE LINES

Using SST, connect the brake lines to the master cylinder Torque the union nuts

SST 09023-00100

Torque: 15 N-m (155 kgf-cm, 11 ft-lbf)

4. CONNECT LEVEL WARNING SWITCH CONNECTOR

5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(SEE PAGE BR-8)

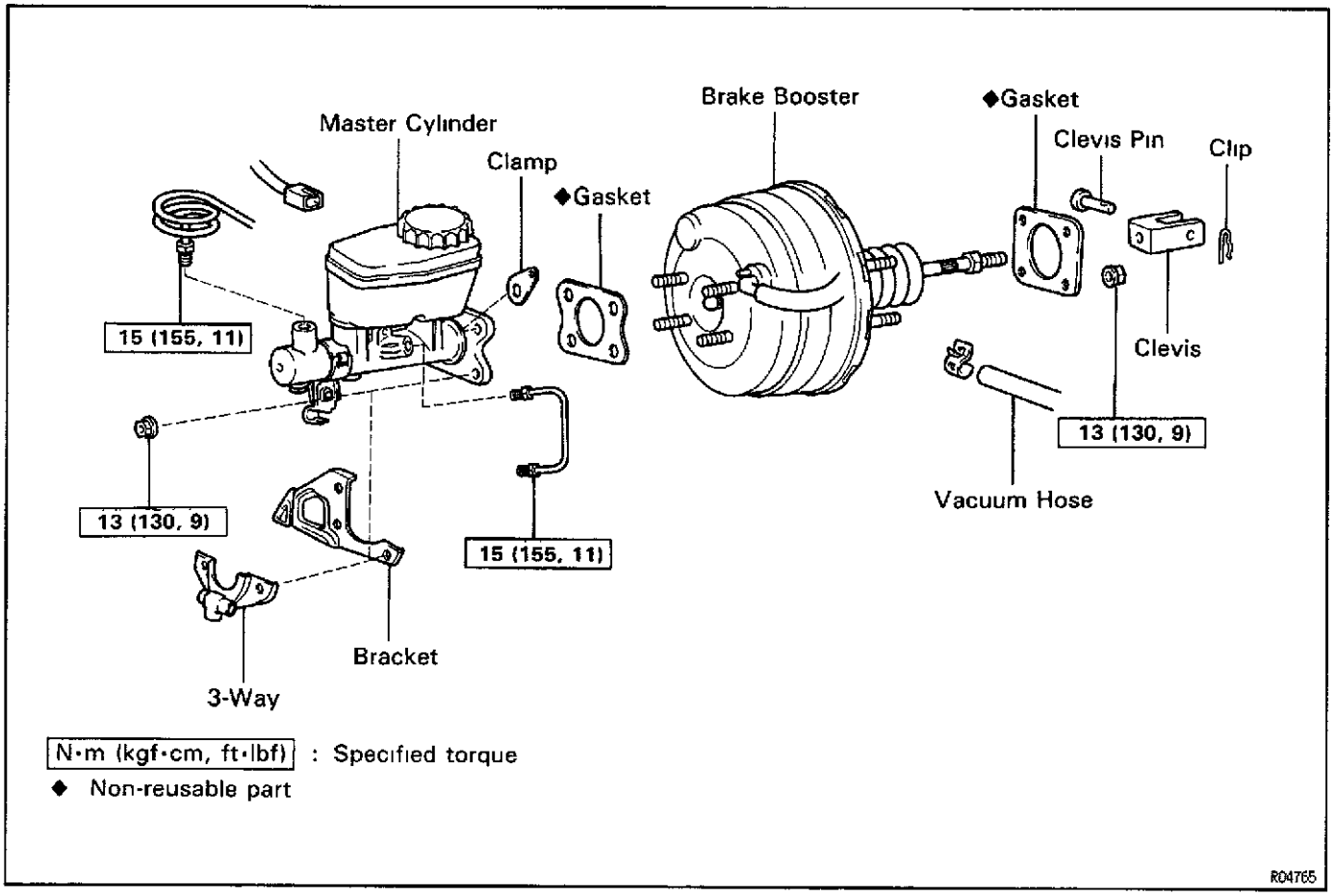
6. CHECK FOR LEAKS

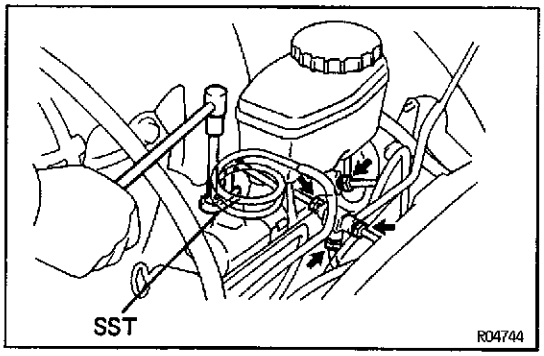
7. CHECK AND ADJUST BRAKE PEDAL
(SEE PAGE BR-7)

BRAKE BOOSTER

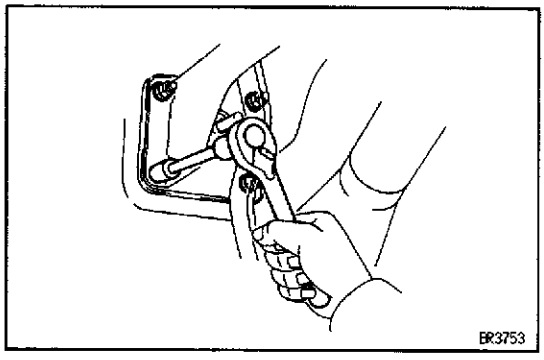
BR0FQ-01

BRAKE BOOSTER REMOVAL





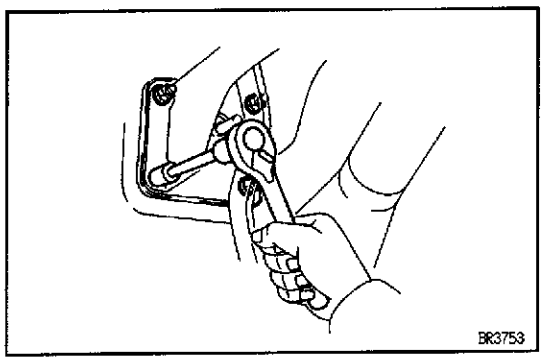
1. REMOVE MASTER CYLINDER
(SEE PAGE BR-11)



2. REMOVE BRAKE BOOSTER

(a) Remove the booster installation nuts

(b) Remove the booster and gasket



BRAKE BOOSTER INSTALLATION

1. INSTALL BRAKE BOOSTER

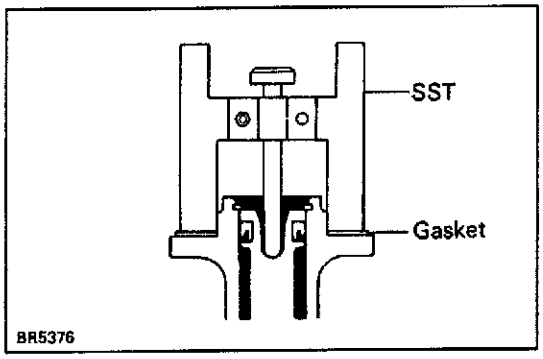
(a) Install the booster with a new gasket

(b) Install and torque the booster installation nuts

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

(c) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin

(d) Install the pedal return spring

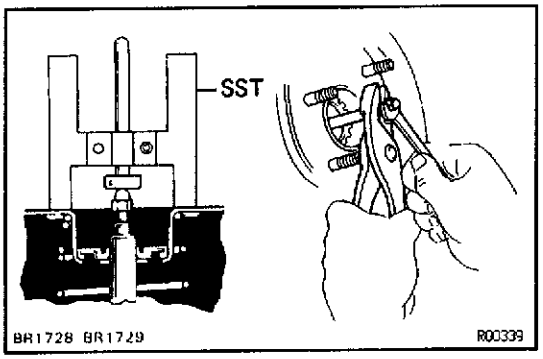


2. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Install the 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 slightly touches the pin head

HINT When adjusting the push rod, depress the brake pedal enough so that the push rod sticks out

3. INSTALL MASTER CYLINDER

(See page BR-1 1)

4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR-8)

5. CHECK FOR FLUID LEAKAGE

6. CHECK AND ADJUST BRAKE PEDAL

(See page BR-7)

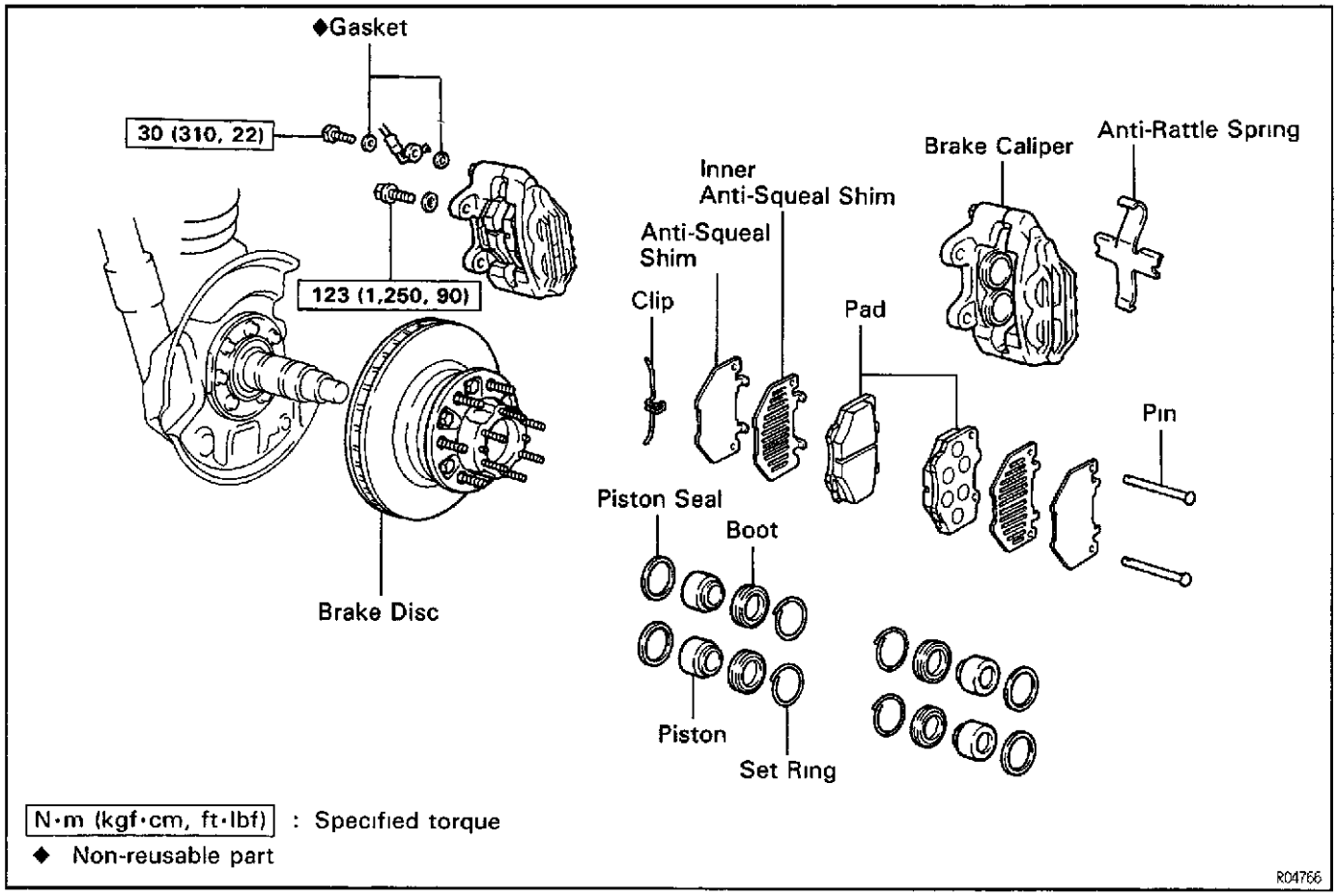
7. PERFORM OPERATIONAL CHECK

(See page BR-8)

FRONT BRAKE

BR01F-03

COMPONENTS

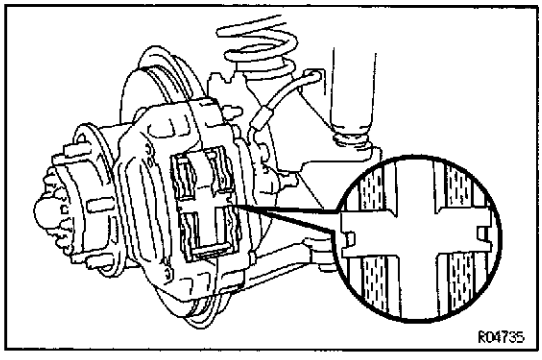


BR0F8-02

BRAKE PADS REPLACEMENT

HINT If squealing noise is made by the front brakes while driving, check the pad wear indicator If there is evidence of the indicator contacting the disc, the brake pads should be replaced

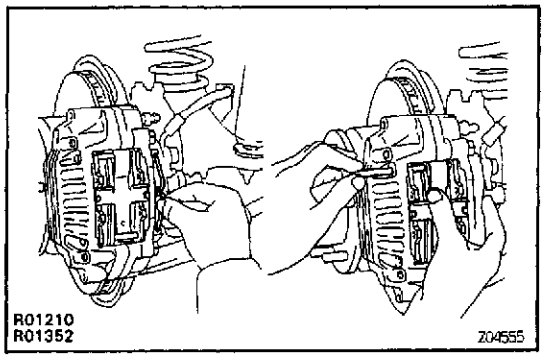
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspection hole and replace the pads if it is not within the specification

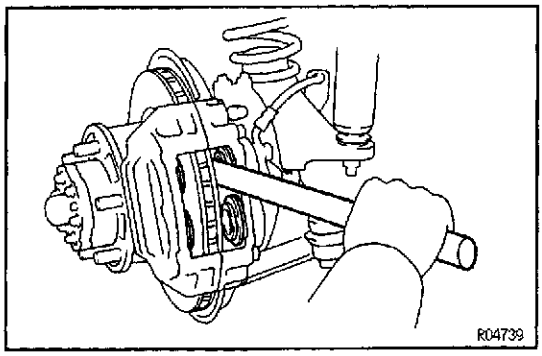
Minimum thickness:
4.0 mm (0.157 in.)



3. REMOVE FOLLOWING PARTS:

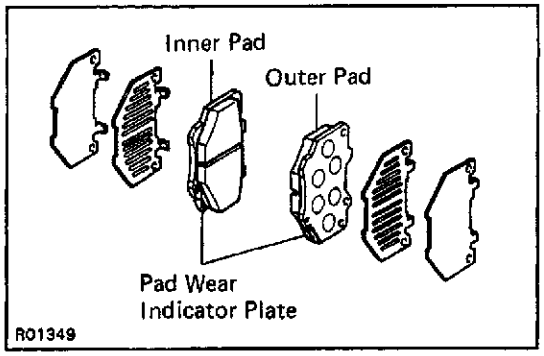
(a) Clip
(b) 2 pins
(c) Anti-rattle spring
(d) 2 pads
(e) 4 anti-squeal shims

4. CHECK DISC THICKNESS AND DISC RUNOUT
(SEE PAGE BR-24)

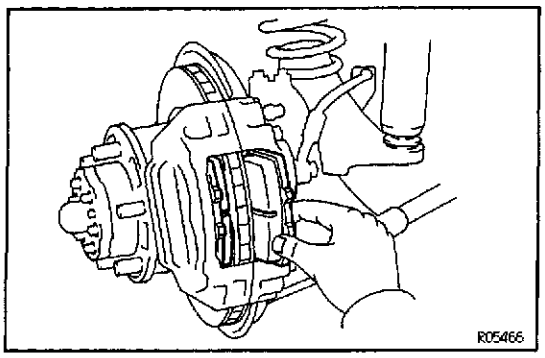


5. INSTALL NEW PADS

(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 pads on one wheel at a time as there is a possibility of the opposite piston flying out

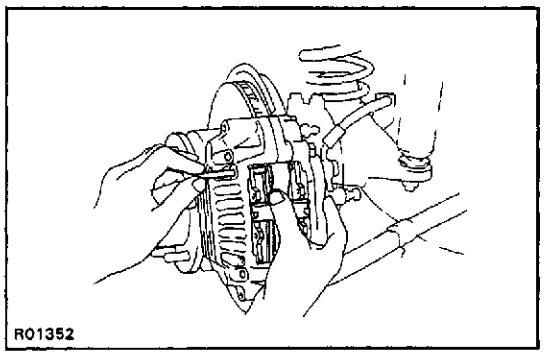


(c) Install the 4 anti - squeal shims to new pads, as shown
HINT Apply disc brake grease to both sides of the inner anti-squeal shims

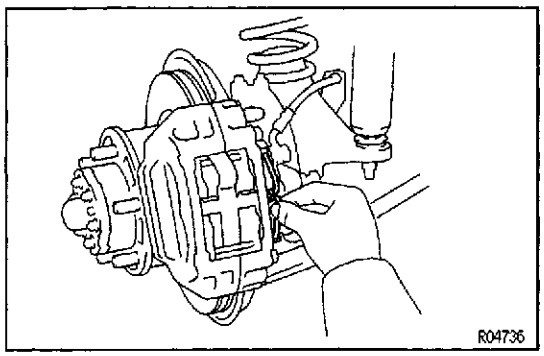


(d) Install the 2 pads

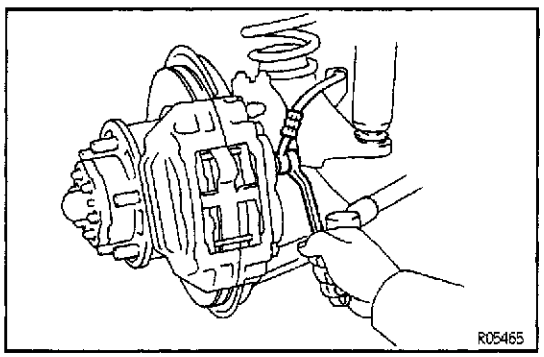
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



6. INSTALL ANTI-RATTLE SPRING AND 2 PINS



7. INSTALL CLIP
8. INSTALL FRONT WHEEL
9. CHECK THAT FLUID LEVEL IS AT MAX LINE



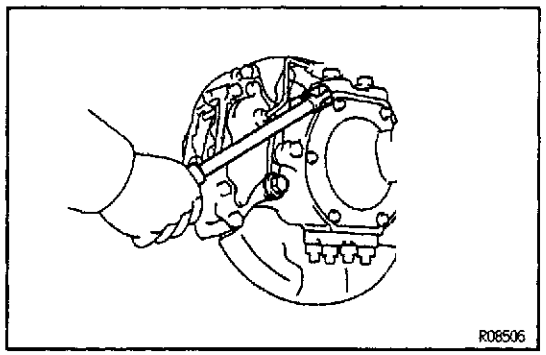
BR01R 04

CALIPER REMOVAL

1. DISCONNECT FLEXIBLE HOSE

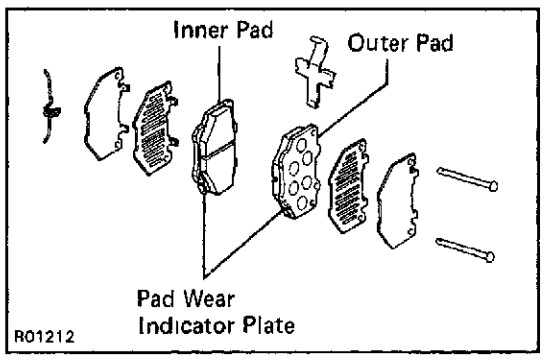
(a) Remove the union bolt and 2 gaskets from the brake caliper, then disconnect the flexible hose from the brake caliper

(b) Use a container to catch the brake fluid as it drains out



2. REMOVE CALIPER

Remove the 2 mounting bolts and remove the caliper

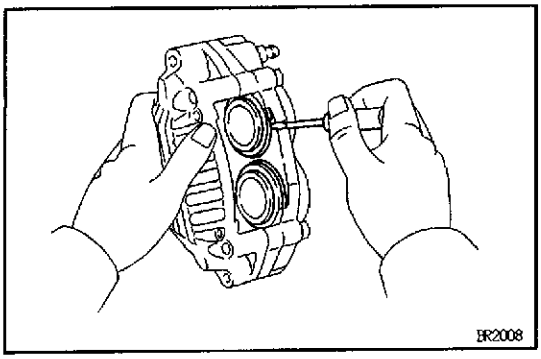


3. REMOVE FOLLOWING PARTS:

(a) Clip
(b) 2 pins
(c) Anti-rattle spring
(d) 2 pads
(e) 4 anti-squeal shims

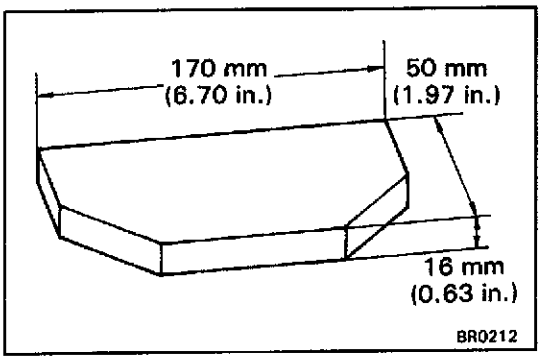
BRGFT-02

CALIPER DISASSEMBLY



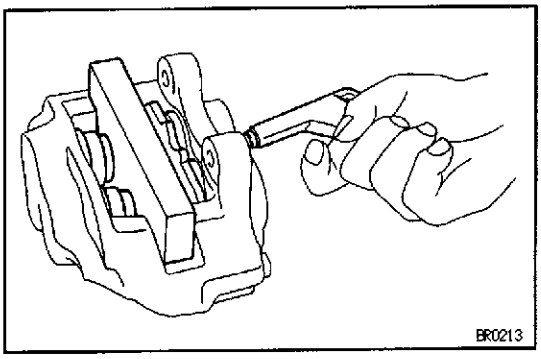
1. REMOVE CYLINDER BOOT SET RINGS AND CYLINDER BOOTS

Using a screwdriver, remove the cylinder boot set rings and cylinder boots from the caliper



2. REMOVE PISTON

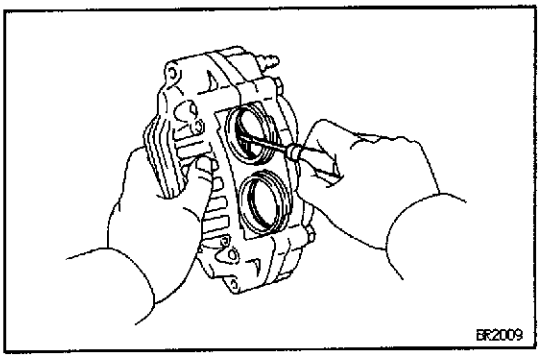
(a) Prepare the wooden plate to hold the pistons



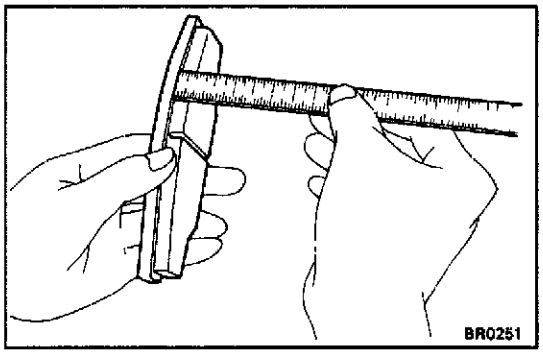
(b) Place the plate between the pistons and insert a pad at one side

(c) Use compressed air to remove the pistons alternately from the caliper

CAUTION: Do not place your fingers in front of the pistons when using compressed air.



3. REMOVE PISTON SEALS



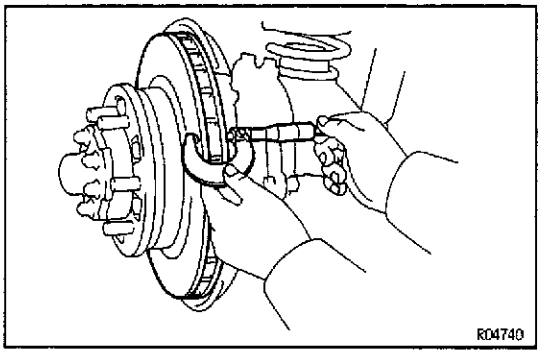
FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness

Standard thickness:
9.5 mm (0.374 in.)
Minimum thickness:
4.0 mm (0.157 in.)

Replace the pad if the pad's thickness is at the minimum thickness or less, or if the pad has severely uneven wear

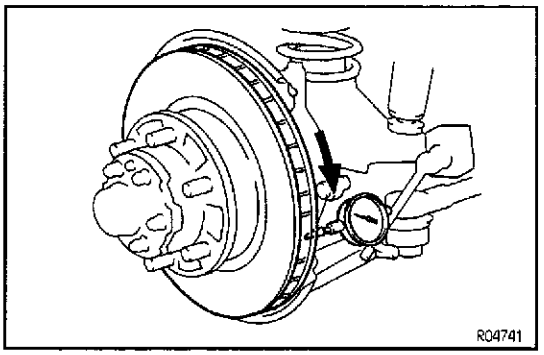


2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness

Standard thickness:
32.0 mm (1.260 in.)
Minimum thickness:
30.0 mm (1.187 in.)

Replace the disc if the thickness of the disc is at the minimum thickness or less Replace the disc or grind it on a lathe if it is scored or is worn unevenly



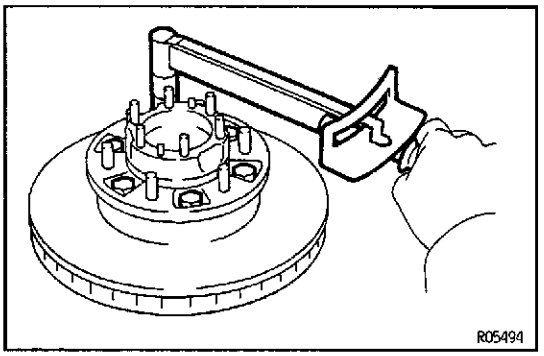
3. MEASURE DISC RUNOUT

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 (0.0058 in.)

If the runout is at greater than maximum, replace the disc

HINT Before measuring the runout, confirm that the front bearing play is within specification

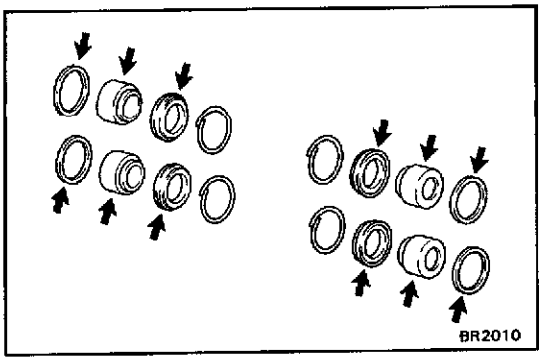


4. IF NECESSARY, REPLACE DISC

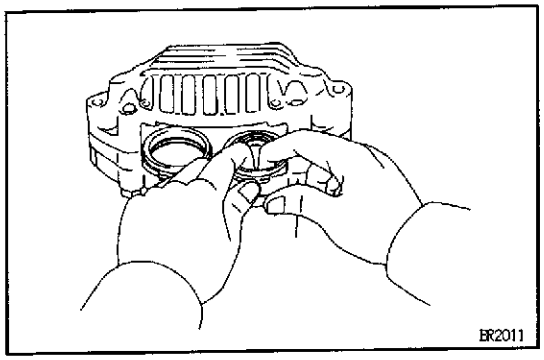
(a) Remove the front axle hub
(b) Remove the disc from the axle hub
(c) Install a new disc and torque the bolts
Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)
(d) Install the axle hub and adjust the front bearing preload

BR0FV-01

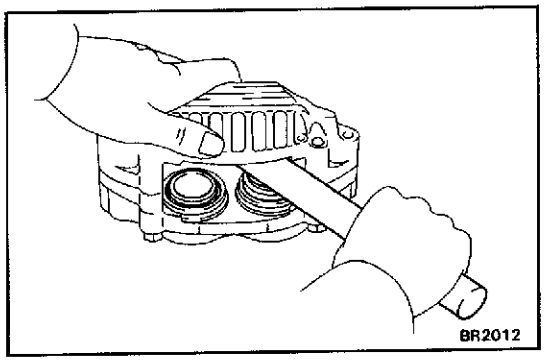
CALIPER ASSEMBLY



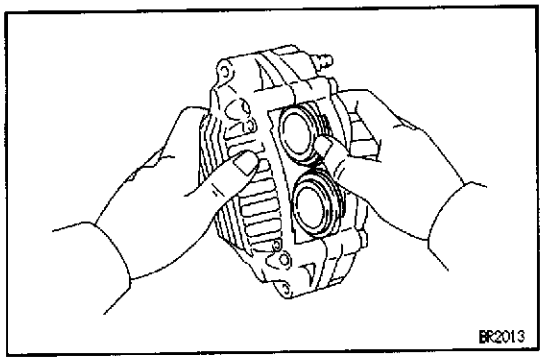
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL PISTON SEALS INTO CYLINDER



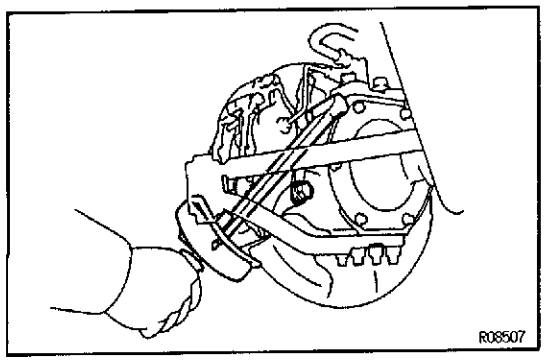
3. INSTALL PISTONS INTO CYLINDER



4. INSTALL CYLINDER BOOTS AND CYLINDER BOOT SET RINGS

BR01V-05

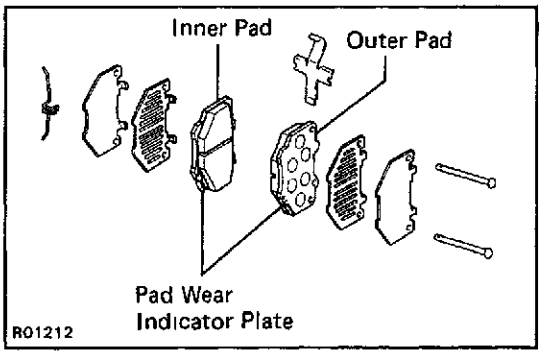
CALIPER INSTALLATION



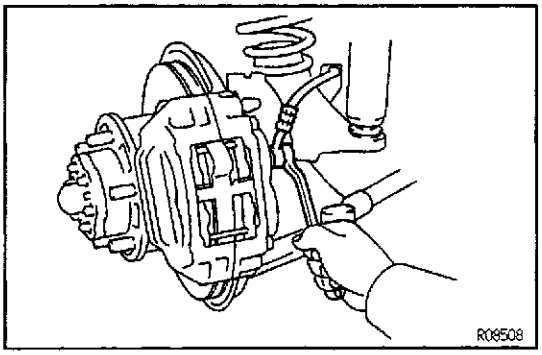
1. INSTALL CALIPER

Install the brake caliper, and torque the 2 mounting bolts

Torque: 123 N-m (1,250 kgf-cm, 90 ft-lbf)



2. INSTALL PADS
(See page BR-23)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the brake caliper- with 2 new gaskets

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

HINT Install the flexible hose lock securely in the lock hole in the brake caliper

4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(SEE PAGE BR-8)

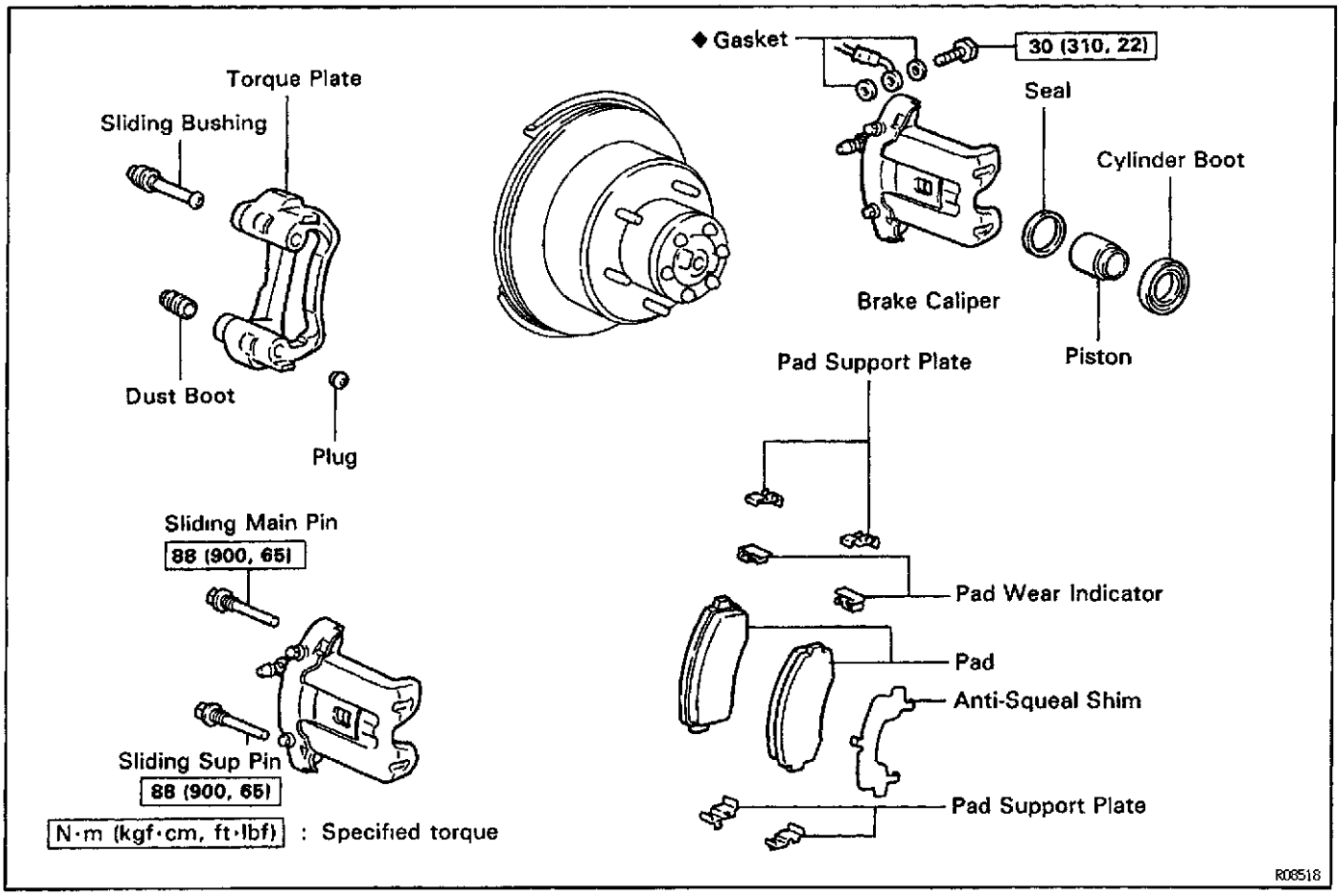
5. CHECK FOR LEAKS

6. INSTALL FRONT WHEEL

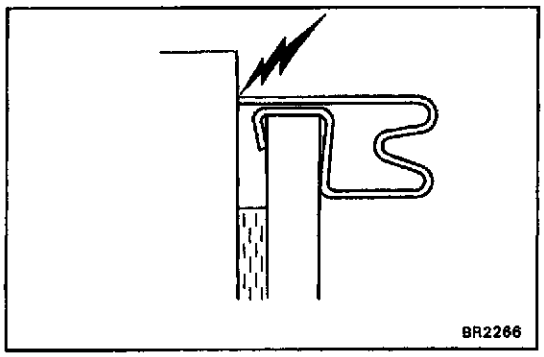
REAR BRAKE
(Disc Brake)

BR020-04

COMPONENTS



BR0FZ-02

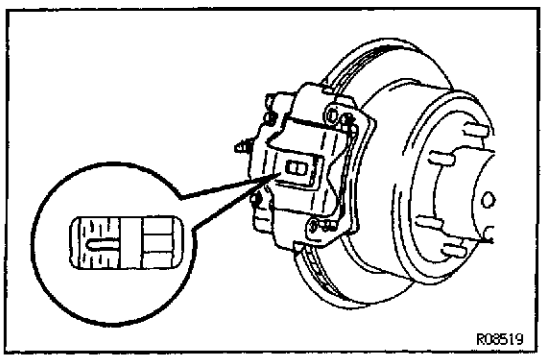


BRAKE PADS REPLACEMENT

HINT If a squealing noise occurs from the brakes while driving, check the pad wear indicator plate If the pad wear indicator plate contacts the disc, the brake pads should be replaced

1. REMOVE REAR WHEEL

Remove the wheel and temporarily fasten the disc with the hub nuts

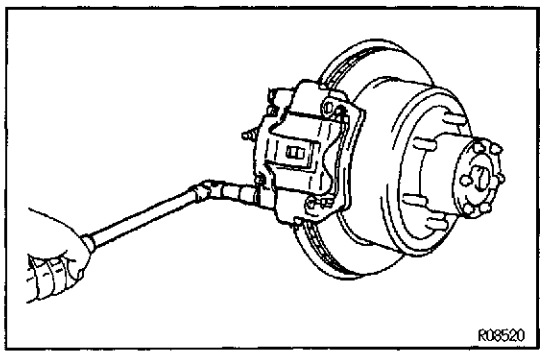


2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspection hole and replace pads if not within specification

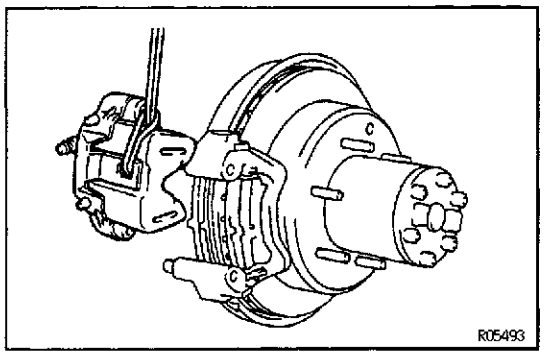
Minimum thickness:

1.0 mm (0.039 in.)



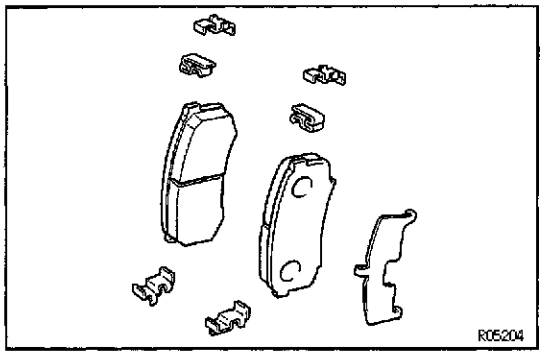
3. REMOVE BRAKE CALIPER

(a) Remove the sliding main pin and sliding sub pin



(b) Remove the brake caliper and suspend it so the hose is not stretched

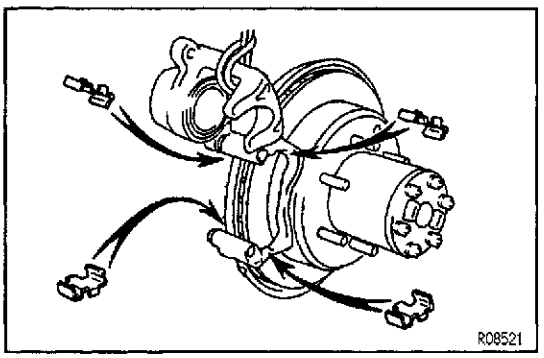
HINT Do not disconnect the brake hose



4. REMOVE FOLLOWING PARTS:

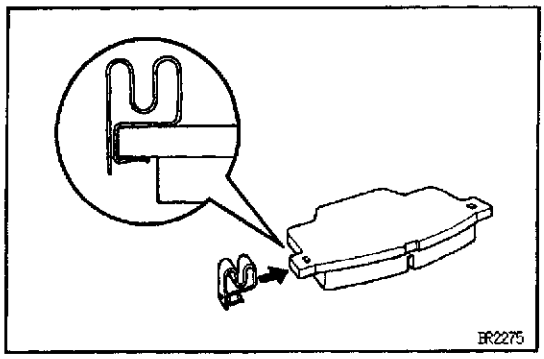
(a) 2 brake pads
(b) Anti-squeal shim
(c) 4 pad support plates
(d) 2 pad wear indicators

5. CHECK DISC THICKNESS AND RUNOUT
(SEE PAGE BR-43)



6. INSTALL PAD SUPPORT PLATES

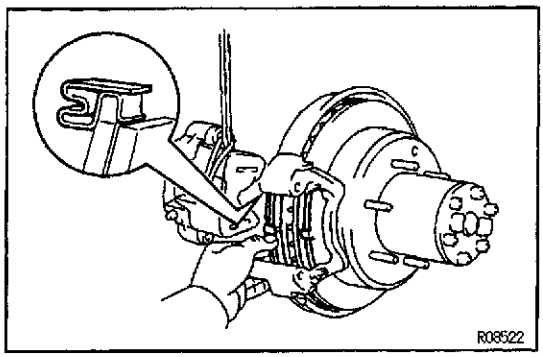
Install the 4 pad support plates



7. INSTALL NEW PADS

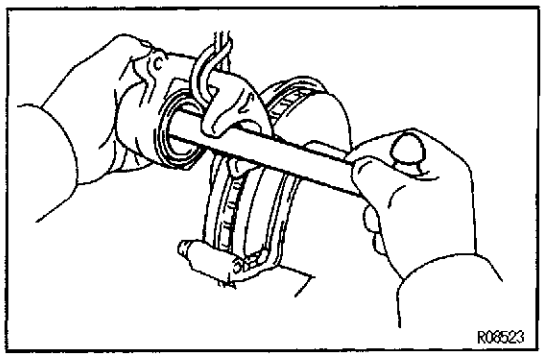
(a) Install pad wear indicator plate to each pads

(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.



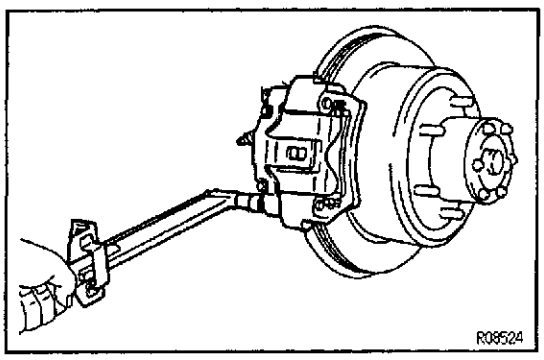
8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from 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 brake 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 ftYbf)

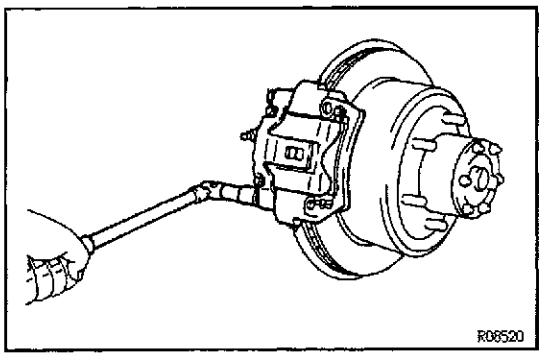
BR000-02

CALIPER REMOVAL

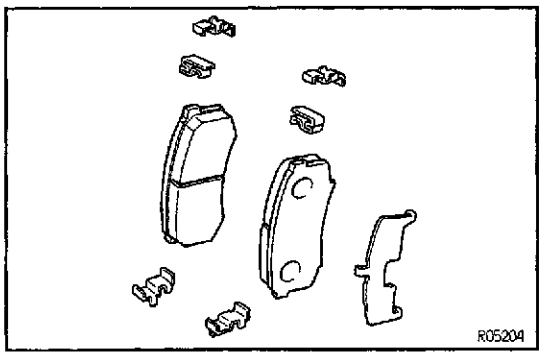
1. DISCONNECT FLEXIBLE HOSE

(a) Remove the union bolt and 2 gaskets from the brake caliper, then disconnect the flexible hose from the brake caliper

(b) Use a container to catch the brake fluid as it drains out



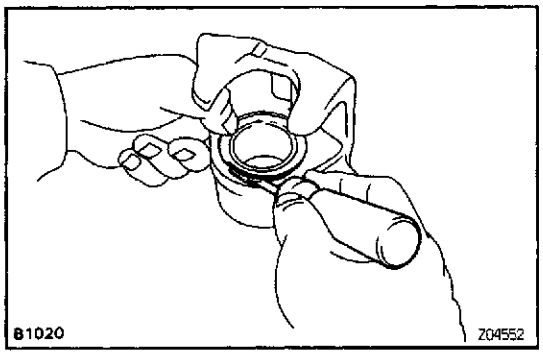
2. REMOVE CALIPER
Remove the 2 sliding pins and caliper



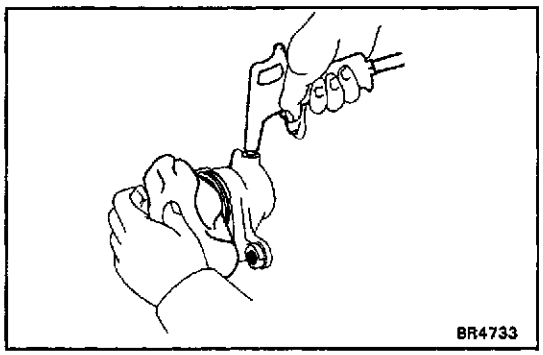
3. REMOVE 2 PADS
(SEE PAGE BR-38)

BR0G1-01

CALIPER DISASSEMBLY

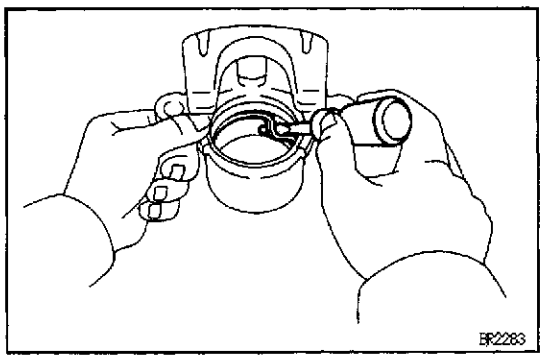


1. REMOVE CYLINDER BOOT
Using a screwdriver, remove the cylinder boot from the caliper

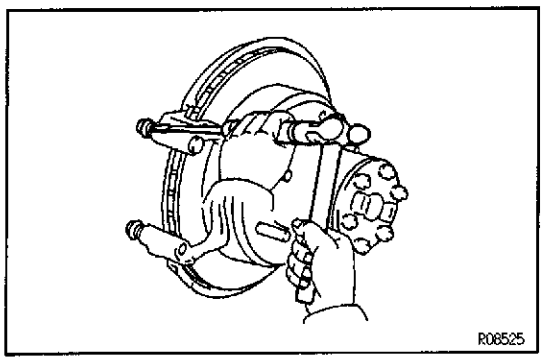


2. REMOVE PISTON
(a) Place a piece of cloth or similar article between the piston and the caliper
(b) Use compressed air to remove the piston from the caliper

CAUTION: Do not place your fingers in front of the piston when using compressed air.



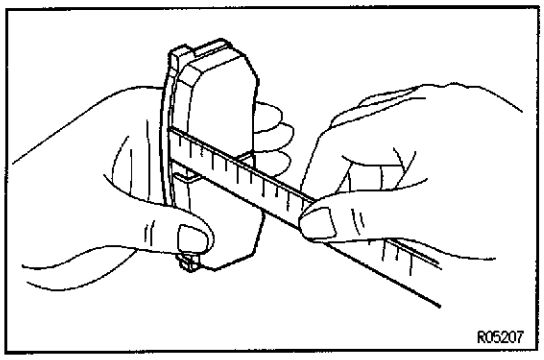
3. REMOVE PISTON SEAL
Using a screwdriver, remove the piston seal from the caliper

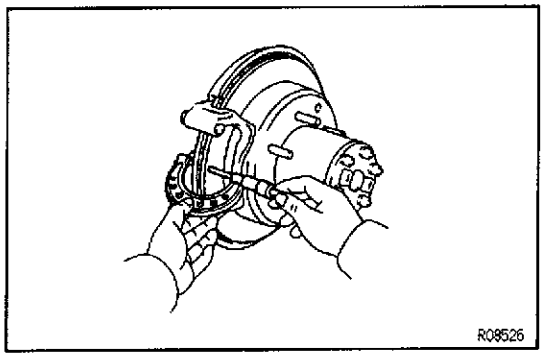


4. REMOVE PIN BOOT AND SLIDING BUSHING

Using a screwdriver and hammer, tap out pin boot and sliding bushing

HINT Tape the screwdriver tip before use





REAR DISC BRAKE COMPONENTS INSPECTION AND REPAIR

BR024-02

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness

Standard thickness:

10.0 mm (0.394 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the minimum thickness or less, or if the pad has severely uneven wear

2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness

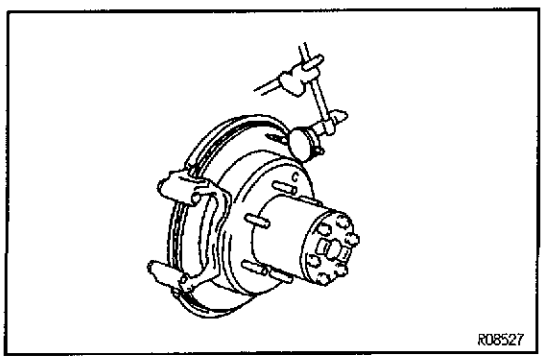
Standard thickness:

18.0 mm (0.630 in.)

Minimum thickness:

16.0 mm (0.709 in.)

Replace the disc if the thickness of the disc is at the minimum thickness or less Replace the disc or grind it on a lathe if it is scored or is worn unevenly



3. MEASURE DISC RUNOUT

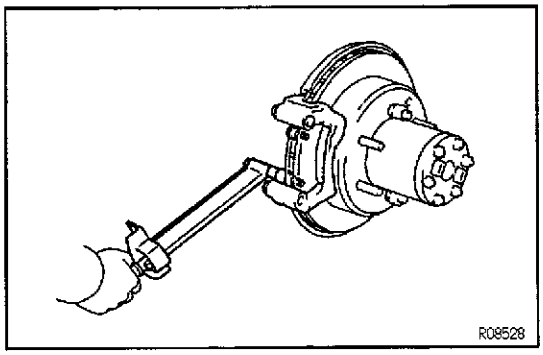
Measure the disc runout at 10 mm (0 39 in) from the outer edge of the disc

Maximum disc runout:

0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc

HINT Before measuring the runout, confirm that the hub bearing play is within specification



4. IF NECESSARY, REPLACE DISC

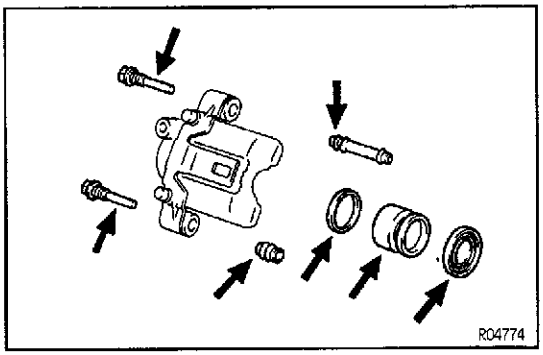
(a) Remove the torque plate

(b) Remove the hub nuts of the temporarily installed disc and pull off the disc

(c) Install a new disc and 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)



BR0G2-02

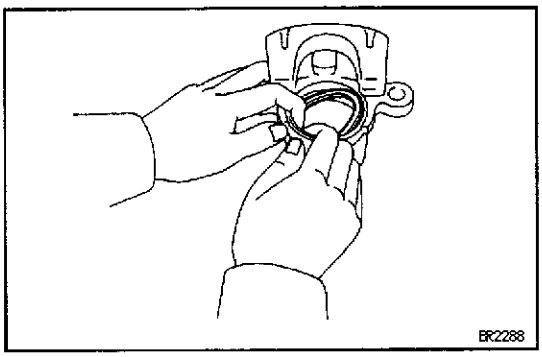
CALIPER ASSEMBLY

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS

(a) Sliding bushing, hole plug and dust boot

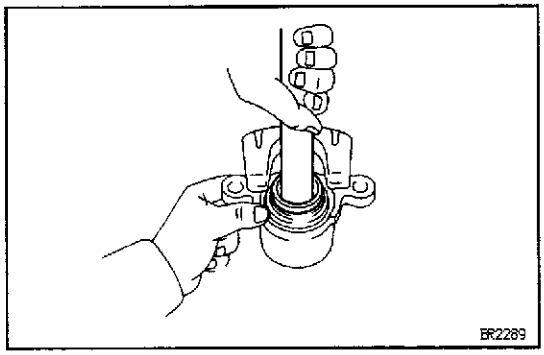
(b) Piston, piston seal and cylinder boot

(c) Sliding pins

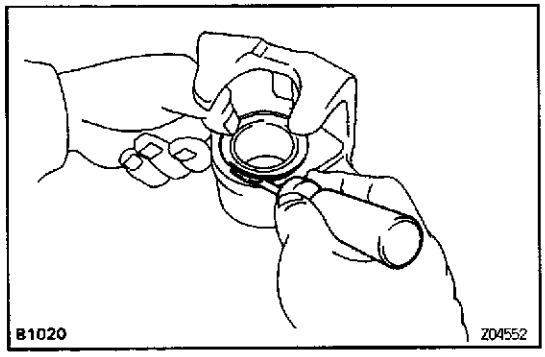


2. INSTALL PISTON SEAL AND PISTON IN CALIPER

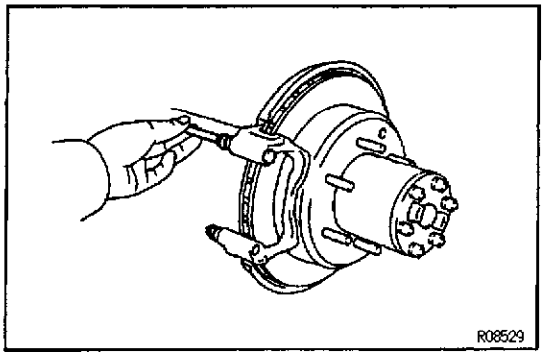
(a) Install the piston seal into the caliper



(b) Install the piston into the caliper



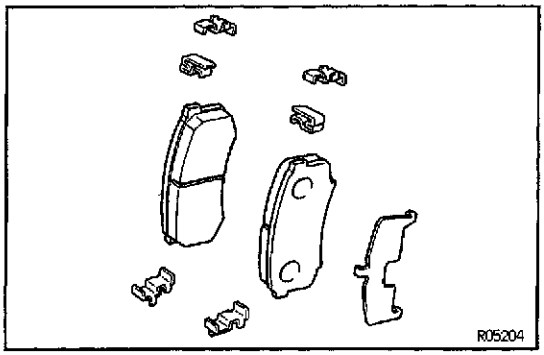
3. INSTALL CYLINDER BOOT AND SET RING IN CALIPER



4. INSTALL DUST BOOT AND SLIDING BUSHING

(a) Install the dust boot into the sliding sub pin side

(b) Using a plastic bar, install the cylinder sliding bushing into the sliding main pin side



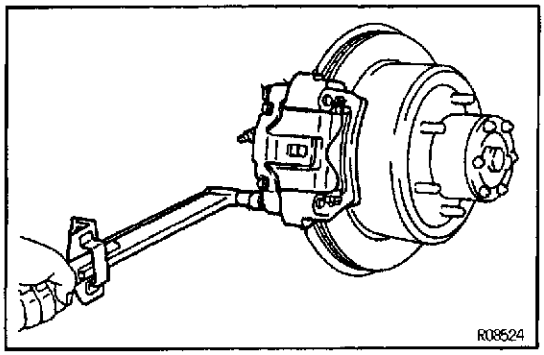
BR0G3-02

CALIPER INSTALLATION

1. INSTALL PADS

Install 2 pads with the pad wear indicator plates facing upward

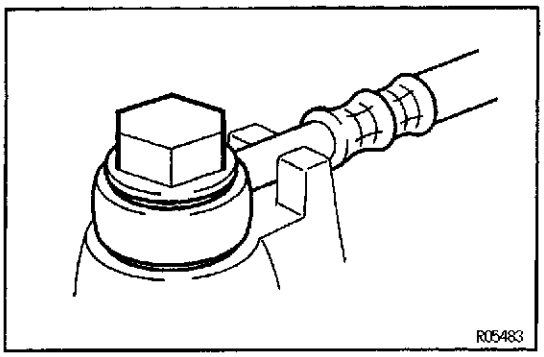
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



2. INSTALL CALIPER

Install the brake caliper and torque the installation bolt

Torque: 88 N-m (900 kgf-cm, 65 ft-lbf)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the brake caliper with 2 new gaskets

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

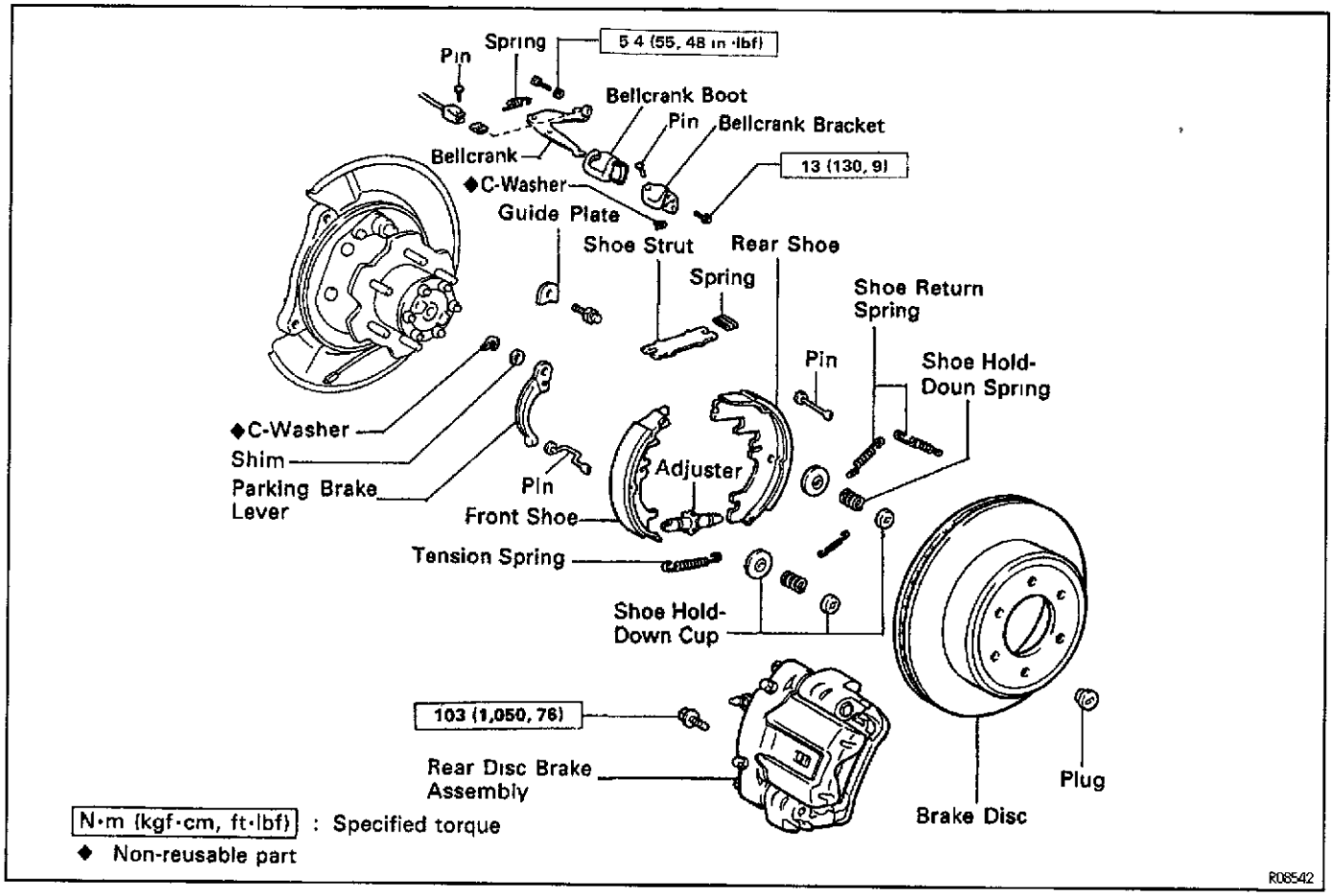
HINT Insert the flexible hose lock securely in the lock hole in the brake caliper

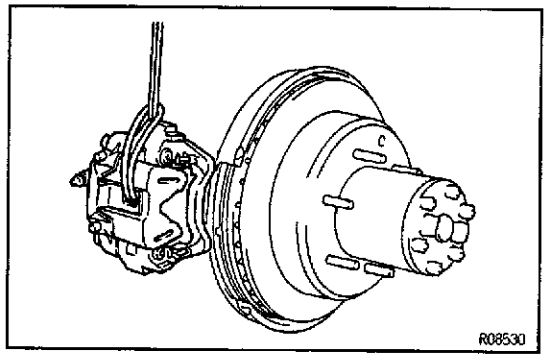
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(SEE PAGE BR-8)

5. CHECK FOR LEAKS

REAR BRAKE
(Parking Brake for Rear Disc Brake)
COMPONENTS





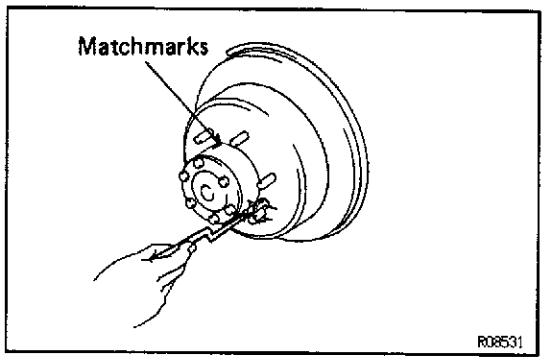
PARKING BRAKE DISASSEMBLY

1. REMOVE REAR WHEEL

2. REMOVE REAR DISC BRAKE ASSEMBLY

(a) Remove the 2 mounting bolts and remove the disc brake assembly

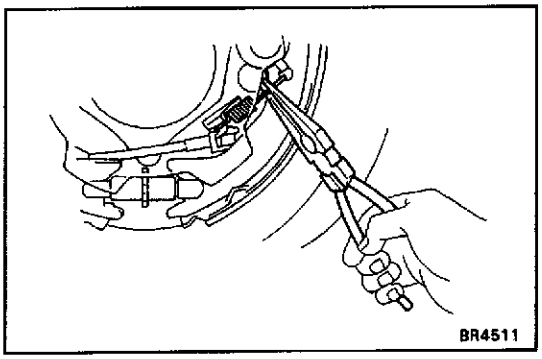
(b) Suspend the disc brake so the hose is not stretched



3. REMOVE DISC

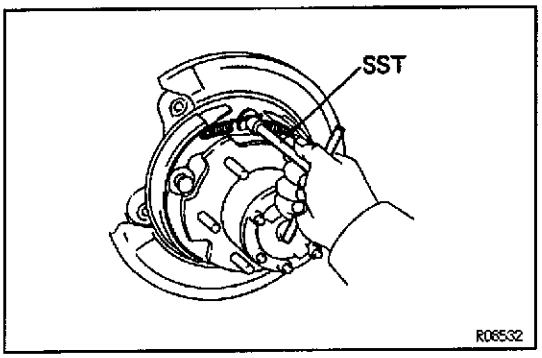
Place the matchmarks on the disc and rear hub, and remove the disc

HINT If the disc cannot be removed easily, turn the shoe adjuster until the wheel turns freely



4. REMOVE TENSION SPRING

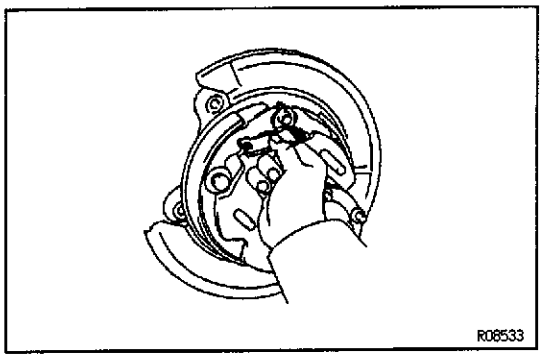
Using pliers, remove the tension spring



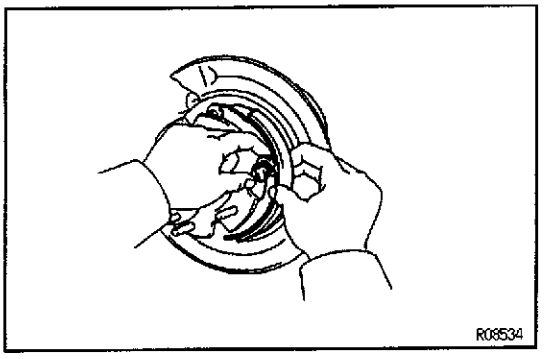
5. REMOVE SHOE RETURN SPRINGS

Using SST, remove the shoe return springs

SST 09 717 - 20010



6. REMOVE SHOE STRUT WITH SPRING

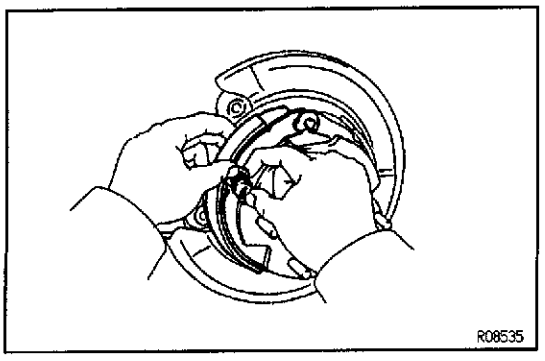


7. REMOVE REAR SHOE, ADJUSTER AND TENSION SPRING

(a) Remove the shoe hold-down spring cups, spring and pin

(b) Slide out the rear shoe, and remove the rear shoe and adjuster

(c) Remove the lower side tension spring

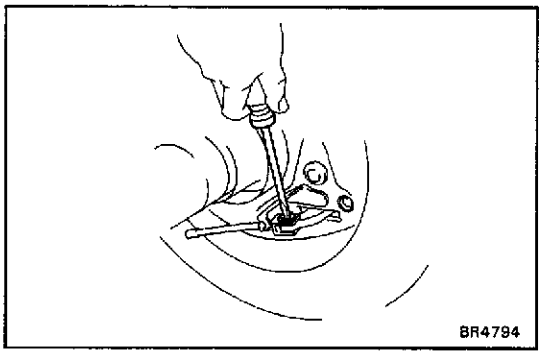


8. REMOVE FRONT SHOE

(a) Remove the shoe hold-down spring cups, springs and pin

(b) Slide out the front shoe

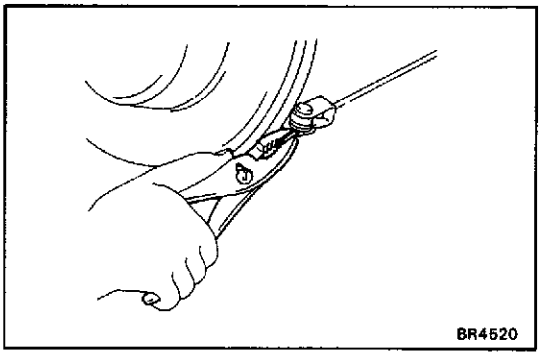
(c) Disconnect the parking brake cable from the parking brake shoe lever



9. IF NECESSARY, REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK ASSEMBLY

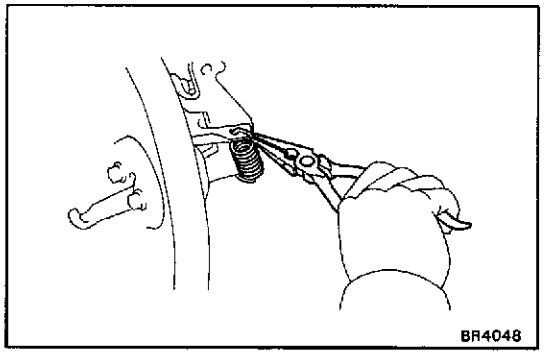
(a) Using a screwdriver, remove the C-washer

(b) Remove the pin and disconnect the parking brake cable No 2 from the bellcrank

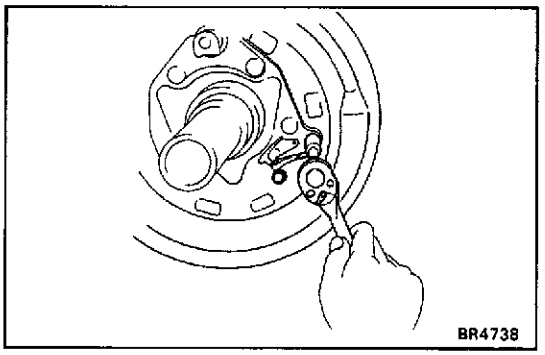


(c) Remove the clip

(d) Remove the pin and wave clip, then disconnect the parking brake cable

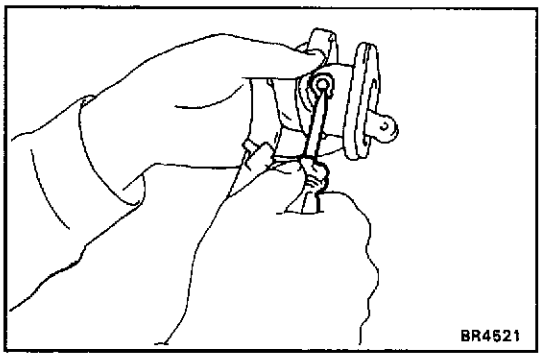


(e) Remove the 2 tension springs



(f) Remove the 2 bolts and parking brake bellcrank assembly

(g) Remove the boot from parking brake bellcrank bracket



(h) Using a screwdriver, remove the C-washer and pin

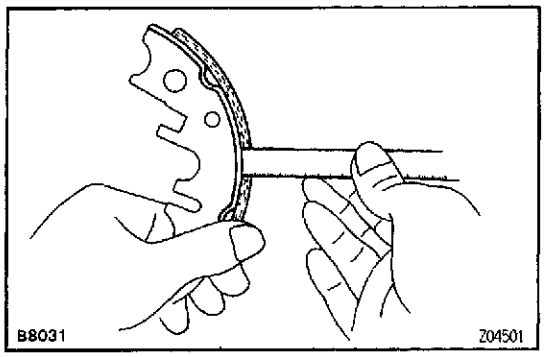
(i) Remove the parking brake bellcrank from the bell crank bracket

PARKING BRAKE COMPONENTS INSPECTION AND REPAIR

BR029-04

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage



2. MEASURE BRAKE SHOE LINING THICKNESS

Using a scale, measure the thickness of the shoe lining

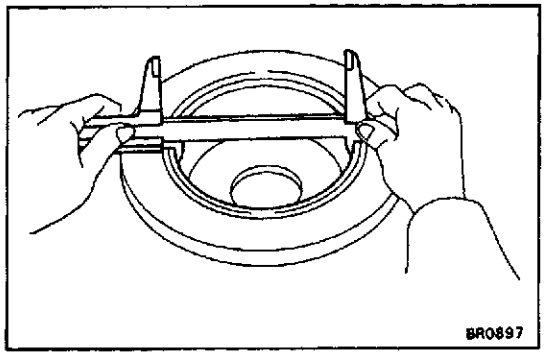
Standard thickness:

4.0 mm (0.158 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 caliper, measure the inside diameter of the disc

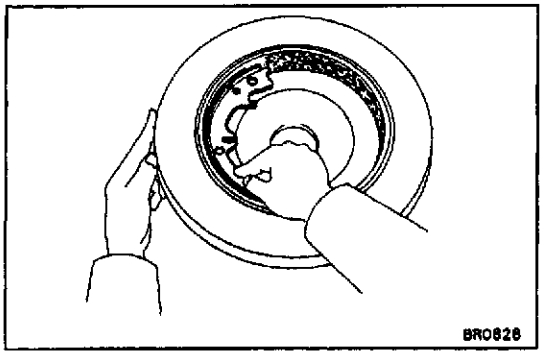
Standard inside diameter:

230 mm (9.06 in.)

Maximum inside diameter

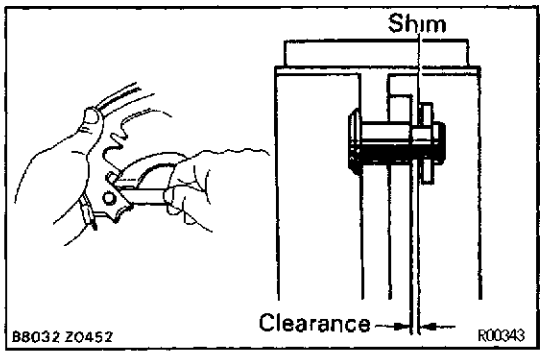
231 mm (9.09 in.)

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

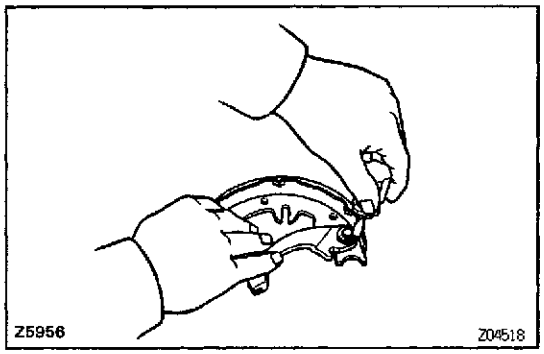
Using a feeler gauge, measure the clearance

Standard clearance:

Less than 0.35 mm (0.0138 in.)

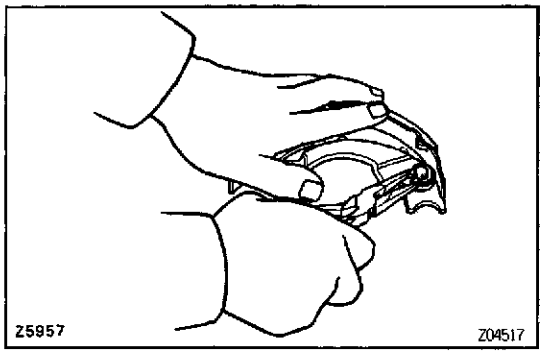
If the clearance is not within the specification, replace the shim with one of the correct size

Shim Thickness	Shim Thickness
0.3mm(0.012in.)	0.9 mm (0.035 in.)
0.6 mm (0.024 in.)	



6. IF NECESSARY, REPLACE SHIM

(a) Remove the parking brake shoe lever, and install the correct size shim



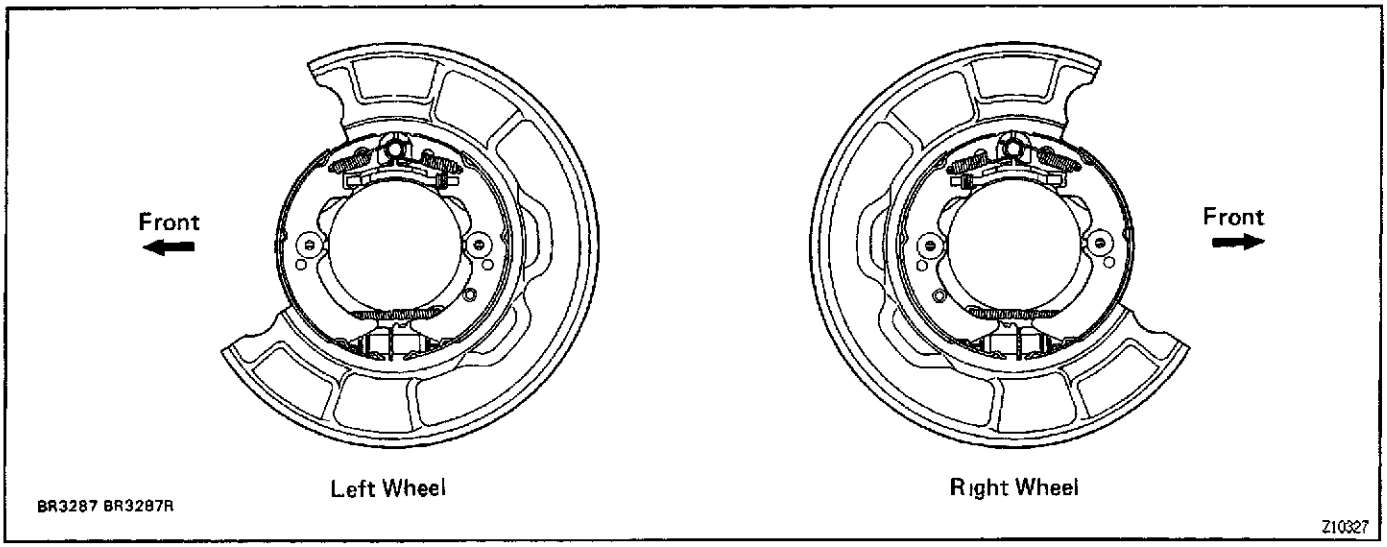
(b) Install the parking brake shoe lever with a new C-washer

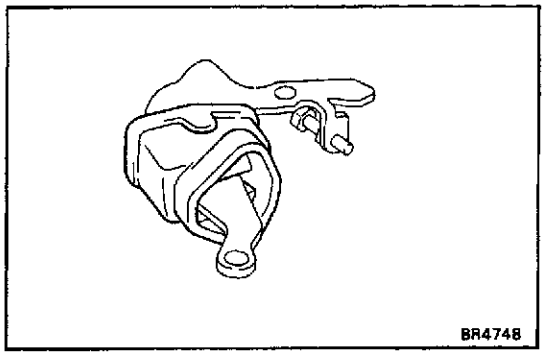
(c) Remeasure the clearance

PARKING BRAKE ASSEMBLY

BR0B5 02

HINT Assemble the parts in the correct direction, as shown

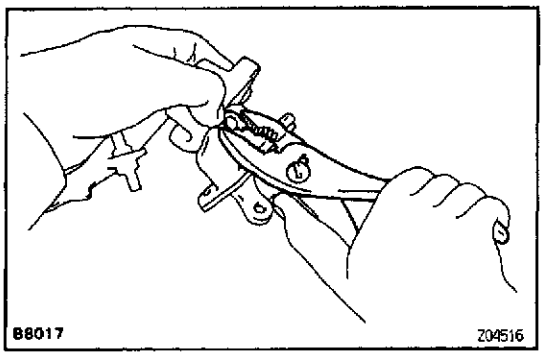




1. IF NECESSARY, ASSEMBLE AND INSTALL PARKING BRAKE BELLCRANK ASSEMBLY

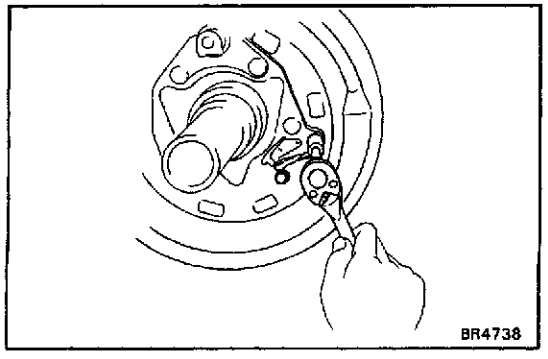
(a) Apply lithium soap glycol grease to the boot

(b) Install the boot to the parking brake bellcrank



(c) Install the parking brake bellcrank to the bellcrank bracket

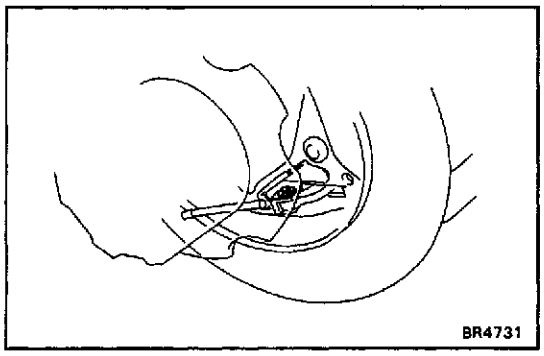
(d) Install the pin with a new C-washer



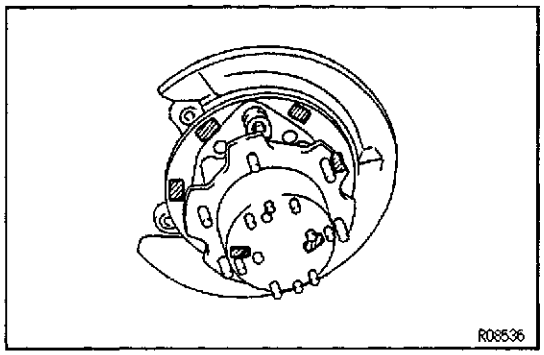
(e) Install the parking brake bellcrank assembly on the backing plate with the 2 bolts

(f) Torque the bolts

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

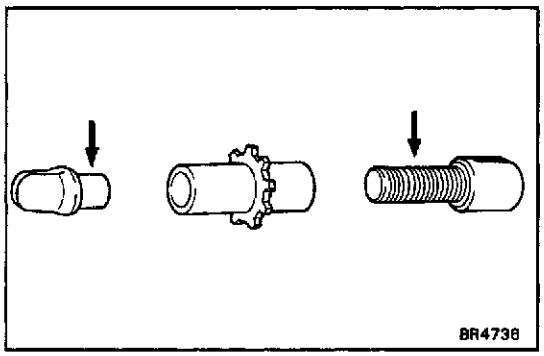


(g) Using pliers, connect parking brake cable No 2 to the bellcrank with the pin and a new C-washer

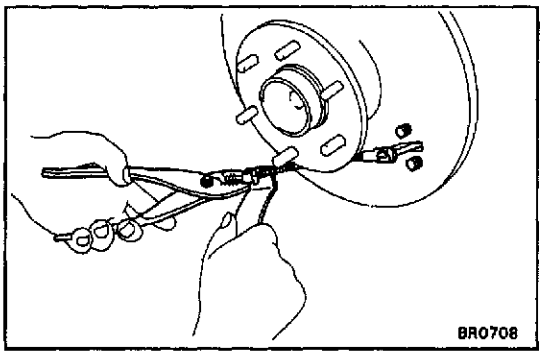


2. APPLY HIGH TEMPERATURE GREASE ON BACKING PLATE AS SHOWN

Apply high temperature grease to the sliding surfaces of the shoe

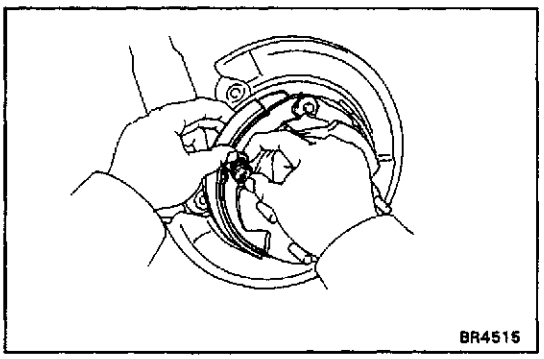


3. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER AS SHOWN



4. CONNECT PARKING BRAKE CABLE TO FRONT SHOE

Using needle-nose pliers, connect the parking brake cable to the parking brake shoe lever



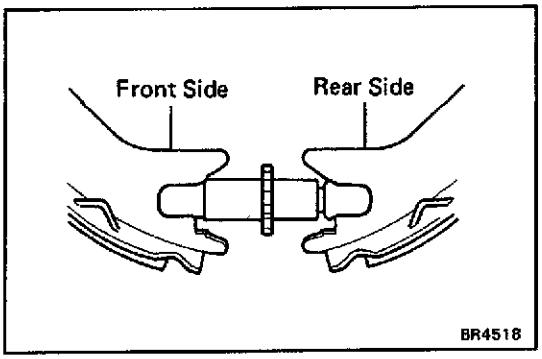
5. INSTALL FRONT SHOE

(a) Install the pin to the backing plate

(b) Slide in the front shoe

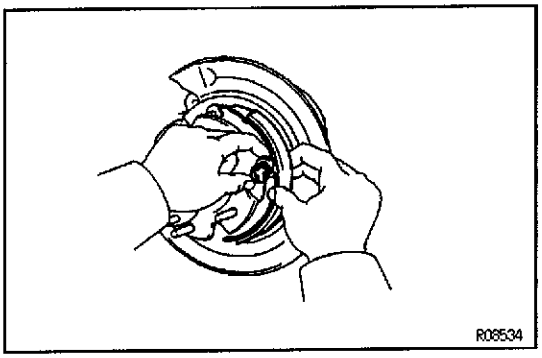
(c) Install the shoe hold-down spring and cups

NOTICE: Do not allow oil or grease to get on the rubbing face.

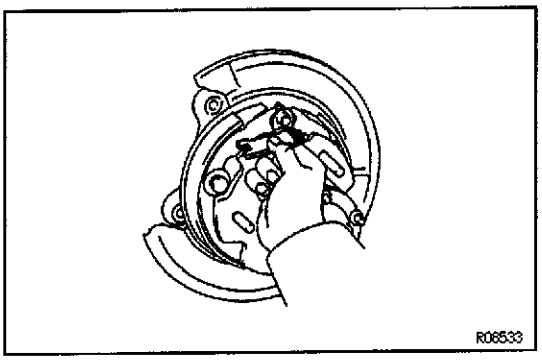


6. INSTALL TENSION SPRING, REAR SHOE AND ADJUSTER

(a) Install the lower side tension spring to the front shoe
(b) Install the rear shoe to the tension spring
(c) Install the adjuster between the front and rear shoes

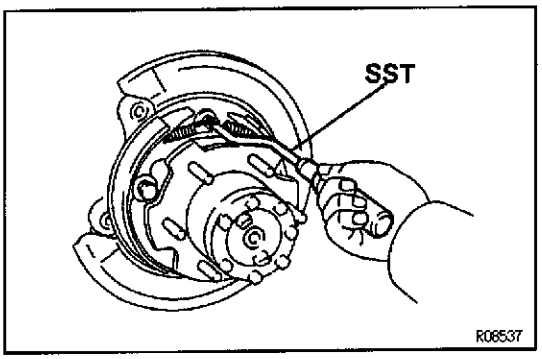


(d) Slide in the rear shoe
(e) Install the pin to the backing plate and the shoe hold-down spring and cups
NOTICE: Do not allow oil or grease on the rubbing face.
(f) Using pliers, install the tension spring



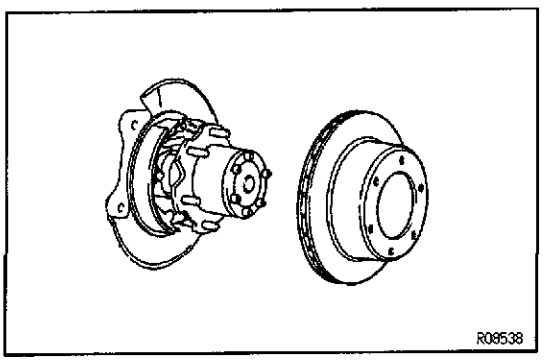
7. INSTALL STRUT WITH SPRING

Install the strut with the spring facing rearward



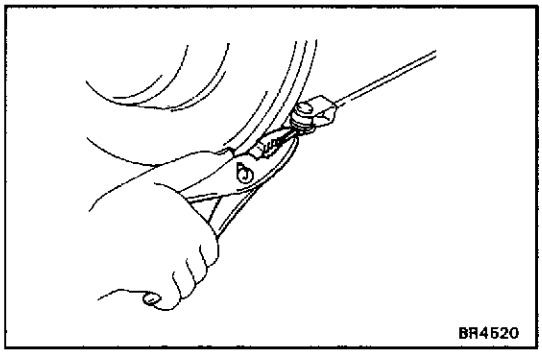
8. INSTALL SHOE RETURN SPRINGS

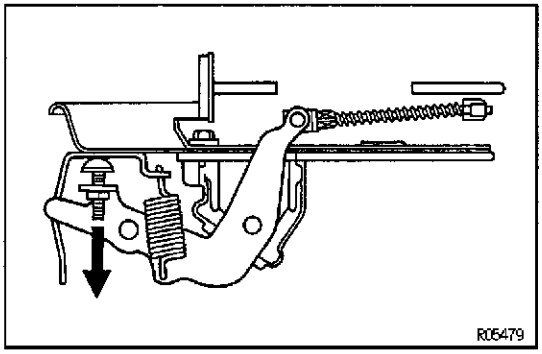
Using SST, install the front shoe return springs and then install the rear return spring
SST 09718 - 20010

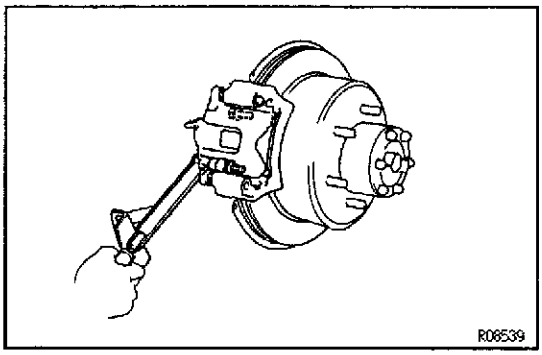


9. INSTALL DISC

Align the matchmarks on the rear axle hub and disc, and install the disc
HINT If there are no matchmarks, align the groove on the rear axle hub flange with the service hole on the disc







10. CONNECT PARKING BRAKE CABLE

Connect the parking brake cable to the bellcrank assembly with the pin, wave clip and clip

11. ADJUST PARKING BRAKE SHOE CLEARANCE

(a) Temporarily install the hub nuts

(b) Remove the hole plug

(c) Turn the adjuster and expand the shoes until the disc locks

(d) Return the adjuster 8 notches

(e) Install the hole plug

12. IF NECESSARY 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

13. INSTALL REAR DISC BRAKE ASSEMBLY

Install the disc brake assembly and torque the 2 mounting bolts

Torque: 103 N-m (1,050 kgf-cm, 76 ft-lbf)

14. INSTALL REAR WHEEL

15. 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

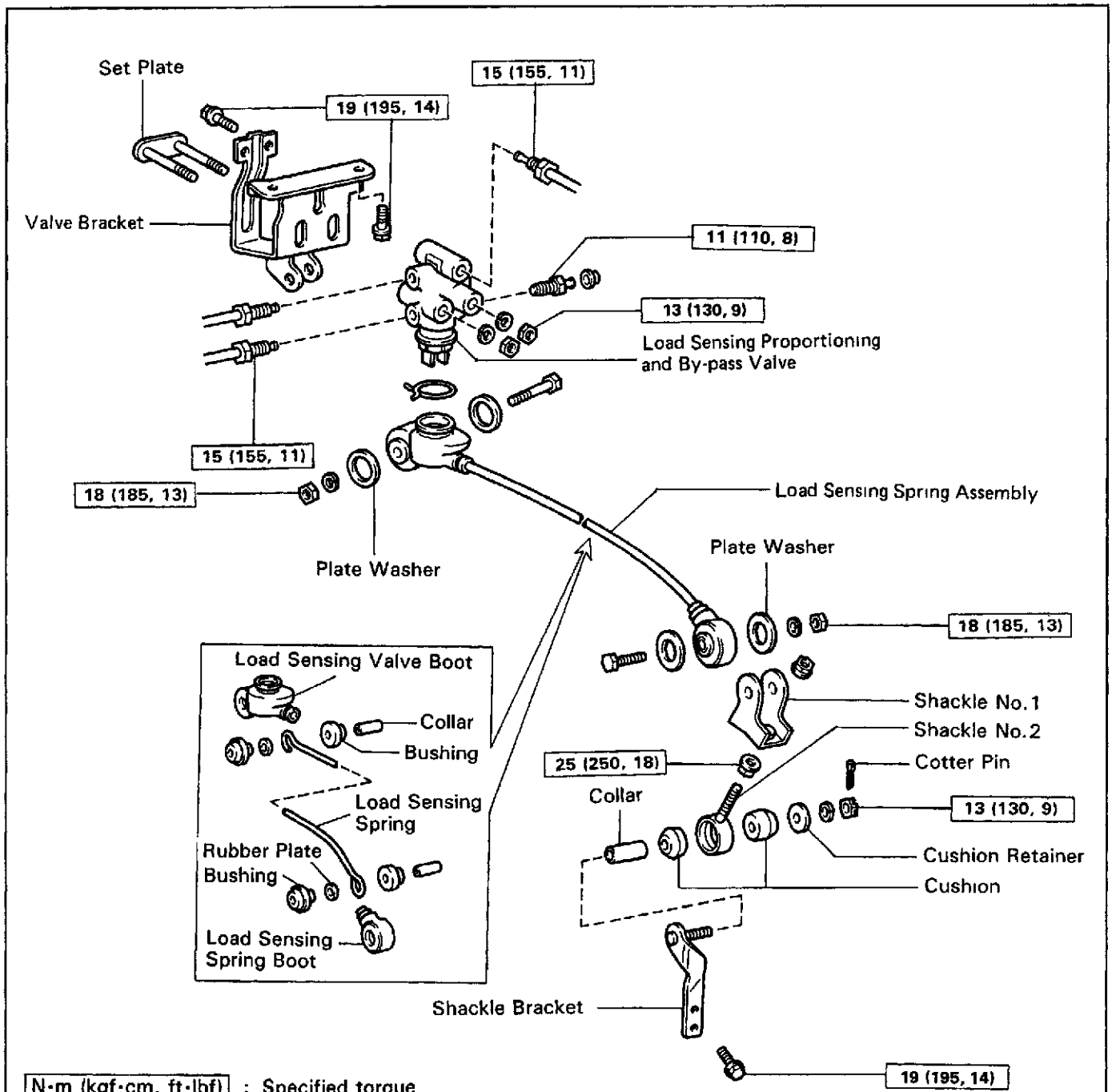
(c) Drive the vehicle for about 400 meters (0 25 mile) in this condition

(d) Repeat this procedure 2 or 3 times

16. RECHECK AND ADJUST PARKING BRAKE LEVER TRAVEL

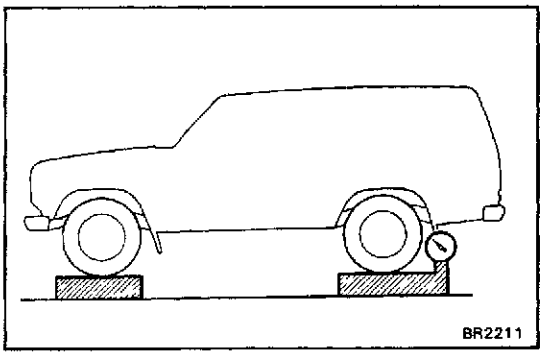
LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

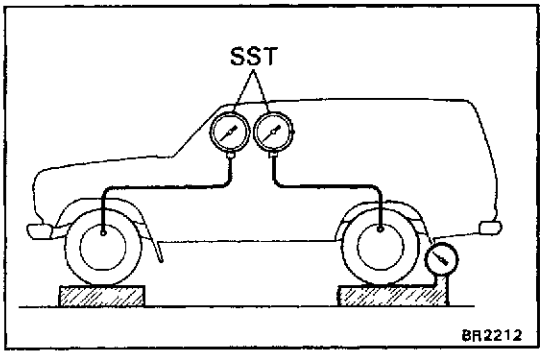


FLUID PRESSURE CHECK AND ADJUSTMENT

BRAGB-03

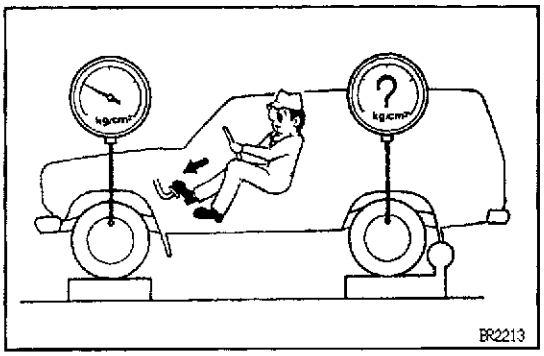
1. SET REAR AXLE LOAD

Rear axle load (include vehicle weight):
1,330 kg (2,932 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709-29017

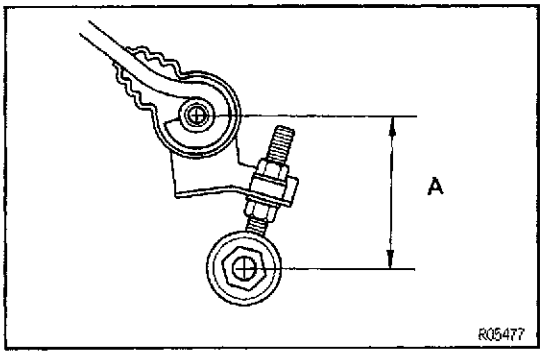


3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm2, 1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:

5,984±589 kPa (61±6 kgf/cmt, 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

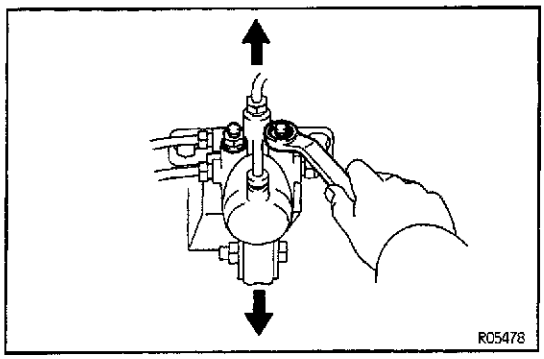
Initial set:

90 mm (3.54 in.)

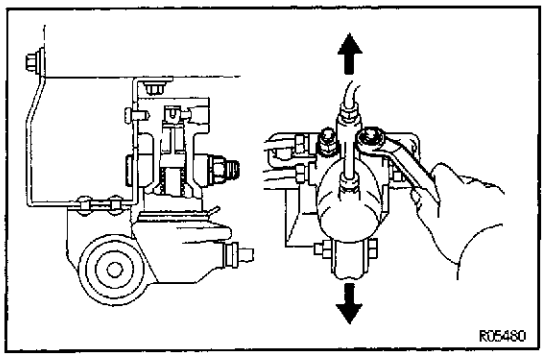
Adjusting range:

84-96 mm (3.31-3.78 in.)

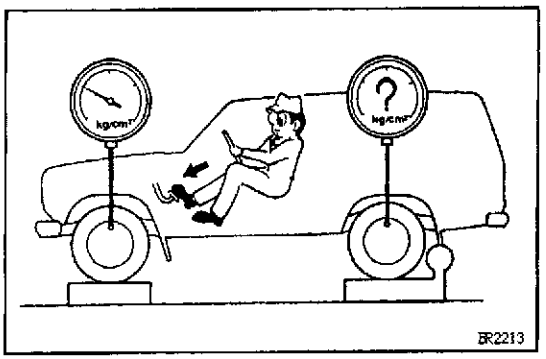
HINT One turn of the No 2 shackle changes the fluid pressure by about 98 1 kPa (1 0 kgf/cm2, 14 2 psi)



(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 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

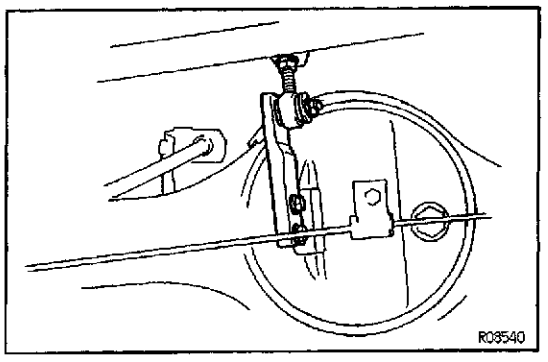


5. IF NECESSARY, CHECK VALVE BODY
(a) Assemble the valve body in the uppermost position
HINT When the brakes are applied, the piston will move down about 1 mm (0 039 in) Even at this time, the piston should not make contact with or move the load sensing spring



(b) In this position, check the rear brake pressure

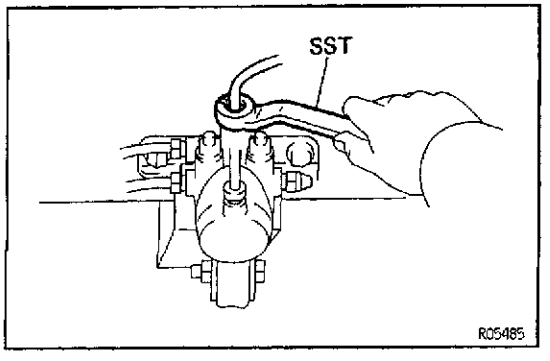
Front brake pressure kPa (kgf/cm^2 psi)	Rear brake pressure kPa (kgf/cm^2 psi)
3 434 (35 498)	3 434 (35 498)
5 396 (55 783)	3 630 - 4 218 (37 - 43 527 - 612)
9 810 (100 1 424)	4 513 - 5 494 (46 - 56 655 - 797)



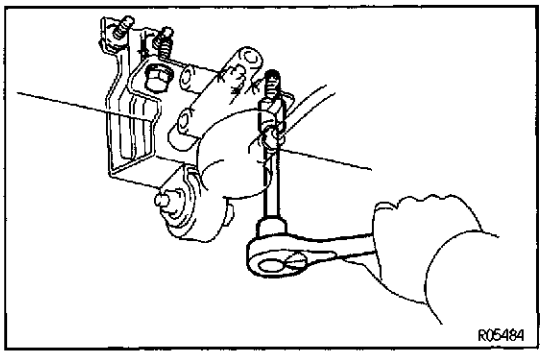
BR0G7-03

LSP & BV 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

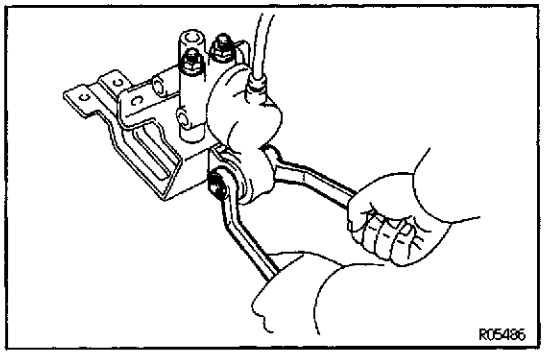


2. REMOVE LSP & BV ASSEMBLY
(a) Using SST, disconnect the brake lines from the valve body
SST 09751 -3601 1



(b) Remove the valve bracket and mounting bolts, then remove the LSP & BV assembly

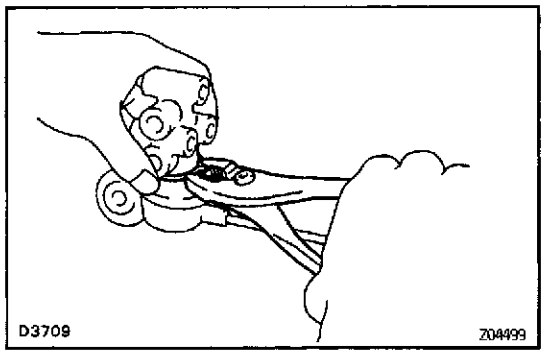
LSP & BV ASSEMBLE DISASSEMBLY



1. REMOVE VALVE BRACKET

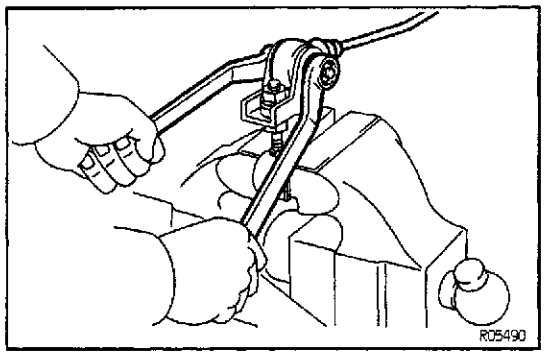
(a) Remove the nut and bolt

(b) Remove the 2 nuts, and remove the 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

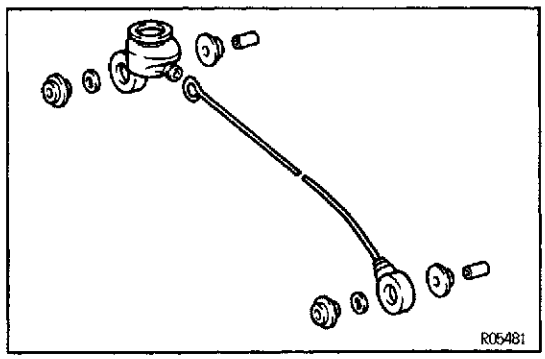


3. REMOVE SHACKLE NO.1 AND NO.2

(a) Remove the bolt and nut, then remove the following 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 following parts

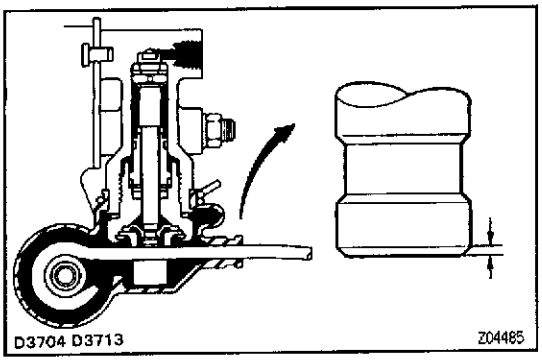
(a) Bushings

(b) Collars

(c) Rubber plates

(d) Load sensing valve boot

(e) Load sensing spring boot



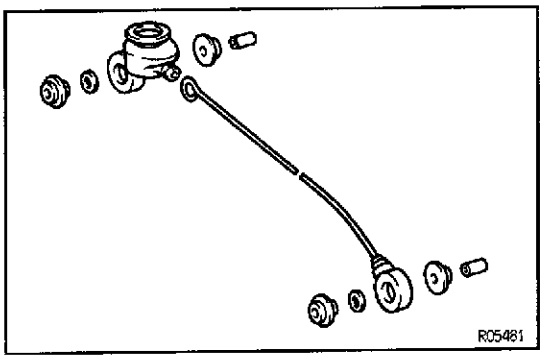
BR0BD-04

LSP & BV INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

Wear limit:

0.7 mm (0.028 in.)



BR0BE-03

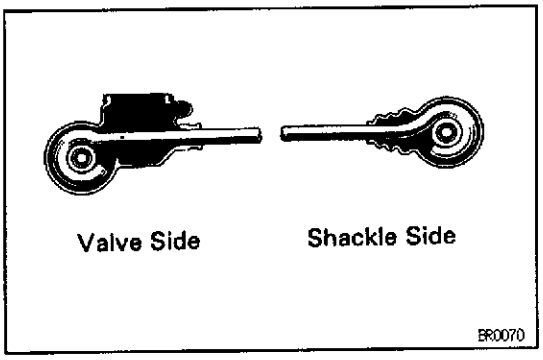
LSP & BV ASSEMBLY

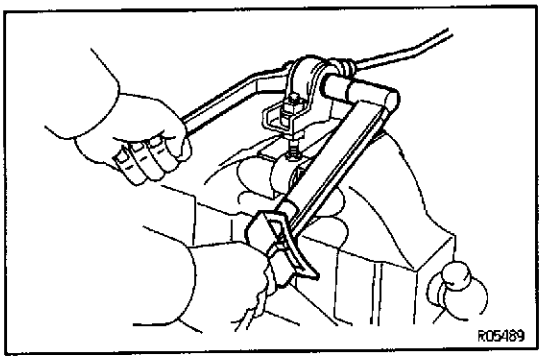
1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING:

(a) Load sensing valve boot
(b) Load sensing spring boot
(c) Bushings
(d) Rubber plates
(e) Collars

HINT Apply lithium soap base glycol grease to all rubbing areas

Do not mistake the valve side for the shackle side of the load sensing spring

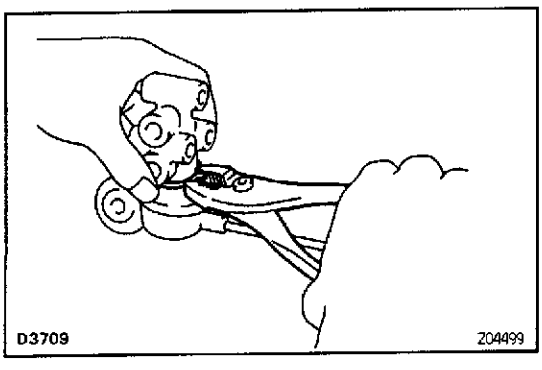




2. INSTALL SHACKLE NO.1 AND NO.2 TO LOAD SENSING SPRING

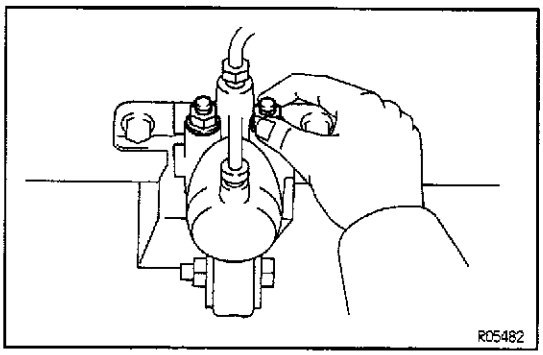
(a) Install the lock nut and shackle No 1 to the shackle No 2
(b) Install and torque the bolt and nut

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



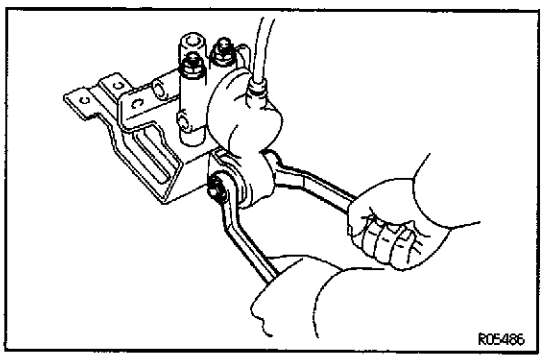
3. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring assembly to the load sensing valve with the clip

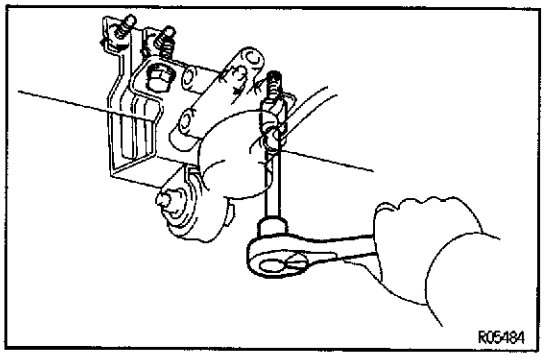


4. INSTALL VALVE BRACKET

(a) Install the 2 set bolts 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)

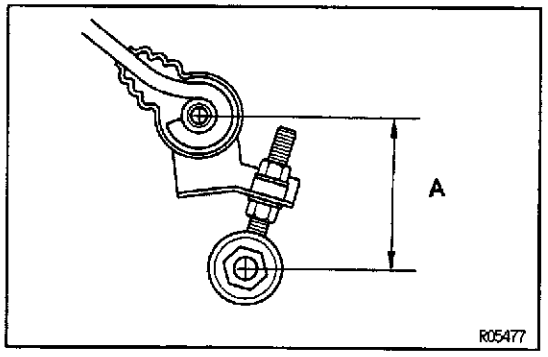


LSP & BV INSTALLATION

1 INSTALL LSP & BV ASSEMBLY

Install the LSP & BV assembly to the frame with the 4 bolts

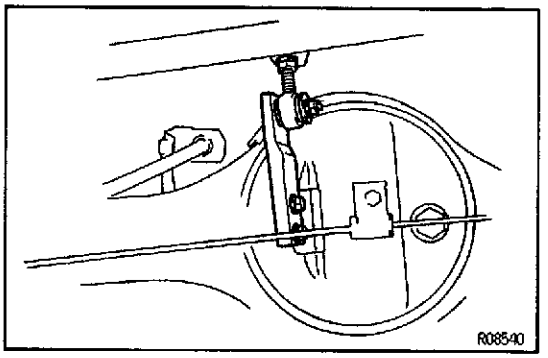
Torque 19 N-m (195 kgf-cm, 14 ft-lbf)



2. CONNECT SHACKLE NO.2 TO BRACKET

(a) Set the dimension A by turning shackle No 2
Initial set:
90 mm (3.54 in.)

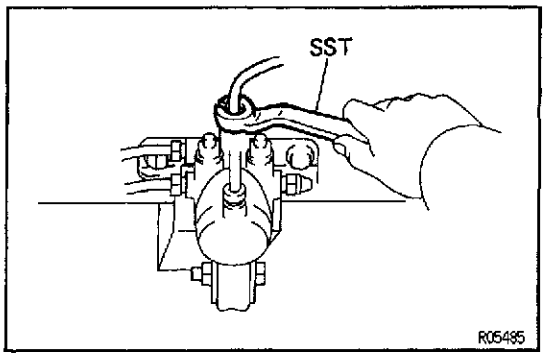
(b) Tighten the lock nut
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)



(c) Install the 2 bushings and collar to the load sensing spring shackle

(d) Install the load sensing spring 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

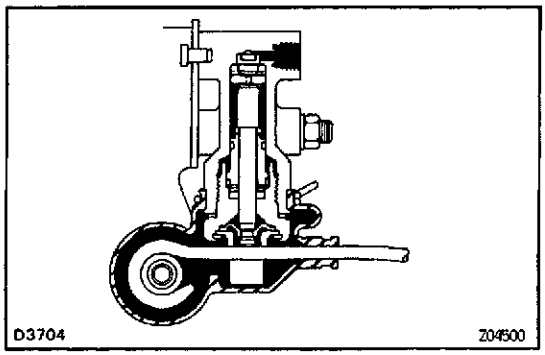
Using SST, connect the brake lines

SST 09751- 36011

Torque: 15 N-m (155 kgf-cm, 11 ft¿lbf)

4. SET REAR AXLE LOAD

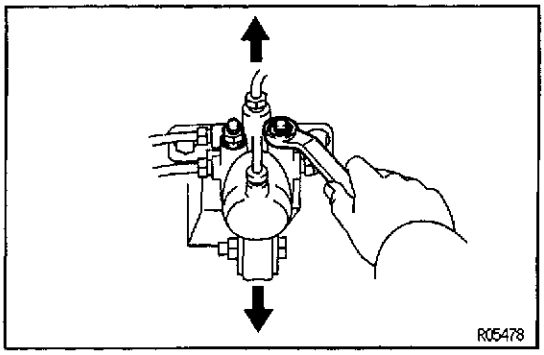
(SEE PAGE BR-54)



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 valve body mounting nuts

Torque: 13 N-m (130 kgf-cm, 9 ft- ibf)

6. BLEED BRAKE SYSTEM

(See page BR-8)

7. CHECK FLUID LEAKAGE

8. CHECK AND ADJUST LSP & BV FLUID PRESSURE

(See page BR-54)

ANTI-LOCK BRAKE SYSTEM (ABS)

DESCRIPTION

This ABS is a brake system which controls the brake cylinder hydraulic pressure of all 4 wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking This ABS provides the following benefits

(1) Enables steering round an obstacle with a greater degree of certainty even when panic braking

(2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves

The function of the ABS is to help maintain directional stability and vehicle steerability on most road conditions However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded

The ABS has a longitudinal deceleration sensor to match braking characteristics to the full-time four wheel drive

In case a malfunction occurs, a diagnosis function and fail-safe system have been adopted for the ABS to increase serviceability

When the center differential is locked, the ABS does not operate, so the ABS warning light lights up to indicate this

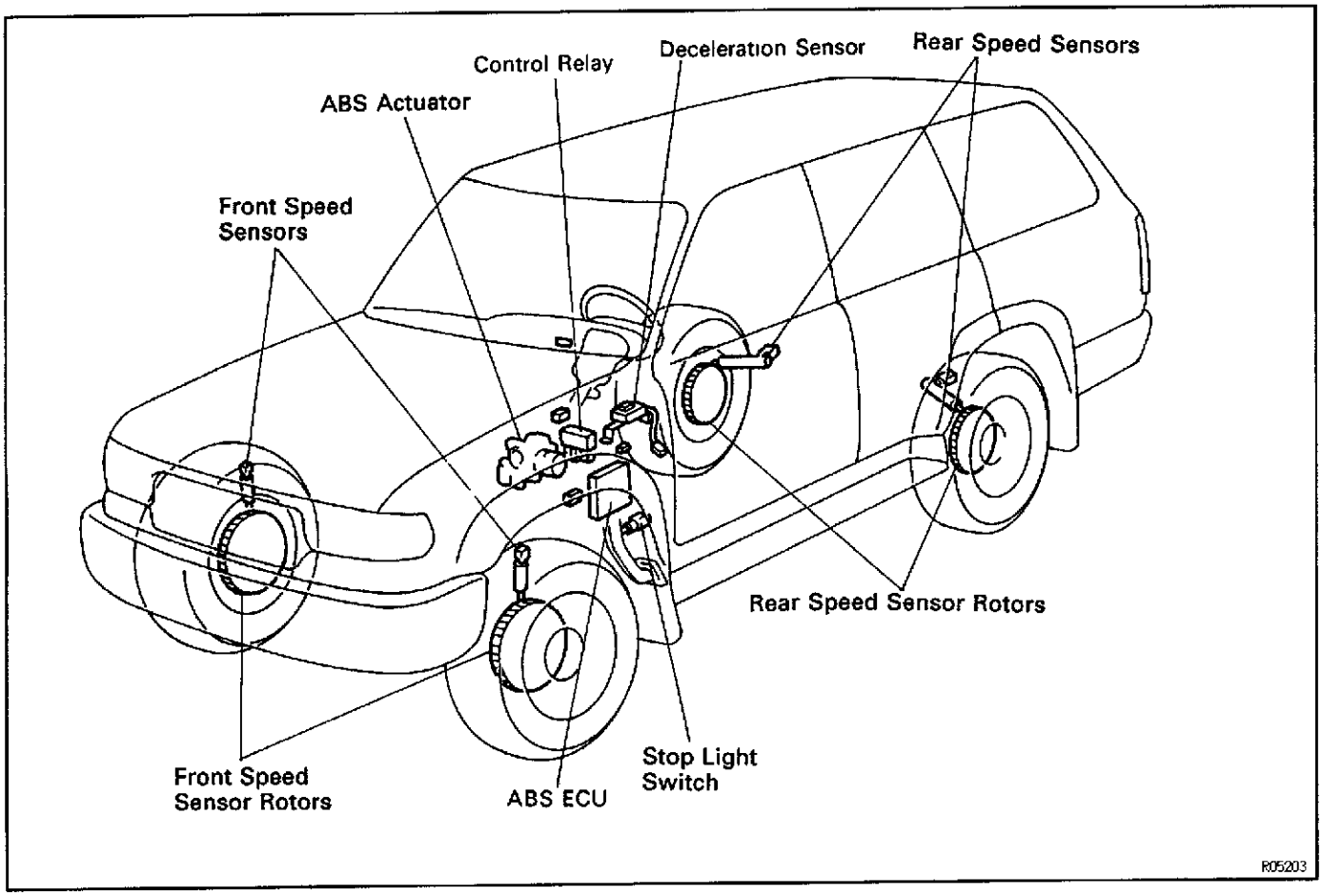
BR02K—08

COMPONENTS FUNCTION

Component	Function
Front Speed Sensor	Detect the wheel speed of each of the left and right front wheels
Rear Speed Sensor	Detect the wheel speed of each of the left and right rear wheels
ABS Warning Light	Lights up to alert the driver when trouble has occurred in the Anti-Lock Brake System and when the center differential is locked
Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the ECU
ABS ECU	From the wheel speed signals from each sensor it calculates acceleration deceleration and slip values and sends signals to the actuator to control brake fluid pressure
Deceleration Sensor	Detect the deceleration value of the vehicle and sends a signal accordingly to the ABS ECU

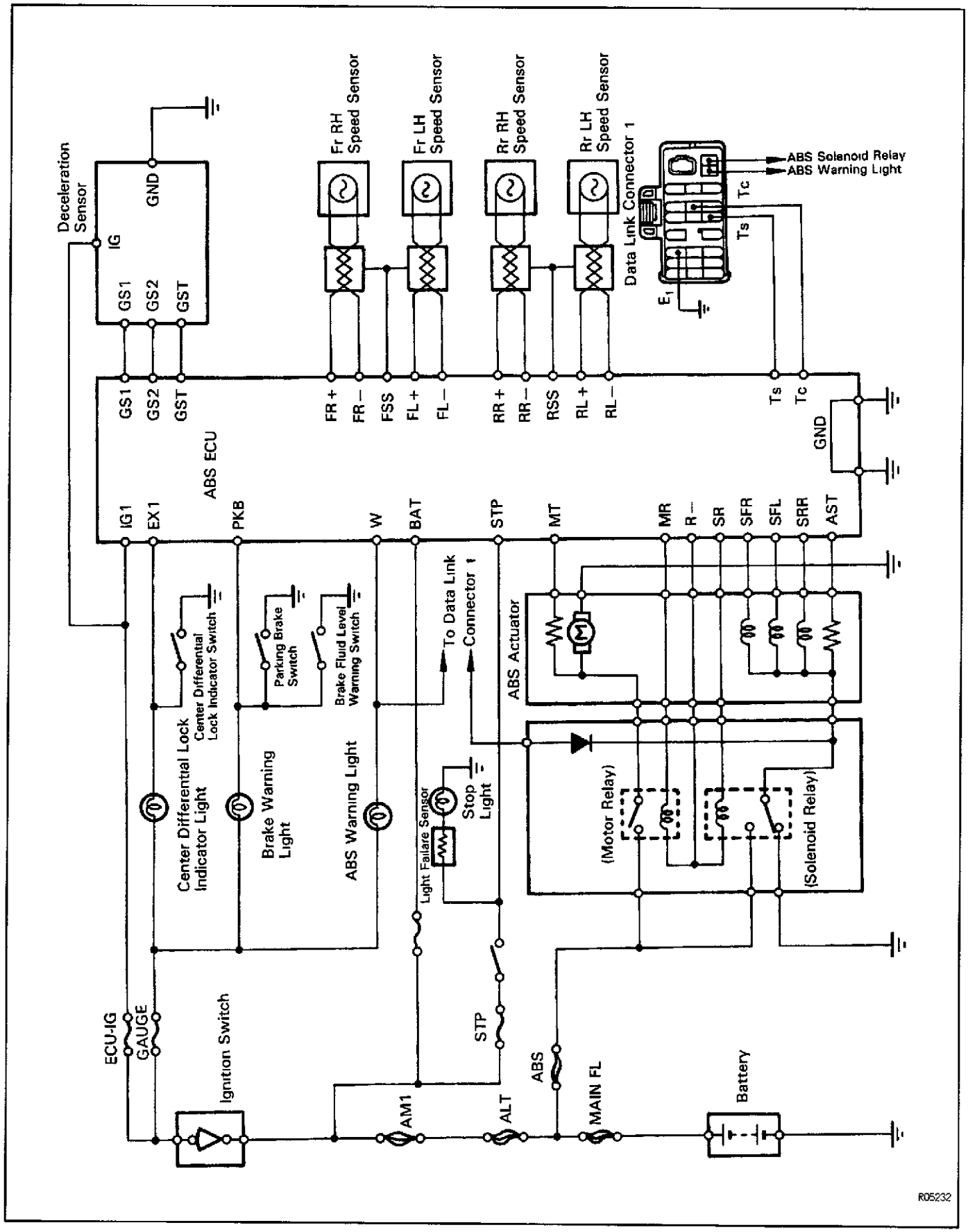
BR02L—07

SYSTEM PARTS LOCATION



WIRING DIAGRAM

BR02M-05

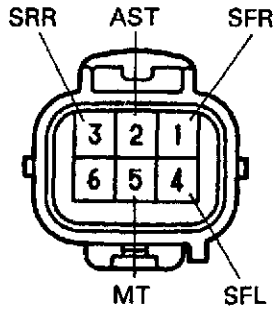


CONNECTORS

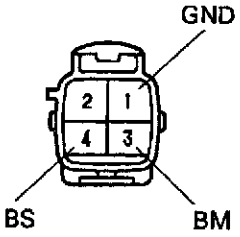
BR02N-05

ABS Actuator

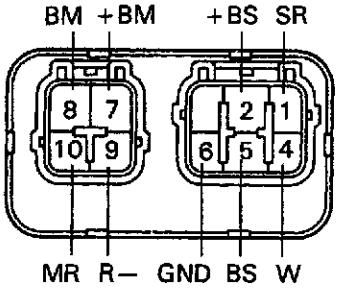
CONNECTOR A



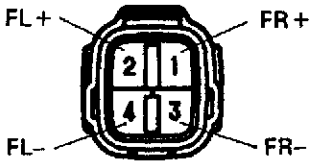
CONNECTOR B



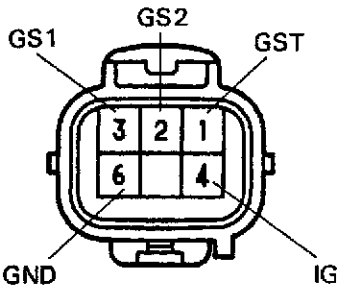
Control Relay



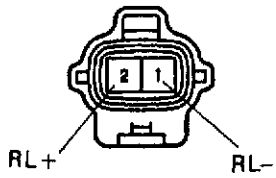
Front Speed Sensor



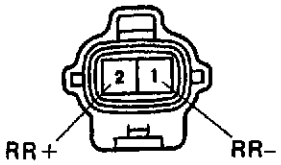
Deceleration Sensor



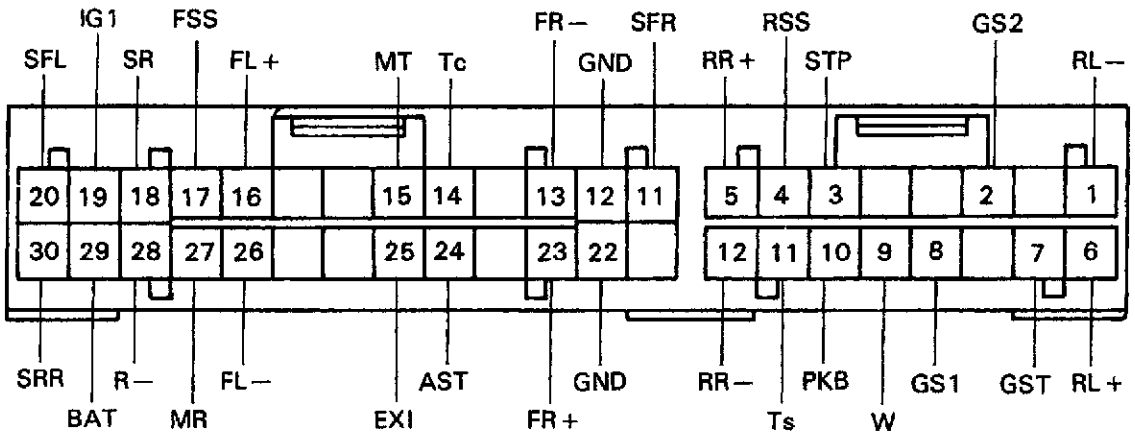
Rear Speed Sensor (LH)



Rear Speed Sensor (RH)

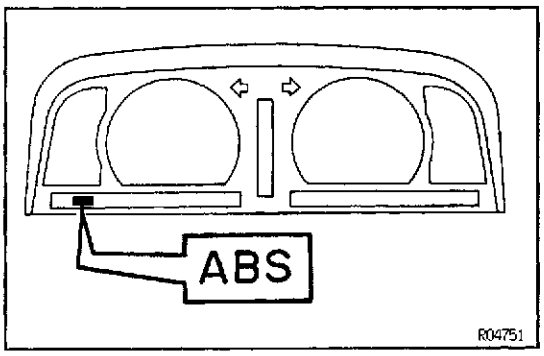


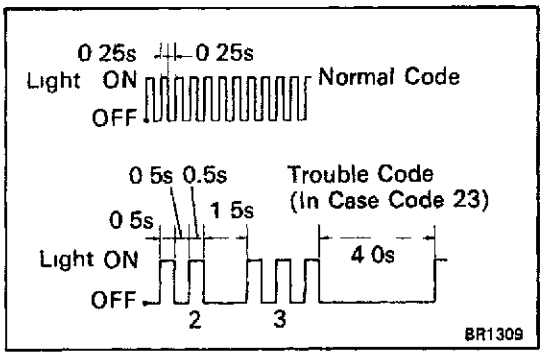
ABS ECU



Is-6-2-C Ig-4-2-A BR3998
Is 4-2-H Is-6-2-C
Is-2-2-T Is-2-2-T
R00463

Z04918





DIAGNOSIS SYSTEM

BR02P-08

DESCRIPTION

If a malfunction occurs, the system will identify the problem and the ECU will store the codes for the trouble items

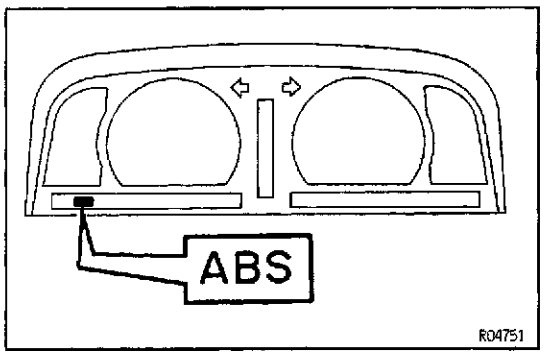
At the same time, the system informs the driver of a malfunction via the "ABS" warning light in the combination meter

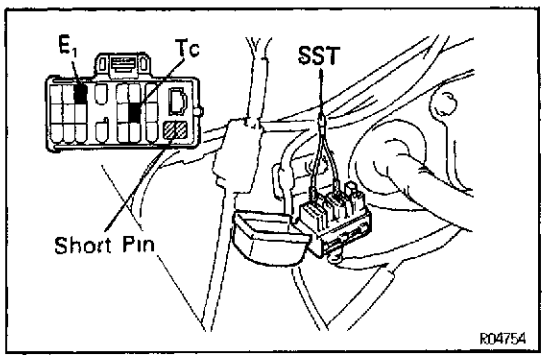
By turning on the ignition switch, disconnecting the short pin of the data link connector 1 and use SST to connect Tc and E, of the data link connector 1, the trouble can be identified by the number of blinks (diagnostic trouble code) of the warning light

In the event of 2 codes, that having the smallest numbered code will be identified first

HINT The warning light does not show the diagnostic trouble codes while the vehicle is running

When the transfer is in L (center differential lock) position, the ABS does not operate and the ABS warning light stays on





DIAGNOSIS SYSTEM INSPECTION

BR02R-06

1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is 10 - 14 V

2. CHECK THAT WARNING LIGHT TURNS ON

(a) Confirm that the center differential is free

(b) Turn the ignition switch on

(c) Check that the "ABS" warning light turns on for 3 seconds

If not, inspect and repair or replace the fuse, bulb and wire harness

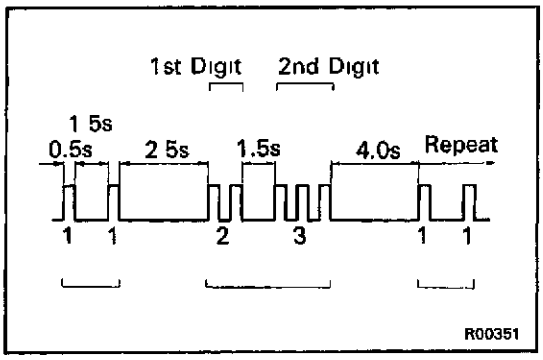
3. READ DIAGNOSTIC TROUBLE CODE

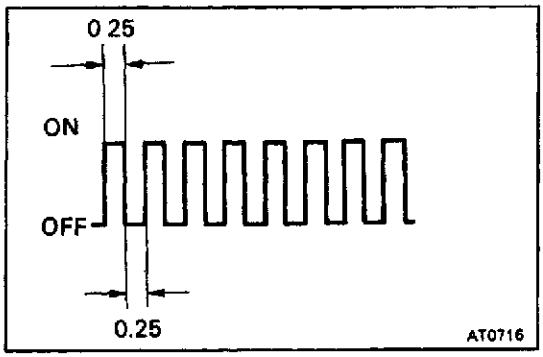
(a) Using SST, connect terminals Te and E, of the data link connector 1

SST 09843-18020

(b) Pull out the short pin from the terminals WA and WB of the data link connector 1

(c) Turn the ignition switch on





(d) In event of a malfunction, 4 seconds later the warning light will begin to blink Read the number of blinks
(See page BR-66)
HINT The first number of blinks will equal the first digit of a 2 digit diagnostic trouble code After a 1 5 second pause, the 2nd number of blinks will equal the 2nd number of a 2 digit code If there are 2 or more codes, there will be a 2 5 second pause between each, and indication will begin after 4 0 second pause from the smaller value and continue in order to larger

(e) If the system is operating normally (no malfunction), the warning light will blink once every 0 5 seconds

(f) Repair the system

(g) After the malfunctioning components has been repaired, clear the diagnostic trouble codes stored in the ECU
(See page BR-67)
HINT If you disconnect the battery cable while repairing, all diagnostic trouble codes in the ECU will erased

(h) Remove the SST from terminals Tc and E, of the data link connector 1
SST 09843-18020

(i) Install the short pin to the terminals WA and WB

(j) Turn the ignition switch on, and check that the "ABS" warning light goes off after the warning light goes on for 3 seconds

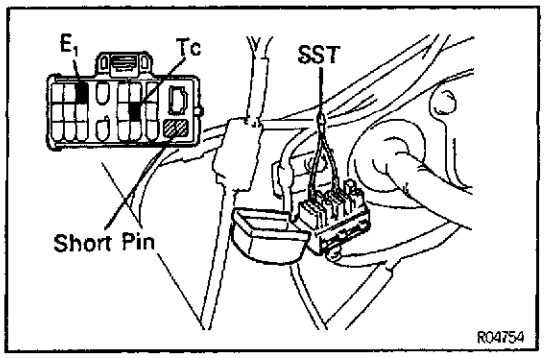
DIAGNOSTIC TROUBLE CODE

BR02S-0A

HINT Using SST 09843-18020, connect the terminals Tc and E,, and remove the short pin

Code No	Light Pattern	Diagnosis	Trouble Part
11	ON / OFF	Open circuit in solenoid relay circuit	• Actuator inside wire harness • Solenoid relay • Wire harness and connector of solenoid relay circuit (Include AST circuit)
12		Short circuit in solenoid relay circuit	
13		Open circuit in pump motor relay circuit	• Actuator inside wire harness • Pump motor relay • Wire harness and connector of pump motor relay circuit (include MT circuit)
14		Short circuit in pump motor relay circuit	
21		Open or short circuit in 3 position solenoid of front right wheel	• Actuator solenoid • Wire harness and connector of actuator solenoid circuit
22		Open or short circuit in 3 position solenoid of front left wheel	
23		Open or short circuit in 3 position solenoid of rear wheel	
31		Front right wheel speed sensor signal malfunction	• Speed sensor • Sensor rotor • Wire harness and connector of speed sensor
32		Front left wheel speed sensor signal malfunction	
33		Rear right wheel speed sensor signal malfunction	
34		Rear left wheel speed sensor signal malfunction	
35		Open circuit in front left or rear right wheel speed sensor	
36		Open circuit in front right or rear left wheel speed sensor	
41		Abnormally high or low battery voltage	• Battery • Voltage regulator
43		Malfunction in deceleration sensor	• Deceleration sensor • Deceleration sensor installation • Wire harness and connector of deceleration sensor
44		Open or short circuit in deceleration sensor	
48		Open or short circuit in center differential lock indicator	• Center differential lock • Center differential lock indicator light • Center differential lock indicator switch • Wire harness and connector of center differential lock
51		Pump motor of actuator locked or open circuit in pump motor circuit in actuator	• Pump motor relay and battery • Wire harness connector and ground bolt or actuator pump motor circuit (Include MT circuit)
Always on		Malfunction in ECU	• ECU

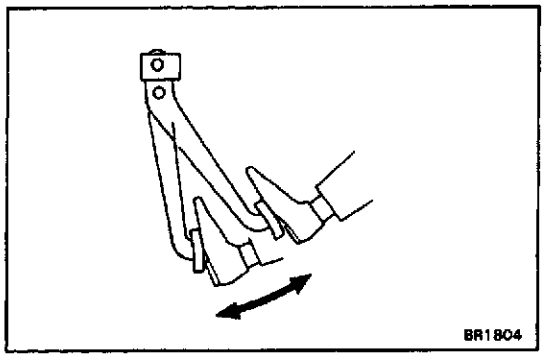
V02258



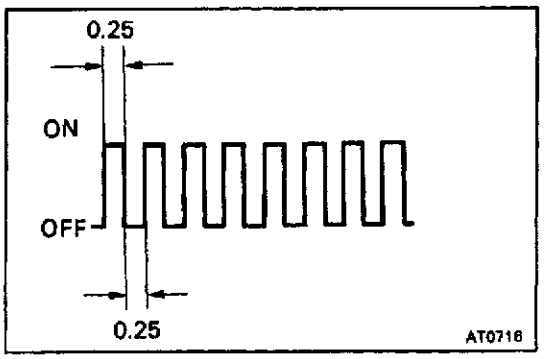
DIAGNOSTIC TROUBLE CODES CLEARING

CLEAR DIAGNOSTIC TROUBLE CODES

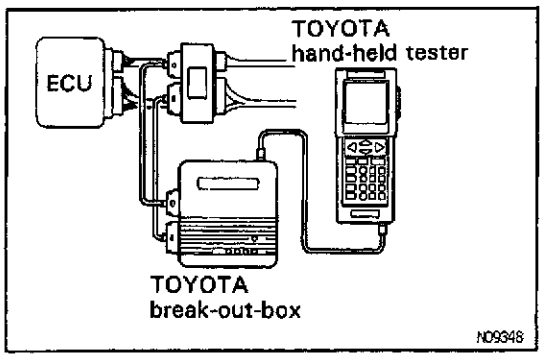
(a) Confirm that the center differential is free
(b) Using SST, connect terminals Tc and E, of the data link connector 1
SST 09843-18020
(c) Turn the ignition switch on
HINT Keep the vehicle stopped stationaly



(d) Clear the diagnostic trouble codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds



(e) Check that the warning light shows the normal code
(f) Remove the SST from terminals Tc and E, of the data link connector 1
SST 09843-18020
(g) Check that the warning light goes off



ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER

1 Hookup 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 operator's manual for further details

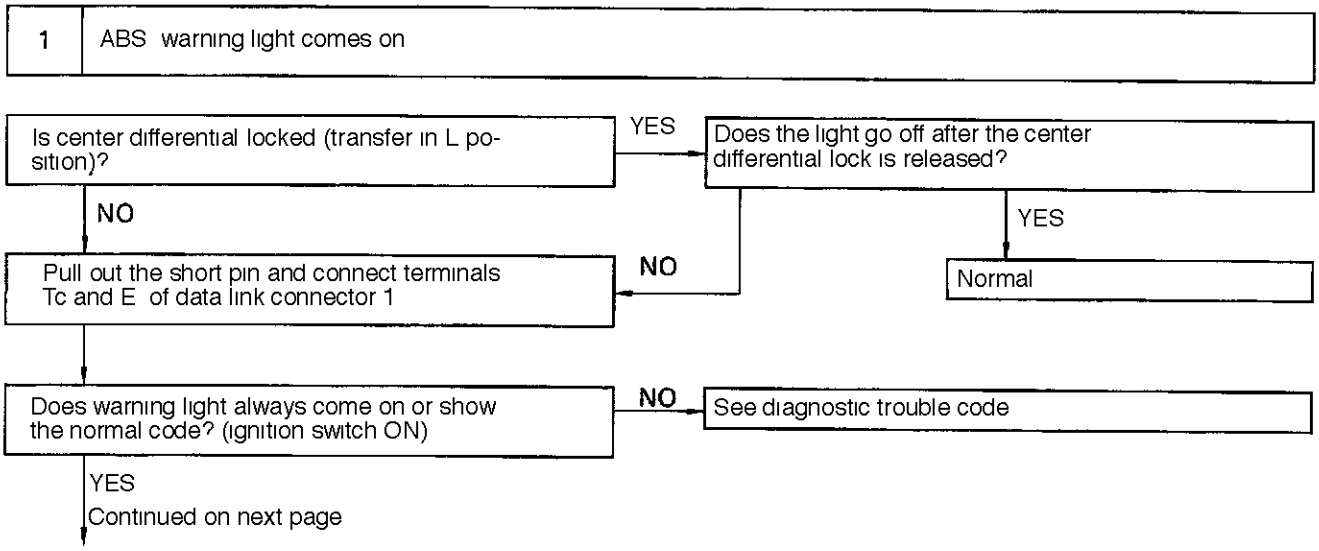
TROUBLESHOOTING

BR0QB-01

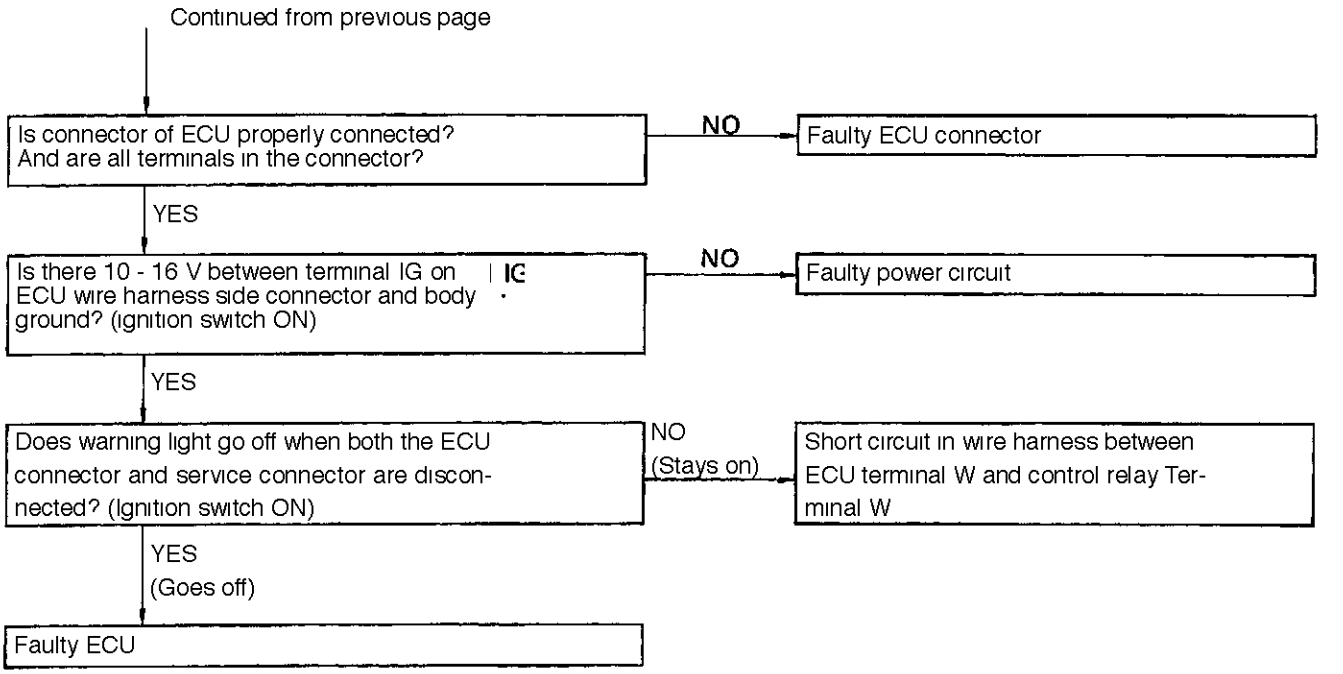
Problem		No
ABS warning light	Always comes on after ignition switch is turned ON	1
	Does not come on for 3 seconds after ignition switch ON	2
	Goes an and off	3
	Comes on while running	1
	Does not light up when the transfer is in L (center differential lock) position	6
Brake condition	Brakes pull *	4
	Braking inefficient *	4
	ABS operates during normal braking	4
	ABS operates just before stopping during normal braking	4
	Brake pedal pulsates abnormally while ABS is operating	4
	Skidding noise occurs while ABS operating (ABS operates inefficiently)	5
	When the transfer is in L (center differential lock) position the ABS operates	6

* Also check the parts of the brake system (brake cylinders pads hydraulic lines etc) not specifically part of the ABS

V02251

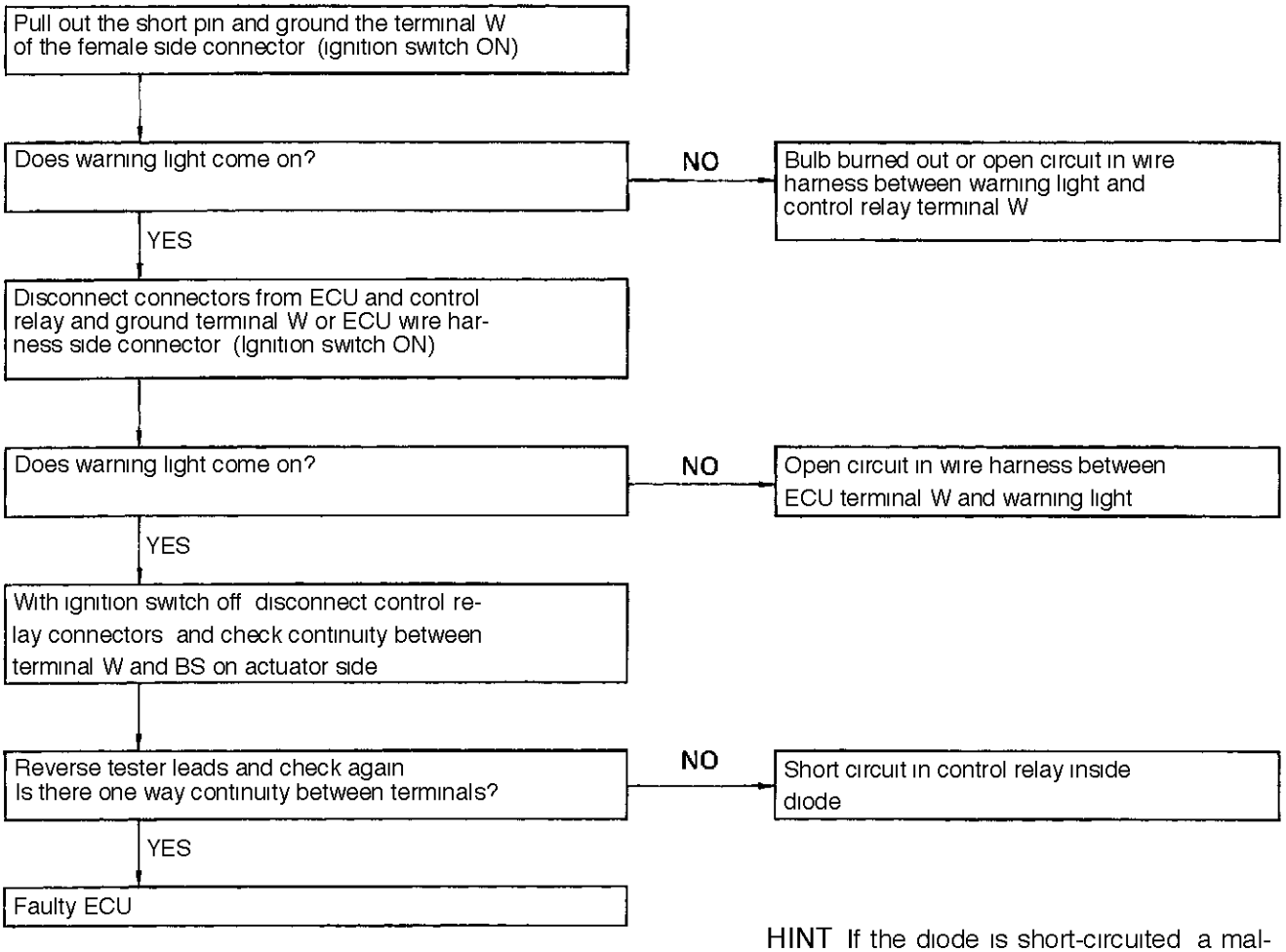


V02252


Continued from previous page
Is connector of ECU properly connected? And are all terminals in the connector?
NO
Faulty ECU connector
YES
Is there 10 - 16 V between terminal IG on ECU wire harness side connector and body ground? (Ignition switch ON)
IG
NO
Faulty power circuit
YES
Does warning light go off when both the ECU connector and service connector are disconnected? (Ignition switch ON)
NO
(Stays on)
Short circuit in wire harness between ECU terminal W and control relay Terminal W
YES
(Goes off)
Faulty ECU

V00406

2	ABS warning light does not come on for 3 seconds after ignition switch ON



HINT If the diode is short-circuited a malfunction at ECU terminal W will occur When inspecting the terminal connect the ECU connector and disconnect actuator connectors and data link connector 1 Then turn the ignition switch on and check that the warning light goes on If it does the ECU terminal is 4K

V02244

3	A6S warning light comes on and off

- Check for short circuit in wire harness between terminal Tc and E of data link connector
- Wire harness either between Te or Ts terminals of ECU and data link connector 1 is short circuited with vehicle body

4	• Brakes pull • Braking inefficient • ABS operates during normal braking • ABS operates just before stopping during normal braking • Brake pedal pulsates abnormally while ABS is operating

Pull out the short pin and connect terminals Tc and E of data link connector 1 (Ignition switch on)

↓

Does warning light show the diagnostic normal code? — NO → See diagnostic trouble code

↓ YES

Are each speed sensors installed in place? And are each installation bolts tightened securely? — NO → Speed sensor installation faulty

↓ YES

Try speed sensor and deceleration sensor diagnosis system Is sensor signal level OK? — NO → Inspect speed sensor and replace if necessary

↓ YES

Try speed sensor and deceleration sensor diagnosis system Is sensor signal change OK? — NO → Inspect sensor rotor and replace if necessary

↓ YES

Disconnect connector from ECU inspect continuity between each speed sensor terminals on wire harness side

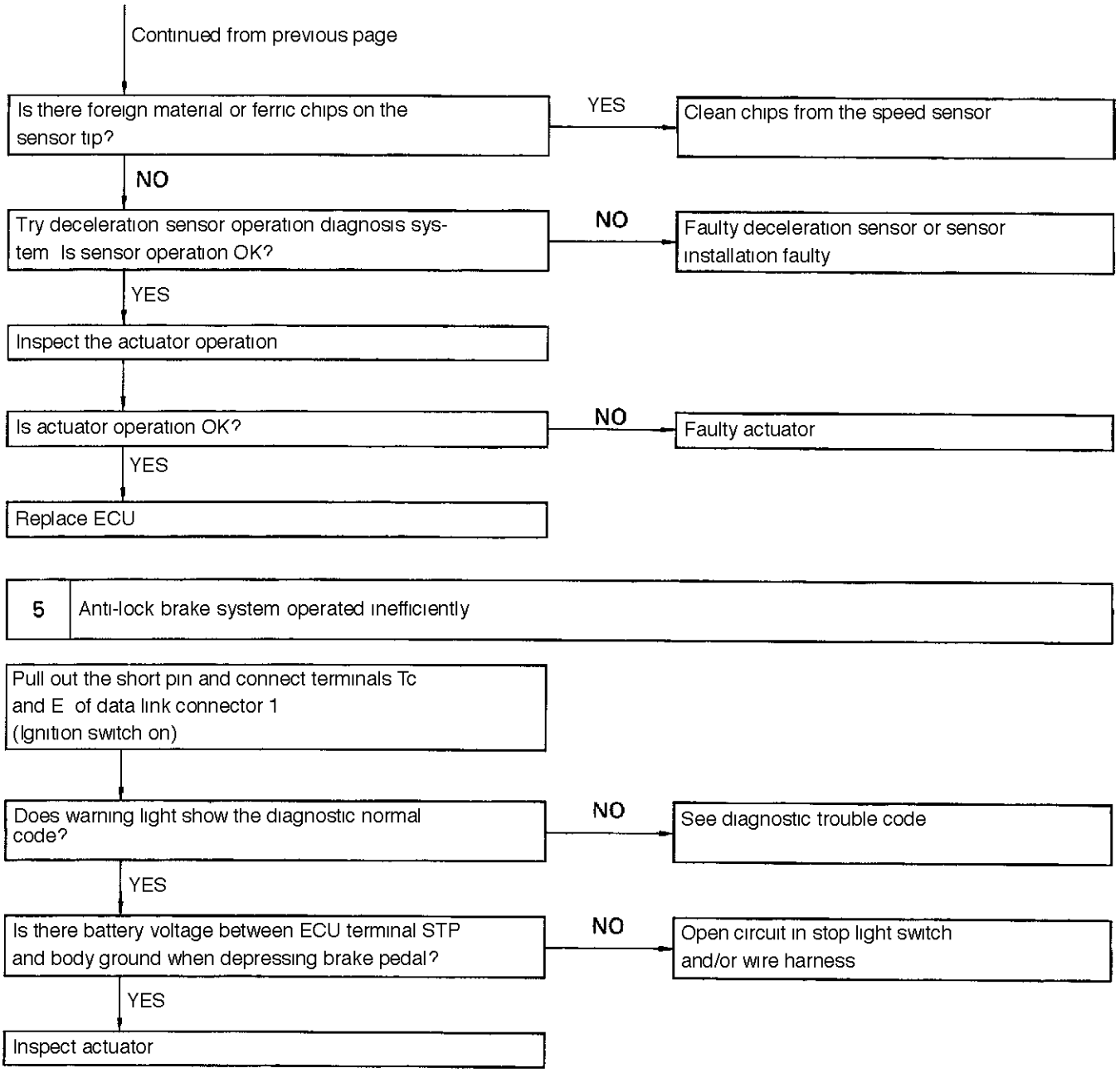
↓

Does any abnormal change occur in continuity when the connectors or wire harness of the speedsensor and intermediate connectors are twisted orbent? — YES (Abnormal change) → Faulty wire harness

↓ NO (No change)

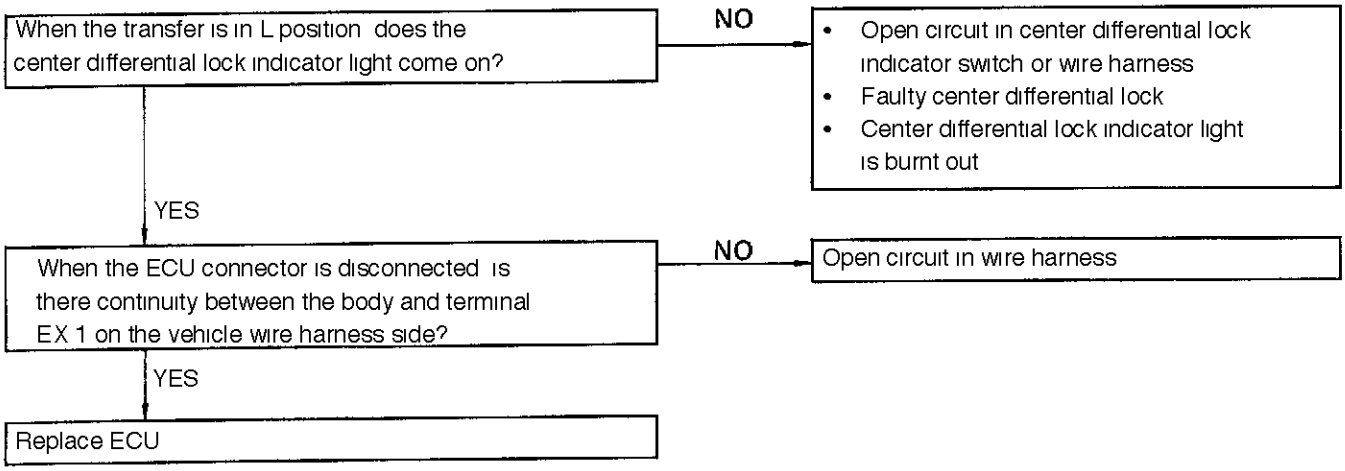
Continued on next page

V02249


Continued from previous page
Is there foreign material or ferric chips on the sensor tip?
YES
Clean chips from the speed sensor
NO
Try deceleration sensor operation diagnosis system Is sensor operation OK?
NO
Faulty deceleration sensor or sensor installation faulty
YES
Inspect the actuator operation
Is actuator operation OK?
NO
Faulty actuator
YES
Replace ECU
5
Anti-lock brake system operated inefficiently
Pull out the short pin and connect terminals Tc and E of data link connector 1 (Ignition switch on)
Does warning light show the diagnostic normal code?
NO
See diagnostic trouble code
YES
Is there battery voltage between ECU terminal STP and body ground when depressing brake pedal?
NO
Open circuit in stop light switch and/or wire harness
YES
Inspect actuator

V02250

6	• Center differential lock indicator light does not light up when the transfer is in L position • When the transfer is in L position the ABS operates



V02248

SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM

DIAGNOSIS SYSTEM INSPECTION

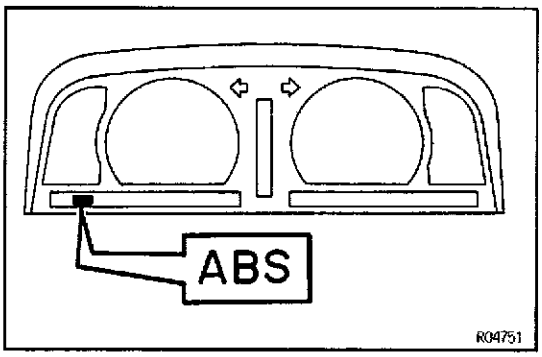
PRECAUTION

While checking the speed sensor diagnosis system, ABS does not operate and brake system operates as normal brake system.

1. INSPECT BATTERY POSITIVE VOLTAGE

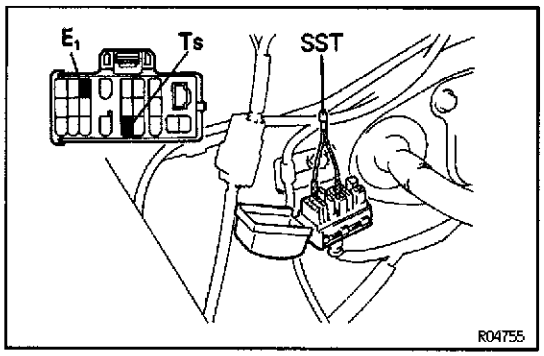
Inspect that the battery positive voltage is 10 - 14 V

2. CHECK THAT WARNING LIGHT TURNS ON

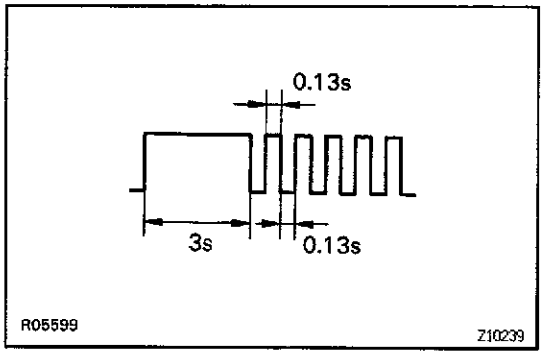


(a) Confirm that center differential is free
(b) Turn the ignition switch on
(c) Check that the "ABS" warning light turns on for 3 seconds
If not inspect and repair or replace the fuse, bulb and wire harness
(d) Check that the "ABS" warning light turns off
(e) Turn the ignition switch off

3. PERFORM FOLLOWING STEPS

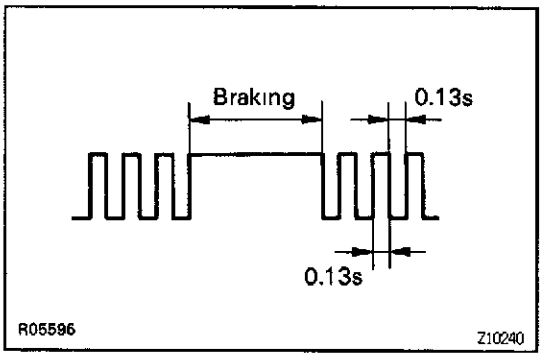


(a) Using SST, connect terminals Ts and E, of the data link connector 1
SST 09843-18020
(b) Start the engine

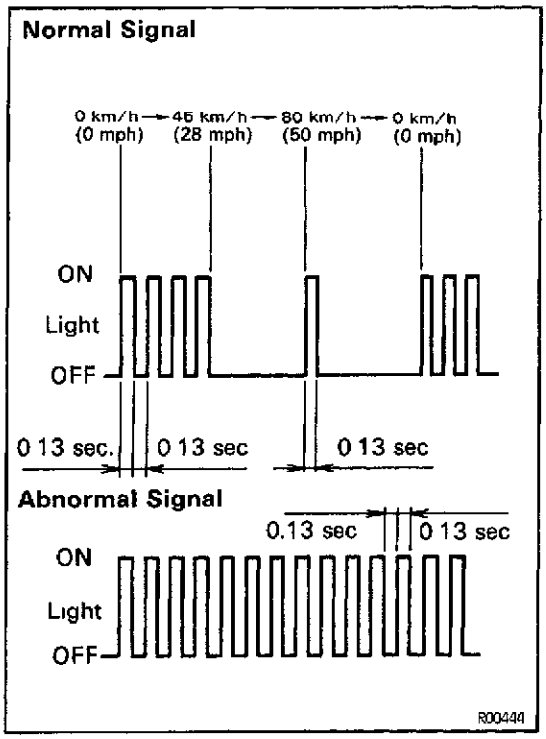


(c) Check that the warning light blinks about 4 times every 1 second, as shown

4. INSPECT DECELERATION SENSOR OPERATION



(a) Drive the vehicle straight ahead at about 20 km (12 4 mph) or more, depress the brake pedal moderately
(b) Check that the warning light turns on while braking



5. INSPECT SPEED SENSOR SIGNAL CHANGE

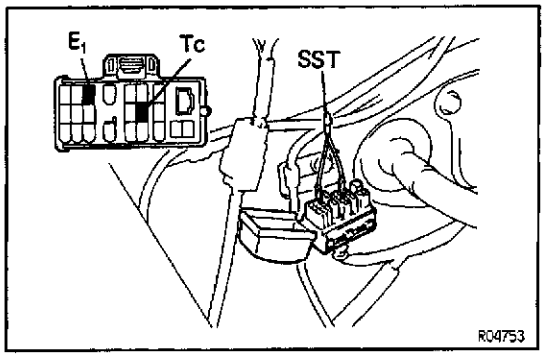
(a) Drive the faster than 45 km/h (28 mph) for several seconds

(b) Check that the warning light signal

If the warning light signal is abnormal, perform the steps 6 and 7

HINT

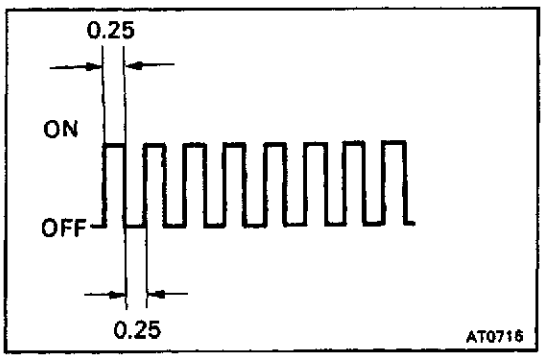
- If the deceleration sensor operation in step 4 does not occur, an abnormal signal is output
- The high-speed check is possible at 80 km/h (50 mph) or highter



6. READ DIAGNOSTIC TROUBLE CODE

(a) Stop the vehicle and the warning light will begin to blink

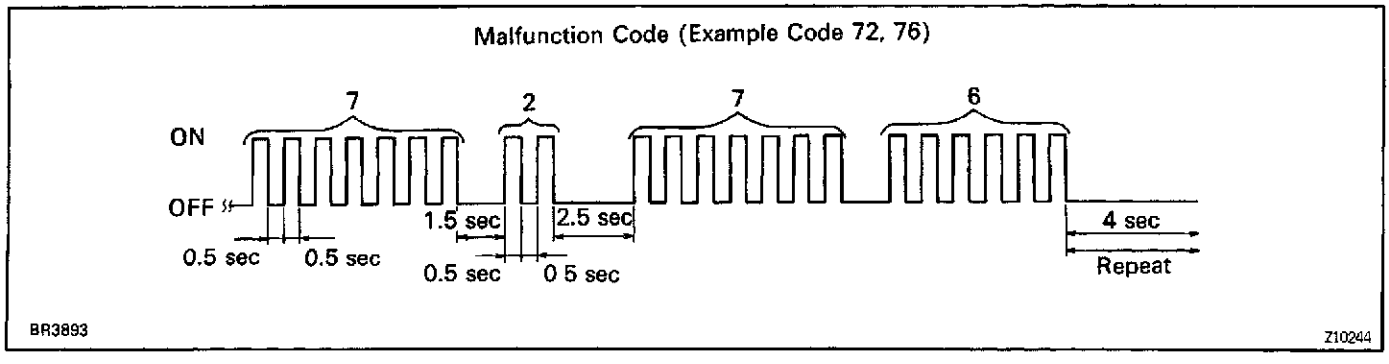
(b) Using SST, connect the terminals Tc and E, of data link connector 1



(c) Read the number of blinks of the ABS warning light (See page BR-77)

HINT If normal, the warning light blinks about 2 times every 1 second

If 2 or more malfunctions are indicated at the same time, the smallest numbered code will be displayed 1st



7. REPAIR MALFUNCTIONING PARTS

Repaır or replace the malfunctıonıng parts

HINT When repaırıng or replacıng parts, turn the ıgnıtıon swıtch to OFF

8. REMOVE SST

Remove the SST from termınals Tc, Ts and E, of the data lınk connector 1

SST 09843-18020

BR02W-04

DIAGNOSTIC TROUBLE CODE

Code No	Light Pattern	Diagnosis	Malfunctioning Part
	ON / OFF	All speed sensors and sensor rotors are normal	• Front right speed sensor • Sensor installation
71		Low voltage of front right speed sensor signal	• Front left speed sensor • Sensor installation
72		Low voltage of front left speed sensor signal	• Rear right speed sensor • Sensor installation
73		Low voltage of rear right speed sensor signal	• Rear left speed sensor • Sensor installation
74		Low voltage of rear left speed sensor signal	• Front right sensor rotor
75		Abnormal change of front right speed sensor signal	• Front left sensor rotor
76		Abnormal change of front left speed sensor signal	• Rear right sensor rotor
77		Abnormal change of rear right speed sensor signal	• Rear left sensor rotor
78		Abnormal change of rear left speed sensor signal	• Deceleration sensor • Sensor installation
79		Deceleration sensor is faulty	

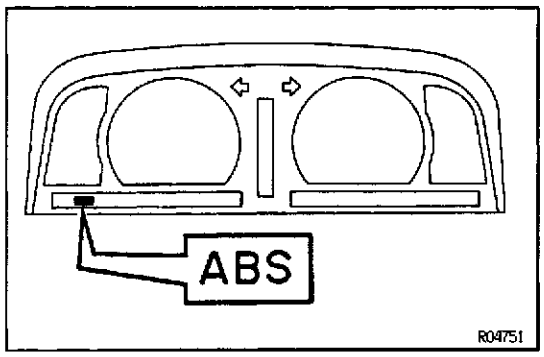
V02247

DECELERATION SENSOR OPERATION DIAGNOSIS SYSTEM

BR0GD 01

PRECAUTION

While checking the deceleration sensor operating diagnosis system, the Anti-lock Brake System does not work and brake system works as normal brake system



DIAGNOSIS SYSTEM INSPECTION

BR0GE-03

1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is 10 - 14 V

2. CHECK THAT WARNING LIGHT TURNS ON

(a) Confirm that the center differential is free

(b) Turn the ignition switch to ON

(c) Check that the "ABS" warning light turns on for about 3 seconds

If not, inspect and repair or replace the fuse, bulb and wire harness

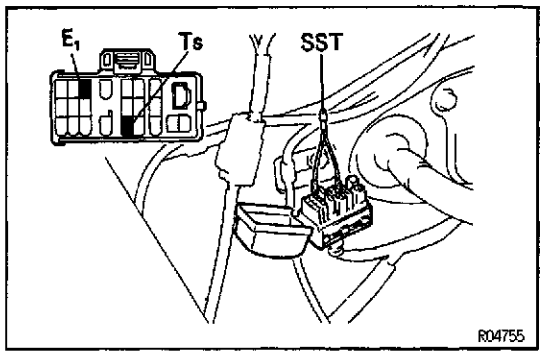
(d) Check that the "ABS" warning light turns off

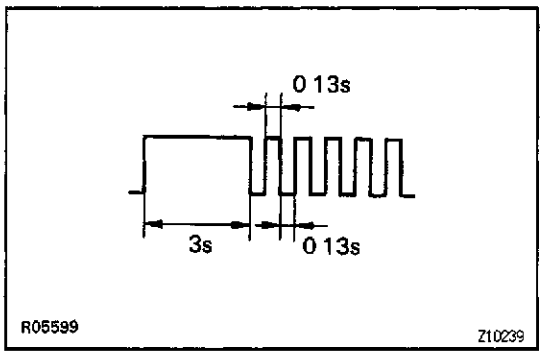
(e) Turn the ignition switch to OFF

3. PERFORM FOLLOWING STEPS

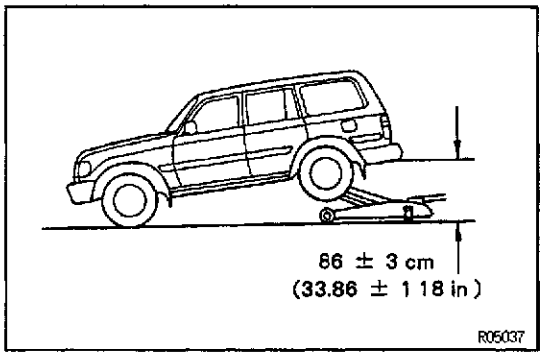
(a) Using SST, connect the terminal Ts to E, of the data link connector 1

SST 09843-18020





(b) Check that the warning light blinks about 4 time every 1 second



4. INSPECT SENSOR DETECTION POINT

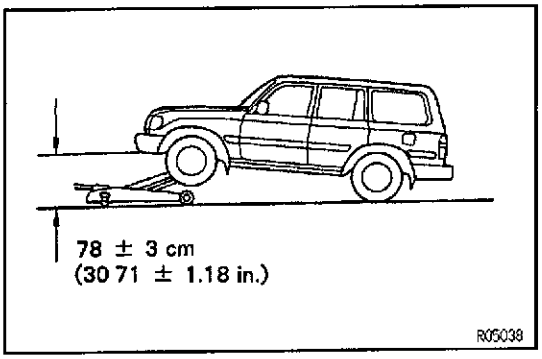
(a) Jack up the rear side of the vehicle slowly

HINT When measuring the height, measure at the center of the lower body of the vehicle

(b) Check that the warning light does not turn on

If the warning light turns on, inspect the deceleration sensor installation And if the sensor installation is OK, replace the deceleration sensor

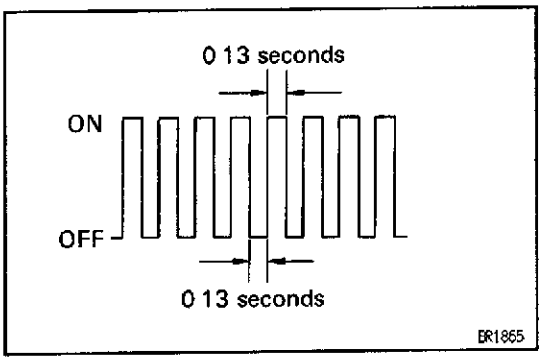
(c) Jack down the vehicle slowly

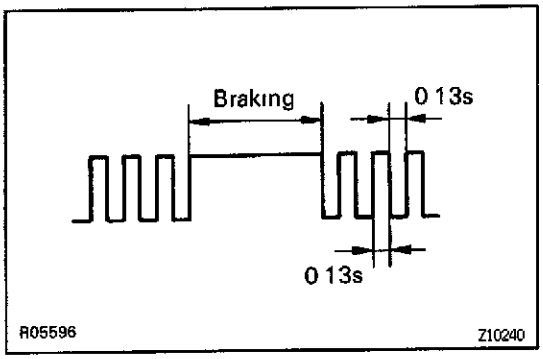


(d) Jack up the front side of the vehicle slowly
HINT When measuring the height, measure at the center of the lower body of the vehicle
(e) Check that the warning light does not turn on
If the warning light turns on, inspect the deceleration sensor installation And if the sensor installation is OK, replace the deceleration sensor
(f) Jack down the vehicle slowly

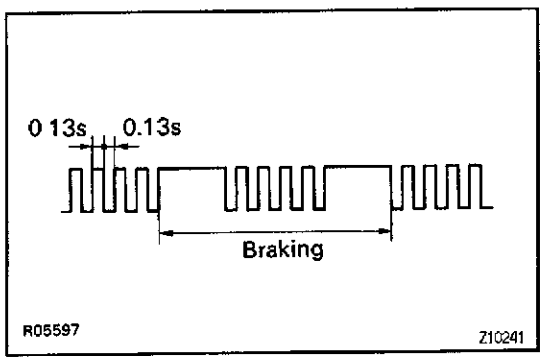
5. INSPECT SENSOR OPERATION

(a) Drive the vehicle straight ahead at about 20 km/h (112 4 mph) or more, lightly depress the brake pedal
(b) Check that there is no change in the warning light pattern





(c) Drive the vehicle straight ahead at about 20 km/h (12 4 mph) or more, depress the brake pedal a little strong
(d) Check that the warning light turns on while braking



(e) Drive the vehicle straight ahead at about 20 km/h (112 4 mph) or more, depress the brake pedal strongly
(f) Check that the warning light pattern changes while braking, as shown
If the operation is not as specified, inspect the deceleration sensor installation And if the sensor installation is OK, replace the deceleration sensor

6. PERFORM FOLLOWING STEPS

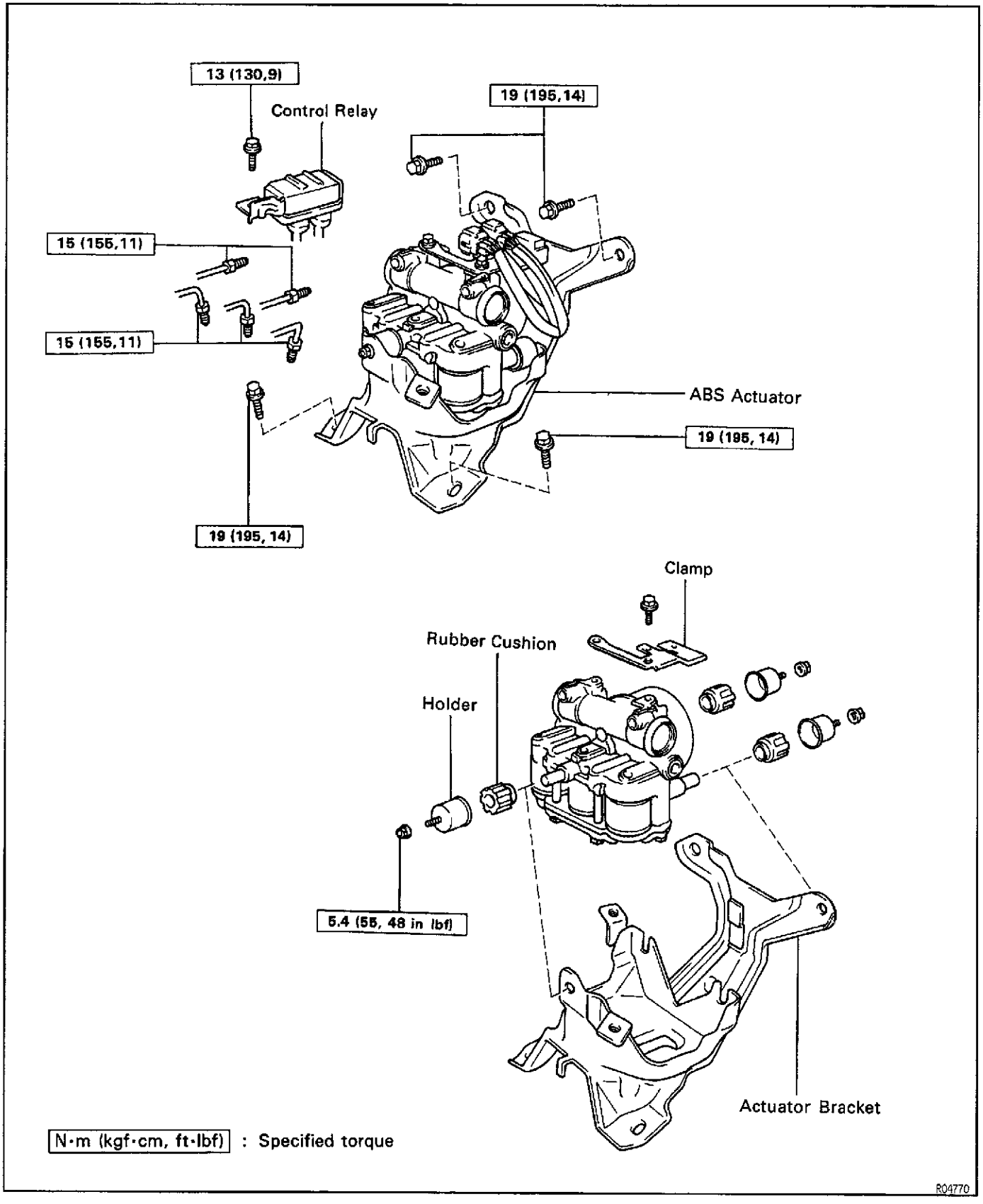
(a) Stop the vehicle and turn the ignition switch to OFF
(b) Remove SST from the terminals Ts and E, of the data link connector 1
SST 09843-18020

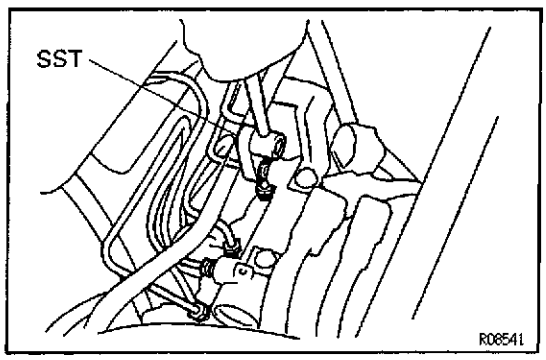
ABS ACTUATOR

ABS ACTUATOR REMOVAL AND INSTALLATION

BR03C-04

Remove and install the parts, as shown





MAIN POINTS OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT BRAKE LINES

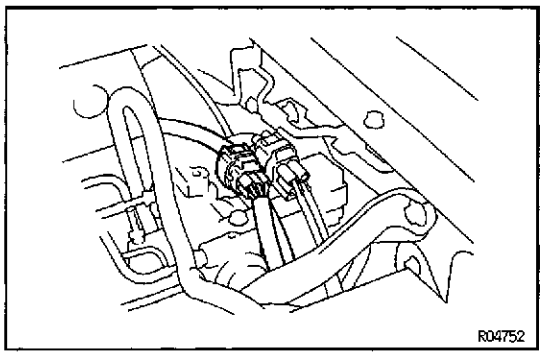
Using SST, disconnect and connect the brake lines from/to the ABS actuator

SST 09023-00100

Torque: 15 N-m (155 kgf-cm, 11 ft-lbf)

2. BLEED BRAKE SYSTEM

(See page BR-8)



ABS ACTUATOR INSPECTION

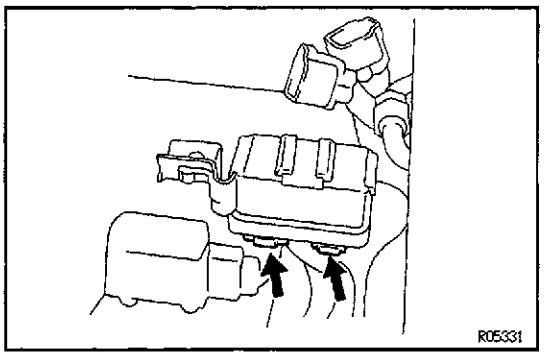
1. INSPECT BATTERY POSITIVE VOLTAGE

Battery positive voltage:

10-14 V

2. DISCONNECT CONNECTORS

(a) Disconnect the connector from the actuator



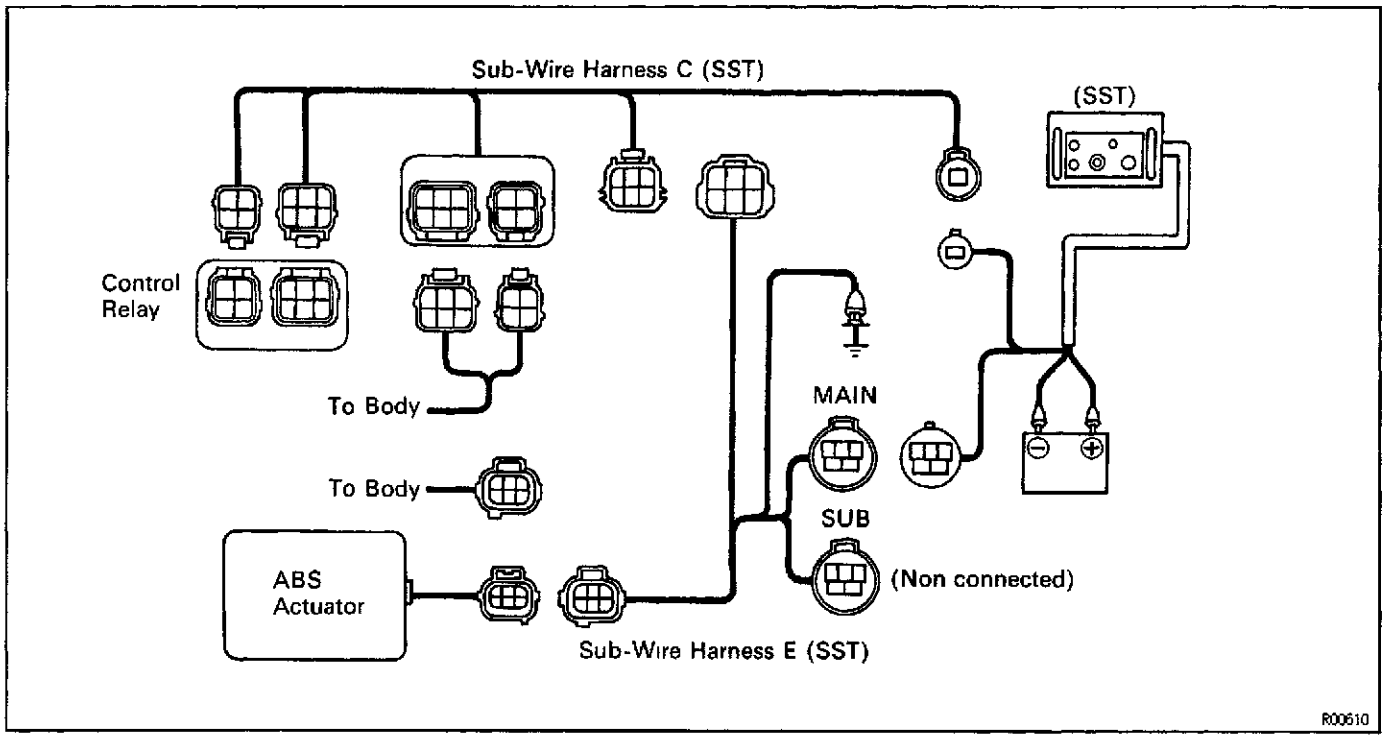
(b) Remove the control relay from the actuator bracket

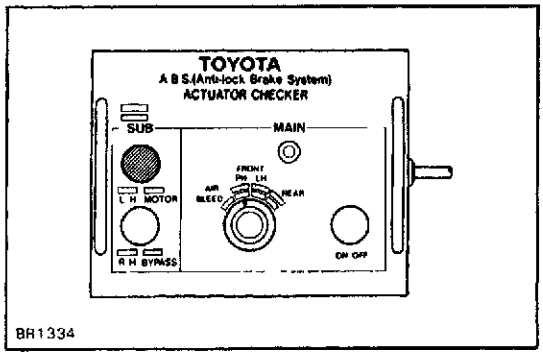
(c) Disconnect the 2 connectors from the control relay

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





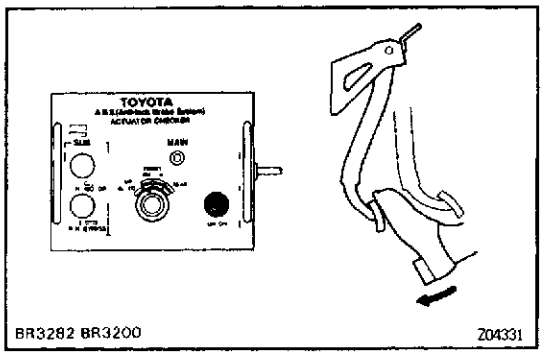
4. INSPECT BRAKE ACTUATOR OPERATION

(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

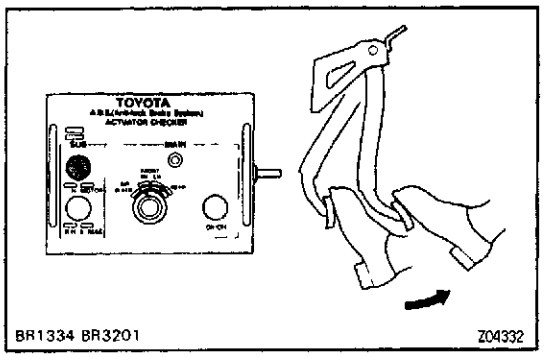
(d) Depress the brake pedal and hold it until the step (g) is completed



(e) Push the POWER SWITCH, and check that the brake pedal does not go down

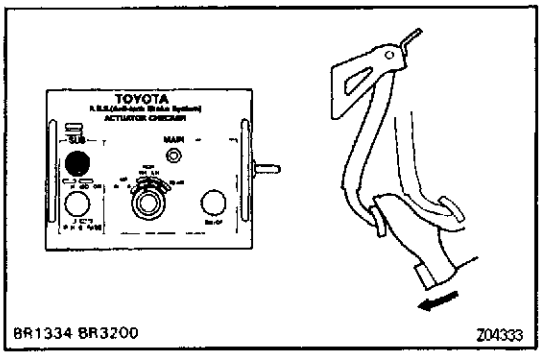
NOTICE: Do not keep the POWER SWITCH pushed down for more than 10 seconds.

(f) Release the switch, and check that the pedal goes down



(g) Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns

(h) Release the brake pedal



(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

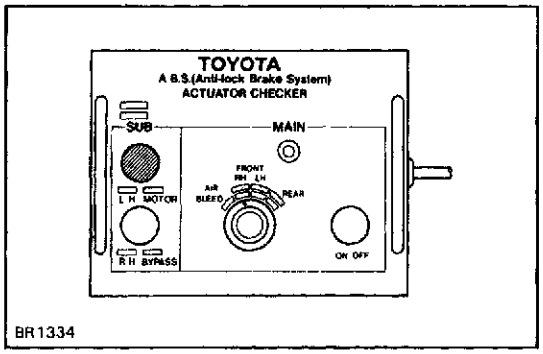
(k) Release the brake pedal

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



BR1334

6. PUSH SUB MOTOR SWITCH

(a) Push and hold in the SUB MOTOR switch for a few seconds

(b) Stop the engine

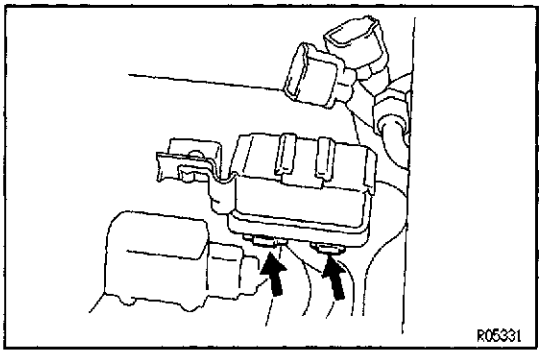
7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

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

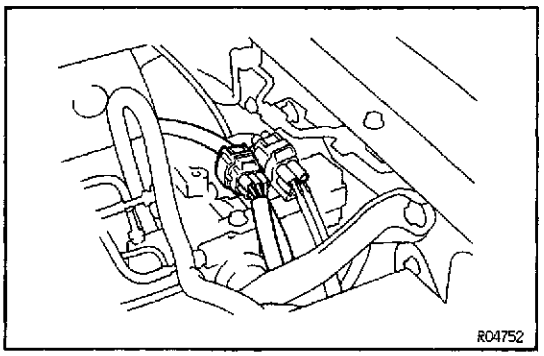
8. CONNECT CONNECTORS

(a) Connect the 2 connectors to the control relay


R05331

(b) Connect the connector to the actuator

(c) Install the control relay to the actuator bracket


R04752

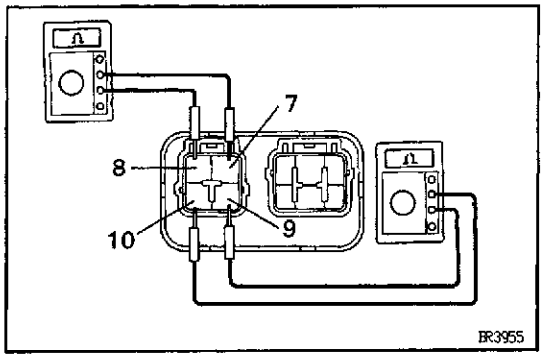
9. CLEAR DIAGNOSTIC TROUBLE CODES

(See page BR-67)

CONTROL RELAY

CONTROL RELAY INSPECTION

BR02Y-08

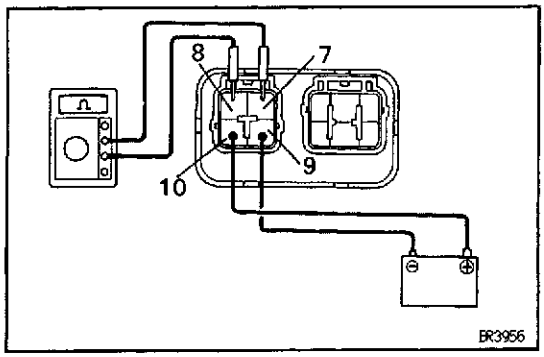


1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT

(a) Check that there is continuity between terminals 9 and 10

(b) Check that there is no continuity between terminals 7 and 8

If continuity is not as specified, replace the relay

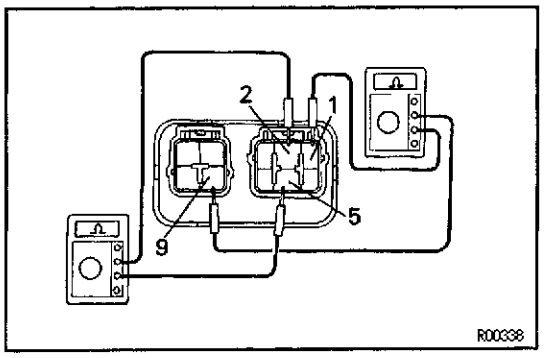


2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT

(a) Connect the positive (+) lead from the battery to terminal 10 and negative (-) lead to terminal 9

(b) Check that there is continuity between terminals 7 and 8

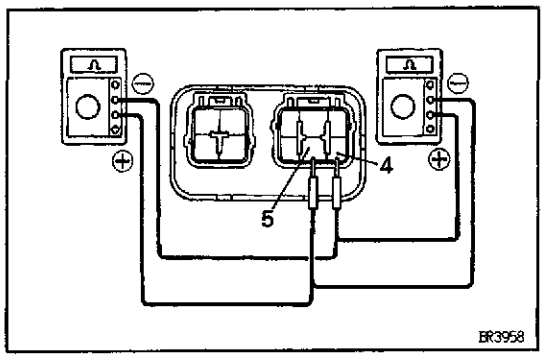
If operation is not as specified, replace the relay



3. INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT

(a) Check that there is continuity between terminals 1 and 9

(b) Check that there is no continuity between terminals 2 and 5



(c) Connect the positive lead from the ohmmeter to terminal 4 and connect negative lead to terminal 5

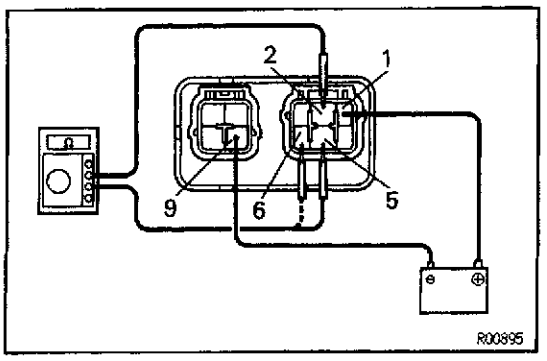
(d) Check that there is continuity between terminals

(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 that there is continuity between terminals 2 and 5

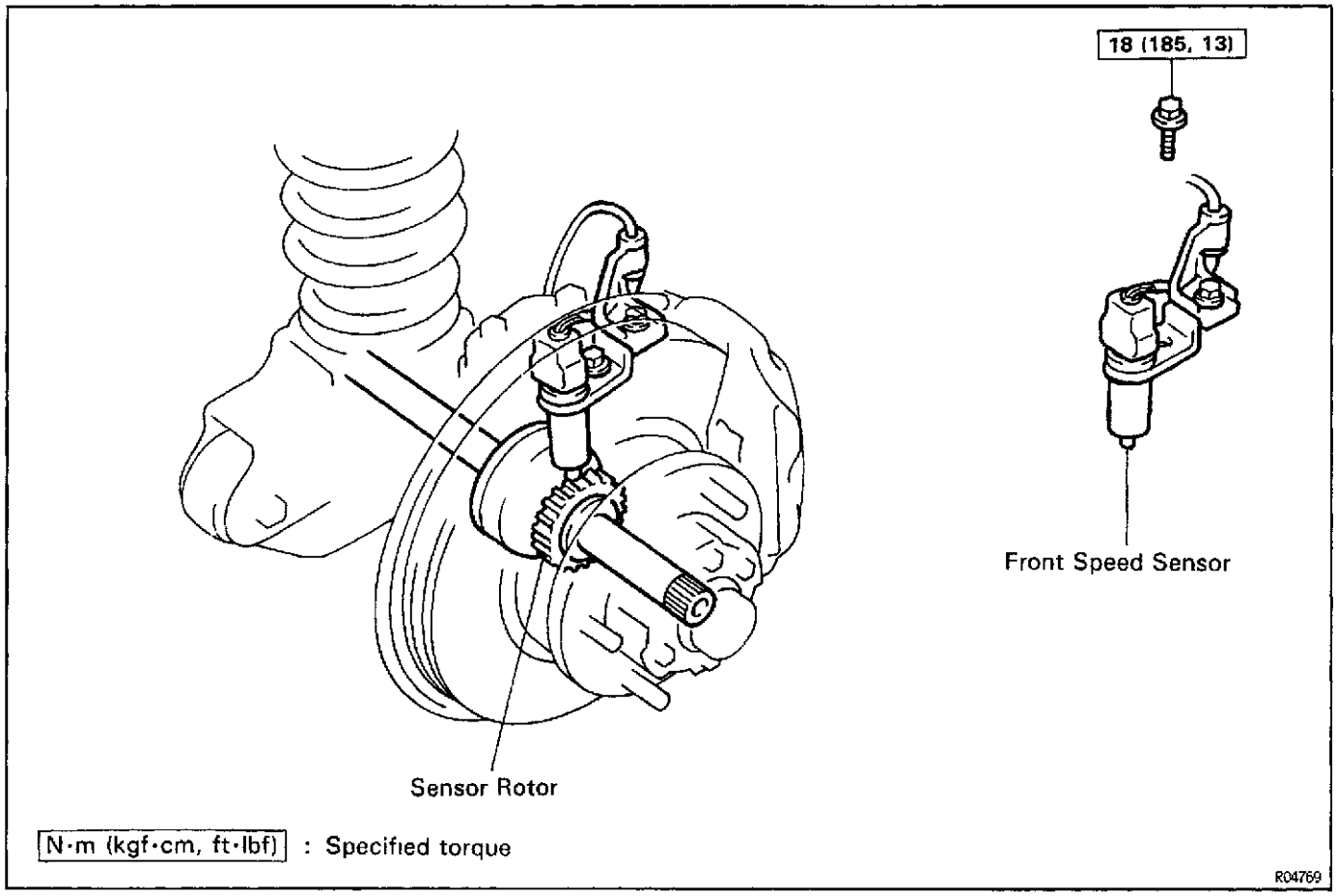
(c) Check that there is no continuity between terminals 2 and 6

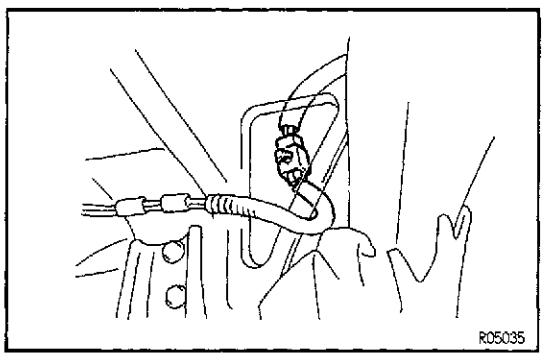
If operation is not as specified, replace the relay

FRONT SPEED SENSOR

BR02Z-07

COMPONENTS

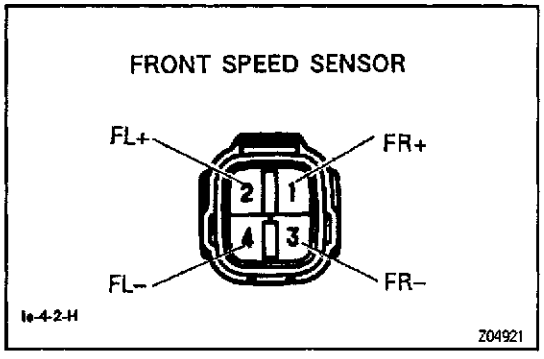




FRONT SPEED SENSOR INSPECTION

1. INSPECT SPEED SENSOR

(a) Disconnect the speed sensor connector

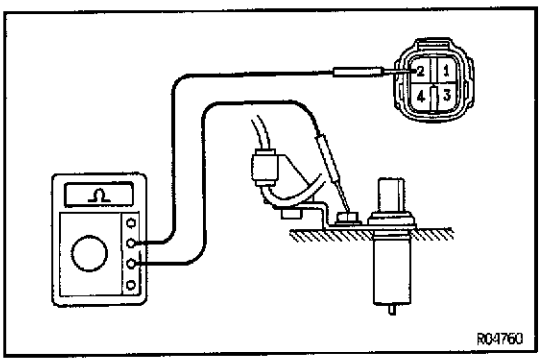


(b) Measure the resistance between terminals FR + and FR-, and FL+ and FL-

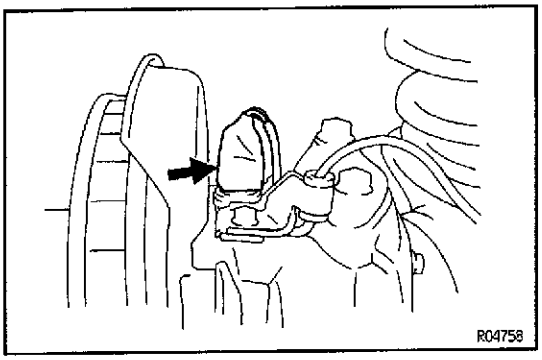
Resistance:

0.87-1.27 kΩ

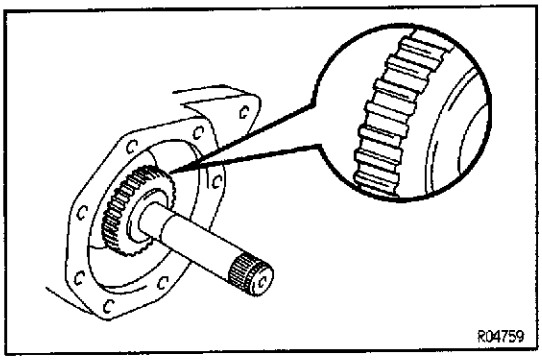
If resistance value is not as specified, replace the sensor



(c) Check that there is no continuity between each terminal and sensor body
If there is continuity, replace the sensor
(d) Connect the speed sensor connector



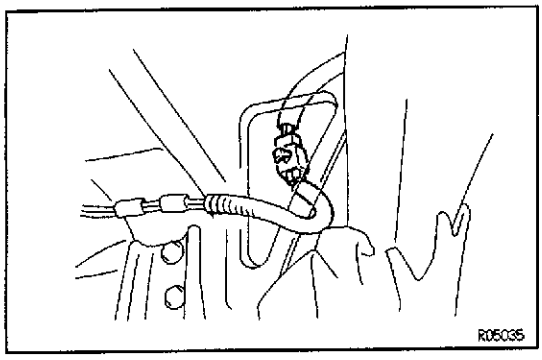
2. INSPECT SENSOR INSTALLATION
Check that the sensor installation bolt is tightened properly If not, tighten the bolt
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS
(a) Remove the axle hub with disc
(See page SA-7)
(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth
(c) Install the axle hub with disc
(See page SA-10)

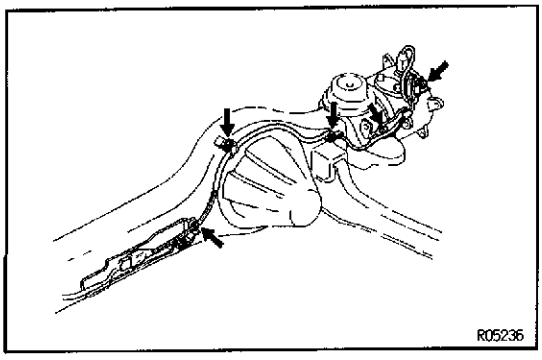
SR0GG-02

FRONT SPEED SENSOR REMOVAL

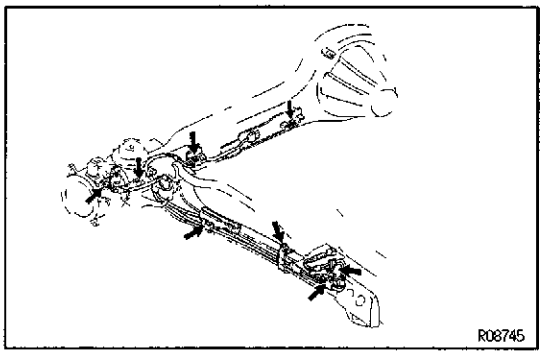


HINT When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set

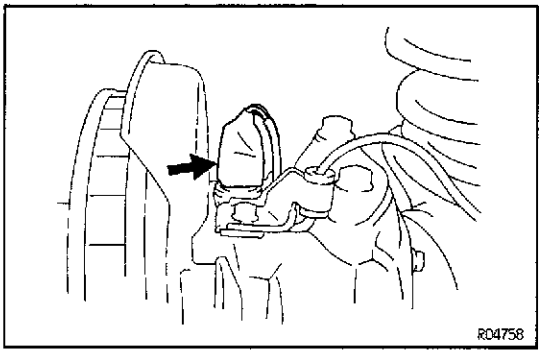
1. DISCONNECT SPEED SENSOR CONNECTOR



2. REMOVE SPEED SENSOR
(a) Remove the 4 clamp bolts holding the sensor harness RH from the axle housing



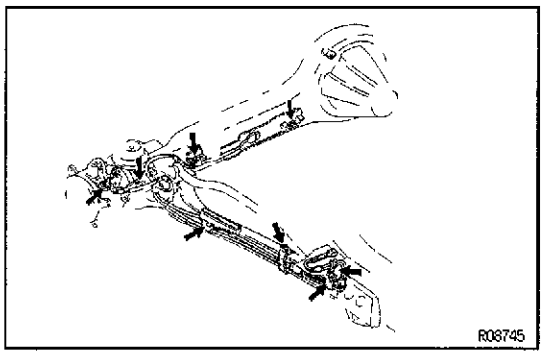
(b) Remove the 8 clamp bolts holding the sensor harness LH from the axle housing and leading arm



(c) Remove the speed sensor LH and RH from the steering knuckle

ROGH-02

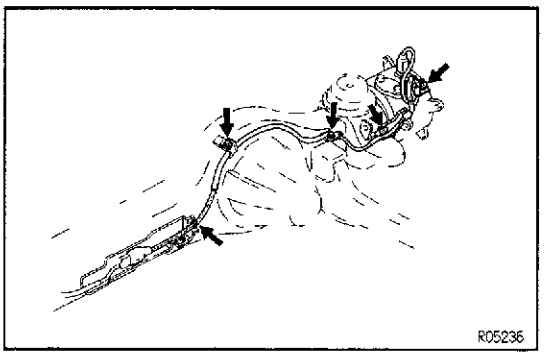
FRONT SPEED SENSOR INSTALLATION



1. INSTALL SPEED SENSOR WIRE HARNESS

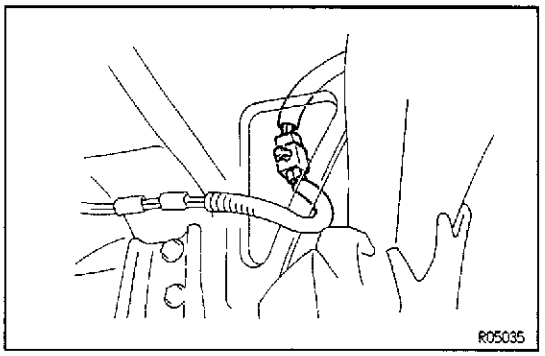
(a) Install the sensor harness LH with the clamps and bolts

Torque: 18 N-m (185 kgf-cm, 13 ftYbf)

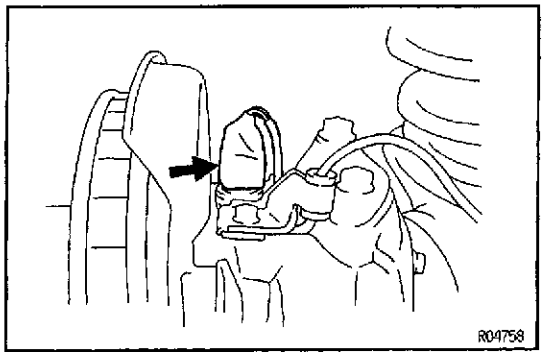


(b) Install the sensor harness RH with the clamps and bolts

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



(c) Connect the speed sensor connector



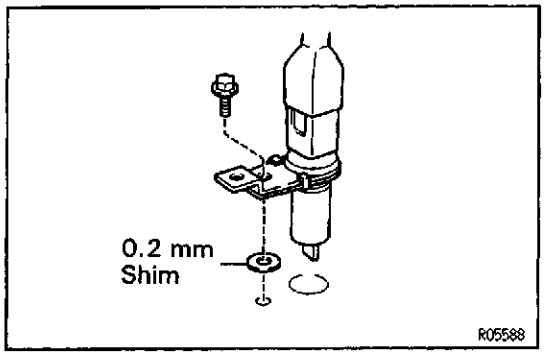
2. INSTALL SPEED SENSOR

HINT When replacing the sensor, adjust the air gap

(a) Install the speed sensor LH and RH to the steering knuckle

Torque: 18 N-m (185 kgf-cm, 73 ft-lbf)

(b) Connect the connector



ADJUST FRONT SPEED SENSOR AIR GAP

FRONT SPEED SENSOR AIR GAP ADJUSTMENT

(a) Install the speed sensor with a 0 2 mm shim to the steering knuckle

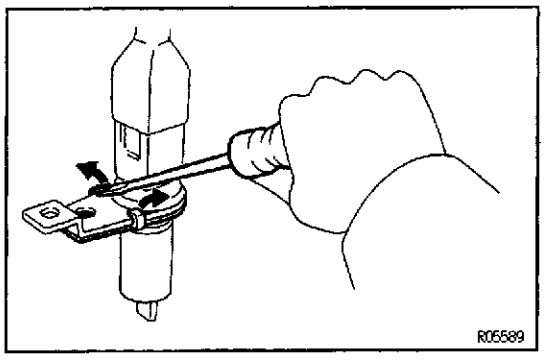
(Reference)

0 2 mm shim 90564-08172 or 90564-09001

(b) Try speed sensor and deceleration sensor diagnosis system

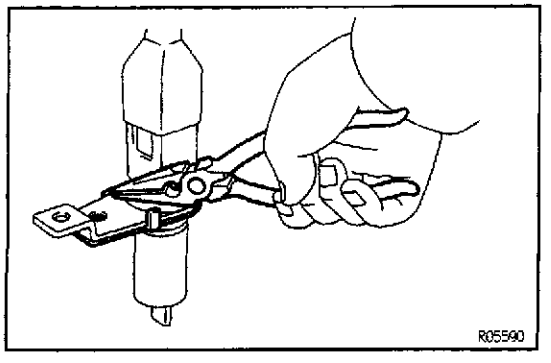
(See page BR-74)

(c) If diagnosis code 71 or 72 is not displayed, remove the 0 2 mm shim and install the speed sensor to the steering knuckle



(d) If diagnosis code 71 or 72 is displayed, replace the original spacer(0 5 mm) installed on the speed sensor with a 0 35 mm spacer

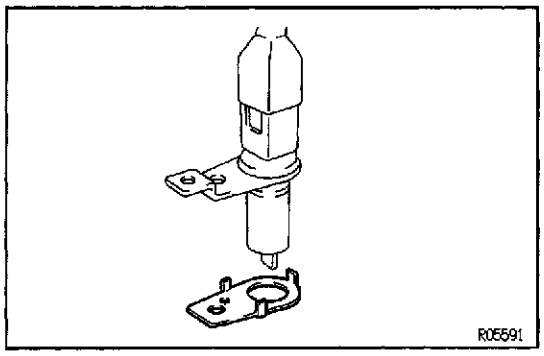
(1) Using a screwdriver, remove the original spacer



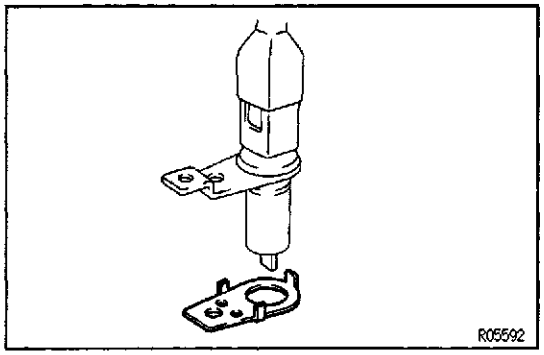
(2) Using needle-nose pliers, install the 0 35 mm spacer

(e) Repeat (a) and (b)

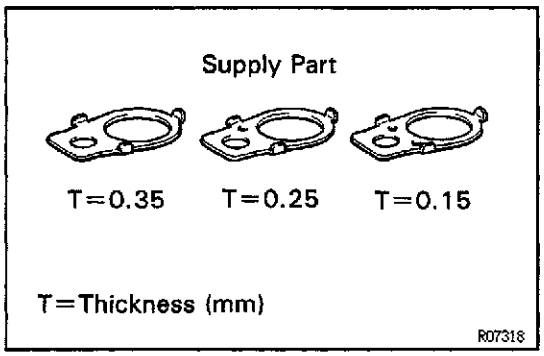
(f) If diagnosis code 71 or 72 is not displayed, remove the 0 2 mm shim and install the speed sensor to the steering knuckle



(g) If diagnosis code 71 or 72 is displayed, replace the 0 35 mm spacer with a 0 25 mm spacer
(h) Repeat (a) and (b)
(i) If diagnosis code 71 or 72 is not displayed, remove the 0 2 mm shim and install the speed sensor to the steering knuckle

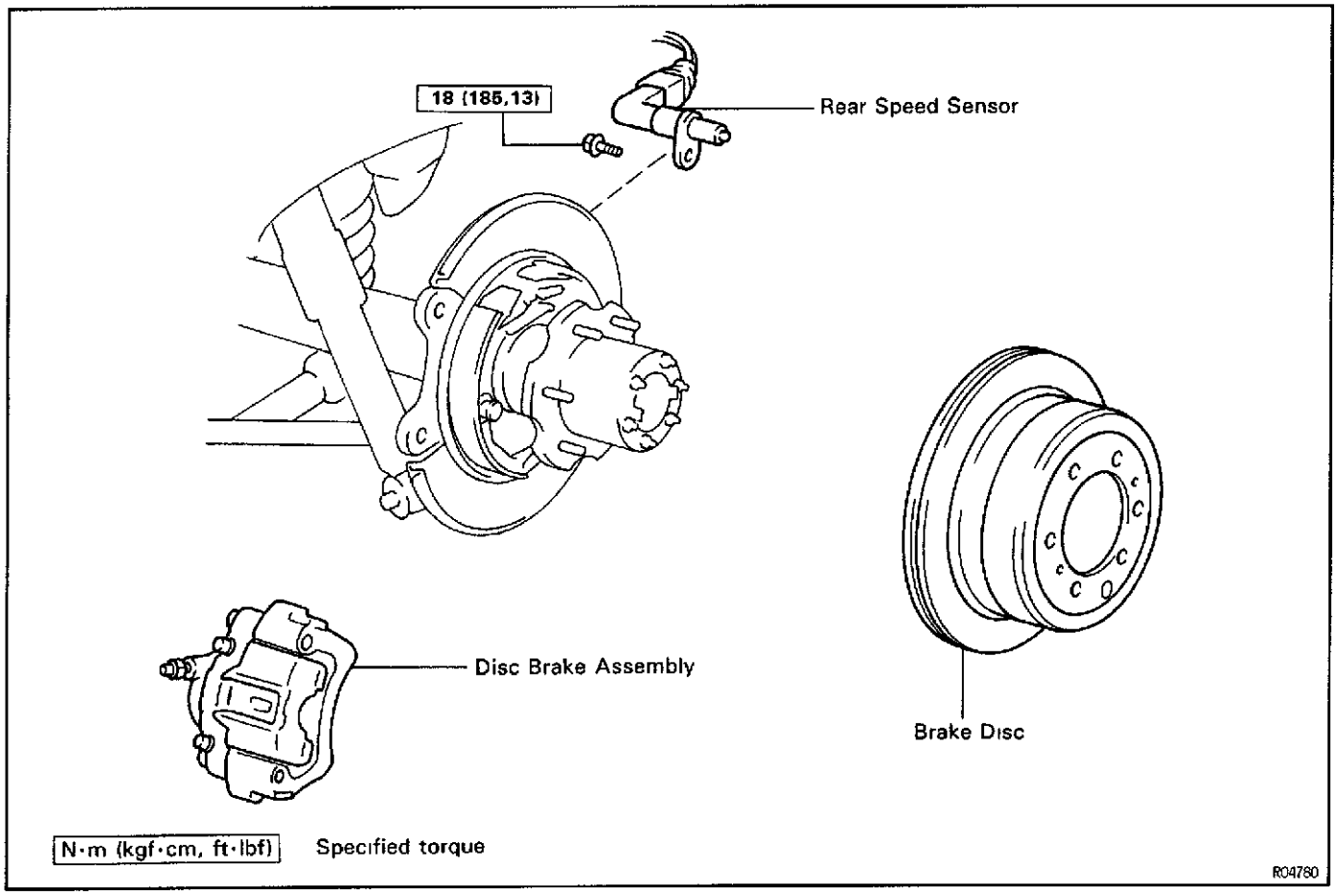


If diagnosis code 71 or 72 is displayed, replace the 0 25 mm spacer with a 0 15 mm spacer and install the speed sensor to the steering knuckle without using the 0 2 mm shim

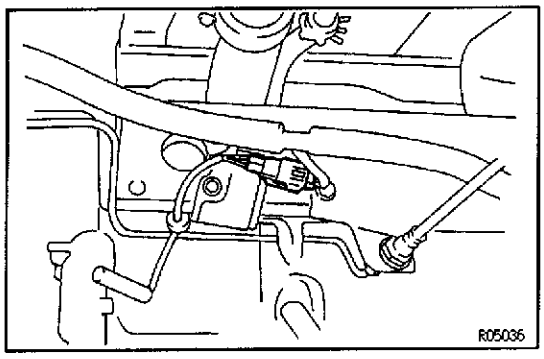


REAR SPEED SENSOR

COMPONENTS

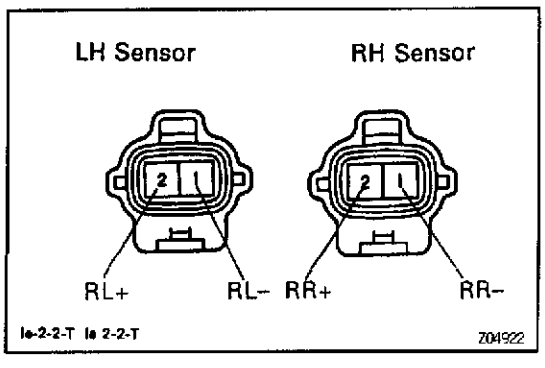


REAR SPEED SENSOR INSPECTION



1 INSPECT SPEED SENSOR

(a) Disconnect the speed sensor connector

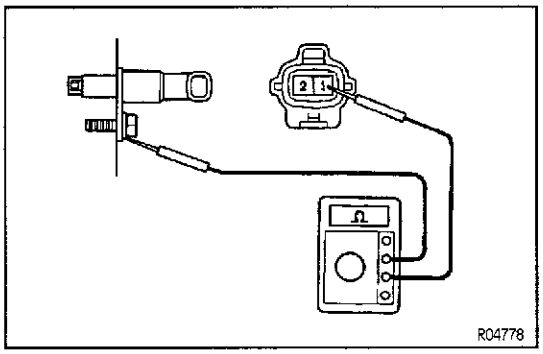


(b) Measure the resistance between terminals

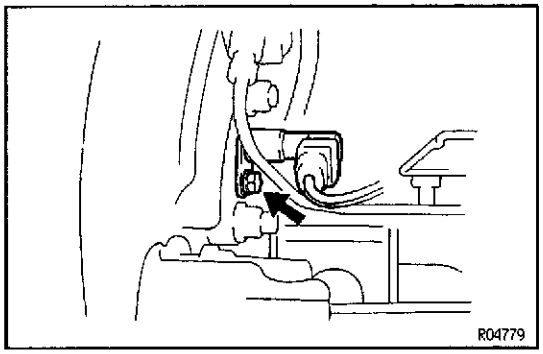
Resistance:

0.7-1.1 kΩ

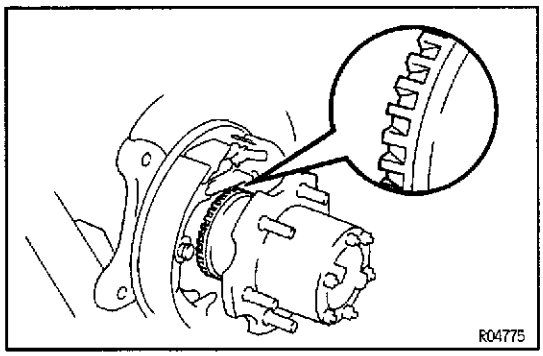
If resistance value is not as specified, replace the sensor



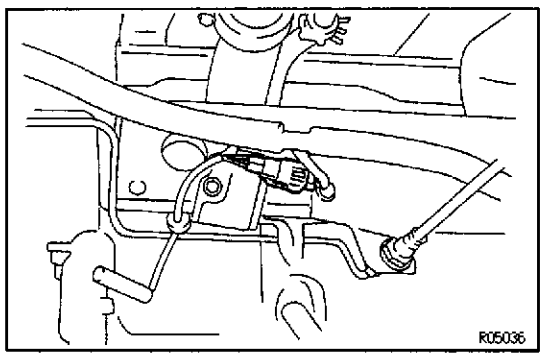
(c) Check that there is no continuity between each terminal and sensor body
If there is continuity, replace the sensor
(d) Connect the speed sensor connector



2. INSPECT SENSOR INSTALLATION
Check that the sensor installation bolt is tightened properly If not, tighten the bolt
Torque: 18 N-m (185 kgf-cm, 13 in.-lbf)



3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS
(a) Remove the brake disc
(See page BR-44)
(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth
(c) Install the brake disc
(See page BR-52)
NOTICE: To prevent damage to the serrations, do not strike the axle hub.

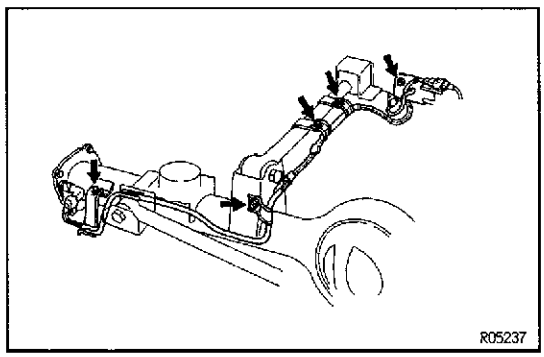


BR037-09

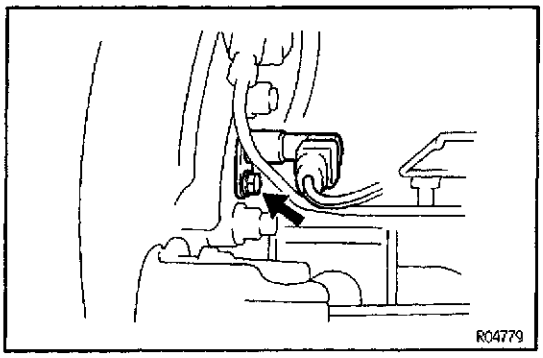
REAR SPEED SENSOR REMOVAL

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

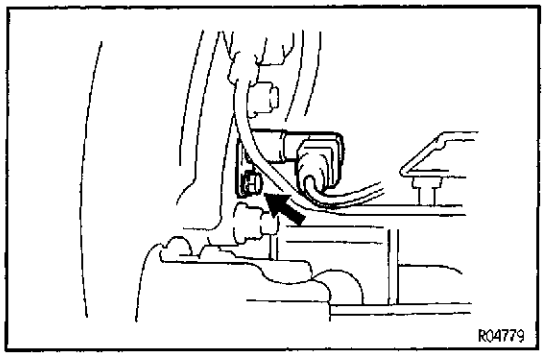


(b) Remove the 5 clamp bolts holding the sensor wire harness from the suspension arm and frame



2. REMOVE SPEED SENSOR

Remove the speed sensor from the axle end

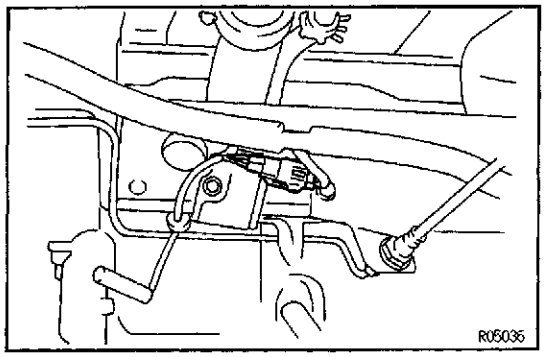


REAR SPEED SENSOR INSTALLATION

1. INSTALL SPEED SENSOR

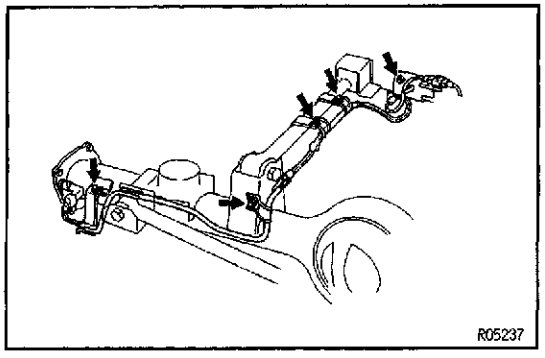
Install the speed sensor to the axle end

Torque: 18 N-m (185 kgf-cm. 13 ft-lbf)



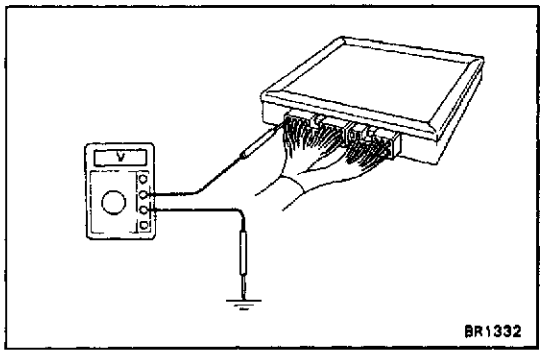
2. INSTALL SPEED SENSOR WIRE HARNESS

(a) Connect the speed sensor connector



(b) Install the sensor harness with the clamps and bolts

3. INSPECT SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM



ANTI-LOCK BRAKE SYSTEM CIRCUIT

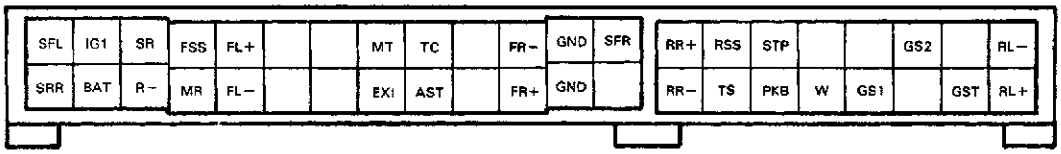
SYSTEM CIRCUIT INSPECTION

1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

BRGGL-01

(a) Remove the ABS ECU

(b) Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal and body ground



R01275

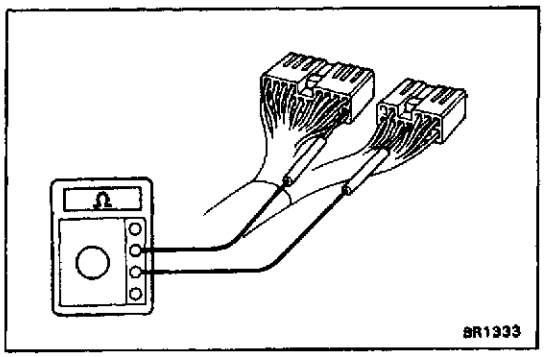
Tester Connection	Check Item	Condition	Specified Value	Trouble Part
RL-	Continuity	IG switch off	Continuity	ABS ECU
GS2	Voltage	IG switch on	4 ~ 6V	Deceleration Sensor
STP	Voltage	IG switch off and brake pedal depressed	10 ~ 14V	Stop light switch Stop light
		IG switch off and brake pedal returned	Below 1 5 V	
RSS	Continuity	IG switch off	Continuity	ABS ECU
GS 1	Voltage	IG switch on	4 ~ 6V or 7 ~ 12V	Deceleration Sensor
W	Voltage	IG switch on and ABS warning light goes on	About 0 V	ABS ECU ABS warning light
		IG switch on and ABS warning light goes off	10 ~ 14 V	
PKB	Voltage	IG switch on and PKB lever pulled	Below 1 5 V	Parking brake switch Level warning switch
		IG switch on and PKB lever returned	10 ~ 14 V	
TS	Voltage	IG switch on and data link connector 1 Ts - E connected	Below 1 0 V	ABS ECU
RR-	Continuity	IG switch off	Continuity	
SFR	Voltage	IG switch on and ABS warning light goes on	About 0 V	Actuator
		IG switch on and ABS warning light goes off	10 ~ 14 V	
GND	Continuity	IG switch off	Continuity	Wiring harness
FR-	Continuity	IG switch off	Continuity	ABS ECU
TC	Voltage	IG switch on and data link connector 1 Tc - E_1 not connected	10 ~ 14 V	
		IG switch on and data link connector 1 Tc - E_1 connected	About 0 V	
FSS	Continuity	IG switch off	Continuity	
SR	Voltage	IG switch on and ABS warning light goes on	About 0 V	
		IG switch on and ABS warning light goes off	10 ~ 14 V	
IG1	Voltage	IG switch on	10 ~14 V	ECU-IG Fuse

V02255

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
SFL	Voltage	IG switch on and ABS warning light goes on	About 0 V	Actuator
		1G switch on and ABS warning light goes off	10 ~ 14 V	
AST	Voltage	IG switch on and ABS warning light goes on	About 0 V	
		IG switch on and ABS warning light goes off	10 ~ 14V	
EXi	Voltage	IG switch on and center differential lock indicator light goes off	10 ~ 14 v	GAUGE Fuse
FL-	Continuity	IG switch off	Continuity	ABS ECU
R-	Continuity	IG switch off	Continuity	
BAT	Voltage	IG switch off	10 ~ 14 V	DOME Fuse
SRR	Voltage	IG switch on and ABS warning light goes on	About 0 V	Actuator
		IG switch on and A6S warning light goes off	10 ~ 14 V	

V02253

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above



2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

(a) Disconnect the connectors from the ECU, inspect at the wire harness side connector

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
RR+↔RR-	Resistance	*0 7 ~ 1 1 kO	RH rear speed sensor	SFL↔AST	Resistance	*About 6 0	Actuator
RL+↔RL-	Resistance	*0 7 ~ 1 1 kΩ	LH rear speed sensor	FR+↔FR-	Resistance	*o0 87 ^- 1.27 kΩ	RH front speed sensor
SFR↔AST	Resistance	*About 6 0	Actuator	AST↔ Body ground	Resistance	*About 5 0	Actuator
MT↔ Body ground	Continuity	Continuity	Actuator	MR↔R-	Resistance	*55 8 -68 29	Control relay
FL+↔FL-	Resistance	*0 87 ~ 1.27 kΩ	LH front speed sensor	SRR↔AST	Resistance	*About 6 0	Actuator
SR↔R-	Resistance	*60 ~ 100Ω	Control relay				

* 20°C(68°F)

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above

V02254

(b) Connect the connectors, and install the ECU in place

SERVICE SPECIFICATIONS

BR03A-GJ

SERVICE DATA

Brake pedal height from asphalt sheet (LHD)		167 5 - 177 5 mm (6 59 - 6 99 in)
Brake pedal freeplay		1 - 6 mm (0 04 - 0 24 in)
Brake pedal reserve distance at 490 N (50 kgf 110 2 lbf)		More than 59 mm (2 32 in)
Brake booster push rod to piston clearance (W/ SST)		0 mm (0 in)
Front brake pad thickness	STD	9 5 mm (0 374 in)
Front brake pad thickness	Limit	4 0 mm (0 157 in)
Front brake disc thickness	STD	32 mm (1 260 in)
Front brake disc thickness	Limit	30 mm (1 181 in)
Front brake disc runout	Limit	0 15 mm (0 0059 in)
Rear brake drum inside diameter	STD	295 0 mm (11 614 in)
Rear brake drum inside diameter	Limit	297 0 mm (11 693 in)
Rear brake drum lining thickness	STD	6 5 mm (0 265 in)
Rear brake drum lining thickness	Limit	1 5 mm (0 059 in)
Rear brake drum to shoe clearance		0 6 mm (0 024 in)
Rear brake disc pad thickness	STD	9 0 mm (0 354 in)
Rear brake disc pad thickness	Limit	1 0 mm (0 039 in)
Rear brake disc thickness	STD	18 0 mm (0 709 in)
Rear brake disc thickness	Limit	16 0 mm (0 630 in)
Rear brake disc runout	Limit	0 15 mm (0 0059 in)
Rear brake disc inside diameter	STD	210 mm (8 27 in)
Rear brake disc inside diameter	Limit	211 mm (8 31 in)
Parking brake lining thickness	STD	4 0 mm (0 157 in)
Parking brake lining thickness	Limit	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 0 12 in)
Parking brake adjusting shim thickness for rear disc brake		0 3 mm (0 012 in) 0 6 mm (0 024 in) 0 9 mm (0 035 in)

TORQUE SPECIFICATIONS

BR03B-00

Part tightened	N-m	kgf-cm	ft-lbf
Master cylinder x Piston stopper bolts	**10**	100	**7**
Master cylinder x Reservoir	**1.7**	17 5	15 2 in lbf
Master cylinder x Brake booster	**13**	130	**9**
Brake tube 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 cylinder installation bolt	123	1 250	**90**
Front disc brake cylinder x Flexible hose	**30**	310	**22**
Rear drum brake wheel cylinder x Backing plate	**10**	100	**7**
Parking brake bellcrank x Backing plate	**13**	130	**9**
Rear disc brake cylinder installation bolt	**88**	900	**65**
Rear disc brake cylinder x Flexible hose	**30**	310	**22**
Rear disc brake torque plate x knuckle	103	1 050	**76**
LSP & BV Bracket x Frame	**19**	195	**14**
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 bracket x Body	**19**	195	**14**
Front speed sensor installation bolt	**18**	185	**13**
Rear speed sensor installation bolt	**18**	185	**13**

ENGINE

ENGINE MECHANICAL

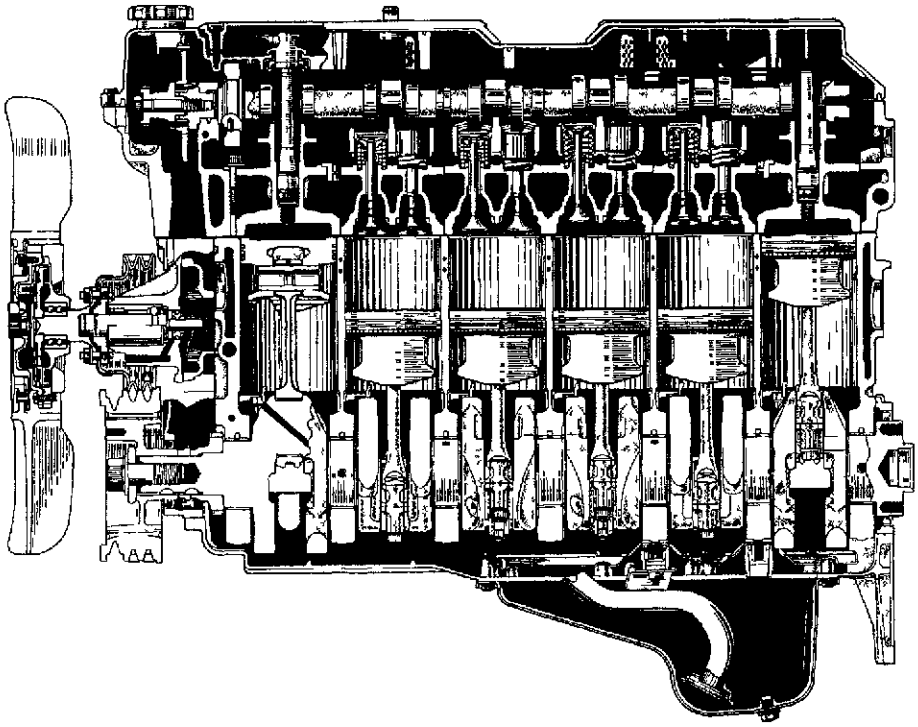
DESCRIPTION

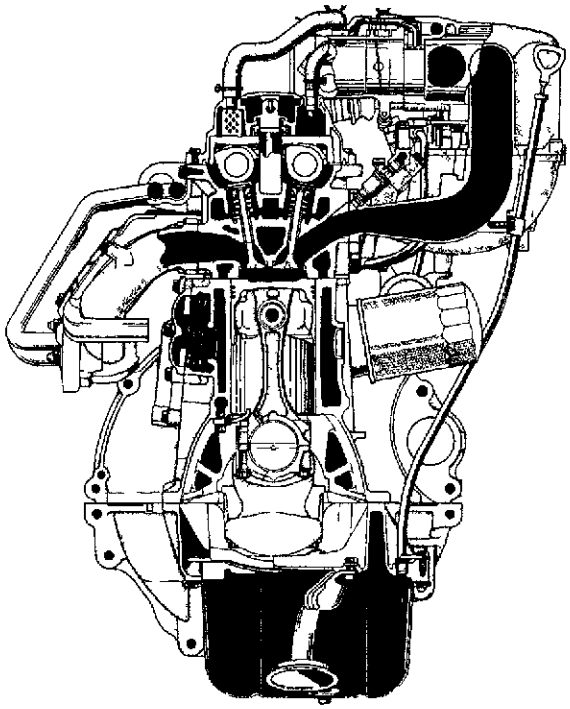
The 1 FZ-FE engine is an in-line, 6-cylinder, 4 5 liter DOHC 24 valve engine

EG1JL 01

OPERATION

EG1JM 01





P09065
P09064

Z04276

The 1 FZ-FE engıne ıs an ın-lıne, 6-cylınder engıne wıth the cylınders numbered 1-2-3-4-5-6 from the front of the vebıde The crankshaft ıs supported by 7 bearıngs ınsıde the crankcase These bearıngs are made of aluminum alloy

The crankshaft ıs ıntegrated wıth 12 weıghts for balance Oıl holes are provıded ın the crankshaft to supply oıl to the connectıng rods, bearıng, pıstons and other components

The fırıng order ıs 1-5-3-6-2-4 The cylınder head ıs made of aluminum alloy, wıth a cross flow type ıntake and exhaust layout and wıth pent-roof type combustıon chambers The spark plugs are located ın the center of the combustıon chambers

Exhaust and ıntake valves are equıpped wıth ırregular pıtch sprıngs made of specıal valve sprıng carbon steel whıch are capable of followıng for the full range of engıne speeds

The ıntake camshaft ıs drıven by a tımıng chaın, and a gear on the ıntake camshaft engages wıth a gear on the exhaust camshaft to drıve ıt The cam journal ıs supported at 7 places between the valve lıfters of each cylınder and on the front end of the cylınder head Lubrıcatıon of the cam journals and gears ıs accomplıshed by oıl beıng supplıed through the oıler port ın the center of the camshaft

Valve adjustıng shıms are located above the valve lıfters

Pıstons are made of hıgh temperature-resıstant aluminum alloy, and a depressıon ıs built ınto the pıston head to prevent ınterference wıth the valves

Pıston pıns are the full-floatıng type, wıth the pıns fastened to neıther the pıston boss nor the connectıng rods Instead, snap rıngs are fıtted on both ends of the pıns, preventıng the pıns from fallıng out

The No 1 compressıon rıng ıs made of srainless steel and the No 2 compressıon rıng ıs made of cast ıron The oıl rıng ıs also made of stainless steel The outer dıameter of each pıston rıng ıs slıghtly larger than the dıameter of the pıston and the flexıbılıty of the rıngs allows them to hug the cylınder walls when they are mounted on the pıston No 1 and No 2 compressıon rıngs work to prevent gas leakage from the cylınder and the oıl rıng works to scrape oıl off the cylınder walls to prevent ıt from enterıng the combustıon chambers

The cylınder block ıs made of cast ıron It has 6 cylınders whıch are approxımately twıce the length of the pıston stroke The top of each cylınder ıs closed off by the cylınder head and the lower end of the cylınders becomes the crankcase, ın whıch the crankshaft ıs ınstalled In addıtıon, the cylınder block contaıns a water jacket, through whıch coolant ıs pumped to cool the the cylınders

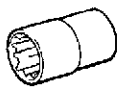
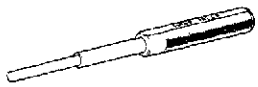
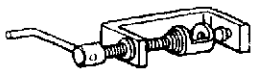
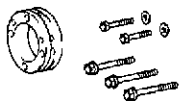
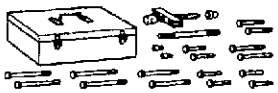
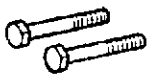
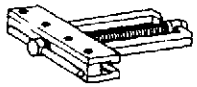
No 1 and No 2 oıl pans are bolted onto the bottom of the cylınder block The No 1 oıl pan ıs an oıl reservoır made of aluminum alloy The No 2 oıl pan ıs an oıl reservoır made of pressed sheet steel A dıvıdıng plate ıs ıncluded ınsıde the oıl pan to keep sufficıent oıl ın the bottom of the pan even when the vehıcle ıs tılted Thıs dıvıdıng plate also prevents the oıl from makıng waves when the vehıcle ıs stopped suddenly and the oıl shıfts away from the oıl pump suctıon pıpe

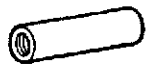
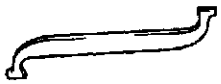
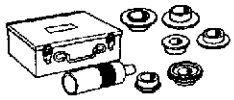
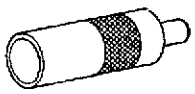
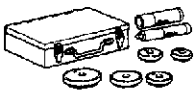
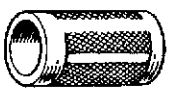
Plastıc regıon tıghtenıng bolts are used for the cylınder head, maın bearıng caps and connectıng rods

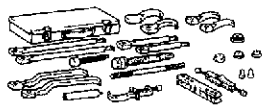
PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG0AY-06

	09011-38121 12 mm Socket Wrench for 12 Pointed Head	Cylinder head bolt
	09032-00100 Oil Pan Seal Cutter	
	09201-15010 Valve Stem Guide Remover & Replacer	
	09202-70010 Valve Spring Compressor	
	09213-58012 Crankshaft Pulley Hoolding Tool	
	09213-60017 Crankshaft Pulley & Gear Puller Set	
	(09213-00020) Body With Bolt	
	(09213-00030) Handle	
	(09213-00060) Bolt set	
	09213 -36020 Timing Gear Remover	
	09223-15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09228-44011 Oil Filter Wrench	
	0923-00101 Water Pump Overhaul Tool Set	

 (09236-15010) Bearing Stay	Valve stem oil seal
09248-66011 Valve Clearance Adjust Tool Set	
(0924$-05310) Valve Lifter Press	
 (09248 -06020) Valve Lifter Stopper	
 09316-60010 Transmission & Transfer Bearing Replacer	
 (09316-00010) Replacer Pipe	Crankshaft front oil seal
(09316-00050) Replacer D	Crankshaft front oil seal
09330-00021 Companion Flange Holding Tool	Crankshaft pulley
 09608-30012 Front Hub & Drive Pinion Bearing Tool Set	
(09608-04020) Handle	Crankshaft rear oil seal Spark plug tube gasket
(09608-04060) Front Hub Outer Bearing Cup Replacer	Spark plug tube gasket
09631-20031 Oil Seal B Remover	Connecting rod bushing
 09636-20010 Upper Ball Joint Dust Cover Replacer	Crankshaft timing gear
09816-30010 Oil Pressure Switch Socket	Knock sensor

	09950-20017 Universal Puller	

RECOMMENDED TOOLS

EG0AZ-07

	09200-00010 Engine Adjust Kit	
	09258-00030 Hose Plug Set	Plug for the vacuum hose fuel hose etc

EQUIPMENT

EG0B0-01

Battery specific gravity gauge	
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune-up tester	
Heater	
Magnetic finger	
Micrometer	
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	

SSM (SPECIAL SERVICE MATERIALS)

08826-00080 Seal packing or equivalent	Over the space between the cylinder block and timing chain case Timing chain cover
08826-00080 Seal packing or equivalent	Semi-circular plug Oil pan Rear oil sear retainer
08833-00070 Adhesive 1311 THREE BOND 1311 or equivalent	Plug tube
08833-00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	TVV

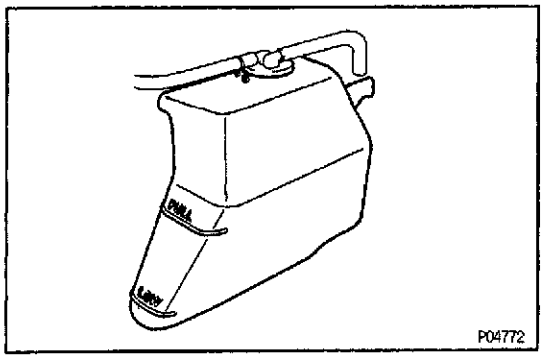
TROUBLESHOOTING

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

	See page	IG-5	IG-5	EG-315	EG-243	EG-242	EG-240	EG-238	EG-242	I	I	I	EG-252	EG-263	EG-277	EG-266	EG-307
	Suspect area	RPM Signal Circuit	Ignition Circuit	Heated Oxygen Sensor Circuit	ECT Sensor Circuit	Intake Air Temp Sensor Circuit	Volume Air Flow Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Switch Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Fuel Pressure Control VSV Circuit
	Symptom																
Dose not start	Engine does not crank																
	Starter runs - engine does not crank																
	No initial combustion	12	2				5						6				
	No complete combustion				5		2							4		10	
Difficult to start	Engine cranks slowly											2					
	Under normal condition	13	14		5	15							8	7	9	17	
	Cold engine				1	6			2				8	7	9	10	
	Hot engine				1	6							8	7	9	10	5
Poor idling	Incorrect first idle				2												
	High engine idle speed				2	4		5			7	6				8	
	Low engine idle speed				1		4									5	
	Rough idling		18		3		13						8	7	9	17	
	Misfire		5		7		9									10	
Poor drivability	Hesitation Poor acceleration			12	10	11	9	8					14	13	15	18	
	Backfire			7	4	8	6	5					10	9	11	12	
	Muffler explosion (after fire)			8	3	7	5	6						4		9	
	Surging													2		5	
	Knocking									1							
Engine stall	Soon after starting				9		8						4	3	5	10	
	After accelerator pedal depressed						1	3						5	6	7	
	After accelerator pedal released						3										
	During AM operation											1					
	When N to D shift										1						
Others	Poor fuel economy			19	14	20	16	15			17	18				12	13
	Engine overheat									9							
	Engine overcool																
	Excessive oil consumption																
	Low oil pressure																
	High oil pressure																
	Starter keeps running																
	Battery often discharges																

EG-294	EG-297	EG-298	EG-321	EG-317	–	–	–	–	–	AX-	ST-1	IG-12	IG-17	EG-184	–	–	EG-351	EG-127	EG-14	EG-73
IAC Valve	EFI Main Relay	Circuit Opening Relay	Fuel Cut System	EMC	**Fuel Quality**	Fuel Leakage	Coolant Leakage	Vacuum Leakage	**Oil Leakage**	Park/Neutral Position Switch	Starter	**Spark Plug**	EGR System	EGR System	Accelerator Pedal Link	Brakes Drag Even when Released	Cooling Fan System	Compression	Valve Clearance	Valve Timing
										2	1									
											1									
8	3	4		13	7								1					9		10
3									1									6		8
											1									
4				18	2				1			3	16	6				10		12
5				11	4				3											
4				11	3				2											
3				4											1					
3				9											1					
2				6										3						
10				19	2				1			5	6	4				11	14	15
				11	2				1			4	6	3				8		
				19	3				1			5	6	4		2		7	16	17
				13					1					2						3
			1	10																2
				6					1			3	4							
				10	2							3		4			7			5
7				11	2				1					6						
				8								4		2						
1				4										2						
2				3																
2				3																
			6	2	2	1						7	8	5	3	4		9		11
							1					8					2			7
																	1			
								1										3		
								1												
											2									

Symptom \ Suspect area		Timing Chain	Water Pump	Valve Stem Guide Bushing	Oil Pump	Connecting Rod Bearing	Crankshaft gearing	Cylinder Head	Piston Ring	Drive Plate	Radiator and Radiator Cap	Thermostat	Drive Belt	ECT Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block
	See page	EG-87	EG-332	EG-53	E G-357	EG-122	EG-125	E G-51	EG-134	–	E G-337	EG-354	CH-5	BE-53	BE-51	CH-1	EG-130
Dose not start	Engine does not crank																
	Starter runs - engine does not crank									2							
	No initial combustion	11															
	No complete combustion	9							7								
Difficult to start	Engine cranks slowly					3	4										
	Under normal condition								11								
	Cold engine																
	Hot engine																
Poor idling	Incorrect first idle																
	High engine idle speed																
	Low engine idle speed																
	Rough idling	16						20	12								
	Misfire																
Poor drivability	Hesitation Poor acceleration																
	Backfire																
	Muffler explosion (after fire)																
	Surging																
	Knocking		9								6	8					
Engine stall	Soon after starting																
	After accelerator pedal depressed																
	After accelerat6r pedal released																
	During A/C operation																
	When N to D shift																
Others	Poor fuel economy								10								
	Engine overheat	5	6		10			11			3	4		13			12
	Engine overcool											2		3			
	Excessive oil consumption			2				5	4								6
	Low oil pressure				2	3	4								5		
	High oil pressure				1										2		
	Starter keeps running																
	Battery often discharges												1			2	



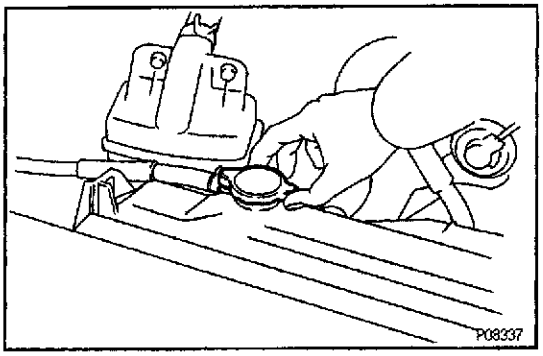
TUNE-UP

ENGINE COOLANT INSPECTION

EQ1JN-01

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

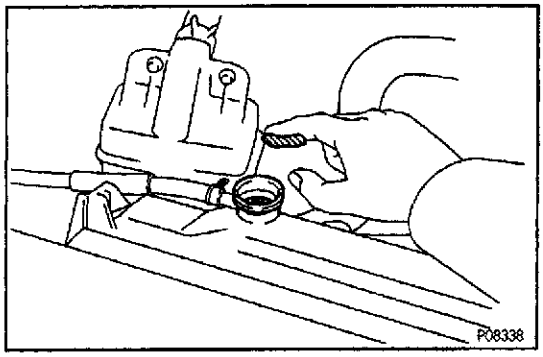
The coolant level should be between the "LOW" and "FULL" lines at low temperature If low, check for leaks and add coolant up to the "FULL" line



2. CHECK ENGINE COOLANT QUALITY

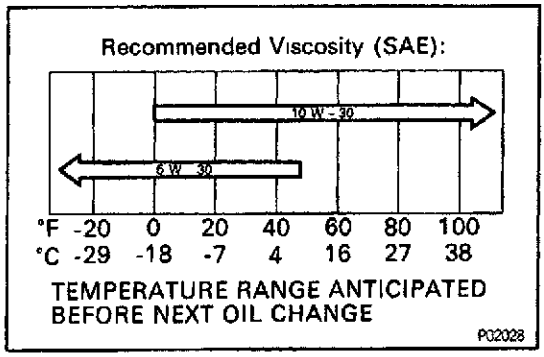
(a) Remove the radiator cap

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 scales 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



ENGINE OIL INSPECTION

EQ0B4-0F

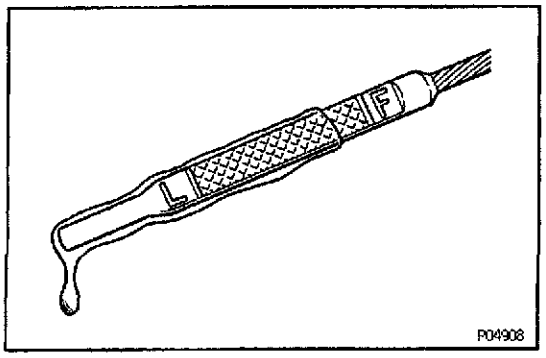
1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning

If oil quality is visibly poor, replace it

Oil grade:

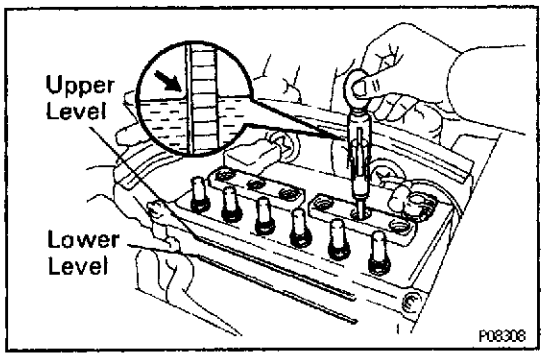
API grade SG or SH, Energy -Conserving II or ILSAC multigrade engine oil. Recommended viscosity is as shown in the illustration.

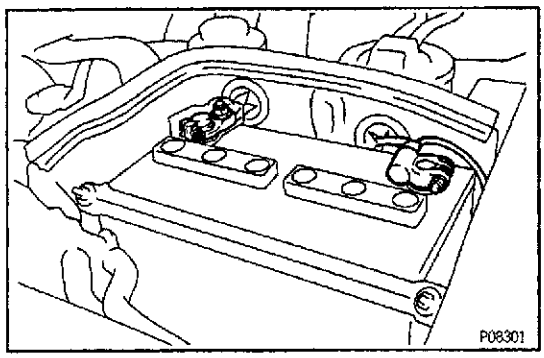


2. CHECK ENGINE OIL LEVEL

The oil level should be between the "L" and "F" marks on the dipstick

If low, check for leakage and add oil up to the "F" mark





EG0V1-02

BATTERY INSPECTION

1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell
If insufficient, refill with distilled (or purified) water

(b) Check the specific gravity of each cell

Standard specific gravity at 20°C (68°F):

1.27 - 1.29 for 105D31 L Battery

1.25 - 1.27 for 75D31 L Battery

If not within specifications, charge the battery

2. CHECK BATTERY TERMINALS, FUSIBLE LINKS AND FUSES

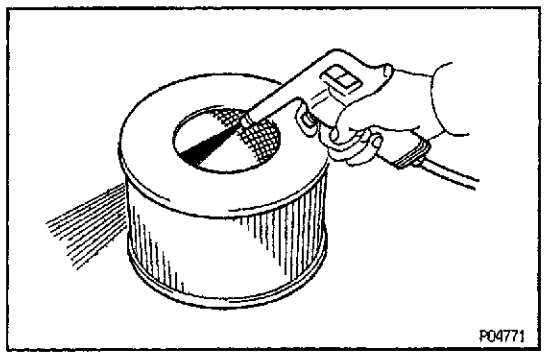
(a) Check that the battery terminals are not loose or corroded

(b) Check the fusible links and fuses for continuity

AIR FILTER INSPECTION AND CLEANING

1. REMOVE AIR FILTER

Remove the air cleaner cap and air filter

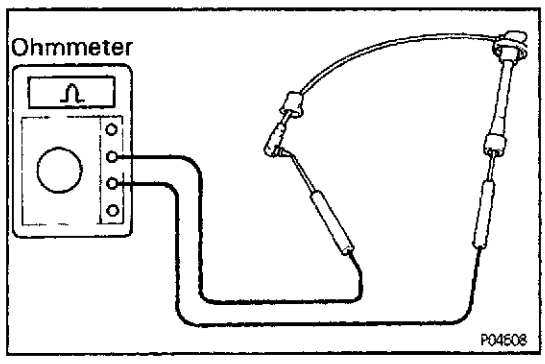


2. INSPECT AND CLEAN AIR FILTER

(a) Visually check that the air filter is not excessively damaged or oily
If necessary, replace the air filter

(b) Clean the air filter with compressed air
First blow from the inside thoroughly, then blow the outside of the air filter

3. REINSTALL AIR FILTER



EG087-02

HIGH-TENSION CORDS INSPECTION

(See IG section)

Maximum resistance:

25 kΩ per cord

SPARK PLUGS INSPECTION

(See IG section)

Recommended spark plug:

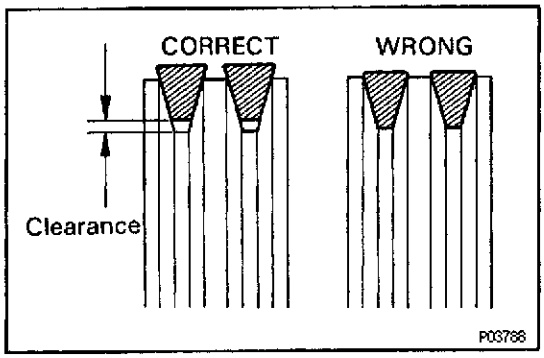
K16R-U for ND

BKR5EYA for NGK

Correct electrode gap:

0.8 mm (0.031 in.)

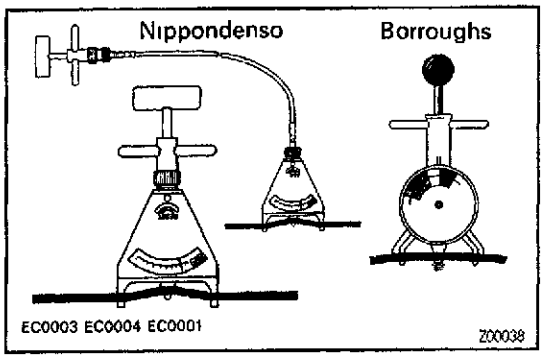
GENERATOR DRIVE BELT INSPECTION



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

125 ± 25 lbf

Used belt

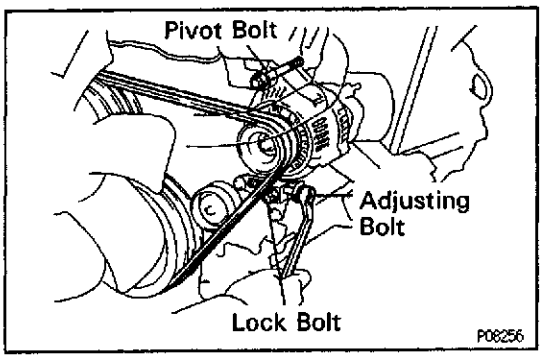
80 ± 20 lbf

If the belt tension is not as specified, adjust it

If necessary, adjust the belt tension

HINT

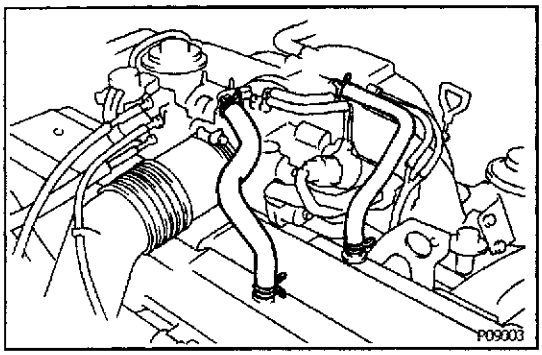
- "New belt" refers to a belt which has been used less than 5 minutes on a running engine
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more
- After installing a new belt, run the engine for about 5 rniutes and recheck the belt tension



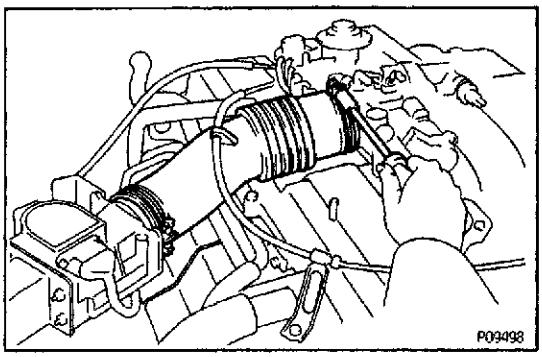
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

HINT Inspect and adjust the valve clearance when the engine is cold

1. DRAIN ENGINE COOLANT

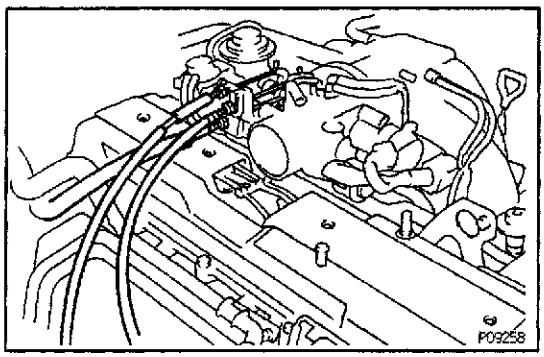


2. REMOVE NO-1 AND NO.2 PCV HOSES



3. REMOVE AIR CLEANER HOSE

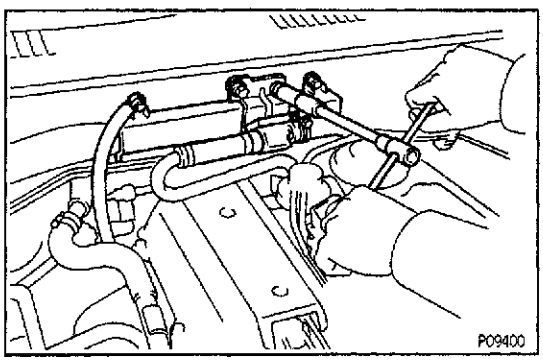
Loosen the 2 clamps and remove the air cleaner hose



4. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY

5. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

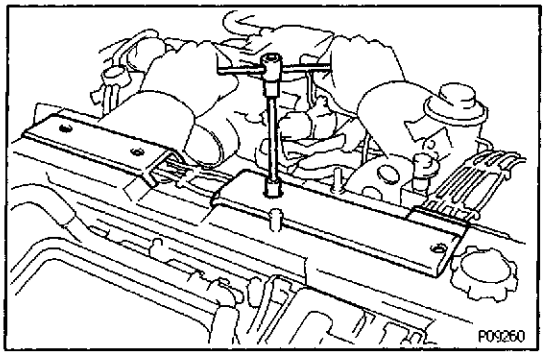
6. DISCONNECT THROTTLE CABLE FROM THROTTLE BODY



7. DISCONNECT HEATER VALVE AND ENGINE WIRE FROM COWL PANEL

(a) Remove the 2 bolts and disconnect the heater valve

(b) Remove the 2 bolts and disconnect the ground strap and engine wire

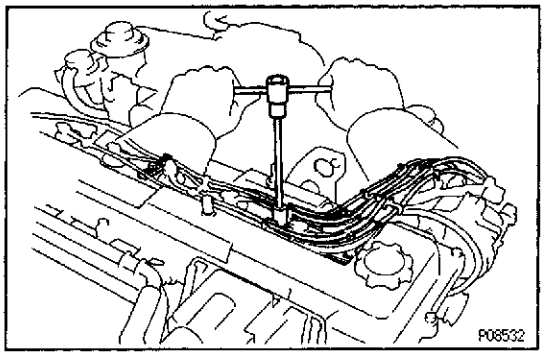


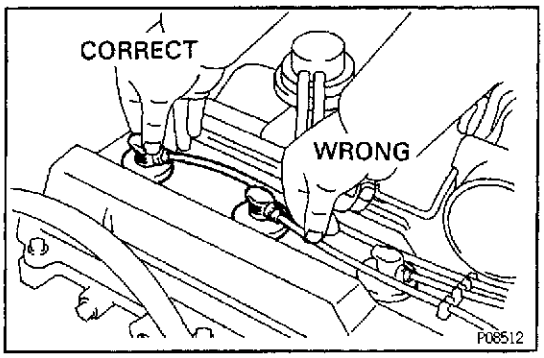
8. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers

9. 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

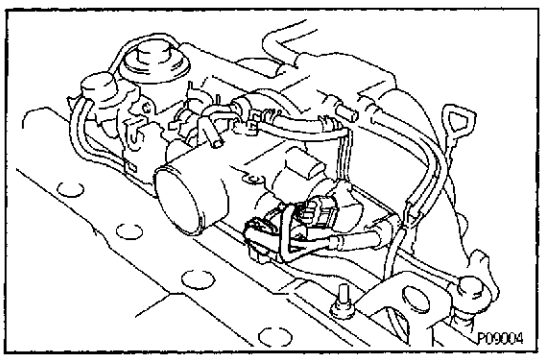
Do not pull on the cords

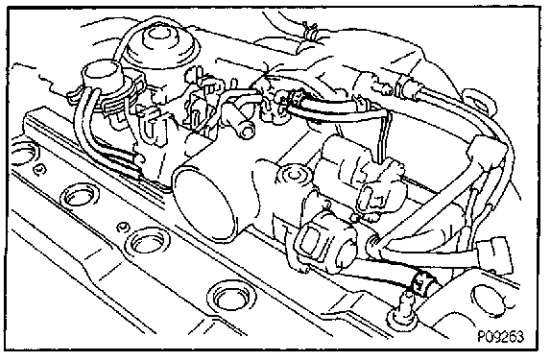
NOTICE: Pulling on or bending the cords may damage the conductor inside.

10. REMOVE THROTTLE BODY

(a) Disconnect the throttle position sensor connector

(b) Disconnect the IAC valve connector

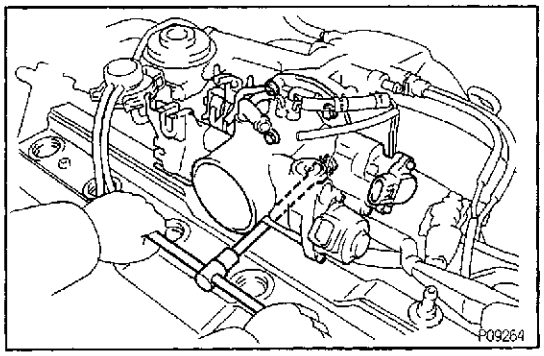




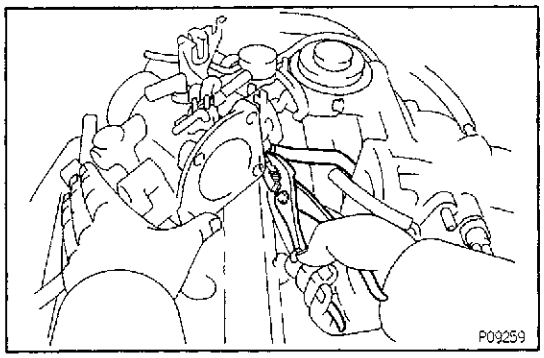
(c) Disconnect the 3 vacuum hoses

(d) Disconnect the EVAP hose

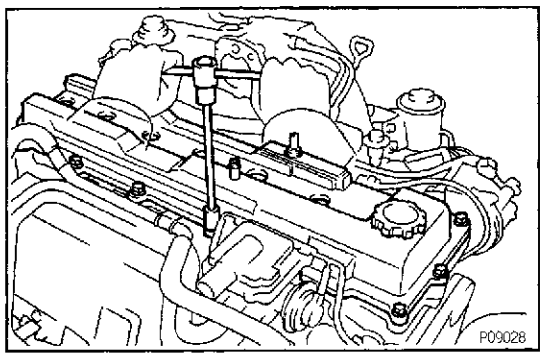
(e) Disconnect the water hose from the No 2 water bypass pipe



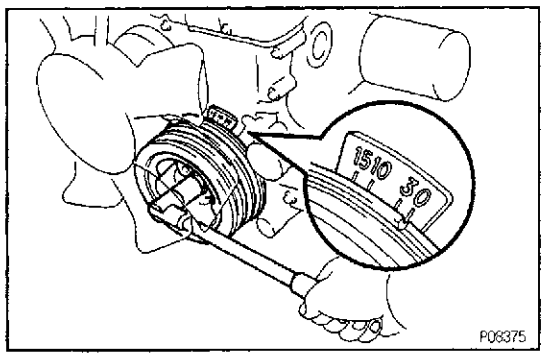
(f) Remove the 4 bolts, and disconnect the throttle body from the air intake chamber
(g) Remove the throttle body gasket



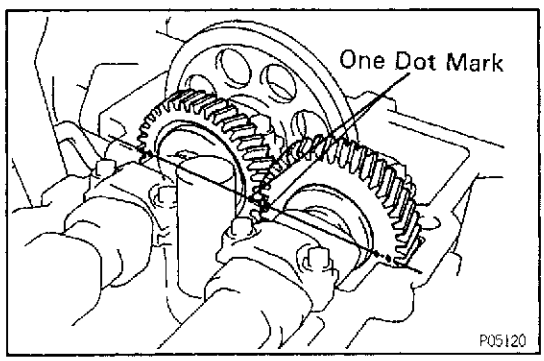
(h) Disconnect the No 1 water bypass hose from the throttle body, and remove the throttle body



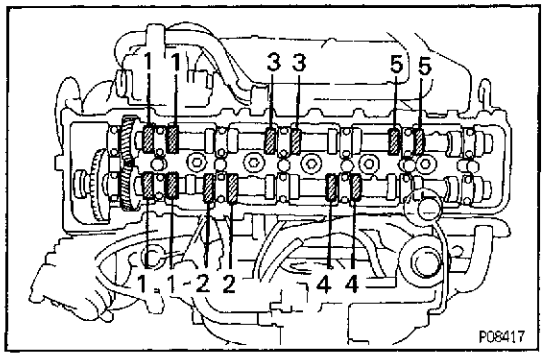
11. REMOVE CYLINDER HEAD COVER
Remove the 13 bolts, cylinder head cover and gasket



12. 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 (one and two 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



13. 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

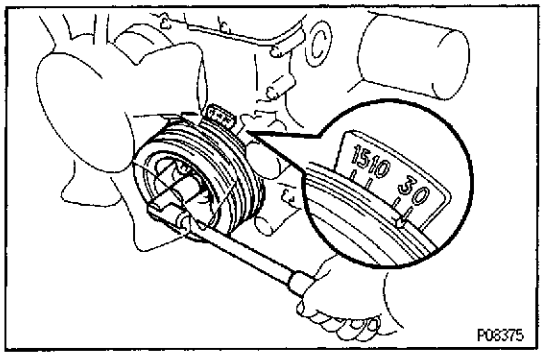
Valve clearance (Cold):

Intake

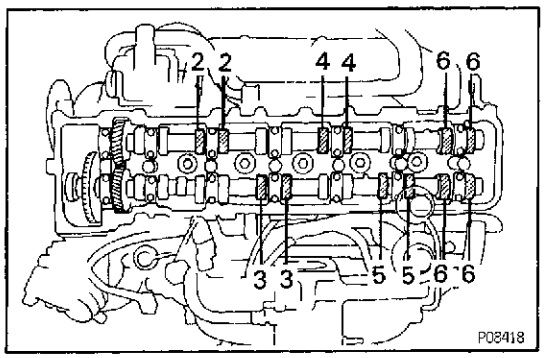
0.15 - 0.25 mm (0.006 - 0.010 in.)

Exhaust

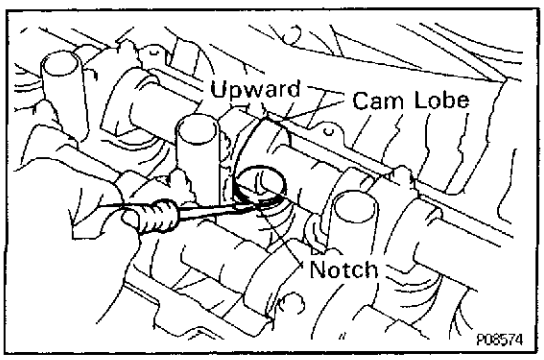
0.25 - 0.35 mm (0.010 - 0.014 in.)



(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))

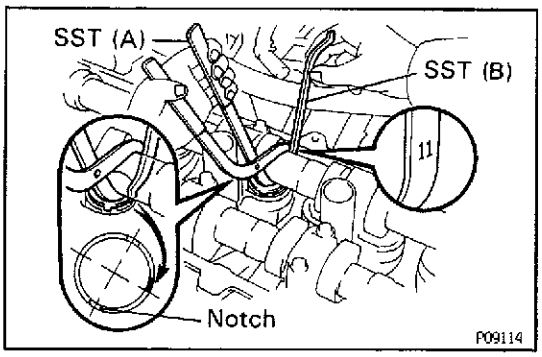


14. ADJUST VALVE CLEARANCE

A. Except for rear valves of No.6 cylinder

(a) Remove the adjusting shim

- Turn the crankshaft to position the cam lobe of the camshaft on the the adjusting valve upward
- Position the notch of the valve lifter toward the spark plug side

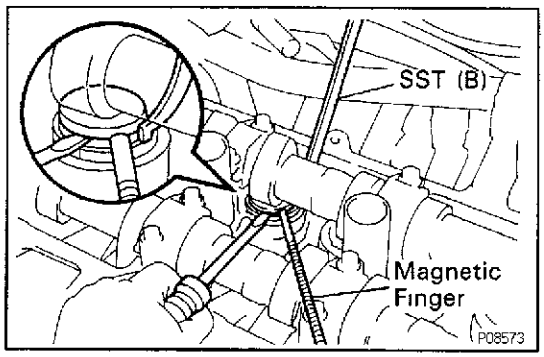


- Using SST (A), press down the valve lifter- and place SST (B) between the camshaft and valve lifter flange Remove SST (A)

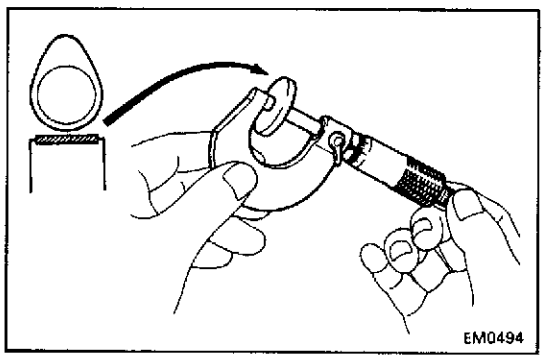
SST 09248-66011 (09248-05310, 09248-06020)

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:

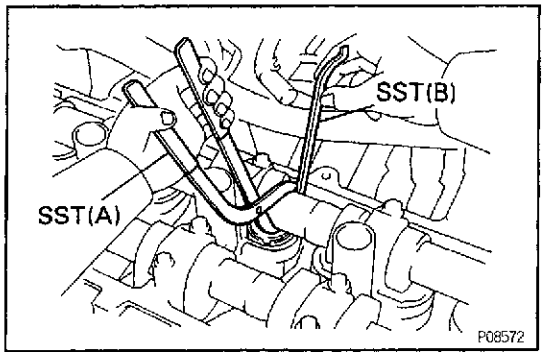
N=T + (A - 0.20 mm (0.008 in.))

Exhaust:

N=T + (A - 0.30 mm (0.012 in.))

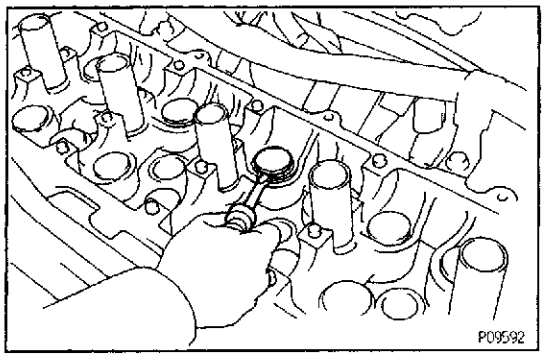
- Select a new shim with a thickness as close as possible to the calculated value

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 09248-66011 (09248-05310, 09248-06020)

(d) Recheck the valve clearance

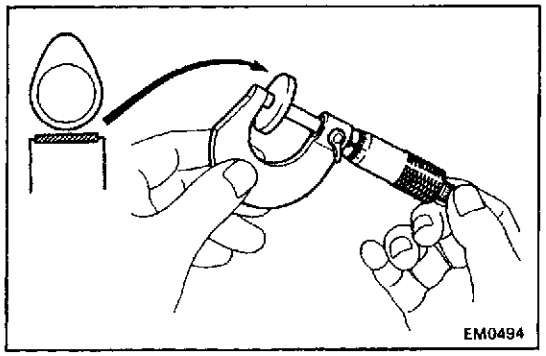


B. Rear valves of No.6 cylinder

(a) Remove the distributor
(See IG section)

(b) Remove the camshafts
(See step 46 on pages EG-44 to 46)

(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

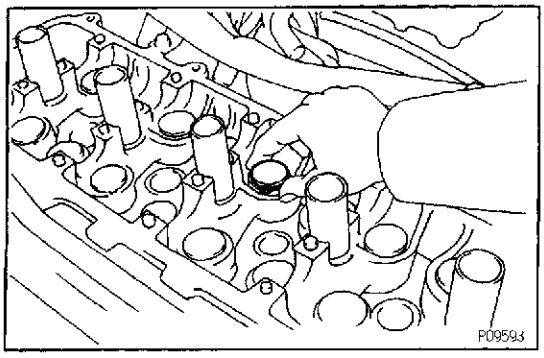
  Intake:

  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)



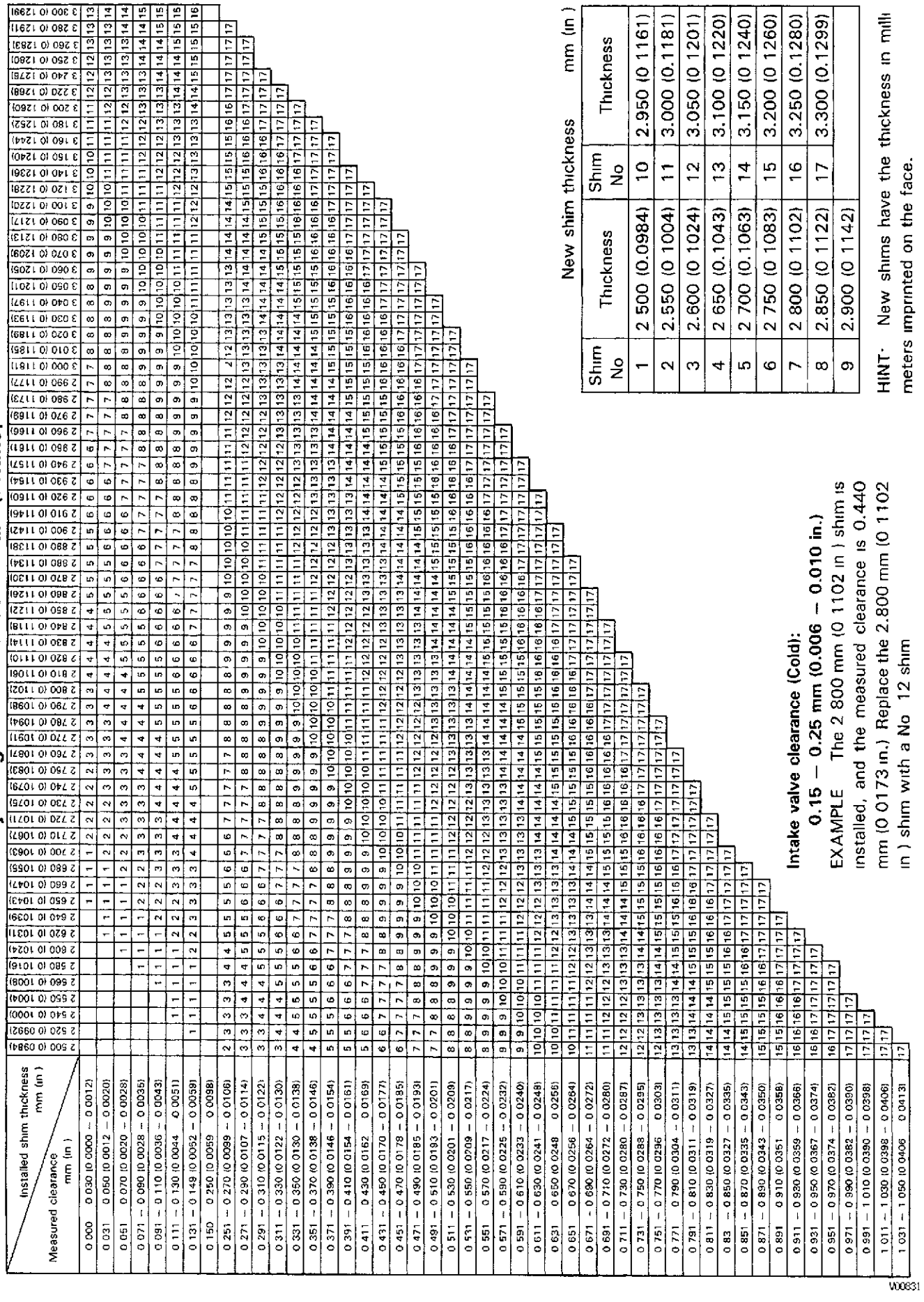
(e) Place a new adjusting shim on the valve lifters

(f) Install the camshafts
(See step 7 on pages EG-67 to 71)

(g) Recheck the valve clearance

(h) Install the distributor
(See IG section)

Adjusting Shim Selection Chart (Intake)



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)		

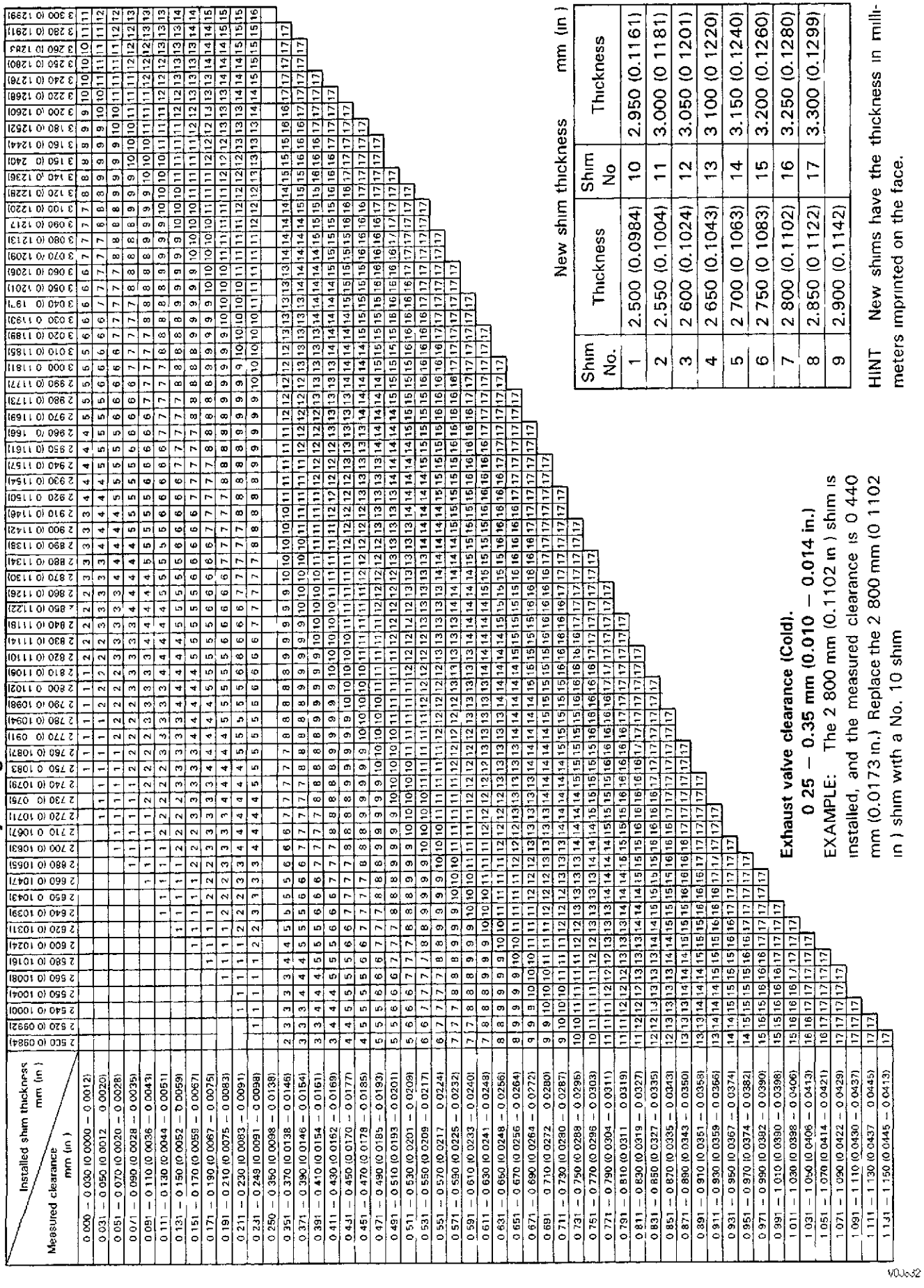
New shim thickness mm (in.)

Intake valve clearance (Cold):
0.15 — 0.25 mm (0.006 — 0.010 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. 12 shim.

HINT: New shims have the thickness in millimeters imprinted on the face.

W0831



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)		

New shim thickness mm (in)

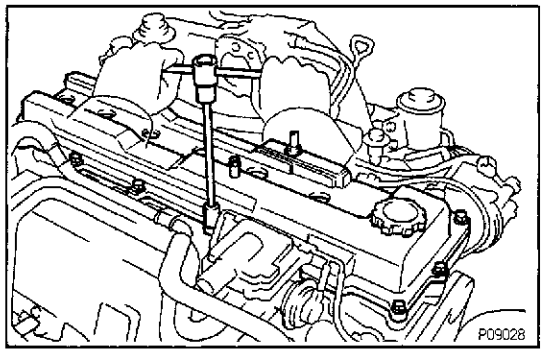
Exhaust valve clearance (Cold).

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 millimeters imprinted on the face.

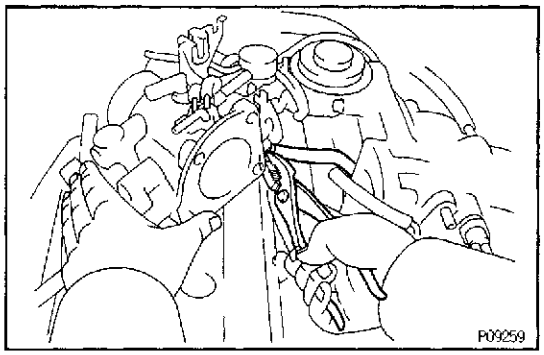
VDJa32



15. REINSTALL CYLINDER HEAD COVER

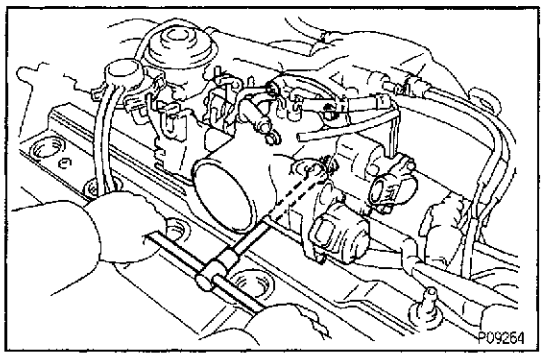
(a) Install the gasket to the cylinder head cover

(b) Install the cylinder head cover with the 13 bolts



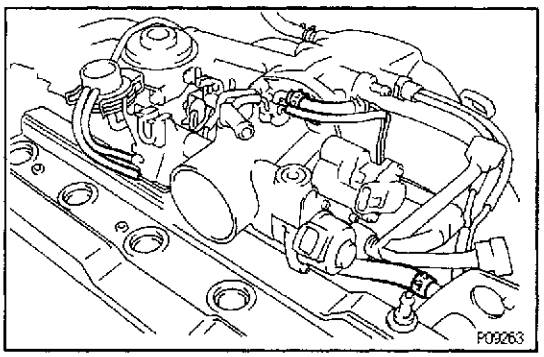
16. INSTALL THROTTLE BODY

(a) Connect the No 1 water bypass hose to the throttle body



(b) Install a new gasket and throttle body with the 4 bolts

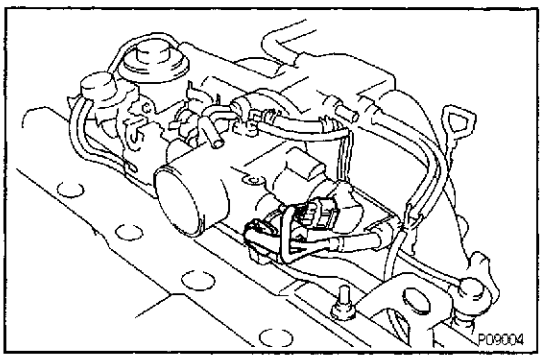
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



(c) Connect the water hose to the No 2 water bypass pipe

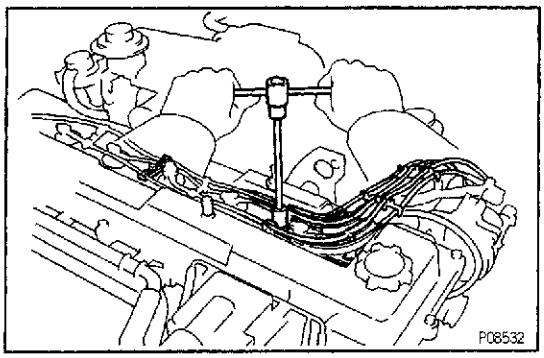
(d) Connect the EVAP hose

(e) Connect the 3 vacuum hoses



(f) Connect the IAC valve connector

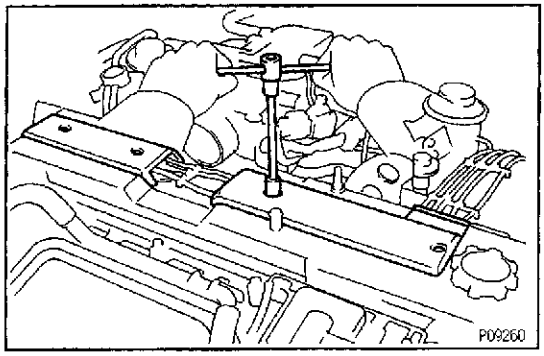
(g) Connect the throttle position sensor connector



17. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

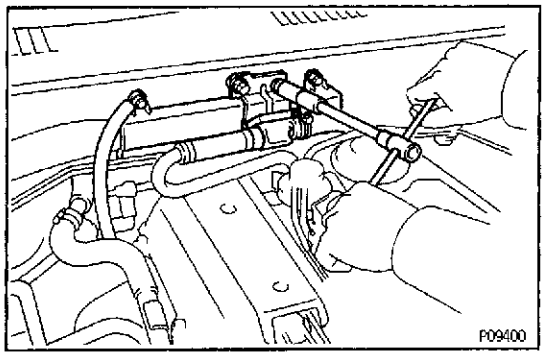
(a) Connect the high-tension cords

(b) Install the No 1 and No 2 cord clamps with the 2 bolts



18. REINSTALL N0.2 AND N0.3 CYLINDER HEAD COVERS

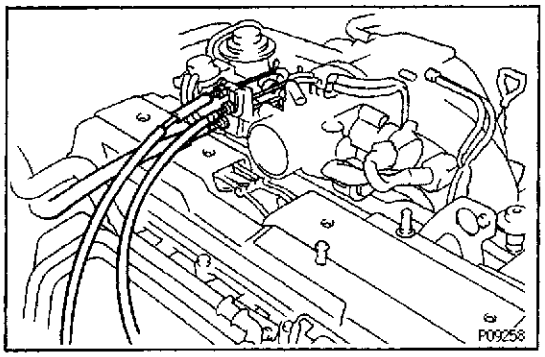
Install the head covers with the 4 bolts



19. RECONNECT ENGINE WIRE AND HEATER VALVE TO CAWL PANEL

(a) Connect the ground strap and engine wire with the 2 bolts

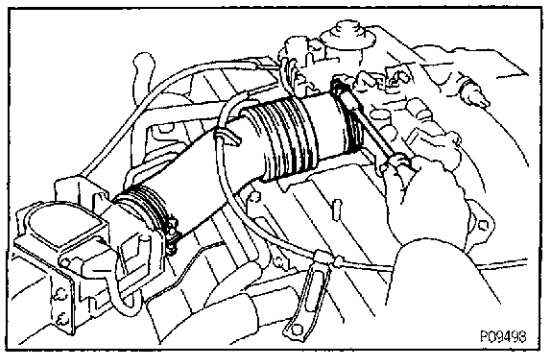
(b) Connect the heater valve with the 2 bolts



20. RECONNECT THROTTLE CABLE TO THROTTLE BODY

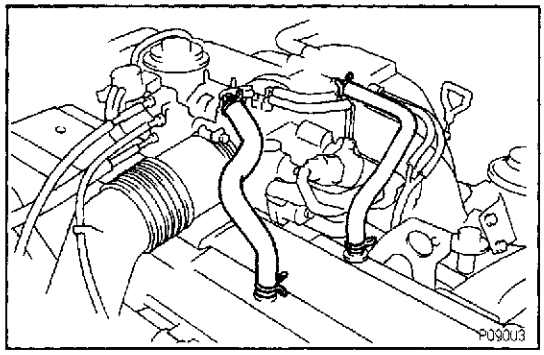
21. RECONNECT ACCELERATOR CABLE

22. RECONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY



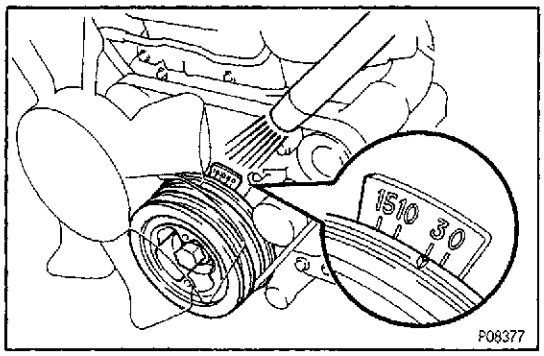
23. REINSTALL AIR CLEANER HOSE

Install the air cleaner hose with the 2 clamp bolts



24. REINSTALL NO.1 AND NO.2 PCV HOSES

25. REFILL WITH ENGINE COOLANT
26. CHECK AND ADJUST IGNITION TIMING
(See IG section)



IGNITION TIMING INSPECTION AND ADJUSTMENT

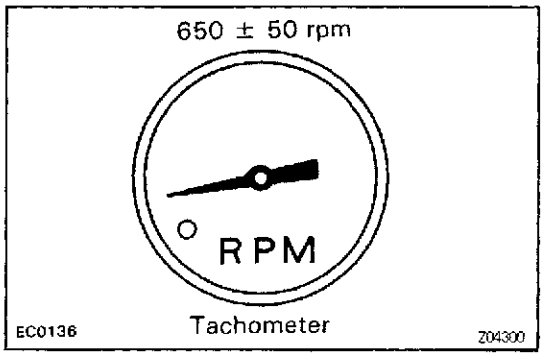
EG1JS 01

(See IG section)

Ignition timing:

3° BTDC @ idle

(w/ Terminals TE1 and E1 connected)



IDLE SPEED INSPECTION

EG1J7 06

HINT Initial conditions (See step 1 on page EG-25)

Idle speed:

650 ± 50 rpm

IDLE AND/OR 2,500 RPM CO/HC CHECK

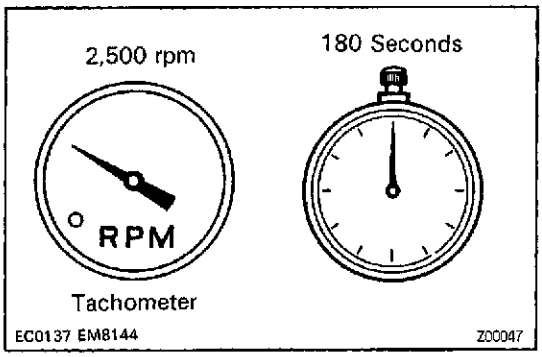
HINT This check is used only to determine whether or not the idle CO/HC complies with regulations

1. INITIAL CONDITIONS

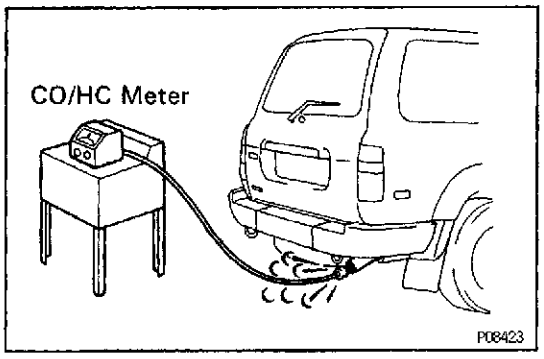
(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

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. INSERT CO/HC METER TESTING PROBE AT LEAST 40cm (1.3ft) INTO TAILPIPE DURING IDLING
5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order- prescribed by the applicable local regulations

Troubleshooting

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below

(a) Check heated oxygen sensor operation
(See page EG-315)

(b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary

HC	CO	Problems	Causes
High	Normal	Rough idle	1 Faulty ignitions • Incorrect timing • Fouled shorted or improperly gapped plugs • Open or crossed high-tension cords • Cracked distributor cap 2 Incorrect valve clearance 3 Leaky EGR valve 4 Leaky intake and exhaust valves 5 Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1 Vacuum leaks • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • I AC valve • Brake booster line 2 Lean mixture causing misfire
High	High	Rough Idle (Black smoke from exhaust)	1 Restricted air filter 2 Faulty SFI systems • Faulty pressure regulator • Clogged fuel return line • Defective ECT sensor • Defective MAP • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty volume air- flow meter

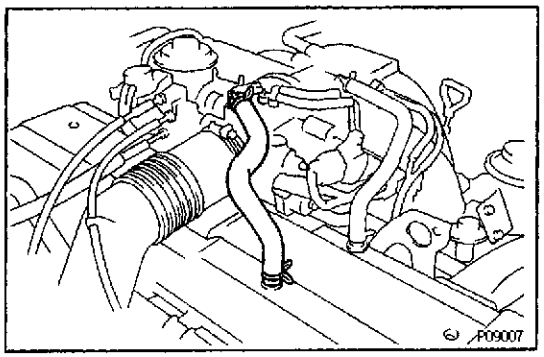
COMPRESSION CHECK

HINT If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure

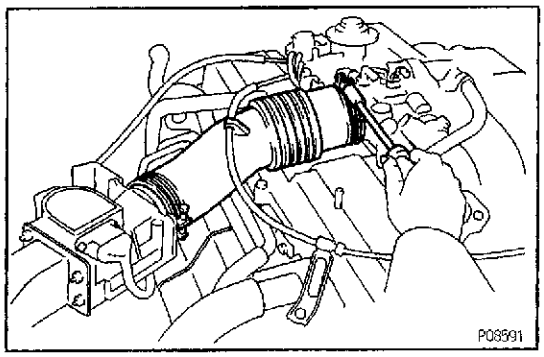
1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature

2. DISCONNECT DISTRIBUTOR CONNECTOR

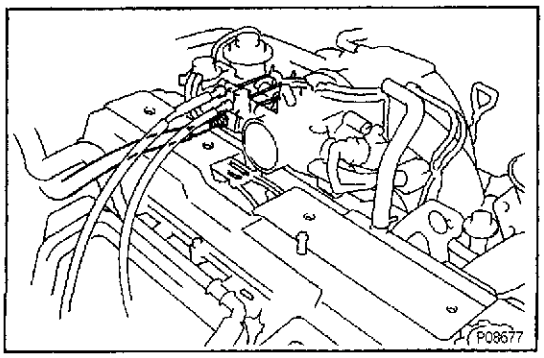


3. REMOVE NO.2 PCV HOSE

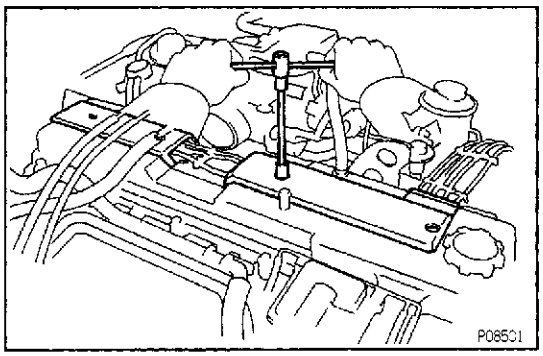


4. REMOVE AIR CLEANER HOSE

Loosen the 2 clamps and remove the air cleaner hose

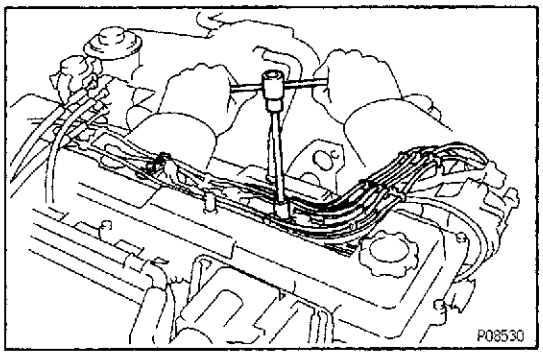


5. DISCONNECT THROTTLE CABLE



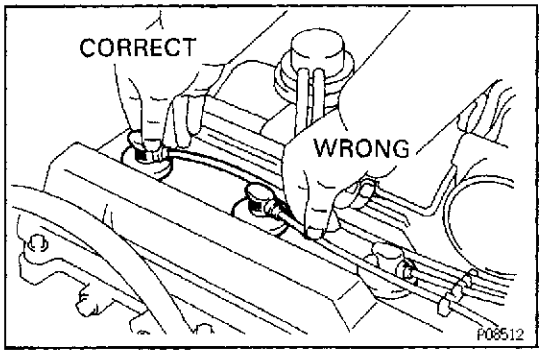
6. REMOVE No.2 AND No.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers



7. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

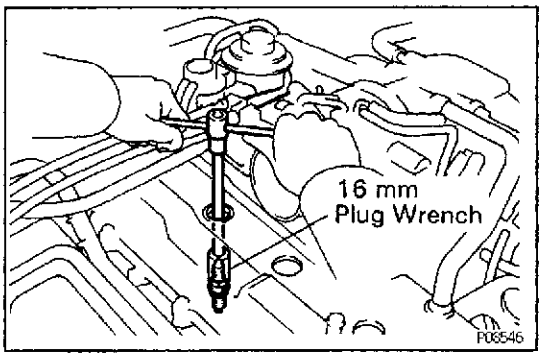
(a) Remove the 2 mounting bolts of the No 1 and No 2 cord clamps



(b) Disconnect the high - tension cords at the rubber boot

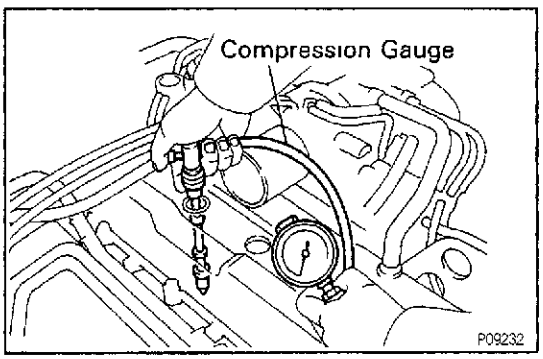
DO NOT pull on the cords

NOTICE: Pulling on or bending the cords may damage the conductor inside.



8. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug



9. 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 compressionpressure

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:

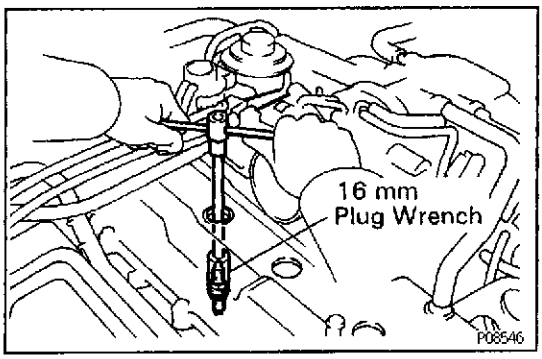
883 kPa (9.0 kgf/cm^2, 128 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) 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

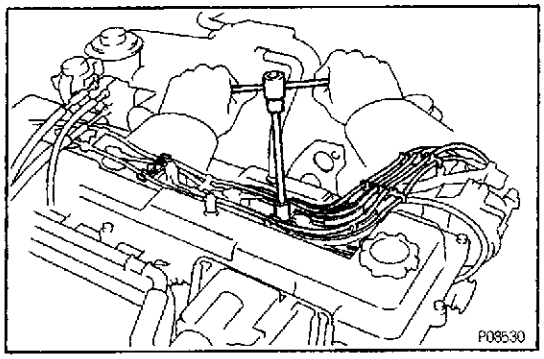
- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damage
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket



10. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug

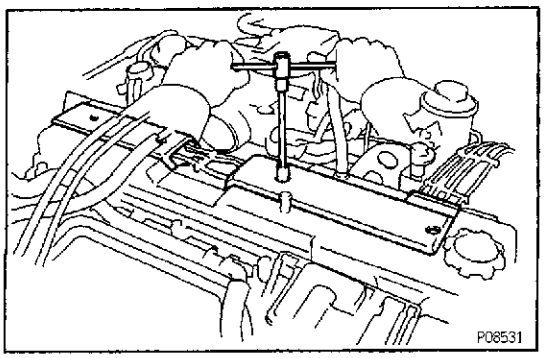
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



11. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

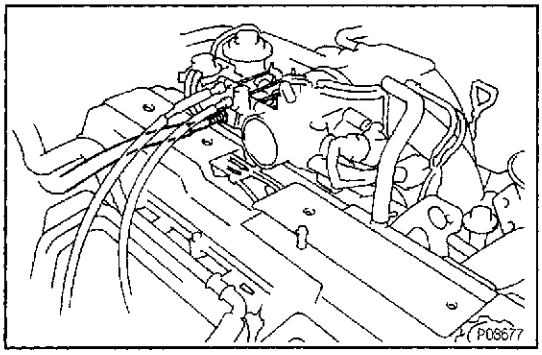
(a) Reconnect the high-tension cords to the spark plugs

(b) Install the No 1 and No 2 cord clamps with the 2 bolts

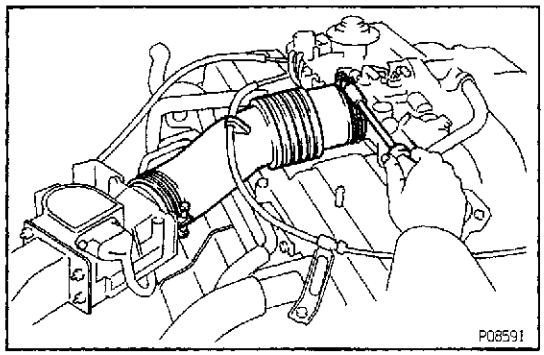


12. INSTALL NO.2 AND NO-3 CYLINDER HEAD COVERS

Install the head covers with the 4 bolts

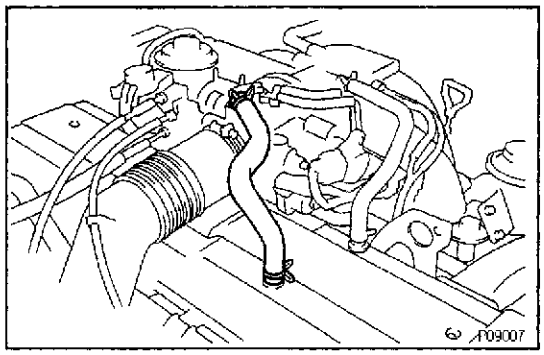


13. CONNECT THROTTLE CABLE



14. INSTALL AIR CLEANER HOSE

Install the air cleaner hose with the 2 clamp bolts



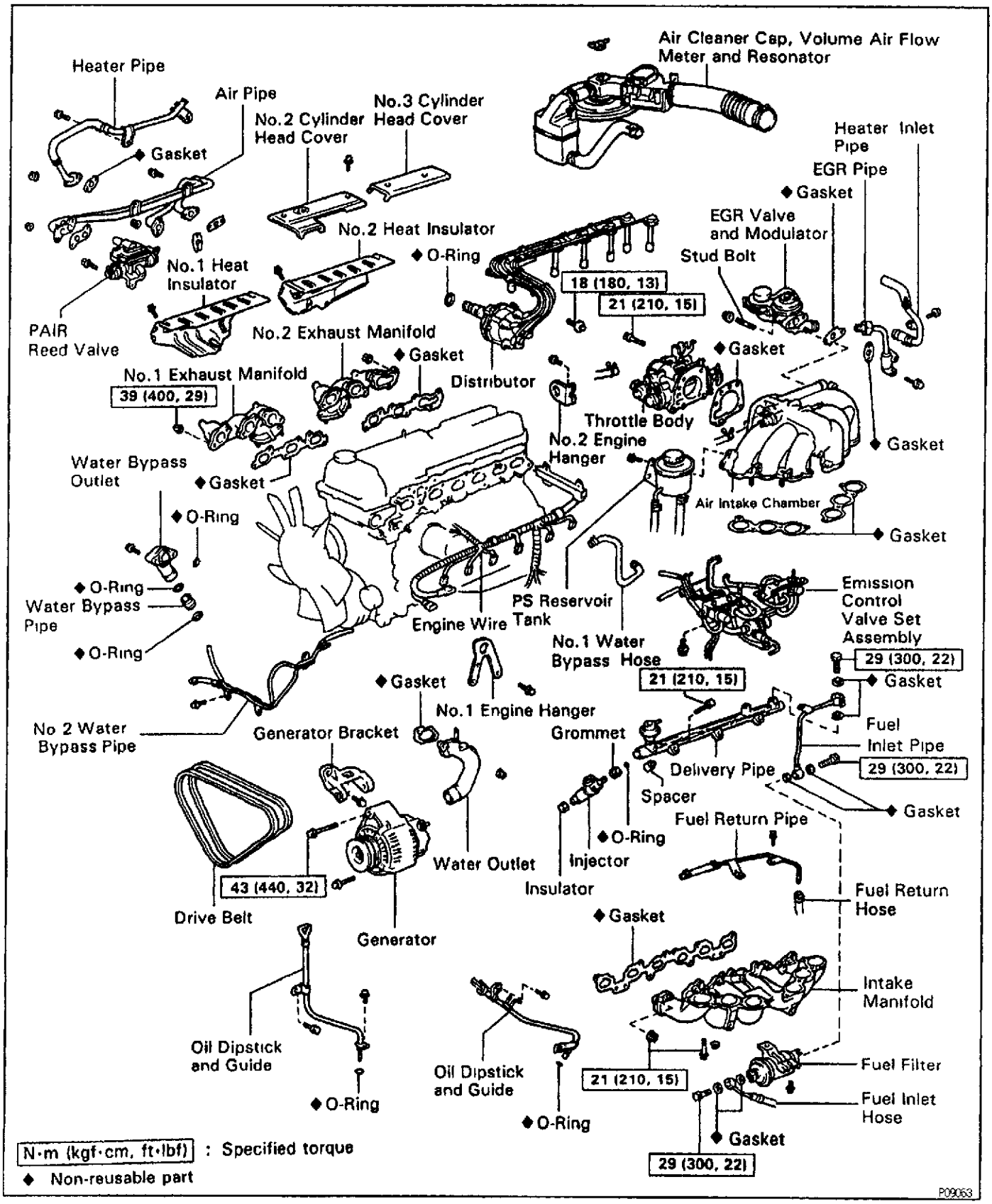
15. INSTALL N0.2 PCV HOSE

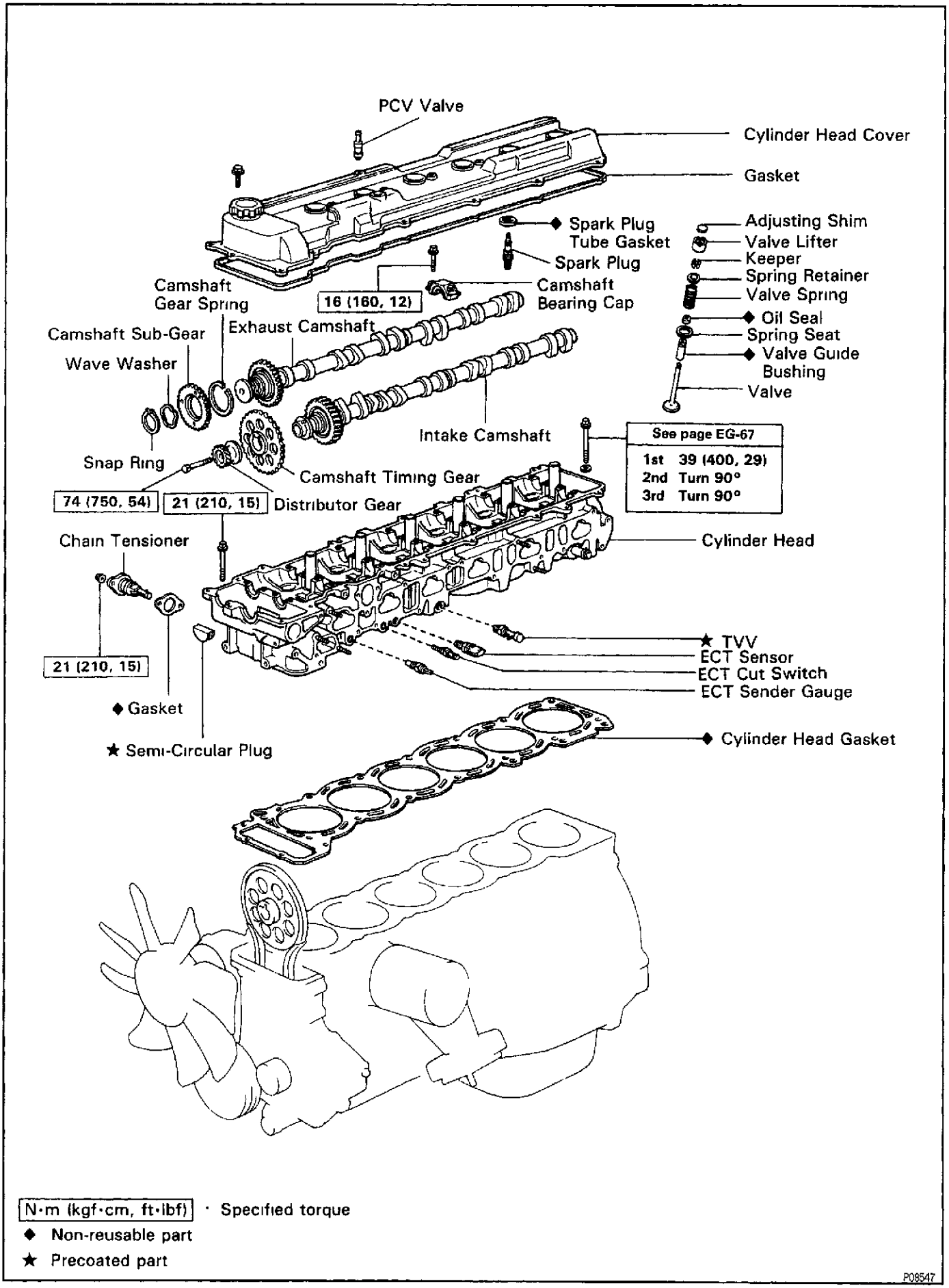
16. CONNECT DISTRIBUTOR CONNECTOR

CYLINDER HEAD

COMPONENTS FOR REMOVAL AND INSTALLATION

EG0BK-03





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

P08547

EG1C9-02

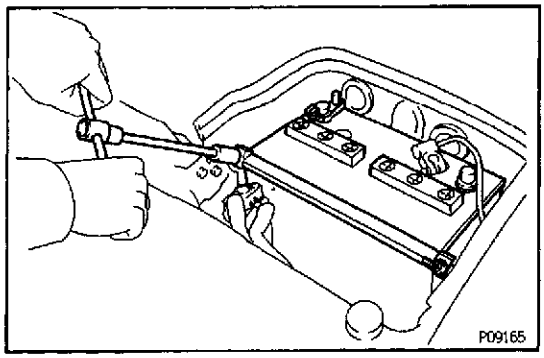
CYLINDER HEAD REMOVAL

(See Components for Removal and Installation)

1. REMOVE BATTERY AND BATTERY TRAY

(a) Disconnect the battery cables

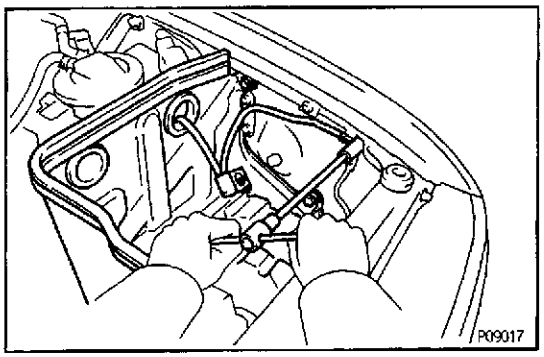
(b) Remove the nuts, hold-down clamp and battery



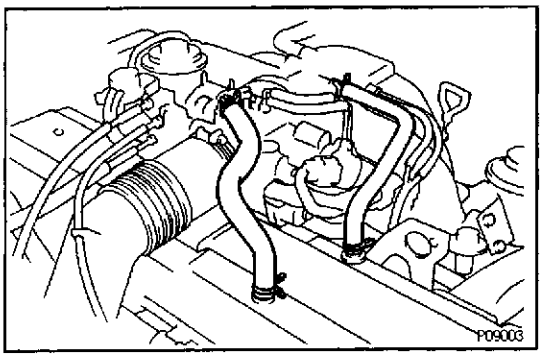
(c) Remove the bolt and disconnect the ground strap

(d) Remove the 5 bolts and battery tray

2. DRAIN ENGINE COOLANT



3. REMOVE NO.1 AND N0.2 PCV HOSES



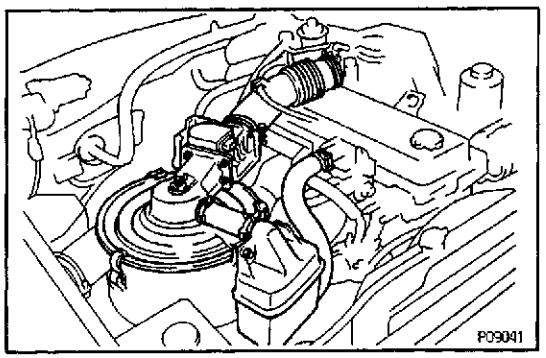
4. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND RESONATOR

(a) Disconnect the volume air flow meter connector and wire clamp

(b) Loosen the air cleaner hose clamp

(c) Loosen the No 2 air hose clamp and disconnect the hose

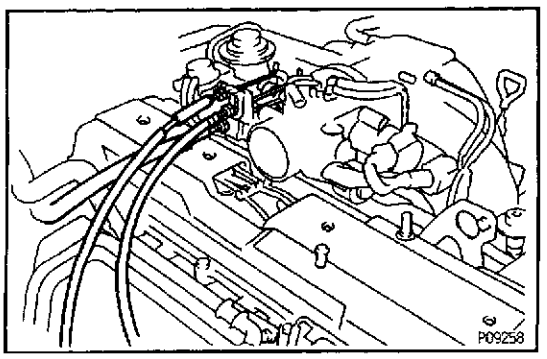
(d) Remove the wing nut and loosen the 3 clips, and remove the air cleaner cap, volume air flow meter and resonator

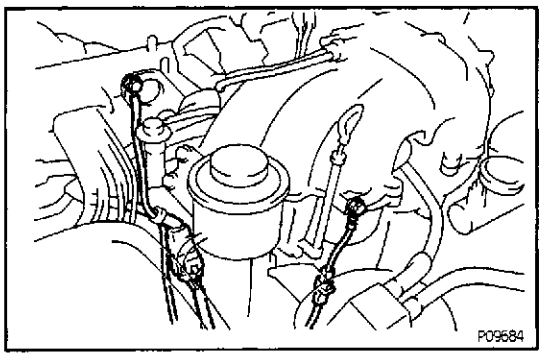


5. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY

6. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

7. DISCONNECT THROTTLE CABLE FROM THROTTLE BODY





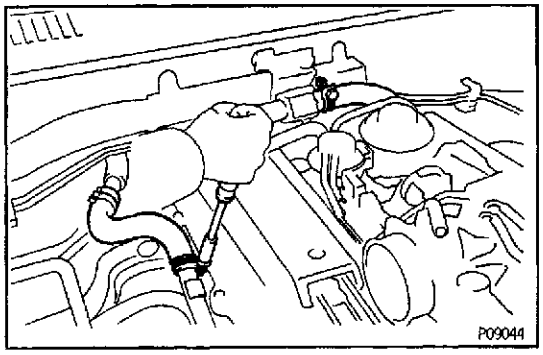
8. DISCONNECT ENGINE GROUND STRAPS

Disconnect the following ground straps

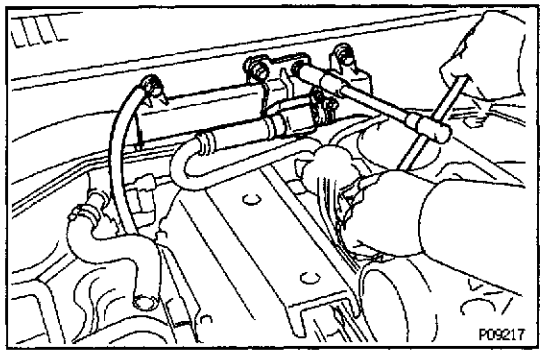
(1) Ground strap from No 1 engine hanger

(2) Ground strap from air intake chamber

9. DISCONNECT CONNECTOR ON INTAKE MANIFOLD FROM LH FENDER APRON



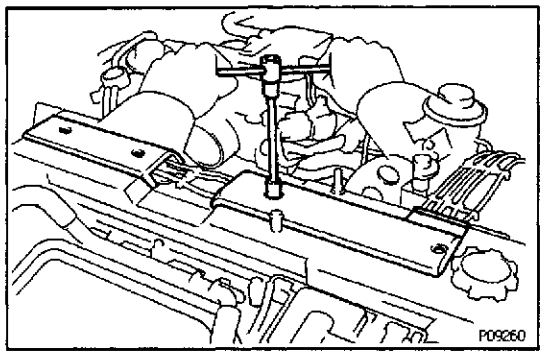
10. DISCONNECT HEATER HOSES



11. DISCONNECT HEATER VALVE AND ENGINE WIRE FROM COWL PANEL

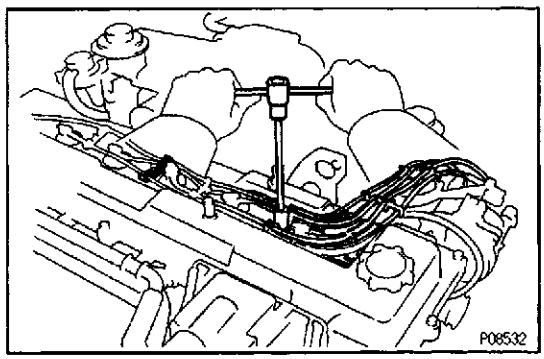
(a) Remove the 2 bolts and disconnect the heater valve

(b) Remove the 2 bolts and disconnect the engine wire and ground strap



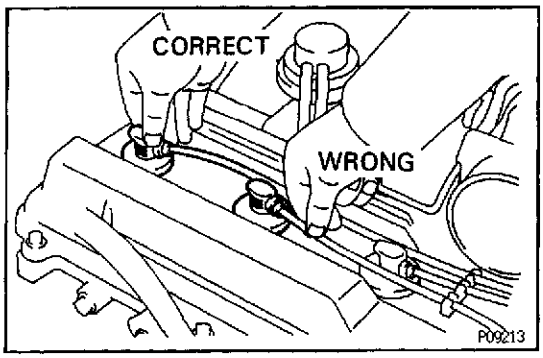
12. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers



13. REMOVE DISTRIBUTOR

(a) Remove the 2 mounting bolts of the No 1 and No 2 cord clamps

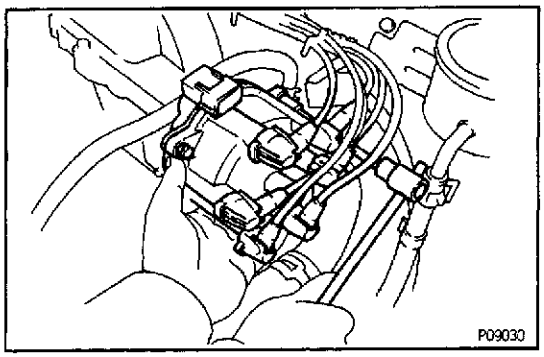


(b) Disconnect the high - tension cords at the rubber boot
DO NOT pull on the cords

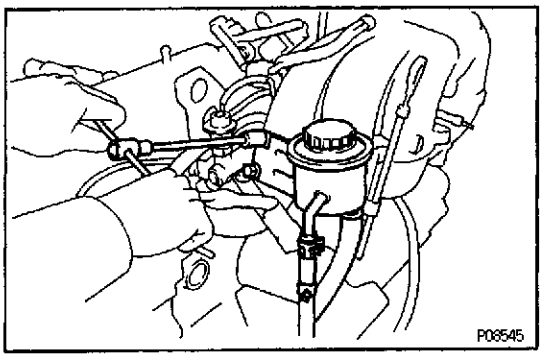
NOTICE: Pulling on or bending the cords may damage the conductor inside

(c) Disconnect the high-tension cord from the ignition coil

(d) Disconnect the distributor connector

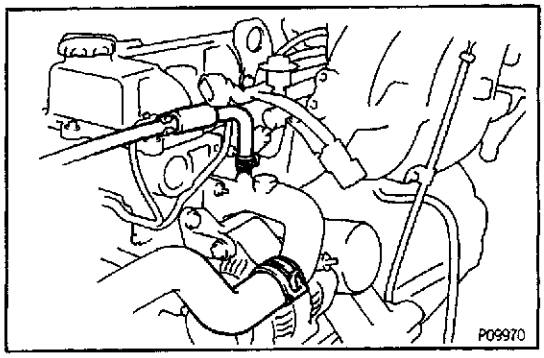


(e) Remove the hold-down bolt and distributor



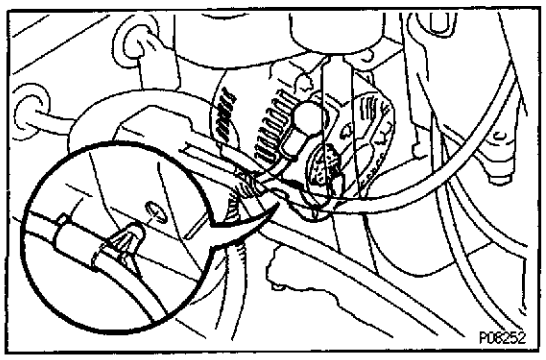
14. DISCONNECT PS RESERVOIR TANK

Remove the 3 bolts and disconnect the reservoir tank



15. DISCONNECT RADIATOR INLET HOSE

16. DISCONNECT NO.3 WATER BYPASS HOSE

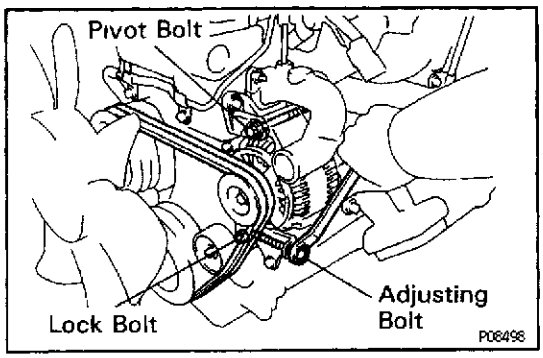


17. REMOVE GENERATOR

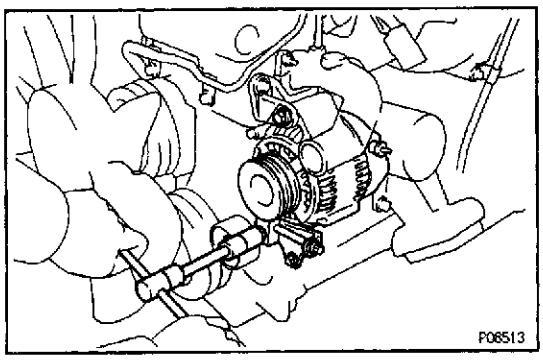
(a) Disconnect the generator connector

(b) Remove the nut, and disconnect the generator wire

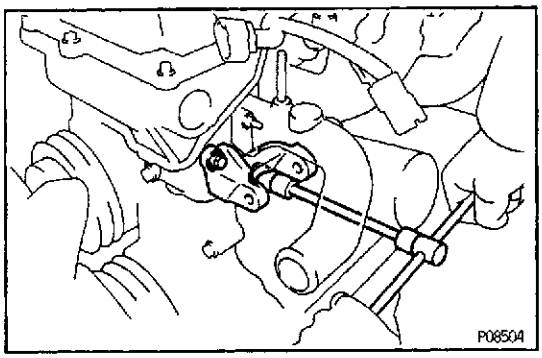
(c) Disconnect the wire harness from the clip



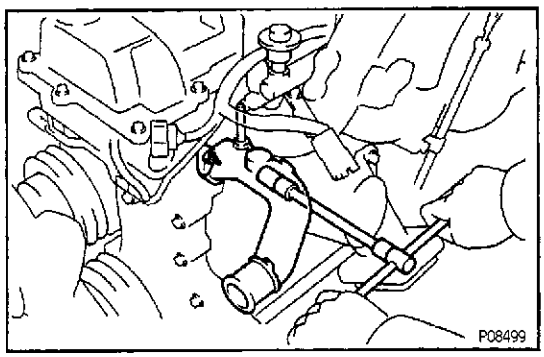
(d) Loosen the lock bolt, pivot bolt and adjusting bolt, and remove the drive belts



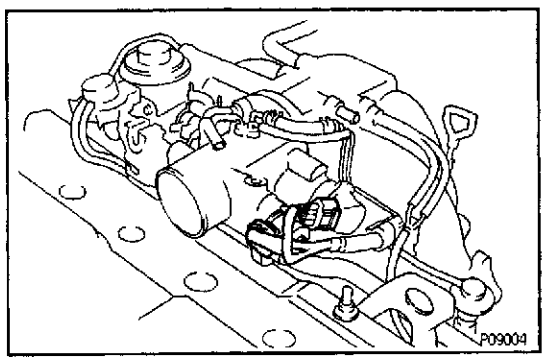
(e) Remove the lock bolt, nut, and drive belt adjusting bar
(f) Remove the pivot bolt and generator



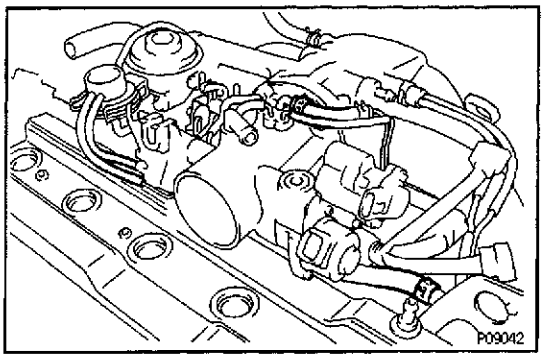
18. REMOVE GENERATOR BRACKET
Remove the 2 bolts and generator bracket



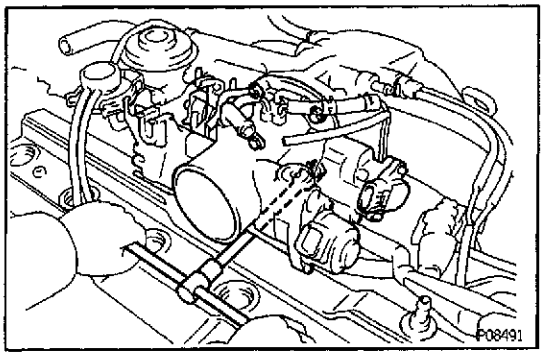
19. REMOVE WATER OUTLET
Remove the 2 nuts, water outlet and gasket



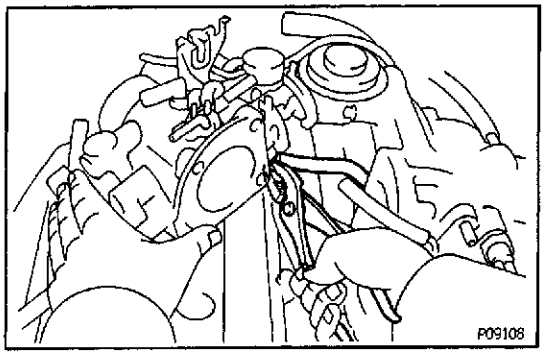
20. REMOVE THROTTLE BODY
(a) Disconnect the throttle position sensor connector
(b) Disconnect the IAC valve connector



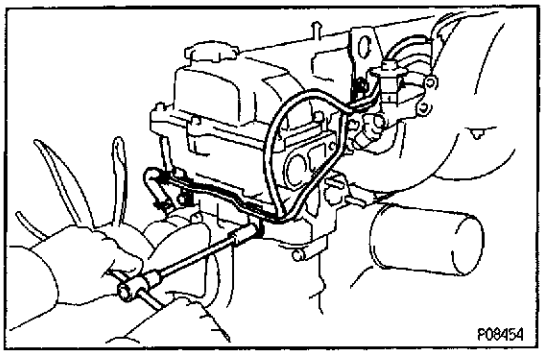
(c) Disconnect the 3 vacuum hoses
(d) Disconnect the EVAP hose
(e) Disconnect the water hose from the No 2 water bypass pipe



(f) Remove the 4 bolts, and disconnect the throttle body from the air intake chamber
(g) Remove the throttle body gasket

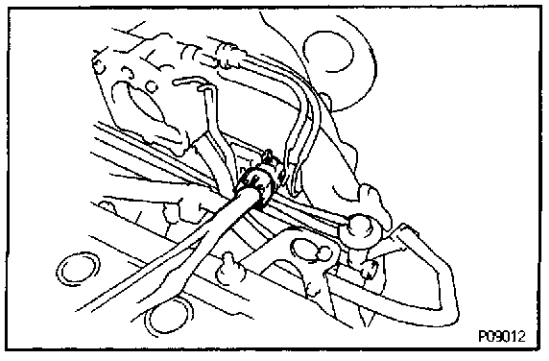


(h) Disconnect the No 1 water bypass hose from the throttle body, and remove the throttle body

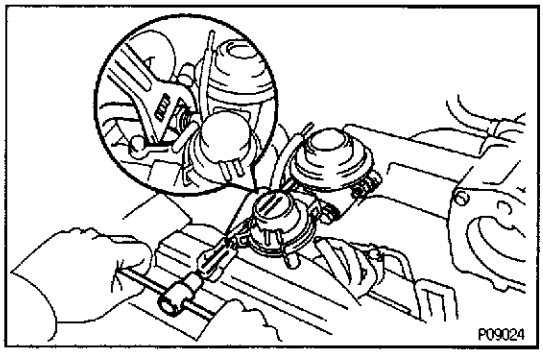


21. REMOVE NO.2 WATER BYPASS PIPE WITH HOSES

(a) Disconnect the 2 vacuum hoses from the PAIR reed valve and No 2 emission control valve set
(b) Disconnect the water hose from the timing chain cover
(c) Remove the 3 bolts and No 2 water bypass pipe with hoses

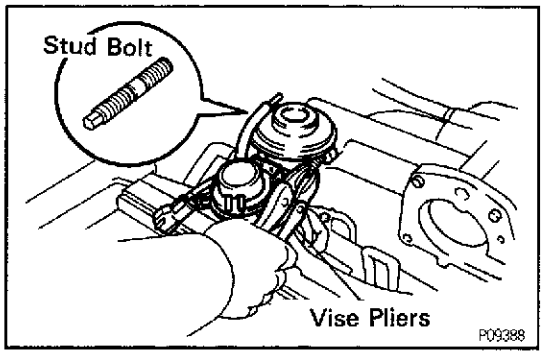


22. DISCONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY

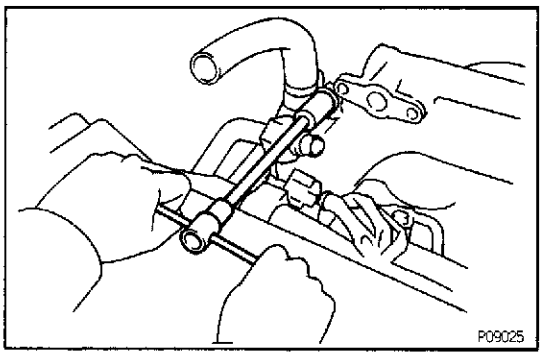


23. REMOVE EGR VALVE AND VACUUM MODULATOR

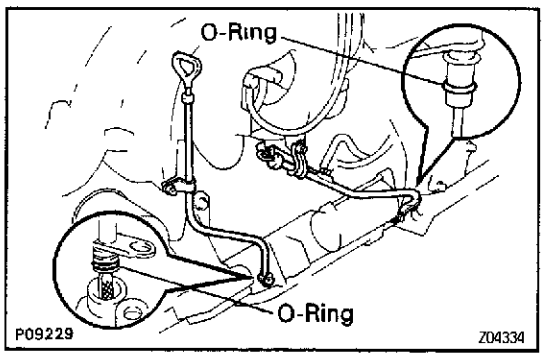
(a) Disconnect the 3 vacuum hoses from the EGR valve
(b) Disconnect the EGR gas temp sensor connector
(c) Loosen the EGR pipe union nut
(d) Remove the 2 nuts holding the EGR valve and air intake chamber



(e) Using vise pliers, remove the 2 stud bolts, EGR valve and vacuum modulator assembly and gasket

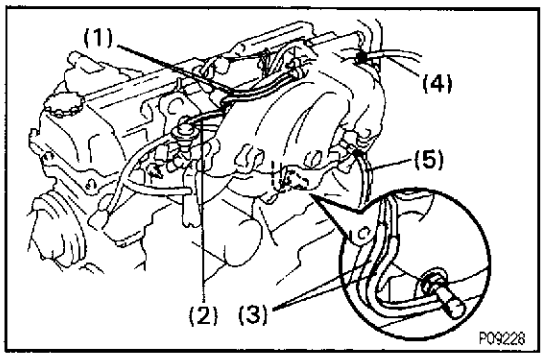


24. REMOVE BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER



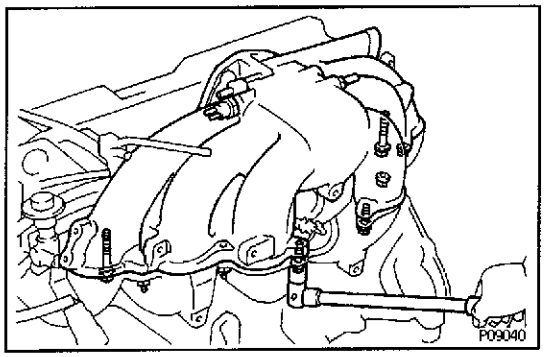
25. REMOVE OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION

(a) Remove the 2 mounting bolts
(b) Pull out the dipstick together with dipstick guide
(c) Remove the 0-ring from the dipstick guide

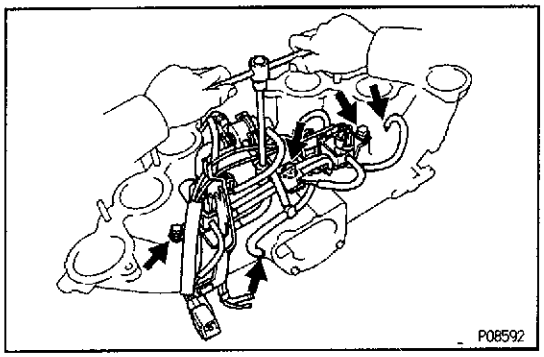


26. REMOVE AIR INTAKE CHAMBER

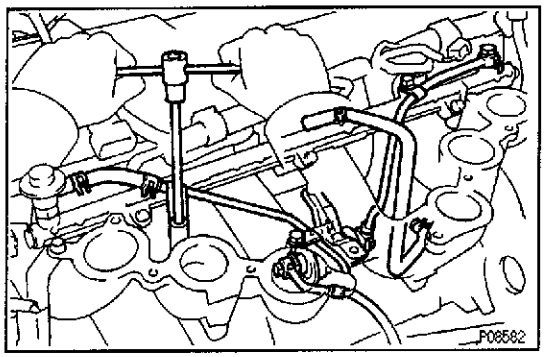
(a) Disconnect the following hoses
(1) 2 vacuum hoses from gas filter
(2) Vacuum hose from fuel pressure regulator
(3) 2 vacuum hoses from TVV
(4) Brake booster hose from brake booster union
(5) EVAP hose from 3-way



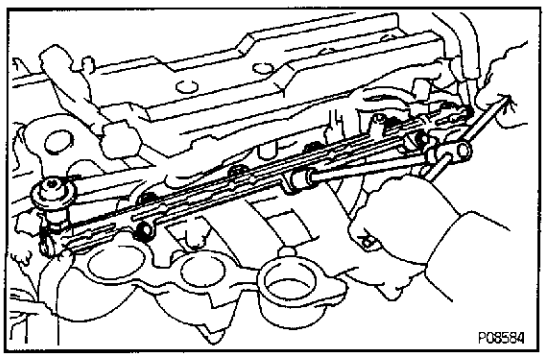
(b) Remove the 4 bolts, 4 nuts, air intake chamber and 2 gaskets



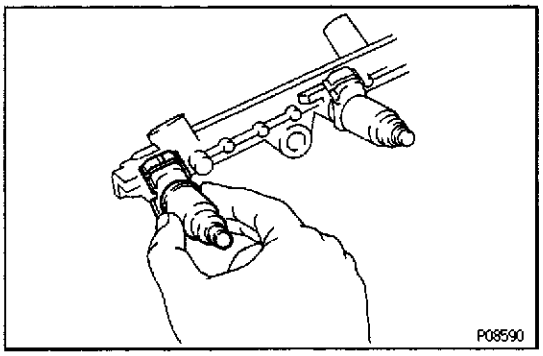
(c) Disconnect the air hose
(d) Disconnect the vacuum hose
(e) Remove the 4 bolts and emission control valve set assembly from the air intake chamber



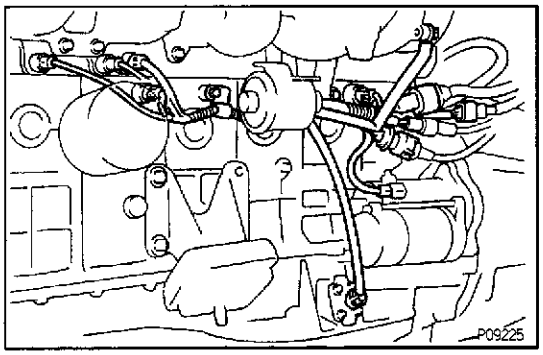
27. REMOVE FUEL RETURN PIPE
(a) Disconnect the fuel hose from the fuel pressure regulator
(b) Remove the 2 bolts and fuel return pipe
28. REMOVE NO.1 WATER BYPASS HOSE
29. REMOVE FUEL INLET PIPE
Remove the 2 union bolts, bolt, 4 gaskets and fuel inlet pipe
30. DISCONNECT FUEL INLET HOSE
Remove the union bolt and 2 gaskets and disconnect the fuel inlet hose from the fuel filter



31. 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.
(e) Remove the 6 insulators and 3 spacers from the intake manifold

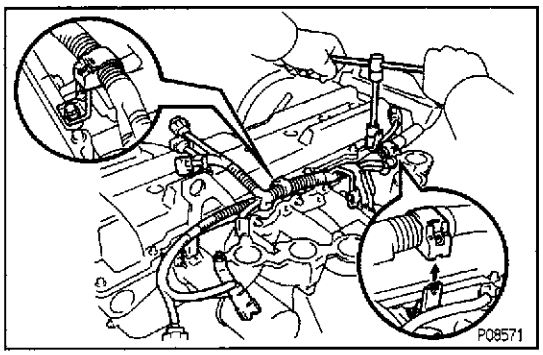


(d) Pull out the 6 injectors from the delivery pipe
(e) Remove the O-ring and grommet from each injector

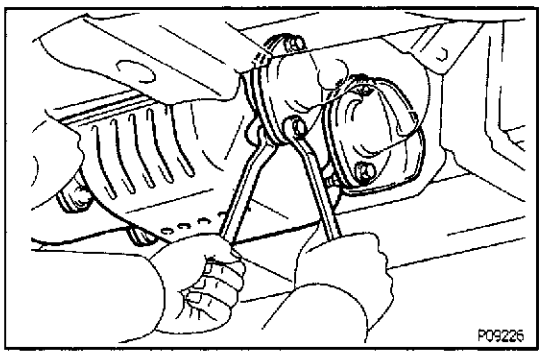


32. DISCONNECT ENGINE WIRE

(a) Disconnect the following connectors
(1) ECT sender gauge connector
(2) ECT cut switch connector
(3) ECT sensor connector
(4) 2 knock sensor connectors
(5) Heated oxygen sensor connector (with clamps)
(6) 4 connectors from transmission
(7) Starter connector
(8) Oil level sensor connector

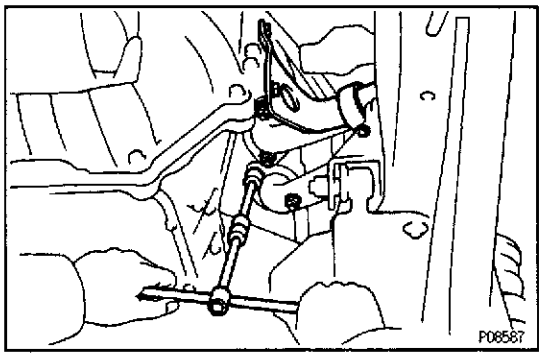


(b) Remove the bolt and disconnect the engine wire from the intake manifold
(c) Remove the 2 bolts and disconnect the engine wire from the cylinder block
(d) Disconnect the engine wire clamp
(e) Remove the 3 bolts and disconnect the engine wire from the cylinder head and intake manifold

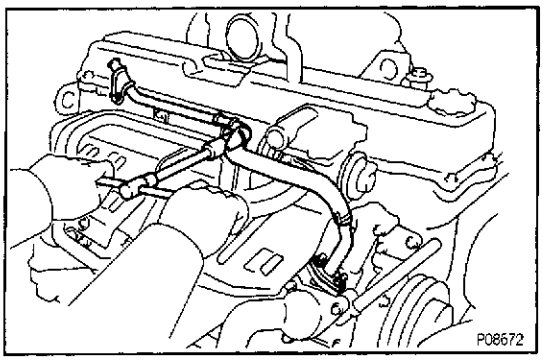


33. REMOVE FRONT EXHAUST PIPE ASSEMBLY

(a) Remove the 4 bolts, 2 nuts and retainer holding the No 3 front exhaust pipe to the TWCs

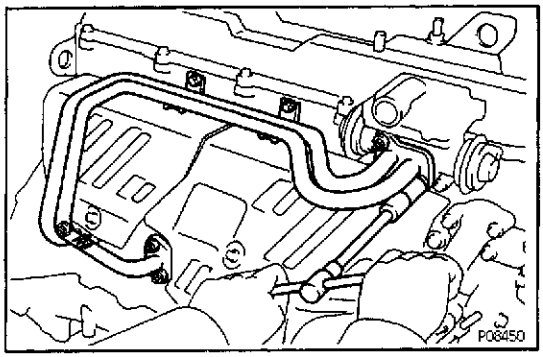


(b) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket
(c) Remove the 2 bolts and No 1 support bracket
(d) Remove the 4 nuts, front exhaust pipe assembly and 4 gaskets



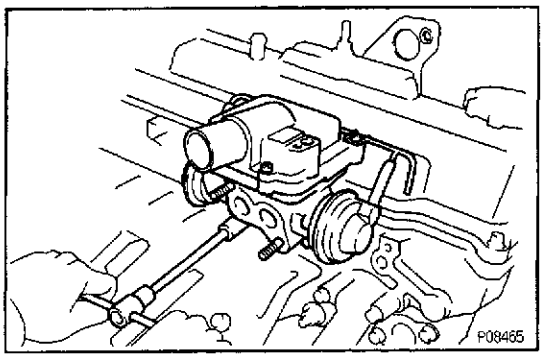
34. REMOVE HEATER PIPE

Remove the 2 bolts, 2 nuts, heater pıpe and gasket



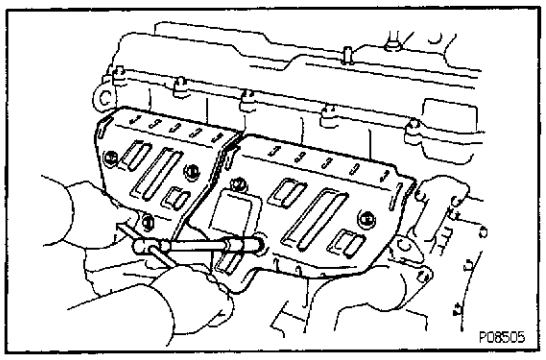
35. REMOVE AIR PIPE

Remove the 2 bolts, 6 nuts, aır- pıpe and 3 gaskets



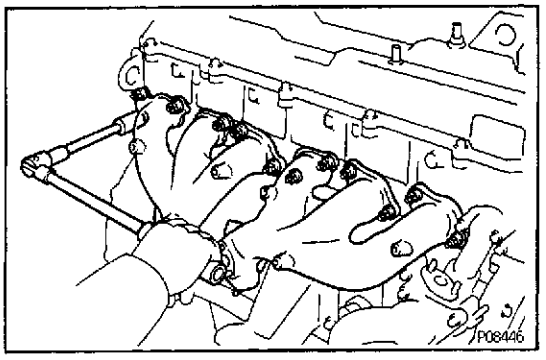
36. REMOVE PAIR REED VALVE

Remove the 2 bolts and PAIR reed valve

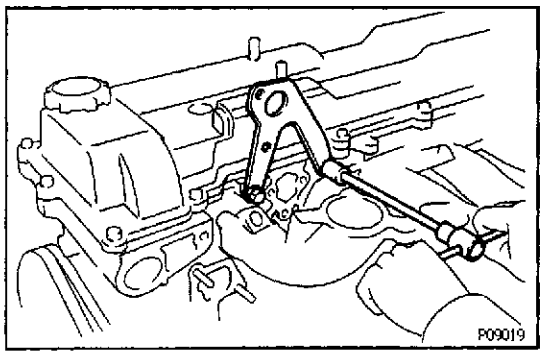


37. REMOVE NO.1 AND NO.2 EXHAUST MANIFOLDS

(a) Remove the 6 bolts, No 1 heat ınsulator and No 2 heat ınsulator

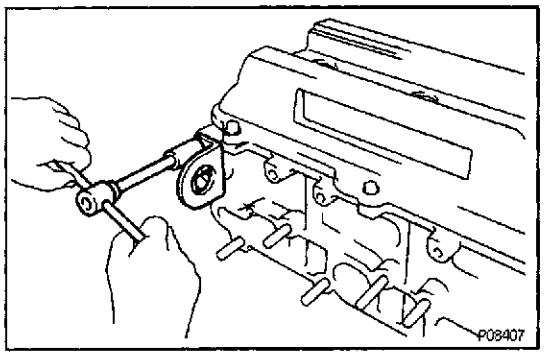


(b) Remove the 13 nuts, No 1 exhaust manıfold, No 2 exhaust manıfold and 2 gaskets



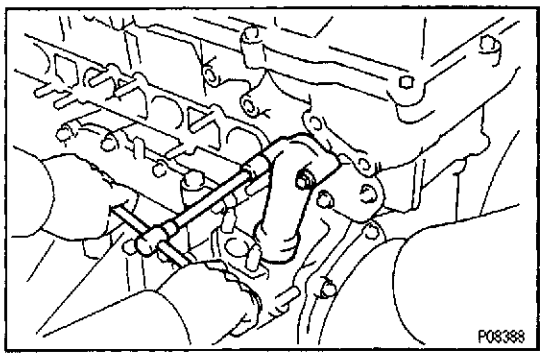
38. REMOVE NO.1 ENGINE HANGER

Remove the 2 bolts and No 1 engine hanger



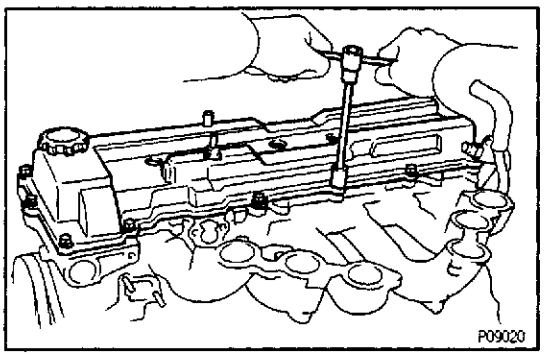
39. REMOVE No.2 ENGINE HANGER

Remove the 2 bolts and No 2 engine hanger



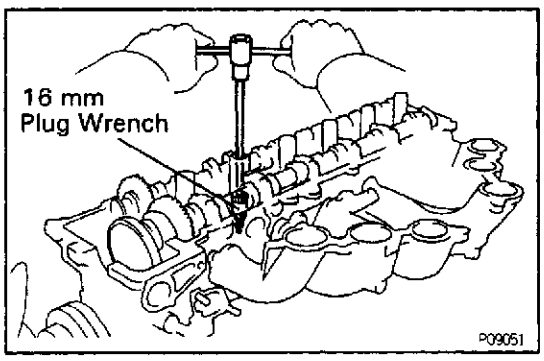
40. REMOVE WATER BYPASS OUTLET AND PIPE

(a) Remove the 2 bolts and water bypass outlet and pipe
(b) Remove the 3 0-rings from the water bypass outlet and pipe



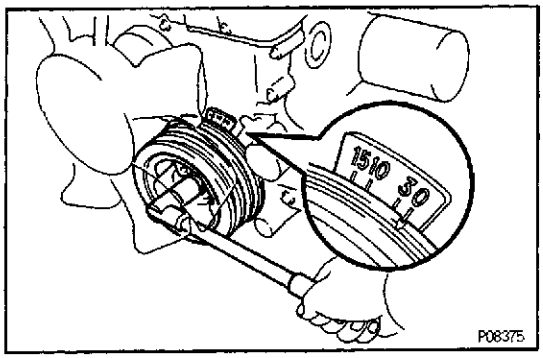
41. REMOVE CYLINDER HEAD COVER

Remove the 13 bolts, cylinder head cover and gasket



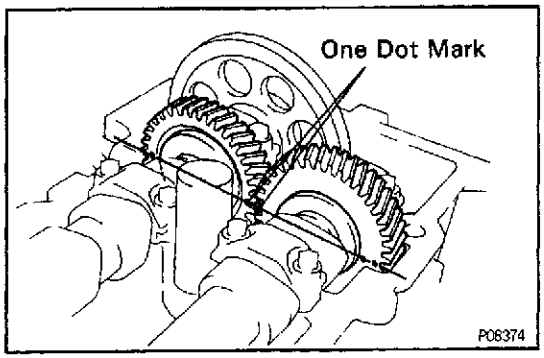
42. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug

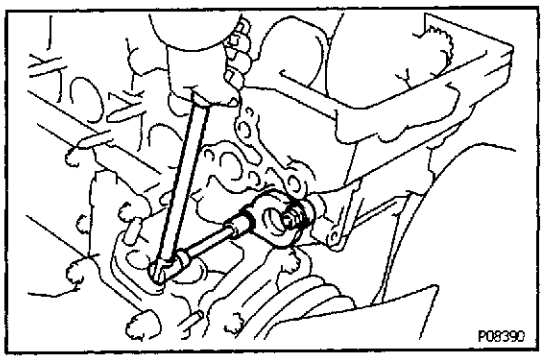


43. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the "0" mark on the timing chain cover

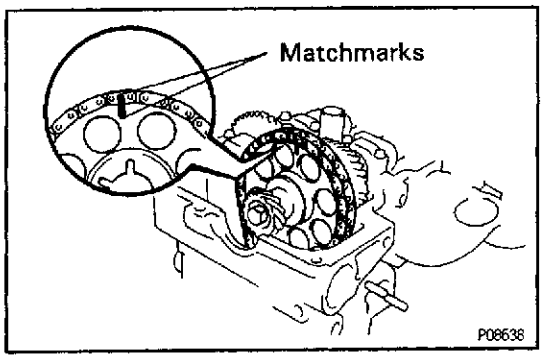


(b) Check that the timing marks (one and two dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration If not, turn the crankshaft 1 revolution (360°) and align the marks as above



44. REMOVE CHAIN TENSIONER

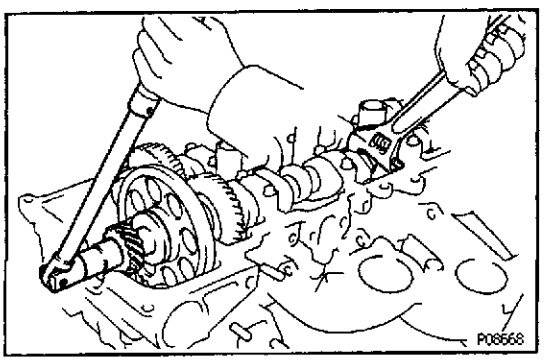
Remove the 2 nuts, chain tensioner and gasket



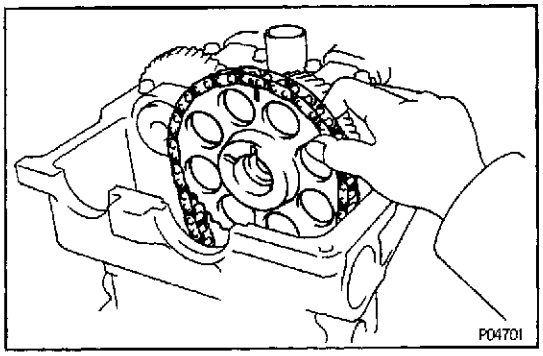
45. REMOVE CAMSHAFT TIMING GEAR

(a) Remove the semi-circular plug

(b) Place the matchmarks on the camshaft timing gear and timing chain



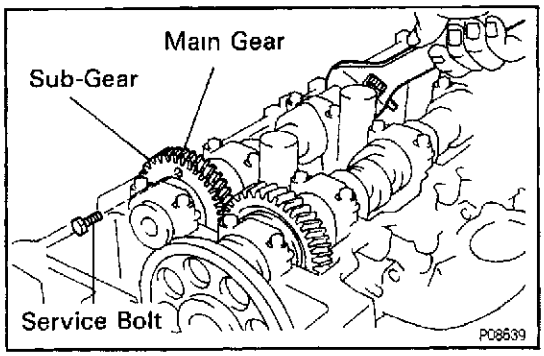
(c) Hold the intake camshaft with a wrench, remove the bolt and distributor gear



(d) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper

46. REMOVE CAMSHAFTS

NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level white 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.



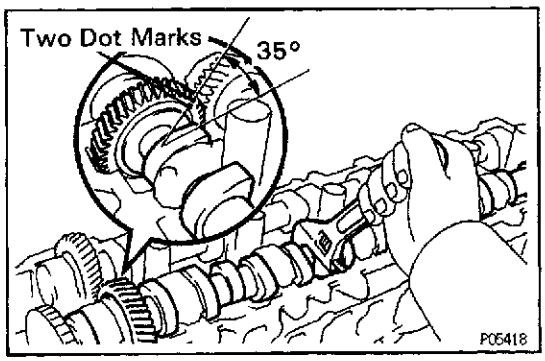
A. Remove exhaust camshaft

(a) 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

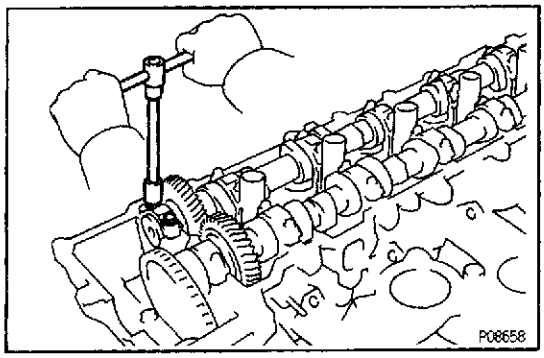
(b) Secure the exhaust camshaft sub-gear to the main gear with a service bolt

Recommended service bolt
Thread diameter 6 mm
Thread pitch 1 0 mm
Bolt length 16 - 20 mm (0 63 - 0 79 in)

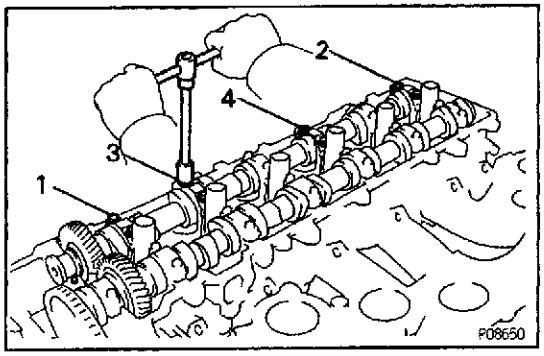
HINT When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation



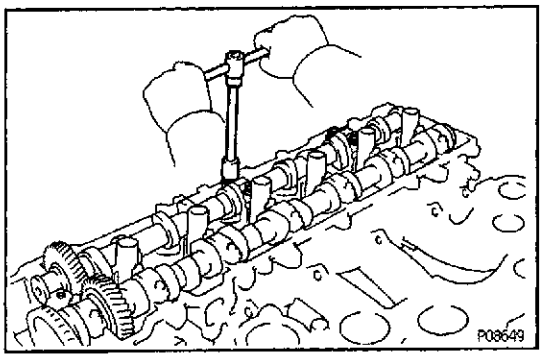
(c) Set the timing mark (two dot marks) of the camshaft driven gear at approx 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench



(d) Lightly push the camshaft towards the rear without applying excessive force
(e) Loosen and remove the No 1 bearing cap bolts, alternately loosening the left and right bolts uniformly

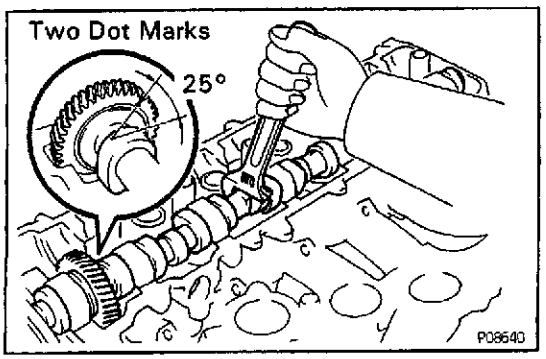


(f) Loosen and remove the No 2, No 3, No-5 and No 7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown
NOTICE: Do not remove the No.4 and No.6 bearing cap bolts at this stage.
(g) Remove the 4 bearing caps

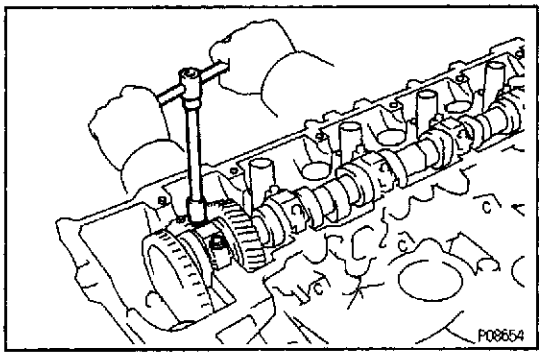


(h) Alternately and uniformly loosen and remove the No 4 and No 6 bearing cap bolts
HINT
- As the 4 No 4 and No 6 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level
- If the camshaft is not being lifted out straight and level, retighten the 4 No 4 and No 6 bearing cap bolts Then reverse the order of above steps from (g) to (a) and repeat steps from (a) to (f) once again

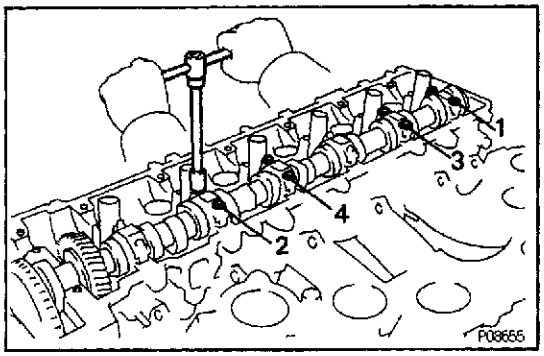
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.
(i) Remove the 2 bearing caps and exhaust camshaft



B. Remove intake camshaft
(a) Set the timing mark (two 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



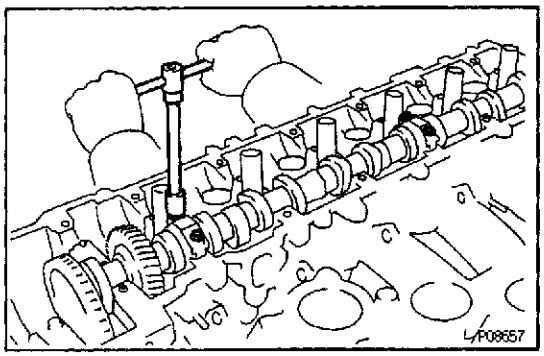
(b) Lightly push the intake camshaft towards the front without applying excessive force
(c) Loosen and remove the No 1 bearing cap bolts, alternately loosening the left and right bolts uniformly



(d) 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

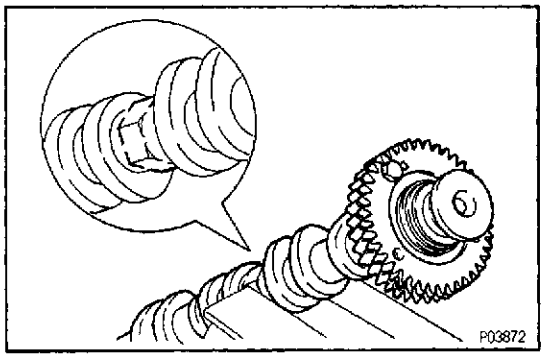
(e) Remove the 4 bearing caps



(f) 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 (f) to (a) and repeat steps from (a) to (g) once again

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

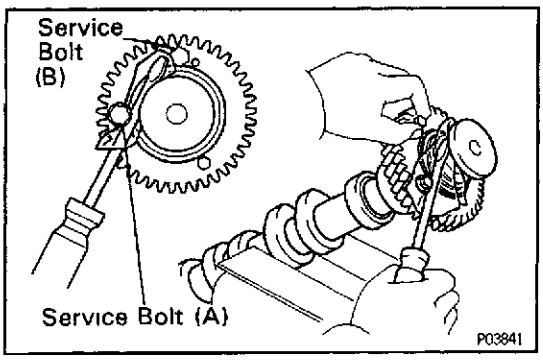
(g) Remove the 2 bearing caps and exhaust camshaft



47. DISASSEMBLE EXHAUST CAMSHAFT

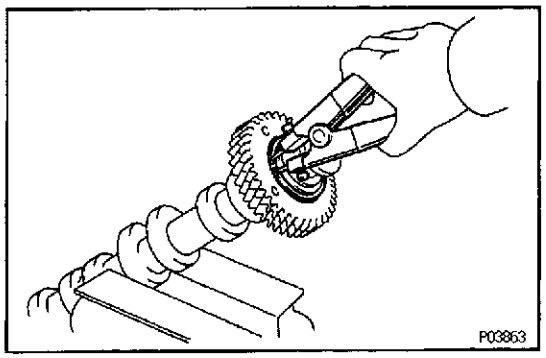
(a) Mount the hexagon wrench head portion of the camshaft in a vise

NOTICE: Be careful not to damage the camshaft.

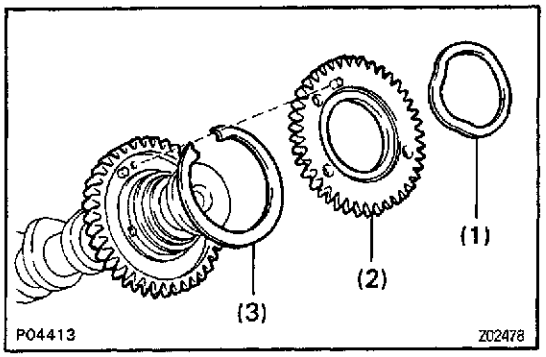


(b) Insert a service bolt (A) into the service hole of the camshaft sub-gear
(c) Using a screwdriver, turn the sub-gear clockwise, and remove the service bolt (B)

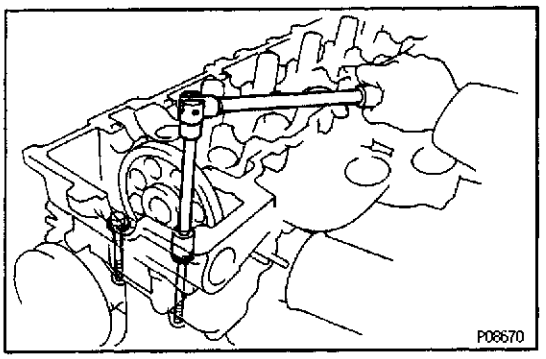
NOTICE: Be careful not to damage the camshaft.



(d) Using snap ring pliers, remove the snap ring

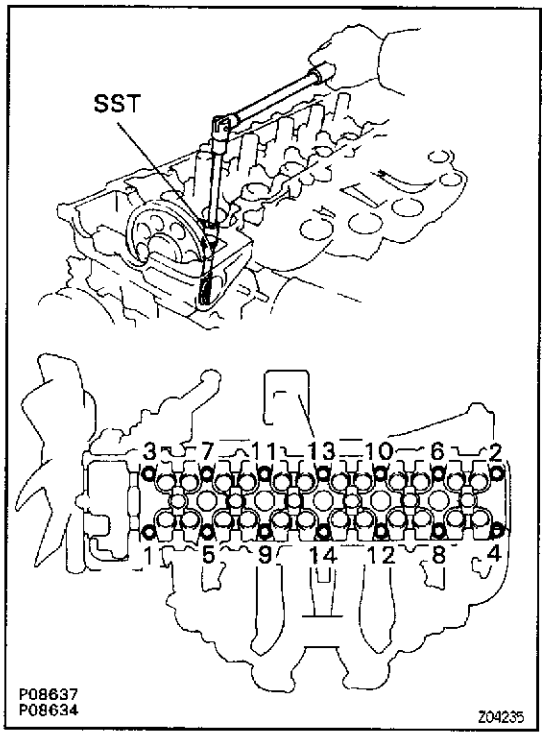


(e) Remove the following parts
(1) Wave washer
(2) Camshaft sub-gear
(3) Camshaft gear spring



48. REMOVE CYLINDER HEAD

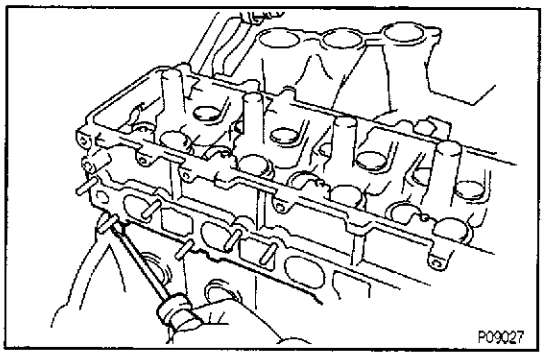
(a) Remove the 2 bolts in front of the head before the other head bolts are removed



(b) Using SST, uniformly loosen and remove the 14 cylinder head bolts, in several passes, in the sequence shown

SST 09011 -38121

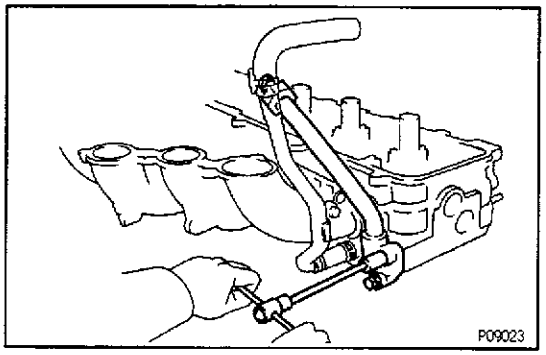
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench

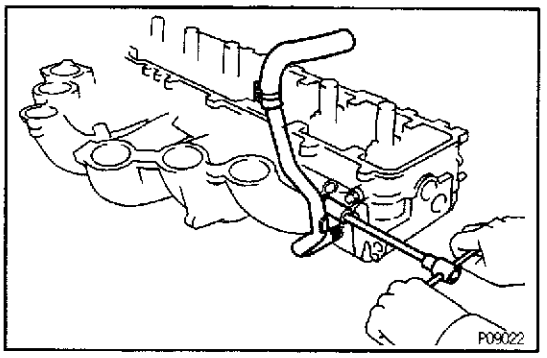
HINT If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver

NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



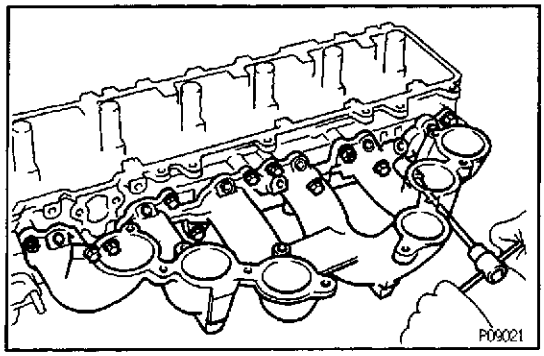
49. REMOVE EGR PIPE

Remove the 2 bolts EGR pipe and gasket

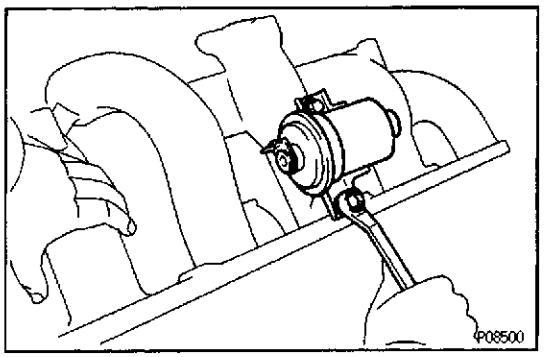


50. REMOVE HEATER INLET PIPE AND HOSE

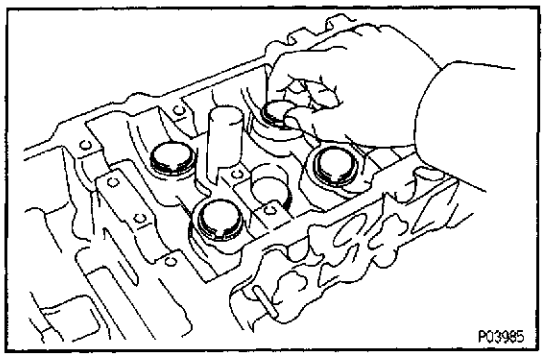
Disconnect the heater hose, and remove the bolt and heater inlet pipe



51. REMOVE INTAKE MANIFOLD WITH FUEL FILTER
Remove the 6 bolts, 2 nuts, intake manifold and gasket



52. REMOVE FUEL FILTER
Remove the 2 bolts and fuel filter

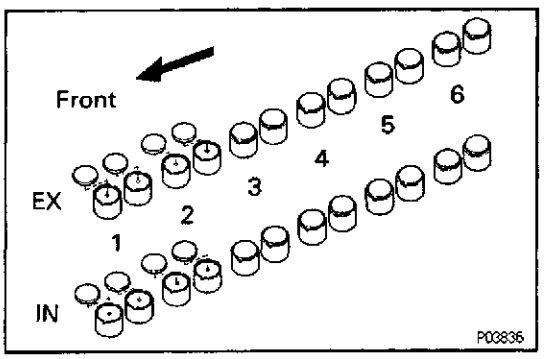


CYLINDER HEAD DISASSEMBLY

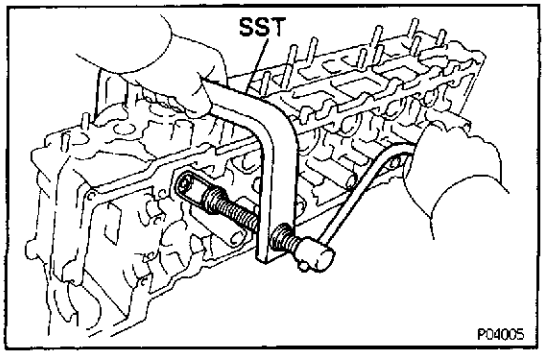
EG0VC-04

(See Components for Removal and Installation)

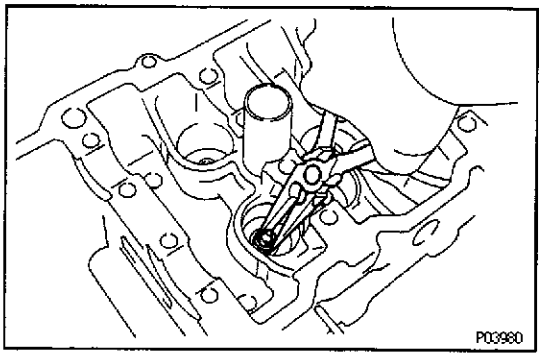
1. REMOVE VALVE LIFTERS AND SHIMS



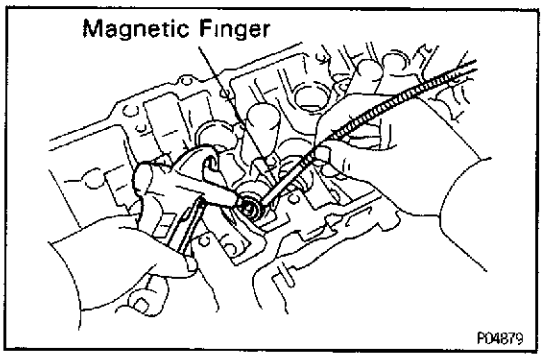
HINT Arrange the valve lifters and shims in correct order



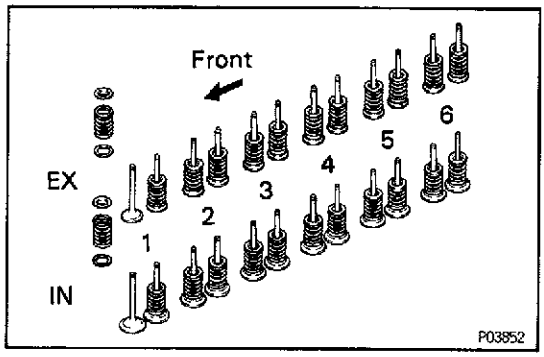
2. REMOVE VALVES
(a) Using SST, compress the valve spring and remove the 2 keepers
SST 09202-70010
(b) Remove the spring retainer, valve spring and valve



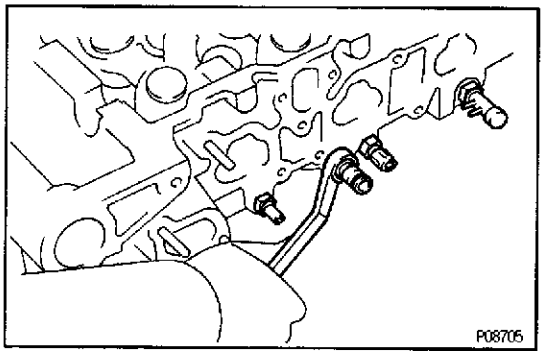
(c) Using needle-nose pliers, remove the oil seal



(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air

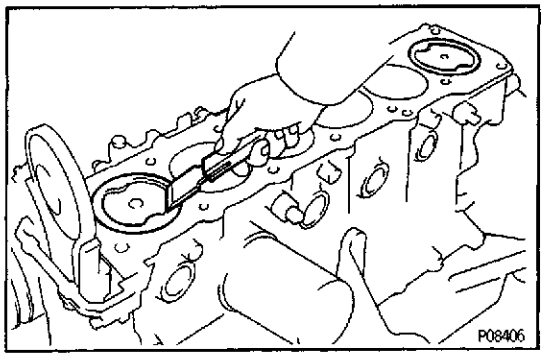


HINT Arrange the valves, valve springs, spring seats and spring retainers in correct order



3. REMOVE FOLLOWING PARTS:

(a) ECT sender gauge
(b) ECT cut switch
(c) ECT sensor
(d) TVV



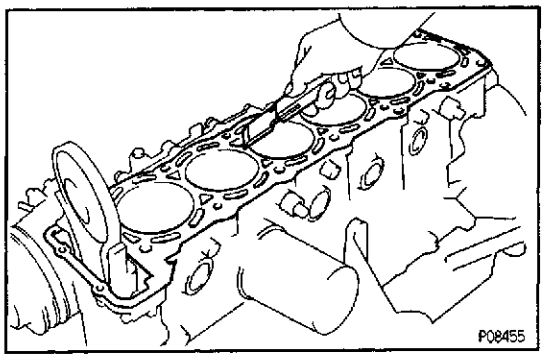
CYLINDER HEAD COMPONENTS

E01JX-03

INSPECTION, CLEANING AND REPAIR

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

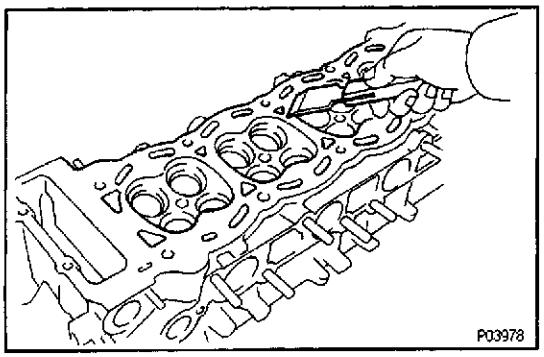
(a) Turn the crankshaft, and bring each piston to top dead center (TDC) Using a gasket scraper, remove all the carbon from the piston top surface



(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.

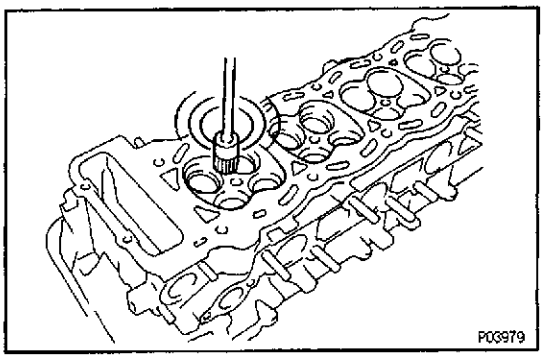


2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface

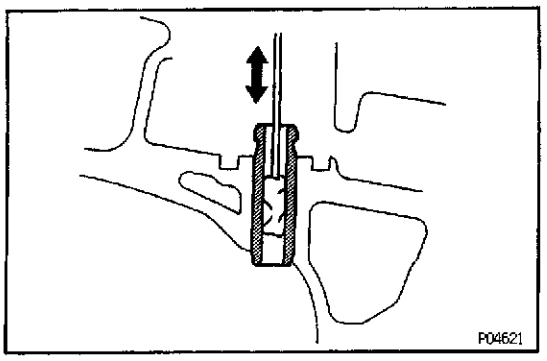
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

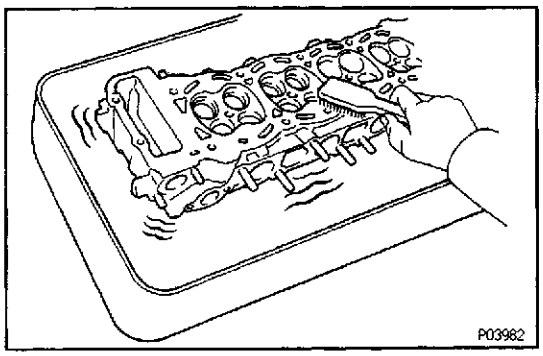
Using a wire brush, remove all the carbon from the combustion chambers

NOTICE: Be careful not to scratch the cylinder block contact surface.



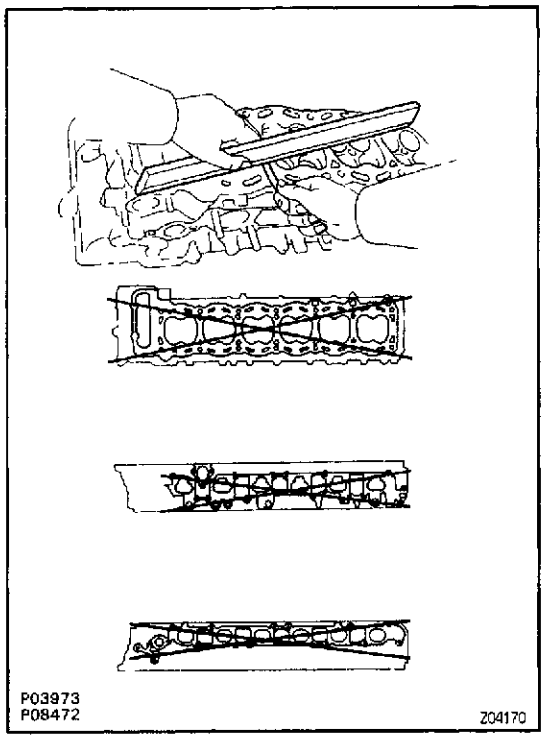
C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings



D. Clean cylinder head

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:

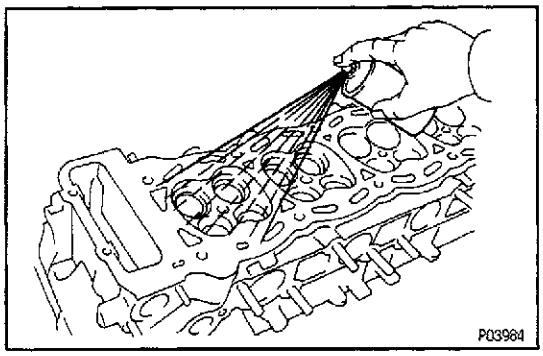
Cylinder block side

0.15 mm (0.0059 in.)

Manifold side

0.10 mm (0.0039 in.)

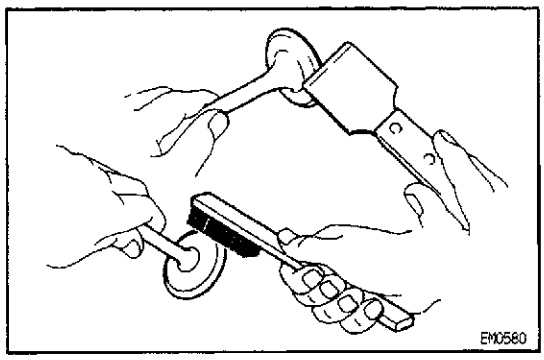
If warpage is greater than maximum, replace the cylinder head



B. Inspect for cracks

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks

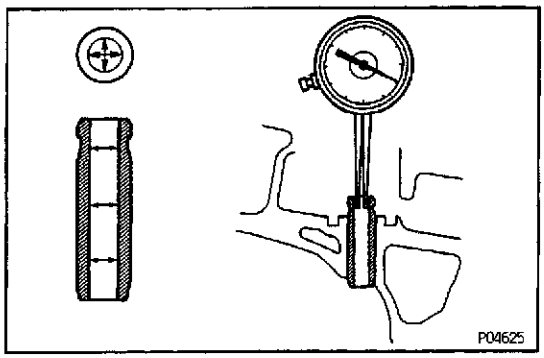
If cracked, replace the cylinder head



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

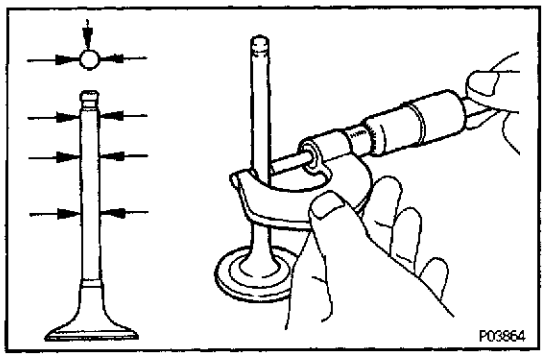


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(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:

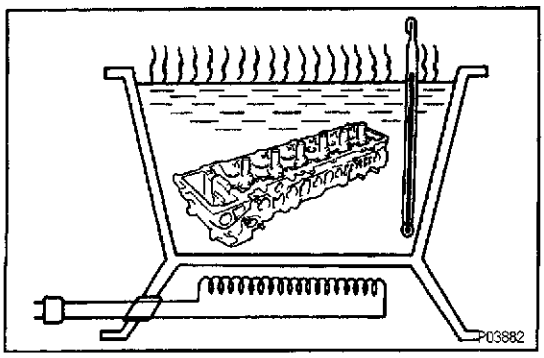
Intake

0.08 mm (0.0031 in.)

Exhaust

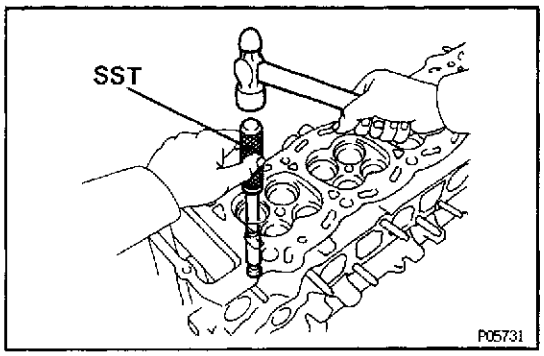
0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing

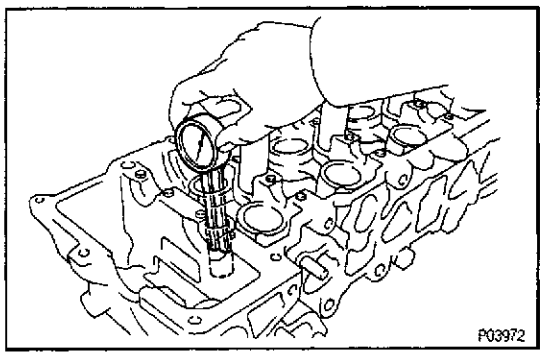


6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(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 -15010



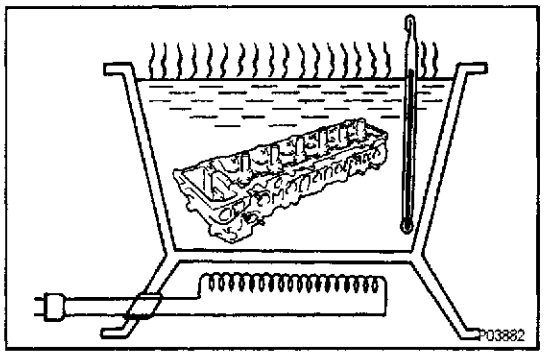
(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head

Both ntake and exhaust

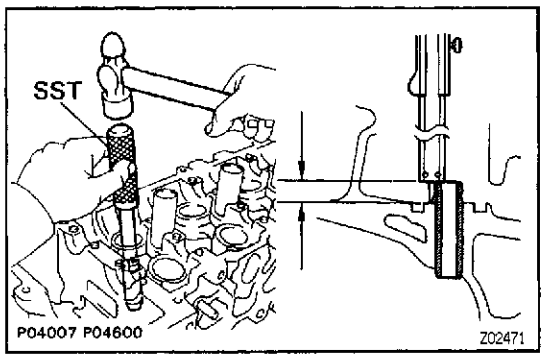
Bush ng bore d ameter mm (n)	Bush ng s ze
11 492 11 513 (0 4524 0 4533)	Use STD
11 542 11 563 (0 4544 0 4552)	Use OIS0 05

V00741

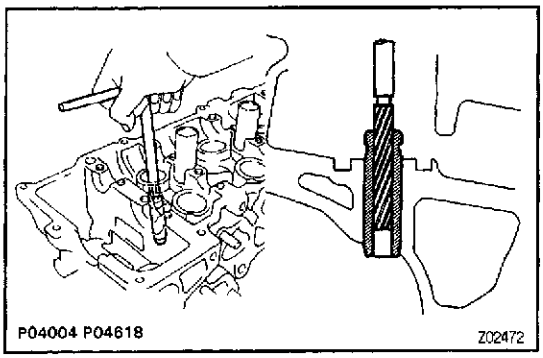
(d) Select a new guide bushing (STD size or O/S 0 05)
If the bushing bore diameter of the cylinder head is greater than 11 513 mm (0 4533 in), machine the bushing bore to the following dimension
11.542 - 11.563 mm (0.4544 - 0.4552 in.)
If the bushing bore diameter of the cylinder head is greater than 11 563 mm (0 4552 in), replace the cylinder head



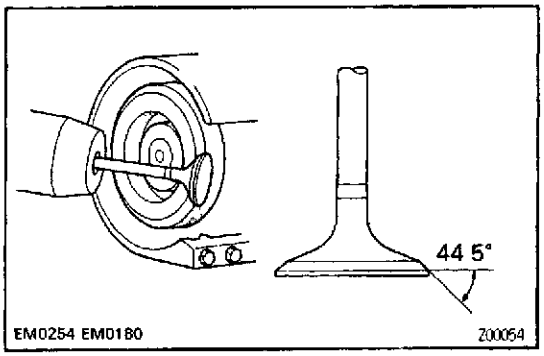
(e) Gradually heat the cylinder head to 80 - 100°C (176 - 212° F)



(f) Using SST and a hammer, tap in a new guide bushing to where there 8 2 - 8 6 mm (0 323 - 0 339 in) protruding from the cylinder head
SST 09201-15010



(g) Using a sharp 7 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EG-53) between the guide bushing and valve stem



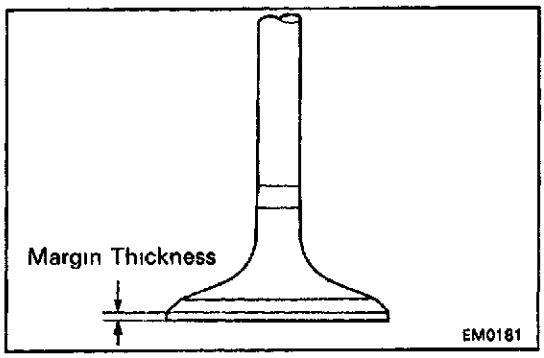
7. INSPECT AND GRIND VALVES

(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

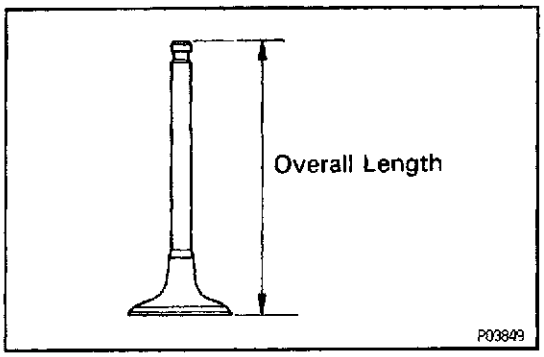
Standard margin thickness:

1.2 mm (0.047 in.)

Minimum margin thickness:

1.0 mm (0.039 in.)

If the margin thickness is less than minimum, replace the valve



(d) Check the valve overall length

Standard overall length:

Intake

98.4 mm (3.874 in)

Exhaust

97.9 mm (3.854 in.)

Minimum overall length:

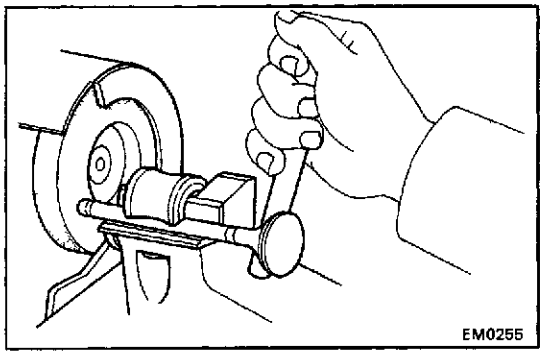
Intake

97.9 mm (3.854 in.)

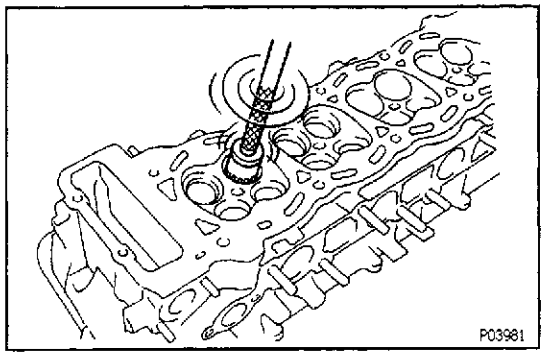
Exhaust

97.4 mm (3.835 in.)

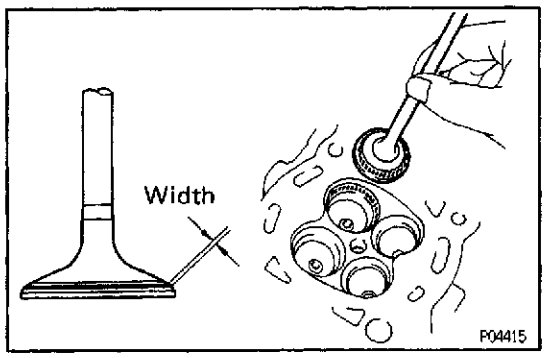
If the overall length is less than minimum replace the valve



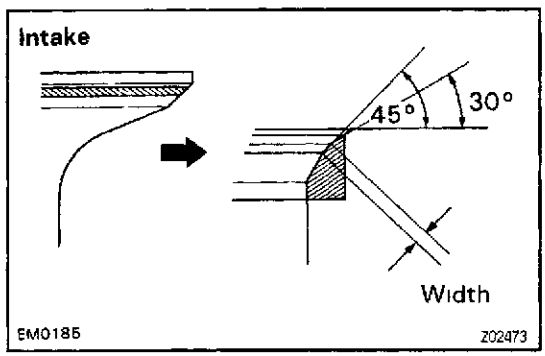
(e) Check the surface of the valve stem tip for wear
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve
NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS
(a) Using a 45° carbide cutter, resurface the valve seats
Remove only enough metal to clean the seats

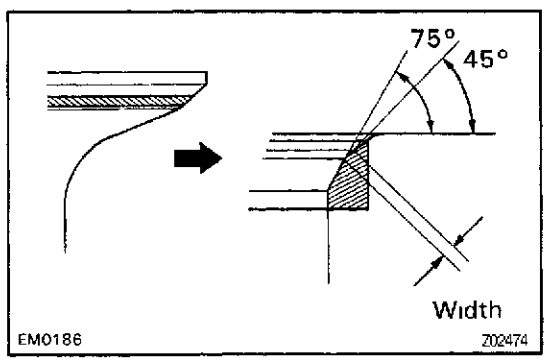


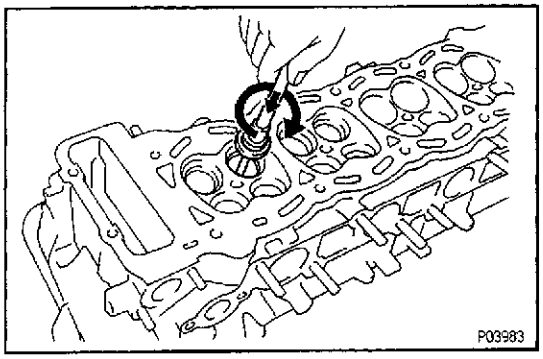
(b) Check the valve seating position
Apply a light coat of prussian blue (or white lead) to the valve face Lightly press the valve against the seat Do not rotate valve
(c) Check the valve face and seat for the following
If blue appears 360° around the face, the valve is concentric If not, replace the valve



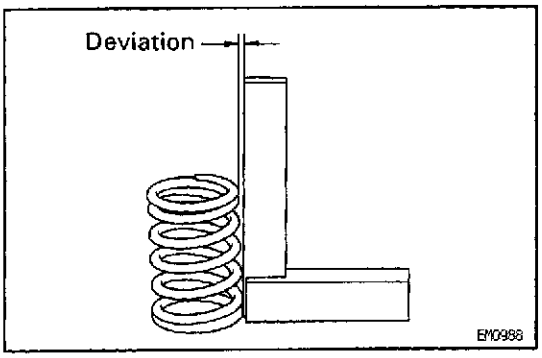
- If blue appears 360° around the valve seat, the guide and face are concentric If not, resurface the seat
- Check that the seat contact is in the middle of the valve face with the following width
  Intake
  1.2 - 1.6 mm (0.047 - 0.063 in.)
  Exhaust
  1.0 - 1.4 mm (0.039 - 0.055 in.)

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

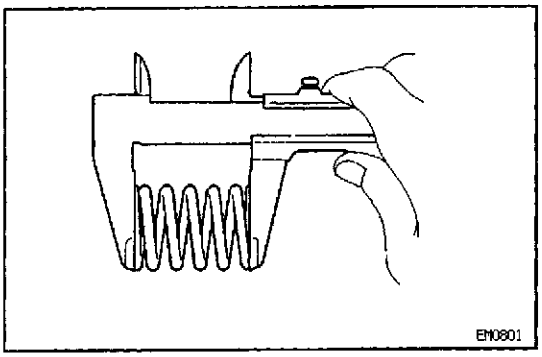




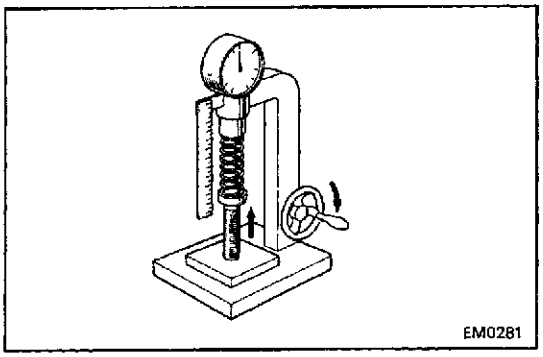
(d) Hand-lap the valve and valve seat with an abrasive compound
(e) After hand-lapping, clean the valve and valve seat



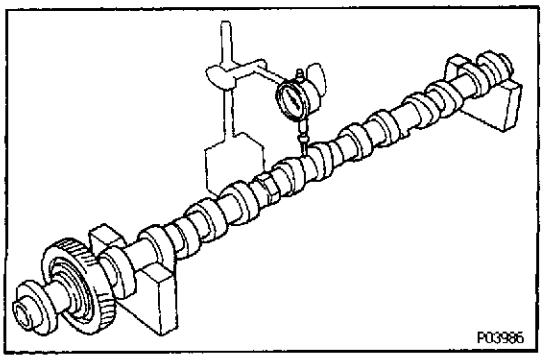
9. INSPECT VALVE SPRINGS
(a) Using a steel square, measure the deviation of the valve spring
Maximum deviation:
2.0 mm (0.079 in.)
If the deviation is greater than maximum, replace the valve spring



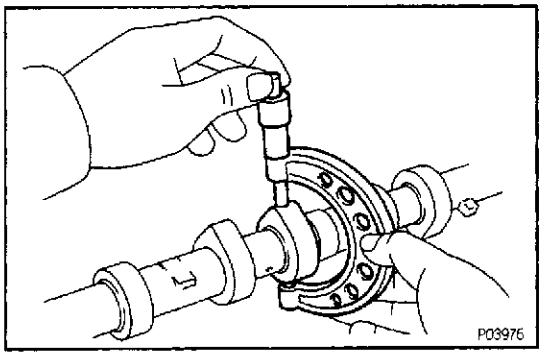
(b) Using a vernier caliper, measure the free length of the valve spring
Free length:
43.94 - 45.06 mm (1.7299 - 1.7740 in.)
If the free length is not as specified, replace the valve spring



(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 1bf)
at 36.5 mm (1.437 in.)
If the installed tension is not as specified, replace the valve spring



10. INSPECT CAMSHAFTS AND BEARINGS
A. Inspect camshaft for runout
(a) Place the camshaft on V-blocks
(b) 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 cam lobes

Using a micrometer, measure the cam lobe height

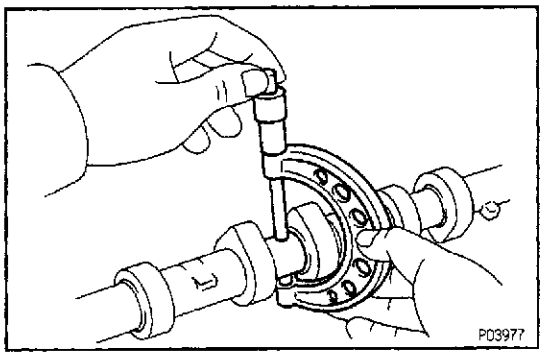
Standard cam lobe height:

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



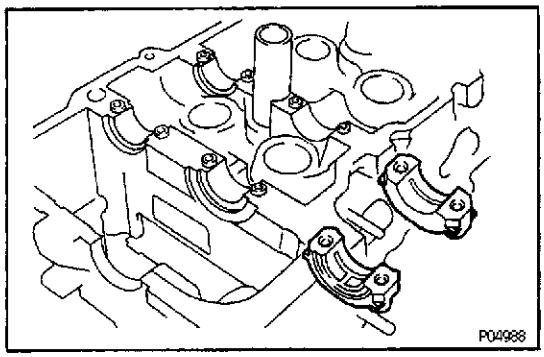
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter

Journal diameter:

26.959 - 26.975 mm (1.0614 - 1.0620 in.)

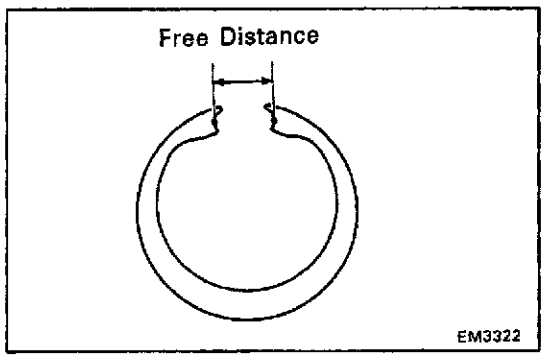
If the journal diameter is not as specified, check the oil clearance



D. Inspect camshaft bearings

Check that bearings for flaking and scoring

If the bearings are damaged, replace the bearing caps and cylinder head as a set



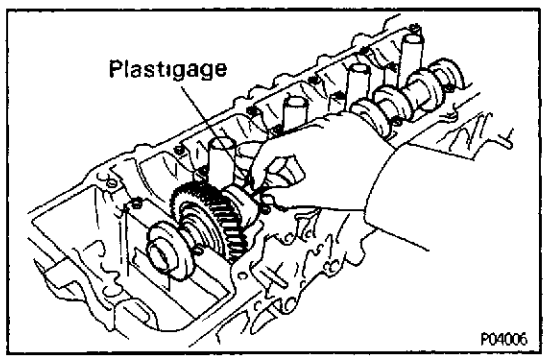
E. Inspect camshaft gear spring

Using a vernier caliper, 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

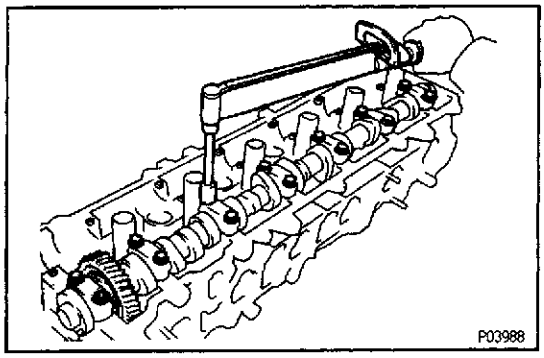


F. Inspect camshaft journal oil clearance

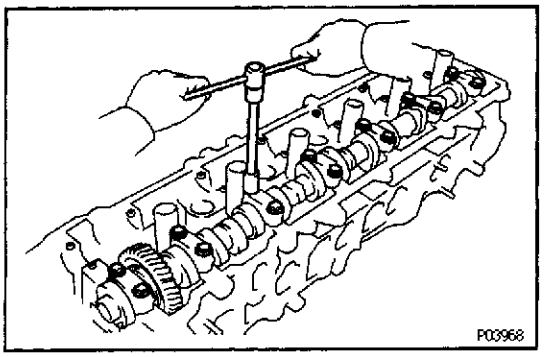
(a) Clean the bearing caps and camshaft journals

(b) Place the camshafts on the cylinder head

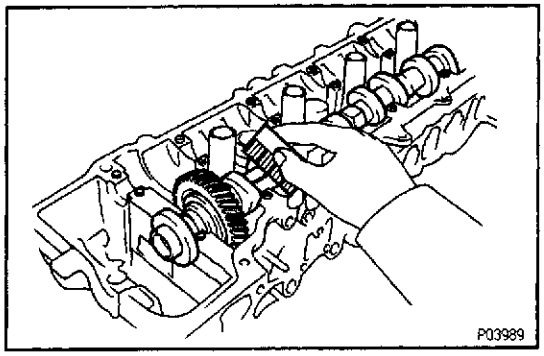
(c) Lay a strip of Plastigage across each of the camshaft journals



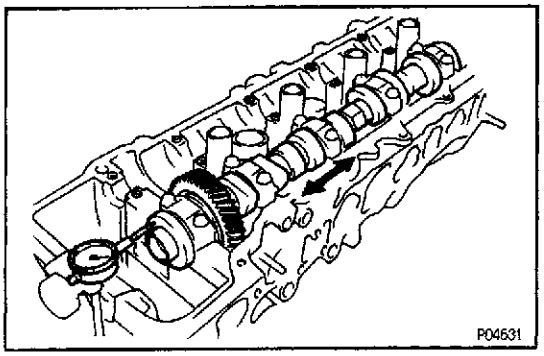
(d) Install the bearing caps
(See step 7 on pages EG-68 to 71)
Torque: 16 N-m (160 kgf-cm, 12 ft-lbf)
NOTICE: Do not turn the camshaft.



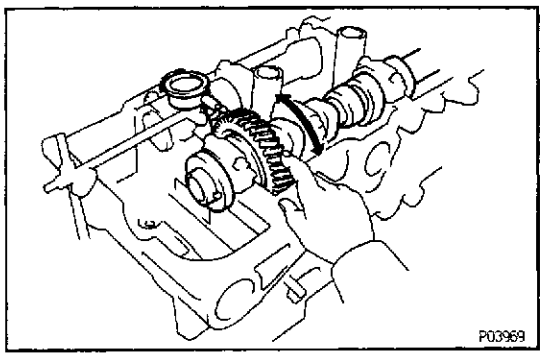
(e) Remove the bearing caps



(f) 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
(g) Completely remove the Plastigage



G. Inspect camshaft thrust clearance
(a) Install the camshaft
(See step 7 on pages EG-68 to 71)
(b) 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



H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust cam sub-gear

(See step 7 on pages EG-68 to 71)

(b) Using a dial indicator, measure the backlash

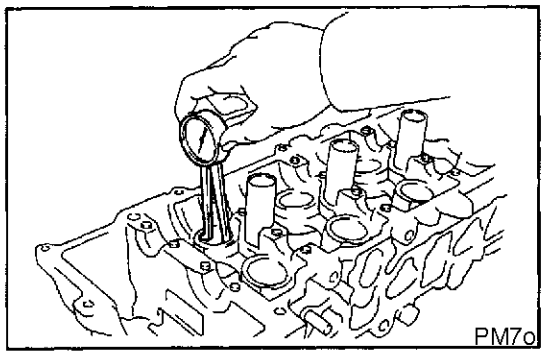
Standard backlash:

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

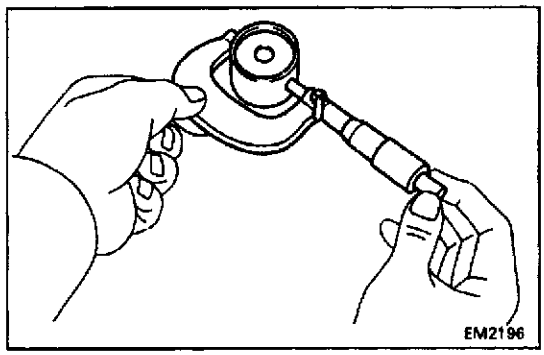


11. INSPECT VALVE LIFTERS AND LIFTER BORES

(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

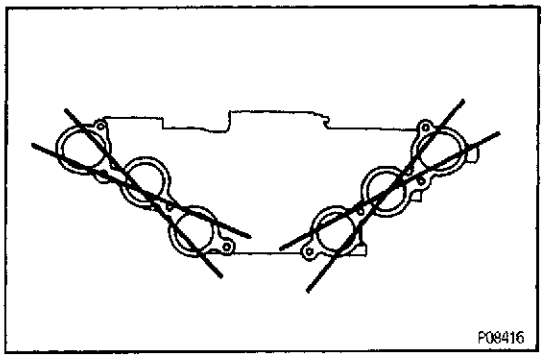
Standard oil clearance:

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



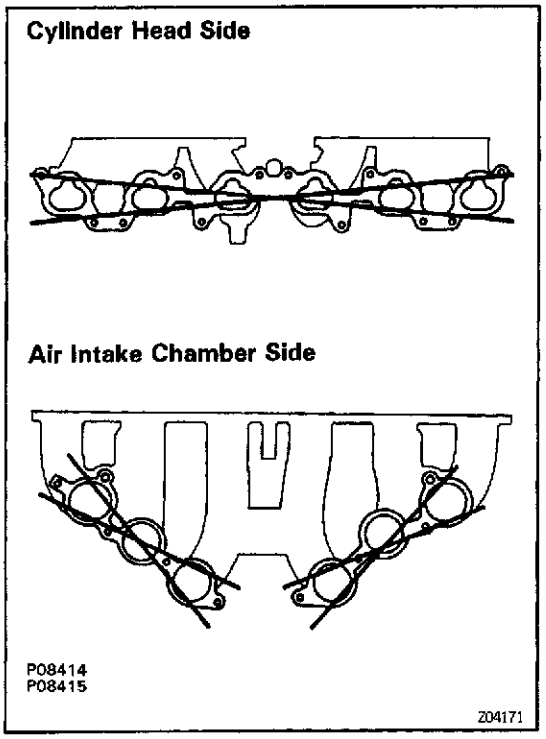
12. INSPECT AIR INTAKE CHAMBER

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



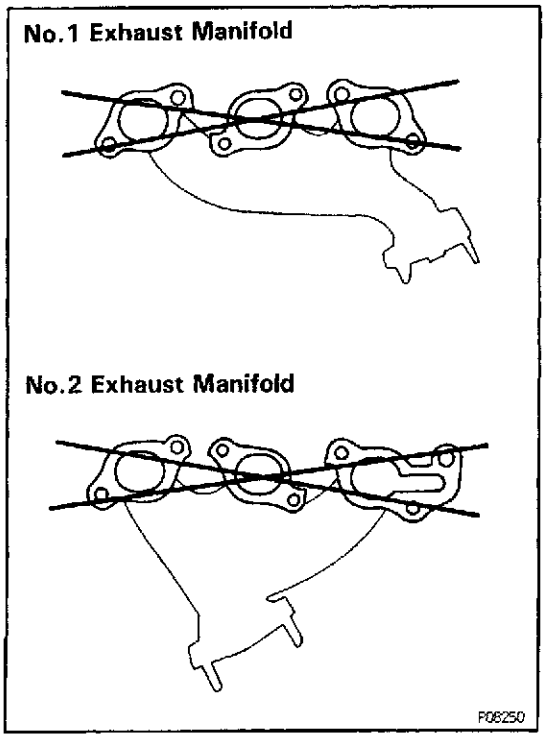
13. INSPECT INTAKE MANIFOLD

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



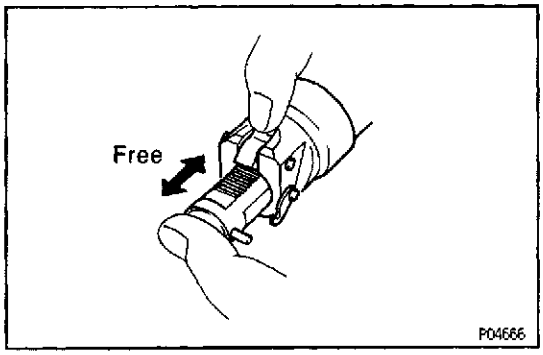
14. INSPECT EXHAUST MANIFOLDS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head for warpage

Maximum warpage:

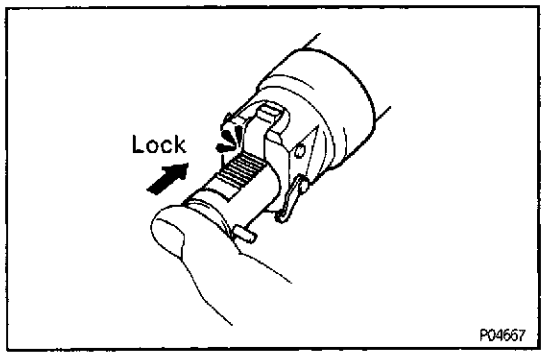
0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold

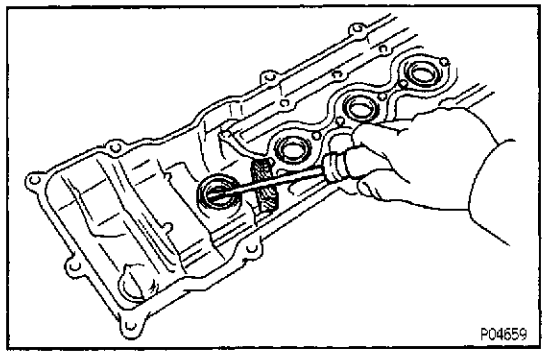


15. INSPECT CHAIN TENSIONER

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger

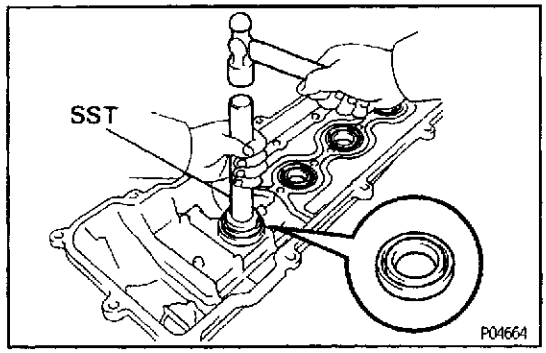


(b) Released the ratchet pawl and check that the plungens locked in place by the ratchet pawl and does not move when pushed with your finger



16. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

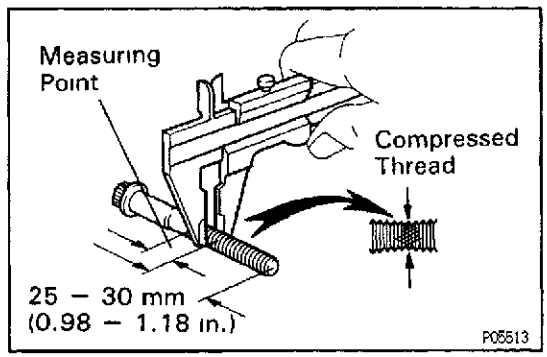
(a) Using a screwdriver, pry off the tube gasket



(b) Using SST and a hammer, tap in a new tube gasket as shown in the illustration

SST 09608-60012 (09608-04020, 09608-04060)

(c) Apply a light coat of IMP grease to the gasket lip



17. INSPECT CYLINDER HEAD BOLTS

Using vernier calipers, measure the thread outside diameter- of the bolt

Standard outside diameter

10.86 - 11.00 mm (0.4272 - 0.4331 in.)

Minimum outside diameter:

10.6 mm (0.417 in.)

If the diameter is less than minimum, replace the bolt

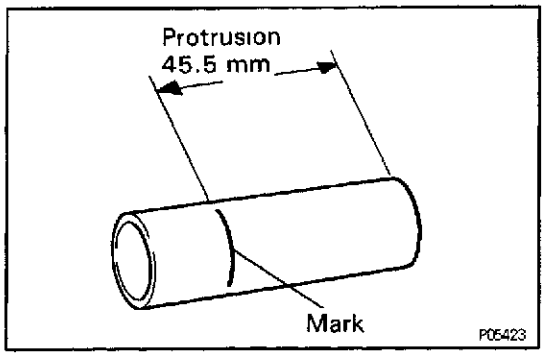
CYLINDER HEAD ASSEMBLY

EG0VE-04

(See Components for Removal and Installation)

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

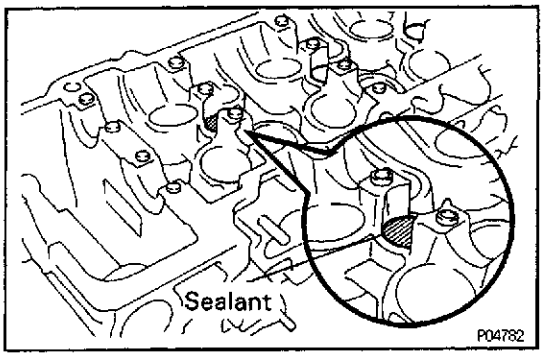


1. INSTALL SPARK PLUG TUBES

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

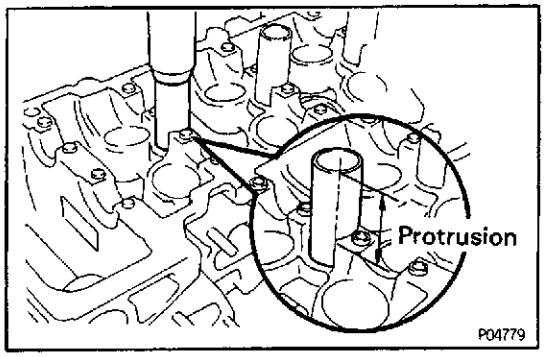
Standard protrusion:
45.5 mm (1.791 in.)



(b) Apply adhesive to the spark plug tube hole of the cylinder head

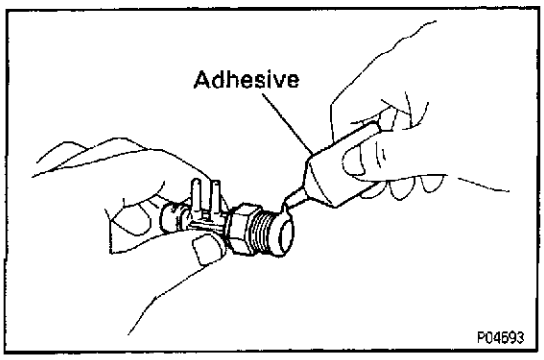
Sealant:

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.

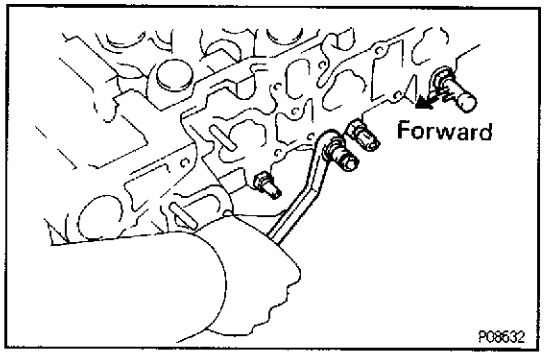


2. INSTALL FOLLOWING PARTS:

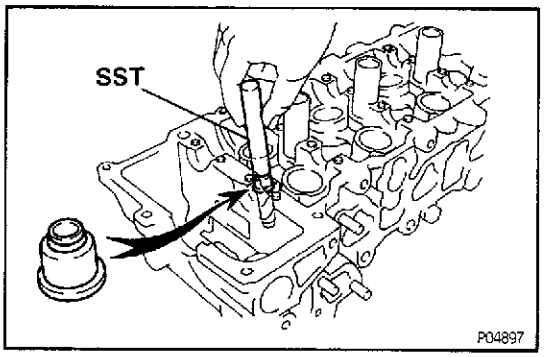
HINT Apply adhesive to 2 or 3 threads of the TVV

Adhesive:

Part No.08833 - 00080, THREE BOND 1344, LOCTITE 242 or equivalent

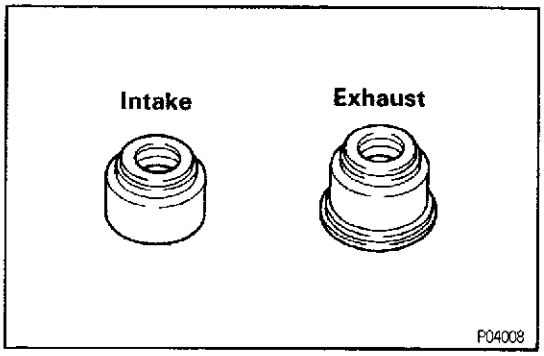


(a) ECT sender gauge
(b) ECT cut switch
(c) ECT sensor
(d) TVV

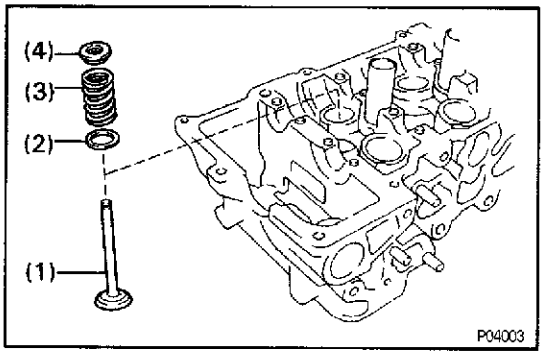


3. INSTALL VALVES

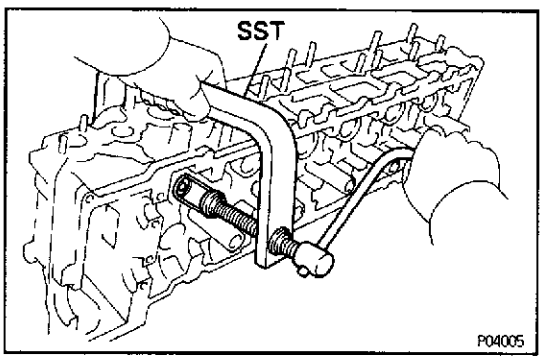
(a) Using SST, push in a new oil seal
SST 09236-00101 (09236-15010)



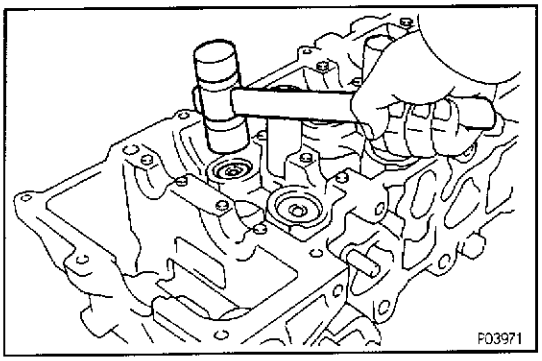
HINT Different oil seals are used for the intake and exhaust



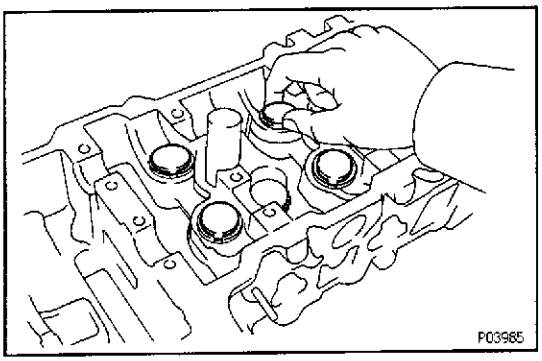
(b) Install the following parts
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem
SST 09202-70010



(d) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit



4. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim

(b) Check that the valve lifter rotates smoothly by hand

EG1QA-02

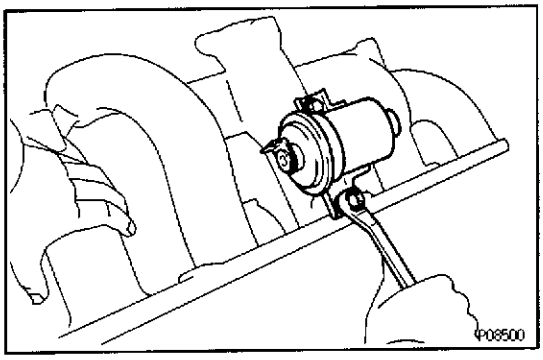
CYLINDER HEAD INSTALLATION

(See Components for Removal and Installation)

1. INSTALL FUEL FILTER TO INTAKE MANIFOLD

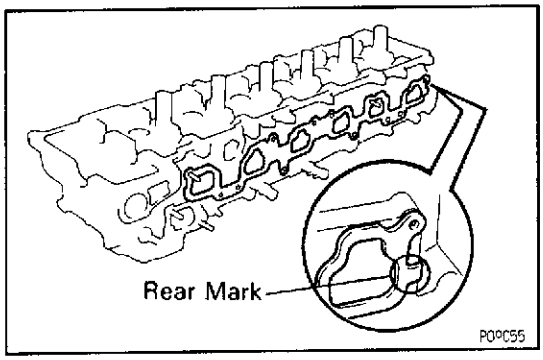
Install the fuel filter with the 2 bolts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



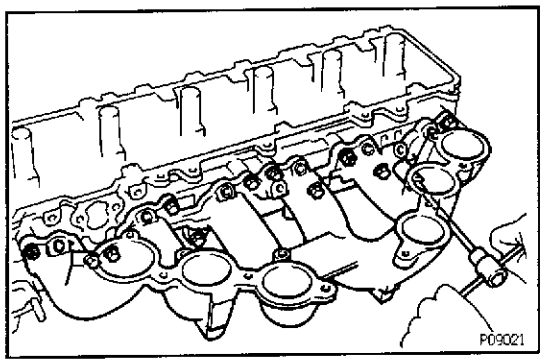
2. INSTALL INTAKE MANIFOLD

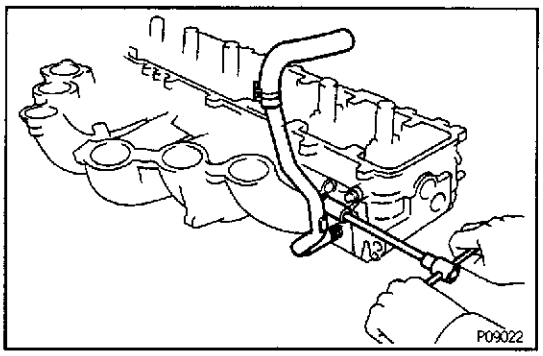
(a) Place a new gasket so that the rear mark is toward the rear side



(b) Install the intake manifold with the 6 bolts and 2 nuts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)

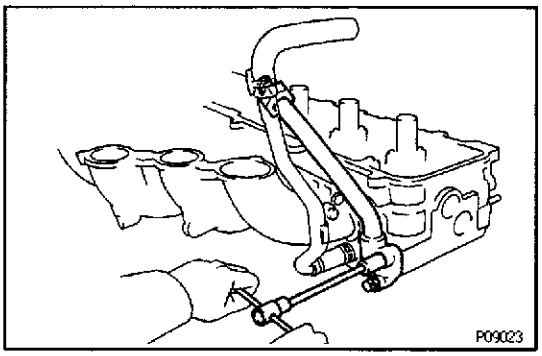




3. INSTALL HEATER INLET PIPE AND HOSE

Install the heater hose to the cylinder head, and connect the pipe to the intake manifold

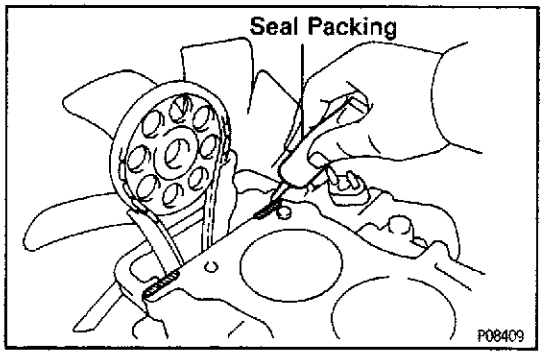
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



4. INSTALL EGR PIPE

Install a new gasket and the EGR pipe with the 2 bolts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



5. INSTALL CYLINDER HEAD

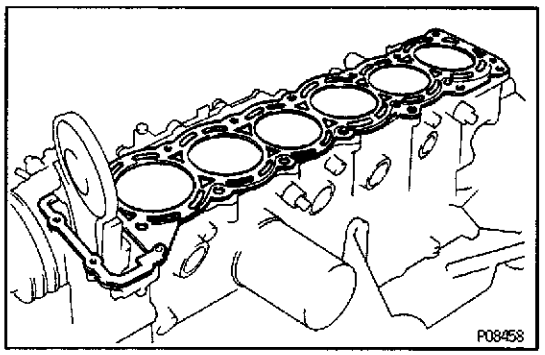
A. Place cylinder head on cylinder block

(a) Apply seal packing to the 2 locations as shown

Seal packing:

Part No. 08826-00080 or equivalent

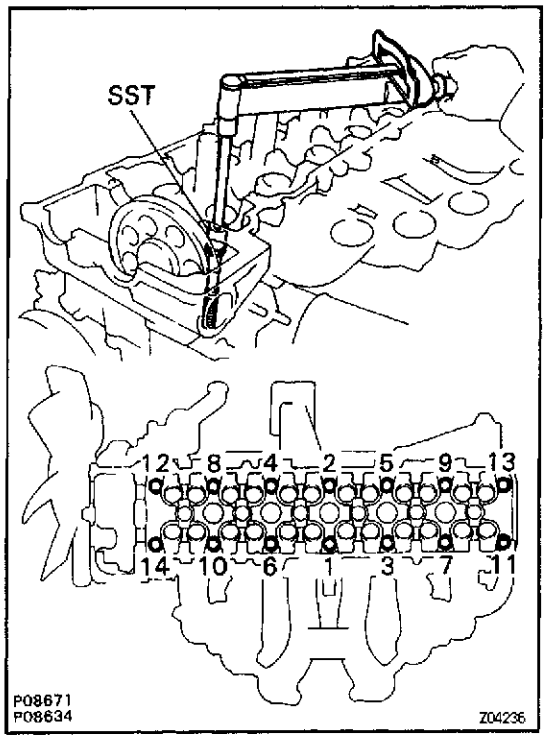
NOTICE: Do not apply too much seal packing



(b) Place a new cylinder head gasket in position on the cylinder block

NOTICE: Be careful of the installation direction.

(c) Place the cylinder head in position on the cylinder head gasket



B. Install cylinder head bolts

HINT

- The cylinder head bolts are tightened in 2 progressive steps (steps (b) and (d))
- If any cylinder head bolt is broken or deformed, replace it

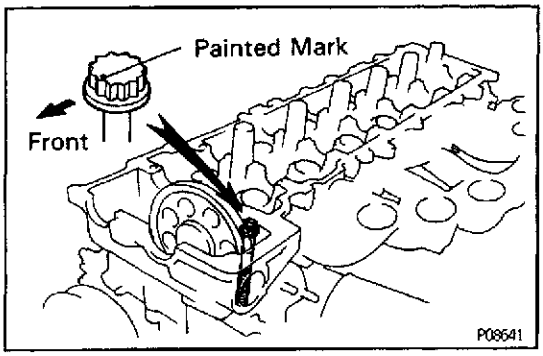
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts

(b) Using SST, install and uniformly tighten the 14 cylinder head bolts and plate washers in several passes, in the sequence shown

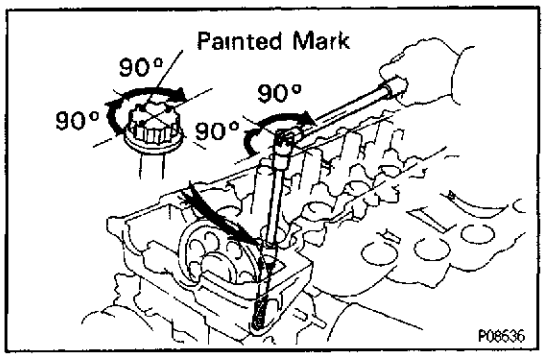
SST 09011 -38121

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



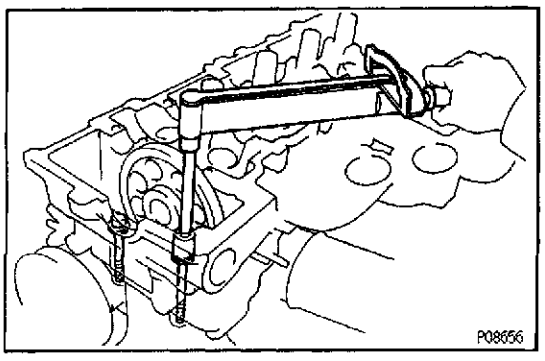
(c) Mark the front of the cylinder head bolt head with paint



(d) Retighten the cylinder head bolts by 90° in the numerical order shown

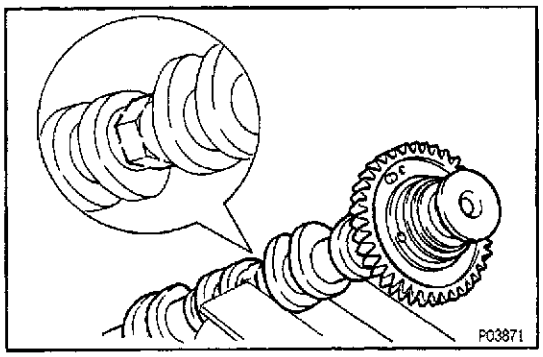
(e) Retighten the cylinder head bolts by an additional 90°

(f) Check that the painted mark is now facing rearward



(g) Install and torque the 2 mounting bolts

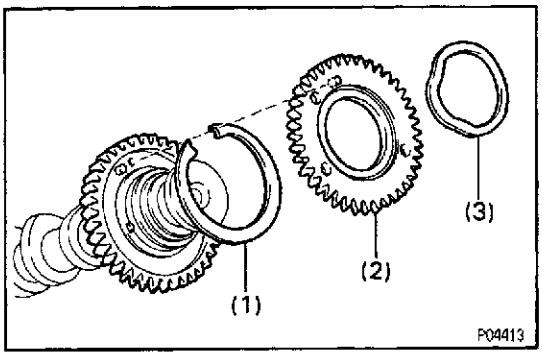
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



6. ASSEMBLY EXHAUST CAMSHAFT

(a) Mount the hexagon wrench head portion of the camshaft in a vise

NOTICE: Be careful not to damage the camshaft.



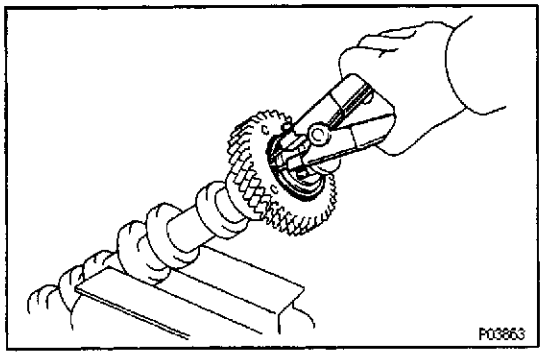
(b) Install the following parts

(1) Camshaft gear spring

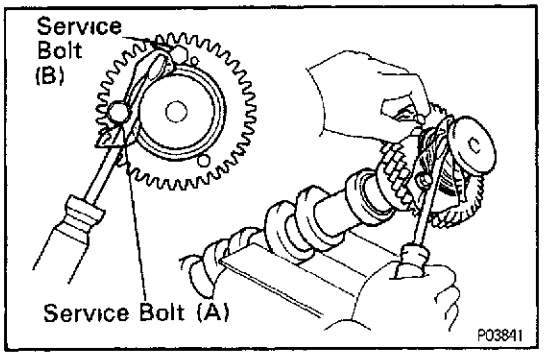
(2) Camshaft sub-gear

(3) Wave washer

HINT Align the pins on the gears with the spring ends



(c) Using snap ring pliers, install the snap ring



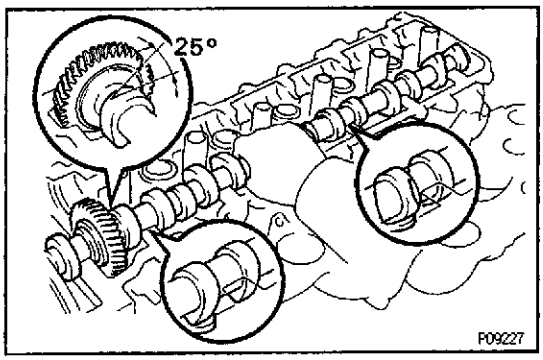
(d) Insert a service bolt (A) into the service hole of the camshaft sub-gear

(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.

7. 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.

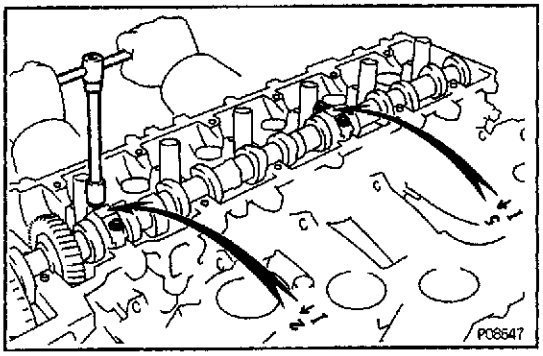


A. Install intake camshaft

(a) Apply engine oil to the thrust portion of the intake camshaft

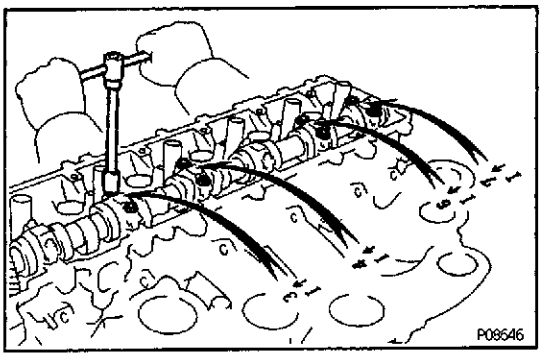
(b) Lightly place the intake camshaft on top of the cylinder head as shown in the illustration so that the No 1 and No 4 cylinder cam lobes face downward

(c) Lightly push the camshaft towards the front without applying excessive force



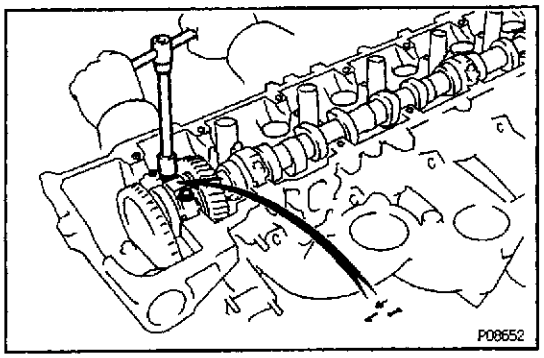
(d) Place the No 2 and No 5 bearing caps in their proper location

(e) Temporarily tighten these bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head



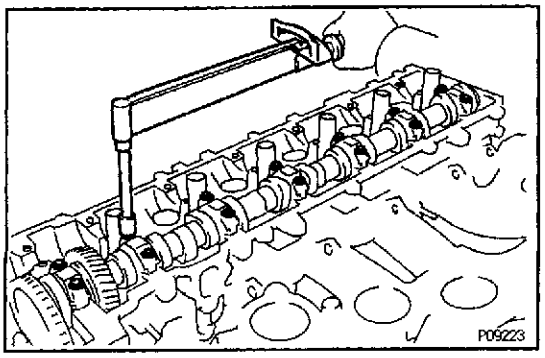
(f) Place the No 3, No 4, No 6 and No 7 bearing caps in their proper location

(g) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly



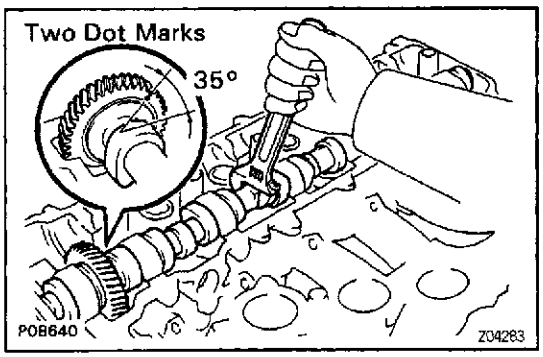
(h) Place the No 1 bearing cap in its proper location When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap

(i) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly



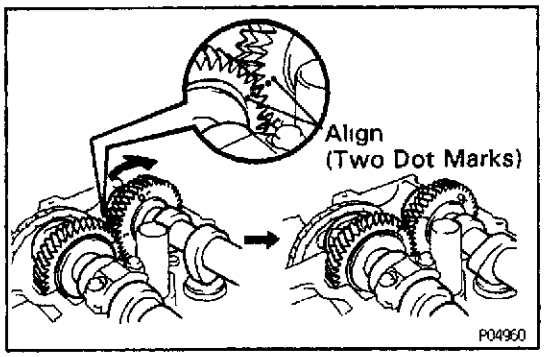
(j) Uniformly tighten the 14 bearing cap bolts in several passes

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

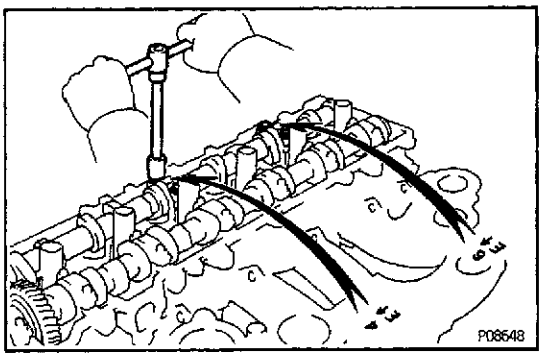


B. Install exhaust camshaft

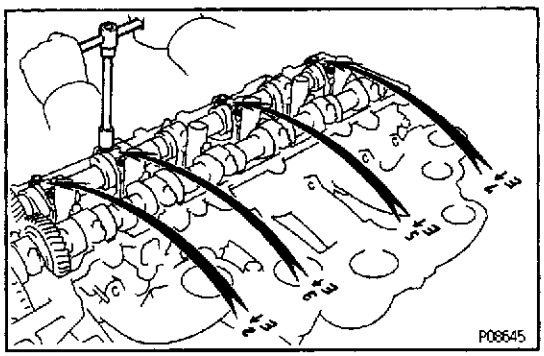
(a) Set the timing mark (two dot marks) of the camshaft drive gear at approx 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench



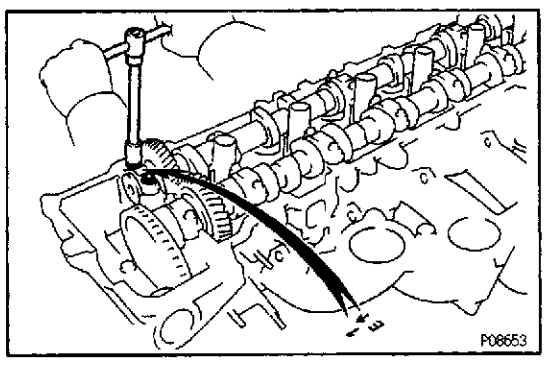
(b) Apply engine oil to thrust portion of the exhaust camshaft
(c) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (two dot marks) on each gear
(d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other
(e) Lightly push the intake camshaft towards the front without applying excessive force



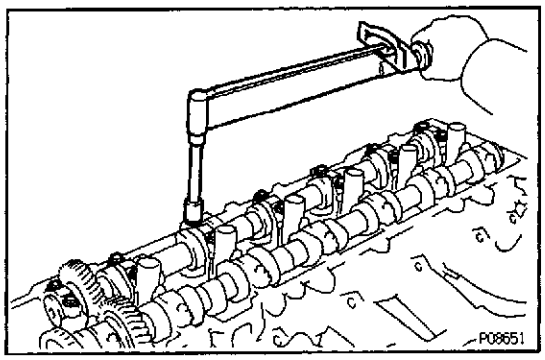
(f) Install the No 4 and No 6 bearing caps in their proper location
(g) Temporarily tighten the bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head



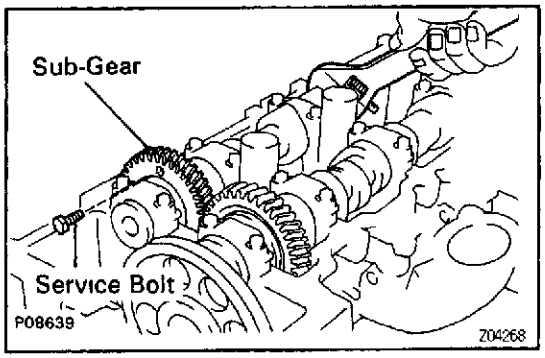
(h) Place the No 2, No 3, No 5 and No 7 bearing caps in their proper location
(i) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly



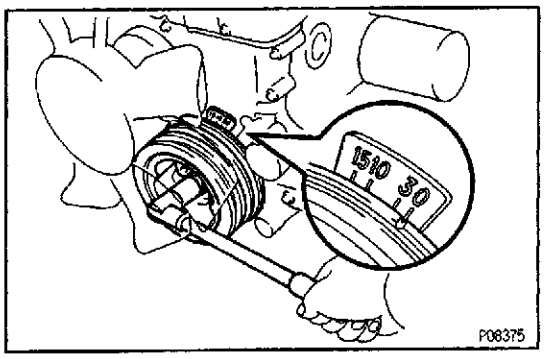
(j) Place the No 1 bearing cap in its proper location When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap
(k) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly



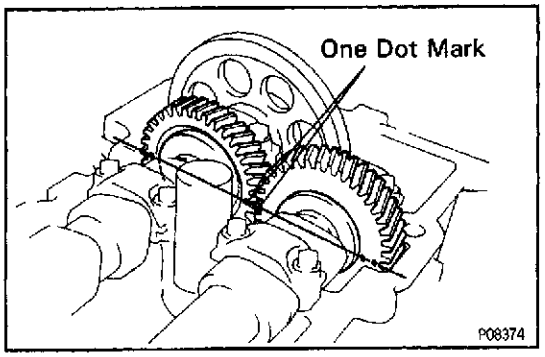
(l) Uniformly tighten the 14 bearing cap bolts in sever passes
Torque: 16 N-m (160 kgf-cm, 12 ft-lbf)



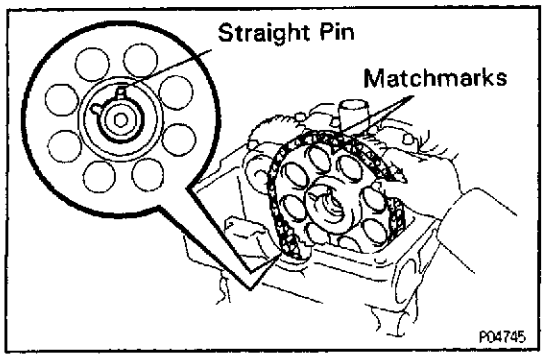
(m) Bring the service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench
(n) Remove the service bolt
(o) Check that the intake and exhaust camshafts turn smoothly



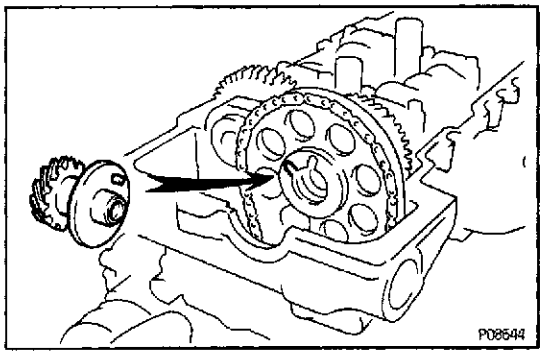
8. SET NO.1 CYLINDER TO TDC/COMPRESSION
(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover



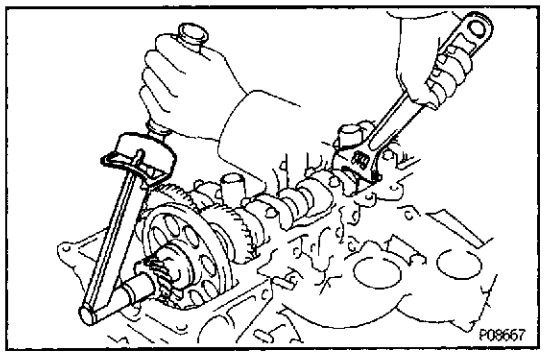
(b) Turn the camshafts so that the timing marks with one and two dots will be in straight line on the cylinder head surface as shown in the illustration



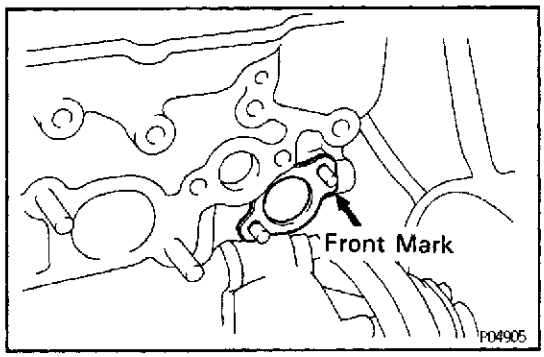
9. INSTALL CAMSHAFT TIMING GEAR
HINT Check that the matchmarks on the camshaft timing gear and timing chain are aligned
(a) Place the gear over the straight pin of the intake camshaft



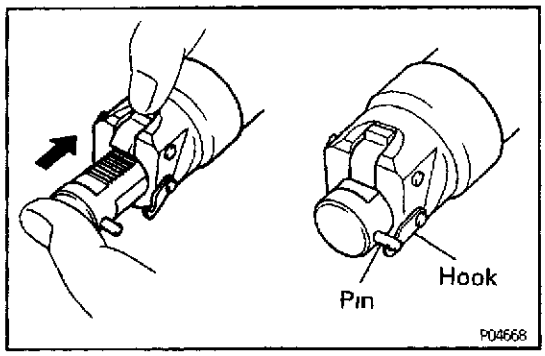
(b) Align the straight pin of distributor gear with the straight pin groove of the intake camshaft gear as shown



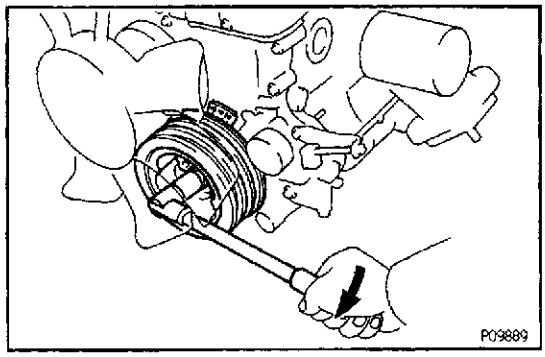
(c) Hold the intake camshaft with a wrench, install and torque the bolt
Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



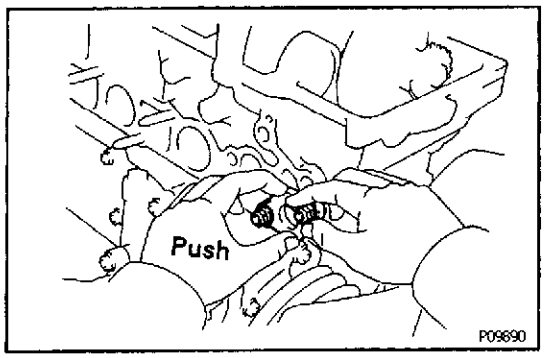
10. INSTALL CHAIN TENSIONER
(a) Place a new gasket so that the front mark is toward the front side



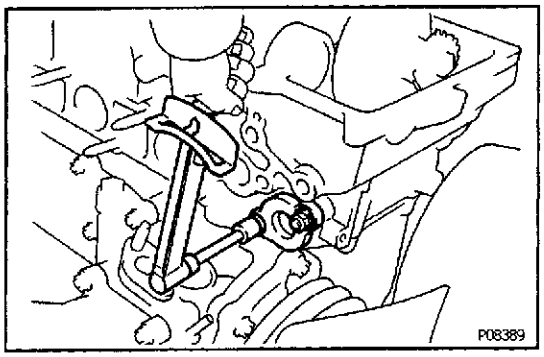
(b) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out



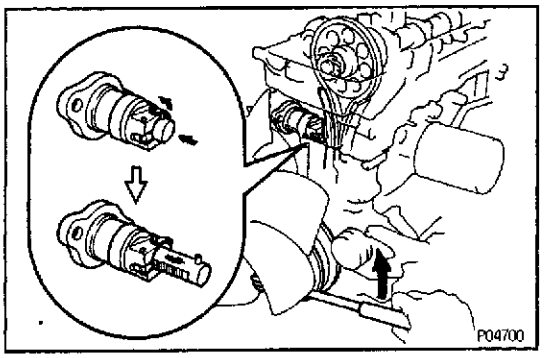
(c) Turn the crankshaft pulley clockwise to provide some slack for the chain on the tensioner side
NOTICE: Do not turn the pulley counterclockwise.



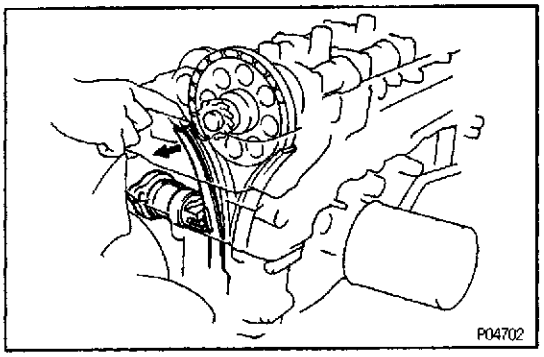
(d) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts



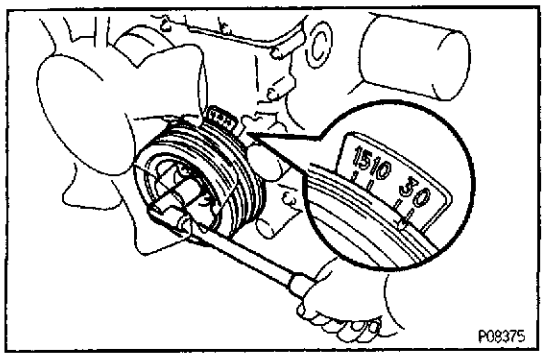
(e) Tighten the 2 nuts
Torque: 21 N-m (210 kgf-cm, 15 ft-bf) ,
(f) Check that the hook of the tensioner is not released
NOTICE: If the plunger springs out during installation of the chain tensioner, repeat the operation in step (b) before installing the tensioner.



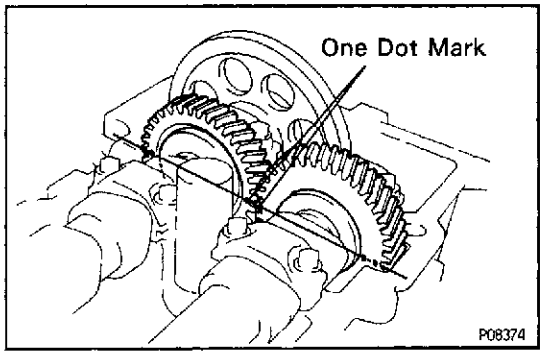
11. SET CHAIN TENSIONER
Turn the crankshaft to the left so that the hook of the chain tensioner is released from the pin of the plunger, causing the plunger to spring out and the slipper to be pushed into the chain



HINT If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released and the plunger springs out



12. 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 (one and two 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

13. CHECK AND ADJUST VALVE CLEARANCE (SEE STEPS 12 TO 14 on pages EG-16 to 21)

Turn the camshaft and position the cam lobe upward and check and adjust the valve clearance

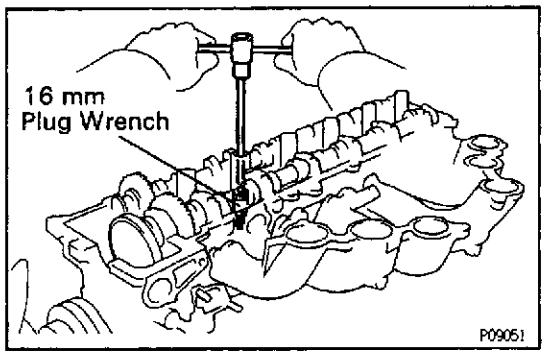
Valve clearance (Cold):

Intake

0.15 - 0Z5 mm (0.006 - 0.010 in.)

Exhaust

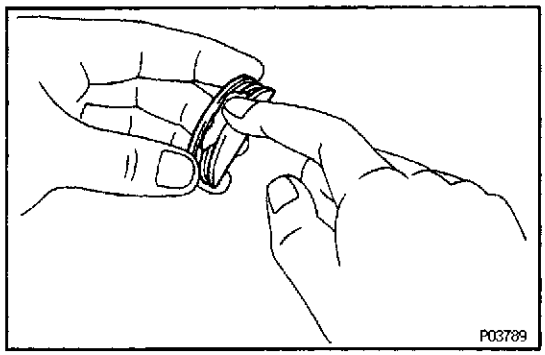
025 - 0.35 mm (0.010 - 0.014 in.)



14. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



15. INSTALL SEMI-CIRCULAR PLUG

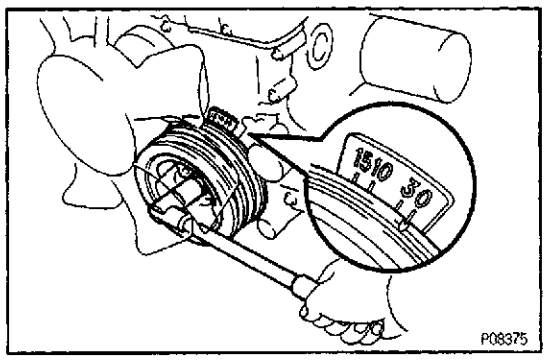
(a) Remove any old packing (FIPG) material

(b) Apply seal packing to the cylinder head installation surface of the semi-circular plug

Seal packing:

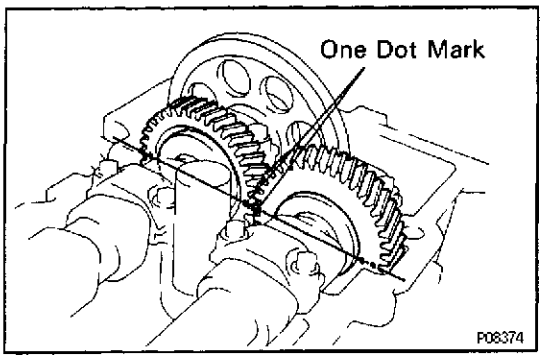
Part No. 08826-00080 or equivalent

(c) Install the semi-circular plug to the cylinder head

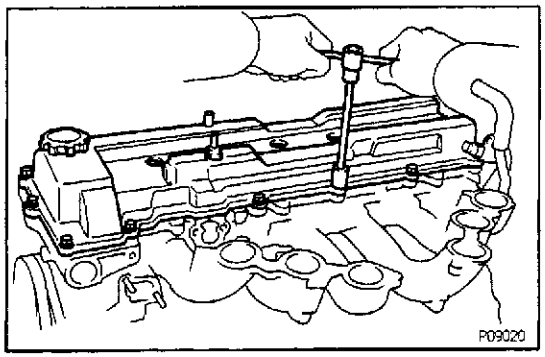


16. SET NO.1 CYLINDER TO TDC/COMPRESSION

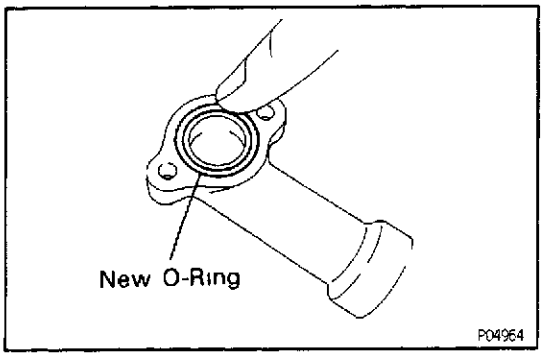
(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover



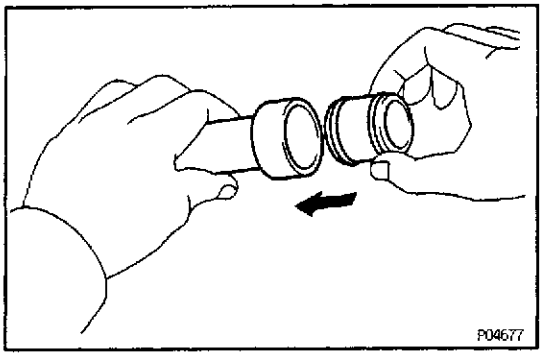
(b) Check that the timing marks with one and two dots are in straight line on the cylinder head surface as shown in the illustration
If not, turn the crankshaft 1 revolution (360°) and align the mark as above



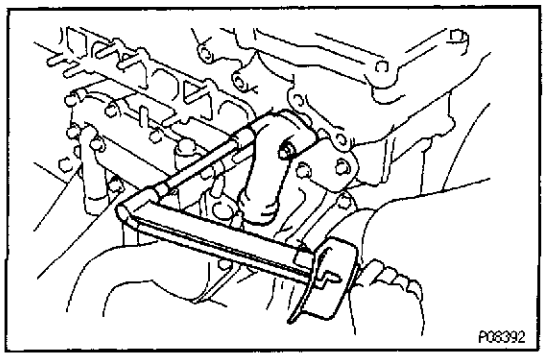
17. INSTALL CYLINDER HEAD COVER
(a) Install the gasket to the cylinder head cover
(b) Install the cylinder head cover with the 13 bolts



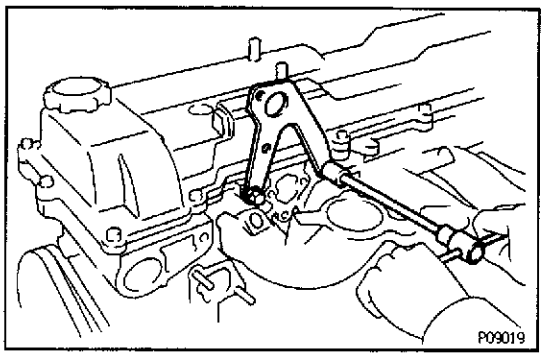
18. INSTALL WATER BYPASS OUTLET AND PIPE
(a) Install a new O-ring to the water bypass outlet



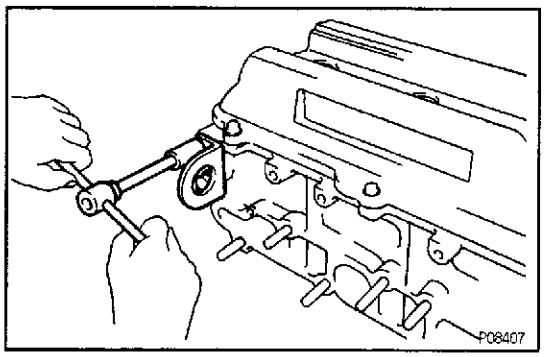
(b) Install 2 new O- rings to the water bypass pipe
(c) Apply soapy water to the O-rings
(d) Assemble the water bypass outlet and pipe



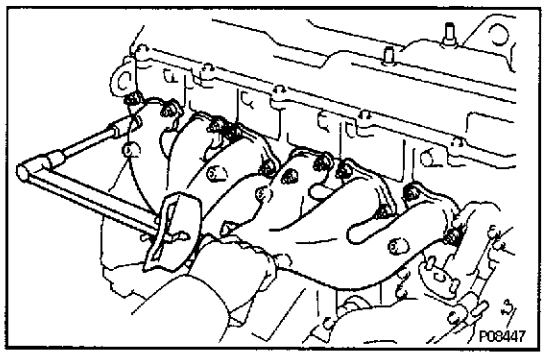
(e) Install the water bypass outlet and pipe with the 2 bolts
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



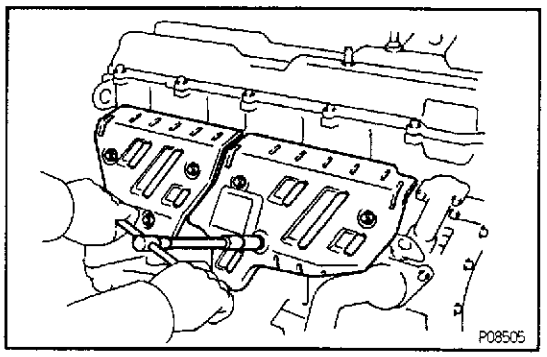
19. INSTALL NO.1 ENGINE HANGER
Install the No 1 engine hanger with the 2 bolts
Torque: 41 N-m (420 kgf-cm, 30 ft-lbf)



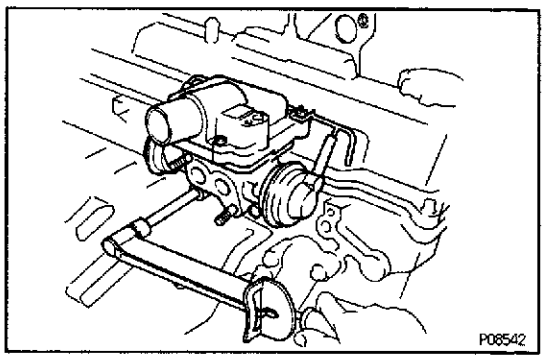
20. INSTALL NO.2 ENGINE HANGER
Install the No 2 engine hanger with the 2 bolts
Torque: 41 N-m (420 kgf-cm, 30 ft-lbf)



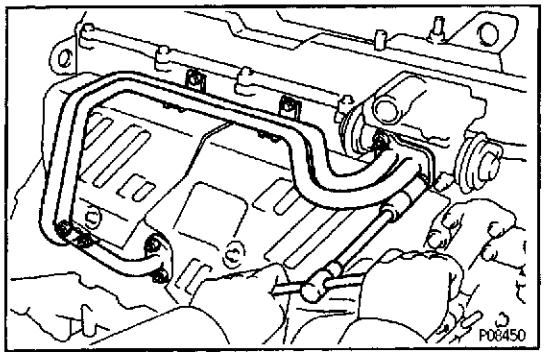
21. INSTALL NO.1 AND NO.2 EXHAUST MANIFOLDS
(a) Install 2 new gaskets, No 1 exhaust manifold and No 2 exhaust manifold with the 13 nuts
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



(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)



22. INSTALL PAIR REED VALVE
Install the PAIR reed valve with the 2 bolts
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

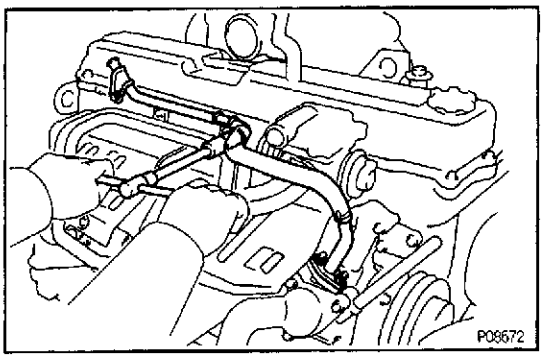


23. INSTALL AIR PIPE

Install 3 new gaskets and air pipe with the 2 bolts and 6 nuts

Torque:

20 N-m (200 kgf-cm, 14 ft-lbf) for bolt
21 N-m (210 kgf-cm, 15 ft-lbf) for nut

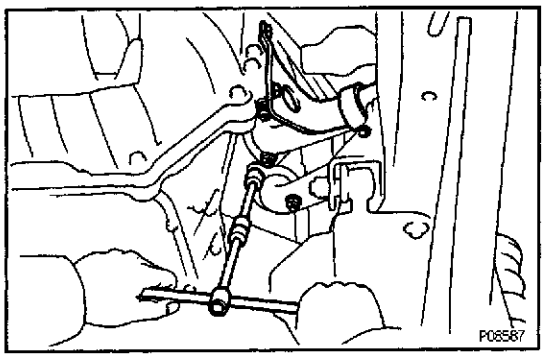


24. INSTALL HEATER PIPE

Install a new gasket and heater pipe 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



25. INSTALL FRONT EXHAUST PIPE ASSEMBLY

(a) Install 2 new gaskets and the front exhaust pipe assembly with the 4 bolts

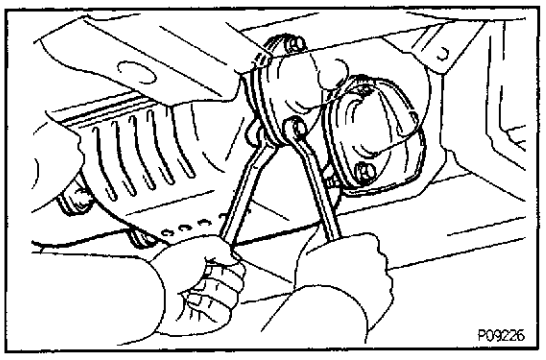
Torque: 62 N-m (630 kgf-cm, 46 ft-bf)

(b) Install the No 1 support bracket with the 2 bolts

Torque: 39 N-m (400 kgf-cm. 29 ft-lbf)

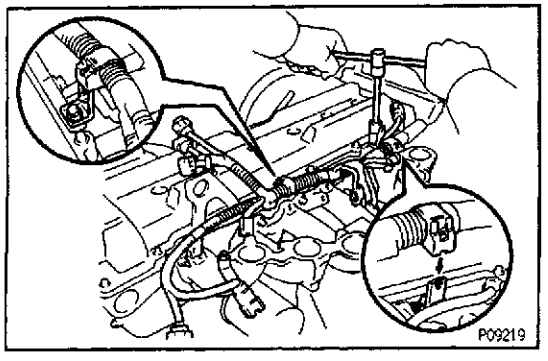
(c) Connect the clamp and tighten the clamp bolt

Torque: 19 N-m (195 kgf-cm. 14 ft-lbf)



(d) Connect 2 new gaskets and the front exhaust pipe assembly to the No 3 front exhaust pipe with the 4 bolts, 2 nuts and retainer

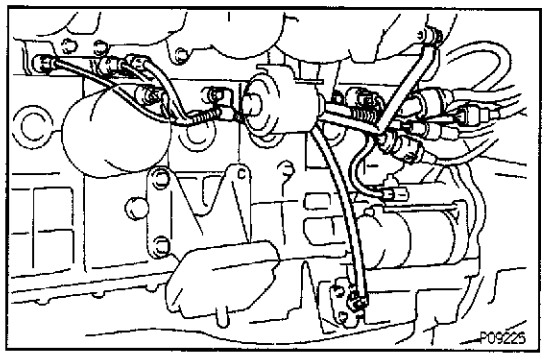
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



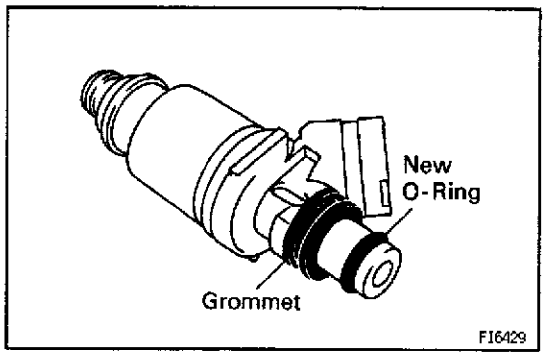
26. CONNECT ENGINE WIRE

(a) Connect the engine wire to the cylinder head and intake manifold with the 3 bolts

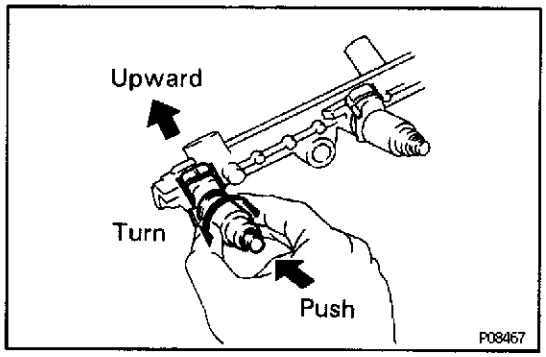
(b) Connect the engine wire clamp



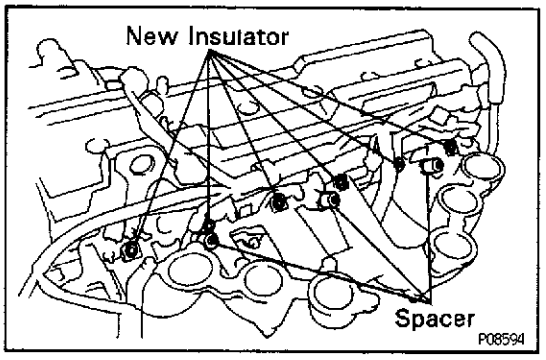
(c) Connect the engine wire to the cylinder block with the 2 bolts
(d) Connect the following connectors
(1) ECT sender gauge connector
(2) ECT cut switch
(3) ECT sensor connector
(4) 2 knock sensor connectors
(5) Heated oxygen sensor connector (with clamps)
(6) 4 connectors to transmission
(7) Starter connector
(8) Oil level sensor connector
(e) Connect the engine wire to the intake manifold with the bolt



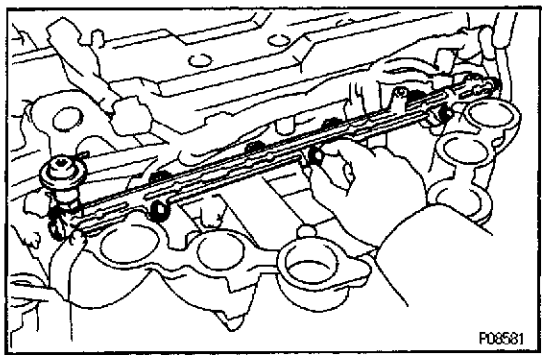
27. INSTALL INJECTORS AND DELIVERY PIPE
(a) Install a new grommet to the injector
(b) Apply a light coat of gasoline to a new O-ring and install it to the injector



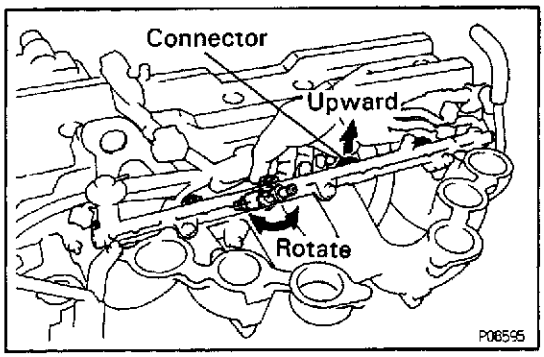
(c) While turning the injector left and right, install it to the delivery pipe Install the 6 injectors
(d) Position the injector connector upward



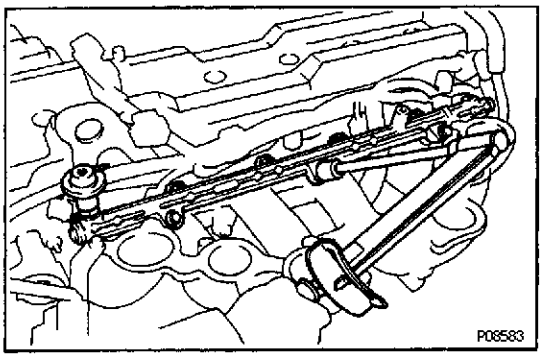
(e) Place 6 new insulators and the 3 spacers in position on the intake manifold



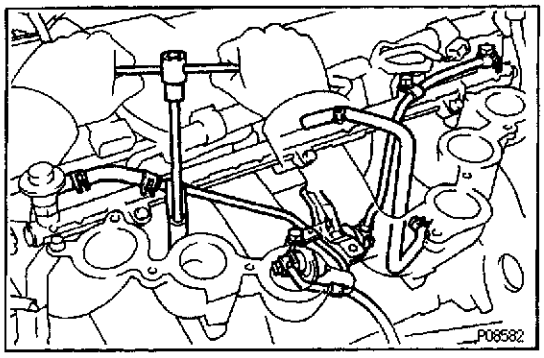
(f) Place the 6 injectors together with the delivery pipe in position on the intake manifold
(g) Temporarily install the 3 bolts holding the delivery pipe to the intake manifold



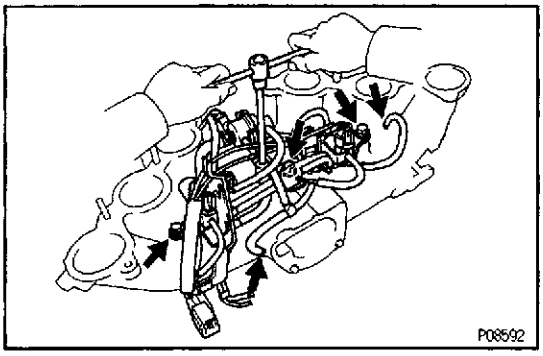
(h) Check that the injectors rotate smoothly
HINT If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings Replace the O-rings
(i) Position the injector connector upward



(j) Tighten the 3 bolts holding the delivery pipe to the intake manifold
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



28. CONNECT FUEL INLET HOSE
Connect the fuel inlet hose to the fuel filter with 2 new gaskets and union bolt
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)
29. INSTALL FUEL PIPE
Install the fuel inlet pipe with 4 new gaskets, the 2 union bolts and bolt
Torque:
29 N-m (300 kgf-cm, 22 ft-lbf) for union bolt
20 N-m (200 kgf-cm, 14 ft-lbf) for bolt
30. INSTALL NO.1 WATER BYPASS HOSE
31. 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



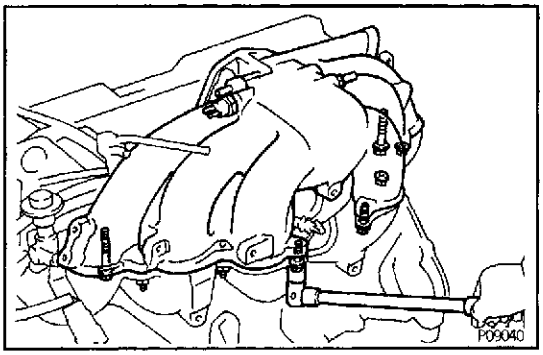
32. INSTALL AIR INTAKE CHAMBER

(a) Install the emission control valve set assembly to the air intake chamber with the 4 bolts

Torque: 20 N-m (200 kgf-cm. 4 ft-lbf)

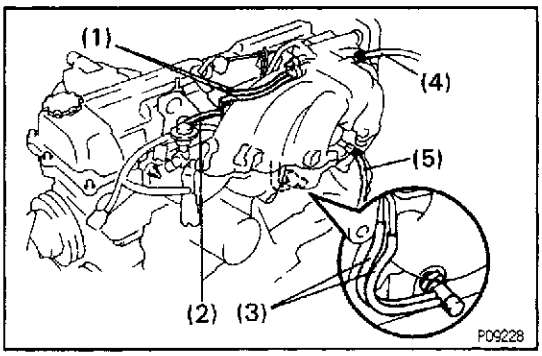
(b) Connect the air hose

(c) Connect the vacuum hose



(d) Install 2 new gaskets and the air intake chamber with the 4 bolts and 4 nuts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



(e) Connect the following hoses

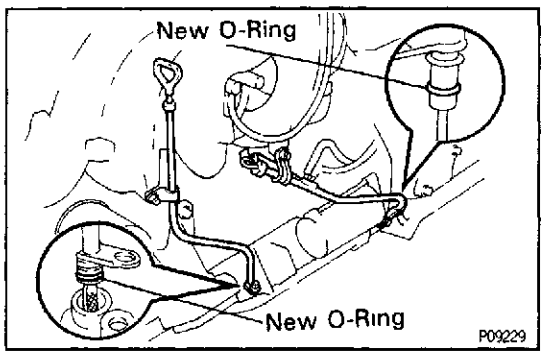
(1) 2 vacuum hoses to gas filter

(2) Vacuum hose to fuel pressure regulator

(3) 2 vacuum hoses to TVV

(4) EVAP hose to 3-way

(5) Brake booster hose to brake booster union



33. INSTALL OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION

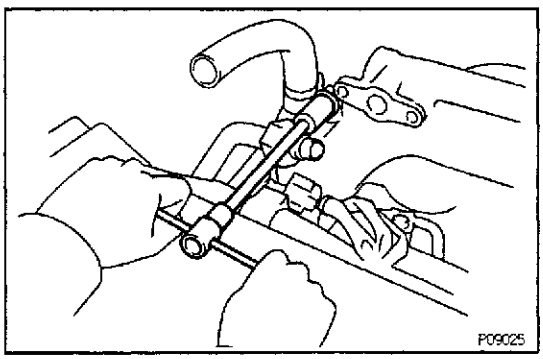
(a) Install a new O-ring to the dipstick guide

(b) Apply light coat of engine oil on the O-ring

(c) Push in the dipstick guide into the guide hole of the oil pan

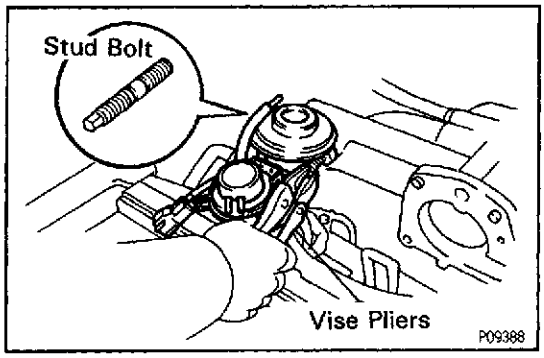
(d) Install the dipstick guide with the 2 bolts

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



34. INSTALL BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER

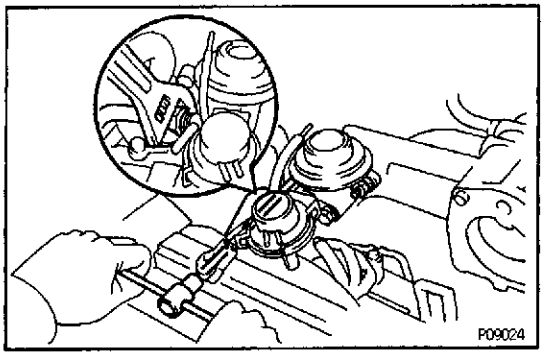
Torque: 20 N-m (200 kgf-cm. 14 ft-lbf)



35. INSTALL EGR VALVE AND VACUUM MODULATOR

(a) Using vise pliers, temporarily install a new gasket, and EGR valve and vacumm modulator assembly with the 2 stud bolts

Torque: 10 N-m (105 kgf-cm, 8 ft-lbf)



(b) Install the 2 nuts holding the EGR valve and air intake chamber

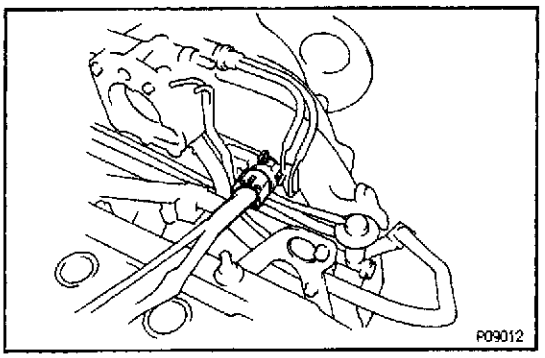
Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

(c) Tighten the union nut of the EGR pipe

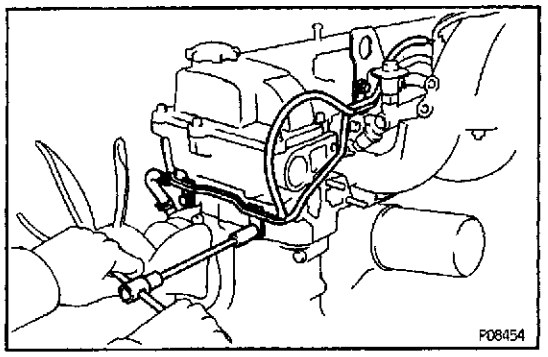
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)

(d) Connect the EGR gas temp sensor connector

(e) Connect the vacuum hose to the EGR valve



36. CONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY



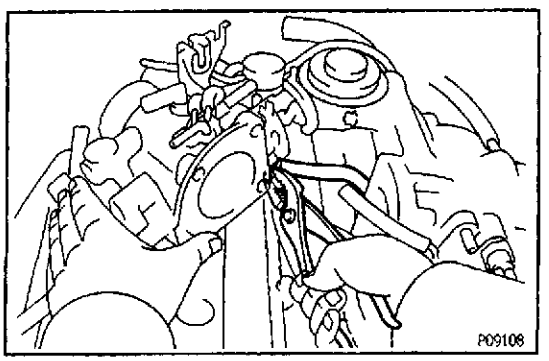
37. INSTALL NO.2 WATER BYPASS PIPE AND HOSES

(a) Install the No 2 water bypass pipe and hoses with the 3 bolts

Torque: 20 N-m (200 kgf-cm. 14 ft-lbf)

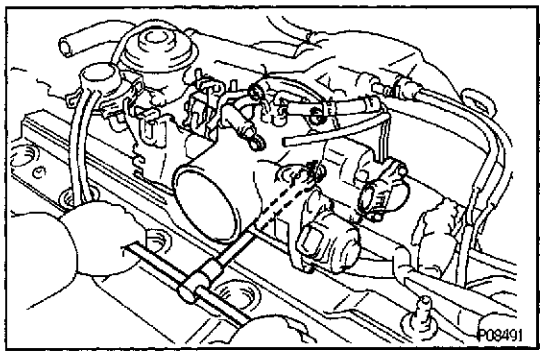
(b) Connect the water hose to the timing chain cover

(c) Connect the 2 vacuum hose to the PAIR reed valve and No 2 emission control valve set

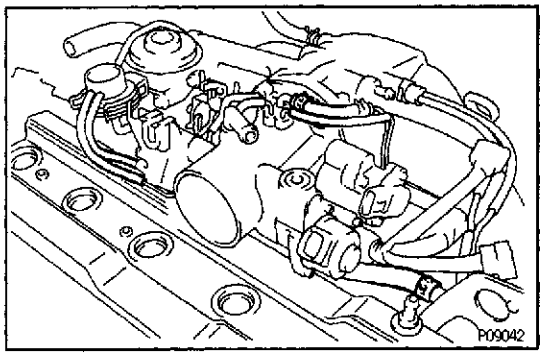


38. INSTALL THROTTLE BODY

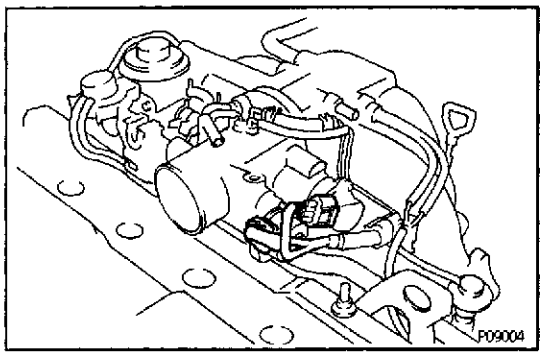
(a) Connect the No 1 water bypass hose to the throttle body



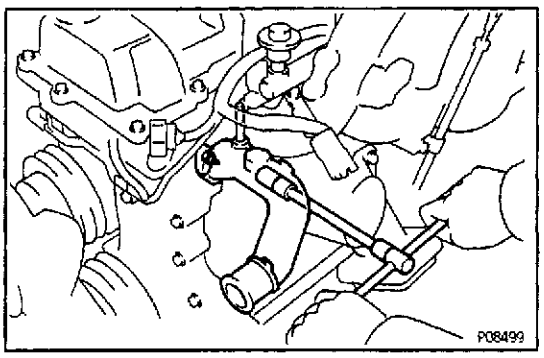
(b) Install a new gasket and throttle body with the 4 bolts
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



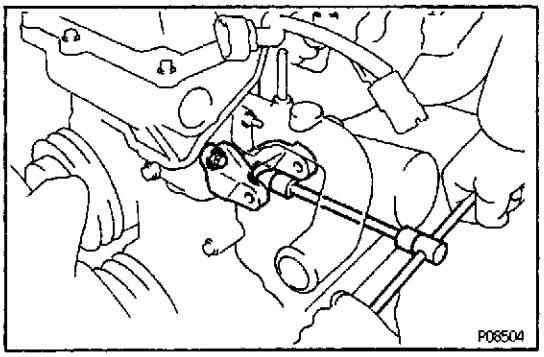
(c) Connect the water hose to the No 2 water bypass pipe
(d) Connect the EVAP hose
(e) Connect the 3 vacuum hoses



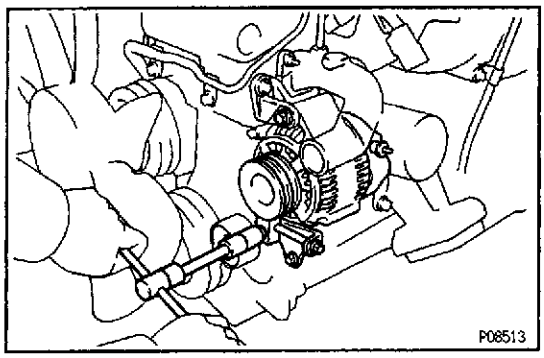
(f) Connect the IAC valve connector
(g) Connect the throttle position sensor connector



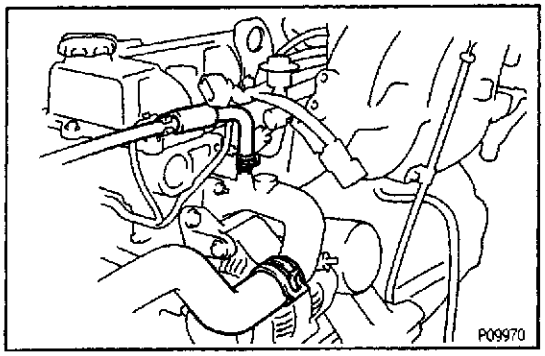
39. INSTALL WATER OUTLET
Install a new gasket and water outlet with the 2 nuts
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



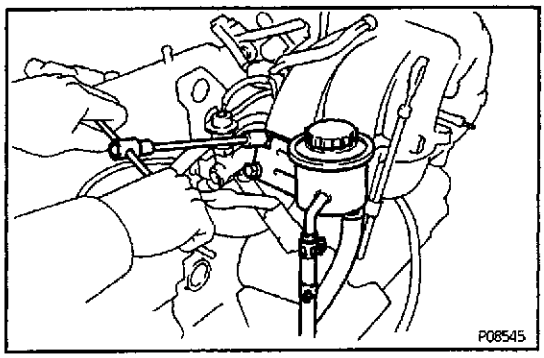
40. INSTALL GENERATOR BRACKET
Install the generator bracket with the 2 bolts
Torque: 43 N-m (440 kgf¿cm, 32 ft-lbf)



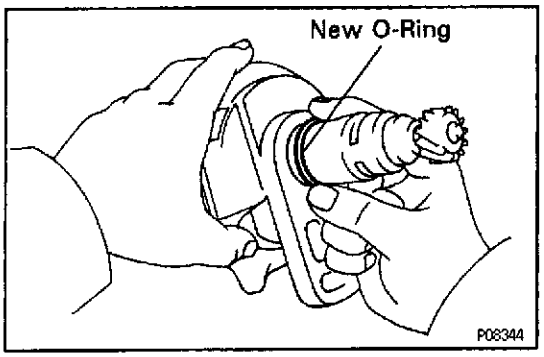
41. INSTALL GENERATOR AND DRIVE BELTS
(See CH section)



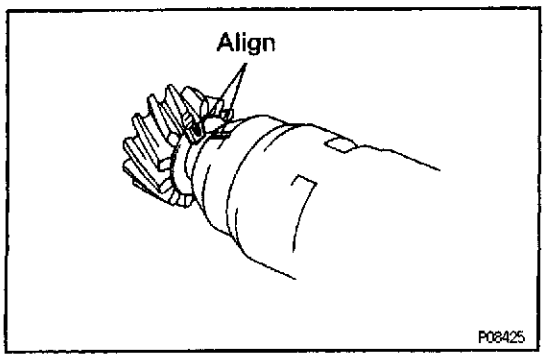
42. CONNECT NO.3 WATER BYPASS HOSE
43. CONNECT RADIATOR INLET HOSE



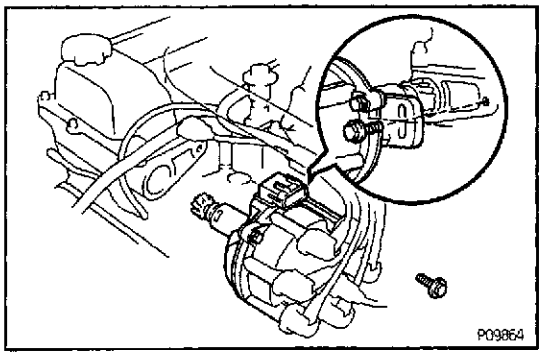
44. CONNECT PS RESERVOIR TANK
Connect the reservoir tank with the 3 bolts
Torque: 20 N-m (200 k9f-cm, 14 ft-ibf)



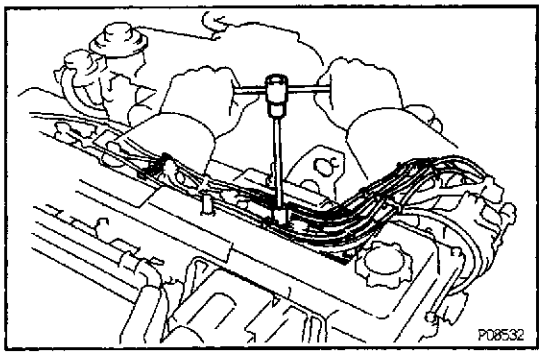
45. INSTALL DISTRIBUTOR
(a) Install a new O-ring to the distributor
HINT Always use a new O-ring when installing the distributor



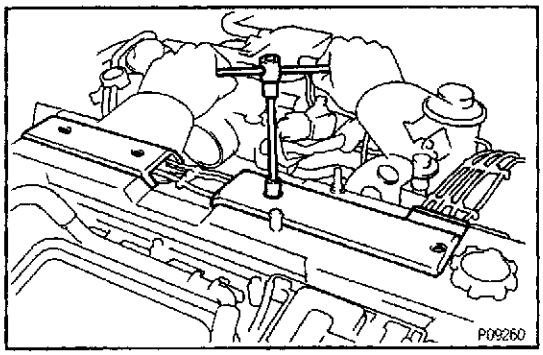
(b) Align the groove of the distributor housing with the protrusion on the driven gear
(c) Apply a light coat of engine oil on the O-ring



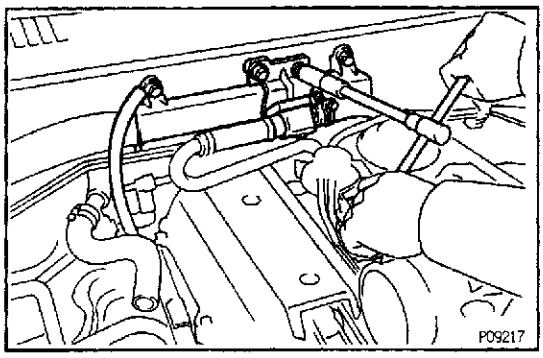
(d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head
(e) Lightly tighten the hold-down bolt
(f) Connect the distributor connector
(g) Connect the high-tension cords to the spark plugs
Firing order:
1-5-3-6-2-4



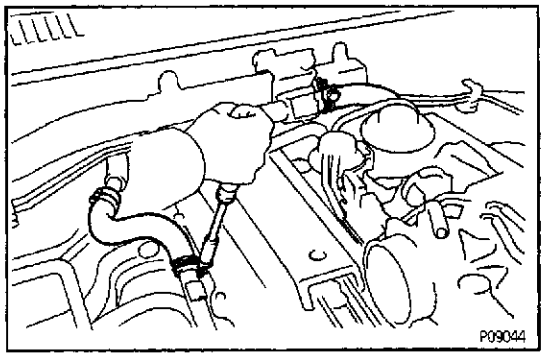
(h) Install the No 1 and No 2 cord clamps with 2 mounting bolts
(i) Connect the high-tension cord to the ignition coil



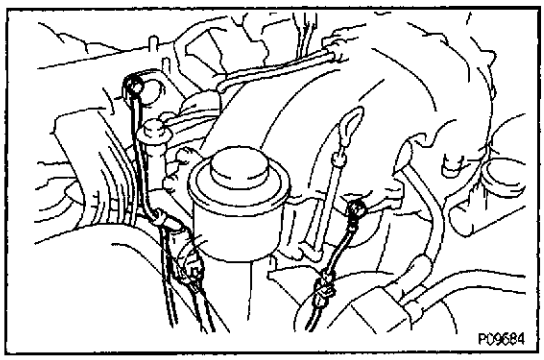
46. INSTALL NO.2 AND NO.3 CYLINDER HEAD COVERS
Install the head covers with the 4 bolts



47. CONNECT ENGINE WIRE AND HEATER VALVE TO COWL PANEL
(a) Connect the engine wire and ground strap with the 2 bolts
(b) Connect the heater valve with the 2 bolts



48. CONNECT HEATER HOSES



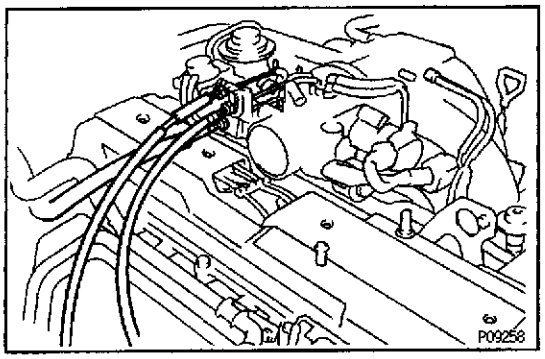
49. CONNECT CONNECTOR ON INTAKE MANIFOLD TO LH FENDER APRON

50. CONNECT ENGINE GROUND STRAPS

Connect the following ground straps

(1) Ground strap to No 1 engine hanger

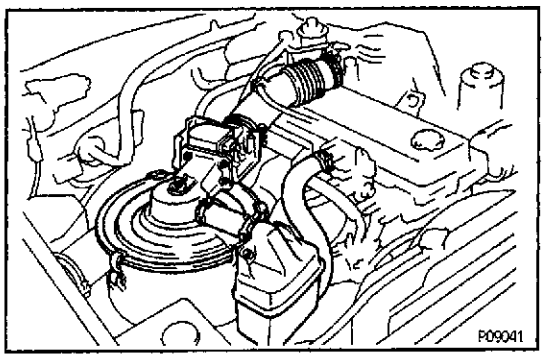
(2) Ground strap to air intake chamber



51. CONNECT THROTTLE CABLE TO THROTTLE BODY

52. CONNECT ACCELERATOR CABLE TO THROTTLE BODY

53. CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY



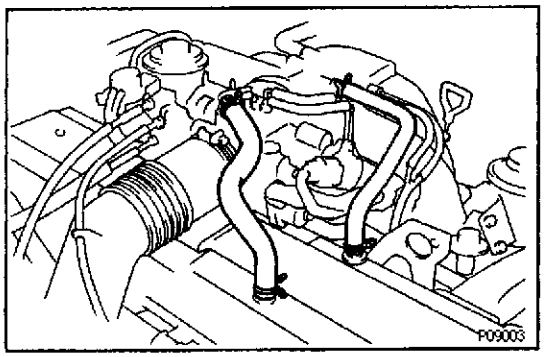
54. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND RESONATOR

(a) Connect the air cleaner hose and install the air cleaner cap, volume air flow meter and resonator with the wing nut and 3 clips

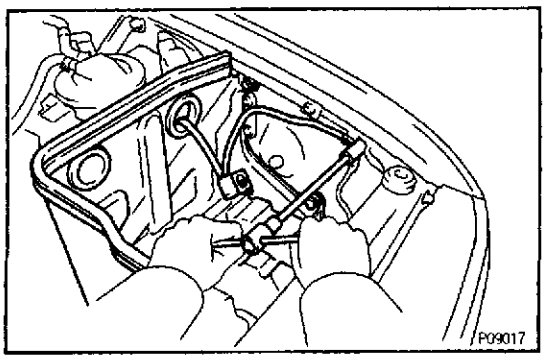
(b) Tighten the air cleaner hose clamp

(c) Connect the No 2 air hose with the clamp

(d) Connect the volume air flow meter connector and wire clamp



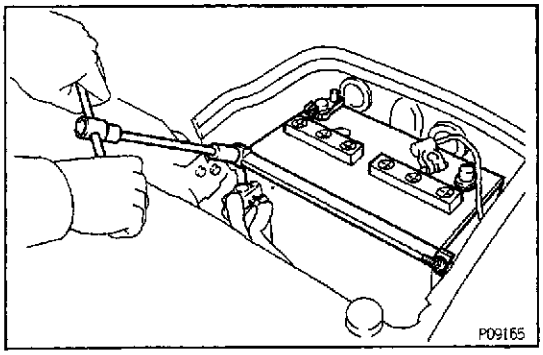
55. INSTALL NO.1 AND NO.2 PCV HOSES



56. INSTALL BATTERY TRAY AND BATTERY

(a) Install the battery tray with the 5 bolts

(b) Connect the ground strap with the bolt



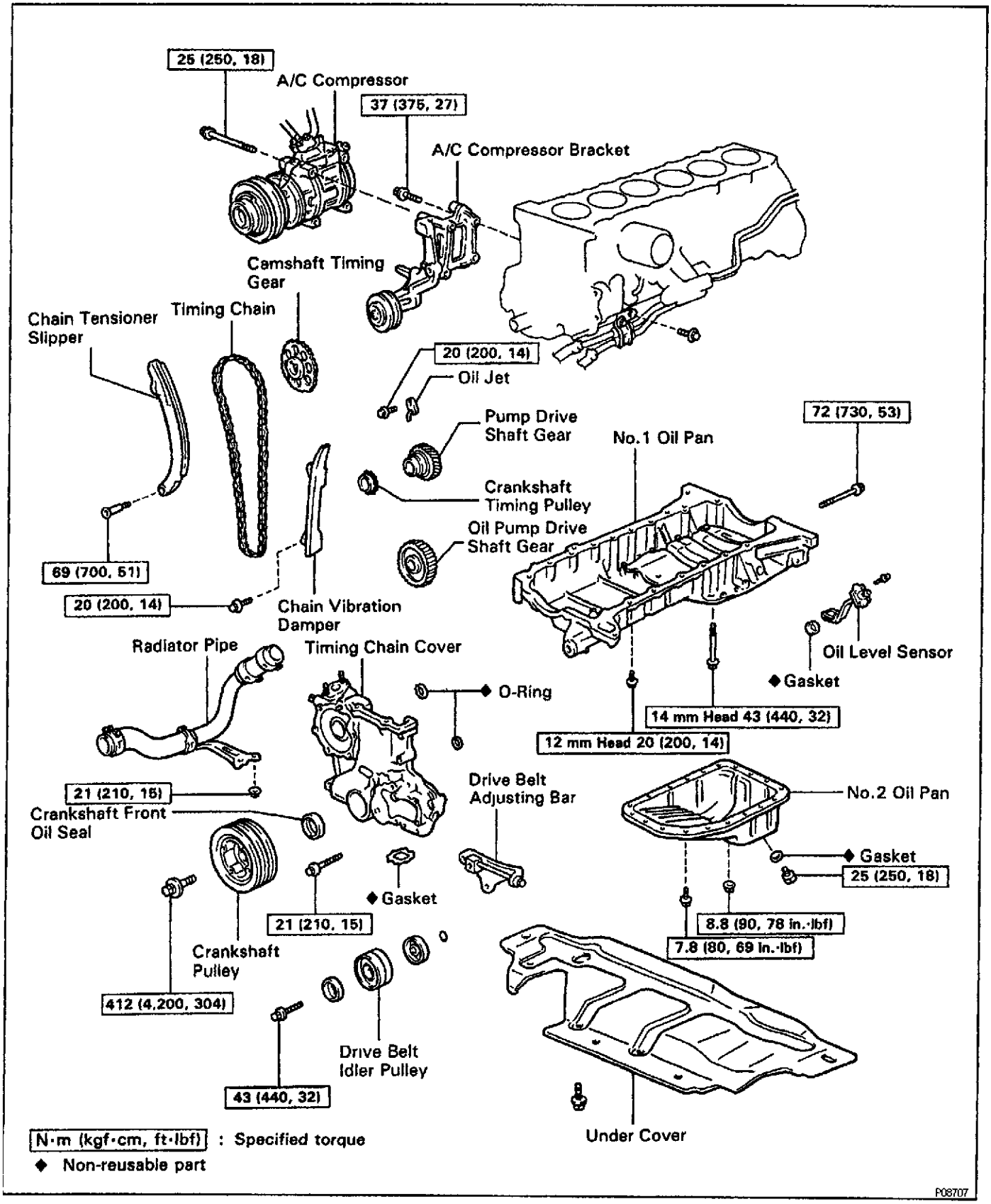
(c) Install the battery and hold-down clamp with the nuts
(d) Connect the battery cables

57. FILL WITH ENGINE COOLANT
Capacity (w/ Front and rear heaters):
14.2 liters (15.0 US qts, 12.4 Imp. qts)
58. START ENGINE AND CHECK FOR LEAKS
59. ADJUST IGNITION TIMING (SEE IG SECTION)
Ignition timing:
3° BTDC @ idle
(w/ Terminals TE1 and E1 connected)
64. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation
61. RECHECK ENGINE COOLANT LEVEL

TIMING CHAIN

EG0VG-02

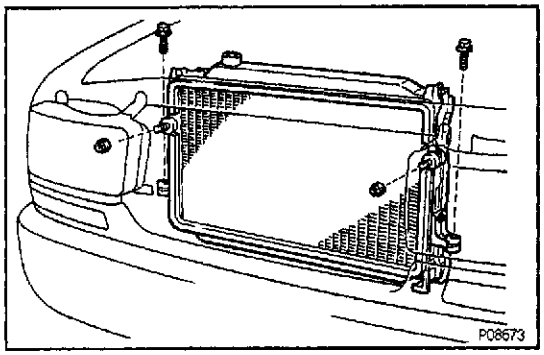
COMPONENTS FOR REMOVAL AND INSTALLATION



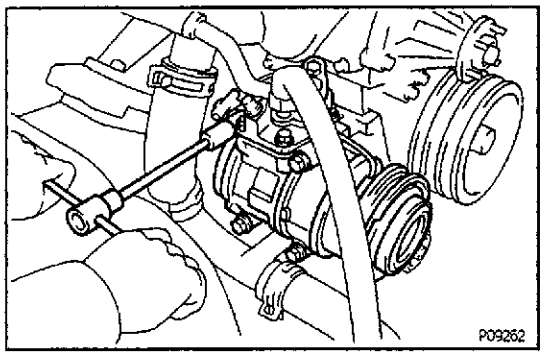
EG1JZ-02

TIMING CHAIN REMOVAL

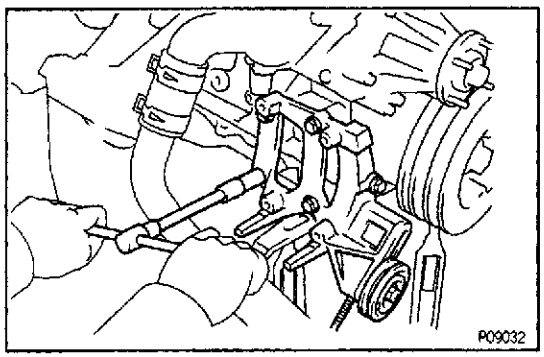
1. DRAIN ENGINE OIL
2. DRAIN ENGINE COOLANT
3. REMOVE ENGINE UNDER COVER
4. REMOVE RADIATOR
(See page EG-364 **)**



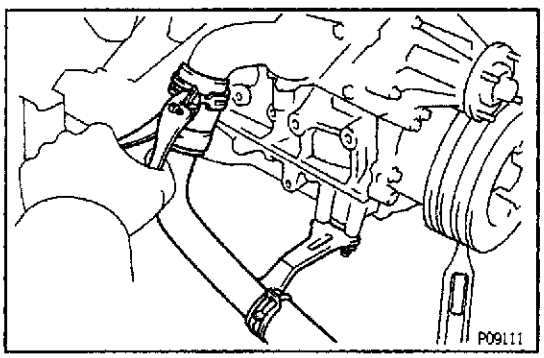
5. DISCONNECT A/C COMPRESSOR AND BRACKET
(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt
(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket
HINT Put aside the compressor, and suspend it



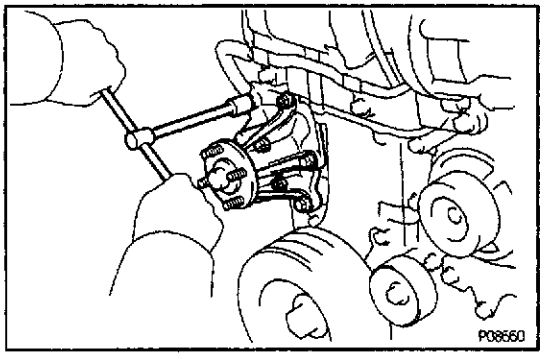
(c) Remove the 5 bolts and A/C compressor bracket

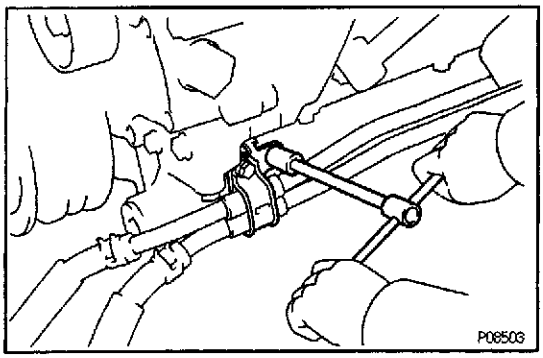


6. REMOVE RADIATOR PIPE
(a) Disconnect the No 2 radiator hose from the water inlet
(b) Remove the 2 nuts and radiator pipe

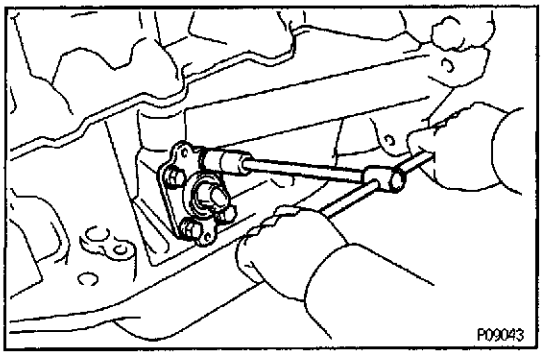


7. REMOVE WATER PUMP
Remove the 4 bolts, 2 nuts, water pump and gasket
8. REMOVE CYLINDER HEAD
(See page EG-33 **)**





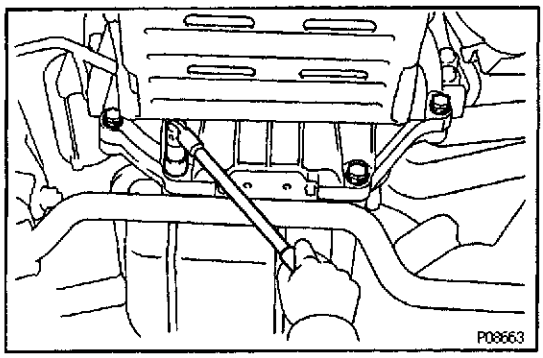
9. DISCONNECT OIL COOLER PIPE BRACKET FROM N0.1 OIL PAN



10. REMOVE OIL LEVEL SENSOR

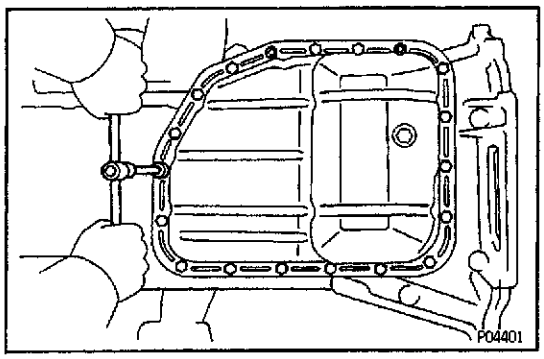
(a) Remove the 4 bolts and level sensor

(b) Remove the gasket from the level sensor



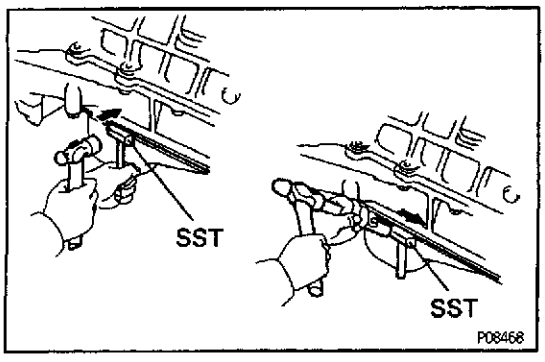
11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING

Remove the 4 bolts



12. REMOVE NO.2 OIL PAN

(a) Remove the 17 mounting bolts and 2 nuts

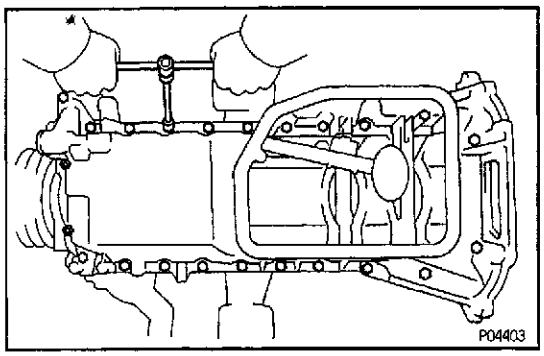


(b) Insert the blade of SST between the No 1 and No 2 oil pans, cut off applied sealer and remove the No 2 oil pan

SST 09032-00100

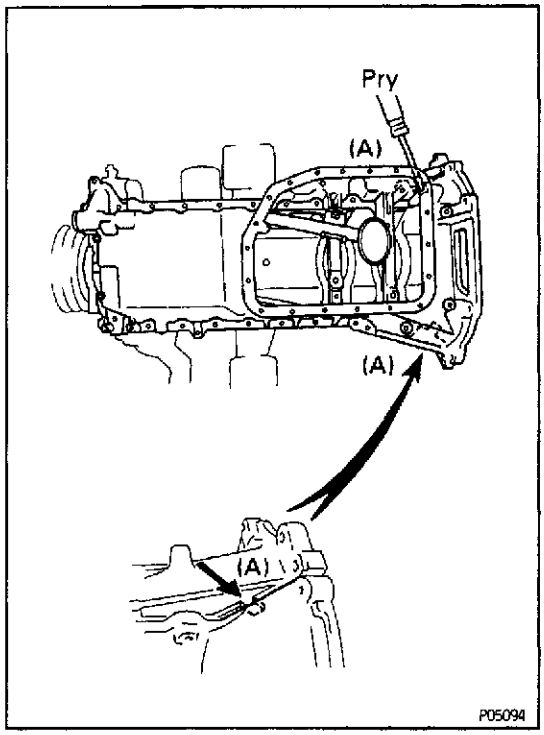
NOTICE:

- **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.**



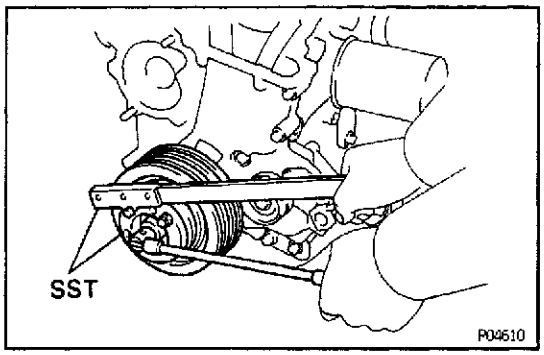
13. REMOVE NO.1 OIL PAN

(a) Remove the 21 mounting bolts and 2 nuts



(b) Remove the No 1 oil pan by prying the portions (A) between the cylinder block and No 1 oil pan with a screw driver

NOTICE: Be careful not to damage the contact surfaces the cylinder block and No.1 oil pan.

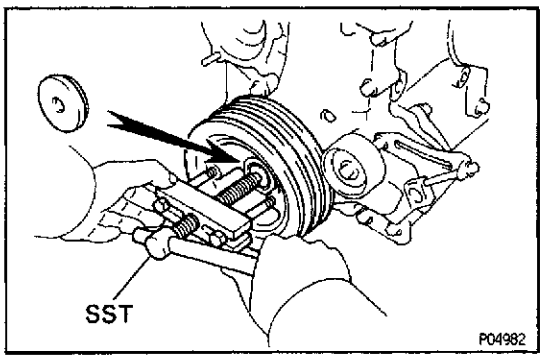


14. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt

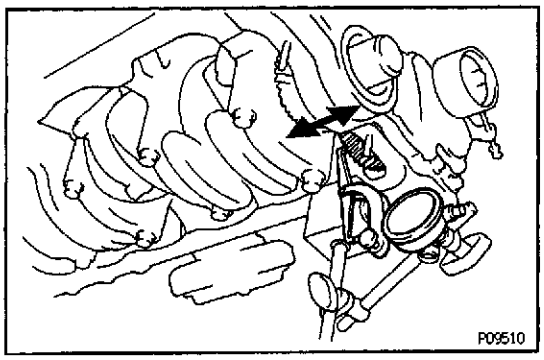
SST 09213-58012, 09330-00021

(b) Remove the crankshaft pulley



HINT: If necessary, remove the pulley with SST

SST 09213-60017 (09213-00020, 09213-00030, 09213-00060), 09950-20017



15. CHECK THRUST CLEARANCE OF OIL PUMP DRIVE SHAFT GEAR

Using a dial indicator with lever type attachment, measure the thrust clearance

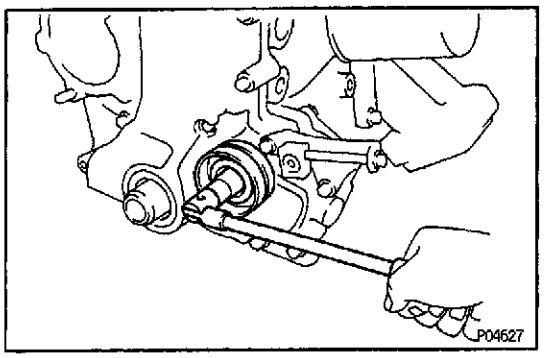
Standard thrust clearance:

0.040 - 0.160 mm (0.0016 - 0.0063 in.)

Maximum thrust clearance:

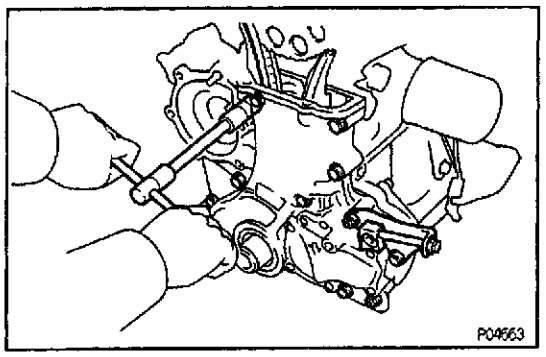
0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the oil pump drive shaft gear and/or timing chain cover



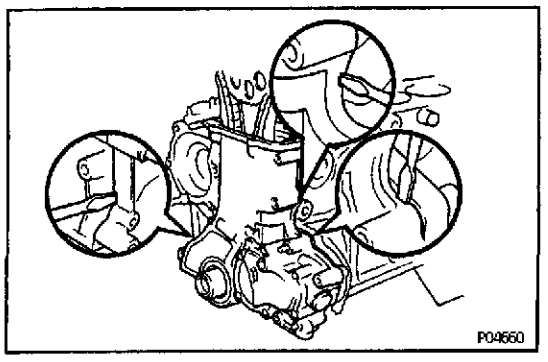
16. REMOVE DRIVE BELT IDLER PULLEY

Remove the bolt and idler pulley



17. TIMING CHAIN COVER

(a) Remove the 9 mounting bolts, 2 mounting nuts and drive belt adjusting bar

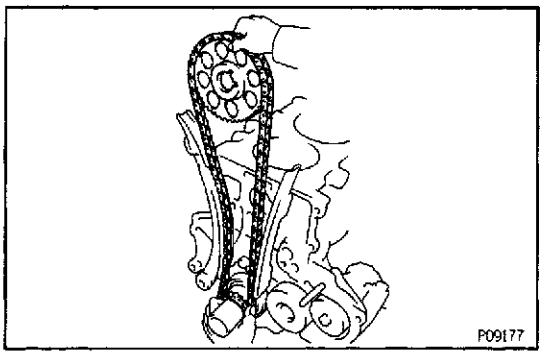


(b) Remove the oil pump by prying the portions between the cylinder block and oil pump with a screwdriver

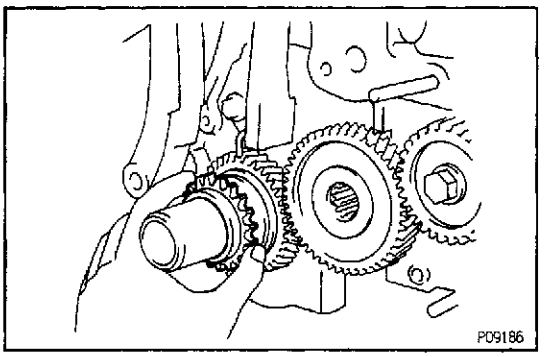
NOTICE: Be careful not to damage the contact surfaces of the cylinder block and oil pump.

(c) Remove the O-rings from the oil pump

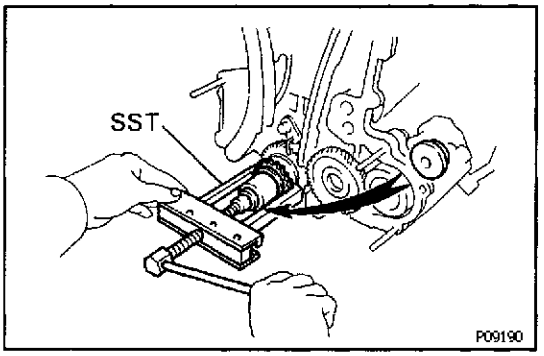
(d) Remove the gasket from the oil pump



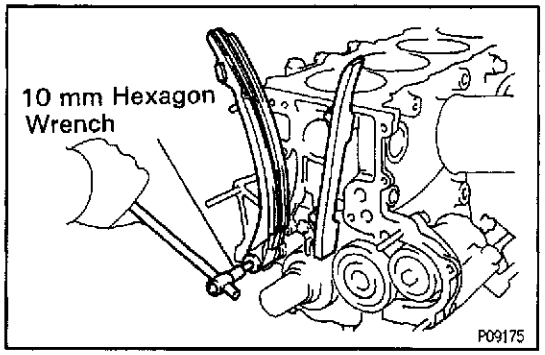
18. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR



19. REMOVE CRANKSHAFT TIMING GEAR

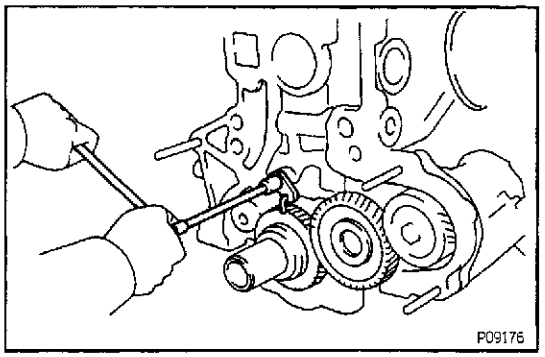


HINT If necessary, remove the gear with SST
SST 09213-36020, 09950-20017



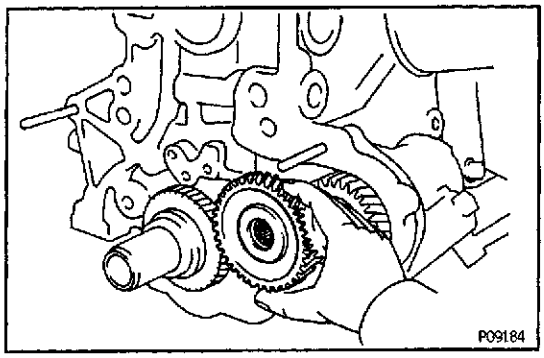
20. REMOVE CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

(a) Using a 10 mm hexagon wrench, remove the bolt and slipper
(b) Remove the 2 bolts and damper

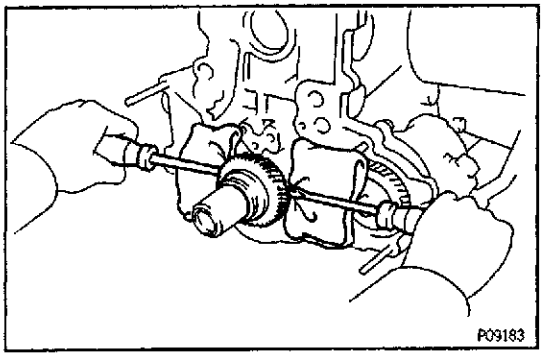


21. REMOVE OIL JET

Remove the bolt and oil jet



22. REMOVE OIL PUMP DRIVE SHAFT GEAR



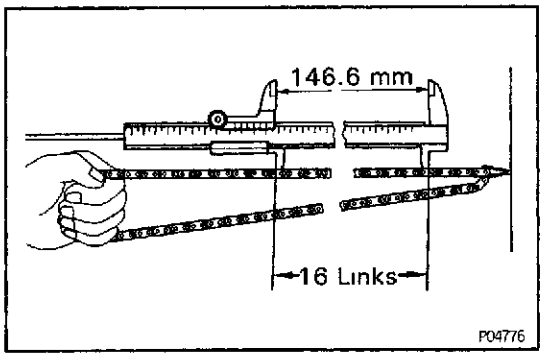
23. REMOVE PUMP DRIVE SHAFT GEAR

If the pump drive shaft gear cannot be removed by hand, use 2 screwdrivers

NOTICE: Position shop rags as shown to prevent damage.

TIMING CHAIN COMPONENTS INSPECTION

EG0VJ-04



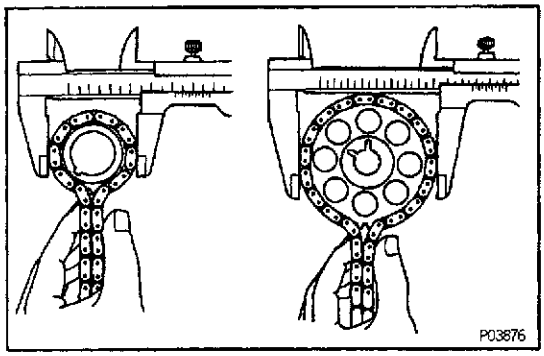
1. INSPECT TIMING CHAIN AND TIMING GEARS

(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):

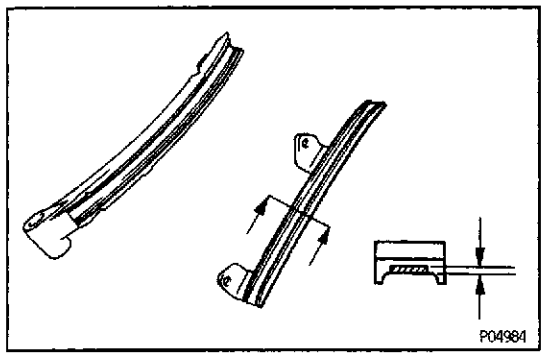
Camshaft

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



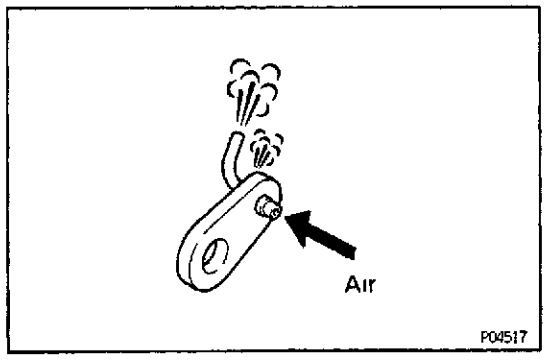
2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

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

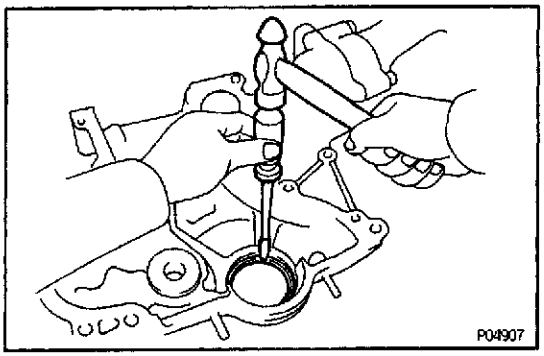
Check the oil jet for damage or clogging

If necessary, replace the oil jet

E20K0-04

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

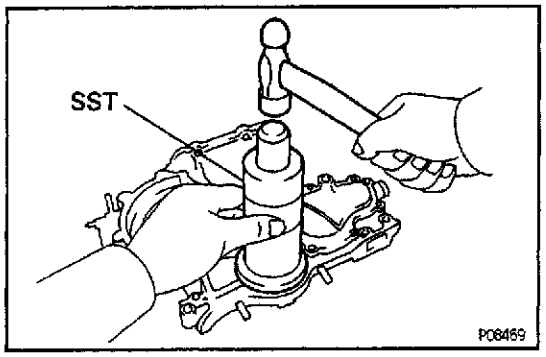
HINT There are 2 methods (A and B) to replace the oil seal which are as follows



REPLACE CRANKSHAFT FRONT OIL SEAL

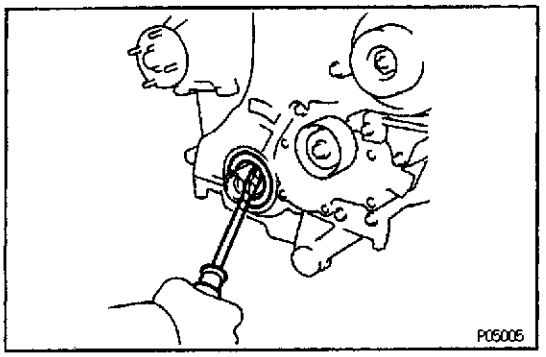
A. If timing chain cover is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge
SST 09316-60010 (09316-00010, 09316-00050)

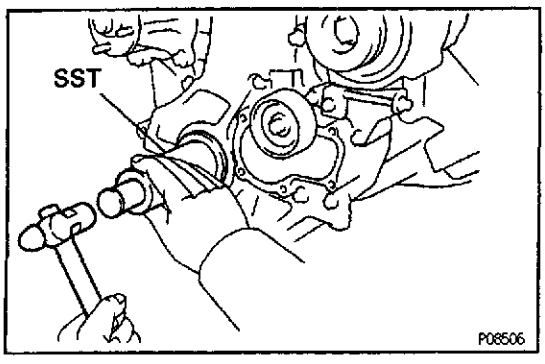
(c) Apply MP grease to the oil seal lip



B. If timing chain cover is installed to the cylinder block:

(a) Using a screwdriver, pry out the oil seal

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(b) Apply MP grease to a new oil seal lip

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge
SST 09316-60010 (09316-00010, 09316-00050)

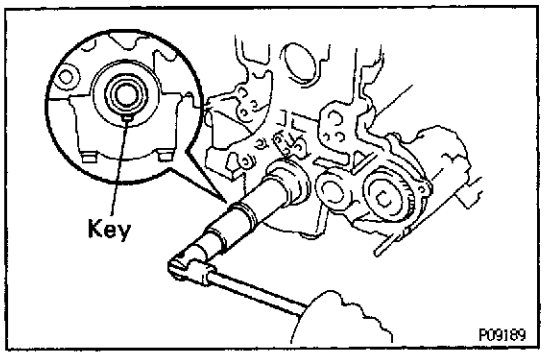
EG1K0-02

TIMING CHAIN INSTALLATION

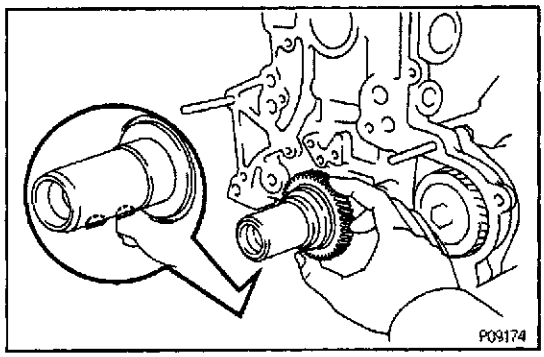
(See Components for Removal and Installation)

1. SET CRANKSHAFT

Turn the crankshaft until the set key on crankshaft facing downward



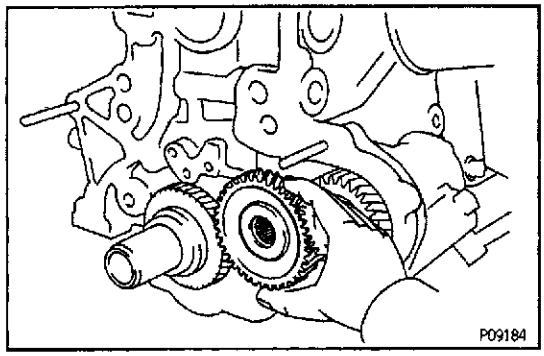
2. INSTALL PUMP DRIVE SHAFT GEAR



3. INSTALL OIL PUMP DRIVE SHAFT GEAR

(a) Apply light coat of engine oil on the shaft portion of the gear

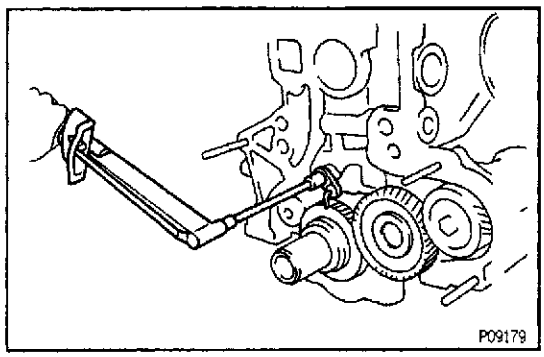
(b) Install the gear



4. INSTALL OIL JET

Install the oil jet with the bolt

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



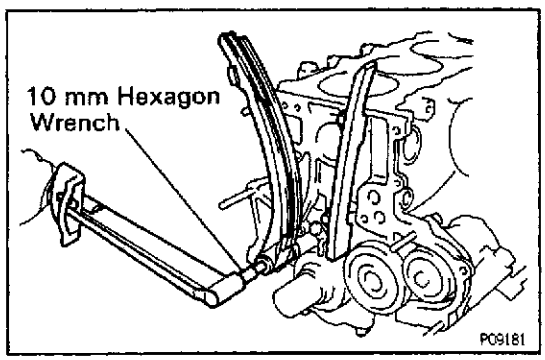
5. INSTALL CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

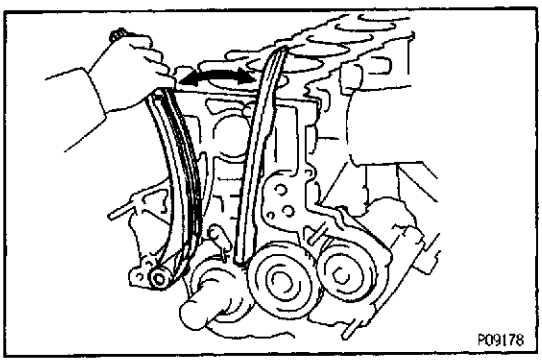
(a) Install the damper with the 2 bolts

Torque: 20 N-m (200 kgf-cm, 14 ft-bf)

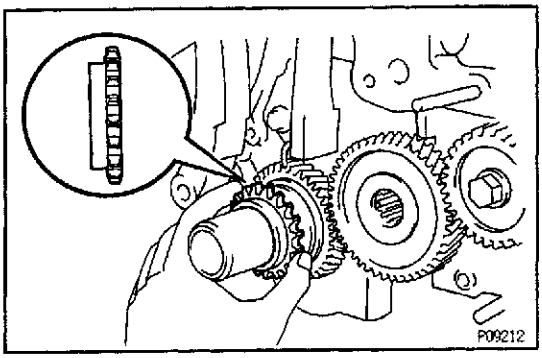
(b) Using a 10 mm hexagon wrench, install the slipper with the bolt

Torque: 69 N-m (700 kgf-cm, 51 ft-lbf)

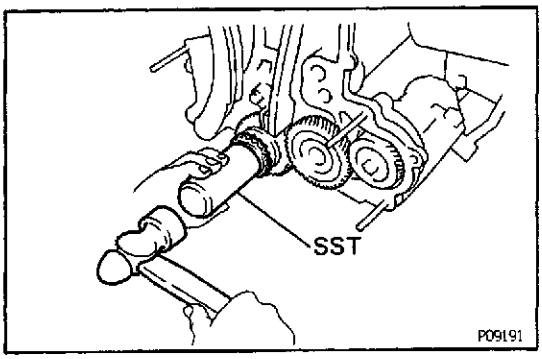




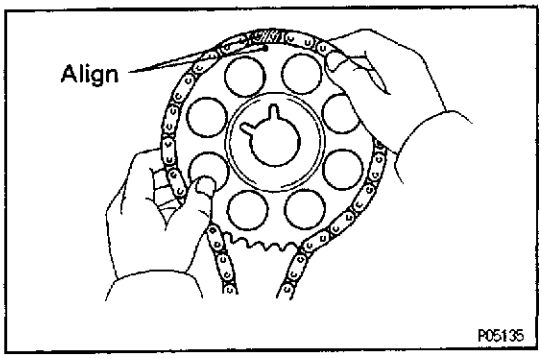
(c) Check that the slipper moves smoothly



6. INSTALL CRANKSHAFT TIMING GEAR

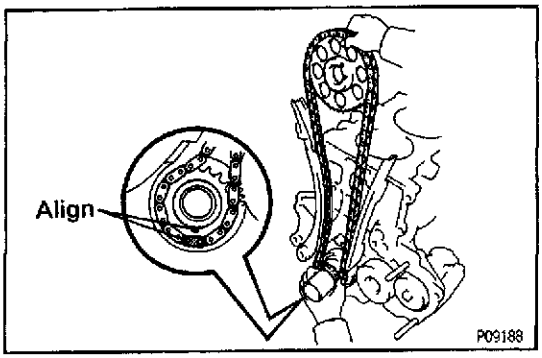


HINT If necessary, install the gear with SST
SST 09636 - 20010

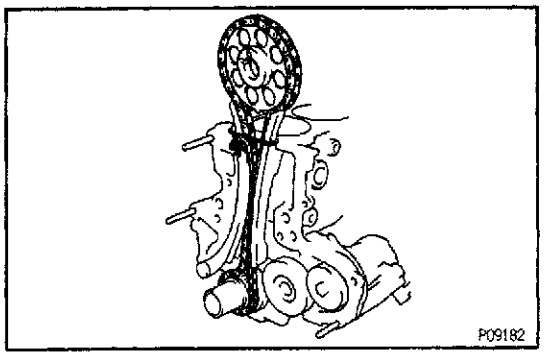


7. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR

(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

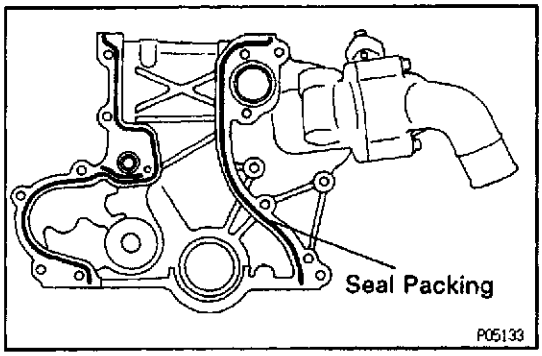


(c) Tie the timing chain with a cord as shown in the illustration and make sure it doesn't come loose

8. 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

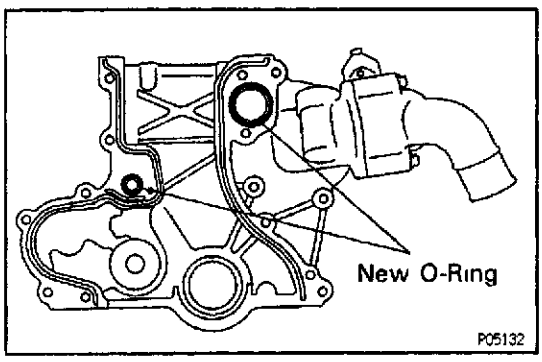
Seal packing:

Part No. 0882fi-00080 or equivalent

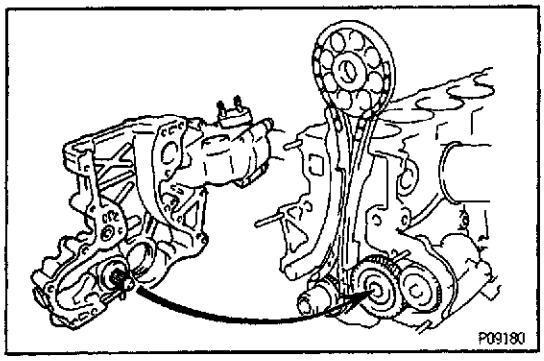
- Install a nozzle that has been cut to a 2 - 3 mm (0 08 - 0 12 in) opening

HINT Avoid applying an excessive amount to the surface

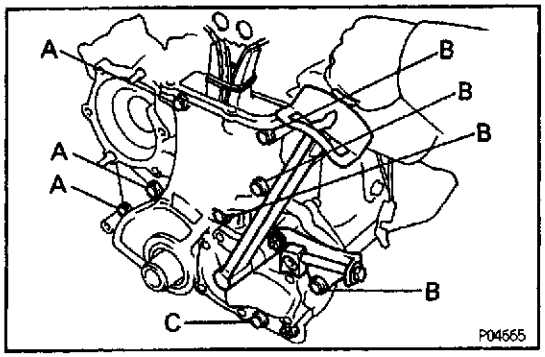
- Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap



(c) Place 2 new O-rings in position on the timing chain cover



(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)

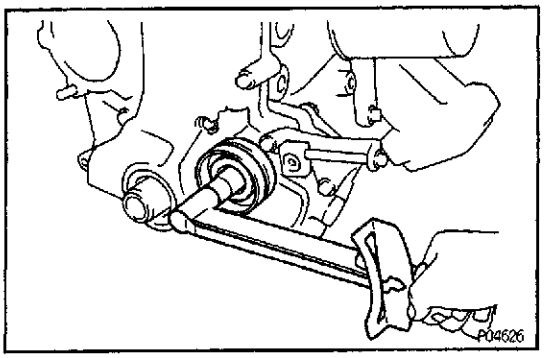
HINT Each bolt length is indicated in the illustration

A 30 mm (1 18 in)

B 50 mm (1 97 in)

C 60 mm (2 38 in)

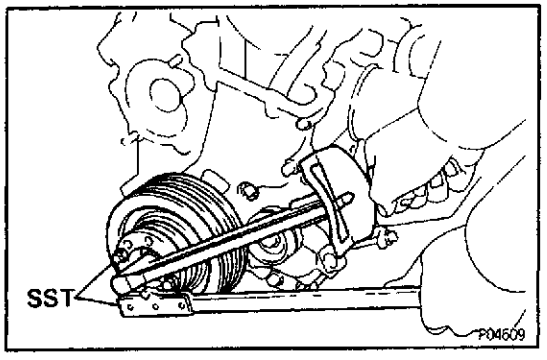
(f) Remove the cord from the chain



9. INSTALL DRIVE BELT IDLER PULLEY

Install the pulley with the bolt

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)



10. 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

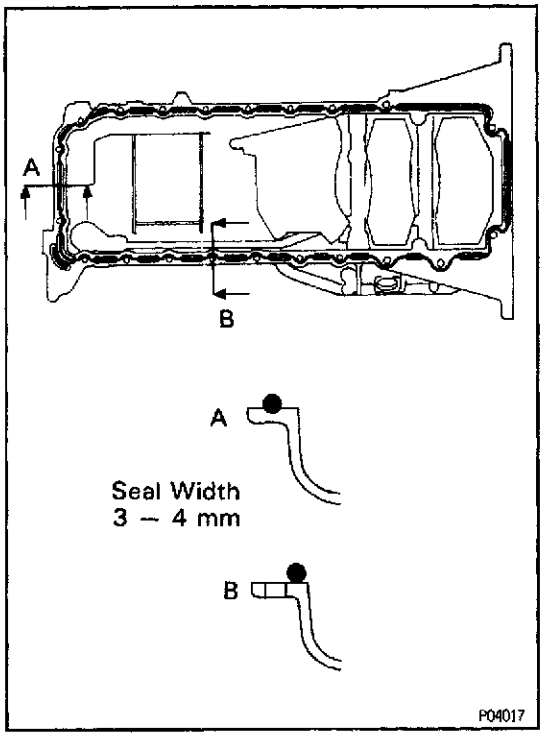
SST 09213-58012, 09330-00021

Torque: 412 N-m (4,200 kgf-cm, 304 ft-lbf)

11. 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 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 No 1 oil pan as shown in the illustration

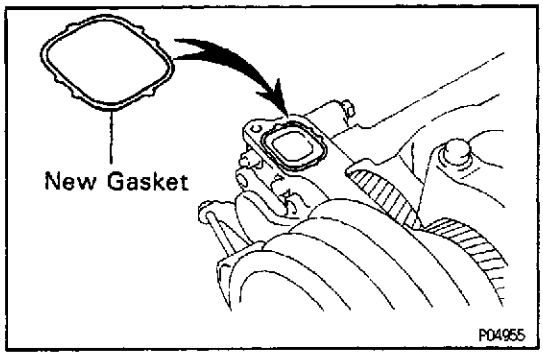
Seal packing:

Part No. 08826-00080 or equivalent

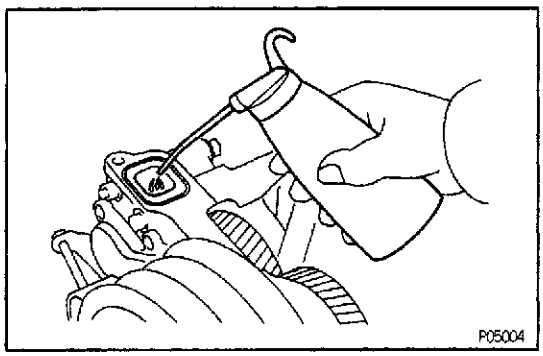
- Install a nozzle that has been cut to a 3 - 4 mm (0 12 - 0 16 in) opening

HINT Avoid applying an excessive amount to the surface

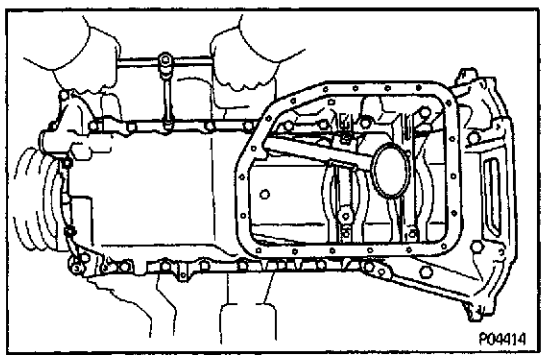
- Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
- Immediately remove nozzle from the tube and reinstall cap



(c) Install a new gasket in position



(d) Pour in approximately 15 cm^3 (0 9 cu in) of engine oil into the oil pump hole

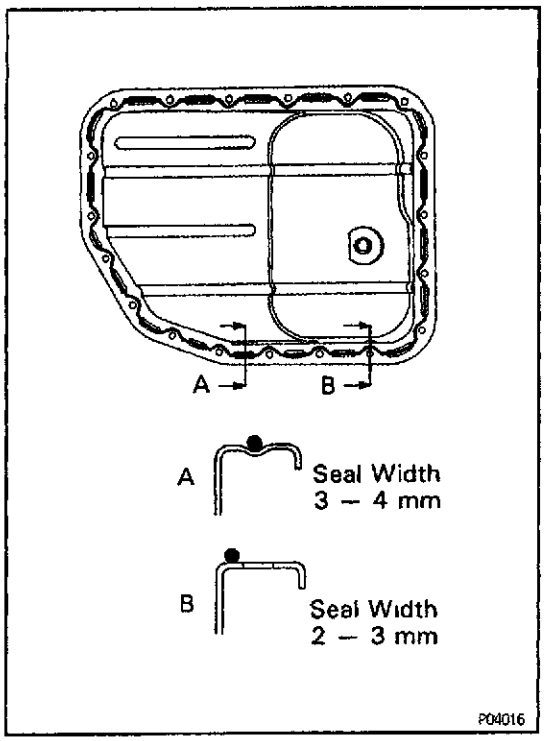


(e) Install the No 1 oil pan with the 21 bolts and 2 nuts

Torque:

43 N-m (440 kgf-cm, 32 ft-lbf) for 14 mm head

20 N-m (200 kgf-cm, 14 ft-lbf for 12 mm head



12. 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.

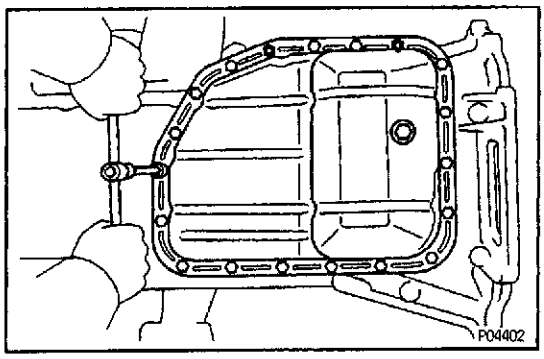
Seal packing:

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

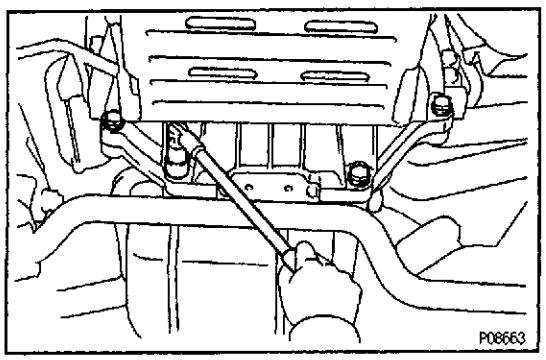


(c) Install the No 2 oil pan with the 17 bolts and 2 nuts

Torque:

7.8 N-m (80 kgf-cm, 69 in.-lbf) for bolt

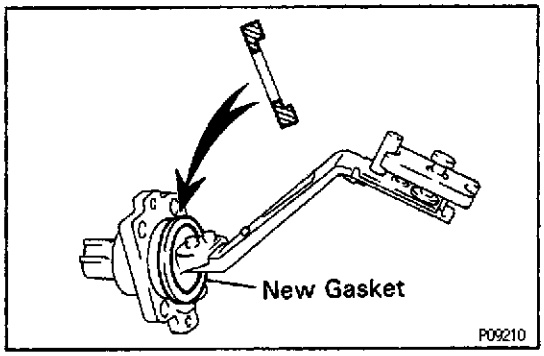
8.8 N-m (90 kgf-cm, 78 in.-lbf) for nut



13. INSTALL BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING

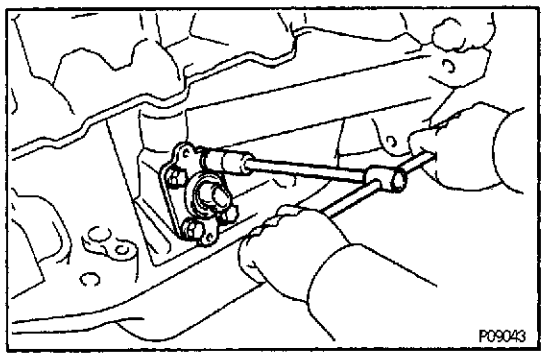
Install the 4 bolts

Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)



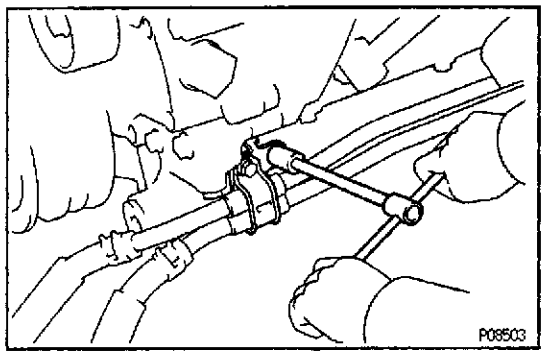
14. INSTALL OIL LEVEL SENSOR

(a) Install a new gasket to the level sensor

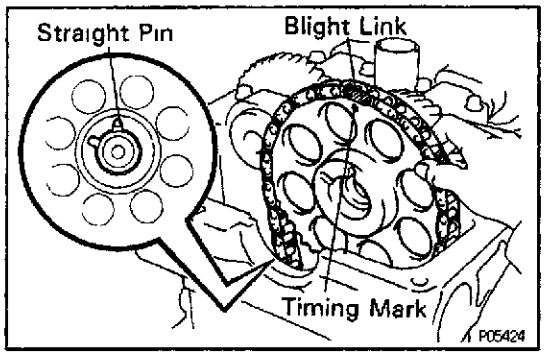


(b) Install the level sensor with the 4 bolts

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



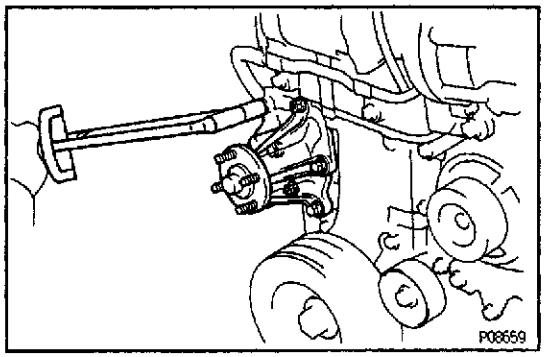
15. CONNECT OIL COOLER PIPE BRACKET TO NO.1 OIL PAN



16. INSTALL CYLINDER HEAD

(See page EG-65 **)**

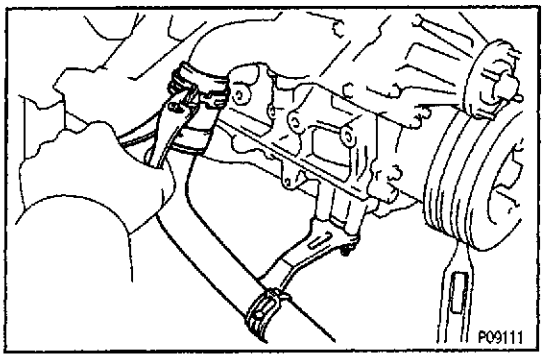
NOTICE: However, for the installation of the camshaft timing gear and timing chain, follow the below procedure. Align the blight link of the timing chain and camshaft timing gear mark, and install them to the camshaft.



17. 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)

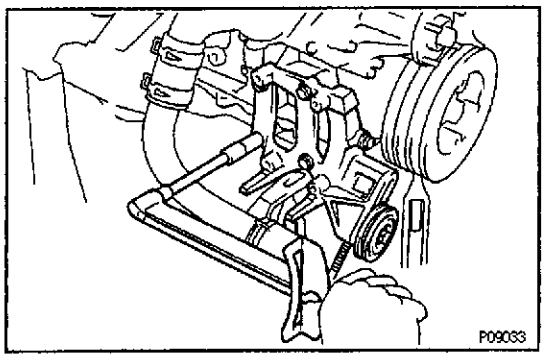


18. INSTALL RADIATOR PIPE

(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

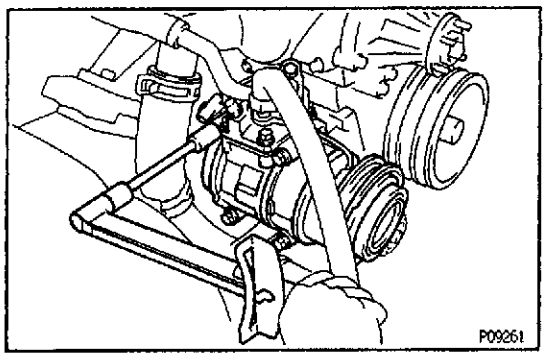
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



19. 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)

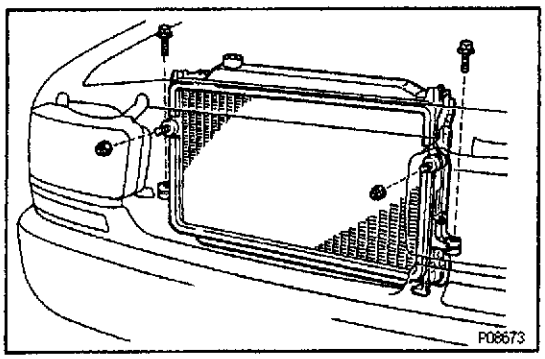


(b) Install the A/C compressor with the 4 bolts

Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

(c) Install and adjust the drive belt

(See AC section)



20. INSTALL RADIATOR

(See page EG-371)

21. FILL ENGINE WITH OIL

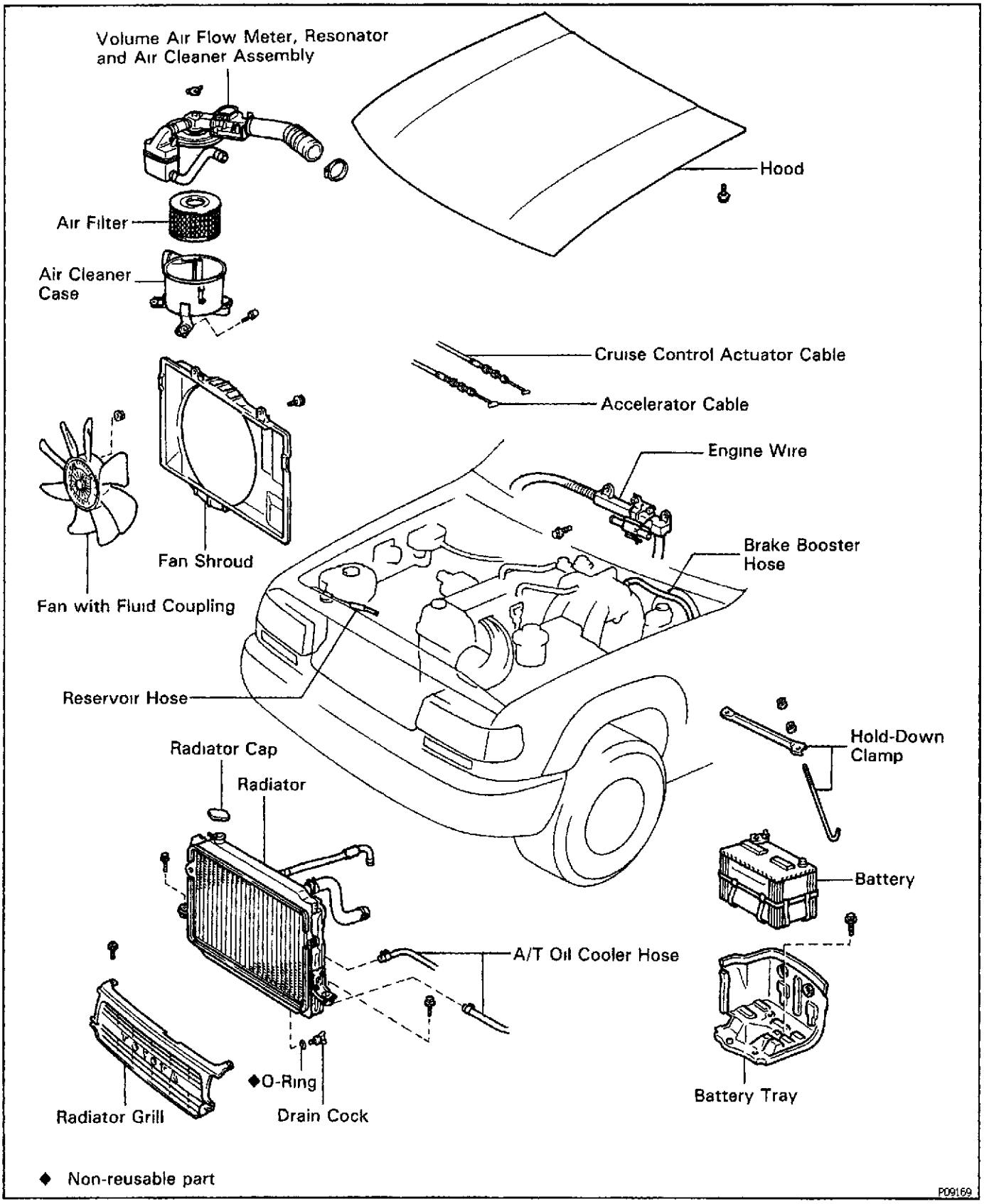
22. INSTALL ENGINE UNDER COVER

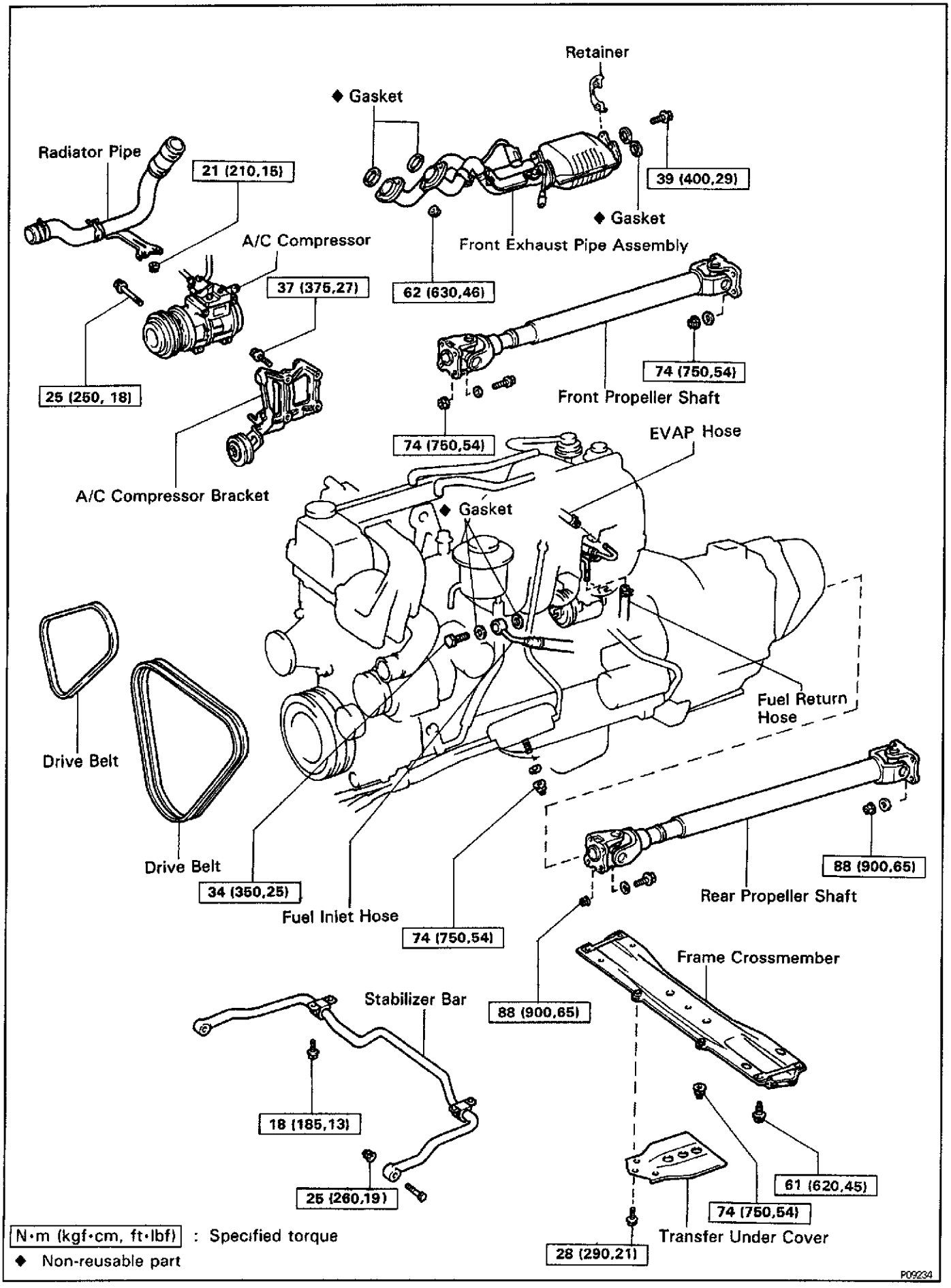
23. START ENGINE AND CHECK FOR LEAKS

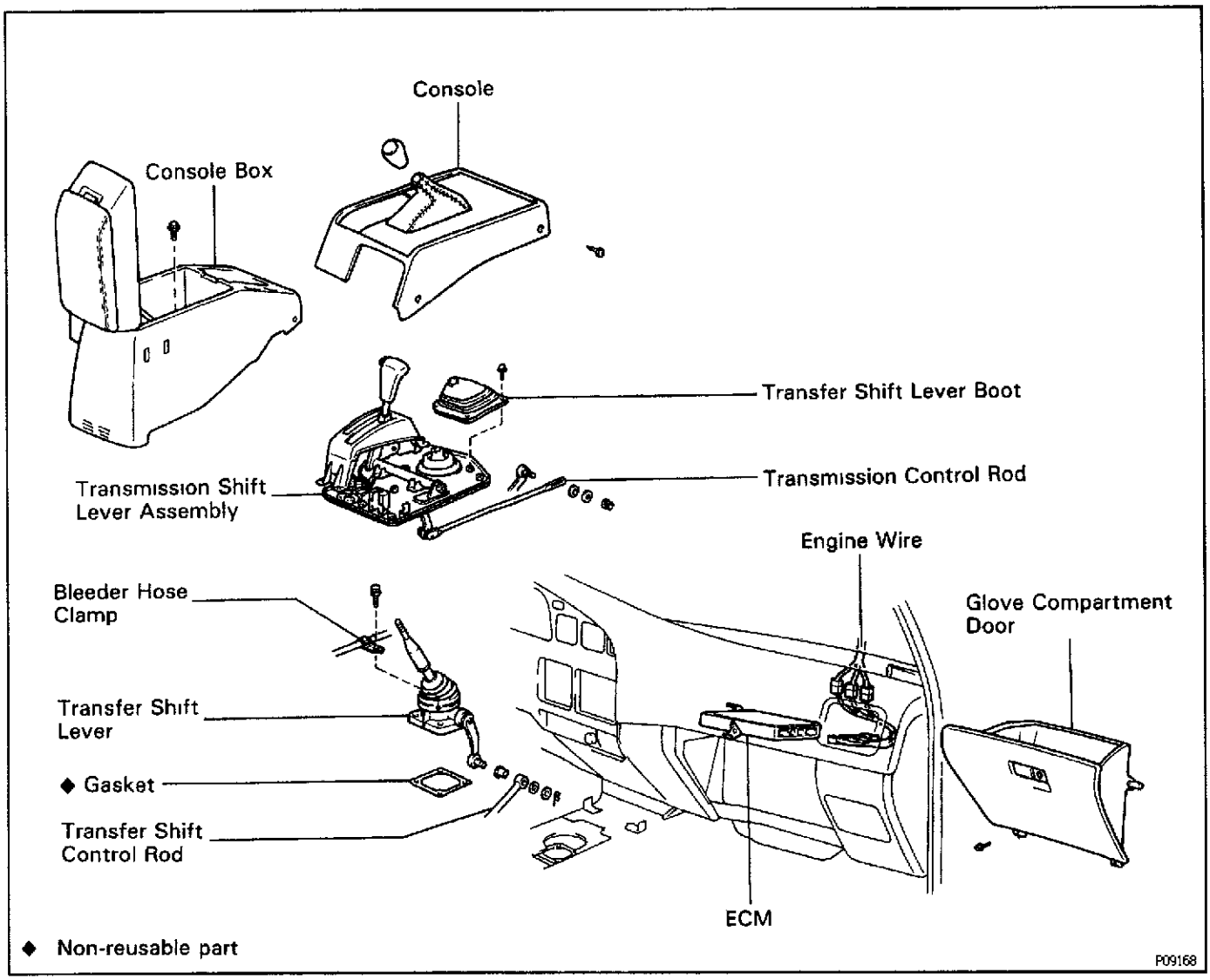
CYLINDER BLOCK

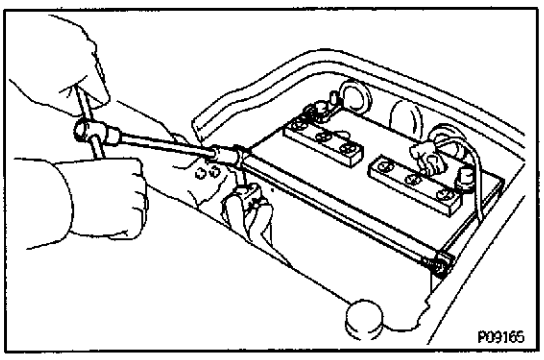
EG1K1-02

COMPONENTS FOR REMOVAL AND INSTALLATION




Retainer
◆ Gasket
Radiator Pipe
21 (210,15)
39 (400,29)
◆ Gasket
A/C Compressor
Front Exhaust Pipe Assembly
37 (375,27)
62 (630,46)
74 (750,54)
25 (250, 18)
Front Propeller Shaft
74 (750,54)
EVAP Hose
A/C Compressor Bracket
◆ Gasket
Drive Belt
Fuel Return Hose
Drive Belt
88 (900,65)
34 (350,25)
Rear Propeller Shaft
Fuel Inlet Hose
74 (750,54)
Frame Crossmember
Stabilizer Bar
88 (900,65)
18 (185,13)
61 (620,45)
74 (750,54)
25 (260,19)
Transfer Under Cover
28 (290,21)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P09234



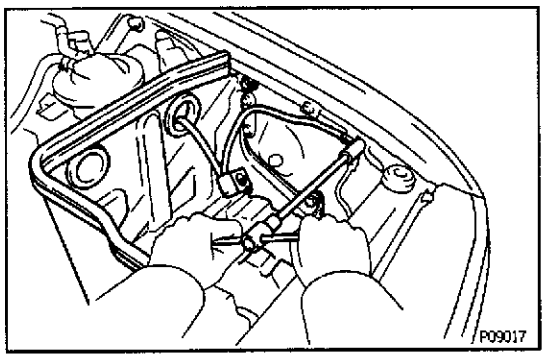


ENGINE WITH TRANSMISSION REMOVAL

1. REMOVE BATTERY AND BATTERY TRAY

(a) Disconnect the battery cables

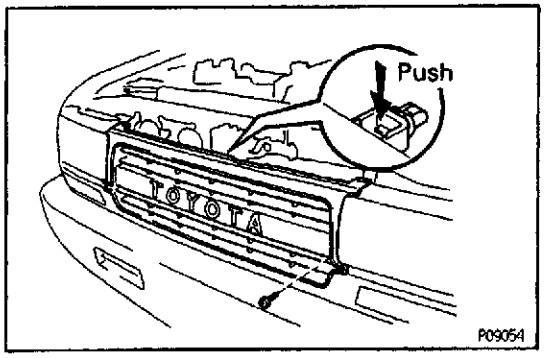
(b) Remove the nuts, hold-down clamp and battery



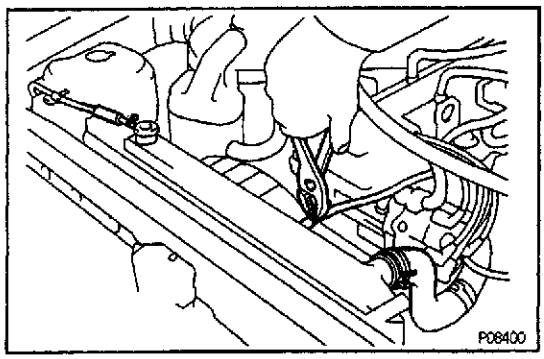
(c) Remove the bolt and disconnect the ground strap

(d) Remove the 5 bolts and battery tray

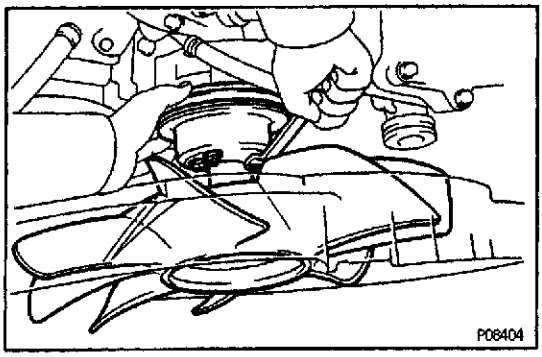
2. DRAIN ENGINE COOLANT
3. DRAIN ENGINE OIL
4. REMOVE HOOD



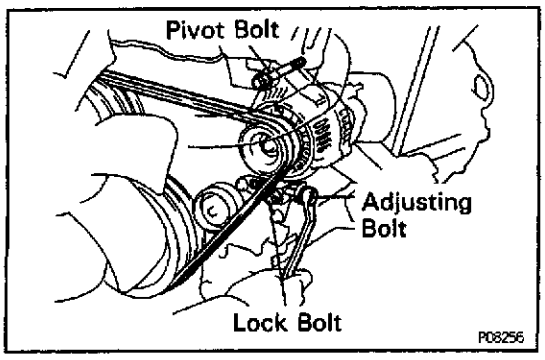
5. REMOVE RADIATOR GRILLE
Remove the 5 screws, clip and radiator grille



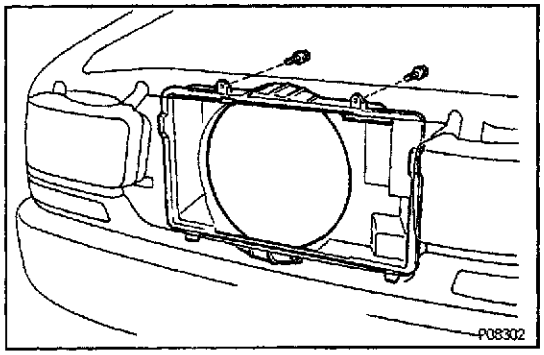
6. REMOVE RADIATOR
(a) Disconnect the following hoses
(1) No 3 water bypass hose
(2) Radiator inlet hose
(3) Reservoir hose



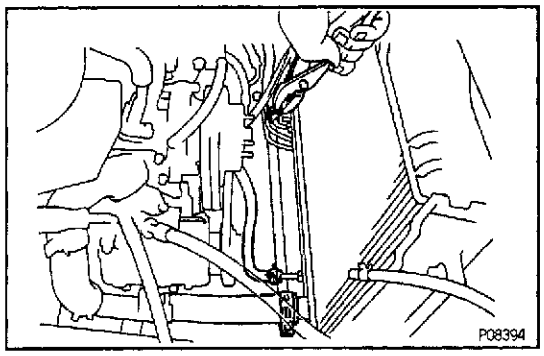
(b) Stretch the belts and loosen the water pump pulley mounting nuts



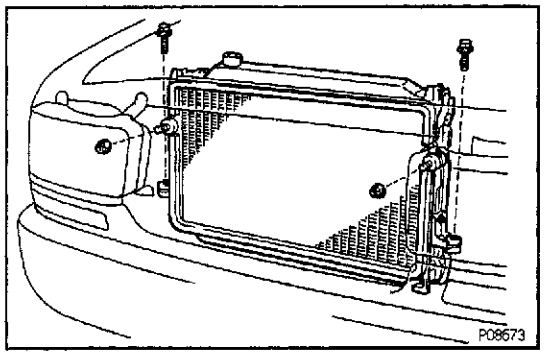
(c) Loosen the pivot and adjusting bolt of the generator, and remove the drive belts



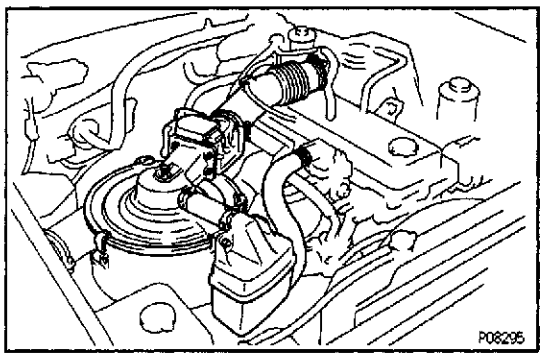
(d) Remove the 2 bolts holding the fan shroud to the radiator
(e) Remove the 4 water pump pulley mounting nuts
(f) Pull out the fan with fluid coupling, water pump pulley and fan shroud



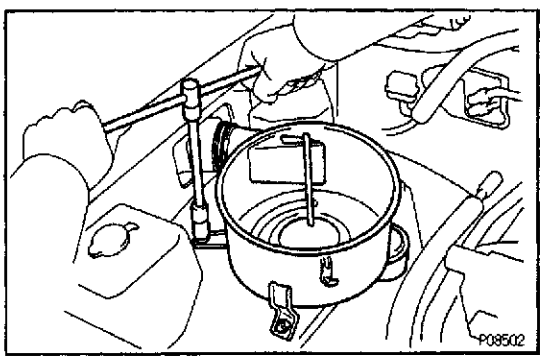
(g) Disconnect the 2 A/T oil cooler hoses
Plug the hose ends
(h) Disconnect the radiator outlet hose

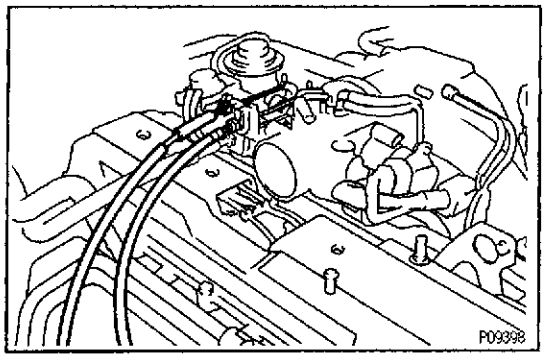


(i) Remove the 2 bolts, 2 nuts and radiator

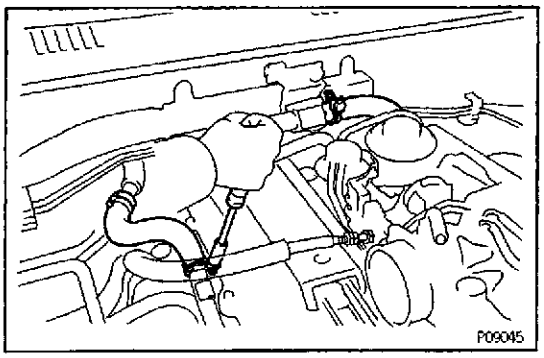


7. REMOVE VOLUME AIR FLOW METER, RESONATOR AND AIR CLEANER ASSEMBLY
(a) Disconnect the volume air flow meter connector and wire clamp
(b) Loosen the air cleaner hose clamp
(c) Loosen the No 2 air hose clamp and disconnect the hose
(d) Remove the wing nut and loosen the 3 clips and remove the air cleaner cap, volume air flow meter and resonator
(e) Remove the air filter
(f) Remove the 3 bolts and air cleaner case



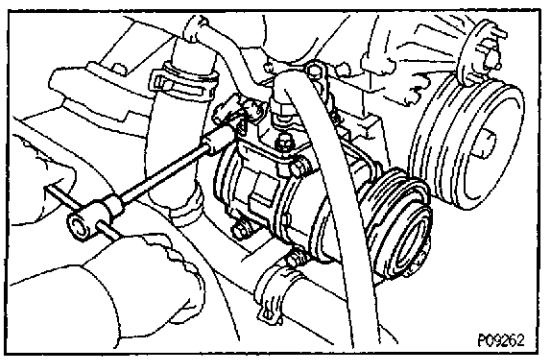


8. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY
9. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

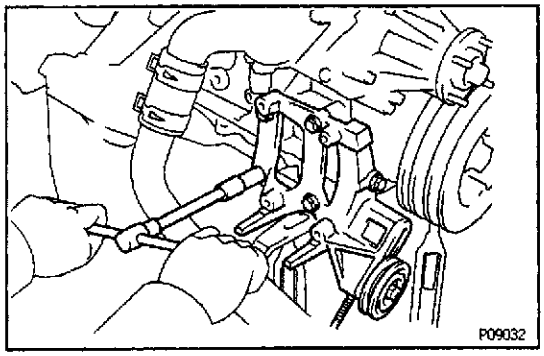


10. DISCONNECT HEATER HOSES

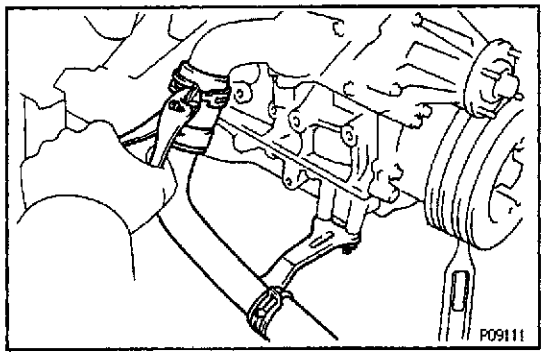
11. DISCONNECT BRAKE BOOSTER VACUUM HOSE
12. DISCONNECT EVAP HOSE
13. DISCONNECT FUEL HOSES
14. DISCONNECT WIRES AND CONNECTORS
Disconnect the following wires and connectors
(1) 2 heated oxygen sensor connectors (with clamps)
(2) DLC1 clamp
(3) 2 oil pressure gauge connectors
(4) Generator wire and connector
(5) Connector on intake manifold from fender apron
(6) High tension cord from ignition coil
(7) Ground strap from No 1 engine hanger
(8) Ground strap from air intake chamber
(9) Starter wire



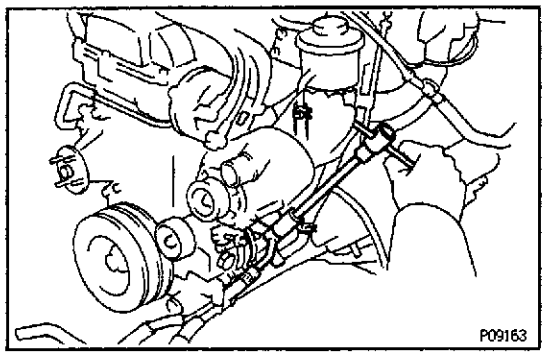
15. DISCONNECT A/C COMPRESSOR AND BRACKET
(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt
(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket
HINT Put aside the compressor, and suspend it



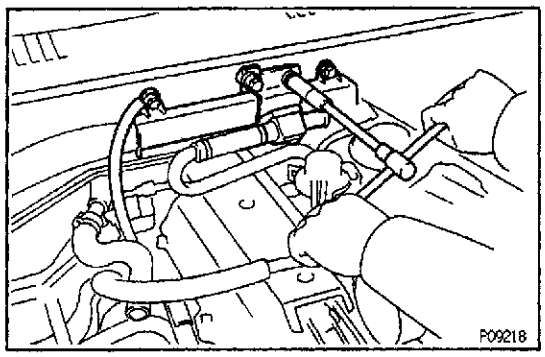
(c) Remove the 5 bolts and A/C compressor bracket



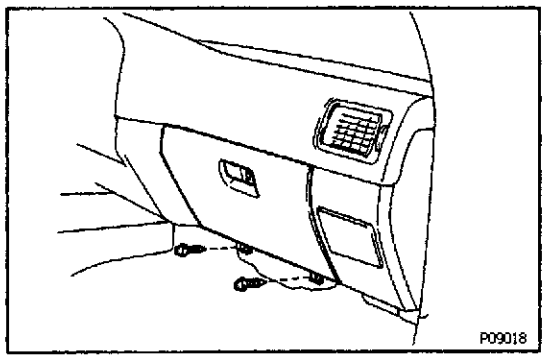
16. REMOVE RADIATOR PIPE
(a) Remove the 2 nuts holding the radiator pipe to the No 1 oil pan
(b) Disconnect the No 2 radiator- hose from the water inlet and remove the radiator pipe



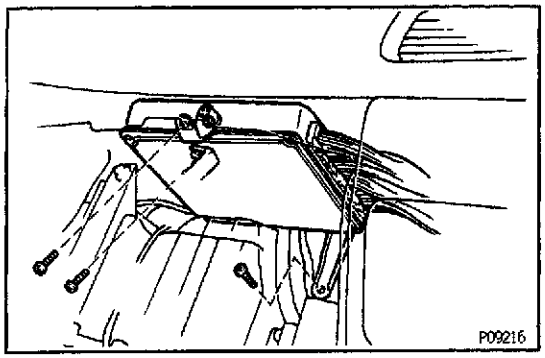
17. DISCONNECT PS PRESSURE HOSE
Remove the union bolt and 2 gaskets, and disconnect the pressure hose from the PS pump
18. DISCONNECT PS RETURN HOSE
Disconnect the return hose from the PS reservoir tank



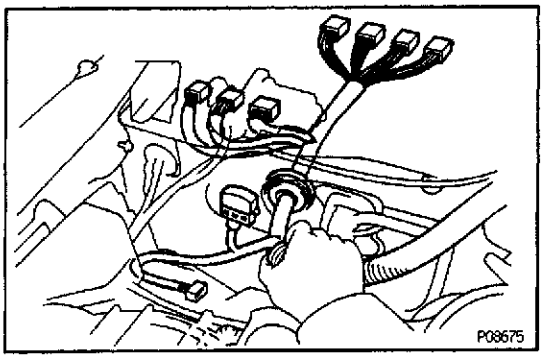
19. DISCONNECT ENGINE WIRE FROM COWL PANEL
(a) Remove the 2 bolts and disconnect the heater valve
(b) Remove the 2 bolts and disconnect the ground strap and engine wire



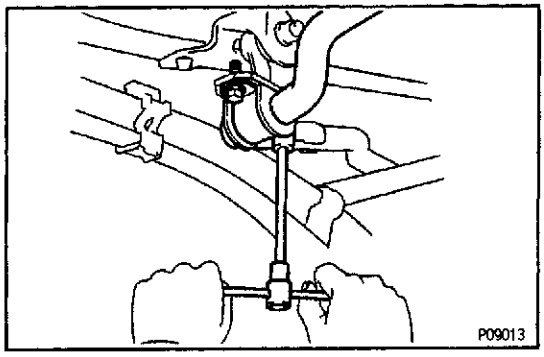
20. DISCONNECT ENGINE WIRE FROM CABIN
(a) Remove the 2 screws and glove compartment door



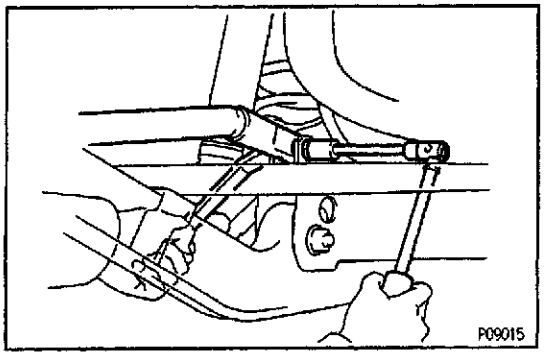
(b) Remove the 3 screws and disconnect the ECM
(c) Disconnect the 4 ECM connectors
(d) Disconnect the 3 connectors from the cow) wire



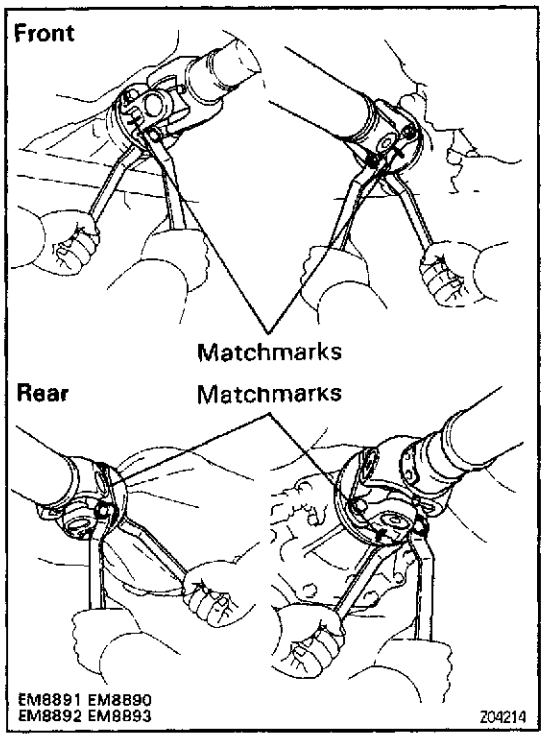
(e) Pull out the engine wire from the cabin



21. REMOVE STABILIZER BAR
(a) Remove the 2 bolts and disconnect stabilizer bar from the bracket

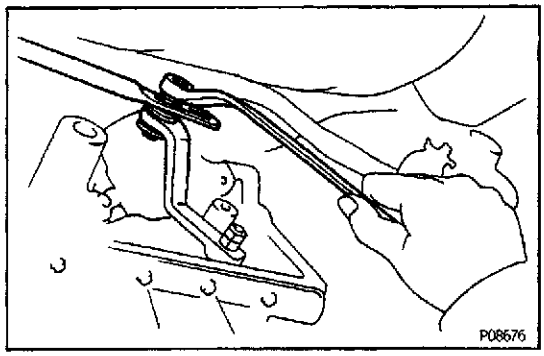


(b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing



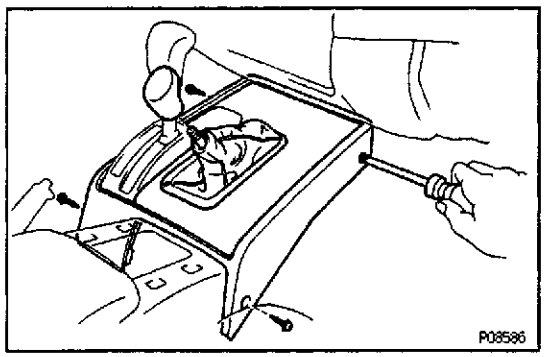
22. REMOVE FRONT AND REAR PROPELLER SHAFTS

(a) Put matchmarks on the flanges
(b) Remove the 4 bolts and nuts
(c) Remove the 4 nuts
(d) Remove the propeller shaft

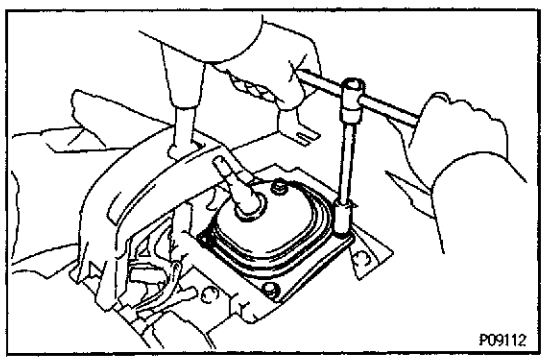


23. REMOVE TRANSFER SHIFT LEVER

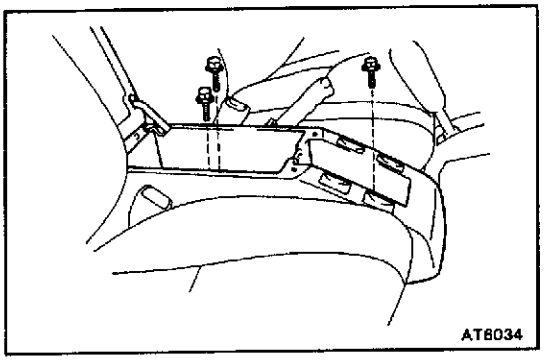
(a) Remove the nut and transmission control rod



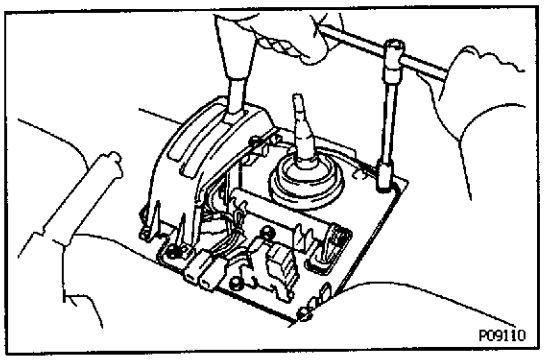
(b) Remove the transfer shift lever knob
(c) Remove 4 screws and the console



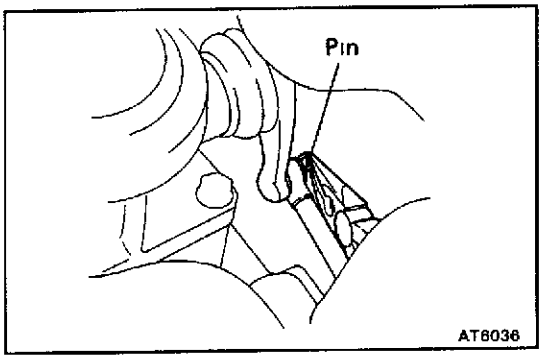
(d) Remove 4 bolts and transfer shift lever boot



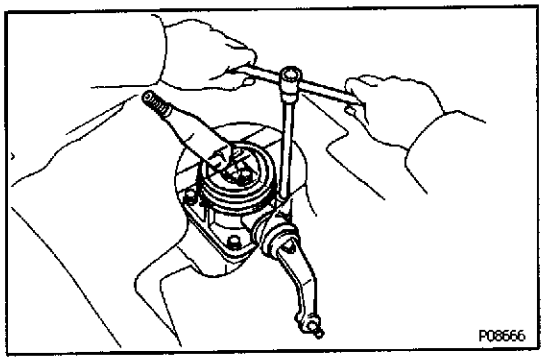
(e) Remove 3 bolts
(f) Disconnect the 2 connectors and remove the console box



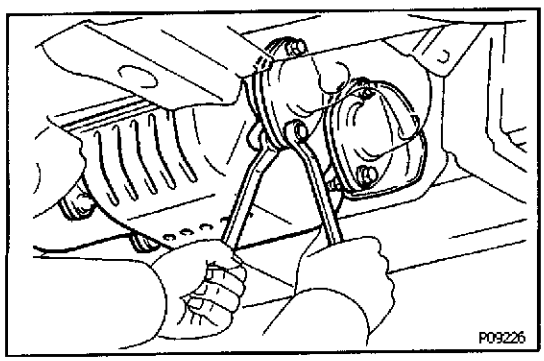
(g) Disconnect the 2 connectors
(h) Remove the 6 bolts and the transmission shift lever assembly



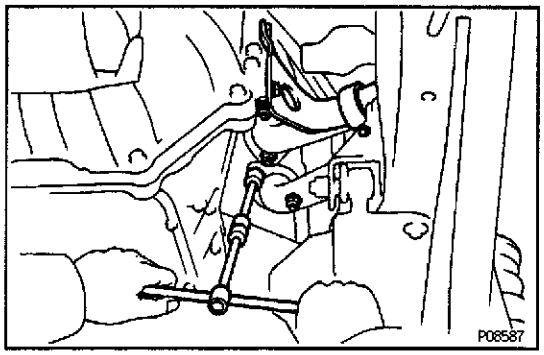
(i) Pull out the pin and disconnect the shift rod



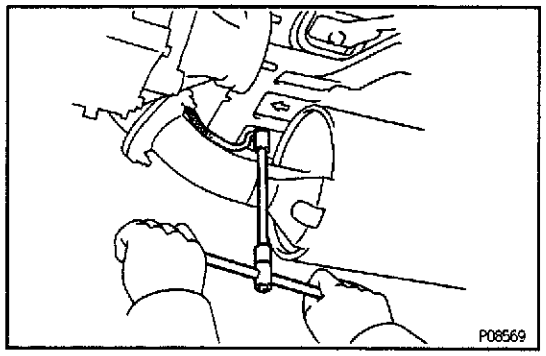
(j) Remove the 4 bolts, hose clamp and the transfer shift lever



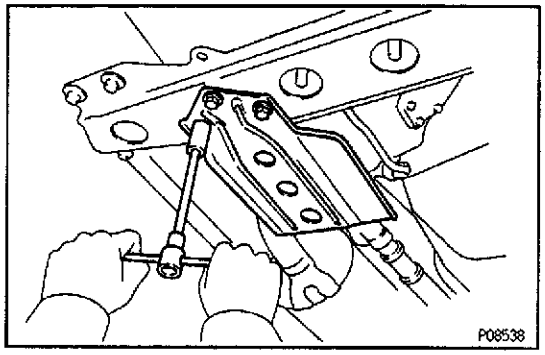
24. REMOVE FRONT EXHAUST PIPE ASSEMBLY
(a) Remove the 4 bolts, 2 nuts and retainer holding the No 3 front exhaust pipe to the TWCs



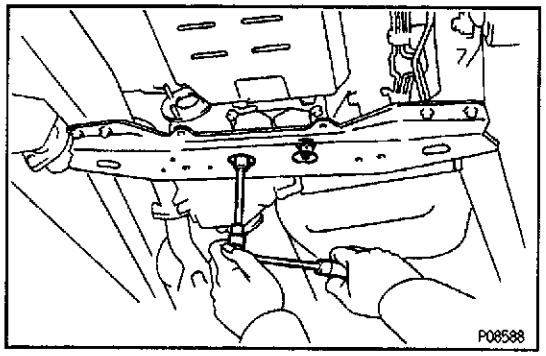
(b) Loosen the clamp bolt and disconnect the clamp from the No 1 support bracket
(c) Remove the 2 bolts and No 1 support bracket
(d) Remove the 4 nuts, front exhaust pipe assembly and 4 gaskets



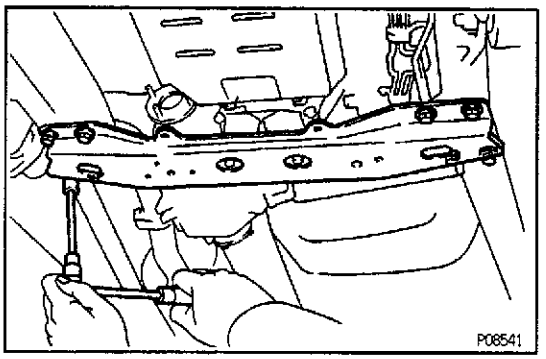
25. DISCONNECT GROUND STRAP FROM HEAT INSULATOR



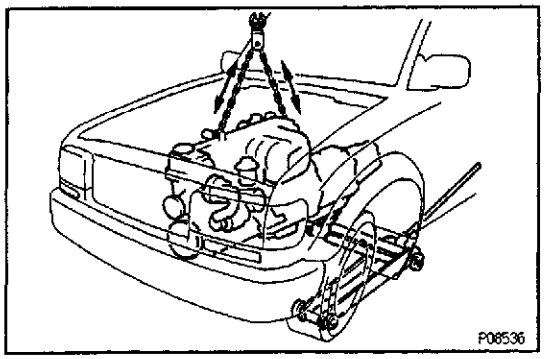
26. REMOVE TRANSFER UNDER COVER
Remove the 3 bolts and transfer under cover
27. PLACE JACK UNDER TRANSMISSION
Be sure to put a wooden block between the jack and the transmission oil pan to prevent damage



28. REMOVE FRAME CROSSMEMBER
(a) Remove the 2 nuts holding the crossmember to the engine rear mounting insulator

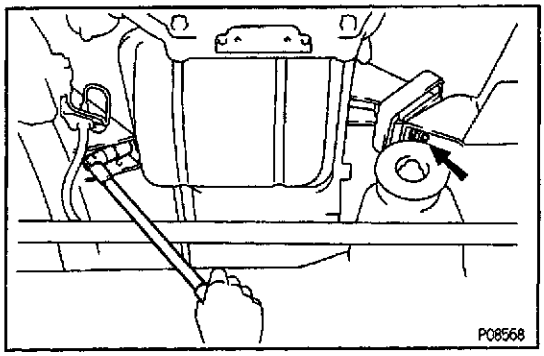


(b) Remove the 8 bolts and crossmember

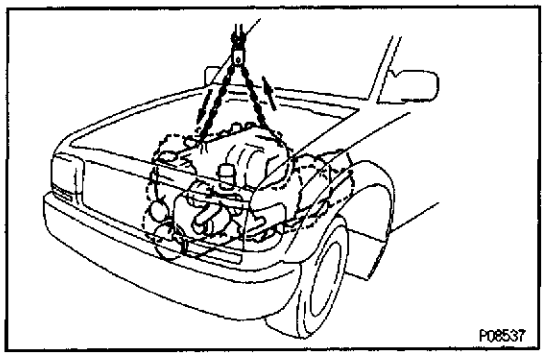


29. REMOVE ENGINE WITH TRANSMISSION

(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



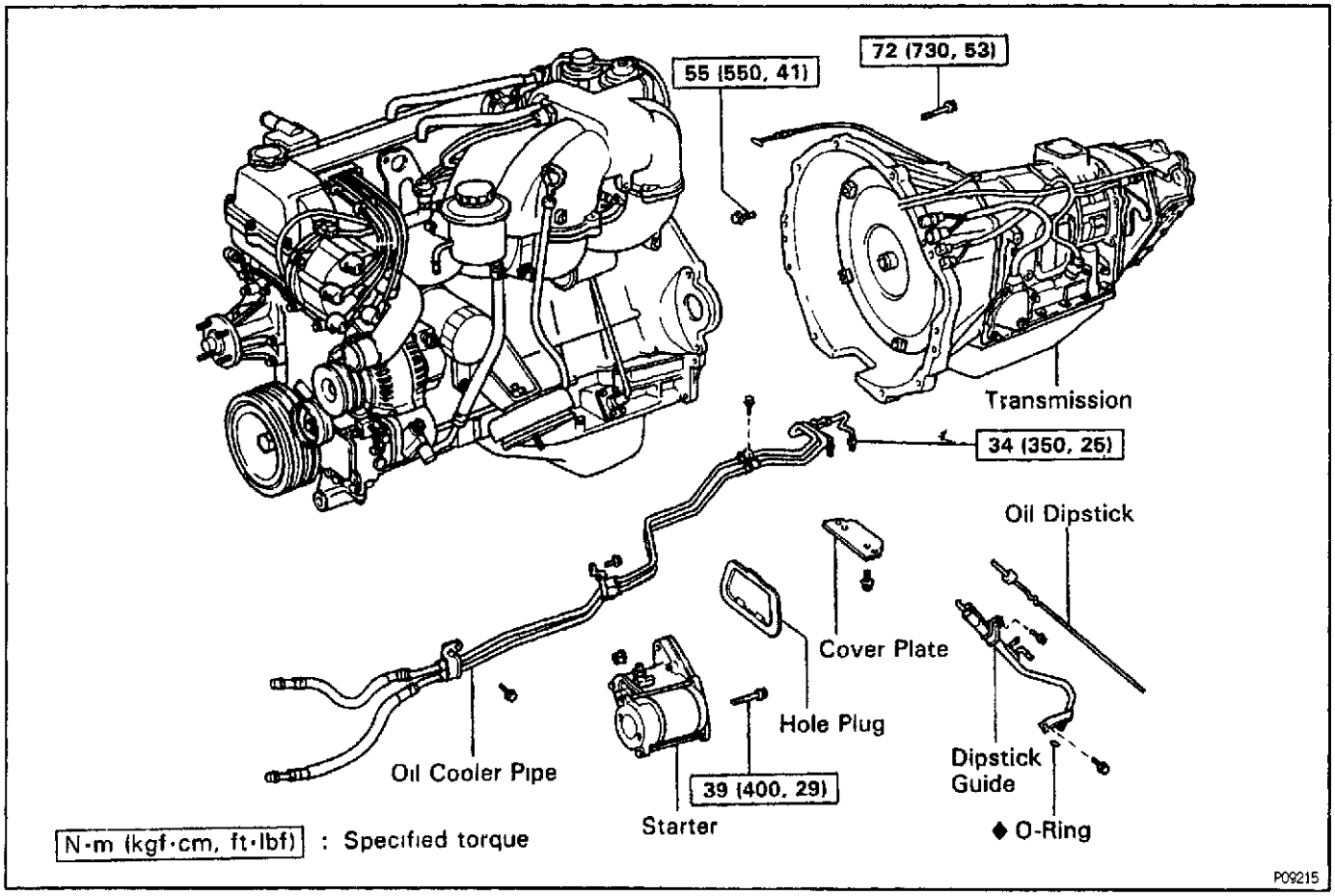
(c) Lift the engine with transmission out of the vehicle slowly and carefully

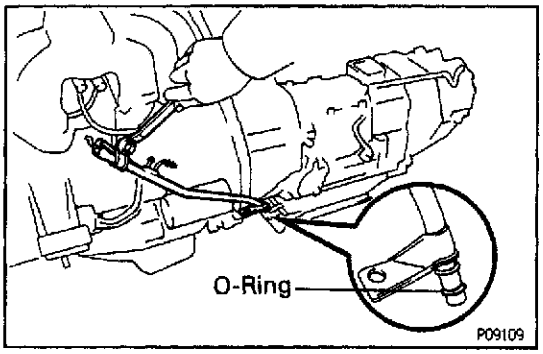
NOTICE: Make sure the engine is clear of all wiring and hoses.

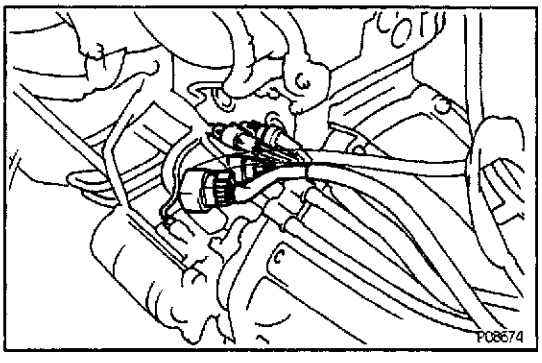
(d) Place the engine and transmission assembly onto the stand

COMPONENTS FOR SEPARATION AND ASSEMBLY OF ENGINE AND TRANSMISSION

EG1K3-01







EG1K4-02

ENGINE AND TRANSMISSION SEPARATION

1. REMOVE OIL DIPSTICK GUIDE FOR TRANSMISSION

(a) Disconnect the 2 bleeder hoses

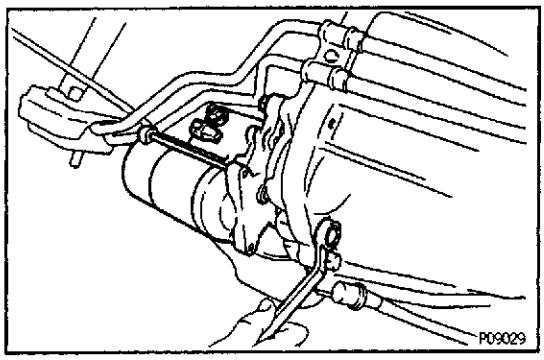
(b) Remove the 2 mounting bolts

(c) Pull out the dipstick guide and dipstick from the transmission

(d) Remove theO-ring from the dipstick guide

2. DISCONNECT ENGINE WIRE FROM TRANSMISSION

Disconnect the 4 connectors

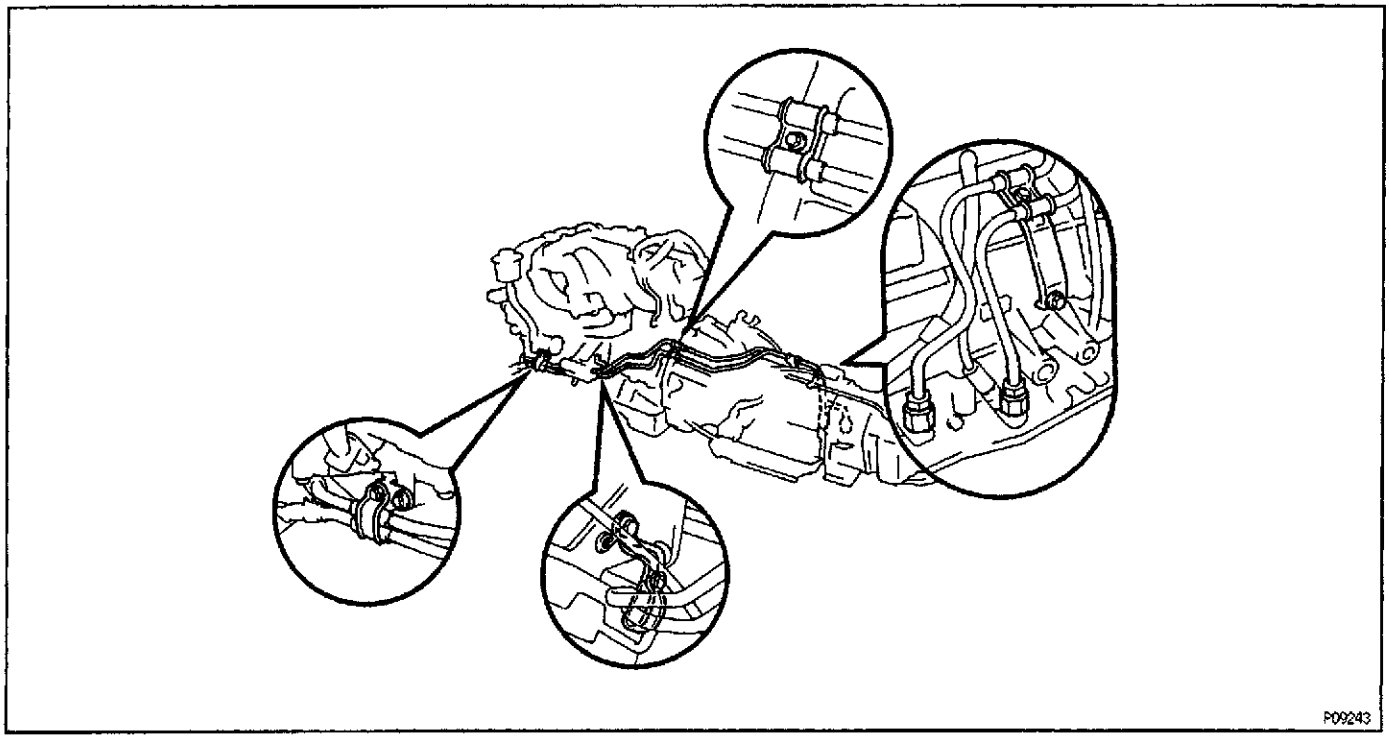


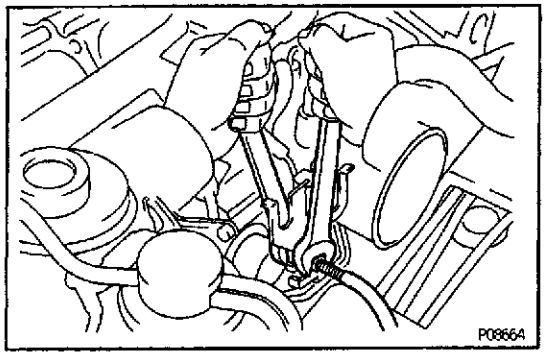
3. REMOVE STARTER

4. REMOVE A/T OIL COOLER PIPES FOR TRANSMISSION

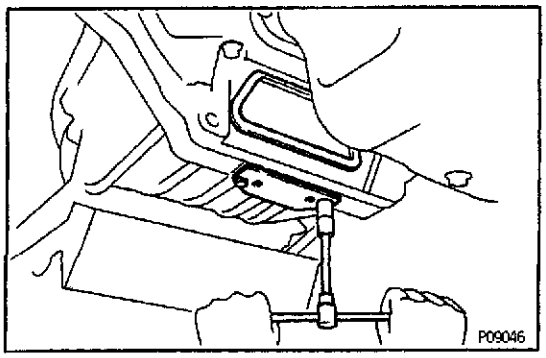
(a) Remove the 4 clamp mounting bolts

(b) Loosen the 2 union nuts, and remove the oil cooler pipes





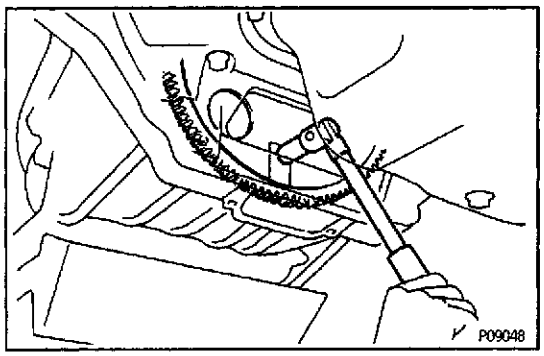
5. DISCONNECT THROTTLE CABLE FROM THROTTLE BODY



6. REMOVE COVER PLATE

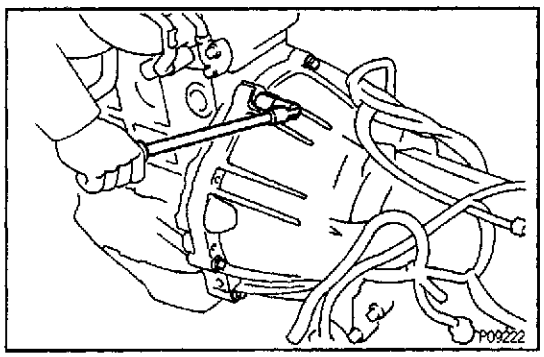
Remove the 2 bolts and cover plate

7. REMOVE HOLE PLUG



8. REMOVE 6TORQUE CONVERTER CLUTCH MOUNTING BOLT

Turn the crankshaft to gain access to each bolt
Remove the 6 bolts

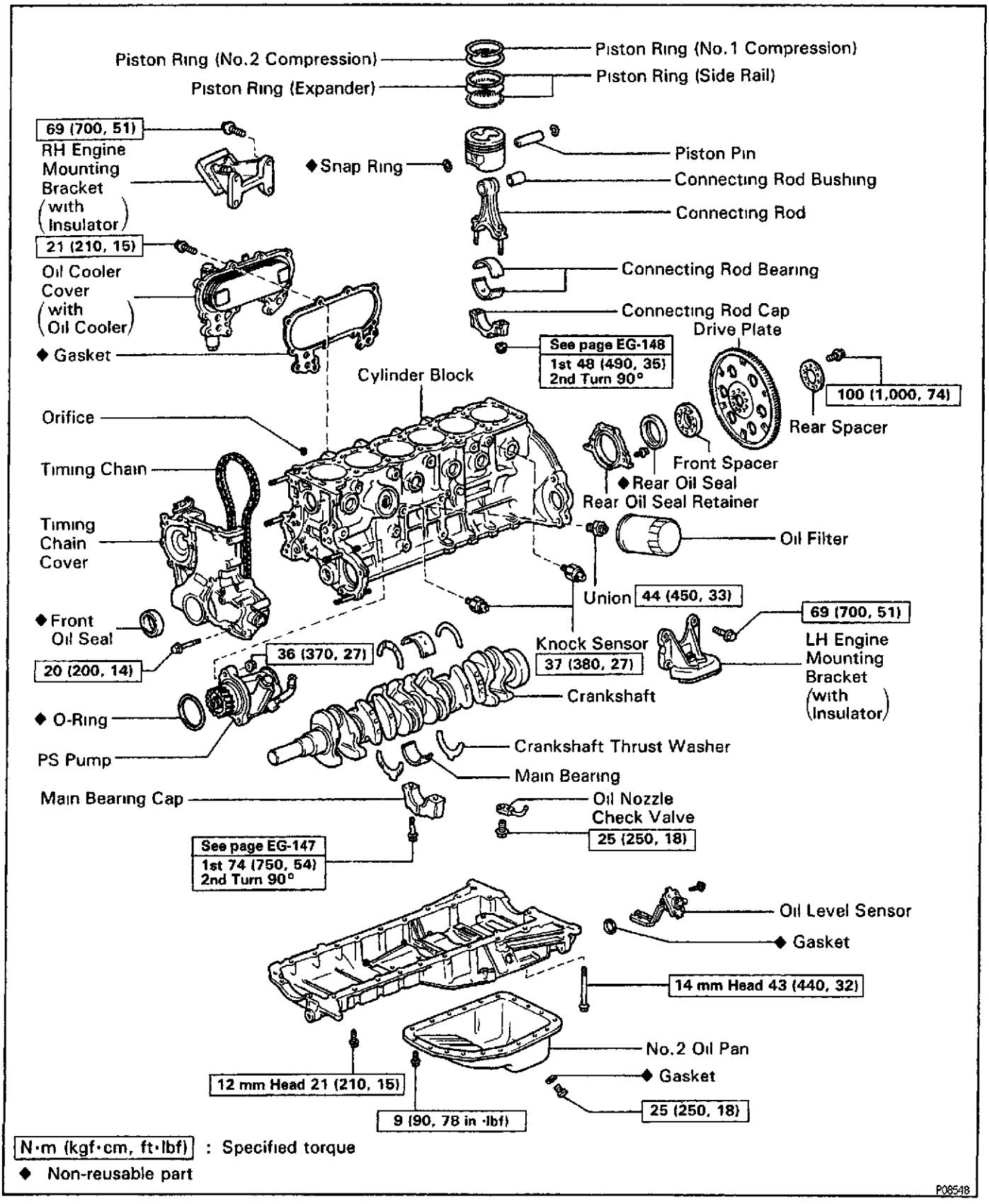


9. SEPARATE ENGINE AND TRANSMISSION

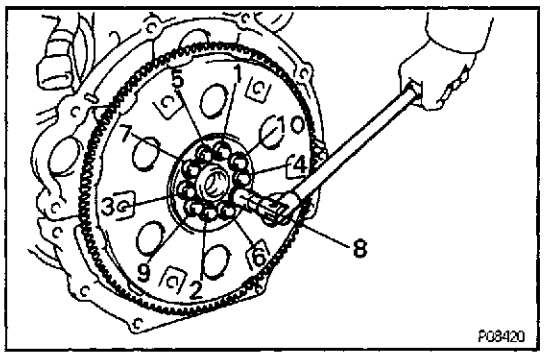
Remove the 10 bolts and transmission

EG1K5--01

COMPONENTS FOR DISASSMBLY AND ASSEMBLY



PREPARATION FOR DISASSEMBLY EG0VL-04



1. REMOVE DRIVE PLATE

Uniformly loosen and remove the drive plate bolts, in several passes, in the sequence shown

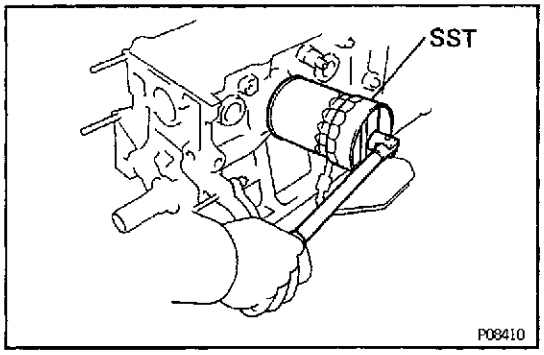
2. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

3. REMOVE CYLINDER HEAD

(See page EG-33 **)**

4. REMOVE TIMING CHAIN AND GEARS

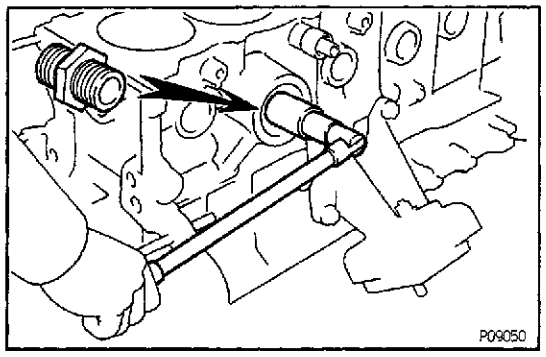
(See page EG-88)



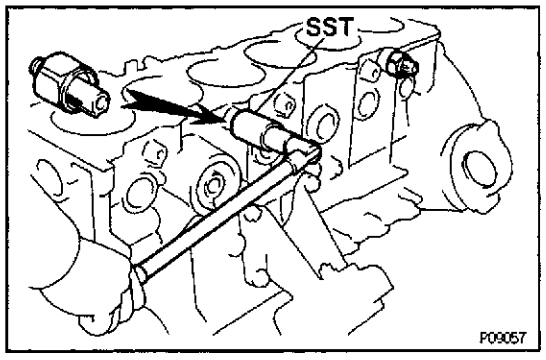
5. REMOVE OIL FILTER

Using SST, remove the oil filter

SST 09228-44011



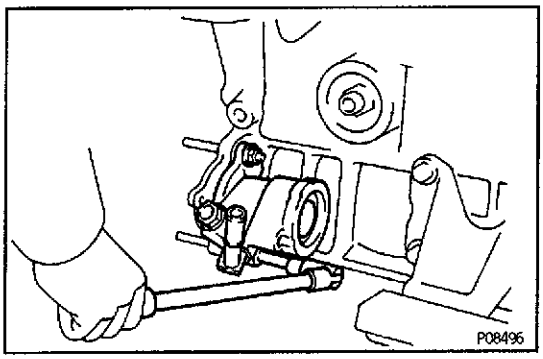
6. REMOVE OIL FILTER UNION



7. REMOVE KNOCK SENSORS

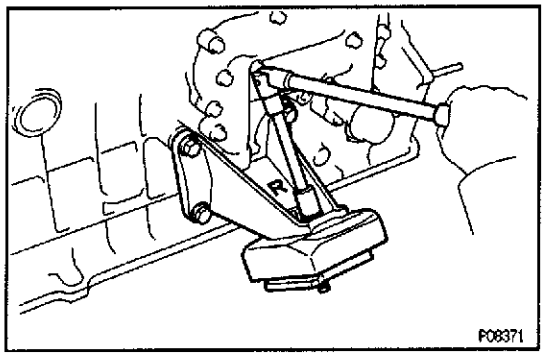
Using SST, remove the 2 knock sensors

SST 09816 - 30010



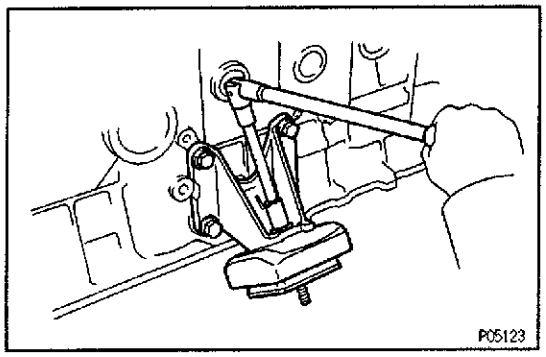
8. REMOVE PS PUMP

(a) Remove the 2 nuts and pump
(b) Remove the O-ring from the pump



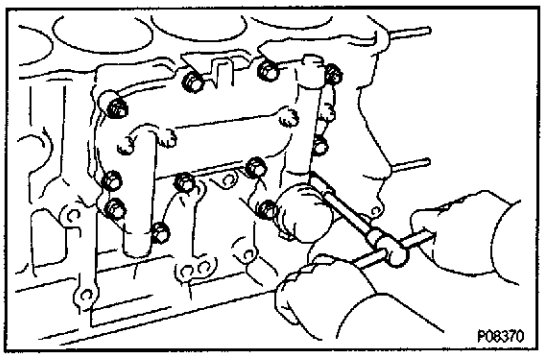
9. REMOVE RH ENGINE MOUNTING BRACKET

(a) Remove the nut and insulator
(b) Remove the 4 bolts and bracket



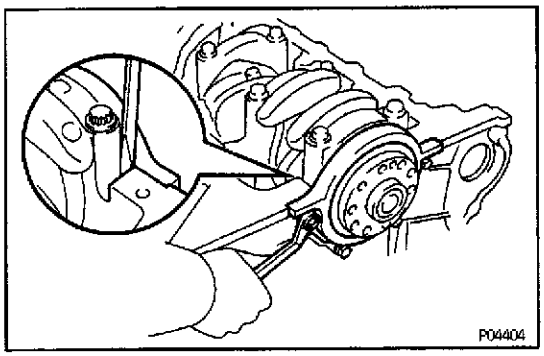
10. REMOVE LH ENGINE MOUNTING BRACKET

(a) Remove the nut and insulator
(b) Remove the 4 bolts and bracket



11. REMOVE OIL COOLER COVER AND OIL COOLER

Remove the 10 bolts, 2 nuts, oil cooler cover with the oil cooler and gasket



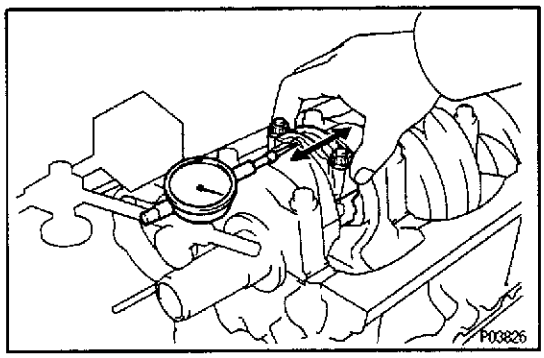
CYLINDER BLOCK DISASSEMBLY

EG007-02

(See Components for Disassembly and Assembly)

1. REMOVE REAR OIL SEAL RETAINER

Remove the 4 bolts and retainer



2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth

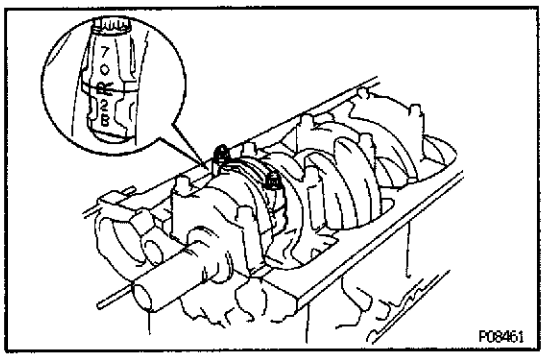
Standard thrust clearance:

0.160 - 0.262 mm (0.0063 - 0.0103 in.)

Maximum thrust clearance:

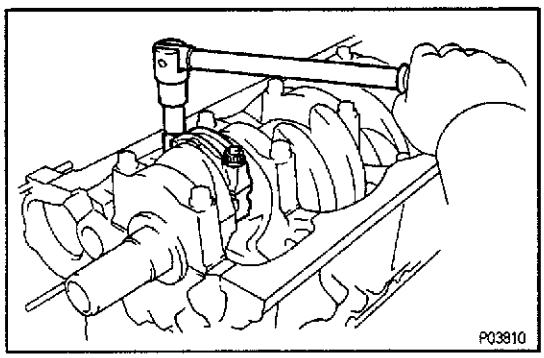
0.362 mm (0.0143 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly If necessary, replace the crankshaft

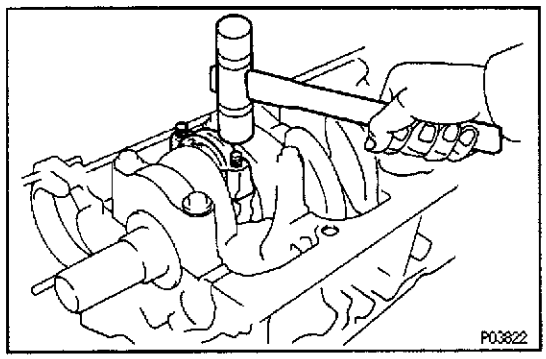


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly

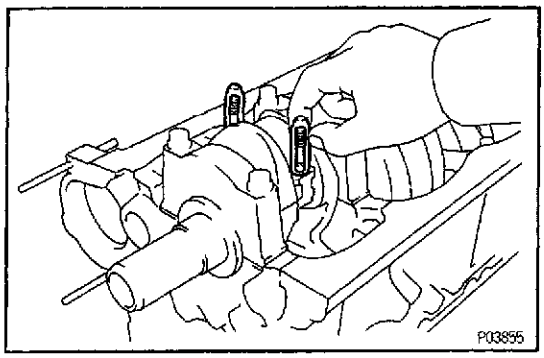


(b) Remove the connecting rod cap nuts

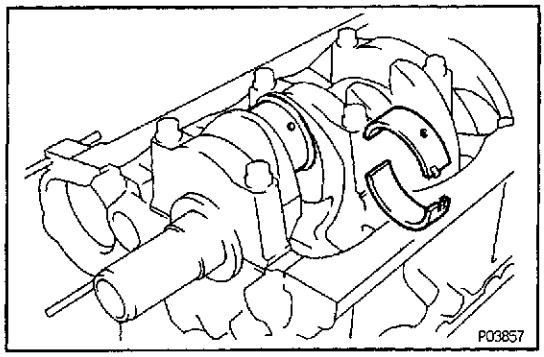


(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap

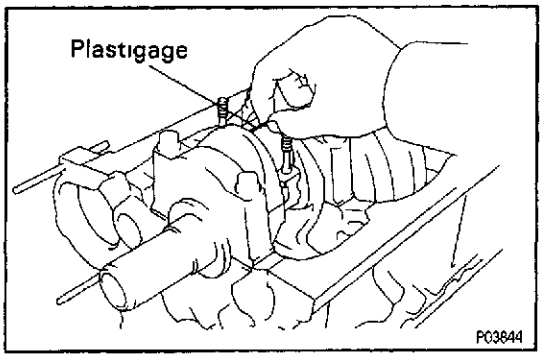
HINT Keep the lower bearing inserted with the connecting rod cap



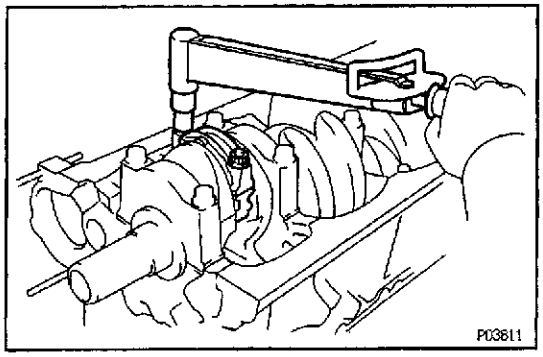
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage



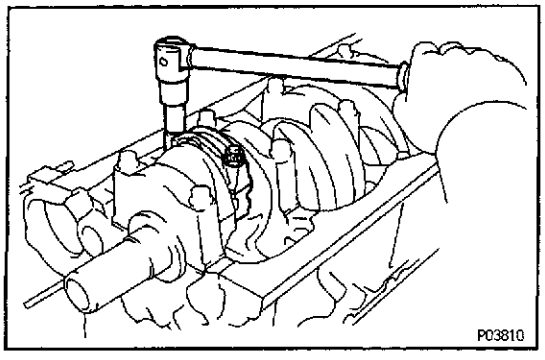
(e) Clean the crank pin and bearing
(f) Check the crank pin and bearing for pitting and scratches
If the crank pin or bearing is damaged, replace the bearings If necessary, grind or replace the crankshaft



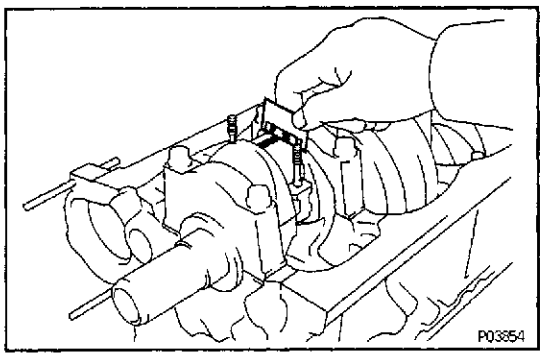
(g) Lay a strip of Plastigage across the crank pin



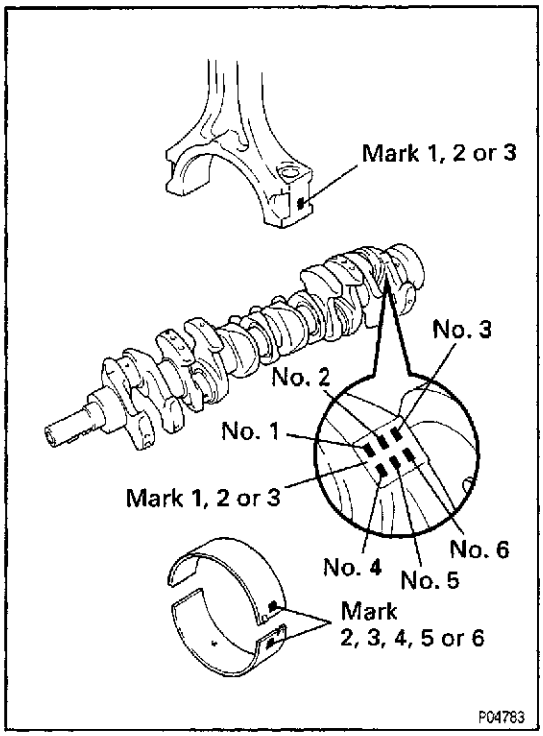
(h) Install the connecting rod cap with the 2 nuts
(See step 8 on page EG-148)
Torque:
1st 48 N-m (490 kgf-cm, 35 ft-lbf)
2nd Turn extra 90°
NOTICE: Do not turn the crankshaft.



(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 "'I"
= Total number 4 (Use bearing "4")

V04632

Reference:
Connecting rod big end inside diameter
Mark 'I'
60.526 - 60.532 mm(2.3829 - 2.3831 in.)
Mark '2'
60.532 - 60.538 mm(2.3851 - 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.)

Standard sized bearing center wall thickness:

Mark "2"

2.489 - 2.492 mm (0.0980 - 0.0981 in.)

Mark '3"

2.492 - 2.495 mm (0.0981 - 0.0982 in.)

Mark "4'

2.495 - 2.498 mm (0.0982 - 0.0983 in.)

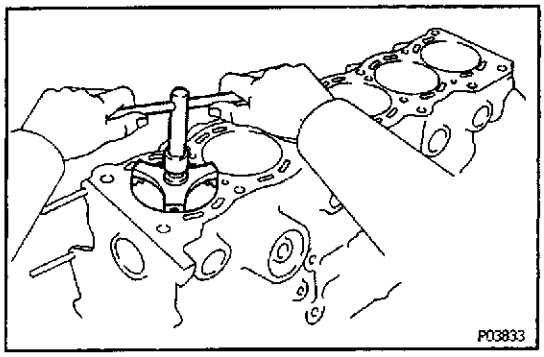
Mark "5"

2.498 - 2.501 mm (0.0983 - 0.0985 in.)

Mark '6'

2.501 - 2.504 mm (0.0985 - 0.0986 in.)

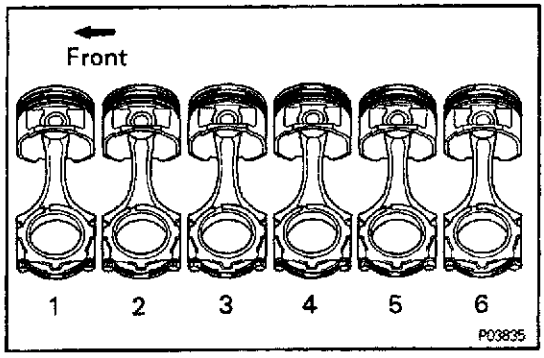
(k) Completely remove the Plastigage



4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

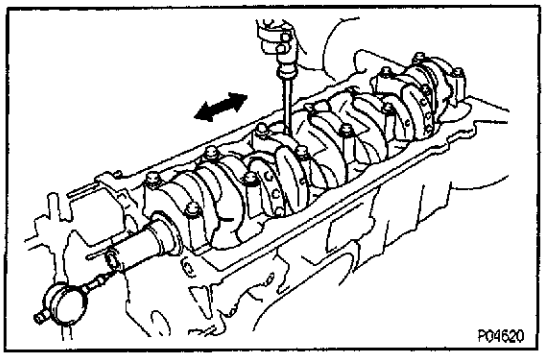
(a) Using a ridge reamer, remove the all carbon from the top of the cylinder

(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



5. 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

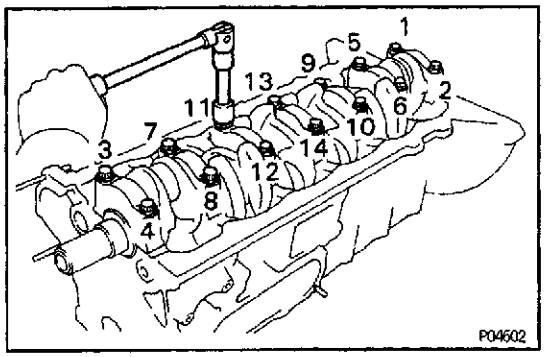
2.440 - 2.490 mm (0.0961 - 0.0980 in.)

O/S 0.125

2.503 - 2.553 mm (0.0985 - 0.1005 in.)

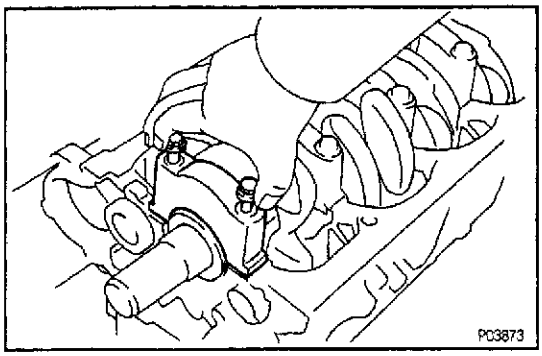
O/S 0.250

2.565 - 2.615 mm (0.1010 - 0.1030 in.)



6. 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

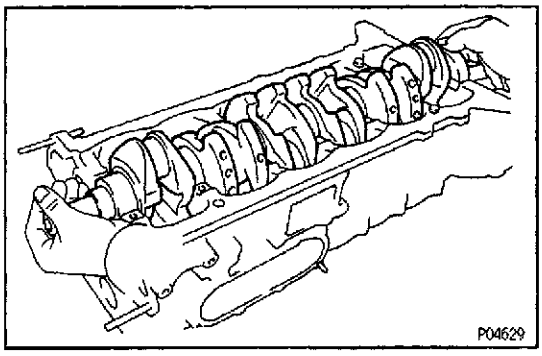


(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and (No 4 main bearing cap only) lower thrust washers

HINT

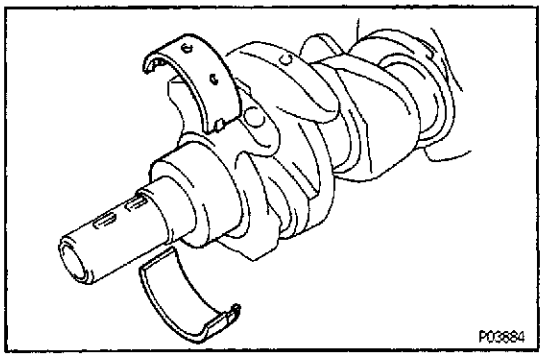
Keep the tower bearing and main bearing cap together

Arrange the main bearing caps and lower thrust washers in correct order



(c) Lift out the crankshaft

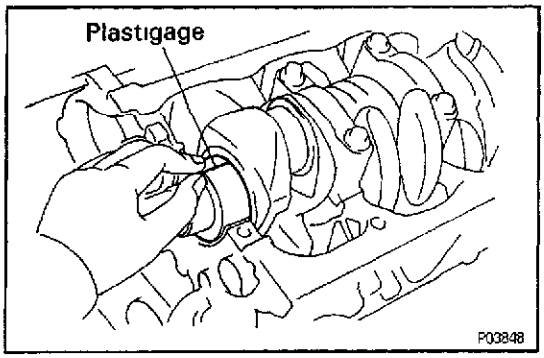
HINT Keep the upper bearing and upper thrust washers together with the cylinder block



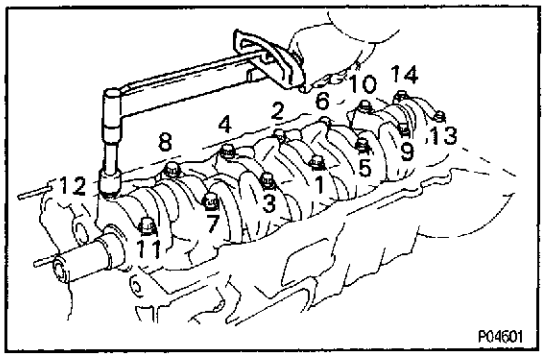
(d) Clean each main journal and bearing

(e) Check each main journal and bearing for pitting and scratches

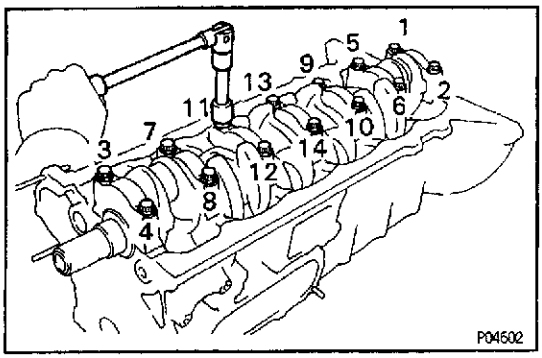
If the journal or bearing is damaged, replace the bearings If necessary, grind or replace the crankshaft



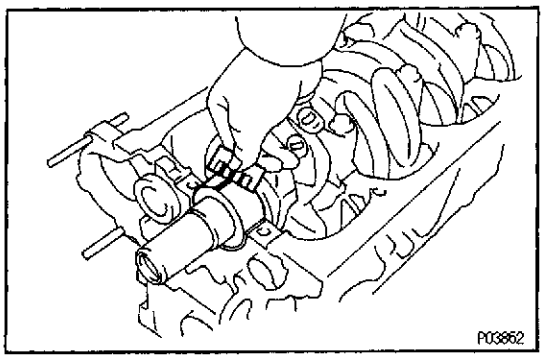
(f) Place the crankshaft on the cylinder block
(g) Lay a strip of Plastigage across each journal



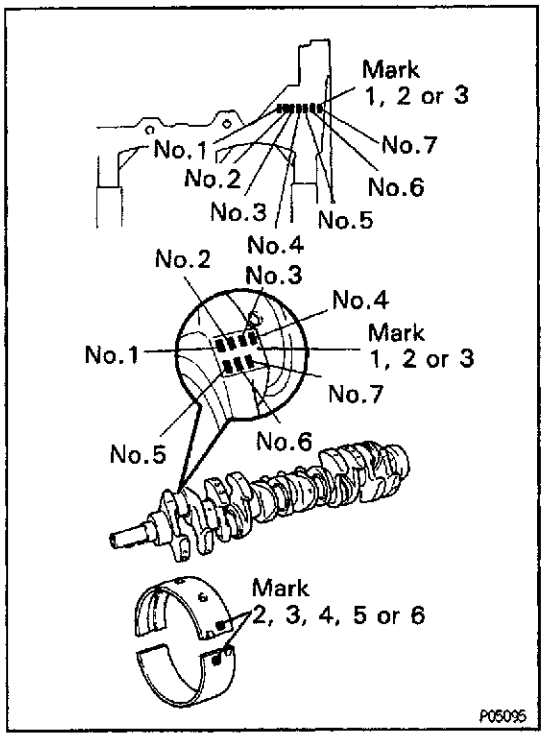
(h) Install the main bearing caps
(See step 6 on page EG-146)
Torque:
1 st 74 N-m (750 kgf-cm, 54 ft-lbf)
2nd Turn extra 90°
NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps
(See procedure (a) and (b) above)



(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")

V00739

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 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 sized bearing center wall thickness

Mark "2"

2.489 - 2.492 mm (0.0980 - 0.0981 in.)

Mark "3"

2.492 - 2.495 mm (0.0981 - 0.0982 in.)

Mark

2.495 - 2.498 mm (0.0982 - 0.0983 in.)

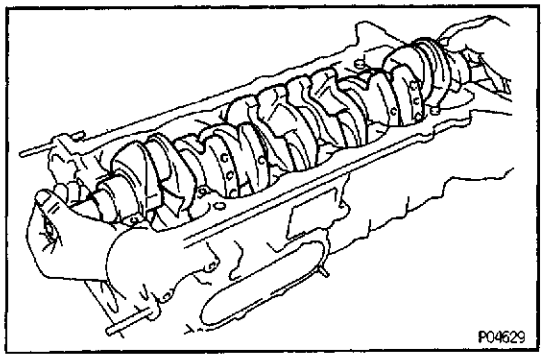
Mark '5'

2.498 - 2.501 mm (0.0983 - 0.0985 in.)

Mark "6"

2.501 - 2.504 mm (0.0985 - 0.0986 in.)

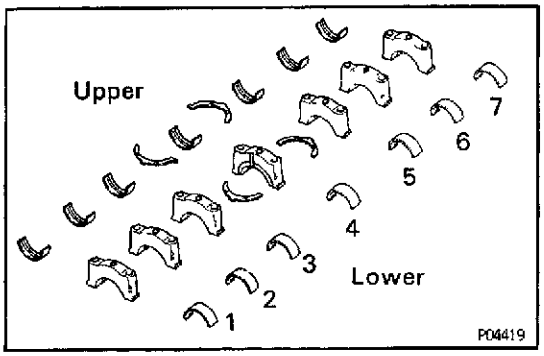
(k) Completely remove the Plastigage



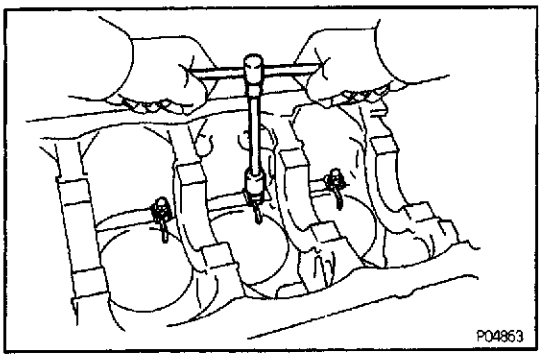
7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft

(b) Remove the upper main bearings and upper thrust washers from the cylinder block

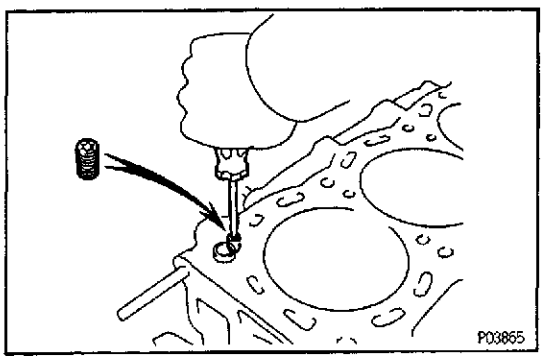


HINT: Arrange the main bearings and thrust washers in correct order

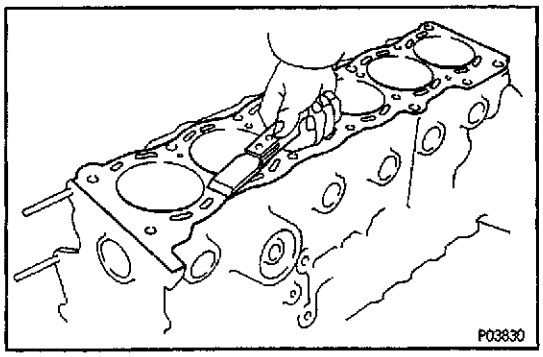


8. REMOVE CHECK VALVES AND OIL NOZZLES

Remove the 6 check valves and oil nozzles



9. REMOVE CYLINDER BLOCK ORIFICE



CYLINDER BLOCK INSPECTION

EG0VV-05

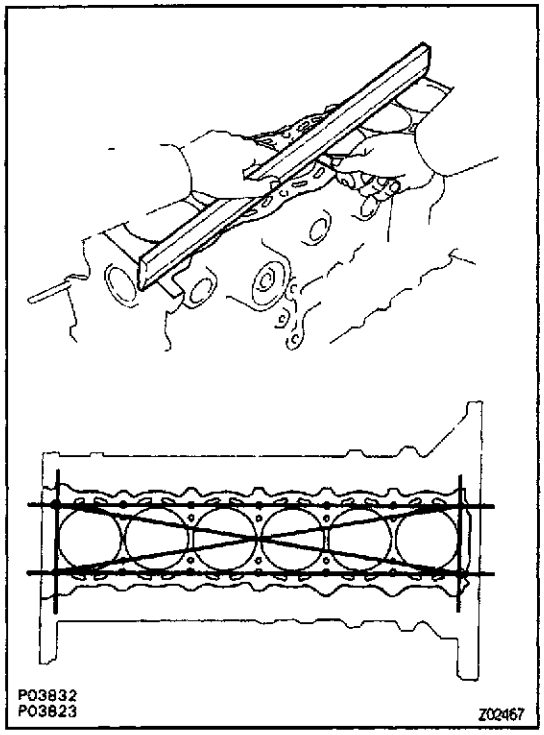
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block



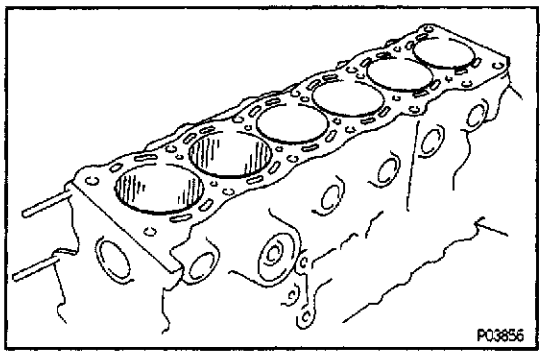
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head gasket for warpage

Maximum warpage:

0.05 mm (0.0020 in.)

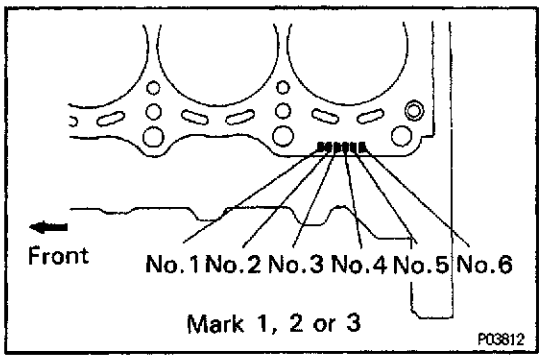
If warpage is greater than maximum, replace the cylinder block



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

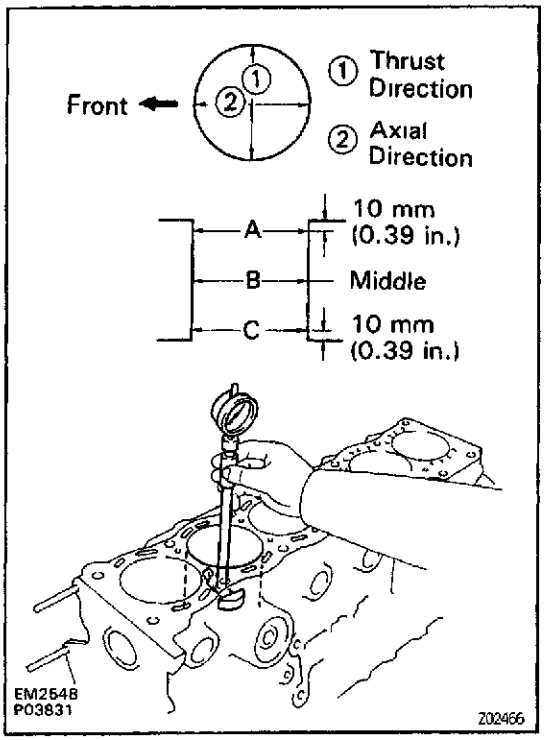
Visually check the cylinder for vertical scratches

If deep scratches are present, rebore all the 6 cylinders If necessary, replace the cylinder block



4. INSPECT 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



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 m m

(3.9374 - 3.9378 in.)

Mark '3'

100.020 - 100.030

(3.9378 - 3.9382 in.)

Maximum diameter:

STD

100.23 mm (3.9461 in.)

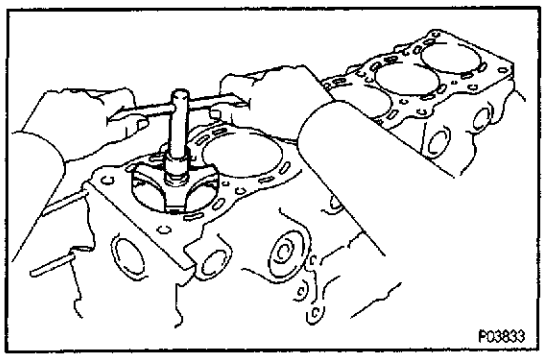
O/S 0.50

100.73 mm (3.9658 in.)

O/S 1.00

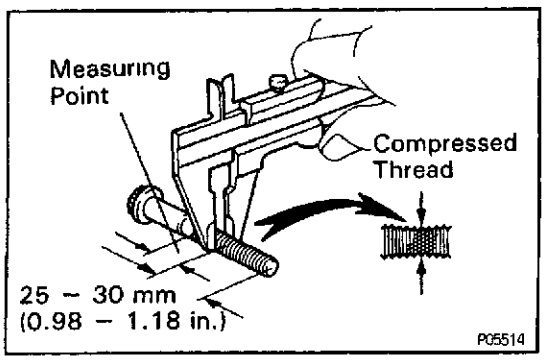
101.23 mm (3.9854 in.)

If the diameter is greater than maximum, rebore all the 6 cylinders If necessary, replace the cylinder block



5. REMOVE CYLINDER RIDGE

If the wear is less than 0 2 mm (0 008 in), using a ridge reamer, grind the top of the cylinder



6. INSPECT MAIN BEARING CAP BOLTS

Using vernior calipers, measure the thread outside diameter of the bolt

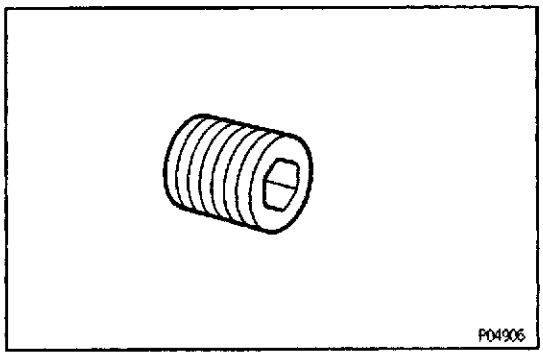
Standard outside diameter:

10.85 - 11.00 mm (0.4271 - 0.4331 in.)

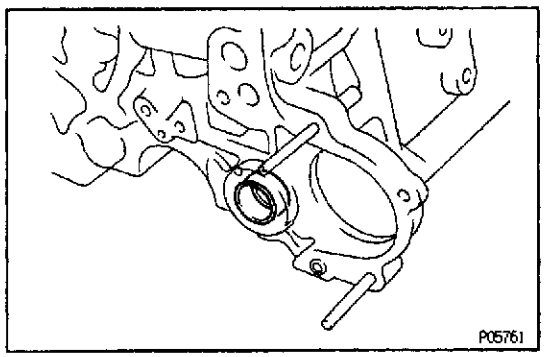
Minimum outside diameter:

10.6 mm (0.417 in.)

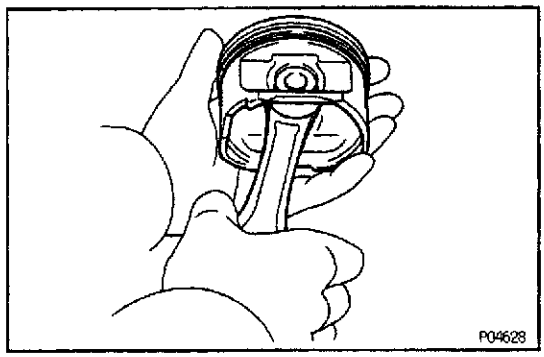
If the diameter is less than minimum, replace the bolt



7. INSPECT CYLINDER BLOCK ORIFICE
Check the orifice for clogging
If necessary, replace the orifice

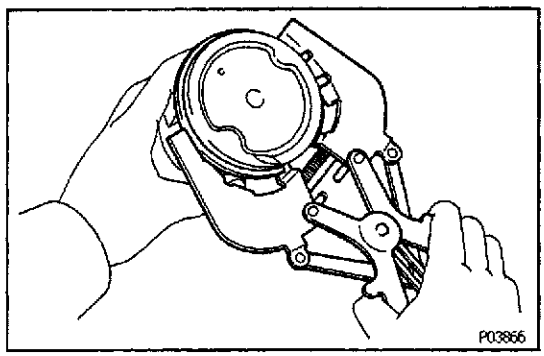


8. INSPECT BEARING OF OIL PUMP DRIVE SHAFT GEAR
Check the bearing for pitting and scratches
If the bearing is damaged, replace the bearing

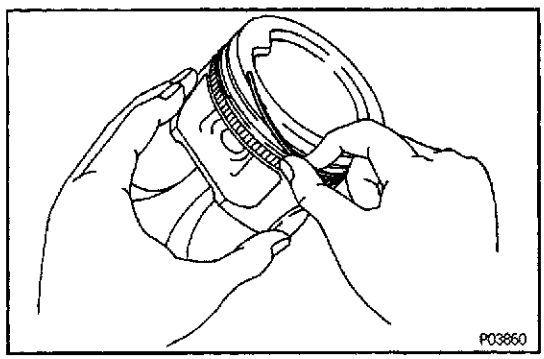


PISTON AND CONNECTING ROD ASSY DISASSEMBLY

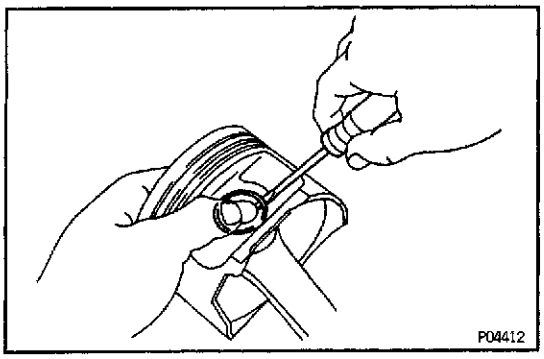
1. CHECK FIT BETWEEN PISTON AND PISTON PIN
Try to move the piston back and forth on the piston pin
If any movement is felt, replace the piston and pin as a set



2. REMOVE PISTON RINGS
(a) Using a piston ring expander, remove the 2 compression rings

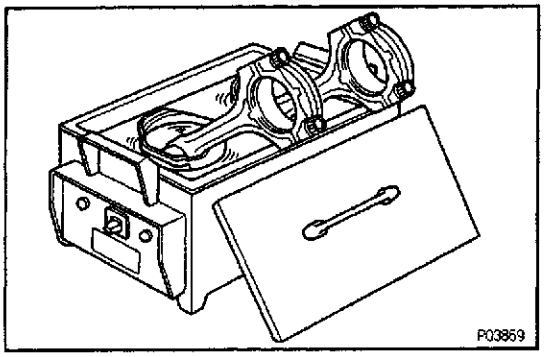


(b) Remove the 2 side rails and oil ring by hand
HINT Arrange the rings in correct order only

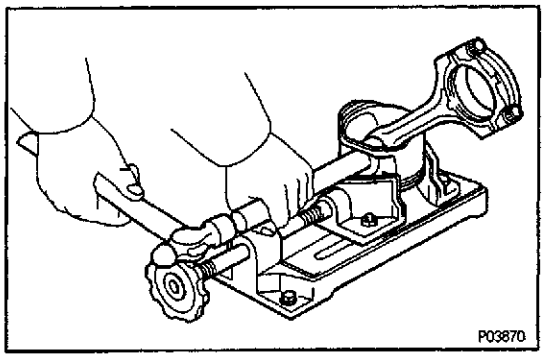


3. DISCONNECT CONNECTING ROD FROM PISTON

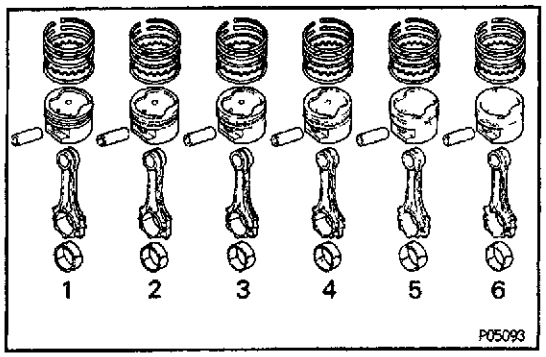
(a) Using a small screwdriver, pry out the 2 snap rings



(b) Gradually heat the piston to 80 - 90°C (176 - 194° F)

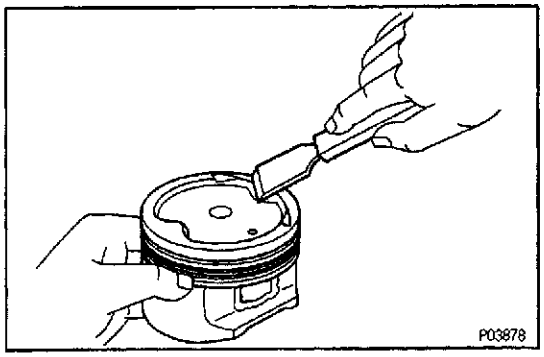


(c) Using plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod



HINT

- The piston and pin are a matched set
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order

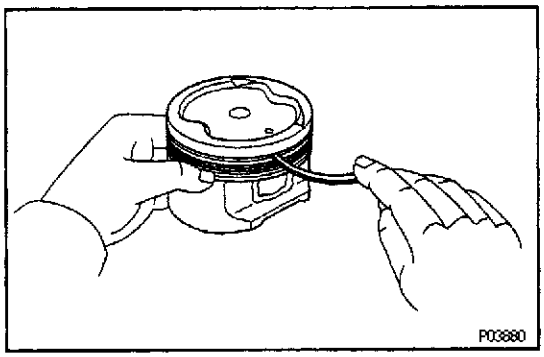


PISTON AND CONNECTING ROD INSPECTION

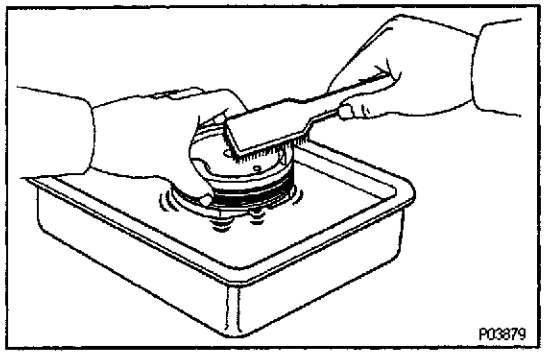
EG3G6-01

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top

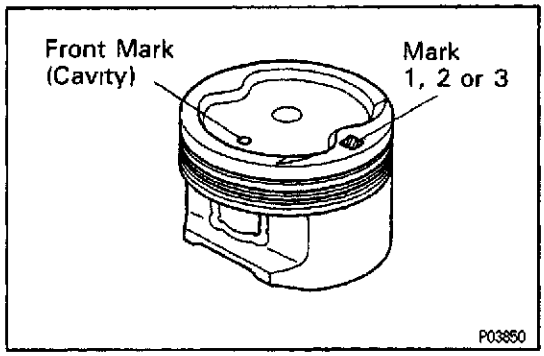


(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves



(c) Using solvent and a brush, thoroughly clean the piston

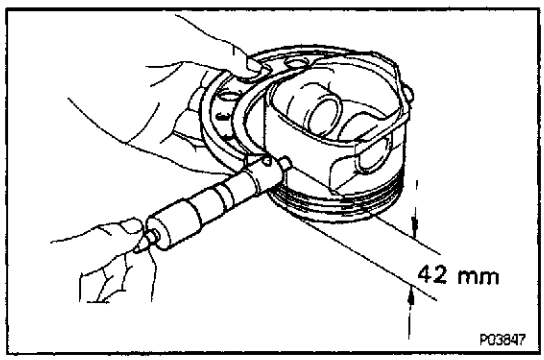
NOTICE: Do not use a wire brush.



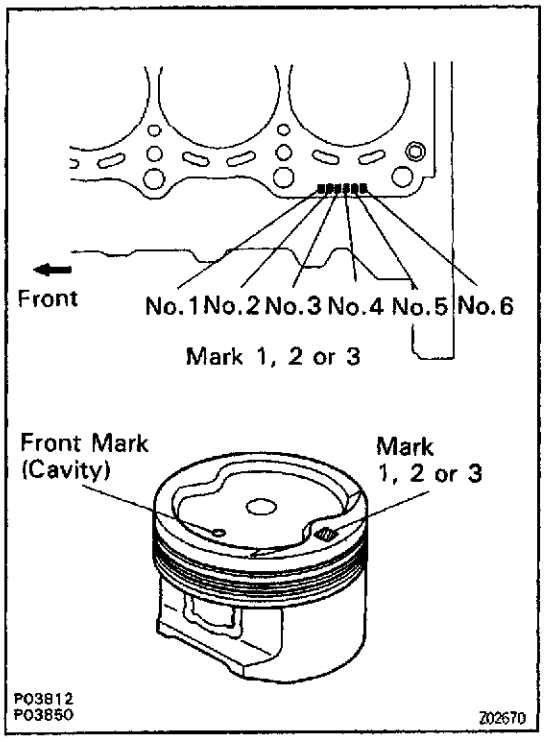
2. INSPECT PISTON AND PISTON RING

A. Inspect piston oil clearance

HINT There are 3 sizes of the standard piston diameter, marked 1', "2" and "3" accordingly The mark is stamped on the piston top



(a) Using a micrometer, measure the piston diameter at ring 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.)

(b) Measure the cylinder bore diameter in the thrust directions

(See step 4 on page EG-130)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement

Standard oil clearance:

0.040 - 0.060 mm (0.0016 - 0.0024 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 piston ring groove clearance

Using a thickness gauge, measure the clearance between new piston ring and the wall of the piston ring groove

Ring groove clearance:

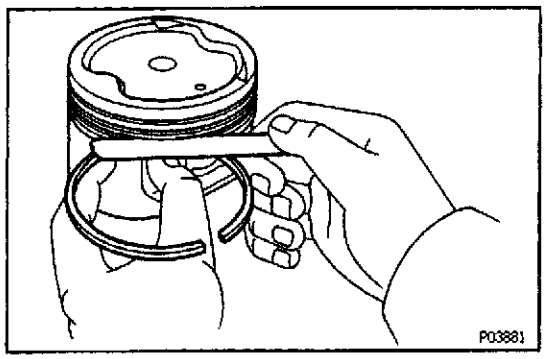
No.1

0.040 - 0.080 (0.0016 - 0.0031 in.)

No.2

0.030 - 0.070 (0.0012 - 0.0028 in.)

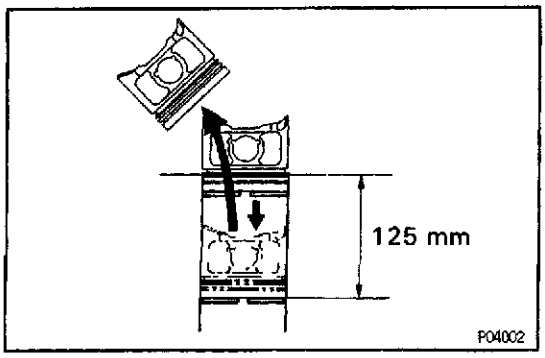
If the clearance is greater than maximum, replace the piston

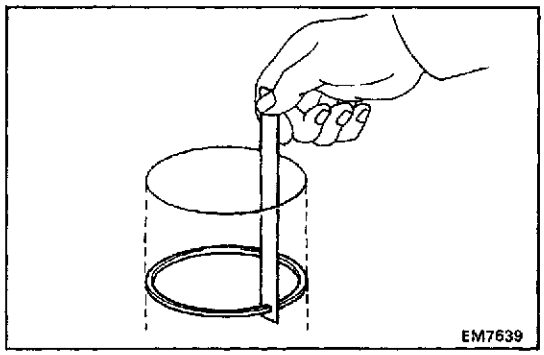


C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore

(b) 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





(c) Using a thickness 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 m (0.0441 in.)

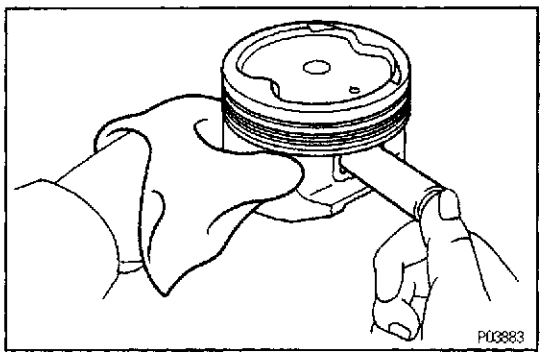
No.2

1.17 mm (0.0461 in.)

Oil (Side rail)

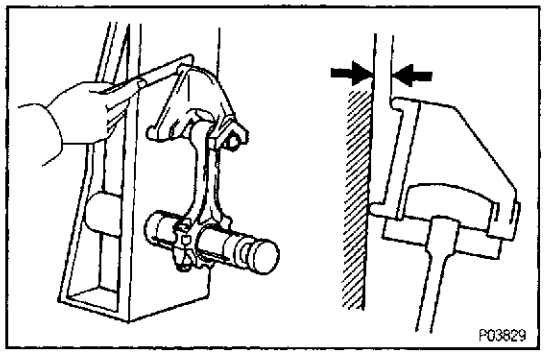
1.12 mm (0.0441 in.)

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 piston pin fit

At 80 - 90°C (1176 - 194°F) you should be able to push the piston pin into the piston pin hole with your thumb



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

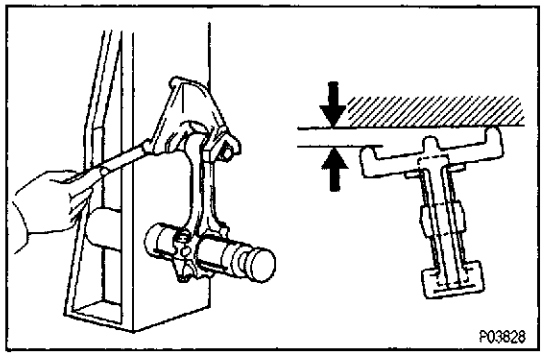
Using a rod aligner and thickness gauge, check the connecting rod alignment

- Check for out-of -alignment

Maximum out-of-alignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly

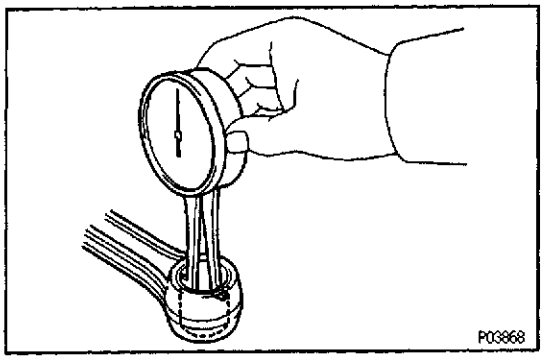


Check for- twist

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

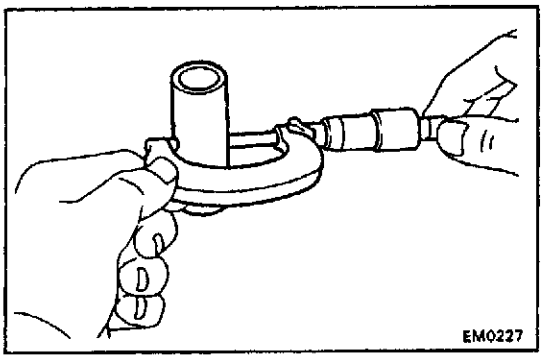


B. Inspect piston pin oil clearance

(a) 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.)



(b) Using a micrometer, measure the piston pin diameter

Piston pin diameter:

26.000 - 26.012 mm (1.0236 - 1.0241 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement

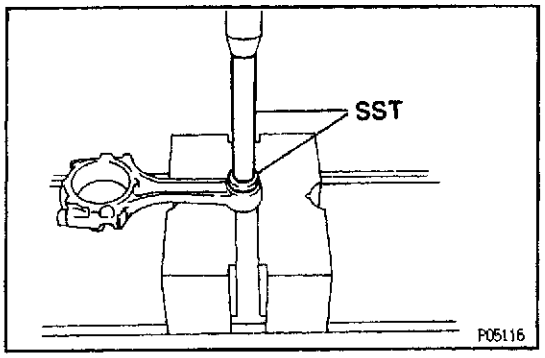
Standard oil clearance:

0.004 - 0.012 mm (0.0002 - 0.0005 in.)

Maximum oil clearance:

0.05 mm (0.0020 in.)

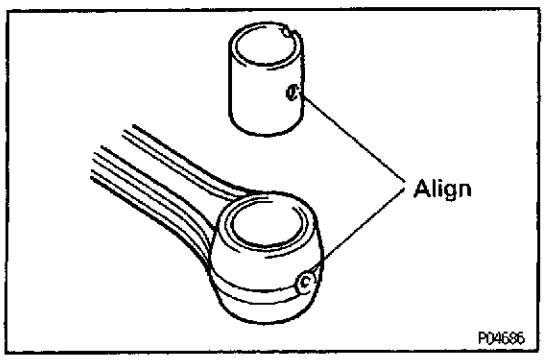
If the oil clearance is greater than maximum, replace the bushing If necessary, replace the piston and piston pin as a set



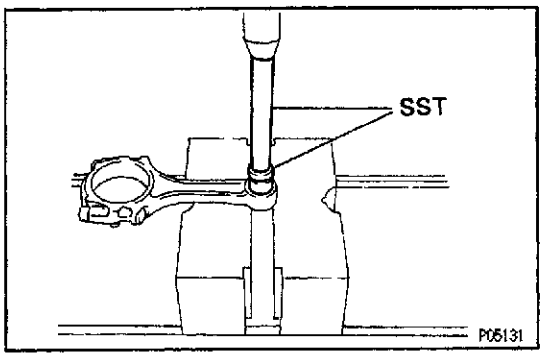
C. If necessary, replace connecting rod bushing

(a) Using SST and a press, press out the bushing

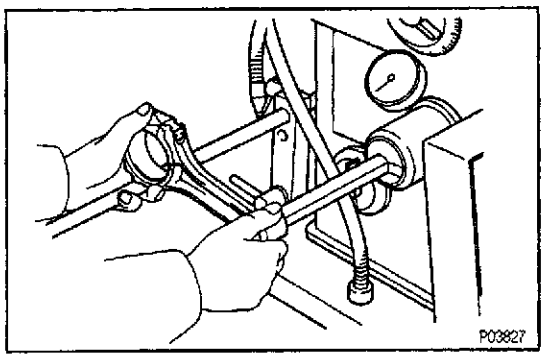
SST 09608 - 30012, (09608 - 04020), 09631 - 20031



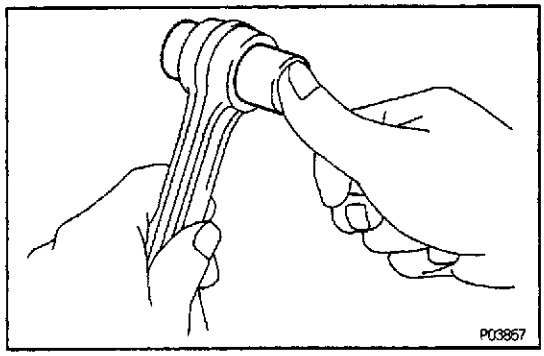
(b) Align the oil holes of a new bushing and the connecting rod



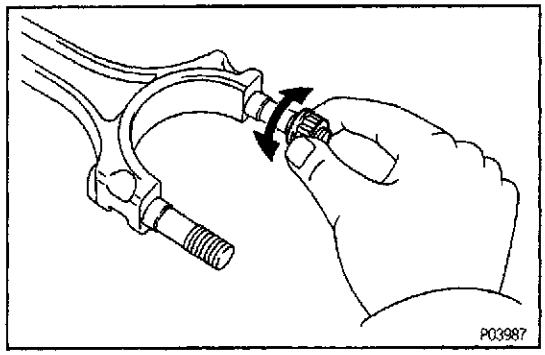
(c) Using SST and a press, press in the bushing
SST 09608 - 30012, (09608 - 04020), 09631- 20031



(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) 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



D. Inspect connecting rod bolts

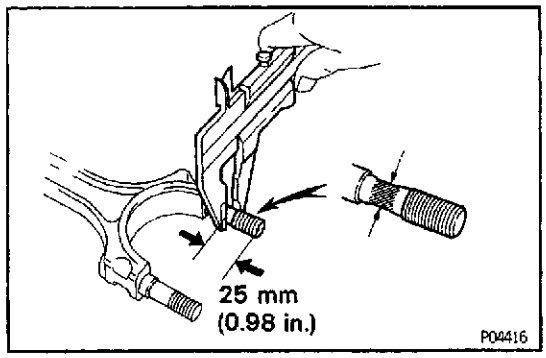
(a) Install the cap nut to the connecting rod bolt Check that the cap nut can be turned easily by hand to the end of the thread

(b) 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.)

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



EG1K0-03

CYLINDER BORING

HINT

- Bore all the 6 cylinders for the oversized piston outside diameter
- Replace all the piston rings with ones to match the oversized pistons

1. SELECT OVERSIZED PISTONS

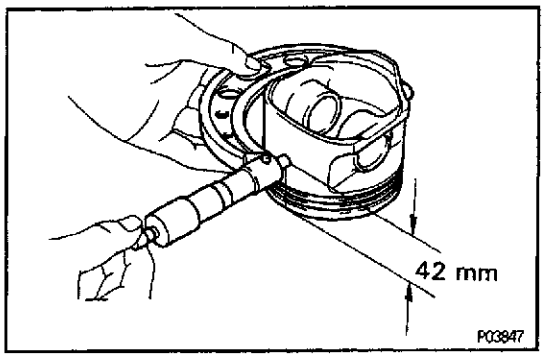
Oversized piston diameter:

O/S o.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. CALCULATE AMOUNT TO BORE CYLINDERS

(a) 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

(b) Calculate the amount of each cylinder is to be rebored as follows

Size to be rebored = P + C - H

P = Piston diameter

C = Piston clearance

0.040 - 0.060 mm (0.0016 - 0.0024 in.)

H = Allowance for honing

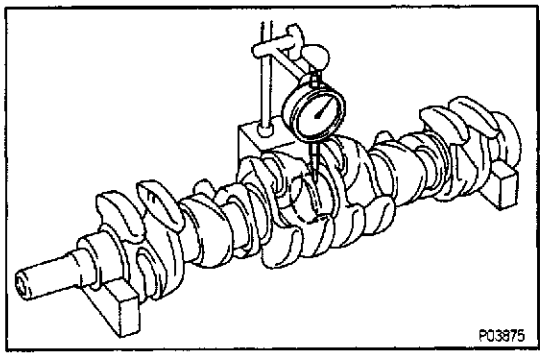
0.20 mm (0.0008 in.) or less

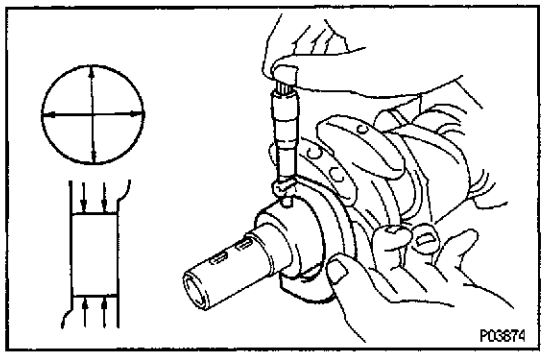
3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.





E00 CM

CRANKSHAFT INSPECTION AND REPAIR

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V-blocks

(b) 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

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin

Main journal diameter:

STD size

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 size

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 pages EG-122 to 125) If necessary, grind or replace the crankshaft

(b) 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

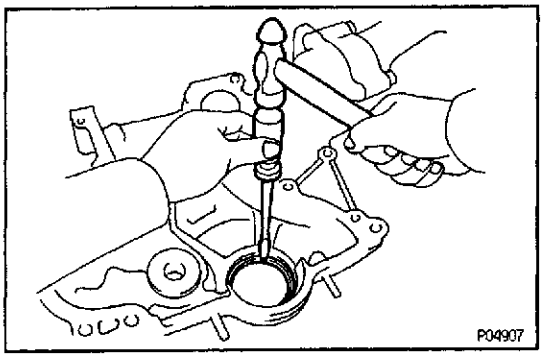
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 2)

Install new main journal and/or crankshaft pin undersized bearings

CRANKSHAFT OIL SEALS REPLACEMENT

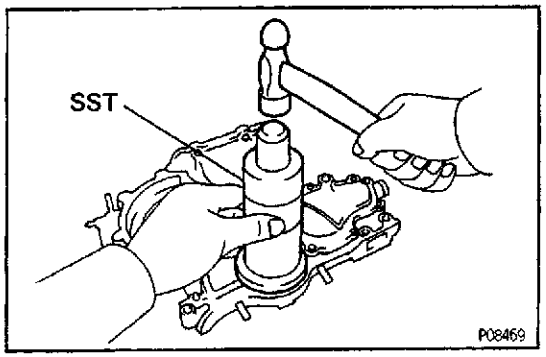
HINT There are 2 methods (A and B) to replace the oil seal which are as follows



1. REPLACE CRANKSHAFT FRONT OIL SEAL

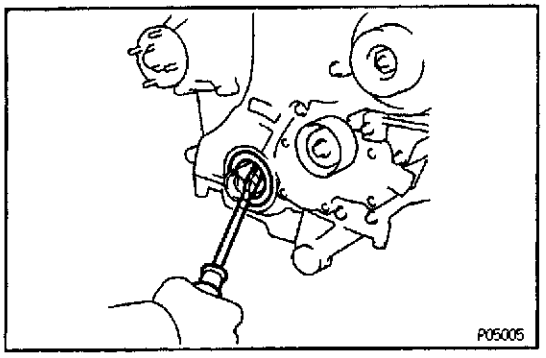
A. If timing chain cover is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge
SST 09316-60010 (09316-00010, 09316-00050)

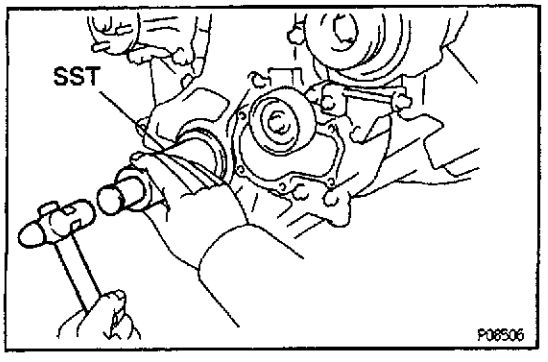
(c) Apply MP grease to the oil seal lip



B. If timing chain cover is installed to the cylinder block:

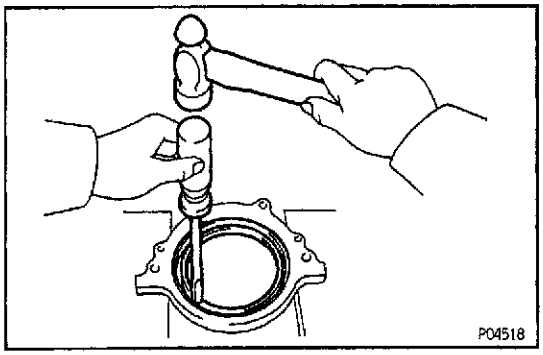
(a) Using a screwdriver, pry out the oil seal

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(b) Apply MP grease to a new oil seal lip

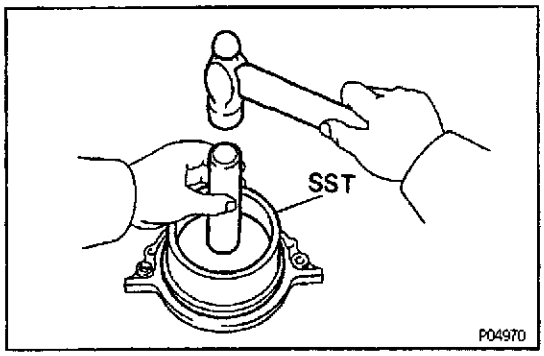
(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge
SST 09316-60010 (09316-00010, 09316-00050)



2. REPLACE CRANKSHAFT REAR OIL SEAL

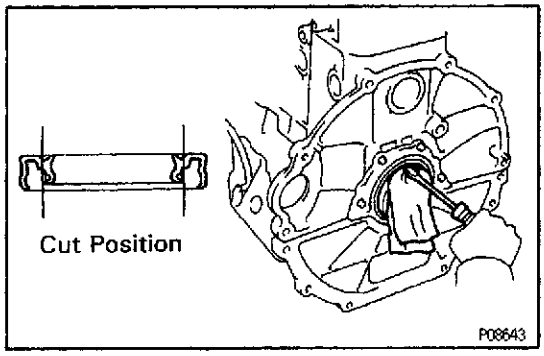
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal



(b) 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, 09608-30012 (09608-04020)

(c) Apply MP grease to the oil seal lip

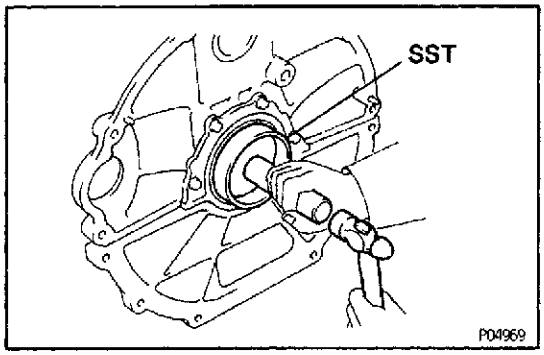


B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip

(b) Using a screwdriver, pry out the oil seal

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.

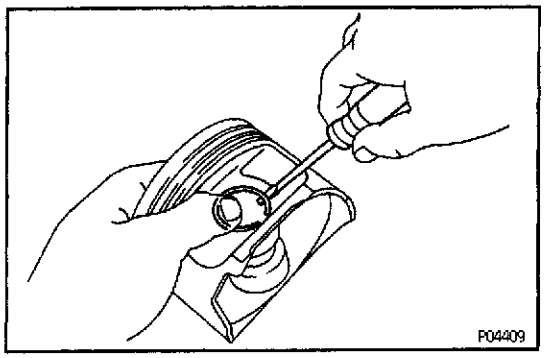


(c) Apply MP grease to a new oil seal lip

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge
SST 09223-15030, 09608-30012 (09608-04020)

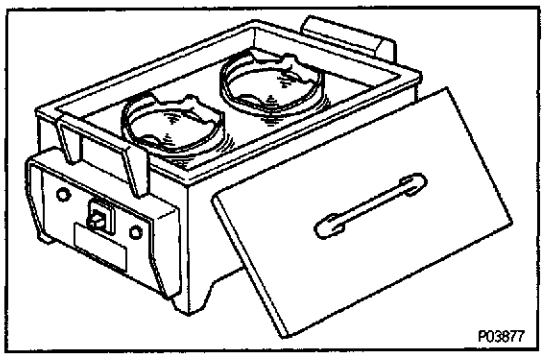
EG0C1-08

PISTON AND CONNECTING ROD ASSEMBLY

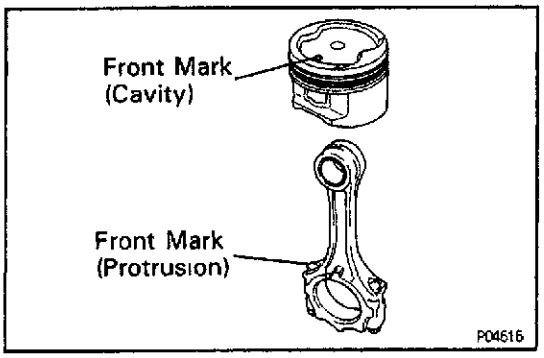


1. ASSEMBLE PISTON AND CONNECTING ROD

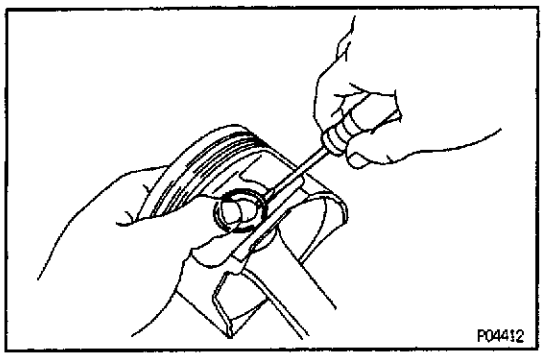
(a) Install a new snap ring on one side of the piston pin hole



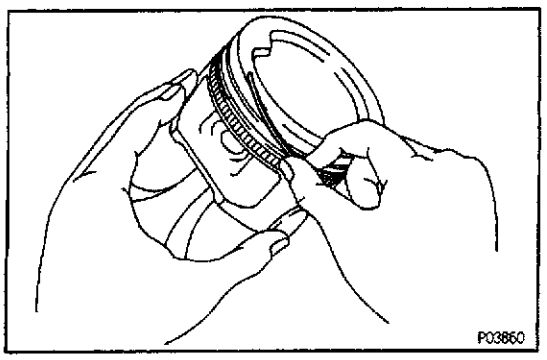
(b) Gradually heat the piston to 80-90°C (176-194°F)



(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

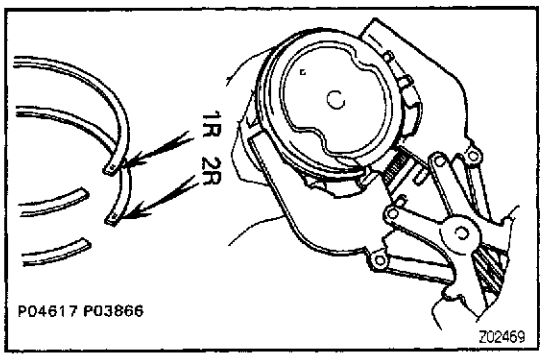


(e) Install a new snap ring on the other side of the piston pin hole



2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand

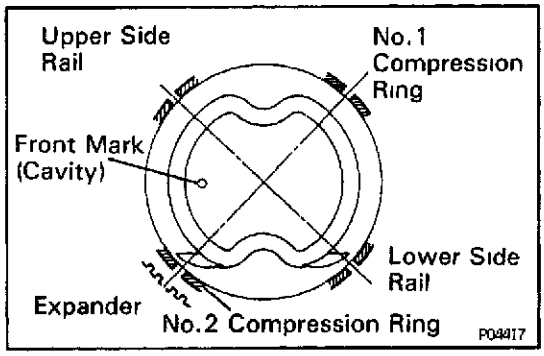


(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward

Code mark:

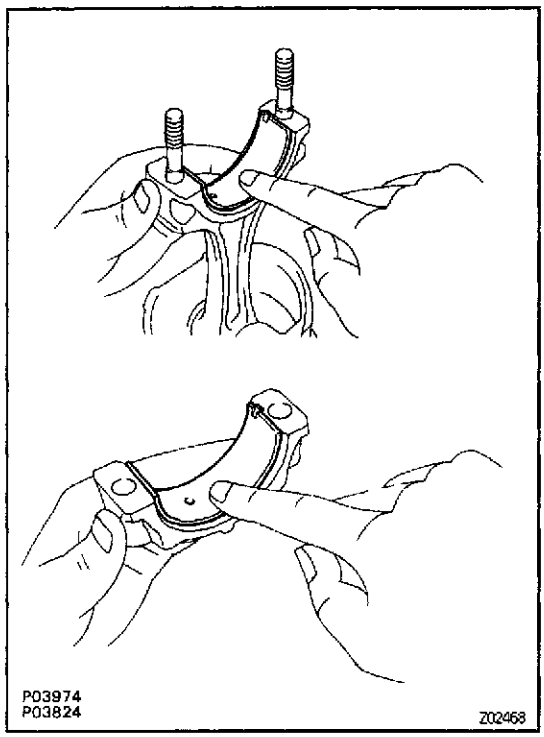
1 R for No.1

2R for No.2



(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 cap

(b) Install the bearings in the connecting rod and connecting rod cap

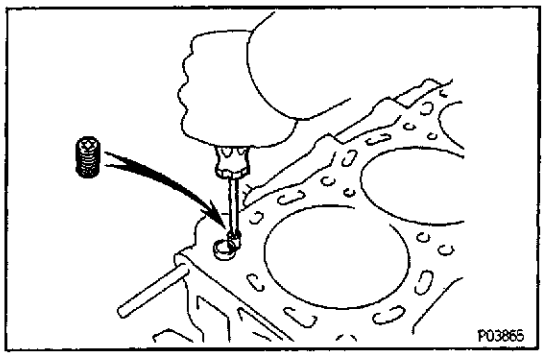
EG0VR-03

CYLINDER BLOCK ASSEMBLY

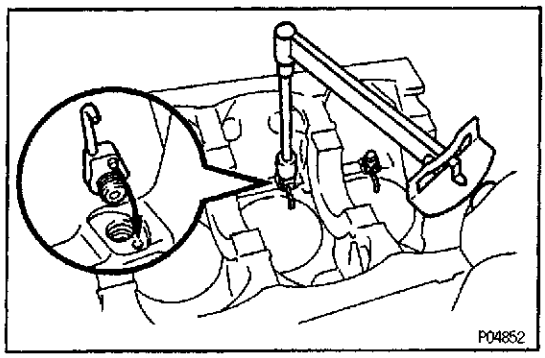
(See Components for Disassembly and Assembly)

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. INSTALL CYLINDER BLOCK ORIFICE

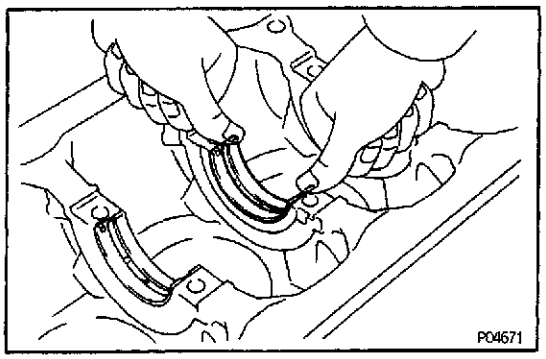


2. INSTALL OIL NOZZLES AND CHECK VALVES

(a) Align the pin of the oil nozzle with the pin hole of the cylinder block

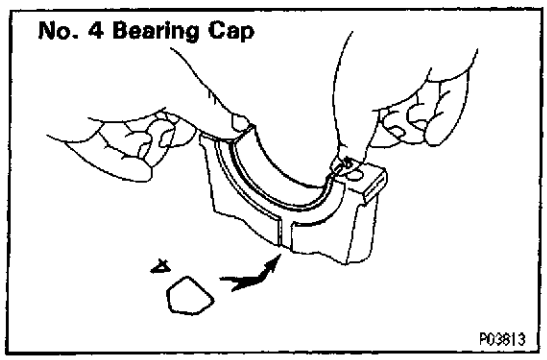
(b) Install the oil nozzle with the check valve Install the 6 oil nozzles and check valves

Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)



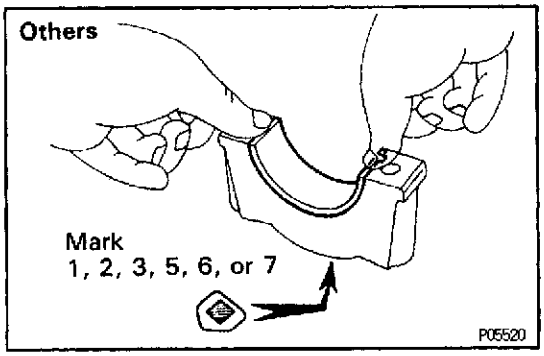
3. INSTALL MAIN BEARINGS

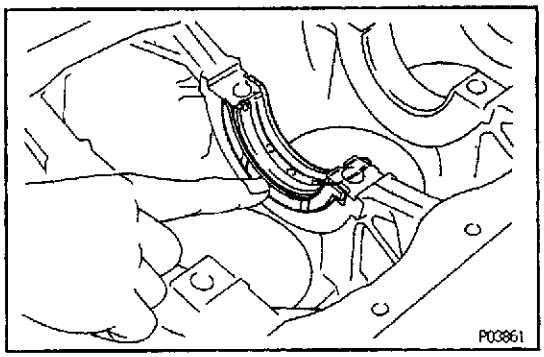
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 7 upper bearings



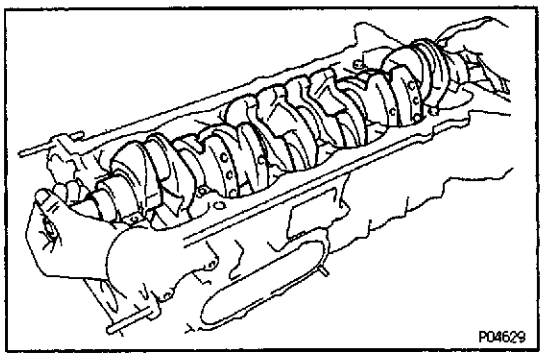
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 7 lower bearings

HINT A number is marked on each main bearing cap to indicate the installation position

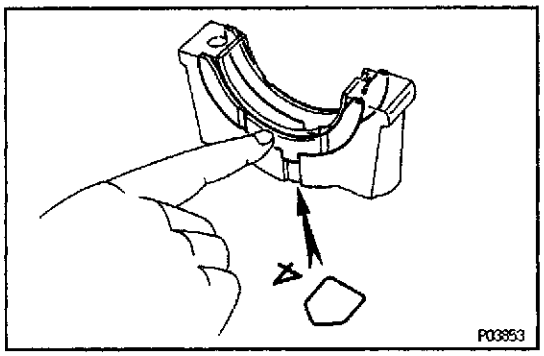




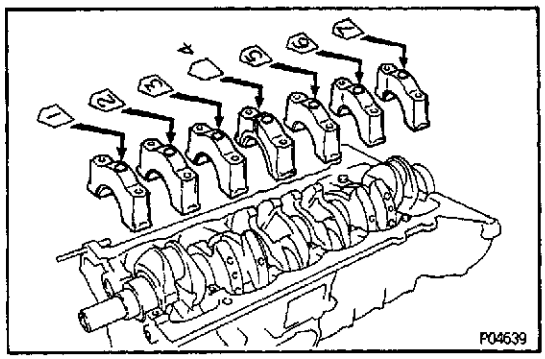
4. INSTALL UPPER THRUST WASHERS
Install the 2 thrust washers under the No 4 journal position of the cylinder block with the oil grooves facing outward



5. PLACE CRANKSHAFT ON CYLINDER BLOCK



6. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS
A. Place main bearing cap and lower thrust washers on cylinder block
(a) Install the 2 thrust washers on the No 4 bearing cap with the grooves facing outward

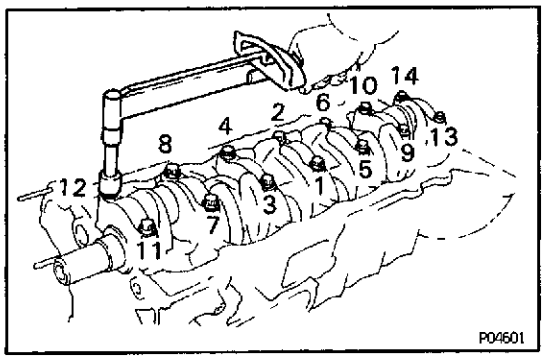


(b) Install the 7 main bearing caps in their proper locations
HINT Each bearing cap has a number and front mark

B. Install 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

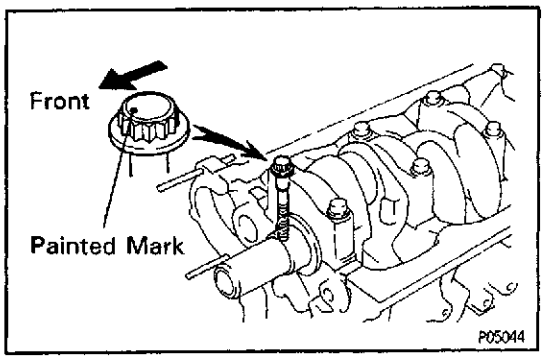


(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts

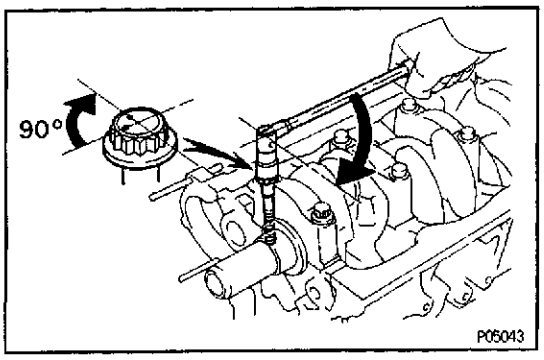
(b) Install and uniformly tighten the 14 bolts of the main bearing caps, in several passes, in the sequence shown

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



(c) Mark the front of the main bearing cap bolt with paint



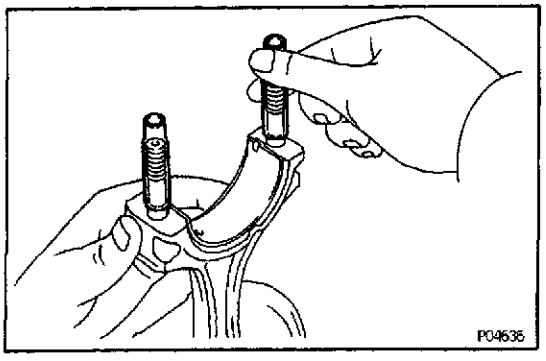
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown above

(e) Check that the painted mark is now at a 90° angle to the front

(f) Check that the crankshaft turns smoothly

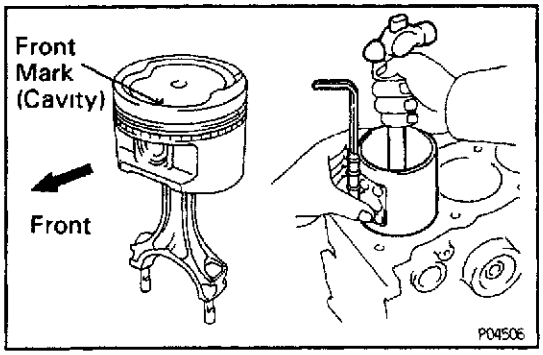
(g) Check the crankshaft thrust clearance

(See step 5 on page EG-124)

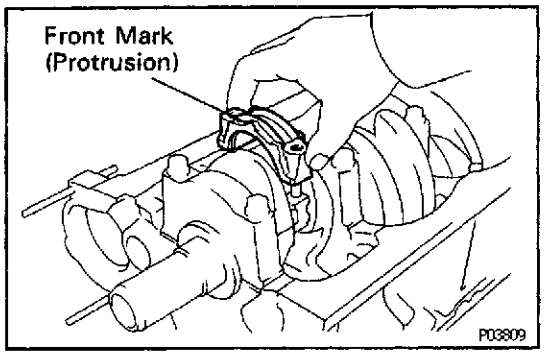


7. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage



(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



8. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

(a) Match the numbered connecting rod cap with the connecting rod

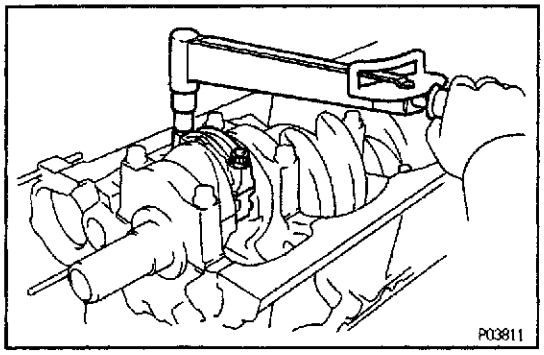
(b) Install the connecting rod cap with the front mark facing forward

B. Install 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

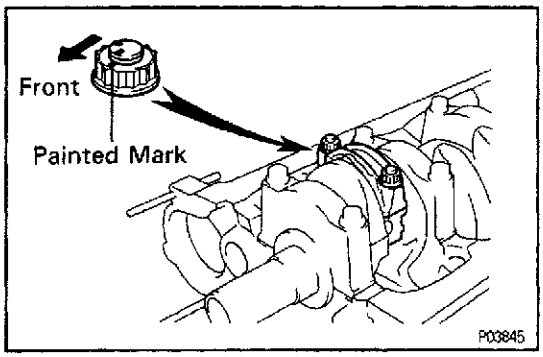


(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap

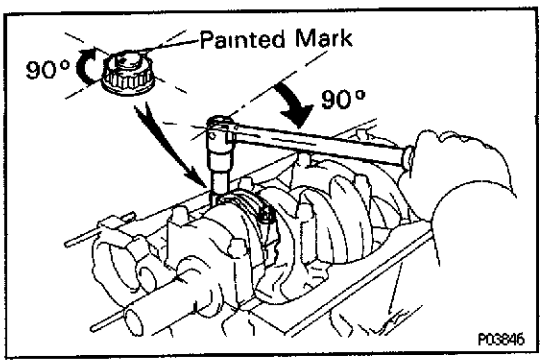
(b) Install and alternately tighten the nuts of the connecting rod cap in several passes

Torque 48 N-m (490 kgf-cm, 35 ft-lbf)

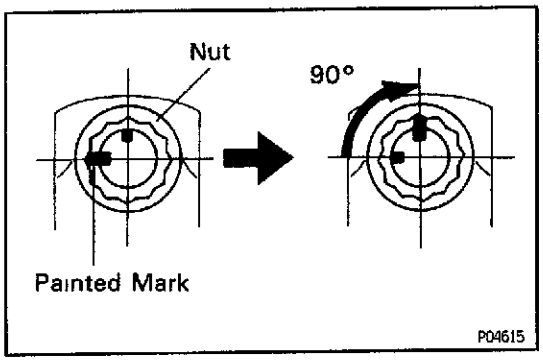
If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set



(c) Mark the front of the connecting rod cap nut and bolt with paint



(d) Retighten the connecting rod cap nuts 90° as shown



(e) Check that the painted mark on the nut is at 90° angle in relation to the mark on the bolt
(f) Check that the crankshaft turns smoothly
(g) Check the connecting rod thrust clearance
(See step 2 on page EG-122)

9. 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

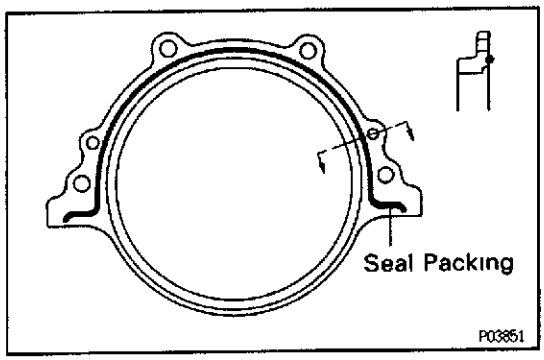
Seal packing:

Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 - 3 mm (0 08 - 0 12 in) opening

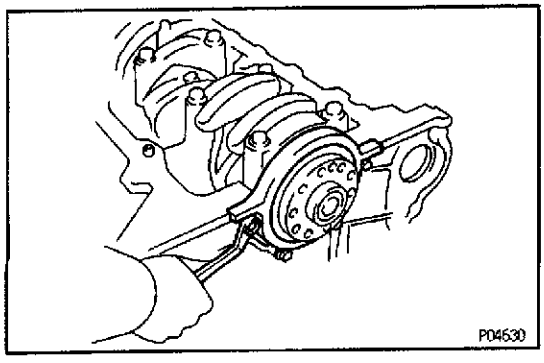
HINT Avoid applying an excessive amount to the surface

- 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



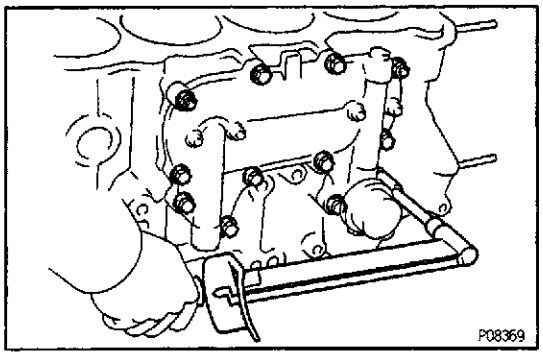
(c) Install the retainer with the 4 bolts

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



EG1K7-05

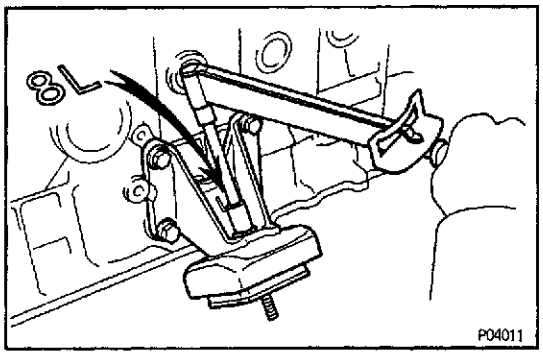
AFTER ASSEMBLY



1. 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)



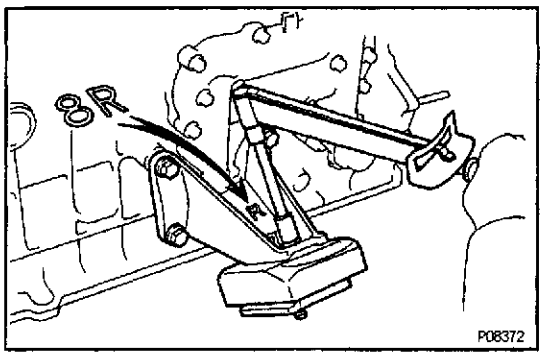
2. INSTALL LH ENGINE MOUNTING BRACKET

(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)



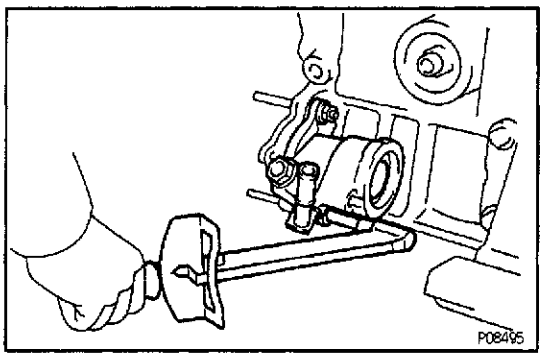
3. INSTALL RH ENGINE MOUNTING BRACKET

(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-crn, 43 ft-lbf)

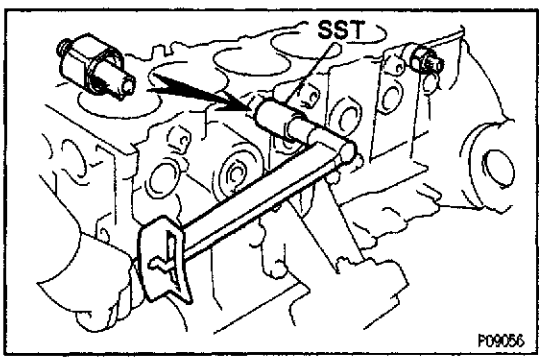


4. INSTALL PS PUMP

(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)

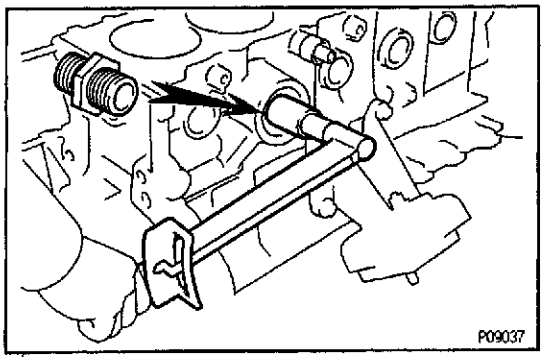


5. INSTALL KNOCK SENSORS

Using SST, install the 2 knock sensors

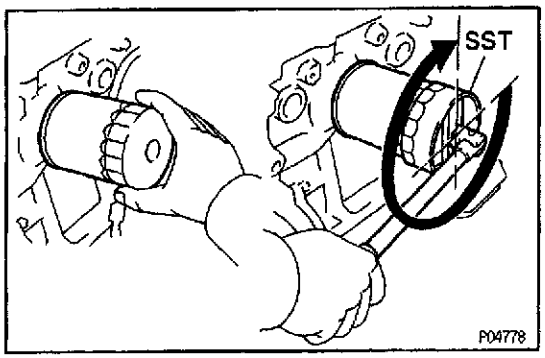
SST 09816 - 30010

Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)



6. INSTALL OIL FILTER UNION

Torque: 44 N-m (450 kgf-cm, 33 ft-lbf)



7. INSTALL OIL FILTER

(a) Lubricate the filter rubber gasket with engine oil

(b) Tighten filter until the gasket contacts seat of the filter mounting Then using SST, give it an additional 3/4 turn to seat the filter

SST 09228-44011

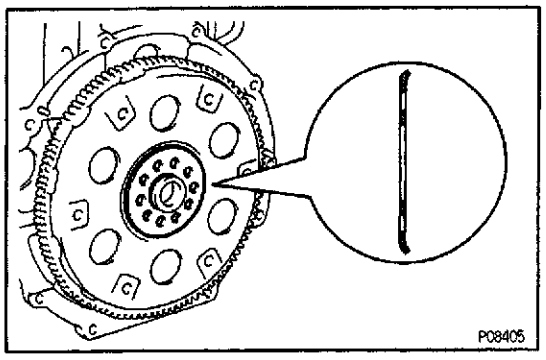
8. INSTALL TIMING CHAIN

(SEE PAGE EG-96)

9. INSTALL CYLINDER HEAD

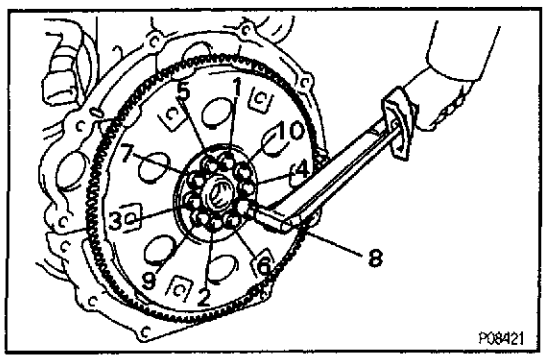
(SEE PAGE EG-65)

10. REMOVE ENGINE STAND



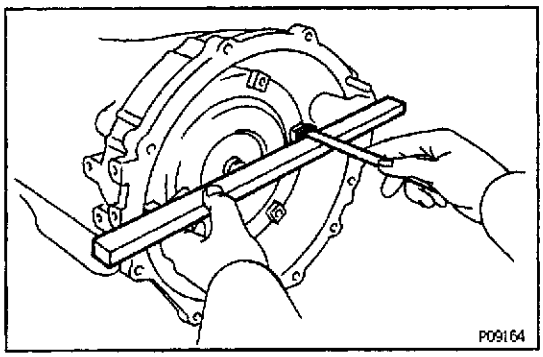
11. INSTALL DRIVE PLATE

(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)



ENGINE AND TRANSMISSION ASSEMBLY

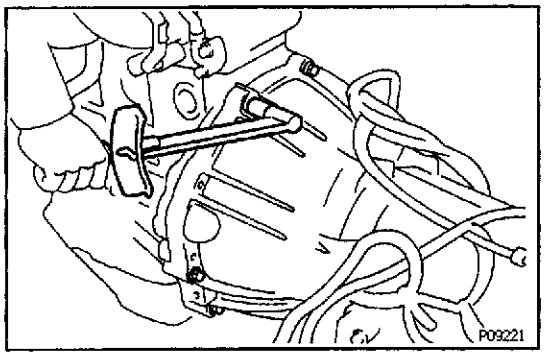
1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

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

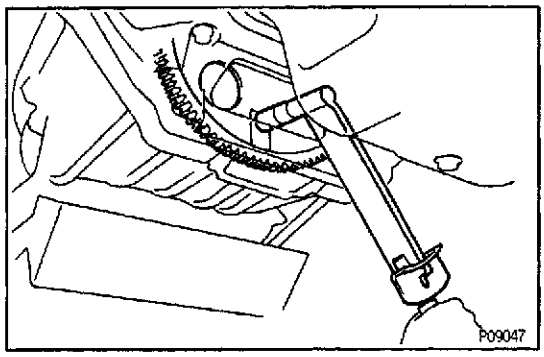
If the distance is less than the specifications, check for an improper installation



2. ASSEMBLY ENGINE AND TRANSMISSION

Install the transmission with the 7 bolts

Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)

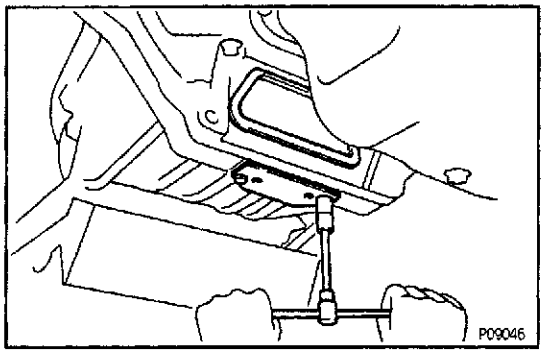


3. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS

Install the 6 bolts by turning the crankshaft

Torque: 55 N-m (550 kgf-cm, 41 ft-lbf)

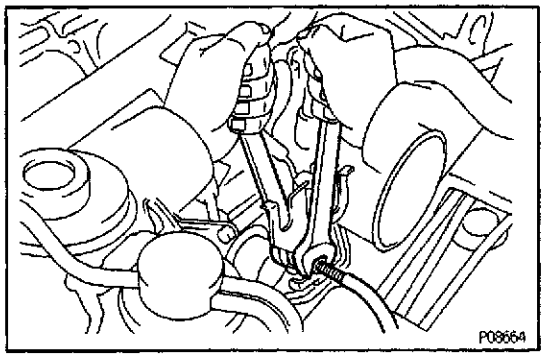
HINT First install the green colored bolt and then the remaining 5 bolts



4. INSTAL HOLE PLUG

5. INSTALL COVER PLATE

Install the cover plate with the 2 bolts



6. CONNECT THROTTLE CABLE TO THROTTLE BODY

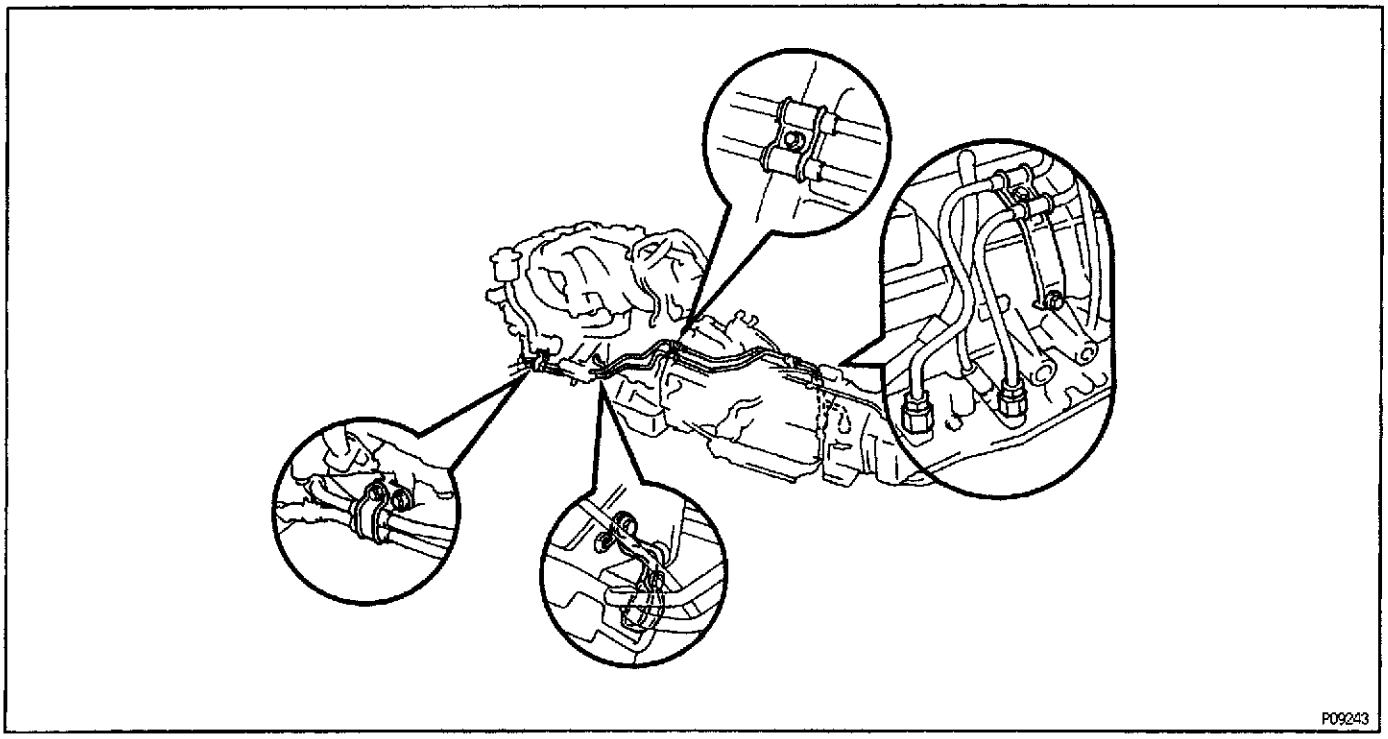
7. INSTALL A/T OIL COOLER PIPES FOR TRANSMISSION

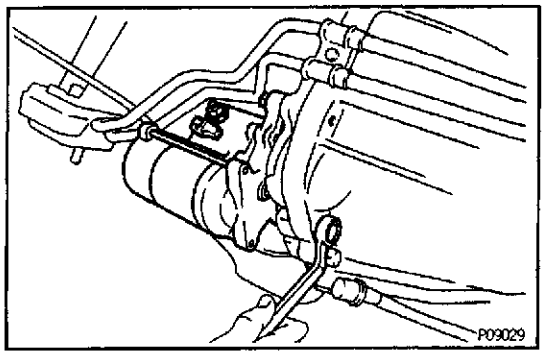
(a) Temporarily install the 4 mounting bolts

(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)

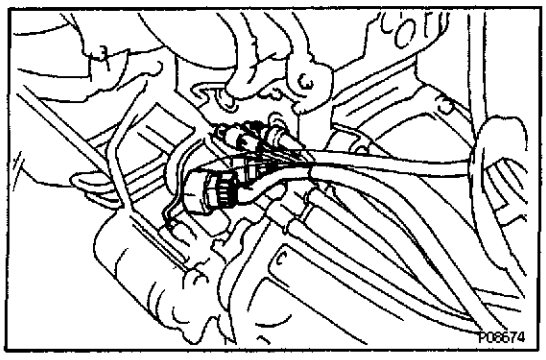
(c) Tighten the 4 clamp mounting bolts



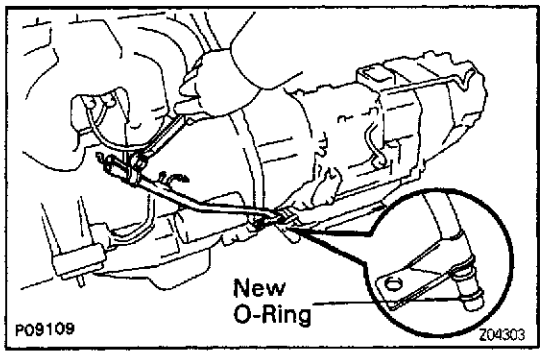


8. INSTALL STARTER

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



9. CONNECT ENGINE WIRE TO TRANSMISSION

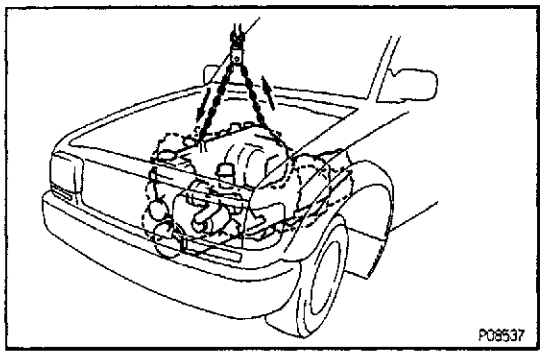


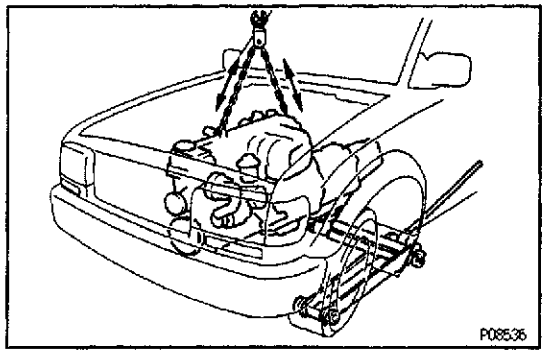
10. INSTALL OIL DIPSTICK GUIDE FOR TRANSMISSION

(a) Install a new O-ring to the dipstick guide
(b) Apply soapy water 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 bleeder hoses

ENGINE INSTALLATION

EG1K0-02

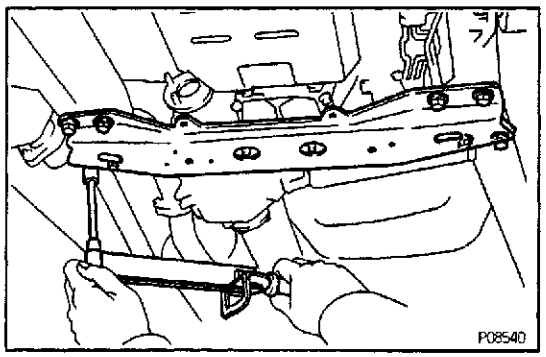




(See Components for Removal an Installation)

1. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

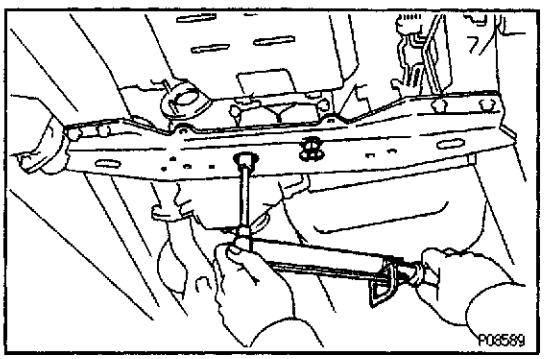
(a) Attach the engine hoist chain to the engine hangers
(b) Lower the engine and transmission assembly into the engine compartment
(c) Insert the stud bolts of the front engine mounting insulators into the stud bolt holes of the frame
(d) Temporarily install the 2 nuts holding the engine front mounting insulators to the frame crossmember
(e) Keep the engine level with a jack
(f) Remove the hoist chain



2. INSTALL FRAME CROSSMEMBER

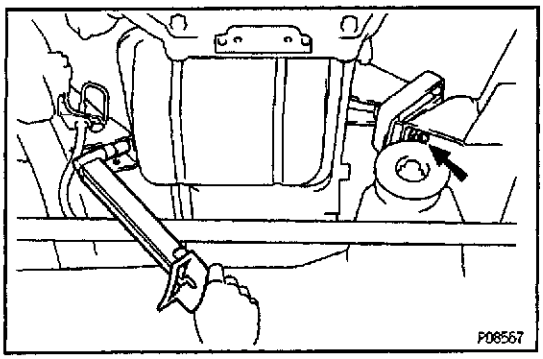
(a) Temporarily instal) the crossrnember to the engine rear mounting insulator with the 2 nuts
(b) Install the 8 bolts holding the crossmember to the frame

Torque: 61 N-m (620 kgf-cm, 45 ft-lbf)

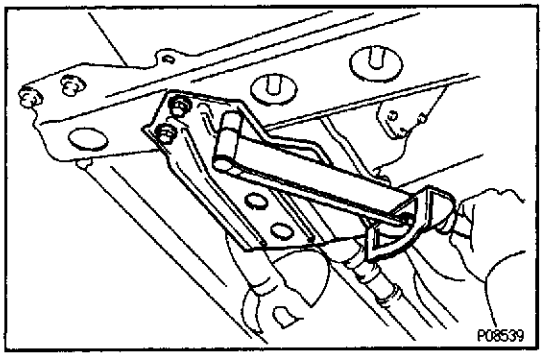


(c) Tighten the 2 nuts holding the crossmember to the engine rear mounting insulator

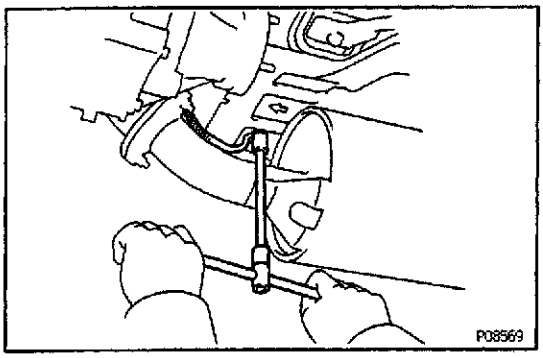
Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



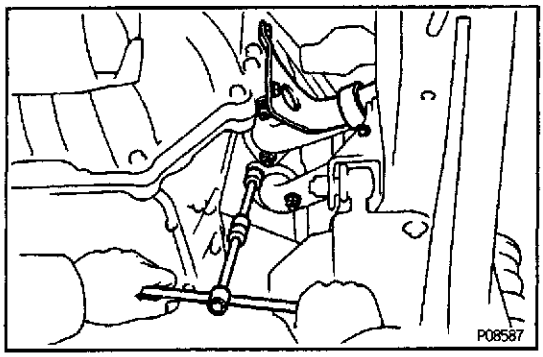
3. TIGHTEN NUTS HOLDING ENGINE FRONT MOUNTING INSULATORS TO FRAME
Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



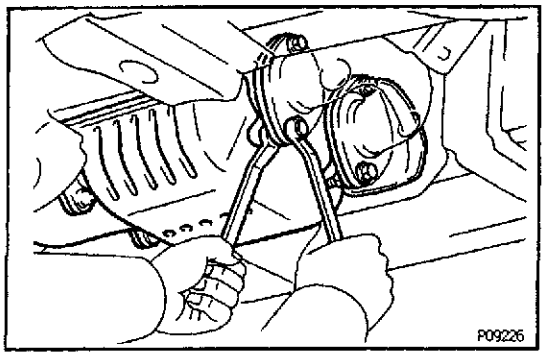
4. INSTALL TRANSFER UNDER COVER
Install the under cover with the 3 bolts
Torque: 28 N-m (290 kgf-cm, 21 ft-lbf)



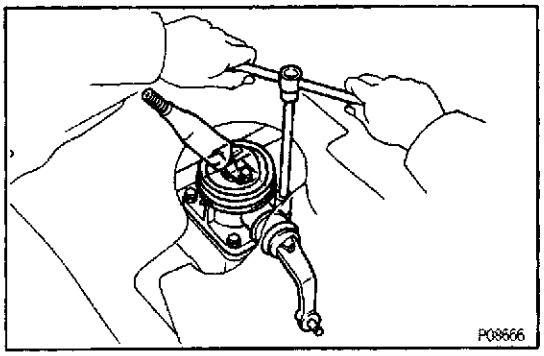
5. CONNECT GROUND STRAP TO HEAT INSULATOR



6. INSTALL FRONT EXHAUST PIPE ASSEMBLY
(a) Install 2 new gaskets and the front exhaust pipe assembly with the 4 nuts
Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)
(b) Install the No 1 support bracket with the 2 bolts
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)
(c) Connect the clamp and tighten the clamp bolt
Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)



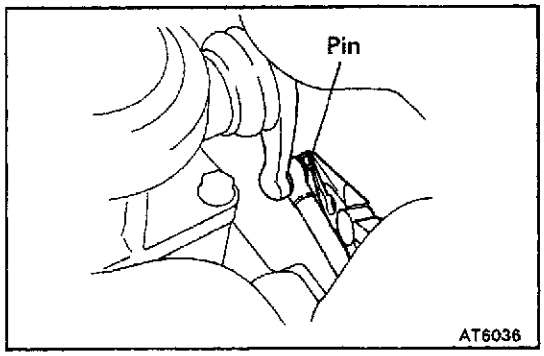
(d) Connect 2 new gaskets and the front exhaust pipe assembly to the No 3 front exhaust pipe with the 4 bolts, 2 nuts and retainer
Torque: 39 N.m (400 kgf-cm, 29 ft-lbf)



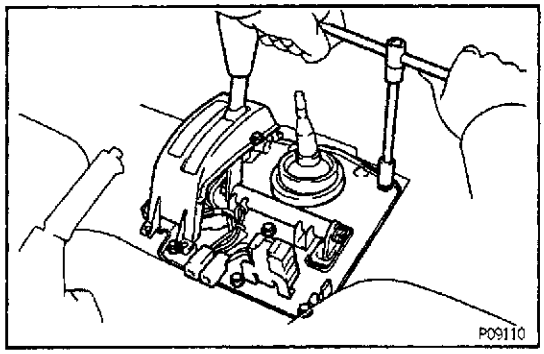
7. INSTALL TRANSFER SHIFT LEVER

(a) Install the shift lever and hose clamp with the 4 bolts

Torque: 18 N-m (185 kgf-cm. 13 ft-lbf)



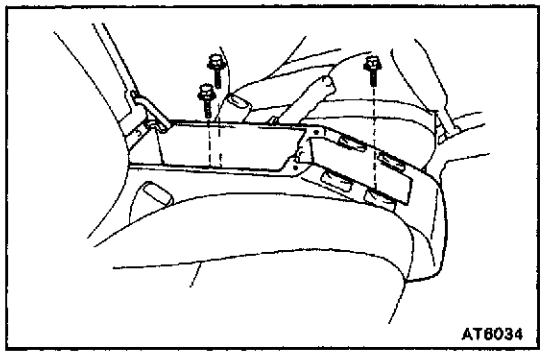
(b) Connect the shift rod and install the pin



(c) Install the transmission shift lever assembly with the ^ bolts

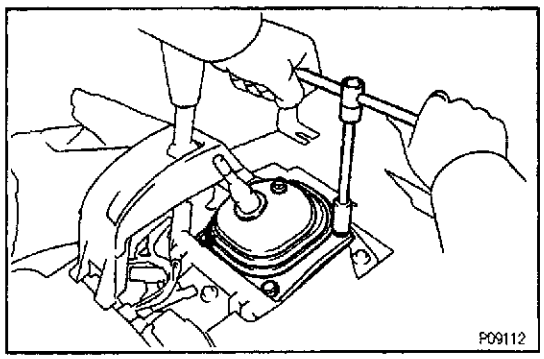
Torque: 5.4 N-m (55 kgf-cm, 48 in.-IM)

(d) Connect the 2 connectors to the transmission shift lever assembly

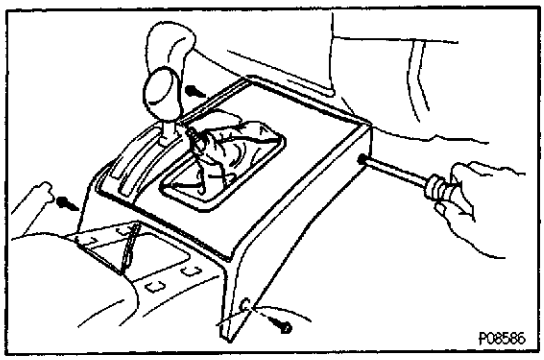


(e) Connect the 2 connectors to the console box

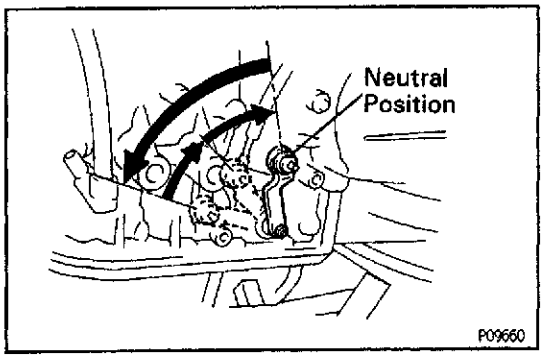
(f) Install the console box with the 3 bolts



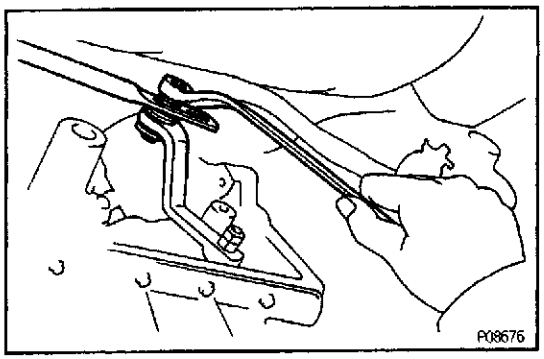
Install the transfer shift lever boot with the 4 bolts



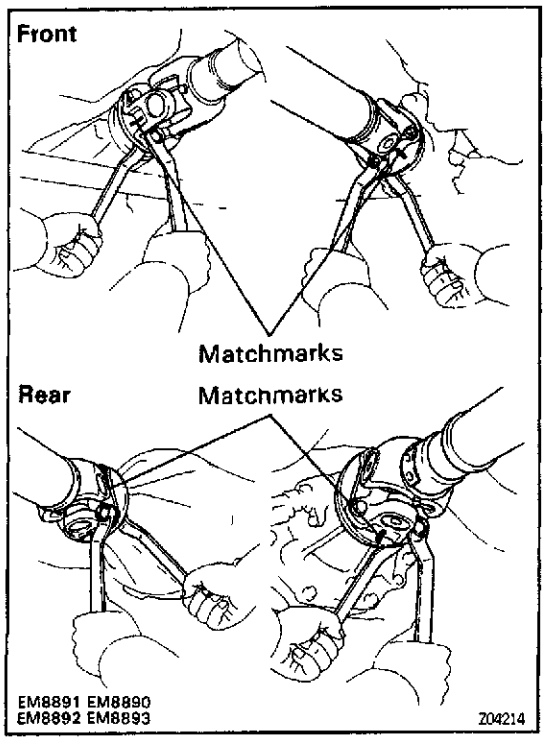
(h) Install the console with the 4 screws
(i) Install the transfer shift lever knob



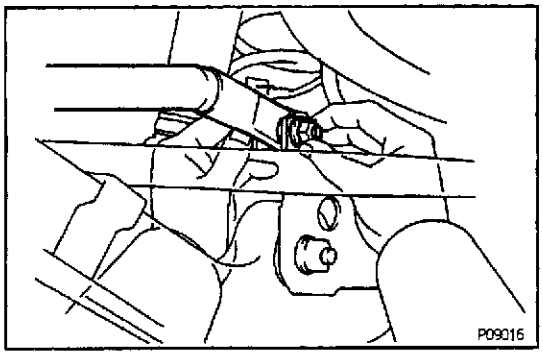
(j) Shift the shift lever to N position
(k) Fully turn the control shaft lever back and return 2 notches It is now in neutral position



(l) Connect the transmission control rod with the nut
Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

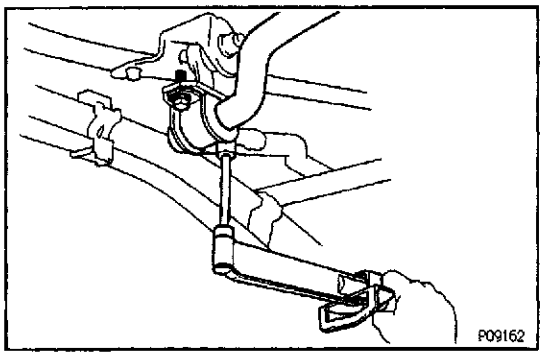


8 INSTALL FRONT AND REAR PROPELLER SHAFTS
Differential Side:
(a) Align the matchmarks on the flanges and connect the flanges with the 4 bolts and nuts
(b) Torque the bolts and nuts
Torque:
74 N-m (750 kgf-cm, 54 ft-lbf) for front shaft
88 N-m (900 kgf-cm, 65 ft-lbf) for rear shaft
Transfer Side:
(a) 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



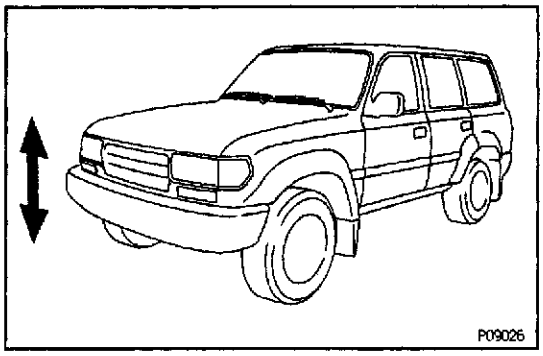
9. INSTALL STABILIZER BAR

(a) Temporarily install the stabilizer bar to the axle housing with the bolt and nut

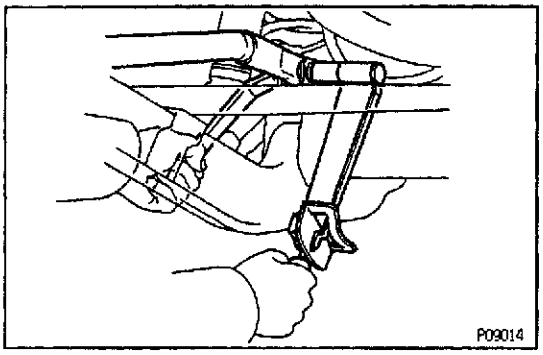


(b) Connect the stabilizer bar with the 2 bolts

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

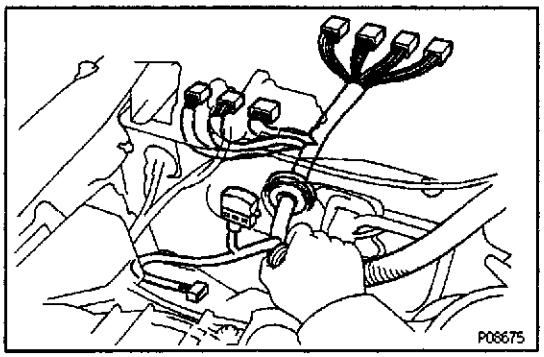


(c) Bounce the vehicle up and down to stabilizer the suspension



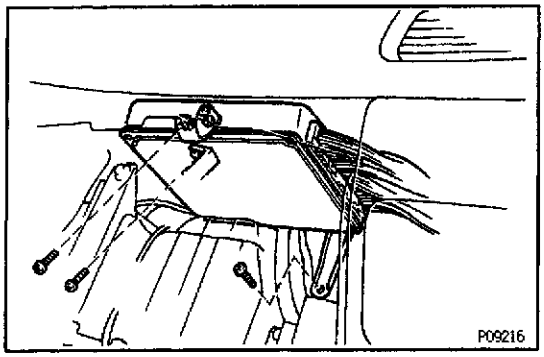
(d) Torque the bolt and nut holding the stabilizer bar to the axle housing

Torque: 25 N-m (260 kgf-cm, 19 ft-lbf)

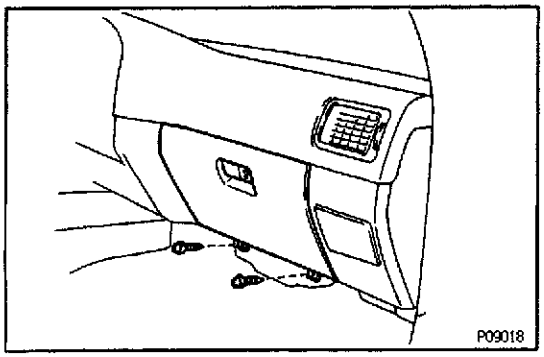


10. CONNECT ENGINE WIRE TO CABIN

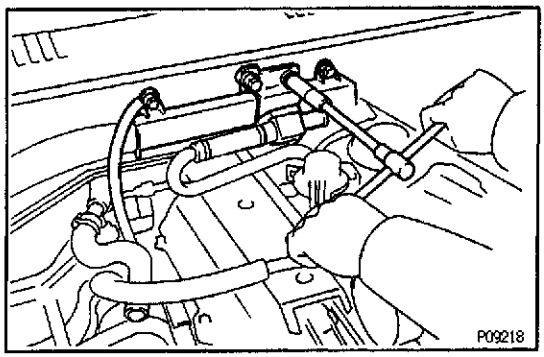
(a) Push in the engine wire through the cowl panel



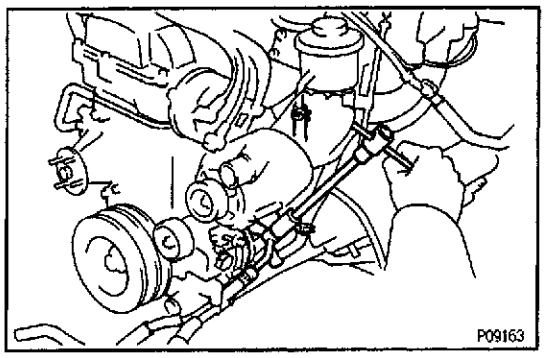
(b) Connect the 3 connectors to cowl wire
(c) Connect the 4 connectors to the ECM
(d) Connect the ECM to the instrument panel reinforcement with the 3 screws



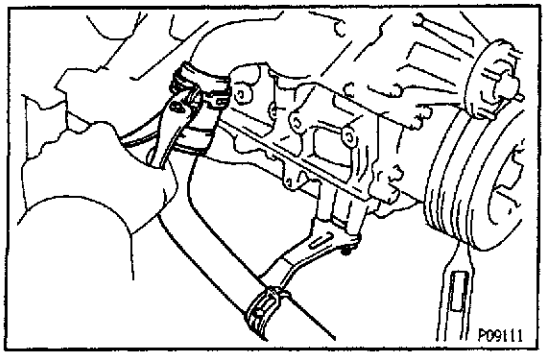
(e) Install the glove compartment door with the 2 screws



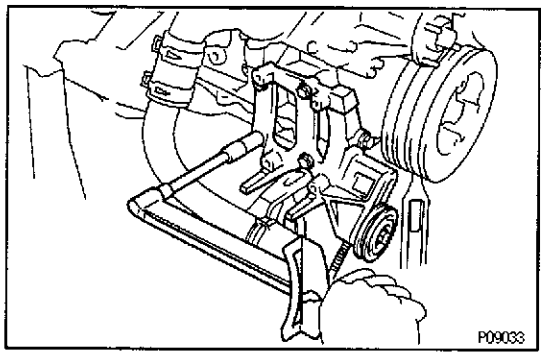
11. CONNECT ENGINE WIRE TO COWL PANEL
(a) Connect the engine wire and ground strap with the 2 bolts
(b) Connect the heater valve with the 2 bolts



12. CONNECT PS RETURN HOSE
Connect the return hose to the PS reservoir tank
13. CONNECT PS PRESSURE HOSE
Connect the PS pressure hose with 2 new gaskets and union bolts
Torque: 44 N-m (450 kgf-cm, 33 ft-lbf)



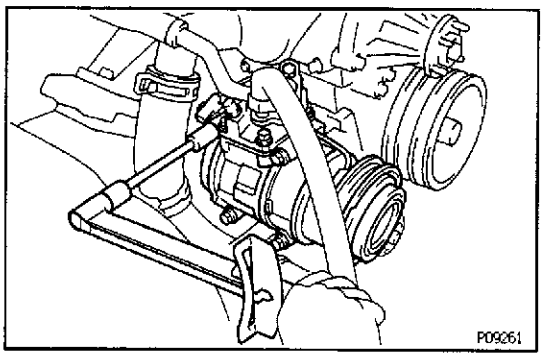
14. INSTALL RADIATOR PIPE
(a) Connect the No 2 radiator hose to the water inlet
(b) Install the 2 nuts holding the radiator pipe to the No 1 oil pan
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



15. 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 AC section)

16. CONNECT WIRES AND CONNECTORS

Connect the following wires and connectors

(1) 2 heated oxygen sensor connectors (with clamps)

(2) DLC1 clamp

(3) 2 oil pressure gauge connectors

(4) Generator wire and connector

(5) Connector on intake manifold to fender apron

(6) High tension cord to ignition coil

(7) Ground strap to No 1 engine hanger

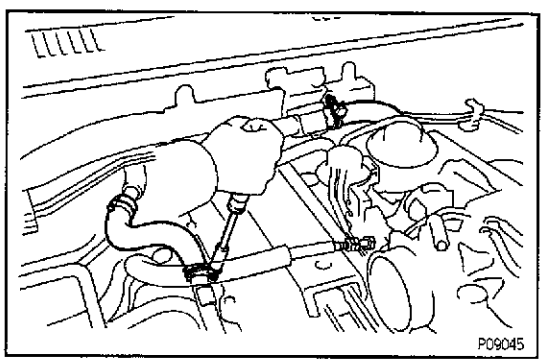
(8) Ground strap to air intake chamber

(9) Starter wire

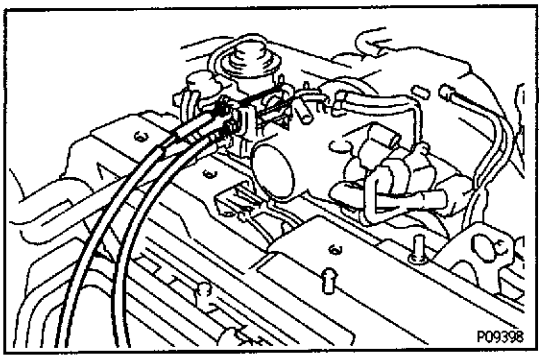
17. CONNECT FUEL HOSES

18. CONNECT EVAP HOSE

19. CONNECT BRAKE BOOSTER VACUUM HOSE

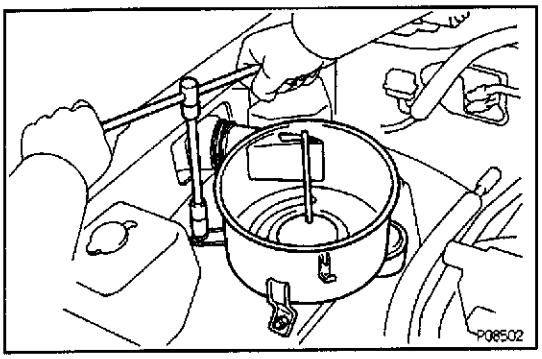


20. CONNECT HEATER HOSES



21. CONNECT ACCELERATOR CABLE TO THROTTLE BODY

22. CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY

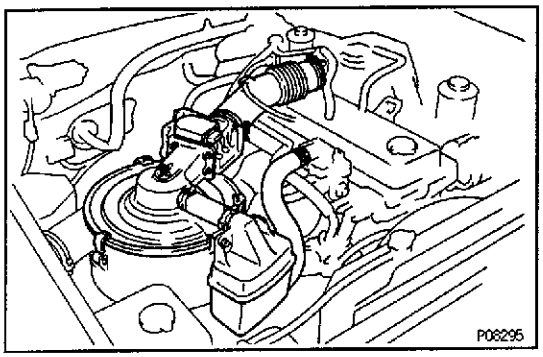


23. INSTALL VOLUME AIR FLOW METER, RESONATOR AND AIR CLEANER ASSEMBLY

(a) Install the air cleaner case with the 3 bolts

Torque: 12 N-m (120 kgf-cm, 9 ft-lbf)

(b) Install the air filter

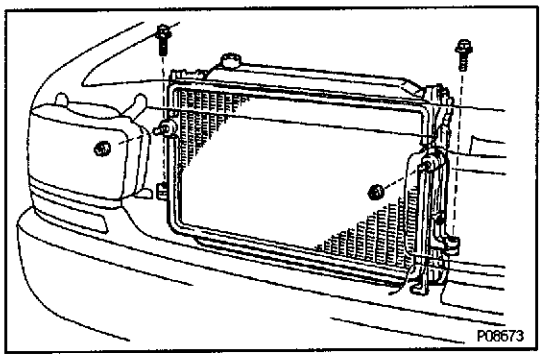


(c) Connect the No 2 air hose with the clamp

(d) Connect the air cleaner hose

(e) Install the air cleaner cap, volume air flow meter and resonator with the wing nut and 3 clips

(f) Connect the volume air flow meter connector and wire clamp



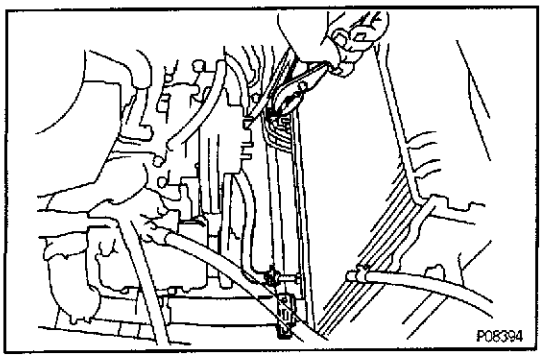
24. INSTALL RADIATOR

(a) Install the radiator with the 2 bolts and 2 nuts

Torque:

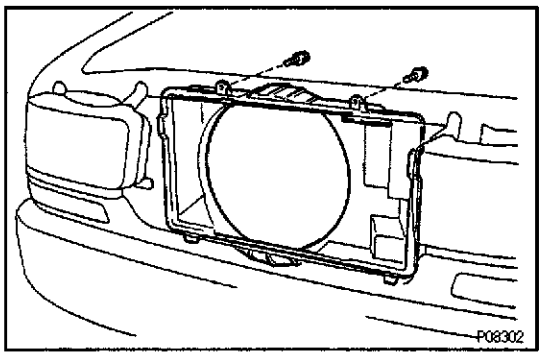
18 N-m (185 kgf-cm. 13 ft-lbf) for bolt

12 N-m (120 kgf-cm, 9 ft-lbf) for nut

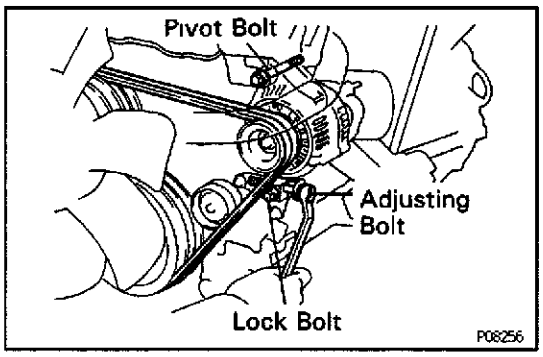


(b) Connect the radiator outlet hose

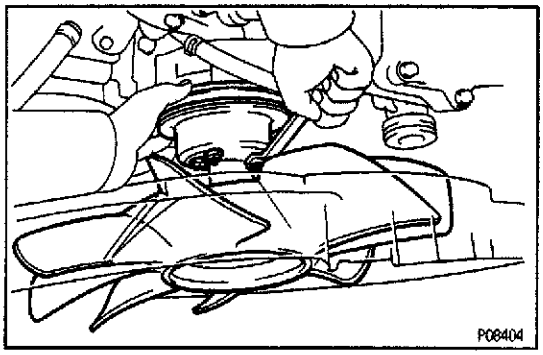
(c) Connect the 2 A/T oil cooler hoses



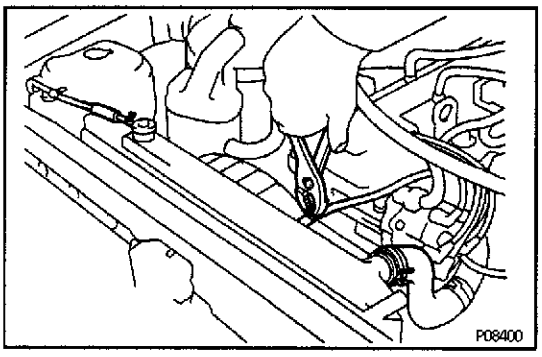
(d) Place the fan with fluid coupling, water pump pulley and fan shroud in position
(e) Temporarily install the fan pulley mounting nuts
(f) Install the fan shroud with the 2 bolts



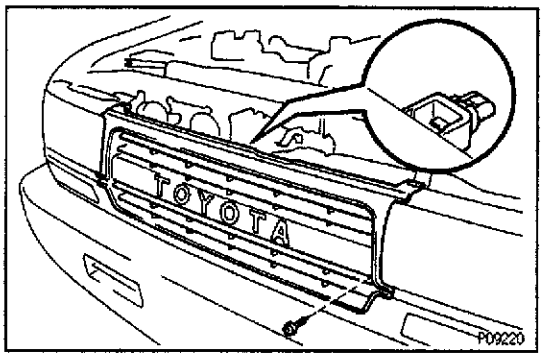
(g) Install the drive belts with the adjusting bolt and pivot bolt



(h) Stretch the belts and tighten the 4 water pump pulley mounting nuts
(i) Adjust the drive belts
(See CH section)

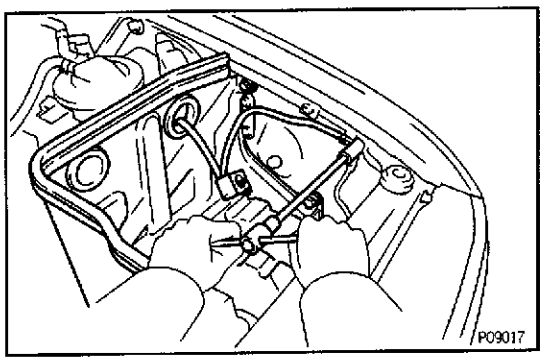


(j) Connect the following hoses
(1) No 3 water bypass hose
(2) Radiator inlet hose
(3) Reservoir hose

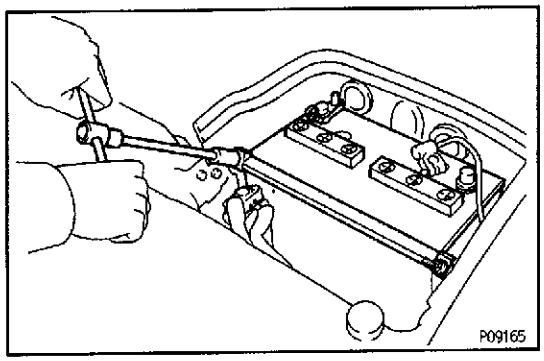


25. INSTALL RADIATOR GRILLE
Install the radiator grille with the 5 screws and clip

26. FILL WITH ENGINE OIL
CAPACITY:
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)
Dry fill
8.0 liters (8.5 US qts, 7.0 Imp. qts)
27. FILL WITH ENGINE COOLANT
CAPACITY (W/ Front and rear heaters):
14.2 liters (15.0 US qts, 12.4 Imp. qts)



28. INSTALL BATTERY TRAY AND BATTERY
(a) Install the battery tray with the 5 bolts
(b) Connect the ground strap with the bolt

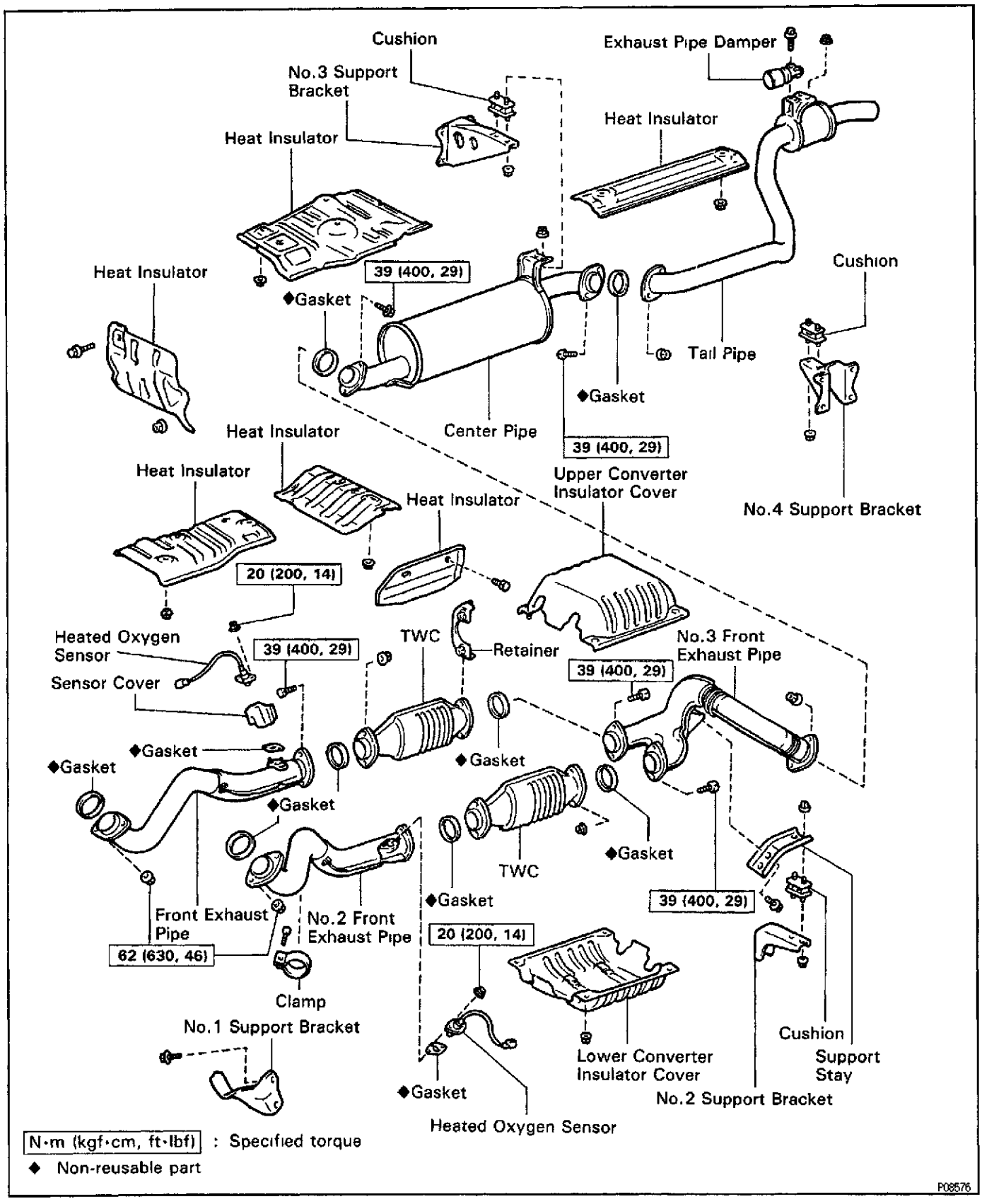


(c) Install the battery and hold-down clamp with the nuts
(d) Connect the battery cables
29. START ENGINE AND CHECK FOR LEAKS
30. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL
31. CHECK IGNITION TIMING (See IG section)
Ignition timing
3 ° BTDC @ idle
(w/ Terminals TE1 and E1 connected)
32. INSTALL HOOD
33. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
34. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

EXHAUST SYSTEM

E00FN-00

COMPONENTS



SERVICE SPECIFICATIONS

SERVICE DATA

EG0VT-02

Tune -up	Engine oil API grade	SG or SH Energy-Conserving II or ILSAC multigrade
	Battery specific gravity-105D31 L battery	1 27 - 1 29
	Battery specific gravity-75D31 battery	1 25 - 1 27 (when fully charged at 20°C (68°F))
	High-tension cord resistance - Limit	25 kΩ per cord
	Spark plug (Recommended spark plug) - ND	K16R-U
	Spark plug (Recommended spark plug) - NGK	BKR5EYA
	Spark plug (Correct electrode gap)	0 8 mm (0 031 in)
	Generator drive belt tension	
	New belt	125 ± 25 lbf
	Used belt	80± 20 lbf
	Valve clearance (Cold) - Intake	0 15-0 25mm(0 006-0 010in)
	Valve clearance (Cold) - Exhaust	0 25 - 0 35 mm (0 010 - 0 014 in)
	Ignition timing	3° BTDC @ idle
	Idle speed	650 ± 50 rpm
Compression pressure	at 250 rpm - STD at 250 rpm - Limit Difference of pressure between each cylinder	1 176 kPa (12 0 kgf/cm^2 171 psi) or more 882 kPa (9 0 kg f/cm^2 128 psi) 98 kPa (1 0 kgf/cm^2 14 psi) or less
Intake manifold vacuum	at idle speed	63 kPa (473 mmHg 18 6 in Hg)
Cylinder head	Warpage - Cylinder block side (Limit) Warpage - Manifold side (Limit) Valve seat - Refacing angle (Intake) Valve seat - Refacing angle (Exhaust) Valve seat - Contacting angle Valve seat - Contacting width (Intake) Valve seat - Contacting width (Exhaust) Cylinder head bolt outside diameter - STD Cylinder head bolt outside diameter - Limit	0 15 mm (0 0059 in) 0 10 mm (0 0039 in) 30° 45° 75° 45° 75° 45° 1 2 - 1 6 mm (0 047 - 0 063 in) 1 0 - 1 4 mm (0 039 - 0 055 in) 10 85 - 11 00 mm (0 4272 - 0 4331 in) 10 6 mm (0 417 in)
Valve guide bushing	Inside diameter Outside diameter (for repair part) - STD Outside diameter (for repair part) - 0/S 0 05 Protrusion height Replacing temperature (Cylinder head side)	7 010 - 7 030 mm (0 2760 - 0 2768 in) 11 492 - 11 513 mm (0 4524 - 0 4533 in) 11 542 - 11 563 mm (0 4544 - 0 4552 in) 8 2 - 8 6 mm (0 323 - 0 339 in) 80 - 1 00° C (176 - 212° F)

Valve	Valve overall length - STD (Intake) Valve overall length - STD (Exhaust) Valve overall length - Limit (Intake) Valve overall length - Limit (Exhaust) Valve face angle Stem diameter (Intake) Stem diameter (Exhaust) Stem oil clearance - STD (Intake) Stem oil clearance - STD (Exhaust) Stem oil clearance - Limit (Intake) Stem oil clearance - Limit (Exhaust) Margin thickness - STD Margin thickness - Limit	98 4 mm (3 874 in) 97 9 mm (3 854 in) 97 9 mm (3 854 in) 97 4 mm (3 835 in) 44 5° 6 970 - 6 985 mm (0 2744 - 0 2750 in) 6 965 - 6 980 mm (0 2742 - 0 2748 in) 0 025 - 0 060 mm (0 0010 - 0 0024 in) 0 030 - 0 065 mm (0 0012 - 0 0026 in) 0 08 mm (0 0031 in) 0 10 mm (0 0039 in) 1 2 mm (0 047 in) 1 0 mm (0 039 in)
Valve spring	Squareness - Limit Free length Installed tension at 36 5 mm (1 437 in)	2 0 mm (0 079 in) 43 94 - 45 06 mm (1 7299 - 1 7740 in) 214 - 238 N (21 8 - 24 2 kgf 48 1 - 53 4 lbf)
Valve lifter	Lifter diameter Lifter bore diameter Oil clearance - STD Oil clearance - Limit	33 966 - 33 976 mm (1 3372 - 1 3376 in) 34 000 - 34 021 mm (1 3386 - 1 3394 in) 0 024 - 0 055 mm (0 0009 - 0 0022 in) 0 07 mm (0 0028 in)
Manifold	Warpage - Limit	0 30 mm (0 0118 in)
Air intake chamber	Warpage - Limit	0 30 mm (0 0118 in)
Camshaft	Thrust clearance - STD Thrust clearance - Limit Journal oil clearance - STD Journal oil clearance - Limit Journal diameter Circle rounout - Limit Cam lobe height - STD Cam lobe height - Limit Camshaft gear backlash - STD Camshaft gear backlash - Limit Camshaft gear spring end free distance	0 030 - 0 080 mm (0 0012 - 0 0031 in) 0 10 mm (0 0039 in) 0 025 - 0 062 mm (0 0010 - 0 0024 in) 0 10 mm (0 0039 in) 26 959 - 26 975 mm (1 0614 - 1 0620 in) 0 06 mm (0 0024 in) 50 61 - 50 71 mm (1 9925 - 1 9965 in) 50 51 mm (1 9886 in) 0 020 - 0 200 mm (0 0008 - 0 0079 in) 0 30 mm (0 0188 in) 18 2 - 18 8 mm (0 717 - 0 740 in)
Spark plug tube	Protrusion	45 5 mm 0 791 in)
Oil pump drive shaft gear	Thrust clearance - STD Thrust clearance - Limit	0 040 - 0 160 mm (0 0016 - 0 0063 in) 0 30 mm (0 0118 in)
Chain and timing gear	Chain length at 16 links - Limit Crankshaft timing gear wear (w/ chain) - Limit Camshaft timing gear wear (w/ chain) - Limit	146 6 mm (5 772 in) 126 0 mm (4 961 in) 65 4 mm (2 575 in)
Chain tensioner slipper and vibration damper	Wear - Limit	1 0 mm (0 039 in)

Cylinder block	Cylinder head surface warpage - Limit Cylinder bore diameter - STD (Mark 1) Cylinder bore diameter - STD (Mark 2) Cylinder bore diameter - STD (Mark 3) Cylinder bore diameter - Limit (STD) Cylinder bore diameter - Limit (0/S 0 50) Main bearing bolt outside diameter - STD Main bearing bolt outside diameter - Limit	0 05 mm (0 0020 in) 100 000 - 100 010 mm (3 9370 - 3 9374 in) 100 010 - 100 020 mm (3 9374 - 3 9378 in) 100 020 - 100 030 mm (3 9378 - 3 9382 in) 100 23 mm (3 9461 in) 100 73 mm (3 9658 in) 10 85 - 11 00 mm (0 4271 - 0 4331 in) 10 6mm(0 417in)
Piston and piston ring	Piston diameter - STD (Mark 1) Piston diameter - STD (Mark 2) Piston diameter - STD (Mark 3) Piston diameter - O/S 0 50 Piston diameter - O/S 1 00 Piston oil clearance - STD Piston ring groove clearance - No 1 Piston ring groove clearance - No 2 Piston ring end gap - STD (No 1) Piston ring end gap - STD (No 2) Piston ring end gap - STD (Oil) Piston ring end gap - Limit (No 1) Piston ring end gap - Limit (No 2) Piston ring end gap - Limit (Oil) Piston pin installing temperature	99 950 - 99 960 mm (3 9350 - 3 9354 in) 99 960 - 99 970 mm (3 9354 - 3 9358 in) 99 970 - 99 980 mm (3 9358 - 3 9362 in) 100 450 - 100 480 mm (3 9547 - 3 9559 in) 100 950 - 100 980 mm (3 9744 - 3 9756 in) 0 040 - 0 060 mm (0 0016 - 0 0024 in) 0 040 - 0 080 mm (0 0016 - 0 0031 in) 0 030 - 0 070 mm (0 0012 - 0 0028 in) 0 300 - 0 520 mm (0 0118 - 0 0205 in) 0 450 - 0 670 mm (0 0177 - 0 0264 in) 0 150 - 0 520 mm (0 0059 - 0 0205 in) 1 12 mm (0 0441 in) 1 17 mm (0 0461 in) 1 12 mm (0 0441 in) 80 - 90° C (176 - 194° F)
Connecting rod	Thrust clearance - STD Thrust clearance - Limit Connecting rod bearing center wall thickness - STD (Mark 2) - STD (Mark 3) - STD (Mark 4) - STD (Mark 5) - STD (Mark 6) Connecting rod oil clearance - STD (STD) - STD (U/S 0 25) - Limit Rod out-of-alignment - Limit per 100 mm (3 94 in) Rod twist - Limit per 100 mm (3 94 in) Bushing inside diameter Piston pin diameter Piston pin oil clearance - STD Piston pin oil clearance - Limit Connecting rod bolt outside diameter - STD Connecting rod bolt outside diameter - Limit	0 160 - 0 262 mm (0 0063 - 0 0103 in) 0 362 mm (0 0143 in) 2 489 - 2 492 mm (0 0980 - 0 0981 in) 2 492 - 2 495 mm (0 0981 - 0 0982 in) 2 495 - 2 498 mm (0 0982 - 0 0983 in) 2 498 - 2 501 mm (0 0983 - 0 0985 in) 2 501 - 2 504 mm (0 0985 - 0 0986 in) 0 032 - 0 050 mm (0 0013 - 0 0020 in) 0 033 - 0 073 mm (0 0013 - 0 0029 in) 0 10 mm (0 0039 in) 0 05 mm (0 0020 in) 0 15 mm (0 0059 in) 26 008 - 26 020 mm (1 0239 - 1 0244 in) 26 000 - 26 012 mm (1 0236 - 1 0241 in) 0 004 - 0 012 mm (0 0002 - 0 0005 in) 0 05 mm (0 0020 in) 8 40 - 8 60 mm (0 3307 - 0 3386 in) 8 0 mm (0 315 in)

Crankshaft	Thrust clearance - STD	0 020 - 0 0220 mm (0 0008 - 0 0087 in)
	Thrust clearance - Limit	0 30 mm (0 0118 in)
	Thrust washer thickness (STD)	2 440 - 2 490 mm (0 0961 - 0 0980 in)
	Thrust washer thickness (O/S 0 125)	2 503 - 2 553 mm (0 0985 - 0 1005 in)
	Thrust washer thickness (0/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)
	Main journal oil clearance - STD (U/S 0 25)	0 041 - 0 081 mm (0 0016 - 0 0032 in)
	Main journal oil clearance - Limit	0 10 mm (0 0039 in)
	Main journal diameter - STD	68 982 - 69 000 mm (2 7158 - 2 7165 in)
	Main journal diameter - U/S 0 25	68 745 - 68 755 mm (2 7065 - 2 7069 in)
	Main bearing center wall thickness	
	- STD (Mark 2)	2 489 - 2 492 mm (0 0980 - 0 0981 in)
	- STD (Mark 3)	2 492 - 2 495 mm (0 0981 - 0 0982 in)
	- STD (Mark 4)	2 495 - 2 498 mm (0 0982 - 0 0983 in)
	- STD (Mark 5)	2 498 - 2 501 mm (0 0983 - 0 0985 in)
	- STD (Mark 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)
	Crank pin diameter - U/S 0 25	56 745 - 56 755 mm (2 2341 - 2 2344 in)
	Circle runout - Limit	0 06 mm (0 0024 in)
	Main journal taper and out-of-round (Limit)	0 02 mm (0 0008 in)
	Crank pin taper and out-of -round (Limit)	0 02 mm (0 0008 in)

EG0VU-05

TORQUE SPECIFICATIONS

Part tightened	N-m	kgf-cm	ft-lbf
Throttle body x Air intake chamber	**21**	210	**15**
Spark plug x Cylinder head	**20**	200	**14**
Fuel filter 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**
Cylinder head x Cylinder block (1 sty	**39**	400	**29**
Cylinder head x Cylinder block (2nd)	Turn 90°	Turn 90°	Turn 90°
Cylinder head x Cylinder block (3rd)	Turn 90°	Turn 90°	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**
Engine hanger x Cylinder head	**41**	420	**30**
Exhaust manifold x Cylinder head	**39**	400	**29**
Heat insulator x Exhaust manifold	**19**	195	**14**
PAIR reed valve x Cylinder head	**20**	200	**14**
Air pipe x PAIR reed valve	**21**	210	**15**
Air pipe x Exhaust manifold	**21**	210	**15**
Air pipe x Cylinder head	**20**	200	**14**
Heater pipe x Timing chain cover	**21**	210	**15**
Heater pipe x Cylinder head	**20**	200	**14**
Front exhaust pipe x Exhaust manifold	**62**	630	**46**
Intake manifold x Cylinder head	**21**	210	**15**

No 1 support bracket x Transmission	**39**	400	**29**
No 1 support bracket clamp bolt	**19**	**195**	**14**
Front exhaust pipe x No 3 front exhaust pipe	**39**	400	**29**
Fuel inlet hose x Fuel filter	**29**	300	**22**
Delivery pipe x Intake manifold	**21**	210	**15**
No 1 fuel pipe x Delivery pipe (Union bolt)	**29**	300	**22**
No 1 fuel pipe x Delivery pipe (Bolt)	**20**	200	**14**
No 1 fuel pipe x Fuel filter	**29**	300	**22**
Fuel return pipe x Intake manifold	**20**	200	**14**
Emission control valve set assembly x Intake manifold	**20**	200	**14**
Air intake chamber x Intake manifold	**21**	210	**15**
Oil dipstick guide x Intake manifold	**20**	200	**14**
Oil dipstick guide x No 1 oil pan	**20**	200	**14**
Heater inlet pipe x Air intake chamber	**20**	200	**14**
EGR pipe x EGR valve	**64**	650	**47**
No 2 water by-pass pipe x Cylinder head	**20**	200	**14**
No 2 water by pass p pe x Engine hanger	**20**	200	**14**
Water outlet x Cylinder head	**21**	210	**15**
Generator bracket x Cylinder head	**43**	440	**32**
Distributor x Cylinder head	**21**	210	**15**
PS reservoir tank x Cylinder head	**20**	200	**14**
Oil jet x Cylinder block	**20**	200	**14**
Chain tensioner slipper x Cylinder block	**69**	700	**51**
Vibration damper x Cylinder block	**20**	200	**14**
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
No 1 oil pan x Cylinder block for- 14 mm head bolt	**43**	440	**32**
No 1 oil pan x Cylinder block for 12 mm head bolt	**20**	200	**14**
No 1 oil pan x Timing chain cover	**20**	200	**14**
No 2 oil pan x No 1 oil pan for bolt	7 8	**80**	69 in -lbf
No 2 oil pan x No 1 oil pan for nut	8 8	**90**	78 in -lbf
Transmission housing x No 1 oil pan	**72**	730	**53**
Oil level sensor x No 1 oil pan	5 4	**55**	48 in -lbf
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**
Water pump x Timing chain cover	**21**	210	**15**
Main bearing cap x Cylinder block (1 st)	**74**	750	**54**
Main bearing cap x Cylinder block (2nd)	Turn 90°	Turn 90°	Turn 90°
Connecting rod cap x Connecting rod (1 st)	**48**	490	**35**
Connecting rod cap x Connecting rod (2nd)	Turn 90°	Turn 90°	Turn 90°
Oil nozzle x Cylinder bracket	**25**	**250**	**18**
Rear oil seal retainer x Cylinder block	**20**	200	**14**
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 block	**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 under cover x Frame crossmember	**28**	290	**21**
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**
Stabilizer bar bracket mounting bolt	18	185	**13**
Stabilizer bar x Axle carrier	**25**	260	**19**

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG05T-04

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Pulsed secondary air injection	PAIR	Reduces CO and HC
Three-way catalytic converter	TWC	Reduces CO HC and NOx
Sequential multiport fuel injection*	SFI	Regulates alt engine conditions for reduction of exhaust emissions

* For inspection and repair of the SFI system refer to the SFt section

V02007

PREPARATION

RECOMMENDED TOOLS

EG06V-02

	09082-00050 TOYOTA Electrical Tester Set	

EQUIPMENT

EG05W-04

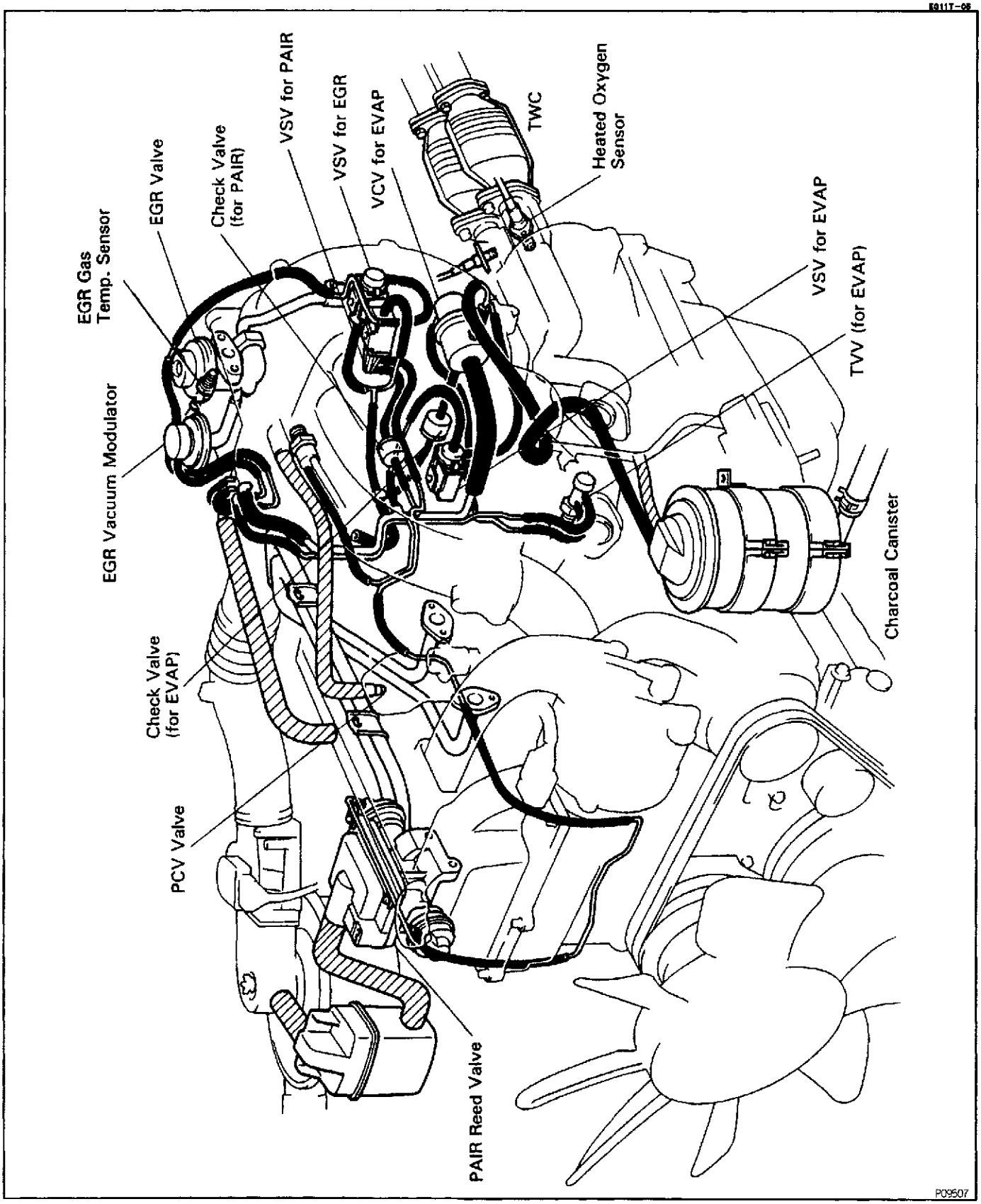
Heater	TVV
Thermometer	TVV
Tachometer	
Torque wrench	
Vacuum gauge	

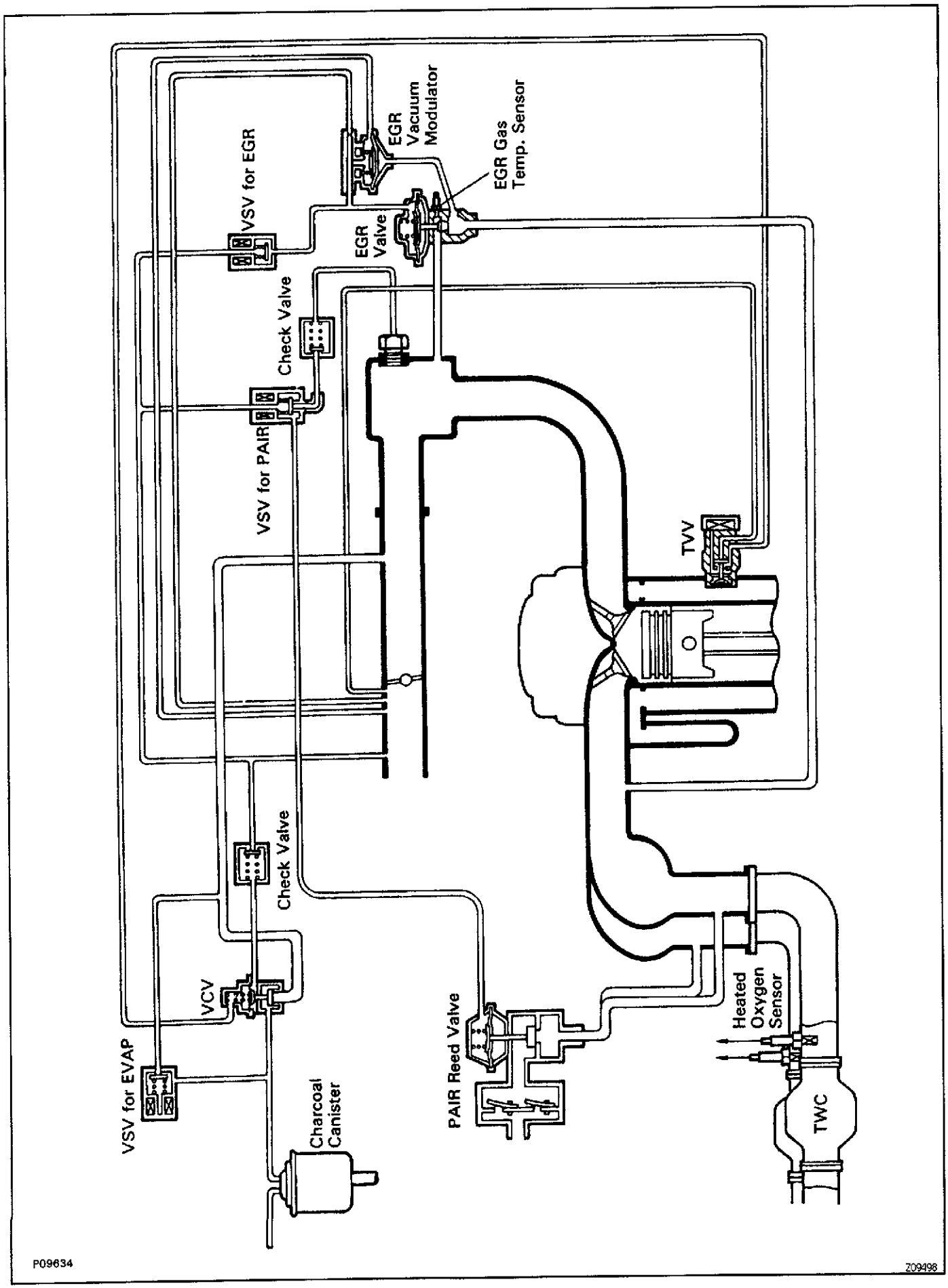
SSM (SPECIAL SERVICE MATERIALS)

EG05X 04

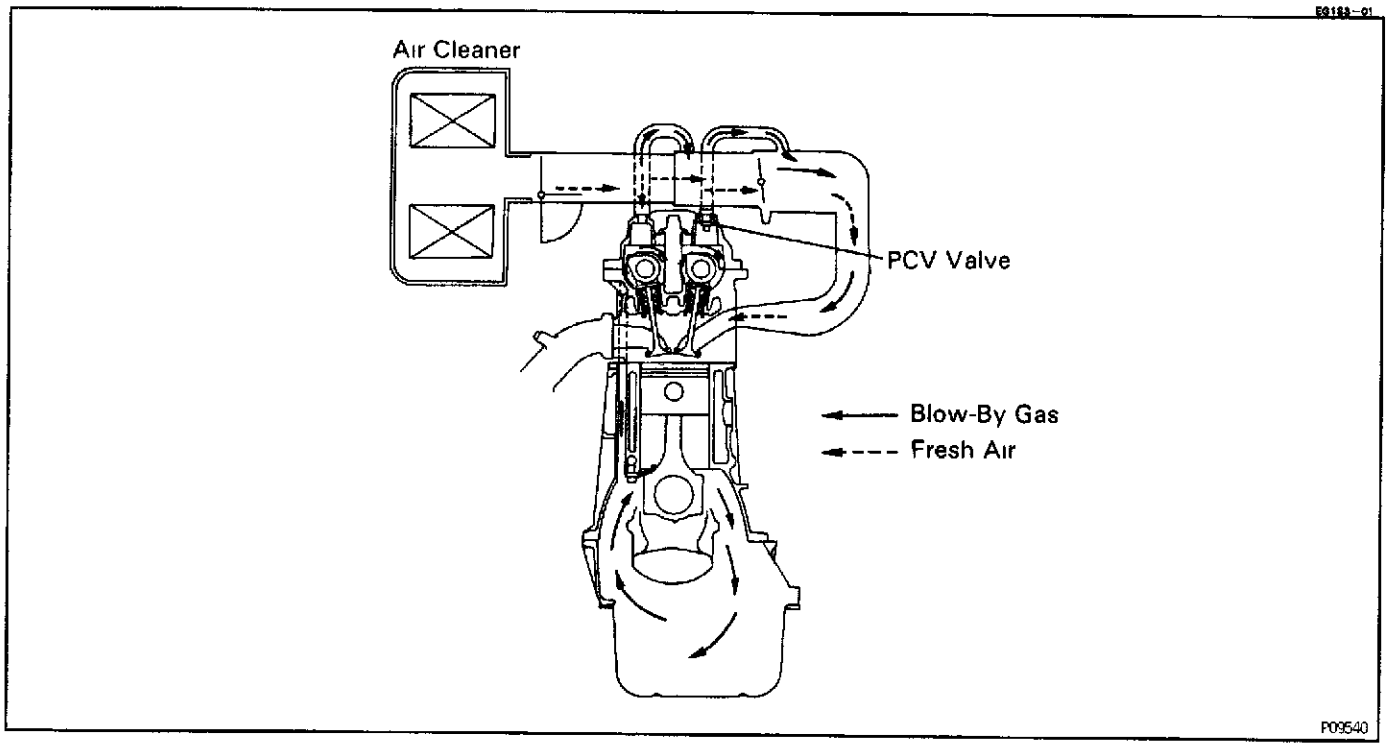
08833-00070 Adhesive 1311 THREE BOND 1311 or equivalent	TVV

LAYOUT AND SCHEMATIC DRAWING



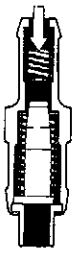

VSV for EGR
EGR Vacuum Modulator
EGR Gas Temp. Sensor
EGR Valve
Check Valve
VSV for PAIR
TVV
Check Valve
VCV
VSV for EVAP
Charcoal Canister
PAIR Reed Valve
Heated Oxygen Sensor
TWC
P09634
Z09498

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emission crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders

Engine not Running or Backfiring
Air Intake Chamber Side

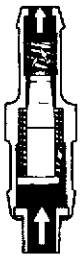


O PCV VALVE IS CLOSED

Cylinder Head Cover Side

P05450

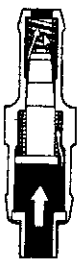
Normal Operation



O PCV VALVE IS OPEN
O VACUUM PASSAGE IS SMALL

P05452

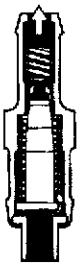
Idling or Decelerating



O PCV VALVE IS OPEN
O VACUUM PASSAGE IS LARGE

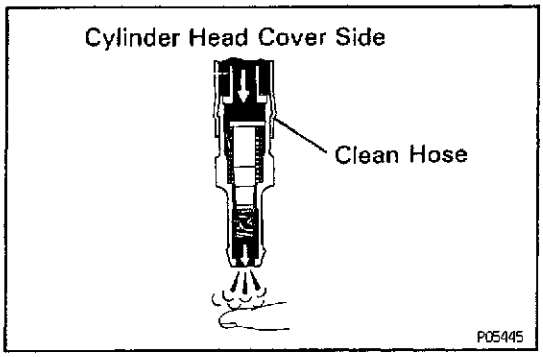
P05451

Acceleration or High Load



O PCV VALVE IS FULLY OPEN

P05453



EG061-04

PCV VALVE INSPECTION

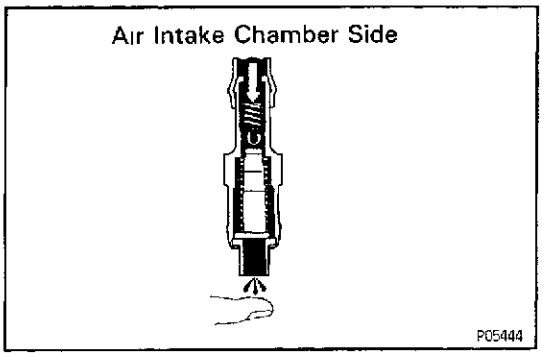
1. REMOVE PCV VALVE

2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

(a) Blow into the cylinder head cover side, and check that air passes through easily

CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.

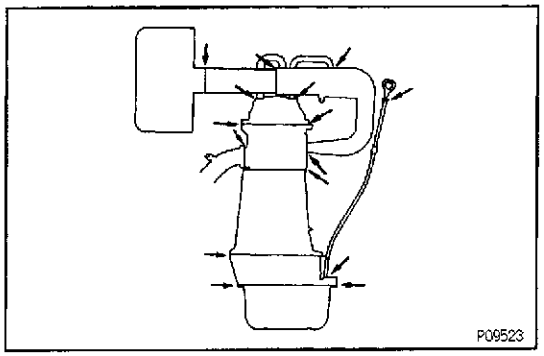


(b) Blow air into the air intake chamber side, and check that air passes through with difficulty

If operation is not as specified, replace the PCV valve

4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE



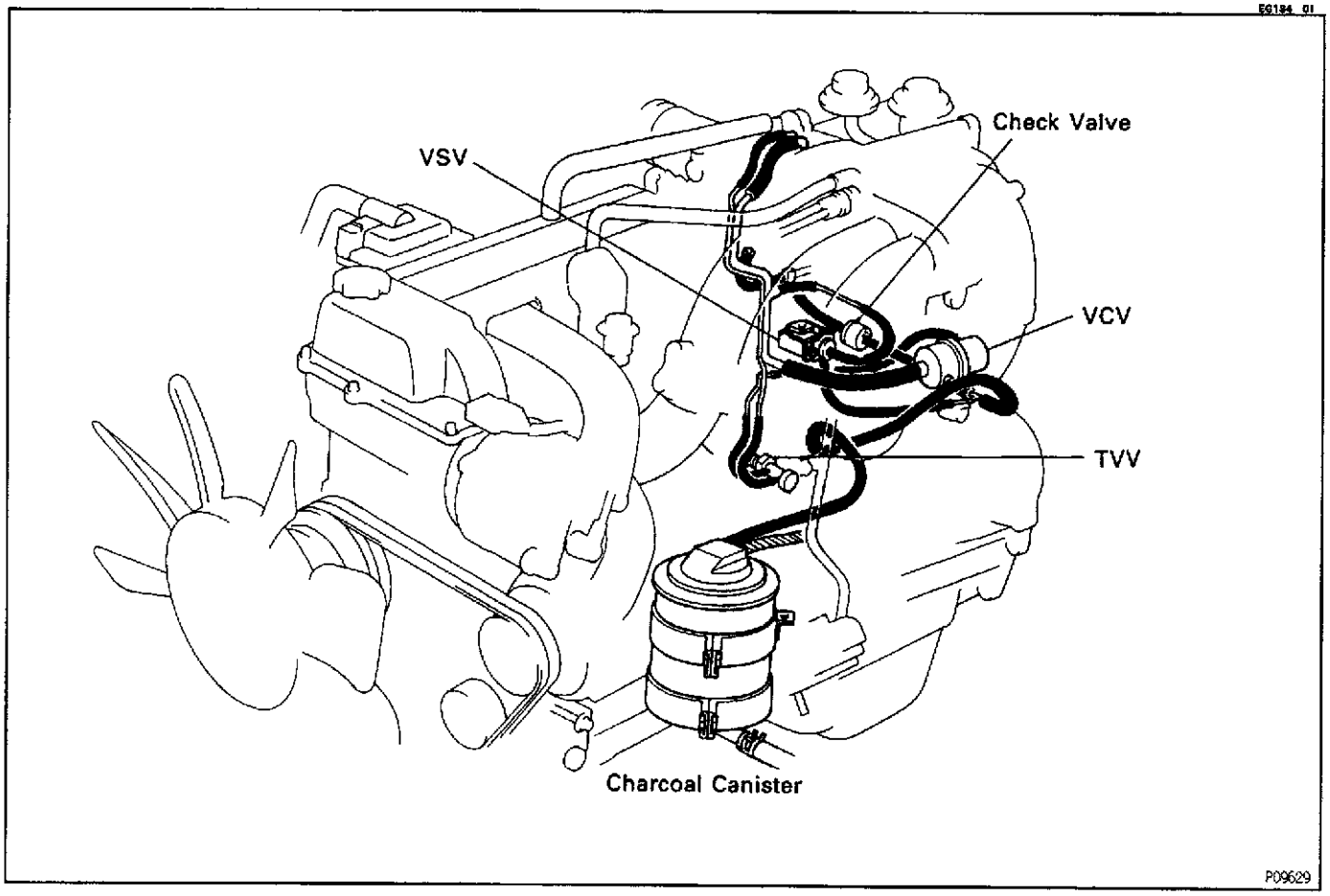
EG062-05

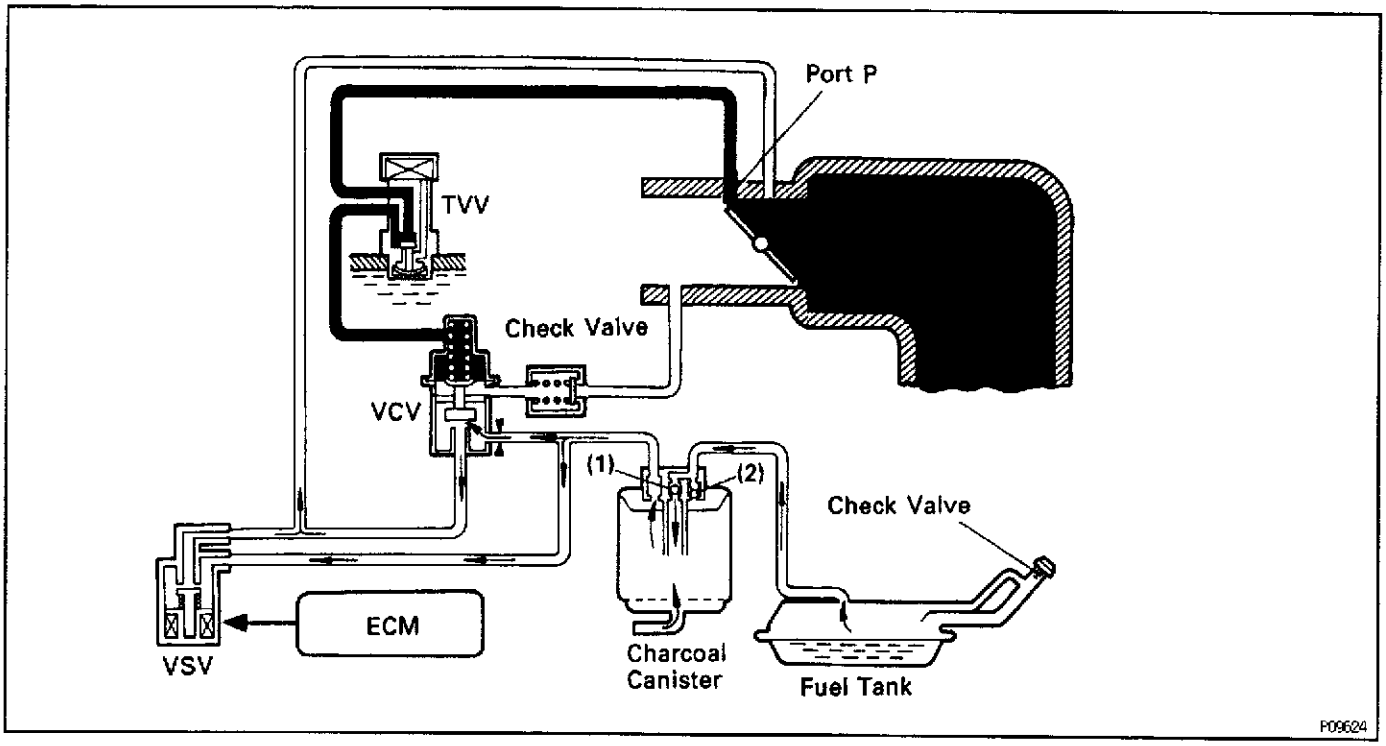
PCV HOSES AND CONNECTIONS INSPECTION

VISUALLY INSPECT HOSES AND CONNECTIONS

Check for cracks, leaks or damage

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM



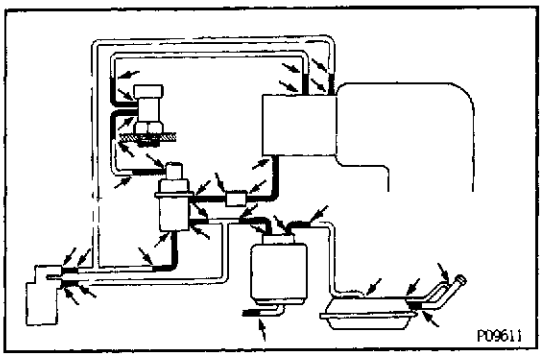


To reduce HC emission evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders

ECT	TVV	Throttle Position	VCV	VSV	Check Valve (1)	Check Valve (2)	Check Valve In Cap	Evaporated Fuel (HC)
Below 45°C (113°F)	CLOSED	–	CLOSED	–	–	–	–	HC from tank is absorbed into the canister
Above 64°C(147°F)	OPEN	Below port P	CLOSED	–	–	–	–	
		Above port P	OPEN	–	–	–	–	HC from canister is led into air intake chamber
Above 35°C(95°F)	–	Idling (A/C idle-up)	–	*VARIABLE OPEN	–	–	–	HC from canister is led into air intake chamber
		Others	–	CLOSE	–	–	–	HC from tank is absorbed into the canister
High pressure in tank	–	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister
High vacuum in tank	–	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank

*The ECM controls the on-off period of the VSV to adjust the EVAP purge quantity in accordance with the engine load

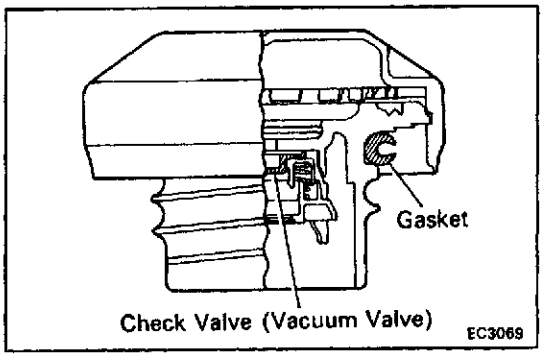
VC2008



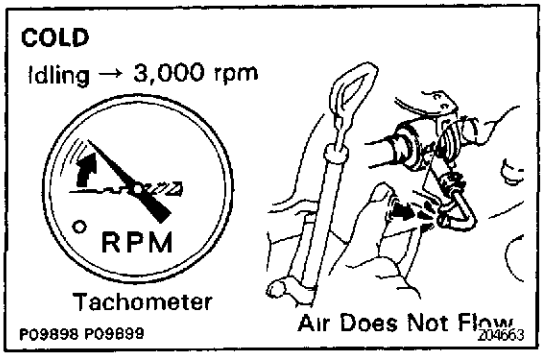
EVAP CONTROL SYSTEM INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS
Look for loosen connections, sharp bends or damage

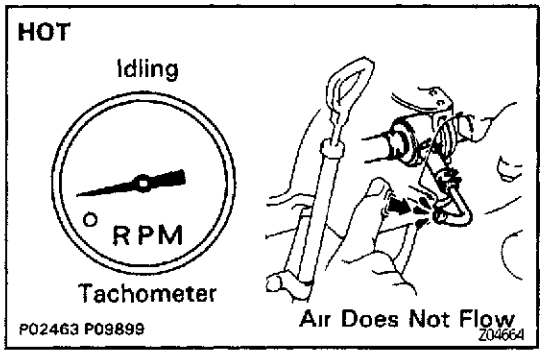
2. VISUALLY INSPECT FUEL TANK
Look for deformation, cracks or fuel leakage



3. VISUALLY INSPECT FUEL TANK CAP
Check if the cap and/or gasket are deformed or damaged
If necessary, repair or replace the cap

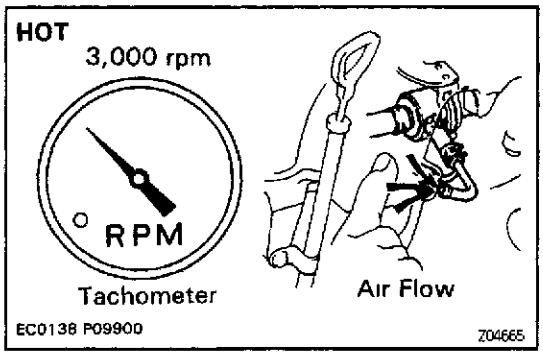


4. INSPECT TVV OPERATION WITH COLD ENGINE
(a) The engine coolant temperature should be below 45° C (113°F)
(b) Disconnect the EVAP hose from the union pipe
(c) Start the engine
(d) Gradually increase the engine speed from idling to 3,000 rpm and check that air suction is not felt at the union pipe



5. INSPECT OPERATION OF VSV AND VCV WITH HOT ENGINE

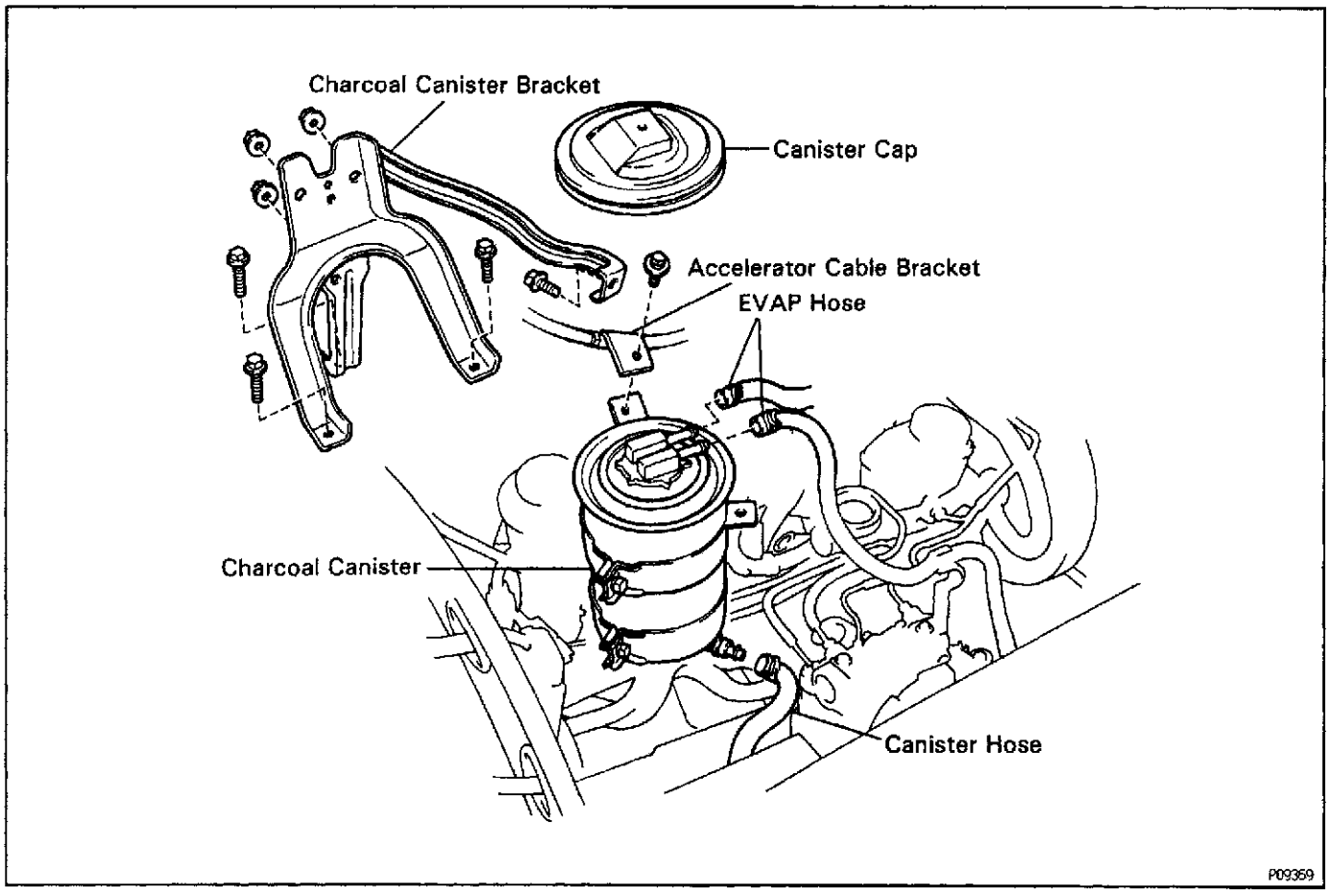
(a) Warm up the engine and turn off the A/C switch
(b) With the engine idling, check that air suction is not felt at union pipe

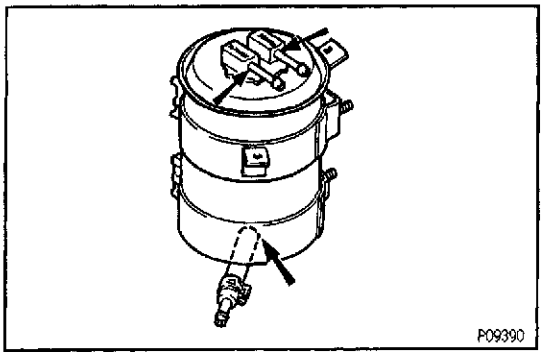


(c) Gradually increase the engine speed to 3,000 rpm and check that there is air suction at the union pipe
(d) Reconnect the EVAP hose to the union pipe

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL, OTHERWISE INSPECT EACH PART

COMPONENTS FOR CHARCOAL CANISTER REMOVAL AND INSTALLATION





CHARCOAL CANISTER INSPECTION

(See Components for Charcoal Canister Removal end Installation)

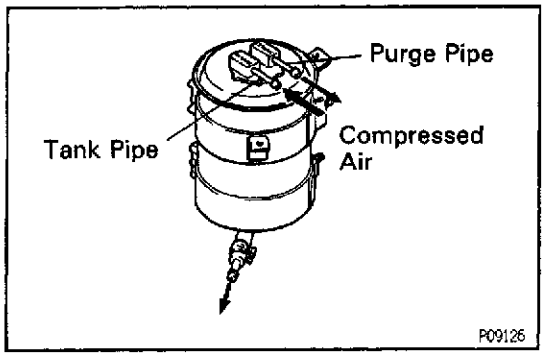
1. REMOVE CHARCOAL CANISTER AND BRACKET

2. DISCONNECT CHARCOAL CANISTER FROM BRACKET

3. REMOVE CAP FROM CHARCOAL CANISTER

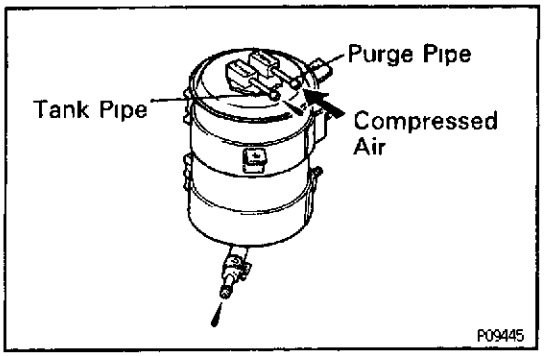
4. VISUALLY INSPECT CHARCOAL CANISTER

Lock for cracks or damage



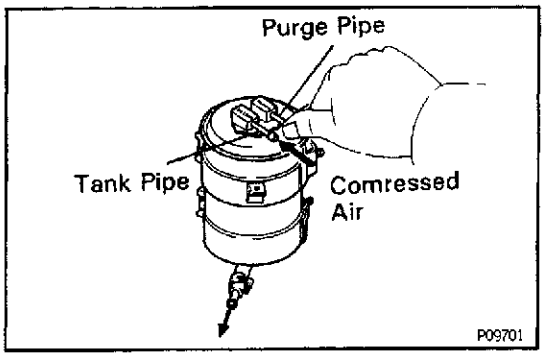
5. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using tow pressure compressed air (4 71 kPa, 48 gf/cm^2, 0 68 psi), blow into tank pipe and check that air flows without resistance from the other pipes



(b) Blow air (4 71 kPa, 48 gf/cm^2, 0 68 psi) into purge pipe and check that air does not flow from the other pipes

If a problem is found, replace the charcoal canister



6. 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.**

7. REINSTALL CAP TO CHARCOAL CANISTER

8. RECONNECT CHARCOAL CANISTER TO BRACKET

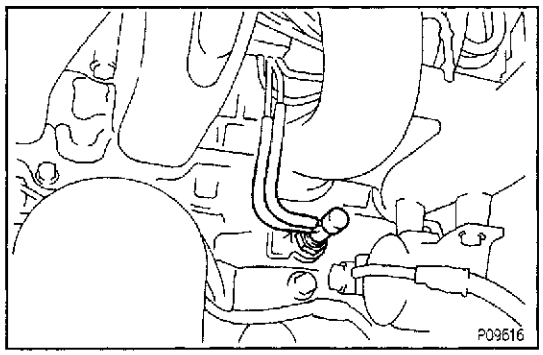
Torque: 14 N-m (145 kgf-cm, 10 ft-lbf)

9. REINSTALL CHARCOAL CANISTER AND BRACKET

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

EG197-02

TVV INSPECTION

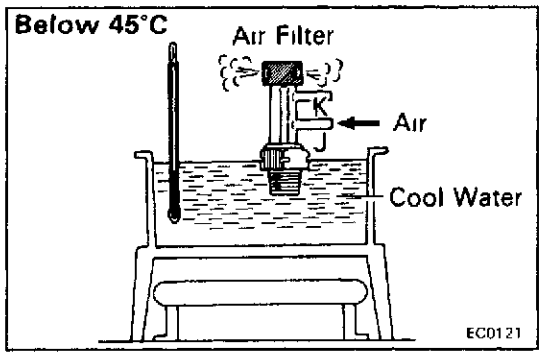


1. DRAIN ENGINE COOLANT

2. REMOVE TVV FROM CLINDER HEAD

(a) Disconnect the 2 vacuum hoses

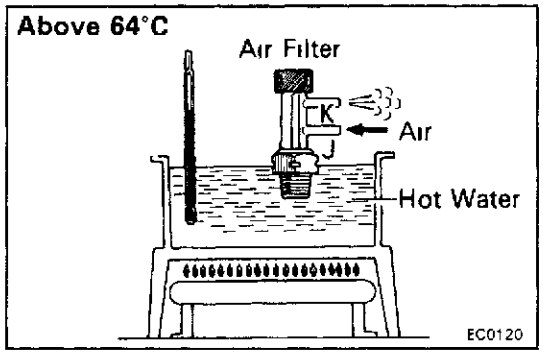
(b) Remove the TVV



3. INSPECT TVV OPERATION

(a) Cool the TVV to below 45°C (1 13°F) with cool water

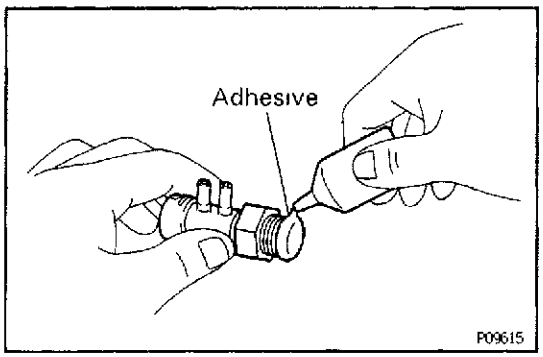
(b) Check that air flows from pipe J to the air filter



(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



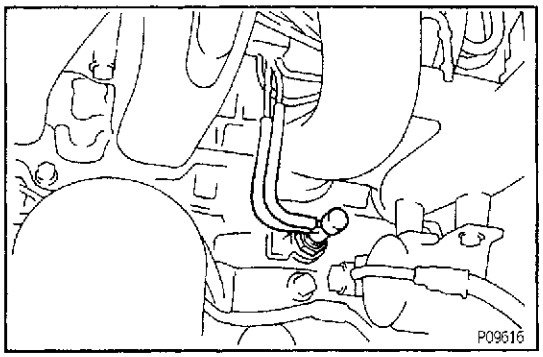
4. REINSTALL TVV

(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

5. REFILL WITH ENGINE COOLANT

EG19V-02

VSV INSPECTION

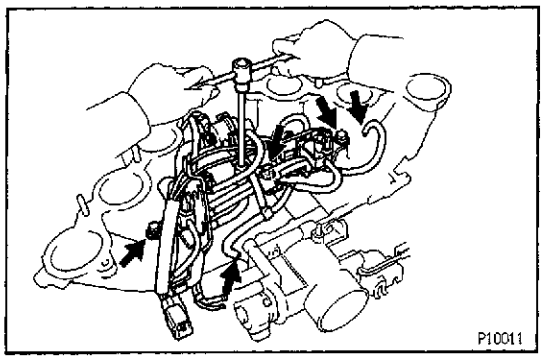
1. REMOVE AIR INTAKE CHAMBER

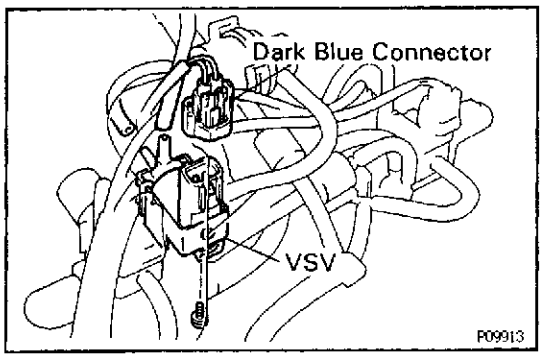
(See pages EG-269 **and 270)**

2. REMOVE VSV

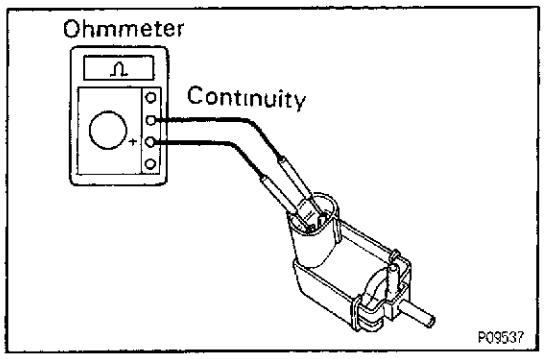
(a) Disconnect the air hose and vacuum hose from the air intake chamber

(b) Remove the 4 bolts and emission control valve set assembly





(c) Disconnect the connector and 2 vacuum hoses, and remove the screw and VSV



3. INSPECT VSV

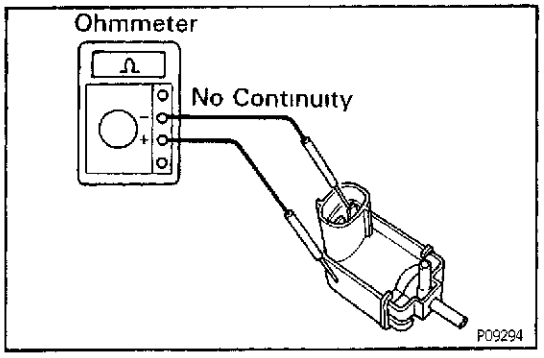
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals

Resistance:

30 - 33Ω at 20°C (68°F)

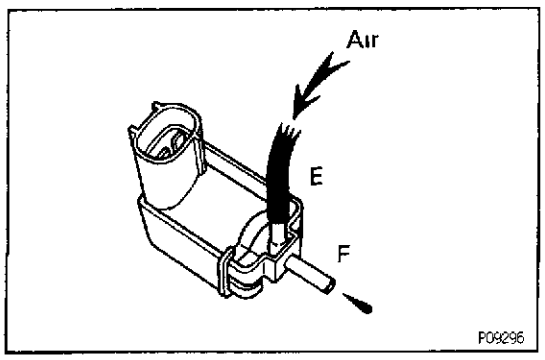
If there is no continuity, replace the VSV



B. Inspect VSV for ground

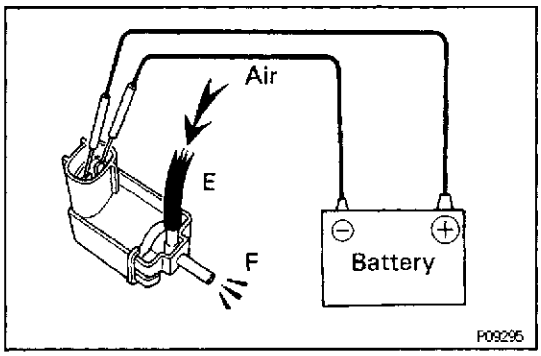
Using an ohmmeter, check that there is no continuity between each terminal and the body

If there is continuity, replace the VSV

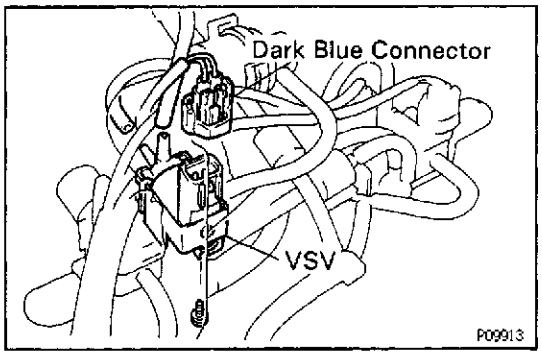


C. Inspect VSV operation

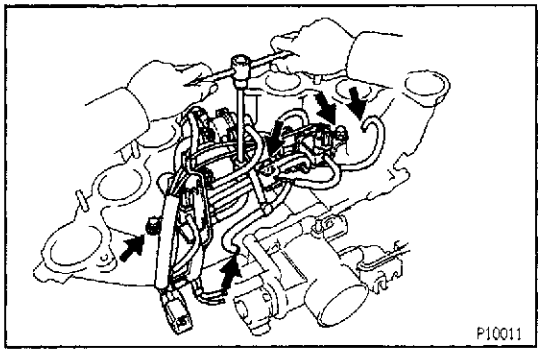
(a) Check that the air does not flow from pipe E to pipe F



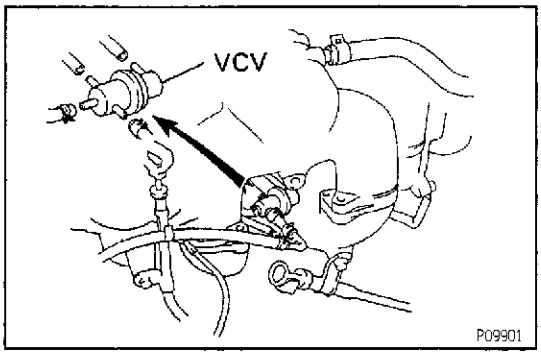
(b) Apply battery voltage across the terminals
(c) Check that the air flows from pipe E to the pipe F
If operation is not as specified, replace the VSV



4. REINSTALL VSV
(a) Install the VSV with the screws
(b) Connect the connector and 2 vacuum hoses to the VSV



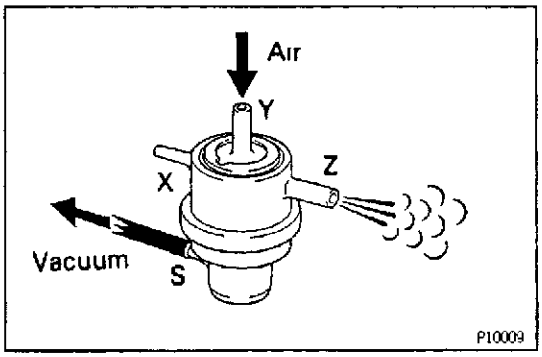
(c) Install the emission control valve set assembly with the 4 bolts
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)
(d) Connect the air hose and vacuum hose to the air intake chamber
5. REINSTALL AIR INTAKE CHAMBER
(See pages EG-276 **and 277)**



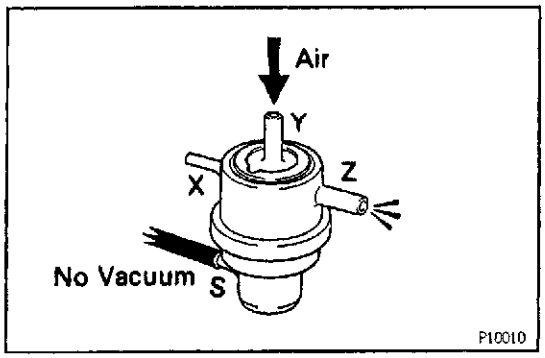
EG16W-01

VCV INSPECTION

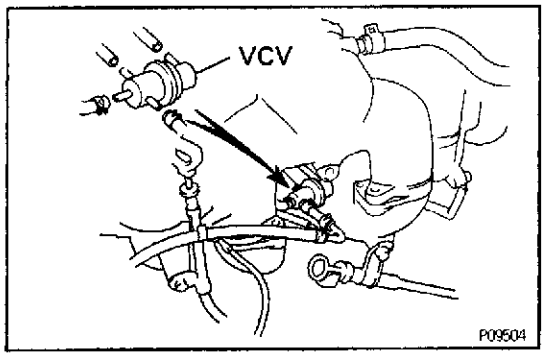
1. REMOVE VCV



2. INSPECT VCV
(a) Apply vacuum above 9 3 kPa (70 mmHg, 2 76 in Hg) to pipe S
(b) Blow air into pipe * and check that air comes out of pipe Z



(c) Stop the applied vacuum
(b) Blow air into pipe * and check that air does not come out of pipe Z
If operation is not as specified, replace the VCV

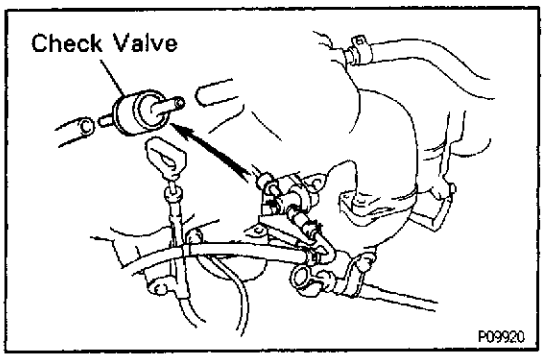


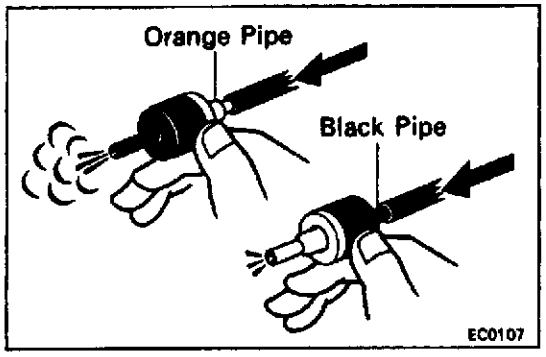
3. REINSTALL VCV

CHECK VALVE INSPECTION

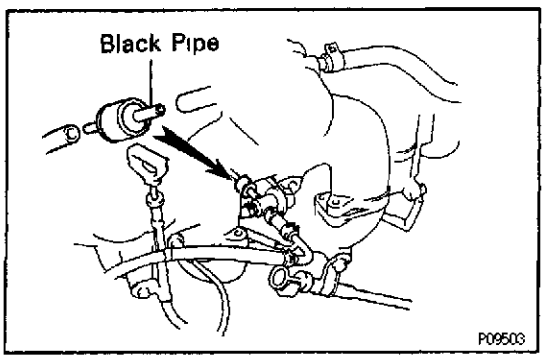
EG18X-01

7. REMOVE CHECK VALVE





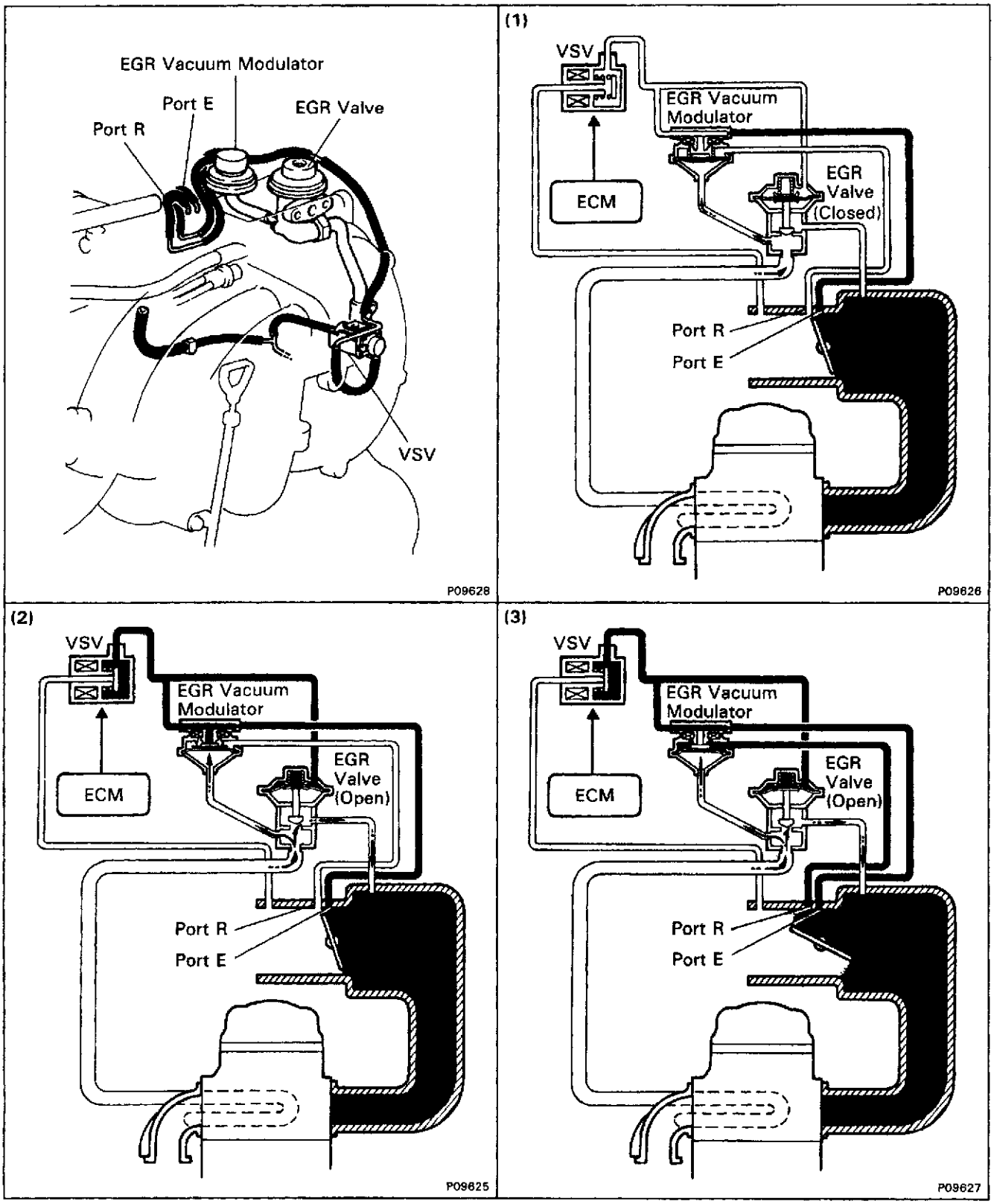
2. INSPECT CHECK VALVE
(a) Check that air flows from the orange pipe to the black pipe
(b) Check that air does not flow from the black pipe to the orange pipe
If operation is not as specified, replace the check valve



3. REINSTALL CHECK VALVE
HINT Reinstall the check valve with the black pipe facing the VCV side

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EG19W-02



V02040

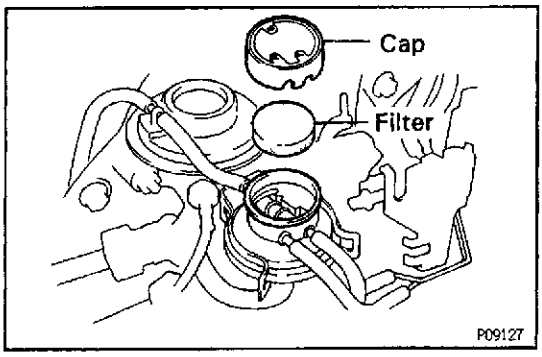
To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature

ECT	RPM	Driving Condition	Intake Air Volume	VSV	Throttle Position	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 47°C (117°F)		-	-	OFF	-	-		-	CLOSED	Not recirculated
Above 53°C (127°F)	Above 3 500 rpm	-		OFF	-	-		-	CLOSED	Not recirculated
	Below 3 500 rpm	Deceleration	-	OFF	-	-		-	CLOSED	Not recirculated
		Ex deceleration	LOW	OFF	-	-		-	CLOSED	Not recirculated
			HIGH	OFF	-	-		-	CLOSED	Not recirculated
				ON	Below port E	-		-	CLOSED	Not recirculated
					Between port E and port R	(1) LOW	* Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
						(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
					Above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

* Pressure increase → Modulator closes → EGR valve opens → Pressure drops
EGR valve closes ← Modulator opens ←

** When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas even if the exhaust pressure is insufficiently low

V01994



EG138-01

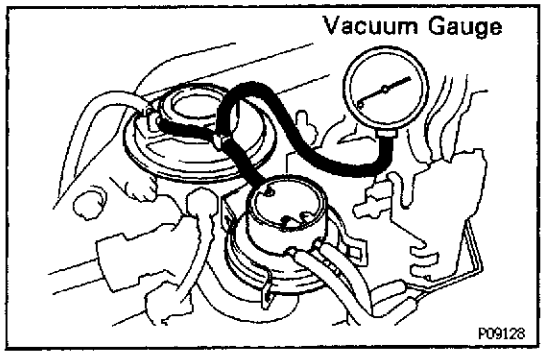
EGR SYSTEM INSPECTION

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)

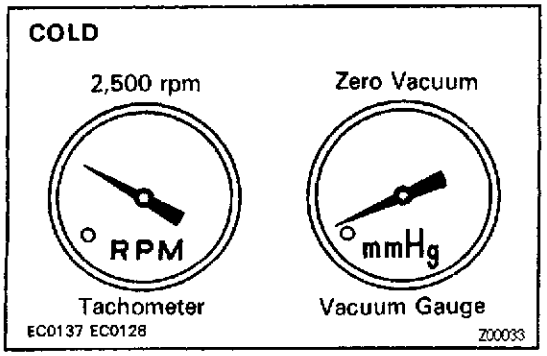
2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator



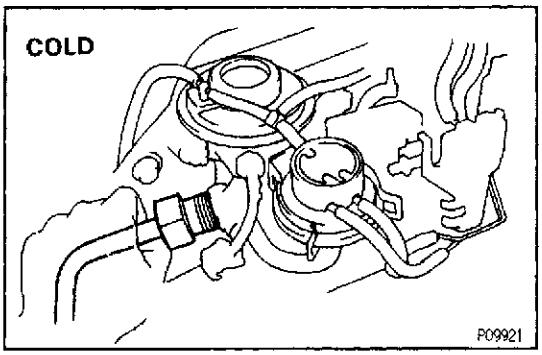
3. INSPECT SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle

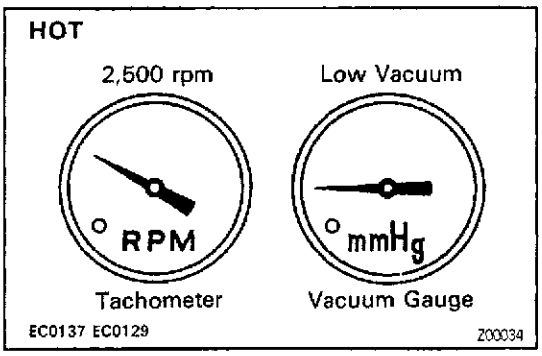


4. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 47° C (117°F)
(b) Check that the vacuum gauge indicates zero at 2,500 rpm



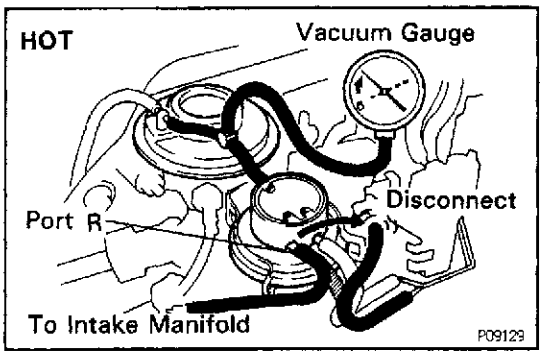
(c) Check that the EGR pipe is not hot



5. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine to above 53°C (1270 F)

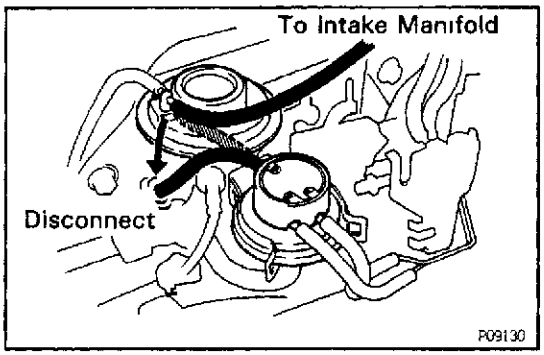
(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm



(c) Disconnect the vacuum hose port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose

(d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm

HINT As a large amount of exhaust gas enters, the engine will misfire slightly



6. REMOVE VACUUM GAUGE

Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations

7. INSPECT EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling

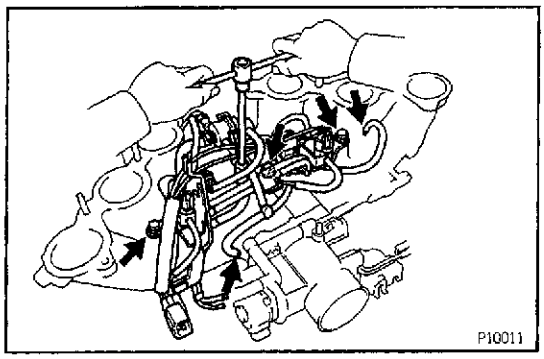
(b) Check that the engine runs rough or dies

(c) Reconnect the vacuum hoses to the proper locations

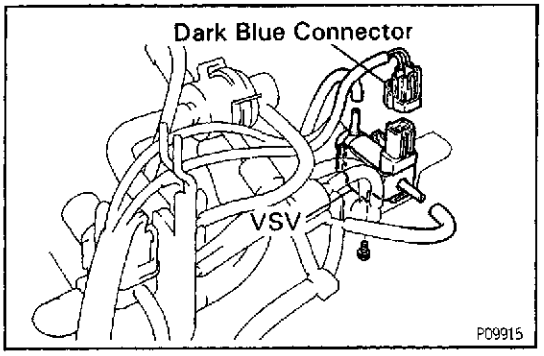
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART

VSV INSPECTION

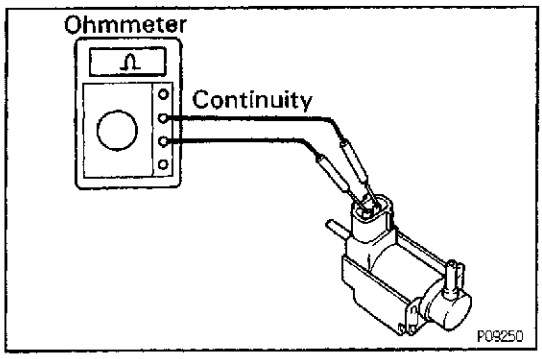
EG198-02



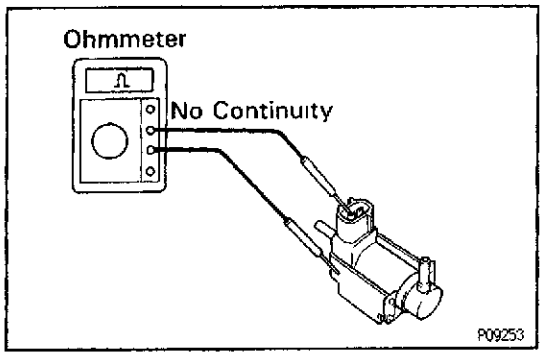
1. REMOVE AIR INTAKE CHAMBER
(SEE PAGES EG-269 AND 270)
2. REMOVE VSV
(a) Disconnect the air hose and vacuum hose from the air intake chamber
(b) Remove the 4 bolts and emission control valve set assembly



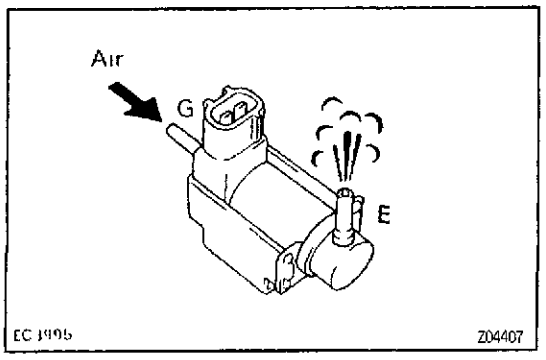
(c) Disconnect the connector and 2 vacuum hoses, and remove the screw and VSV



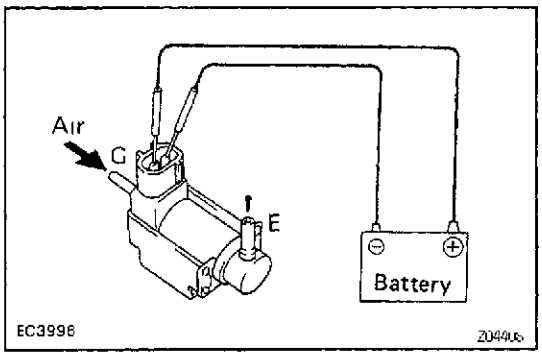
3. INSPECT VSV
A Inspect VSV for open circuit
Using an ohmmeter, check that there is continuity between the terminals
Resistance:
30 - 34 Ω at 20°C (68°F)
If there is no continuity, replace the VSV



B. 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

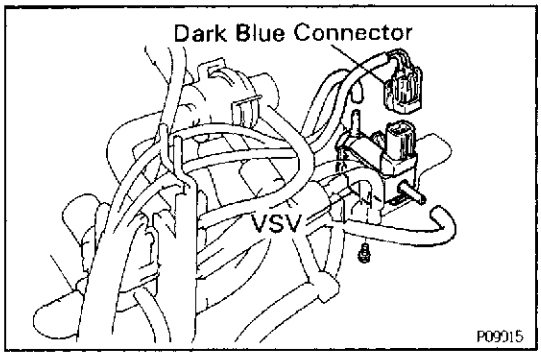


C. Inspect VSV operation
(a) Check that the air flows from pipe G to pipe E

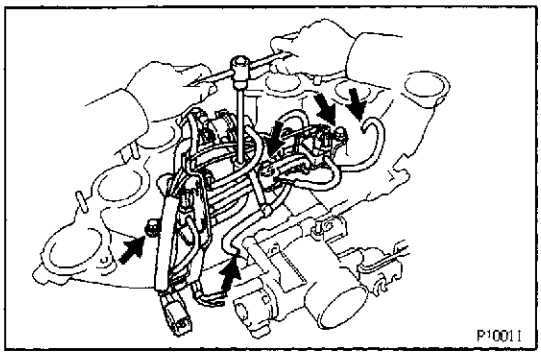


(b) Apply battery voltage across the terminals

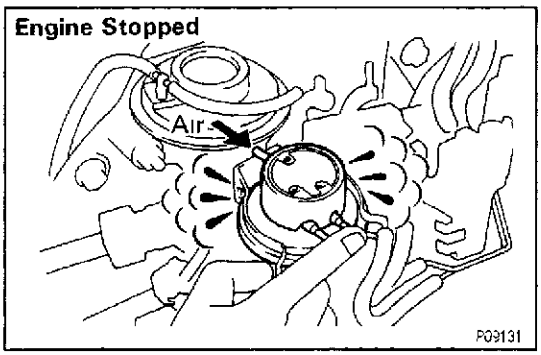
(c) Check that the air does not flows from pipe G to pipe E
If operation is not as specified, replace the VSV



4. REINSTALL VSV
(a) Install the VSV with the screws
(b) Connect the connector and 2 vacuum hoses to the VSV

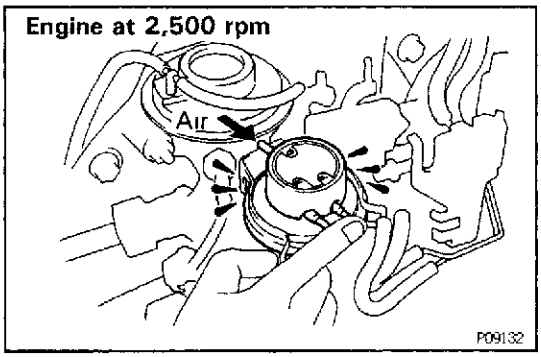


(c) Install the emission control valve set assembly with the 4 bolts
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)
(d) Connect the air hose and vacuum hose to the air intake chamber
5. REINSTALL AIR INTAKE CHAMBER
(See pages EG-276 **and 277)**



EGDEAQ
EGR VACUUM MODULATOR INSPECTION

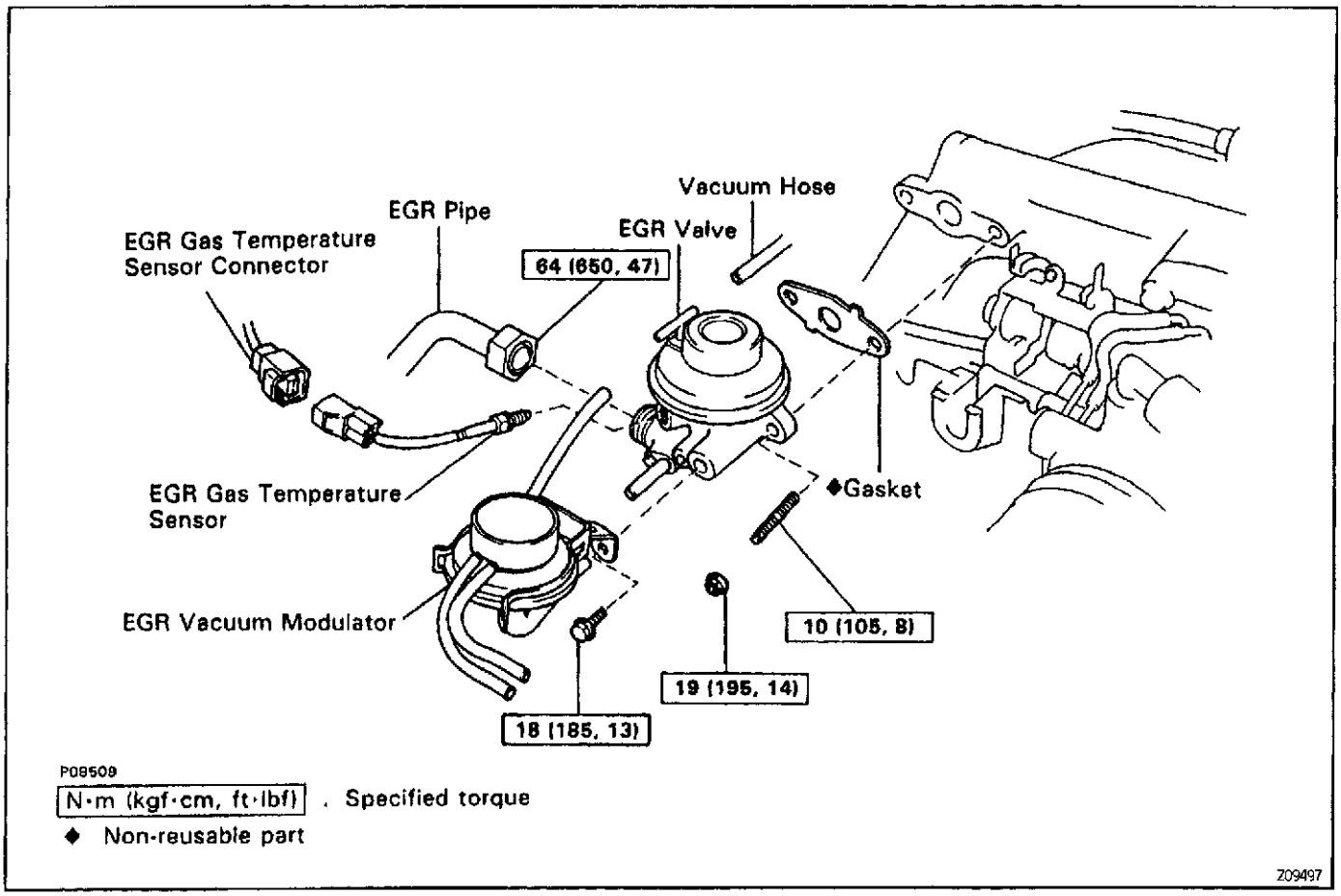
INSPECT EGR VACUUM MODULATOR OPERATION
(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator
(b) Block ports P and R with your finger
(c) Blow air into port Q, and check that the air passes through to the air filter side freely



(d) Start the engine, and maintain speed at 2,500 rpm
(e) 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
(f) Reconnect the vacuum hoses to the proper locations

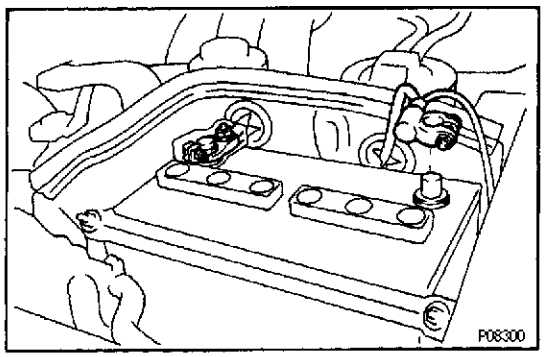
EG19Y-03

COMPONENTS FOR EGR VALVE REMOVAL AND INSTALLATION

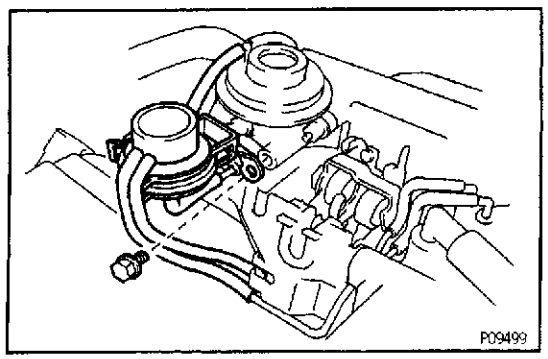


EG18A-02

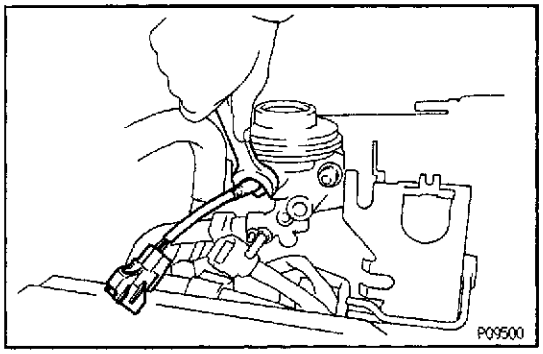
EGR VALVE INSPECTION



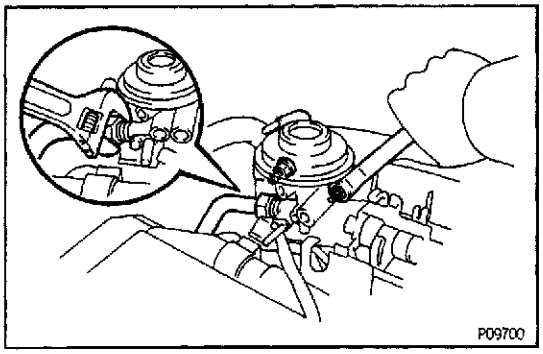
1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY



2. REMOVE EGR VACUUM MODULATOR



3. REMOVE EGR GAS TEMP. SENSOR

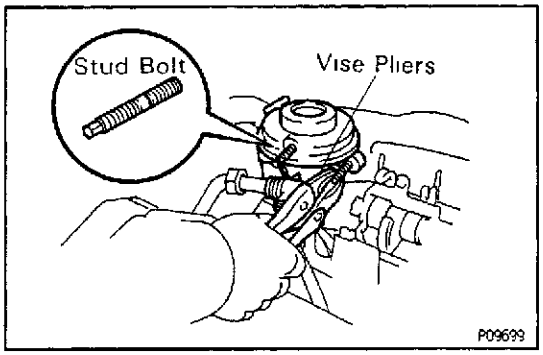


4. REMOVE EGR VALVE

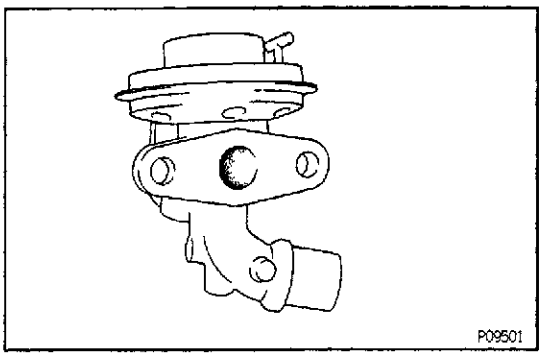
(a) Loosen the EGR pipe union nut

(b) Remove the 2 nuts holding the EGR valve to the air intake chamber

(c) Disconnect the vacuum hose from the EGR valve



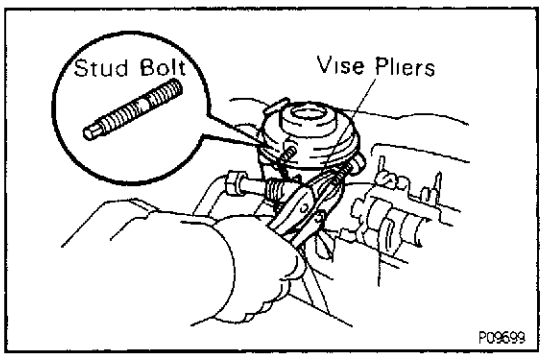
(d) Using vise pliers, remove the 2 stud bolts, EGR valve and gasket



5. INSPECT EGR VALVE

Check for sticking and heavy carbon deposits

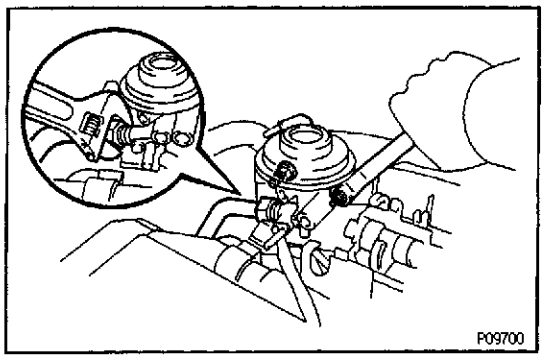
If a problem is found, replace the valve



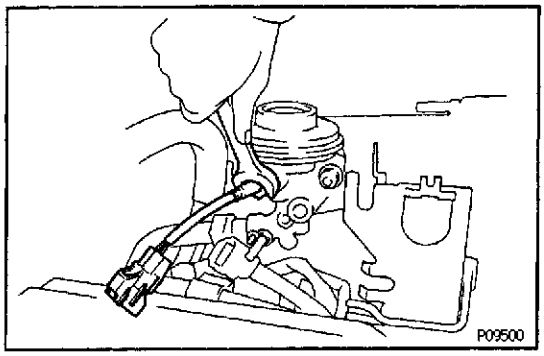
6. REINSTALL EGR VALVE

(a) Using vise pliers, temporarily install a new gasket, and EGR valve with the 2 stud bolts

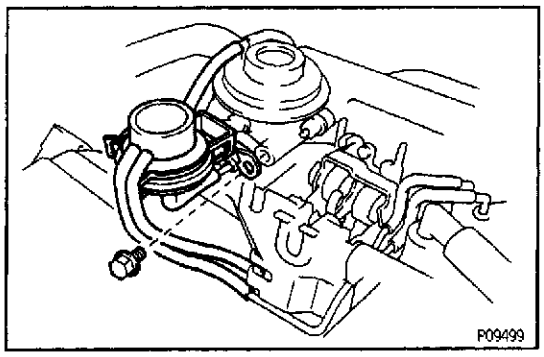
Torque: 10 N-m (105 kgf-cm, 8 ft-fbf)



(b) Connect the vacuum hose to the EGR valve
(c) Install the 2 nuts holding the EGR valve to the air intake chamber
Torque: 18 N-m (195 kgf cm. 14 ft-lbf)
(d) Tighten the union nut of the EGR pipe
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)



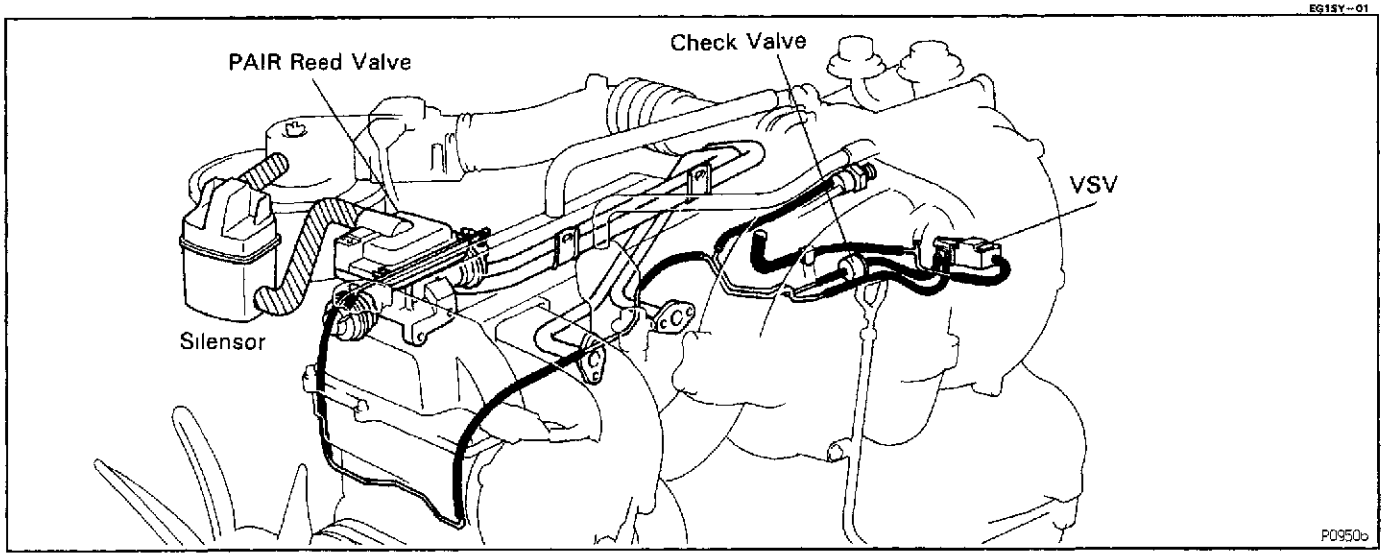
7. REINSTALL EGR GAS TEMP. SENSOR
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

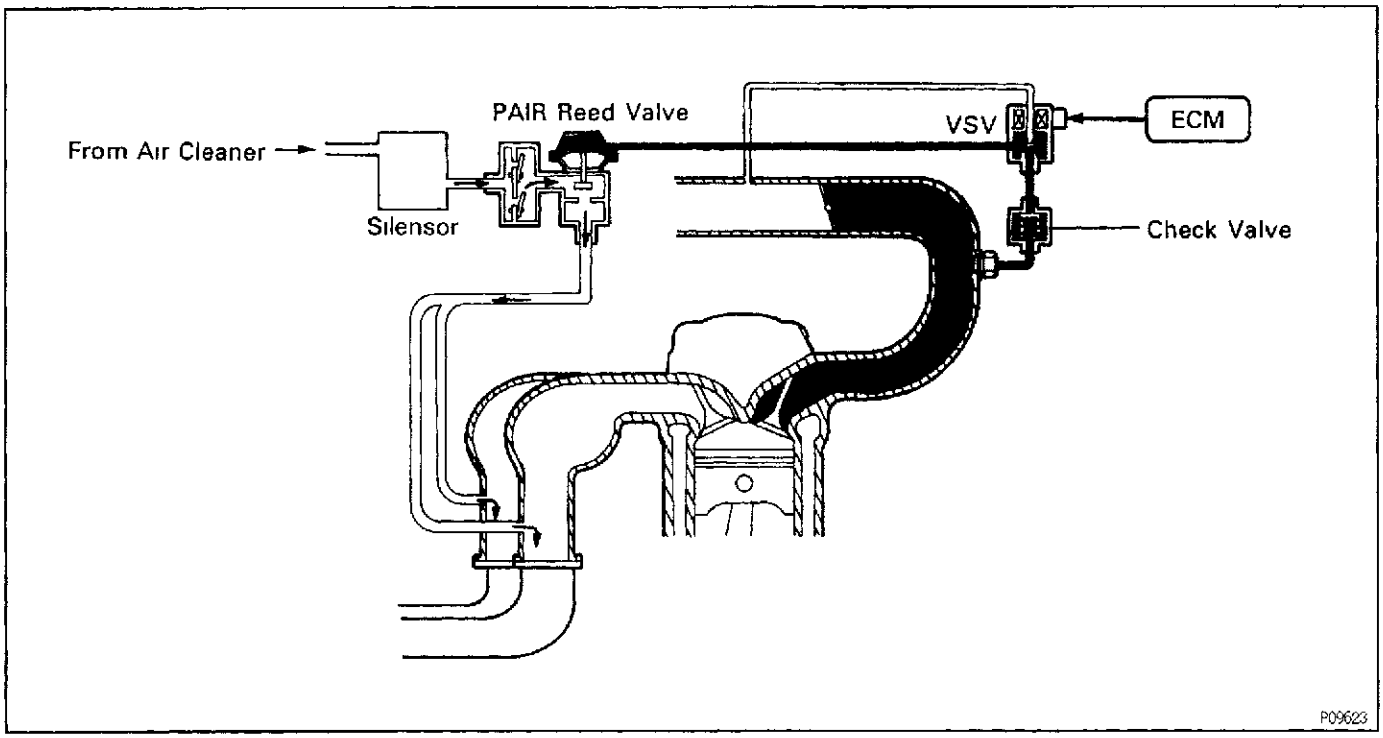


8. REINSTALL EGR VACUUM MODULATOR
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)

9. RECONNECT NEGATIVE TERMINAL CABLE TO BATTERY

PULSED SECONDARY AIR INJECTION (PAIR) SYSTEM



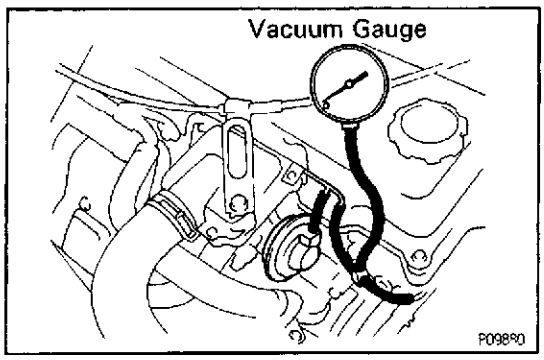


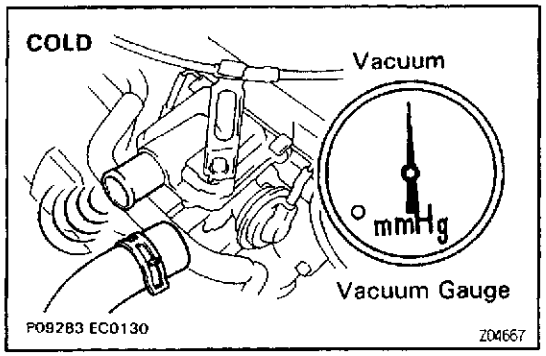
To reduce HC and CO emissions this system draws in air into exhaust ports to accelerate oxidation using vacuum generated by the exhaust pulsation in the exhaust manifold

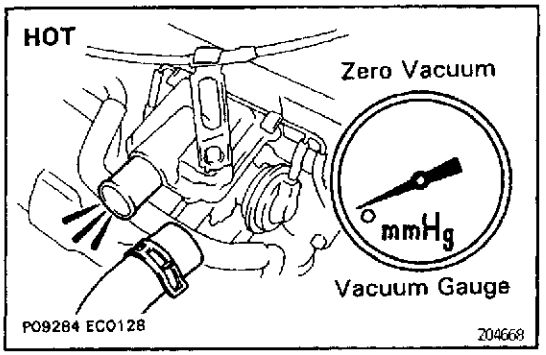
Condition	ECT	Throttle position	Vehicle speed	RPM	VSV	PAIR
Normal driving	Below 35°C (95°F)		—	Below 3 150 rpm	ON	ON
				Above 3 150 rpm	OFF	OFF
Deceleration	Above 35°C (95°F)	Idling	Below 15 km/h¿9 mph)	Below 1 200 (1 500) rpm	OFF	OFF
				Above 1 400 (1 700) rpm	ON	ON
			Above 15 km/h (9 mph)	—	ON	ON

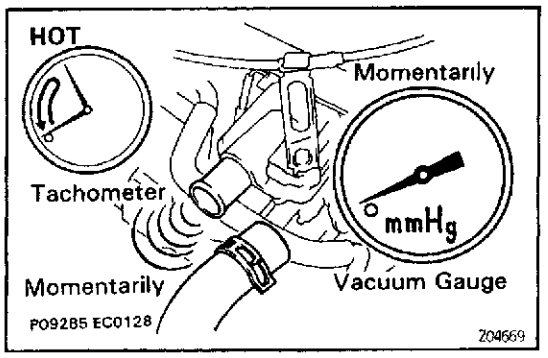
Remarks ( ) is A/C ON

v01993









EG16Z-01

PAIR SYSTEM INSPECTION

1. VISUALLY INSPECT HOSES AND PIPES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS

2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the reed valve and No 2 water by -pass pipe

3. INSPECT PAIR SYSTEM OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 35° C (95° F)

(b) Disconnect the No 2 air hose from the PAIR reed valve

(c) Start the engine

(d) Check that the vacuum gauge indicates vacuum at idle

(e) Check that a bubbling noise is heard from the PAIR reed valve

4. INSPECT PAIR SYSTEM OPERATION WITH HOT ENGINE

(a) Warm up the engine

(b) Check that the vacuum gauge indicates zero vacuum at idle

(c) With the engine idling, check that a bubbling noise is not heard from the PAIR reed valve

(d) Race the engine about 2,500 rpm and quickly close the throttle valve

(e) Check that the vacuum gauge indicates zero vacuum momentarily

(f) Check that a bubbling noise stops momentarily

(g) Reconnect the No 2 air hose to the PAIR reed valve

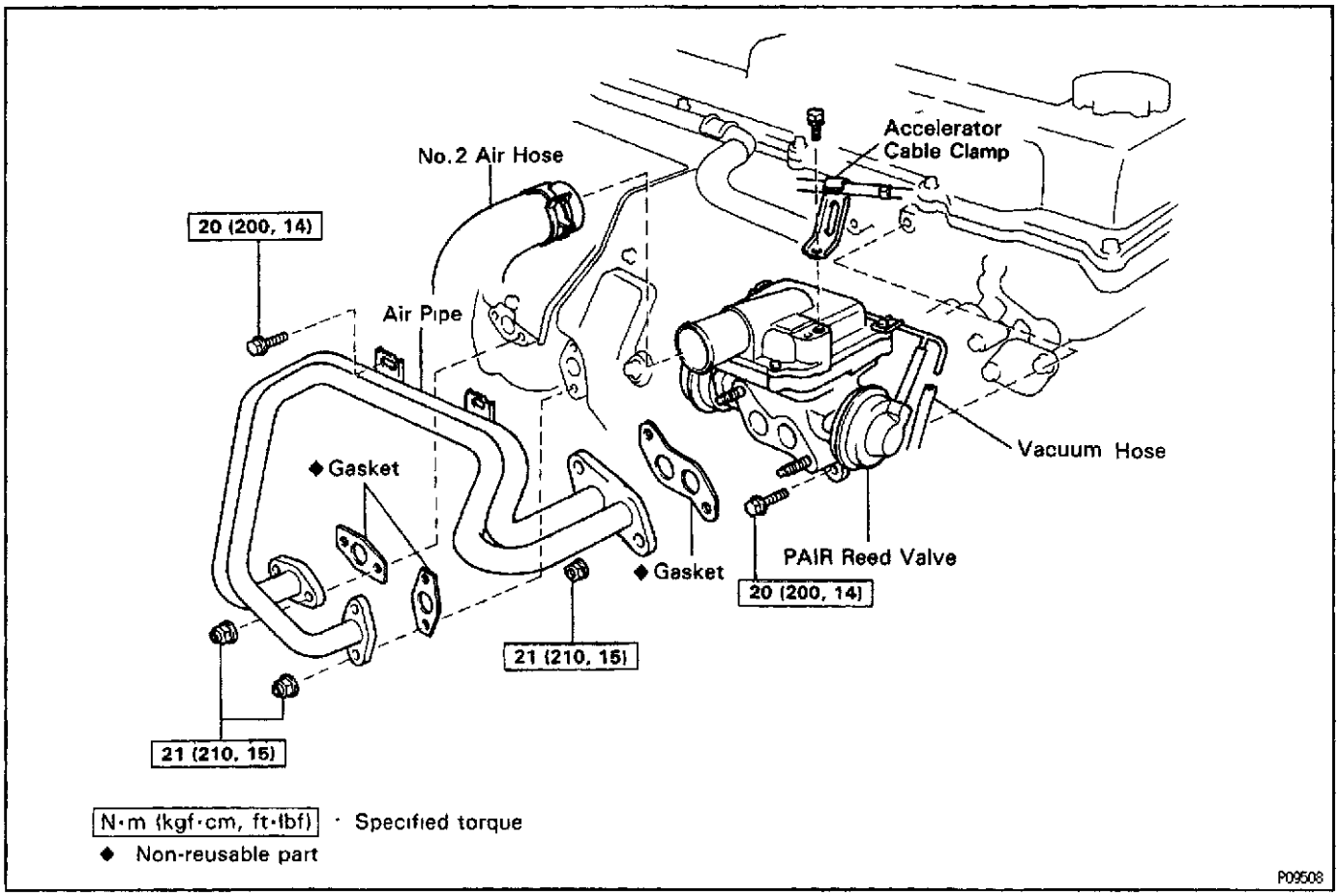
5. REMOVE VACUUM GAUGE

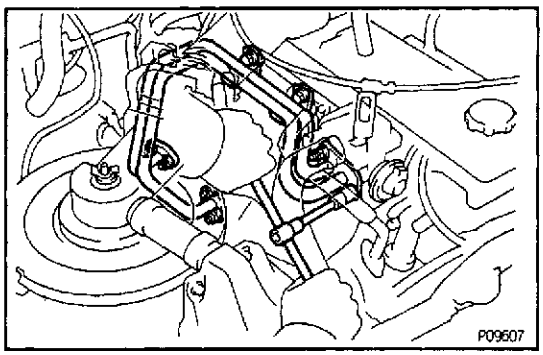
Remove the vacuum gauge, and reconnect the vacuum hose to the proper location

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART

COMPONENTS FOR PAIR REED VALVE REMOVAL AND INSTALLATION

EG1T0-01



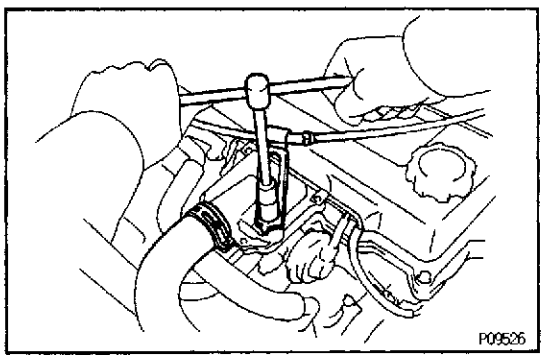


EG1T1-02

PAIR REED VALVE INSPECTION

1. REMOVE AIR PIPE

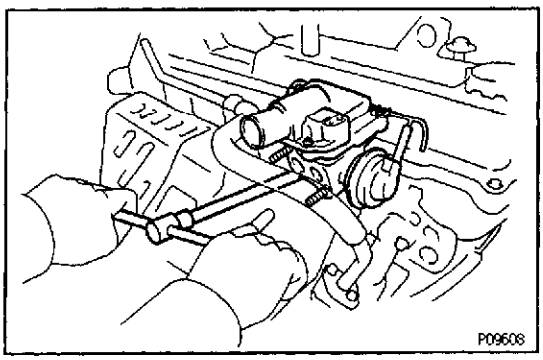
Remove the 2 bolts, 6 nuts, air pipe and 3 gaskets



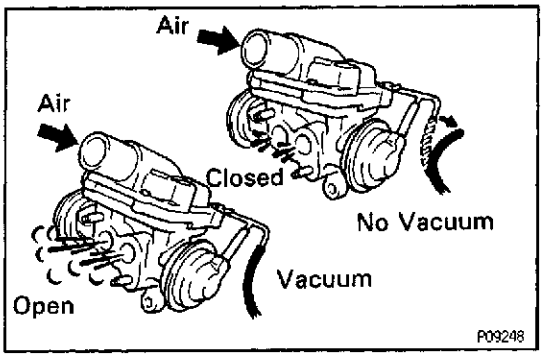
2. REMOVE PAIR REED VALVE

(a) Remove the bolt and disconnect accelerator cable clamp

(b) Disconnect the vacuum hose and No 2 air hose



(c) Remove the 2 bolts and PAIR reed valve



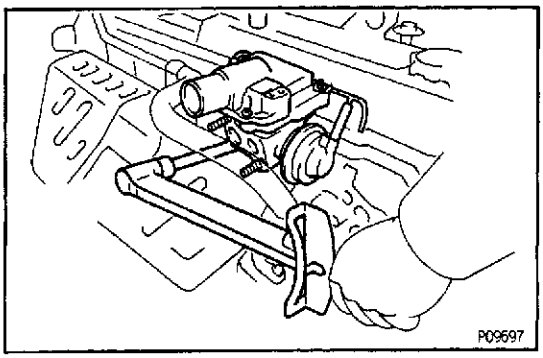
3. INSPECT PAIR REED VALVE

(a) Apply vacuum to the reed valve diaphragm

(b) Blow air into a pipe and check that the reed valve is open

(c) Release the vacuum and check that the reed valve is closed

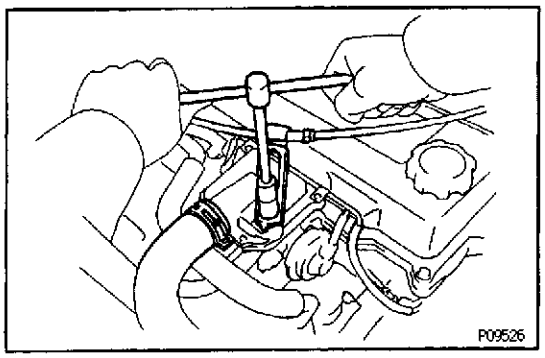
If operation is not as specified, replace the reed valve



4. REINSTALL PAIR REED VALVE

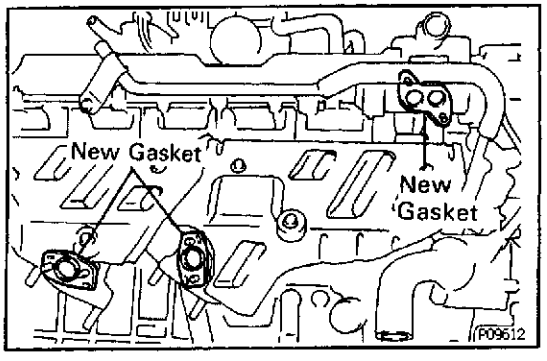
(a) Install the PAIR reed valve with the 2 bolts

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



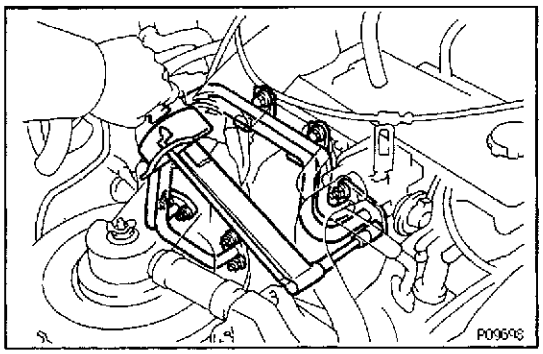
(b) Connect the No-2 air hose and vacuum hose

(c) Connect the accelerator cable clamp with the bolt

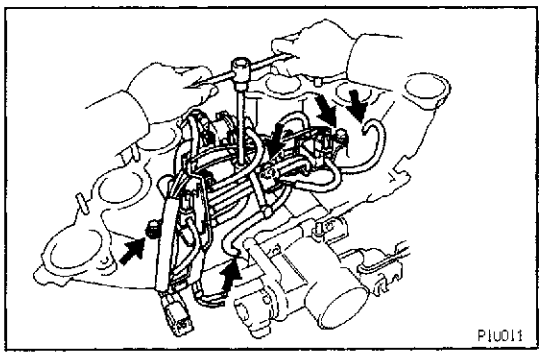


5. REINSTALL AIR PIPE

(a) Install 3 new gaskets on the exhaust manifolds and PAIR reed valve



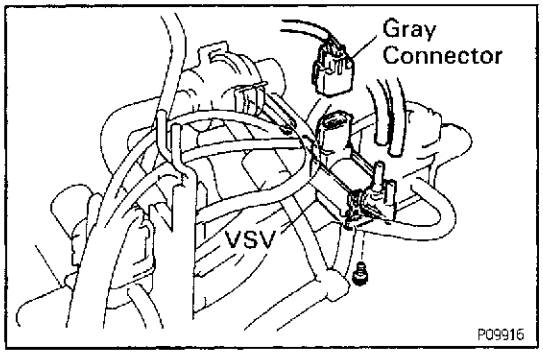
(b) Install the air pipe with the 2 bolts and 6 nuts
Torque:
20 N-m (200 kgf-cm, 14 ft-lbf) for Bolt
21 N-m (210 kgf-cm, 15 ft-lbf) for Nut



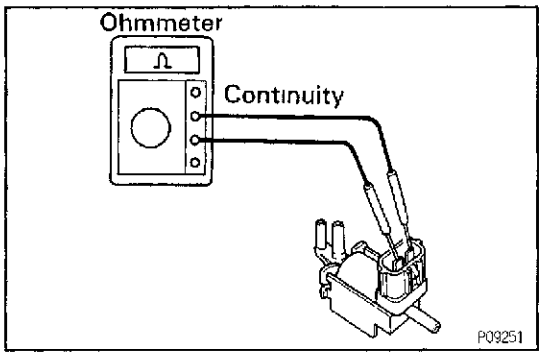
EG1T2-02

VSV INSPECTION

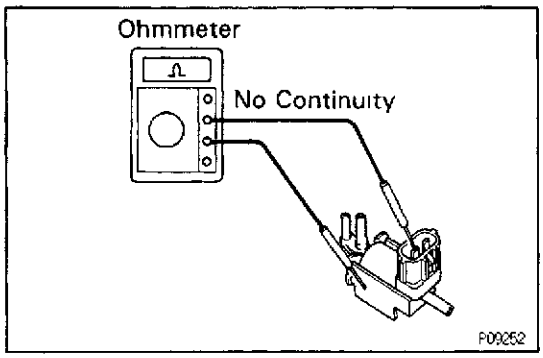
1. REMOVE AIR INTAKE CHAMBER
(See pages EG-269 **and 270)**
2. REMOVE VSV
(a) Disconnect the air hose and vacuum hose from the air intake chamber
(b) Remove the 4 bolts and emission control valve set assembly



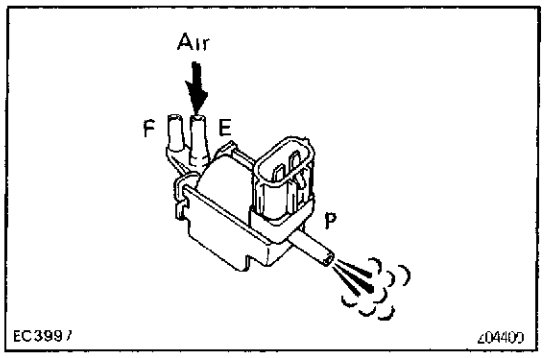
(c) Disconnect the connector and 3 vacuum hoses, and remove the screw and VSV



3. INSPECT VSV
A. 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

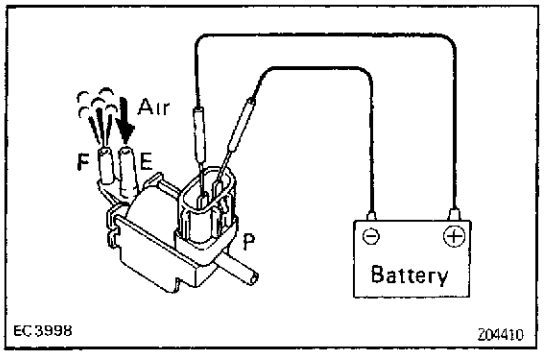


B. Inspect VSV for ground
Using an ohmmeter-, check that there is no continuity between each terminal and the body
If there is continuity, replace the VSV



C. Inspect VSV operation

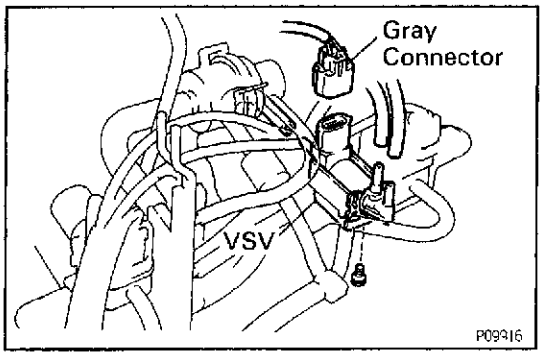
(a) Check that the air flows from pipe E to pipe P



(b) Apply battery voltage across the terminals

(c) Check that the air flows from pipe E to pipe F

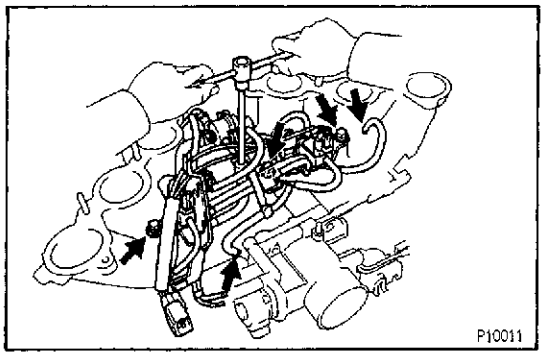
If operation is not as specified, replace the VSV



4. REINSTALL VSV

(a) Install the VSV with the screws

(b) Connect the connector and 3 vacuum hoses to the VSV

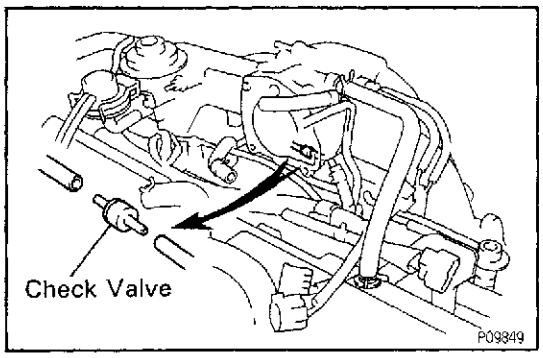


(c) Install the emission control valve set assembly with the 4 bolts

Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

(d) Connect the air- hose and vacuum hose to the air intake chamber

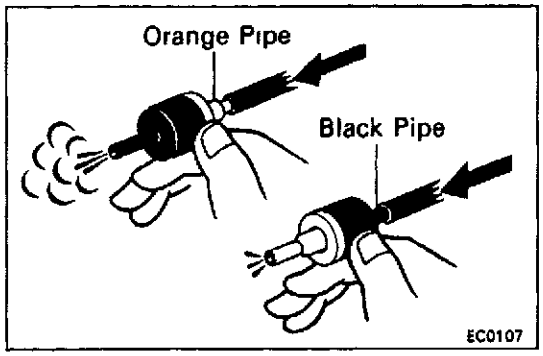
5. REINSTALL AIR INTAKE CHAMBER
(SEE PAGES EG-276 AND 277)



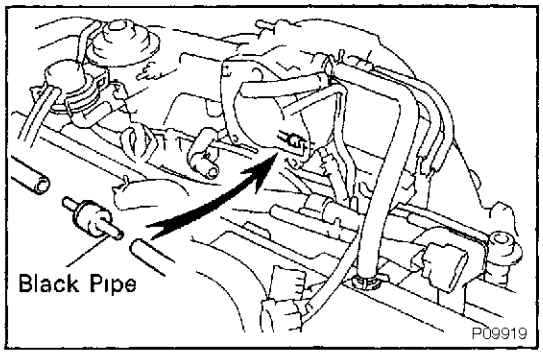
CHECK VALVE INSPECTION

EG1T3-01

1. REMOVE THROTTLE BODY
(See page EG-284 **)**
2. REMOVE CHECK VALVE



3. 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

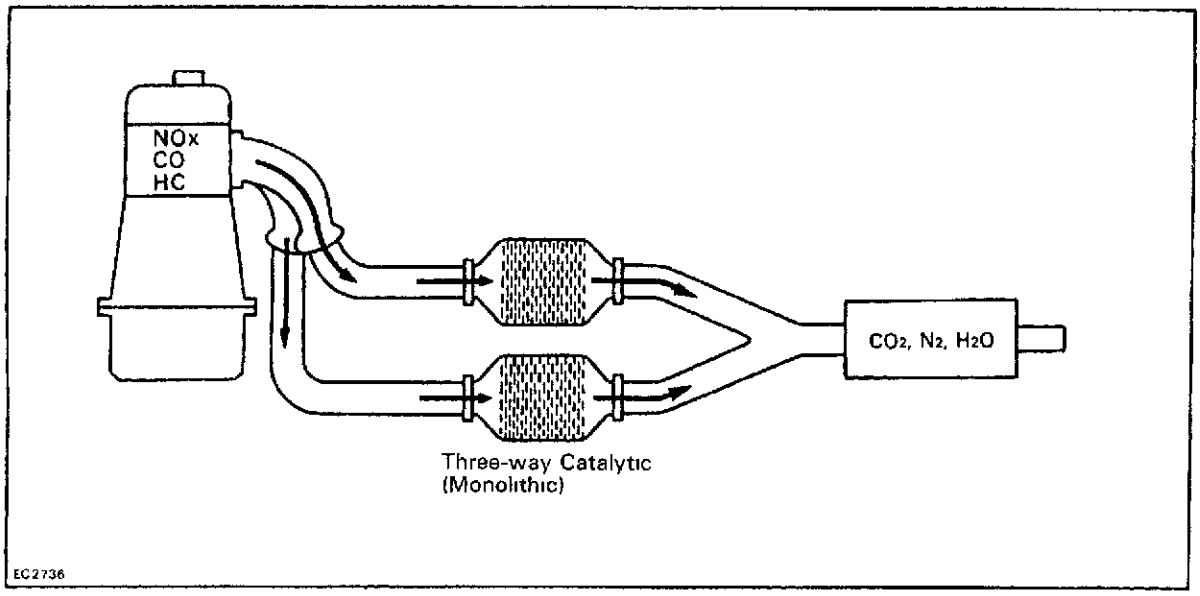


4. REINSTALL CHECK VALVE
HINT Reinstall the check valve with the black pipe facing the front of the vehicle

5. REINSTALL THROTTLE BODY
(SEE PAGE EG-287)

THREE-W AY CATALYTIC CONVERTER (TWC) SYSTEM

EG08T-07



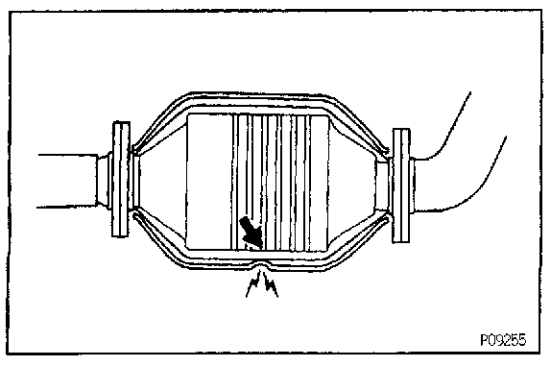
To reduce CO, HC and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

V01989

EXHAUST PIPE ASSEMBLY INSPECTION

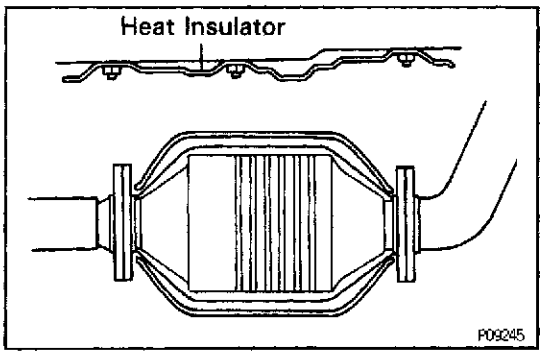
1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



THREE-W AY CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it touches the converter, repair or replace it



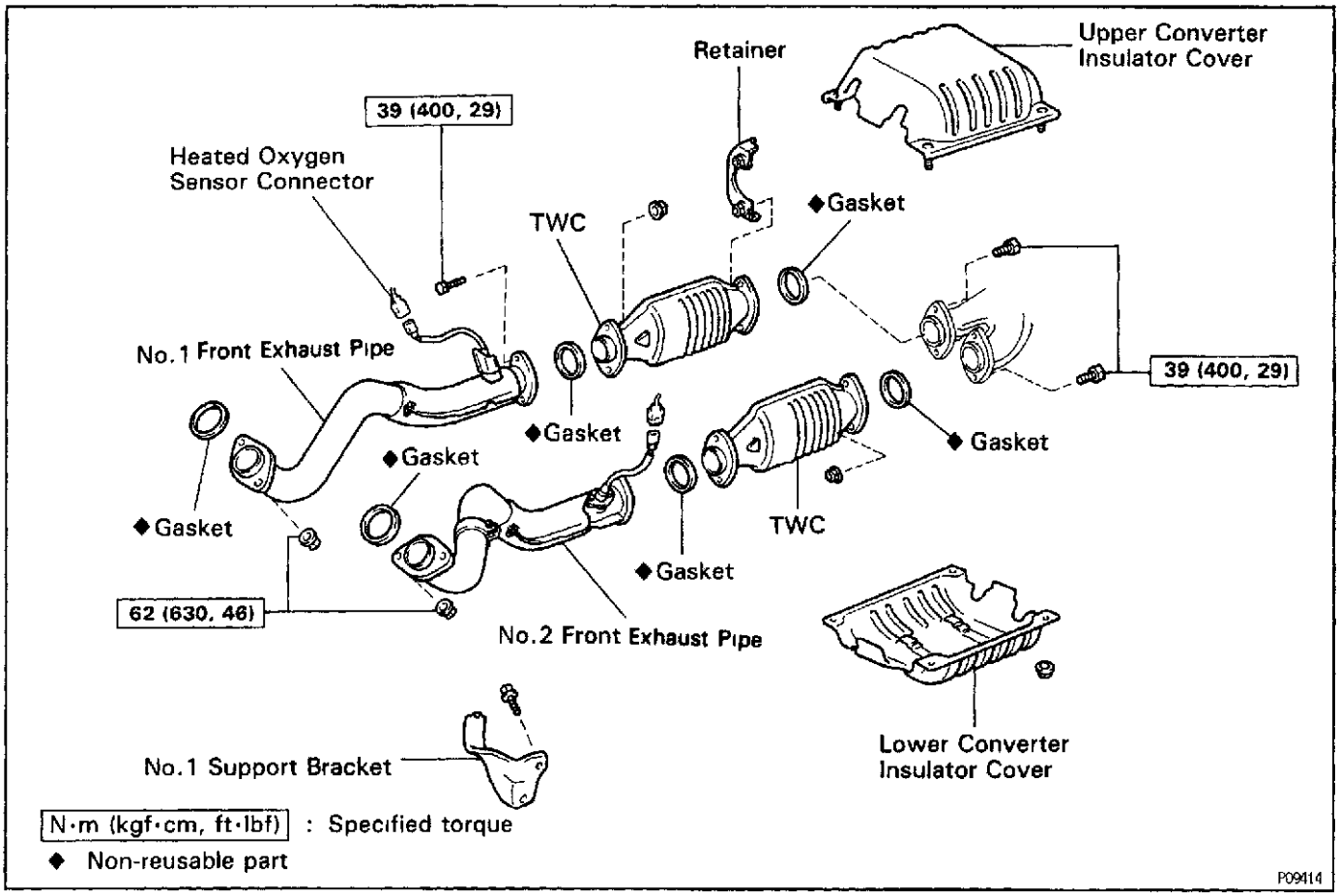
HEAT INSULATOR INSPECTION

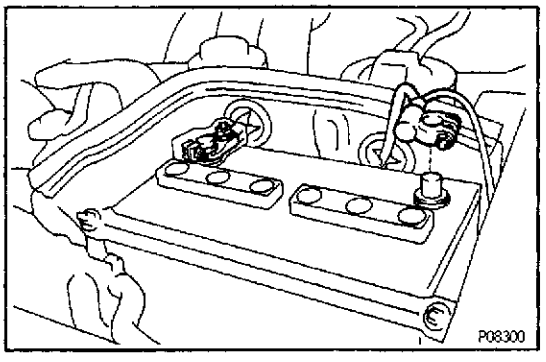
EG06G 03

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

COMPONENTS FOR THREE-WAY CATALYTIC CONVERTERS REMOVAL AND INSTALLATION

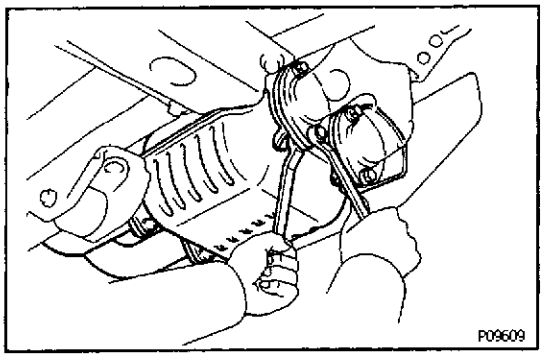
EG1T4 01





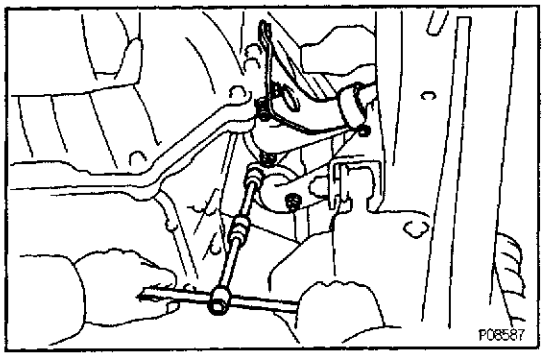
THREE-W AY CATALYTIC CONVERTERS REPLACEMENT

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY
2. DISCONNECT HEATED OXYGEN SENSOR CONNECTERS



3. REMOVE FRONT EXHAUST PIPE ASSEMBLY

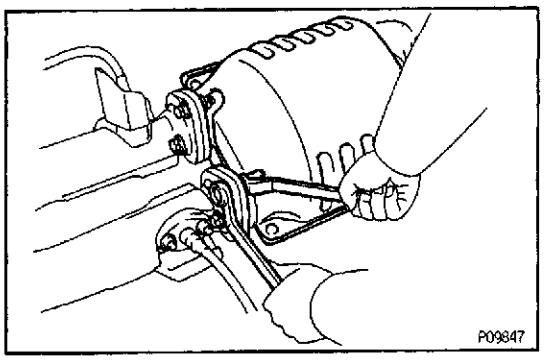
(a) Remove the 4 bolts, 2 nuts and retainer holding the front No 3 front exhaust pipe to the converters



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

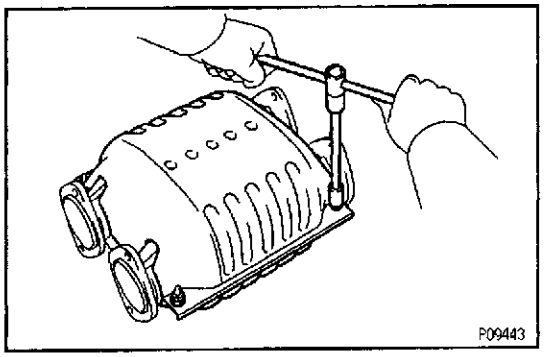
(c) Remove the 2 bolts and No 1 support bracket

(d) Remove the 4 nuts, front exhaust pipe assembly and 4 gaskets

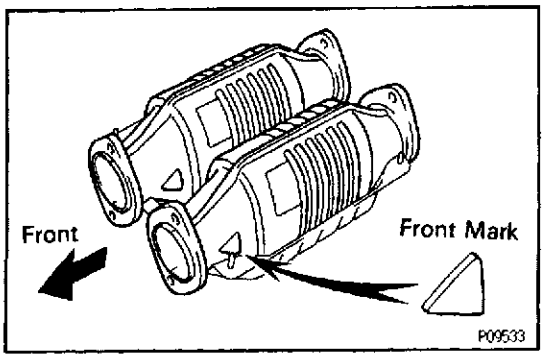


4. REMOVE CONVERTERS (TWC)

(a) Remove the 4 bolts, nuts, 2 front exhaust pipes and gaskets

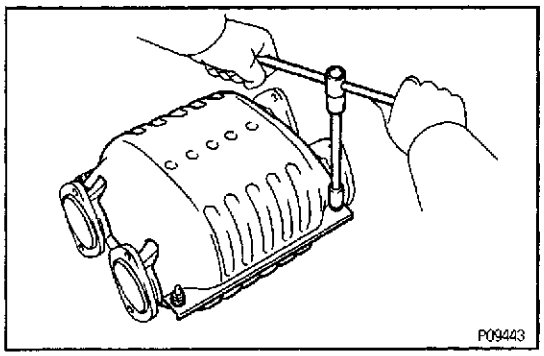


(b) Remove the 4 nuts, 2 insulator covers and TWCs

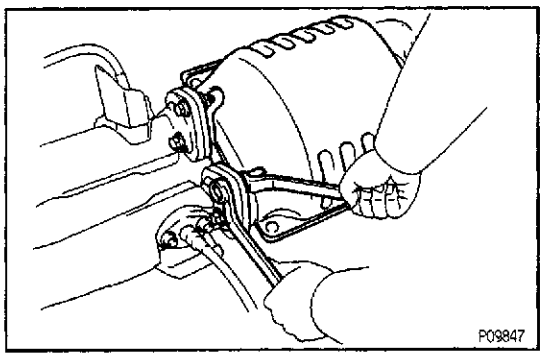


5. REINSTALL CONVERTERS (TWC)

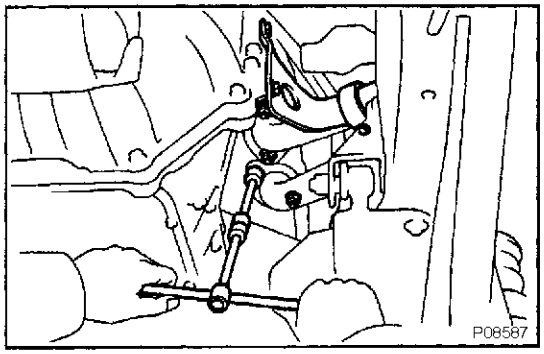
(a) Place TWCs on the upper converter insulator cover, with the front mark of the TWC facing forward



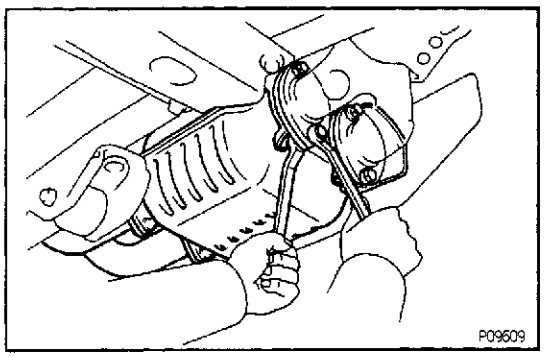
(b) Install the lower converter insulator cover with the 4 nuts
Torque: 11 N-m (110 kgf-cm, 8 ft-lbf)



(c) Install 2 new gaskets and the front exhaust pipes with the 4 bolts and nuts
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



6. REINSTALL FRONT EXHAUST PIPE ASSEMBLY
(a) Install 2 new gaskets and the front exhaust pipe assembly with the 4 nuts
Torque: 62 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 N-m (195 kgf-cm, 14 ft-lbf)



(d) Connect 2 new gaskets and the front exhaust pipe assembly to the No 3 front exhaust pipe with the 4 bolts, 2 nuts and retainer.
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

7. RECONNECT HEATED OXYGEN SENSOR CONNECTORS
8. RECONNECT NEGATIVE TERMINAL CABLE TO BATTERY

SERVICE SPECIFICATIONS

EG05P-05

SERVICE DATA

VSV for EVAP	Resistance	30 - 33 et 20° C (68° -F)
VSV for EGR	Resistance	30 - 34 et 20° C (68° -F)
VSV for PAIR	Resistance	37 - 44 at 20° C (68° -F)

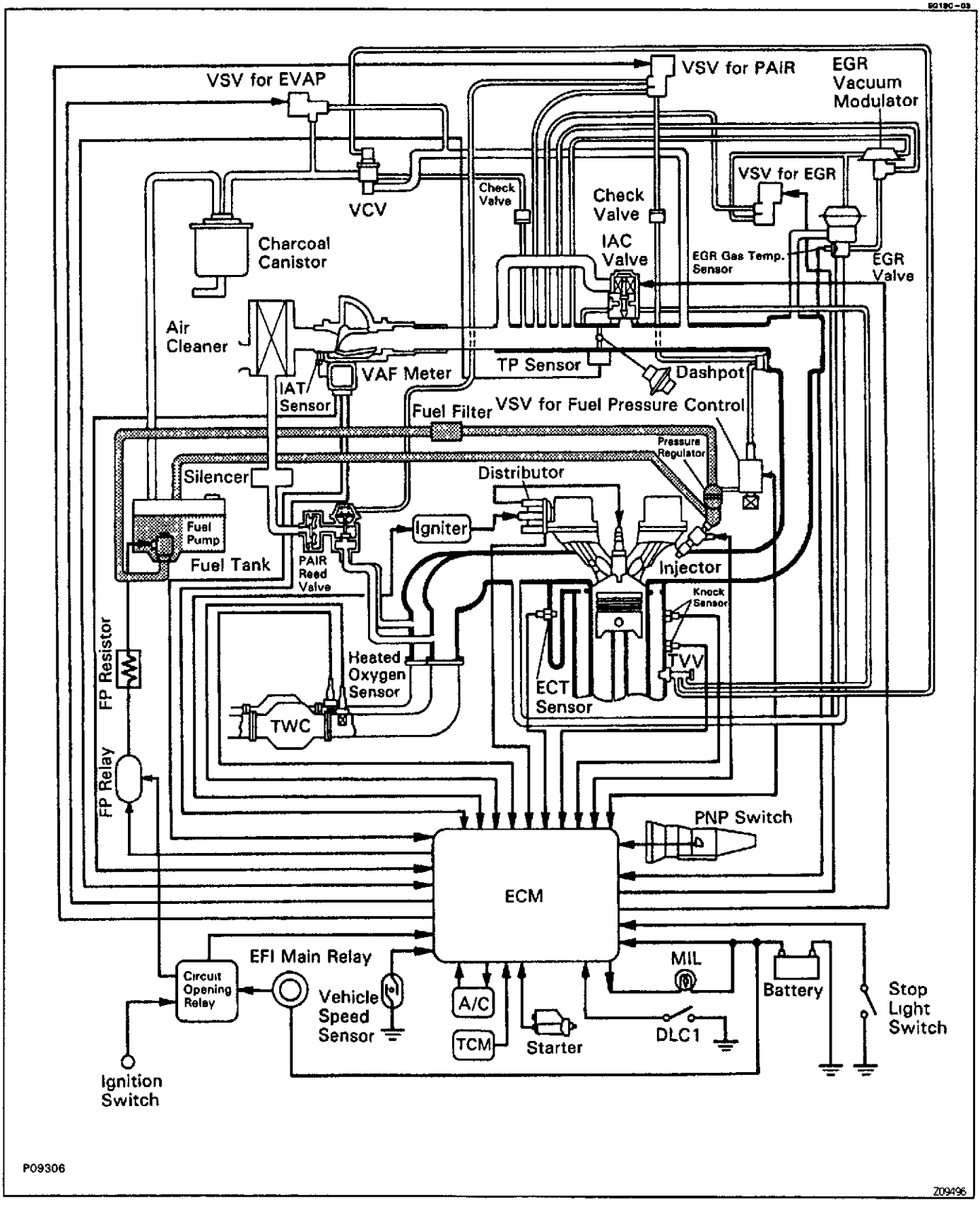
TORQUE SPECIFICATIONS

EG06Q-05

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**
EGR valve x Air intake chamber for stud bolt	**10**	105	**8**
EGR valve x Air intake chamber for nut	**19**	195	**14**
EGR valve x EGR pipe	**64**	650	**47**
EGR valve x EGR gas temp sensor	**20**	200	**14**
EGR valve x EGR vacuum modulator	**18**	185	**13**
PAIR reed valve x Cylinder head	**20**	200	**14**
Air pipe x PAIR reed valve	**21**	210	**15**
Air pipe x No 1 exhaust manifold	**21**	210	**15**
Air pipe x No 2 exhaust manifold	**21**	210	**15**
Air pipe x Cylinder head	**20**	200	**14**
Converter insulator cover x TWC	**11**	110	**8**
No 1 front exhaust pipe x TWC	**39**	400	**29**
No 2 front exhaust pipe x TWC	**39**	400	**29**
No 1 front exhaust pipe x No 1 exhaust manifold	**62**	630	**46**
No 2 front exhaust pipe x No 2 exhaust manifold	**62**	630	**46**
No 1 support bracket x Transmission	**24**	240	**17**
No 1 support bracket x Clamp bolt	**19**	195	**14**
TWC x No 3 front exhaust pipe	**39**	400	**29**

SFI SYSTEM

DESCRIPTION



The SFI (Sequential Multiport Fuel Injection) system is composed of three basic sub-systems
Fuel, Air Induction and Electronic Control Systems

FUEL SYSTEM

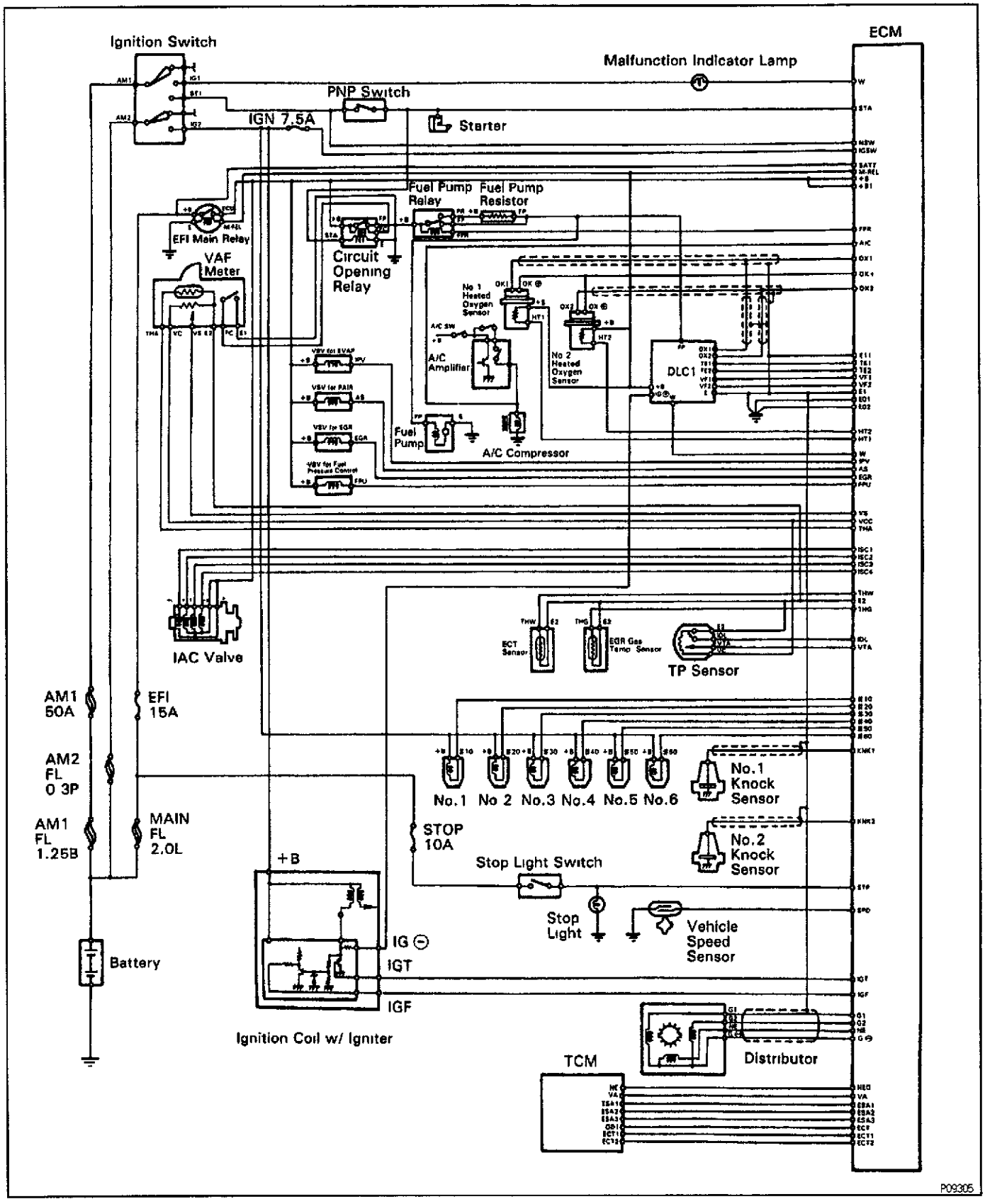
Fuel is supplied under constant pressure to the SFI injectors by an electric fuel pump The injectors inject a metered quantity of fuel into the intake port in accordance with signals from the ECM (Engine Control Module)

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation
ELECTRONIC CONTROL SYSTEM
The 1 FZ-FE engine is equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the SFI, ESA, IAC diagnosis systems etc by means of a Engine Control Module (ECM)-formerly SFI computer) employing a microcomputer
The ECM controls the following functions are controlled
1. Sequential Multiport Fuel Injection (SFI)
The ECM receives signals from various sensors indicating changing engine operation conditions such as
Intake air volume
Intake air temperature (IAT)
Engine coolant temperature (ECT)
Engine speed (RPM)
Accleration / deceleration
Exhaust oxygen content etc
The signals are utilized by the ECM to determine the injection duration necessary for an optimum air-fuel ratio
2. Electronic Spark Advance (ESA)
The ECM is programmed with data for optimum ignition timing under all operating conditions Using data provided by sensors which monitor various engine functions (engine speed (RPM), engine coolant temperature (ECT), etc), the microcomputer (ECM) triggers the spark at precisely the right instant
3. Idle Air Control (IAC)
The ECM is programmed with target idling speed values to respond to different engine conditions (engine coolant temperature (ECT), air conditioning (A/C) ON/OFF, etc) Sensors transmit signals to the ECM which controls the flow of air through the bypass of the throttle valve and adjust idle speed to the target value
4. Diagnosis
The ECM detects any malfunctions and abnormalties in the sensor network and lights a malfunction indicator lamp (MIL) in the combination meter At the same time, trouble is identified and a diagnostic trouble code (DTC) is recorded by the ECM The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp (MIL) when terminals TE1 and E 1 are connected The diagnostic trouble codes are referred to in a later page
(See Diagnostic Trouble Code Chatr in EG-223)
5. Fail-Safe Function
In the event of the sensor malfunction, a back-up circuit will take over to provide minimal drivability, and the malfunction indicator lamp will illuminate

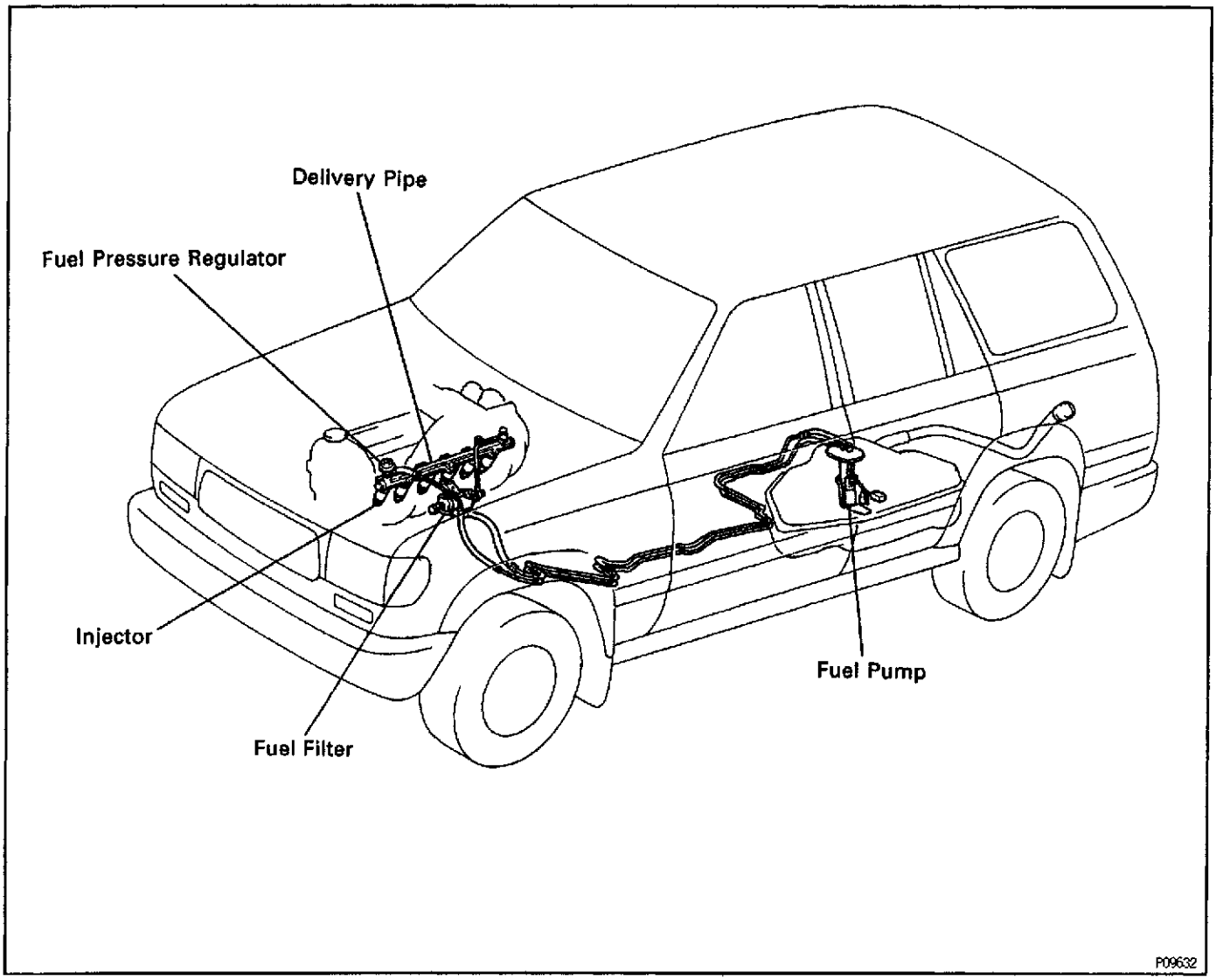
SYSTEM CIRCUIT

EG0C7-05



OPERATION

FUEL SYSTEM

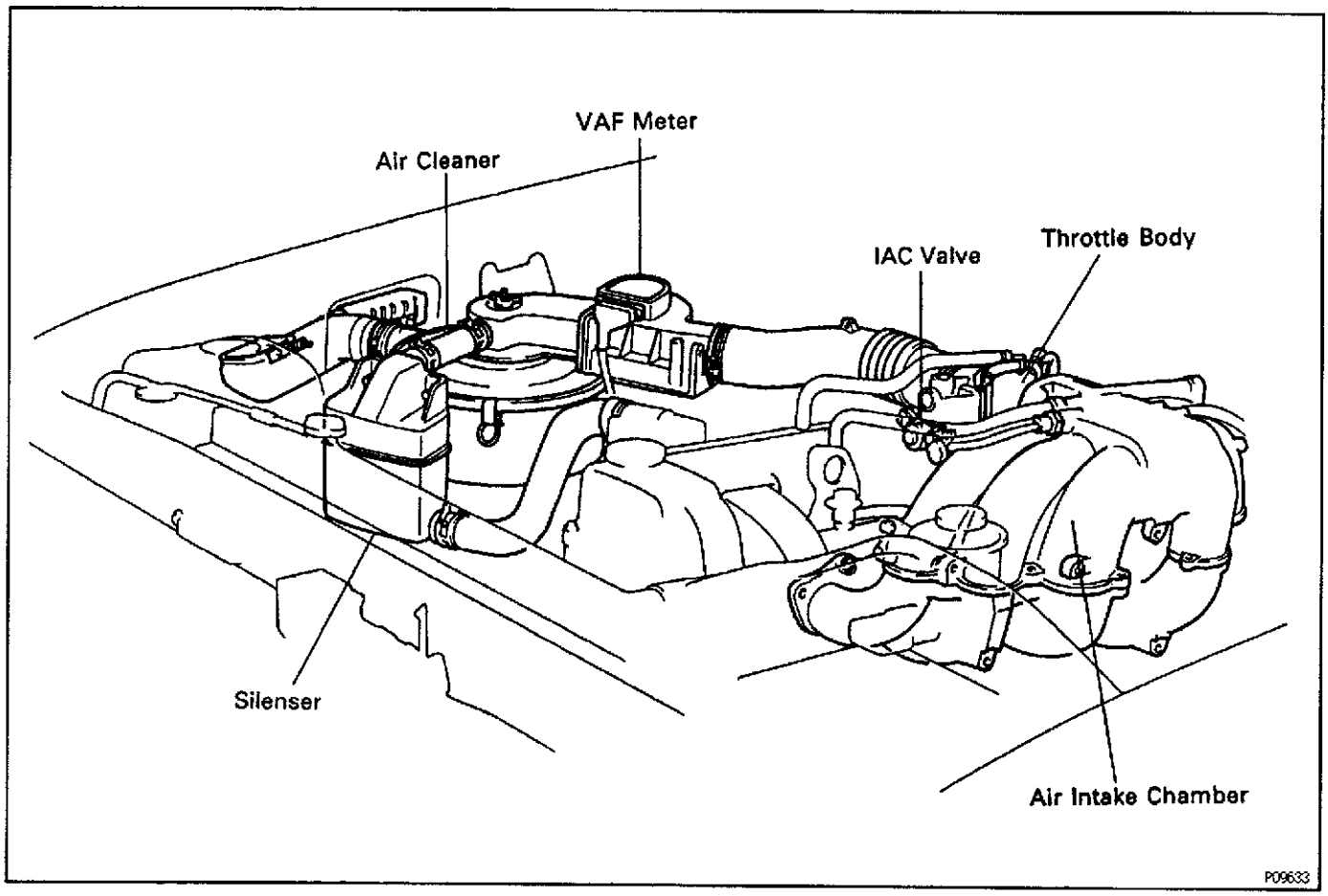


Fuel pumped up by the fuel pump, flows through the fuel filter and is distributed to each injector at a set pressure maintained by the fuel pressure regulator

The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2 9 kgf/cm^2, 41 psi) higher than the pressure inside the intake manifold, and excess fuel is returned to the fuel tank through the return hose and pipe

The injectors operate on input of injection signals from the ECM and inject fuel into the intake manifold

AIR INDUCTION SYSTEM



Air is filtered through the air cleaner and passes through the volume air flow (VAF) meter and the amount flowing to air intake chamber is determined according to the throttle valve opening in the throttle body and the engine speed

The VAF meter measures the intake air flow by the opening of the measuring plate in response to the volume of intake air to the engine

Located in the throttle body is the throttle valve, which regulates the volume of intake air to the engine

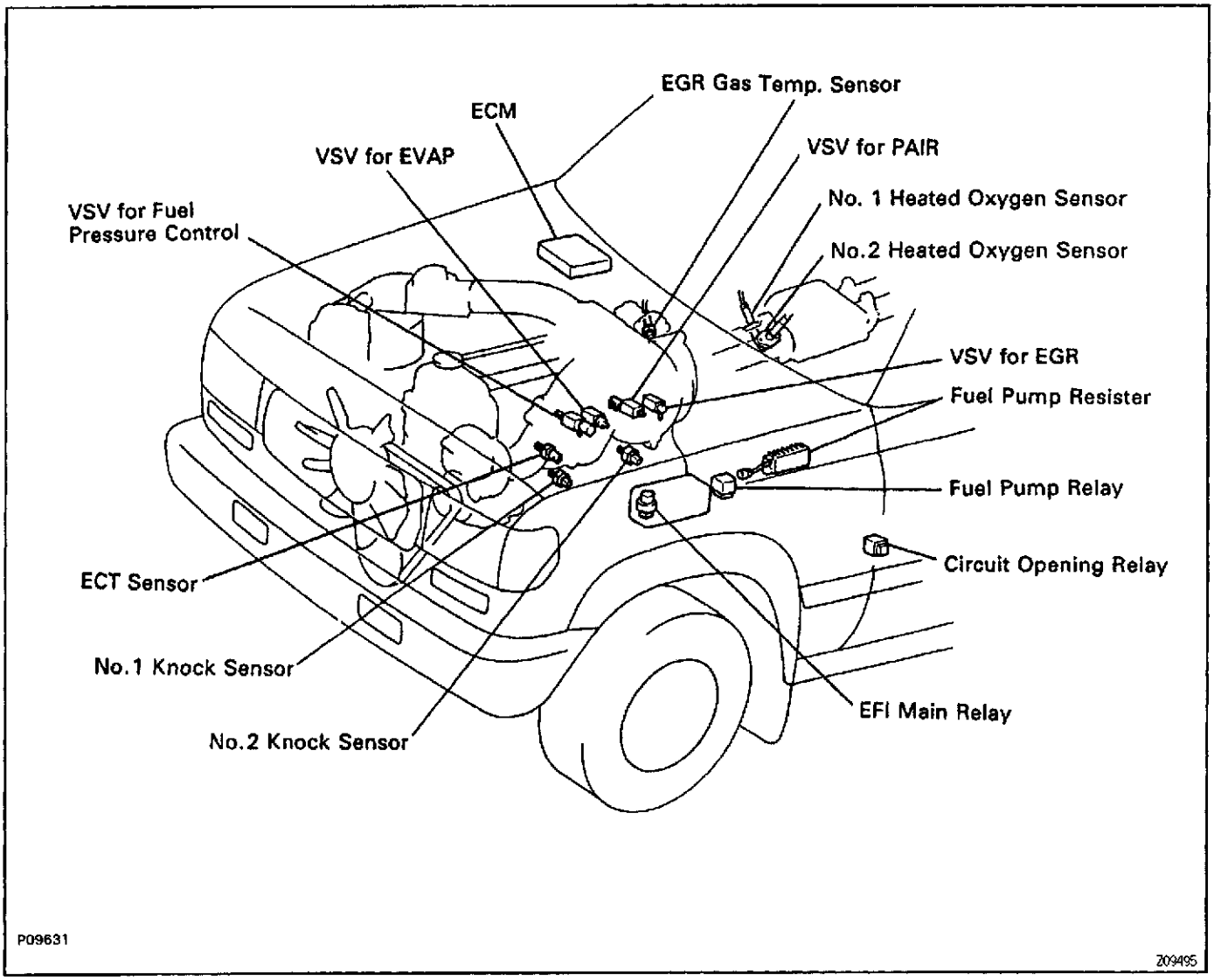
Intake air controlled by the throttle valve opening is distributed from the air intake chamber to the manifold of each cylinder and is drawn into the combustion chamber

At low temperatures the idle air control (IAC) valve opens and the air flows through the IAC valve and the throttle body, into the air intake chamber During engine warming up, even if the throttle valve is completely closed, air flows to the air intake chamber, thereby increasing the idle speed (first idle operation)

The air intake chamber prevents pulsation of the intake air, reduces the influence on the VAF meter and increases the accuracy of the measurement of the intake air volume It also prevents intake air interference in each cylinder

ELECTRONIC CONTROL SYSTEM

EGOCE-OP



The control system consists of sensors which detect various engine conditions, and a ECM which determines the injection volume (timing) based on the signals from the sensors

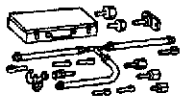
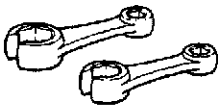
The various sensors detect the intake air volume, engine speed (RPM), oxygen density in the exhaust gas, engine coolant temperature (ECT), intake air temperature (IAT) and atmospheric pressure etc and convert the information into an electrical signal which is sent to the ECM Based on these signals, the ECM calculates the optimum ignition timing for the current conditions and operates the injectors

The ECM not only controls the fuel injection timing, but also the self diagnostic function which records the occurrence of a malfunction, ignition timing control, idle air control (IAC), fuel pressure control, fuel pump control, knock control and EGR control

PREPARATION

SST (SPECIAL SERVICE TOOLS)

E00CF-07

	09268-41045 Injection Measuring Tool Set (09268-52010) Injection Measuring Attachment (90405-09015) No 1 union	
	09268-45012 EFI Fuel Pressure Gauge	
	09631-22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816-30010 Oil Pressure Switch Socket	Knock sensor
	09842-30070 Wiring F EFI Inspection	
	09843-18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

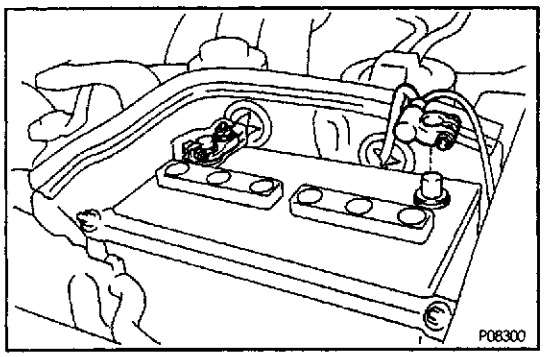
E00CG-07

	09082-00050 TOYOTA Electrical Tester Set	
	09200-00010 Engine Adjust Kit	
	09256-00030 Hose Plug set	Plug for vacuum hose fuel hose etc

EGOCH-01

EQUIPMEMT

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Soft brush	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	



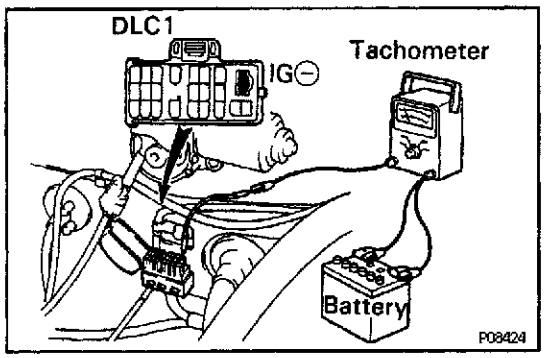
PRECAUTION

1. Before working on the fuel system, disconnect negative (-) terminal cable from the battery.
HINT Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed
Therefore, if necessary, read the diagnosis before removing the terminal
2. Do not smoke or work near an open flame when working on the fuel system.
3. Keep gasoline away from rubber or leather parts.

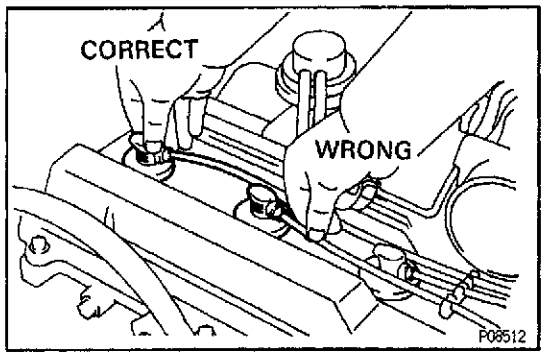
MAINTENANCE PRECAUTIONS

EG11U-06

1. CHECK CORRECT ENGINE TUNE-UP
(See page EG-1 1)



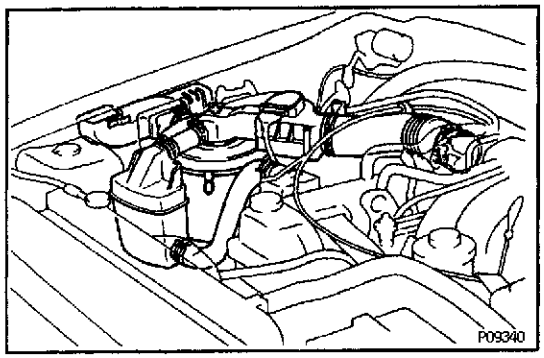
2. PRECAUTION WHEN CONNECTING GAUGE
(a) Use battery as the power source for the timing light, tachometer, etc
(b) Connect the tester probe of a tachometer to the terminal IG(-) of DLC1



3. IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN
(a) Check proper connection of battery terminals, etc
(b) Handle high-tension cords carefully
(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water
4. PRECAUTIONS WHEN HANDLING HEATED OXYGEN SENSORS
(a) Do not allow oxygen sensor to drop or hit against an object
(b) Do not allow the sensor to come into contact with water

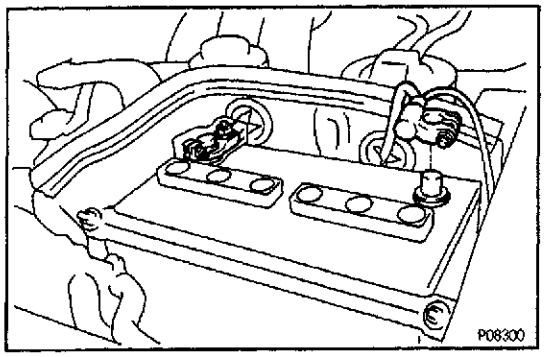
IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

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



AIR INDUCTION SYSTEM

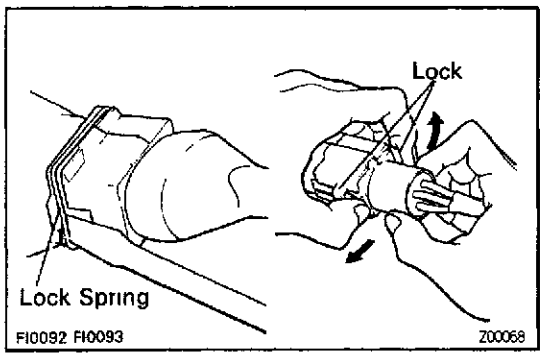
1 Separation of the engine oil dipstick, oil filler cap, PCV hose, etc may cause the engine to run out of tune
2 Disconnection, looseness or cracks in the parts of the air induction system between the VAF meter and cylinder head will allow air scution and cause the engine to run out of tune



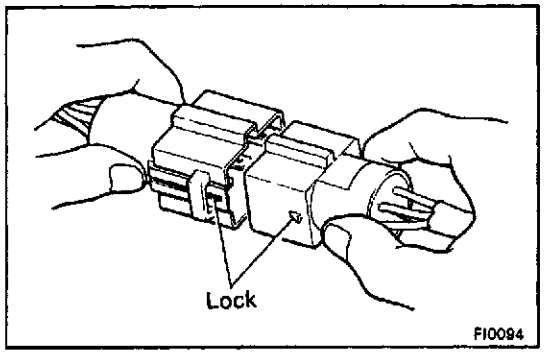
ELECTRONIC CONTROL SYSTEM

1 Before removing SFI wiring connectors, terminals, etc , first disconnect the power by either turning the ignition switch to LOCK or disconnecting the battery terminals
HINT Always check the diagnostic trouble code before disconnecting the battery terminal

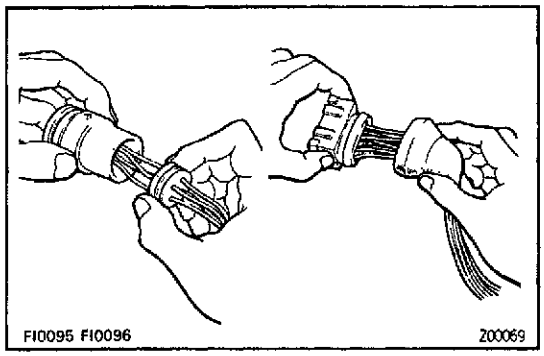
2 When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (-) cables
3 Do not permit parts to receive a severe impact during removal or installation Handle all SFI parts carefully, especially the ECM
4 Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles
5 Do not open the ECM cover
6 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
7 Parts should be replaced as an assembly



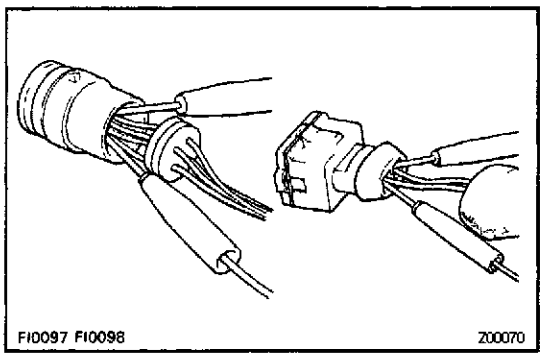
8 Care is required when pulling out and inserting wiring connectors
(a) Release the lock and pull out the connector, pulling on the connectors



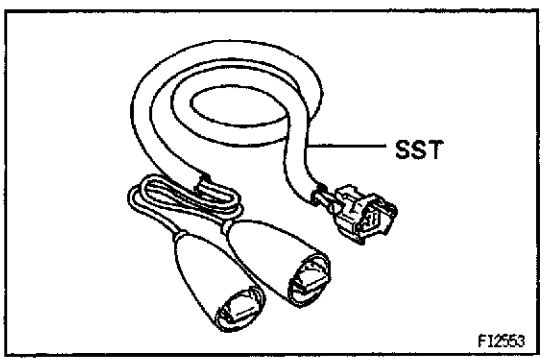
(b) Fully insert the connector and check that it is locked



9 When inspecting a connector with a volt/ohmmeter
(a) Carefully take out the water-proofing rubber if it is water-proof type connector



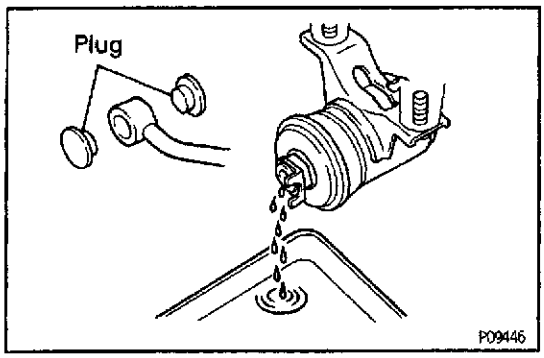
(b) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage
(c) Do not apply unnecessary force to the terminal
(d) After checking, install the water-proofing rubber on the connector securely



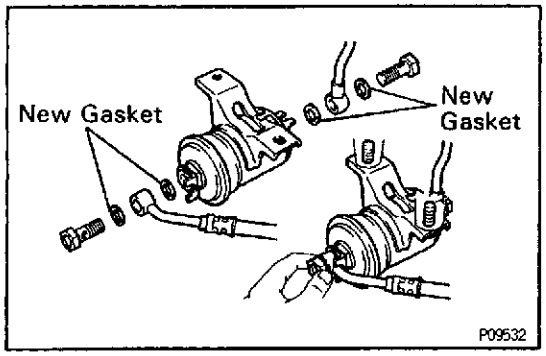
10 Use SST for inspection or test of the injector or its wiring connector
SST 09842-30070

FUEL SYSTEM

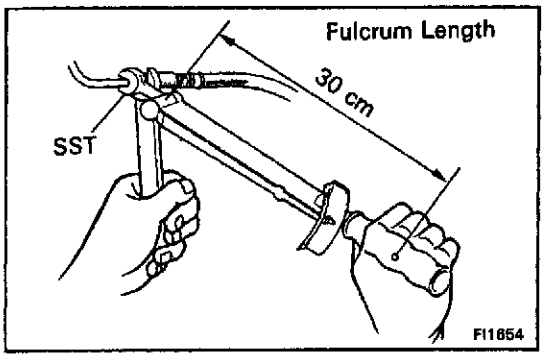
1 When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe the following procedures
(a) Put a container under the connection
(b) Slowly loosen the connection
(c) Disconnect the connection
(d) Plug the connection with a rubber plug



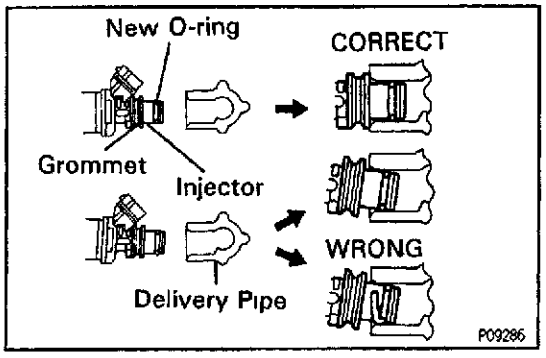
2 When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures
Union Bolt Type
(a) Always use a new gasket
(b) Tighten the union bolt by hand
(c) Tighten the union bolt to the specefied torque
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)



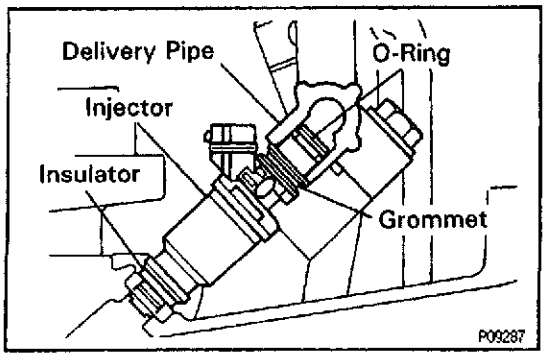
Flare Nut Type
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand
(b) Using SST, tighten the flare nut to the specified torque
SST 09631 -22020
Torque: 30 N-m (370 kgf-cm, 22 ft-lbf)
HINT Use a torque wrench with a fulcrum length of 30 cm (11 81 in)

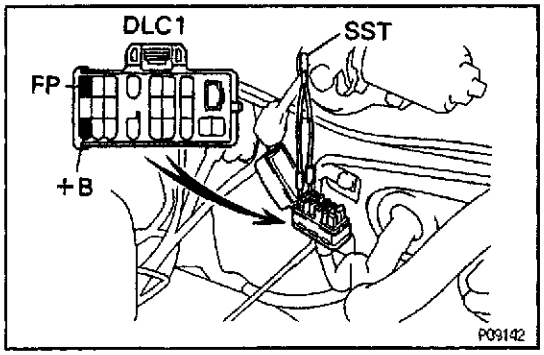


3 Observe the following precautions when removing and installing the injectors
(a) Never reuse the O-ring
(b) When placing a new O-ring on the injector, take care not to damage it in any way
(c) Coat a new O-ring with spindle oil or gasoline before installing-never use engine, gear or brake oil

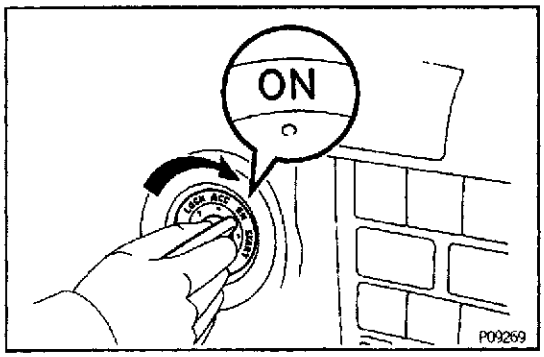


4 Install the injector to the delivery pipe and intake manifold as shown in the illustration

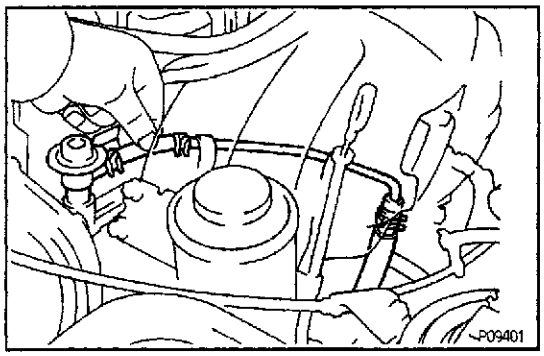




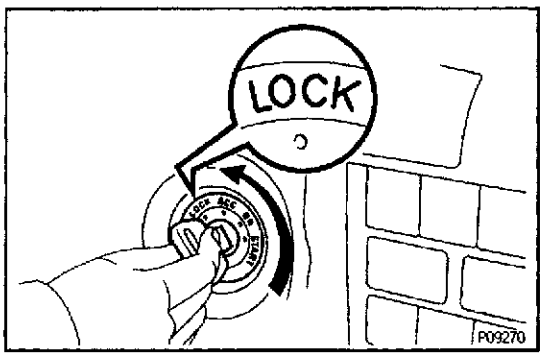
5 Check that there are no fuel leaks after performing maintenance anywhere on the fuel system
(a) Using SST, connect terminals +B and FP of the DLC 1
SST 09843-18020



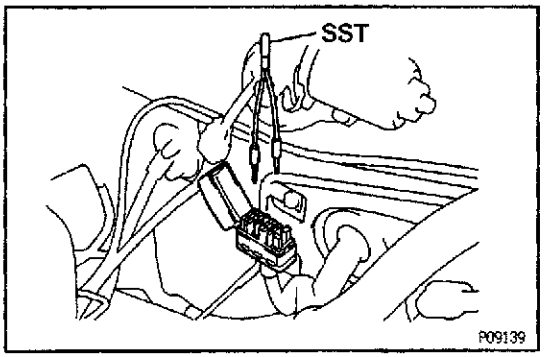
(b) Turn the ignition switch ON
NOTICE: Do not start the engine.



(c) Pinch the fuel return hose The pressure in 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.



(d) Turn the ignition switch to LOCK



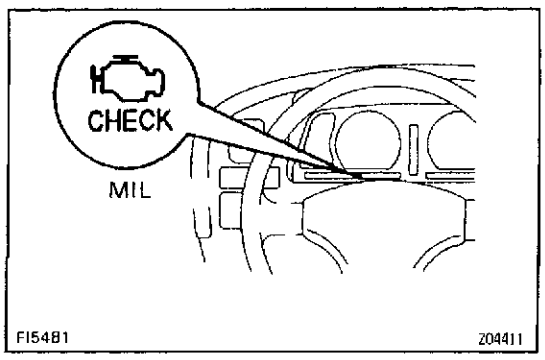
(e) Remove SST from the DLC1
SST 09843-18020

DIAGNOSIS SYSTEM

EG11Z 07

DESCRIPTION

The ECM contains a built-in, self-diagnosis system by which troubles with the engine signal network are detected and a malfunction indicator lamp on the combination meter lights up
By analyzing various signals as shown in the later table (See page EG-223) the ECM detects system malfunctions relating to the sensors or actuators
The self-diagnosis system has 2 modes, a normal mode and a test mode
If a malfunction is detected when in the normal mode, the ECM lights up the malfunction indicator lamp to inform the driver of the occurrence of a malfunction (For some codes the light does not come on) The light goes off automatically when the malfunction has been repaired But the diagnostic trouble code(s) remains stored in the ECM memory The ECM stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch to LOCK
The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the DLC1 are connected When 2 or more codes are indicated, the lowest number (code) will appear first
If a malfunction is detected when in the test mode, the ECM lights up the malfunction indicator lamp to inform the technician of the occurrence of a malfunction (except for code Nos 43, 51 and 53) In this case, TE2 and E1 terminals on the DLC1 should be connected as shown later (See page EG-220)
In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch is to LOCK (except code Nos 43, 51 and 53) This also applies in the normal mode The diagnostic mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE1, TE2 and E1 terminals on the DLC1, as shown later
A test mode function has been added to the functions of the self-diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode This function fills up the self-diagnosis system The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later (See page EG-220)



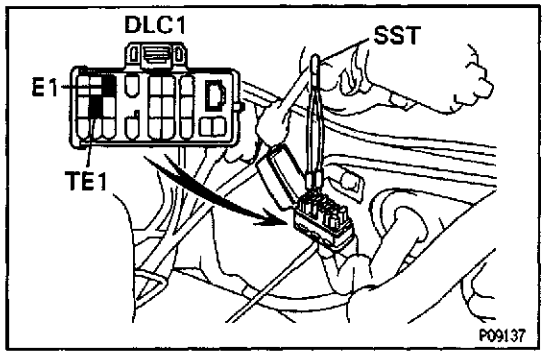
EG2 0Q

MALFUNCTION INDICATOR LAMP (MIL)

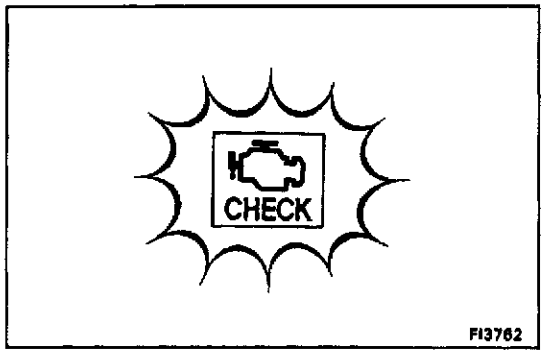
1 The malfunction indicator lamp will come on when the ignition switch is placed at ON and the engine is not running
2 When the engine is started, the malfunction indicator lamp should go off
If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system

DIAGNOSTIC TROUBLE CODES OUTPUT
Normal Mode

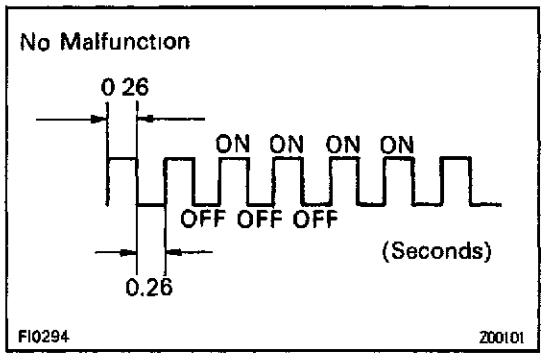
To obtain an output of diagnostic trouble codes, proceed as follows
1 Initial conditions
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed (throttle position sensor IDL points closed)
(c) Transmission in neutral position
(d) Accessories switched OFF
(e) Engine at normal operating temperature
2 Turn the ignition switch ON Do not start the engine



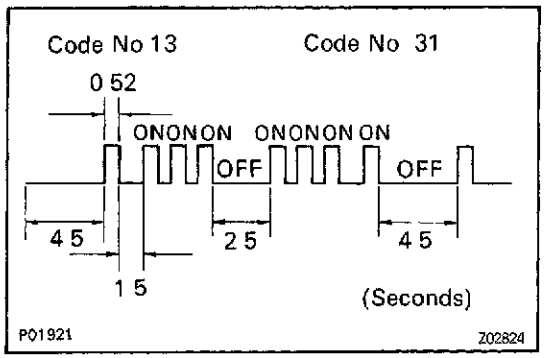
3 Using SST, connect terminals TE1 and E1 of the DLC 1
SST 09843-18020



4 Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp



Diagnostic Trouble Codes (See page EG-223)
(a) Normal System Operation (no malfunction)
- The light will alternately blink ON and OFF at 0 26 seconds intervals

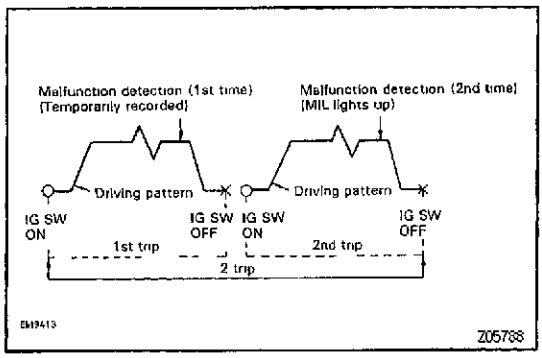


(b) Malfunction Code Indication

- In the event of a malfunction, the light will blink every 0 52 seconds The first number of blinks will equal the first digit of a 2-digit diagnostic trouble code and, after a 1 5 seconds pause, the 2nd number of blinks will equal the 2nd If there are 2 or more codes, there will be a 2 5 seconds pause between each code

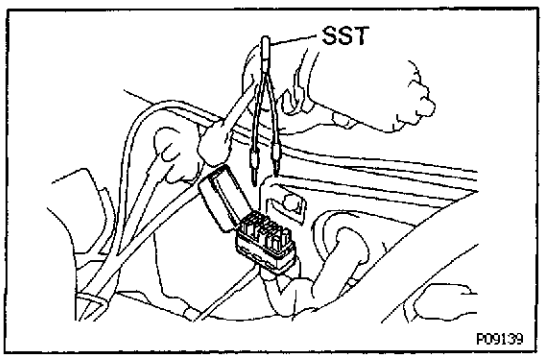
- After all the codes have been output, there will be a 4 5 seconds pause and they will all be repeated as long the terminals TE1 and E1 of the DLC1 are connected

HINT In the event of multiple trouble codes, indication will begin from the smaller value and continue to the larger



(c) 2 Trip Detection Logic

Diagnostic trouble code Nos 25, 26 and 71 use "2 trip detection logic" With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECM memory If the same case is detected again during the second drive test, this second detection causes the malfunction indicator lamp to light up The 2 trip repeats the same mode a 2nd time (However, the ignition switch must be turned LOCK between the 1 st time and 2nd time) In the Test Mode, the malfunction indicator lamp lights up the 1st time a malfunction is detected



5 After the diagnosis check, remove SST
SST 09843-18020

Test Mode

HINT

- Compared to the normal mode the test mode has high sensing ability to detect malfunctions
- It can also detect malfunctions in the starter signal circuit, air conditioning signal and park/ neutral position switch signal
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode

To obtain an output of diagnostic trouble codes, proceed as follows

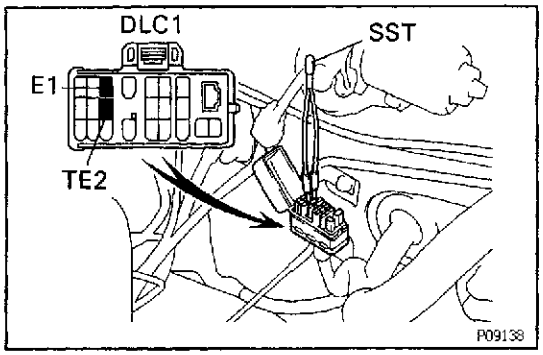
1 Initial conditions

(a) Battery voltage 1 1 volts or more

(b) Transmission in neutral position

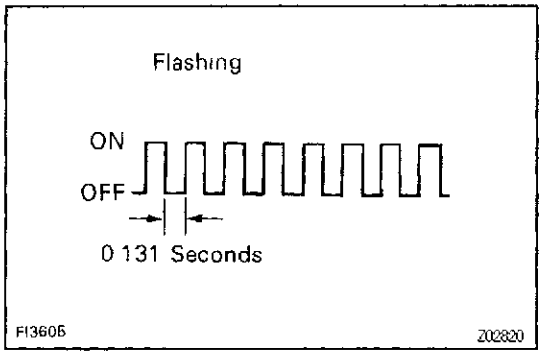
(c) Accessories switched OFF

(d) Engine at normal operation temperature



2 First using SST, connect terminals TE2 and E 1 of the DLC 1

SST 09843- 18020

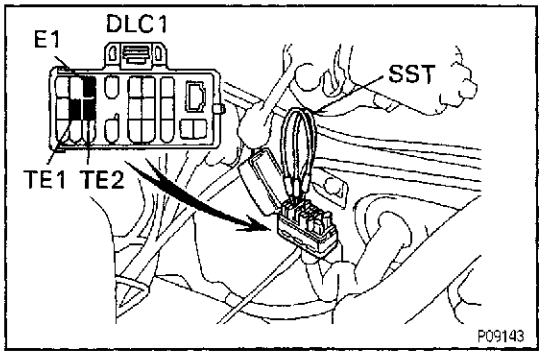


3 Turn the ignition switch ON

HINT To confirm that the test mode is operating, check that the malfuntion indicator lamp flashes when the ignition switch is turned ON

4 Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher

5 Simulate the conditions of the malfunction decribed by the customer

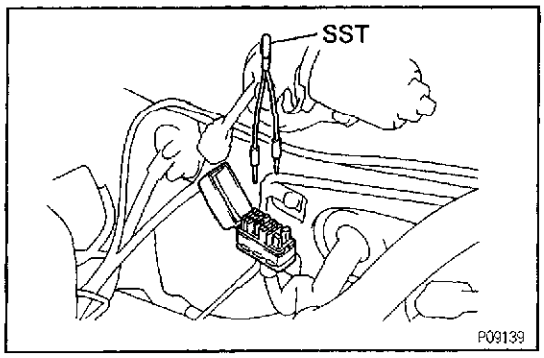


6 Using SST, connect terminals TE1 and E1 of the DLC 1

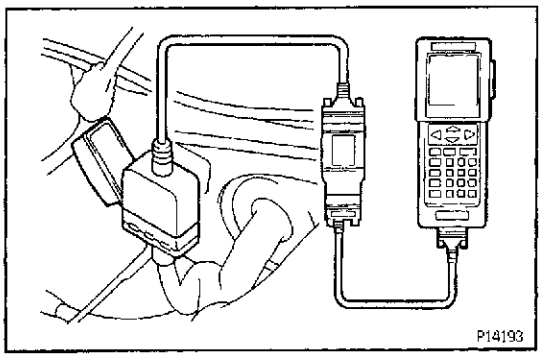
SST 09843-18020

7 Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp

(See page EG-223)

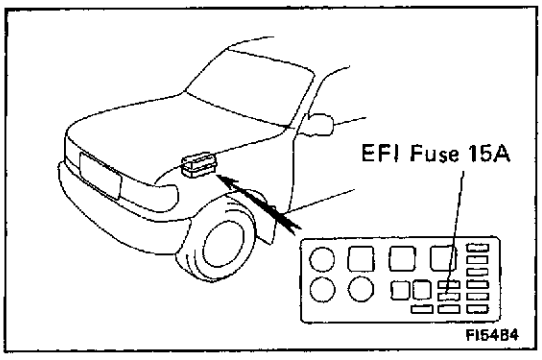


8 After the diagnosis check, remove SST
SST 09843-18020
HINT
- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned ON
- The starter signal and vehicle speed signal will be diagnosed by the ECM as malfunctions, and code Nos 42 and 43 will be output, if the operation in step 4 is not performed
- When the automatic transmission shift lever is in the "D", "2", "L" or "R" shift position, or when the air conditioning is turn ON or when the accelerator- pedal is depressed code No 51 (Switch condition signal) is output but this is not abnormal



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND-HELD TESTER

1 Hook up the TOYOTA hand-held tester to the DLC1
2 Read the diagnostic trouble codes by following the prompts on the tester screen
Please refer to the TOYOTA hand - held tester operator's manual for further details



DIAGNOSTIC TROUBLE CODE CANCELLATION

EG123-02

1 After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be cancelled out by removing the EFI fuse (15A) for 30 seconds or more depending on ambient temperature (the lower the temperature the longer the fuse must be left out) with the ignition switch to LOCK
HINT
- Cancellation can also be done by removing the battery negative (-) terminal, but in this case, other memory systems (clock, radio ETR etc) will also cancelled out
- If the diagnostic trouble code is not cancelled out it will be retained by the ECM and appear along with a new code in the event of future trouble

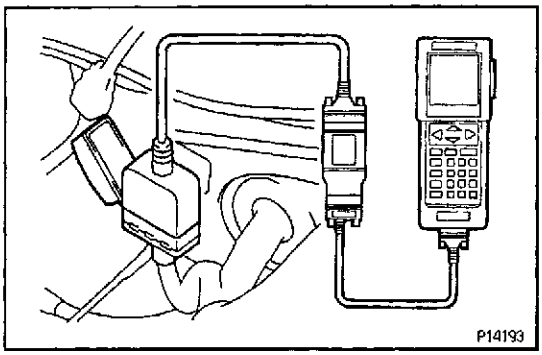
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded

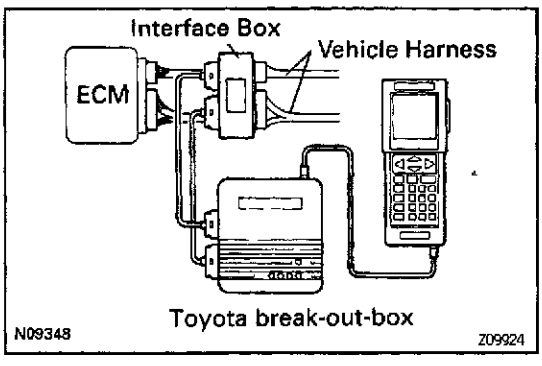
2 After cancellation, perform road test of the vehicle to check that a normal code is now read on the malfunction indicator lamp
If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly

DIAGNOSIS INDICATION

EG124-02

(1) When 2 or more codes are indicated, the lowest number (code) will appear first
(2) All detected diagnostic trouble codes, except for code Nos 51 and 53 will be retained in memory by the ECM from the time of detection until canceled out
(3) Once the malfunction is cleared, the malfunction indicator lamp on the combination meter will go off but the diagnostic trouble code (s) remain stored in ECM memory (except for code Nos 43, 51 and 53)





EG386 02

ECM DATA MONITOR USING TOYOTA HAND-HELD TESTER

1 Hook up the TOYOTA hand-held tester to the DLC1
2 Monitor the ECM data by following the prompts on the tester screen
HINT TOYOTA hand-held tester has a "Snapshot" function which records the monitored data
Please refer to the TOYOTA hand - held tester operator's manual for further details

ECM TERMINAL VALUES MEASUREMENT BY USING MASTERLINK AND TOYOTA HAND-HELD TESTER

1 Hook up the TOYOTA break-out-box and TOYOTA hand-held tester to the vehicle
2 Read the ECM 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 operator's manual for further- details

EG126-08

DIAGNOSTIC TROUBLE CODES

HINT

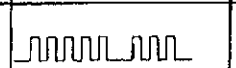
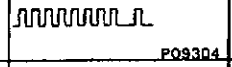
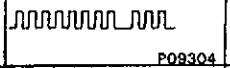
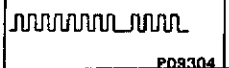
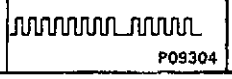
- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page
- Your readings may vary from the parameters listed in the table, depending on the instruments used

DTC No	Number of Malfunction Indicator Lamp Blinks	System	Malfunction Indicator Lamp		Diagnosis	Trouble area	Memory 2
			Normal Mode	Teat Mode			
–	FI1604	Normal	–	–	No malfunctions detected	–	–
12	FI1606	RPM Signal	ON	N A	No NE or G1 G2 signal to ECM within 2 seconds after cranking the engine	•Distributor circuit •Distributor •Starter signal circuit •ECM	O
13	FI1607	RPM Signal	ON	ON	No NE signal is to ECM for 0 1 sec and more when engine speed is above 1 000 rpm arid start OFF	•Distributor circuit •Distributor •ECM	O
14	FI1608	Ignition Signal	ON	N A	No IGF signal to ECM 6 times in succession and no signal input within 256 msec	•Igniter and ignition coil circuit •Igniter and ignition coil •Starter signal circuit •ECM	O
21	FI1609	No 1 Heated Oxygen Sensor Signal	ON	ON	At normal driving speed Ibefow 100 kmlh and engine speed is above 1 700 rpm) amplitude of heated oxygen sensor signal JOX 1) is reduced to between 0 35 - 0 70 V continuously for 60 seconds or more	•Heated oxygen sensor circuit •Heated oxygen sensor •ECM	O
		No 1 Heated Oxygen Sensor Heater Signal			Open or short circuit in heated oxygen sensor heater (HT 1)	•Heated oxygen sensor circuit •Heated oxygen sensor •ECM	
22	FI1610	Engine Coolant Temp Sensor Signal	ON	ON	Open or short circuit in engine coolant temp sensor signal for 0 5 sec. or more (THW)	•ECT sensor circuit •ECT sensor •ECM	O
24	FI1611	Intake Air Temp Sensor Signal	3 ON	ON	Open or short circuit in Intake air temp sensor signal for 0 5 sec. or more (THA)	•IAT sensor circuit •IAT sensor •ECM	O

DIAGNOSTIC TROUBLE CODES (Cont'd)

DTC No	Number of Malfunction Indicator Lamp Blinks	system	Malfunction Indicator Lamp *1		Diagnosis	Trouble area	Memory
			Normal Mode	Test Mode			
25	FI2562	Air Fuel Ratio Lean Malfunction	ON	ON	(1) Heated oxygen sensor output at 2 000 rpm is less than 0.45 V for at least 90 seconds when engine warmed up. Applies only to code 25 and for California models excepting high-altitude areas (2) When the engine speed varies by more than 15 rpm over the preceding crank angle period during a period of 30 seconds during idling with the intake air temp. 0°C (32°F) or above (3) When the difference between the air-fuel ratio feed back compensation value of the front and rear exceeds 15% of the two values in a period of 10 seconds while the engine speed is 2 000 rpm or more and the engine coolant temp. is between 70°C (158°F) and 95°C (203°F) *6 (2 trip detection logic) (1) - (3)	•Engine ground bolt loose •Open in EFI circuit •Injector circuit •Injector •Fuel line pressure •VAF meter •PAIR system •Heated oxygen sensor circuits •Heated oxygen sensors •Ignition system •ECM	○
26	FI2563	Air Fuel Ratio Rich Malfunction	ON	ON		•Engine ground bolt loose •Open in E1 circuit •Injector circuit •Injector •Fuel line pressure •ECT sensor •Compression pressure •ECM	○
28	FI2698	No. 2 Heated Oxygen Sensor Signal	ON	ON	At normal driving speed (below 100 km/h and engine speed is above 1 700 rpm) amplitude of heated oxygen sensor signal (OX2) is reduced to between 0.35 - 0.70 V continuously for 60 seconds or more	•Heated oxygen sensor circuit •Heated oxygen sensor •ECM	○
		No. 2 Heated Oxygen Sensor Heater Signal			Open or short circuit in heated oxgen sensor heater (HT2)	•Heated oxygen sensor circuit •Heated oxygen sensor •ECM	
31	FI1612	Volume Air Flow Meter Signal	ON	ON	When idle contacts are closed and engine speed is 1 500 rpm or less there is an open circuit in VC and VS signal or a short circuit between VS and E2	•VAF meter circuit •VAF meter •ECU	○
32	FI1613	Volume Air Flow Meter Signal	ON	ON	Open circuit in E2 or short circuit between VC and VS	•VAF meter circuit •VAF meter •ECM	○
35	FI2699	BARO Sensor Signal	ON	ON	Open or short circuit in BARO sensor signal for 0.5 sec. or more	•ECM	○
41	FI1614	Throttle Position Sensor Signal	ON	ON	Open or short circuit in throttle position sensor signal for 0.5 sec. of more	•TP sensor circuit •TP sensor •ECM	○
42	FI1615	Vehicle Speed Sensor Signal	OFF	OFF	No. SPD signal for 8 seconds when engine speed 2 700 rpm or more and with vehicle not moving and Break OFF	•Vehicle speed sensor circuit •Vehicle speed sensor •ECM	○
43	FI1616	Starter Signal	N.A.	OFF	No. STA signal to ECM until engine speed reaches 800 rpm with vehicle not moving	•Ignition switch circuit •Ignition switch •ECM	×
52	BE3935	No. 1 Knock Sensor Signal (front side)	ON	N.A.	No No. 1 knock sensor signal to ECM for 6 crank revolutions with engine speed between 1 800 rpm and 5 200 rpm	•Open or short in No. 1 knock sensor circuit •No. 1 knock sensor (looseness) •ECM	○

DIAGNOSTIC TROUBLE CODES (Cont'd)

DTC No	Number of Malfunction Indicator Lamp Blinks	System	Malfunction Indicator Lamp *1 Normal Mode	Malfunction Indicator Lamp *1 Test Mode	Diagnosis	Trouble area	Memory
53	 RE3935	Knock Control Signal	ON	N A	No knock control signal to ECM for12 crank revolutions with engine speed between 1 800 rpm and 5 200 rpm	•ECM	×
55	RE3935	No 2 Knock Sensor Signal (rear side)	ON	N A	No No 2 knock sensor signal to ECM for 6 crank revolutions with engine speed between 1 800 rpm and 5 200 rpm	•Open or short in No 2 knock sensor circuit •No 2 knock sensor (looseness) •ECM	○
71	FI2622	EGF System Malfunction	ON	ON	60 seconds after start of EGR operation EGR gas temp is less than 70°C (158°F) and the following (a)-(c) conditions also occurs (a)Engine coolant temp 53°C (127°F) or more (b) Engine speed 1 200 rpm or more (c) Intake air temp 0 °C (32 °F) or more *6 (2 trip detection logic)	•EGR valve •EGR hose •EGR gas temp sensor circuit •EGR gas temp sensor •VSV for EGR •VSV circuit for EGR •ECM	○
81	 P09304	TCM Communication	ON	N A	Open in ECT circuit for 2 sec or more	• ECT 1 circuit	○
83	 P09304	TCM Communication n	ON	N A	Open in ESA 1 circuit for 0 5 sec after 0 5 sec at idle or idle signal faulty	• ESA 1 circuit	○
84	 P09304	TCM Communication	ON	N A	Open in ESA2 circuit for 0 5 sec after 0 5 sec at idle or idle signal faulty	• ESA2 circuit	○
85	 P09304	TCM Communication	ON	N A	Open in ESA3 circuit for 0 5 sec after 0 5 sec at idle or idle signal faulty	• ESA3 circuit	○
51	FI1617	Switch Condition Signal	N A	OFF	No IDL signal NSW signal or A/C signal to ECM with the DLC 1 terminals E 1 and TE 1 connected and starter OFF	•A/C switch circuit •A/C switch •A/C amplifier •TP sensor IDL circuit •PNP switch circuit •PNP switch •Accelerator pedal and cable •ECM	×

V03880

REMARKS

1 "ON" displayed in the diagnosis mode column indicates that the malfunction indicator lamp is lighted up when a malfunction is detected

"OFF" indicates that the "CHECK" does not light up during malfunction is detected

2 "0" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs "X" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs

Accordingly, output of diagnostic results is performed with the ignition switch ON

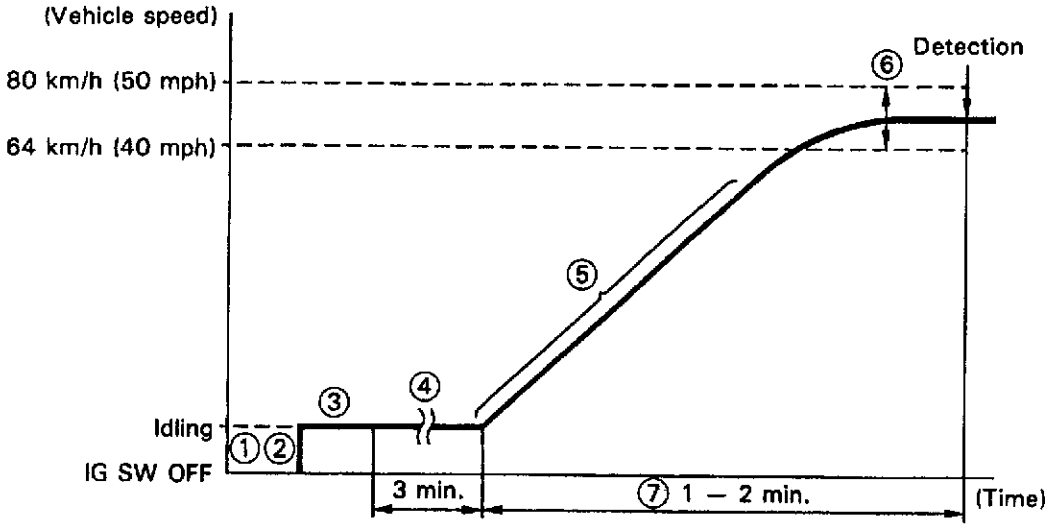
3 "2 trip detection logic" (See page EG-219)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded
(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected

DTC No.	21,28	Heated Oxygen Sensor Circuit

Malfunction: Deterioration of Heated Oxygen Sensor



(1) Disconnect the EFI fuse (1 5A) for 10 seconds or more with ignition switch OFF
(2) Initiate test mode Connect terminals TE2 and E 1 of DI-CI with ignition switch OFF
(3) Start the engine and warm the engine up with all accessory switches OFF
(4) After the engine is warmed up let it idle for 3 minutes
(5) Accelerate gradually and maintain at approximately 1 500 rpm or within the 1 300 to 1 700 rpm range Turn the A/C ON and drive in D upshift appropriately Shift carefully so that the engine speed would not fall below 1 200 rpm Depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking
(6) Maintain the vehicle speed at 64 - 80 km/h (40 - 50 mph)
(7) Keep the vehicle running for 1 - 2 minutes after starting acceleration
HINT If any malfunction is detected the malfunction indicator lamp will light up during step (7)

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V02030

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

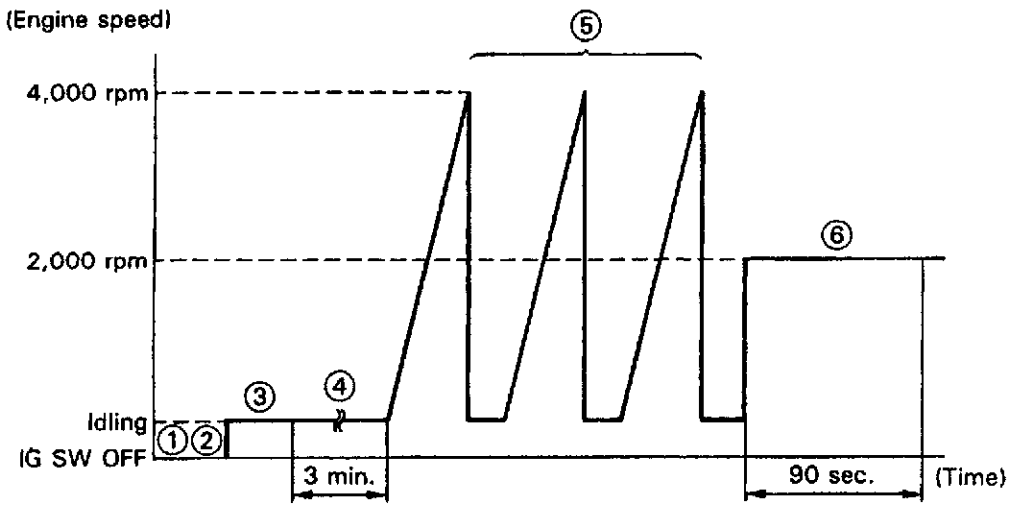
Purpose of the driving pattern

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected

DTC No.	25	Air-Fuel Ratio Lean Malfunction
	26	Air-Fuel Ratio Rich Malfunction

Malfunction Open or Short in Heated Oxygen Sensor



(1) Disconnect the EFI fuse (15 A) for 10 seconds or more with ignition switch OFF

(2) Initial test mode Connect terminal TE2 and E 1 of DLC 1 with ignition switch OFF

(3) Start the engine and warm the engine up with all accessory switches OFF

(4) After the engine is warmed up let it idle for 3 minutes

(5) Accelerate rapidly to 4 000 rpm 3 times

(6)Maintain 2 000 rpm for 90 seconds

HINT If a malfunction is detected the malfunction indicator lamp will light up during step (6)

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V03879

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

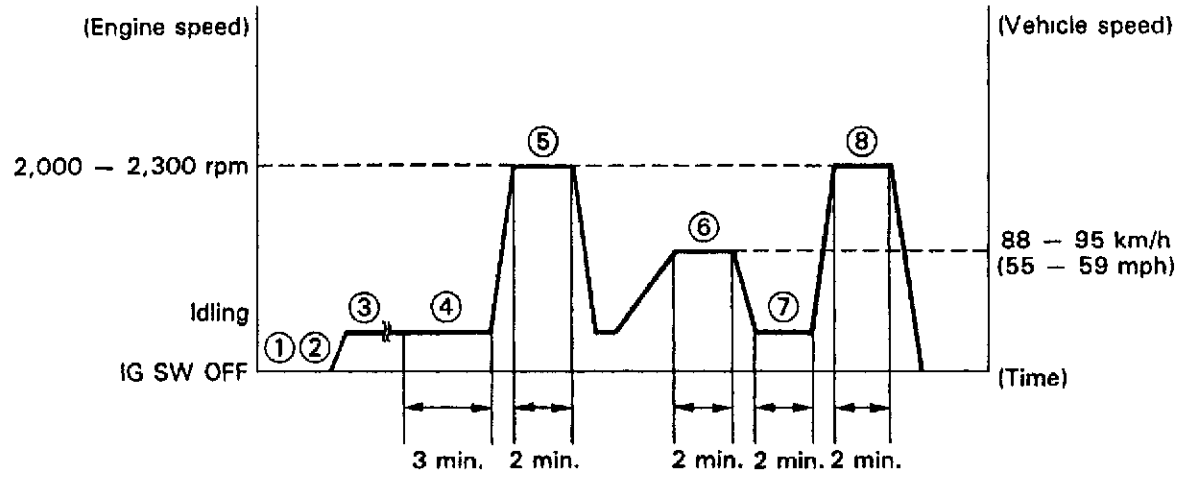
Purpose of the driving pattern

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected

DTC No.	25	Air-Fuel Ratio Lean Malfunction
	26	Air-Fuel Ratio Rich Malfunction

Malfunction Open or Short in Heated Oxygen Sensor, Open or Short in Injector Leak, Blockage, Loose
Engine Ground Bolt



HINT: Before this test check the feedback voltage for heated oxygen sensor

(1) Disconnect the EFI fuse (15A) for 10 seconds or more with ignition switch OFF

(2) Initiate test mode Connect terminals TE2 and EI of DLC1 with ignition switch OFF

(3) Start and warm up the engine

(4) After the engine is warmed up let it idle for 3 minutes

(After the engine has started do not depress the accelerator pedal)

(5) Accelerate and maintain at 2 000 to 2 300 rpm for 2 minutes

(6) Drive the vehicle at 88 - 95 km/h (55 to 59 mph) for 2 minutes

(7) Stop at a safe place and idle for 2 minutes

(8) Accelerate and maintain at 2 000 to 2 300 rpm for 2 minutes

HINT If a malfunction is detected the malfunction indicator lamp will light up during step (8)

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V03878

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

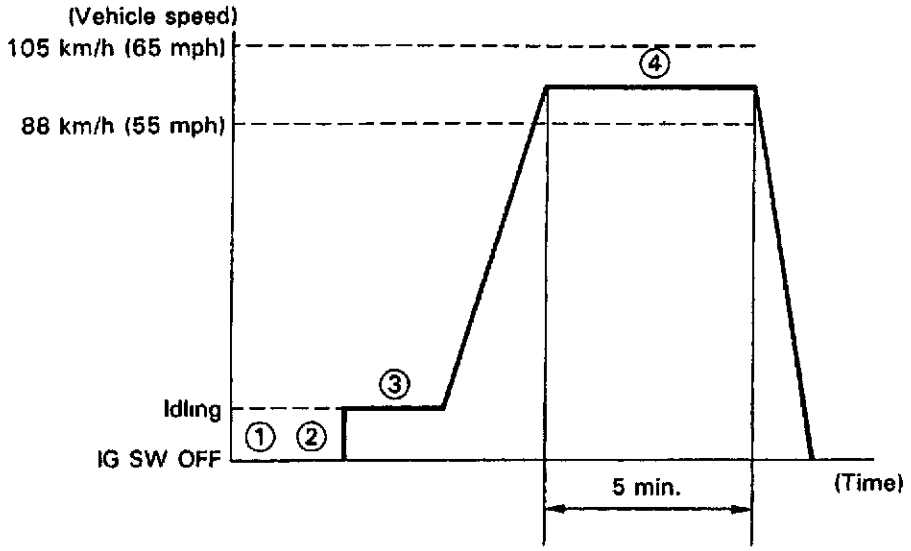
Purpose of the driving pattern

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected

DTC No.	71	EGR System Malfunction

Malfunction Short in VSV Circuit for EGR Loose EGR Hose Valve Stuck



(1) Disconnect the EFI fuse (15 A) for 10 seconds or more with ignition switch OFF

(2) Initiate test mode Connect terminals TE2 and E 1 of DLC 1 with ignition switch OFF

(3) Start and warm up the engine

(4) With the transmission in D position and A/C OFF drive at 88 - 105 km/h (55 - 65 mph) for 5 minutes

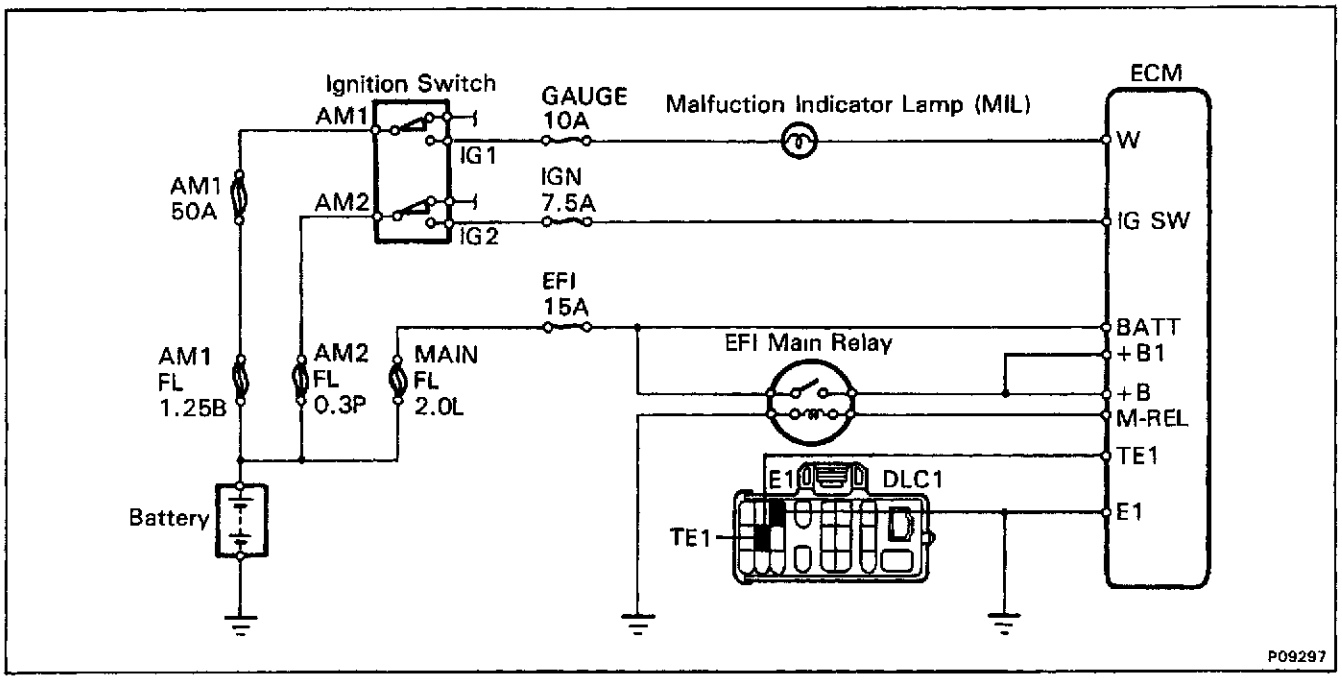
HINT If a malfunction is detected the malfunction indicator lamp will light up during step(4)

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V03877

EG127-02

DIAGNOSIS CIRCUIT INSPECTION



1. Does malfuction indicator lamp (MIL) come on when ignition switch is at ON?
   - YES → System normal
   - NO → Does malfuction indicator lamp (MIL) come on when ECM terminal W is grounded to the body?
     - YES → Check wiring between ECM terminal E 1 and body ground
       - OK → Try another ECM
       - BAD → Repair or replace
     - NO → Check bulb fuse and wiring between ECM and ignition switch
       - BAD → Repair or replace

2. Does malfuction indicator lamp (MIL) go off when the engine is started?
   - YES → System normal
   - NO → Check wiring between ECM and malfuction indicator lamp (MIL)
     - BAD → Repair
     - OK → Is there diagnostic trouble code output when DLC 1 terminals TE 1 and E 1 connected?
       - NO → Check wiring between ECM terminal TE1 and DLC 1 terminal TE 1 and ECM terminal Ell and DLC 1 terminal El
         - OK → Try another ECM
       - YES → Does malfuction indicator lamp (MIL) go out after repair according to malfunction code?
         - NO → Further repair required
         - YES → System OK → Cancel out diagnostic trouble code

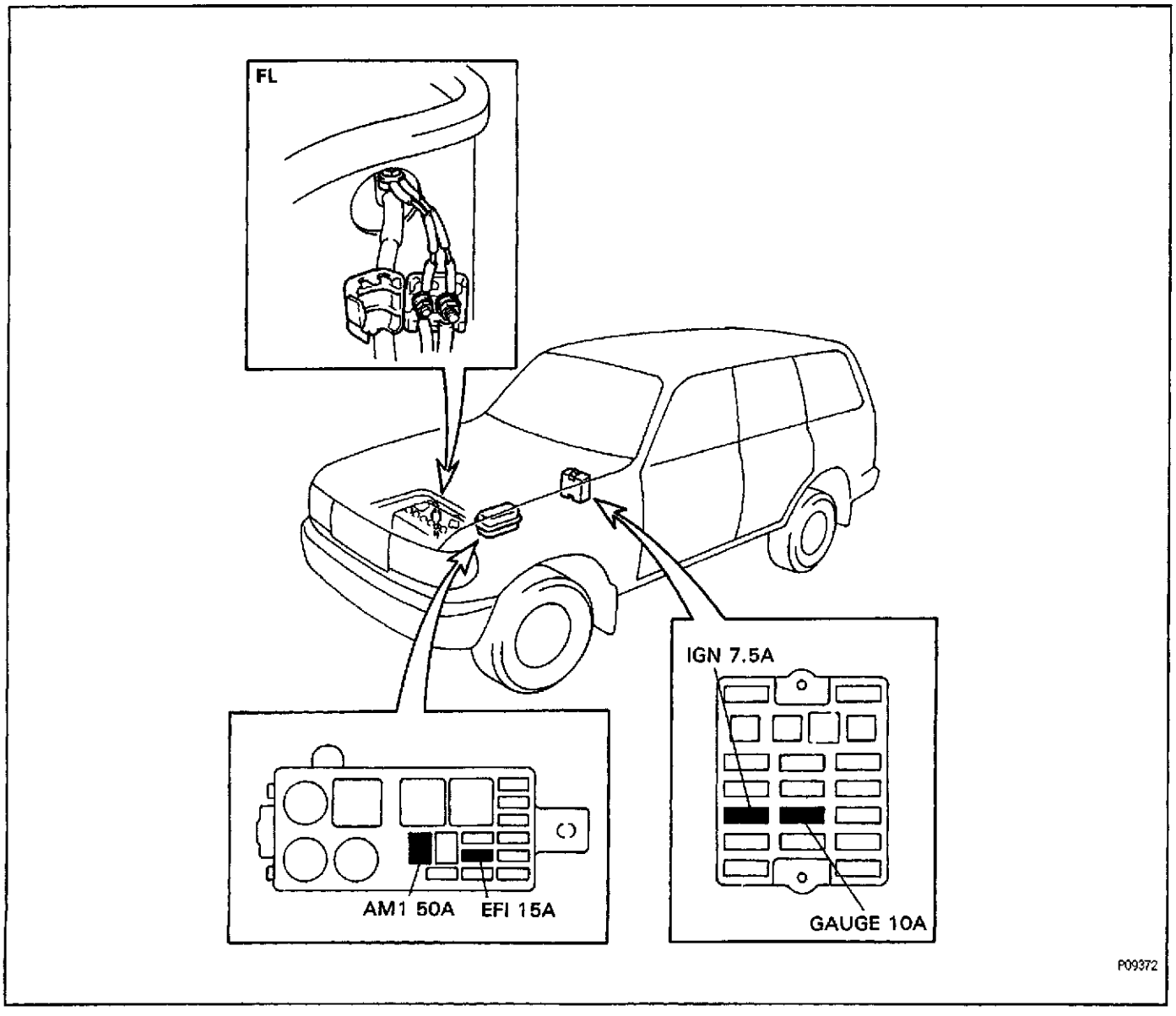
V01927

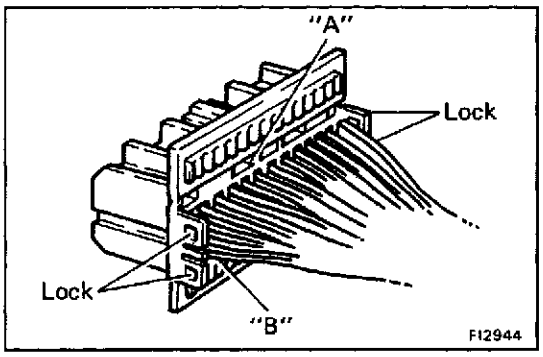
TROUBLESHOOTING

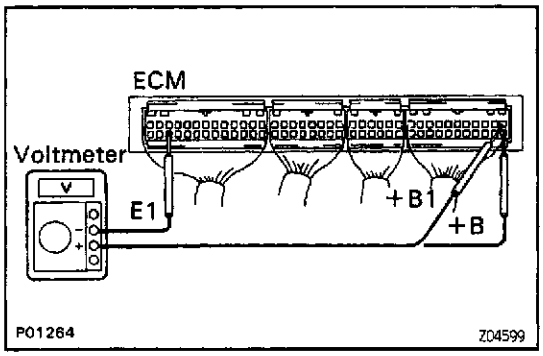
EG00B-02

- HINT
  The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat However, troubleshooting should be performed while referring to the inspection methods described in this manual
- Before beginning inspection, it is best to first make a simple check of the fuses, H-fuses, fusible links and the condition of the connectors
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECM is faulty and should be replaced

FUSES AND FUSIBLE LINKS LOCATION







SF1 SYSTEM CHECK PROCEDURE EG00A-02

PREPARATION

(a) Disconnect the connectors from the ECM
(b) Remove the locks so that the tester probe(s) can easily come in
NOTICE Pay attention to sections "A" and "B" in the illustration which can be easily broken
(c) Reconnect the connectors to the ECM
(d) Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors
HINT

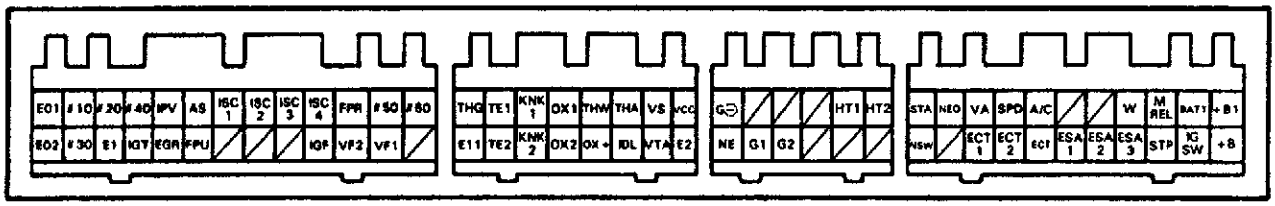
- Perform all voltage measurements with the connectors connected
- Verify that the battery voltage is 1 1 V or more when the ignition switch is in "ON"' position

EGOGB-05

ECM Terminals

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	THG	EGR GAS TEMP SENSOR	HT2	N0 2 HEATED OXYGEN SENSOR
E02	POWER GROUND	E11	ECM GROUND		–
# 10	INJECTOR (No 1)	TE1	DLC1	STA	PNP SWITCH
# 30	INJECTOR (No 3)	TE2	DLC 1	NSW	IGNITION SWITCH
# 20	INJECTOR (No 2)	KNK 1	NO 1 KNOCK SENSOR	NEO	TCM
E1	ECM GROUND	KNK2	NO 2 KNOCK SENSOR		–
# 40	INJECTOR (No 4)	OX1	N0 1 HEATED OXYGEN SENSOR	VA	TCM
IGT	IGNITER	OX2	N0 2 HEATED OXYGEN SENSOR	ECT1	TCM
IPV	VSV FOR EVAP	THW	ECT SENSOR	SPD	VEHICLE SPEED SENSOR
EGR	VSV FOR EGR	OX +	HEATED OXYGEN SENSORS	ECT2	TCM
AS	VSV FOR PAIR	THA	VAF METER	A/C	A/C AMPLIFIER
FPU	VSV FOR FUEL PRESSURE CONTROL	IDL	TP SENSOR	ECT	TCM
ISC1	IAC VALVE (No 1 Motor Coil)	VS	VAF METER		–
		VTA	TP SENSOR	ESA1	TCM
ISC2	IAC VALV E (No 2 Motor Coil)	VCC	TP SENSOR		–
	–	E2	SENSOR GROUND	ESA2	TCM
ISC3	IAC VALVE (No 3 Motor Coil)	G(-)	DISTRIBUTOR	W	MALFUNCTION INDICATOR LAMP
	–	NE	DISTRIBUTOR	ESA3	TCM
ISC4	IAC VALVE (No 4 Motor Coil)		–	M-REL	EFI MAIN RELAY (COIL)
IGF	IGNITER	G1	DISTRIBUTOR	STP	STOP LIGHT SWITCH
FPR	FUEL PUMP RELAY		–	BATT	BATTERY B +
VF2	DLC 1	G2	DISTRIBUTOR	IGSW	IGNITION SWITCH
# 50	INJECTOR (No 5)		–	+B1	EFI MAIN RELAY
VF1	DLC 1		–	+B	EFI MAIN RELAY
#60	INJECTOR (No 6)	HT1	N0 1 HEATED OXYGEN SENSOR		
	–		–		

ECM Terminals



P01399

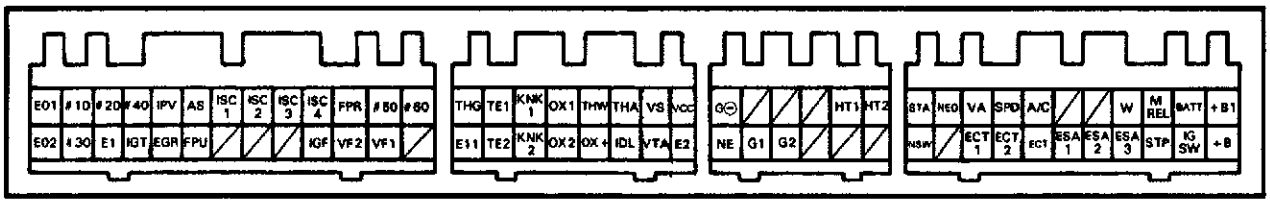
V03876

ECM Wiring Connectors Voltage

EG00C-03

No	Terminals	Condition		STD voltage (V)	See page
1	BATT-E1	—		9- 14	EG-235
	IG SW - E 1	IG SW ON			
	M-REL - E 1				
	+B, +B1 — E1				
2	IDL - E2	IG SW ON	Throttle valve open	9 - 14	EG-283
	VCC - E2		—	4 5 - 5 5	
	VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0 3 - 0 8	
			Throttle valve fully open	3 2 - 4 9	
3	VCC - E2		—	4 5 - 5 5	EG-240
	VS - E2		Measuring plate fully closed	3 5-4 5	
			Measuring plate fully open	0 2 - 0 5	
		Idling		1 2 - 2 4	
		3 000 rpm		0 8 - 1 3	
4	#10, #20, #40, #60 — E01, E02	IG SW ON		9- 14	EG-241
5	THA - E2	IG SW ON	Intake air temp 20°C (68°F)	0 5 - 3 4	EG-242
6	THW - E2		Engine coolant temp 80°C (1 760F)	0 2 - 1 o	EG-243
7	STA-E1	Cranking		6 or more	EG-244
8	IGT-E1	Idling		Pulse generation	EG-245
9	ISC1, ISC2, ISC3, ISC4 — E1	IG SW ON		9- 14	EG-246
10	W - E1	No trouble (malfunction indicator lamp light off) and engine running		9 - 14	EG-247

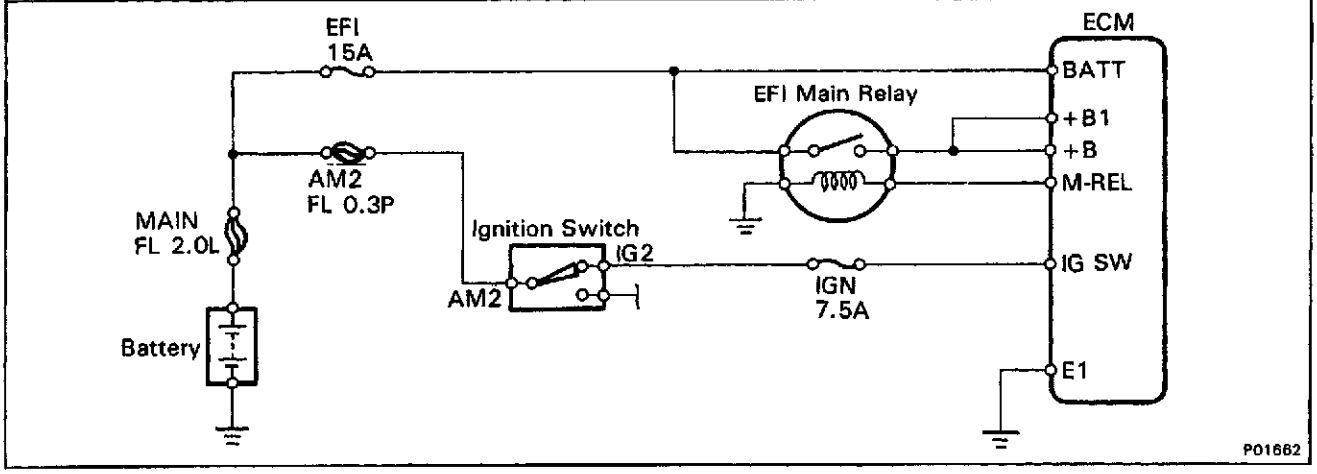
ECM Terminals

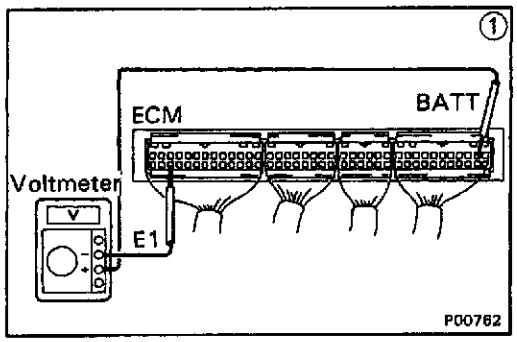


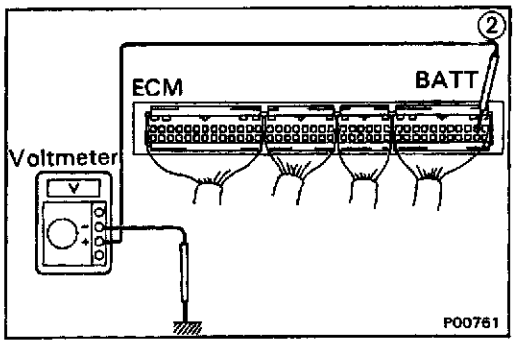
P01399

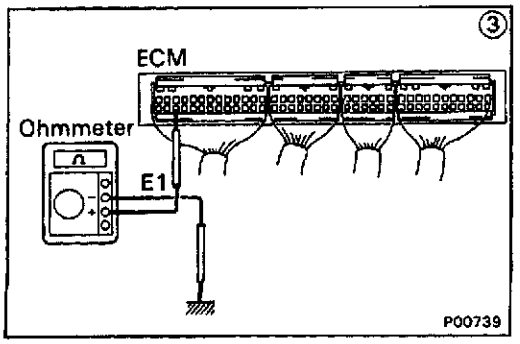
V01926

No	Terminals	Trouble	Condition	STD voltage
1	BATT - E1	No voltage	—	9 - 14 V
	IG SW-E1	No voltage	IG SW ON	9 - 14V
	M-REL - E 1			
	+B (+B1) - E1			









• BATT - E 1

(1) There is no voltage between ECM terminals BATT and E 1

(2) Check that there is voltage between ECM terminal BATT and body ground

NO

OK

Check wiring between ECM terminal E1 and body ground

OK

BAD

Try another ECM

Repair or replace

Check fuse and fusible link

BAD

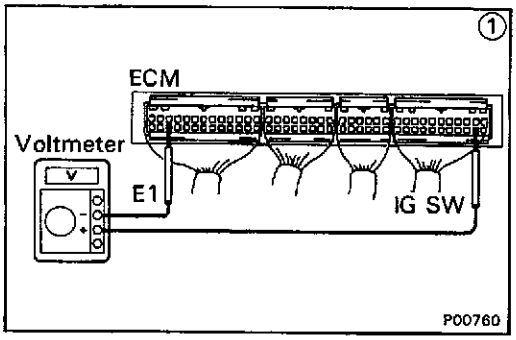
Replace

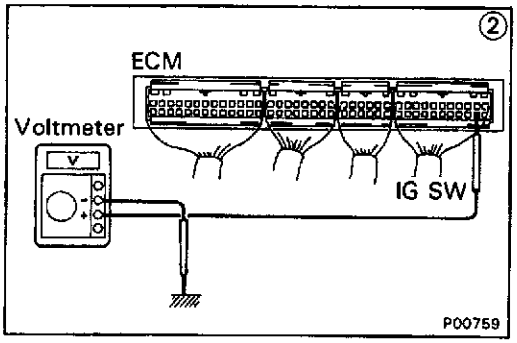
OK

Check wiring between ECM terminal and battery

BAD

Repair or replace





• IG SW - E 1

(1) There is no voltage between ECM terminals IG SW and EI (IG SW ON)

(2) Check that there is voltage between ECM terminal IG SW and body ground (1G SW ON)

NO → OK

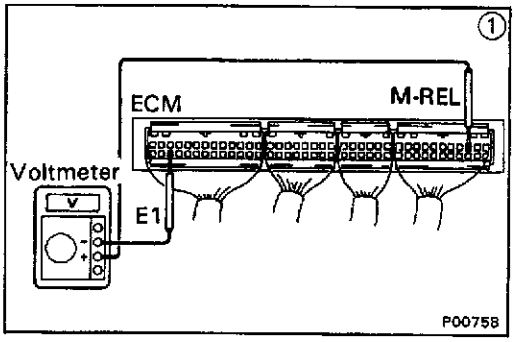
Check wiring between ECM terminal E1 and body ground

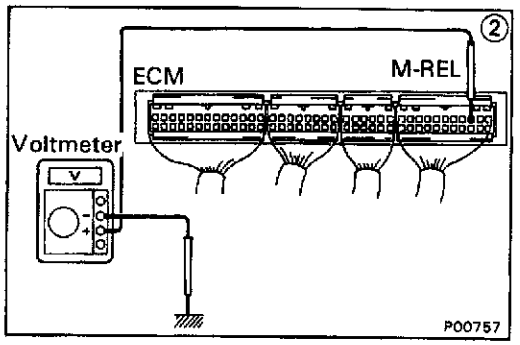
OK → Try another ECM

BAD → Repair or replace

Check fuses fusible link and ignition switch

BAD → Repair or replace





• M-REL - E 1

(1) There is no voltage between ECM terminals M-REL and E1 (IG SW ON)

(2) Check that there is voltage between ECM terminal M-REL and body ground (IG SW ON)

NO → OK

Check wiring between ECM terminal E1 and body ground

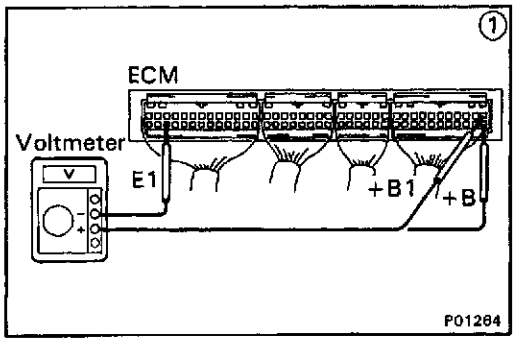
OK → Try another ECM

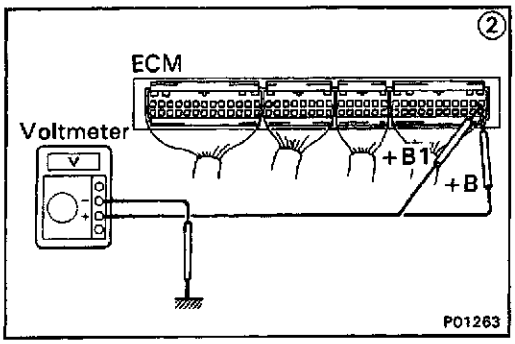
BAD → Repair or replace

Check EFI main relay and wiring harness (See page EG-297)

BAD → Replace

OK → Try another ECM





- **+B (+B1) - E1**

(1) There is no voltage between ECM terminals +B (+ B1) and E1 **(IG SW ON)**

Check that there is voltage between ECM terminal +B (+B1) and body ground **(IG SW ON)**

NO

OK

Check wiring between ECM terminal E1 and body ground

OK

BAD

Try another ECM

Repair or replace

Check fuse fusible link and wiring harness

BAD

Repair or replace

OK

Check EFI main relay (See page EG-297)

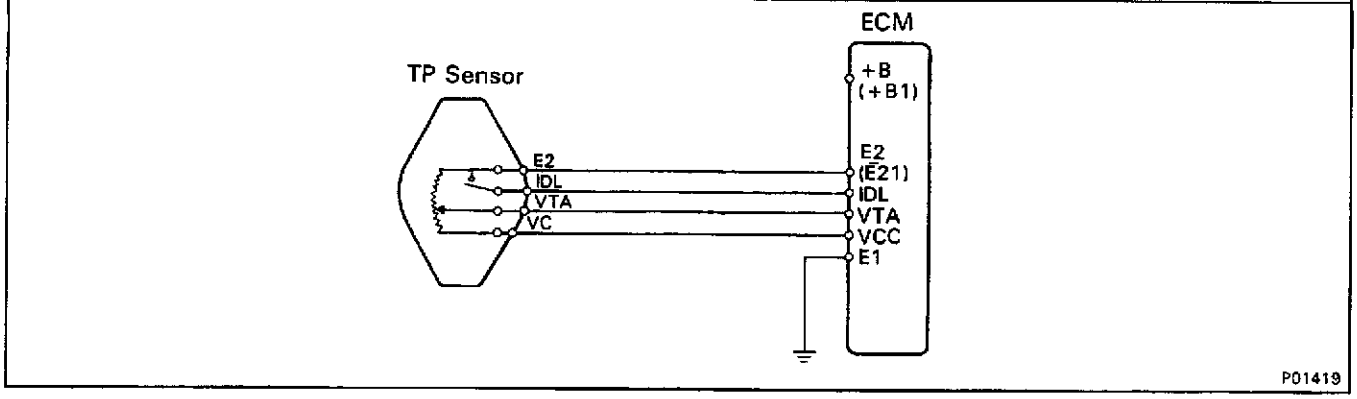
BAD

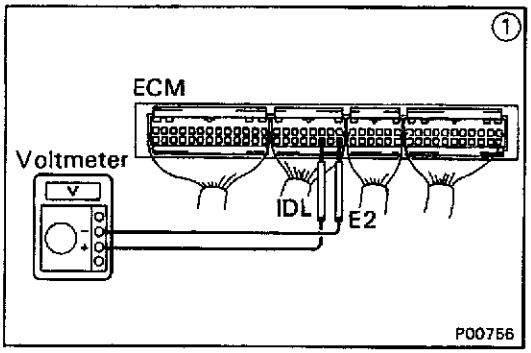
Replace

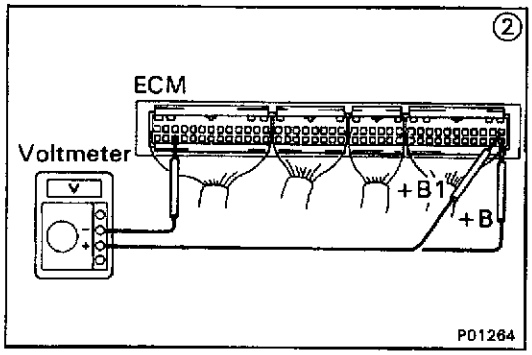
OK

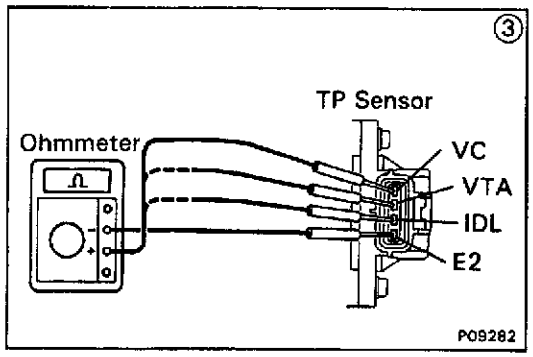
Refer to M-REL - E 1 trouble section

No	Terminals	Trouble	Condition	STD voltage
2	IDL - E2	No voltage	IG SW ON	Throttle valve open — 9 - 14V
	VCC- E2			— — 4 5 - 5 5 V
	VTA - E2			Throttle valve fully closed (Throttle opener must be cancelled first) — 0 3 - 0 8 V
				Throttle valve fully open — 3 2 - 4 9 V









• IDL-E2

(1) There is no voltage between ECM terminals IDL and E2 **(IG SW ON)** (Throttle valve open)

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground **(IG SW ON)**

NO

OK

Check wiring between ECM termianl E 1 and body ground

OK

BAD

Try another ECM

Repair or replace

Refer- to No 1 (See page EG-235)

BAD

Repair or replace

OK

BAD

(3) Check TP sensor (See page EG-281)

BAD

OK

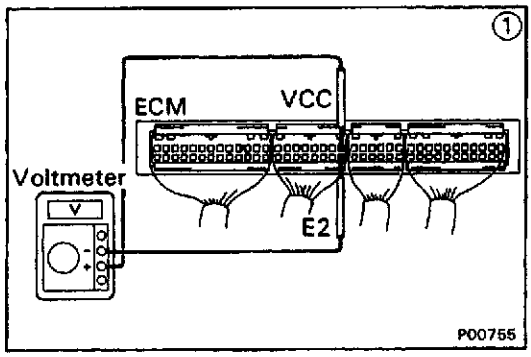
Repair or replace TP sensor

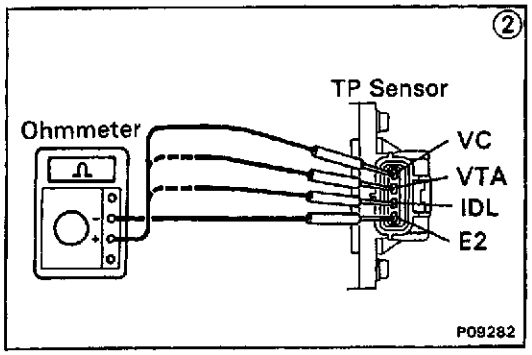
Check wiring between ECM and TP sensor

OK

Try another ECM

V01931





• VCC - E2

There is no voltage between ECM terminals VCC and E2 **(IG SW ON)**

↓

Check that there is voltage between ECM terminal +B (+B1) and body ground **(IG SW ON)**

↓ **OK** → Check TP sensor (See page EG-281)

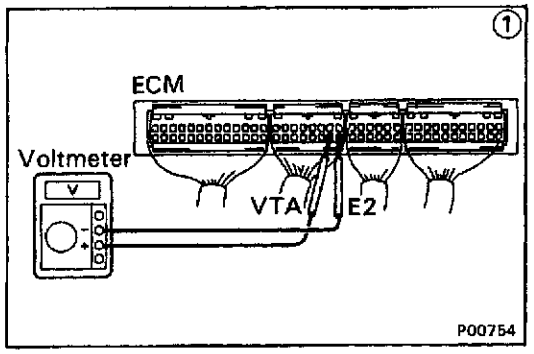
↓ BAD → Repair or replace

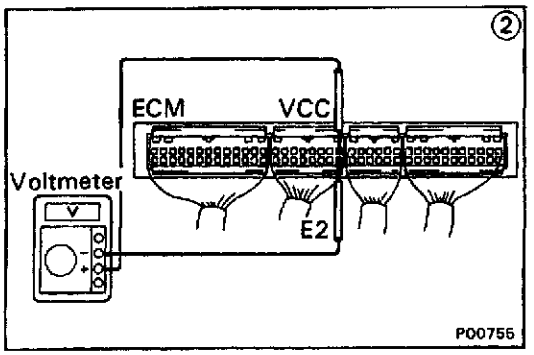
↓ OK → Check wiring between ECM and TP sensor

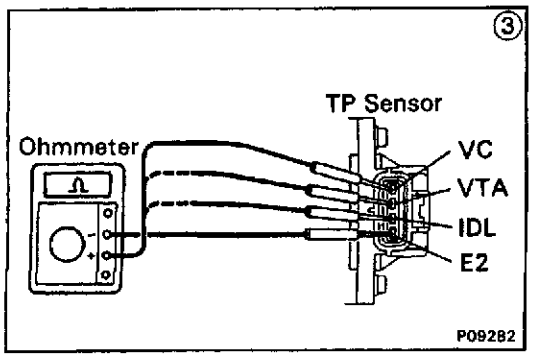
↓ OK → Try another ECM

↓ BAD → Repair or replace wiring

↓ **NO** → Refer to No. 1 (See page EG-235)







• VTA-E2

(1)There is no specified voltage at ECM terminals VTA and E2 **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals VCC and E2 **(IG SW ON)**

↓ **NO** → Refer to VCC - E2 trouble section

↓ **OK**

↓ OK (from (2)) → (3)Check TP sensor (See page EG-281)

↓ BAD → Repair or replace

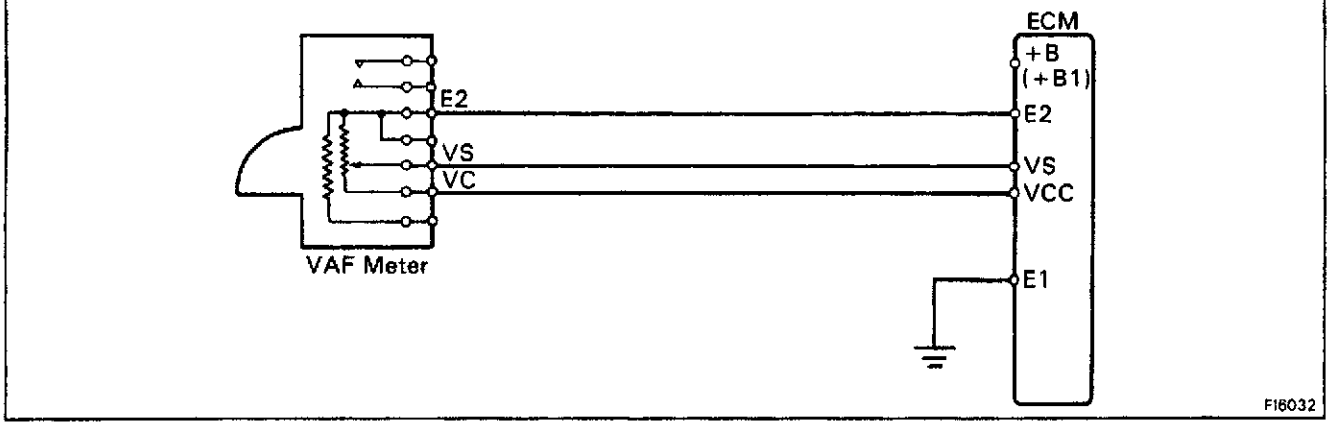
↓ OK → Check wiring between ECM and TP sensor

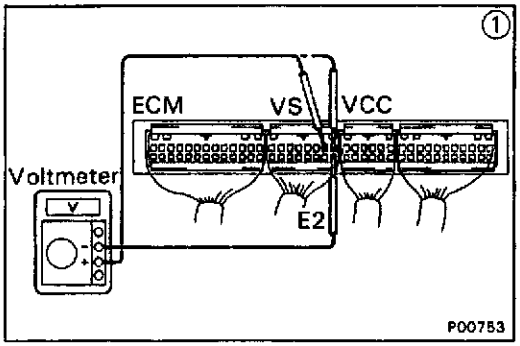
↓ BAD → Repair or replace

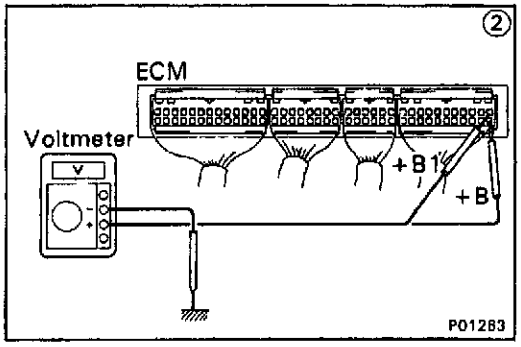
↓ OK → Try another ECM

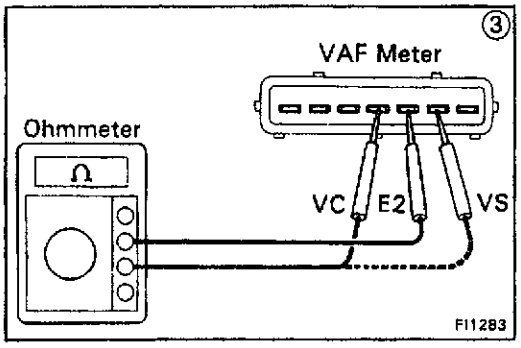
V01932

No	Terminals	Trouble	Condition		STD voltage
3	VCC -E2	No voltage	IG SW ON	–	4 s - s s V
	VS -E2			Measuring plate fully closed	3 5 - 4 5 V
	VS -E2			Measuring plate fully open	0 2 - 0 5 V
	VS -E2		Idling		1 2 - 2 4 V
	VS -E2		3,000 rpm		0.8 - 1.3 V









(1)There is no voltage between ECM terminals VCC or VS and E2 **(IG SW ON)**

(2)Check that there is voltage between ECM terminal +B (+B1) and body ground **(IG SW ON)**

OK → Check wiring between ECM terminal E1 and body ground

NO → Refer to No 1 (See page EG-235)

OK → Check VAF meter (See page EG-290)

BAD → Repair or replace

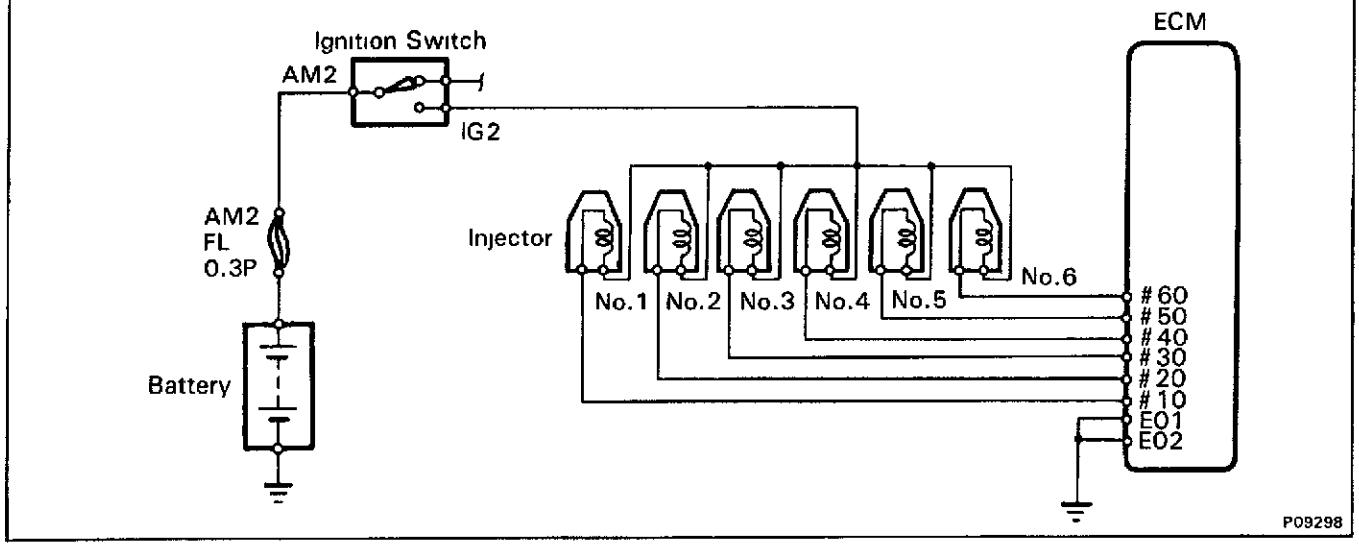
BAD → Replace VAF meter

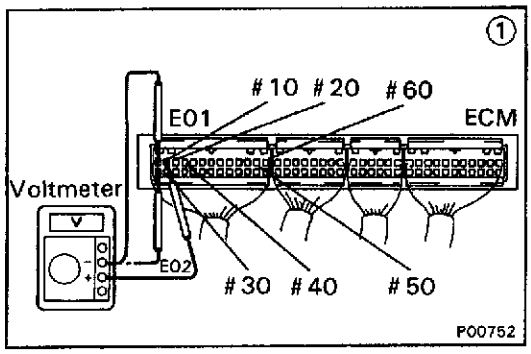
OK → Check wiring between ECM and VAF meter

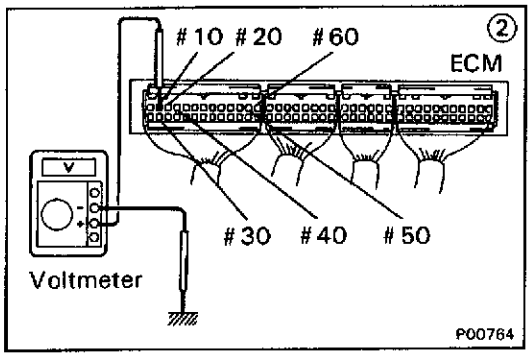
OK → Try another ECM

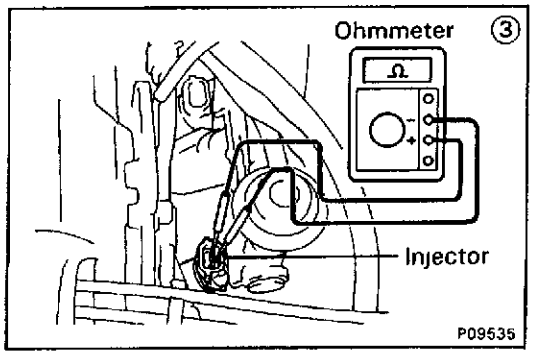
BAD → Repair or replace

No	Terminals	Trouble	Condition	STD voltage
4	# 10 E01 — #60 EOZ	No voltage	IG SW ON	9 - 14V









(1)There is no voltage between ECM terminals # 10 - # 60 and E01 and/or E02 (IG SW ON)

(2)Check that there is voltage between ECM terminal # 10 - # 60 and body ground

NO

OK

Check wiring between ECM terminal E01 and/or E02 and body ground

OK

BAD

Try another ECM

Repair or replace

Check fusible link and ignition switch

BAD

Repair or replace

OK

(3) Check resistance of each injector
STD resistance Approx 13 8Ω

OK

BAD

Replace injector

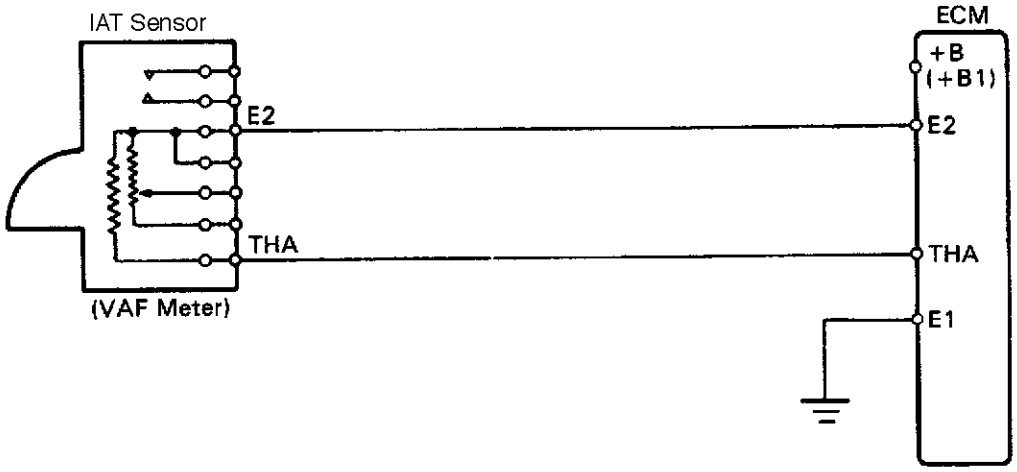
Check wiring between ECM terminal # 10 - # 60 and battery

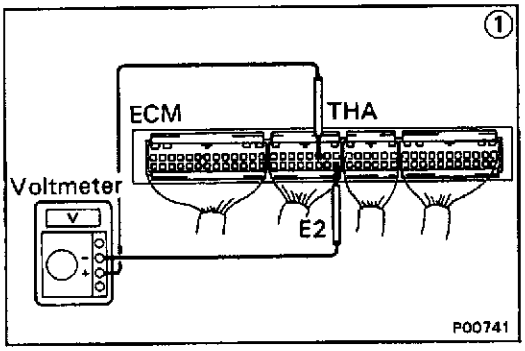
BAD

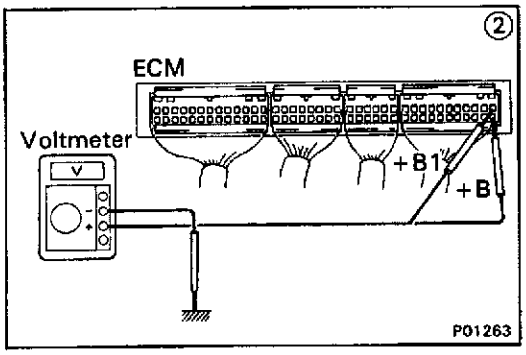
Repair or replace

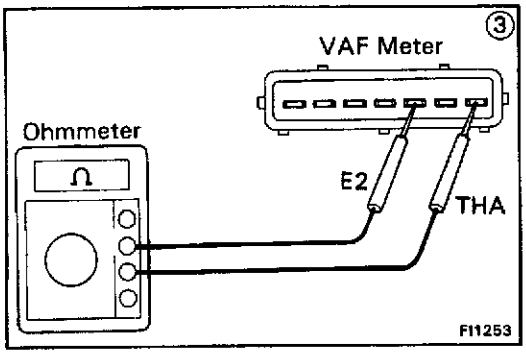
V01934

No	Terminals	Trouble	Condition		STD Voltage
5	THA - E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	0.5 - 3.4 V









(1)There is no voltage between ECM terminals THA and E2 **(IG SW ON)**

(2)Check that there is voltage between ECM terminal +B (+ B 1) and body ground **(IG SW ON)**

OK

NO → Refer to No. 1 (See page EG-235)

Check wiring between ECM terminal E 1 and body ground

OK

BAD → Repair or replace

(3) Check IAT sensor (See page EG-290)

BAD → Replace VAF meter

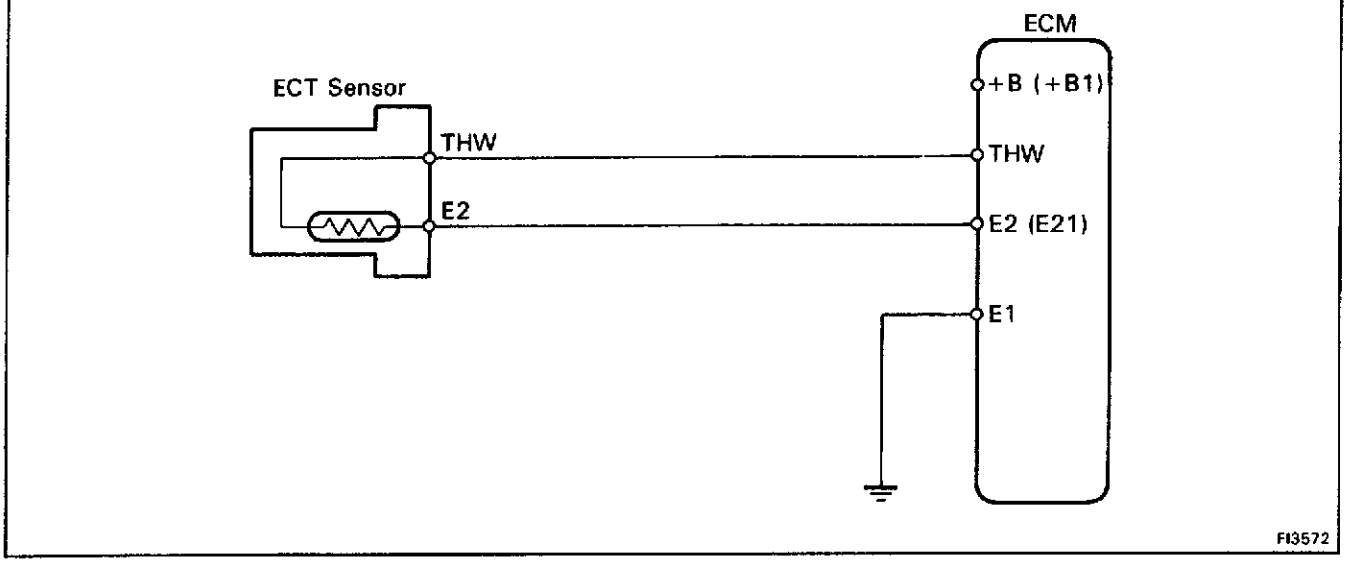
OK → Check wiring between ECM and IAT sensor

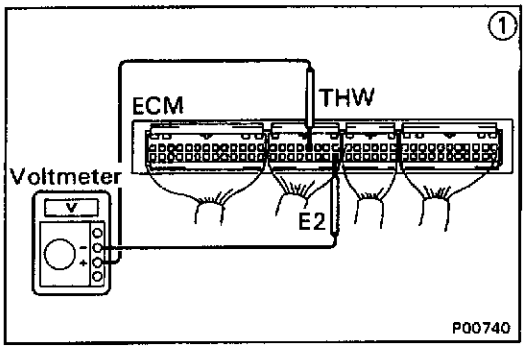
OK → Try another ECM

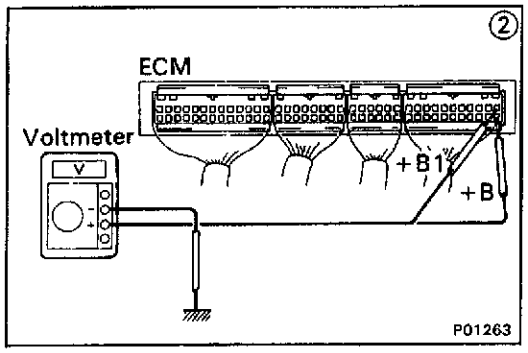
BAD → Repair or replace

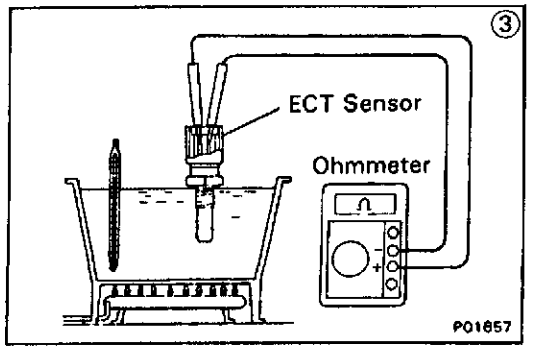
V01935

No	Terminals	Trouble	Condition		STD Voltage
6	THW - E2	No voltage	IG SW ON	Engine coolant temperature 80 ° C (176 ° F)	0 2 - 1 0 v









(1)There is no voltage between ECM terminals THW and E2 **(IG SW ON)**

(2) Check that there is voltage between ECM terminal +B (+B 1) and body ground (IG SW ON)

OK

NO

Refer to No 1 (See page EG-235)

Check wiring between ECM terminal E 1 and body ground

OK

BAD

(3)Check ECT sensor (See page EG-300)

Repair or replace

BAD

OK

Replace ECT sensor

Check wiring between ECM and ECT sensor

OK

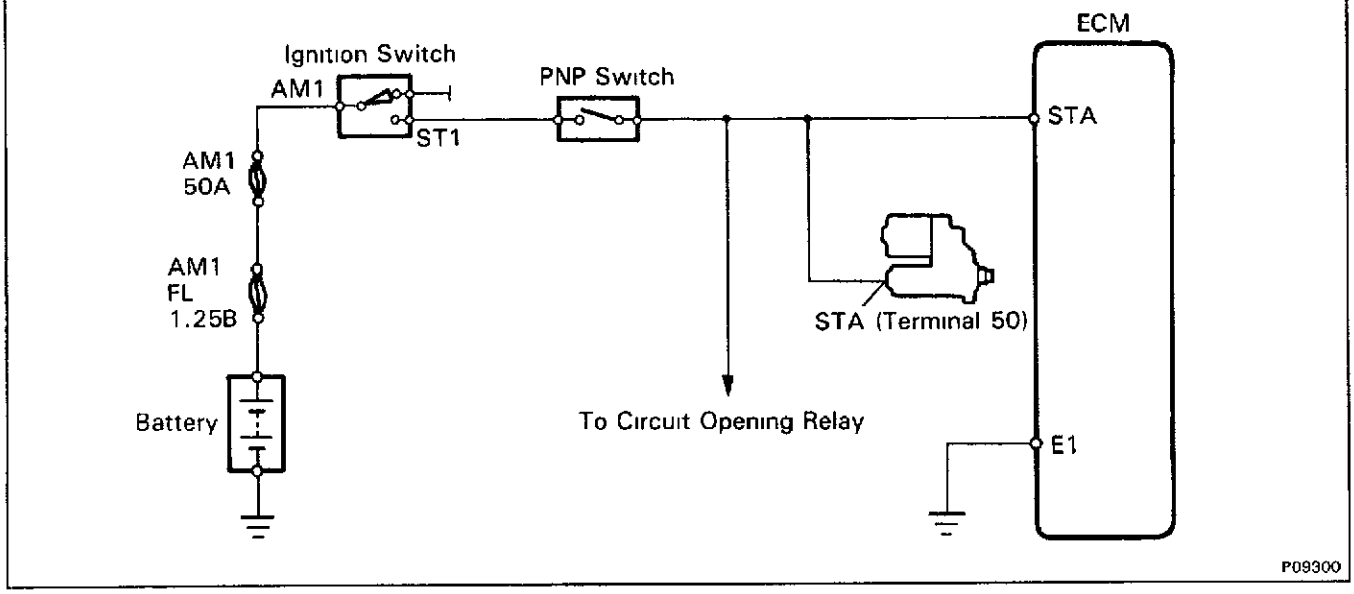
BAD

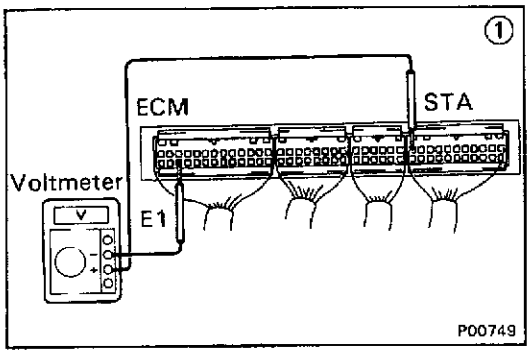
Try another ECM

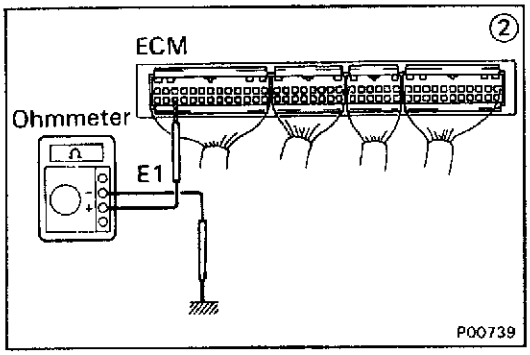
Repair or replace

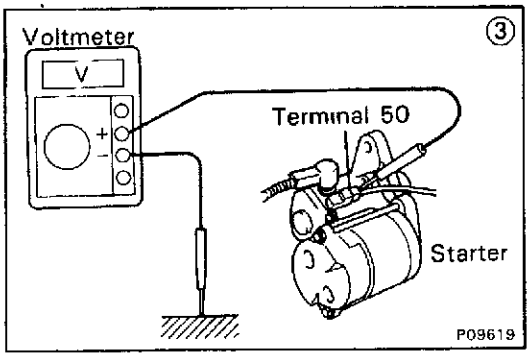
V01936

No	Terminals	Trouble	Condition	STD voltage
7	STA - E 1	No voltage	Cranking	6 V or more









(1) There is no voltage between ECM terminals STA and E1 **(IG SW START)**

Check starter operation — OK → Check wiring between ECM terminal STA and ignition switch terminal ST 1

Check starter operation — BAD

Check wiring between ECM terminal STA and ignition switch terminal ST 1 — OK

Check wiring between ECM terminal STA and ignition switch terminal ST 1 — BAD → Repair or replace

(2) Check wiring between ECM terminal E 1 and body ground — OK → Try another ECM

(2) Check wiring between ECM terminal E 1 and body ground — BAD → Repair or replace

Check H-fuse fusible link battery wiring ignition switch and PNP switch — BAD → Repair or replace

Check H-fuse fusible link battery wiring ignition switch and PNP switch — OK

(3) Check that there is voltage at starter terminal 50 **(IG SW START) STD voltage 6 V or more**

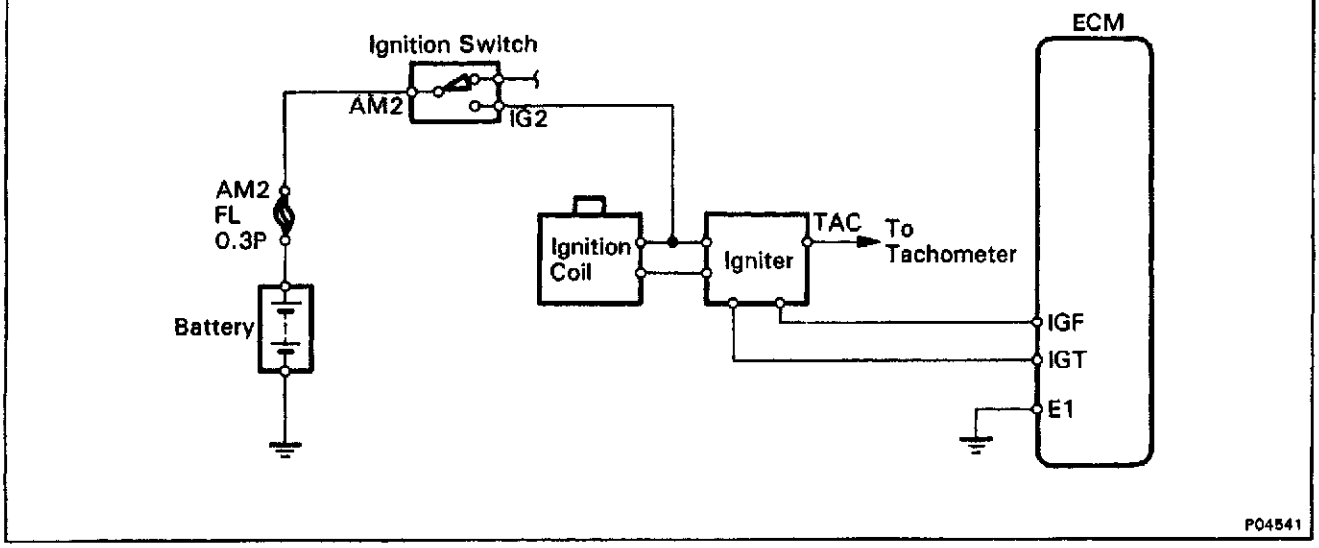
(3) Check that there is voltage at starter terminal 50 — OK

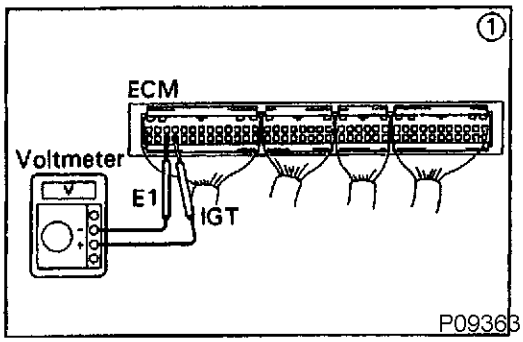
(3) Check that there is voltage at starter terminal 50 — NO → Check wiring between ignition switch terminal ST 1 and starter terminal 50

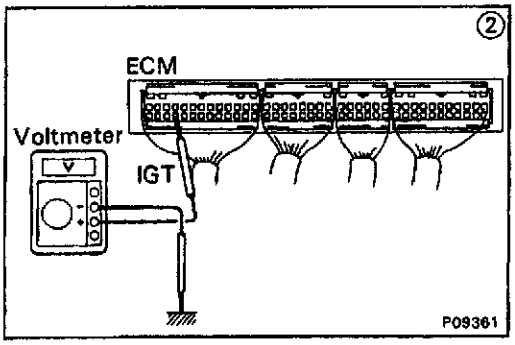
Check starter — BAD → Check wiring between ignition switch terminal ST 1 and starter terminal 50

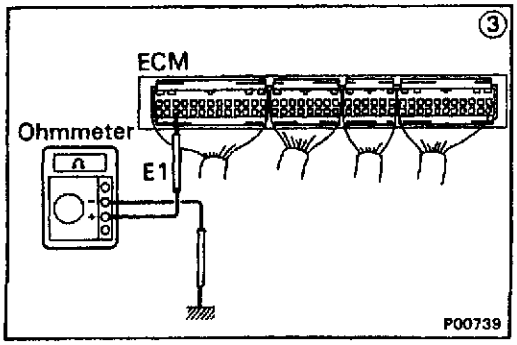
V01937

No	Terminals	Trouble	Condition	STD voltage
8	IGT-E1	No voltage	Idling	Pulse generation









(1) There is no voltage between ECM terminals IGT and E1 **(Idling)**

(2) Check that there is voltage between ECM terminal IGT and body ground **(Idling)**

NO

OK

(3) Check wiring between ECM terminal E1 and body ground

BAD → Repair or replace

OK

Try another ECM

Check fusible link and ignition switch

6AD → Repair or replace

OK

Check distributor (See IG section)

BAD → Repair or replace

OK

Check wiring between ECM and battery

BAD → Repair or replace

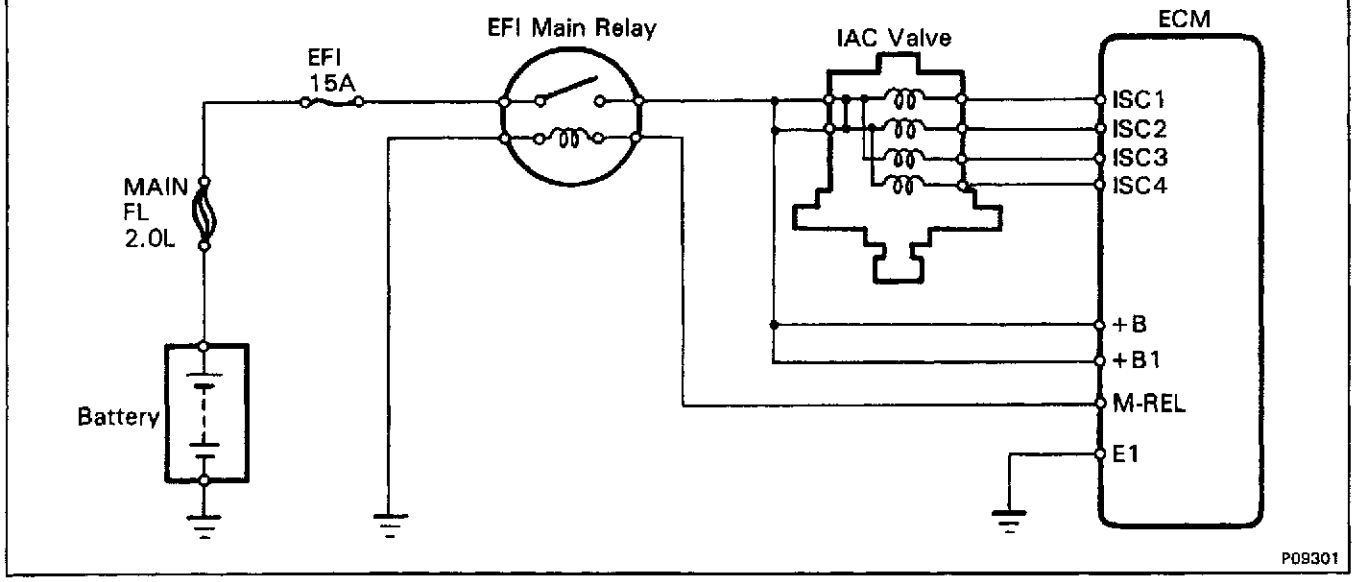
OK

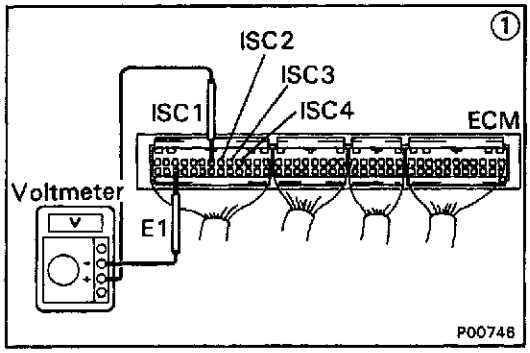
Check igniter (See IG section)

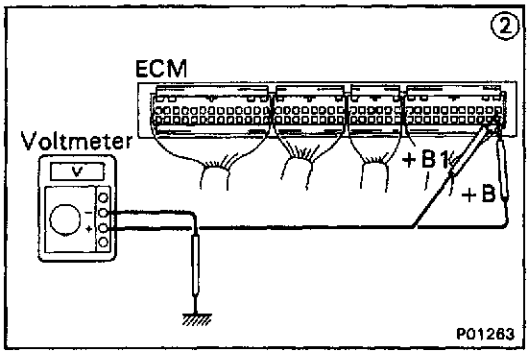
BAD → Repair or replace

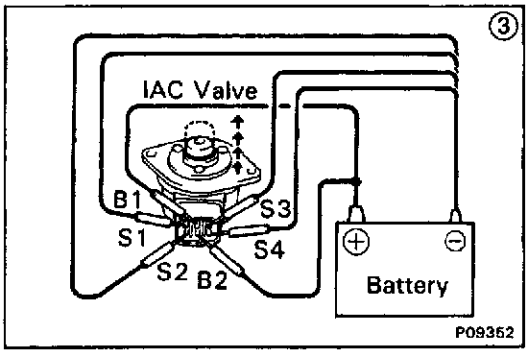
V01938

No	Terminals	Trouble	Condition	STD Voltage
9	ISC1-ISC4-E1	No voltage	IG SW ON	9 - 14V









(1)There is no voltage between ECM terminals ISC 1 - ISC4 and E 1 **(IG SW ON)**

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground **(UG SW ON)**

OK

NO

Refer to No 1 (See page EG-235)

Check wiring between ECM terminal E 1 and body ground

OK

BAD

(3) Check IAC valve (See page EG-295)

Repair or replace

BAD

OK

Replace IAC valve

Check wiring between ECM and EFI main relay

OK

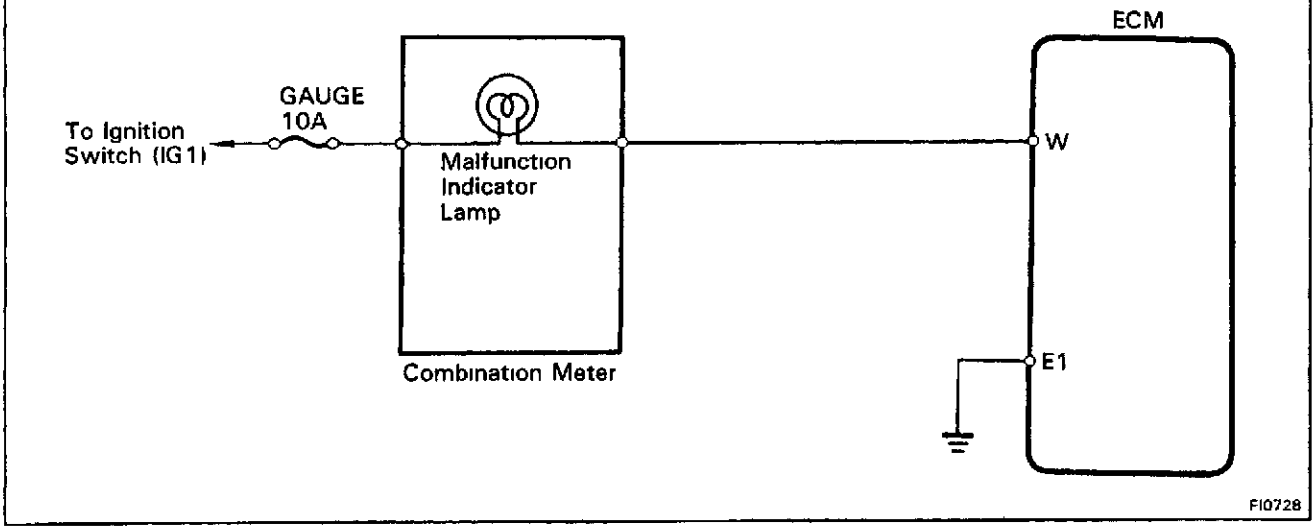
BAD

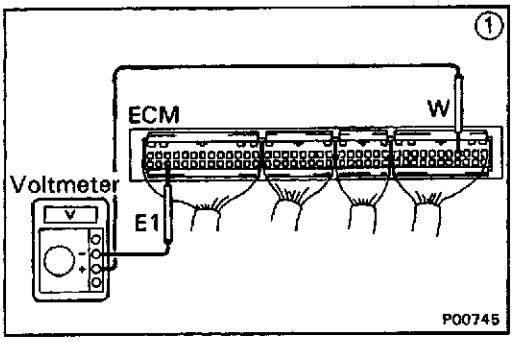
Try another ECM

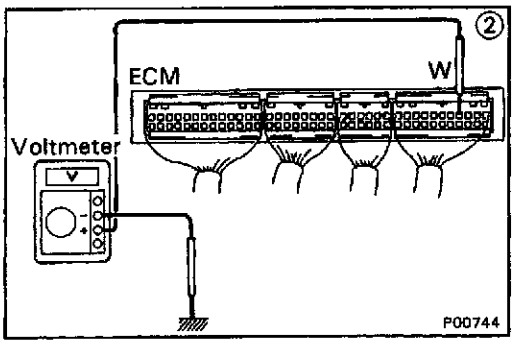
Repair or replace

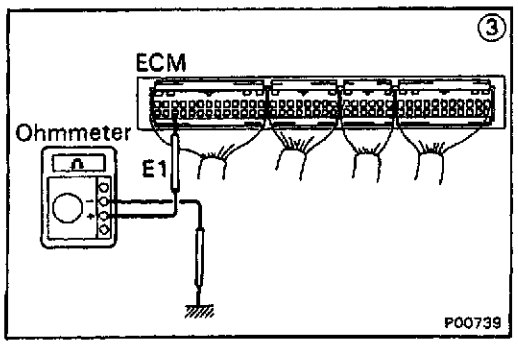
V01939

No.	Terminals	Trouble	Condition	STD voltage
10	W — E1	No voltage	No trouble (malfunction indicator lamp light off) and engine running.	9 — 14 V









① There is no voltage between ECM terminals W and E1. (Idling)

↓

② Check that there is voltage between ECM terminal W and body ground.

NO → OK

OK → ③ Check wiring between ECM terminal E1 and body ground.

③ OK → Try another ECM.

③ BAD → Repair or replace.

NO → Check GAUGE fuse (10A) and malfunction indicator lamp.

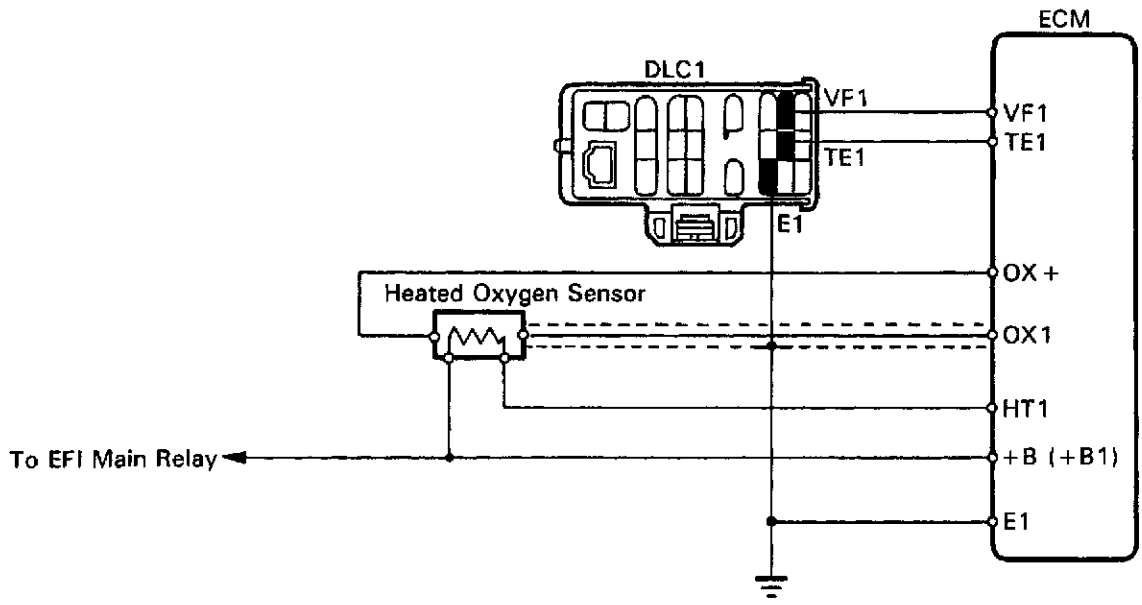
OK → Check wiring between ECM terminal W and fuse.

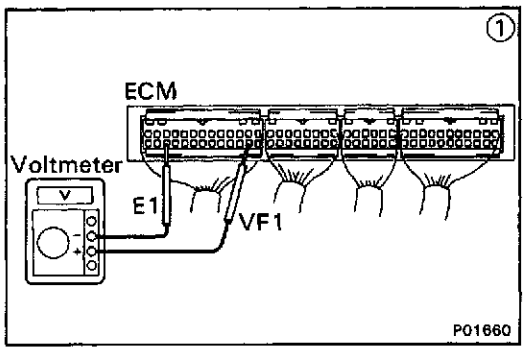
BAD → Repair or replace.

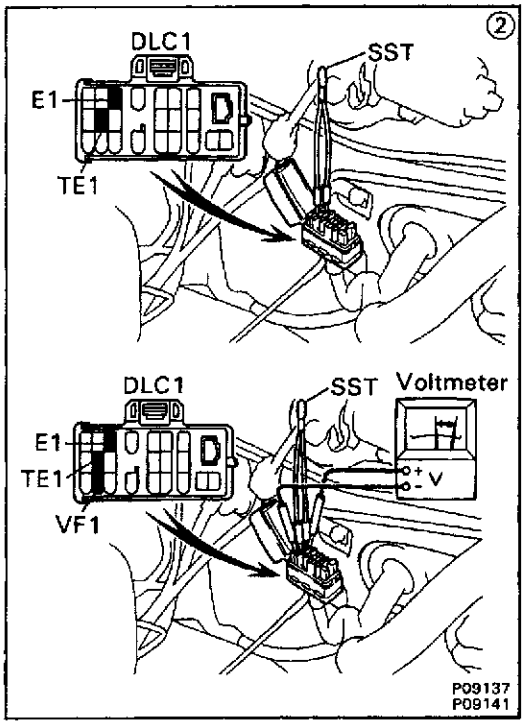
Fuse blows again → Check wiring between ECM terminal W and fuse.

BAD → Repair or replace.

No 1 Heated Oxygen Sensor







(1) There is no voltage between ECM terminals VF 1 and E 1

Check that there is specified voltage between ECM terminal VF 1 and body ground

NO → OK: Check wiring between ECM terminal E 1 and body ground

OK → Try another ECM

BAD → Repair or replace

Check for air suction of air into exhaust system — BAD → Repair air suction

OK

Check for air leak from air induction system — BAD → Repair air leak

OK

Check spark plugs — BAD Rep → Repair or replace

OK

Check distributor and ignition system — BAD → Repair or replace

OK

Check fuel pressure — BAD → Repair or replace

OK

Check injectors — BAD → Repair or replace

OK

Check VAF meter — BAD → Repair or replace

OK

(3) Check operation of heated oxygen sensor → System normal

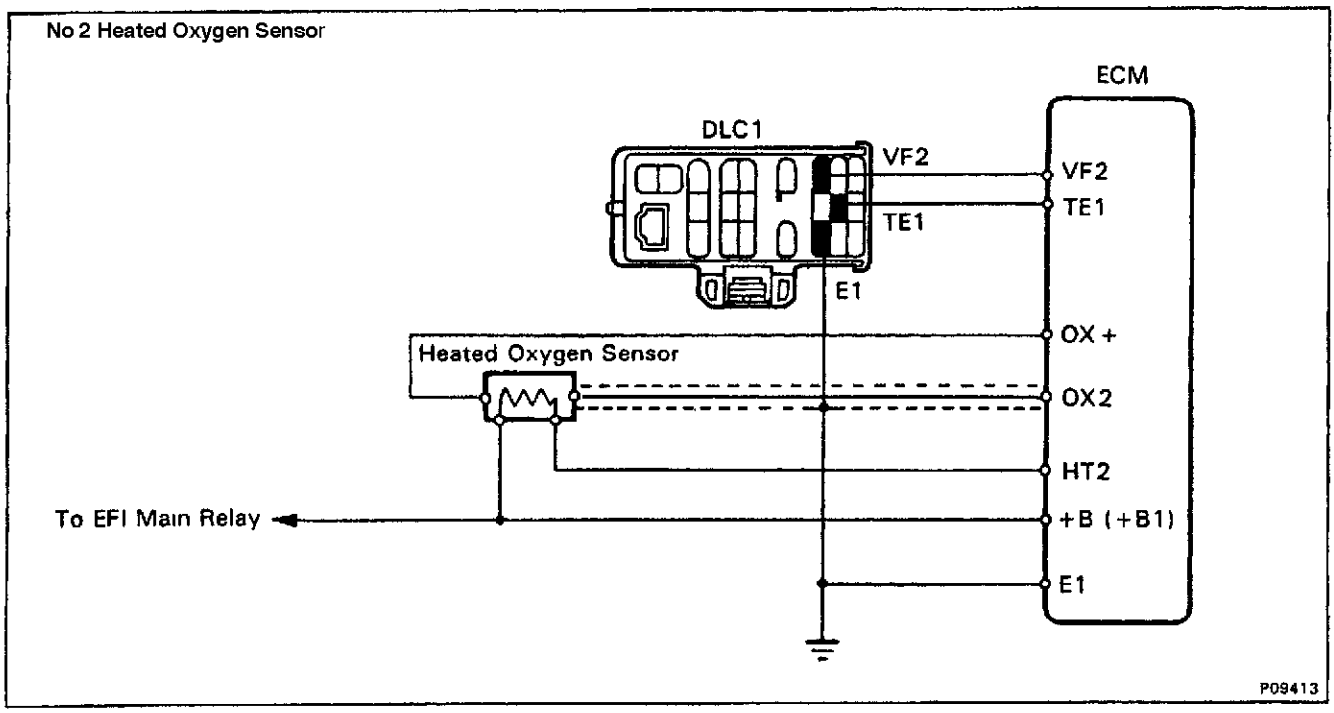
BAD

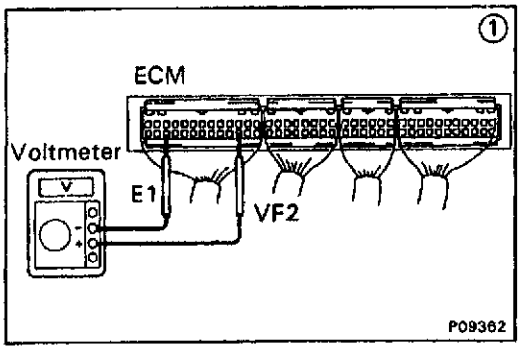
Check wiring between heated oxygen sensor and ECM connectors — BAD → Repair wiring

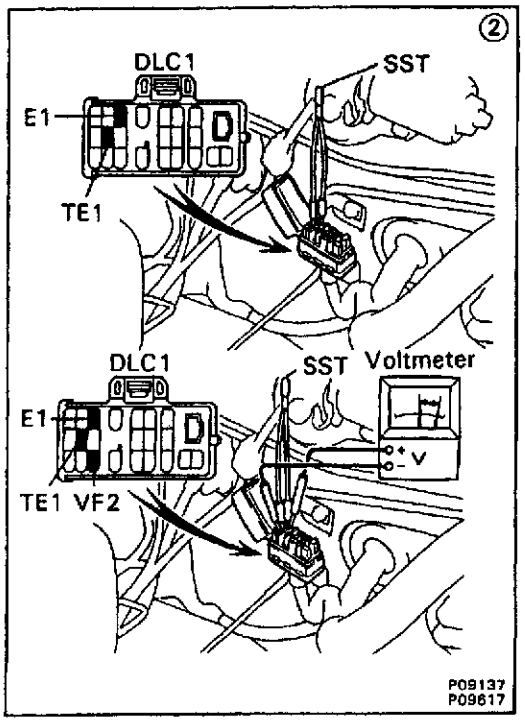
OK

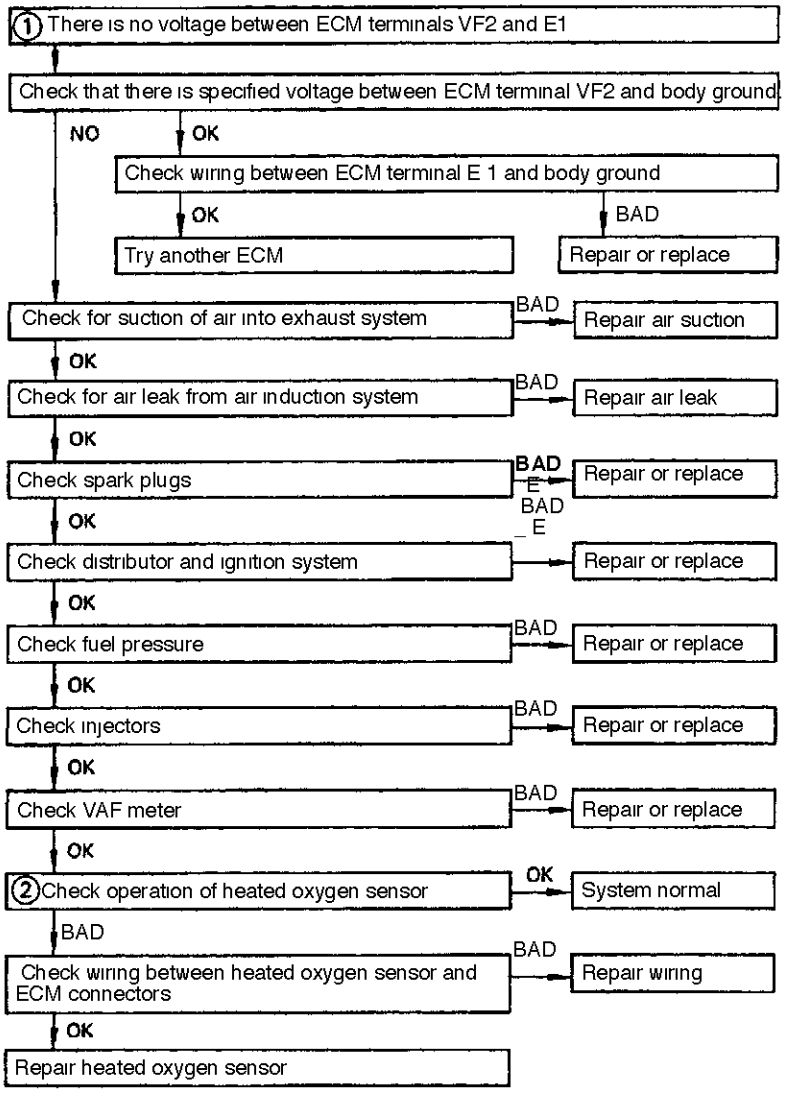
Repair heated oxygen sensor

V01941

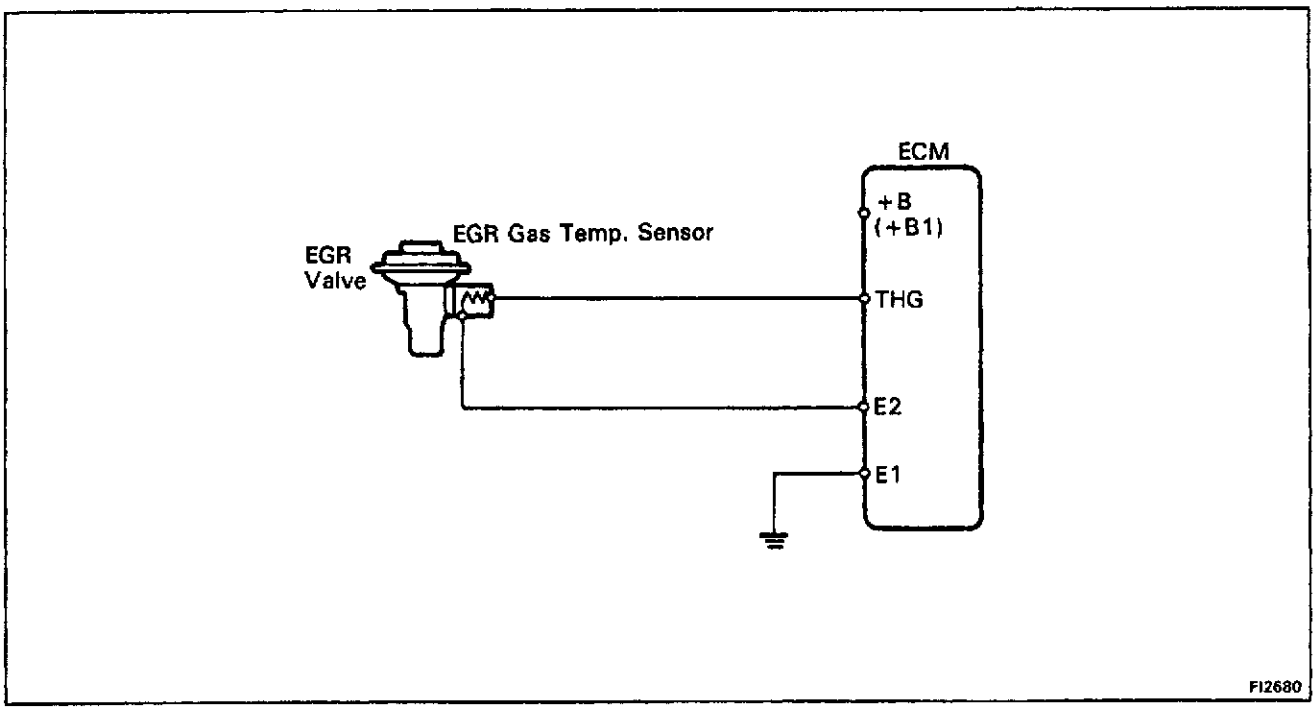

No 2 Heated Oxygen Sensor
ECM
DLC1
VF2
TE1
E1
VF2
TE1
OX +
Heated Oxygen Sensor
OX2
HT2
To EFI Main Relay
+B (+B1)
E1
P09413

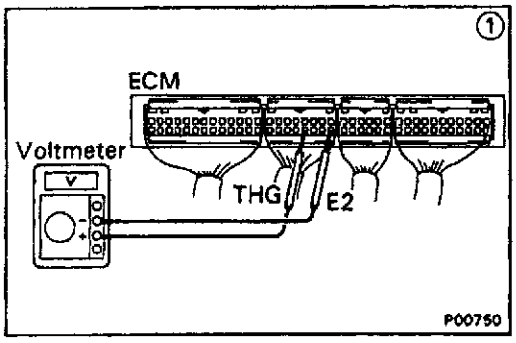

①
ECM
Voltmeter
E1
VF2
P09362

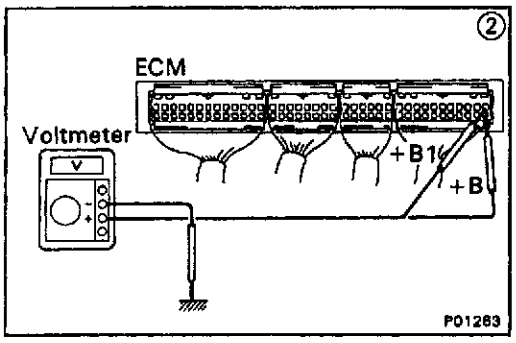

②
DLC1
SST
E1
TE1
DLC1
SST
Voltmeter
E1
TE1 VF2
P09137
P09617

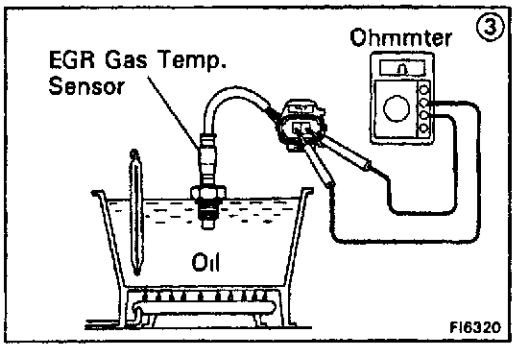

① There is no voltage between ECM terminals VF2 and E1
Check that there is specified voltage between ECM terminal VF2 and body ground
NO
OK
Check wiring between ECM terminal E 1 and body ground
OK
BAD
Try another ECM
Repair or replace
Check for suction of air into exhaust system
BAD
Repair air suction
OK
Check for air leak from air induction system
BAD
Repair air leak
OK
Check spark plugs
BAD
Repair or replace
BAD
OK
Check distributor and ignition system
Repair or replace
OK
Check fuel pressure
BAD
Repair or replace
OK
Check injectors
BAD
Repair or replace
OK
Check VAF meter
BAD
Repair or replace
OK
② Check operation of heated oxygen sensor
OK
System normal
BAD
Check wiring between heated oxygen sensor and ECM connectors
BAD
Repair wiring
OK
Repair heated oxygen sensor

V01942









(1) There is no voltage between ECM terminals THG and E2 **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground **(1C3 SW ON)**

OK

NO

Refer- to No 1 (See page EG-235)

Check wiring between ECM terminal E 1 and body ground

OK

BAD

Repair or replace

Check EGR system (See page EG-185)

BAD

Repair or replace

OK

Check EGR gas temp sensor (See page EG-314)

BAD

OK

Replace EGR gas temp sensor

Check wiring between ECM and EG R gas temp sensor

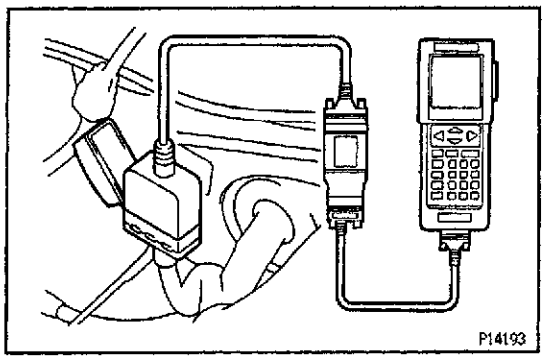
OK

BAD

Try another ECM

Repair or replace

V03875



REFERENCE VALUE OF ECM DATA

HINT ECM data can be monitored by TOYOTA hand -held tester

1 Hook up the TOYOTA hand-held tester to DLC1

2 Monitor ECM data by following the prompts on the tester screen

Please refer to the TOYOTA hand - held tester operator's manual for further details

REFERENCE VALUE

Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temperature	Gradually decreases Approx 3 msecs
IGNITION	Increase engine speed	Gradually increases
IAC STEP	Engine idling at normal operating temperature A/C switch ON A/T shifting in D position Ignition switch ON (Do not start engine)	40 ± 10 steps Step increases Step increases Approx 125 steps
ENGINE SPEED	RPM kept stable (Comparison with tachometer)	No great changes
VAF	Engine idling increase engine speed	Approx 1 2 - 2 4 V Gradually increases
ECT	Engine at normal operating temperature	75 - 95° C (167 - 203° F) *1
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 5° Above 70° Gradually increases
SPD VEHICLE	During driving (Comparison with speedmeter)	No large differences
TARGET No 1	Engine idling at normal operating temperature	2 50 ± 1 25 V *2
TARGET No 2	Engine idling at normal operating temperature	2 50 ± 1 25 V *2
A/F FB No 1	RPM stable at 2500 rpm with normal operating temperature	ON
A/F FB No 2	RPM stable at 2500 rpm with normal operating temperature	ON
STA SIGNAL	During cranking	ON
CTP SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch O N	ON
PNP SIGNAL	When shifting from P or N position into a position other than P or N	GEAR
Ox No 1	RPM stable at 2500 rpm	RICH LEAN is repeated
Ox No 2	RPM stable at 2500 rpm	RICH LEAN is repeated

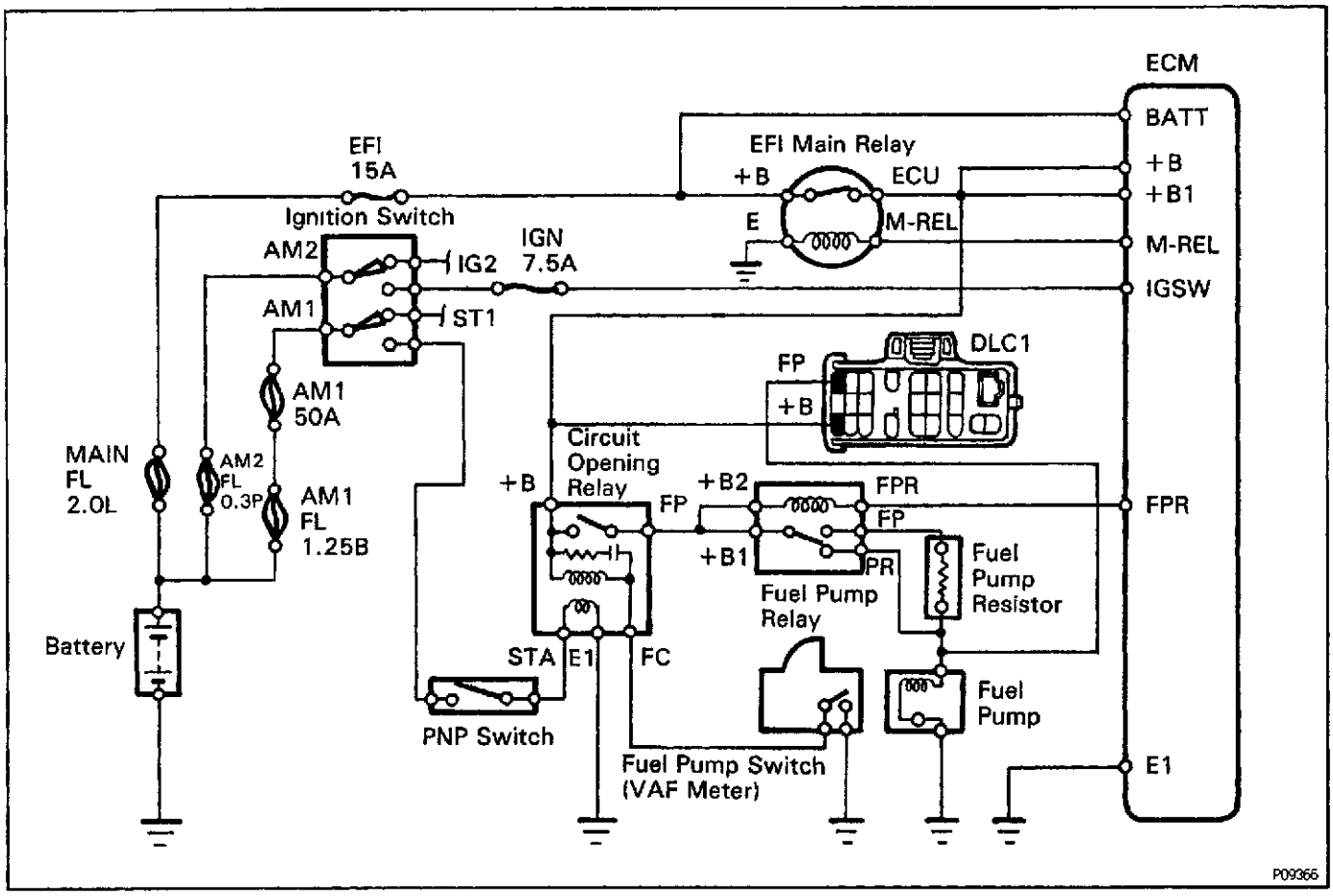
*1 If the engine coolant temperature sensor circuit is open or shorted, the ECM assumes an engine coolant temperature value of 80°C (176" F)

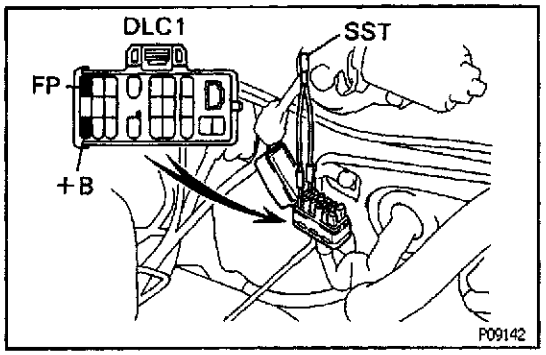
*2 When feedback control is forbidden, 0 V is displayed

FUEL PUMP

E90CV-07

SYSTEM CIRCUIT





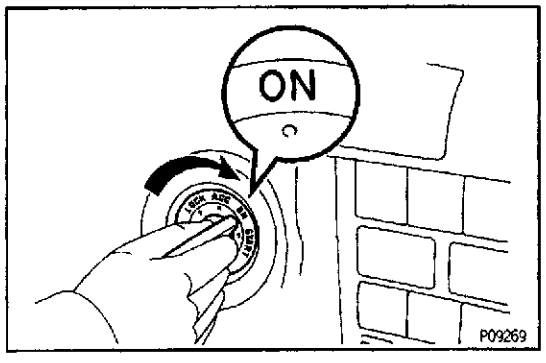
E91AS-05

ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

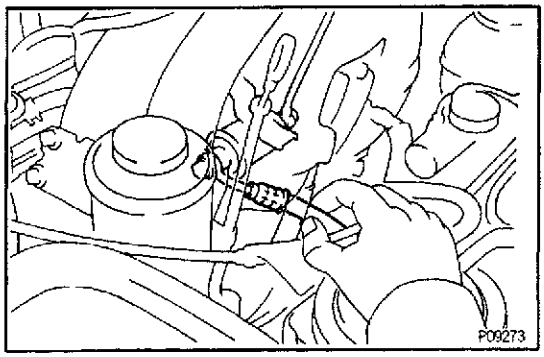
(a) Using SST, connect terminals +B and FP of the DLC 1

SST 09843-18020



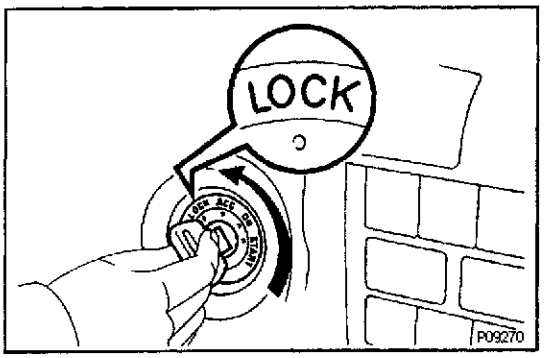
(b) Turn the ignition switch ON

NOTICE: Do not start the engine.

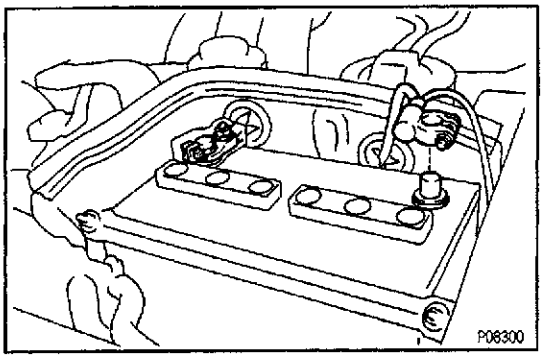


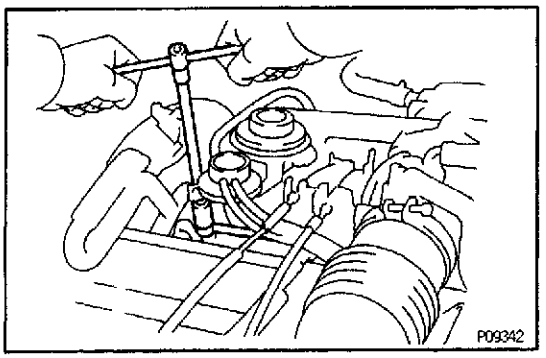
(c) Check that there is pressure in the hose from the fuel filter
HINT At this time, you will hear fuel return noise
- If there is no pressure, check the following parts
- Fusible links (MAIN 2 OL, AM2 0 3P)
- Fuses (EF1 15A, IGN 7 5A)
- EFI main relay
- Fuel pump
- ECM
- Wiring connections

(d) Turn the ignition switch to LOCK
(e) Remove SST
SST 09843-18020

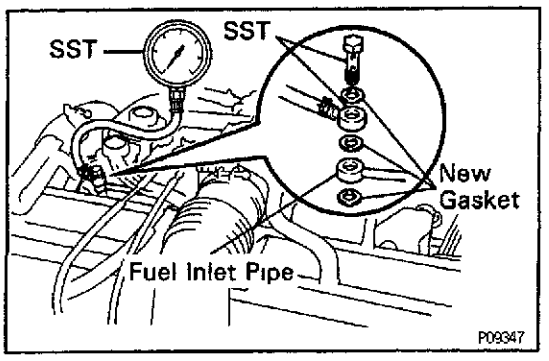


2. CHECK FUEL PRESSURE
(a) Check that the battery voltages is above 12 volts
(b) Disconnect the negative (-) terminal cable from the battery

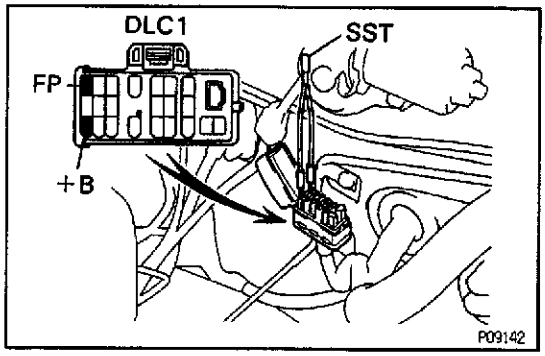




(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe
HINT
- Put a suitable container or shop rag under the delivery pipe ,
- Slowly loosen the union bolt

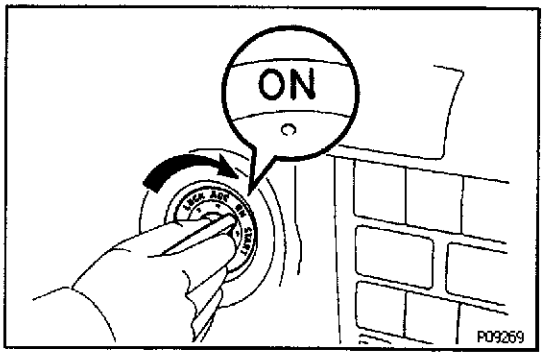


(d) Install the fuel inlet pipe and SST (pressure gauge) to the delivery pipe with 3 new gaskets and SST (union bolt)
SST 09268-45012
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)
(e) Wipe off any splattered gasoline

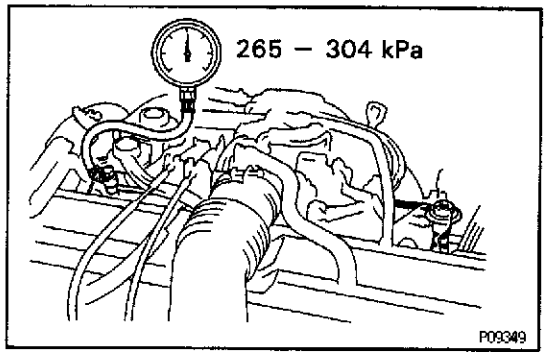


(f) Using SST, connect terminals +B and FP of the DLC 1
SST 09843-18020

(g) Reconnect the battery negative (-) cable



(h) Turn the ignition switch ON



(i) Measure the fuel pressure

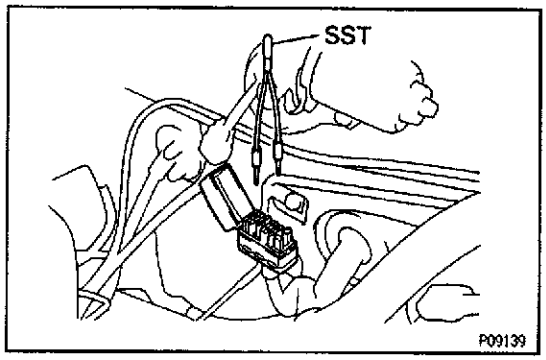
Fuel pressure:

265-304 kPa (2.7-3.1 kgf/cm^2, 38-44 psi)

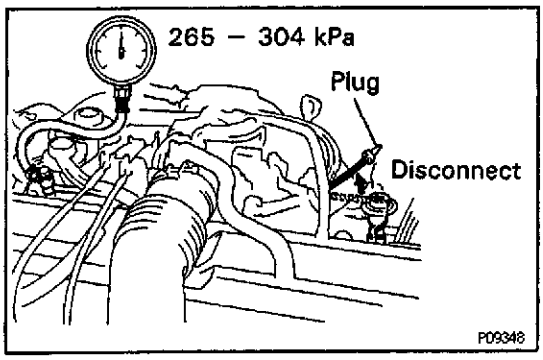
If pressure is high, replace the fuel pressure regulator

If pressure is low, check the following parts

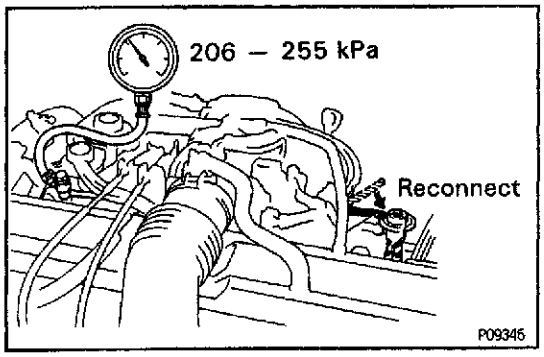
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator
- Fuel pump relay
- Fuel pump resistor
- Injectors



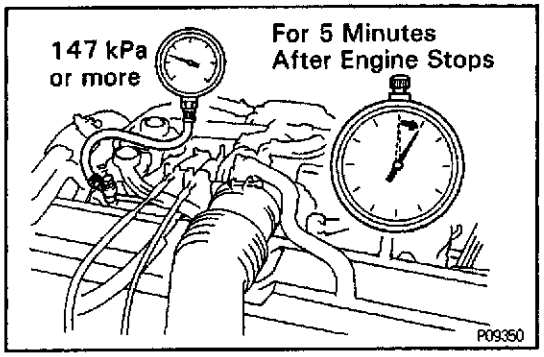
(j) Remove SST from the DLC1
SST 09843-18020



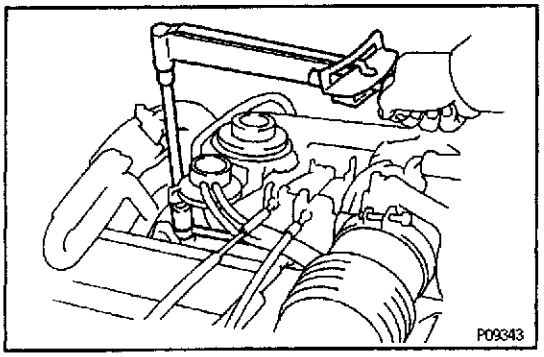
(k) Start the engine
(l) Disconnect the vacuum sensing hose from the fuel pressure regulator and plug the hose end
(m) Measure the fuel pressure at idle
Fuel pressure:
265-304 kPa (2.7-3.1 kg f/cm^2, 38-44 psi)



(n) Reconnect the vacuum sensing hose to the fuel pressure regulator
(o) Measure the fuel pressure at idle
Fuel pressure:
206-255 kPa (2.1-2.6 kgf/cm^2. 31-37 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator
(p) Stop the engine

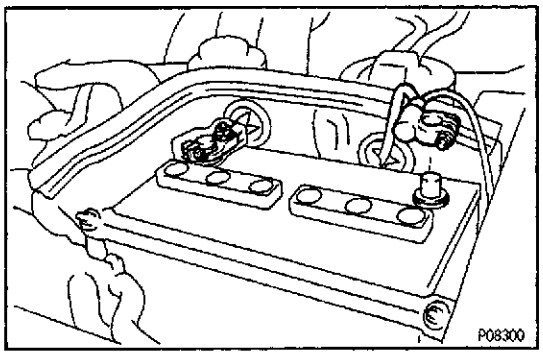


(q) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped
Fuel pressure:
147 kPa (1.5 kgf/cm^2 21 psi) or more
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector
(r) After checking fuel pressure, disconnect the battery negative (-) cable and carefully remove SST to prevent gasoline from splashing
SST 09268-45012



(s) Reconnect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)

(t) Reconnect the negative (-) terminal cable to the battery
(u) Check for fuel leakage



FUEL PUMP INSPECTION

5G1A6--03

(SEE COMPONENTS FOR REMOVAL AND INSTALLATION)

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY

2. REMOVE SECOND SEATS

3. REMOVE SCUFF PLATE

4. REMOVE SIDE GARNISH

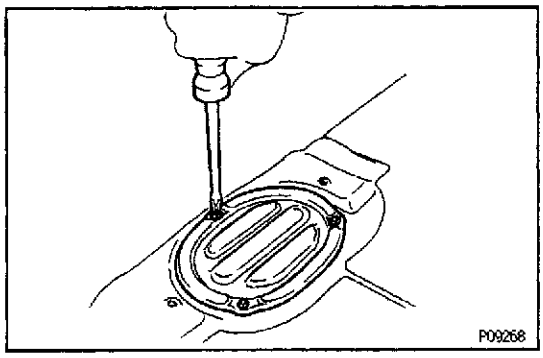
5. REMOVE STEP PLATE

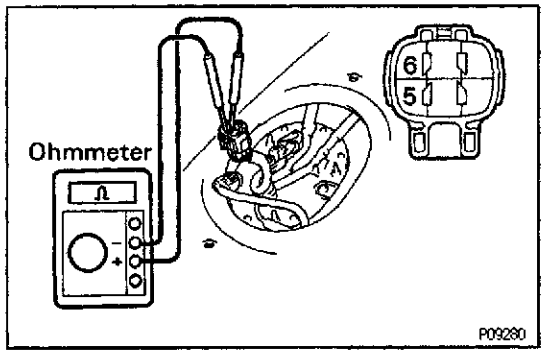
6. DISCONNECT FLOOR MATS

7. REMOVE FLOOR SERVICE HOLE COVER

Remove the 3 screws and service hole cover

8. DISCONNECT FUEL PUMP & SENDER GAUGE CONNECTOR





9. INSPECT FUEL PUMP

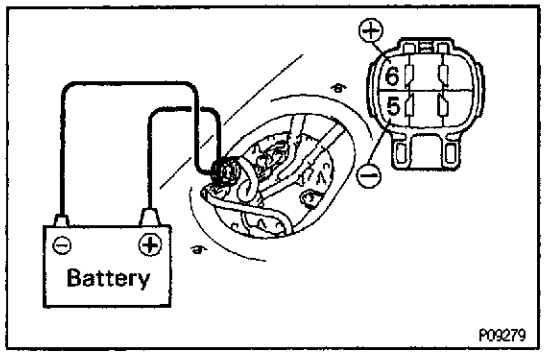
A. Inspect fuel pump resistance

Using an ohmmeter, measure the resistance between the terminals 5 and 6

Resistance:

0.2 - 3.0 0 at 20°C (68-F)

If the resistance is not as specified, replace the fuel pump



B. Inspect fuel pump operation

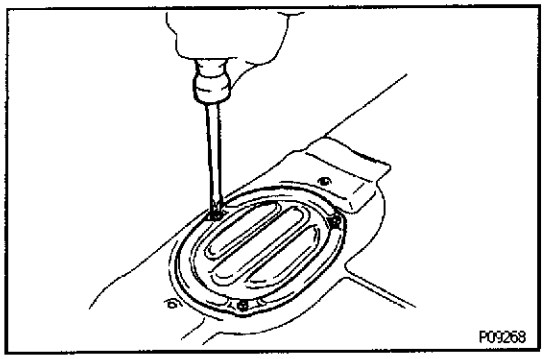
Connect the positive (+) lead from the battery to terminal 6 of the connector, and the negative (-) lead to terminal 5 Check that the fuel pump operates

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

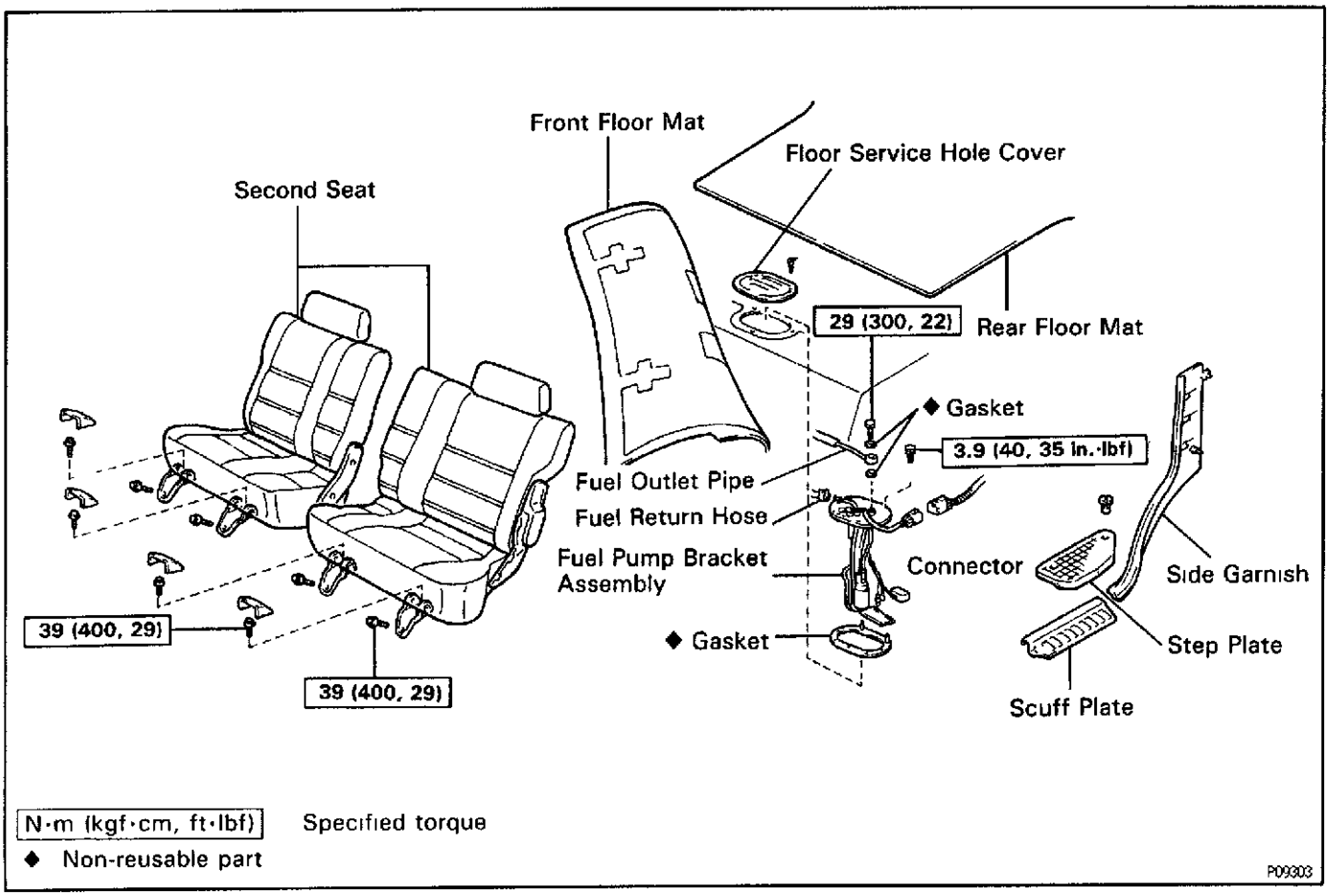
10. RECONNECT FUEL PUMP & SENDER GAUGE CONNECTOR



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)
17. RECONNECT NEGATIVE TERMINAL CABLE TO BATTERY

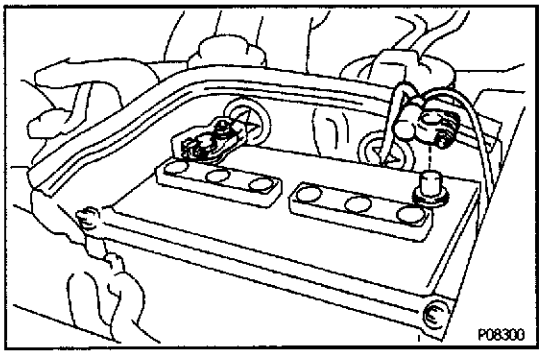
EG1A7-08

COMPONENTS FOR REMOVAL AND INSTALLATION

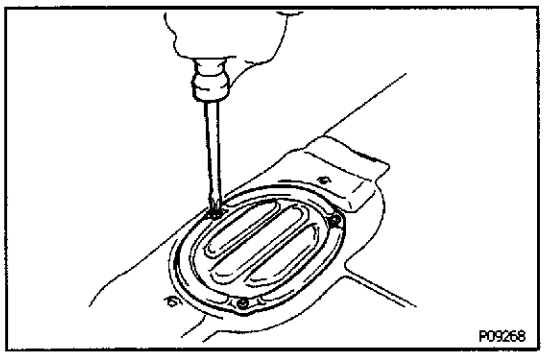


FUEL PUMP REMOVAL

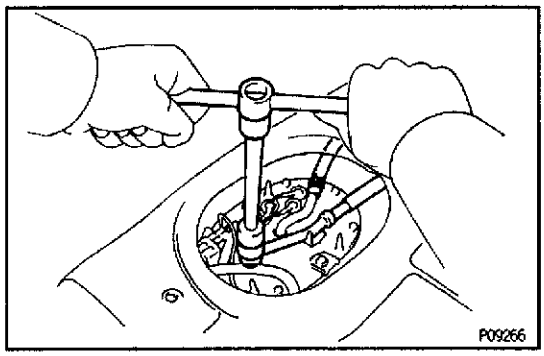
CAUTION: Do not smoke or work near an open flame when working on the fuel pump



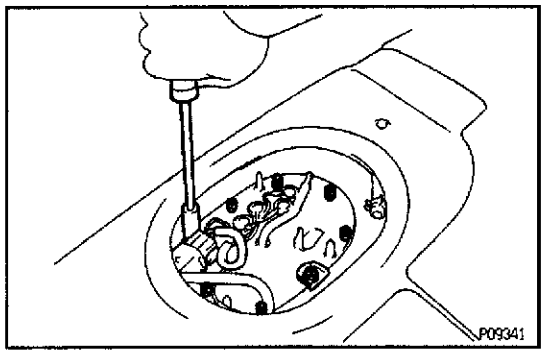
1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY
2. REMOVE SECOND SEATS
3. REMOVE SCUFF PLATE
4. REMOVE SIDE GARNISH
5. REMOVE STEP PLATE
6. DISCONNECT FLOOR MATS



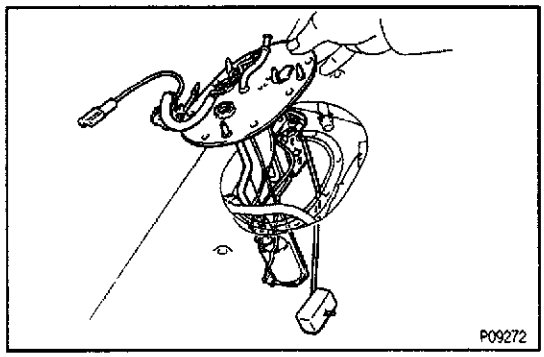
7. REMOVE FLOOR SERVICE HOLE COVER
Remove the 3 screws and service hole cover



8. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET
CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.
(a) Remove the union bolt and gaskets, and disconnect the outlet pipe from the pump bracket
(b) Disconnect the return hose from the pump bracket

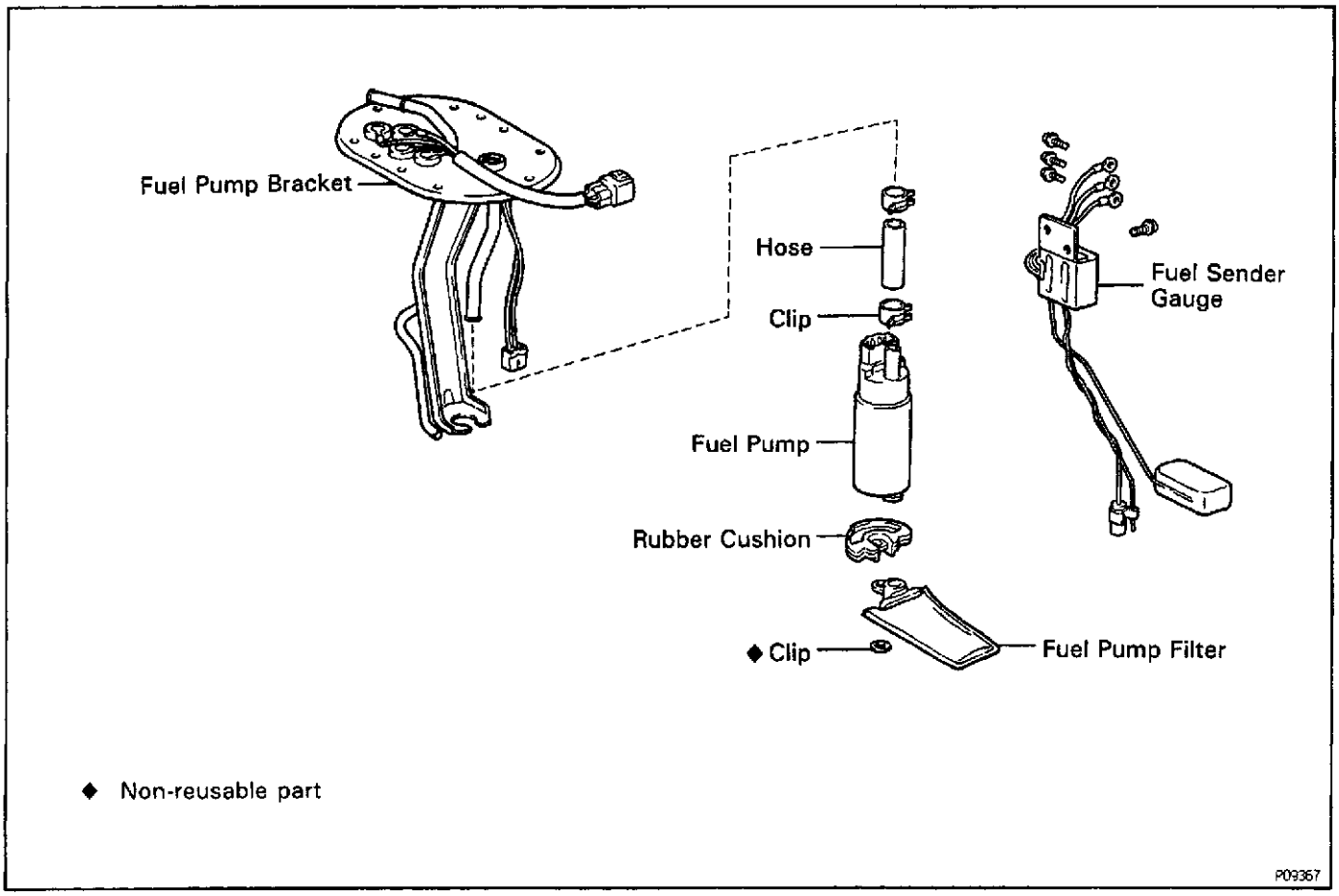


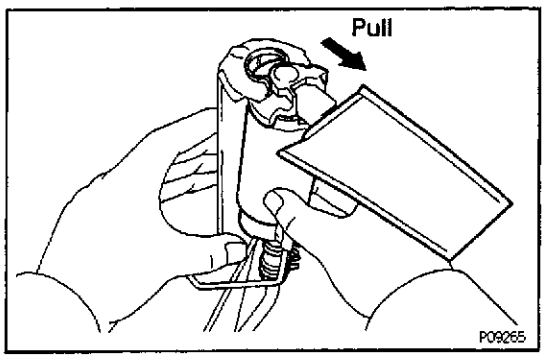
9. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK
(a) Remove the 8 bolts
(b) Disconnect the fuel pump & sender gauge connector

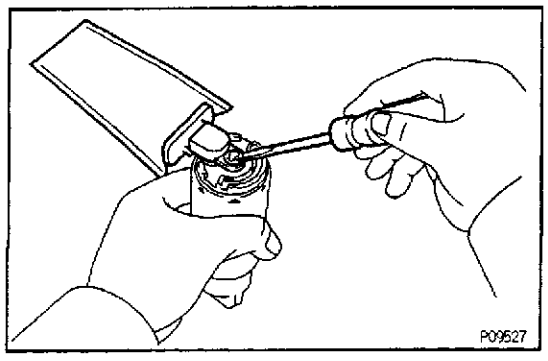


(c) Pull out the pump bracket assembly
(d) Remove the gasket from the pump bracket

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY







FUEL PUMP 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

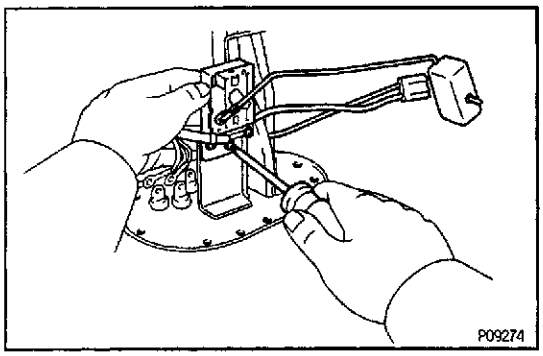
(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump

(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

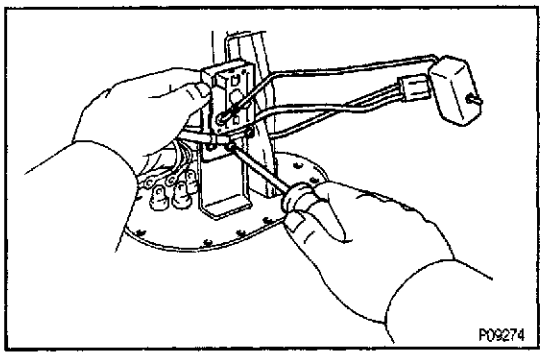
(b) Pull out the pump filter



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 3 screws and sender gauge

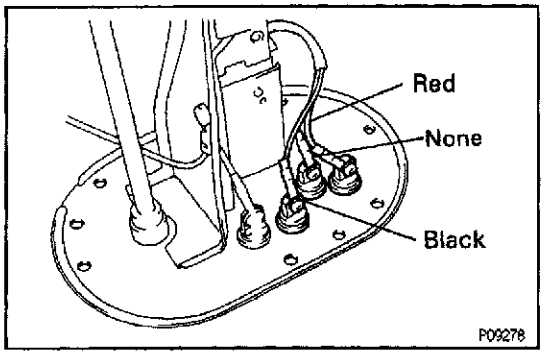


FUEL PUMP ASSEMBLY

(See Components for Disassembly and Assembly)

1 INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET

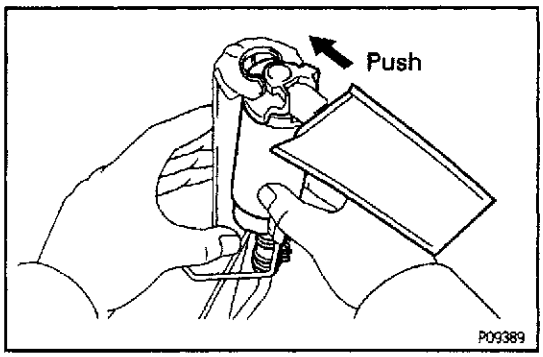
(a) Install the sender gauge with the 3 screws



(b) Connect the 3 lead wires to the pump bracket with the screws as shown

2. INSTALL FUEL PUMP FILTER TO FUEL PUMP

Install the pump filter with a new clip



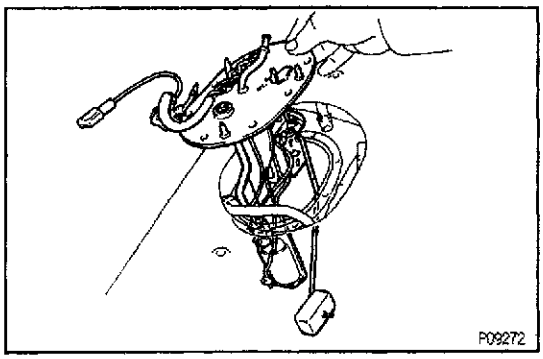
3. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Install the rubber cushion to the fuel pump

(b) Connect the fuel hose to the outlet port of the fuel pump

(c) Install the fuel pump connector

(d) Install the fuel pump by pushing the lower side of the fuel pump



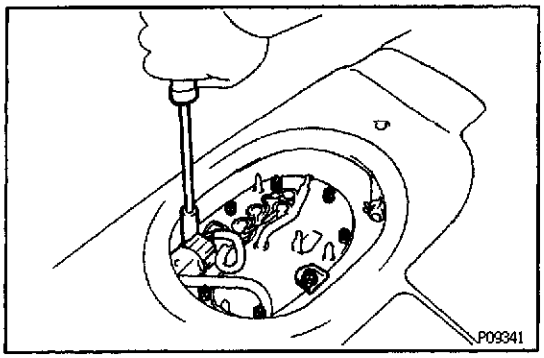
FUEL PUMP INSTALLATION

(See Components for Removal and Installation)

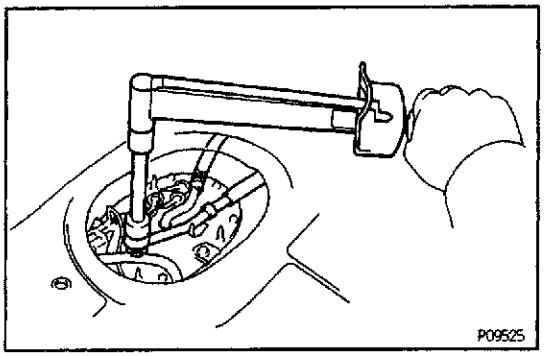
1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

(a) Install a new gasket to the pump bracket

(b) Insert the pump bracket assembly into the fuel tank

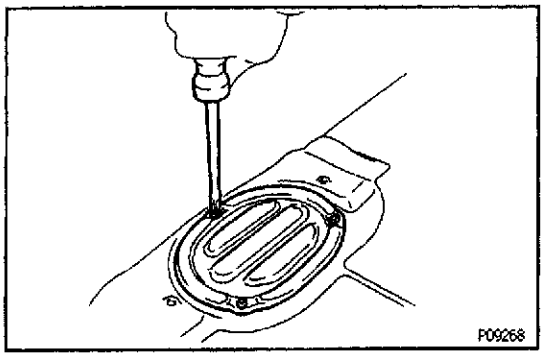


(c) Connect the fuel pump & fuel sender gauge connector
(d) Install the pump bracket with the 8 screws
Torque: 3.9 N-m (40 kgf-cm. 35 in-lbf)



2. CONNECT FUEL PIPE AND HOSE TO FUEL PUMP BRACKET
(a) Connect the return hose to the pump bracket
(b) Connect the outlet pipe to the pump bracket with 2 new gaskets and the union bolt
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)

3. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY
4. CHECK FOR FUEL LEAKAGE



5. INSTALL FLOOR SERVICE HOLE COVER
Install the service hole cover with the 3 screws

6. INSTALL SECOND SEATS
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)
7. INSTALL FLOOR MATS
8. INSTALL STEP PLATE
9. INSTALL SIDE GARNISH
10. INSTALL SCUFF PLATE

FUEL FILTER

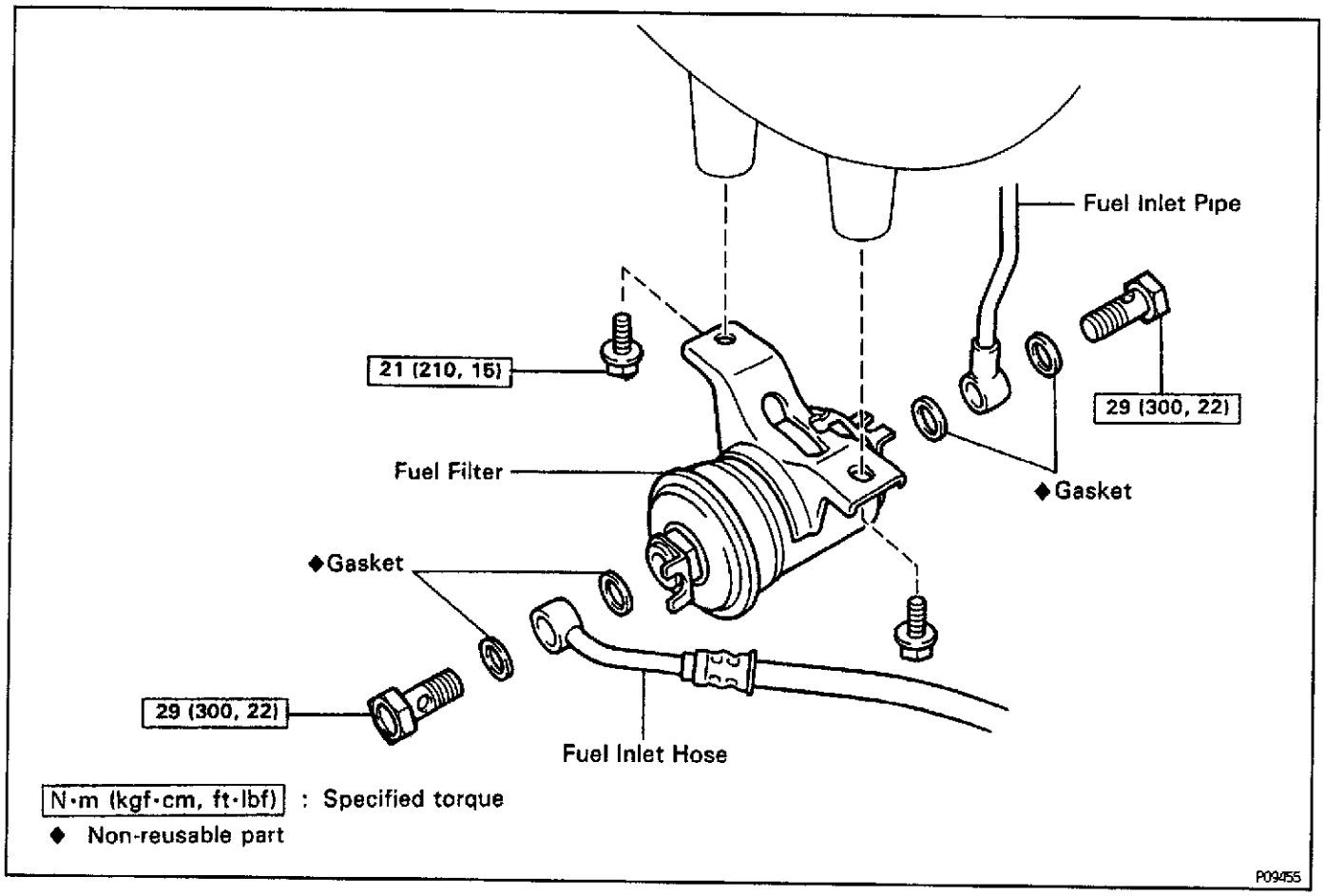
ON-VEHICLE INSPECTION

E01AS-04

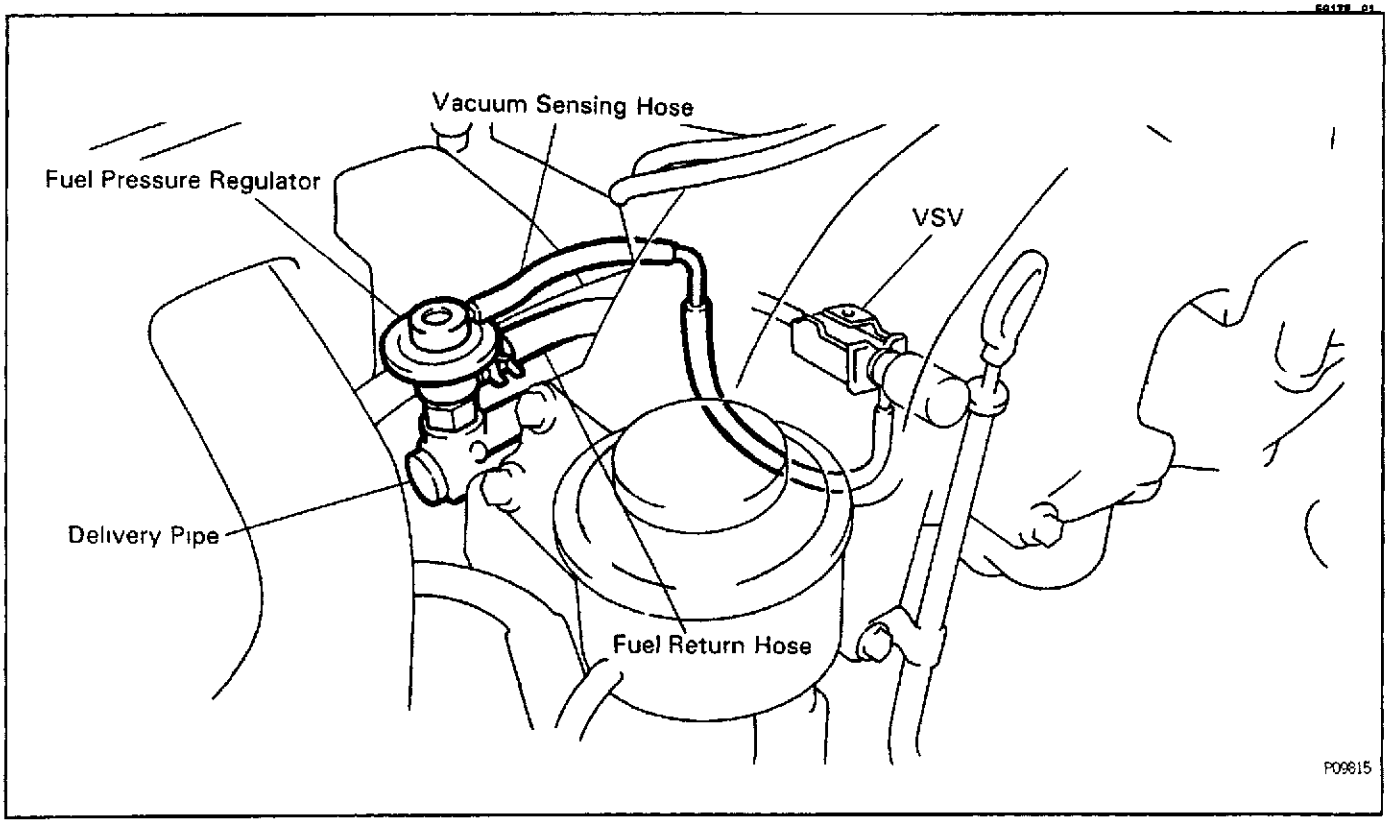
INSPECT FUEL PRESSURE
(SEE STEP 2 ON PAGE EG-253)

E01AS-02

COMPONENTS FOR REMOVAL AND INSTALLATION



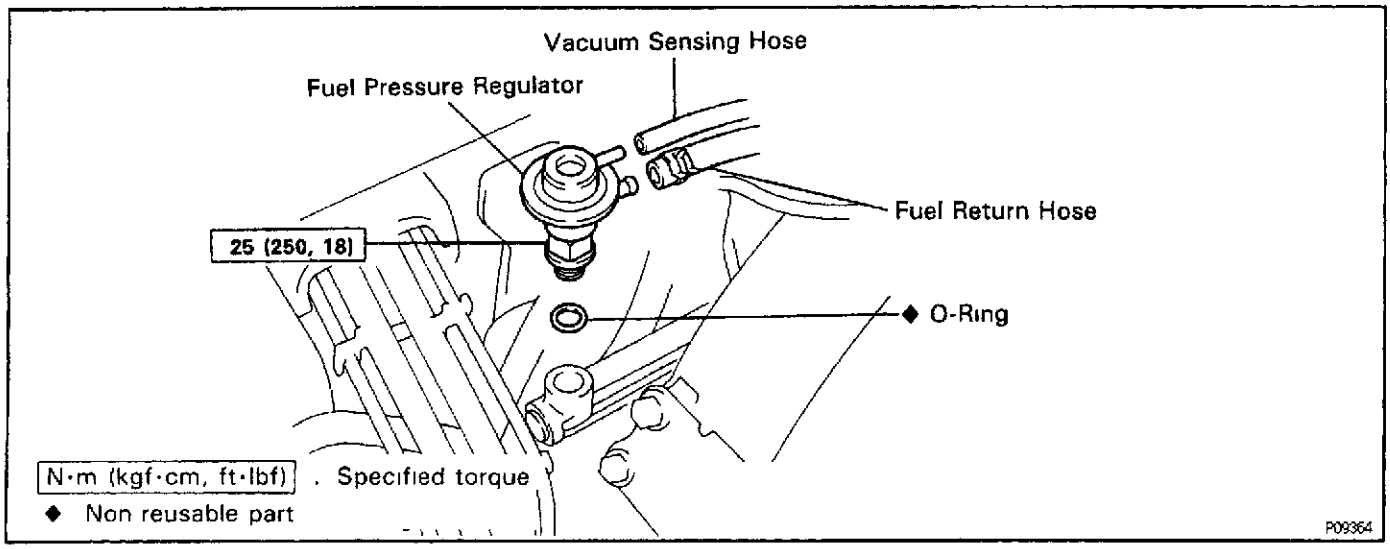
FUEL PRESSURE REGULATOR

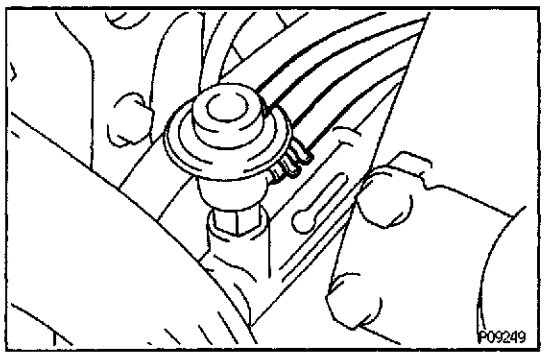


ON-VEHICLE INSPECTION

INSPECT FUEL PRESSURE
(SEE STEP 2 ON PAGE EG-253)

COMPONENTS FOR REMOVAL AND INSTALLATION





FUEL PRESSURE REGULATOR REMOVAL

(See Components for Removal and Installation)

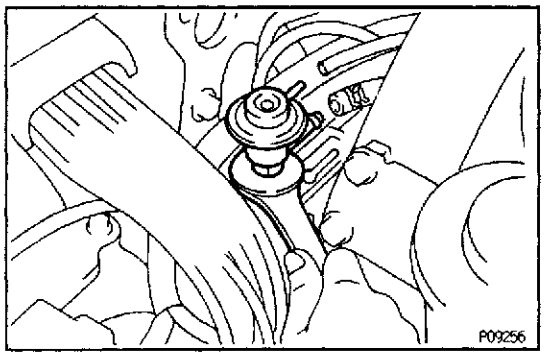
1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

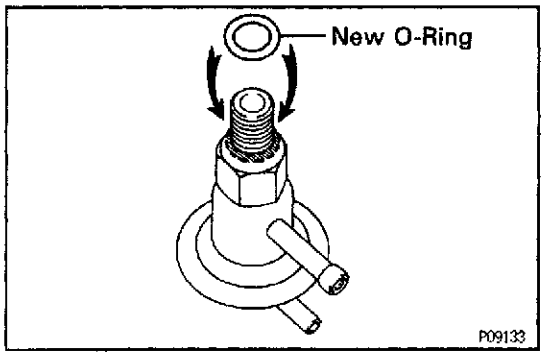
2. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

HINT Put a suitable container or shop towel under the pressure regulator

3. REMOVE FUEL PRESSURE REGULATOR

Loosen the lock nut, and remove the fuel pressure regulator





EG1AE-02

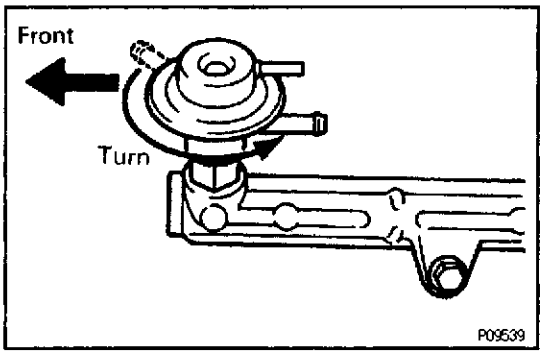
FUEL PRESSURE REGULATOR INSTALLATION

(See Components for Removal and Installation)

1. INSTALL FUEL PRESSURE REGULATOR

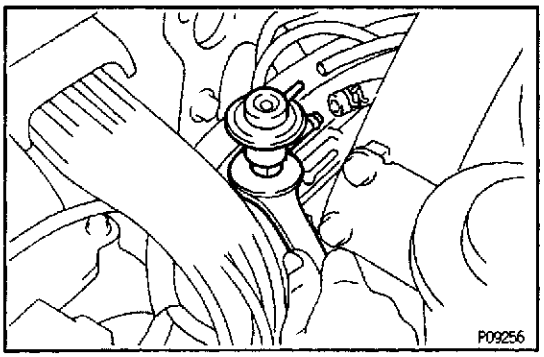
(a) Fully loosen the lock nut of the fuel pressure regulator

(b) Apply a light coat of gasoline to a new O-ring and install it to the fuel pressure regulator



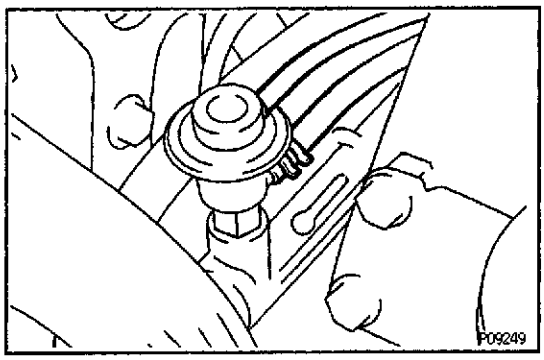
(c) Thrust the fuel pressure regulator completely into the delivery pipe by hand

(d) Turn the fuel pressure regulator counterclockwise until the outlet faces in the direction indicated in the illustration



(e) Torque the lock nut

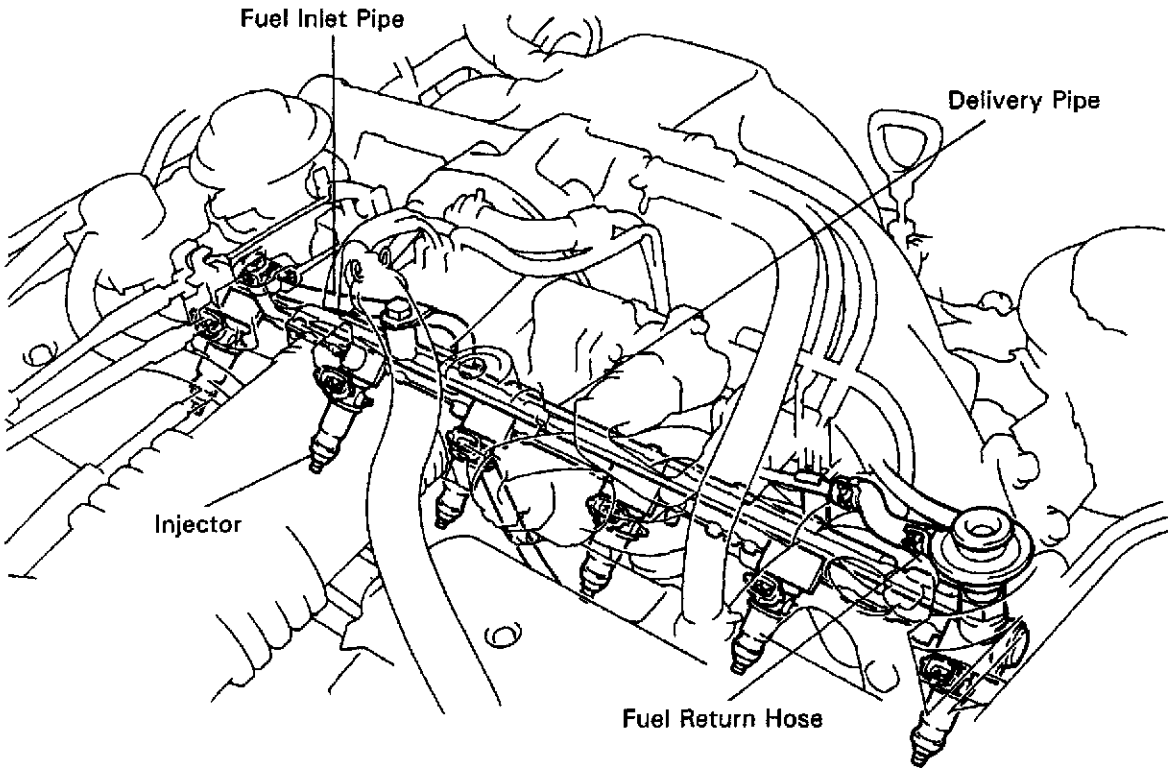
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

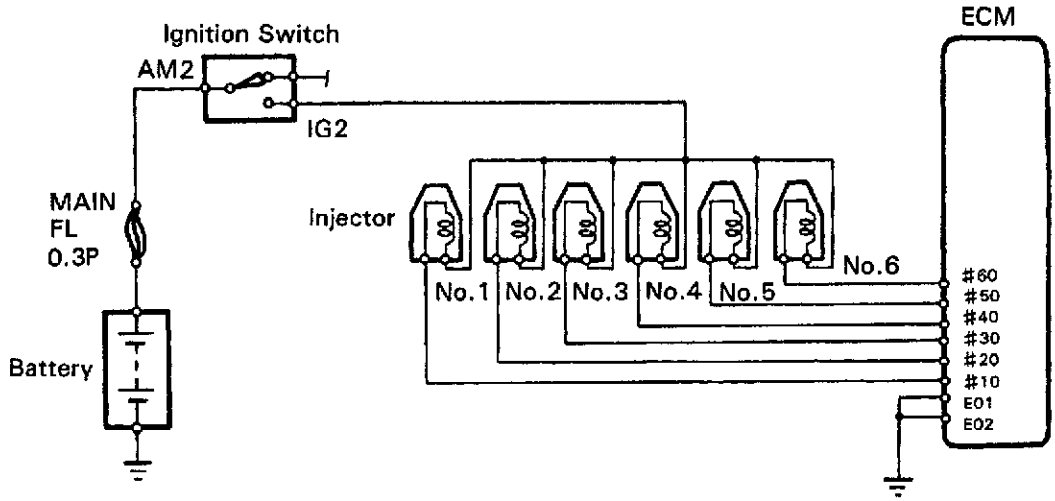


2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR
3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

4. START ENGINE AND CHECK FOR FUEL LEAKAGE

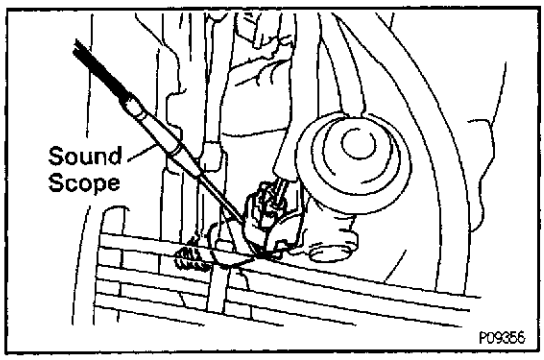
INJECTOR





P09371
P09298

Z04416

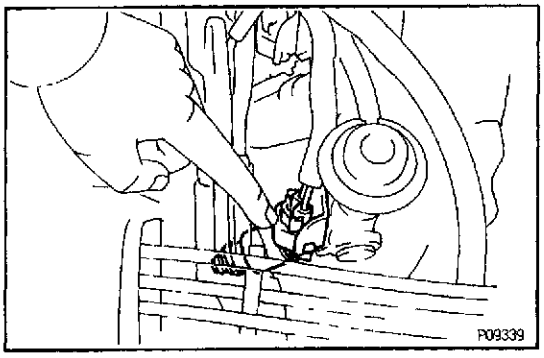


ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation sound from each injector

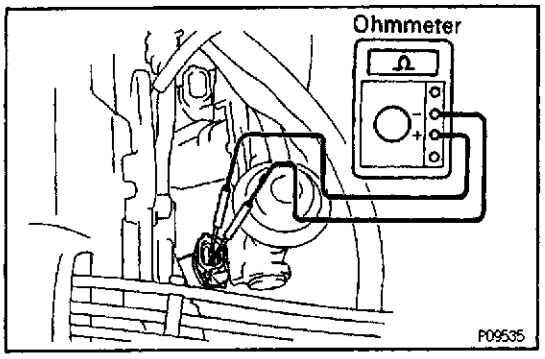
(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed



(b) If you have no sound scope, you can check the injector transmission operation with your finger

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the E C IVI

2. INSPECT INJECTOR RESISTANCE



(a) Remove the throttle body (See page EG-284)

(b) Disconnect the injector connectors

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

Resistance:

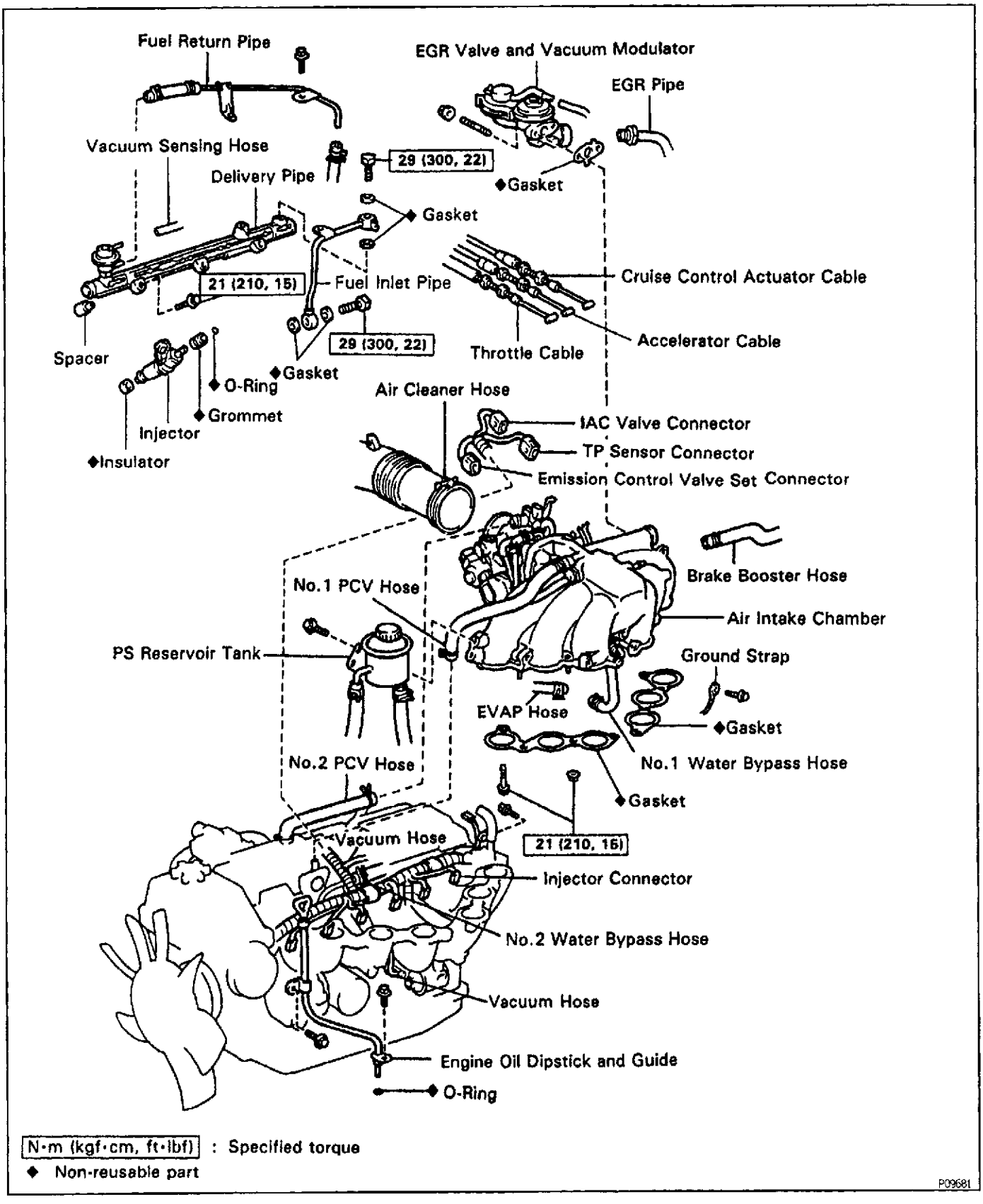
12 to 16Ω at 20° C (680 F)

If the resistance is not as specified, replace the injector

(d) Reconnect the injector connectors

(e) Reinstall the throttle body (See page EG-284)

COMPONENTS FOR REMOVAL AND INSTALLATION EG180-05



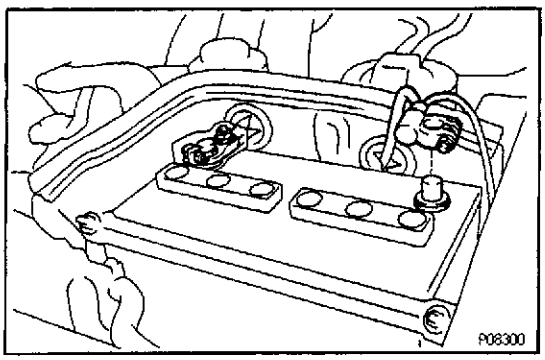
EG1AF-03

INJECTORS REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY

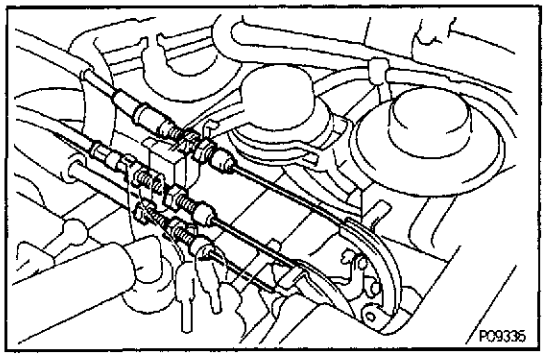
2. DRAIN ENGINE COOLANT



3. DISCONNECT CRUISE CONTROL ACTUATOR CABLE

4. DISCONNECT ACCELERATOR CABLE

5. DISCONNECT THROTTLE CABLE

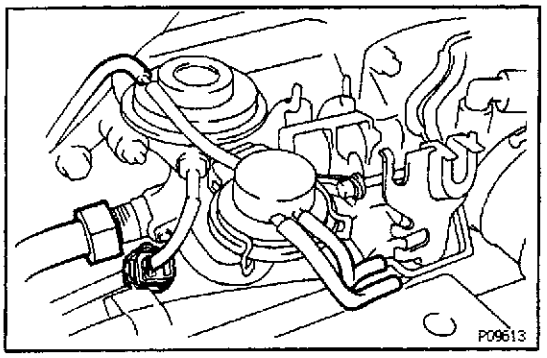


6. REMOVE EGR VALVE AND VACUUM MODULATOR

(a) Disconnect the 3 vacuum hoses

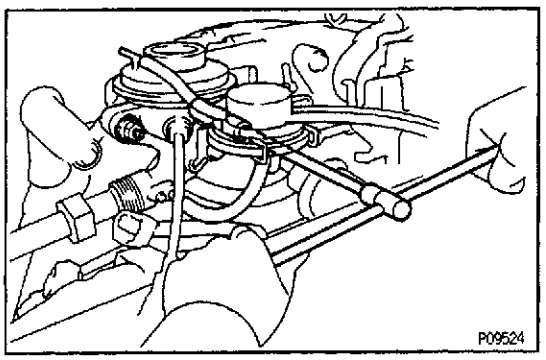
(b) Disconnect the EGR gas temp sensor connector

(c) Loosen the EGR pipe union nut

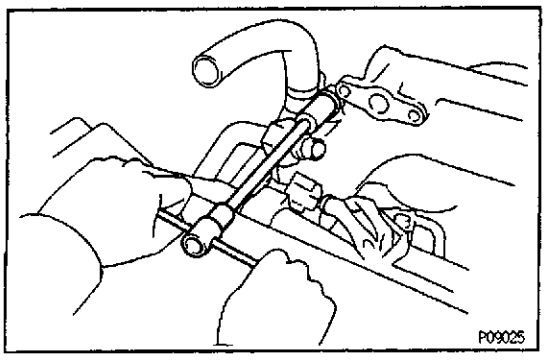


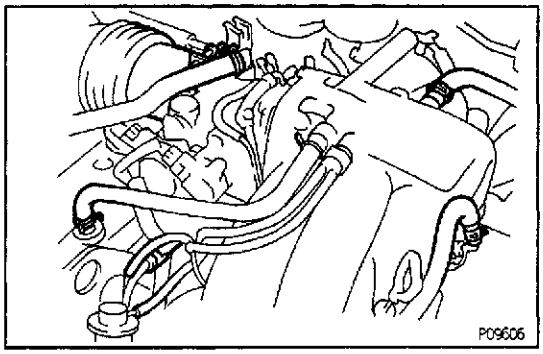
(d) Remove the 2 nuts holding the EGR valve to the air intake chamber

(e) Remove the 2 stud bolts, EGR valve and vacuum modulator assembly and gasket

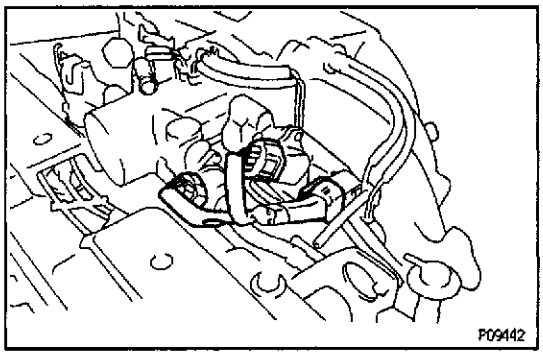


7. REMOVE BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER

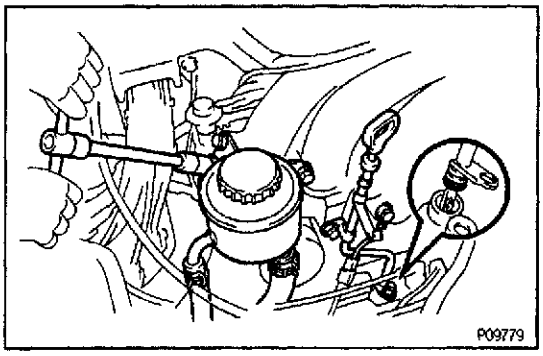




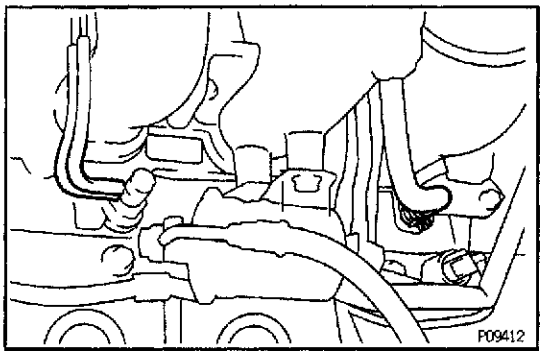
8. DISCONNECT AIR CLEANER HOSE
9. DISCONNECT N0.1 AND NO.Z PCV HOSES
10. DISCONNECT VACUUM HOSES
11. DISCONNECT NO.2 WATER BYPASS HOSE
12. DISCONNECT EVAP HOSE
13. DISCONNECT BRAKE BOOSTER HOSE



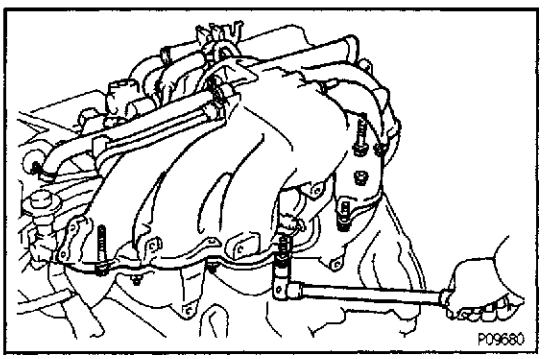
14. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
15. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR
16. DISCONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY



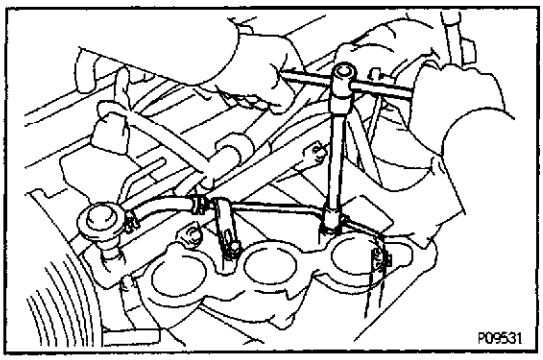
17. DISCONNECT PS RESERVOIR TANK
Remove the 3 bolts and disconnect the reservoir tank
18. REMOVE ENGINE OIL DIPSTICK AND GUIDE
(a) Remove the 2 mounting bolts
(b) Pull out the dipstick together with dipstick guide
(c) Remove the 0-ring from the dipstick guide
19. DISCONNECT GROUND STARP



20. REMOVE AIR INTAKE CHAMBER
(a) Disconnect the 2 vacuum hoses from the TVV
(b) Disconnect the No 1 water bypass hose from the cylinder head



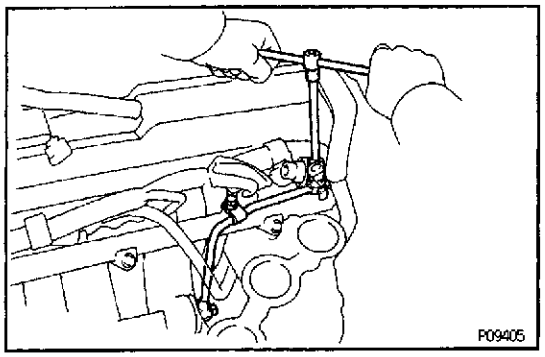
(c) Remove the 4 bolts, 4 nuts, air intake chamber and 2 gaskets



21. REMOVE FUEL RETURN PIPE

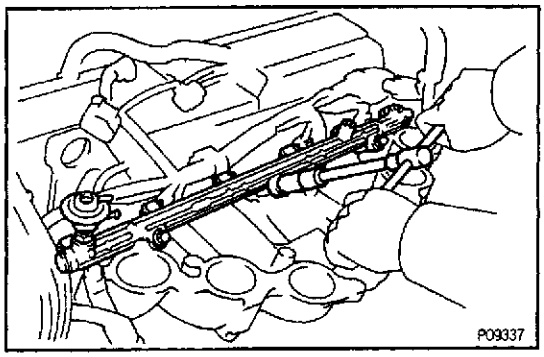
(a) Disconnect the fuel hose from the fuel pressure regulator

(b) Remove the 2 bolts and fuel return pipe



22. REMOVE FUEL INLET PIPE

Remove the 2 union bolts bolt 4 gaskets and fuel pipe



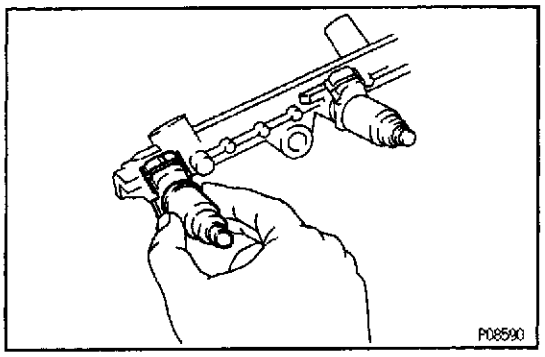
23. REMOVE DELIVERY PIPE AND INJECTORS

(a) Disconnect the 6 injector connectors

(b) Remove the 3 bolts and delivery pipe together with the 6 injectors

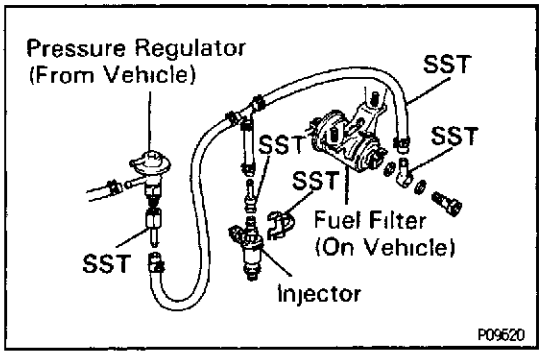
NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

(c) Remove the 6 insulators and 3 spacers from the intake manifold



(d) Pull out the 6 injectors from the delivery pipe

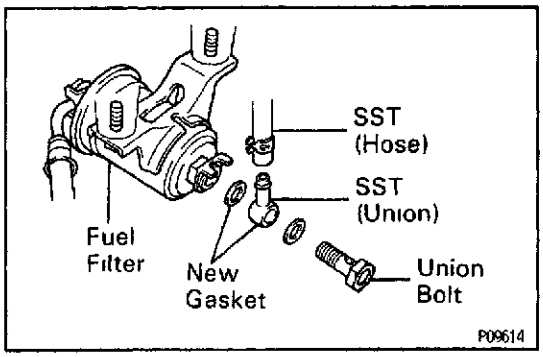
(e) Remove the O-ring and grommet from each injector



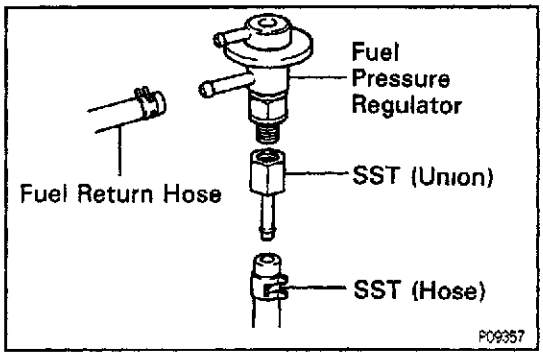
INJECTORS INSPECTION

1. INSPECT INJECTOR INJECTION

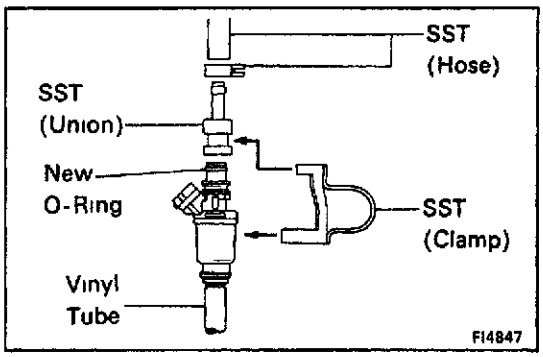
CAUTION: Keep injector clean of sparks during the test.



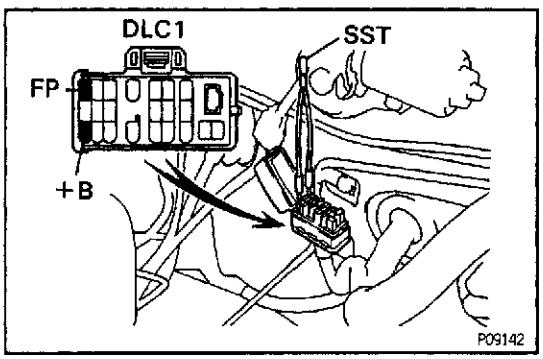
(a) Connect SST (union and hose) to the fuel filter outlet with 2 new gaskets and the union bolt
SST 09268-41045 (90405-09015)
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)



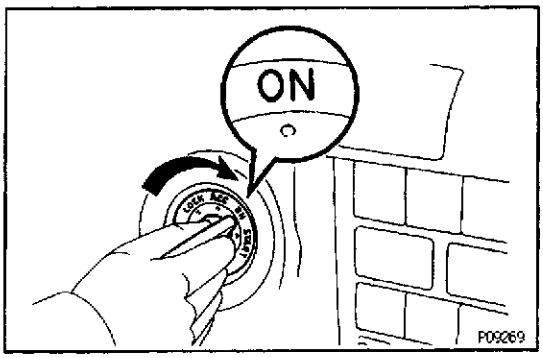
(b) Remove the fuel pressure regulator
(c) Install a new O-ring to the fuel inlet of pressure regulator
(d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union)
SST 09268-41045 (09268 -52010)
Torque: 25 N-m (250 kgf-cm. 18 ft-lbf)
(e) Connect the fuel return hose to the fuel outlet of the pressure regulator



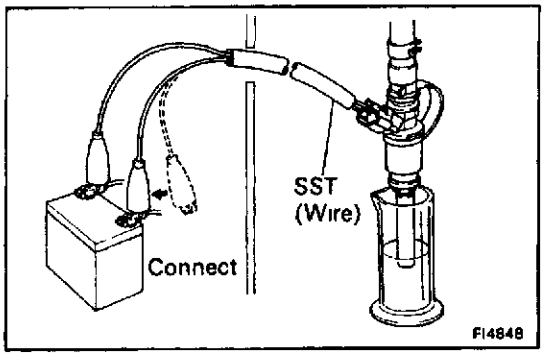
(f) Install the grommet and a new O-ring to the injector
(g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp)
SST 09268-41045
(h) Put the injector into the graduated cylinder
HINT Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out



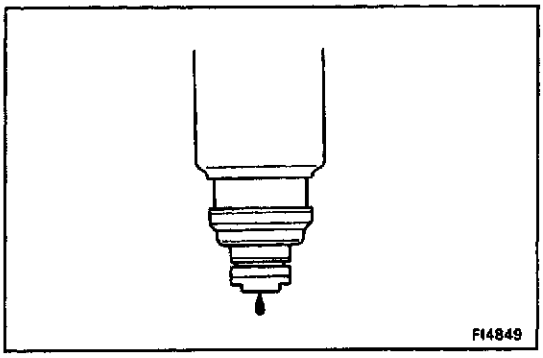
(i) Using SST, connect terminals +B and FP of the DLC 1
SST 09843-18020
(j) Reconnect the battery negative (-) cable



(k) Turn the ignition switch ON
NOTICE: Do not start the engine.

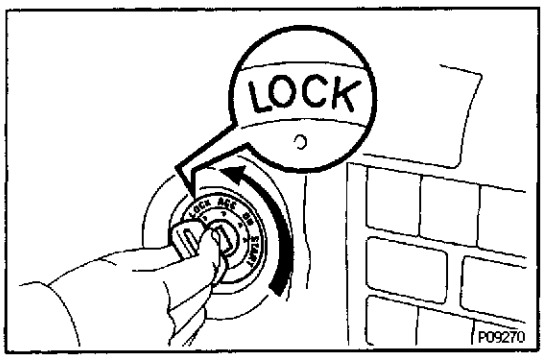


(l) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder Test each injector 2 or 3 times
SST 09842 - 30070
Volume:
66 - 82 cm^3 (4.0 - 5.0 cu in.) per 15 seconds
Difference between each injector:
5 cm^3 (0.3 cu in.) or less
If the injection volume is not as specified, replace the injector

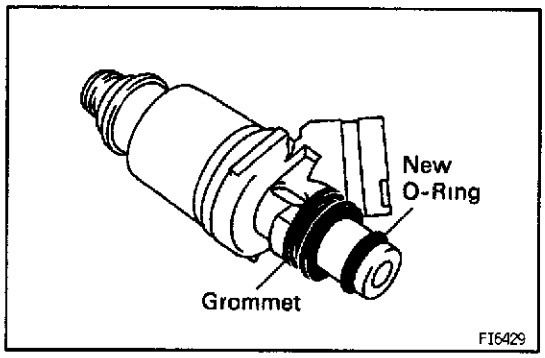


2. INSPECT LEAKAGE

(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 battery negative (-) cable
(d) Remove SST
SST 09268-41045, 09843-18020
(e) Reinstall the fuel pressure regulator to the delivery pipe



INJECTORS INSTALLATION

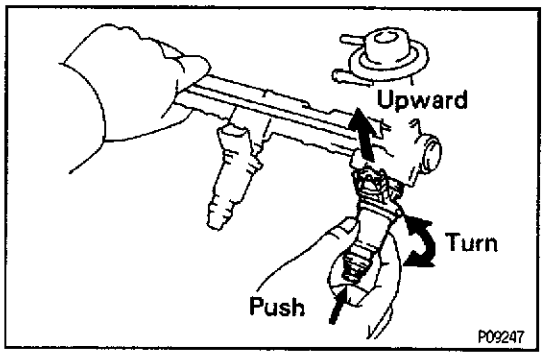
EG1AG-02

(See Components for Removal and Installation)

1. INSTALL INJECTORS AND DELIVERY PIPE

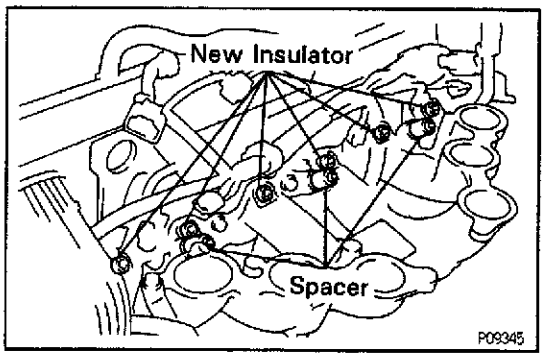
(a) Install a new grommet to the injector

(b) Apply a light coat of gasoline to a new O-ring and install it to the injector

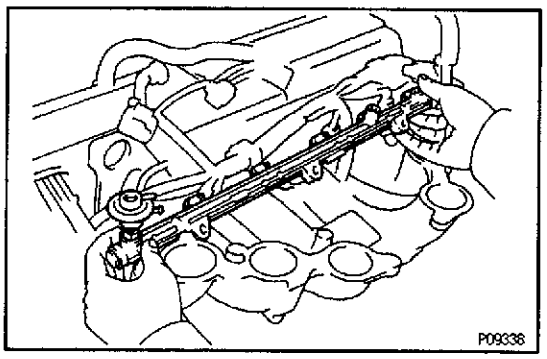


(c) While turning the injector left and right, install it to the delivery pipe Install the 6 injectors

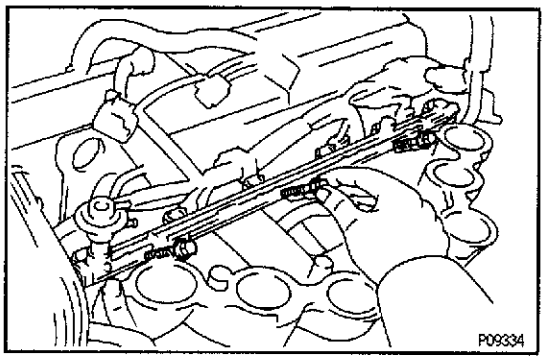
(d) Position the injector connector upward



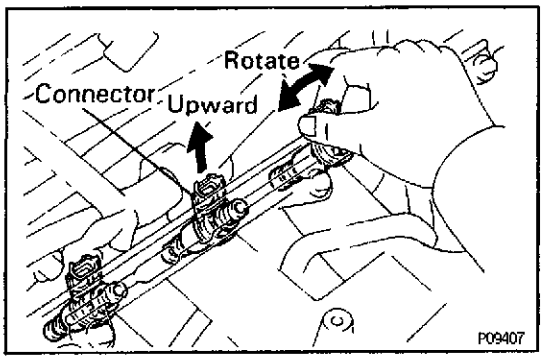
(e) Place 6 new insulators and the 3 spacers in position on the intake manifold



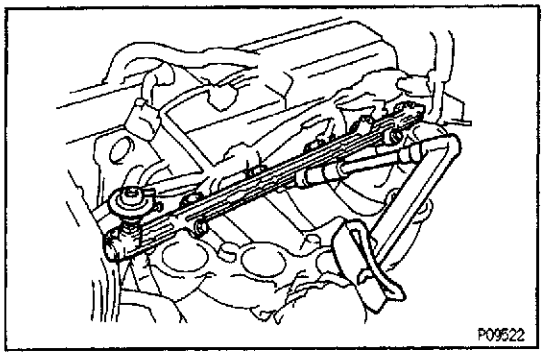
(f) Place the 6 injectors together with the delivery pipe in position on the intake manifold



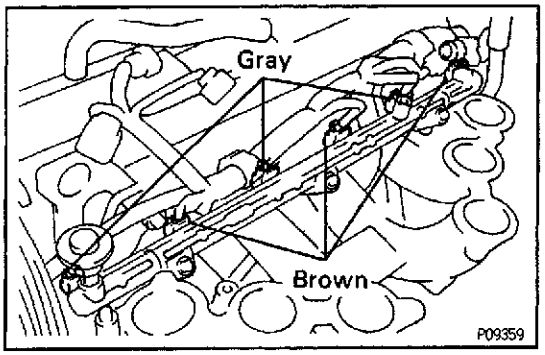
(g) Temporarily install the 3 bolts holding the delivery pipe to the intake manifold



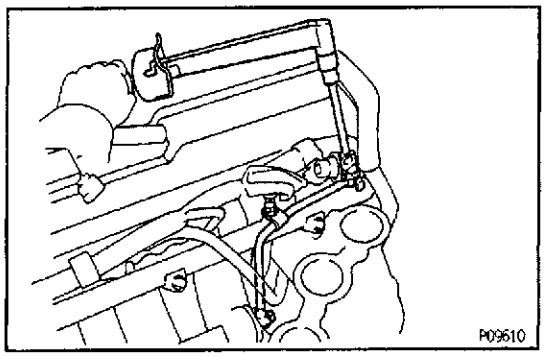
(h) Check that the injectors rotate smoothly
HINT If injectors do not rotate smoothly, the probable cause is incorrect installation of O - rings Replace the O-rings
(i) Position the injector connector upward



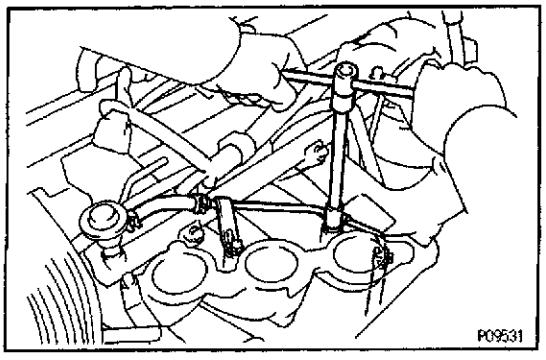
(j) Tighten the 3 bolts holding the delivery pipe to the intake manifold
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



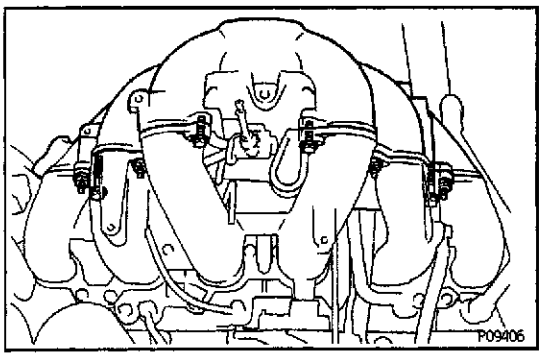
(k) Connect the 6 injector connectors as shown



2. INSTALL FUEL INLET PIPE
Install the fuel inlet pipe with 4 new gaskets, the 2 union bolts and bolt
Torque:
29 N-m (300 kgf-cm, 22 ft-lbf) for union bolt
20 N-m (200 kgf-cm, 14 ft-lbf) for bolt



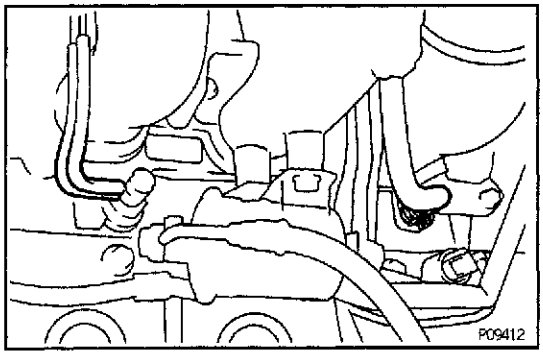
3. INSTALL FUEL RETURN PIPE
(a) Install the fuel return pipe with the 2 bolts
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)
(b) Connect the fuel hose to the fuel pressure regulator



4. INSTALL AIR INTAKE CHAMBER

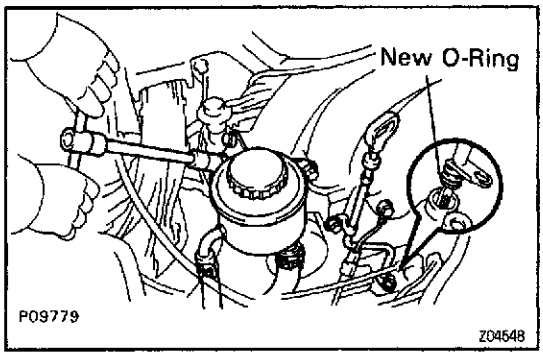
(a) Install 2 new gaskets and the air intake chamber with the 4 bolts and 4 nuts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



(b) Connect the No 1 water bypass hose to the cylinder head

(c) Connect the 2 vacuum hoses to the TVV



5. CONNECT GROUND STARP

6. INSTALL ENGINE OIL DIPSTICK AND GUIDE

(a) Install a new 0-ring to the dipstick guide

(b) Apply light coat of engine oil on the 0-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)

7. CONNECT PS RESERVOIR TANK

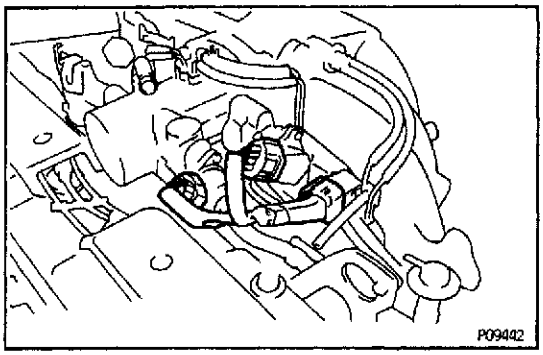
Connect the reservoir tank with the 3 bolts

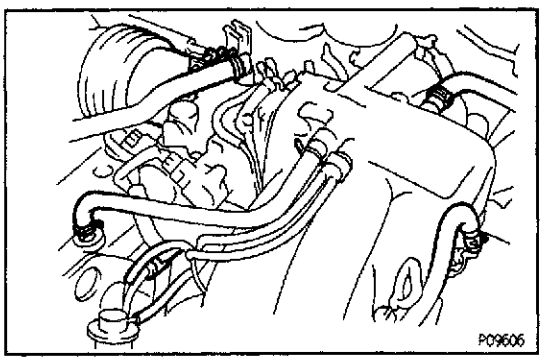
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)

8. CONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY

9. CONNECT IDLE AIR CONTROL VALVE CONNECTOR

10. CONNECT THROTTLE POSITION SENSOR CONNECTOR





11. CONNECT BRAKE BOOSTER HOSE

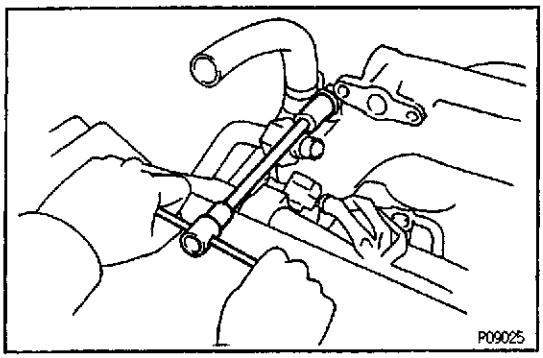
12. CONNECT EVAP HOSE

13. CONNECT NO.2 WATER BYPASS HOSE

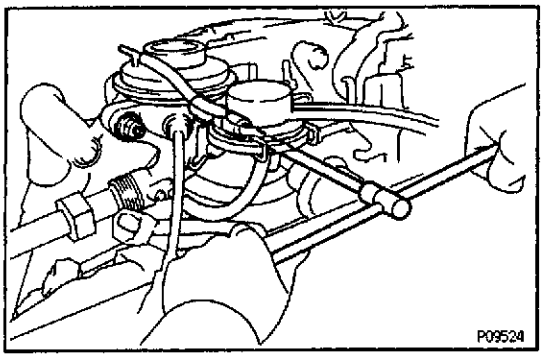
14. CONNECT VACUUM HOSES

15. CONNECT NO.1 AND NO.2 PCV HOSES

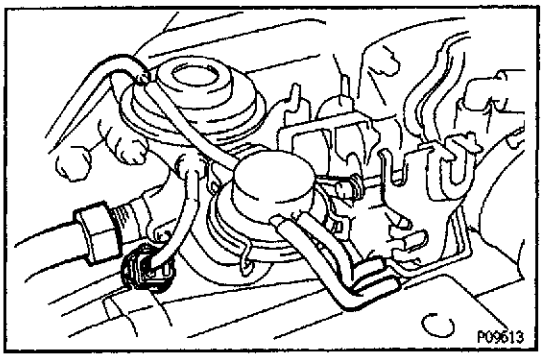
16. CONNECT AIR CLEANER HOSE



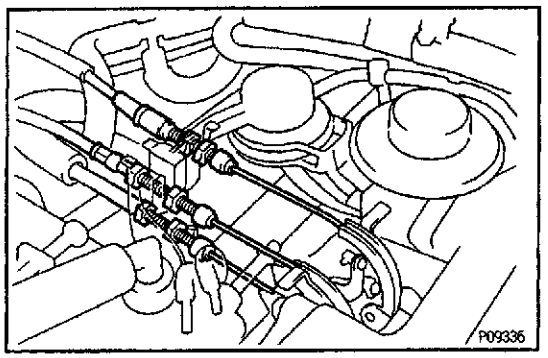
17. INSTALL BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER
Torque: 20 N-m (200 kgf-14 ft-lbf)



18. INSTALL EGR VALVE AND VACUUM MODULATOR
(a) Temporarily install a new gasket, and EGR valve and vacuum modulator assembly with the 2 stud bolts
Torque: 10 N-m (105 kgf-cm, 8 ft-lbf)
(b) Install the 2 nuts holding the EGR valve to the air intake chamber
Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)



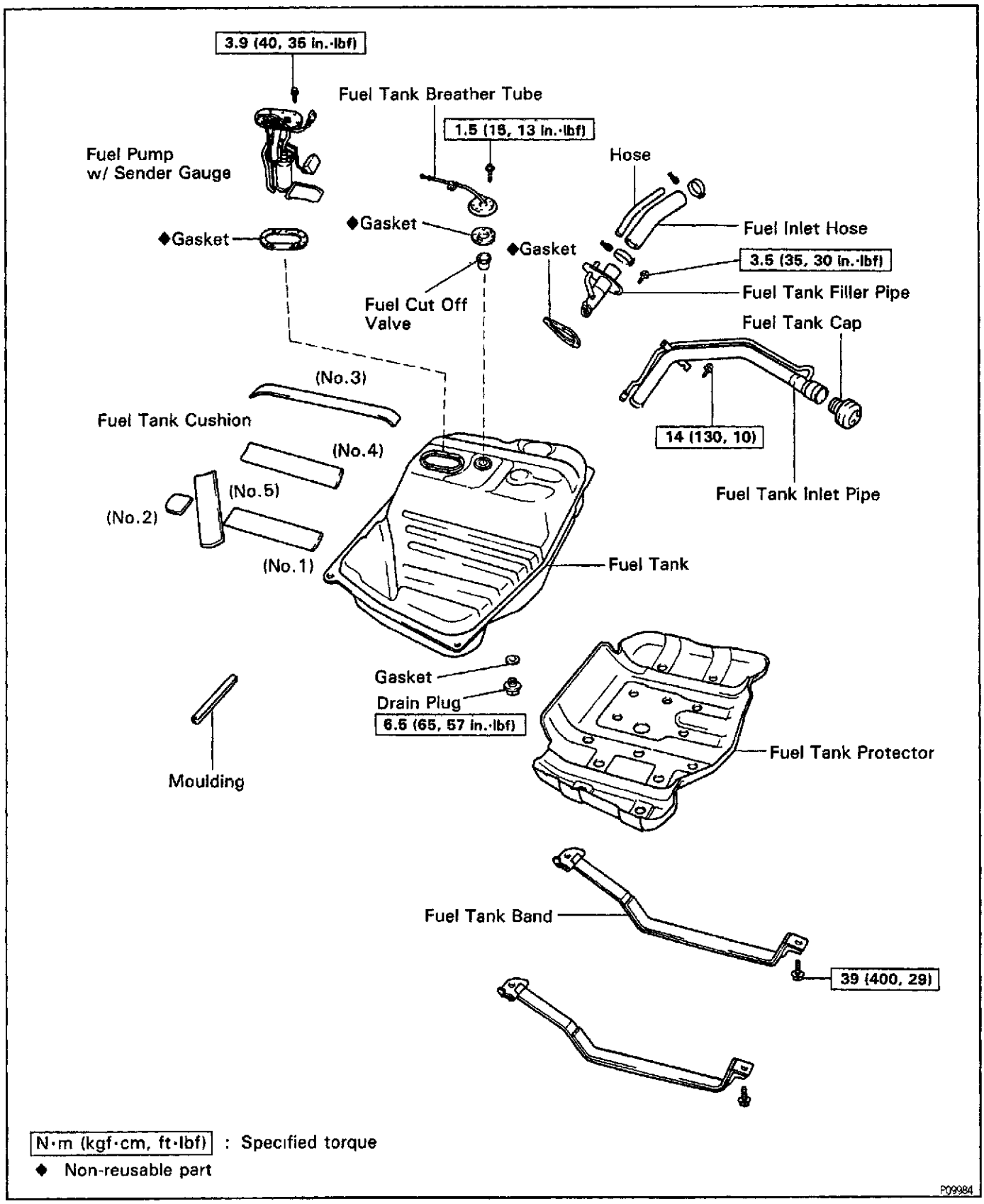
(c) Tighten the union nut of the EGR pipe
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)
(d) Connect the EGR gas temp sensor connector
(e) Connect the 3 vacuum hoses



19. CONNECT THROTTLE CABLE
20. CONNECT ACCELERATOR CABLE
21. CONNECT CRUISE CONTROL ACTUATOR CABLE

22. FILL WITH ENGINE COOLANT
23. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY
24. RECHECK ENGINE COOLANT LEVEL

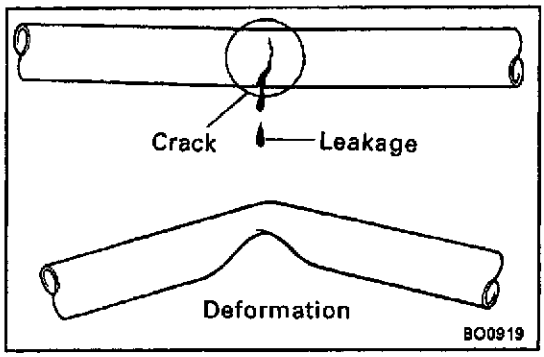
FUEL TANK AND LINE
COMPONENTS



PRECAUTIONS

E600D-01

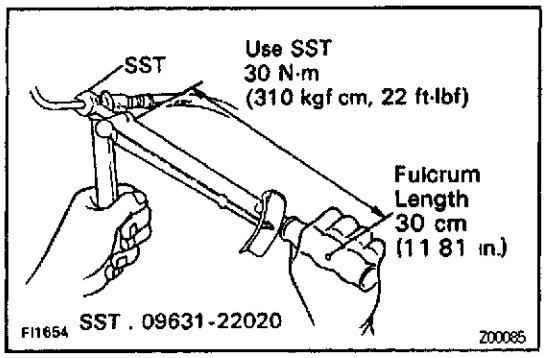
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.

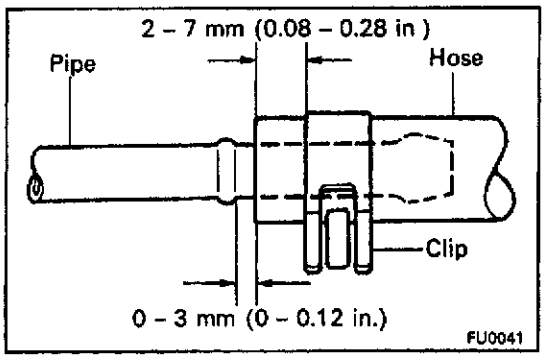


FUEL LINES AND CONNECTIONS INSPECTION

E600E-02

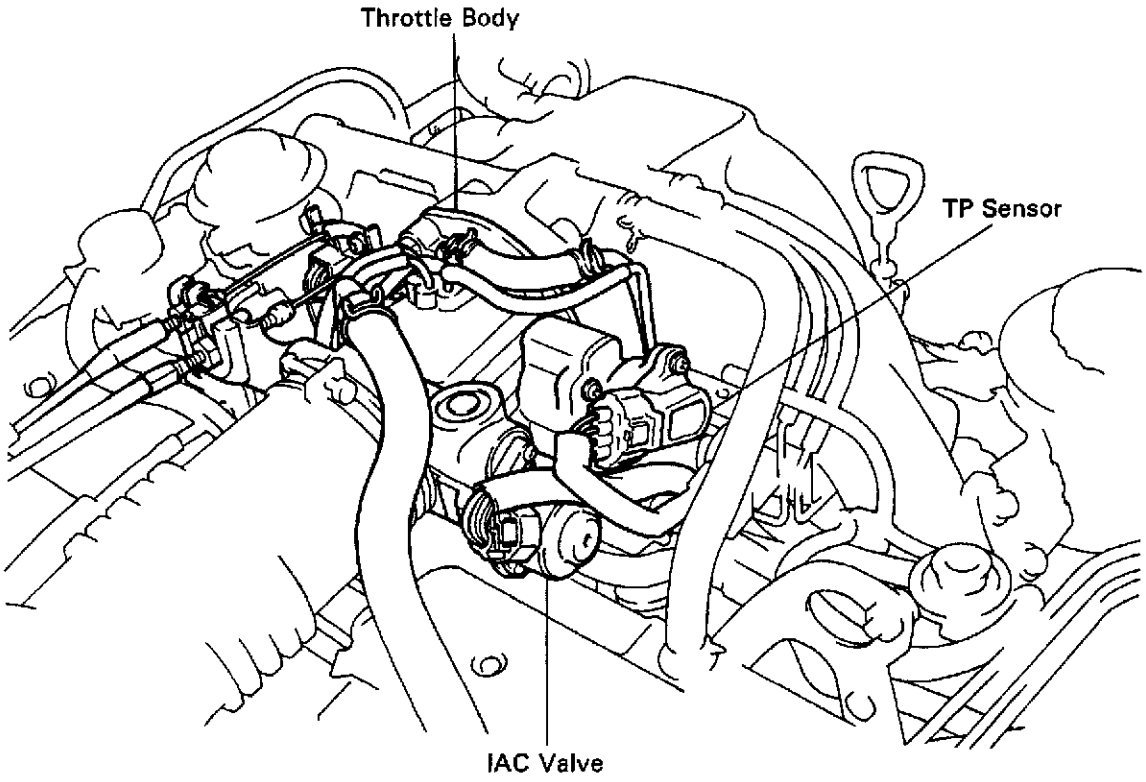
(a) Check the fuel lines for cracks or leakage, and all connections for deformation
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage
(c) Check the fuel tank for deformation, cracks fuel leakage or tank band looseness
(d) Check the filler neck for damage 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

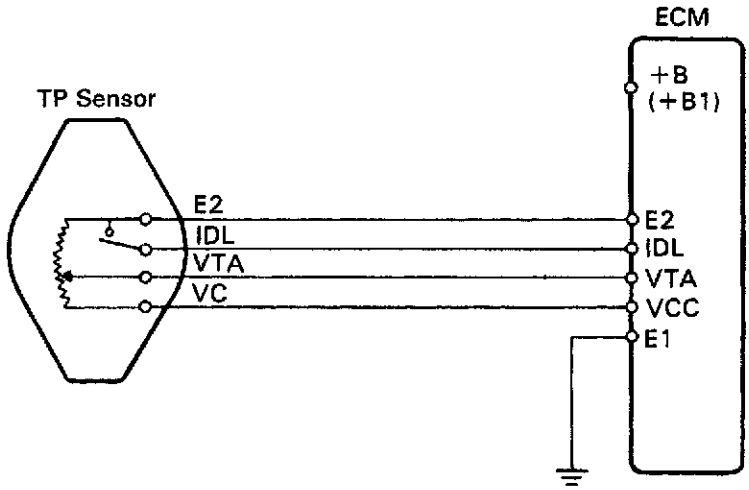




THROTTLE BODY

EG1AH-02





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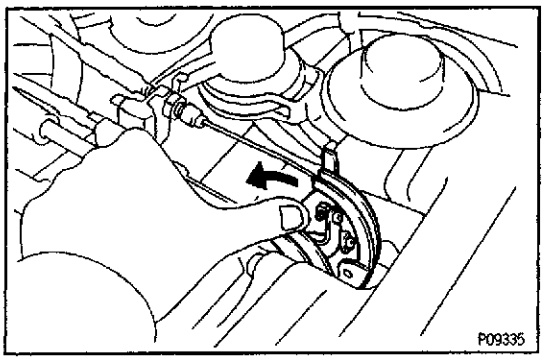
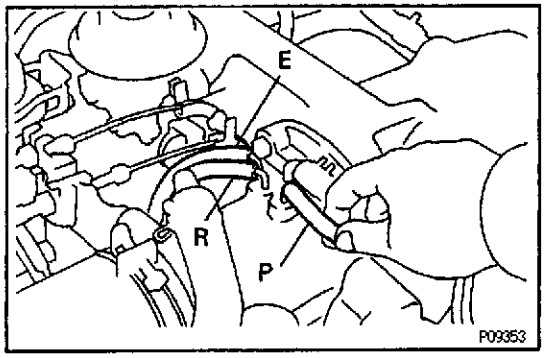


ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

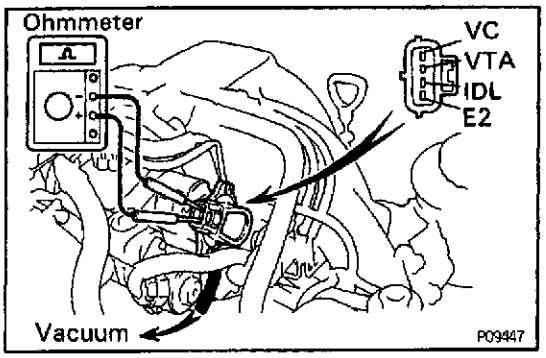
(a) Check that the throttle linkage moves smoothly



(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 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	1DL - E2	Infinity
Fully open	VTA - E2	2 0 - 10 2 kΩ
–	VC - E2	2 5 - 5 9 kΩ

(d) Reconnect the TP sensor connector

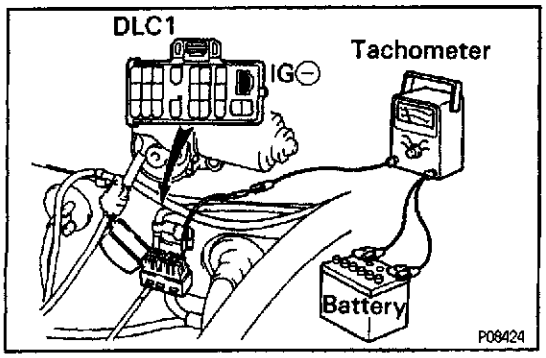
3. INSPECT AND ADJUST DASHPOT

A. Warm up engine

Allow the engine to warm up to normal operating temperature

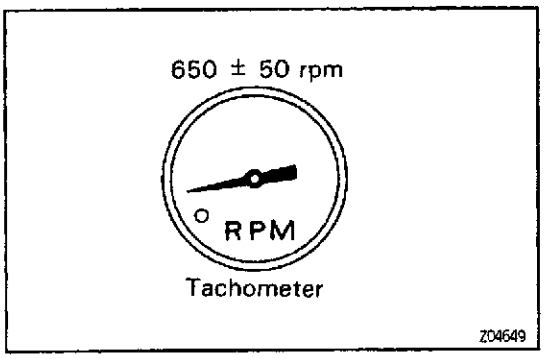
B. Connect tachometer

Connect the test probe of a tachometer to terminal IG (-) of the DLC1



NOTICE:

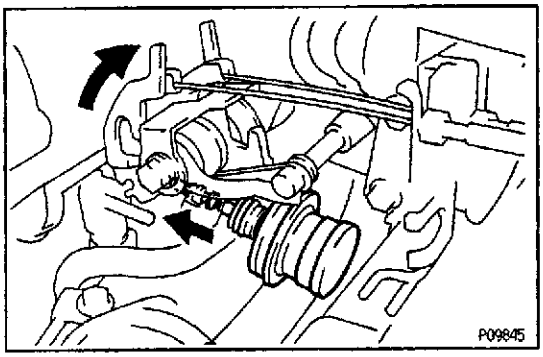
- **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



C. Check idle speed

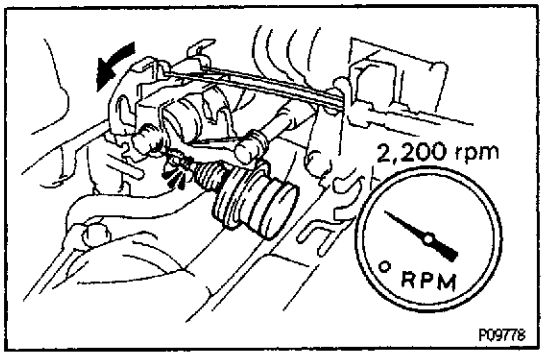
Idle speed :

650 ± 50 rpm (N position)



D. Check and adjust dashpot setting speed

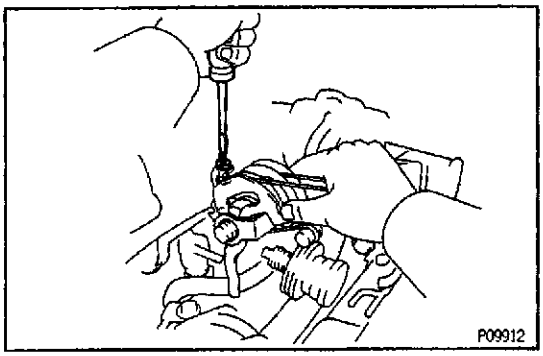
(a) Open the throttle valve until the throttle lever separates from the dashpot end



(b) 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



If not as specified, adjust using the following procedure

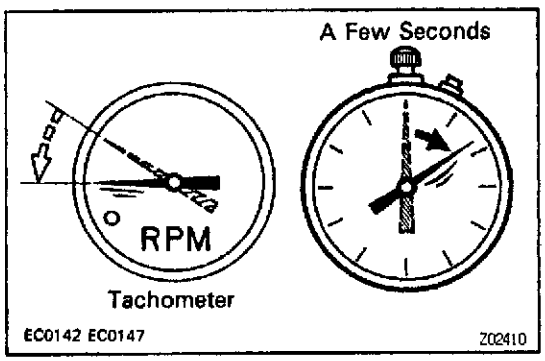
(a) Stop the engine

(b) Loosen the lock nut of the stopper bolt

(c) Adjust the dashpot setting speed by turning the stopper bolt

(d) Start the engine and check the dashpot setting speed

(e) Retighten the lock nut



E. Check VTV operation

(a) Maintain the engine at 3,500 rpm

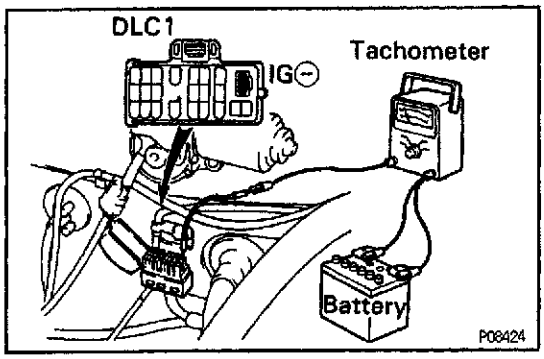
(b) Release the throttle valve, and check that the engine returns to idle in a few seconds

F. Disconnect tachometer

4. INSPECT THROTTLE OPENER

A. Warm up engine

Allow the engine to warm up to normal operating temperature



B. Connect tachometer

Connect the test probe of a tachometer to terminal IG (-) of the DLC 1

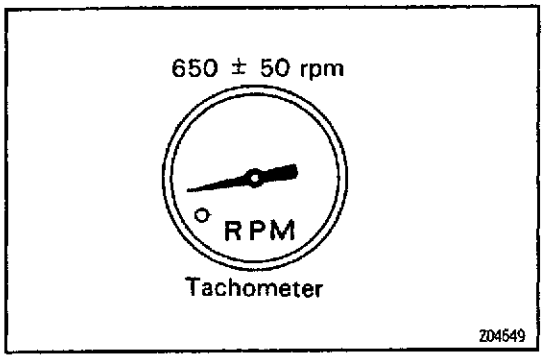
NOTICE:

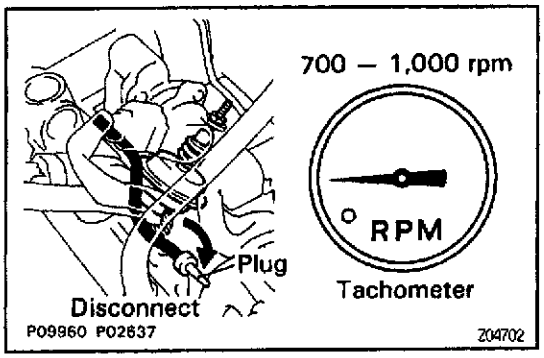
- **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your- unit before use.**

C. Check idle speed

Idle speed:

650 ± 50 rpm (N position)





D. Check throttle opener setting speed

(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

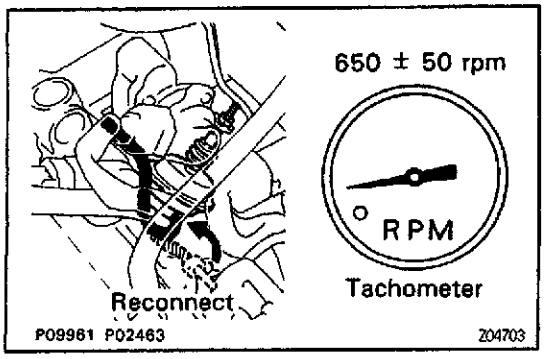
(d) Reconnect the vacuum hose to the throttle opener

(e) Start the engine, and check that the idle speed returns to the correct speed

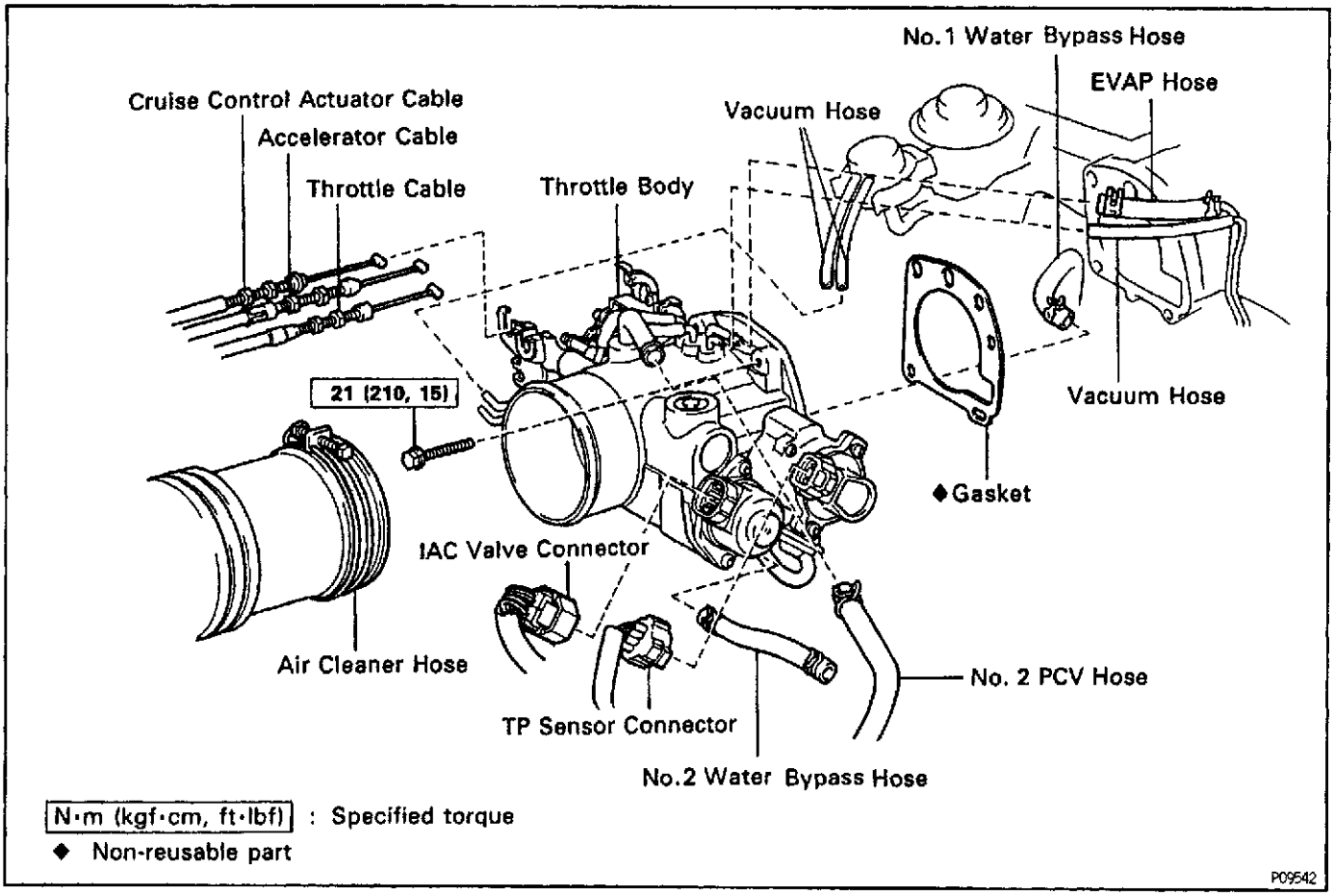
Idle speed:

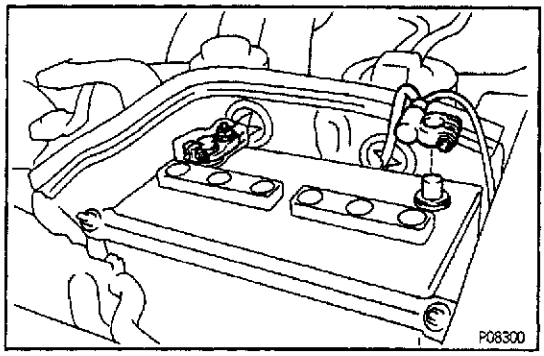
650 ± 50 rpm (N position)

E Disconnect tachometer



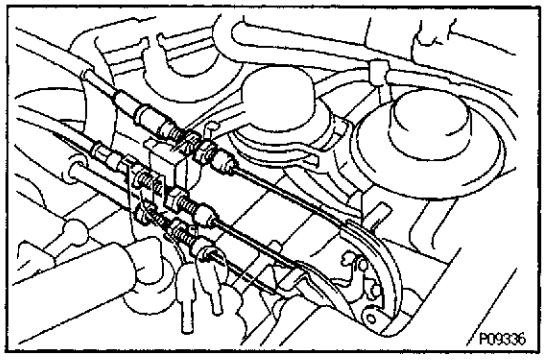
COMPONENTS FOR REMOVAL AND INSTALLATION



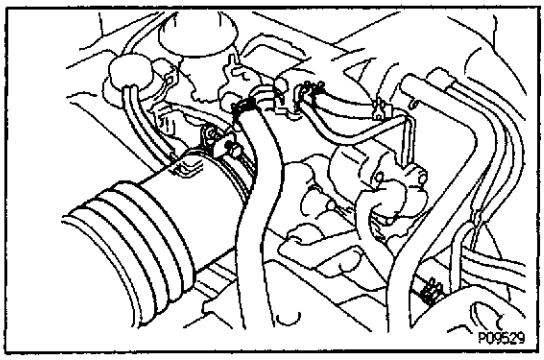


THROTTLE BODY REMOVAL

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY
2. DRAIN ENGINE COOLANT

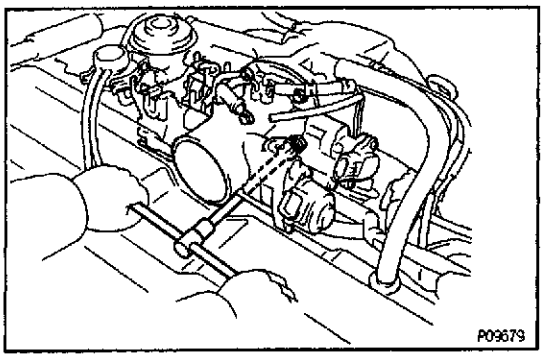


3. DISCONNECT CRUISE CONTROL ACTUATOR CABLE
4. DISCONNECT ACCELERATOR CABLE
5. DISCONNECT THROTTLE CABLE

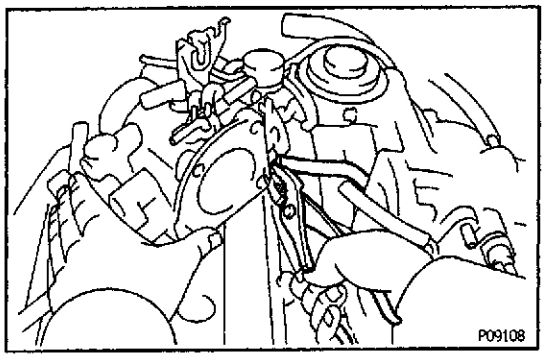


6. DISCONNECT AIR CLEANER HOSE
7. DISCONNECT NO.2 PCV HOSE
8. DISCONNECT EVAP HOSE
9. DISCONNECT VACUUM HOSES
10. DISCONNECT N0.2 WATER BYPASS HOSE

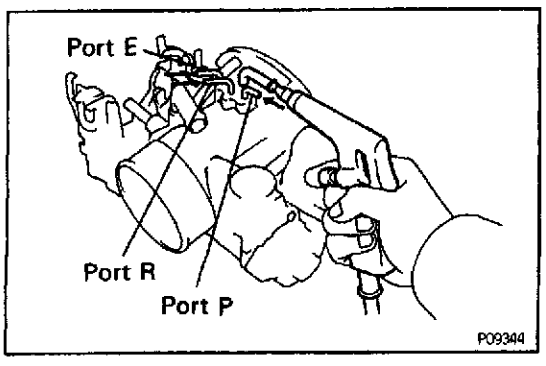
11. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
12. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR



13. REMOVE THROTTLE BODY
(a) Remove the 4 bolts, and disconnect the throttle body from the air intake chamber
(b) Remove the throttle body gasket

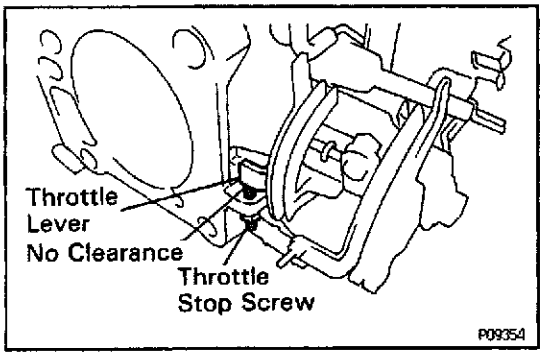


(c) Disconnect the No 1 water bypass hose from the throttle body, and remove the throttle body
(d) Disconnect the No 2 water bypass hose from the throttle body



THROTTLE BODY INSPECTION

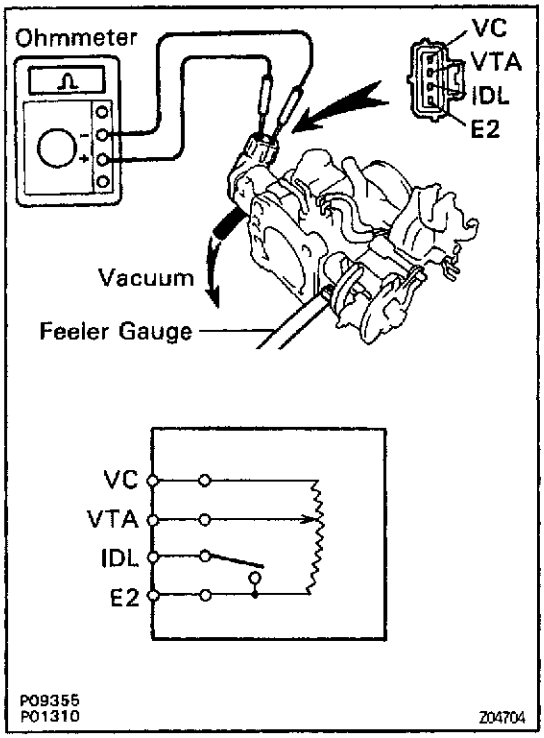
1. CLEAN THROTTLE BODY
(a) Using a soft brush and carburetor cleaner, clean the cast parts
(b) Using compressed air, clean all the passages and apertures
NOTICE: To prevent deterioration, do not clean the TP sensor, dashpot and IAC valve.



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 closed throttle position



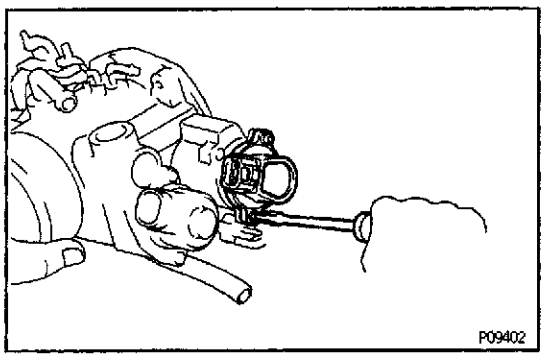
3. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener

(b) Insert a feeler gauge between the throttle stop screw and stop lever

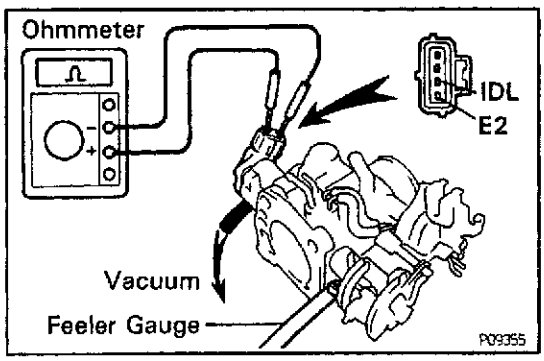
(c) Using an ohmmeter, measure the resistance between each terminal

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 k() or less
0 75 mm (0 030 in)	IDL - E2	Infinity
Throttle valve fully open	VT A - E2	2 0 - 10 2 kΩ
–	VC - E2	2 5 - 5 9 kΩ



4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

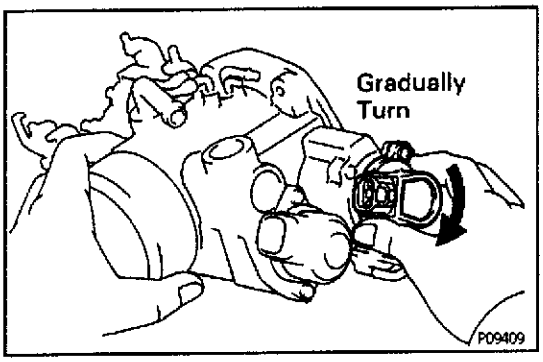
(a) Loosen the 2 set screws of the TP sensor



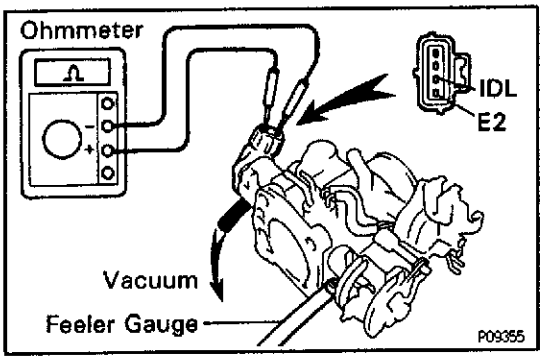
(b) Apply vacuum to the throttle opener

(c) Insert a 0 62 mm (0 024 in) 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 TP sensor

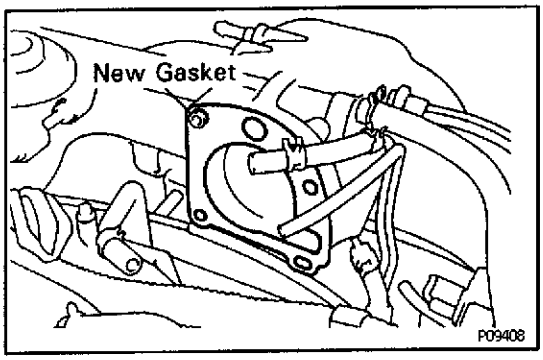


(e) Gradually turn the TP sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws



(f) Recheck the continuity between terminals IDL and E2

Clearance between lever and stop screw	Continuity (IDL - E2)
0 50 mm (0 020 in)	Continuity
0 75 mm (0 030 in)	No continuity



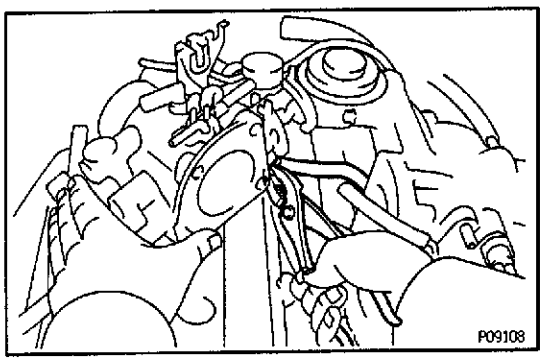
THROTTLE BODY INSTALLATION

(See Components for Removal and Installation)

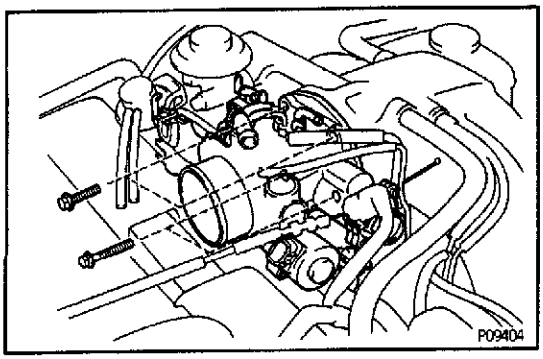
1. INSTALL THROTTLE BODY

(a) Install the No 2 water bypass hose to the throttle body

(b) Install a new gasket on the air intake chamber



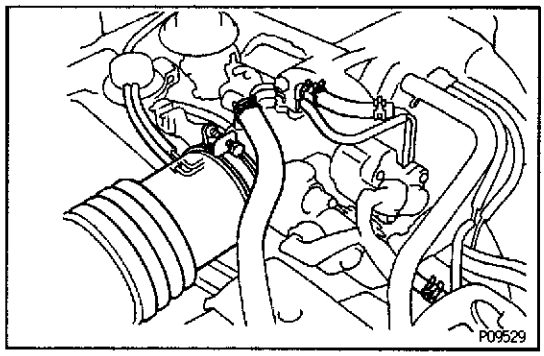
(c) Connect the No 1 water bypass hose to the throttle body



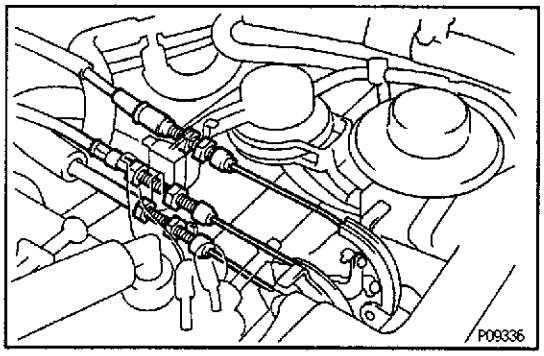
(d) Install the throttle body with the 4 bolts

Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)

2. CONNECT IDLE AIR CONTROL VALVE CONNECTOR
3. CONNECT THROTTLE POSITION SENSOR CONNECTOR



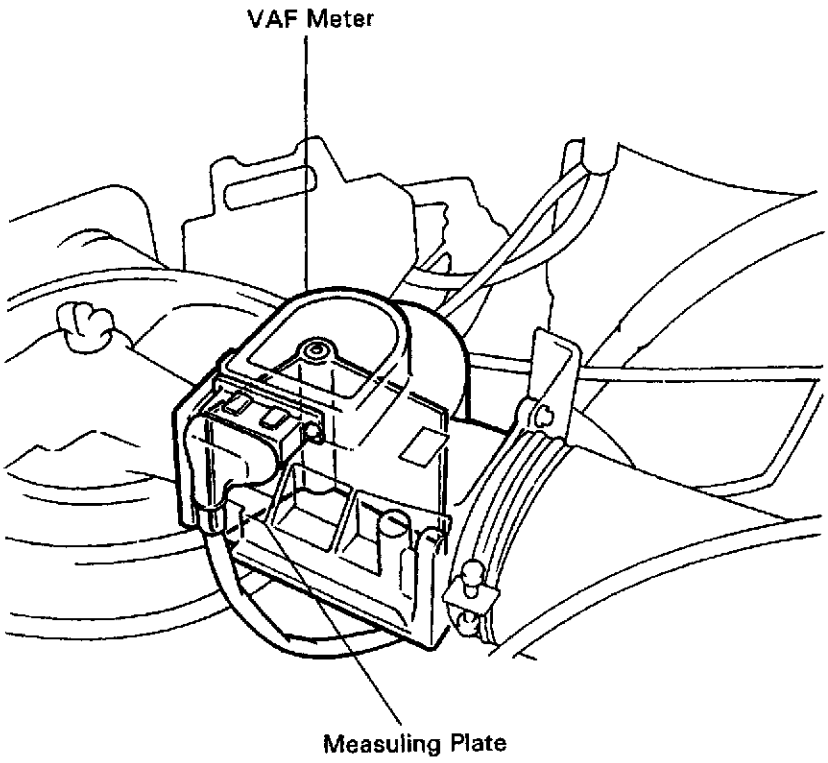
4. CONNECT NO.2 WATER BYPASS HOSE
5. CONNECT VACUUM HOSES
6. CONNECT EVAP HOSE
7. CONNECT NO.2 PCV HOSE
8. CONNECT AIR CLEANER HOSE

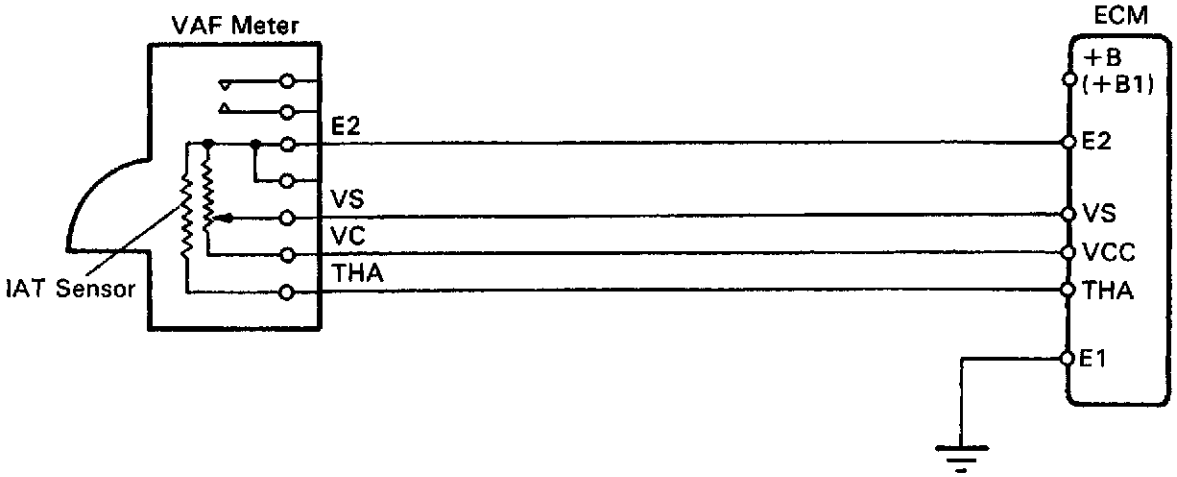


9. CONNECT THROTTLE CABLE
10. CONNECT ACCELERATOR CABLE
11. CONNECT CRUISE CONTROL ACTUATOR CABLE

12. FILL WITH ENGINE COOLANT
13. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY

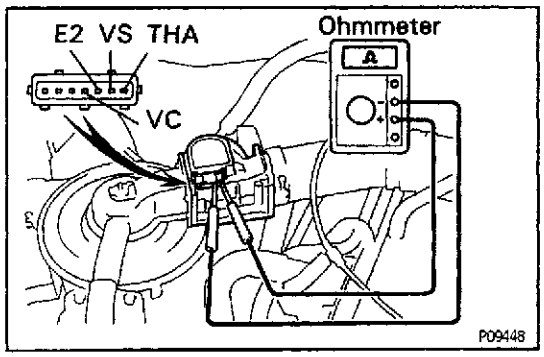
VOLUME AIR FLOW (VAF) METER





P09622
P05967

Z04502



ON-VEHICLE INSPECTION

5G0YH-07

INSPECT RESISTANCE OF VOLUME AIR FLOW METER

(a) Disconnect the VAF meter connector

(b) Using an ohmmeter, measure the resistance between each terminal

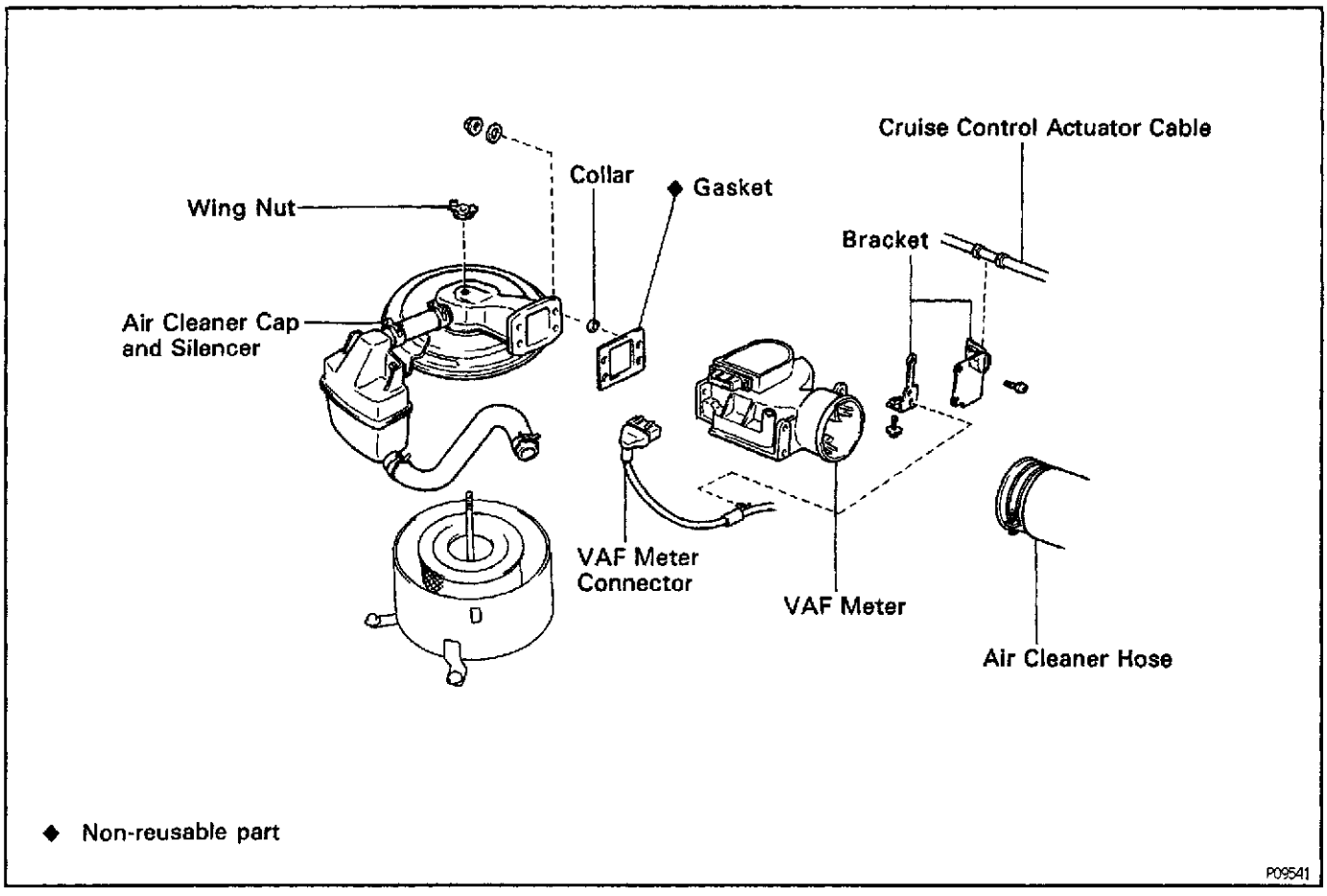
Between terminals	Resistance	Temperature
VS - E2	200-600 Ω	–
VS -E2	200 - 400Ω	–
THA - E2	10-20k Ω	**–20°C (–4°F)**
THA - EZ	4 -7kΩ	0° C (32° F)
THA - E2	2 -3kΩ	20 °C (68 F)
THA - E2	0 9 - 1 3 kΩ	40° C (104° F)
THA - E2	0 4-0 7k Ω	60°C (140° F)

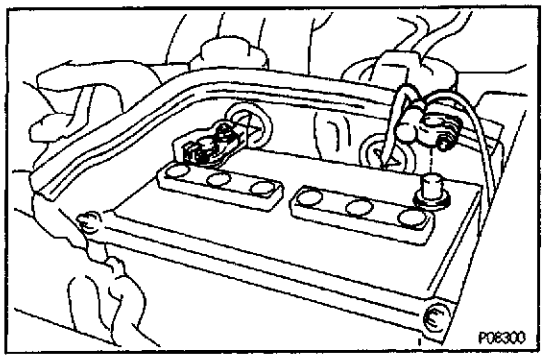
If the resistance is not as specified, replace the VAF meter

(c) Reconnect the VAF meter connector

5G0YJ-02

COMPONENTS FOR REMOVAL AND INSTALLATION





VOLUME AIR FLOW METER REMOVAL

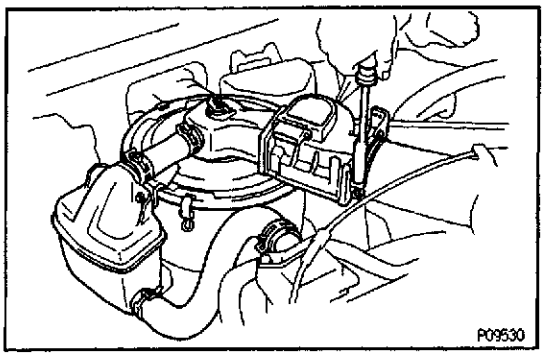
[2018J-03]

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY

2. DISCONNECT VOLUME AIR FLOW METER CONNECTOR AND WIRE CLAMP

3. DISCONNECT CRUISE CONTROL ACTUATOR CABLE

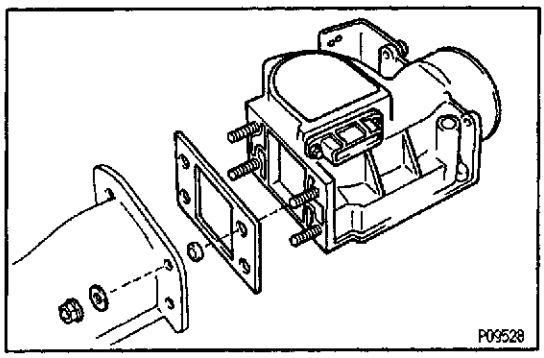


4. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND SILENCER

(a) Disconnect the air cleaner hose from the VAF meter

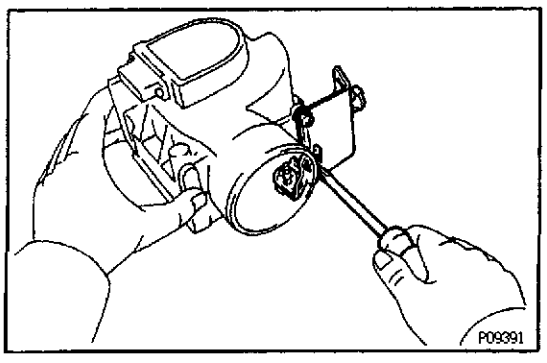
(b) Disconnect the No 2 air hose from the PAIR reed valve

(c) Disconnect the three clamps, and remove the wing nut, air cleaner cap, VAF meter and silencer

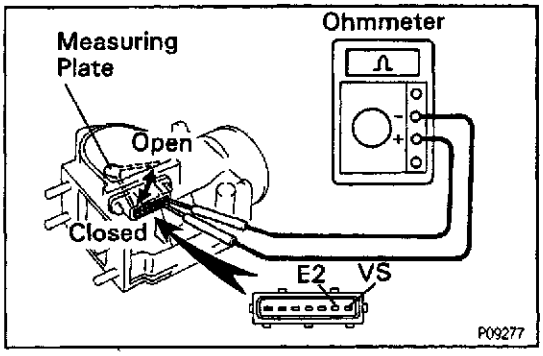


5. REMOVE VOLUME AIR FLOW METER FROM AIR CLEANER CAP

(a) Remove the 4 nuts, plate washers, VAF meter, gasket and 4 collars



(b) Remove the 2 screws, bolt and 2 brackets



AIR FLOW METER INSPECTION

INSPECT AIR FLOW METER

Using an ohmmeter, measure the resistance between terminals VS and E2 by moving the measuring plate

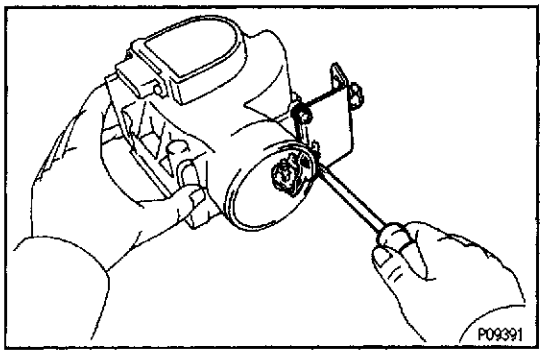
Resistance:

200 - 600Ω at fully closed

20 - 1,200Ω at fully open

HINT Resistance will change in a wave pattern as the measuring plate slowly opens

If the resistance is not as specified, replace the air flow meter



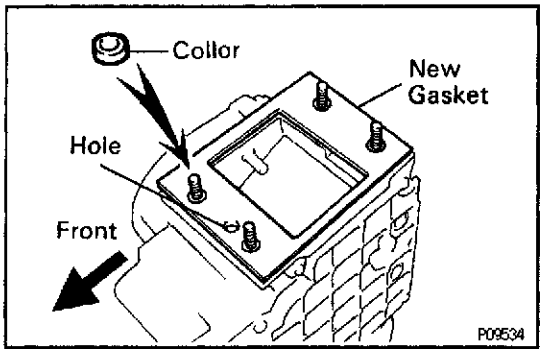
VOLUME AIR FLOW METER INSTALLATION

(See Components for Removal and Installation)

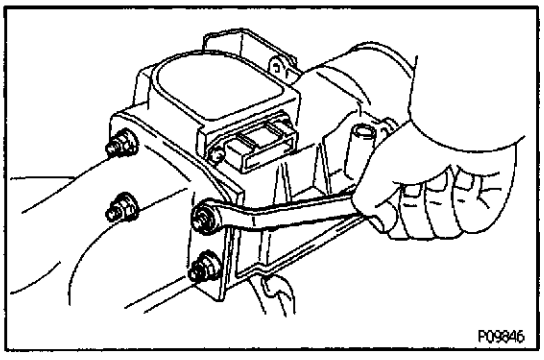
1. INSTALL VOLUME AIR FLOW METER TO AIR CLEANER CAP

(a) Install the 2 bracket with the 2 screws and bolt

Torque: 4.9 N-m (50 kgf-cm, 43 in-lbf)

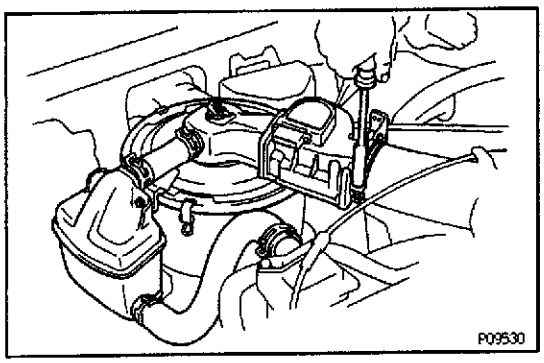


(b) Place a new gasket and the 4 collars on the VAF meter



(c) Install the VAF meter with the 4 plate washers and nuts

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



2. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND SILENSOR

(a) Install the air cleaner cap to the air cleaner case with the 3 clips and wing nut

(b) Connect the No 2 air hose to the PAIR reed valve

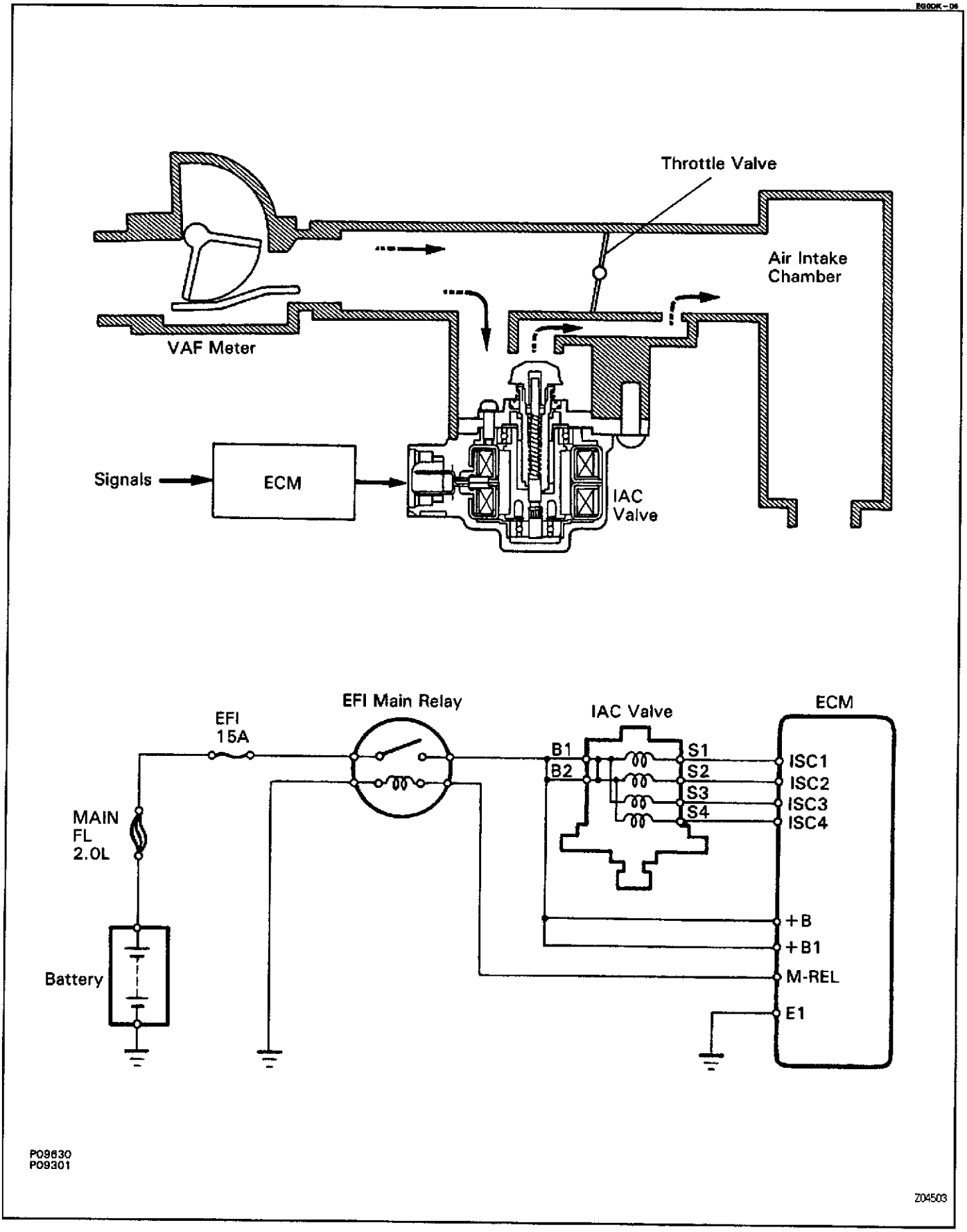
(c) Connect the air cleaner hose to the VAF meter

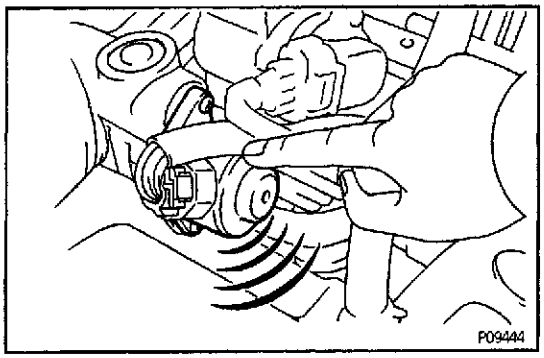
3. CONNECT CRUISE CONTROL ACTUATOR CABLE

4. CONNECT VOLUME AIR FLOW METER CONNECTOR AND WIRE CLAMP

5. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY

IDLE AIR CONTROL (IAC) VALVE





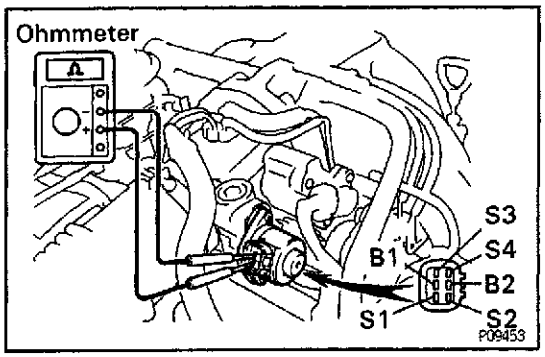
EG19L-01

ON-VEHICLE INSPECTION

1. INSPECT IDLE AIR CONTROL 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 IDLE AIR CONTROL VALVE RESISTANCE

(a) Disconnect the IAC valve connector

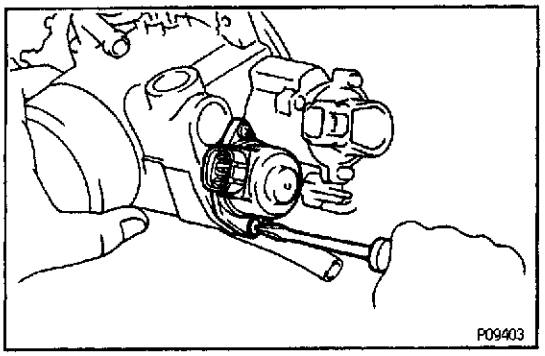
(b) Using an ohmmeter, measure the resistance between the terminals (131 -S1 and S3, B2-S2 and S4)

Resistance:

10-30 Ω at 20°C (68" F)

If resistance is not as specified, replace the IAC valve

(c) Reconnect the IAC valve connector



EG13S-06

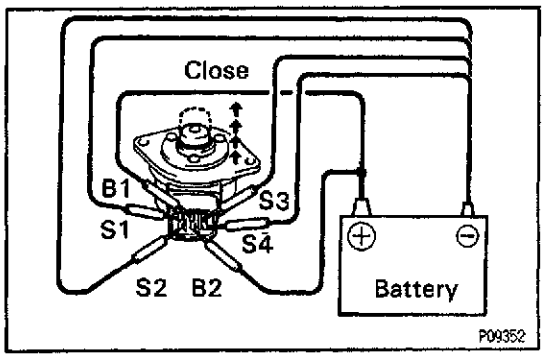
IDLE AIR CONTROL VALVE REMOVAL

1. REMOVE THROTTLE BODY

(See page EG-284 **)**

2. REMOVE IDLE AIR CONTROL VALVE

Remove the 2 screws, IAC valve and O-ring

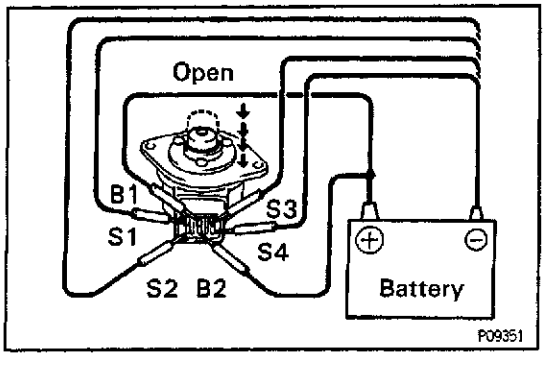


EG EG

IDLE AIR CONTROL VALVE 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

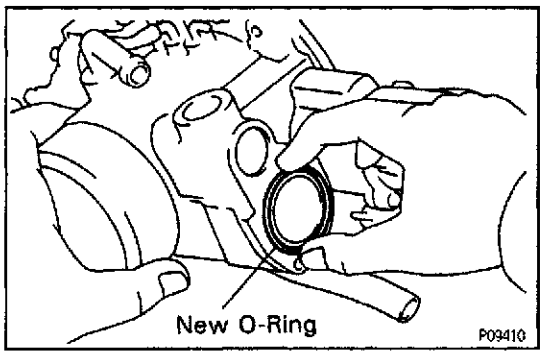


(b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4-S3-S2-S1 -S4 in sequence, and check that the valve moves toward the open position

If operation is not as specified, replace the IAC valve

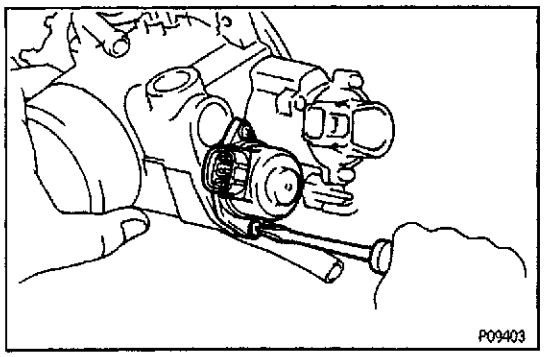
EG90P-00

IDLE AIR CONTROL VALVE INSTALLATION



1. INSTALL IDLE AIR CONTROL VALVE

(a) Place a new 0-ring on the throttle body

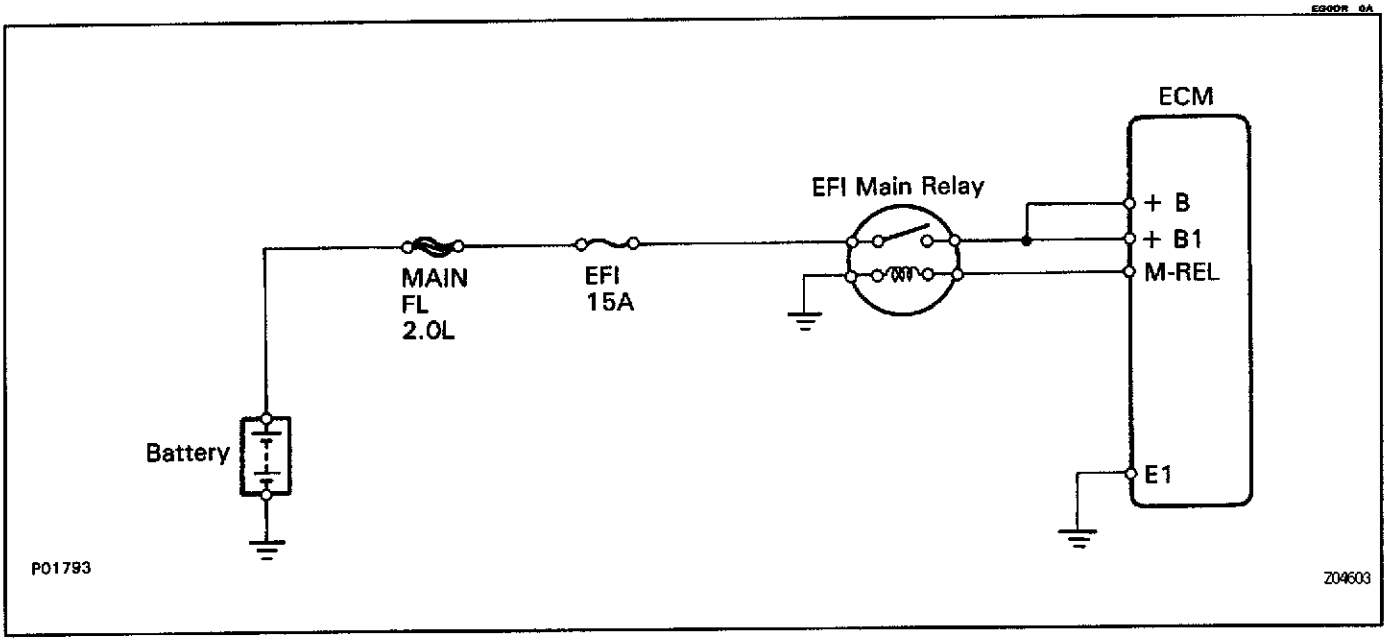


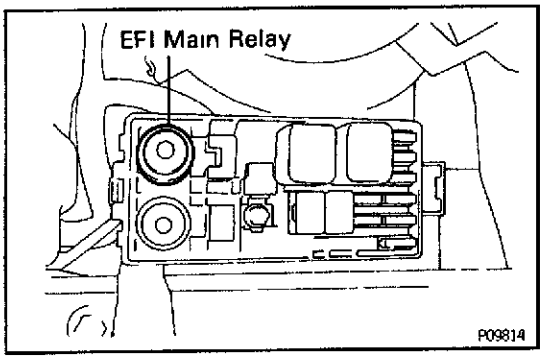
(b) Install the IAC valve with the 2 screws

2. INSTALL THROTTLE BODY

(See page EG-284 **)**

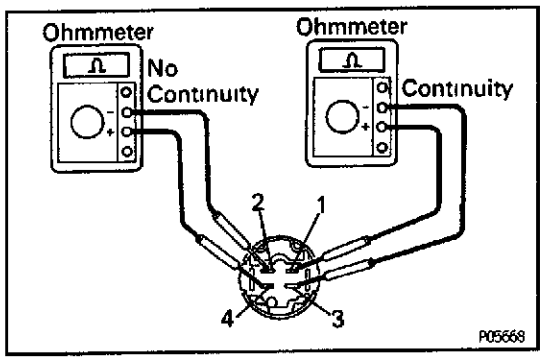
EFI MAIN RELAY





EFI MAIN RELAY INSPECTION

1. REMOVE EFI MAIN RELAY



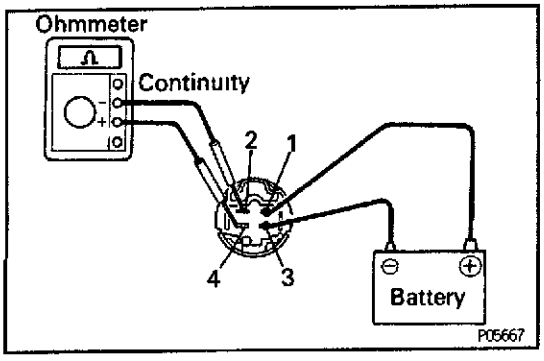
2. INSPECT EFI MAIN RELAY

A. Inspect 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



B. Inspect relay operation

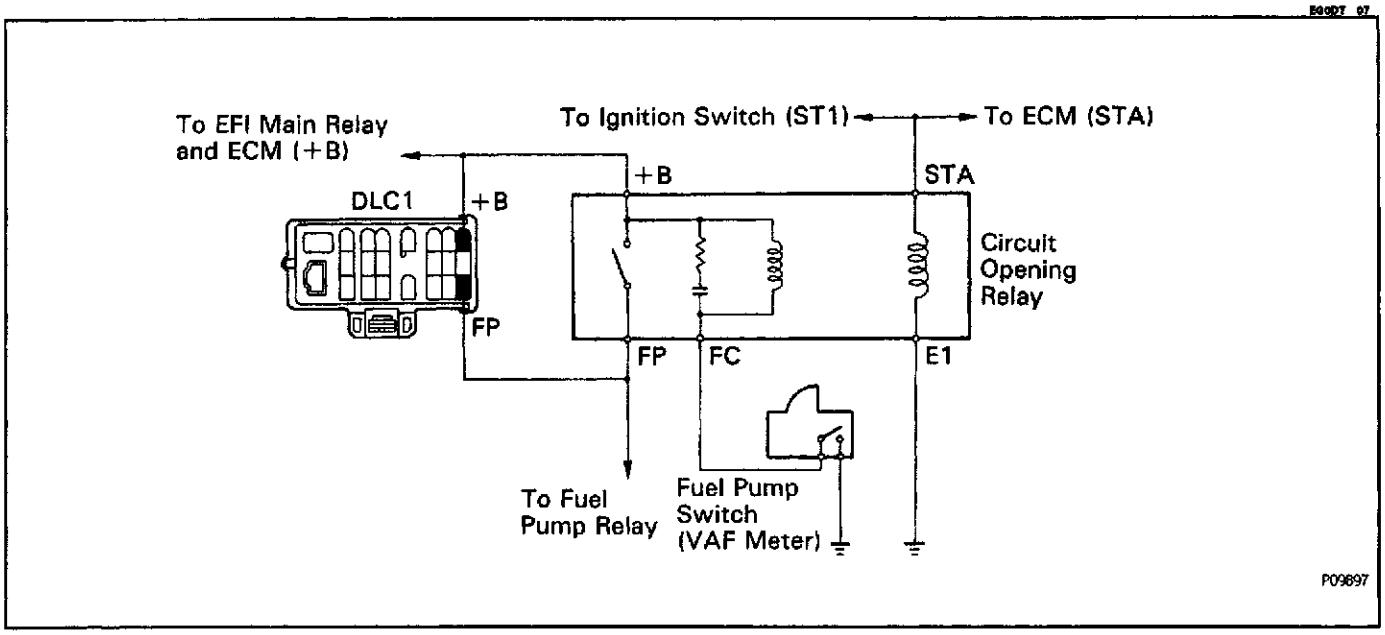
(a) Apply battery voltage across terminals 1 and 3

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4

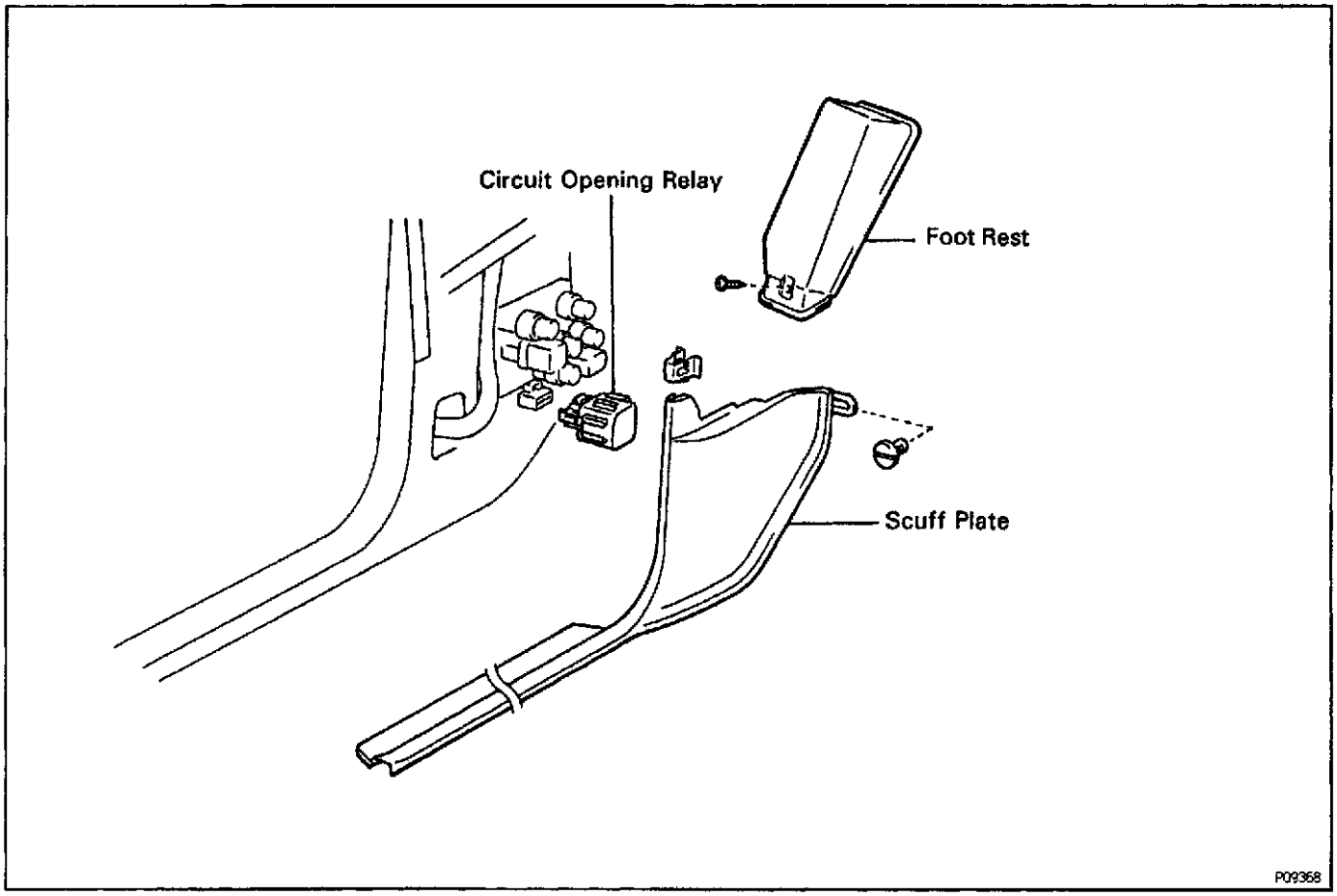
If operation is not as specified, replace the relay

3. REINSTALL EFI MAIN RELAY

CIRCUIT OPENING RELAY



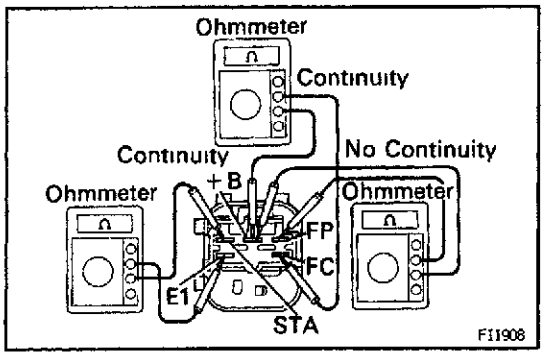
COMPONENTS FOR REMOVAL AND INSTALLATION



CIRCUIT OPENING RELAY INSPECTION

(See Components for Removal and Installation)

1. REMOVE FOOT REST
2. REMOVE SCUFF PLATE
3. REMOVE CIRCUIT OPENING RELAY



4. INSPECT CIRCUIT OPENING RELAY

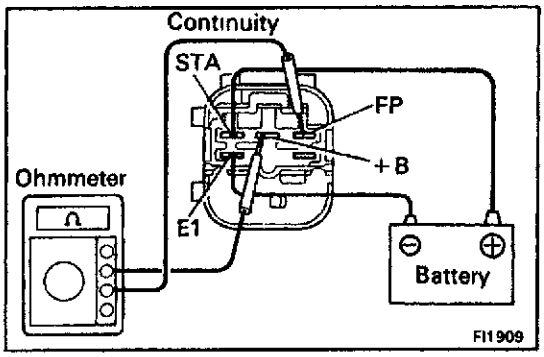
A. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1

(b) Check that there is continuity between terminals +B and FC

(c) Check that there is no continuity between terminals +B and FP

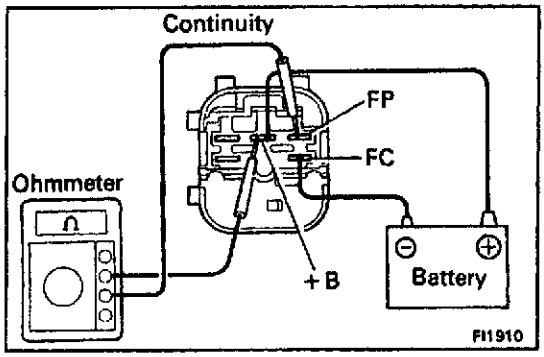
If continuity is not as specified, replace the relay



B. Inspect relay operation

(a) Apply battery voltage across terminals STA and E1

(b) Using an ohmmeter, check that there is continuity between terminals +B and FP



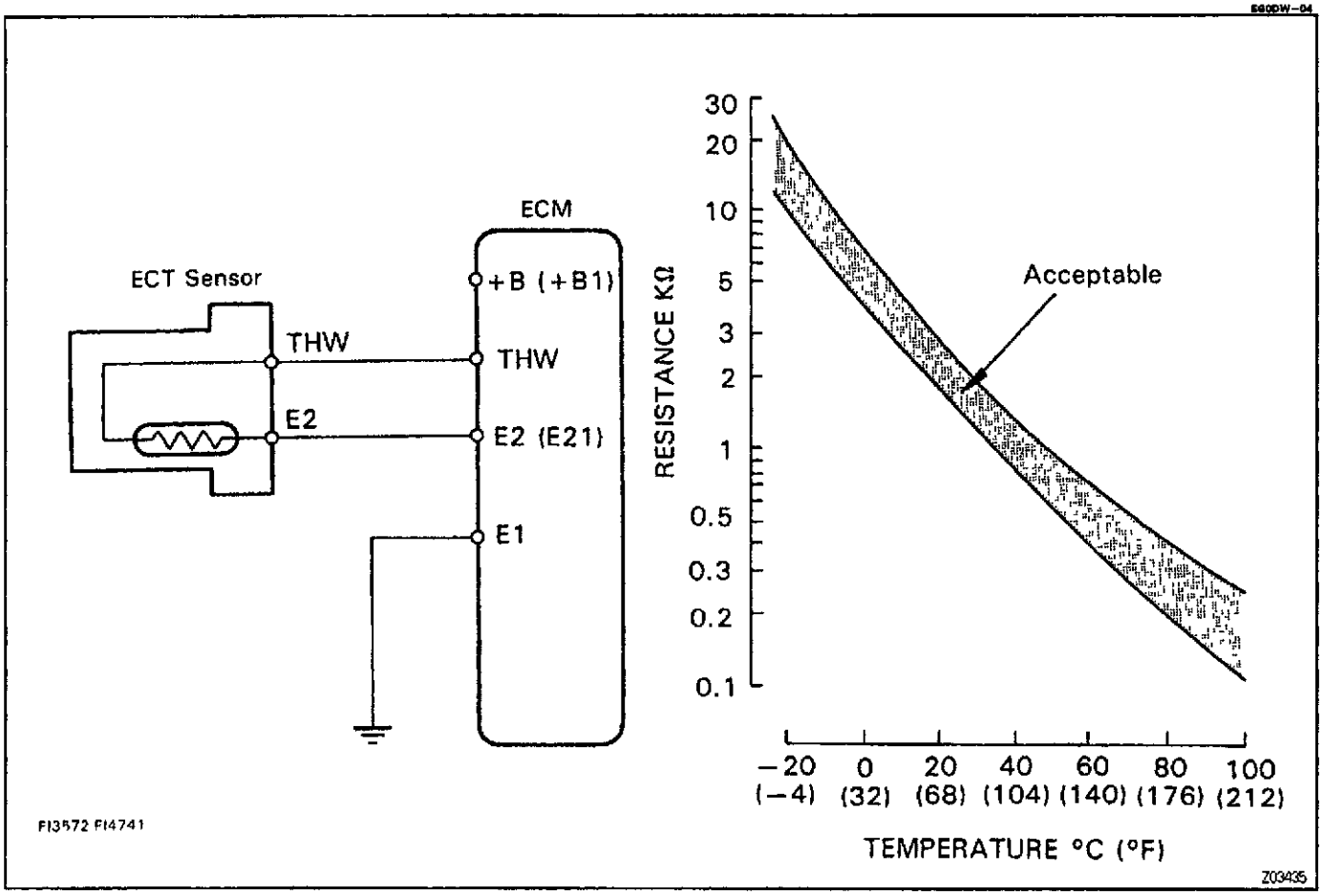
(c) Apply battery voltage across terminals +B and FC

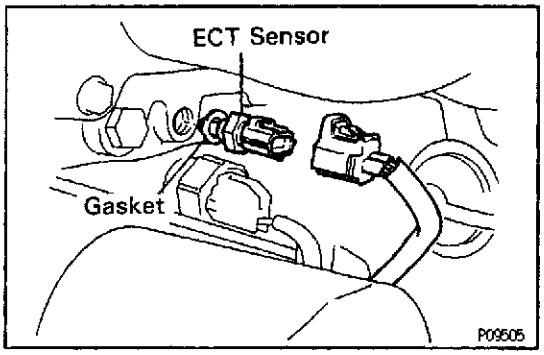
(d) Check that there is continuity between terminals +B and FP

If operation is not as specified, replace the relay

5. REINSTALL CIRCUIT OPENING RELAY
6. REINSTALL SCUFF PLATE
7. REINSTALL FOOT REST

ENGINE COOLANT TEMPERATURE (ECT) SENSOR





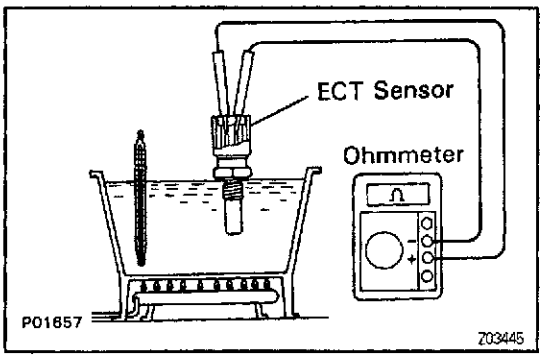
ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

(a) Disconnect the ECT sensor connector

(b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket



3. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals

Resistance:

Refer to the chart graph above

If the resistance is not as specified, replace the ECT sensor

4. REINSTALL ENGINE COOLANT TEMPERATURE SENSOR

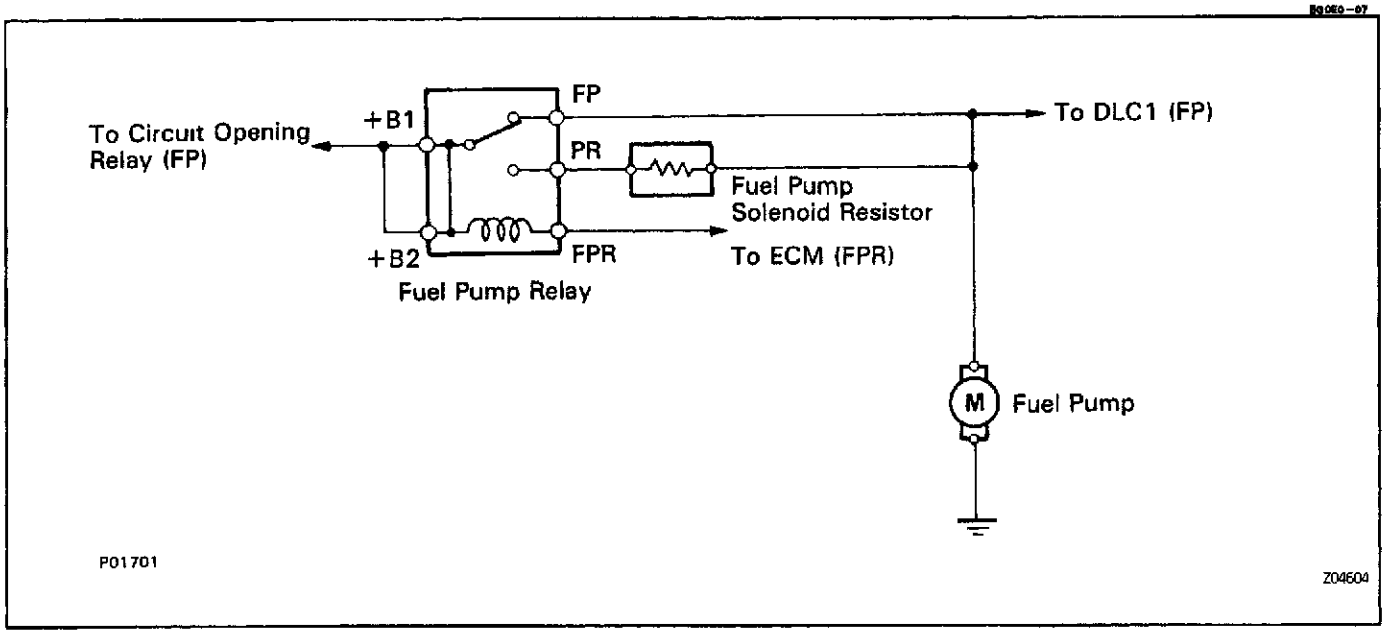
(a) Using a 19 mm deep socket wrench, install the ECT sensor and gasket

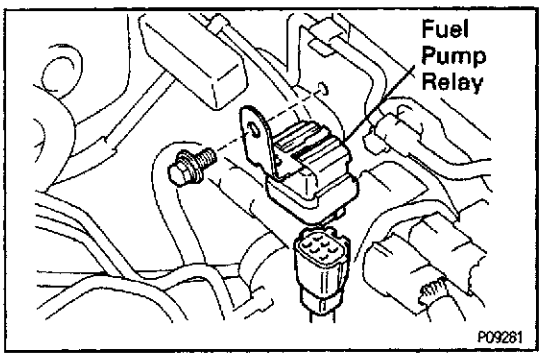
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

(b) Connect the ECT sensor connector

5. REFILL ENGINE COOLANT

FUEL PUMP RELAY AND RESISTOR



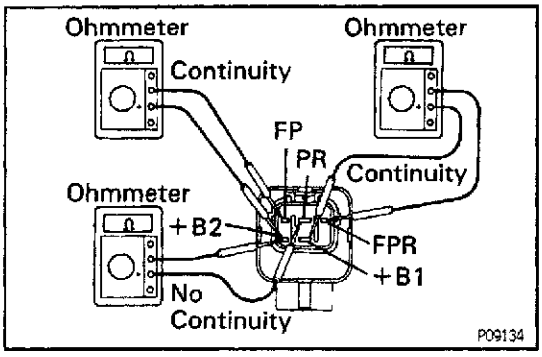


FUEL PUMP RELAY INSPECTION

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

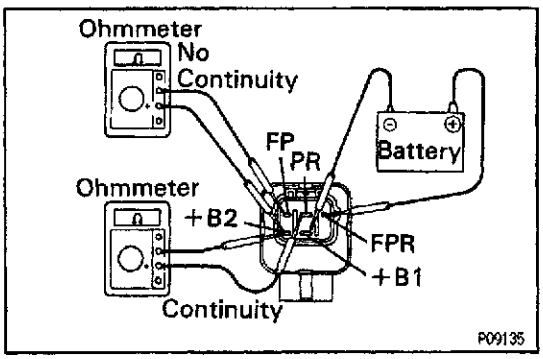
A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals +131 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



B. Inspect relay operation

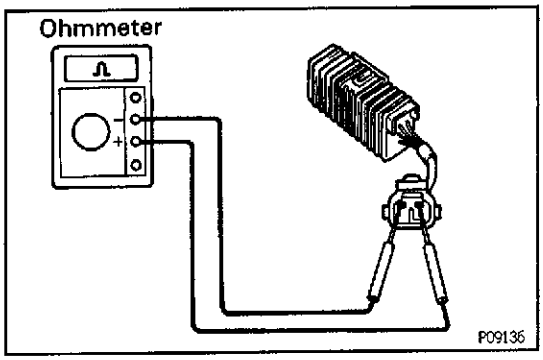
(a) Apply battery voltage across terminals +B1 and FPR

(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

3. REINSTALL FUEL PUMP RELAY



FUEL PUMP RESISTOR INSPECTION

5G0YK-02

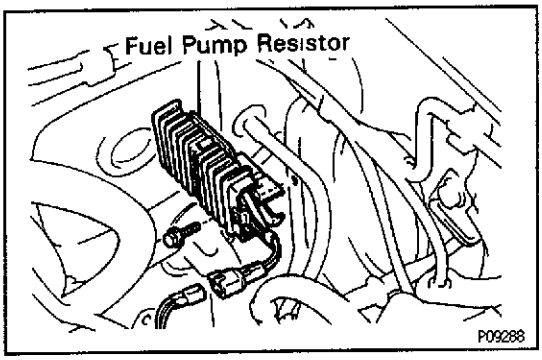
1. DISCONNECT FUEL PUMP RESISTOR CONNECTOR

2. INSPECT FUEL PUMP RESISTOR

Using an ohmmeter, measure the resistance between the terminals

Resistance:

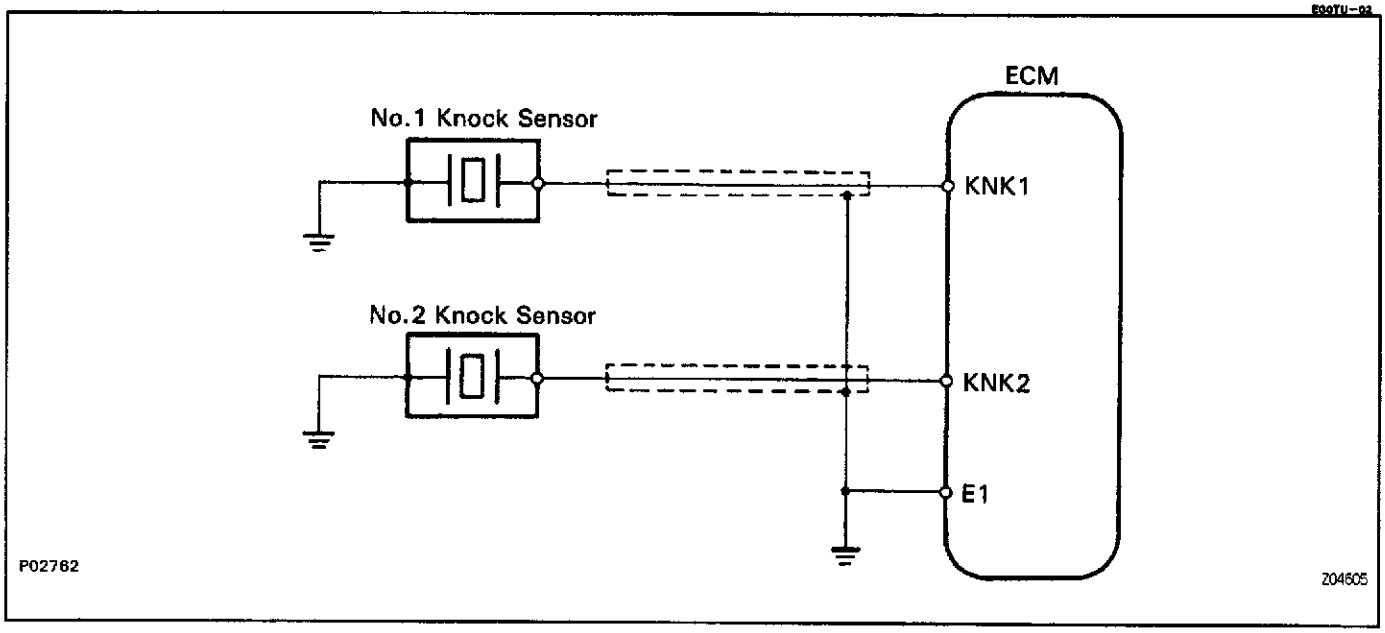
Approx. 0.73 0 at 20° C (68° F)

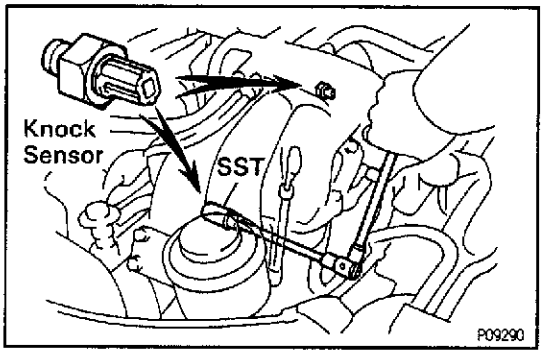


If there is no continuity, replace the resistor

3. RECONNECT FUEL PUMP RESISTOR CONNECTOR

KNOCK SENSOR





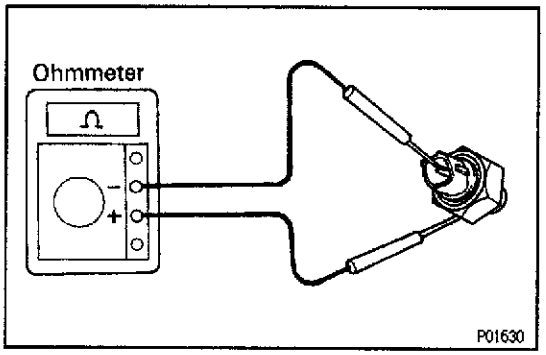
KNOCK SENSORS INSPECTION

1. REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connector

(b) Using SST, remove the knock sensor

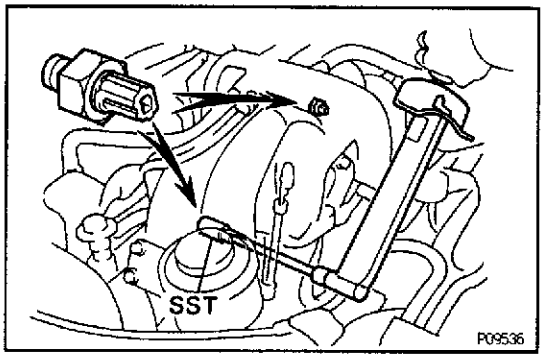
SST 09816-30010



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

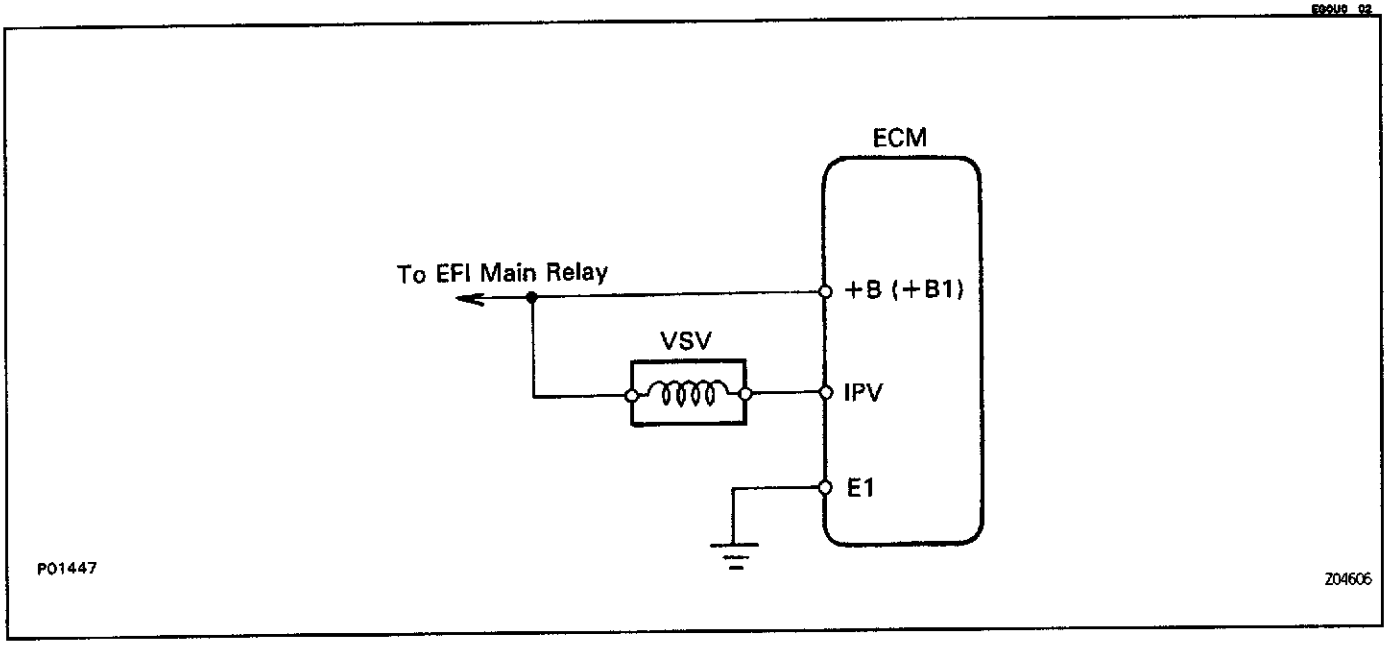
(a) Using SST, install the knock sensor

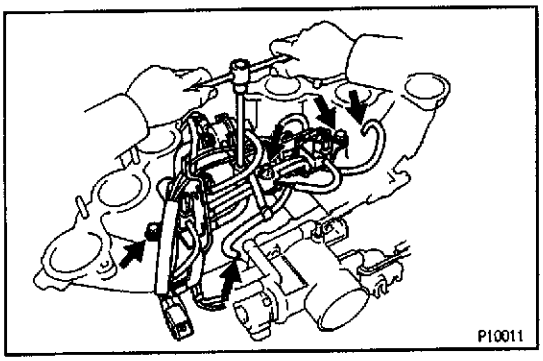
SST 09816 - 30010

Torque: 44 N-m (450 kgf-cm, 33 ft-lbf)

(b) Connect the knock sensor connector

VSV FOR EVAP





VSV INSPECTION

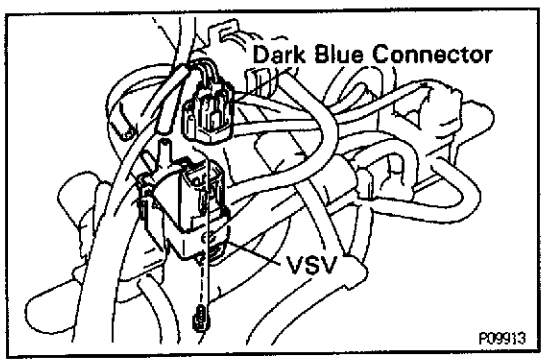
1. REMOVE AIR INTAKE CHAMBER

(See pages EG-269 **and 270)**

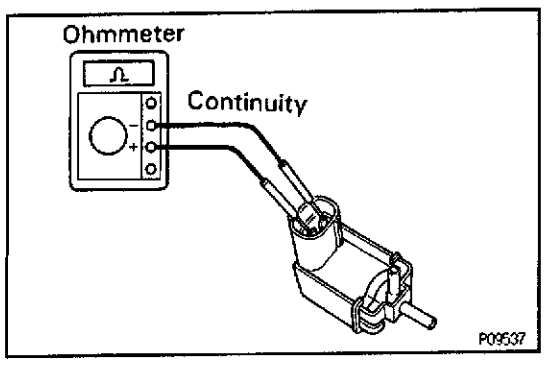
2. REMOVE VSV

(a) Disconnect the air hose and vacuum hose from the air intake chamber

(b) Remove the 4 bolts and emission control valve set assembly



(c) Disconnect the connector and 2 vacuum hoses, and remove the screw and VSV



3. INSPECT VSV

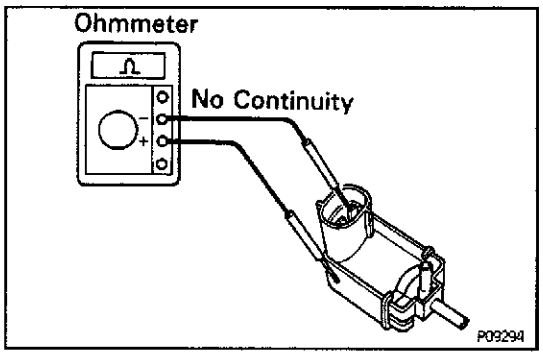
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals

Resistance:

30 - 33 0 at 20° e (68°F)

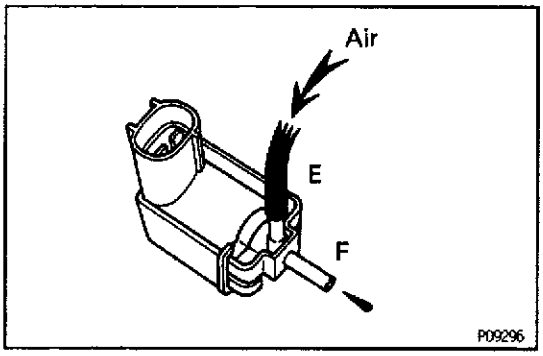
If there is no continuity, replace the VSV



B. Inspect VSV for ground

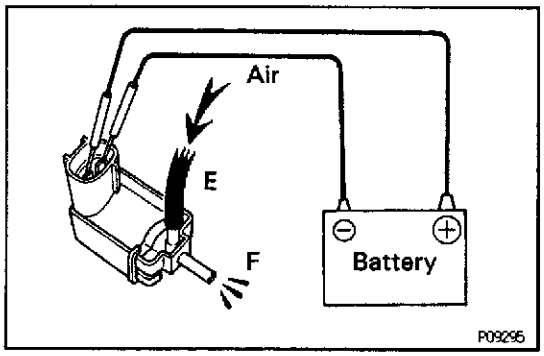
Using an ohmmeter, check that there is no continuity between each terminal and the body

If there is continuity, replace the VSV



C. Inspect VSV operation

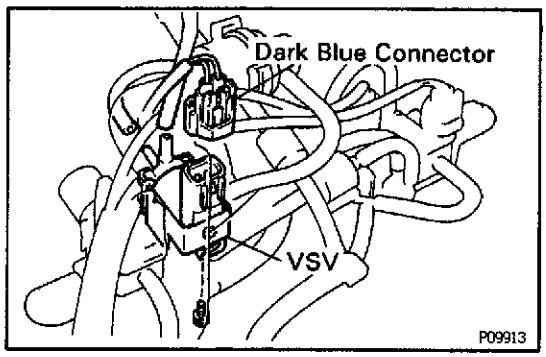
(a) Check that the air does not flow from pipe E to pipe F



(b) Apply battery voltage across the terminals

(c) Check that the air flows from pipe E to the pipe F

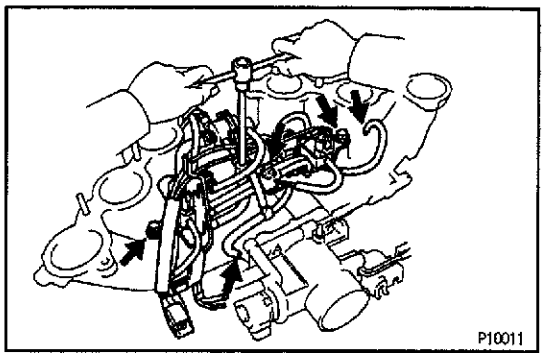
If operation is not as specified, replace the VSV



4. REINSTALL VSV

(a) Install the VSV with the screws

(b) Connect the connector and 2 vacuum hoses to the VSV



(c) Install the emission control valve set assembly with the 4 bolts

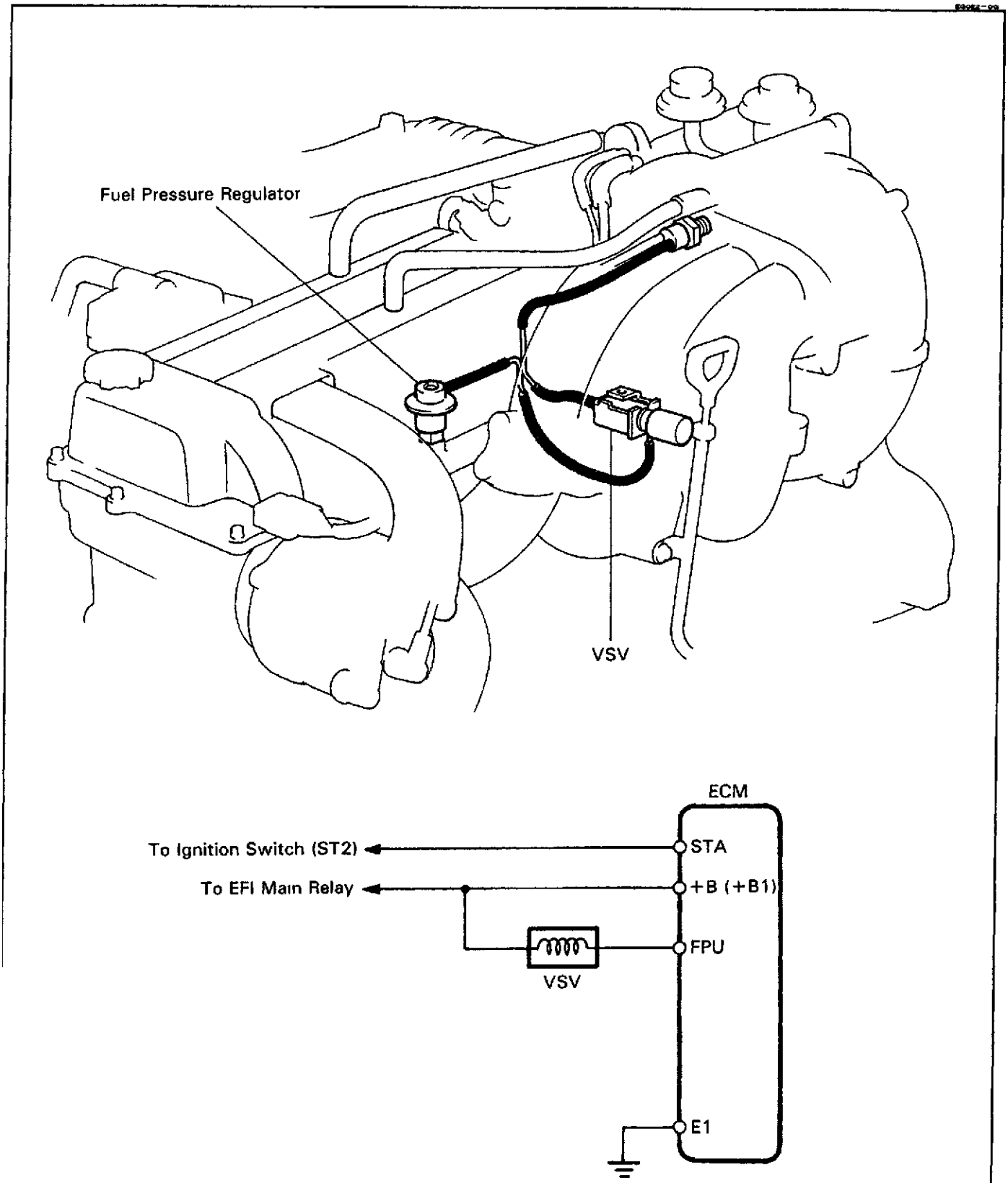
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

(d) Connect the air hose and vacuum hose to the air intake chamber

5. REINSTALL AIR INTAKE CHAMBER

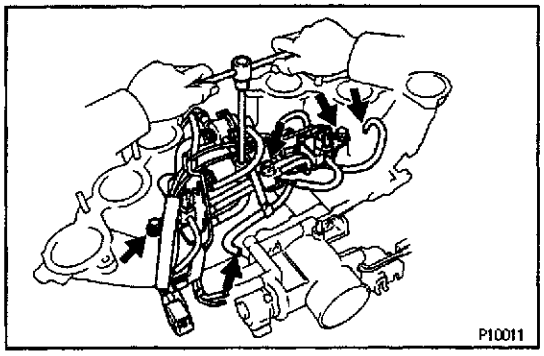
(See pages EG-276 **and 277)**

VSV FOR FUEL PRESSURE CONTROL



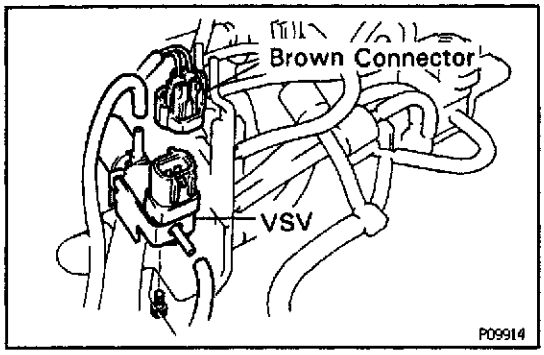
P09621
FI3041

Z04504

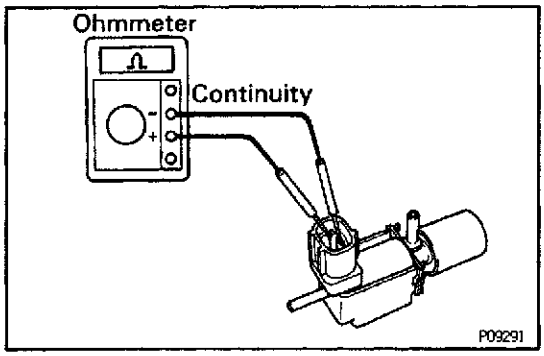


VSV INSPECTION

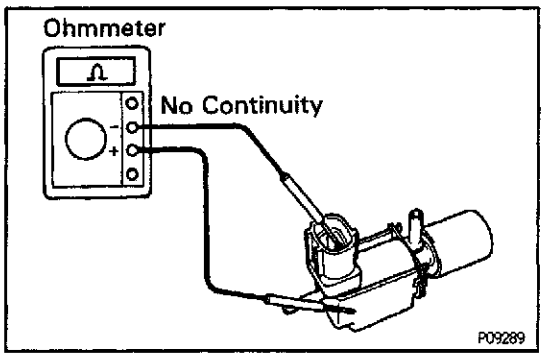
1. REMOVE AIR INTAKE CHAMBER
(See pages EG-269 **and 270)**
2. REMOVE VSV
(a) Disconnect the air hose and vacuum hose from the air intake chamber
(b) Remove the 4 bolts and emission control valve set assembly



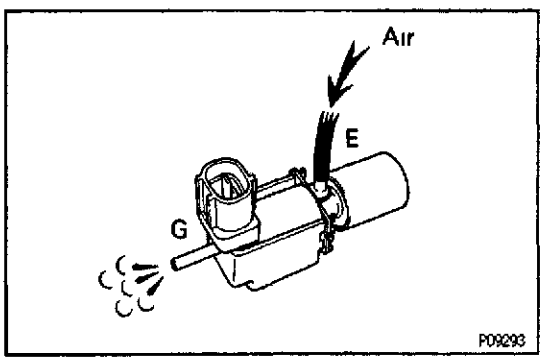
(c) Disconnect the connector and 2 vacuum hoses, and remove the screw and VSV



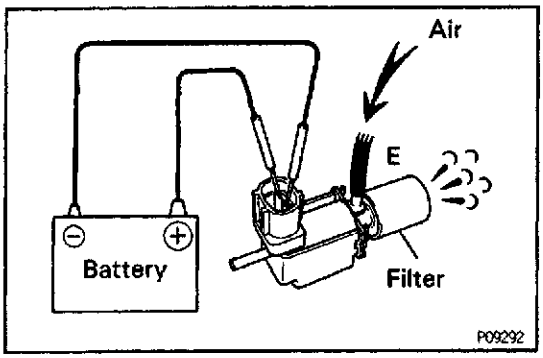
3. INSPECT VSV
A. Inspect VSV for open circuit
Using an ohmmeter, check that there is continuity between the terminals
Resistance:
37 - 44Ω at 20° C (68° F)
If there is no continuity, replace the VSV



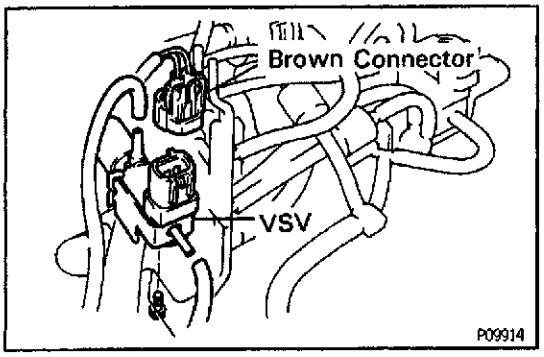
B. Inspect VSV for ground
Using an ohmmeter, check that there is no continuity between each terminal and the body
If there is continuity, replace the VSV



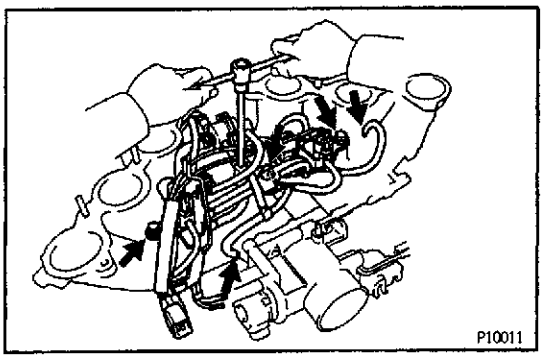
C. Inspect VSV operation
(a) Check that the air flows from pipe E to pipe G



(b) Apply battery voltage across the terminals
(c) Check that the air flows from pipe E to the filter
If operation is not as specified, replace the VSV



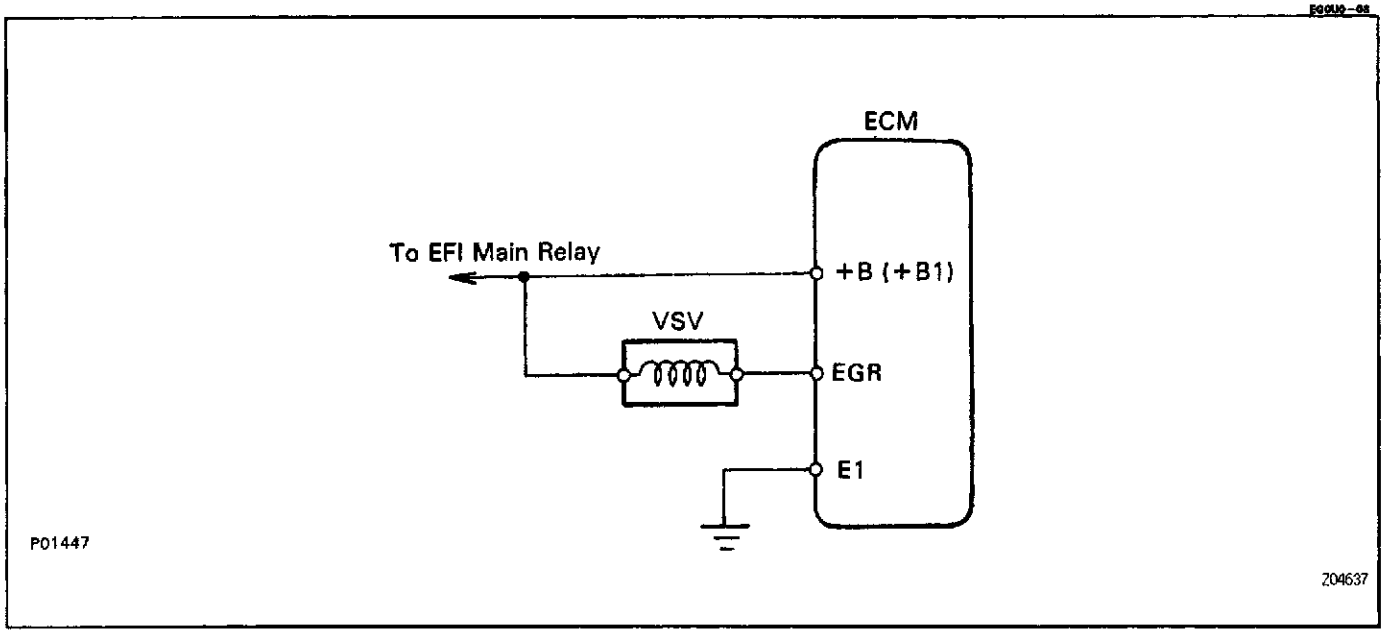
4. REINSTALL VSV
(a) Install the VSV with the screws
(b) Connect the connector and 2 vacuum hoses to the VSV

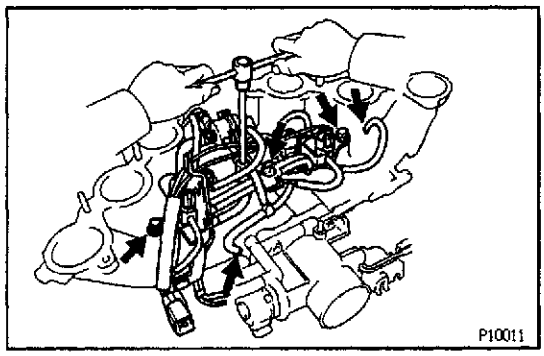


(c) Install the emission control valve set assembly with the 4 bolts
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)
(d) Connect the air hose and vacuum hose to the air intake chamber

5. REINSTALL AIR INTAKE CHAMBER
(SEE PAGES EG-276 AND 277)

VSV FOR EGR





VSV INSPECTION

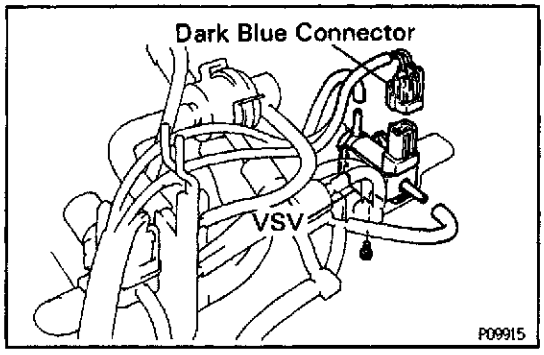
1. REMOVE AIR INTAKE CHAMBER

(See pages EG-269 **and 270)**

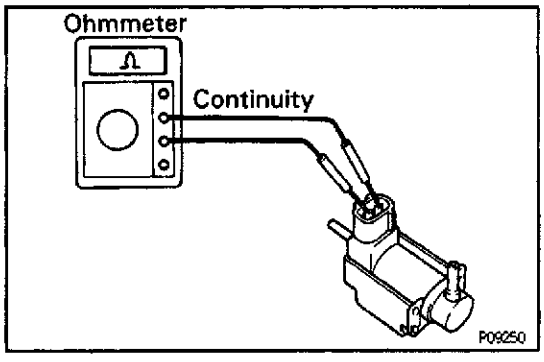
2. REMOVE VSV

(a) Disconnect the air hose and vacuum hose from the air intake chamber

(b) Remove the 4 bolts and emission control valve set assembly



(c) Disconnect the connector and 2 vacuum hoses, and remove the screw and VSV



3. INSPECT VSV

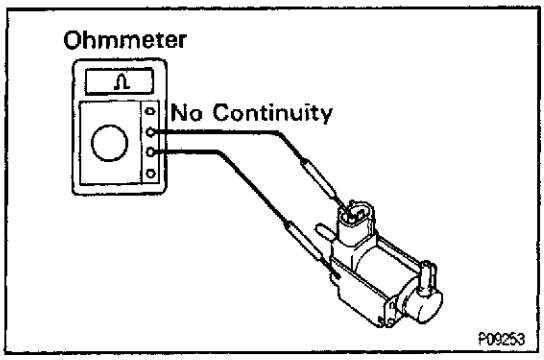
A. Inspect VSV for open circuit

Using an ohmmeter check that there is continuity between the terminals

Resistance:

30 - 34Ω at 200C (680F)

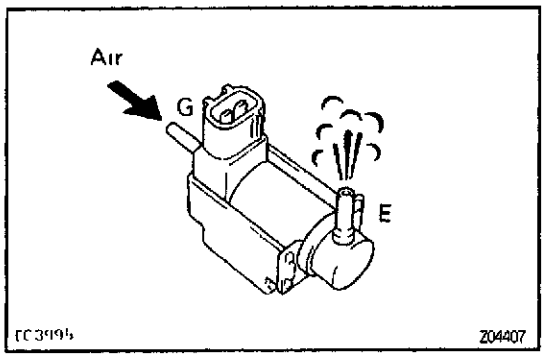
If there is no continuity replace the VSV



B Inspect VSV for ground

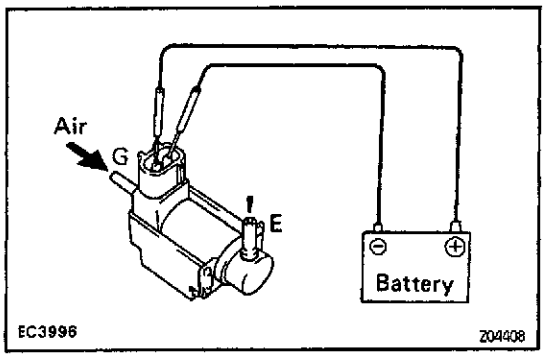
Using an ohmmeter, check that there is no continuity between each terminal and the body

If there is continuity, replace the VSV



C. Inspect VSV operation

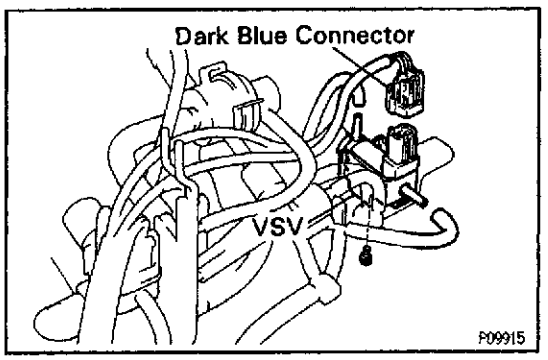
(a) Check that the air flows from pipe G to pipe E



(b) Apply battery voltage across the terminals

(c) Check that the air does not flows from pipe G to pipe E

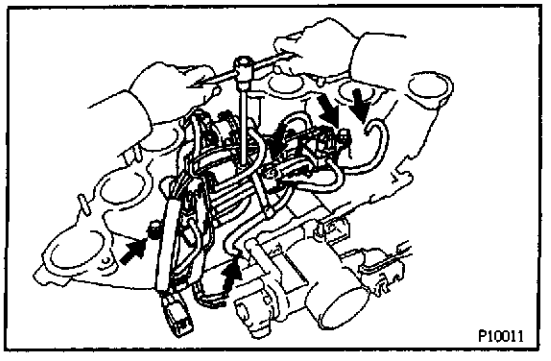
If operation is not as specified, replace the VSV



4. REINSTALL VSV

(a) Install the VSV with the screws

(b) Connect the connector and 2 vacuum hoses to the VSV



(c) Install the emission control valve set assembly with the 4 bolts

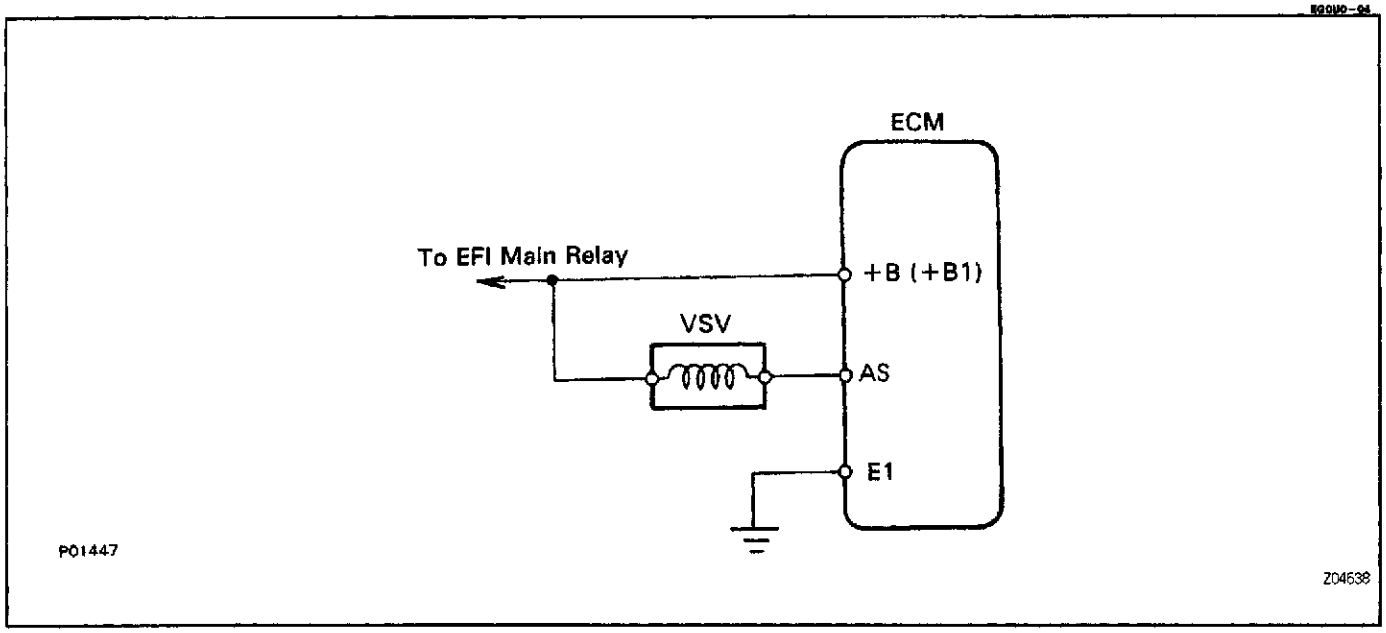
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

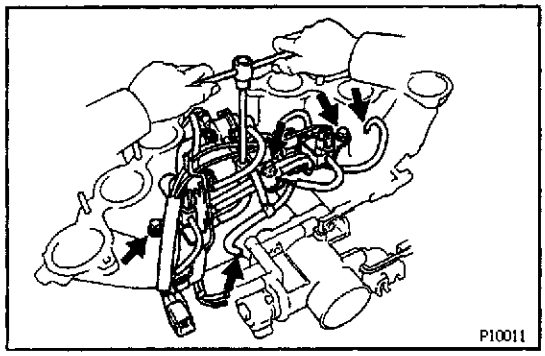
(d) Connect the air hose and vacuum hose to the air intake chamber

5. REINSTALL AIR INTAKE CHAMBER

(See pages EG-276 **and 277)**

VSV FOR PAIR





VSV INSPECTION

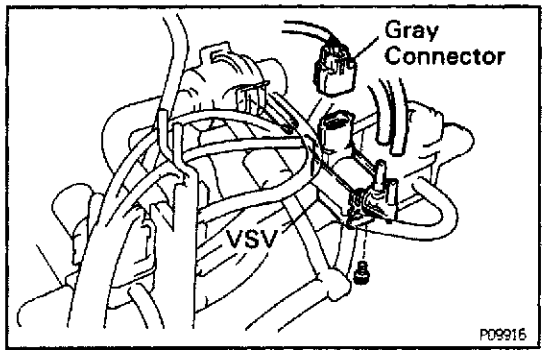
1. REMOVE AIR INTAKE CHAMBER

(See pages EG-269 **and 270)**

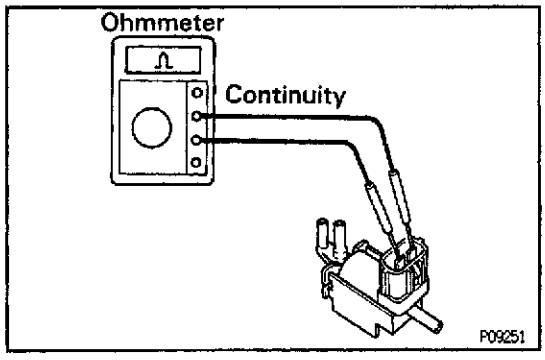
2. REMOVE VSV

(a) Disconnect the air hose and vacuum hose from the air intake chamber

(b) Remove the 4 bolts and emission control valve set assembly



(c) Disconnect the connector and 3 vacuum hoses, and remove the screw and VSV



3. INSPECT VSV

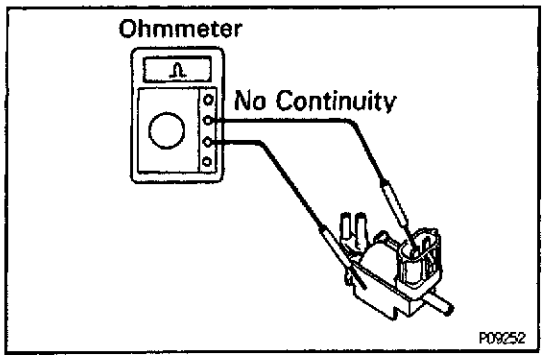
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals

Resistance:

37 - 44Ω at 20° c (68° F)

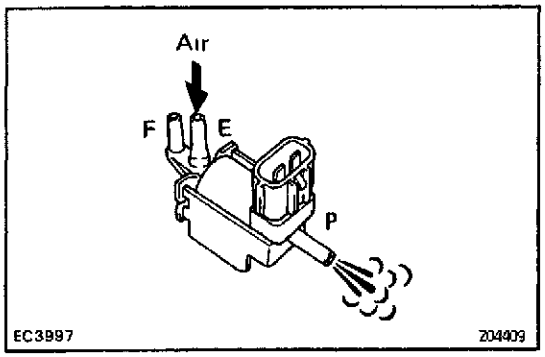
If there is no continuity, replace the VSV



B. Inspect VSV for ground

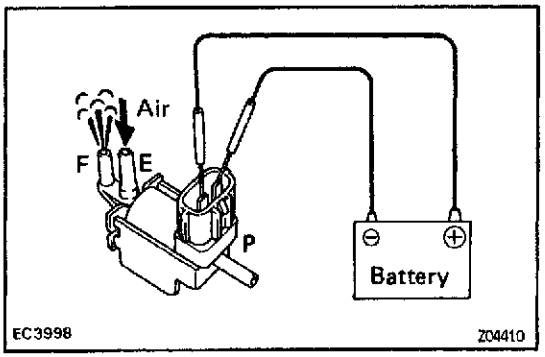
Using an ohmmeter, check that there is no continuity between each terminal and the body

If there is continuity, replace the VSV



C. Inspect VSV operation

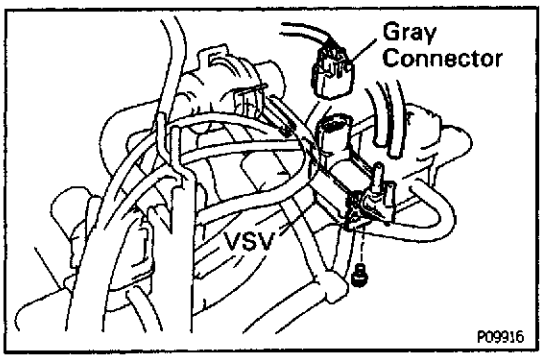
(a) Check that the air flows from pipe E to the pipe P



(b) Apply battery voltage across the terminals

(c) Check that the air flows from pipe E to pipe F

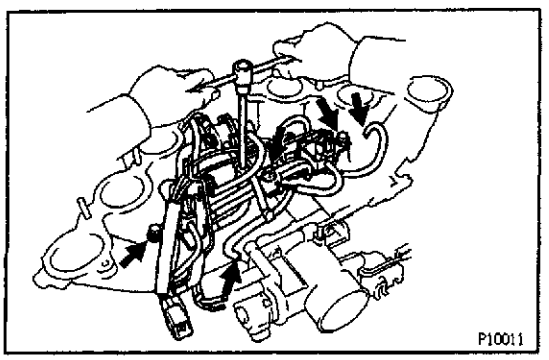
If operation is not as specified, replace the VSV



4. REINSTALL VSV

(a) Install the VSV with the screws

(b) Connect the connector and 3 vacuum hoses to the VSV



(c) Install the emission control valve set assembly with the 4 bolts

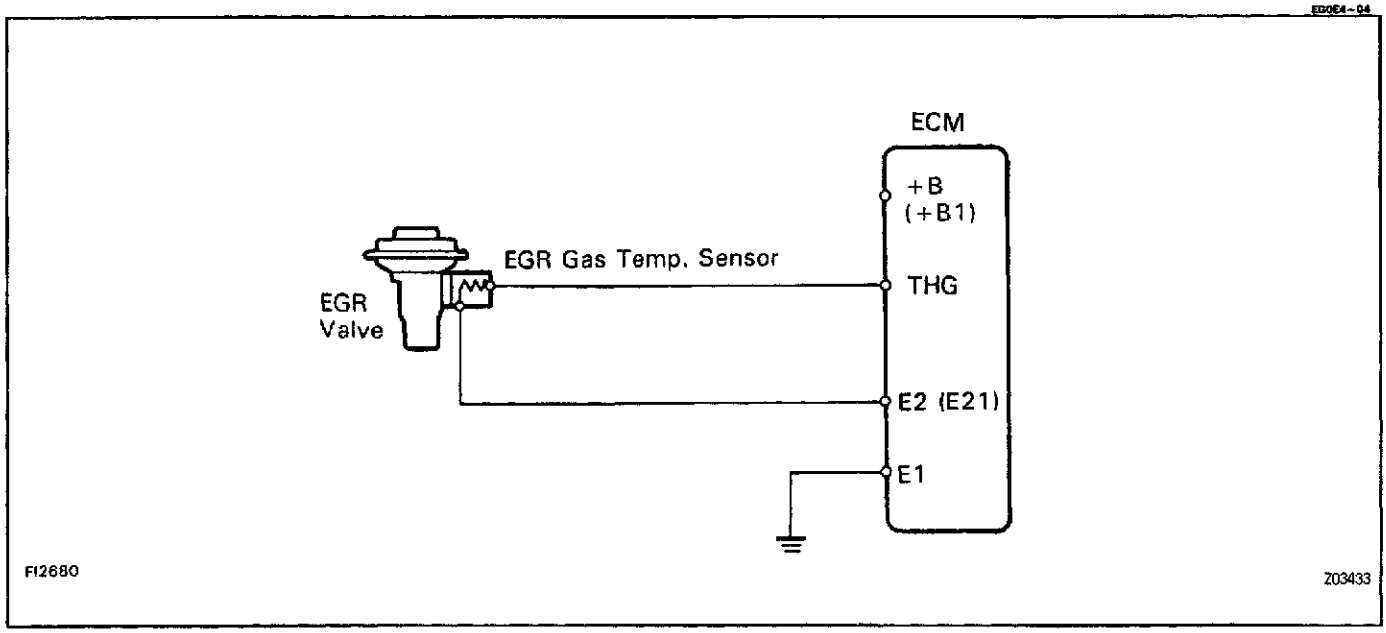
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

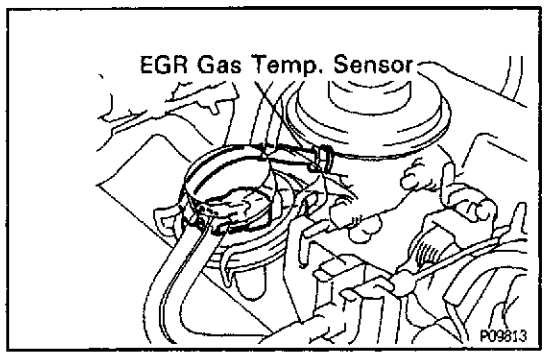
(d) Connect the air hose and vacuum hose to the air intake chamber

5. REINSTALL AIR INTAKE CHAMBER

(See pages EG-276 **and 277)**

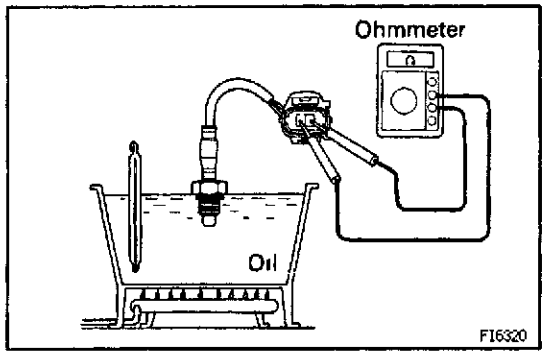
EGR GAS TEMPERATURE SENSOR





EGR GAS TEMPERATURE SENSOR INSPECTION

1. REMOVE EGR GAS TEMPERATURE SENSOR



2. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals

Resistance:

69 - 89 k Ω at 50° C (112° F)

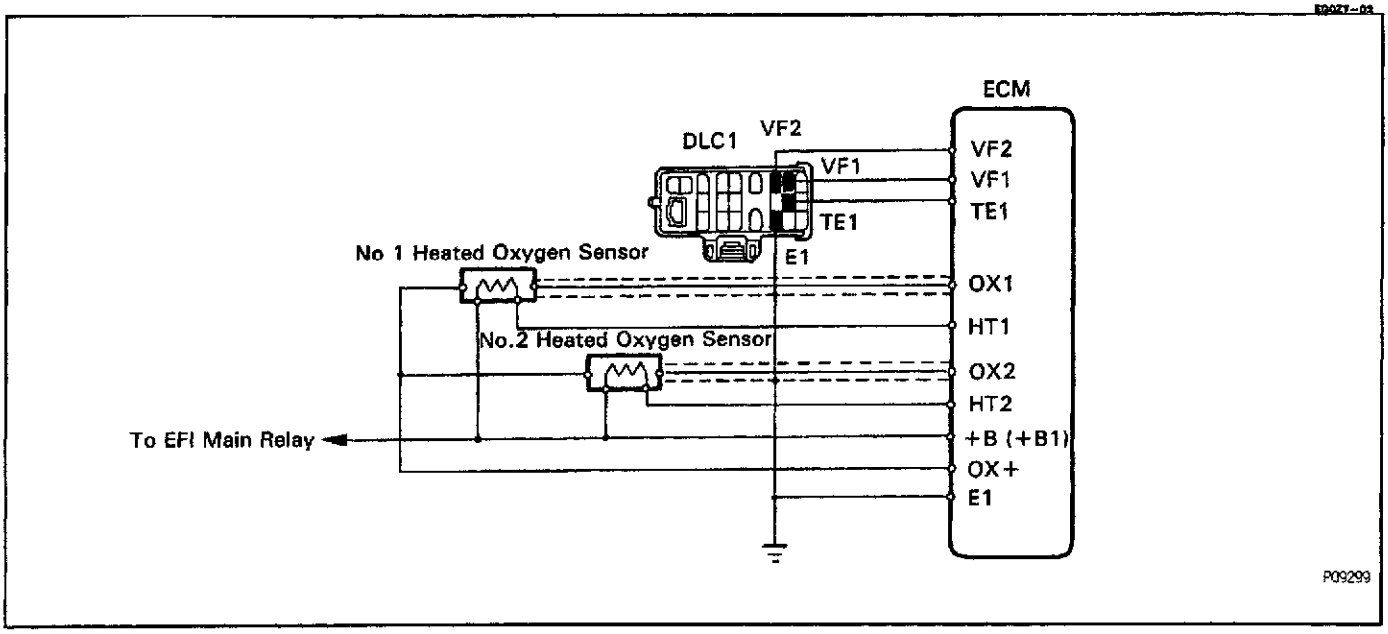
11 - 15 kΩ at 100° C (212° F)

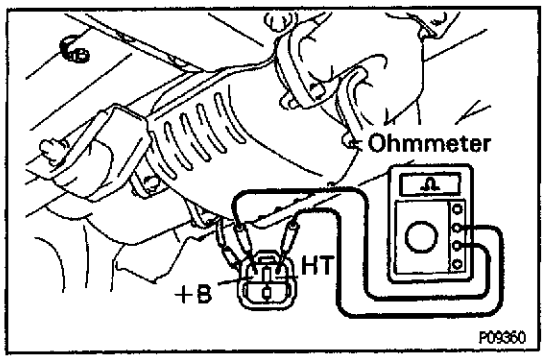
2 - 4 kΩ at 150° C (302° F)

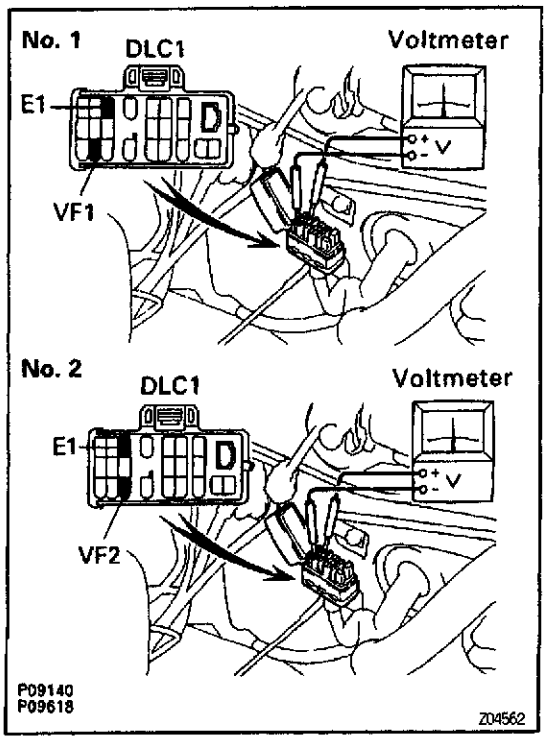
If the resistance is not as specified, replace the sensor

3. REINSTALL EGR GAS TEMPERATURE SENSOR

HEATED OXYGEN SENSOR







HEATED OXYGEN SENSORS INSPECTION

1. INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSOR

(a) Disconnect the heated oxygen sensor connector

(b) Using an ohmmeter, measure the resistance between terminals +B and HT

Resistance:

5.0 - 6.5Ω at 20° C (68° F)

If resistance is not as specified, replace the heated oxygen sensor (See page MA-9)

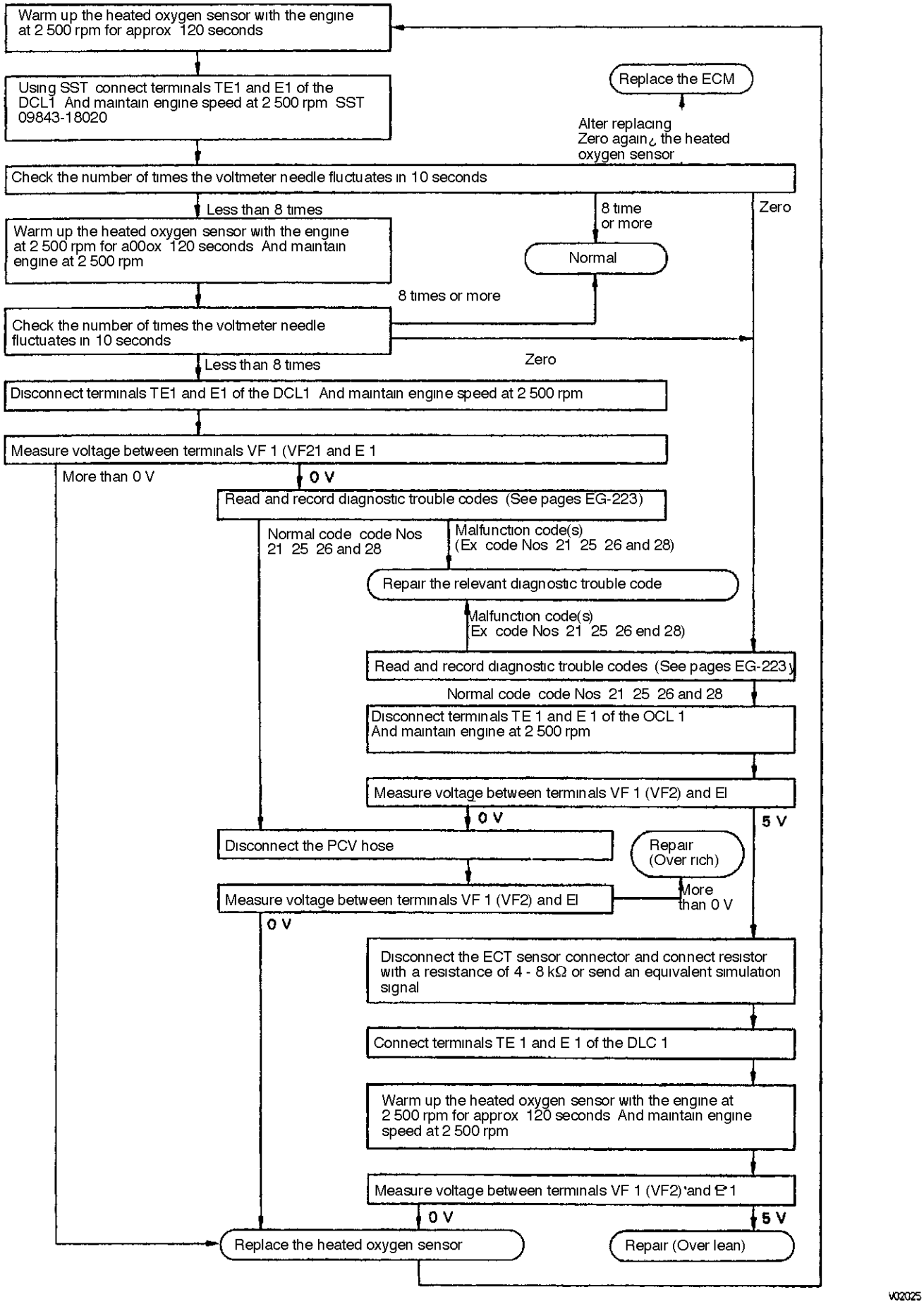
(c) Reconnect the heated oxygen sensor connector

2. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature

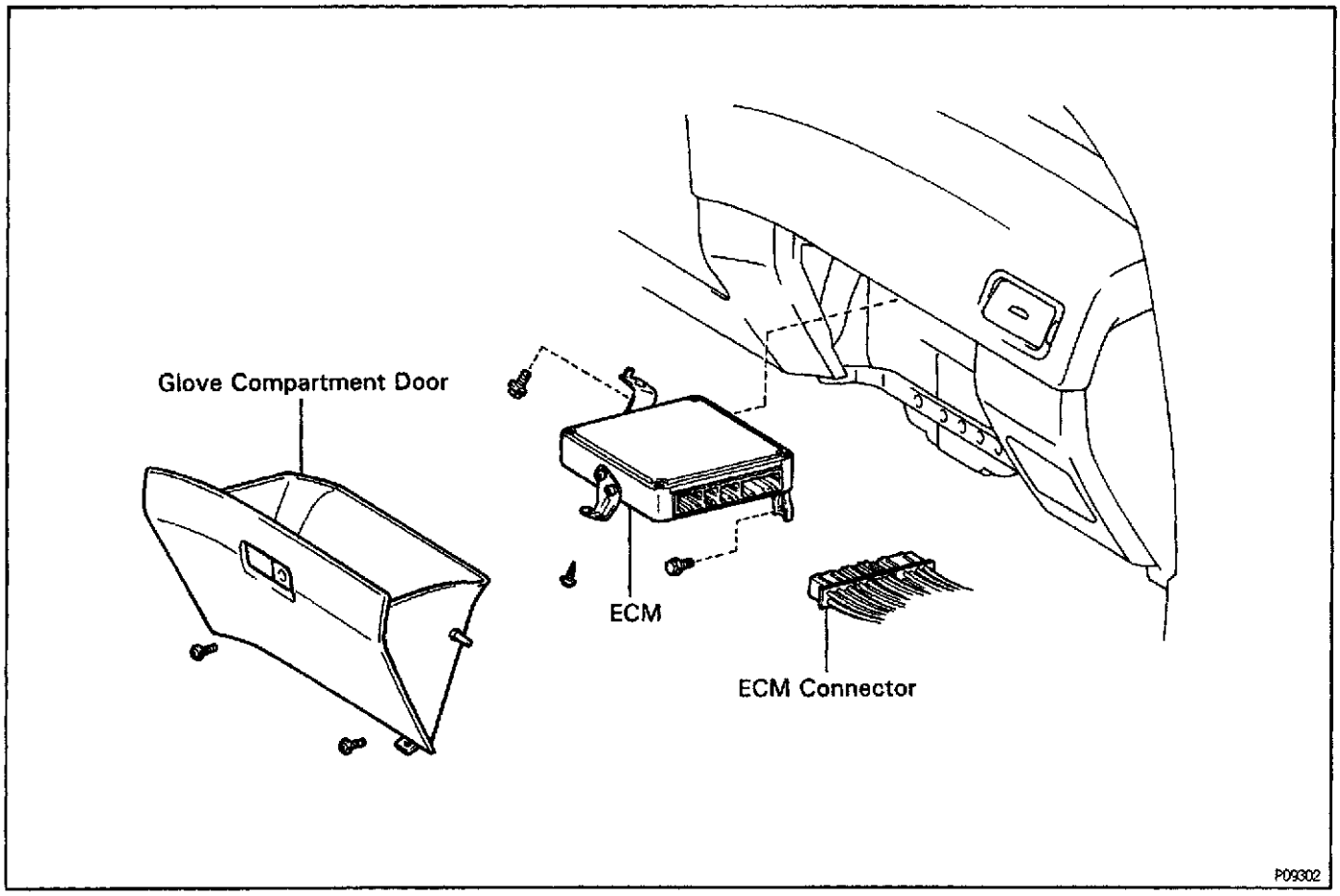
3. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) probe of a voltmeter to terminal VF1 or VF2 of the DLC1, and negative (-) probe to terminal E1 Perform the test as follows


Warm up the heated oxygen sensor with the engine at 2 500 rpm for approx 120 seconds
Using SST connect terminals TE1 and E1 of the DCL1 And maintain engine speed at 2 500 rpm SST 09843-18020
Replace the ECM
Alter replacing Zero again¿ the heated oxygen sensor
Check the number of times the voltmeter needle fluctuates in 10 seconds
Less than 8 times
8 time or more
Zero
Warm up the heated oxygen sensor with the engine at 2 500 rpm for a00ox 120 seconds And maintain engine at 2 500 rpm
Normal
8 times or more
Check the number of times the voltmeter needle fluctuates in 10 seconds
Less than 8 times
Zero
Disconnect terminals TE1 and E1 of the DCL1 And maintain engine speed at 2 500 rpm
Measure voltage between terminals VF 1 (VF21 and E 1
More than 0 V
0 V
Read and record diagnostic trouble codes (See pages EG-223)
Normal code code Nos 21 25 26 and 28
Malfunction code(s) (Ex code Nos 21 25 26 and 28)
Repair the relevant diagnostic trouble code
Malfunction code(s) Ex code Nos 21 25 26 end 28)
Read and record diagnostic trouble codes (See pages EG-223)
Normal code code Nos 21 25 26 and 28
Disconnect terminals TE 1 and E 1 of the OCL 1 And maintain engine at 2 500 rpm
Measure voltage between terminals VF 1 (VF2) and El
0 V
5 V
Disconnect the PCV hose
Repair (Over rich)
Measure voltage between terminals VF 1 (VF2) and El
More than 0 V
0 V
Disconnect the ECT sensor connector and connect resistor with a resistance of 4 - 8 kΩ or send an equivalent simulation signal
Connect terminals TE 1 and E 1 of the DLC 1
Warm up the heated oxygen sensor with the engine at 2 500 rpm for approx 120 seconds And maintain engine speed at 2 500 rpm
Measure voltage between terminals VF 1 (VF2) and E 1
0 V
5 V
Replace the heated oxygen sensor
Repair (Over lean)
V02025

ENGINE CONTROL MODULE (ECM)

ENGINE CONTROL MODULE FOR REMOVAL AND INSTALLATION

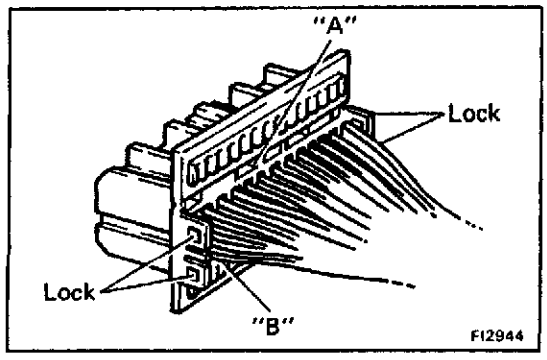


ENGINE CONTROL MODULE INSPECTION

(See Components for Removal and Installation)

HINT The SFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECM

1. REMOVE GLOVE COMPARTMENT DOOR



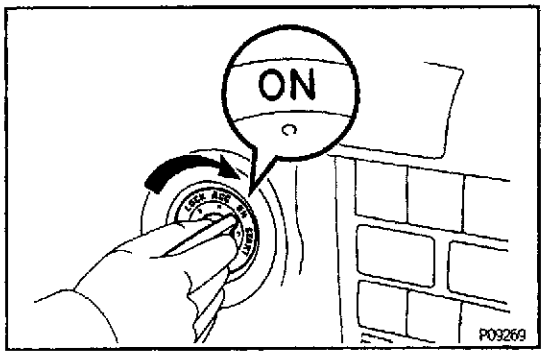
2. PREPARATION

(a) Disconnect the 4 connectors from the ECM

(b) Carefully remove the locks so that the tester probe(s) can easily come in

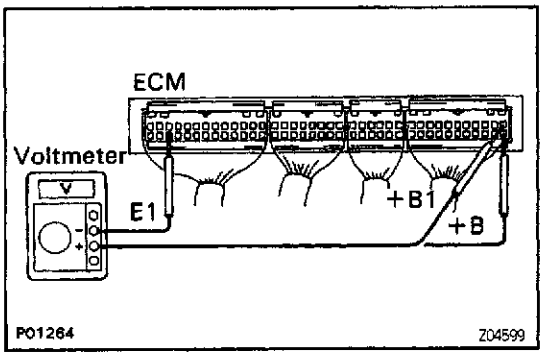
NOTICE: Pay attention to sections "A' and 'B' in the illustration which can easily broken.

(c) Reconnect the 4 connectors to the ECM



3. INSPECT VOLTAGE OF ENGINE CONTROL MODULE

(a) Turn the ignition switch ON



(b) Measure the voltage between each terminal of the wiring connectors

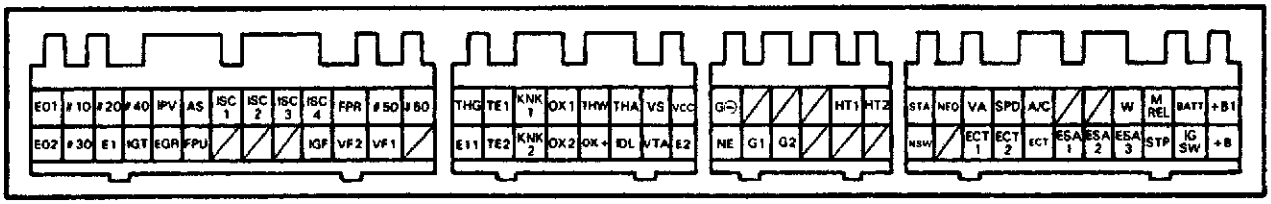
HINT

- Perform all voltage measurements with the connectors connected
- Verify that the battery voltage is 1 1 V or more when the ignition switch is ON

ECM Wiring Connectors Voltage

Terminals	Condition		STD voltage (V)
BATT - E 1	–		9 - 14
IGSW - EI	IG SW ON		
M-REL - E 1			
+B _ EB1 -B _			
IDL - E2	IG SW ON	Throttle valve open	9 - 14
VCC-E2		–	4 5 - 5 5
VTA - E 2		Throttle valve fully closed (Throttle opener must be cancelled first)	0 3 - 0 8
		Throttle valve fully open	3 2 - 4 9
VCC - E2		–	4 5 - 5 5
VS - E2		Measuring plate fully closed	3 5 - 4 5
		Measuring plate fully open	0 2 -0 5
	Idling		1 2 - 2 4
	3 000 rpm		0 8 - 1 3

ECM Terminals



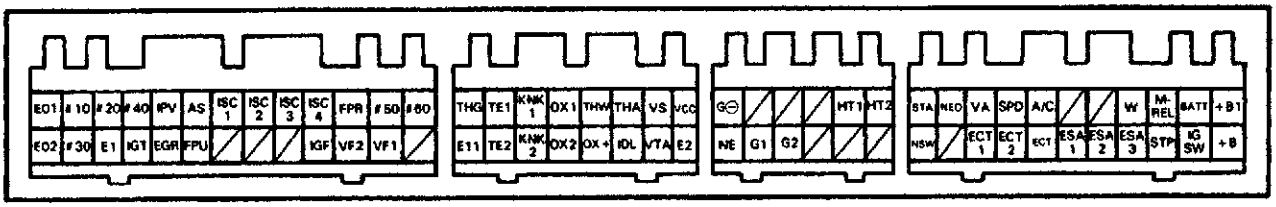
P01399

V02022

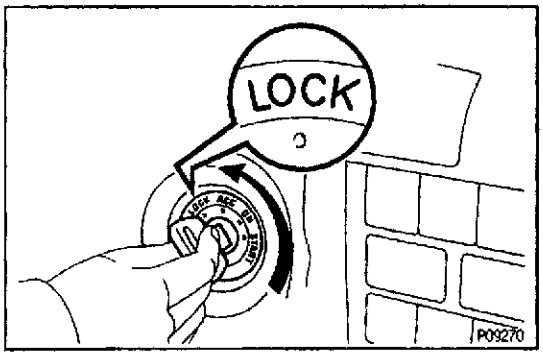
ECM Wiring Connectors Voltage (Cont'd)

Terminals	Condition		STD voltage (II)
#10 _ E01 ς E02 #60	IG SW ON		9 - 14
THA - E2	IG SW ON	Intake air temp 20°C (68°F)	0 5 - 3 4
THW - E2		Engine coolant temp 80°C (1 760F)	0 2-1 0
STA - E ı	Cranking		6 or more
IGT - E1	Idling		Pulse generation
ISC 1 ς - E1 ISC4	IG SW ON		9 - 14
W- EI	No trouble (malfunction indicator lamp light off) and engine running		9 - 14
IGF - E1	IG SW ON		2 0 or less
G1 GE2 -G(-)	Idling		Pulse generation
NE -G(-)			
KNK 1 KNK 2 -E1			
VF1 VF2 -E1	Maintain engine speed at 2 500 rpm for 120 seconds after warming up then return to idling		1 8 - 3 2
NSW - E 1	IG SW ON	Shift position P or N	3 or less
		Ex shift position P or N	9 - 14
SPD - E 1		Rotate driving wheel slowly	Pulse generation
TE1 TE2 -E1		Data link connector 1 TE 1 - E 1 not connected	9 - 14
		Data link connector 1 TE 1 - E 1 connected	1 5 or less
A/C - E 1		Air conditioning ON	7 5 - 14
		Air conditioning OFF	1 5 or less
STP - E 1	Stop light SW ON (Brake pedal depressed)		7 5 - 14
	Stop light SW OFF		1 5 or less

ECM Terminals



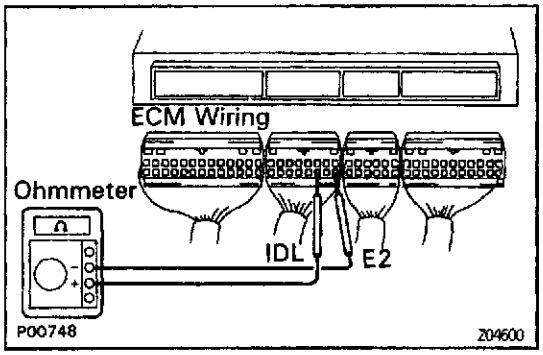
P01399



4. INSPECT RESISTANCE OF ENGINE CONTROL MODULE

(a) Turn the ignition switch to LOCK

(b) Disconnect the 4 connectors from the ECM



(c) Measure the resistance between each terminal of the wiring connectors

NOTICE:

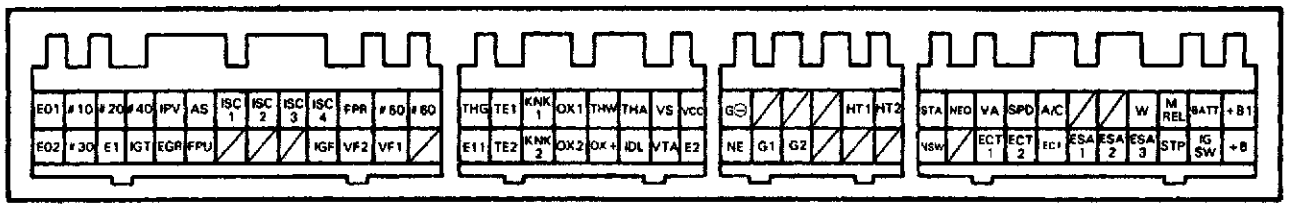
Do not touch the ECM terminals.

The tester probe should be inserted in the wiring connector from the wiring side.

ECM Wiring Connectors Resistance

Terminals	Condition	STD resistance (9)
IDL - E2	Throttle valve open	Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)	2 300 or less
VTA - E2	Throttle valve fully open	2 000 - 10 200
	Throttle valve fully closed (Throttle opener must be cancelled first)	200- 5 700
VCC - E2	-	**2,500** - 5 900
VS - E2	Measuring plate fully closed	200 - 600
	Measuring plate fully open	20 - 1,Zoo
THA - E2	Intake air temp 200C (680F)	2 000 - 3 000
THW - E2	Engine coolant temp 80* C 0 761F)	200 -400
G1 GE2 -G(-)	Cold (-1o°C (11 41F) to 50°C (122°F))	185 - 275
	Hot (50°C (1 220F) to 1 00°C (212°F)J	240 - 325
NE - G(-)	Cold (-10°C 0 4°F) to 50°C 0 22° F)y	185 - 275
	Hot (50°C (122°F) to 100°C (212°F))	240 - 325
ISC 1 ς ISC4 - +B +B1	-	10 - 30

ECM Terminals



V02023

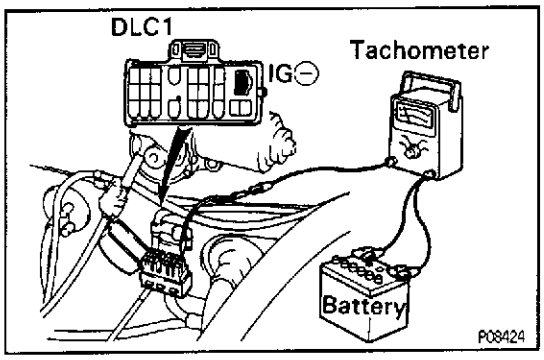
FUEL CUT RPM

EG151-08

FUEL CUT OFF RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature

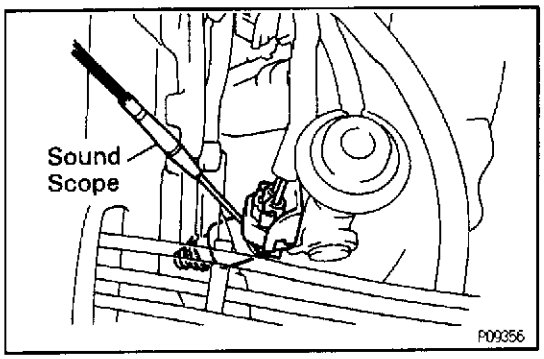


2. CONNECT TACHOMETER TO ENGINE

Connect the test probe of a tachometer to terminal IG (-) of the DLC1

1.NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result in damage to the¿gniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your before use.**



3. INSPECT FUELOFF CUT RPM

(a) Increase the engine speed to at least 3,000 rpm

(b) Using a sound scope, 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 TACHOMETER

SERVICE SPECIFICATIONS

EG0ZA-08

SERVICE DATA

Fuel pressure regulator	Fuel pressure at no vacuum		265 - 304 kPa (2 7 - 3 1 kgf/Cm^2 38 - 44 psi)
Fuel pump	Resistance		0 2 - 3 0 0 et 20* C (68-F)
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage		12 - 16 0 at 20 C (68 F) 66 - 82 cm (4 0 - 5 0 cu in) per 15 seconds 5 cm (0 3 cu in) or less One drop or less per minute
VAF meter	Resistance	Terminals VS - E2 VS - E2 VC - E2 THA - E2 THA - E2 THA - E2 THA - E2 THA - E2	Resistance 200 - 600Ω (Measuring plate fully closed) 20 - 1 200Ω (Measuring plate fully open) 200 - 400Ω 10 - 20 kΩ at -20°C (-4°F) 4 - 7 kΩ at O- C (32-F) 2 - 3 kΩ et 20° C (68° F) 0 9 - 1 3 k 0 at 40° C (104° F) 0 4 - 0 7 k 0 at 60° C (140° F)
Throttle body	Throttle valve fully closed angle Dashpot setting speed Throttle opener setting speed		6° 2 200±300 rpm 700 - 1 000 rpm
TP sensor	Clearance between stop screw and lever	Terminals	Resistance
	0 mm (0 in) 0 50 mm (0 020 in) 0 75 mm (0 030 in) Throttle valve fully open	VTA - E2 IDL - E2 IDL - E2 VTA - E2 VC - E2	0 2 - 5 7 kΩ 2 3 kΩ or less Infinity 2 0 - 10 2 kΩ 2 5 - 5 9 kΩ
IAC valve	Resistance	B1 - S1 S3 B2 - S2 S4	10 - 30Ω at 20 C (68° F) 10 - 30Ω et 20° C (68° F)
ECT sensor	Resistance		10 - 20 kΩ at -20°C (-4°F) 4 - 7 kΩ at O- C (32°F) 2 - 3 kΩ at 20° C (68° F) 0 9 - 1 3 k 0 at 40° C (104° F) 0 4 - 0 7 k 0 at 600 C (140° F) 0 2 - 0 4 k 0 at 80° C (176 F)
Fuel pump resistor	Resistance (Cold)		ApproX 0 73Ω et 200C (680F)
VSV for EVAP	Resistance		30 - 33Ω at 20°C (68 °F)
VSV for fuel pressure control	Resistance		37 - 44 0 et 20° C (68° F)
VSV for EG R	Resistance		30 - 34 Ω at 20 C (68 F)
vsv for PAIR	Resistance		37 - 44Ω at 20° C (68° F)
EGR gas temp sensor	Resistance		69 - 89 k 0 at 50° C (122° F) 11 - 15 kΩ et 1000C (2120F) 2 - 4 kΩ at 150° C (3020F)
Heated oxygen sensor	Heater coil resistance		5 0 - 6 5Ω et 20°C (68°F)

ECM	Condition	Terminals	Voltage
		BATT - E1	9 - 14V
	IG SW ON	IG SW - E1	9 - 14V
	IG SW ON	M-REL - E1	9 - 14V
	IG SW ON	+B +B1 - E1	9 - 14V
	IG SW ON - Throttle valve open	IDL - E2	9 - 14V
	IG SW ON	VCC - E2	4 5 - 5 5 V
	IG SW ON - Throttle valve fully closed (Throttle opener must be cancelled first)	VTA - E2	0 3 - 0 8 v
	IG SW ON - Throttle valve fully open	VTA - E2	3 2 - 4 9 V
	IG SW ON - Measuring plate fully closed	VS - E2	3 5 - 4 5 V
	IG SW ON - Measuring plate fully open	VS - E2	0 2 - 0 5 V
	Idling	VS - E2	1 2 - 2 4 V
	3 000 rpm	VS - E2	0 8 - 1 3 V
	IG SW ON	#10 N #60 - E01	9 - 14V
	IG SW ON	#10 - #60 - E02	9 - 14V
	IG SW ON - IAT 20° C (68° F)	THA - E2	0 5 - 3 4 V
	IG SW ON - ECT 80-C (176° F)	THW - E2	0 2 - 1 0 V
	Cranking	STA - E1	6 V or more
	Idling	IGT - E1	Pulse generation
	IG SW ON	ISC1～ ISC4 - E1	9 - 14V
	No trouble (MIL light off) and engine running	W-E1	**9** - 14V
	IG SW ON	IGF - E1	2 V or less
	Idling	IGF - E1	Pulse generation
	Idling	G1 G2 - G(-)	Pulse generation
	Idling	NE - G(-)	Pulse generation
	Idling	KNK1 KNK2 - E1	Pulse generation
	Maintain engine speed at 2 500 rpm for 120 seconds after warming up then return to idling	VF1 VF2 - E1	1 8 - 3 2 V
	IG SW ON - Shift position P or N	NSW - E1	3 V or less
	IG SW ON - Ex shift position P or N	NSW - E1	9 - 14V
	IG SW ON - Rotate driving wheel slowly	SPD - E1	Pulse generation
	IGSWON - DLC1 TE1 - E1 not connected	TE1 TE2 - E1	9 - 14V
	IG SW ON - DLC1 TE1 - E1 connected	TE1 TE2 - E1	1 5 V or less
	IG SW 0 N - A/C ON	A/C - E1	7 5 - 14 V
	I G SW 0 N - A/C OFF	A/C - E1	1 5 V or less
	Stop light SW ON (Brake pedal depressed)	STP - E1	7 5 - 14 V
	Stop light SW OFF	STP - E1	1 5 V or less

ECM	Condition	Terminals	Resistance
	Throttle valve open	IDL - E2	Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)	IDL - E2	2 300Ω or less
	Throttle valve fully open	VTA - E2	2 000 - 10 200Ω
	Throttle valve fully closed (Throttle opener must be cancelled first)	VTA - E2	200 - 5 700Ω
	-	VCC - E2	2 500 - 5 900Ω
	Measuring plate fully closed	VS - E2	200 - 600Ω
	Measuring plate fully open	VS - E2	20 - 1 200Ω
	IAT 20°C (68°F)	THA - E2	2 000 - 3 000 0
	ECT 80° C (176° F)	THW - E2	200 - 400Ω
	Cold (-10° C (14° F) to 50° C (122° F))	G1 G2 - G(-)	185-275 Ω
	Hot (50° C (122° F) to 100° C (212° F))	G1 G2 - G(-)	**240-325** Ω
	Cold (-10°C (14° F) to 50°C (122° F))	NE - G(-)	185 - 275Ω
	Hot (50 C (122° F) to 100° C (212°-F))	N E - G(-)	240-325 Ω
	-	+ B + B1 - ISC 1 ~ ISC4	10-300
Fuel cut RPM	Fuel return rpm		1 200 rpm

TORQUE SPECIFICATIONS

EG0EE-08

Part tightened	N-m	kgf-cm	ft-lbf
Fuel line (Union bolt type)	**29**	300	**22**
Fuel line (Flare nut type)	**30**	310	**22**
Fuel pump bracket assembly x Fuel tank	3.9	**40**	35 in.lbf
Second seat x Body	**39**	400	**29**
Drain plug x Fuel tank	6.5	**65**	57 in.lbf
Fuel tank brether 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**
Fuel pressure regulator x Delivery pipe	**25**	250	**18**
Fuel inlet hose x Fuel filter	**29**	300	**22**
Delivery pipe x Intake manifold	**21**	210	**15**
No.1 fuel pipe x Delivery pipe (Union bolt)	**29**	300	**22**
No.1 fuel pipe x Delivery pipe (Bolt)	**20**	200	**14**
No.1 fuel 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**
PS reservoir tank x Air intake chamber	**18**	185	**13**
Oil dipstick guide x Intake manifold	**20**	200	**14**
Oil dipstick guide x No.1 oil pan	**20**	200	**14**
Heater inlet pipe x Air intake chamber	**20**	200	**14**
EGR valve x Air intake chamber (Stud bolt)	**10**	105	**8**
EGR valve x Air intake chamber (Nut)	**19**	195	**14**
EGR valve x EGR pipe	**64**	650	**47**
VAF meter x Bracket	4.9	**50**	43 in.lbf
VAF meter x Air cleaner cap	**10**	100	**7**
Throttle body x Air intake chamber	**21**	210	**15**
ECT sensor x Cylinder head	**20**	200	**14**
Knock sensor x Cylinder block	**44**	450	**33**

LUBRICATION SYSTEM

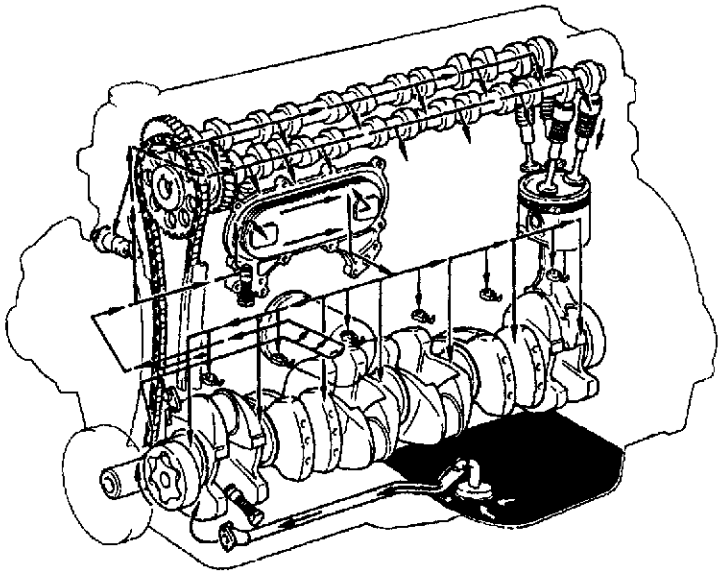
DESCRIPTION

EG1JD-01

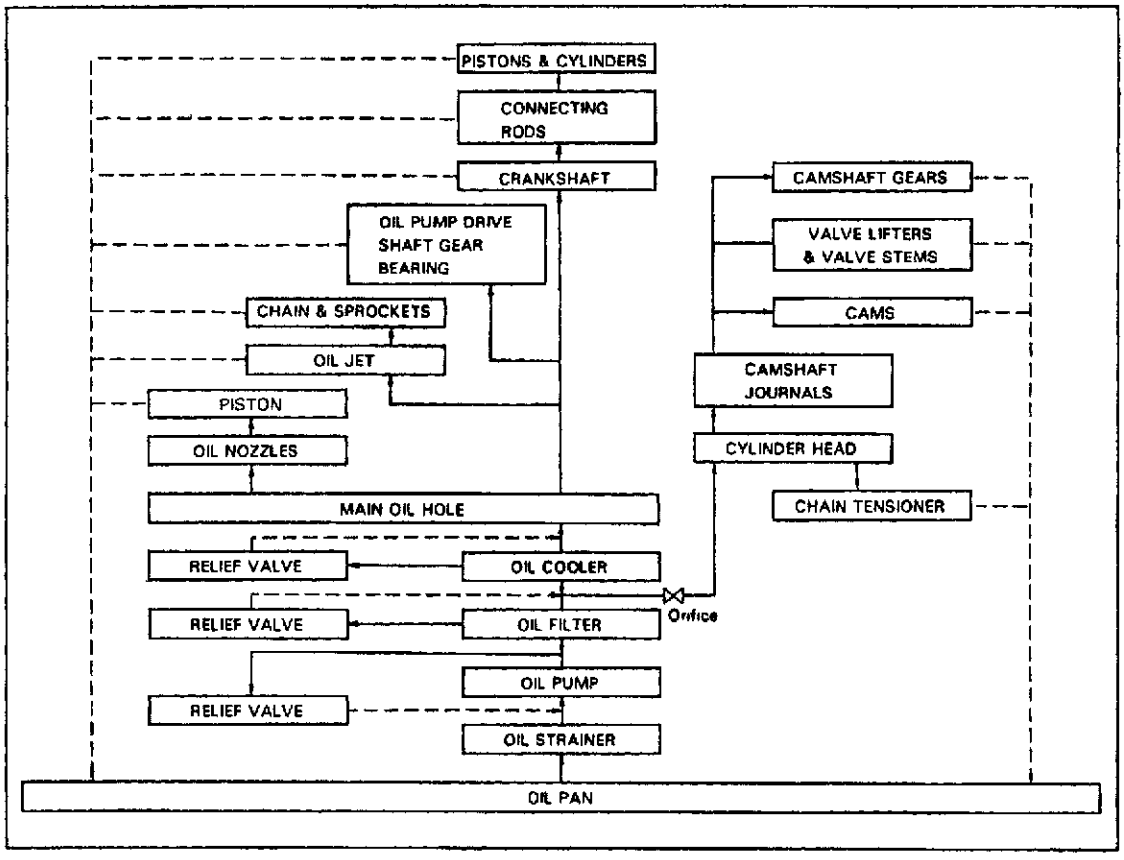
A fully pressurized, fully filtered lubrication system has been adopted for this engine

OPERATION

EG1JE-04



P05443



Z04444

A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump to remove impurities. The oil pump itself is a trochoid type pump, inside of which is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the 2 rotors changes as they rotate. Oil is drawn in when the space widens and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the bypass closed, but when too much oil is being fed, the pressure becomes extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the valve and return to the oil pump inlet.

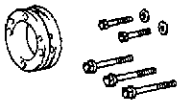
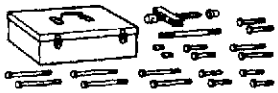
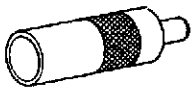
OIL FILTER

The oil filter is a full flow type filter with a relief valve built into the paper filter element. Particles of metal from wear, airborne dirt, carbon and other impurities can get into the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve bypasses the oil filter and flows directly into the main oil hole in the engine.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EQ07P-04

	09032-00100 Oil Pan Sea(Cutter	
	09213-5801 2 Crankshaft Pulley Hooldıng Tool	
	09213-60017 Crankshaft Pulley & Gear Puller Set	
	(09213-00020) Body With Bolt	
	(09213-00030) Handle	
	---- ---------- --------- - ----- - (09213-OOOfi0) Bolt Set	
	09228-4401 1 Oil Filter Wrench	
	09316-60010 Transmıssıon & Transfer Bearıng Replacer	
	(09316-00010) Replacer Pıpe	Crankshaft front oil seal
	(09316-00050) Replacer D	Crankshaft front oil seal
	09330-00021 Companıon Flange Holdıng Tool	Crankshaft pulley
	09950-20017 Unıversal Puller	

EG07G-03

RECOMMENDED TOOLS

	09200-00010 Engine Adjust Kit	

EG07R-04

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

EG07S-03

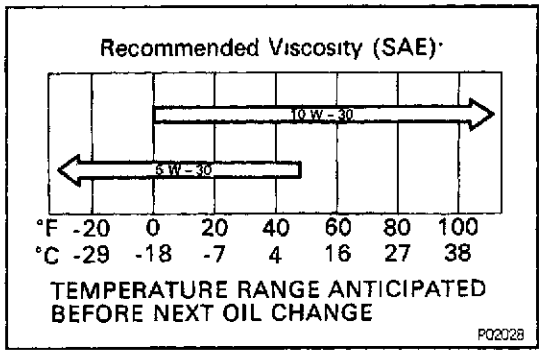
LUBRICANT

Item	Capacity	Classification
Engine oil Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	8.0 liters (8.5 US qts, 7.0 Imp. qts) 7.4 liters (7.8 US qts, 6.5 Imp. qts) 6.9 liters (7.3 US qts, 6.1 Imp. qts)	API grade SG or SH, Energy-Conserving II or ILSAC multigrade and recommended viscosity oil

EG07T-02

SSM (SPECIAL SERVICE MATERIALS)

08826-00080 Seal packing or equivalent	Oil pump Oil pan (Timing chain cover)
08833-00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Oil pressure switch



OIL PRESSURE CHECK

1. CHECK ENGINE OIL QUALITY EG0NM-04

Check the oil for deterioration, entry of water, discoloring or thinning

If the quality is visibly poor, replace the oil

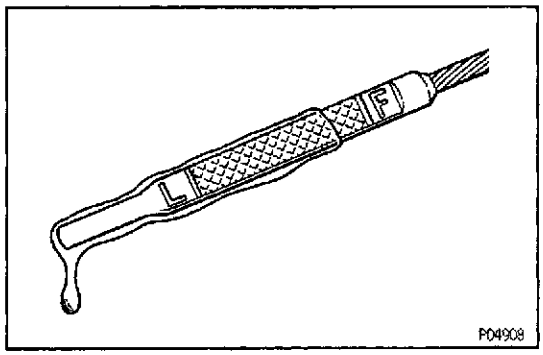
Oil grade

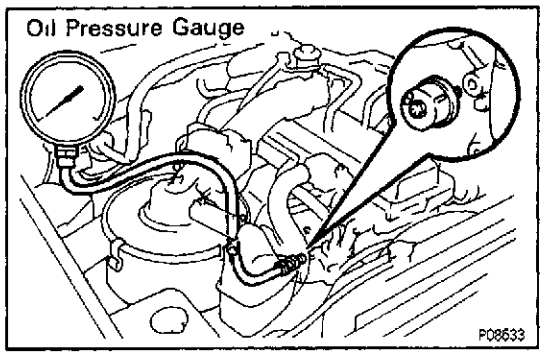
API grade SG or SH, Energy- Conserving II or ILSAC multigrade engine oil Recommended viscosity is as shown in the illustration

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

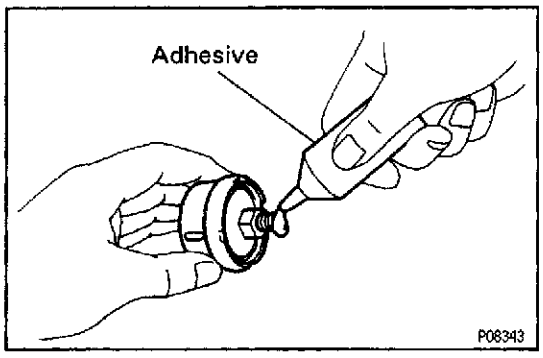
Oil pressure

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 kg f/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

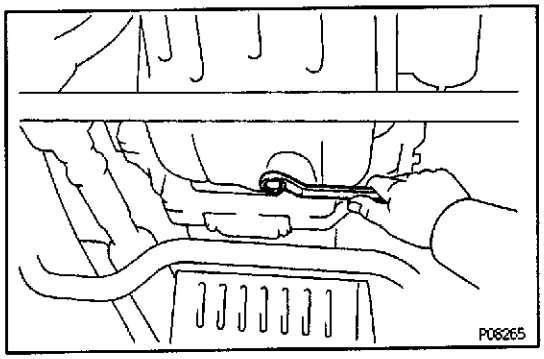
(c) Reinstall the oil pressure switch

7. START ENGINE AND CHECK FOR LEAKS

OIL AND FILTER REPLACEMENT

CAUTION:

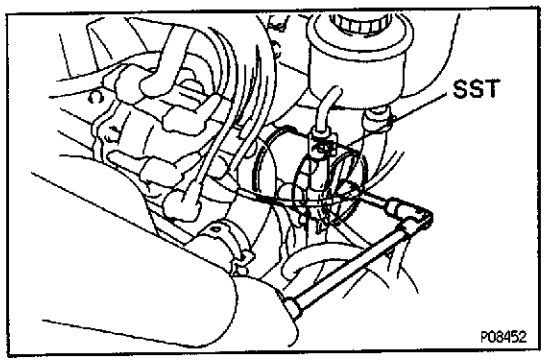
- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin leading to dryness irritation and dermatitis In addition used engine oil contains potentially harmful contaminants which may cause skin cancer
- Care should be taken therefore when changing engine 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 use 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

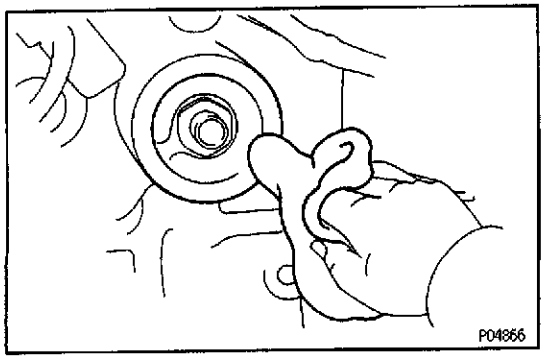
(b) Remove the oil drain plug, and drain the oil into a container



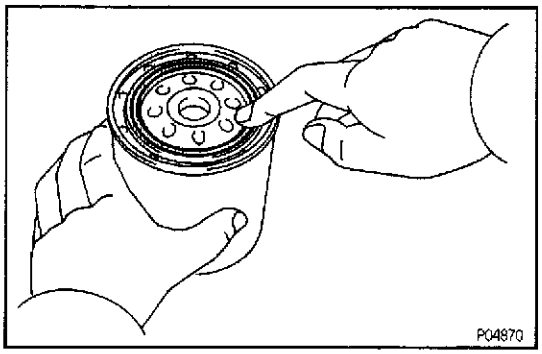
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter

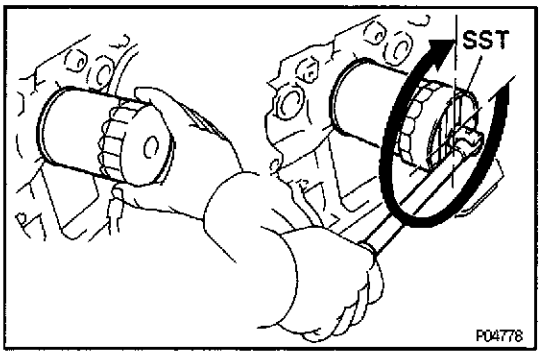
SST 09228-44011



(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 on page EG-354
Capacity:
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)
Dry fill
8.0 liters (8.5 US qts, 7.0 Imp. qts)

(c) Reinstall the oil filler cap

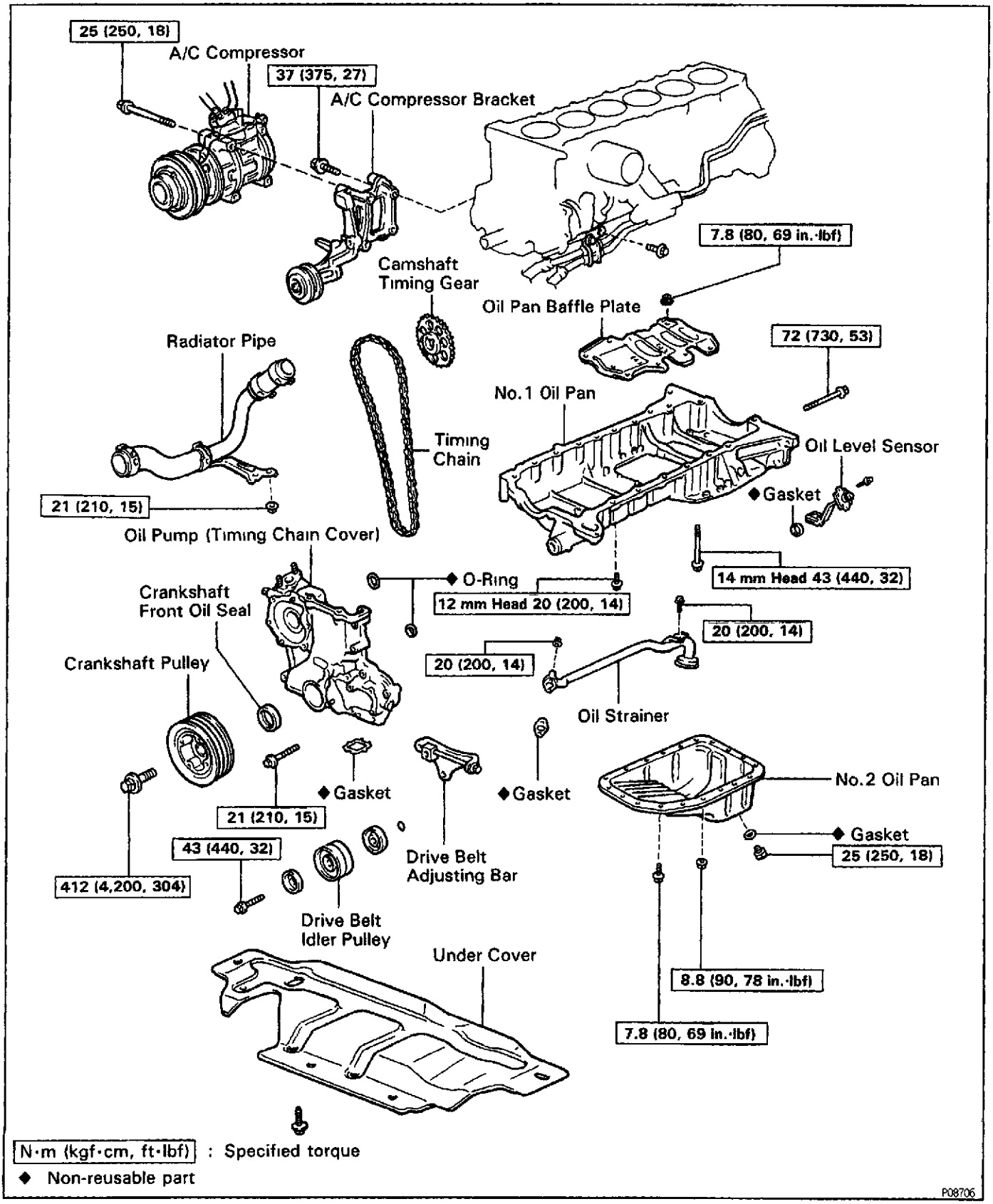
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

OIL PUMP

EG07X-05

COMPONENTS FOR REMOVAL AND INSTALLATION



EG1JF-02

OIL PUMP REMOVAL

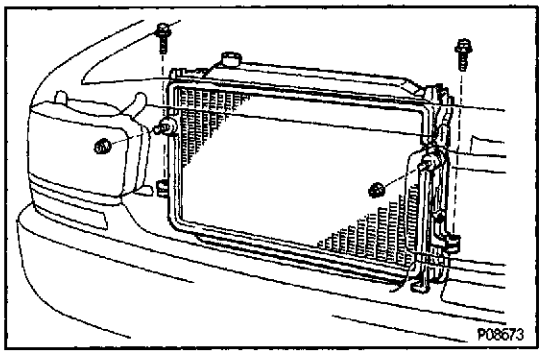
(See Components for Removal and Installation)

HINT When repairing the oil pump, the oil pan and strainer should be removed and cleaned

1. DRAIN ENGINE OIL

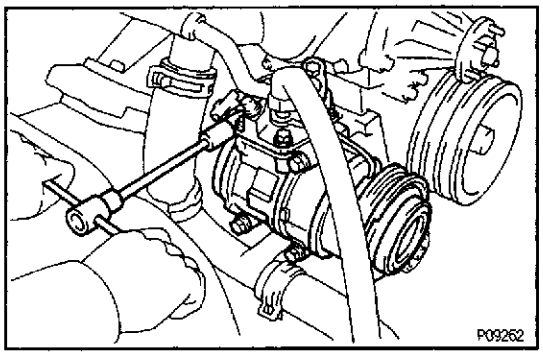
2. REMOVE ENGINE UNDER COVER

3. DRAIN ENGINE COOLANT



4. REMOVE RADIATOR

(SEE PAGE EG-339)

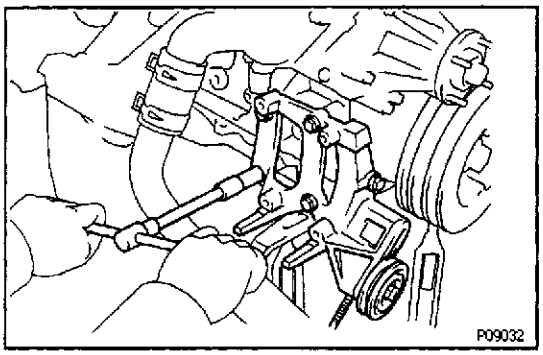


5. DISCONNECT A/C COMPRESSOR AND BRACKET

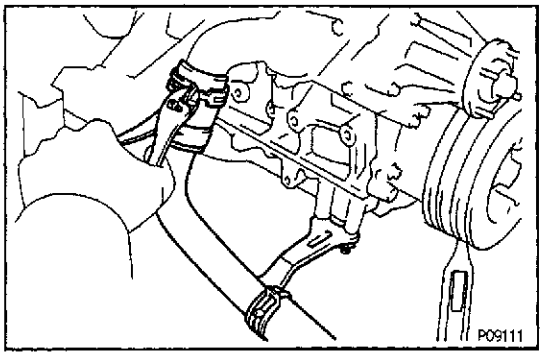
(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt

(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket

HINT Put aside the compressor, and suspend it



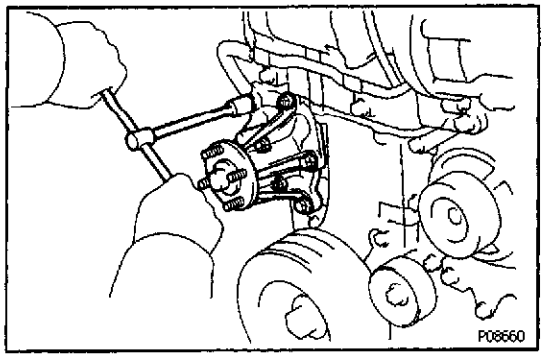
(c) Remove the 5 bolts and A/C compressor bracket



6. REMOVE RADIATOR PIPE

(a) Disconnect the No 2 radiator hose from the water inlet

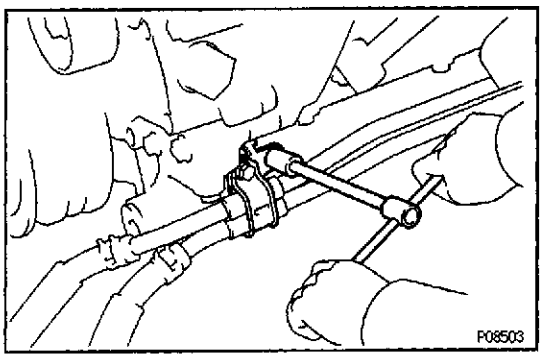
(b) Remove the 2 nuts and radiator pipe



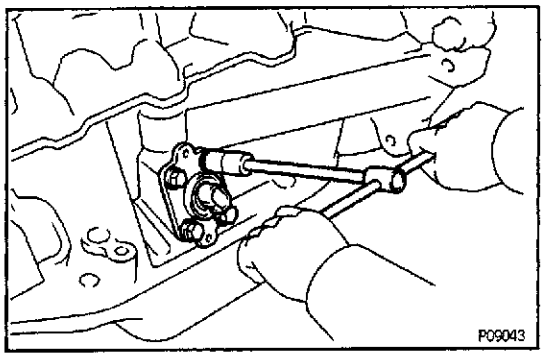
7. REMOVE WATER PUMP

Remove the 4 bolts, 2 nuts, water pump and gasket

8. REMOVE CYLINDER HEAD
(SEE PAGE EG-33)

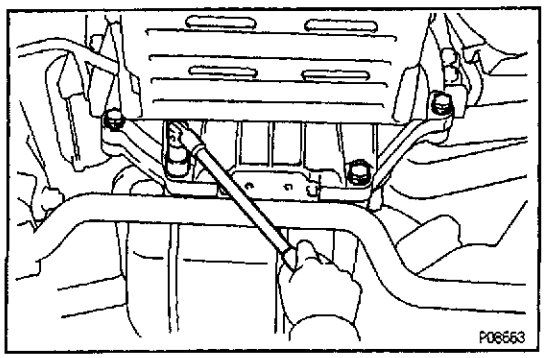


9. DISCONNECT OIL COOLER PIPE BRACKET FROM NO.1 OIL PAN



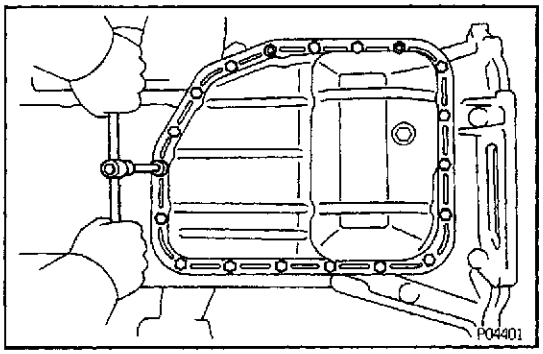
10. REMOVE OIL LEVEL SENSOR

(a) Remove the 4 bolts and level sensor
(b) Remove the gasket from the level sensor



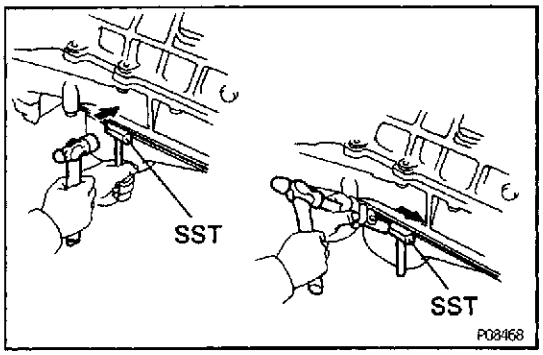
11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING

Remove the 4 bolts



12. REMOVE NO.2 OIL PAN

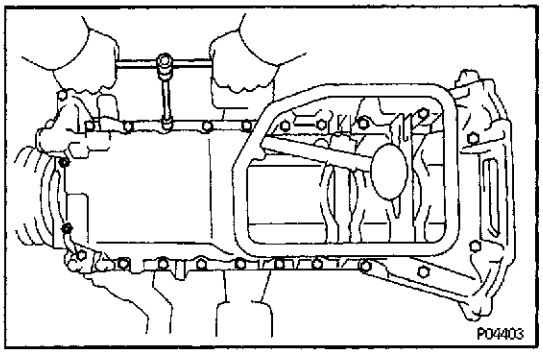
(a) Remove the 17 mounting bolts and 2 nuts



(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

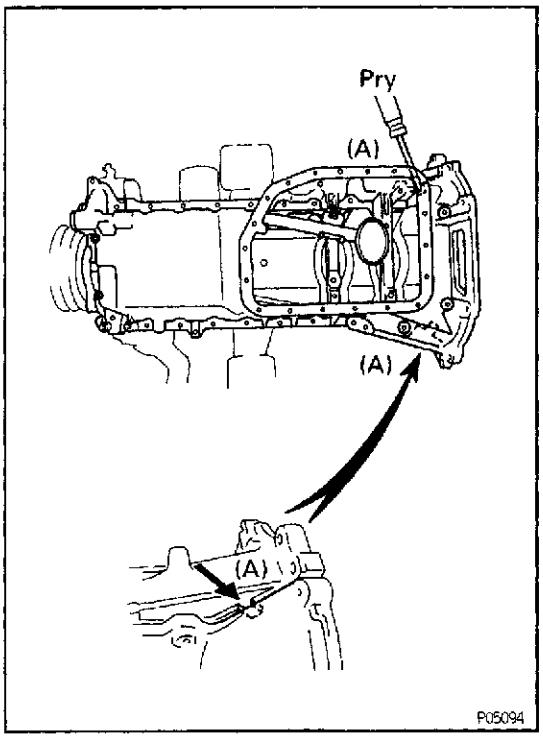
NOTICE:

- **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.**



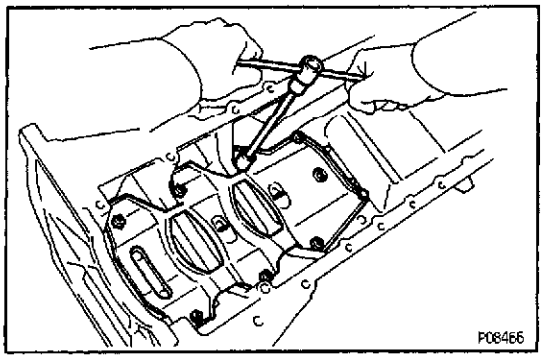
13. REMOVE NO.1 OIL PAN

(a) Remove the 21 mounting bolts and 2 nuts

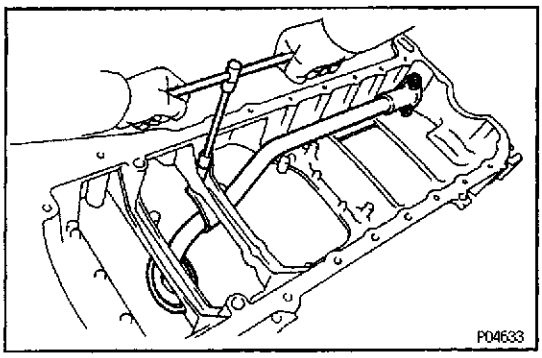


(b) Remove the No 1 oil pan by prying the portions (A) between the cylinder block and No 1 oil pan with a screwdriver

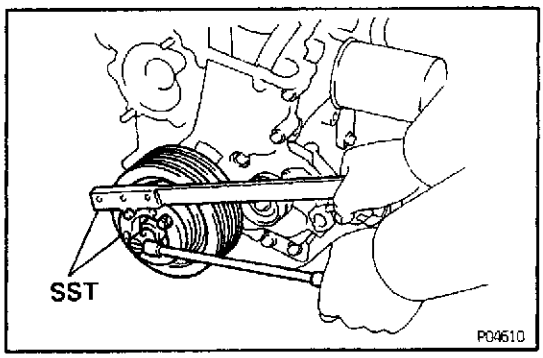
NOTICE: Be careful not to damage the contact surfaces the cylinder block and No.1 oil pan



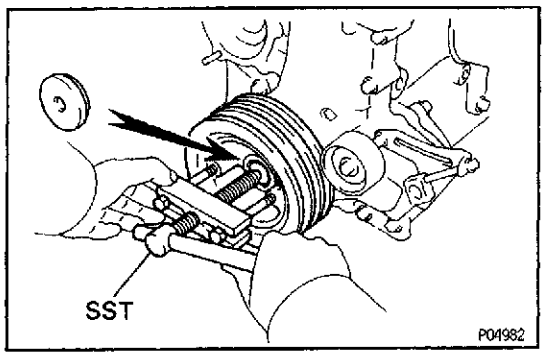
14. REMOVE OIL PAN BAFFLE PLATE
Remove the bolt, 7 nuts and baffle plate



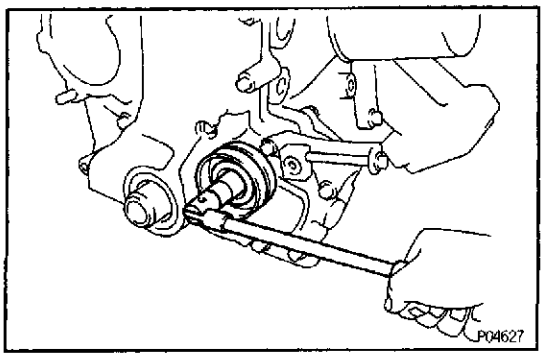
15. REMOVE OIL STRAINER
Remove the bolt, 2 nuts, oil strainer and gasket



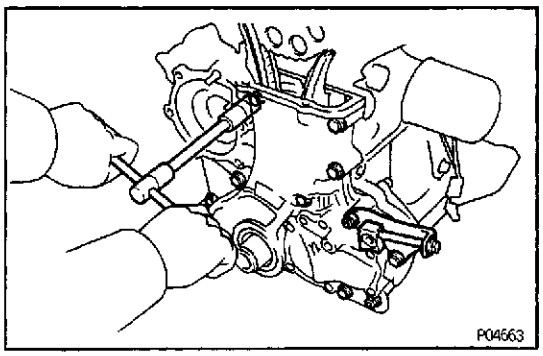
16. REMOVE CRANKSHAFT PULLEY
(a) Using SST, remove the pulley bolt
SST 09213-58012, 09330-00021
(b) Remove the crankshaft pulley



HINT: If necessary remove the pulley with SST
SST 09213-60017 (09213-00020 09213-00030 09213-00060) 09950-20017

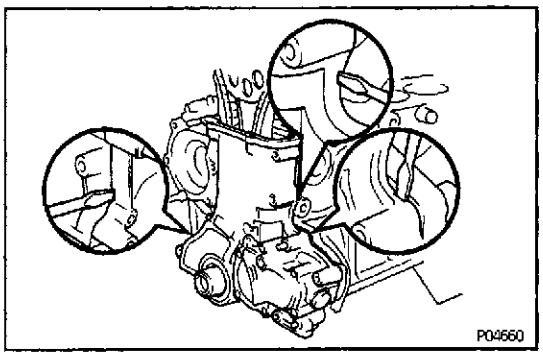


17. REMOVE DRIVE BELT IDLER PULLEY
Remove the bolt and idler pulley



18. REMOVE OIL PUMP (TIMING CHAIN COVER)

(a) Remove the 9 mounting bolts, 2 mounting nuts and drive belt adjusting bar

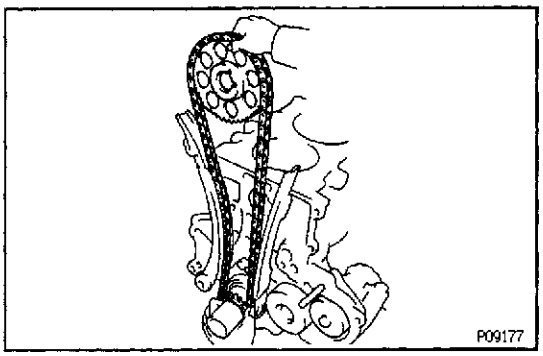


(b) Remove the oil pump by prying the portions between the cylinder block and oil pump with a screwdriver.

NOTICE: Be careful not to damage the contact surfaces of the cylinder block and oil pump

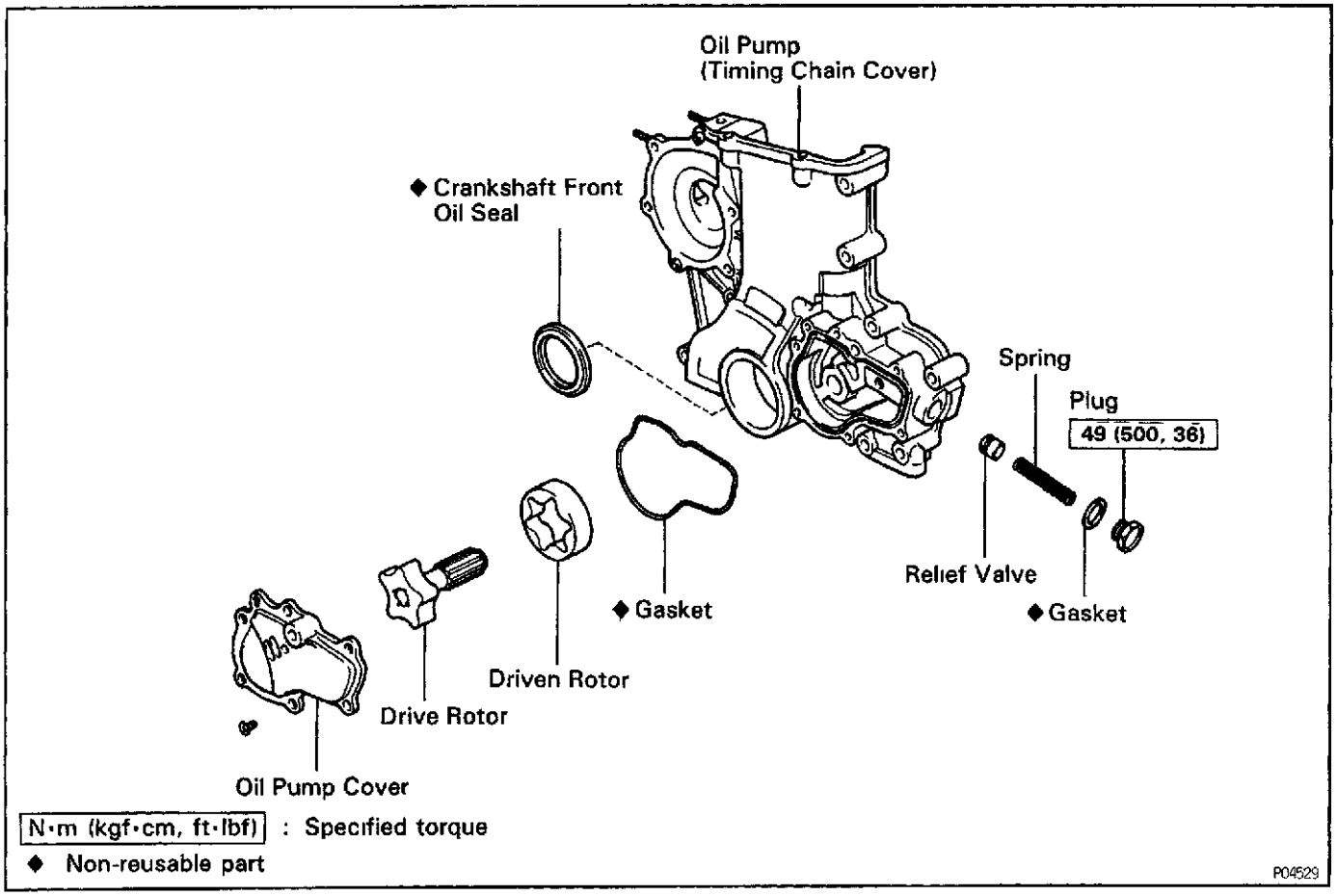
(c) Remove the 0-rings from the oil pump.

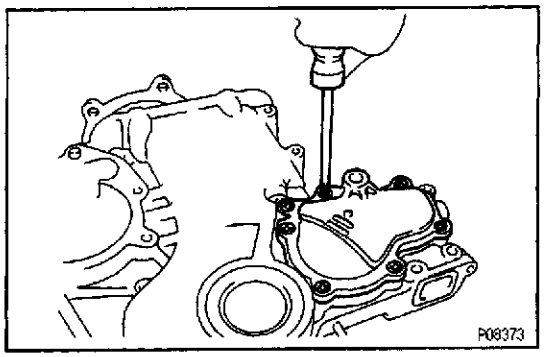
(d) Remove the gasket from the oil pump.

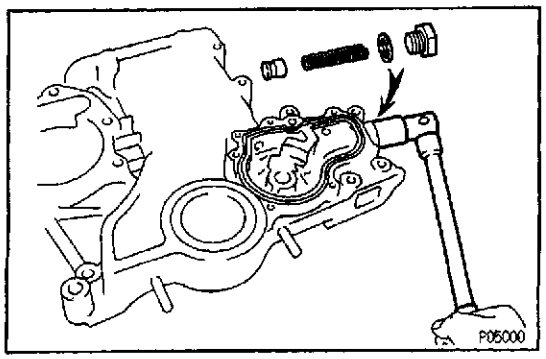


19. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY







OIL PUMP DISASSEMBLY

EGONP-03

1 REMOVE DRIVE AND DRIVEN ROTORS

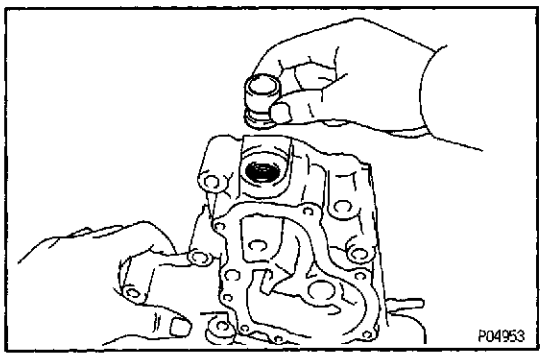
Remove the 7 screws, pump cover, drive rotor, driven rotor and gasket

2. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve

EQ0B-09

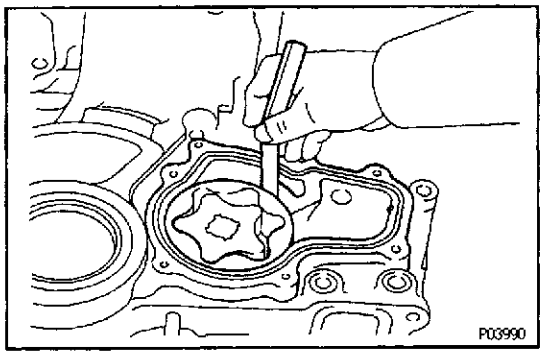
OIL PUMP INSPECTION



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 DRIVE AND DRIVEN ROTORS

A Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and body

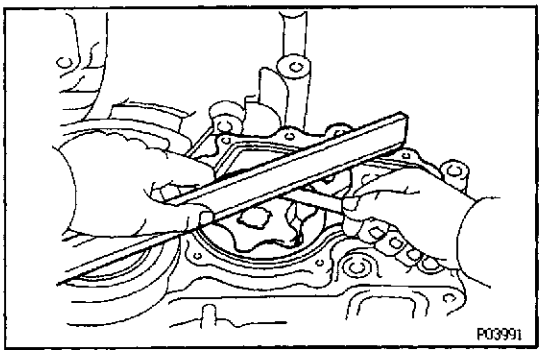
Standard body clearance

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



B Inspect rotor side clearance

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge

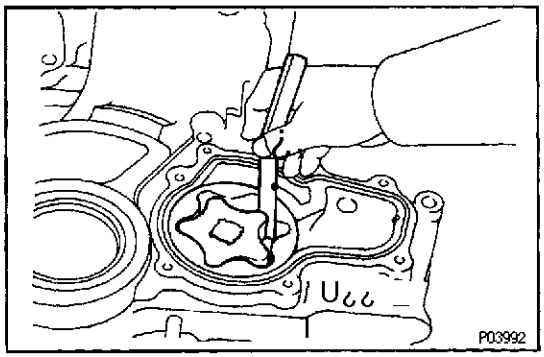
Standard side clearance

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



C. 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

CRANKSHAFT FRONT OIL SEAL

EG061-07

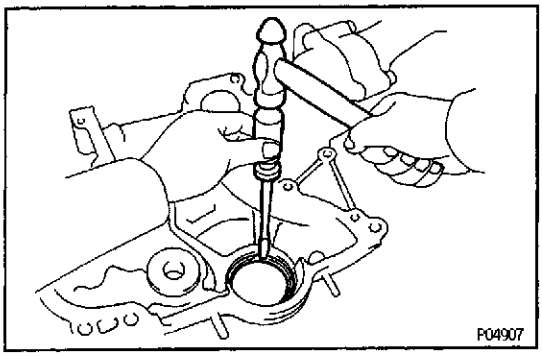
REPLACEMENT

HINT There are 2 methods (A and B) to replace the oil seal which are as follows

REPLACE CRANKSHAFT FRONT OIL SEAL

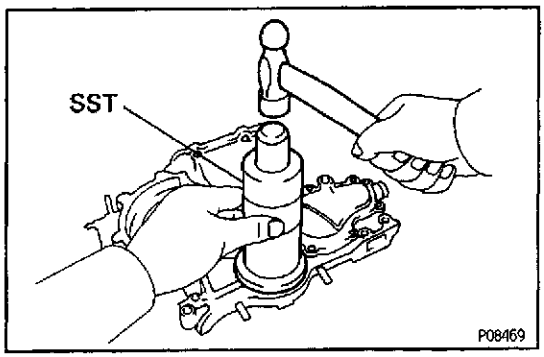
A. If oil pump is removed from cylinder block

(a) Using a screwdriver and a hammer, tap out the oil seal



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge
SST 09316-60010 (09316-00010, 09316-00050)

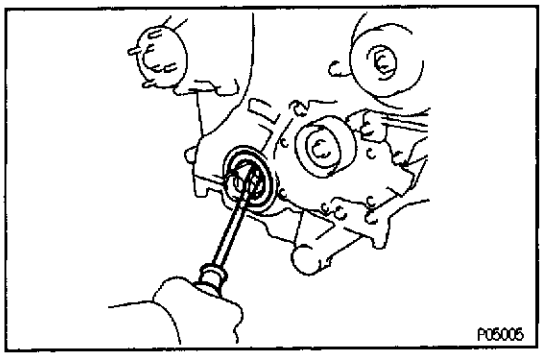
(c) Apply MP grease to the oil seal lip



B. If oil pump is installed to the cylinder block

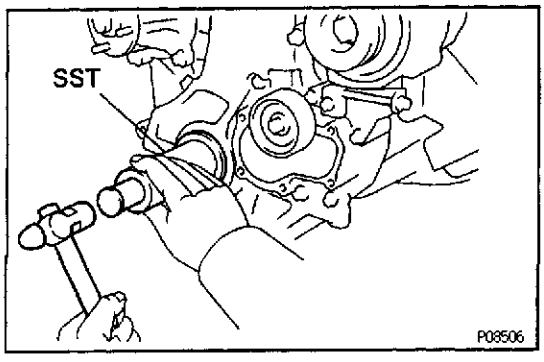
(a) Using a screwdriver, pry out the oil seal

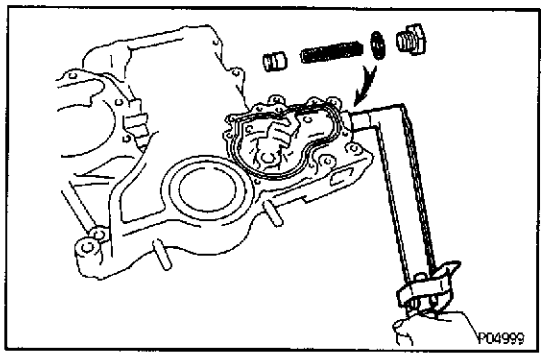
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip



(b) Apply MP grease to a new oil seal lip

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge
SST 09316-60010 (09316-00010, 09316-00050)





OIL PUMP ASSEMBLY

EG0NQ-04

(See Components for Disassembly and Assembly)

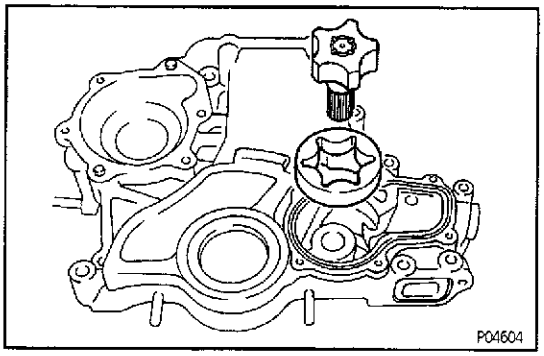
1 INSTALL RELIEF VALVE

(a) Insert the relief valve and spring into the pump body hole

(b) Install a new gasket to the plug

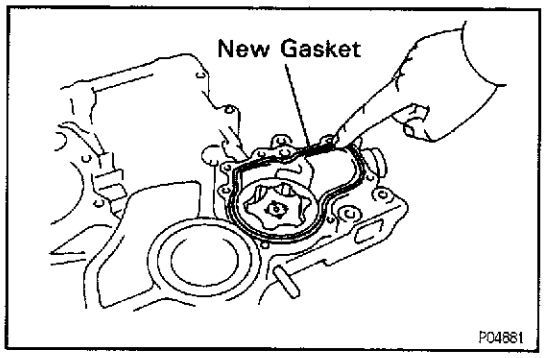
(c) Install and torque the plug

Torque 49 N-m (500 kgf-cm, 36 ft-lbf)

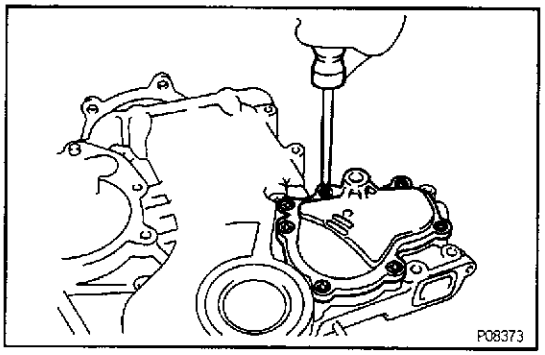


2. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into the pump body



(b) Place a new gasket on the pump body



(c) Install the pump cover with the 7 screws

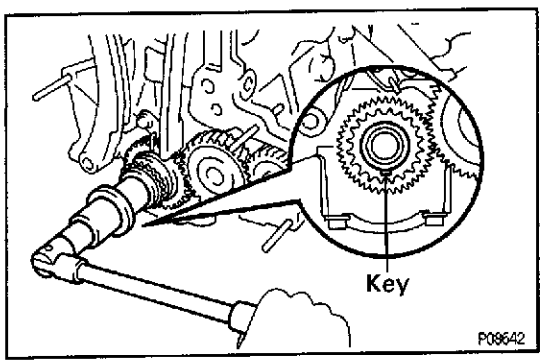
OIL PUMP INSTALLATION

EG1JH-02

(See Components for Removal and Installation)

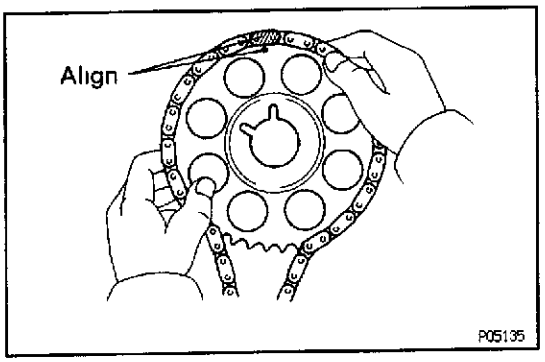
1 SET CRANKSHAFT

Turn the crankshaft until the set key on the crankshaft facing downward

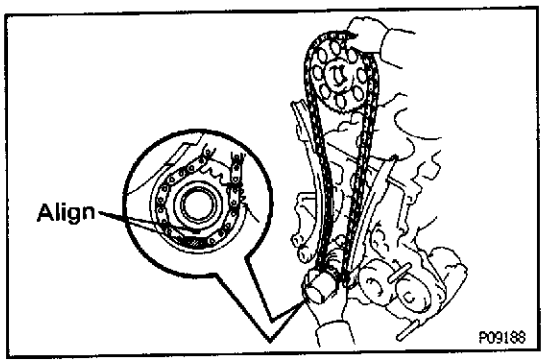


2. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR

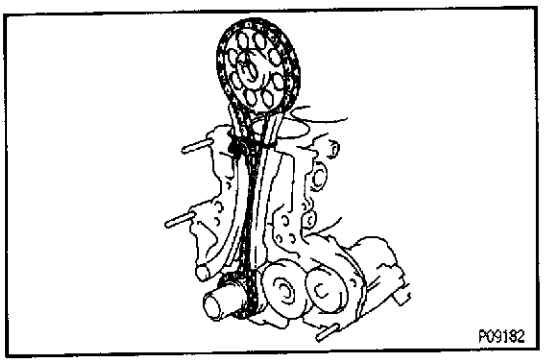
(a) Install the timing chain on the camshaft timing gear with the bright link aligned with the timing mark on the camshaft timing gear



(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



(c) Tie the timing chain with a cord as shown in the illustration and make sure it doesn't come loose

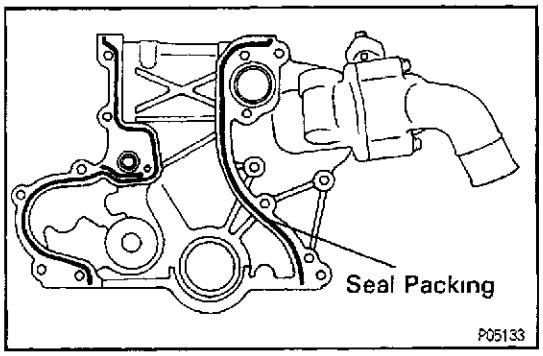


3. INSTALL OIL PUMP (TIMING CHAIN COVER)

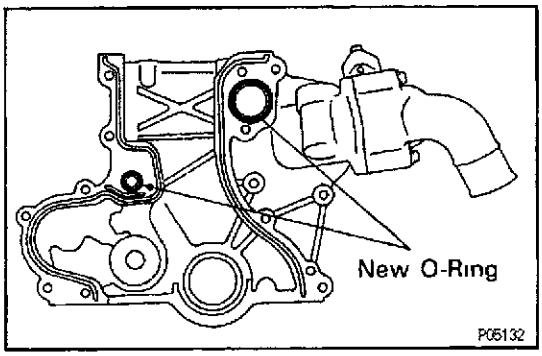
(a) Remove any old packing (FIPG) material and be careful not to drop an oil on the contact surfaces of the oil pump and cylinder block

Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves

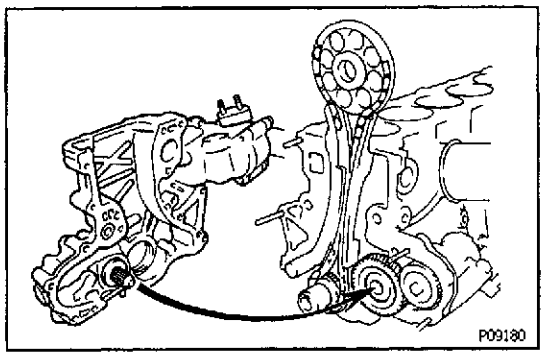
- Thoroughly clean all components to remove all the loose material



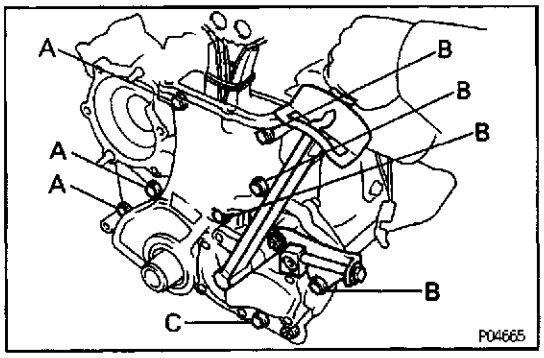
Using a non-residue solvent, clean both sealing surfaces
(b) Apply seal packing to the oil pump as shown in the illustration
Seal packing
Part No 08826-00080 or equivalent
Install a nozzle that has been cut to a 2 - 3 mm (0 08 - 0 12 in) opening
HINT Avoid applying an excessive amount to the surface
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 0-ring in position on the oil pump



(d) Engage the gear of the oil pump drive rotor with the gear of the oil pump drive gear, and slide the oil pump

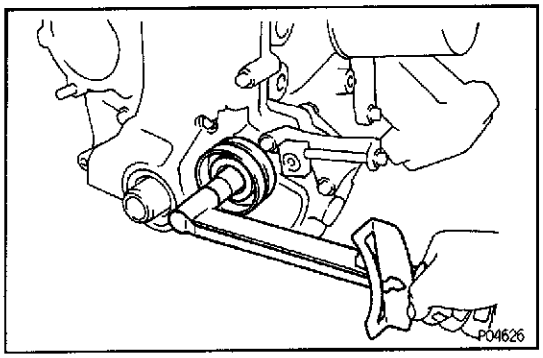


(e) Install the oil pump and drive belt adjusting bar with the 9 bolts and 2 nuts

Torque: 21 N-m (210 kgf-cm, 15 ftYbf)

HINT: Each bolt length is indicated in the illustration
A 30 mm (1 18 in)
B 50 mm (1 97 in)
C 60 mm (2 38 in)

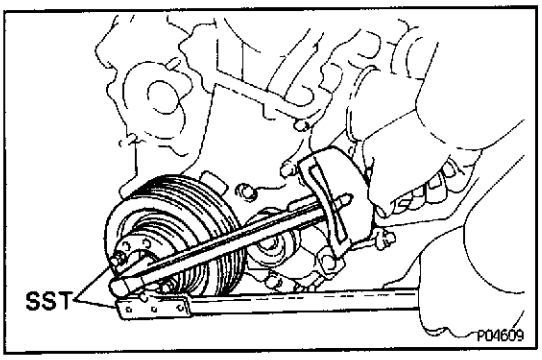
(f) Remove the cord from the chain.



4. INSTALL DRIVE BELT IDLER PULLEY

Install the pulley with the bolt

Torque: 43 N-m (44Q k9f¿cm, 32 ft-lbf)



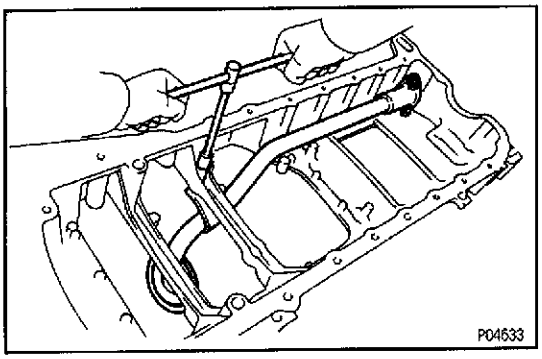
5. INSTALL CRANKSHAFT PULLEY

(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

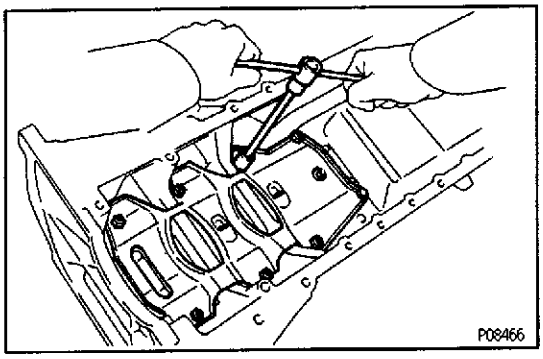
Torque: 412 N-m (4,200 kgf-cm, 304 ft-lbf)



6. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts

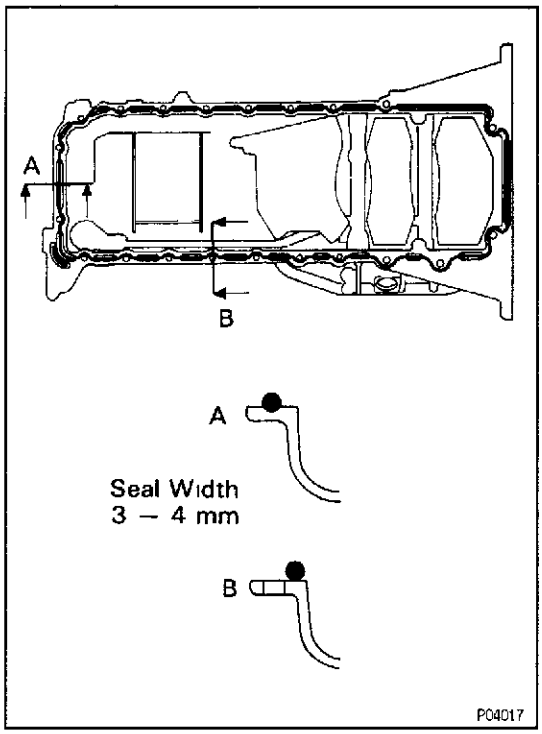
Torque: 20 N-m (200 kgf-cm 14 ft-lbf)



7. INSTALL OIL PAN BAFFLE PLATE

Install the baffle plate with the bolt and 7 nuts

Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)



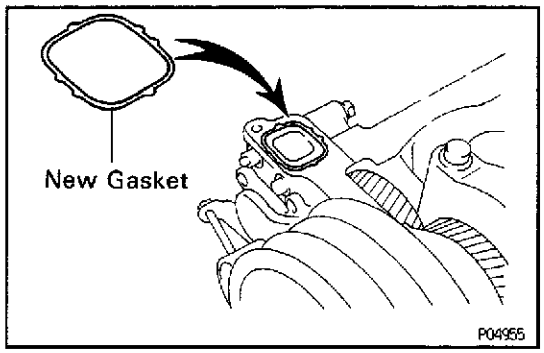
8. INSTALL NO.1 OIL PAN

(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

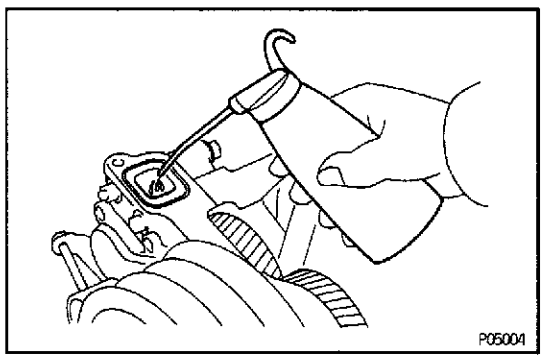
- Thoroughly clean all components to remove all the loose material
  Using a non-residue solvent, clean both sealing surfaces
  (b) Apply seal packing to the No 1 oil pan as shown in the illustration
  Seal packing

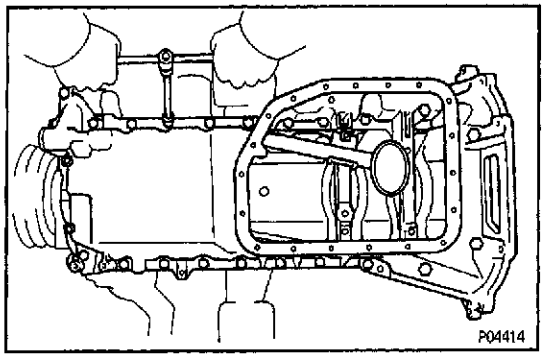
Part No 08826-00080 or equivalent
Install a nozzle that has been cut to a 3 - 4 mm - 0 16 in) opening
HINT Avoid applying an excessive amount to the surface
Parts must be assembled within 5 minutes of application Otherwise the material must be removed and reapplied
Immediately remove nozzle from the tube and reinstall cap

(c) Install a new gasket in to oil pump hole



(d) Pour in approximately 15 cm' (0 9 cu in) of engine oil in to oil pump hole



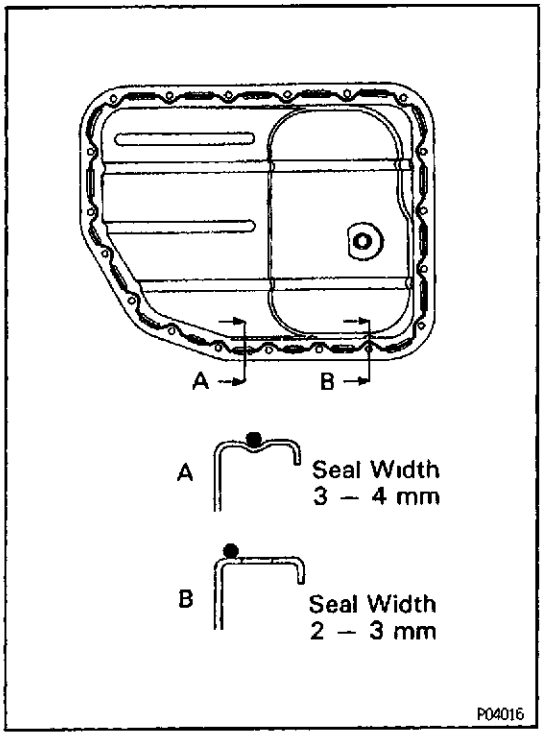


(e) Install the No 1 oil pan with the 21 bolts and 2 nuts
Torque:
43 N-m (440 kgf-cm. 32 ft-ibf) for 14 mm head
20 N-m (200 kgf-cm, 14 ft-lbf) for 12 mm head

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



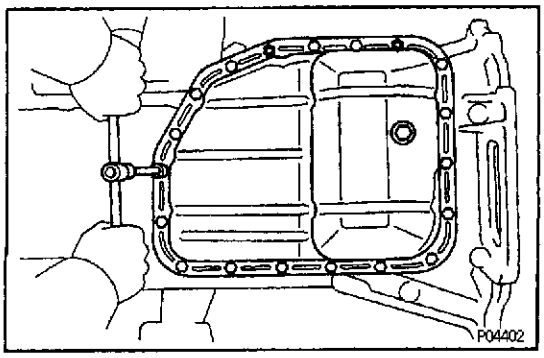
(b) Apply seal packing to the No 2 oil pan as shown in the illustration

NOTICE: Do not use a solvent which will affect the painted surfaces.
Seal packing:
Part No. 08826-00080 or equivalent

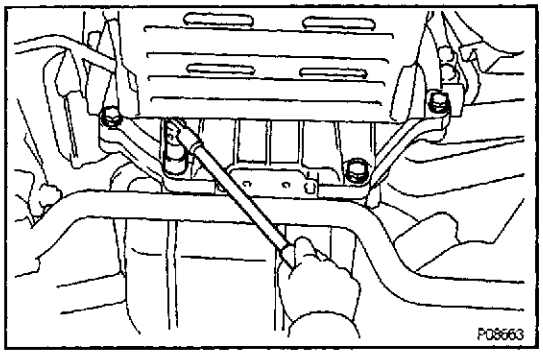
- Install a nozzle that has been cut to a 2 - 3 mm (0 08 - 0 12 in) opening or 3 - 4 mm (0 012 - 0 016 in) opening

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



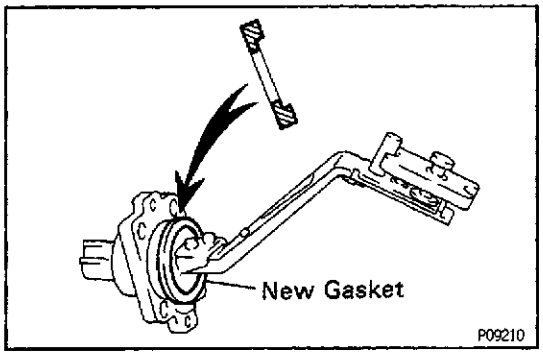
(c) Install the No 2 oil pan with the 17 bolts and 2 nuts
Torque:
7.8 N-m (80 kgf-cm, 69 in.-lbf) for bolt
8.8 N-m (90 kgf-cm. 78 in.-lbf) for nut



10. INSTALL BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSON HOUSING

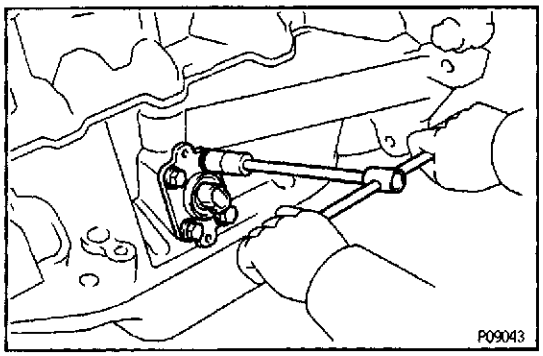
Install the 4 bolts

Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)



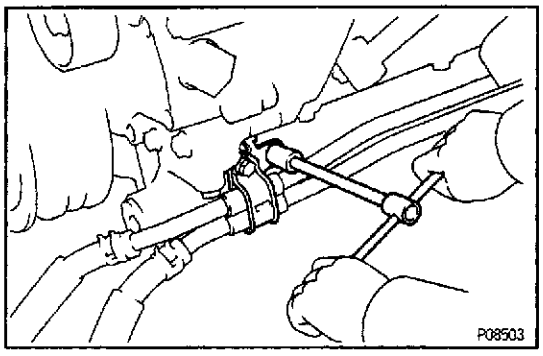
11. INSTALL OIL LEVEL SENSOR

(a) Install a new gasket to the level sensor



(b) Install the level sensor with the 4 bolts

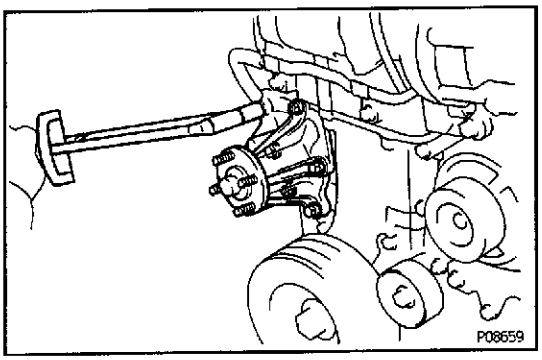
Torque: 5.4 N-m (55 kgf-cm, 48 in..lbf)



12. CONNECT OIL COOLER PIPE BRACKET TO NO.1 OIL PAN

13. INSTALL CYLINDER HEAD

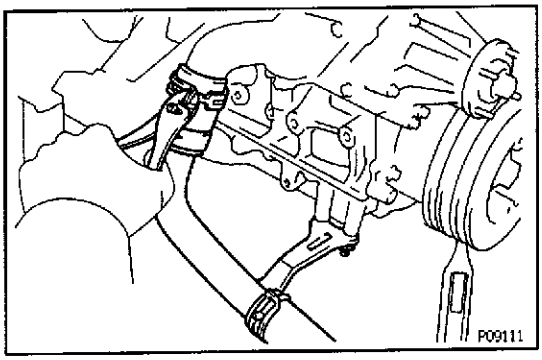
(SEE PAGE EG-66)



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

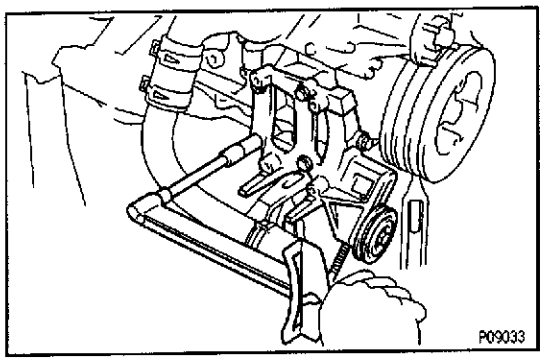
(b) Install the 2 nuts holding the radiator pipe to the No 1 oil pan

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)

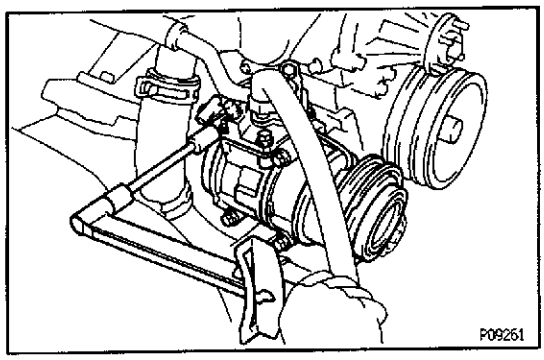


(b) Install the A/C compressor with the 4 bolts

Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

(c) Install and adjust the drive belt

(See AC section)



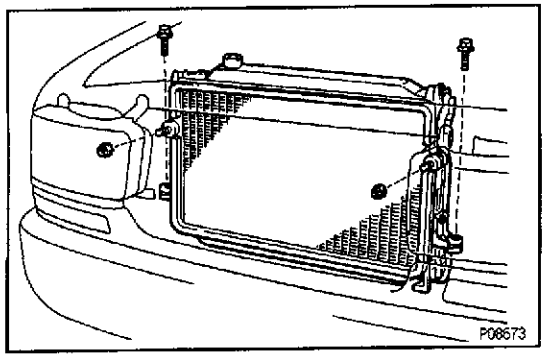
17. INSTALL RADIATOR

(SEE PAGE EG-246)

18. INSTALL ENGINE UNDER COVER

19. FILL WITH ENGINE OIL

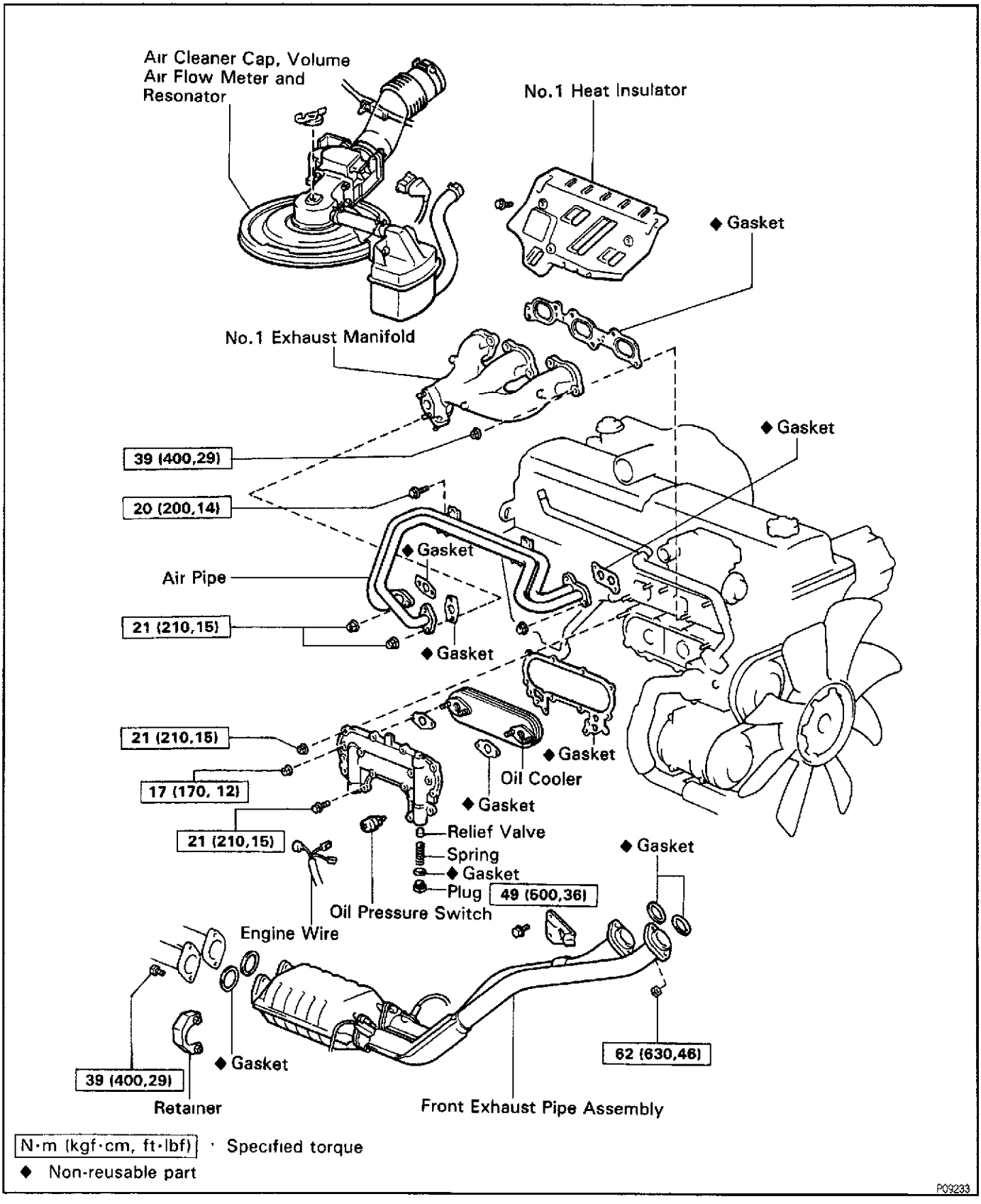
20. START ENGINE AND CHECK FOR LEAKS



OIL COOLER

EGOPT-02

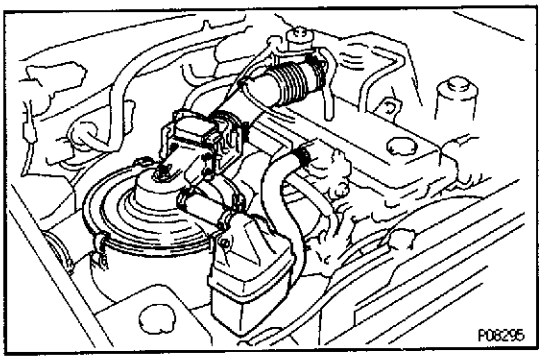
COMPONENTS FOR REMOVAL AND INSTALLATION



EG1JJ–02

OIL COOLER REMOVAL
(See Components for Removal and Installation)

1. DRAIN ENGINE COOLANT



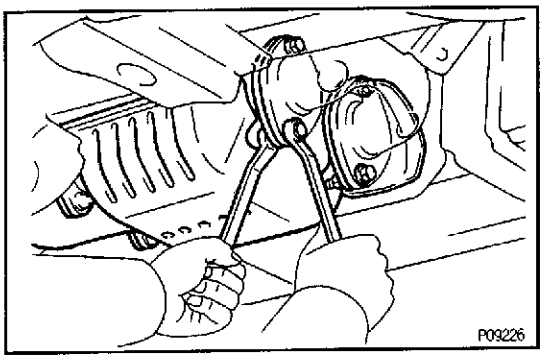
2. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND RESONATOR

(a) Disconnect the volume air flow meter connector and wire clamp

(b) Loosen the air cleaner hose clamp

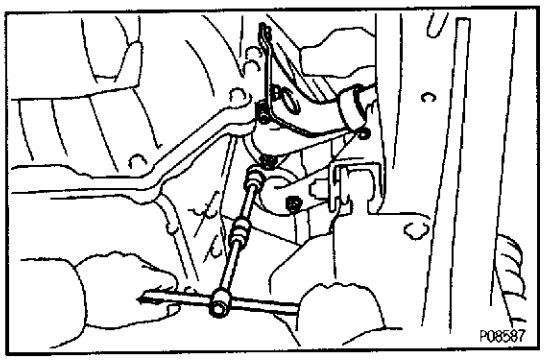
(c) Loosen the No 2 air hose clamp and disconnect the hose

(d) Remove the wing nut and loosen the 3 clips, and remove the air cleaner cap, volume air flow meter and resonator



3. REMOVE FRONT EXHAUST PIPE ASSEMBLY

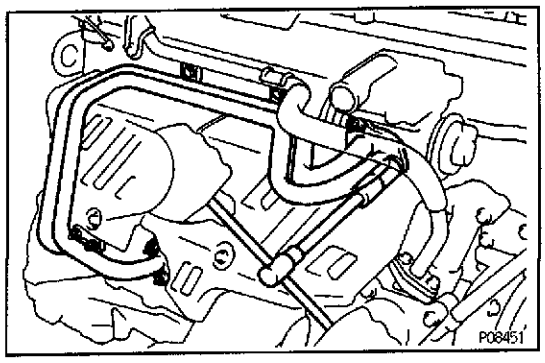
(a) Remove the 4 bolts and retainer holding the No 3 front exhaust pipe to the TWCs



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

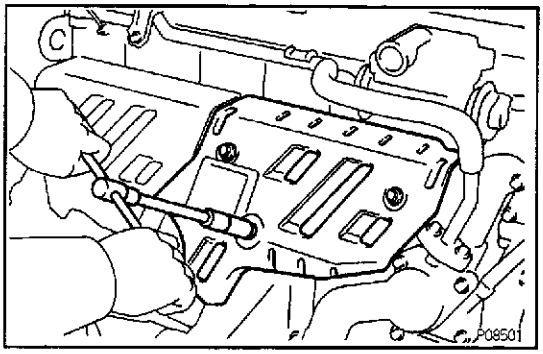
(c) Remove the 2 bolts and No 1 support bracket

(d) Remove the 4 nuts, front exhaust pipe assembly and 4 gaskets



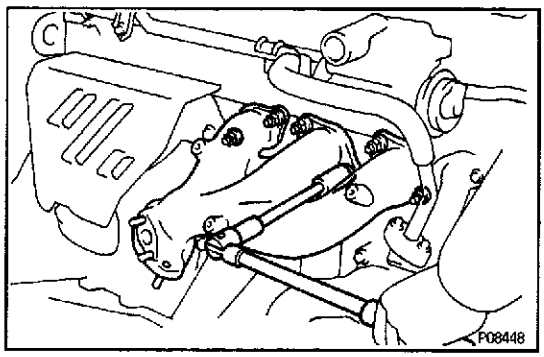
4. REMOVE AIR PIPE

Remove the 2 bolts, 6 nuts, air pipe and 3 gaskets

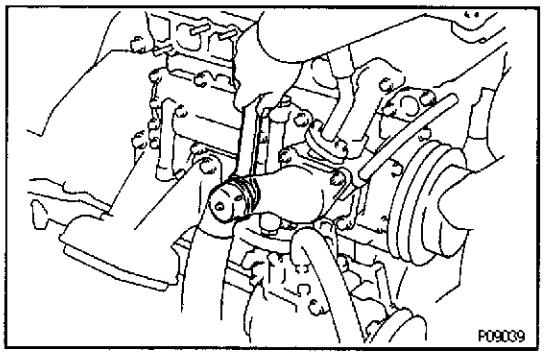


5. REMOVE NO.1 EXHAUST MANIFOLD

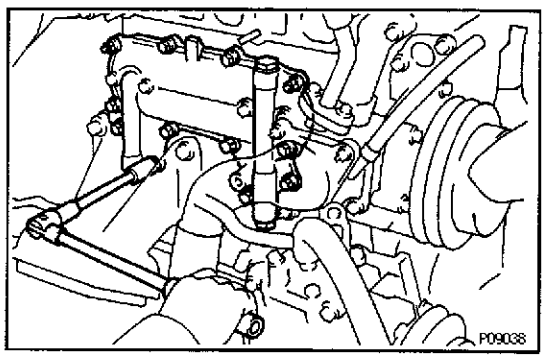
(a) Remove the 3 bolts and No 1 heat ınsulator



(b) Remove the 6 nuts, exhaust manıfold and gasket

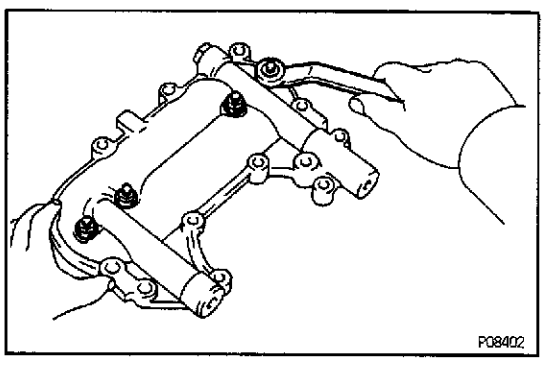


6. REMOVE OIL PRESSURE SWITCH



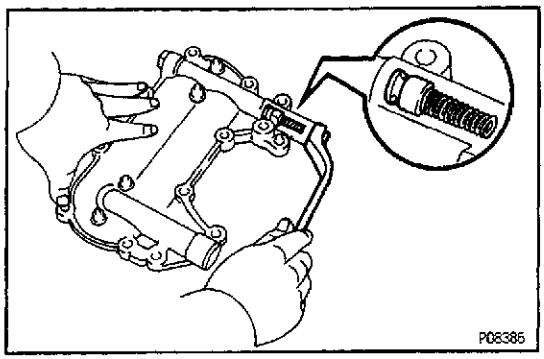
7. REMOVE OIL COOLER AND OIL COOLER COVER ASSEMBLY

Remove the 10 bolts, 2 nuts, oıl cooler and oıl cooler cover assembly and gasket



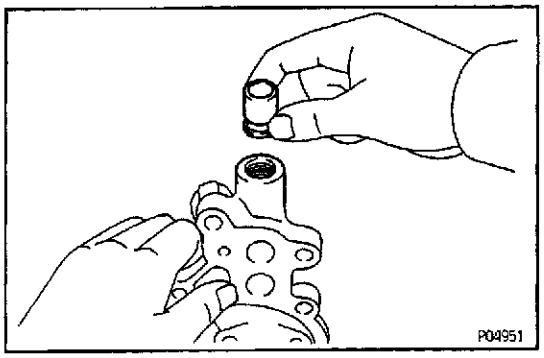
8. SEPARATE OIL COOLER AND OIL COOLER COVER

Remove the 4 nuts, oıl cooler and 2 gaskets from the oıl cooler cover



9. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve

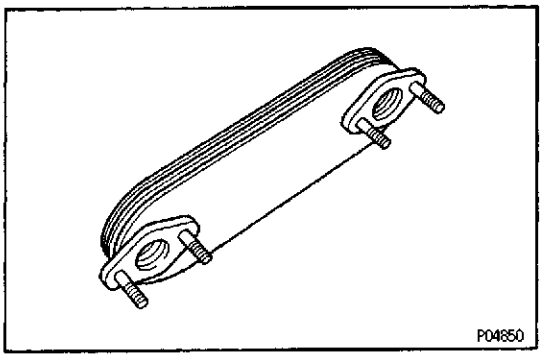


EG0NS--01

OIL COOLER 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

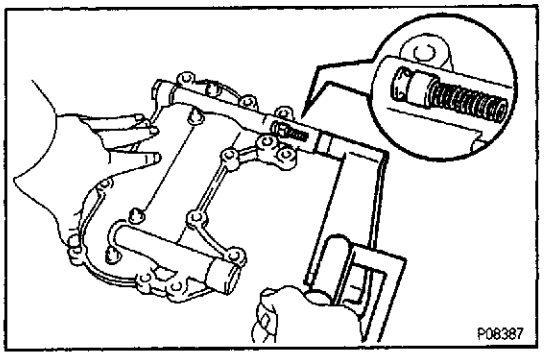
EG1JK--02

OIL COOLER INSTALLATION

(See Components for Removal and Installation)

1. INSTALL RELIEF VALVE

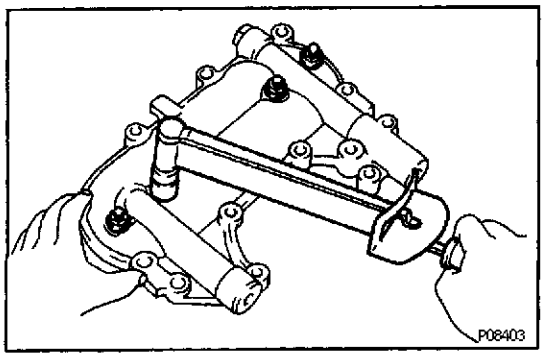
Install the relief valve, spring and a new gasket with the plug
Torque 49 N-m (500 kgf-cm, 36 ft-lbf)

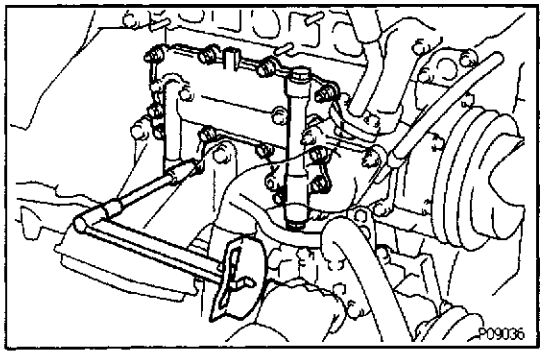


2. ASSEMBLE OIL COOLER AND OIL COOLER COVER

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)

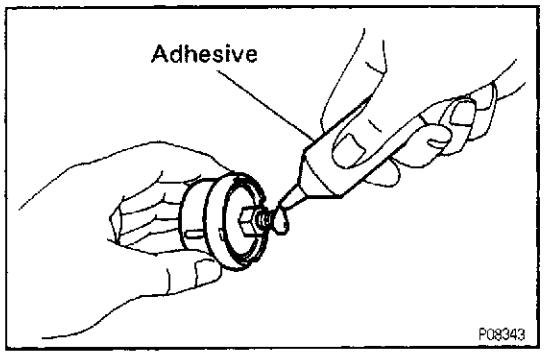




3. INSTALL OIL COOLER AND OIL COOLER COVER ASSEMBLY

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)

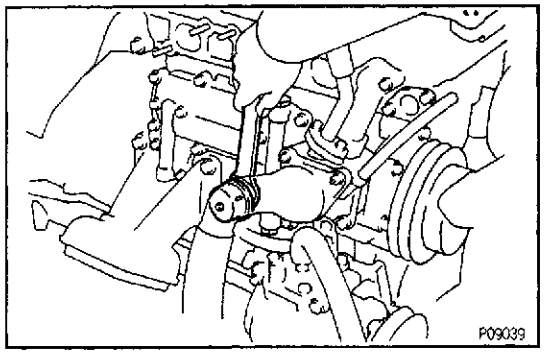


4. INSTALL OIL PRESSURE SWITCH

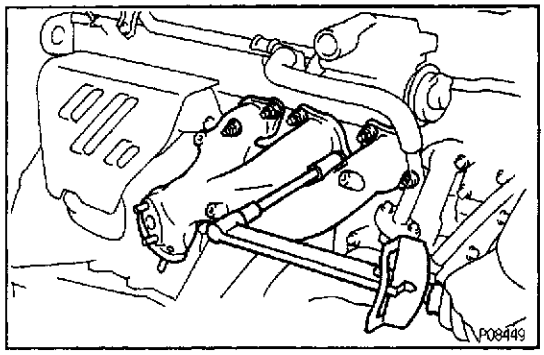
(a) Apply adhesive to 2 or 3 threads of the oil pressure switch

Adhesive

Part No 08833-00080, THREE BOND 1344, LoCTITE 242 or equivalent



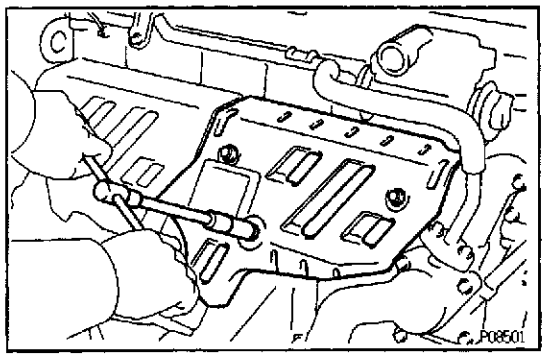
(b) Install the oil pressure switch



5. INSTALL NO.1 EXHAUST MANIFOLD

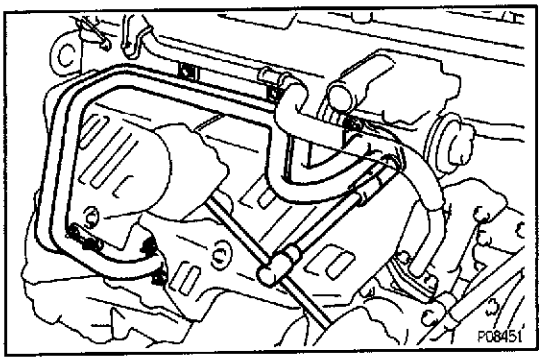
(a) Install a new gasket and the exhaust manifold with the 6 nuts

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



(b) Install the heat insulator with the 3 bolts

Torque: 20 N-m (195 kgf-cm, 14 ftYbf)



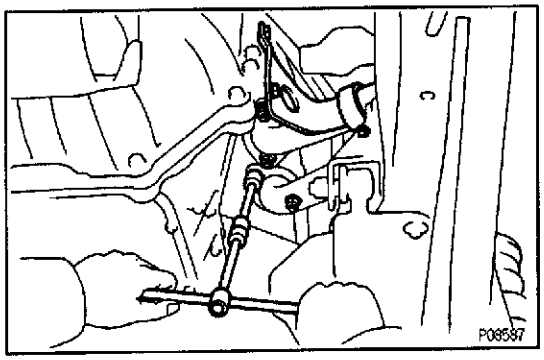
6. INSTALL AIR PIPE

Install 3 new gaskets and the air pipe with the 2 bolts and 6 nuts

Torque:

20 N-m (200 kgf-cm, 14 ft-lbf) for bolt

21 N-m (210 kgf-cm, 15 ft-lbf) for nut



7. INSTALL FRONT EXHAUST PIPE ASSEMBLY

(a) Install 2 new gaskets and the front exhaust pipe assembly with the 4 bolts

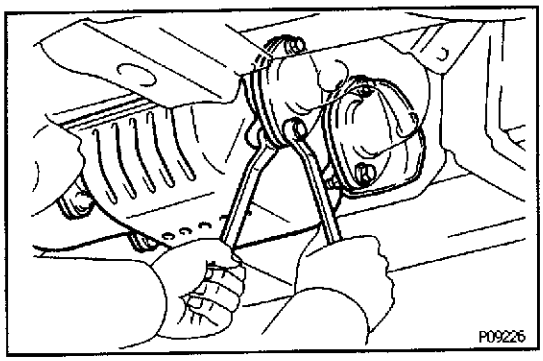
Torque: 62 N-m (630 kgf-cm. 46 ft-lbf)

(b) Install the No 1 support bracket with the 2 bolts

Torque 39 N-m (400 kgf-cm, 29 ftYbf)

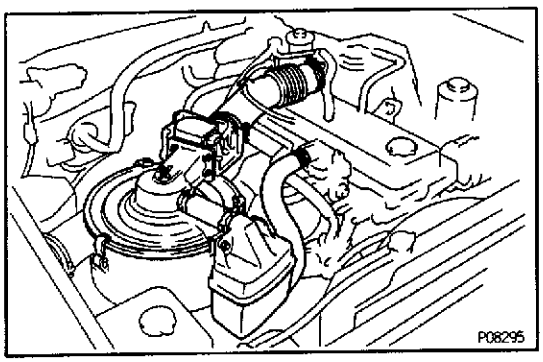
(c) Connect the clamp and tighten the clamp bolt

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



(d) Connect 2 new gaskets and the front exhaust pipe assembly to the No 3 front exhaust pipe with the 4 bolts, 2 nuts and retainer

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



8. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND RESONATOR

(a) Connect the air cleaner hose and install the air cleaner cap, volume air flow meter and resonator with the wing nut and 3 clips

(b) Tighten the air cleaner hose clamp

(c) Connect the No 2 air hose with the clamp

(d) Connect the volume air flow meter connector and wire clamp

9. FILL WITH ENGINE COOLANT

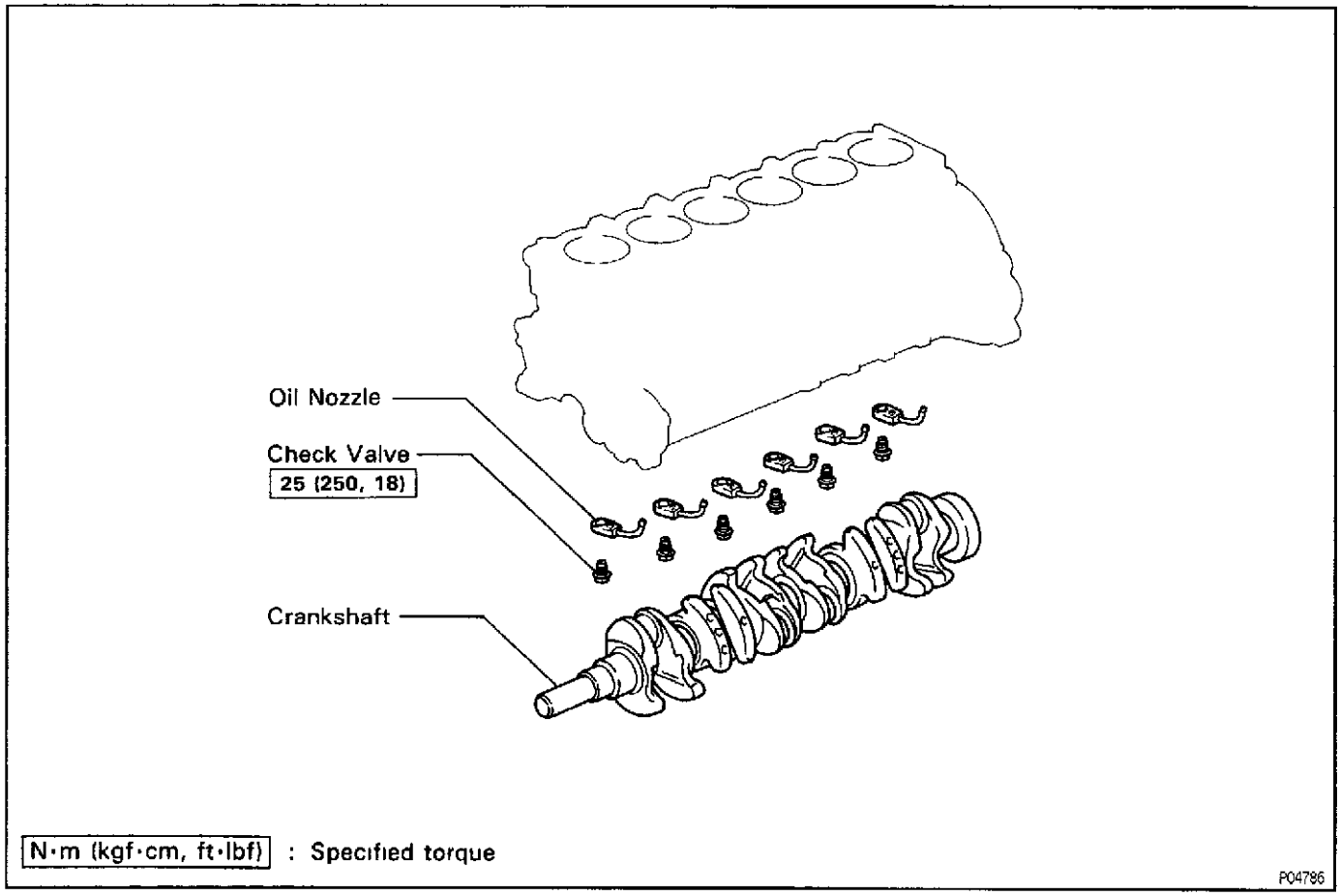
10. START ENGINE AND CHECK FOR LEAKS

11. CHECK ENGINE OIL

OIL NOZZLE

EGONU-02

COMPONENTS FOR REMOVAL AND INSTALLATION

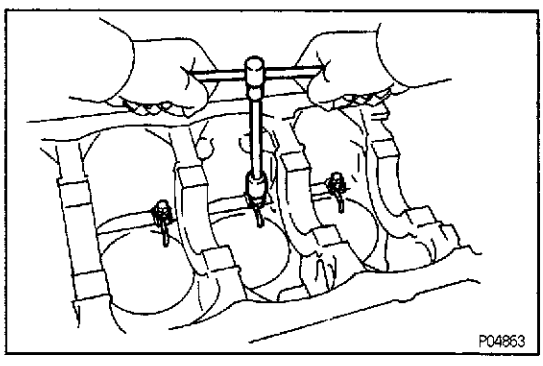


OIL NOZZLES REMOVAL

EGONV-03

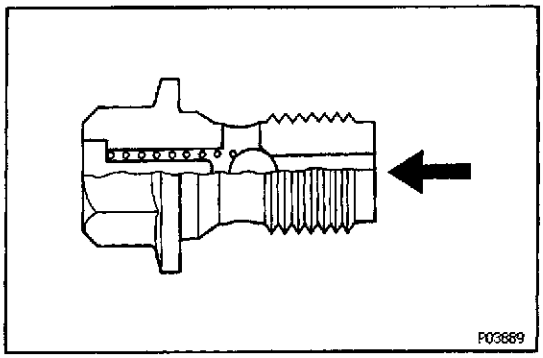
1. REMOVE CRANKSHAFT

(See pages EG -106 to 129)



2 REMOVE OIL NOZZLES

Remove the 6 check valves and oil nozzles

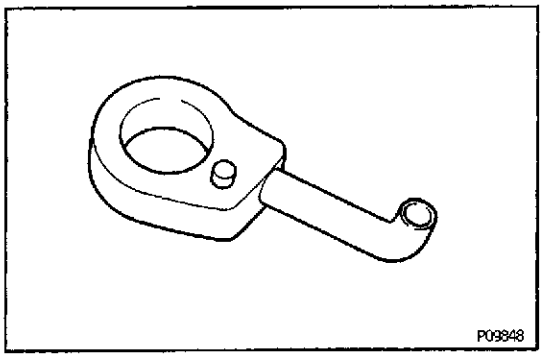


OIL NOZZLES COMPONENTS INSPECTION

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

OIL NOZZLES INSTALLATION

EGONX-03

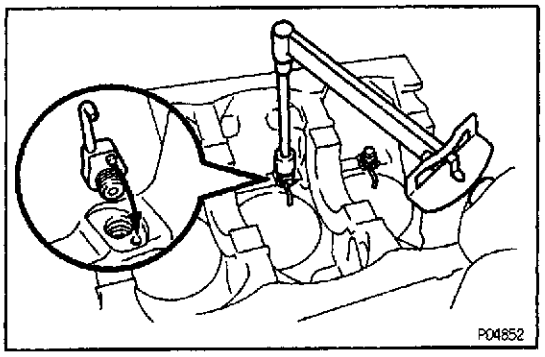
(See Components for Removal and Installation)

1. INSTALL OIL NOZZLES

(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

Torque 25 N-m (250 kgf-cm, 18 ft-lbf)



2. INSTALL CRANKSHAFT

(See pages EG-145 to 163)

SERVICE SPECIFICATIONS

SERVICE DATA

EG06N-02

Oil pressure	At idle speed (normal operating temperature) At 3 000 rpm (normal operating temperature)	29 kPa (0 3 kgf/cm2 4 3 psi) or more 245 - 490 kPa (2 5 - 5 0 kgf/cm2 36 - 71 psi)
Oil pump	Body clearance (STD) Body clearance (Maximum) Tip clearance (STD) Tip clearance (Maximum) Side clearance (STD) Side clearance (Maximum)	0 100 - 0 170 mm (0 0039 - 0 0067 in) 0 30 mm (0 0118 in) 0 030 - 0 160mm (0 0012 - 0 0063 in) 0 25 mm (0 0098 in) 0 030 - 0 090 mm (0 0012 - 0 0035 in) 0 15 mm (0 0059 in)

TORQUE SPECIFICATIONS

EG0NY-02

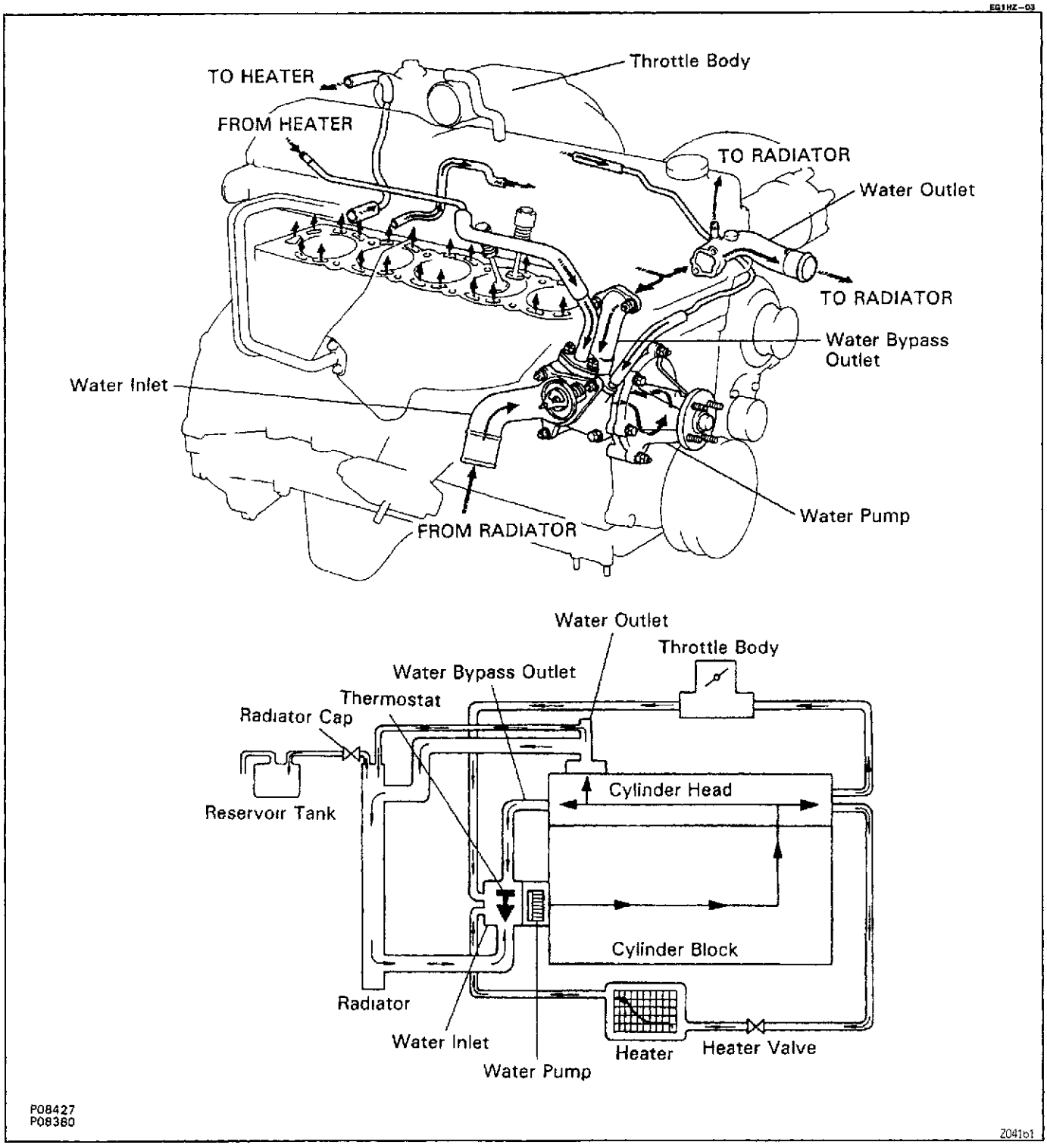
Part tightened	N-m	kgf-cm	ft-lbf
Oil pan x Drain plug	**25**	250	**18**
Oil pump x Relief valve plug	**49**	500	**36**
Oil pump cover x Oil pump	**10**	105	**8**
Oil pump x Cylinder block	**21**	210	**15**
Drive belt idler pulley x Oil pump	**43**	440	**32**
Oil strainer x No 1 oil pan	**20**	200	**14**
Baffle plate x No 1 oil pan	7 8	**80**	69 in lbf
No 1 oil pan x Cylinder block (14 mm head bolt)	**43**	440	**32**
No 1 oil pan x Cylinder block (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
No 2 oil pan x No 1 oil pan (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
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 x Oil cooler cover	**17**	170	**12**
Oil cooler cover x Cylider block	**21**	210	**15**
No 1 exhaust manifold x Cylinder head	**39**	400	**29**
No-1 exhaust manifold x Heat insulator	**20**	195	**14**
Air pipe x Cylinder head	**20**	200	**14**
Air pipe x Exhaust manifold	**21**	210	**15**
Air pipe x PAIR reed valve	**21**	210	**15**
Front exhaust pipe assembly x Exhaust manifold	**62**	630	**46**
No 1 suuport bracket x Transmission housing	**39**	400	**29**
Front exhaust pipe assembly x No 3 front exhaust pipe	**39**	400	**29**
Oil check valve x Cylinder block	**25**	250	**18**

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a bypass valve mounted on the inlet side

OPERATION



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, cooling fan, hoses and other components
Coolant which is heated in the water jacket is pumped to the radiator, through which a cooling fan blows air to cool the coolant as it passes through Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine
The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation

RADIATOR

The radiator mounted in the front of the vehicle performs the function of cooling the coolant which has passed through the water jacket and become hot The radiator consists of an upper and lower tank, and a core which connects the 2 tanks The upper tank contains the inlet for coolant from the water jacket and the filler inlet It also has a hose attached through which excess coolant or steam can flow The lower tank has an outlet and drain cock for the coolant The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as to cooling fins which radiate heat away from the coolant in the tubes The air sucked through the radiator by the cooling fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the coolant An automatic transmission fluid cooler is built into the lower tank of the radiator A cooling fan with fluid coupling is mounted behind the radiator to assist the flow of air through the radiator

RADIATOR CAP

The radiator cap is a pressure-type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100°C (212°F) A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (coolant temperature 110-120 °C (230-248 F) pressure 59-103 kPa (0 6-1 05 kgf/cm2 8 5-14 9 psi) The vacuum valve opens to alleviate the vacuum which develops in the cooling system after the engine is stopped and the coolant temperature drops The valve s opening allows the coolant in the reservoir tank to return to the cooling system

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows from the cooling system as a result of volumetric expansion when the coolant is heated The coolant in the reservoir tank returns to the radiator when the coolant temperature drops, thus keeping the radiator full at all times and avoiding needless coolant loss
Check the reservoir tank level to learn if the coolant needs to be replenished

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system It is mounted on the front of the cylinder block and driven by 2 drive belts

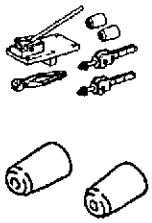
THERMOSTAT

The thermostat has a wax type bypass valve and is mounted in the water inlet housing The thermostat includes a type of automatic valve operated by fluctuations in the coolant temperature This valve closes when the coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly The valve opens when the coolant temperature has risen, allowing the circulation of coolant Wax inside the thermostat expands when heated and contracts when cooled Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve When the wax cools, its contraction allows the force of the spring to take effect once more, closing the valve The thermostat in this engine operates at a temperature of 82°C (180°F)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG1BK 02

 09230-00010 Radiator Service Tool Set **(09231 -00060)** No 3 Plug	This Part No is a component part of 09230-01010

EQO V-02

EQUIPMENT

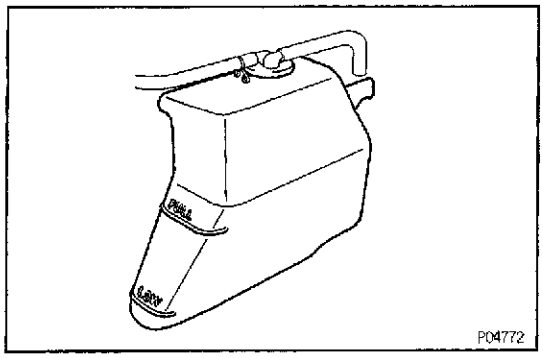
Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

COOLANT

EQOLV-04

Item	Capacity	Classification
Engine coolant (w/ Front and rear heaters)	14 2 liters (15 0 US qts 12 4 Imp qts)	Ethylene-glycol base

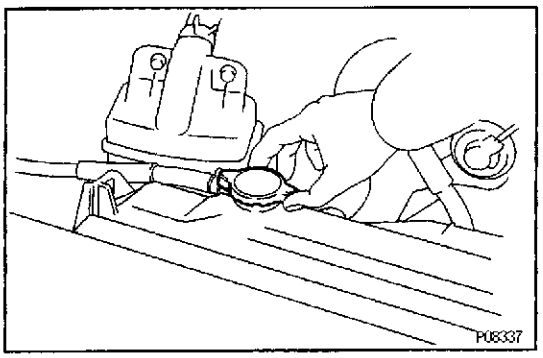
COOLANT CHECK AND REPLACEMENT



1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The coolant level should be between the "LOW" and "FULL" lines

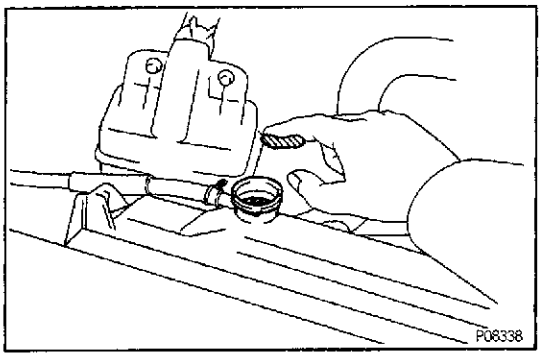
If low check for leaks and add coolant up to the FULL line



2. CHECK ENGINE COOLANT QUALITY

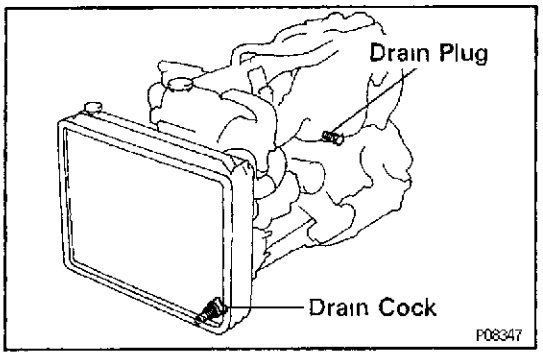
(a) Remove the radiator cap

CAUTION: To avoid the danger of being burned, do not remove it 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 scales 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



3. REPLACE ENGINE COOLANT

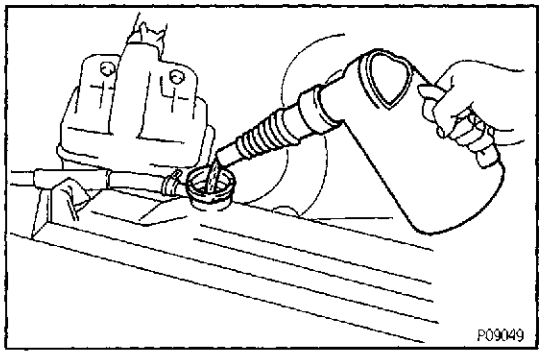
(a) Remove the radiator cap

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(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 cock and plug

Torque (Engine drain plug):
29 N-m (300 kgf-cm, 22 ft-lbf)



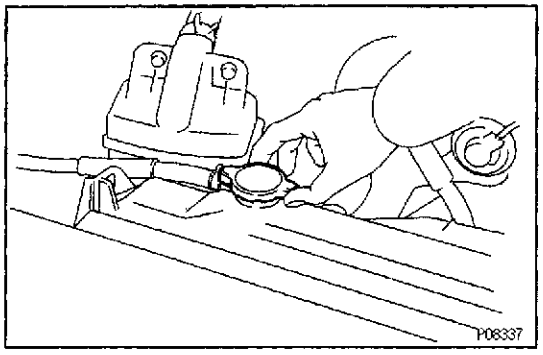
(d) Slowly fill the system with coolant

- 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 and rear heaters)
14 2 liters (15 0 U S qts 12 4 Imp qts)

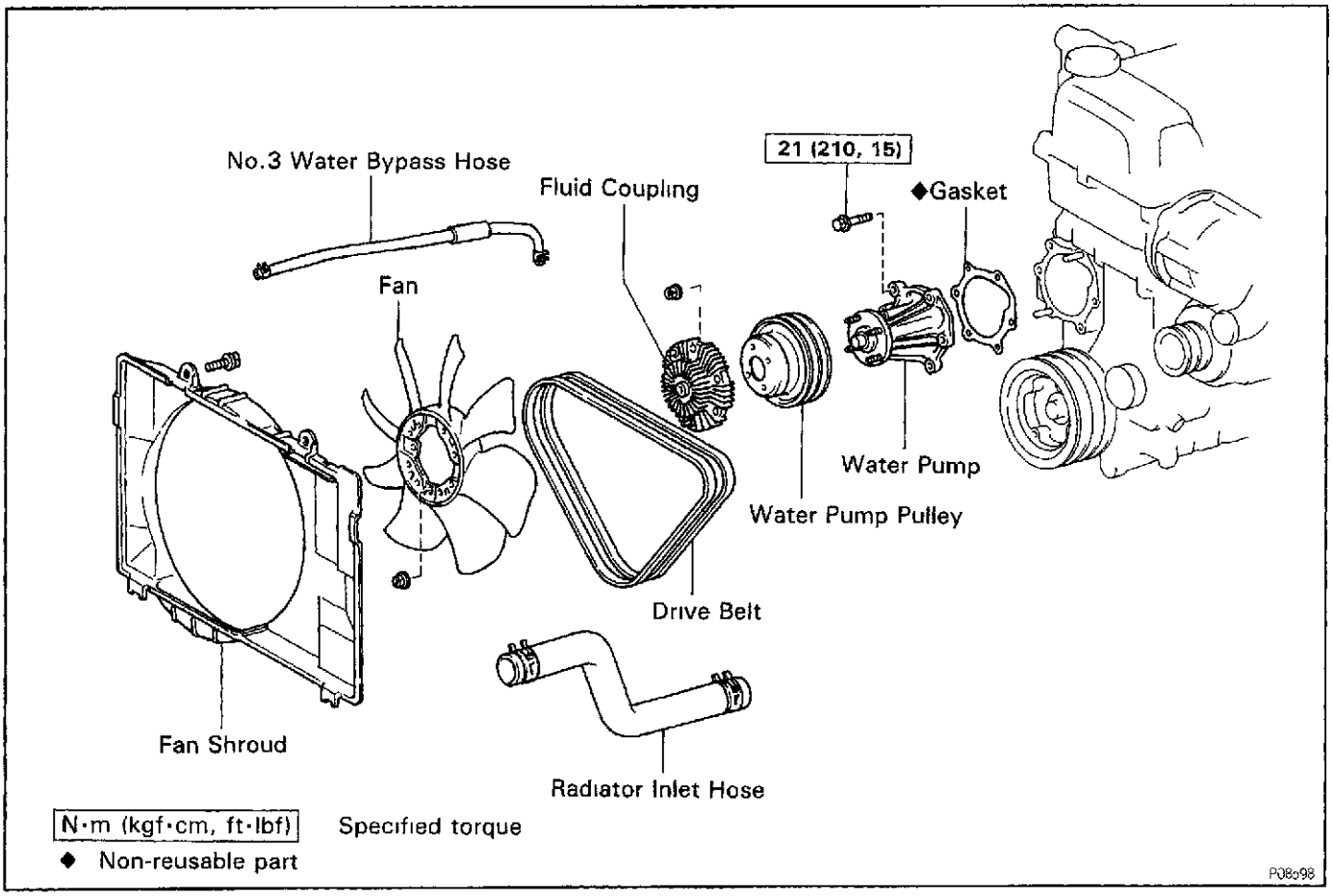


(e) Reinstall the radiator cap
(f) Warm up the engine and check for leaks
(g) Recheck the coolant level and refill as necessary

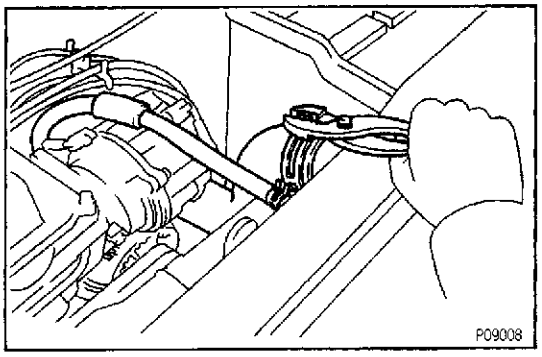
WATER PUMP

EG06X-04

COMPONENTS FOR REMOVAL AND INSTALLATION

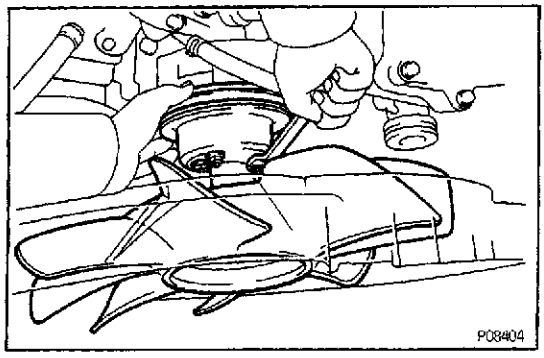


EG1J1-02



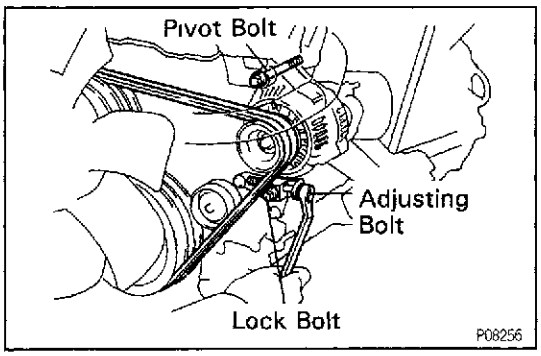
WATER PUMP REMOVAL

1. DRAIN ENGINE COOLANT
2. DISCONNECT NO.3 WATER BYPASS HOSE
3. DISCONNECT RADIATOR INLET HOSE

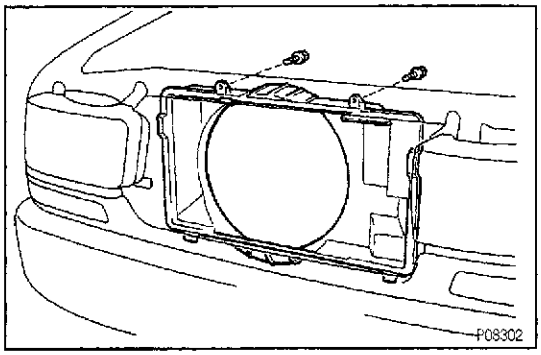


4. REMOVE DRIVE BELTS, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD

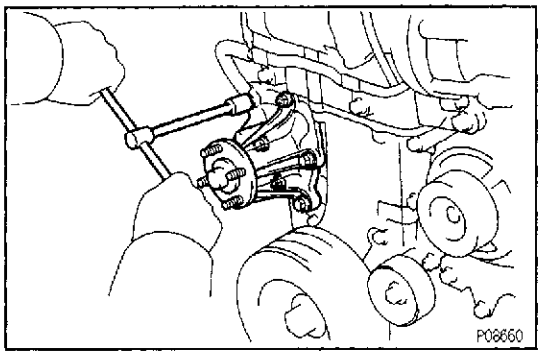
(a) Stretch the belts and loosen the water pump pulley mounting nuts



(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts

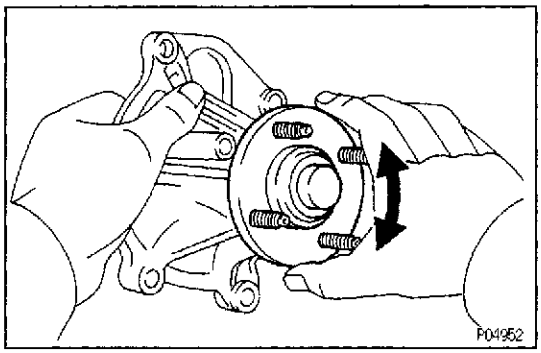


(c) Remove the 2 bolts holding the fan shroud to the radiator
(d) Remove the 4 water pump pulley mounting nuts
(e) Pull out the fan with fluid coupling, water- pump pulley and fan shroud
(f) Remove the fan from the fluid coupling

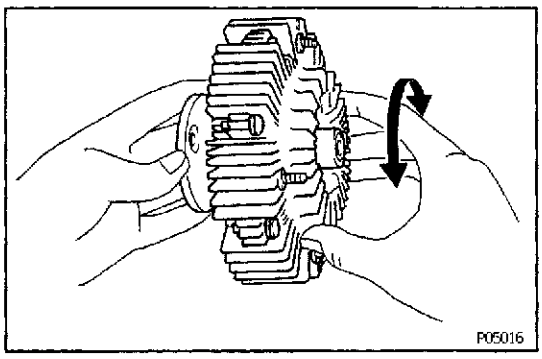


5. REMOVE WATER PUMP
Remove the 4 bolts, 2 nuts, water pump and gasket

WATER PUMP COMPONENTS INSPECTION



1. INSPECT WATER PUMP
Turn the pulley seat and check that the water pump bearing is not rough or noisy
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

EG1J2-03

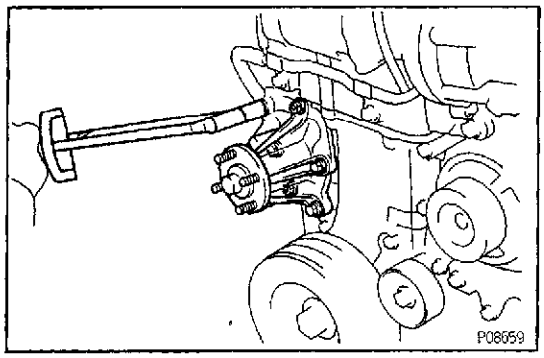
WATER PUMP INSTALLATION

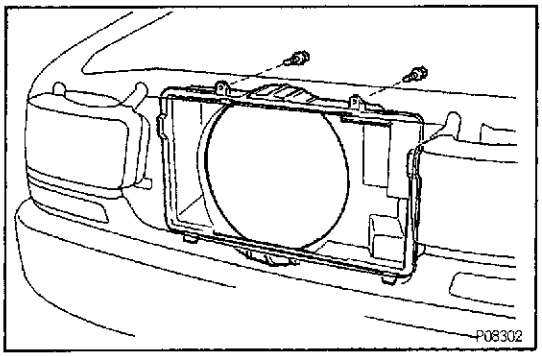
(See Components for Removal and Installation)

1. 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)





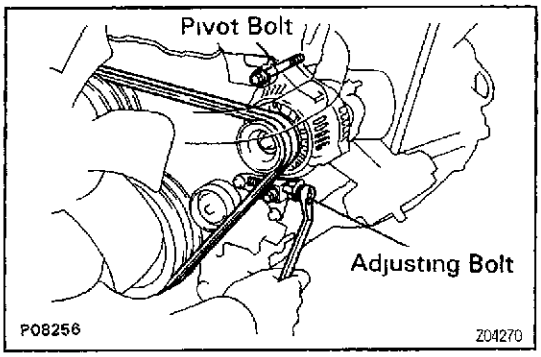
2. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS

(a) Install fan to the fluid coupling

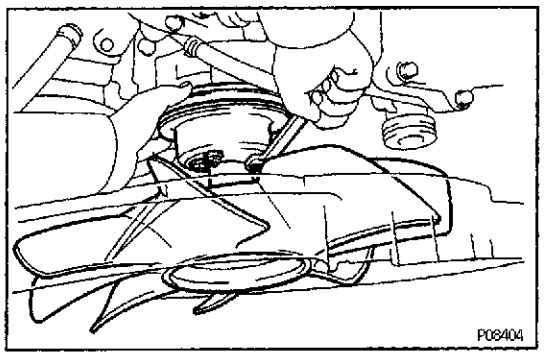
(b) Place the fan with fluid coupling, water pump pulley and fan shroud in position

(c) Temporarily install the fan pulley mounting nuts

(d) Install the fan shroud with the 2 bolts

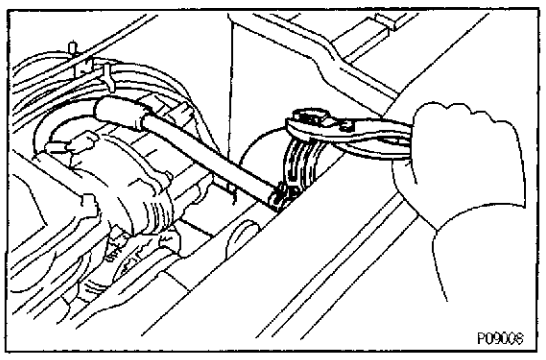


(e) Install the drive belts with the adjusting bolt and pivot bolt



(f) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts

(g) Adjust the drive belts
(See CH section)



3. CONNECT NO.3 WATER BYPASS HOSE

4. CONNECT RADIATOR INLET HOSE

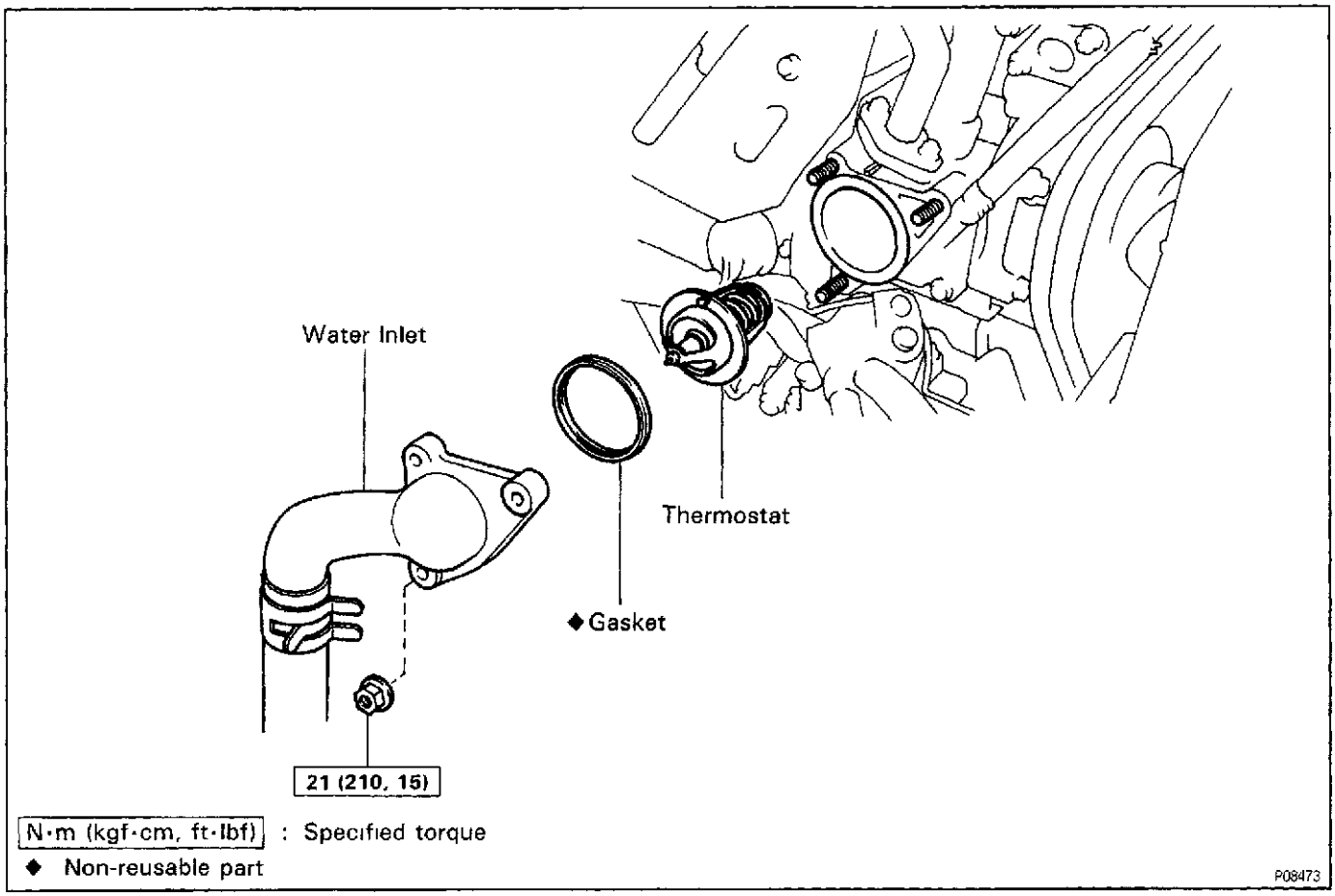
5. FILL WITH ENGINE COOLANT

FI. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT

EG13D D3

COMPONENTS FOR REMOVAL AND INSTALLATION

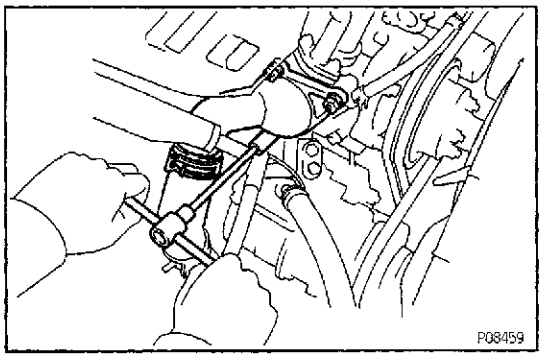


EG1J8-03

THERMOSTAT 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

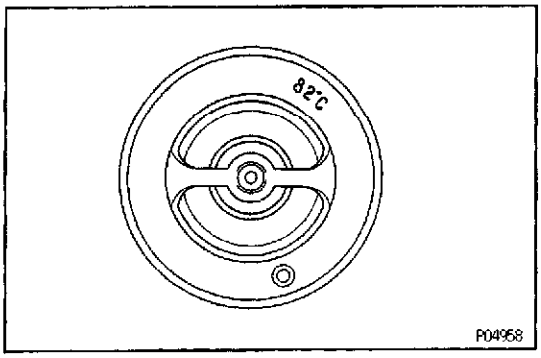
(a) Remove the 3 nuts holding the water inlet to the inlet housing, and disconnect the water inlet from the inlet housing
(b) Remove the thermostat
(c) Remove the gasket from the thermostat

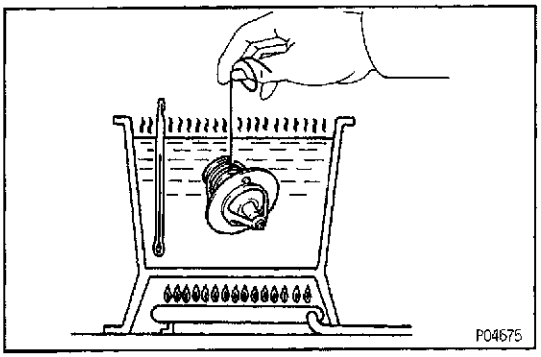
EG072 02

THERMOSTAT INSPECTION

INSPECT THERMOSTAT

HINT The thermostat is numbered with the valve opening temperature





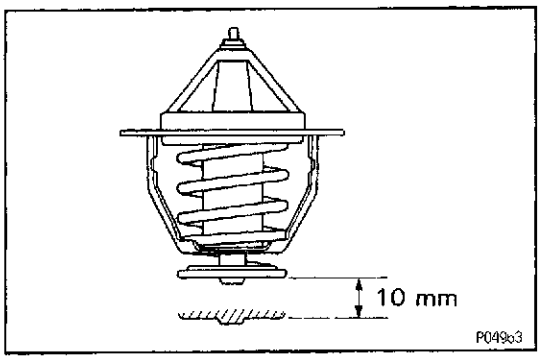
(a) Immerse the thermostat in water and gradually heat the water

(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

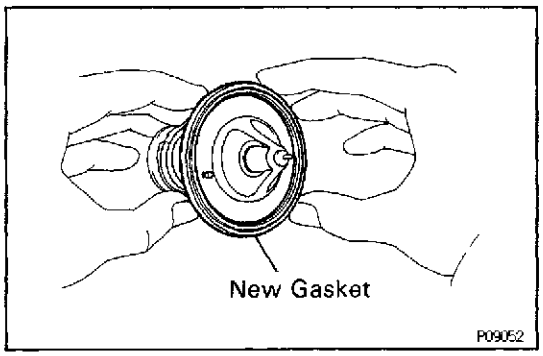
Valve lift

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 spring is tight when the thermostat is fully closed

If not closed, replace the thermostat



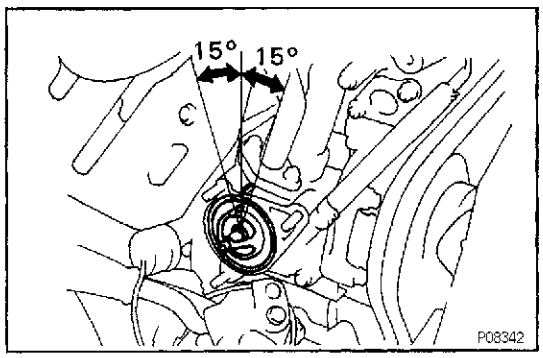
THERMOSTAT INSTALLATION

EG1J4—03

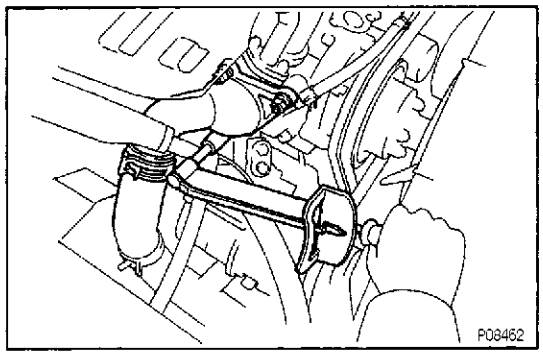
(See Components for Removal and Installation)

1. PLACE THERMOSTAT IN WATER PUMP

(a) Install a new gasket to the thermostat



(b) Align the jiggle valve of the thermostat 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 WITH ENGINE COOLANT

4. START ENGINE AND CHECK FOR LEAKS

RADIATOR

RADIATOR CLEANING

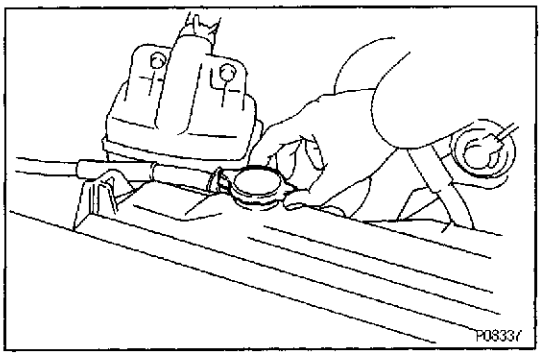
EG074 01

Using water or a steam cleaner, remove any mud or dirt from the radiator core

NOTICE If using a high pressure type cleaner, be careful not to deform the fins of the radiator core If the cleaner nozzle pressure is 2,942 - 3,432 kPa (30 - 35 kgf/cm^2, 427 - 498 psi), keep a distance of at least 40 cm (15 75 in) between the radiator core and cleaner nozzle

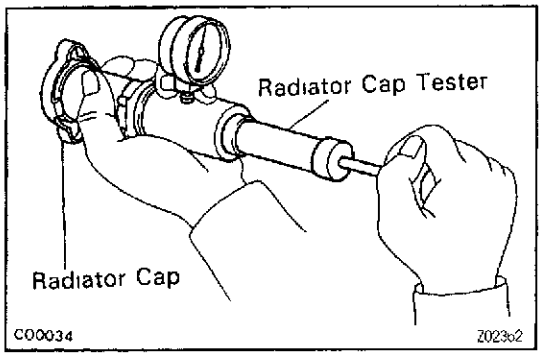
RADIATOR INSPECTION

EG1J5 04



1. REMOVE RADIATOR TANK CAP

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

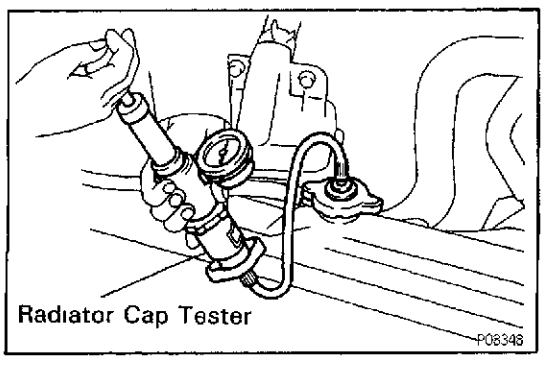


2. INSPECT RADIATOR CAP

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)

If the opening pressure is less than minimum, replace the radiator cap



3. INSPECT COOLING SYSTEM FOR LEAKS

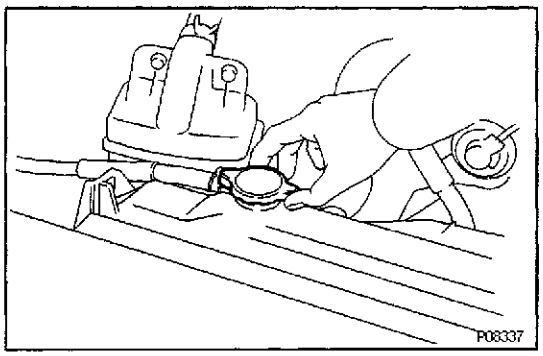
(a) Fill the radiator with coolant and attach a radiator cap tester

(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

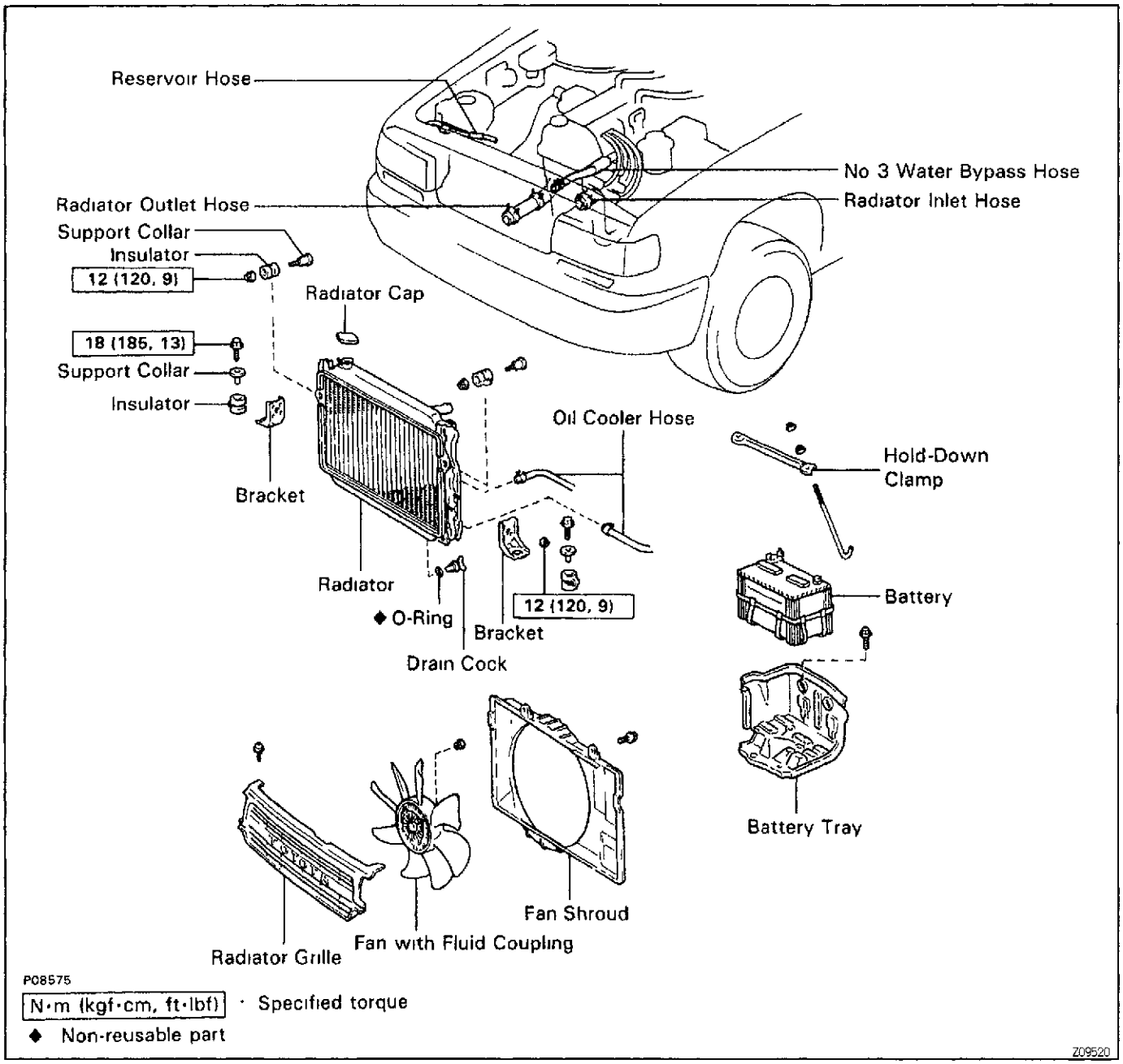
If the pressure drops, check the hoses, radiator or water pump for leaks If no external leaks are found, check the heater core, cylinder block and head

4. REINSTALL RADIATOR CAP



COMPONENTS FOR REMOVAL AND INSTALLATION

EG1J8-02



EGIJ7-02

RADIATOR REMOVAL

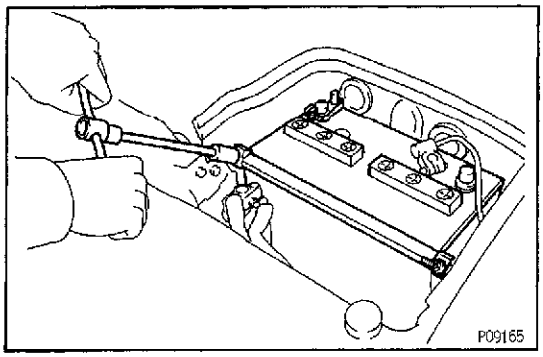
(See Components for Removal and Installation)

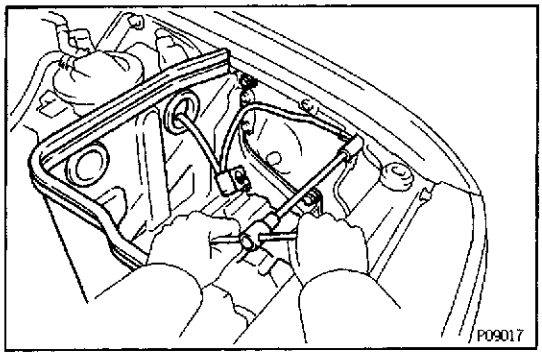
1. DRAIN ENGINE COOLANT

2. REMOVE BATTERY AND BATTERY TRAY

(a) Disconnect the battery cables

(b) Remove the nuts, hold-down clamp and battery



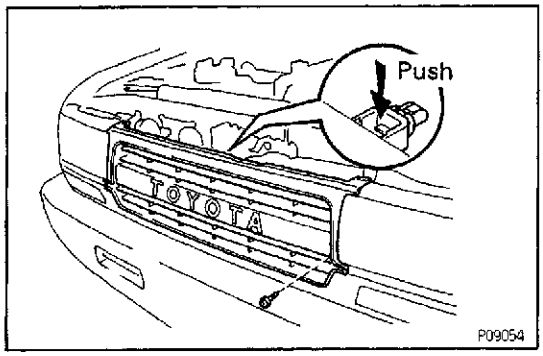


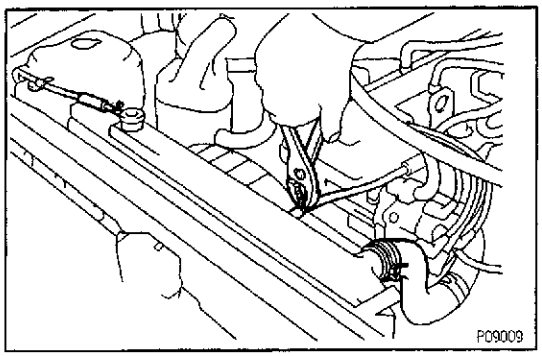
(c) Remove the bolt and disconnect the ground strap

(d) Remove the 5 bolts and battery tray

3. REMOVE RADIATOR GRILLE

Remove the 5 screws, clip and radiator- grille

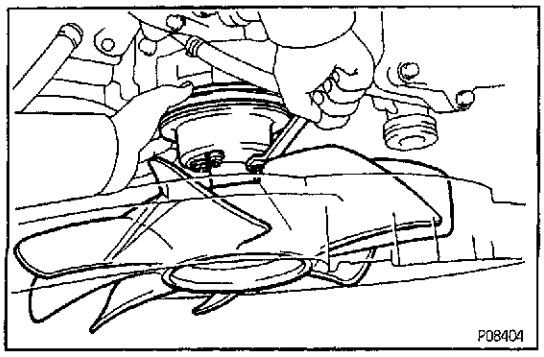




4. DISCONNECT NO.3 WATER BYPASS HOSE

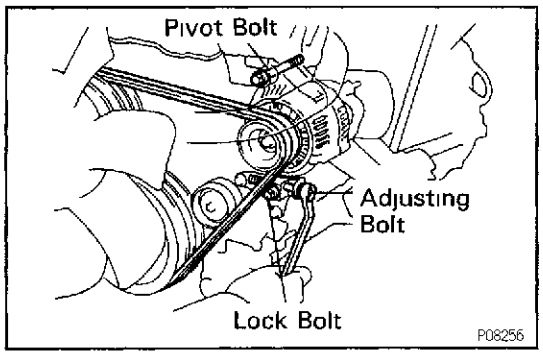
5. DISCONNECT RADIATOR INLET HOSE

6. DISCONNECT RADIATOR RESERVOIR HOSE

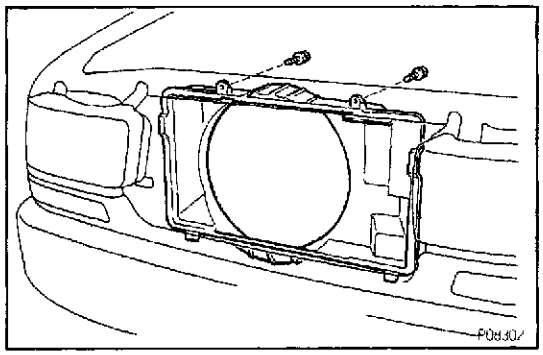


7. REMOVE RADIATOR

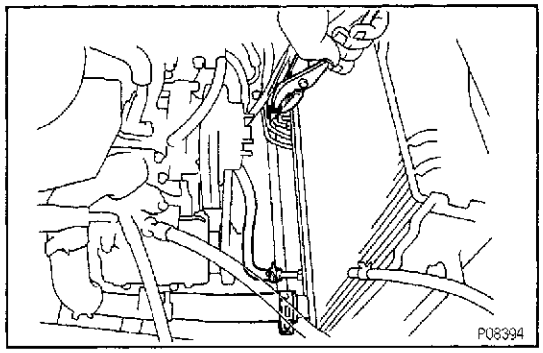
(a) Stretch the belts and loosen the water pump pulley mounting nuts



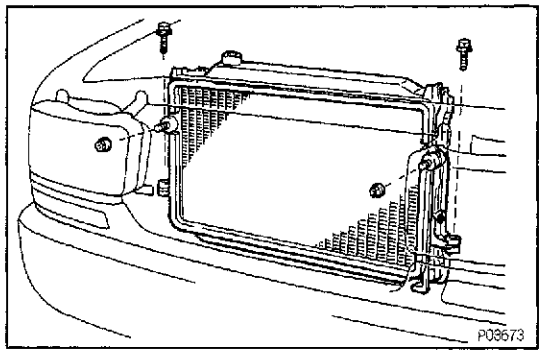
(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts



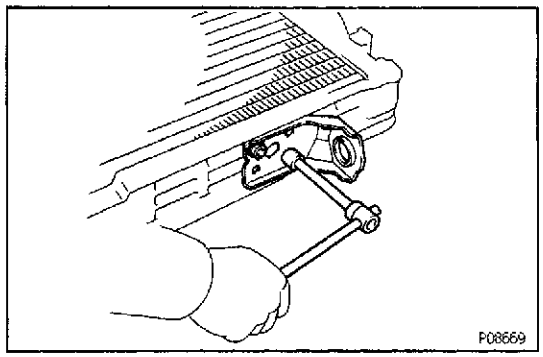
(c) Remove the 2 bolts holding the fan shroud to the radiator
(d) Remove the 4 water pump pulley mounting nuts
(e) Pull out the fan with fluid coupling, water pump pulley and fan shroud



8. DISCONNECT A/T OIL COOLER HOSES
9. DISCONNECT RADIATOR OUTLET HOSE

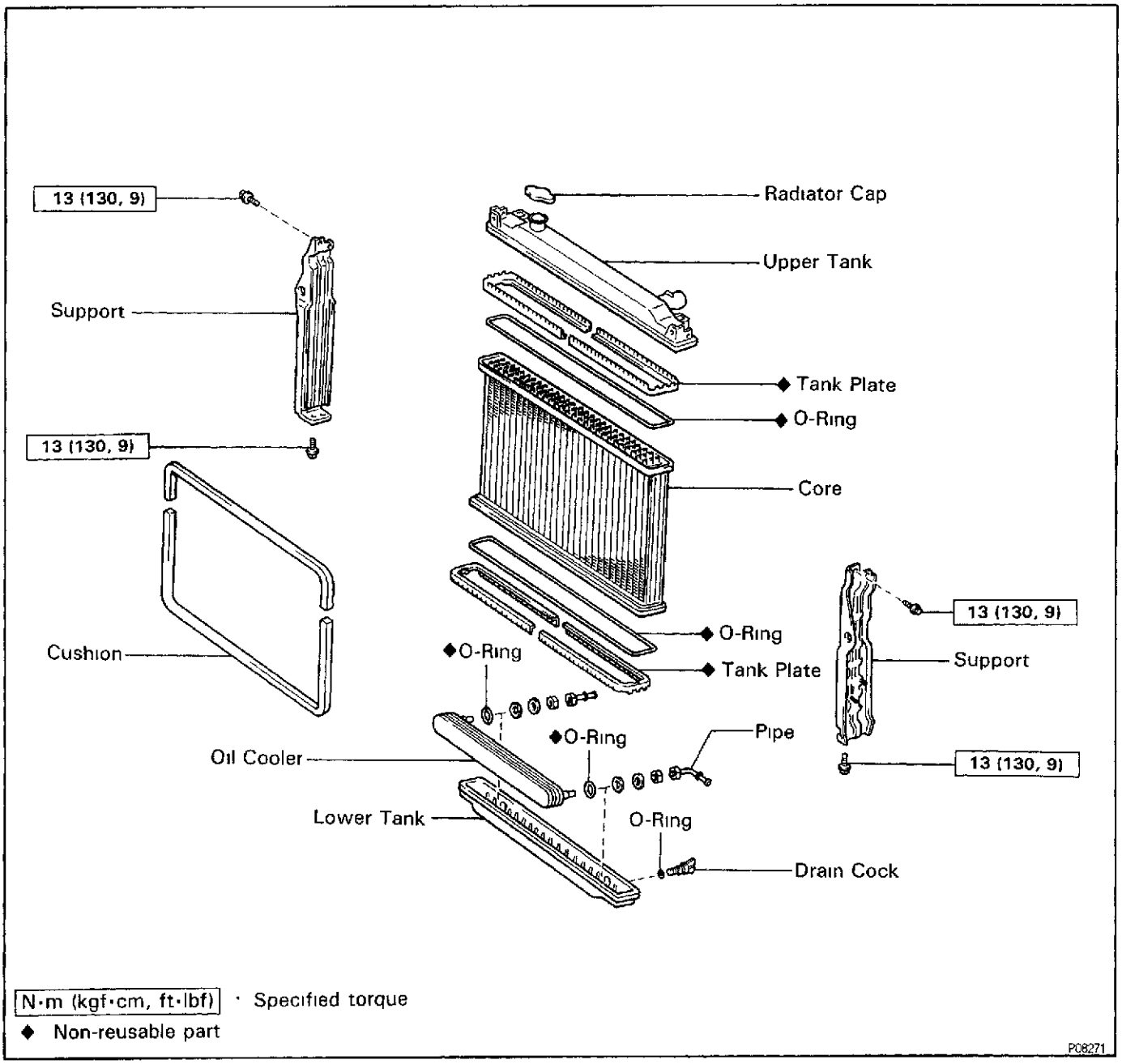


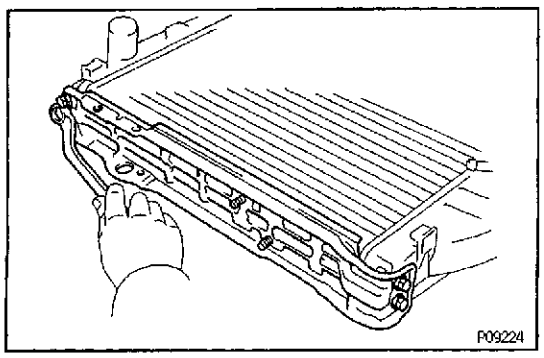
10. REMOVE RADIATOR
(a) Remove the 2 bolts, 2 nuts and radiator



(b) Remove the 4 nuts and 2 radiator brackets

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



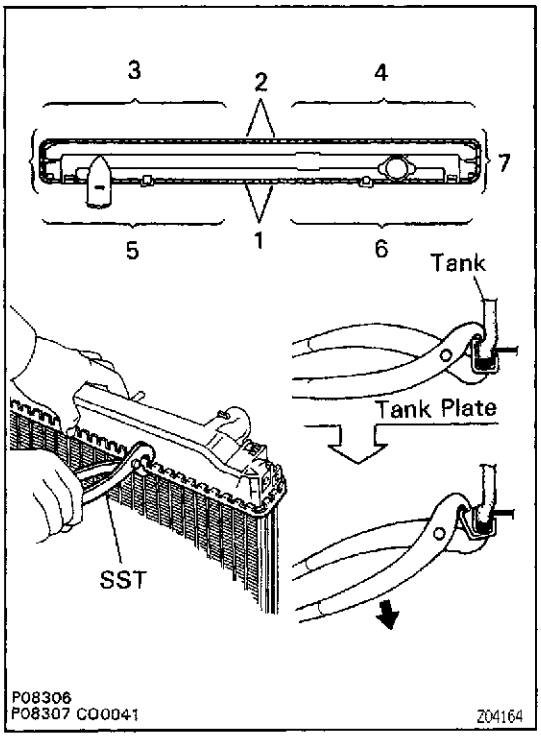


RADIATOR DISASSEMBLY

EG1J9 02

1. REMOVE SUPPORTS

Remove the 8 bolts and 2 supports

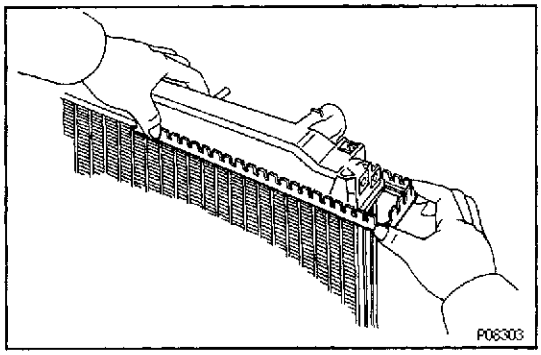


2. REMOVE TANK PLATE

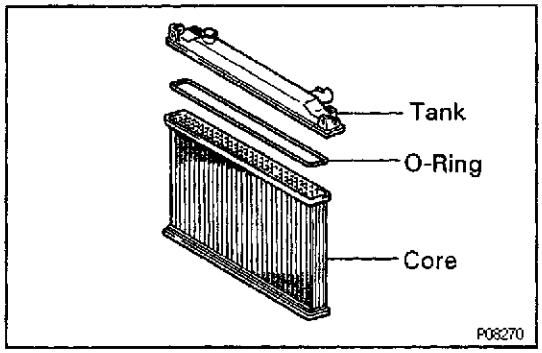
(a) Raise the claws of the tank plates with SST in the numerical order shown in the illustration

SST 09230-00010

NOTICE: Be careful not to damage the core plate.



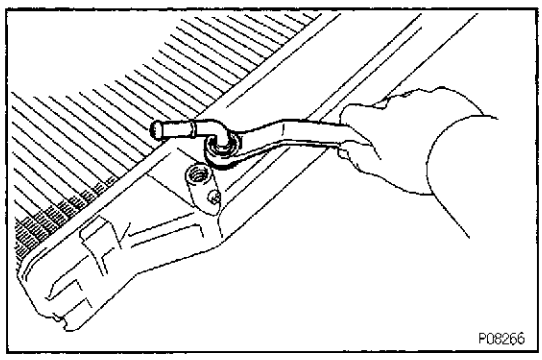
(b) Pull the tank plates outward



3. REMOVE TANK

(a) Pull the tank upward

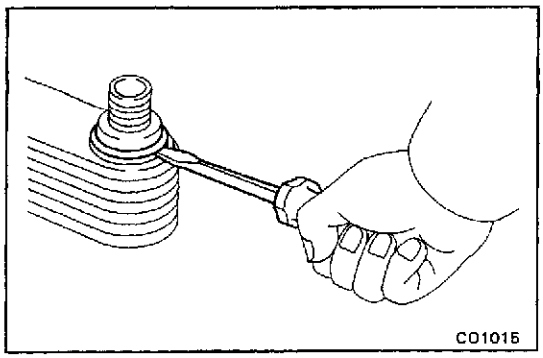
(b) Remove the 0-ring



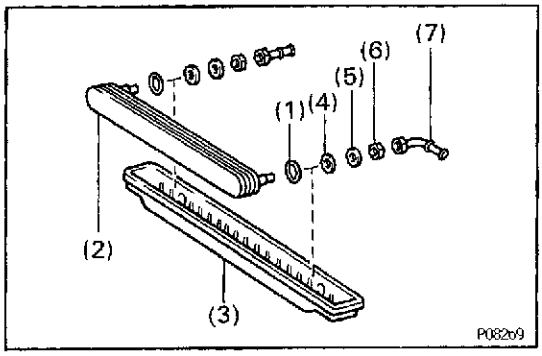
4. REMOVE OIL COOLER FROM LOWER TANK

(a) Remove the pipes

HINT Make a note of the direction the pipes face



(b) Remove the nuts spring washers plate washers and oil cooler-
(c) Remove the O-ring from the oil cooler



RADIATOR ASSEMBLY

EG1JA 02

(See Components for Disassembly and Assembly)

1 INSTALL OIL COOLER TO LOWER TANK

(a) Clean the 0-ring contact surface of the lower tank and oil cooler
(b) Install new 0-rings (1) to the oil cooler (2)
(c) Install the oil cooler (2) to the lower tank (3)
(d) Install the plate washers (4), spring washers (5) and nuts (6)

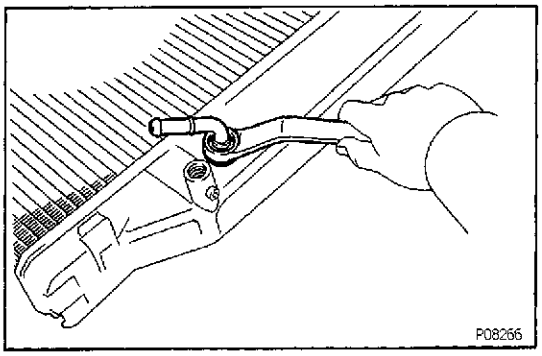
Torque the nuts.

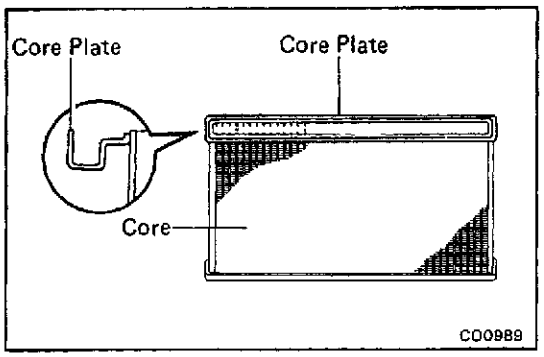
Torque: 10 N-m (100 kgf-cm, 7 ft-lbf)

(e) Install the pipes (7)

Torque: 15 N .m (150 kgf-cm, 11 ft-lbf)

HINT: Face the pipes in the same direction as they were before disassembly



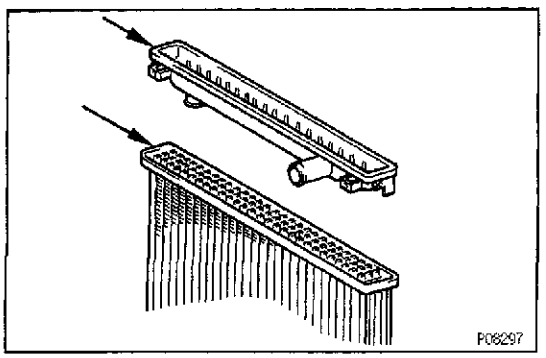


2. CHECK CORE PLATE FOR DAMAGE

HINT

If the sides of the core plate groove are deformed, reassembly of the tank will be impossible Therefore, first correct any deformation with pliers

Water- leakage will result if the bottom of the core plate groove is damaged or- dented Therefore, repair or replace if necessary

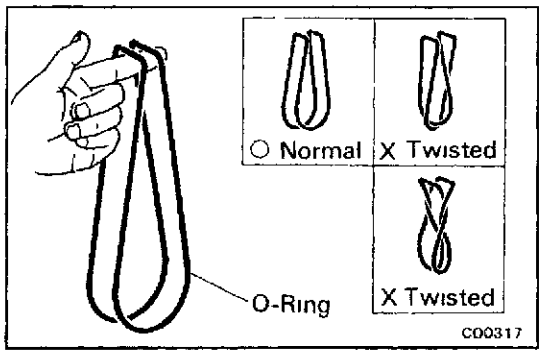


3. INSTALL TANK

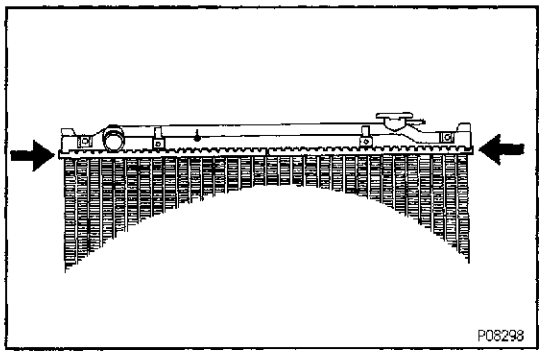
Install a new 0-ring and the tank

HINT

Clean the tank and core plate

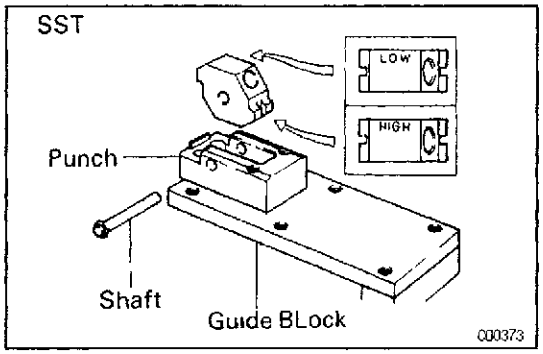


- Take out any twists



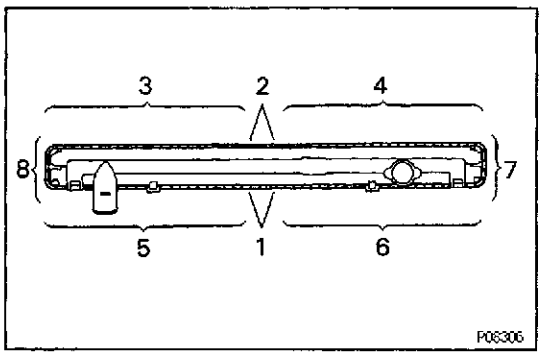
4. INSTALL TANK PLATE

Insert new tank plates from both ends in the direction of the arrows. Firmly set the tank plates in the core plate.

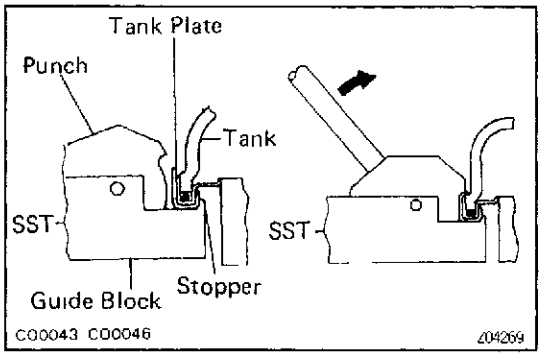


5. STAKE CLAWS OF TANK PLATES

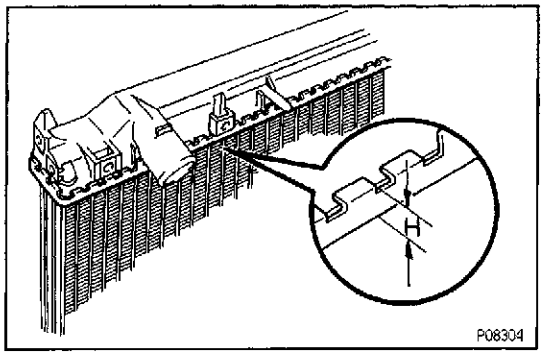
(a) Set the punch of SST to "LOW".
SST 09230 - 00010



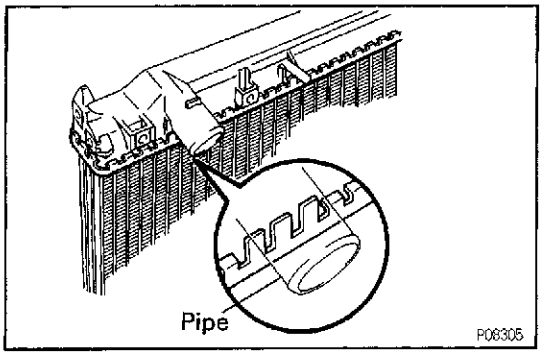
(b) Stake the claws of the tank plates with SST in the numerical order shown in the illustration.



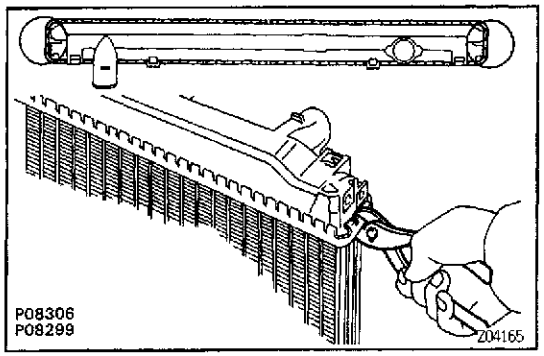
NOTICE: If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.



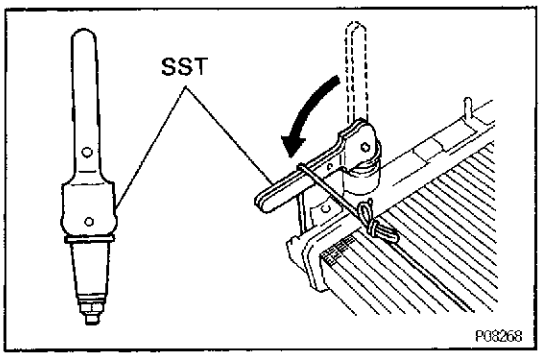
HINT
Stake with just enough pressure to leave a mark on the claw The staked plate height (H) should be as follows
Plate height (H):
9.2 - 9.6 mm (0.362 - 0.378 in.)



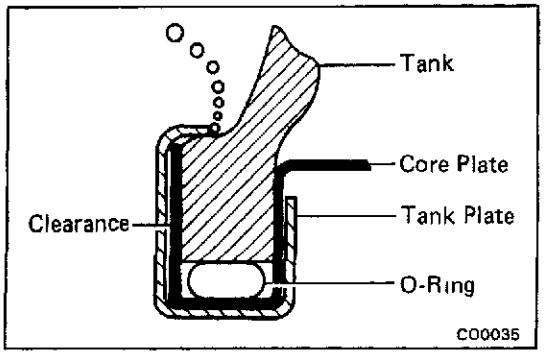
Do not stake the areas protruding around the pipes



The points shown in the illustration cannot be staked with the SST Use pliers and be careful not to damage the core plates



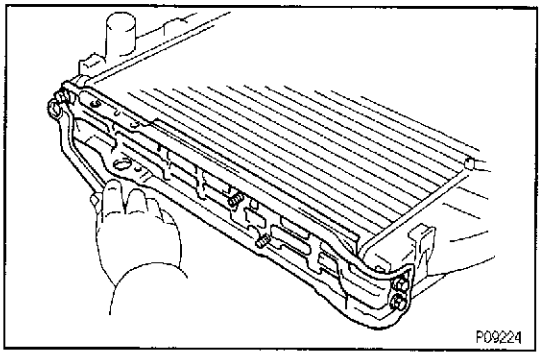
6. CHECK FOR WATER LEAKS
(a) Tighten the drain plug
(b) Plug the inlet and outlet pipes of the radiator with SST
SST 09231 -00060
(c) Using a radiator cap tester apply pressure to the radiator
Test pressure:
147 kPa (1.5 kgf/cm^2, 21 psi)



(d) Check for water leaks
HINT On radiators with resin tanks, there is a clearance between the core plate and tank plate where a minute amount of air will remain, giving the appearance of an air- leak when the radiator is submerged in water Therefore, before performing the water leak test, first swirl the radiator- around in the water until all air bubbles disappear

7. PAINT TANK PLATE

HINT If the water- leak test checks out okay, allow the radiator to dry completely and then paint the tank plate



8. INSTALL SUPPORTS

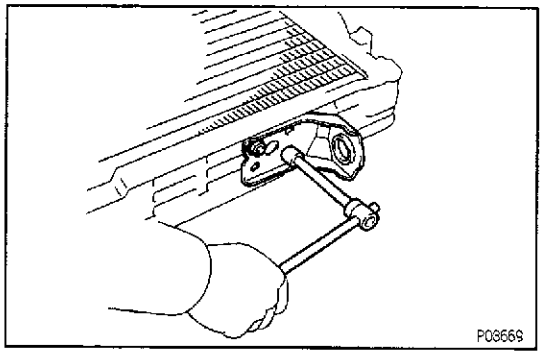
Install the 2 supports with the 8 bolts

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

RADIATOR INSTALLATION

EG1JB-02

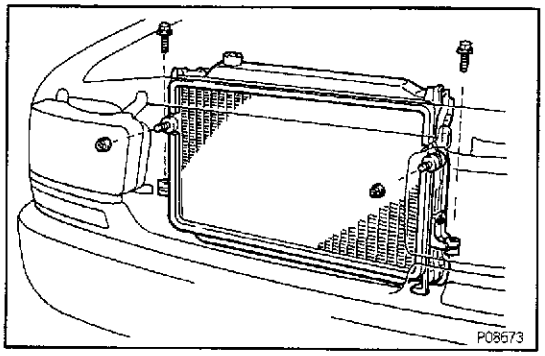
(See Components for Remval and Installation)



1. INSTALL RADIATOR

(a) Install the 2 radiator brackets with the 4 nuts

Torque: 12 N-m (120 kgf-cm, 9 ft-lbf)

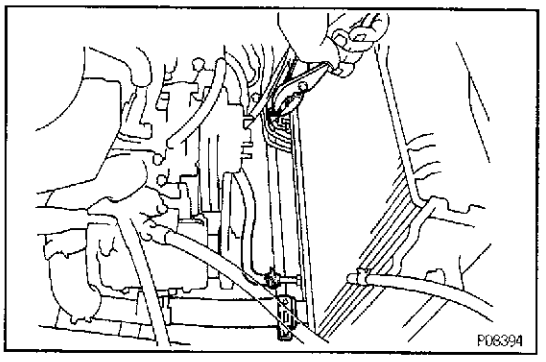


(b) Install the radiator with the 2 bolts and 2 nuts

Torque:

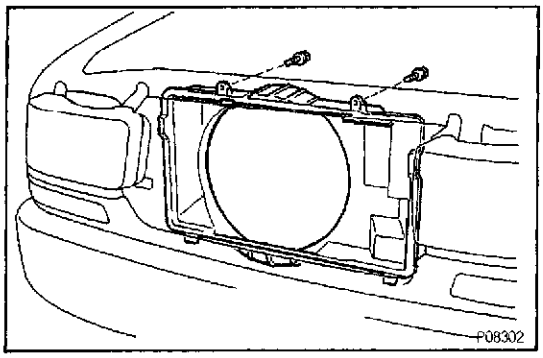
18 N-m (185 kgf-cm, 13 ft-lbf) for bolt

12 N-m (120 kgf-cm, 9 ft-lbf) for nut



2. CONNECT A/T OIL COOLER HOSES

3. CONNECT RADIATOR OUTLET HOSE

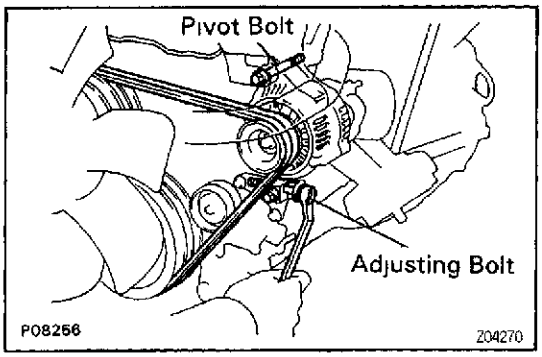


4. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS

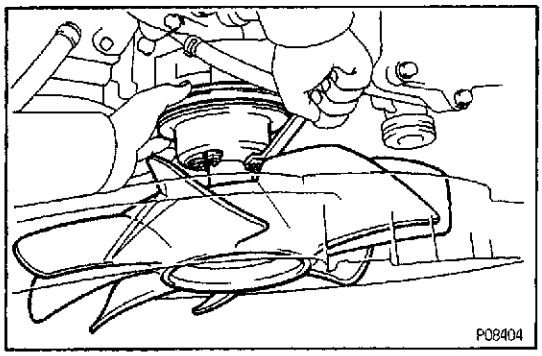
(a) Place the fan with fluid coupling, water pump pulley and fan shroud in position

(b) Temporarily install the fan pulley mounting nuts

(c) Install the fan shroud with the 2 bolts

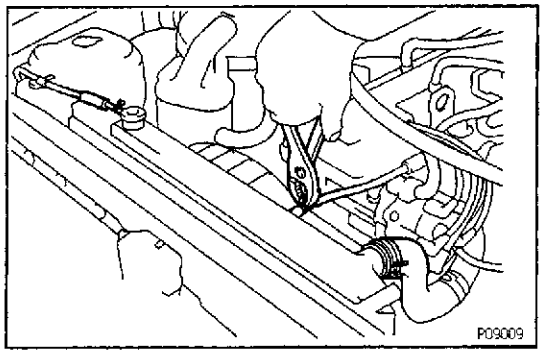


(d) Install the drive belts with the adusting bolt and pivot bolt



(e) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts

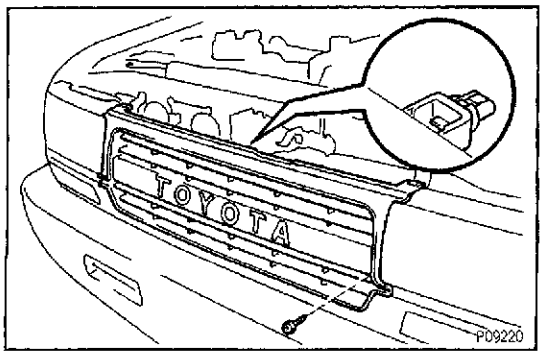
(f) Adjust the drive belts
(See CH section)



5. CONNECT RADIATOR RESERVOIR HOSE

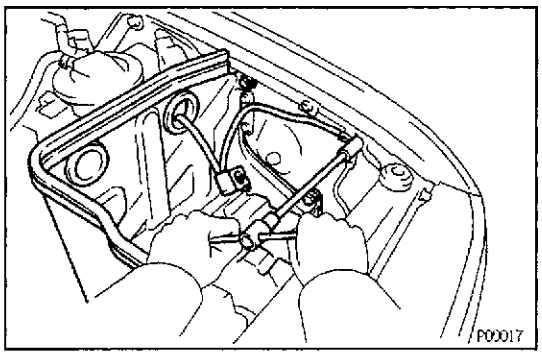
6. CONNECT RADIATOR INLET HOSE

7. CONNECT NO.3 WATER BYPASS HOSE



8. INSTALL RADIATOR GRILLE

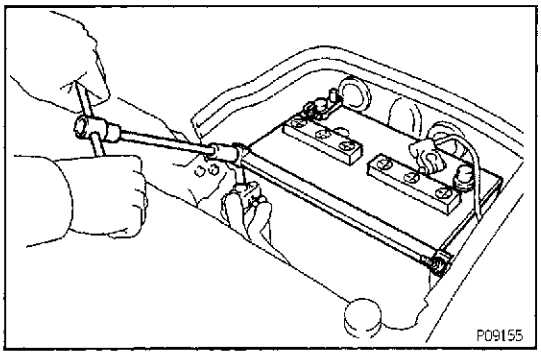
Install the radiator grille with the 5 screws and clip



9. INSTALL BATTERY AND BATTERY TRAY

(a) Install the battery tray with the 5 bolts

(b) Connect the ground strap with the bolt

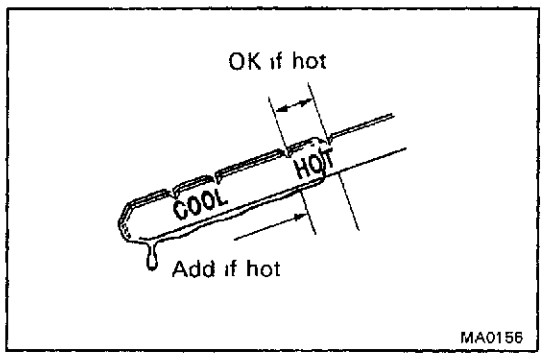


(c) Install the battery with the hold-down clamp and nuts

(d) Connect the battery cables

10. FILL WITH ENGINE COOLANT

11. START ENGINE AND CHECK FOR LEAKS



12. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.

SERVICE SPECIFICATIONS

EG07L 02

SERVICE DATA

Thermostat	Valve opening temperature Valve lift at 95°C (203°F)	80 - 84°C (176 - 183° F) 10 mm (0 39 in) or more
Radiator cap	Relief valve opening pressure (STD) Relief valve opening pressure (Limit)	74 - 103 kPa (0 75 - 1 05 kgf/cm^2 10 7 - 14 9 psi) 59 kPa (O 6 kgf/cm^2 8 5 psi)

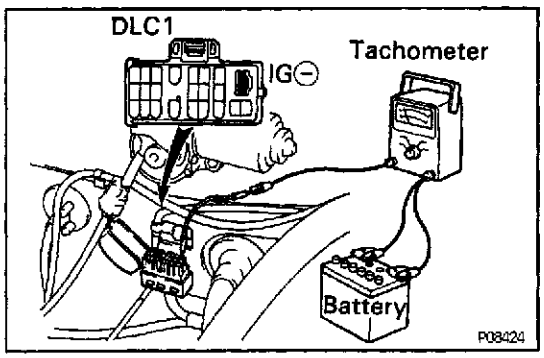
TORQUE SPECIFICATIONS

EG07M 09

Part tightened	N-m	kgf-cm	ft-lbf
Cylinder block x Drain plug	**29**	300	**22**
Water pump x Cylinder block	**21**	210	**15**
Water inlet x Water inlet housing	**21**	210	**15**
Radiator support x Radiator tank	**13**	130	**9**
Radiator x Bracket	**12**	120	**9**
Radiator mounting bolt	**18**	185	**13**
Radiator mounting nut	**12**	120	**9**
Radiator lower tank x Nut (for Oil cooler)	**10**	100	7
Radiator lower tank x Pipe (for Oil cooler)	**15**	150	11

PRECAUTION

1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



2. With a tachometer connected to the system, connect the test probe of the tachometer to the IG(-) of the DLC1.

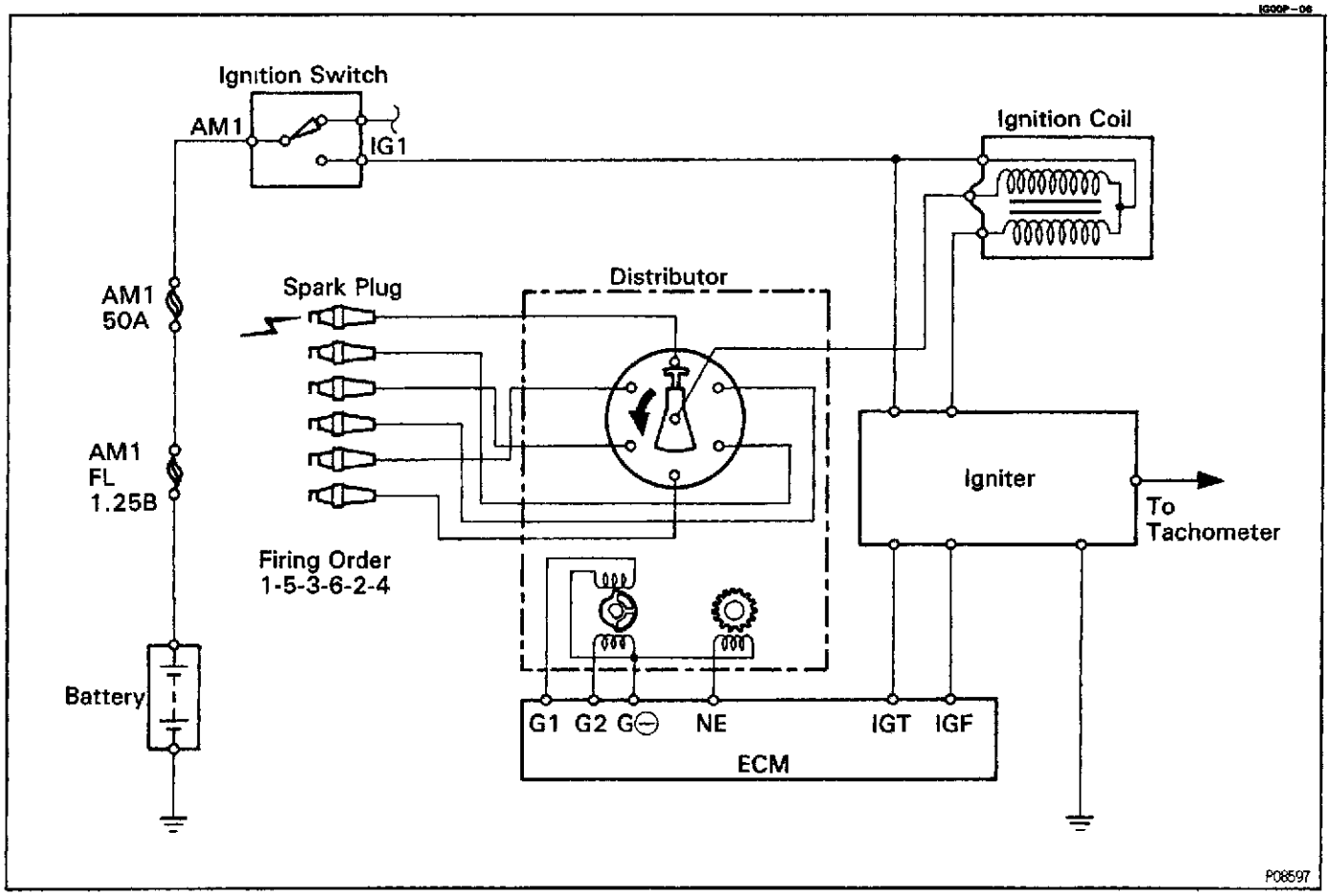
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

4. NEVER allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.

5. Do not disconnect the battery while the engine is running.

6. Check that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG00R-01

	09843-18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

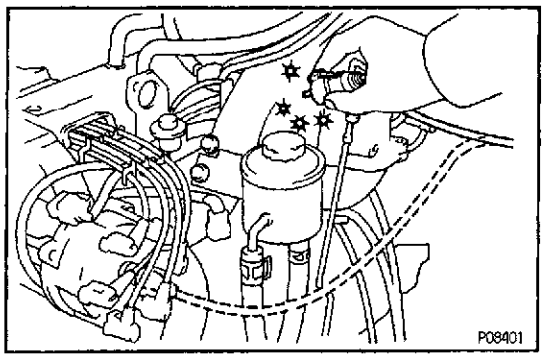
IG00S-05

	09082-00050 TOYOTA Electrical Tester Set	
	09200-00010 Engine Adjust Kit	

EQUIPMENT

IG00T-05

Spark plug cleaner	
Tachometer	
Torque wrench	
Timing light	Ignition timing



ON-VEHICLE INSPECTION

SPARK TEST

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, perform 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 page IG-8)
Maximum resistance 25 kΩ per cord

BAD → Replace the cord (s)

OK

CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER
1 Turn ignition switch to ON
2 Check that there is battery voltage at ignition coil positive (+) terminal

BAD → Check wiring between ignition switch to ignition coil and igniter

OK

CHECK RESISTANCE OF IGNITION COIL (See page IG-16)

Resistance	(Cold)	(Hot)
Primary	0 36 - 0 55	0 45-0 65
Secondary	9 0 - 15 4 kΩ	11 4-18 1 kΩ

BAD → Replace the ignition coil

OK

CHECK RESISTANCE OF SIGNAL GENERATOR (PICKUP COIL) (See page IG-18)

Resistance	(Cold)	(Hot)
G1 and G(-)	185 - 275Ω	244 - 325 n
G2 and G(-)	185-27592	240-3250
NE and G(-)	185 - 275Ω	240 - 325Ω

BAD → Replace the distributor housing assembly

OK

CHECK AIR GAP OF DISTRIBUTOR (See page IG-17 J
Air gap 0 2 - 0 4 mm (0 008 - 0 016 in)

BAD → Replace the distributor housing assembly

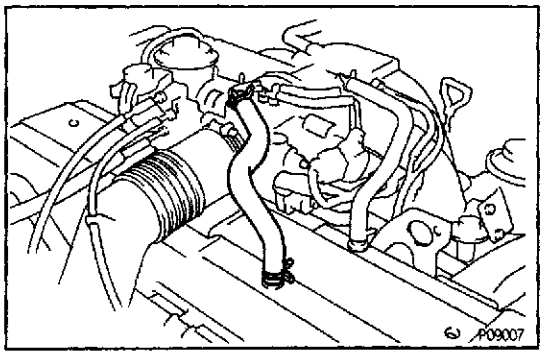
OK

CHECK IGT SIGNAL FROM ECM (See page EG-245)

BAD → Check wiring between ECM distributor and igniter and then try another ECM

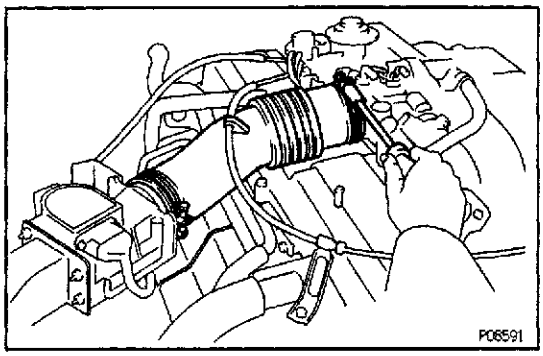
OK

TRY ANOTHER IGNITER



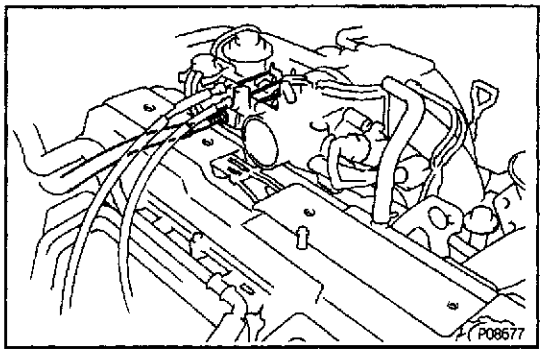
HIGH-TENSION CORDS INSPECTION IG0S4-02

1. REMOVE NO.2 PCV HOSE

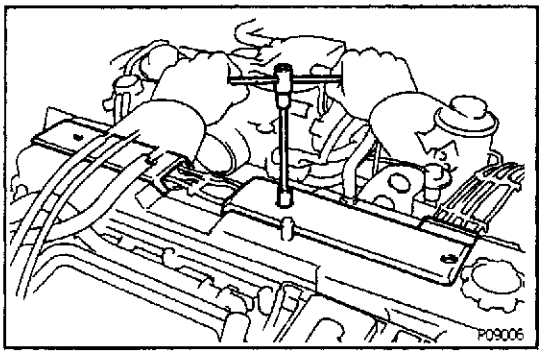


2. REMOVE AIR CLEANER HOSE

Loosen the 2 clamps and remove the air- cleaner hose

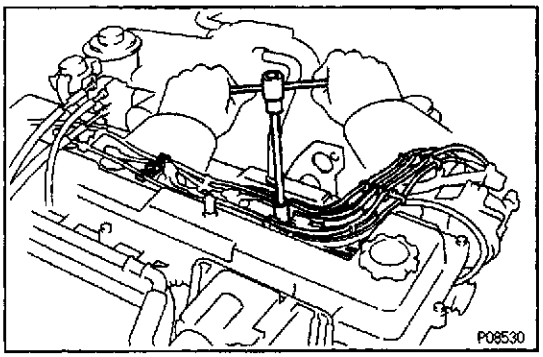


3. DISCONNECT THROTTLE CABLE



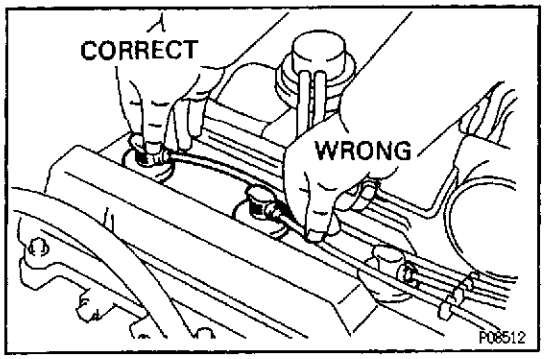
4. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers

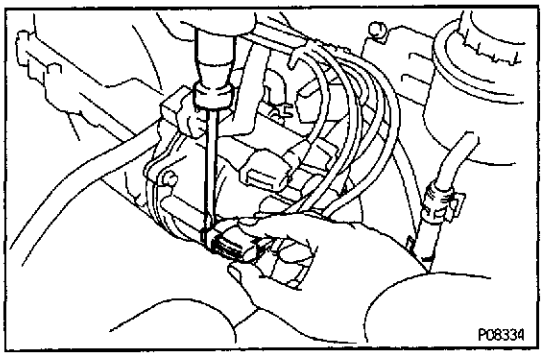


5. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

(a) Remove the 2 mounting bolts of the No 1 and No 2 cord clamps

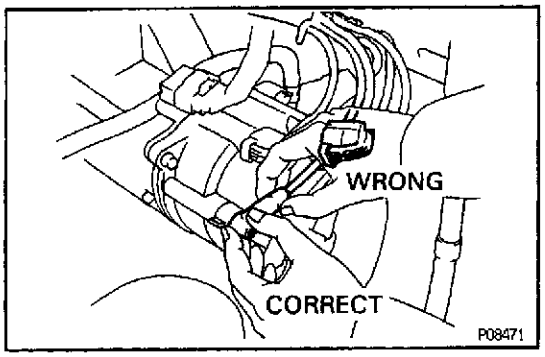


(b) Disconnect the high - tension cords at the rubber boot
DO NOT pull on the cords
NOTICE: Pulling on or bending the cords may damage the conductor inside.



6. DISCONNECT HIGH-TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

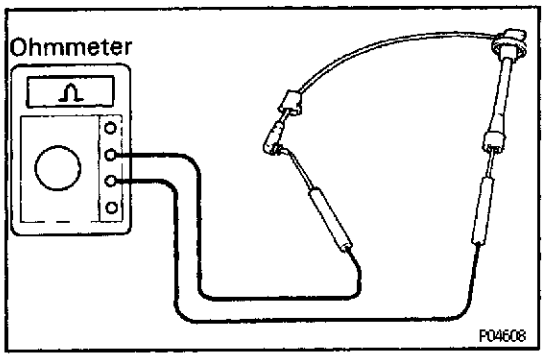
(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil)



(b) Disconnect the high-tension cord at the grommet
DO NOT pull on the cord

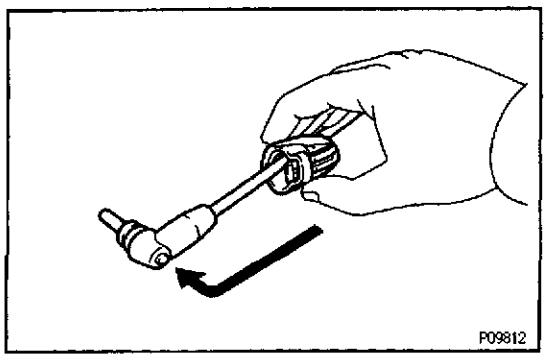
NOTICE:

- **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.**



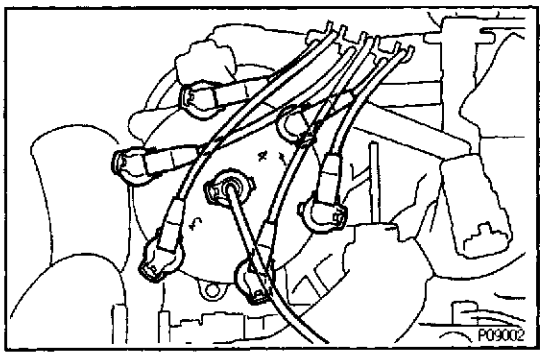
7. INSPECT HIGH-TENSION CORD RESISTANCE

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

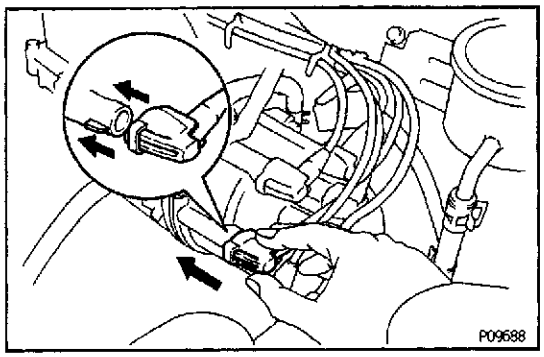


8. RECONNECT HIGH-TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL

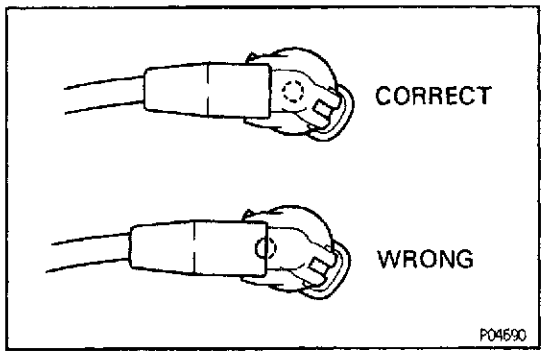
(a) Assemble the holder and grommet



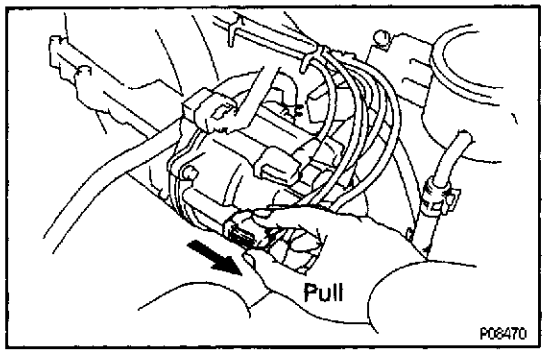
HINT Connect the high-tension cords to the distributor cap as shown in the illustration



(b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord



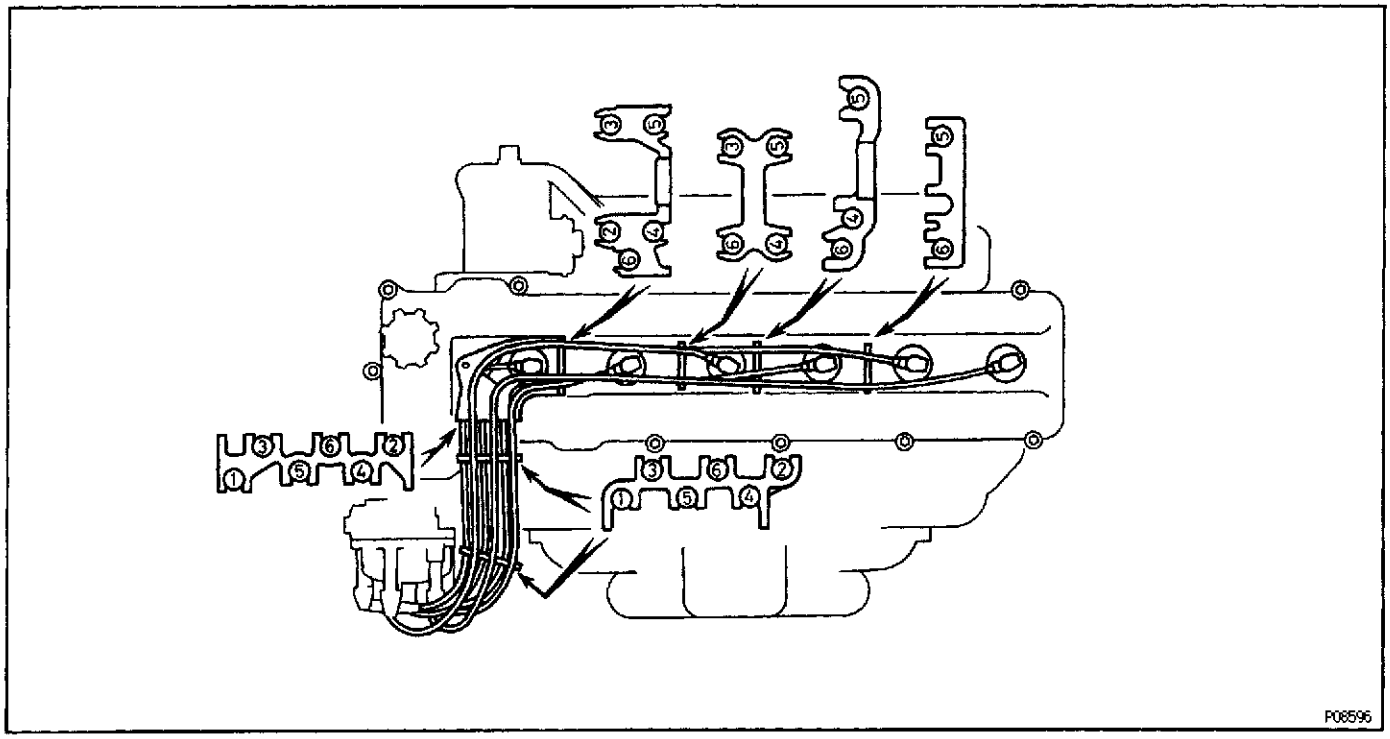
NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.

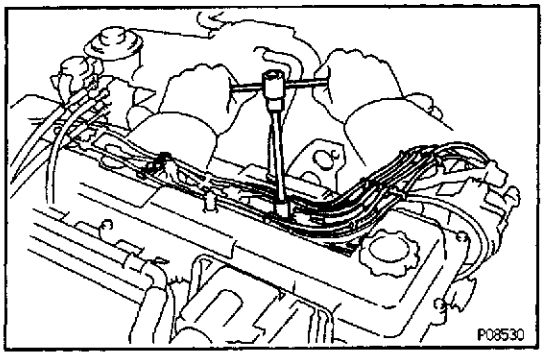


(c) Check that the lock claw of the holder is engaged by lightly pulling the holder

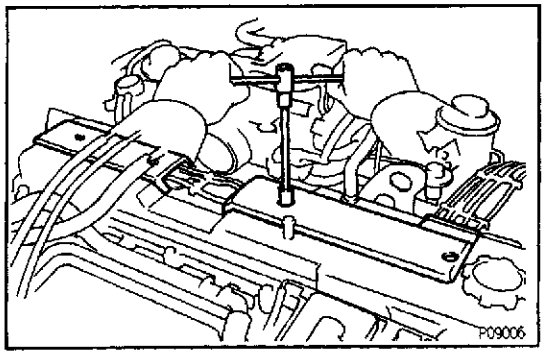
9. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

(a) Secure the high-tension cords with the clamps see the illustration on the next page



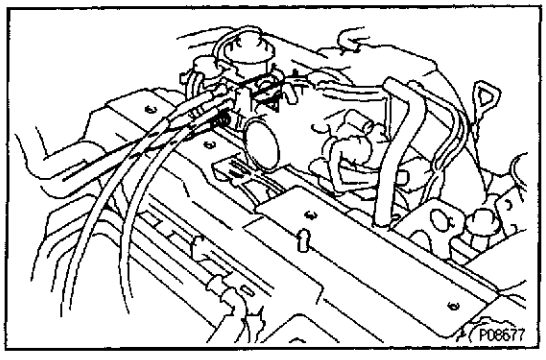


(b) Install the No 1 and No 2 cord clamps with the 2 bolts

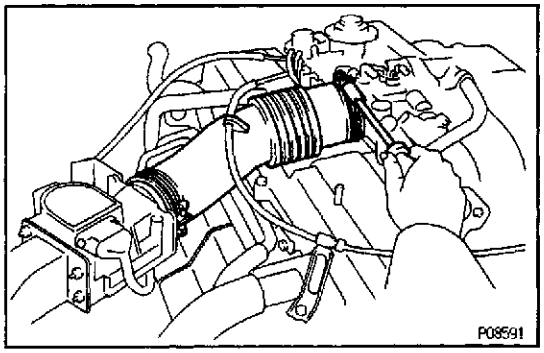


10. INSTALL N0.2 AND NO.3 CYLINDER HEAD COVERS

Install the head covers with the 4 bolts

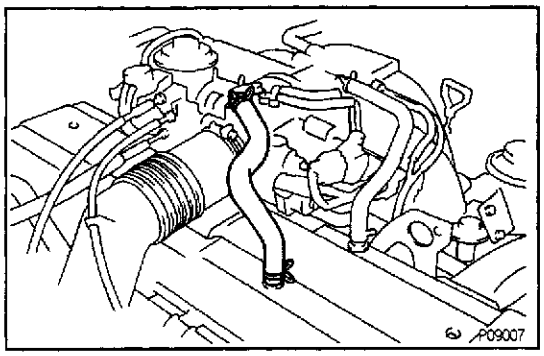


11. CONNECT THROTTLE CABLE

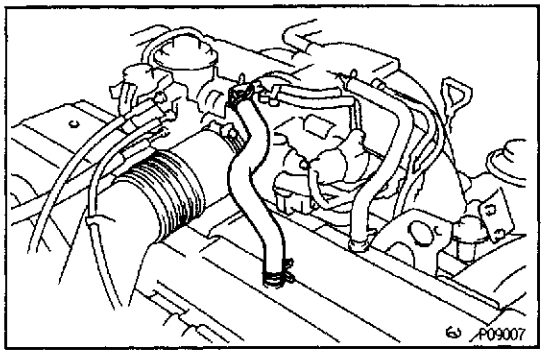


12. INSTALL AIR CLEANER HOSE

Install the air cleaner hose with the 2 clamp bolts

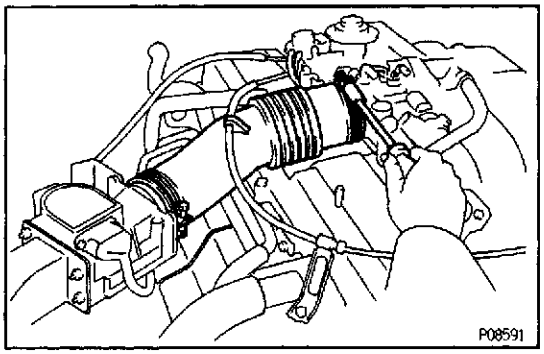


13. INSTALL NO.2 PCV HOSE



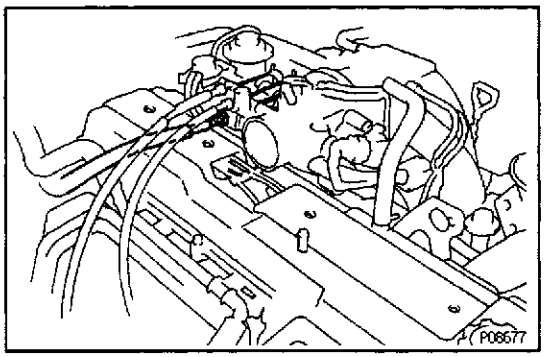
SPARK PLUGS INSPECTION

1. REMOVE N0.2 PCV HOSE

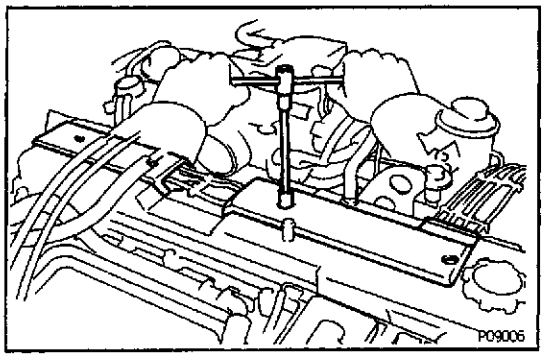


2. REMOVE AIR CLEANER HOSE

Loosen the 2 clamps and remove the air cleaner- hose

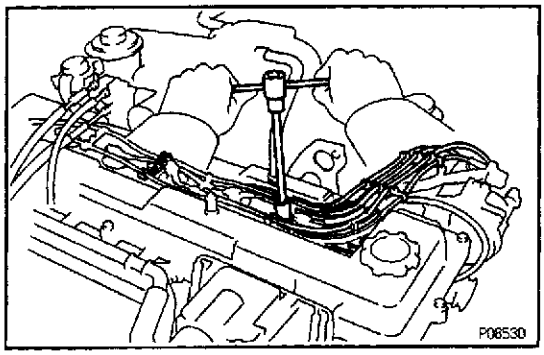


3. DISCONNECT THROTTLE CABLE



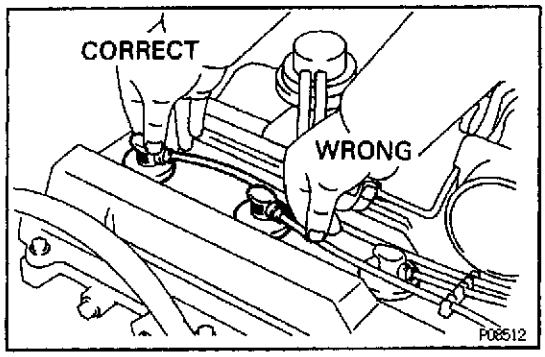
4. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS

Remove the 4 bolts and head covers



5. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

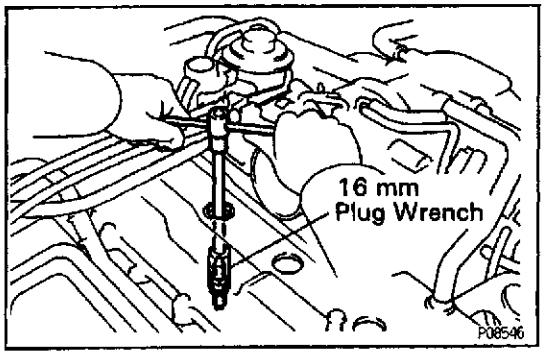
(a) Remove the 2 mounting bolts of the No 1 and No 2 cord clamps



(b) Disconnect the high - tension cords at the rubber boot

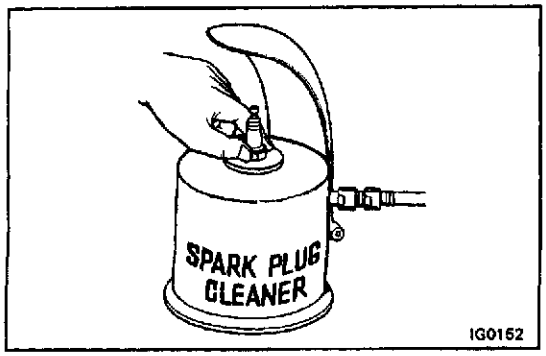
DO NOT pull on the cords

NOTICE: Pulling on or bending the cords may damage the conductor inside.



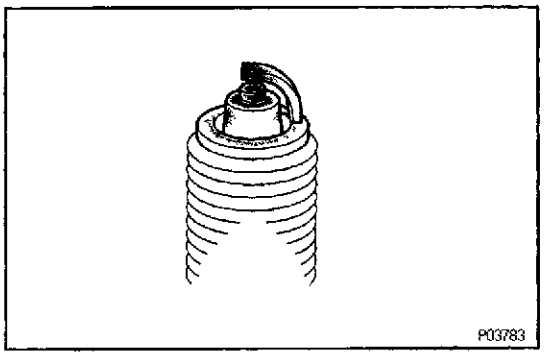
6. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug



7. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug



8. VISUALLY INSPECT SPARK PLUGS

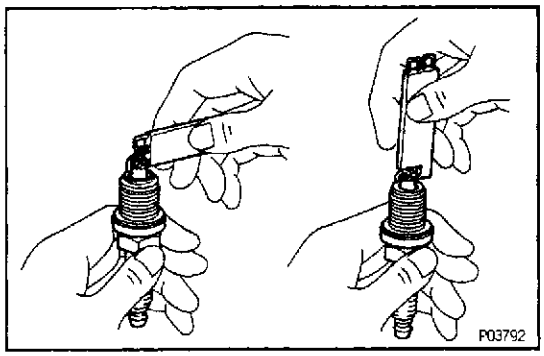
Check the spark plug for electrode wear, threads damage and insulator damage

If abnormal, replace the plugs

Recommended spark plugs:

K16R-U for ND

BKR5EYA for NGK

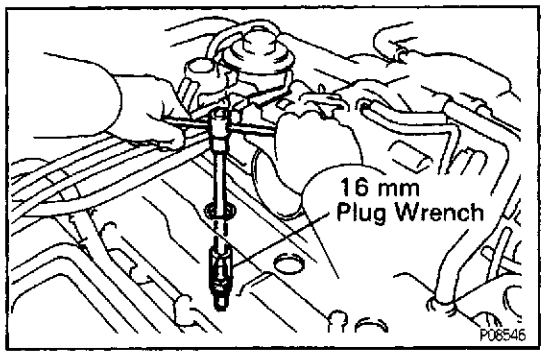


9. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the correct electrode gap

Correct electrode gap:

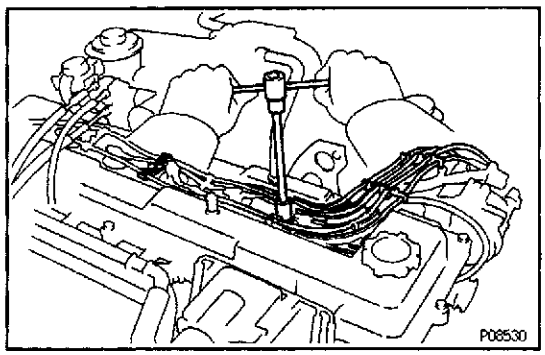
0.8 mm (0.031 in.)



10. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug

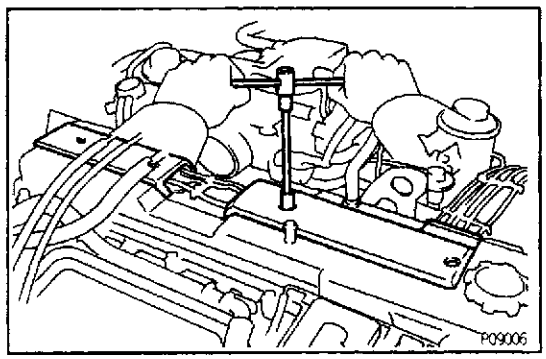
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



11. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

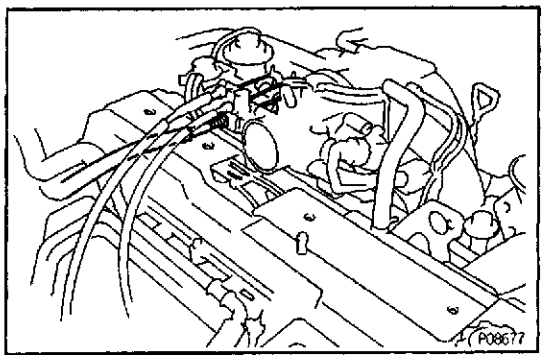
(a) Reconnect the high-tension cords to the spark plugs

(b) Install the No 1 and No 2 cord clamps with the 2 bolts

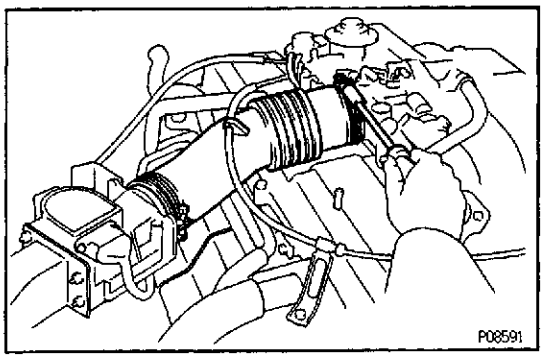


12. INSTALL NO.2 AND NO.3 CYLINDER HEAD COVERS

Install the head covers with the 4 bolts

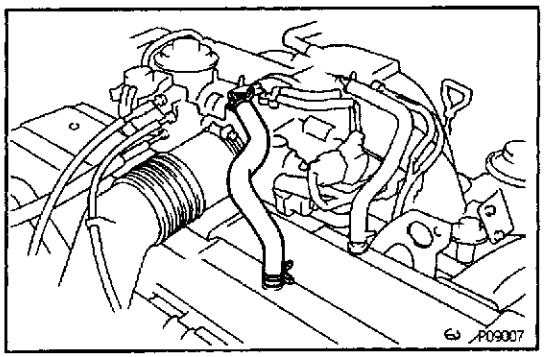


13. CONNECT THROTTLE CABLE



14. INSTALL AIR CLEANER HOSE

Install the air cleaner hose with the 2 clamp bolts



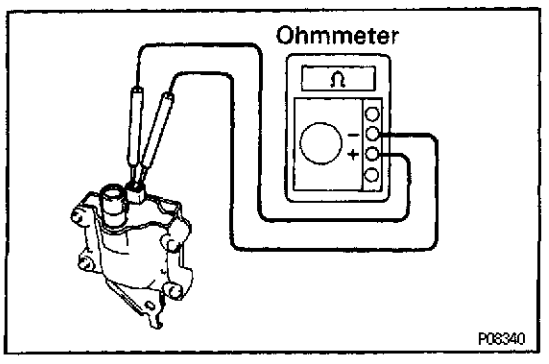
15. INSTALL NO.2 PCV HOSE

IGNITION COIL INSPECTION

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).

1. DISCONNECT IGNITION COIL CONNECTOR

2. DISCONNECT HIGH-TENSION CORD



3. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (-) terminals

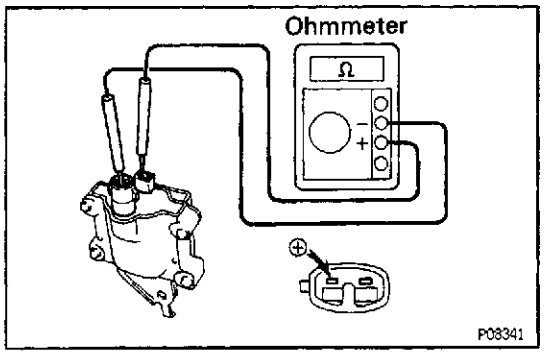
Primary coil resistance (Cold):

0.36-0.550

Primary coil resistance (Hot):

0.45-0-650

If the resistance is not as specified, replace the ignition coil



4. 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

Secondary coil resistance (Hot):

11.4 - 18.1 kΩ

If the resistance is not as specified, replace the ignition coil

5. RECONNECT HIGH-TENSION CORD

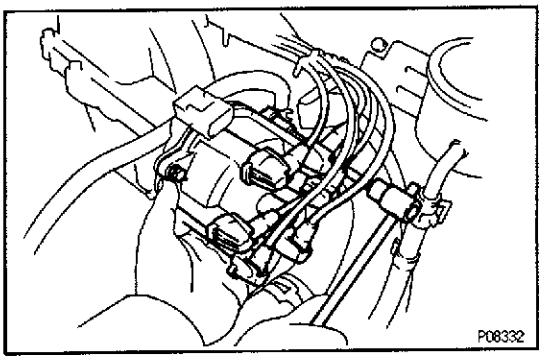
6. RECONNECT IGNITION COIL CONNECTOR

DISTRIBUTOR INSPECTION

IG05J-03

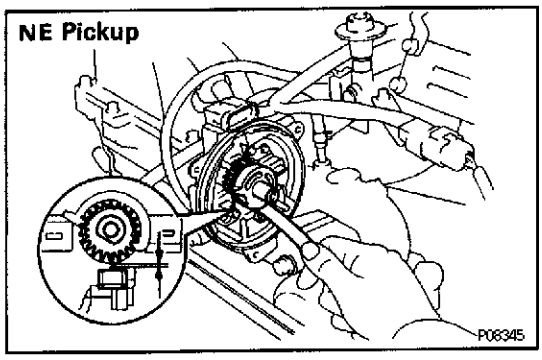
NOTICE: "Cold" and 'Hot" in the following sentences express the temperature of the coils themselves. 'Cold" is from -10°C (14°F) to 50°C (122°F) and 'Hot' is from 50° C (122° F) to 100° C (212° F).

1. DISCONNECT DISTRIBUTOR CONNECTOR



2. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS

3. REMOVE ROTOR



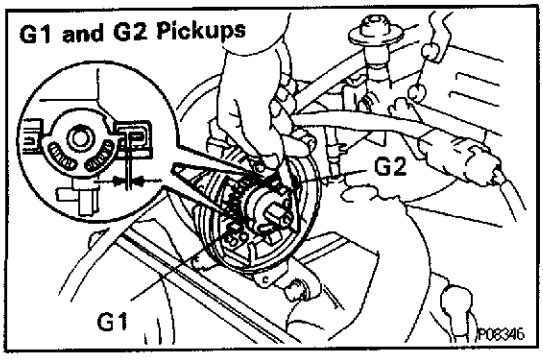
4. INSPECT AIR GAPS

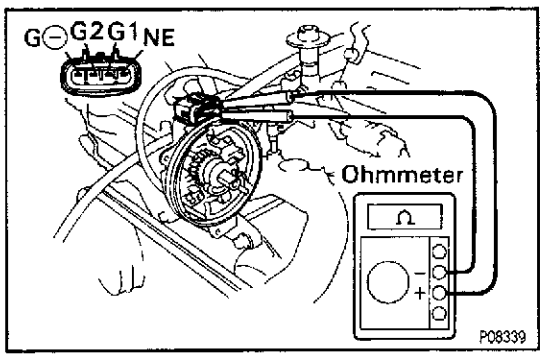
Using a thickness gauge, measure the gap between the signal rotor and the pickup coil projection

Air gap:

0.2 - 0.4 mm (0.008 - 0.016 in.)

If the gap is not as specified, replace the distributor housing





5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, check that the resistance of the pickup coil

Pickup coil resistance (Cold):

G1 and G(-)

185-2750Ω

G2 and G(-)

185-275Ω

NE and G(-)

185-2750Ω

Pickup coil resistance (Hot):

G1 and G(-)

240 -3250Ω

G2 and G(-)

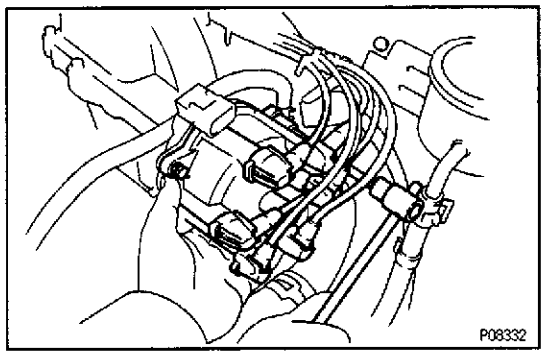
240-325Ω

NE and G(-)

240- 325Ω

If the resistance is not as specified, replace the distributor housing

6. REINSTALL ROTOR



7. REINSTALL DISTRIBUTOR CAP

8. RECONNECT DISTRIBUTOR CONNECTOR

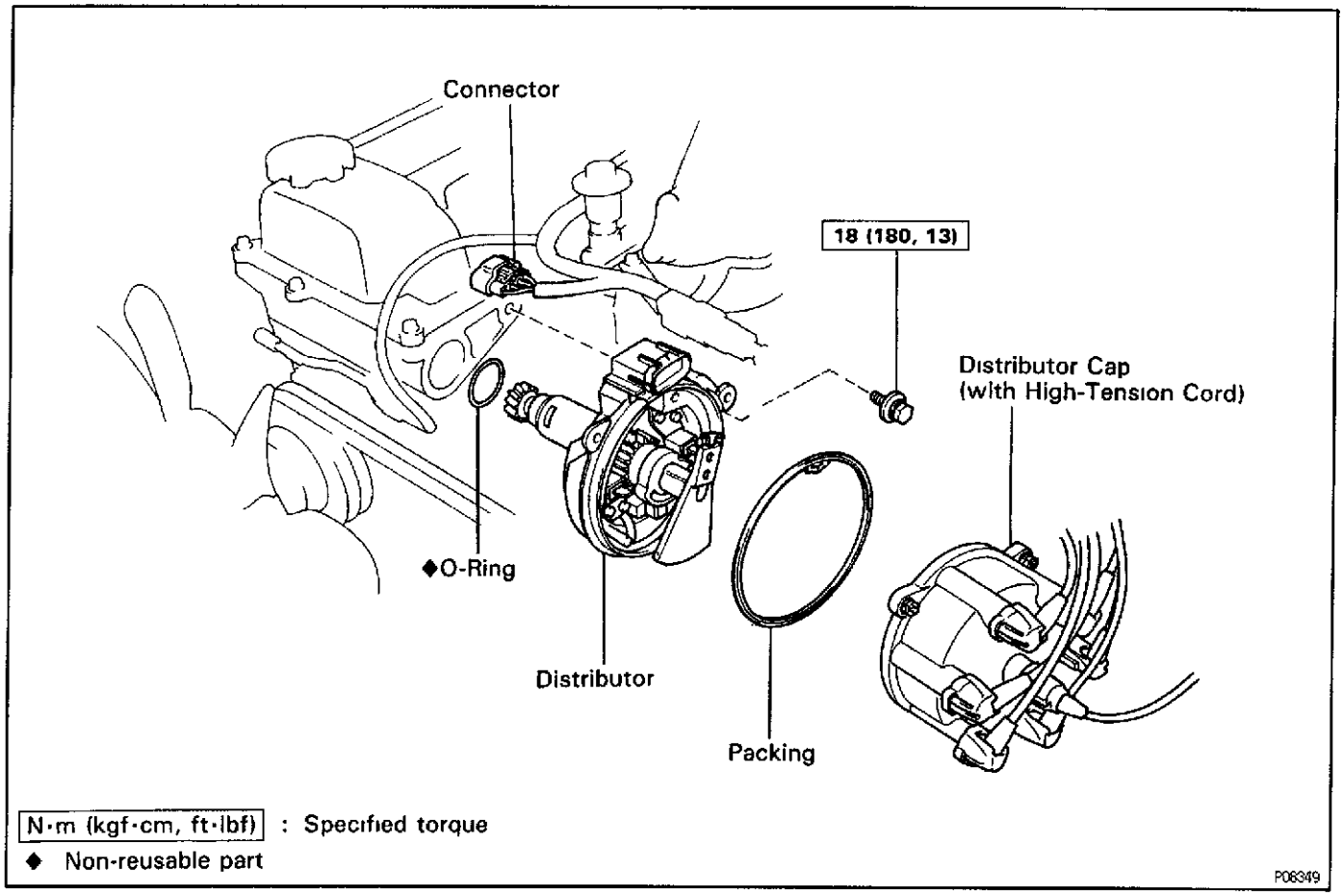
IGNITER INSPECTION

(See procedure Spark Test on page IG-7)

DISTRIBUTOR

IG039-02

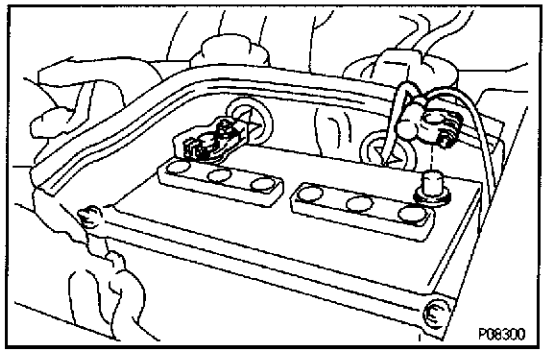
COMPONENTS FOR REMOVAL AND INSTALLATION

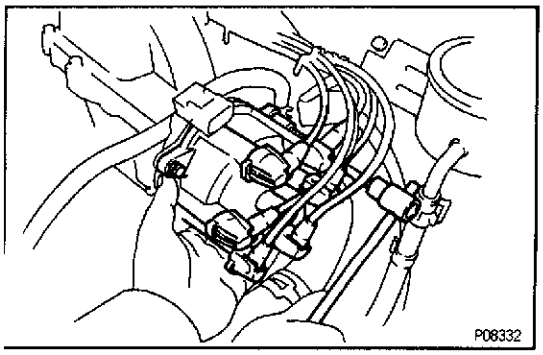


IG05K-02

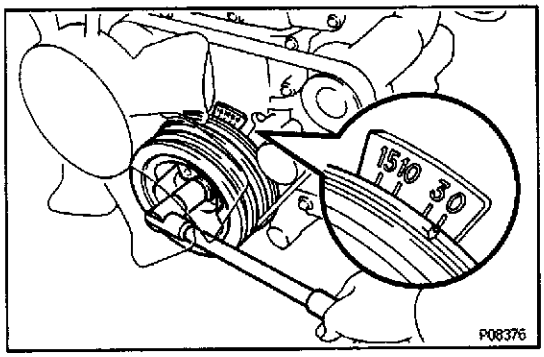
DISTRIBUTOR REMOVAL

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY
2. DISCONNECT DISTRIBUTOR CONNECTOR



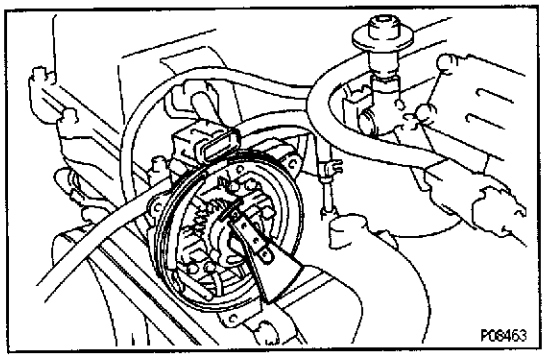


3. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS

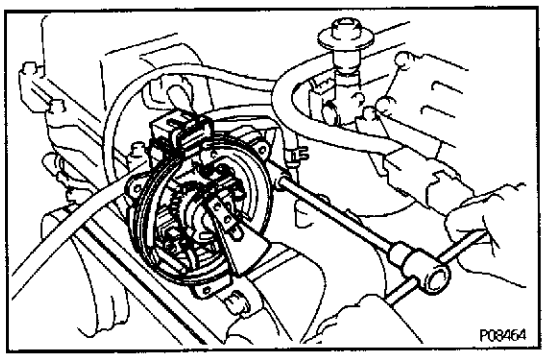


4. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley until the timing mark is aligned with "0" mark on the timing chain cover



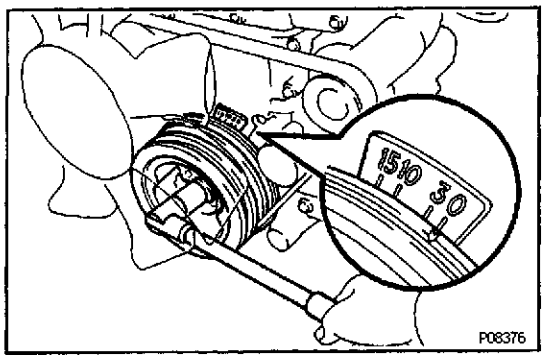
(b) Check that the distributor rotor direction is as shown
If not, turn the crankshaft pulley one complete revolution



5. REMOVE DISTRIBUTOR

(a) Remove the hold-down bolt and pull out the distributor

(b) Remove the O-ring from the distributor housing



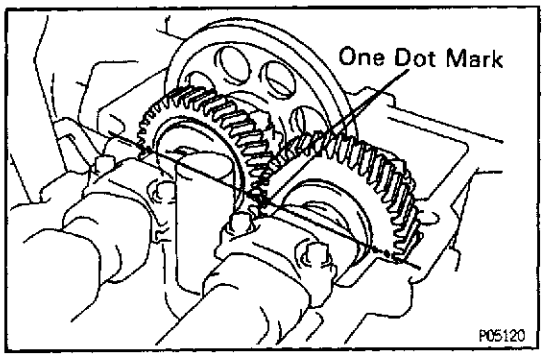
DISTRIBUTOR INSTALLATION

(See Components for Removal and Installation)

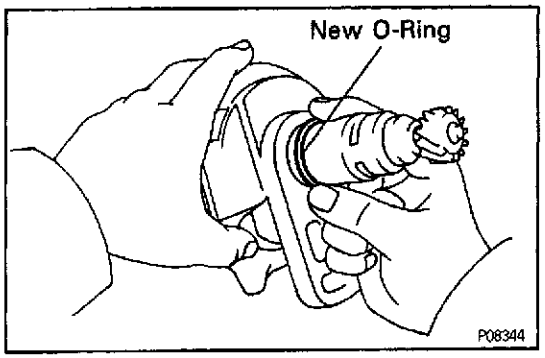
1. CHECK No.1 CYLINDER TO TDC/COMPRESSION

If necessary, remove the cylinder head cover, and check the following conditions

- Turn the crankshaft pulley and align its groove with the timing mark "0" of the timing chain cover

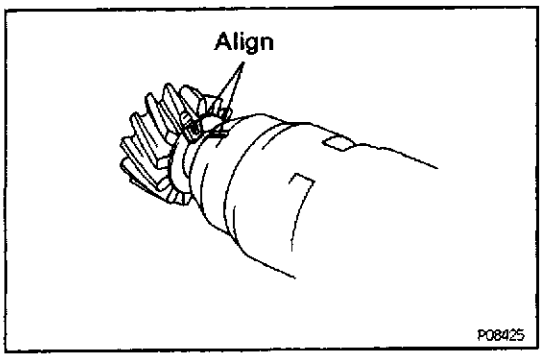


- Verify that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration
  If not, turn the crankshaft 1 revolution (360°) and align the mark as above

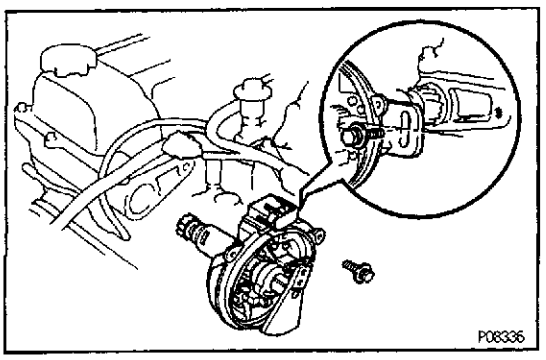


2. INSTALL DISTRIBUTOR

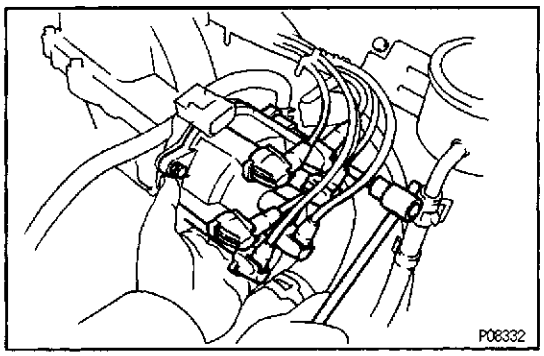
(a) Install a new O-ring to the distributor
HINT Always use a new 0-ring when installing the distributor



(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 0-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



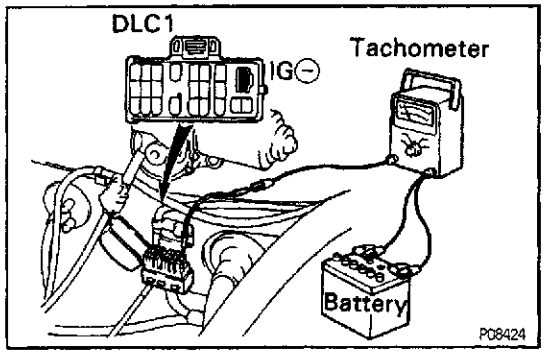
3. INSTALL DISTRIBUTOR CAP

4. CONNECT DISTRIBUTOR CONNECTOR

5. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY

6. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature



7. CONNECT TACHOMETER AND TIMING LIGHT

Connect the test probe of a tachometer to terminal IG (-) of the DLC

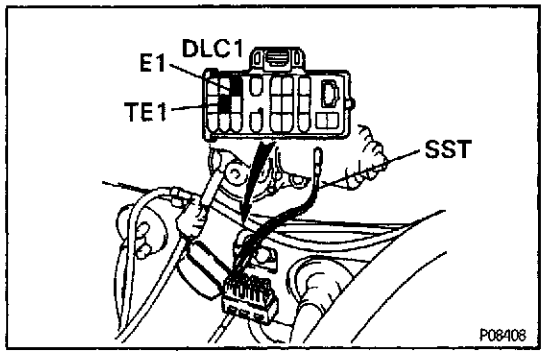
NOTICE:

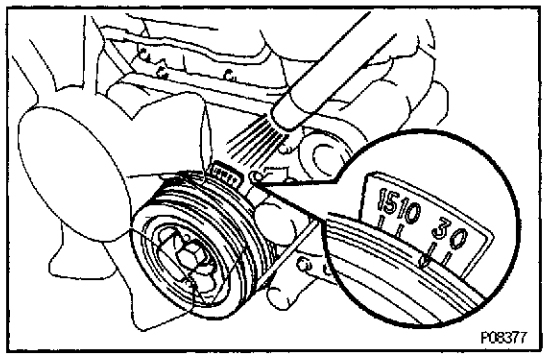
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**

8. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC 1

SST 09843-18020



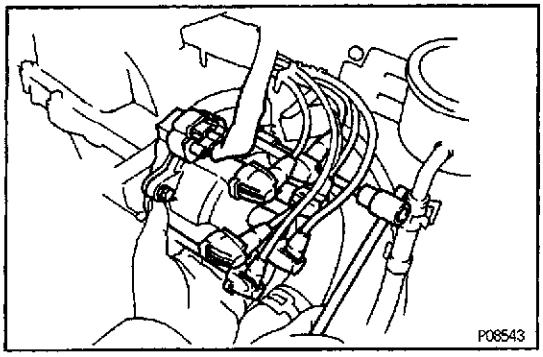


(b) Using a timing light, check the ignition timing

Ignition timing:

3° BTDC @ idle

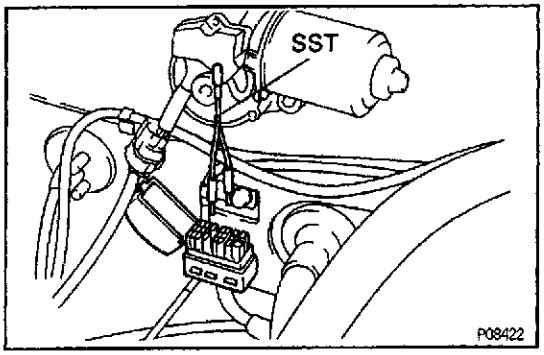
(Transmission in neutral position and A/C OFF)



(c) Loosen the hold-down bolt, and adjust by turning the distributor

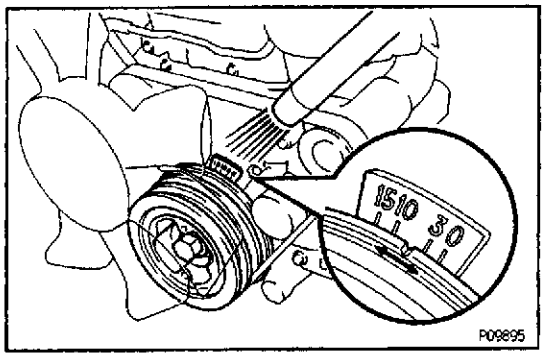
(d) Tighten the hold -down bolt, and recheck the ignition timing

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)



(e) Remove SST from the DLC1

SST 09843-18020



9. 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°

10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

IG05M-01

SERVICE DATA

Ignition timing	w/ Terminals TE1 and E1 connected	3° BTDC @ idle
Firing order	–	1-5-3-6-2-4
High-tension cord	Resistance (Maximum)	25 kΩ per cord
Spark plug	Recommended spark plug ND Recommended spark plug NGK Correct electrode gap	K18R-U 6KR5EYA 0 8 mm (0 031 in)
Ignition coil	Primary coil resistance (Cold) Primary coil resistance (Hot) Secondary coil resistance (Cold) Secondary coil resistance (Hot)	0 36 - 0 55Ω 0 45 - 0 65Ω 9 0 - 15 4 kΩ 11 4 - 18 1 kΩ
Distributor	Air gap Signal generator (pickup coil) resistance (Cold) G - G(-) G2-G(-) NE -G(-) Signal generator (pickup coil) resistance (Hot) G1- G(-) G2-G(-) NE-G(-)	0 2 - 0 4 mm (0 008 - 0 016 in) 185 - 275Ω 185-275 Ω 185 - 275Ω 240-3250 240-3250 240-325 Ω

TORQUE SPECIFICATIONS

IG017-02

Part tightened	N-m	kgf-cm	ft-lbf
Spark plug x Cylinder head	**20**	200	**14**
Distributor x Cylinder head	**18**	180	**13**

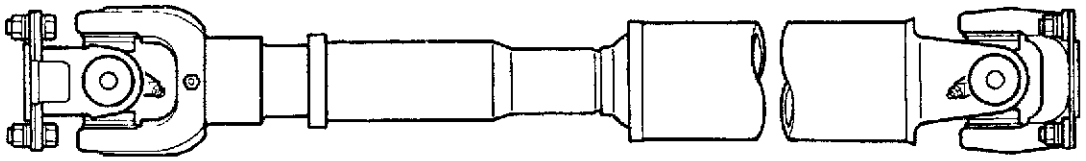
PROPELLER SHAFT

DESCRIPTION

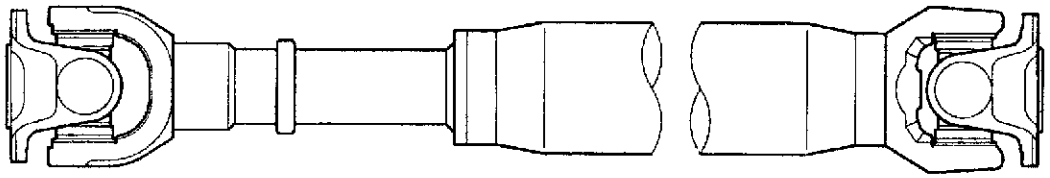
The propeller shafts are the 2-joint type

PR029-02

Front Propeller Shaft



Rear Propeller Shaft



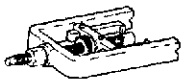
R05260
R07480

Z09227

PREPARATION

SST (SPECIAL SERVICE TOOLS)

PR02A-01

	09332-25010 Universal Joint Bearing Remover & Replacer	

PR02B-01

EQUIPMENT

Torque wrench	

PRECAUTION

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation

TROUBLESHOOTING

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

See Page / Parts Name / Trouble	Sleeve yoke spline worn	Propeller shaft runout	Propeller shaft imbalance	Sleeve yoke spline stuck	Spider bearing worn or stuck
	PR-7	PR-6	–	PR-7	PR-7
Noise	1				2
Vibration		2	3	1	

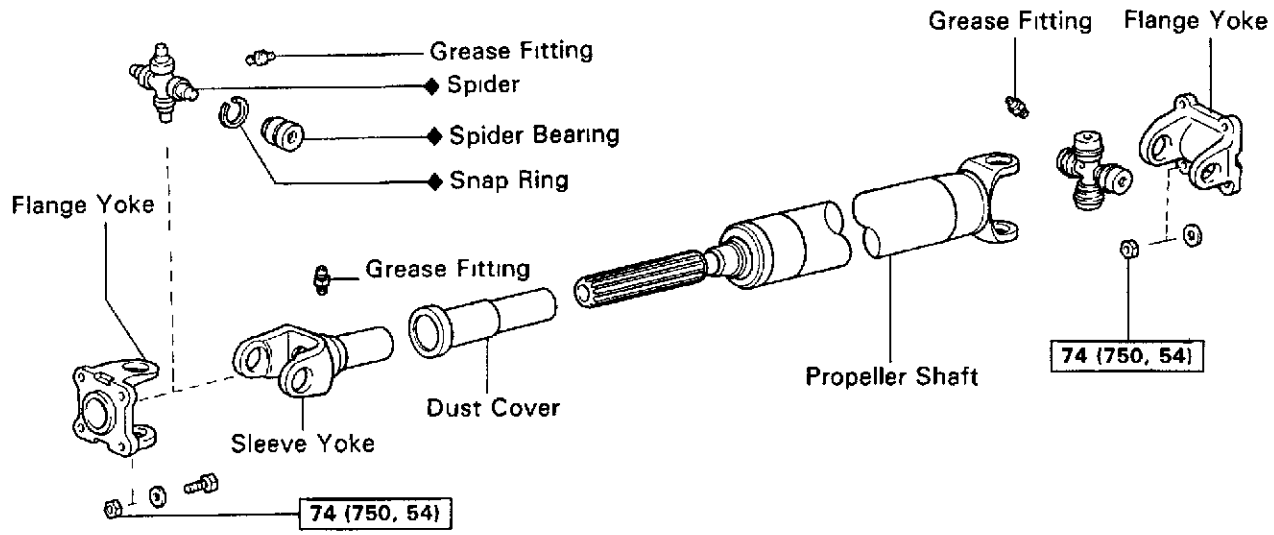
V04652

PROPELLER SHAFT

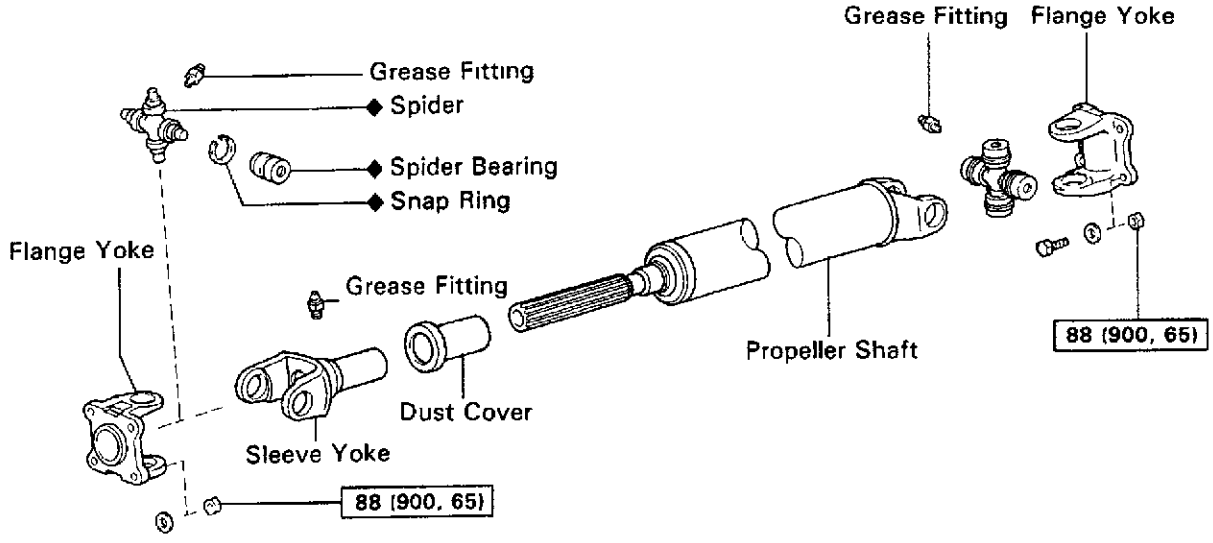
COMPONENTS

PR02C-02

Front Propeller Shaft



Rear Propeller Shaft

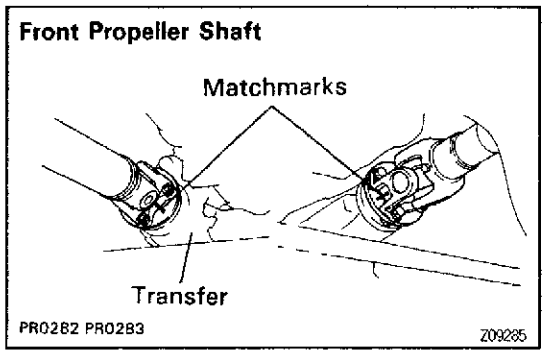


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

R07481
R07482

Z09228



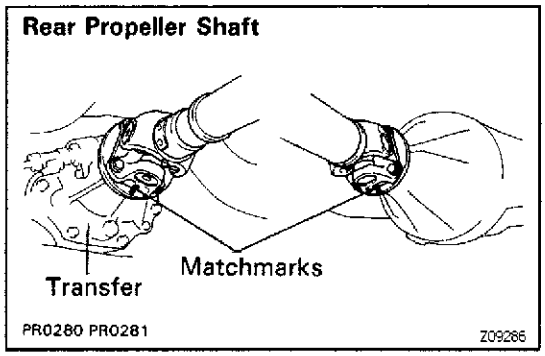
FRONT AND REAR PROPELLER SHAFTS REMOVAL

1. DISCONNECT FRONT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER

(a) Place matchmarks on the flanges
(b) Remove the 4 nuts

2. DISCONNECT FRONT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Place matchmarks on the flanges
(b) Remove the 4 bolts and nuts
(c) Remove the front propeller shaft



3. DISCONNECT REAR PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER

(a) Place matchmarks on the flanges
(b) Remove the 4 nuts

4. DISCONNECT REAR PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Place matchmarks on the flanges
(b) Remove the 4 bolts and nuts
(c) Remove the rear propeller shaft

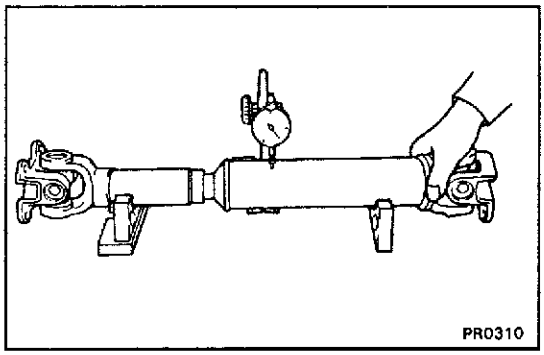
PR03E-01

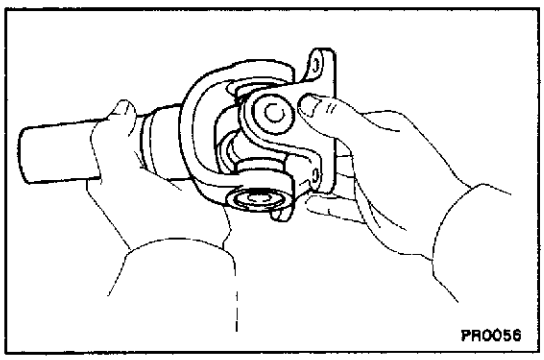
PROPELLER SHAFT INSPECTION

1. INSPECT FRONT AND REAR PROPELLER SHAFTS FOR DAMAGE OR RUNOUT

If shaft runout is greater than maximum, replace the shaft

Maximum runout:
0.8 mm (0.031 in.)



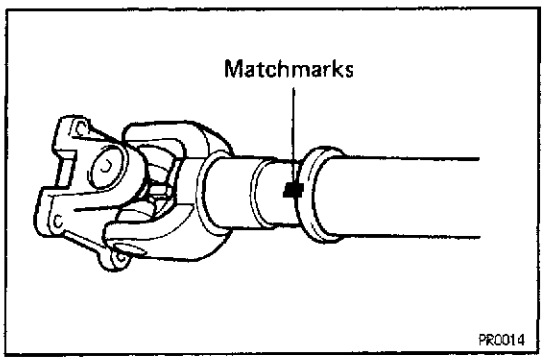


2. INSPECT SPIDER BEARING

(a) Inspect the spider bearings for wear or damage
(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly

Bearing axial play:
Less than 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing



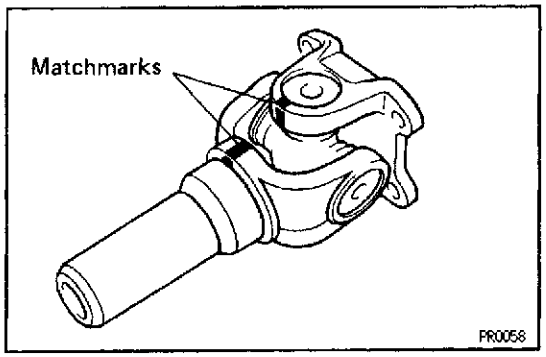
PROPELLER SHAFT DISASSEMBLY

PR02F-02

1. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT

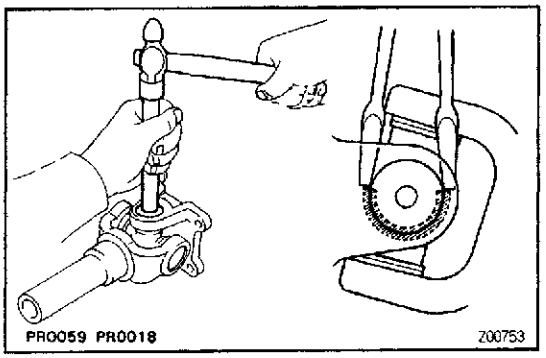
(a) Place matchmarks on the sleeve yoke and shaft

(b) Pull out the sleeve yoke from the shaft



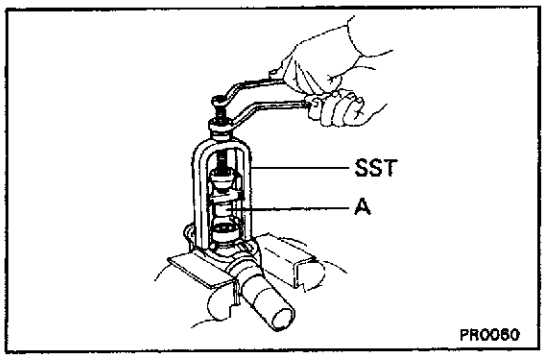
2. REMOVE SPIDER BEARING

(a) Place matchmarks on the sleeve yoke and flange



(b) Slightly tap in the bearing outer races

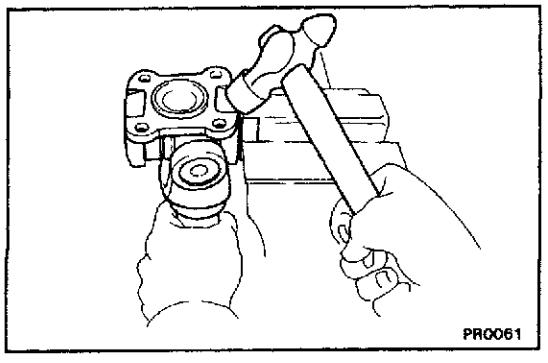
(c) Using 2 screwdrivers, remove the 4 snap rings from the grooves



(d) Using SST, push out the bearing from the flange

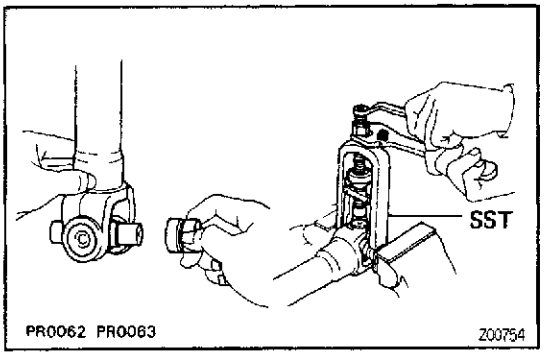
SST 09332 - 25010

HINT Sufficiently raise the part indicated by A so that it does not come into contact with the bearing

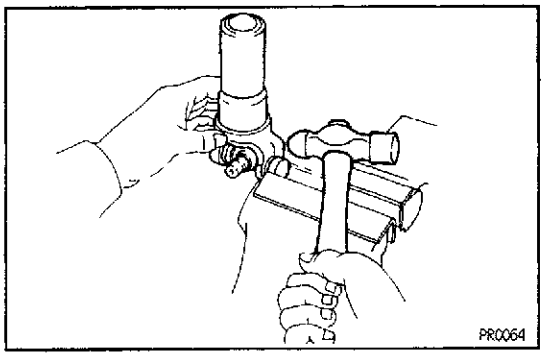


(e) Clamp the bearing outer race in a vise and tap off the flange with a hammer

HINT Remove the bearing on the opposite side by the same procedure



(f) Install the 2 removed bearing outer races to the spider
(g) Using SST, push out the bearing from the yoke
SST 09332-25010



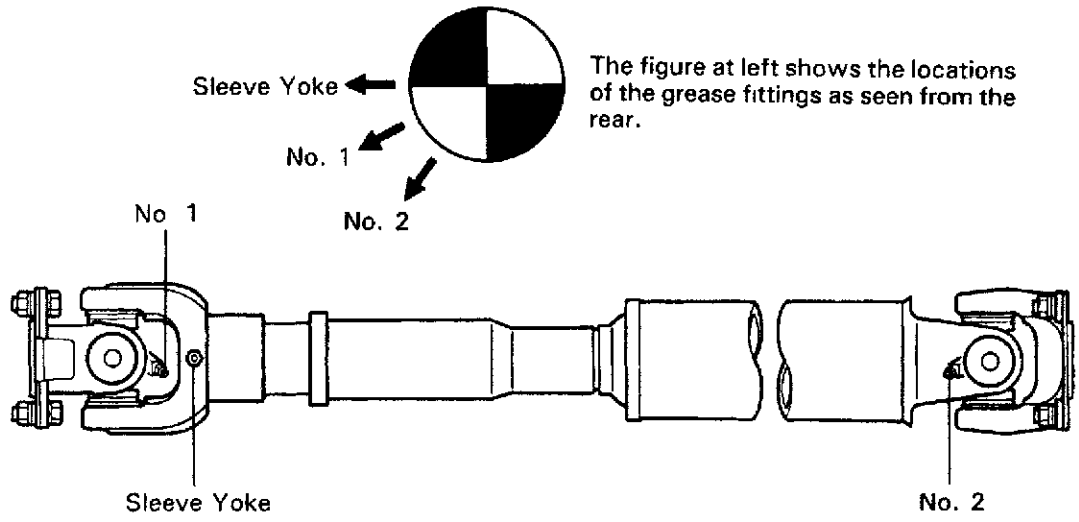
(h) Clamp the outer bearing race in a vise and tap off the yoke with a hammer
HINT Remove the bearing on the opposite side in the same procedure

PR02G-02

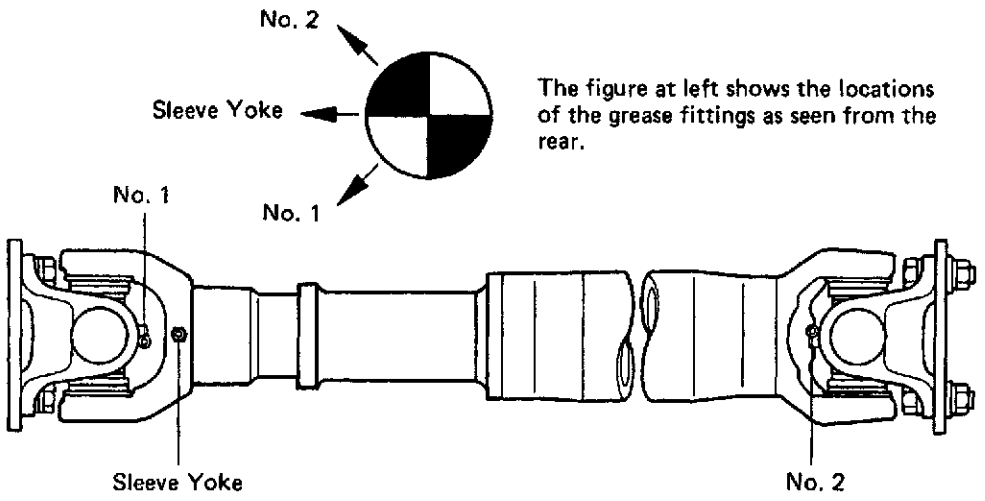
PROPELLER SHAFT ASSEMBLY

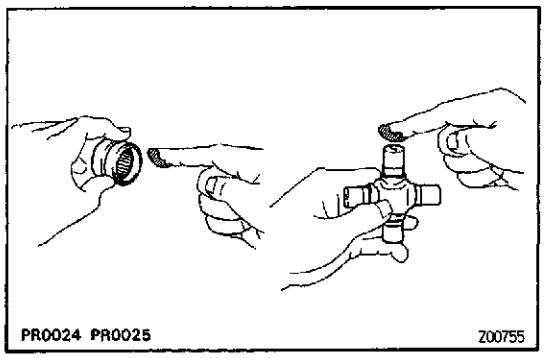
HINT When replacing the spider, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration

SPIDER GREASE FITTING ASSEMBLY DIRECTION
Front Propeller Shaft



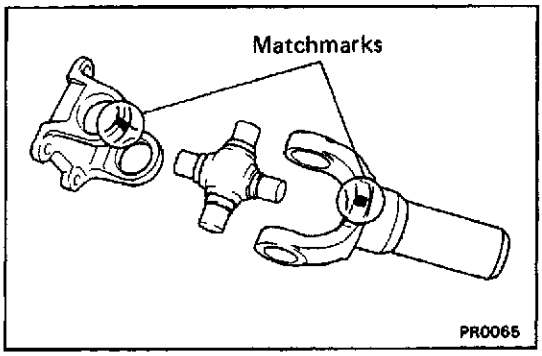
SPIDER GREASE FITTING ASSEMBLY DIRECTION
Rear Propeller Shaft



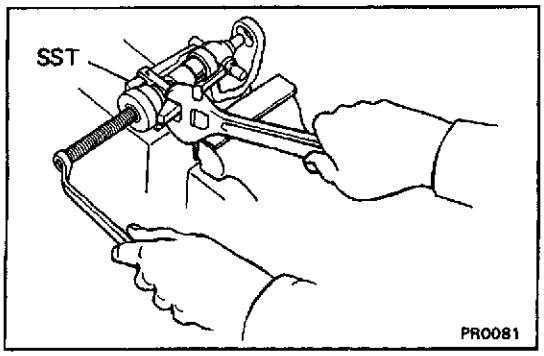


1. INSTALL SPIDER BEARING

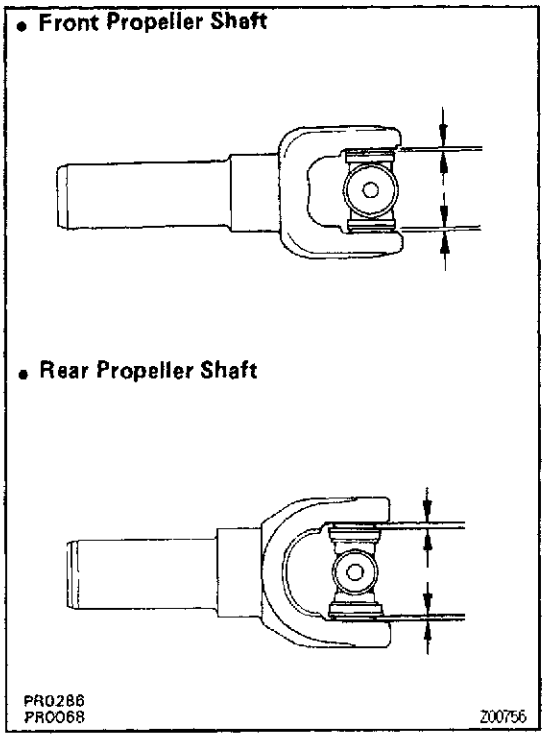
(a) Apply MP grease to the a new spider and bearings
HINT Be careful not to apply too much grease



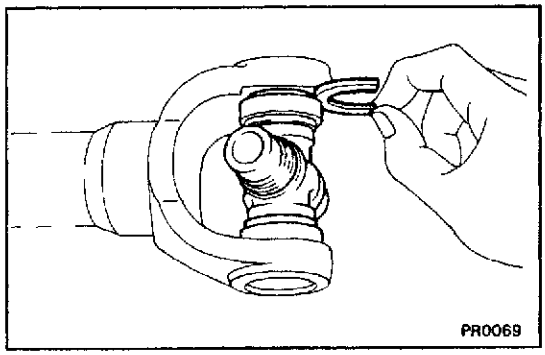
(b) Align the matchmarks on the yoke and flange



(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



(f) 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

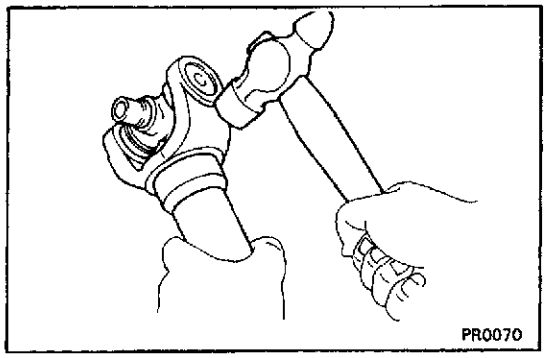
Thickness of snap ring

Front Propeller Shaft

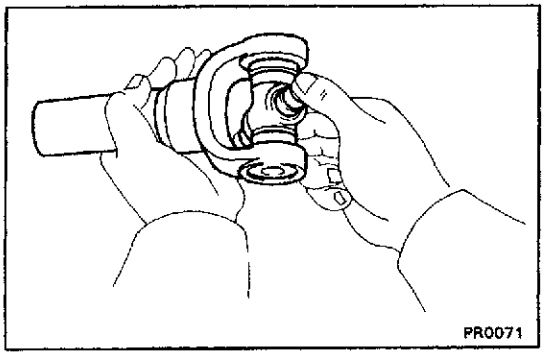
Color	Mark	Thickness mm (in)
–	1	2 100-2 150 (0 0827-0 0846)
–	2	2 15o-2 2oo (o o846-o o866)
–	3	2 200-2 250 (0 0866-0 0886)
Brown	–	2 250-2 300 (0 0886-0 0906)
Blue	–	2 300-2 350 (0 0906-0 0925)
–	6	2 350-2 400 (0 0925-0 0945)
–	7	2 400-2 450 (0 0945-0 0965)
–	8	2 450-2 500 (0 0965-0 0984)

Rear Propeller Shaft

Color	Thickness mm (in)
–	2 00 (0 0787)
Brown	2 03 (0 0799)
Blue	2 06 (0 0811)
–	2 09 (0 0823)



(g) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring

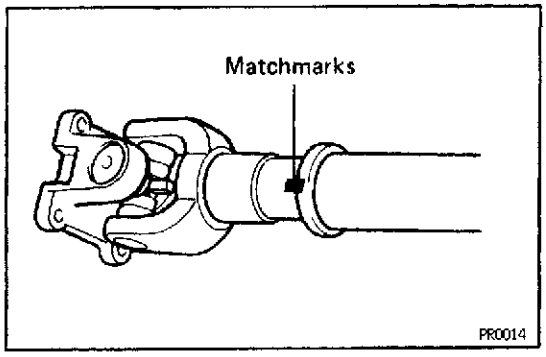


(h) Check that the spider bearing moves smoothly
(i) Check the spider bearing axial play

Bearing axial play:

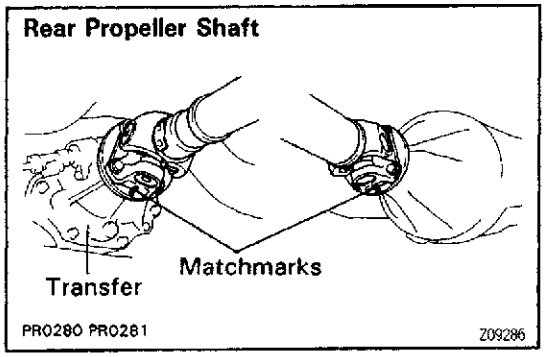
Less than 0.05 mm (0.002a in.)

HINT Install a new spider bearing on the flange side in the procedure described above



2. 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



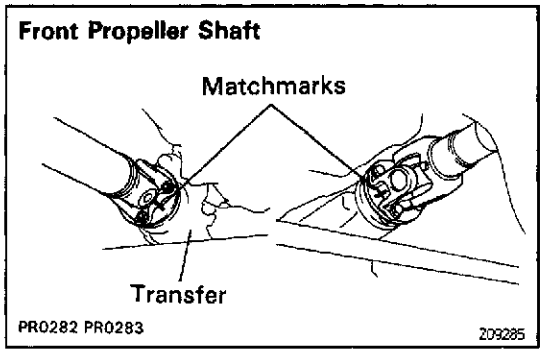
REAR AND FRONT PROPELLER SHAFTS INSTALLATION

1. INSTALL REAR PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with 4 nuts
(b) Torque the nuts
Torque 88 N-m (900 kgf-cm, 65 ft-lbf)

2. INSTALL REAR PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with 4 bolts and nuts
(b) Torque the bolts and nuts
Torque 88 N-m (900 kgf-cm, 65 ftYbf)



3. INSTALL FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with 4 nuts

(b) Torque the nuts

Torque 74 N-m (750 kgf-cm, 54 ft-lbf)

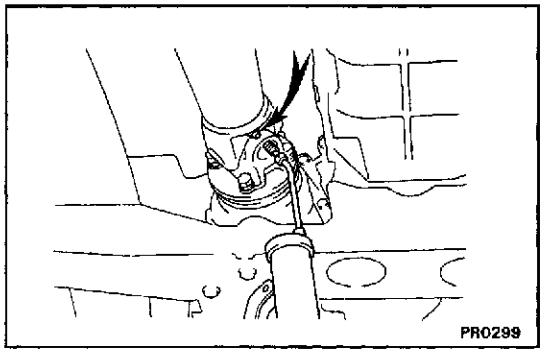
4. INSTALL FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with 4 bolts and nuts

(b) Torque the bolts and nuts

Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)

HINT When installing the washers, put them properly in place



5. APPLY MP GREASE TO GREASE FITTING

With a grease gun, pump MP grease into each fitting until it begins to flow around the oil seal

SERVICE SPECIFICATIONS

PR03J-01

SERVICE DATA

Propeller shaft runout		Limit	0 8 mm (0 031 in)
Spider bearing axial play			Less than 0 05 mm (0 0020 in)
Snap ring thickness	Mark	Color	
Front propeller shaft	**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 0908 - 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	–	–	2 00 mm (0 0787 in)
	–	Brown	2 03 m m (0 0799 in)
	–	Blue	2 06 mm (0 0811 in)
	–	–	2 09 mm (0 0823 in)

TORQUE SPECIFICATIONS

PR02K-01

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**

WHEEL ALIGNMENT

GENERAL INSPECTION

6A19C-01

1. INSPECT TIRE

(a) Check the tires for wear and for the proper inflation pressure

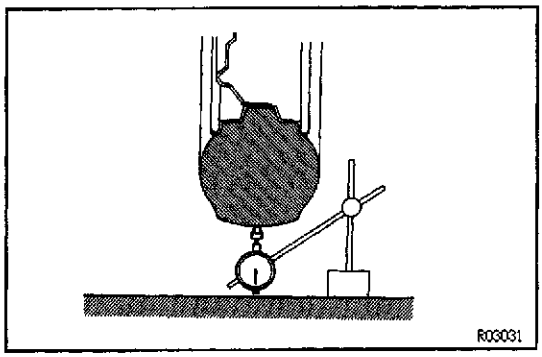
Cold tire inflation pressure:

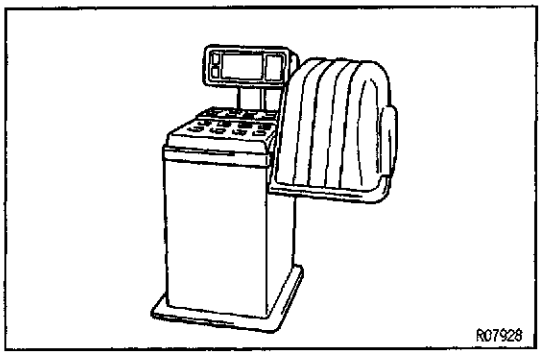
See page SA-167

(b) Check the tire runout

Tire runout:

3.0 mm (0.118 in.) or less





2. 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

3. CHECK WHEEL BEARING LOOSENESS

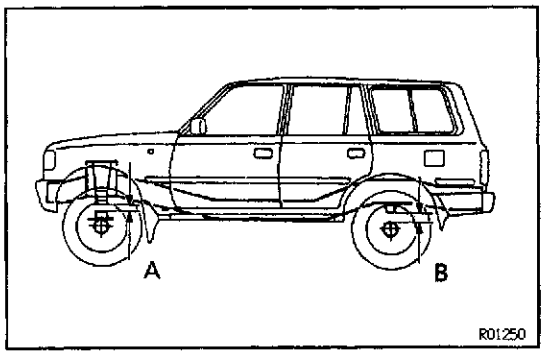
4. CHECK FRONT SUSPENSION FOR LOOSENESS

5. CHECK STEERING LINKAGE FOR LOOSENESS

6. CHECK BALL JOINT FOR EXCESSIVE LOOSENESS

7. CHECK SHOCK ABSORBER WORK PROPERLY

- Check for oil leaks
- Check mounting bushings for wear
- Bounce front and rear of the vehicle



FRONT WHEEL ALIGNMENT

1. MEASURE VEHICLE HEIGHT

8A17C-01

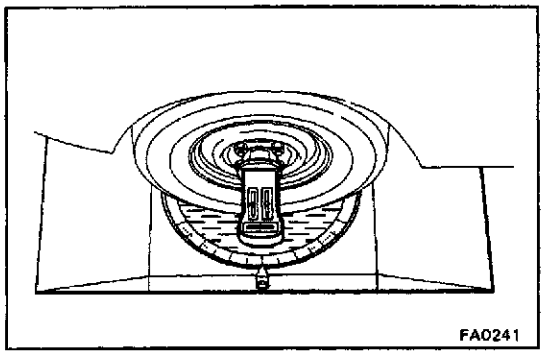
Clearance:

A (Follow spring clearance) 36 mm (1.42 in.)

B (Bumper stopper clearance) 104 mm (4.09 in.)

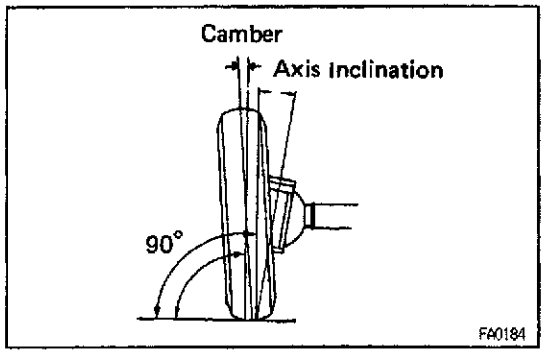
If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down

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 AND STEERING AXIS INCLINATION

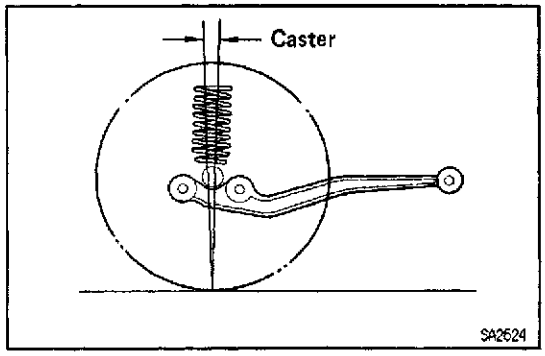
Camber:

1°00' ± 45'

Steering axis inclination:

13°00' ± 45'

If the steering axis inclination is not as specified after camber have been correctly adjusted, recheck the steering knuckle and front wheel for distortion or looseness

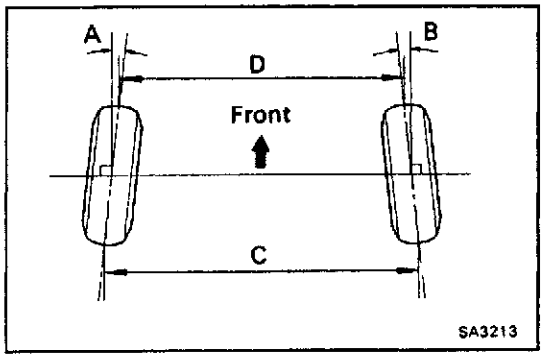


4. INSPECT CASTER

Caster:

3°00' ± 1°

If caster is not as specified, inspect and replace damage or worn parts

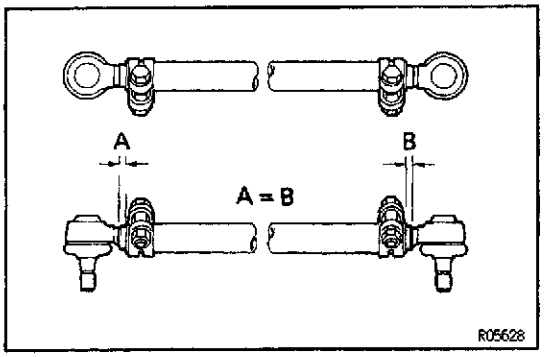


5. INSPECT TOE-IN

Toe-in (total):

2mm ± 2mm(0.16 in.±0.16 in.)

If toe-in is not within specification adjust by the tie rod end



6. ADJUST TOE-IN

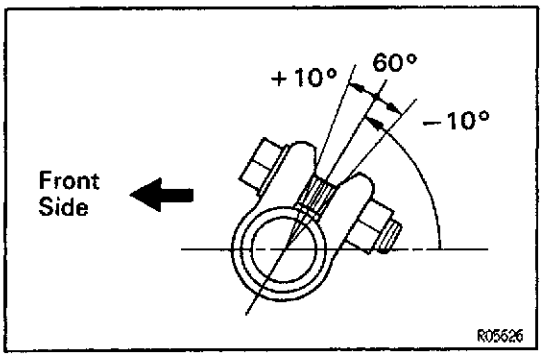
(a) Loosen the clamp bolts and nuts

(b) Adjust toe-in to the correct value by turning the tie rod

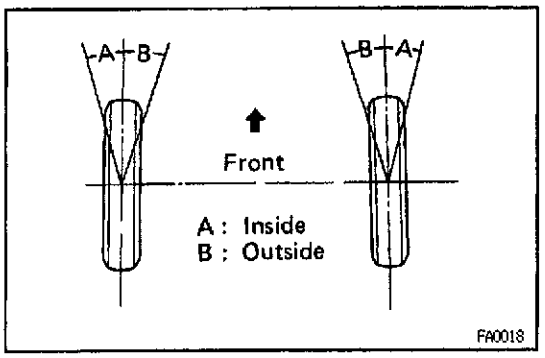
(c) Ensure that the lengths of the tie rod ends are same

(d) Torque the clamp bolts and nuts

Torque: 37 N-m (375 kgf-cm, 27 ft-lbf)



HINT The clamps opening must be positioned at the rear of the tie rod and face within 60° ± 10° from the vertical axis

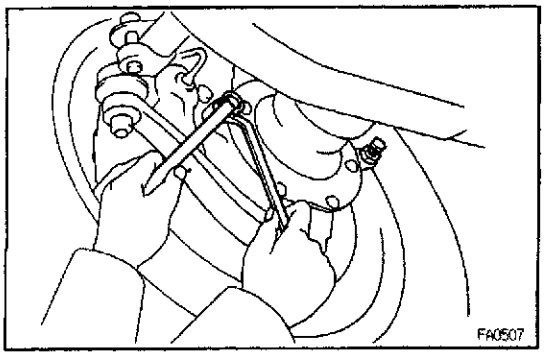


7. INSPECT WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles

Wheel angle:

Inside wheel	32°00 - 35°00
Outside wheel (reference)	31°00



HINT When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose

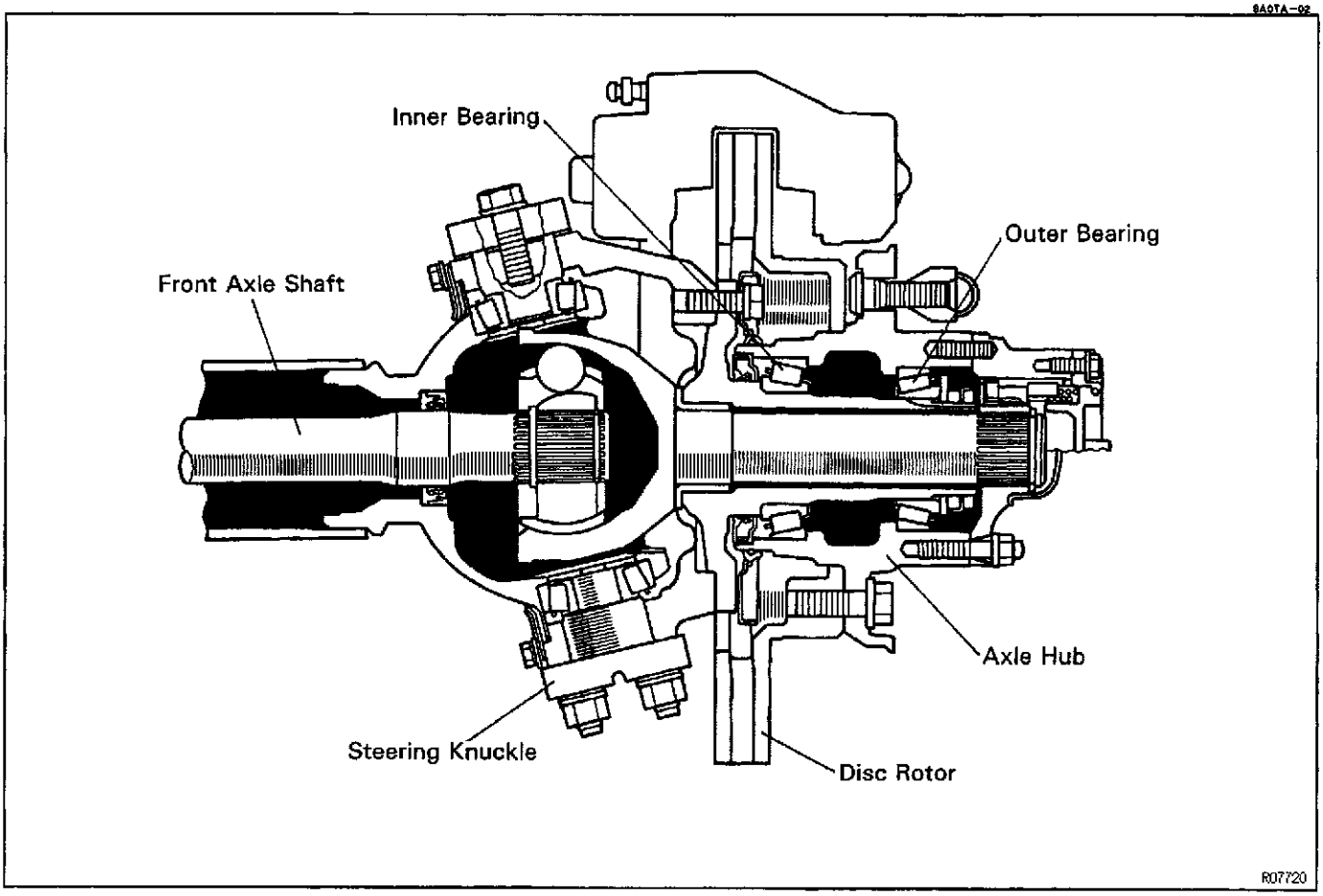
If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts

Torque: 44 N-m (450 k9f-cm, 33 ft-lbf)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts

FRONT AXLE

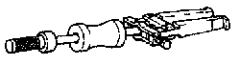
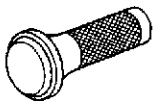
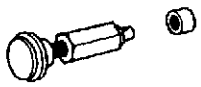
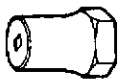
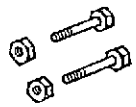
DESCRIPTION



PREPARATION

SST (SPECIAL SERVICE TOOLS)

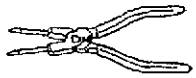
SA0TB-02

	09308-00010 Oil Seal Puller	
	09605-60010 Steering Knuckle Bearing Cup Replacer	
	09606-60020 Steering Knuckle Bearing Remover	
	09607-80020 Front Wheel Adjusting Nut Wrench	
	09608-35014 Axle Hub & Drive Pinion Bearing Tool Set	
	(09608-06020) Handle	
	(09608-06150) Rear Hub Outer Bearing Cup Replacer	
	(09608-06200) Rear Axle Bearing Replacer	
	(09608-06210) Rear Axle Bearing Replacer	
	09611-22012 Tie Rod End Puller	
	09612-65014 Steering Worm Bearing Puller	
	(09612-01010) Claw A	
	(09612-01050) Hanger Pin with Nut	

	09618-60010 Front Axle & Drive Shaft Bearing Replacer	

SA0TC 01

RECOMMENDED TOOLS

	09905-00012 Snap Ring No 1 Expander	
	09905-00013 Snap Ring Pliers	

SA0TD 01

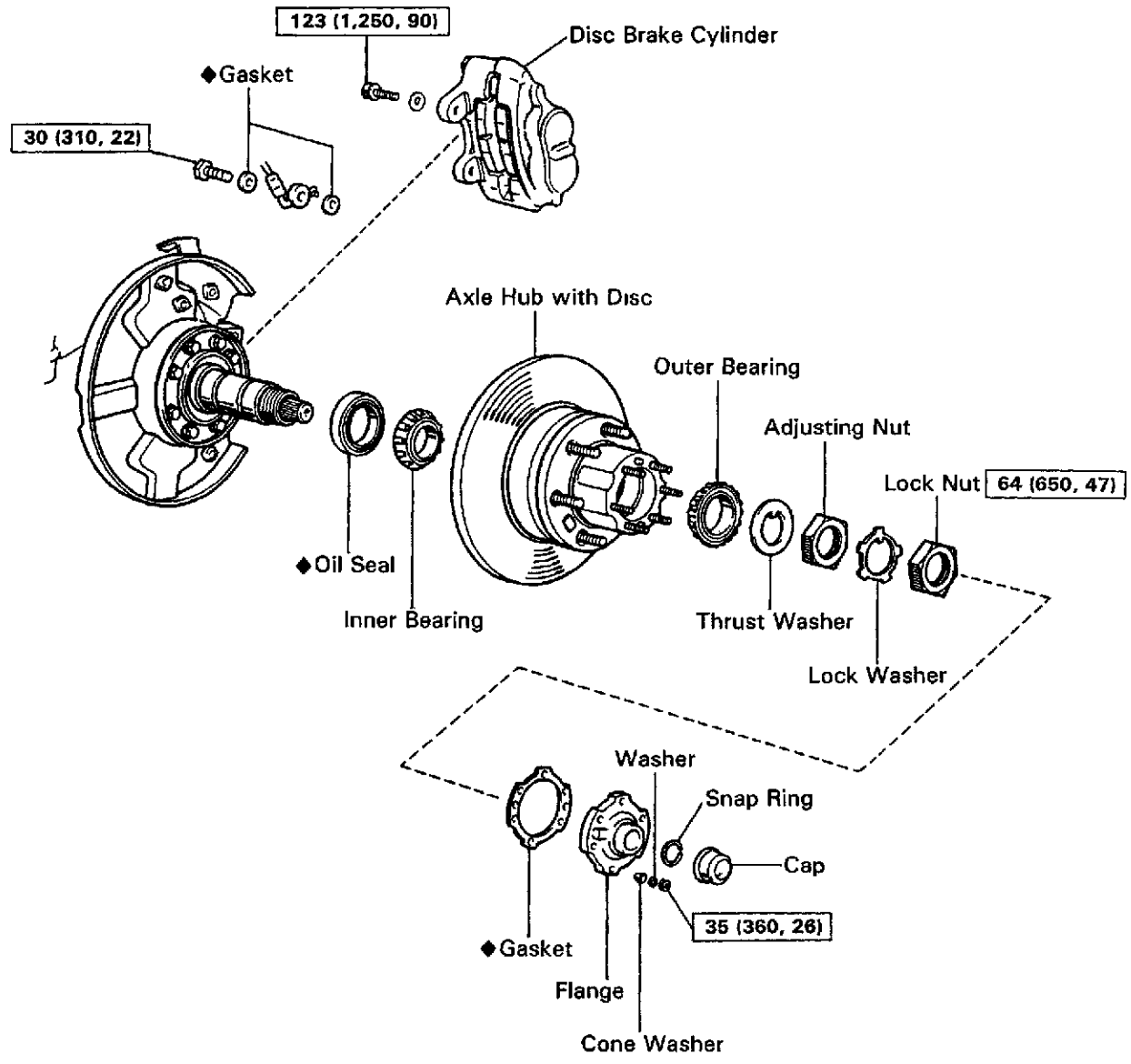
EQUIPMENT

Dial indicator	
Torque wrench	
Spring tension gauge	

FRONT AXLE HUB

SAOTE-01

COMPONENTS



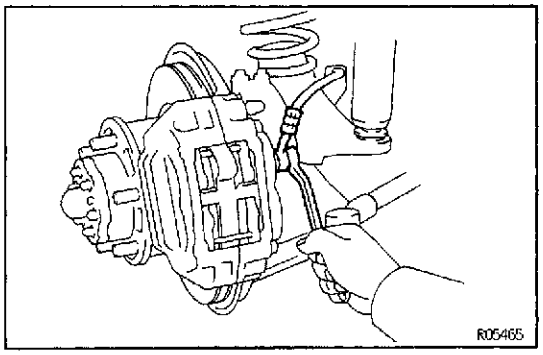
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

R08420

SA0TF-02

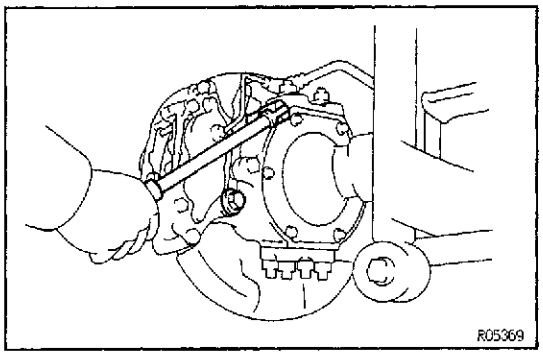
FRONT AXLE HUB REMOVAL



1. REMOVE BRAKE CALIPER

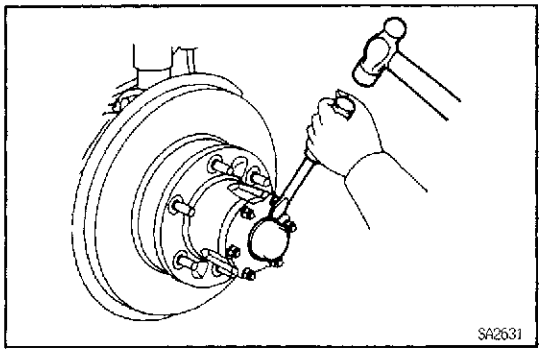
(a) Remove the union bolt and 2 gaskets from the brake caliper, then disconnect the flexible hose from the brake caliper

(b) Use a container to catch the brake fluid as it drains out

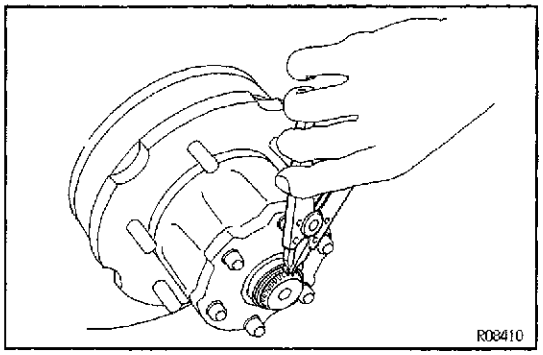


(c) Remove the 2 mounting bolts and remove the caliper

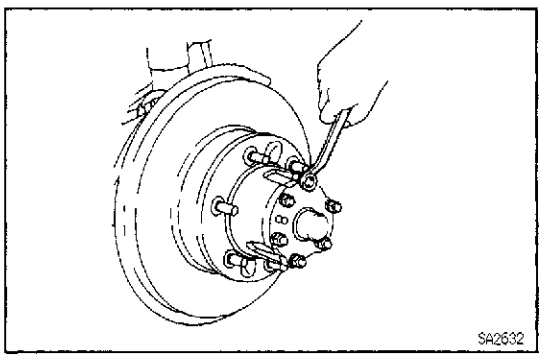
2. REMOVE FLANGE



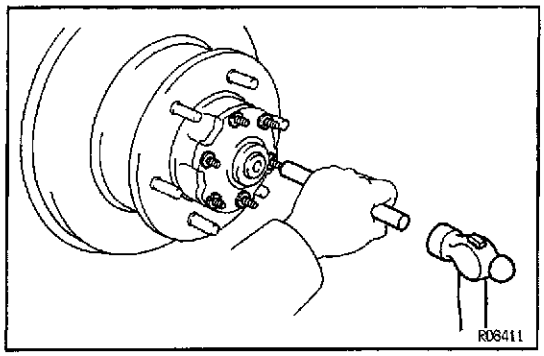
(a) Remove the grease cap from the flange



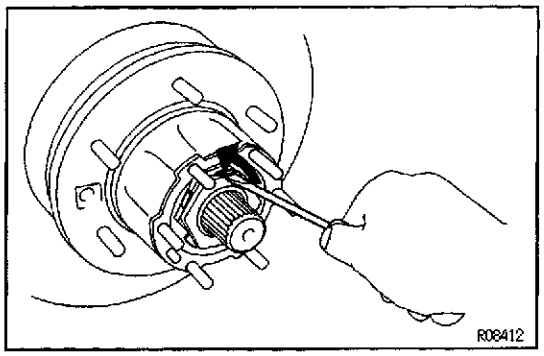
(b) Using a snap ring expander, remove the snap ring



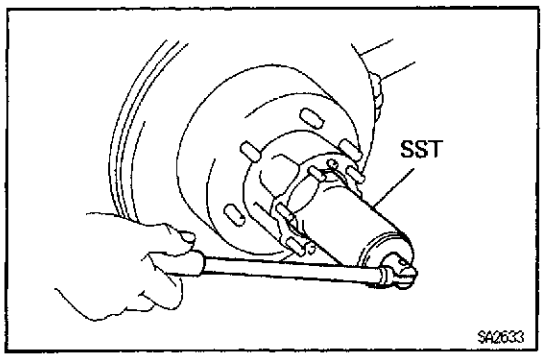
(c) Remove the 6 mounting nuts



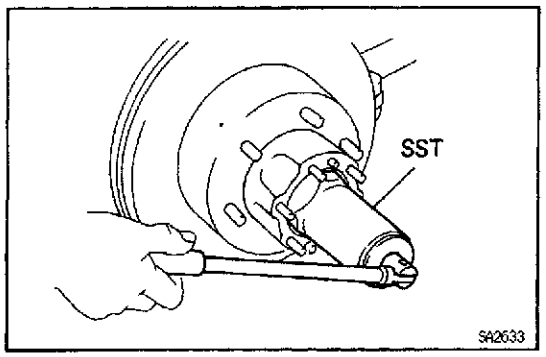
(d) Using a brass bar and hammer, tap on the bolt heads and remove the 6 cone washers
(e) Remove the flange



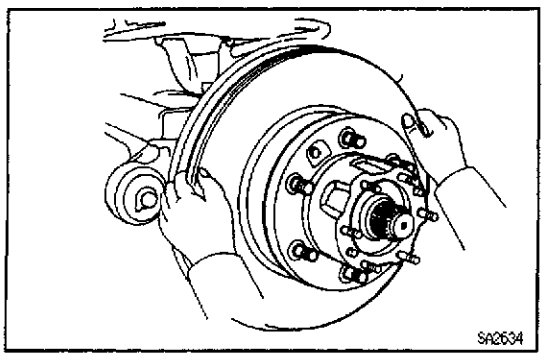
3. REMOVE AXLE HUB WITH DISC
(a) Using a screwdriver, release the lock washer



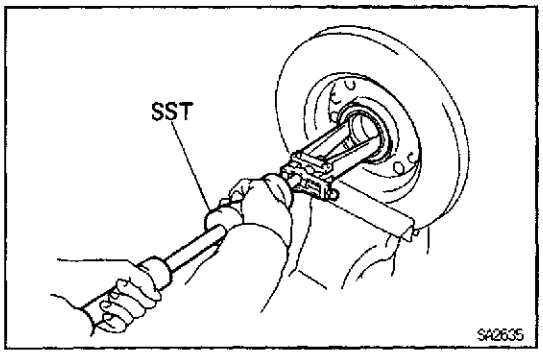
(b) Using SST, remove the lock nut
SST 09607-60020
(c) Remove the lock washer



(d) Using SST, remove the adjusting nut
SST 09607-60020



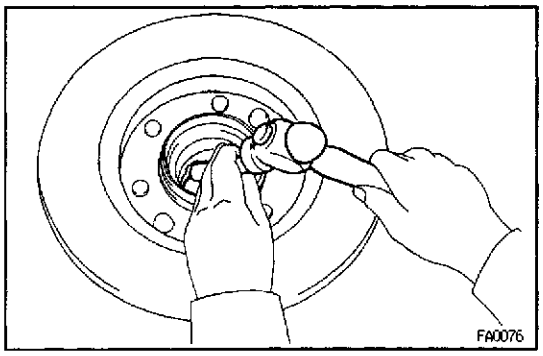
(e) Remove the hub and disc together with the outer bearing



4. REMOVE OIL SEAL AND INNER BEARING

(a) Using SST, remove the oil seal
SST 09308-00010

(b) Remove the inner bearing from the hub



5A188-01

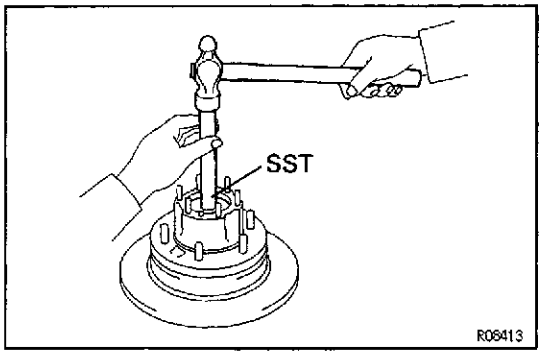
FRONT AXLE HUB INSPECTION AND REPAIR

1. INSPECT BEARINGS

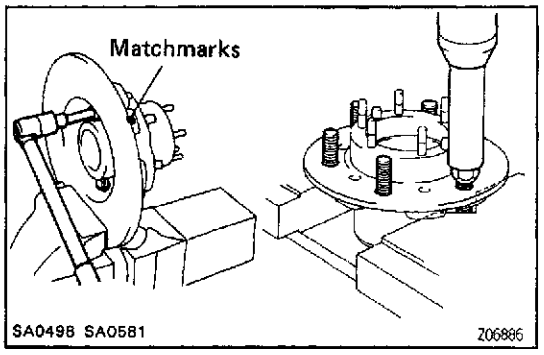
Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race.

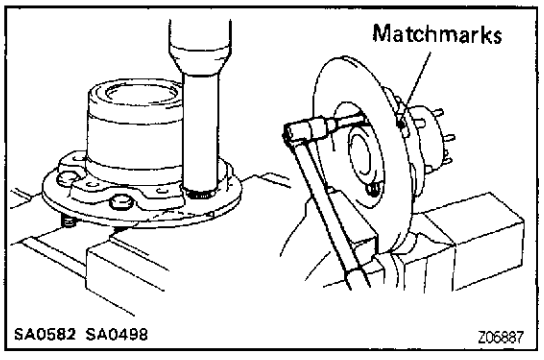


(b) Using SST, carefully drive in a new bearing outer race.
SST 09608-35014,
Outside race (09608-06020, 09608-06200)
Inside race (09608-06020, 09608-06210)



3. REPLACE HUB BOLTS

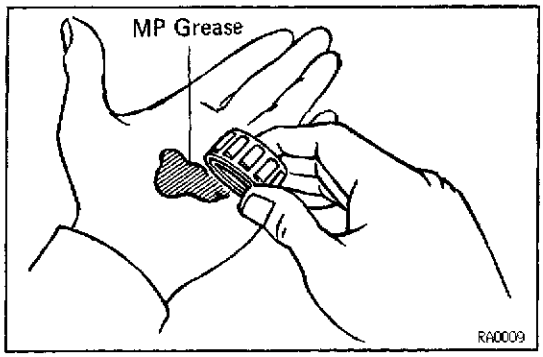
(a) Place matchmarks on the axle hub and rotor disc
(b) Remove the 6 bolts and rotor disc from the axle hub
(c) Install the nut to the hub bolt
(d) Using an extension bar and press, press out the hub bolt



(e) Using an extension bar and press, press in new hub bolt
(f) Align the matchmarks on the axle hub and rotor disc
(9) Install and torque the 6 bolts
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)

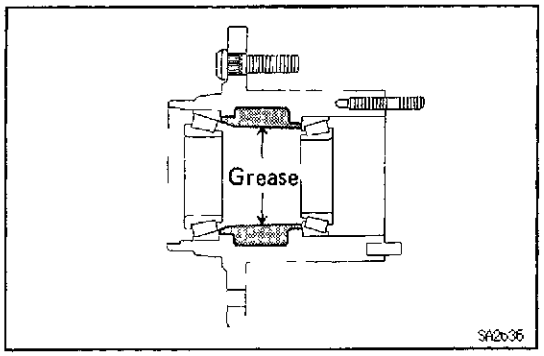
SA0TG-02

FRONT AXLE HUB INSTALLATION

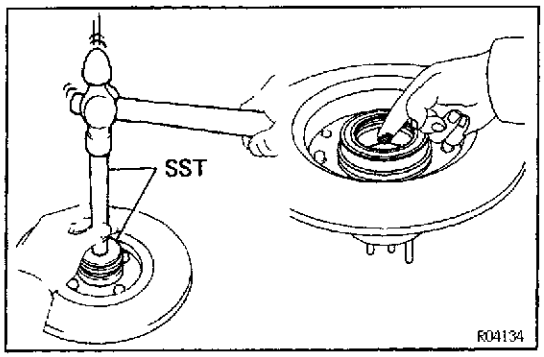


1. PACK BEARINGS WITH MP GREASE

(a) Place MP grease in the palm of your hand
(b) Pack grease into the bearing, continuing until the grease oozes out from the other side
(c) Do the same around the bearing circumference

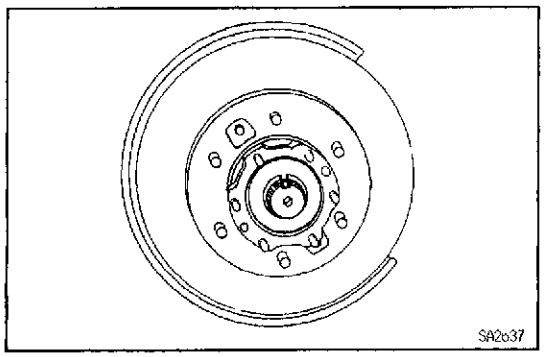


2. COAT INSIDE OF HUB WITH MP GREASE



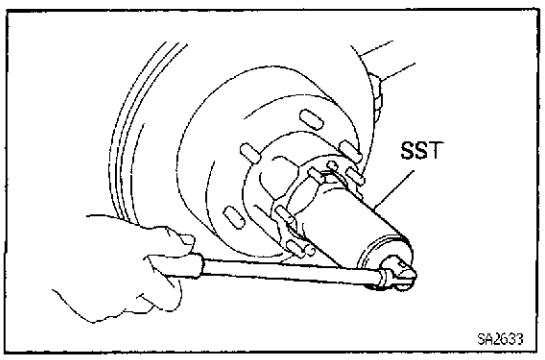
3. INSTALL INNER BEARING AND OIL SEAL

(a) Place the inner bearing into the hub
(b) Using SST, drive in a new oil seal into the hub
SST 09608-35014 (09608-06020, 09608-06150)
(c) Coat the oil seal lip with MP grease



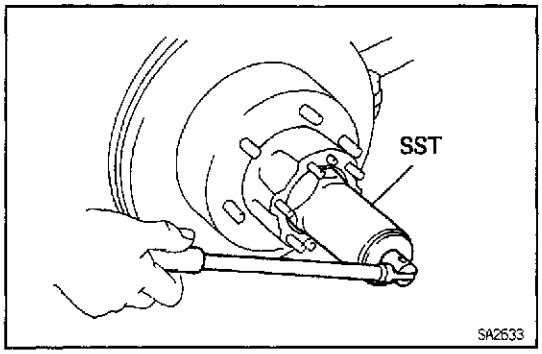
4. INSTALL AXLE HUB TO SPINDLE

(a) Place the axle hub to the spindle
(b) Install the outer bearing
(c) Install the thrust washer

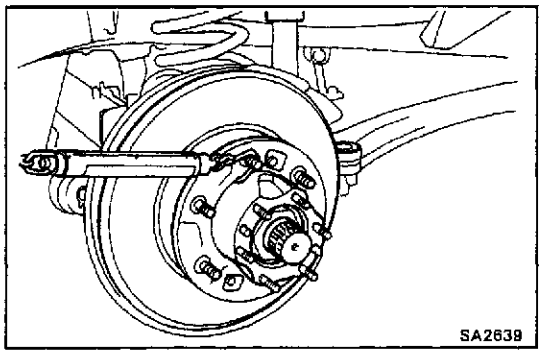


5. ADJUST PRELOAD

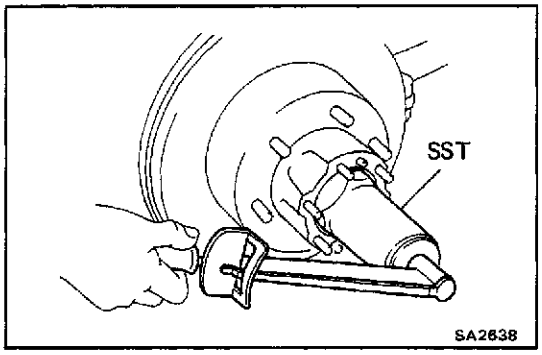
(a) Using SST, torque the adjusting nut
SST 09607-60020
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)
(b) Turn the hub right and left 2 or 3 times



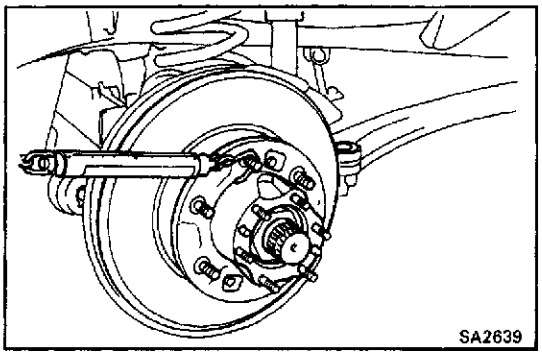
(c) Using SST, torque the adjusting nut
SST 09607-60020
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)
(d) Loosen the nut until it can be turned by hand



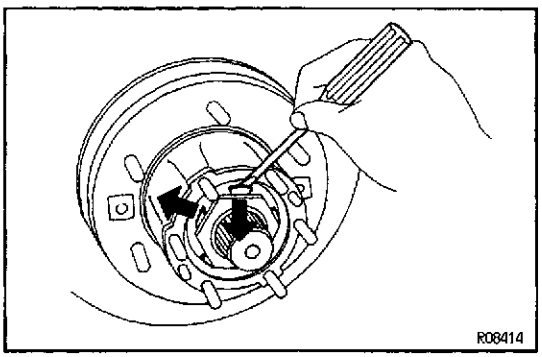
(e) Using a spring tension gauge, measure the preload
Preload (starting) :
28-56 N (2.9-5.7 kgf, 6.4-12.6 lbf)



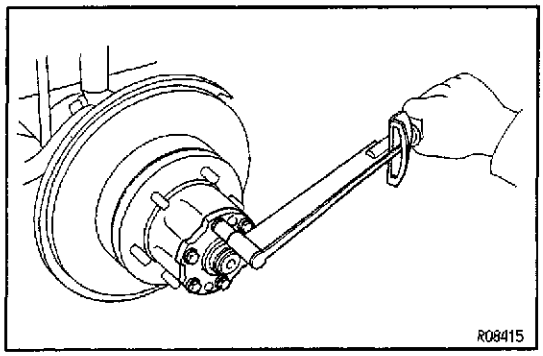
6. INSTALL LOCK WASHER AND LOCK NUT
(a) Install a new lock washer and the lock nut
(b) Using SST, torque the lock nut
SST 09607-60020
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)
(c) Check that the bearing has no play



(d) Using a spring tension gauge, check the preload
Preload (starting) :
28-56 N (2.9-5.7 kgf, 6.4-12.6 l bf)
If not within specification, adjust with the adjusting nut after remove the lock washer and lock nut



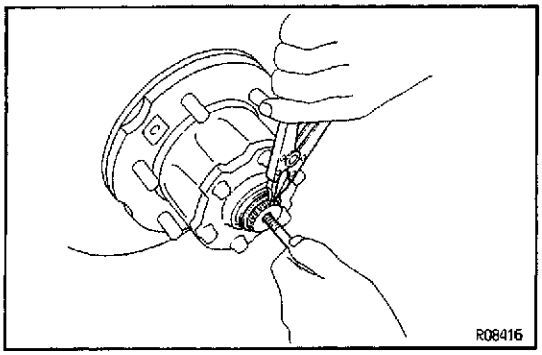
(e) Secure the lock nut by bending one of the lock washer teeth inward and the other lock washer teeth outward



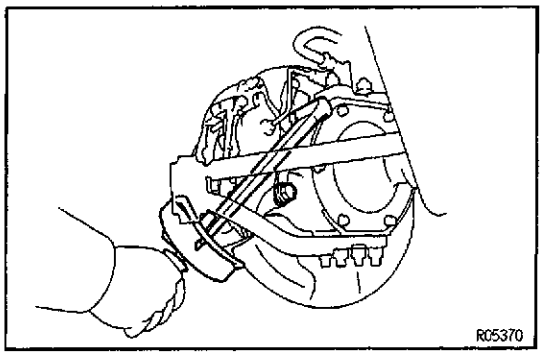
7. INSTALL FLANGE

(a) Place the new gasket in position on the axle hub
(b) Apply MP grease to inner flange splines
(c) Install the flange to the axle hub
(d) Install 6 cone washers, plate washers and nuts
(e) Torque the 6 nuts

Torque: 35 N-m (360 kgf-cm, 26 ft-lbf)



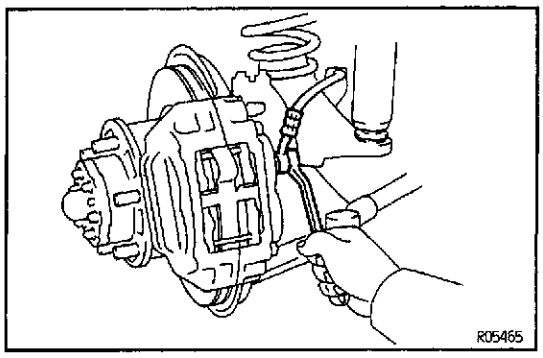
(f) Install the bolt in the axle shaft and pull it out
(g) Using a snap ring expander, install the snap ring
(h) Remove the bolts
(i) Coat inside of the cap with MP grease
(j) Install the cap to the flange



8. INSTALL BRAKE CALIPER

(a) Install the brake caliper
(b) Torque the 2 mounting bolts

Torque: 123 N-m (1,250 kgf-cm, 90 ft-lbf)



(c) Install the flexible hose on the brake caliper with 2 new gaskets

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

HINT Install the flexible hose lock securely in the lock hole in the brake caliper

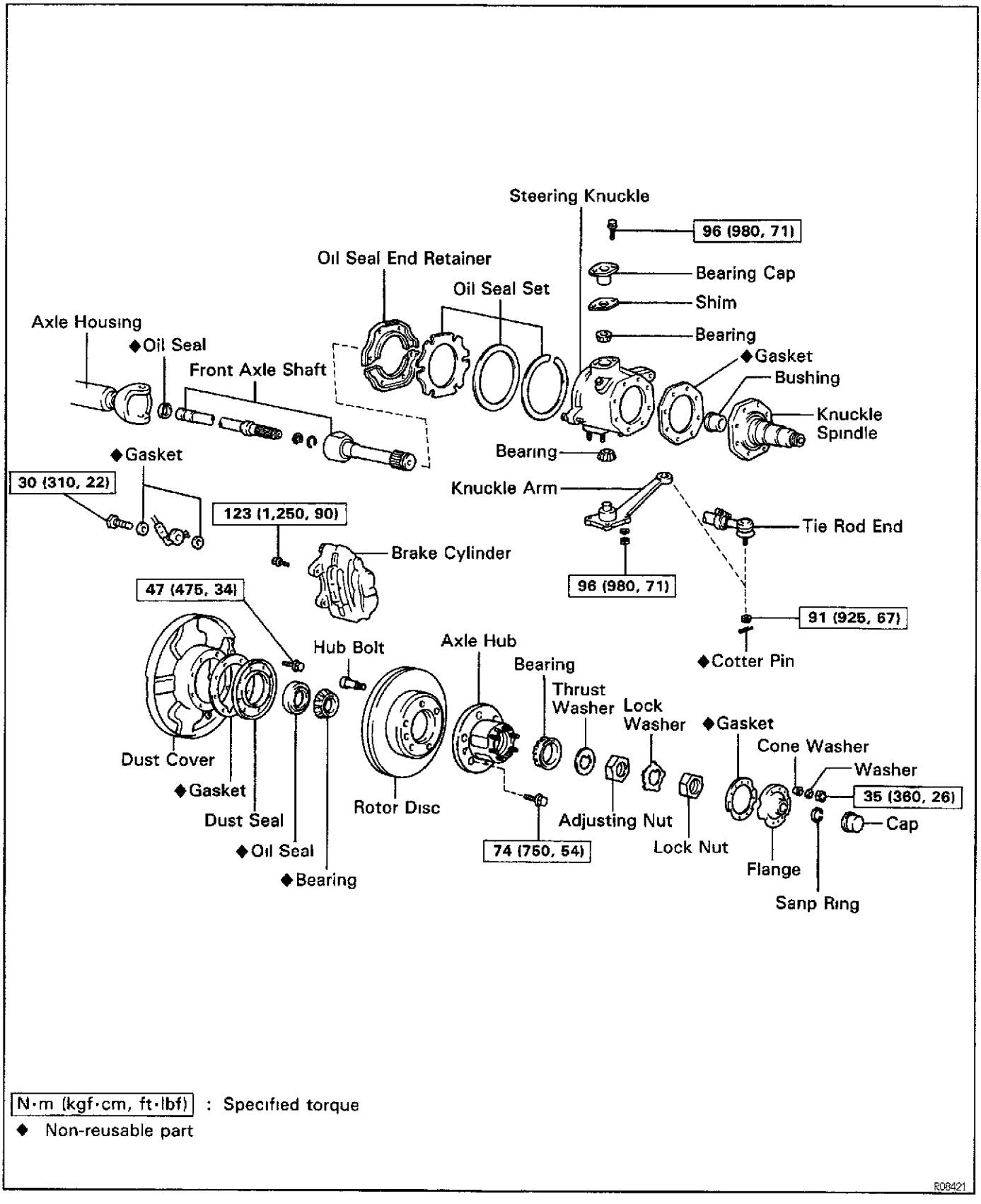
9. BLEED BRAKE LINE

(See page BR-8)

STEERING KNUCKLE AND AXLE SHAFT

SA0TH-01

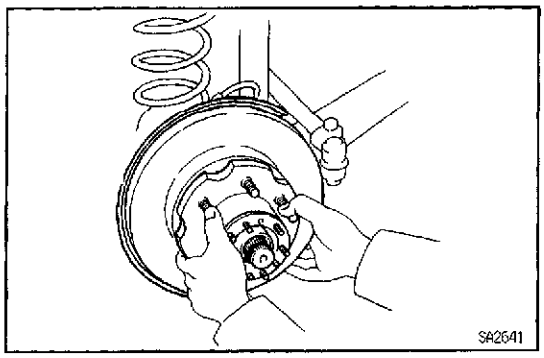
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

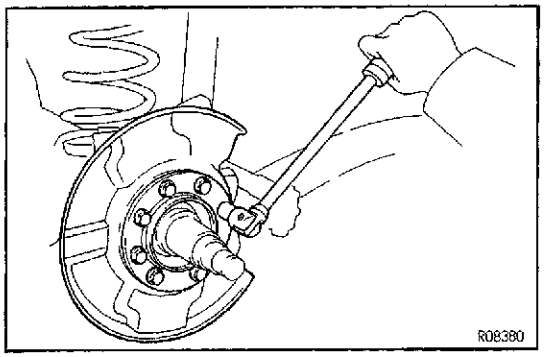
R08421



STEERING KNUCKLE AND AXLE SHAFT REMOVAL

1. REMOVE FRONT AXLE HUB

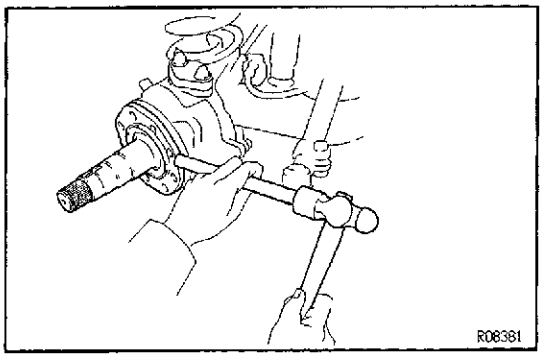
(See page SA-10 **)**



2. REMOVE KNUCKLE SPINDLE MOUNTING BOLTS

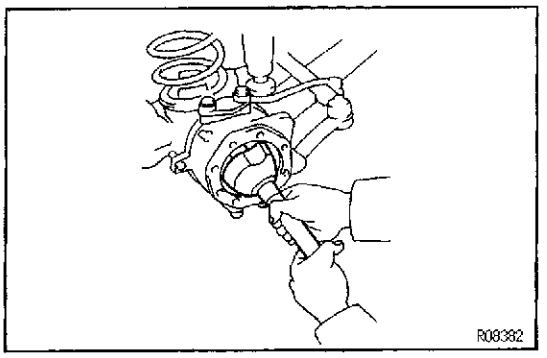
3. REMOVE DUST SEAL AND DUST COVER

Remove the 8 bolts and dust seal, dust cover and gasket



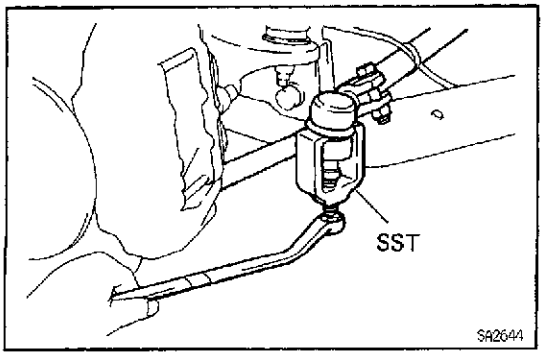
4. REMOVE KNUCKLE SPINDLE

Using a brass bar and hammer, tap the knuckle spindle of the steering knuckle



5. REMOVE AXLE SHAFT

Position one flat part of the outer shaft upward and pull out the axle shaft

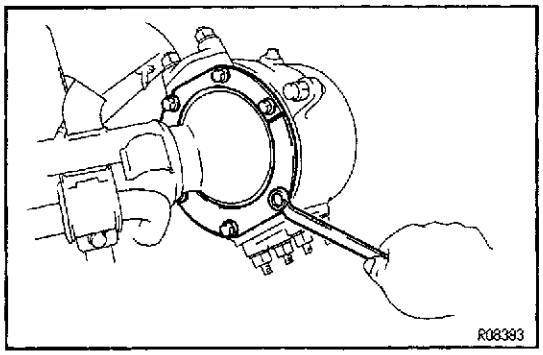


6. DISCONNECT TIE ROD END FROM KNUCKLE ARM

(a) Remove the cotter pin and castle nut

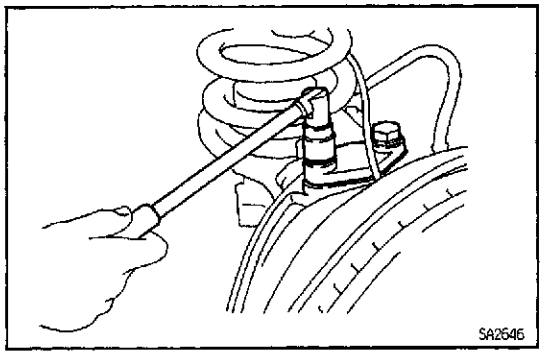
(b) Using SST, disconnect the tie rod end from the knuckle arm

SST 09611 -22012



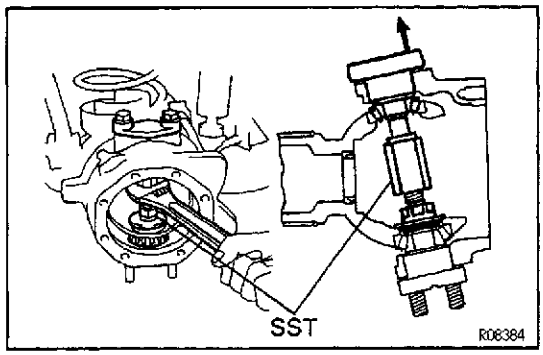
7. REMOVE OIL SEAL END RETAINER

Remove the 6 bolts and the end retainer

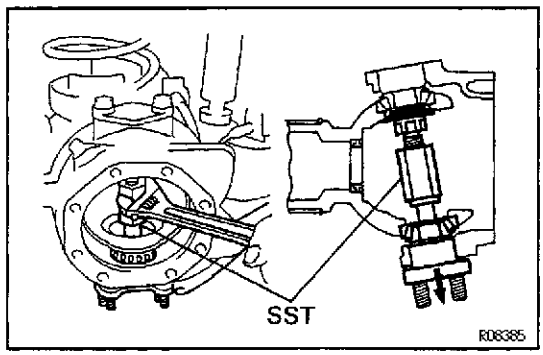


8. REMOVE KNUCKLE ARM AND BEARING CAP

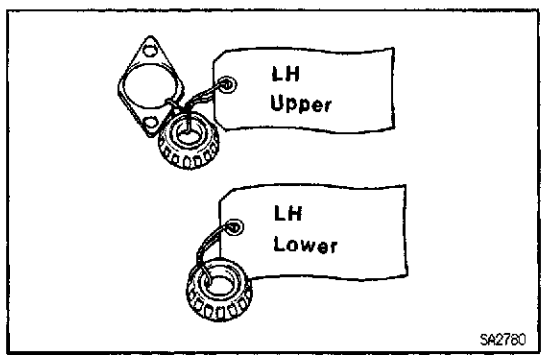
(a) Remove the knuckle and bearing cap mounting nuts



(b) Using SST, push out the knuckle arm and shims from the steering knuckle
SST 09606-60020
HINT Use the SST without a collar



(c) Using SST, push out the bearing cap and shims from the steering knuckle
SST 09606-60020



9. REMOVE STEERING KNUCKLE AND BEARING

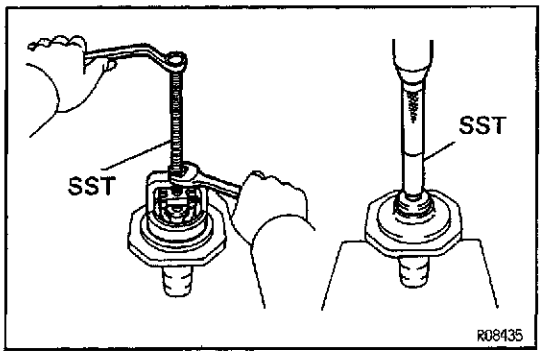
HINT Mark the removed adjusting shims and bearings so as to enable reassembling them to their proper positions

STEERING KNUCKLE AND AXLE SHAFT INSPECTION AND REPLACEMENT

(See page SA-16)

1. INSPECT KNUCKLE SPINDLE

Clean the knuckle spindle and inspect the bushing for wear or damage

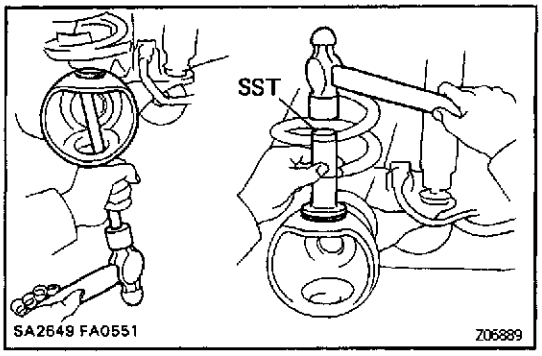


2. REPLACE BUSHING

(a) Using SST, remove the bushing
SST 09612-65014 (09612-01010, 09612-01050)
(b) Using SST, press the new bushing into the spindle
SST 09618-60010

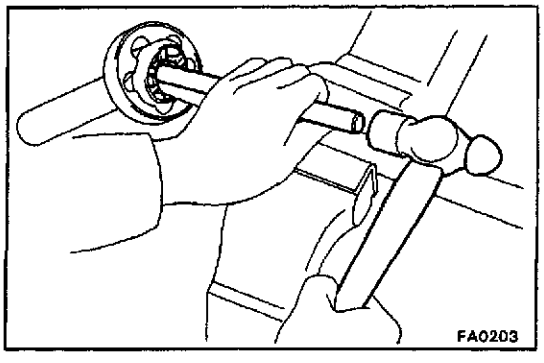
3. INSPECT BEARING

Clean the bearing and outer races and inspect them for wear or damage



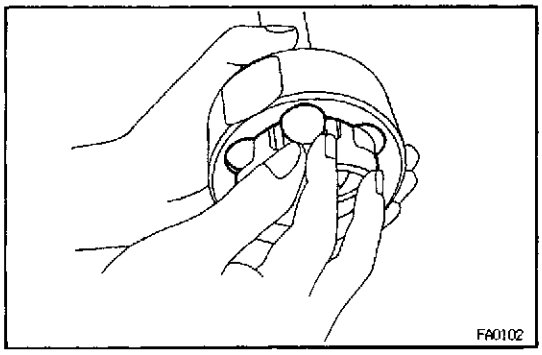
4. IF NECESSARY, REPLACE BEARING OUTER RACE

(a) Using a brass bar, drive out the bearing outer race
(b) Using SST, carefully drive in a new bearing outer race
SST 09605-60010

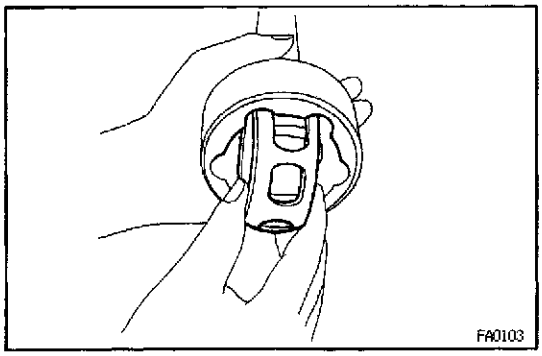


5. INSPECT BIRFIELD JOINT INNER PARTS

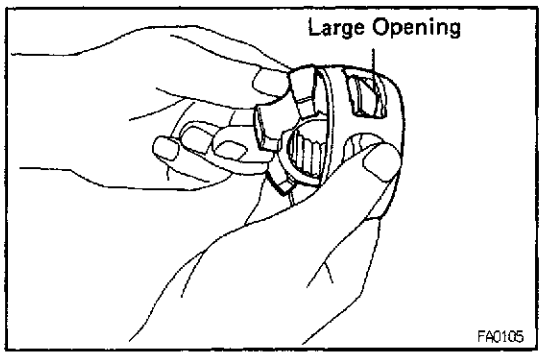
(a) Hold the inner shaft in a vise
(b) Place a brass bar against the joint inner race and drive out the outer shaft



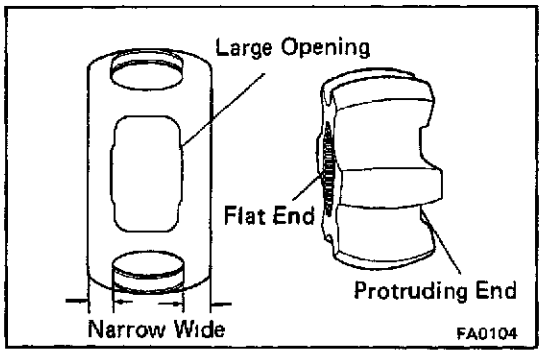
(c) Tilt the inner race and cage and take out the bearing balls one by one



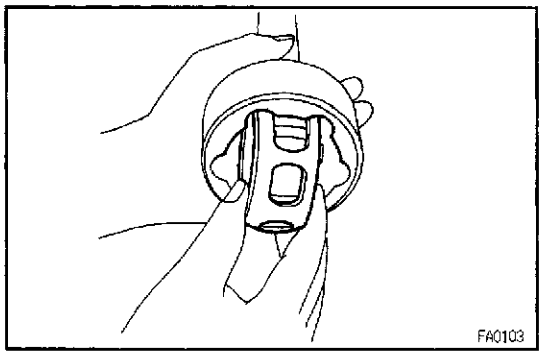
(d) Fit the 2 large openings in the cage against the protruding parts of the outer shaft, and pull out the cage and inner race



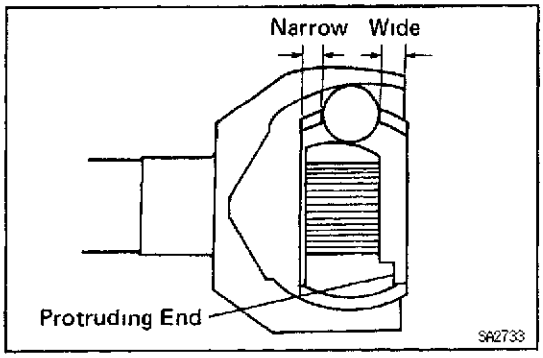
(e) Take out the inner race from the cage though the large opening
(f) Clean and inspect the joint parts for wear or damage



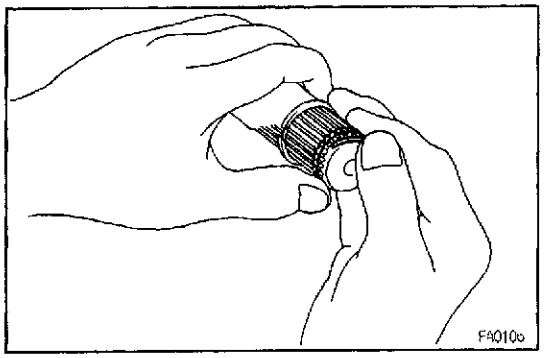
(g) Coat the joint inner parts and outer shaft inside with molybdenum disulphide lithium base grease
(h) Install the inner race in the cage through the large opening
(i) Position the protruding end of the inner race toward the wide side of the cage



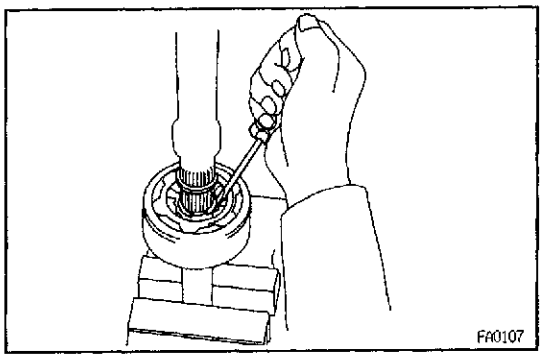
(j) Assemble the cage and inner race to the outer shaft by fitting the 2 large openings in the cage against the protruding parts of the outer shaft



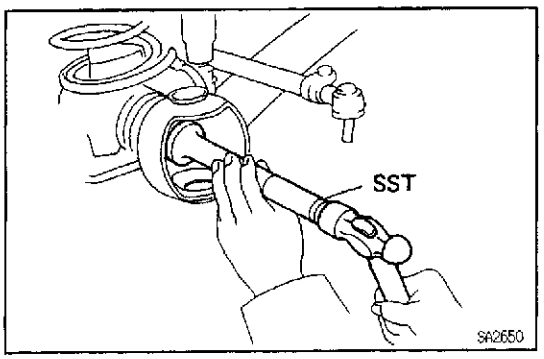
(k) Make sure to position the wide side of the cage and the inner race protruding end outward
(l) Fit in the inner race and cage, and install the 6 bearing balls in the outer shaft (See step (c))
(m) Pack molybdenum disulphide lithium base grease in the outer shaft



(n) Install a new snap rings on the inner shaft



(o) Hold the outer shaft in a vise and while compressing the snap inner ring, install the inner shaft to the outer shaft
(p) Verify that the inner shaft cannot be pulled out

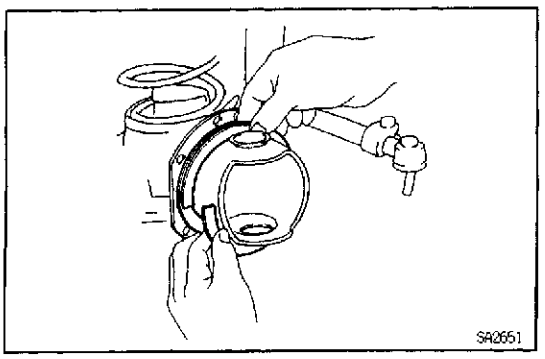


STEERING KNUCKLE AND AXLE SHAFT INSTALLATION

(See page SA-16)

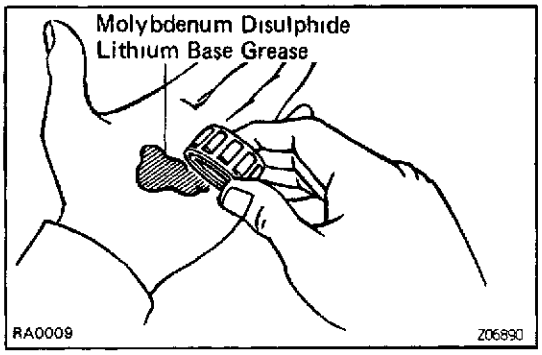
1. INSTALL OIL SEAL TO AXLE HOUSING

Using SST, drive in the oil seal into the axle housing
SST 09618-60010



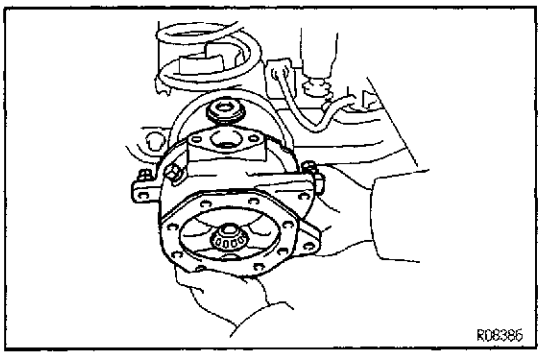
2. INSTALL OIL SEAL SET END RETAINER

Install the parts in the following order
(1) Felt dust seal
(2) Rubber seal
(3) Steel ring



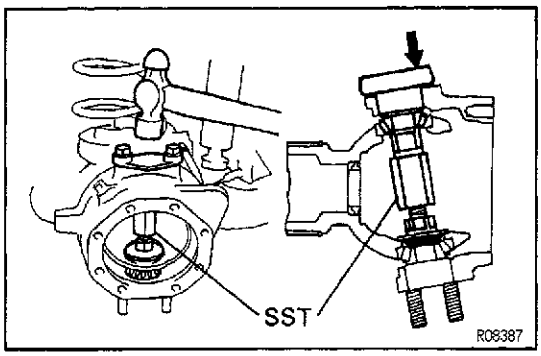
3. PACK BEARINGS WITH MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

(a) Place molybdenum disulphide lithium base grease in your hand
(b) Pack grease into the bearing, continuing until the grease oozes out from the outer side
(c) Do the same around the bearing circumference



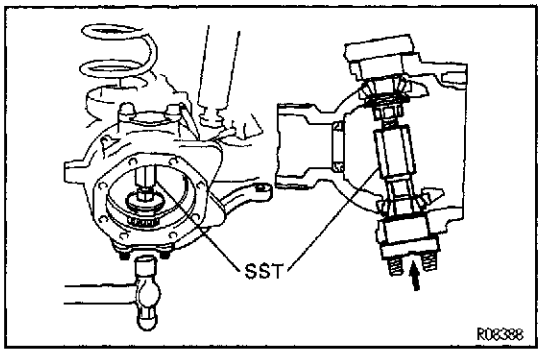
4. INSTALL STEERING KNUCKLE AND BEARINGS

(a) Place the bearings in positions on the knuckle and axle housing
(b) Install the knuckle on the axle housing

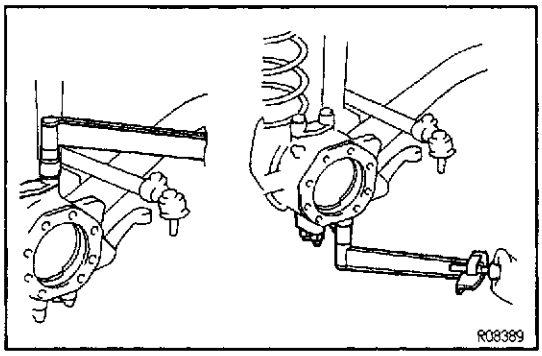


5. INSTALL KNUCKLE ARM AND BEARING CAP

(a) Using SST, support the upper bearing inner race
SST 09606-60020
HINT Use SST with a collar
(b) Install the bearing cap over the shims that were originally used or were selected as described in the adjustment operations
(c) Using a hammer, tap the bearing cap into the bearing inner race



(d) Using SST, support the lower bearing inner race
SST 09606-60020
HINT Use SST with a collar
(e) Using a hammer, tap the knuckle arm into the bearing inner race
(f) Remove SST from the knuckle

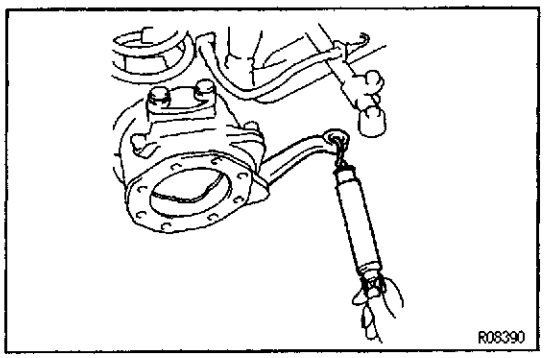


(Knuckle arm)
Install the cone washers, plate washers and torque the nuts

Torque: 96 N-m (980 kgf-cm, 71 ft-lbf)

(Bearing cap)
Install the plate washers and torque the bolts

Torque: 96 N-m (980 kgf-cm, 71 ft-lbf)



6. MEASURE BEARINGS PRELOAD

Using a spring tension gauge, measure the preload

Preload (starting):

25 - 44 N (2.5 -4.5 kgf, 5.6 - 9.9 lbf)

7. ADJUST BEARING PRELOAD

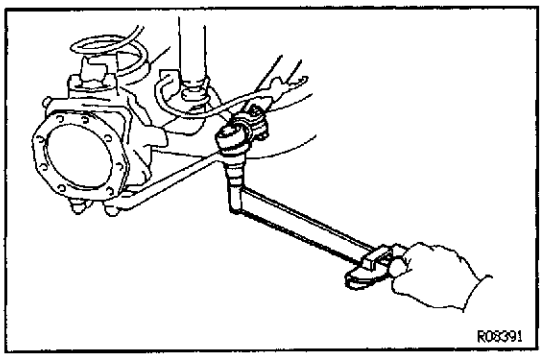
(a) Remove the bearing cap and the knuckle arm (See page SA-18)

(b) Select the adjusting shims

Adjusting shim thickness:

Thickness	Thickness
0.1 mm (0.004 in.)	0.5 mm (0.020 in.)
0.2 mm (0.008 in.)	1.0 mm (0.039 in.)

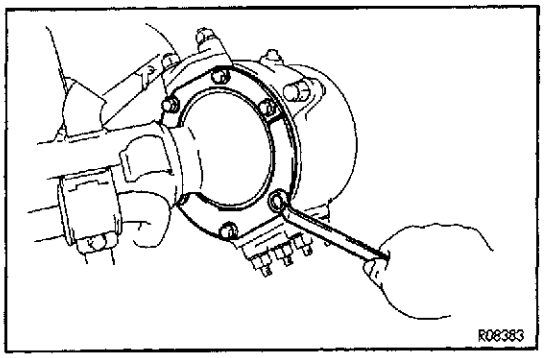
(c) Install the bearing cap and knuckle arm (See page SA-22)



8. CONNECT TIE ROD TO KNUCKLE ARM

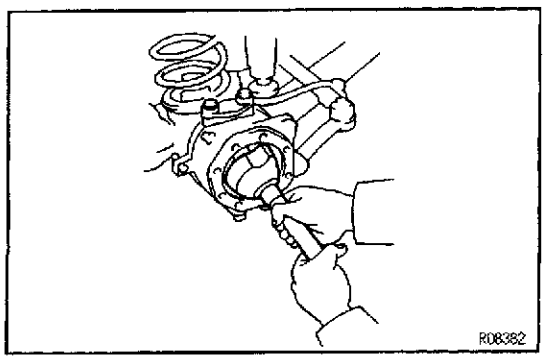
Torque the castle nut and secure it with a cotter pin

Torque: 91 N-m (925 kgf-cm, 67 ft-lbf)



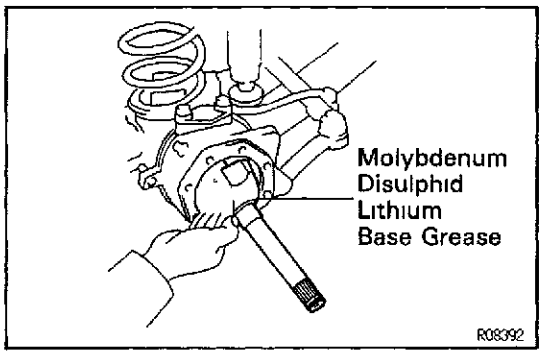
9. INSTALL OIL SEAL SET RETAINER TO KNUCKLE

Install the oil seal set retainer to steering knuckle with the 6 bolts



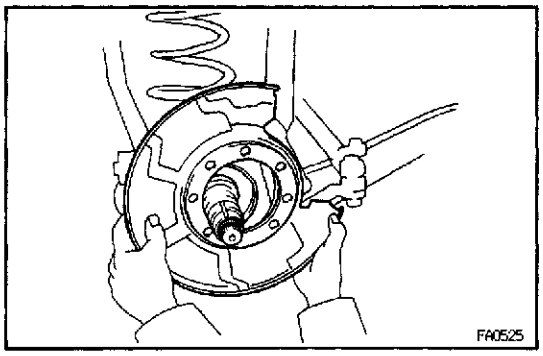
10. INSTALL AXLE SHAFT

Position 1 flat part of the outer shaft upward, and install the shaft



11. PACK MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

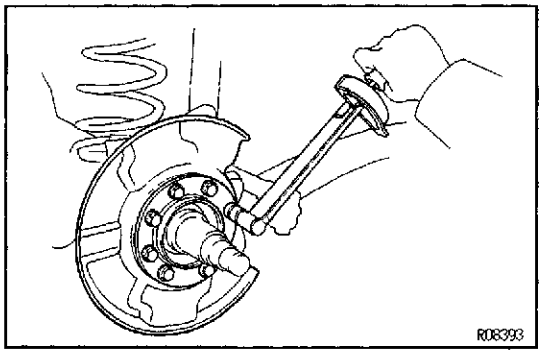
Pack molybdenum disulphide lithium base grease into the knuckle to about three fourths of the knuckle



12. INSTALL KNUCKLE SPINDLE DUST COVER WITH NEW GASKETS AND DUST SEAL

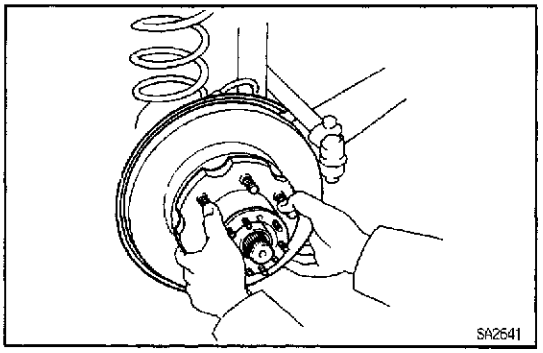
(a) Place a new gasket in the position on the knuckle and install the spindle

(b) Place the gasket, dust cover and seal on the spindle



(c) Torque the spindle mounting bolts

Torque: 47 N-m (475 kgf-cm, 34 ft-lbf)

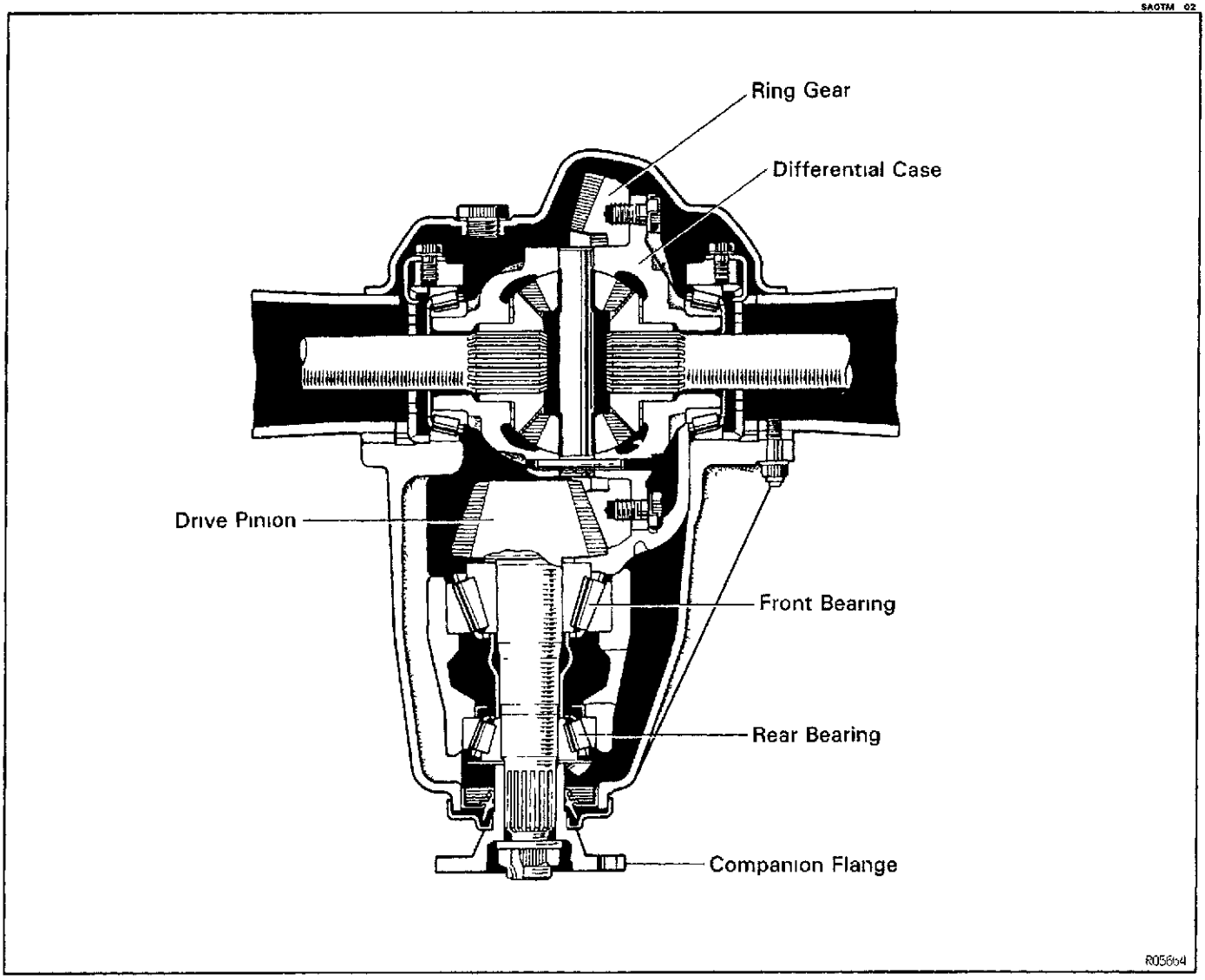


13. INSTALL AXLE HUB

(SEE PAGE SA-13)

FRONT DIFFERENTIAL

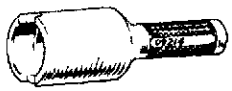
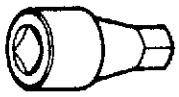
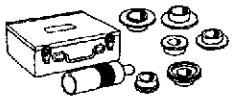
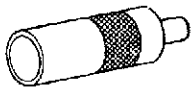
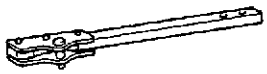
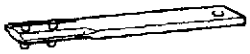
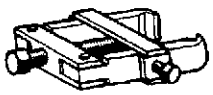
DESCRIPTION

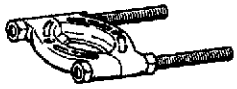


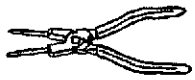
PREPARATION

SST (SPECIAL SERVICE TOOLS)

SA07N-02

	09214-76011 Crankshaft Pulley Replacer	
	09223-15020 Oil Seal & Bearing Replacer	
	0930$-00010 Oil Seal Puller	
	09308-10010 Oil Seal Puller	
	09313-30021 Detent Ball Plug Socket	
  	09316-60010 Transmission & Transfer Bearing Replacer (09316-00010) Replacer Pipe (09316-00020) Replace A (09316-00050) Replacer- D	
	09330-00021 Companion Flange Holding Tool	
	09504-00011 Differential Side Bearing Adjusting Nut Wrench	
	09506-30012 Differential Drive Pinion Rear Bearing Cone Replacer	
	09556-22010 Drive Pinion Front Bearing Remover	

	09557-22022 Companion Flange Remover & Replacer (09557-22050) No 3 Bolt	
	09608-30012 Front Hub & Drive Pinion Bearing Tool Set (09608-00060) Drive Pinion Front Bearing Cup Replacer (09608-04060) Front Hub Outer Bearing Cup Replacer	
	09726-40010 Lower Control Shaft Bearing Replacer	
	09950-00020 Bearing Remover	
	09950-20017 Universal Puller	

	09905-00012 Snap Ring No 1 Expander	
	09905-00013 Snap Ring Pliers	

SASTG-01

EQUIPMENT

Dial indicator	
Torque wrench	

SA0TR-02

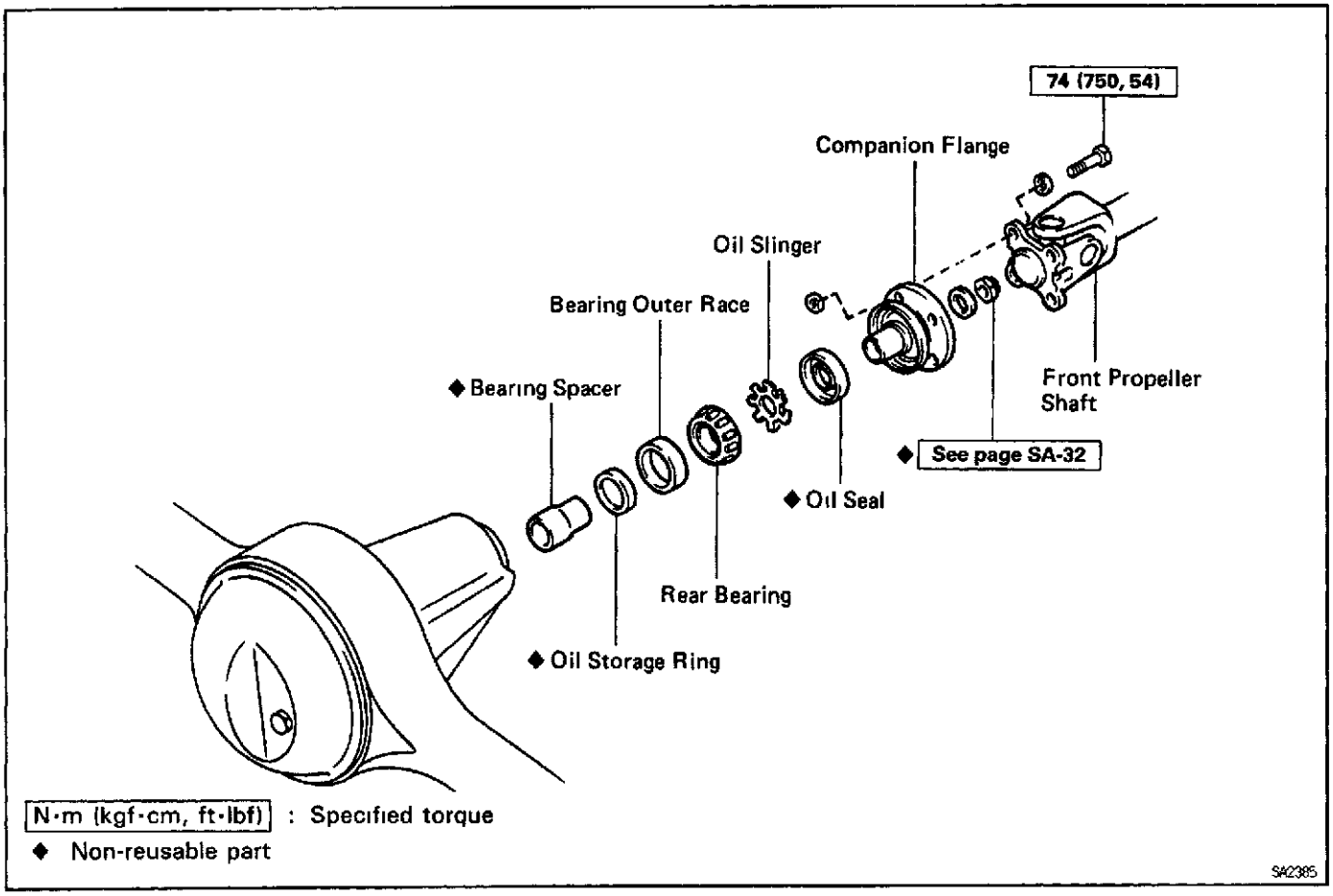
LUBRICANT

Item	Capacity	Classification
Differential oil (w/o Differential lock) (w/ Differential lock)	2.8 liters (2.9 US qts, 2.5 Imp qts) 2.65 liters (2.8 US qts, 2.3 Imp qts)	API GL-5 Hypoid gear oil [Above - 18° C (0° F)] SAE 90 [Below -18° C (0° F)] SAE 80W or 80W -90

ON-VEHICLE REPAIR

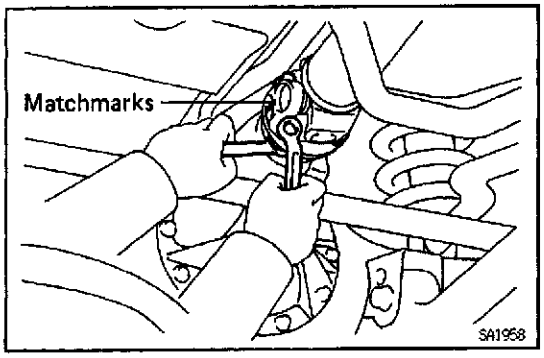
SA0TS-01

COMPONENTS



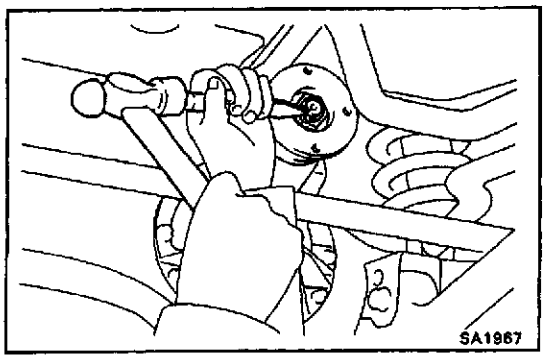
SA0TT-02

REAR OIL SEAL REPLACEMENT



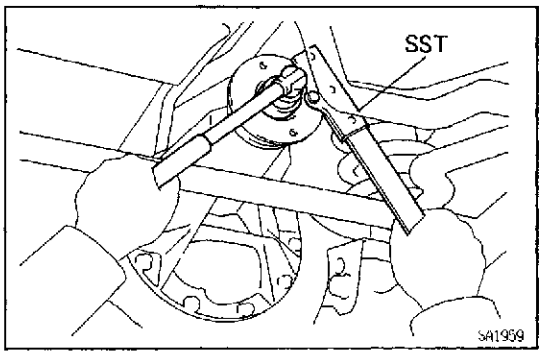
1. DISCONNECT FRONT PROPELLER SHAFT

(a) Place matchmarks on the flanges
(b) Remove the 4 bolts and nuts
(c) Disconnect the front propeller shaft

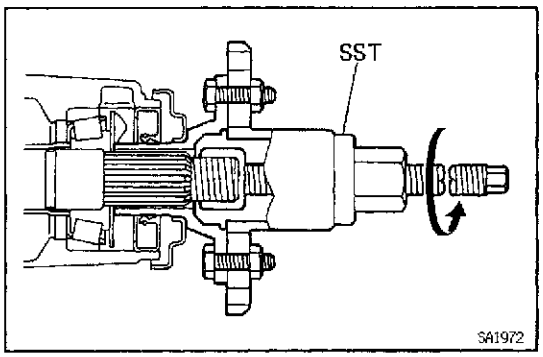


2. REMOVE COMPANION FLANGE

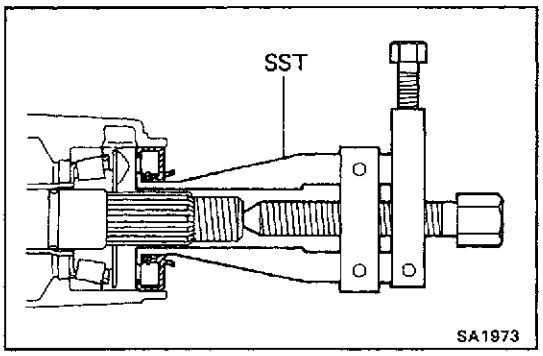
(a) Using a chisel and hammer, loosen the staked part of the nut



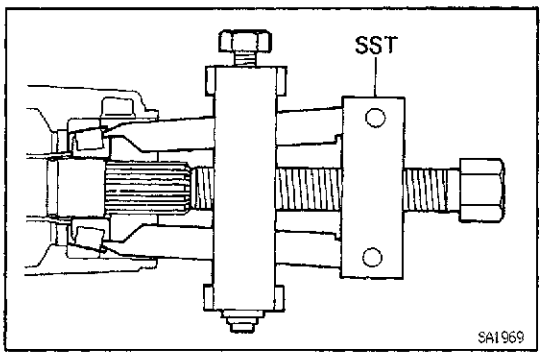
(b) Using SST to hold the flange, remove the nut and washer
SST 09330-00021



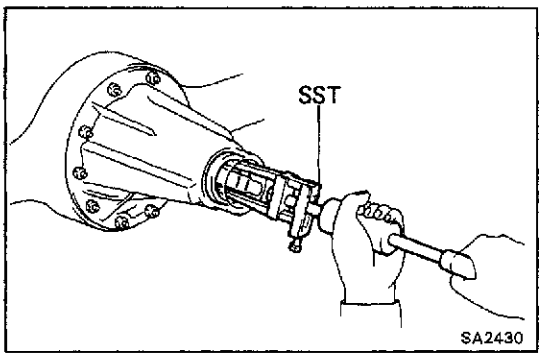
(c) Using SST, remove the companion flange
SST 09557-22022 (09557-22050)



3. REMOVE OIL SEAL AND OIL SLINGER
(a) Using SST, remove the oil seal
SST 09308-10010
(b) Remove the oil slinger

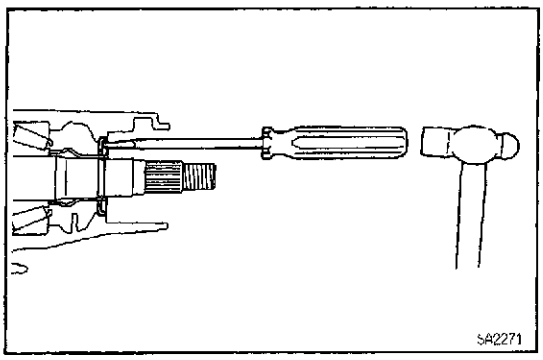


4. REMOVE REAR BEARING
Using SST remove the rear bearing from the drive pinion
SST 09556 - 22010



5. REMOVE BEARING OUTER RACE
Using SST, remove the bearing outer race
SST 09308 - 00010

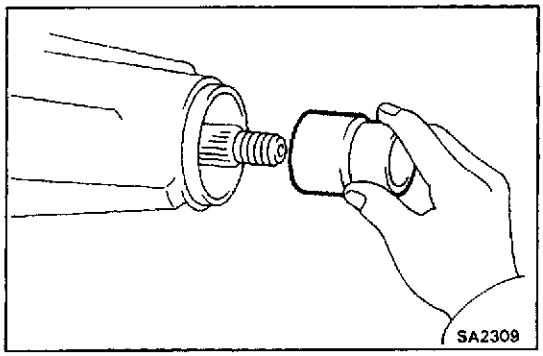
NOTICE: Do not scratch the taper surface of the outer race.



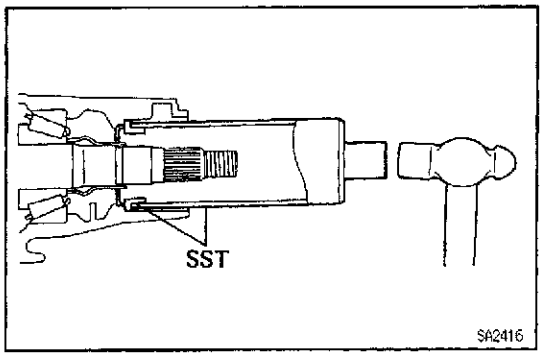
6. REMOVE OIL SEAL STORAGE RING

Using a screwdriver, bend the oil storage ring and drive it out

7. REMOVE BEARING SPACER



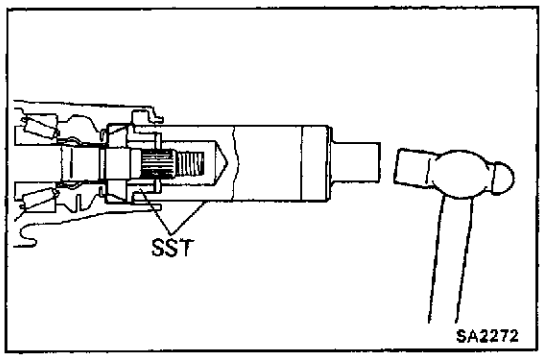
8. INSTALL NEW BEARING SPACER



9. INSTALL NEW OIL STRAGE RING

Using SST, drive in a new oil strage ring

SST 09316-60010 (09316-00010, 09316-00020)

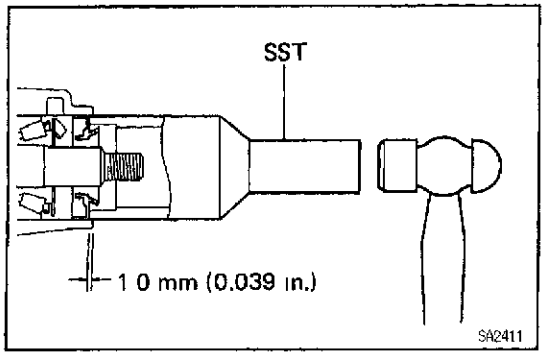


10. INSTALL REAR BEARING

(a) Using SST, drive in a bearing outer race

SST 09316-60010 (09316-00010, 09316-00020)

(b) Install the rear bearing



11. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown

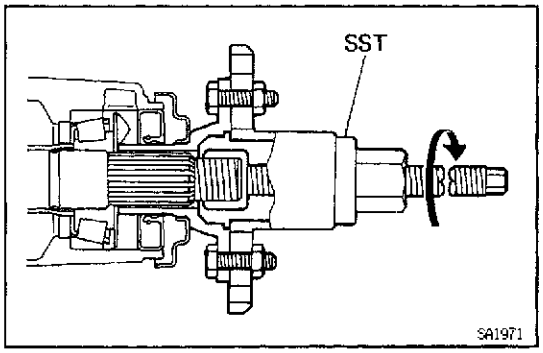
(b) Using SST, drive in the new oil seal as shown

SST 09214-76011

Oil seal drive in depth:

1.0 mm (0.039 in.)

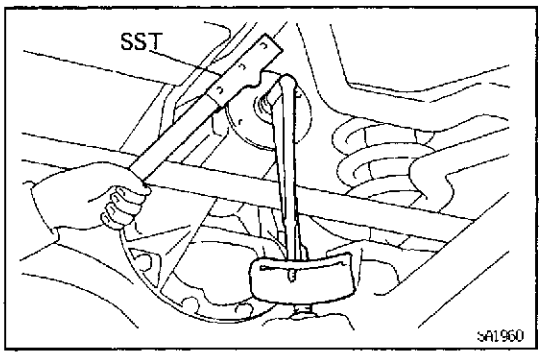
(c) Coat the lip of the oil seal with MP grease



12. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion
SST 09557-22022 (09557-22050)

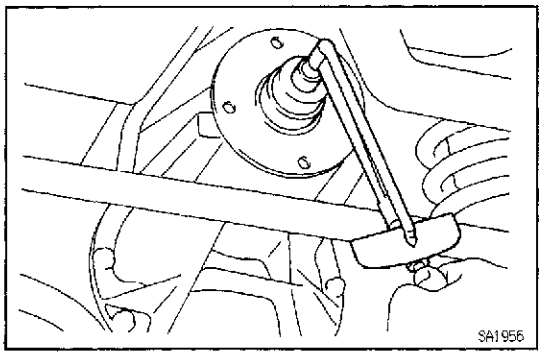
(b) Place the plate washer on the companion flange



(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: 196 N-m (2,000 kgf-cm, 145 ft-lbf)



13. ADJUST DRIVE PINION PRELOAD

Using a torque wrench measure the preload of the backlash between the drive pinion and ring gear

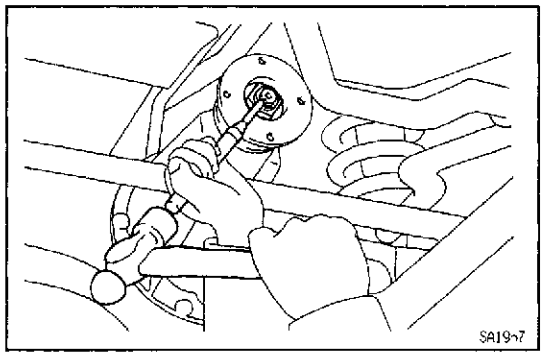
New bearing preload (at starting):
0.9-1.6 N-m (10-16 kgf-cm, 8.7-13.9 in-lbf)

Reused bearing preload (at starting):
0.5-0.8 N-m (5-8 kgf-cm, 4.3-6.9 in-lbf)

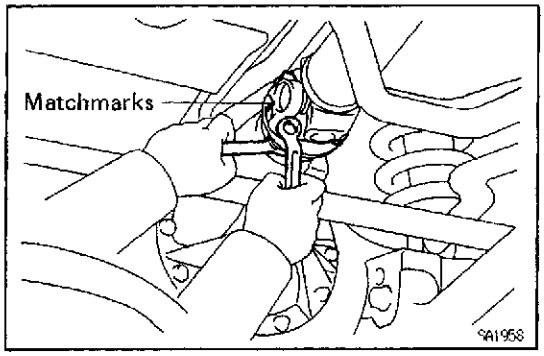
- If the preload is greater than specification replace the bearing spacer
- If the preload is less than specification retighten the nut 13 N-m (130 kgf-cm 9 ft-lbf) a little at a time until the specified preload is reached

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



14. STAKE DRIVE PINION NUT

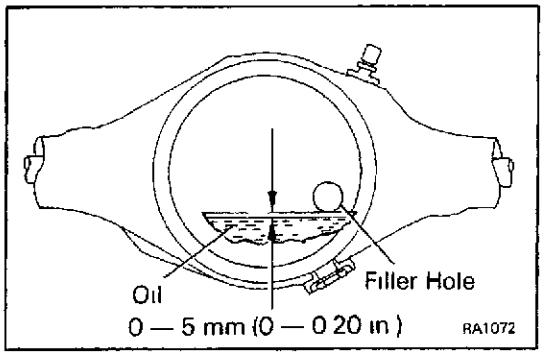


15. CONNECT FRONT PROPELLER SHAFT

(a) Align the matchmarks and connect the propeller shaft to the companion flange with the 4 bolts spring washers and nuts

(b) Torque the bolts and nuts

Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



16. FILL DIFFERENTIAL WITH GEAR OIL

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 or 80W - 90

Capacity:

w/o Differential lock

2.8 liters (2.9 US qts, 2.5 Imp. qts)

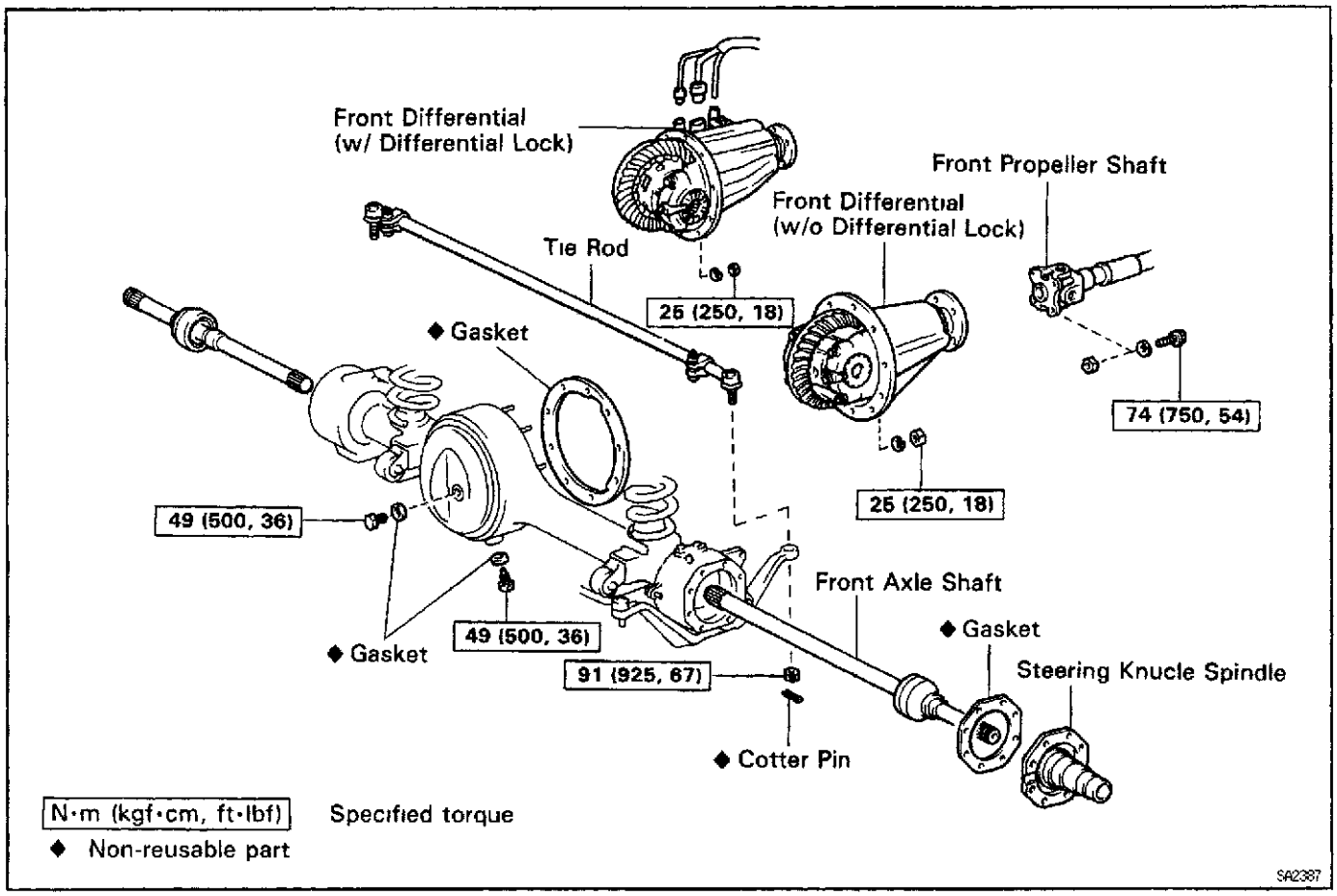
w/ Differential lock

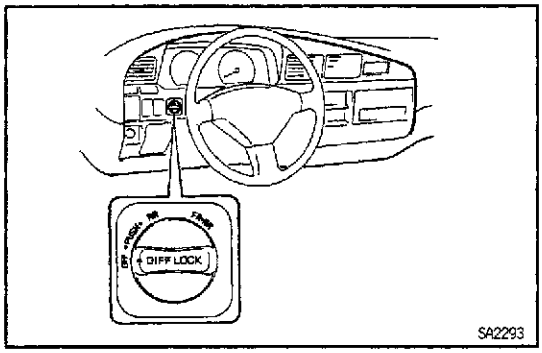
2.65 liters (2.8 US qts, 2.3 Imp. qts)

ASSEMBLY REMOVAL AND INSTALLATION

SA0TU-02

COMPONENTS





SA17D 01

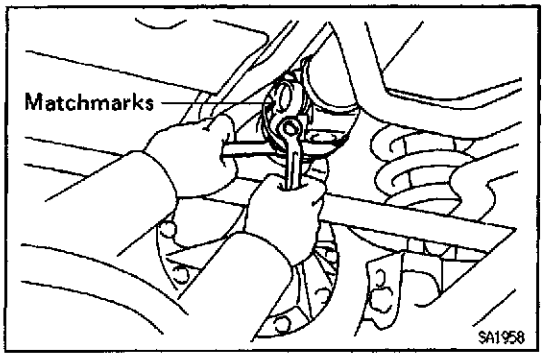
DIFFERENTIAL REMOVAL

1. (w/ DIFFERENTIAL LOCK)
SHIFTING FRONT DIFFERENTIAL LOCK
(a) Turn the ignition switch to ON position
(b) Keep the center differential lock condition
(c) Turn the differential lock control switch to FR/RR position and lock the front 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 FRONT AXLE SHAFTS
(See page SA-17 **)**

4. REMOVE TIE ROD
(See page SA-17 **)**

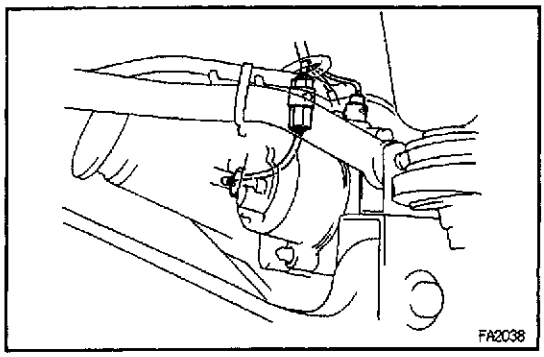


5. DISCONNECT FRONT PROPELLER SHAFT

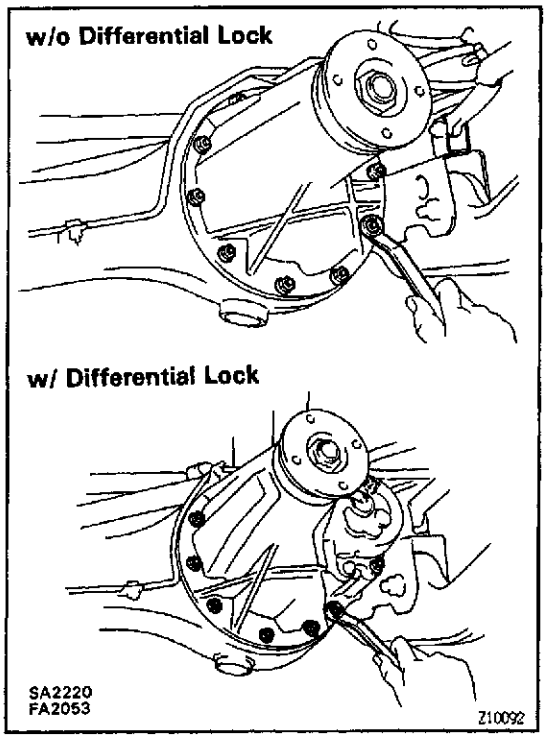
(a) Place the matchmarks on the flanges

(b) Remove 4 nuts and bolts

(c) Disconnect the front propeller shaft



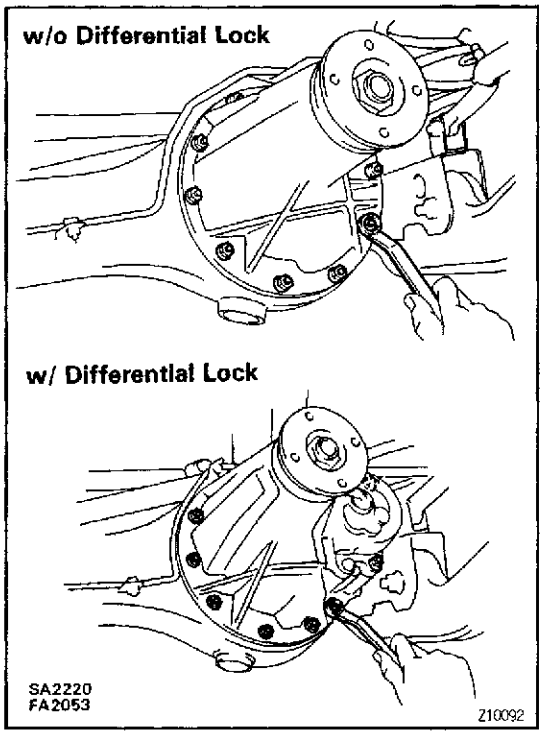
6. (w/ DIFFERENTIAL LOCK)
DISCONNECT CONNECTORS AND TUBE



7. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

Remove the nuts, washers and differential carrier assembly

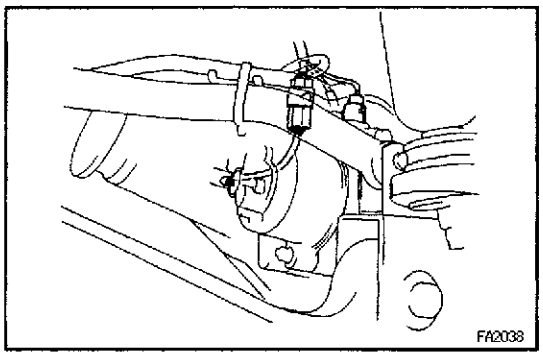
NOTICE: Be careful not to damage the installation surface.



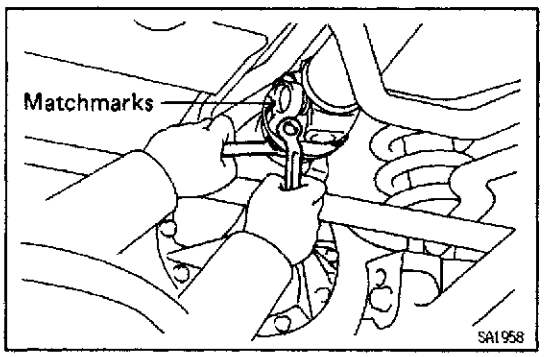
DIFFERENTIAL INSTALLATION

SA176-01

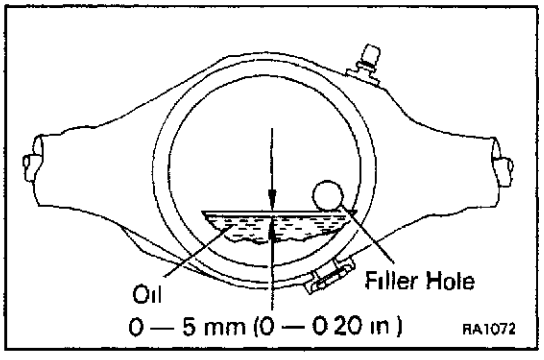
1. (w/ DIFFERENTIAL LOCK)
CHECK DIFFERENTIAL LOCK OPERATION
(a) Connect the connecter of the actuator to the connecter of the vehicle side, and check that the sleeves on work with switching over the differential lock control switch
(b) After checking, lock the front differential
2. INSTALL NEW GASKET TO AXLE HOUSING
3. INSTALL DIFFERENTIAL CARRIER ASSEMBLY
Install the differential carrier assembly in the axle housing with the nuts
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)



4. (w/ DIFFERENTIAL LOCK)
CONNECT 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 the equivalent shall not adhere to the connector and hose



5. CONNECT FRONT PROPELLER SHAFT
(a) Align the matchmarks and connect the propeller shaft to the companion flange with the 4 bolts, spring washers and nuts
(b) Torque the bolts and nuts
Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)
6. INSTALL TIE ROD
(SEE page SA-23)
7. INSTALL FRONT AXLE SHAFTS
(See page SA-23 **)**



8. FILL DIFFERENTIAL WITH HYPOID GEAR OIL
Fill with hypoid gear oil.
Oil type:
Hypoid gear oil API GL-5
Recommended oil viscosity:
Above -18°C (0°F) SAE 90
Below -18°C (0°F) SAE 80 W or 80 W-90

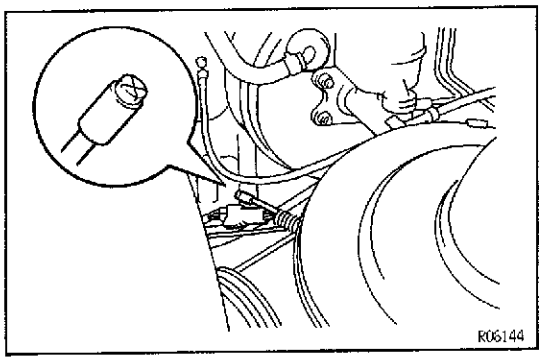
Capacity:

w/o Differential lock

2.8 liters (2.9 US qts, 2.5 Imp.qts)

w/ Differential lock

2.65 liters (2.8 US qts, 2.3 Imp.qts)



9. (w/ DIFFERENTIAL LOCK)

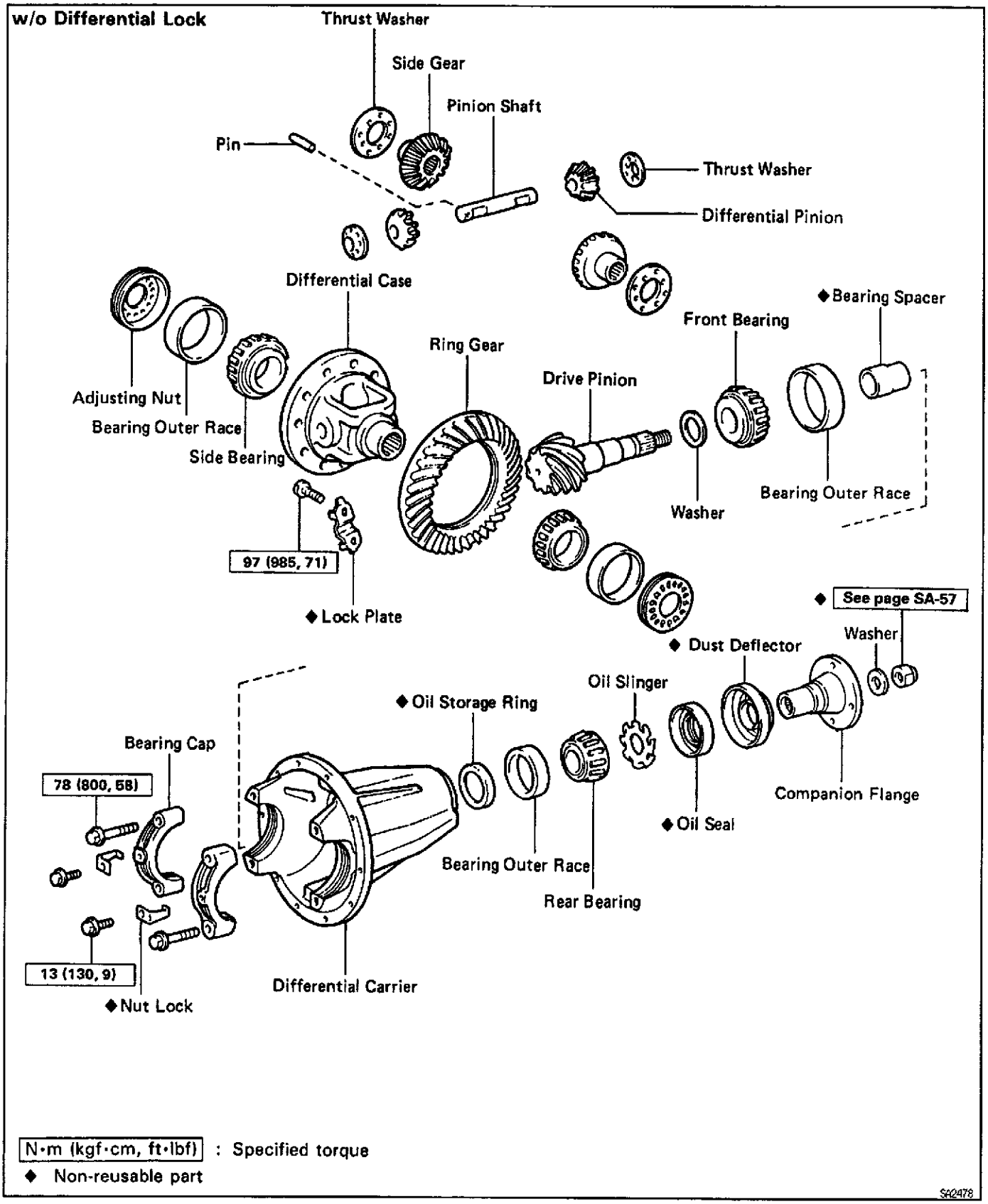
CHECK BLEEDER PLUG

Check that the bleeder plug at the point of the bleeder tube (inside of the engine room) is not damaged or worn

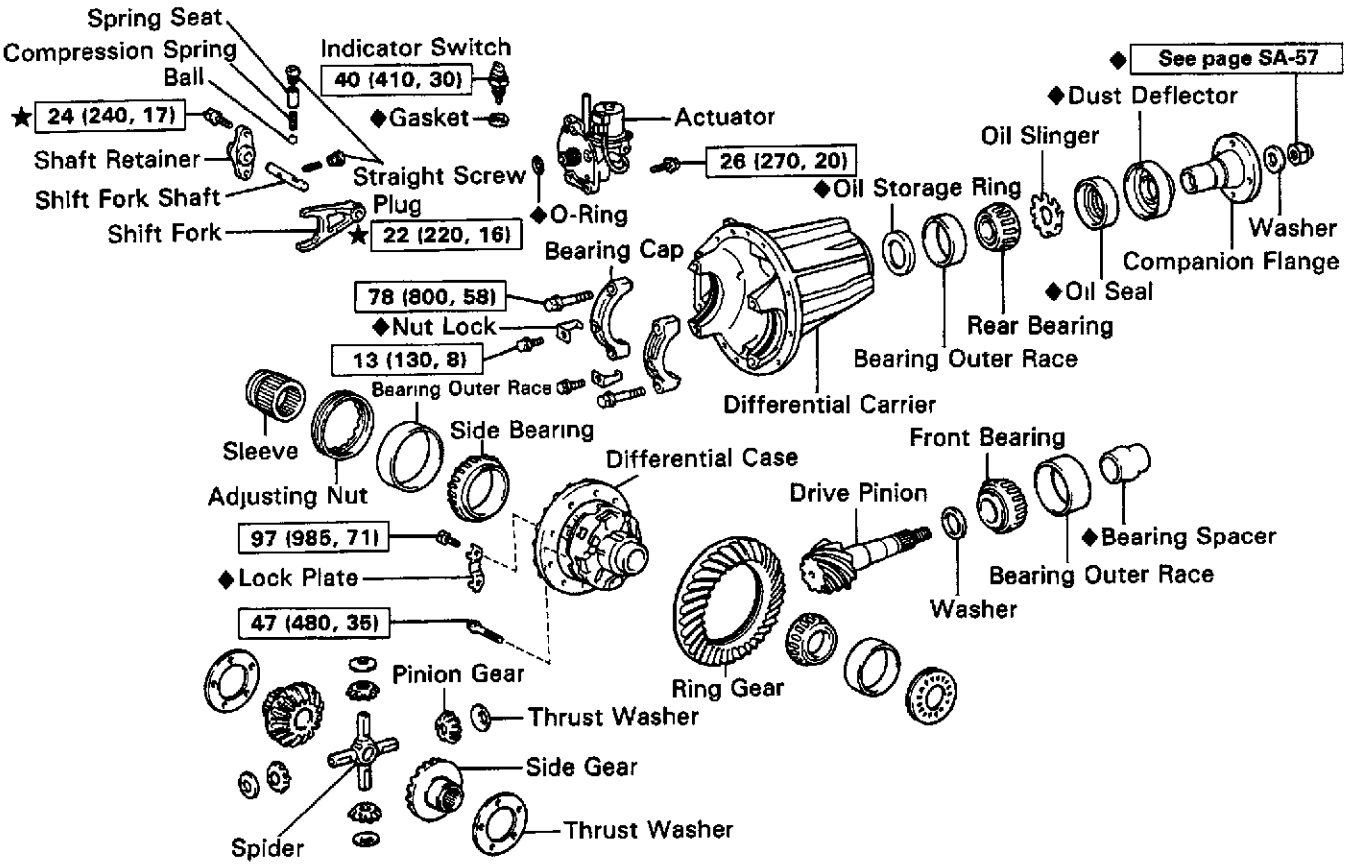
DIFFERENTIAL CARRIER

8A17F-01

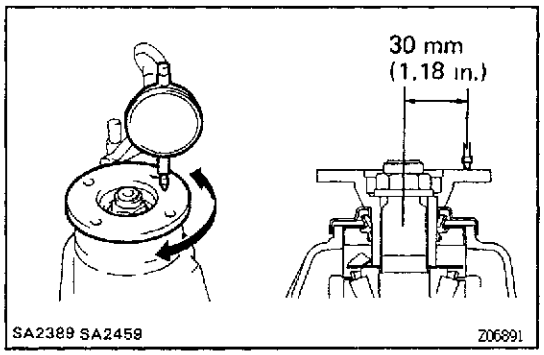
COMPONENTS



w/ Differential Lock



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part



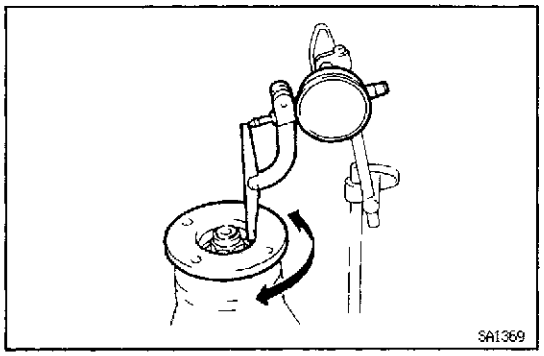
DIFFERENTIAL CARRIER INSPECTION

1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

Maximum vertical runout:

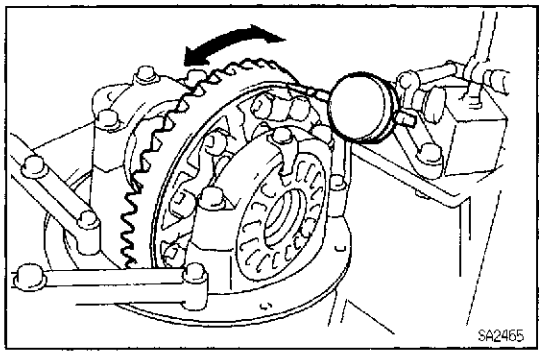
0.10 mm (0.0039 in.)



Maximum lateral runout:

0.10 mm (0.0039 in.)

If the runout is greater than the maximum replace the companion flange

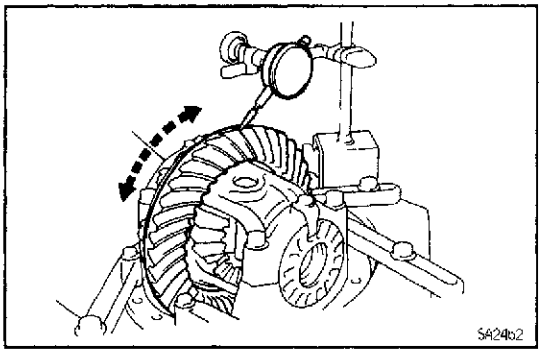


2. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, replace a new ring gear

Maximum runout:

0.10 mm (0.0039 in.)

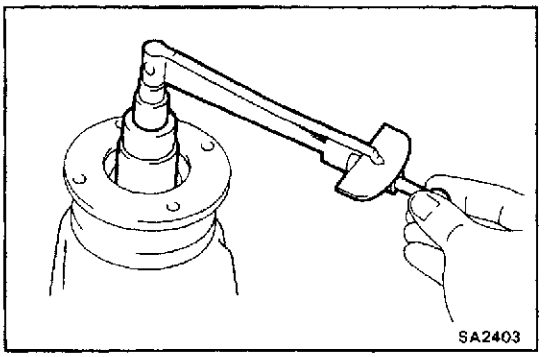


3. CHECK RING GEAR BACKLASH

If the backlash is not within specification, adjust the side bearing preload or repair as necessary

Backlash:

0.13-0.1$ mm (0.0051 -0.0071 in.)

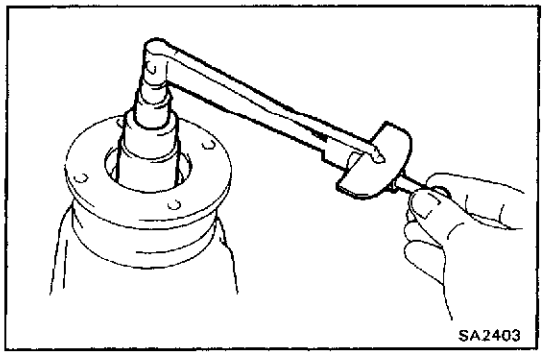


4. MEASURE DRIVE PINION PRELOAD

Using a torque wrench measure the preload of back-lash 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

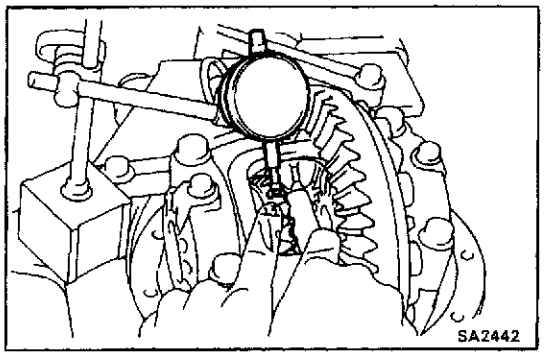
Using a torque wrench measure the total preload

Total preload (at starting):

In addition to drive pinion preload

0.4-0.6 N-m (4-6 kgf-cm, 3.5-5.2 in.-lbf)

If necessary disassemble and inspect a differential



6. (w/o DIFFERENTIAL LOCK)

CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding 1 pinion gear toward the case

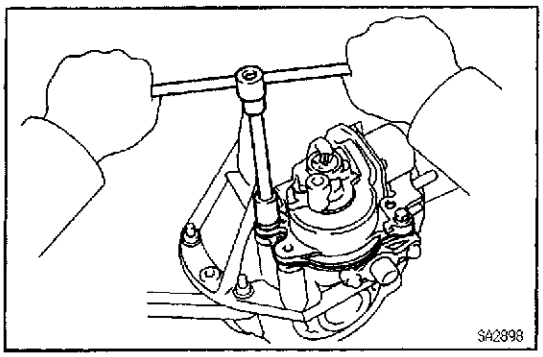
Standard backlash:

0.05-0.20 mm (0.0020-0.0079 in.)

If the backlash is out of specification, install the correct thrust washers (See page SA-48)

7. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(See page SA-56)



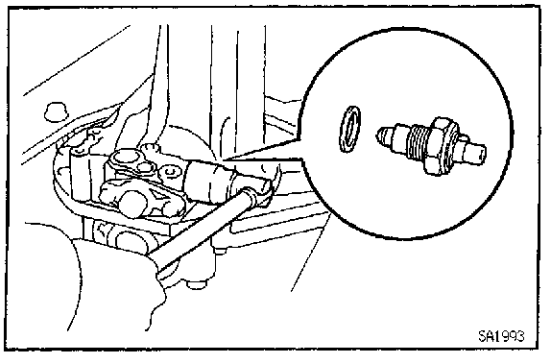
DIFFERENTIAL CARRIER DISASSEMBLY

1. (w/ DIFFERENTIAL LOCK)

REMOVE ACTUATOR

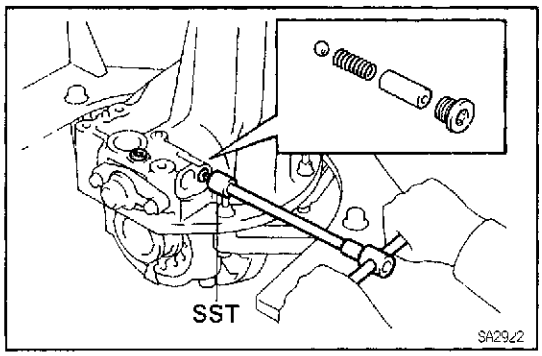
(a) Remove the bolt and actuator from the differential carrier

(b) remove the 0-ring



2. (w/ DIFFERENTIAL LOCK)

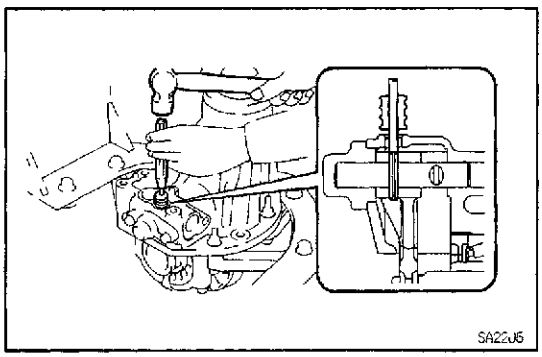
REMOVE INDICATOR SWITCH



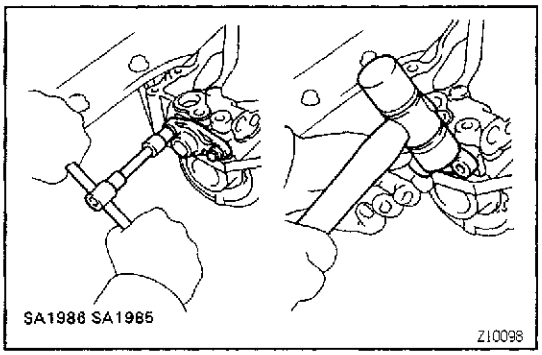
3. (w/ DIFFERENTIAL LOCK)
REMOVE SHIFT FORK SHAFT

(a) Using SST, remove the 2 straight screw plugs
SST 09313-30021

(b) Remove the spring seat, compression spring and ball

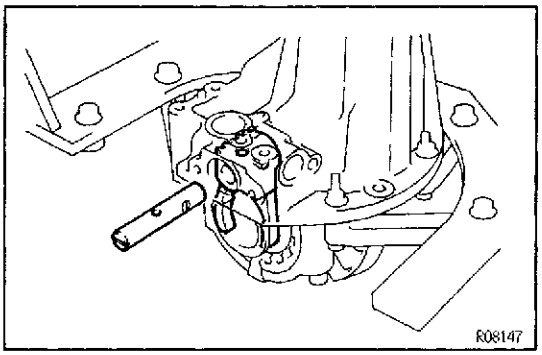


(c) Using a pin punch and hammer, drive out the slotted spring pin



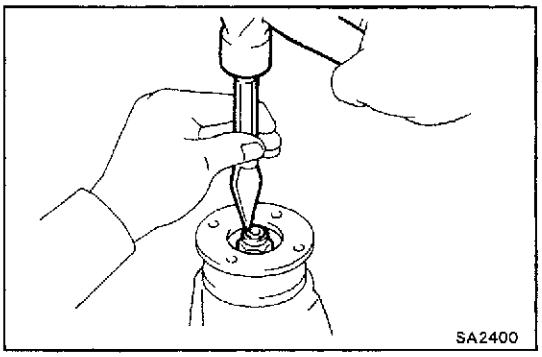
(d) Remove the 2 bolts from the shaft retainer

(e) Using a plastic hammer, tap out the shaft retainer



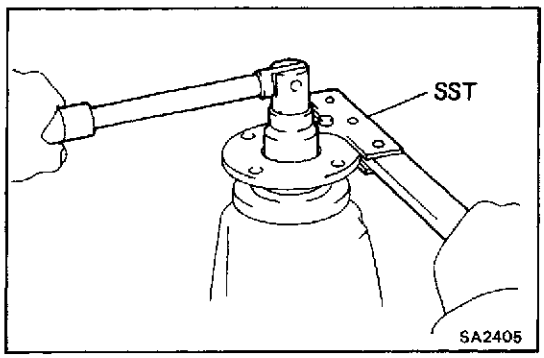
(f) Remove the shift fork shaft

HINT Pull out the shift fork shaft with the screwdriver turned round

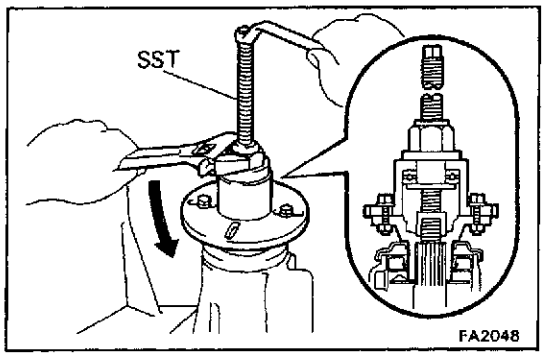


4. REMOVE COMPANION FLANGE

(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

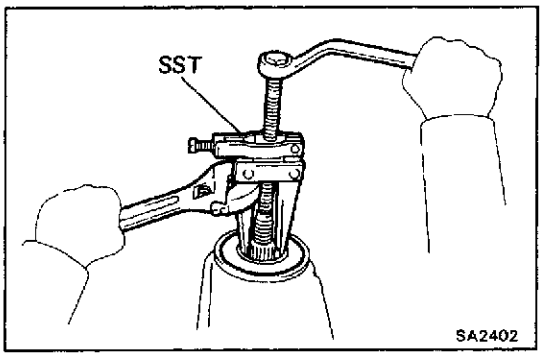


(c) Using SST, remove the companion flange
SST 09557-22022 (09557-22050)

5. REMOVE OIL SEAL AND OIL SLINGER

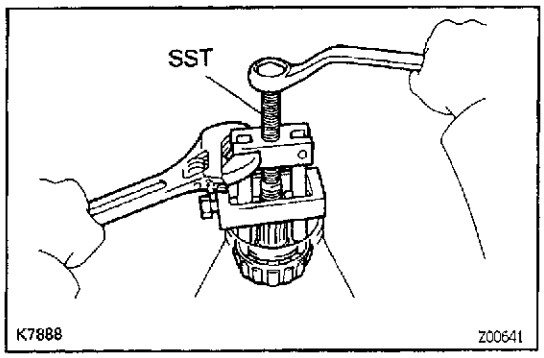
(a) Using SST, remove the oil seal from the differential carrier
SST 09308-10010

(b) Remove the oil slinger



6. REMOVE REAR BEARING

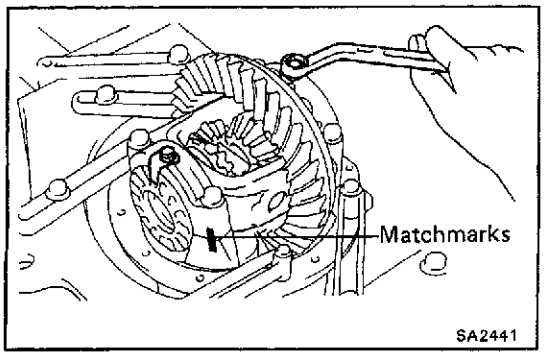
Using SST, remove the rear bearing from the drive pinion
SST 09556- 22010

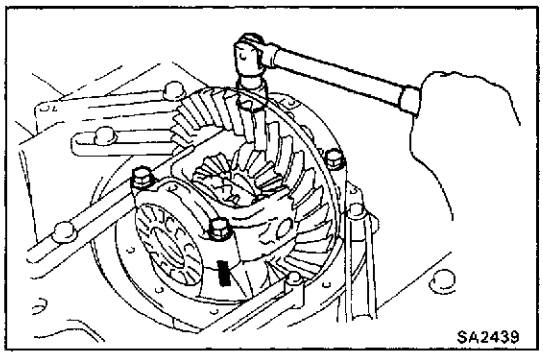


7. REMOVE DIFFERENTIAL CASE

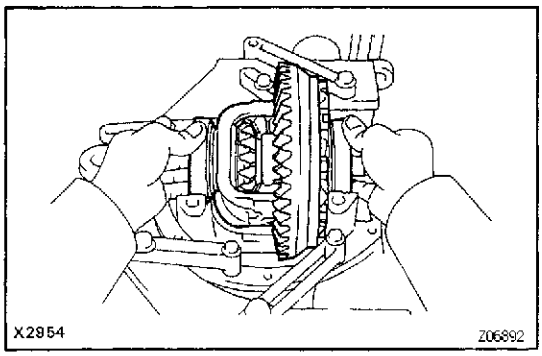
(a) (w/o Differential lock only)
Place matchmarks on the bearing cap and differential carrier

(b) Remove the 2 adjusting nut locks



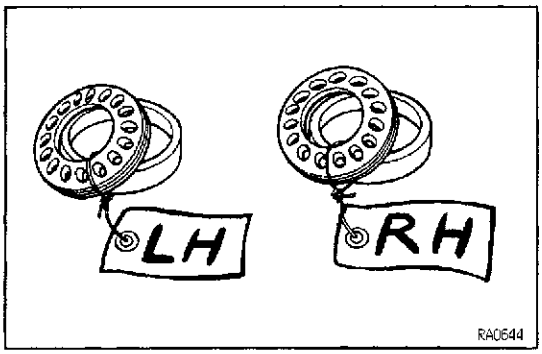


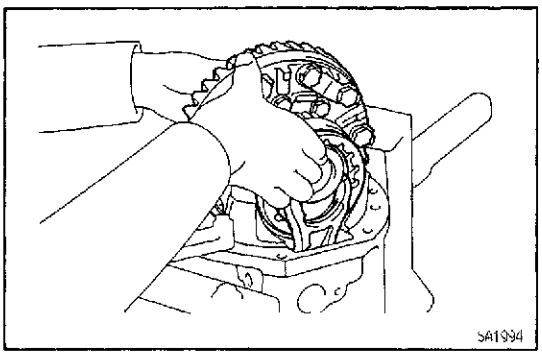
(c) Remove the 4 bolts and 2 bearing caps
(d) (w/o Differential lock only)
Remove the 2 adjusting nuts



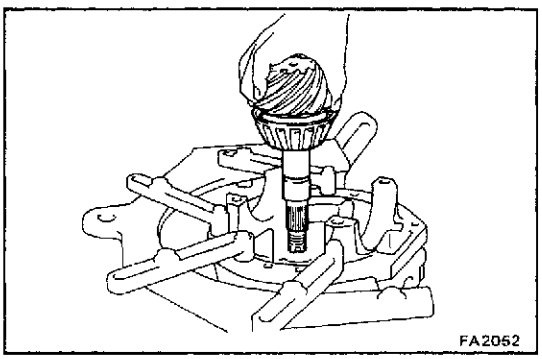
(e) (w/o differential lock only)
Remove the differential case with the side bearing outer races from the carrier

HINT: Tag the disassembled parts to show the location for reassembly

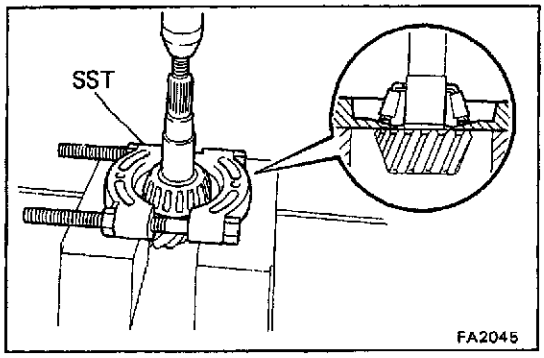




(f) (w/ Differential lock only)
Remove the differential case with both side bearing outer race, adjusting nuts and sleeve from the differential carrier
(g) (w/ Differential lock only)
Remove the shift fork



8. REMOVE DRIVE PINION AND BEARING SPACER
(a) Remove the drive pinion with the front bearing
(b) Remove the bearing spacer



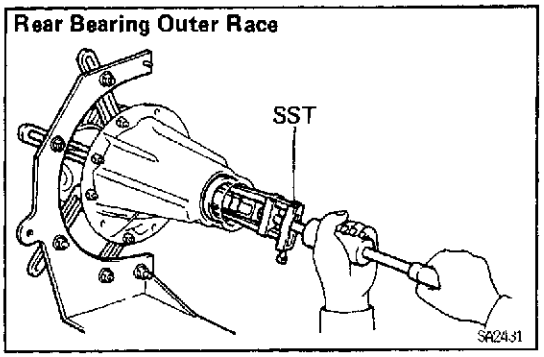
9. REMOVE DRIVE PINION FRONT BEARING

(a) Using SST and a press, pull out the bearing from the drive pinion

SST 09950-00020

HINT If the drive pinion or ring gear are damaged, replace them as a set

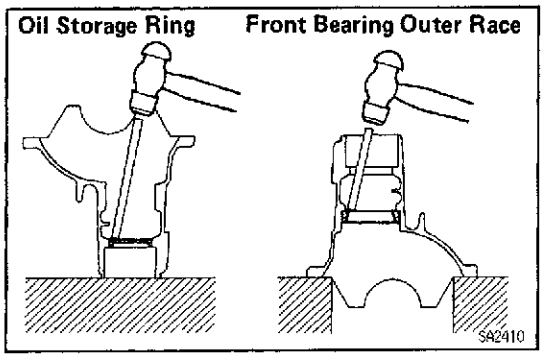
(b) Remove the plate washer from the drive pinion



10. REMOVE FRONT, REAR BEARING OUTER RACES AND OIL STORAGE RING

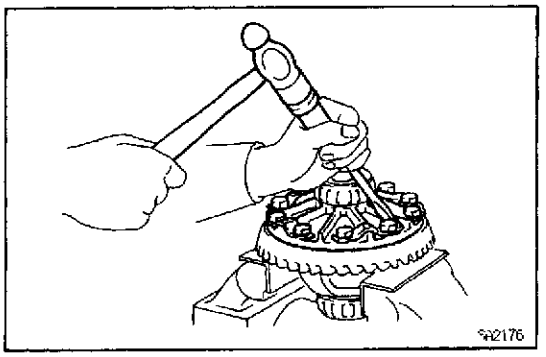
(a) Using SST, remove the bearing outer race

SST 09308 - 00010



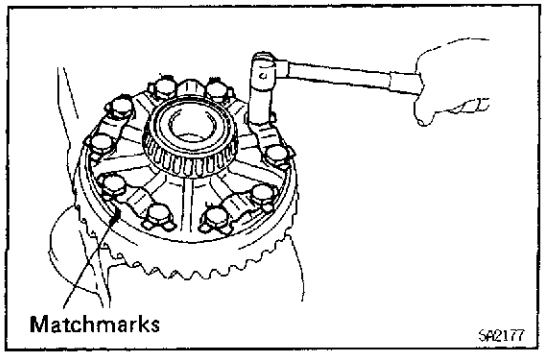
(b) Using a hammer and brass bar drive out the oil storage ring and outer race

HINT Do not remove the oil storage ring unless replacing it with a new one



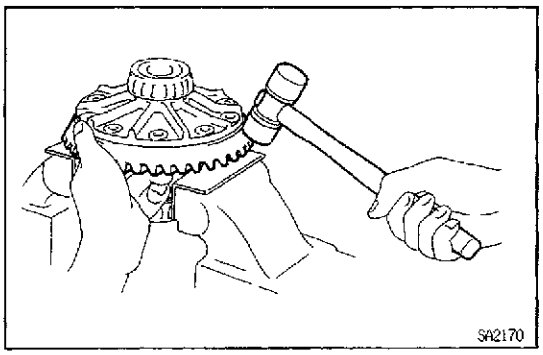
11. REMOVE RING GEAR

(a) Using a screwdriver, unstake the lock plate

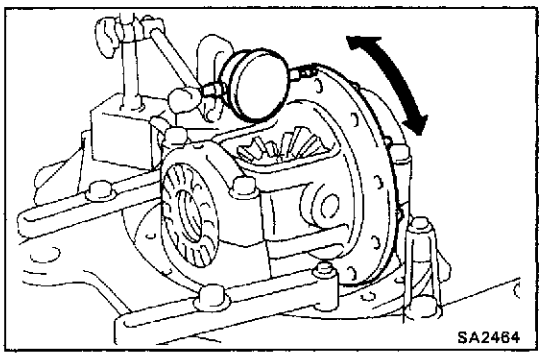


(b) Place the matchmarks on the ring gear and differential case

(c) Remove the ring gear set bolts and lock plates



(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case



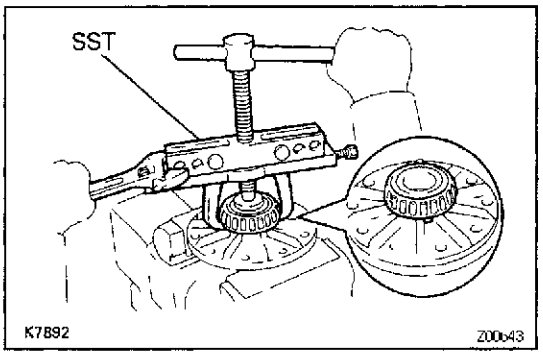
12. CHECK DIFFERENTIAL CASE RUNOUT

(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.

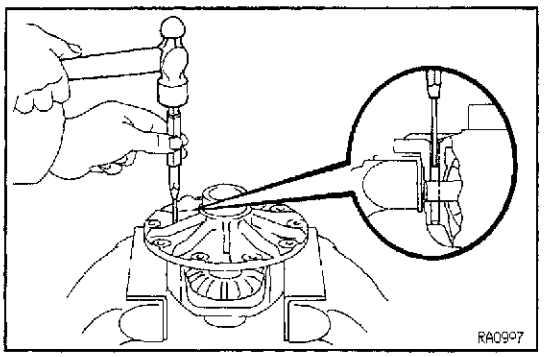


13. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, pull the side bearing from the differential case

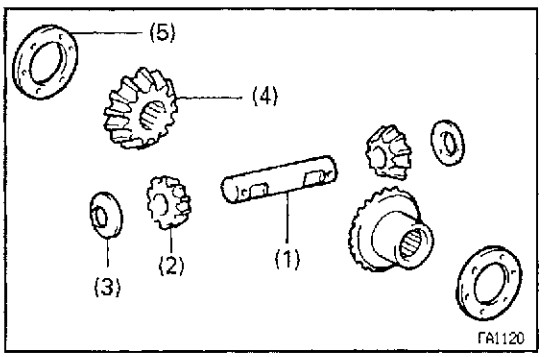
SST 09950-20017

HINT Fix the claws of SST to the notches in the differential case



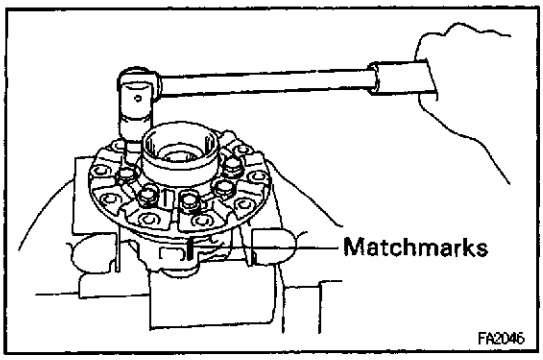
14. (w/o DIFFERENTIAL LOCK) DISASSEMBLE DIFFERENTIAL CASE

(a) Using a hammer and punch, drive out the straight pin

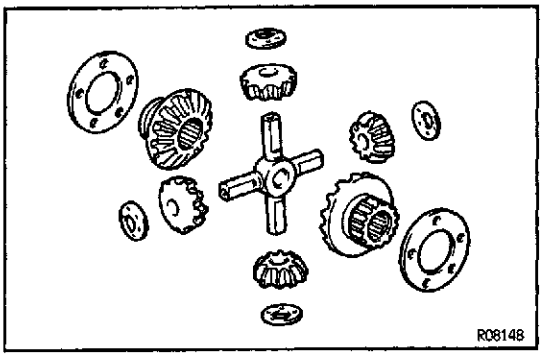


(b) Remove the following parts

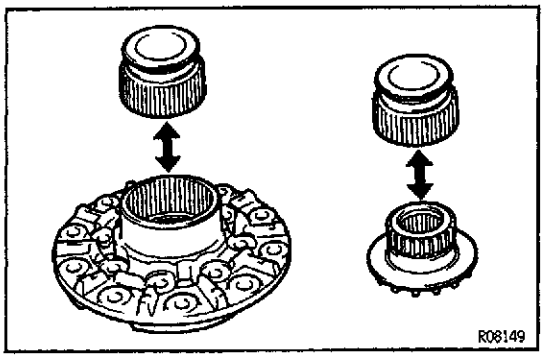
(1) Pinion shaft
(2) Pinion gears
(3) Pinion gear thrust washers
(4) Side gears
(5) Side gear thrust washers



15. (w/ DIFFERENTIAL LOCK)
DISASSEMBLE DIFFERENTIAL CASE
(a) Place the 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

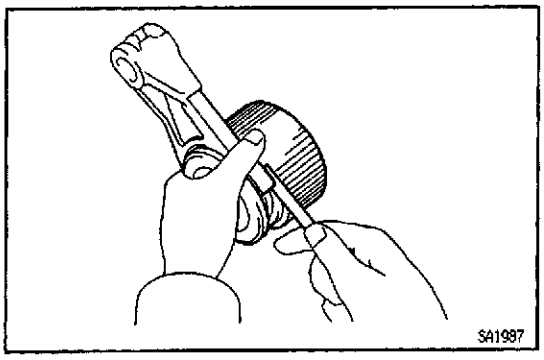


(d) Remove the following parts
- Side gear (2 pieces)
- Side gear thrust washer (2 pieces)
- Spider
- Pinion gear (4 pieces)
- Pinion gear thrust washer (4 pieces)

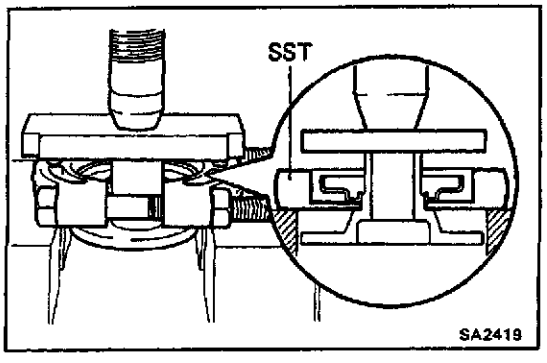


COMPANION FLANGE DUST DEFLECTOR REPLACEMENT

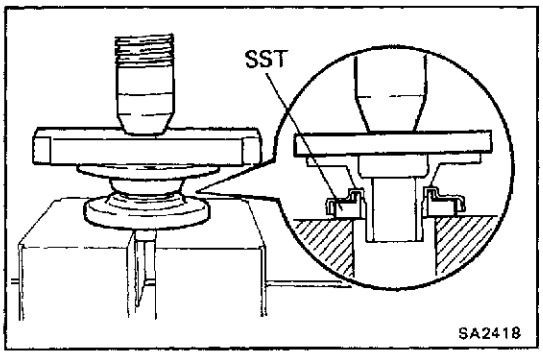
1. (w/ DIFFERENTIAL LOCK)
INSPECT SLEEVE
(a) Install the sleeve to the differential case (I-H) and check it moves smoothly
(b) Install the sleeve to the side gear and check it moves smoothly



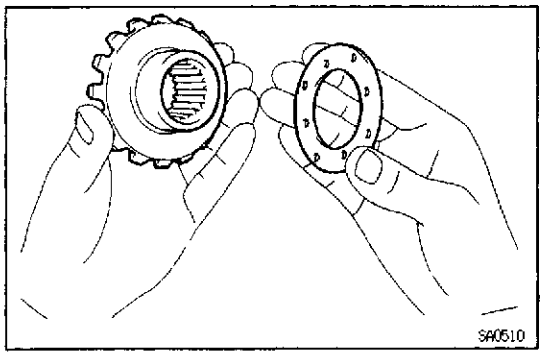
2. (w/ DIFFERENTIAL LOCK)
MEASURE CLEARANCE OF SHIFT FORK AND SLEEVE
Using a feeler gauge, measure the clearance between the shift fork and sleeve
Clearance (Reference):
0.15 - 0.35 mm (0.06 - 0.014 in.)



3. REMOVE DUST DEFLECTOR
Using SST and a press, remove the dust deflector
SST 09950-00020



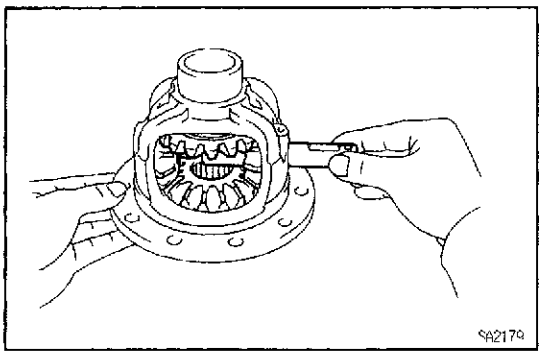
4. INSTALL NEW DUST DEFLECTOR
Using SST and a press, install the new dust deflector
SST 09726-40010



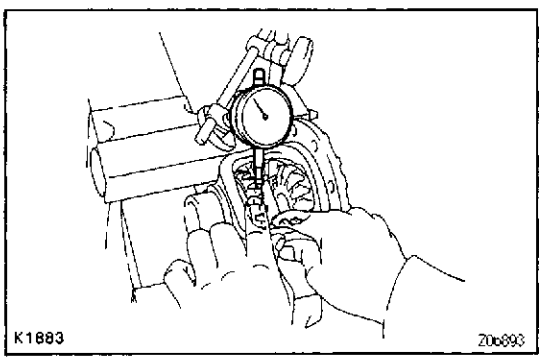
DIFFERENTIAL CARRIER ASSEMBLY (See page SA-38)

1. (w/o DIFFERENTIAL LOCK)
ASSEMBLE DIFFERENTIAL CASE
(a) Install the proper thrust washers and side gears
Using the table below, select the thrust washers which will ensure that the backlash is within specification
Try to select washers of the same size for both sides
Standard backlash:
0.05-0.20 mm (0.0020-0.0079 in.)
Thrust washer thickness:

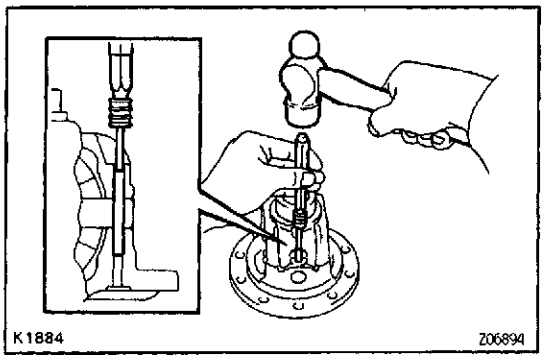
Thickness mm (in)	Thickness mm (in)
1 6 (0 063)	1 8 (0 071)
1 7 (0 067)	



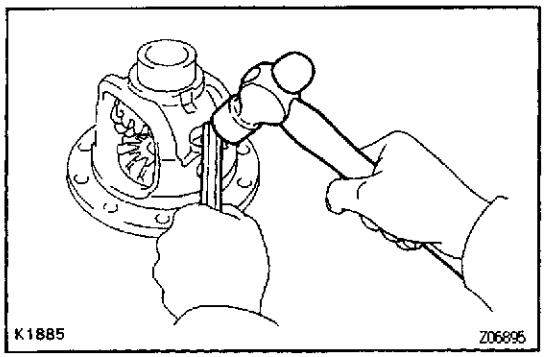
(b) Install the side gears with the thrust washers, pinion gears, pinion gear thrust washers and pinion shaft
HINT Align the hole for the pinion shaft with the case hole



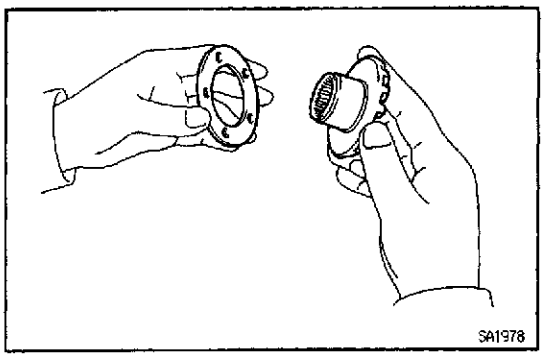
(c) Using a dial indicator, measure the side gear backlash while holding 1 pinion gear toward the case
Standard backlash:
005-0.20 mm (0.0020-0.0079 in.)
If the backlash is not within specification, install a thrust washer of different thickness



(d) Using a pin punch and hammer drive in the straight pin through the holes in the differential case and pinion shaft

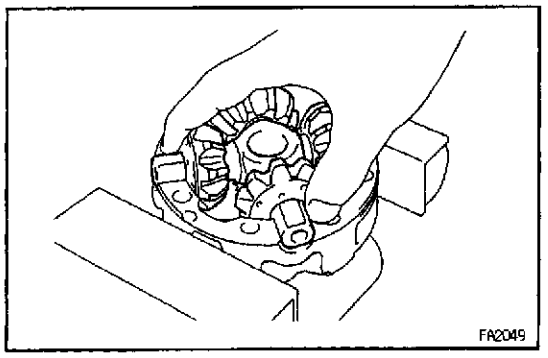


(e) Using a chisel and hammer, stake the out side of the differential case pin hole

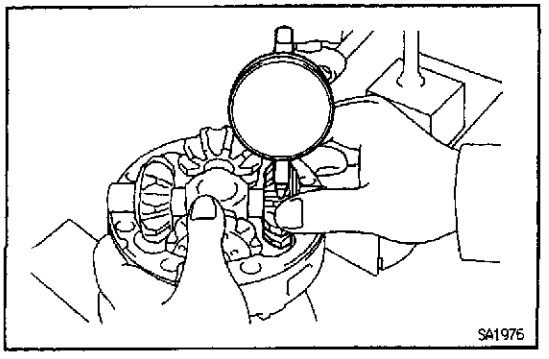


2. (w/ DIFFERENTIAL LOCK)
ASSEMBLE DIFFERENTIAL CASE

(a) Apply gear oil to each part
(b) Install the thrust washer to the side gear
(c) Install the side gear to the RH case



(d) Install the 4 pinion gears and thrust washers to the spider
(e) Install the pinion gear and spider to the RH case



(f) Hold the side gear and spider, measure the side gear backlash

Standard backlash:

0.05 - 0.20 mm (0.0010 - 0.0079 in.)

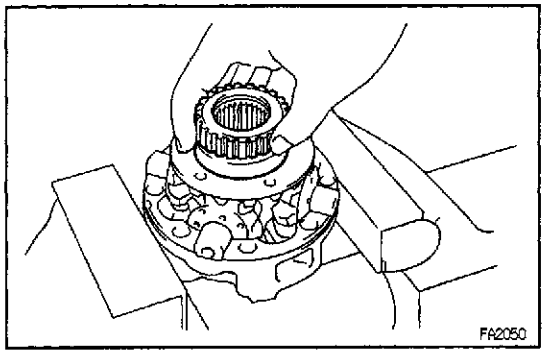
HINT

- Measure at all 4 locations
- Measure the backlash at the RH case at the LH case

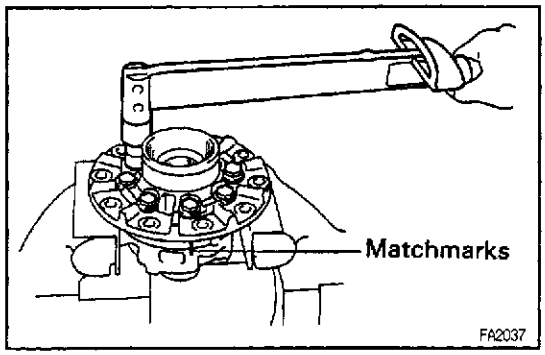
If the backlash is not within specification, install a thrust washer of a different thickness

Thrust washer thickness:

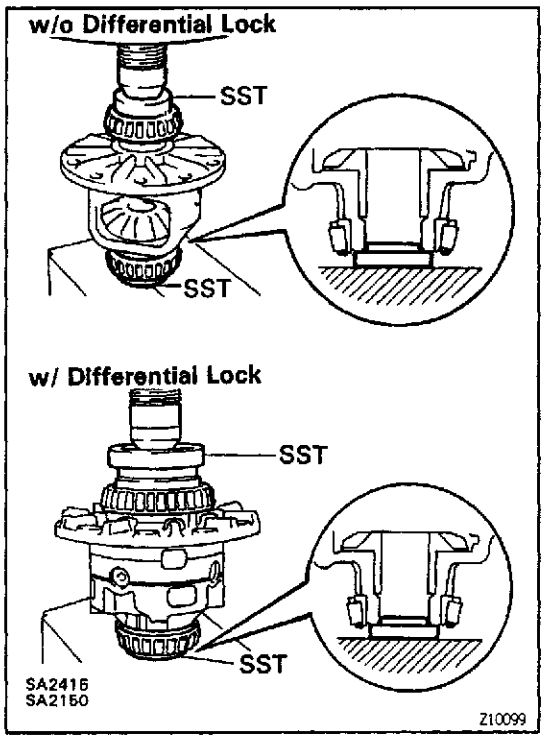
Thickness mm (in)	Thickness mm (in)
0 9(0 035)	1 1(0 043)
1 0(0 039)	



(g) Install the side gear and thrust washer to the RH case
(h) Install the pinion gears and spider to the RH case
(i) Install the side gear and thrust washer to the RH case



(j) Align the matchmarks on the LH and RH cases
(k) Torque the 8 bolts uniformly, a little at a time
Torque: 47 N-m (480 kgf-cm, 35 ft-lbf)

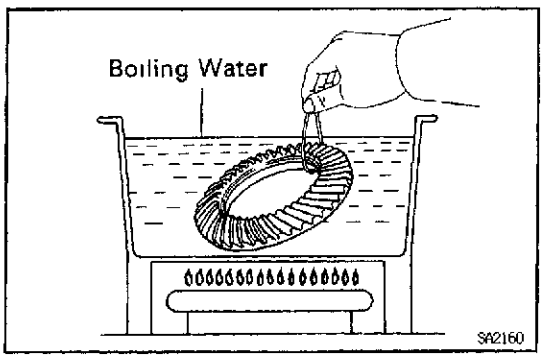


3. INSTALL SIDE BEARINGS

Using a press and SST, press the side bearings on the differential case

SST (w/o Differential lock)
09608-30012 (09608-00060, 09608-04060)

(w/ Differential lock)
09223-15020 and 09608-30012 (09608-04060)

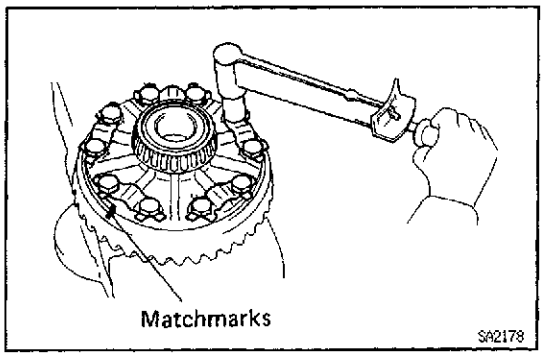


4. INSTALL RING GEAR ON DIFFERENTIAL CASE

(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) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case



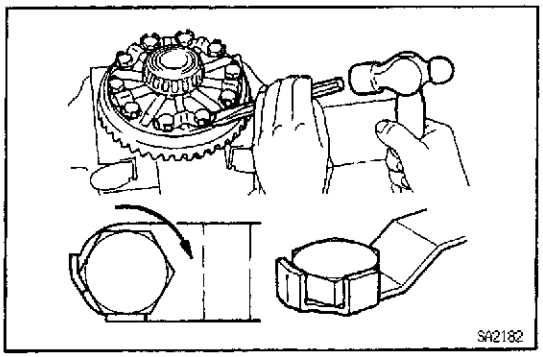
(d) Align the matchmarks on the ring gear and differential case

(e) Temporarily install the lock plates and set bolts

NOTICE: The ring gear set bolts should not tight until the ring gear has cooled sufficiently.

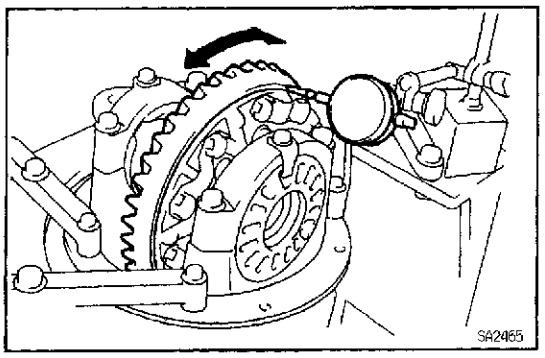
(f) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time

Torque: 97 N-m (985 kgf-cm, 71 ft-lbf)



(g) Using a hammer and drift punch, 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



5. CHECK RING GEAR RUNOUT

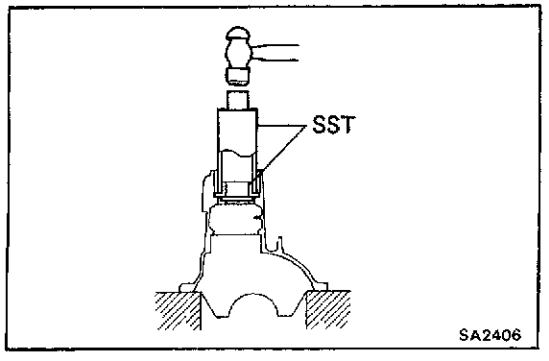
(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings

(b) Check the ring gear runout

Maximum runout:

0.10 mm (0.0039 in.)

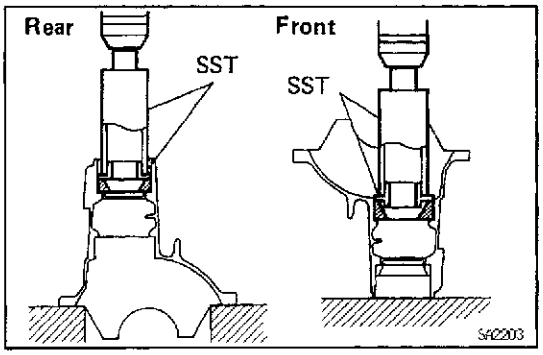
(c) Remove the differential case



6. INSTALL OIL STORAGE RING

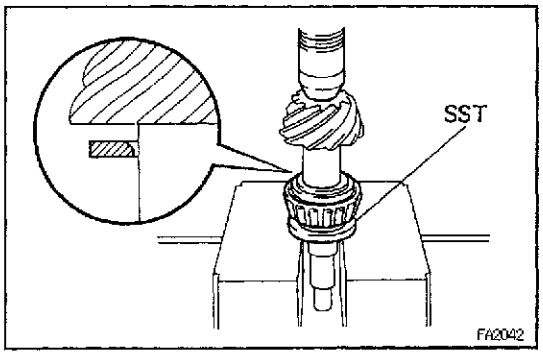
Using SST and a hammer, install the new oil storage ring

SST 09316-60010 (09316-00010, 09316-00020)



7. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

Using SST and a press, install the outer races
Front side
SST 09316 - 60010 (09316 - 00010, 09316 - 00020)
Rear side
SST 09316-60010 (09316-00010, 09316-00050)

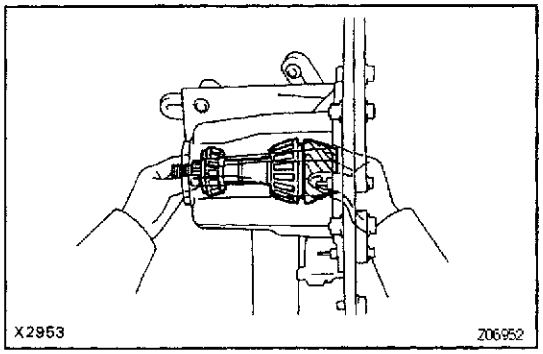


8. INSTALL DRIVE PINION FRONT BEARING

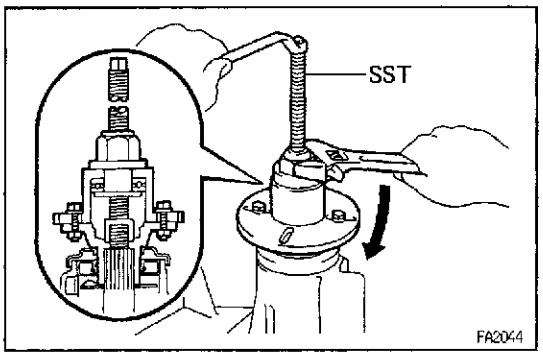
(a) Install the washer on the drive pinion with the chamfered end facing the pinion gear
(b) Using a press and SST, press in the front bearing onto the drive pinion
SST 09506-30012

9. 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

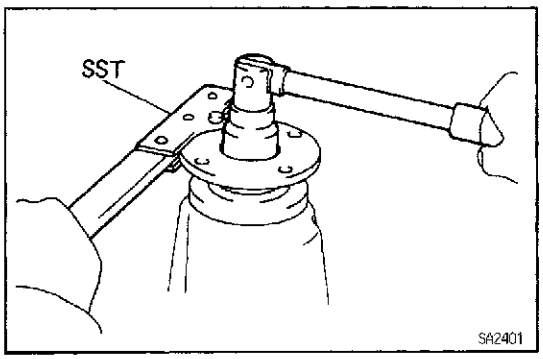


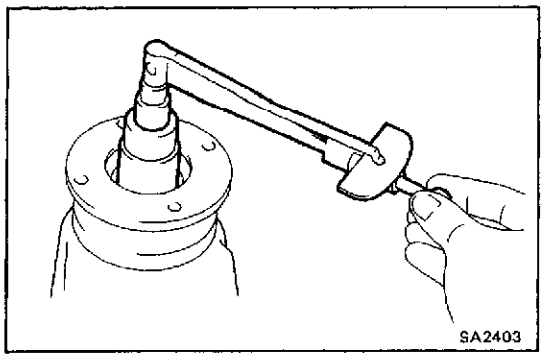
(b) Install the companion flange with SST
SST 09557-22022 (09557-22050)



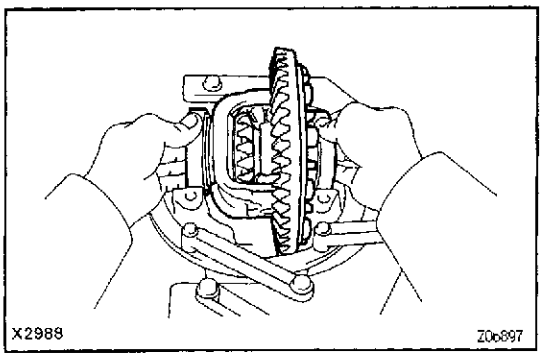
(c) Adjust the drive pinion preload by tightening the companion flange nut
Using SST to hold the flange tighten the nut
SST 09330-00021

NOTICE: As there is no spacer, tighten a little at a time, being careful not to overtighten.

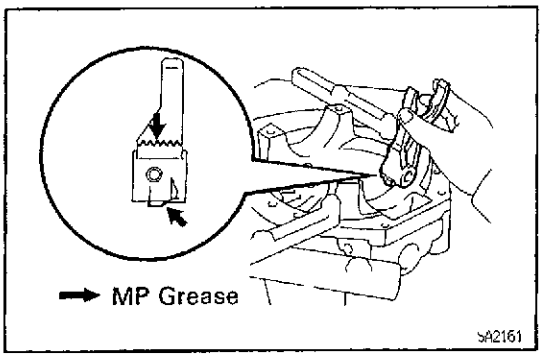




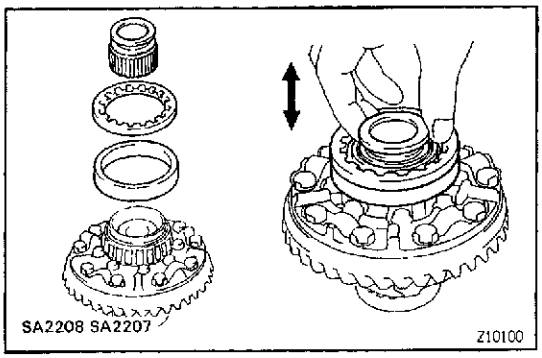
(d) Using a torque wrench, measure the preload
Preload (starting):
New bearing
0.9-1.6 N-m (10-16 kgf-cm, 8.7-13.9 in.-lbf)
Reused bearing
0.5-0.8 N-m (5-8 kgf-cm, 4.3-6.9 in.-lbf)
HINT Measure the total preload after first turning the bearing clockwise and counterclockwise several times to snug down the bearing



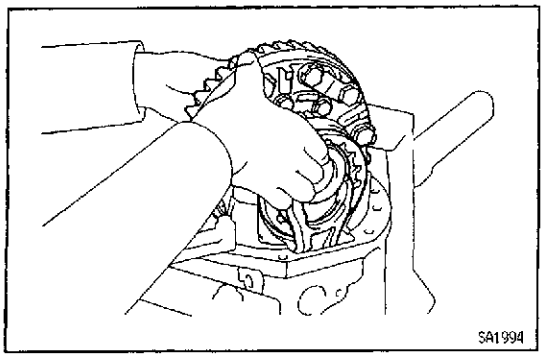
10. (w/o DIFFERENTIAL LOCK)
INSTALL DIFFERENTIAL CASE IN CARRIER
(a) Place the bearing outer races on their respective bearings Make sure the left and right outer races are not interchanged
(b) Install the case in the carrier
HINT Make sure that there is backlash between the ring gear and drive pinion



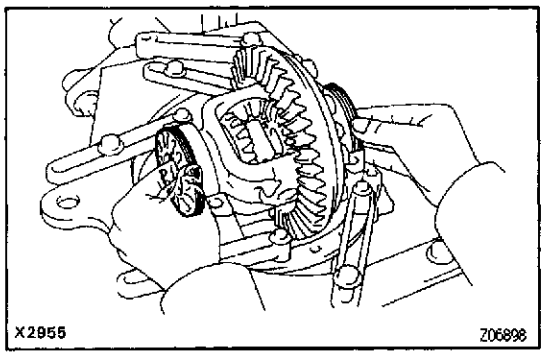
11. (w/ DIFFERENTIAL LOCK)
INSTALL DIFFERENTIAL CASE IN CARRIER
(a) Apply MP grease on the rack of the shift fork and connecting part of the indicator switch
(b) Insert the shift fork into the differential carrier as shown



(c) Install both outer races, adjusting nuts and sleeve
HINT Check that the sleeve moves smoothly

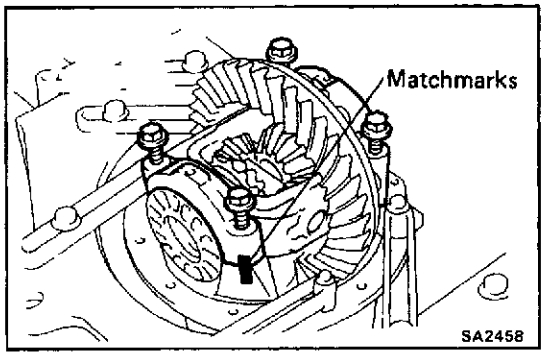


(d) Install the shift fork in the groove of the sleeve, holding it by hand, install the case in the carrier
HINT Make sure that there is backlash between the ring gear and drive pinion



12. (w/o DIFFERENTIAL LOCK)
INSTALL ADJUSTING NUTS

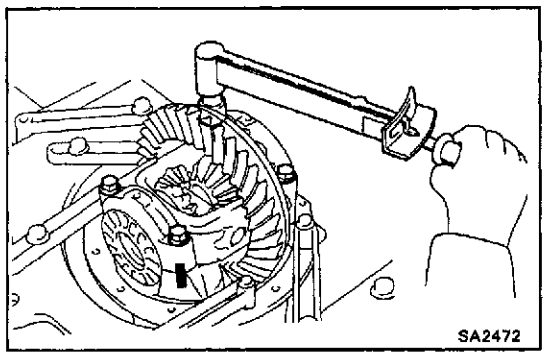
Install the adjusting nuts on the carrier, making sure the nuts are threaded properly



13. 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



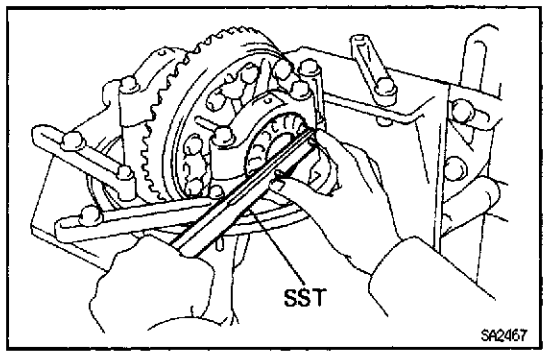
14. ADJUST SIDE BEARING PRELOAD

(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

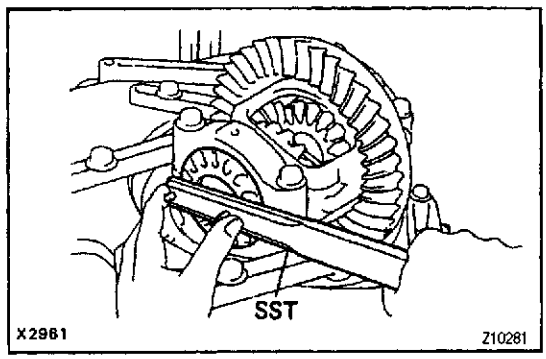
Torque: 78 N-m (800 kgf-cm, 58 ft-lbf)

(b) Fully tighten the 4 bearing cap bolts by hand



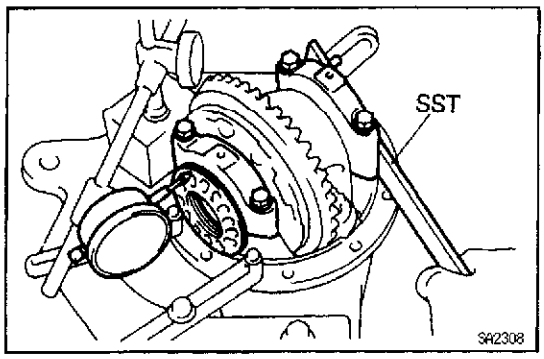
(c) Using SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0 2 mm (0 008 in)

SST 09504-0001 1



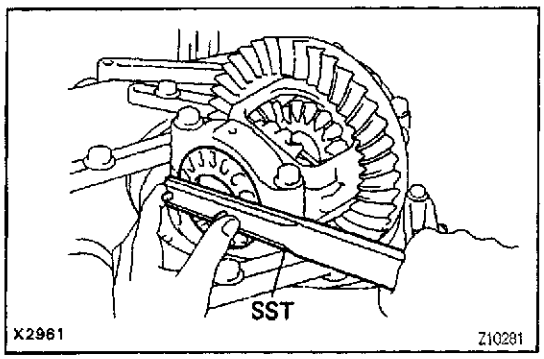
(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side After the bearings as settled, loosen the adjusting nut on the drive pinion side

SST 09504 - 00011

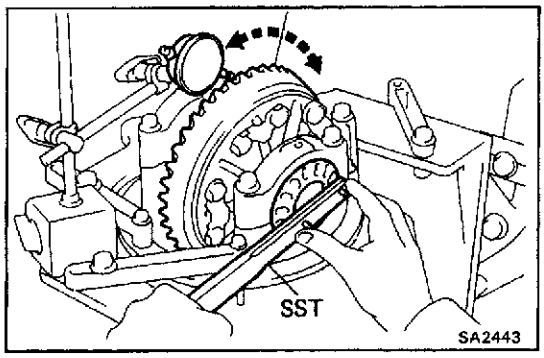


(e) Place a dial indicator on the top of the adjusting nut on the ring gear side

(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

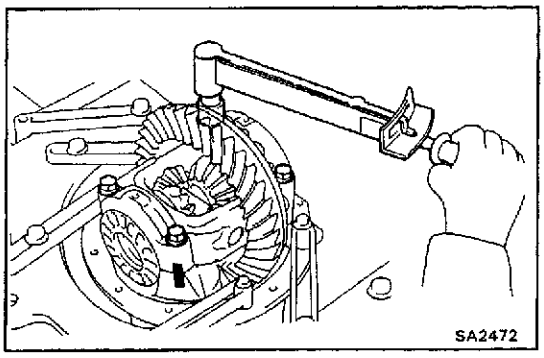


(h) Using a dial indicator, adjust the ring gear backlash until it is within specification

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 on notch and torque the nut on the right side one notch



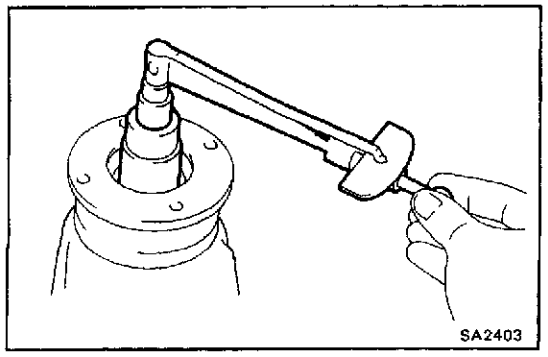
(I) Torque the bearing cap bolts

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)

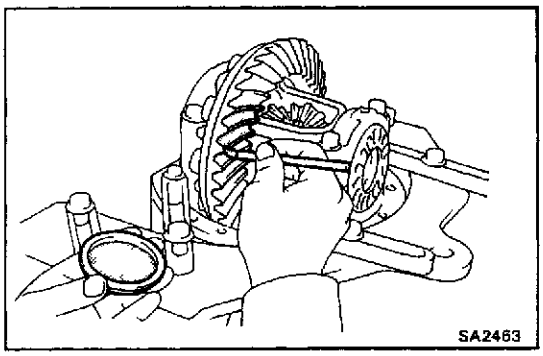


(k) Using a torque wrench, measure the total preload

Total preload (starting):

Add drive pinion preload

0.4-0.6 N-m (4-6 kgf-cm, 3.5-5.2 in.-lbf)

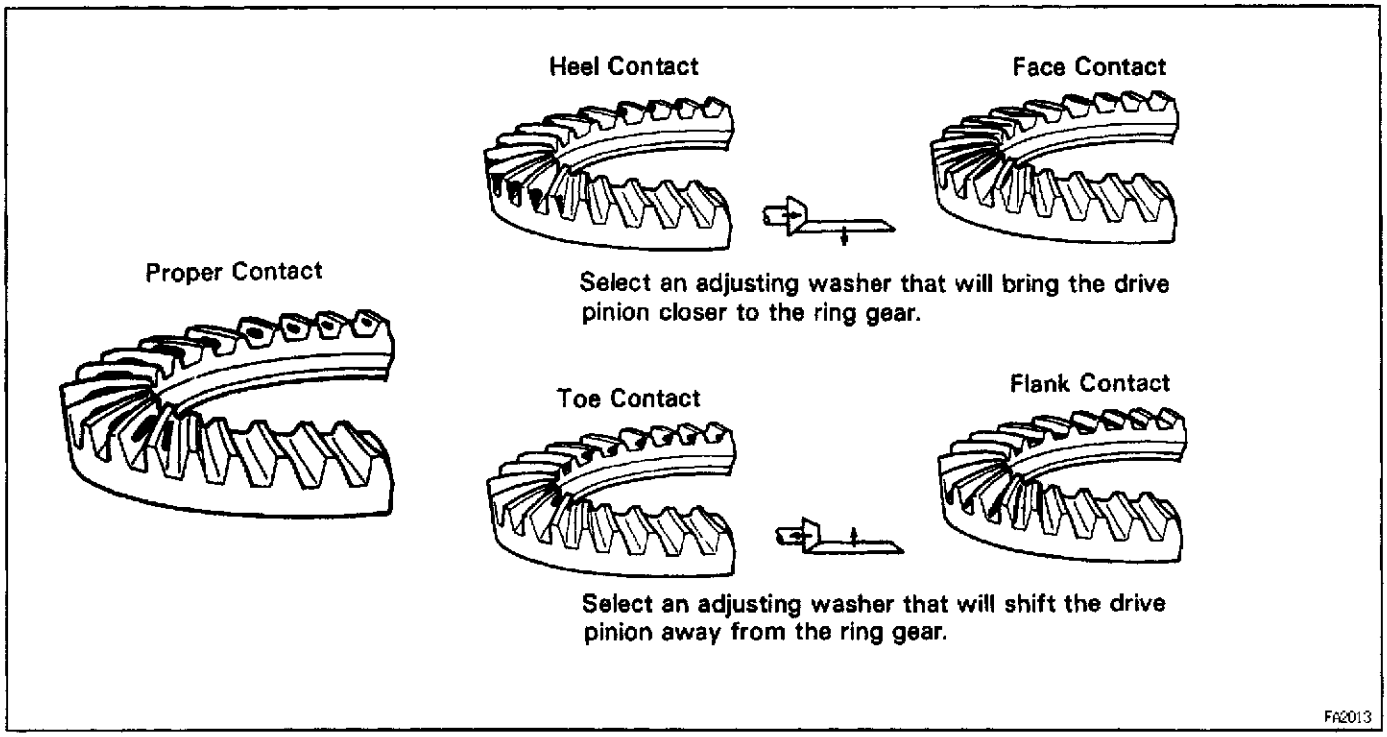

SA2463

15. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

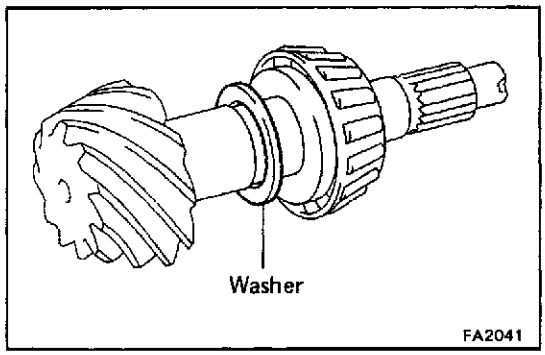
(a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead

(b) Hold the companion flange firmly and rotate the ring gear in both directions

(c) Inspect the tooth pattern



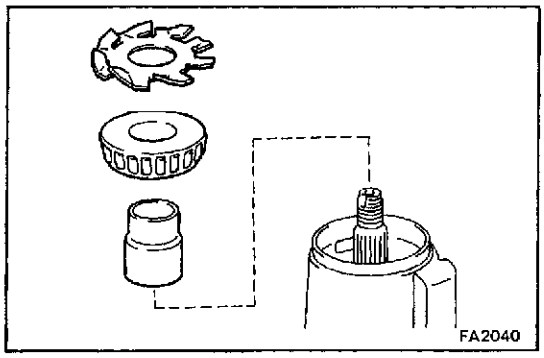
FA2013



FA2041

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 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)

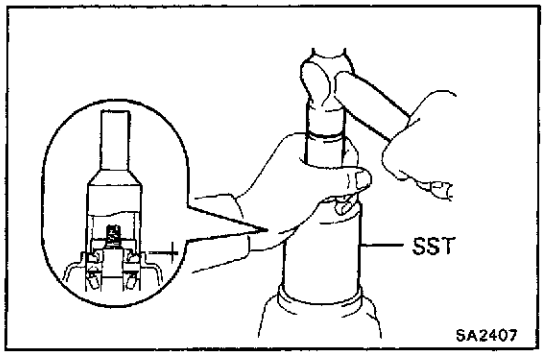


16. REMOVE COMPANION FLANGE
(See page SA-42)

17. REMOVE OIL SLINGER AND REAR BEARING
(SEE PAGE SA-43)

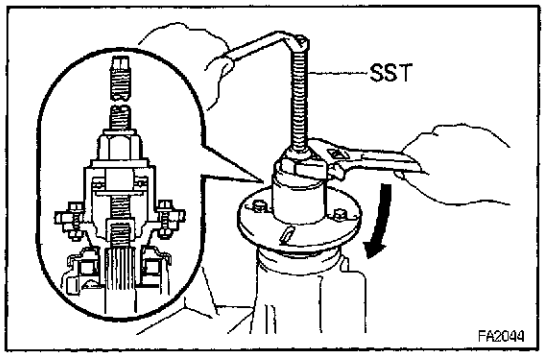
18. INSTALL NEW BEARING SPACER AND REAR BEARING

(a) Install a new bearing spacer on the shaft
(b) Install the rear bearing and oil slinger



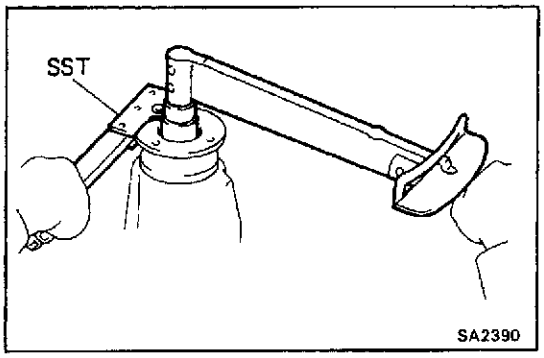
19. INSTALL NEW OIL SEAL

(a) Using SST, drive in a new oil seal as shown
SST 09214-7601 1
Oil seal drive in depth:
1.0 mm (0.039 in.)
(b) Apply MP grease to the oil seal lip

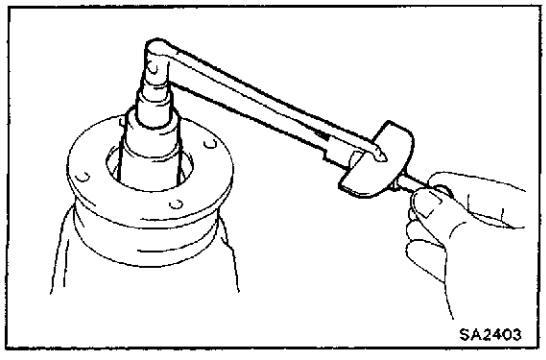


20. INSTALL COMPANION FLANGE

(a) Install the companion flange with SST
SST 09557-22022 (09557-22050)



(b) Install the washer and 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)



21. ADJUST DRIVE PINION PRELOAD

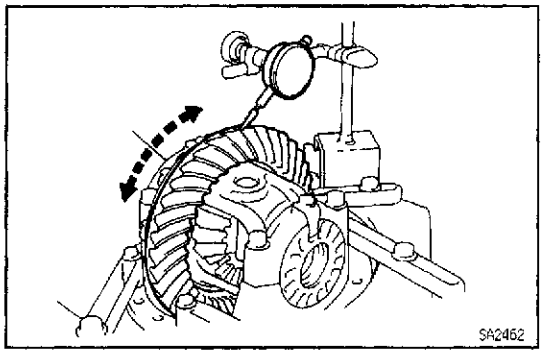
Using a small torque wrench measure the preload of the backlash between the drive pinion and ring gear
Preload (starting):
New bearing
0.9-1.6 N-m (10-16 kgf-cm, 8.7-13.9 in.-lbf)
Reuse bearing
0.5-0.8 N-m (5-8 kgf-cm, 4.3-6.9 in.-lbf)

- If preload is greater than specification, replace the bearing spacer
- If preload is less than specification, retighten the nut 13 N-m (130 kgf-cm, 9 ft-lbf) a little at a time 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



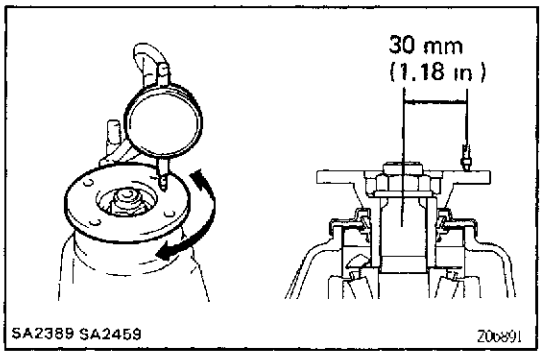
22. RECHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash

Ring gear backlash:

0.13-0.18 mm (0.0051-0.0071 in.)

23. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA-56)

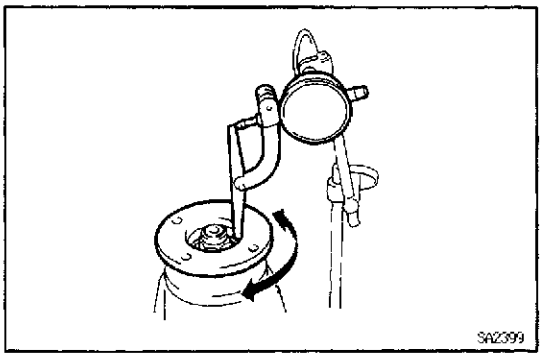


24. CHECK RUN4UT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

Maximum vertical runout:

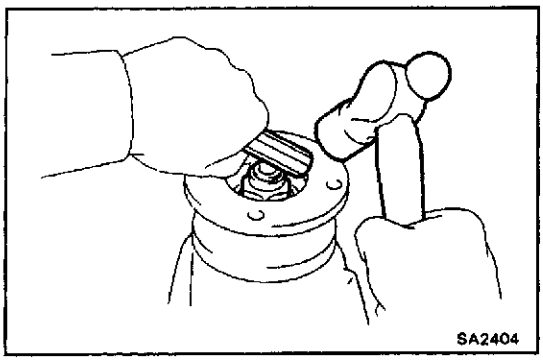
0.10 mm (0.0039 in.)



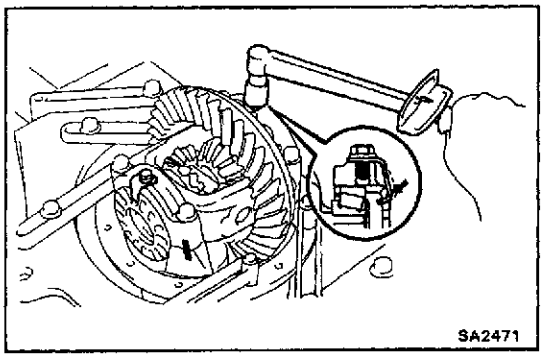
Maximum lateral runout:

0.10 mm (0.0039 in.)

If the runout is greater than maximum inspect the bearings



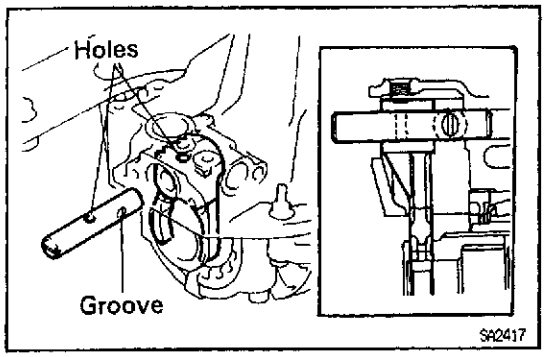
25. STAKE DRIVE PINION NUT



26. INSTALL ADJUSTING NUT LOCKS

(a) Install new 2 nut locks on the bearing caps
Torque: 13 N-m (130 kgf-cm. 9 ft-lbf)

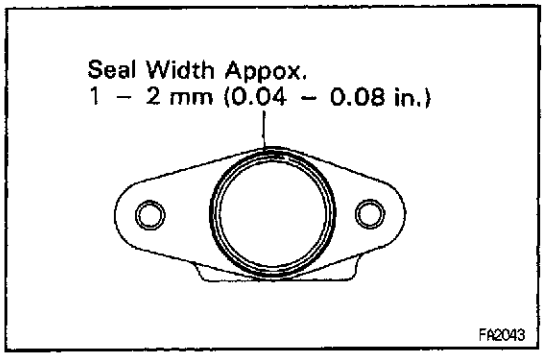
(b) After tightening bolts, bend the nut locks



27. (w/ DIFFERENTIAL LOCK)
INSTALL SHIFT FORK SHAFT

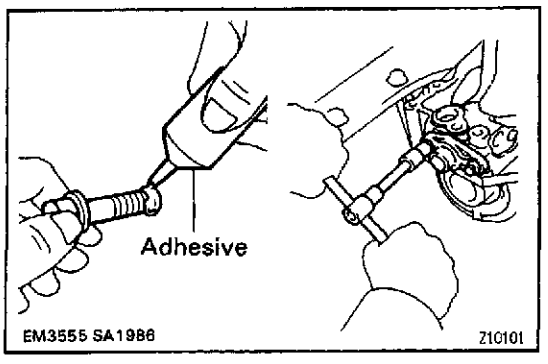
(a) Apply MP grease onto the outer circuit of the fork shaft

(b) Install the fork shaft to match the hole of the shift fork and that of the shift fork shaft



(c) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier and shaft retainer

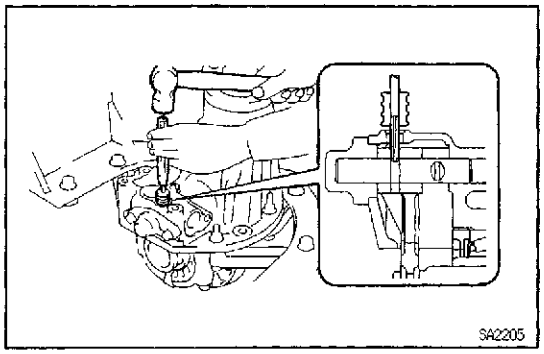
(d) Apply seal packing to the carrier as shown
Seal packing: Part No. 08826 - 00090, THREE BOND 1281 or equivalent
HINT Install the shaft retainer within 10 minutes after applying seal packing



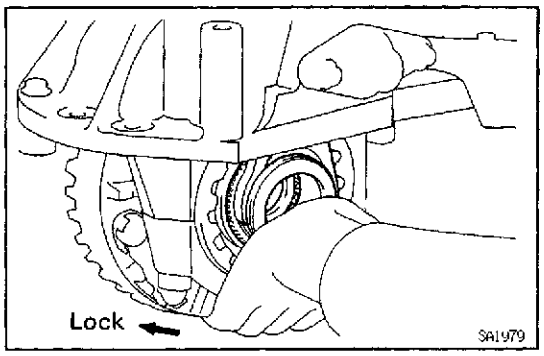
(e) Clean the threads of the bolts and retainer bolts holes with toluene or trichlorethylene

(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

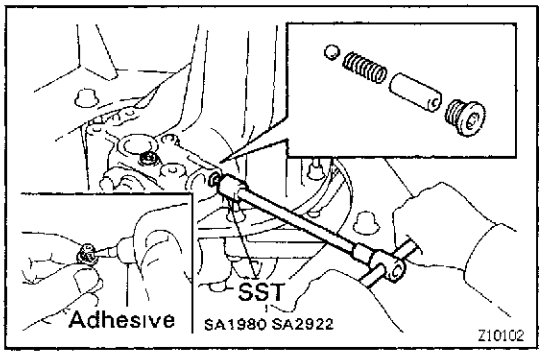
(g) Tighten the shaft retainer with the 2 bolts
Torque: 24 N-m (240 kgf-cm, 17 ft-lbf)



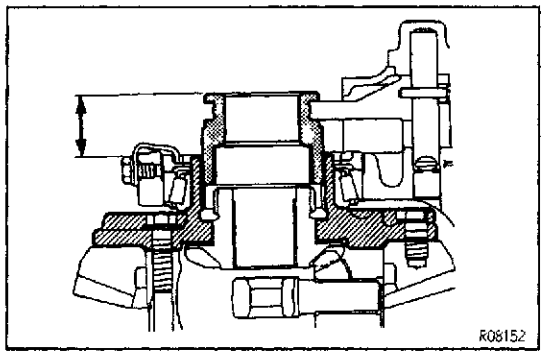
(h) Using a pin punch and hummer, drive in the slotted spring pin to the shift fork



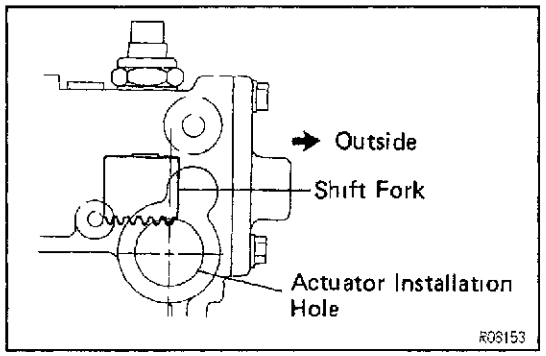
(i) Shift the fork deeply and keep the differential lock condition



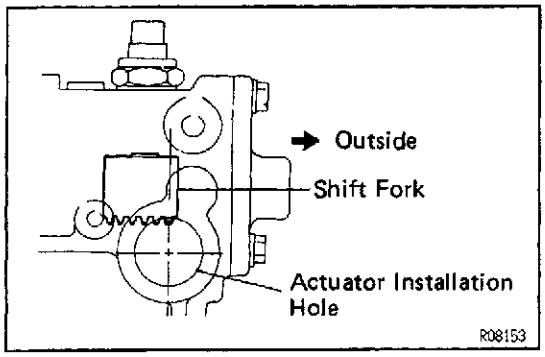
(j) Install the ball, compression spring and spring seat
(k) Clean the threads of 2 plugs and plug holes with toluene or trichloroethylene
(l) Apply adhesive to the plug threads
Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
(m) Using SST, install and tighten the screw plugs
SST 09313-30021
Torque: 22 N-m (220 kgf-cm, 16 ft-lbf)



28. (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 32.40 - 33.90 mm (1.2756 - 1.3346 in.)
FREE 17.44 - 18.86 mm (0.6866 - 0.7425 in.)

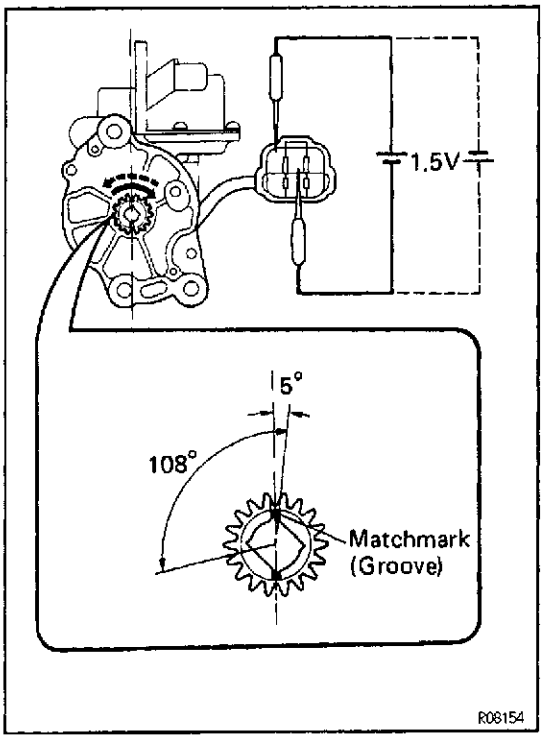


29. (w/ DIFFERENTIAL LOCK)
INSTALL INDICATOR SWITCH
Install the indicator switch with a new gasket
Torque: 40 N-m (410 kgf-cm, 30 ft-lbf)



30. (w/ DIFFERENTIAL LOCK)
INSTALL ACTUATOR

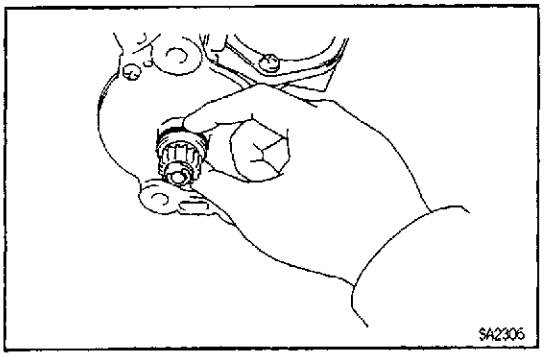
(a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole



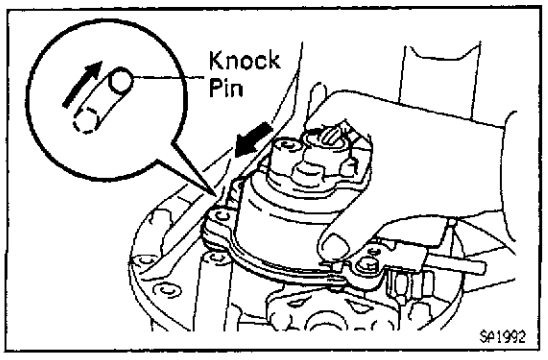
(b) Ensure that the matchmarks of the pinion of the actuator is in the extent between zero and 5 degrees clockwise above the center line of the actuator

NOTICE:

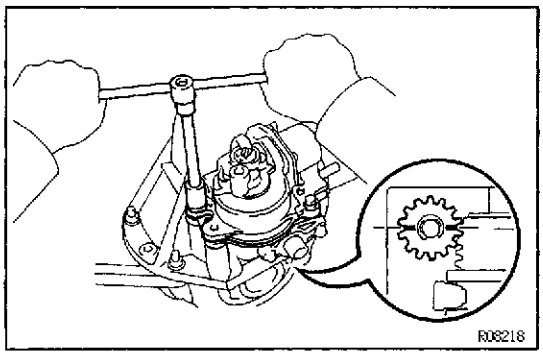
- **If the matchmarks is not in this extent, rotate the pinion to be matched.**
- **Don't supply the battery voltage directly between terminals.**
- **If the matchmarks come to the extension limit of the rotation, don't electrify moreover.**



(c) Install a new O-ring to the actuator
(d) Apply a light coat of gear oil on the 0 -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 Don't damage the 0-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



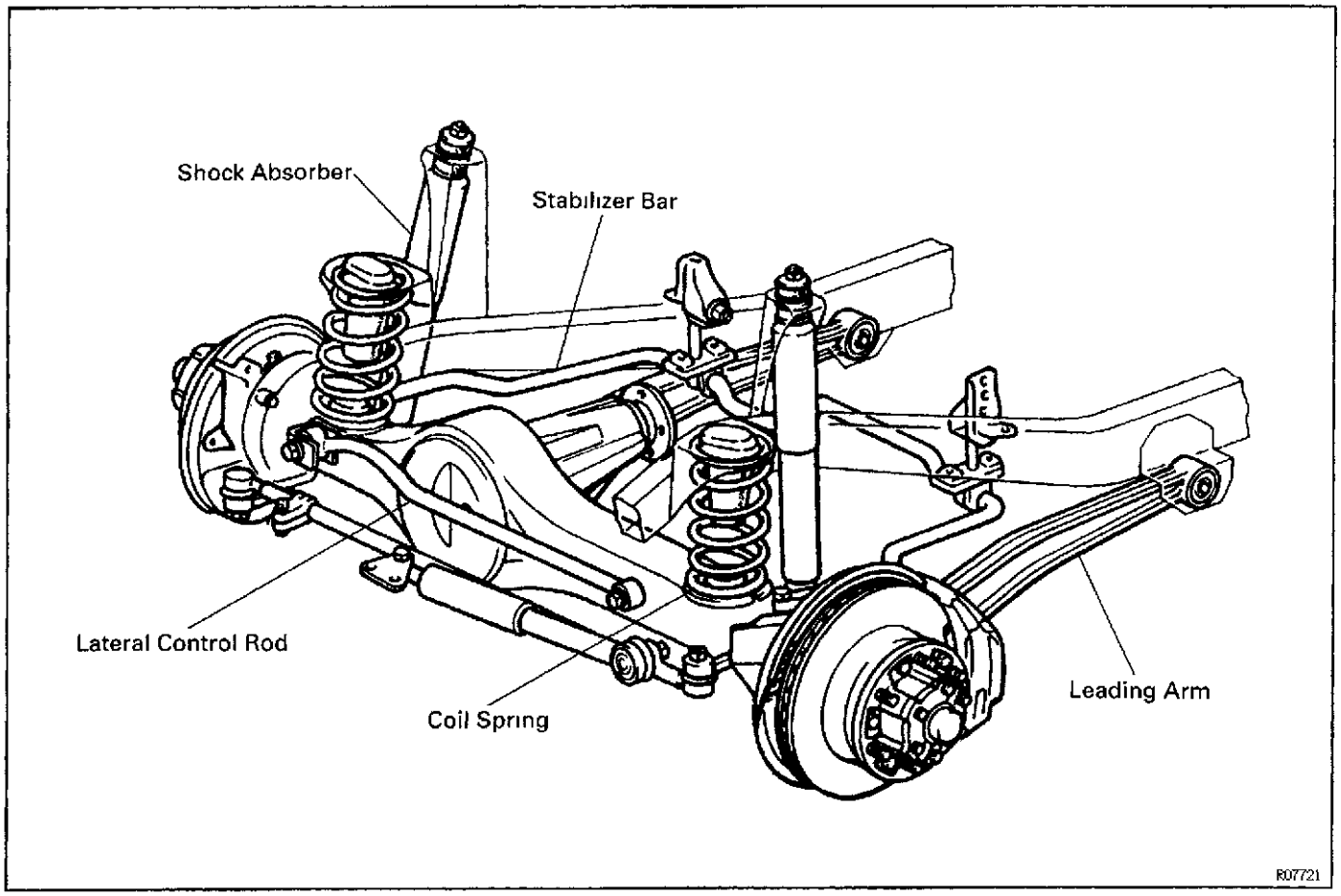
(h) Install the actuator to the differential carrier with bolt so that the outermost rack tooth of the shift fork shall fit the matchmarks of the pinion of the actuator

Torque: 26 N-m (270 kgf-cm, 20 ft-lbf)

FRONT SUSPENSION

DESCRIPTION

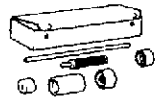
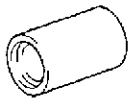
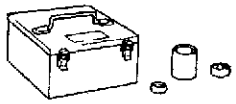
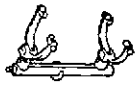
The front suspension is a 3-link type suspension which consists of 2 leading arms, a lateral control rod



PREPARATION

SST (SPECIAL SERVICE TOOLS)

SA0ZC-01

	0922$-22020 Oil Filter Wrench	
	09710-22041 Rear Suspension Bushing Tool Set	
	(09710-02020) Handle	
	(09710-02050) Base	
	(09710-02070) Bushing Remover & Replacer	
	09710-30030 Rear Suspension Bushing Tool Set	
	(09710-03180) Replacer	
	09727-30020 Coil Spring Compressor	

SA0ZD-01

EQUIPMENT

Torque wrench	

COIL SPRING AND SHOCK ABSORBER

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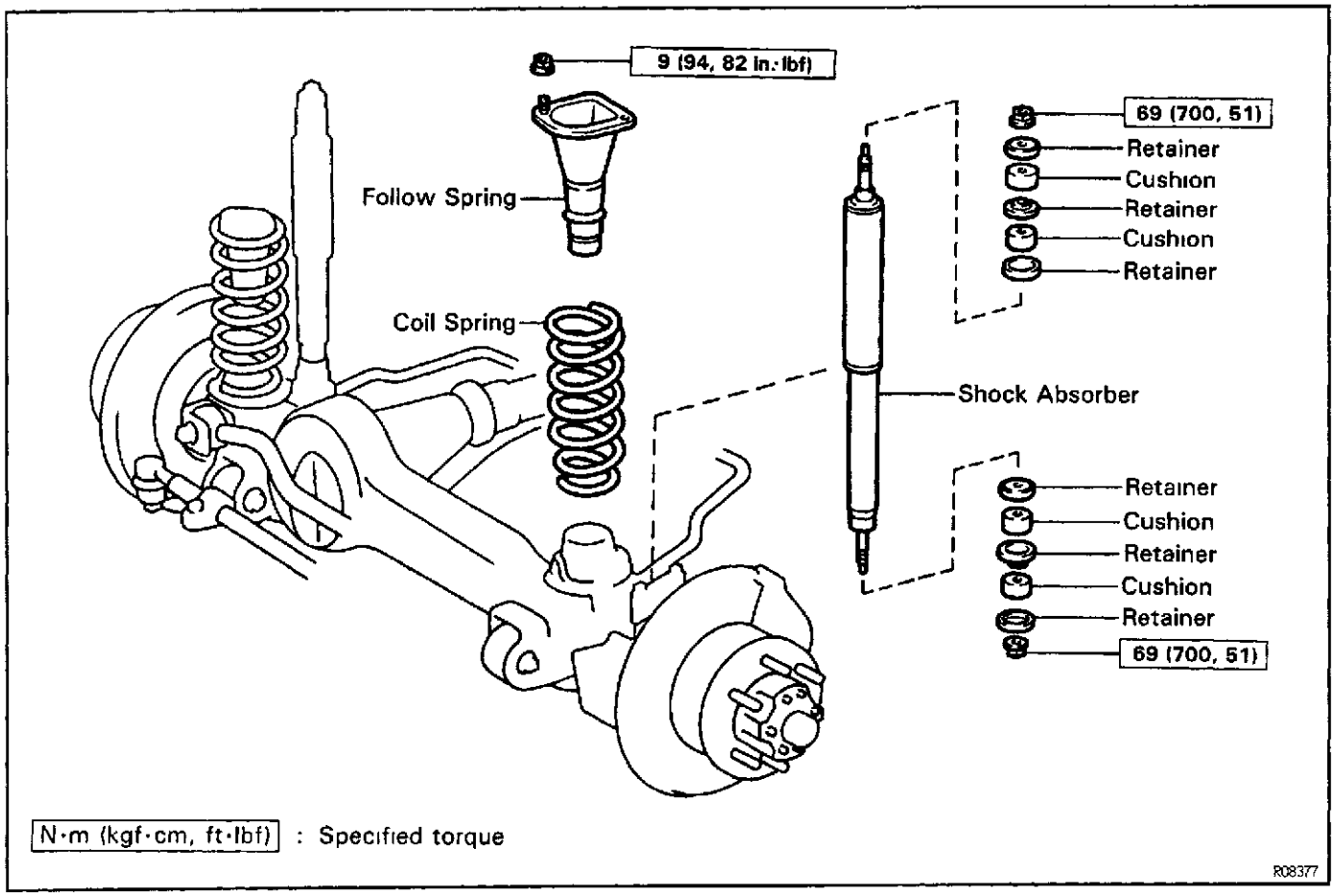
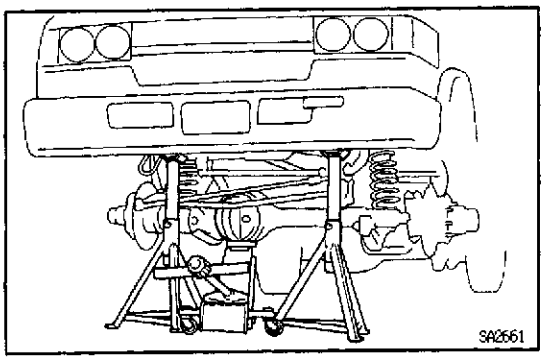
COMPONENTS



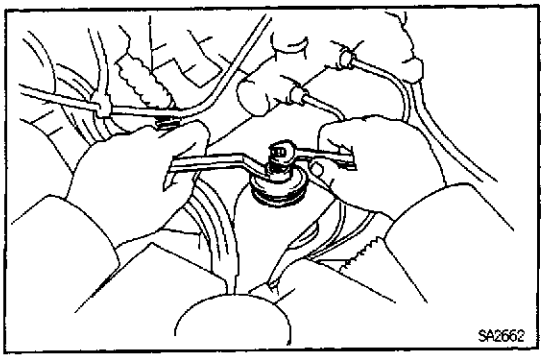
SA0EF-02



COIL SPRING AND SHOCK ABSORBER REMOVAL

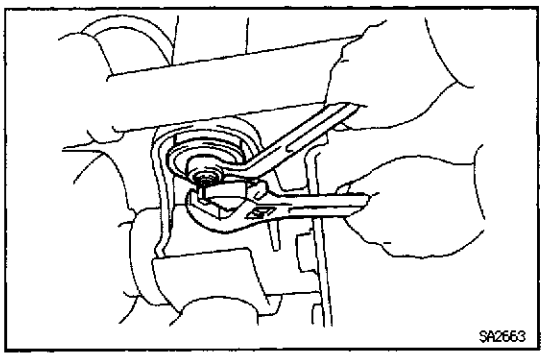
1. JACK UP AND SUPPORT BODY

Jack up and support the body on stands

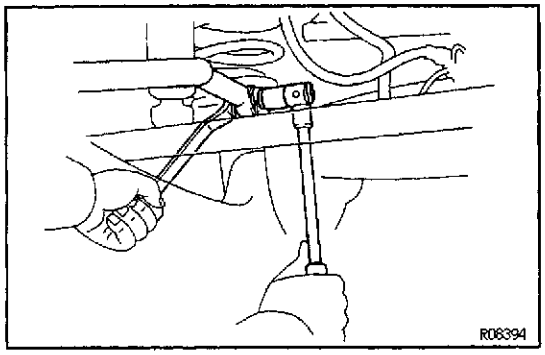


2. REMOVE FRONT SHOCK ABSORBER

(a) Jack up and support the axle housing
(b) Hold the piston rod, and remove the upper mounting nut

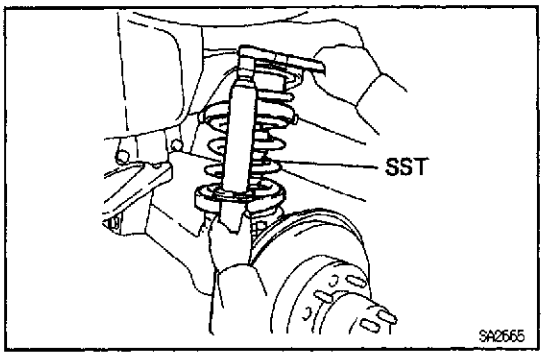


(c) Hold the shock absorber, and remove the lower mounting nut, shock absorber, cushions and the retainer



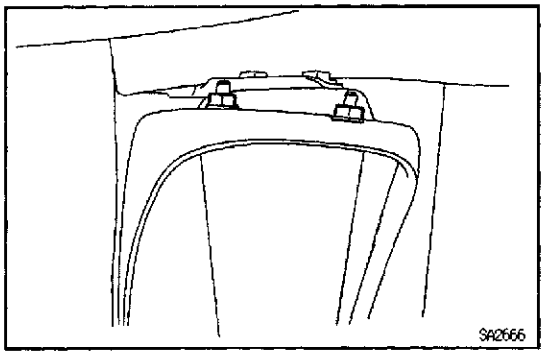
3. DISCONNECT STABILIZER BAR

Remove the bolt and nut, and disconnect the stabilizer bar with the cushion and bracket



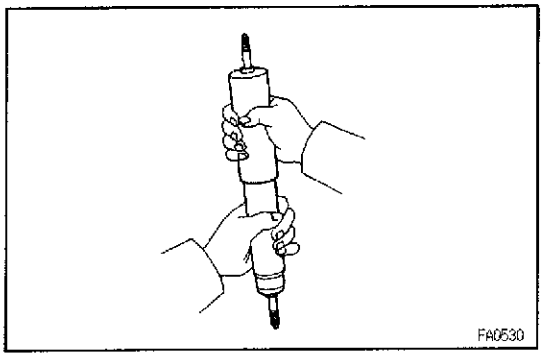
4. REMOVE COIL SPRING

(a) Jack down and support axle housing
(b) Using SST, compress the coil spring
SST 09727-30020
(c) Remove the coil spring



5. REMOVE FOLLOW SPRING

Remove the 2 nuts and the follow spring



FRONT SHOCK ABSORBER INSPECTION

1. INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is noabnormal resistance or unusual operation sounds

If there is any abnormality, replace the shock absorber with a new one

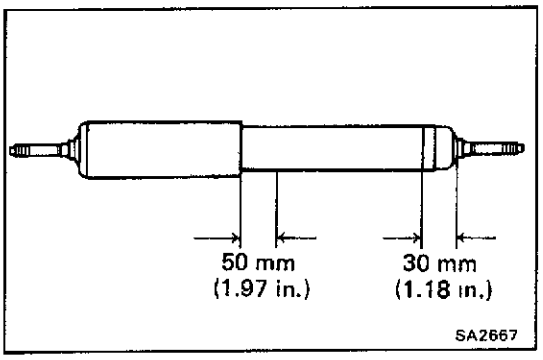
NOTICE: When discarding the shock absorber, use the following procedure.

2. DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a holl 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



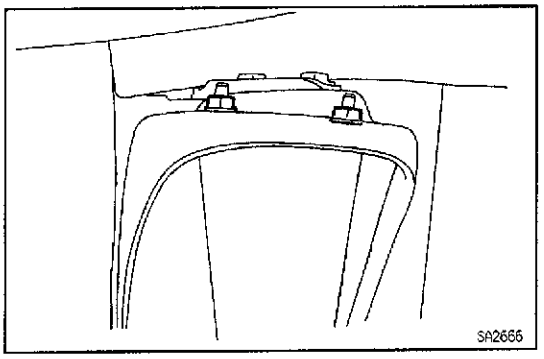
SA0ZH-02

COIL SPRING AND SHOCK ABSORBER INSTALLATION

(See page SA-65)

1. INSTALL FOLLOW SPRING

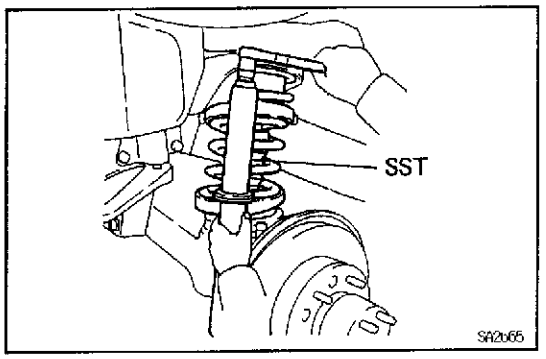
Install the follow spring to the body with the 2 nuts



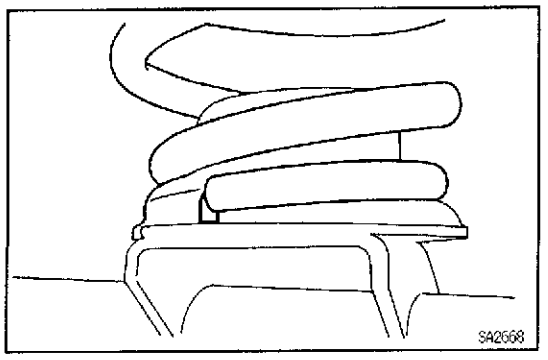
2. INSTALL COIL SPRING

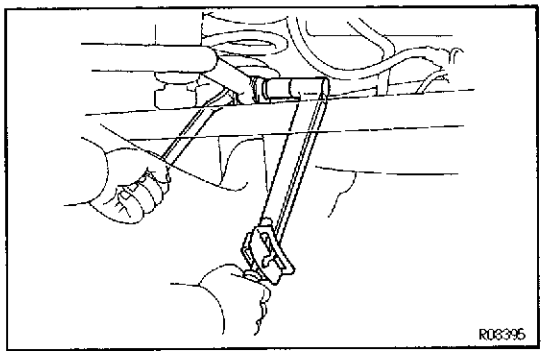
(a) Using SST, compress the coil spring

SST 09727-30020



(b) Align the coil spring end with the lower seat and install



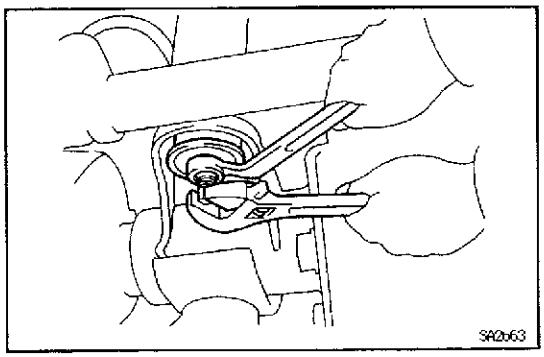


3. CONNECT STABILIZER BAR

(a) Jack up and support axle housing

(b) Connect the stabilizer bar to the axle housing with the bolt and nut

Torque: 25 N-m (260 kgf-cm, 19 ft¿fbf)

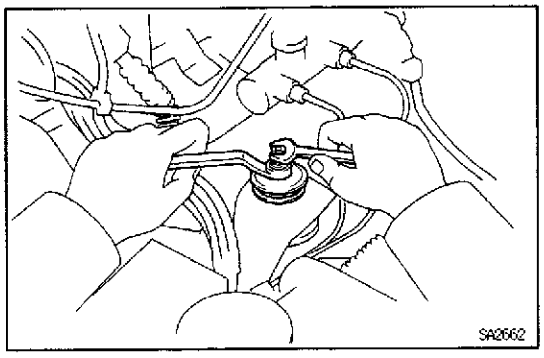


4. INSTALL SHOCK ABSORBER

(a) Install the retainers, cushions and shock absorber

(b) Hold the shock absorber to the axle housing with the lower mounting nut

Torque: 69 N-m (700 kgf-cm, 51 ft-lbf)



(c) Install the cushion and the retainers

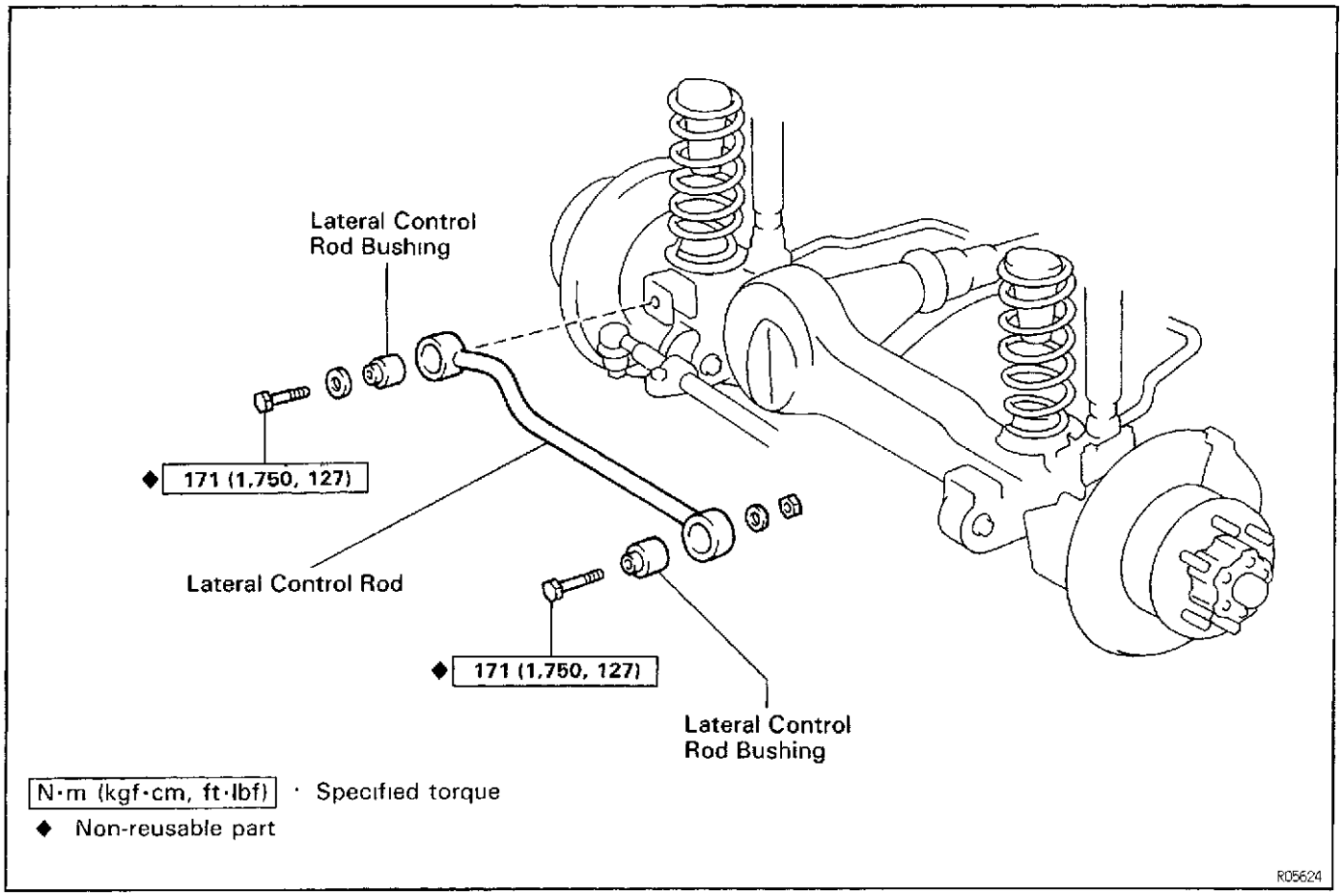
(b) Hold the piston rod to the body with the upper mounting nut

Torque: 69 N-m (700 kgf-cm, 51 ft-lbf)

LATERAL CONTROL ROD

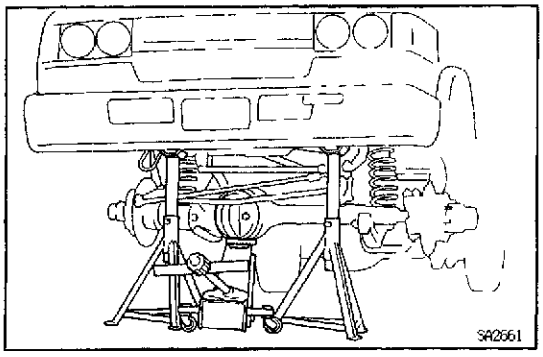
9A0ZJ-01

COMPONENTS



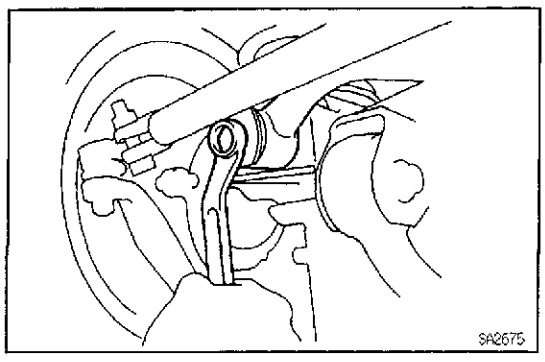
9A0ZK-01

LATERAL CONTROL ROD REMOVAL



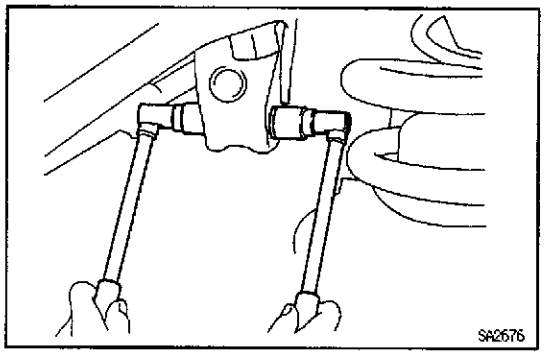
1. JACK UP AND SUPPORT BODY

Jack up and support the body on the stands

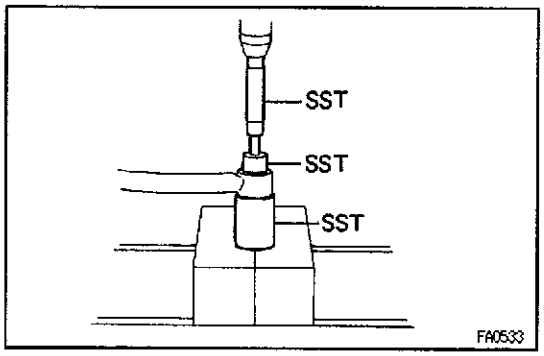


2. DISCONNECT LATERAL CONTROL ROD FROM AXLE HOUSING

Remove the nut, and disconnect the lateral control rod from the axle housing



3. REMOVE LATERAL CONTROL ROD FROM FRAME
Remove the nut, bolt and the lateral control rod

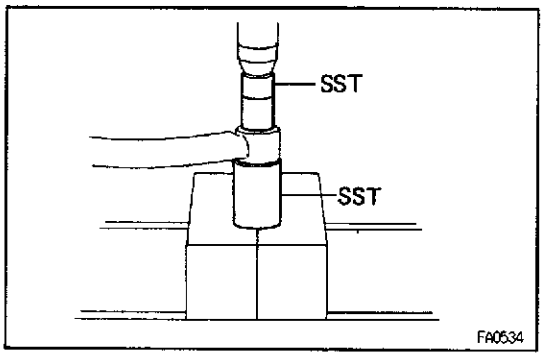


LATERAL CONTROL ROD BUSHING REPLACEMENT

SA6ZL 01

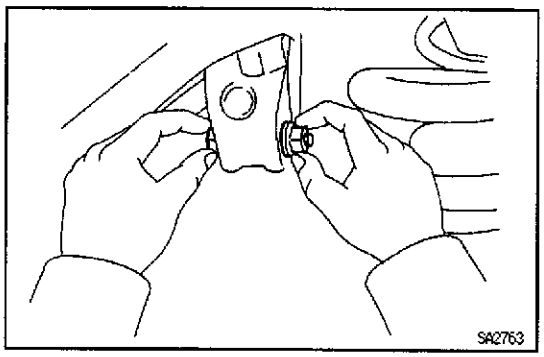
1. REMOVE BUSHING

Using SST, press out the bushing from the lateral control rod
SST 09710-22041 (09710-02020, 09710-02050, 09710-02070)

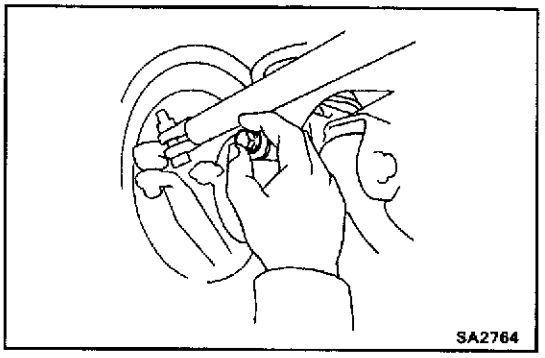


2. INSTALL BUSHING
Using SST, press in a new bushing into the later-al control rod
SST 09710-22041 (09710-02050, 09710-02070)
HINT Do not use a lubricant when pressing in the bushing

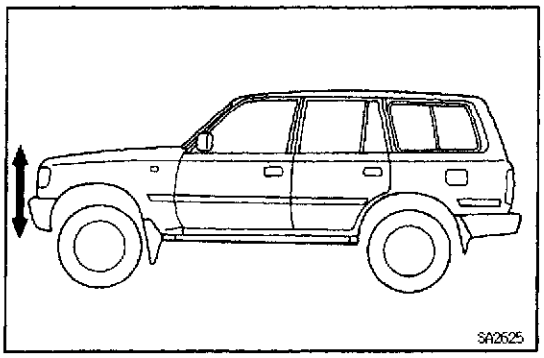
LATERAL CONTROL ROD INSTALLATION



1. INSTALL LATERAL CONTROL ROD TO FRAME
Temporarily install the lateral control rod to the frame with the bolt and nut

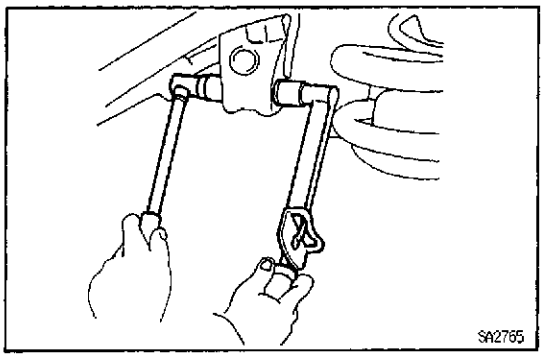


2. CONNECT LATERAL CONTROL ROD TO AXLE HOUSING
Temporarily install the lateral control rod to the axle housing with the bolt



3. STABILIZE SUSPENSION

Bounce the vehicle up and down stabilize the suspension



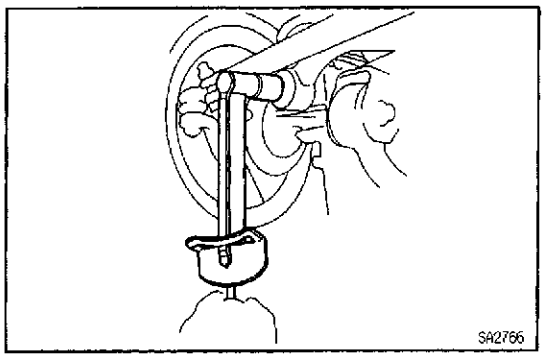
4. TORQUE BOLTS AND NUT

(a) Jack up the axle housing

(b) Torque the bolt and nut

(Body side)

Torque: 171 N-m (1,750 kgf-cm, 127 ft-lbf)



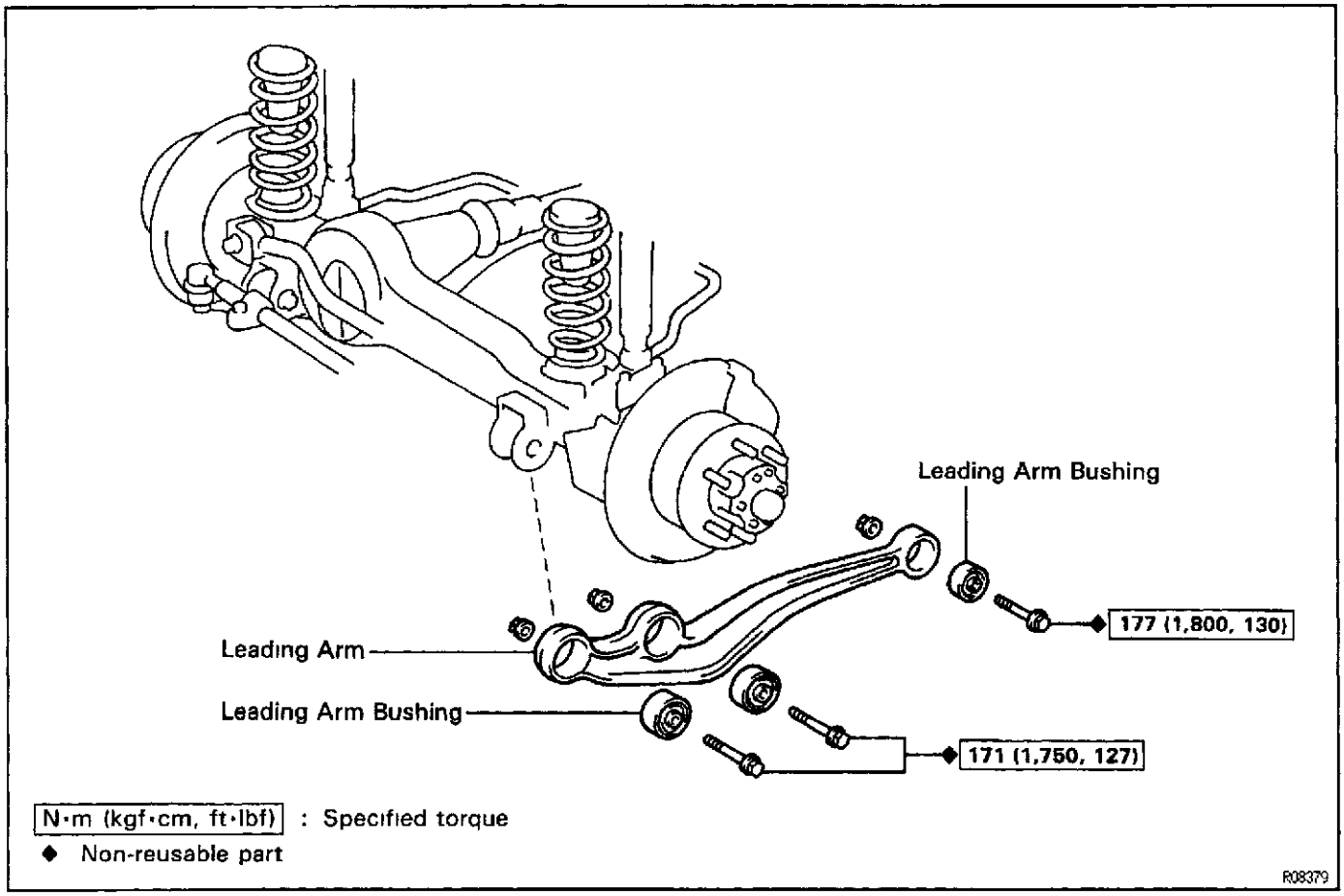
(Axle housing side)

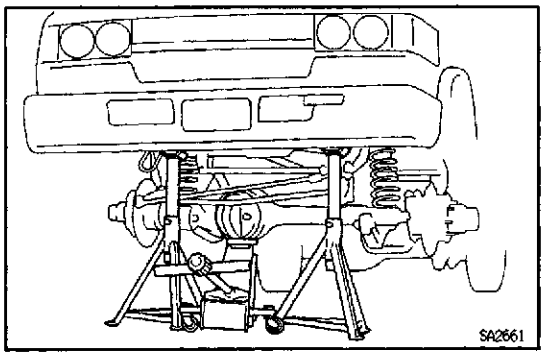
Torque: 171 N-m (1,750 kgf-cm, 127 ft-lbf)

HINT: when tightening the lateral control rod set nut and bolt lower the vehicle load until the lateral control rod is horizontal

LEADING ARM

COMPONENTS

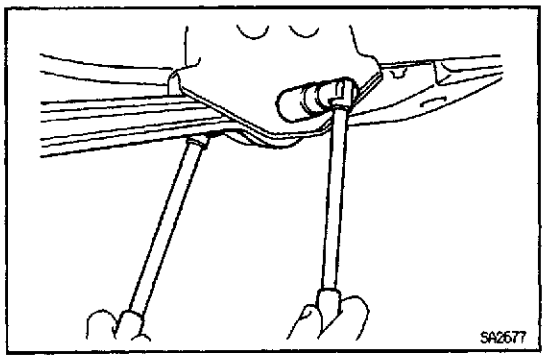




LEADING ARM REMOVAL

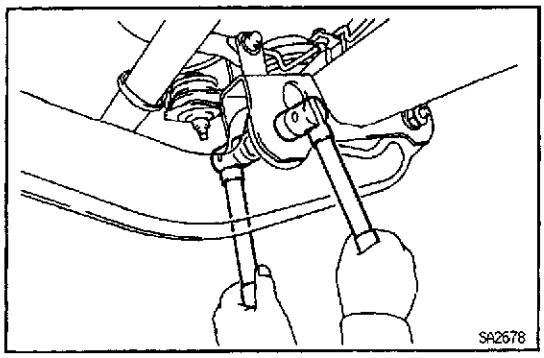
1. JACK UP VEHICLE

(a) Jack up and support the frame with stands
(b) Hold the front axle housing with a jack

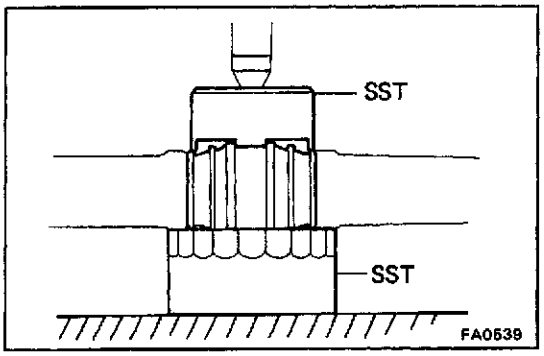


2. REMOVE LEADING ARM

(a) Remove the bolt and nut from the leading arm to the frame side



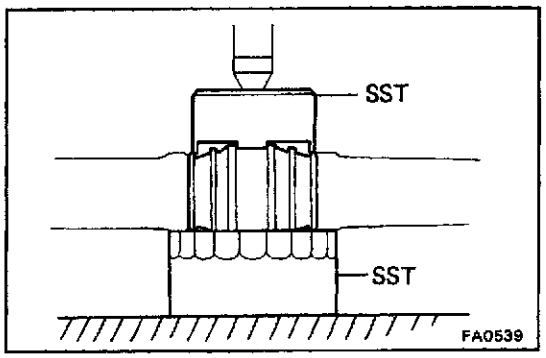
(b) Remove the 2 bolts and nuts from the leading arm to the axle housing side
(c) Remove the leading arm



LEADING ARM BUSHING REPLACEMENT

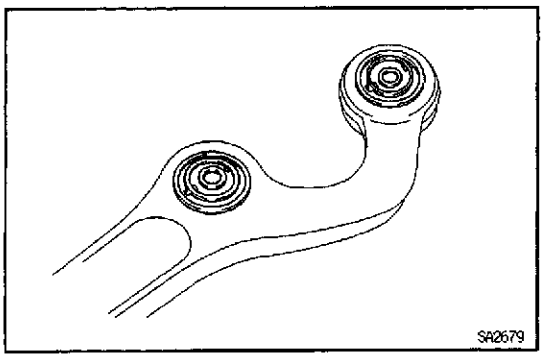
1. REMOVE BUSHINGS

Using SST and a press, press out the bushing from the leading arm
SST 09228-22020, 09710-30030 (09710-03180)



2. INSTALL BUSHINGS

Using SST and a press, press in the new bushing into the leading arm
SST 09228-22020, 09710-30030 (09710-03180)



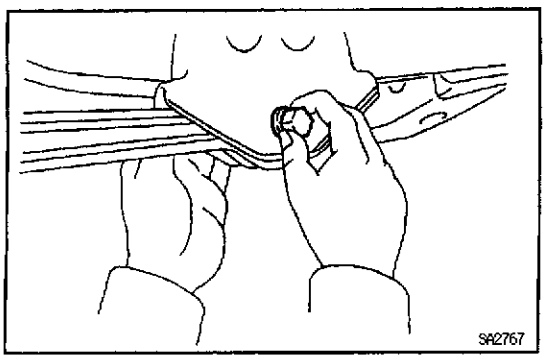
HINT When assembling the bushing assemble it so its holes are horizontally

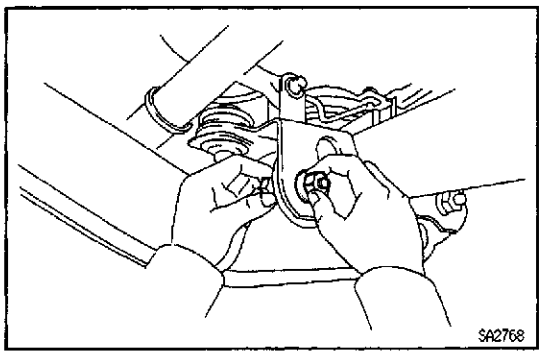
SA02R 01

LEADING ARM INSTALLATION

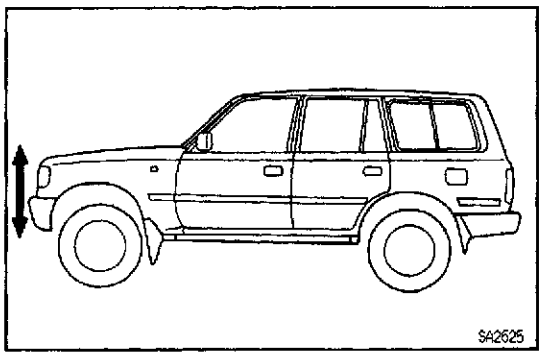
1. INSTALL LEADING ARM TO FRAME

Temporarily install the leading arm to the body with the new bolt and nut

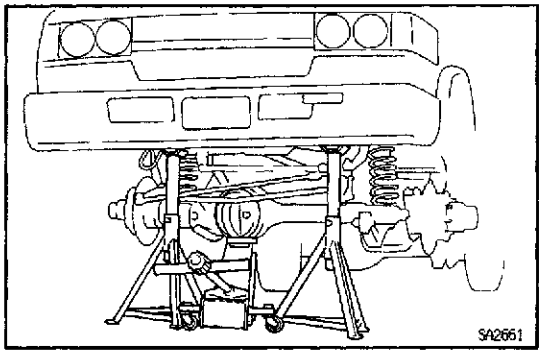




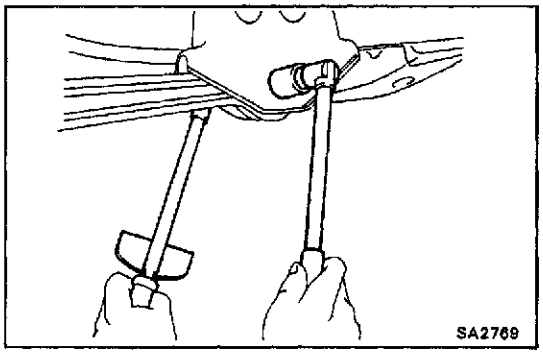
2. INSTALL LEADING ARM TO AXLE HOUSING
Temporarily install the leading arm to the axle housing with the new bolts and nuts



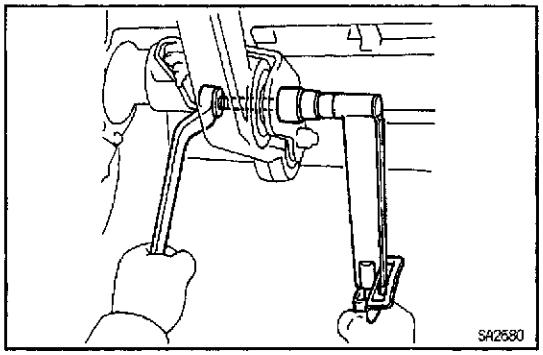
3. STABILIZE SUSPENSION
Bounce the vehicle up and down to stabilize the suspension



4. TORQUE LEADING ARM
(a) Jack up the axle housing
HINT For safety, place stands under either side of the vehicle frame



(b) Torque the nut
(Body side)
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)

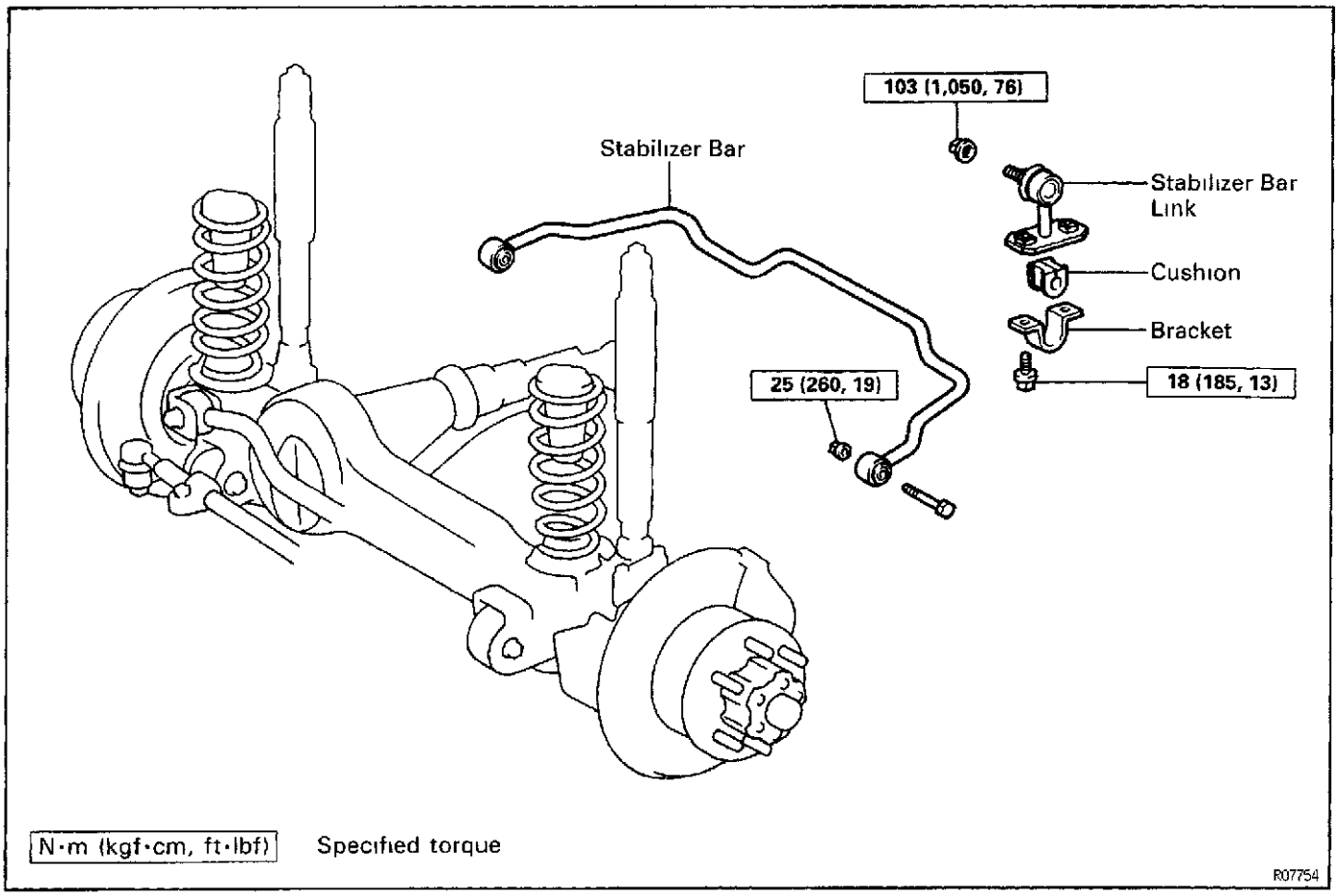


(Axle side)
Toruqe: 171 N-m (1,750 kgf-cm, 127 ft-lbf)
HINT When tightening the nuts tighten with the vehicle s fully weight applied to the axle housing

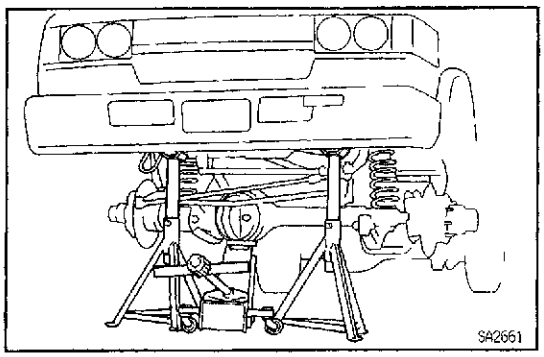
STABILIZER BAR

SA0Z6 02

COMPONENTS

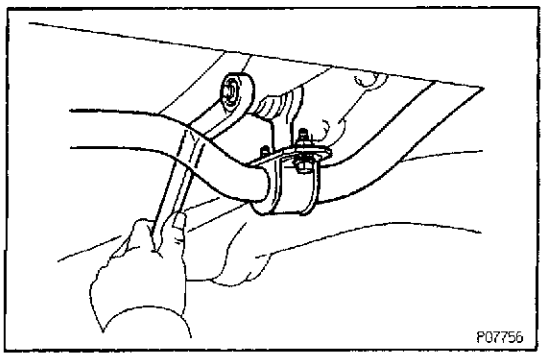


SA02T 02



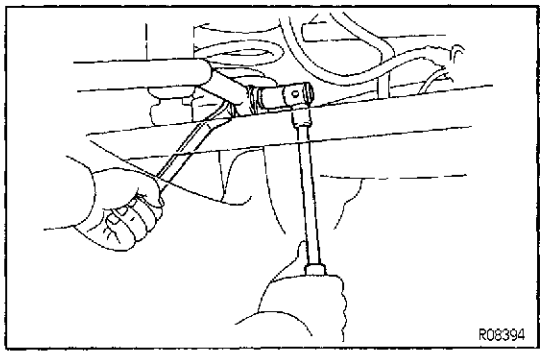
STABILIZER BAR REMOVAL

1. JACK UP AND SUPPORT VEHICLE

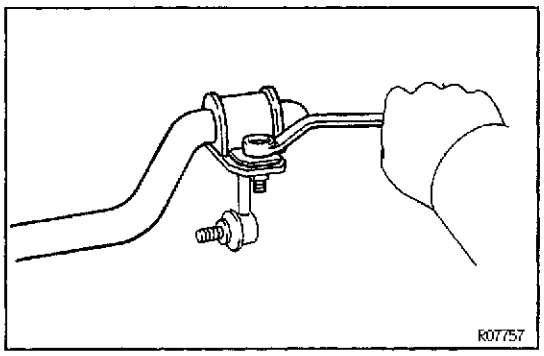


2. REMOVE STABILIZER BAR

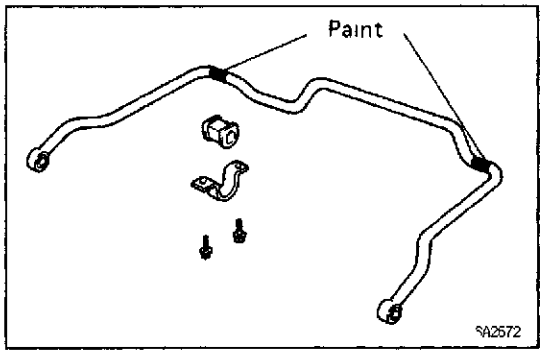
(a) Remove the nut and disconnect the stabilizer bar with the link from the frame



(b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing



(c) Remove the 2 bolts, and cushion from the stabirizer ba r

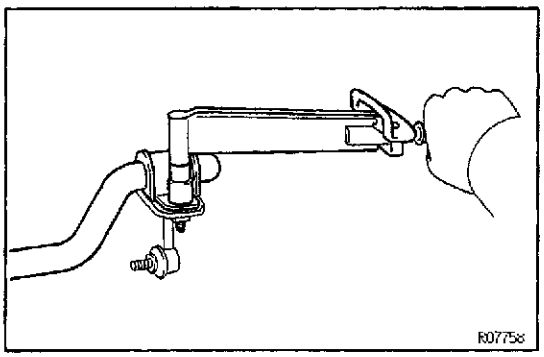


SA0ZU 02

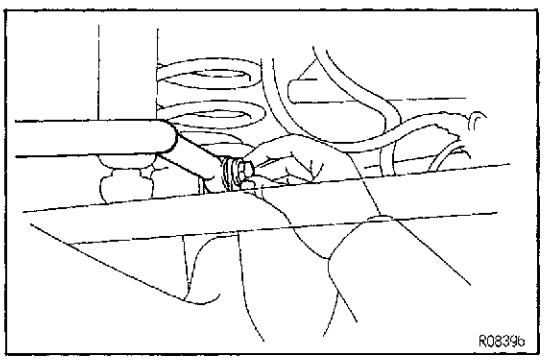
STABILIZER BAR INSTALLATION (See page SA-75)

1. INSTALL STABILIZER BAR

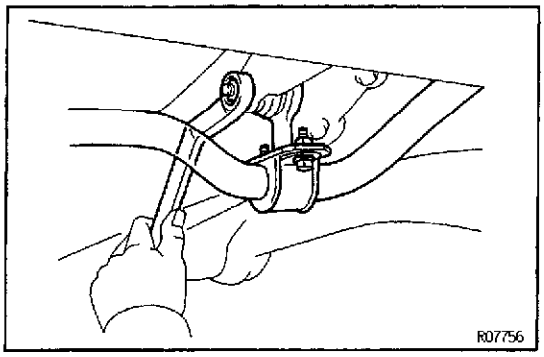
(a) Install the cushions on the lines painted on the stabilizer bar and install the brackets onto cushions



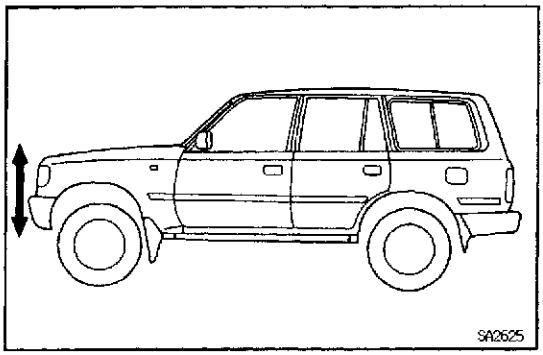
(b) Install the 2 bolts and link to stabilizer bar
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



(c) Temporarily install the stabilizer bar with link to the axle housing with the bolt and nut

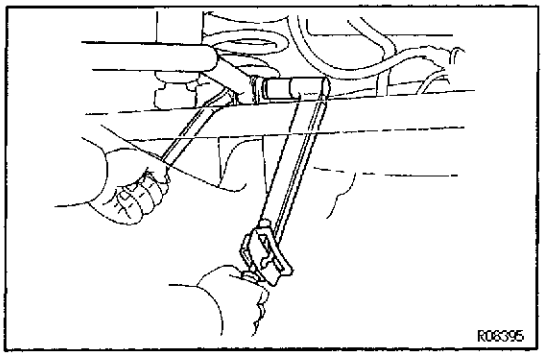


(d) Temporarily connect the nut to the frame



2. STABILIZE SUSPENSION

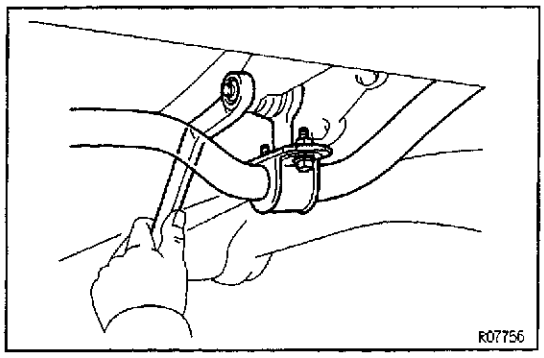
Bounce the vehicle up and down to stabilize the suspension



3. TORQUE STABILIZER MOUNTING BOLT AND NUT

(a) Torque the bolt and nut

Torque: 25 N-m (260 kgf-cm, 19 ft-lbf)

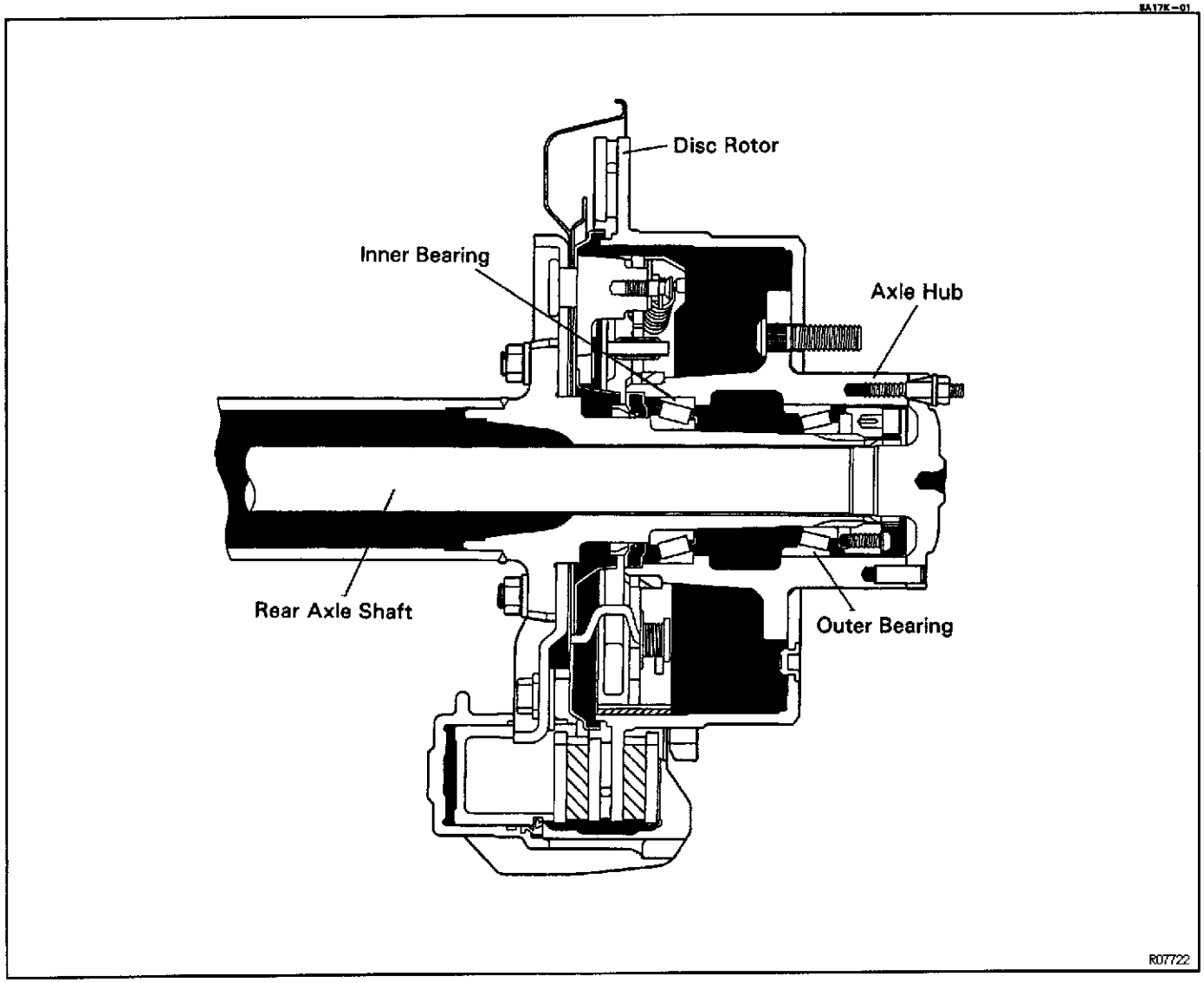


(b) Torque the nut

Torque: 103 N-m (1,050 kgf-cm, 76 ft-lbf)

REAR AXLE (DISK BRAKE)

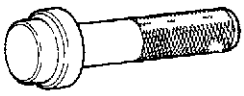
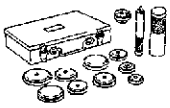
DESCRIPTION



PREPARATION

SST(SPECIAL SERVICE TOOLS)

SA17L 01

	09223-15020 Oil Seal & Bearing Replacer	
	09308-00010 Oil Seal Puller	
	09509-2501 1 Rear Axle Bearing Lock Nut Wrench	
	09517 -36010 Rear Axle Shaft Oil Seal Replacer	
	09608-35014 Axle Hub & Drive Pinion Bearing Tool Set	
	(09608-06020) Handle	
	(09608-06110) Front Hub Inner & Drive Pinion Front Bearing Cup Replacer	
	(09608 -06210) Rear Axle Bearing Replacer	

EQUIPMENT

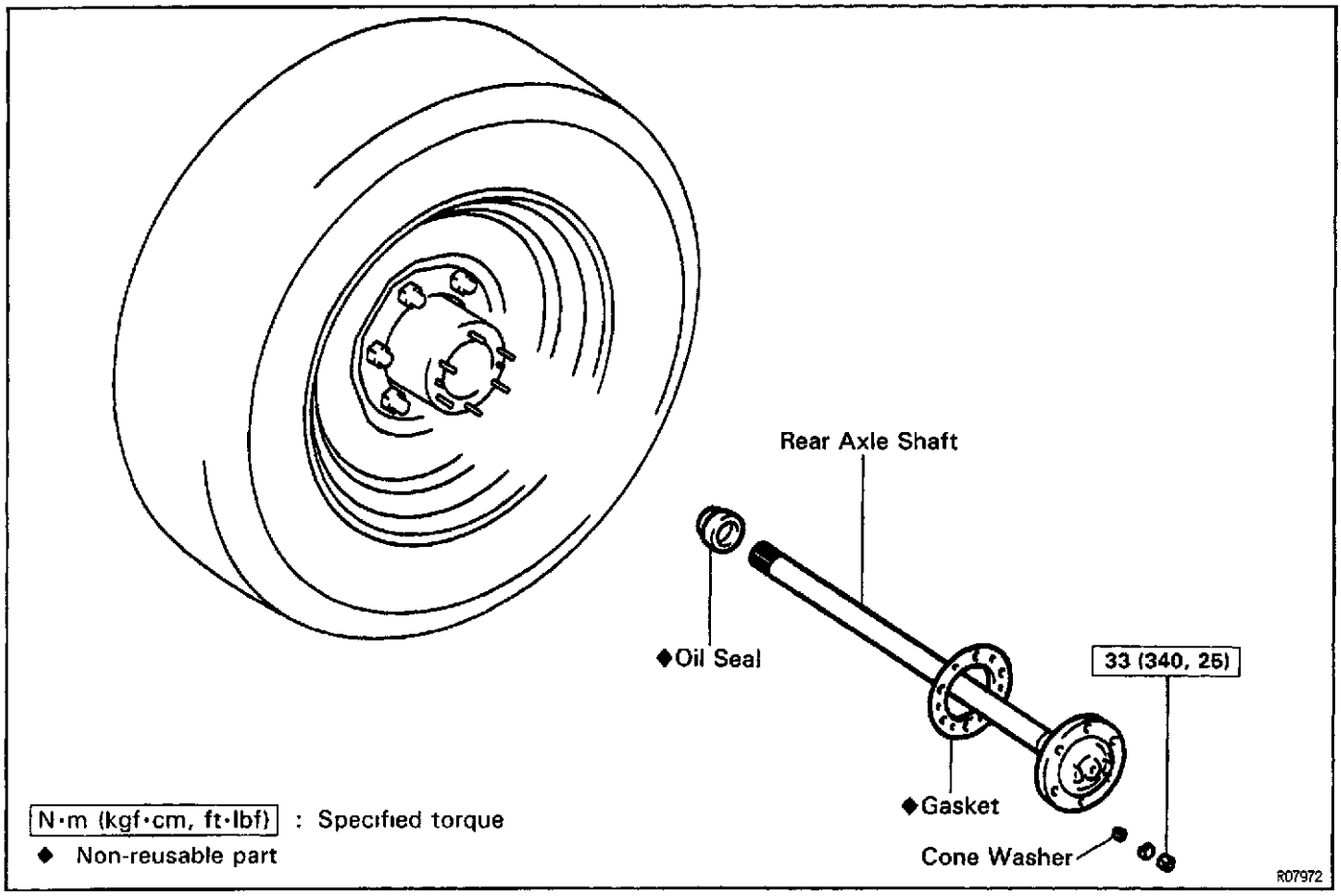
SA17M 01

Torque wrench	
Spring tension gauge	

REAR AXLE SHAFT

SA17N-01

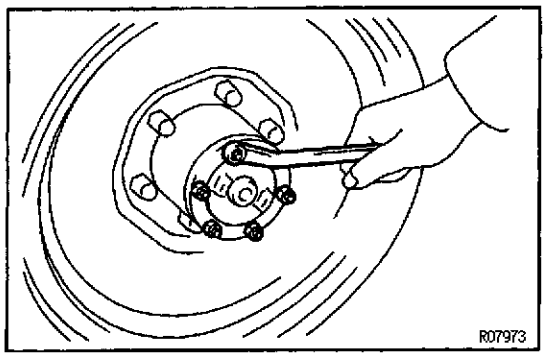
COMPONENTS



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

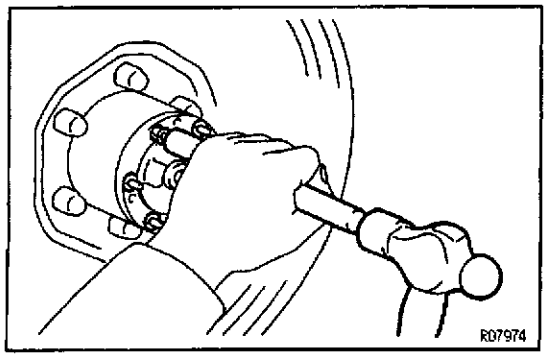
SA17P-01

REAR AXLE SHAFT REMOVAL



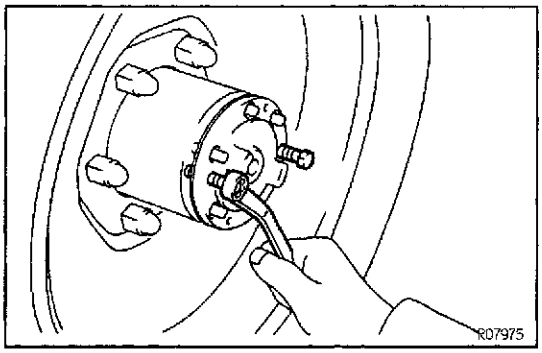
1. REMOVE REAR AXLE SHAFT SET NUT

Remove the 6 set nuts and plate washers

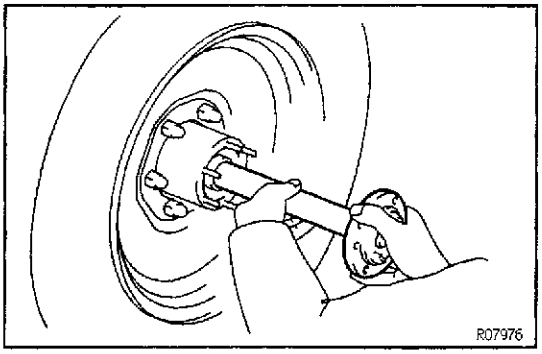


2. REMOVE CONE WASHERS

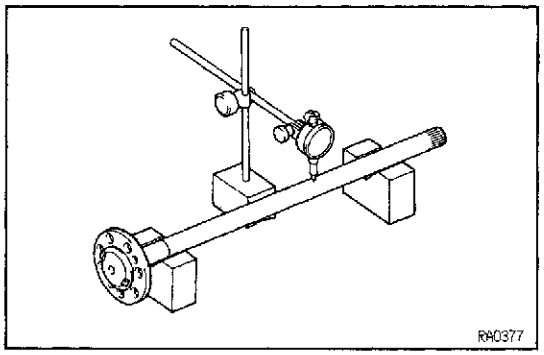
Using a brass bar and hammer, tap on the bolts heads and remove the 6 cone washer-s



3. REMOVE REAR AXLE SHAFT
(a) Install and gradually tighten 2 bolts, and pull the axle shaft
(b) Remove the 2 bolts from rear axle shaft



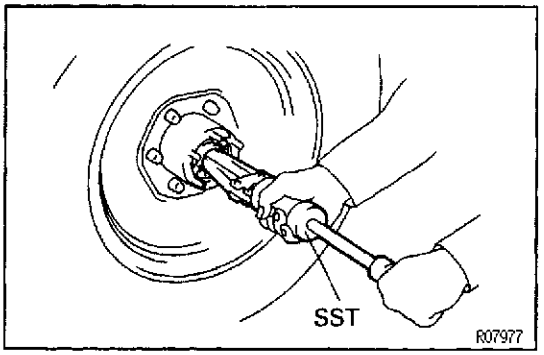
(c) Remove the rear axle shaft and gasket



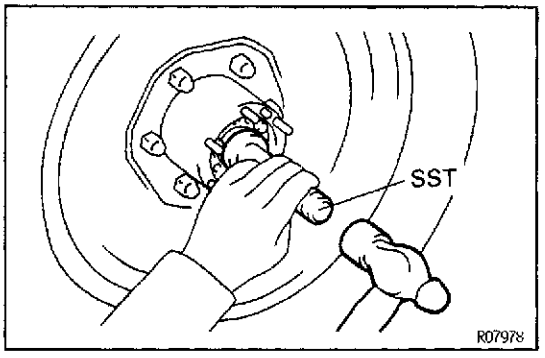
REAR AXLE SHAFT INSPECTION AND REPAIR

SA170-01

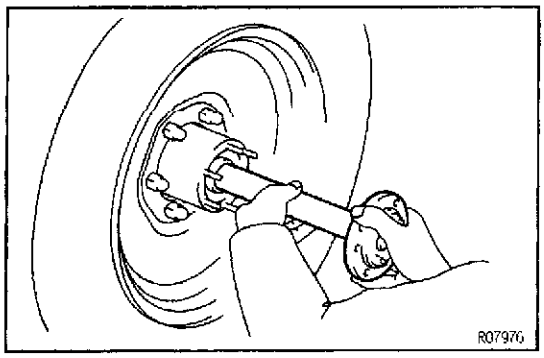
1. INSPECT REAR AXLE SHAFT
(a) Check for wear or damage
(b) Check the runout of axle shaft
Maximum runout: 0.8 mm (0.031 in.)



2. REPLACE OIL SEAL
(a) Using SST, drive out a oil seal
SST 09308 - 00010



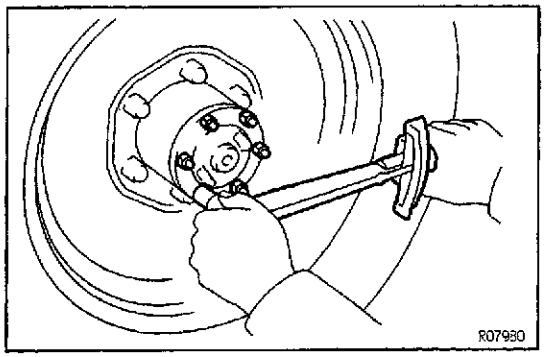
(b) Using SST and a hammer, tap in a new oil seal into the hub
SST 09517-36010
(c) Apply MP grease to the oil seal lip



REAR AXLE SHAFT INSTALLATION SA17R-01

INSTALL REAR AXLE SHAFT

(a) Place a new gasket in position on the axle hub
(b) Install the rear axle shaft to the axle hub
NOTICE: Be careful not to damage the oil seal.

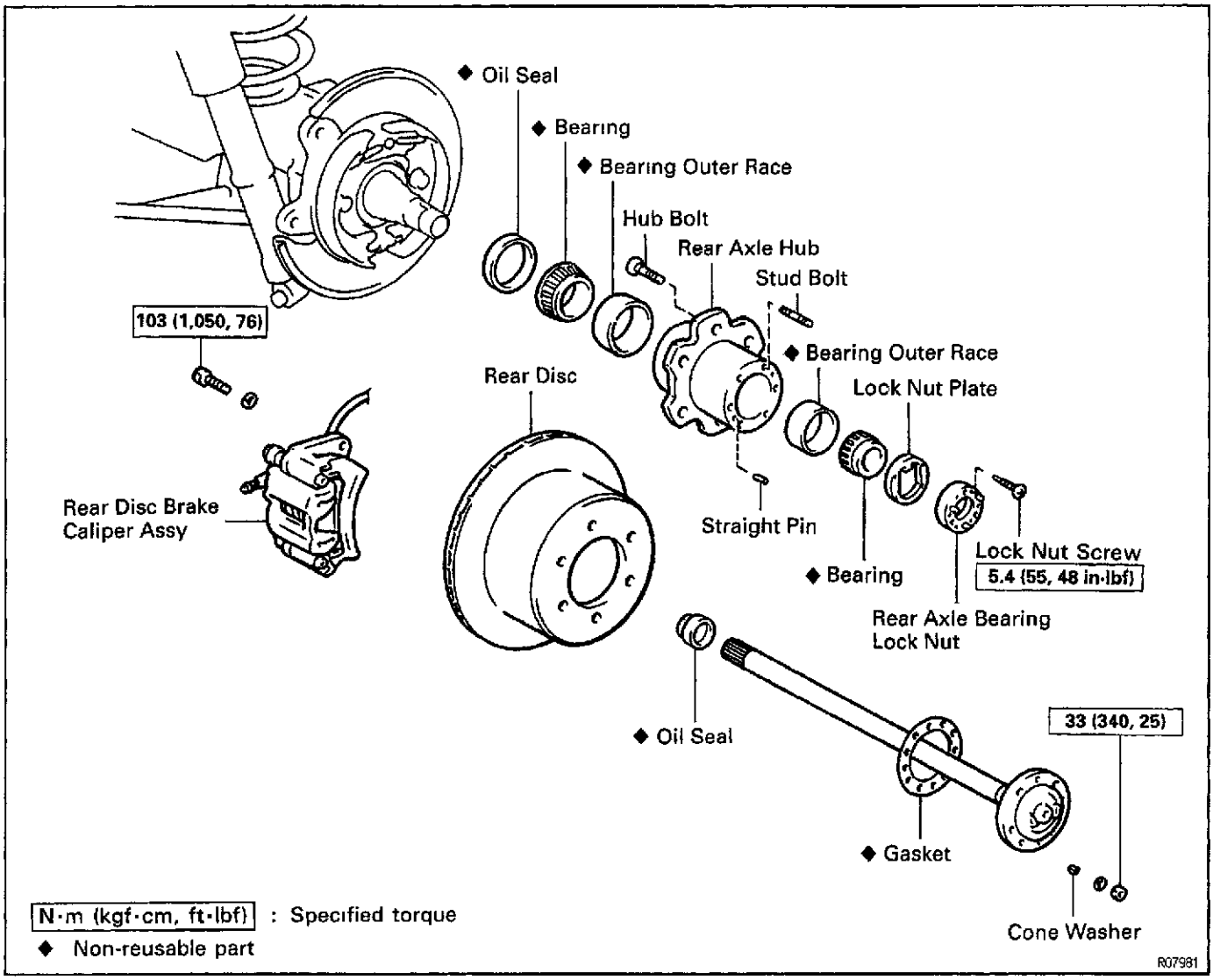


(c) Install the 6 cone washers, plate washers and nuts
(d)
Torque the 6 nuts.
Torque: 33 N-m (340 kgf-cm. 25 ft.ibf)

REAR AXLE HUB

COMPONENTS

SA17S-01

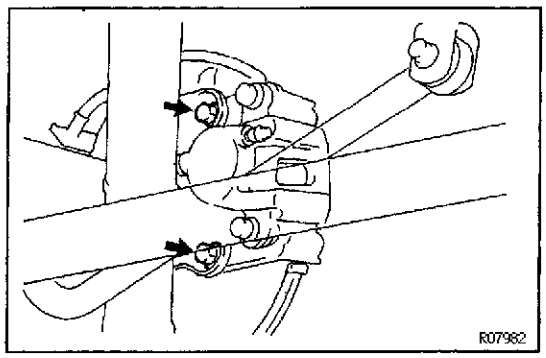


SA17T-01

REAR AXLE HUB REMOVAL

1. JACK UP AND SUPPORT VEHICLE
2. REMOVE REAR WHEEL
3. REMOVE REAR AXLE SHAFT

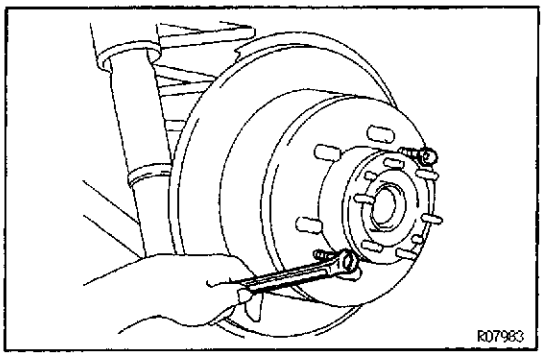
(See page SA-89)



4. REMOVE REAR DISC CALIPER AND DISC ROTOR

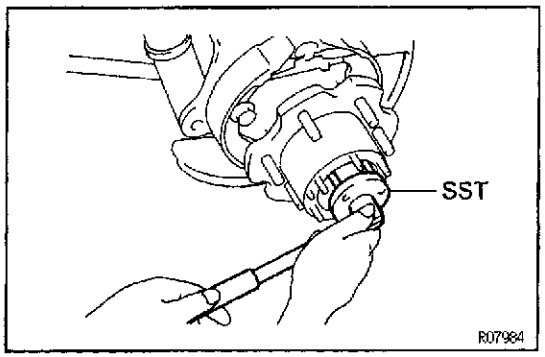
(a) Remove the 2 caliper installation bolts

(b) lift up the caliper and suspend it, making sure the hose is not stretched



(c) Install and gradually tighten 2 bolts, and remove the disc rotor

(d) Remove the 2 bolts from the disc rotor

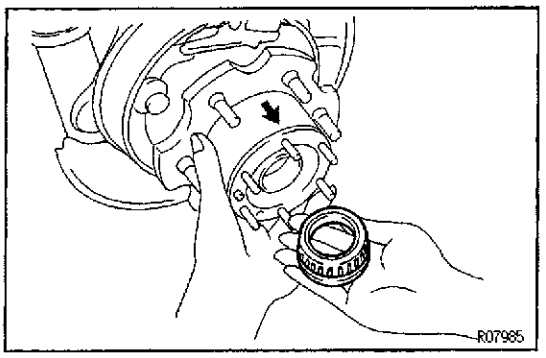


5. REMOVE REAR AXLE BEARING LOCK NUT

(a) Remove the 2 screws from the lock nut

(b) Using SST, remove the lock nut

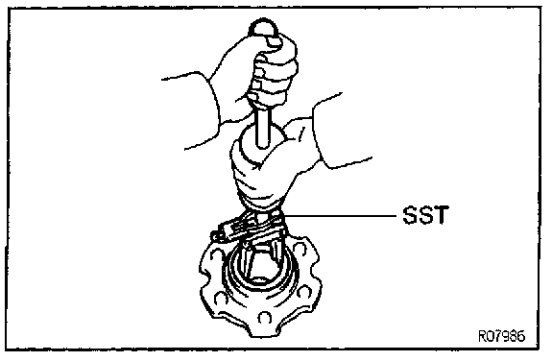
SST 09509-25011



6. REMOVE REAR AXLE HUB

(a) Pull out the axle hub, remove the lock nut plate and outer bearing

(b) Remove the axle hub



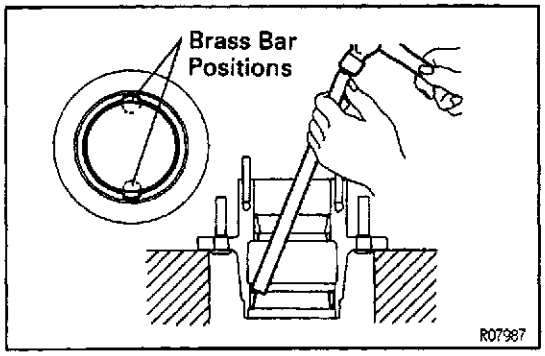
REAR AXLE HUB BEARING AND OIL SEAL REPLACEMENT

1. REMOVE OIL SEAL AND INNER BEARING

(a) Using SST, pry out the oil seal

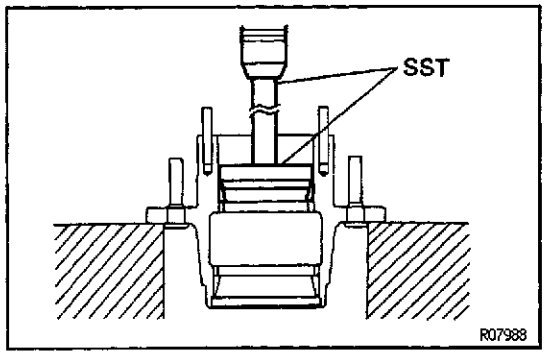
SST 09308-00010

(b) Remove the inner bearing from the hub



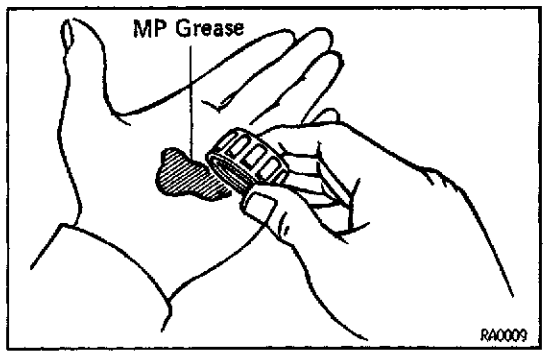
2. REMOVE BEARING OUTER RACE

Using a brass bar and hammer, drive out the bearing outer race



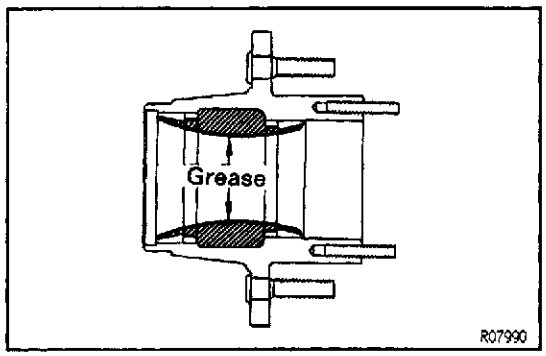
3. INSTALL BEARING OUTER RACE

Using SST, drive in a new bearing outer race
Outside race
SST 09608-06110, 09608-06020
Inside race
SST 09608-06210, 09608-06020

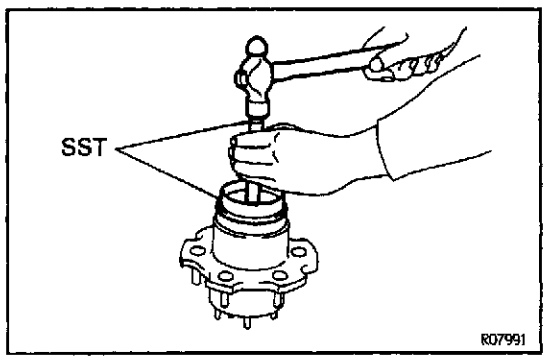


4. PACK BEARINGS WITH MP GREASE

(a) Place MP grease in the palm of your hand
(b) Pack grease into the bearing, continuing until the grease ooze out from the other side
(c) Do the same around the bearing circumference

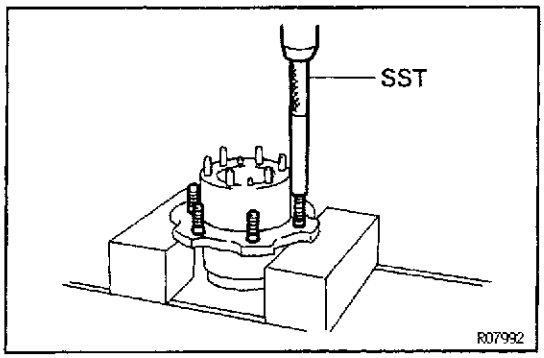


5. COAT INSIDE OF HUB WITH MP GREASE



6. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the hub
(b) Using SST, drive the oil seal into the hub
SST 09223-15020, 09608-06020
(c) Apply MP grease to the oil seal lip

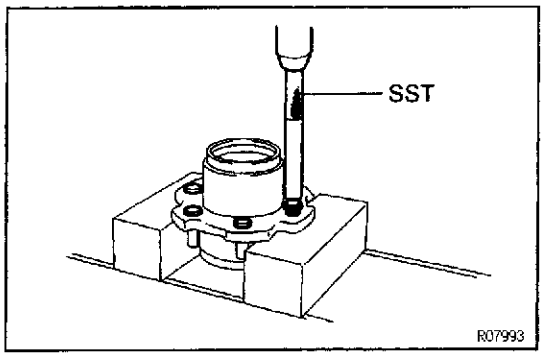


SA17V-01

HUB BOLT REPLACEMENT

1. REMOVE HUB BOLT

Using SST, remove hub bolts from the axle hub
SST 09608-06020



2. INSTALL HUB BOLT

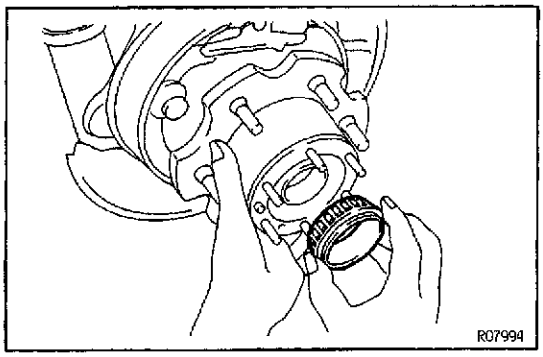
Using SST, press in the hub bolt
SST 09608-06020

SA17W-01

REAR AXLE HUB INSTALLATION

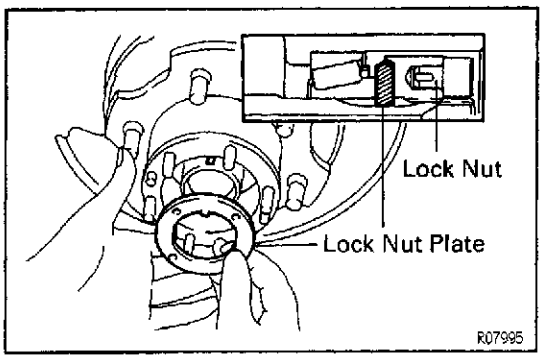
1. INSTALL REAR AXLE HUB

(a) Clean the hub installation position of the axle housing and apply the 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



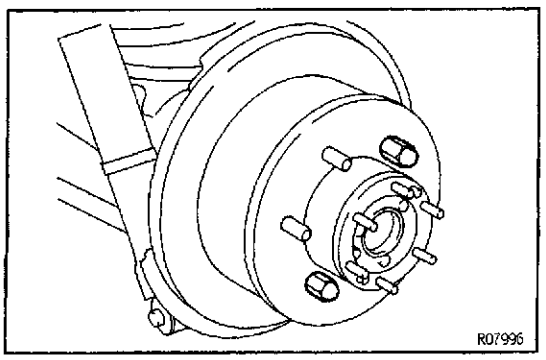
2. INSTALL LOCK NUT PLATE AND REAR AXLE BEARING LOCK NUT

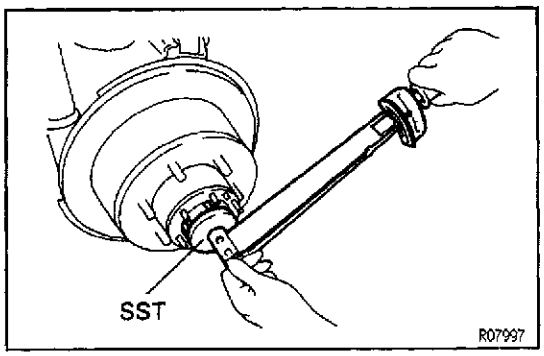
(a) Place the lock nut plate on the axle housing, making sure the tongue lines up with the key groove
(b) Temporarily install the lock nut



3. INSTALL REAR DISC

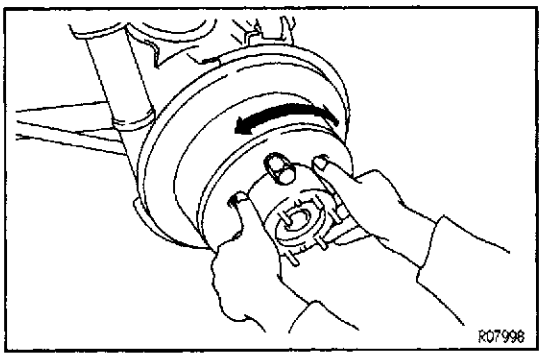
Install the rear disc to the rear axle hub and temporarily install 2 hub nuts



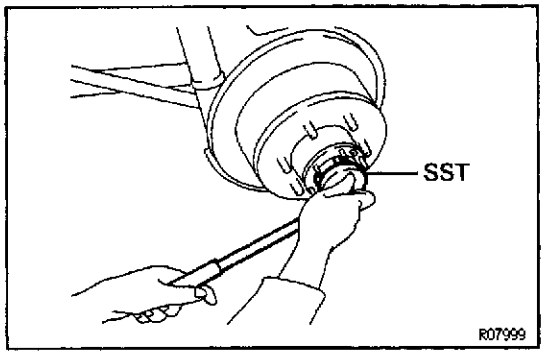


4. ADJUST PRELOAD

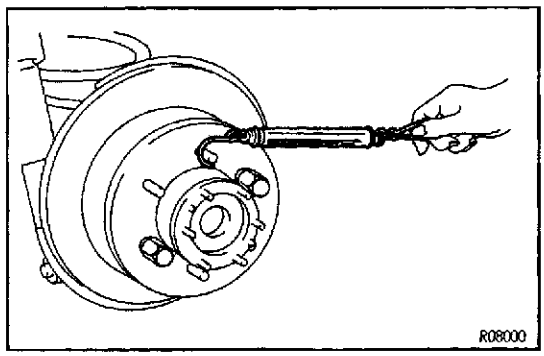
(a) Using SST, torque the bearing lock nut
SST 09509-25011
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



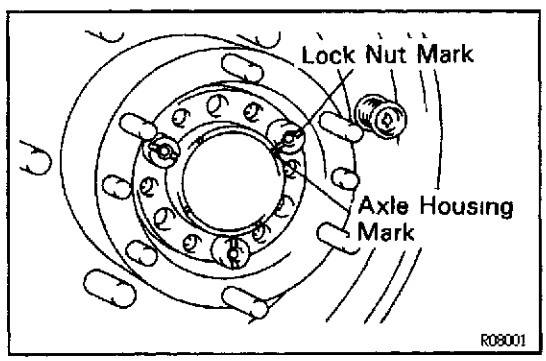
(b) Snug down the bearing by turning the hub several times
(c) Using SST, retighten the bearing lock nut
SST 09509-25011
Torque: 59 N-m (600 kgf-cm, 43 ft.ibf)



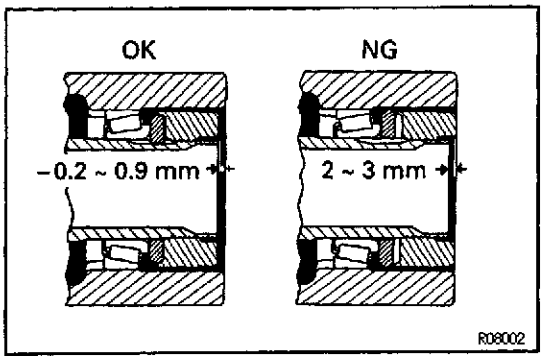
(d) Using SST, loosen the nut until it can be turned by hand



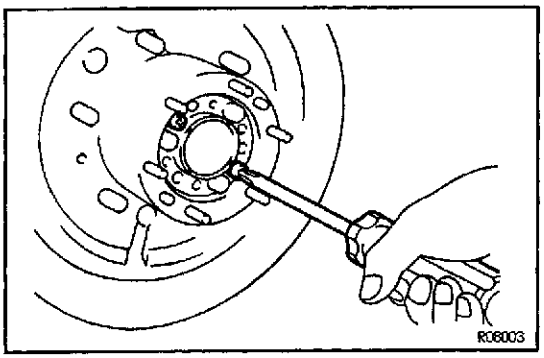
(e) Using a spring tension gauge, check the preload and tighten the nut until the preload is within specification
Preload(at starting)
25 5-55 9 N (2 6-5 7 kgf 5 7-12 6 lbf)
NOTICE: Make sure there is no contact with the parking brake shoe.



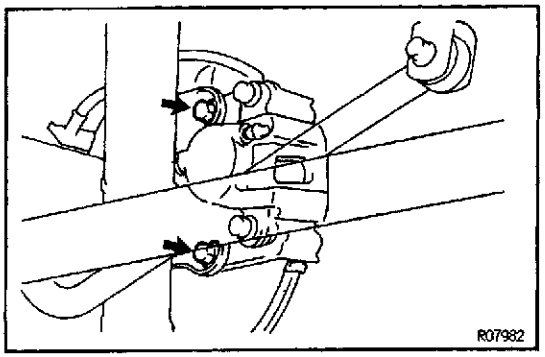
(f) Align the marking on the bearing lock nut and the tip of axle housing under the above preload range



(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 distance is greater than 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)

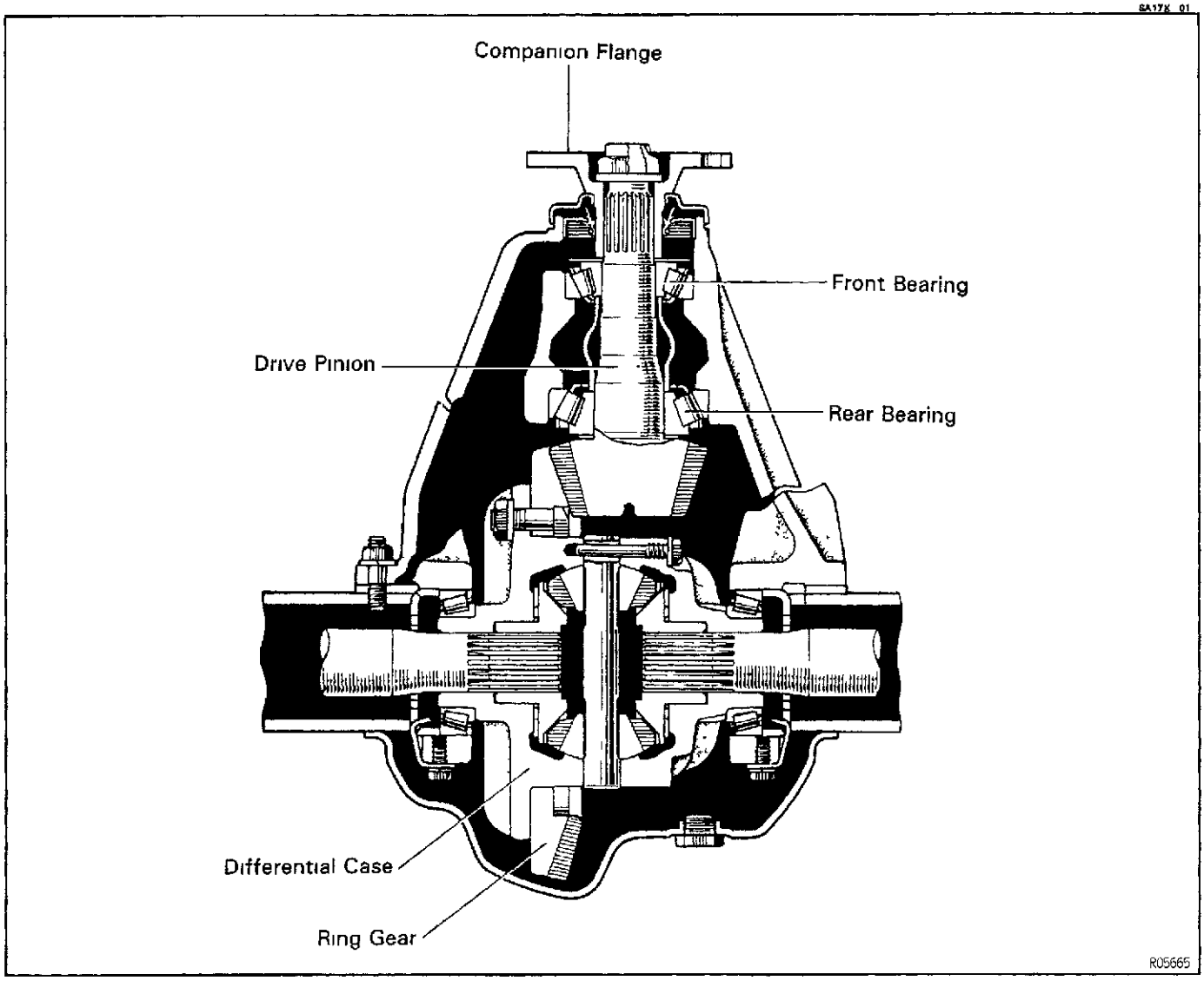


6. INSTALL REAR DISC CALIPER ASSY
(a) Install the disc brake caliper
(b)
Torque the 2 bolts.
Torque: 103 N-m (1050 kgf-cm, 76 ft-lbf)
(c) Remove the 2 hub nuts

7. INSTALL REAR AXLE SHAFT
(SEE PAGE SA-91)
8. INSTALL REAR WHEEL
TORQUE: 147 N
• m (1500 kgf-cm, 108 ft-lbf)
6. LOWER VEHICLE

REAR DIFFERENTIAL

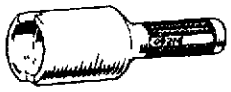
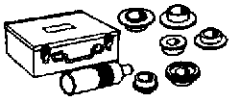
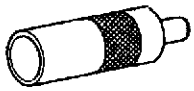
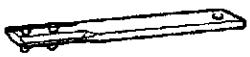
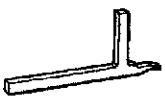
DESCRIPTION

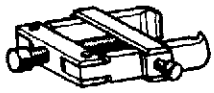
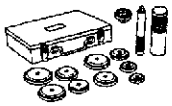
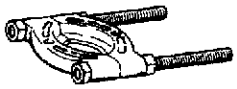


PREPARATION

SST (SPECIAL SERVICE TOOLS)

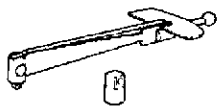
SA199-01

	09214-76011 Crankshaft Pulley Replacer --- (09252-10010) No 1 Replacer Handle	
	09308-00010 Oil Seal Puller	
	09308-10010 Oil Seal Puller	
	O^315-00021 Clutch Release Bearing Remover & Replacer	
 	09316-60010 Transmission & Transfer Bearing Replacer --- (09316-00010) Replacer Pipe --- (09316-00020) Replacer A	
	09504-00011 Differential Side Bearing Adjusting Nut Wrench	
	09504-22011 Differential Side Bearing Replacer	
	09506-35010 Differential Drive Pinion Rear Bearing Replacer	
	09550-10012 Replacer Set B	
	09550-60010 Differential Side Bearing Replacer	

	(09558-10010) Rear Axle Shaft Oil Seal Replacer	
	09557-22010 Drive Pinion Front Bearing Remover	
	(09557-10010) Differential Drive Pinion Front Bearing Replacer	
	09608-35014 Axle Hub & Drive Pinion Bearing Tool Set	
	(09608 -06020) Handle	
	(0960$-061 10) Front Hub Inner & Drive Pinion Front Bearing Cup Replacer	
	(09608-06180) Drive Pinion Rear Bearing Cup Replacer	
	09726-40010 Lower Control Shaft Bearing Replacer	
	09950-00020 Bearing Remover	
	09950-20017 Universal Puller	

RECOMMENDED TOOLS

SA17Y-01

	09025-00010 Small Torque Wrench	

EQUIPMENT

SA17Z-01

Dial indicator	
Torque wrench	

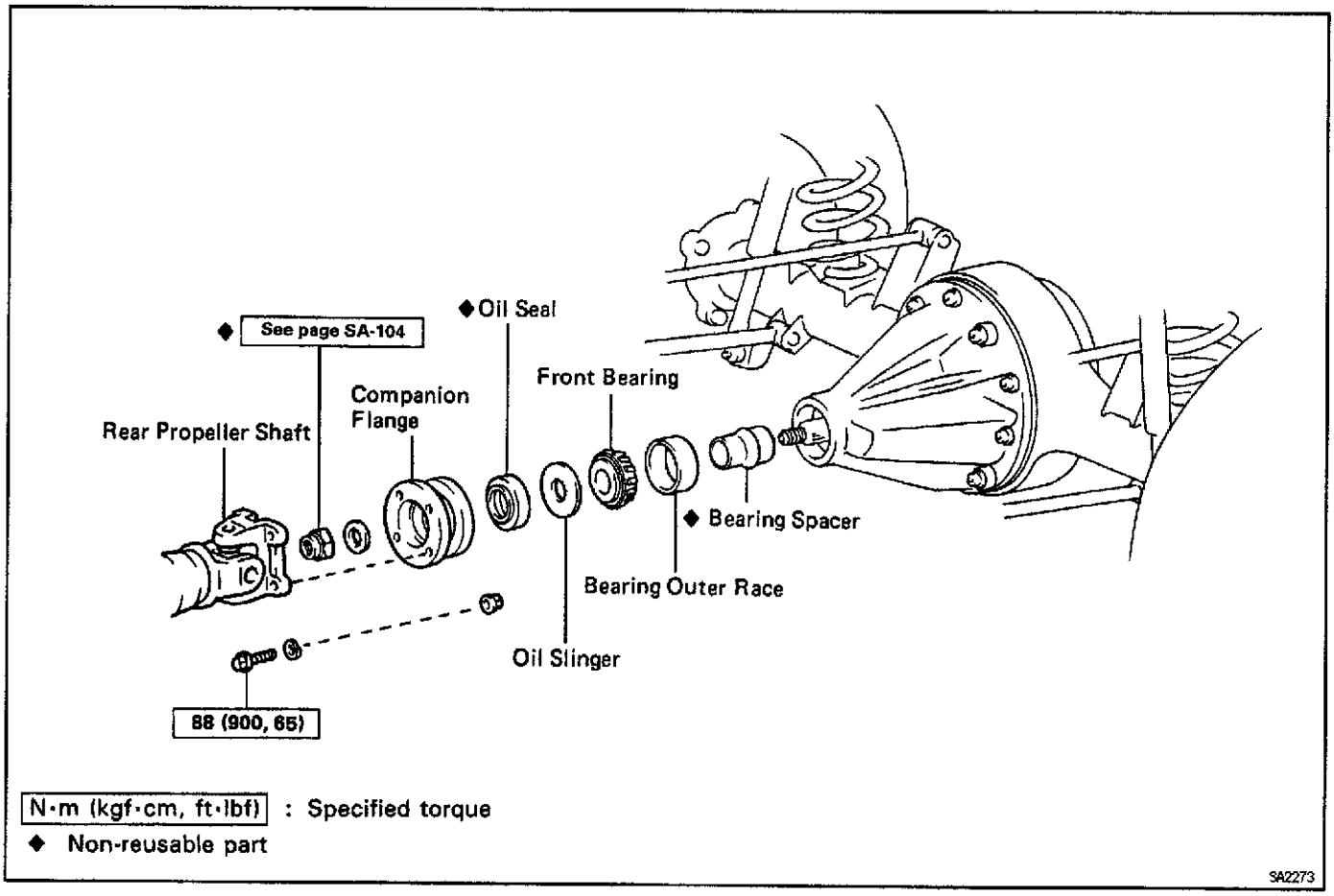
LUBRICANT

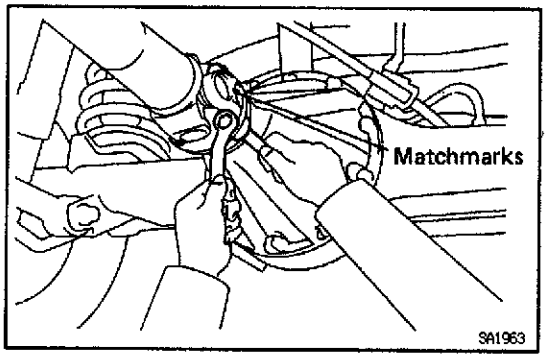
Item	Capacity	Classification
Differential oil	3.25 liters (3.4 US qts, 2.9 Imp qts)	API GL-5 Hypoid gear oil [Above - 18° C (0° F)] SAE 90 (Below - 18 C (0 F))] SAE 80W or 80W-90

ON-VEHICLE REPAIR

SA100-01

COMPONENTS





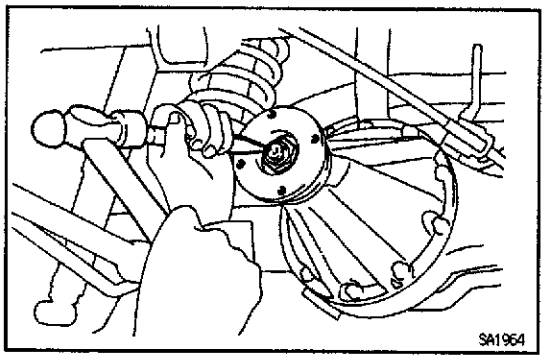
Z0020480

FRONT OIL SEAL REPLACEMENT

1. DISCONNECT REAR PROPELLER SHAFT

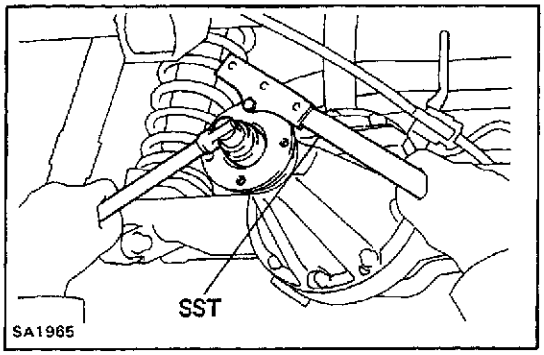
(a) Place matchmarks on the flanges

(b) Remove the 4 bolts and nuts and disconnect the rear propeller shaft

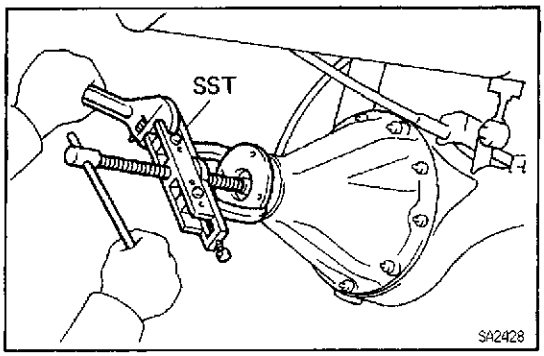


2. REMOVE CONPANfON FLANGE

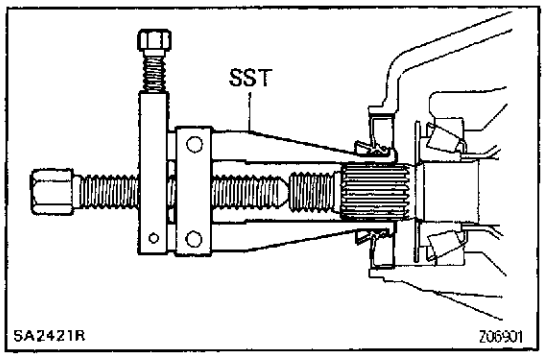
(a) Using a chisel and hammer, loosen the staked part of the nut



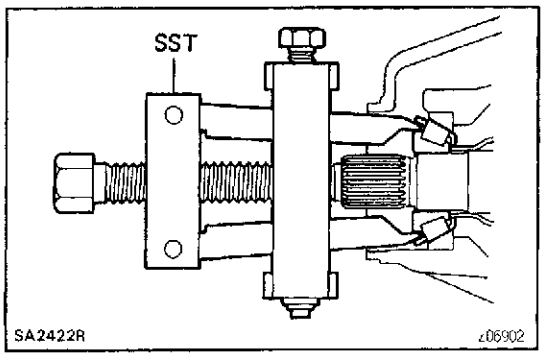
(b) Using SST to hold the flange, remove the nut and washer
SST 09330-00021



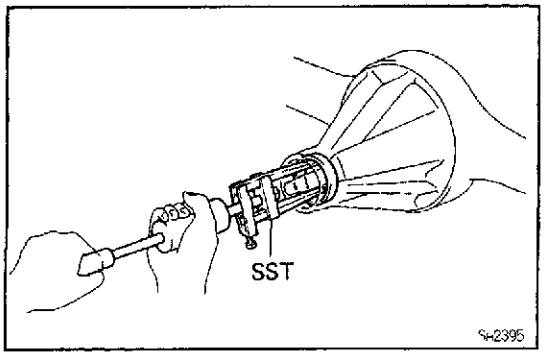
(c) Using SST, remove the companion flange
SST 09950-20017



3. REMOVE OIL SEAL AND OIL SLINGER
(a) Using SST, remove the oil seal
SST 09308-10010
(b) Remove the oil slinger

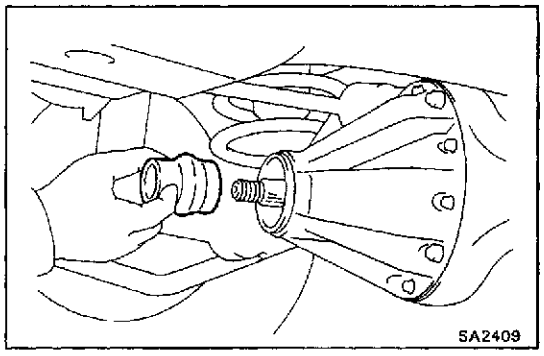


4. REMOVE FRONT BEARING
Using SST remove the front bearing from the drive pinion
SST 09556-22010

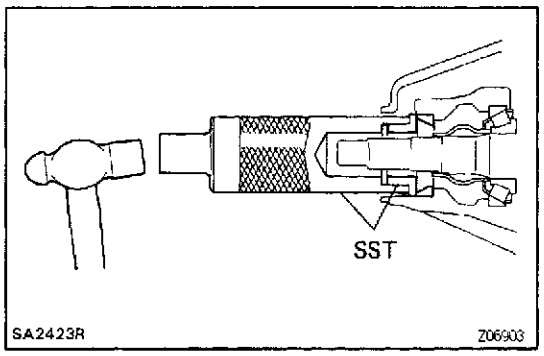


5. REMOVE BEARING OUTER RACE
Using SST, remove the bearing outer race
SST 09308 - 00010
NOTICE: Do not scratch the taper surface of the outer race.

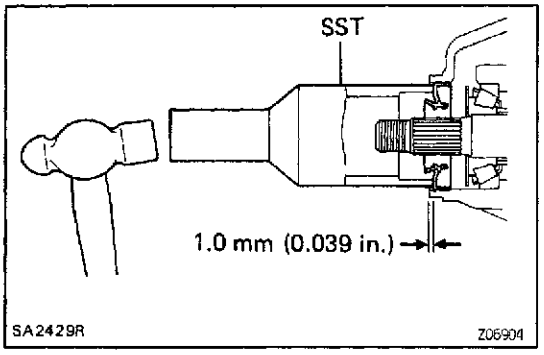
6. REMOVE BEARING SPACER



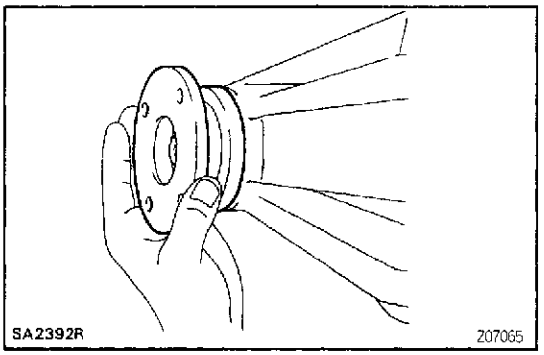
7. INSTALL NEW BEARING SPACER
Install a new bearing spacer



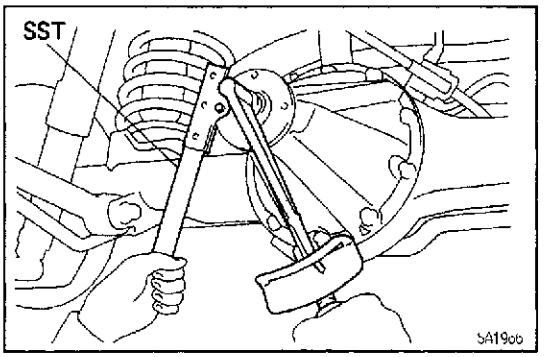
8. INSTALL BEARING OUTER RACE
Using SST, drive in the bearing outer race
SST 09316-60010 (09316-00010, 09316-00020)
9. INSTALL FRONT BEARING



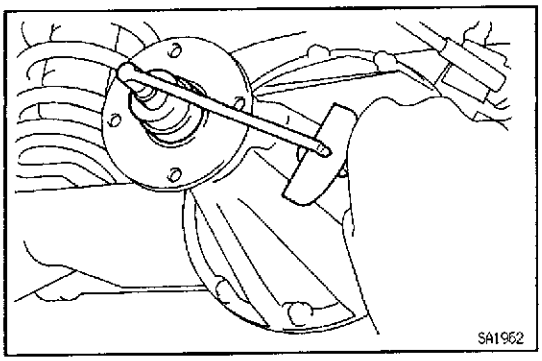
10. INSTALL OIL SLINGER AND NEW OIL SEAL
(a) Install the oil slinge
(b) Using SST, drive in a new oil seal as shown
SST 09214-76011
Oil seal drive in depth
1 0 mm (0 039 in)
(c) Apply MP grease to the oil seal lip



11. INSTALL COMPANION FLANGE
(a) Install the companion flange on the drive pinion
(b) Place the 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)



12. ADJUST DRIVE PINION PRELOAD

Using a torque wrench measure the preload of the backlash between the drive pinion and ring gear

New bearing preload (at starting)

1 3-2 0 N-m (13-20 kgf-cm 11 3-17 4 in -lbf)

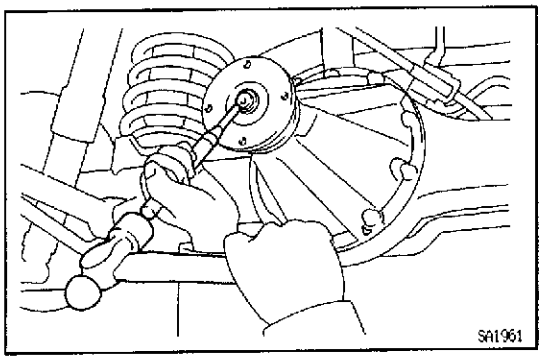
Reused bearing preload tat starting)

0 7-1 0 N -m (7-10 kgf-cm 6 1- 8 7 in -lbf)

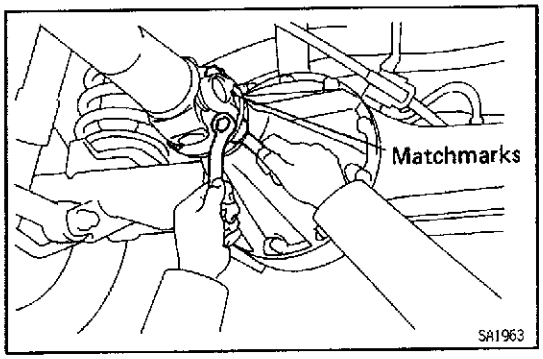
- If the preload is greater than specification replace the bearing spacer
- If the preload is less than specification etig hten the nut 13 N-m (130 kgf-cm, 9 ft-lbf) a little at a time until the specified preload is reached

Maximum torque: 441 N-m (4,500 kgf-cm, 325 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



13. STAKE DRIVE PINION NUT



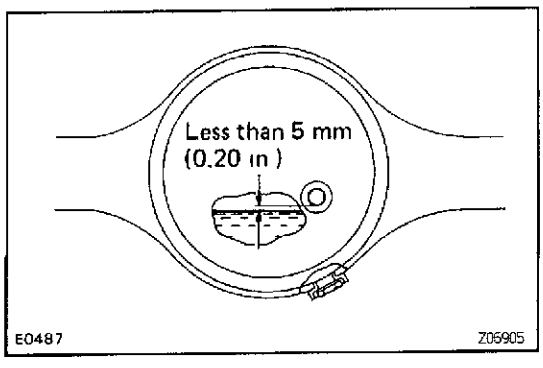
14. CONNECT REAR PROPELLER SHAFT

(a) Align the matchmarks and connect the propeller shaft to the companion flange with the 4 bolts spring washers and nuts

(b)

Torque the bolts and nuts.

Torque: 88 N-m (900 kgf-cm, 65 ft-lbf)



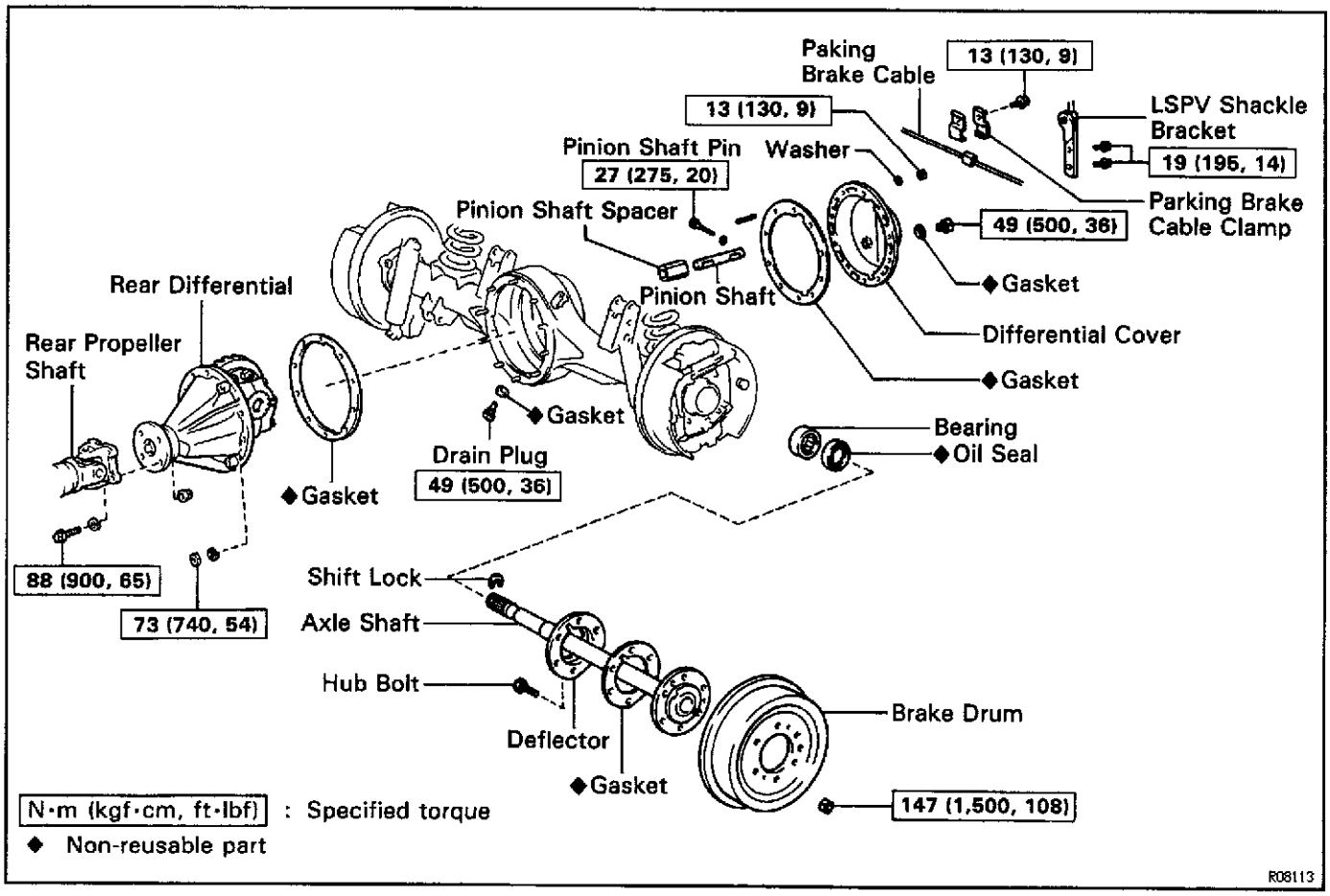
15. FILL DIFFERENTIAL WITH GEAR OIL

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 or 80W - 90
Capacity
3 25 liters (3 4 US qts 2 9 Imp qts)

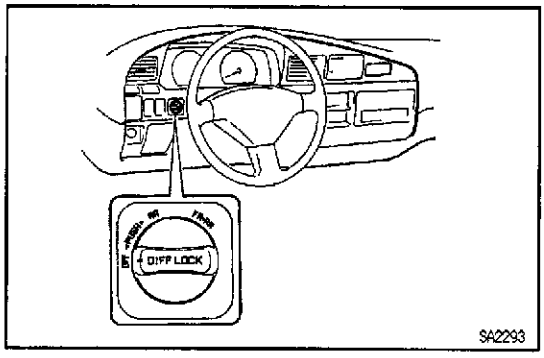
ASSEMBLY REMOVAL AND INSTALLATION

SA106-02

COMPONENTS



SA161-02



DIFFERENTIAL REMOVAL

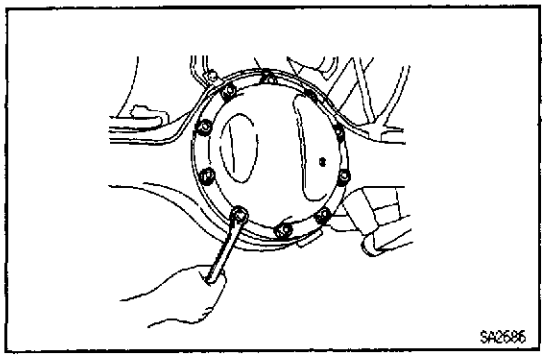
1. (w/ DIFFERENTIAL LOCK)
SHIFTING REAR DIFFERENTIAL LOCK
(a) Turn the ignition switch to ON position
(b) Keep the center differential lock condition
(c) Turn the differential lock control switch to RR or FR/RR position and lock the rear differential
HINT Rotating the tires, check they are in the differential lock condition
(d) Disconnect the cable from the negative terminal of battery

2. JACK UP AND SUPPORT VEHICLE

3. REMOVE REAR WHEEL AND BRAKE DRUM

4. DRAIN DIFFERENTIAL OIL

5. REMOVE LSPV SHACKLE BRACKET AND PARKING BRAKE CABLE CLAMP
(See page SA-81)



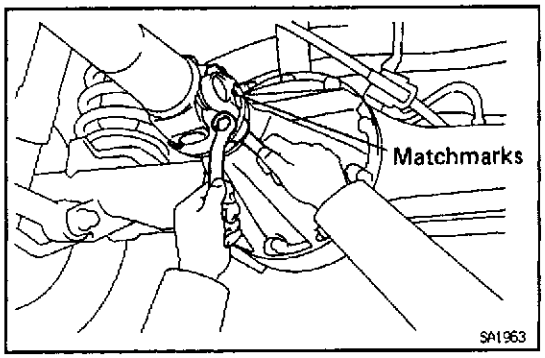
6. REMOVE DIFFERENTIAL COVER

(a) Remove the 10 nuts and washers from the differential

(b) Remove the differential cover with gasket from the differential

7. REMOVE REAR AXLE SHAFTS

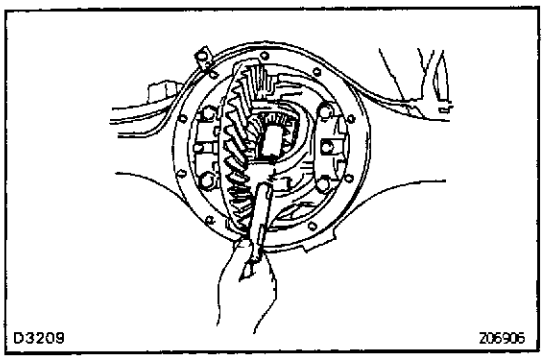
(SEE PAGE SA-89)



8. DISCONNECT PROPELLER SHAFT

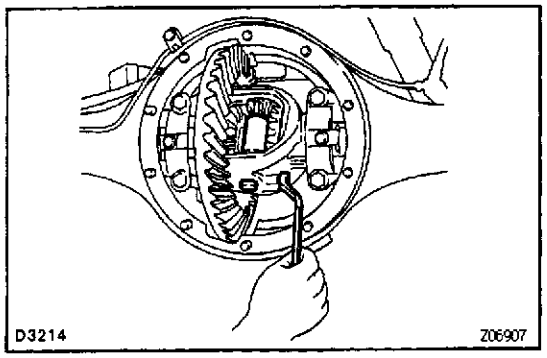
(a) Place the matchmarks on the flanges

(b) Remove 4 nuts and bolts and disconnect the propeller shaft



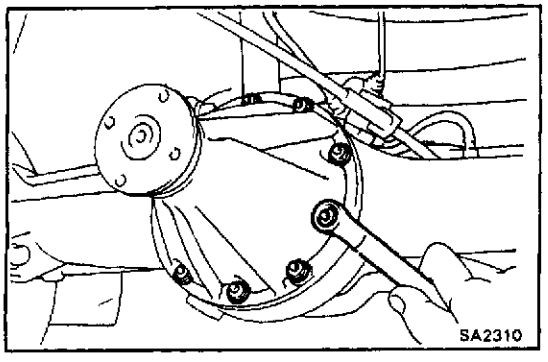
9. INSTALL PINION SHAFT AND PINION SPACER

(a) Install the spacer and pinion shaft to the differential



(b) Install the pinion shaft pin.

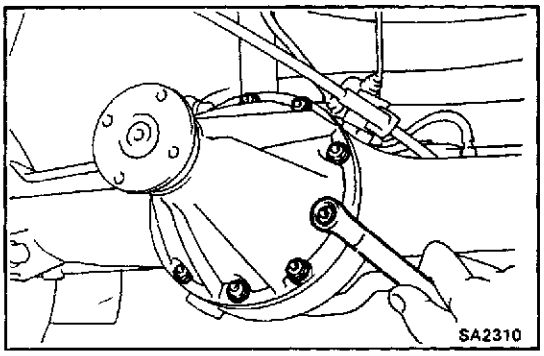
Torque: 27 N-m (275 kgf-cm, 20 ft-lbf)



10. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

Remove the nuts, washers and differential carrier assembly

NOTICE: Be careful not to damage the installation surface.



DIFFERENTIAL INSTALLATION

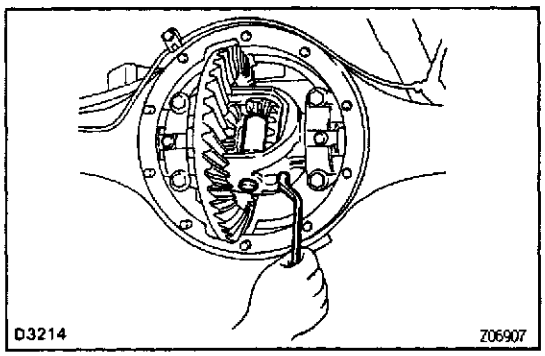
SA182-02

1 INSTALL NEW GASKET TO AXLE HOUSING

2 INSTALL DIFFERENTIAL CARRIER ASSEMBLY

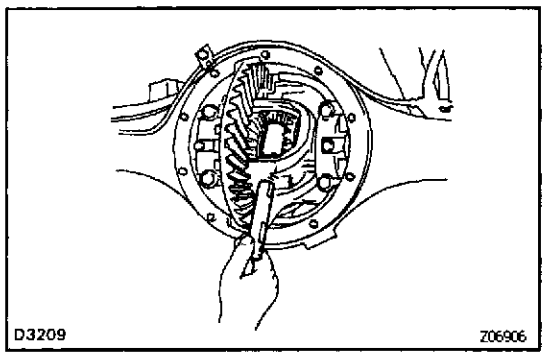
Install the differential carrier assembly in the axle housing with the nuts

Torque 73 N-m (740 kgf-cm, 54 ft-lbf)



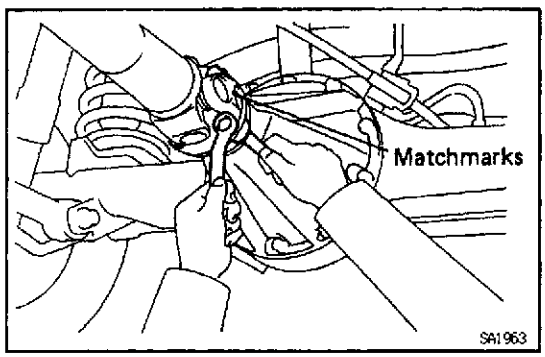
3. REMOVE PINION SHAFT AND PINION SPACER

(a) Remove the pinion shaft pin from the differential



(b) Remove the pinion shaft and spacer

HINT When the pinion shaft is removed, the pinion gear and thrust washer will come off also



4. CONNECT PROPELLER SHAFT

(a) Align the matchmarks and connect the propeller shaft to the companion flange with the 4 bolts, spring washers and nuts

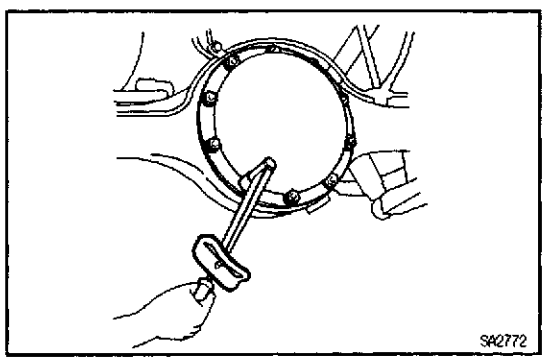
(b)

Torque the bolts and nuts.

Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)

5. INSTALL REAR AXLE SHAFTS

(SEE PAGE SA-91)



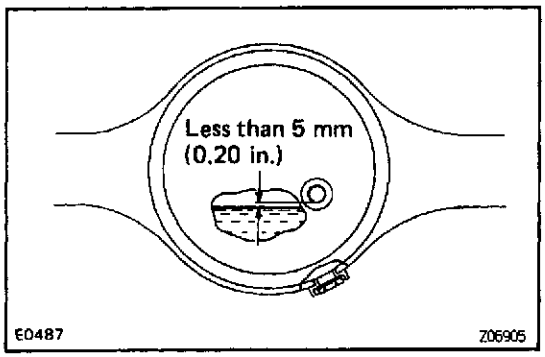
6. INSTALL DIFFERENTIAL COVER

(a) Install the new gasket and differential cover to the axle housing

(b) Install the 10 washers and nuts

Torque: 13 N-m(130 kgf-cm, 9 ft-lbf)

7. INSTALL LSPV SHACKLE BRACKET AND PARKING BRAKE CABLE CLAMP
(SEE PAGE SA-85)
8. INSTALL BRAKE DRUM AND REAR WHEEL
9. INSTALL DRAIN PLUG

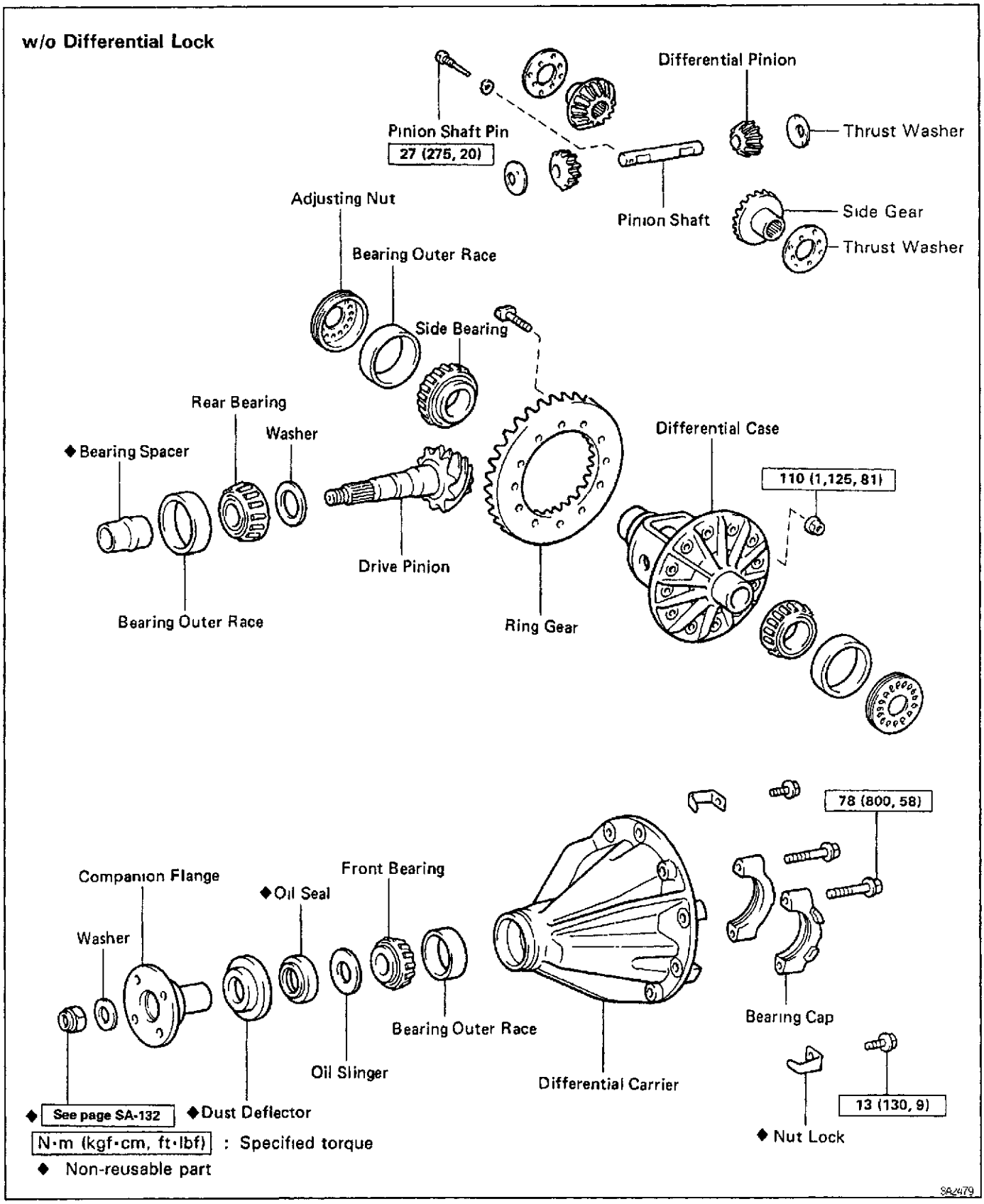


10. FILL DIFFERENTIAL WITH HYPOID GEAR OIL
Fill with hypoid gear oil
Oil type
Hypoid gear oil API GL-5
Recommended oil viscosity
Above -18° C (0° F) SAE 90
Below -180C (0° F) SAE 80 W or 80 W-90
Capacity
3 25 liters (3 4 US qts 2 9 Imp qts)
11. LOWER VEHICLE

DIFFERENTIAL CARRIER

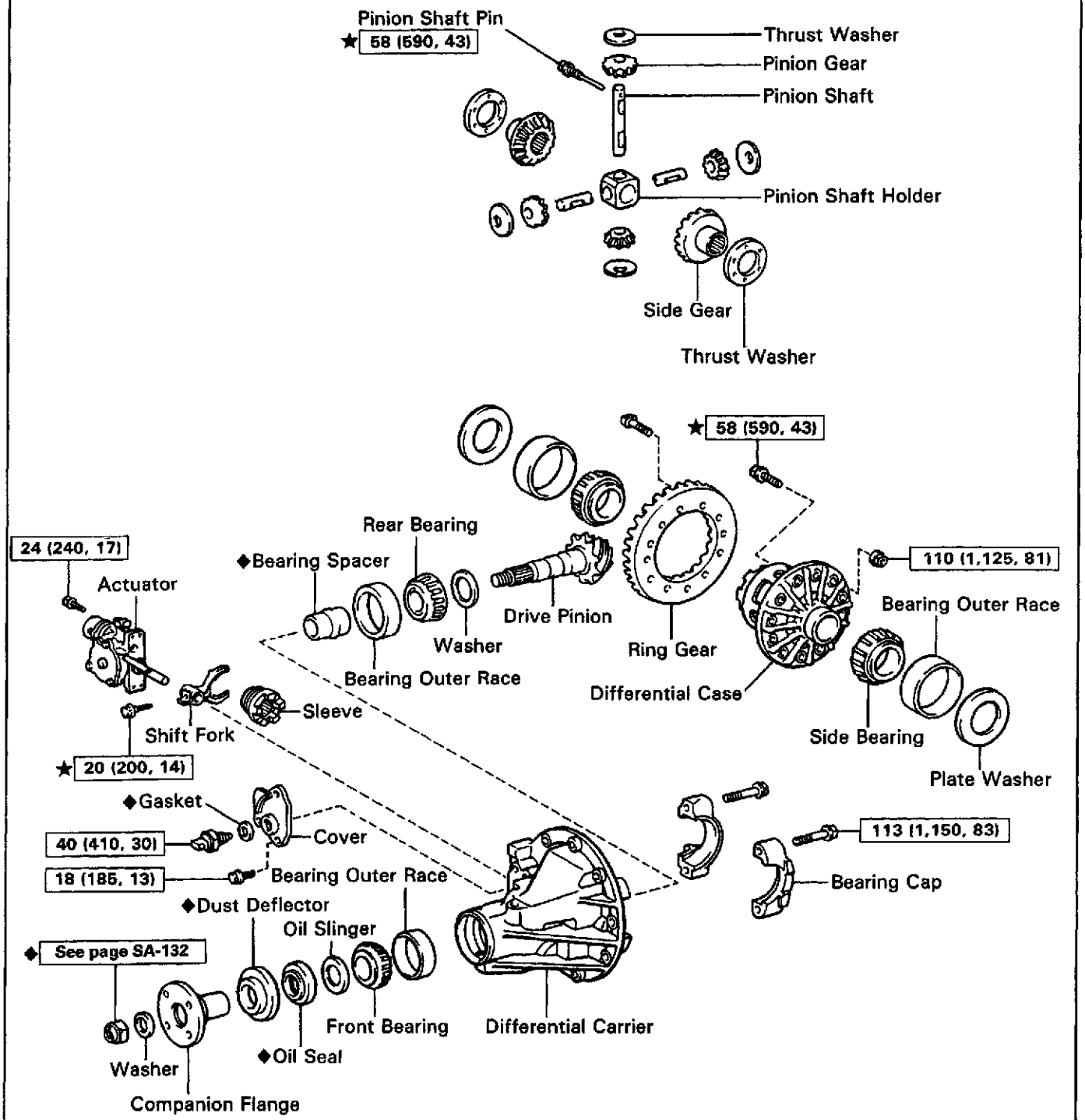
SA183-01

COMPONENTS



SA2479

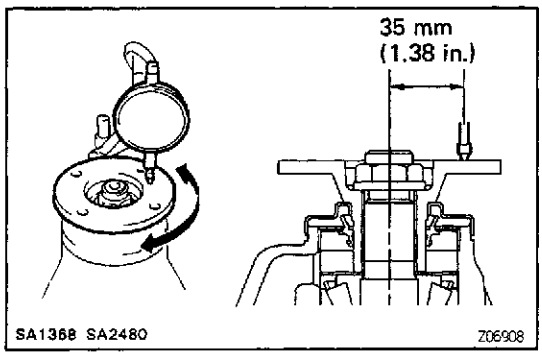
w/ Differential Lock



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

R08305

DIFFERENTIAL CARRIER INSPECTION

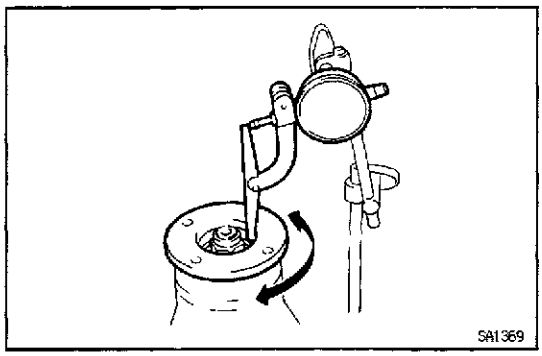


1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

Maximum vertical runout

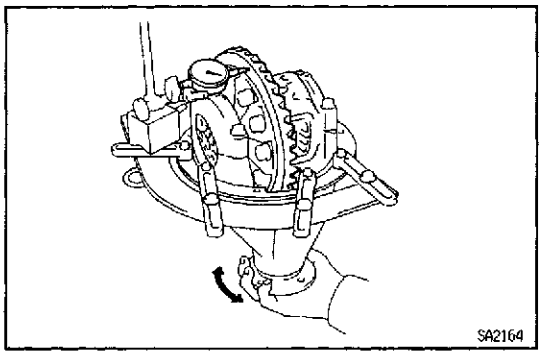
0 10 mm (0 0039 in)



Maximum lateral runout:

0 10 mm (0 0039 in)

If the runout is greater than the maximum, replace the companion flange

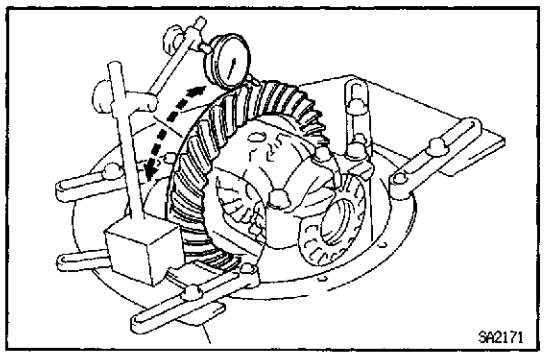


2. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, replace a new ring gear

Maximum runout:

0.10 mm (0.0039 in.)



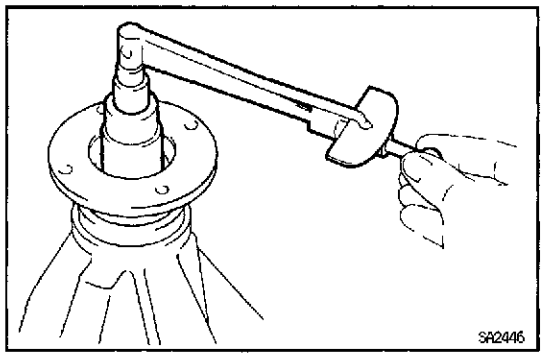
3. CHECK RING GEAR BACKLASH

If the backlash is not within specification, adjust the side bearing preload or repair as necessary

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

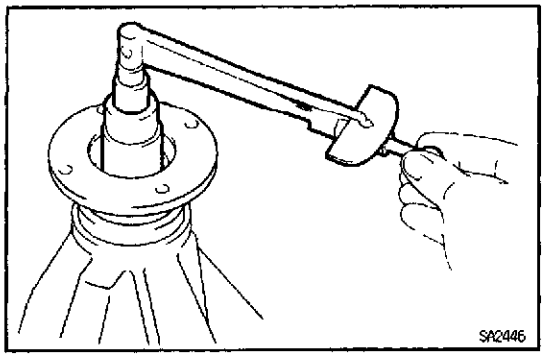


4. MEASURE DRIVE PINION PRELOAD

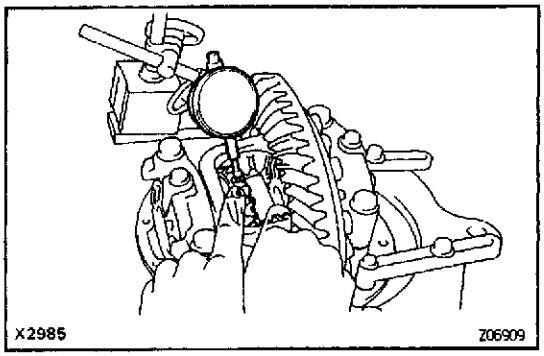
Using a torque wrench, measure the preload of backlash between the drive pinion and ring gear

Preload tat starting)

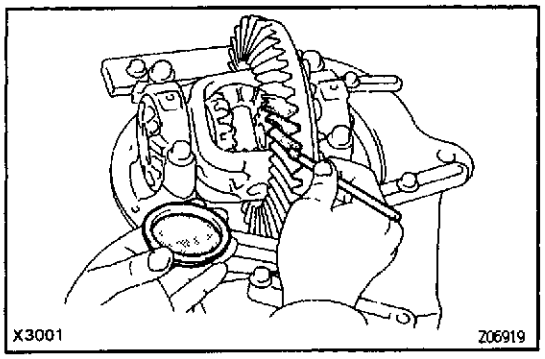
0 7 -1 0 N-m (7-10 kgf-cm, 6 1-8 7 in ¿lbf)



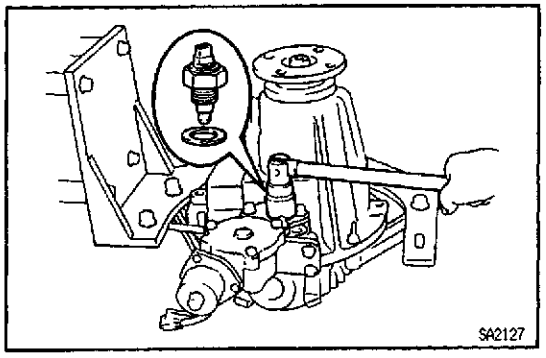
Using a torque wrench, measure the total preload
Total preload (at starting)
1n addition to drive pinion preload
w/o Differential lock
0 4-0 6 N-m (4-6 kgf-cm, 3 5-5 2 in =lbf)
w/ differential lock
0 3-0 7 N-m (3-7 kgf-cm, 2 6-6 1 in -lbf)
If necessary, disassemble and inspect a differential



5. CHECK SIDE GEAR BACKLASH
Measure the side gear backlash while holding 1 pinion gear toward the case
Standard backlash:
0 02-0 20 m m (0 0008-0 0079 in)
If the backlash is out of specification, install the correct thrust washers (See page SA-124)



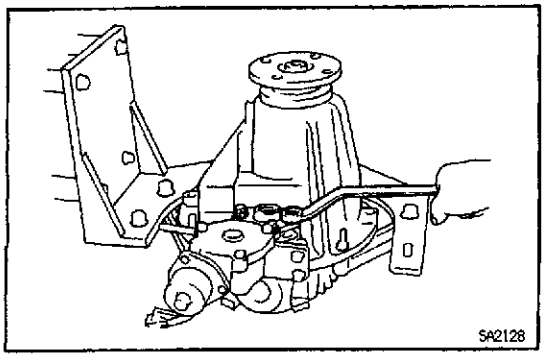
6. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION
(See page SA-131)



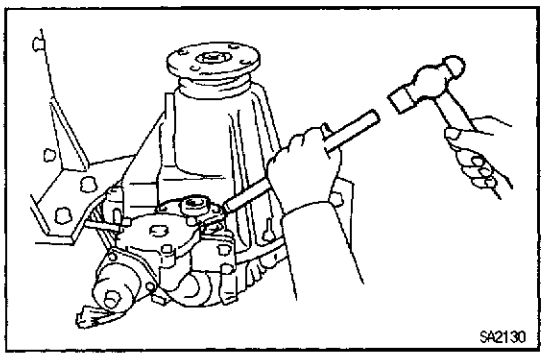
DIFFERENTIAL CARRIER DISASSEMBLY

(See page SA-1 10)

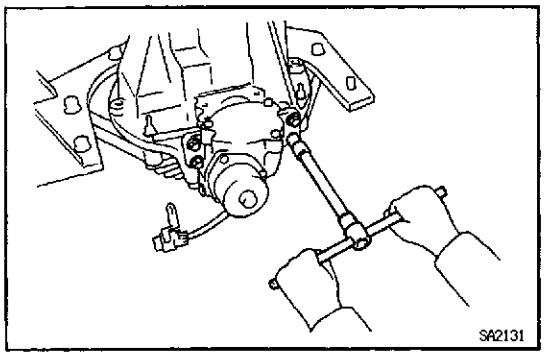
1. (w/ DIFFERENTIAL LOCK)
REMOVE INDICATOR SWITCH



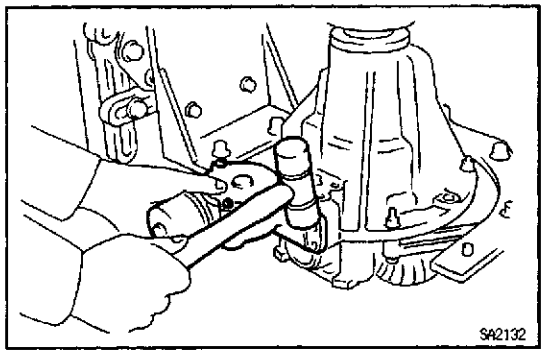
2. (wI DIFFERENTIAL LOCK)
REMOVE COVER
(a) Remove the 3 bolts



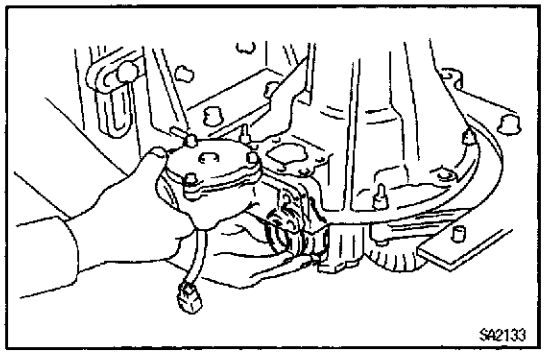
(b) Using a brass bar and hammer, remove the cover



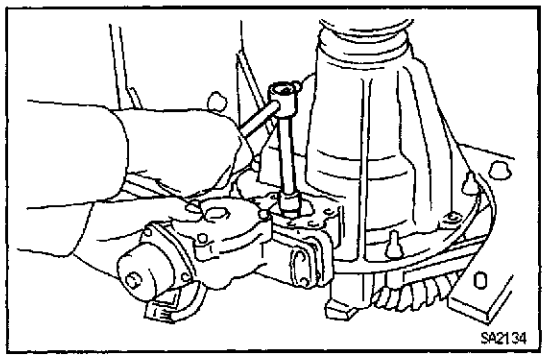
3. (w/ DIFFERENTIAL LOCK)
REMOVE SLEEVE
(a) Remove the 4 bolts



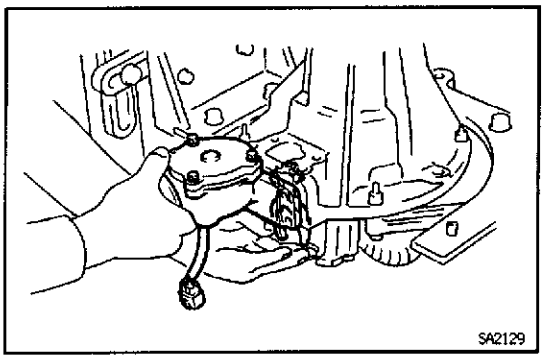
(b) Using a plastic hammer, tap off the actuator



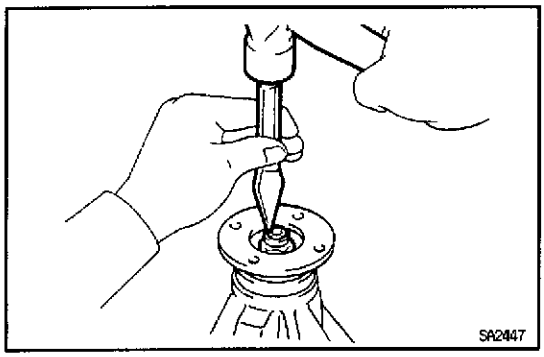
(c) Pull the actuator, remove the sleeve



4. (w/ DIFFERENTIAL LOCK)
REMOVE ACTUATOR AND SHIFT AND SHIFT FORK
(a) Remove the shift fork shaft bolt

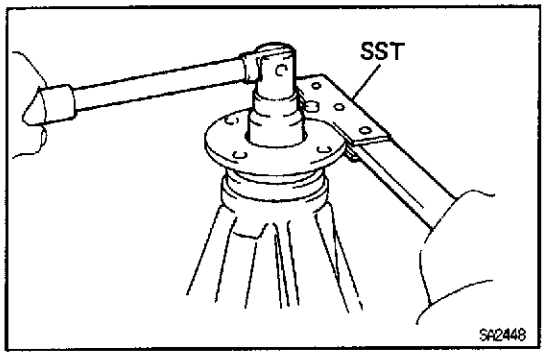


(b) Pull out the actuator, remove the shift fork

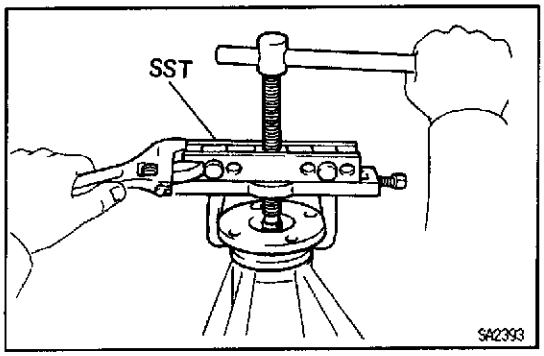


5. REMOVE COMPANION FLANGE

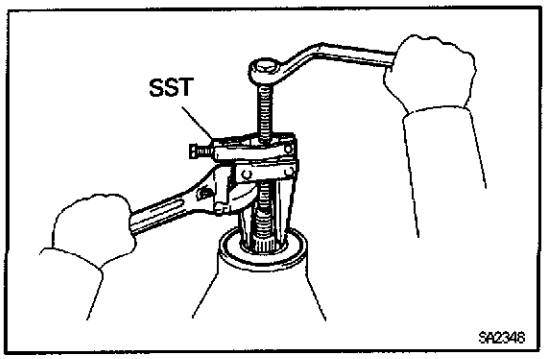
(a) Using a chisel and hammer, unstake the nut



(b) Using SST to hold the flange, remove the nut and plate washer
SST 09330-00021



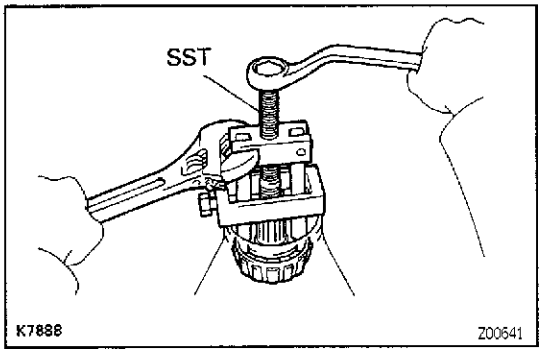
(c) Using SST, remove the companion flange
SST 09950-20017



6. 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

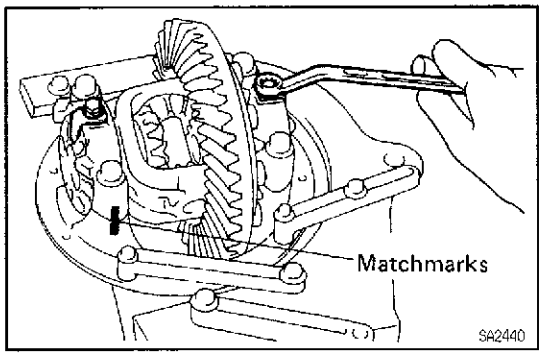


7. REMOVE FRONT BEARING

Using SST, remove the front bearing from the drive pinion

SST 09556 - 22010

If the front bearing is damaged or worn, replace the bearing

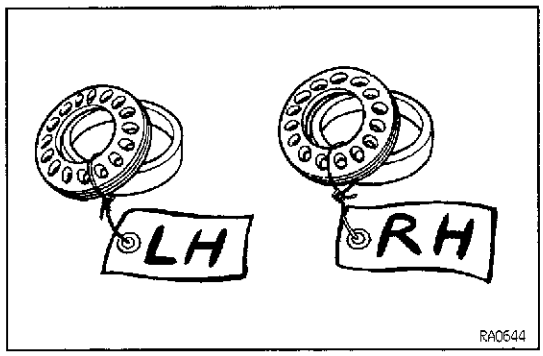


8. REMOVE DIFFERENTIAL CASE ASSEMBLY

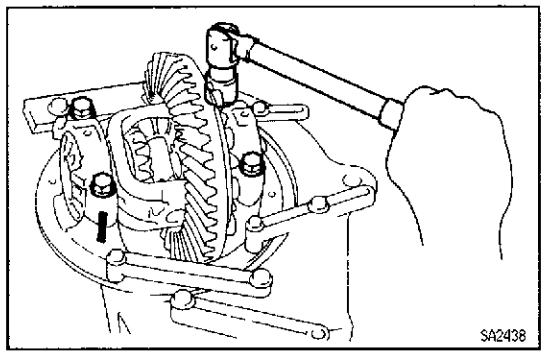
(w/o DIFFERENTIAL LOCK)

(a) Place the matchmarks on the bearing cap and differential carrier

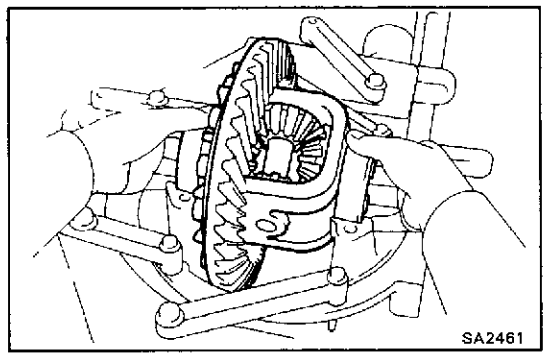
(b) Remove the 2 adjusting nut locks



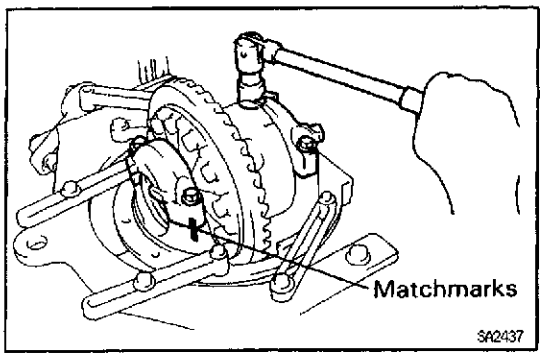
HINT: Tag the disassembled parts to show the location for- reassembly



(c) Remove the 2 bearing caps and 2 adjusting nuts



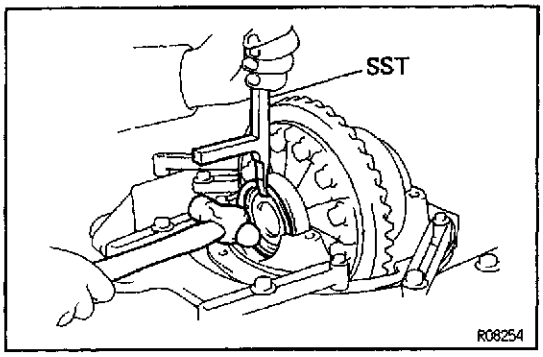
(d) Remove the differential case with bearing outer races from the carrier



(w/ DIFFERENTIAL LOCK)

(a) Place matchmarks on the bearing cap and differential carrier

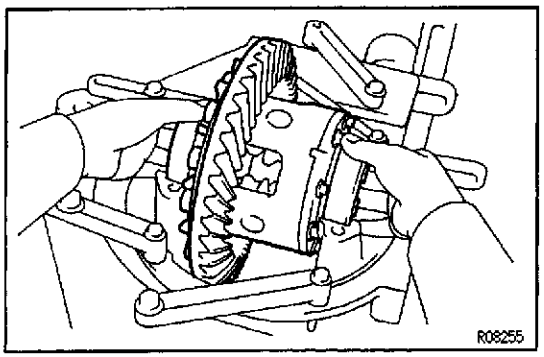
(b) Remove the 4 bolts and the 2 bearing caps



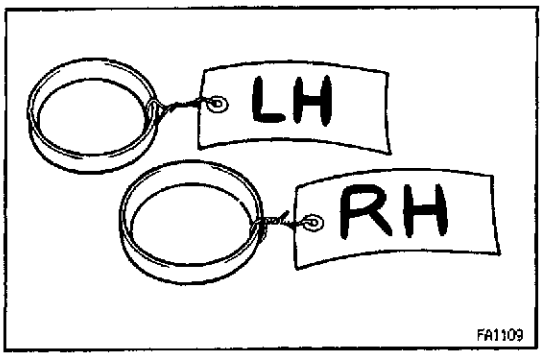
(c) Using SST, remove the plate washer

SST 09504-2210

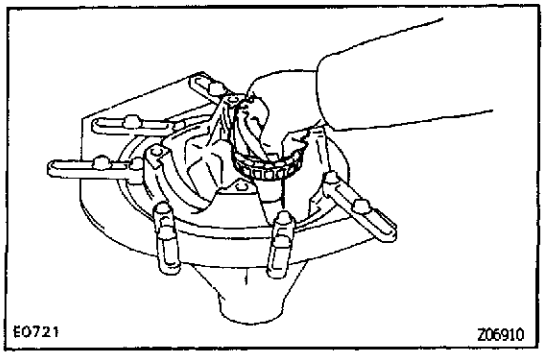
HINT Measure the plate washer thickness and note it



(d) Remove the diffferential case with the side bearing outer races from the differential carrier



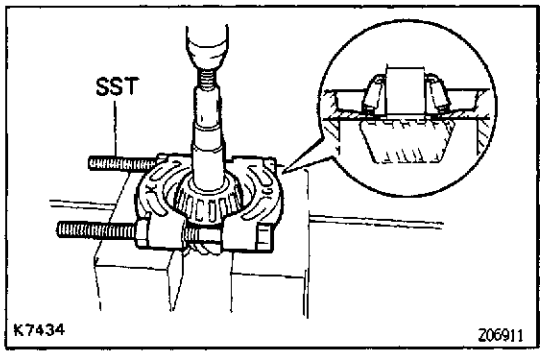
HINT: Tag the bearing outer races to show the location for reassembly



9. REMOVE DRIVE PINION AND BEARING SPACER FROM DIFFERENTIAL CARRIER

(a) Remove the drive pinion with the rear bearing

(b) Remove the bearing spacer



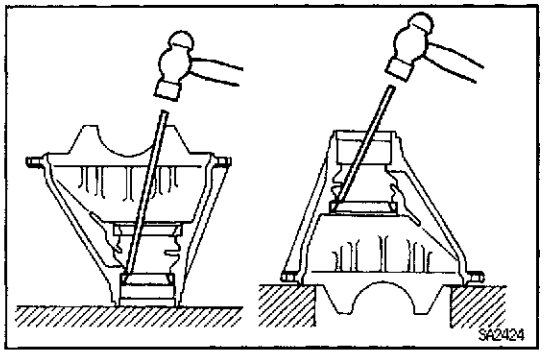
10. REMOVE DRIVE PINION REAR BEARING

(a) Using SST and a press, remove the rear bearing from the drive pinion

SST 09950-00020

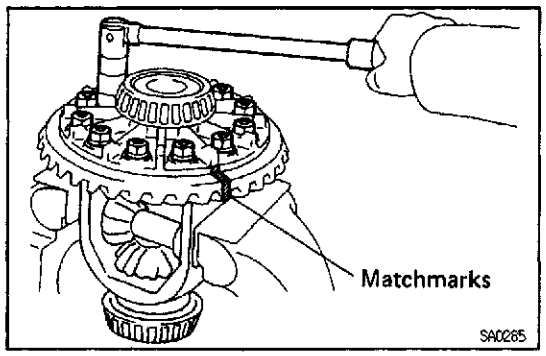
HINT If the drive pinion or ring gear are damaged, replace them as a set

(b) Remove the plate washer from the drive pinion



11. REMOVE FRONT AND REAR BEARING OUTER RACES

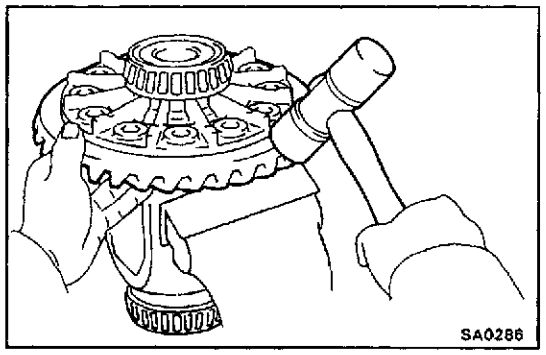
Using a hammer and brass bar, drive out the outer race



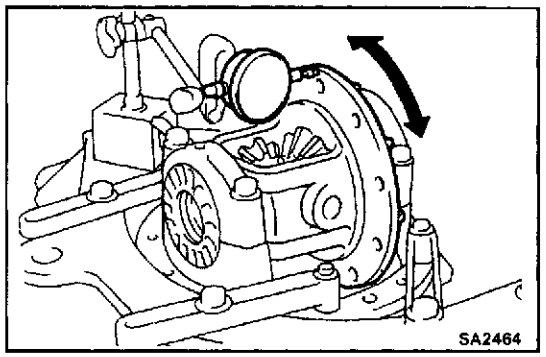
12. REMOVE RING GEAR

(a) Place the matchmarks on the ring gear and differential case

(b) Remove the ring gear set nuts and bolts



(c) Using a plastic hammer, tap on the ring gear to separate it from the dirrerential case



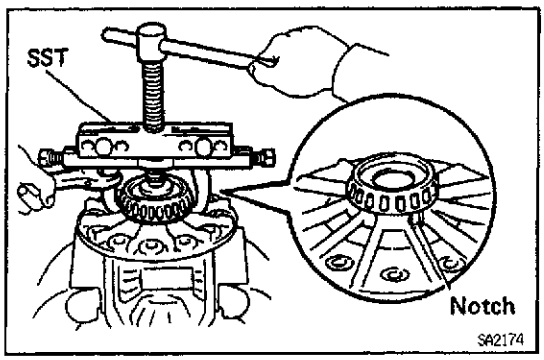
13. CHECK DIFFERENTIAL CASE RUNOUT

(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



14. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

(w/o DIFFERENTIAL LOCK)

Using SST, remove the side bearing from the differential case

SST 09950-20017

(w/ DIFFERENTIAL LOCK)

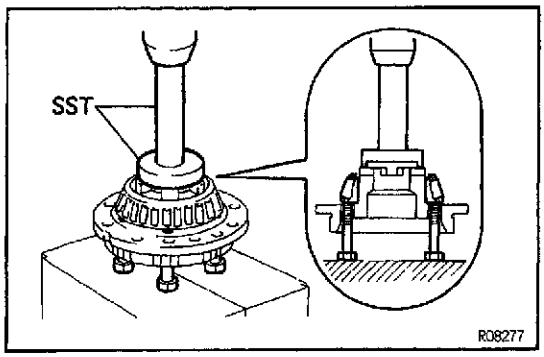
(a) Using SST, remove the side bearing (ring gear side)

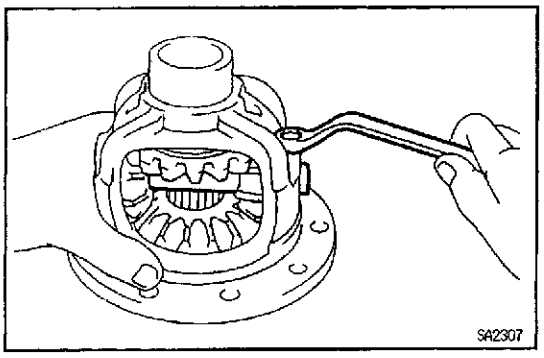
HINT Fix the claws of SST to the notches in the differential case

(b) Using 4 bolts and SST, remove the side bearing (cover side)

HINT Fix the claws of SST to the notches in the differential case

SST 09550-10012 (09252-10010, 09557-10010)

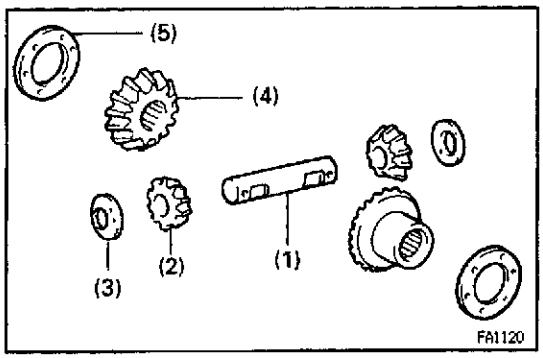




15. DISASSEMBLE DIFFERENTIAL CASE

(w/o DIFFERENTIAL LOCK)

(a) Remove the pinion shaft pin



(b) Remove the following parts

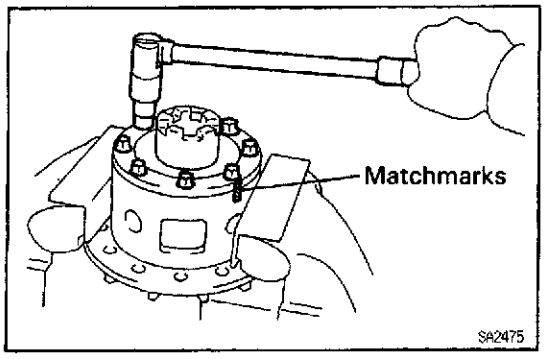
(1) Pinion shaft

(2) Pinion gears

(3) Pinion gear thrust washers

(4) Side gears

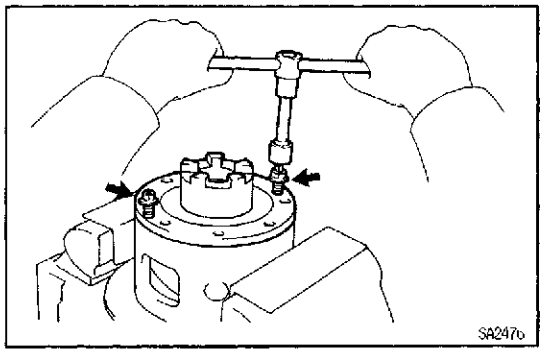
(5) Side gear thrust washers



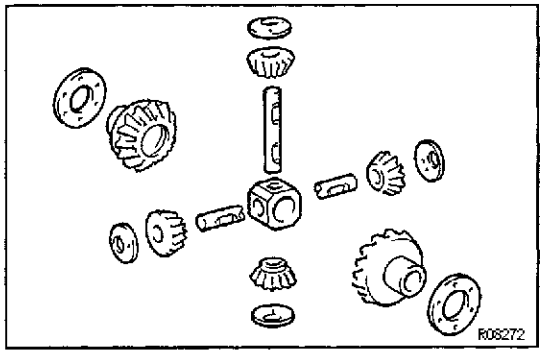
(wl DIFFERENTIAL LOCK)

(a) Place matchmarks on the case and cover

(b) Using a torx socket wrench (09044-00020), remove the 5 set bolts and 3 pinion shaft pins

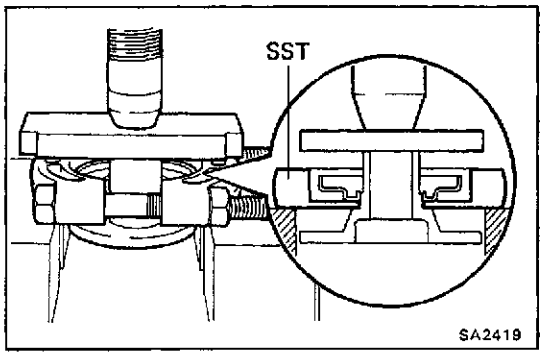


(c) Using 2 cover- installation bolts, separate the cover and case



(d) Remove the following parts from the cate
- Side gear (2 pieces)
- Side gear thrust washer (2 pieces)
- Pinion gear (4 pieces)

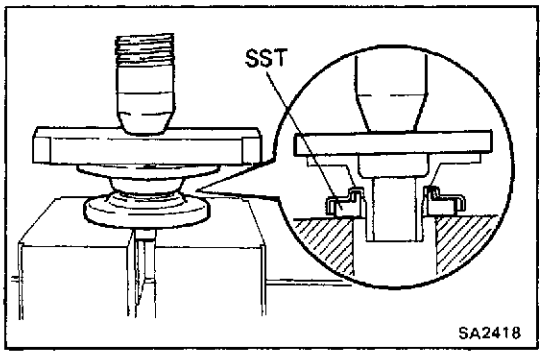
Pinion thrust washer (4 pieces)
Pinion shaft (3 pieces)
Pinion shaft holder



COMPANION FLANGE DUST DEFLECTOR REPLACEMENT

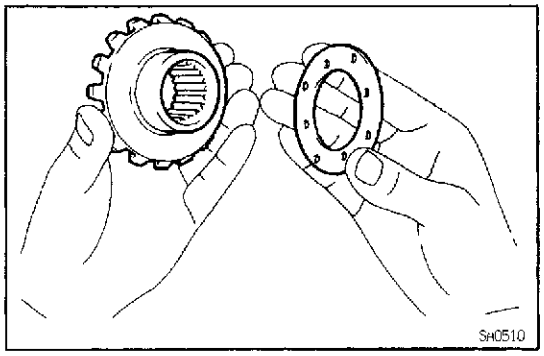
1. REMOVE DUST DEFLECTOR

Using SST and a press, remove the dust deflector
SST 09950-00020



2. INSTALL NEW DUST DEFLECTOR

Using SST and a press, install the new dust deflector
SST 09726 - 40010



DIFFERENTIAL CARRIER ASSEMBLY

(See page SA-110)

1. (w/o DIFFERENTIAL LOCK)

ASSEMBLE DIFFERENTIAL CASE

(a) Install the proper thrust washer and side gears

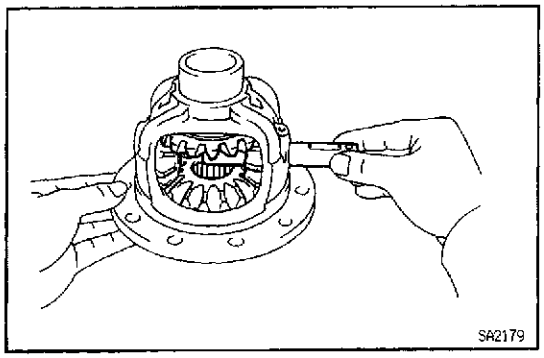
Using the table below, select the thrust washers which will ensure that the backlash is within specification
Try to select washers of the same size for both sides

Standard backlash:

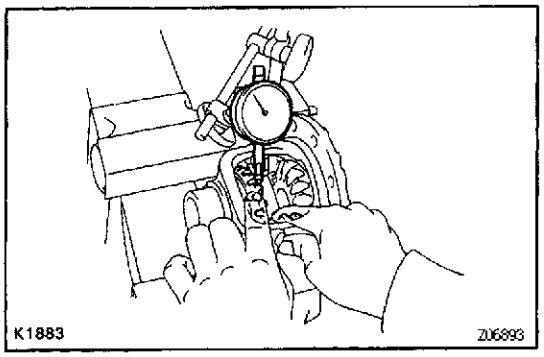
0.02-0.20 m m (0.0008-0.0079 in.)

Thrust washer thickness:

Thickness mm (in)	Thickness mm (in)
1 60 (0 0630)	1 90 (0 0748)
1 75 (0 0689)	2 05 (0 0807)



(b) Install the side gears with the thrust washers, pinion gears, pinion gear thrust washers and pinion shaft
HINT Align the hole for the pinion shaft and the differential case hole

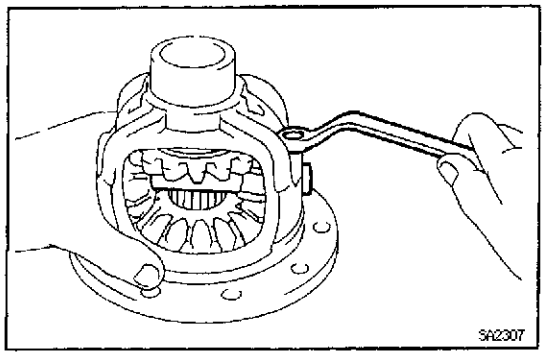


(c) Using a dial indicator, measure the side gear backlash while holding 1 pinion gear toward the case

Standard backlash:

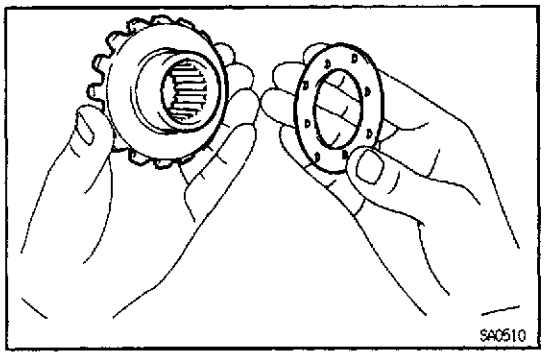
0.02-0.20 mm (0.0008-0.0079 in.)

If the backlash is not within specification, install a thrust washer of different thickness



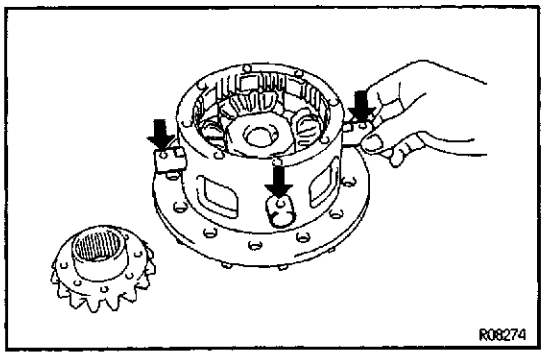
(d) install) the pinion shaft pin

Torque: 27 N-m (275 kgf-cm, 20 ft-lbf)

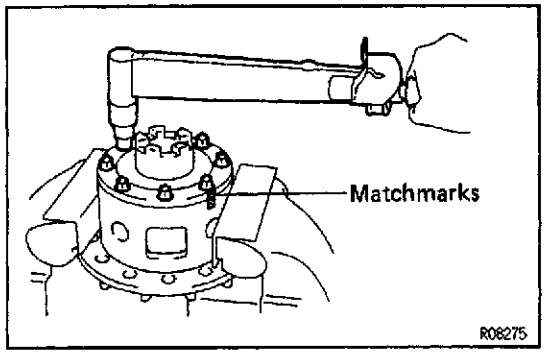


2. (w/ DIFFERENTIAL LOCK)
MEASURE SIDE GEAR BACKLASH

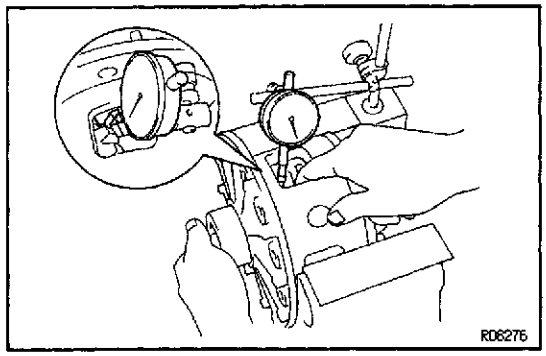
(a) Apply gear oil to each part
(b) Install the thrust washer to the side gear
(c) Install the thrust washer to the pinion



(d) Install the side gear into the case
(e) Install the holder into the case
(f) Install the 4 pinion gears
(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



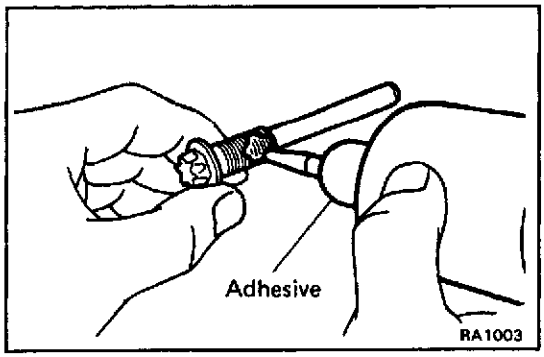
(i) Align the matchmarks, install the case and cover
(j) Using a torx socket wrench (09044-00020), torque the 5 bolts and 3 pinion shaft pins
Torque: 58 N-m (590 kgf•cm, 43 ft-lbf)



(k) Holding the side gear, 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 specification, install the thrust washer of a different thickness
Thrust washer thickness:

Thickness mm (in)	Thickness mm (in)
1 60 (0 0630)	1 90 (0 0748)
1 75 (0 0689)	2 05 (0 0807)

(l) After measuring backlash, remove the 5 set bolts and 3 pinion shaft pins.

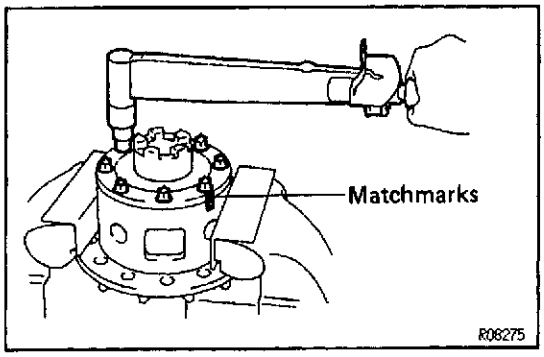


3. (w/ DIFFERENTIAL LOCK)
ASSEMBLE DIFFERENTIAL CASE

(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

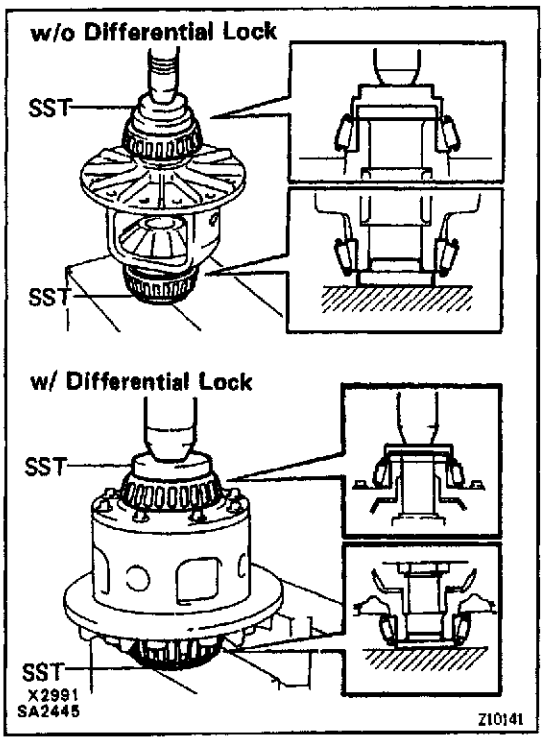
Adhesive Part No 08833-00070, THREE BOND 1324 or equivalent



(c) Align the matchmarks, install the case and cover

(d) Using a torx socket wrench (09044-00020), torque the 5 bolts and 3 pinion shaft pins

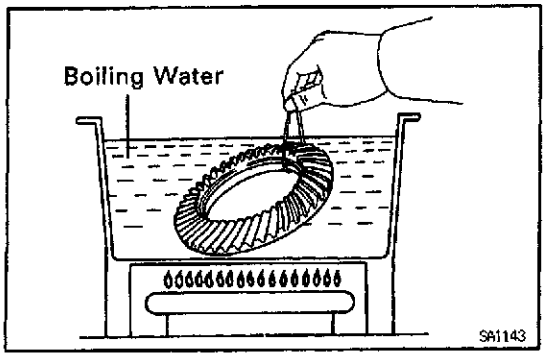
Torque: 58 N-m (590 kgf-cm. 43 ft-lbf)



4. INSTALL SIDE BEARINGS

Using a press and SST, install the side bearings on the differential case

SST w/o Differential lock: 09315-00021
09550-10012(09558-10010)
w/ Differential lock: 09550-60010
09550 -10012(09558 -10010)

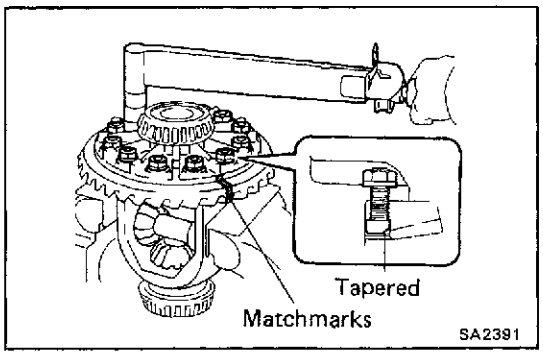


5. INSTALL RING GEAR ON DIFFERENTIAL CASE

(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) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case

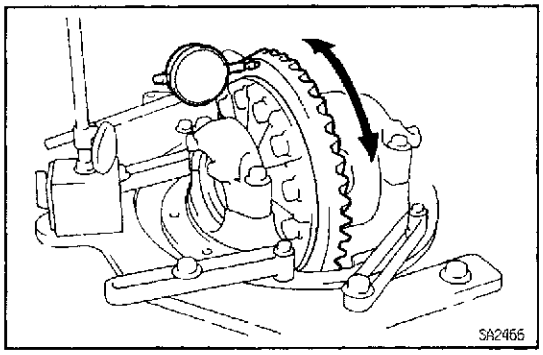


(d) Align the matchmarks on the ring gear and differential case
(e) Temporarily install the set bolts and nuts so that the bolt holes in the ring gear and differential case are not misaligned

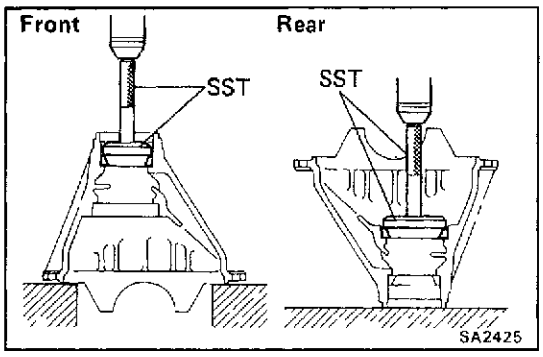
NOTICE:

- **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.**

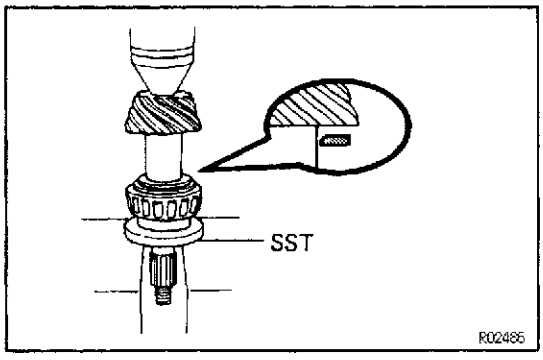
(f) After- the ring gear cools down enough, tighten the set bolts uniformly and a little at a time
Torque: 110 N-m (1,125 kgf-cm, 81 ft-lbf)



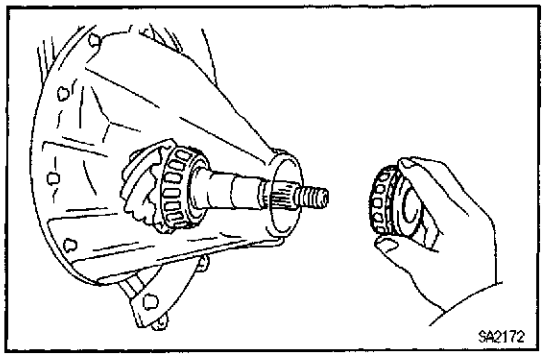
6. CHECK RING GEAR RUNOUT
(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings
(b) Check the ring gear runout
Maximum runout:
0.10 mm (0.0039 in.)
(c) Remove the differential case



7. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES
Using SST and a press, install the outer races
Front side
SST 09608 - 35014 (09608 - 06020 09608 - 06110)
Rear side
SST 09608-35014 (09608-06020, 09608-06180)



8. INSTALL DRIVE PINION REAR BEARING
(a) Install the washer on the drive pinion with the chamfered end facing the pinion gear
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
(d) Using a press and SST, press in the rear bearing onto the drive pinion
SST 09506 - 35010

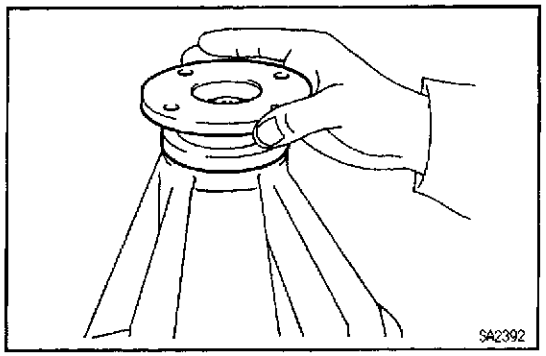


9. TEMPORARILY ADJUST DRIVE PINION PRELOAD

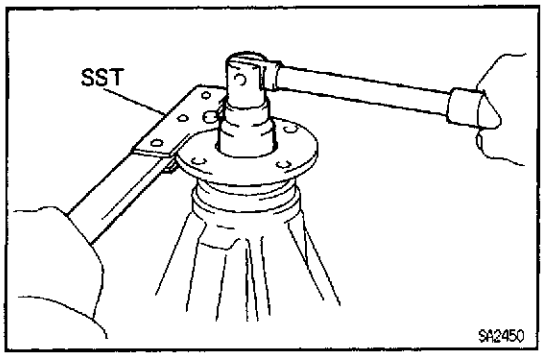
(a) Install the drive pinion and front bearing

HINT Assemble the spacer and oil seal after adjusting the gear contact pattern

(b) Install the oil slinger



(c) Install the companion flange and plate washer



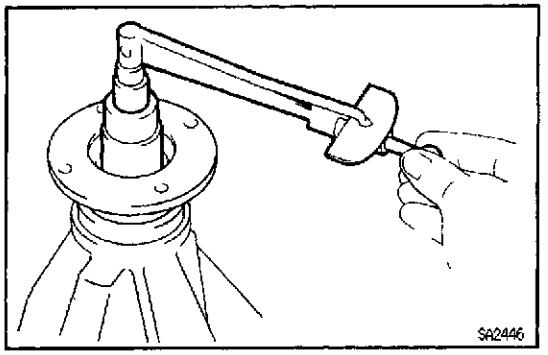
(d) Adjust the drive pinion preload by tightening the companion flange nut

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 (starting):

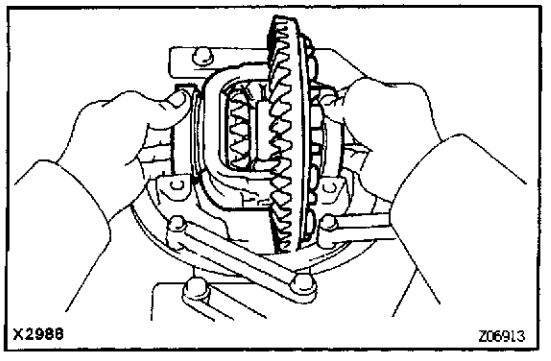
New bearing

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- $.7 in.-lbf)

HINT Measure the total preload after first turning the bearing clockwise and counterclockwise several times to snug down the bearing

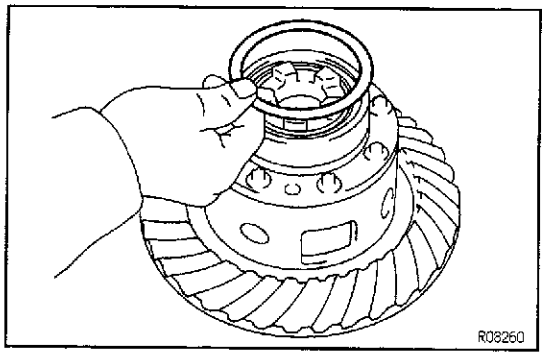


10. INSTALL DIFFERENTIAL CASE IN CARRIER (w/o DIFFERENTIAL LOCK)

(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

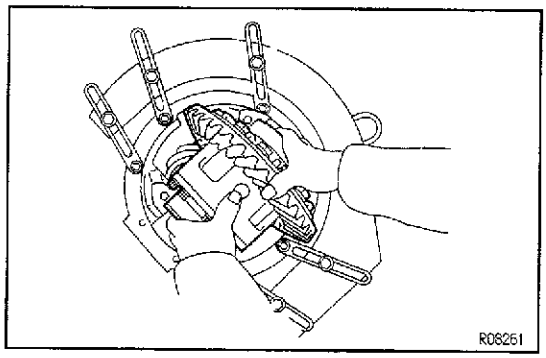
HINT Make sure that there is backlash between the ring gear and drive pinion



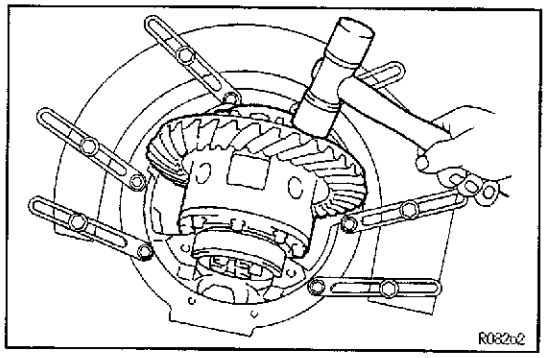
(w/ DIFFERENTIAL LOCK)

(a) Place the bearing outer races on their respective bearings. Make sure the left and right races are not interchanged.

(b) Install the assembled plate washer onto the side bearing.



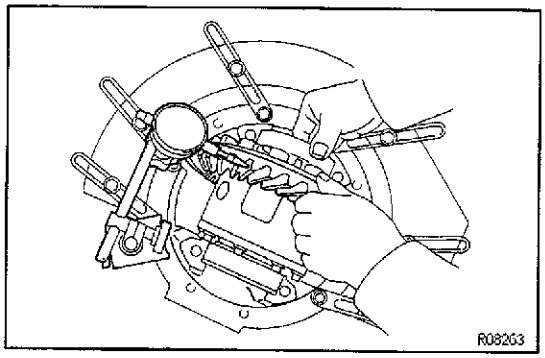
(c) Install the differential case in the carrier.



(d) Snug down the washer and bearing 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.



11. (w/ DIFFERENTIAL LOCK)

ADJUST RING GEAR BACKLASH

(a) Hold the side bearing of the ring gear side and measure the backlash.

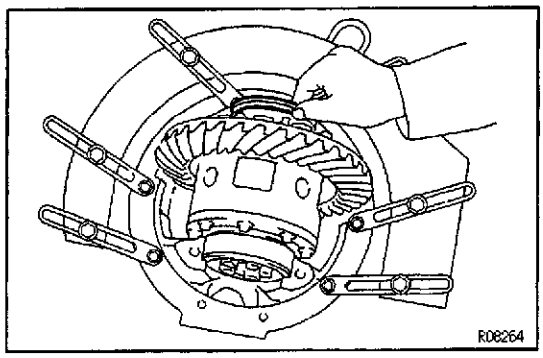
Backlash (reference): 0.15 mm (0.0059 in.)

(b) Select a case cover side plate washer using the backlash as reference.

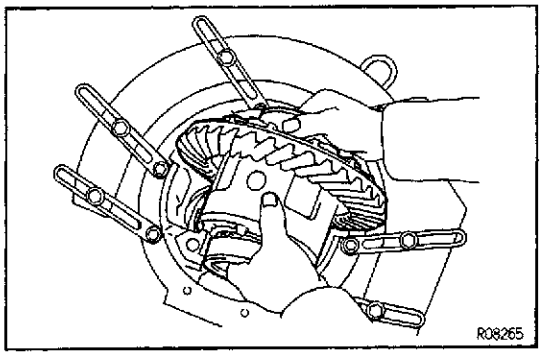
Side plate washer thickness:

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)		

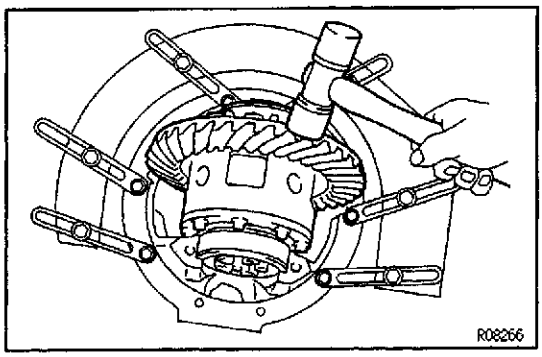
V04434



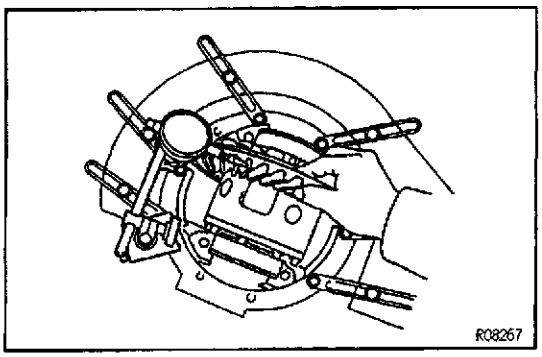
(c) Select a ring gear side plate washer of a thickness which eliminates any clearance between the plate washer and carrier



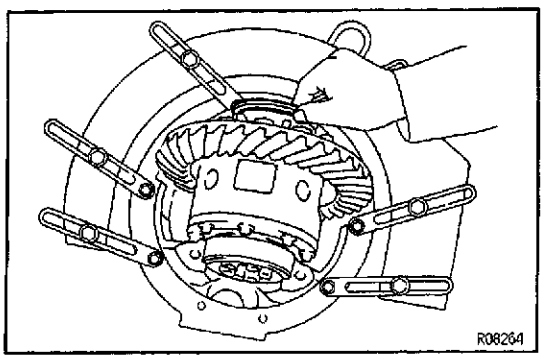
(d) Remove the plate washers and differential carrier
(e) Install the plate washer into the lower part of the carrier
(f) Place the plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier



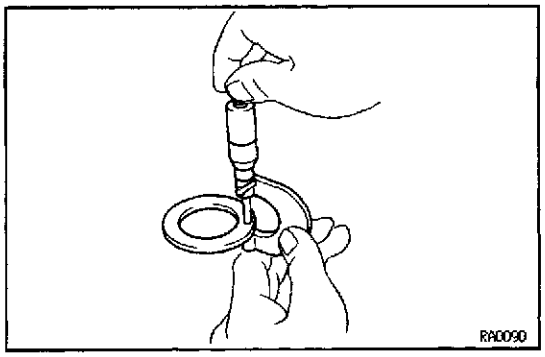
(g) Using a plastic hammer, snug down the washer and bearing by tapping the ring gear



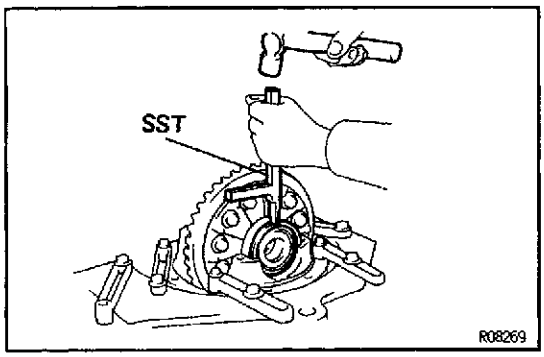
(h) Measure the ring gear backlash
Backlash: 0.15 - 0.20 mm (0.0059 - 0.0079 in.)
If not within specification, adjust by either increasing or decreasing the number of washers on both sides by an equal amount
HINT There should be no clearance between the plate washer and case
Insure that there is ring gear backlash



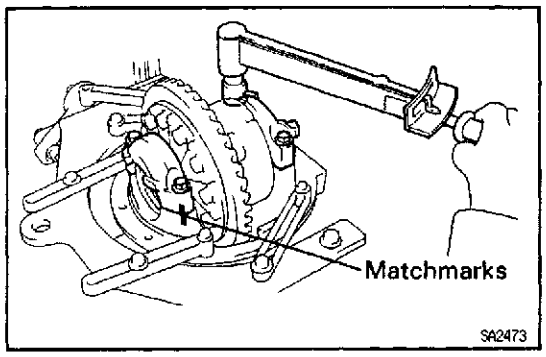
12. (w/ DIFFERENTIAL LOCK)
ADJUST SIDE BEARING PRELOAD
(a) After adjustment with the backlash as reference, remove the ring gear side plate washer



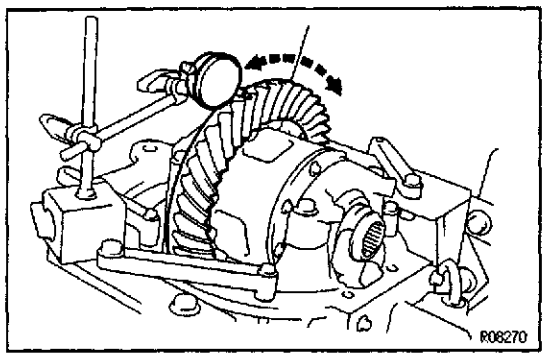
(b) Measure the thickness of the removed plate washer
(c) Install a new thicker washer of 0 06 - 0 09 mm (0 0024 -0 0035 in) than the washer removed
HINT Select a washer which can be pressed in 2/3 of the way with finger



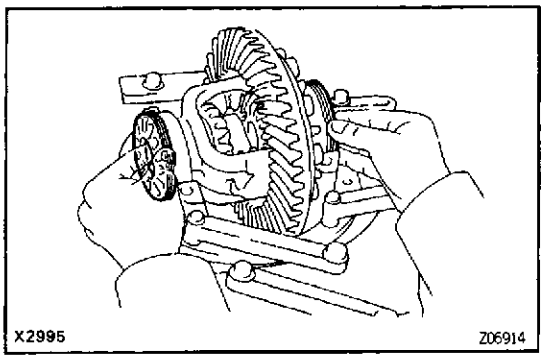
(d) Using SST, tap in the plate washer
SST 08504-22010



(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)

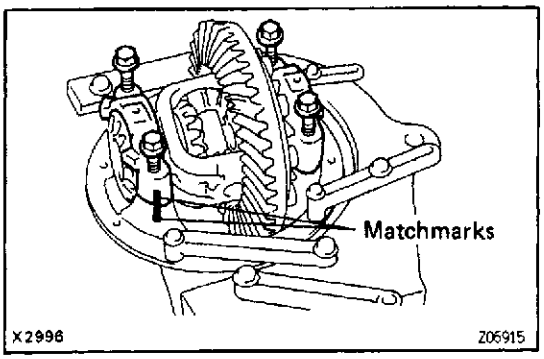


(g) Using a dial indicator, adjust the ring gear backlash until it is within specification
Backlash: 0.15 - 0.20 mm (0.0059 - 0.0079 in.)
If not within standard, follow the procedure listed below
If backlash is greater than specification
Replace the cover side washer with a thicker washer
When doing so replace the ring gear side plate washer with one having a thickness equalling the amount the cover side plate washer thickness was 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



13. (w/o DIFFERENTIAL LOCK)
INSTALL ADJUSTING NUTS

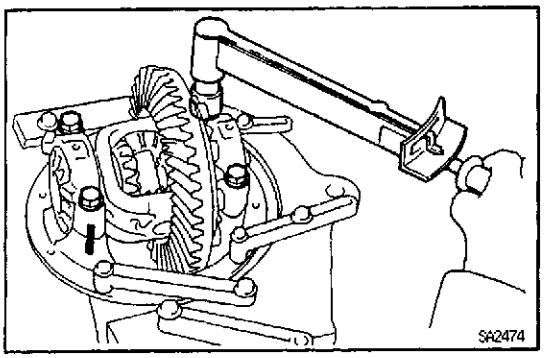
Install the adjusting nuts on the carrier, making sure the nuts are threaded properly



14. (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



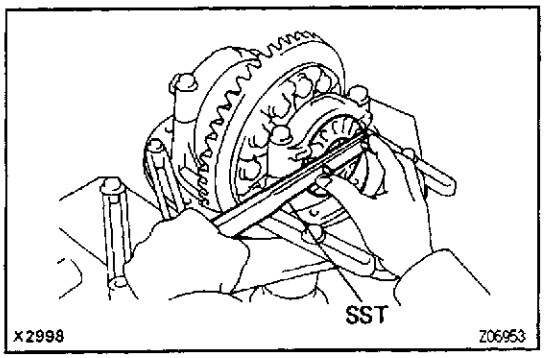
15. (w/o DIFFERENTIAL LOCK)
ADJUST SIDE BEARING PRELOAD

(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

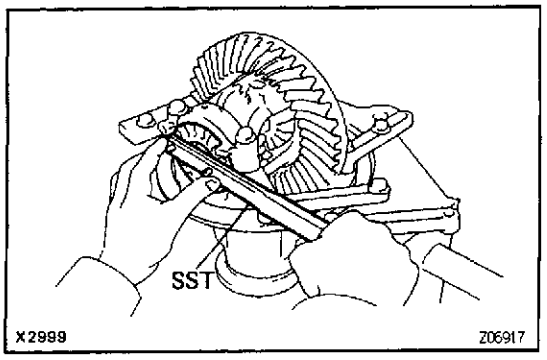
Torque: 78 N-m (800 kgf-cm, 58 ft-lbf)

(b) Fully tighten the 4 bearing cap bolts by hand



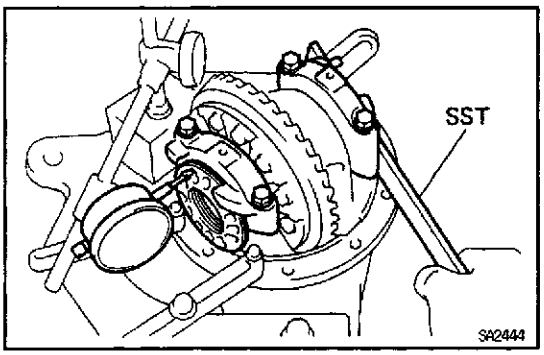
(c) Using SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0 2 mm (0 008 in)

SST 09504-00011

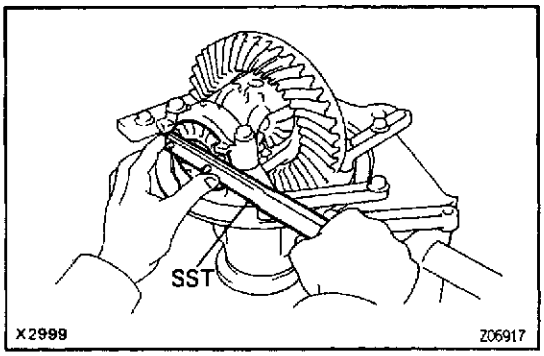


(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side After the bearings as settled, loosen the adjusting nut on the drive pinion side

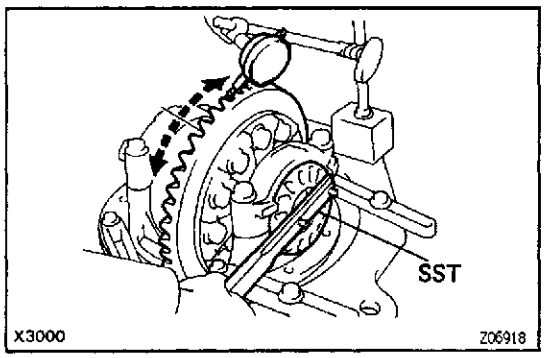
SST 09504-00011



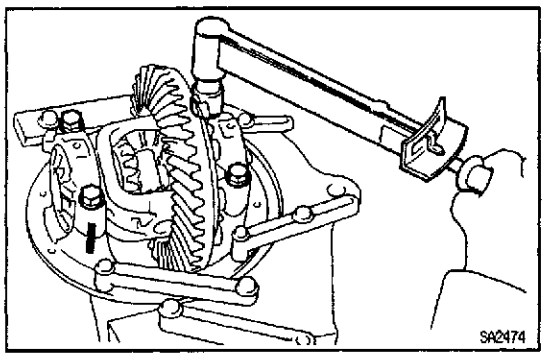
(e) Place a dial indicator on the top of the adjusting nut on the ring gear side
(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move



(g) Torque the adjusting nut 1-1 5 notches from the zero preload position

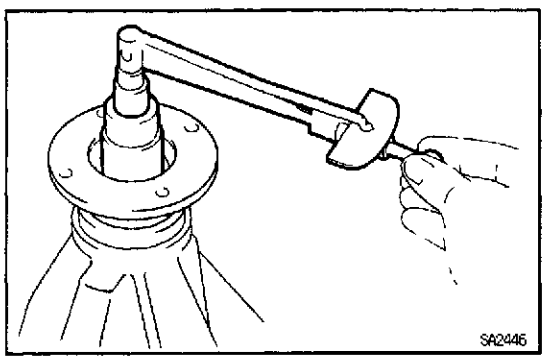


(h) Using a dial indicator, adjust the ring gear backlash until it is within specification
Backlash
0 1 5-0 20 mm t0 0059-0 0079 in ?
HINT The backlash is adjusted by turning the left and right adjusting nuts equal amounts For example, loosen the nut on the left side on notch and torque the nut on the right side one notch

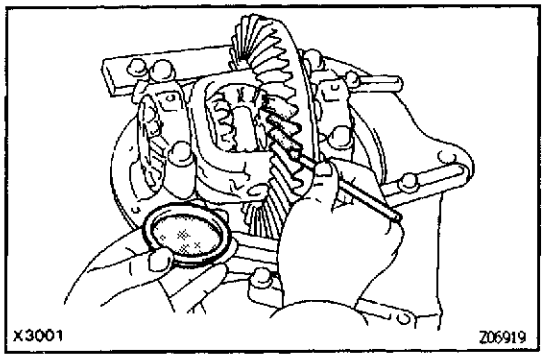


(I) Torque the bearing cap bolts
Torque: 78 N-m (800 kgf-cm. 58 ft-lbf)

(J) Recheck the ring gear backlash
Backlash:
0 15-0 20 mm (0 0059-0 0079 in)



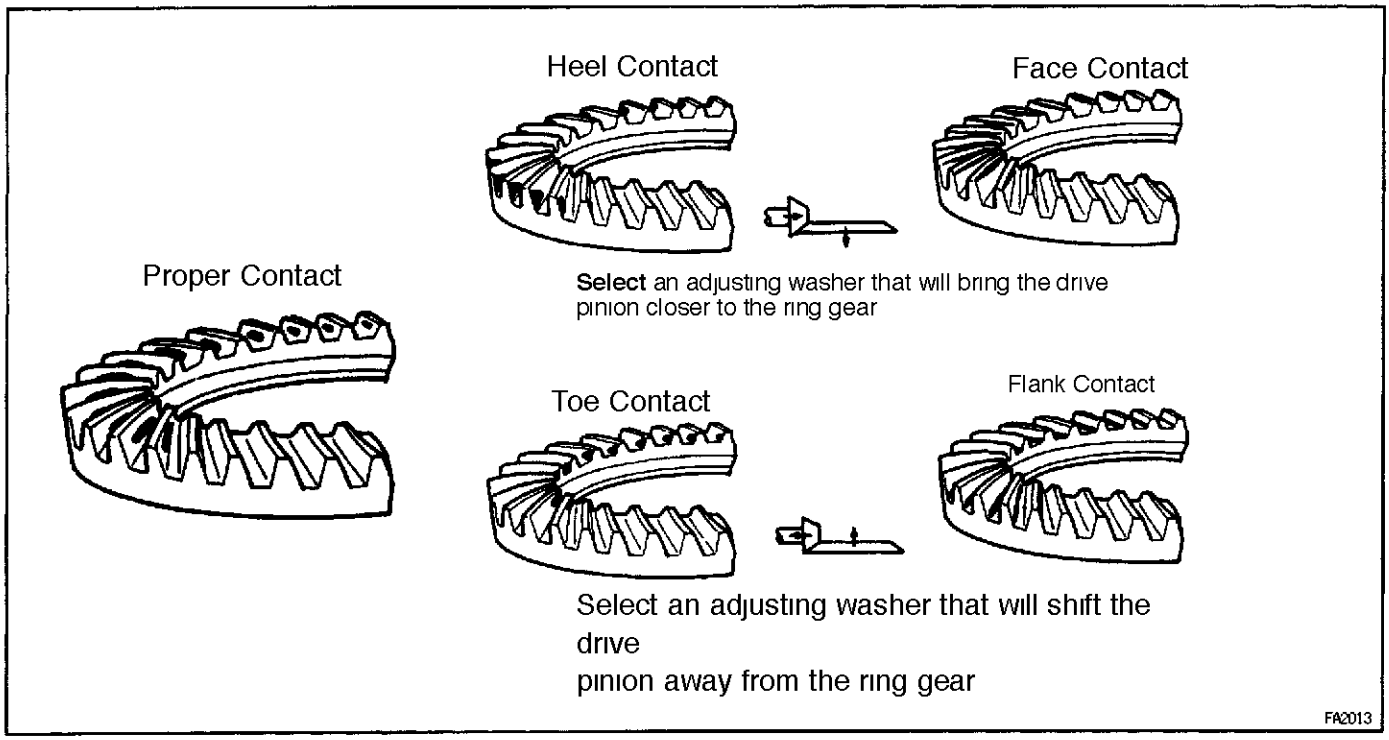
16. MEASURE TOTAL PRELOAD
Using a torque meter measure the total preload
Total preload (starting):
Add drive pinion preload
w/o Differential lock
0.4-o.6 N-m (4-6 kgf-cm, 3.5-5.2 in.¿lbf)
w/ Differential lock
0.3-0.7 N-m (3-7 k9f¿cm, 2.6-6.1 in.)

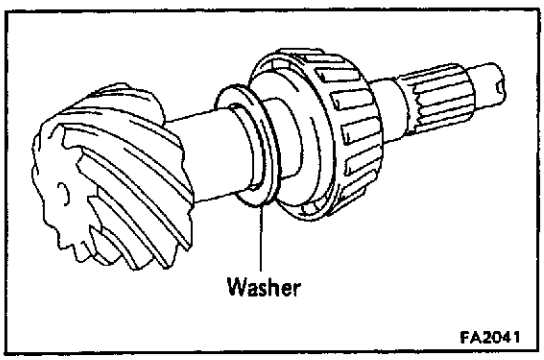


17. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead

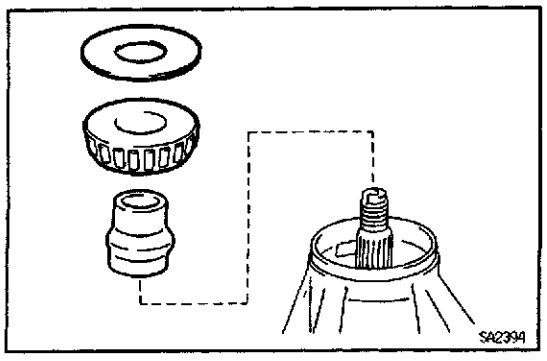
(b) Turn the companion flange, pin both directions to inspect the ring gear for proper tooth contact





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)	



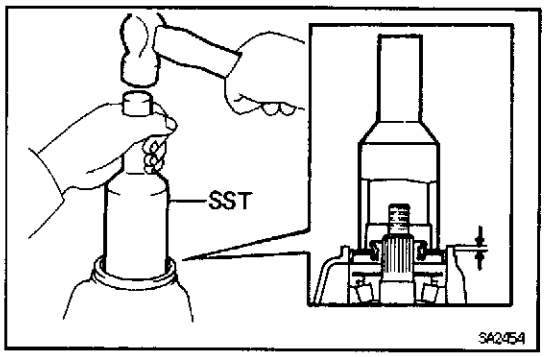
18. REMOVE COMPANION FLANGE (SEE PAGE SA-1 15)

19. REMOVE OIL SLINGER AND FRONT BEARING (SEE PAGE $A- 115)

20. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the shaft

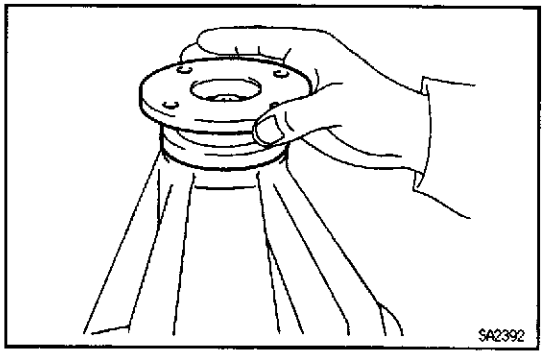
(b) Install the front bearing and oil slinger



21. INSTALL NEW OIL SEAL

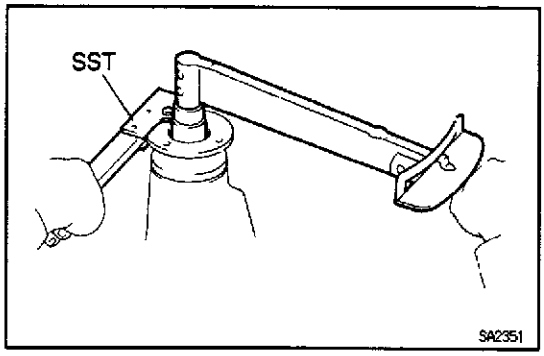
(a) Using SST, drive in a new oil sea) as shown
SST 09214-76011
Oil seal drive in depth:
1.0 mm (0.039 in.)

(b) Apply MP grease to the oil seal lip



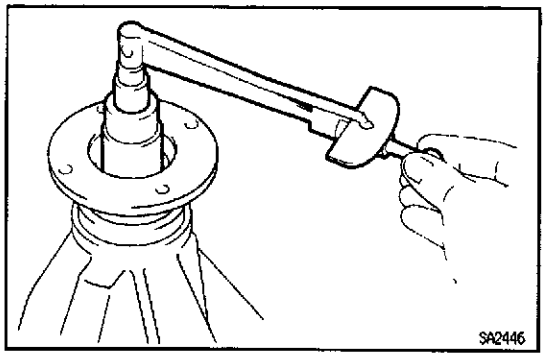
22. INSTALL COMPANION FLANGE

(a) Install the companion flange



(b) Install the washer and 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)

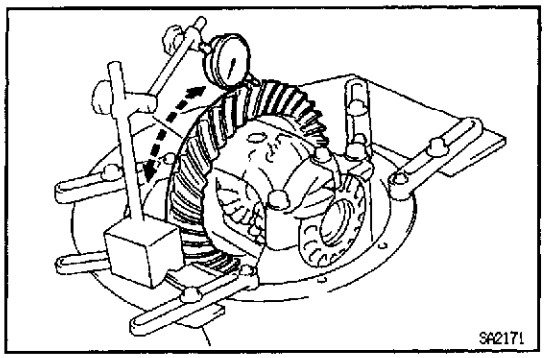


23. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear
Preload (starting):
New bearing
1.3-2.0 N-m (13-20 kgf-cm, 11.3-17.4 in.¿lbf)
Reuse bearing
0.7 -1.0 N-m (7 -10 kgf-cm, 6.1- 8.7 in.-lbf)

(a) If preload is greater than specification, replace the bearing spacer

(b) If preload is less than specification, retighten the nut 13 N-m (130 kgf-cm, 9 ft-lbf) a little at a time 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



24. RECHECK RING GEAR BACKLASH

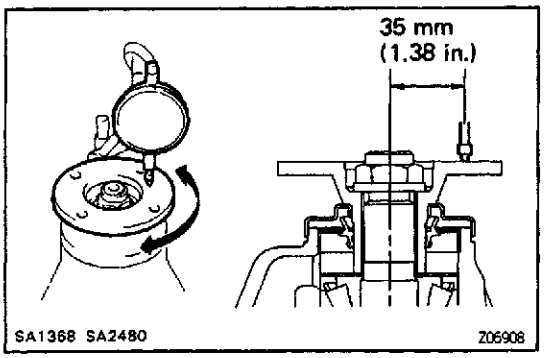
Using a dial indicator, measure the ring gear backlash

Ring gear backlash:

0.15-0.20 mm (0.0059-0.0079 in.)

25. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(See page SA -131)

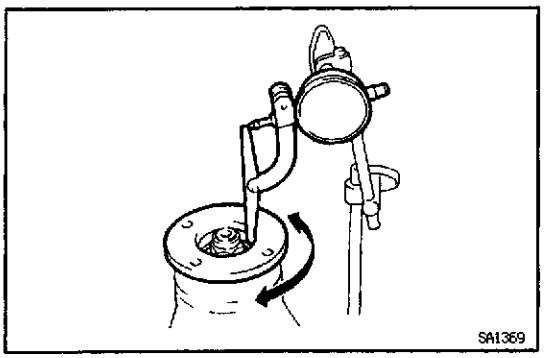


26. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange

Maximum vertical runout:

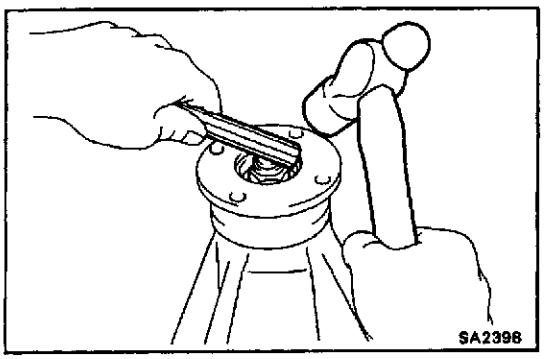
0.10 mm (0.0039 in.)



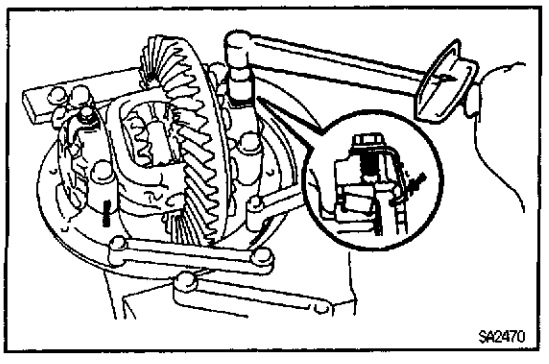
Maximum lateral runout:

0.10 mm (0.0039 in.)

If the runout is greater than maximum, inspect the bearings



27. STAKE DRIVE PINION NUT



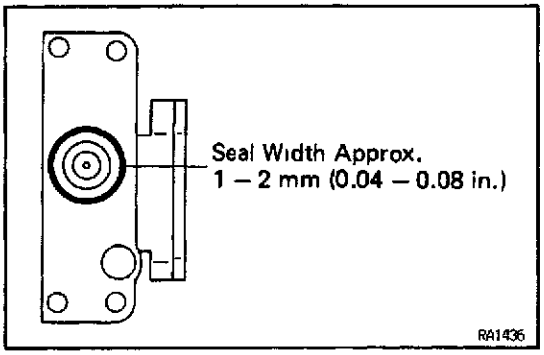
28. (w/o DIFFERENTIAL LOCK)

INSTALL ADJUSTING NUT LOCKS

(a) Install new 2 nut locks on the bearing caps

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

(b) After tightening bolts, bend the nut locks

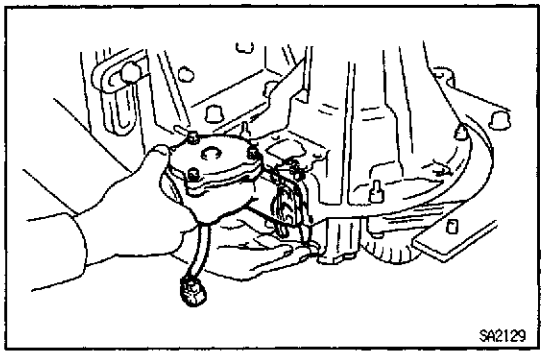


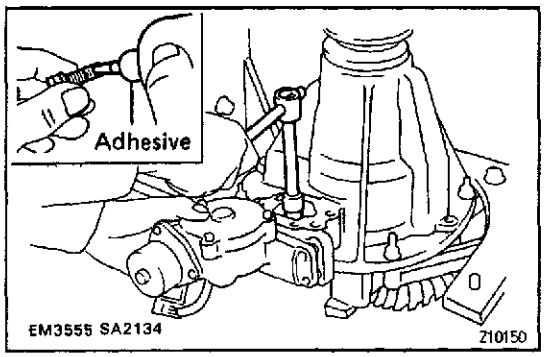
29. (w/ DIFFERENTIAL LOCK)
INSTALL ACTUATOR, SHIFT FORK AND SLEEVE

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol

(b) Apply seal packing to the actuator
Seal packing: Pert No. 08826 - 00090, THREE BOND 1281 or equivalent
HINT Install the actuator within 10 minutes after applying seal packing

(c) Install the actuator to the differential and match the shift fork hole

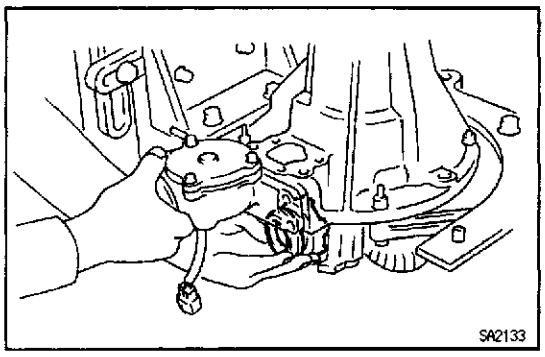




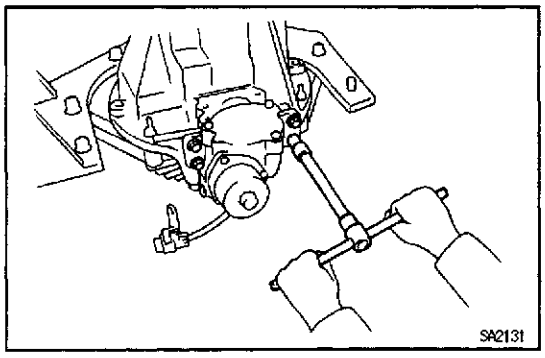
(d) Clean the threads of set bolt and fork shaft with the white gasoline

(e) Coat the threads of the set bolt with adhesive
Adhesive: Part No. 08833- 00070, THREE BOND 1324 or equivalent

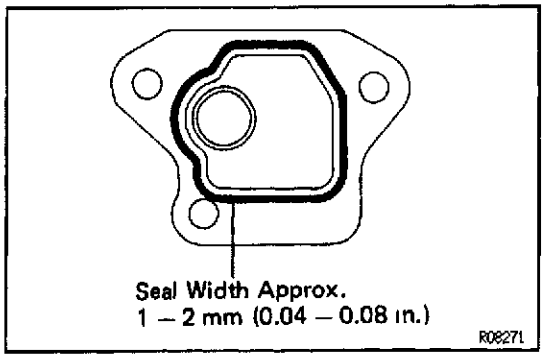
(f) Tighten the shift fork shaft set bolt
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)



(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)



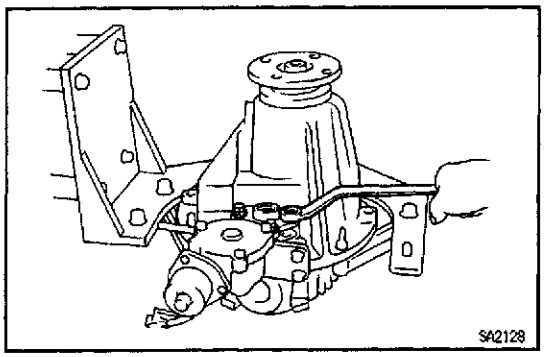
30. (w/ DIFFERENTIAL LOCK)
INSTALL COVER

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol

(b) Apply seal packing to the cover

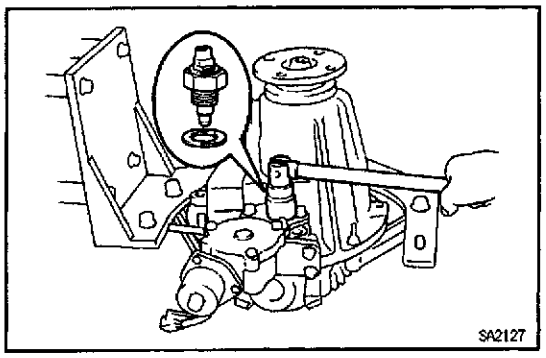
Seal packing: Part No. 08826 - 00090, THREE BOND 1281 or equivalent

HINT Install the cover within 10 minutes after applying seal packing



(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

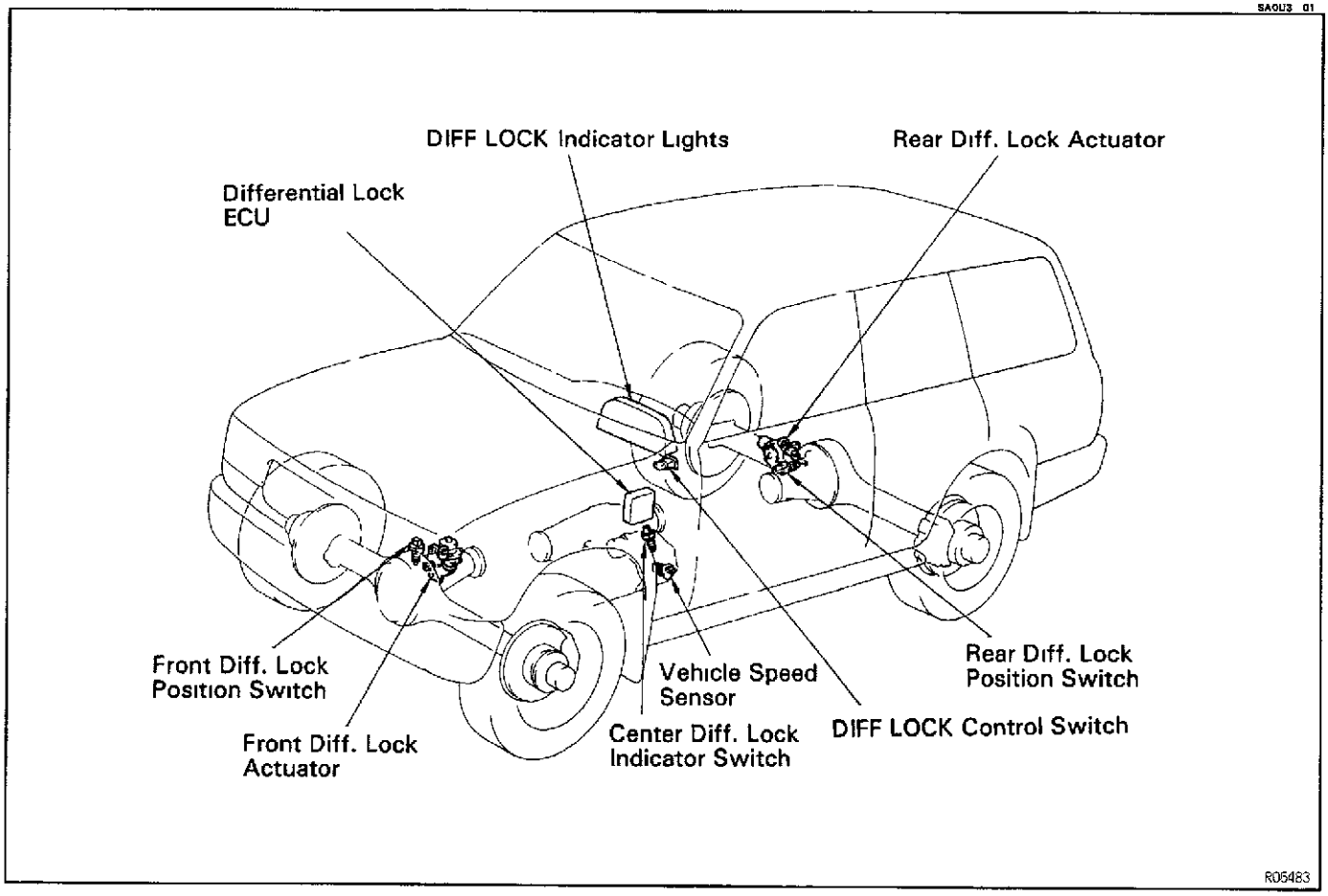
Torque: 40 N•m (410 kgf•cm, 30 ft•lbf)

DIFFERENTIAL LOCKING SYSTEM

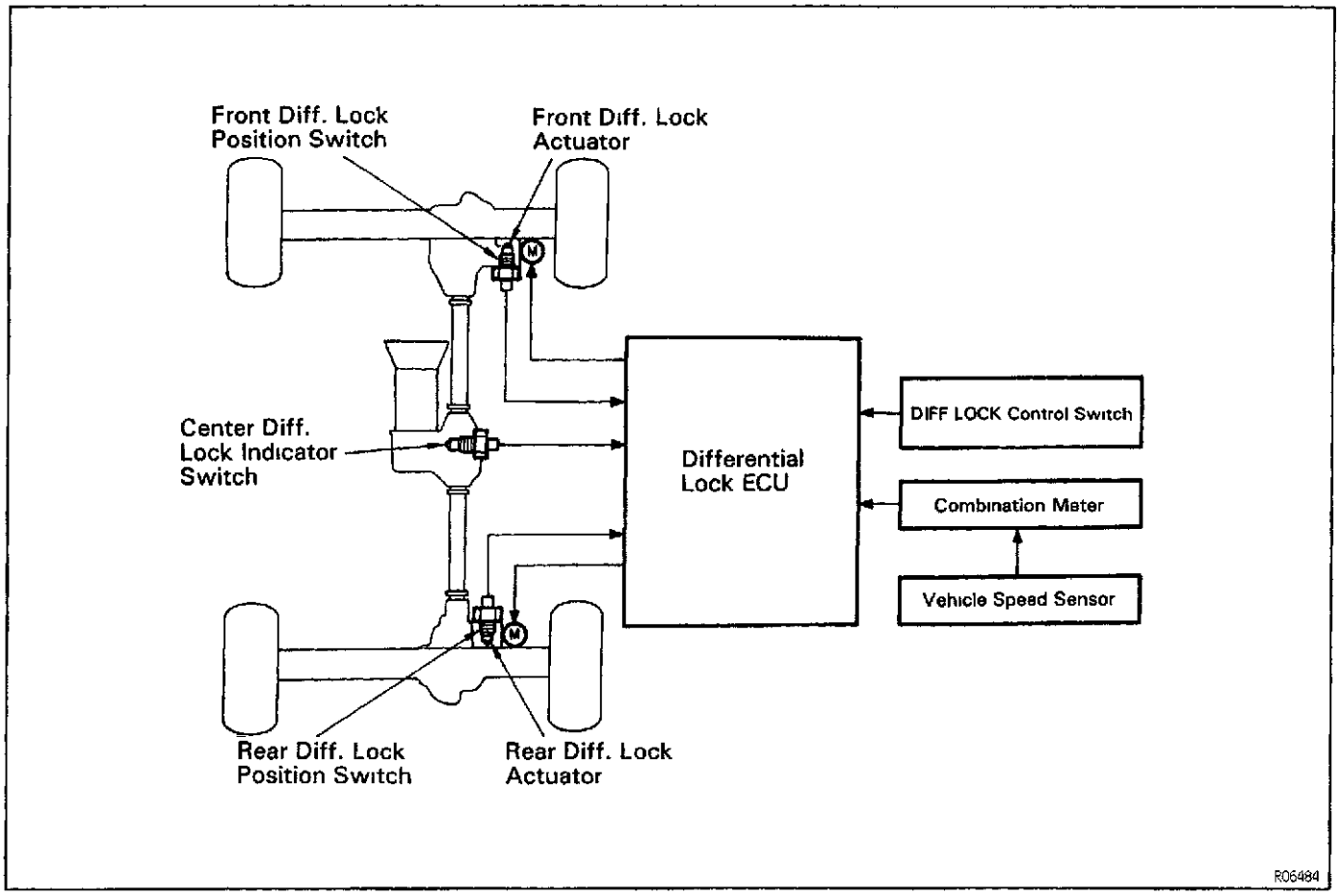
DESCRIPTION

The differential locking system slides the differential lock sleeve which is meshed to the axle shaft, and by meshing with the differetial case, restricts the operation of the differential In the vehicles, an electrical motor is used to slide the differential lock sleeve Driving of the motor is accomplished by the ECU (Electronic Control Unit) in accordance with signals from the differential lock control switch on the instrument panel and from various other switches and sensors This motor is built into the differential lock actuator

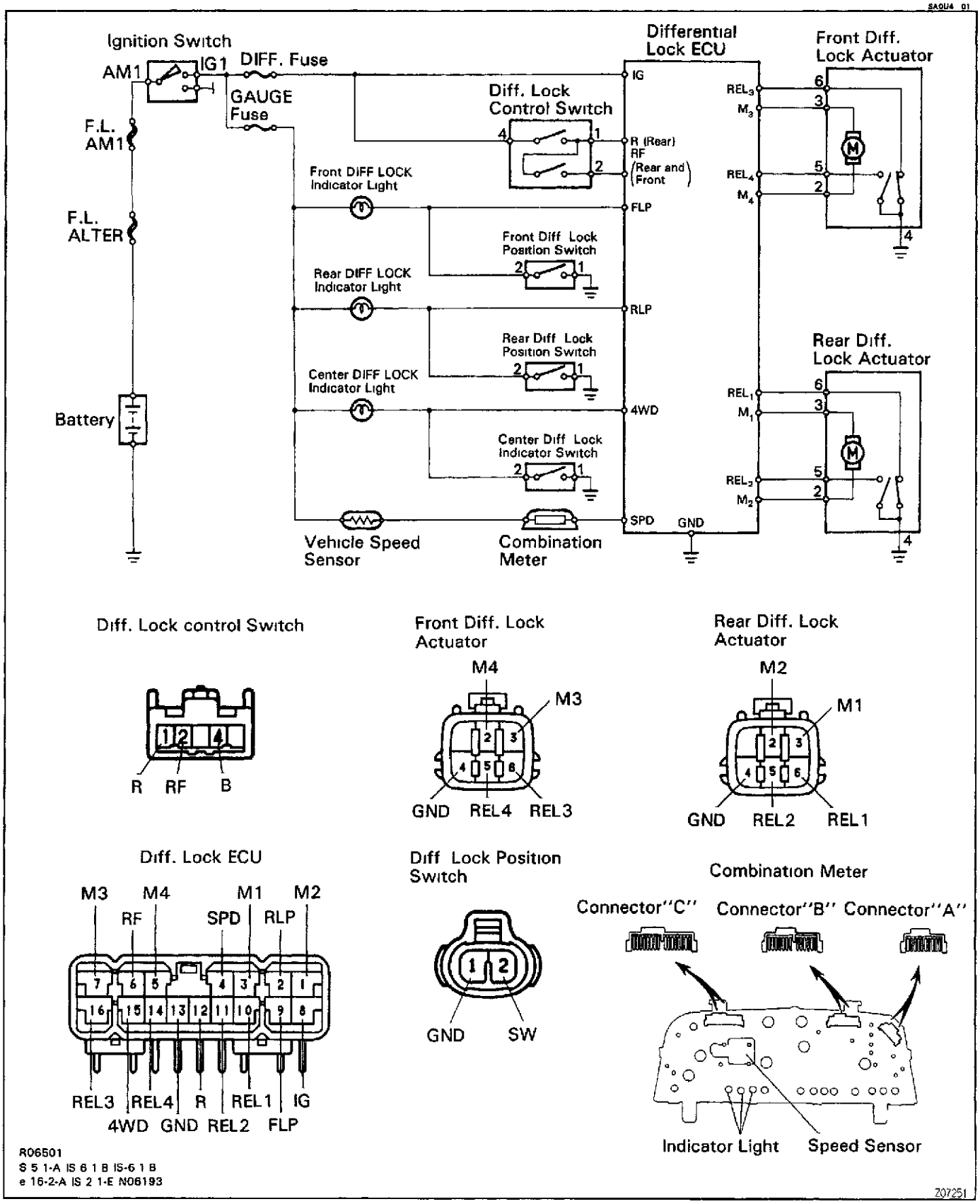
PARTS LOCATION



SYSTEM DIAGRAM



WIRING AND CONNECTOR DIAGRAMS

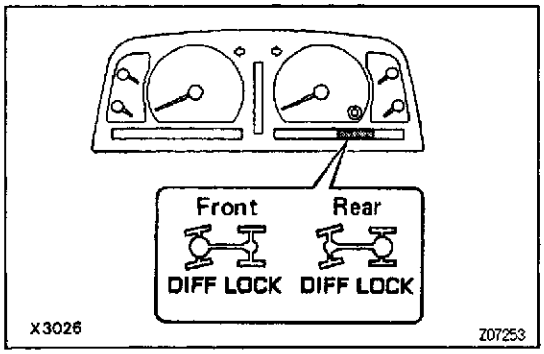


TROUBLESHOOTING

- **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.**

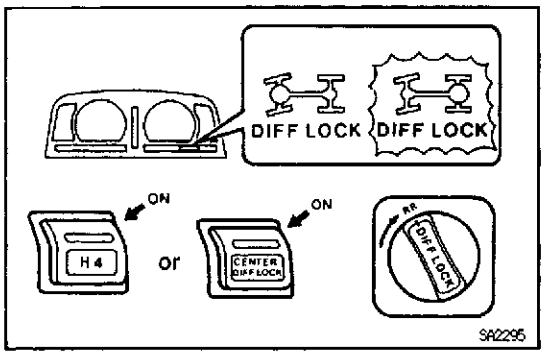
Problem	Possible cause	Remedy	Page
Indicator lights do not light up	Fusible link blown GAUGE fuse blown Bulb burned out Wiring or ground faulty	Replace fusible link Replace fuse and check for short Replace bulb Repair as necessary	
Indicator lights do not light up (Diff lock control switch RR or FR -RR position)	DIFF fuse blown Diff lock switch control switch Diff lock ECU faulty Wiring or ground faulty	Replace fuse and check for short Check switch Check ECU Repair as necessary	 SA-149 SA-142
Differential lock does not operate	Diff lock position switch faulty Diff lock actuator faulty Diff lock ECU faulty Differential carrier (Diff lock) faulty Wiring or ground faulty	Check switch Check actuator Check ECU Repair as necessary Repair as necessary	SA-149 SA-144 SA-142 SA-38 110
After differential lock lock not released when vehicle speed is higher than approx 8 km/h (5 mph)	Speed sensor faulty Diff lock ECU faulty Wiring or ground faulty	Check sensor Check ECU Repair as necessary	BE-48 SA-142

SYSTEM INSPECTION



1. INSPECT 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



2. INSPECT DIFFERENTIAL LOCK OPERATION

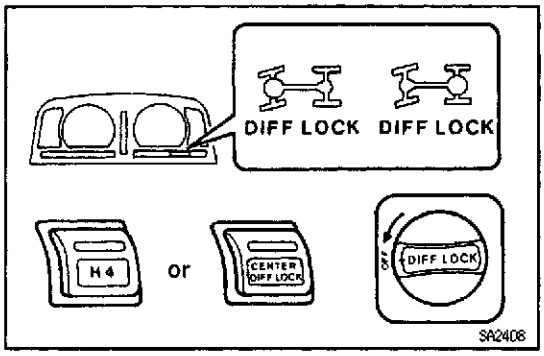
HINT Put the shift lever on neutral

(a) Jack up the vehicle then start the engine

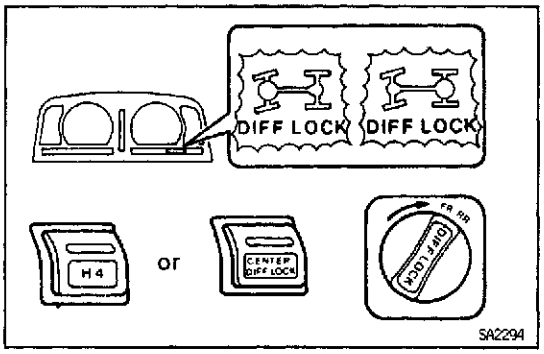
(b) Put on the center differential lock switch

(c) When the Diff lock control switch is set to RR position, the indicator light (rear side) is turned on
Differential lock is applied to the rear wheel at this time

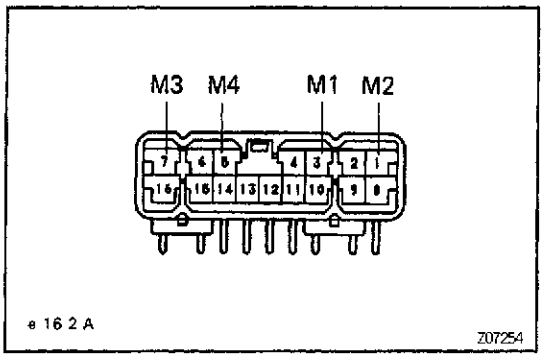
HINT If the gears of the differential lock system are not meshed, the indicator light remains blinking, so rotate the tires to meshed the gear



(d) When the Diff lock control switch is at OFF position, the indicator light goes off
Differential lock is released for the rear wheel at this time



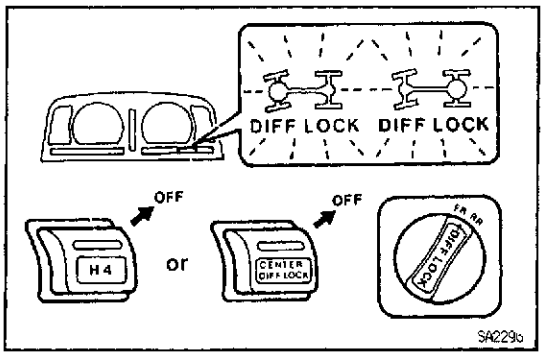
(e) When the Diff lock control switch is set to FR/RR position, the indicator lights (front side and rear side) are turned on
Differential lock is applied to both the front wheels and rear wheels at this time



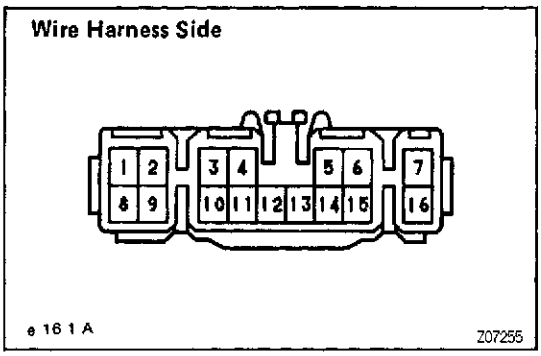
(f) Check the voltage the terminals of the Diff lock ECU when switching the Diff lock control switch with the speedometer, registering approx 8 km/h (5 mph) or more

Diff lock control switch	Terminal	Specified value
OFF - RR	3 (MI) - 1 (M2)	0 5 V or less (on change)
RR -) FR-RR	7 (M3) - 5 (M4)	0 5 V or less (on change)

V03070



(g) 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
(h) Return the Diff lock control switch to OFF
(i) Stop the engine and jack down the vehicle



DIFFERENTIAL LOCKING SYSTEM CIRCUIT

1. INSPECT 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	Tester Connection	Check item	Condition		Specified Value
Rear Diff Lock Actuator	1 - 3 (M2) (M1)	Resistance	–		Less than 100 Ω
Front Diff Lock Actuator	5 - 7 (M4) (M3)				Less than 100Ω
Body Ground	13 -Body (GND) ground	Continuity			Continuity
Speed Sensor	4 - Body (SPD) ground		Vehicle moving slowly		1 pulse each 40 cm (15 75 in)
DIFF Fuse	8 - Body (IG) ground	Voltage	Ignition switch ON		Battery voltage
Rear Diff Lock Position Switch	2 - Body (RLP) ground		Ignition switch ON	Indicator light (Rear) ON	About O V
				Indicator light (Rear) OFF	Battery voltage
Front Diff Lock Position Switch	9 - Body (FLP) ground			Indicator light (Front) ON	About 0 V
				Indicator light (Front) OFF	Battery voltage
Center Diff Indicator Switch	15 - Body (4WD) ground			Indicator light (Center diff lock) ON	About 0 V
				Indicator light (Center diff lock) OFF	Battery voltage
Differential Lock Control Switch	12 - Body (R) ground			Diff lock control switch RR or FR-RR	Battery voltage
				Diff lock control switch OFF	About 0 V
	6 - Body (RF) ground			Diff lock control switch FR-RR	Battery voltage
				Diff lock control switch OFF or RR	About 0 V

V03067

HINT: When a signal enters the ECU to LOCK the front differential and set the rear differential to FREE (when battery 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

2. INSPECT BATTERY VOLTAGE

Battery voltage:

10-14.5 V

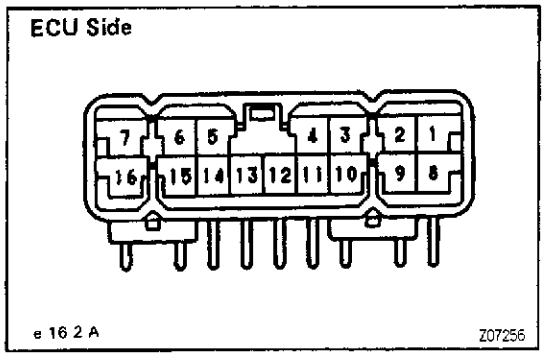
3. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

(a) Turn the ignition switch to ON position

(b) Keep the center Diff lock condition

(c) Remove the Diff lock ECU

(d) Using voltmeter, measure the voltage when the differential lock control switch is in the position as shown below

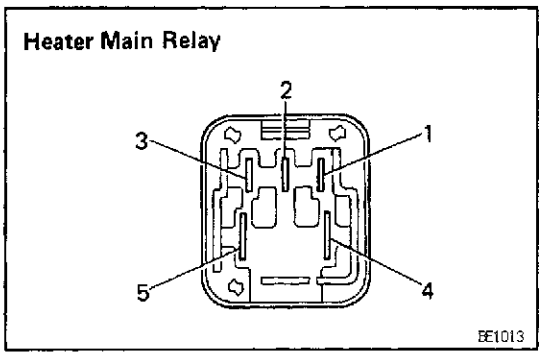


Tester connection ⊕ − ⊖	Switch position	Specified valve
15 (4WD - 13 (GND)	—	0 5 V or less
9 (FLP) - 13 (GND)	FR-RR	
2 (RLP)- 13 (GND)	RR or FR-RR	
3 (M1) - 1 (M2)	OFF - R R	0 5 V or less ↓ 10 - 14 5 V (Approx 1 sec) ↓ 0 5 V or less
1 (M2) - 3 (MI)	R R - OFF	
7 (M3) - 5 (M4)	OFF or RR - FR-RR	
5 (M4) - 7 (M3)	FR -RR - RR or OFF	

W03068

If the circuit is not as specified, replace the ECU

(e) Install the ECU in place

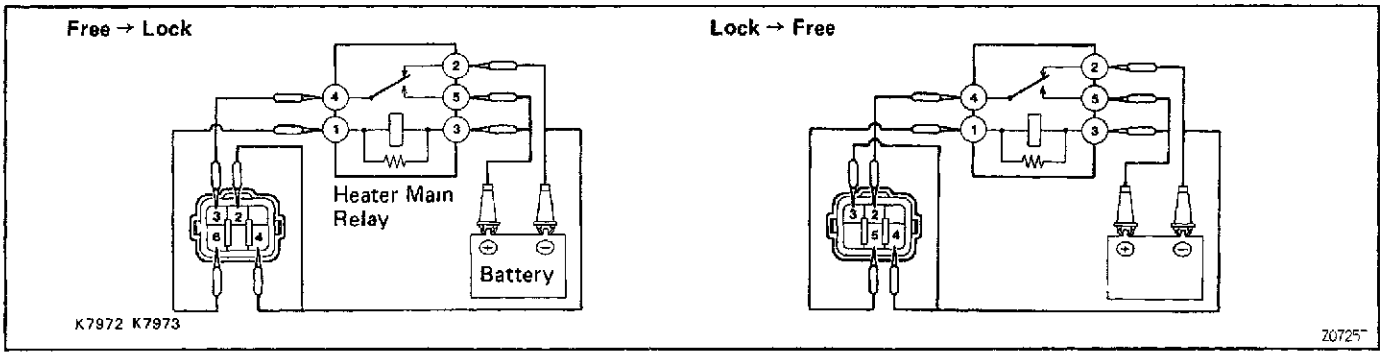


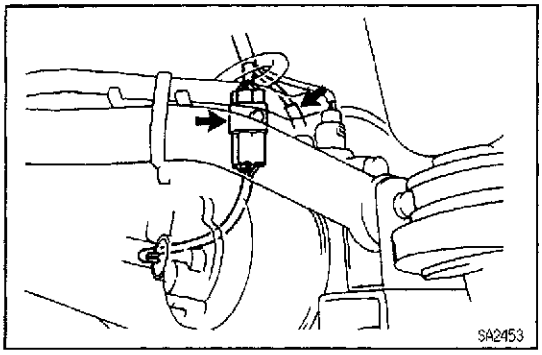
DIFFERENTIAL LOCK ACTUATOR

INSPECT RELAY OPERATION

SA0UB-01

(a) Jack up the vehicle
(b) Use the heater main relay and connect it as shown below
(c) Rotate the tire and check that differential lock has occurred
If operation is not as specified, replace the actuator





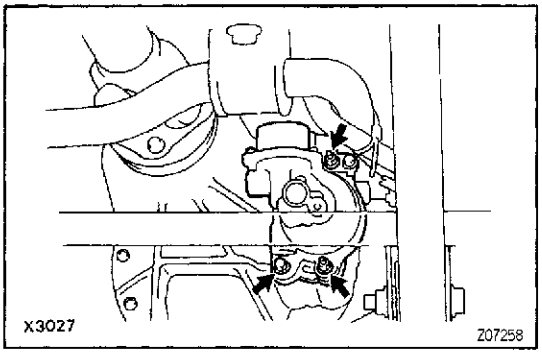
FRONT DIFF. LOCK ACTUATOR REMOVAL AND INSTILLATION

1. SHIFTING FRONT DIFFERENTIAL LOCK

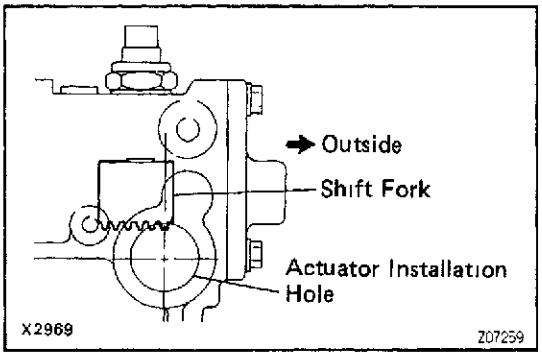
(SEE PAGE SA-140)

2. REMOVE ACTUATOR

(a) Disconnect the connector and tube

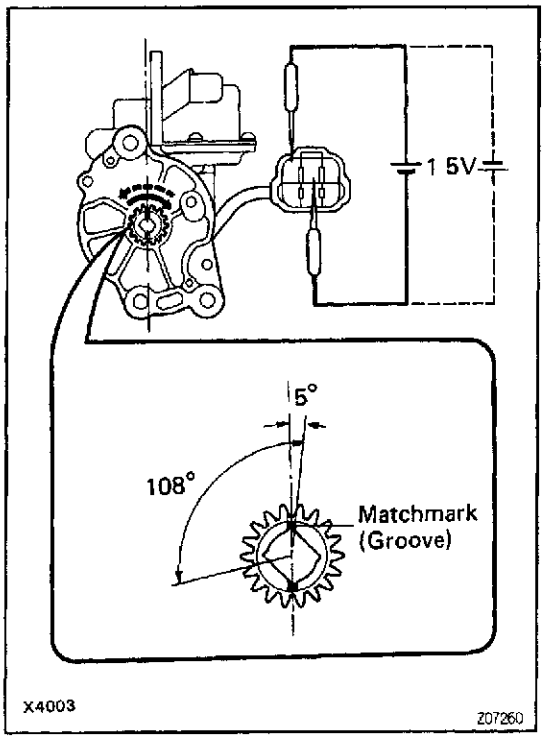


(b) Remove the 2 nuts, bolt and actuator
(c) Remove the O-ring from the actuator

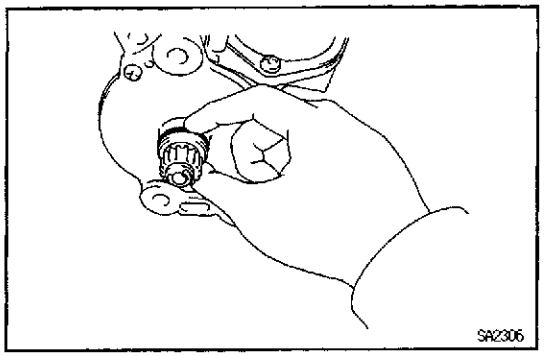


3. INSTALL ACTUATOR

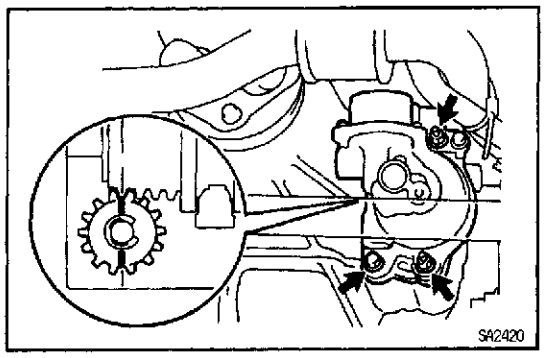
(a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole



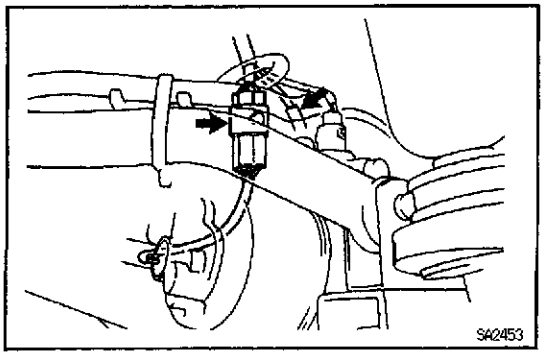
(b) Using a dry cell battery, align the matchmark on the actuator pinion with the center line of the actuator
NOTICE:
- If the pinion of the actuator is not in the specified place, the actuator is difficult to be installed
- Don't supply the battery voltage between terminals
- If the matchmark comes to the extension limit of the rotation, don't electrify moreover



(c) Install a new 0-ring to the actuator
(d) Apply a light coat of gear oil on the 0- ring
(e) Apply MP grease to the gear part of the actuator

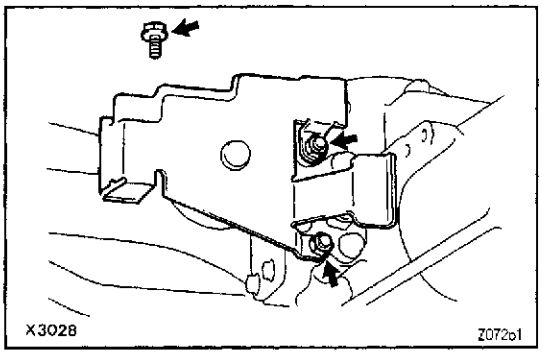


(f) Install the actuator- to the differential with the 2 nuts and bolt, so that the outermost rack tooth of the shift fork shall fit rnatchmark of the pinion of the actuator-
HINT Don't damage the O-ring of the actuator
Torque: 26 N-m (270 kgf-cm, 20 ft-lbf)



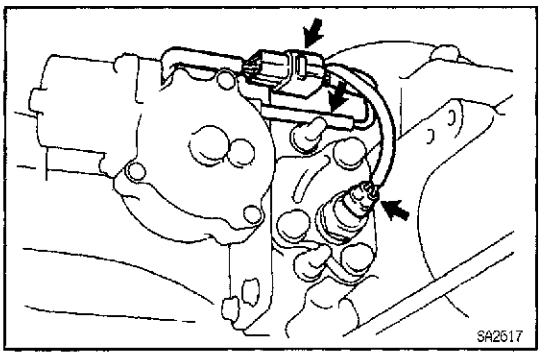
(g) Connect the connector and tube
HINT
- The depth of the insertion of the bleeder tube into the hose is approx 15 mm (0 59 in)
- Take care that water or the equivalent shall not adhere to the connector and hose

4. CANCEL FRONT DIFFERENTIAL LOCK
With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock

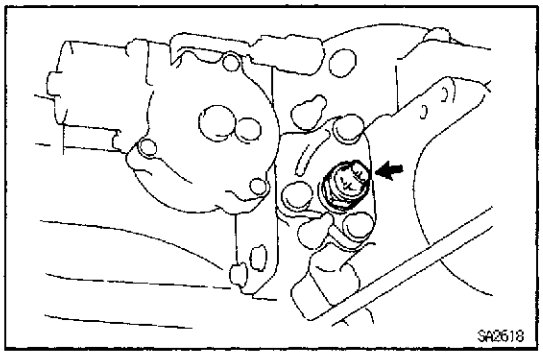


REAR DIFF. LOCK ACTUATOR REMOVAL AND INSTALLATION

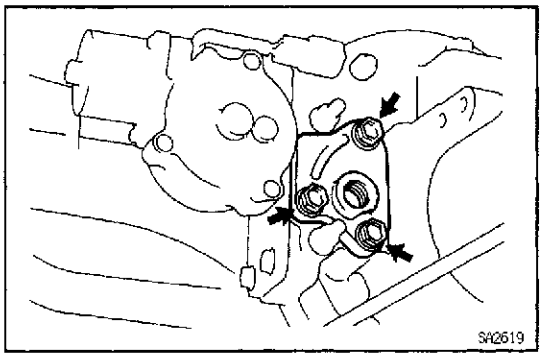
1. SHIFTING GEAR DIFFERENTIAL LOCK
(SEE PAGE SA-140)
2. REMOVE ACTUATOR PROTECTOR
Remove the 2 nuts, bolt and protector



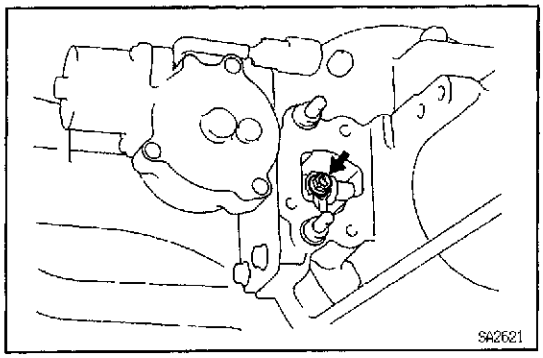
3. DISCONNECT CONNECTORS AND TUBE



4. REMOVE REAR DIFF. LOCK POSITION SWITCH

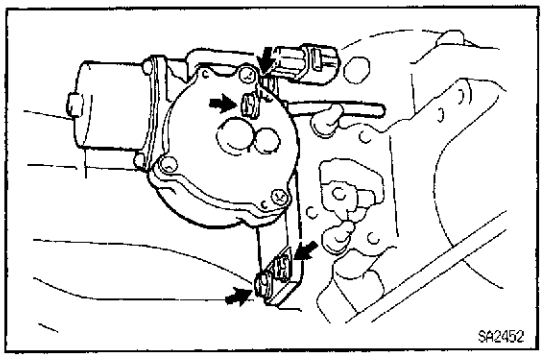


5. REMOVE COVER
(a) Remove the 3 bolts
(b) Using a brass bar and hammer, remove the cover



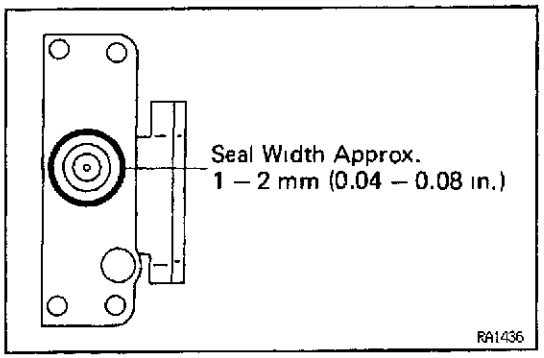
6. REMOVE ACTUATOR

(a) Remove the shift from set bolt



(b) Remove the 4 bolts

(c) Using a screwdriver, pry out the actuator



7. INSTALL ACTUATOR

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol

(b) Apply seal packing to the actuator

Seal packing:

Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT Install the actuator within 10 minutes after applying seal packing

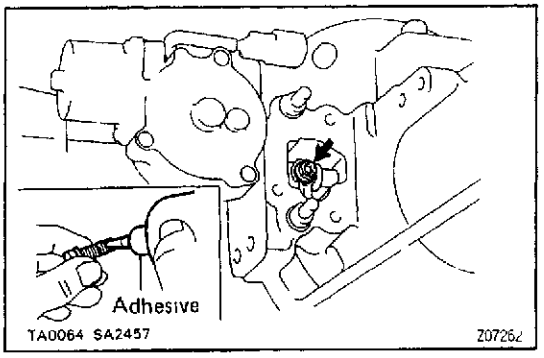
(c) Install the actuator to the differential and match the shaft with the shaft fork hole

(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

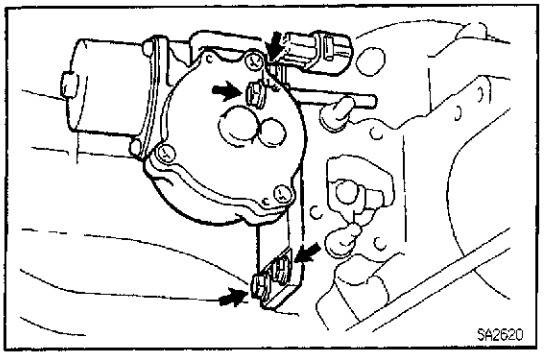


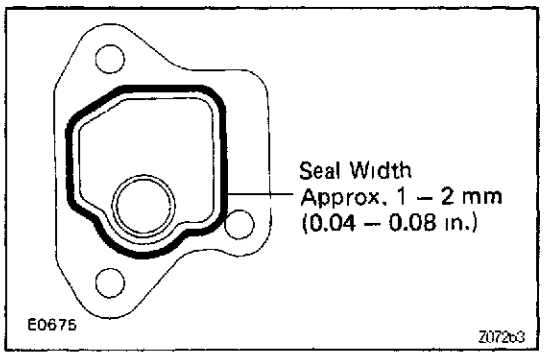
(f) Tighten the shift fork set bolt

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)





8. INSTALL COVER

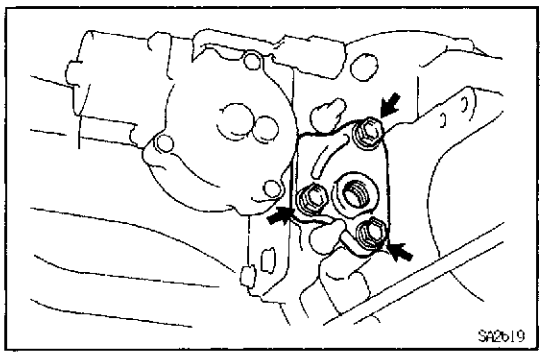
(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol

(b) Apply seal packing to the cover

Seal packing:

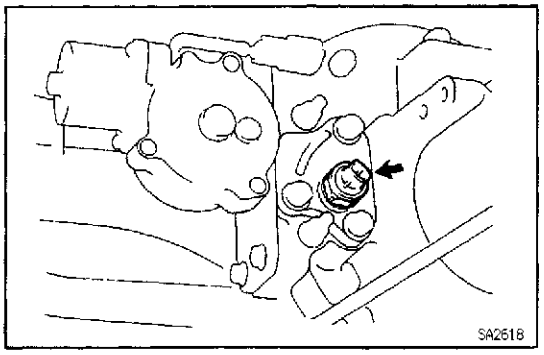
Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT Install the cover 10 minutes after applying seal packing



(c) Tighten the 3 bolts

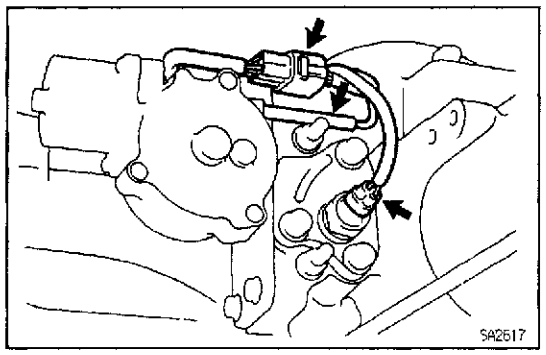
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



9. INSTALL REAR DIFF. LOCK POSITION SWITCH

Install the position switch with a new gasket

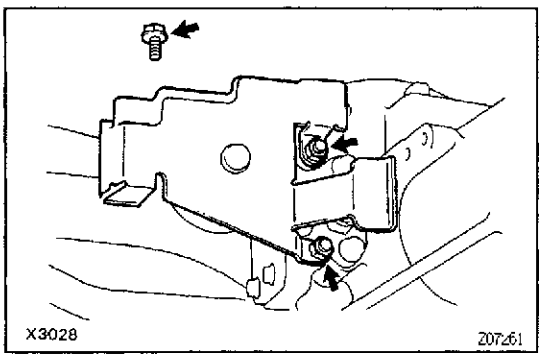
Torque: 40 N-m (410 kgf-cm, 30 ft-lbf)



10. CONNECT 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 the water or the equivalent shall not adhere to the connectors and hose



11. INSTALL ACTUATOR PROTECTOR

Install the protector with the 2 nuts and bolt

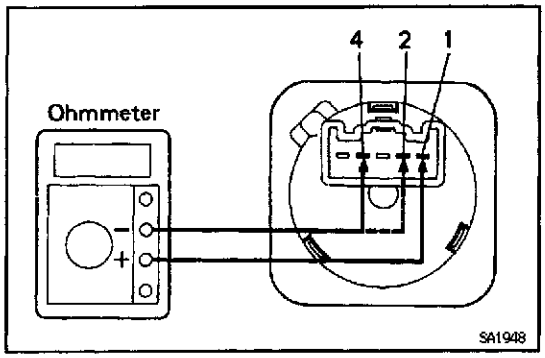
Torque:

Nut 35 N-m (360 kgf-cm, 26 ft-lbf)

Bolt 20 N-m (200 kgf-cm, 14 ft-lbf)

12. CANCEL REAR DIFFERENTIAL LOCK

With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock



DIFFERENTIAL LOCK CONTROL SWITCH

SA0UB-01

DIFF. LOCK CONTROL SWITCH INSPECTION

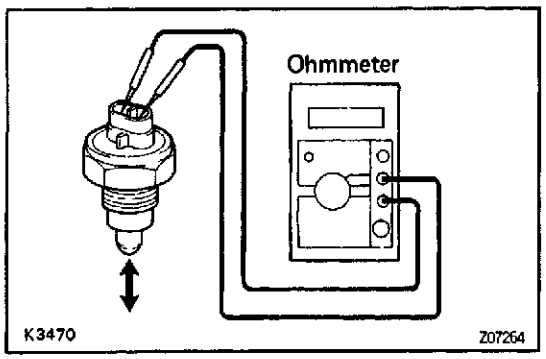
INSPECT SWITCH CONTINUITY

Inspect switch continuity between terminals as shown

Terminal / Switch position	1 (B)	2 (RF)	4 (R)
OFF			
RR	○		○
FR·RR	○	○	○

V03069

If continuity is not as specified, replace the switch



DIFFERENTIAL LOCK POSITION SWITCH

SA0UC-01

DIFF. LOCK POSITION SWITCH INSPECTION

1. INSPECT DIFF. LOCK POSITION SWITCH (FRONT AND REAR)

(a) Check that there is continuity between terminals when the switch is pushed (differential connected position)

(b) Check that there is no continuity when the switch is free (differential disconnected position)

If operation is not as specified, replace the switch

2. INSPECT CENTER DIFF. INDICATOR SWITCH

(See page TR-16 **)**

COMBINATION METER

SPEED SENSOR AND INDICATOR LIGHT INSPECTION

1. INSPECT SPEED SENSOR

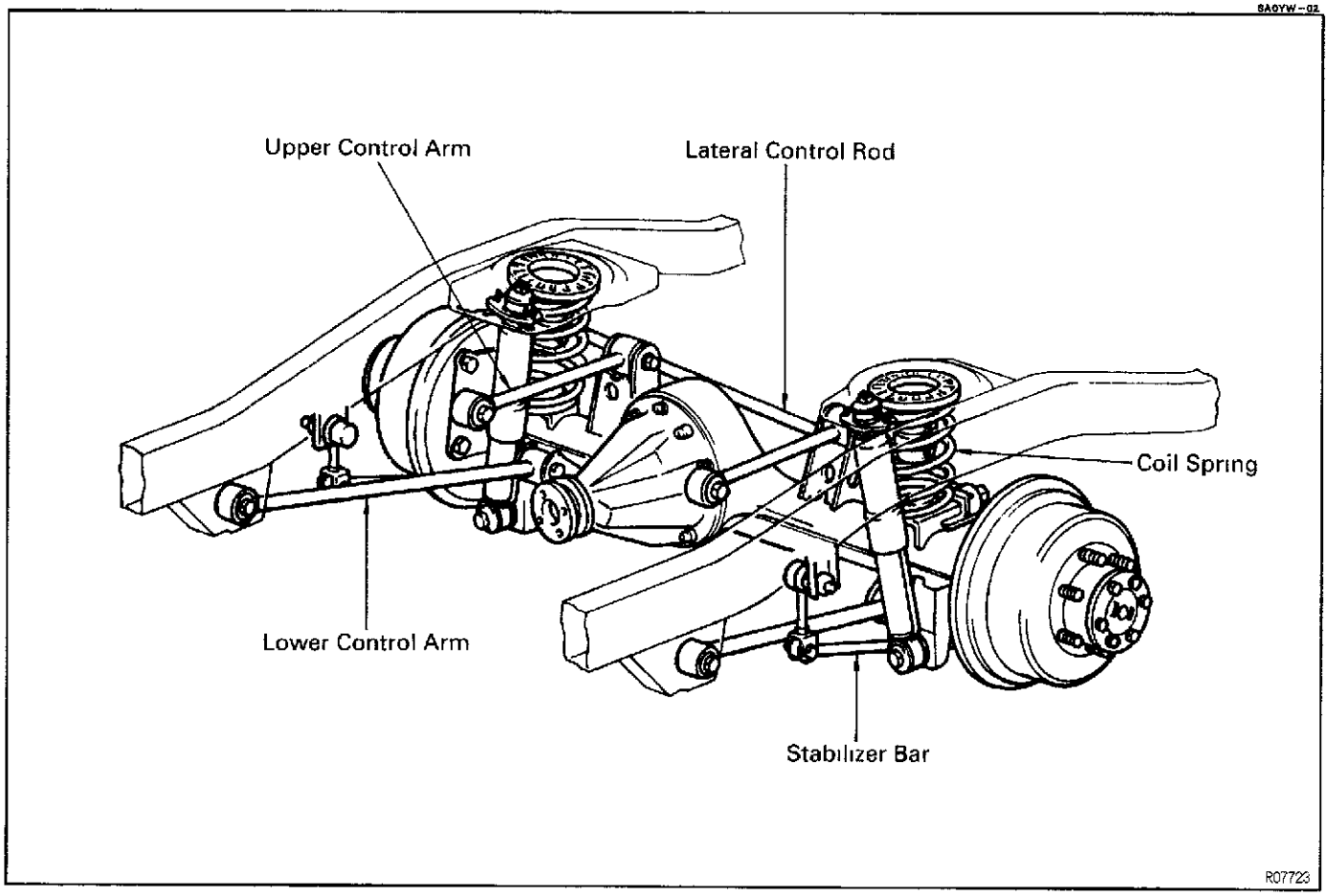
(SEE PAGE BE-48)

2. INSPECT INDICATOR LIGHT

REAR SUSPENSION

DESCRIPTION

SA0YW-02



PREPARATION

EQUIPMENT

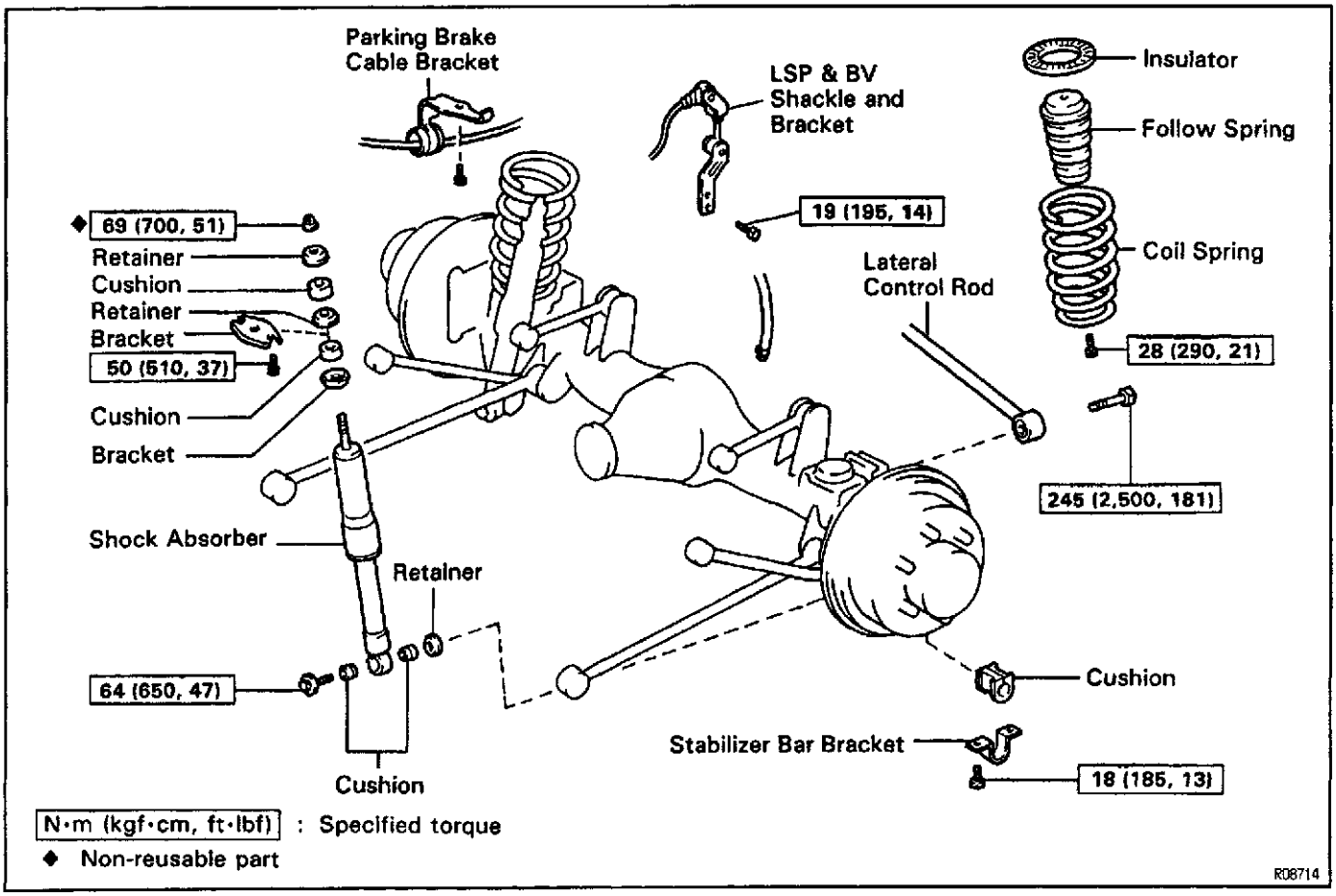
SA0YX-01

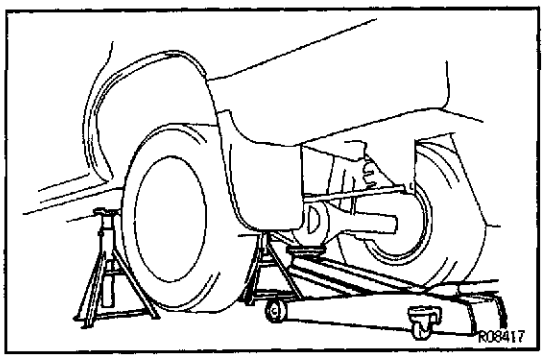
Torque wrench	

COIL SPRING AND SHOCK ABSORBER

COMPONENTS

8A0YY-01





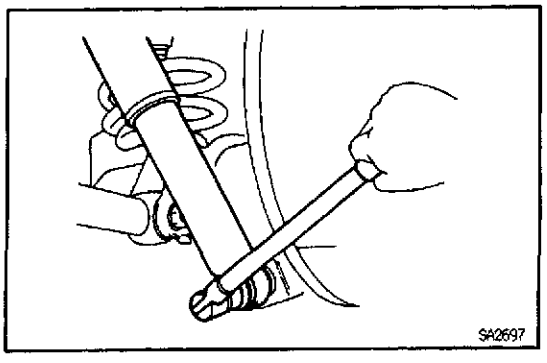
REAR CHOCK ABSORBER AND COIL SPRING REMOVAL

8A0YZ-02

1. JACK UP AND SUPPORT VEHICLE

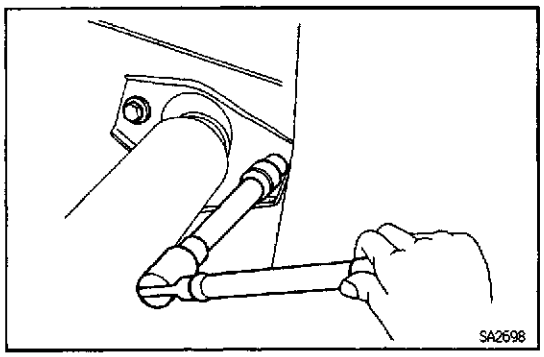
Jack up the rear axle housing and support the frame with stands Hold the rear axle housing with a jack

2. REMOVE REAR WHEEL

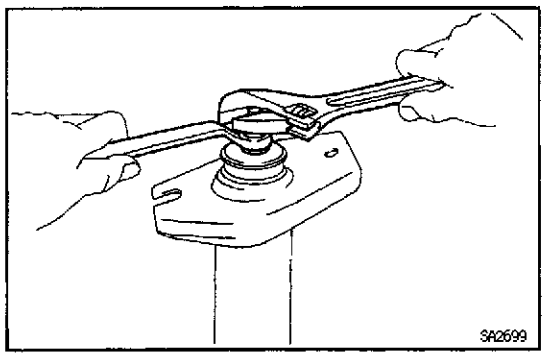


3. REMOVE REAR SHOCK ABSORBER

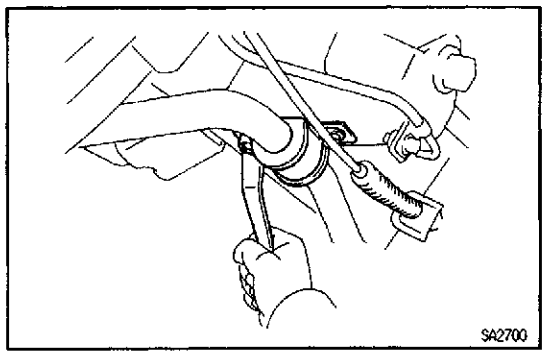
(a) Remove the bolt holding the shock absorber from the rear axle housing and disconnect the shock absorber



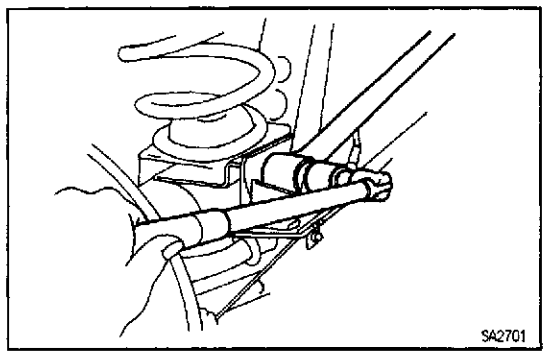
(b) Remove the 2 upper bolts and shock absorber



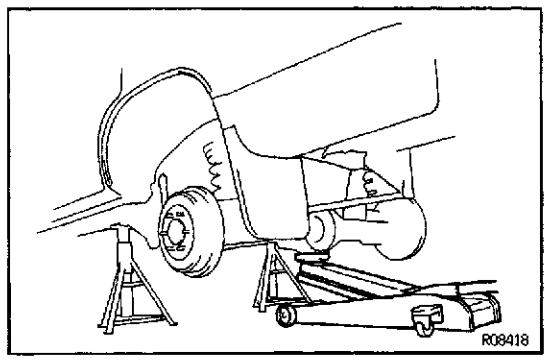
(c) Remove the following parts
- Nuts
- Retainers
- Bracket



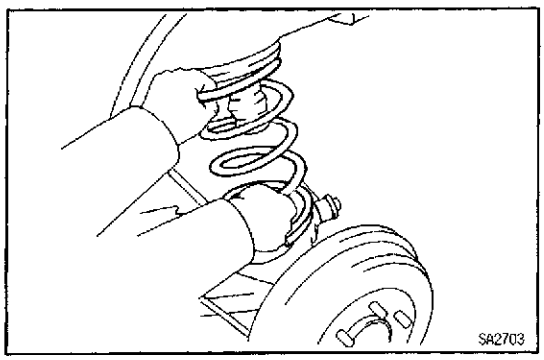
4. DISCONNECT STABILIZER BAR BRACKETS
Remove the 2 bolts holding the stabilizer bar bracket from the rear axle housing



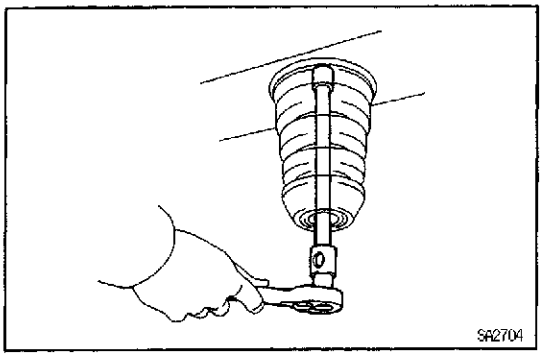
5. DISCONNECT LATERAL CONTROL ROD
Remove the bolt and disconnect lateral control rod from the axle housing



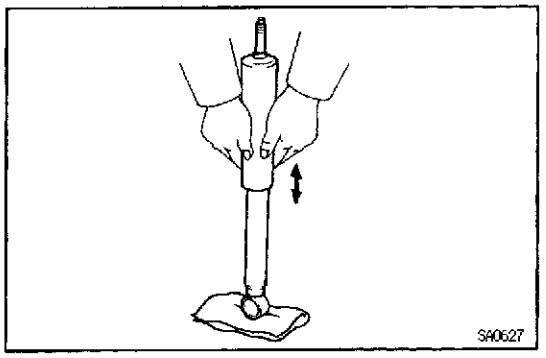
6. REMOVE COIL SPRING
(a) Begin to lower the axle housing
HINT Be careful not to snap the brake line and parking brake cable

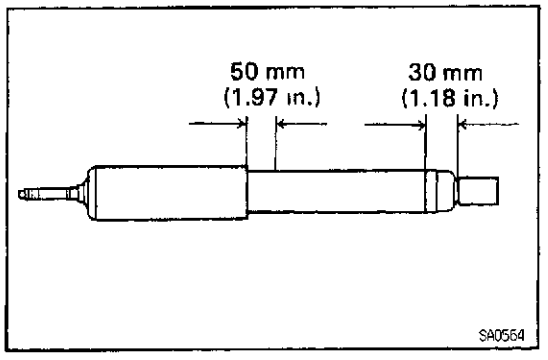


(b) While lowering the rear axle housing, remove the coil spring and upper insulator



(c) Remove the bolt and the follow spring from the frame





REAR SHOCK ABSORBER INSPECTION SA0ZG-02

1. 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

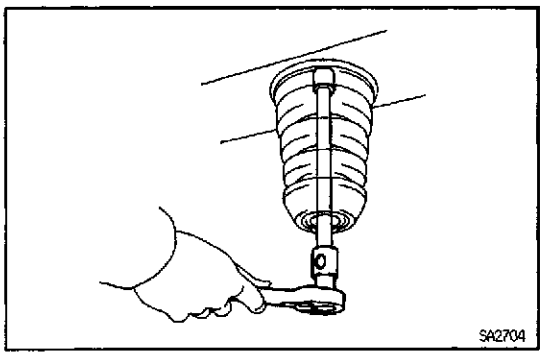
NOTICE: When discarding the shock absorber, use the following procedure.

2. 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 color less, odorless, and non-poisonous.**



REAR SHOCK ABSORBER AND COIL SPRING INSTALLATION

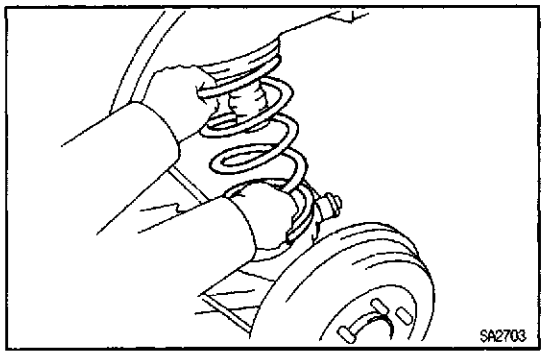
SA021-08

(See page SA-151 **)**

1. INSTALL FOLLOW SPRING

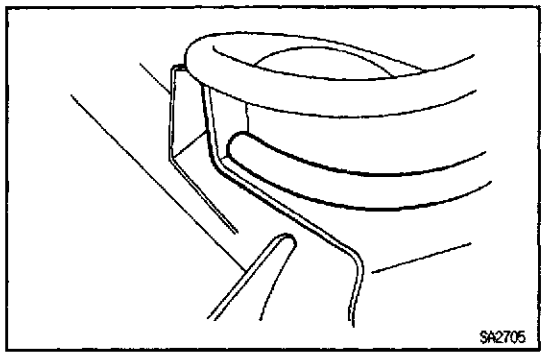
Install the follow spring to the frame with the bolt

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



2. INSTALL COIL SPRING

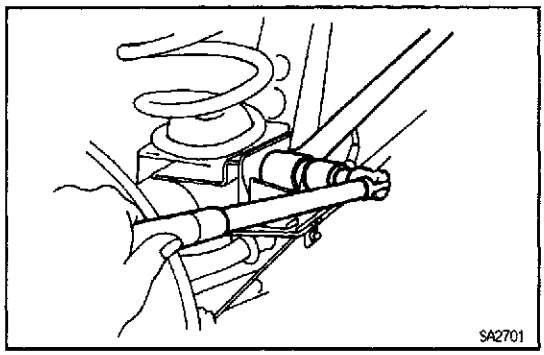
3. JACK UP REAR AXLE HOUSING



4. CHECK POSITION OF COIL SPRING END

Check that the coil spring end is installed correctly

If the coil spring end is not correct position, reinstall the coil spring

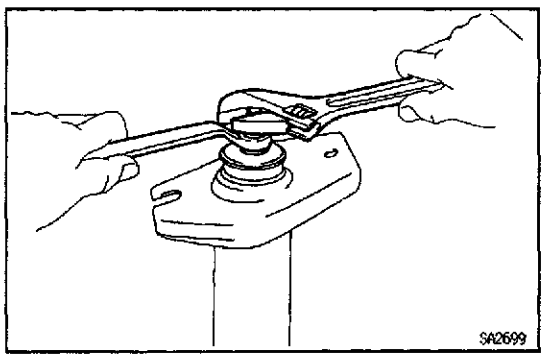


5. TEMPORARILY CONNECT LATERAL CONTROL ROD

Connect the lateral control rod, and temporary install the bolt

HINT

- Install the bolt from the front of the vehicle (shock absorber side)
- Do not tighten the bolt

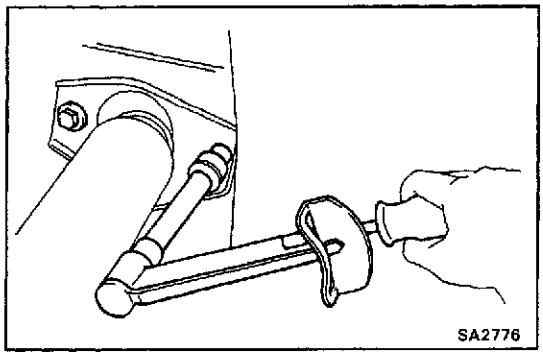


6. INSTALL SHOCK ABSORBER

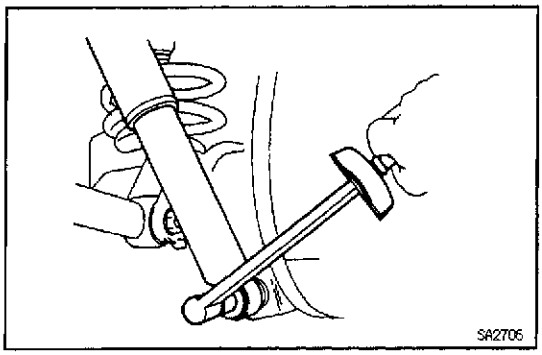
(a) Install the retainers, cushions and bracket to the shock absorber

(b) Hold the piston rod and torque the nut

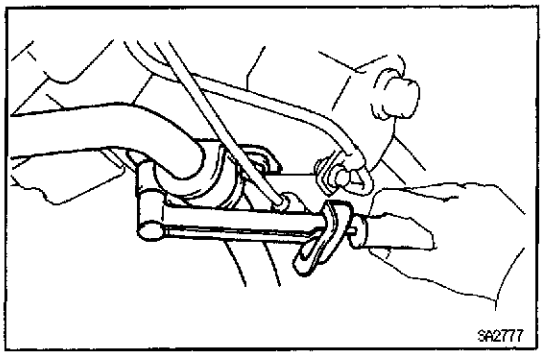
Torque: 69 N-m (700 kgf-cm, 51 ft-lbf)



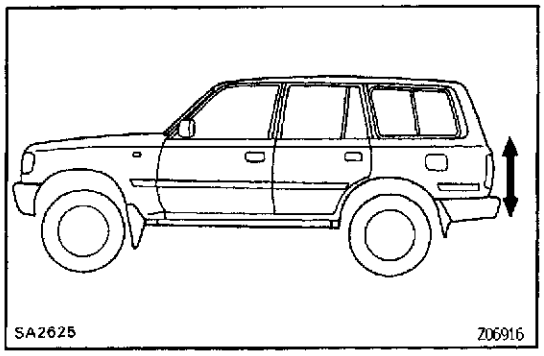
(c) Install the shock absorber with bracket to the frame with the 2 bolts
Torque: 50 N-m (510 kgf-cm. 37 ft-lbf)



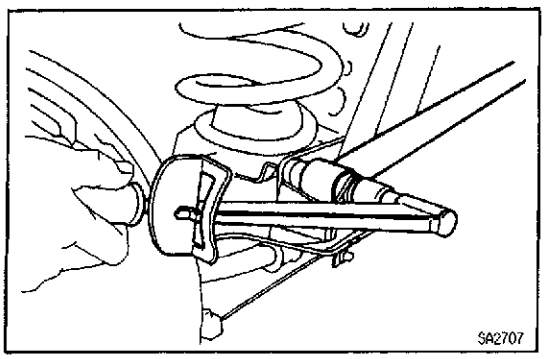
(d) Connect the shock absorber with cushions and retainer to the axle housing with 2 bolts
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)



7. CONNECT STABILIZER BAR
Connect the stabilizer bar with bracket to the axle housing with 2 bolts
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



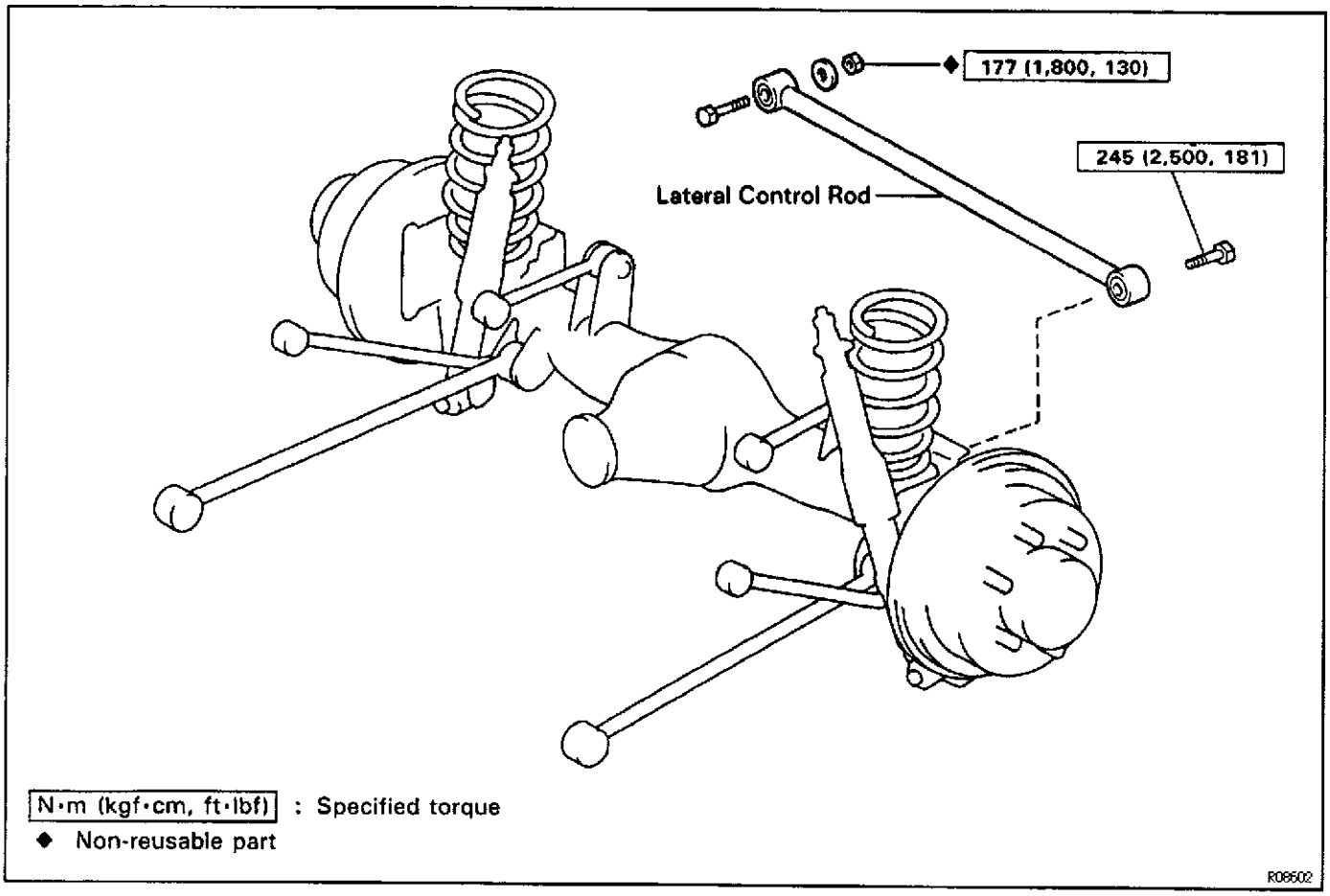
8. INSTALL REAR WHEEL AND LOWER VEHICLE
Torque: 147 N-m (1,500 kgf-cm, 108 ft-lbf)
9. STABILIZE SUSPENSION
Bounce the vehicle up and down to stabilize the suspension

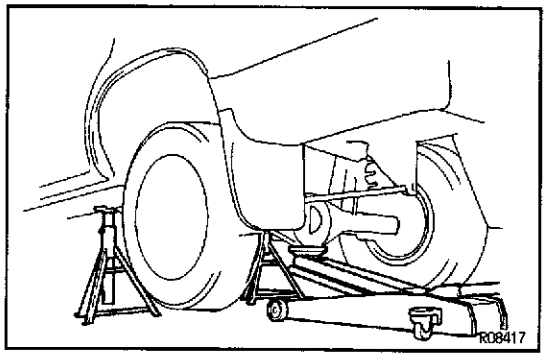


10. TIGHTEN LATERAL CONTROL ROD BOLT
(a) Jack up the rear axle housing and support it with stands
(b) Torque the lateral control rod bolt
Torque: 245 N-m (2,500 kgf-cm, 180 ft-lbf)
(c) Lower the vehicle

LATERAL CONTROL ROD

COMPONENTS

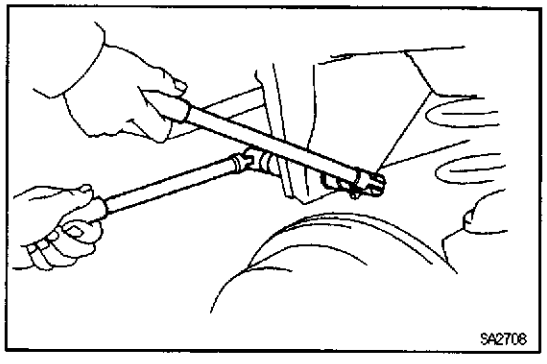




LATERAL CONTROL LOD REMOVAL

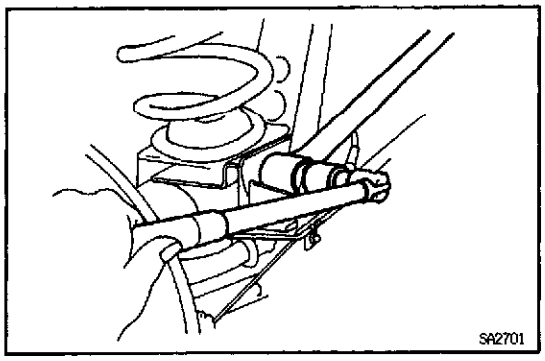
1. JACK UP AND SUPPORT VEHICLE

Jack up the rear axle housing and support the frame with stands Hold the rear axle housing with a jack

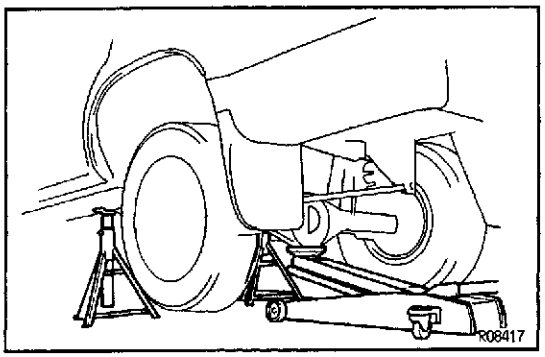


2. REMOVE LATERAL CONTROL ROD

(a) Remove the bolt, nuts and disconnect the lateral control rod



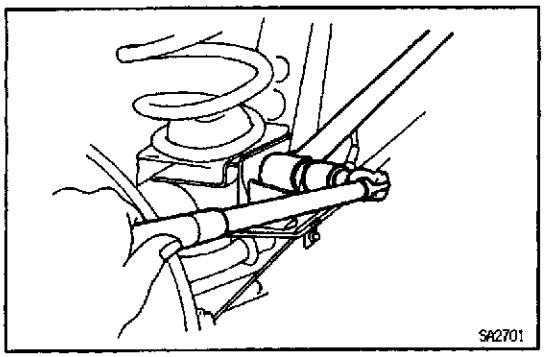
(b) Remove the bolt and lateral control rod from the axle housing



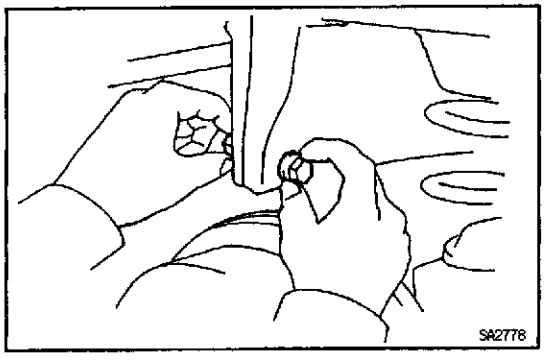
LATERAL CONTROL ROD INSTALLATION

1. INSTALL LATERAL CONTROL ROD

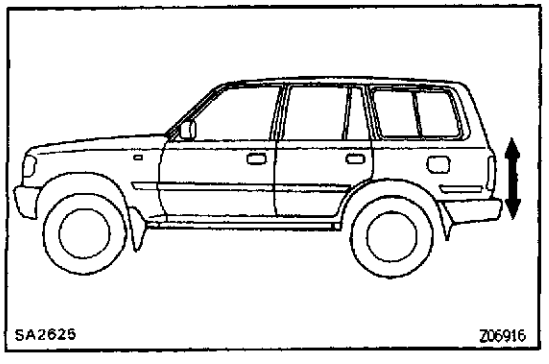
(a) Raise the axle housing until the frame is free from the stands



(b) In this order, temporarily install the bushing, lateral control rod, bushing, plate washer, and nut on the rear axle housing
HINT Do not tighten the nut



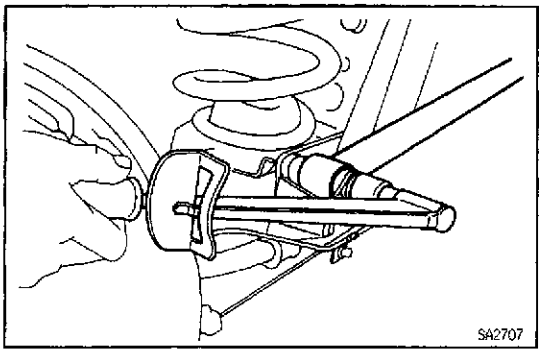
(c) Temporarily install the lateral control rod to the frame with the bolt, plate washer and nut
HINT
- Install the bolt from the front of the vehicle (shock absorber side)
- Do not tighten the nut



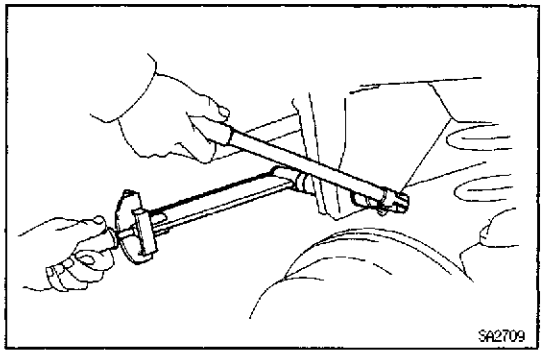
2. STABILIZE SUSPENSION

(a) Install the rear wheel and lower the vehicle
Torque: 147 N-m (1,500 kgf-cm, 108 ft-lbf)

(b) Bounce the vehicle up and down to stabilize the suspension



3. TORQUE BOLT HOLDING LATERAL CONTROL ROD TO REAR AXLE HOUSING
Torque: 245 N-m (2,500 kgf-cm, 181 ft-lbf)

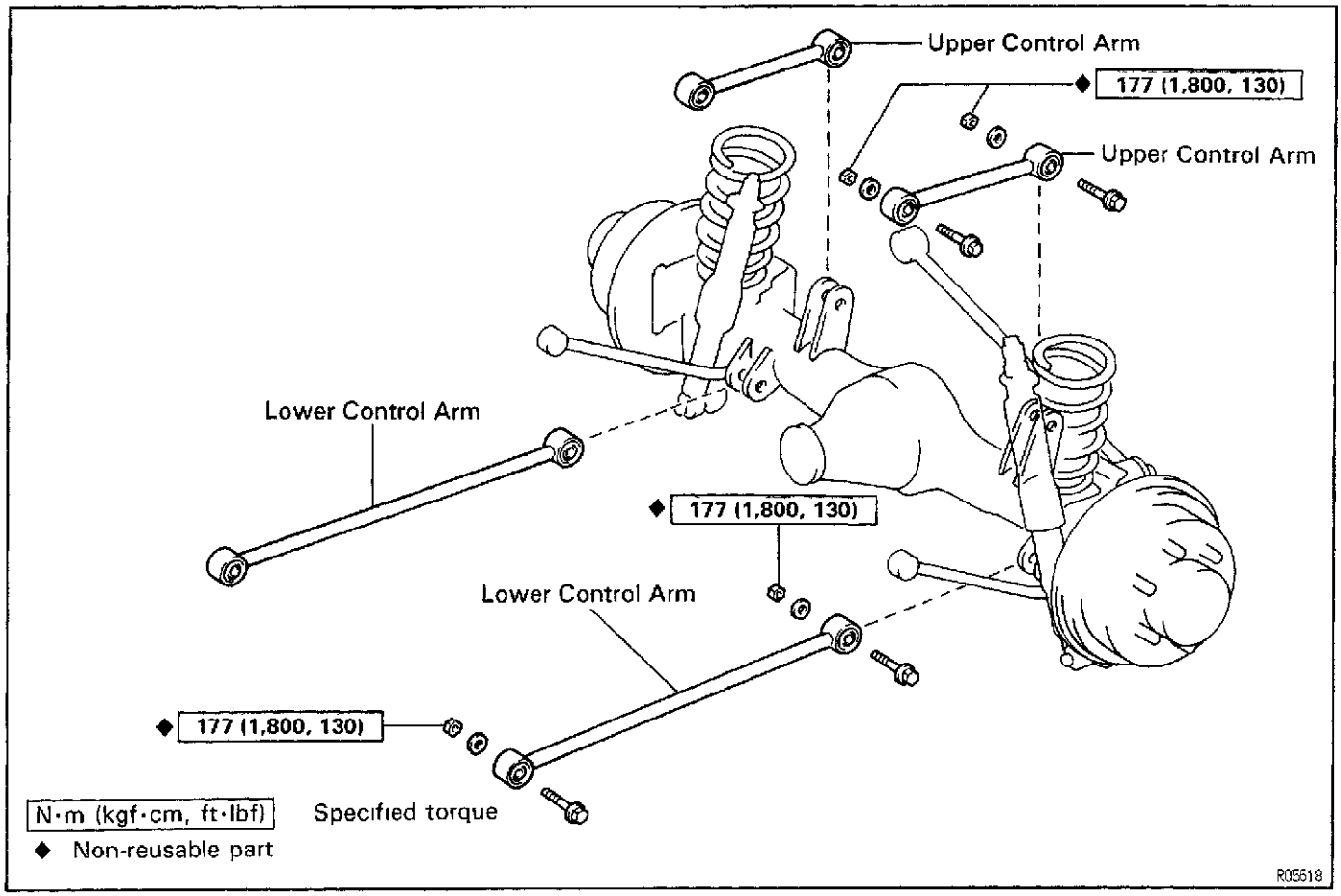


4. TORQUE NUT HOLDING LATERAL CONTROL ROD TO FRAME
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)

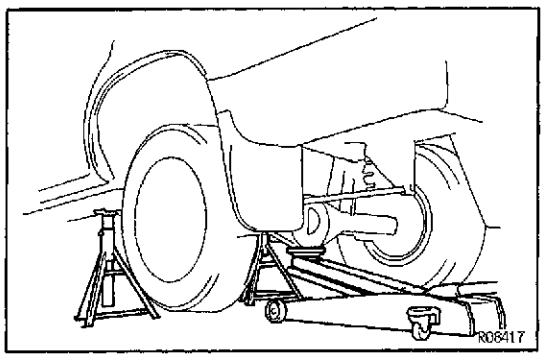
UPPER AND LOWER CONTROL ARM

COMPONENTS

SA0Z5-01



SA0Z6 02

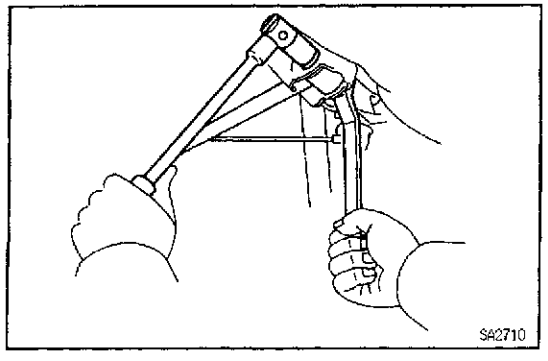


UPPER AND LOWER CONTROL ARMS REMOVAL

1. JACK UP AND SUPPORT VEHICLE

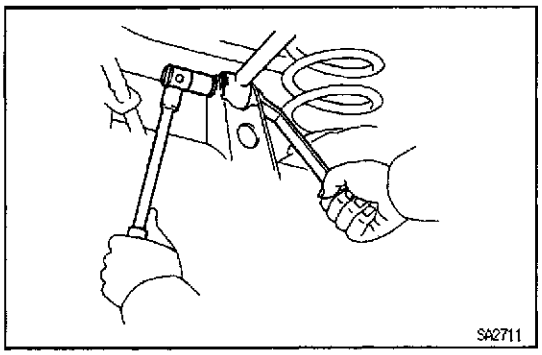
Jack up the rear axle housing and support the frame with stands. Hold the rear axle housing with a jack.

2. REMOVE REAR WHEEL

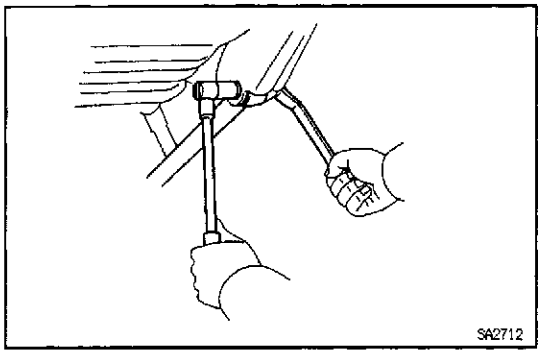


3. REMOVE UPPER CONTROL ARM

(a) Remove the nut and bolt and disconnect the upper control arm from the frame.

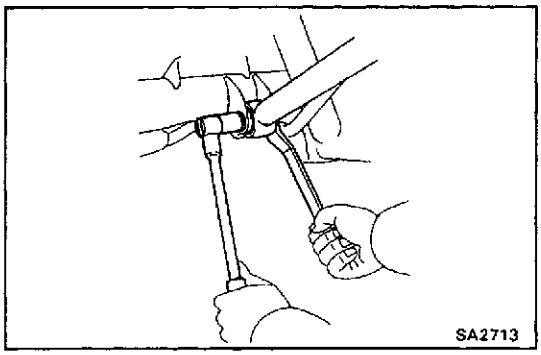


(b) Remove the nut, bolt and upper control arm

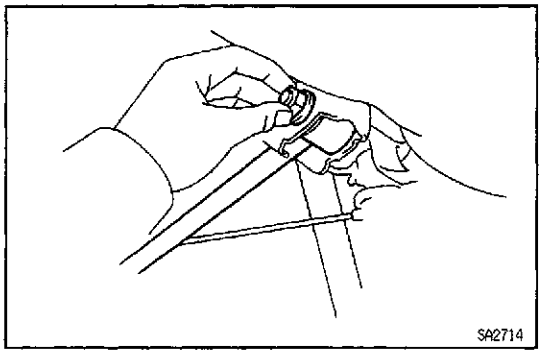


4. REMOVE LOWER CONTROL ARM

(a) Remove the bolt, nut and disconnect lower control arm from the frame



(b) Remove the nut, bolt and lower control arm from the axle housing



SA027-02

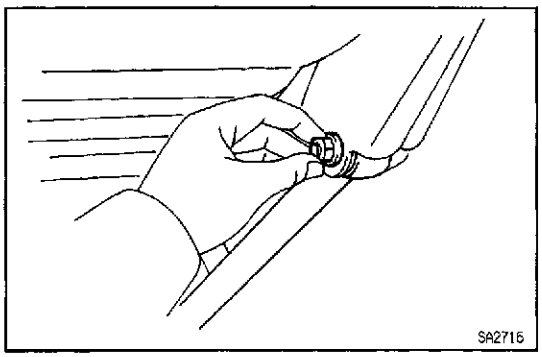
UPPER AND LOWER CONTROL ARMS INSTALLATION

1. INSTALL UPPER CONTROL ARM

(a) Temporarily install the upper control arm to the frame with the bolt and nut

HINT

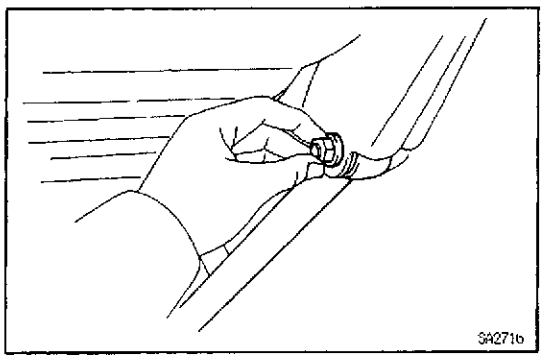
- Install the bolt from the outside of the vehicle
- Do not tighten the nut



(b) Temporarily install the upper control arm to the axle housing with the bolt and nut

HINT

- Install the bolt from the outside of the vehicle
- Do not tighten the nut



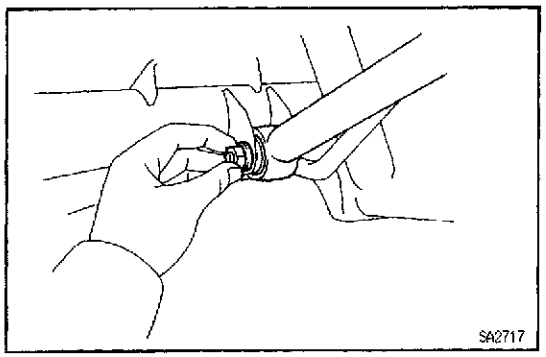
2. INSTALL LOWER CONTROL ARM

(a) Temporarily install the lower control arm to the frame with the bolt and nut

HINT

Install the bolt from the outside of the vehicle

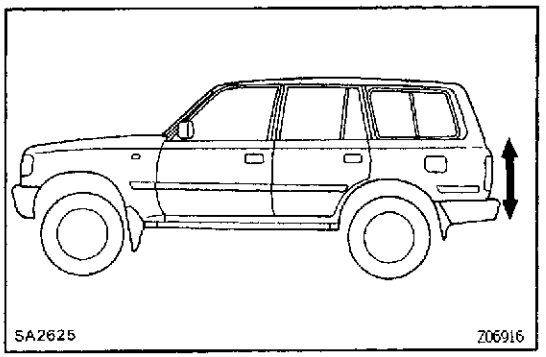
Do not tighten the nut



(b) Temporarily install the lower control arm to the axle housing with the bolt and nut

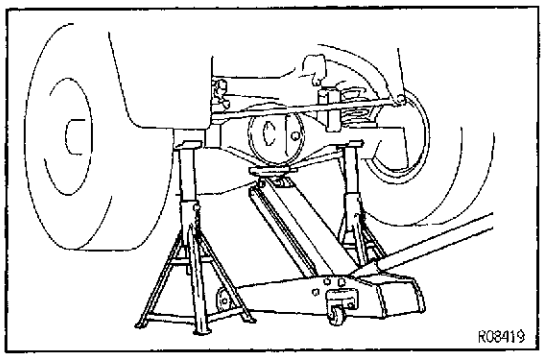
HINT

- Install the bolt from the outside of the vehicle
- Do not tighten the nut



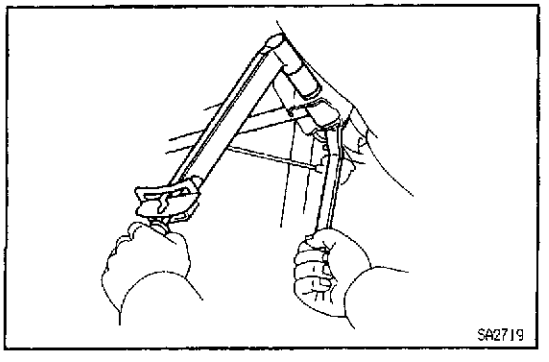
3. STABILIZE SUSPENSION

Bounce the vehicle up and down to stabilize the suspension



4. JACK UP VEHICLE

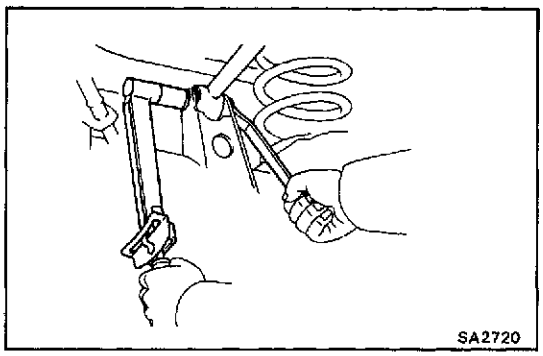
Jack up the rear axle housing and support axle housing with stands



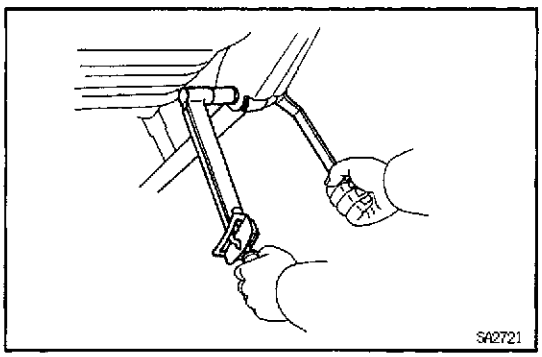
5. TORQUE UPPER CONTROL ARM

(a) Torque the upper control arm front bolt and nut

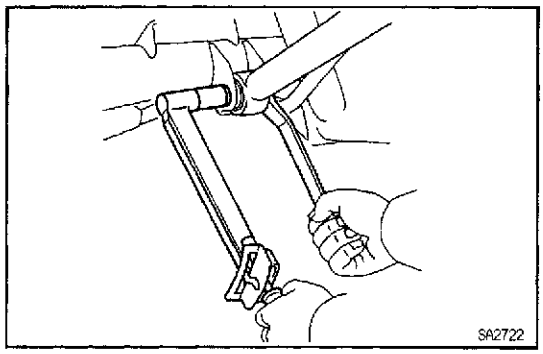
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)



(b) Torque the upper control arm rear bolt and nut
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)



6. TORQUE LOWER CONTROL ARM
(a) Torque the lower control arm front bolt and nut
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)

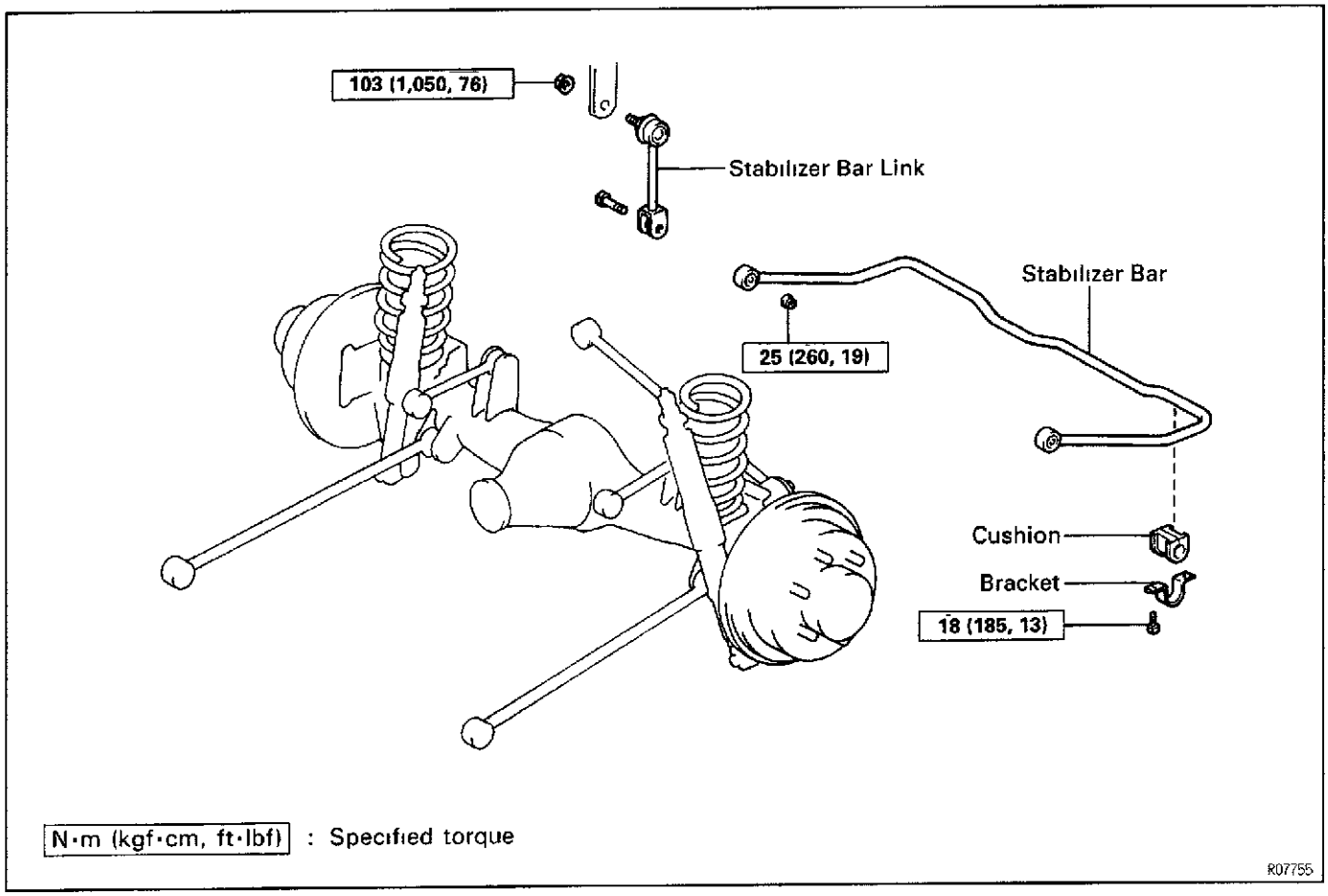


(b) Torque the lower control arm rear bolt and nut
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)

STABILIZER BAR

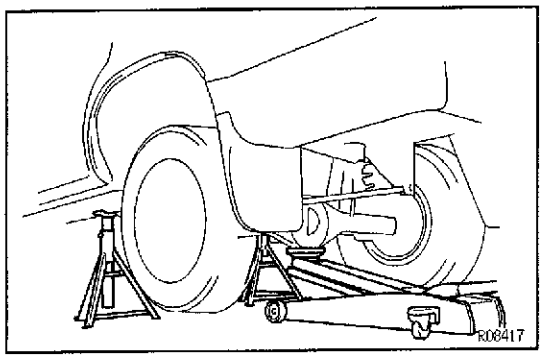
9A0Z8-02

COMPONENTS



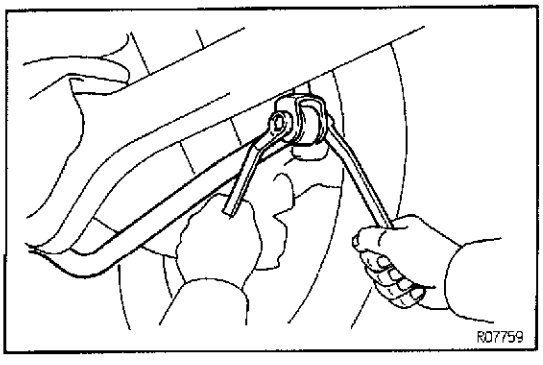
SA0Z9-02

STABILIZER BAR REMOVAL



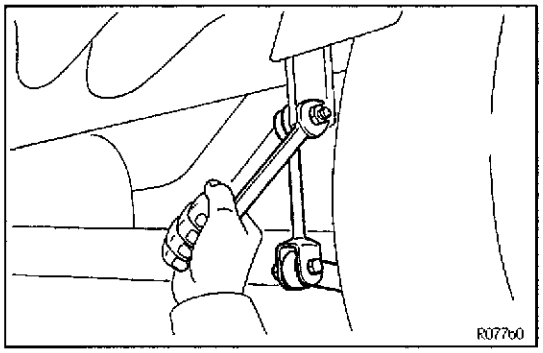
1. JACK UP VEHICLE AND SUPPORT BODY

Jack up and support the body on the stands

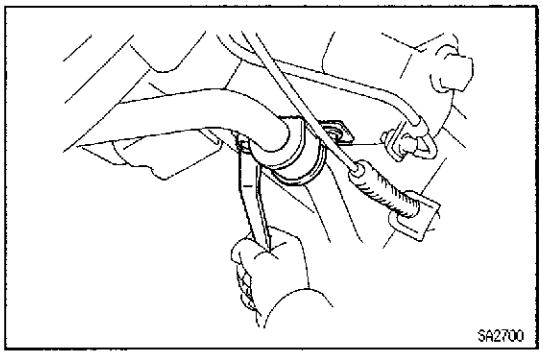


2. REMOVE STABILIZER BAR

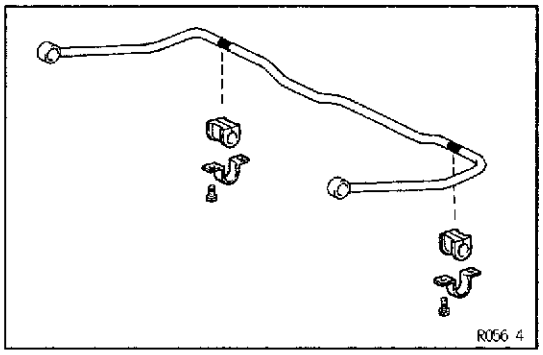
(a) Loosen the bolt and nut



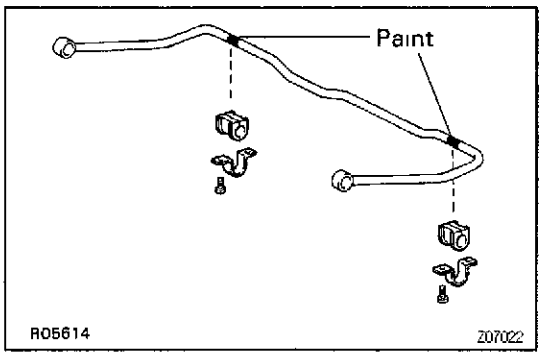
(b) Remove the nut and disconnect the stabilizer bar with the link from the frame
(c) Remove the bolt, nut and link from the stabilizer bar



(d) Remove the 2 bolts and stabilizer bar from the axle housing with the bracket



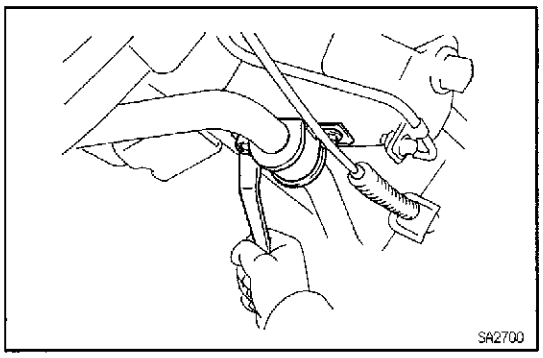
(e) Remove the cushions from the stabilizer bar



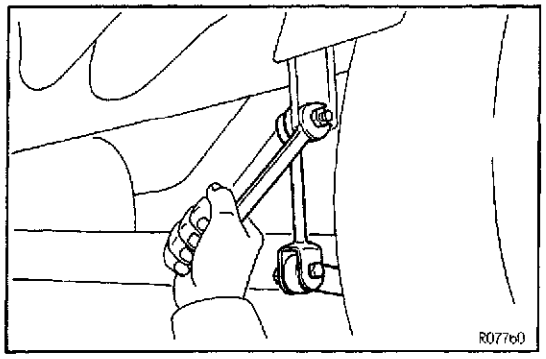
STABILIZER BAR INSTALLATION SA0ZA-02

1. INSTALL STABILIZER BAR

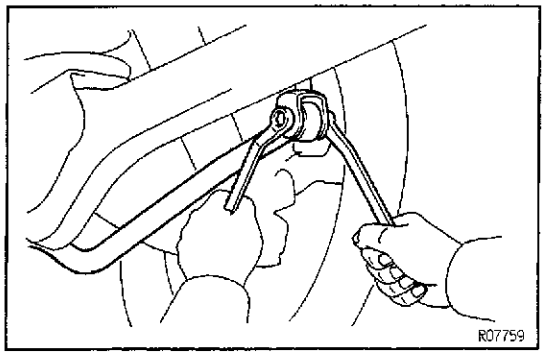
(a) Install the cushions and brackets touching the line painted on the stabilizer bar



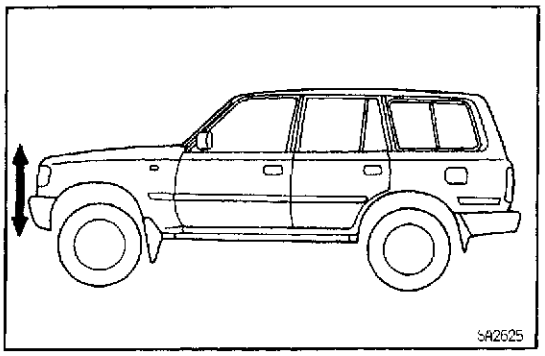
(b) Temporarily install the stabilizer bar with bracket to the axle housing with the 2 bolts



(c) Temporarily install the link to the frame with nut

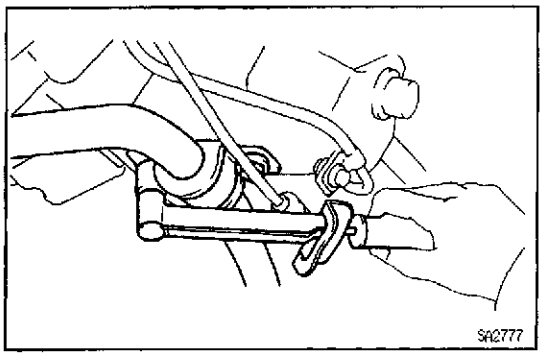


(d) Temporarily install the stabilizer bar to the link with bolt and nut



2. STABILIZE SUSPENSION

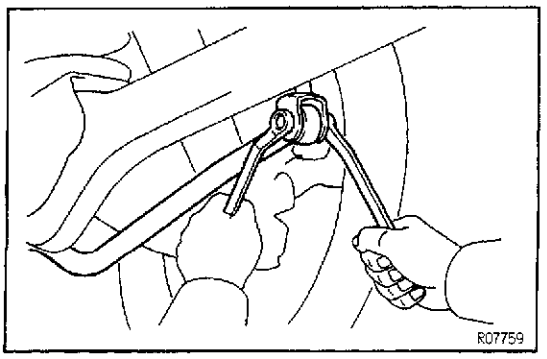
Bounce the vehicle up and down to stabilize the suspension



3. TORQUE BRACKET AND CLAMP

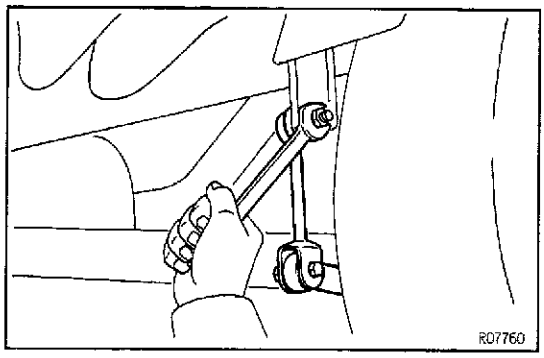
(a) Torque the 2 bolts

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



(b) Torque the bolt and nut

Torque: 25 N-m (250 kgf-cm, 19 ft-lbf)



(c) Torque the nut
Torque: 103 N-m (1,050 kgf-cm, 76 ft-lbf)

SERVICE SPECIFICATIONS

SA9YV-02

SERVICE DATA

Cold tire inflation pressure kPa (kgf/cm^2 psi)		**Tire size**	**Front**	**Rear**
	STD seat	**P275/70R 16**	**220 (2.2, 32)**	**220 (2.2, 32)**
	w/3rd seat	**P275/70R 16**	**220 (2.2, 32)**	**220 (2.2, 32)**
Follw spring and bumper stopper clearance	A Follow spring clearance (Front)		**A**	**B**
	B Bumper Stopper clearance (Rear)		36 mm (1 42 in)	104 mm (4 09 in)
Front wheel alignment	**Camber**	Inspection standard	**1° ± 45'**	
	Steering axis inclination	Inspection standard	**13°00' ± 45'**	
	Caster	Inspection standard	**3°00 ± 1°**	
	Toe-in	**Inspection STD**	Adjustment STD	
		2±2 mm (0 08± 0 08 in)	2±1 mm (0 08 t 0 04 in)	
	Wheel angle	**Max.**	**Inside wheel**	**35°00' $^{+0°}_{-3°}$**
			Outside wheel	**31°00'**
	Side slip (Reference only)		Less than 3 0 mmlm l0 118 in l 3 3 ft)	

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 (starting)	Front	28 - 56 N	2 9 - 5 7 kgf	6 4 - 12 6 lbf
(rotating load at hub bolt)	Rear	25 - 56 N	2 6 - 5 7 kgf	5 7 - 12 6 lbf
Steering knuckle bearing preload (rotating load at knuckle end before installing dust seal)		2 5 - 44N	2 5 - 4 5 kgf	5 5 - 9 9 1 bf

V04094

Front differential	Drive pinion bearing preload at starting New bearing Reused bearing	0.9 - 1.6 N-m (10 - 16 kgf-cm, 8.7 - 13.9 in-lbf) 0.5 - 0.8 N-m (5 - 8 kgf-cm, 4.3 - 6.9 in-lbf)
	Total preload at starting New and reused bearing	Add drive pinion bearing preload 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 Limit	0.10 mm (0.0039 in)
	Companion flange runout Limit Radial Lateral	0.10 mm (0.0039 in) 0.10 m (0.0039 in)
	Oil seal drive depth	1.0 mm (0.039 in)
	Side gear thrust washer thickness w/o Differential lock	1.6 mm (0.063 in) 1.7 mm (0.067 in) 1.8 mm (0.071 in)
	w/ Differential lock	0.9 mm (0.035 in) 1.0 mm (0.039 in) 1.1 mm (0.043 in) 1.2 mm (0.047 in) 1.3 mm (0.051 in)
	Drive pinion adjusting plate washer thickness	1.70 mm (0.0669 in) 1.73 mm (0.0681 in) 1.76 mm (0.0693 in) 1.79 mm (0.0705 in) 1.82 mm (0.0717 in) 1.85 mm (0.0728 in) 1.88 mm (0.0740 in) 1.91 mm (0.0752 in) 1.94 mm (0.0764 in) 1.97 mm (0.0776 in) 2.00 mm (0.0787 in) 2.03 mm (0.0799 in) 2.06 mm (0.0811 in) 2.09 mm (0.0823 in) 2.12 mm (0.0835 in) 2.15 mm (0.0846 in) 2.18 mm (0.0858 in) 2.21 mm (0.0870 in) 2.24 mm (0.0882 in) 2.27 mm (0.0894 in) 2.30 mm (0.0906 in) 2.33 mm (0.0917 in)

Rear differential	Drive pinion bearing preload at starting New bearing Reused bearing Total preload at starting w/o Differential lock wl Differential lock Drive pinion to ring gear backlash Pinion gear to side gear backlash Ring gear runout Limit Companion flange runout Limit Radial Lateral Oil seal drive in depth Side gear thrust washer thickness Drive pinion adjusting plate washer thickness Side bearing adjusting plate thickness (wl Differential lock only)

TORQUE SPECIFICATIONS

SA0AP 03

(FRONT)

Part tightened	N-m	kgf-cm	ft-lbf
Axle hub x Rotor disc	**74**	750	**54**
Axle hub bearing lock nut	**64**	650	**47**
Flange x Axle hub	**35**	360	**26**
Disc brake cylinder x Axle carrier	123	1 250	**90**
Disc brake cylinder 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**
Propeller shaft x Companion flange	**74**	750	**54**
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	**25**	250	**18**
Adjusting nut lock x Bearing cap	**13**	130	**9**
Follow spring x Frame	9 Z	**94**	82in -lbf
Stabilizer bar x Axle housing	**25**	260	**19**
Shock absorber x Axle housing	**69**	700	**51**
Shock absorber x Body	**69**	700	**51**
Stabilizer bar link x Bracket	**18**	185	**13**
Stabilizer bar link x Frame	103	1 050	**76**
Lateral control rod x Frame	**171**	1 750	127
Lateral control rod x Body	**171**	1 750	127
Leading arm x Body	177	1 800	130
Leading arm x Axle housing	**171**	1 750	127
Hub nut	147	1 500	108

(REAR)

Part tightened	N-m	kgf-cm	ft-lbf
LSPV shackle bracket x Differential cover	19	195	14
Follow spring x Frame	28	290	21
Lateral control rod x Axle housing	245	2 500	181
Shock absorber x Bracket	69	700	51
Shock absorber bracket x Frame	50	510	37
Shock absorber x Axle housing	64	650	47
Stabilizer bar bracket x Axle housing	18	185	13
Lateral control rod x Frame	177	1 800	130
Upper control rod x Frame	177	1 800	130
Upper control rod x Axle housing	177	1 800	130
Stabilizer bar link x Frame	103	1 050	76
Stabilizer bar x Link	25	260	19
Hub nut	147	1 500	108
Lower control arm x Frame	177	1 800	130
Lower control arm x Axle housing	177	1 800	130
Pinion shaft pin (w/o Differential lock)	27	275	20
Pinion shaft pin (w/ Differential lock)	58	590	43
Differential cover x Axle housing	13	130	9
Differential cover x Parking brake cable clamp	13	130	9
Propeller shaft x Companion flange	88	900	65
Rear axle shaft x Axle hub (Disc brake)	33	340	25
Rear axle bearing lock nut (Disc brake)	59	600	43
Rear axle bearing lock nut screw	5 4	55	48in -lbf
Rear brake caliper x Axle carrier	103	1 050	76
Side bearing cap x Differential carrier (w/o Differential lock)	78	800	58
Side bearing cap x Differential carrier (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	97	985	71
Adjusting nut lock x Bearing cap	13	130	9
Differential case x 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

STEERING

GENERAL DESCRIPTION

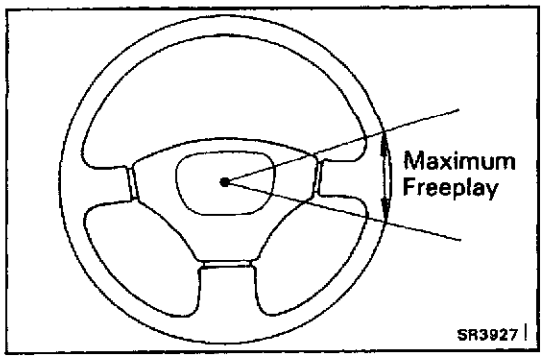
Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.

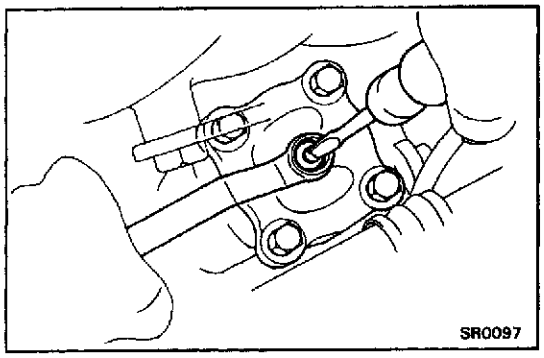
TROUBLESHOOTING

Use the 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

See page / Parts Name / Trouble	Tires (Improperly inflated)	Front wheel alignment (Incorrect)	Fluid level (Low)	Steering system joints (Worn)	Suspension arm ball joints (Worn)	Steering column (Binding)	Sliding yoke (Worn)	Steering gear housing	Front wheel bearing (Worn)
	SA-167	SA-167	SR-23	-	SA-72	-	-	SR-37	SA-13
Hard steering	1	4	2	5	6	7		8	
Poor return	1	2				3		4	
Excessive play				1	2		3	5	4
Abnormal noise			1	2				3	

V03340





ON-VEHICLE INSPECTION

SR0CZ-01

STEERING WHEEL FREEPLAY

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure Freeplay should not exceed the maximum limit

Maximum play:

40 mm (1.58 in.)

If incorrect, adjust or repair as required

2. POINT WHEELS STRAIGHT AHEAD

3. ADJUST STEERING GEAR HOUSING

(a) Loosen the lock nut

(b) Turn the adjusting screw clockwise to decrease wheel freeplay and counterclockwise to increase it

HINT Turn the adjusting screw in small increments and check the wheel freeplay between each adjustment

4. CHECK THAT STEERING DOES NOT BIND

Turn the steering wheel half way around in both directions

Check that the freeplay is correct and steering is smooth and without rough spots

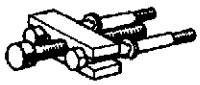
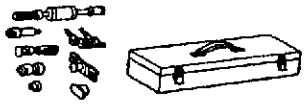
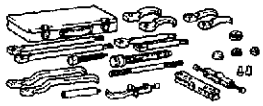
5. HOLD ADJUSTING SCREW AND TIGHTEN LOCK NUT

STEERING COLUMN

PREPARATION

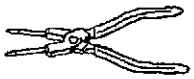
SST (SPECIAL SERVICE TOOLS)

SR0DG-01

	09609-20011 Steering Wheel Puller	
	09910-00015 Puller Set	
	(09911-00011) Puller Clamp	
	(09912 -00010) Puller Slide Hammer	
	09950-20017 Universal Puller	
	(09956-00010) Tightening Piece	

RECOMMENDED TOOLS

SR0D1-01

	09905-00013 snap Ring Pliers	

EQUIPMENT

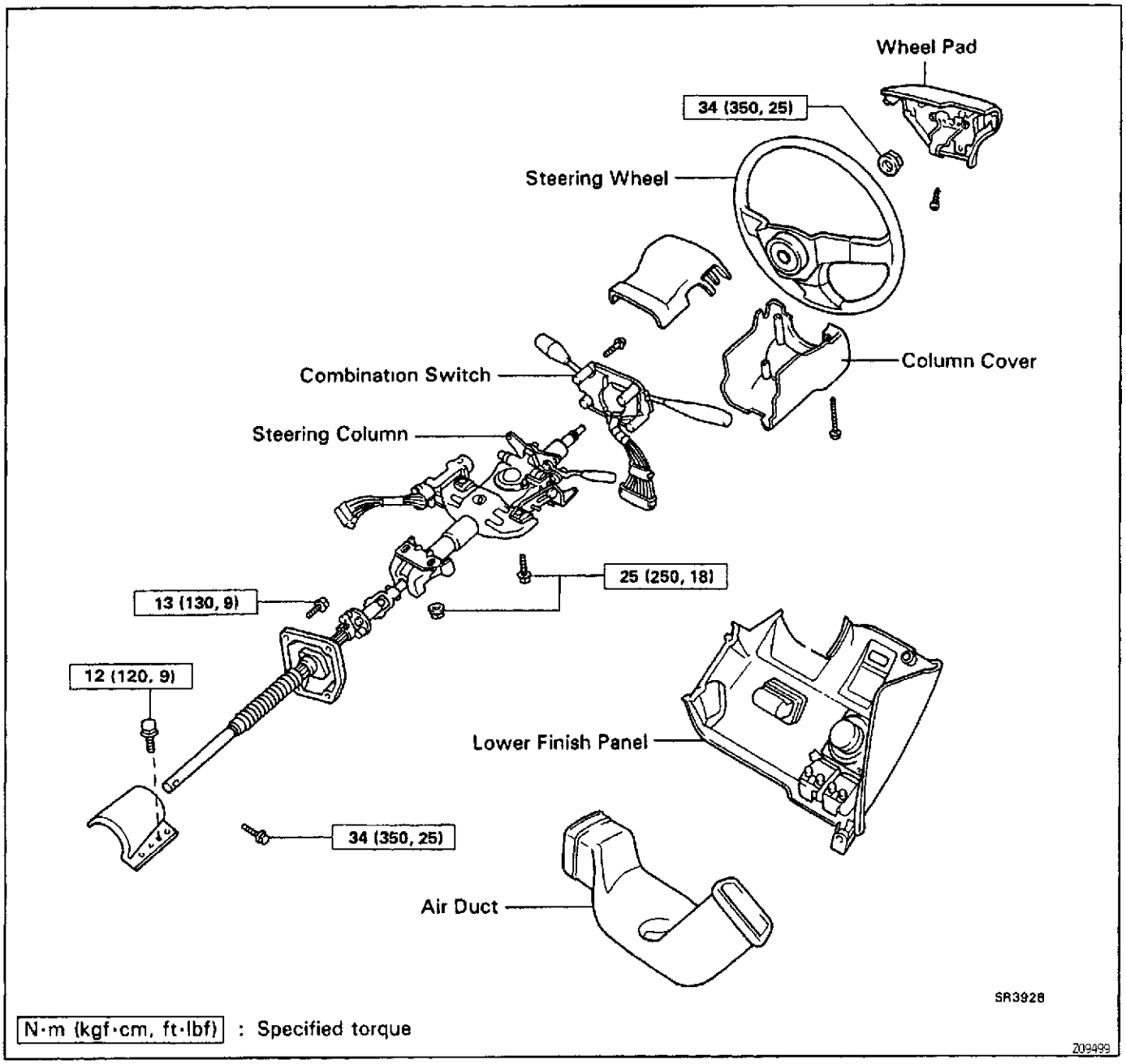
SR0D2-01

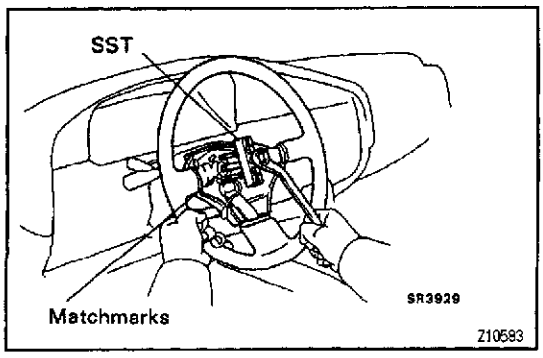
Torque wrench	

ASSEMBLY REMOVAL AND INSTALLATION

SR0D3-02

Remove and install the parts, as shown





MAIN POINT OF REMOVAL AND INSTALLATION

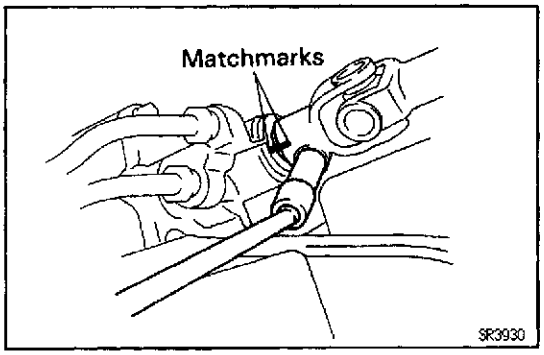
1. REMOVE STEERING WHEEL

(a) Remove the steering wheel pad

(b) Place matchmarks on the steering wheel and main shaft

(c) Using SST, remove the steering wheel

SST 09609-20011



2. DISCONNECT UNIVERSAL JOINT

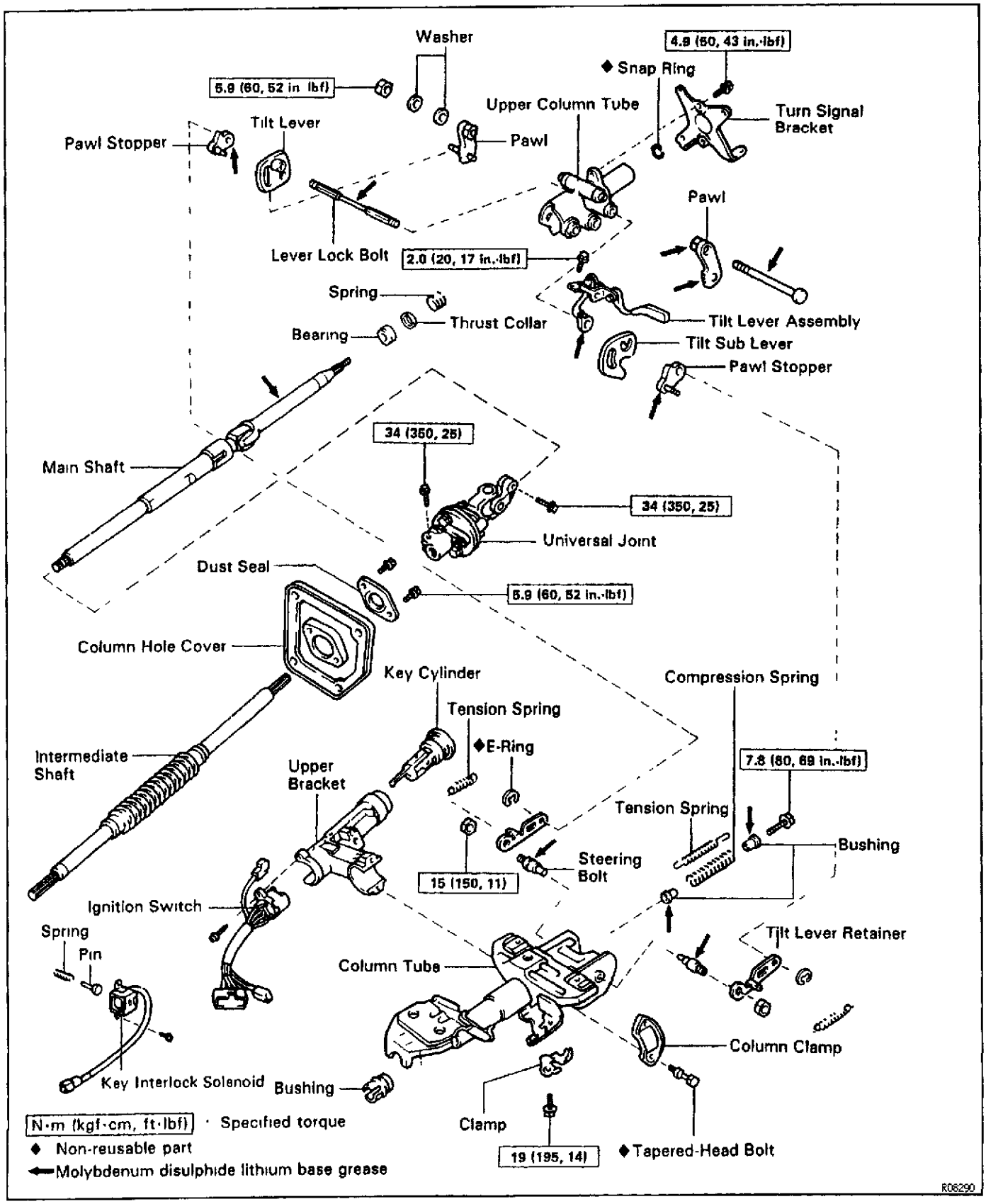
(a) Place matchmarks on the worm shaft and main shaft
(b) Loosen the universal joint upper bolt
(c) Remove the universal joint lower bolt
(d) Slide the joint backward to disconnect the joint from the worm shaft

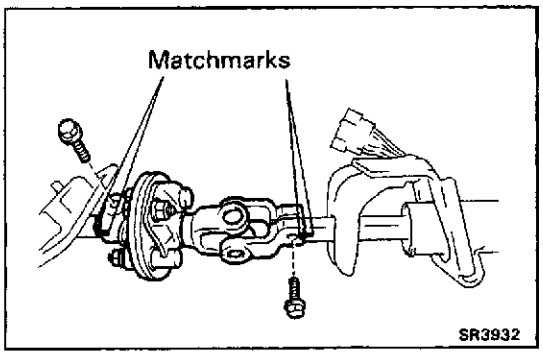
3. CHECK STEERING WHEEL CENTER POINT INSTALLING STEERING COLUMN

TILT STEERING COLUMN

SR0D4-02

COMPONENTS





STEERING COLUMN DISASSEMBLY

SR0DS-02

1. DISCONNECT UNIVERSAL JOINT

Place matchmarks on the universal joint and the shaft, then remove the bolt and the universal joint

2. REMOVE COLUMN HOLE COVER

(a) Place matchmarks on the flexible coupling and the shaft, then remove the bolt and the shaft

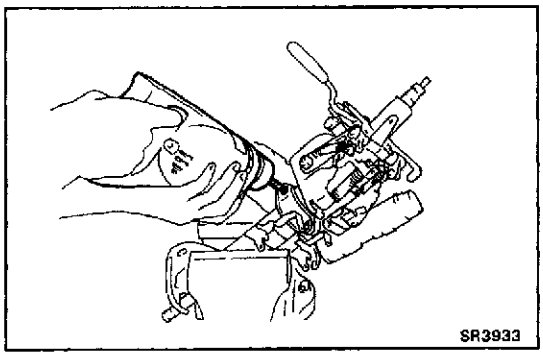
(b) Remove 2 bolts and the dust seal

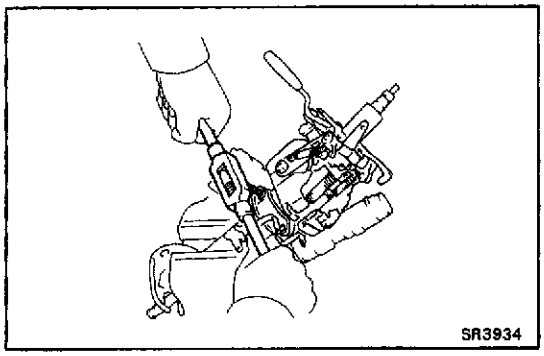
(c) Remove the column hole cover

3. REMOVE UPPER BRACKET

(a) Using a centering 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 tapered-head bolts





(c) Using a screw extractor, remove the 2 tapered-head bolts

(d) Remove the bracket and column clamp

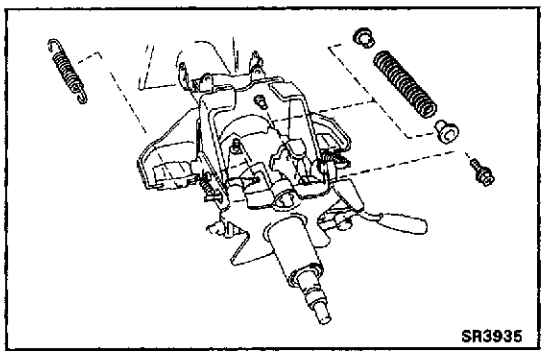
4. REMOVE COMPRESSION SPRING AND TENSION SPRING

(a) Remove the wiring harness clamp

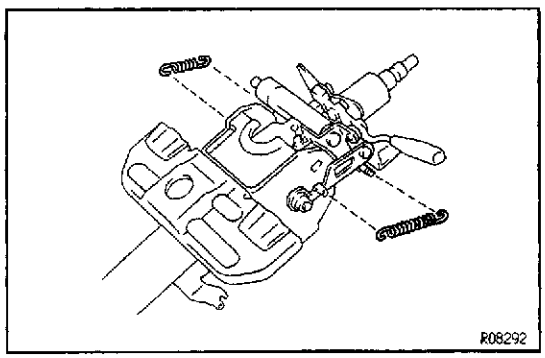
(b) Remove the bolt with the compression spring

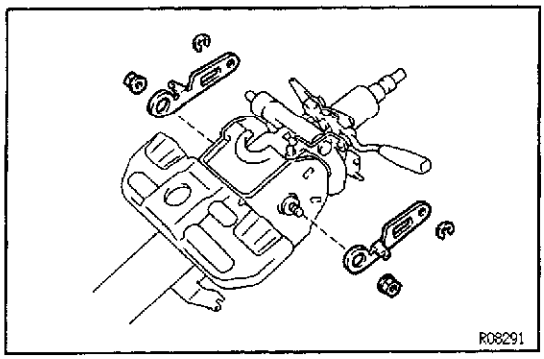
(c) Remove the bushings from the spring

(d) Remove the tension spring



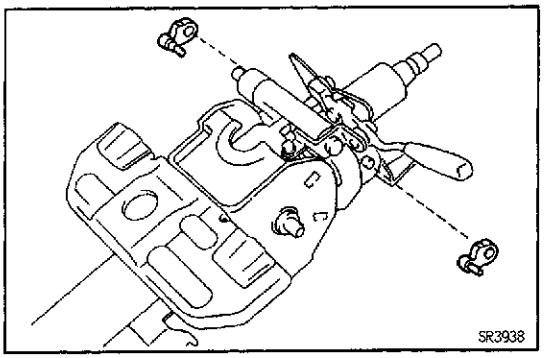
5. REMOVE 2 TENSION SPRINGS



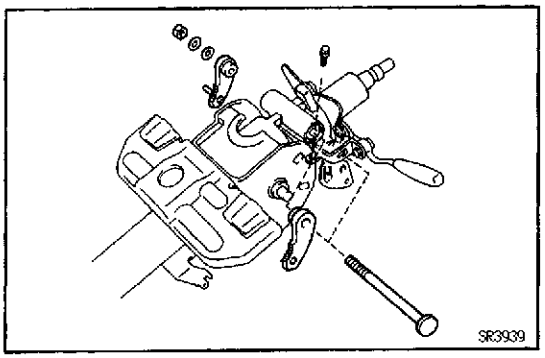


6. REMOVE 2 TILT LEVER RETAINERS

(a) Remove the E-ring from the retainer
(b) Remove the retainer with the nut

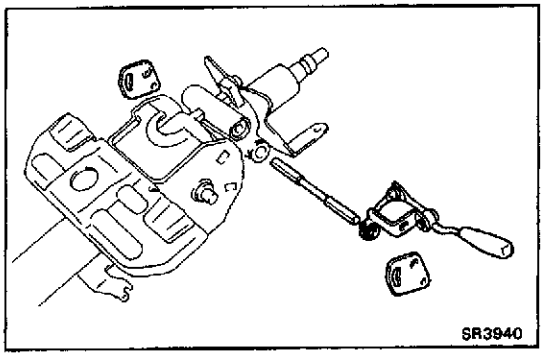


7. REMOVE 2 PAWL STOPPERS

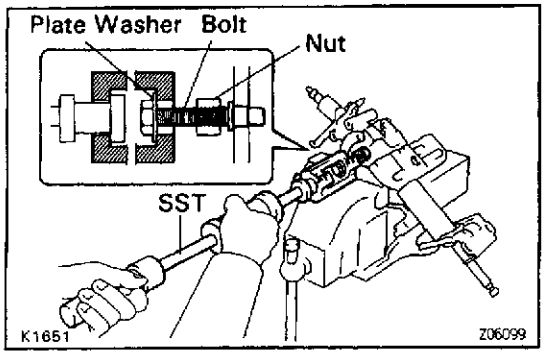


8. REMOVE 2 TILT PAWLS

(a) Remove the nut and bolt
(b) Remove the bolt from the tilt lever assembly
(c) Remove the pawl with the collar



9. REMOVE TILT LEVER ASSEMBLY, TILT LEVER, TILT SUB LEVER AND LEVER LOCK BOLT



10. REMOVE COLUMN TUBE

(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 And then remove the 2 steering bolts

SST 09910-00015 (09911 -0001 1, 09912-00010)

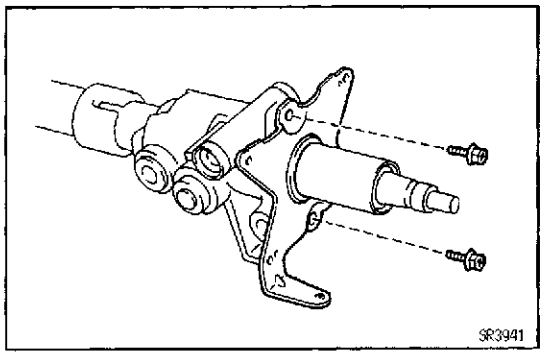
(Reference)

Nut 90170-10004

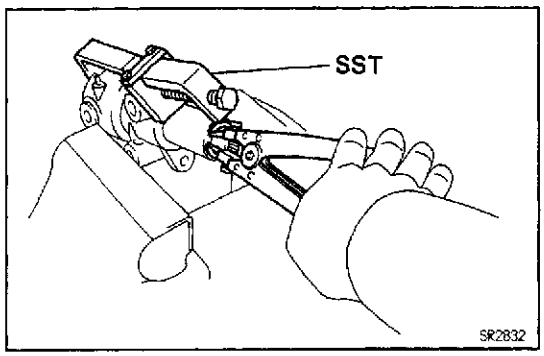
Plate washer 90201-10201

Bolt 91111-51050

(b) Remove the column tube from the upper column tube



11. REMOVE TURN SIGNAL BRACKET



12. REMOVE MAIN SHAFT

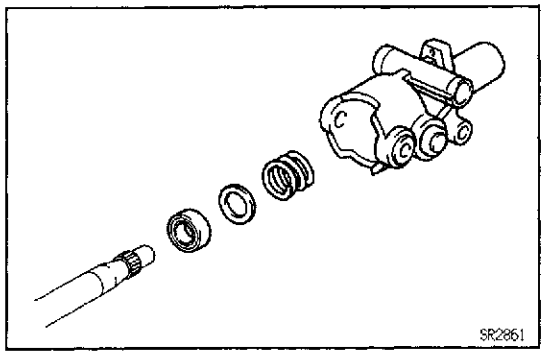
(a) Secure the upper column tube in a vise

NOTICE: Do not tighten the vise too tight.

(b) Using SST, compress the spring

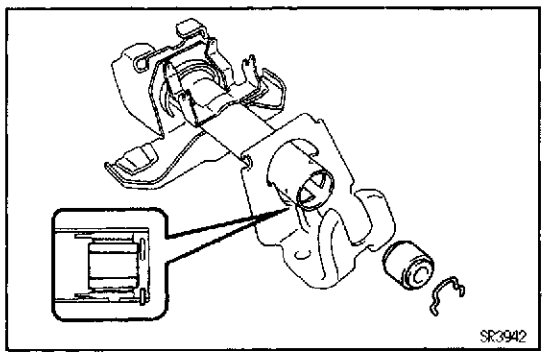
SST 09950-20017 (09956-00010)

(c) Using snap ring pliers, remove the snap ring



(d) Remove the main shaft from the upper column tube

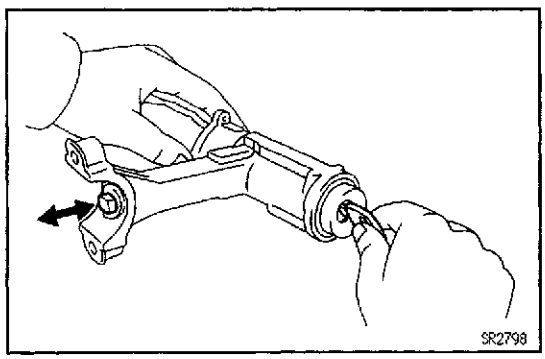
(e) Remove the spring, thrust collar and bearing



13. REMOVE MAIN SHAFT COLLAR

(a) Remove the snap ring from the lower column tube

(b) Remove the main shaft collar

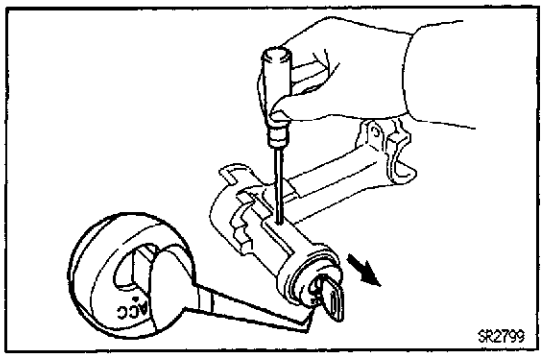


SR0D6-02

STEERING COLUMN INSPECTION AND REPLACEMENT

1. INSPECT KEY CYLINDER

Check that the steering lock mechanism operates properly



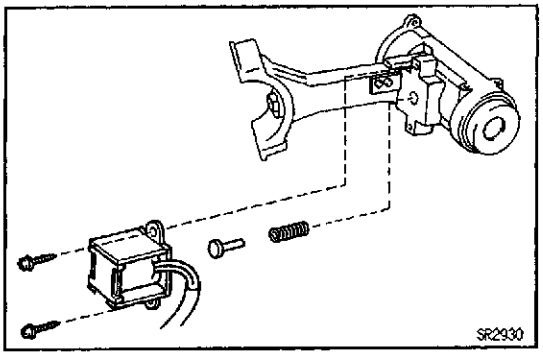
2. IF NECESSARY, REPLACE KEY CYLINDER

(a) Place the ignition key at the ACC position

(b) Push down the stop key with a thin rod, and pull out the key cylinder

(c) Make sure that the ignition key at the ACC position

(d) Install a new key cylinder



3. INSPECT KEY INTERLOCK SOLENOID

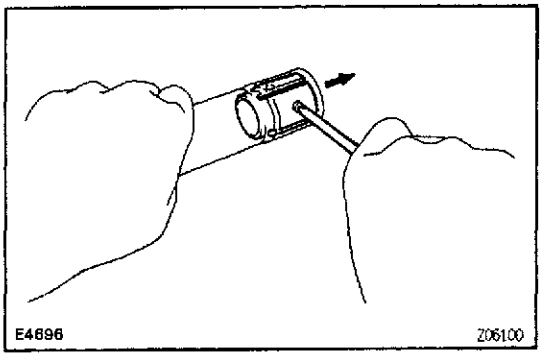
(See page AT-79)

4. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

(a) Remove the 2 screws

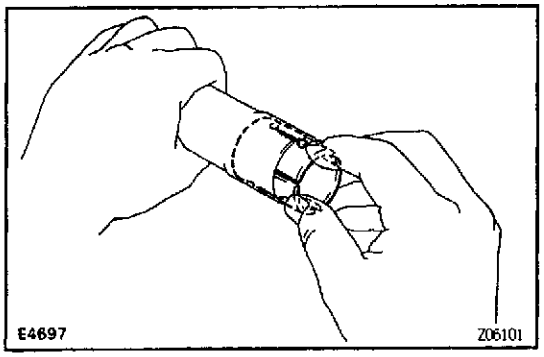
(b) Remove the solenoid, spring and lock pin

(c) Install a new solenoid with the spring and lock pin, and install the 2 screws



5. IF NECESSARY, REPLACE MAIN SHAFT BUSHING

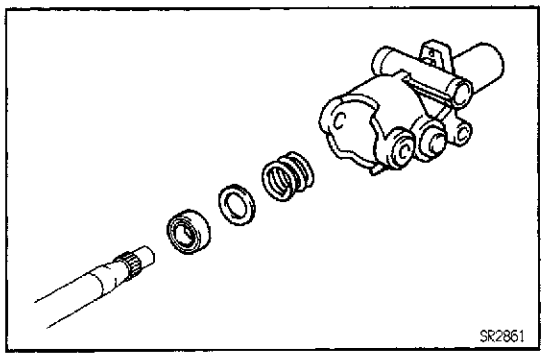
(a) Using a screwdriver, remove the bushing



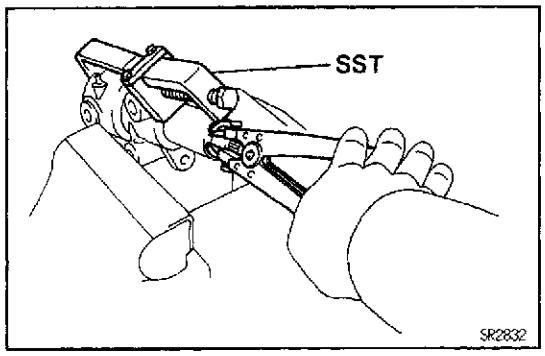
(b) Align the holes of the tube and the projections of a new bushing, and install the bushing in the column tube

TILT STEERING COLUMN ASSEMBLY SR007 02

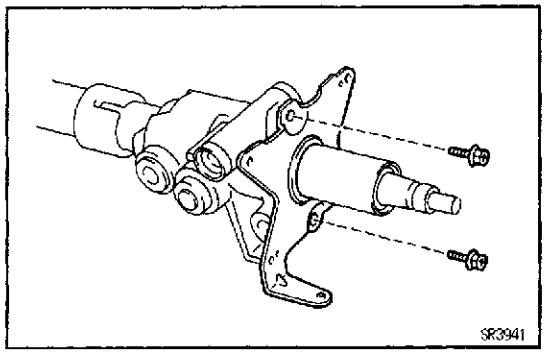
1. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE ON FOLLOWING PARTS
(See page SR-7 **)**



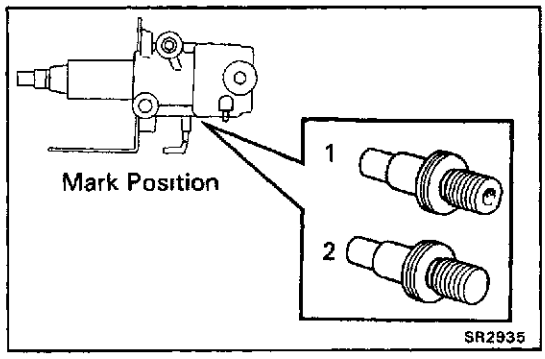
2. INSTALL MAIN SHAFT
(a) Install the main shaft with the bearing, collar and spring
NOTICE: Do not bend the universal joint of the main shaft more than 20° .



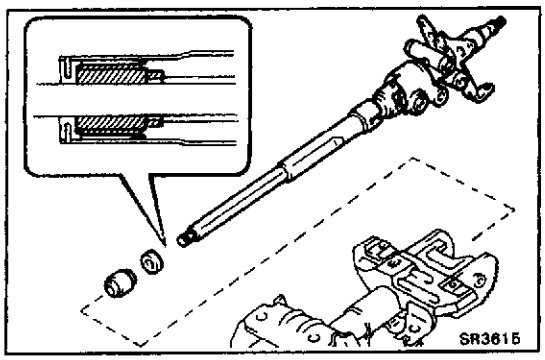
(b) Secure the upper column tube in a vise
NOTICE: Do not tighten the vise too tight.
(c) Using SST, compress the spring
SST 09950-20017 (09956-00010)
(d) Using snap ring pliers, install a new snap ring



3. INSTALL TURN SIGNAL BRACKET
Install the 2 bolts
Torque: 4.9 N-m (50 kgf-cm, 43 in.-lbf)



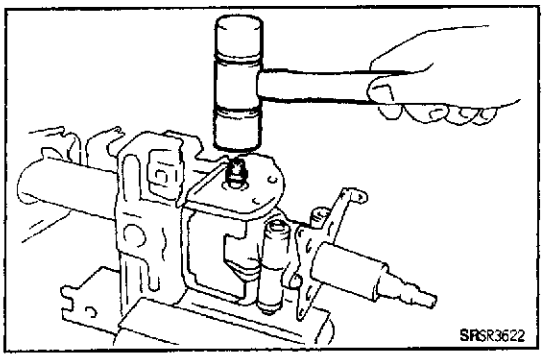
4. SELECT STEERING BOLT AND UPPER COLUMN TUBE
Select the bolt with center hole when the upper column tube mark is 1, and select the bolt without hole when the mark is 2



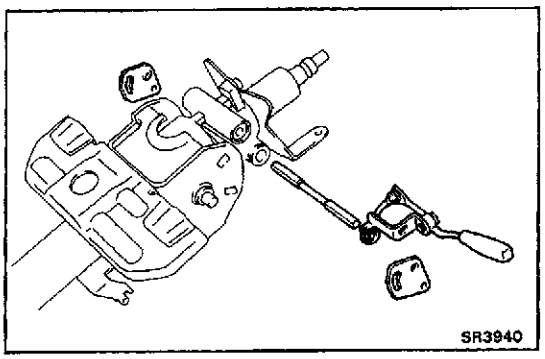
5. INSTALL MAIN SHAFT WITH COLUMN TUBE

(a) Install the stopper and main shaft collar to the main shaft, as shown

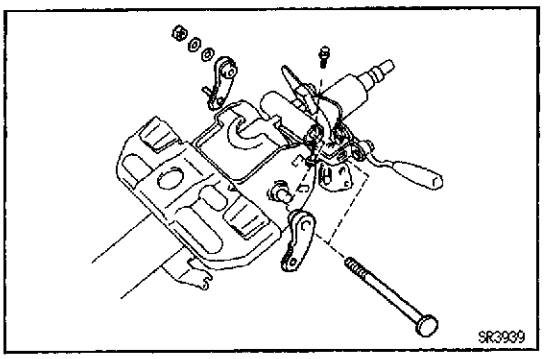
(b) Install the main shaft to the column tube



(c) Using a plastic hammer, drive in the 2 steering bolts



6. INSTALL TILT LEVER LOCK BOLT, TILT LEVER ASSEMBLY, TILT LEVER AND TILT SUB LEVER

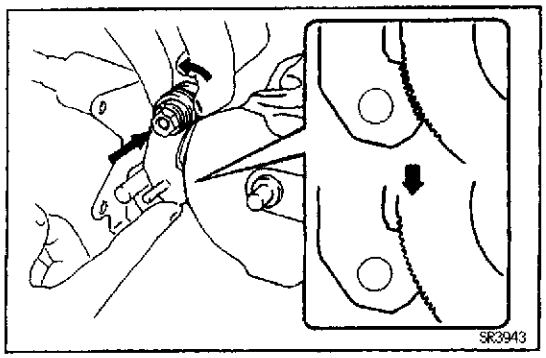


7. INSTALL 2 TILT PAWLS

(a) Temporarily install the tilt pawl

(b) Install the bolt, 2 collars and nut

Torque: 2.0 N-m (20 kgf-cm, 17 in.-lbf)



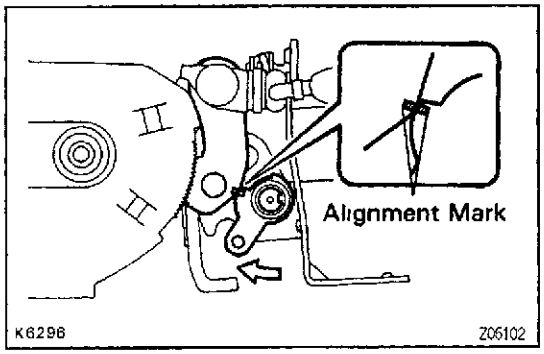
8. ENGAGE AND ADJUST TILT PAWL

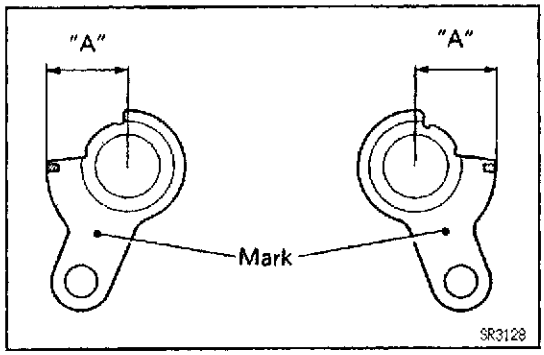
(a) Engage the tilt sub lever side pawl to the center of the ratchet

(b) While turning the tilt lever side collar, engage the tilt lever side pawl to the ratchet completely

(c) Tighten the nut

Torque: 5.9 N-m (60 kgf-cm, 52 in.-lbf)





9. SELECT 2 PAWL STOPPERS

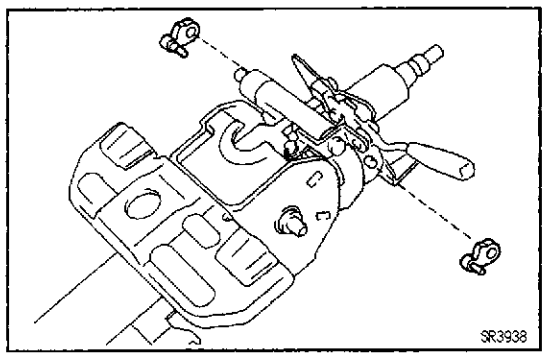
(a) With the tilt pawl and ratchet engaged, install the 2 pawl stoppers

(b) Check that the alignment marks on the stopper and pawl align when the stopper is rotated to the pawl side

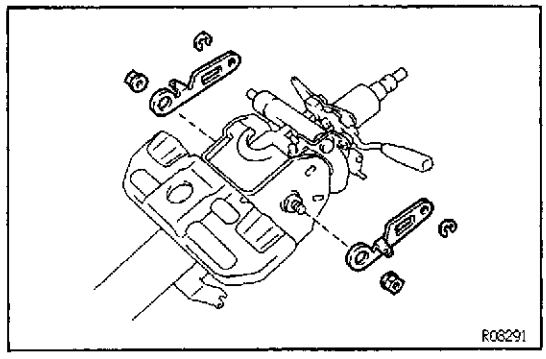
(c) If the alignment marks do not align, select pawl stoppers according to the following table

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 4882)

(d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged



10. INSTALL 2 TILT PAWL STOPPERS

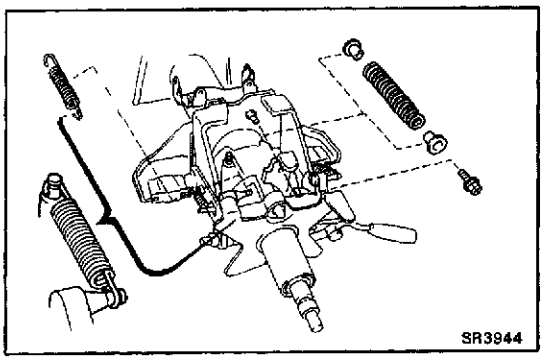


11. INSTALL 2 TILT LEVER RETAINERS

(a) Install the retainer and torque the nut

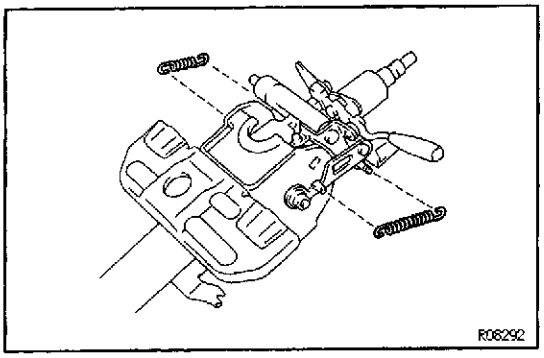
Torque: 15 N-m (150 kgf-cm, 11 ft-lbf)

(b) Install a new E-ring

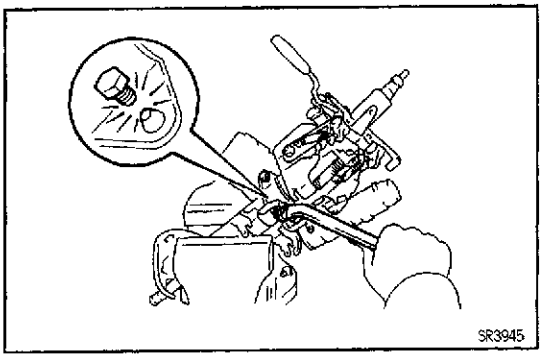


12. INSTALL COMPRESSION SPRING AND TENSION SPRING

(a) Install the bushings to the compression spring
(b) Install the spring and bolt
Torque: 7.8 N-m (80 kgf-cm. 69 in.-lbf)
(c) Install the tension spring
(d) Install the wiring harness clamp

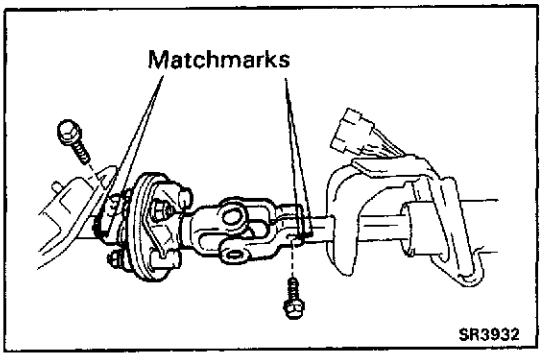


13. INSTALL 2 TENSION SPRINGS



14. INSTALL UPPER BRACKET

(a) Install the upper bracket with 2 new tapered-head bolts
(b) Tighten the 2 tapered-head bolts until the bolt heads break off



15. INSTALL COLUMN HOLE COVER

(a) Install the column hole cover
(b) Install 2 bolts and the dust seal
Torque: 5.9 N-m (60 kgf-cm, 52 in.-lbf)
(c) Align the matchmarks on the shaft and flexible coupling, then torque the bolt
Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)

16. CONNECT UNIVERSAL JOINT

Align the matchmarks on the universal joint and the shaft, and torque the bolt
Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)

17. CHECK OPERATION OF TILT STEERING LEVER AND SUPPORT

(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

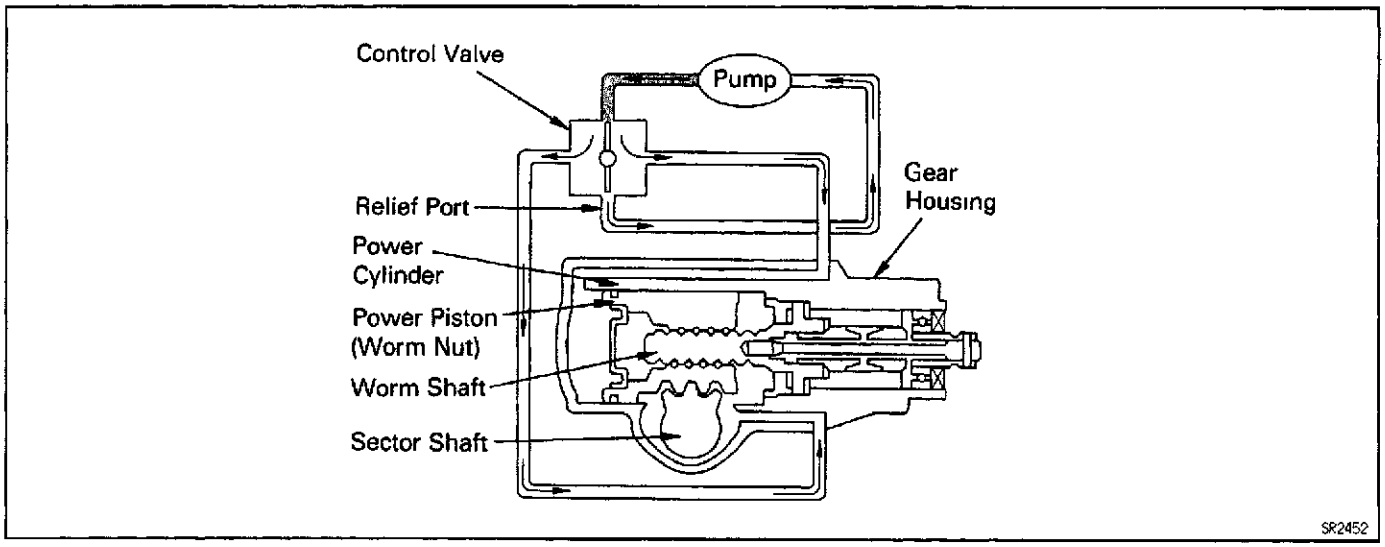
POWER STEERING
DESCRIPTION
POWER STEERING PRINCIPLES

SR0D6-02

Power steering utilizing engine hydraulically reduce power steering effort Consequently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the power cylinder so that the pinion assists the rack effort The amount of this assistance depends on the extent of pressure acting on the piston Therefore, if more steering force is required, the pressure must be raised The variation in the fluid pressure is accomplished by a control valve which is linked to the steering main shaft

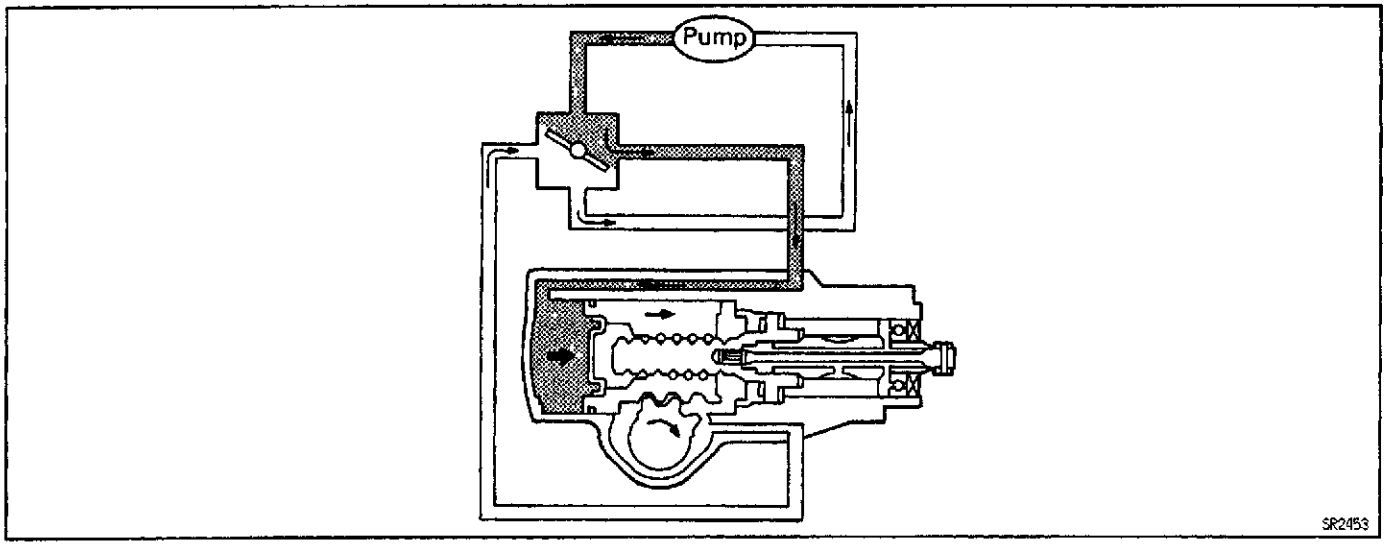
NEUTRAL (STRAIGHT-AHEAD) POSITION

Fluid from the pump is sent to the control valve If the control valve is in the neutral position, all the fluid will flow pass through the control valve in to the relief port and back to the pump At this time, hardly any pressure is created and because the pressure on the cylinder piston is equal on both sides, the piston will not move in either direction



WHEN TURNING

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages The other passage then opens wider, causing a change in fluid flow volume and, at the same time, pressure is created Consequently, a pressure difference occurs between both sides of the piston and the piston moves in the direction of the lower pressure so that the fluid in the cylinder is forced back to the pump through the control valve



SERVICE HINT

SR0D9-02

Troubles with the power steering system are usually concerned with hard steering due to the fact that there is no assist In such case, before attempting to make repairs, it is necessary to determine whether the trouble lies with the pump or with the gear housing To do this, an on-vehicle inspection can be made by using a pressure gauge

ON-VEHICLE INSPECTION

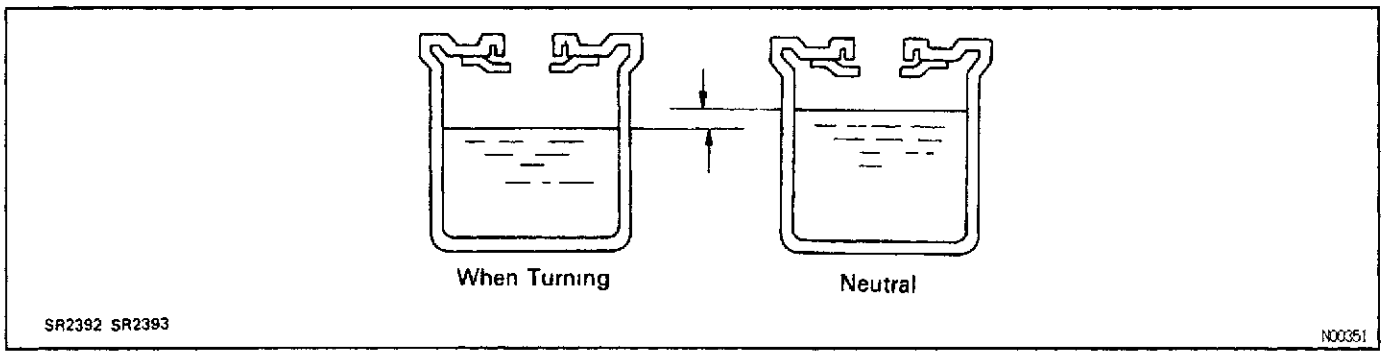
Power steering is a hydraulic device and problems are normally due to insufficient fluid pressure acting on the piston This could be caused by either the pump not producing the specified fluid pressure or the control valve in the gear housing not functioning proper amount of fluid pressure can be obtained

If the fault lies with the pump, the same symptoms will generally occur whether the steering wheel is turned fully to the right or left On the other hand, if the fault lies with the control valve, there will generally be a difference between the amount of assist when the steering wheel is turned to the left and right, causing harder steering However, if the piston seal of the power cylinder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and the symptoms will be the same for both

Before performing an on-vehicle inspection, a check must first be made to confirm that the power steering system is completely free of any air If there is any air in the system, the volume of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly To determine if there is any air in the system, check if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left

Also, air in the system will sometimes result in an abnormal noise occurring from the pump or

gear housing when the steering wheel is fully turned in either direction This on-vehicle inspection must always be performed to insure that the power steering system is working prorely after overhauling or repairing the pump or gear housing

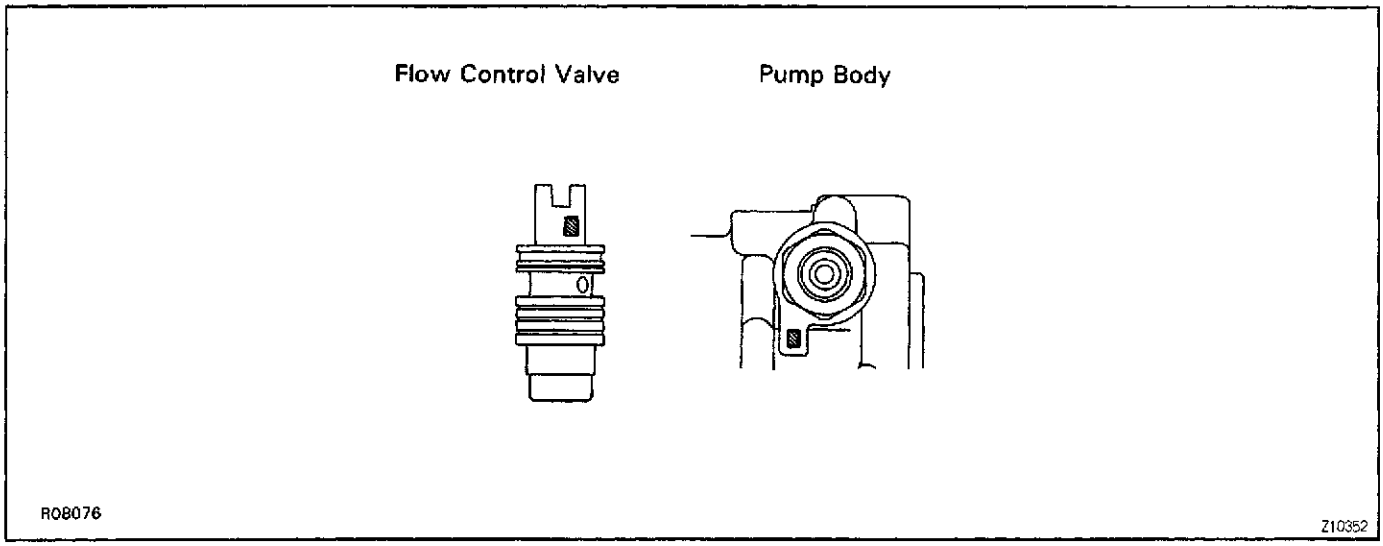


VANE PUMP

The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow control valve are high precision parts and must be handled carefully Also, because this pump produces a very high fluid pressure, 0-rings are used for sealing each part When reassembling the pump, always use new 0-rings

In the flow control valve, there is a relief valve which controls the maximum pressure of the pump The amount of this maximum pressure is very important, if it is too low, there will be insufficient power steering assist and if too high, it will have an adverse effect on the pressure hoses, oil seals, etc If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly

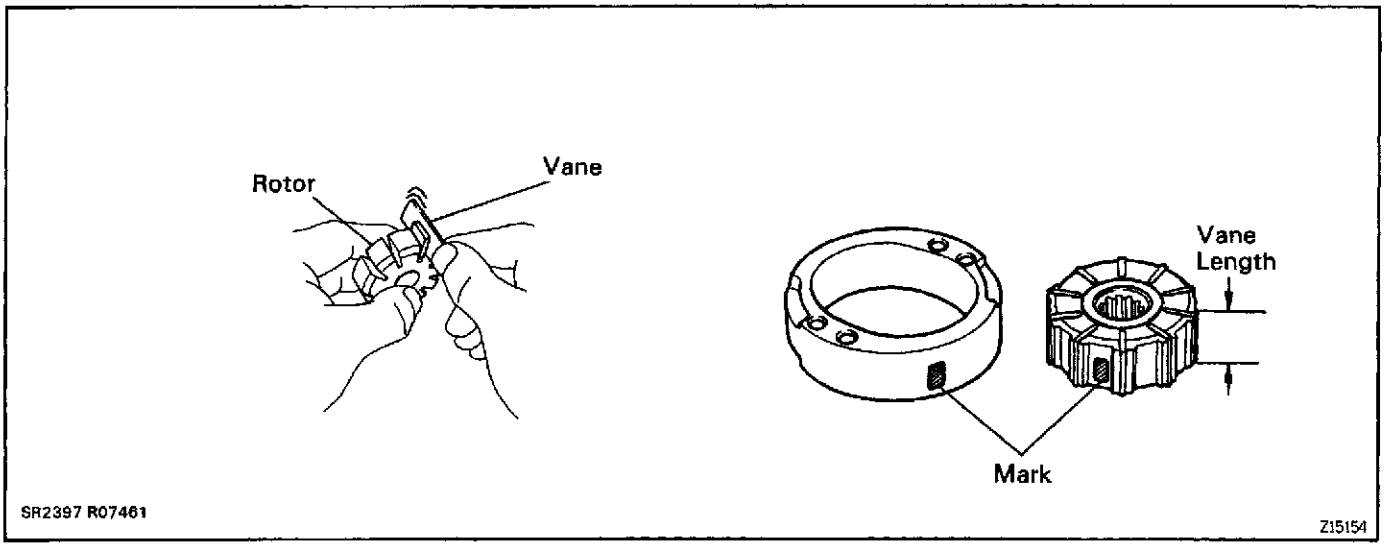
The clearance between the flow control valve and pump body installation hole is very important When replacing the flow control valve, be sure to do so with one having the same make in order to insure the proper clearance



The functional parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked to wear If the clearance between each is not within standard when reassembling, any worn parts should be replaced

In this case, the replaced cam ring and rotor should be of the same length (have the same mark),

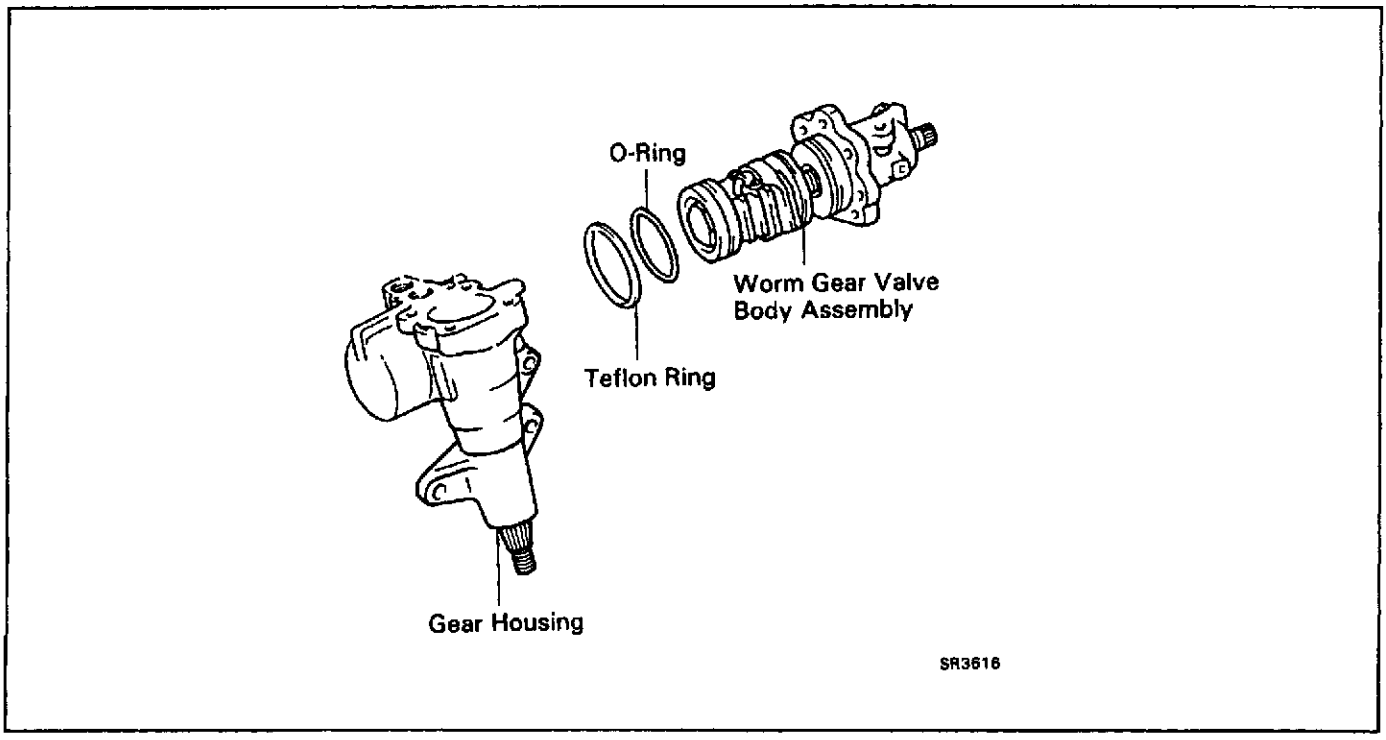
and the vanes should be replaced with those having a length corresponding to that mark, otherwise the proper thrust clearance cannot be obtained If there is too much thrust clearance, there will be insufficient fluid pressure at low speeds If there is too little thrust clearance, it may result in seizure of the vanes



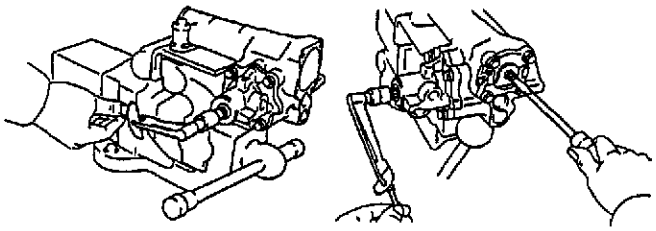
GEAR HOUSING

Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system

Teflon rings are used for the cross shaft, piston and control valve These teflon rings are highly durable against wear, but if it is necessary to replace them, be careful not so stretch the new ones After installing a teflon ring into its groove, snug it down into the groove before assembly of the cylinder or housing to prevent possible damage



As with the recirculating ball type steering, preload is very important If the preload is not correct, it could result in such trouble as steering wheel play or durability of worm gear valve body assembly, so always make or check sure that it is correct



Check the worm gear preload SR2455

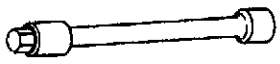
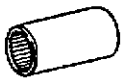
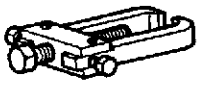
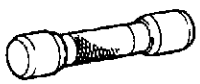
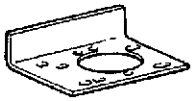
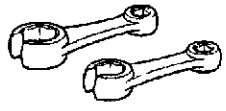
Adjust total preload SR2456

Z02318

PREPARATION

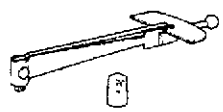
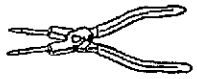
SST (SPECIAL SERVICE TOOLS)

SR0D8-01

	09043-38100 Hexagon 10 mm Wrench	
	09610-55012 Pitman Arm Puller	
	09611-22012 Tie Rod End Puller	
	09616-00010 Steering Worm Bearing Adjusting Socket	
	09628-62011 Ball Joint Puller	
           	09630-00012 Power Steering Gear Housing Overhaul Tool Set (09631 - 00020) Handle (09631 - 00050) No 3 Wrench (09631-00070) Bearing Remover & Replacer (09631-00090) Replacer (09631-00120) Teflon Ring Former (09631-00140) Overhaul Stand	
	09631 -22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	

RECOMMENDED TOOLS

SR0DC-01

	09025-00010 Small Torque Wrench	For measuring preload
	09905-00013 Snap Ring Pliers	

EQUIPMENT

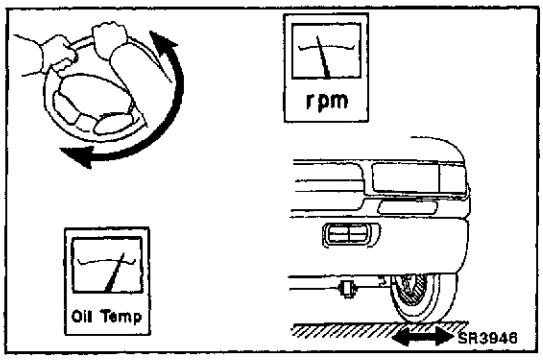
SR0DD-01

Belt tension gauge	
Calipers	
Dial indicator	
Micrometer	
Oil pressure gauge	
Torque wrench	
Vacuum gauge	

SR015-04

LUBRICANT

Item	Capacity	Classification
Power steering fluid Total	0.75 liters (0.20 US qts, 0.17 Imp qts)	ATF DEXRON ®II



ON-VEHICLE INSPECTION

9R0DF-02

FLUID LEVEL CHECK

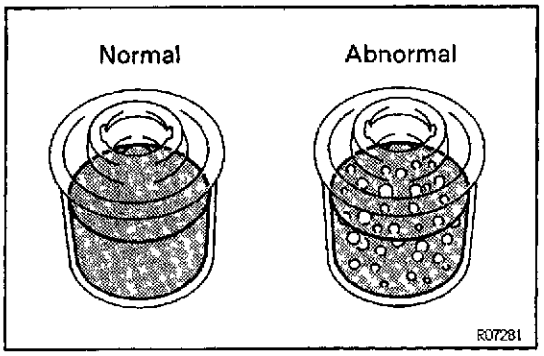
1. KEEP VEHICLE LEVEL

2. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 RPM or less, turn the steering wheel from lock to lock several times to boost fluid temperature

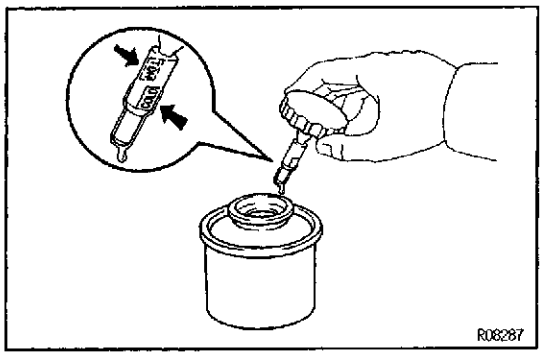
Fluid temperature:

80°C (176°F)



3. CHECK FOR FOAMING OR EMULSIFICATION

HINT Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low



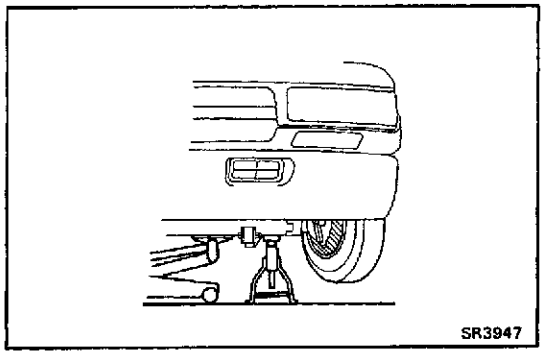
4. CHECK FLUID LEVEL IN OIL RESERVOIR

Check the fluid level and add fluid if necessary

Fluid

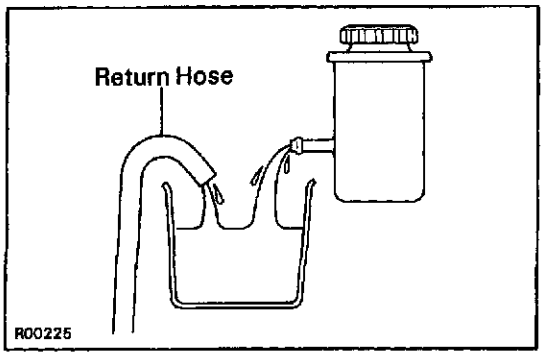
ATF DEXRON® II

HINT Check that the fluid level is within the HOT LEVEL of the dipstick of the reservoir cap If the fluid is cold, check that it is within the COLD LEVEL of the dipstick

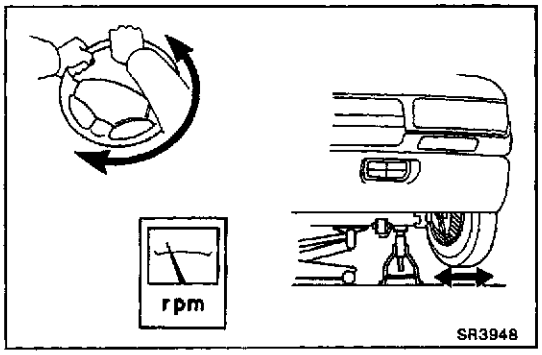


POWER STEERING FLUID REPLACEMENT

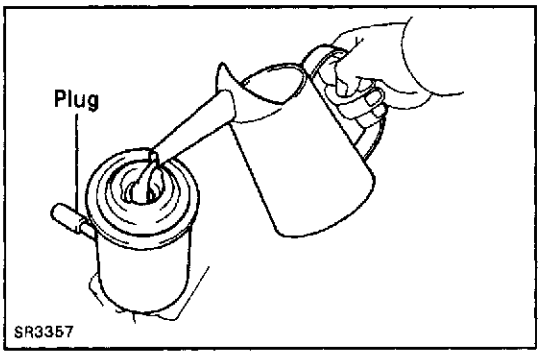
1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS



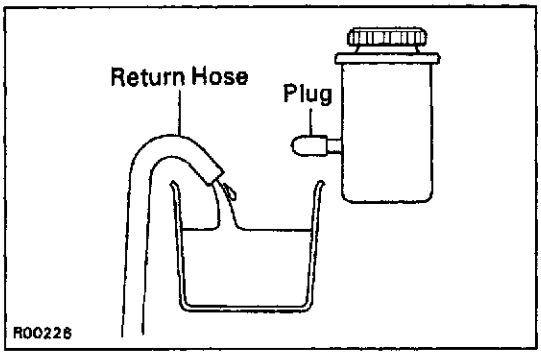
2. REMOVE FLUID RETURN HOSE FROM OIL RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER



3. TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID



4. FILL OIL RESERVOIR TANK WITH FRESH FLUID
Fluid:
ATF DEXRON®II



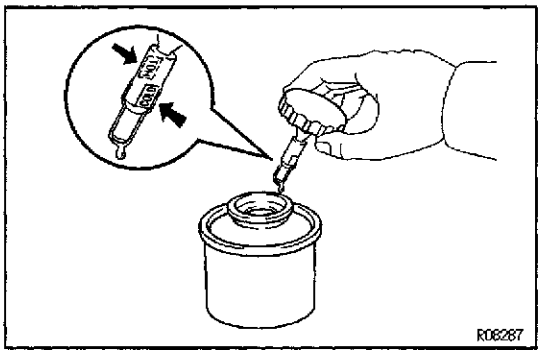
5. START ENGINE AND RUN IT AT 1,000 RPM
After 1 or 2 seconds, fluid will begin to discharge from the return hose Stop the engine immediately at this time

NOTICE: Take care that some fluid remains left in the oil reservoir.

6. REPEAT STEPS 4 AND 5 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

7. CONNECT RETURN HOSE TO OIL RESERVOIR

8. BLEED POWER STEERING SYSTEM
(SEE PAGE SR-24)



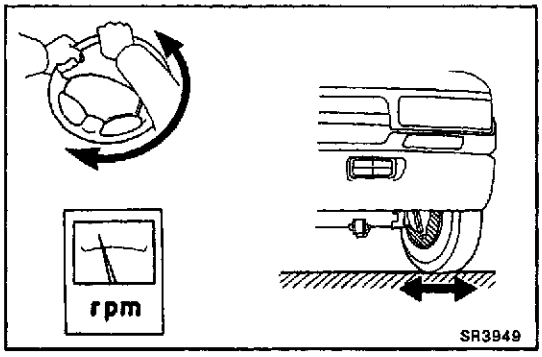
SR00H-02

POWER STEERING SYSTEM BLEEDING

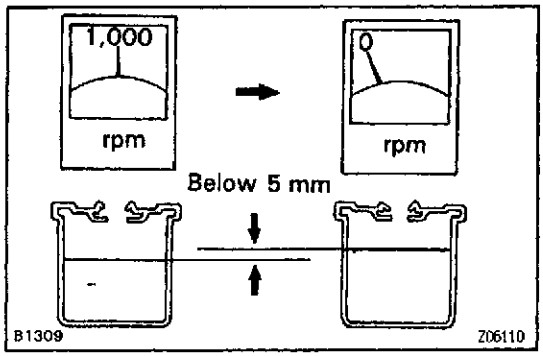
1. CHECK FLUID LEVEL IN OIL RESERVOIR
Check the fluid level and add fluid if necessary
Fluid

ATF DEXRON®II

HINT Check that the fluid level is within the HOT LEVEL of the dipstick of the reservoir cap If the fluid is cold, check that it is within the COLD LEVEL of the dipstick



2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK 3 OR 4 TIMES
With the engine speed below 1,000 RPM, turn the steering wheel to left or right full lock and keep it there for 2 - 3 seconds, then turn the wheel to the opposide full lock and keep it there for 2 - 3 seconds



3. CHECK THAT FLUID IN OIL RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

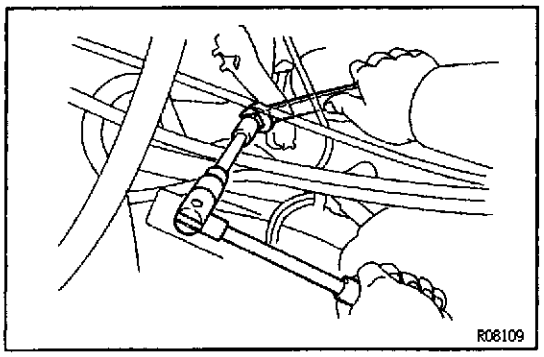
Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

Maximum rise:

5 mm (0.20 in.)

If a problem is found, repeat steps 4 and 5 on page SR-24. Repair the PS if the problem persists.

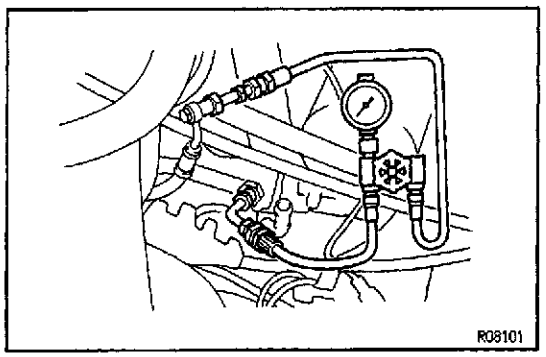
OIL PRESSURE CHECK



1. CONNECT OIL PRESSURE GAUGE

(a) Drain fluid.

(b) Disconnect the pressure line joint.

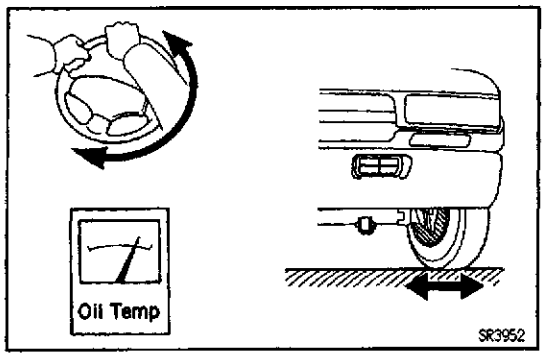


(c) Connect the gauge side of the pressure gauge to the PS pump side and the valve side to the pressure line side.

NOTICE: Check that the valve of the gauge is in the open position.

2. BLEED POWER STEERING SYSTEM

(See page SR-24)



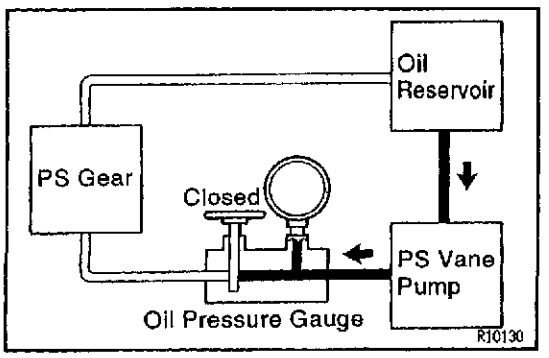
3. START ENGINE AND RUN IT AT IDLE

4. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature:

80° C (176 ° F)



5. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the pressure gauge valve and observe the reading on the gauge.

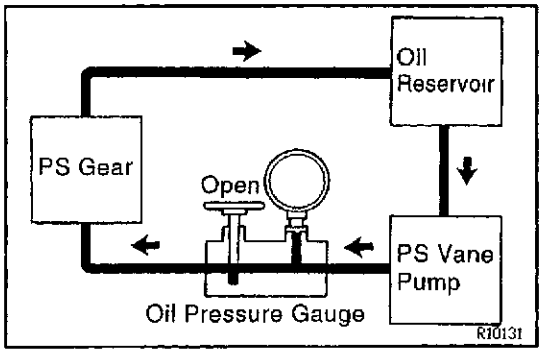
Minimum pressure:

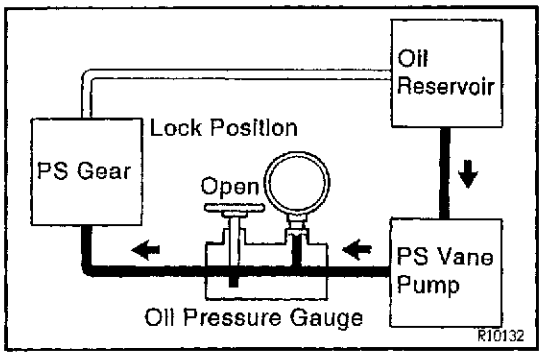
9,316 kPa (95 kgf/cmt, 1,351 psi)

NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, repair or replace the PS pump.





6. OPEN VALVE FULLY

7. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

8. CHECK AND RECORD PRESSURE READING AT 3,000 RPM

Check that the pressure difference between the 1,000 rpm and 3,000 rpm checks is less than 490 kPa (5 kgf/cm2, 71 psi) If the difference is excessive, repair or replace the flow control valve of the PS pump

NOTICE: Do not poerate the steering wheel.

9. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling

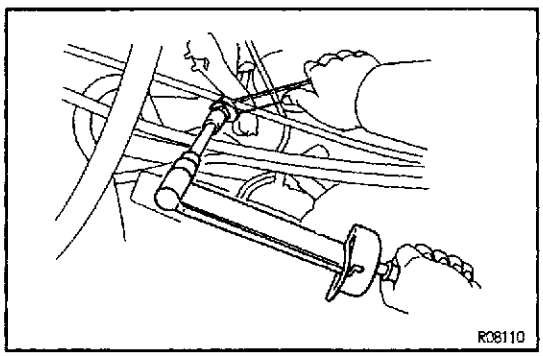
Minimum pressure:

9,316 kPa (95 k9f/cmt, 1,351 psi)

NOTICE:

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, the gear housing has an internal leak and must be repaired or replaced



10. DISCONNECT OIL PRESSURE GAUGE

(a) Drain fluid

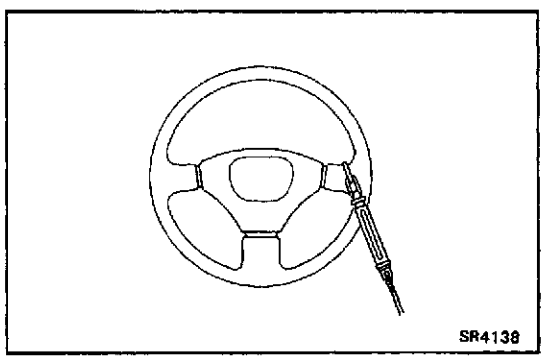
(b) Disconnect the gauge

(c) Connect the pressure line joint

Torque: 56 N-m (575 kgf-cm, 42 ft-lbf)

11. BLEED POWER STEERING SYSTEM

(SEE PAGE SR-24)



12. MEASURE STEERING EFFORT

(a) Center the steering wheel and run the engine at idle

(b) Using a spring scale, measure the steering effort in both directions

Maximum steering effort:

39 N (4.4 k8f, 8.8 lbf)

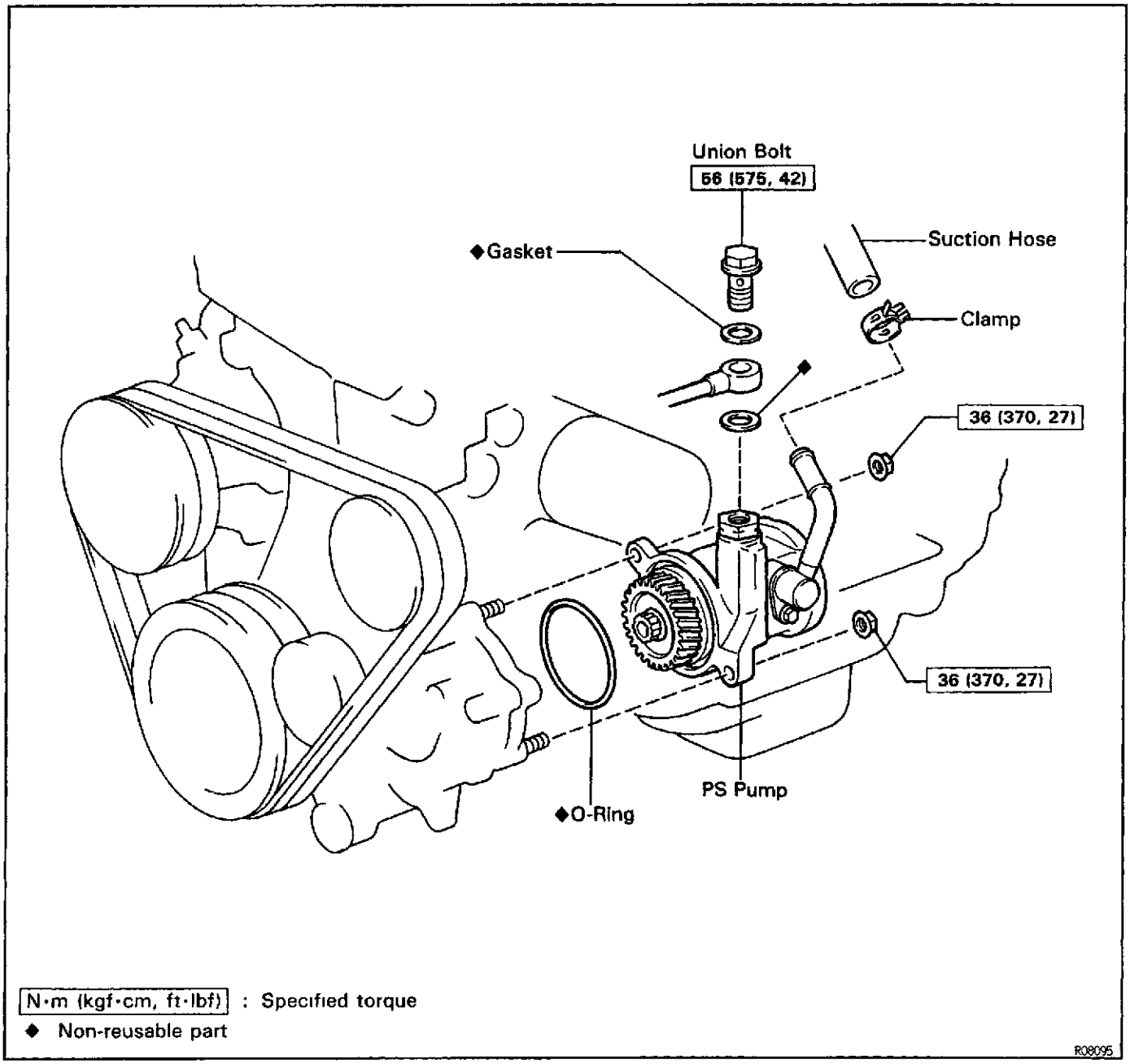
If steering effort is excessive, repair the power steering unit

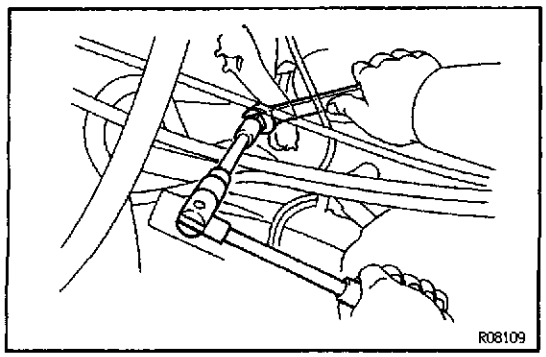
HINT Be sure to consider tire type, pressure and contact surface before making your diagnosis

POWER STEERING PUMP

POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown





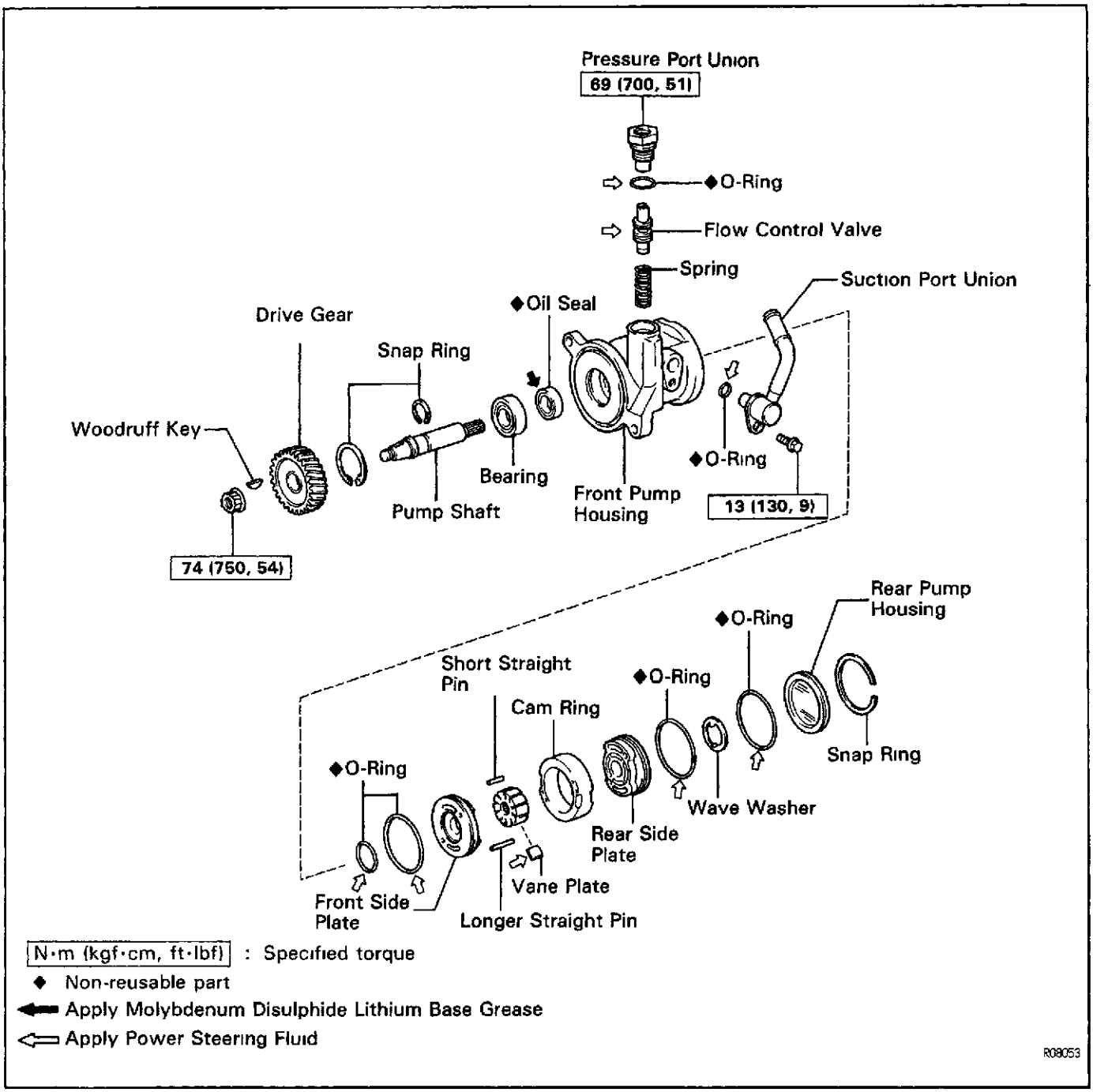
MAIN POINT OF REMOVAL AND INSTALLATION

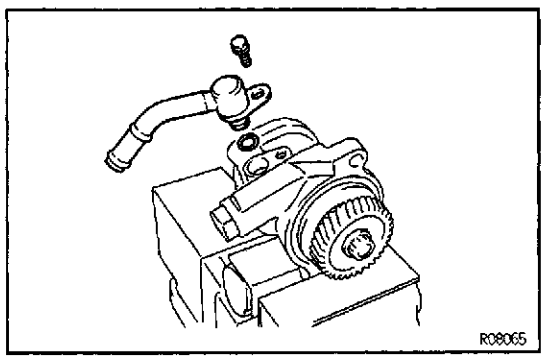
1. DISCONNECT AND CONNECT PRESSURE TUBE

(a) Disconnect and connect pressure tube from/to the PS pump

Torque: 56 N-m (575 kgf-cm, 42 ft-lbf)

COMPONENTS





POWER STEERING PUMP DISASSEMBLY

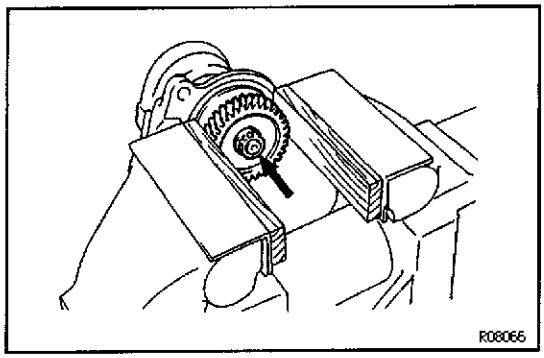
1. CLAMP PS PUMP IN VISE

NOTICE: Do not tighten the vise too tight.

2. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union

(b) Remove the O-ring from the suction port union



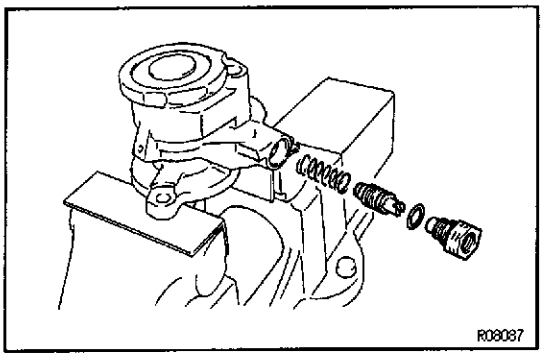
3. REMOVE DRIVE GEAR

(a) Using soft jaws on a vise clamp the gear in the vise

NOTICE: Do not tighten the vise too tight.

(b) Remove the gear lock nut

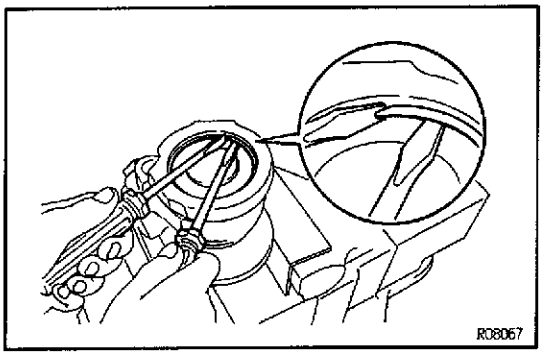
(c) Remove the drive gear and woodruff key



4. REMOVE PRESSURE PORT UNION, SPRING AND FLOW CONTROL VALVE

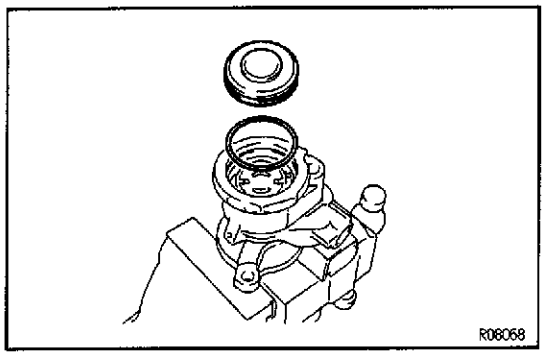
(a) Remove the pressure port union, spring and flow control valve

(b) Remove the O-ring from the pressure port union



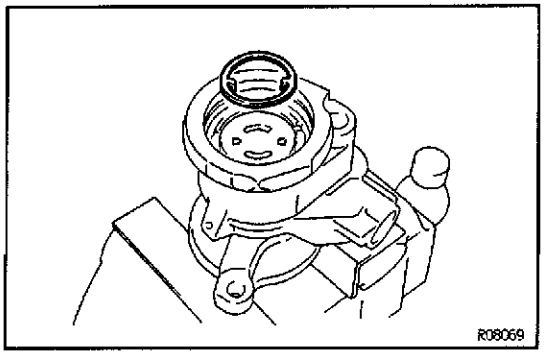
5. REMOVE REAR PUMP HOUSING

(a) Using 2 screwdrivers, remove the snap ring

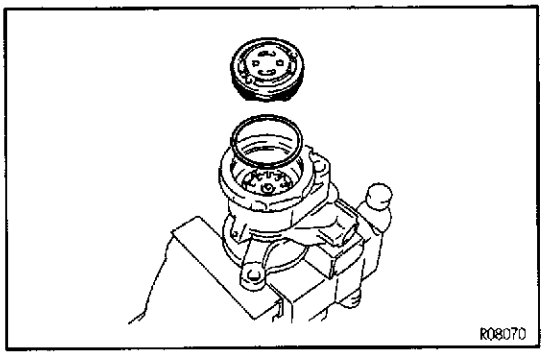


(b) Remove the rear pump housing

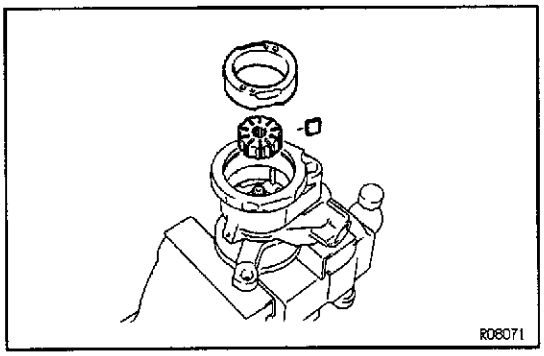
(c) Remove the O-ring from the rear pump housing



(d) Remove the wave washer from the rear side plate

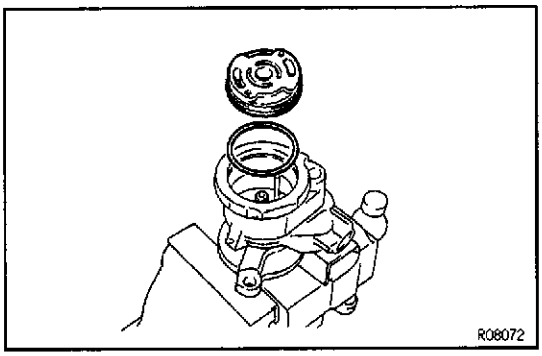


(e) Remove the rear side plate
(f) Remove the O-ring from the rear side plate



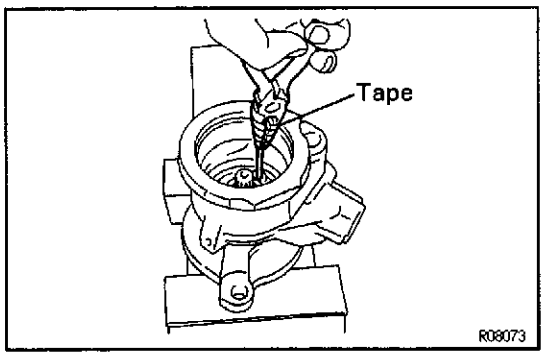
6. REMOVE CAM RING, ROTOR AND VANE PLATES

NOTICE: Be careful not to scratch the cam ring, rotor or vane plates.



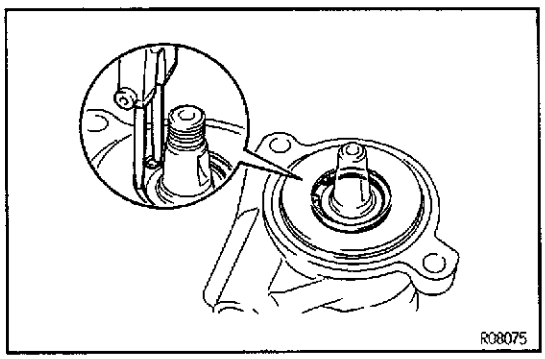
7. REMOVE FRONT SIDE PLATE

(a) Remove the front side plate
(b) Remove the 0-ring from the front side plate



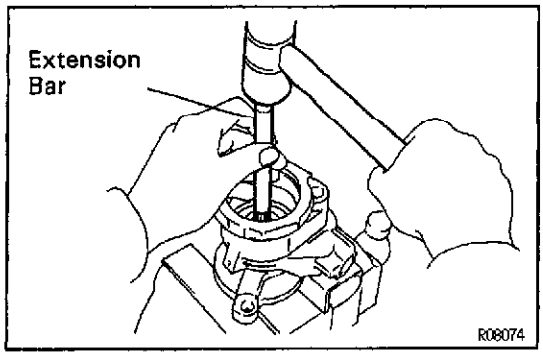
8. REMOVE STRAIGHT PIN

Using needle-nose pliers, remove longer straight pin
HINT Tape the needle-nose pliers tip before use



9. REMOVE PUMP SHAFT

(a) Using snap ring pliers, remove the sanp ring



(b) Using a brass bar and hammer, tap out the pump shaft from the front pump housing

POWER STEERING PUMP INSPECTION AND REPLACEMENT

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, measure the oil clearance

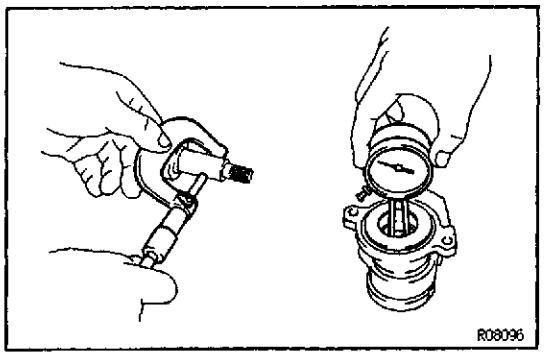
Standard clearance:

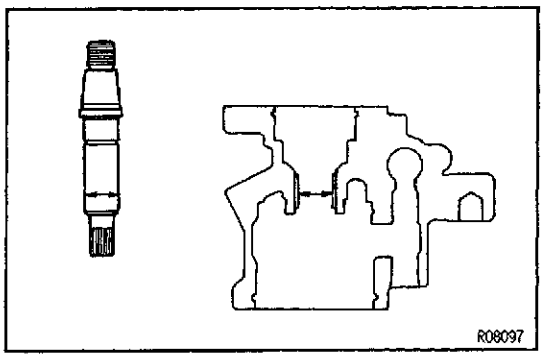
0.03-0.05 mm (0.0012-0.0020 in.)

Maximum clearance:

0.07 mm (0.0028 in.)

If more than maximum, replace the entire power steering pump





2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plates

Minimum hight:

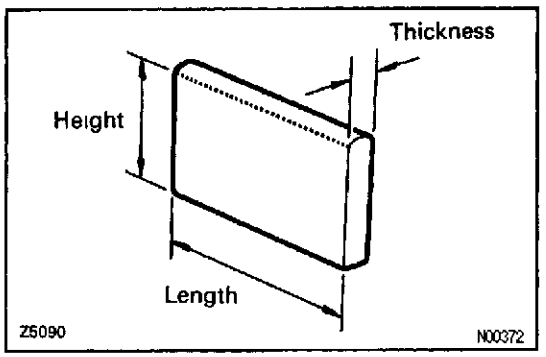
8.6 mm (0.339 in.)

Minimum thickness:

1.397 mm (0.055 in.)

Minimum length:

14.991 mm (0.590 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate

Maximum clearance:

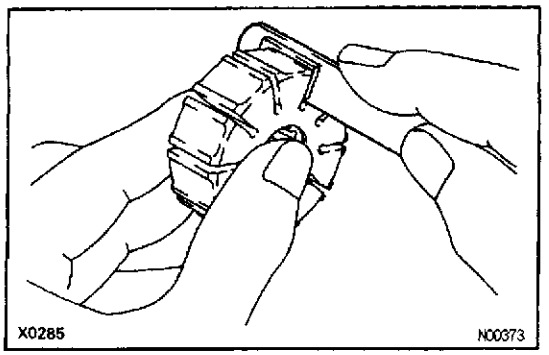
0.033 mm (0.0013 in.)

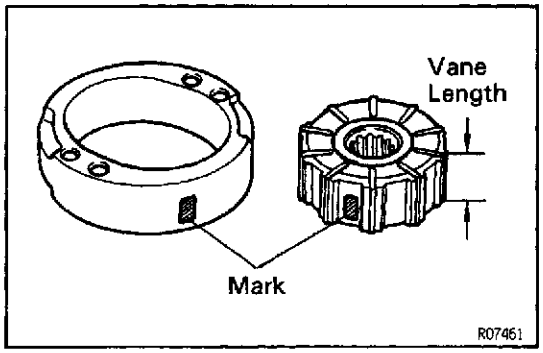
If more than maximum, replace the plate and/or rotor with one having the mark equivalent to the mark stamped on the cam ring

Inscribed mark:

Vane pump rotor: 1, 2 or None

Cam ring: 2, 3 or 4

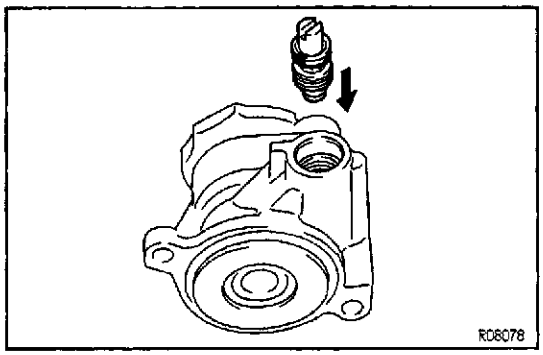




HINT: There are 3 vane lengths for the following rotor and cam ring marks

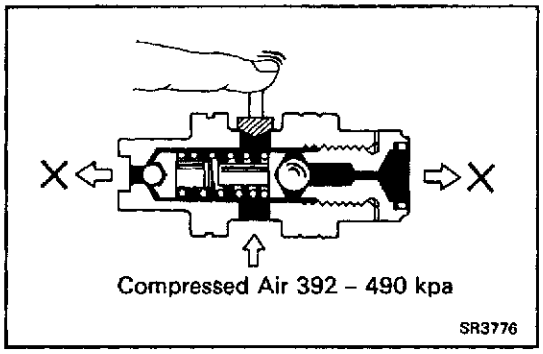
Rotor mark	Cam Ring Mark	Vane length mm (in)
None	2	14.995 - 14.997 (0.59035 - 0.59043)
1	3	14.993 - 14.995 (0.59027 - 0.59035)
2	4	14.991 - 14.993 (0.59020 - 0.59027)

V06457

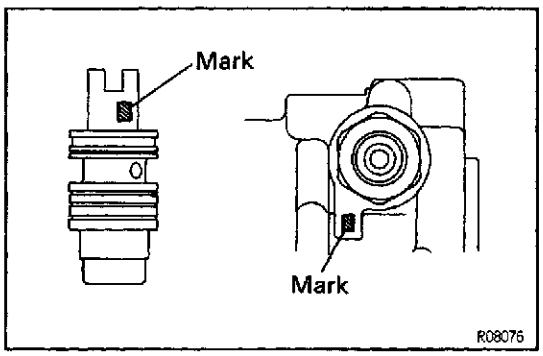


3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight



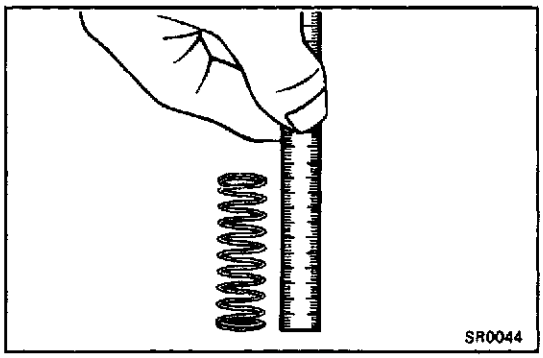
(b) Check the flow control valve for leakage. Close one of the holes and apply compressed air [392-490 kPa (4 -5 kgf/cm, 57-71 psi)] into the opposite side, and confirm that air does not come out from the end hole



If necessary, replace the valve with one having the same letter as inscribed on the front housing

Inscribed mark:

A, B, C, D, E or F



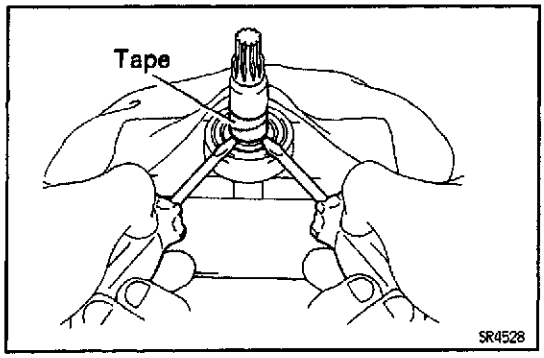
4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring

Spring length:

35-37 mm (1.38-1.46 in.)

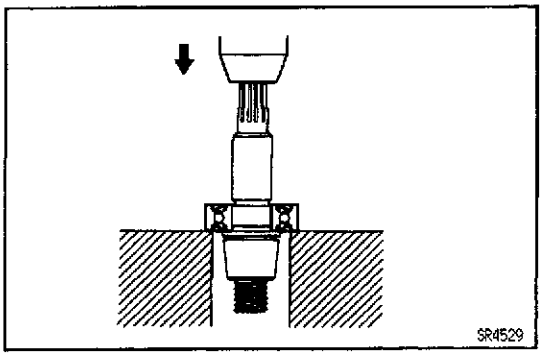
If not within specification, replace the spring



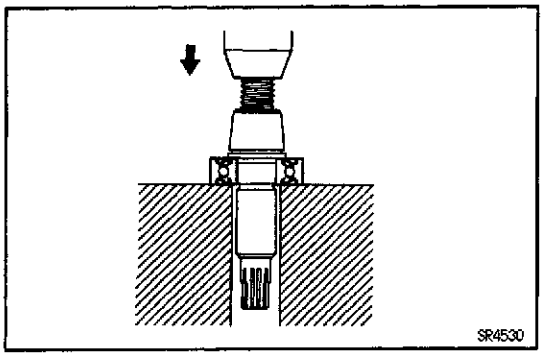
5. IF NECESSARY, REPLACE BEARING

(a) Using 2 screwdrivers, remove the snap ring

NOTICE: To prevent pump shaft damage, wind tape on the pump shaft.



(b) Using a press, press out the bearing



(c) Using a press, press in a new bearing

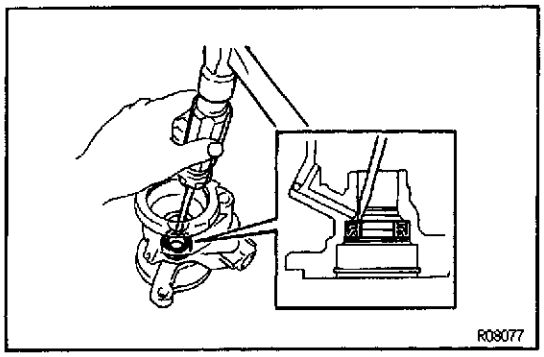
NOTICE: Be careful not to scratch the rotor shaft contact surface with oil seal.

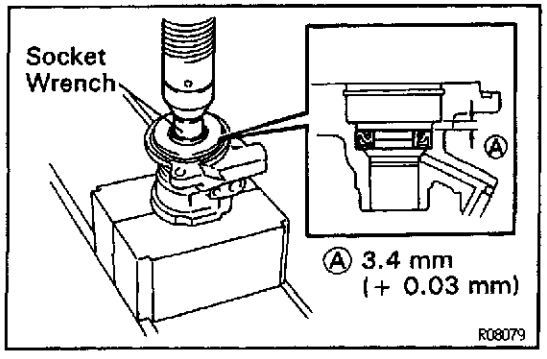
(d) Install the snap ring

6. IF NESCESSARY, REPLACE OIL SEAL

(a) Using a screwdriver and hammer, remove the oil seal

NOTICE: Be careful not to scratch the housing with the screwdriver.

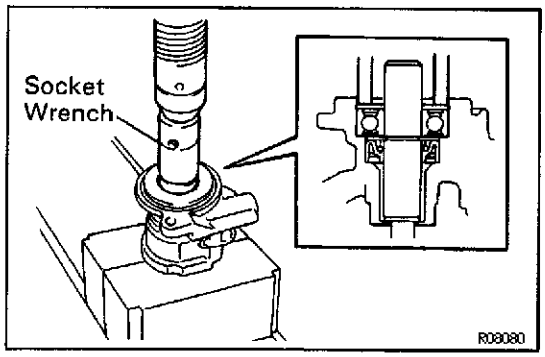




(b) Apply power steering fluid to the lip and outside of a new oil seal

(c) Using a socket wrench (23 mm) and a press, press in the oil seal to the front housing

NOTICE: Be careful not to scratch the frictional surface of the front housing.



POWER STEERING PUMP ASSEMBLY 3R0MF-01

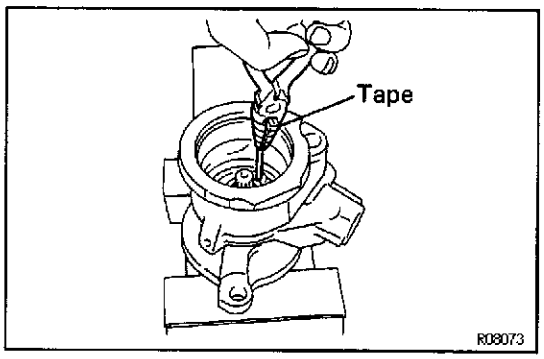
1. COAT POWER STEERING FLUID ON EACH PART

2. INSTALL PUMP SHAFT WITH BEARING

(a) Using socket wrench (29 mm) and a press, press in the pump shaft to the front housing

NOTICE: Be careful not to scratch the oil seal lip and the rotor frictional surface.

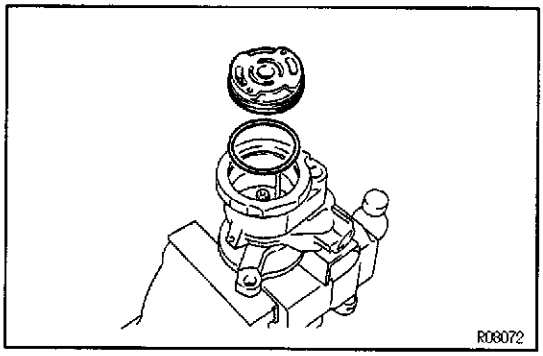
(b) Using snap ring pliers, install the snap ring



3. INSTALL STRAIGHT PIN

Using needle-nose pliers, install the longer straight pin

HINT Tape the needle-nose pliers tip before use

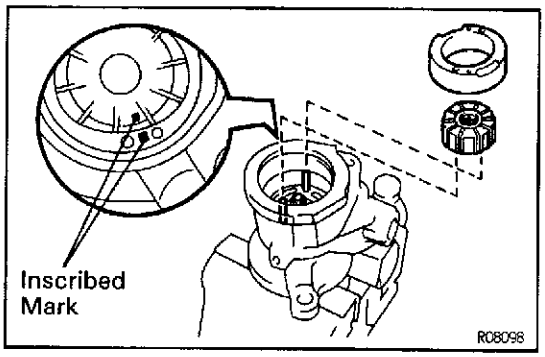


4. INSTALL FRONT SIDE PLATE

(a) Coat a new O-ring with power steering fluid

(b) Install the O-ring to the front side plate

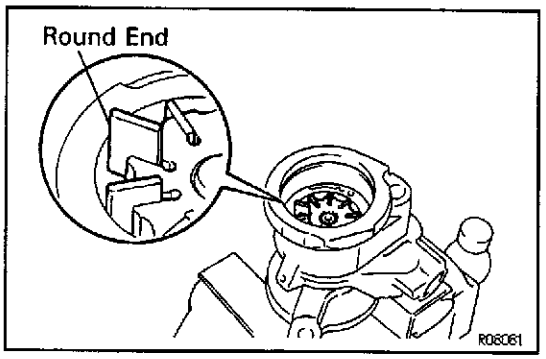
(c) Align the hole of the front side plate and longer straight pin



5. INSTALL CAM RING AND PUMP ROTOR

(a) Install the short straight pin to the front housing

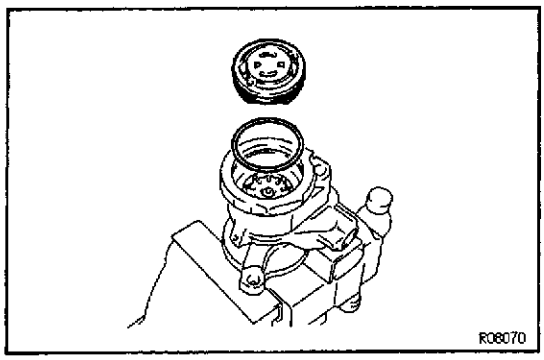
(b) Install the cam ring and rotor with the inscribed mark facing upper side



6. INSTALL VANE PLATES

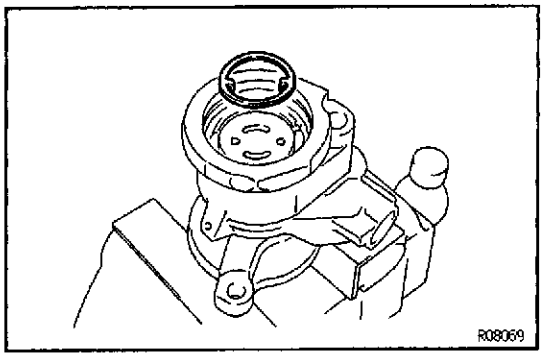
(a) Coat the 10 vane plates with the power steering fluid

(b) Install the 10 vane plates with the round end facing outward



7. INSTALL REAR SIDE PLATE

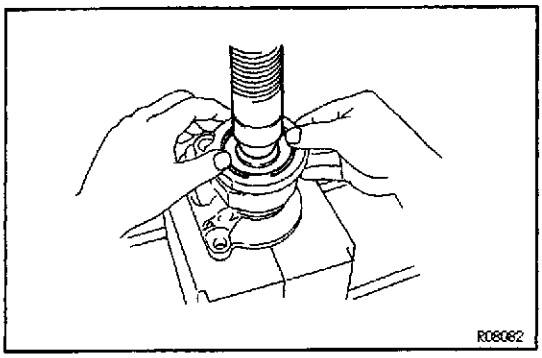
(a) Coat a new O-ring with power steering fluid
(b) Install the 0-ring to the rear side plate
(c) Align the holes of the rear plate with the pins, and install the rear side plate



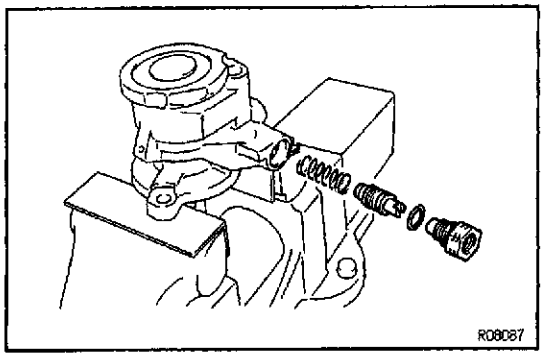
8. INSTALL REAR HOUSING

(a) Install the wave washer on the rear side plate

NOTICE: When installing the wave washer, verify that the 2 protrusions on it mate with the grooves in the rear plate



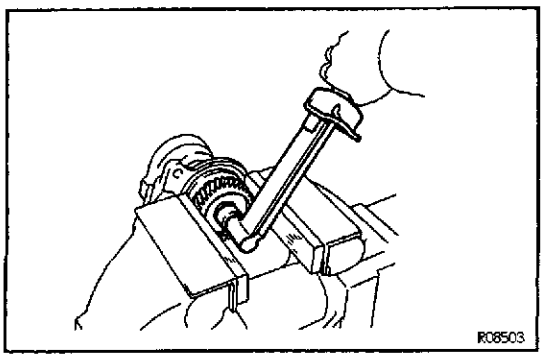
(b) Install the rear housing, using a press, apply just enough pressure to compress the wave wahsher, and install a snap ring



9. INSTALL FLOW CONTROL VALVE, SPRING AND PRESSURE PORT UNION

(a) Coat a new O-ring with power steering fluid
(b) Install the O-ring to the pressure port union
(c) Install the flow control valve and the spring
(d) Install the pressure port union

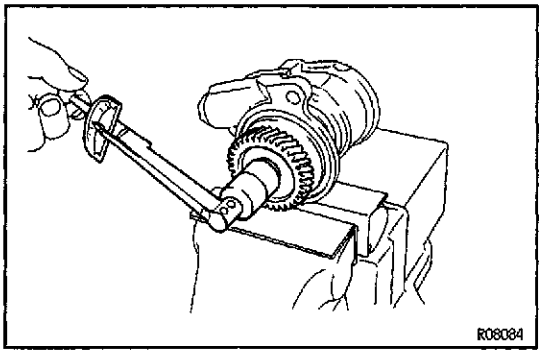
Torque: 69 N-m (700 kgf-cm, 51 ft-lbf)



10. INSTALL DRIVE GEAR

(a) Using soft jaws on a vise, clamp the gear in the vise
(b) Torque the drive gear set bolt

Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



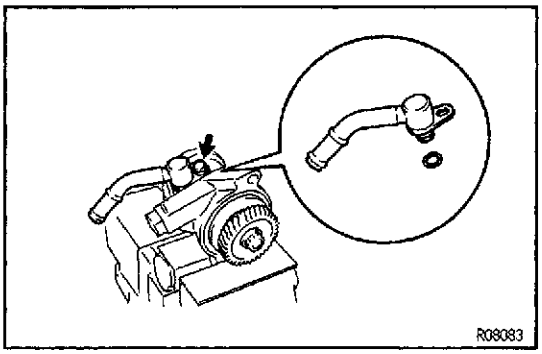
11. CHECK ROTOR SHAFT ROTATION CONDITION

(a) Check that the rotor shaft rotates smoothly without abnormal noise

(b) Temporarily install the bolt and check the rotating torque

Rotation torque:

0.3 N-m (2.8 kgf-cm, 2.4 in.¿lbf)



12. INSTALL SUCTION PORT UNION

(a) Coat a new 0-ring with power steering fluid

(b) Install the O-ring in the suction port union

(c) Push in the union, install and torque the bolt

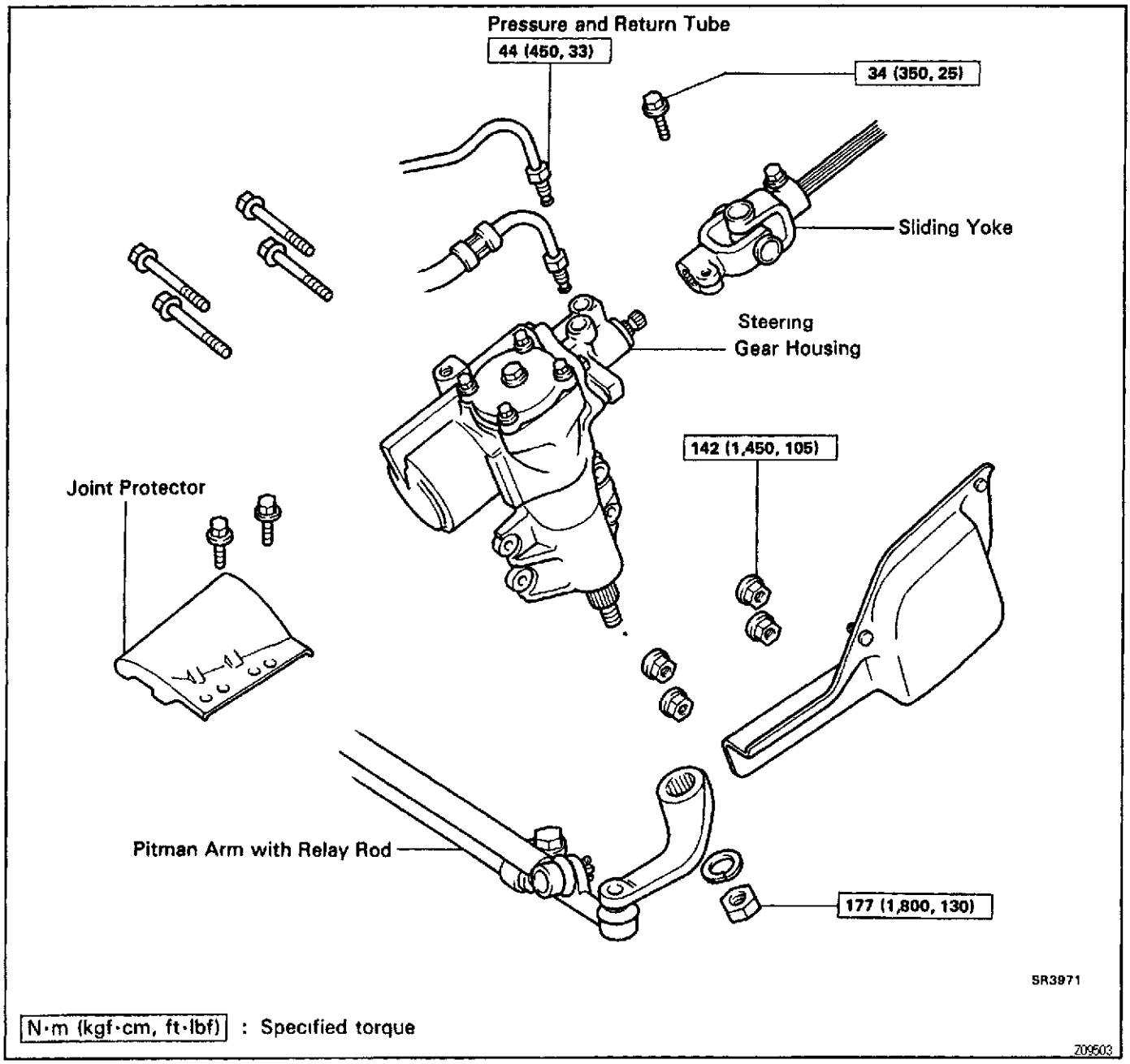
Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

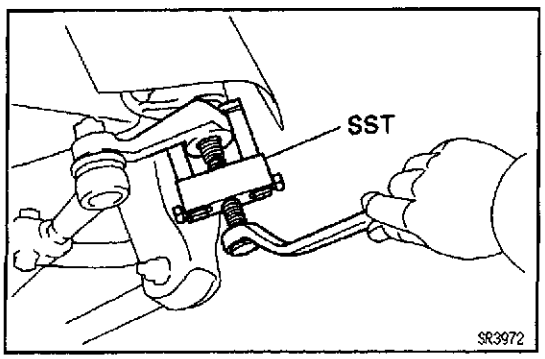
GEAR HOUSING

GEAR HOUSING REMOVAL AND INSTALLATION

SR0DG-02

Remove and install the parts, as shown





MAIN POINT REMOVAL AND INSTALLATION

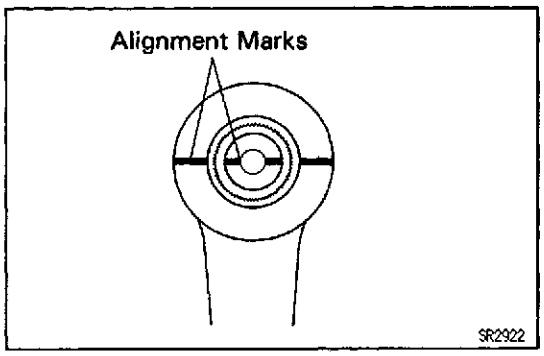
1. DISCONNECT PITMAN ARM

(a) Remove the pitman arm nut

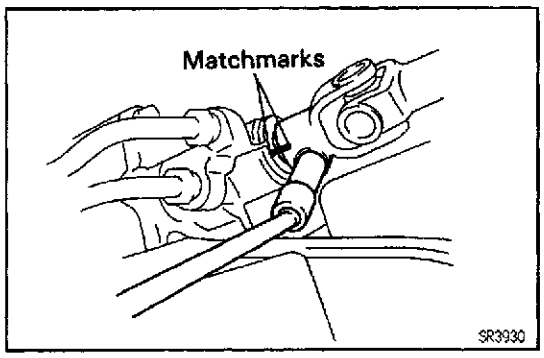
(b) Using SST, disconnect the pitman arm from the cross shaft

SST 09628-62011

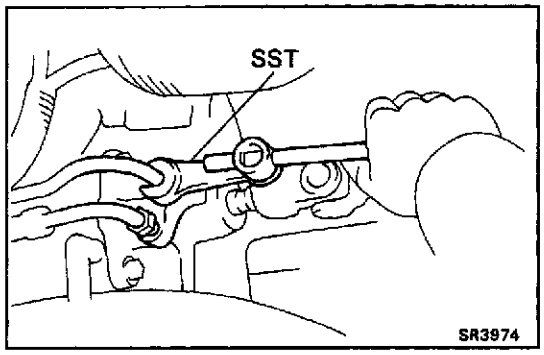
(c) Remove the nut, spring washer and arm



(d) When connecting the pitman arm, align alignment marks on the pitman arm and cross shaft, and install the spring washer and nut
Torque: 177 N-m (1,800 kgf-cm, 130 ft-lbf)



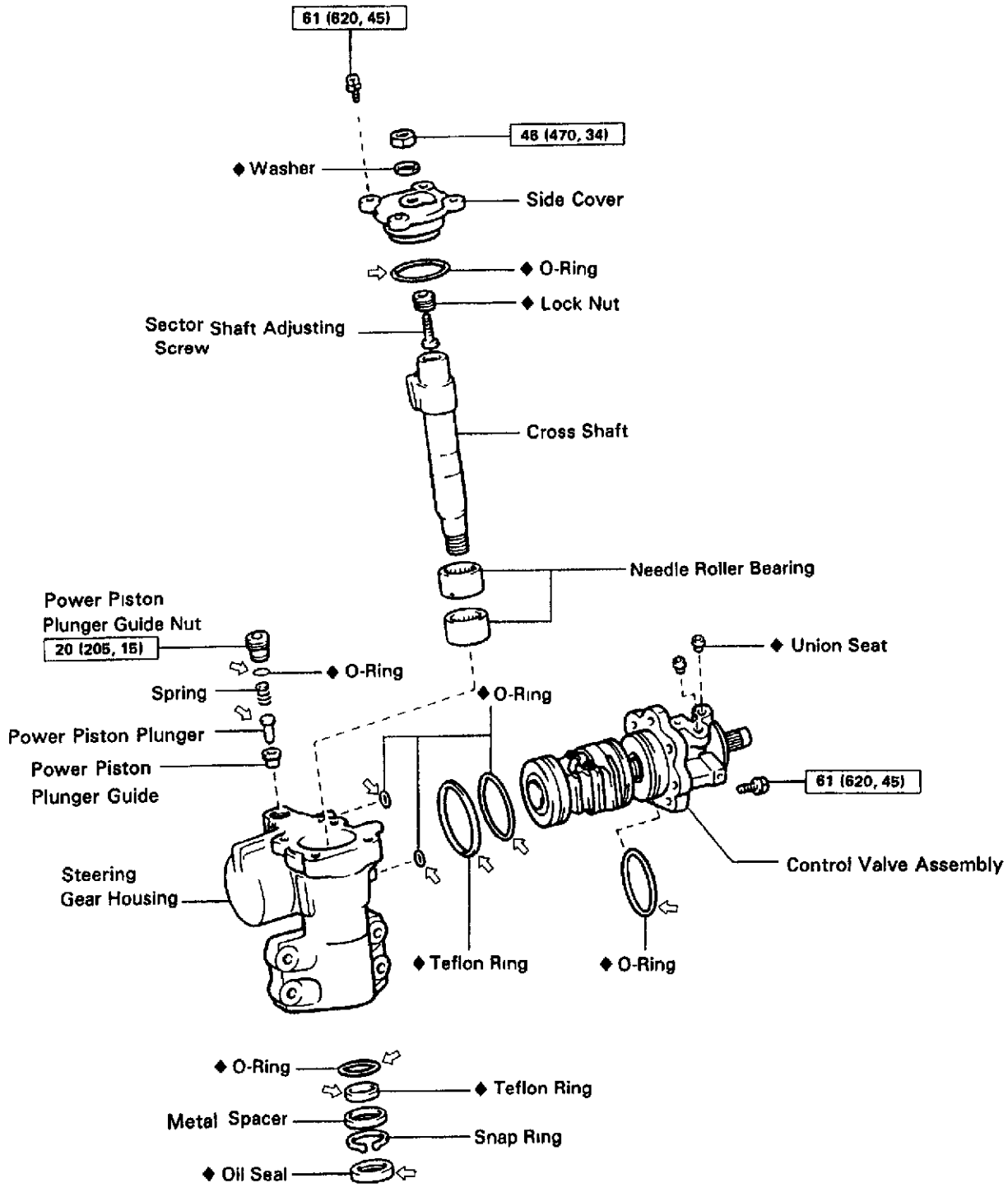
2. DISCONNECT SLIDING YOKE FROM GEAR HOUSING
(a) Place matchmarks on the worm shaft and universal joint
(b) Loosen the sliding yoke upper bolt
(c) Remove the sliding yole lower bolt
(d) Slide the yoke backward to disconnect the yoke from the control valve shaft



3. DISCONNECT PRESSURE AND RETURN TUBES
Using SST, disconnect the pressure and return tubes from the gear housing
SST 09631 -22022

SR00R-02

COMPONENTS



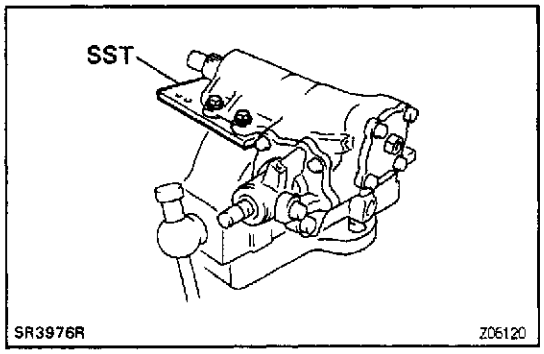
SR3975

N·m (kgf·cm, ft·lbf) Specified torque

◆ *Non-reusable part*

⇦ Apply Power Steering Fluid

Z09504



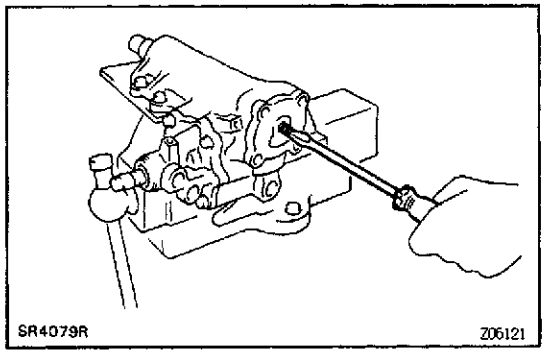
GEAR HOUSING DISASSEMBLY

SR0DS-02

1. MOUNT HOUSING ON STAND

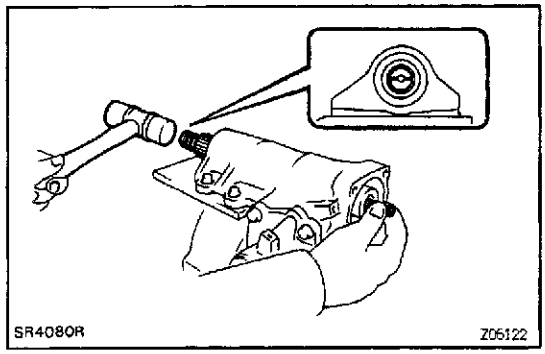
Mount the gear housing on SST and clamp SST in a vise

SST 09630-00012 (09631-00140)



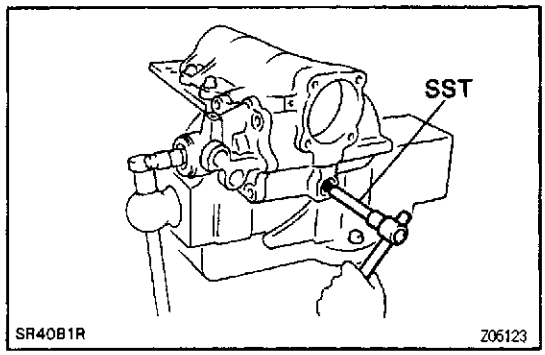
2. REMOVE END COVER

(a) Remove the adjusting screw lock nut
(b) Remove the 4 bolts
(c) Screw in the adjusting screw until the cover comes off



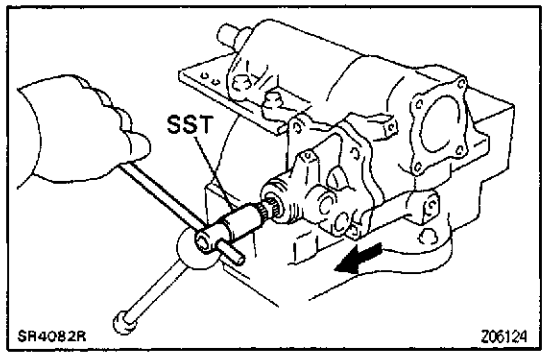
3. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft



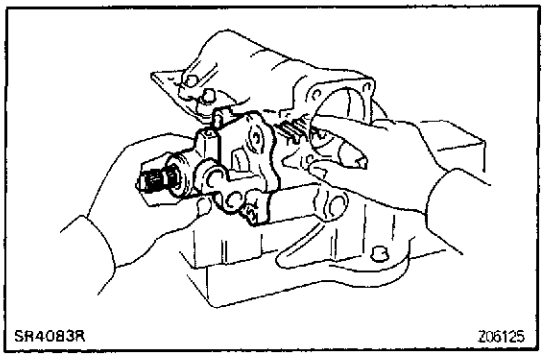
4. REMOVE PLUNGER GUIDE NUT

(a) Using SST, remove the plunger guide nut
SST 09043-38100
(b) Remove the spring, plunger and plunger guide
(c) Remove the O-ring



5. REMOVE WORM GEAR VALVE BODY ASSEMBLY

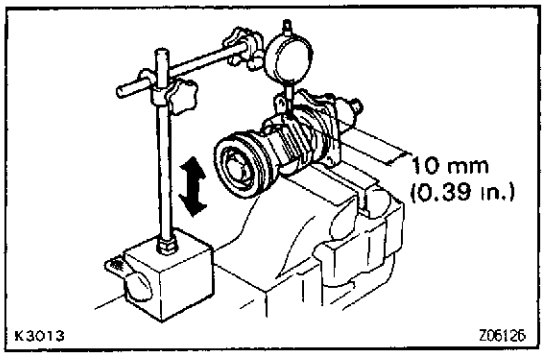
(a) Remove the 4 cap bolts from the housing
(b) Using SST, turn the shaft clockwise to disconnect the worm gear valve body assembly from gear housing
SST 09616-00010



(c) Hold the power piston nut with your thumb so it cannot move, then withdraw the valve body and power piston assembly

NOTICE: Ensure that the power piston nut does not come off the worm shaft.

(d) Remove the O-ring



GEAR HOUSING INSPECTION AND REPLACEMENT

SR0MH-01

1. CHECK BALL CLEARANCE

(a) Mount the control valve housing in a vise

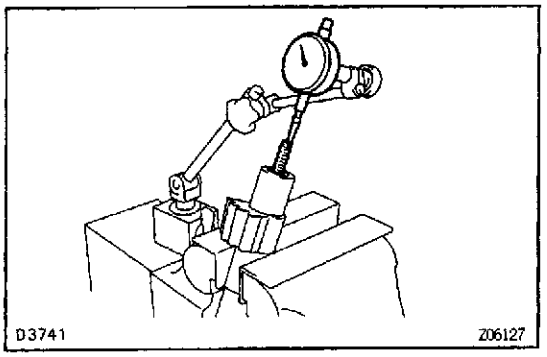
(b) Using a dial indicator, check the ball clearance

Move the worm gear up and down

Maximum ball clearance:

0.15 mm (0.0059 in.)

If clearance is excessive, the control valve assembly must be replaced



2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Clamp the cross shaft in a vise

NOTICE: Do not tighten the vise too tight.

(b) Using a dial indicator, measure the thrust clearance

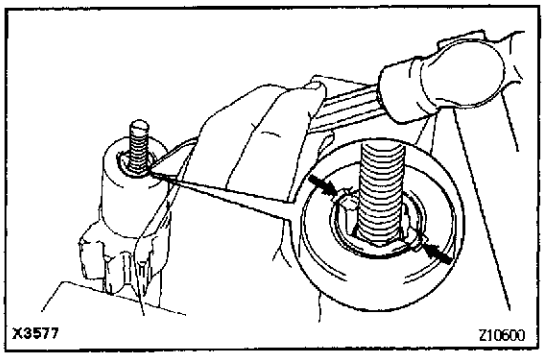
Thrust clearance:

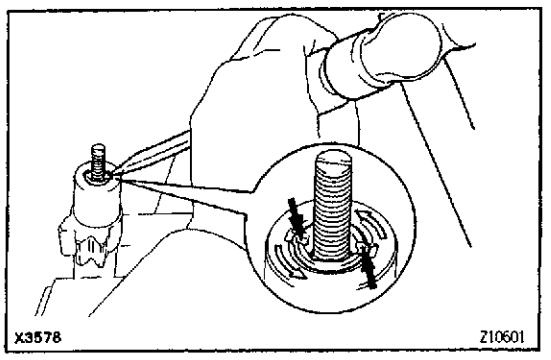
0.03 - 0.05 mm (0.0012 - 0.0020 in.)

If thrust clearance is not correct, adjust the thrust clearance

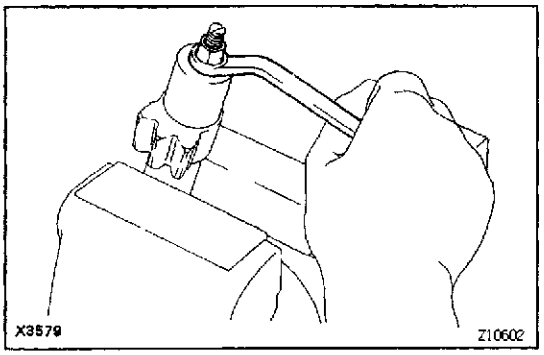
3. IF NECESSARY, ADJUST THRUST CLEARANCE

(a) Using a chisel and hammer, unstake the lock nut

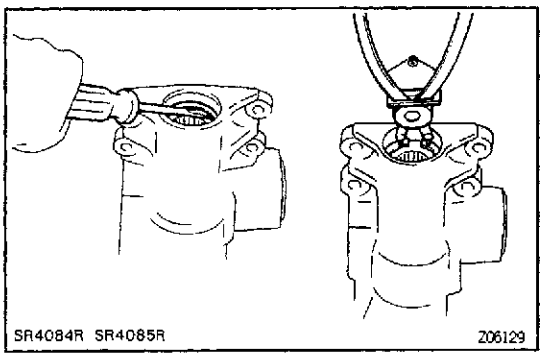




(b) Using a screwdriver, remove the lock nut

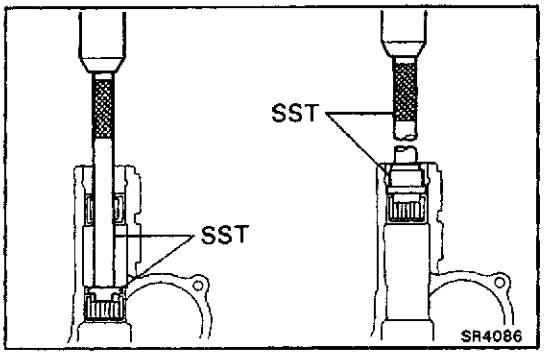


(c) Using a screwdriver, adjust the adjusting screw for correct thrust clearance
(d) Using SST, tighten the lock nut
SST 09630-00012 (09631 -00050)
(e) Stake the lock nut

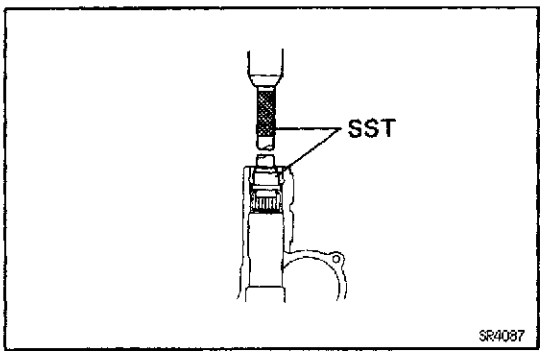


4. IF NECESSARY, REPLACE NEEDLE ROLLER BEARING

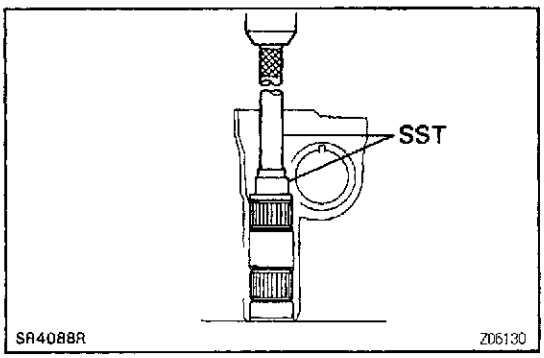
(a) Using a screwdriver, pry out the oil seal
(b) Using snap ring pliers, remove the snap ring
(c) Remove the metal spacer, teflon ring and O-ring



(d) Using SST, press out the upper bearing
SST 09630-00012 (09631 -00020, 09631 -00070)
(e) Using SST, press out the lower bearing
SST 09630-00012 (09631 -00020, 09631 -00090)

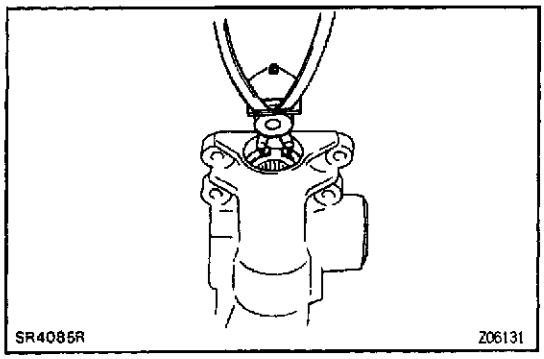


(f) Using SST, press in a new lower bearing
SST 09630-00012 (09631 -00020, 09631 -00090)
HINT Install the lower bearing so that it is positioned 23 1 mm (0 909 in) away from the housing inner end surface

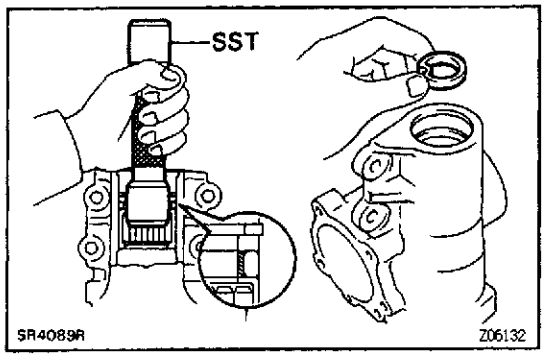


(g) Using SST, press in a new upper bearing
SST 09630-00012 (09631 -00020, 09631 -00090)
HINT The bearing's top end should be installed so that it aligns with the housing end surface

(h) Install a new O-ring and metal spacer



(i) Using snap ring pliers, install a new snap ring

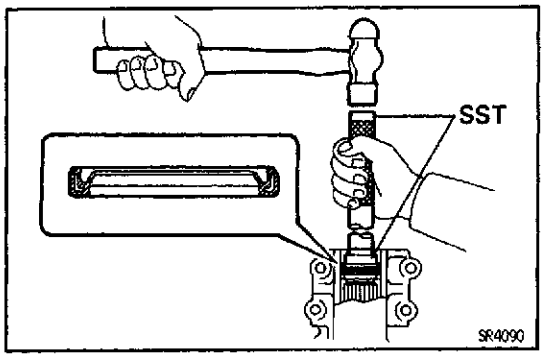


(j) Form a teflon ring into a heart shape and install it with hand

(k) Using SST, form the teflon ring

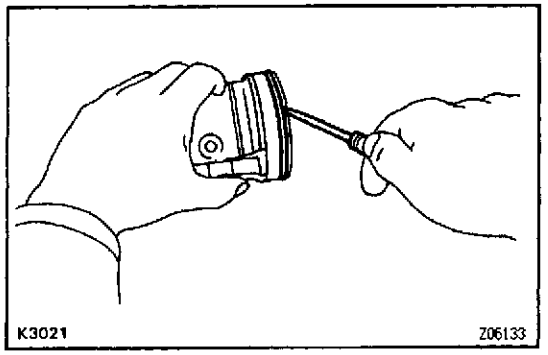
NOTICE: The teflon ring must be squeezed before inserting the cross shaft or damage will result.

SST 09630-00012 (09631 -00120)



(l) Using SST, drive a new oil seal into the gear housing

SST 09630-00012 (09631-00020, 09631-00090)



5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING

(a) Using a screwdriver, remove the teflon ring and O-ring

NOTICE: Be careful not to damage the control valve.

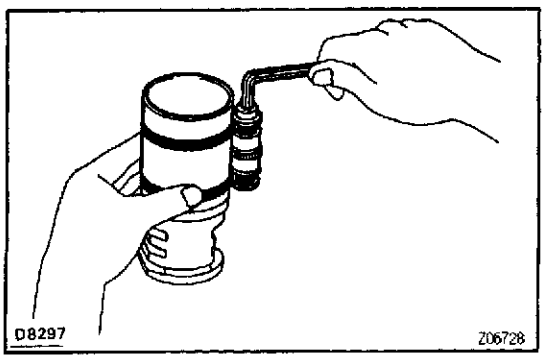
(b) Coat a new O-ring with power steering fluid and install it

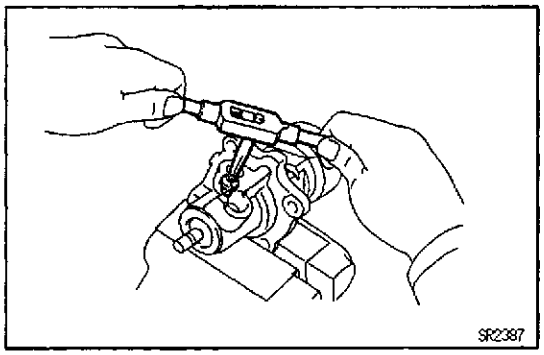
(c) Expand a new teflon ring with your fingers

NOTICE: Be careful not to over-expand the teflon ring.

(d) Install a new teflon ring

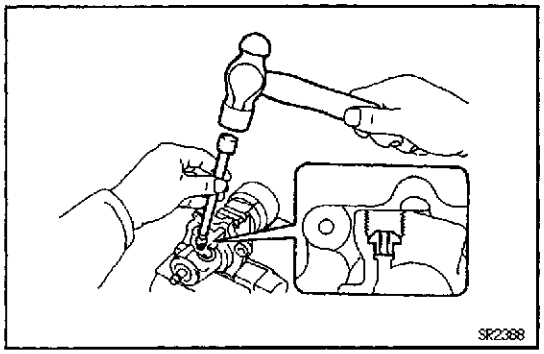
(e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 - 7 minutes



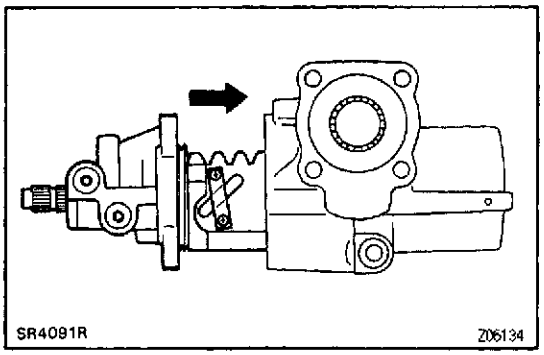


6. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat



(b) Using a plastic hammer and extension bar, tap in a new union seat



GEAR HOUSING ASSEMBLY

1. INSTALL CONTROL VALVE ASSEMBLY

(a) Coat 3 new O-rings with power steering fluid and install them to the gear housing and control valve assembly

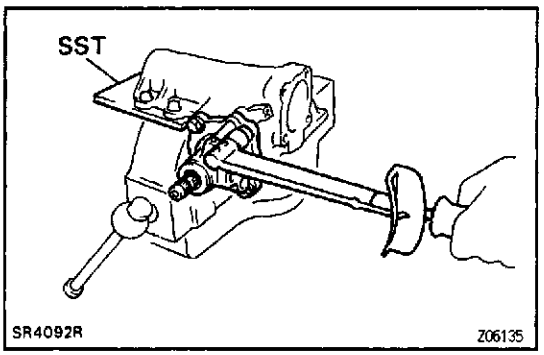
(b) Mount the gear housing on SST and clamp SST in vise
SST 09630-00012 (09631 -00140)

(c) Install the control valve assembly to the gear housing

NOTICE: Be careful not to damage the teflon ring.

(d) Install and torque the 4 bolts

Torque: 61 N-m (620 kgf-cm, 45 ft-lbf)



(e) Using SST, check the worm gear preload

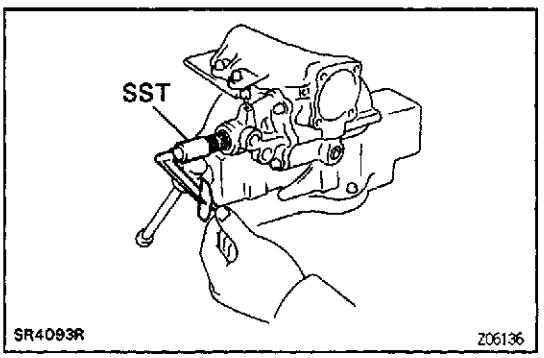
SST 09616 - 00010

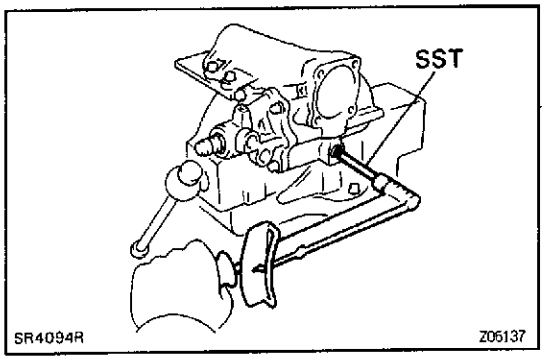
Preload: (at starting)

0.3 - 0.5 N-m (3 - 5.5 kgf.ctr, 2.6 - 4.8 in..lbf)

HINT Hold the power piston nut to prevent it from turning

If preload is not correct, replace the control valve assembly





2. INSTALL POWER PISTON PLUNGER

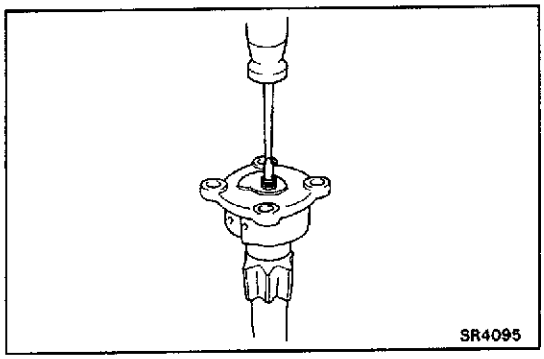
(a) Install the plunger guide, plunger and spring

(b) Coat a new O-ring with power steering fluid and install it to the plunger guide nut

(c) Using SST, install the guide nut

SST 09043-38100

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

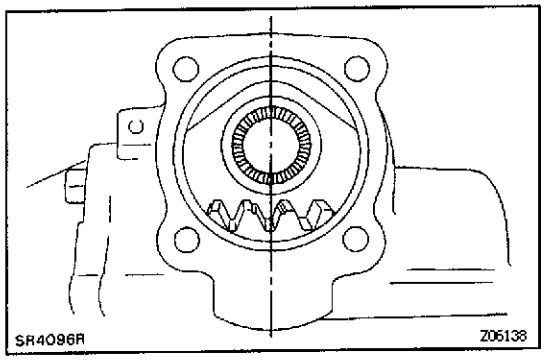


3. INSTALL CROSS SHAFT AND SIDE COVER

(a) Coat a new O-ring with power steering fluid and install it to the side cover

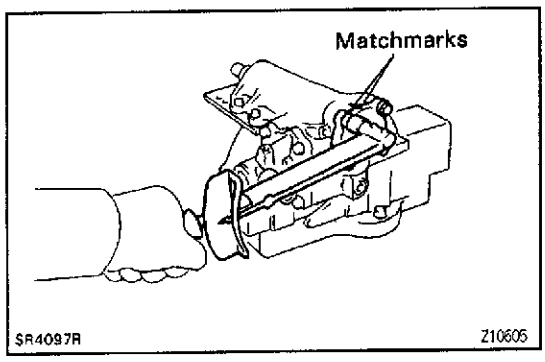
(b) Using a screwdriver, install the cross shaft to the side cover

NOTICE: Fully loosen the adjusting screw.



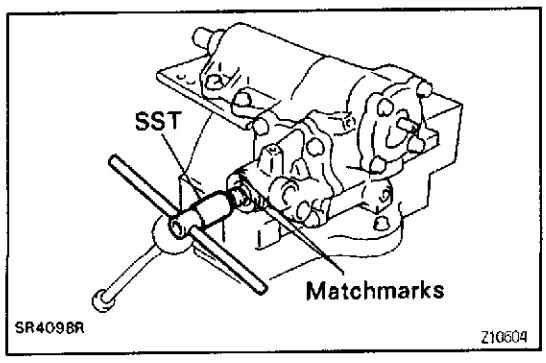
(c) Set the worm gear at the center of the gear housing, as shown

(d) Install and push the cross shaft into the gear housing so that the center teeth mesh together



(e) Align matchmarks on the side cover and gear housing, and install the 4 bolts Torque the bolts in a diagonal pattern

Torque: 61 N-m (620 kgf-cm, 45 ft-lbf)

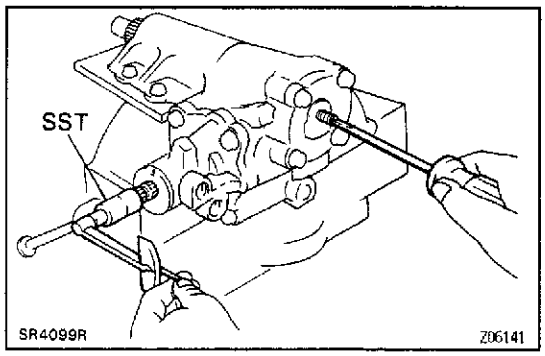


4. DETERMINE CENTER POSITION OF CONTROL VALVE

(a) Using SST, turn the control valve shaft so it is at full lock in both directions and determine the exact center

SST 09616-00010

(b) Place matchmarks on the control shaft and housing to show neutral position position



5. ADJUST SECTOR SHAFT ADJUSTING SCREW

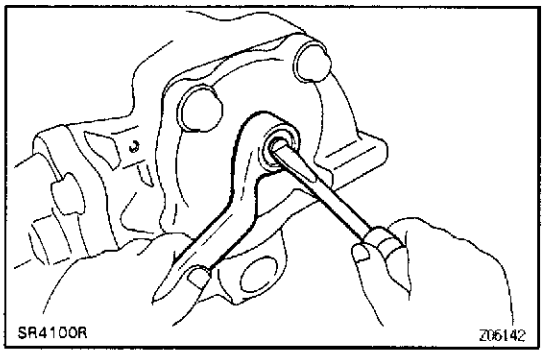
Using the SST with a torque meter, measure the starting torque from the neutral position While doing this, also use the screwdriver to turn the adjusting screw counterclockwise until the starting torque reaches the right valve

SST 09616 - 00010

Total preload: (at starting)

0.74 - 1.08 N-m (7.5 - 11 kgf-cm, 6.5 - 9.6 in..lbf)

NOTICE: make the adjustment by tihgtening the adjusting screw.



6. INSTALL ADJUSTING SCREW LOCK NUT

(a) Install a new washer

(b) Using a screwdriver to hold the adjusting screw,install and torque the lock nut

Torque: 46 N-m (470 kgf-cm, 34 ft-lbf)

(c) Recheck the total preload

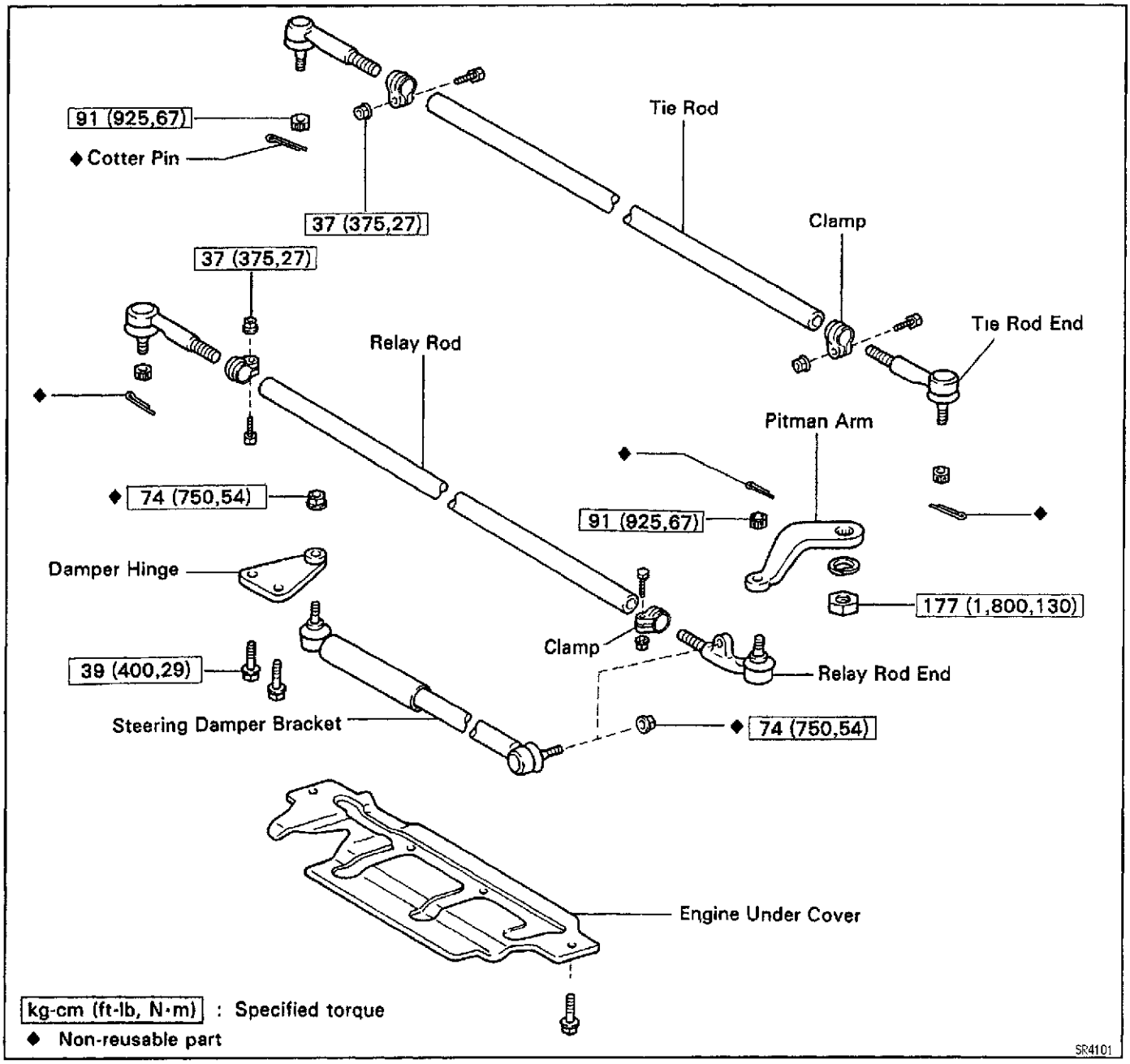
Total preload: (at starting):

0.74 - 1.08 N-m (7.5 - 11 kgf-cm, 6.5 - 9.6 in..lbf)

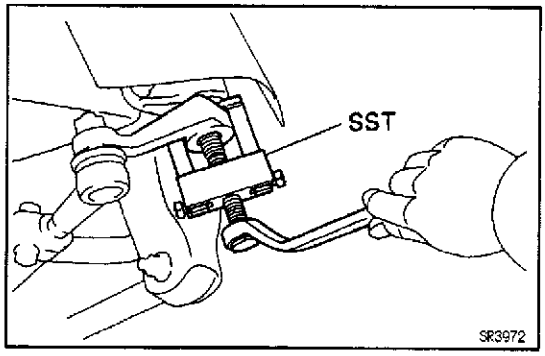
STEERING LINKAGE

STEERING LINKAGE REMOVAL AND INSTALLATION SR0DV-02

Remove and install the parts, as shown



HINT
- When connecting the ball stud to the arm or rod, remove the grease on the joint surfaces
- After torquing the ball stud nut to specified torque, advance the nut just enough to insert the cotter pin
- After installing any of the steering linkage components, check the front wheel alignment (See page SA-167)



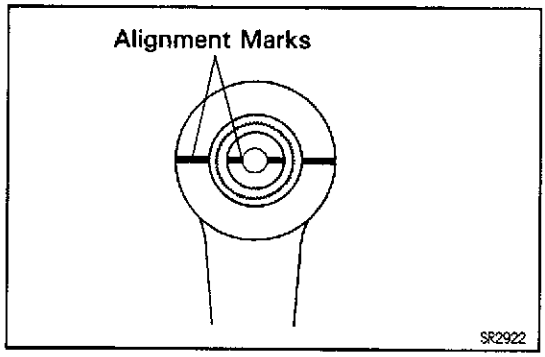
MAIN POINT OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT PITMAN ARM FROM/TO CROSS SHAFT

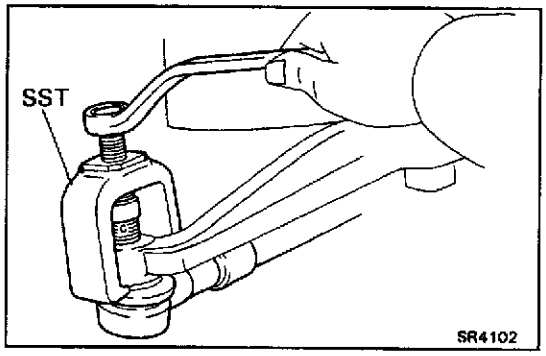
(a) Loosen the pitman arm nut

(b) Using SST, disconnect pitman arm from the cross shaft

SST 09628-62011



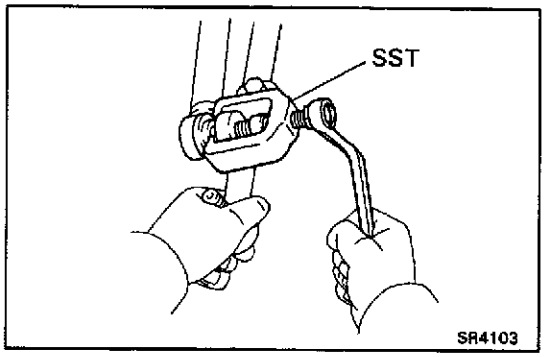
(c) When connecting, align the alignment marks on the pitman arm and the cross shaft, and install the spring washer and nut



2. DISCONNECT PITMAN ARM FROM RELAY ROD END

Using SST, disconnect the pitman arm from the relay rod end

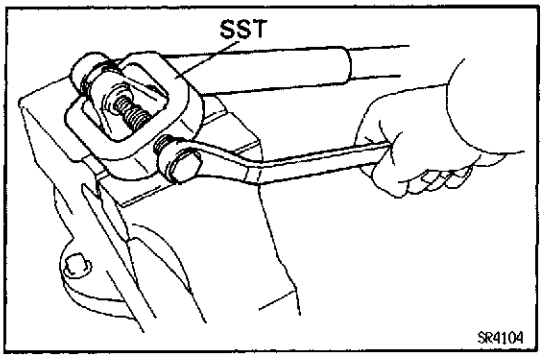
SST 09611 - 22012



3. DISCONNECT STEERING DAMPER FROM RELAY ROD END

Using SST, disconnect the steering damper from the relay rod end

SST 09611 - 22012



4. DISCONNECT STEERING DAMPER FROM STEERING DAMPER BRACKET

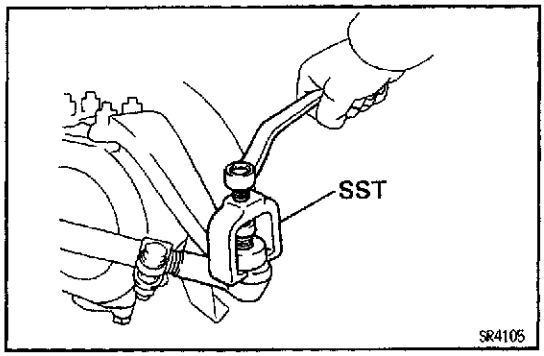
(a) Remove the damper with the bracket

(b) Secure the bracket in a vise

NOTICE: Do not tighten the vise too tight.

(c) Using SST, disconnect the damper from the hinge

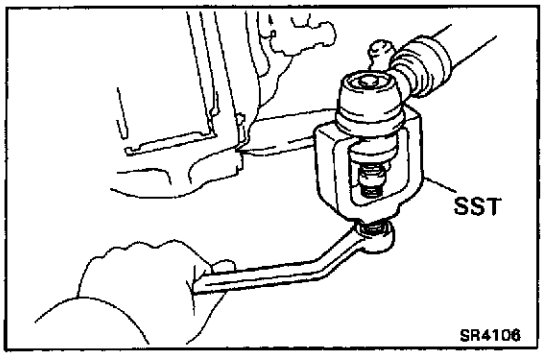
SST 09610-55012



5. DISCONNECT RELAY ROD END FROM KNUCKLE ARM

Using SST, disconnect the relay rod end from the knuckle arm

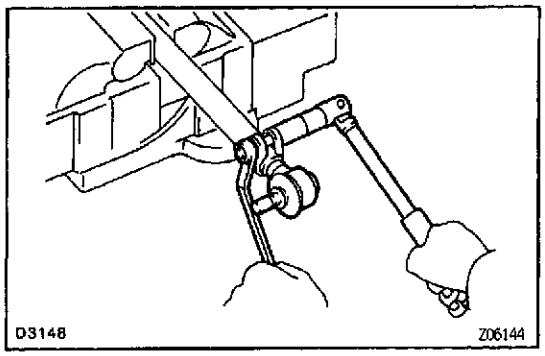
SST 09611 - 22012



6. DISCONNECT TIE ROD END FROM KNUCKLE ARM

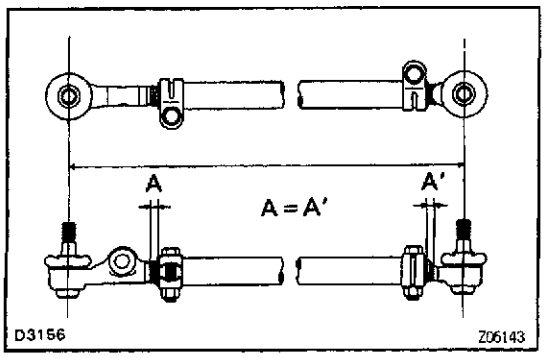
Using SST, disconnect the tie rod end from the knuckle arm

SST 09611 -22012



7. IF NECESSARY, REPLACE TIE OR RELAY ROD END

(a) Loosen the tie or relay rod end clamp and remove the tie or relay rod end



(b) Turn the tie rod ends or relay rod equal amounts into the rod tube Tie rods should be approximately 1,207 mm (47 51 in) Relay rods should be approximately 1,076 mm (42 34 in)

(c) The remaining length of threads on both tie or relay rod ends should be equal

(d) Temporarily tighten the tie or relay rod end clamps

SERVICE SPECIFICATIONS

SERVICE DATA

Steering wheel freeplay (Maximum)		40 mm (1 58 in)
Pawl stopper (Mark)		
	1 or A	12 65-12 75 mm (0 4980-0 5020 in)
	2 or6	12 55-12 65 mm (0 4941-0 4980 in)
	3 or C	12 45-12 55 mm (0 4902-0 4941 in)
	4orD	12 35-12 45 mm (0 4862-0 4902 in)
	5 or E	12 25-12 35 mm (0 4823-0 4862 in)
PS ON -VEHICLE INSPECTION		
Fluid level rise		5 mm (0 20 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)		39 N (4 4 kgf 8 8 lbf)
PS PUMP		
Rotor shaft bushing oil clearance (STD)		0 01- 0 03 mm (0 0004-0 0012 in)
Rotor shaft bushing oil clearance (Maximum)		0 07 mm (0 0028 in)
Clearance between rotor groove and vane plate (Maximum)		0 033 mm (0 00 130 in)
Vane plate length (Minimum)		14 988 mm (0 5901 in)
Vane plate height (Minimum)		8 1 mm (0 319 in)
Vane plate thickness (Minimum)		1 797 mm (0 0707 in)
Vane length Pump rotor mark	Cam ring mark	
None	2	14 995-14 997 mm (0 59035-0 59043 in)
1	3	14 993-14 995 mm (0 59027-0 59035 in)
2	4	14 991 -14 993 mm (0 59020-0 59027 in)
Spring free length		35-37 mm (1 38-1 46 in)
Vane pump rotating torque (Maximum)		0 3 N-m (2 8 kgf-cm 2 4 in -lbf) or less
PS GEAR HOUSING		
Steering rack runout (Maximum)		0 15 mm (0 006 in)
Cross shaft adjusting screw thrust clearance		0 03 - 0 05 mm (0 0012 -0 0020 in)
Worm preload	at Starting	0 3-0 5 N-m (3-5 5 kgf-cm 2 6-4 8 in -lbf)
Total preload	at Starting	0 7-1 1 N-m (7 5-11 kgf-cm 6 5-9 5 in -lbf)

TORQUE SPECIFICATIONS

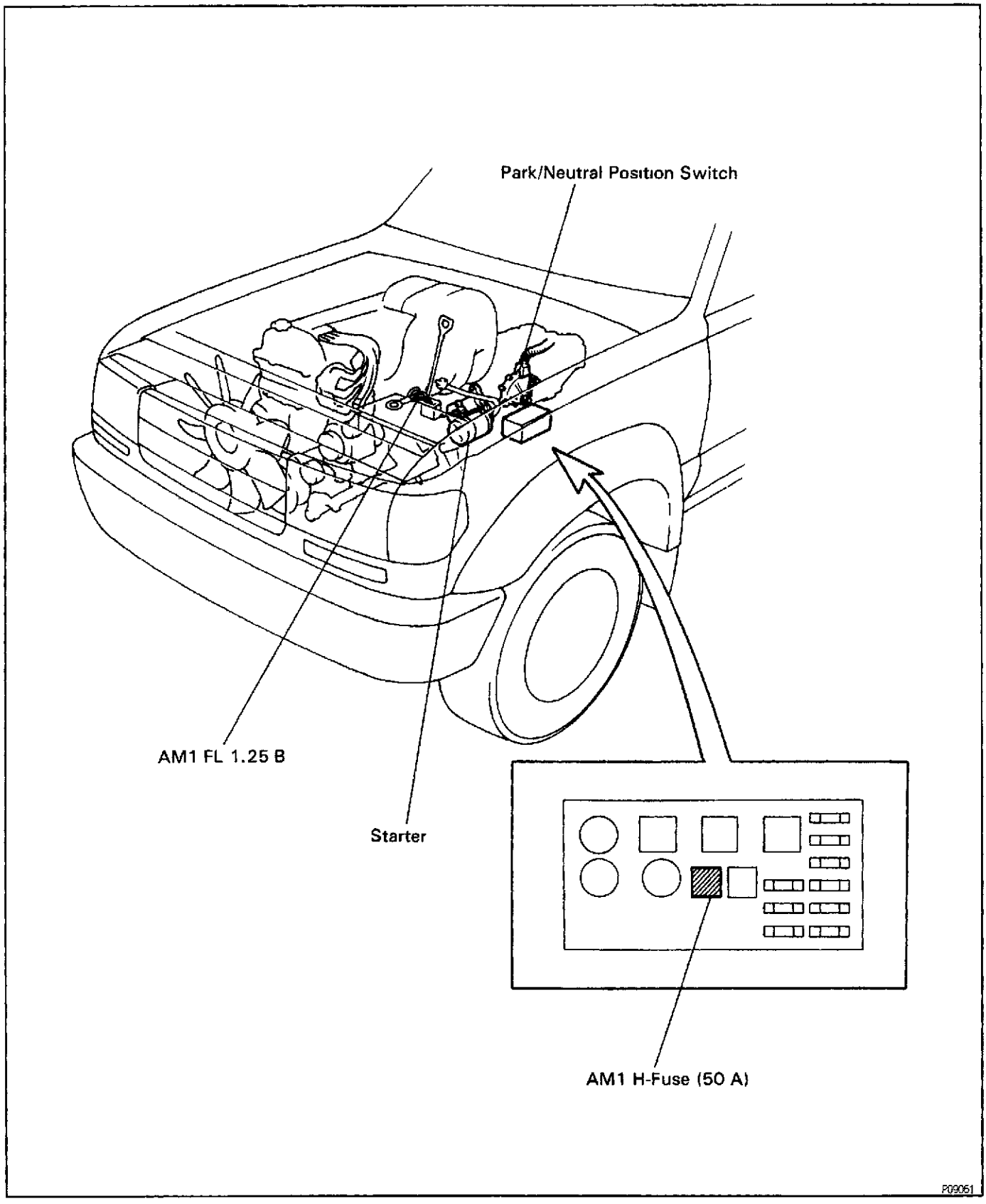
SR01D-03

Part tightened	N-m	kgf-cm	ft-lbf
STEERING COLUMN			
Steering wheel set nut	**34**	350	**25**
Column tube x Body	**25**	250	**18**
Breakaway bracket x Body	**25**	250	**18**
Column hole cover x Body	**13**	130	**9**
Main shaft x Intermediate shaft	**34**	350	**25**
Intermediate shaft x Worm shaft	**34**	350	**25**
Turn signal bracket x Upper column tube	4 9	**50**	43 in -lbf
Tilt pawl set nut	5 9	**60**	52 in -lbf
Compression spring set bolt	7 8	**80**	69 in -lbf
Tilt lever retainer set nut	**15**	150	**11**
Dust seal x Column hole cover	5 9	**60**	52 in -lbf
Clamp x Column tube	**19**	195	**14**
POWER STEERING PUMP			
Union bolt	**56**	575	**42**
PS pump x Engine	**36**	370	**27**
Drive gear x Pump shaft	**74**	750	**54**
Pressure port union	**69**	700	**51**
Suction port union x Pump housing	**13**	130	**9**
POWER STEERING GEAR HOUSING			
Pressure and return tube	**44**	450	**33**
Universal joint	**34**	350	**25**
Gear housing x Body	142	1 aso	105
Gear housing x Pitman arm	177	**1,800**	130
Cross shaft adjusting screw set nut	**46**	470	**34**
Cross shaft end cover lock bolt	**61**	620	**45**
Plunger guide nut	**20**	205	**15**
Worm gear valve body set bolt	**61**	620	**45**
STEERING LINKAGE			
Pitman arm x Relay rod	**91**	925	**67**
Relay rod x Steering damper	**74**	750	**54**
Steering damper x Damper hinge	**74**	750	**54**
Damper hinge x Body	**39**	400	**29**
Relay rod x Knuckle arm	**91**	925	**67**
Tie rod x Knuckle arm	**91**	925	**67**
Tie or relay rod clamp	**37**	375	**27**

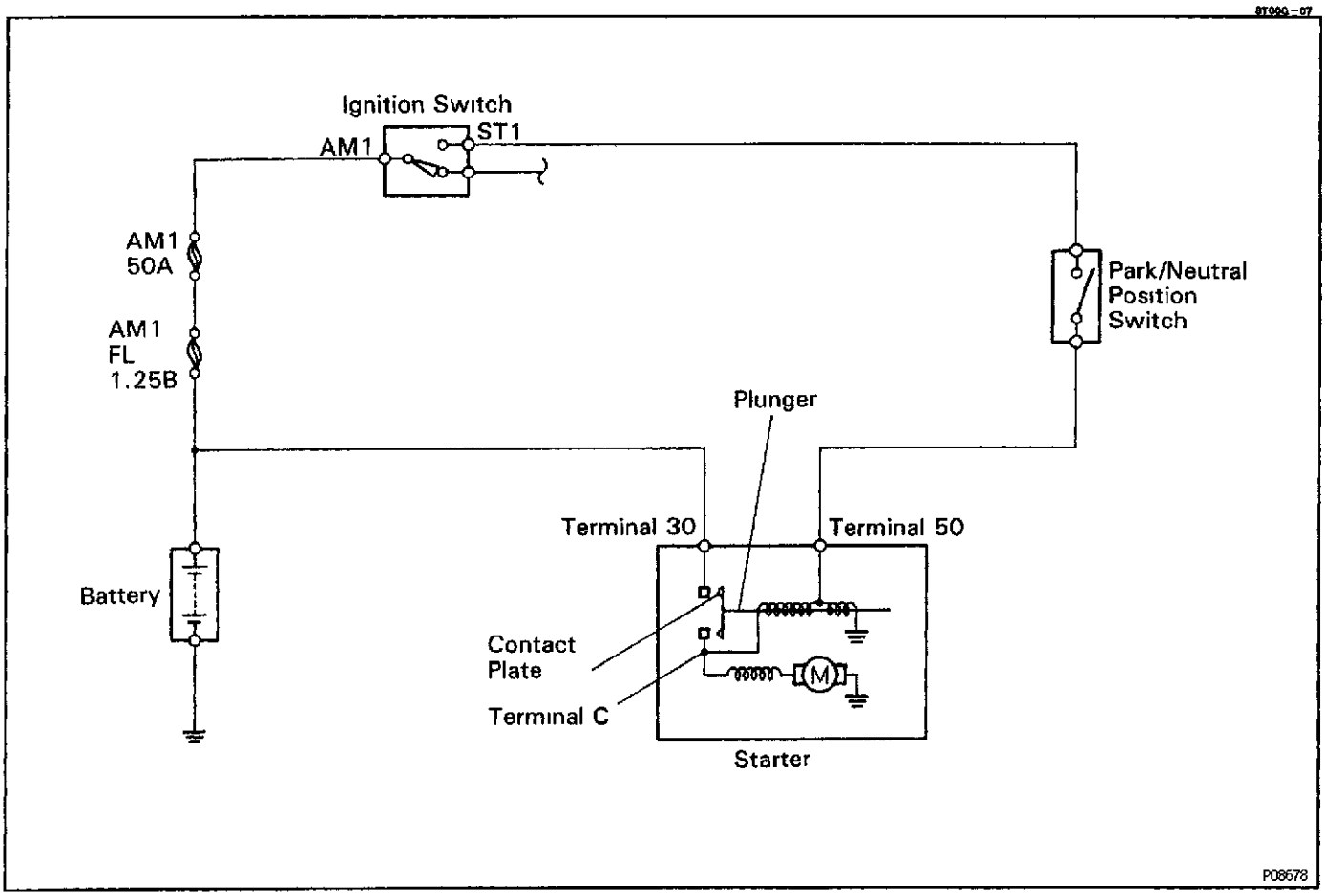
STARTING SYSTEM

DESCRIPTION

The starter is a reduction type with a small, high-speed motor used to drive the pinion gear



SYSTEM CIRCUIT



OPERATION

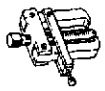
When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil When the plunger is pulled to the left as shown above, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates

When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring Battery voltage no longer flows from terminal 30, so the motor stops

PREPARATION

ST00S-09

SST (SPECIAL SERVICE TOOLS)

	09286-4601 1 Injection Pump Spline Shaft Puller	Armature bear ng
	09820-00030 Alternator Rear Bearing Replacer	Armature rear bearing

ST00T-04

RECOMMENDED TOOLS

	09082-00050 TOYOTA Electrical Tester Set	

ST00U-04

EQUIPMENT

Dial indicator	Commutator
Magnetic finger	
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	
Vernier calipers	Commutator Brush

ON-VEHICLE INSPECTION

NOTICE: Before changing the starter, check the following items again:

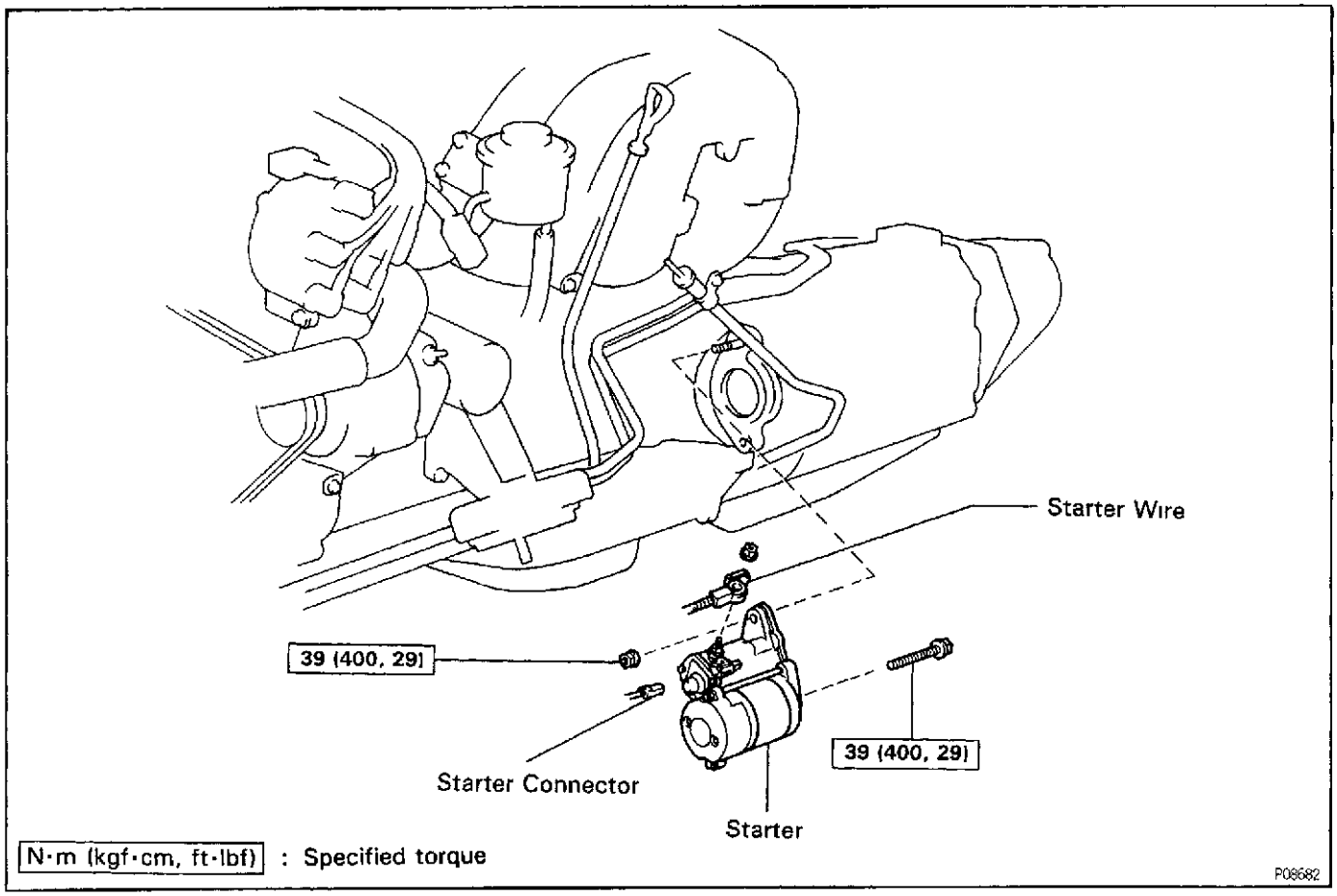
- **Connector connection**
- **Accessory installation, e.g.: theft deterrent system**

ST05K-02

STARTER

ST03K-01

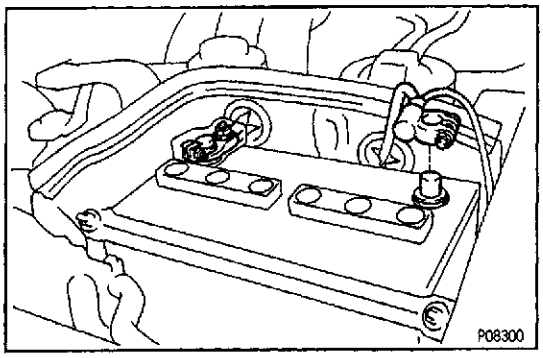
COMPONENTS FOR REMOVAL AND INSTALLATION



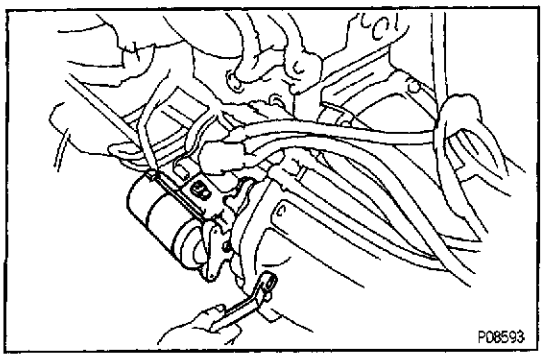
ST02K-04

STARTER REMOVAL

1. DISCONNECT NEGATIVE TERMINAL CABLE FROM BATTERY

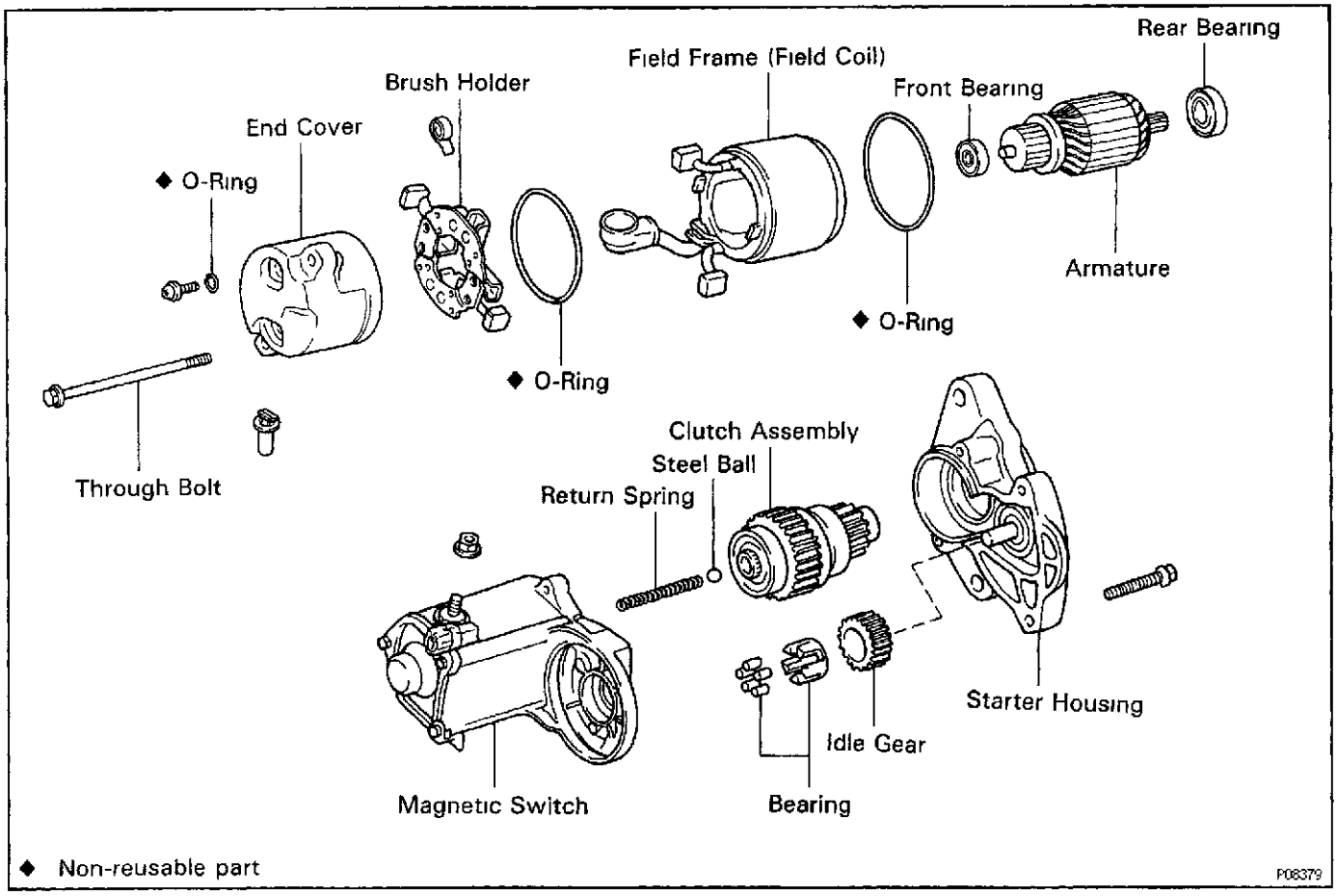


2. REMOVE STARTER



(a) Disconnect the starter connector
(b) Remove the nut, and disconnect the starter wire
(c) Remove the bolt, nut and starter

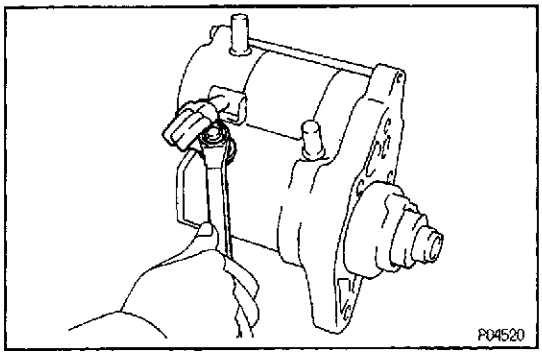
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



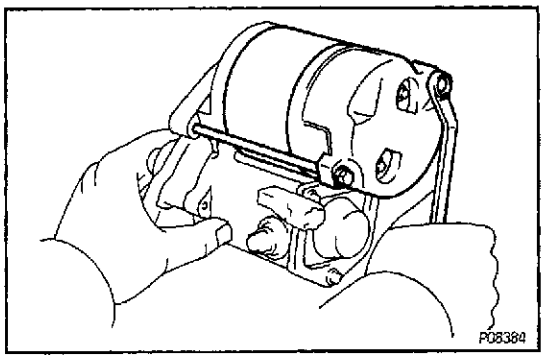
6T00X-07

STARTER DISASSEMBLY

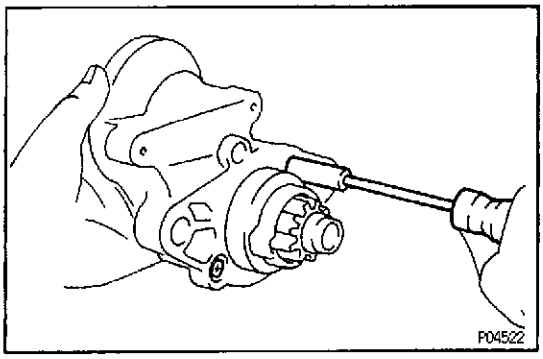
1. REMOVE FIELD FRAME AND ARMATURE



(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal

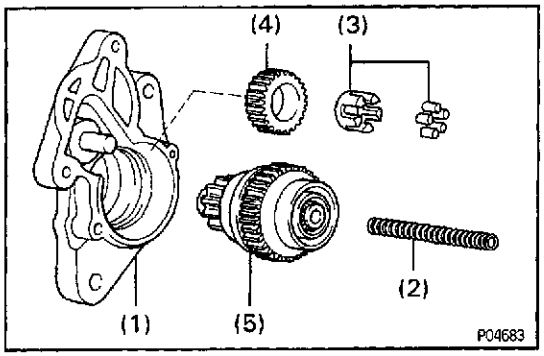


(b) Remove the 2 through bolts
(c) Pull out the field frame with the armature from the magnetic switch assembly
(d) Remove the O-ring

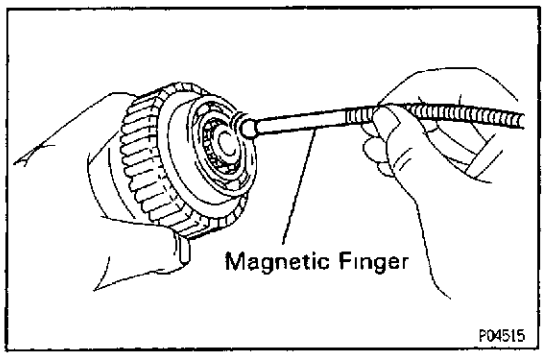


2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws

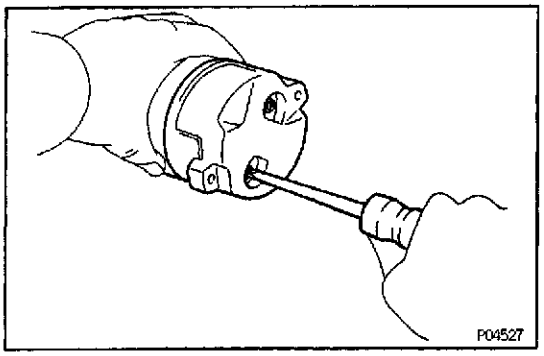


(b) Remove the following parts from the magnetic switch assembly
- (1) Starter housing
- (2) Return spring
- (3) Bearing
- (4) Idler gear
- (5) Clutch assembly



3. REMOVE STEEL BALL

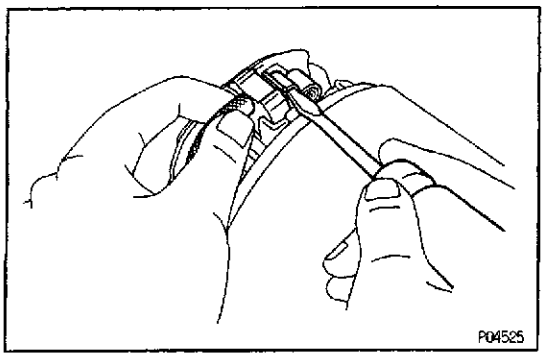
Using a magnetic finger, remove the steel ball from the clutch shaft hole



4. REMOVE BRUSH HOLDER

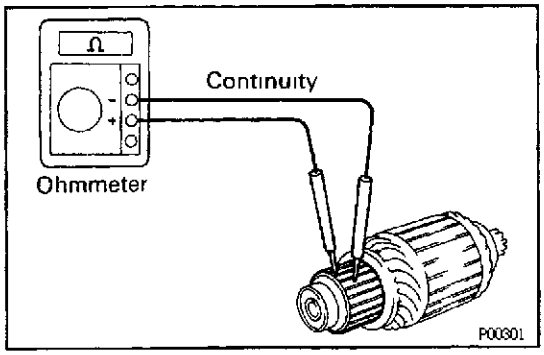
(a) Remove the 2 screws and end cover from the field frame

(b) Remove the O-ring from the field frame



(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



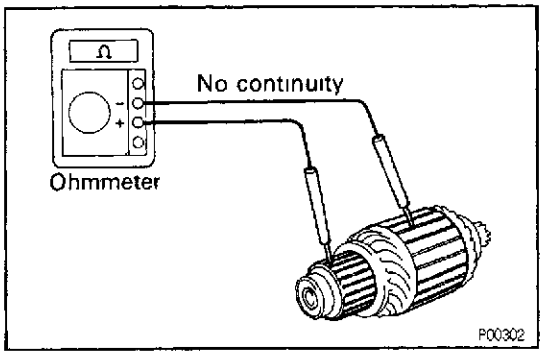
STARTER INSPECTION AND REPAIR

Armature Coil

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

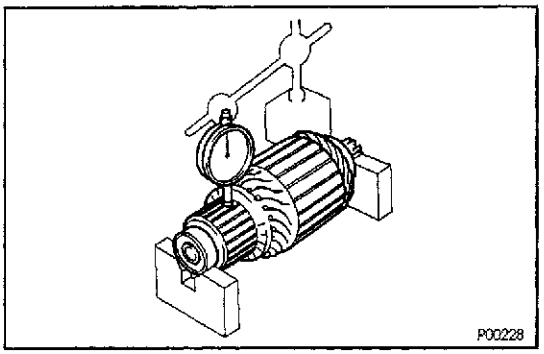
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core

If there is continuity, replace the armature

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No 400) or on a lathe



2. INSPECT CoMMUTATOR CIRCLE RUNOUT

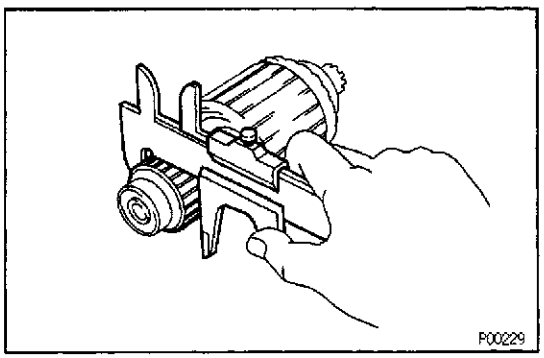
(a) Place the commutator on V-blocks

(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



3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the commutator Diameter

Standard diameter:

30 mm (1.18 in.) for 1.4 kW type

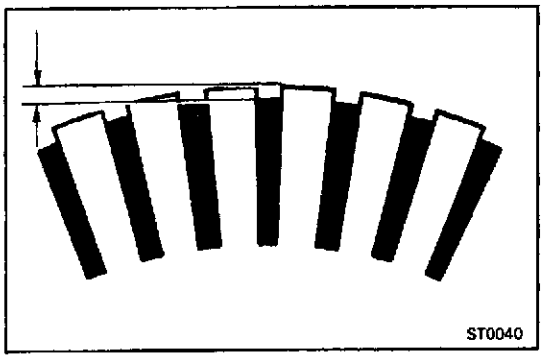
35 mm (1.38 in.) for 2.0 kW type

Minimum diameter:

29 mm (1.14 in.) for 1.4 kW type

34mm (1.34in.) for 2.O kW type

If the diameter is less than minimum, replace the armature



4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials Smooth out the edge

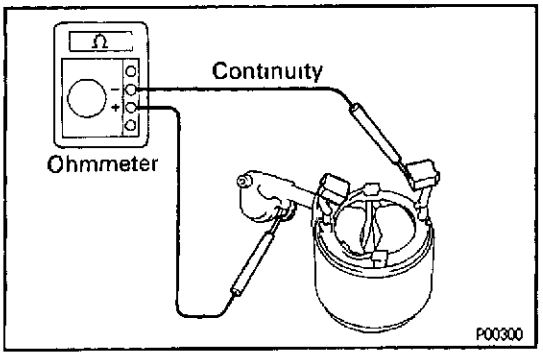
Standard undercut depth:

0.6 mm (0.024 in.)
for 1.4 kW type
0.7 mm - 0.9 mm (0.024 in - 0.035 in.)
for 2.0 kW type

Minimum undercut depth:

0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade

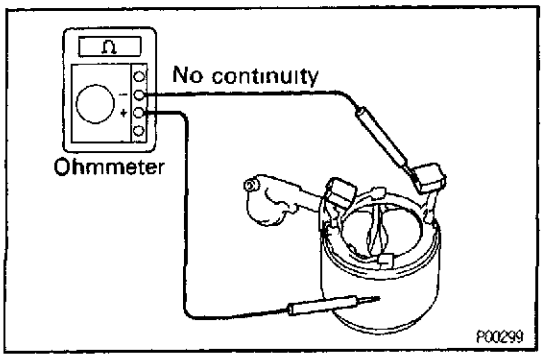


Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead

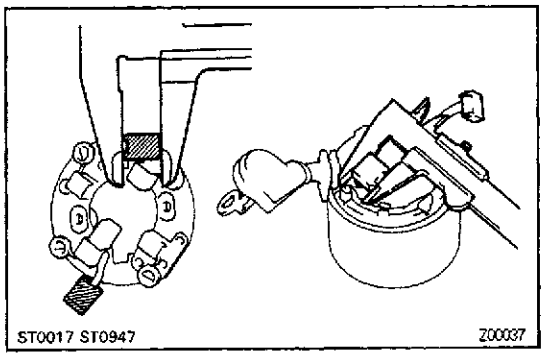
If there is no continuity, replace the field frame



2. 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



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length

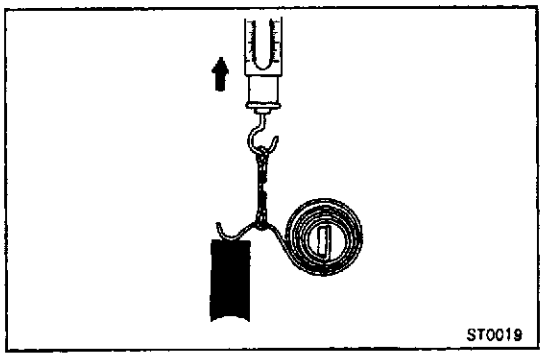
Standard length:

15.0 mm (0.591 in.)

Minimum length:

10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame



Brush Springs

INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush

Spring installed load:

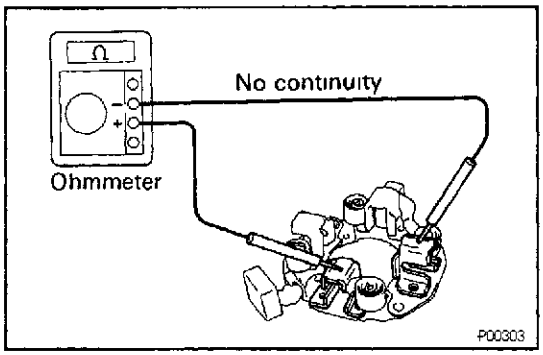
18 - 24 N (1.84 - 2.45 kg f, 3.9 - 5.3 l bf)

for 1.4 kW type

12.7 - 24.5 N (1.30 - 2.50k9f,2.7 - 5.31bf)

for 2.0 kW type

If the installed load is not within specification, replace the brush springs



Brush Holder

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

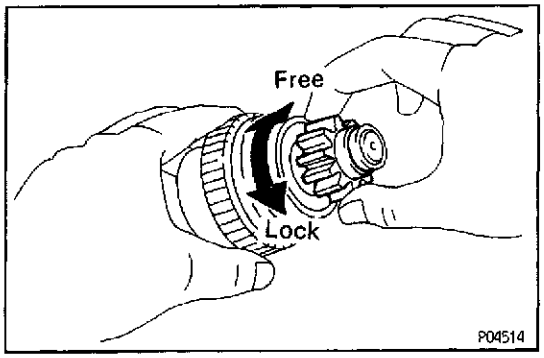
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idle gear and clutch assembly for wear or damage

If damaged, replace the gear or clutch assembly

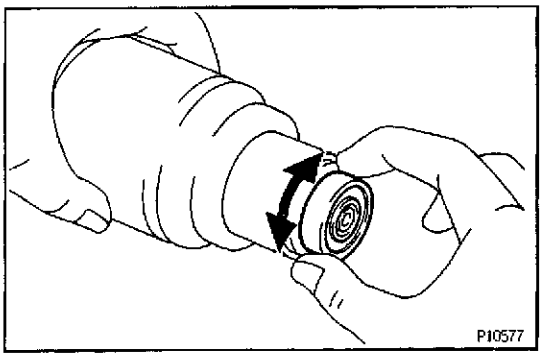
If damaged, also check the drive plate ring gear for wear or damage



2. 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 counterclockwise and check that it locks

If necessary, replace the clutch assembly

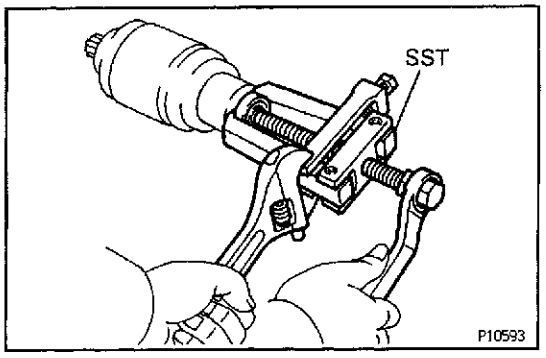


Bearings

1. INSPECT FRONT BEARING

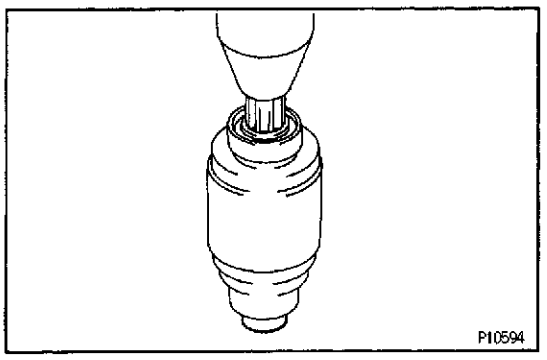
Turn each bearing by hand while applying inward force

If resistance is felt or the bearing sticks, replace the bearing

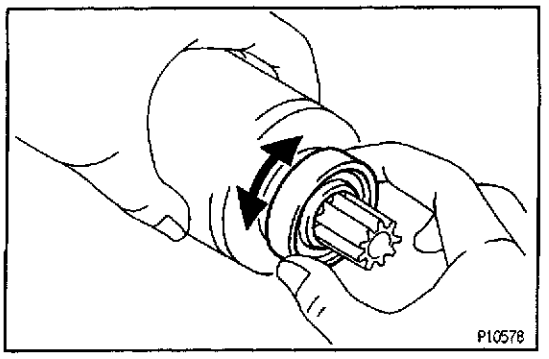


2. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing
SST 09286-4601 1



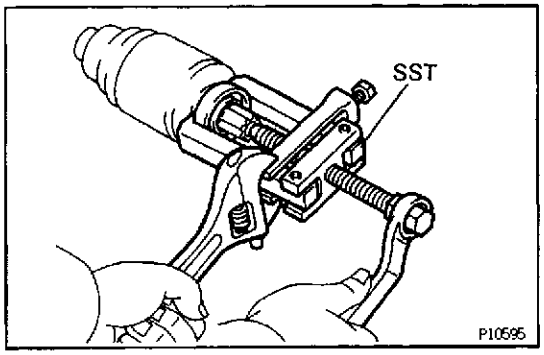
(b) Using a press, press in a new front bearing



3. INSPECT REAR BEARING

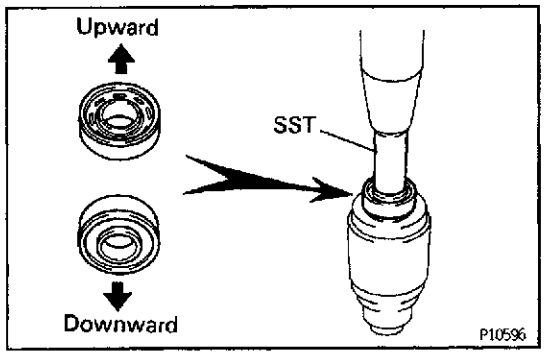
Turn each bearing by hand while applying inward force

If resistance is felt or the bearing sticks, replace the bearing

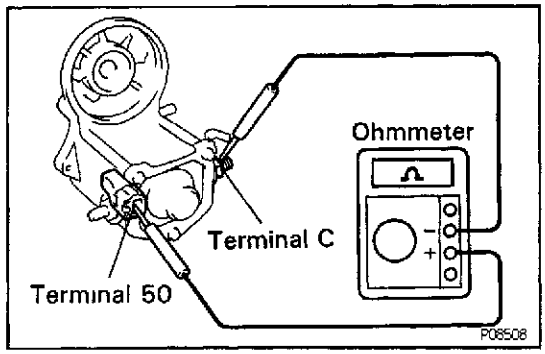


4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing
SST 09286-46011



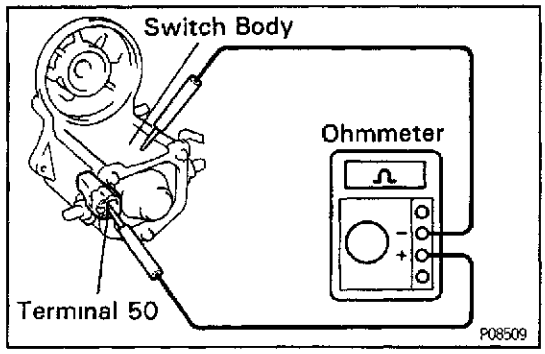
(b) Using a press, press in a new rear bearing
NOTICE: Be careful of the bearing installation direction.
SST 09820-00030



Magnetic Switch

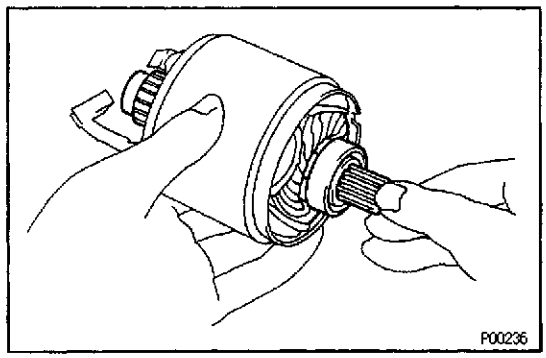
1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C
If there is no continuity, replace the magnetic switch



2. PERFORM 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



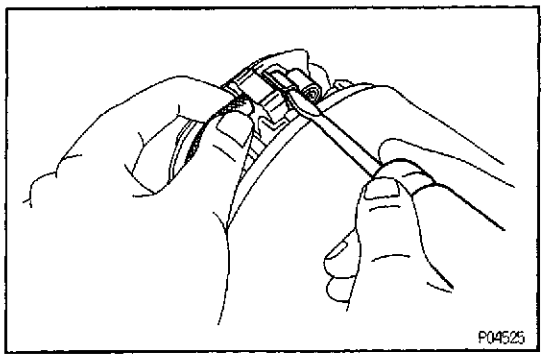
STARTER ASSEMBLY

(See Components for Disassembly and Assembly)

HINT Use high-temperature grease to lubricate the bearings and gears when assembling the starter

1 **PLACE ARMATURE INTO FIELD FRAME**

Apply grease to the armature bearings, and insert the armature into the field frame

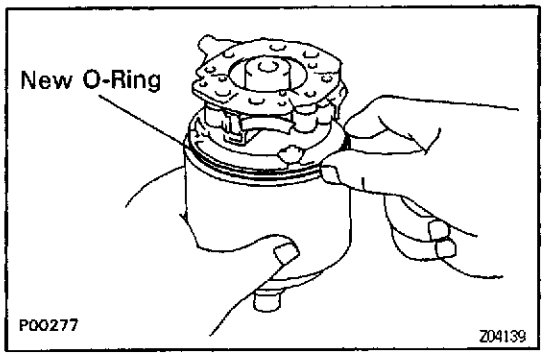


2. INSTALL BRUSH HOLDER

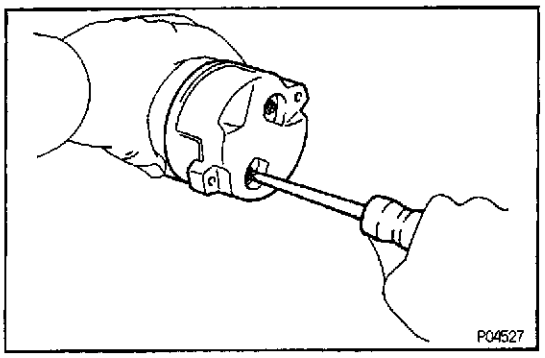
(a) Place the brush holder on the armature

(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder Connect the 4 brushes

NOTICE: Check that the positive (+) lead wires are not grounded.



(c) Place a new O-ring in position on the field frame



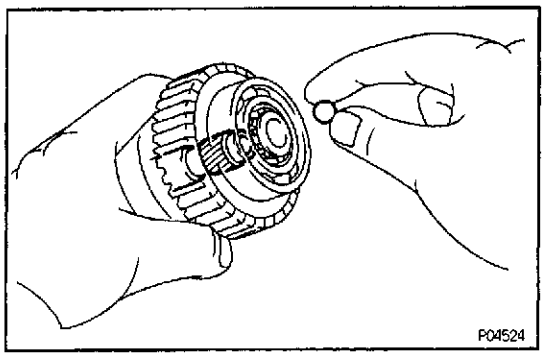
(d) Install a new O-ring to the the end cover screw

(e) Install the end cover to the field frame with the 2 screws

Torque:

1.5 N-m (15 kgf-cm, 13 in.•lbf) for 1.4 kW type

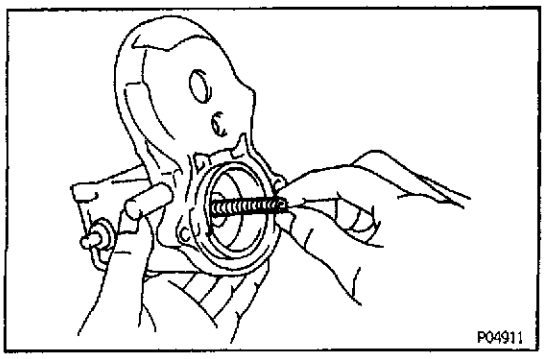
3.8 N-m (38 kgf-cm, 34 in.•lbf) for 2.0 kW type



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball

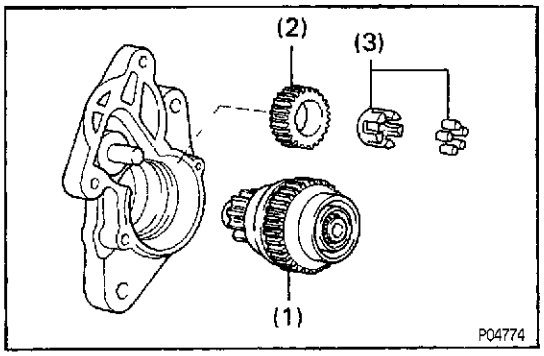
(b) Insert the steel ball into the clutch shaft hole



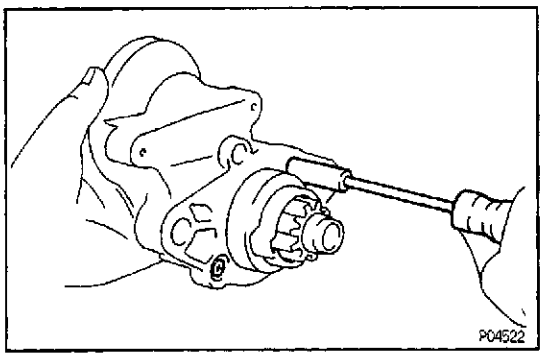
4. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Apply grease to the return spring

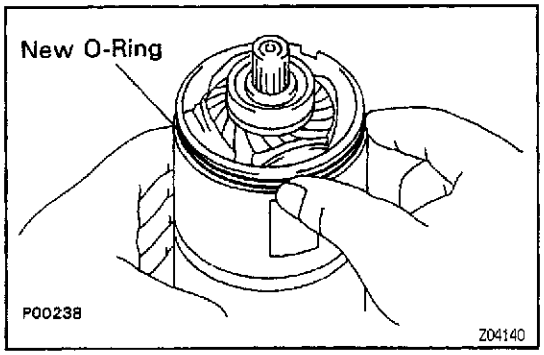
(b) Insert the return spring into the magnetic switch hole



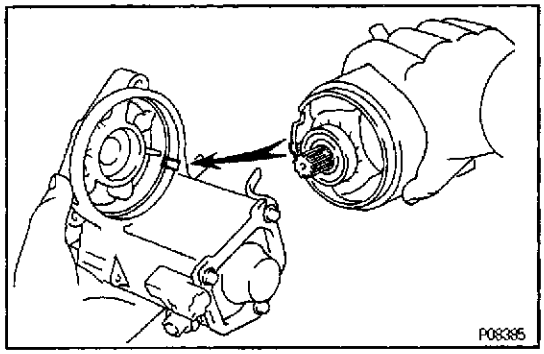
(c) Place the following parts in position on the starter housing
(1) Clutch assembly
(2) Idler gear
(3) Bearing



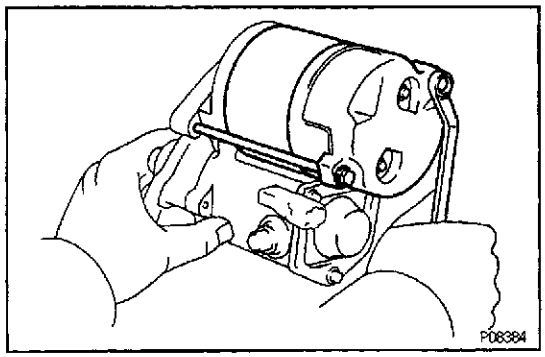
(d) Assemble the starter housing and magnetic switch assembly and install the 2 screws
Torque:
5.9 N•m (60 kgf-cm, 52 in.-lbf) for 1.4 kW type
9.3 N•m (93 kgf-cm, 82 in.-lbf) for 2.0 kW type



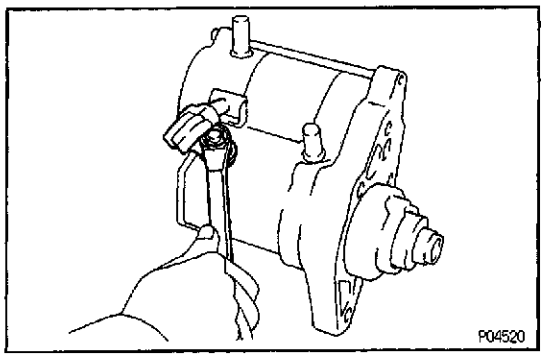
5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY
(a) Place a new O-ring in position on the field frame



(b) Align the protrusion of the field frame with the cutout of the magnetic switch



(c) Install the field frame and armature assembly with the 2 through bolts
Torque:
5.9 N-m (60 kgf-cm, 52 in.¿lbf) for 1.4 kW type
9.3 N-m (93 kgf-cm, 82 in.¿lbf) for 2.0 kW type

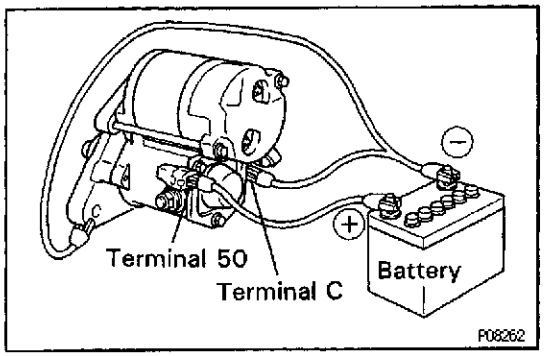


(d) Connect the lead wire to terminal C, and install the nut

Torque:

7.9 N-m (79 kgf-cm, 70 in.-lbf) for 1.4 kW type

5.4 N-m (54 kgf-cm, 48 in.-lbf) for 2.0 kW type



STARTER PERFORMANCE TEST

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

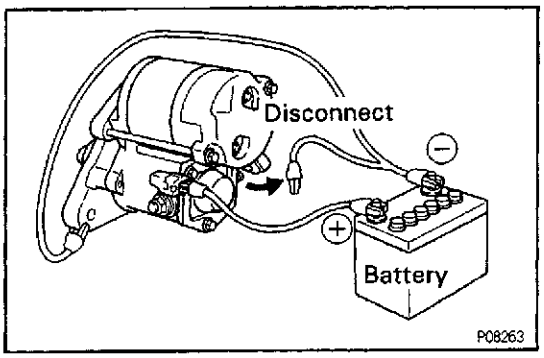
1. PERFORM PULL-IN TEST

(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

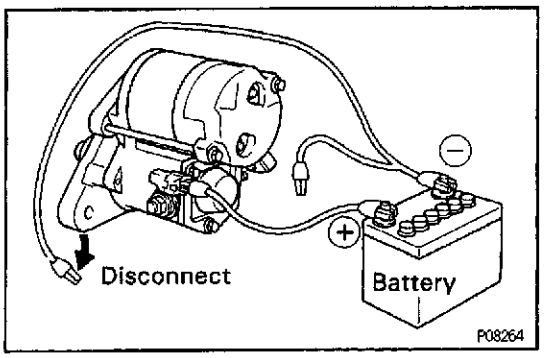
If the clutch pinion gear does not move, replace the magnetic switch assembly



2. PERFORM 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

If the clutch pinion gear returns inward, replace the magnetic switch assembly

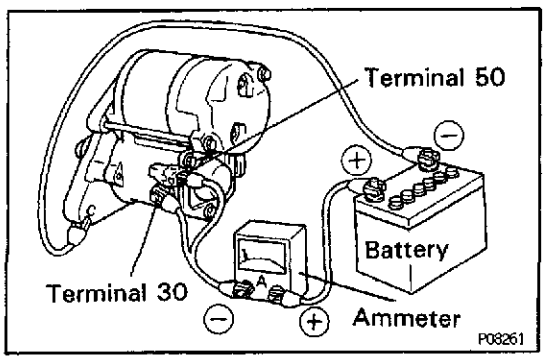


3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (-) lead from the switch body

Check that the clutch pinion gear returns inward

If the clutch pinion gear does not return, replace the magnetic switch assembly



4. PERFORM NO-LOAD PERFORMANCE TEST

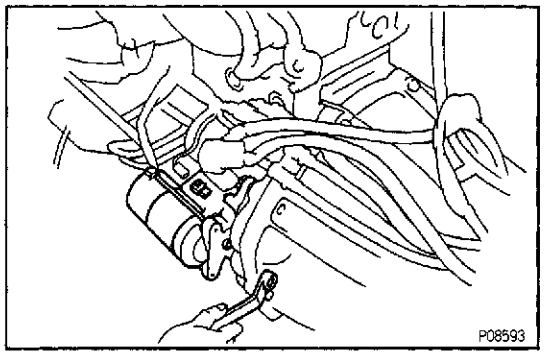
(a) Connect the battery and ammeter to the starter as shown

(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:

90 A or less at 11.5 V for 1.4 kW type

100 A or less at 11.5 V for 2.0 kW type



STARTER INSTALLATION

(See Components for Removal and Installation)

1. INSTALL STARTER

(a) Install the starter with the bolt and nut
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

(b) Connect the starter wire with the nut
Torque: 8.8 N-m (90 kgf-cm, 78 in.-lbf)

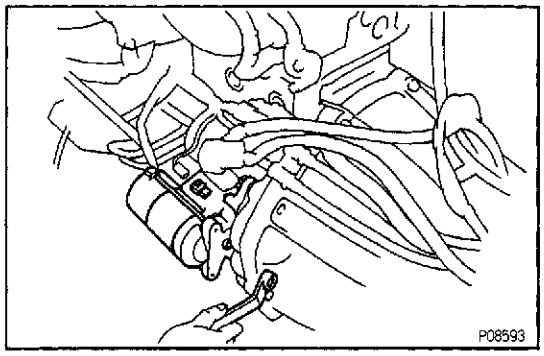
(c) Connect the starter connector

2. CONNECT NEGATIVE TERMINAL CABLE TO BATTERY

3. CHECK THAT ENGINE STARTS

PARK/NEUTRAL POSITION (PNP) SWITCH

(See AT section)



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PARK/NEUTRAL POSITION (PNP) SWITCH

(See AT section)

SERVICE SPECIFICATIONS

ST01E-08

SERVICE DATA

Starter (1 4 kW type)	Rated voltage and output power		12 V 1 4 kW
	No-load characteristics		90 A or less at 11 5 V
		Current	3 000 rpm or more
		rpm	15 5 mm (0 610 in)
		STD	10 0 mm (0 394 in)
	Brush length	Limit	18 - 24 N (1 79 - 2 41 kgf 3 9 - 5 3 lbf)
	Spring installed load		
	Commutator		
	Diameter		
		STD	30 0 mm (1 181 in)
		Limit	29 0 mm (1 412 in)
		STD	0 6 mm (0 024 in)
	Under-cut depth	Limit	0 2 mm (0 008 in)
		Limit	0 05 mm (0 0020 in)
	Circle runout		
Starter (2 0 kW type)	Rated voltage and output power		12 V 2 0 kW
	No-load characteristics		100 A or less at 11 5 V
		Current	2 500 rpm or more
		rpm	15 5 mm (0 610 in)
		STD	10 0 mm (0 394 in)
	Brush length	Limit	12 7-24 5N(1 3-2 5kgf 2 7 -5 31bf)
	Spring installed load		
	Commutator		
	Diameter		
		STD	35 0 mm (1 38 in)
		Limit	34 0 mm (1 34 in)
		STD	0 7 mm - 0 9 mm (0 024 in - 0 035 in)
	Undercut depth	Limit	0 2 mm (0 008 in)
		Limit	0 05 mm (0 0020 in)
	Circle runout		

TORQUE SPECIFICATIONS

ST01E-07

Part tightened		N-m	kgf-cm	ft-lbf
Starter mounting bolt		**39**	400	**29**
Starter mounting nut		**39**	400	**29**
Starter wire mounting nut		8 8	**90**	78 in -lbf
End cover x Field frame	1 4 k W type	1 5	15	13 in -lbf
	2 0 kW type	3 8	38	34 in -1 bf
Starter housing x Magnetic switch	1 4 k W type	5 9	60	52 in -lbf
	2 0 k W type	9 3	93	82 in -lbf
Field frame x Armature assembly	1 4 kW type	5 9	60	52 in -lbf
	2 0 kW type	9 3	93	82 in -lbf
Lead wire x Terminal C of starter	1 4 kW type	7 9	79	70 in -lbf
	2 0 kW type	5 4	54	48 in -lbf

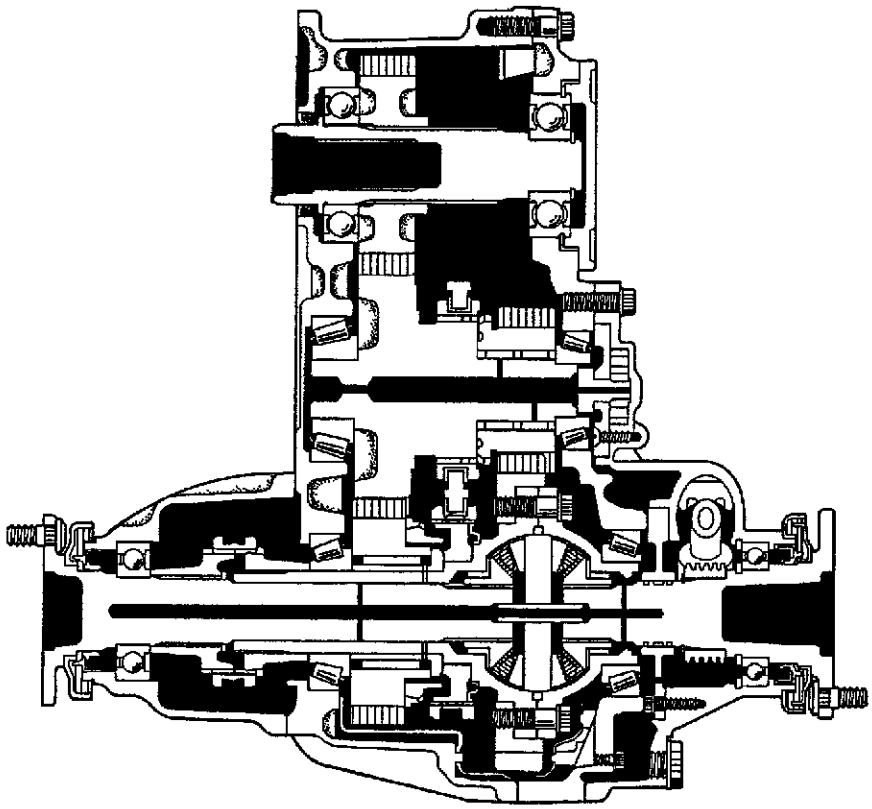
TRANSFER

DESCRIPTION

The transfer transmits the drive force from the transmission to the front and rear wheels
The specifications and cross-section diagrams are as shown

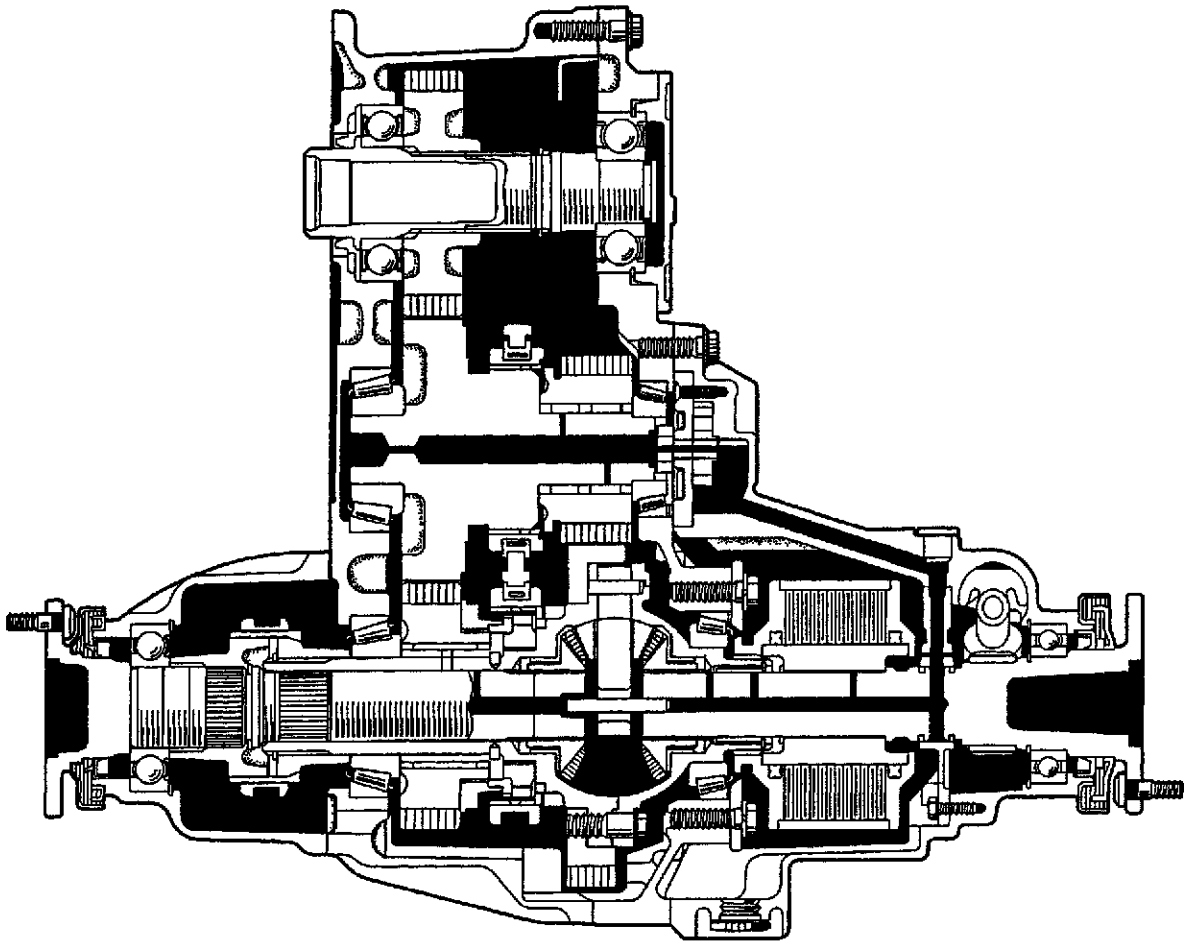
TR036-01

HF2A Transfer



004697

HF2AV Transfer



004698

Specifications

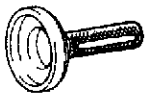
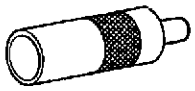
Type of Transmission		A440F	
Type of Engine		1 FZ-FE	
Type of Transfer		HF2A(w/o A6S)	HF2AV(w/ABS)
Gear Ratio	High Speed Range	1 000	
	Low Speed Range	2 488	
Oil Capacity	liters (US qts Imp qts)	1 3 (1 4 1 1)	1 7 (1 8 1 5)
Type of Oil		API GL-4 or- GL-5 SAE 75W-90	

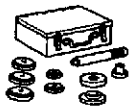
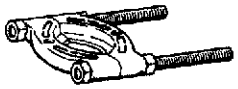
V01698

PREPARATION

SST (SPECIAL SERVICE TOOLS)

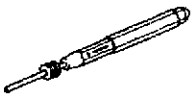
TR037-01

	09223-15020 Oil Seal & Bearing Replace	
	09223-41020 Crankshaft Rear Oil Seal Replacer	
	09316-12010 Transfer Bearing Replacer	
	09316-20011 Transfer Bearing Replacer	
	09316-60010 Transmission & Transfer Bearing Replacer	
	(09316-00010) Replacer Pipe	
	(09316-00020) Replacer -A-	
	(09316-00020) Replacer -B-	
	(09316-00020) Replacer -C-	
	(09316-00020) Replacer -E-	
	(09316-00020) Replacer -F-	
	09325-12010 Transmission Oil Plug	
	09527-30010 Rear Axle Shaft Bearing Remover	

	09555-55010 Differential Drive Pinion Bearing Replacer	
	09608-20012 Front Hub & Drive Pinion Bearing Tool Set	
	(09608-00080) Replacer	
	(09608-03020) Handle	
	09950-00020 Bearing Remover	
	09950-20017 Universal Puller	

TR0S8-02

RECOMMENDED TOOLS

	09031-00030 Pin Punch	
	09905-00012 Snap Ring No 1 Expander	

TR030-02

EQUIPMENT

Dial indicator	
Straight edge	
Torque wrench	

TR0SA-01

LUBRICANT

Item	Capacity	Classification
Transfer oil	HF2A 1 3 liters (1 4 US qts 1 1 Imp qts) HF2AV 1 7 liters (1 8 US qts 1 5 Imp qts)	API GL-4 or GL-5 SAE 75W-90

TR0SB-01

SSM(SPECIAL SERVICE MATERIALS)

08826-00090 Seal Packing 1281 THREE BOND 1281 or equivalent	Front case x Rear case Rear case x Case cover Case x Extension housing
08833-00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Straight screw plug Case cover set bolt

TROUBLESHOOTING

TR00Q-01

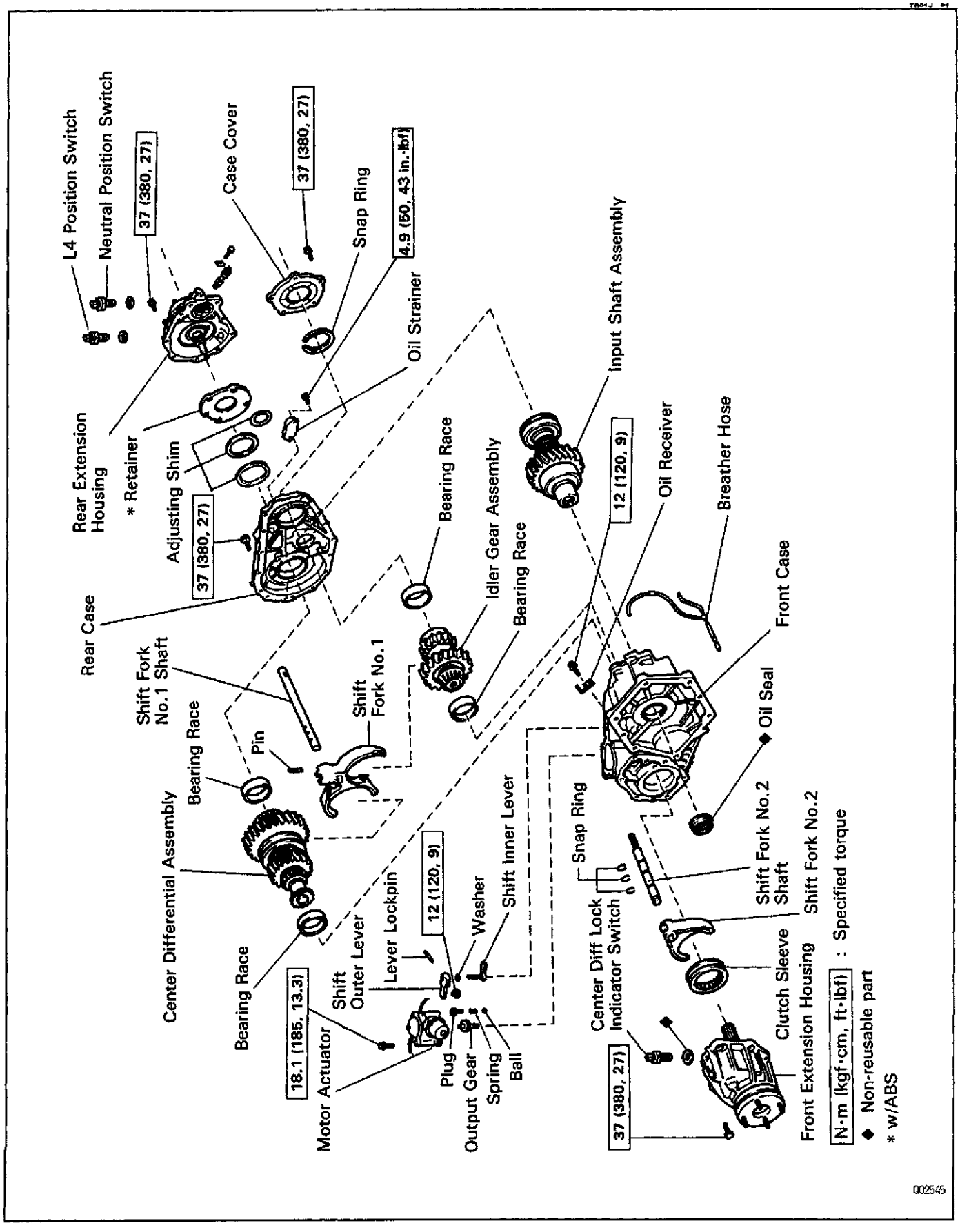
Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TF-9
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TF-9

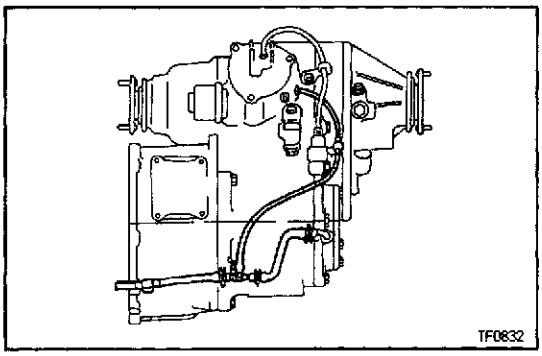
V01482

PRECAUTION

When with FIPG material, you must be observe the following
Using a razor blade and gasket scraper, remove all the old packing (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 the seal packing 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 packing (FIPG) material must be removed and reapplied

COMPONENTS


L4 Position Switch
Neutral Position Switch
37 (380, 27)
Case Cover
37 (380, 27)
Snap Ring
4.9 (50, 43 in.-lbf)
Oil Strainer
Rear Extension Housing
* Retainer
Adjusting Shim
37 (380, 27)
Rear Case
Bearing Race
Idler Gear Assembly
Bearing Race
Input Shaft Assembly
12 (120, 9)
Oil Receiver
Breather Hose
Front Case
Shift Fork No.1 Shaft
Pin
Shift Fork No.1
Bearing Race
Center Differential Assembly
Bearing Race
18.1 (185, 13.3)
Motor Actuator
Shift Outer Lever
Lever Lockpin
12 (120, 9)
Plug
Output Gear
Spring
Ball
Washer
Shift Inner Lever
Snap Ring
Center Diff Lock Indicator Switch
37 (380, 27)
Front Extension Housing
Shift Fork No.2 Shaft
Shift Fork No.2
Clutch Sleeve
Oil Seal
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* w/ABS
002545

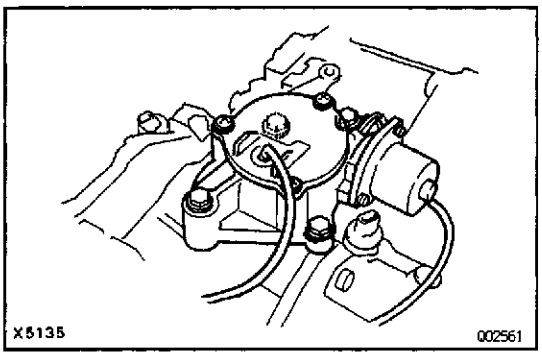


TRANSFER DISASSEMBLY

TR01K 02

(See page TR-9)

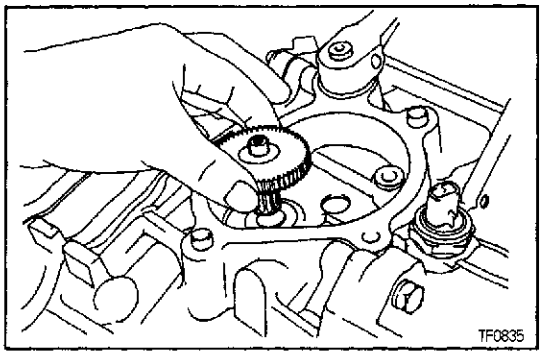
1. REMOVE BREATHER HOSE



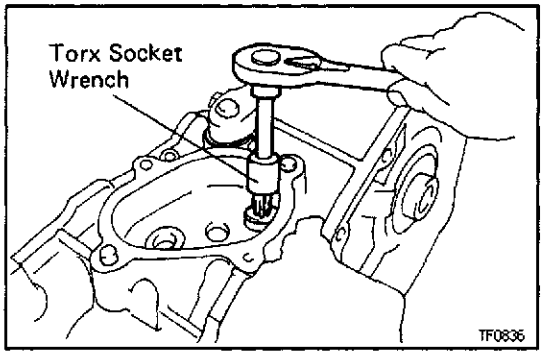
2. REMOVE MOTOR ACTUATOR

Remove the 4 bolts and motor actuator

HINT Remove the motor actuator in differential lock condition

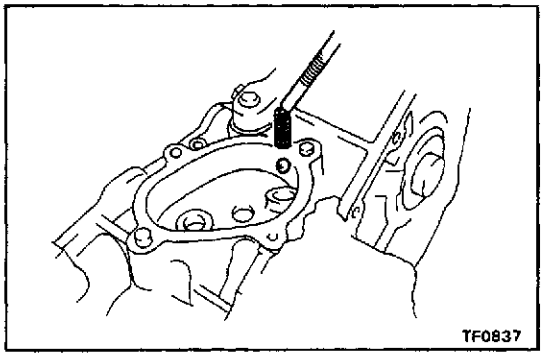


3. REMOVE OUTPUT GEAR

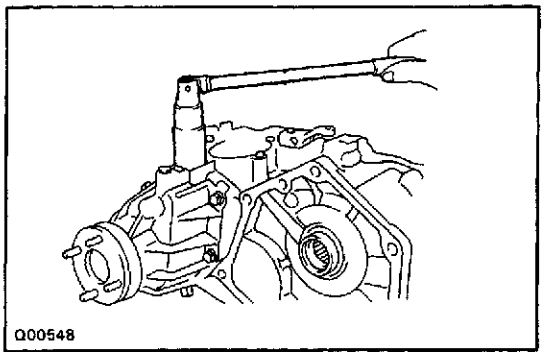


4. REMOVE SCREW PLUG, SPRING AND BALL

(a) Using a torx socket wrench, remove the screw plug (Torx socket wrench T40 09042-00020)

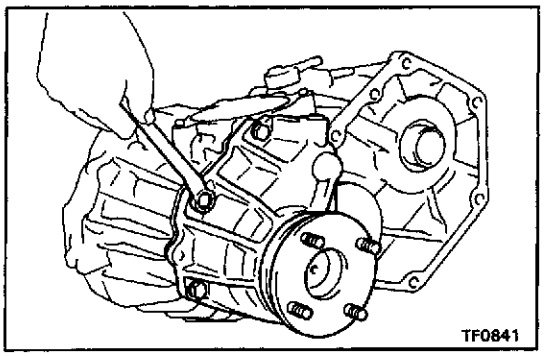


(b) Using a magnetic finger, remove the spring and ball



5. REMOVE TRANSFER INDICATOR SWITCHES

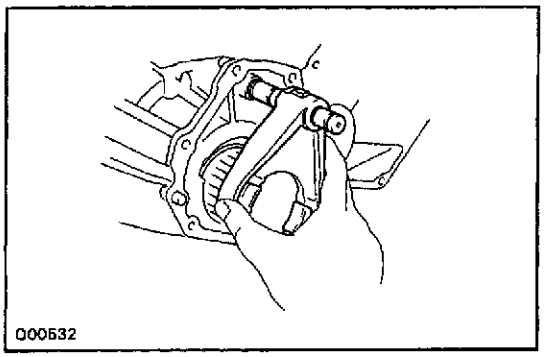
Remove the Center Diff Lock indicator switch, L4 position switch and neutral position switch



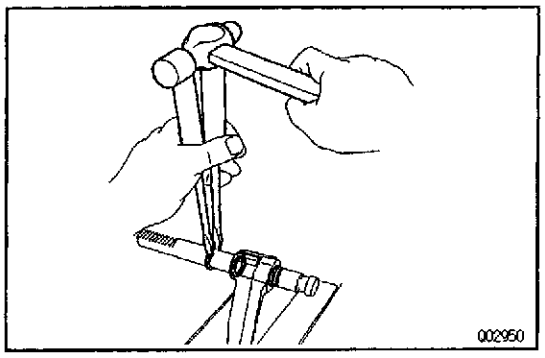
6. REMOVE FRONT EXTENSION HOUSING

Remove the 6 bolts and front extension housing

HINT If necessary, tap the front extension housing with a plastic hammer



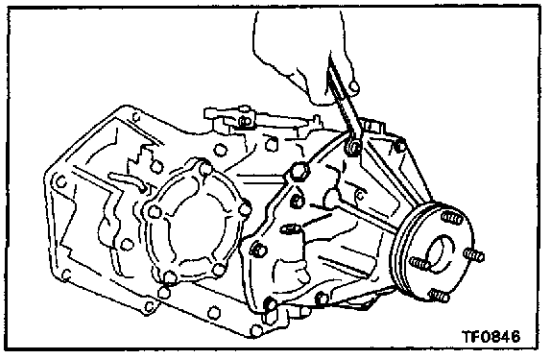
7. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT



8. SEPARATE SHIFT FORK NO.2 AND FORK SHAFT

(a) Using 2 screwdrivers and a hammer, tap out the 3 snap rings

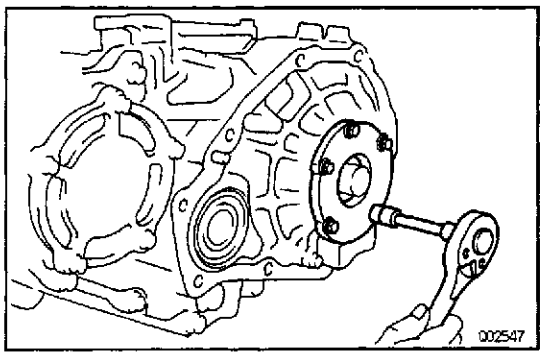
(b) Separate the shift fork No 2 and fork shaft



9. REMOVE REAR EXTENSION HOUSING

Remove the 9 bolts and rear extension housing

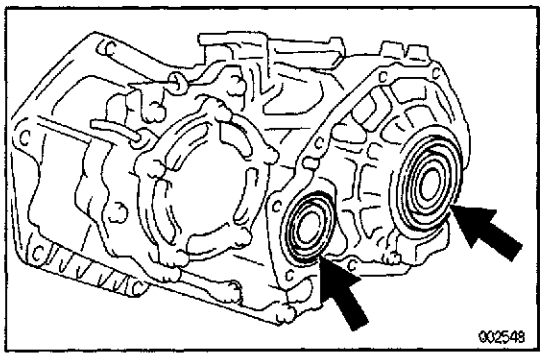
HINT If necessary, tap the rear extension housing with a plastic hammer



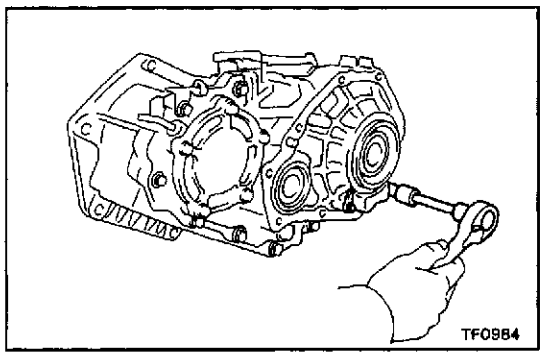
10. w/ABS:

REMOVE RETAINER

Remove the 5 bolts and retainer

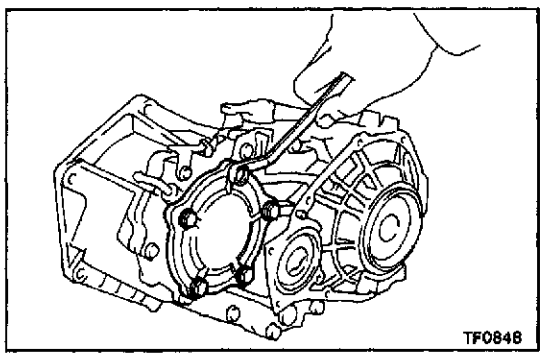


11. REMOVE ADJUSTING SHIMS



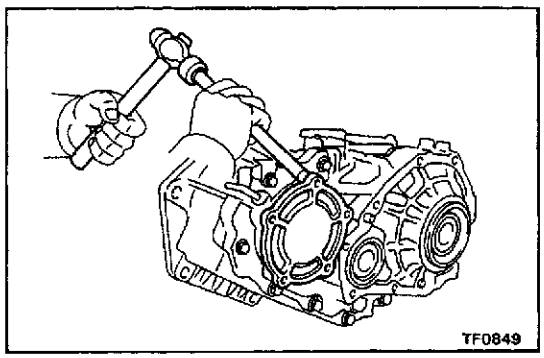
12. REMOVE OIL STRAINER FROM REAR CASE

Remove the 2 set bolts and oil strainer

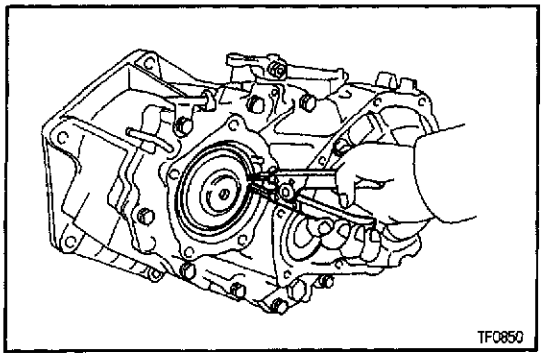


13. REMOVE CASE COVER

(a) Remove the 5 bolts

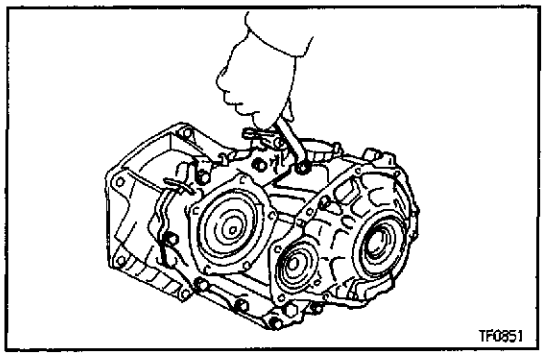


(b) Using a brass bar and hammer, tap the case cover and remove it

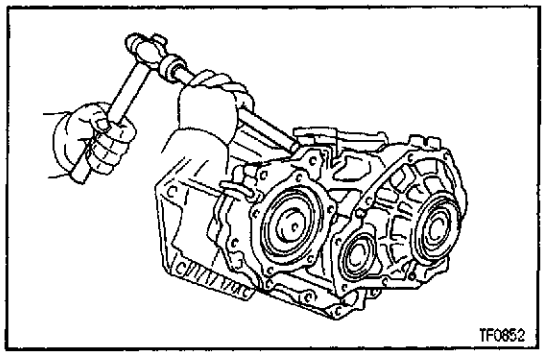


14. SEPARATE FRONT CASE AND REAR CASE

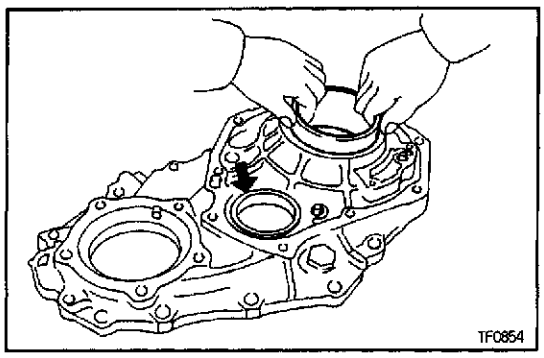
(a) Using a snap ring expander, remove the snap ring



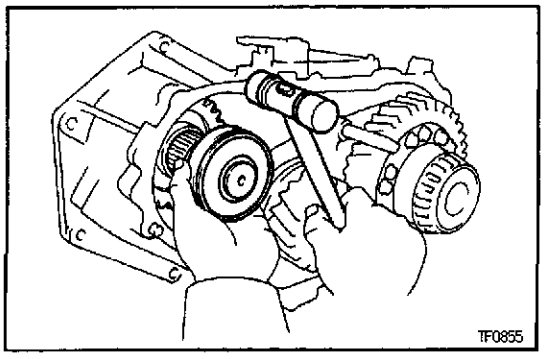
(b) Remove the 8 bolts



(c) Using a brass bar and hammer, tap the rear case and separate it

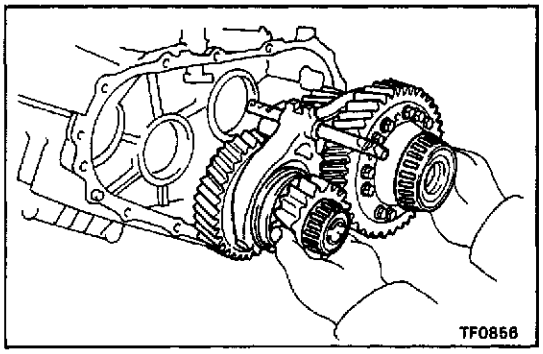


15. REMOVE 2 BEARING RACES FROM REAR CASE

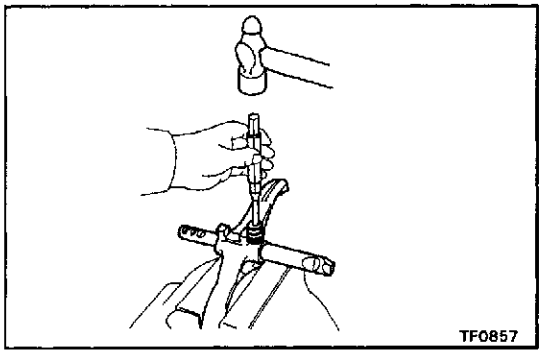


16. REMOVE INPUT SHAFT ASSEMBLY

Using a plastic hammer, remove the input shaft assembly



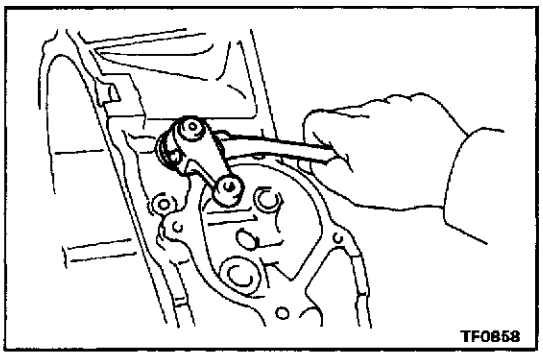
17. REMOVE IDLE GEAR ASSEMBLY, CENTER DI FFEREN-TIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY



18. SEPARATE SHIFT FORK NO.1 AND FORK SHAFT

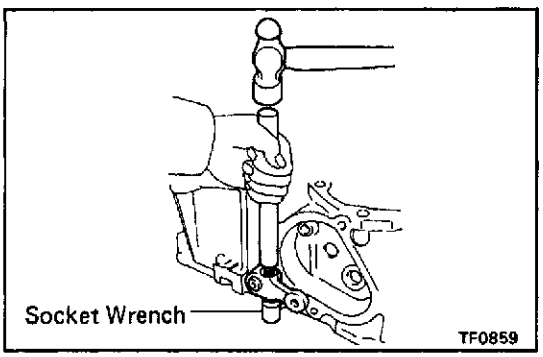
(a) Using a pin punch and hammer, drive out the slotted spring pin

(b) Separate the shift fork No 1 and fork shaft

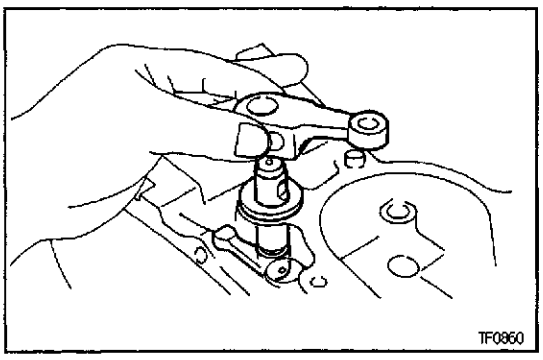


19. REMOVE SHIFT OUTER LEVER AND INNER LEVER

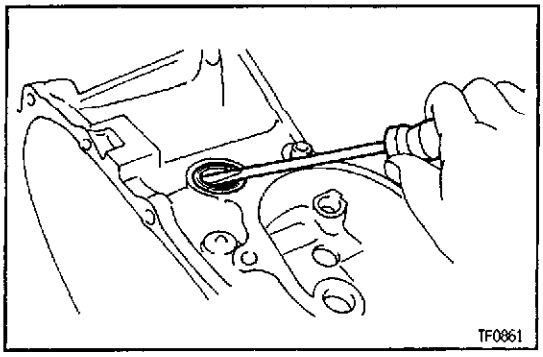
(a) Remove the nut and washer



(b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin

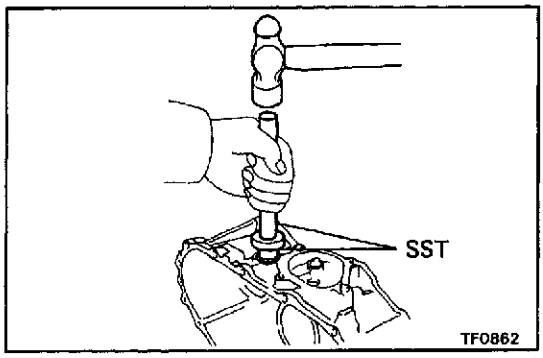


(c) Remove the shift outer lever and inner lever

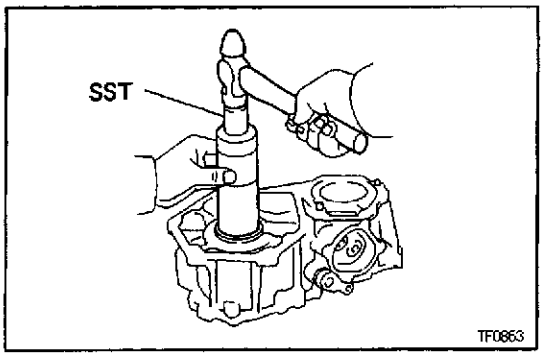


20. IF NECESSARY, REPLACE SHIFT LEVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal

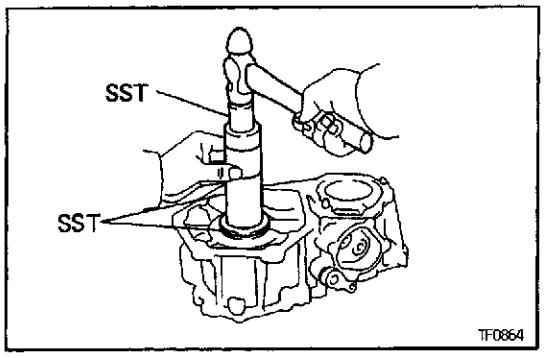


(b) Using SST and a hammer, drive in a new oil seal
SST 09608-20012 (09608-00080, 09608-03020)

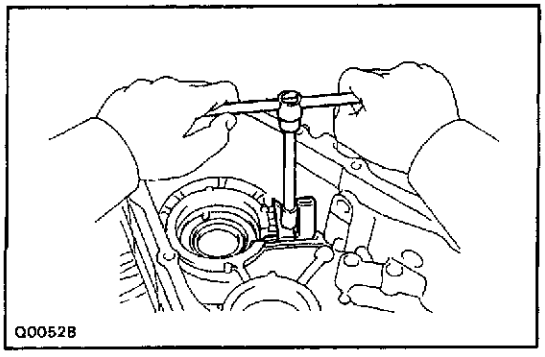


21. IF NECESSARY, REPLACE INPUT SHAFT OIL SEAL

(a) Using SST and a hammer, drive out the oil seal
SST 09316-60010 (09316-00010)

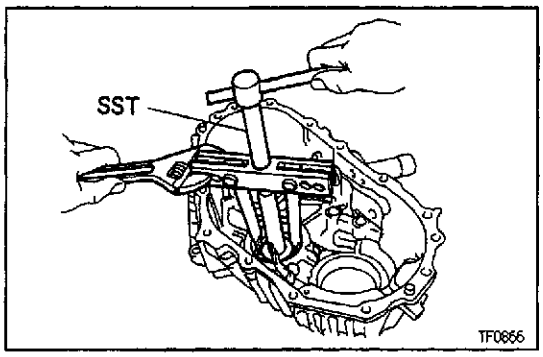


(b) Using SST and a hammer, drive in a new oil seal
SST 09316-60010 (09316-00010, 09316-00030)



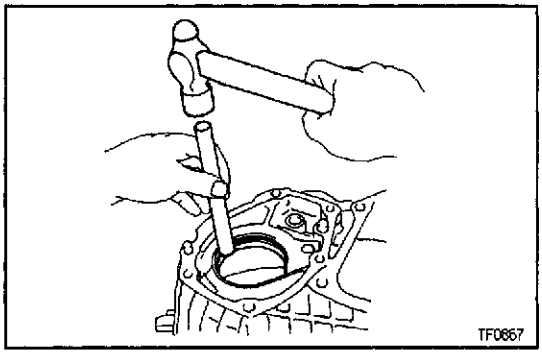
22. REMOVE OIL RECEIVER FROM FRONT CASE

Remove the set bolt and oil receiver

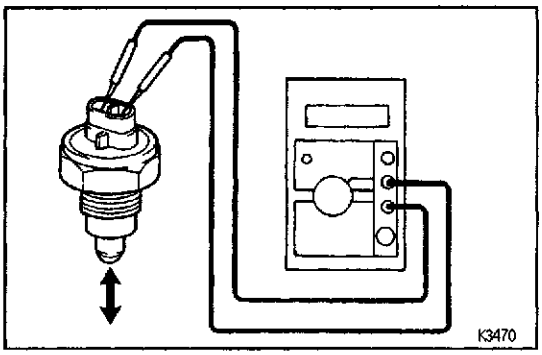


23. REMOVE 2 BEARING RACES FROM FRONT CASE

(a) Using SST, remove the 2 bearing races
SST 09950-20017



(b) Using a brass bar and hammer, remove the bearing race



24. INSPECTION OF TRANSFER INDICATOR SWITCHES

Check that there is continuity between terminals as shown

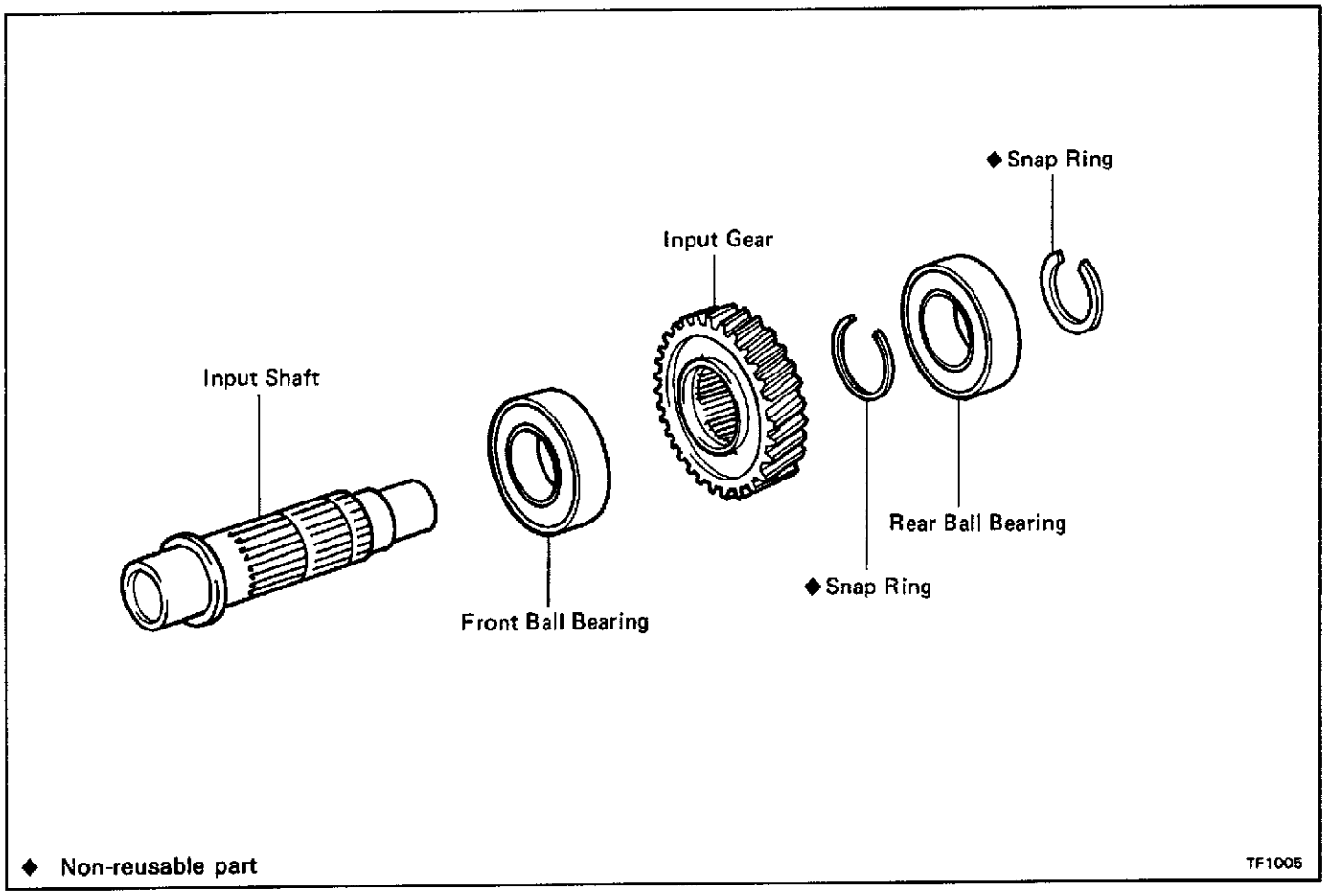
Switch Position	Specified
Push	Continuity
Free	No continuity

If continuity is not as specified, replace the switch

INPUT SHAFT ASSEMBLY

TR01L-01

COMPONENTS

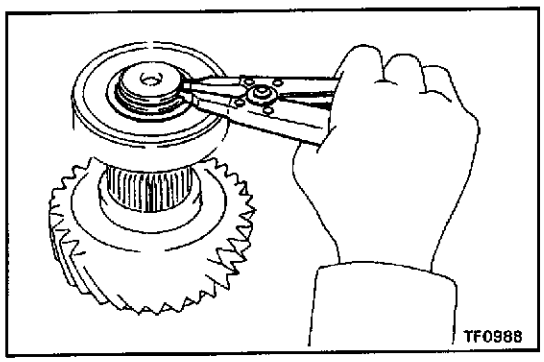


TR01M-02

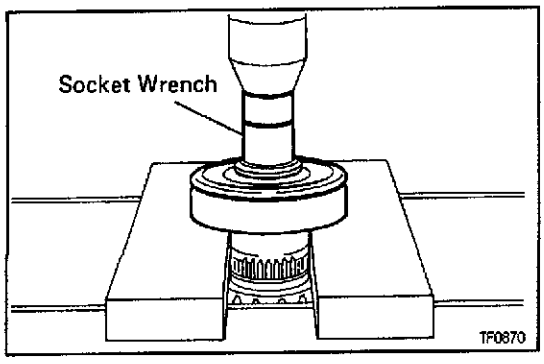
INPUT SHAFT DISASSEMBLY

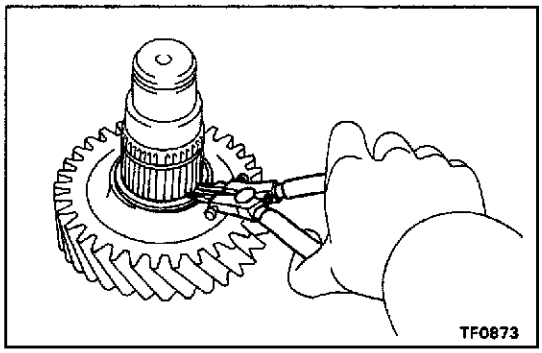
1. REMOVE REAR BALL BEARING

(a) Using a snap ring expander, remove the snap ring



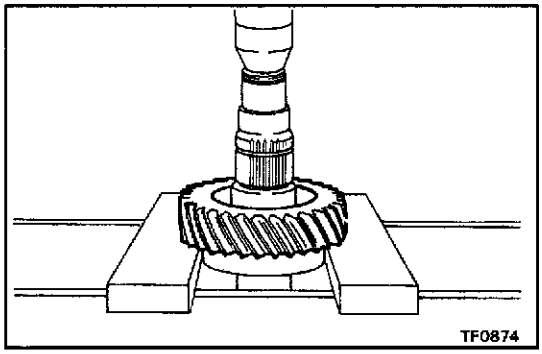
(b) Using a press and socket wrench, remove the rear ball bearing



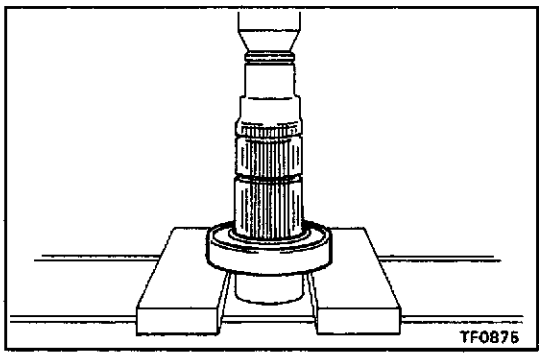


2. REMOVE INPUT GEAR

(a) Using a snap ring expander, remove the snap ring



(b) Using a press, remove the input gear

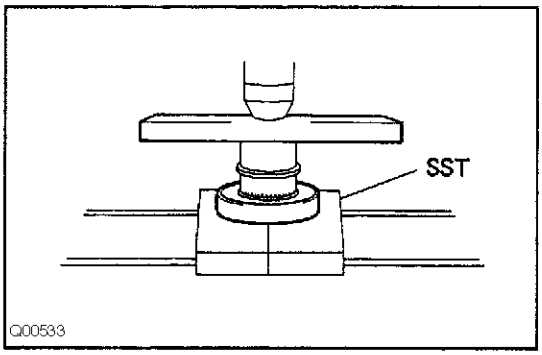


3. REMOVE FRONT BALL BEARING

Using a press, remove the front ball bearing

INPUT SHAFT ASSEMBLY

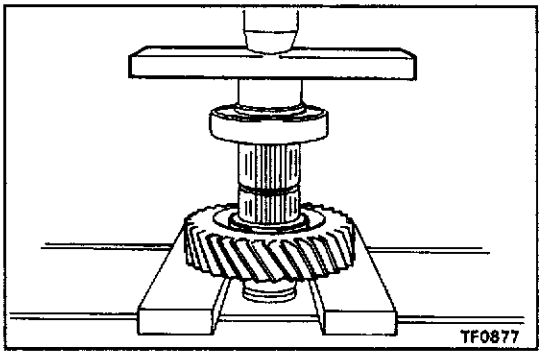
TR01N-02



1. INSTALL FRONT BALL BEARING

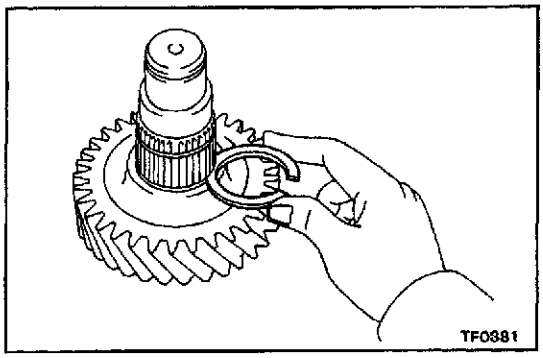
Using SST and a press, install the front ball bearing

SST 09527-30010



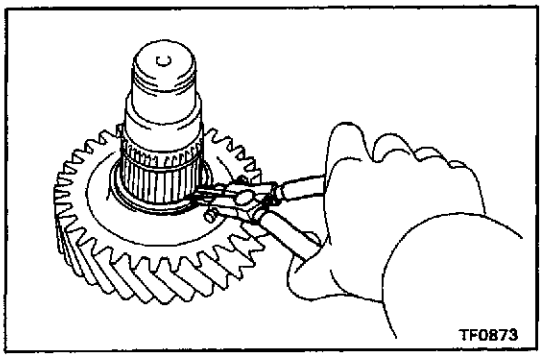
2. INSTALL INPUT GEAR

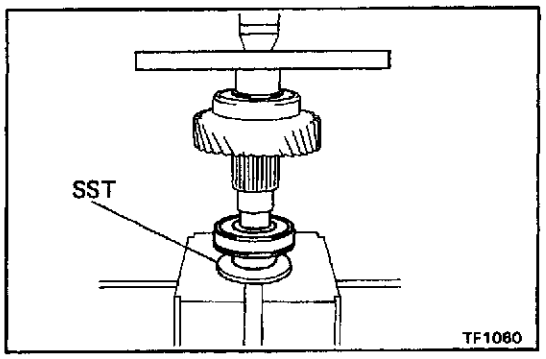
(a) Using a press, install the input gear



(b) Select a snap ring that will allow minimum axial play and install it on the shaft

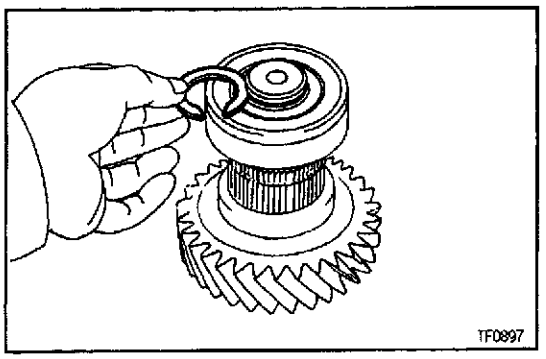
Mark	Thickness mm (in)
A	2.00 (0.0787)
B	2.10 (0.0827)
C	2.20 (0.0866)
D	2.30 (0.0906)
E	2.40 (0.0945)
F	2.50 (0.0984)
G	2.60 (0.1024)
H	2.70 (0.1063)
J	2.80 (0.1102)





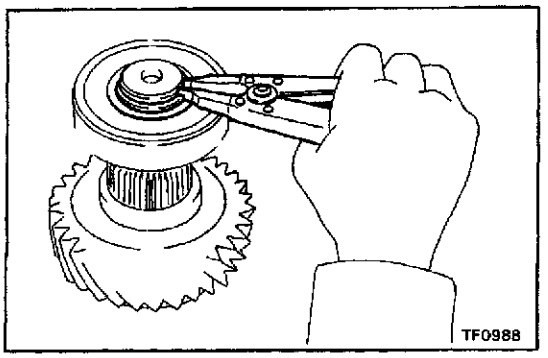
3. INSTALL REAR BALL BEARING

(a) Using SST and a press, install the rear ball bearing
SST 09316-60010 (09316-00030)



(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)

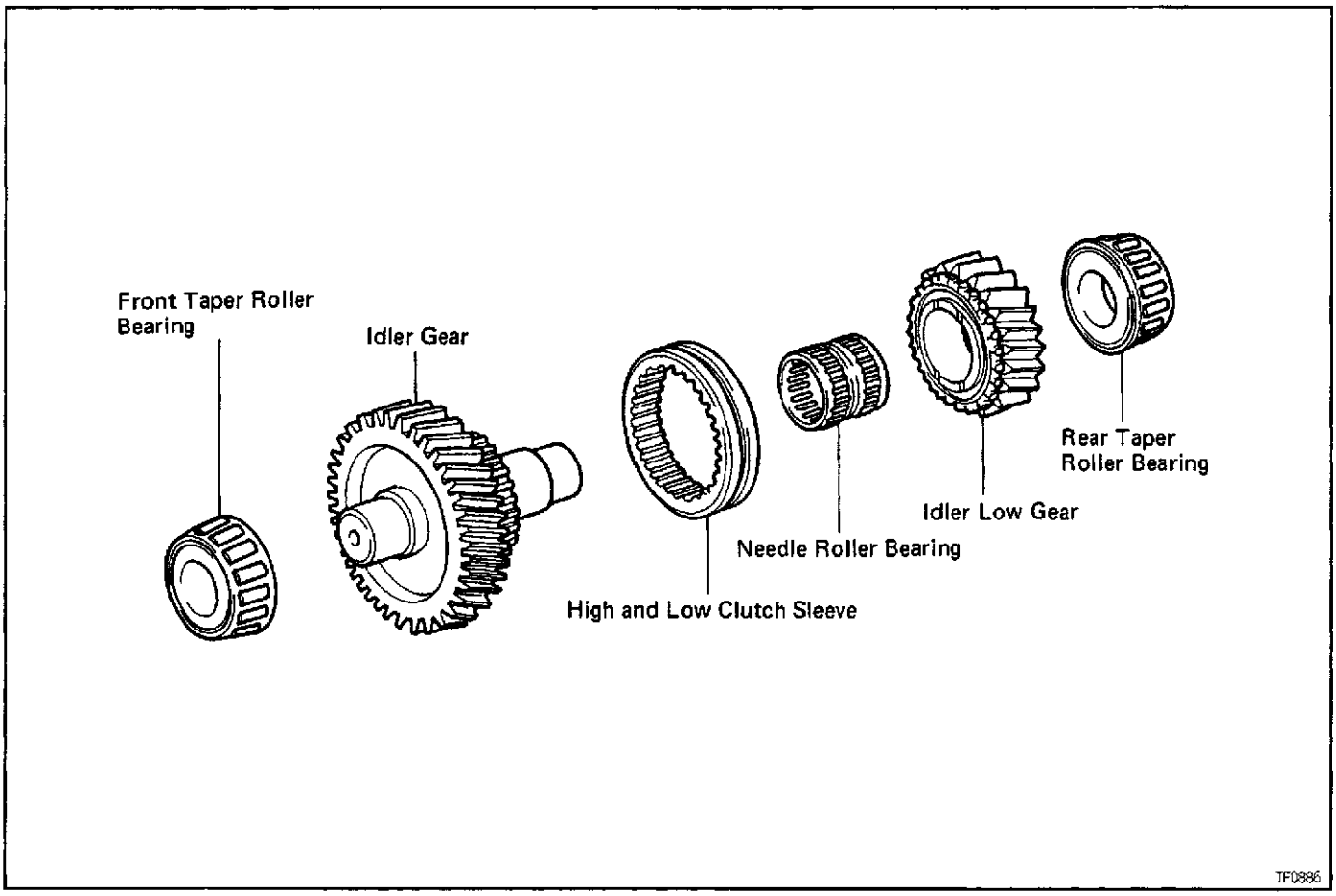


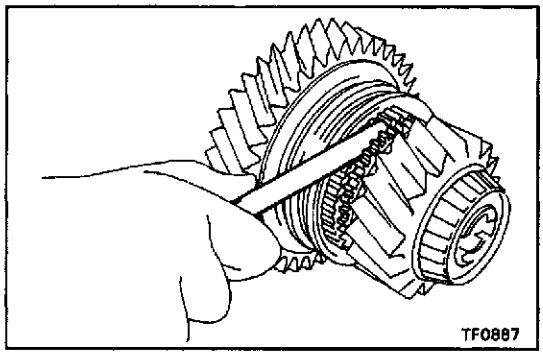
(c) Using a snap ring expander, install the snap ring

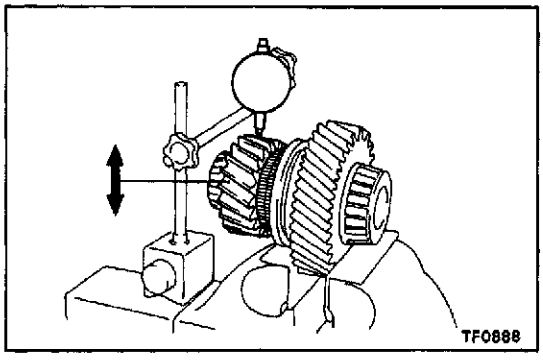
IDLER GEAR ASSEMBLY

TR01F-01

COMPONENTS







IDLER GEAR DISASSEMBLY

TR01G-02

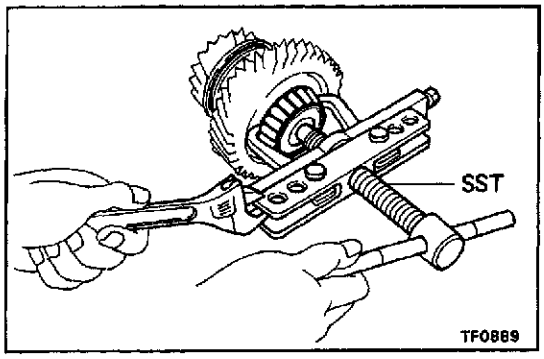
1. CHECK RADIAL CLEARANCE AND THRUST CLEARANCE OF IDLER LOW GEAR

(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.)

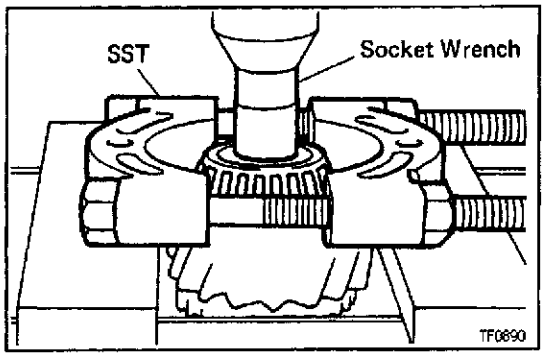
(b) Using a dial indicator, measure the idler low gear radial clearance

Standard clearance:
0.015-0.068 mm (0.0006-0.0027 in.)
Maximum clearance:
0.068 mm (0.0027 in.)



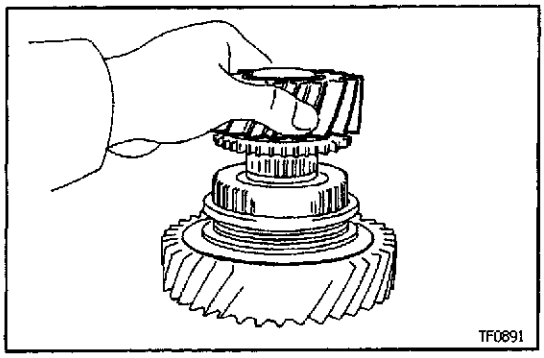
2. REMOVE FRONT TAPER ROLLER BEARING

Using SST, remove the front taper roller bearing
SST 09950-20017

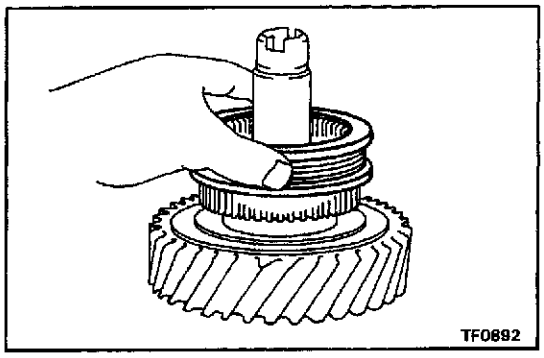


3. REMOVE REAR TAPER ROLLER BEARING

Using SST, press and socket wrench, remove the rear taper roller bearing
SST 09950-00020



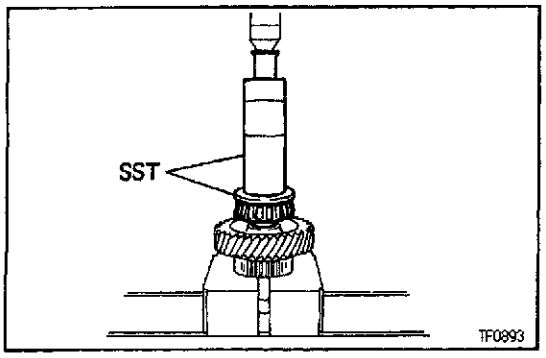
4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEARING



5. REMOVE HIGH AND LOW CLUTCH SLEEVE

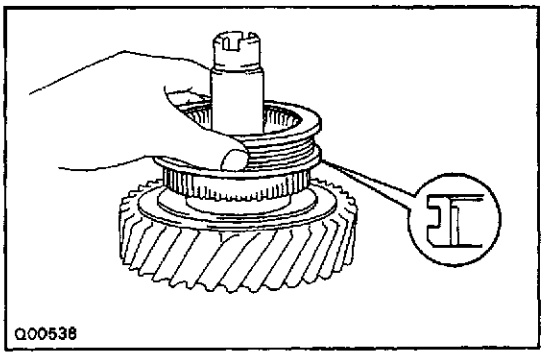
TR01R-03

IDLER GEAR ASSEMBLY



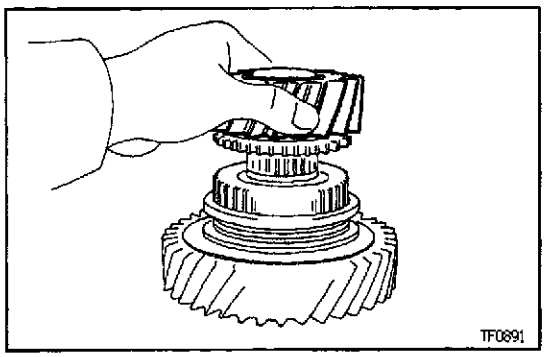
1. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing
SST 09316-60010 (09316-00010, 09316-00030)



2. INSTALL HIGH AND LOW CLUTCH SLEEVE

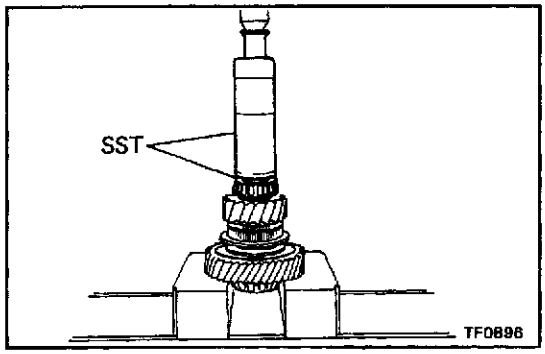
HINT Make sure to install the high and low clutch sleeve in the correct direction



3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR

(a) Apply gear oil to the needle roller bearing

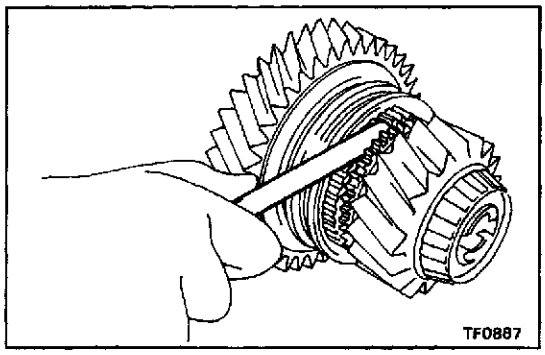
(b) Install the needle roller bearing and idler low gear



4. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bearing

SST 09316-60010 (09316-00010, 09316-00070)



5. MEASURE IDLER LOW GEAR THRUST AND RADIAL CLEARANCE

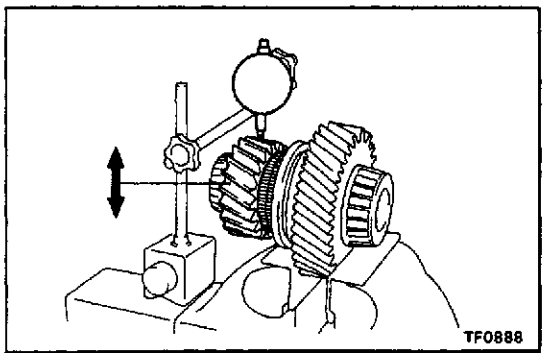
(a) Using a feeler gauge, measure the idler low gear thrust clearance

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:

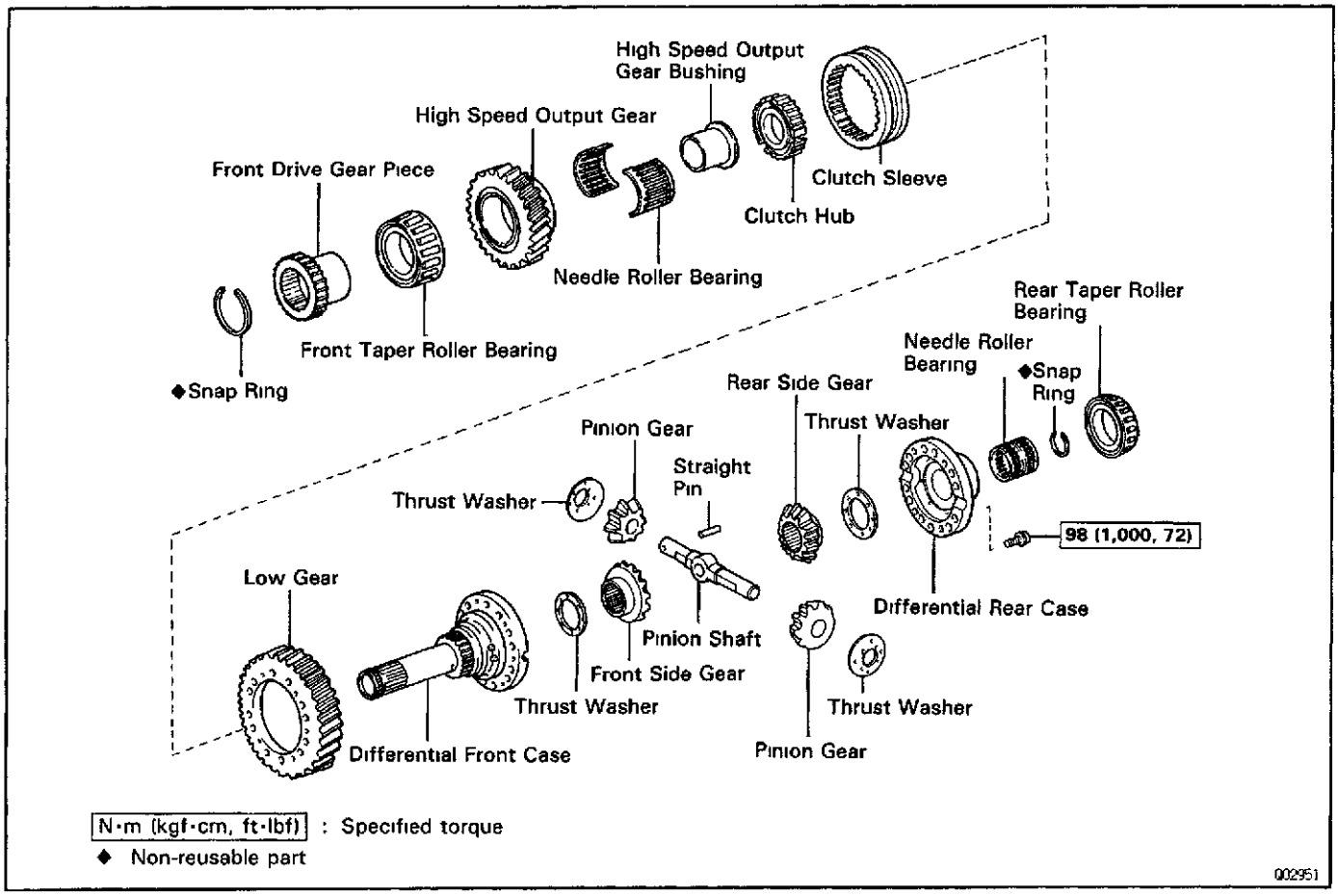
0.015-0.068 mm (0.0006-0.0027 in.)

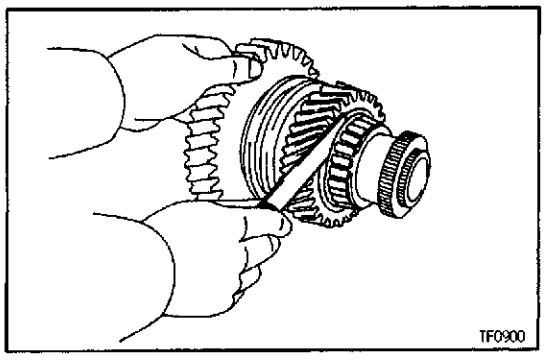
Maximum clearance

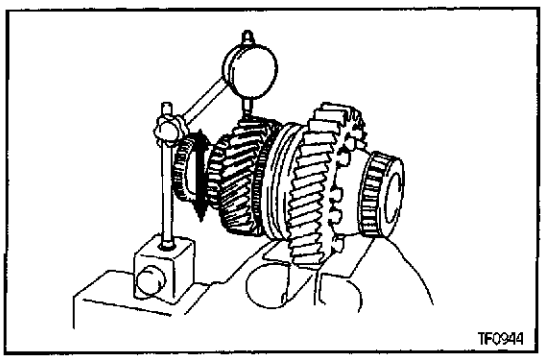
0.068 mm (0.0027 in.)

CENTER DIFFERENTIAL ASSEMBLY

COMPONENTS







CENTER DIFFERENTIAL DISASSEMBLY

1. CHECK RADIAL CLEARANCE AND THRUST CLEARANCE OF HIGH SPEED GEAR

(a) Using a feeler gauge, measure the high speed gear thrust clearance

Standard clearance:

0.10-0.25 mm (0.0039-0.0088 in.)

Maximum clearance:

0.25 mm (0.0098 in.)

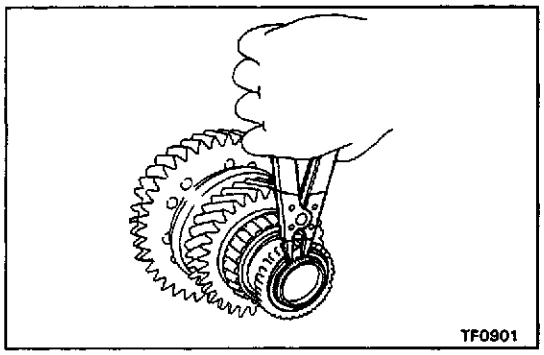
(b) Using a dial indicator measure the high speed gear radial clearance

Standard clearance:

0.015-0.071 mm (0.0006-0.0028 in.)

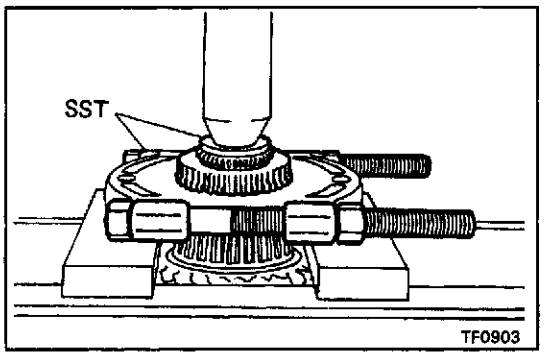
Maximum clearance:

0.071 mm (0.0028 in.)



2. REMOVE FRONT DRIVE GEAR PIECE

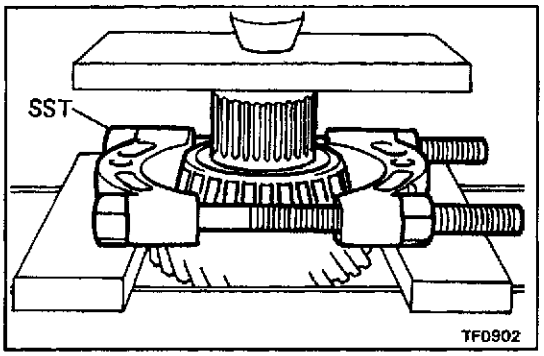
(a) Using a snap ring expander, remove the snap ring



(b) Using SST and a press, remove the front drive gear piece

SST 09950-00020, 09950-20017

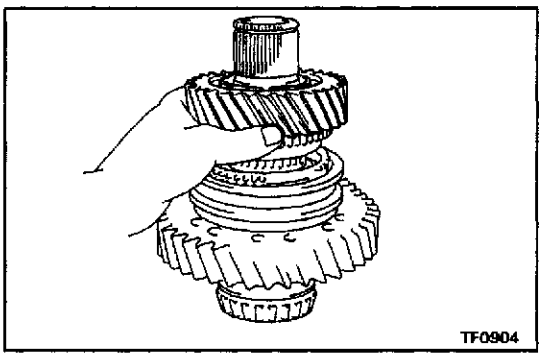
NOTICE: Be careful do not drop the center differential assembly.



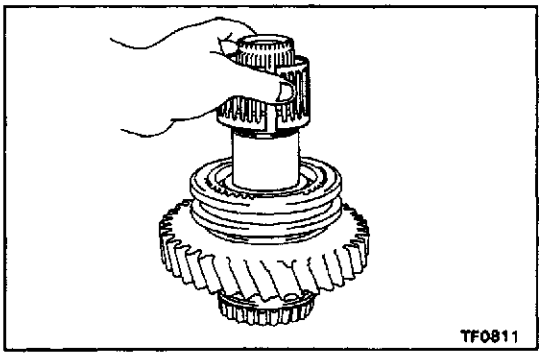
3. REMOVE FRONT TAPER ROLLER BEARING

Using SST and a press, remove the front taper roller bearing

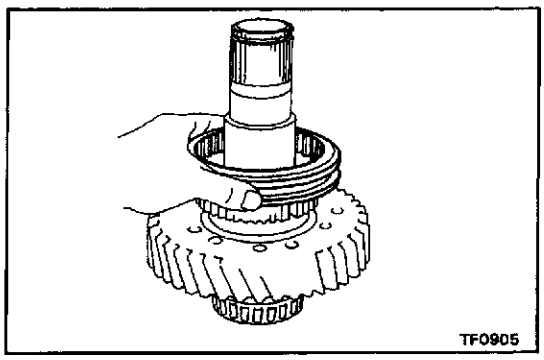
SST 09950 - 00020



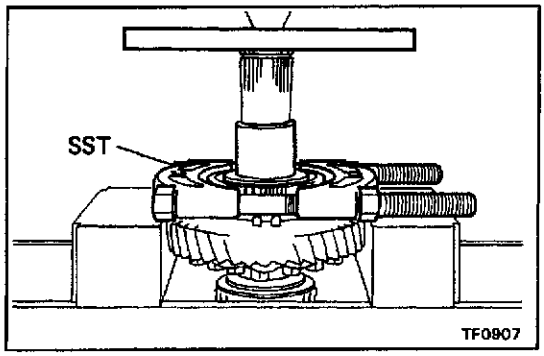
4. REMOVE HIGH SPEED OUTPUT GEAR AND SYNCHRONIZER RING



5. REMOVE NEEDLE ROLLER BEARING



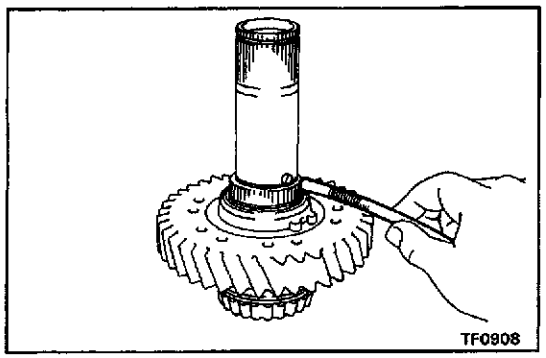
6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY



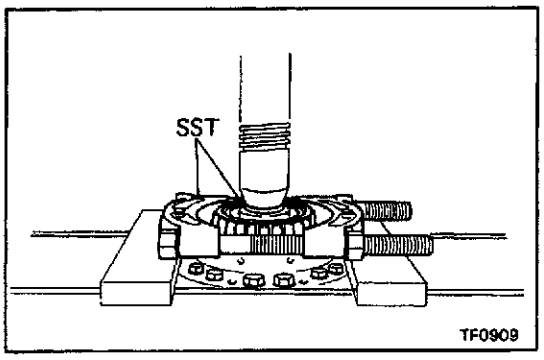
7. REMOVE HIGH SPEED OUTPUT GEAR BUSHING, CLUTCH HUB AND SHIFTING KEY RETAINER

(a) Using SST and a press, remove the high speed output gear bushing and clutch hub

SST 09555 - 55010



(b) Using a magnetic finger, remove the 2 straight pins



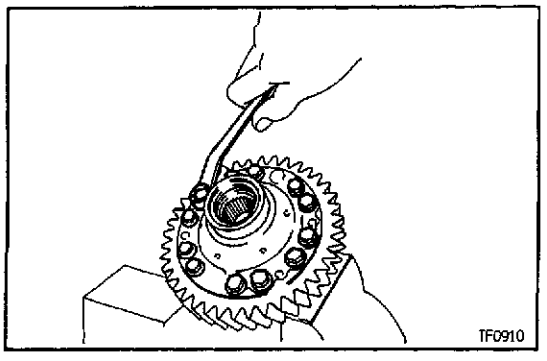
8. REMOVE REAR TAPER ROLLER BEARING

Using SST and a press, remove the rear taper roller bearing

SST 09950 - 00020, 09950 - 20017 (09958 - 30010)

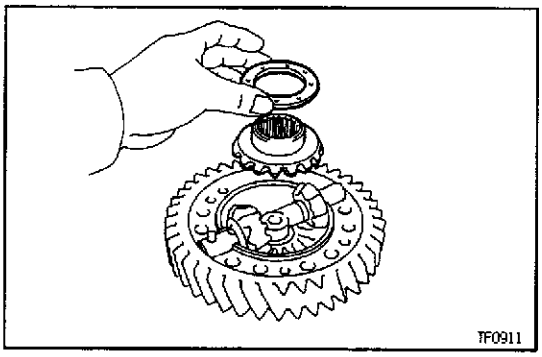
9. W/ABS:

REMOVE SNAP RING AND NEEDLE ROLLER BEARING

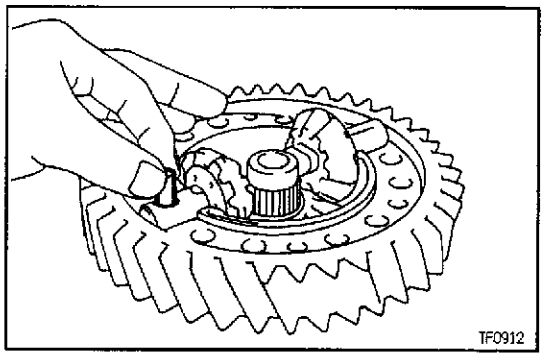


10. REMOVE DIFFERENTIAL REAR CASE

Remove the 12 bolts and differential rear case

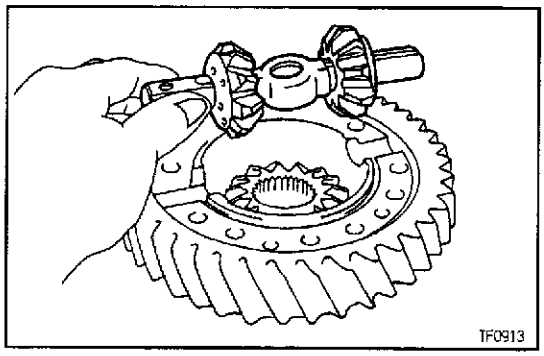


11. REMOVE REAR SIDE GEAR AND THRUST WASHER

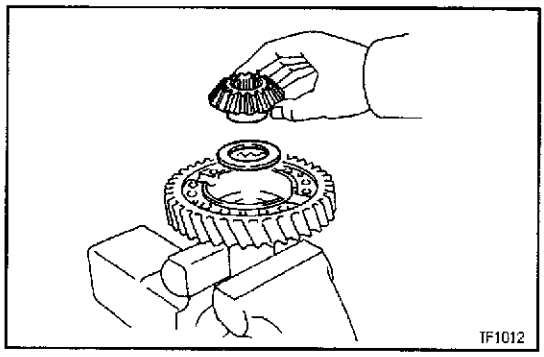


12. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER

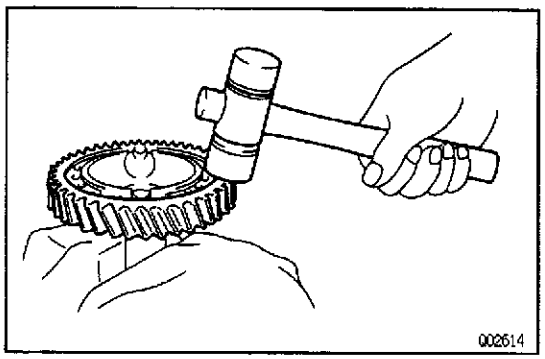
(a) Remove the straight pin



(b) Remove the pinion shaft, pinion gear and thrust washer



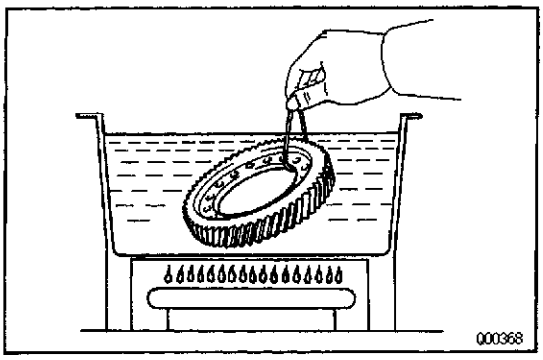
(c) Remove the front side gear and thrust washer



13. REMOVE LOW GEAR

Using a plastic hammer, tap out the low gear

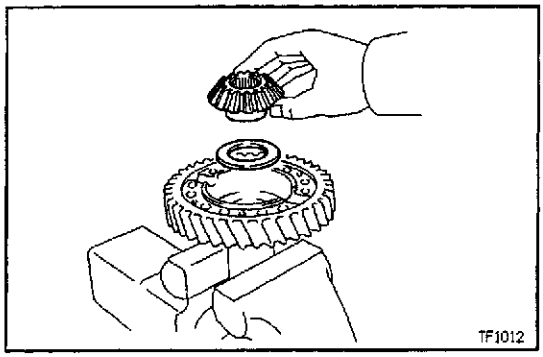
NOTICE: Be careful do not damage the low gear.



CENTER DIFFERENTIAL ASSEMBLY TR01U-02

1. INSTALL LOW GEAR

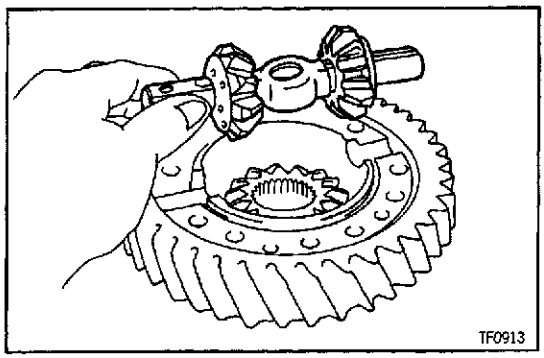
(a) Clean the contact surface of the differential case
(b) Heat the low gear in boiling water
(c) Clean the contact surface of the low gear with cleaning solvent
(d) Then quickly install the low gear on the differential case



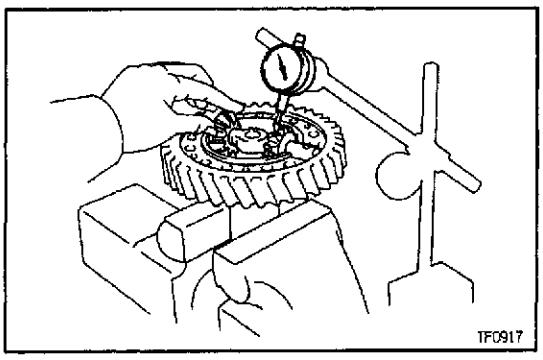
2. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER

HINT Coat all of the sliding and rotating surface with gear oil before assembly

(a) Install the front side gear and thrust washer to the differential front case



(b) Install the 2 pinion gears and thrust washers to the differential front case



(c) Using a dial indicator, measure the front case backlash

HINT Push the pinion shaft

Minimum backlash:

0 05 mm (0 0020 in)

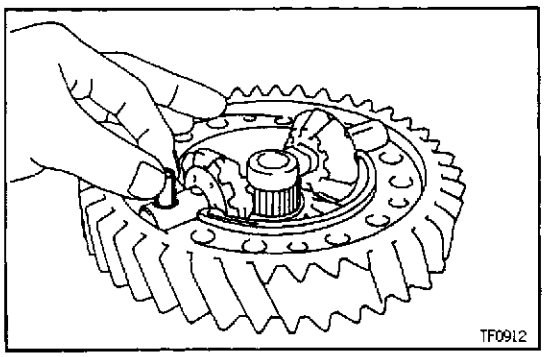
If the backlash is not within specification, replace the thrust washer with one of the correct size and reinstall the thrust washer

Thickness:

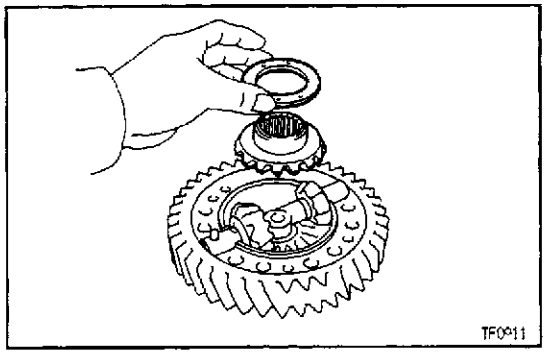
1.70 mm (0.0669 in.)
1.85 mm (0.0728 in.)
2.00 mm (0.0787 in.)
2.15 mm (0.0846 in.)
2.30 mm (0.0906 in.)
2.45 mm (0.0965 in.)
2.60 mm (0.1024 in.)
2.75 mm (0.1083 in.)
2.90 mm (0.1142 in.)
3.05 mm (0.1201 in.)

(d) Measure the rear case backlash

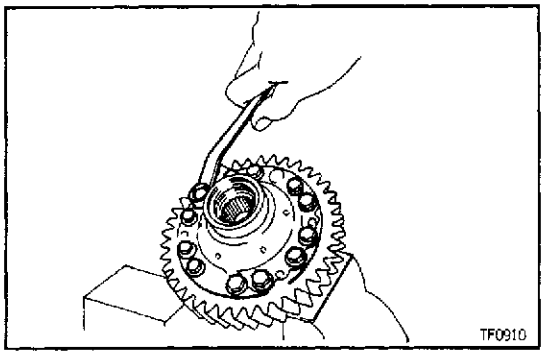
(See steps 3 to 4 on page TR-28)



3. INSTALL STRAIGHT PIN

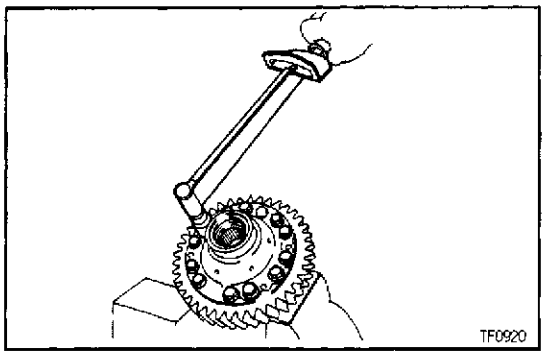


4. INSTALL REAR SIDE GEAR AND THRUST WASHER



5. INSTALL DIFFERENTIAL REAR CASE

Install the differential rear case and 12 set bolts

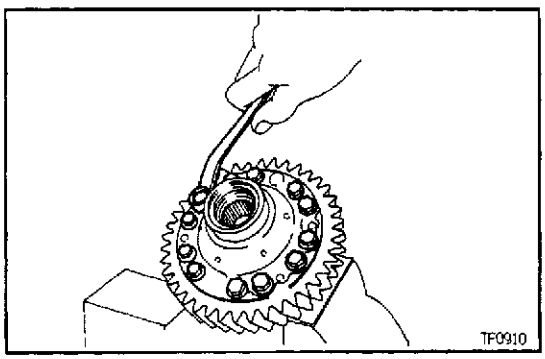


6. TORQUE REAR CASE SET BOLTS

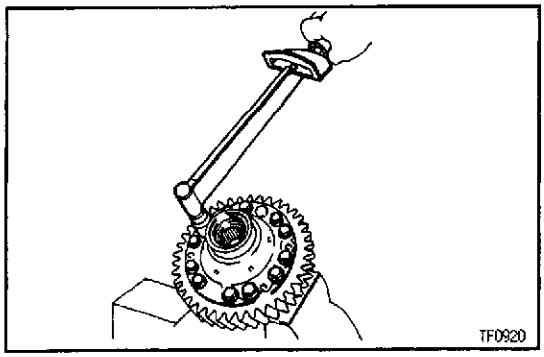
(a) Torque the rear case 12 set bolts

Torque: 88 N-m (900 kgf-cm, 65 ft-lbf)

(b) Turn the pinion gear



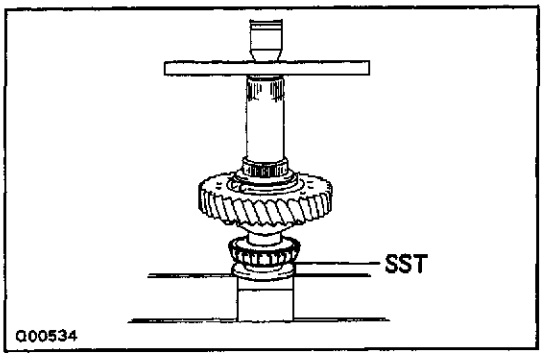
(c) Loosen the rear case 12 set bolts



(d) Torque the rear case 12 set bolts
Torque: 98 N-m (1,000 kgf-cm, 72 ft-lbf)

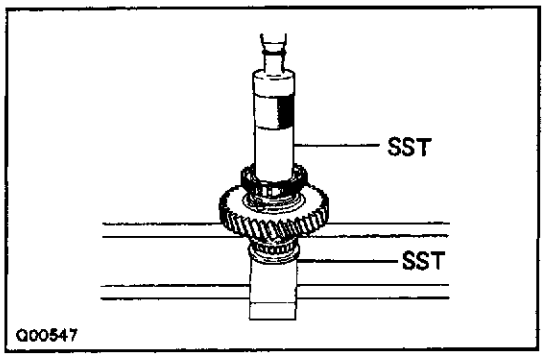
7. w/ABS:

INSTALL NEEDLE ROLLER BEARING AND SNAP RING



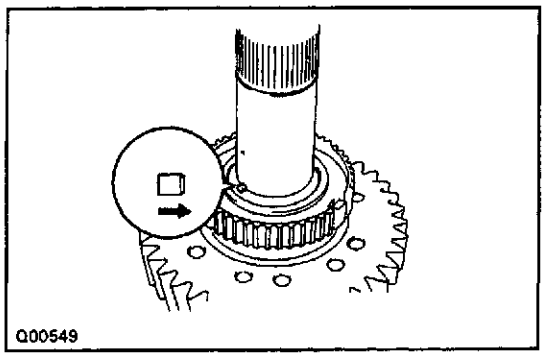
8. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bearing
SST 09316 -12010



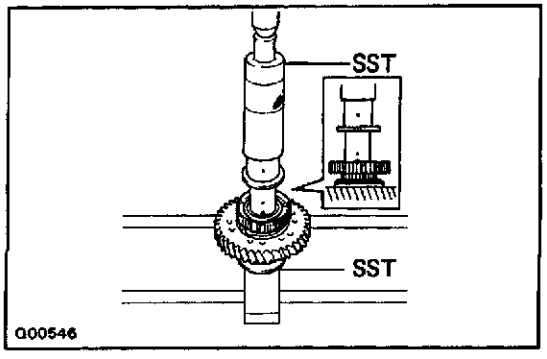
9. INSTALL CLUTCH HUB

Using SST and a press, install the clutch hub
SST 09316-12010, 09316-60010 (09316-00010)



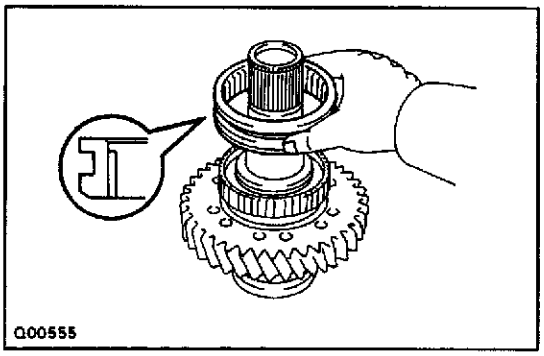
10. INSTALL HIGH SPEED OUTPUT GEAR BUSHING

(a) Apply MP grease to the straight pin
(b) Install the straight pin



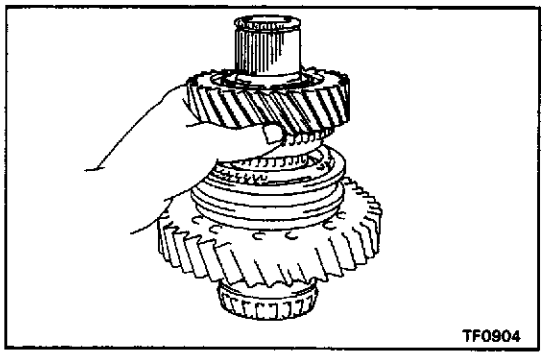
(c) Using SST and a press, install the high speed bushing
SST 09316-12010, 09316-60010 (09316-00010)

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

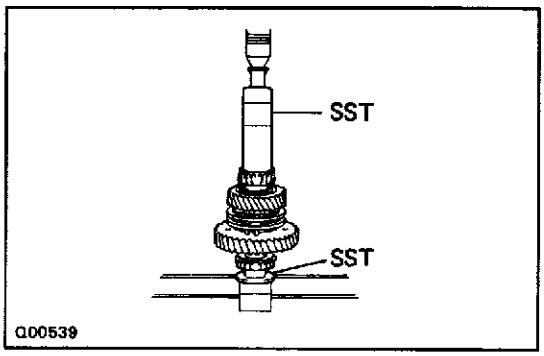
HINT Make sure to ınstall the hıgh and low clutch sleeve ın the correct dırectıon



12. INSTALL HIGH SPEED OUTPUT GEAR AND NEEDLE ROLLER BEARING

(a) Apply gear oıl to the needle roller bearıng

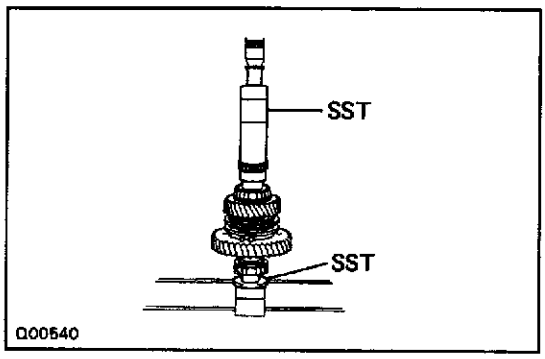
(b) Place the synchronızer rıng on the gear and ınstall the hıgh speed output gear and needle roller bearıng



13. INSTALL FRONT TAPER ROLLER BEARING

Usıng SST and a press, ınstall the front taper roller bearıng

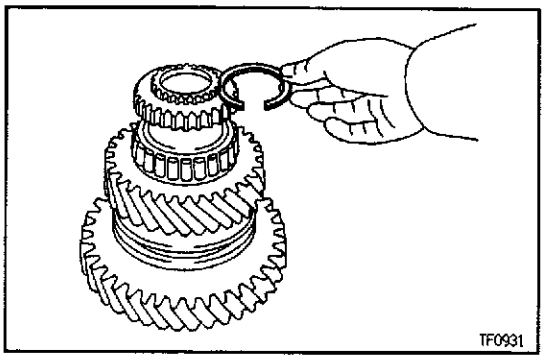
SST 09316-12010, 09316-60010 (09316-00010)



14. INSTALL FRONT DRIVE GEAR PIECE

Usıng SST and a press, ınstall the front drıve gear pıece

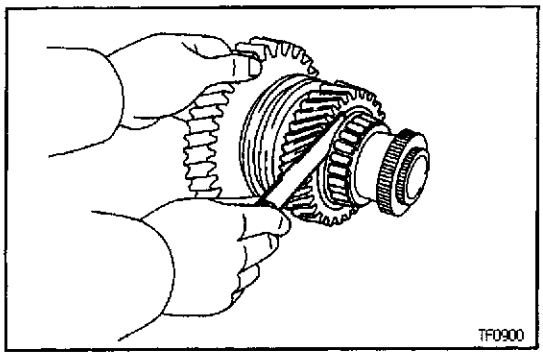
SST 09316-12010, 09316-60010 (09316-00010)

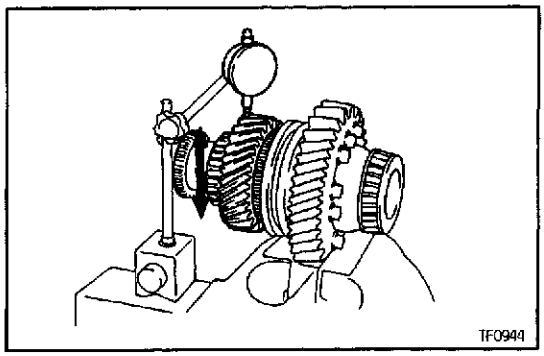


15. INSTALL SNAP RING

Select a snap rıng that wıll allow mınımum axıal play and ınstall ıt on the shaft

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)
F	2 50 (0 0984)
G	2 60 (0 1024)
H	2 70 (0 1063)
J	2 80 (0 1102)
K	1 80 (0 0709)
L	1 90 (0 0748)


TF0900


TF0944

16. MEASURE THRUST CLEARANCE AND RADIAL CLEARANCE OF HIGH SPEED GEAR THRUST CLEARANCE

(a) Using a feeler gauge, measure the high speed 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 gear radial clearance

Standard clearance:

0.015-0.071 mm (0.0006-0.0028 in.)

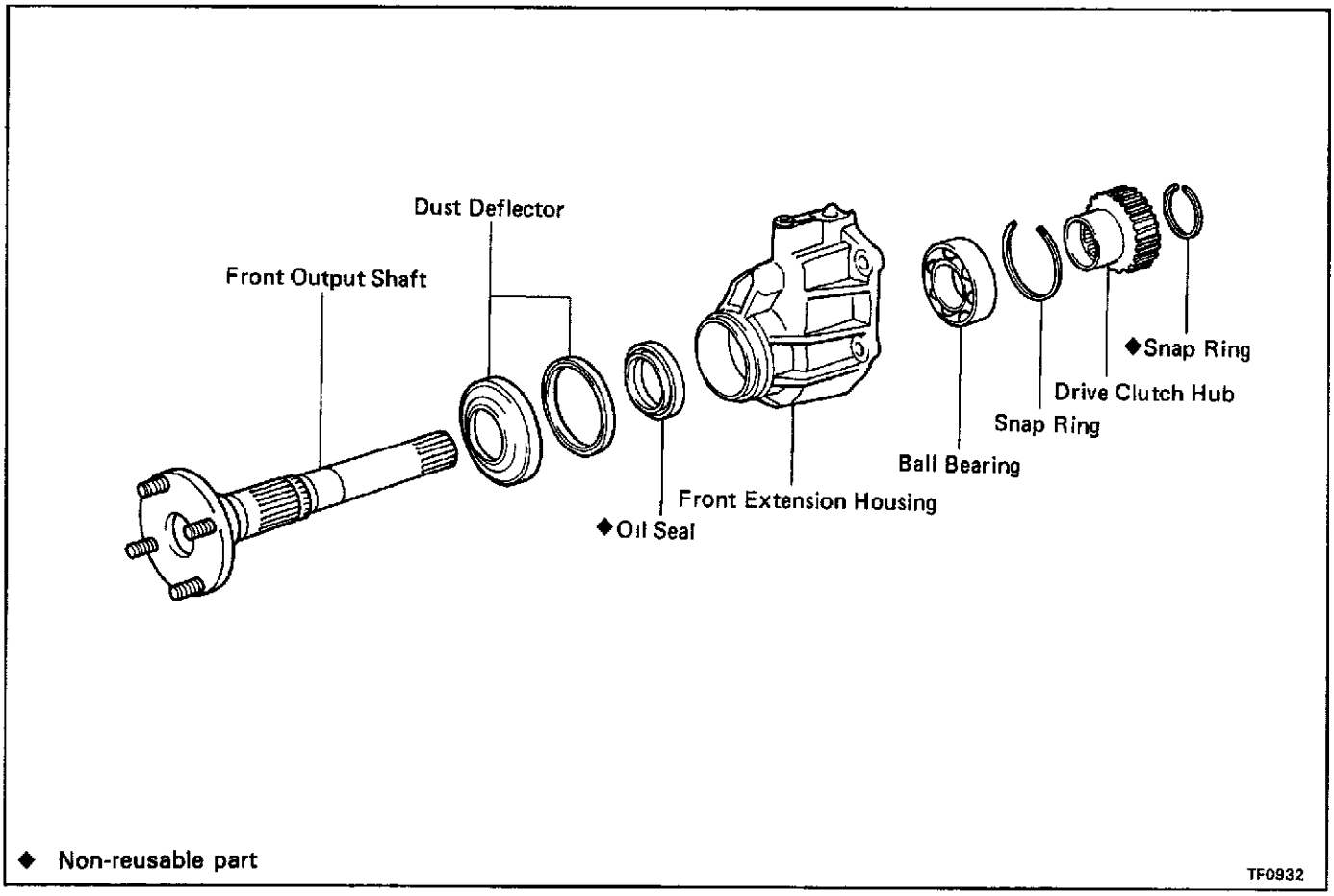
Maximum clearance:

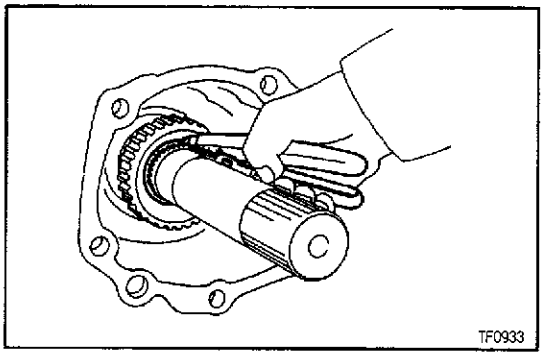
0.071 mm (0.0028 in.)

FRONT EXTENSION HOUSING ASSEMBLY

COMPONENTS

TR01V-01

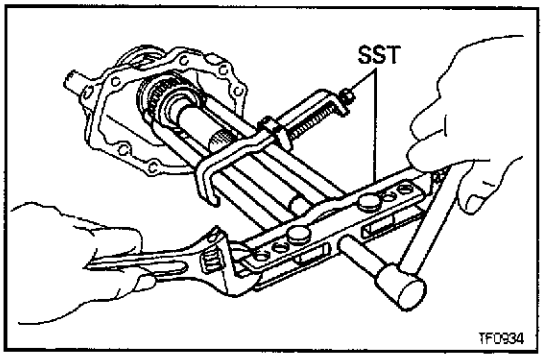




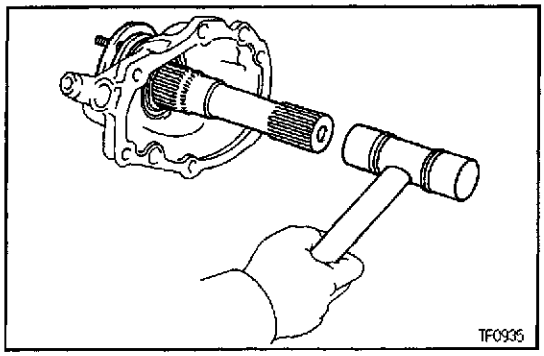
FRONT EXTENSION HOUSING DISASSEMBLY

1. REMOVE DRIVE CLUTCH HUB

(a) Using a snap ring expander, remove the snap ring

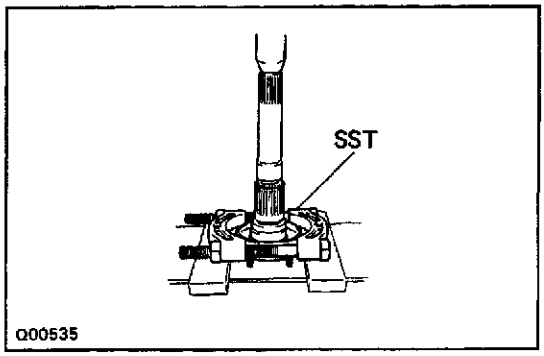


(b) Using SST, remove the drive clutch hub
SST 09950-20017



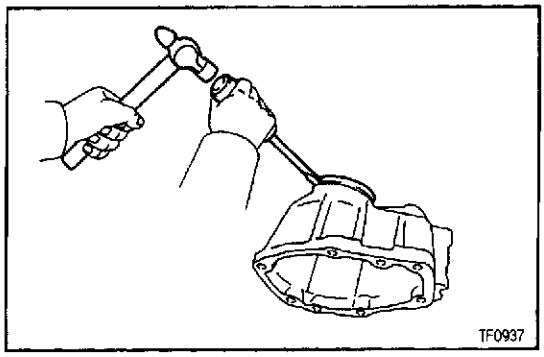
2. REMOVE FRONT OUTPUT SHAFT

Using a plastic hammer, drive out the front output shaft

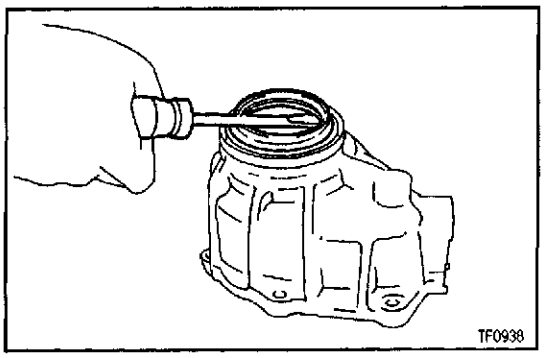


3. REMOVE DUST DEFLECTORS

(a) Using SST and a press, remove the dust deflector
SST 09950-00020

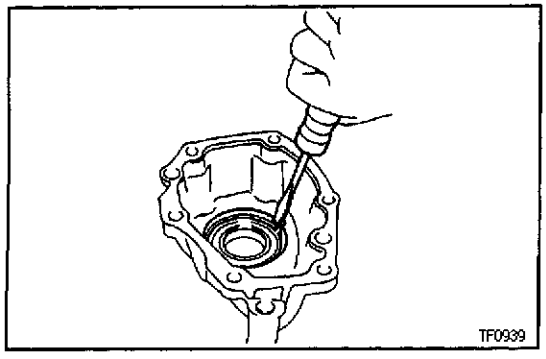


(b) Using a screwdriver and hammer, tap the dust deflector and remove it



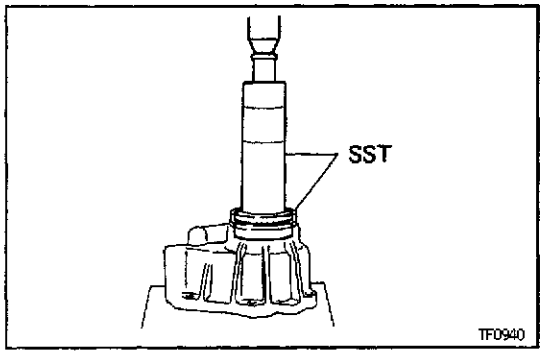
4. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal

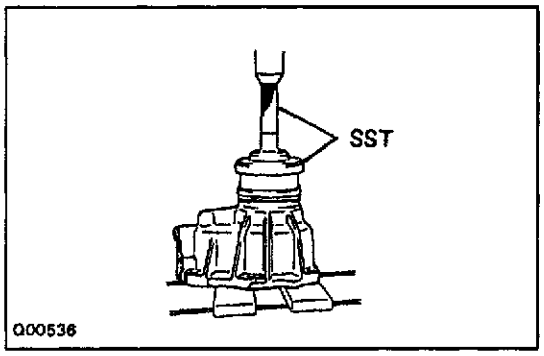


5. REMOVE BALL BEARING

(a) Using a screwdriver, remove the snap ring



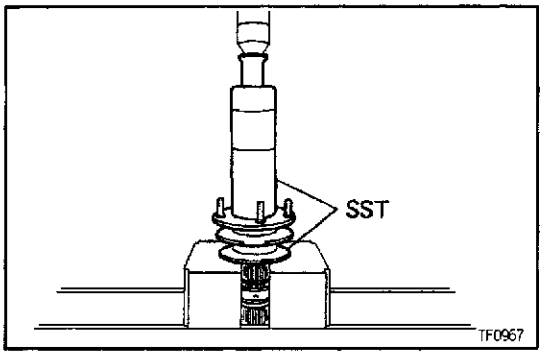
(b) Using SST and a press, remove the ball bearing
SST 09316-60010 (09316-00010, 09316-00070)



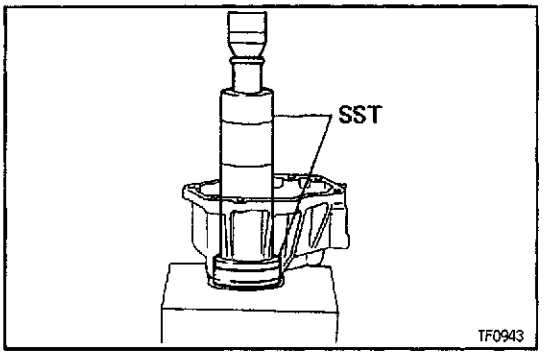
FRONT EXTENSION HOUSING ASSEMBLY

1. INSTALL DUST DEFLECTORS

(a) Using SST and a press, install the dust deflector
SST 09223-15020, 09223-41020

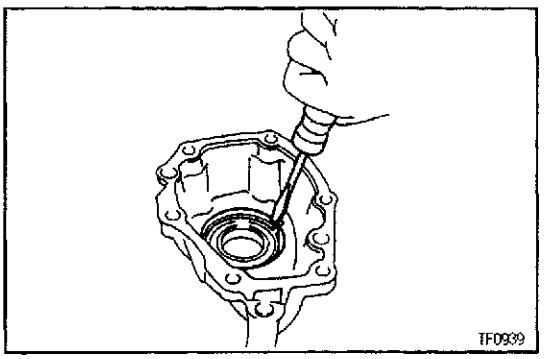


(b) Using SST and a press, install the dust deflector
SST 09316-2001 1, 09316-60010 (09316-00010)

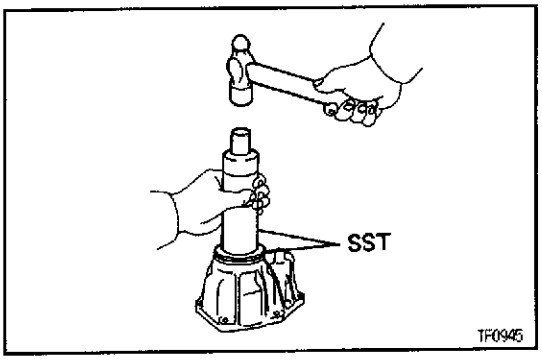


2. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing
SST 09316-60010 (09316-00010, 09316-00030)

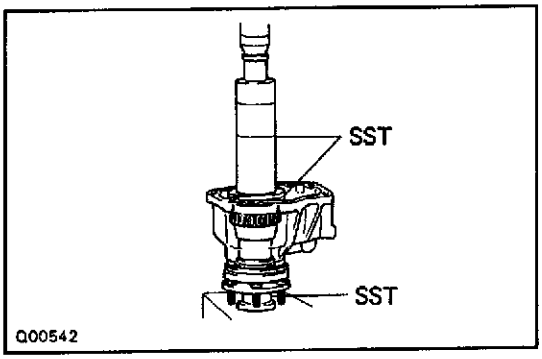


(b) Using a screwdriver, install the snap ring



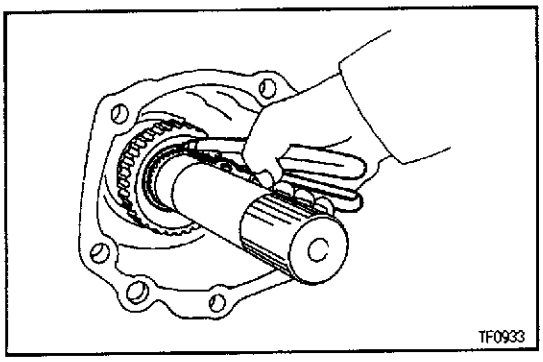
3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal
SST 09316-60010 (09316-00010, 09316-00060)



4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

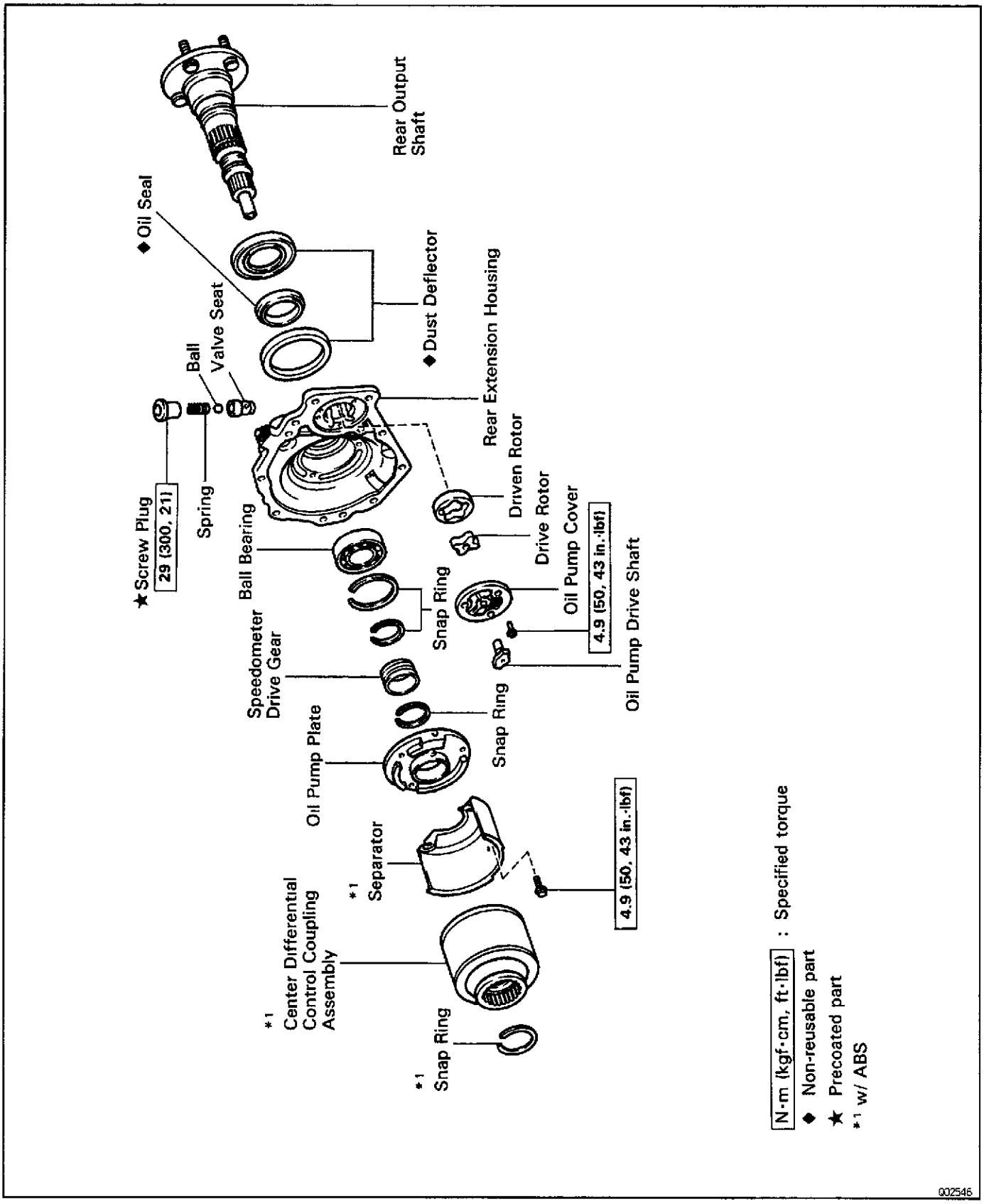
(a) Using SST and press, install the front output shaft and drive clutch hub
SST 09316-20011, 09316-60010 (09316-00010, 09316-00040, 09316-00070)



(b) Using a snap ring expander, install a new snap ring

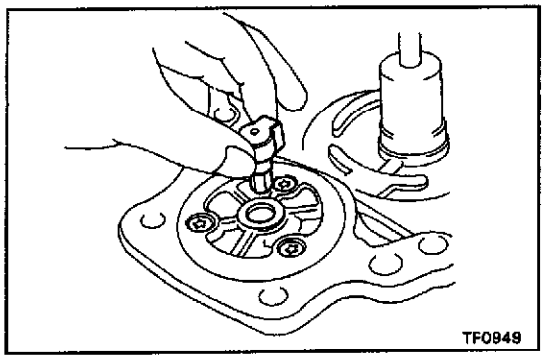
REAR EXTENSION HOUSING ASSEMBLY

COMPONENTS

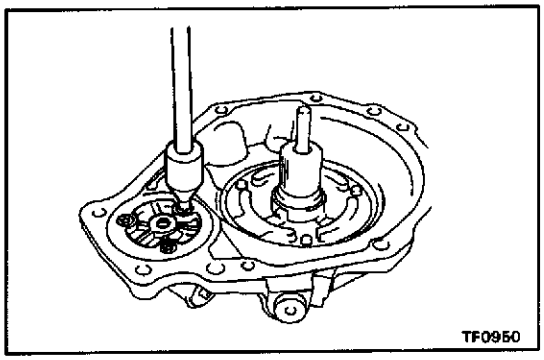


TR01Z—02

REAR EXTENSION HOUSING DISASSEMBLY

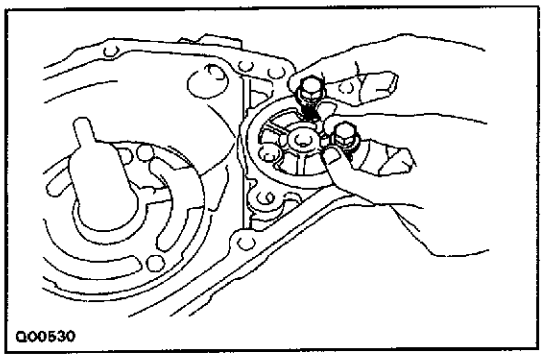


1. REMOVE OIL PUMP DRIVE SHAFT

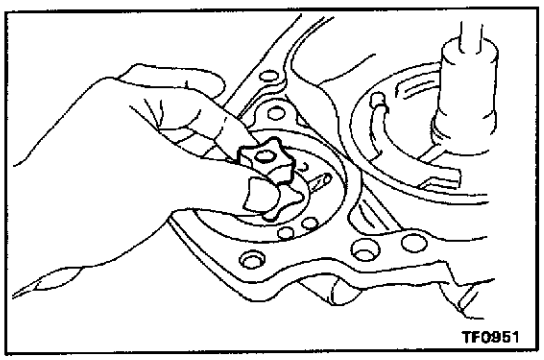


2. REMOVE OIL PUMP COVER

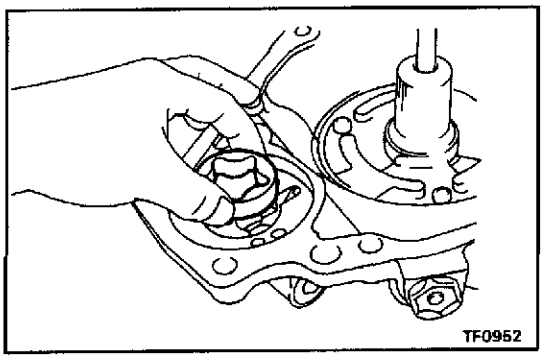
(a) Using a torx socket wrench, remove the 3 screws (Torx socket wrench T30 09042-00010)



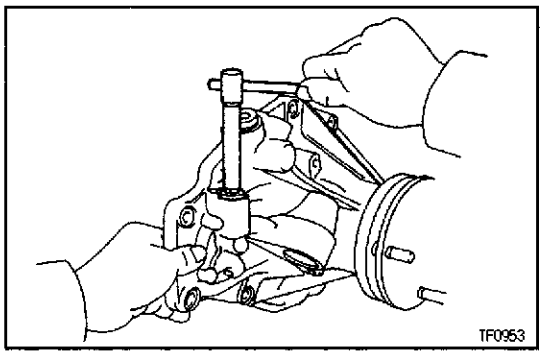
(b) Install 2 suitable bolts to the pump cover
(c) Remove the pump cover from rear extension housing



3. REMOVE DRIVE ROTOR

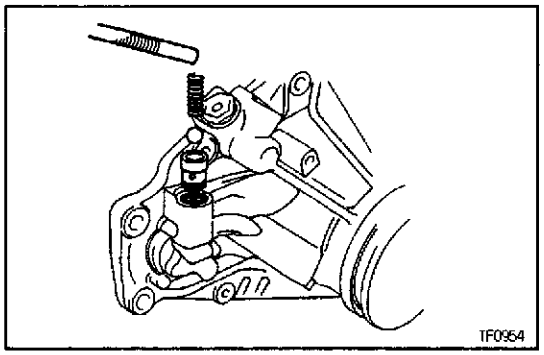


4. REMOVE DRIVEN ROTOR

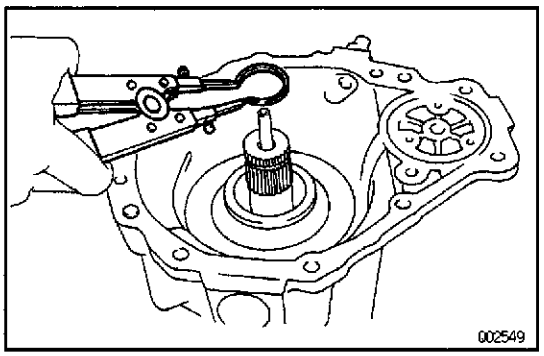


5. REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT

(a) Using a hexagon wrench, remove the screw plug



(b) Using a magnetic finger, remove the spring, ball and valve seat

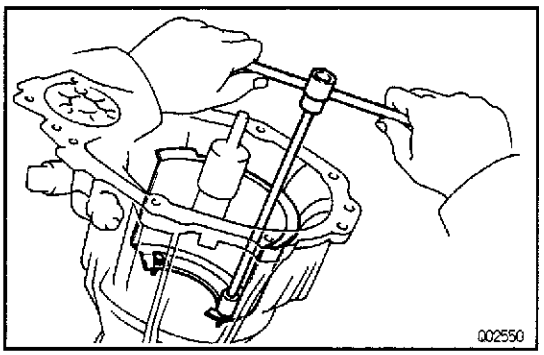


6. w/ ABS:

REMOVE CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

(a) Using a snap ring expander, remove the snap ring

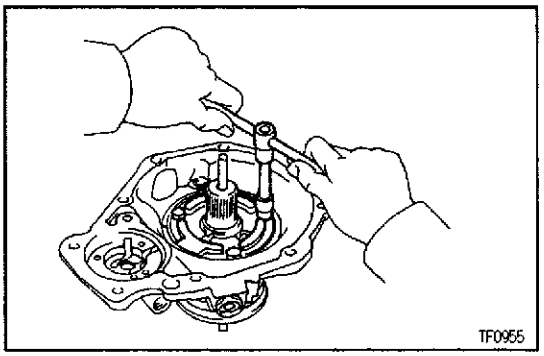
(b) Remove the coupling assembly



7. w/ ABS:

REMOVE SEPARATOR AND OIL PUMP PLATE

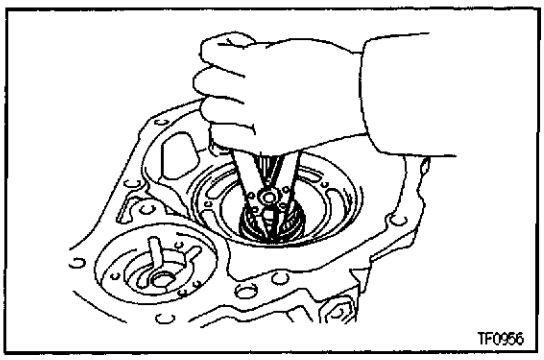
Remove the 3 bolts, the separator and the oil pump plate



8. w/o ABS:

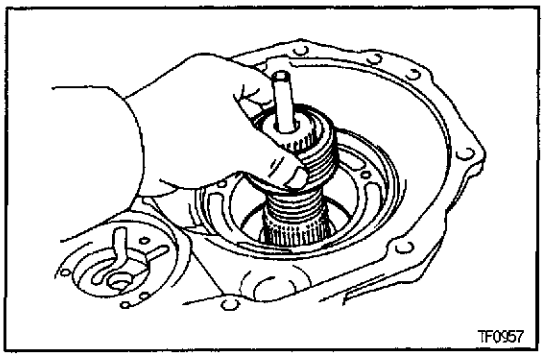
REMOVE OIL PUMP PLATE

Remove the 3 bolts and the oil pump plate

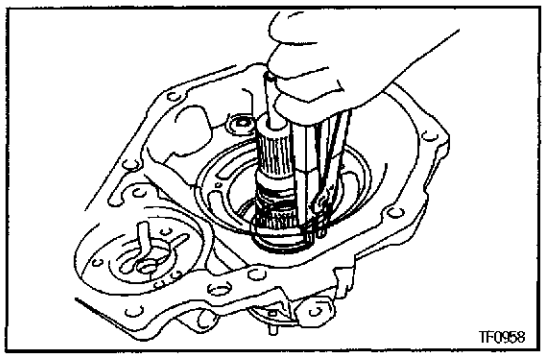


9. REMOVE SPEED METER DRIVE GEAR

(a) Using a snap ring expander, remove the snap ring

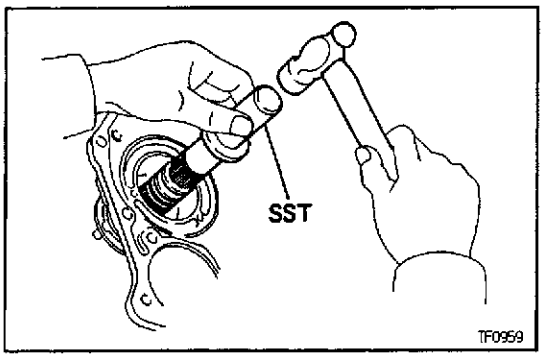


(b) Remove the speedometer drive gear



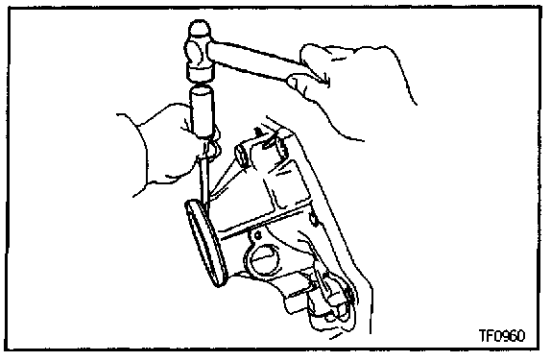
10. REMOVE REAR OUTPUT SHAFT

(a) Using a snap ring expander, remove the snap ring



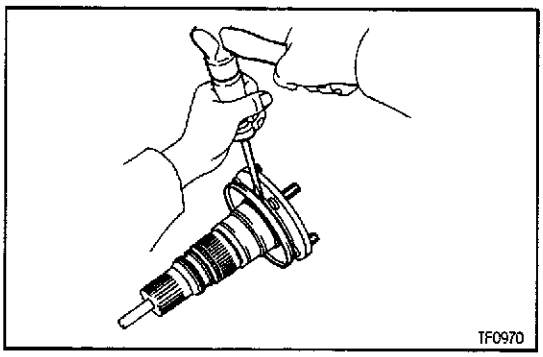
(b) Using SST and a hammer, remove the rear output shaft

SST 09325-12010

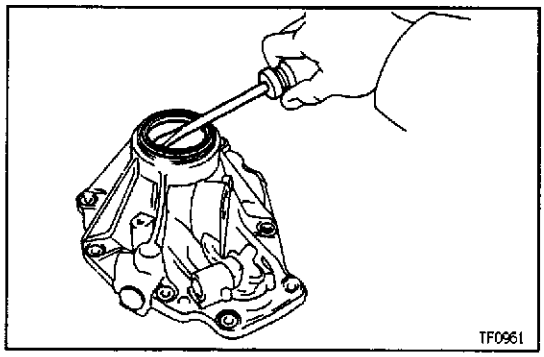


11. REMOVE DUST DEFLECTORS

(a) Using a screwdriver and hammer, remove the rear extension housing dust deflectors

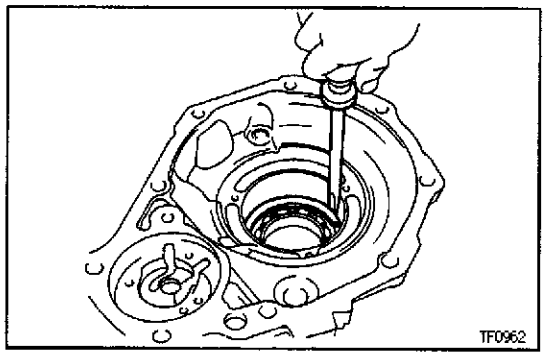


(b) Using a screwdriver and hammer, remove the rear output shaft dust deflector



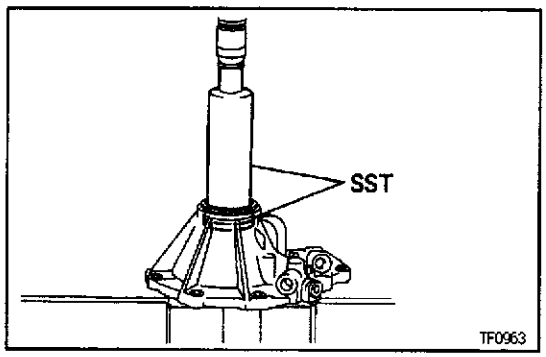
12. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal

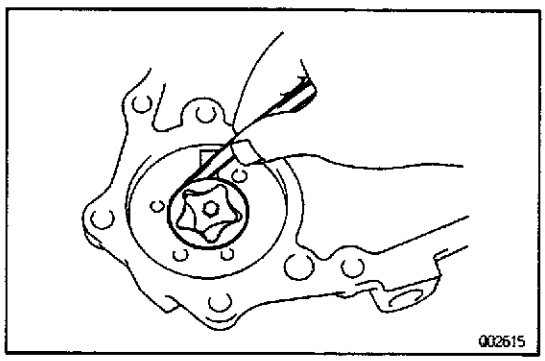


13. REMOVE BALL BEARING

(a) Using a screwdriver, remove the snap ring



(b) Using SST and a press, remove the ball bearing
SST 09316-60010 (09316-00010, 09316-00020)

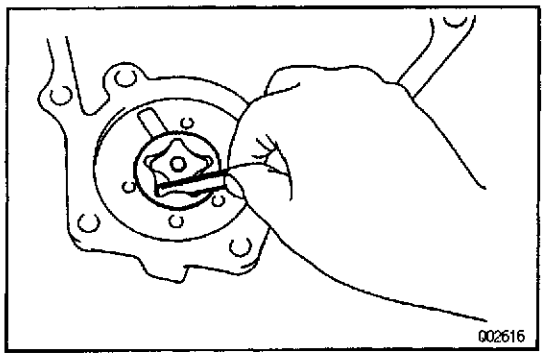


OIL PUMP INSPECTION

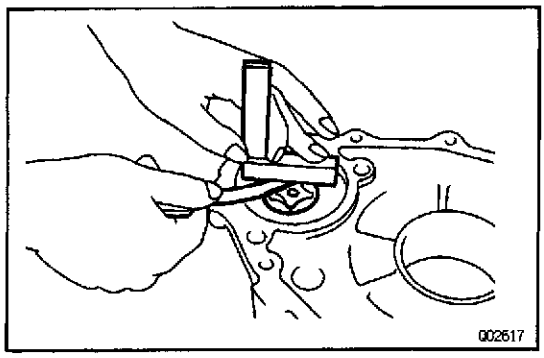
1. CHECK BODY CLEARANCE OF DRIVEN ROTOR

Install the drive rotor to the driven rotor
Using a feeler gauge, measure body clearance between drive rotor and extension housing
Standard body clearance
0 08-0 17 mm (0 0031 - 0 0067 in)

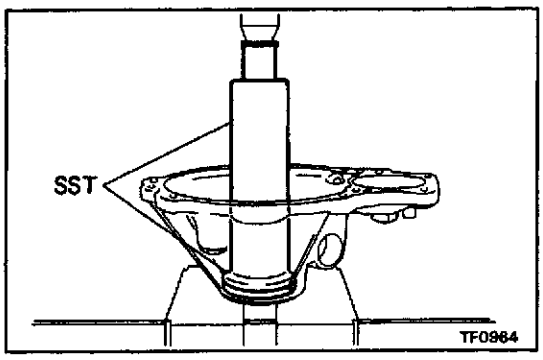
Maximum body clearance:
0.17 mm (0.0067 in.)
If the body clearance is greater than the maximum, replace the drive rotor or driven rotor



2. CHECK DRIVEN ROTOR TIP CLEARANCE
Using a feeler gauge, measure tip clearance between 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 is greater than the maximum, replace the drive rotor or driven rotor

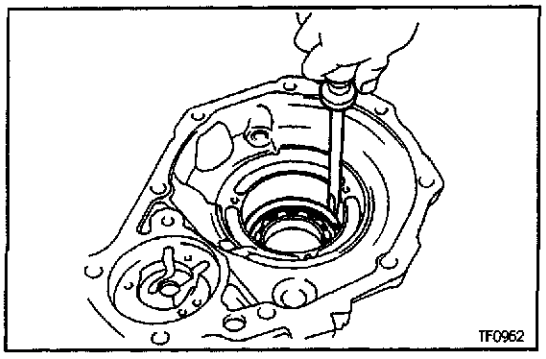


3. CHECK OIL PUMP SIDE CLEARANCE
Using a steel straight edge and a feeler gauge, measure the side clearance of oil pump
Standard side clearance:
0.03-0.10 mm (0.0012 - 0.0039 in.)
Maximum side clearance:
0.10 mm (0.0039 in.)
If the side clearance greater than the maximum, replace the drive rotor or driven rotor

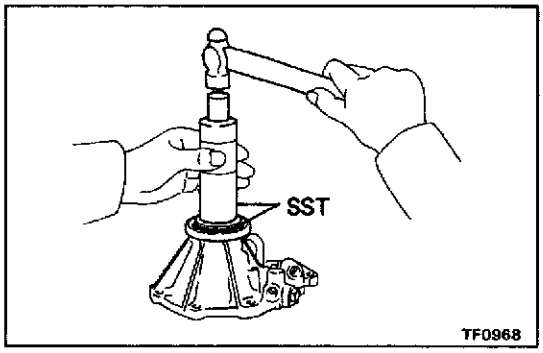


REAR EXTENSION HOUSING ASSEMBLY

1. INSTALL BALL BEARING
(a) Using SST and a press, install the ball bearing
SST 09316-60010 (09316-00010, 09316-00030)



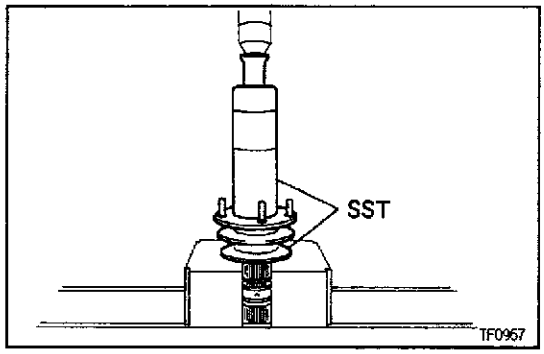
(b) Using a screwdriver, install the snap ring



2. INSTALL DUST DEFLECTORS

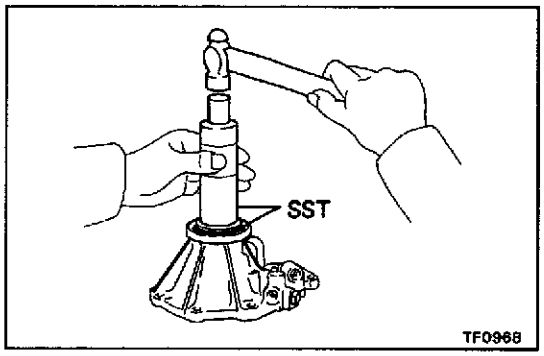
(a) Using SST and a hammer, install a new rear extension housing dust deflector

SST 09316-60010 (09316-00010, 09316-00040)



(b) Using SST and a press, install a new rear extension housing dust deflector

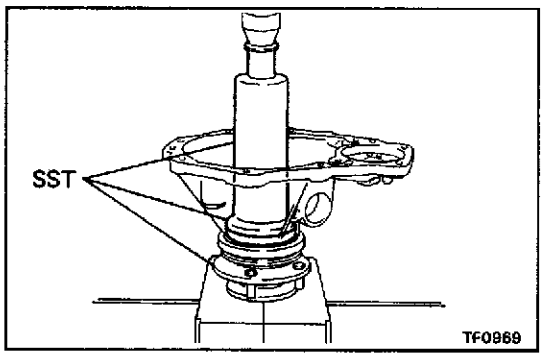
SST 09316-20011, 09316-60010 (09316-00010)



3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal

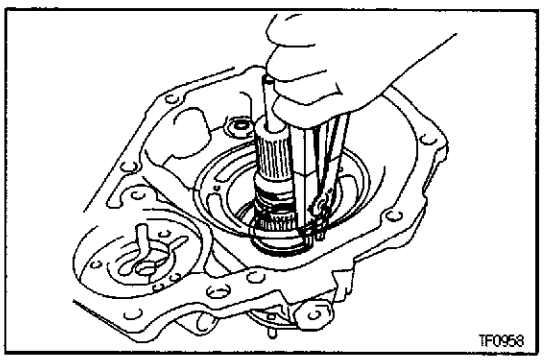
SST 09316-60010 (09316-00010, 09316-00030)



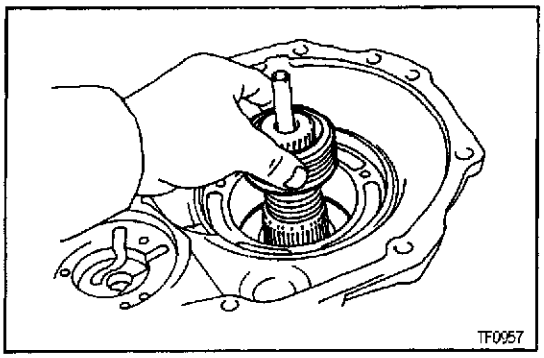
4. INSTALL REAR OUTPUT SHAFT

(a) Using SST and a press, install the rear output shaft

SST 09316 - 20011, 09316 - 60010 (09316 - 00010, 09316-00030)

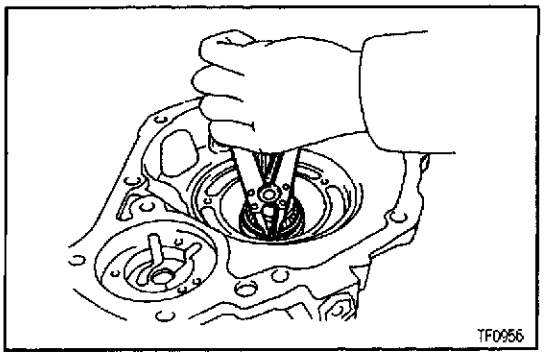


(b) Using a snap ring expander, install the snap ring

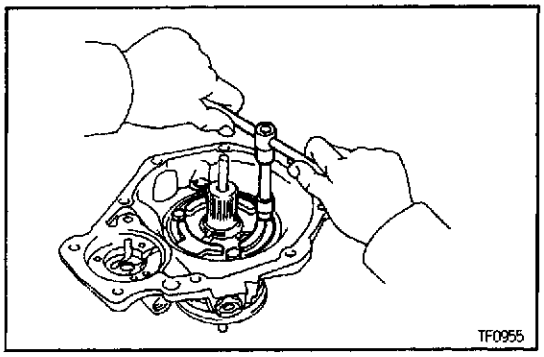


5. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the speedometer drive gear



(b) Using a snap ring expander, install the snap ring



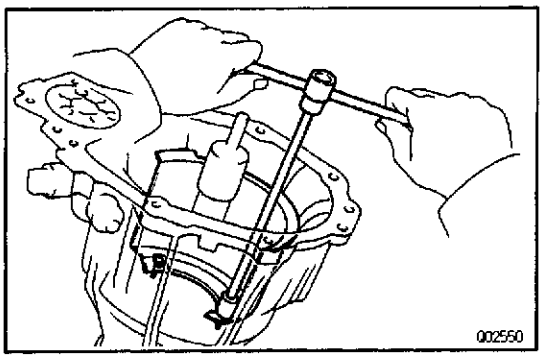
6. w/o ABS:

INSTALL OIL PUMP PLATE

(a) Install the oil pump plate

(b) Install and torque the 3 bolts

Torque: 4.9 N-m (50 kgf-cm, 43 in.•lbf)



7. w/ ABS:

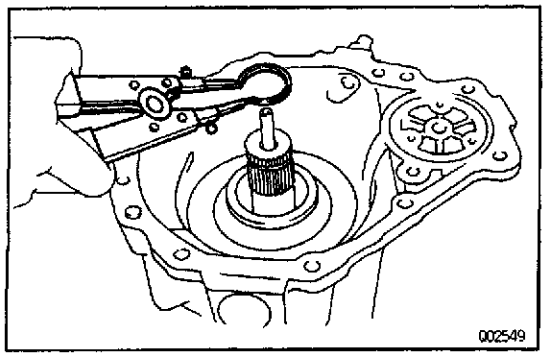
INSTALL OIL PUMP PLATE SEPARATOR

(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)

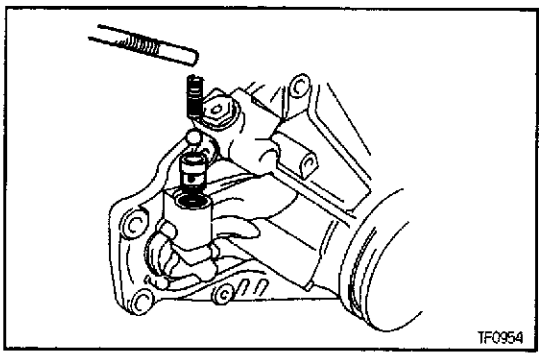


8. w/ ABS:

INSTALL CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

(a) Install the coupling assembly

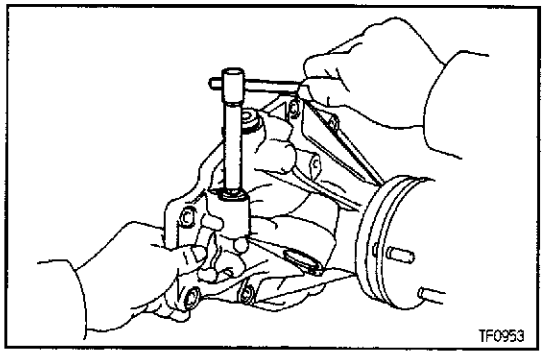
(b) Using a snap ring expander, install the snap ring



9. INSTALL VALVE SEAT, BALL. SPRING AND SCREW PLUG

(a) Apply gear oil to the ball

(b) Install the valve seat, ball and spring

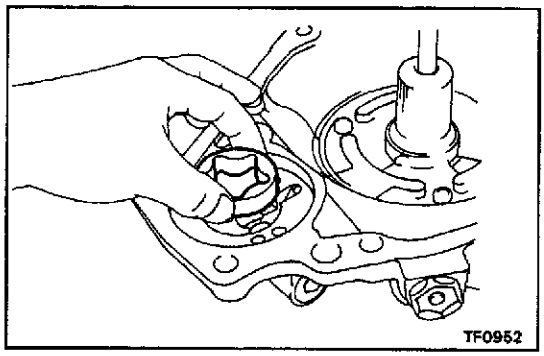


(c) Apply liquid sealer to the screw plug

Sealant:
Part No. 08833-00080, THREE BOND 1344, LOC-TITE 242 or equivalent

(d) Using a hexagon wrench, install and torque the screw plug

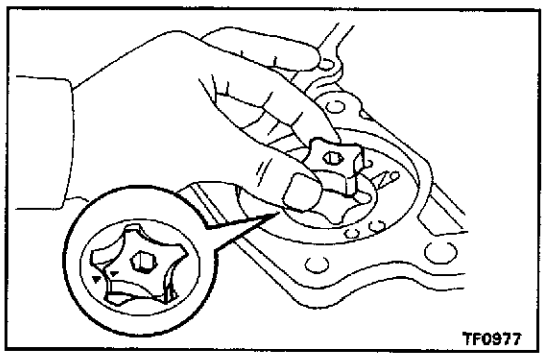
Torque: 29 N-m (300 kgf-cm, 21 ft-lbf)



10. INSTALL DRIVEN ROTOR

(a) Apply gear oil to the driven rotor

(b) Install the driven rotor

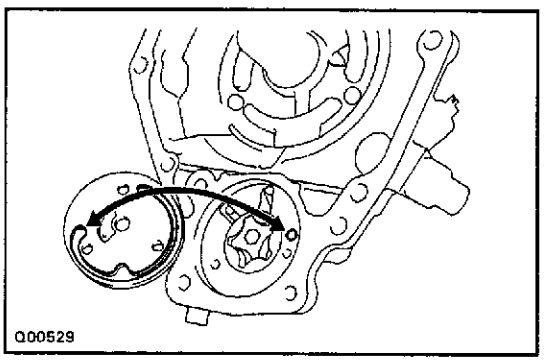


11. INSTALL DRIVE ROTOR

(a) Apply gear oil to the drive rotor

(b) Install the drive rotor

HINT Align the alignment marks



12. INSTALL OIL PUMP COVER

(a) Install the oil pump cover

(b) Using a torx socket wrench, install and torque the 3 screws

(Torx socket wrench T30 09042-00010)

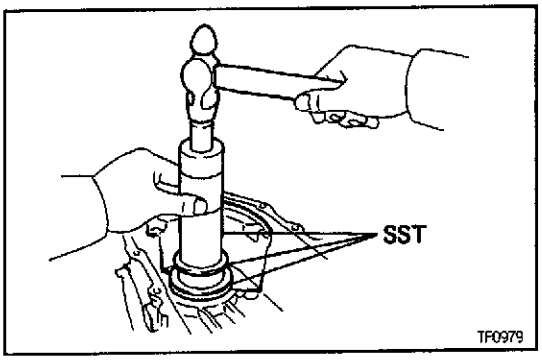
Torque: 4.9 N-m (50 kgf-cm, 43 in.•lbf)

NOTICE: Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.

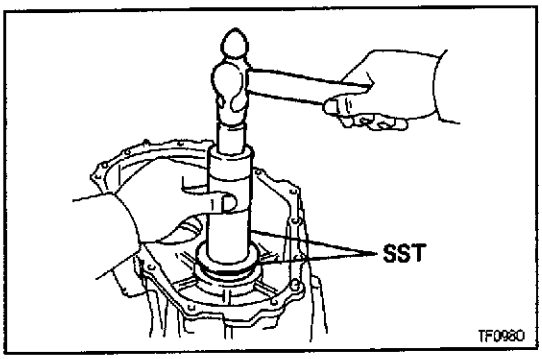
TRANSFER ASSEMBLY

1. INSTALL BEARING RACES TO FRONT CASE TR022-02

(a) Using SST and a hammer, install the 2 center differential bearing races
SST 09316-20011, 09316-60010 (09316-00010, 09316-00030)

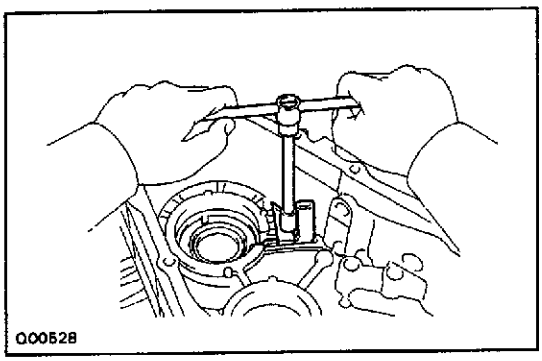


(b) Using SST and a hammer, install the idler gear bearing race
SST 09316-60010 (09316-00010, 09316-00040)



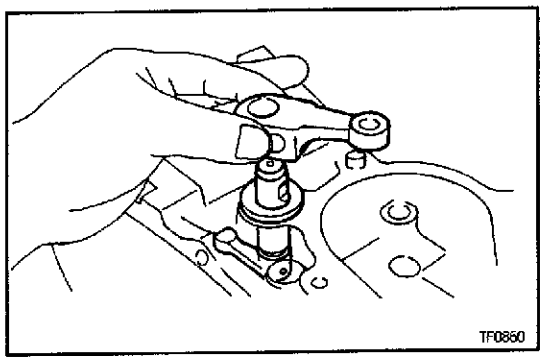
2. INSTALL OIL RECEIVER TO FRONT CASE

(a) Install the oil receiver
(b) Install and torque the bolt
Torque: 12 N-m (120 kgf-cm, 9 ft-lbf)

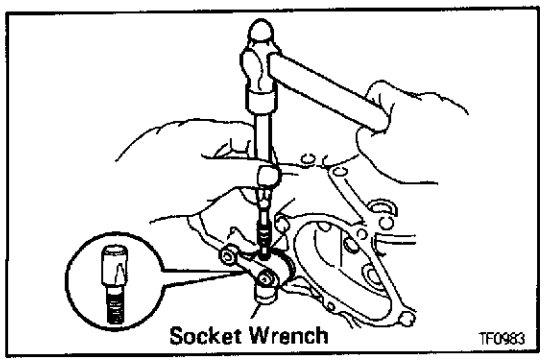


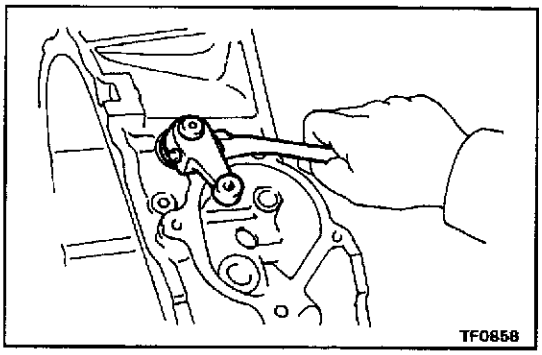
3. INSTALL SHIFT OUTER LEVER AND INNER LEVER

(a) Install the shift outer lever and inner lever

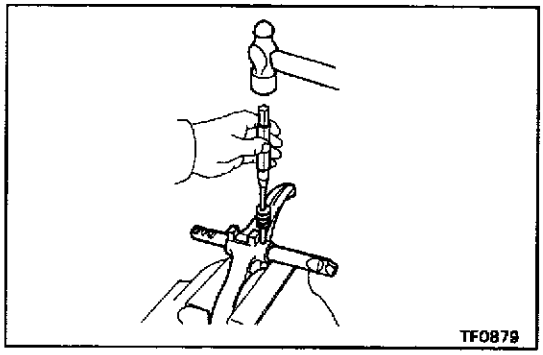


(b) Using a pin punch, hammer and socket wrench, install the lever lock pin

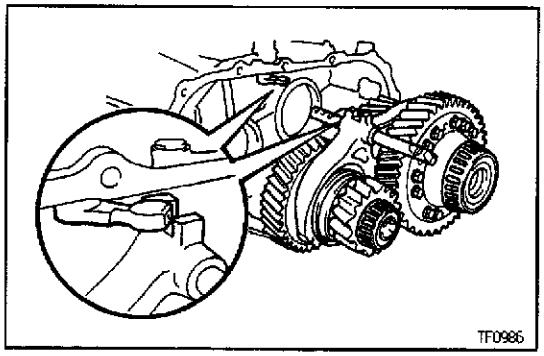




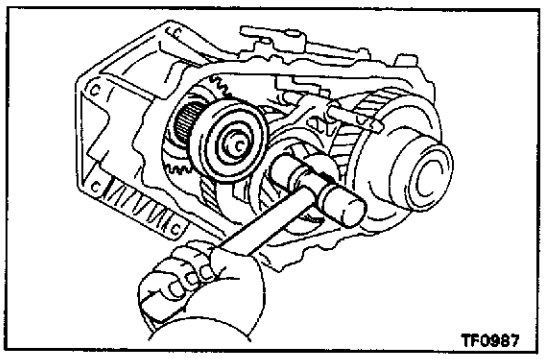
(c) Install the washer and nut
Torque: 12 N-m (120 kgf•em. 9 ft-lbf)



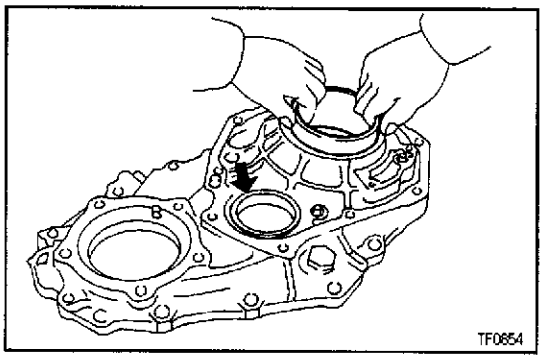
4. ASSEMBLE SHIFT FORK No.1 AND FORK SHAFT
Using a pin punch and a hammer, drive in the slotted spring pin



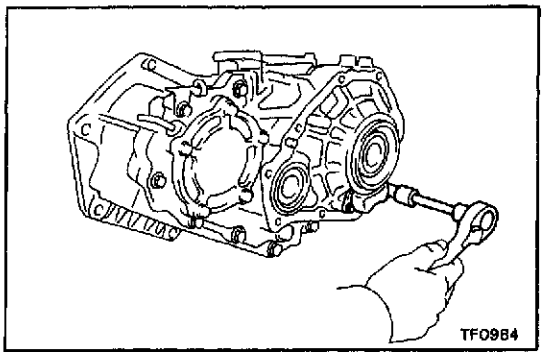
5. INSTALL IDLER GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY TO FRONT CASE



6. INSTALL INPUT SHAFT ASSEMBLY
Using a plastic hammer, tap in the input shaft



7. INSTALL 2 BEARING RACES TO REAR CASE

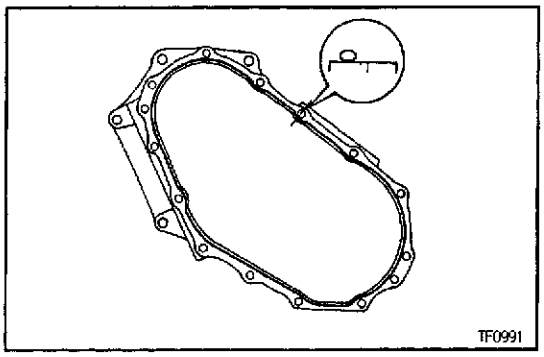


8. INSTALL OIL STRAINER TO REAR CASE

(a) Install the oil strainer

(b) Install and torque the 2 bolts

Torque: 4.9 N-m (50 kgf-cm, 43 in..lbf)



9. ASSEMBLE FRONT CASE AND REAR CASE

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case

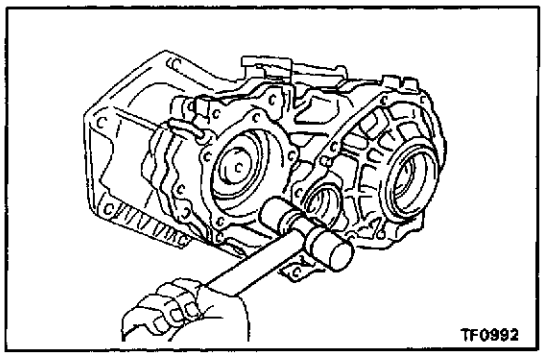
(b) Apply seal packing to the front case as shown

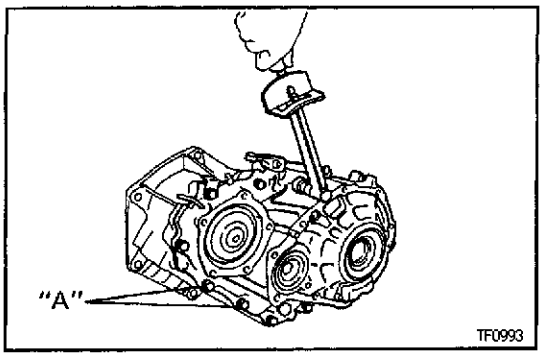
Seal packing:

Part No.08826-00090, THREE BOND 1281 or equivalent

HINT Install the rear case as soon as the seal packing is applied

(c) Using a plastic hammer, tap the rear case and assemble it





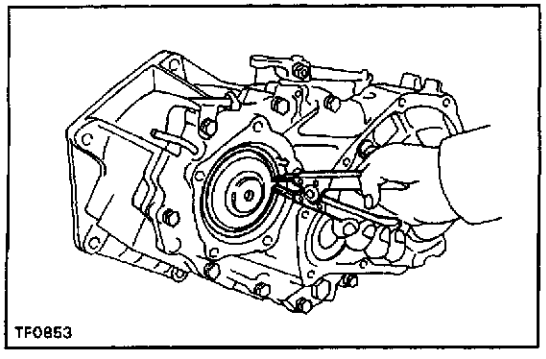
(d) Apply liquid sealer to the A bolt threads

Sealant:

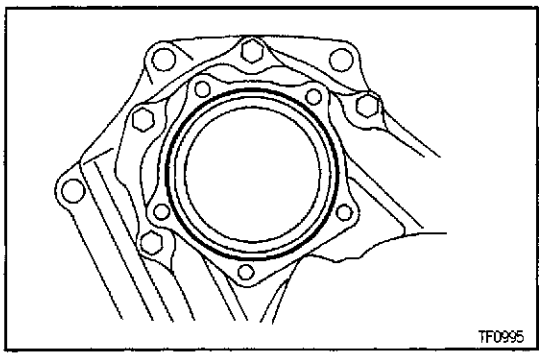
Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

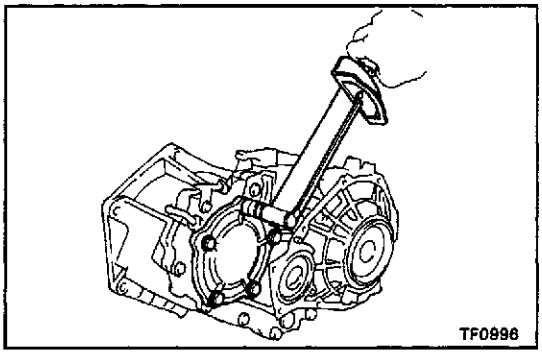
(e) Install and torque the 8 bolts

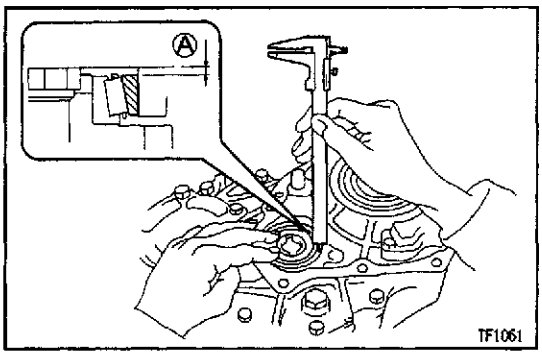
Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)

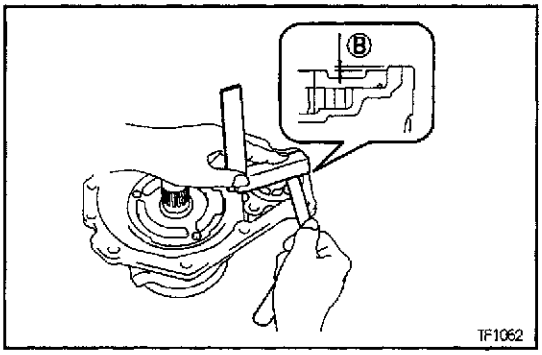


(f) Using a snap ring expander, install the snap ring









10. INSTALL CASE COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the rear case

(b) Apply seal packing to the rear case as shown

Seal packing:

Part No.08826-00090, THREE BOND 1281 or equivalent

HINT Install the case cover as soon as the seal packing is applied

(c) Install the case cover

(d) Apply liquid sealer to the bolt threads

Sealant:

Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(e) Install and torque the 5 bolts

Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)

11. SELECT ADJUSTING SHIMS FOR IDLER GEAR REAR TAPER ROLLER BEARING

(a) Using a vernier calipers, measure dimension (A)

HINT Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement

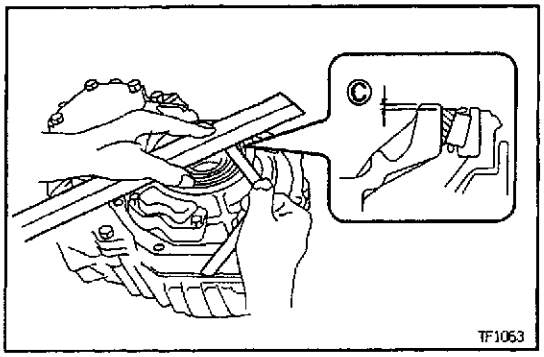
(b) Using a steel straight edge and feeler gauge, measure the clearance of dimension (B)

(c) Calculate the required thickness of the adjusting shim

Thickness Dimension (A) + Dimension (B) + (0 03 ~ 0 08 mm)

(d) From the following table, select a shim with a thickness fitting within the range of the calculation in (C)

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)

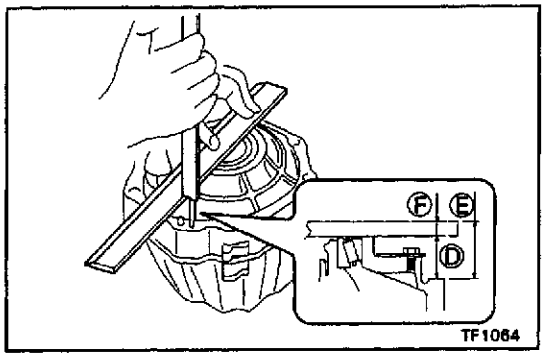


12. w/o ABS:

SELECT ADJUSTING SHIMS FOR OUTPUT SHAFT TAPER ROLLER BEARING

(a) Using a steel straight edge and feeler gauge, measure the clearance of dimension (C)

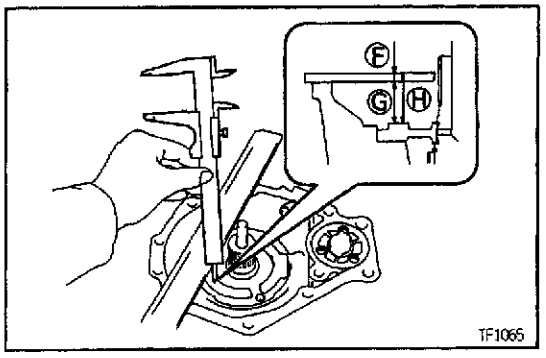
HINT Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement



(b) Using a steel straight edge and vernier calipers, measure dimension(D)

HINT Dimension (D) is the straight edge thickness (Dimension (F)) subtracted from Dimension (E)) in the illustration to the left

Dimension(D) Dimension (E) - Dimension (F)



(c) Using a steel straight edge and vernier calipers, measure dimension (G)

HINT Dimension (G) is the straight edge thickness (Dimension (F)) subtracted from Dimension (H)

Dimension (G) Dimension (H) - Dimension (F)

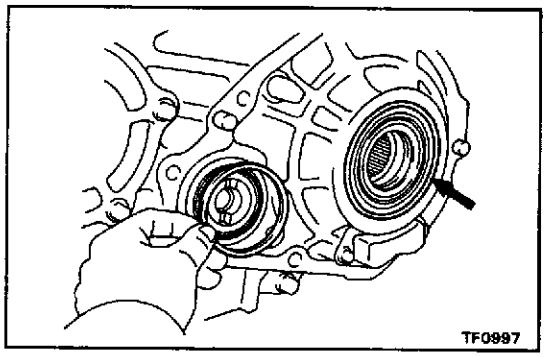
(d) Calculate the required thickness of the adjusting shim

Thickness

Dimension (G) - (Dimension (D) - Dimension (D)) + (0 02~ 0 07 mm)

(e) From the following table, select a shim with a thickness fitting within the range of the calculation in(d)

Mark	Thickness mm (in)	Mark	Thickness mm (in)
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 6o (o o 6 3o)	N	0 55 (0 02 16)

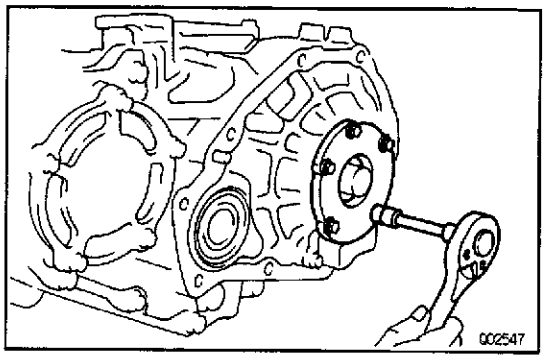


13. INSTALL ADJUSTING SHIMS TO IDLER GEAR AND OUTPUT SHAFT TAPER ROLLER BEARINGS

(a) Apply MP grease to the adjusting shims

(b) Install the adjusting shims to bearing outer races

HINT Install the thinner shim on the bearing outer race side

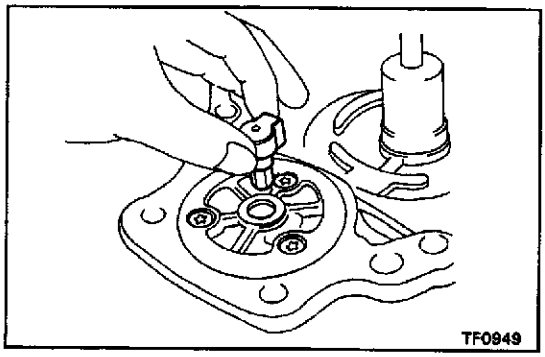


14. w/ ABS:

INSTALL RETAINER

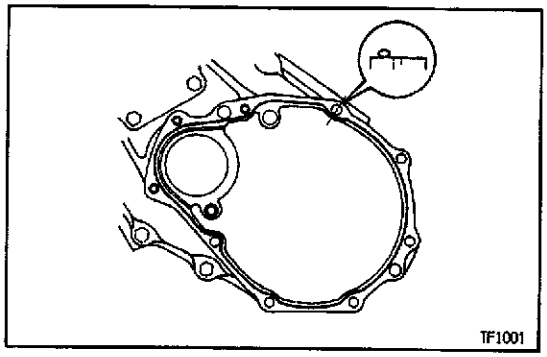
Install the retainer with the 5 bolts

Torque: 39 N-m (400 kgf-cm, 28 ft-lbf)



15. INSTALL REAR EXTENSION HOUSING

(a) Install the oil pump drive shaft



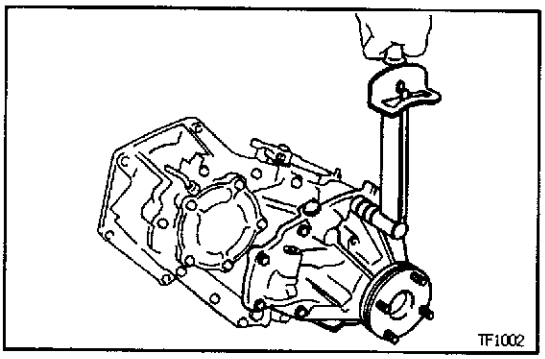
(b) Remove any packing material and be careful not to drop oil on the contacting surfaces of the rear case

(c) Apply seal packing to the rear case as shown

Seal packing:

Part No.08826-00090, THREE BOND 1281 or equivalent

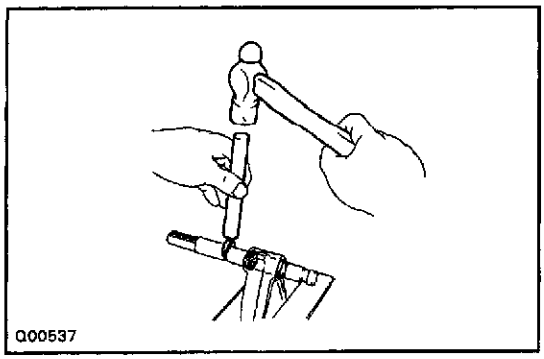
HINT Install the rear extension housing as soon as the seal packing is applied



(d) Install the rear extension housing

(e) Install and torque the 9 bolts

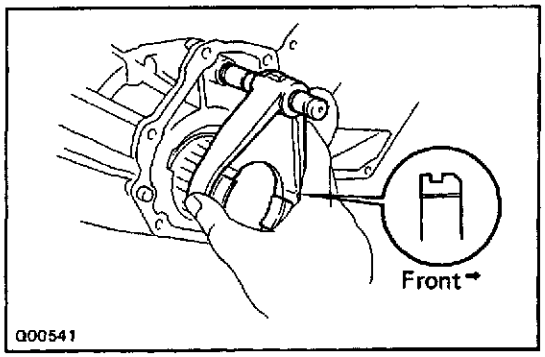
Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)



16. ASSEMBLE SHIFT FORK NO.2 AND FORK SHAFT

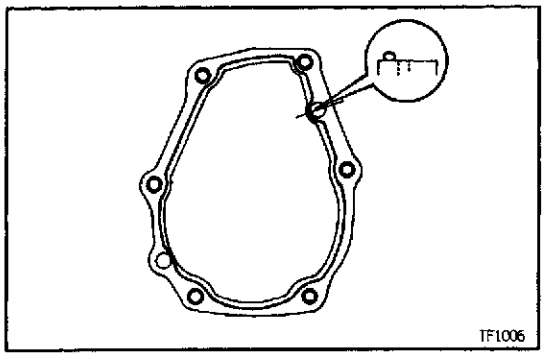
(a) Assemble the shift fork No 2 and fork shaft

(b) Using a brass bar and hammer, tap in the snap rings



17. INSTALL CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT

HINT Make sure to install the high and low clutch sleeve in the correct direction



18. INSTALL FRONT EXTENSION HOUSING

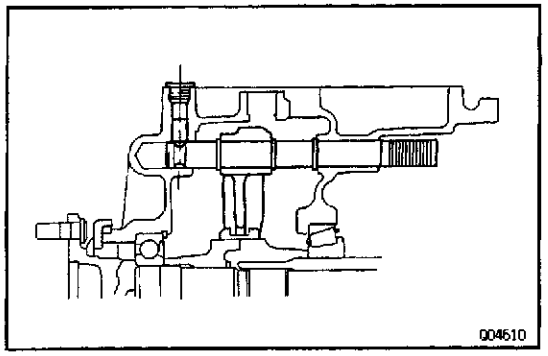
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case

(b) Apply seal packing to the front case as shown

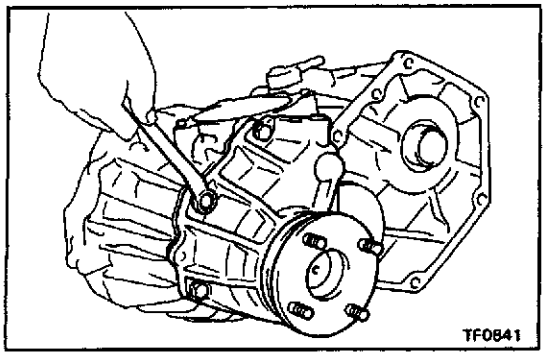
Seal packing:

Part No.08826-00090, THREE BOND 1281 or equivalent

HINT Install the front extension housing as soon as the seal packing is applied

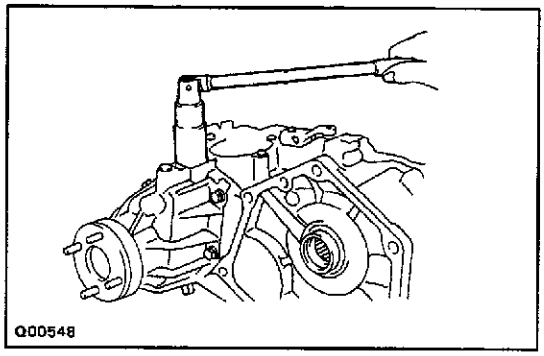


(c) Set the clutch sleeve in 4WD condition in differential lock condition, install the front extension housing



(d) Install and torque the 6 bolts

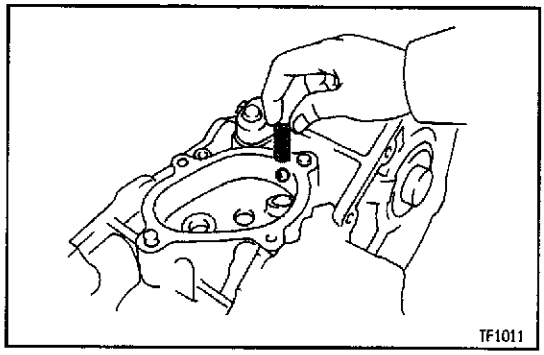
Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)



19. INSTALL TRANSFER INDICATOR SWITCHES

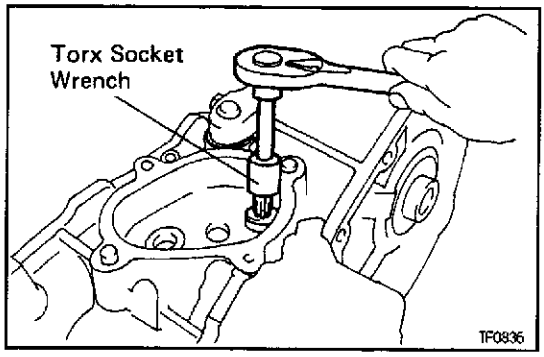
Install and torque the Center- Diff Lock indicator switch, L 4 position switch and neutral position switch

Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)



20. INSTALL BALL, SPRING AND SCREW PLUG

(a) Install the ball and spring



(b) Apply liquid sealer to the screw plug

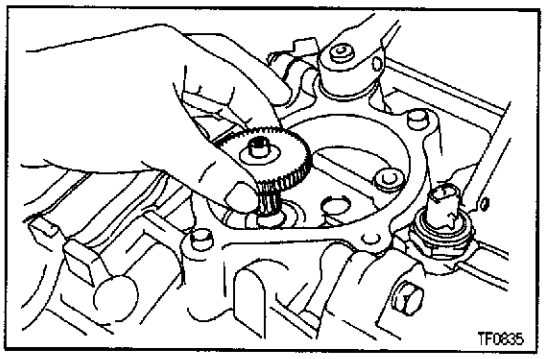
Sealant:

Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install and torque the screw plug

(Torx socket wrench T40 09042-00020)

Torque: 19 N-m (190 kgf-cm, 14 ft-lbf)

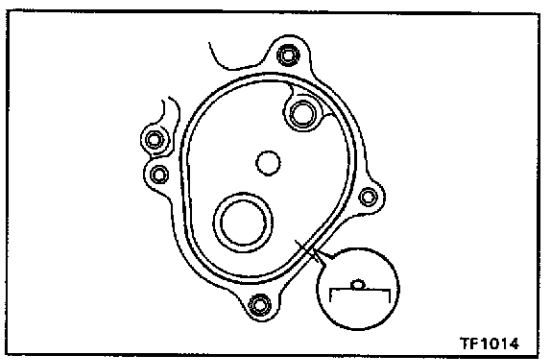


21. INSTALL OUTPUT GEAR

(a) Apply gear oil to the output gear

(b) Install the output gear

NOTICE: Do not turn the output gear.



22. INSTALL MOTOR ACTUATOR

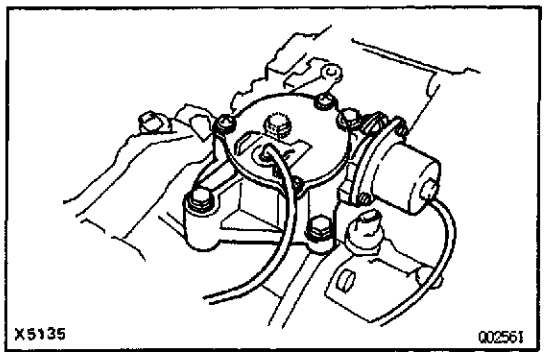
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case

(b) Apply seal packing to the front case as shown

Seal packing:

Part No.08826-00090, THREE BOND 1281 or equivalent

HINT Install the motor actuator as soon as the seal packing is applied

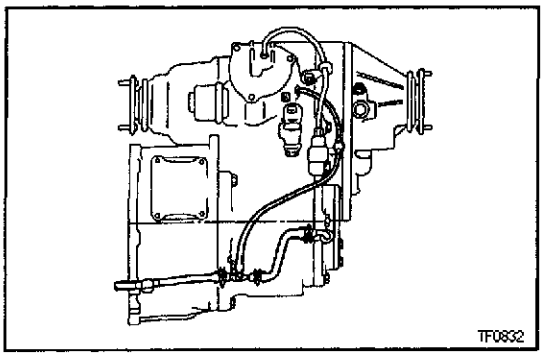


(c) Install the motor actuator

HINT Set the motor actuator in differential lock condition

(d) install and torque the 4 bolts

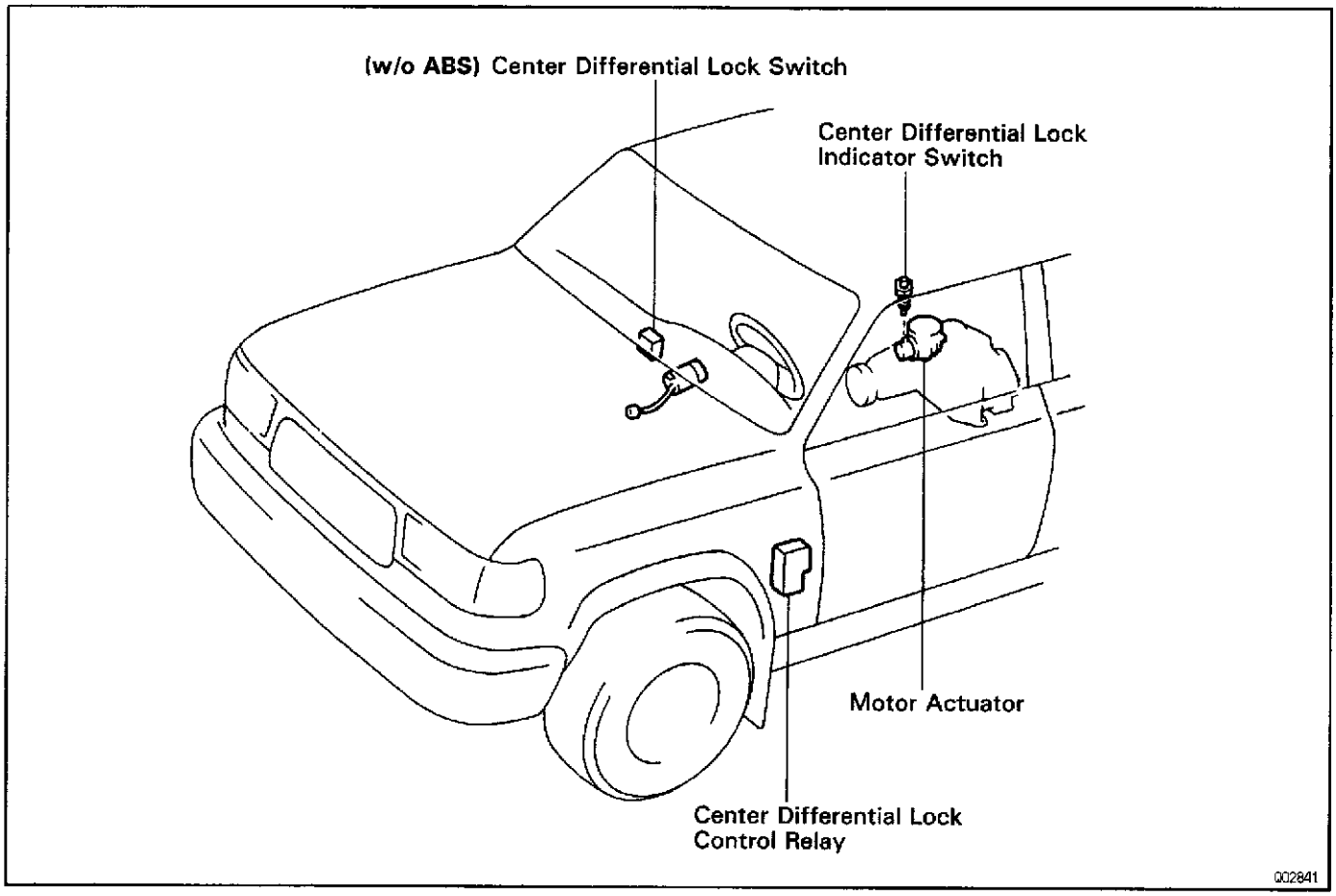
Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)

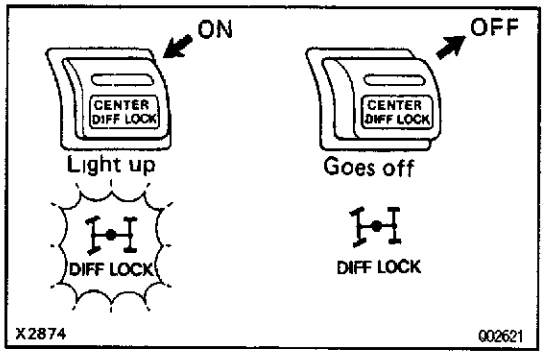


23. INSTALL BREATHER HOSE

MOTOR SHIFT CONTROL SYSTEM

PARTS LOCATION





SYSTEM INSPECTION

1. w/o ABS:

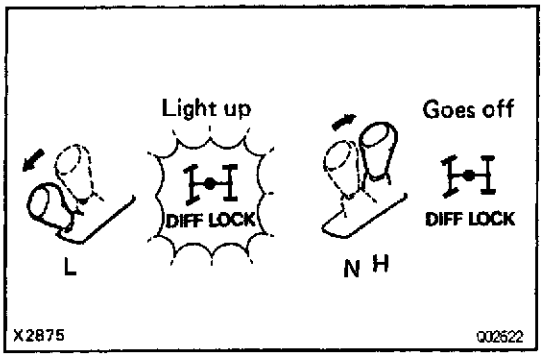
INSPECT CENTER DIFFERENTIAL LOCK SWITCH

(a) Start the engine and shift the transfer shift lever in H position

(b) Check that the center differential lock indicator light comes on when the center differential lock switch is turned ON

Check that the light goes off when the switch is turned OFF

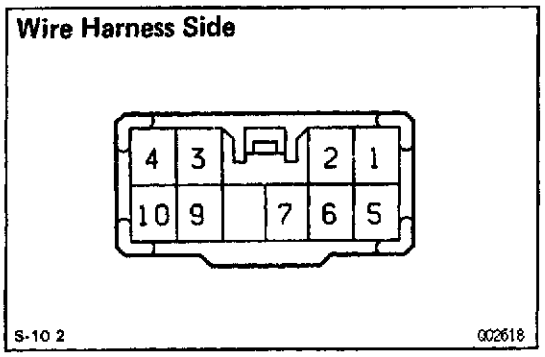
HINT There are times when the light will not go off unless the steering is straight ahead and acceleration and deceleration are performed slowly



2. INSPECT SHIFT LEVER POSITION

(a) Start the engine, and center differential lock switch turned to OFF

(b) Check that the center differential indicator light comes on when the transfer shift lever shifted to L position Check that the light goes off when the lever is shifted to N or H position

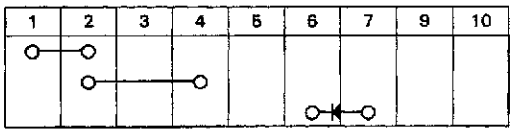


TR025-02

PARTS INSPECTION

1. INSPECT CENTER DIFFERENTIAL LOCK CONTROL RELAY

(a) Check that there is continuity between terminals as shown in the chart



HINT There is a diode between terminals 6 and 7 If the circuit shown no continuity, change the positive (+) and negative (-) probes and recheck the circuit

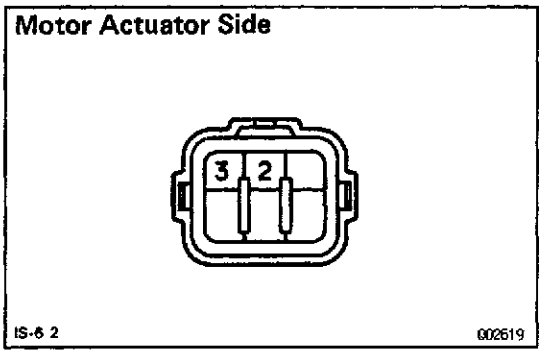
(b) Apply battery voltage between terminals and check that there is continuity between terminals as shown in the chart

Terminal / Battery voltage		1	2	3	4	5	6	7	8	9	10
⊕	⊖										
6	5	○—○ ○✕○									
7	2									○✕○	
9	10		○—✕—○	○—○							

○—○ Continuity
○—✕—○ No continuity

V01700

If continuity is not as specified, replace the relay



2. INSPECT MOTOR ACTUATOR

(a) Using an ohmmeter, measure the resistance between terminals 2 and

3. STANDARD RESISTANCE:

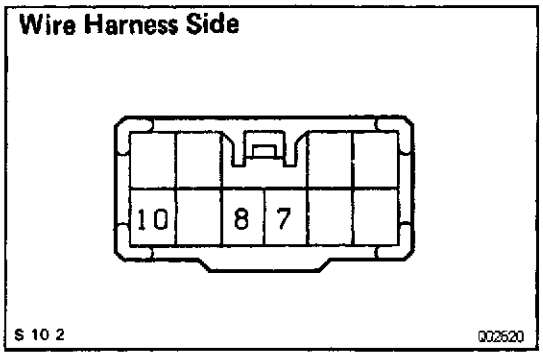
0.3- 100Ω

(b) Using an ohmmeter, measure the resistance between terminals 2 or 3 and body ground

Standard resistance:

More than 0.5Ω

If resistance value is not as specified, replace the motor actuator



3. w/o ABS:

INSPECT CENTER DIFFERENTIAL LOCK SWITCH

Check that there is continuity between terminals as shown in the chart

Terminal / Switch position	7	10	8
OFF	o——	——o	
ON	o——	——	——o

V01701

If continuity is not as specified, replace the switch

SERVICE SPECIFICATIONS

SERVICE DATA

TR02B-02

Input gear snap ring	Mark		
	A	2 00 m m	0 0787 in
	B	2 10 mm	0 0827 in
	C	2 20 mm	0 0866 in
	D	2 30 m m	0 0906 in
	E	2 40 m m	0 0945 in
	F	2 50 mm	0 0984 in
	G	2 60 m m	0 1024 in
	H	2 70 mm	0 1063 in
	J	2 80 m m	0 1102 in
Input shaft rear ball bearing snap ring	Mark		
	A	2 00 m m	0 0787 in
	B	2 10 mm	0 0827 in
	C	2 20 m m	0 0866 in
	D	2 30 mm	0 0906 in
	E	2 40 m m	0 0945 in
Idler low gear thrust clearance	STD	0 125 - 0 275 mm	0 0049 - 0 0108 in
	Limit	0 275 mm	0 0108 in
Idler low gear radial clearance	STD	0 015 - 0 068 mm	0 0006 - 0 0027 in
	Limit	0 068 m m	0 0027 in
High speed gear thrust clearance	STD	0 10 - 0 25 m m	0 0039 - 0 0098 in
	Limit	0 25 mm	0 0098 in
High speed gear radial clearance	STD	0 015 - 0 071 mm	0 0006 - 0 0028 in
	Limit	0 071 mm	0 0028 in
Center differential backlash adjusting shim		1 70 mm	0 0669 in
		1 85 mm	0 0728 in
		2 00 m m	0 0787 in
		2 15 m m	0 0846 in
		2 30 mm	0 0906 in
		2 45 m m	0 0965 in
		2 60 mm	0 1024 in
		2 75 mm	0 1083 in
		2 90 mm	0 1142 in
		3 05 m m	0 1201 in
Center differential backlash	Limit	0 05 mm	0 0020 in
Oil pump driven rotor body clearance	STD	0 08-0 17mm	0 0031 - 0 0067 in
	Limit	0 17 mm	0 0067 in
Oil pump driven rotor body tip clearance	STD	0 05 - 0 15 mm	0 0020 - 0 0059 in
	Limit	0 15 mm	0 0059 in
Oil pump side clearance	STD	0 03 - 0 10 m m	0 0012 - 0 0039 in
	Limit	0 10 mm	0 0039 in
Front drive gear piece snap ring	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 m m	0 0945 in
F	2 50 mm	0 0984 in
G	2 60 m m	0 1024 in
H	2 70 mm	0 1063 in
J	2 80 mm	0 1102 in
K	1 80 m m	0 0709 in
L	1 90 mm	0 0748 in
Rear output shaft adjusting shim		
Idler gear side Mark		
2	0 30 mm	0 0118 in
3	0 45 mm	0 0177 in
4	2 40 m m	0 0945 in
5	2 60 m m	0 1024 in
6	2 80 mm	0 1102 in
7	3 00 m m	0 1 181 in
8	3 20 mm	0 1260 in
9	3 40 m m	0 1339 in
10	3 60 mm	0 1417 in
11	3 80 m m	0 1496 in
12	4 00 mm	0 1575 in
13	0 55 mm	0 0216 in
Output shaft side Mark		
B	0 30 mm	0 0118 in
C	0 45 m m	0 0177 in
D	1 00 m m	0 0394 in
E	1 20 mm	0 0472 in
F	1 40 m m	0 0551 in
G	1 60 mm	0 0630 in
H	1 80 mm	0 0709 in
J	2 00 m m	0 0787 in
K	2 20 m m	0 0866 in
L	2 40 m m	0 0945 in
M	2 60 mm	0 1024 in
N	0 55 mm	0 0216 in

TORQUE SPECIFICATIONS

TR027-02

Part tightened	N-m	kgf•cm	ft-lbf
Oil pump plate x Rear extension housing	4 9	**50**	43 in -lbf
Screw plug x Rear extension housing	**29**	300	**22**
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
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 Diff Lock Indicator switch x Front extension housing	**37**	380	**27**
Screw plug x Front case	**19**	190	**14**
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 Bearing Retainer	**39**	400	**28**