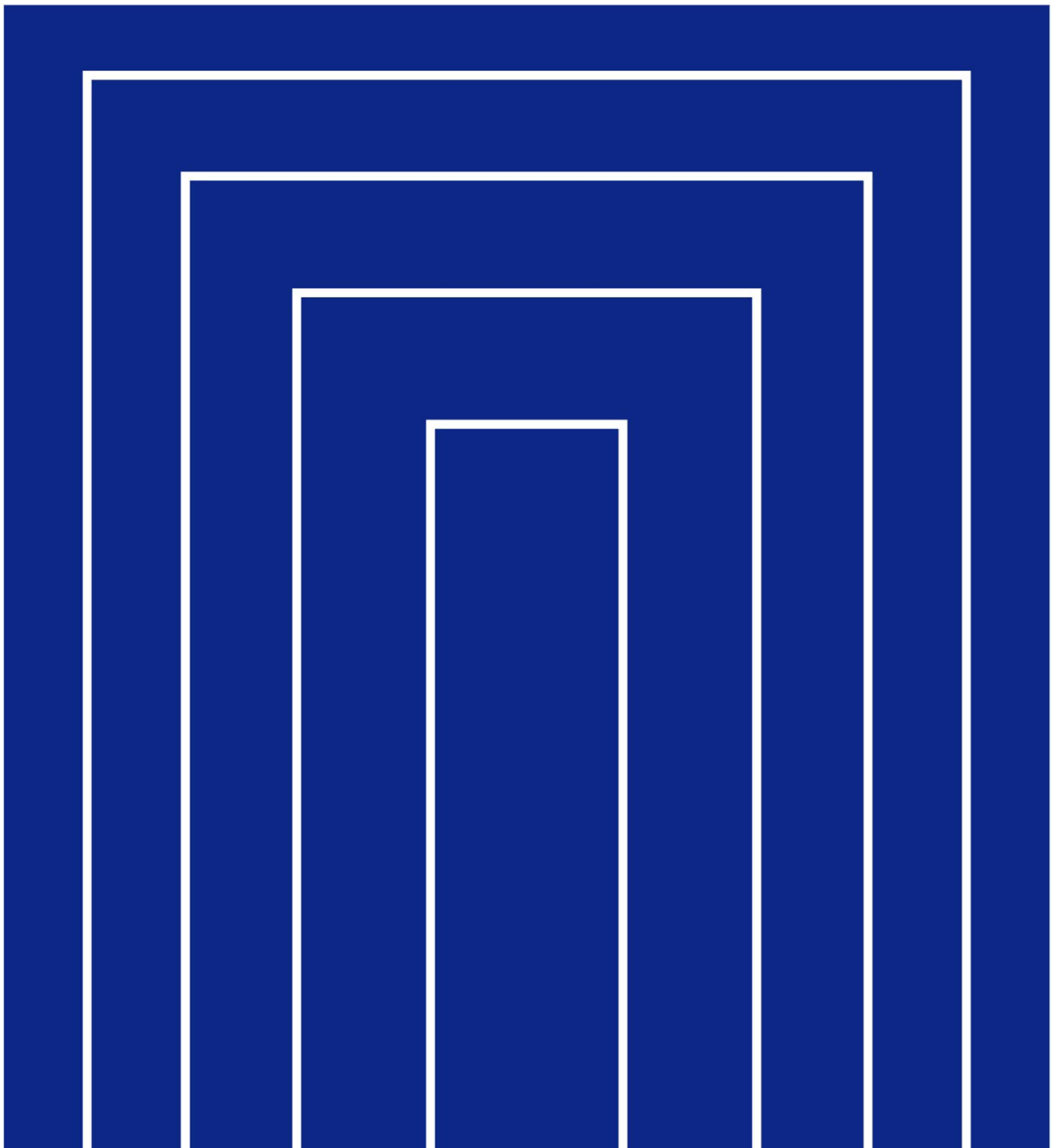
TOYOTA

5VZ-FE

ENGINE

REPAIR MANUAL SUPPLEMENT

Jun., 1999



Pub. No. RM703E

FOREWORD

This supplement has been prepared to provide information covering general service repairs for the 5VZ–FE engine equipped on the LAND CRUISER/LAND CRUISER PRADO.

Applicable models: VZJ90, 95 series

For the service specifications and repair procedures of the above model other than those listed in this supplement, refer to the following manuals.

Manual Name	Pub. No.
• 5VZ–FE Engine Repair Manual	RM519E
• LAND CRUISER/LAND CRUISER PRADO Electrical Wiring Diagram	EWD269F
• LAND CRUISER/LAND CRUISER PRADO Electrical Wiring Diagram Supplement (Jan., 1998)	EWD340F
• LAND CRUISER/LAND CRUISER PRADO Electrical Wiring Diagram Supplement (Jun., 1999)	EWD376F

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

First Printing: May 11, 1999 01–990511–00

CAUTION

This manual does not include all the necessary items about repair and service. This manual is made for the purpose of the use for the persons who have special techniques and certifications. In the cases that non–specialized or uncertified technicians perform repair or service only using this manual or without proper equipment or tool, that may cause severe injury to you or other people around and also cause damage to your customer's vehicle.

In order to prevent dangerous operation and damages to your customer's vehicle, be sure to follow the instruction shown below.

- Must read this manual thoroughly. It is especially important to have good understanding all the contents written in the PRECAUTION of "IN" section.
- The service method written in this manual is very effective to perform repair and service. When performing the operations following the procedures using this manual, be sure to use tools specified and recommended. If using non–specified or recommended tools and service method, be sure to confirm safety of the technicians and any possibility of causing personal injury or damage to the customer's vehicle before starting the operation.
- If part replacement is necessary, must replace the part with the same part number or equivalent part. Do not replace it with inferior quality.
- It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive, because it is important to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

INTRODUCTION

HOW TO USE THIS MANUAL

GENERAL INFORMATION

IN0EU–01

1. INDEX

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

2. GENERAL DESCRIPTION

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

3. TROUBLESHOOTING

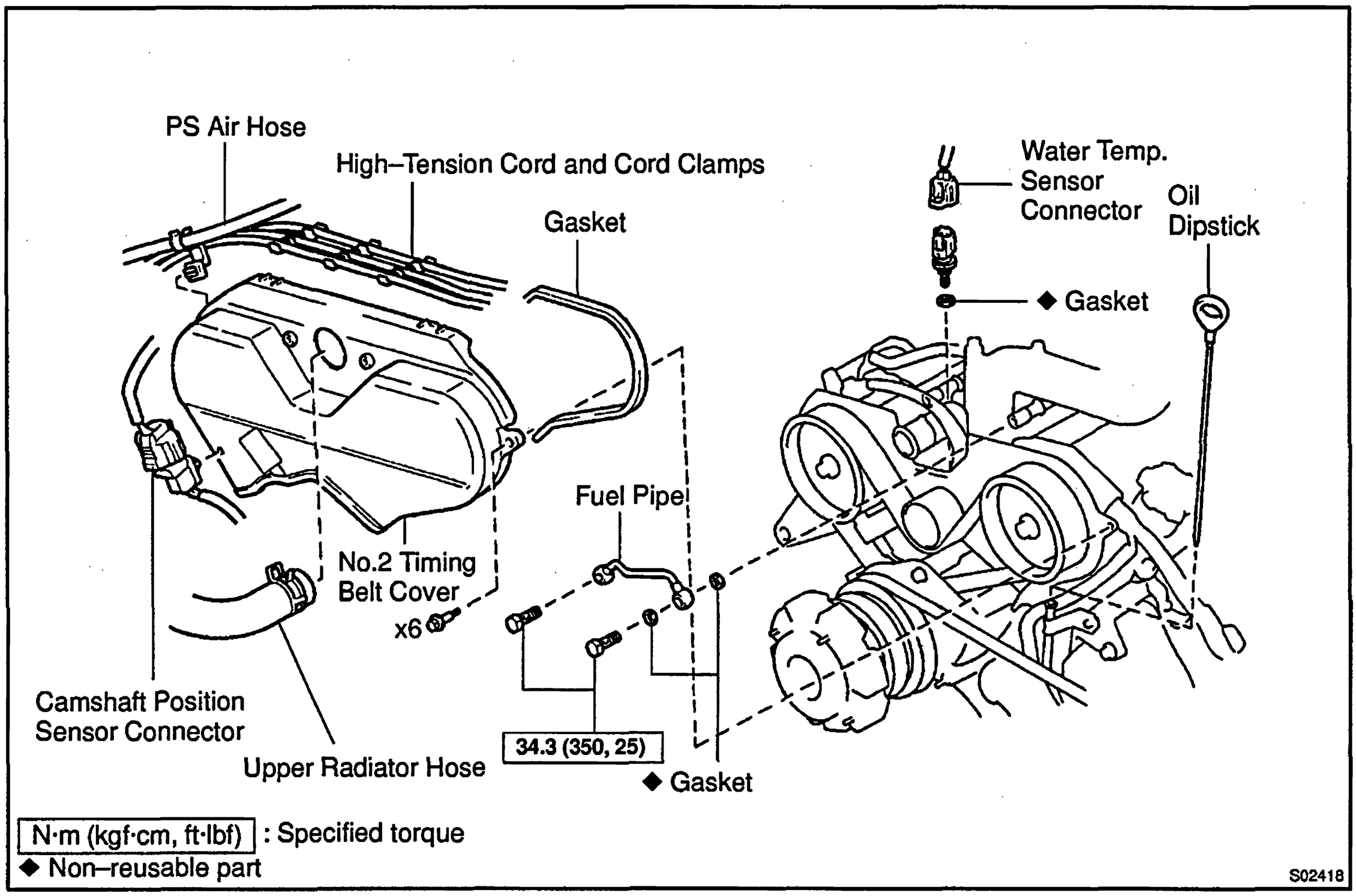
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN–9.
Be sure to read this before performing troubleshooting.

4. PREPARATION

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

5. REPAIR PROCEDURES

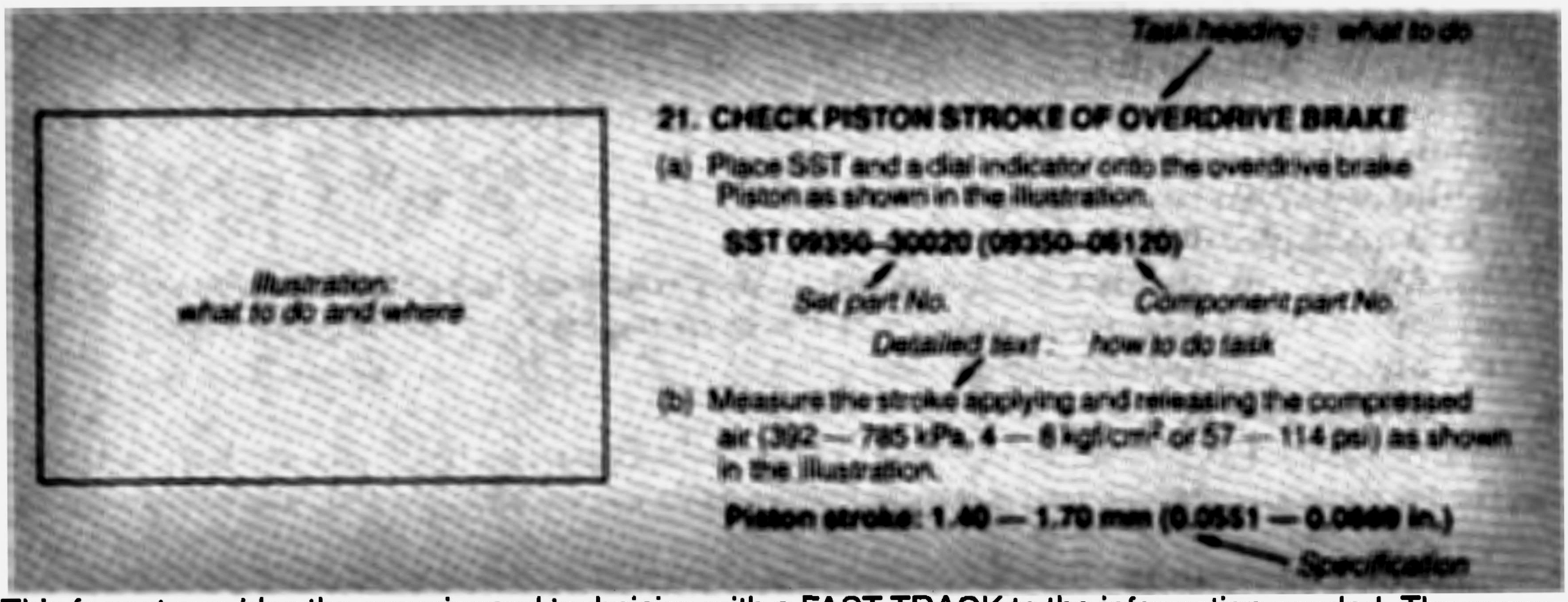
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



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.

6. REFERENCES

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

7. SPECIFICATIONS

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

8. CAUTIONS, NOTICES, HINTS:

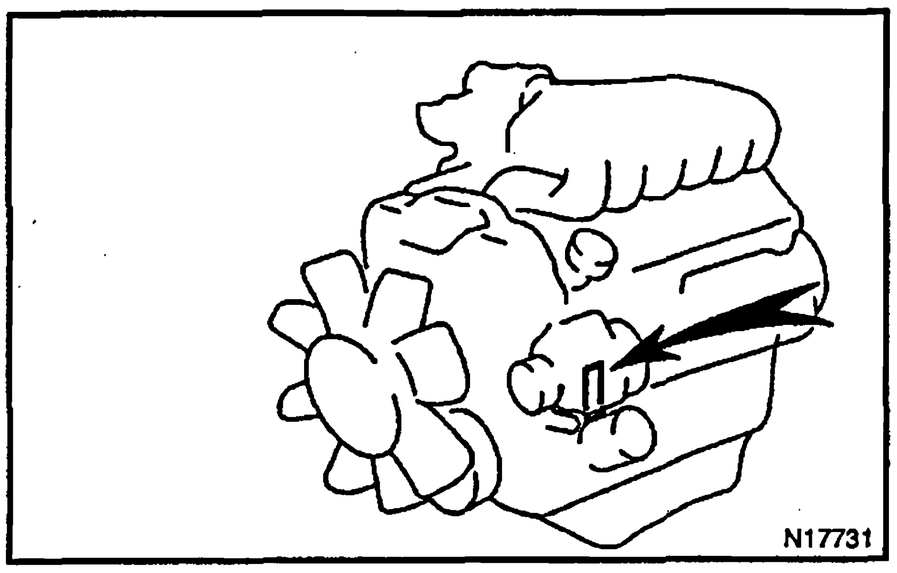
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide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

9. SI UNIT

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

Example:

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

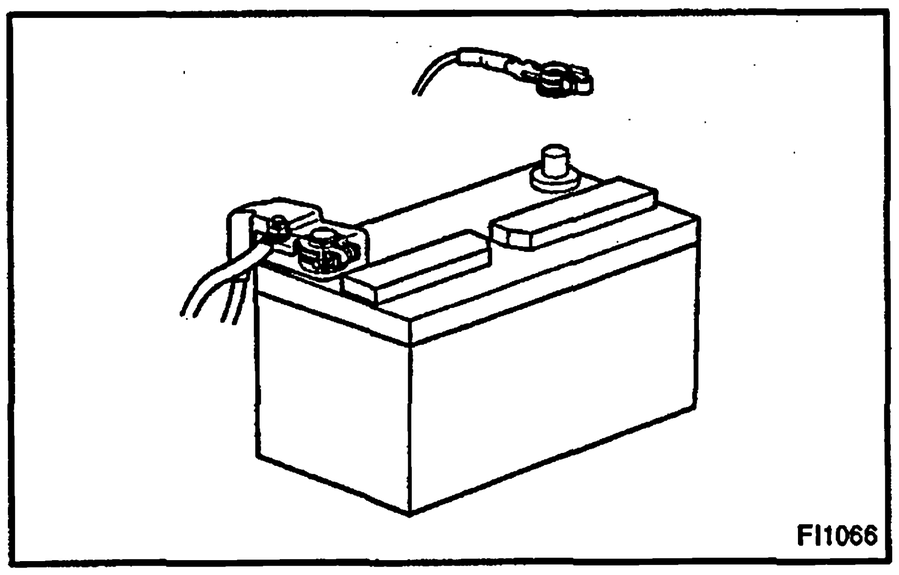


IDENTIFICATION INFORMATION

IN0EV-01

ENGINE SERIAL NUMBER

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


FI1066

REPAIR INSTRUCTIONS

GENERAL INFORMATION

INOEW–01

BASIC REPAIR HINT

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

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

(c) Observe the following:

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

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

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

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

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

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

(d) Check hose and wiring connectors to make sure that they are secure and correct.

(e) Non–reusable parts

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

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

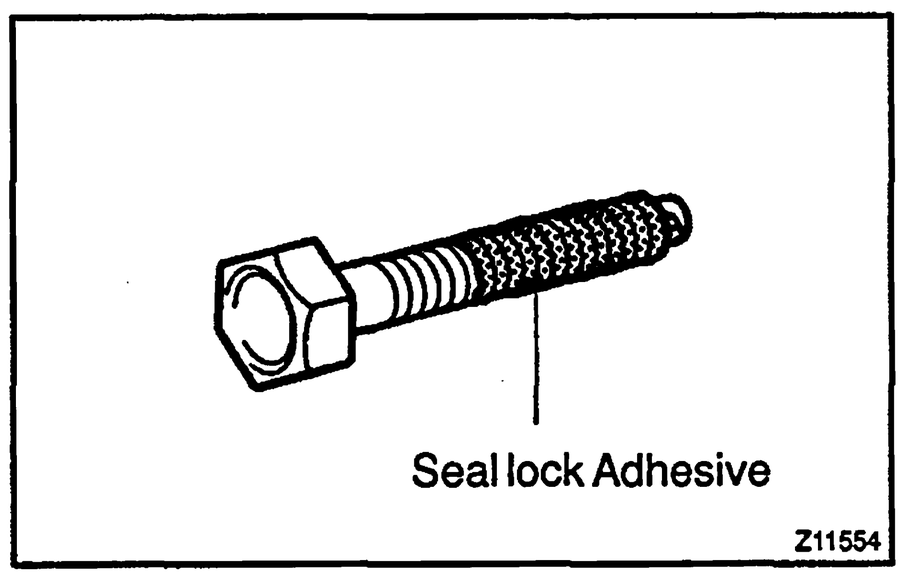
(f) Precoated parts

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

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

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

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



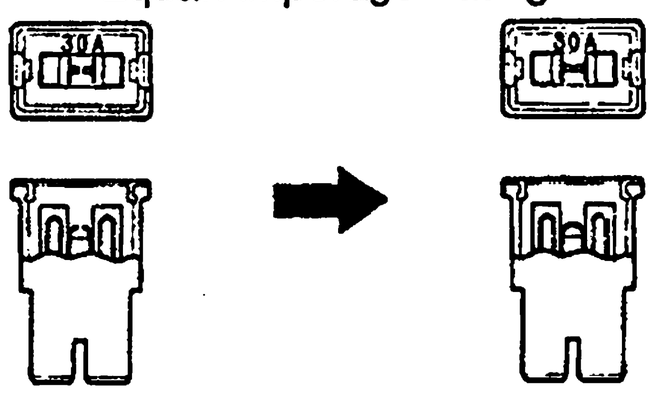
Z11554

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

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

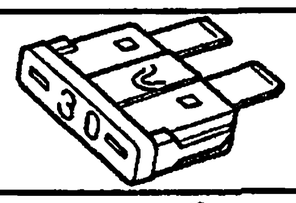
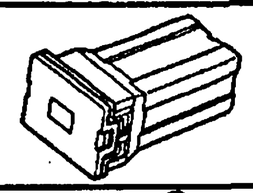
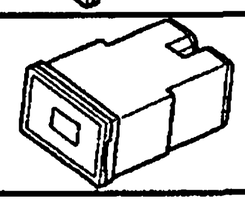
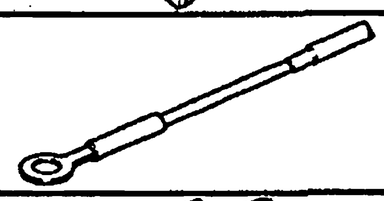
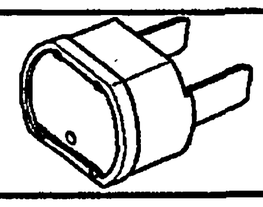
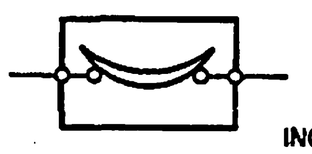
(i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in section PP (Preparation) in this manual.

Medium Current Fuse and High Current Fuse Equal Amperage Rating



BE1367

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

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

V00076

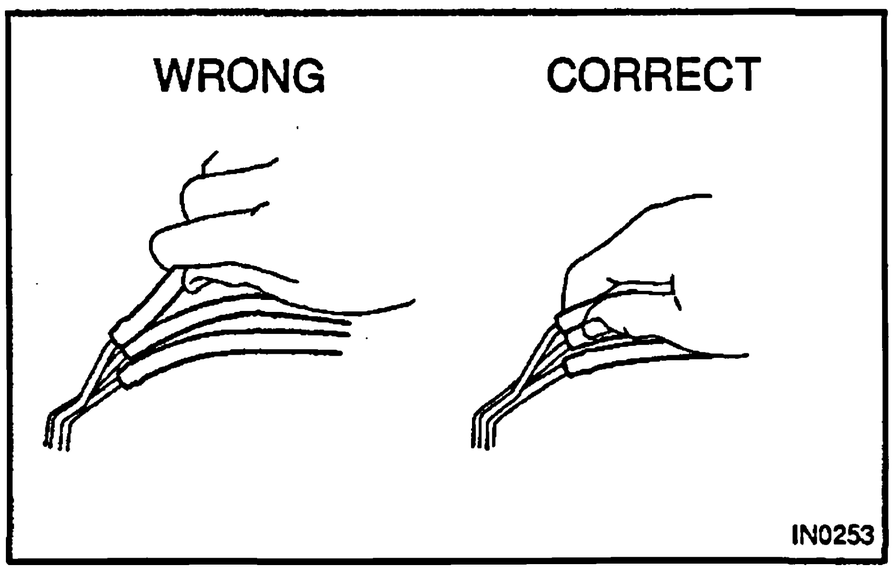
(k) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.

- Cancel the parking brake on the level place and shift the transmission in Neutral (or N range).
- When jacking up the front wheels of the vehicle, at first place stoppers behind the rear wheels.
- When jacking up the rear wheels of the vehicle, at first place stoppers behind the rear wheels.

- When either the front or rear wheels only should be jacked up, set rigid racks and place stoppers in front and behind the other wheels on the ground.
- After the vehicle is jacked up, be sure to support it on rigid racks. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

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

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



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

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

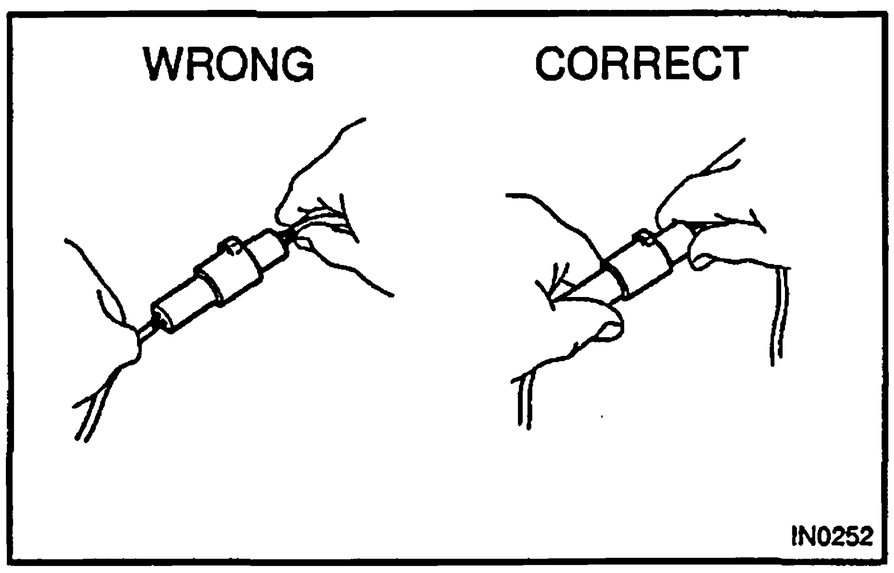
(4) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.

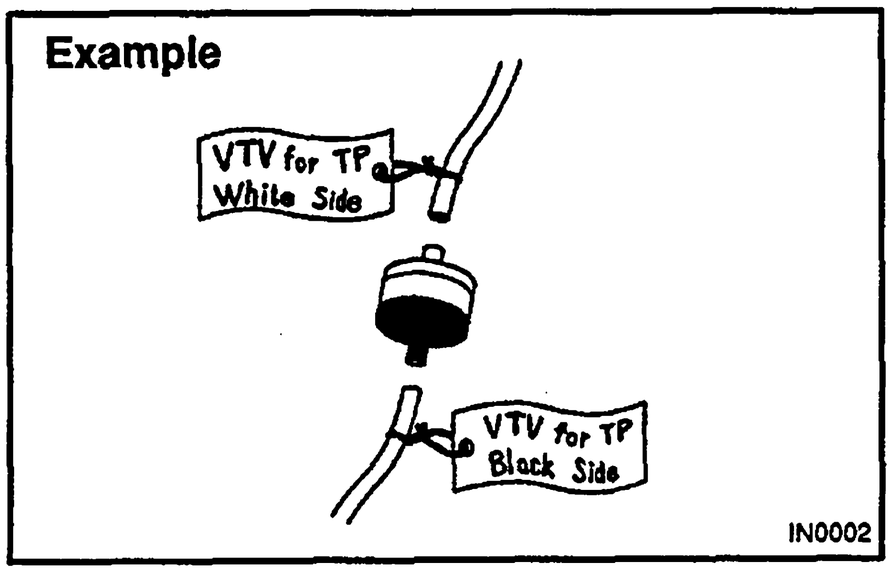
(5) When steam cleaning an engine, protect the electronic components, air filter and emissions–related components from water.

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

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

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





(m) Installation and removal of vacuum hose:
  (1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to.
  (2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

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

FOR ALL OF VEHICLES

IN0EX-01

PRECAUTION

1. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

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.

(a) Use only unleaded gasoline

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

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

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

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

(f) Avoid coasting with ignition turned off and prolonged braking

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

2. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

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

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

(b) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronic systems. For details about ECU and sensors locations, refer to the section on the applicable component.

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

(d) Check that the antenna and feeder are correctly adjusted.

(e) Do not install powerful mobile communications system.

3. FOR USING HAND–HELD TESTER

CAUTION:

Observe the following items for safety reasons:

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

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

INCEY-01

GENERAL INFORMATION

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

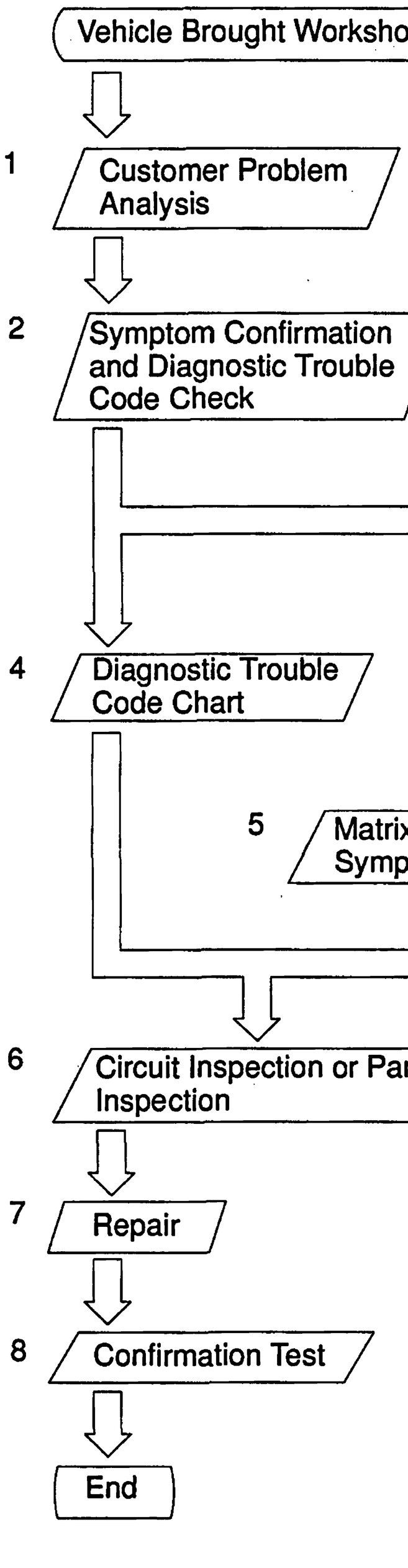
System	Page
1. Engine	DI–1

The troubleshooting procedure and how to make use of it are described on the following pages.

IN0EZ-01

HOW TO PROCEED WITH TROUBLESHOOTING

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



1

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

2, 3

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

4, 5, 6

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

7

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

8

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

1. CUSTOMER PROBLEM ANALYSIS

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

Important Point in the Problem Analysis:

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

Important Points in the Customer Problem Analysis

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

(Sample) Engine control system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

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

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

☐ enstant ☐ Sometimes (times per day/month)

2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the LAND CRUISER/LAND CRUISER PRADO fulfills various functions. The first function is the Diagnostic Trouble Code Check in which a malfunction in the signal circuits to the ECU is stored in code in the ECU memory at the time of occurrence, to be output by the technician during troubleshooting. Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly.

By using these check functions, the problem areas can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in the LAND CRUISER/LAND CRUISER PRADO.

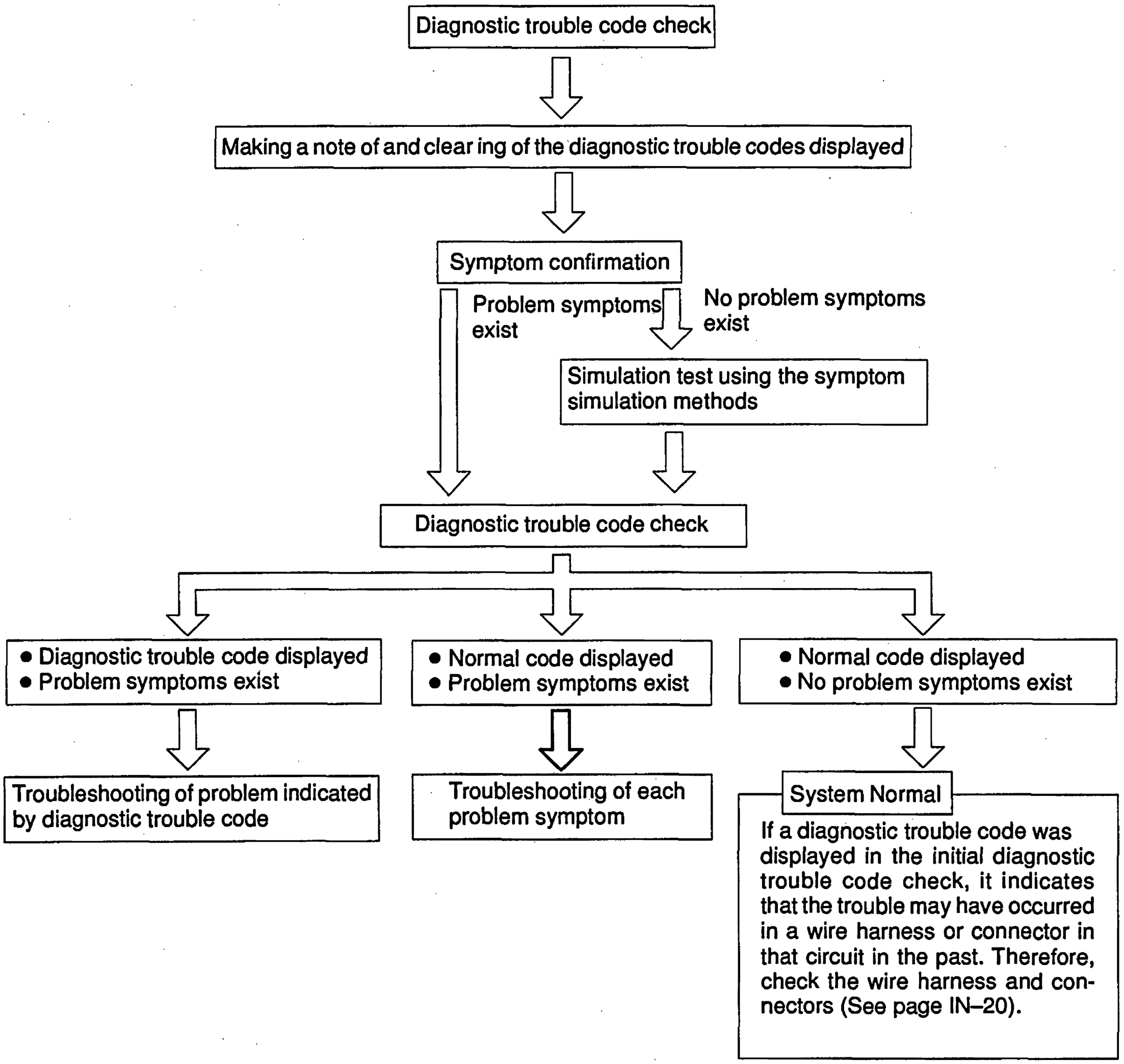
System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Other Diagnosis Function
Engine	○ (with Check Mode)	○	Diagnostic Test Mode

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

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

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

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

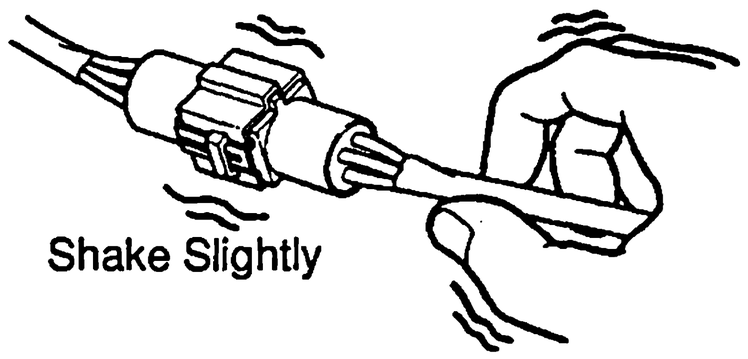
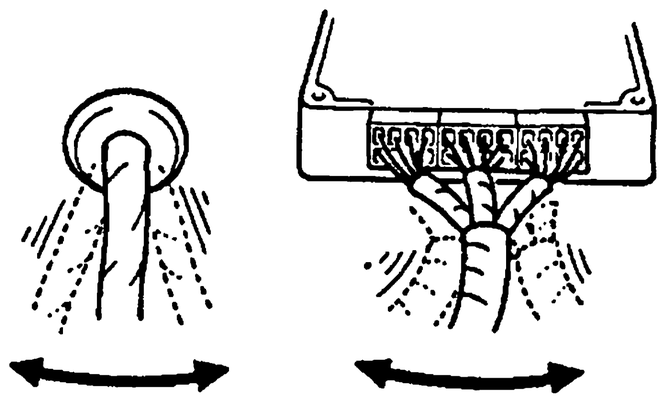
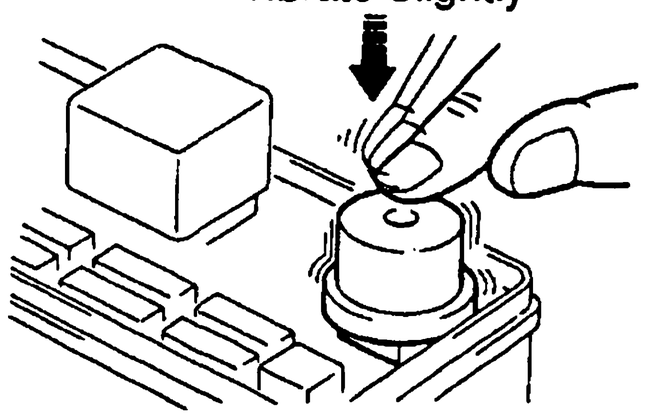


3. SYMPTOM SIMULATION

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

Important Points in the Symptom Simulation Test:

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

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

V07268

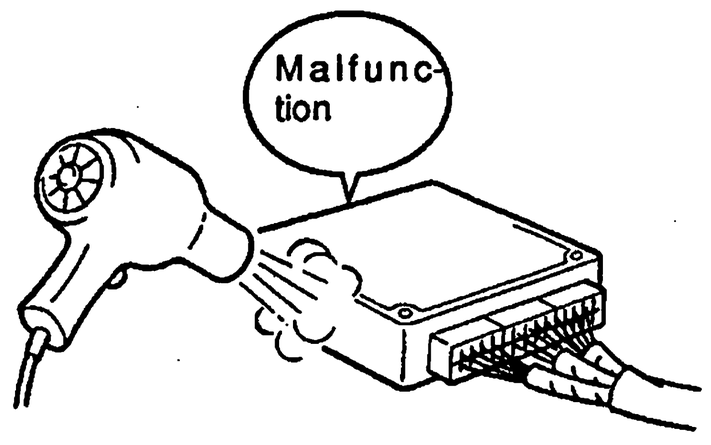
2	**HEAT METHOD: When the problem seems to occur when the suspect area is heated.**

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

NOTICE:

(1) Do not heat to more than 60°C (140°F). (Temperature limit that no damage is done to the component.)

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



FI2334

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

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

NOTICE:

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

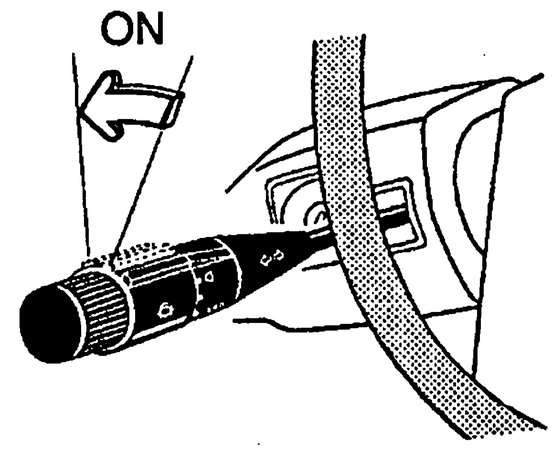
(2) Never apply water directly onto the electronic components.

(Service hint)
If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be used.

FI6649

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

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



FI2336

V07469

4. DIAGNOSTIC TROUBLE CODE CHART

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

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

- Trouble Area
  Indicates the suspect area of the problem.

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

DTC CHART (SAE Controlled)

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

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

DTC No. (See page)	Detection Item	Trouble Area	CHK ENG *1	*Memory
P0105/31 (DI–12)	Vacuum Sensor Circuit Malfunction	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine ECU	○	○
P0110/24 (DI–28)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU	–	○
P0115/22 (DI–31)	Water Temp. Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU	○	○
P0120/41 (DI–32)	Throttle Position Sensor Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU	–	○
		• Open or short in Oxygen sensor circuit • Oxygen sensor		

5. PROBLEM SYMPTOMS TABLE

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

HINT:

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

- Page
  Indicates the page where the flow chart for each circuit is located.
- Circuit Inspection, Inspection Order
  Indicates the circuit which needs to be checked for each problem symptom. Check in the order indicated by the numbers.
- Problem Symptom
- Circuit or Part Name
  Indicates the circuit or part which needs to be checked.

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–12, 13
No initial combustion (Does not start)	1. Engine ECU power source circuit 2. Fuel pump control circuit 3. Engine ECU	DI–124 DI–127 IN–30
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–127
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–121 DI–127 EM–3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–121 DI–127
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–121 DI–127
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Engine ECU power source circuit	AC–54 DI–124
lling)	1. A/C signal circuit 2. Fuel pump control circuit	
	1. Compression 2. Fuel pump control circuit	

6. CIRCUIT INSPECTION

How to read and use each page is shown below.

● Diagnostic Trouble Code No. and Detection Item

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

DTC	P0325/52	Knock Sensor Circuit Malfunction

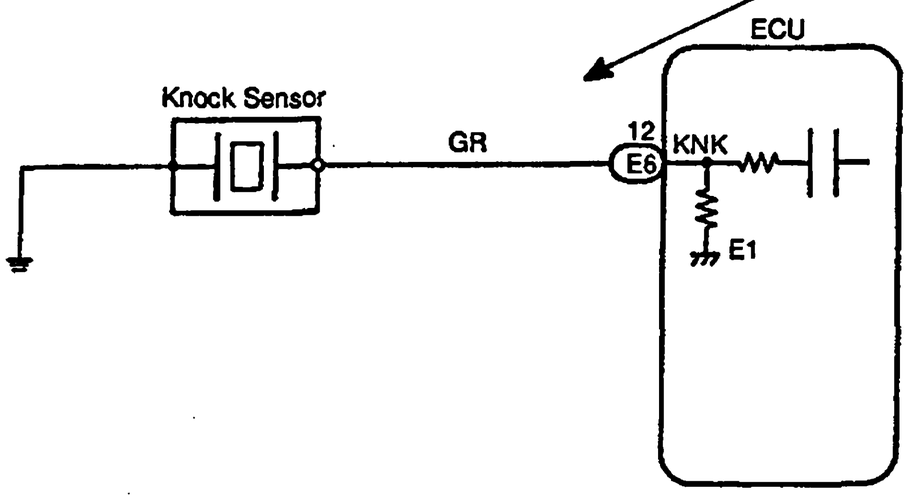
CIRCUIT DESCRIPTION

Knock sensor are fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking.

DTC No.	Detection Item	Trouble Area
P0325/52	No knock sensor 1 signal to engine ECU with engine speed between 1,700 rpm and 5,200 rpm	● Open or short in knock sensor circuit ● Knock sensor (Looseness) ● Engine ECU

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

WIRING DIAGRAM



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

V08423

● Indicates the position of the ignition switch during the check.

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

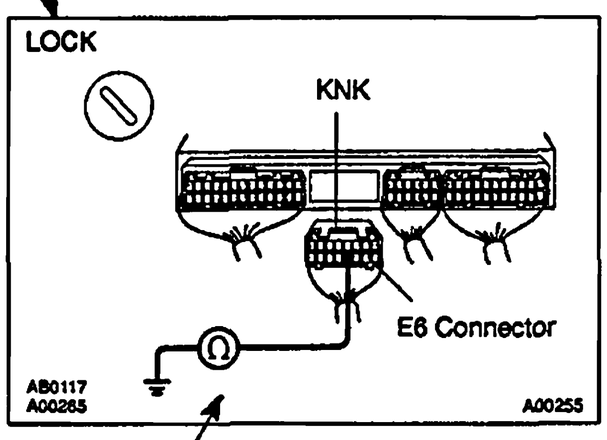
START
Ignition Switch START

ACC
Ignition Switch ACC

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

INSPECTION PROCEDURE

1	Check continuity between terminal KNK of ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment (See page FI–37).
(b) Disconnect the E6 connector of ECU.

CHECK:
Measure resistance between terminal KNK of ECU connector and body ground.

OK:
Resistance: 1 MΩ or higher

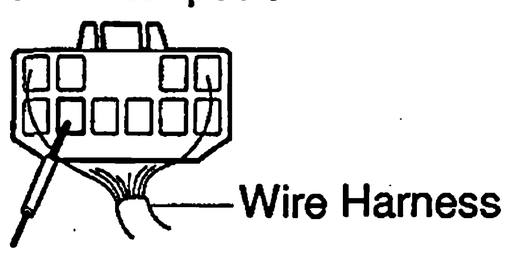
OK → **Go to step 3.**

NG

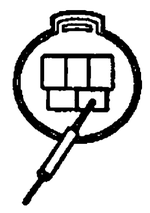
2	Check knock sensor (See page FI–34).

OK → **Replace knock sensor.**

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

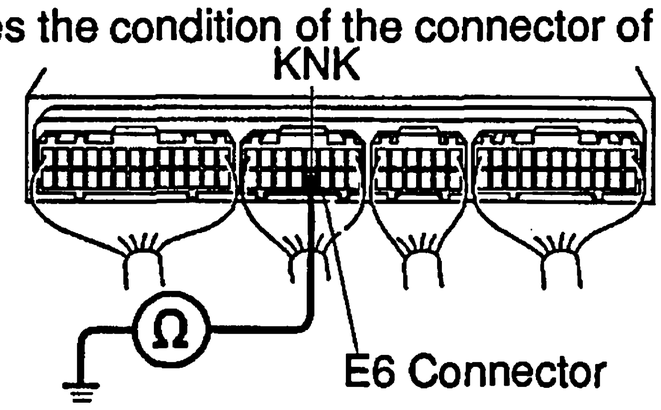


Check from the connector back side. (with harness)

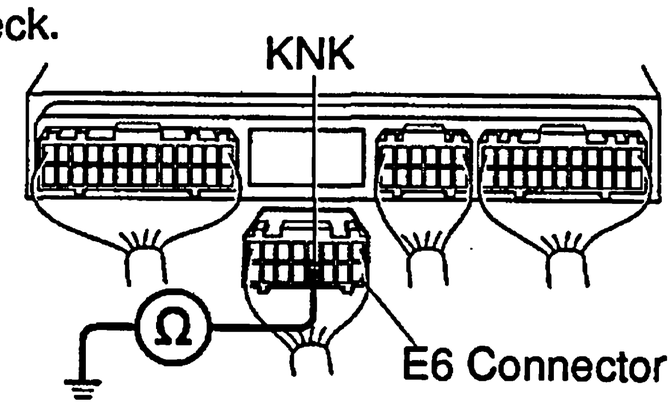


Check from the connector front side. (without harness)
In this case, care must be taken not to bend the terminals.

● Indicates the condition of the connector of ECU during the check.

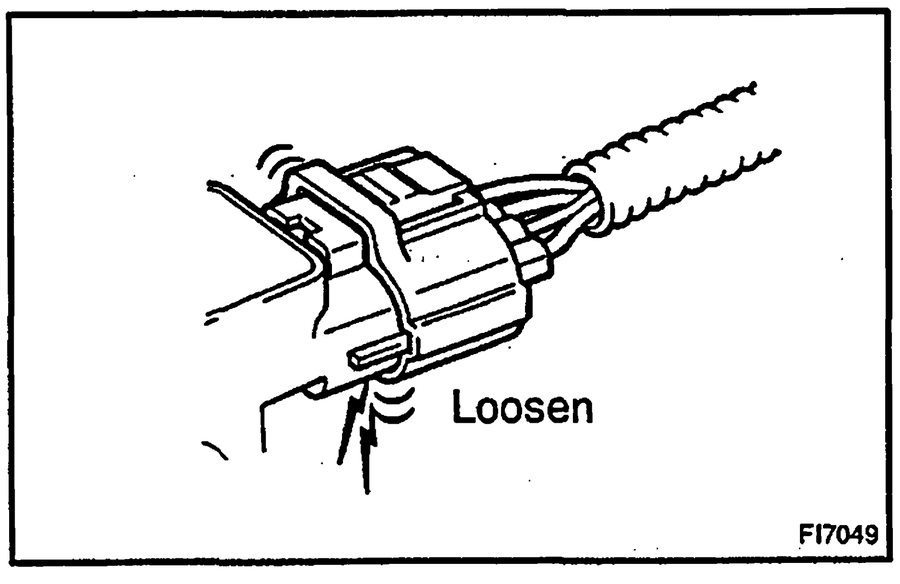


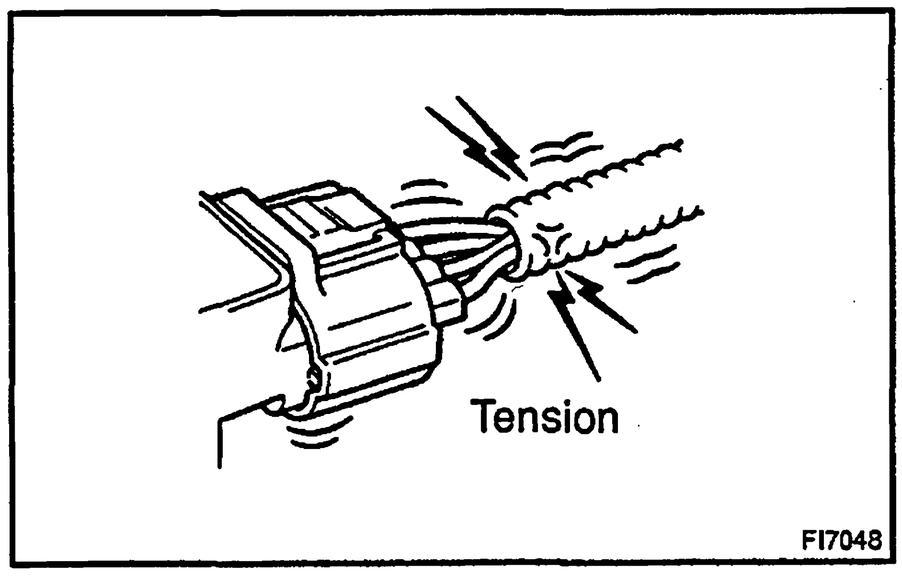
Connector being checked is connected.



Connector being checked is disconnected.

V08425





IN0F0–01

HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code charts or problem symptom table are provided for each circuit with detailed inspection procedures on the following pages.
- When all the component parts, wire harnesses and connectors of each circuit except the ECU are found to be normal in troubleshooting, then it is determined that the problem is in the ECU. Accordingly, if diagnosis is performed without the problem symptoms occurring, the instruction will be to check and replace the ECU, even if the problem is not in the ECU. So always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
- The instructions "Check wire harness and connector" and "Check and replace ECU" which appear in the inspection procedure, are common and applicable to all diagnostic trouble codes. Follow the procedure outlined below whenever these instructions appear.

OPEN CIRCUIT:

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

HINT:

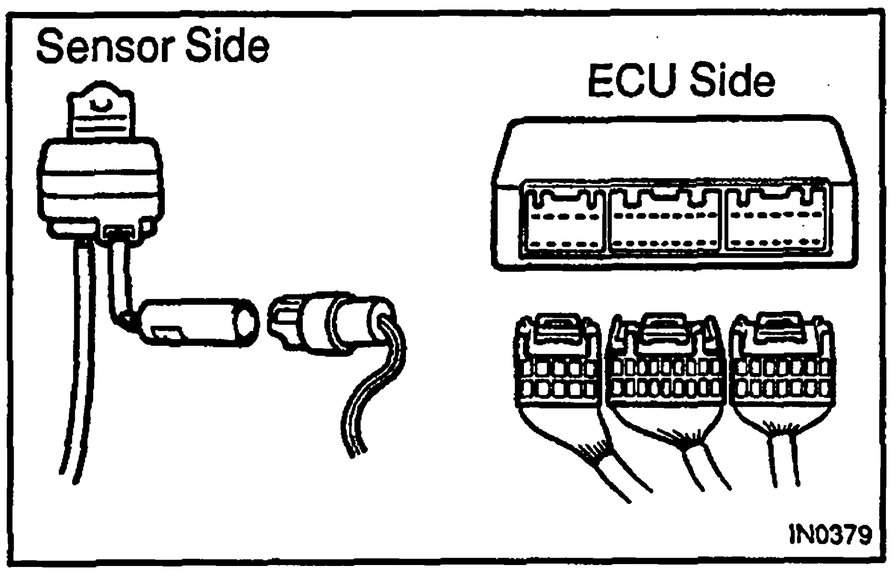
- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators.
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a drop in the contact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

SHORT CIRCUIT:

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

HINT:

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



2. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

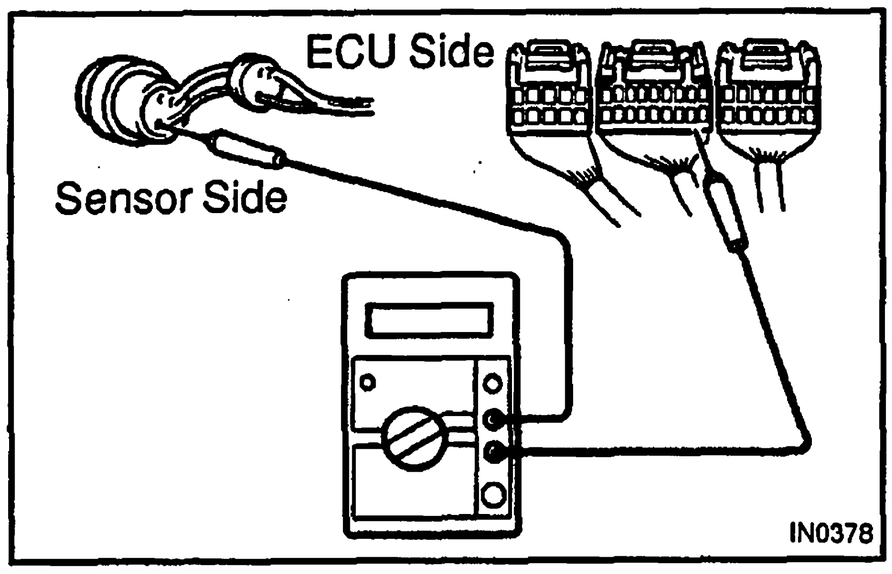
(a) Disconnect the connectors at both ECU and sensor sides.

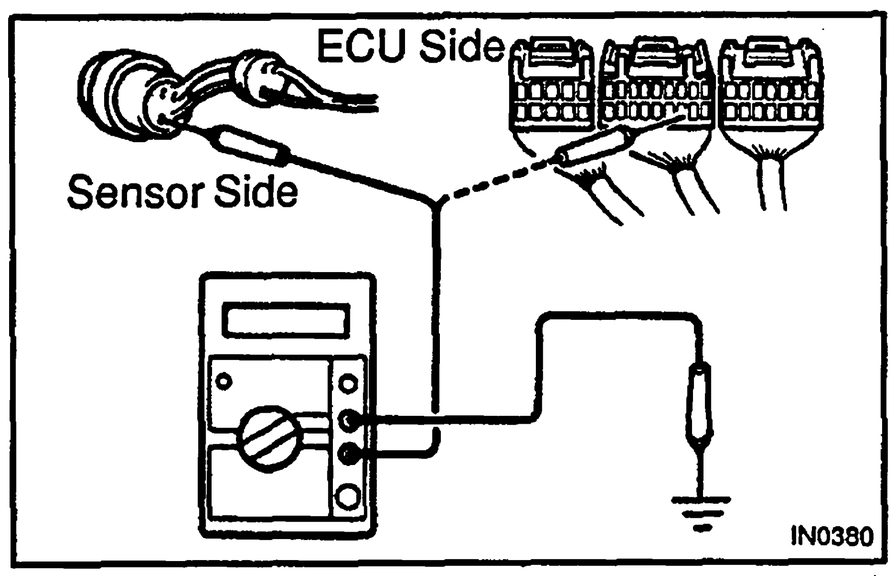
(b) Measure the resistance between the applicable terminals of the connectors.

Resistance: 1 Ω or less

HINT:

- Measure the resistance while lightly shaking the wire harness vertically and horizontally.
- When tester probes are inserted into a connector, insert the probes from the back. For waterproof connectors in which the probes cannot be inserted from the back, be careful not to bend the terminals when inserting the tester probes.





3. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

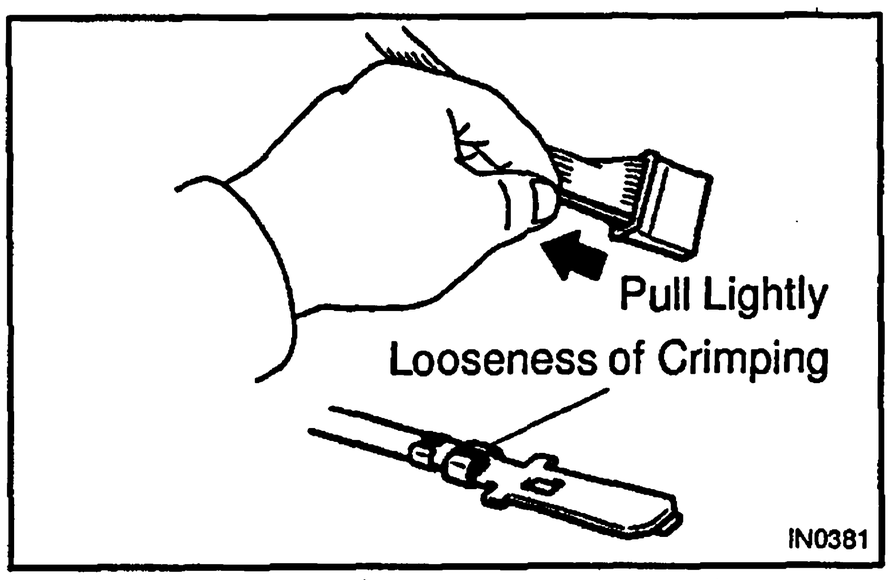
(a) Disconnect the connectors at both ends.

(b) Measure the resistance between the applicable terminals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 1 MΩ or higher

HINT:

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



4. VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.

(b) Check for rust or foreign material, etc. in the terminals of the connectors.

(c) Check crimped portions for looseness or damage and check if the terminals are secured in lock portion.

HINT:

The terminals should not come out when pulled lightly.

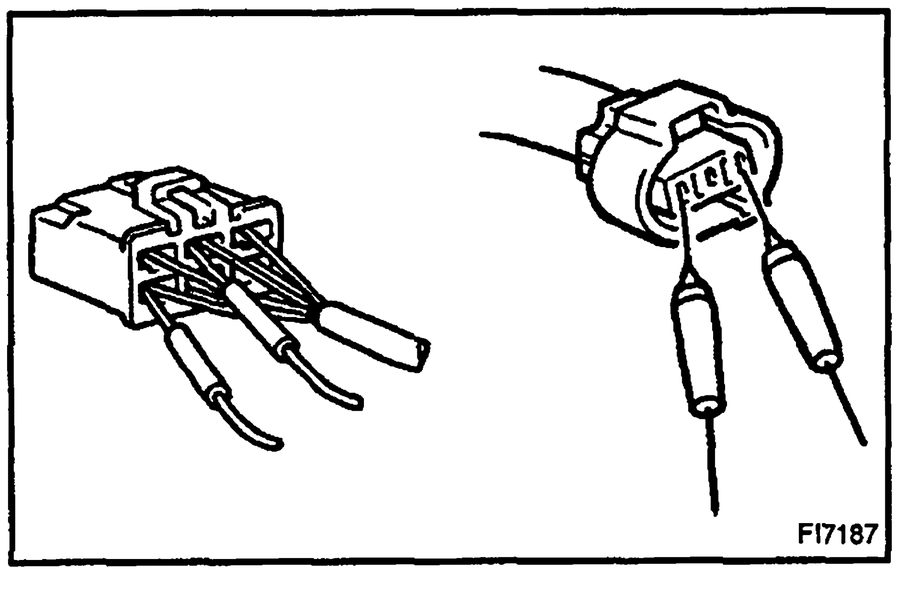
(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

NOTICE:

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

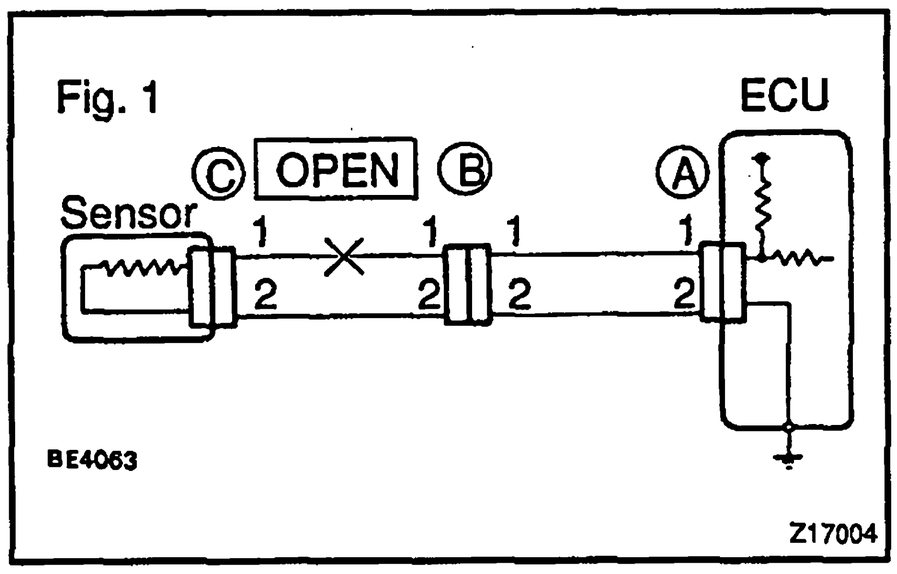
HINT:

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



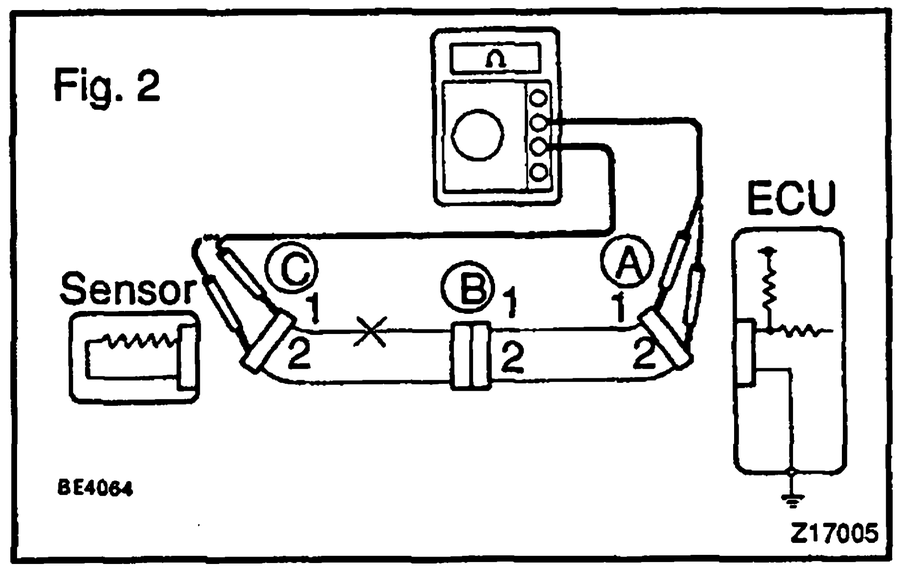
5. CONNECTOR HANDLING

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



6. CHECK OPEN CIRCUIT

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



(a) Check the continuity.

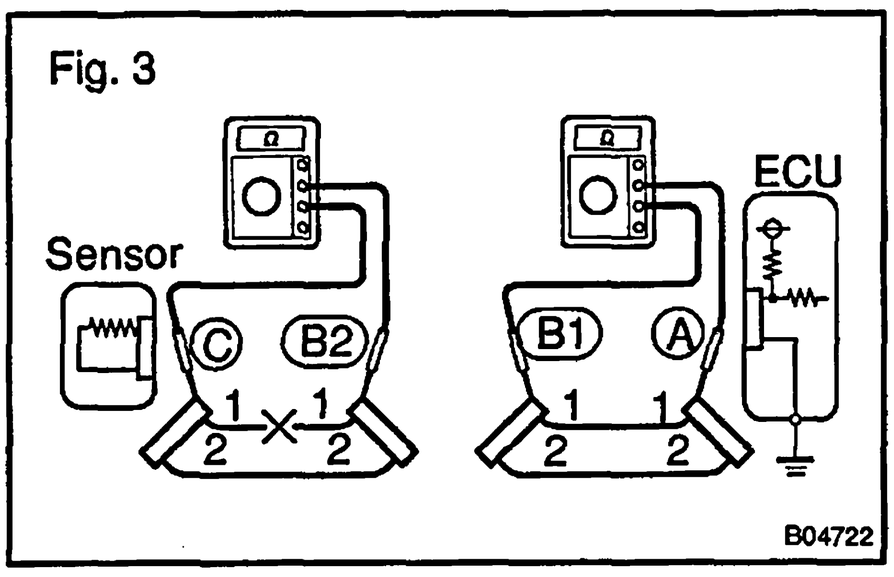
(1) Disconnect connectors "A" and "C" and measure the resistance between them.

In the case of Fig. 2,

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

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

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



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

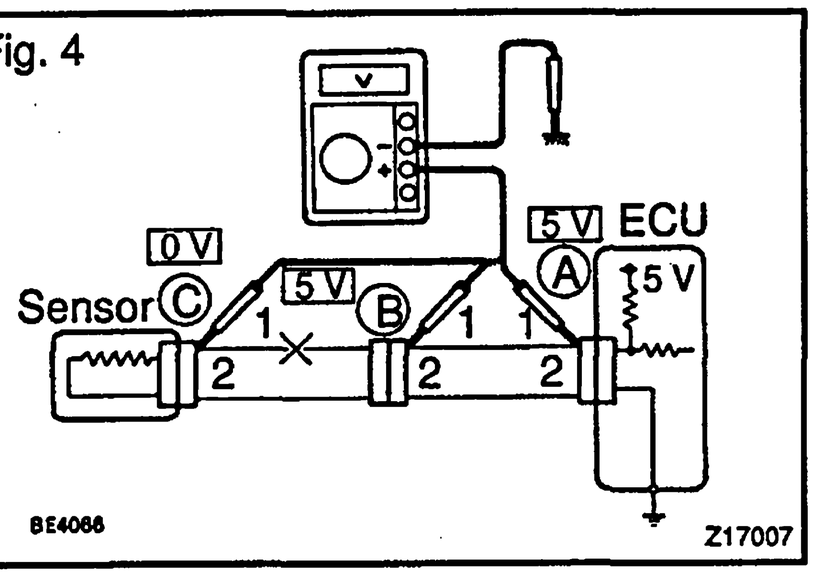
In the case of Fig. 3,

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

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

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

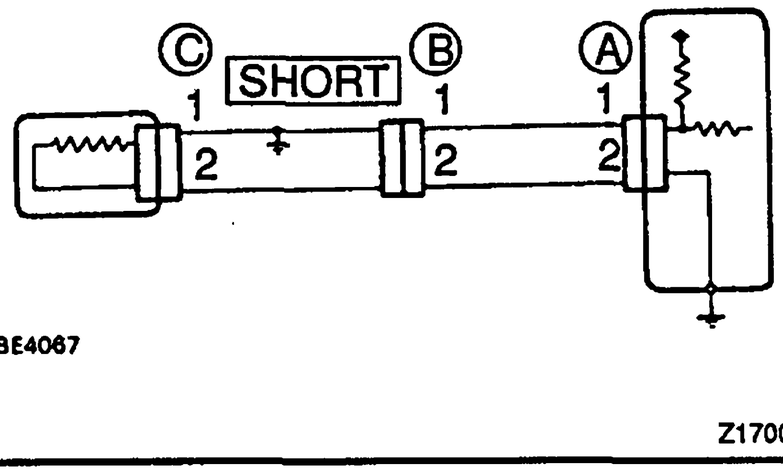
Fig. 4



(b) Check the voltage.
In a circuit in which voltage is applied (to the ECU connector terminal), an open circuit can be checked for by conducting a voltage check.
As shown in Fig. 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector "A" at the ECU 5 V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order.

If the results are:
5 V: Between Terminal 1 of connector "A" and Body Ground
5 V: Between Terminal 1 of connector "B" and Body Ground
0 V: Between Terminal 1 of connector "C" and Body Ground
Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C".

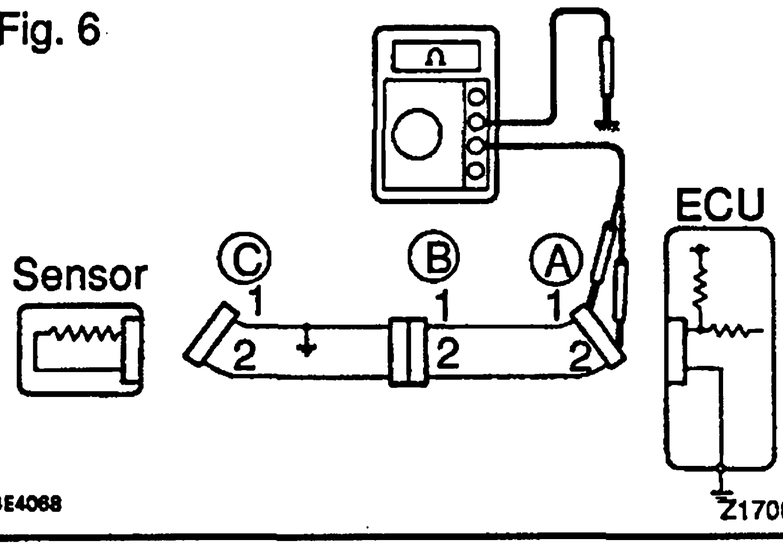
Fig. 5



7. CHECK SHORT CIRCUIT

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

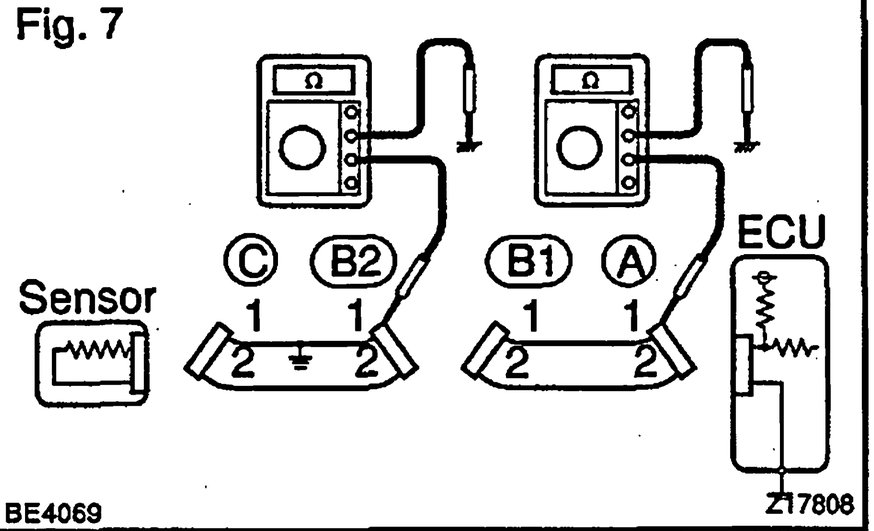
Fig. 6



Check the continuity with ground.

(1) Disconnect connectors "A" and "C" and measure the resistance between terminal 1 and 2 of connector "A" and body ground.
In the case of Fig. 6
Between terminal 1 of connector "A" and body ground → Continuity (short)
Between terminal 2 of connector "A" and body ground → No continuity
Therefore, it is found out that there is a short circuit between terminal 1 of connector "A" and terminal 1 of connector "C".

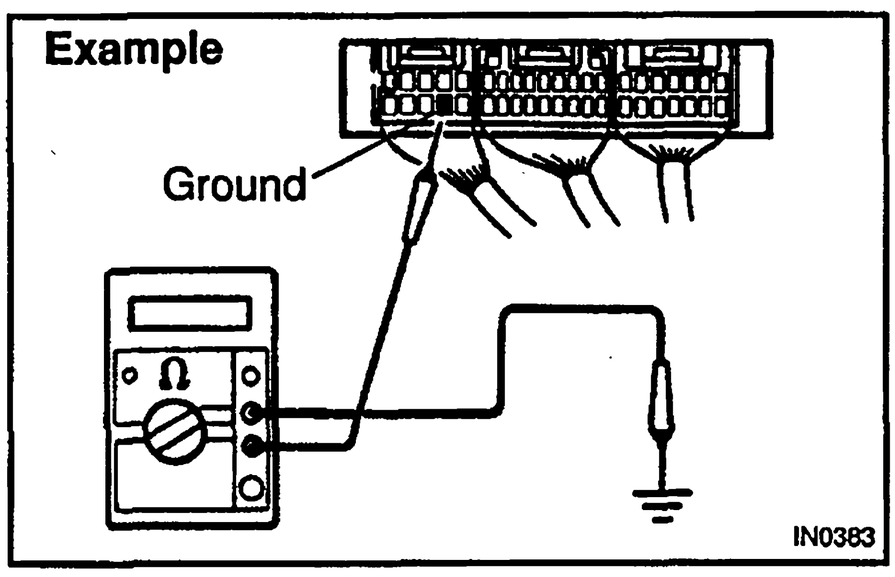
Fig. 7



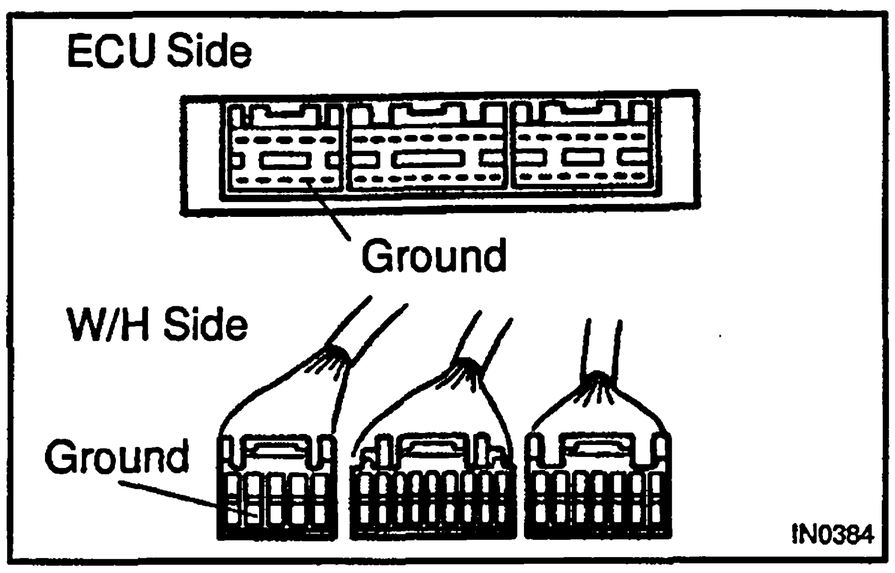
(2) Disconnect connector "B" and measure the resistance between terminal 1 of connector "A" and body ground, and terminal 1 of connector "B2" and body ground.
In the case of Fig. 7
Between terminal 1 of connector "A" and body ground → No continuity
Between terminal 1 of connector "B2" and body ground → Continuity (short)
therefore, it is found out that there is a short circuit between terminal 1 of connector "B2" and terminal 1 of connector "C".

8. CHECK AND REPLACE ECU

First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty, so replace the ECU with a known good one and check if the symptoms appear.



(1) Measure the resistance between the ECU ground terminal and the body ground.
Resistance: 1 Ω or less



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

TERMS

ABBREVIATIONS USED IN THIS MANUAL

IN00S–12

Abbreviations	Meaning
A/C	Air Conditioning
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACSD	Automatic Cold Start Device
ALT	Alternator
AMP	Amplifier
APPROX.	Approximately
A/T	Automatic Transmission (Transaxle)
BACS	Boost Altitude Compensation System
BAT	Battery
BTDC	Befor Top Dead Center
BVSV	Bimetallic Vacuum Switching Valve
CB	Circuit Breaker
CCO	Catalytic Converter for Oxidation
DC	Direct Current
DLC	Data Link Connector
DTC	Diagnostic Trouble Code
ECD	Electronic Control Diesel
ECT	Electronic Control Transmission
ECU	Electronic Control Unit
EDU	Electronic Driving Unit
EFI	Electronic Fuel Injection
E/G	Engine
EGR	Exhaust Gas Recirculation
EVAP	Evaporative Emission Control
E–VRV	Electronic Vacuum Regulating Valve
EX	Exhaust
FIPG	Formed In Place Gasket
FL	Fusible Link
Fr	Front
GND	Ground
HAC	High Altitude Cmpensator
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake
ISC	Idle Speed Control
J/B	Junction Block
J/C	Junction Connector
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left–Hand

LHD	Left–Hand Drive
LO	Low
MAP	Manifold Absolute Pressure
MAX.	Maximum
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MP	Multipurpose
M/T	Manual Transmission
N	Neutral
O2S	Oxygen Sensor
O/D	Overdrive
O/S	Oversize
PKB	Parking Brake
PS	Power Steering
RAM	Random Access Memory
R/B	Relay Block
RH	Right–Hand
RHD	Right–Hand Drive
ROM	Read Only Memory
Rr	Rear
SICS	Starting Injection Control System
SPEC	Specification
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch
TACH	Tachometer
TDC	Top Dead Center
TEMP.	Temperature
T/M	Transmission
TMC	TOYOTA Motor Corporation
TWC	Three–Way Catalyst
U/D	Underdrive
VCV	Vacuum Control Valve
VIN	Vehicle Identification Number
VSV	Vacuum Switching Valve
w/	With
W/H	Wire Harness
w/o	Without
WU–TWC	Warm Up Three–Way Catalytic Converter
2WD	Two Wheel Drive Vehicle (4x2)
4WD	Four Wheel Drive Vehicle (4x4)

PREPARATION

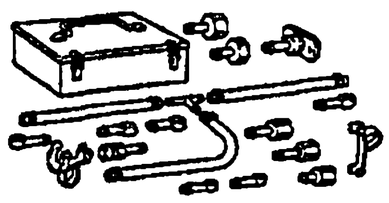
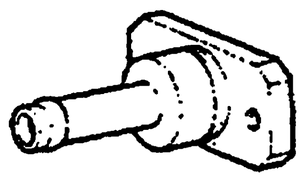
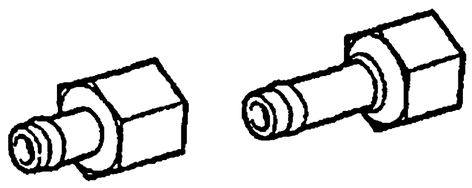
REFER TO 5VZ–FE ENGINE REPAIR MANUAL (Pub. No. RM519E)

NOTE: The above pages contain only the points which differ from the above listed manual.

ELECTRONIC FUEL INJECTION

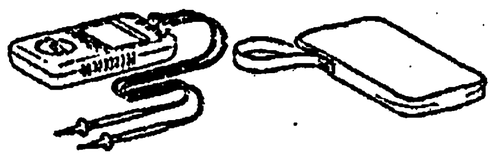
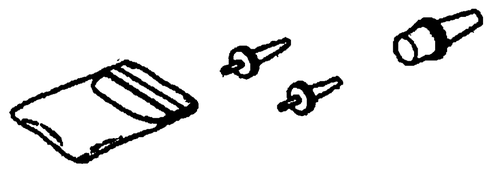
SST (Special Service Tools)

PP2AH–01

	09268–41047 Injection Measuring Tool Set	
	(09268–41091) NO.7 Union	
	(09268–52011) Injection Measuring Attachment	
	09842–30070 Wiring "F" EFI Inspection	

PP2AI-01

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	
	09258–00030 Hose Plug Set .	

PP2AJ-01

EQUIPMENT

Hand–held tester	
Sound scope	
Graduated cylinder	
Torque wrench	

SERVICE SPECIFICATIONS

SS

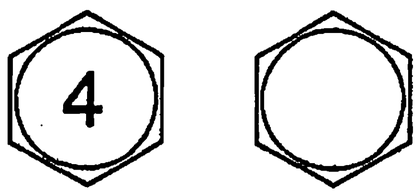
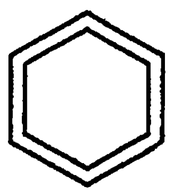
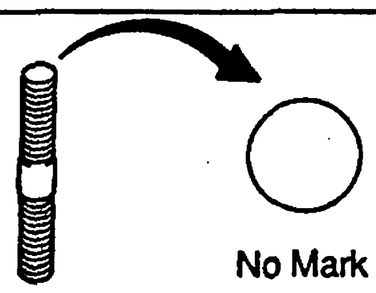
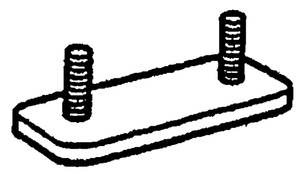
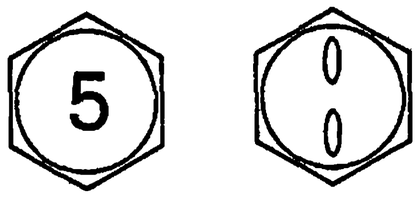
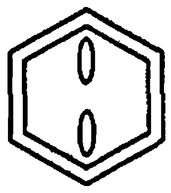
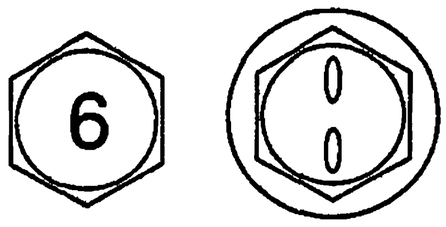
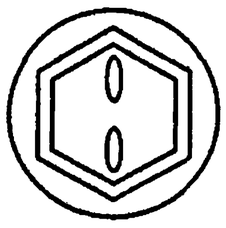
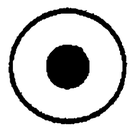
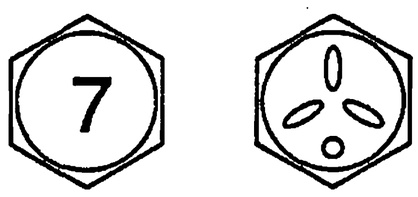
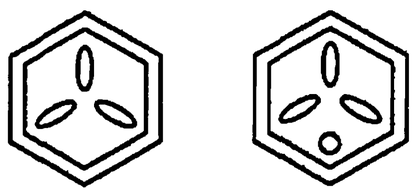
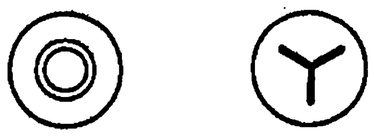
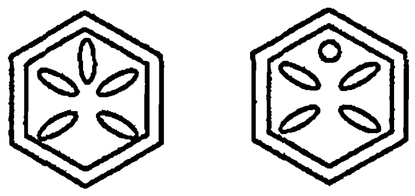
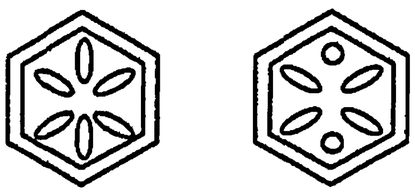
REFER TO 5VZ–FE ENGINE REPAIR MANUAL (Pub. No. RM519E)

NOTE: The above pages contain only the points which differ from the above listed manual.

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS0Z8–01

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
 No Mark	 No Mark	 No Mark		4T
				5T
 w/ Washer	 w/ Washer			6T
				7T
				8T
				9T
				10T
				11T

B06431

SS

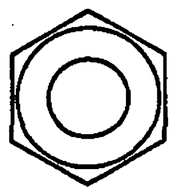
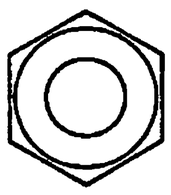
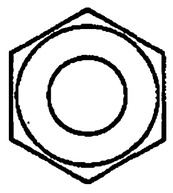
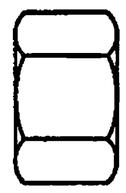
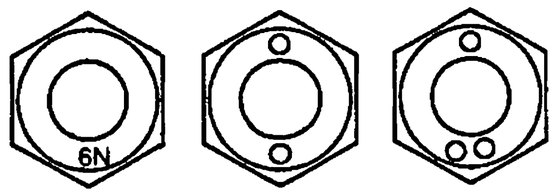
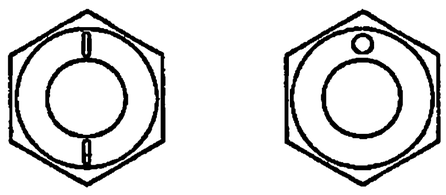
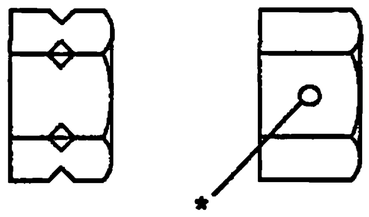
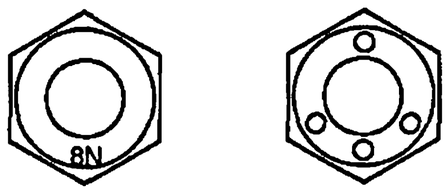
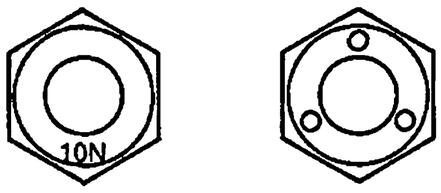
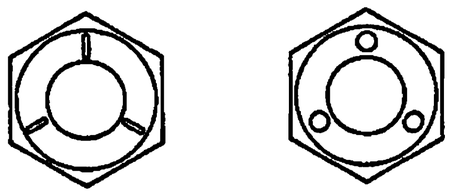
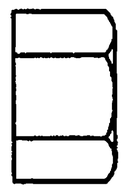
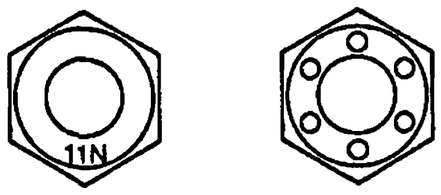
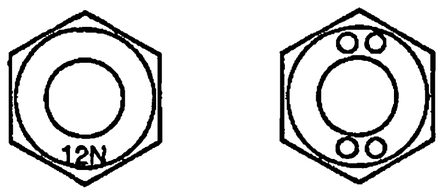
SS0ZT-01

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

SS0ZU-01

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/ Washer)	 No Mark (w/ Washer)	 No Mark	5N (4T)
			6N
			7N (5T)
			8N
		 No Mark	10N (7T)
			11N
			12N

*: Nut with 1 or more marks on one side surface of the nut.

B06432

HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

ELECTRONIC FUEL INJECTION

SERVICE DATA

SS15C-01

Injector	Resistance	at 21 °C(68 °F)	13.8 Ω
	Injection volume		56 – 69 cm^3 (3.4 – 4.2 cu in.) per 15 seconds
	Difference between each injector		13 cm^3 (0.8 cu in.) or less
	Fuel leakage		1 drop or less per minute
Mass air flow meter	Resistance	at –20°C (–4°F)	12.5 – 16.9 kΩ
		at 20°C (68°F)	2.2 – 2.7 kΩ
		at 60°C (140°F)	0.5 – 0.7 kΩ

6S15D-01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Air intake chamber assembly x Intake air connector assembly	18	180	13
Intake air connector assembly x Cylinder block	18	180	13
Delivery pipe x Fuel pipe union bolt	34.3	350	25
Delivery pipe x Intake manifold	13	130	10
Delivery pipe x Fuel pressure regulator	8	80	71 in.·lbf

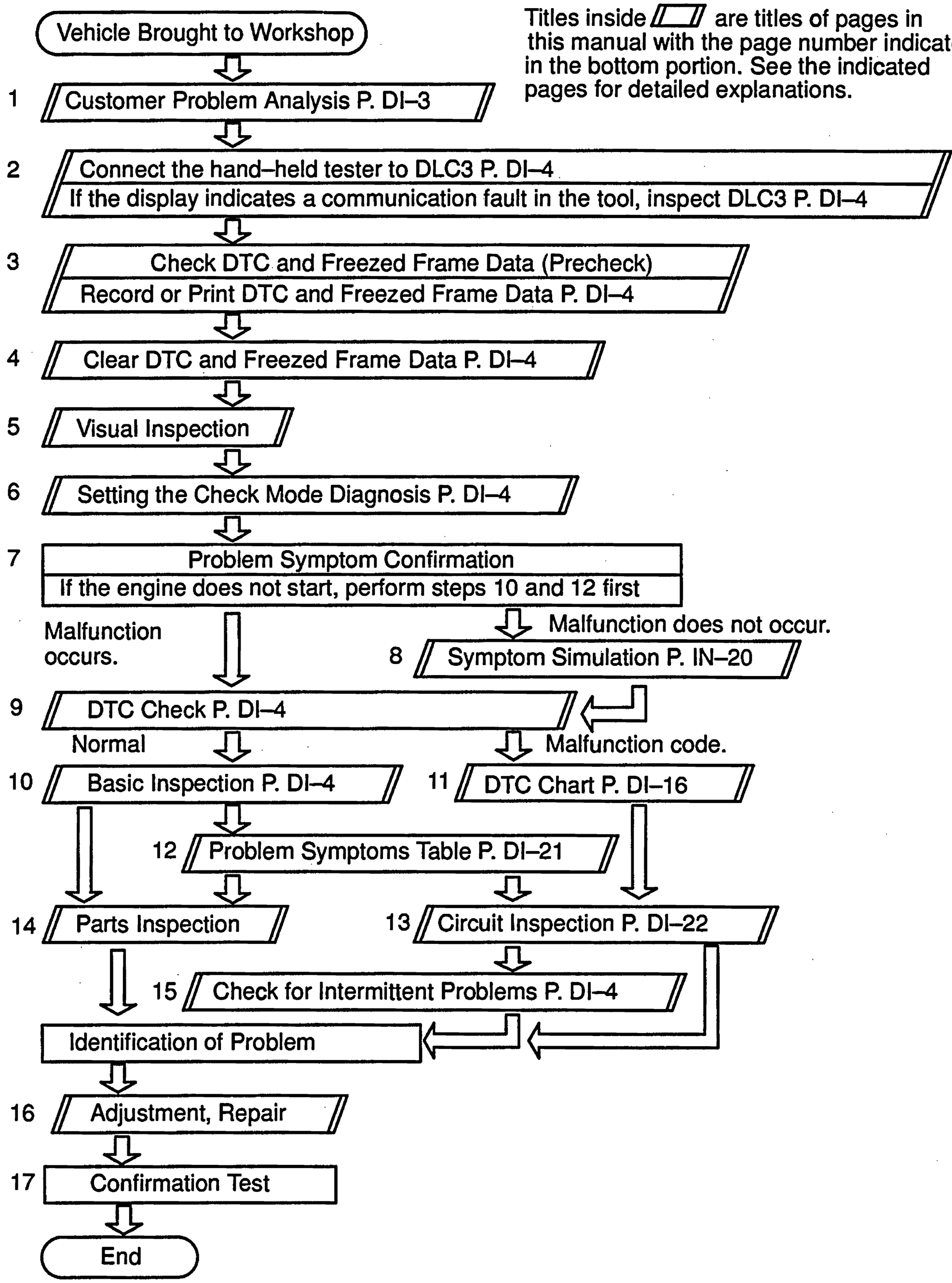
DIAGNOSTICS

ENGINE

HOW TO PROCEED WITH TROUBLESHOOTING

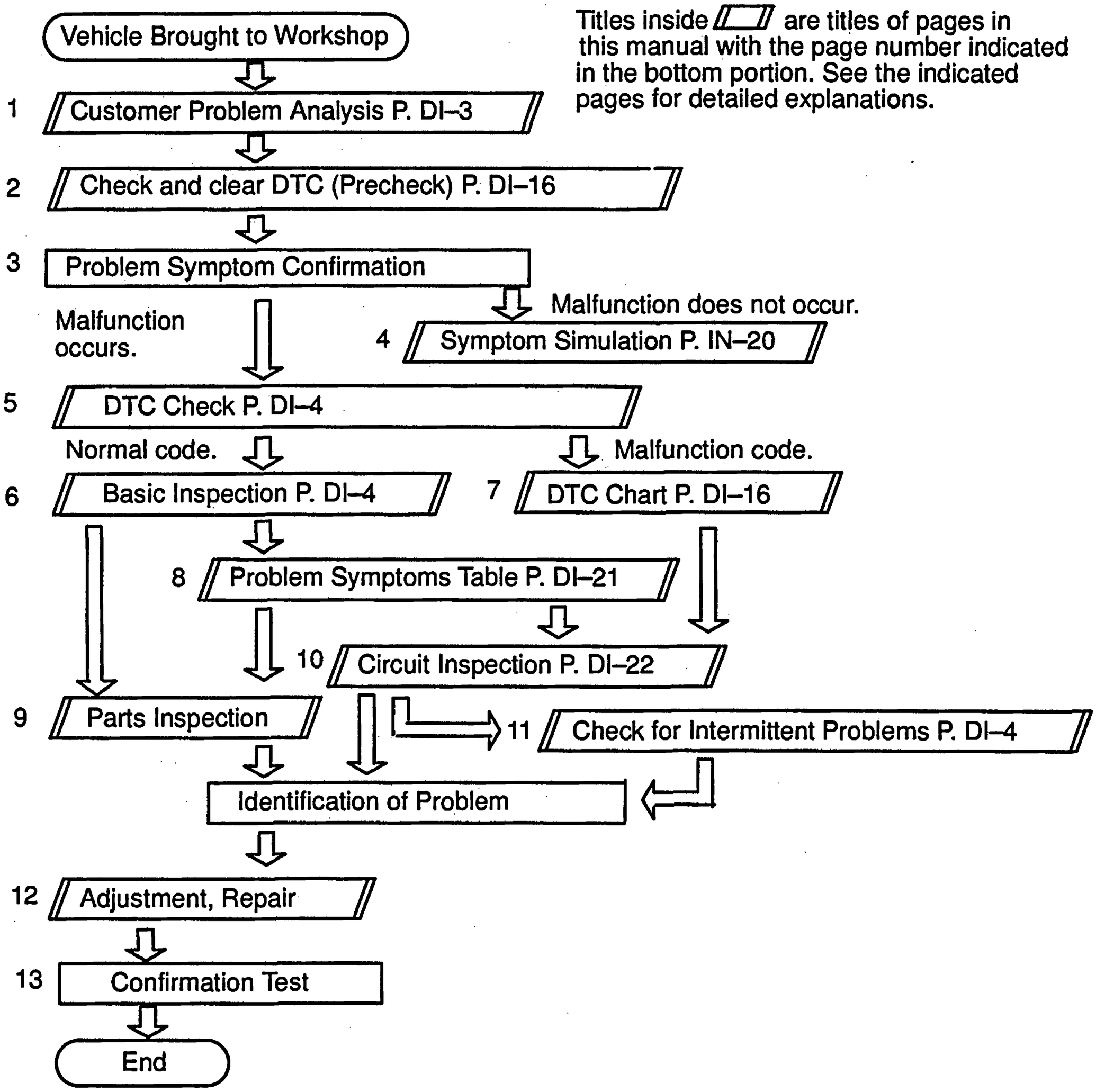
D16AI–01

When using hand–held tester, Troubleshoot in accordance with the procedure on the following page.



Titles inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

When not using hand–held tester, Troubleshoot in accordance with the procedure on the following page.



Titles inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

DI

DI6AJ–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

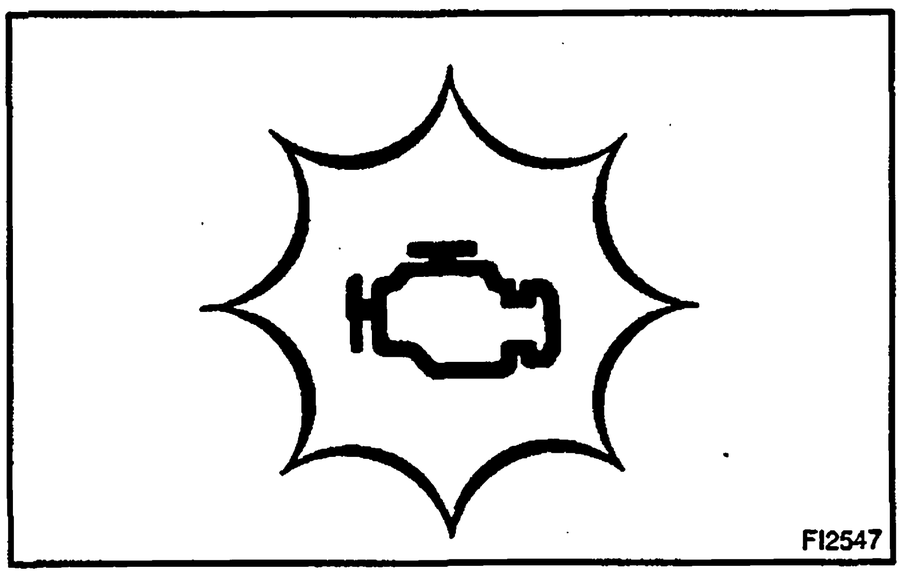
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Date Vehicle Brought In		Engine Model	
License No.		Odometer Reading	km miles

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

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____ °F/____ °C)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

DTC Inspection	Normal Mode (Precheck)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )
	Check (test) Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )

DI



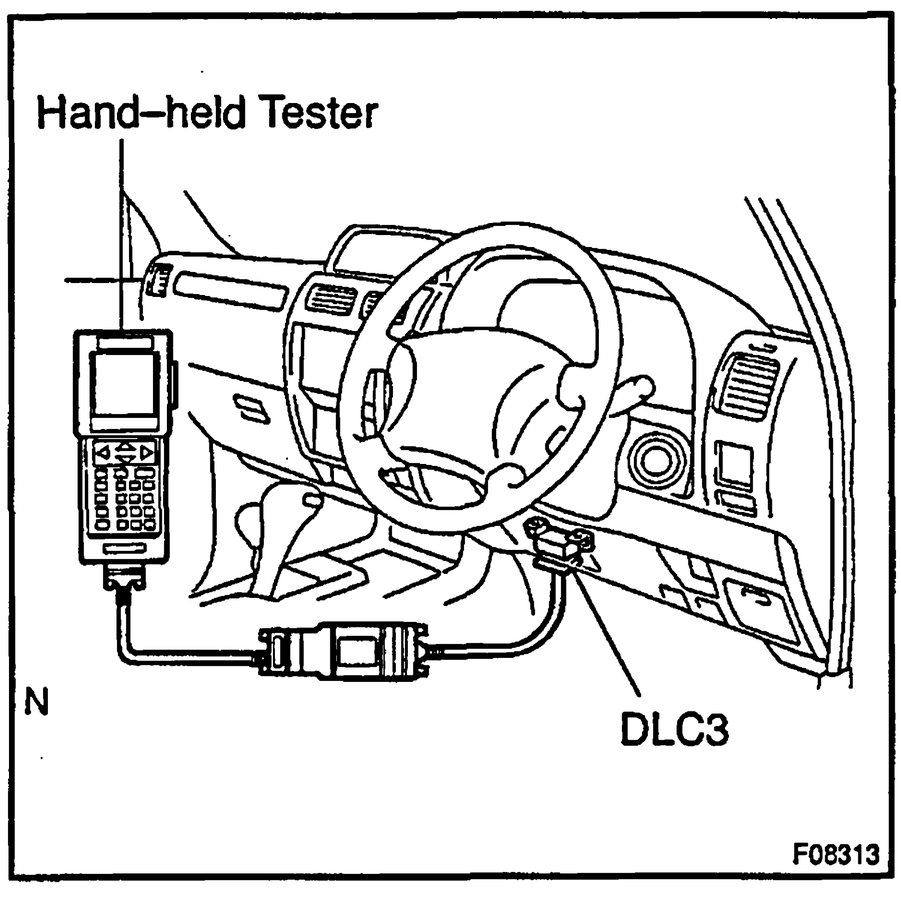
DI6AK–01

PRE–CHECK

1. DIAGNOSIS SYSTEM

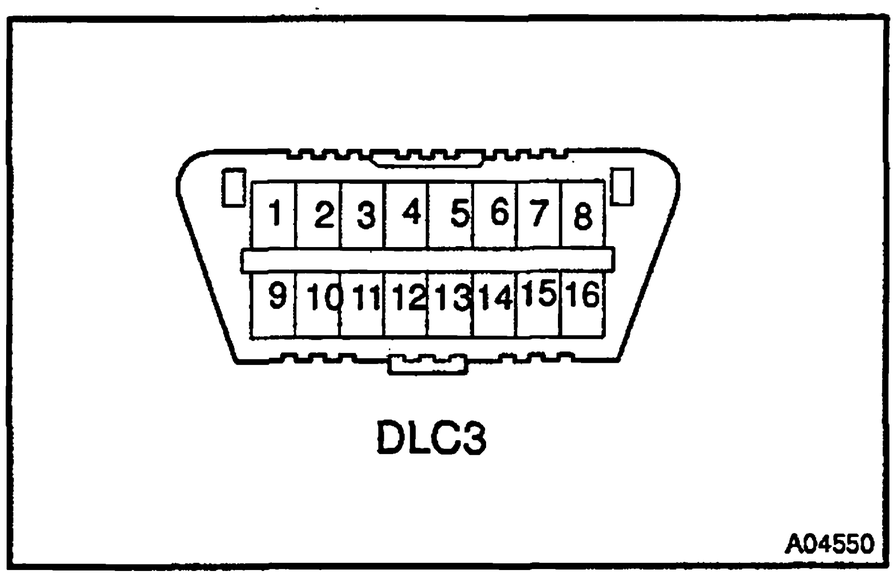
(a) Description

- When troubleshooting Multiplex OBD (M–OBD) vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the hand–held tester, and read off various data output from the vehicle's engine ECU.
- The vehicle's on–board computer lights up check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components. In addition to an indication of the CHK ENG lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) recorded in the engine ECU memory (See page DI–16). If the malfunction has been repaired, the CHK ENG goes off automatially but the DTCs remain recorded in the engine ECU memory.



- To check the DTCs, connect the hand–held tester to Data Link Connector 3 (DLC3) on the vehicle or read the diagnostic trouble code which is indicated on the multi information display when TC and CG terminals on the DLC3 are connected. The hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the instruction book.)
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the engine ECU to check (test) mode using hand–held tester when troubleshooting, the technician can cause the CHK ENG light up for a malfunction that is only detected once or momentarily. (Hand–held tester only) (See step 2)
- *2 trip detection logic: When a logic malfunction is first detected, the malfunction is temporarily stored in the engine ECU memory. If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG light up. The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip.)

- Freeze frame data:
  Freeze frame data records the engine condition when a malfunction , is detected.
  Because freeze frame data records the engine conditions (fuel system, calculator load, Water temperature, fuel trim,engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.



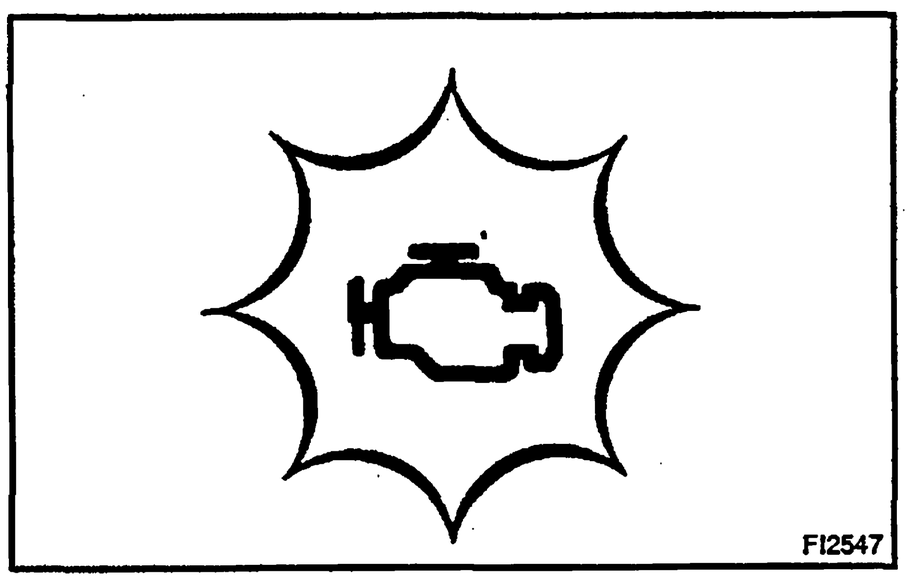
DLC3
A04550

(b) Check the DLC3.
The vehicle's engine ECU uses ISO 14230 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 14230 format.

Terminal No.	Connection / Voltage or Resistance	Condition
7	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
5	Signal Ground ↔ Body Ground / 1 Ω or less	Always
16	Battery Positive ↔ Body Ground / 9 ~ 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the hand–held tester to DLC3, turned the ignition switch ON and operated the hand–held tester, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the DTC using hand–held tester.

NOTICE:

Hand–held tester only: When the diagnosis system is switched from normal mode to check (test) mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

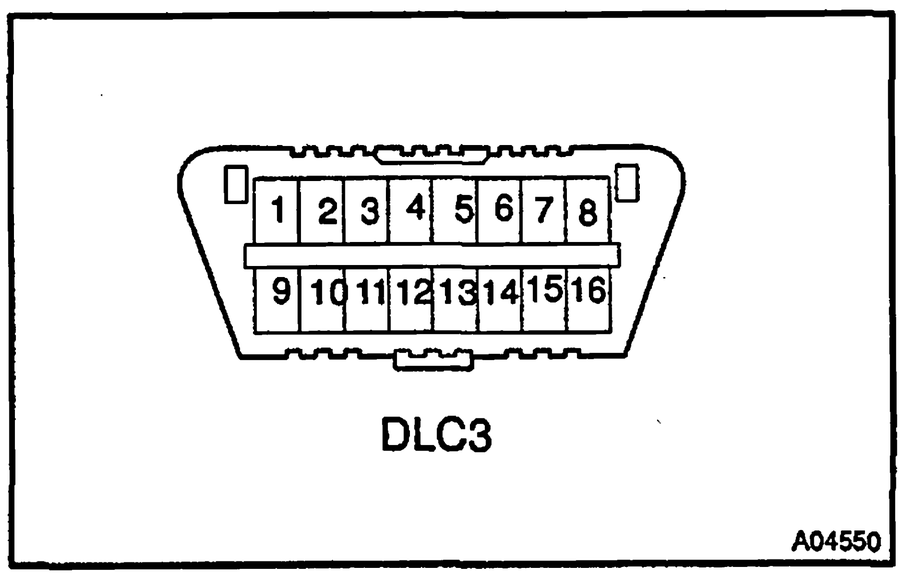
(1) Prepare the hand–held tester.

(2) Connect the hand–held tester to DLC3.

(3) Turn the ignition switch ON and push the hand–held tester main switch ON.

(4) Use the hand–held tester to check the DTCs and freezed frame data, note them down. (For operating instructions, see the hand–held tester instruction book.)

(5) See page DI–16 to confirm the details of the DTCs.



(b) Check the DTC

(1) Turn the ignition switch ON.

(2) Using SST, connect between terminals 13 (TC) and 4 (CG) of DLC3.

SST 09843–18040

(3) Read the DTC on the multiinformation display.

HINT:

- If a DTC is not indicated, check the TC terminal circuit (See page DI–19).
- If a code No.89 is indicated, read the number of blinks of the 2nd STRT indication (only for A/T)/ETCS indicator (only for M/T) to get the DTC for the electric throttle control system (ETCS).

NOTICE:

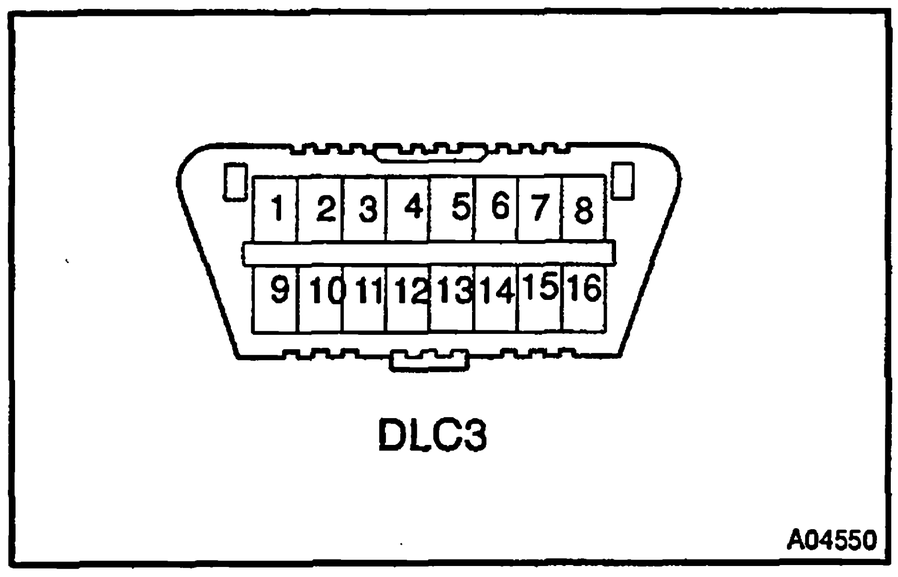
When simulating symptoms with out a hand–held tester to check the DTCs, use normal mode. For code on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the CHK ENG light up and the DTCs are recorded in the engine ECU.

(c) Check the DTC for ETCS

(1) Turn ignition switch ON.

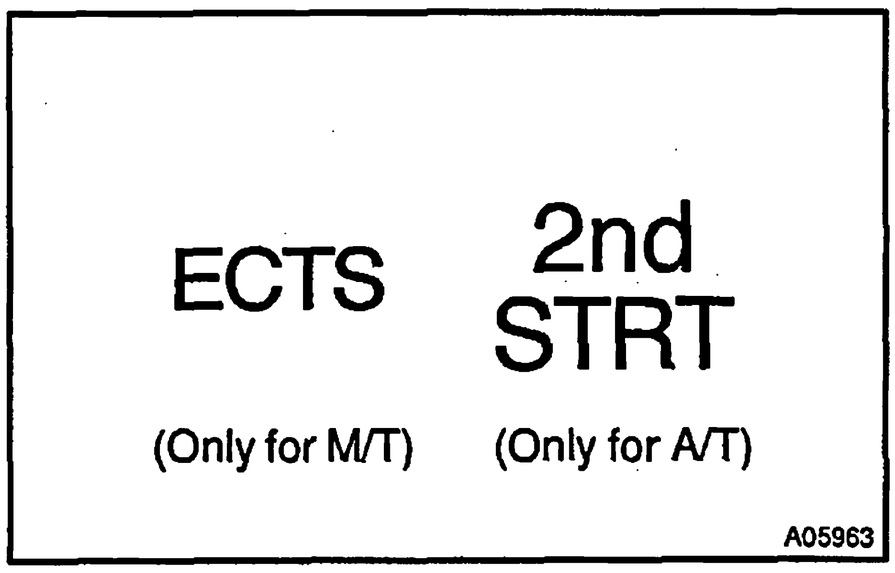
HINT:

If the 2nd STRT indicator (only for A/T)/ETCS indicator (only for M/T) does not light up, troubleshoot the combination meter (See page DI–18).



(2) Using SST, connect between terminals 13 (TC) and 4 (CG) of DLC3.

SST 09843–18040



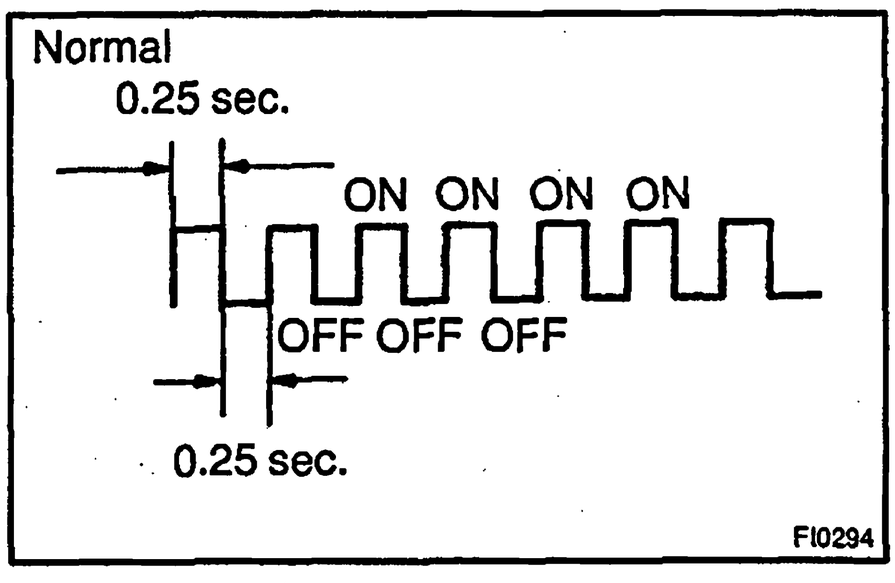
(3) Read the diagnostic trouble code from 2nd STRT indicator (only for A/T)/ETCS indicator (only for M/T) on the combination meter.

HINT:

If a DTC is not output, check the TC terminal circuit (See page DI–19).

(4) Check details of the malfunction using the DTC chart on page DI–16.

(5) After completing the check, disconnect terminals 13 (TC) and 4 (CG) and turn off the display.



HINT:

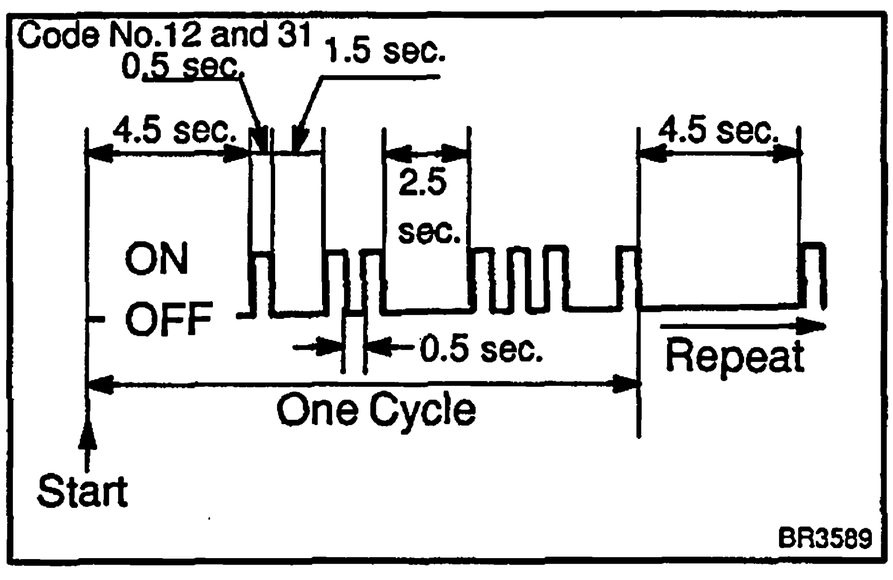
In the event of 2 or more malfunction codes, indication will begin from the smaller numbered code and continue in order to the lager.

(d) Clear the DTC.

The DTCs and freezed frame data will be erased by either actions.

(1) Operating the hand–held tester to erase the codes. (See the hand–held tester's instruction book for operating instructions.)

(2) Disconnecting the battery terminals of EFI and THROTTLE fuses.



NOTICE:

If the hand–held tester switches the engine ECU from normal mode to check (test) mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check (test) mode, the DTCs and freezed frame data will be erased.

3. INSPECT DIAGNOSIS (Check (Test) Mode)

HINT:

Hand–held tester only:

Compared to the normal mode, the check (test) mode has an increased sensitivity to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check (test) mode.

(a) Check the DTC.

(1) Initial conditions

- Battery positive voltage 11V or more.
- Throttle valve fully closed.
- Transmission in "P" or "N" position.
- Air conditioning switched OFF.

(2) Turn the ignition switch OFF.

(3) Prepare the hand–held tester.

(4) Connect the hand–held tester to the DLC3.

(5) Turn the ignition switch ON and push the hand–held tester main switch ON.

(6) Switch the hand–held tester normal mode to check (test) mode.

NOTICE:

If the hand–held tester switches the engine ECU from normal mode to check (test) mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check (test) mode, the DTCs and freezed frame data will be erased.

(7) Start the engine.

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

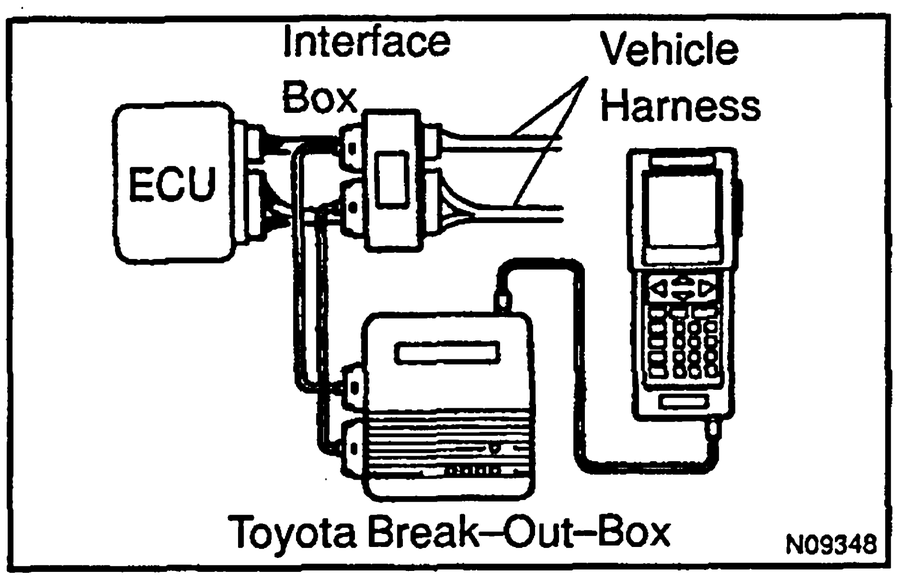
Leave the Ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

HINT:

Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check (test) mode to normal mode. so all DTCs, etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.



(b) Engine ECU Terminal Values Measurement Using Break–Out–Box and Hand–Held Tester

(1) Hook up the break–out–box and hand–held tester to the vehicle.

(2) Read the engine ECU input/output values by following the prompts on the tester screen.

HINT:

- 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 hand–held tester/break–out–box operator's manual for further details.

DI

4. FAIL–SAFE CHART

If any of the following codes is recorded, the engine ECU enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100/31	Ignition timing fixed at 10° BTDC	Returned to normal condition
P0110/24	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115/22	Engine coolant temp. is fixed at 80 °C (176 °F)	Returned to normal condition
P0120/41	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively (a) VTA ≧ 0.1 V and ≦ 0.95 V, vehicle speed = 0 km/h (only ECT) (b) Vehicle speed: 0 km/h (0 mph) (only for A/T)
P0135/21	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325/52 P0330/55	Max. timing retardation	Ignition switch OFF
P1300/14	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

HAND–HELD TESTER only:

By putting the vehicle's engine ECU in check (test) mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTCs.

(2) Set the check (test) mode.

(3) Perform a simulation test (See page IN–10).

(4) Check the connector and terminal (See page IN–20).

(5) Handle the connector (See page IN–20).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to problem symptoms table on page DI–21.**

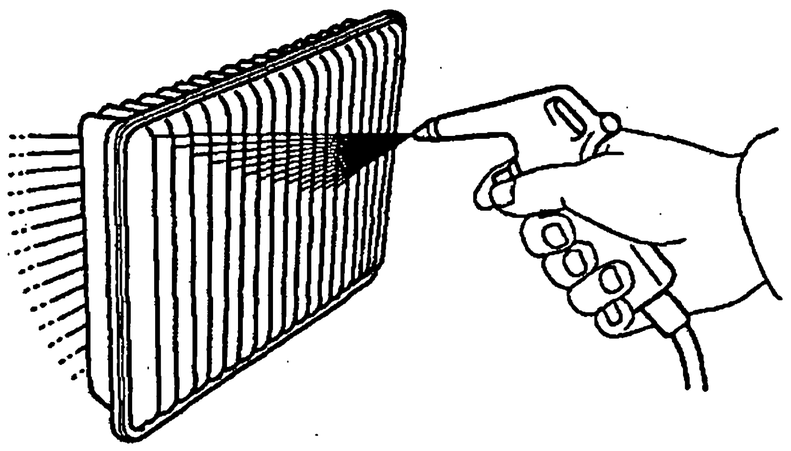
YES

3	**Does engine start?**

NO → **Go to step 7.**

YES

4	Check air filter.

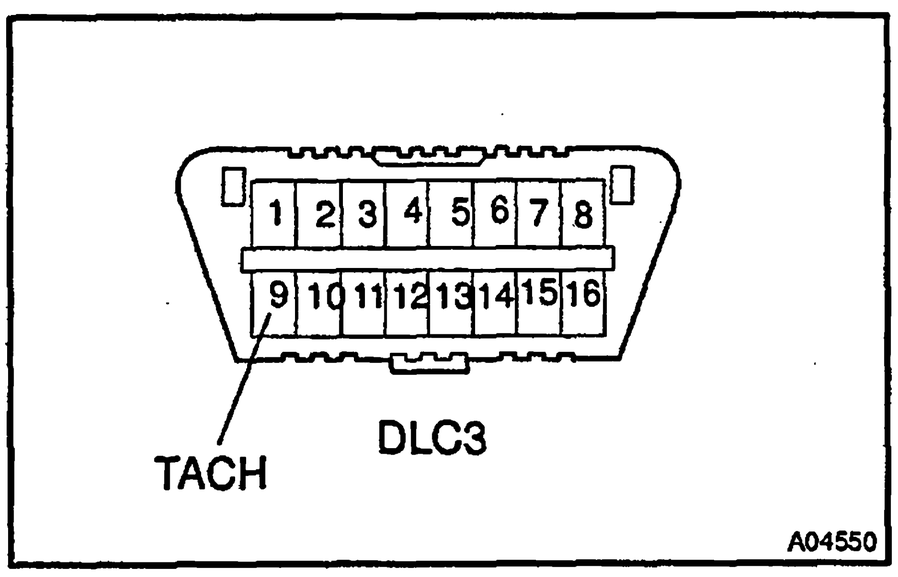


PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of the air filter.

NG → **Repair or replace.**

OK

5	Check idle speed.



PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into "N" position.
(e) Connect the hand–held tester to the DLC3 on the vehicle.
(f) If you have no hand–held tester, connect tachometer test prove to terminal 9 (TACH) of the DLC3.
SST 09843–18030

NOTICE:
As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your until before use.

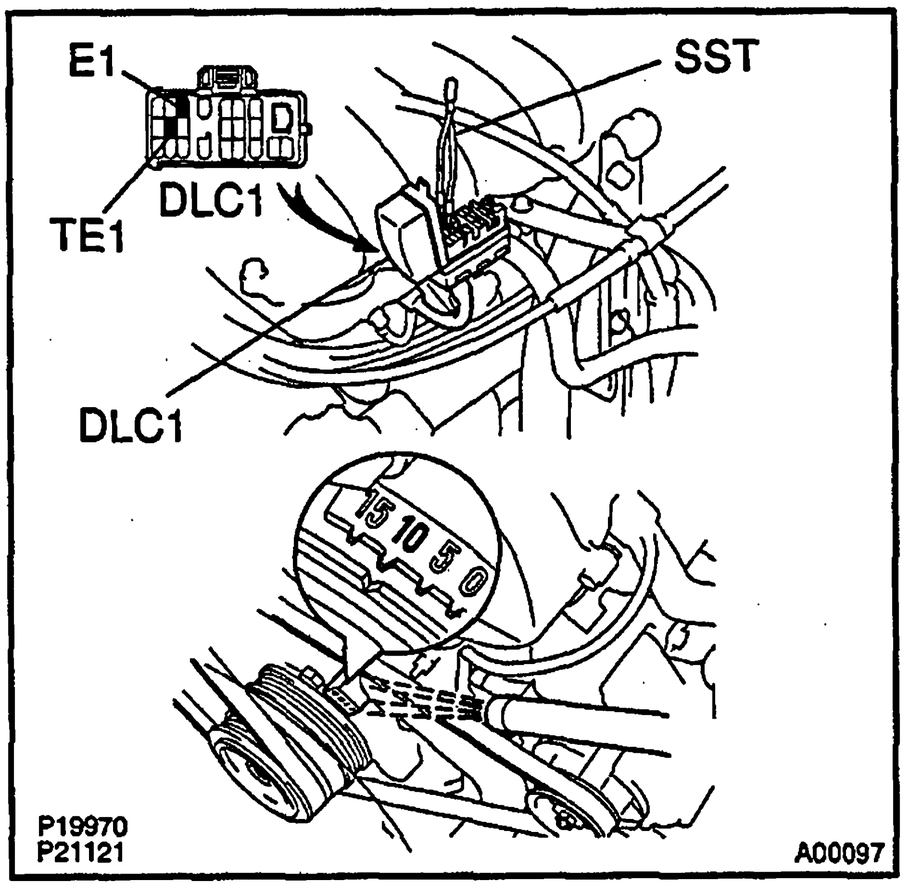
CHECK:
Check the idle speed.

OK:
Idle speed: 650 – 750 rpm

NG → **Proceed to problem symptoms table on page DI–21.**

OK

6	Check ignition timing.



PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Shift transmission into the "N" position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to the No. 1 high–tension cord.

CHECK:

Check the ignition timing.

OK:

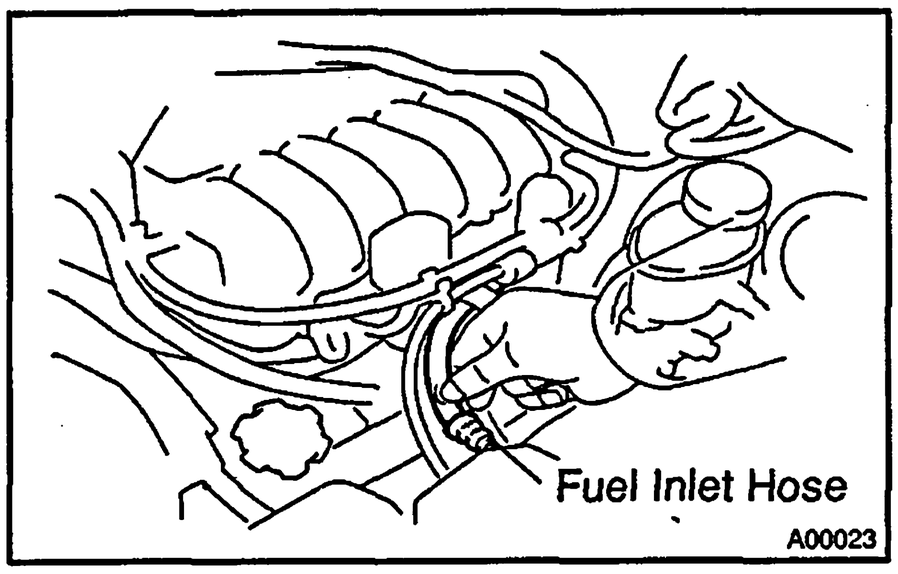
Ignition timing: 10° BTDC at idle

NG → **Proceed to See Pub. No. RM519E on page IG–3 and continue to troubleshoot.**

OK →

Proceed to problem symptoms table on page DI–21.

7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push hand–held tester main switch ON.
(d) Use ACTIVE TEST mode to operate the fuel pump.
(e) Please refer to the hand–held tester operator's manual for further details.
(f) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See Pub. No. RM519E on page EG–130).

CHECK:

Check that pulsation damper screw rises up when fuel pump operates.

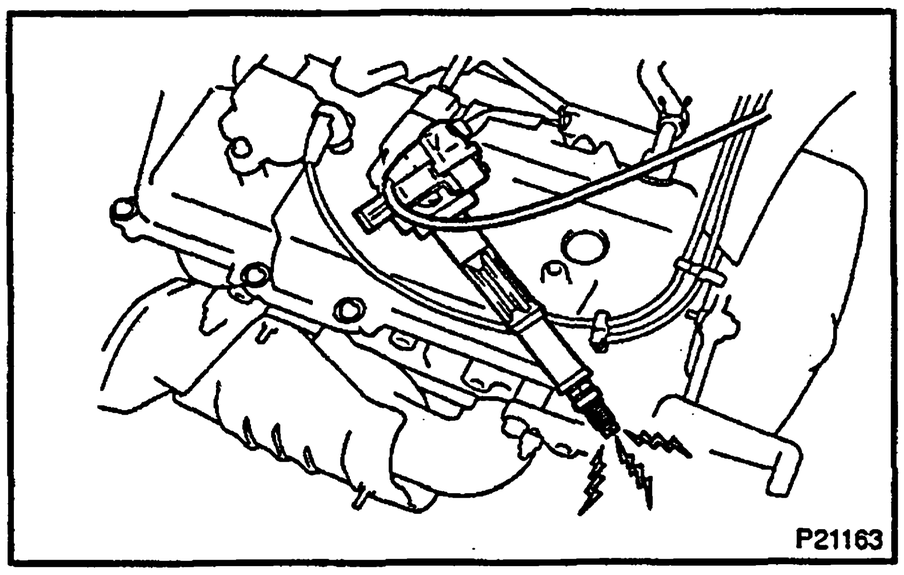
HINT:

At this time, you will hear a fuel flowing noise.

NG → **Proceed to See Pub. No. RM519E on page EG–130 and continue to troubleshoot.**

OK

8	Check for spark.


P21163

PREPARATION:

(a) Remove the ignition coil from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 ± 10 seconds at a time.

NG → **Proceed to See Pub. No. RM519E on page IG–3 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–21.

7. ENGINE OPERATING CONDITION

NOTICE:

The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

Hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 14.9 – 21.3 % Racing without load (2,500 rpm): 16.6 – 23.5 %
COOLANT TEMP.	Engine Coolant Temp. Sensor Value	After warming up: 80 – 95 °C (176 – 203 °F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 650 – 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 12.5 – 22.0 °
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

Hand–held tester display	Measurement Item	Normal Condition*
AFM	Air Flow Rate Through Mass Air Flow Meter	Idling: 3.3 – 4.7 gm/sec. Racing without load (2,500 rpm): 12.9 – 18.9 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle valve fully closed: 7 – 11 % Throttle valve fully open: 65 – 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1 Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1 Sensor 2	Driving 50 km/h (31 mph): 0.1 – 0.9 V
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No .1	Idling: 1.82 – 3.15 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 22 – 46 %
STARTER SIG	Starter Signal	Cranking: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
NSW	Park/Neutral Position Switch Signal	P or N position ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL#1 – CYL#6	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 3,000 rpm
A/C CUT SIG	A/C Cut Signal	A/C SW OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE)VSV	EVAP VSV Signal	VSV operating: ON
VAPOR PRESS VSV	Vapor Pressure VSV Signal	VSV operating: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1 Sensor 1: Response time for oxygen sensor output to switch from lean to rich	Idling after warning up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1 Sensor 1: Response time for oxygen sensor output to switch from rich to lean	Idling after warning up: 0 – 1,000 msec.

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

DI8AL-01

DIAGNOSTIC TROUBLE CODE CHART

ENGINE TROUBLE CODES

HINT:

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

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

DTC No. (See Page)	Detection Item	Trouble Area	CHK ENG *1	Memory
P0100/31 (DI–22)	Air Flow Circuit Malfunction	• Open or short in air flow meter circuit • Air flow meter • Engine ECU	○	○
P0110/24 (DI–28)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (inside air flow meter) • Engine ECU	–	○
P0115/22 (DI–35)	Water Temp. Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU	○	○
P0120/41 (DI–41)	Throttle Position Sensor Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU	–	○
P0130/21 (DI–47)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Oxygen sensor • Fuel trim malfunction	–	○
P0135/21 (DI–53)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU	–	○
P0171/25 (DI–55)	Fuel Trim System too Lean (Air–Fuel Ratio Lean Malfunction, Bank 1)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Oxygen sensor malfunction • Air flow meter • Water temp. sensor	–	○
P0325/52 (DI–61)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • Engine ECU	○	○
P0330/55 (DI–61)	Knock Sensor 2 Circuit Malfunction (Bank 2)	• Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • Engine ECU	○	○
P0335/12, 13 (DI–66)	Crankshaft Position Sensor Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU	○	○
P0340/12 (DI–69)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • Engine ECU	○	○

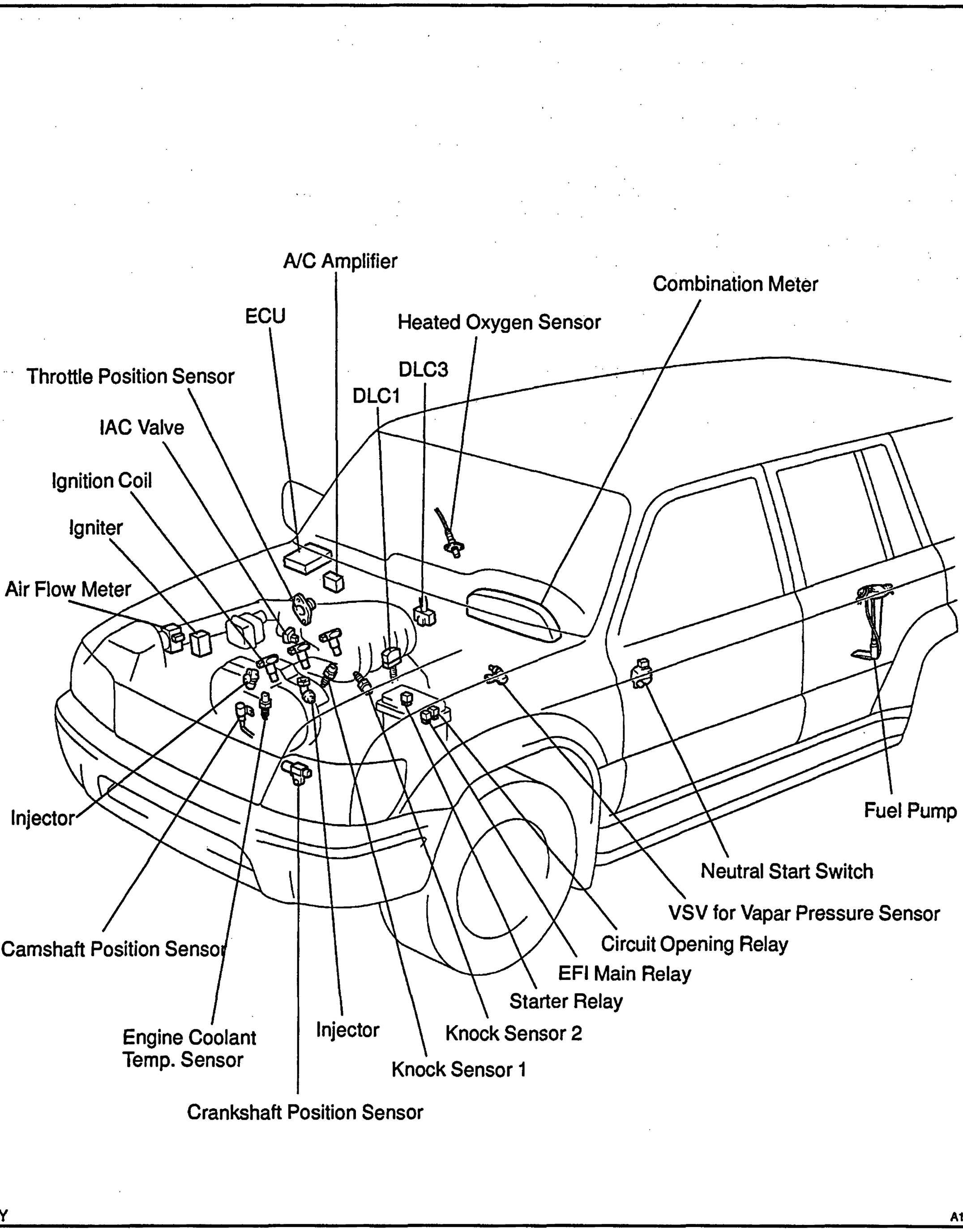
*1: ○ ... Check engine warning light (CHK ENG) light up
– ... Check engine warning light (CHK ENG) does not light up

DTC No. (See Page)	Detection Item	Trouble Area	CHK ENG *1	Memory
P0500/42 (DI–71)	Vehicle Speed Sensor Circuit Malfunction	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Combination meter • Engine ECU	○	○
P0505/33 (DI–73)	Idle Control System Malfunction	• Open or short in ISC valve circuit • ISC valve • Engine ECU	○	○
P1300/14 (DI–78)	Igniter Circuit Malfunction No. 1	• Open or short in IGF or IGT circuit from igniter to engine ECU • Ignition coil No. 1 (w/ Igniter) • Engine ECU	○	○
P1335/13 (DI–84)	Crankshaft Position Sensor Circuit Malfunction (during idling)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU	–	○

*1: ○ ... Check engine warning light (CHK ENG) light up
– ... Check engine warning light (CHK ENG) does not light up

DI6AM-01

PARTS LOCATION



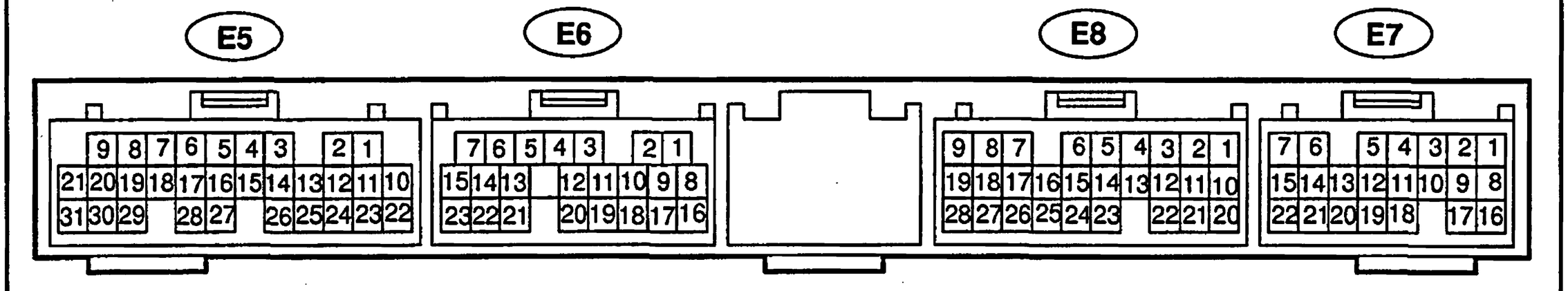
Y

A10729

D18AN–01

TERMINALS OF ECU

ECM Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E7–16) – E1 (E6–17)	B–Y ↔ BR	Always	9 – 14
+B (E7–1) – E1 (E6–17)	B ↔ BR	IG switch ON	9 – 14
VC (E5–25) – E2 (E5–11)	G–B ↔ BR	IG switch ON	4.5 – 5.5
VTA (E5–15) – E2 (E5–11)	Y–R ↔ BR	IG switch ON, Throttle valve fully closed	0.3 – 1.0
		IG switch ON, Throttle valve fully open	2.7 – 5.2
VG (E5–12) – E2 (E5–11)	Y ↔ BR	Idling, A/C switch OFF	1.1 – 1.5
THA (E5–13) – E2 (E5–11)	Y–G ↔ BR	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E5–18) – E2 (E5–11)	G ↔ BR	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E7–7) – E1 (E6–17)	R ↔ BR	Cranking	6.0 or more
#10 (E6–6) – E01 (E5–4)	L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
#20 (E6–5) – E01 (E5–4)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
#30 (E6–4) – E01 (E5–4)	G ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
#40 (E6–3) – E01 (E5–4)	Y ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
#50 (E6–1) – E01 (E5–4)	R–B ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
#60 (E6–8) – E01 (E5–4)	R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–98)
IGT1 (E6–11) – E1 (E6–17)	B ↔ BR	Idling	Pulse generation (See page DI–78)
IGT2 (E6–10) – E1 (E6–17)	G–B ↔ BR	Idling	Pulse generation (See page DI–78)
IGT3 (E6–9) – E1 (E6–17)	B–W ↔ BR	Idling	Pulse generation (See page DI–78)
IGF (E6–2) – E1 (E6–17)	B–R ↔ BR	IG switch ON	4.5 – 5.5
		Idling	Pulse generation (See page DI–78)

G2 (E6–13) – NE– (E6–21)	W ↔ B	Idling	Pulse generation (See page DI–66)
NE+ (E6–12) – NE– (E6–21)	W ↔ B	Idling	Pulse generation (See page DI–66)
FC (E7–22) – E1 (E6–17)	R–W ↔ BR	IG switch ON	9 ± 14
		Idling	0 – 3.0
RSC (E6–24) – E1 (E6–17)	B–L ↔ BR	IG switch ON, Disconnect E9 from ECM connector	9 – 14
RSO (E6–16) – E1 (E6–17)	P ↔ BR		
OX1 (E5–16) – E1 (E6–17)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–47)
KNK1 (E5–23) – E1 (E6–17)	GR ↔ BR	Idling	Pulse generation (See page DI–61)
KNK2 (E5–22) – E1 (E6–17)	B ↔ BR	Idling	Pulse generation (See page DI–61)
NSW (E8–3) – E1 (E6–17)	B–W ↔ BR	IG switch ON, Other shift position in P or N	9 – 14
		IG switch ON, Shift position in P or N	0 – 3.0
SPD (E7–6) – E1 (E6–17)	V–W ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–71)
W (E7–2) – E1 (E6–17)	Y–R ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E7–3) – E1 (E6–17)	L–B ↔ BR	A/C switch OFF	Below 2.0
		A/C switch ON at idling	5.0 or more
AC1 (E7–9) – E1 (E6–17)	L–Y ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF	9 – 14
SIL (E7–14) – E1 (E6–17)	V–W ↔ BR	During transmission	Pulse generation
STP (E7–20) – E1 (E6–17)	G–W ↔ BR	IG switch ON, Brake pedal is depressed	7.5 – 14
		IG switch ON, Brake pedal is released	Below 1.5

DI6AO-01

PROBLEM SYMPTOMS TABLE

(★: 5VZ–FE ENGINE Repair Manual Pub. No. RM519E)

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter 2. Starter relay	★ ★
No initial combustion (Does not start)	1. Engine ECU power source circuit 2. Fuel pump control circuit 3. Engine ECU	DI–91 DI–102 IN–20
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–102
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–88 DI–102 ★
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–88 DI–102
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–88 DI–102
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Engine ECU power source circuit	IN–20 DI–91
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	IN–20 DI–102
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	★ DI–102
Hunting (Poor idling)	1. Engine ECU power source circuit 2. Fuel pump control circuit	DI–91 DI–102
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–102 *1
Surging (Poor driveability)	1. Fuel pump control circuit	DI–102
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI–102
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. Engine ECU	IN–20 IN–20

*1. Only for A/T

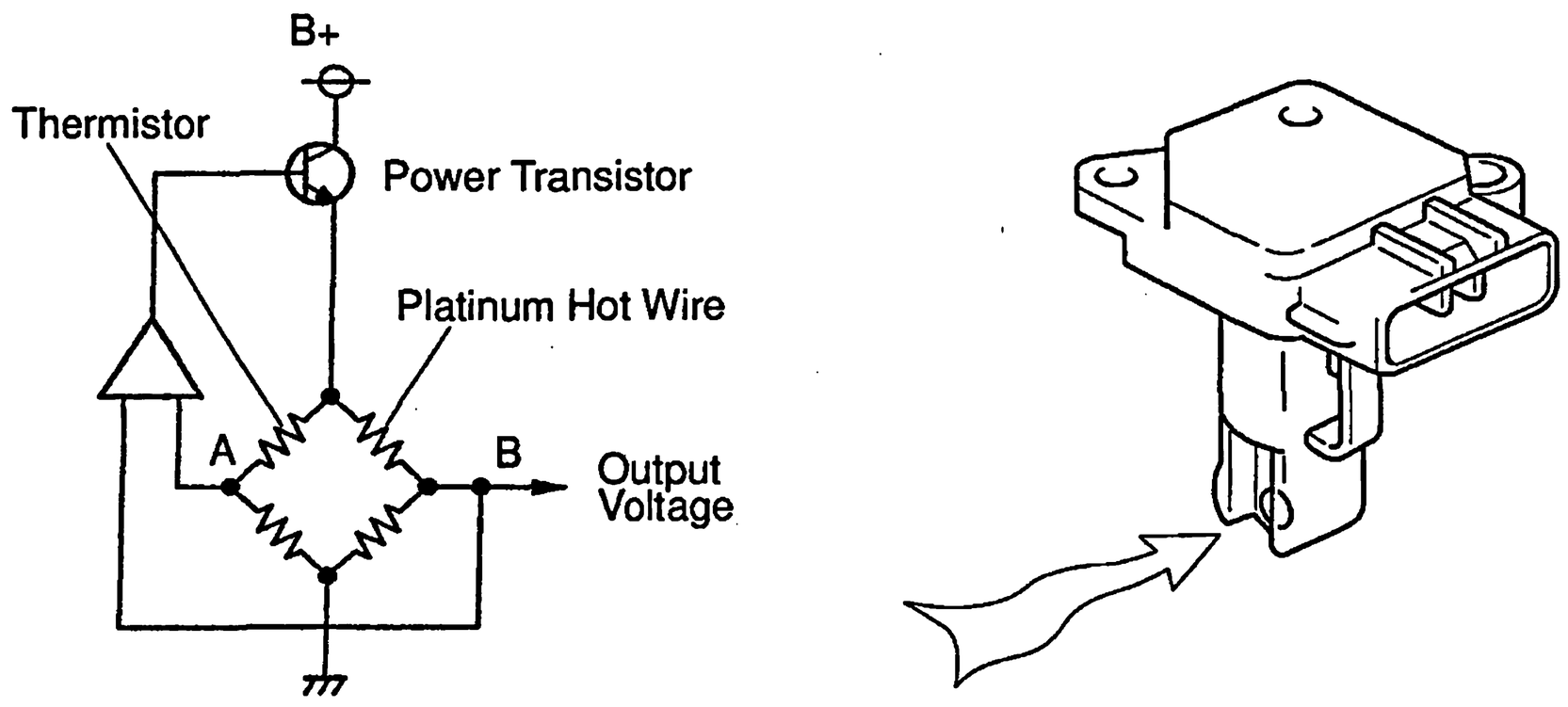
DI6AP–01

CIRCUIT INSPECTION

DTC	P0100/31	Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

The air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temperature. The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the air flow meter.
The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



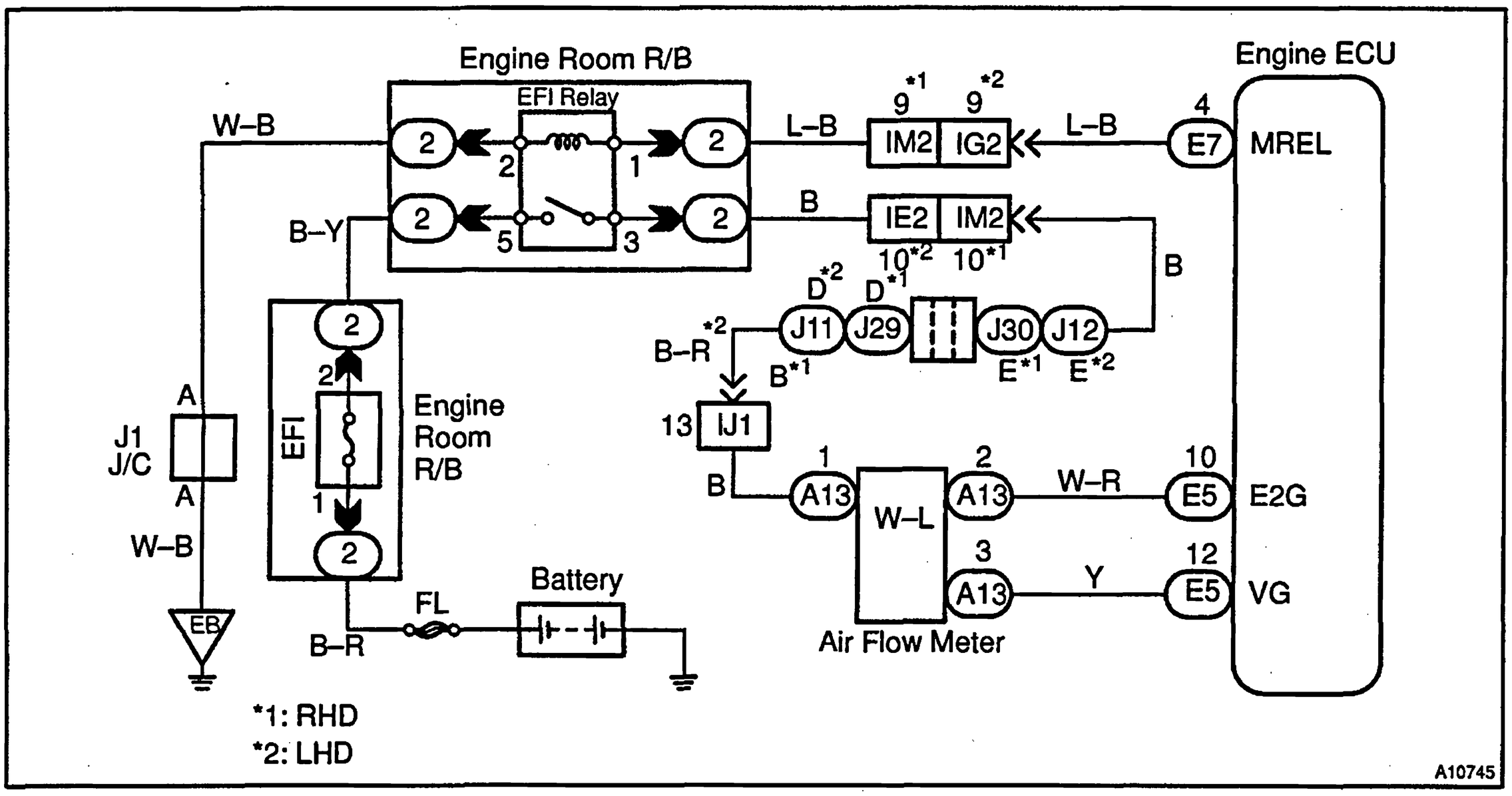
A06106

DTC No.	DTC Detecting Condition	Trouble Area
P0100/31	Open or short in air flow meter circuit with engine speed 2,000 rpm or less for 3 seconds or more	• Open or short in air flow meter circuit • Air flow meter • Engine ECU
	Open or short in air flow meter circuit with engine speed 3,000 rpm or more for 3 seconds or more (2 trip detection logic)	

HINT:
After confirming DTC P0100/31, use the hand–held tester to confirm the air flow ratio from the CURRENT DATA.

Air Flow Value (gm/sec.)	Malfunction
Approx. 0	• Air flow meter power source circuit open • VG circuit open or short
11.0 ~ 25.1 (idling after warmed up)	• E3 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

When using hand–held tester

HINT:

Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Connect hand–held tester, and read value of air flow rate.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.

CHECK:

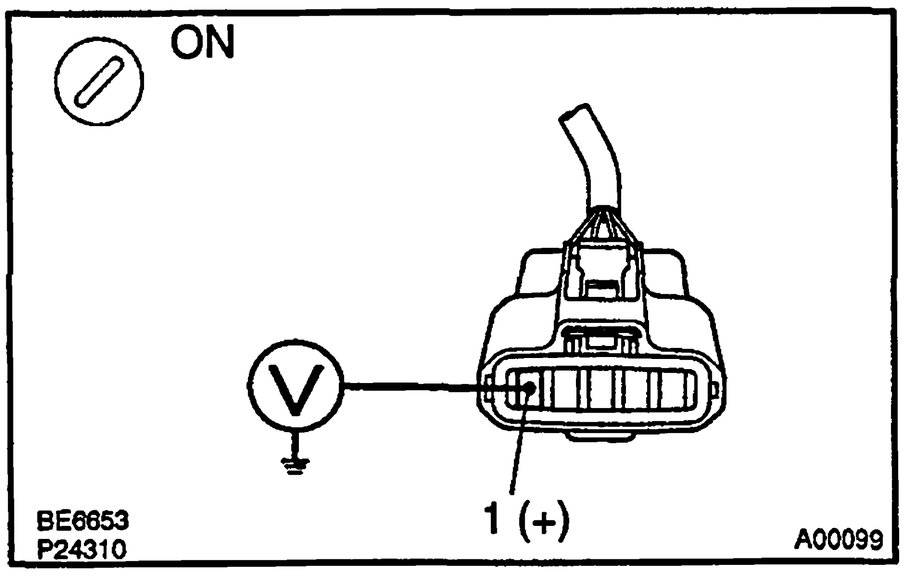
Read mass air flow rate on the hand–held tester.

RESULT:

	Type I	Type II
Air flow rata (gm/sec.)	Approx. 0	11.0 – 25.1 (idling after warmed up)

Type I	**Go to step 2.**
Type II	**Go to step 5.**

2	Check voltage of air flow meter power source.



PREPARATION:
(a) Disconnect the air flow meter connector.
(b) Turn the ignition switch ON.

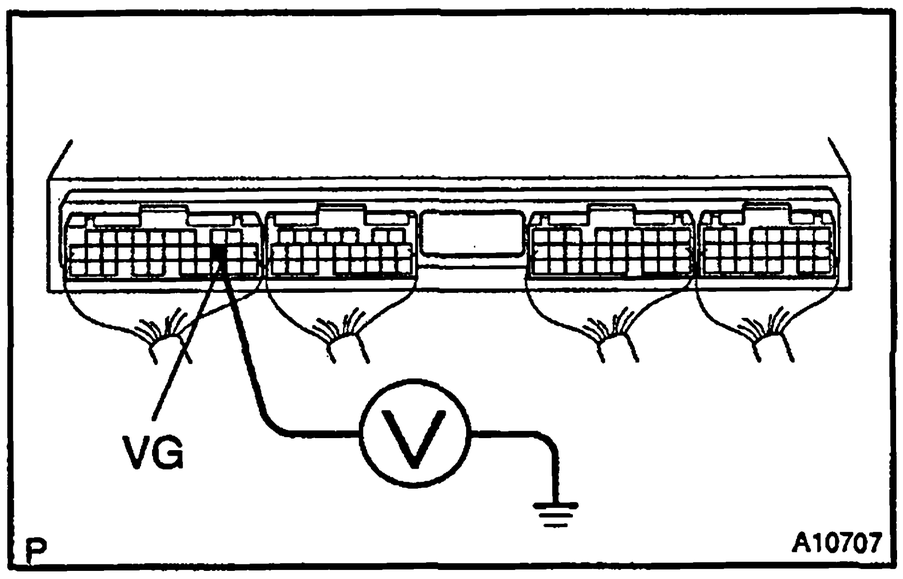
CHECK:
Measure voltage between terminal 1 of the air flow meter connector and body ground.

OK:
Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking: EFI) and air flow meter (See page IN–20).**

OK

3	Check voltage between terminal VG of engine ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment.
(b) Start the engine.

CHECK:
Measure voltage between terminal VG of the engine ECU connector and body ground while the engine is idling.

OK:
Voltage:
1.1 – 1.5 V (P or N range and A/C switch OFF)

OK → **Check and replace engine ECU (See page IN–20).**

NG

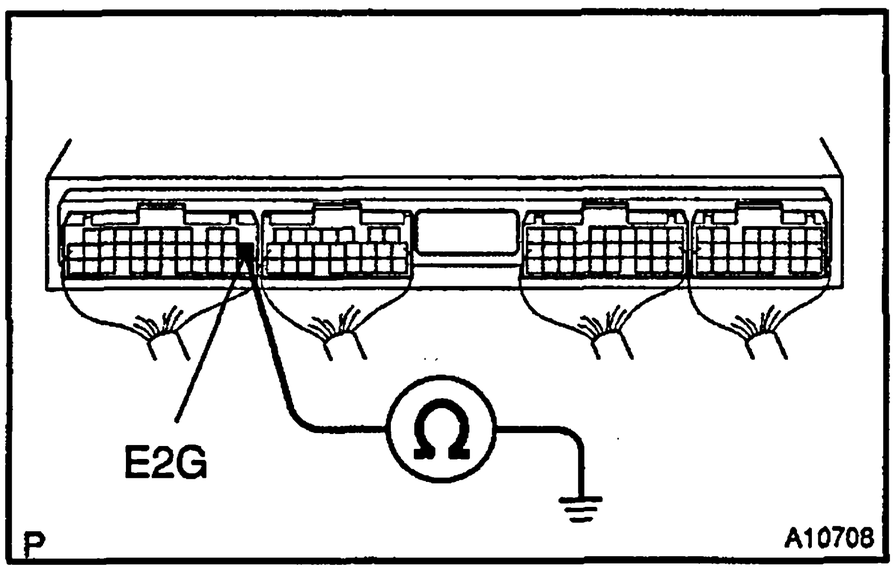
4	Check for open and short in harness and connector between mass air flow meter and engine ECU (See page IN–20).

NG → Repair or replace harness or connector.

OK →

Replace air flow meter.

5	Check continuity between terminal E2G of engine ECU connector and body ground.



PREPARATION:
Remove the glove compartment.
CHECK:
Check continuity between terminal E2G of the engine ECU connector and body ground.
OK:
Continuity (1 Ω or less)

NG → Check and replace engine ECU (See page IN–20).

OK →

6	Check for open in harness and connector between air flow meter and engine ECU (See page IN–20).

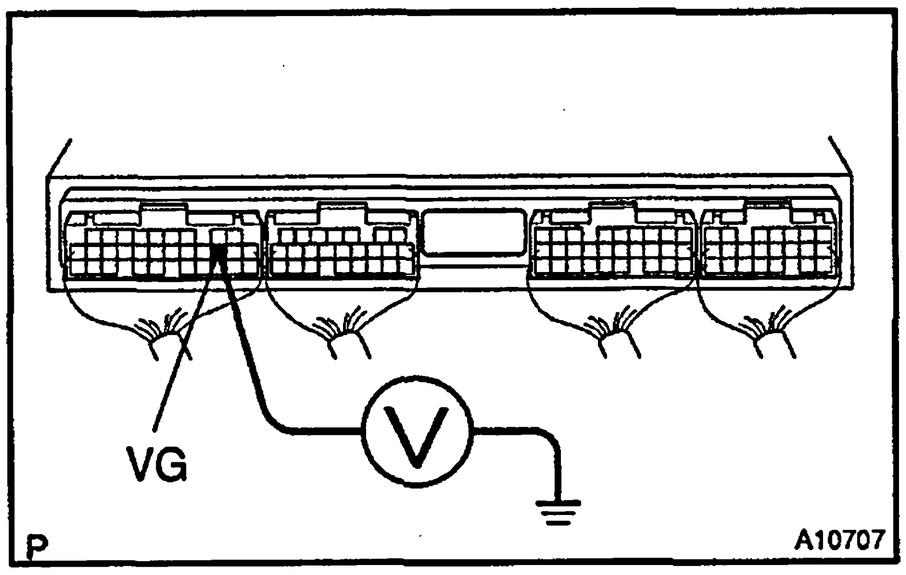
NG → Repair or replace harness or connector.

OK →

Replace air flow meter.

When not using hand–held tester

1	**Check voltage between terminals VG of engine ECU connector and body ground.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Start the engine.

CHECK:
Measure voltage between terminal VG of the engine ECU connector and body ground while engine is idling.

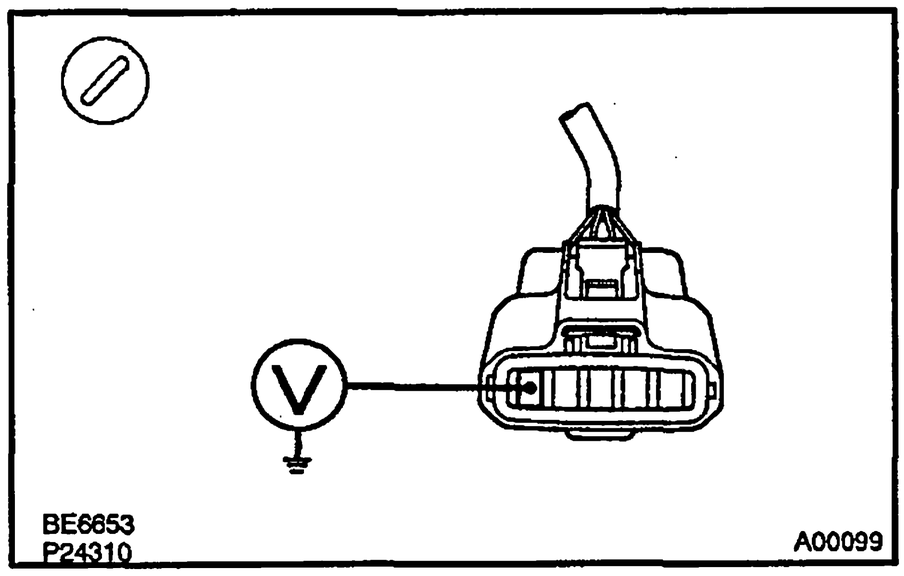
OK:

voltage:
1.1 – 1.5 V (P or N range and A/C switch OFF)

OK	**Check and replace engine ECU (See page IN–20).**

NG

2	**Check voltage of air flow meter power source.**



PREPARATION:
(a) Disconnect the air flow meter connector.
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal 1 of the air flow meter connector and body ground.

OK:

Voltage: 9 – 14 V

NG	**Check for open in harness and connector between EFI main relay (Marking: EFI) and air flow meter (See page IN–20).**

OK

3	Check for open in harness and connector between air flow meter and engine ECU (See page IN–20).

NG → Repair or replace harness or connector.

OK →

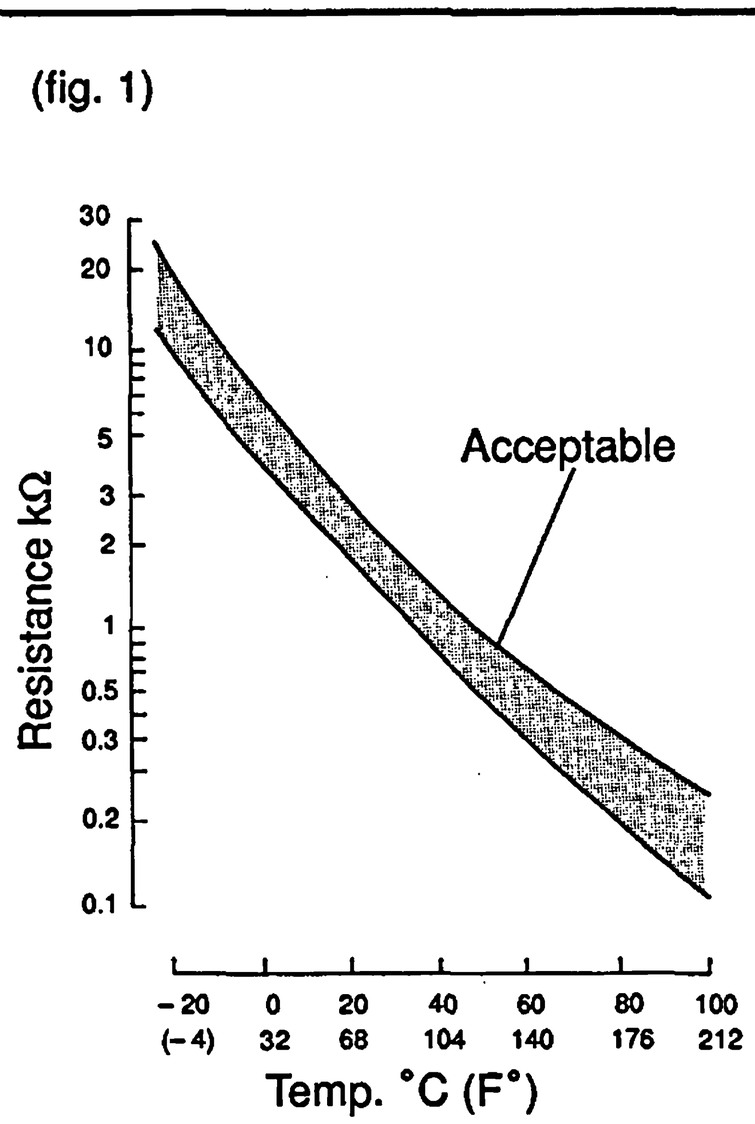
Replace air flow meter.

D16AQ–01

DTC	P0110/24	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

(fig. 1)



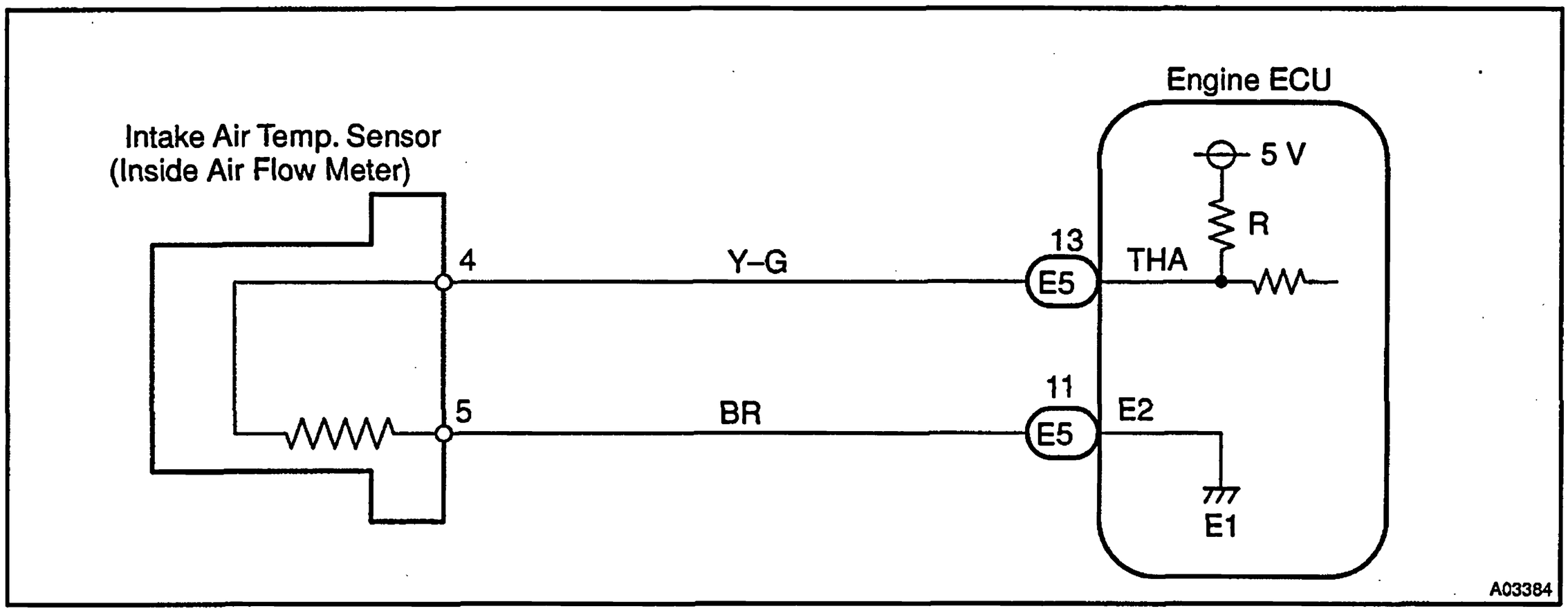
The intake air temp. sensor is built into the mass air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See fig. 1).
The intake air temp. sensor is connected to the engine ECU (See below). The 5 V power source voltage in the engine ECU is applied to the intake air temp. sensor from the terminal THA via resistor R.
That is, the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during cold engine operation. If the engine ECU detects the DTC "P0110/24", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	DTC Detecting Condition	Trouble Area
P0110/24	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • Engine ECU

HINT:
After confirming DTC P0110/24, use the hand–held tester to confirm the intake air temperature from the CURRENT DATA.

Temperature Displayed	Malfunction
–40 °C (–40 °F)	Open circuit
140°C (284 °F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0110/24 (Intake Air Temp. Circuit Malfunction), P0115/22 (Engine Coolant Temp. Circuit Malfunction) and P0120/41 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.
- Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	**Connector hand–held tester, and read value of intake air temp.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read temperature value on the hand–held tester.

OK:

Same as actual intake air temp.

HINT:

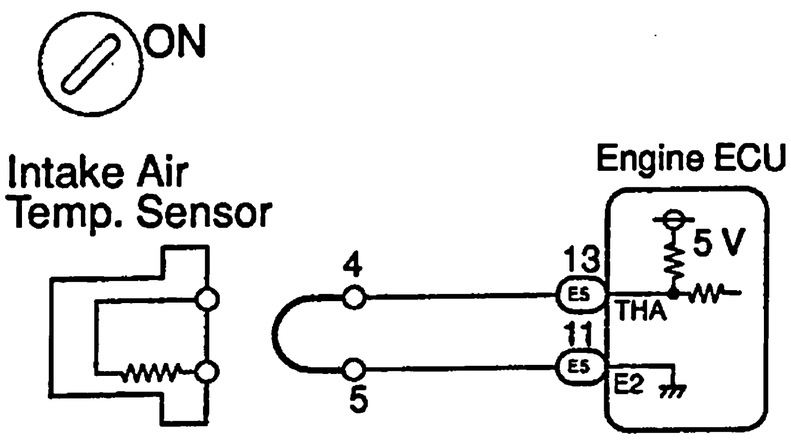
- If there is open circuit, hand–held tester indicates –40°C (–40°F).
- If there is short circuit, hand–held tester indicates 140°C (284°F) or more.

NG → **–40°C (–40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–4).

2	Check for open in harness or engine ECU.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read temperature value on the hand–held tester.

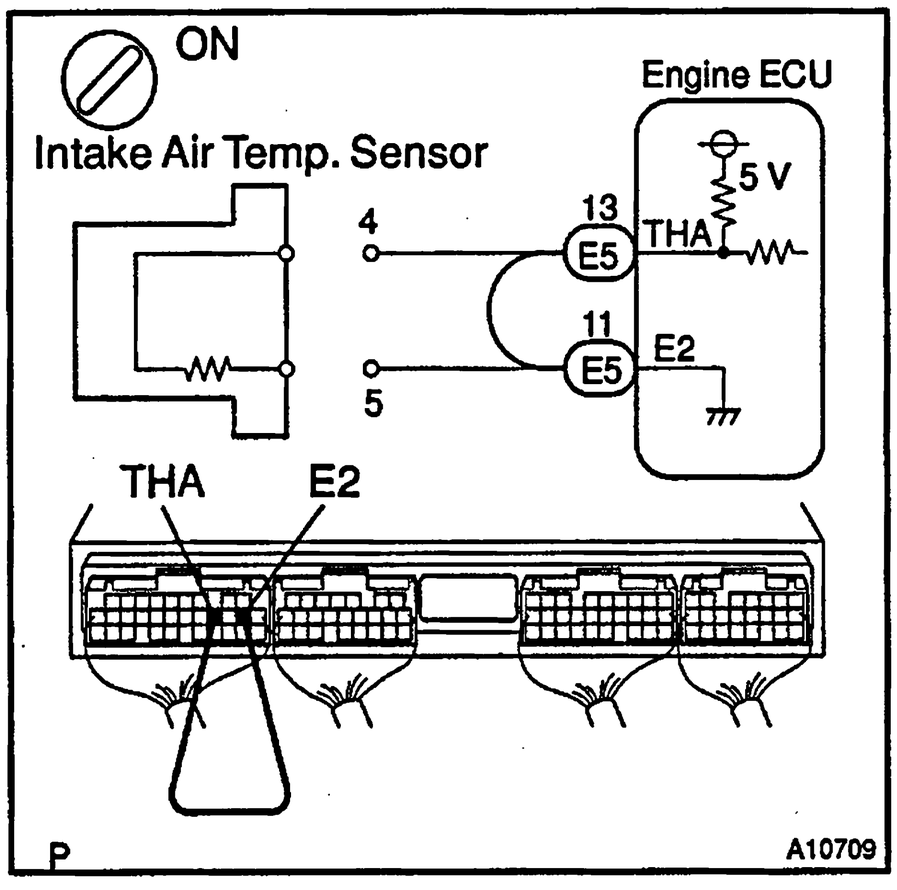
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment.
(b) Connect between terminals THA and E2 of the engine ECU connector.

HINT:

The mass air flow meter connector is disconnected.

Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–20).

CHECK:

Read temperature value on the hand–held tester.

OK:

Temperature value: 140°C (284°F) or more

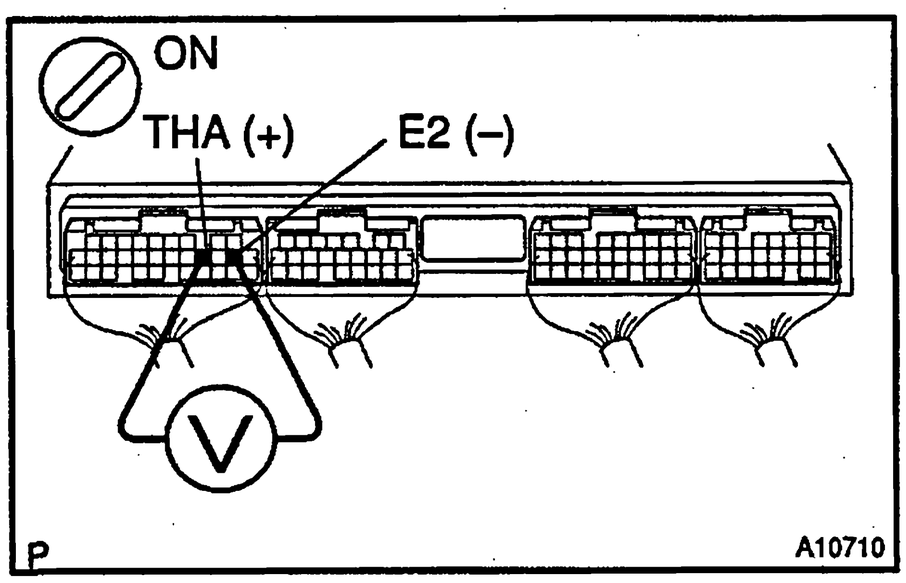
OK	Open in harness between terminals E2 and THA, repair or replace harness.

NG

Confirm good connection at engine ECU. If OK, check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	**Check voltage between terminals THA and E2 of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn ignition switch ON.

CHECK:
Measure voltage between terminals THA and E2 of engine ECU connector.

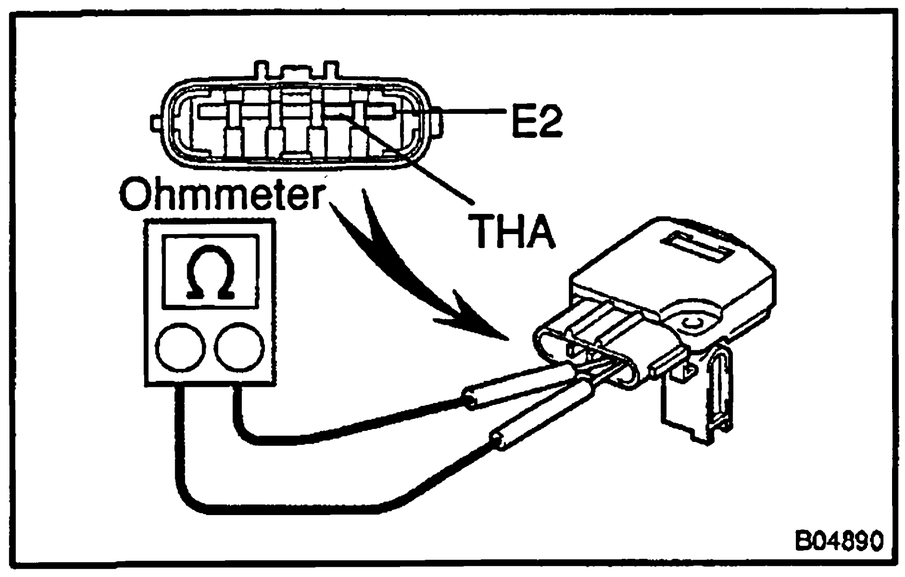
OK:

Intake air temperature	Voltage
20°C (68°F)	0.5 – 3.4 V
60°C (140°F)	0.2 – 1.0 V

OK → **Check for intermittent problems (See page IN–20).**

NG

2	**Check intake air temp. sensor.**



PREPARATION:
Disconnect the air flow meter connector.

CHECK:
Measure resistance between terminals THA and E2 of mass air flow meter connector.

OK:
Resistance is within acceptable zone on chart.

Intake air temperature	Resistance
20°C (68°F)	2.2 – 2.7 kΩ
80°C (176°F)	0.2 – 0.4 kΩ

NG → **Replace mass air flow meter.**

OK

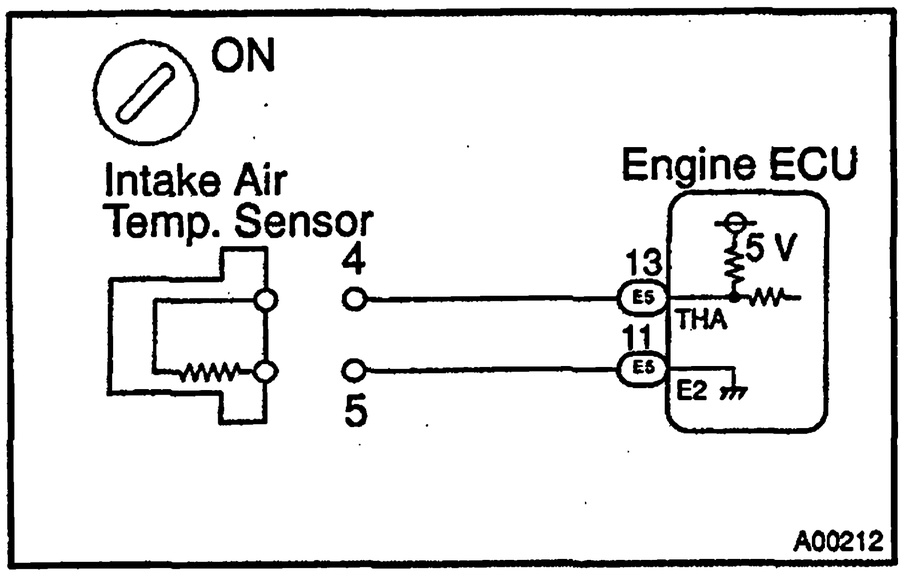
3	Check for open and short in harness and connector between engine ECU and intake air temp. sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK →

Check and replace engine ECU (See page IN–20).

4	Check for short in harness and engine ECU.

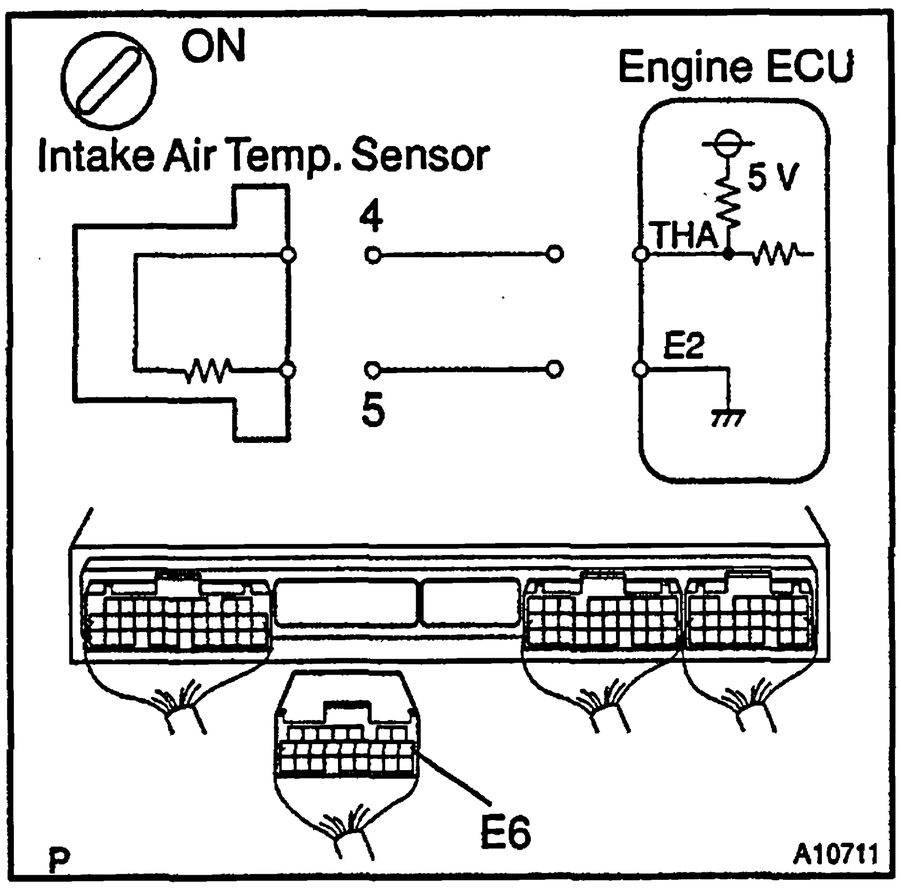


PREPARATION:
(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
CHECK:
Read temperature value on the hand–held tester.
OK:
Temperature value: –40°C (–40°F)

OK → **Replace mass air flow meter.**

NG

5	Check for short in harness or engine ECU.



PREPARATION:
(a) Remove the glove compartment.
(b) Disconnect the E6 connector from the engine ECU.
HINT:
The mass air flow meter connector is disconnected.
(c) Turn the ignition switch ON.
CHECK:
Read temperature value on the hand–held tester.
OK:
Temperature value: –40°C (–40°F)

OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

DI6AR–01

DTC	P0115/22	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the engine ECU is the same as in the DTC P0110/24 (Intake Air Temp. Circuit Malfunction) shown on page DI–28.

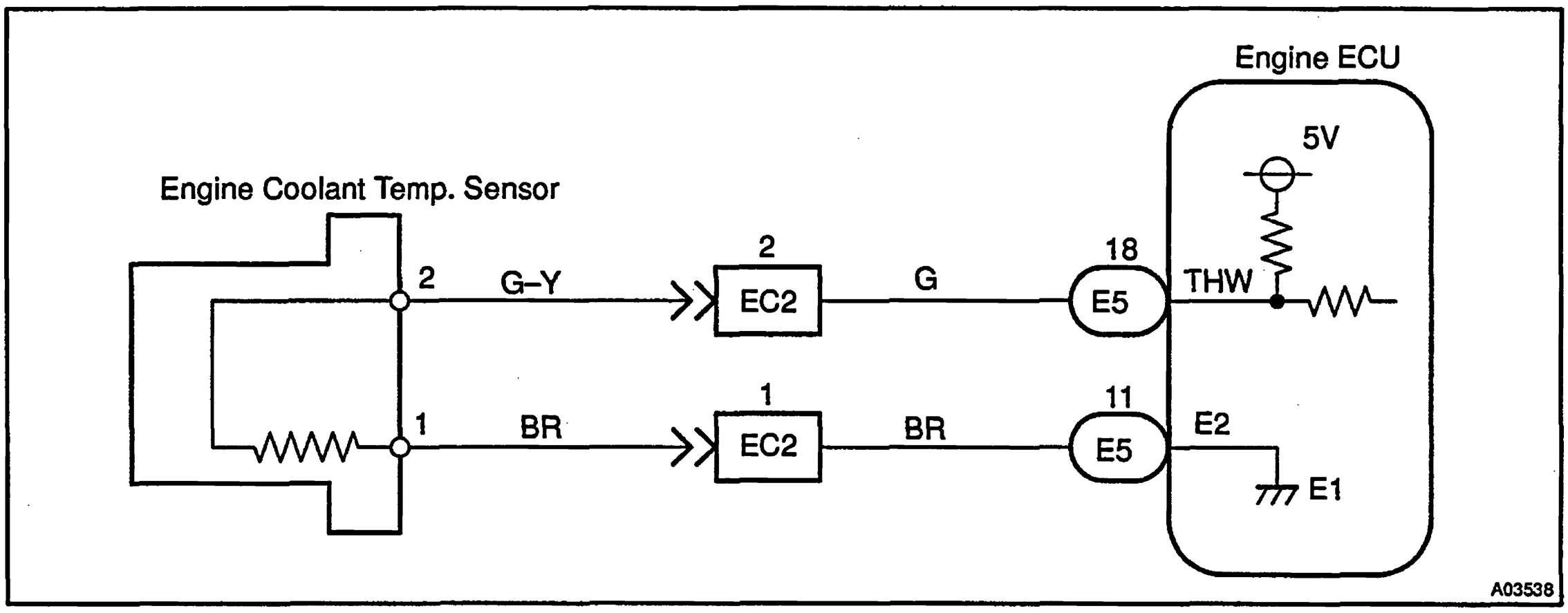
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • Engine ECU

HINT:

After confirming DTC P0115/22, use the hand–held tester to confirm the engine coolant temperature from the CURRENT DATA.

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140° (284°F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0110/24 (Intake Air Temp. Circuit Malfunction), P0115/22 (Engine Coolant Temp. Circuit Malfunction) and P0120/41 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	**Connect hand–held tester, and read value of engine coolant temperature.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
CHECK:
Read temperature value on the hand–held tester.
OK:

Same as actual engine coolant temperature

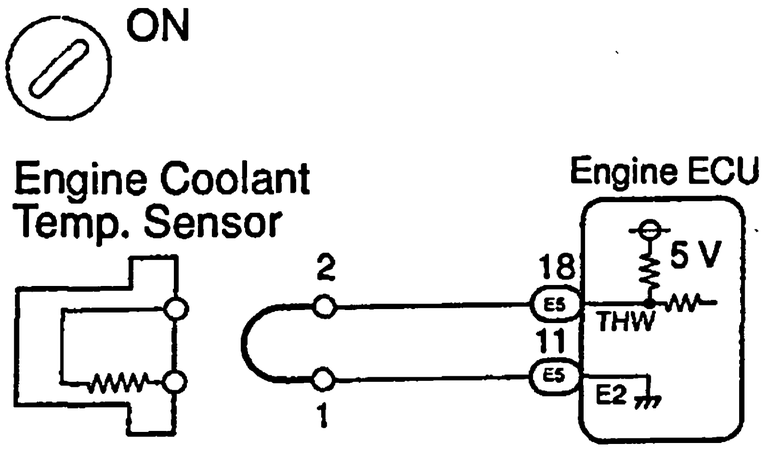
HINT:
- If there is open circuit, Hand–held tester indicates –40°C (–40°F).
- If there is open circuit, Hand–held tester indicates 140°C (284°F) or more.

NG → **–40°C (–40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–4).

2	**Check for open in harness or engine ECU.**



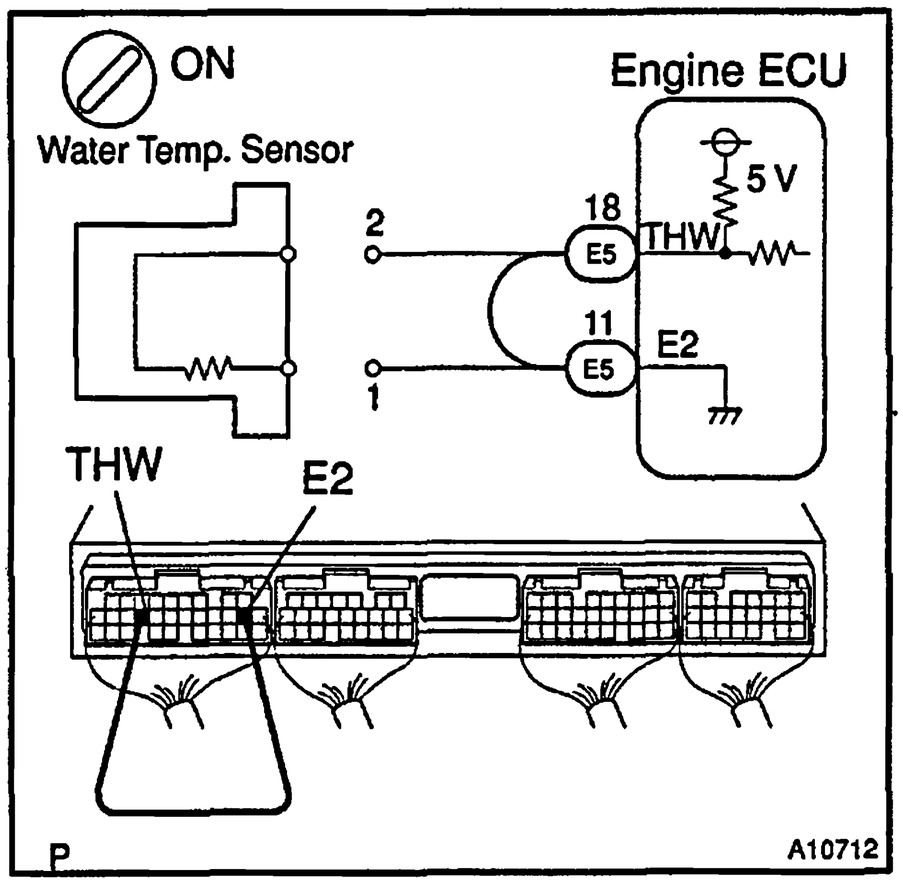
PREPARATION:
(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
CHECK:
Read temperature value on the hand–held tester.
OK:

Temperature value: 140°C (284°F) or more

OK → **Confirm good connection at sensor. If OK, replace engine coolant temp. sensor.**

NG

3	Check for open in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment.

(b) Connect between terminals THW and E2 of the engine ECU connector.

HINT:

The water temp. sensor connector is disconnected.

Before checking, do a visual and contact pressure check for the engine ECU connector (See page IN–20).

(c) Turn the ignition switch ON.

CHECK:

Read temperature value on the hand–held tester.

OK:

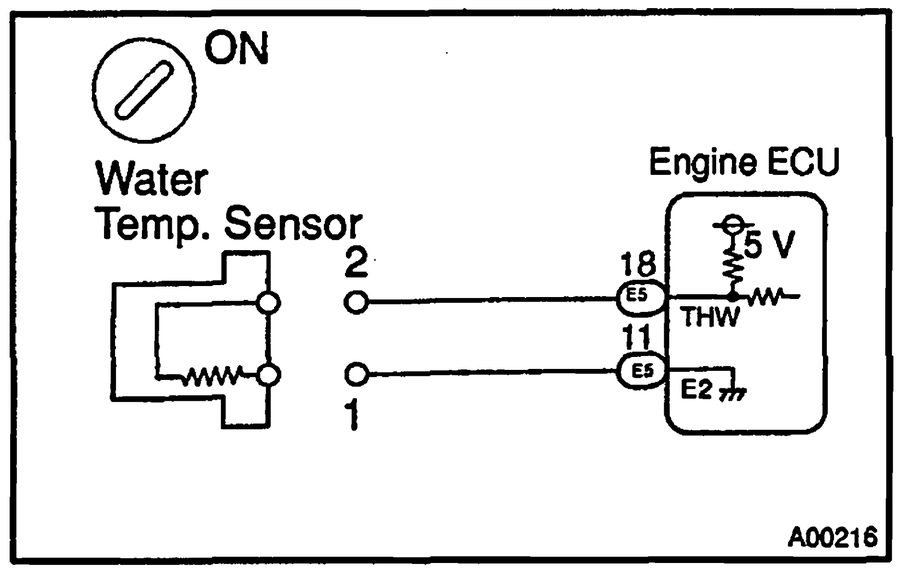
Temperature value: 140°C (284°F) or more

OK → **Open in harness between terminals E2 and THW, repair or replace harness.**

NG

Confirm good connection at engine ECU. If OK, check and replace engine ECU. (See page IN–20).

4	Check for short in harness and engine ECU.



PREPARATION:

(a) Disconnect the water temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read temperature value on the hand–held tester.

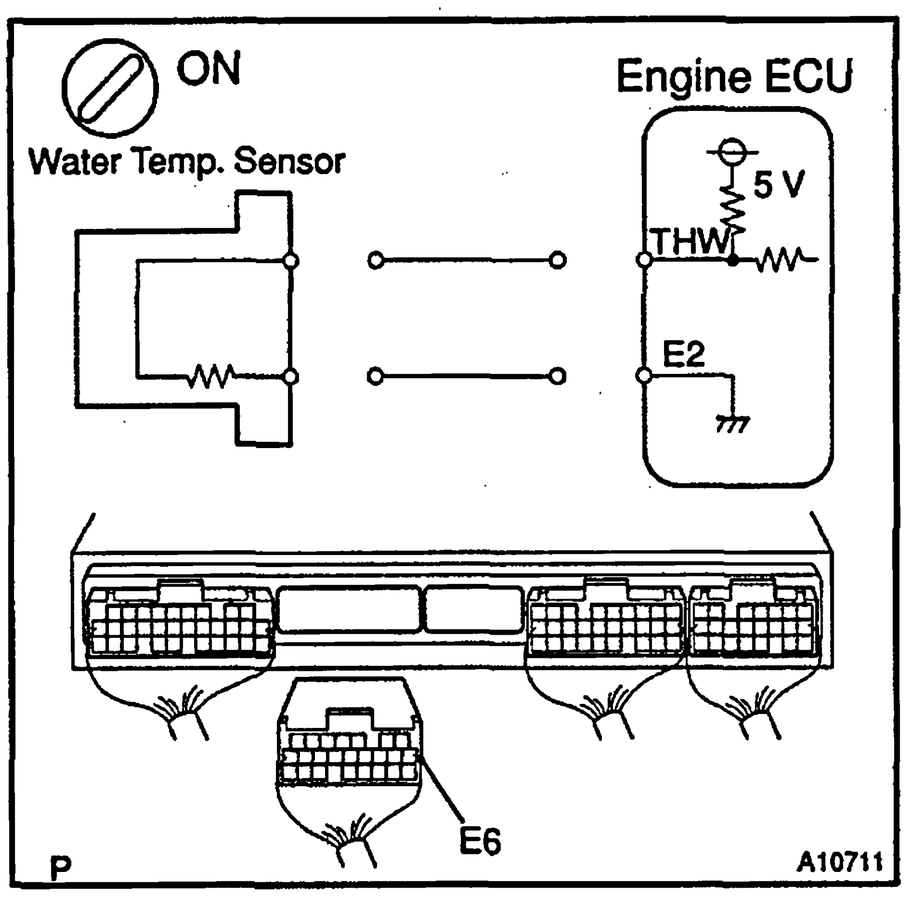
OK:

Temperature value: –40°C (–40°F)

OK → **Replace water temp. sensor**

NG

5	Check for short in harness or engine ECU.



PREPARATION:

(a) Remove the glove compartment.

(b) Disconnect the E6 connector from the engine ECU.

HINT:

The water temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read temperature value on the hand–held tester.

OK:

Temperature value: –40°C (–40°F)

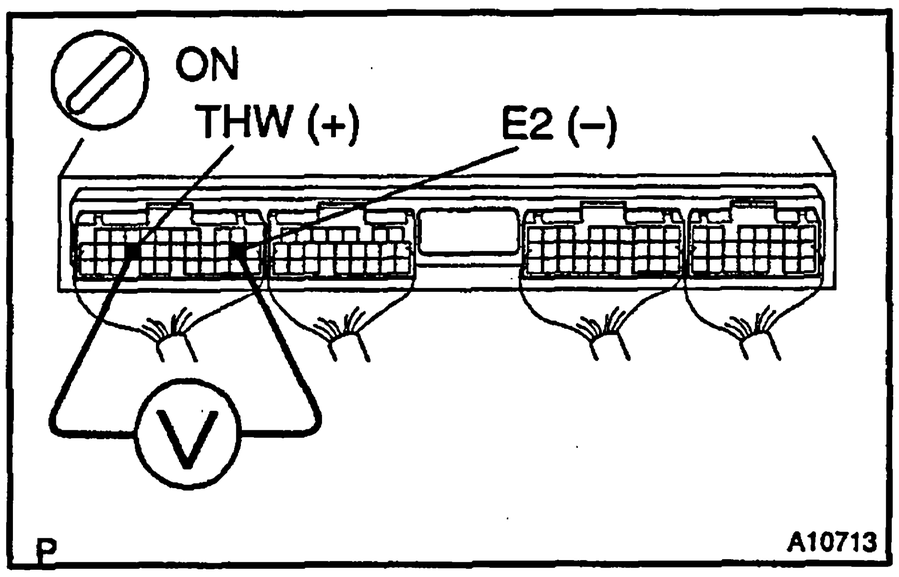
OK → **Repair or replace harness or connector.**

NG

Check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	**Check voltage between terminals THW and E2 of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn ignition switch ON.

CHECK:
Measure voltage between terminals THW and E2 of engine ECU connector.

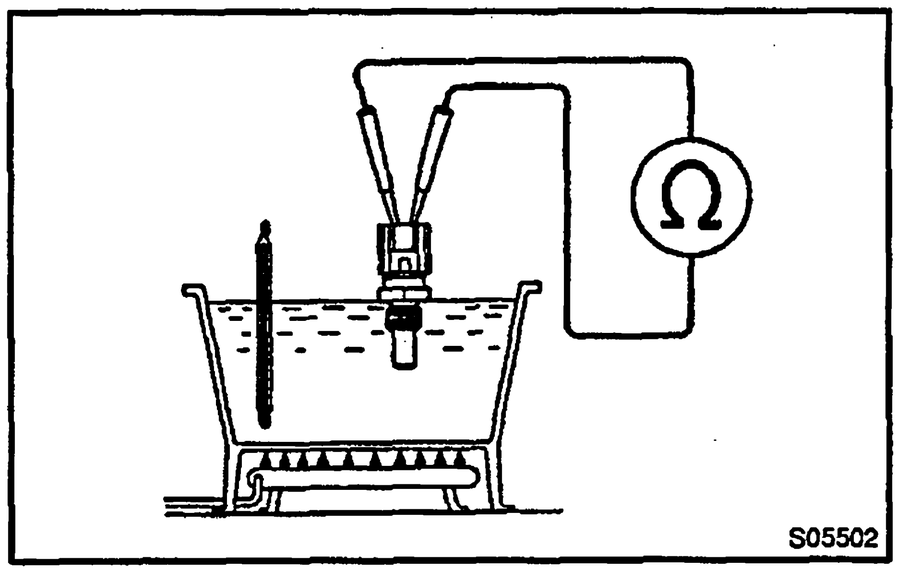
OK:

Water temperature	Voltage
20°C (68°F)	0.5 – 3.4 V
60°C (140°F)	0.2 – 1.0 V

OK → **Check for intermittent problems (See page IN–20).**

NG

2	**Check water temp. sensor.**



PREPARATION:
Disconnect the water temp. sensor connector.

CHECK:
Measure resistance between terminals.

OK:

Resistance is within acceptable zone on chart.

Water temperature	Resistance
20°C (68°F)	2 – 3 kΩ
60°C (140°F)	0.2 – 0.4 kΩ

NG → **Replace water temp. sensor.**

OK

3	Check for open and short in harness and connector between engine ECU and water temp. sensor (See page IN–20).

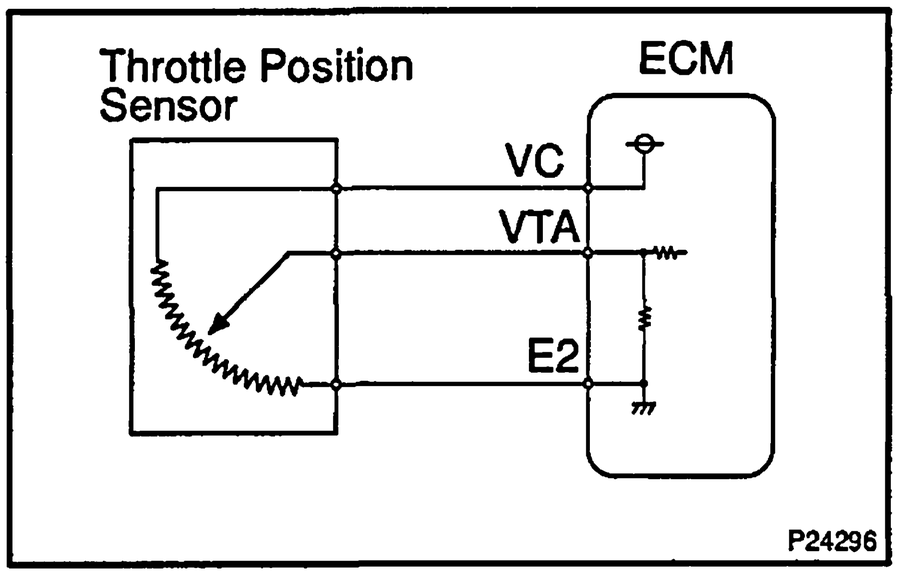
NG → Repair or replace harness or connector.

OK →

Check and replace engine ECU.

DTC	P0120/41	Throttle/Pedal position Sensor/Switch "A" Circuit Malfunction

CIRCUIT DESCRIPTION



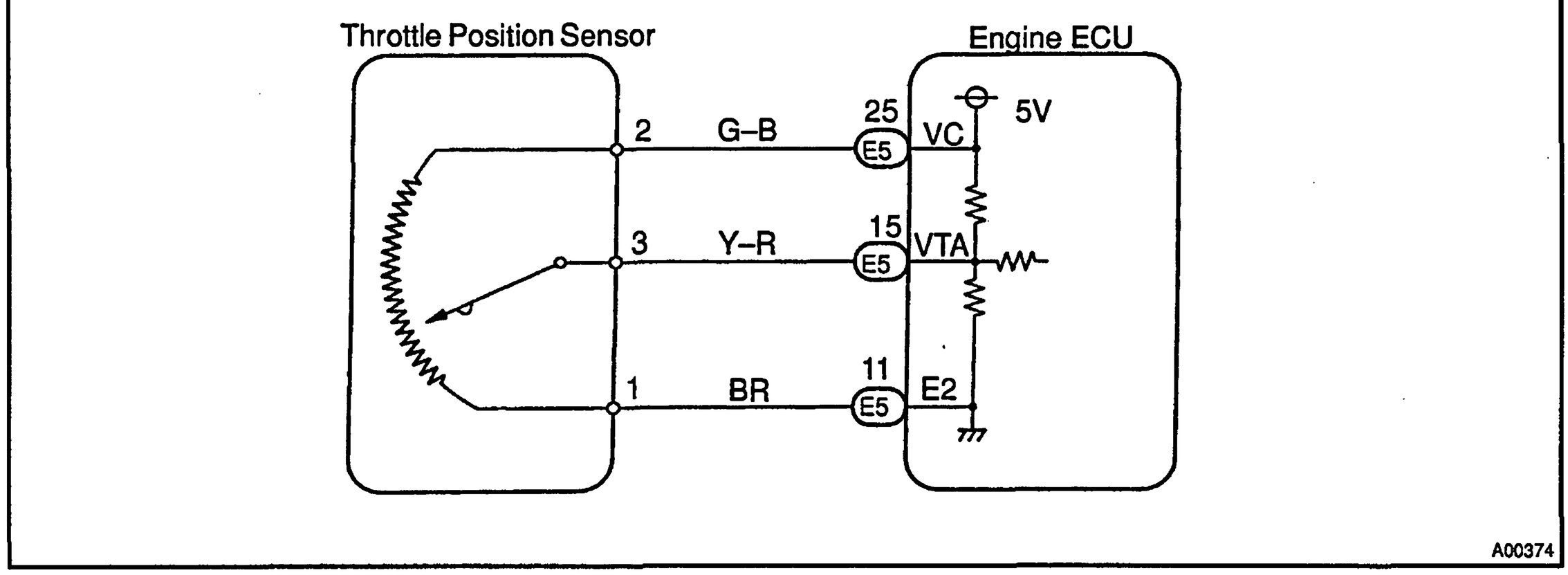
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 ~ 1.0 V is applied to terminal VTA of the engine ECU. The voltage applied to terminals VTA of the engine ECU increases in proportion to opening angle of the throttle valve and becomes approximately 2.7 ~ 5.2 V when the throttle valve is fully opened. The engine ECU judges the vehicle driving conditions from these signals input from terminals VTA and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues (a) VTA < 0.1 V (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU

HINT:
After confirming DTC P0120/41, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VCC line open VTA line open or short
Approx. 100 %	Approx. 100 %	E2 line open

WIRING DIAGRAM



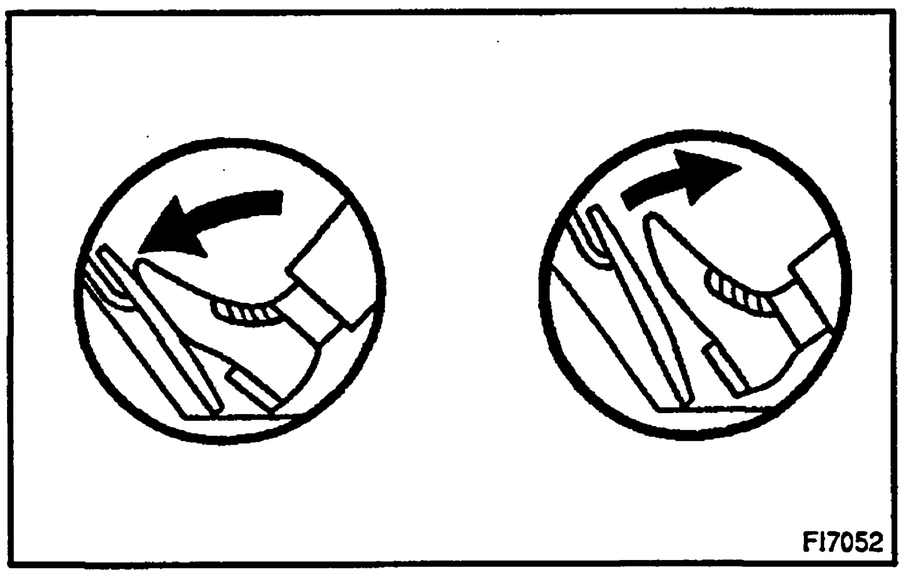
INSPECTION PROCEDURE

HINT:

- If DTCs P0110/24 (Intake Air Temp. Circuit Malfunction), P0115/22 (Engine Coolant Temp. Circuit Malfunction) and P0120/41 (Throttle/Pedal/Position Sensor/Switch "A " Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	**Connect hand–held tester, read the throttle valve opening percentage.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.

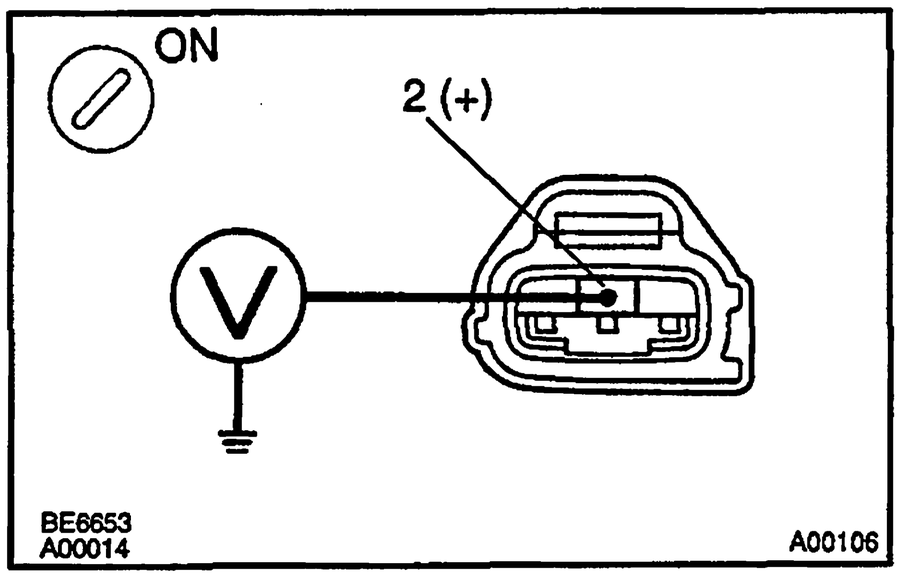
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

OK → **Check for intermittent problems (See page DI–4).**

NG

2	Check voltage between terminal 2 of throttle position sensor connector and body ground.



PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.

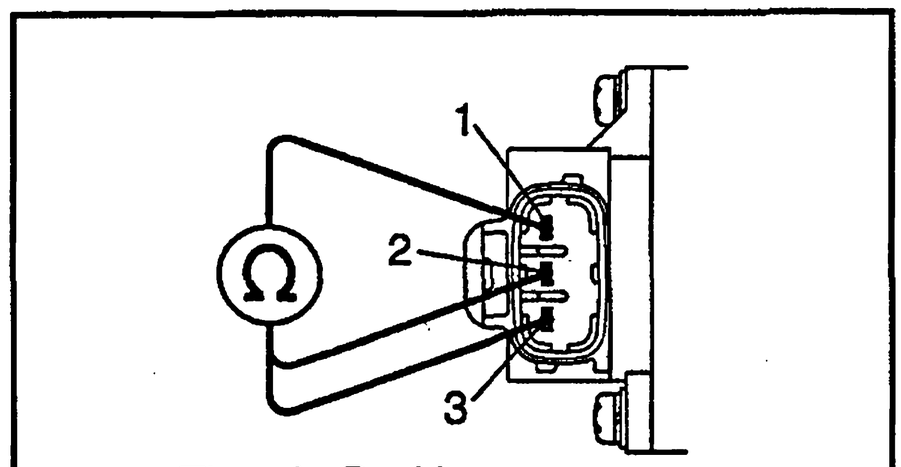
CHECK:
Measure voltage between terminal 2 of the throttle position sensor connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

OK

3	Check throttle position sensor.



PREPARATION:
Disconnect the throttle position sensor connector.

CHECK:
Measure resistance between terminals 1, 2 and 3 of throttle position sensor.

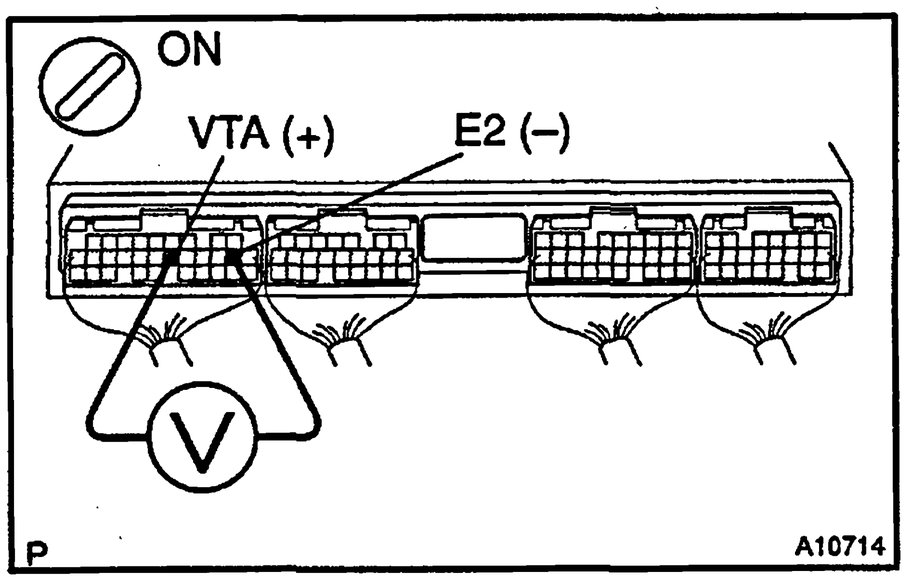
OK:

Terminals	Throttle valve	Resistance
1 – 2	—	2.5 – 5.9 kΩ
1 – 3	Fully closed	0.2 – 5.7 kΩ
1 – 3	Fully open	2.0 – 10.2 kΩ

NG → **Replace throttle position sensor.**

OK

4	Check voltage between terminals VTA and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VTA and E2 of the engine ECU connector.

OK:

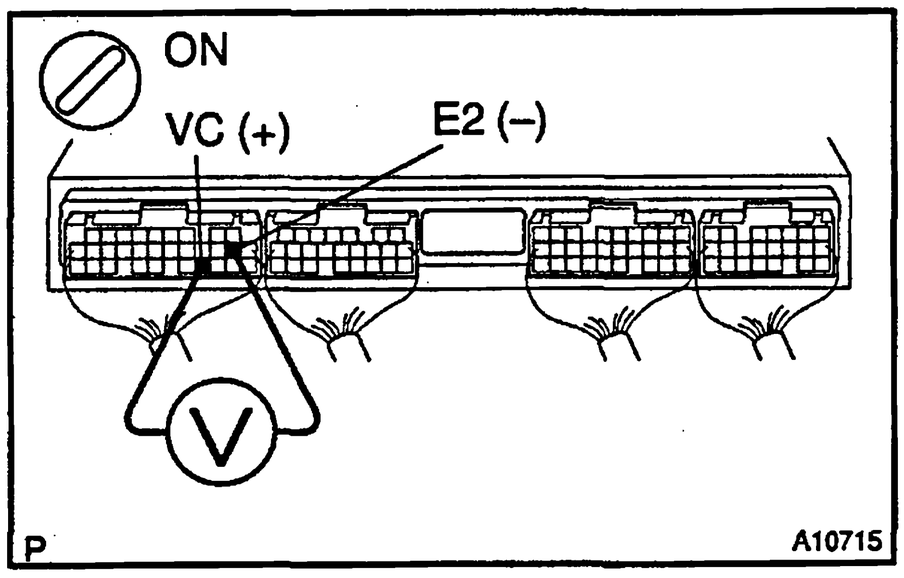
Throttle valve	Voltage
Fully closed	0.3 – 1.0 V
Fully open	2.7 – 5.2 V

NG → **Check for open and short in harness and connector between engine ECU and throttle position sensor (VTA line) (See page IN–20).**

OK

Check and replace engine ECU (See page IN–20).

5	Check voltage between terminals VC and E2 of engine ECU connector.



PREPARATION:

(a) Remove the glove compartment.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of the engine ECU connector.

OK:

Voltage: 4.5 – 5.5 V

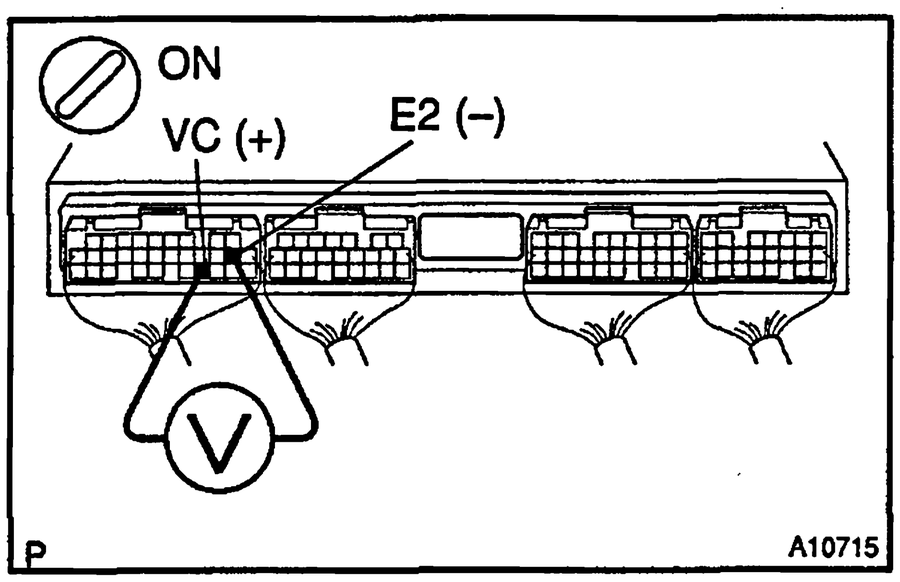
NG → **Check and replace engine ECU (See page IN–20).**

OK

Check for open in harness and connector between engine ECU and sensor (VC line) (See page IN–20).

When not using hand–held tester

1	**Check voltage between terminals VC and E2 of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

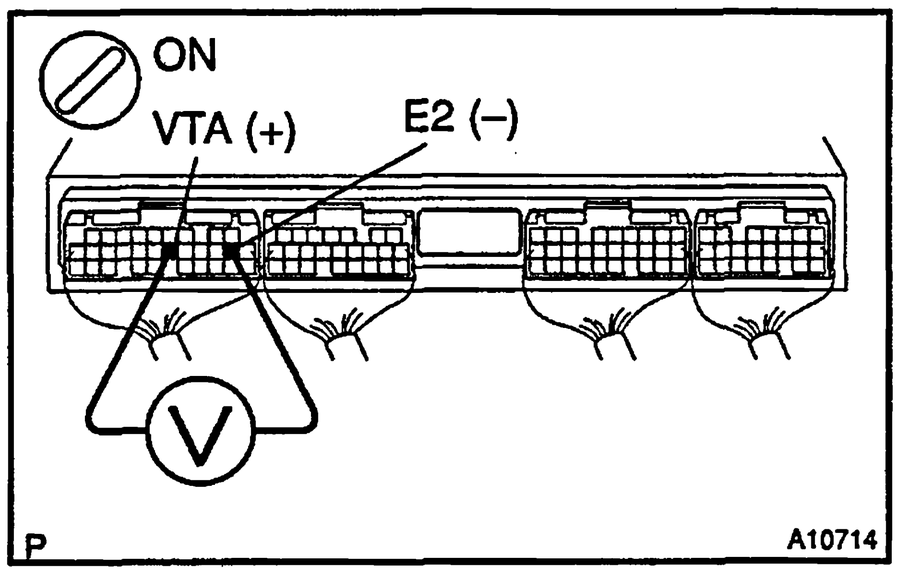
CHECK:
Measure the voltage between terminals VC and E2 of the engine ECU connector.

OK:
Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

2	**Check voltage between terminals VTA and E2 of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals VTA and E2 of the engine ECU connector.

OK:

Throttle valve	Voltage
Fully closed	0.3 – 1.0 V
Fully opened	2.7 – 5.2 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

3	Check throttle position sensor (See Pub. No. RM519E on page EG–145).

NG → Replace throttle position sensor (See Pub. No. RM519E on page EG–145).

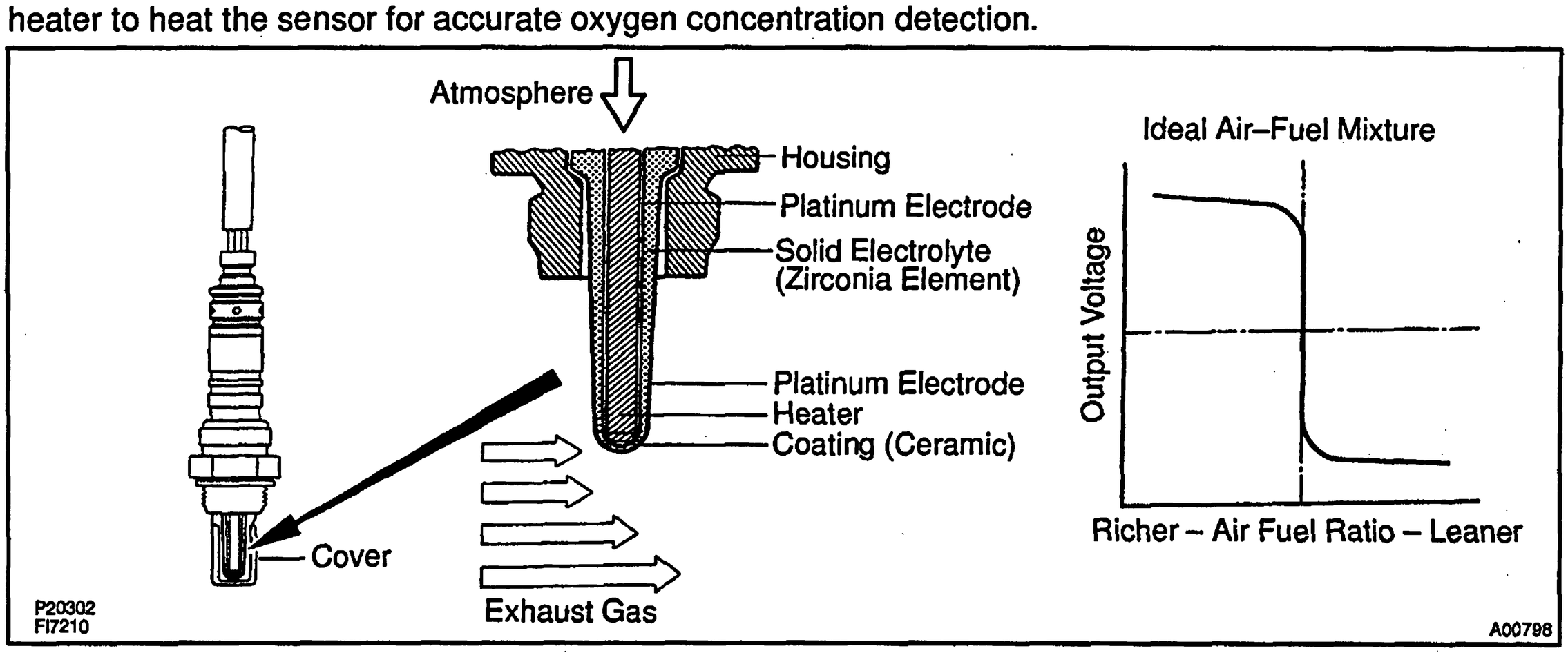
OK →

Check for open and short in harness and connector between engine ECU and throttle position sensor (VC, VTA, E2 line) (See page IN–20).

DTC	P0130/21	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the engine ECU of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the engine ECU of the RICH condition (large electromotive force: 1 V). The engine ECU judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the engine ECU is unable to perform accurate air–fuel ratio control.
The oxygen sensors include a heater which heats the Zirconia element. The heater is controlled by the engine ECU. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

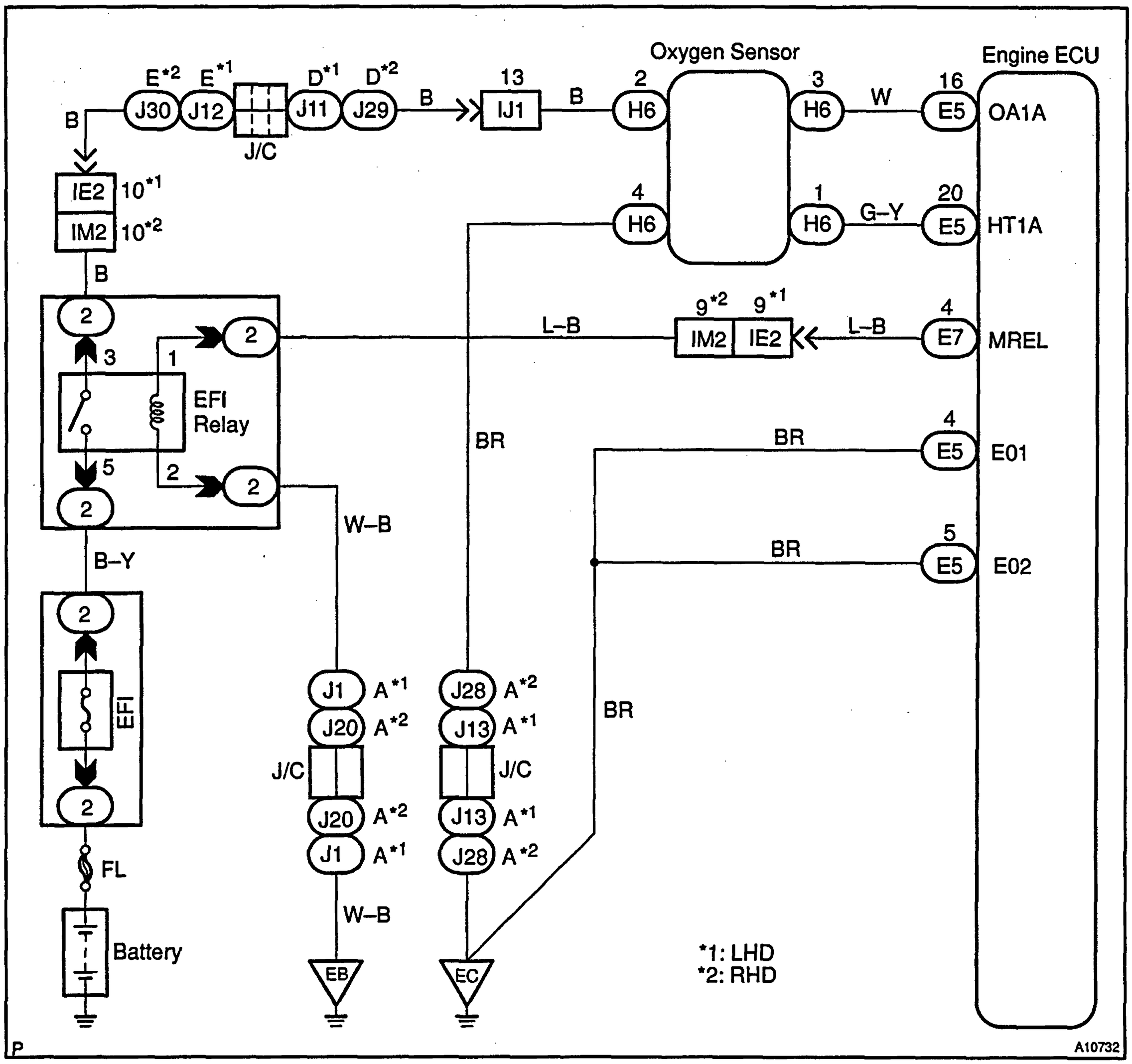


DTC No.	DTC Detecting Condition	Trouble Area
P0130/21	After the engine is warmed up, oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. with under conditions (a) and (b): (a) Engine speed: 4,000 rpm or less (b) Vehicle speed: 100 km/h (62 mph) or less	• Oxygen sensor • Fuel trim malfunction

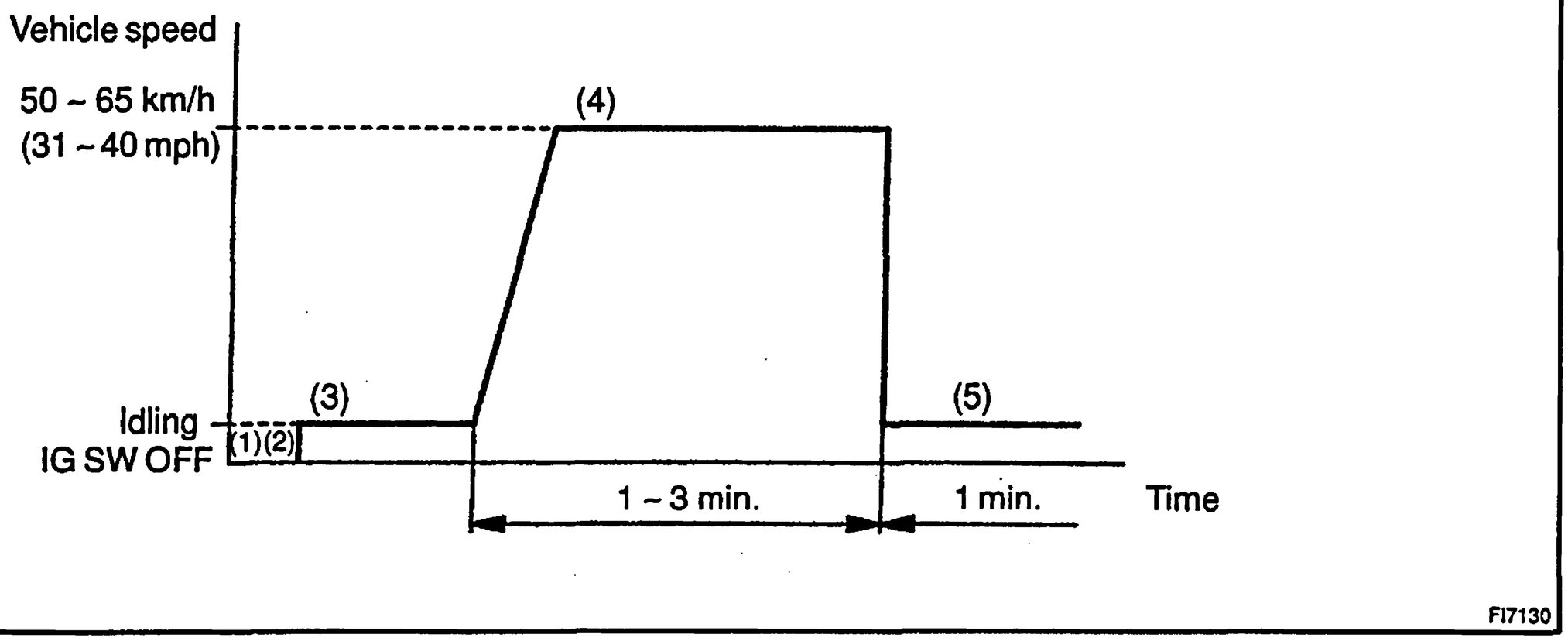
HINT:

- Bank 1 refers to bank that includes cylinder No.1.
- Sensor 1 refers to the sensor closer to the engine body.
- The oxygen sensor's output voltage and the short–term fuel trim value can be read using the hand–held tester.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(1) Connect the hand–held tester to the DLC3.
(2) Switch the hand–held tester from normal mode to check (test) mode (See page DI–4).
(3) Start the engine and warm it up with all accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 ± 3 min. to warm up the oxygen sensor.
(5) Let the engine idle for 1 min.
(6) Perfom steps (3) to (5) three times.

HINT:

If a malfunction exists, the CHK ENG will be indicated on the multiinformation display during step (6).

NOTICE:

If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (3) to (6), then perform steps (3) to (6) again.

INSPECTION PROCEDURE

When using hand–held tester

HINT:

Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check for open and short in harness and connector between engine ECU and oxygen sensor (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

2	**Check for oxygen sensor data.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temperature.

CHECK:

Read the oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about –20 %
3	Except 1 and 2	

1, 2	**Check fuel trim system (See page DI–55).**

3

3	**Check output voltage of oxygen sensor during idling.**

PREPARATION:

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

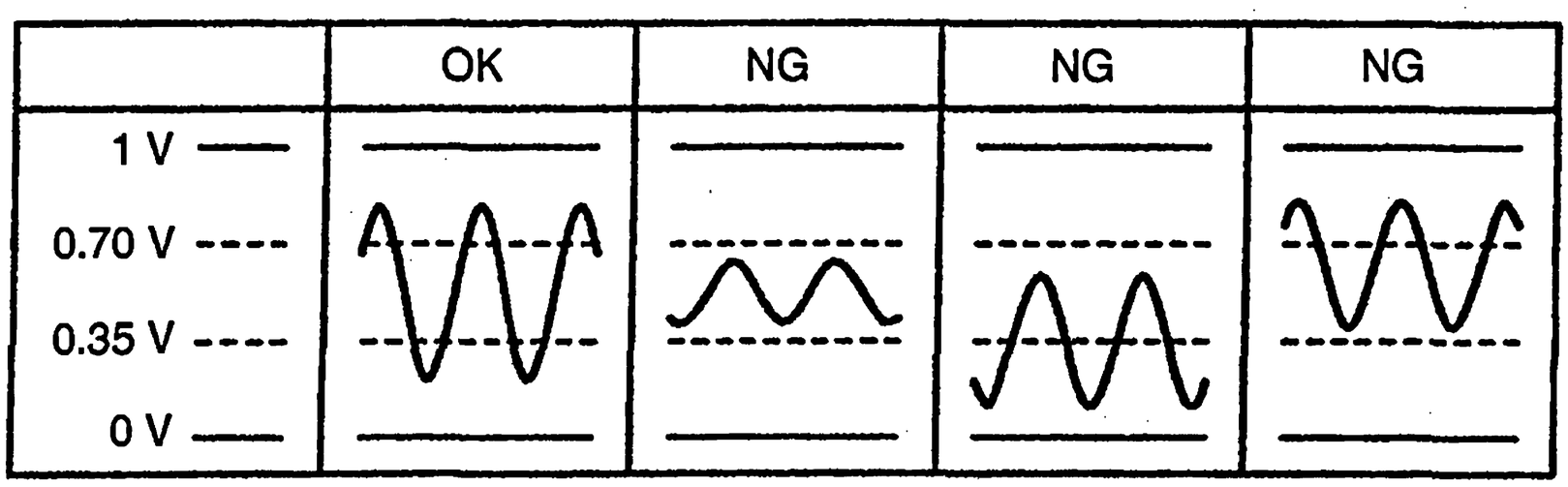
CHECK:

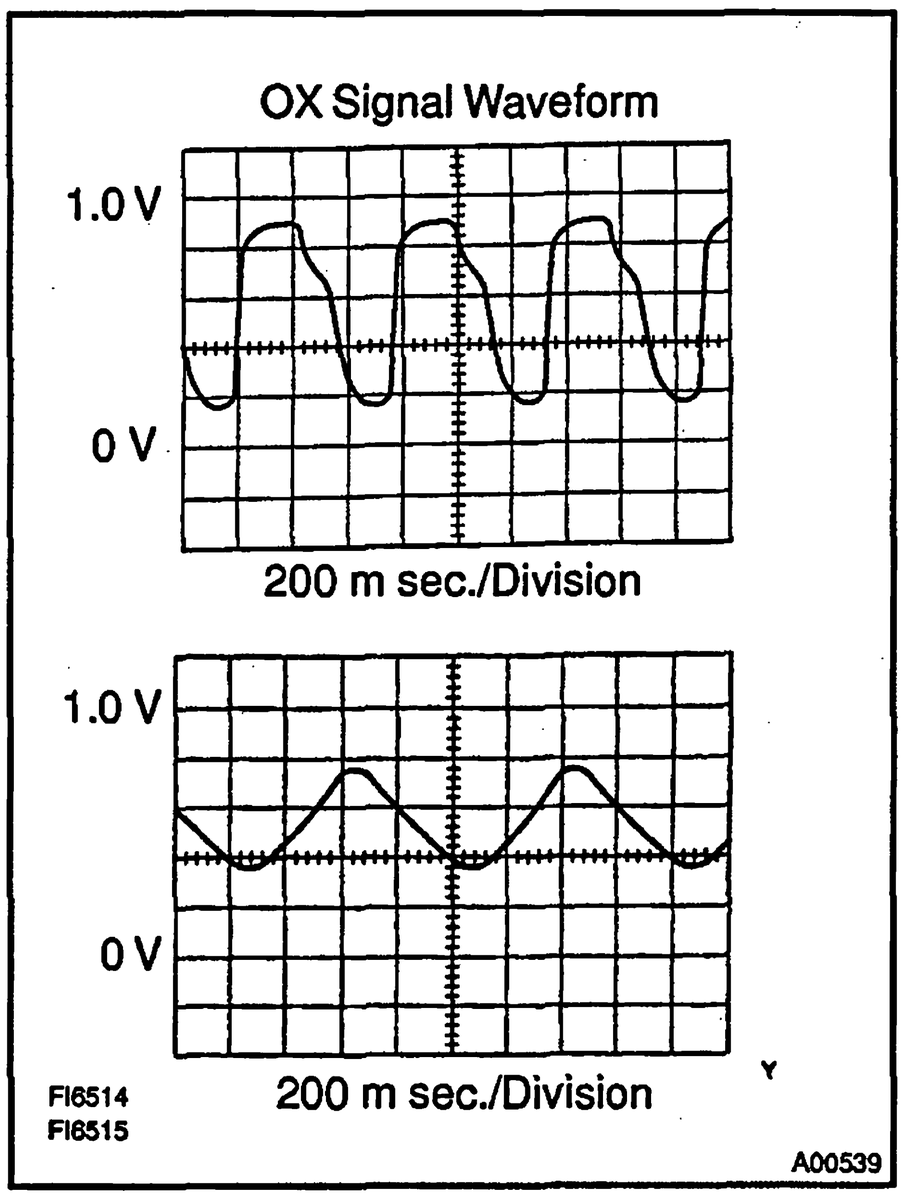
Use the hand–held tester read the output voltage of the oxygen sensor during idling.

OK:

Oxygen sensor output voltage:

Alternates repeatedly between less than 0.35 V and more than 0.70 V (See the following table).





Reference: INSPECTION USING OSCILLOSCOPE

With the engine racing (4,000 rpm) measure waveform between terminals HT1A and E1 of the engine ECU .

HINT:

- The correct waveform is as shown oscillating between approx. 0.1 V and 0.9 V.
- If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

OK → **Perform confirmation driving pattern.**

NG

Replace oxygen sensor.

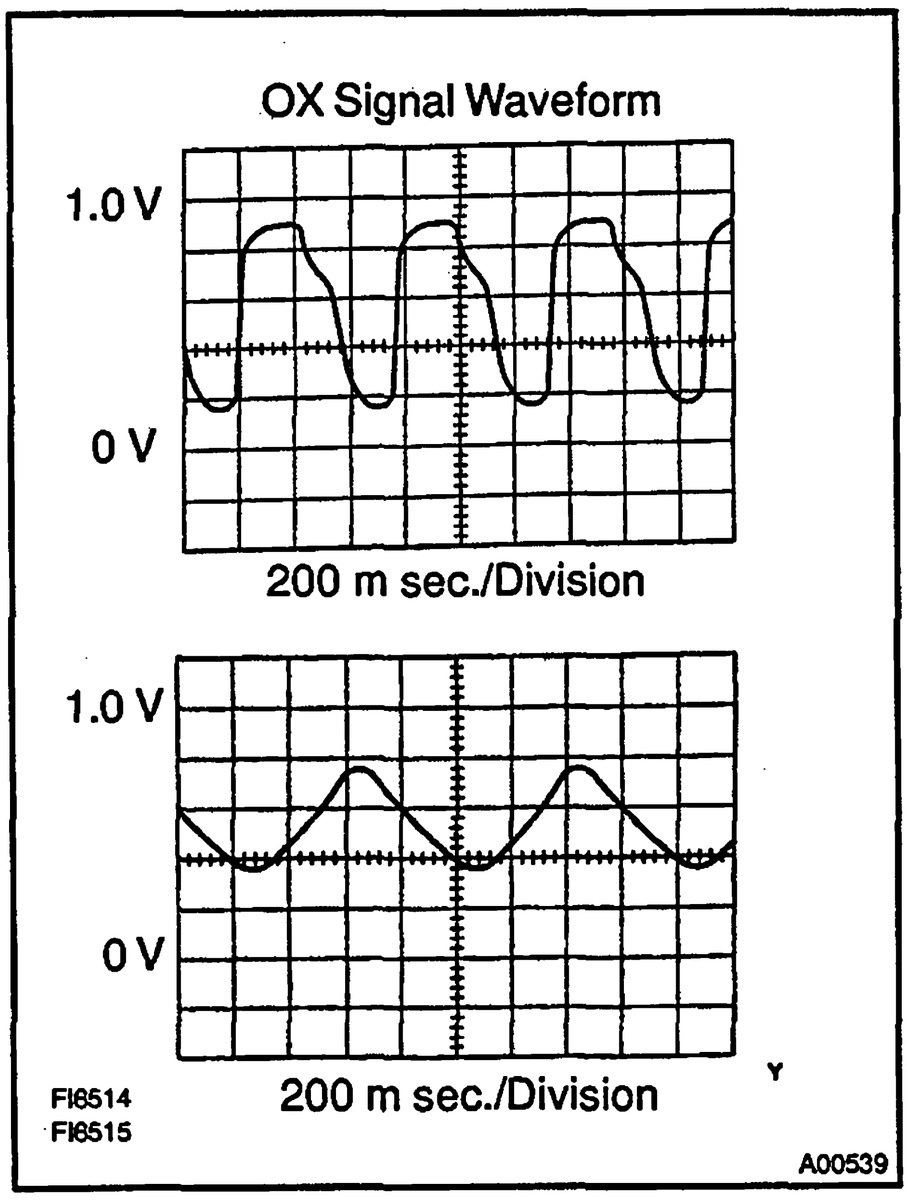
When not using hand–held tester

1	**Are there any other codes (besides code 21 and 28) being output?**

YES → **Go to relevant DTC chart (See page DI–16).**

NO

Replace oxygen sensor.



Reference: INSPECTION USING OSCILLOSCOPE

With the engine racing (4,000 rpm) measure waveform between terminals HT1A and E1 of the engine ECU .

HINT:

- The correct waveform is as shown oscillating between approx. 0.1 V and 0.9 V.

- If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

DTC	P0135/21	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130/21, P0150/28 (Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) on page DI–47.

DTC No.	DTC Detecting Condition	Trouble Area
P0135/21	Open or short in heater circuit of oxygen sensor 0.5 sec. or more	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU

HINT:

- Bank 1 refers to bank that includes cylinder No.1.
- Sensor 1 refers to the sensor closer to the engine body.

WIRING DIAGRAM

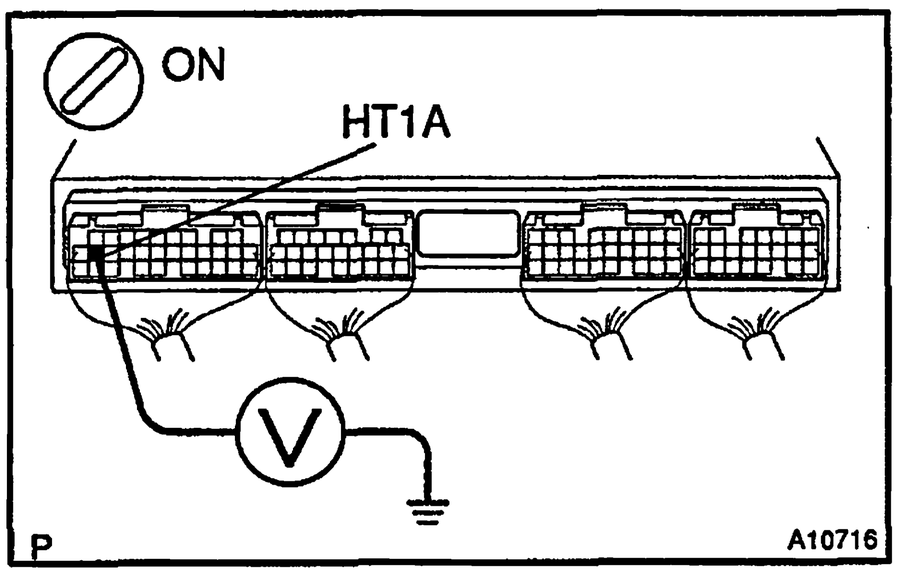
Refer to DTC P0130/21 (Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) on page DI–47 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check voltage between terminals HT1A of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1A of the engine ECU connector and body ground.

HINT:

Connect terminal HT1A to bank 1 sensor 1.

OK:

Voltage: 9 – 14 V

OK → **Check and replace engine ECU (See page IN–20).**

NG

2	Check resistance of oxygen sensor heater (See Pub. No. RM519E on page EG–159).

NG → Replace oxygen sensor.

OK →

Check and repair harness or connector between main relay and oxygen sensor and engine ECU (See page IN–20).

DTC	P0171/25	Fuel Trim System too Lean (Air–Fuel Ratio Lean Malfunction, Bank 1)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.
Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.
Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim form the central value due to individual engine differences, wear over time and changes in the usage environment.
If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction.

DTC No.	DTC Detecting Condition	Trouble Area
P0171/25	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the LEAN side (2 trip detection logic)	• Gas leakage on exhaust system • Air intake (hose loose) • Fuel line pressure • Injector blockage • Oxygen sensor (bank 1 sensor 1) malfunction • Air flow meter • Water temp. sensor

HINT:

- When DTC P0171/25 is recorded, the actual air–fuel ratio is on the LEAN side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171/25 is recorded.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 %, the system is functioning normally.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	Ask customer whether vehicles runs out of fuel.

YES → DTC P0171/25 was recorded because the vehicle runs out of fuel.

NO

2	Check air induction system (See Pub. No. RM519E on page EG–91).

NG → Repair or replace.

OK

3	Check for oxygen sensor (bank 1 sensor 1) data.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temperature.

CHECK:

Read the oxygen sensor (bank 1 sensor 1) output voltage and short–term fuel trim.

HINT:

Read the values for the same bank.

RESULT:

Pattern	Oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about –20 %
3	Except 1 and 2	

3 → Check for oxygen sensor (bank 1 sensor 1) (See page DI–47).

1, 2

4	Check fuel pressure (See Pub. No. RM519E on page EG–130).

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See Pub. No. RM519E on page EG–130).

OK

5	Check injector injection (See page FI–3).

NG → Replace injector.

OK

6	Check air flow meter and water temp. sensor (See page DI–22 and DI–35).

NG → Repair or replace.

OK

7	Check for spark and ignition (See Pub. No. RM519E on page IG–3).

NG → Repair or replace.

OK

8	Check gas leakage on exhaust system.

NG → Repair or replace.

OK →

Check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	Check air induction system (See Pub. No. RM519E on page EG–91).

NG → Repair or replace.

OK →

2	Check fuel pressure (See Pub. No. RM519E on page EG–130).

NG → Check and repair fuel pump, fuel pipe line and filter (See Pub. No. RM519E on page EG–130).

OK →

3	Check injector injection (See page FI–3).

NG → Replace injector.

OK →

4	Check air flow meter (See page DI–22).

NG → Repair or replace.

OK

5	Check water temp. sensor (See page DI–35).

NG → Repair or replace.

OK

6	Check for spark and ignition (See Pub. No. RM519E on page IG–3).

NG → Repair or replace.

OK

7	Check gas leakage on exhaust system.

NG → Repair or replace.

OK

8	Does malfunction disappear when a good oxygen sensor installed?

YES → Repair oxygen sensor.

NO →

Check and replace engine ECU (See page IN–20).

DI6AW–01

DTC	P0325/52	Knock Sensor 1 Circuit Malfunction

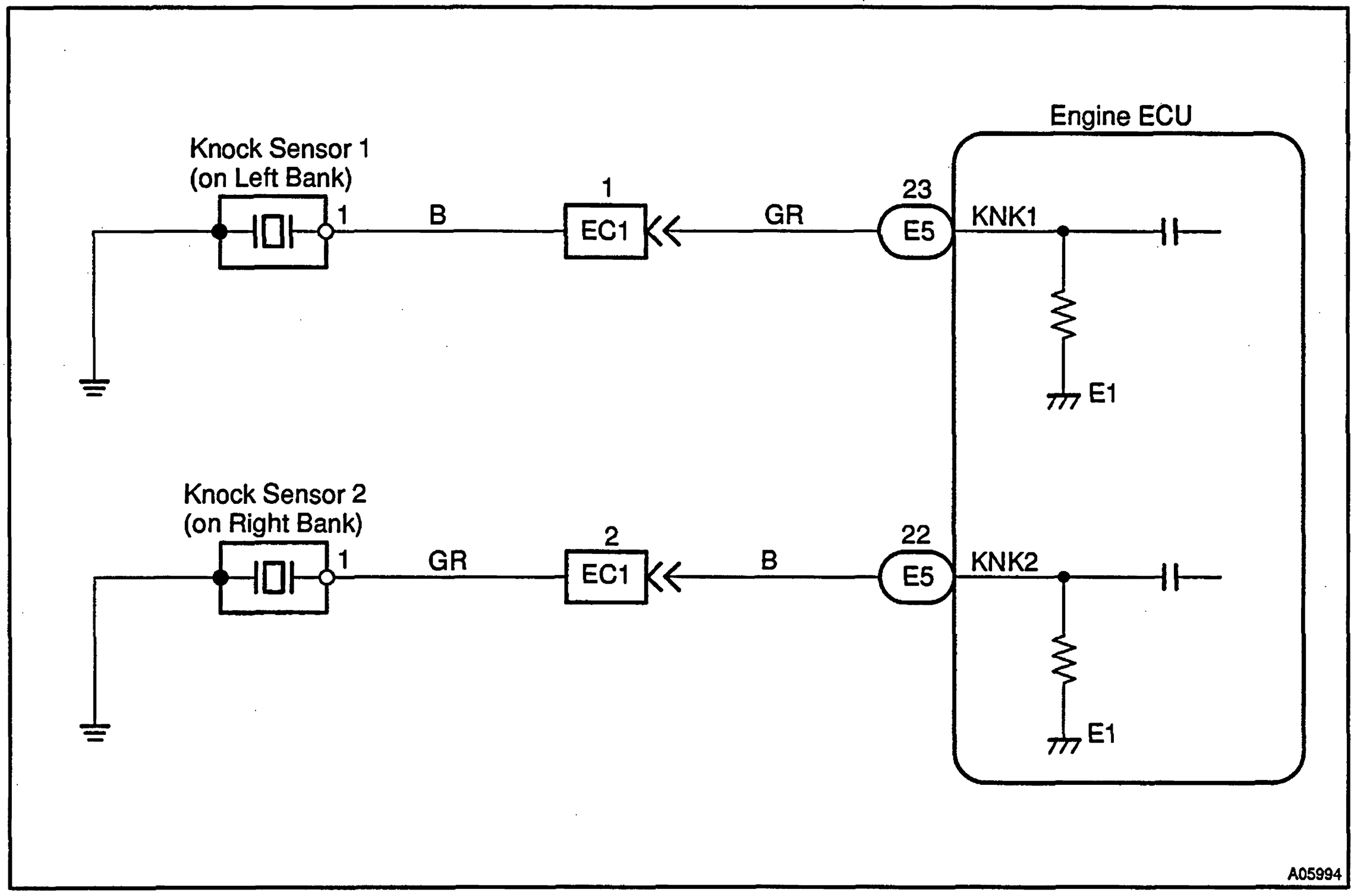
DTC	P0330/55	Knock Sensor 2 Circuit Malfunction

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
P0325/52	No knock sensor 1 signal to engine ECU with engine speed between 1,750 rpm and 5,600 rpm	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • Engine ECU
P0330/55	No knock sensor 2 signal to engine ECU with engine speed between 1,750 rpm and 5,600 rpm	• Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • Engine ECU

WIRING DIAGRAM



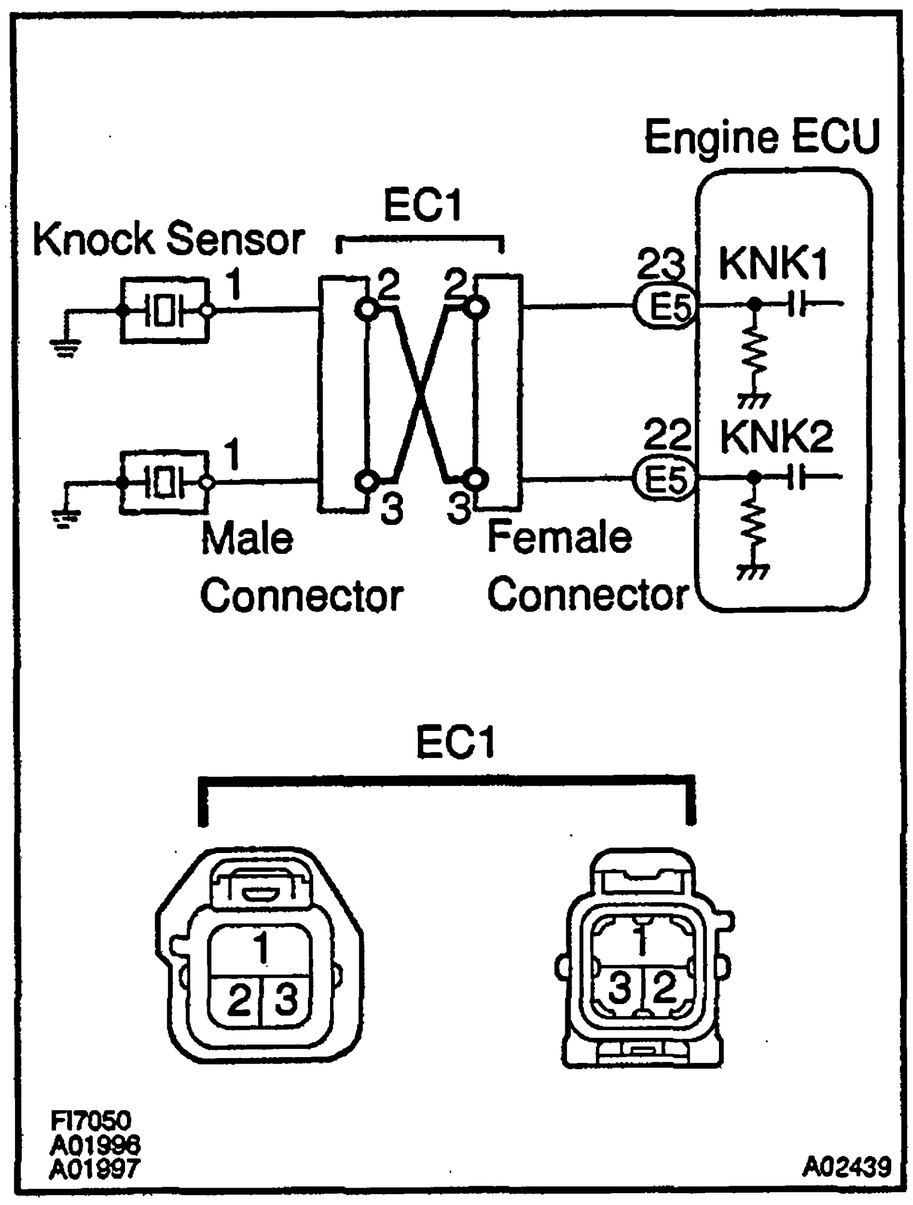
INSPECTION PROCEDURE

HINT:

- DTC P0325/52 is for the left bank knock sensor circuit.
- DTC P0330/55 is for the right bank knock sensor circuit.
- Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	**Connect hand–held tester and check knock sensor circuit.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Disconnect the wire to wire connector EC1.
(c) Connect the terminals of the disconnected EC1 male connector and EC1 female as follows.

Male connector ↔ Female connector
Terminal 1 ↔ Terminal 2
Terminal 2 ↔ Terminal 1

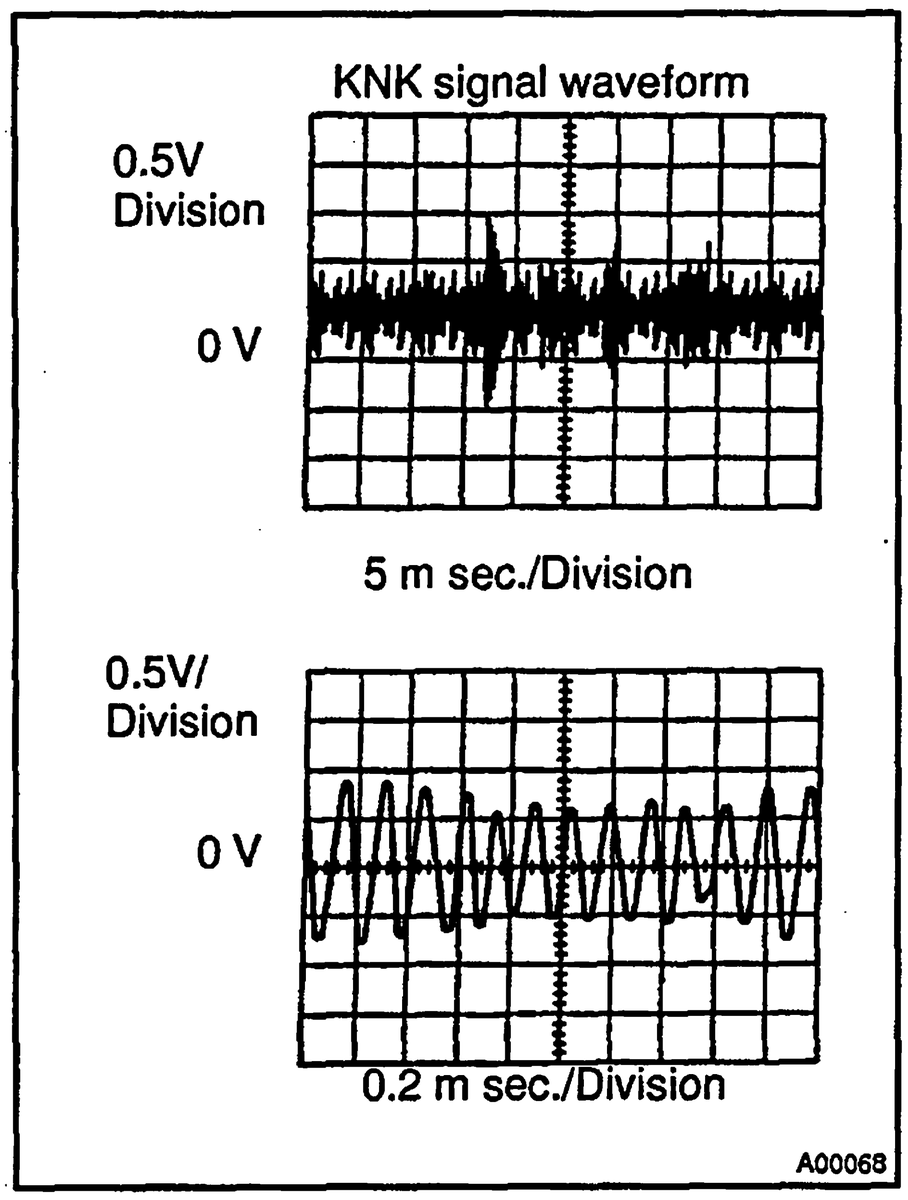
(d) Turn ignition switch ON and switch the hand–held tester main switch ON.
(e) After the engine is warmed up, perform quick racing to 4,000 rpm three times.

CHECK:

Check the DTC.

RESULT:

Type I	DTC same as when vehicle brought in. P0325/52 → P0325/52 or P0330/55 → P0330/55
Type II	DTC different to when vehicle brought in. P0325/52 → P0330/55 or P0330/55 → P0325/52



Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm) measure between terminal KNK1, KNK2 of the engine ECU connector and body ground.

HINT:
The correct waveforms are as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 0.13 m sec.
  (Normal mode vibration frequency of knock sensor: 8.1 kHz)

HINT:
If normal mode vibration frequency is not 8.1 kHz, the sensor is malfunctioning.

Type II → **Go to step 3.**

Type I

2	**Check for open and short in harness and connector between EC1 connector and engine ECU (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU (See page IN–20).

3	**Check for open and short in harness and connector between EC1 connector and knock sensor (See page IN–20).**

HINT:

- If DTC P0325/52 has changed to P0330/55, check the knock sensor circuit on the left bank side.
- If DTC P0330/55 has changed to P0325/52, check the knock sensor circuit on the right bank side.

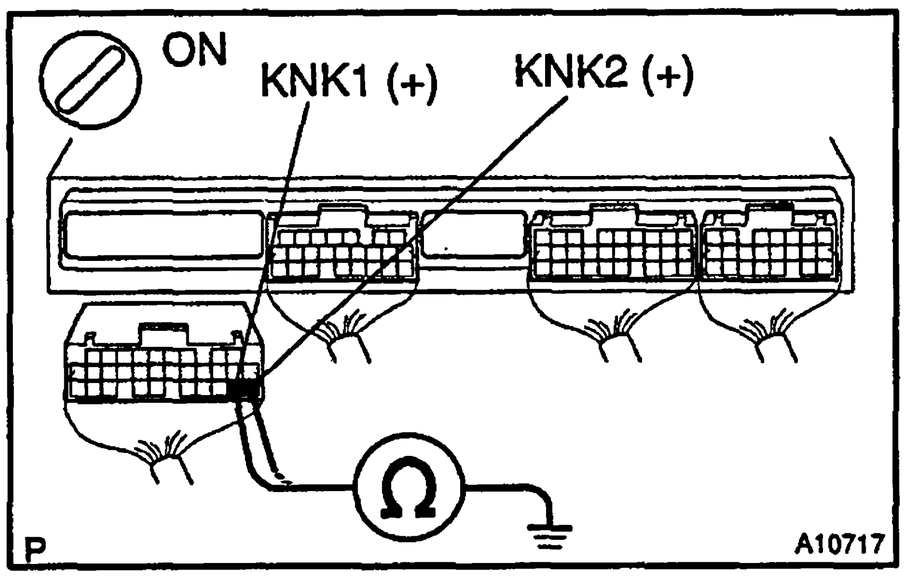
NG → **Repair or replace harness or connector.**

OK

Replace knock sensor.

When not using hand–held tester

1	**Check continuity between terminal KNK1, KNK2 of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Disconnect the E7 connector of engine ECU.

CHECK:

Measure resistance between terminal KNK1, KNK2 of engine ECU connector and body ground.

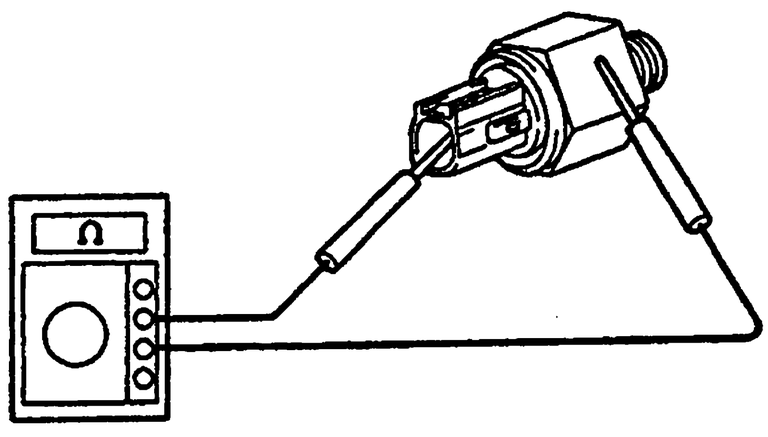
OK:

Resistance: 1 MΩ or higher

OK → **Go to step 3.**

NG

2	**Check knock sensor.**



FI6630

PREPARATION:

Disconnect knock sensor connector.

CHECK:

Measure resistance between the knock sensor terminal and body.

OK:

Resistance: 1 MΩ or higher

NG → **Replace knock sensor.**

OK

3	**Check for open and short in harness and connector between engine ECU and knock sensor (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

4	**Does malfunction disappear when a good knock sensor is installed?**

YES → **Replace knock sensor.**

NO

Check and replace engine ECU (See page IN–20).

DI6AX-01

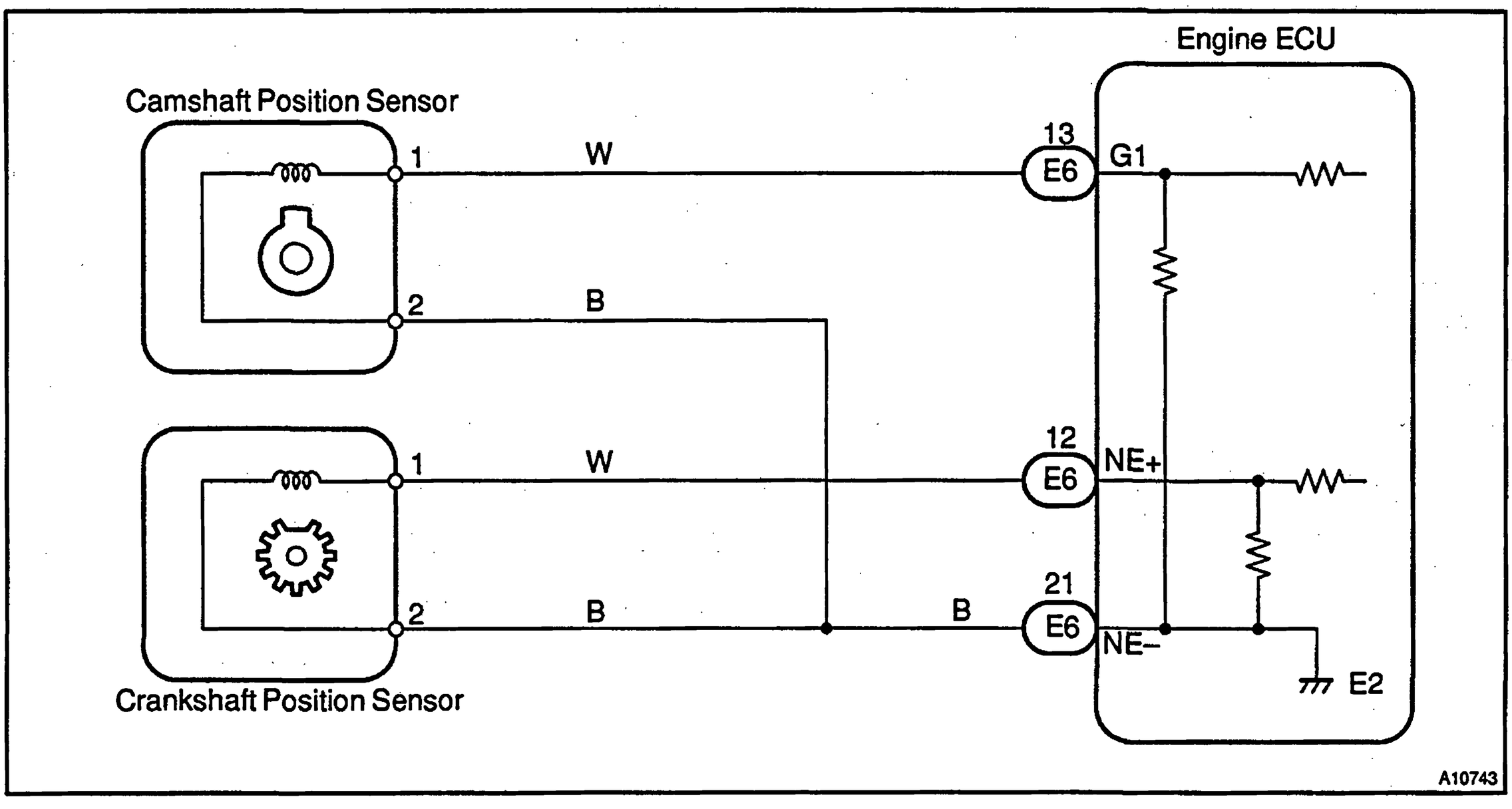
DTC	P0335/12, 13	Crankshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor, which detects the engine speed and crankshaft angle signal (NE signal), has been installed on the oil pump body.
The NE signal plate has 34 teeth. The NE signal sensor generates 34 signals of every engine revolution. The engine ECU detects the standard crankshaft angle based on the G2 signals, and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335/12, 13	No crankshaft position sensor signal to engine ECU during cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU
	No crankshaft position sensor signal to engine ECU with engine speed 600 rpm or more	

WIRING DIAGRAM

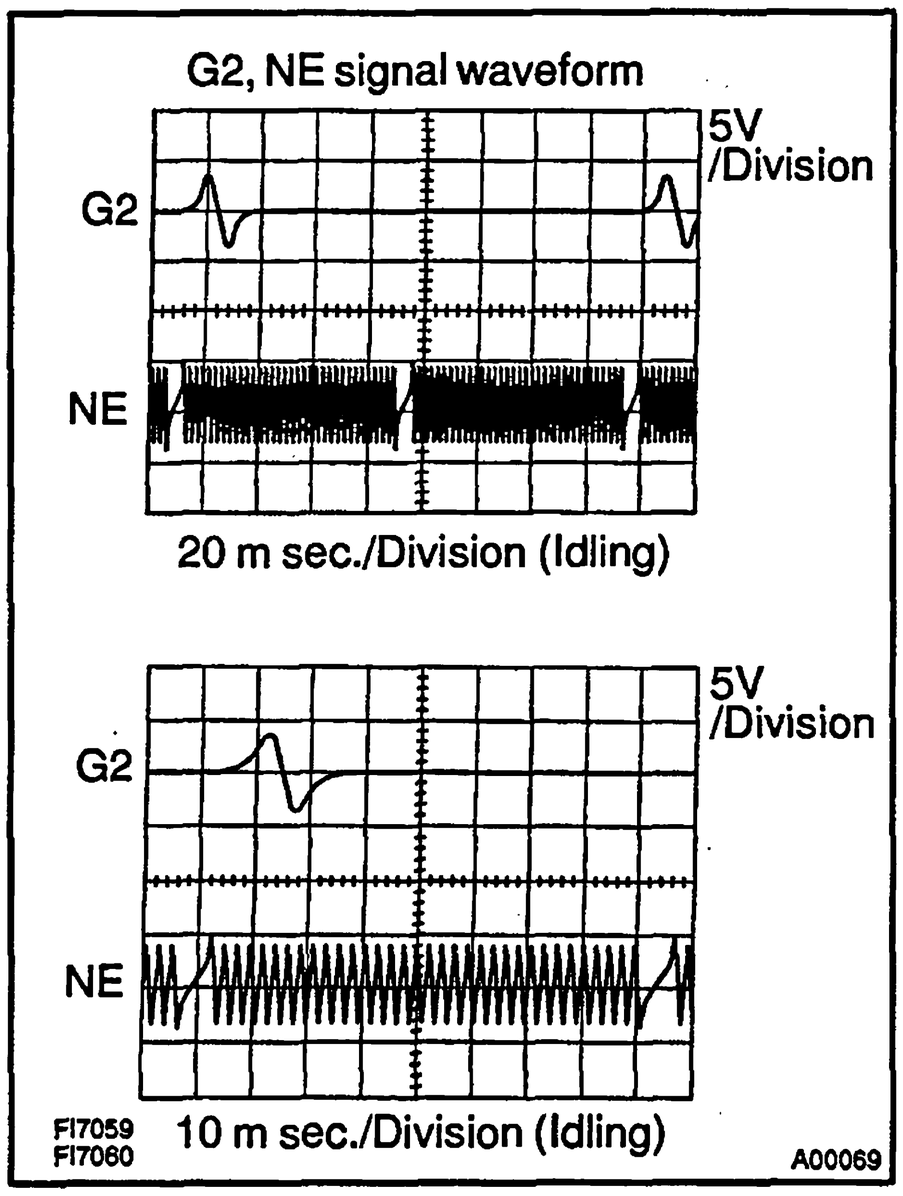


INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335/12, 13 first. If no trouble is found, troubleshoot the following mechanical systems.
- Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check resistance of crankshaft position sensor (See Pub. No. RM519E on page IG–3).**



Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G2 and NE–, NE and NE– of the engine ECU connector.

HINT:

The correct waveforms are as shown.

NG → **Replace crankshaft position sensor.**

OK

2	**Check for open and short in harness and connector between engine ECU and crankshaft position sensor (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

3	Inspect sensor installation and teeth of signal plate.

NG → Tighten sensor. Replace signal plate.

OK →

Check and replace engine ECU
(See page IN–20).

DTC	P0340/12	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G2 signal) consist of a signal plate and pickup coil.
The G2 signal plate has 1 tooth, on its outer circumference and is mounted on the left bank camshafts.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The engine ECU detects the standard crankshaft angle based on the G2 signal and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340/12	No camshaft position sensor signal to engine ECU during cranking	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • Engine ECU
	No camshaft position sensor signal to engine ECU with engine speed 600 rpm or more	

WIRING DIAGRAM

Refer to DTC P0335/12, 13 (Crankshaft Position Sensor Circuit Malfunction) on page DI–66 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check resistance of camshaft position sensor (See Pub. No. RM519E on page IG–3).**

Reference: INSPECTION USING OSCILLOSCOPE
Refer to DTC P0335/12, 13 (Crankshaft Position Sensor Circuit Malfunction) on page DI–66 for the Reference: INSPECTION USING OSCILLOSCOPE.

NG → **Replace camshaft position sensor.**

OK

2	Check for open and short in harness and connector between engine ECU and camshaft position sensor (See page IN–20).

NG → Repair or replace harness or connector.

OK ↓

3	Inspect sensor installation.

NG → Tighten sensor.

OK ↓

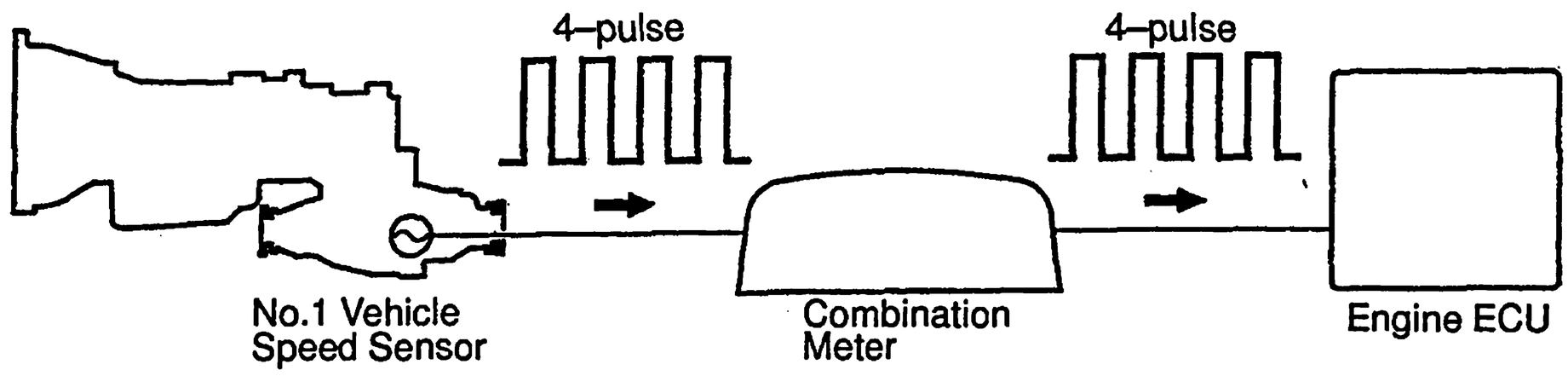
Check and replace engine ECU (See page IN–20).

DI6AZ–01

DTC	P0500/42	Vehicle Speed Sensor Malfunction

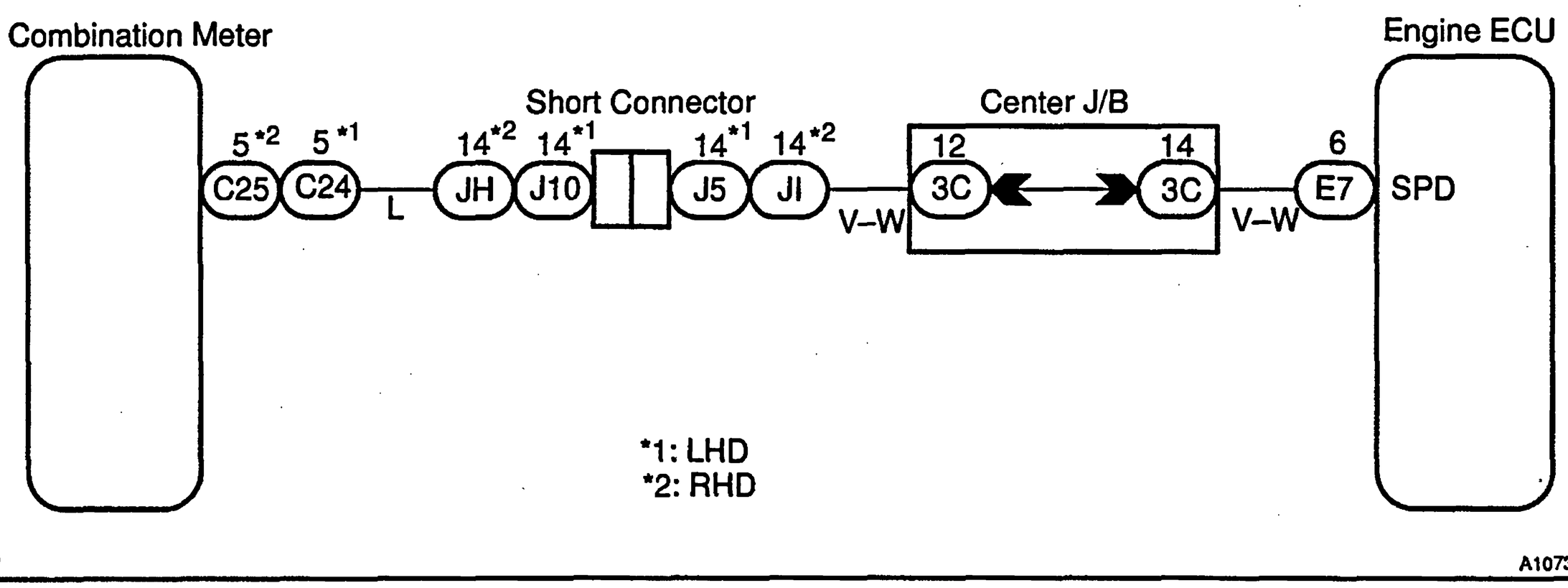
CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4 – pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular wavefrom by the waveform shaping circuit inside the combination meter, it is then transmitted to the engine ECU. The engien ECU determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500/42	No vehicle speed sensor signal to engine ECU under conditions (a) and (b): (a) Neutral start switch is OFF (b) Vehicle is being driven	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Combination meter • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

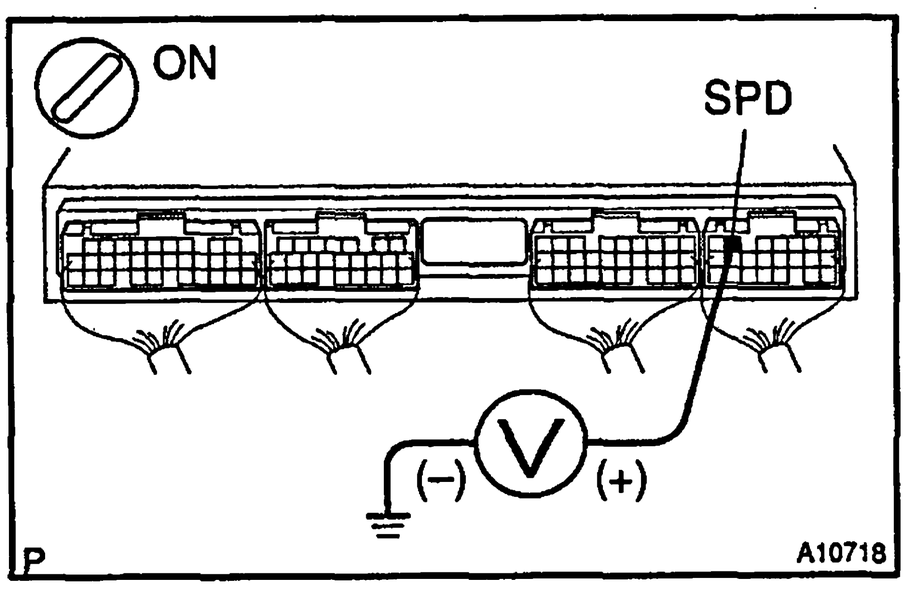
1	Check operation of speedometer.

CHECK:
Drive the vehicle and check if the operation of the speedmeter in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit.**

OK

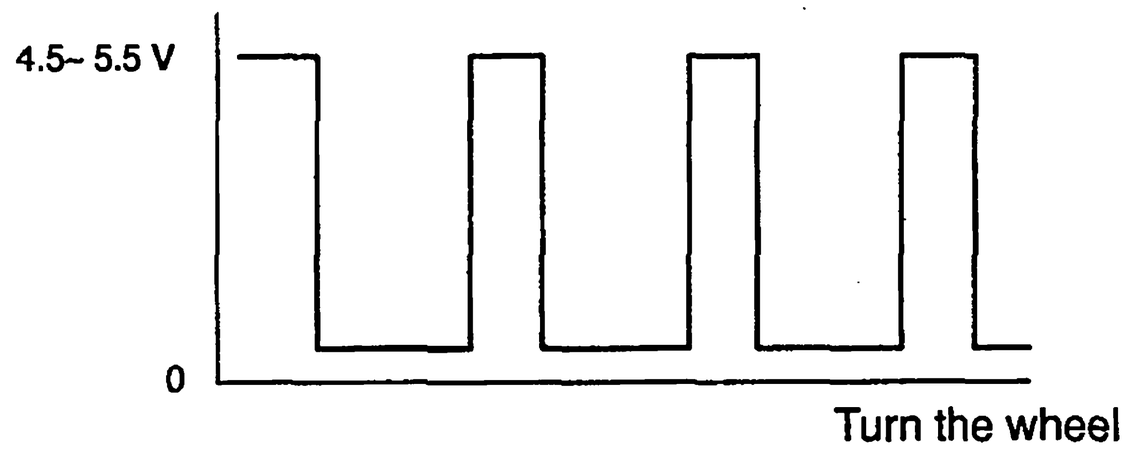
2	Check voltage between terminal SPD of engine ECU connector and body ground.



PREPARATION:
(a) Remove the glove compartment door.
(b) Shift the shift lever to neutral.
(c) Jack up a rear wheels on one side.
(d) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal SPD of the engine ECU connector and body ground when the wheel is turned slowly.

OK:
Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and engine ECU.**

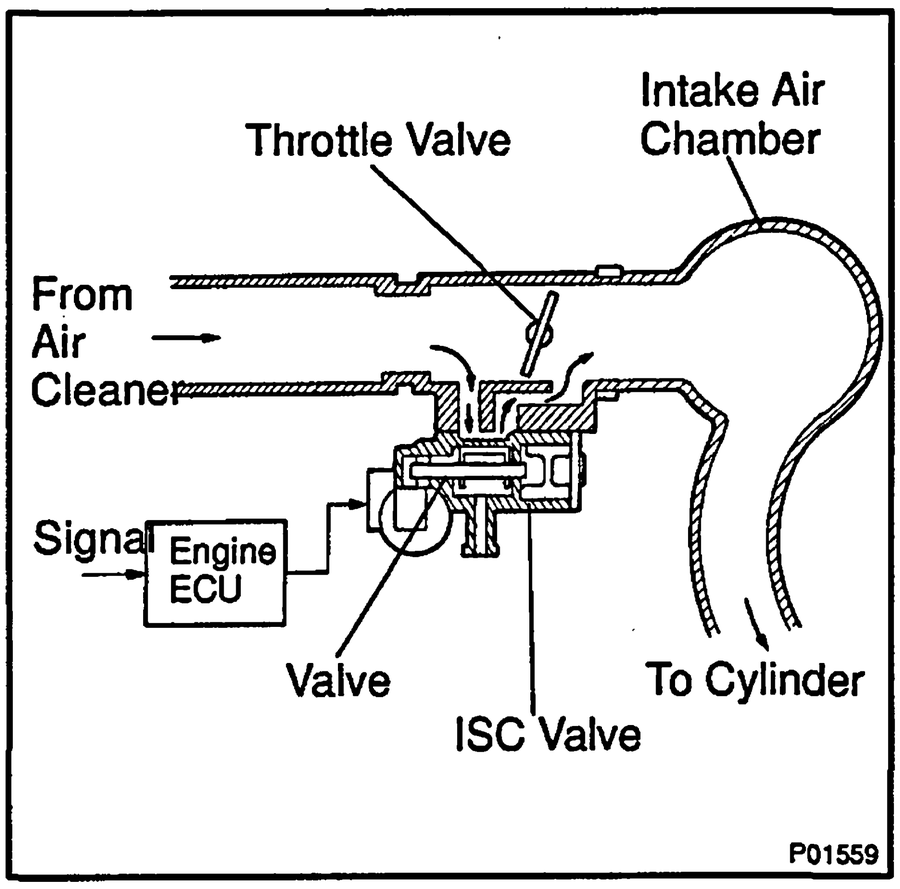
OK

Check and replace engine ECU (See page IN–20).

DI6B0-01

DTC P0505/33 Idle Control System Malfunction

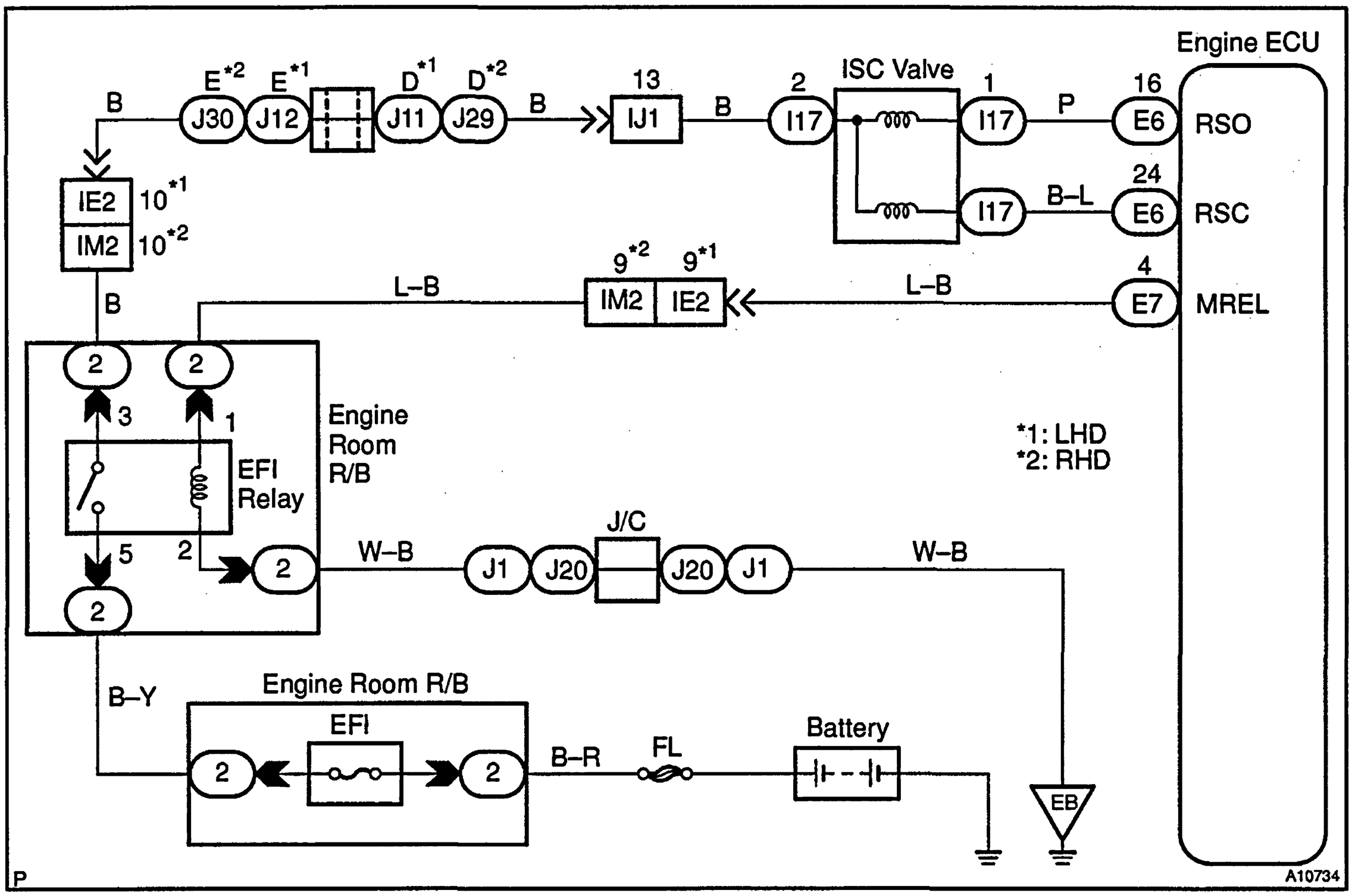
CIRCUIT DESCRIPTION



The rotary solenoid type ISC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the ISC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The engine ECU operates only the ISC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505/33	Open or short in ISC valve circuit.	• Open or short in ISC valve circuit • ISC valve • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

When using hand–held tester

1	**Check operation of the ISC valve.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Turn ignition switch ON and hand–held tester main switch ON.
(c) Select the active test mode on the hand–held tester.

CHECK:
Check engine speed when the ISC valve operated by hand–held tester.

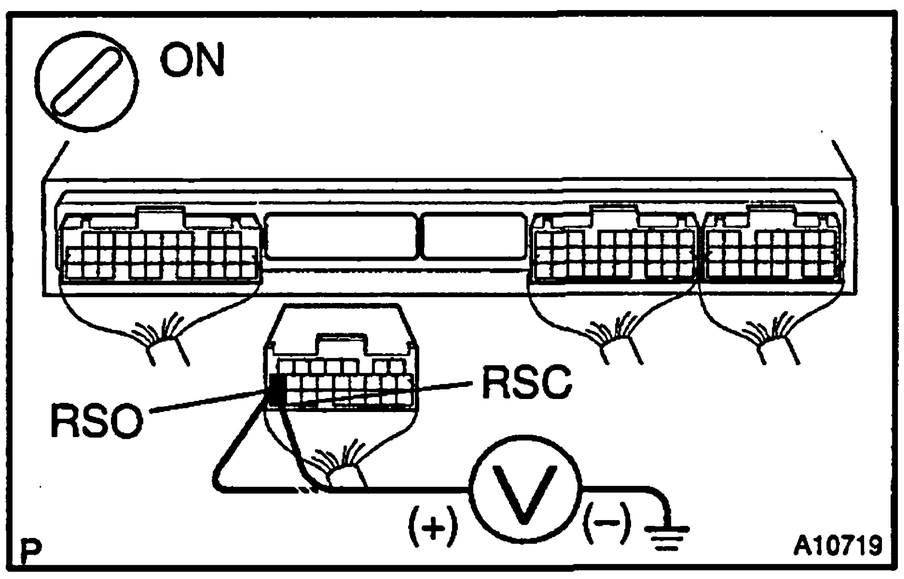
OK:

Engine speed is increased and decreased in response to change of ISC duty ratio.

OK → **Go to step 4.**

NG

2	**Check voltage between terminals RSO, RSC of the engine ECU connector and body ground.**



PREPARATION:
(a) Remove the glove compartment.
(b) Disconnect the E6 connector of the engine ECU.
(c) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals RSO, RSC of the engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 4.**

NG

3	Check ISC valve (See Pub. No. RM519E on page EG–150).

NG → Replace ISC valve.

OK →

Check for open and short in harness and connector between E/G Room J/B and ISC valve, ISC valve and engine ECU (See page IN–20).

4	Check air induction system.

NG → Repair or replace.

OK →

5	Check the A/C signal circuit.

NG → Repair or replace.

OK →

Check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	Check air induction system.

OK → Repair or replace.

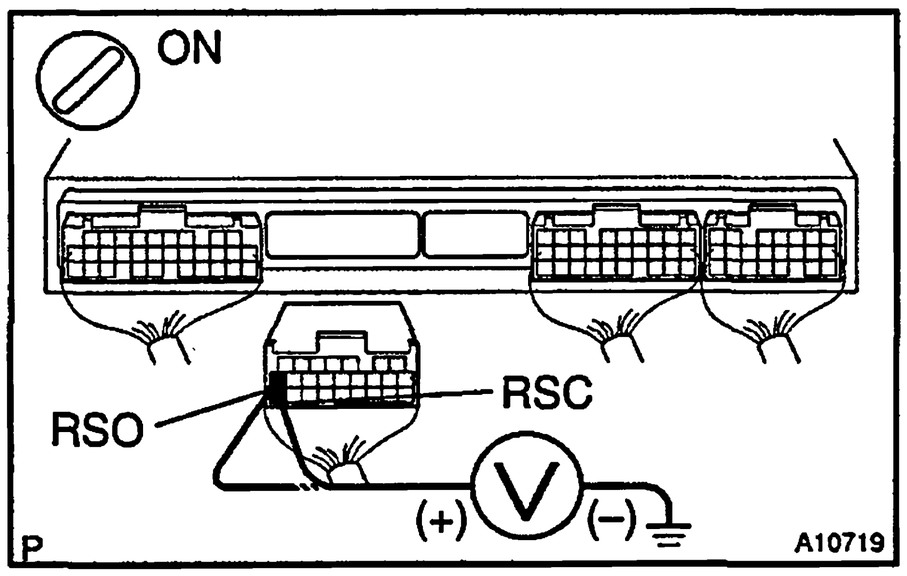
OK

2	Check for A/C signal circuit.

OK → Repair or replace.

OK

3	Check voltage between terminals RSO, RSC of engine ECU and body ground.



PREPARATION:

(a) Remove glove compartment.
(b) Disconnect the E6 connector of engine ECU.
(c) Turn ignition switch ON.

CHECK:

Measure voltage between terminals RSO, RSC of engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V

OK → Go to step 5.

NG

4	Check ISC valve.

NG → Replace ISC valve.

OK ↓

Check for open and short in harness and connector between J/B and ISC valve and engine ECU (See page IN–20).

5	Check operation of the ISC valve.

NG → Replace ISC valve.

OK ↓

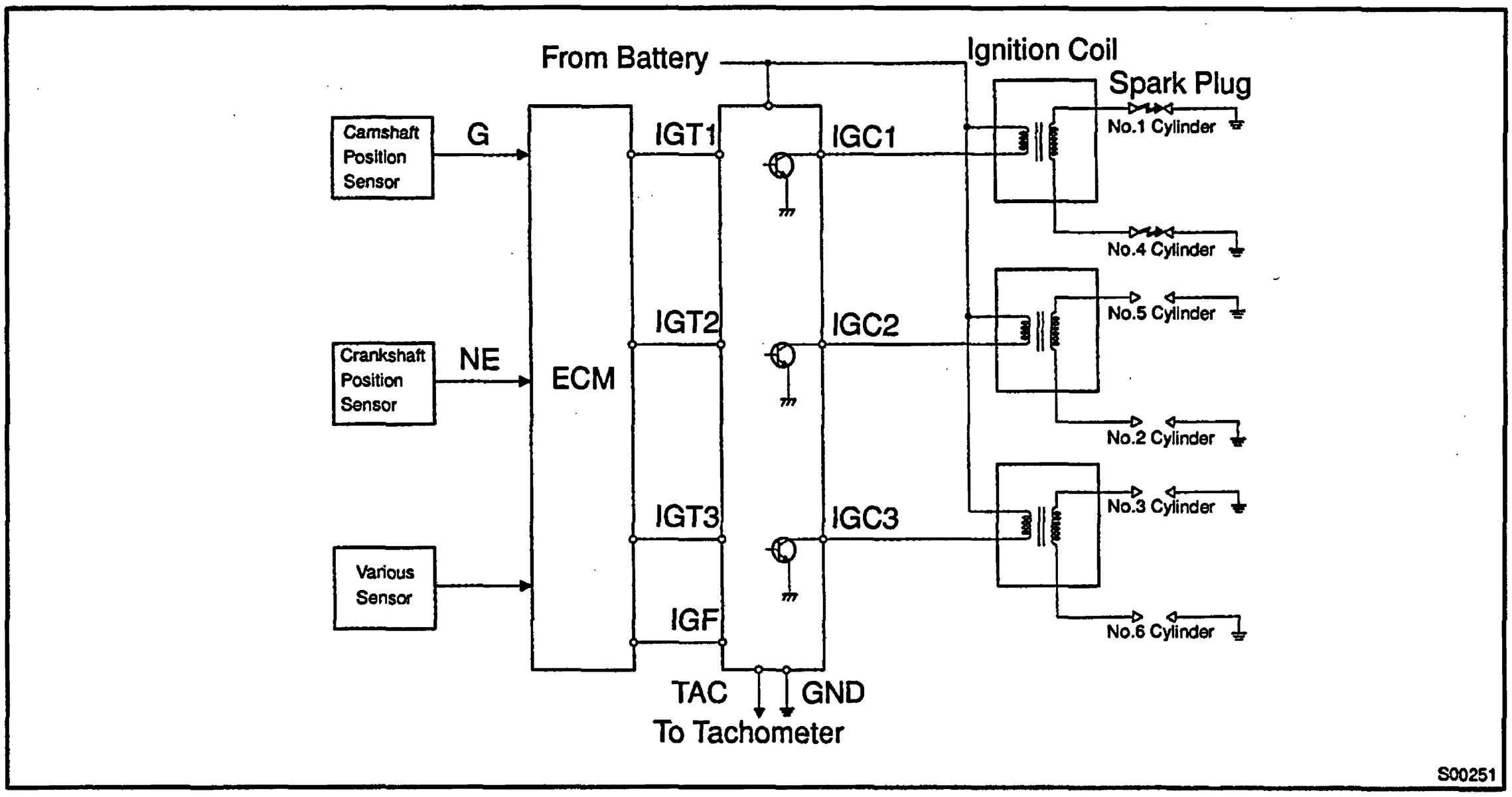
Check and replace engine ECU (See page IN–20).

DI6B1–01

DTC	P1300/14	Igniter Circuit Malfunction

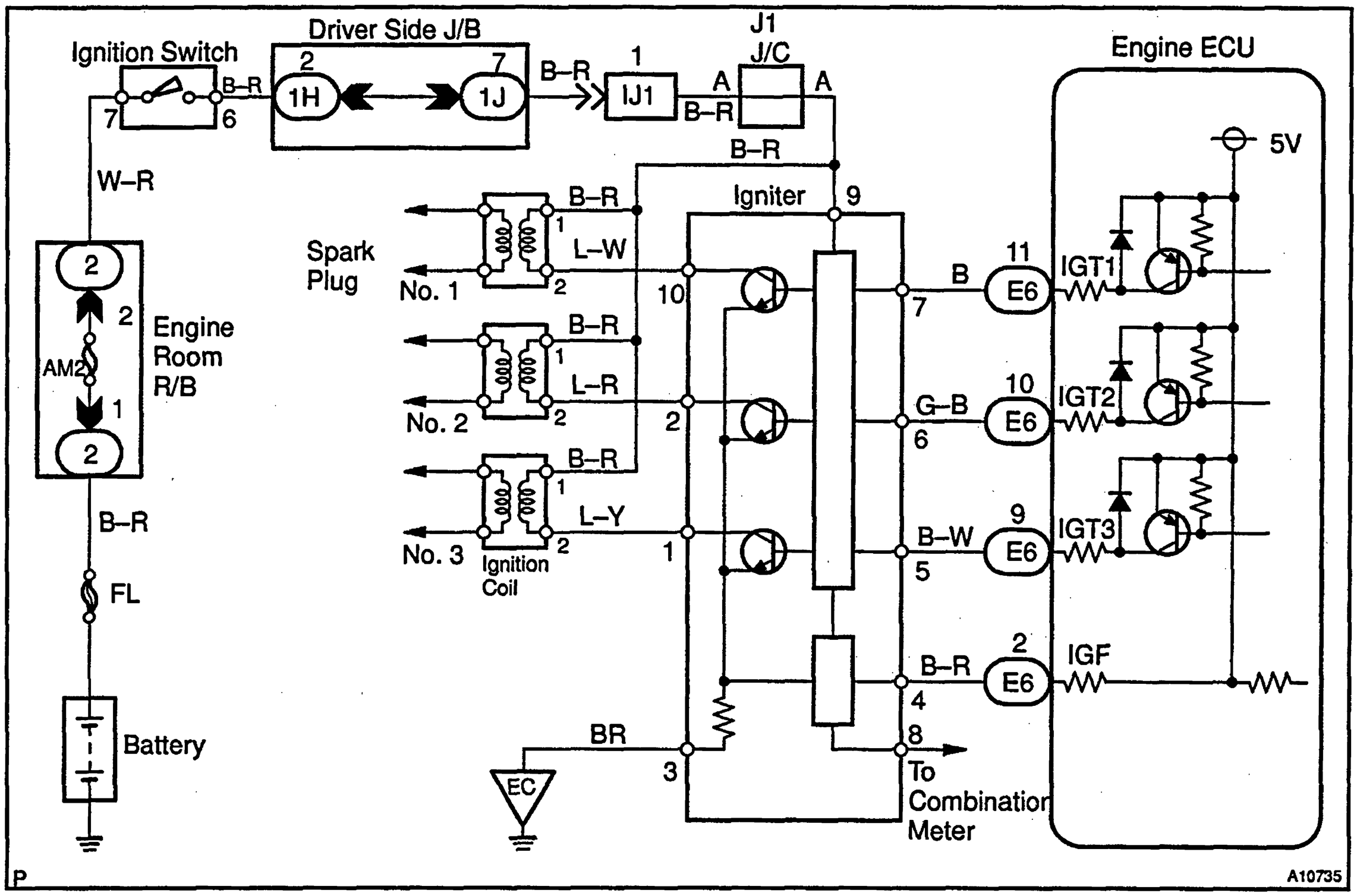
CIRCUIT DESCRIPTION

A DIS (Direct Ignition System) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with one ignition coil. In the 2–cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode. The engine ECU determines ignition timing end outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the igniter controls the primary ignition signals (IGC) for all ignition coils. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the engine ECU.



DTC No.	DTC Detecting Condition	Trouble Area
P1300/14	Condition (a) is repeated 3 times consecutively during 6 consecutively IGT signals while engine is running (a) IGF signal is not input to engine ECU for 2 or more ignitions	• Open or short in IGF and IGT circuit from igniter to engine ECU • Igniter • Ignition coil • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check spark plug and spark (See Pub. No. RM519E on page IG–3).**

NG → **Go to step 4.**

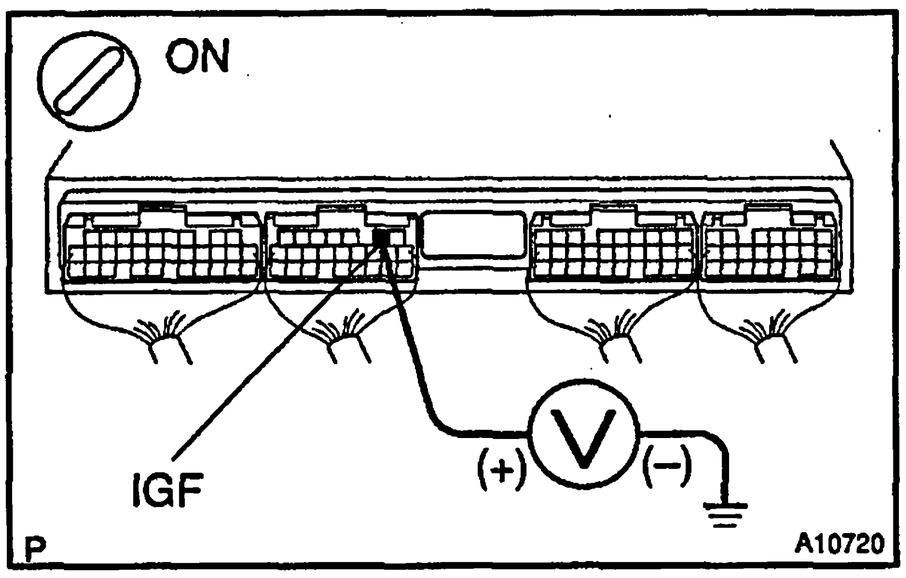
OK

2	**Check for open and short in harness and connector in IGF signal circuit between engine ECU and igniter (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

3	**Disconnect igniter connector and check voltage between terminal IGF of engine ECU connector and body ground.**



PREPARATION:

(a) Disconnect the igniter connector.
(b) Remove the glove compartment.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal IGF of the engine ECU connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → **Replace igniter.**

NG

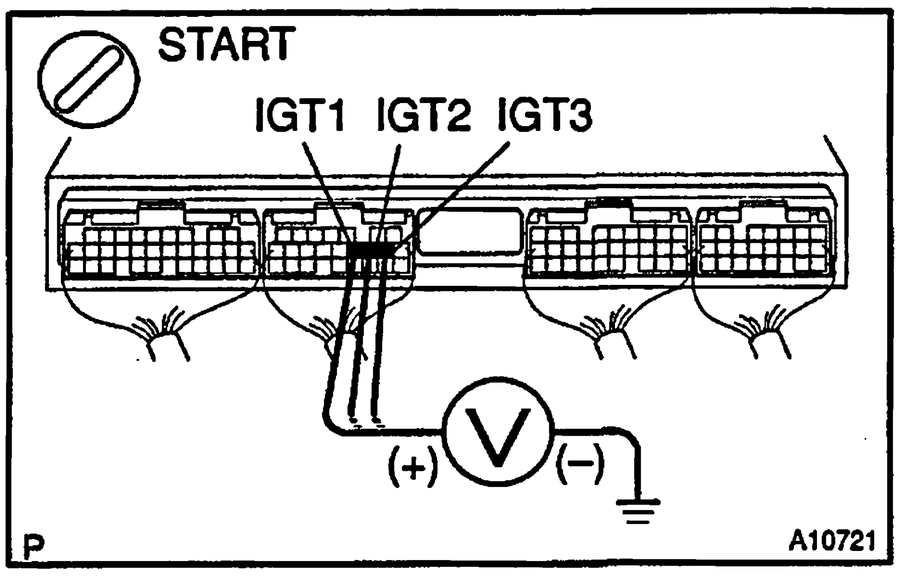
Check and replace engine ECU (See page IN–20).

4	**Check for open and short in harness and connector in IGT 1 – 3 signal circuit between engine ECU and igniter (See page IN–20).**

NG → **Repair or replace harness or connector.**

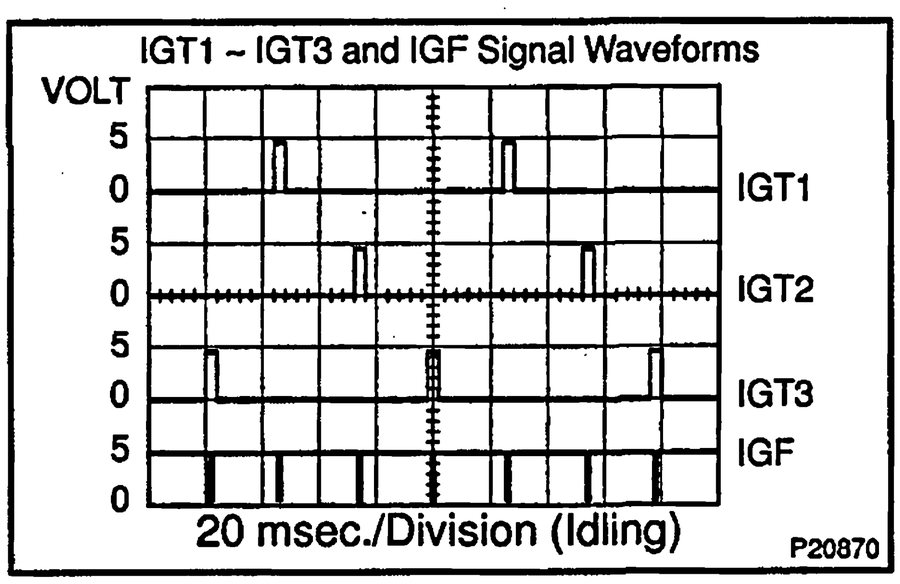
OK

5	**Check voltage between terminals IGT 1 – 3 of engine ECU connector and body ground.**



PREPARATION:
Remove the glove compartment.
CHECK:
Measure voltage between terminal IGT 1 – 3 of the engine ECU connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

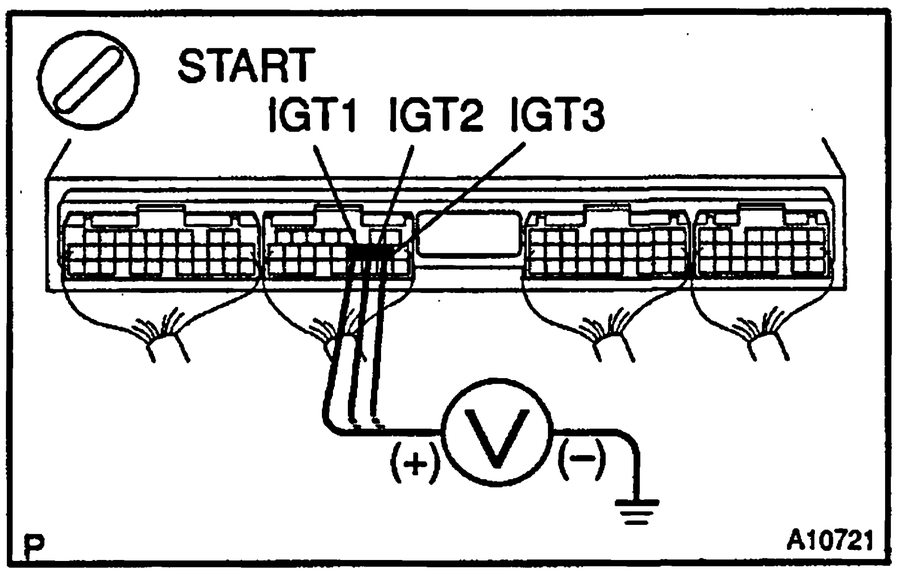


Reference: INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminals IGT 1 – 3, IGF and E1 of the engine ECU connector.
HINT:
The correct waveform is as shown.

NG → **Check and replace engine ECU (See page IN–20).**

OK

6	**Disconnect igniter connector and check voltage between terminals IGT 1 – 3 of engine ECU connector and body ground.**



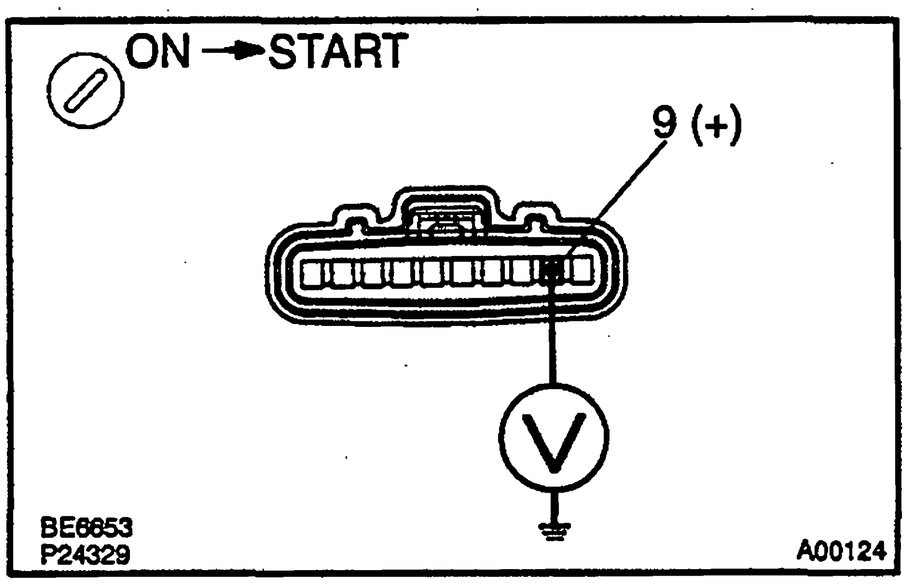
PREPARATION:
(a) Disconnect the igniter connector.
(b) Remove the glove compartment.
CHECK:
Measure voltage between terminals IGT 1 – 3 of the engine ECU connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 5.0 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

7	**Check voltage between terminal 9 of igniter connector and body ground.**



PREPARATION:
Disconnect the igniter connector.
CHECK:
Measure voltage between terminal 9 of the igniter connector and body ground, when the ignition switch is turned to "ON" and "START" position.
OK:
Voltage: 9 – 14 V

NG → **Check and repair igniter power source circuit.**

OK

8	**Check for open and short in harness and connector between ignition switch and ignition coil, and ignition coil and igniter (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

9	**Check Ignition coil (See Pub. No. RM519E on page IG–7).**

NG → **Replace ignition coil.**

OK

10	Check EFI main relay (Marking: EFI).

NG → Replace EFI main relay (Marking: EFI).

OK →

Replace igniter.

D16B2-01

DTC	P1335/13	Crankshaft Position Sensor Circuit Malfunction (during engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–66.

DTC No.	DTC Detecting Condition	Trouble Area
P1335/13	No crankshaft position sensor signal to ECM with engine speed 1,500 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • Engine ECU

WIRING DIAGRAM

Refer to DTC P0335/12, 13 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–66.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

Refer to DTC P0335/12, 13 (Crankshaft Position Sensor "A" Circuit Malfunction) on page DI–66

D16B3–01

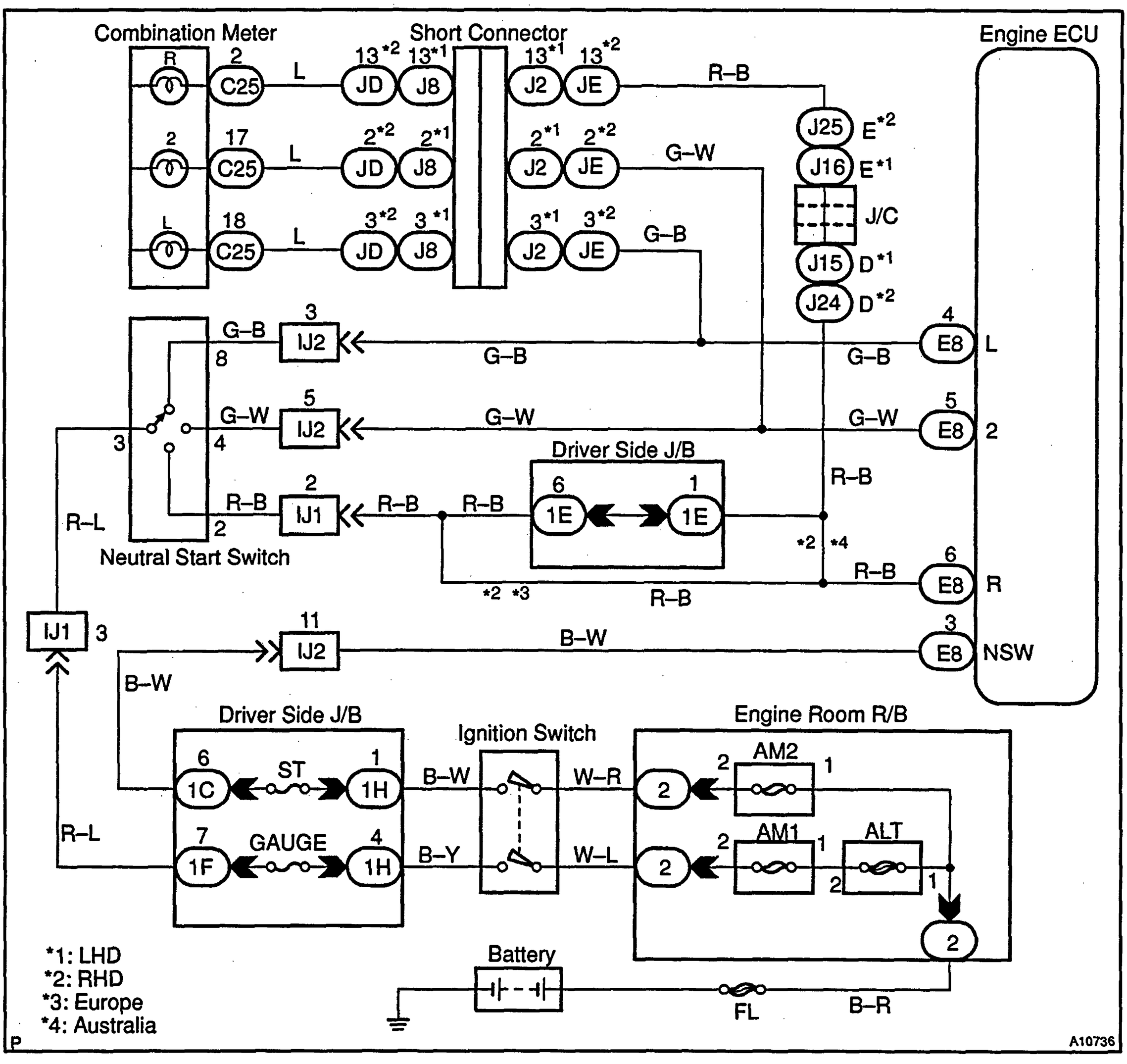
Neutral Start Switch Circuit

CIRCUIT DESCRIPTION

The neutral start switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the engine ECU is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0V. When the shift lever is in the D, 2, L or R position, the neutral start switch goes off, so the voltage of engine ECU. Terminal NSW becomes battery voltage, the voltage of the engine ECU internal power source.

If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check R , 2, L and NSW signals.**

When using hand–held tester:

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

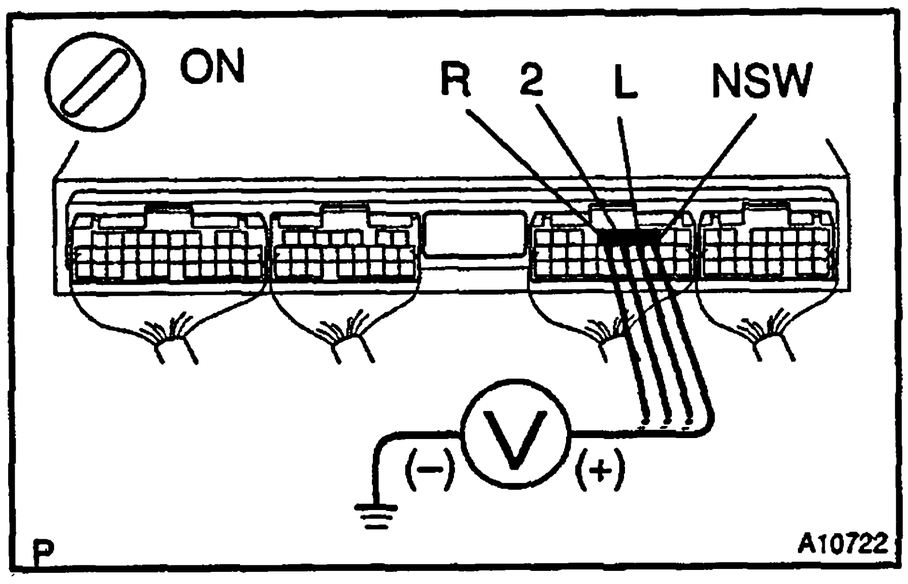
(b) Turn the ignition switch ON and hand–held tester main switch ON.

CHECK:

Shift the shift lever to the P, R, N, 2, or L positions, and read the NSW, R, 2 and L signal on the hand–held tester.

OK:

Shift position	Signal
P, N	NSW OFF → ON
R	R OFF → ON
2	2 OFF → ON
L	L OFF → ON



When not using hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals R, NSW, 2, L of engine ECU and body ground when the shift lever is shifted to the following positions.

OK:

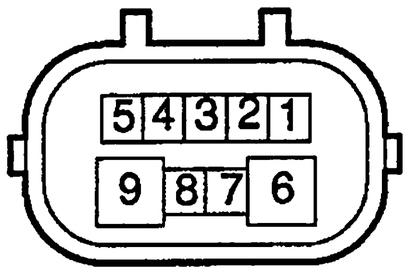
Position	R–Body ground	NSW–Body ground	2–Body ground	L–Body ground
P, N	0 V	Below 1 V	Below 1 V	Below 1 V
R	7.5 – 14 V	7.5 – 14 V	Below 1 V	Below 1 V
D	Below 1 V	7.5 – 14 V	Below 1 V	Below 1 V
2	Below 1 V	7.5 – 14 V	7.5 – 14 V	Below 1 V
L	Below 1 V	7.5 – 14 V	Below 1 V	7.5 – 14 V

*: The voltage will drop slightly due to lighting up of the back up light.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

NG

2	Check neutral start switch.



PREPARATION:
Remove the neutral start switch connector.

CHECK:
Check continuity between each terminal shown below when the shift lever is shifted to each position.

OK:

Shift position	Terminal No. to continuity	Terminal No. to continuity
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–
2	3 – 4	–
L	3 – 8	–

NG → **Replace neutral start switch.**

OK ↓

3	Check harness and connector between battery and neutral start switch, neutral start switch and engine ECU (See page IN–20).

NG → **Repair or replace harness and connector.**

OK ↓

Check and replace engine ECU (See page IN–20).

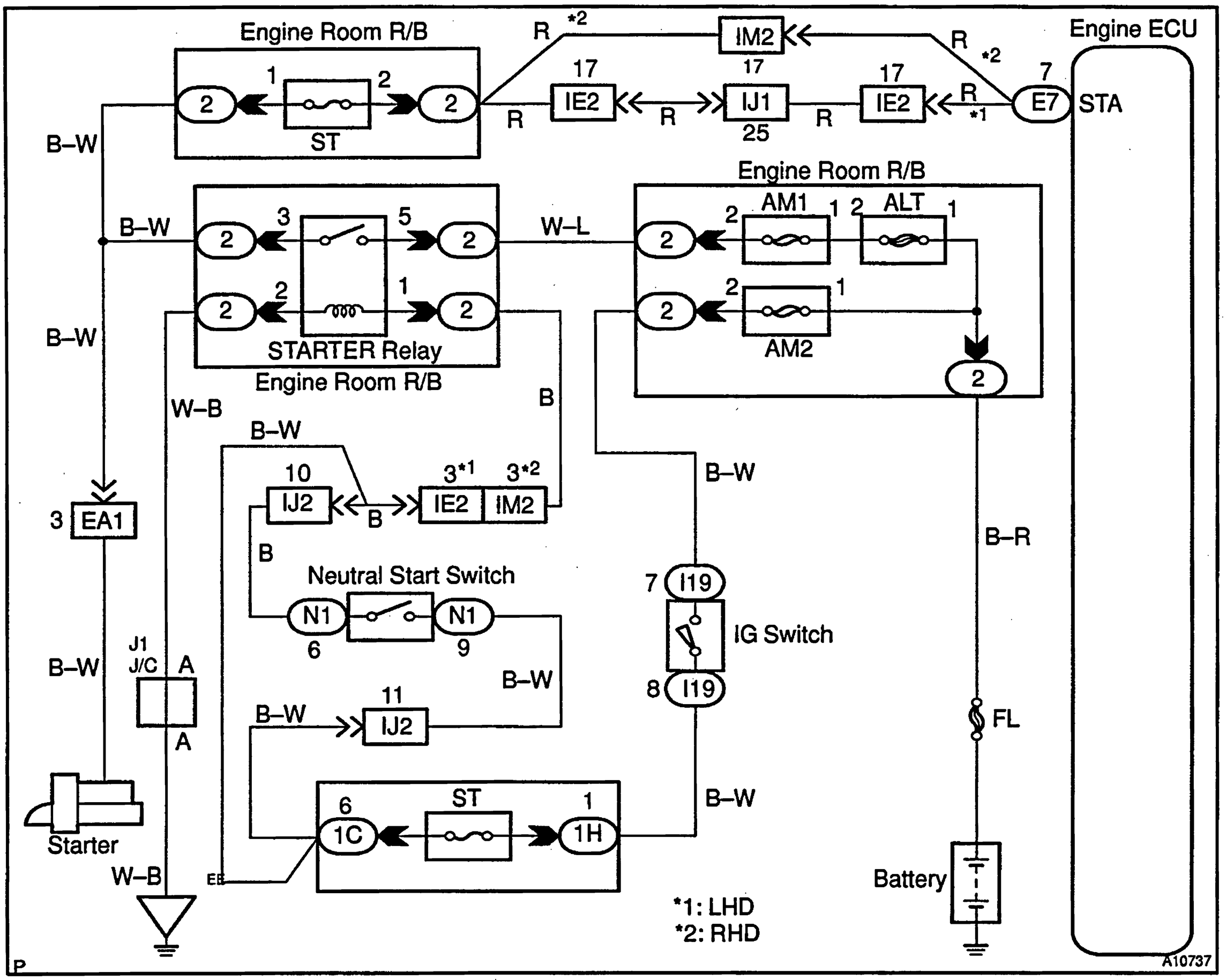
DI6B4-01

Starter Signal Circuit

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the engine ECU. The starter signal id mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page DI–21.

When using hand–held tester

1	**Connect hand–held tester and check STA signal.**

PREPARATION:
(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:
Read STA signal on the hand–held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA signal	OFF	ON

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (Marking: STARTER) (See page IN–20).**

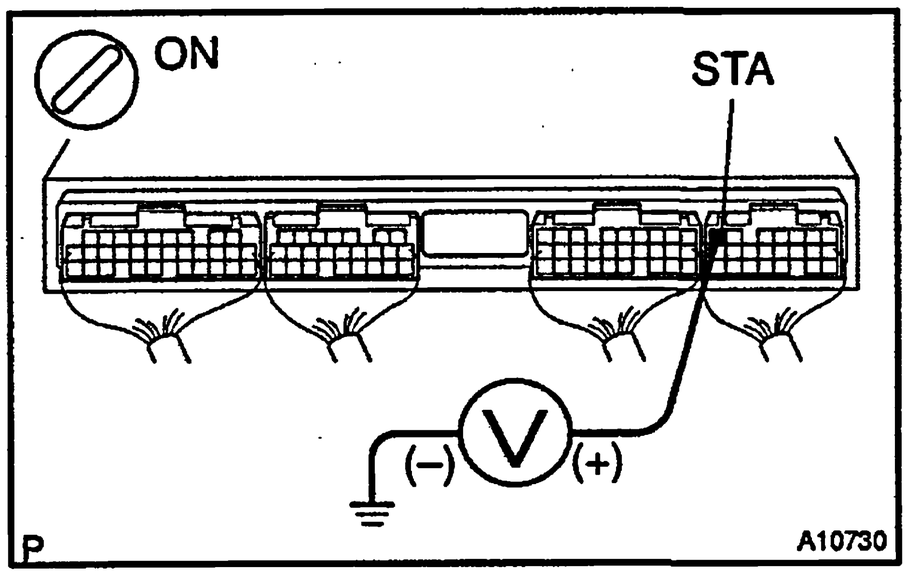
NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	**Check voltage between terminal STA of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal STA of the engine ECU connector and body ground, during engine cranking.

OK:

Voltage: 6 V or more

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (Marking: STARTER) (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

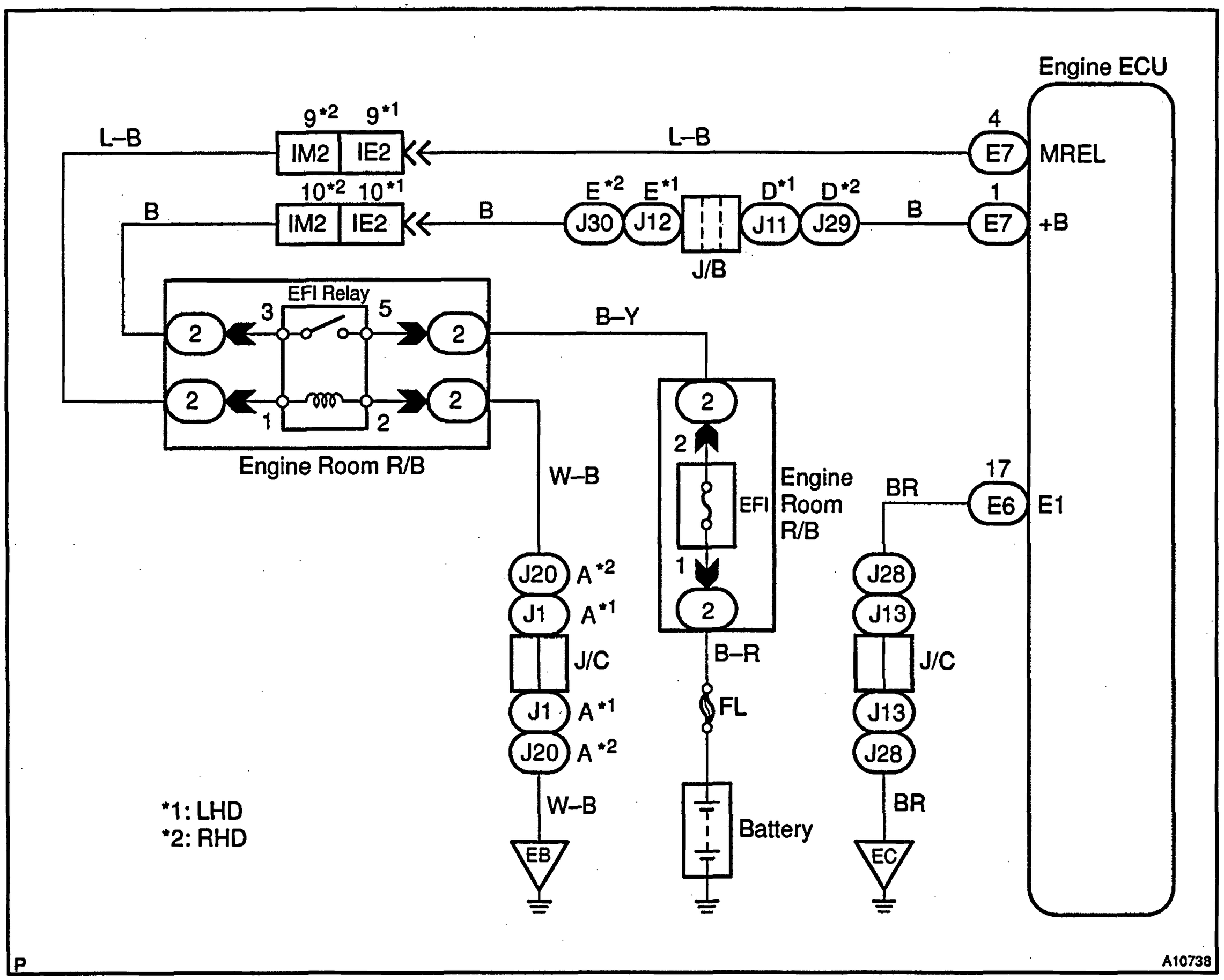
Check and replace engine ECU (See page IN–20).

Engine ECU Power Source Circuit

CIRCUIT DESCRIPTION

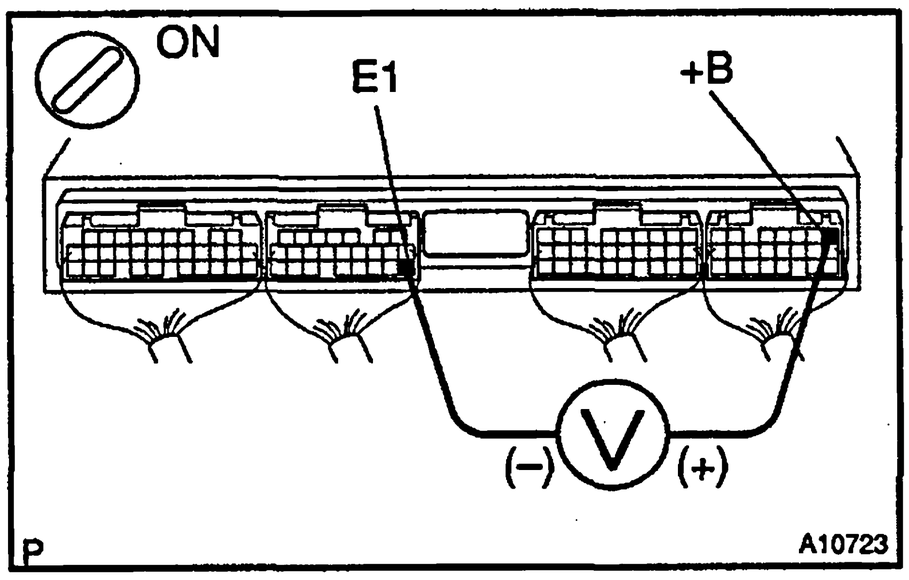
When the ignition switch is turned ON, battery positive voltage is applied to the terminal IGSW of the engine ECU and the EFI main relay (Making: EFI) control circuit in the engine ECU sends a signal to the terminal MREL of the engine ECU switching on the EFI main relay.
This signal causes current to flow to the coil, closing the contacts of the EFI main relay and supplying power to the terminals +B of the engine ECU.
If the ignition switch is turned off, the engine ECU continues to switch on the EFI main relay for a maximum of 2 seconds for the initial setting of the throttle body.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 of engine ECU connector.**



PREPARATION:
(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals +B and E1 of the engine ECU connector.

OK:
Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on Problem symptoms table (See page DI–21).**

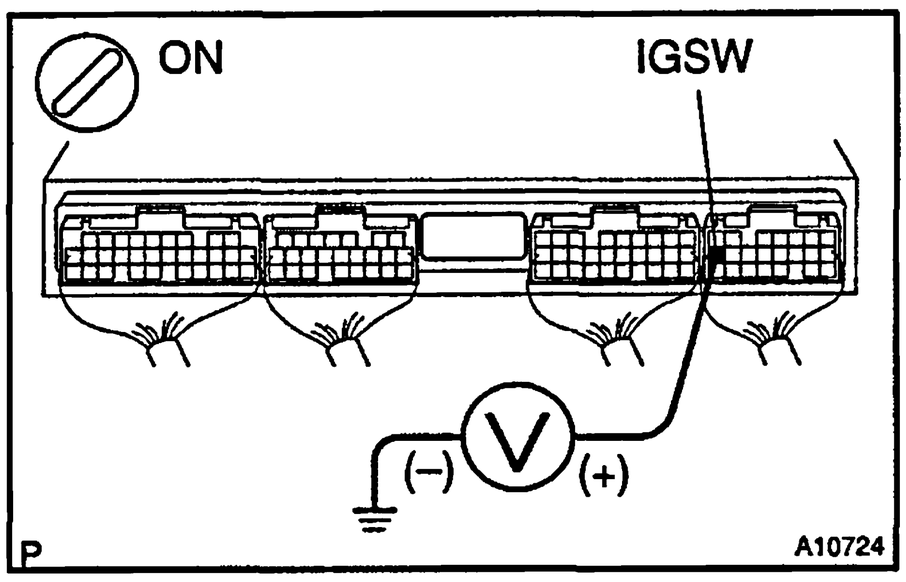
NG

2	**Check for open in harness and connector between terminal E1 of engine ECU and body ground (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminal IGSW of engine ECU connector and body ground.**



PREPARATION:
Turn the ignition switch ON.

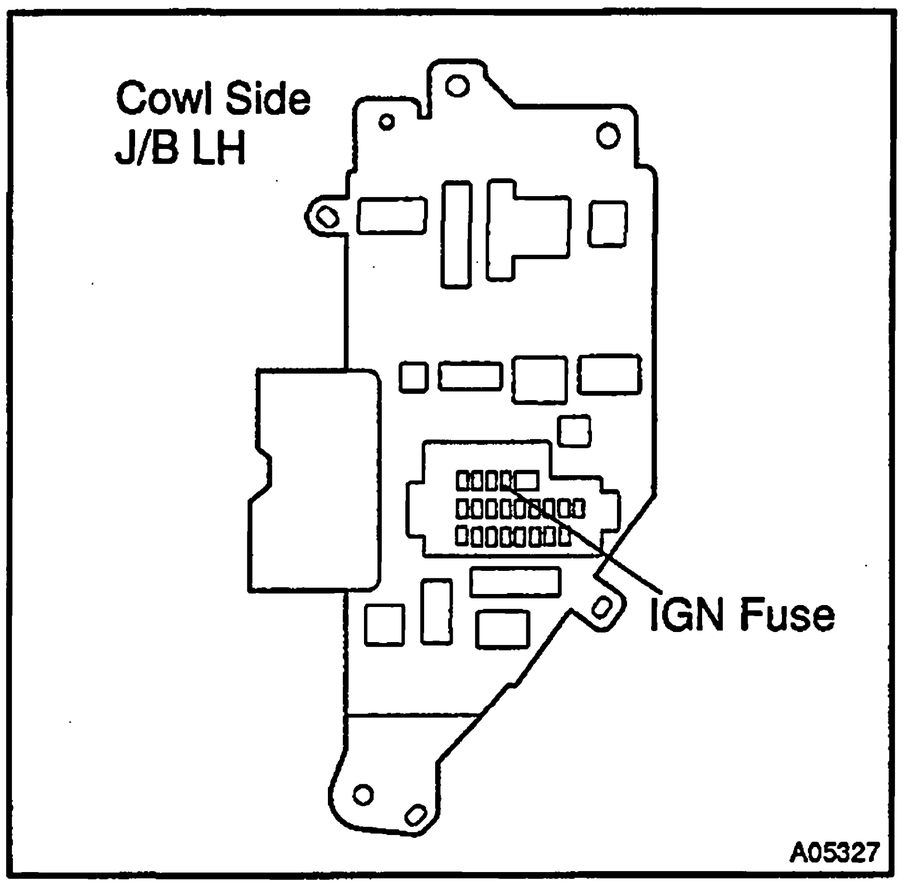
CHECK:
Measure voltage between terminal IGSW of the engine ECU and body ground.

OK:
Voltage: 9 – 14 V

OK → **Go to step 6.**

NG

4	Check IGN fuse.



PREPARATION:
Remove the IGN fuse from the cowl side J/B LH.
CHECK:
Check continuity of the IGN fuse.
OK:

Continuity

NG → **Check for short in all harness and components connected to IGN fuse.**

OK ↓

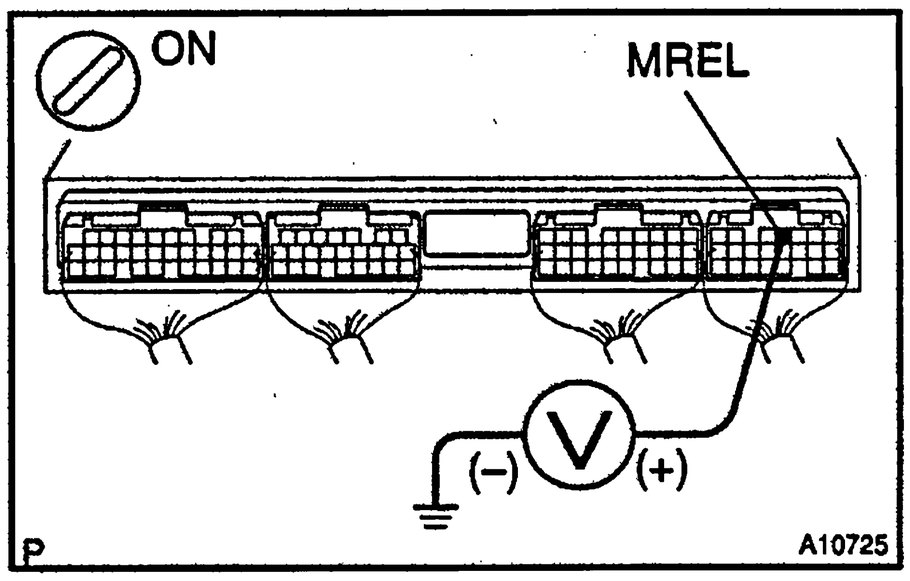
5	Check ignition switch.

NG → **Replace ignition switch.**

OK ↓

Check and repair harness and connector between battery and ignition switch, ignition switch and engine ECU.

6	**Check voltage between terminal MREL of engine ECU connector and body ground.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure voltage between terminal MREL of the engine ECU connector and body ground.
OK:
Voltage: 9 – 14 V

NG → **Check and replace engine ECU (See page IN–20).**

OK

7	**Check EFI fuse of engine room J/B.**

NG → **Check for short in all harness and components connected to EFI fuse.**

OK

8	**Check EFI main relay (Marking: EFI).**

NG → **Replace EFI main relay (Marking: EFI).**

OK

9	Check for open and short in harness and connector between terminal MREL of engine ECU and body ground (See page IN–20).

NG → Repair and replace harness or connector.

OK →

Check and repair harness or connector between EFI fuse and battery.

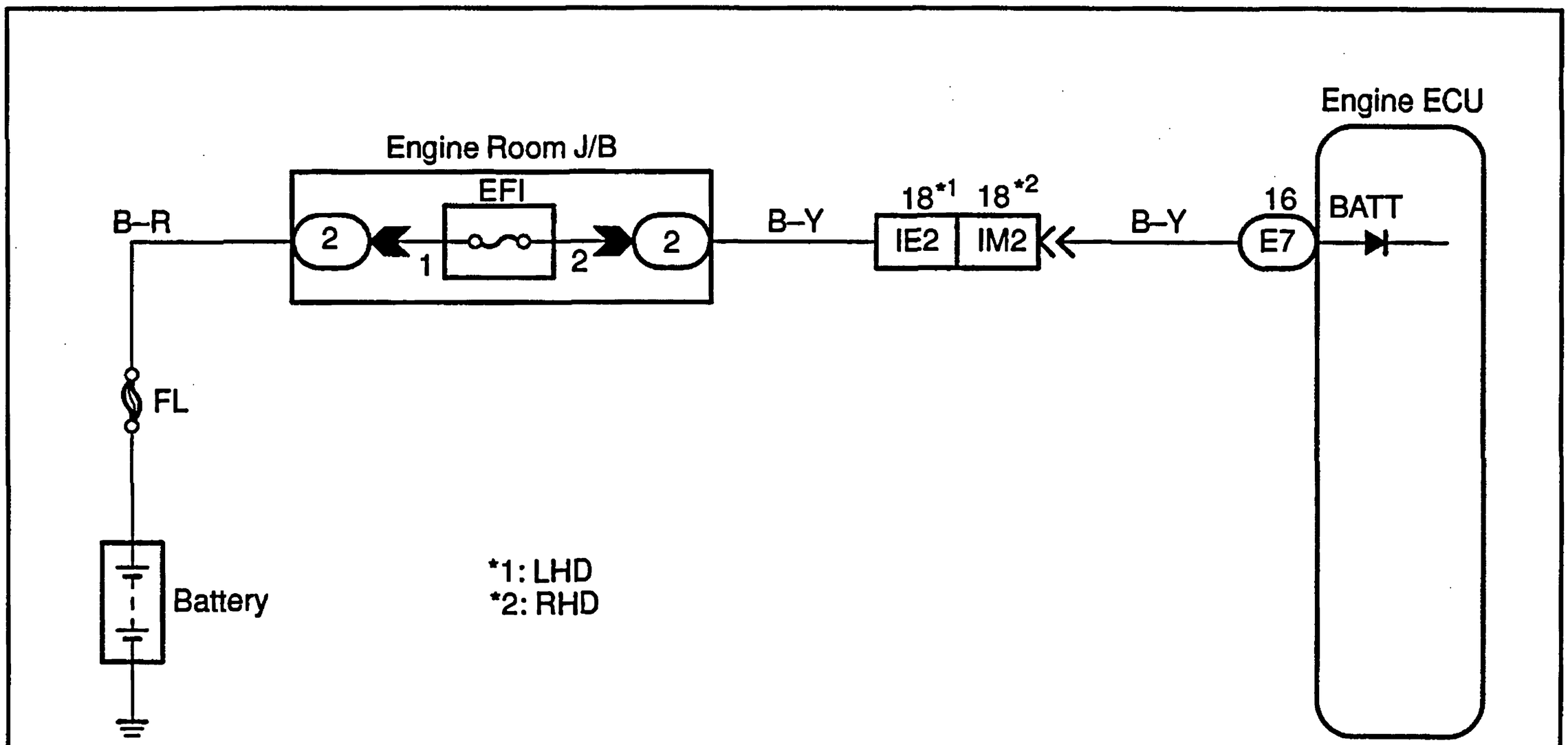
DI656-01

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

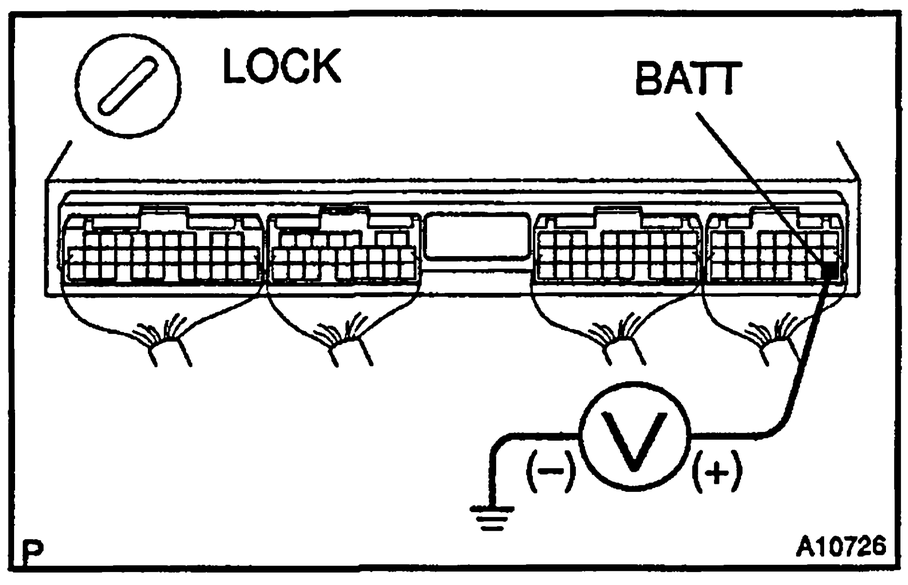
Battery positive voltage is supplied to terminal BATT of the engine ECU even when the ignition switch is OFF for use by the DTC memory, air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal BATT of engine ECU connector and body ground.**



PREPARATION:

Remove the glove compartment door.

CHECK:

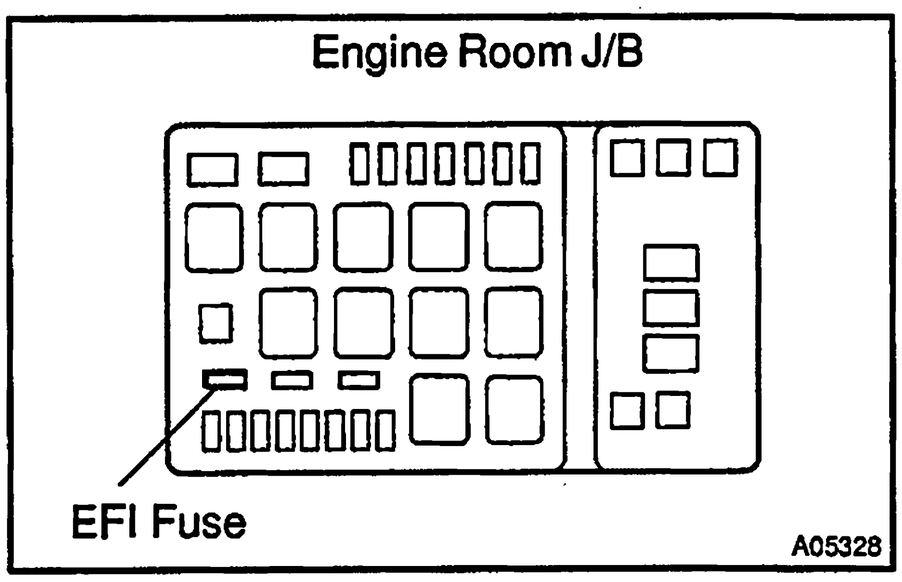
Measure voltage between terminal BATT of the engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V

OK	**Check and replace engine ECU (See page IN–20).**
NG	

2	**Check EFI fuse.**



PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check continuity of the EFI fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

Check and repair harness or connector between battery, EFI fuse and engine ECU.

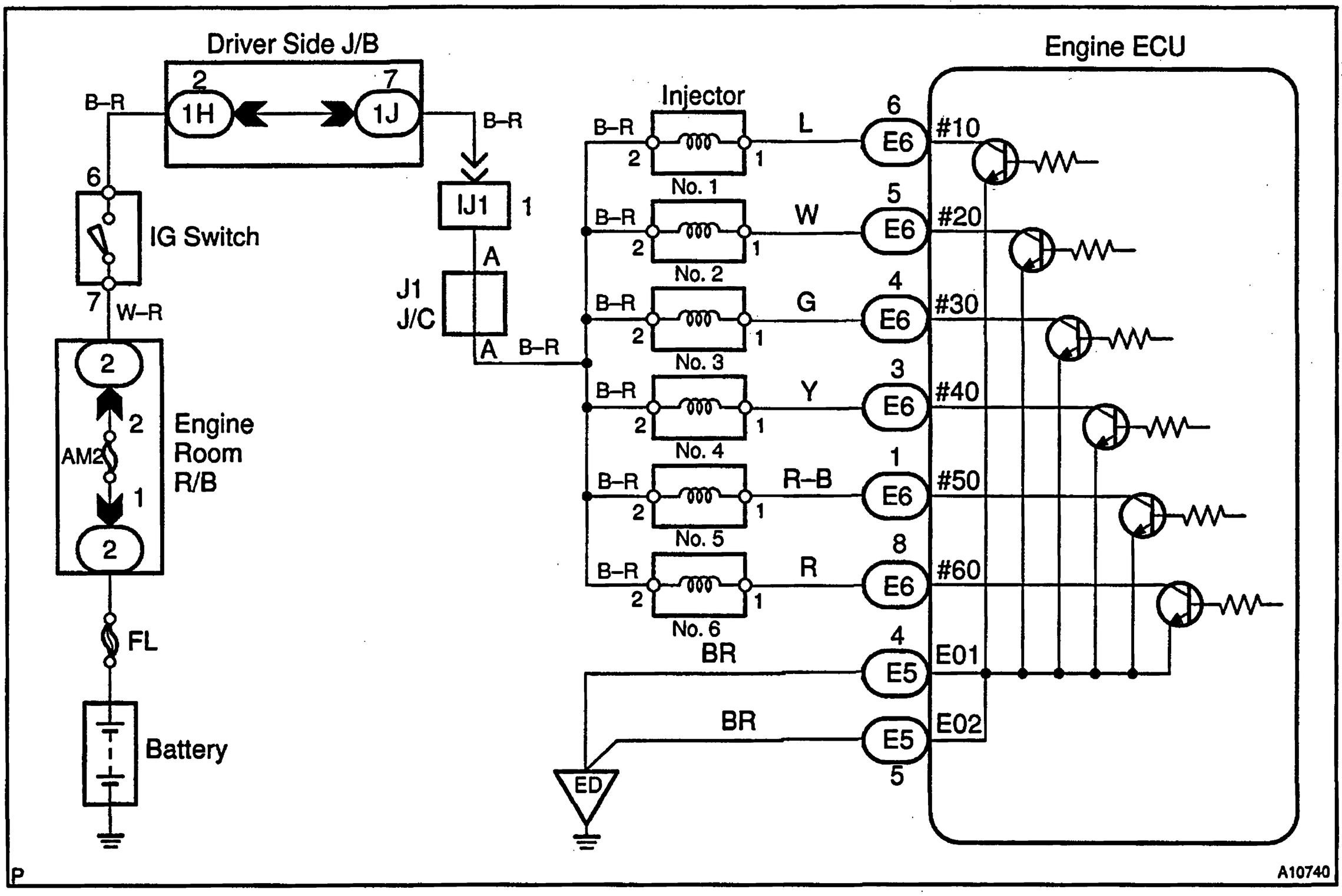
DI6B7-01

Injector Circuit

CIRCUIT DESCRIPTION

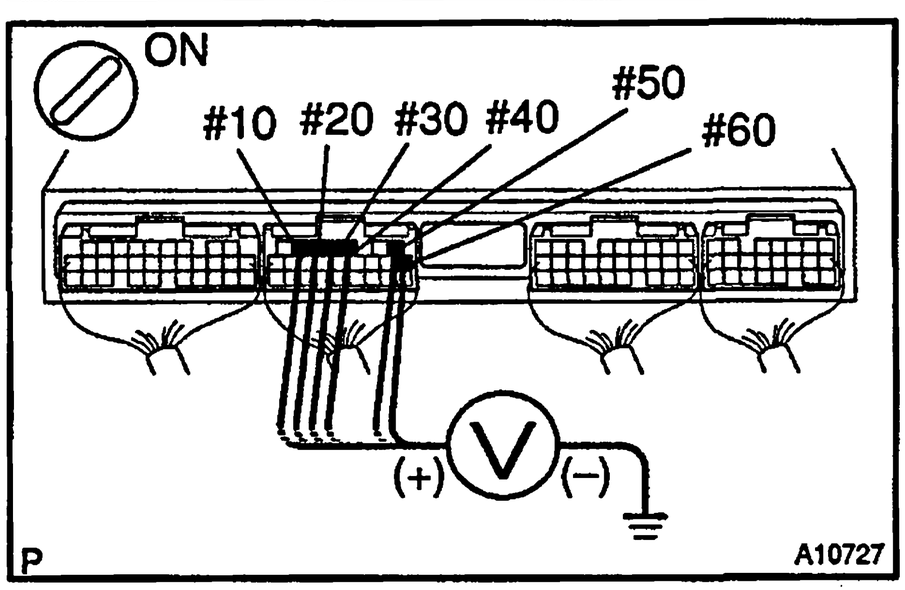
The injectors are provided to the intake manifold. They inject fuel into the cylinders based on the signals from engine ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage of engine ECU terminal for injector of failed cylinder.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of the engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V

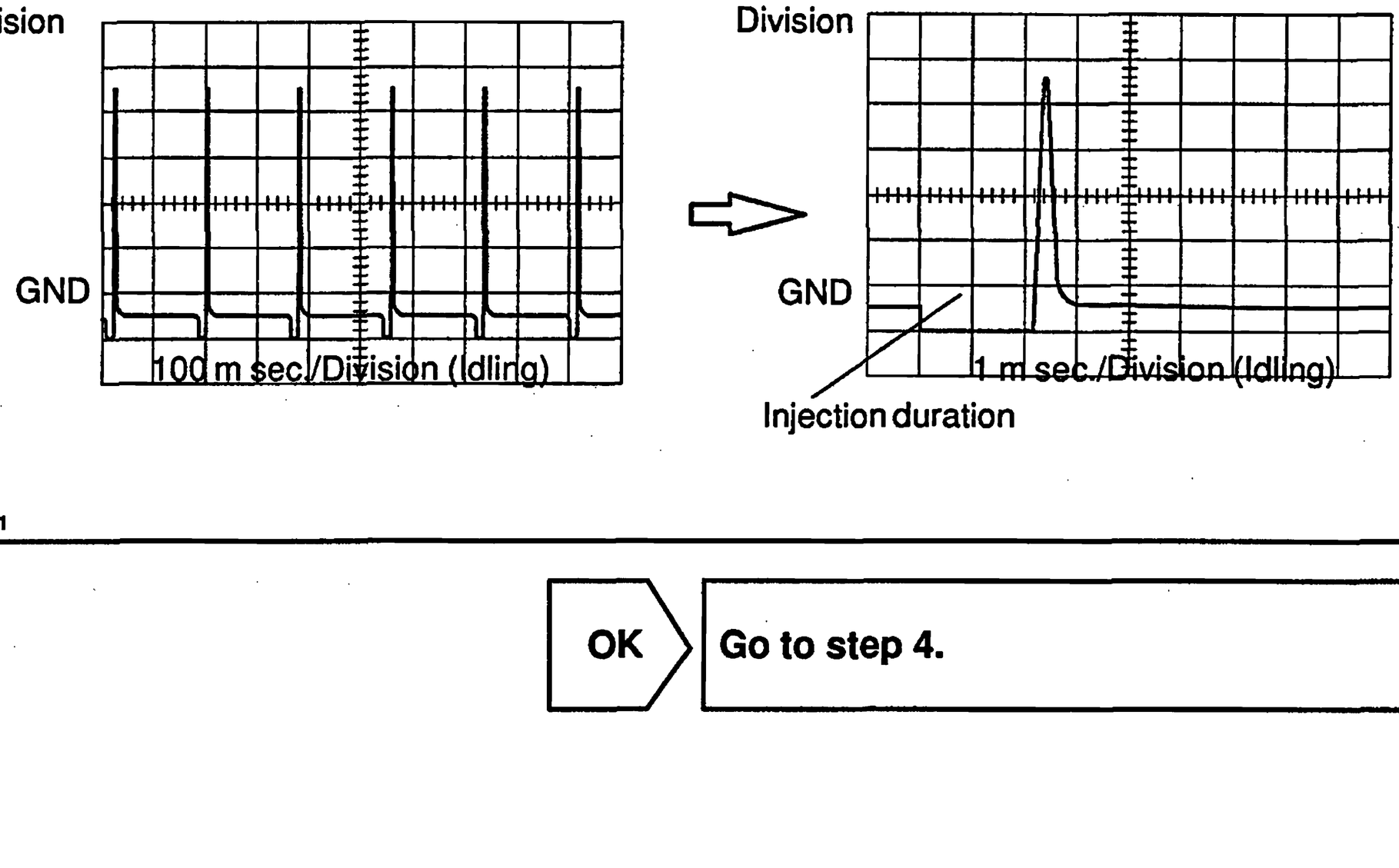
Reference INSPECTION USING OSCILLOSCOPE

With the engine idling, measure between terminals #10 – #60 and E01 of the engine ECU connector.

HINT:

The correct waveforms are as shown.

Injector Signal Waveform

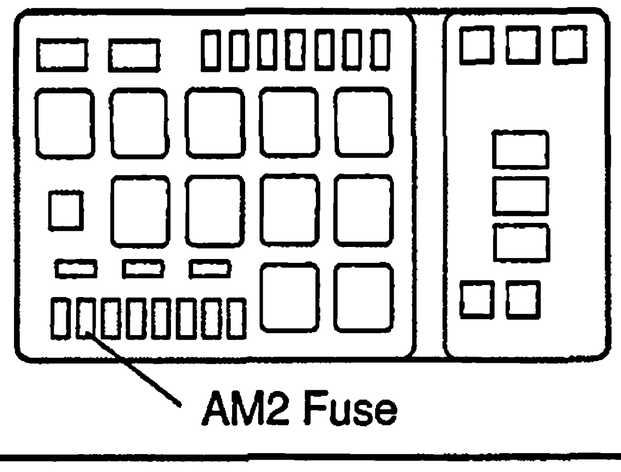


B05020 B05021 A05944

OK → Go to step 4.

NG

2	**Check AM2 fuse.**



A05328

PREPARATION:

Remove the AM2 fuse from the engine room J/B.

CHECK:

Check continuity of the AM2 fuse.

OK:

Continuity

NG → **Check for short in harness and all components connected to AM2 fuse.**

OK

3	Check resistance of injectors (See page FI–3).

NG → Replace injector.

OK

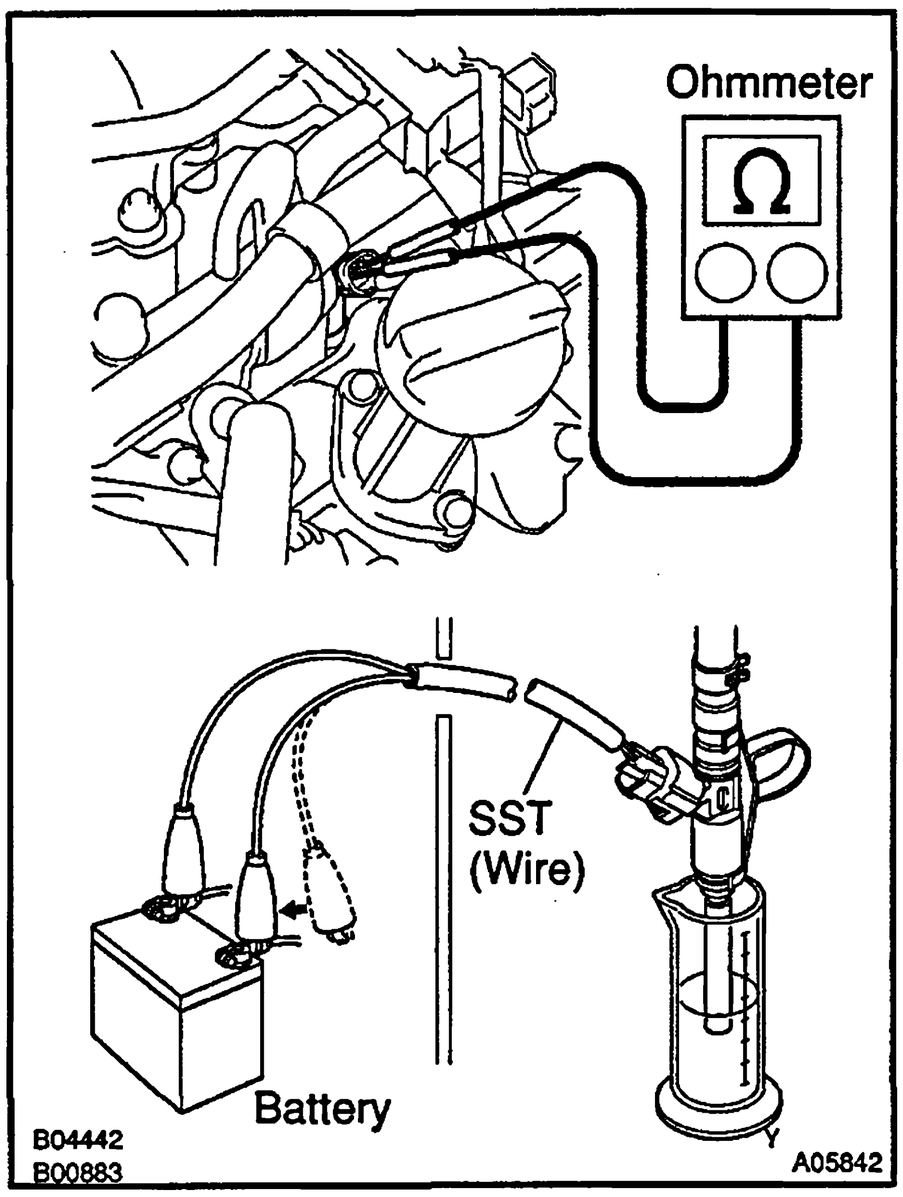
Check and repair harness and connector between engine ECU and battery.

4	Check for open in harness and connector between terminal E01 – E03 of engine ECU connector and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK

5	Check injectors.



PREPARATION:
Disconnect the injector connectors.

CHECK:
Measure resistance of the injectors.

OK:

Resistance: 13.4 – 14.2 Ω at 21°C (68°F)

CHECK:
Check injection volume of the injectors.

OK:

Injection volume:
60 – 73 cm^3 (3.7 – 4.5 cu in.)/15 sec.
Difference between each injector:
Less than 13 cm^3 (0.8 cu in.)
Leakage
Fuel drop: One drop or less per minute

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

NG

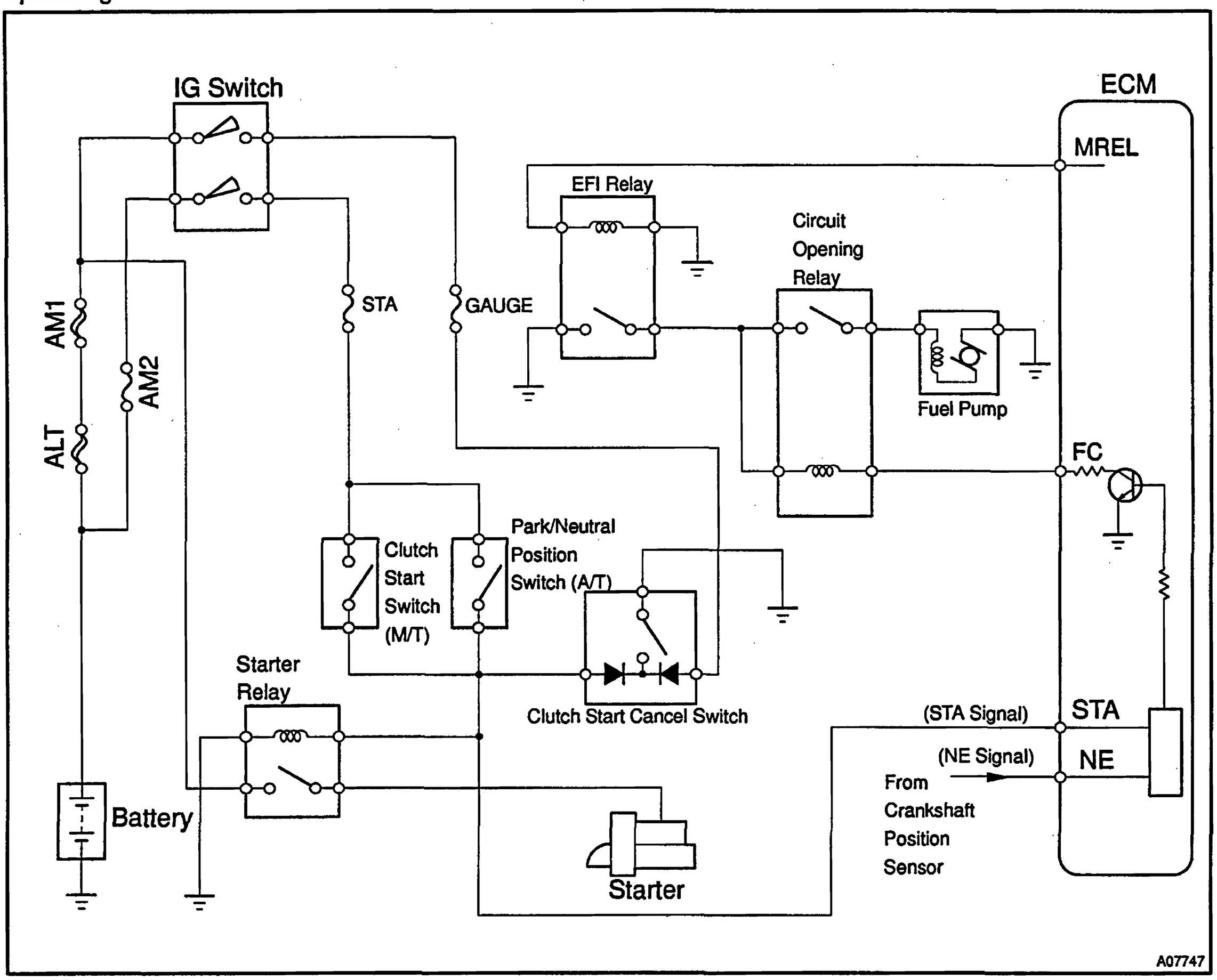
Replace injector(s).

D16B6-01

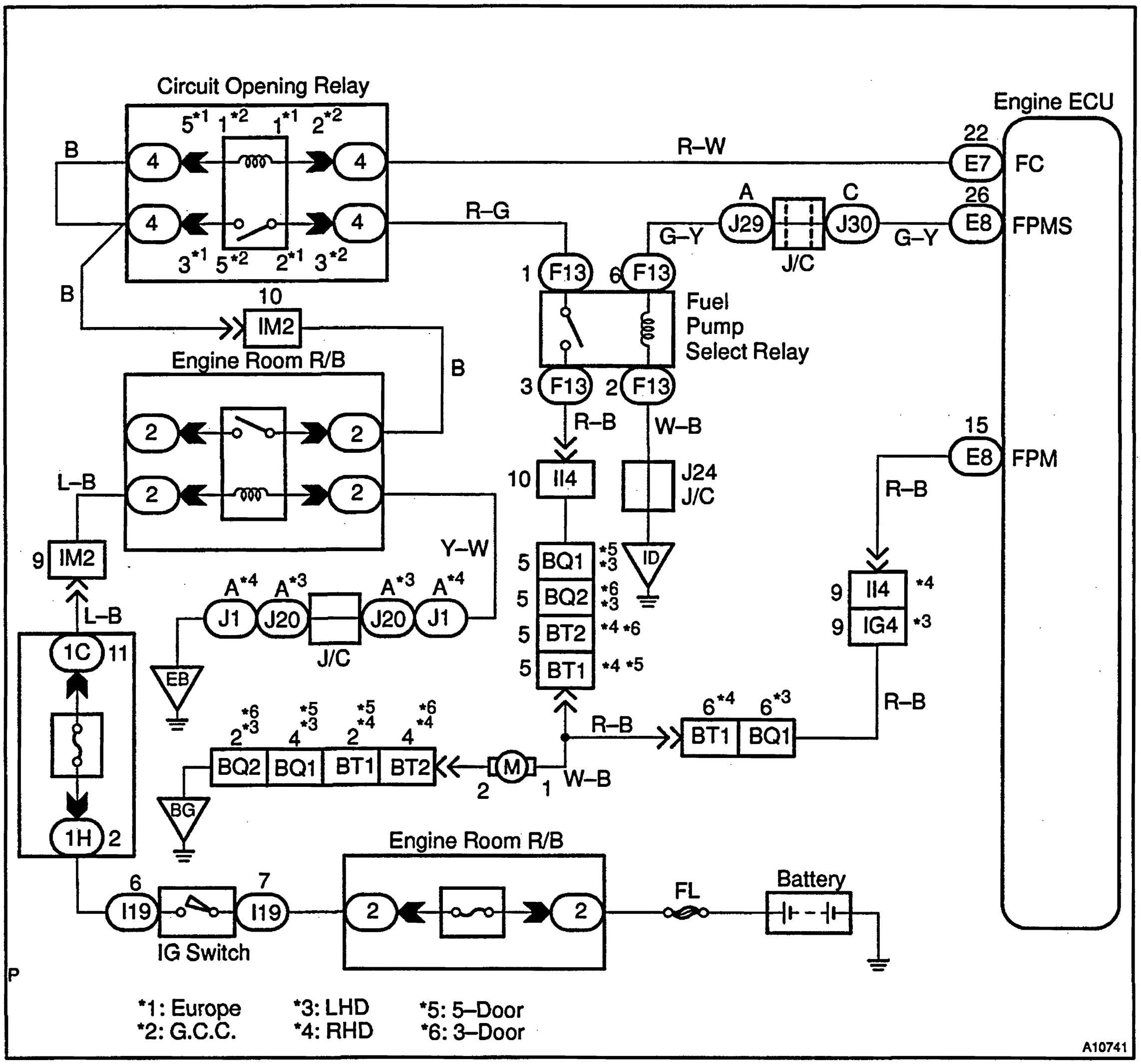
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump oparates. When the STA signal and NE signal are input to the engine ECU, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on, and the fuel pump operates. While the NE signal is generated (engine running), the engine ECU keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



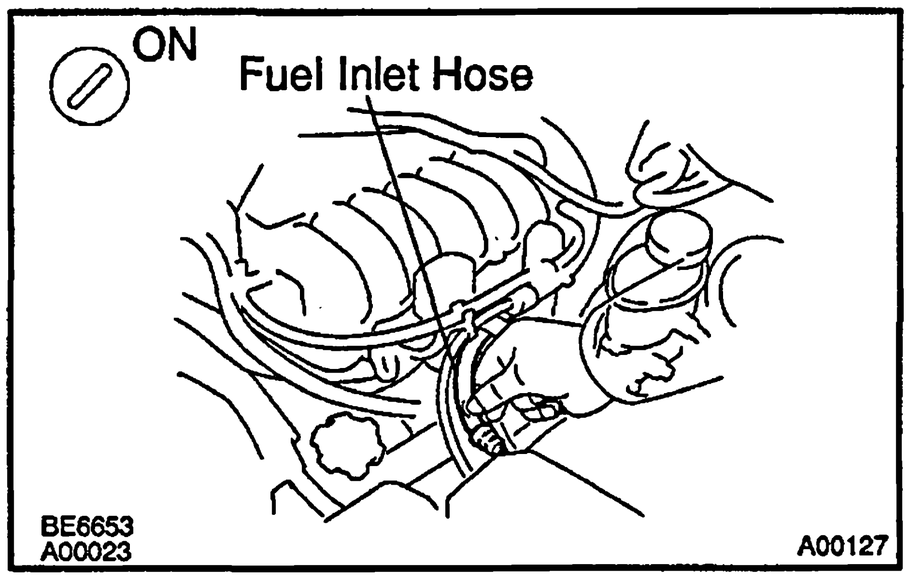
WIRING DIAGRAM



INSPECTION PROCEDURE

When using hand–held tester

1	**Connect hand–held tester, and check operation of fuel pump.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Use ACTIVE TEST mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK → **Check for starter signal circuit (See page DI–88).**

NG

2	**Check for engine ECU power source circuit (See page DI–91).**

NG → **Repair or replace.**

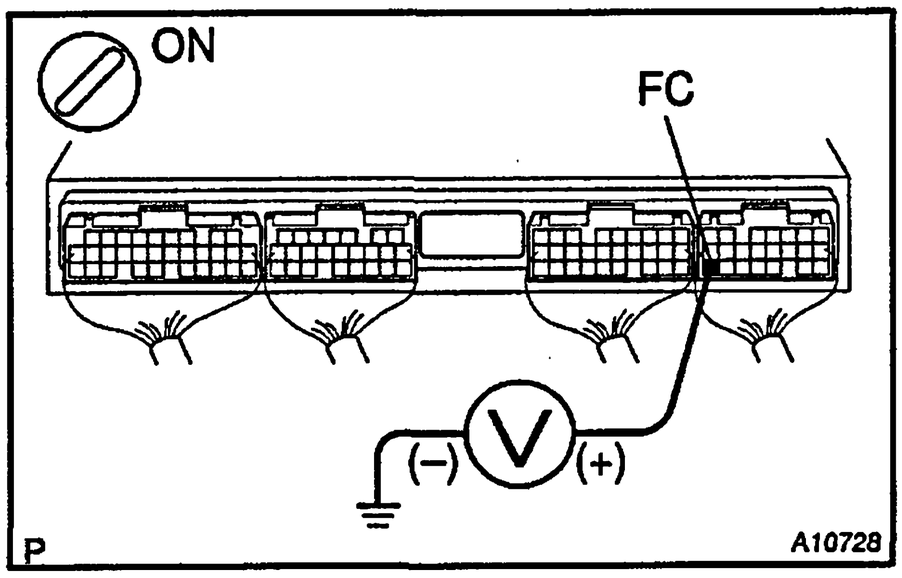
OK

3	**Check circuit opening relay (See Pub. No. RM519E on page EG–154).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminals FC of engine ECU and body ground.**



PREPARATION:

(a) Remove the glove compartment.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the engine ECU and body ground.

OK:

Voltage: 9 ~ 14 V

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, and circuit opening relay and engine ECU.**

OK

5	**Check fuel pump (See Pub. No. RM519E on page EG–132).**

NG → **Repair or replace fuel pump.**

OK

6	**Check for open in harness and connector between circuit opening relay and fuel pump, and fuel pump and body ground (See page IN–20).**

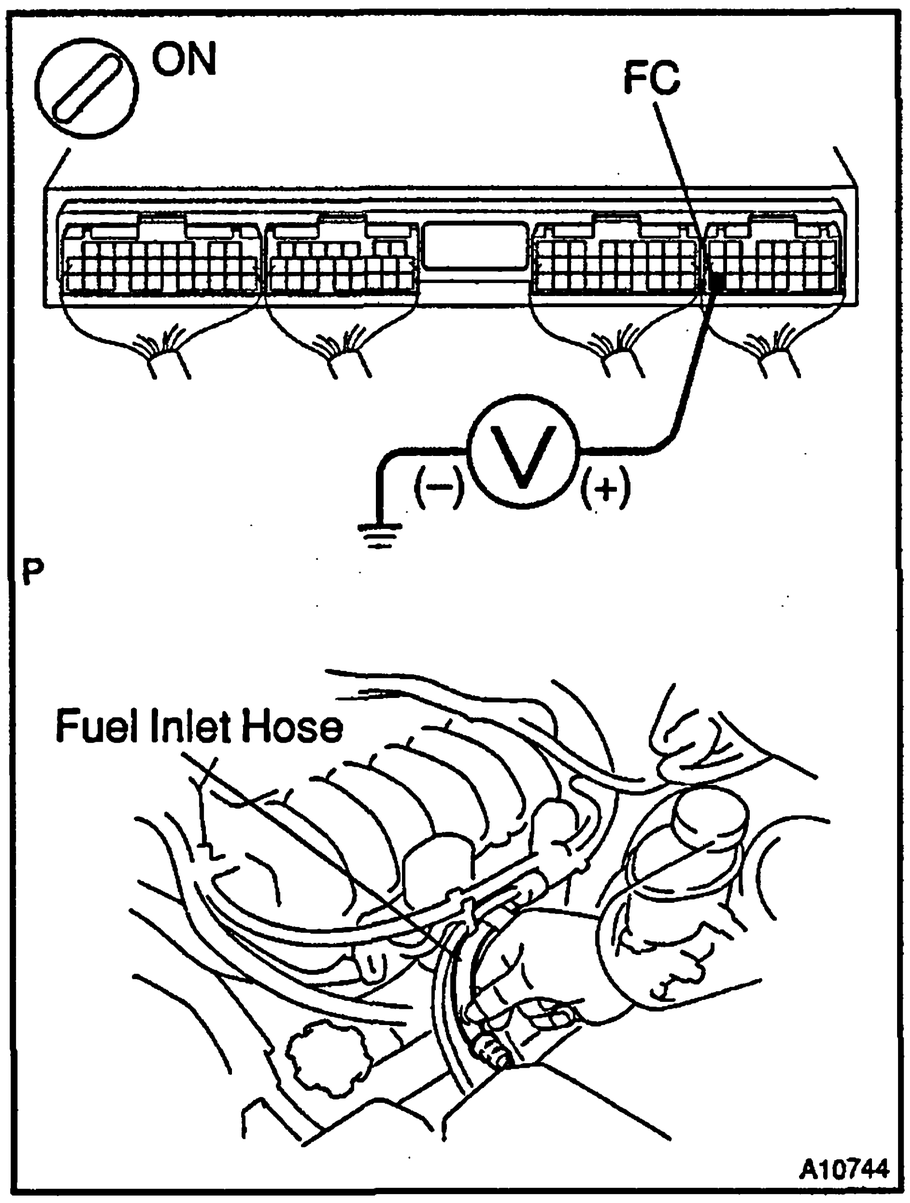
NG → **Repair or replace harness or connector.**

OK

Check and replace engine ECU (See page IN–20).

When not using hand–held tester

1	**Check operation of fuel pump.**



PREPARATION:

(a) Remove the glove compartment.
(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the engine ECU connector and body ground.
(b) Check for fuel pressure in the inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK → **Check for starter signal circuit (See page DI–88).**

NG

2	**Check for engine ECU power source circuit (See page DI–91).**

NG → **Repair or replace.**

OK

3	**Check circuit opening relay (See Pub. No. RM519E on page EG–154).**

NG → **Replace circuit opening relay.**

OK

4	Check voltage between terminals FC of engine ECU connector and body ground.

NG → Check for open in harness and connector between EFI main relay and circuit opening relay, and circuit opening relay and engine ECU.

OK ↓

5	Check fuel pump (See Pub. No. RM519E on page EG–132).

NG → Repair or replace fuel pump.

OK ↓

6	Check for open in harness and connector between circuit opening relay and fuel pump, and fuel pump and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK ↓

Check and replace engine ECU (See page IN–20).

ELECTRONIC FUEL INJECTION

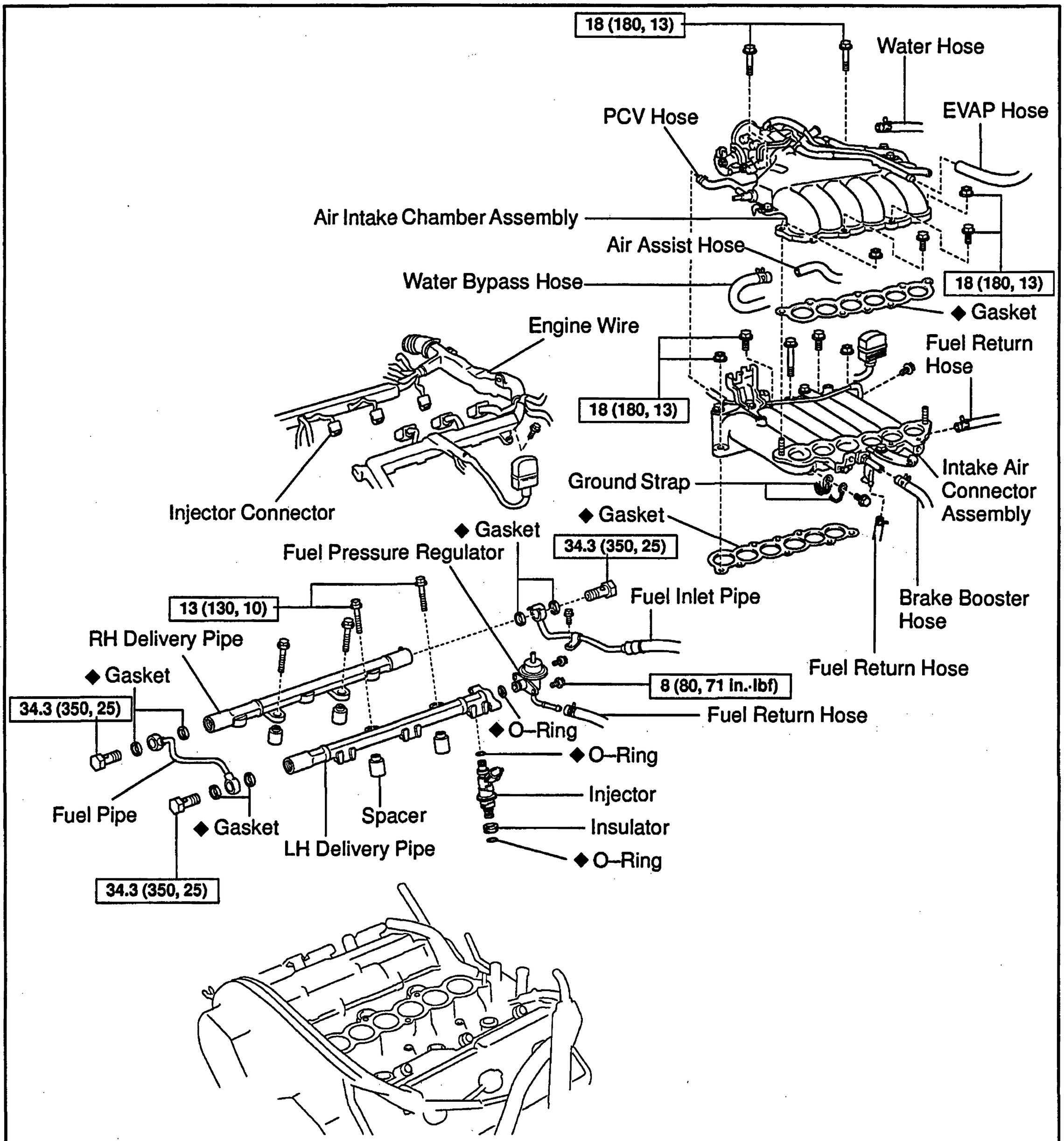
REFER TO 5VZ–FE ENGINE REPAIR MANUAL (Pub. No. RM519E)

NOTE: The above pages contain only the points which differ from the above listed manual.

INJECTOR

COMPONENTS

FI0CU–01



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

Y

B08126

FI

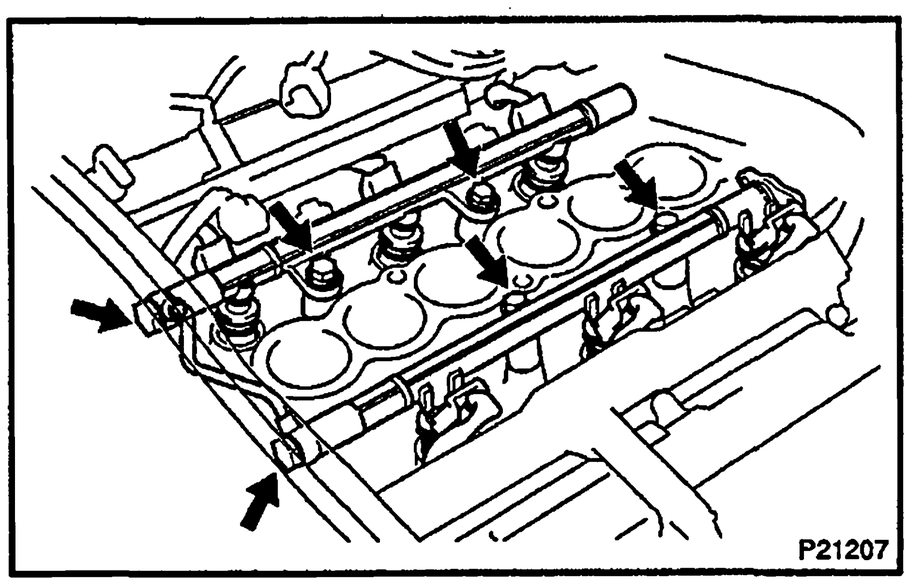
SF04L–04

REMOVAL

1. REMOVE AIR CLEANER HOSE
2. REMOVE INTAKE AIR CONNECTOR ASSEMBLY
   (See Pub. No. RM519E on page EG–32)
3. REMOVE FUEL PRESSURE REGULATOR
   (See Pub. No. RM519E on page EG–138)
4. DISCONNECT FUEL INLET PIPE

CAUTION:
Catch leaking fuel in a container.

5. REMOVE FUEL PIPE
6. DISCONNECT INJECTOR CONNECTORS

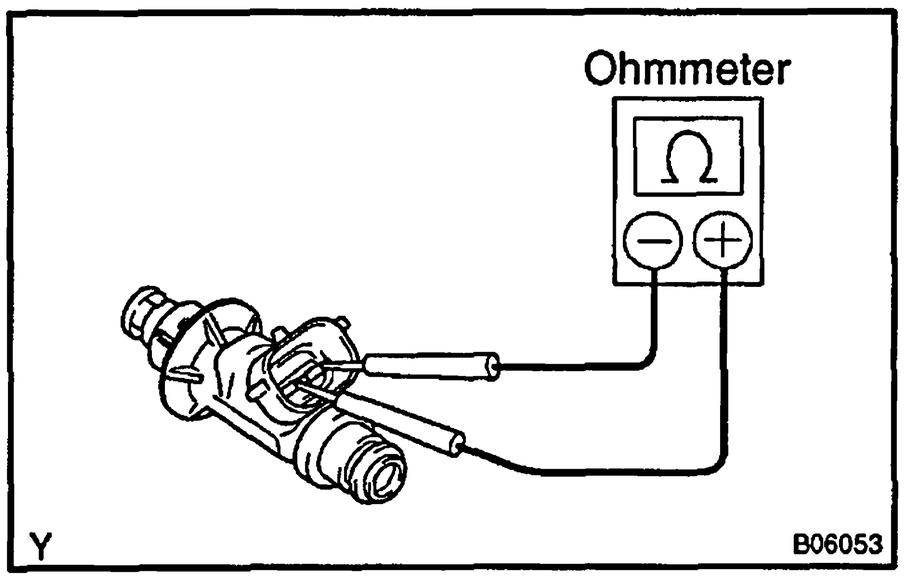

P21207

7. REMOVE DELIVERY PIPES AND INJECTORS

NOTICE:
- Be careful not to drop the injectors when removing the delivery pipes.
- Pay attention to put any hung load on the injector to and from the side direction.

(a) Remove the 4 bolts and delivery pipes together with the 6 injectors
(b) Remove the 4 spacers from the intake manifold.
(c) Pull out the 6 injectors from the delivery pipes.
(d) Remove the 2 O–rings and insulator from each injector.

SF10A–02



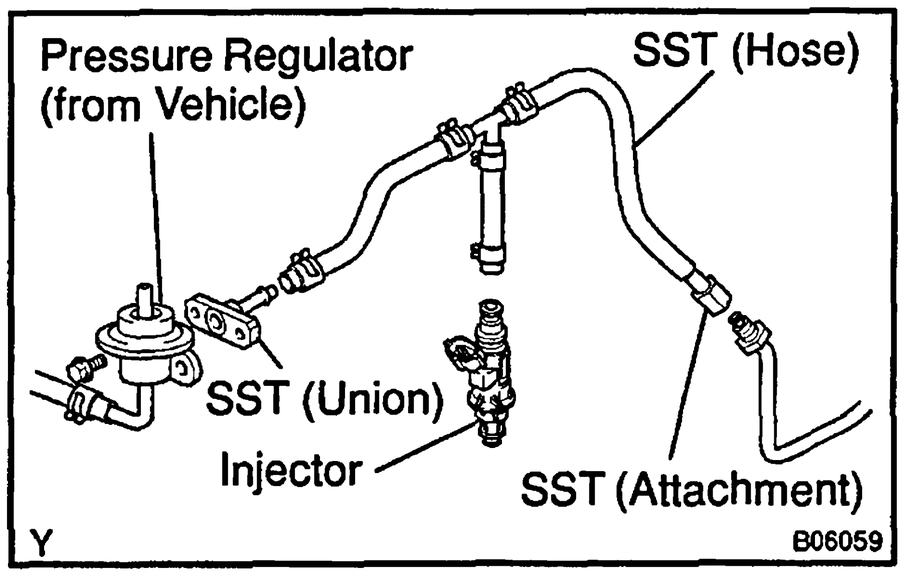
INSPECTION

1. INSPECT INJECTOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 13.8 Ω at 21°C (68°F)

If the resistance is not as specified, replace the injector.



2. INSPECT INJECTOR INJECTION

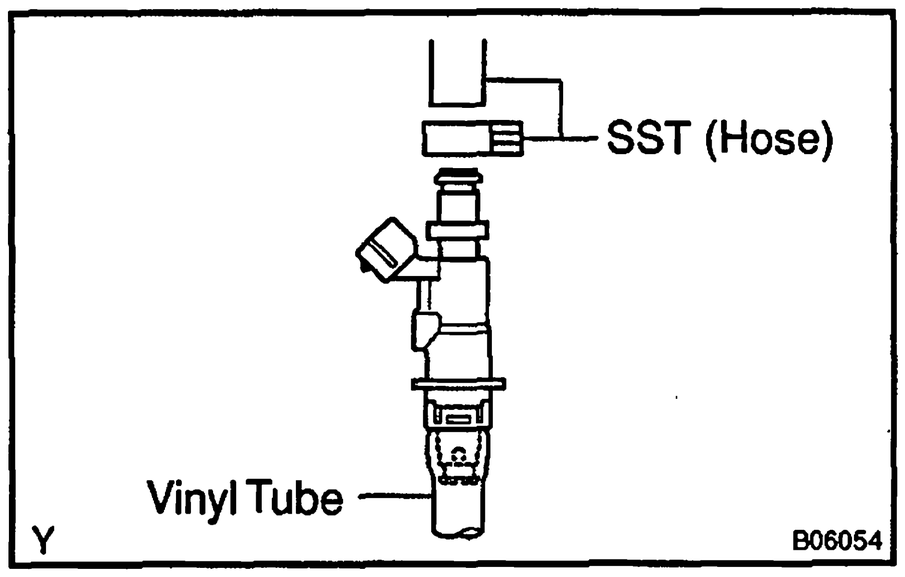
CAUTION:

Keep injector clear of sparks during the test.

(a) Disconnect the fuel inlet pipe from the fuel tube.

(b) Connect SST (attachment and hose) to the fuel tube.
SST 09268–41047 (09268–52011)

(c) Connect the fuel return hose, SST (union) and SST (hose) to the fuel pressure regulator.
SST 09268–41047 (09268–41091)



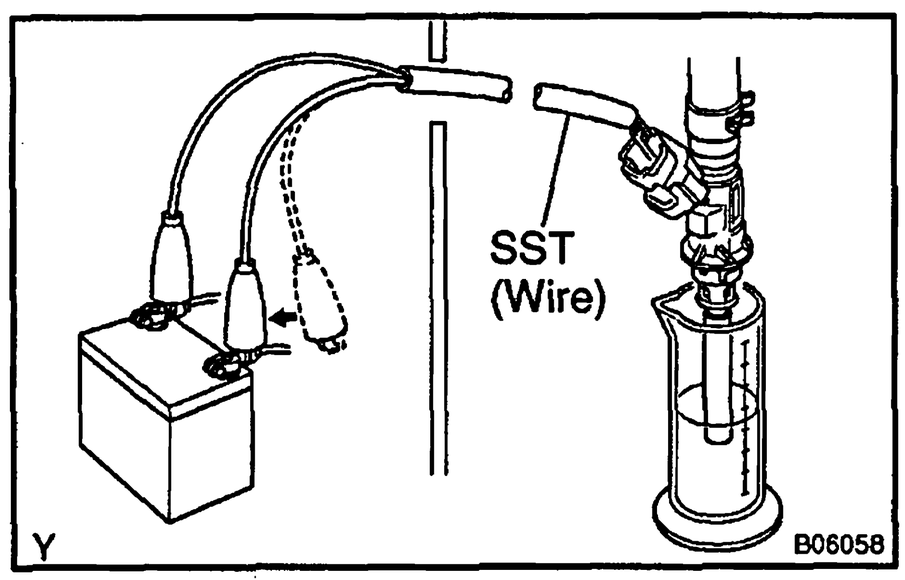
(d) Connect SST (hose) to the injector.
SST 09268–41047

(e) Put the injector into the graduated cylinder.

HINT:

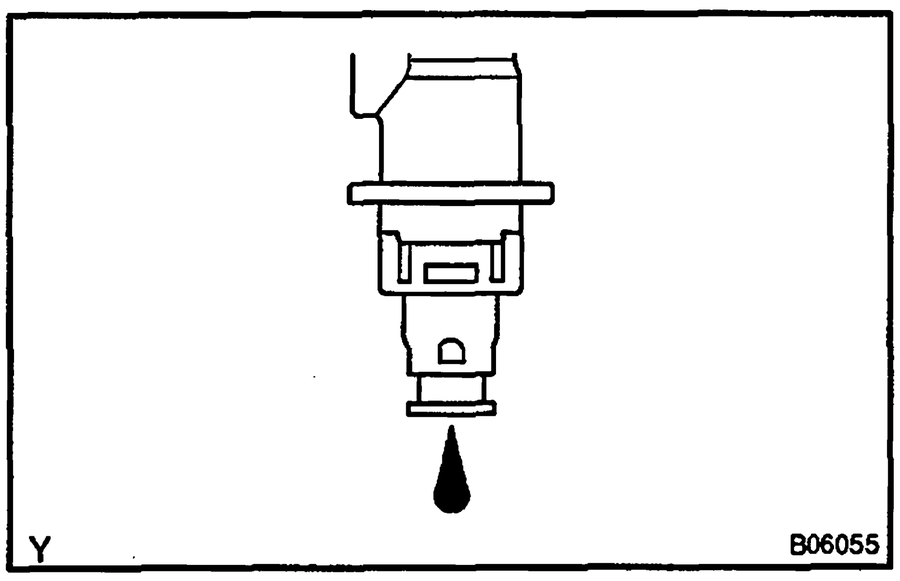
Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

(f) Connect a hand–held tester to the DLC3.
(See page DI–4)



(g) 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: 56 – 69 cm^3 (3.4 – 4.2 cu in.) per 15 sec.
Difference between each injector:
1.3 cm^3 (0.08 cu in.) or less

If the injection volume is not as specified, replace the injector.



3. INSPECT LEAKAGE

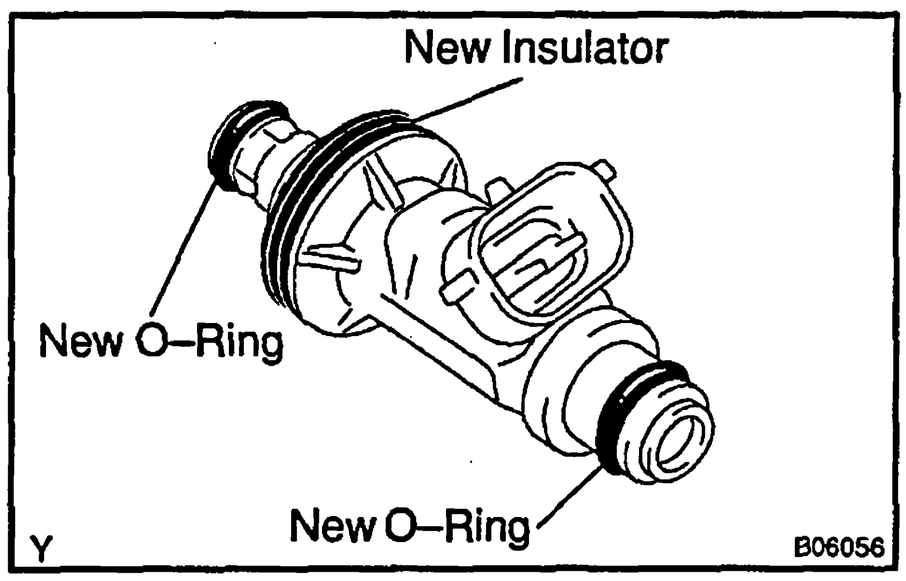
(a) In the condition above, disconnect the tester probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop: 1 drop or less per minute

(b) Turn the ignition switch OFF.

(c) Disconnect the negative (–) terminal cable from the battery.

(d) Remove the SST.
SST 09268–41047, 09842–30070

(e) Disconnect the hand–held tester from the DLC3.



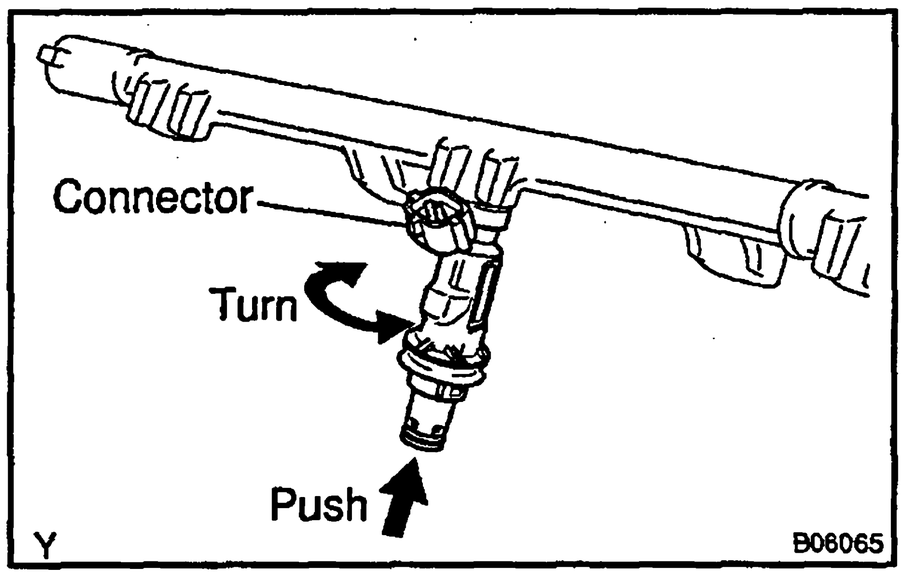
SF04N-04

INSTALLATION

1. TEMPORARILY INSTALL INJECTORS AND DELIVERY PIPES

(a) Install a new insulator to each injector.

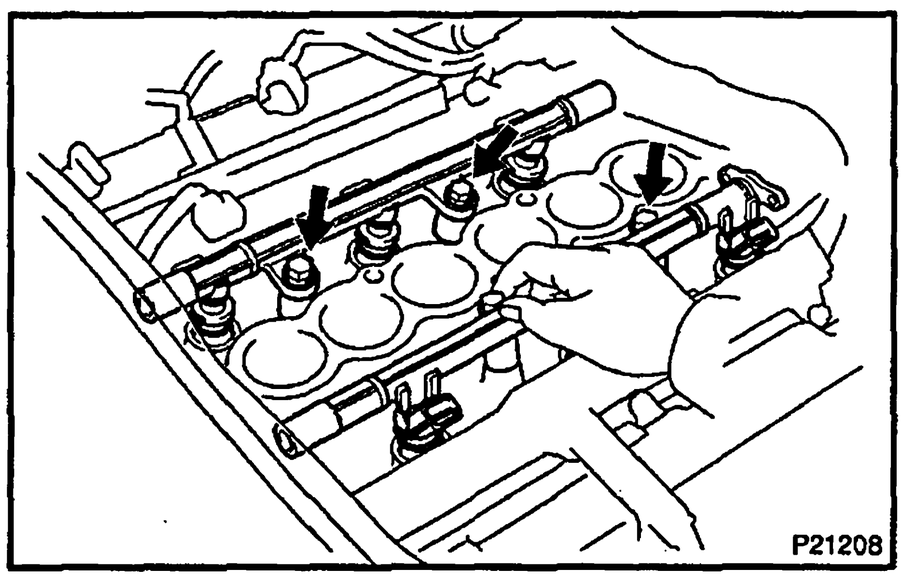
(b) Apply a light coat of spindle oil or gasoline to 2 new O–rings and install them to each injector.



(c) While turning the injector clockwise and counterclockwise, push it to the delivery pipes. Install the 6 injectors.

(d) Position the injector connector outward.

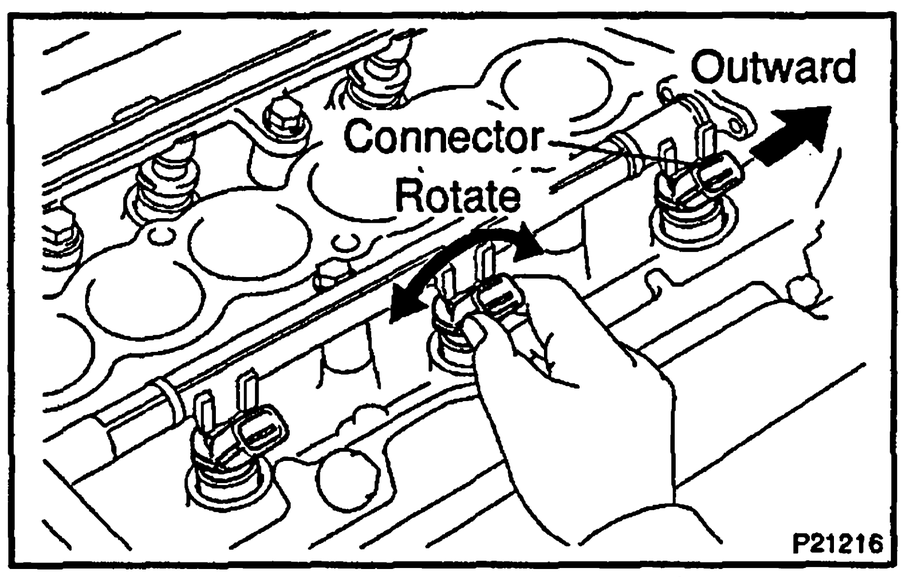
FI



(e) Place the 4 spacers in position on the intake manifold.

(f) Place the delivery pipes with the 6 injectors in position on the intake manifold.

(g) Temporarily install the 4 bolts holding the delivery pipes to the intake manifold.

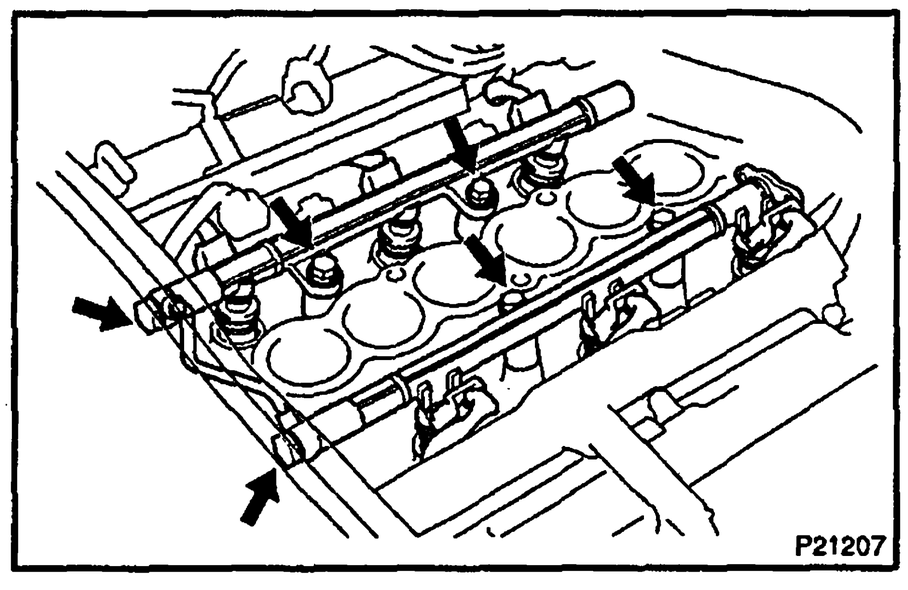


(h) Check that the injectors rotate smoothly.

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 outward.



2. CONNECT INJECTOR CONNECTORS

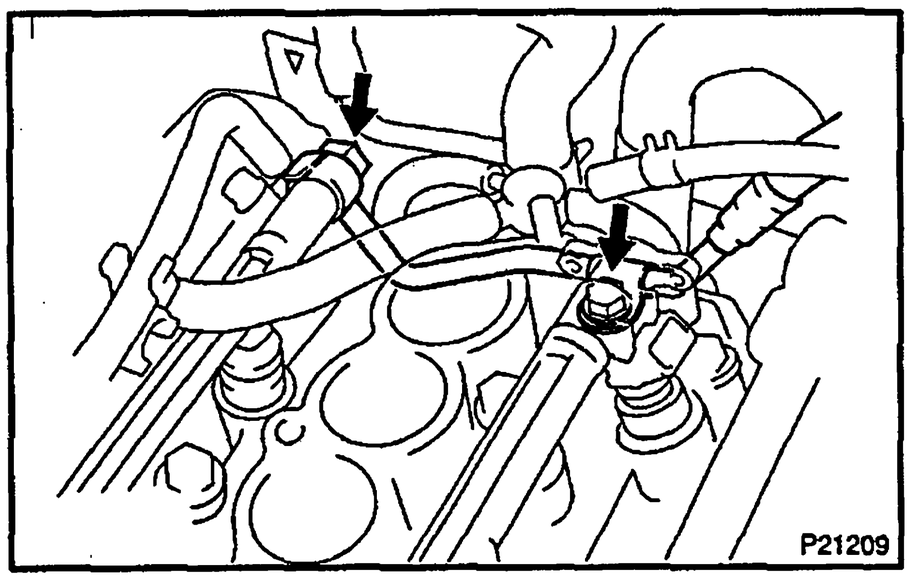
3. INSTALL FUEL PIPE AND TIGHTENING DELIVERY PIPE HOLDING BOLTS

(a) Install the fuel pipe with 4 new gaskets and the 2 union bolts.

Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

(b) Tighten the 4 bolts holding the delivery pipes to the intake manifold.

Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)



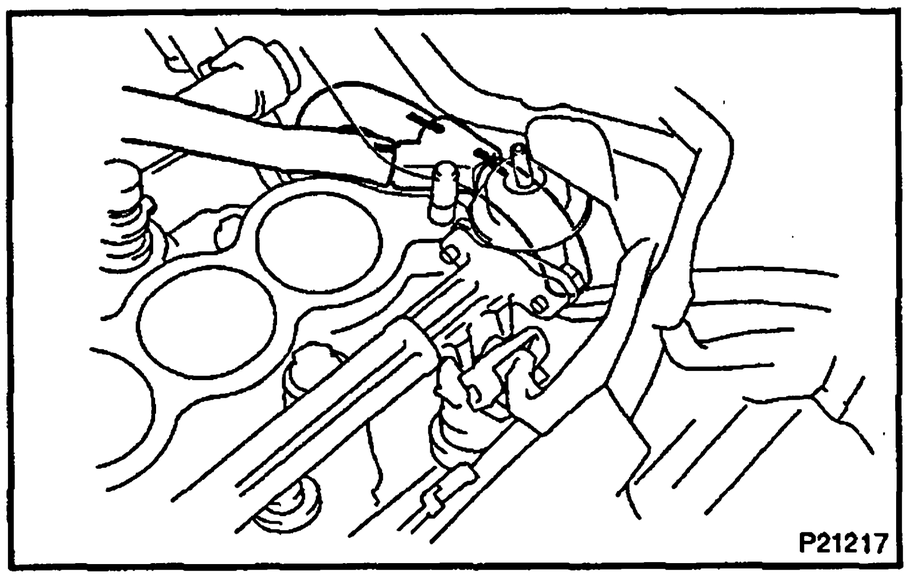
4. CONNECT FUEL INLET PIPE

(a) Temporarily install the inlet pipe with 2 new gaskets, union bolt and bolt.

(b) Tighten the clamp bolt.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

(c) Tighten the union bolt.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

5. INSTALL FUEL PRESSURE REGULATOR
(See Pub. No. RM519E on page EG–138)



6. INSPECT AIR ASSIST LINES AND CONNECTIONS

Visually check for loose connections, sharp bends or damage.

7. INSTALL INTAKE AIR CONNECTOR ASSEMBLY
(See Pub. No. RM519E on page EG–60)

8. INSTALL AIR INTAKE CHAMBER ASSEMBLY

9. CHECK FOR FUEL LEAKS

AIR FLOW METER

FI0OV-01

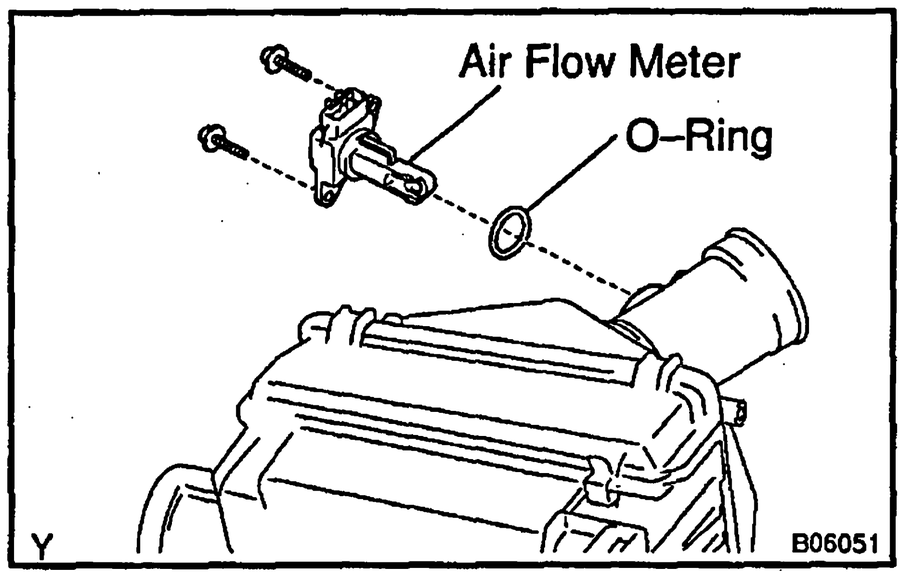
REMOVAL

1. REMOVE AIR CLEANER CASE

(a) Disconnect the air cleaner hose.

(b) Disconnect the air flow meter connector.

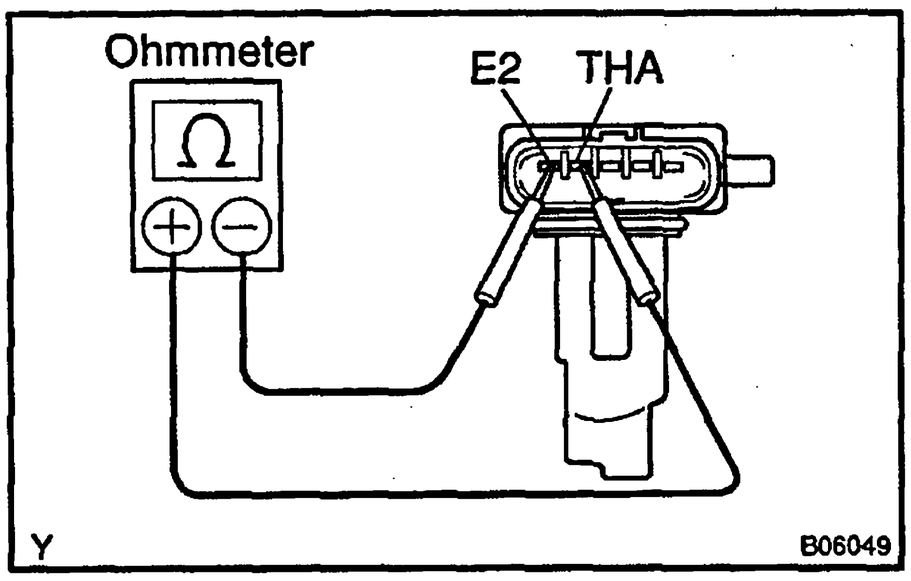
(c) Remove the 3 bolts and air cleaner case.



2. REMOVE AIR FLOW METER

(a) Remove the 2 screws and air flow meter.

(b) Remove the O–ring from the air flow meter.



FIOOW–01

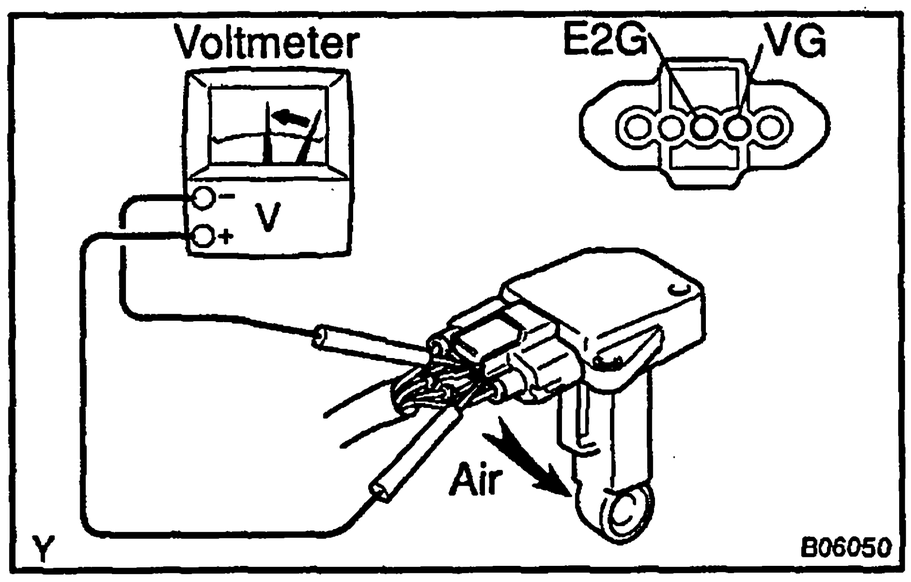
INSPECTION

1. INSPECT AIR FLOW METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Resistance	Temperature
13.6 – 18.4 kΩ	–20°C (–4°F)
2.2 – 2.7 kΩ	20°C (68°F)
0.5 – 0.7 kΩ	60°C (140°F)

If the resistance is not as specified, replace the air flow meter.

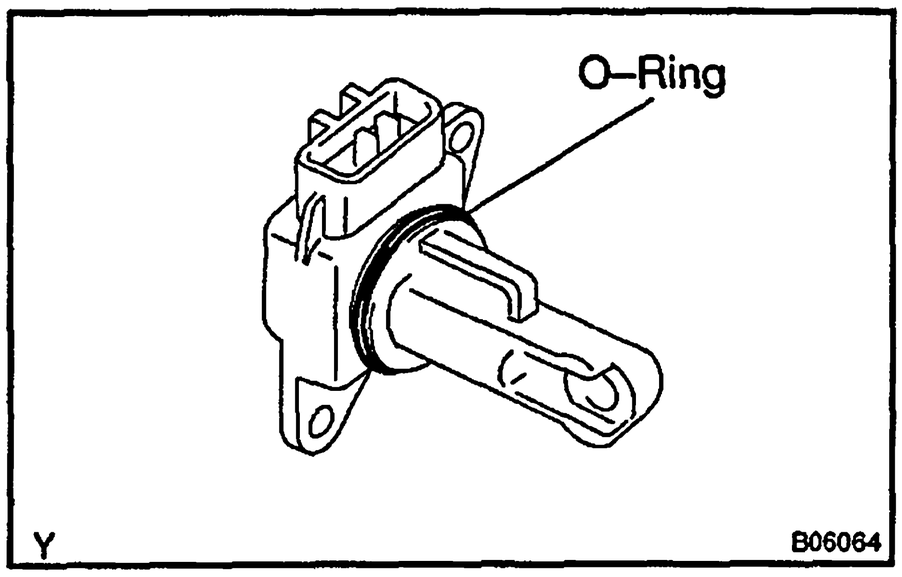


2. INSPECT AIR FLOW METER OPERATION

(a) Connect the air flow meter connector.
(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.
(c) Turn the ignition switch ON.
(d) Blow air into the air flow meter, and check that the voltage fluctuates.

If operation is not as specified, replace the air flow meter.

(e) Turn the ignition switch OFF.
(f) Disconnect the air flow meter connector.



FI0OX–01

INSTALLATION

1. INSTALL AIR FLOW METER

(a) Install the O–ring to the air flow meter.

(b) Install the air flow meter with the 2 screws.

2. INSTALL AIR CLEANER CASE

(a) Install the air cleaner case with the 3 bolts.

(b) Connect the air flow meter connector.

(c) Connect the air cleaner hose.

ALPHABETICAL INDEX

ID

A

C

D

E

F

G

H

I

P

R

S

T