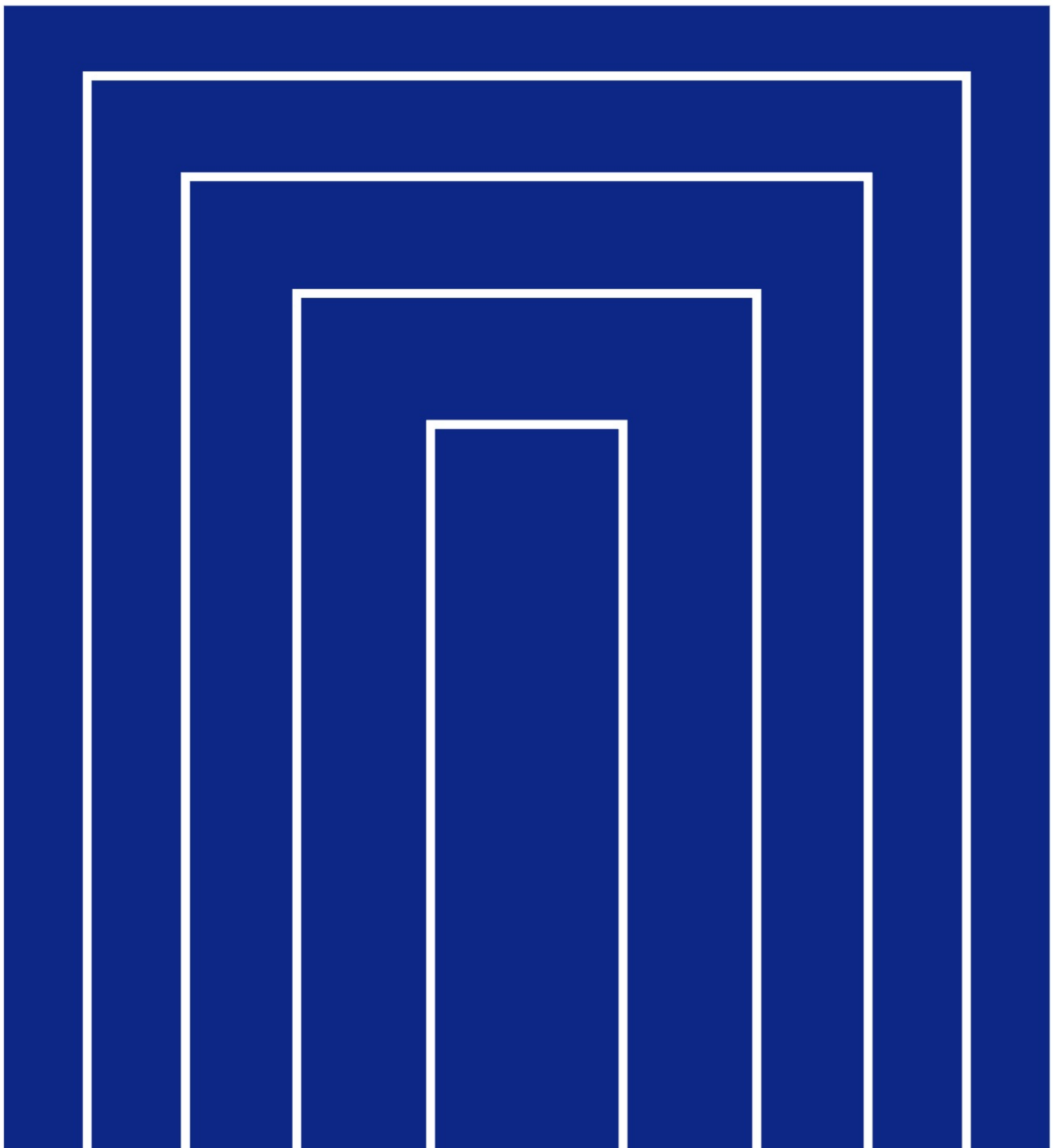
TOYOTA

3RZ-FE

ENGINE

REPAIR MANUAL SUPPLEMENT

Jun., 1999



Pub. No. RM704E

FOREWORD

This supplement has been prepared to provide information covering general service repairs for the 3RZ–FE engine equipped on the LAND CRUISER/LAND CRUISER PRADO.

Applicable models: RZJ90, 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.
• 3RZ–F, 3RZ–FE Engine Repair Manual	RM521E
• 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.

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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 IN
PREPARATION PP
SERVICE SPECIFICATIONS SS
DIAGNOSTICS DI
ELECTRONIC FUEL INJECTION FI
IGNITION IG
ALPHABETICAL INDEX ID

INTRODUCTION

HOW TO USE THIS MANUAL IN–1
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HOW TO USE THIS MANUAL

GENERAL INFORMATION

IN02X–03

1. INDEX

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

2. PRECAUTION

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

3. TROUBLESHOOTING

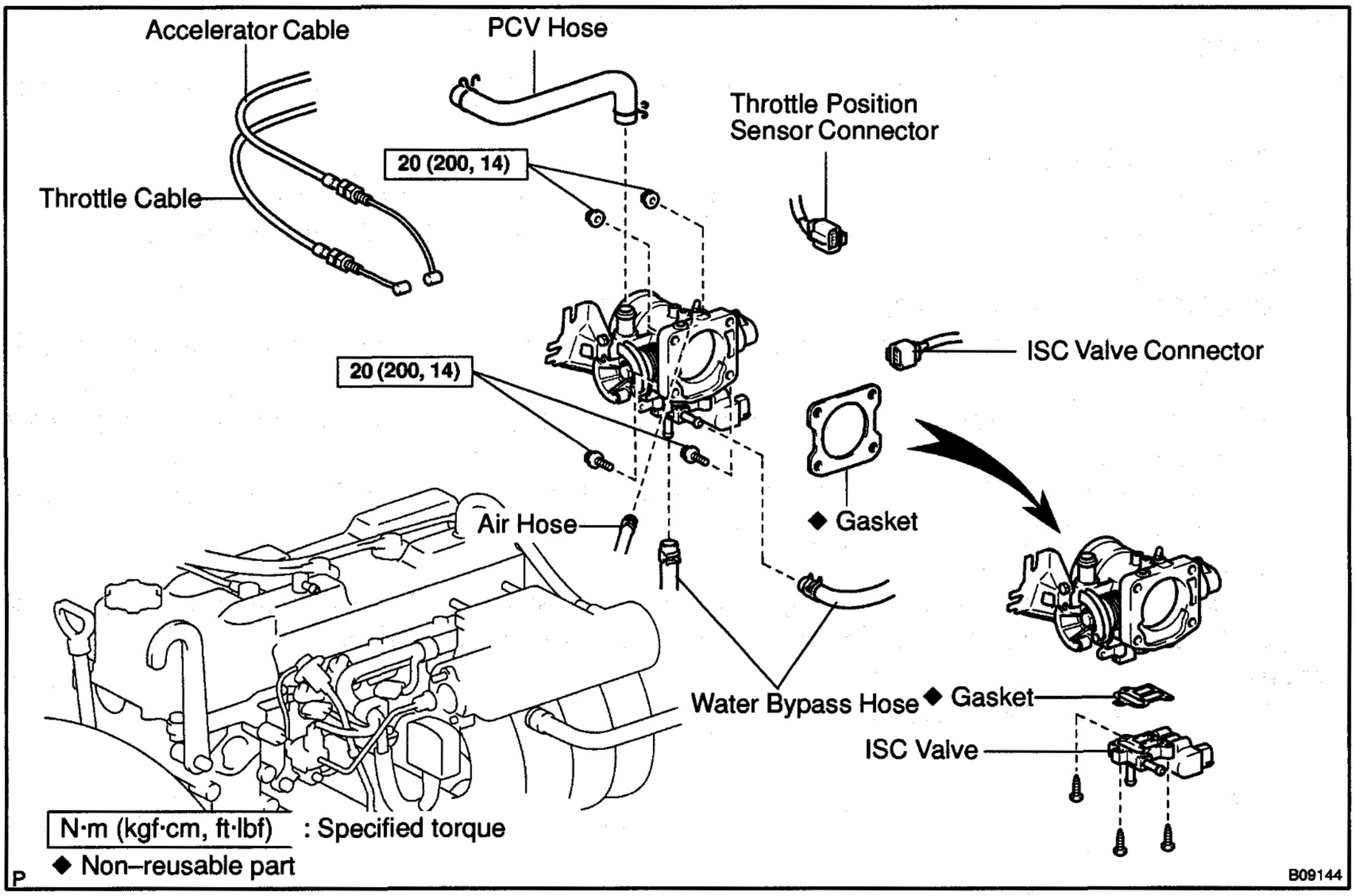
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN–8
Be sure to read this before performing troubleshooting.

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

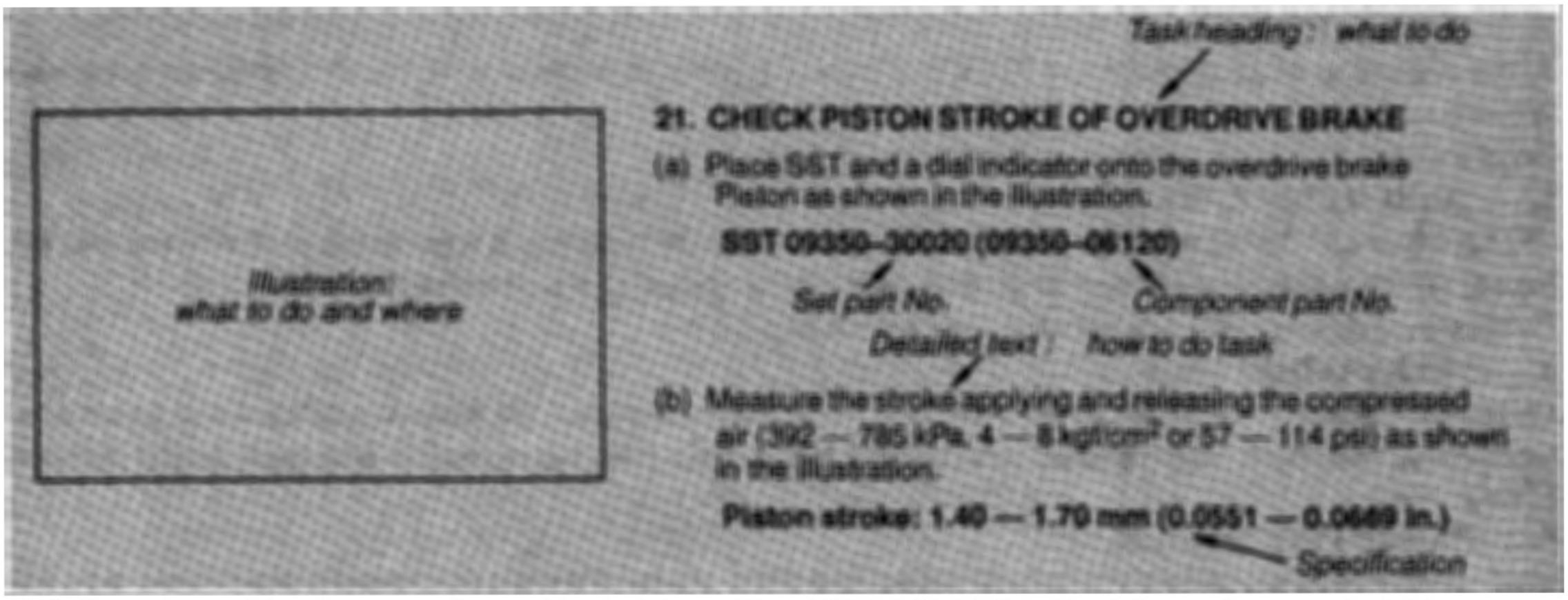
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



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:

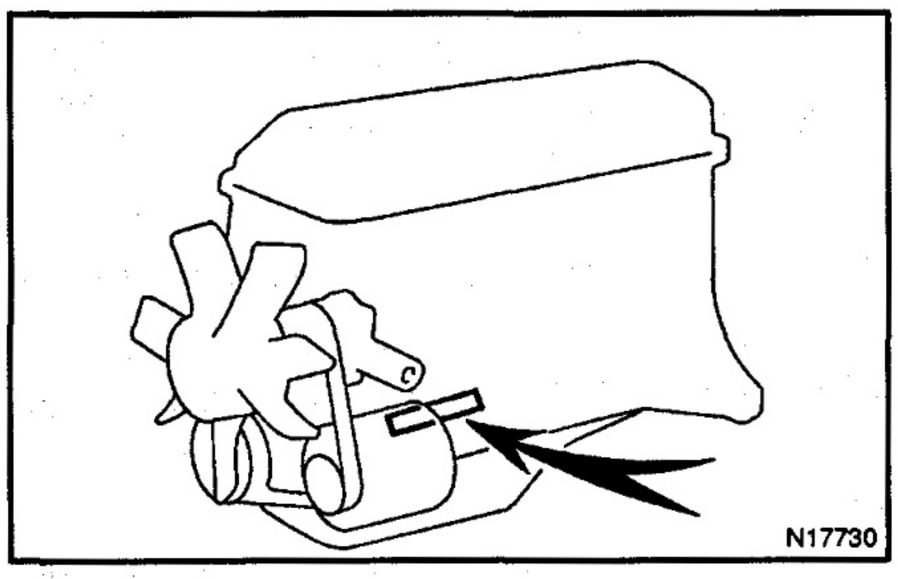
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide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

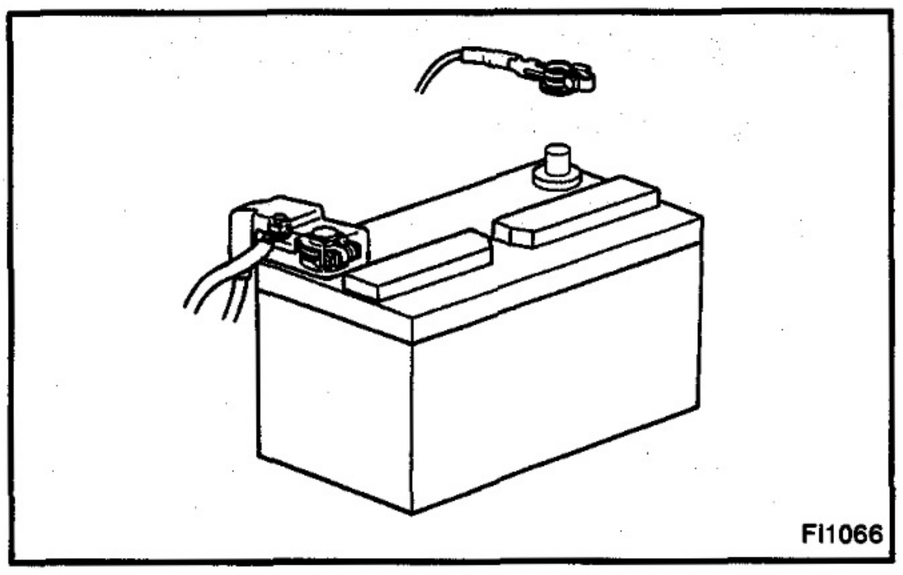


IDENTIFICATION INFORMATION

IN0ZY–01

ENGINE SERIAL NUMBER

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


FI1066

REPAIR INSTRUCTIONS

GENERAL INFORMATION

IN02Z–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 and 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 and 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.

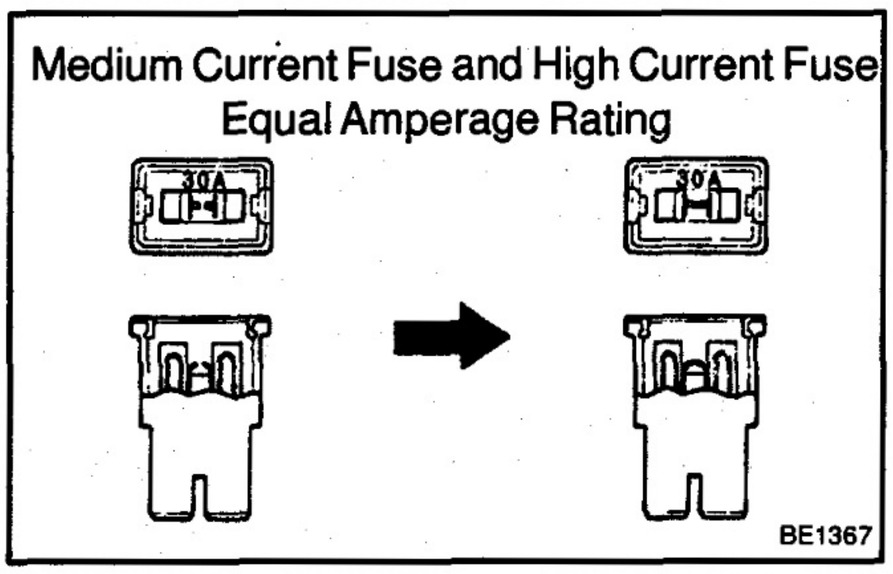
(2) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

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

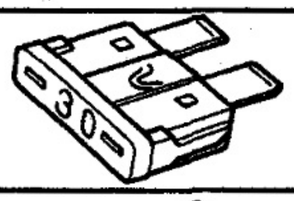
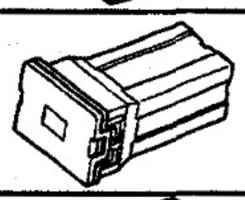
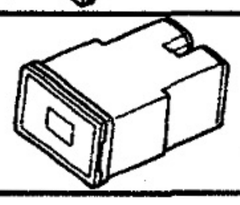
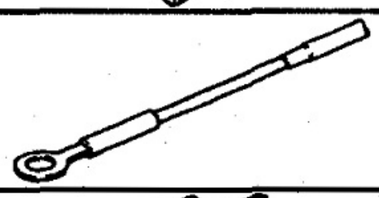
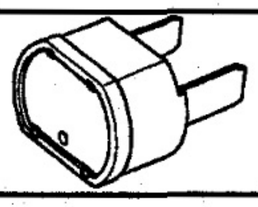
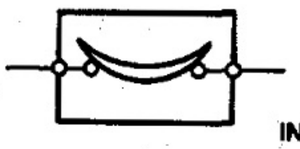
(g) When necessary, use a sealer on gaskets to prevent leaks.

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



(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

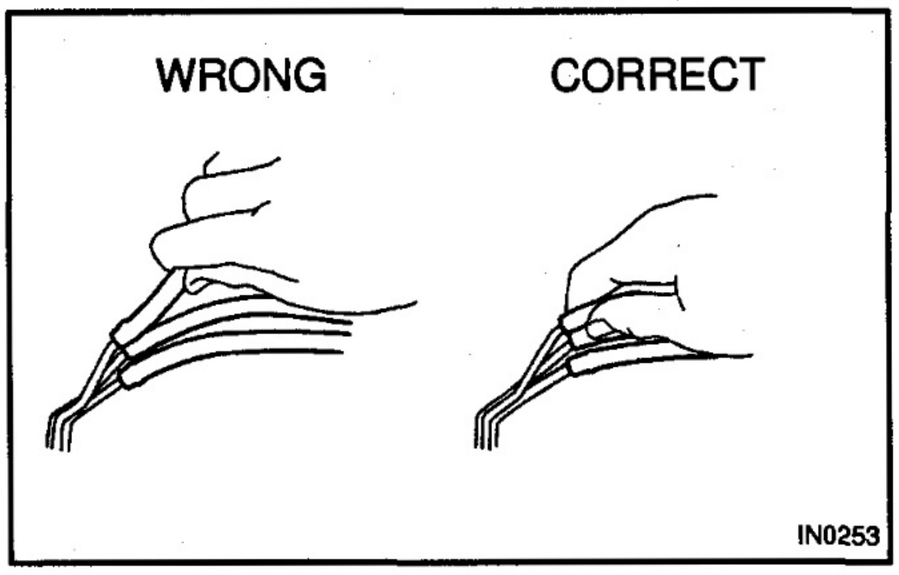
V00076

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

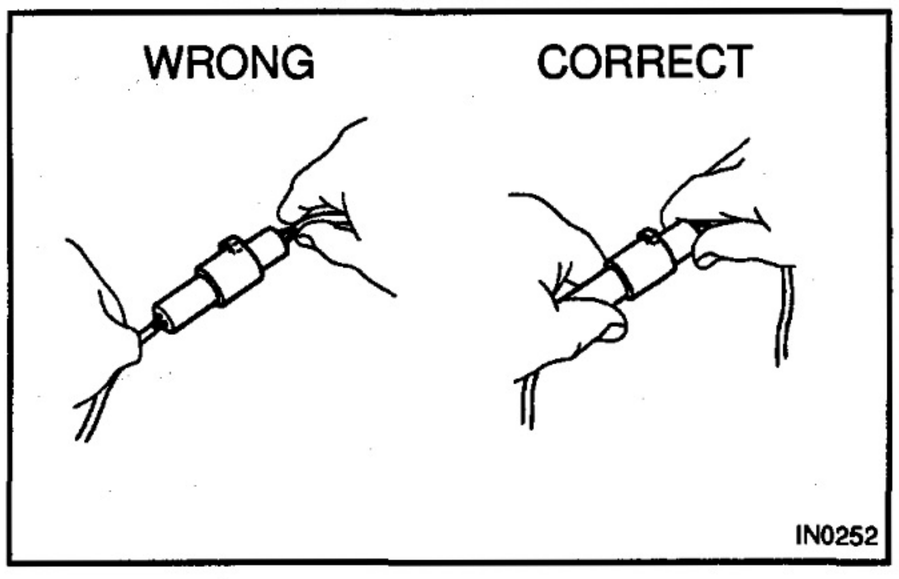
(1) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.

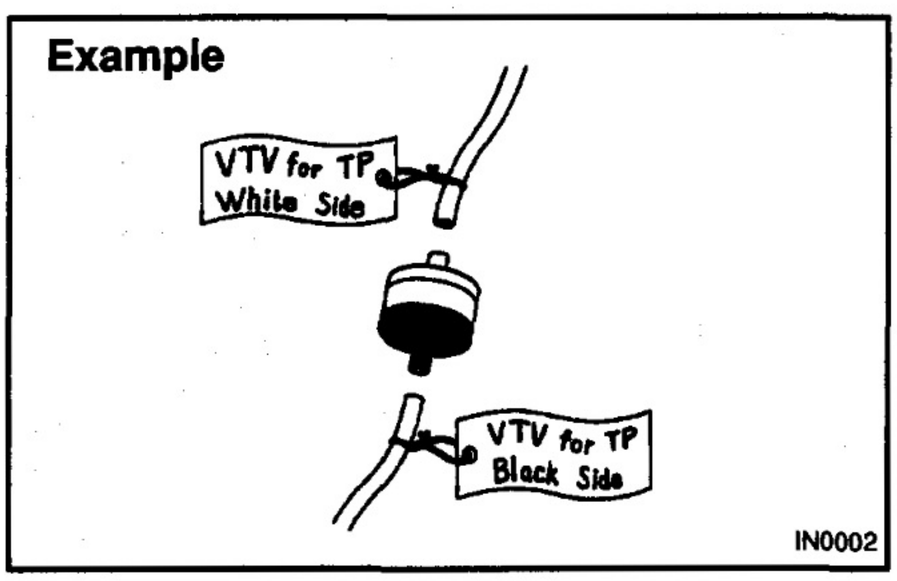
(2) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

(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 instead. Once the hose has been stretched, it may leak.





(m) Tag hoses before disconnecting them:
(1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
(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, measurements should be made when the engine has cooled down.

FOR ALL OF VEHICLES

PRECAUTION

IN00R–05

1. 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) Do not wind the antenna feeder together with the other wiring as much as possible, also avoid running the antenna feeder parallel with other wire harnesses.

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

(e) Do not install powerful mobile communications system.

2. FOR USING HAND–HELD TESTER

CAUTION:

Observe the following items for safety reasons:

- **Before using the hand–held tester, the hand–held tester operator's manual should be read thoroughly.**
- **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

GENERAL INFORMATION

IN031–06

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:

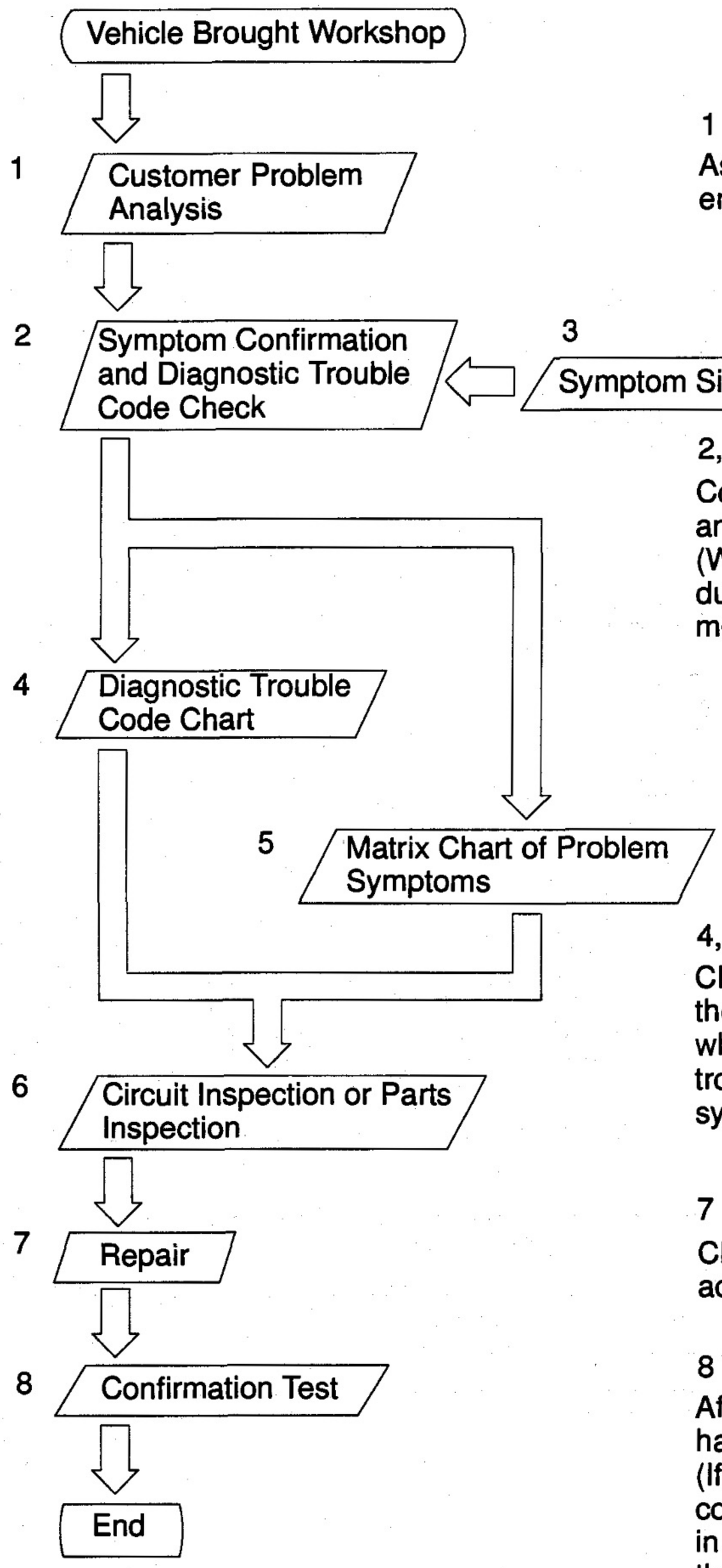
System	Page
Engine	DI–1
Sub Fuel Tank System	DI–84

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

IN0ET–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 each 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 obtain 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.

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 the troubleshooting 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	

☐ onstant ☐ 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.

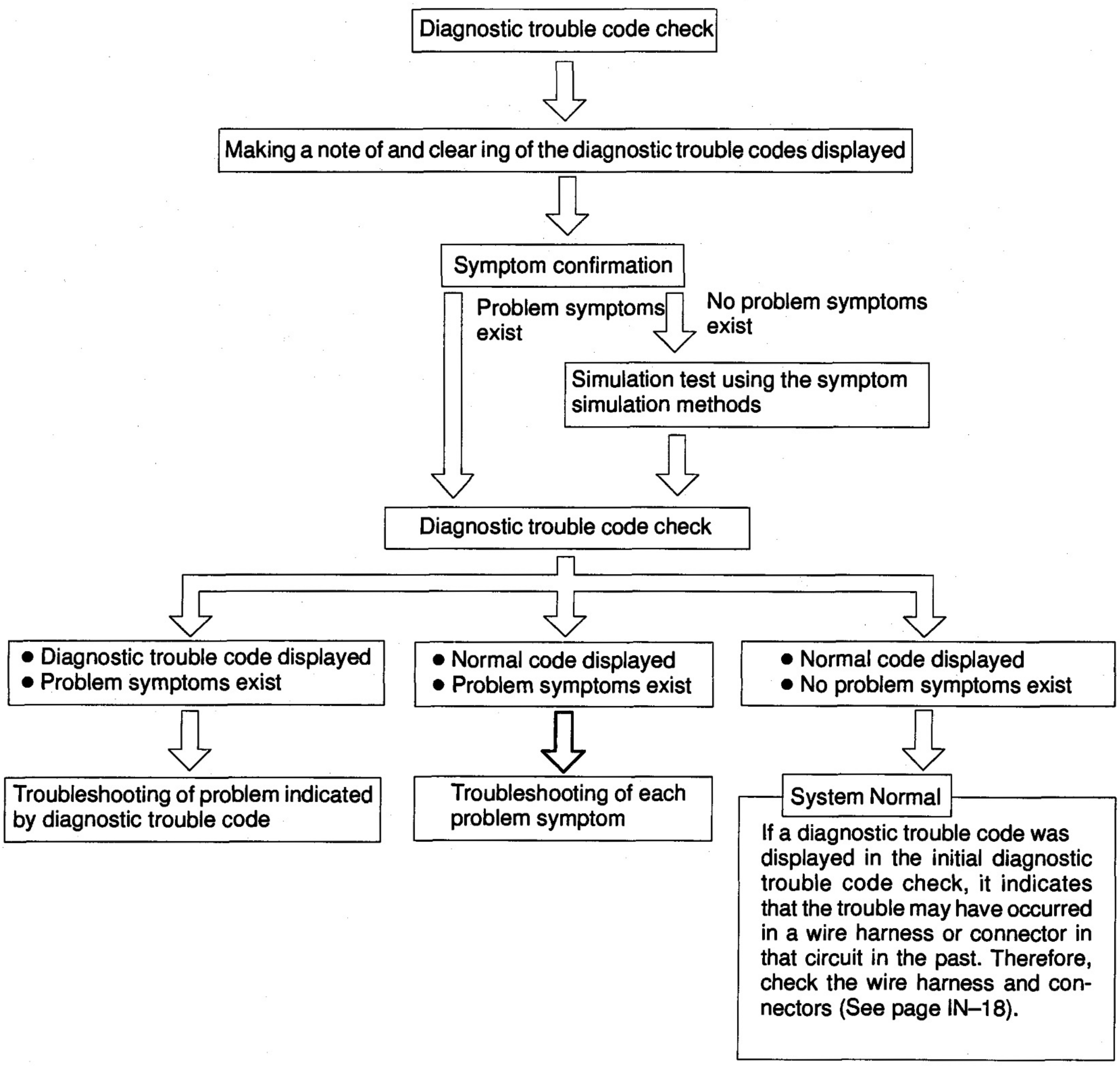
System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Other Diagnosis Function
Engine Sub Fuel Tank System	○(with Test Mode) ○	○	

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 above points, 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.

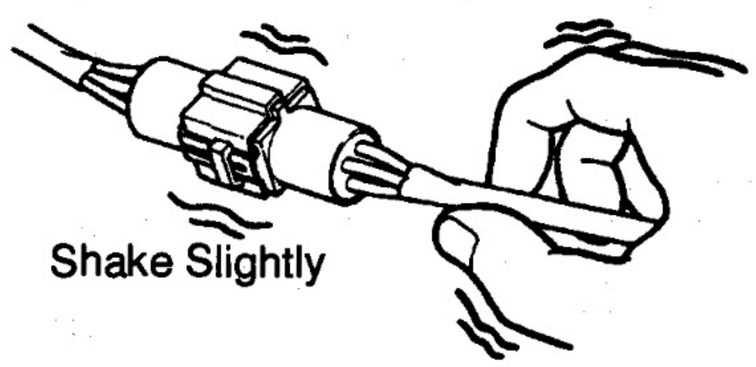
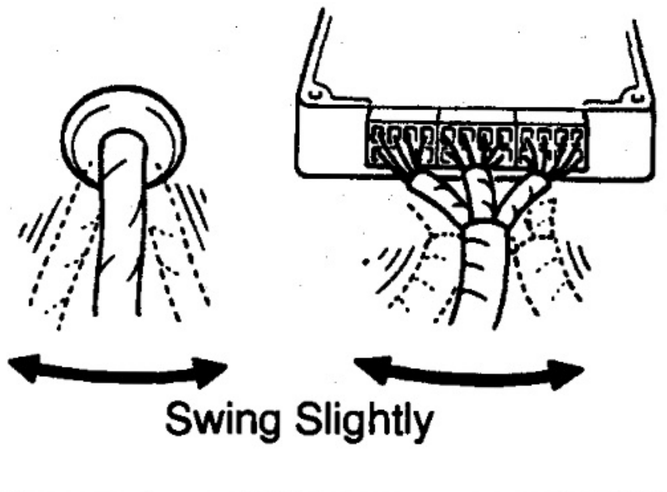
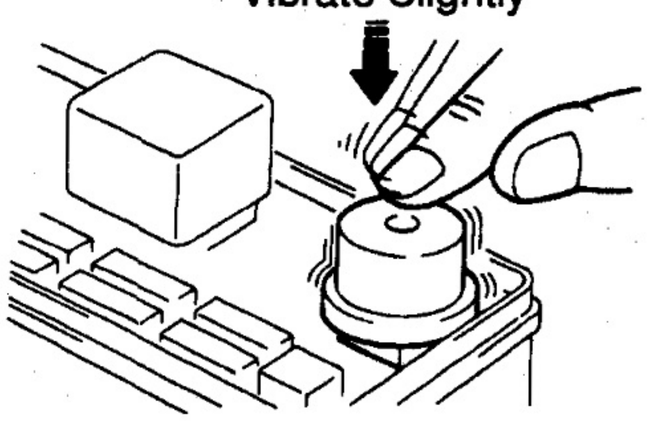


3. SYMPTOM SIMULATION

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

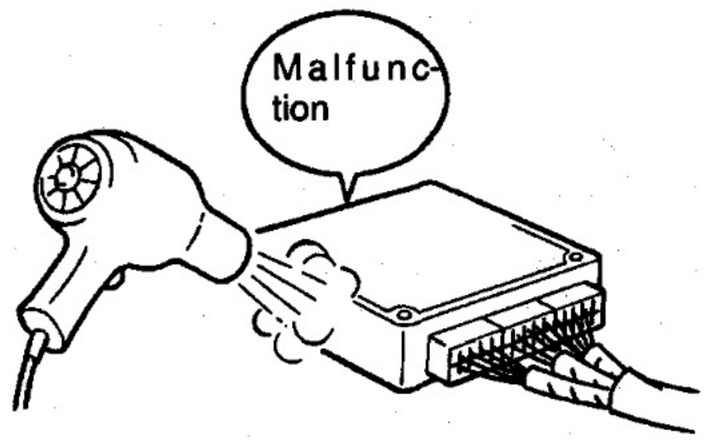
2	**HEAT METHOD: When the problem seems to occur when the suspect area is heated.**

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.

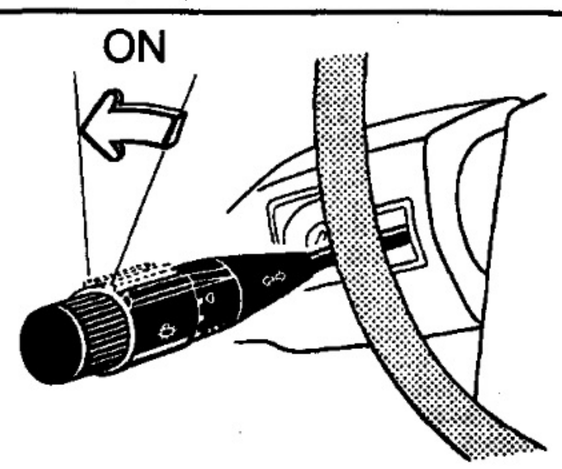
(2) Never apply water directly onto the electronic components.

(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	*1 Check Engine Warming Light Nomal Mode/ Test Node	*Memory
12 (DI – 12)	NE Signal Circuit	● Open or short in NE circuit ● IIA ● Open or short in STA circuit ● Engine ECU	ON / N.A	○
13 (DI – 28)	NE Signal Circuit	● Open or short in NE circuit ● IIA ● Engine ECU	ON / N.A	○
14 (DI – 31)	Ignition Signal Circuit	● Open or short in IGF or IGT circuit from IIA to engine ECU ● Igniter ● Engine ECU	ON / N.A	○
22 (DI – 32)	Water Temp. Sensor Circuit	● Open or short in water temp. sensor circuit ● Water temp. sensor ● Engine ECU	ON / N.A	○
		● Open or short intake air temp. sensor circuit ● Intake air temp. 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	43	Starter Signal Circuit

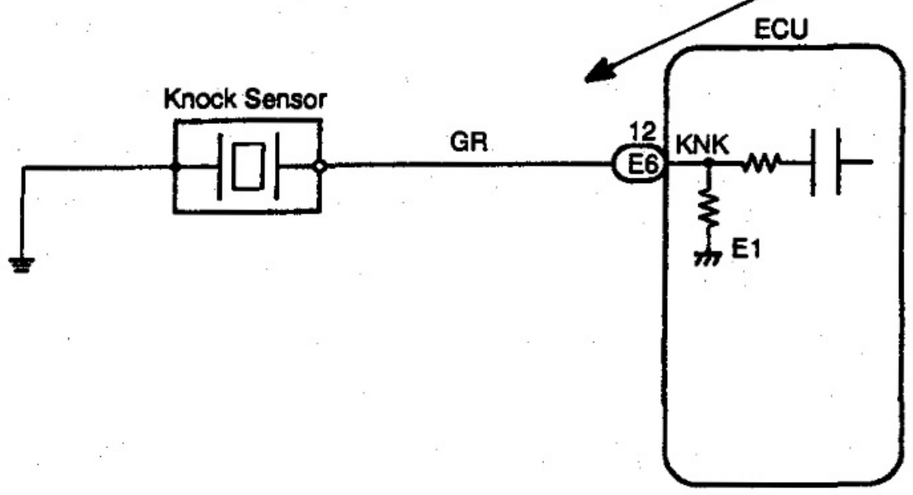
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is these fore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECU.

DTC No.	Detection Item	Trouble Area
43	No starter signal to ECU	● Open or short in signal circuit ● engine ECU

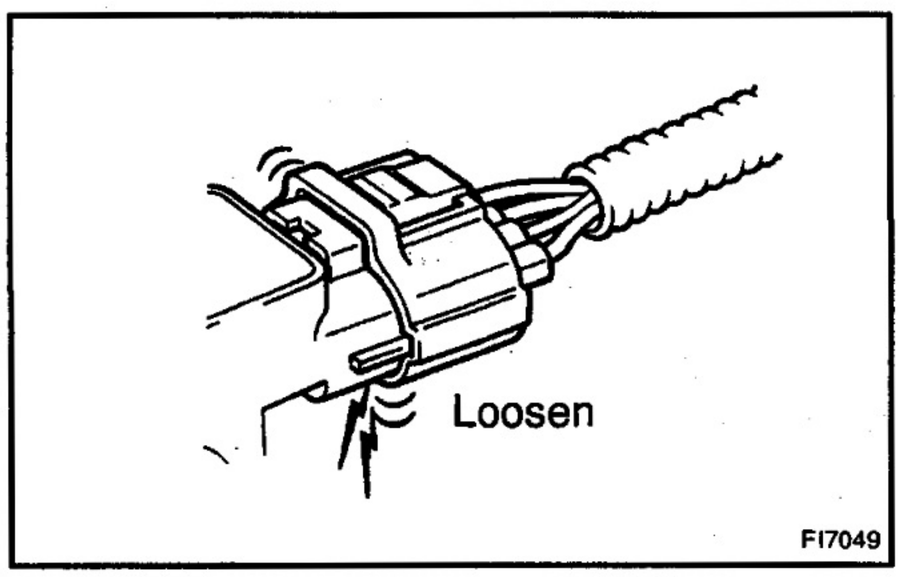
● Indicates the diagnostic trouble code, diagnostic trouble code set parameter and suspect area of the problem.

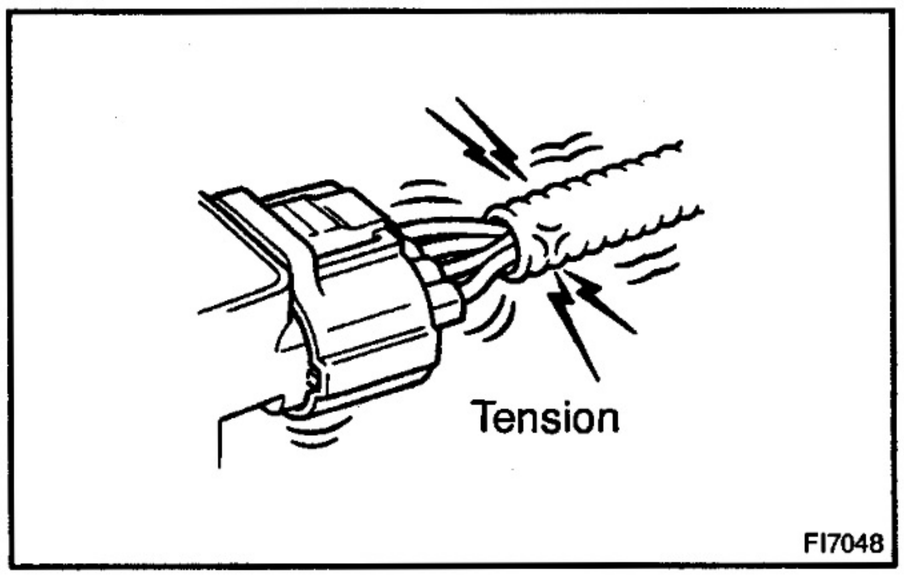
WIRING DIAGRAM



● 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
The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

V08423





IN0BW–07

HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code charts or problem symptom charts 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:

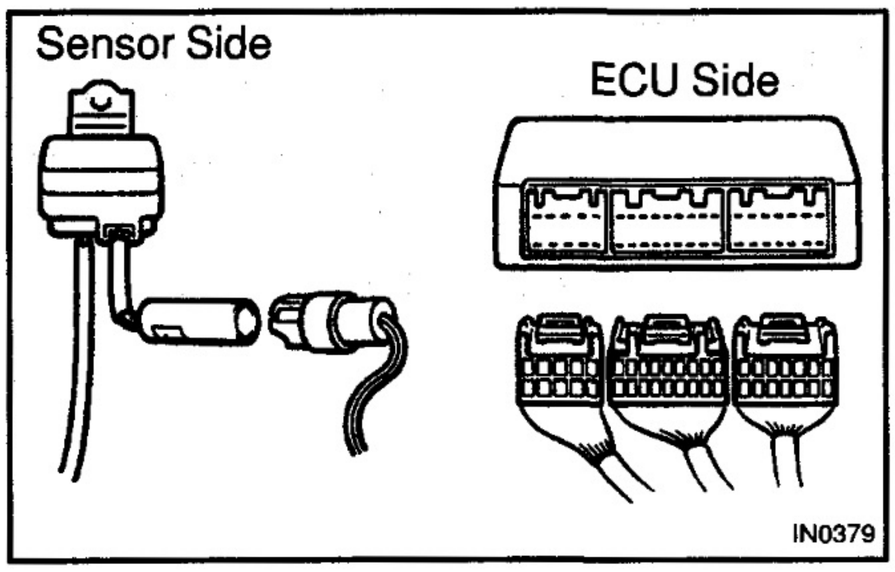
- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators.
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a drop in the contact 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 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)

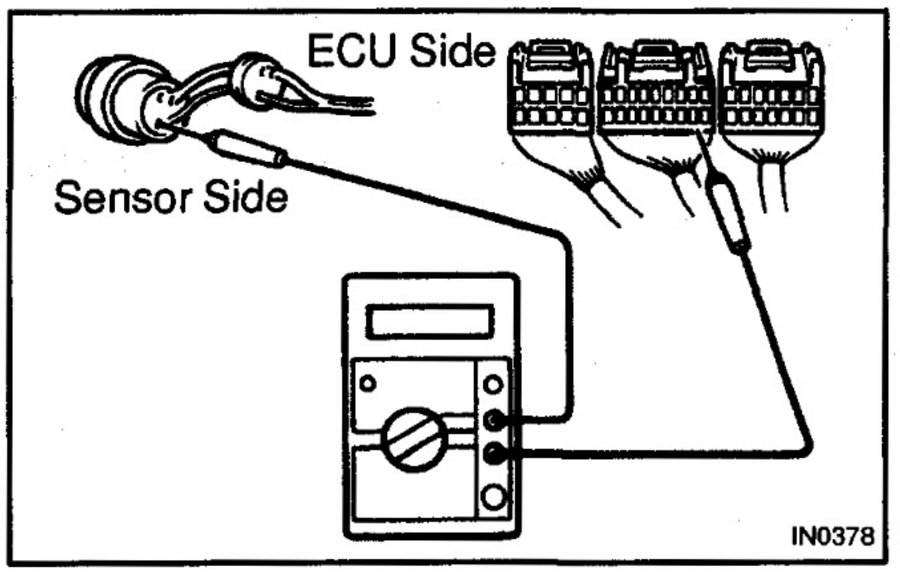
(a) Disconnect the connectors at both ECU and sensor sides.

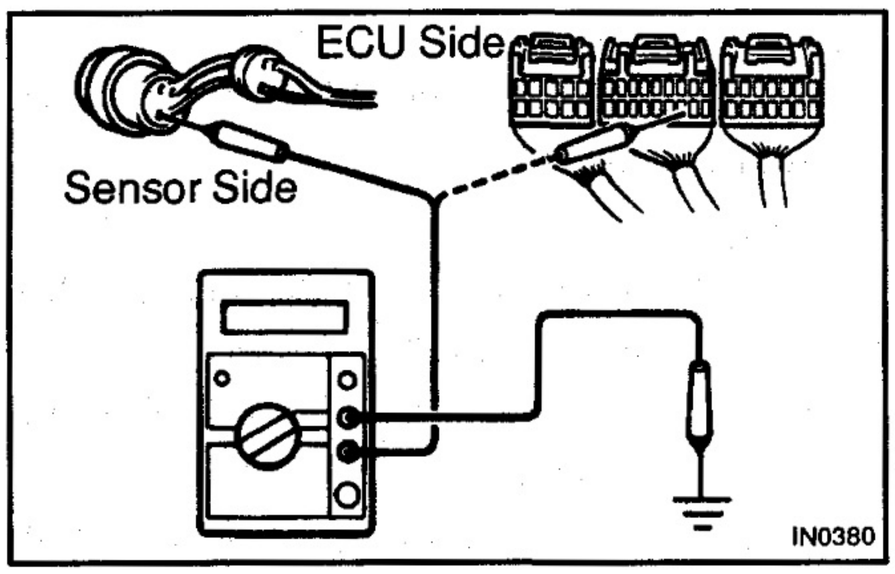
(b) Measure the resistance between the applicable terminals of the connectors.

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)

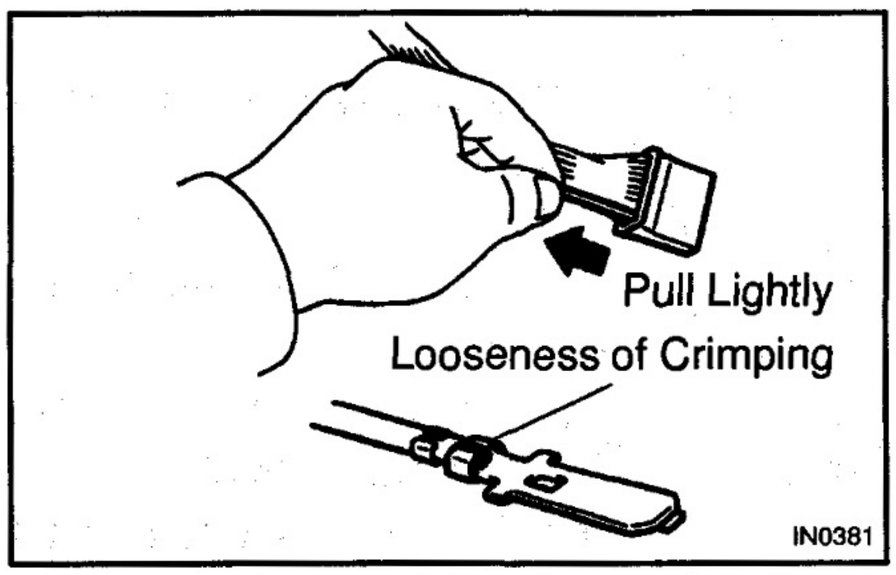
(a) Disconnect the connectors at both ends.

(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.

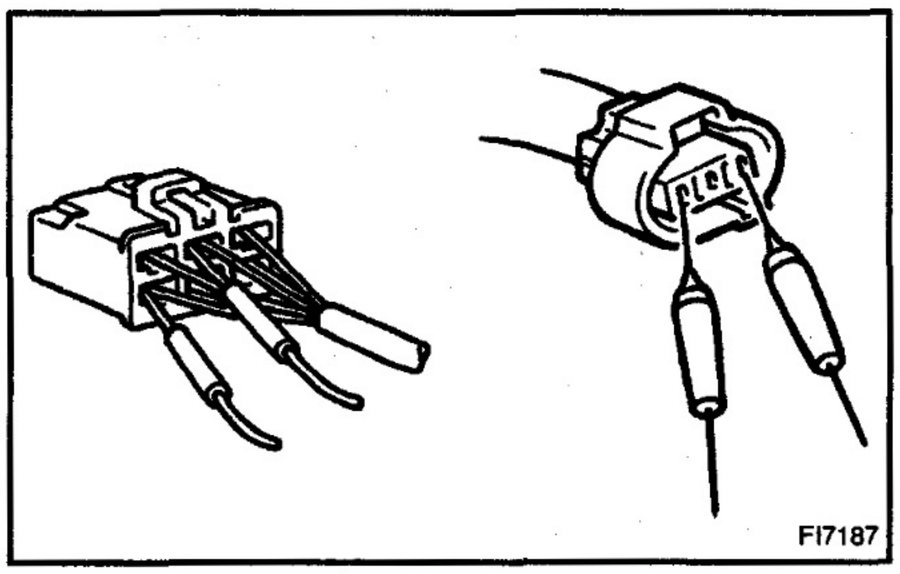
(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

NOTICE:

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

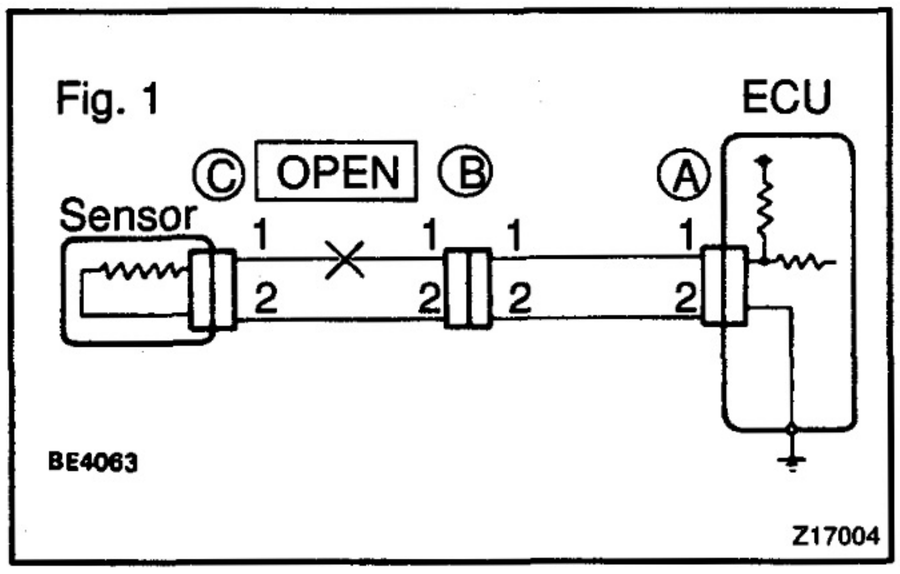
HINT:

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



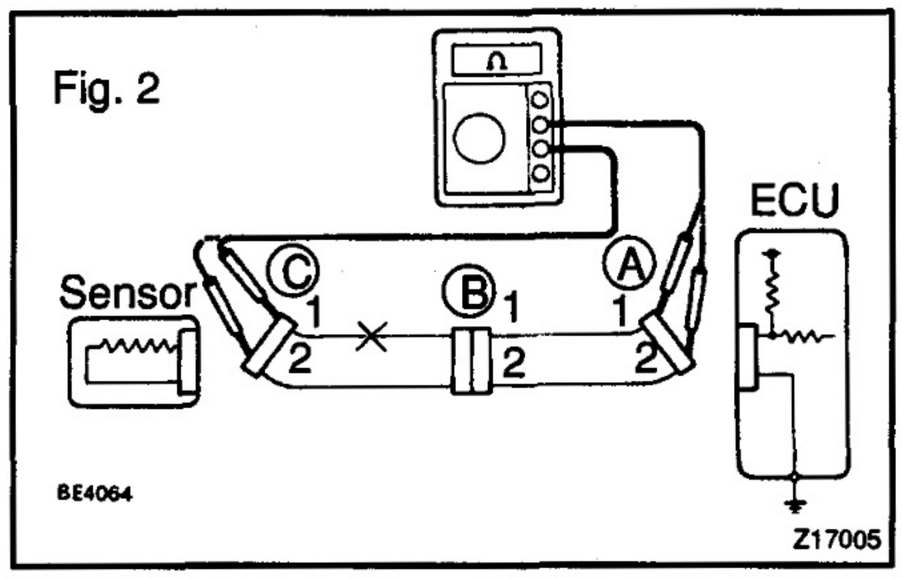
5. CONNECTOR HANDLING

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.

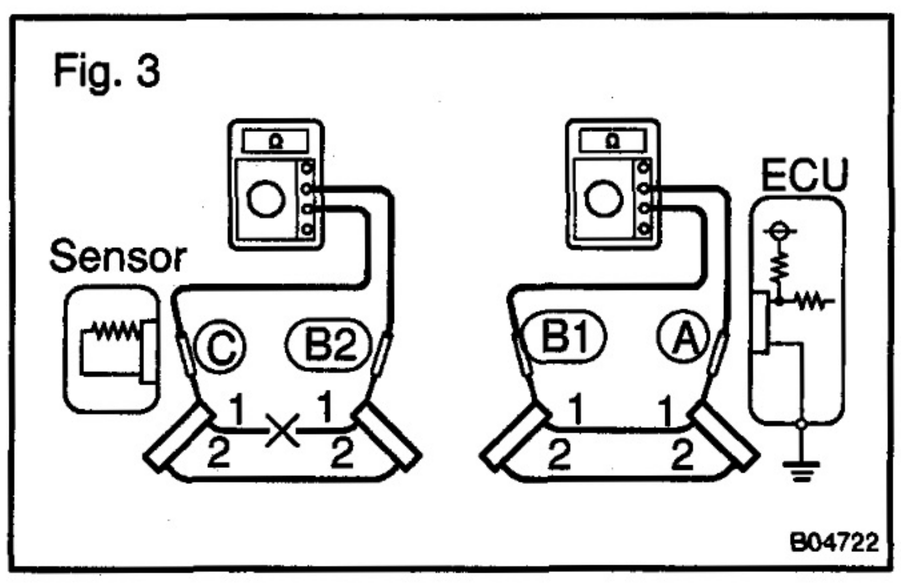
(1) Disconnect connectors "A" and "C" and measure the resistance between them.

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.

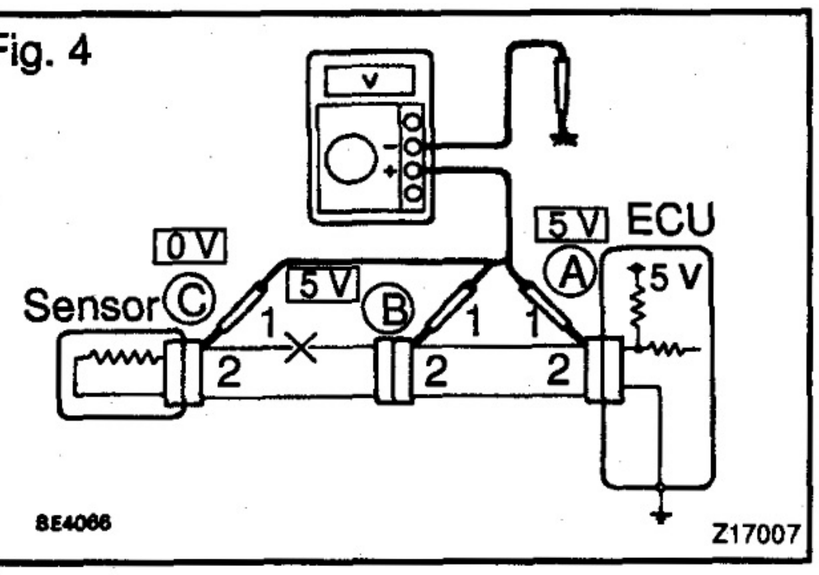
In the case of Fig. 3,

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".

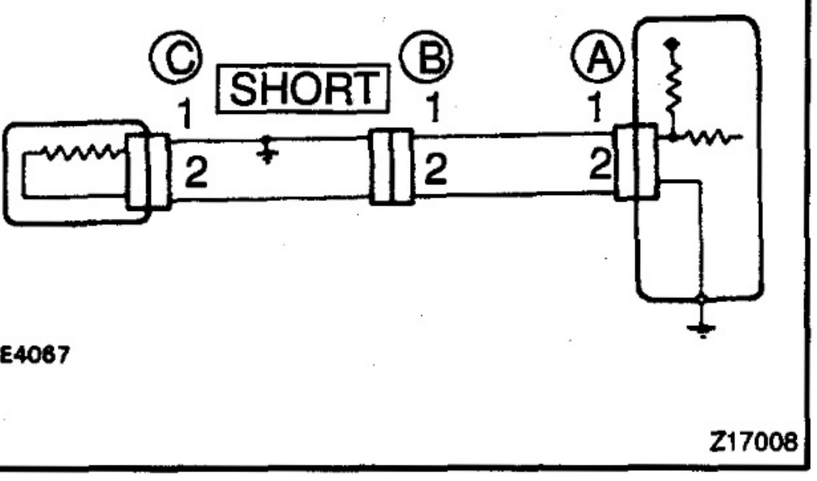
Fig. 4



(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 5V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order.

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

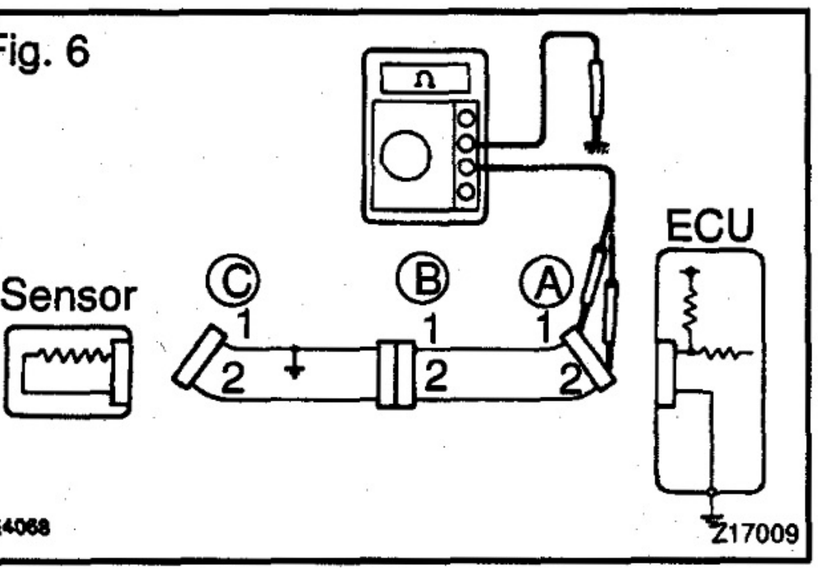
Fig. 5



7. CHECK SHORT CIRCUIT

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

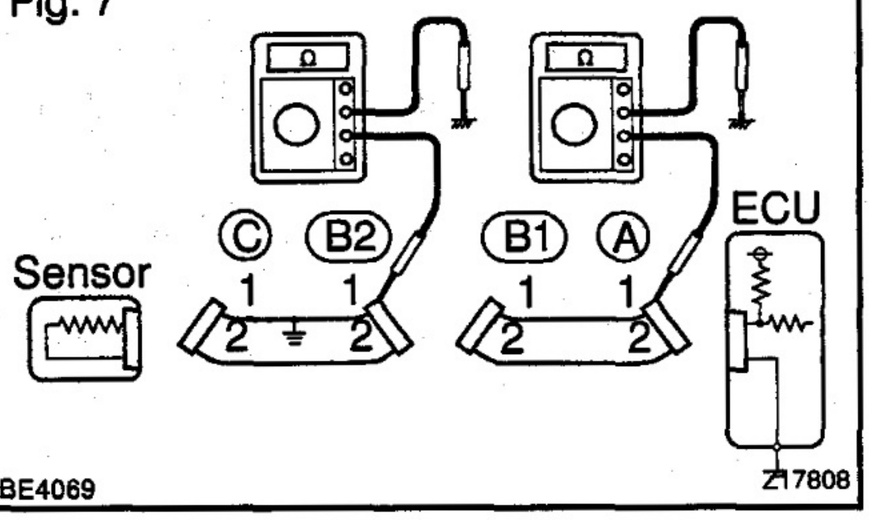
Fig. 6



Check the continuity with ground.

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

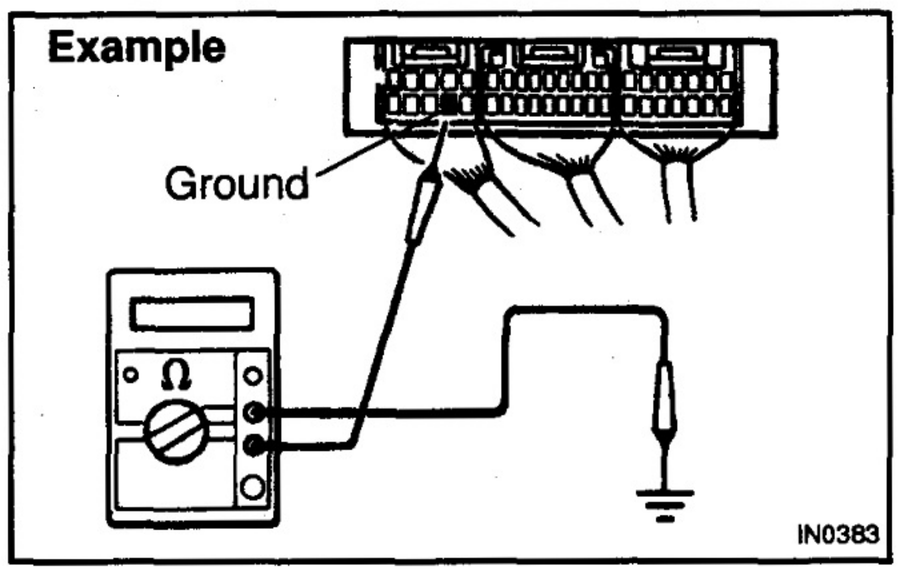
Fig. 7



(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.
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".

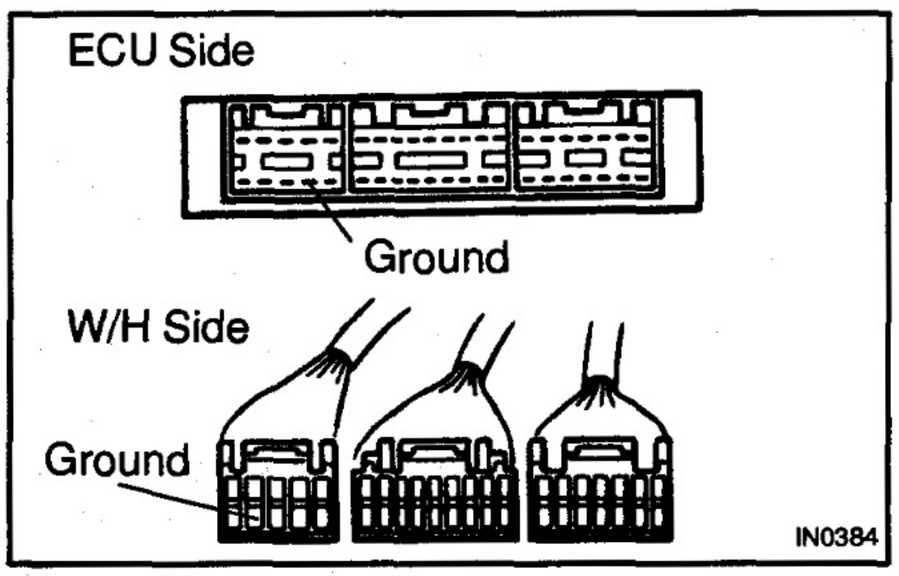
8. CHECK AND REPLACE ECU

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–13

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
APROX.	Approximately
A/T	Automatic Transmission (Transaxle)
BACS	Boost Altitude Compensation System
BAT	Battery
BTDC	Before 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 Compensator
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
TM	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	For Wheel Drive Vehicle (4x4)

PREPARATION

ELECTRONIC FUEL INJECTION PP–1
IGNITION PP–4

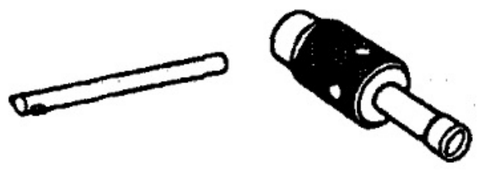
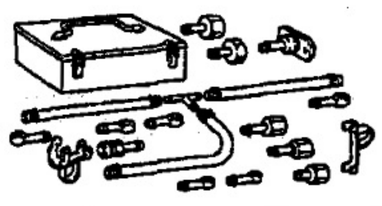
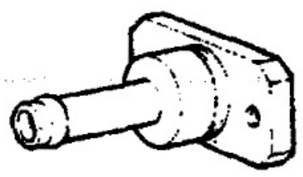
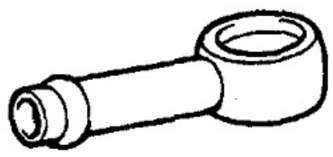
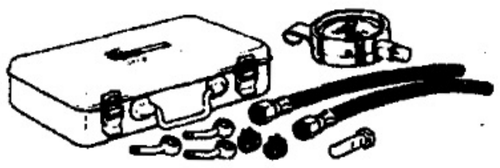
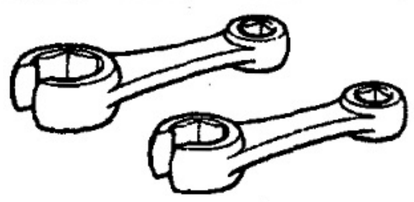
REFER TO 3RZ–F, 3RZ–FE ENGINE REPAIR MANUAL (Pub. No. RM521E)

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

ELECTRONIC FUEL INJECTION

SST (Special Service Tools)

PP0L8–02

	09243–00020 Idle Adjusting Screw Wrench	
	09268–41047 Injection Measuring Tool Set	
	(09268–41091) NO.7 Union	
	(90405–09015) No.1 Union	
	09268–45012 EFI Fuel Pressure Gauge	
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816–30010 Oil Pressure Switch Socket	Knock sensor
	09842–30070 Wiring "F" EFI Inspection	
	09843–18020 Diagnosis Check Wire	

PP

PP0L9-02

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	
	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

PP0LA-01

EQUIPMENT

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Heater	
Ohmmeter	
Soft brush	Throttle body
Sound scope	Injector
Thermometer	
Tachometer	
Torque wrench	

IGNITION

RECOMMENDED TOOLS

PP0LI-02

	09082–00040 TOYOTA Electrical Tester.	
	09200–00010 Engine Adjust Kit .	

PP0LJ–01

EQUIPMENT

Spark plug cleaner	
Torque wrench	
Ohmmeter	

SERVICE SPECIFICATIONS

STANDARD BOLT SS–1
ELECTRONIC FUEL INJECTION SS–4
IGNITION SS–6

SS

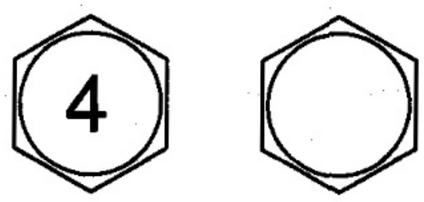
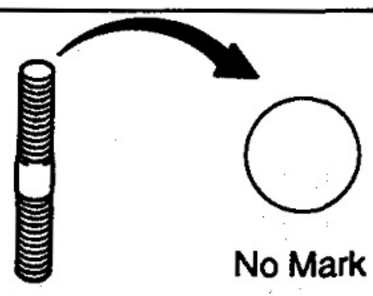
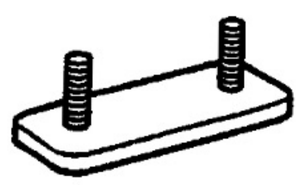
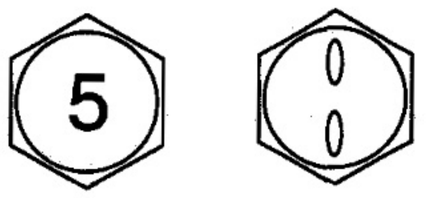
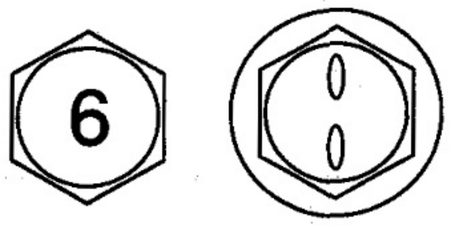
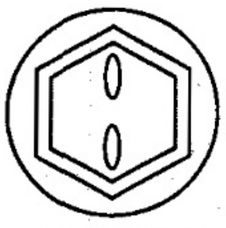
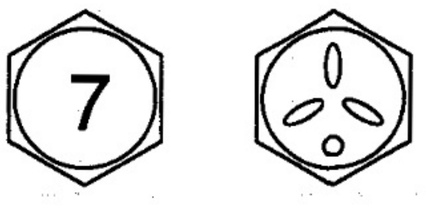
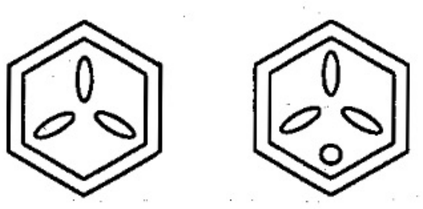
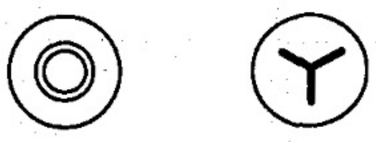
REFER TO 3RZ–F, 3RZ–FE ENGINE REPAIR MANUAL (Pub. No. RM521E)

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

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS0ZS–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

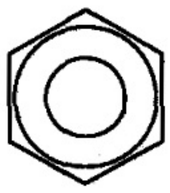
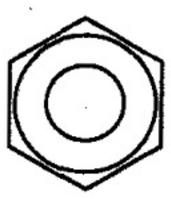
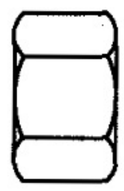
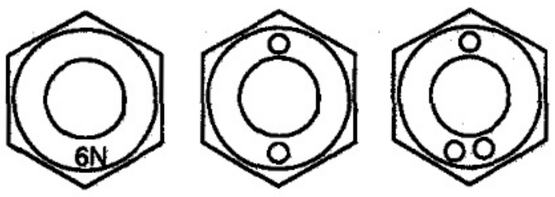
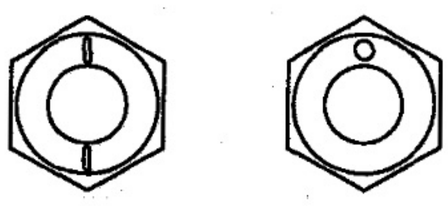
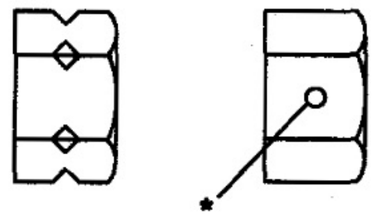
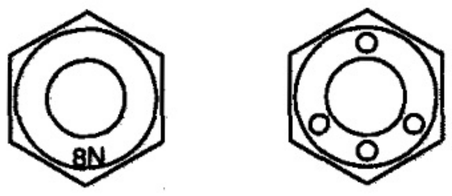
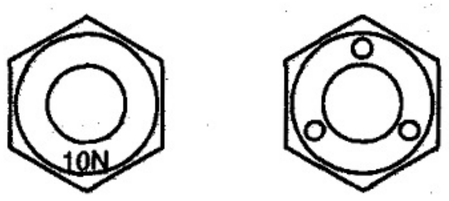
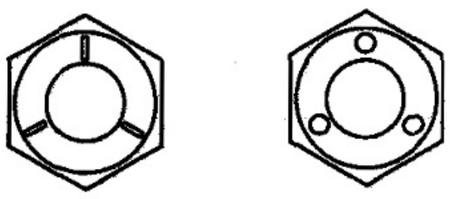
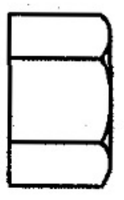
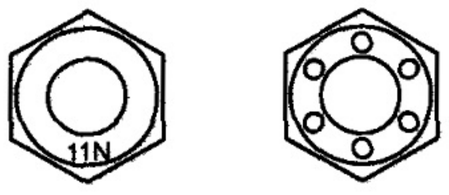
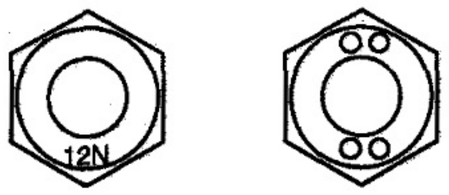
SS0ZT–01

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

SS0B4–04

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
Main fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Sub fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage	at 20°C (68°F)	13.4 – 14.2 Ω 72 – 86 cm^3 (13.4 – 14.2 cu in.) per 15 seconds 14 cm^3 (0.3 cu in.) or less 1 drop or less per 3 minutes
Throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) Throttle valve fully open 	 VTA–E2 VTA–E2 VC–E2	 0.2 – 5.7 kΩ 2.0 – 10.2 kΩ 2.5 – 5.9 kΩ
Throttle body	Throttle body fully closed angle Throttle opener setting speed		6° 1,200 – 1,500 rpm
ISC valve	Resistance (+B – RSC or RSO)	at cold at hot	17.0 – 24.5 Ω 21.5 – 28.5 Ω
Water temperature sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
Intake air temperature sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
Oxygen sensor	Heater resistance	20°C (68°F)	11.7 – 14.3 Ω
Variable resistor	Voltage Resistance	VCC–E2	4.5 – 5.5 V 4 – 6 kΩ

SS0B5-02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Flare nut type) w/ SST	28	285	21
Fuel pump bracket assembly x Fuel tank	3.5	35	31 in.·lbf
Fuel pressure regulator x Delivery pipe	8.0	80	69 in.·lbf
Delivery pipe x Cylinder head	29	300	22
Fuel inlet pipe x Delivery pipe	21	210	15
Water temperature sensor x Cylinder head	20	200	14
Knock sensor x Cylinder block	44	450	33
Throttle body x Air intake chamber	20	200	14

IGNITION

SERVICE DATA

SS0BA–02

High–tension cord	Resistance	Maximum	25 kΩ per cold
Spark plug	Recommended spark plug	ND	K16R–U
		NGK	BKR5EYA
	Correct electrode gap for new spark plug		0.8 mm (0.031 in.)
Ignition coil	Resistance	Secondary at cold	9.7 – 16.7 kΩ
		at hot	12.4 – 19.6 kΩ

SS0BB–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	20	200	14
Ignition coil x Cylinder head	10	100	7

DIAGNOSTICS

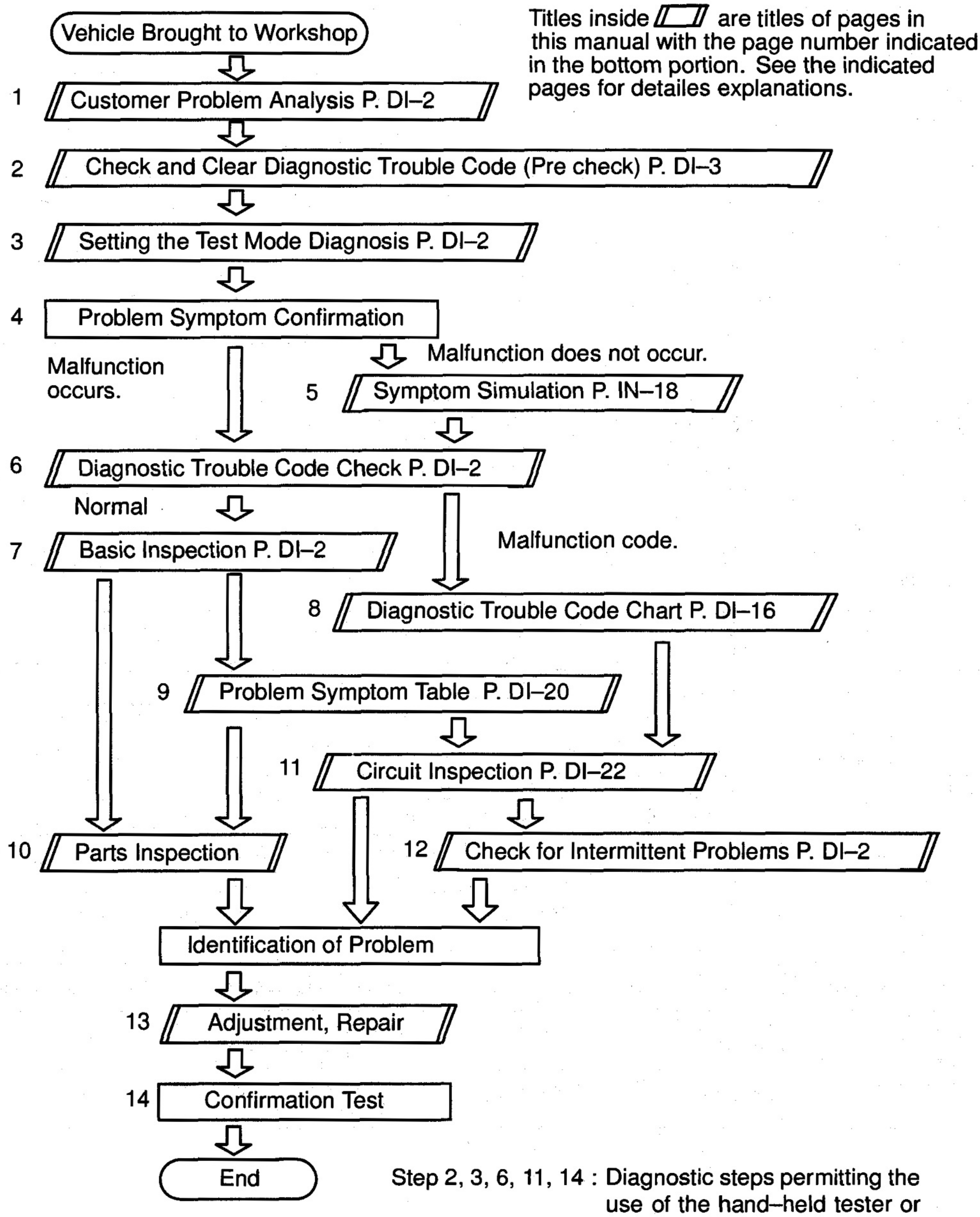
ENGINE DI–1
HOW TO PROCEED WITH TROUBLESHOOTING DI–1
CUSTOMER PROBLEM ANALYSIS CHECK ... DI–2
PRE–CHECK DI–3
DIAGNOSTIC TROUBLE CODE CHART DI–16
PARTS LOCATION DI–17
TERMINALS OF ECU DI–18
PROBLEM SYMPTOMS TABLE DI–20
CIRCUIT INSPECTION DI–22
SUB FUEL TANK SYSTEM DI–84
HOW TO PROCEED WITH TROUBLESHOOTING DI–84
CUSTOMER PROBLEM ANALYSIS CHECK ... DI–85
PRE–CHECK DI–86
DIAGNOSTIC TROUBLE CODE CHART DI–88
PARTS LOCATION DI–89
TERMINALS OF ECU DI–90
CIRCUIT INSPECTION DI–91

ENGINE

HOW TO PROCEED WITH TROUBLESHOOTING

DI1HG–04

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 detailes explanations.

Step 2, 3, 6, 11, 14 : Diagnostic steps permitting the use of the hand–held tester or break–out box.

DI

DI1HH–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

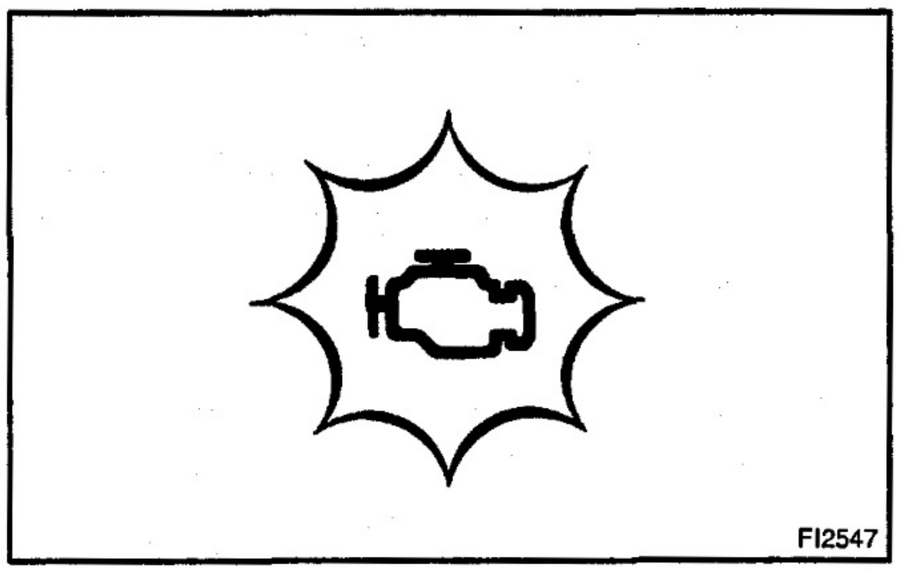
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

DI

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 Driveaability	☐ 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	

Datas 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 _____

Condition of Check Engine Warning Light		☐ Remains on	☐ Sometimes light up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal mode (Precheck)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )
	Test Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )


FI2547

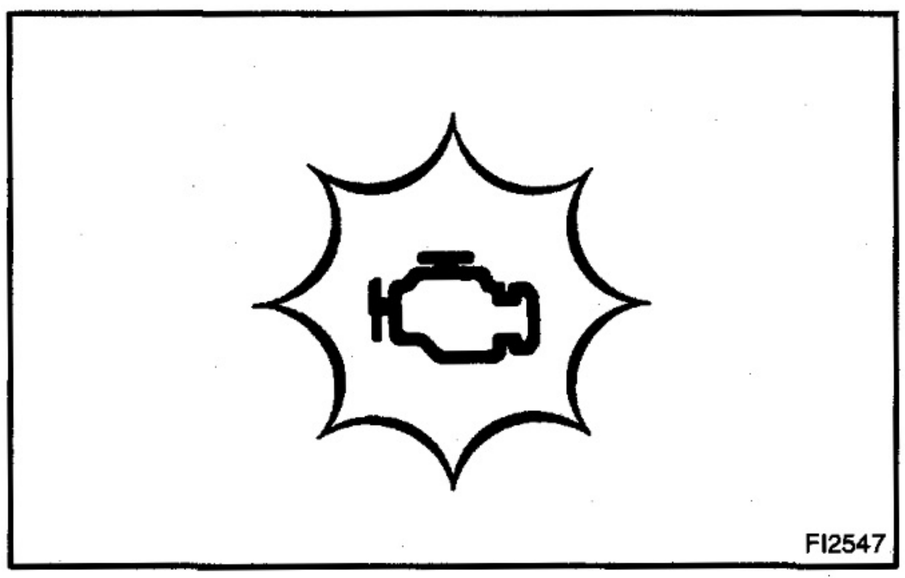
DI6DJ–01

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- The Engine ECU contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and a check engine warning light in the combination meter lights up.
- By analyzing various signals as shown in the later table (See page DI–16) the Engine ECU detects system malfunctions relating to the sensors or actuators.
- In the normal mode, the self–diagnosis system monitors 14 items, indicated by code No. as shown in DI–16 A check engine warning light informs the driver that a malfunction has been detected. The ECU stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.
- The diagnostic trouble code can be read by the number of blinks of the check engine warning light when TE1 and E1 terminals on the check connector are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.
- In the test mode, 10 items, indicated by code No. as shown in DI–16 are monitored. If a malfunction is detected in any one of the systems indicated by code Nos. 13, 22, 24, 31, and 41 the ECU lights the check engine warning light to warn the technician that malfunction has been detected. In this case, TE2 and E1 terminals on the check connector should be connected as shown later.
(See page DI–3)
- In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECU memory even when the ignition switch is off. This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the check engine warning light can be selected by connecting the TE1, TE2, and E1 terminals on the check connector, as shown later.
- A test mode function has been added to the functions of the self–diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self–diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page DI–3)



2. DIAGNOSIS INSPECTION (Normal Mode)

(a) Check Engine warning Light Check

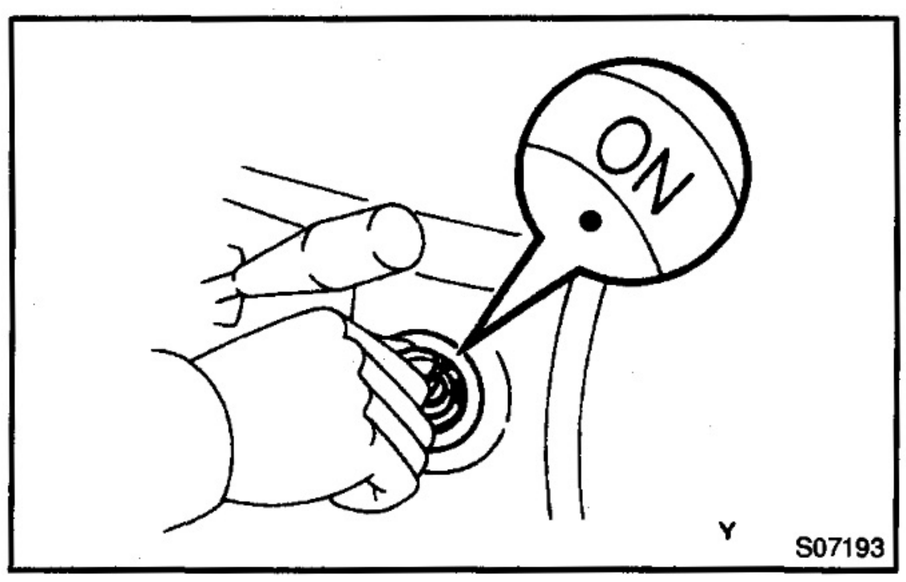
(1) The check engine warning light will light up when the ignition switch is turned ON and the engine is not running.

HINT:

If the check engine warning light does not light up, proceed to troubleshooting of the combination meter.

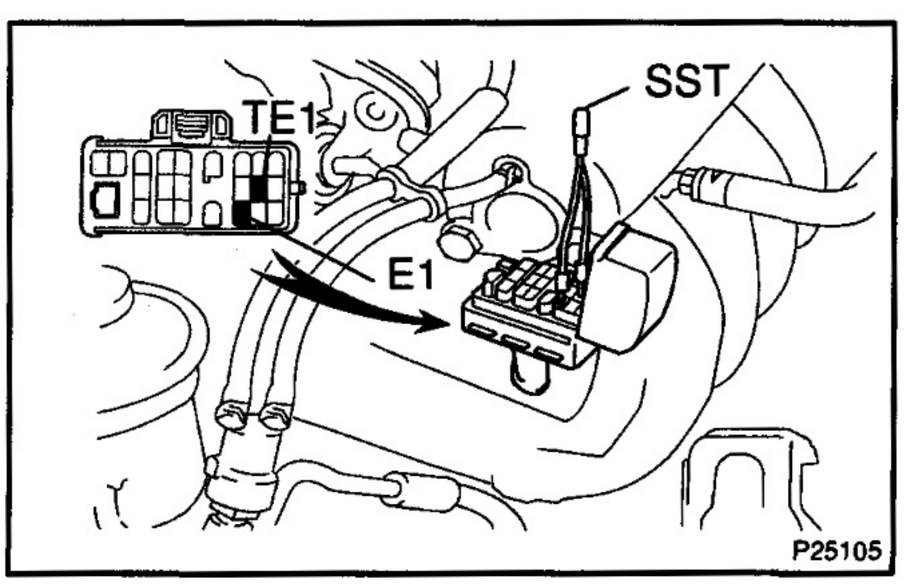
(2) When the engine is started, the check engine warning light should go off.

If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.



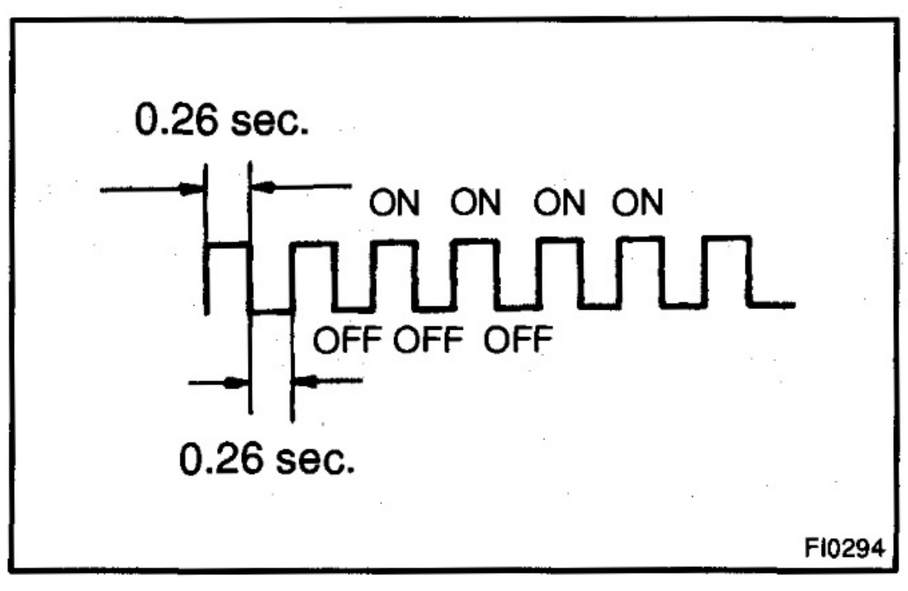
(b) Diagnostic Trouble Code Check

(1) Turn ignition switch ON.

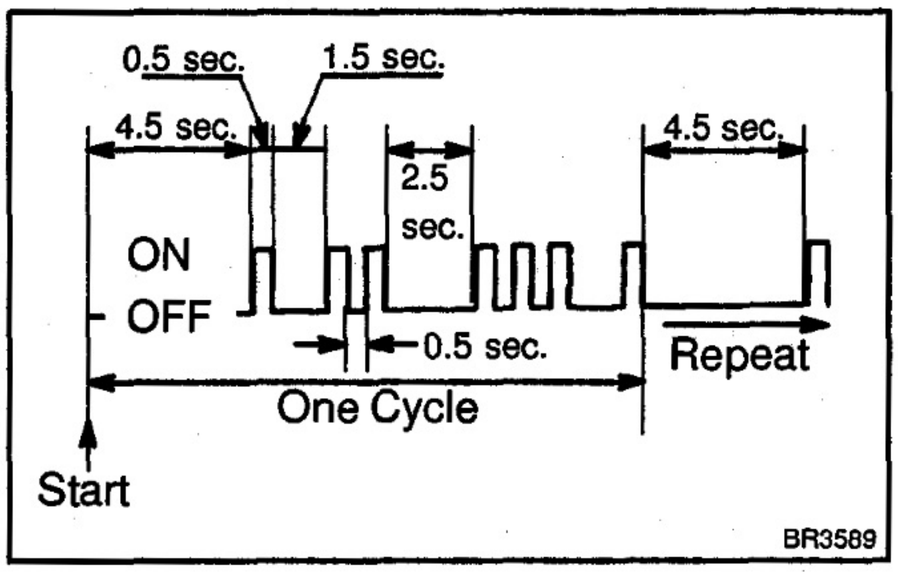


(2) Using SST, connect terminals between TE1 and E1 of check connector.

SST 09843–18020



(3) Read the diagnostic trouble code from check engine warning light.



As an example, the blinking patterns for codes; normal, 12 and 31 are as shown on the illustration.

HINT:

If a diagnostic trouble code is not output, check the TE1 terminal circuit (See Page DI–65).

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

(5) After completing the check, disconnect the SST from terminals TE1 and E1, and turn off the display.

HINT:

If the event of 2 or more malfunction codes, indication will begin from the smallest numbered code and continue in order to the largest.

DI

3. DIAGNOSIS INSPECTION (Test Mode)

HINT:

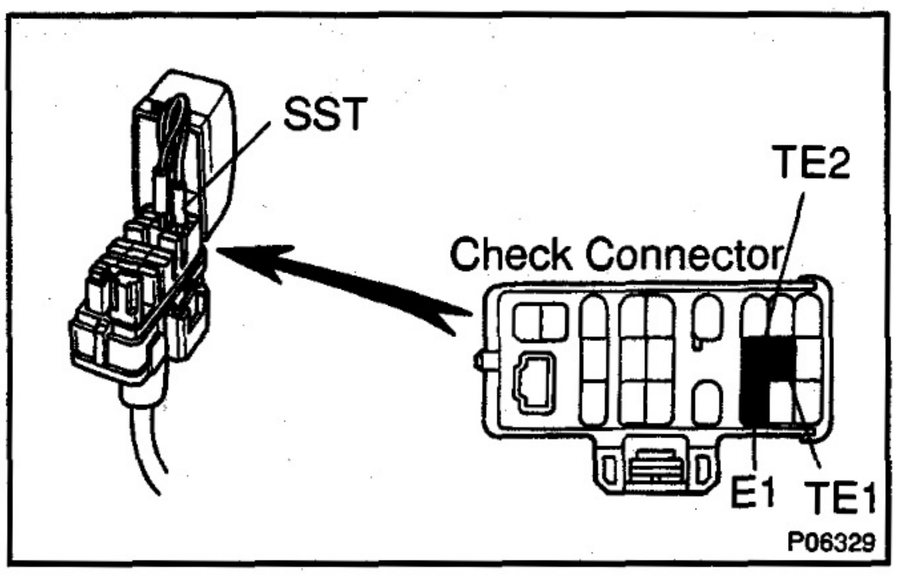
Compared to the normal mode, the test mode has an increased sensing ability to detect malfunctions.

The same diagnostic items which are detected in the normal mode can also be detected in the test mode.

(a) Diagnostic Trouble Code Check

(1) Initial conditions.

- Battery positive voltage 11 V or more.
- Throttle valve fully closed.
- Air conditioning switched OFF.



(2) Turn ignition switch OFF.

(3) Using SST, connect terminals TE2 and E1 of check connector.

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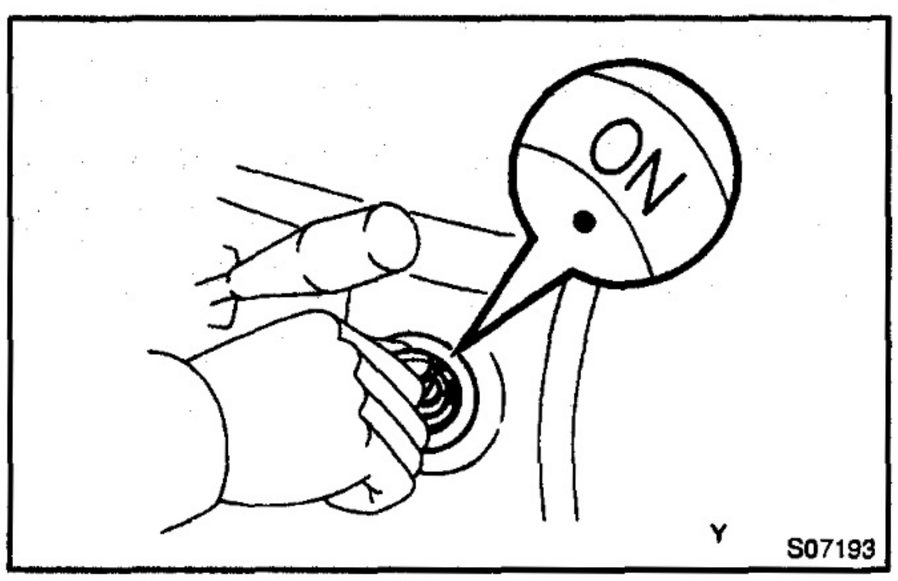
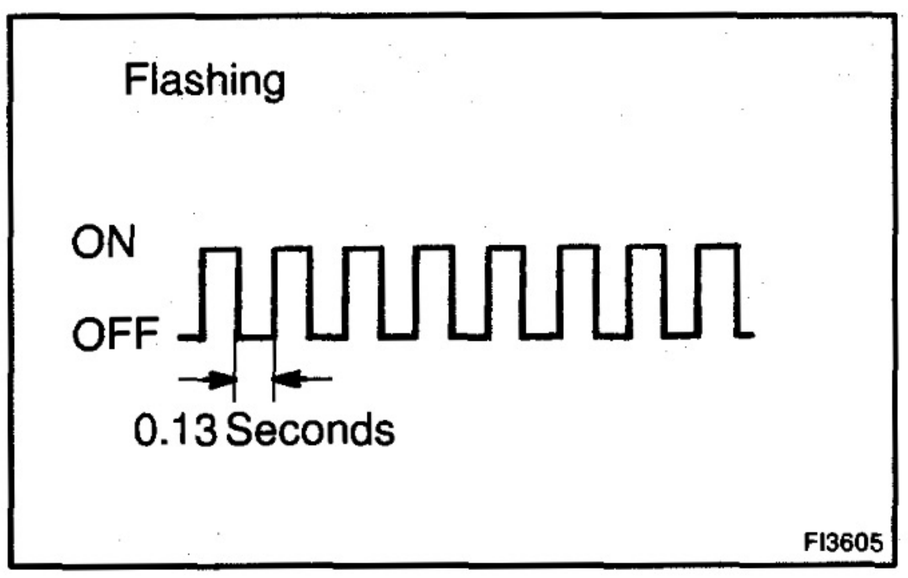


(4) Turn ignition switch ON.



HINT:

- To confirm that the test mode is operating, check that the check engine warning light flashes when the ignition switch turned ON.
- If the check engine warning light does not flash, refer to diagnostic chart for the TE2 terminal circuit on page DI–16.

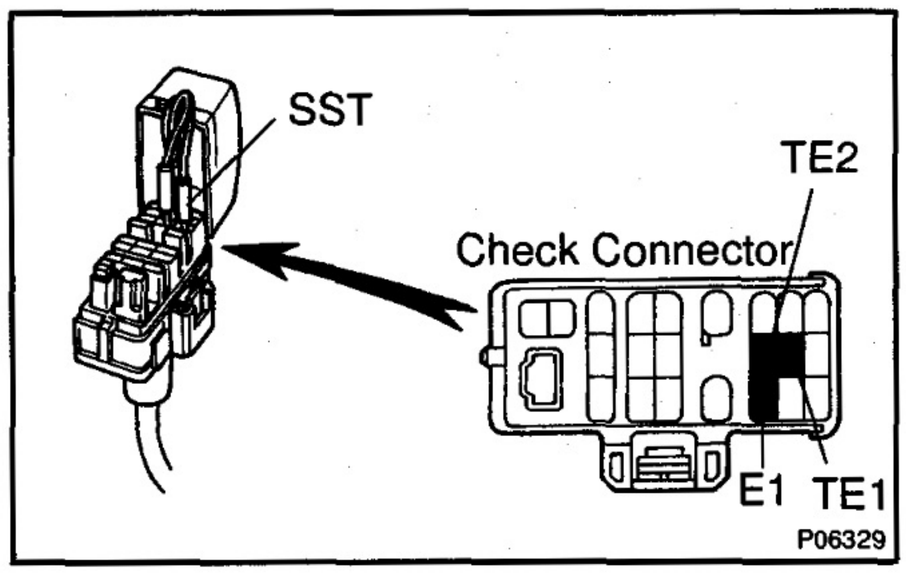
(5) Start the engine.

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

(7) After the road test, using SST, connect terminals TE1 and E1 of check connector.

SST 09843–18020

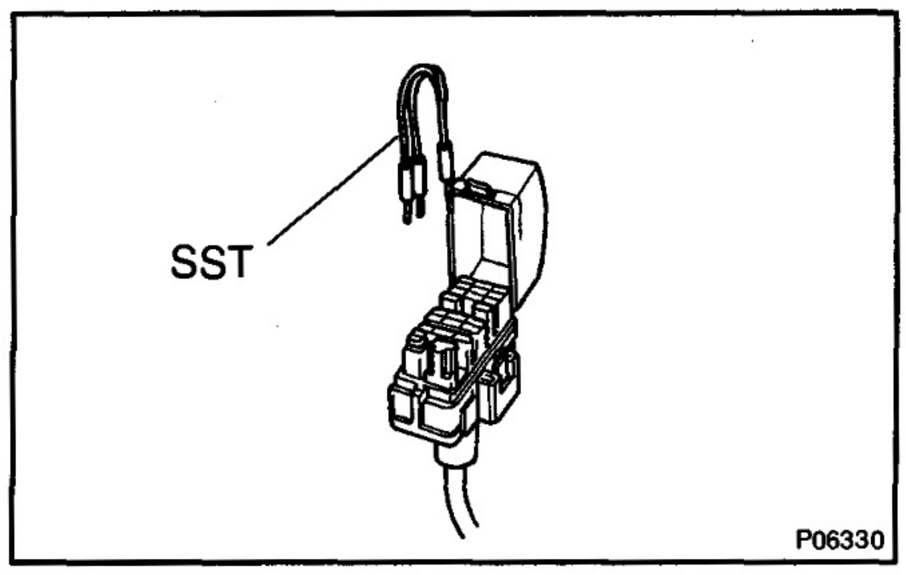
(8) Read the diagnostic trouble code on check engine warning light in the combination meter .



(9) After completing the check, disconnect the SST from terminals TE1, TE2 and E1, and turn off the display.

HINT:

- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch turned ON.
- When vehicle speed is 5 km/h (3 mph) or below, diagnostic trouble code "42" (Vehicle speed signal) is output, but this is not abnormal.



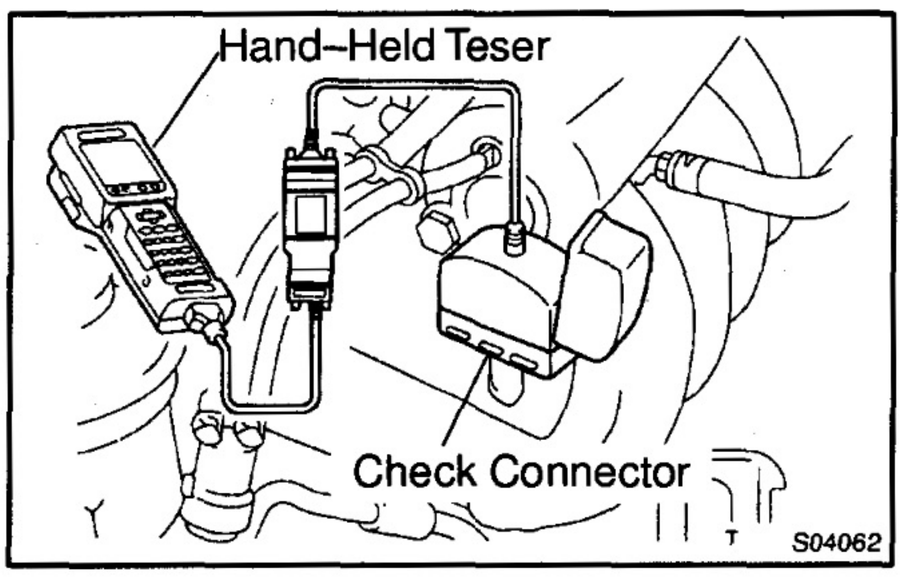
(b) Diagnostic Trouble Code Check Using Hand–Held Tester

(1) Hook up the hand–held tester to the check connector.

(2) Read the diagnostic trouble codes by following the prompts on the tester screen.

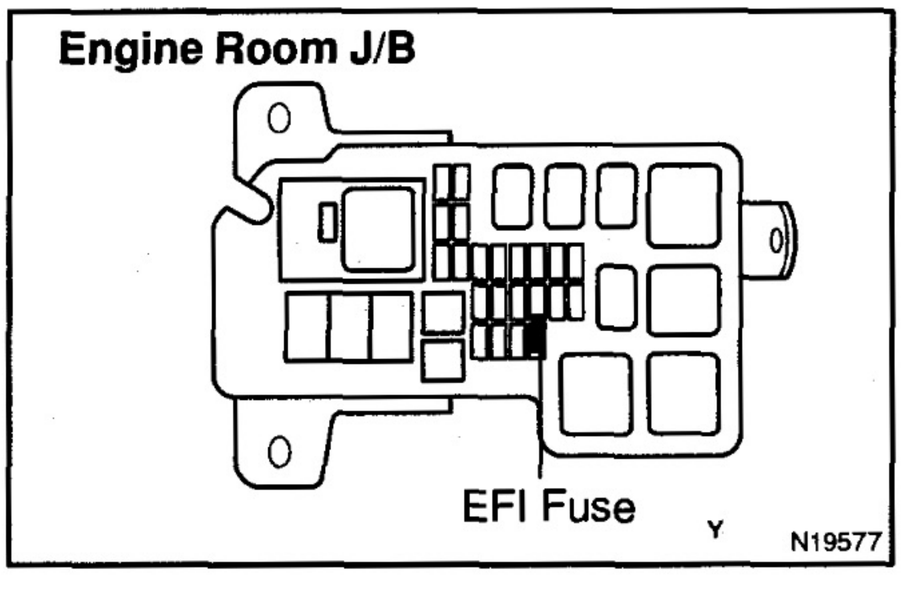
HINT:

Please refer to the hand–held tester operator's manual for further details.



(c) Diagnostic Trouble Code Clearance

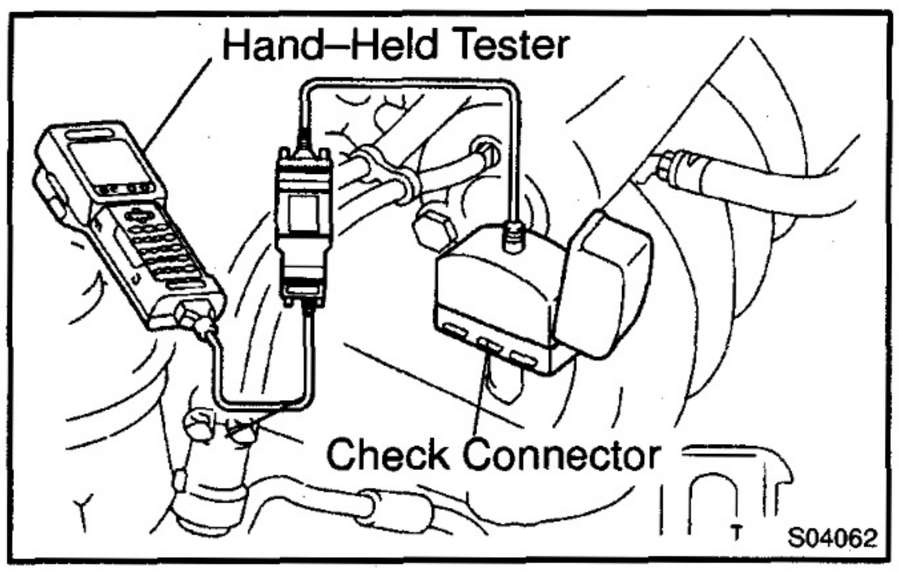
(1) After repair the trouble areas, the diagnostic trouble code retained in the ECU memory must be cleared out by removing the EFI fuse (15 A) from engine room J/B for 10 seconds or more, with the ignition switch OFF.



HINT:

- Cancellation can also be done by removing the negative (–) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If it is necessary to work on engine components requiring removal of the negative (–) terminal cable from the battery, a check must first be made to see if a diagnostic trouble code has been recorded.

(2) After cancellation, road test the vehicle to check that a normal code is now read on the check engine warning light.
If the same diagnostic trouble code(s) appears, it indicates that the trouble area has not been repaired throughly.



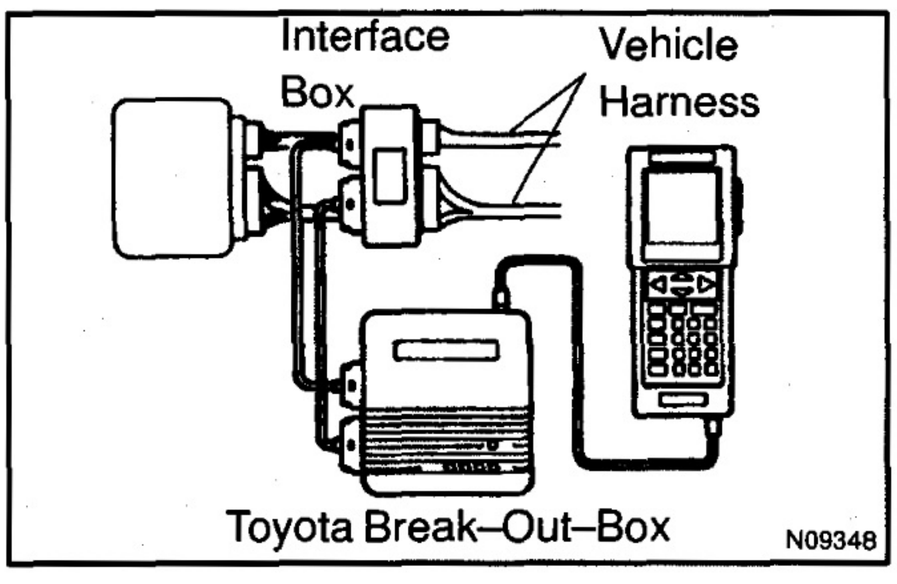
(d) ECU Data Monitor Using Hand–Held Tester

(1) Hook up the hand–held tester to the check connector.

(2) Monitor the ECU data by following the prompts on the tester screen.

HINT:

- Hand–held tester has a "Snapshot" function which records the monitored data.
- Please refer to the hand–held tester operator's manual for further details.



(e) 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 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.

4. FAIL–SAFE CHART

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

Trouble Code No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
22	Engine coolant temp. is fixed at 80°C (176°F)	Returned to normal condition
24	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
31	• Ignition timing fixed at 5° BTDC • Manifold absolute pressure is fixed at 46.7 kPa (350 mmHg, 13.8 in. Hg)	Returned to normal condition
41	Throttle position is fixed at 0°	The following must each be repeated at least 2 times consecutively • 0.1 V ≦ VTA and 0.95 V
42	High RPM for cut is prohibited ISC control prohibited	Return to normal condition

DTC	Circuit
13	Crankshaft position sensor circuit
22	Water temp. sensor circuit
24	Intake air temp. sensor circuit
31	Vacuum sensor circuit
41	Throttle position sensor circuit

5. CHECK FOR INTERMITTENT PROBLEMS

As previously described DI–3, abnormality detection ability in the test mode is increased compared to that in the normal mode, so that when intermittent problems occur in the ECU signal circuits (NE, THW, THA, PIM, VTA) shown in the table opposite, the appropriate diagnostic trouble code is output.
Accordingly, when the diagnostic trouble codes shown in the table opposite (13, 22, 24, 31, 41) are output during the diagnostic trouble code check, and inspection of the appropriate circuits reveals no abnormality, check for intermittent problems as described below.
By check for intermittent problems, the place where intermittent problems are occurring due to poor contacts can be isolated.

(1) Clear Diagnostic Trouble Codes
(See step 3.)

(2) Set Test Mode
- With the ignition switch OFF, using SST, connect the terminals TE2 and E1 of the check connector.

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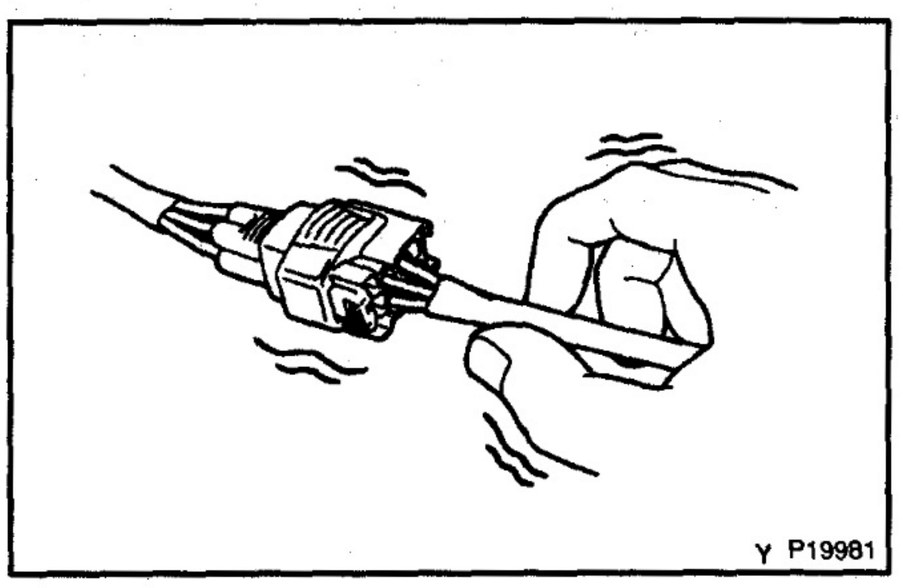
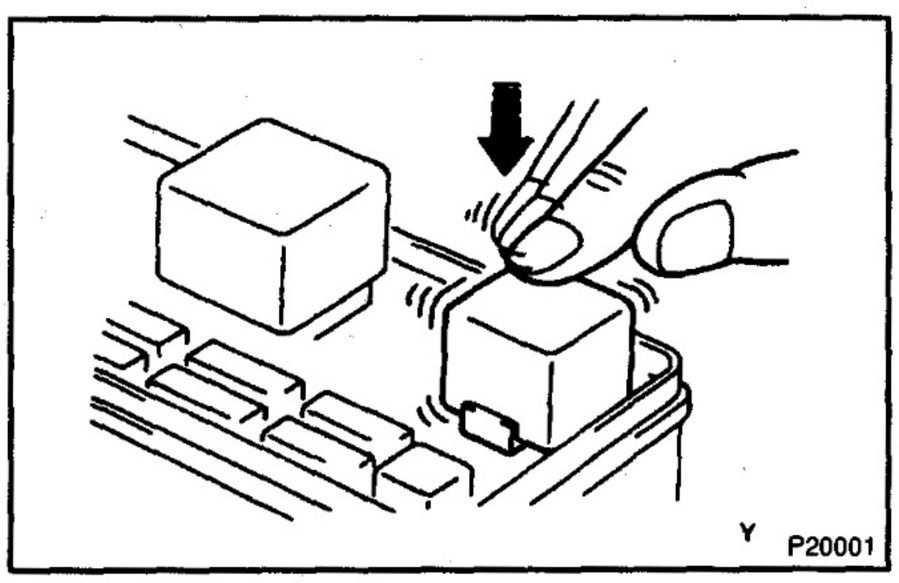
- Start the engine and check to see if the check engine warning light to goes off.



(3) Perform a Simulation Test
Using the symptom simulation
(See page IN–9), apply vibration to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code.
In this test, if the check engine warning light lights up, it indicates that the place where the wire harness, connector or terminals being pulled or vibrated has faulty contact. Check that point for loose connections, dirt on the terminals, poor fit or other problems and repair as necessary.



HINT:
After cancelling out the diagnostic trouble code in memory and set the test mode, if the check engine warning light does not go off after the engine is started, check thoroughly for faulty contact, etc., then try the check again. If the check engine warning light still does not go off, check and replace ECU.

DI

6. BASIC INSPECTION

When the normal code is displayed in the diagnostic trouble code 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	**Does engine crank ?**

NO → **Proceed to problem symptoms table on page DI–20.**

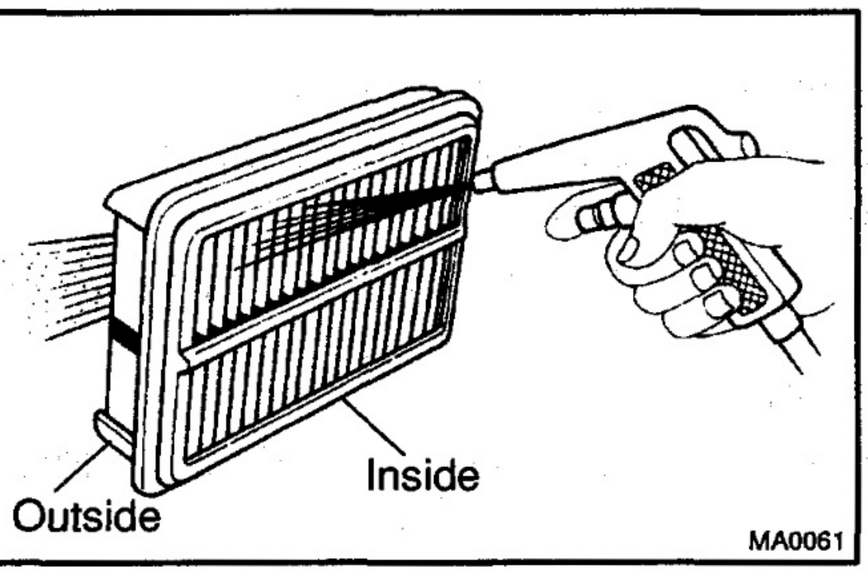
YES

3	**Does engine start ?**

NO → **Go to step 7.**

YES

4	Check air filter.

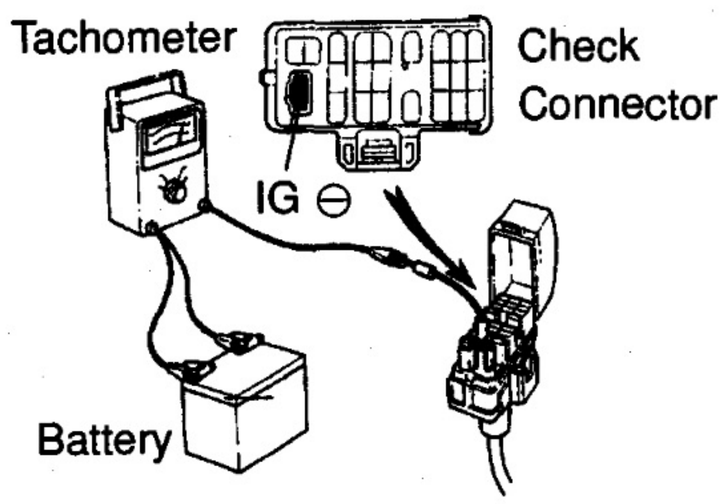


PREPARATION:
Remove air filter.
CHECK:
Visually check that the air filter is not excessively dirty or oily.
HINT:
If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow from outside of the air filter.

NG → **Repair or replace.**

OK

5	Check idle speed.



PREPARATION:
(a) Shift transmission into neutral.
(b) Warm up engine to normal operating temperature.
(c) Switch off all accessories.
(d) Switch off air conditioning.
(e) Connect tachometer test probe to terminal IG⊖ of check connector and set the tachometer to the 4–cylinder range.

CHECK:
Check idle speed.

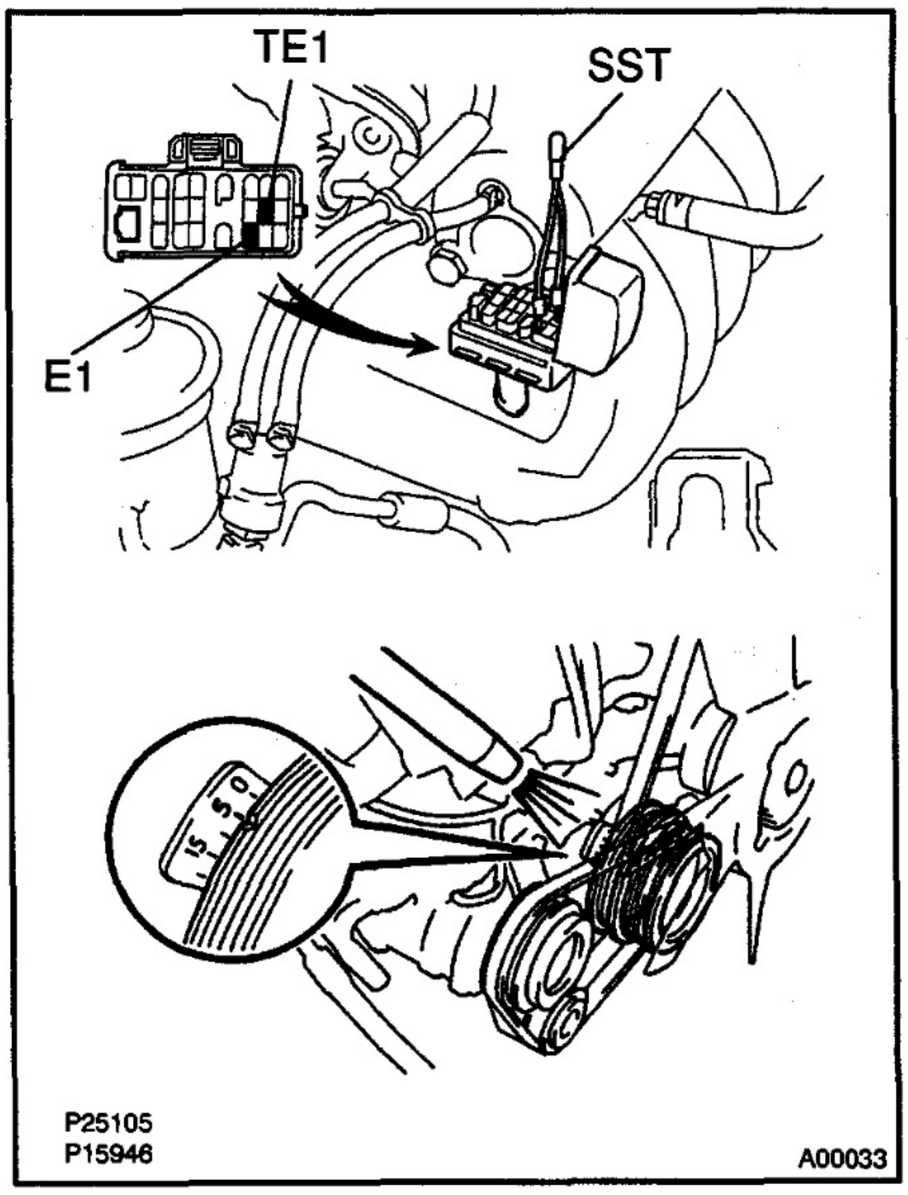
OK:
Idle speed: 650 – 750 rpm

CAUTION:
- **Never allow tachometer test probe to touch ground as it could result in damage to igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, confirm the compatibility of your unit before use.**

NG → **Proceed to problem symptoms table on page DI–20.**

OK

6	Check ignition timing.



P25105
P15946

A00033

PREPARATION:

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

CHECK:

Check ignition timing.

OK:

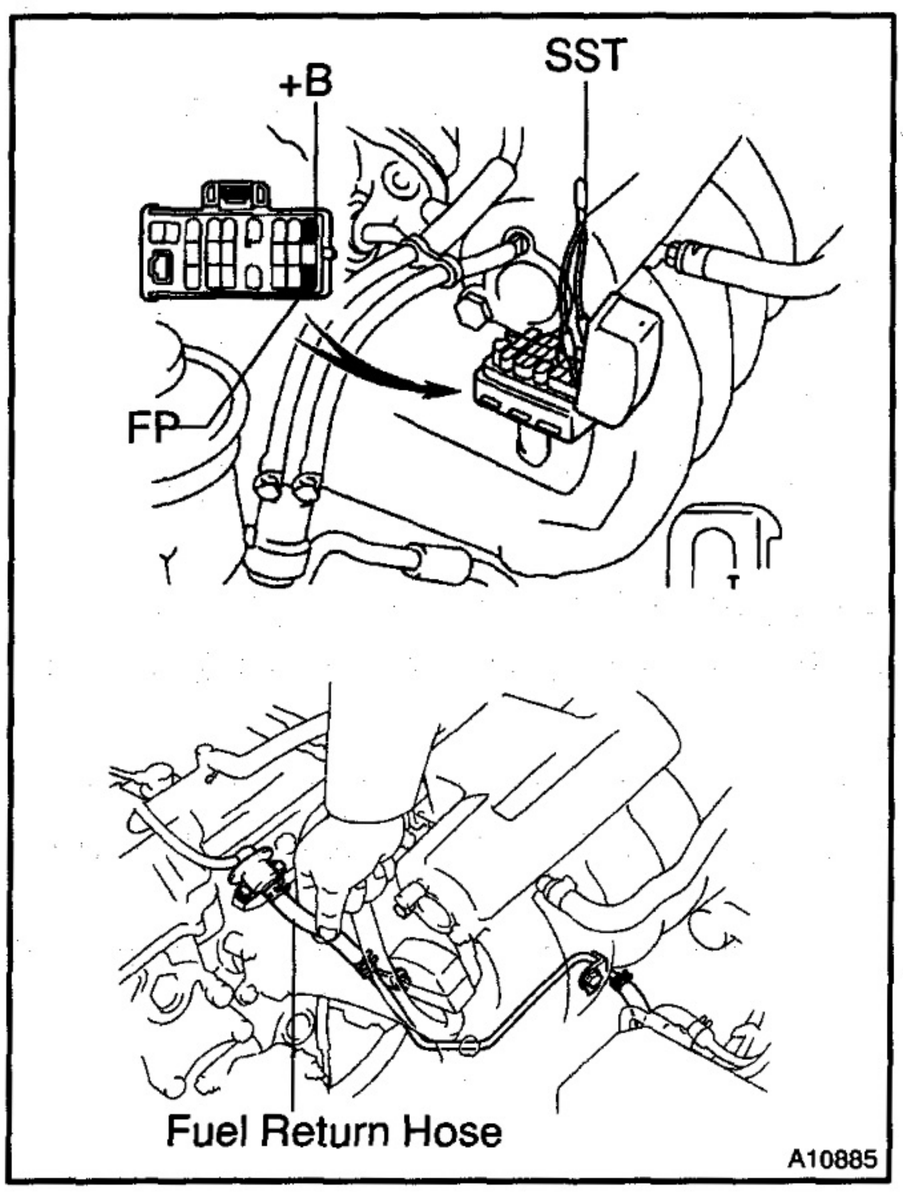
Ignition timing: 5° BTDC at idle

NG → **Proceed to page DI–3 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–20.

7	**Check fuel pressure.**



PREPARATION:

(a) Be sure that there is enough fuel in the tank.
(b) Turn ignition switch ON.
(c) Using SST, connect terminals FP and +B of check connector.
SST 09843–18020

CHECK:

Check the fuel pressure by pinching the fuel return hose.
HINT:
At this time, you will hear fuel return noise.

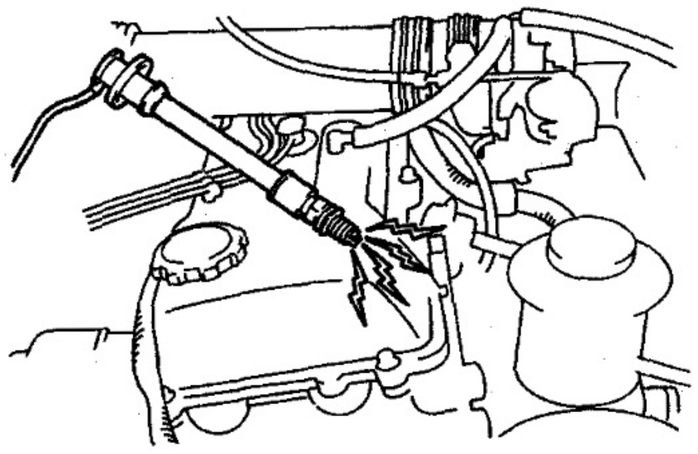
NOTICE:

Never make a mistake with the terminal connecting position as this will cause a malfunction.

NG → **Proceed to page DI–3 and continue to troubleshoot.**

OK

8	Check for spark.



P25086

PREPARATION:

(a) Disconnect the high–tension cord from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the high–tension cord.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

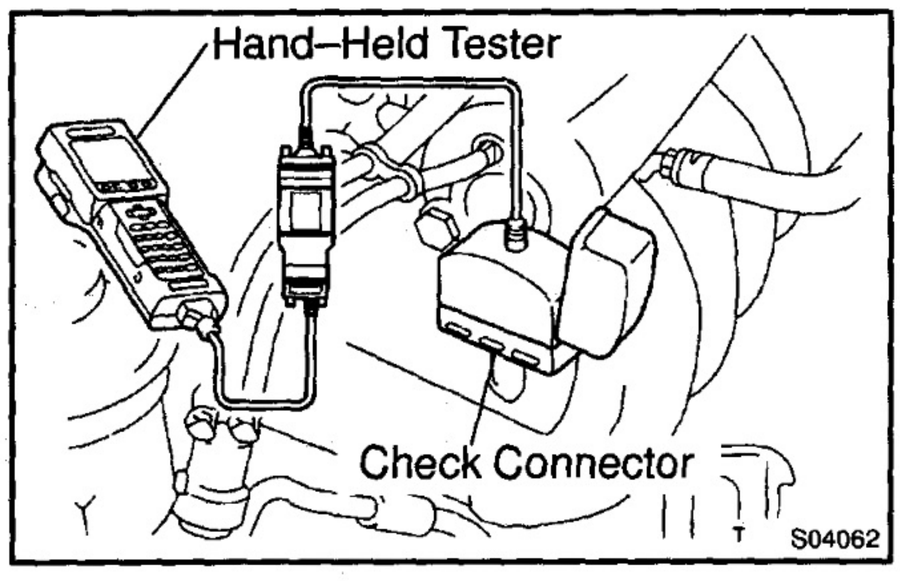
NOTICE:

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 page DI–3 and continue to trouble-shoot.**

OK

Proceed to problem symptoms table on page DI–3.



7. REFERENCE VALUE OF ENGINE ECU DATA

HINT:

Engine ECU data can be monitored by hand–held tester.

(a) Hook up the hand–held tester to the check connector.

(b) Monitor ECU data by following the prompts on the tester screen.

Please refer to the hand–held tester operator's manual for further detail.

(c) Reference Value

Item	Inspection Condition	Reference Value
INJECTOR	Engine cold to hot Engine idling at normal operating temp. *1	Gradually decreases Approx. 3 – 4 msecs
IGNITION	Increase engine speed	Gradually increases
ENGINE SPEED	RPM kept stable (Comparison with tachometer)	No great changes
INTAKE MAN.	Engine idling at normal operating temp. *1 Increase engine load	Approx. 160 – 350 Gradually increases
COOLANT TEMP.	Engine at normal operating temp.	75 – 95°C (185 – 203°F) *2
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 5° Above 70° Gradually increases
VEHICLE SPD	During driving (Comparison with speedometer)	No large differences
TARGET A/F L	Engine idling at normal operating temp.	2.50 ± 0.7 V *3
A/F FB LEFT	RPM stable at 2,500 rpm with normal operating temp.	ON
STA SIGNAL	During cranking	ON
IDL SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON

*1: All accessories and A/C are switched OFF.

*2: If the water temp. sensor circuit is open or shorted, the engine ECU assumes an engine coolant temp. value of 80°C (176°F).

*3: When feedback control is forbidden, 0 V is displayed.

DI1HJ–04

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors. If a malfunction code is displayed during the DTC check in test 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 (*2)
12 (DI–22)	Crankshaft Position Sensor Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Combination meter • Engine (and ECT) ECU	○	○
13 (DI–25)	Crankshaft Position Sensor Circuit (during idling)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine (and ECT) ECU	–	○
22 (DI–26)	Water Temp. Sensor Circuit Malfunction	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine (and ECT) ECU	○	○
24 (DI–29)	Intake Air Temp. Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine (and ECT) ECU	○	○
31 (DI–32)	Vacuum Sensor Malfunction	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine (and ECT) ECU	○	○
41 (DI–34)	Throttle position Sensor Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine (and ECT) ECU	○	○
42 (DI–37)	Vehicle Speed Sensor Circuit	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • Engine (and ECT) ECU	○	○
52 (DI–39)	Knock Sensor Circuit	• Open or short in knock sensor circuit • Knock sensor • Engine (and ECT) ECU	○	○
53 (DI–42)	Idle Control System Malfunction	• ISC valve is stuck or closed • Open or short in ISC valve circuit • Air intake (hose loose) • Engine (and ECT) ECU	○	○

*1:

○ ... Check engine warning light (CHK ENG) light up

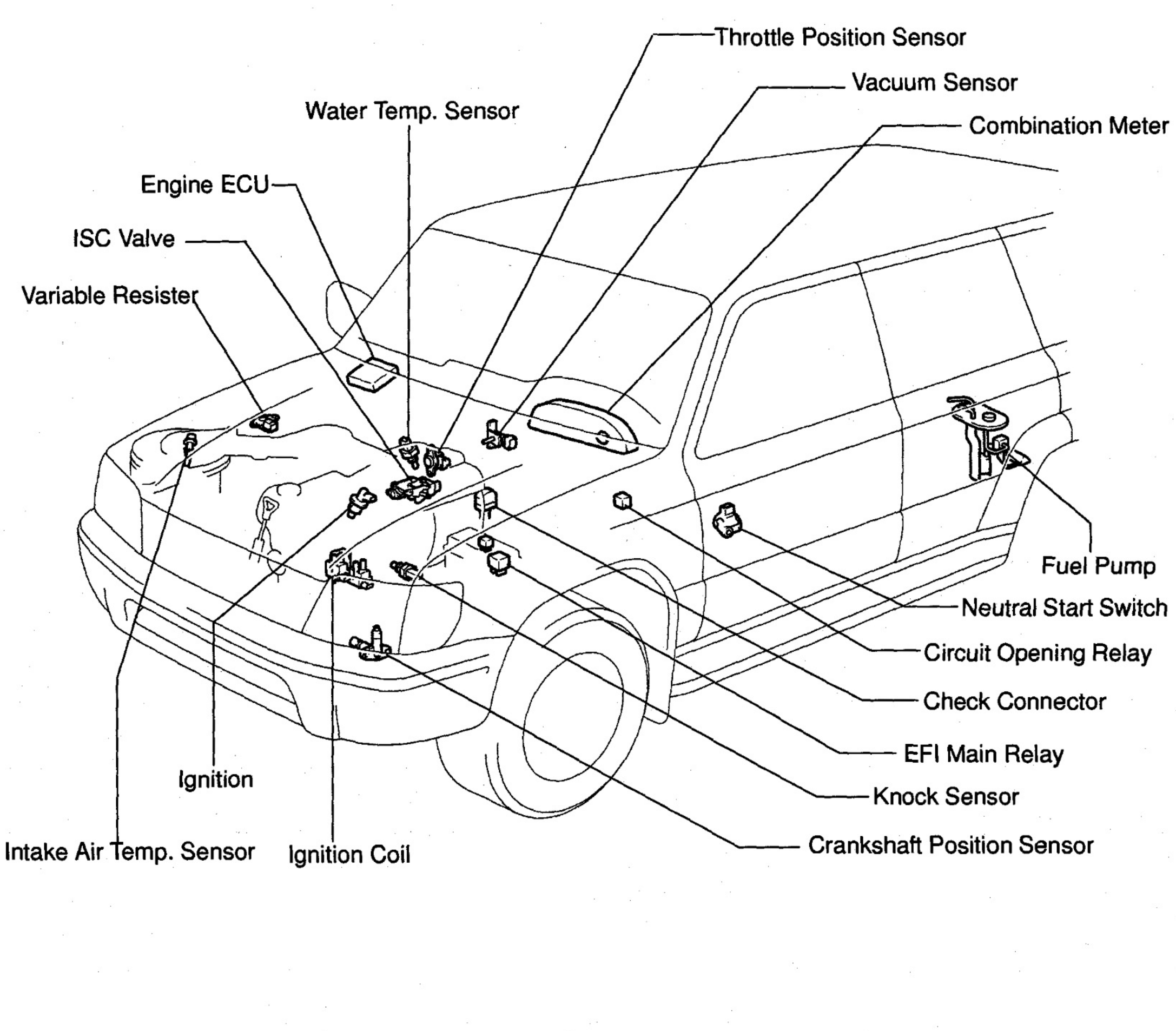
– ... Check engine warning light (CHK ENG) does not light up

*2: "○" in the memory column indicates that a diagnostic trouble code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECU memory even if a malfunction occurs.

Accordingly, output of diagnostic results in normal or test mode is done with the IG switch ON.

DI6DK–01

PARTS LOCATION



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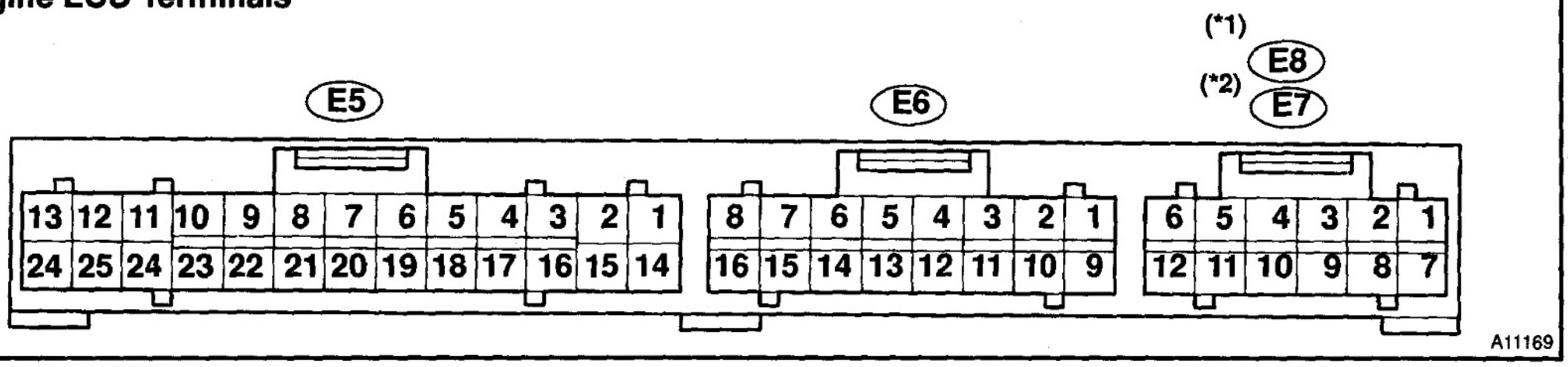
DI6DL–01

TERMINALS OF ECU

Engine ECU Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
*1BATT (E8–2) – E1 (E5–24) *2BATT (E7–2) – E1 (E5–24)	B–Y ↔ BR	Always	9 – 14
*1+B (E8–7) – E1 (E5–24) *2+B (E7–7) – E1 (E5–24)	B ↔ BR	IG switch ON	9 – 14
VC (E6–11) – E2 (E6–9)	G–Y ↔ BR	IG switch ON	4.5 – 5.5
VTA (E6–10) – E2 (E6–9)	Y–R ↔ BR	IG switch ON Throttle valve fully closed	0.3 – 1.0
		IG switch ON Throttle valve fully open	3.2 – 4.9
PIM (E6–2) – E2 (E6–9)	B–Y ↔ BR	IG switch ON	3.3 – 3.9
		Apply vacuum 24.7 kPa (200 mmHg, 7.9 in.Hg)	2.5 – 3.1
THA (E6–3) – E2 (E6–9)	G ↔ BR	Idling, Intake air temp. 20°C (68° F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	*1G ↔ BR *2Y–G ↔ BR	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E5–2) – E1 (E5–24)	R ↔ BR	Cranking	6.0 or more
#10 (E5–12) – E01 (E5–13)	L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation
IGT1 (E5–23) – E1 (E5–24) IGT2 (E5–22) – E1 (E5–24)	B ↔ BR	Idling	Pulse generation
*1FC (E8–4) – E1 (E5–24) *2FC (E7–4) – E1 (E5–24)	R–W ↔ BR	IG switch ON	9 – 14
NE (E5–4) – NE– (E5–17)	R ↔ G	Idling	Pulse generation
RSD (E5–10) – E1 (E5–24)	P–L ↔ BR	IG switch ON Disconnect E5 of ECU connector	9 – 14
KNK1 (E6–14) – E1 (E5–24)	GR ↔ BR	Idling	Pulse generation
NSW (E5–15) – E1 (E5 – 24)	B ↔ BR	IG switch ON Other shift position P or N position	9 – 14
		IG switch ON Shift position P or N position	0 – 3.0
*1SPD (E8–11) – E1 (E5–24) *2SPD (E8–11) – E1 (E5–24)	V–W ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation
TE1 (E6–15) – E1 (E5 – 24)	L–Y ↔ BR	IG switch ON	9 – 14
*1W (E8–8) – E1 (E5 – 24) *2W (E7–8) – E1 (E5 – 24)	Y–R ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
*1AC1 (E8–10) – E1 (E5–24) *2AC1 (E7–10) – E1 (E5–24)	Y–R ↔ BR	Idling, A/C switch ON	Below 2.0
		Idling, A/C switch OFF	9 – 14

*1ACT (E8–6) – E1 (E5–24) *2ACT (E7–6) – E1 (E5–24)	L–B ↔ BR	Idling, A/C switch ON	9 – 14
		Idling, A/C switch OFF	Below 2.0
*1ESL (E8–12) – E1 (E5–24) *2ESL (E7–12) – E1 (E5–24)	*1P ↔ BR *2Y–R ↔ BR	Defogger switch and taillight switch ON	7.5 – 14
		Defogger switch and taillight switch OFF	Below 1.5
STP (E6–1) – E1 (E5–24)	G–W ↔ BR	Brake pedal is depressed	7.5 – 14
		Brake pedal is released	Below 0.5

*1: LHD models
*2: RHD models

DI1A–09

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, proceed to this problem symptoms tables and troubleshoot according to the numbered order given below.

Symptom	Suspect Area	See page
Engine does not crank (does not start)	1. Starter and starter relay 2. Neutral start switch circuit	DI–57 DI–78
No initial combustion (Dies not start)	1. ECU power source circuit 2. Ignition circuit 3. Fuel pump control circuit 3. Injector circuit	DI–68 DI–49 DI–53 DI–46
No complete combustion (Does not start)	1. Fuel pump control circuit 2. Ignition circuit 3. Injector circuit	DI–53 DI–49 DI–46
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Ignition coil (w/ igniter) 5. Spark plug 6. compression 7. Injector circuit	DI–57 DI–42 DI–53 DI–49 IG–1 – DI–46
Cold engine (Difficult to start)	1.Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Injector circuit 5. Ignition coil (w/ igniter) 6. Spark plug	DI–57 DI–42 DI–53 DI–46 DI–49 IG–1
Hot engine (Difficuil to start)	1. Starter signal circuit 2. ISC valve circuit 3. Fuel pump control circuit 4. Injector circuit 5. Ignition coil (w/ igniter) 6. Spark plug	DI–57 DI–42 DI–53 DI–46 DI–49 IG–1
Incorrect first idle (Poor idling)	1. ISC valve circuit	DI–42
High engine idle speed (Poor idling)	1. ISC valve circuit 2. ECU power source circuit 3. Neutral start switch circuit 4. Back up power source circuit	DI–42 DI–68 DI–78 DI–63
Low engine idle speed (Poor idling)	1. ISC valve circuit 2. Neutral start switch circuit 3. Fuel pump control circuit 4. Injector circuit 5. Vacuum sensor circuit 6. Back up power source circuit	DI–42 DI–78 DI–53 DI–46 DI–32 DI–63
Rough idling (Poor idling)	1. ISC valve circuit 2. Vacuum sensor circuit 3. Injector circuit 4. Variable resistor circuit 5. Ignition circuit 6. Compression 7. Fuel pump control circuit 8. Back up power source circuit	DI–42 DI–32 DI–46 DI–73 DI–49 – DI–53 DI–63

Hunting (Poor idling)	1. ISC valve circuit 2. Vacuum sensor circuit 3. ECU power source circuit 4. Fuel pump control circuit	DI–42 DI–32 DI–68 DI–53
Hesitation/Poor acceleration (Poor driveability)	1. Vacuum sensor circuit 2. Injector circuit 3. Fuel pump control circuit 4. Variable resistor circuit 5. Ignition circuit 6. A/T faulty	DI–32 DI–46 DI–53 DI–73 DI–49 –
Muffler explosion, after fire (Poor driveability)	1. Ignition coil (w/ igniter) 2. Spark plug 3. Injector circuit	DI–49 IG–1 DI–46
Surging (Poor drefveability)	1. Fuel pump control circuit 2. Variable resistor circuit 3. Spark plug 4. Injector circuit	DI–53 DI–73 IG–1 DI–46
Engine stall (Soon after starting)	1. Fuel pump control circuit 2. Vacuum sensor circuit 3. ISC valve circuit	DI–53 DI–32 DI–42
Engine stall (After accelerator pedal depressed)	1. Vacuum sensor circuit	DI–32
Engine stall (After accelerator pedal releaseda)	1. Injector circuit 2. ISC valve circuit 3. Engine ECU	DI–46 DI–42 IN–18
Engine stall (When shifting N to D)	1. Neutral start switch circuit 2. ISC valve circuit	DI–78 DI–42

DI6DM–01

CIRCUIT INSPECTION

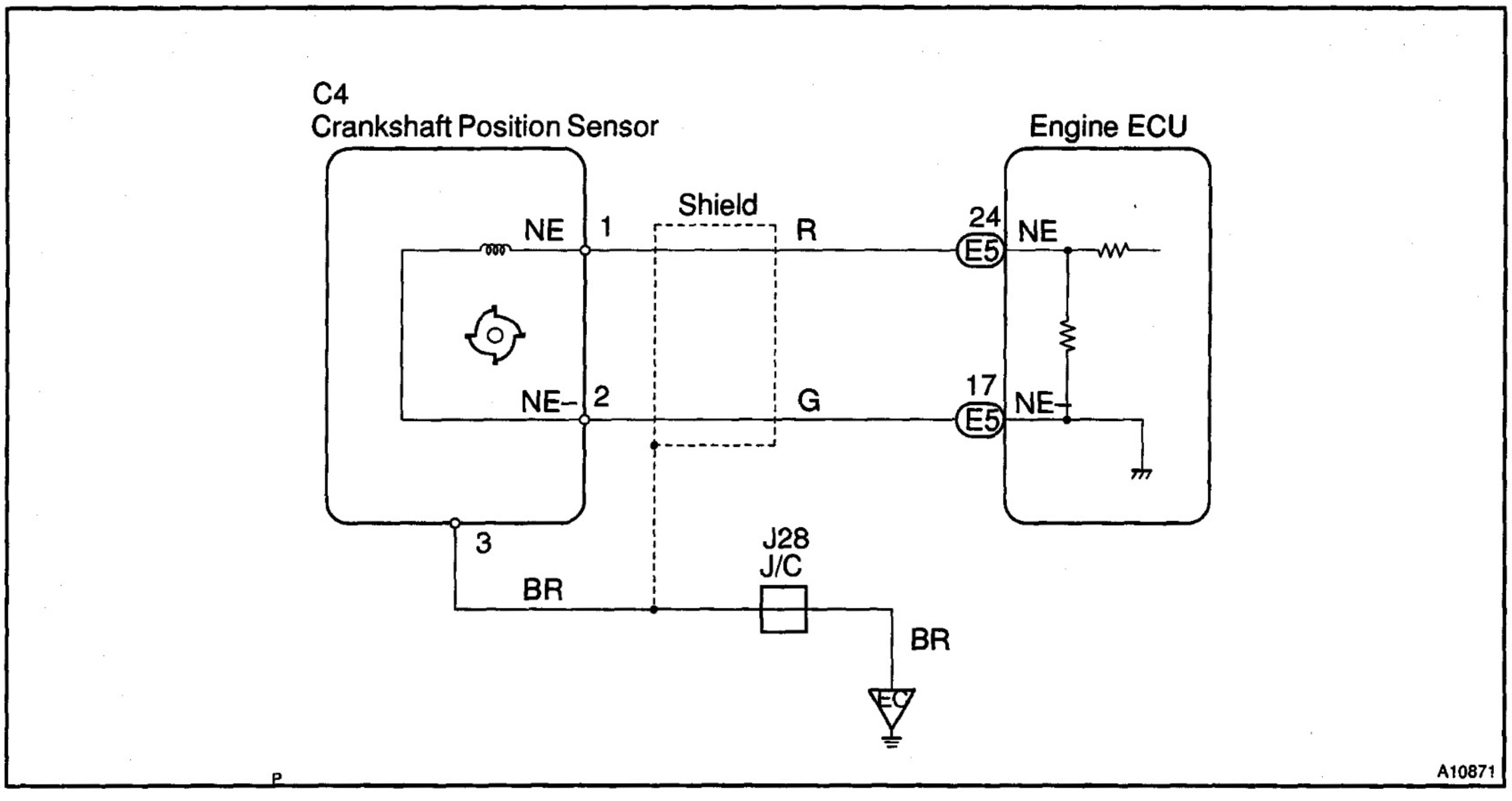
DTC	12	Crankshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pick up coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. 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 the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
12	No crankshaft position sensor signal to engine ECU during cranking	• Open or short in crankshaft position sensor circuit. • Crankshaft position sensor • Starter • Engine ECU

WIRING DIAGRAM



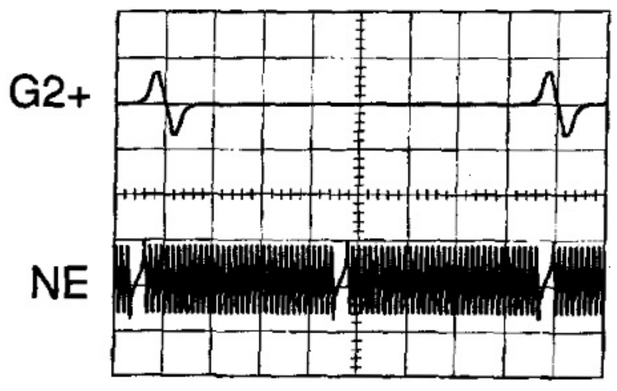
INSPECTION PROCEDURE

HINT:

- Read freed 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.
- Perfrom troubleshooting of 12 first. If no trouble is found, troubleshoot the following mechanical system.

1	**Check resistance of crankshaft position sensor (See Pub. No. RM521E on page IG–7).**

G2+, NE signal waveforms

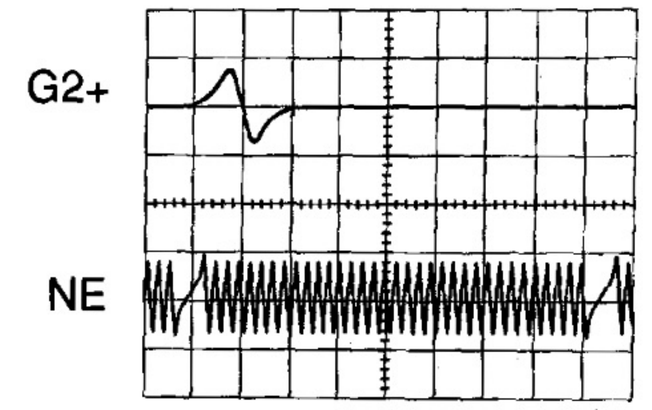


Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G2+ and NE–, NE+ and NE– of engine ECU

HINT:

The correct waveforms are as shown.



A01991
A01992

A02359

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–18).**

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

OK

3	Inspect sensor installation and teeth of signal plate.

NG → Tighten the sensor. Replace signal plate.

OK →

Check and replace engine ECU
(See page IN–18).

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

CIRCUIT DESCRIPTION

Refer to DTC 12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–22.

DTC No.	DTC Detecting Condition	Trouble Area
13	No crankshaft position sensor signal to engine ECU with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • Engine ECU

WIRING DIAGRAM

Refer to DTC 12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–22 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

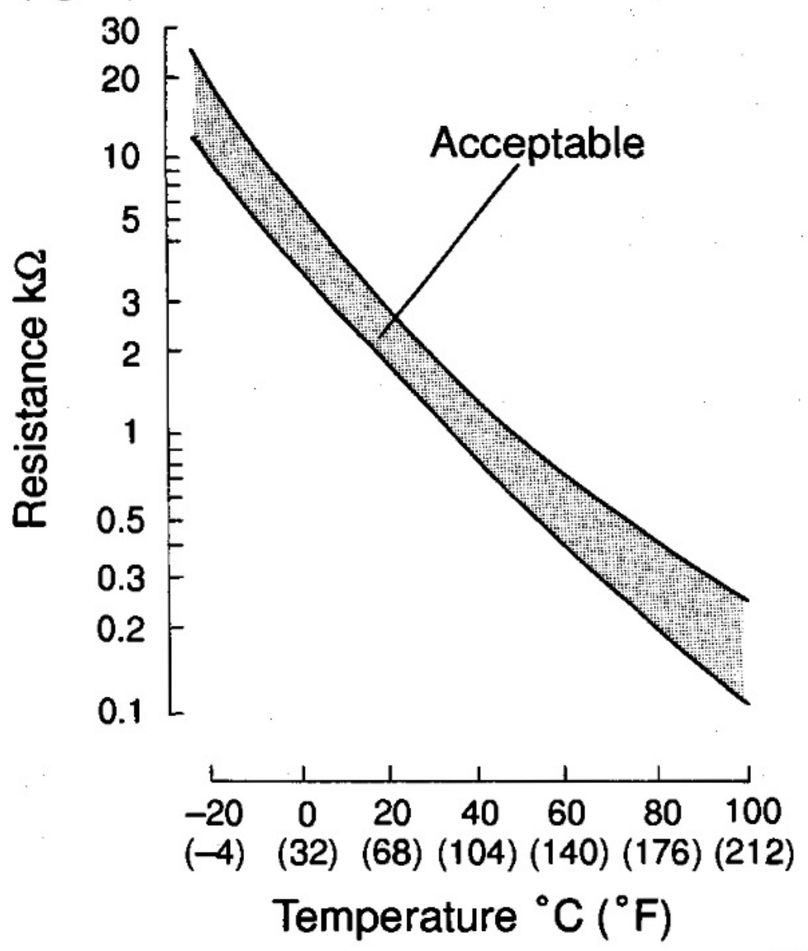
HINT:
Read freed frame data using hand–held tester. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
Refer to DTC 12 (Crankshaft Position Sensor Circuit Malfunction) on page DI–22.

DI1HQ–04

DTC	22	Water Temp. Sensor Circuit

CIRCUIT DESCRIPTION

(fig–1)

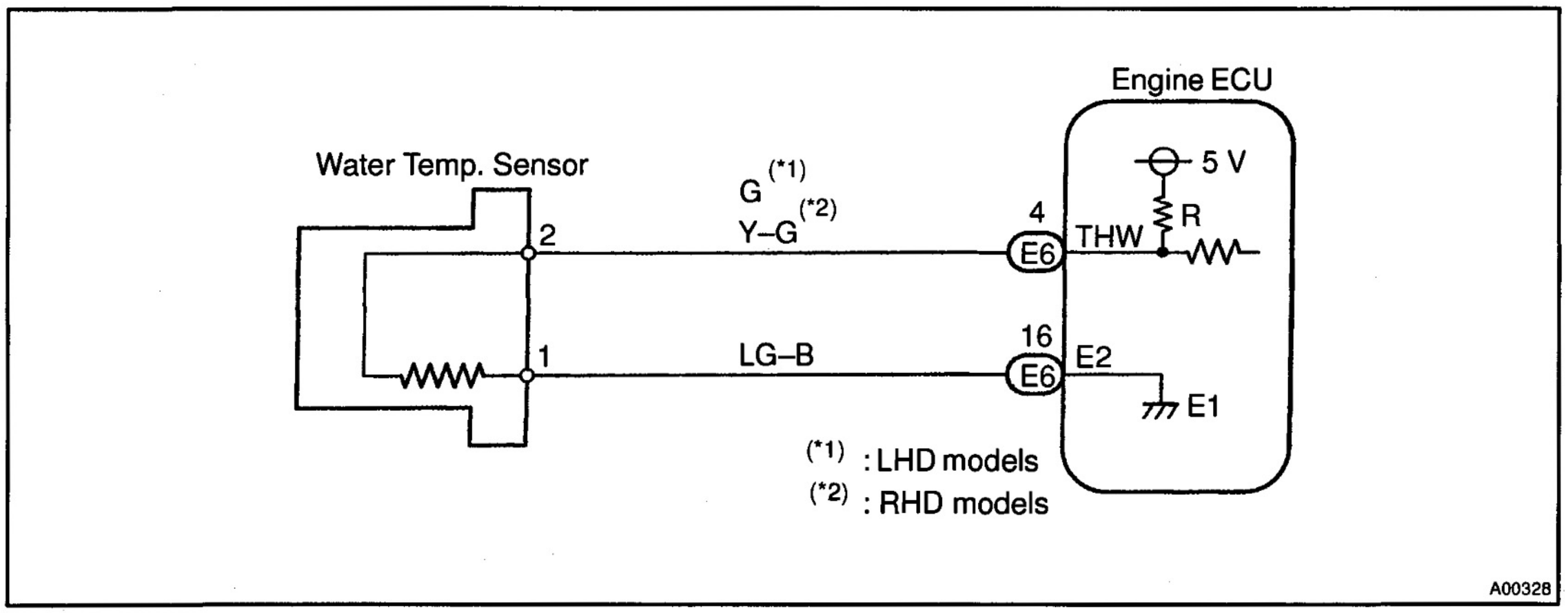


The water temperature sensor senses the coolant temperature. A thermistor built into the sensor changes the resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower the thermistor resistance value (See Fig.1).

The water temperature sensor is connected to the ECU (See below). The 5 V power source voltage in the ECU is applied to the water temperature sensor from the terminal THW via a resistor R. That is, the resistor R and the water temperature sensor are connected in series. When the resistance value of the water temperature sensor changes in accordance with changes in the coolant temperature, the potential at the terminal THW also changes. Based on this signal, the ECU increases the fuel injection volume to improve driveability during cold engine operation. If the ECU detects the diagnostic trouble code 22, it operates the fail safe function in which the engine coolant temperature is assumed to be 80°C (170°F).

DTC No.	Detection Item	Trouble Area
22	Open or short in water temp. sensor circuit for 0.5 sec. or more	• Open or short in water temp. sensor circuit • Water temp. sensor • Engine ECU

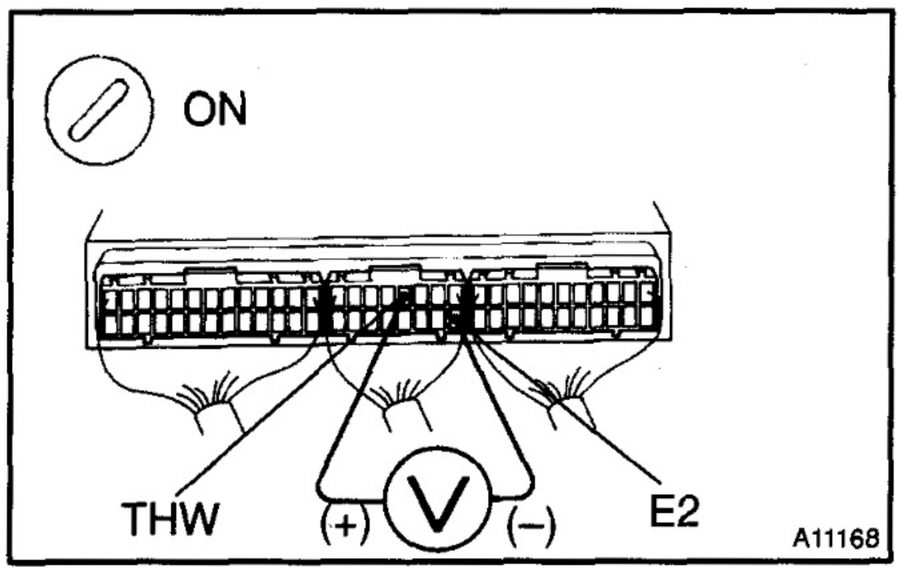
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
If diagnostic trouble code "22" (water temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (vacuum sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

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



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

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

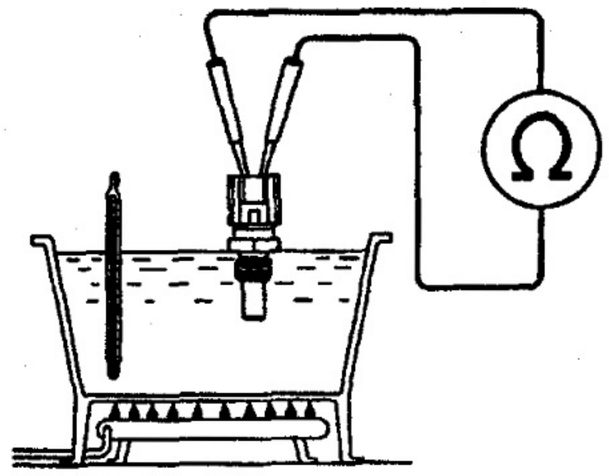
OK:

Engine Coolant Temp.	Voltage
20°C (68°F) (Engine is cool)	0.5 – 3.4 V
80°C (176°F) (Engine is hot)	0.2 – 1.0 V

OK → **Check for intermittent problems (See page DI–3).**

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.

Engine Coolant Temp.	Resistance
20°C (68°F)	2 – 3 kΩ
80°C (176°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–18).**

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

OK

Check and replace engine ECU.

DI1HR–04

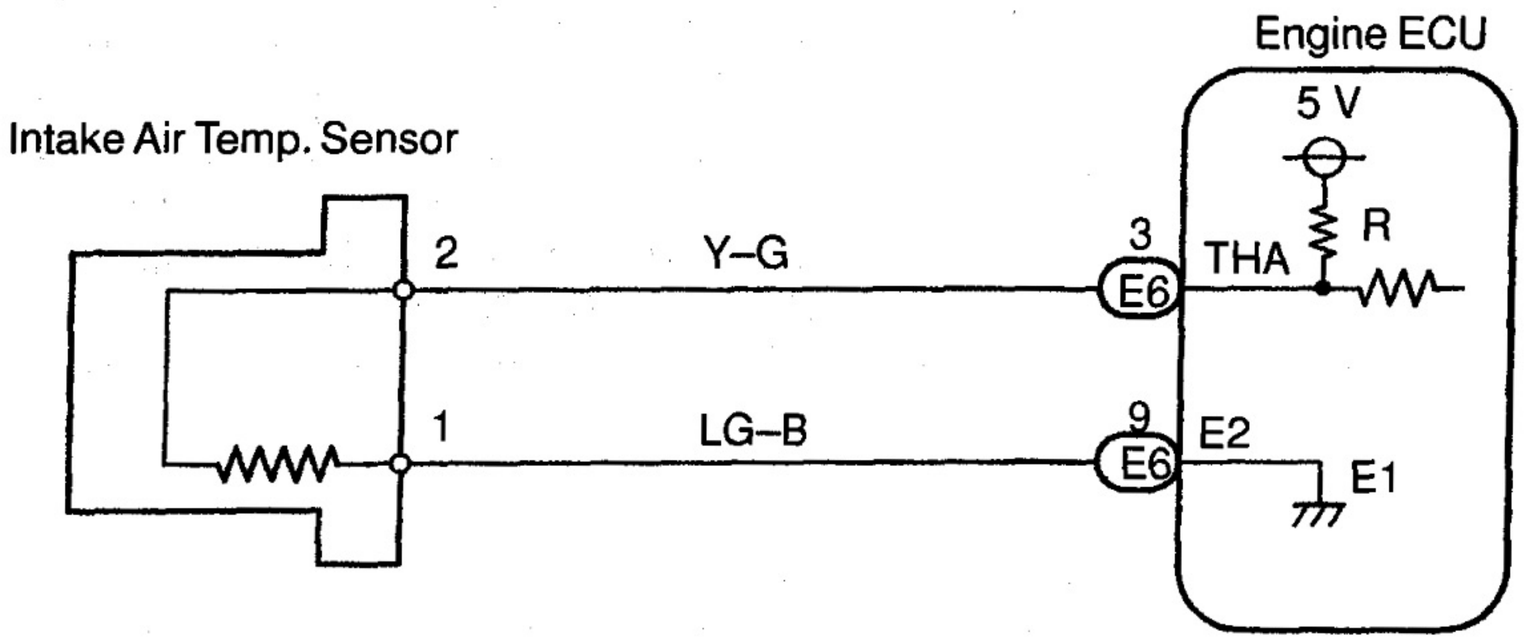
DTC	24	Intake Air Temp. Sensor Circuit

CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air cleaner cap and senses the intake air temperature.
The structure of the sensor and connection to the engine ECU is the same as in the water temp. sensor shown on page DI–26.
If the engine ECU detects the diagnostic trouble code "24", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

DTC No.	Detection Item	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec or more.	• Open or short in intake air temp. sensor circuit. • Intake air temp. sensor • Engine ECU

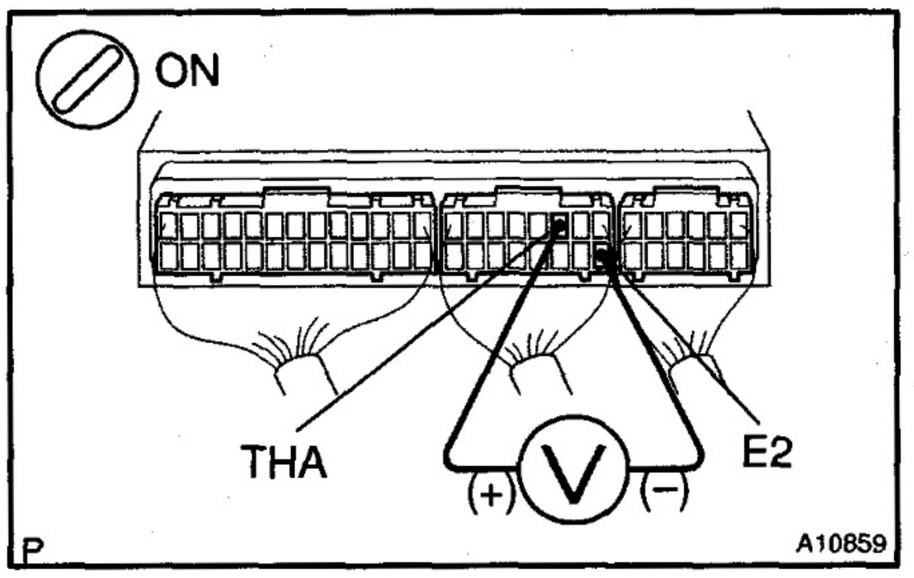
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
If diagnostic trouble code "22" (water temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (vacuum sensor circuit) and "41"(throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

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



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

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

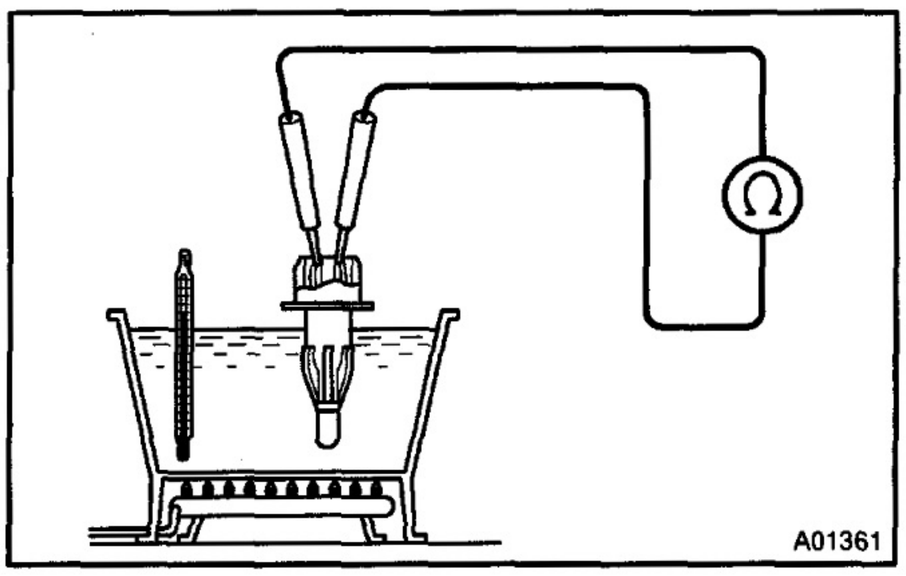
OK:

Engine Coolant Temp.	Voltage
20°C (68°F) (Engine is cool)	0.5 – 3.4 V
80°C (176°F) (Engine is hot)	0.2 – 1.0 V

OK → **Check for intermittent problems (See page DI–3).**

NG

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



PREPARATION:
Disconnect the intake air temp. sensor connector.

CHECK:
Measure resistance between terminals.

OK:
Resistance is within acceptable zone on chart.

Engine Coolant Temp.	Resistance
20°C (68°F)	2 – 3 kΩ
80°C (176°F)	0.2 – 0.4 kΩ

NG → **Replace intake air temp. sensor.**

OK

3	**Check for open and short in harness and connector between engine ECU and intake air temp. sensor (See page IN–18).**

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

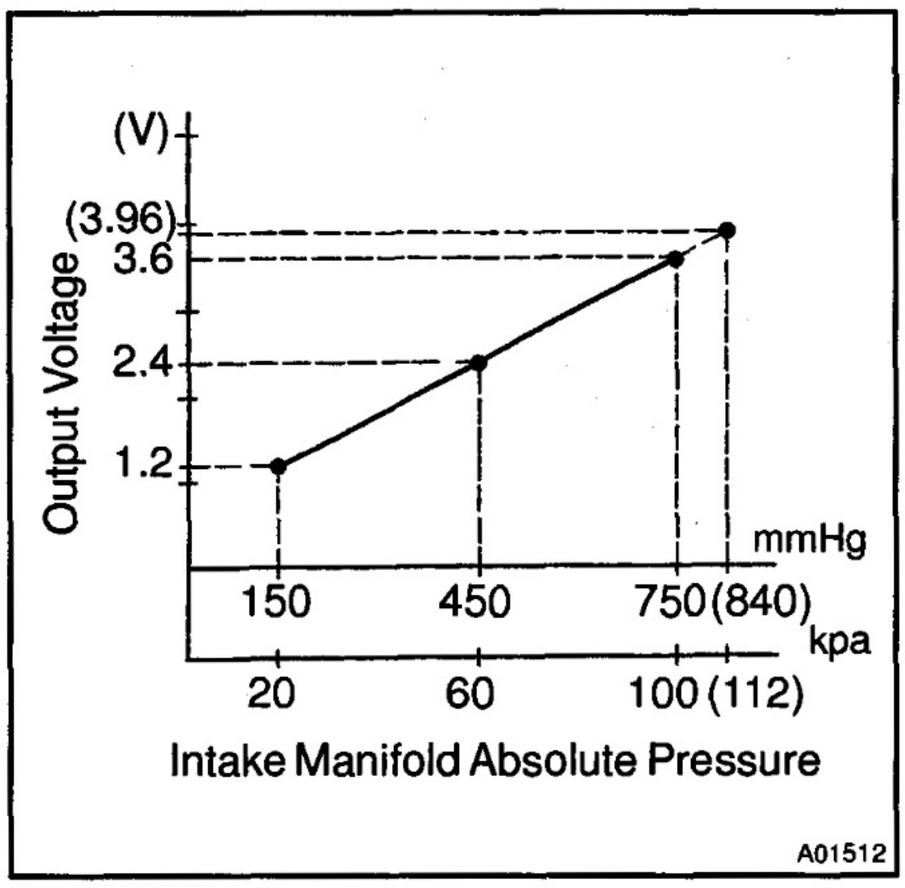
OK

Check and replace engine ECU.

DI1HS–04

DTC	31	Vacuum Sensor Circuit

CIRCUIT DESCRIPTION

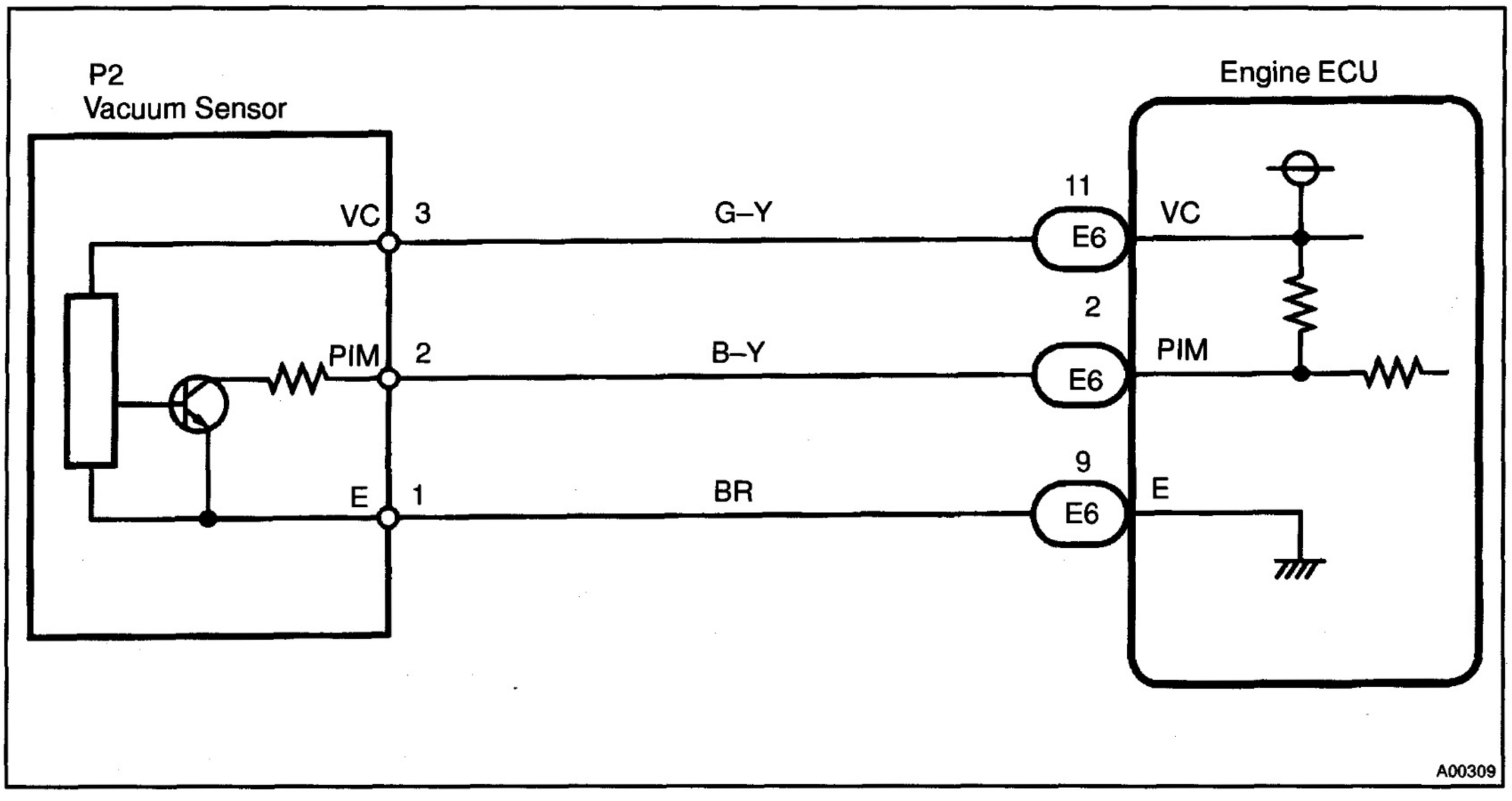


By a built–in sensor unit, the vacuum sensor detects the intake manifold pressure as a voltage. The ECU then determines the basic injection duration and basic ignition advance angle based on this voltage.
Since the vacuum sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. this permits it to control the air fuel ratio at the proper level under all conditions.

DTC No.	Detection Item	Trouble Area
31	Open or short in vacuum sensor circuit for 0.5 sec. or more	• Open or short in vacuum sensor circuit • Vacuum sensor • Engine ECU

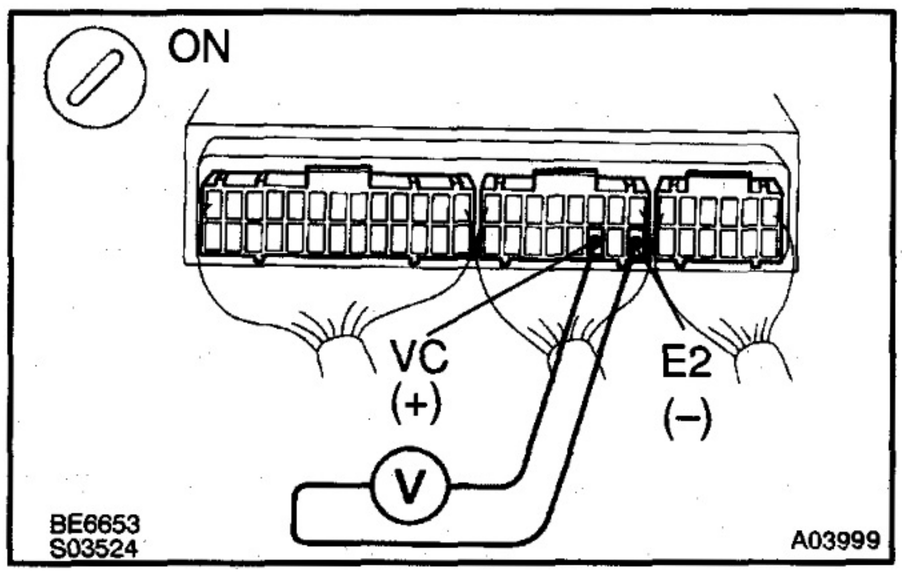
If the ECU detects diagnostic trouble code "31", it operates the fail safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the glove compartment.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of engine ECU.

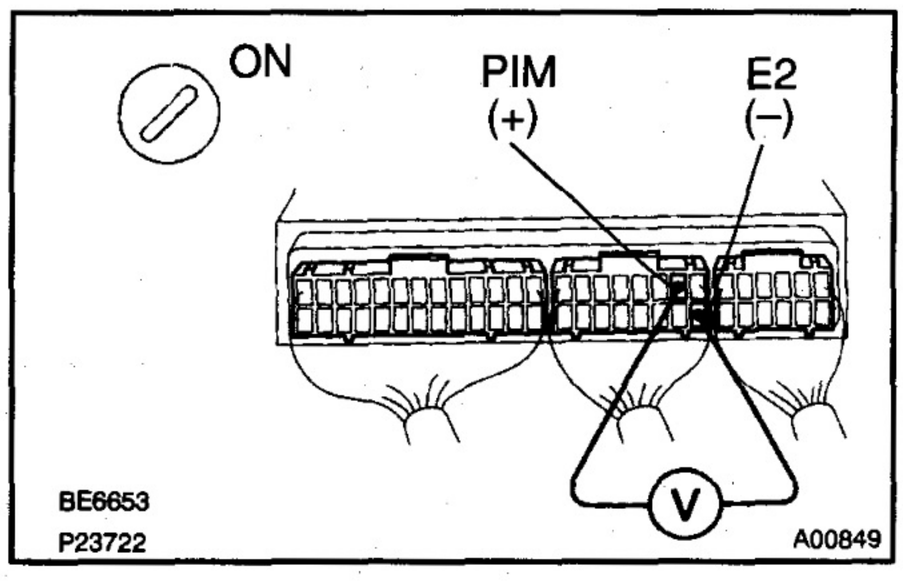
OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace engine ECU.**

OK

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



PREPARATION:

(a) Remove the glove compartment.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals PIM and E2 of engine ECU.

OK:

Voltage: 3.3 – 3.9 V

OK → **When diagnostic trouble code 31 is displayed, check and replace engine ECU.**

NG

3	**Check for open and short in harness and connector between engine ECU and vacuum sensor (See page IN–18).**

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

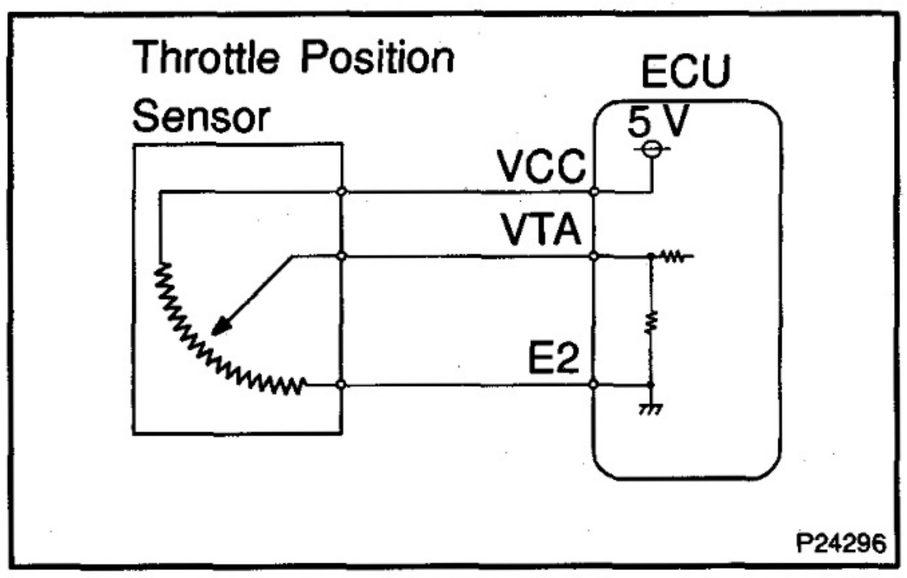
OK

Replace vacuum sensor.

DI1HT–04

DTC	41	Throttle Position Sensor Circuit

CIRCUIT DESCRIPTION



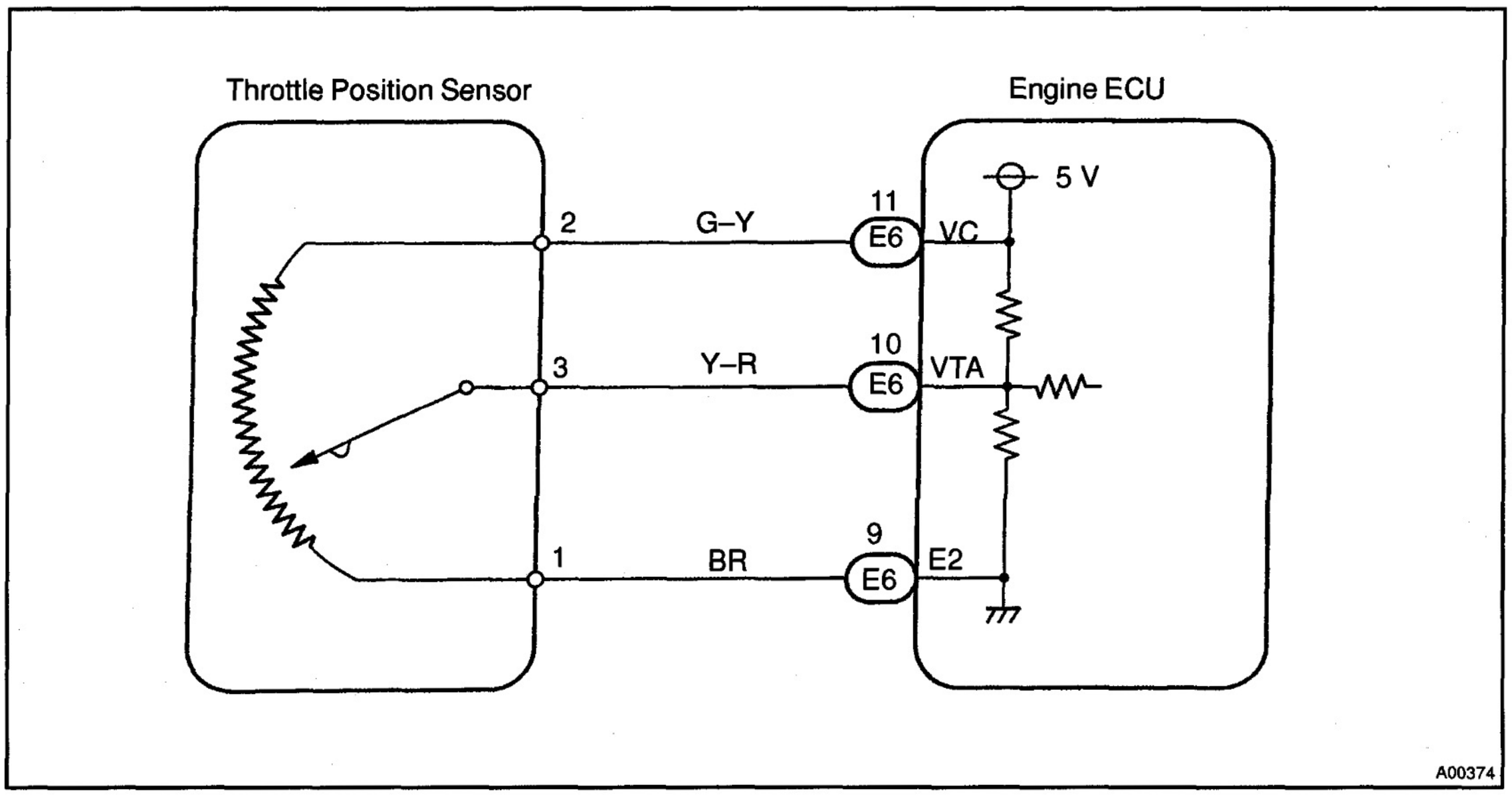
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 ~ 0.8 V is applied to the terminal VTA of the ECU. When the throttle valve is opened, the voltage applied to the terminal VTA of the ECU increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECU judges the vehicle driving conditions from these signals input from the 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.	Detection Item	Trouble Area
41	Open or short in throttle position sensor circuit for 0.5 sec. or more	• Open or short in throttle position sensor circuit • Throttle position sensor • Engine ECU

HINT:

When the connector for the throttle position sensor is disconnected, diagnostic trouble code 41 is not displayed. Diagnostic trouble code 41 is displayed only when there is an open or short in the VTA signal circuit of the throttle position sensor.

WIRING DIAGRAM

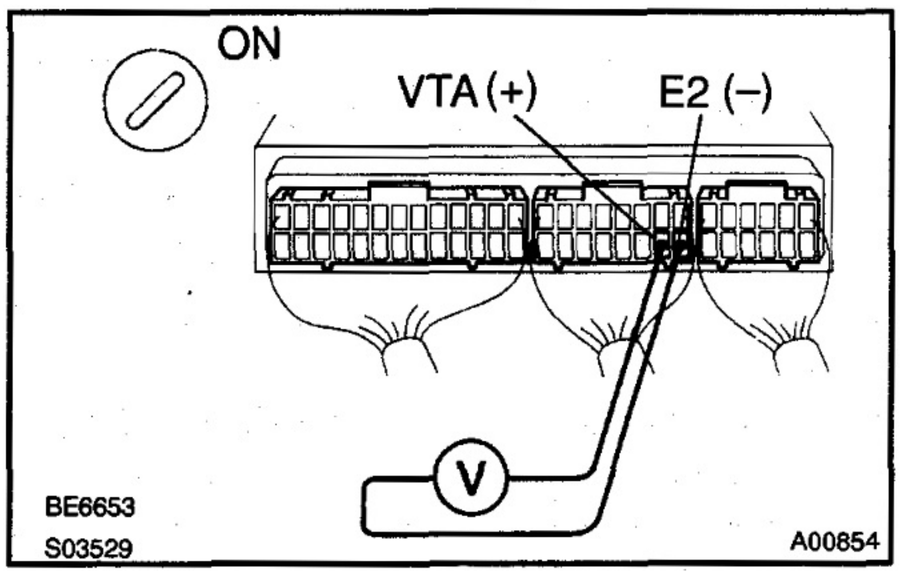


INSPECTION PROCEDURE

HINT:

If diagnostic trouble codes "22" (water temperature sensor circuit), "24" (intake air temperature sensor circuit) "31" (vacuum sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

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



PREPARATION:

(a) Remove the glove compartment.
(b) Turn ignition switch ON.
(c) Apply vacuum to the throttle opener.

CHECK:

Measure voltage between terminals VTA and E2 of engine ECU connector when the throttle valve is opened gradually from the closed condition.

OK:

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

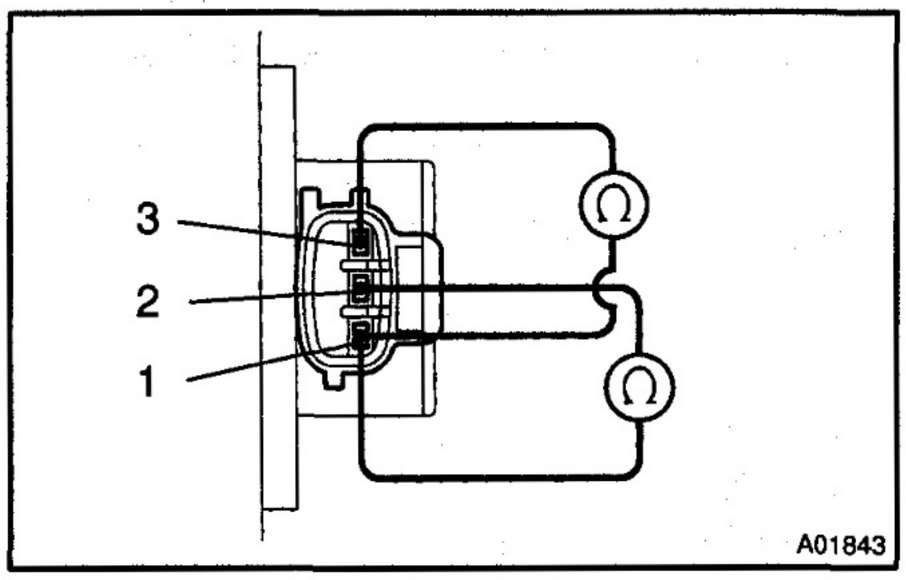
HINT:

The voltage should increase steadily in proportion to the throttle valve opening angle.

OK → **Check for problem symptoms table (See page DI–20).**

NG

2	Check throttle position sensor.



PREPARATION:

Disconnect throttle position sensor connector.

CHECK:

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

OK:

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

HINT:

Resistance between terminals 1 and 3 should increrace gradually in accordance with the throttle valve opening angle.

NG → **Replace throttle position sensor .**

OK

3	Check for open and short in harness and connector between engine ECU and throttle position sensor (See page IN–18).

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

OK

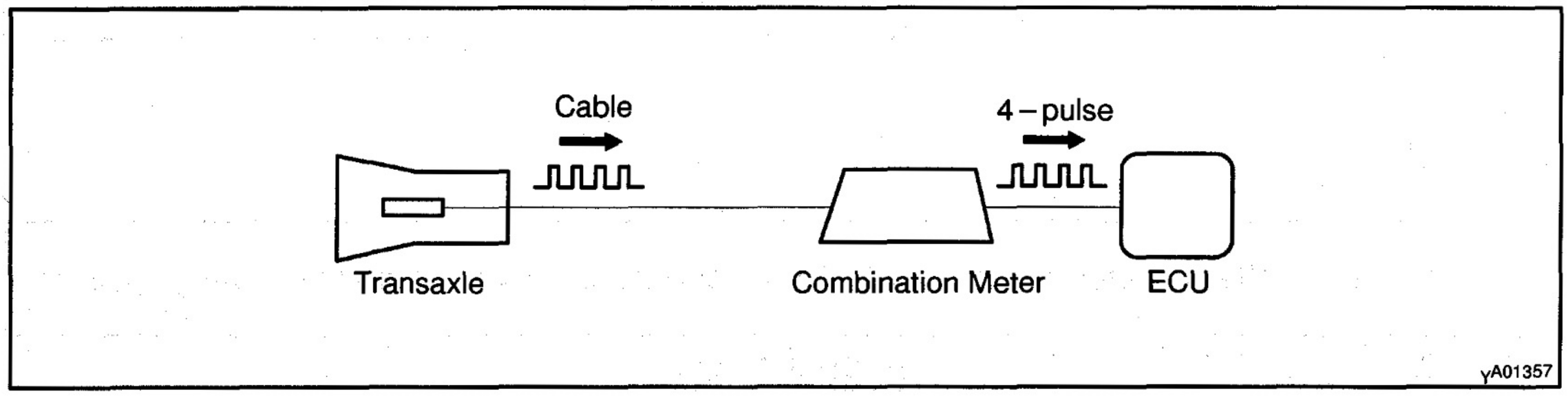
Check and replace engine ECU.

DI1HU–03

DTC	42	Vehicle Speed Sensor Signal Circuit

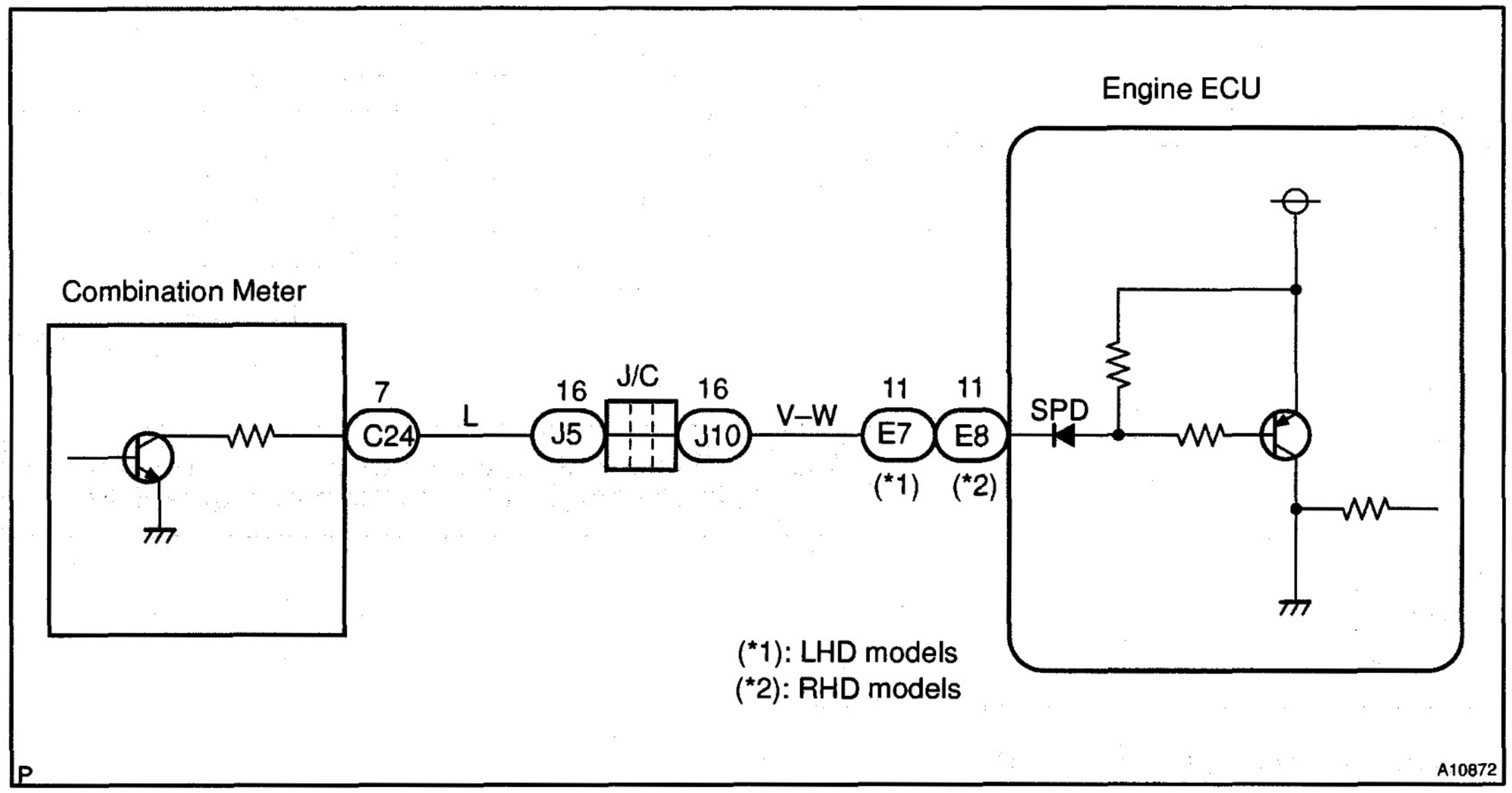
CIRCUIT DESCRIPTION

This sensor is mounted in the combination meter. It contains a magnet which is rotated by the speedometer cable.
Turning the reed switch ON and OFF 4 times for every revolution of the speedometer.
It is then transmitted to the ECU. The ECU determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
42	All conditions below are detected continuously for 8 sec. or more: (a) Vehicle speed signal: 0 km/h (0 mph) (b) Engine speed: 2,500 ~ 4,500 rpm (c) Water temp.: 80°C (176°F) or more (d) Load driving	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of speedometer.**

CHECK:

Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

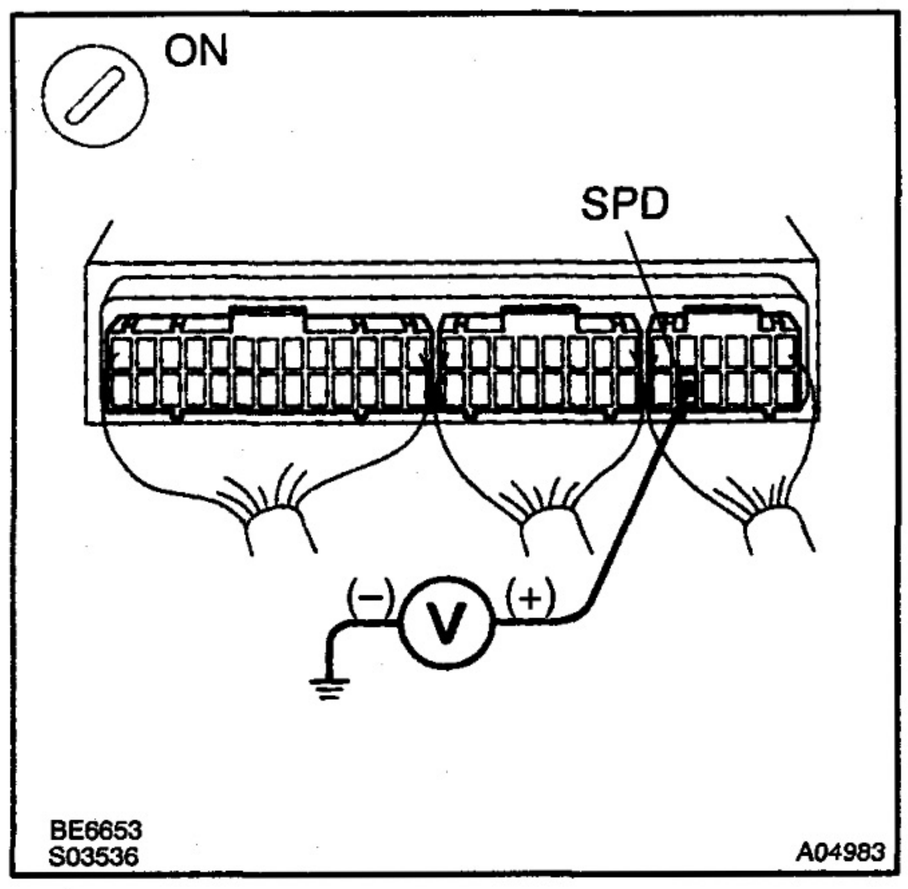
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit. See combination meter troubleshooting.**

OK

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



PREPARATION:

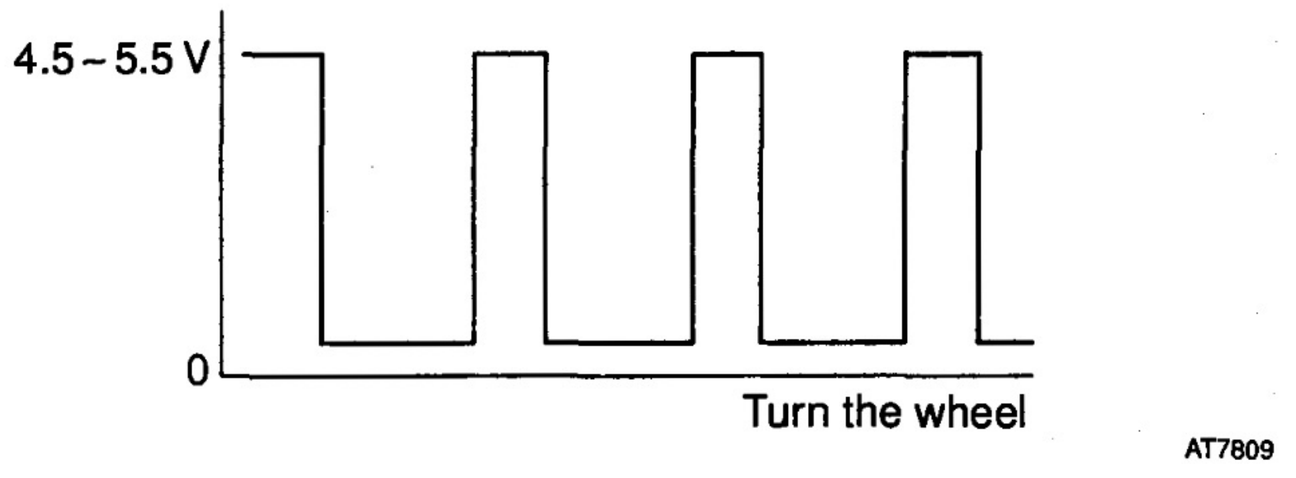
(a) Remove the glove compartment.
(b) Shift the shift lever to N position.
(c) Jack up one of the rear wheels.
(d) Turn ignition switch ON.

CHECK:

Measure voltage between terminal SPD of 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.

DI6DO–01

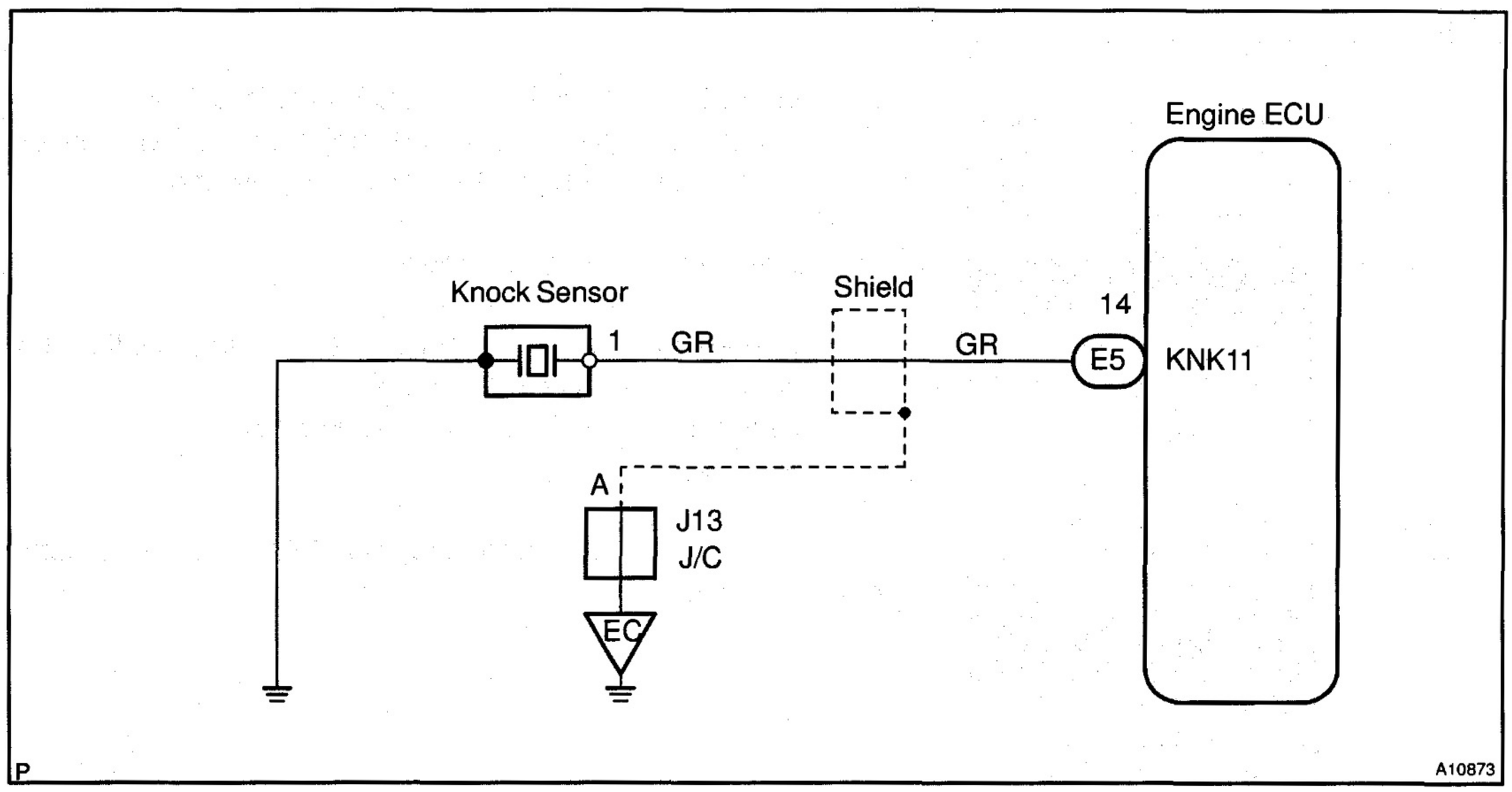
DTC	52	Knock Sensor Circuit Malfunction

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. If engine knocking occurs, ignition timing is retarded to suppress it.

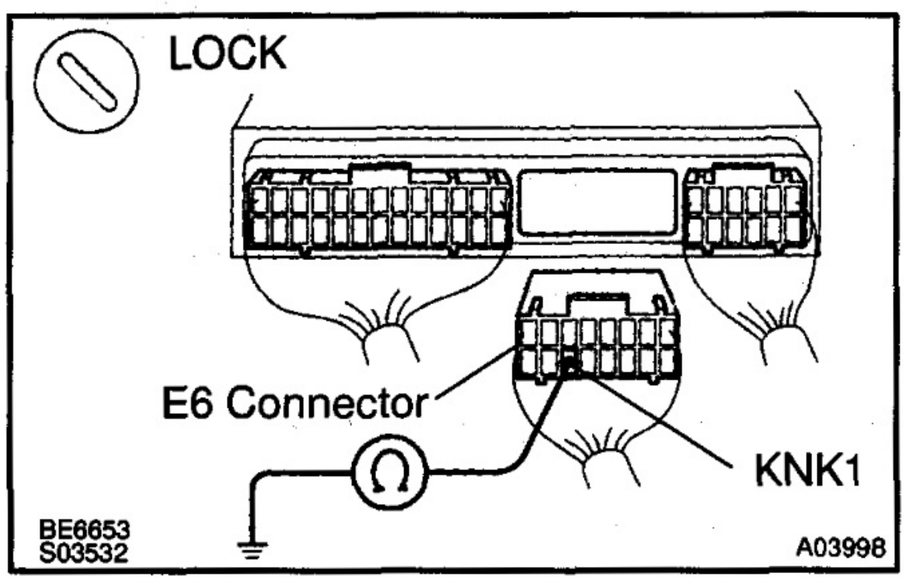
DTC No.	DTC Detecting Condition	Trouble Area
52	No knock sensor 1 signal to engine ECU with engine speed between 1,700 rpm and 5,200 rpm	• Open or short in knock sensor circuit • Knock sensor (looseness) • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the glove compartment.

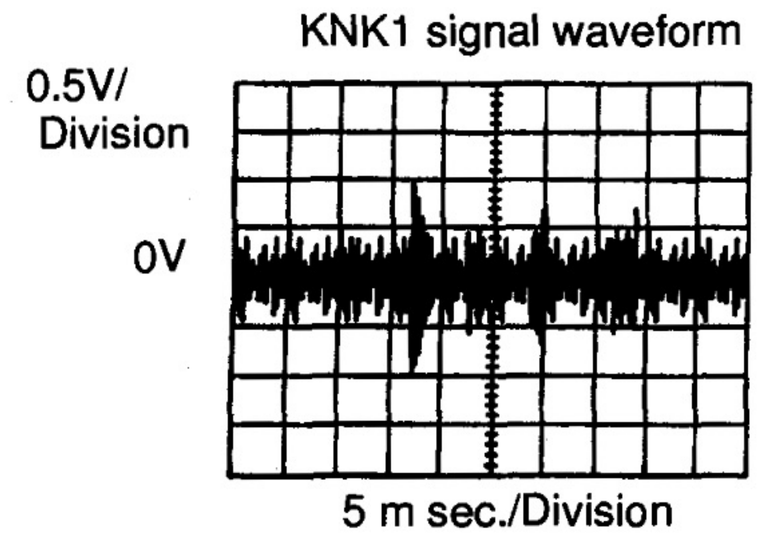
(b) Disconnect the E6 connector of engine ECU.

CHECK:

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

OK:

Resistance: 1 MΩ or higher



Reference: INSPECTION USING OSCILLOSCOPE

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

HINT:

The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 151 μ sec.
  (Normal mode vibration frequency of knock sensor: 6.6 kHz).

HINT:

If normal mode vibration frequency is not 6.6 kHz the sensor is malfunctioning.

OK	**Go to step 3 .**
NG	

2	Check knock sensor (See page FI–46).

NG → Replace knock sensor.

OK ↓

3	Check for open and short in harness and connector between engine ECU and knock sensor (See page IN–18).

NG → Repair or replace harness or connector.

OK ↓

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

YES → Replace knock sensor.

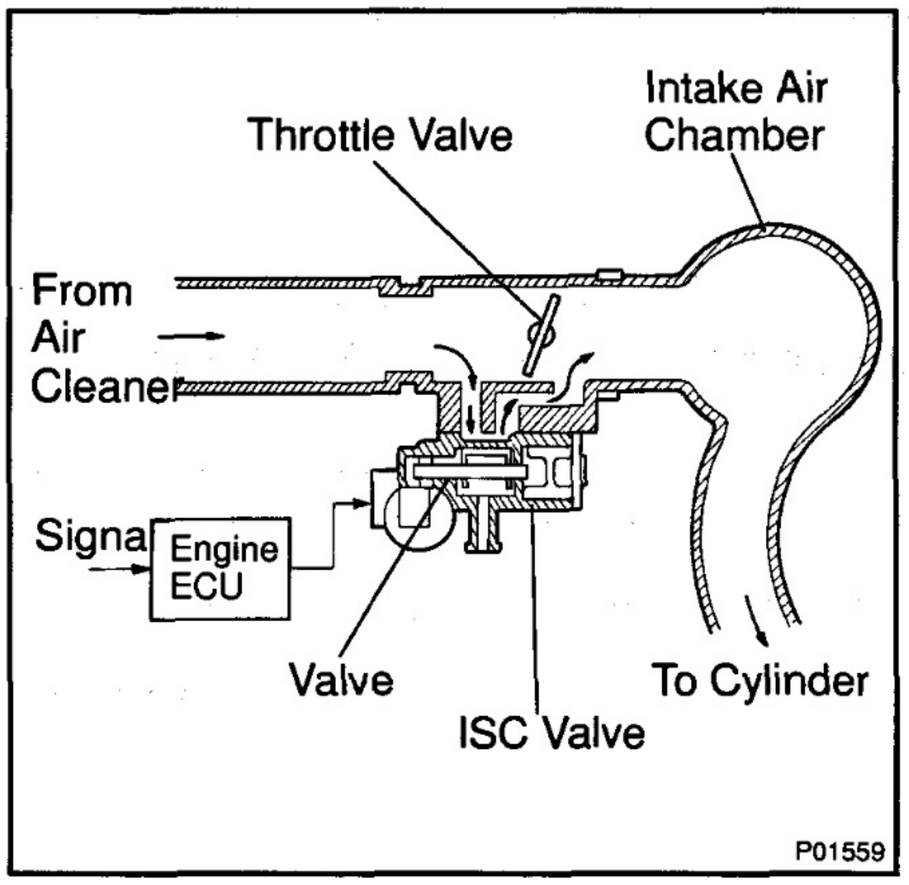
NO ↓

Check and replace engine ECU (See page IN–18).

DI6DP–01

DTC 53 Idle Control System Malfunction

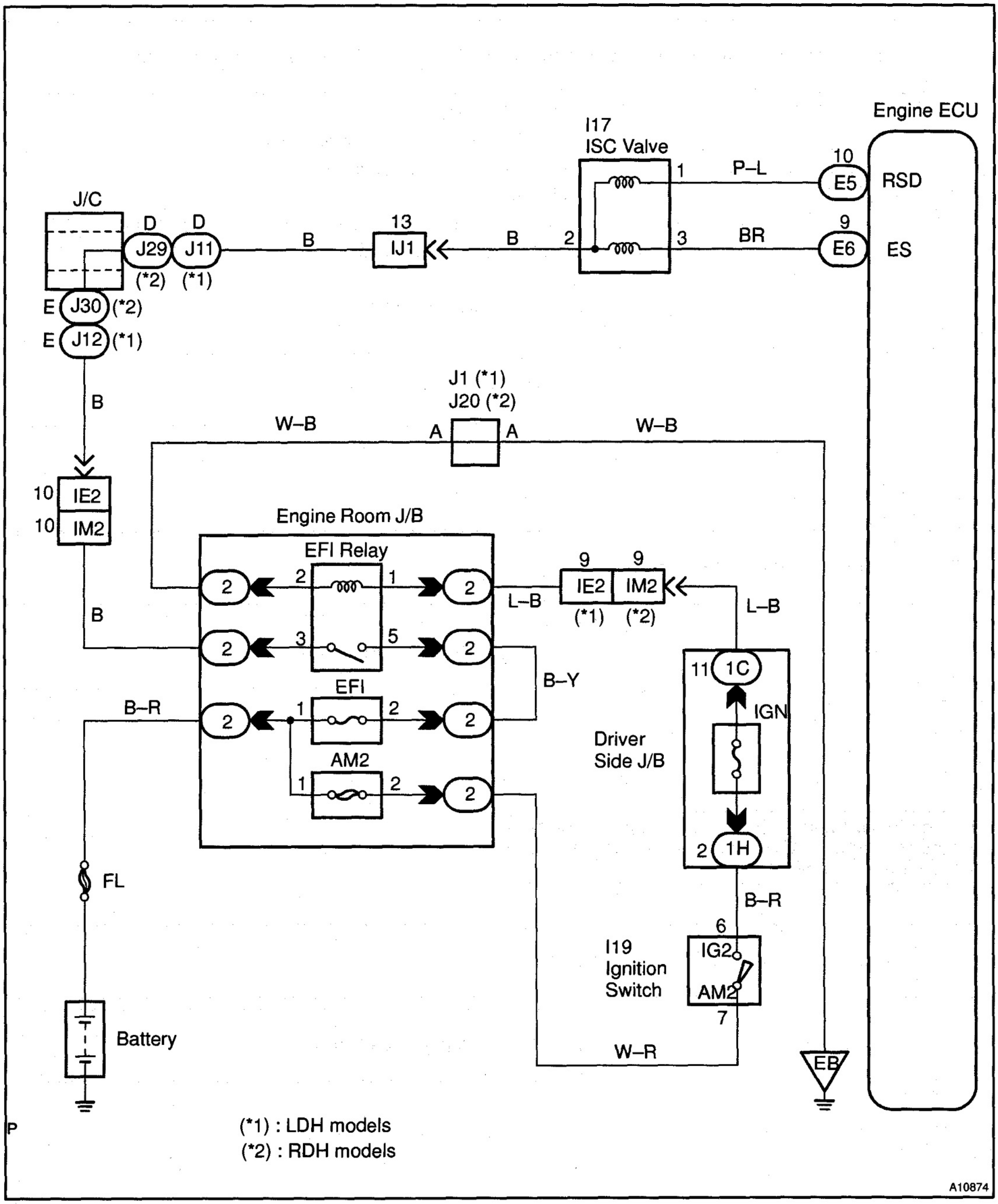
CIRCUIT DESCRIPTION



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.

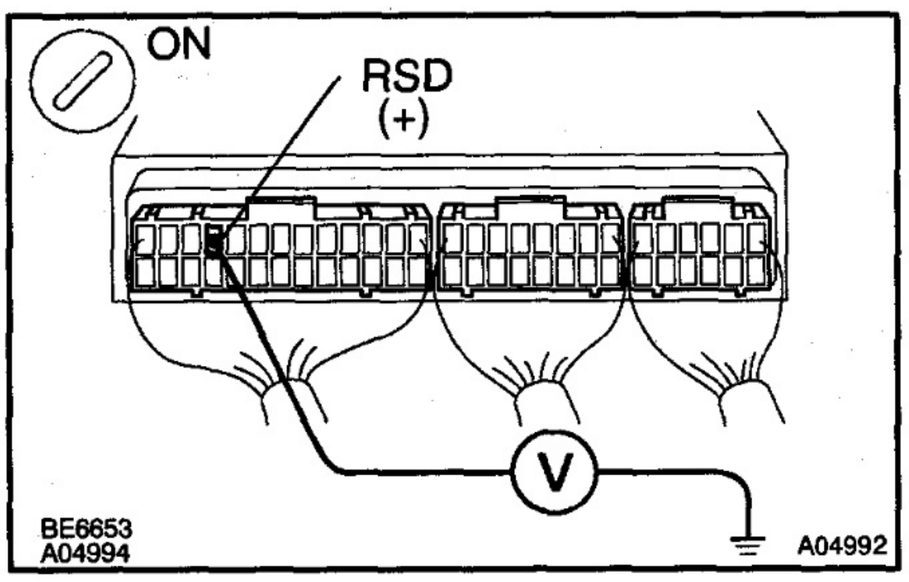
DTC No.	DTC Detecting Condition	Trouble Area
53	Open or short in ISC valve circuit.	• Open or short in ISC valve circuit • ISC valve • Engine ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

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



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

CHECK:
Measure voltage between terminals RSD of engine ECU connector and body ground.

OK:
Voltage: 9 – 14 V

OK → **Go to step 5.**

NG

2	**Check ISC valve (See page FI–34).**

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–18).

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

NG → **Replace ISC valve.**

OK

4	Check the blockage of ISC valve and the passage to bypass the throttle valve.

NG → Repair or replace ISC valve.

OK

Check and replace engine ECU (See page IN–18).

DI110-04

Injector Circuit

CIRCUIT DESCRIPTION

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

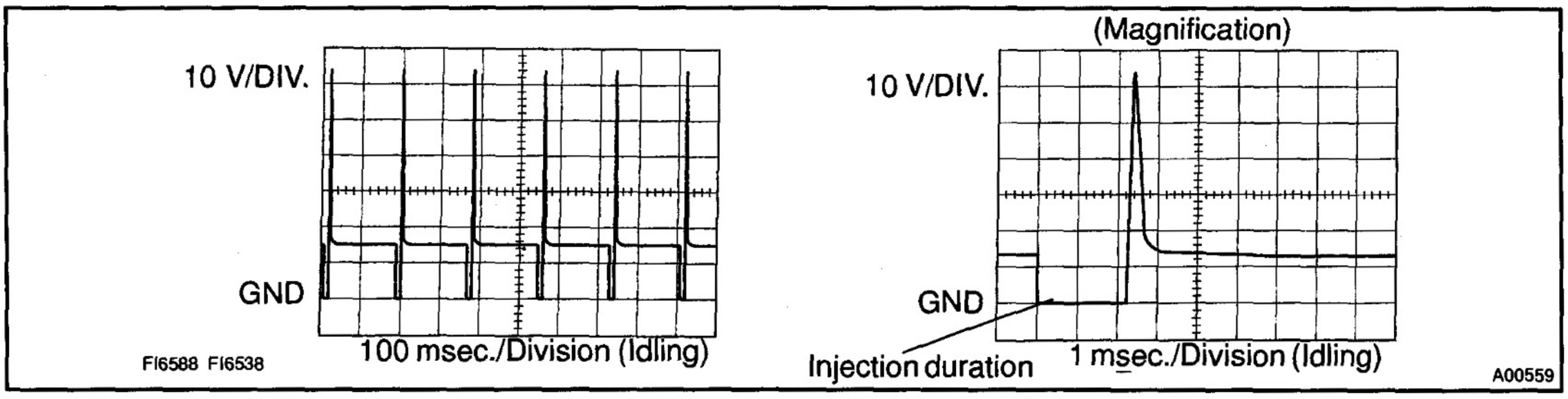
Reference: INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

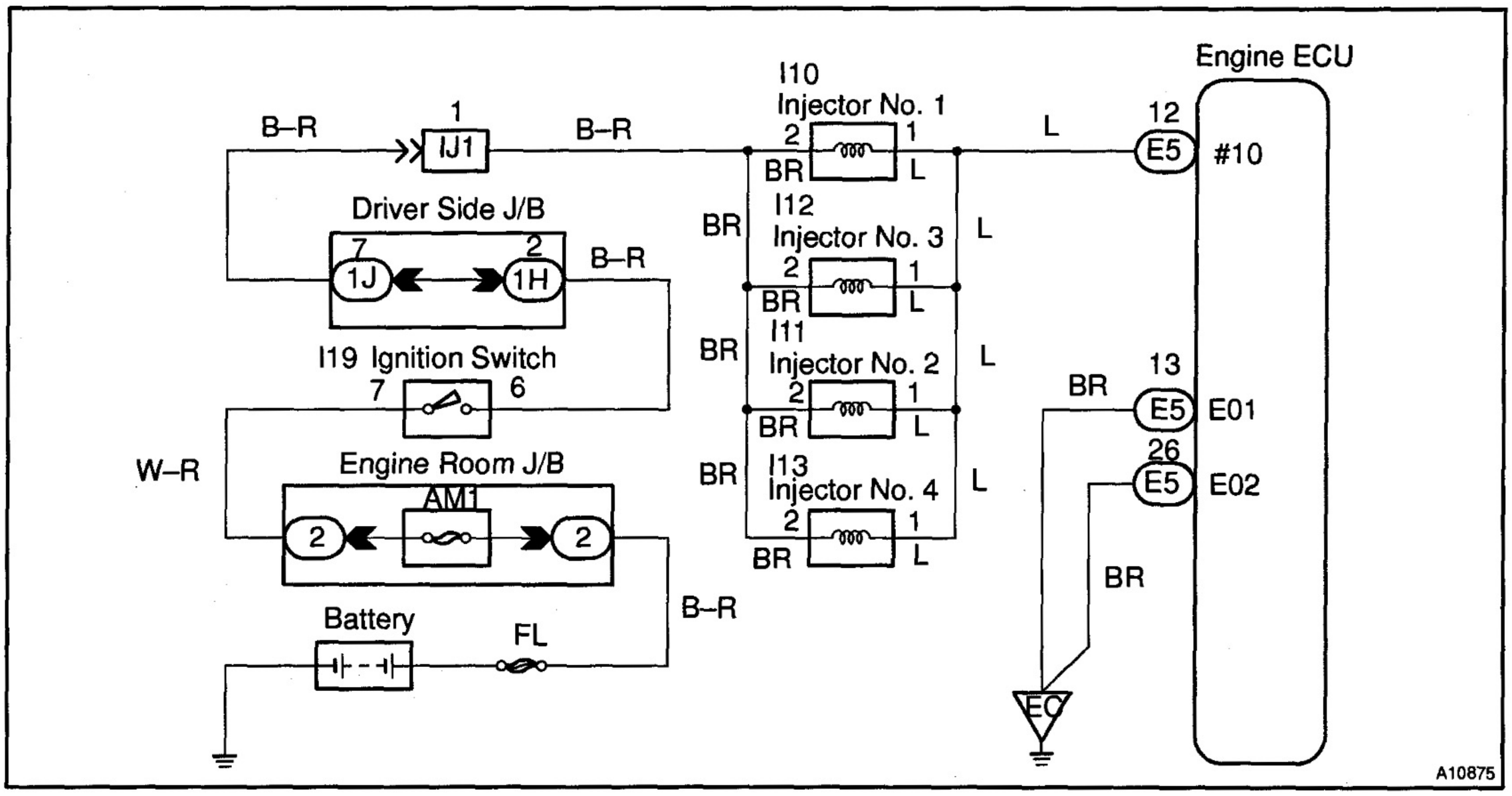
With the engine idling measure waveform between terminals #10 and E01 of engine ECU.

HINT:

The correct waveforms are as shown.

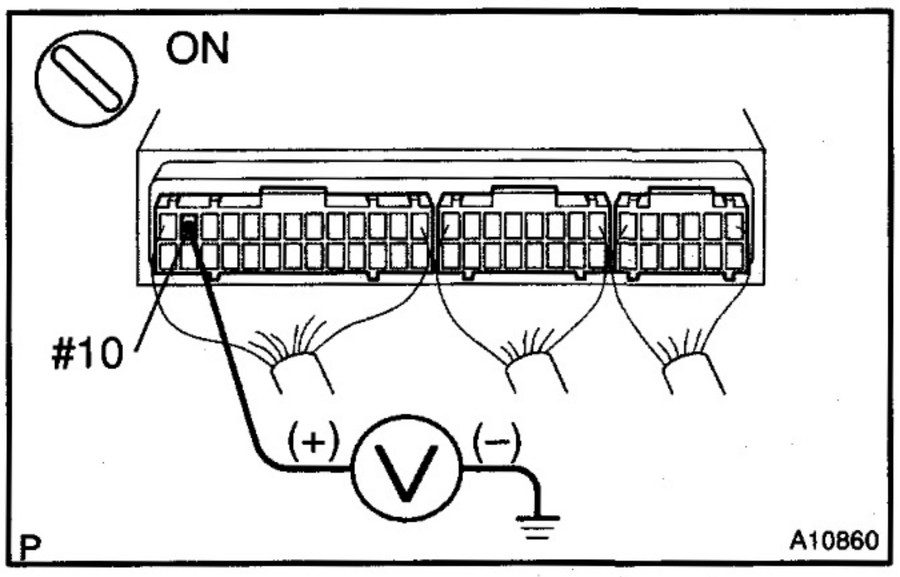


WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals #10 of engine ECU and body ground.**



PREPARATION:

(a) Remove the glove compartment.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals #10, of engine ECU and body ground.

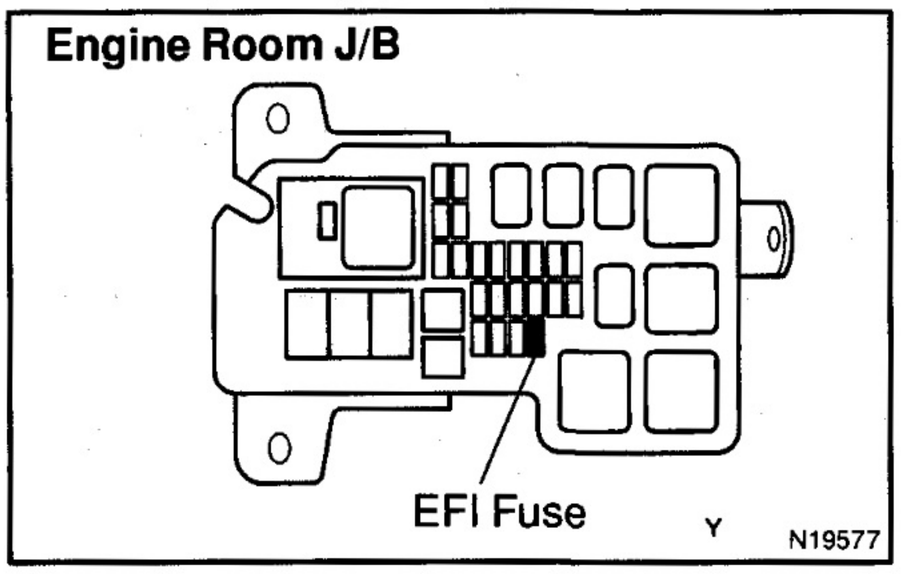
OK:

Voltage: 9 – 14 V

OK	**Go to step 3.**

NG

2	**Check EFI fuse.**



PREPARATION:

Remove EFI fuse from engine room J/B.

CHECK:

Check continuity of EFI fuse.

OK:

Continuity

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

OK

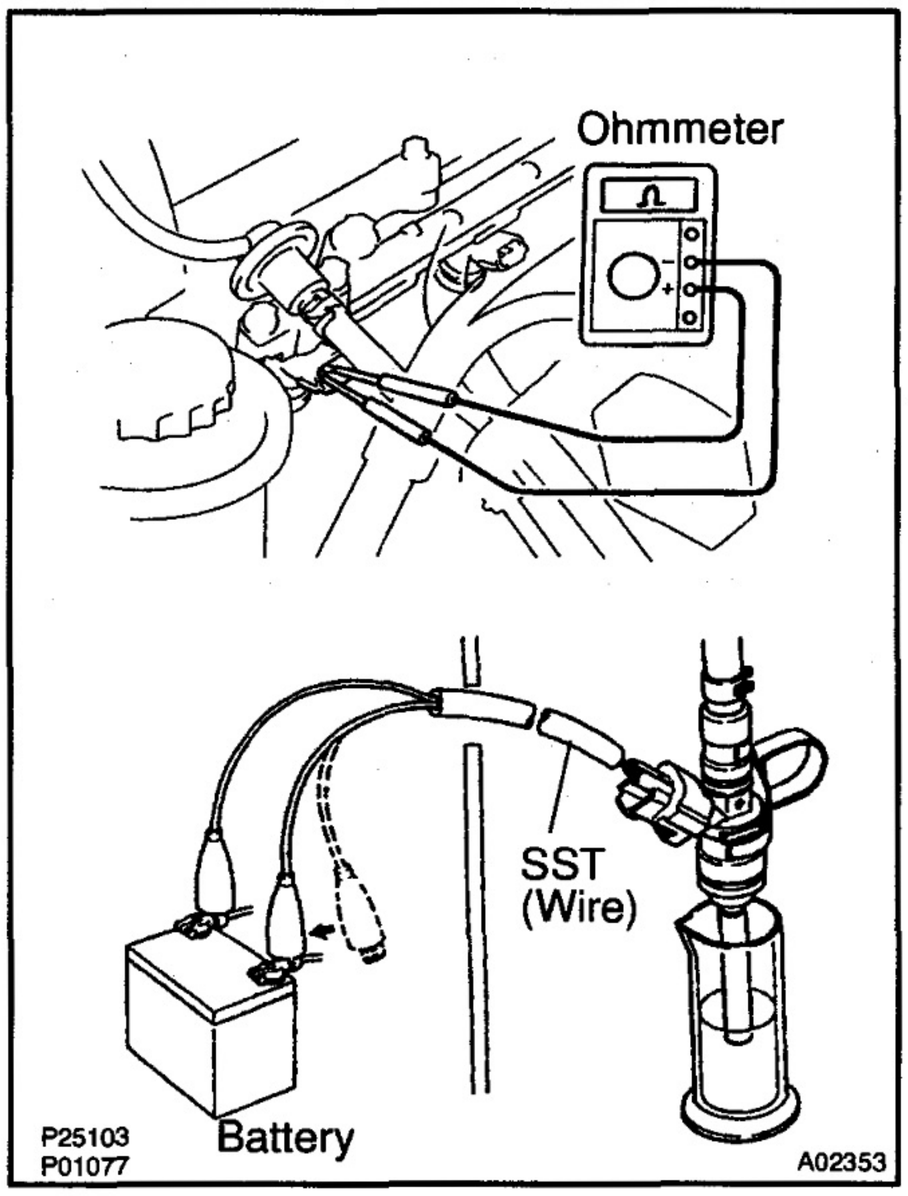
Check for open in harness and connector between engine ECU and battery.

3	**Check for open in harness and connector between terminals E01, E02 of engine ECU connector and body ground (See page IN–18).**

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

OK

4	Check injectors.



PREPARATION:
Disconnect injector connectors.
CHECK:
Measure resistance of injectors.
OK:
Resistance: At 20°C (68°F): 12 – 16 Ω
CHECK:
Check injection volume of injectors.
OK:
Injection volume:
69 – 88 cm³ (4.2 – 5.4 cu in.)/15 sec.
Difference between each injector:
Less than 5 cm³ (0.3 cu in.)
Leakage: 1 drop or less per 3 minutes

NG → **Replace injector(s).**

OK

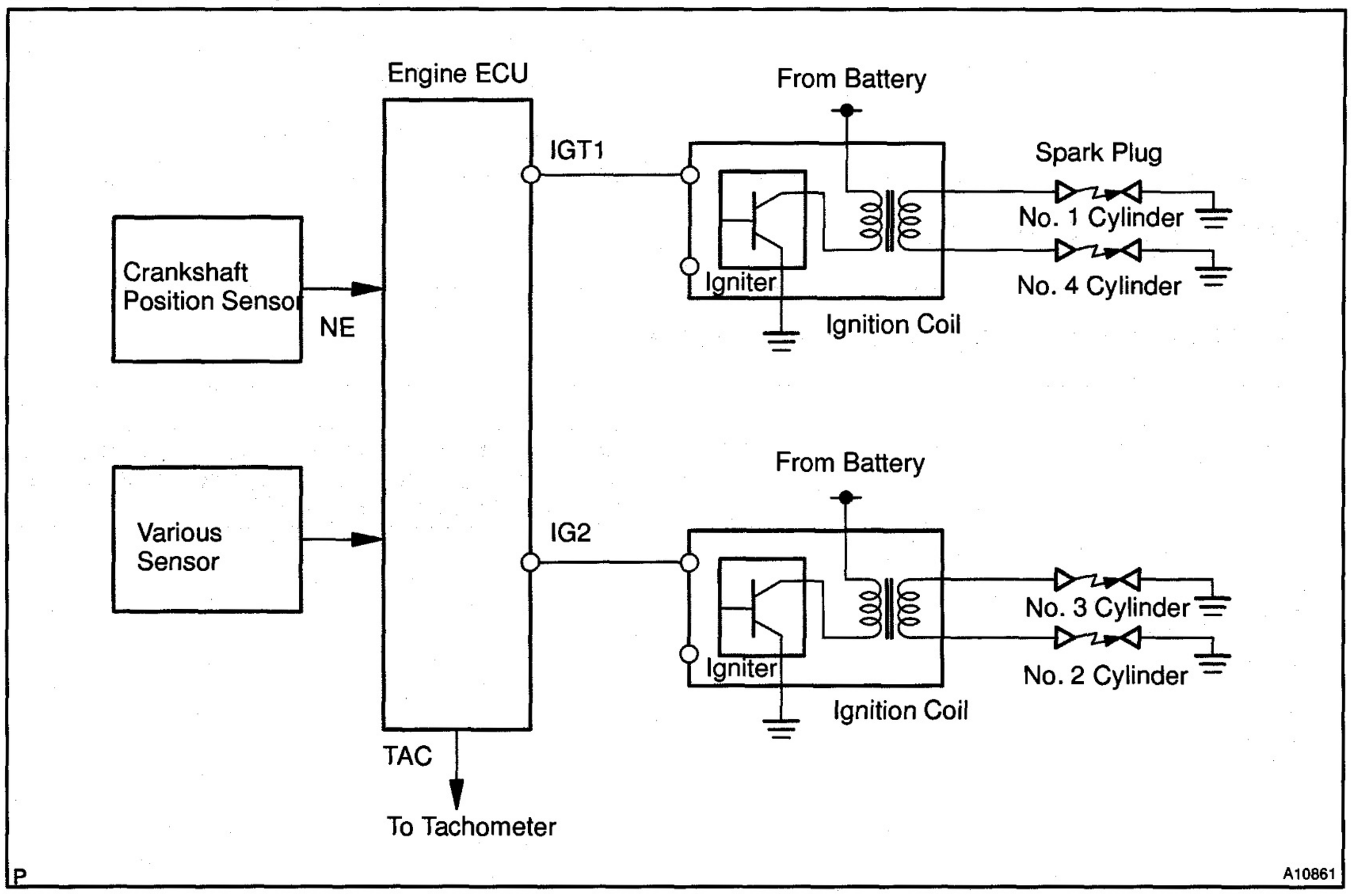
Check and replace engine ECU.

DI6DQ–01

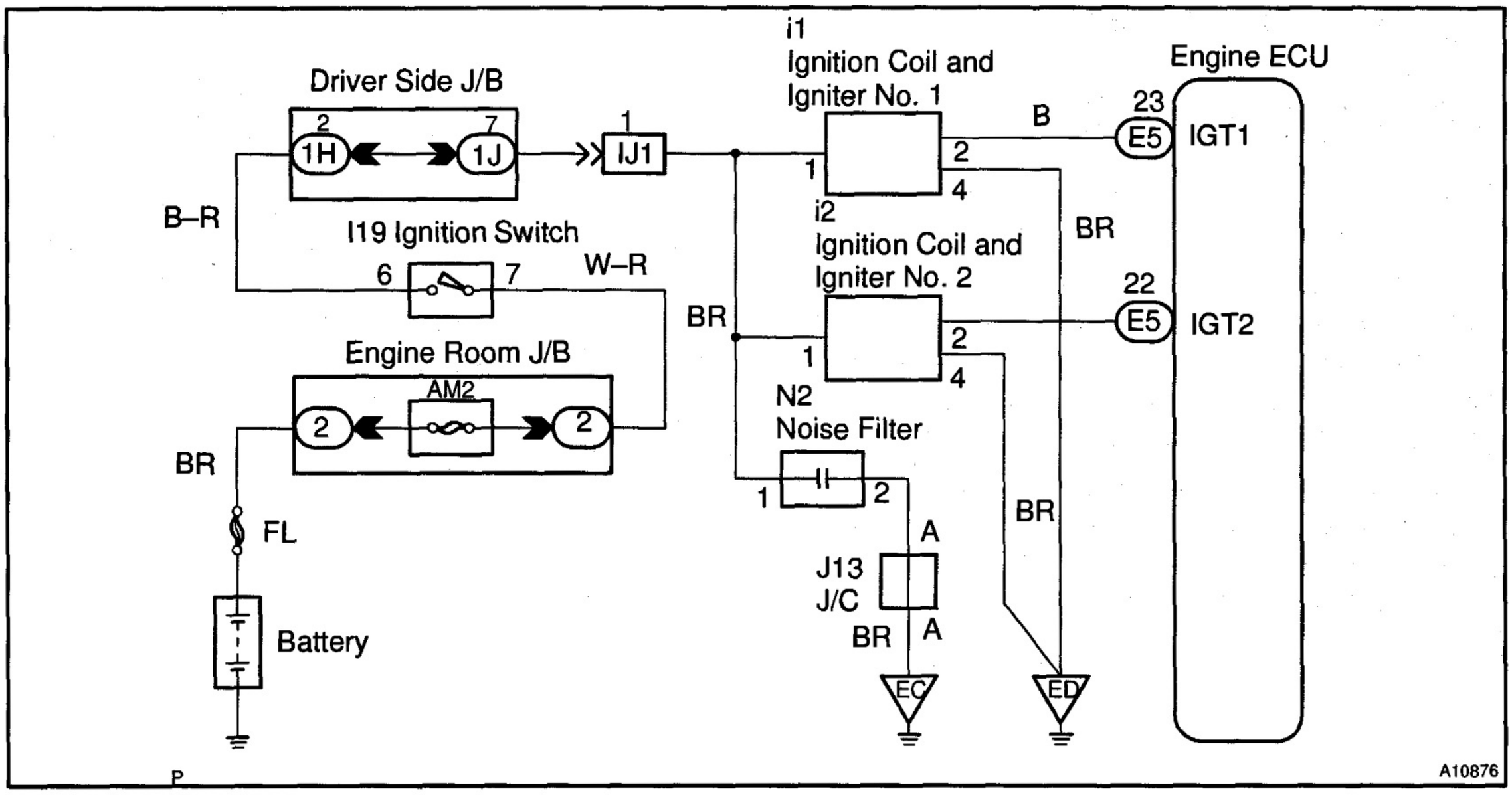
Ignition Signal Circuit

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 1 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 2 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 and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil is supplied simultaneously to the 2 spark plugs via the high–tension cords that are connected to the both ends of the secondary coil.



WIRING DIAGRAM



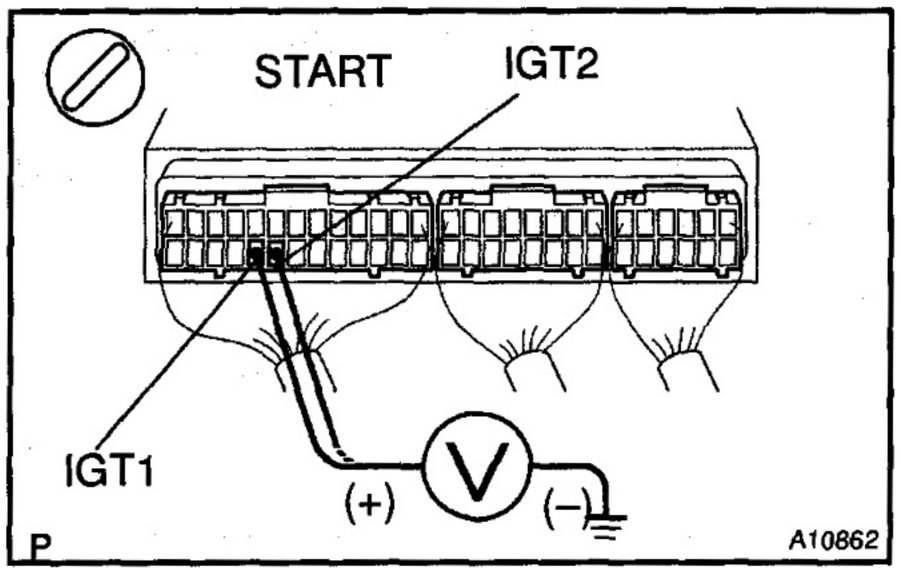
INSPECTION PROCEDURE

1	Check spark plug and spark (See page IG–1).

NG → Check for open and short in harness and connector between engine ECU and ignition coil No. 1, No. 2 (See page IN–18).

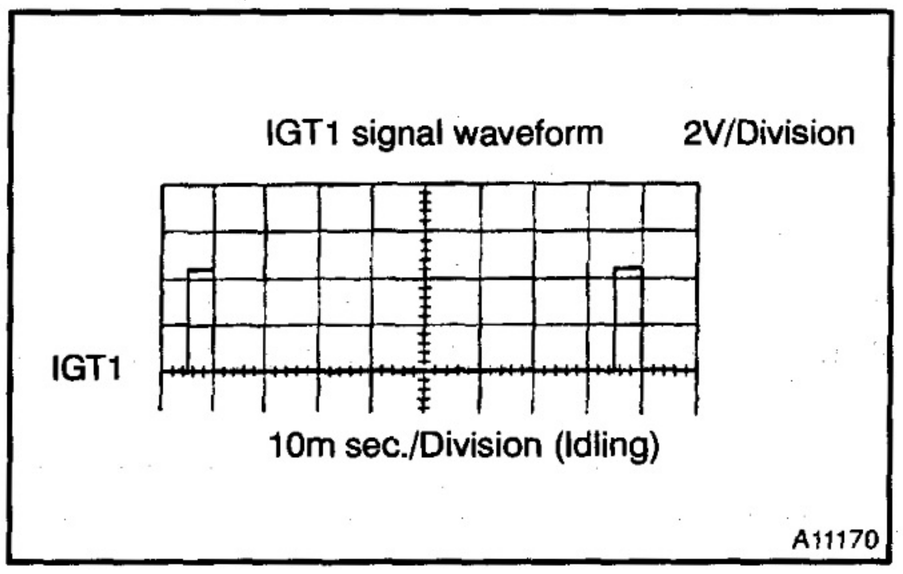
OK →

2	**Check voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground.**



PREPARATION:
Remove the grove compartment.
CHECK:
Measure voltage between terminal IGT1 and IGT2 of engine ECU connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less then 4.5 V

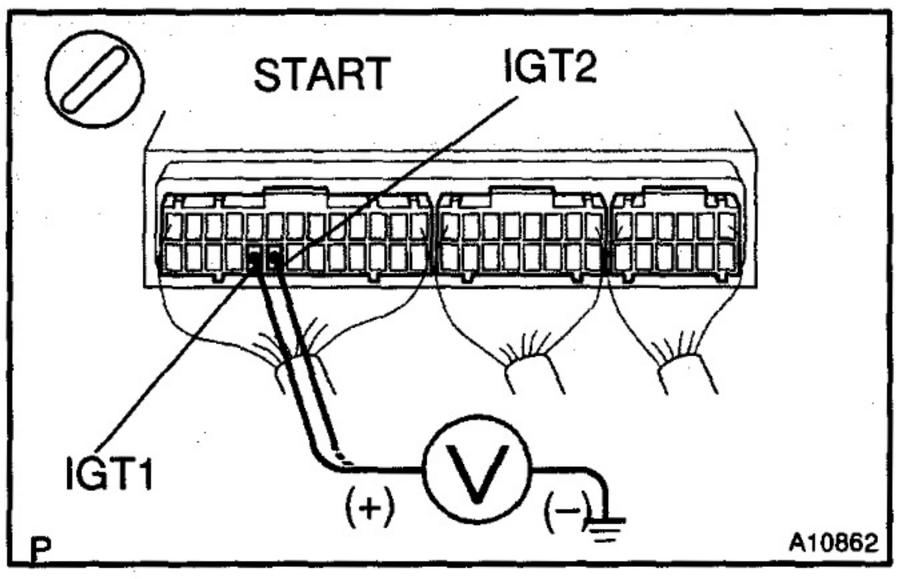


Reference: INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminals IGT1 and E1 of engine ECU.
HINT:
The correct waveform are as shown.
IGT2 signal waveform is same as the IGT1 signal waveform.

NG → **Check and replace engine ECU (See page IN–18).**

OK

3	**Disconnect ignition coil (w/ igniter) connector and check voltage between terminal IGT1 IGT2 of engine ECU connector and body ground.**



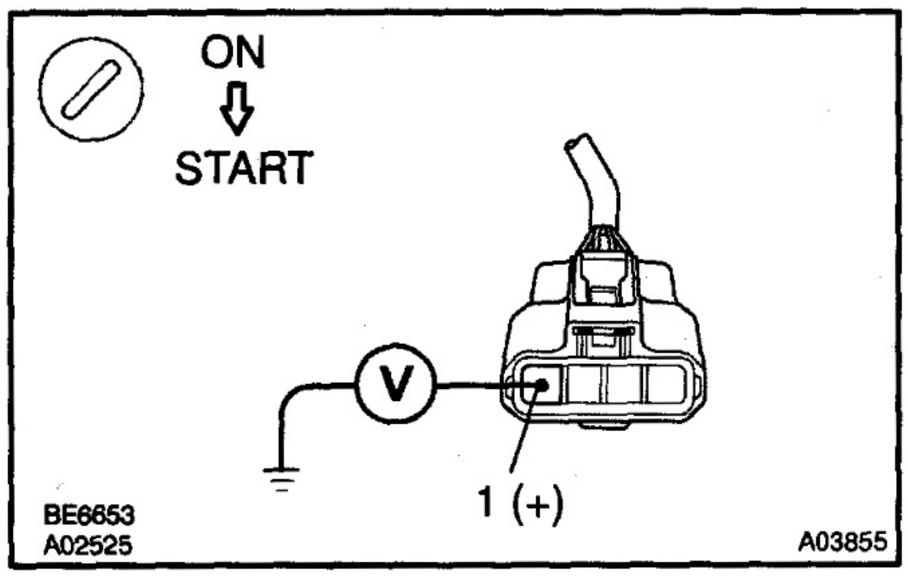
PREPARATION:
(a) Disconnect the ignition coil (w/ igniter) connector.
(b) Remove the glove compartment.
CHECK:
Measure voltage between terminals IGT1 and IGT2 of engine ECU connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less then 4.5 V

NG → **Check and replace engine ECU (See page IN–18).**

OK

4	Check ignition coil (w/ igniter) power source circuit.



PREPARATION:

Disconnect the ignition coil (w/ igniter) with igniter connector.

CHECK:

Measure voltage between terminals 1 of ignition coi (w/ igniter) connector and body ground, when ignition switch is turned to "ON" and "STA" position.

OK:

Voltage: 9 – 14 V

NG → **Repair ignition coil (w/ igniter) power source circuit.**

OK

5	Check for open and short in harness and connector between ignition switch and ignition coil (w/ igniter) (See page IN–18).

NG → **Replace ignition coil (w/ igniter).**

OK

6	Check ignition coil (w/ igniter) (See page IN–18).

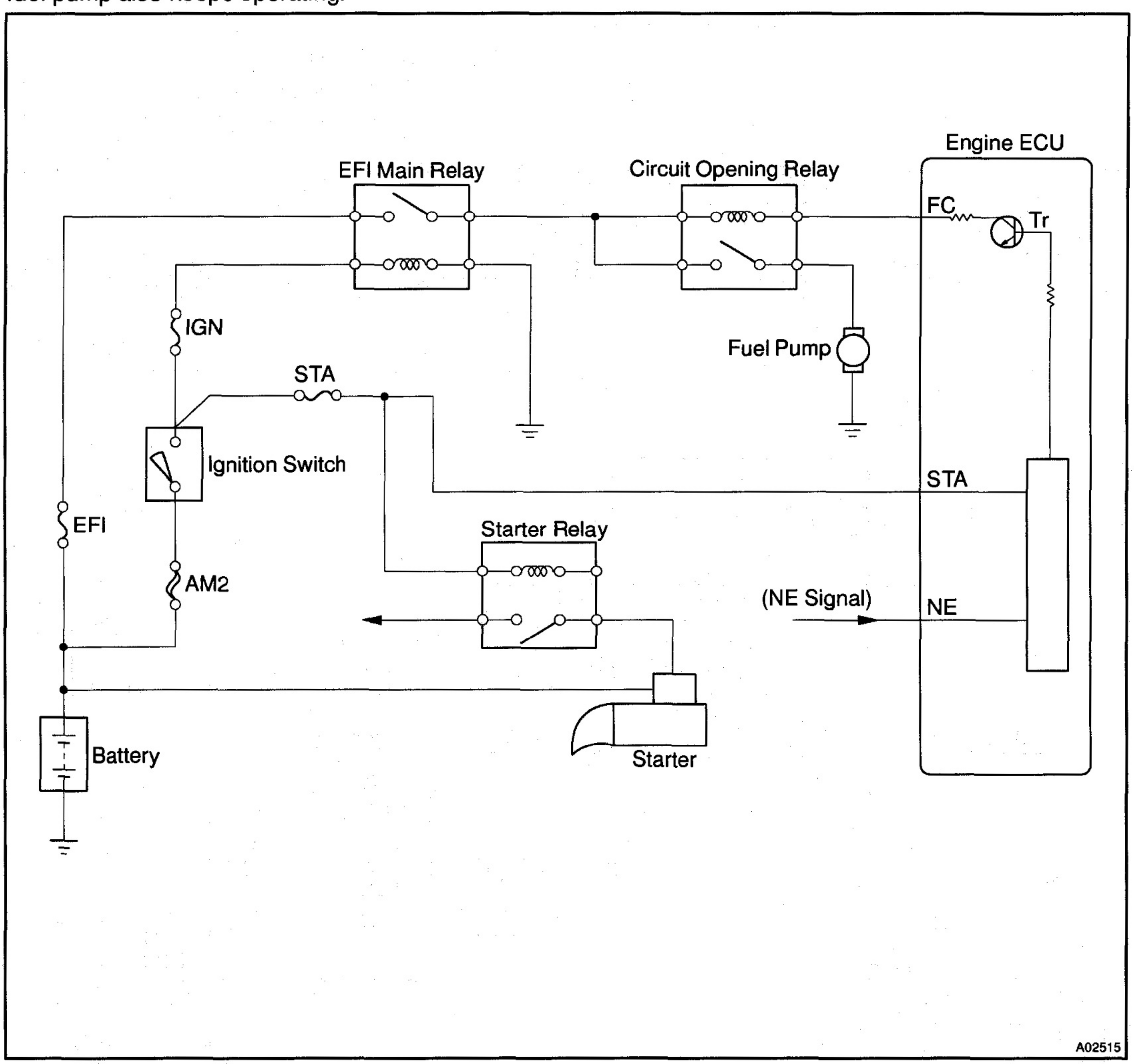
NG → **Replace ignition coil (w/ igniter).**

OK

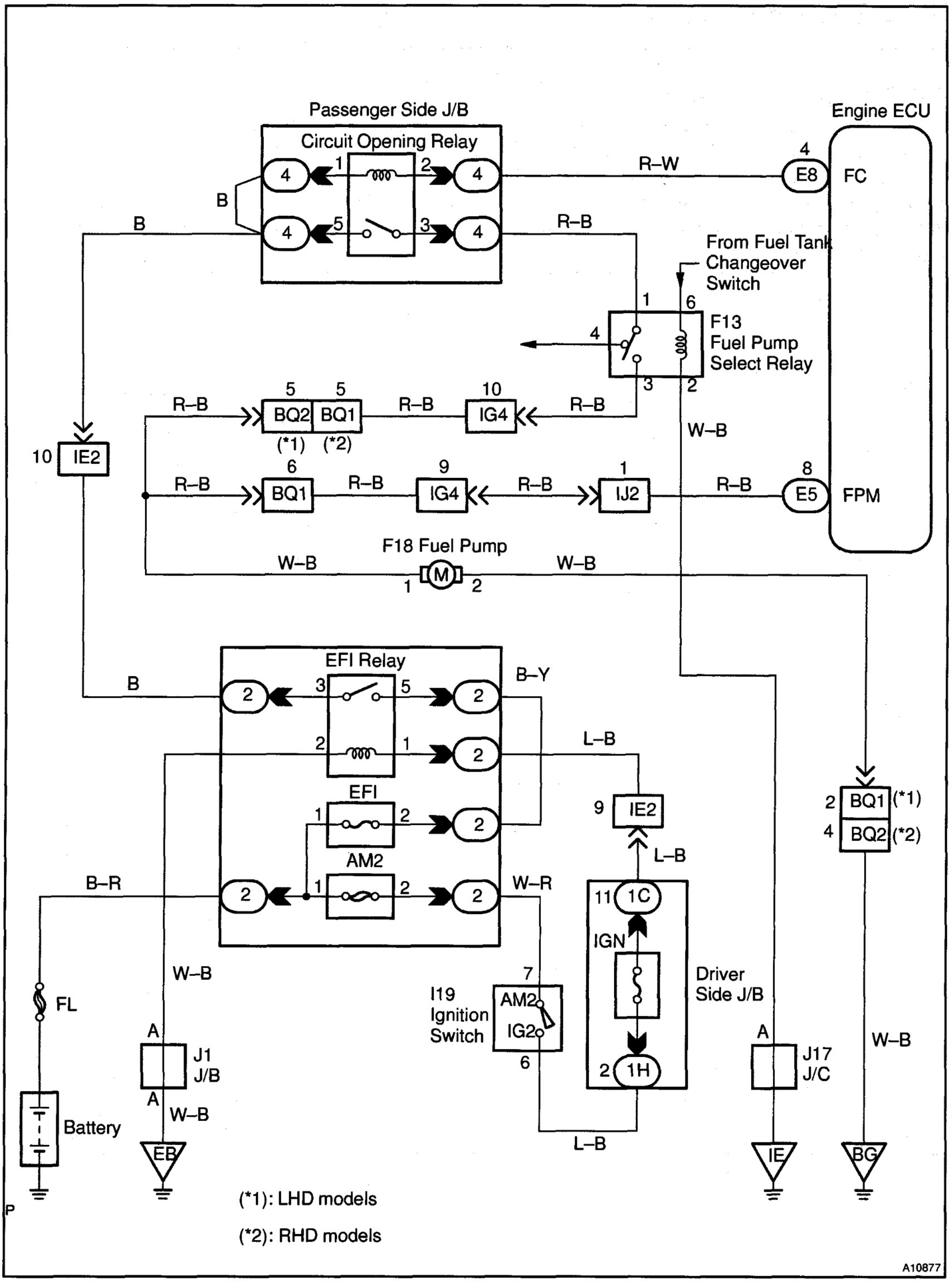
Fuel System Circuit

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 and also current flows to terminal STA of ECU (STA signal).
When the STA signal and NE signal are input to the ECU, Tr is turned ON, current flows to coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates.
While the NE signal is generated (engine running), the ECU keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

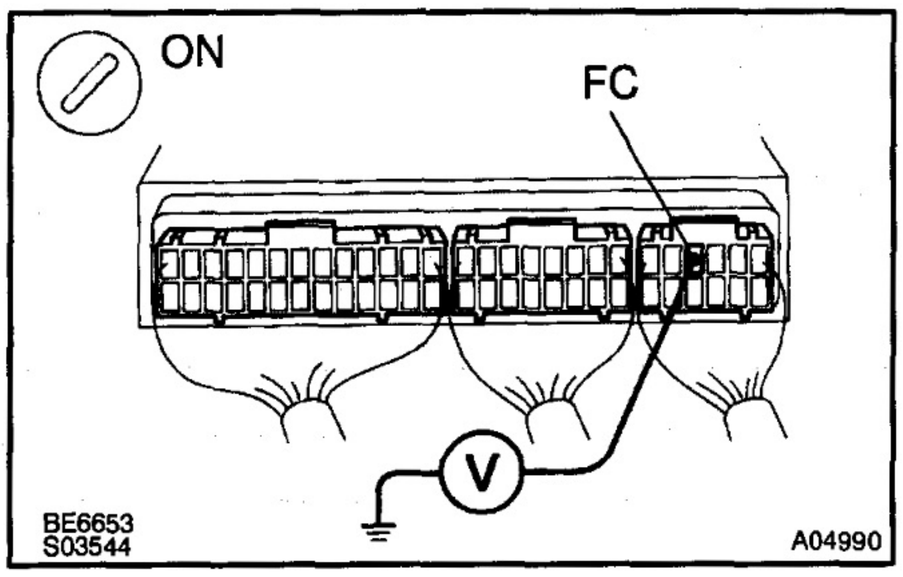


WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage terminal FC.



PREPARATION:

(a) Remove the glove compartment.

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK → **Check and replace engine ECU.**

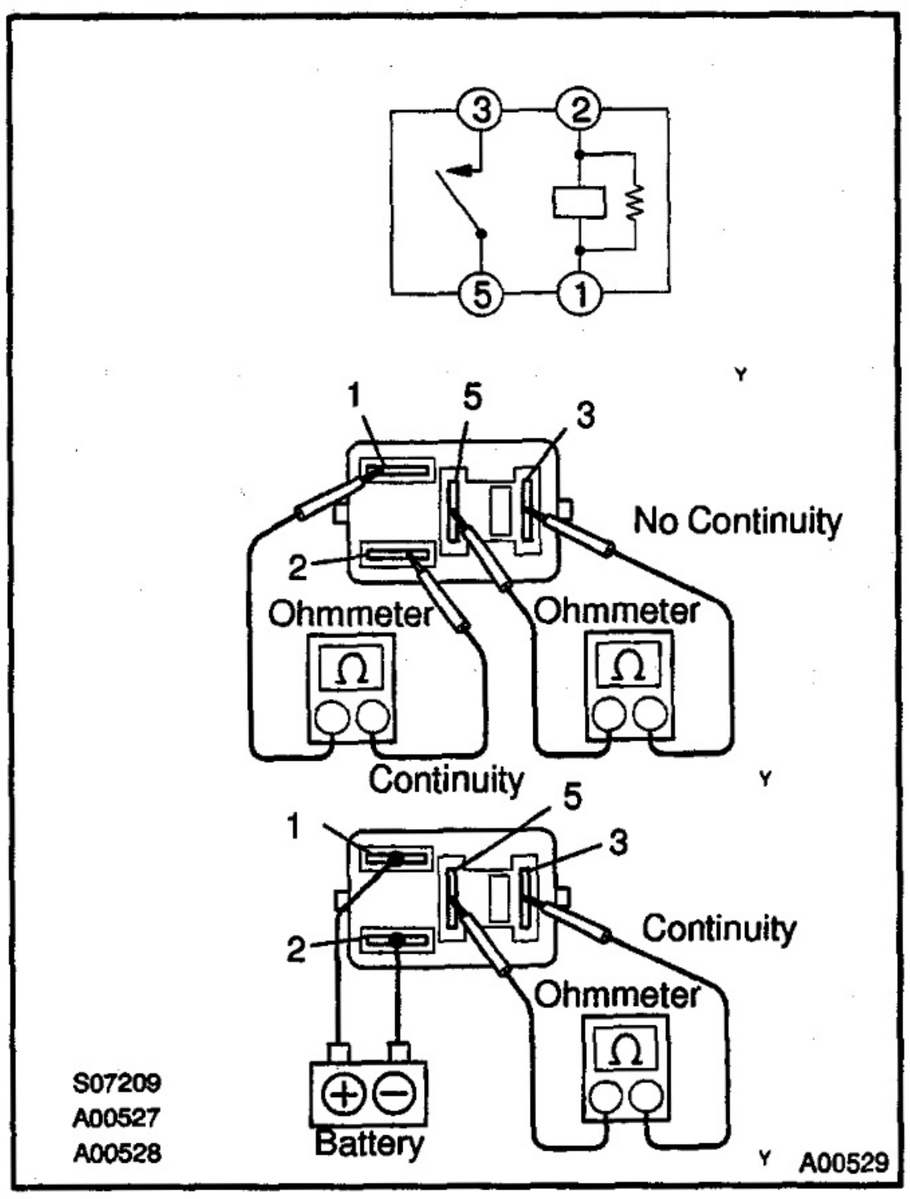
NG

2	Check for ECU power source circuit (See page DI–68).

NG → **Repair or replace.**

OK

3	**Check circuit opening relay.**



PREPARATION:

(a) Remove the driver's cowl side trim.

(b) Remove circuit opening relay.

CHECK:

Check continuity between terminals of circuit opening relay shown below.

OK:

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check continuity between terminals 3 and 5.

OK:

Terminals 3 and 5	Continuity

NG → **Replace circuit opening relay.**

OK

4	**Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and engine ECU (See page IN–18).**

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

OK

5	**Check fuel pump (See page IN–18).**

NG → **Replace fuel pump.**

OK

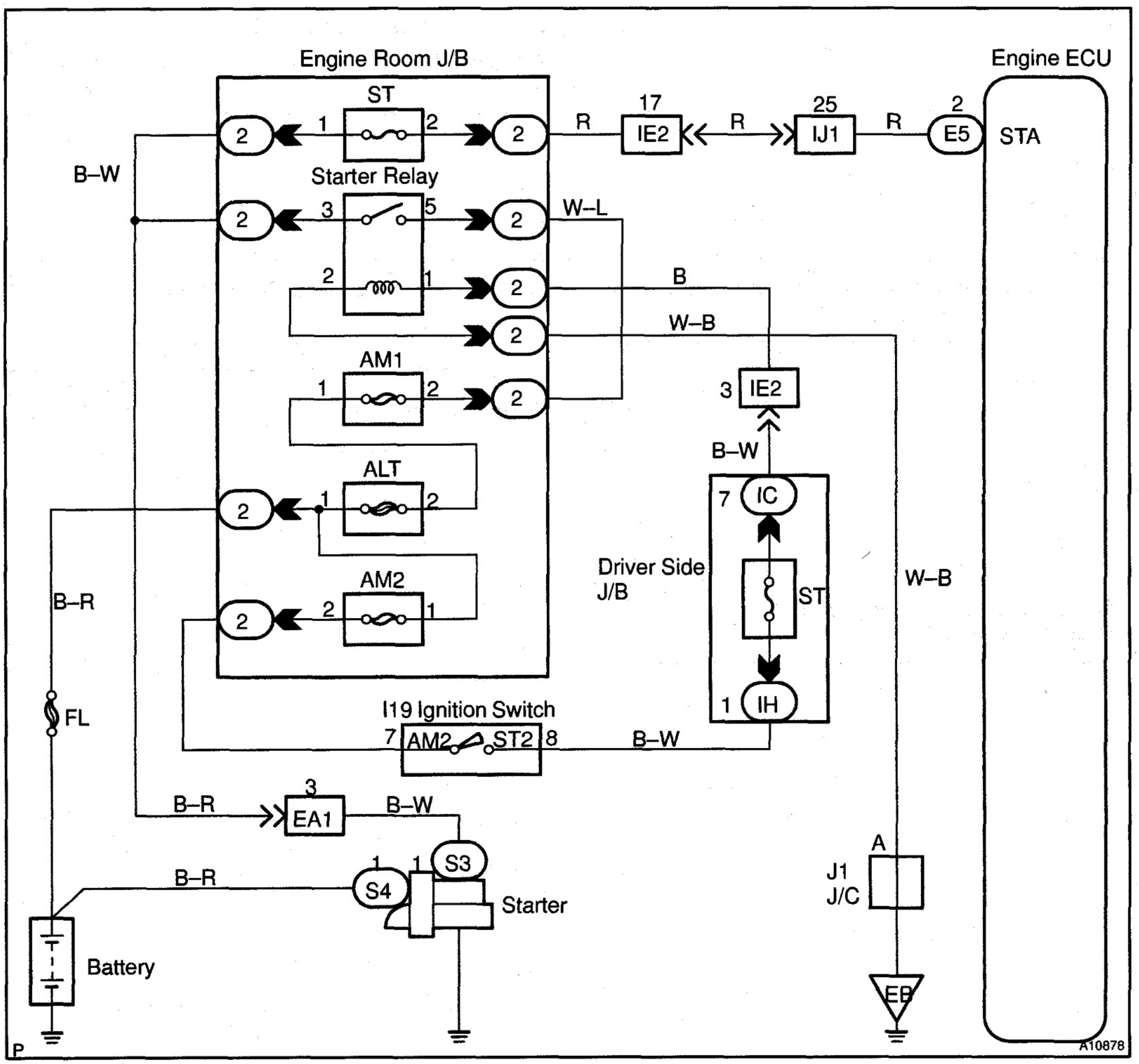
Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground.

Starter Signal Circuit

CIRCUIT DESCRIPTION

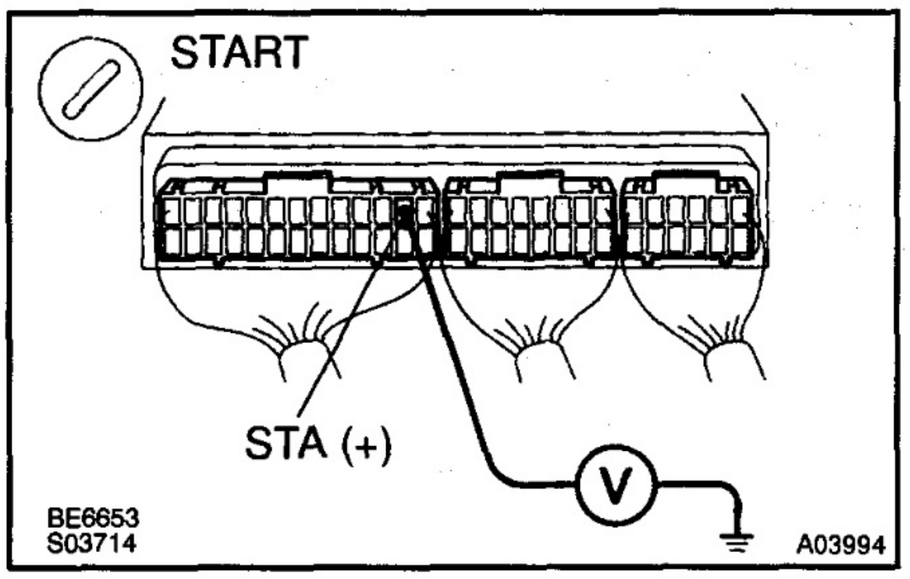
When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECU. The starter signal is mainly used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

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:
Remove glove compartment .

CHECK:
Measure voltage between terminal STA of engine ECU connector and body ground during engine cranking.

OK:

Voltage: 6.0 V or more

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–20).**

NG

2	**Check for open in harness and connector between engine ECU and starter relay (See page IN–18).**

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

OK

Check and replace engine ECU (See page IN–18).

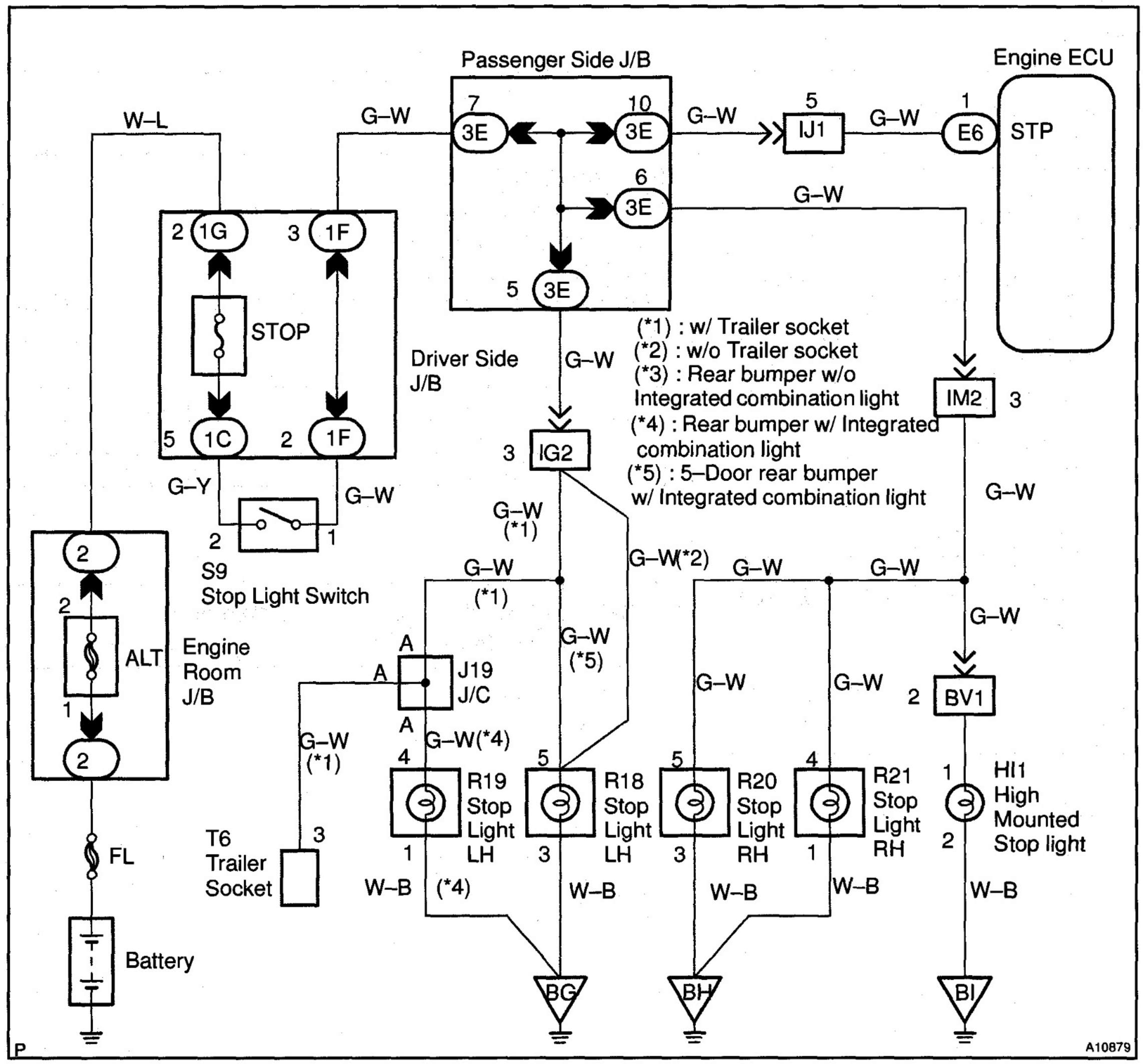
DI6OS–01

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

This signal is used to detect when the brakes have been applied. The STP signal voltage is the same as the voltage supplied to the stop lights.
The STP signal is used mainly to control the fuel cut–off engine speed. (The fuel cut–off engine speed is reduced slightly when the vehicle is braking.)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

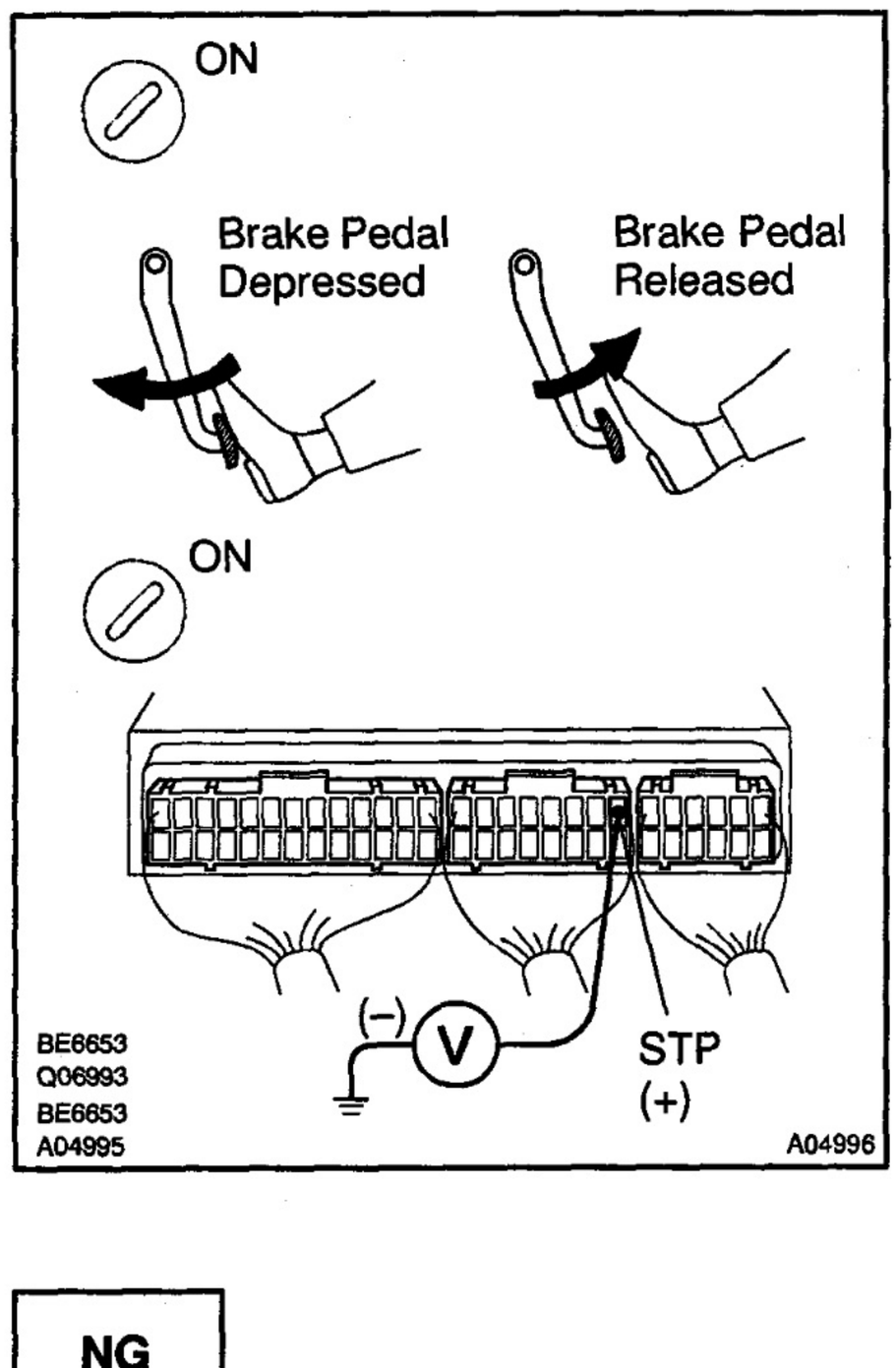
PREPARATION:

Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See Pub. No. RM517E on page BE–33).**

OK

2	**Check STP signal.**



PREPARATION:

(a) Remove the glove compartment door.

(b) Turn the ignition switch ON.

CHECK:

Check voltage between terminal STP of engine ECU and body ground.

OK:

Brake pedal	Voltage
Depressed	7.5 – 14 V
Released	Below 1.5 V

OK → **Check for intermittent problems (See page DI–3).**

NG

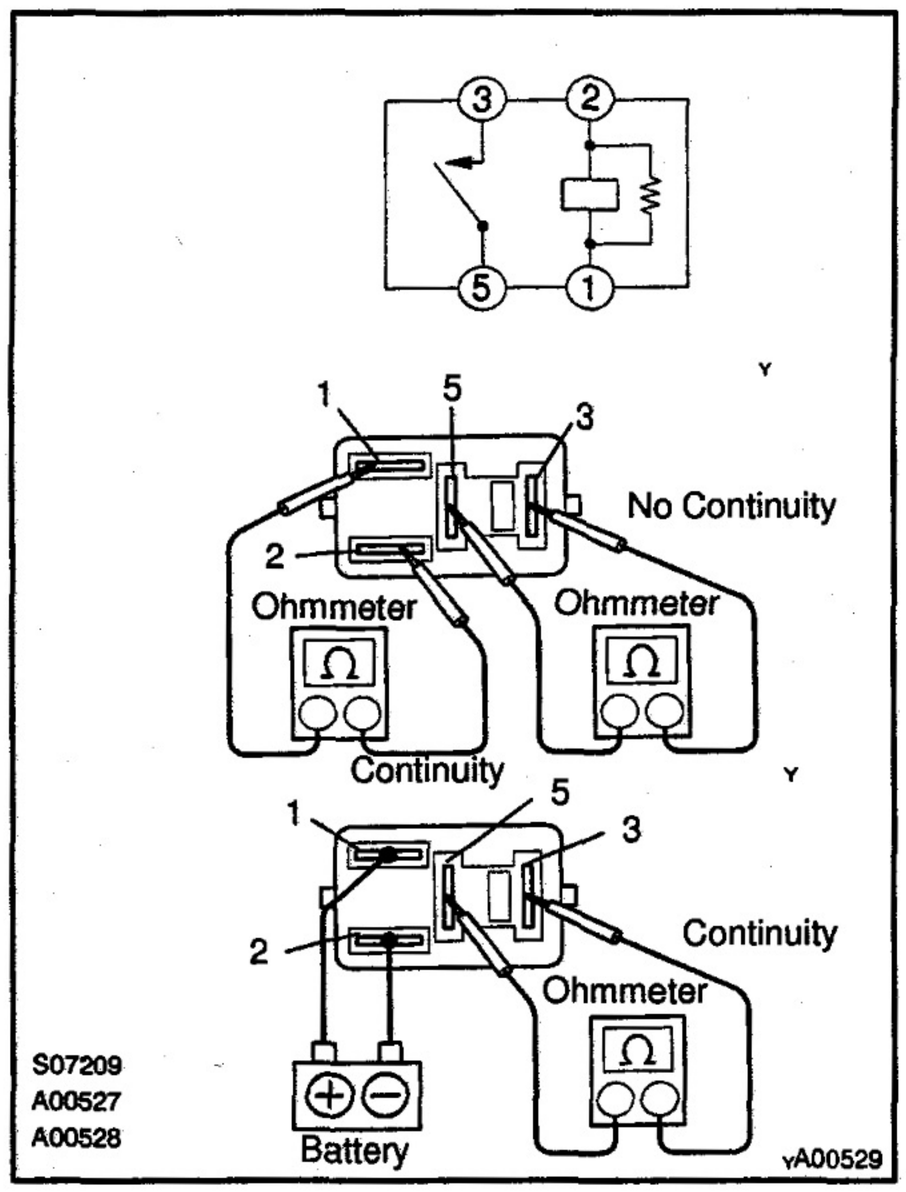
3	**Check harness and connector between engine ECU and stop light switch (See page IN–18).**

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

OK

Check and replace engine ECU.

4	**Check EFI main relay.**



PREPARATION:

Remove EFI main relay from engine room J/B.

CHECK:

Check continuity between terminals EFI main relay shown below.

OK:

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check continuity between terminals 3 and 5.

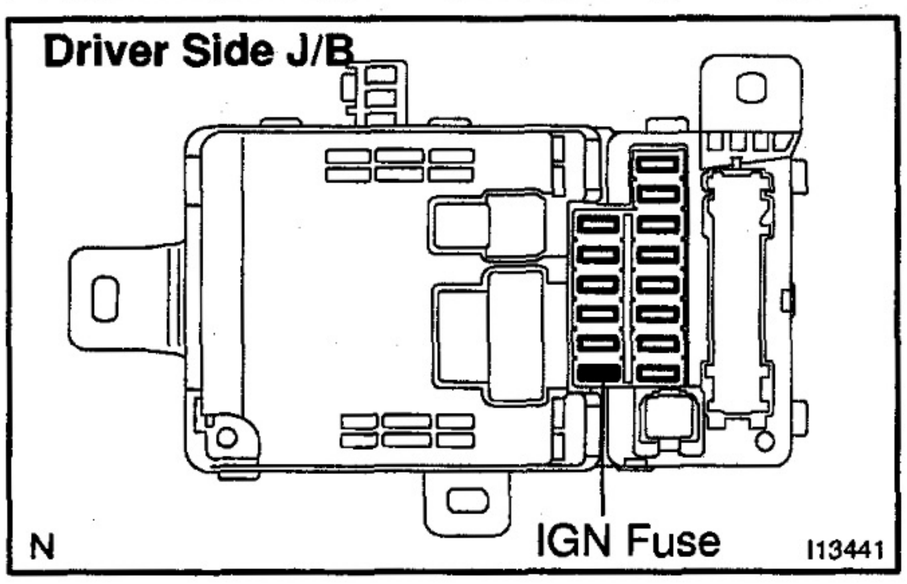
OK:

Terminals 3 and 5	Continuity

NG → **Replace EFI main relay.**

OK

5	Check IGN fuse.



PREPARATION:

Remove IGN fuse from drive side J/B.

CHECK:

Check continuity of IGN fuse.

OK:

Continuity

NG → **Check for short in all the harness and components connected to IGN fuse (See attached wiring diagram).**

OK

Check and repair harness or connector between battery and IGN fuse and engine ECU (See page IN–18).

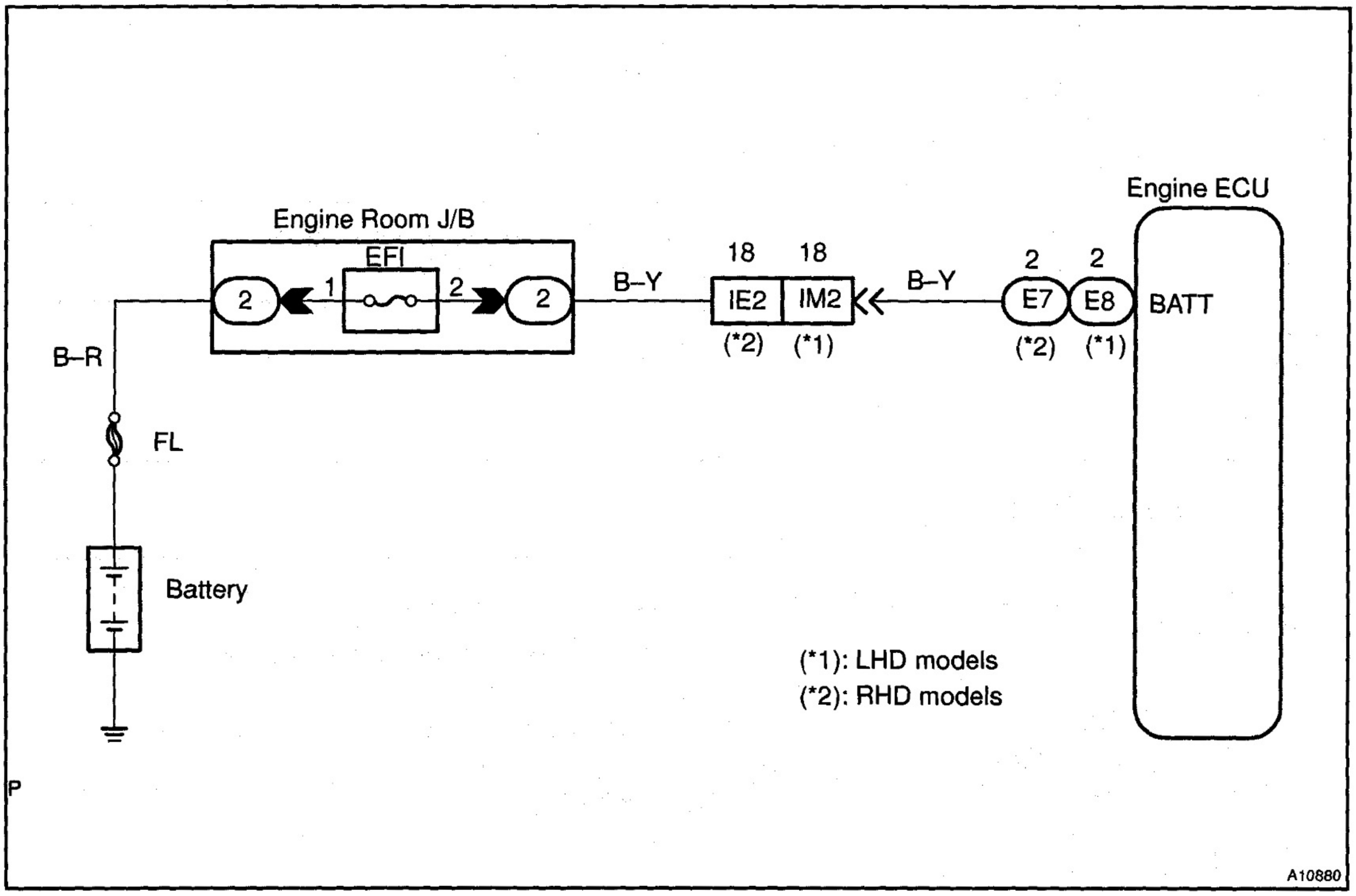
DI8DT–01

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

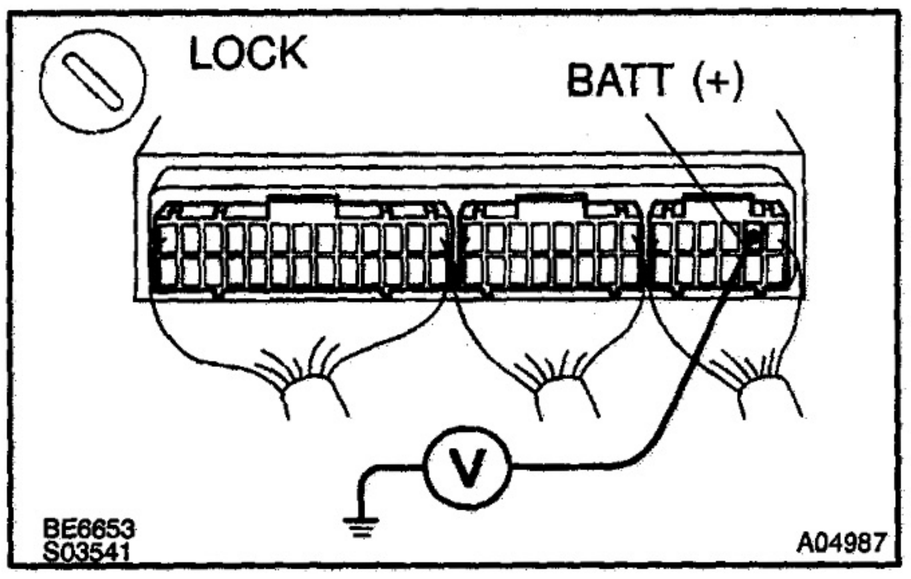
Battery voltage is supplied to terminal BATT of the engine ECU even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

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

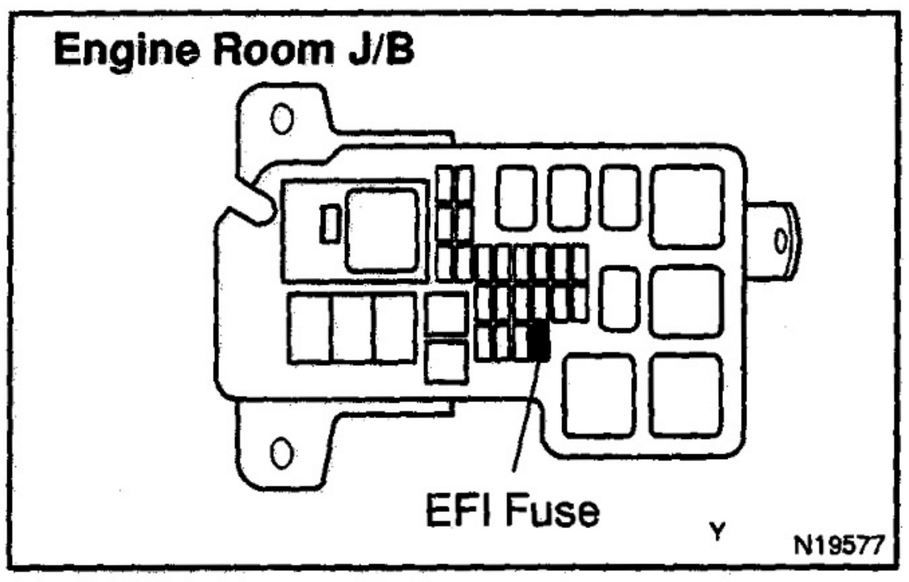


PREPARATION:
Remove the lower center finish panel.
CHECK:
Measure voltage between terminal BATT of engine ECU connector and body ground.
OK:
Voltage: 9 – 14V

OK → **Check and replace engine ECU (See page IN–18).**

NG

2	**Check EFI fuse.**



PREPARATION:
Remove the EFI fuse from the engine room R/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 and EFI fuse and engine ECU. (See page IN–18).

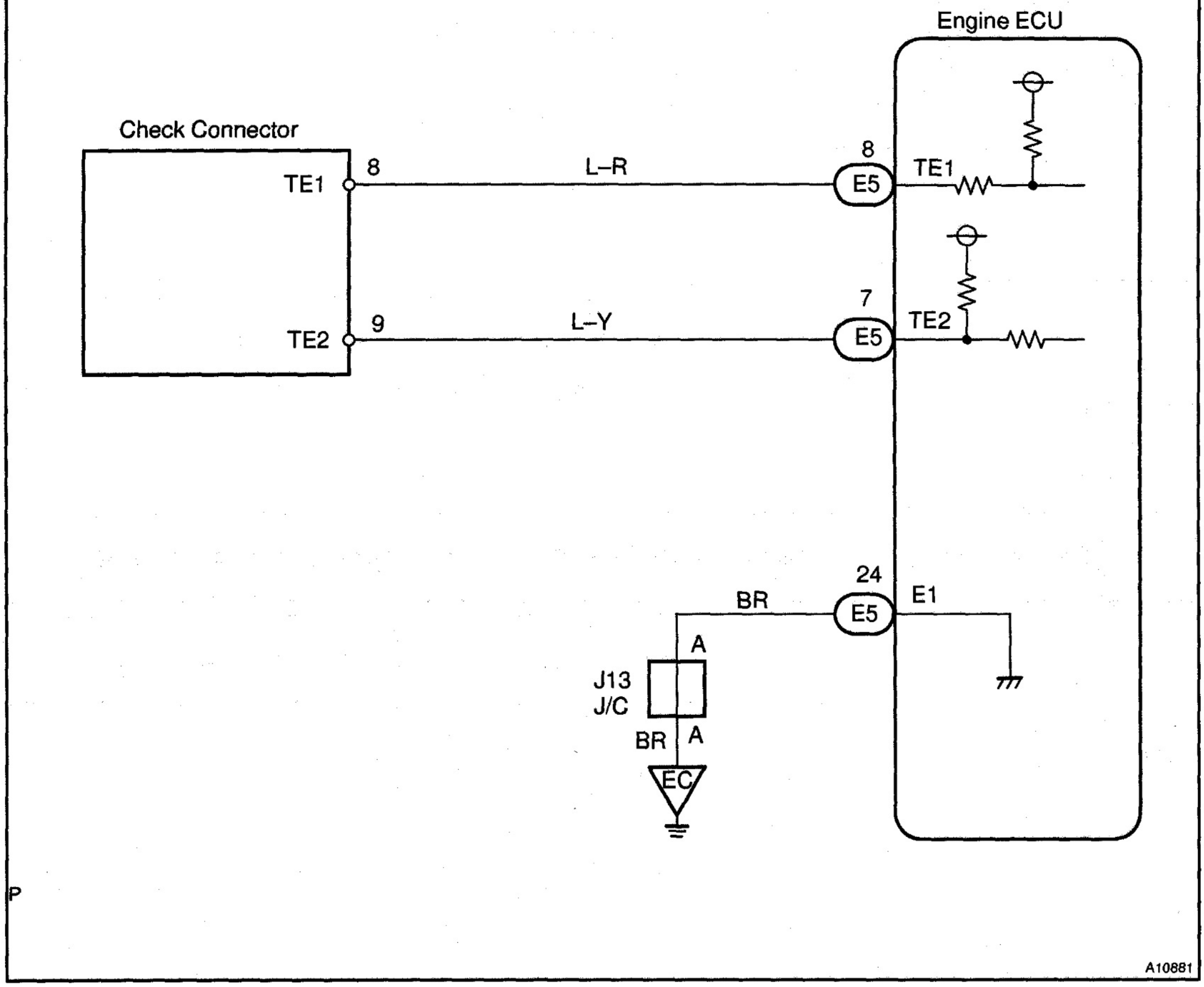
DI112-04

TE1, TE2 Terminal Circuit

CIRCUIT DESCRIPTION

Terminals TE1 and TE2 are located in the check connector.
The check connector is located in the engine compartment. When these terminals are connected with the E1 terminal, diagnostic trouble codes in normal mode or test mode can be read from the check engine warning light in the combination meter.

WIRING DIAGRAM

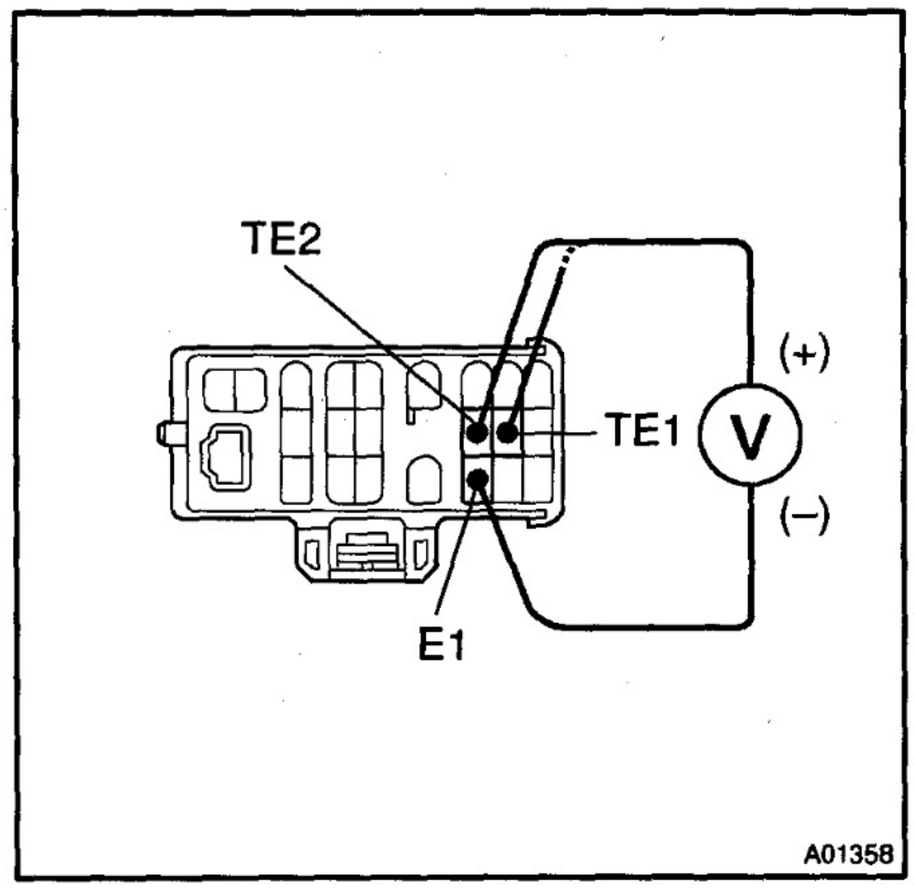


INSPECTION PROCEDURE

HINT:

- If terminals TE1 and TE2 are connected with terminal E1, diagnostic trouble code is not output or test mode is not activated.
- Even though terminal TE1 is not connected with terminal E1, the check engine warning light blinks.
- For the above phenomenon, the likely cause is an open or short in the wire harness, or malfunction inside the ECU.

1	**Check voltage between terminals TE1, TE2 and E1 of check connector.**



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminal TE1, TE2 and E1 of check connector.

OK:

Voltage: 9 – 14 V

OK → **Check and replace engine ECU.**

NG

2	**Check continuity between terminal E1 of check connector and body ground.**

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

OK

3	**Check for open and short in harness and connector between terminal TE1, TE2 of engine ECU and check connector (See page IN–18).**

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

OK

Check and replace engine ECU.

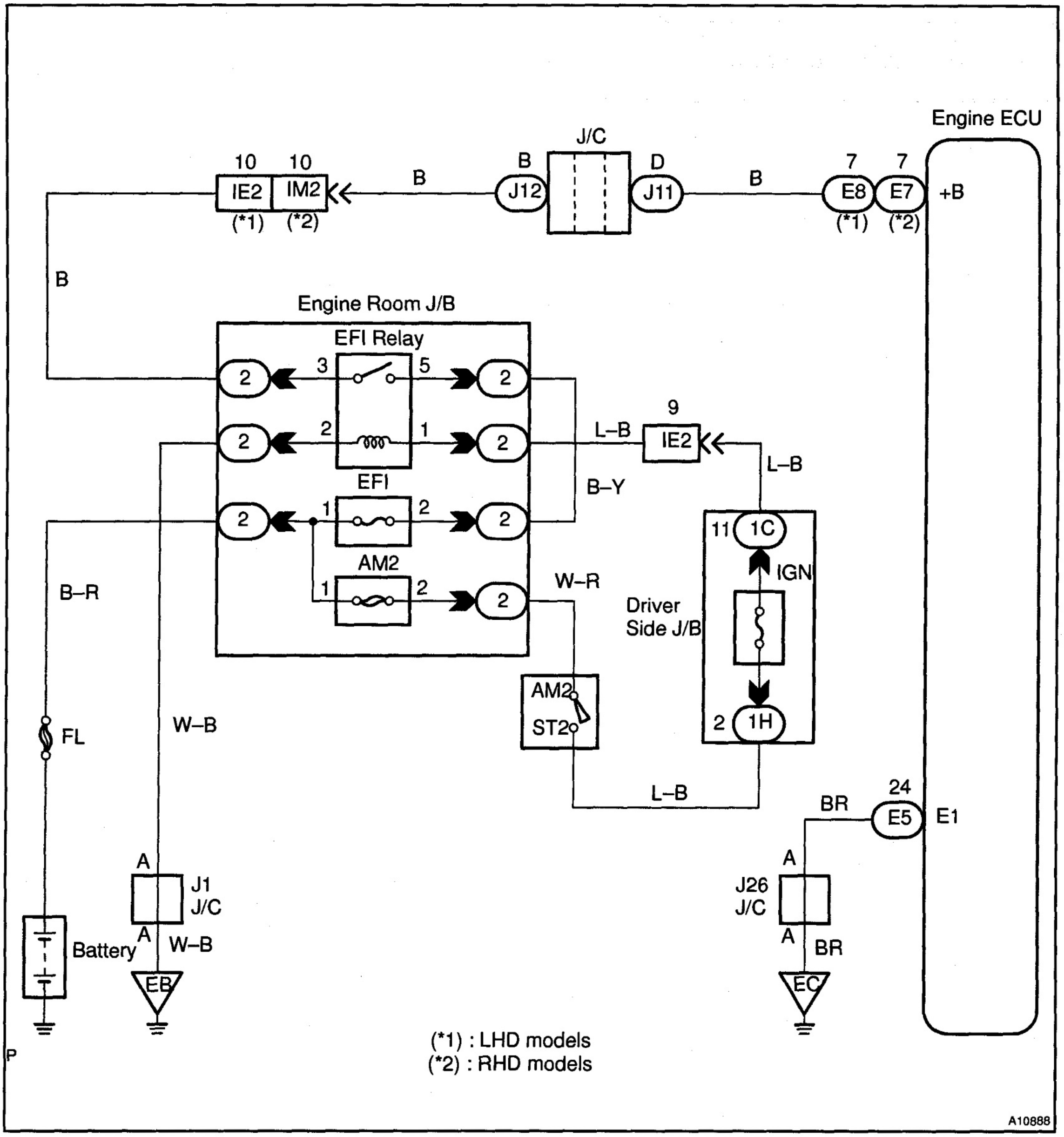
DI1HY–02

ECU Power Source Circuit

CIRCUIT DESCRIPTION

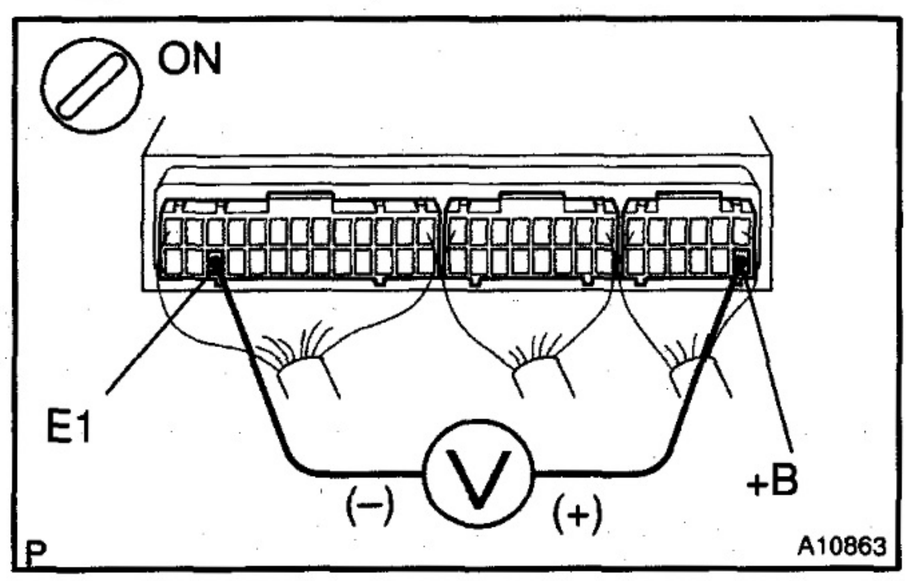
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminal +B of the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the glove compartment.

(b) Turn ignition switch ON.

CHECK:

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

OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–20).**

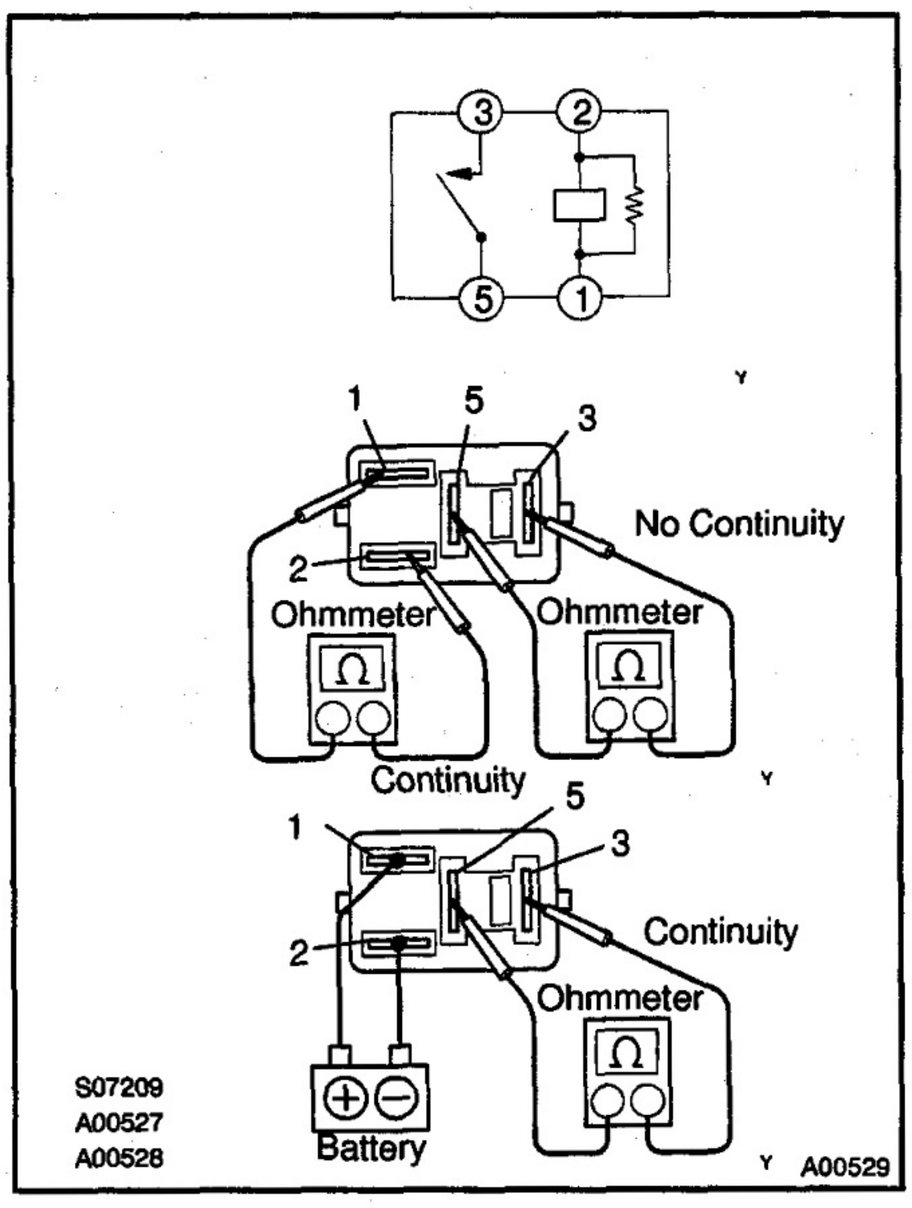
NG

2	**Check for open in harness and connector between terminal E1 of engine ECU and body ground (See page IN–18).**

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

OK

3	Check EFI main relay.



PREPARATION:

Remove EFI main relay from engine room J/B.

CHECK:

Check continuity between terminals EFI main relay shown below.

OK:

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity

CHECK:

(a) Apply battery positive voltage between terminals 1 and 2.

(b) Check continuity between terminals 3 and 5.

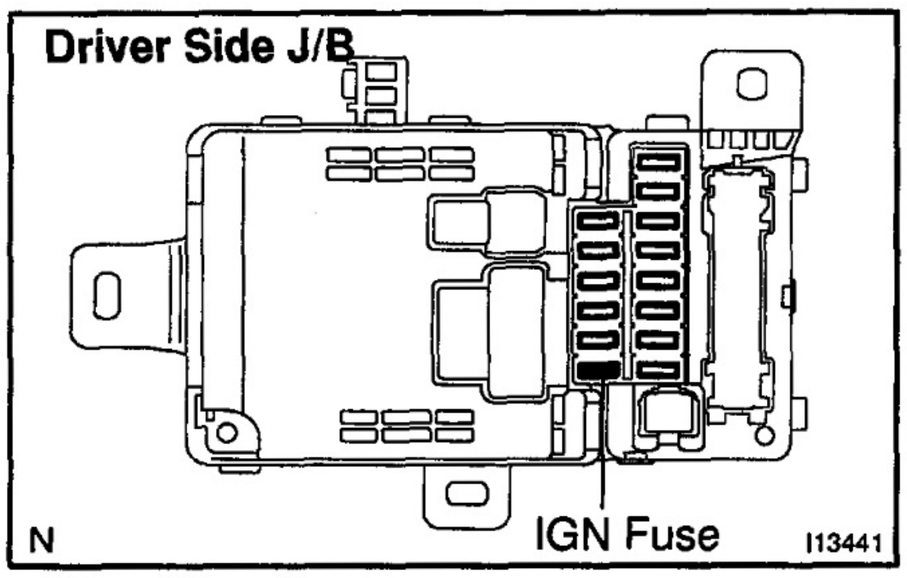
OK:

Terminals 3 and 5	Continuity

NG → **Replace EFI main relay.**

OK

4	Check IGN fuse.



PREPARATION:

Remove IGN fuse from driver side J/B.

CHECK:

Check continuity of IGN fuse.

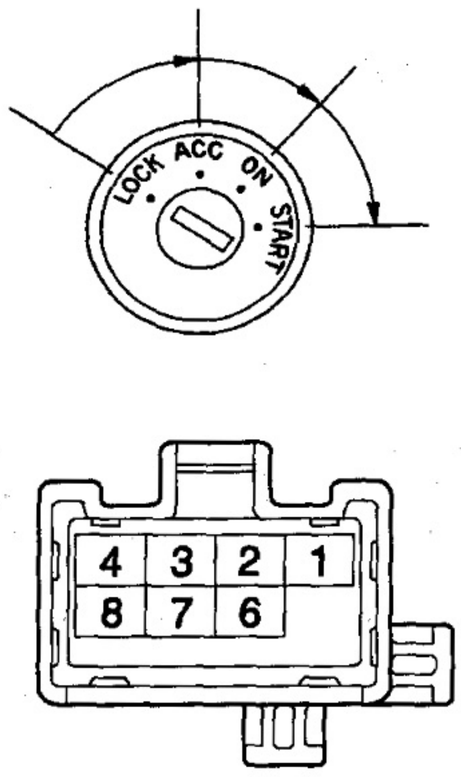
OK:

Continuity

NG → **Check for short in all the harness and components connected to IGN fuse (See attached wiring diagram).**

OK

5	Check ignition switch.



BE3582
A02521

A03273

PREPARATION:

(a) Remove lower finish panel.

(b) Disconnect the ignition switch connector.

CHECK:

Check continuity between terminals shown below.

OK:

Switch Position	Terminal No. to continuity	
Lock	–	–
ACC	2–3	–
ON	2–3–4	6–7
START	1–2–4	6–7–8

NG → **Replace ignition switch.**

OK

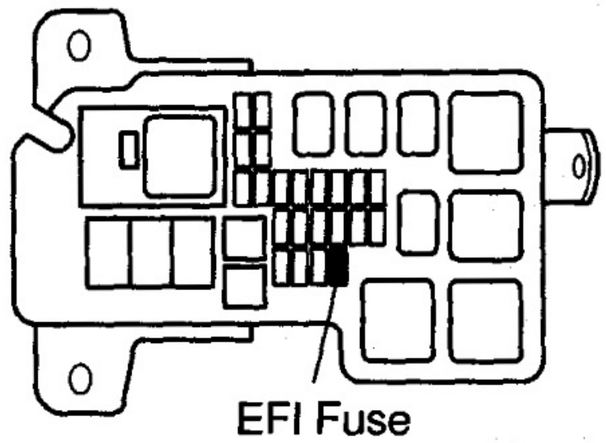
6	Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–18).

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

OK

7	Check EFI fuse.

Engine Room J/B



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

NG → **Check for short in all the harness and components connected to EFI fuse (See attached wiring diagram).**

OK

Check for open in harness and connector between main relay and battery, main relay and ECU.

8	Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF ?.

NO → **Check for replace engine ECU.**

YES

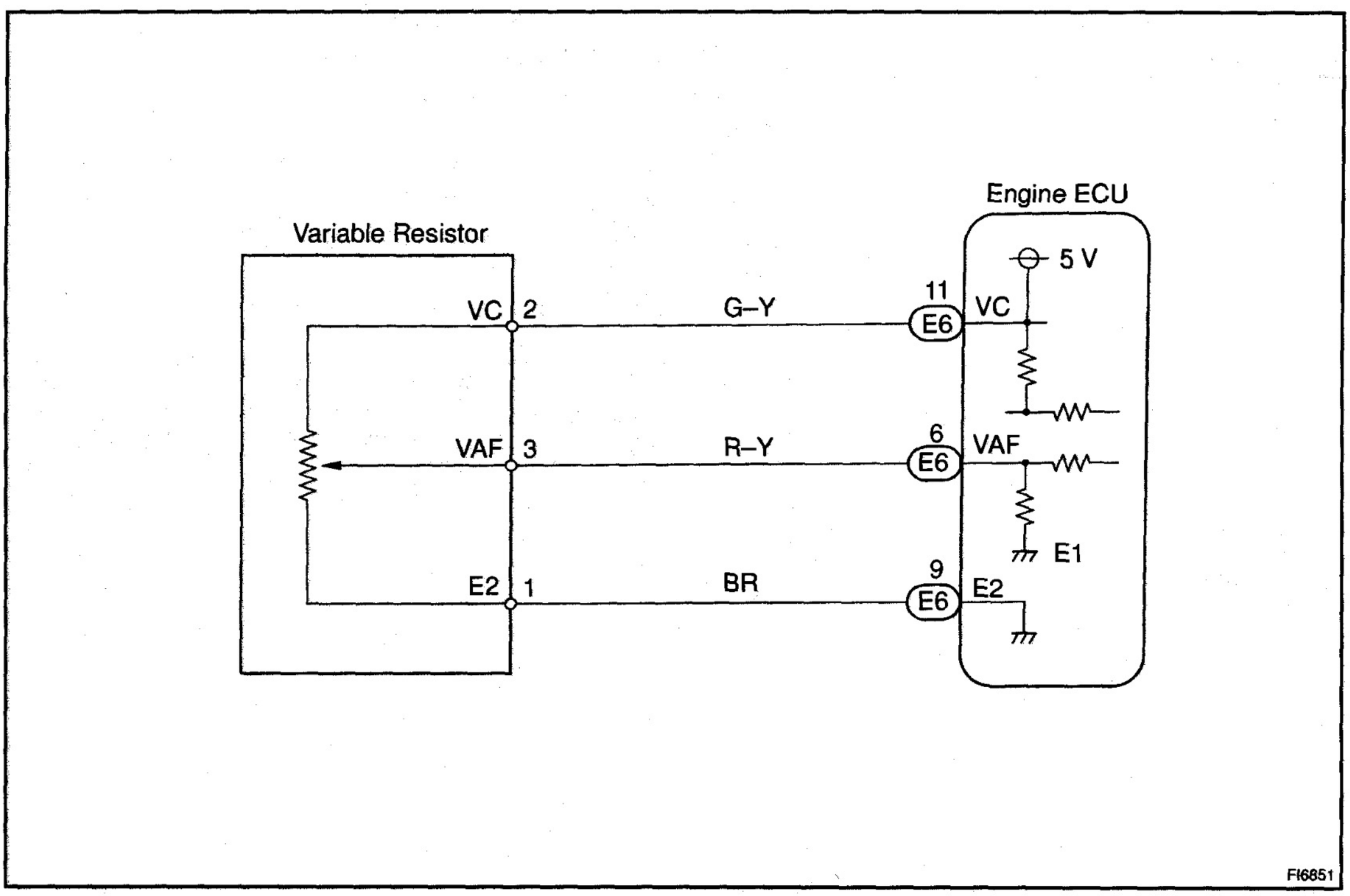
Proceed to next circuit inspection shown on problem symptoms table.
(See page DI–20)

Variable Resistor Circuit.

CIRCUIT DESCRIPTION

This resistor is used to change the air–fuel ratio of the air–fuel mixture.
The idle mixture is adjusted using this resistor.
Turning the idle mixture adjusting screw clockwise moves the contacts inside the resistor, raising terminal VAF voltage. Conversely, turning the screw counterclockwise lowers the terminal VAF voltage.
When the terminal VAF voltage rises, the ECU increases the injection volume slightly, making the air–fuel mixture a little richer.

WIRING DIAGRAM

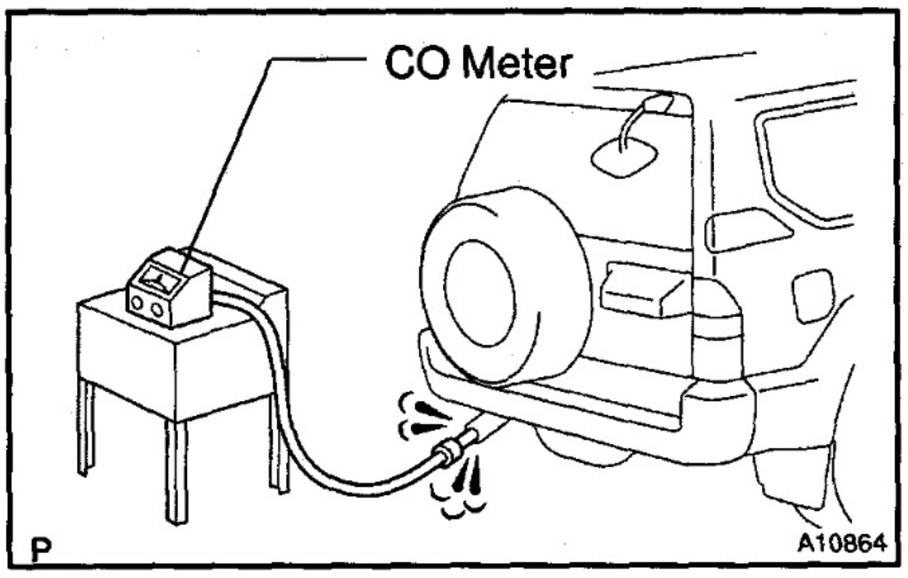


INSPECTION PROCEDURE

NOTICE:

Always use a CO meter when adjusting the idle mixture. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

1	**Check CO concentration.**



PREPARATION:

(a) Warm up engine to normal operating temperature.
(b) All accessories switched OFF.
(c) All vacuum lines properly connected.
(d) Transmission in "N" position.
(e) Connect the tachometer.
(f) Ignition timing check correctly.
(g) Idle speed check correctly.
(h) Check that the CO meter is properly calibrated.
(i) Race the engine at 2,500 rpm about 2 minutes.

CHECK:

Insert a tester probe at least 40 cm (1.3 ft) into the tailpipe. Measure the concentration with 1 – 3 minutes after racing the engine to allow the the concentration to stabilize.

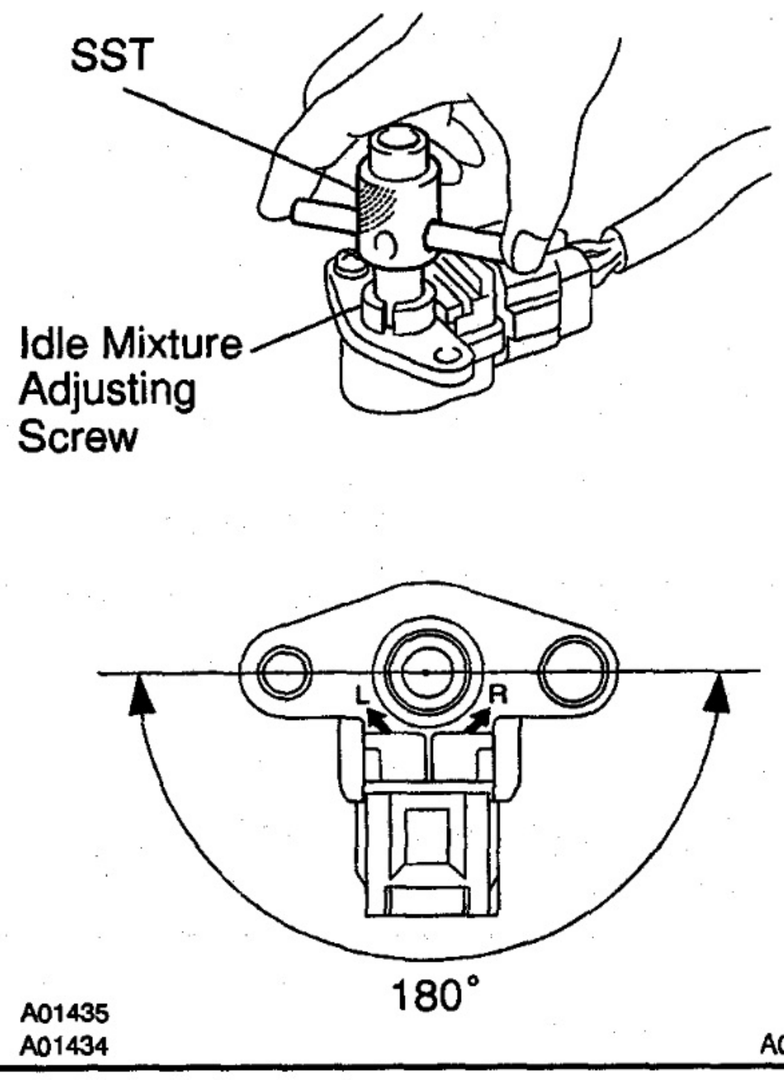
OK:

Idle CO concentration: 1.5 ± 0.5 %

OK → **CO concentration is normal. Proceed to next circuit inspection shown problem symptom tables (See page DI–20).**

NG

2	**Adjust CO concentration.**



PREPARATION:

Same condition as step 1 of this chart.

CHECK:

Using SST, adjust the mixture by turning the idle mixture adjusting screw in the variable resistor.

SST 09243 – 00020

RESULT:

OK	CO concentration: 1.5 ± 0.5 %
NG type I	Change in CO concentration
NG type II	No change in CO concentration

HINT:

Always check idle speed after turning the idle mixture adjusting screw. If it is incorrect, readjust idle speed.

Adjustable range of the idle mixture adjust to turn this screw is 180 degrees. Do not turn this screw more than it.

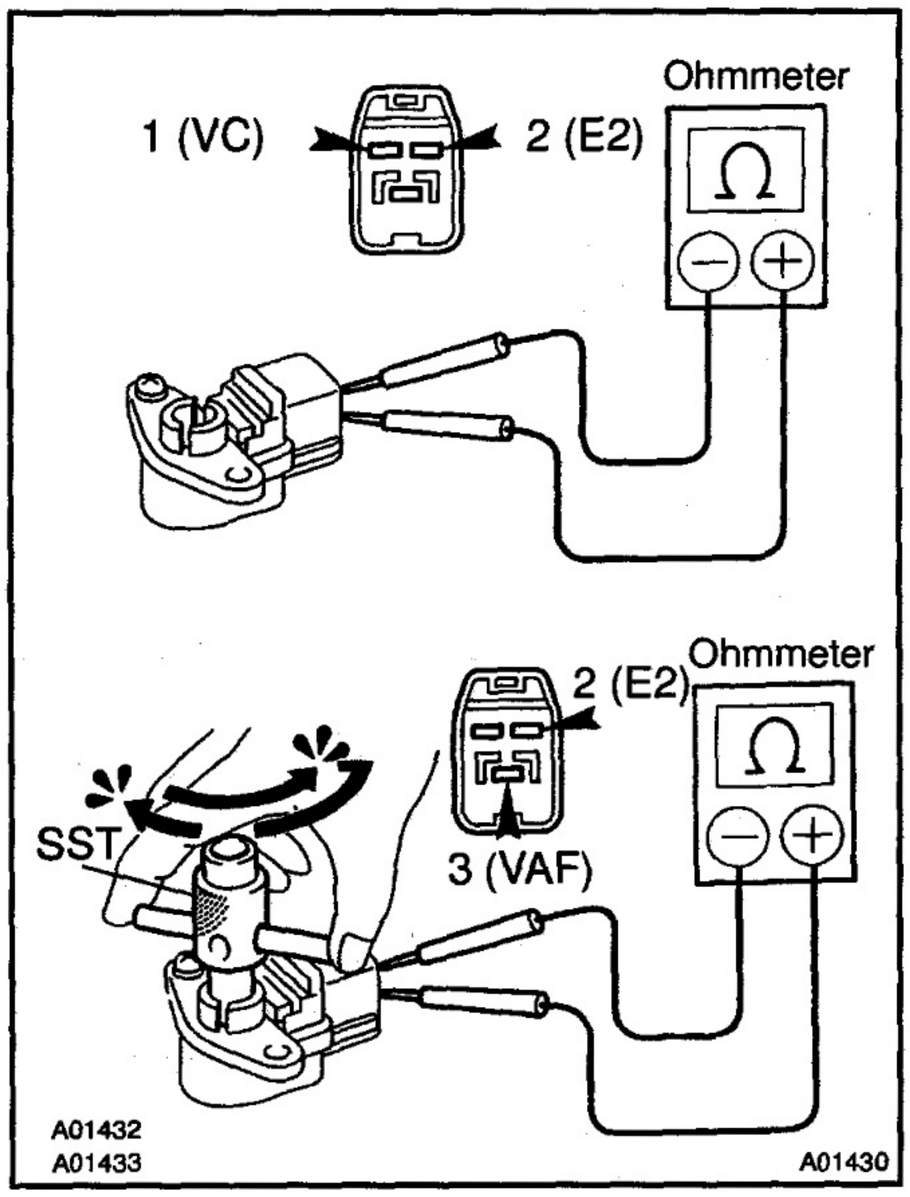
Type I → **See IDLE CO CHECK AND ADJUSTMENT (Pub. No. RM521E on page EG–6).**

TypeII → **Go to step 3.**

OK

Adjustment is complete.

3	Check resistance of variable resistor.



Check Resistance Between 1 and 2:

PREPARATION:

Disconnect the variable resistor connector.

CHECK:

Measure resistance between terminals 1 and 2 of the variable resistor.

OK:

Resistance: 4 – 6 kΩ

Check Resistance Between 2 and 3:

CHECK:

Measure resistance between terminals 2 and 3 when turning the idle mixture adjusting screw fully clockwise and counter-clockwise using SST.

SST 09243 – 00020

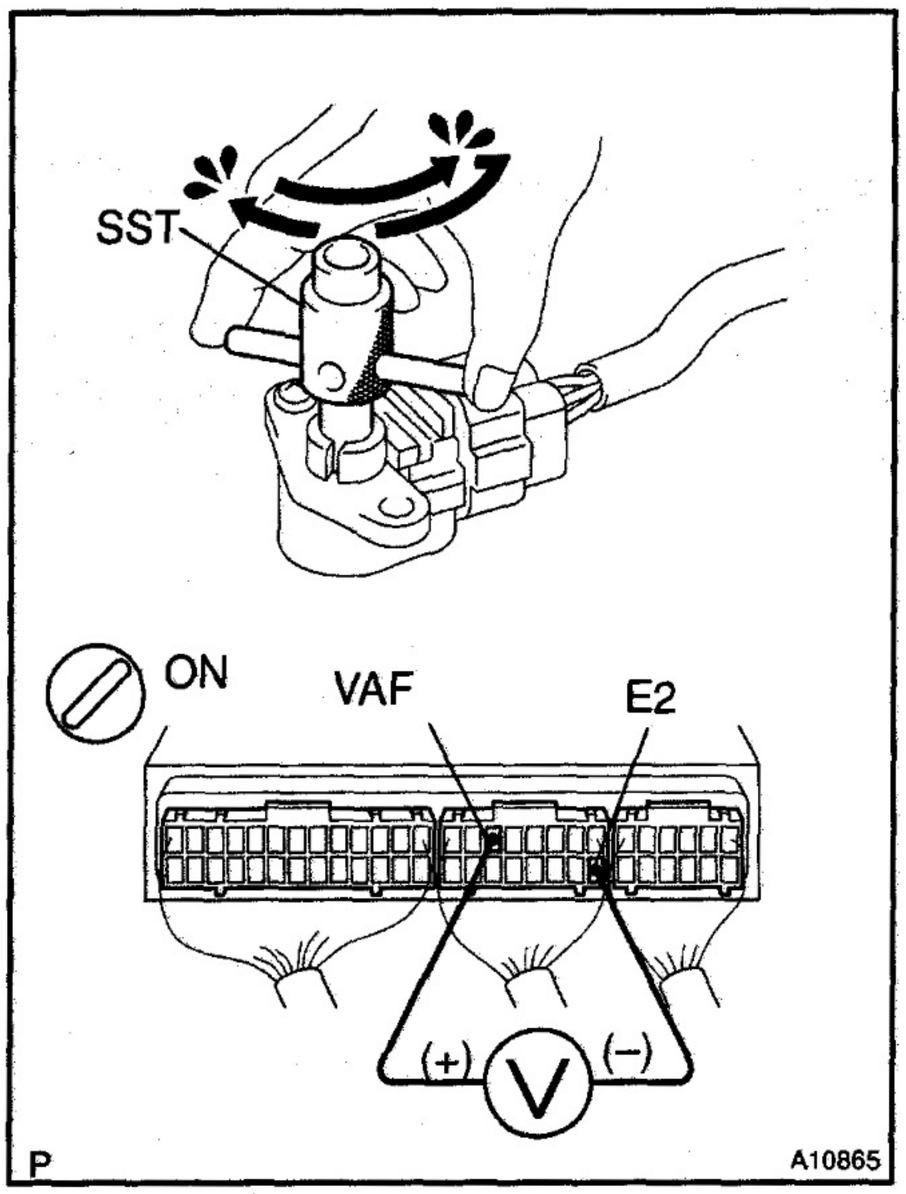
OK:

Resistance: Change from about 5 kΩ to 0 kΩ accordingly

NG → **Replace variable resister.**

OK

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



PREPARATION:

(a) Reconnect the variable resistor connector.
(b) Remove the glove compartment.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VAF and E2 of engine ECU connector while slowly turning the idle mixture adjusting screw first fully counterclockwise, and then fully clockwise, using SST.

SST 09243 – 00020

OK:

Voltage changes smoothly from 0 V to about 5 V; i.e., does not suddenly jump up to 5 V or down to 0 V.

OK → **Check and replace engine ECU.**

NG

5	Check for open and short in harness and connector between variable resistor and engine ECU (See page IN–18).

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

OK

Check and replace engine ECU.

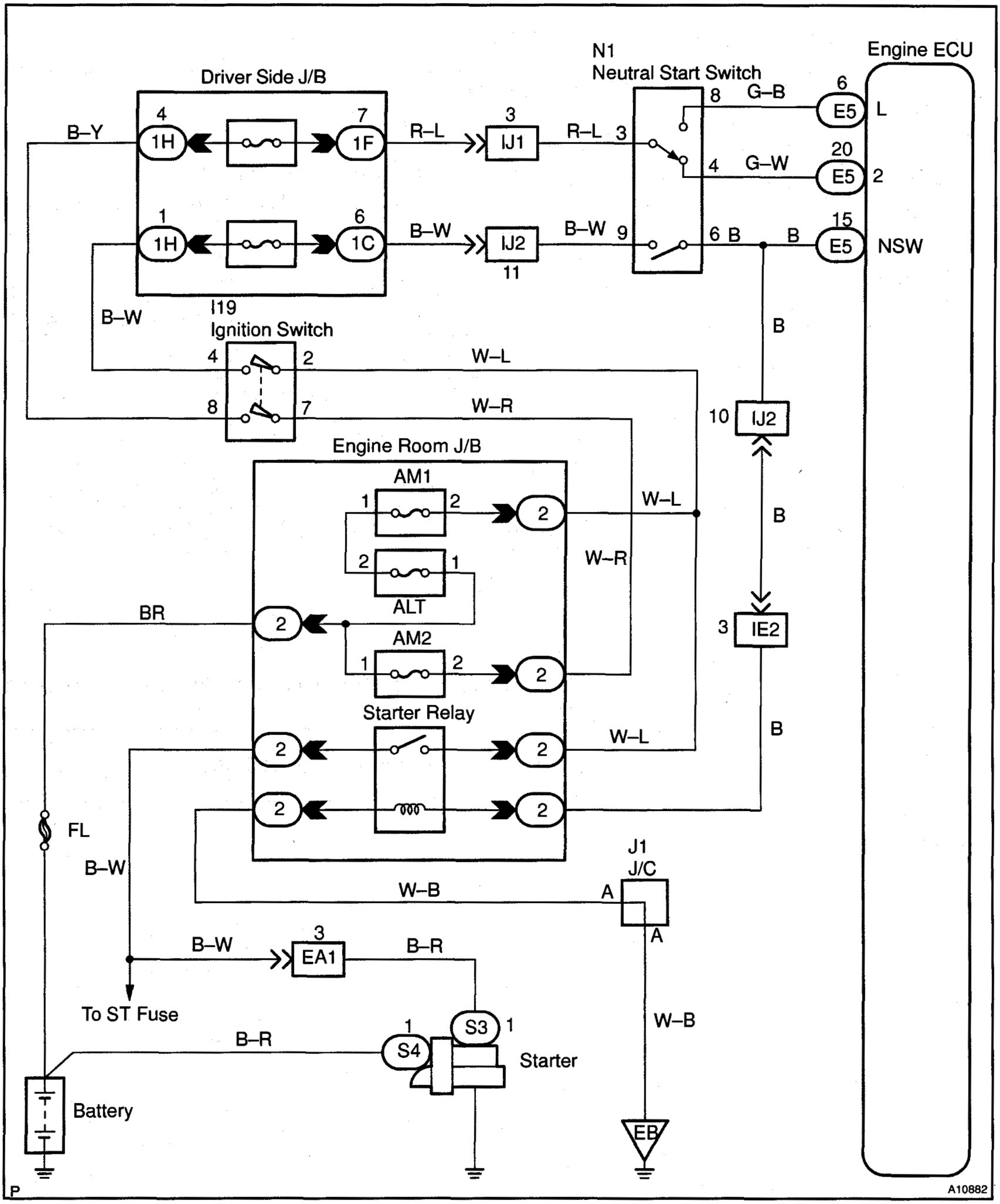
DI1IT–06

Neutral Start Switch Circuit

CIRCUIT DESCRIPTION

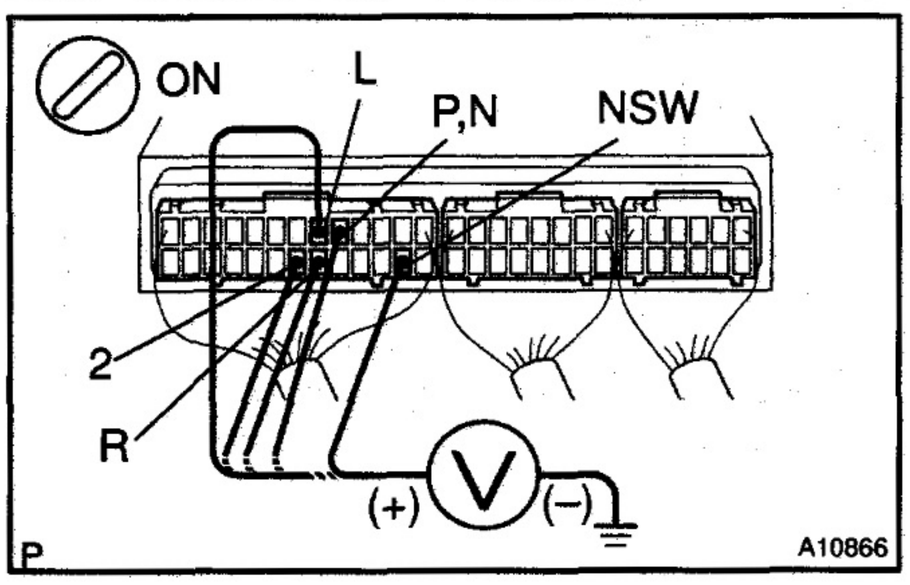
The neutral start switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the engine ECU is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0V. When the shift lever is in the D, 2, L or R position, the neutral start switch 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 PN, R, 2ND, L and NSW signals.**



PREPARATION:
Turn the ignition switch ON.

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

OK:

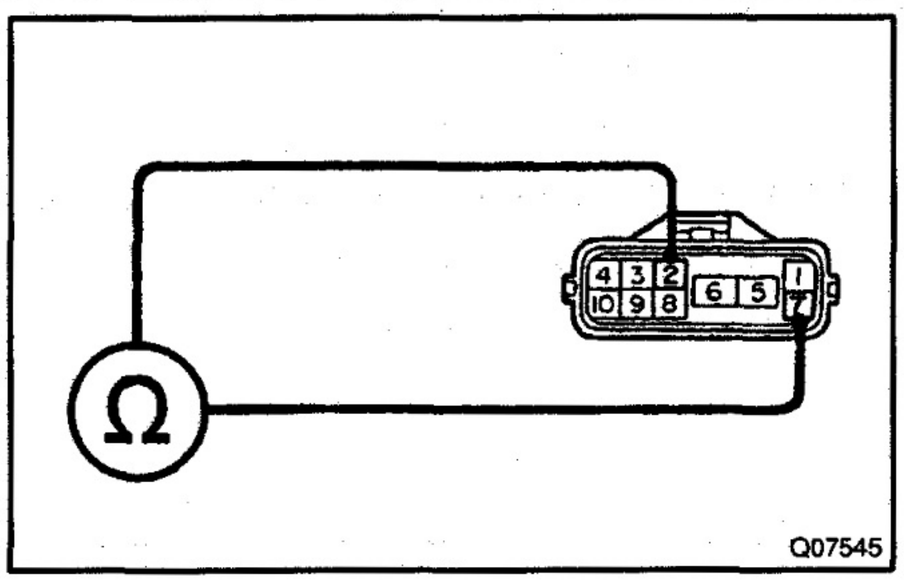
Position	NSW– Body ground	R– Body ground	2– Body ground	L– Body ground
P, N	0 V	0 V	0 V	0 V
R	7.5 – 14 V*	7.5 – 14 V*	0 V	0 V
D	7.5 – 14 V	0 V	0 V	0 V
2	7.5 – 14 V	0 V	7.5 – 14 V	0 V
L	7.5 – 14 V	0 V	0 V	7.5 – 14 V

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

OK → **Check and replace the ECM.**

NG

2	Check neutral start switch.



PREPARATION:

Remove the neutral start switch

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	5 – 6	2 – 7
R	2 – 8	–
N	5 – 6	2 – 9
D	2 – 10	–
2	2 – 3	–
L	2 – 4	–

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–18).

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

OK

Check and replace engine ECU.

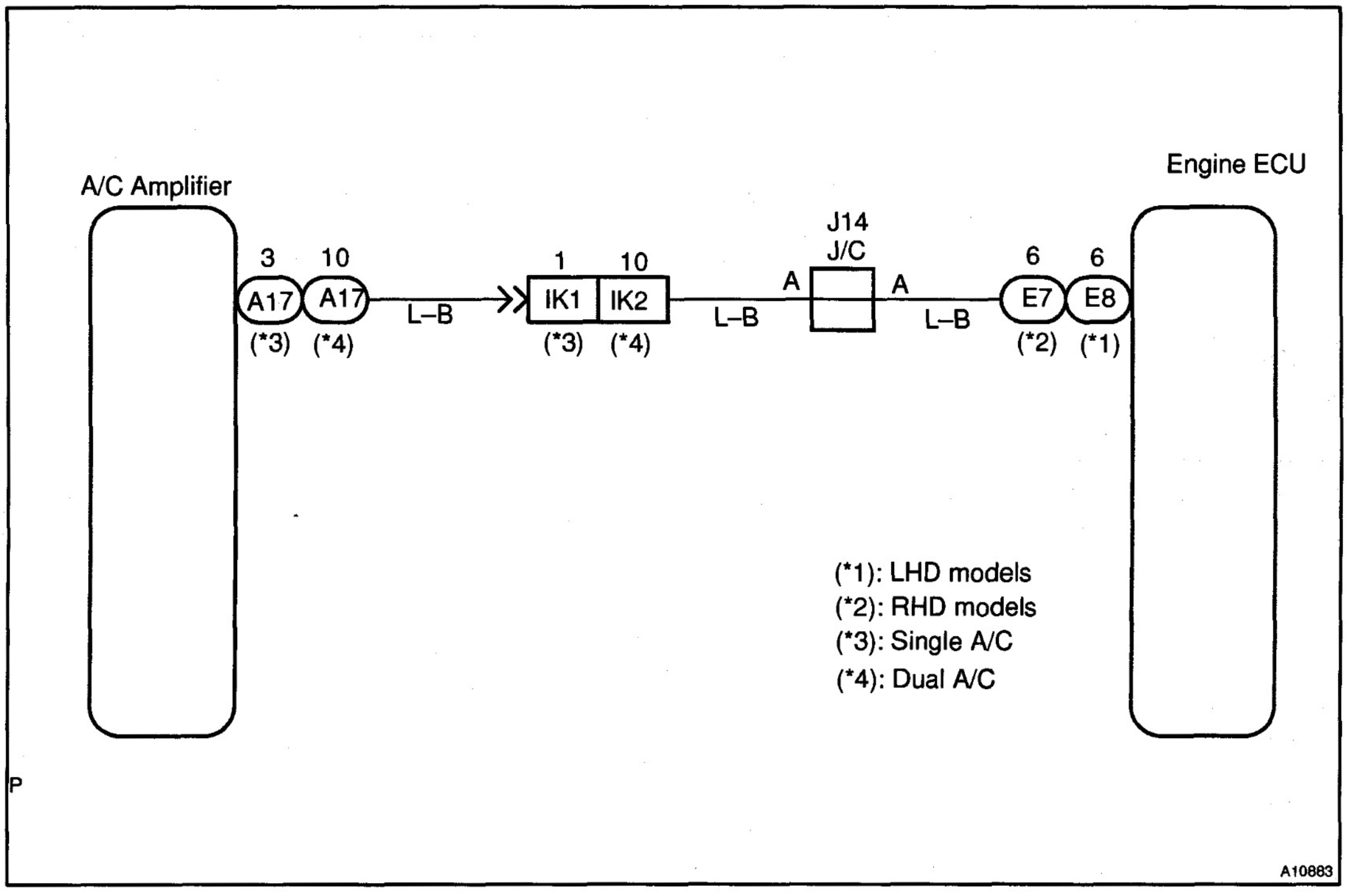
DI6DU–01

A/C Cut Control Circuit

CIRCUIT DESCRIPTION

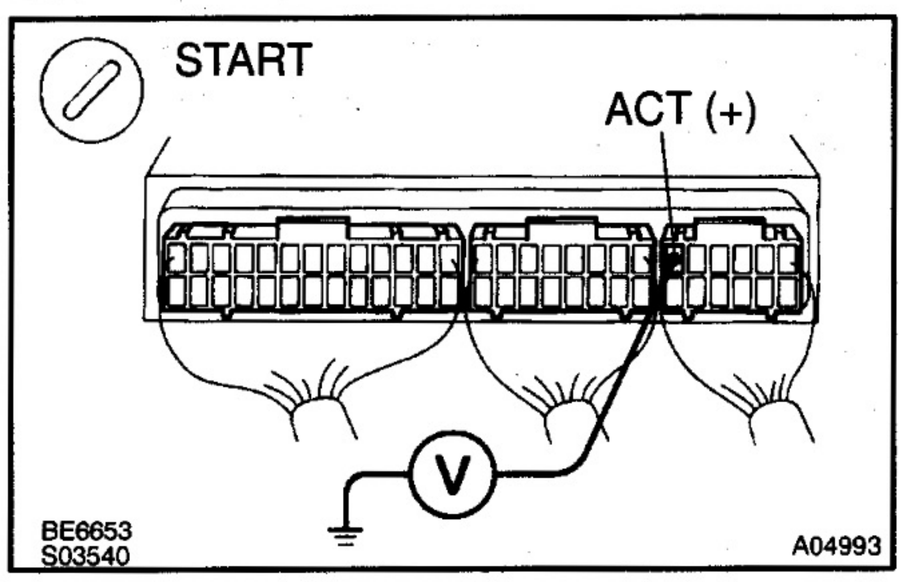
This circuit cuts air conditioning operation during vehicle acceleration in order to increase acceleration performance. During acceleration with the vehicle speed at 25 km/h (16 mph) or less, engine speed at 1,200 rpm or less and throttle valve opening angle at 50 ° or more, the A/C magnet switch is turned OFF for several seconds.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal ACT of engine ECU body ground**



PREPARATION:

(a) Remove the glove compartment.

(b) Start the engine.

CHECK:

Measure voltage between terminal ACT of the ECU connector and body ground when A/C switch is turned to ON and OFF.

OK:

A/C switch condition	Voltage
ON	9 – 14 V
OFF	Below 1.5 V

OK → **Check and repair ECM (See page IN–18).**

NG

2	**Check for open and short in harness and connector between engine ECU and A/C amplifier (See Pub. No. RM517E on page AC–67).**

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

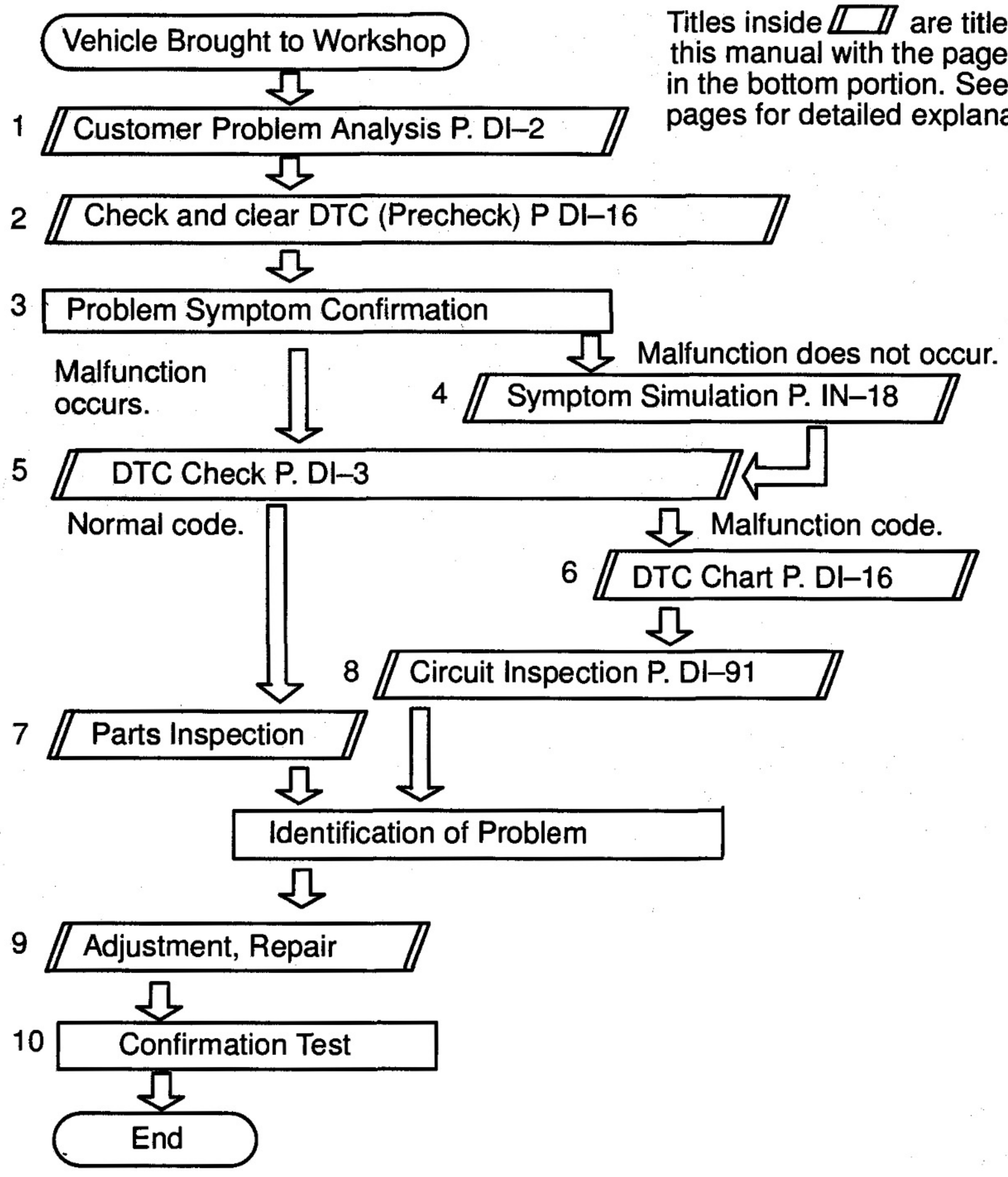
OK

Check and replace A/C amplifier.

SUB FUEL TANK SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI3M7–03



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.

DI3M8–01

CUSTOMER PROBLEM ANALYSIS CHECK

SUB FUEL TANK SYSTEM Check Sheet

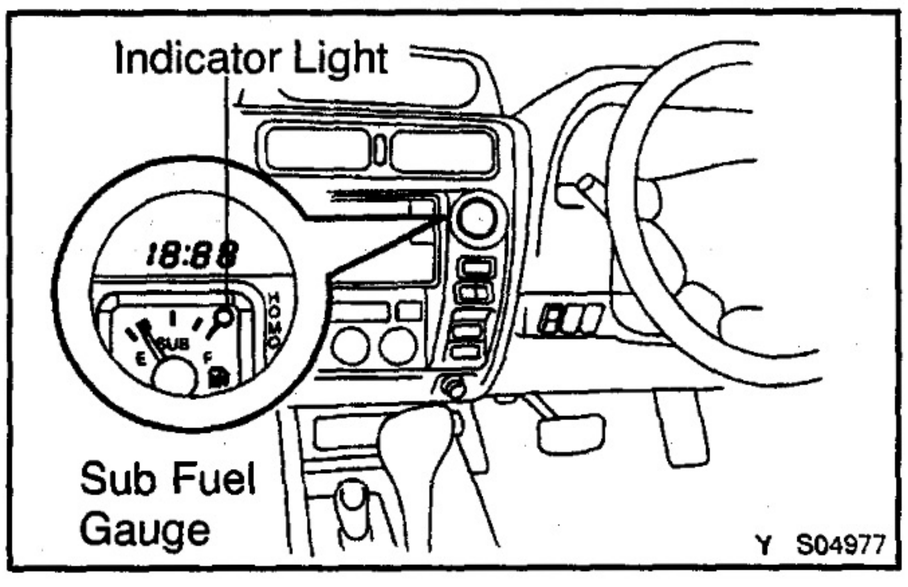
Inspector's Name

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	☐ Fuel Tank Changeover Switch is OFF	☐ Main fuel pump does not operate ☐ Main fuel pump and sub fuel pump operate simultaneously ☐ Sub fuel pump operate
	☐ Fuel Tank Changeover Switch is ON	☐ Sub fuel pump does not operate ☐ Main fuel pump and sub fuel pump operate simultaneously ☐ Main fuel pump operate
	☐ Others _____	

Dates Problem Occurred	
Problem Frequency	☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____

DTC Inspection	☐ Normal ☐ Malfunction code(s) (code)



DI6DA–01

PRE–CHECK

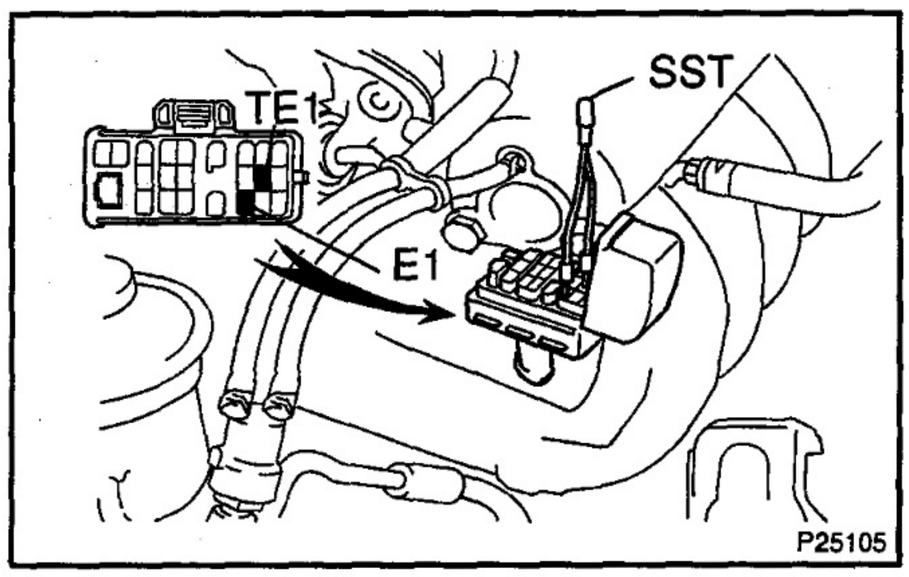
DIAGNOSIS SYSTEM

(a) Check the indicator.

(1) The indicator light will come on when the ignition switch is at ON and the engine is not running.

(2) When the engine is started, the indicator light should go off (in case that the fuel tank changeover switch is off).

If the light blinks on, the double tank system has detected a malfunction or abnormality in the system.

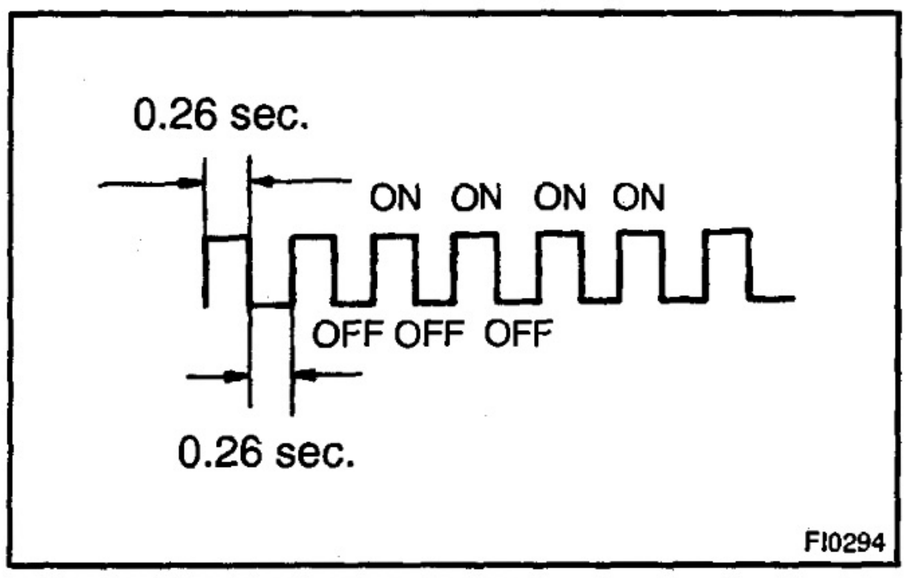


(b) Check the DTC.

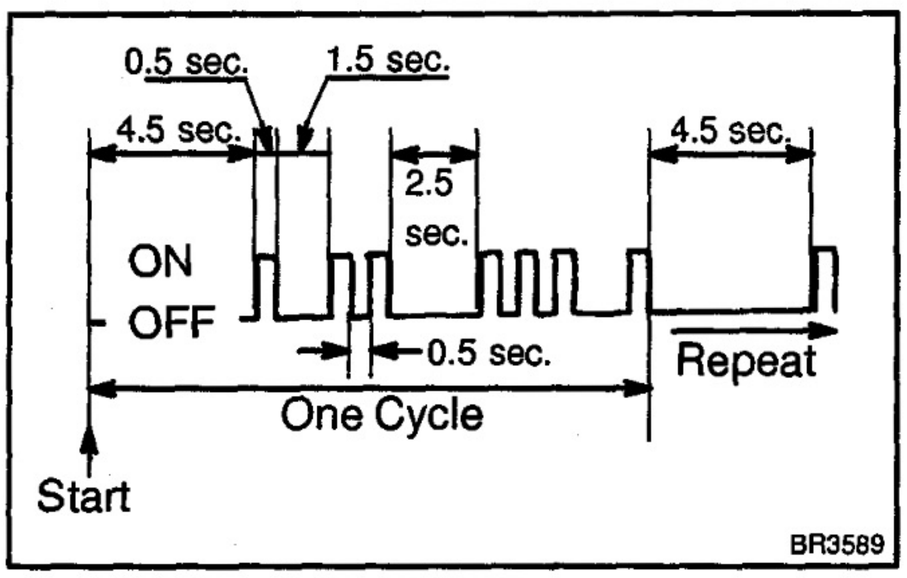
(1) Turn ignition switch ON.

(2) Using SST, connect terminals between TE1 and E1 of check connector.

SST 09843–18020



(3) Read the diagnostic trouble code from check sub fuel tank indicator.



(4) As an example, the blinking patterns fro codes, normal, 12 and 31 are as shown on the illustration.

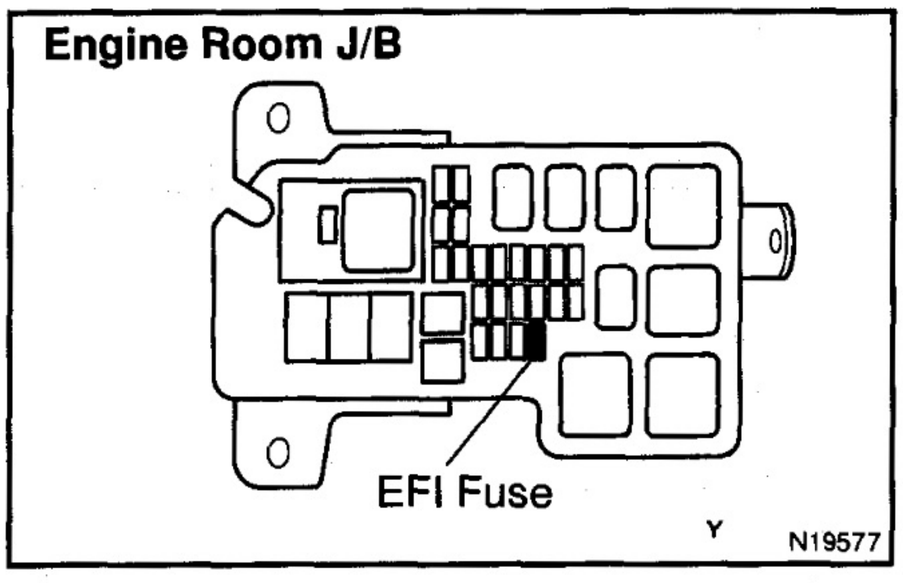
HINT:

If a diagnostic trouble code is not output, check the TE1 terminal circuit (See page DI–65).

(5) Check the details of the malfunction using the diagnostic trouble code chart on page DI–88.

(6) After completing the check, disconnect the SST from terminals TE1 and E1, and turn off the display.

HINT:
If the event of 2 or more malfunction codes, indication will begin from the smallest numbered code and continue in order to the largest.

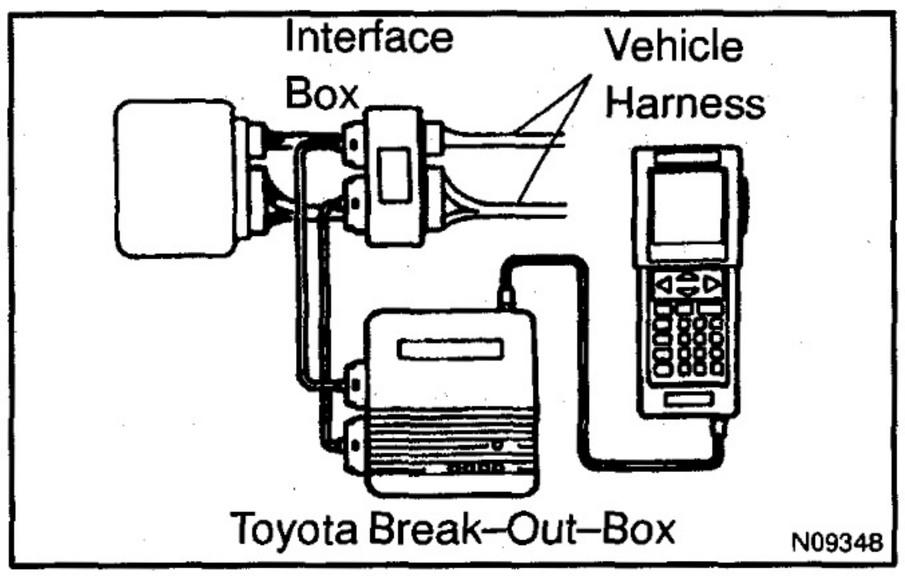


(c) Diagnostic Trouble Code Clearance
(1) After repair the trouble areas, the diagnostic trouble code retained in the ECU memory must be cleared out by removing the EFI fuse (15 A) from engine room J/B for 10 seconds or more, with the ignition switch OFF.

HINT:
- Cancellation can also be done by removing the negative (–) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If it is necessary to work on engine components requiring removal of the negative (–) terminal cable from the battery, a check must first be made to see if a diagnostic trouble code has been recorded.

(2) After cancellation, road test the vehicle to check that a normal code is now read on the check engine warning light.

If the same diagnostic trouble code (s) appears, it indicates that the trouble area has not been repaired thoroughly.



(d) 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 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.

DI3MA–03

DIAGNOSTIC TROUBLE CODE CHART

SUB FUEL TANK TROUBLE CODES

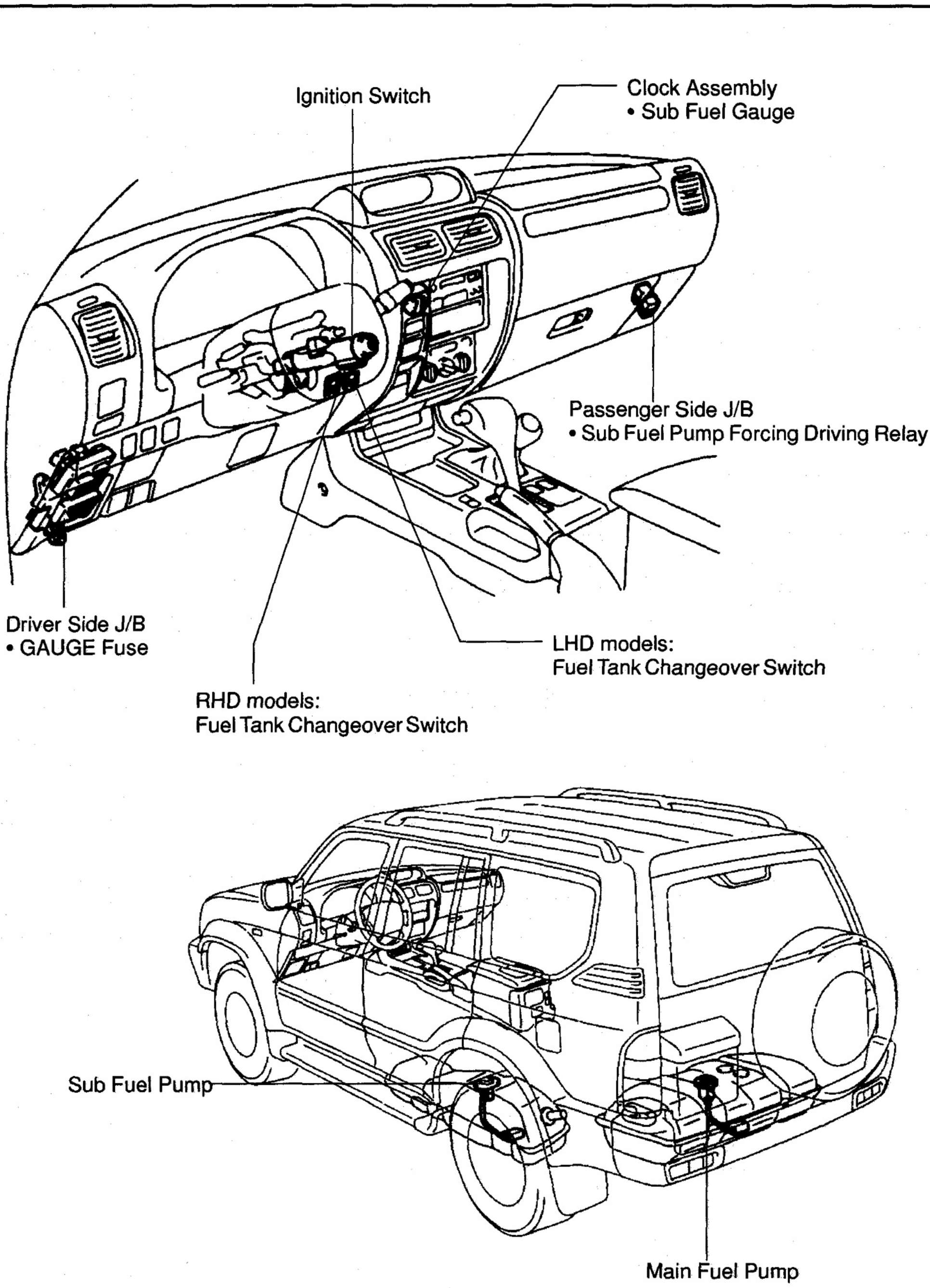
HINT:

If a malfunction code is displayed during the DTC check, 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
11 (DI–91)	Main Fuel Pump Circuit Malfunction	• Open or short in main fuel pump circuit • Main fuel pump • Fuel tank select relay • Fuel pump relay • Circuit opening relay
12 (DI–97)	Fuel Tank Select Relay Malfunction	• Fuel tank select relay • Open or short in main fuel pump circuit • Main fuel pump • Fuel pump relay • Circuit opening relay • Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)
22 (DI–100)	Both Fuel Pump Simultaneous Operation Malfunction (Fuel Tank Changeover Switch OFF)	• Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)
31 (DI–102)	Sub Fuel Pump Circuit Malfunction	• Open or short in sub fuel pump circuit • Sub fuel pump • Fuel tank select relay • Fuel pump relay • Circuit opening relay
41 (DI–105)	Fuel Tank Select relay Circuit Malfunction	• Open or short in fuel tank select relay circuit • Fuel tank select relay • Open or short in sub fuel pump circuit • Sub fuel pump • Short in main fuel pump circuit (+B short)
42 (DI–107)	Both Fuel Pump Simultaneous Operation Malfunction (Fuel tank changeover switch ON)	• Short in main fuel pump circuit (+B short) • Open or short in fuel tank select relay circuit • Fuel tank select relay • Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)

DI6DB–01

PARTS LOCATION

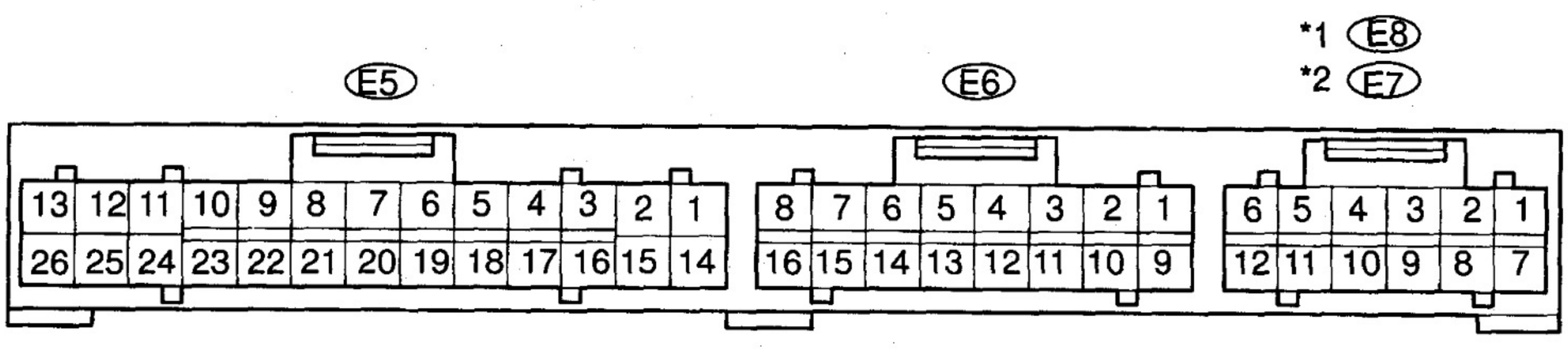


A11172

DI6DC–01

TERMINALS OF ECU

Engine ECU Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
FPR2 (*1 E8, *2 E7–5) – E01 (E5–13)	O ↔ BR	Idling Fuel tank changeover switch OFF	9 – 14
		Idling Fuel tank changeover switch ON	0 – 3.0
FPM2 (E5–7) – E01 (E5–13)	R–G ↔ BR	Idling Fuel tank changeover switch OFF	0 – 2
		Idling Fuel tank changeover switch ON	9 – 14
FPM (E5–8) – E01 (E5–13)	R–B ↔ BR	Idling Fuel tank changeover switch OFF	0 – 2
		Idling Fuel tank changeover switch ON	9 – 14
FPLD (E5–14) – E01 (E5–13)	P ↔ BR	Idling Fuel tank changeover switch OFF	0 – 2
		Idling Fuel tank changeover switch ON	9 – 14
FPMS (E5–21) – E01 (E5–13)	G–Y ↔ BR	IG switch ON Fuel tank changeover switch OFF	0 – 3.0
		IG switch ON Fuel tank changeover switch ON	9 – 14

(*1): LHD models
(*2): RHD models

CIRCUIT INSPECTION

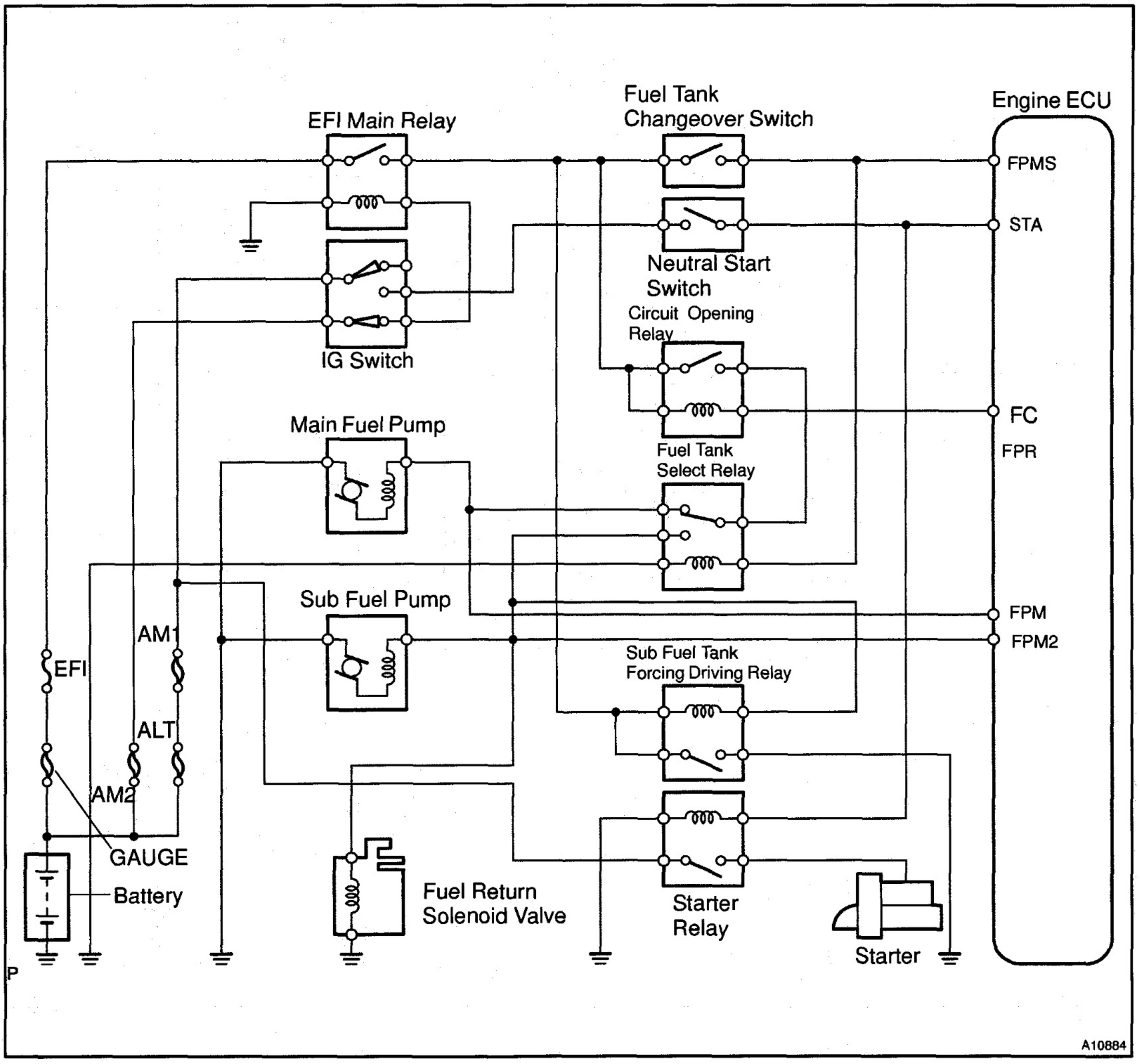
DTC	11	Main Fuel Pump Circuit Malfunction

CIRCUIT DESCRIPTION

When the STA signal and NE signal are input to the engine ECU, Tr1 is turned ON, current flows to coil of the circuit opening relay, relay switches on, power is supplied to the fuel pump via a pump select relay and the fuel pump operates.

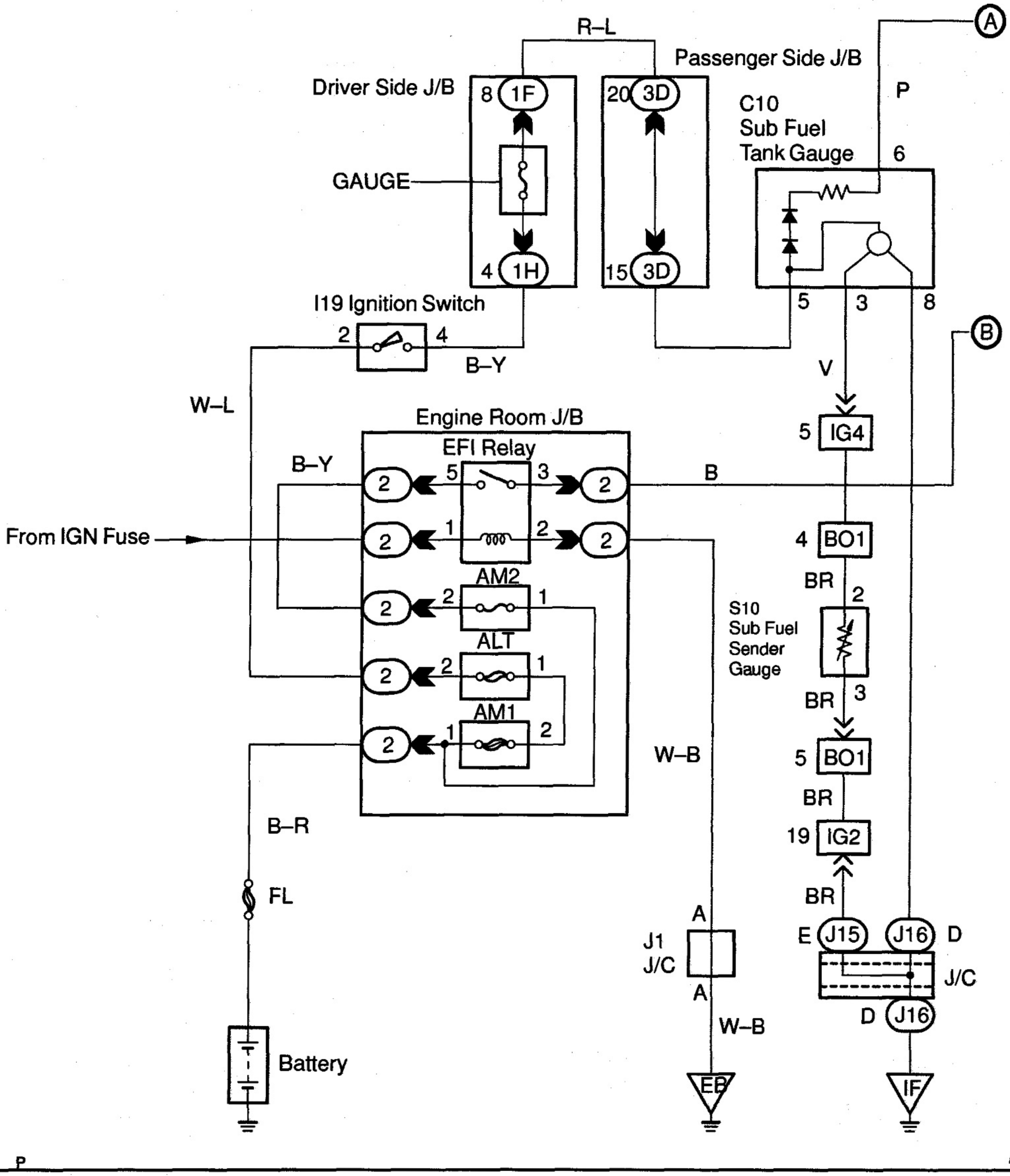
When the fuel tank changeover switch is OFF, the pump select relay point contacts with the main fuel pump side, power is supplied to the main fuel pump and the main fuel pump operates.

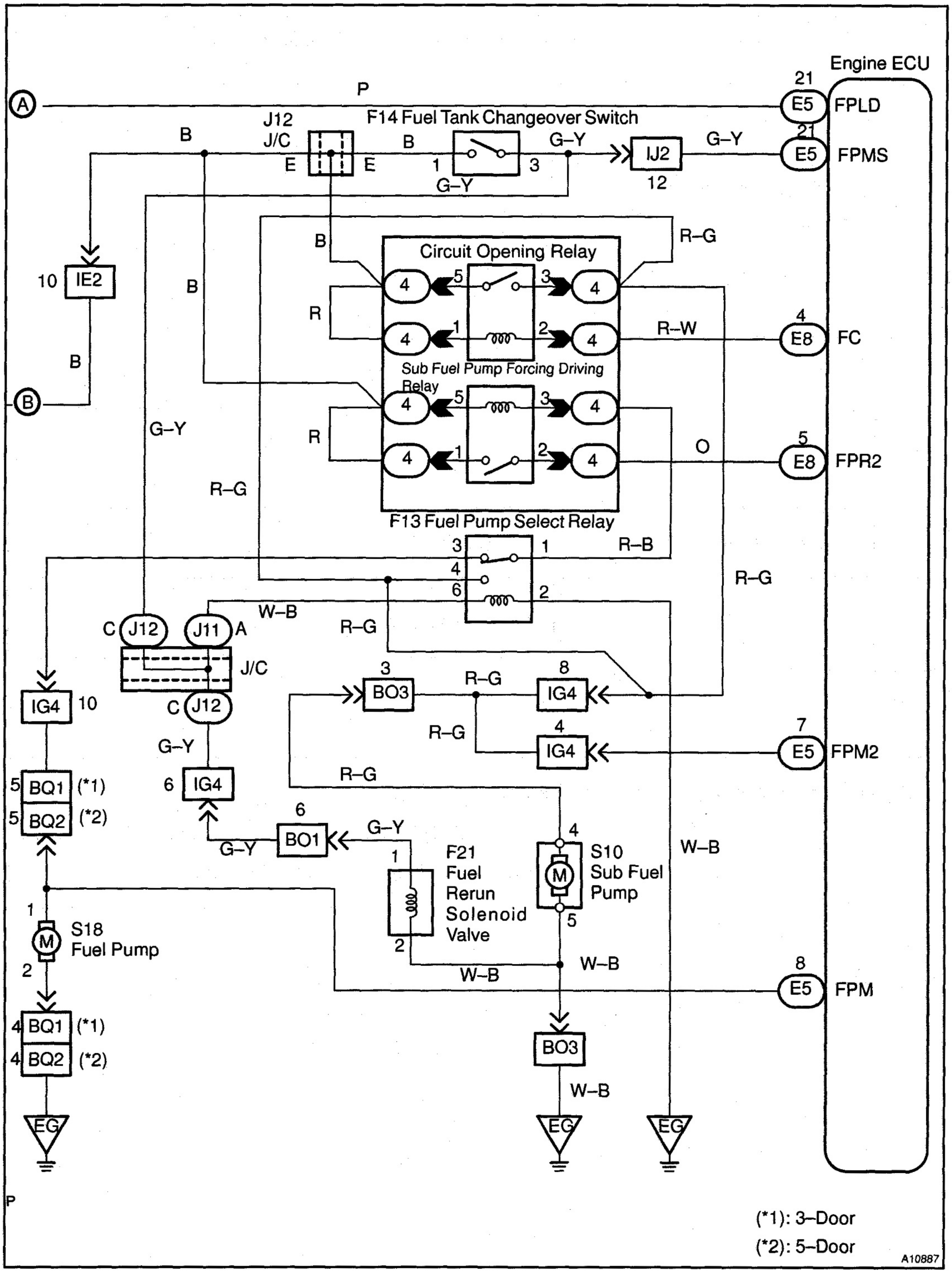
When the fuel tank changeover switch is ON, current flows to coil of the pump select relay, relay point contacts with the sub fuel pump side, power supplied to the sub fuel pump and the sub fuel pump operates.



DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch OFF (Voltage of FPMS terminal is low) (b) Voltage of FPM terminal is low (c) Voltage of FPM2 terminal is low	• Open or short in main fuel pump circuit • Main fuel pump • Fuel tank select relay • Fuel pump relay • Circuit opening relay

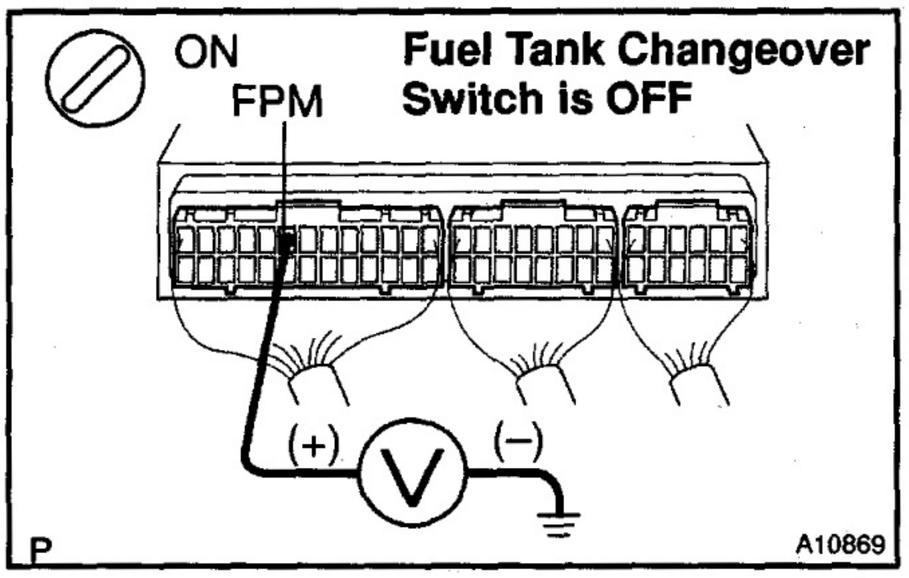
WIRING DIAGRAM




Engine ECU
21
E5
FPLD
21
E5
FPMS
P
A
J12
J/C
F14 Fuel Tank Changeover Switch
B
E
E
B
1
3
G–Y
G–Y
IJ2
12
G–Y
10
IE2
B
B
B
Circuit Opening Relay
R–G
4
5
3
4
R
4
1
2
4
R–W
4
E8
FC
Sub Fuel Pump Forcing Driving Relay
4
5
3
4
R
4
1
2
4
O
5
E8
FPR2
G–Y
R–G
F13 Fuel Pump Select Relay
3
1
R–B
4
6
2
R–G
W–B
R–G
C
J12
J11
A
J/C
C
J12
3
BO3
R–G
8
IG4
IG4
10
R–G
4
IG4
7
E5
FPM2
G–Y
5
BQ1
(*1)
5
BQ2
(*2)
6
IG4
R–G
6
BO1
G–Y
G–Y
4
W–B
1
F21
Fuel
Rerun
Solenoid
Valve
S10
Sub Fuel
Pump
M
5
2
W–B
W–B
1
S18
Fuel Pump
M
2
8
E5
FPM
BO3
W–B
4
BQ1
(*1)
4
BQ2
(*2)
EG
EG
EG
P
(*1): 3–Door
(*2): 5–Door
A10887

INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Fuel tank changeover switch is OFF.

CHECK:

Measure voltage between terminal FPM1 of engine ECU connector and body ground.

OK:

Voltage: 9 – 14 V

OK	**Go to step 4.**

NG

2	**Check fuel tank select relay (See page FI–42).**

NG	**Replace fuel tank select relay.**

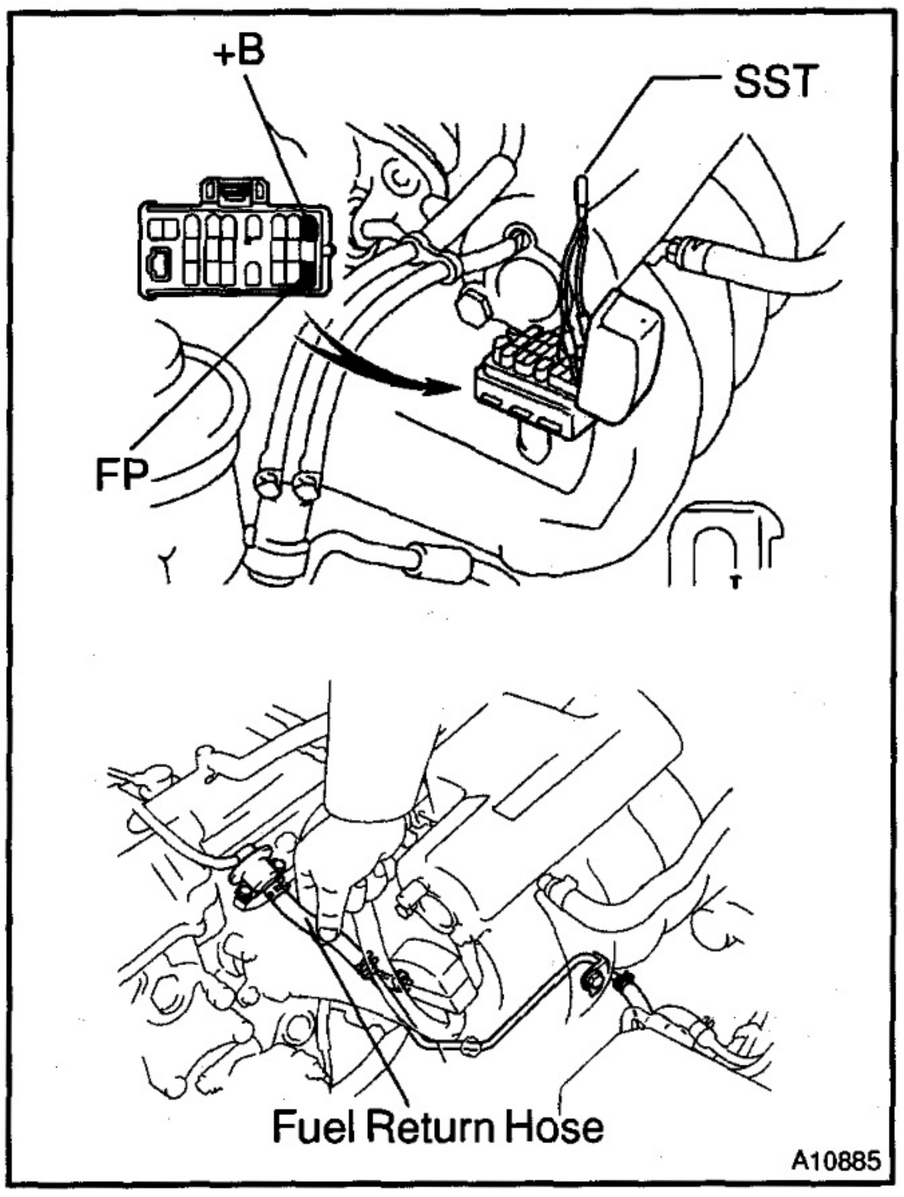
OK

3	**Check circuit opening relay (See page FI–41).**

NG	**Replace circuit opening relay.**

OK

4	Check operation of main fuel pump.



PREPARATION:

(a) Using SST, connect terminals +B and FP of check connector.
SST 09843–18020

(b) Turn ignition switch ON.

(c) Fuel tank changeover switch is OFF.

CHECK:

Check that there is pressure in the hose from fuel filter.

OK:

There is pressure

OK → **Go to step 7.**

NG

5	Check main fuel pump (See page FI–5).

NG → **Replace main fuel pump.**

OK

6	Check for open or short in harness and connector between main fuel pump and fuel tank select relay, fuel tank select relay and fuel pump relay, fuel pump relay and circuit opening relay (See page IN–18).

NG → **Repair or replace.**

OK

7	Check fuel tank select relay (See page FI–42).

NG → Replace fuel tank select relay.

OK

8	Check circuit opening relay (See page FI–41).

NG → Replace circuit opening relay.

OK

9	Check operation of main fuel pump.

NG → Replace sub fuel pump.

OK

10	Check for open and short in harness and connector between fuel tank select relay and engine ECU (See page IN–18).

NG → Repair or replace harness and connector.

OK

Check and replace engine ECU.
(See page IN–18)

DTC	12	Fuel Tank Select Relay Malfunction

CIRCUIT DESCRIPTION

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

DTC No.	DTC Detecting Condition	Trouble Area
12	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch OFF (Voltage of FPMS terminal is low) (b) Voltage of FPM terminal is low (c) Voltage of FPR2 terminal is high	• Fuel tank select relay • Open or short in main fuel pump circuit • Main fuel pump • Fuel pump relay • Circuit opening relay • Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)

WIRING DIAGRAM

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

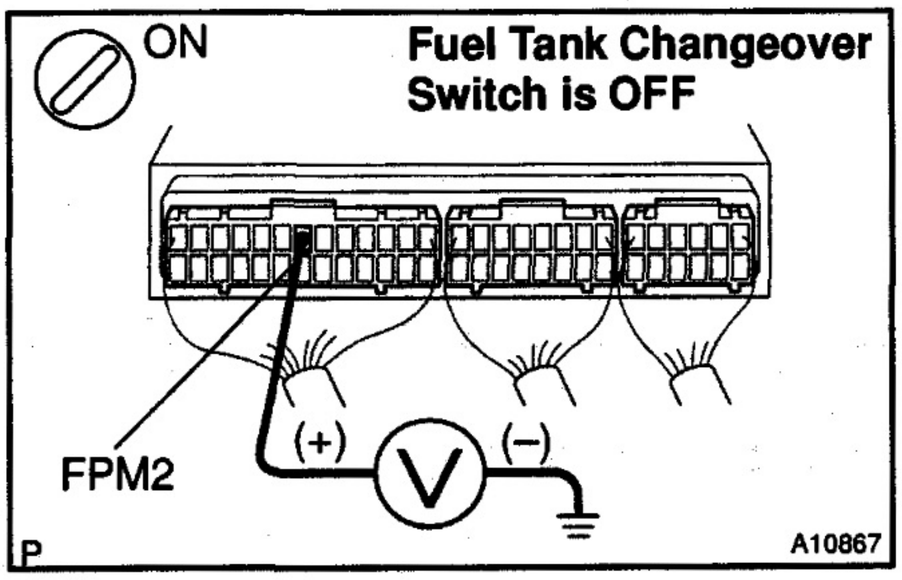
INSPECTION PROCEDURE

1	**Check fuel tank select relay (See page FI–42).**

NG → **Replace fuel tank select relay.**

OK

2	**Check voltage between terminal FPM2 of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Fuel tank changeover switch is OFF.

CHECK:

Measure voltage between terminal FPM2 of engine ECU and body ground, and turn the ignition switch ON after 4 seconds or more.

OK:

Voltage: 0 – 3.0 V

OK → **Go to step 5.**

NG

3	Check sub fuel tank forcing driving relay (See page FI–43).

NG → Replace sub fuel tank forcing driving relay, and then go to step 5.

OK

4	Check for short in harness and connector between sub fuel tank forcing driving relay and engine ECU (See page IN–18).

NG → Repair or replace harness and connector, and then go to step 5.

OK

Check and replace engine ECU (See page IN–18).

5	Check voltage between terminal FPM of engine ECU connector and body ground (See page DI–91, step 1).

OK → Go to step 7.

NG

6	Check circuit opening relay (See page FI–41).

NG → Replace circuit opening relay.

OK

7	Check main fuel pump (See page FI–5).

NG → Replace main fuel pump.

OK

8	Check for open or short in harness and connector between main fuel pump and fuel tank select relay, fuel tank select relay and circuit opening relay (See page IN–18).

NG → Repair or replace.

OK

9	Check for open and short in harness and connector between fuel tank select relay and engine ECU (See page IN–18).

NG → Repair or replace harness and connector.

OK

Check and replace engine ECU
(See page IN–18).

DI6DF–01

DTC	22	Both Fuel Pump Simultaneous Operation Malfunction (*)

***: Fuel Tank Changeover Switch OFF**

CIRCUIT DESCRIPTION

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

DTC No.	DTC Detecting Item	Trouble Area
22	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch OFF (Voltage of FPMS terminal is low) (b) Voltage of FPM terminal is high (c) Voltage of FPM2 terminal is high	• Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)

WIRING DIAGRAM

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

INSPECTION PROCEDURE

1	Check voltage between terminal FPM2 of engine ECU connector and body ground (See page DI–102, step 2).

OK → Repair and replace harness and connector.

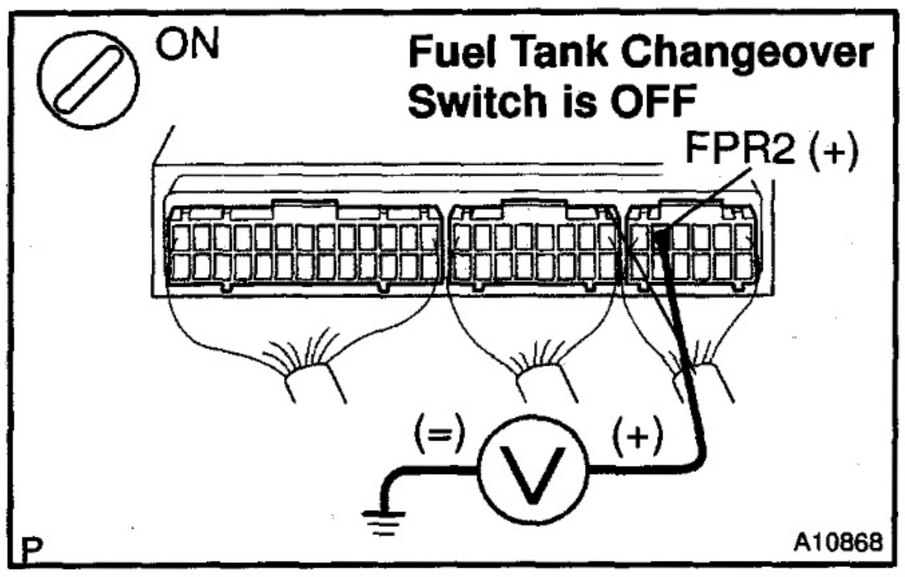
NG

2	Check sub fuel tank forcing driving relay (See page FI–43).

NG → Replace sub fuel tank forcing driving relay.

OK

3	**Check voltage between terminal FPR2 of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Fuel tank changeover switch is OFF.

CHECK:

Measure voltage between terminal FPR2 of engine ECU connector and body ground, and turn the ignition switch ON after 4 seconds.

OK:

Voltage: 9 – 14 V

NG → **Go to step 4.**

OK

Check and repair harness and connector between sub fuel pump and sub fuel tank forcing driving relay (+B short circuit) (See page IN–18).

4	**Check for short in harness and connector between sub fuel tank forcing driving relay and engine ECU (See page IN–18).**

NG → **Repair or replace.**

OK

Check and replace engine ECU (See page IN–18).

DI6DG–01

DTC	31	Sub Fuel Pump Circuit Malfunction

CIRCUIT DESCRIPTION

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

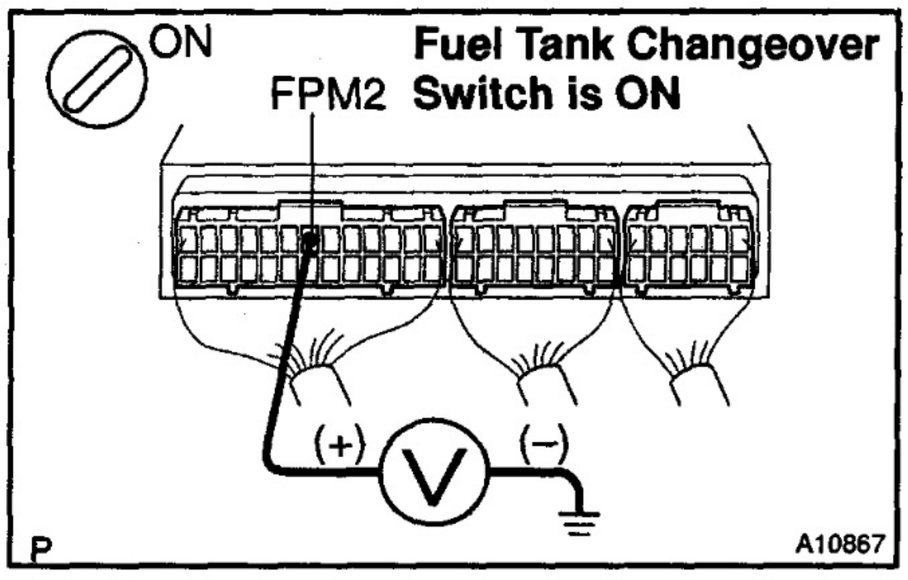
DTC No.	DTC Detecting Item	Trouble Area
31	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch ON (Voltage of FPMS terminal is high) (b) Voltage of FPM terminal is low (c) Voltage of FPM2 terminal is low	• Open or short in sub fuel pump circuit • Sub fuel pump • Fuel tank select relay • Fuel pump relay • Circuit opening relay

WIRING DIAGRAM

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

INSPECTION PROCEDURE

1	Check voltage between terminal FPM2 of engine ECU connector and body ground.



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Push the fuel tank changeover switch ON.

CHECK:

Measure voltage between terminal FPM2 of engine ECU and body ground, turn the ignition switch ON after 4 seconds or more.

OK:

Voltage: 9 – 14 V

OK → **Go to step 3.**

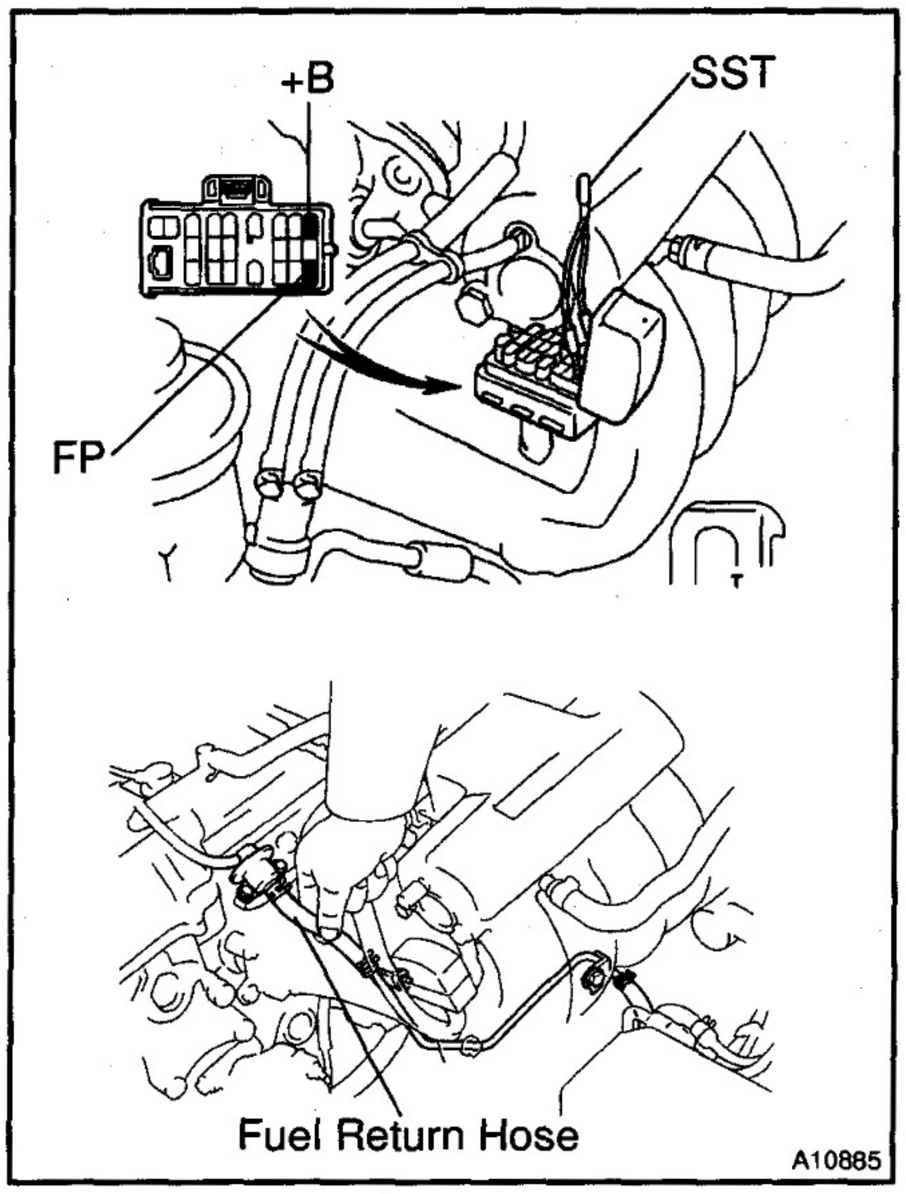
NG

2	Check fuel tank select relay (See page FI–42).

NG → **Replace fuel tank select relay.**

OK

3	Check operation of main fuel pump.



PREPARATION:

(a) Using SST, connect terminals +B and FP of check connector.
SST 09843–18020

(b) Turn ignition switch ON.

(c) Fuel tank changeover switch is OFF.

CHECK:

Check that there is pressure in the hose from fuel filter.

OK:

There is pressure

OK → **Go to step 6.**

NG

4	Check sub fuel pump (See page FI–12).

NG → **Replace sub fuel pump.**

OK

5	Check for open or short in harness and connector between sub fuel pump and fuel tank select relay, fuel tank select relay and fuel pump relay, fuel pump relay and circuit opening relay (See page IN–18).

NG → **Repair or replace.**

OK

6	**Check for open and short in harness and connector between fuel tank select relay and engine ECU (See page IN–18).**

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

OK

Check and replace engine ECU (See page IN–18).

DTC	41	Fuel Tank Select Relay Circuit Malfunction

CIRCUIT DESCRIPTION

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

DTC No.	DTC Detecting Condition	Trouble Area
41	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch ON (Voltage of FPMS terminal is high) (b) Voltage of FPM terminal is high (c) Voltage of FPM2 terminal is low	• Open or short in fuel tank select relay circuit • Fuel tank select relay • Open or short in sub fuel pump circuit • Sub fuel pump • Short in main fuel pump circuit (+B short)

WIRING DIAGRAM

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

INSPECTION PROCEDURE

1	**Check fuel tank select relay (See page FI–42).**

NG → **Replace fuel tank select relay.**

OK

2	**Check voltage between terminal FPM of engine ECU connector and body ground (See page DI–91, step 1).**

OK → **Go to step 4.**

NG

3	**Check for open and short in harness and connector between fuel tank change-over switch and fuel tank select relay, fuel tank select relay and body ground (See page IN–18).**

NG → **Repair or replace harness and connector, and then go to step 7.**

OK

4	Check sub fuel pump (See page FI–12).

NG → Replace sub fuel pump, and then go to step 6.

OK

5	Check for open or short in harness and connector between sub fuel pump and fuel tank select relay (See page IN–18).

NG → Repair or replace, and then go to step 7.

OK

6	Check for open and short in harness and connector between fuel tank select relay and engine ECU, sub fuel tank forcing driving relay and engine ECU (See page IN–18).

NG → Repair or replace, and then go to step 7.

OK

7	Check for short in harness and connector between main fuel pump and fuel tank select relay (+B short circuit) (See page IN–18).

NG → Repair or replace harness and connector.

OK

Check and replace engine ECU
(See page IN–18).

DTC	42	Both Fuel Pump Simultaneous Operation Malfunction (*)

***: Fuel Tank Changeover Switch ON**

CIRCUIT DESCRIPTION

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

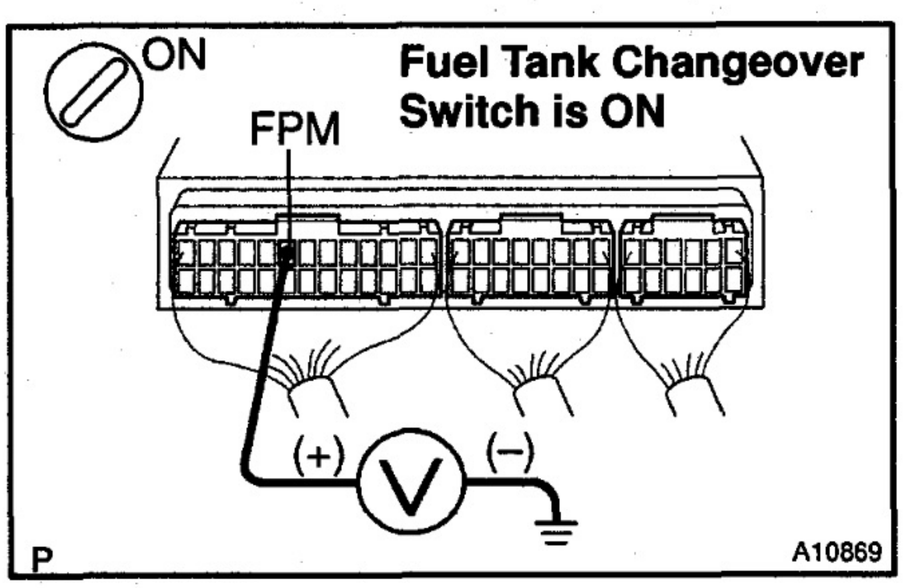
DTC No.	DTC Detecting Item	Trouble Area
42	Conditions (a), (b) and (c) continue: (a) Fuel tank changeover switch ON (Voltage of FPMS terminal is high) (b) Voltage of FPM terminal is high (c) Voltage of FPM2 terminal is high	• Short in main fuel pump circuit (+B short) • Open or short in fuel tank select relay circuit • Fuel tank select relay • Short in sub fuel tank forcing driving relay circuit • Sub fuel tank forcing driving relay • Short in sub fuel pump circuit (+B short)

WIRING DIAGRAM

Refer to DTC 11 (Main Fuel Pump Circuit Malfunction) on page DI–91.

INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Push the fuel tank changeover switch ON.

CHECK:

Measure voltage between terminal FPM of engine ECU and body ground, turn the ignition switch ON after 4 seconds or more.

OK:

Voltage: 0 – 3.0 V

OK	Go to step 4.

NG

2	Check fuel tank select relay (See page FI–42).

NG → Replace fuel tank select relay, and then go to step 4.

OK

3	Check for open and short in harness and connector between fuel tank change-over switch and fuel tank select relay, fuel tank select relay and body ground (See page IN–18).

NG → Repair or replace harness and connector, and then go to step 4.

OK

4	Check for short in harness and connector between fuel tank select relay and engine ECU, fuel tank select relay and main fuel pump (+B short circuit) (See page IN–18).

NG → Repair or replace harness and connector.

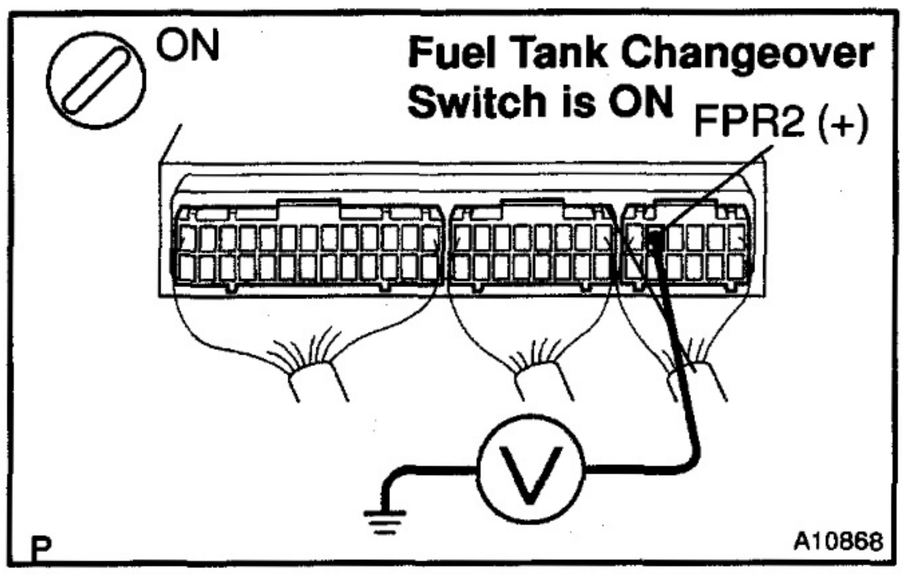
OK

5	Check sub fuel tank forcing driving relay (See page FI–43).

NG → Replace sub fuel tank forcing driving relay.

OK

6	**Check voltage between terminal FPR2 of engine ECU connector and body ground.**



PREPARATION:

(a) Remove the glove compartment door.
(b) Turn the ignition switch ON.
(c) Push the fuel tank changeover switch ON.

CHECK:

Measure voltage between terminal FPR2 of engine ECU connector and body ground, turn the ignition switch ON after 4 seconds.

OK:

Voltage: 9 – 14 V

NG → **Go to step 7.**

OK

Check and repair harness and connector between sub fuel pump and sub fuel tank forcing driving relay (+B short circuit) (See page IN–18).

7	**Check for short in harness and connector between sub fuel tank forcing driving relay and engine ECU (See page IN–18).**

NG → **Repair or replace.**

OK

Check and replace engine ECU (See page IN–18).

ELECTRONIC FUEL INJECTION

EFI SYSTEM FI–1
FUEL PUMP FI–5
SUB FUEL PUMP FI–12
FUEL PRESSURE REGULATOR FI–19
INJECTOR FI–22
THROTTLE BODY FI–28
FUEL TANK SOLENOID RETURN VALVE ... FI–33
IDLE SPEED CONTROL (ISC) VALVE FI–34
EFI MAIN RELAY FI–39
CIRCUIT OPENING RELAY FI–40
FUEL TANK SELECT RELAY FI–42
SUB FUEL TANK FORCING DRIVING RELAY FI–43
WATER TEMPERATURE SENSOR FI–44
INTAKE AIR TEMPERATURE SENSOR FI–45
KNOCK SENSOR FI–46
ENGINE ECU FI–47
FUEL CUT RPM FI–49

REFER TO 3RZ–F, 3RZ–FE ENGINE REPAIR MANUAL (Pub. No. RM521E)

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

EFI SYSTEM

PRECAUTION

FI0NO–01

1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

HINT:

Any diagnostic trouble code retained by the Engine (and ECT) ECU will be erased when the battery negative (–) terminal cable is removed from the battery.

Therefore, if necessary, read the diagnostic trouble code(s) before removing the negative (–) terminal cable from the battery.

2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM

3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS

4. MAINTENANCE PRECAUTIONS

(a) Precaution when the connecting gauge.
Use battery as the power source for the timing light, etc.

(b) In the event of engine misfire, these precautions should be taken.
  (1) Check proper connection of battery terminals, etc.
  (2) Handle high–tension cords carefully.
  (3) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
  (4) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

(c) Precautions when the handling heated oxygen sensors.
  (1) Do not allow oxygen sensor to drop or hit against an object.
  (2) Do not allow the sensor to come into contact with water.

If Vehicle is Equipped with Mobile Radio System (ham, cb, etc.)

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

5. AIR INDUCTION SYSTEM

(a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.

(b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will cause air suction and cause the engine to run out of tune.

FI

6. ELECTRONIC CONTROL SYSTEM

(a) Before removing EFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch to LOCK or disconnecting the negative (–) terminal cable from the battery.

HINT:
Always check the diagnostic trouble code before disconnecting the battery terminal cable.

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cable terminals.

(c) Do not permit parts to receive a severe impact during removal or installation. Handle all EFI parts carefully, especially the ECU.

(d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.

(e) Do not open the ECU cover.

(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.

(g) Parts should be replaced as an assembly.

(h) Care is required when pulling out and inserting wiring connectors.

(1) Release the lock and pull out the connector, pulling on the connectors.

(2) Fully insert the connector and check that it is locked.

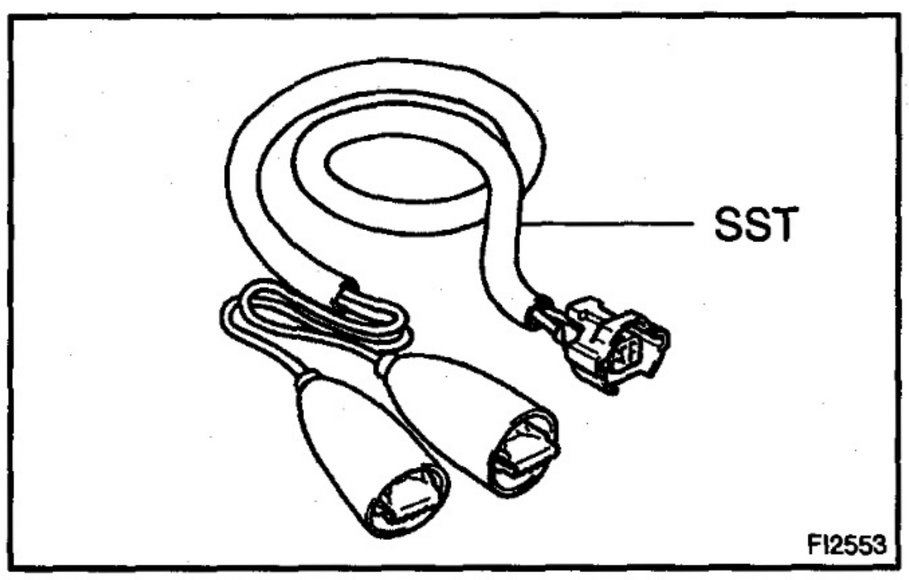
(i) When inspecting a connector with a volt/ohmmeter.

(1) Carefully take out the water–proofing rubber if it is a water–proof type connector.

(2) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.

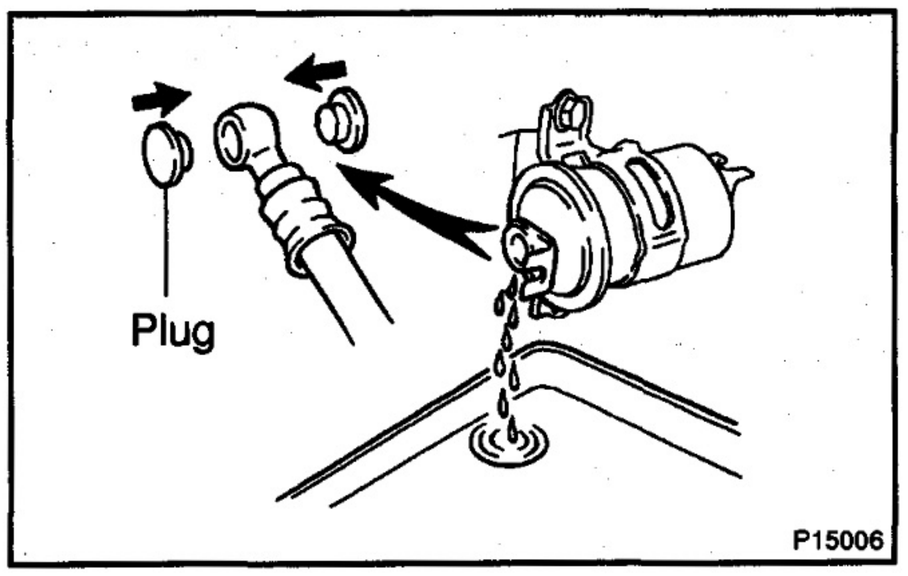
(3) Do not apply unnecessary force to the terminal.

(4) After checking, install the water–proofing rubber on the connector securely.



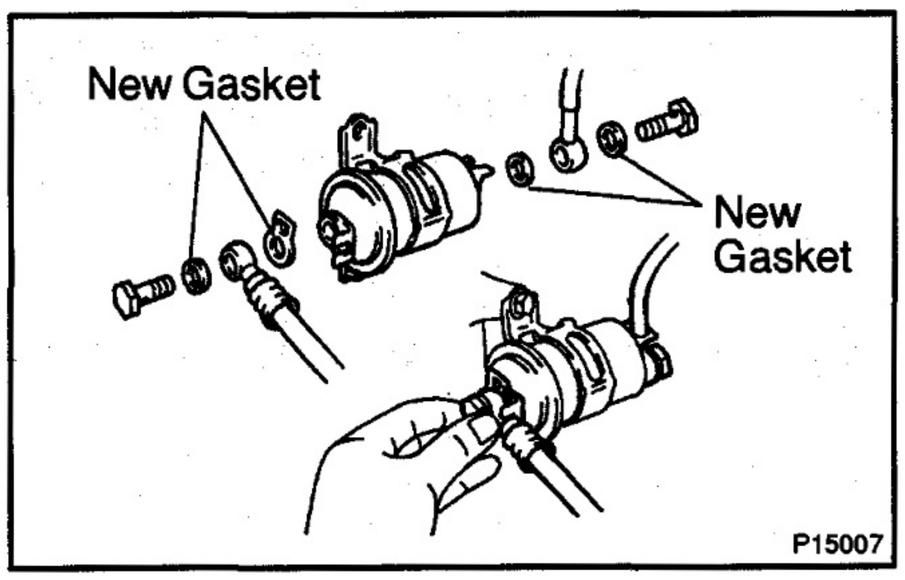
(5) Use SST for inspection or test of the injector or its wiring connector.

SST 09842–30070

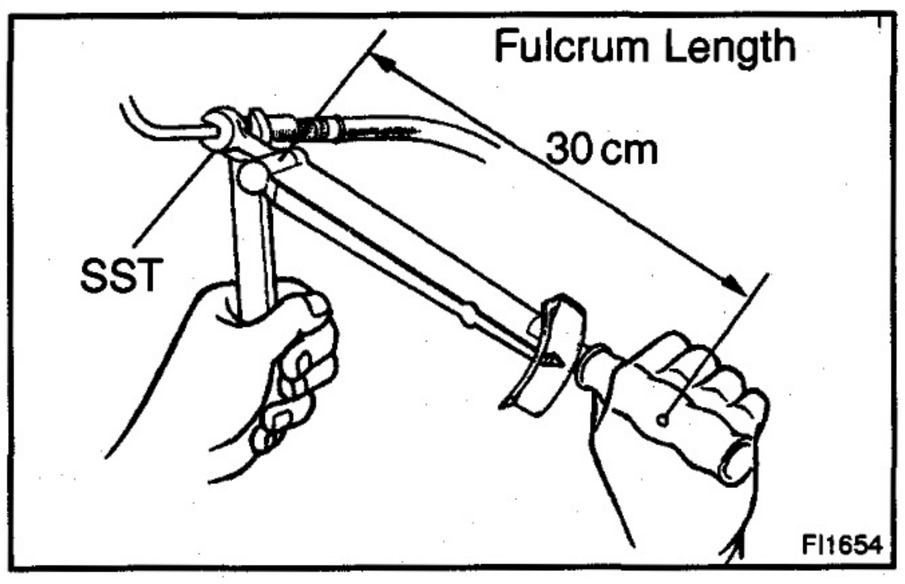


7. FUEL SYSTEM

(a) When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe these procedures:
  (1) Put a container under the connection.
  (2) Slowly loosen the connection.
  (3) Disconnect the connection.
  (4) Plug the connection with a rubber plug.



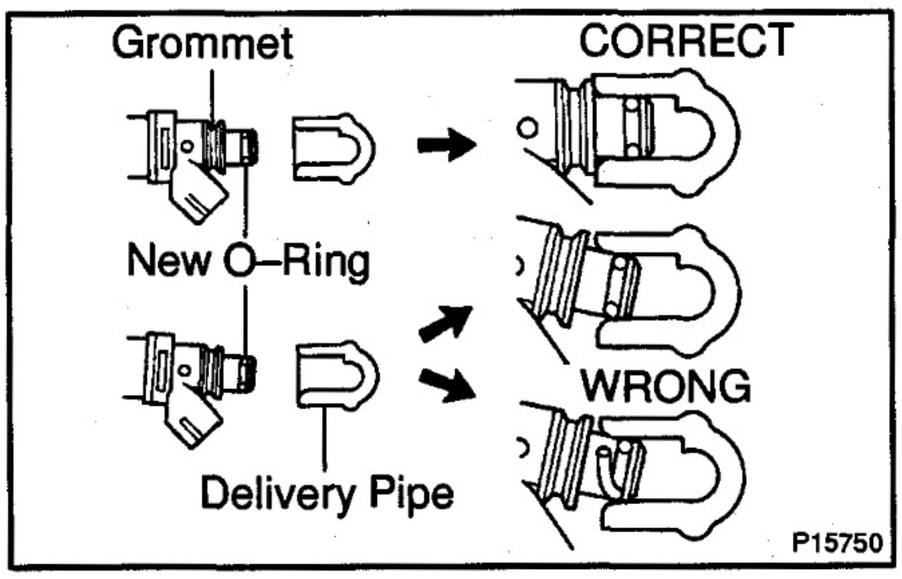
(b) When connecting the flare nut or union bolt on the high pressure pipe union, observe these procedures:
  (1) (Union Bolt Type)
  Always use a new gasket.
  (2) (Union Bolt Type)
  Tighten the union bolt by hand.
  (3) (Union Bolt Type)
  Tighten the union bolt to the specified torque.
  Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

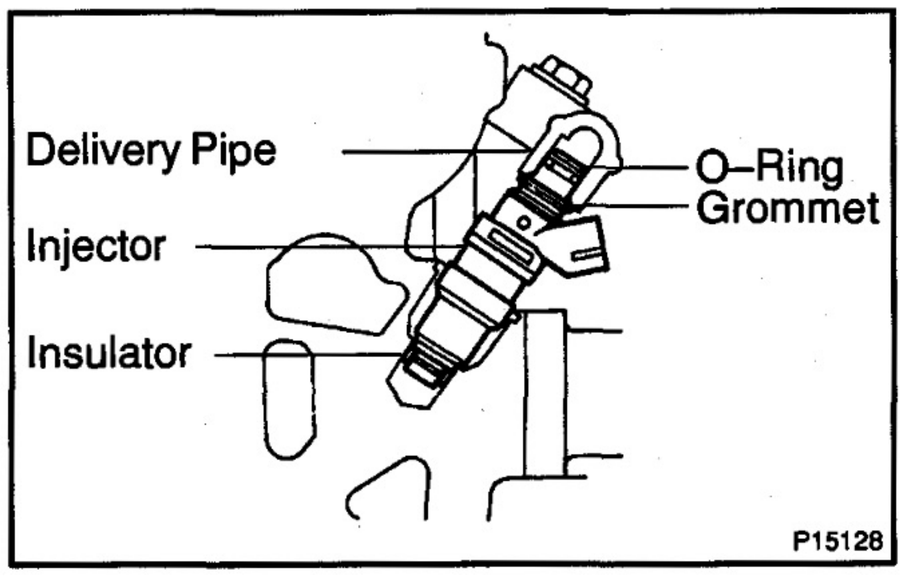


  (4) (Flare Nut Type)
  Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
  (5) (Flare Nut Type)
  Using SST, tighten the flare nut to the specified torque.
  SST 09631–22020
  Torque: 28 N·m (285 kgf·cm, 21 ft·lbf)

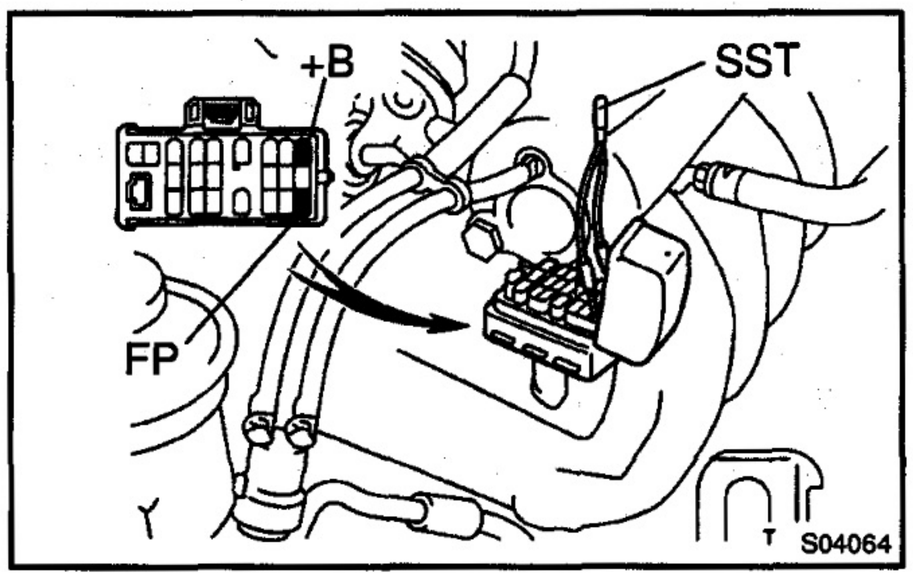
HINT:
Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

(c) Observe these precautions when removing and installing the injectors.
  (1) Never reuse the O–ring.
  (2) When placing a new O–ring on the injector, take care not to damage it in any way.
  (3) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.





(d) Install the injector to the delivery pipe and cylinder head as shown in the illustration.



(e) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.

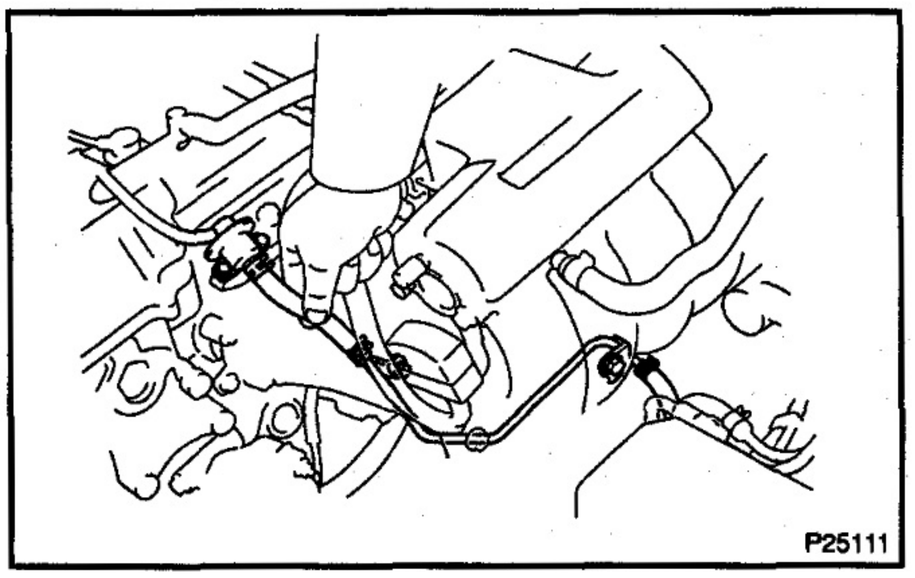
(1) Using SST, connect terminals +B and FP of check connector.

SST 09843–18020

(2) Turn the ignition switch ON.

NOTICE:

Do not start the engine.



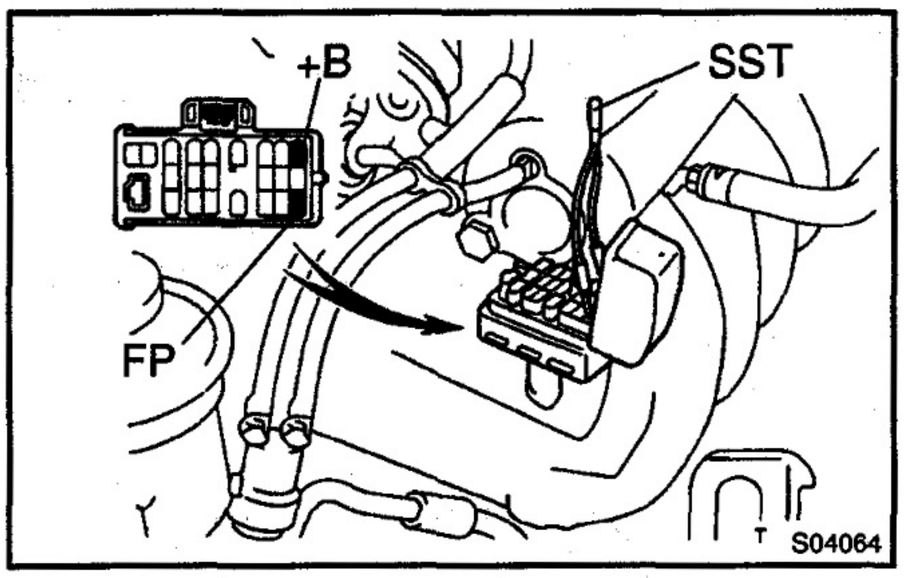
(3) Pinch the fuel return hose. The pressure in high pressure line will rise to approx. 400 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

NOTICE:

Always pinch the hose. Avoid bending as it may cause to hose to crack.

(4) Turn the ignition switch to LOCK.

FI



FUEL PUMP

ON–VEHICLE INSPECTION

FI0NP–01

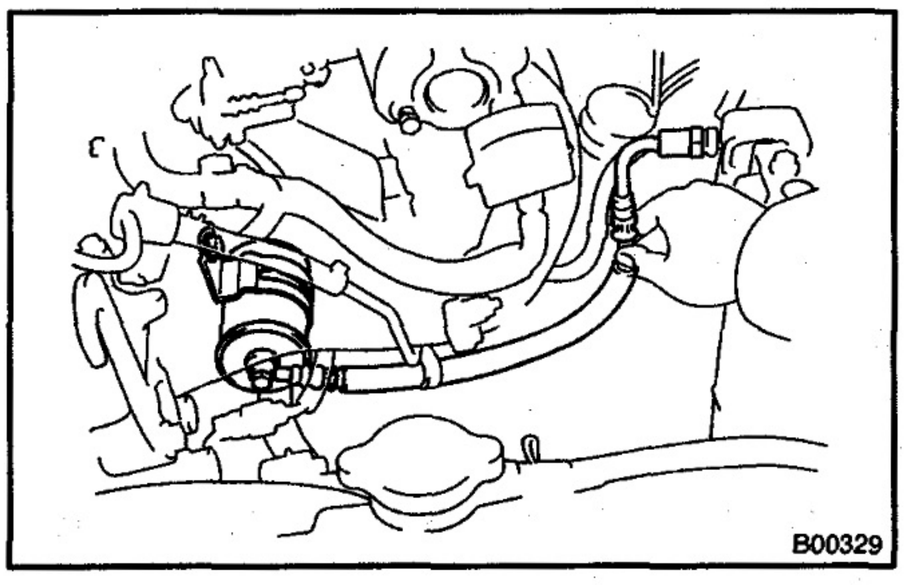
1. CHECK FUEL PUMP OPERATION

(a) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020

(b) Turn the ignition switch ON.

NOTICE:

Do not start the engine.



(c) Check that there is pressure in the inlet hose from the fuel filter.

HINT:

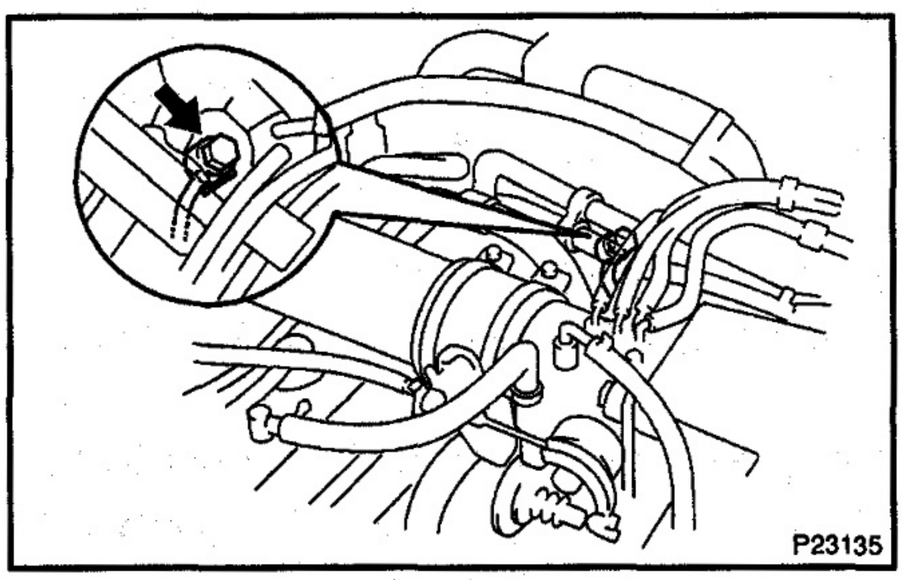
At this time, you will hear fuel return noise.

If there is no pressure, check these parts:

- Fusible link
- H–fuse
- Fuses
- EFI main relay
- Circuit opening relay
- Fuel pump
- Engine ECU
- Wiring connections

(d) Turn the ignition switch to LOCK.

(e) Remove the SST.
SST 09843–18020

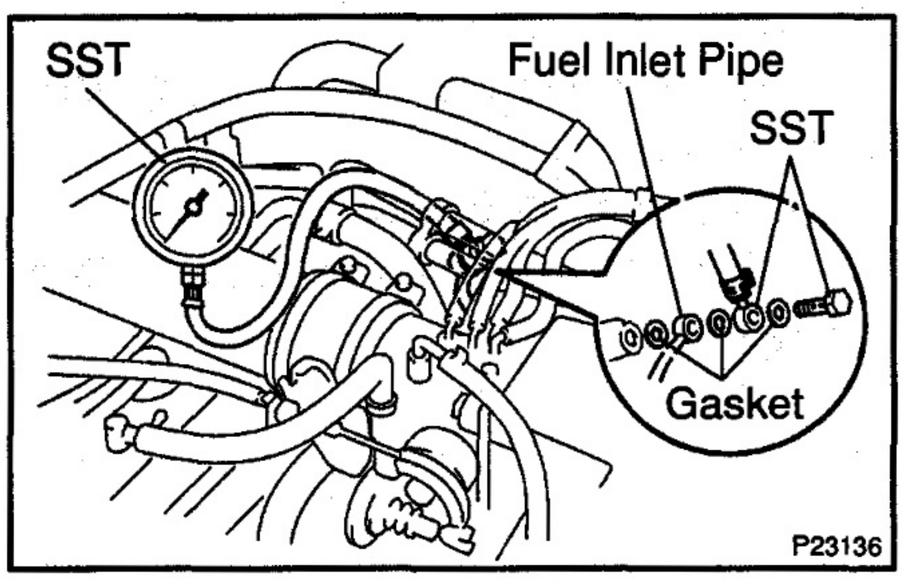


2. CHECK FUEL PRESSURE

(a) Check that the battery voltages is above 12 bolts.

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

(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the delivery pipe.



HINT:

- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.

(d) Install the fuel inlet hose and SST (pressure gauge) to the delivery pipe with the 3 gaskets and SST (union bolt).
SST 09268–45012
Torque: 29 N·m (300kgf·cm, 22 ft·lbf)

(e) Wipe off any splattered gasoline.
(f) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020
(g) Reconnect the negative (–) terminal cable to the battery.
(h) Turn the ignition switch ON.
(i) Measure the fuel pressure.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

If pressure is high, replace the fuel pressure regulator.
If pressure is low, check these parts:

- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator

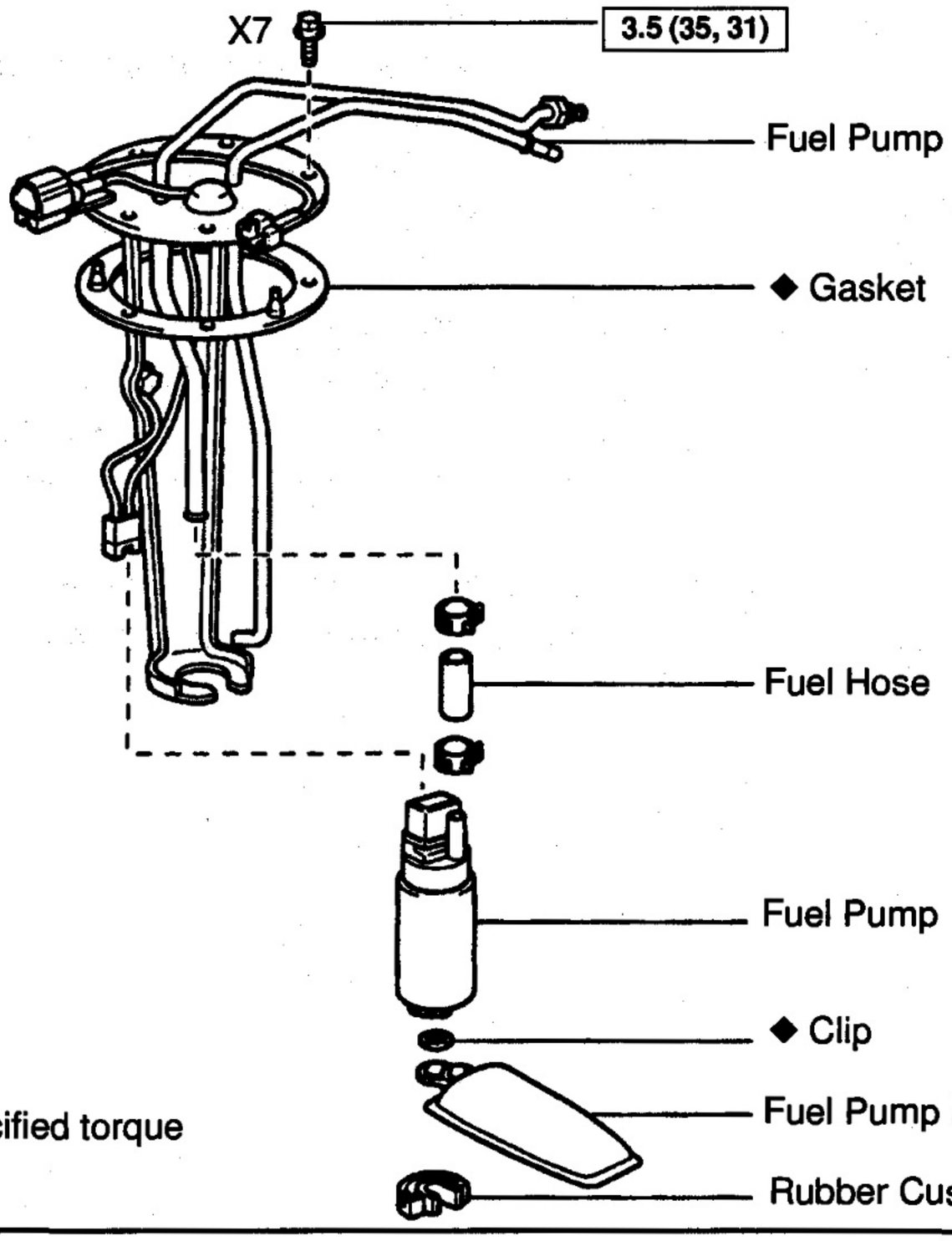
(j) Remove the SST.
SST 09483–18020
(k) Start the engine.
(l) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.
(m) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
(n) Reconnect the vacuum sensing hose to the flue pressure regulator.
(o) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.
(p) Stop the engine.
(q) Check that the fuel pressure remains as specified for 5 minutes after the engine is stopped.
Fuel pressure:
147 kPa (1.5 kgf/cm^2, 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.
(r) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012
(s) Reconnect the fuel inlet hose to the delivery pipe with 2 new gaskets and the union bolt.
Torque: 29 N·m (300kgf·cm, 22 ft·lbf)
(t) Reconnect the negative (–) terminal cable to the battery.
(u) Check for fuel leakage.

FI0NO-01

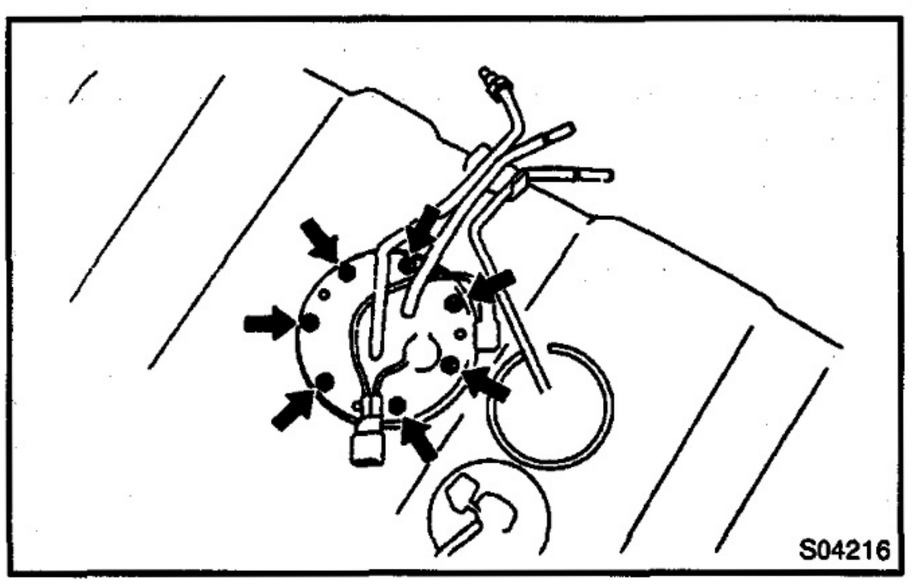
COMPONENTS



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

◆ Non–reusable part

S04224



FI0NR-01

REMOVAL

CAUTION:

Do not smoke or work near an open flame when working on the fuel pump.

1. **REMOVE FUEL TANK**
2. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**

(a) Remove the 8 bolts.
Torque: 3.5 N·m (35 kgf·cm, 31 in.·lbf)

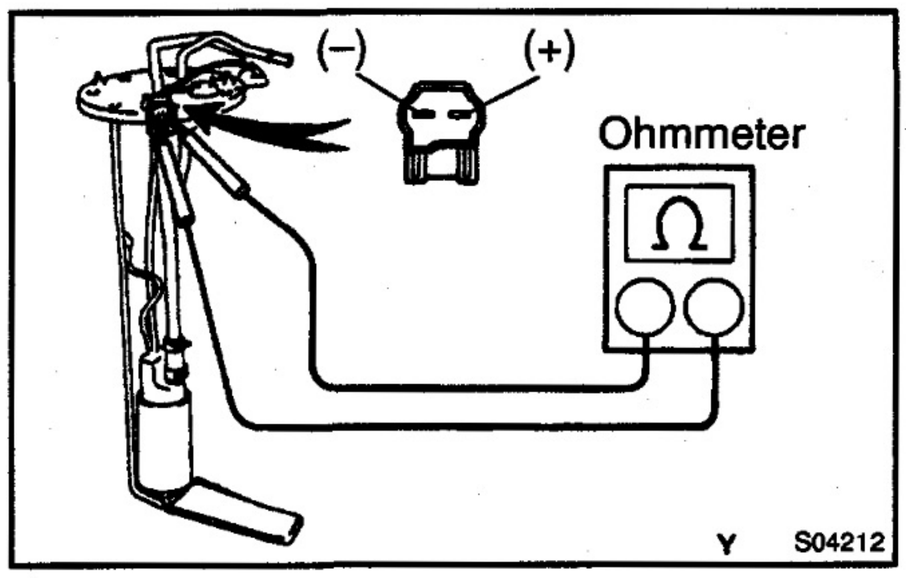
(b) Pull out the pump bracket assembly.

(c) Remove the gasket from the pump bracket.

HINT:

At the time of installation, please refer to the following item.

Install the pump bracket with a new clip.



FI0NS–01

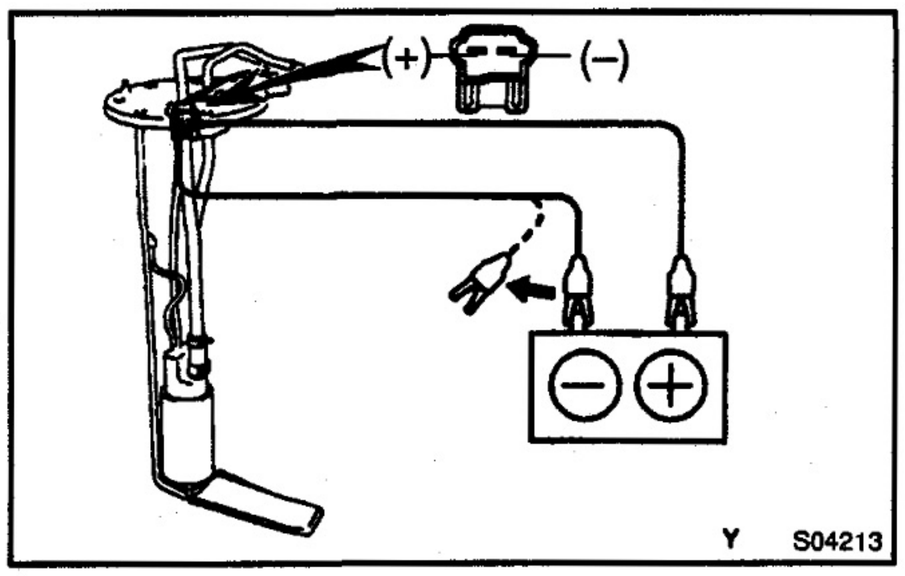
DISASSEMBLY

1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: At 20°C (68°F): 0.2 – 3.0 Ω

If the resistance is not as specified, replace the fuel pump and/or lead wire.



2. INSPECT FUEL PUMP OPERATION

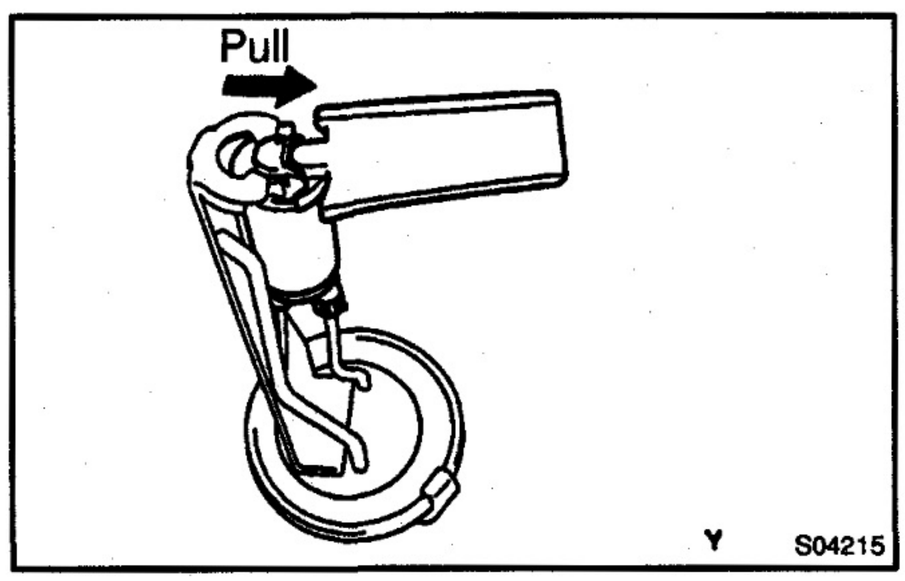
Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (–) lead to terminal 2. Check that the fuel pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

If operation is not as specified, replace the fuel pump and/or lead wire.

3. REMOVE FUEL PUMP LEAD WIRE

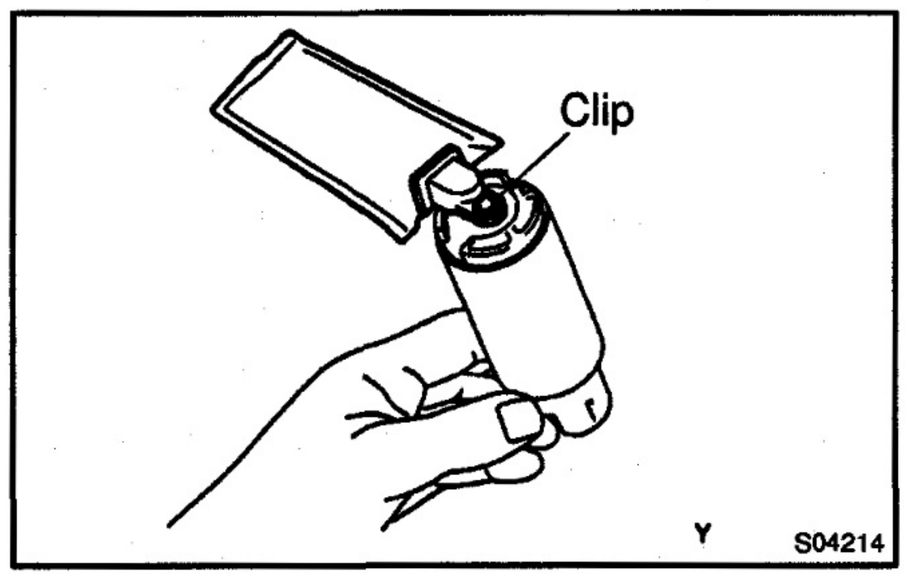


4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Pull off the lower side of the fuel pump from the pump bracket.

(b) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

(c) Remove the rubber cushion from the fuel pump.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.

HINT:

At the time of assembly please refer to the following items.

Install the pump filter with a new clip.

FIONT–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page FI–9).

FI0NU–01

INSTALLATION

Installation is in the reverse order of removal (See page FI–8).

SUB FUEL PUMP

FI0NV-01

ON–VEHICLE INSPECTION

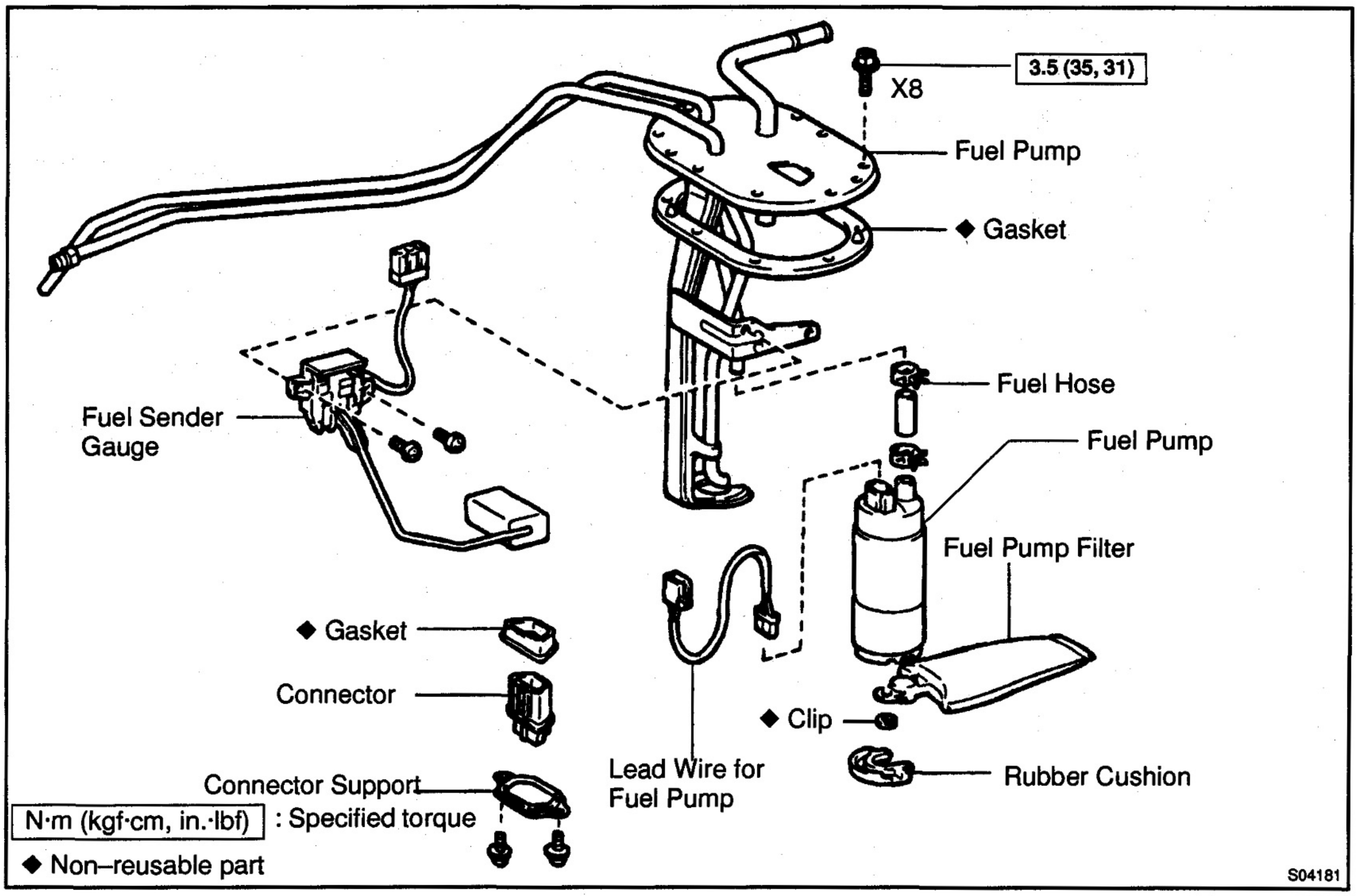
CHECK SUB FUEL PUMP OPERATION AND FUEL PRESSURE (See steps 1 and 2 in FI–12)

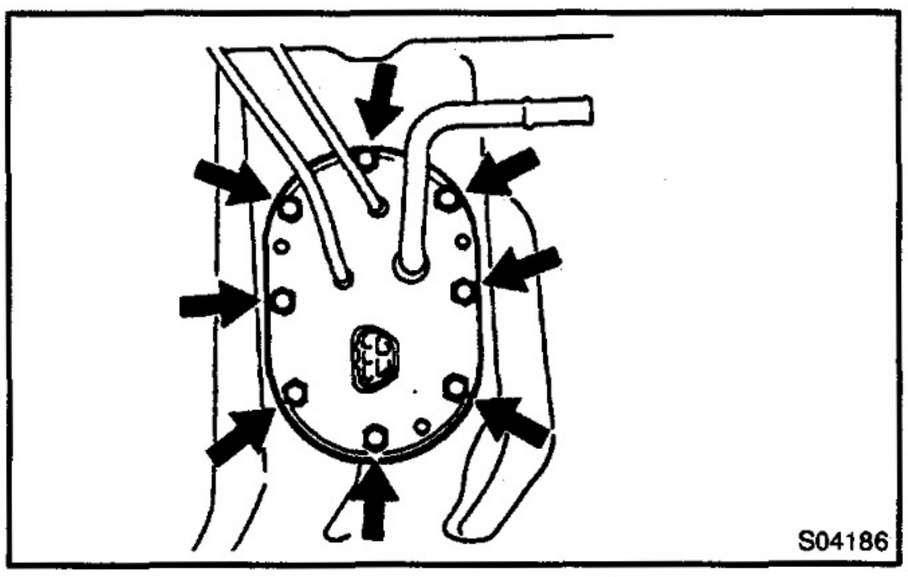
NOTICE:

Push the fuel tank changeover switch ON.

FI0NW–01

COMPONENTS





FI0NX-01

REMOVAL

CAUTION:

Do not smoke or work near an open flame when working on the fuel pump.

1. **REMOVE FUEL TANK**
2. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**

(a) Remove the 8 bolts.
Torque: 3.5 N·m (35 kgf·cm, 31 in.·lbf)

(b) Pull out the pump bracket assembly.

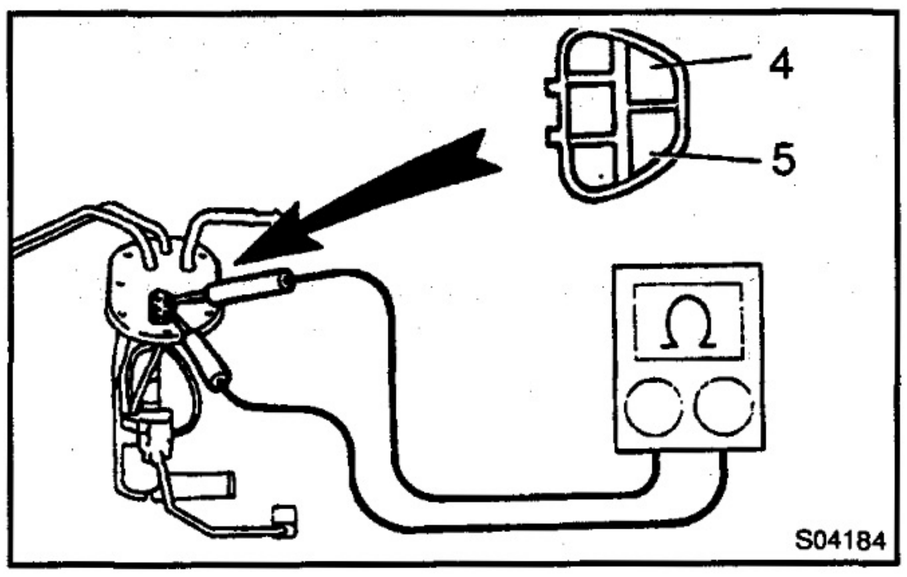
(c) Remove the gasket from the pump bracket.

HINT:

At the time of installation please refer to the following items.
Install the pump bracket with a new clip.

FI0NY–01

DISASSEMBLY

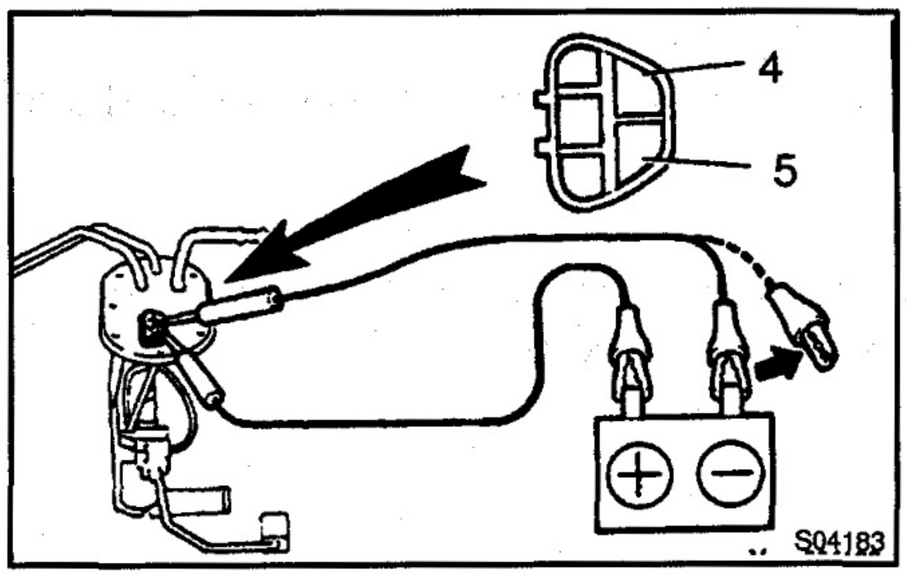


1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals 4 and 5.

Resistance: At 20°C (68°F): 0.2 – 3.0 Ω

If the resistance is not as specified, replace the fuel pump and/or lead wire.



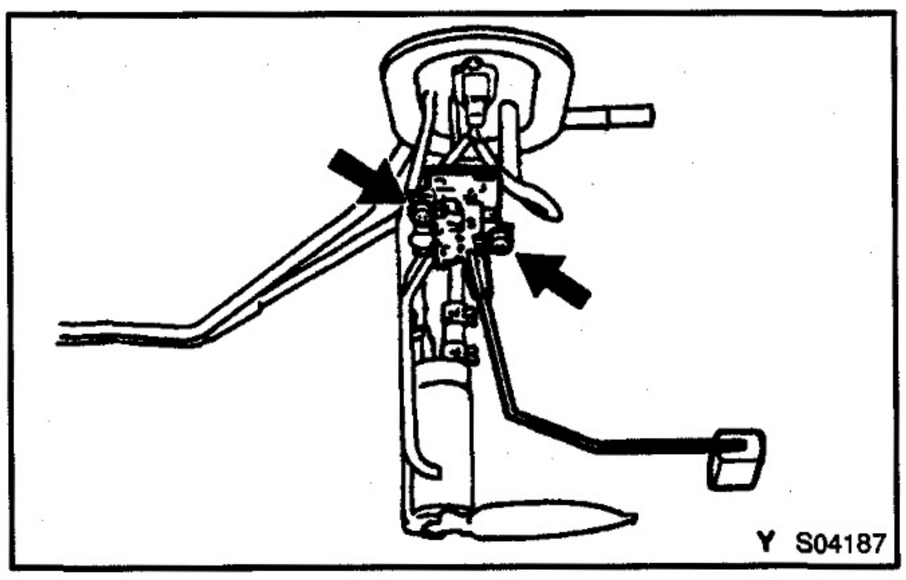
2. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 4 of the connector, and the negative (–) lead to terminal 5. Check that the fuel pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

If operation is not as specified, replace the fuel pump and/or lead wire.

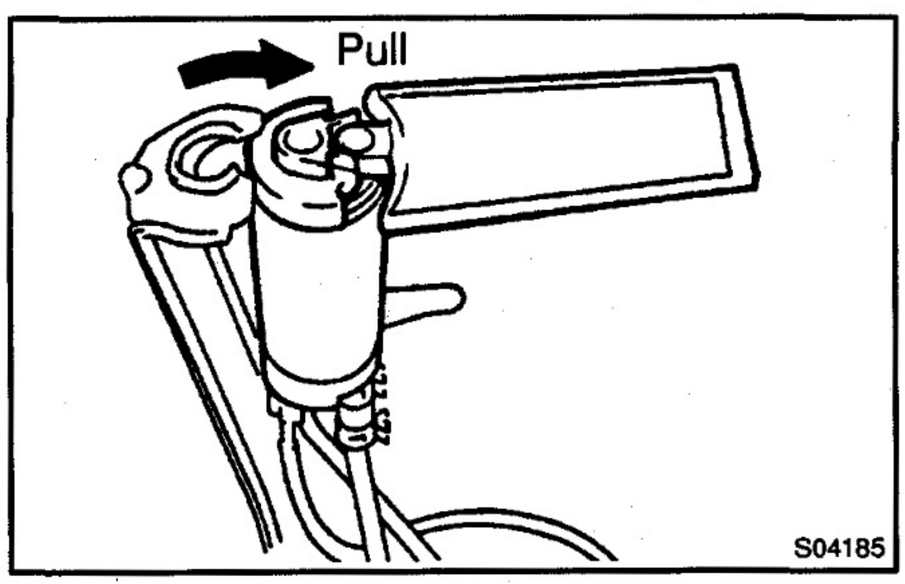


3. REMOVE FUEL PUMP LEAD WIRE

4. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

(a) Disconnect the fuel sender gauge connector.

(b) Remove the 2 screws and sender gauge.

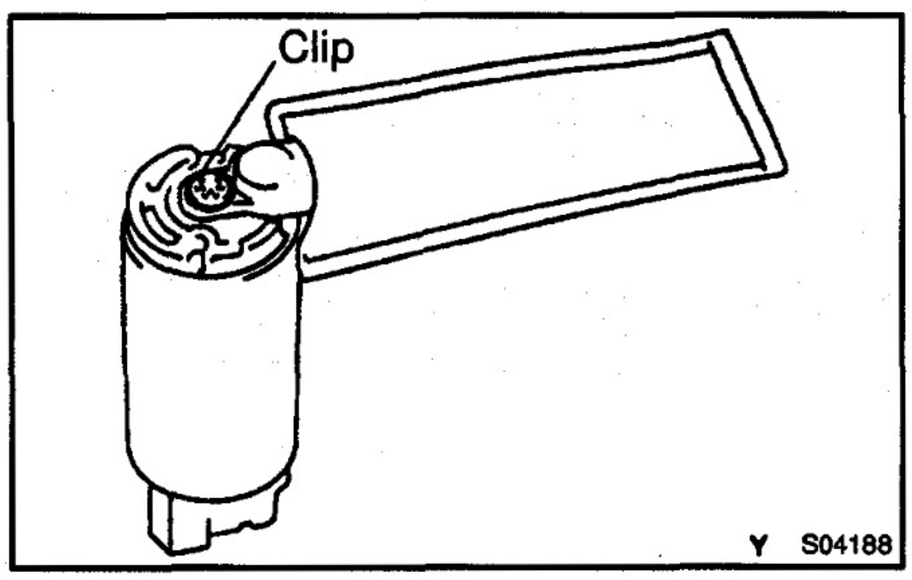


5. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Pull off the lower side of the fuel pump from the pump bracket.

(b) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

(c) Remove the rubber cushion from the fuel pump.



6. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

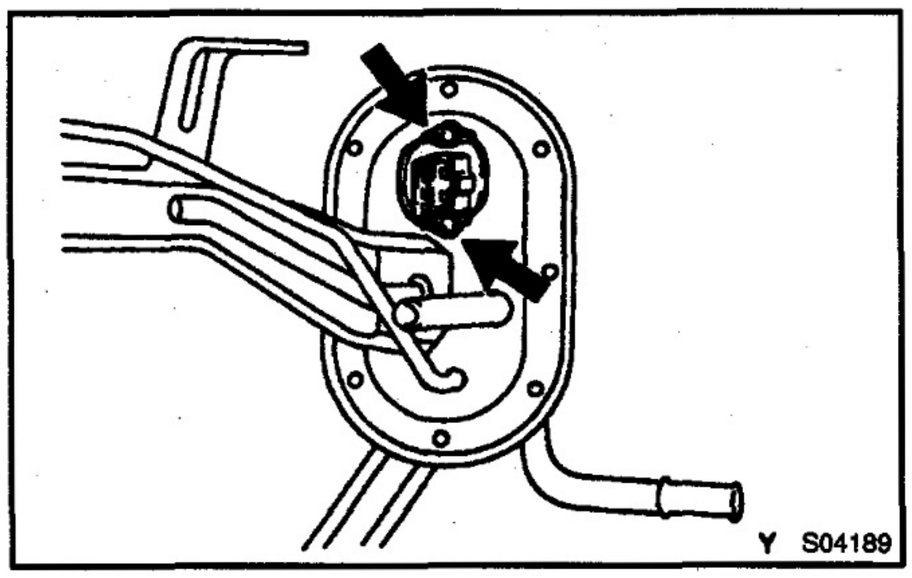
(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.

HINT:

At the time of assembly please refer to the following items.

Install the pump filter with a new clip.



7. REMOVE CONNECTOR

Remove the 2 screws, connector support, connector and gasket.

HINT:

At the time of assembly please refer to the following items.

Install the connector with a new gasket.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page FI–15).

FI0O0–01

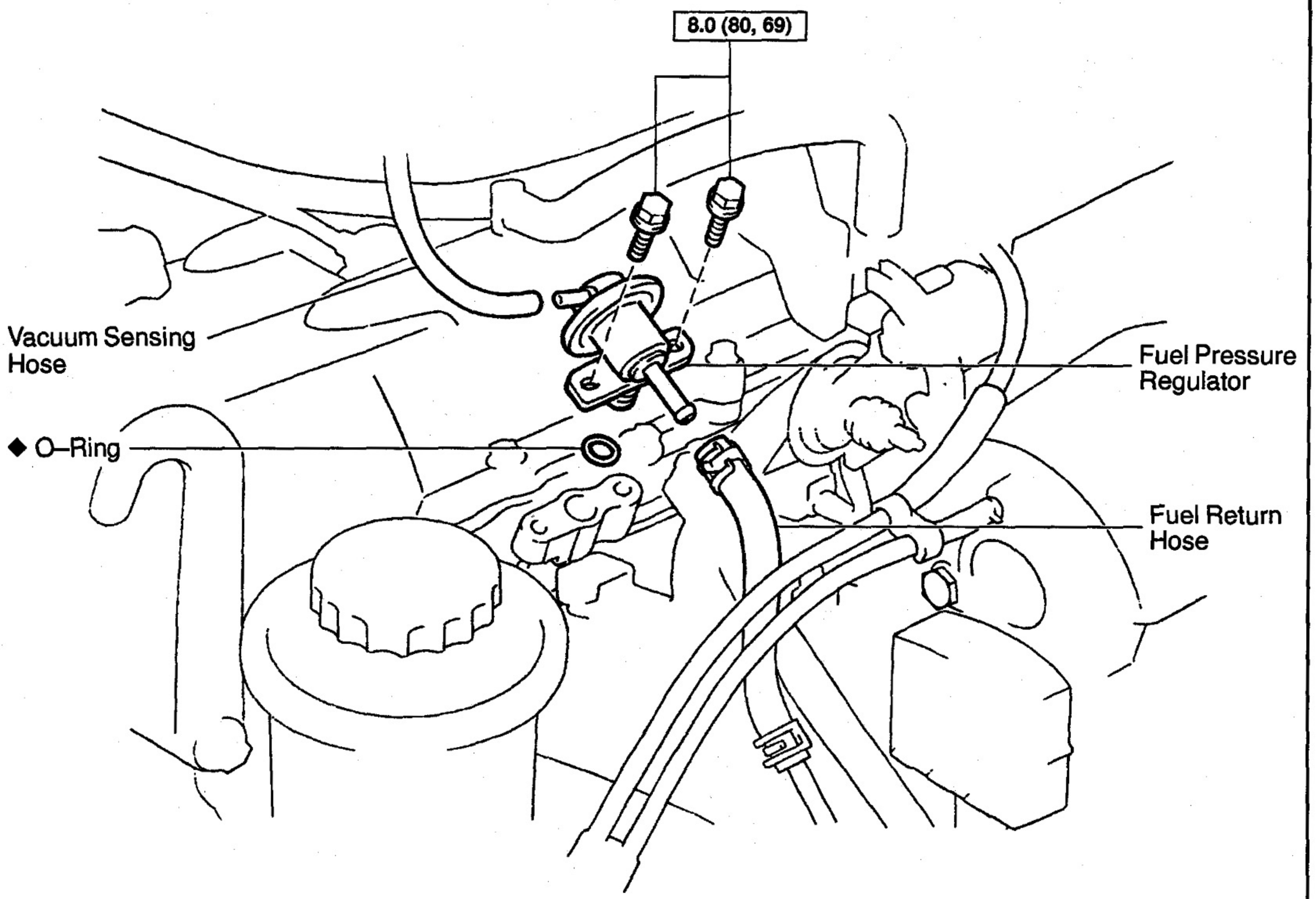
INSTALLATION

Installation is in the reverse order of removal (See page FI–14).

FUEL PRESSURE REGULATOR

COMPONENTS

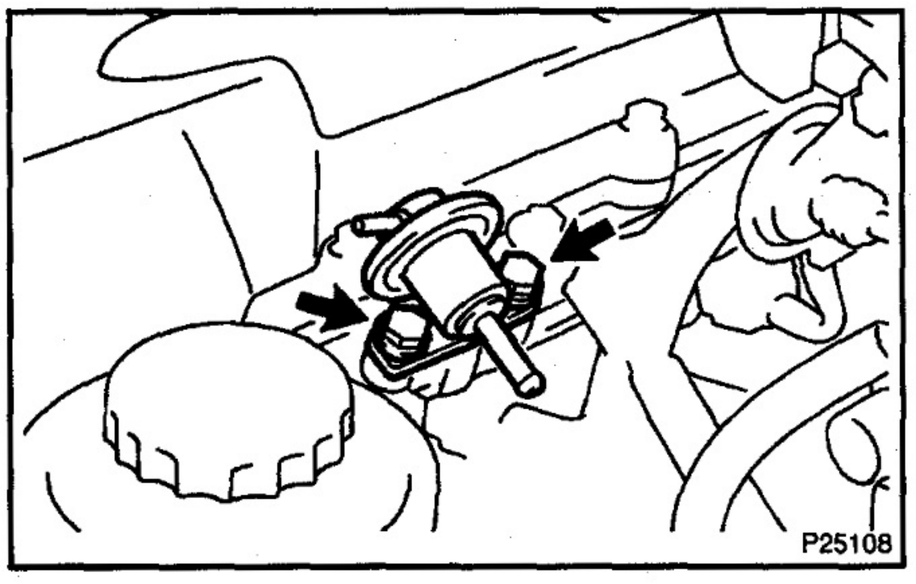
FI0O1–01



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

◆ Non–reusable part

P25123



FI0O2-01

REMOVAL

1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

2. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

HINT:

Put a suitable container or shop towel under the pressure regulator.

3. REMOVE FUEL PRESSURE REGULATOR

(a) Remove the 2 bolts and fuel pressure regulator.

Torque: 8.0 N·m (80 kgf·cm, 69 in.·lbf)

(b) Remove the O–ring.

HINT:

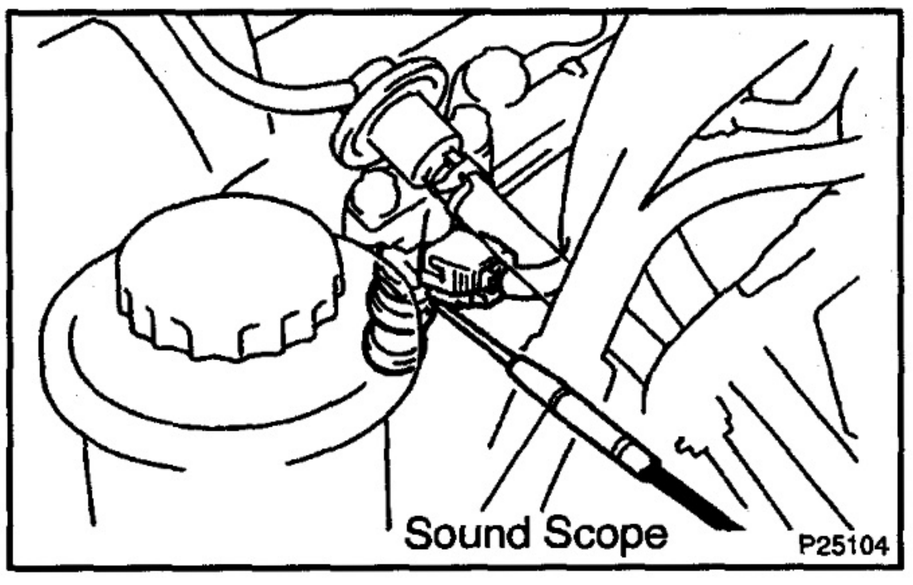
At the time of installation please refer to the following item.

Install the pressure regulator with a new gasket.

FI0O3-01

INSTALLATION

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



INJECTOR

ON–VEHICLE INSPECTION

FI0O4–01

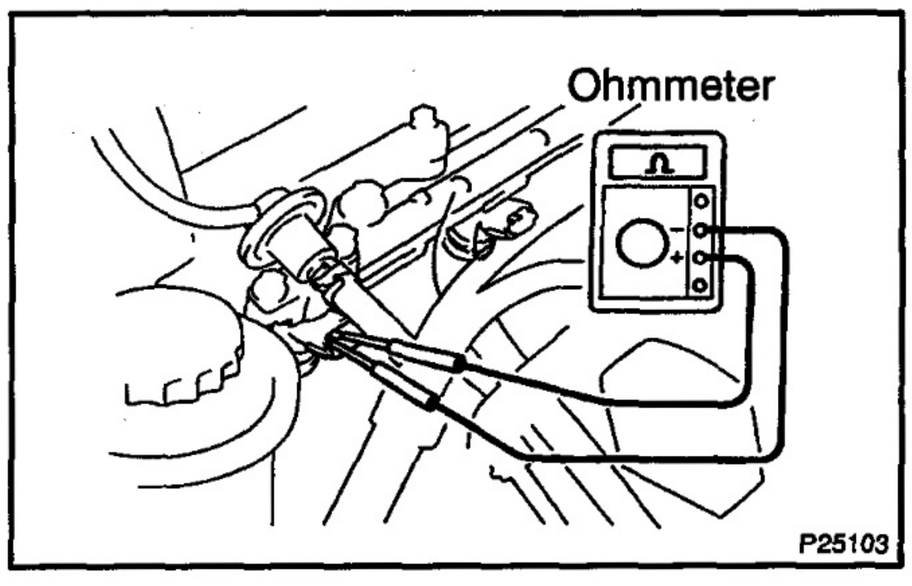
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.

(b) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the engine (and ECT) ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Remove the throttle body (See page FI–30).

(b) Disconnect the injector connectors.

(c) Using an ohmmeter, measure the resistance between the terminals.

Resistance: At 20°C (68°F): 13.4 – 14.2 Ω

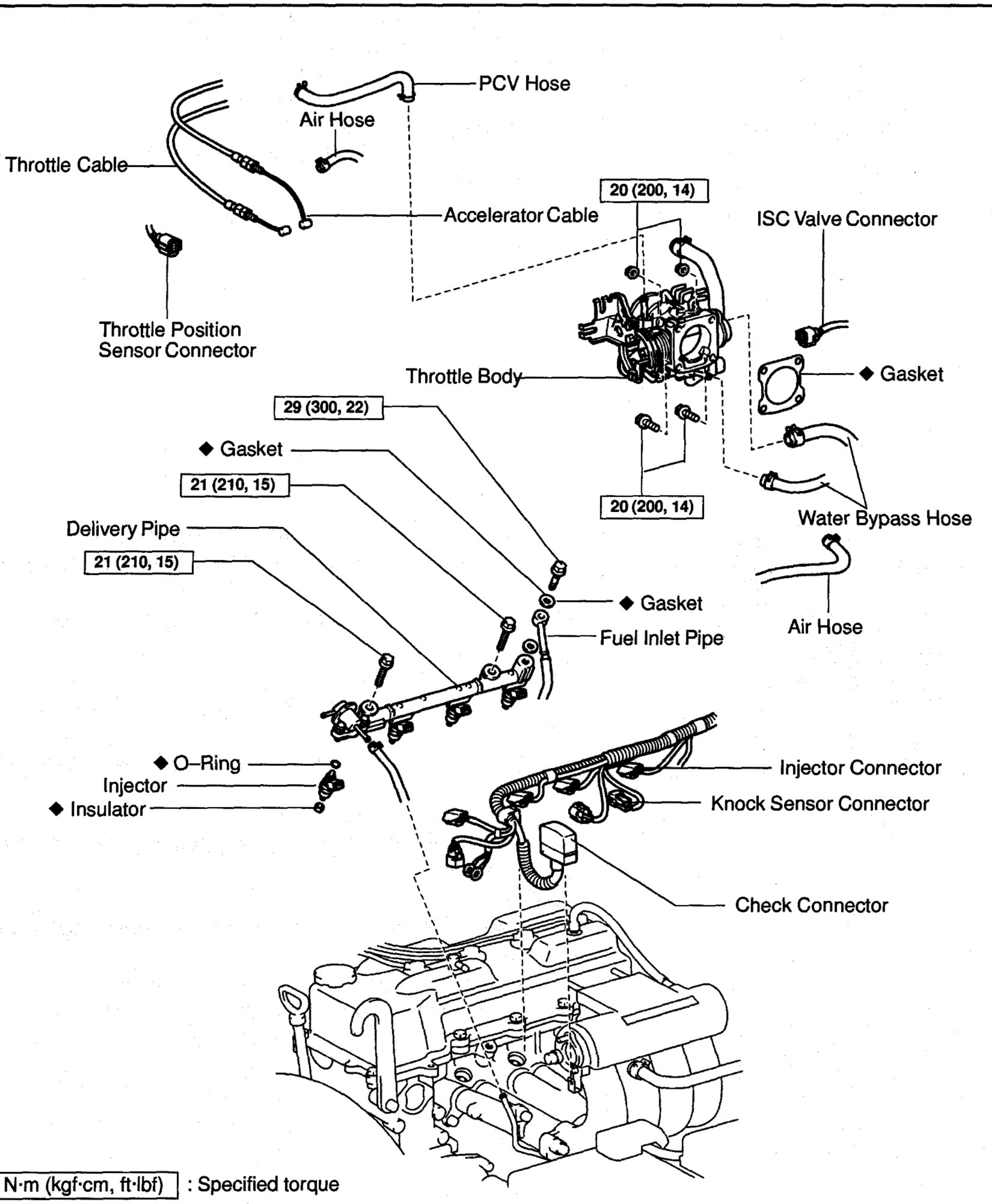
If the resistance is not as specified, replace the injector.

(d) Reconnect the injector connectors.

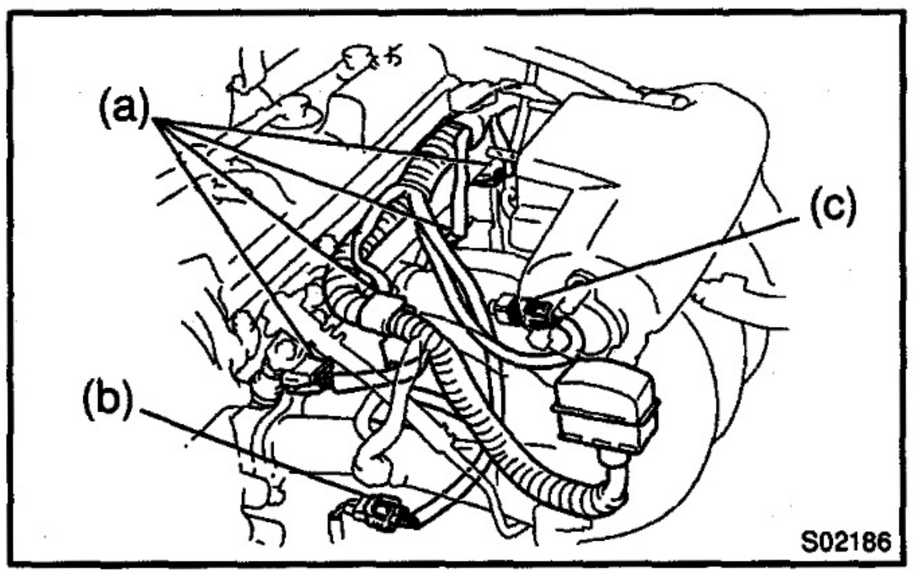
(e) Install the throttle body.
(See page FI–32)

FI00S-01

COMPONENTS



FI0O6-01



REMOVAL

1. REMOVE THROTTLE BODY (See page FI–30)

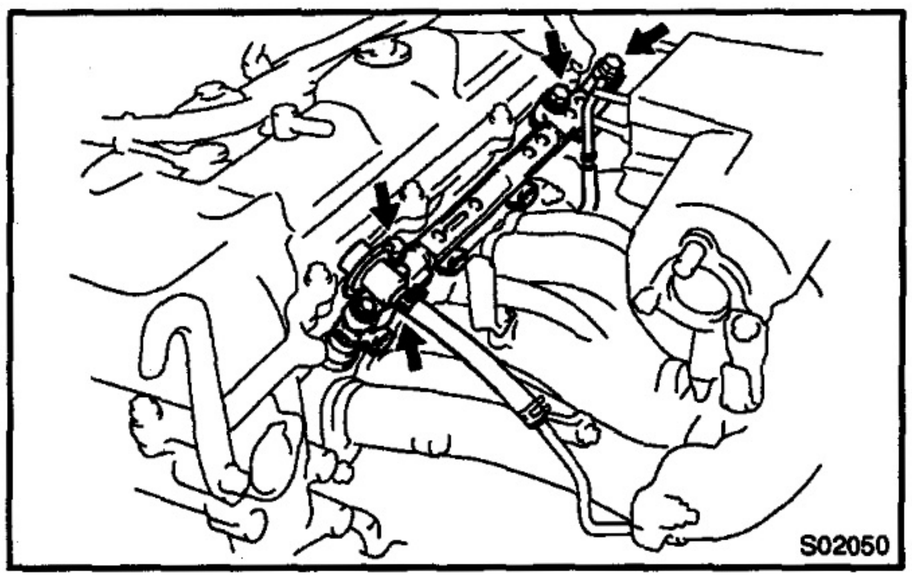
2. DISCONNECT ENGINE WIRE

(a) Disconnect the 4 injector connectors.

(b) Disconnect the crankshaft position sensor.

(c) Disconnect the knock sensor connector.

(d) Disconnect the check connector and wire clamp from the brackets.



3. REMOVE DELIVERY PIPE AND INJECTORS

(a) Disconnect the vacuum sensing hose from the fuel pressure regulator.

(b) Disconnect the fuel return hose from the fuel pressure regulator.

(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe.

HINT:

- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.

(d) Remove the 2 bolts and delivery pipe together with the 4 injectors.

NOTICE:

Be careful not to drop the Injectors when removing the delivery pipe.

(e) Remove the 4 insulators from the 4 spacers.

(f) Pull out the 4 injectors from the delivery pipe.

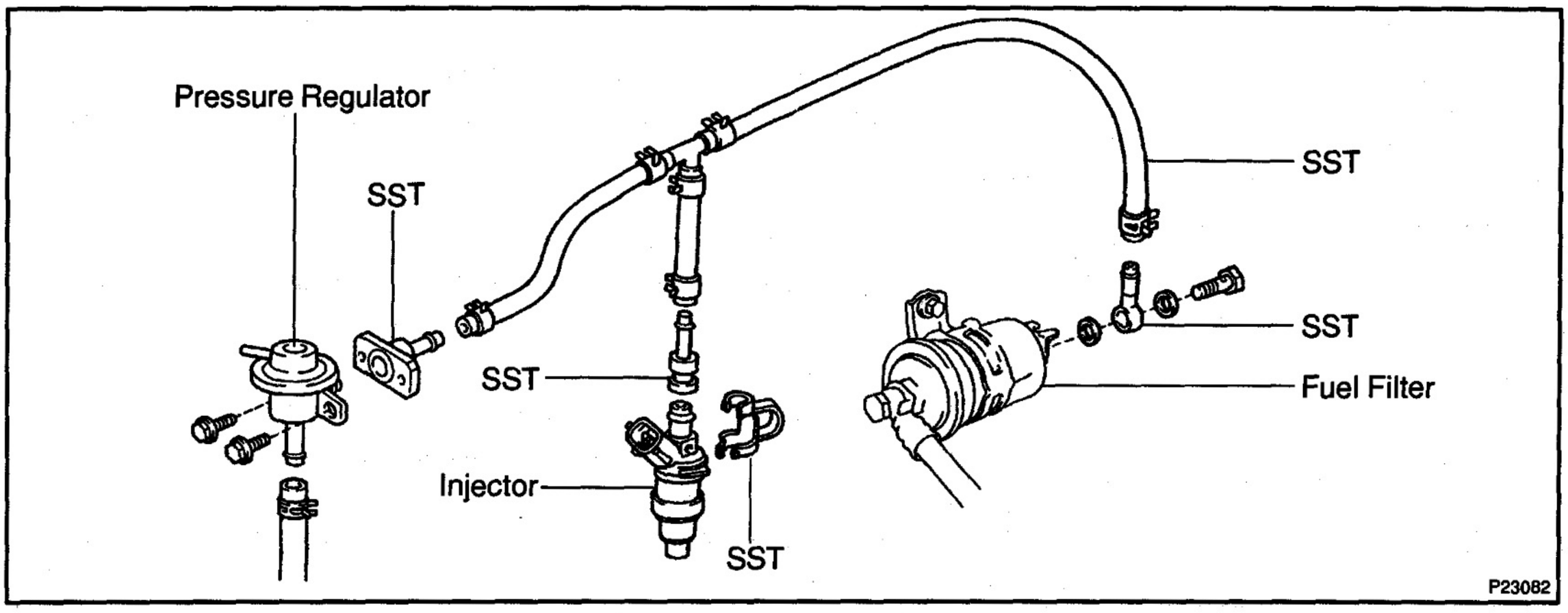
(g) Remove the O–ring from each injector.

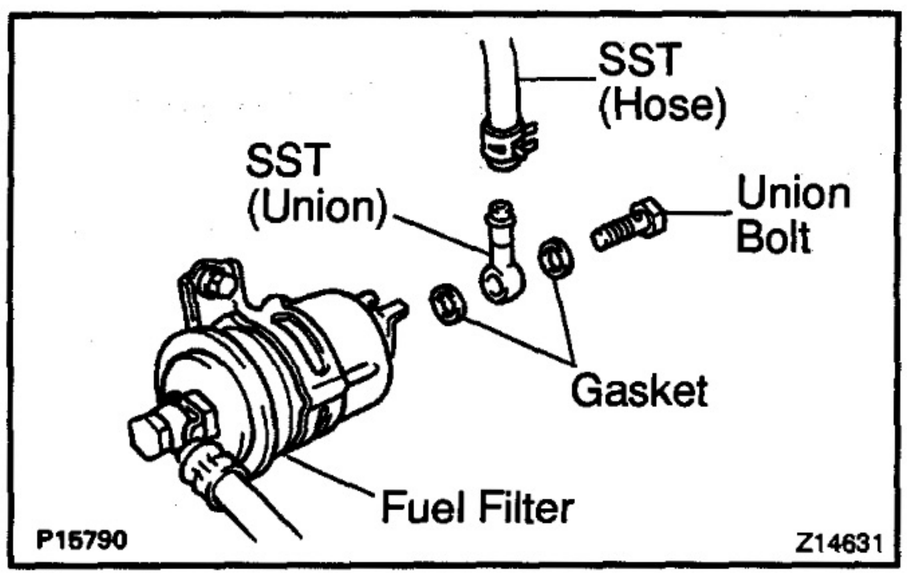
FI0O7–01

INSPECTION

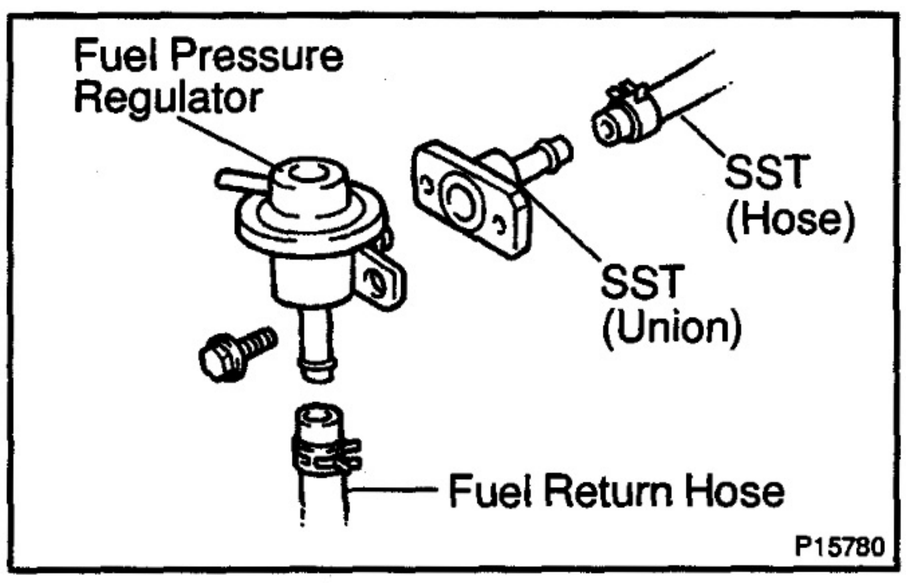
1. INSPECT INJECTOR INJECTION

CAUTION:
Keep injector clean of sparks during the test.

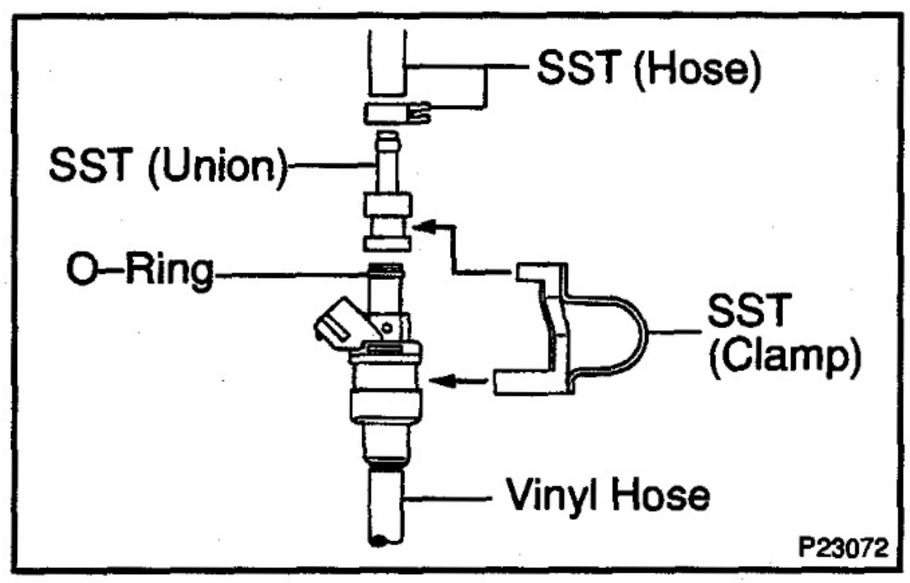




(a) Remove the fuel inlet pipe from the fuel filter outlet.
(b) Connect SST (union and hose) to the fuel filter outlet with the 2 gaskets and union bolt.
SST 09268–41047 (90405–09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

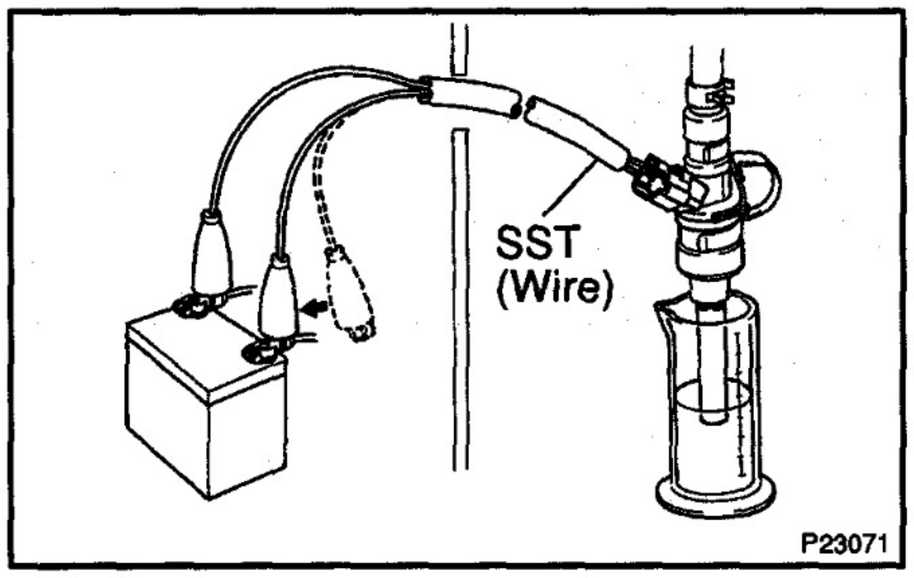


(c) Remove the fuel pressure regulator from the delivery pipe.
(d) Install the O–ring to the fuel inlet of pressure regulator.
(e) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268–41047 (09268–41091)
(f) Connect the fuel return hose to the fuel outlet of the pressure regulator.



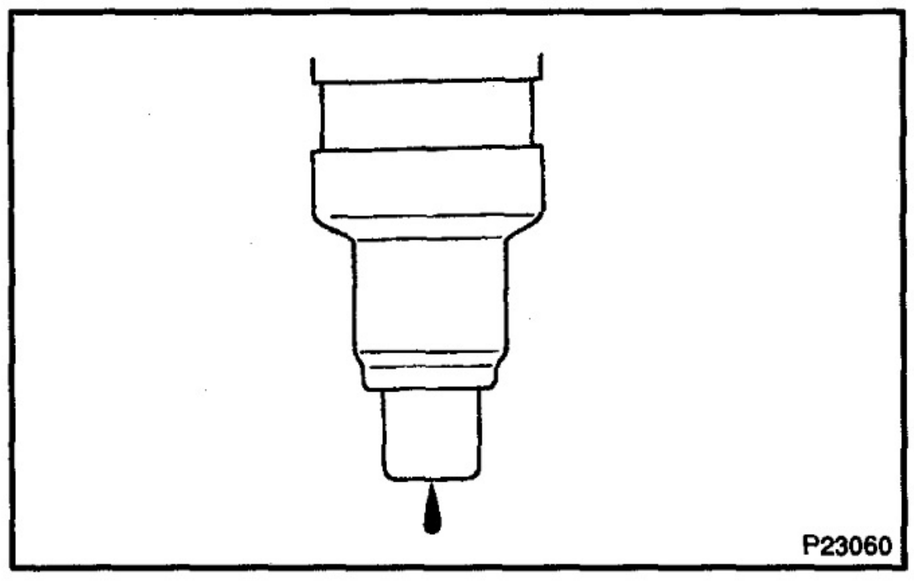
(g) Install the O–ring to the injector.
(h) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41047
(i) Put the injector into a graduated cylinder.

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



(j) 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: 72 – 86 cm³ (4.4 – 5.2 cu in.) per 15 seconds
Difference between each injector:
14 cm³ (0.3 cu in.) or less

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



2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop: 1 drop or less per 3 minutes

(b) Turn the ignition switch to LOCK.

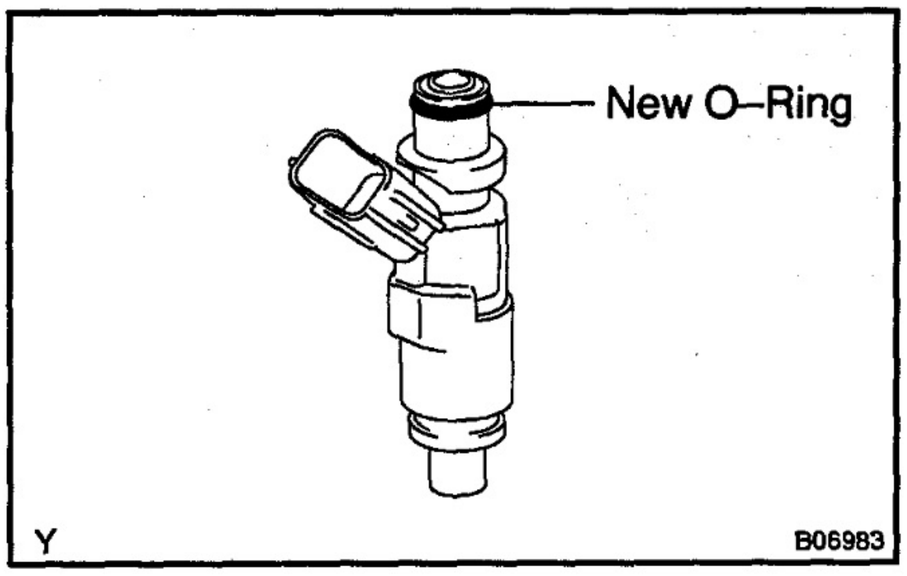
(c) Disconnect the negative (–) terminal cable from the battery.

(d) Remove the SST.
SST 09268–41047, 09843–18020

(e) Install the fuel pressure regulator and fuel inlet pipe.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

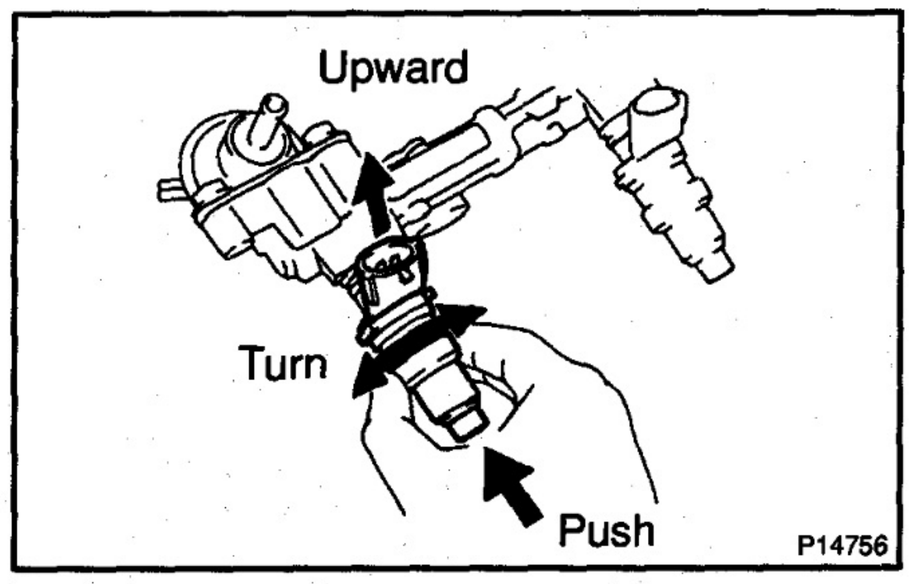
FI0O8–01

INSTALLATION



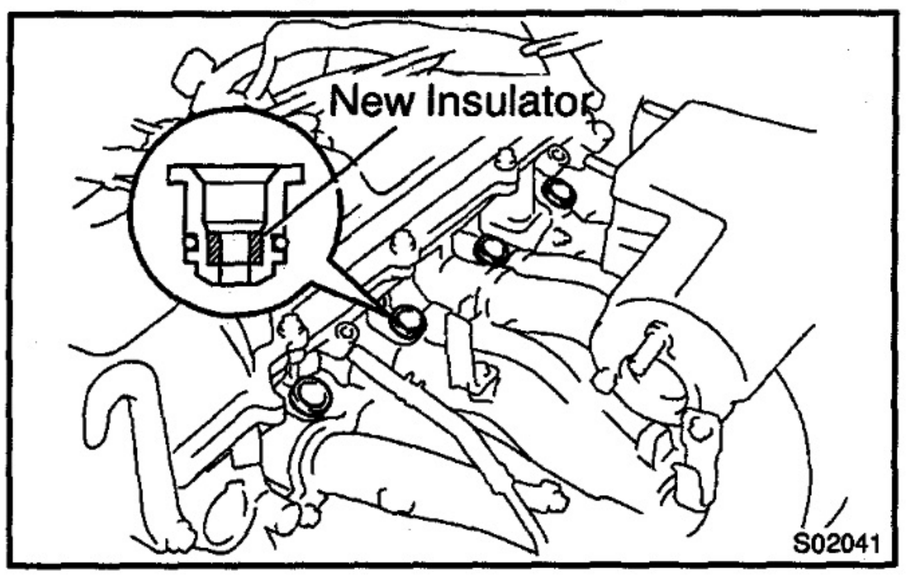
1. INSTALL INJECTORS TO DELIVERY PIPE

(a) Apply a light coat of gasoline to a new O–ring and install it to the injector.



(b) While turning the injector left and right, install it to the delivery pipe. Install the 4 injectors.

(c) Position the injector connector upward.

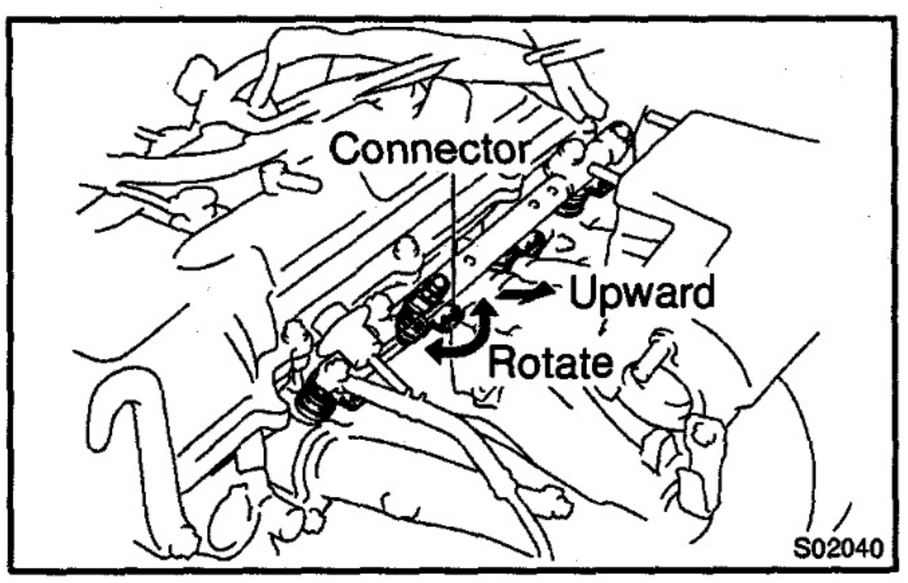


2. INSTALL INJECTORS AND DELIVERY PIPE

(a) Place the 4 new insulators and in position on the spacers.

(b) Place the 4 injectors together with the delivery pipe in position on the cylinder head.

(c) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.



(d) 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.

(e) Position the injector connector upward.

(f) Tighten the 2 bolts holding the delivery pipe to the cylinder head.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(g) Connect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

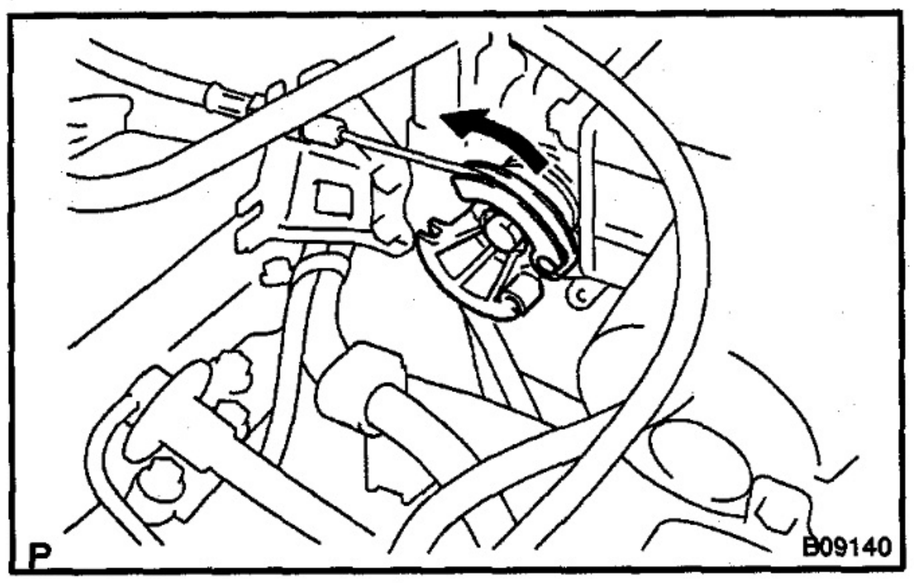
(h) Connect the fuel return hose to the fuel pressure regulator.

(i) Connect the vacuum sensing hose to the fuel pressure regulator.

3. CONNECT ENGINE WIRE

4. INSTALL THROTTLE BODY

(See page FI–32)



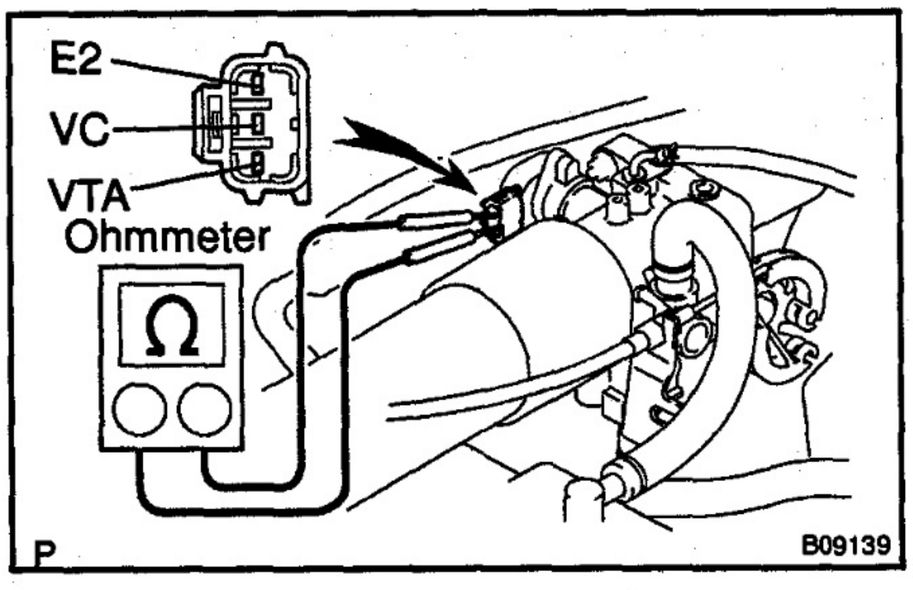
THROTTLE BODY

FI0C9–01

ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

Check that the throttle linkage moves smoothly.



2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Apply vacuum to the throttle opener.

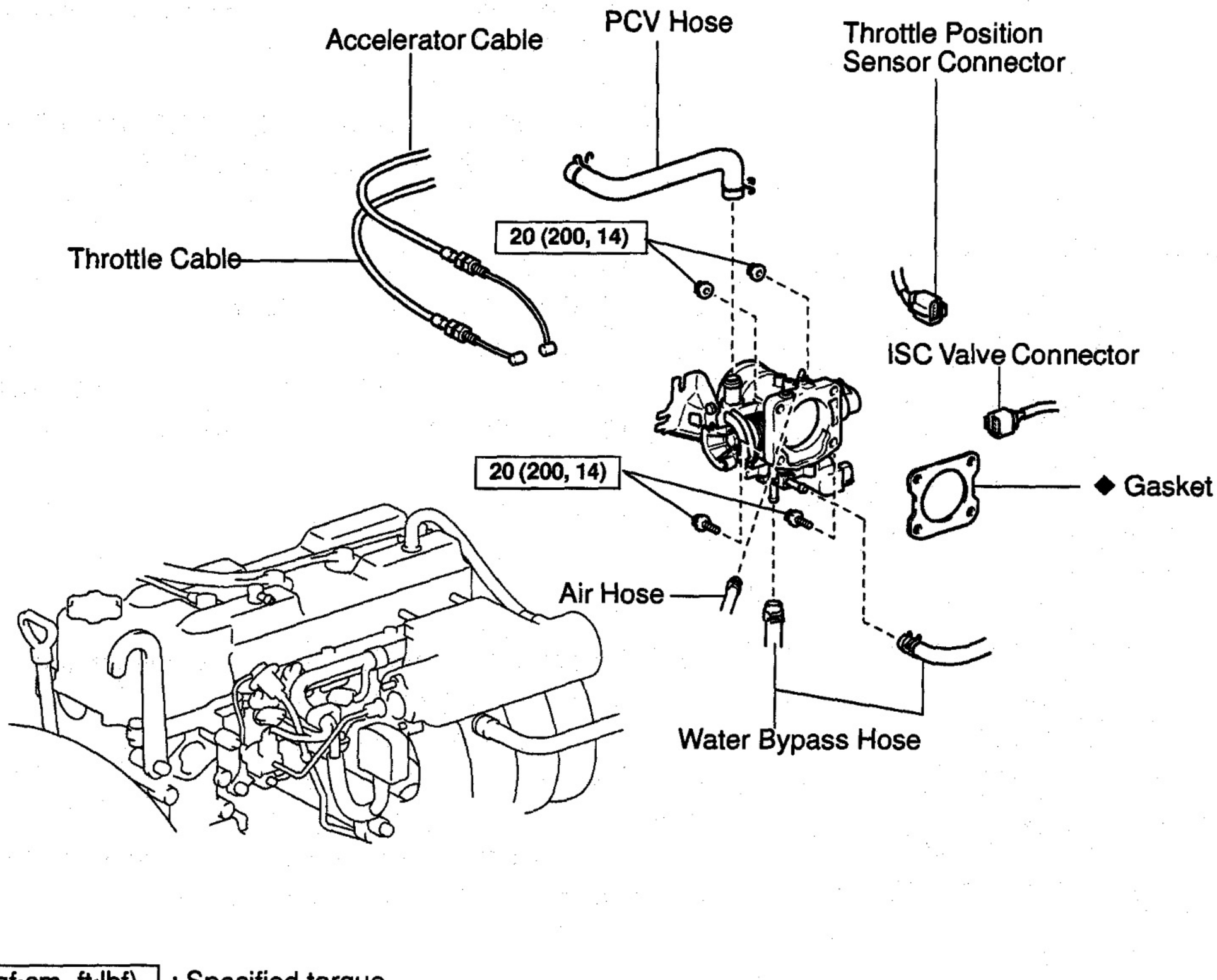
(c) Using an ohmmeter, measure the resistance between each terminal.

Throttle valve condition	Between terminals	Resistance
Fully closed	VTA – E2	0.2 – 5.7 kΩ
Fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

(d) Connect the sensor connector.

FI0OA–01

COMPONENTS



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

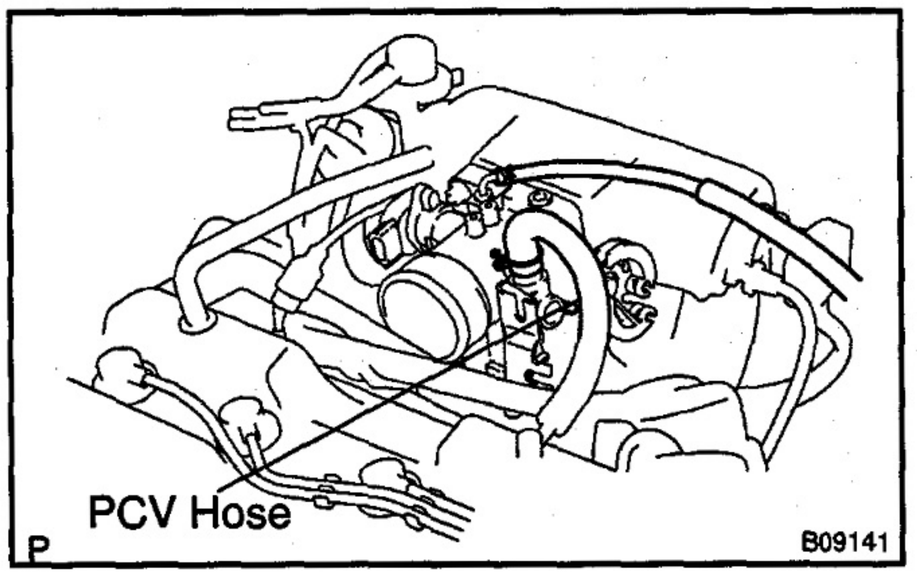
◆ Non–reusable part

B09143

FI0OS–01

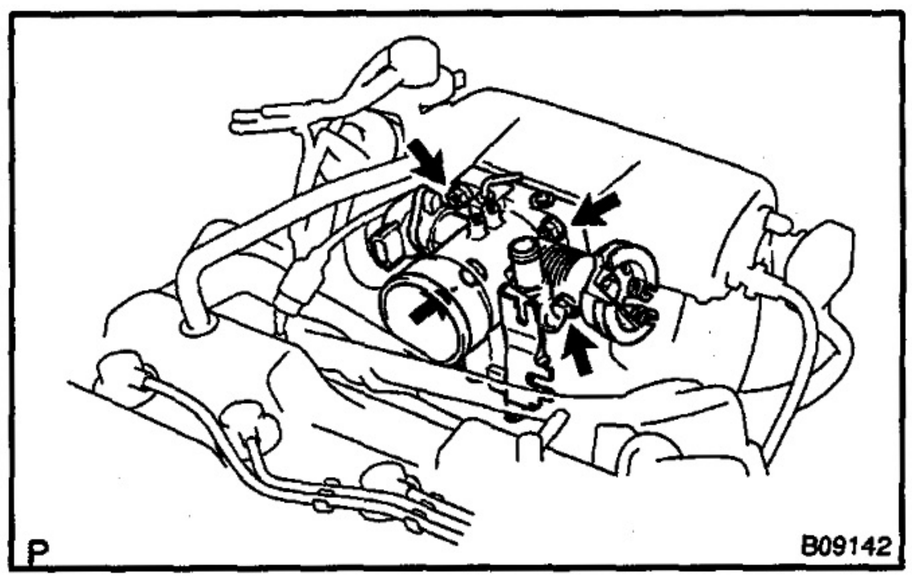
REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **(M/T)**
   DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY
3. **(A/T)**
   DISCONNECT ACCELERATOR AND THROTTLE CABLES FROM THROTTLE BODY



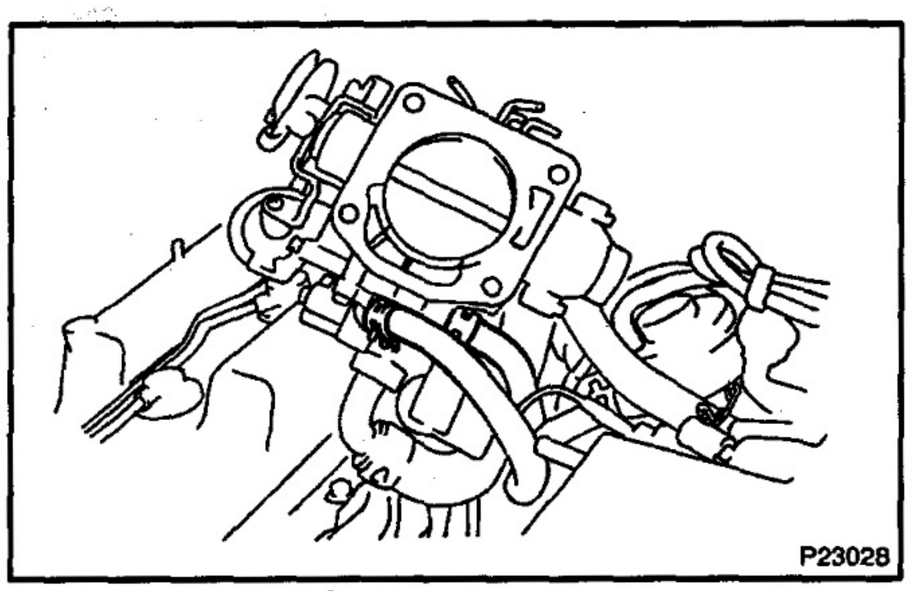
4. **REMOVE PCV HOSE**
5. **REMOVE THROTTLE BODY**

(a) Disconnect the air hose.
(b) Disconnect the throttle position sensor connector.
(c) Disconnect the ISC valve connector.



(d) Remove the 2 bolts, 2 nuts, and disconnect the throttle body form the air intake chamber.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
(e) Remove the throttle body gasket.

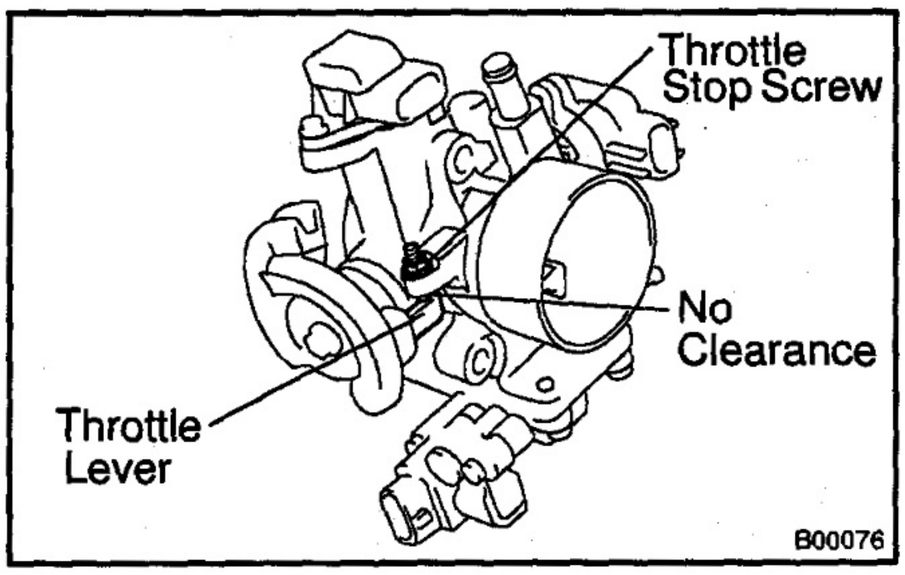
HINT:
At the time of installation please to the following items.
Install the throttle body with a new gasket.



(f) Disconnect the water bypass hoses from the throttle body, and remove the throttle body.

6. **REMOVE AIR HOSE FROM ISC VALVE**

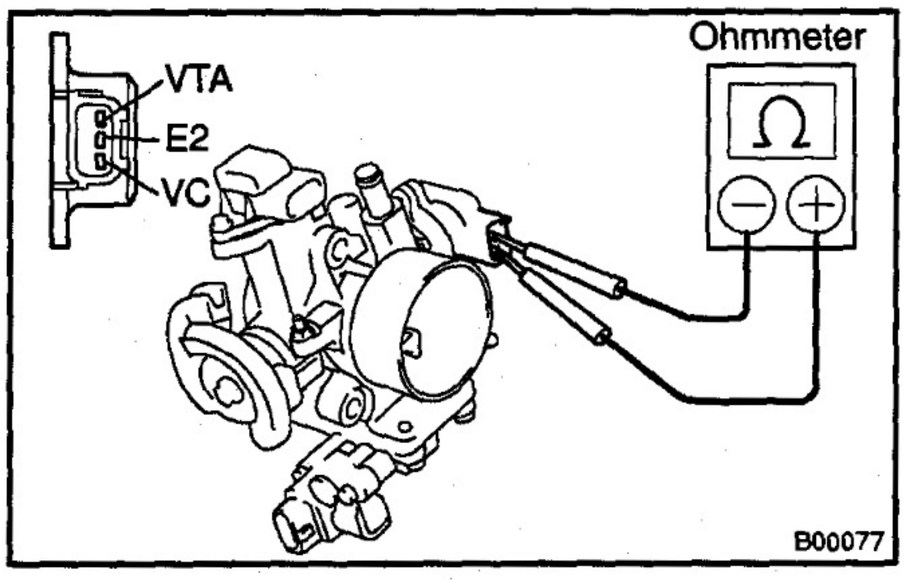
FI0OC–01



INSPECTION

1. INSPECT THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the closed throttle position.



2. INSPECT THROTTLE POSITION SENSOR

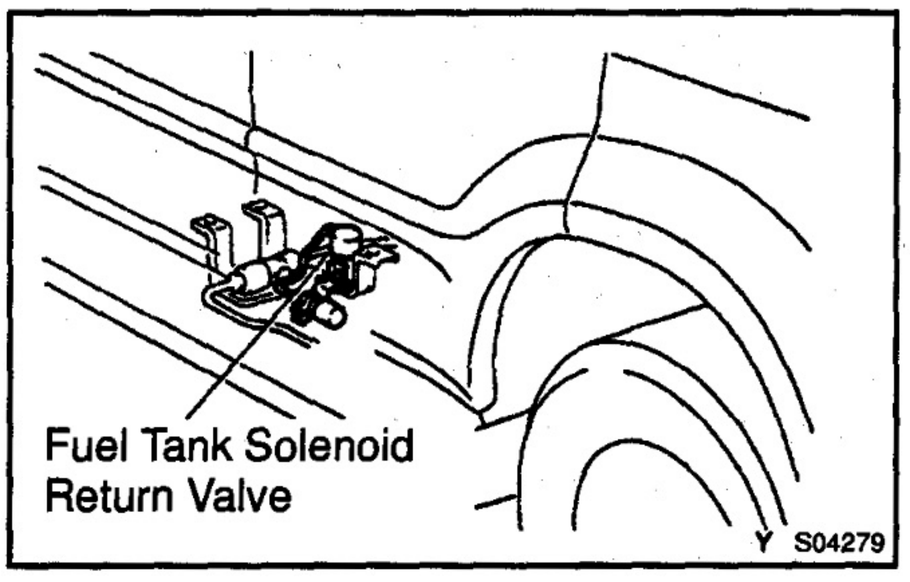
Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

FI0OD–01

INSTALLATION

Installation is in the reverse order of removal (See page FI–30).



FUEL TANK SOLENOID RETURN VALVE

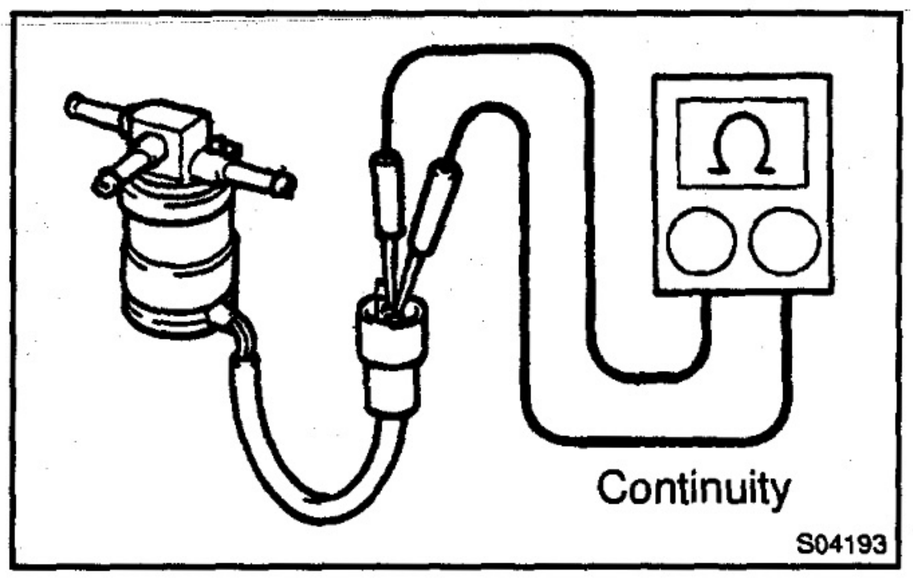
INSPECTION

F10OH-01

1. REMOVE FUEL TANK SOLENOID RETURN VALVE

(a) Disconnect the 2 fuel hoses from the fuel tank solenoid return valve.

(b) Remove the bolt and fuel tank solenoid return valve.

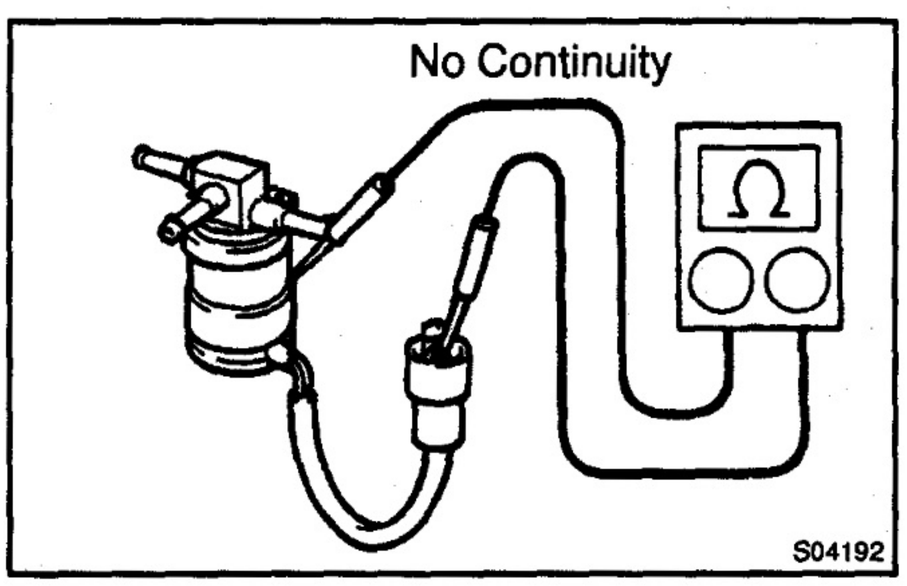


2. INSPECT FUEL TANK SOLENOID RETURN VALVE

(a) Using an ohmmeter, check that there is continuity between the terminals.

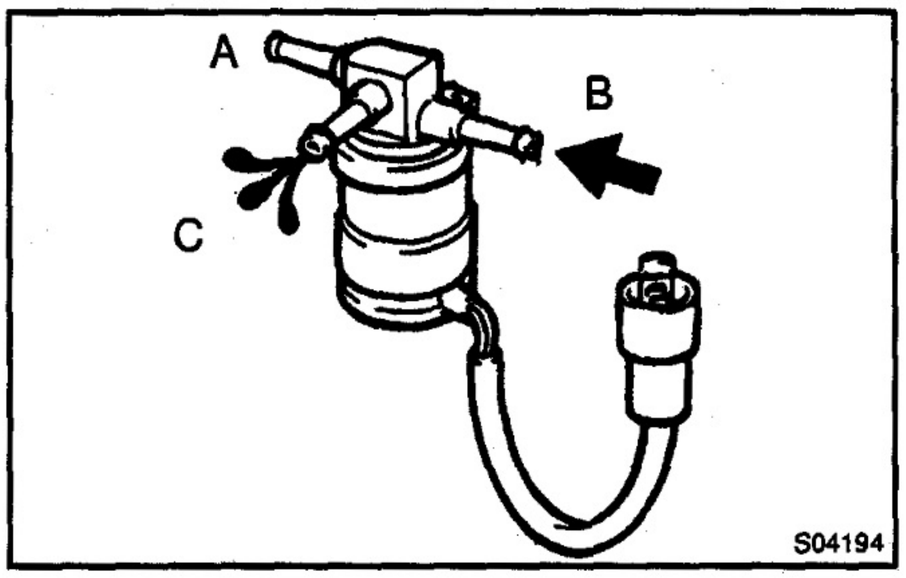
Resistance: At 20 °C (68 °F): 33 – 39 Ω

If there is no continuity, replace the fuel tank solenoid return valve.

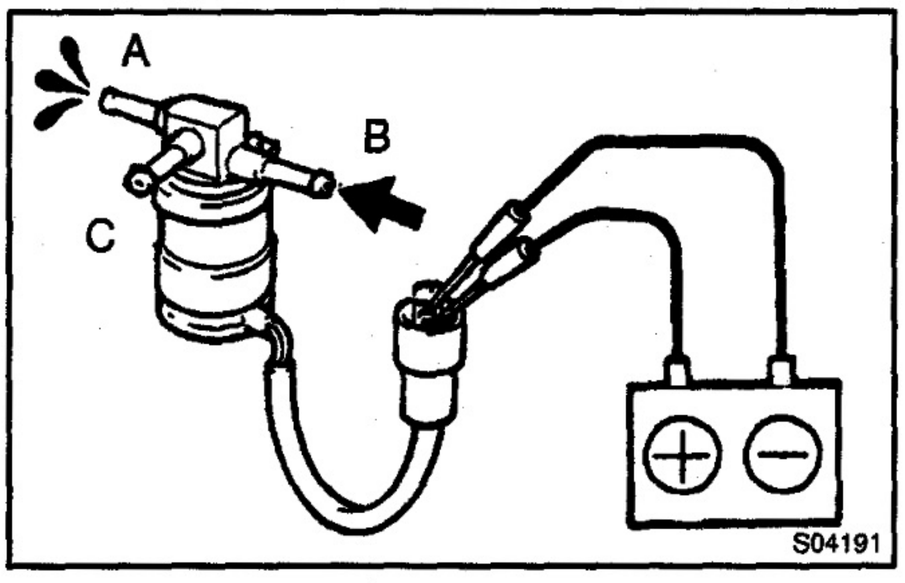


(b) Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the fuel tank solenoid return valve.



(c) Check that air flows from ports B to C.



(d) Apply battery positive voltage across the terminals.

(e) Check that air flows from ports B to A.

If operation is not as specified, replace the fuel tank solenoid return valve.

3. REINSTALL FUEL TANK SOLENOID RETURN VALVE

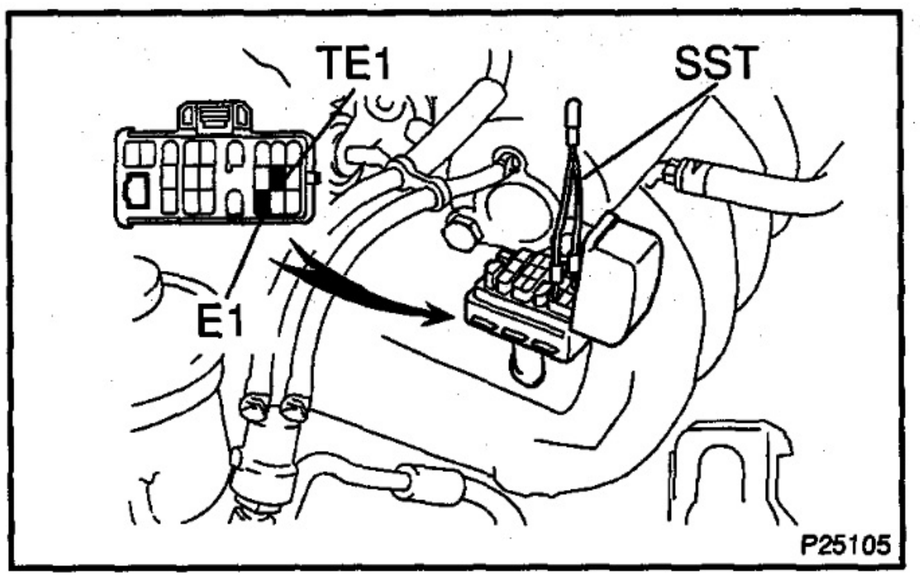
IDLE SPEED CONTROL (ISC) VALVE

FI0OE-01

ON–VEHICLE INSPECTION

INSPECT ISC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed check correctly
- Transmission in neutral position



(b) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020

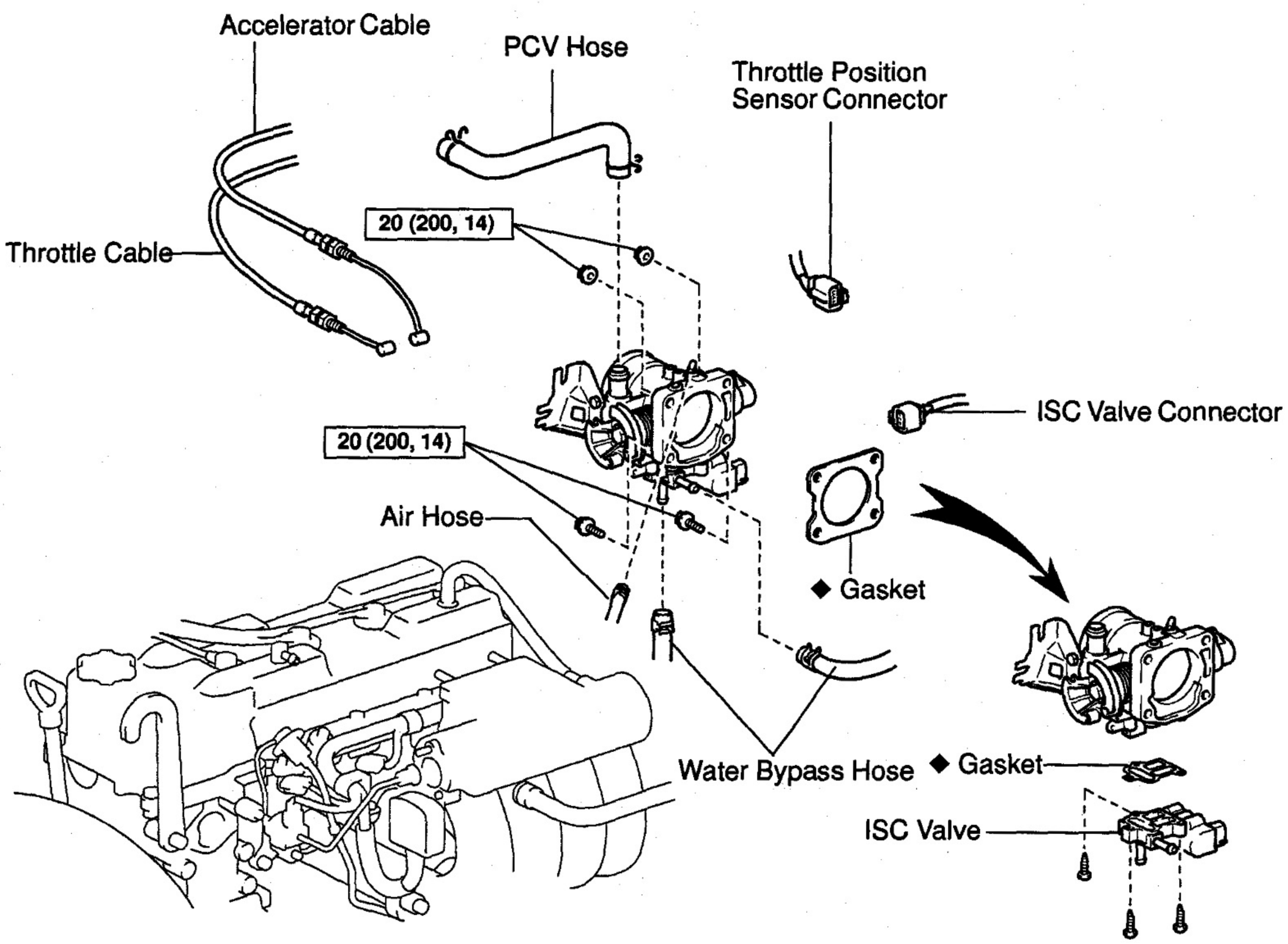
(c) After engine speed are kept at 1,000 – 1,500 rpm for 5 seconds, check that they return to idle speed.

If the engine speed operation is as specified, check ISC valve, wiring and ECU.

(d) Remove the SST
SST 09843–18020

FI0OF–01

COMPONENTS

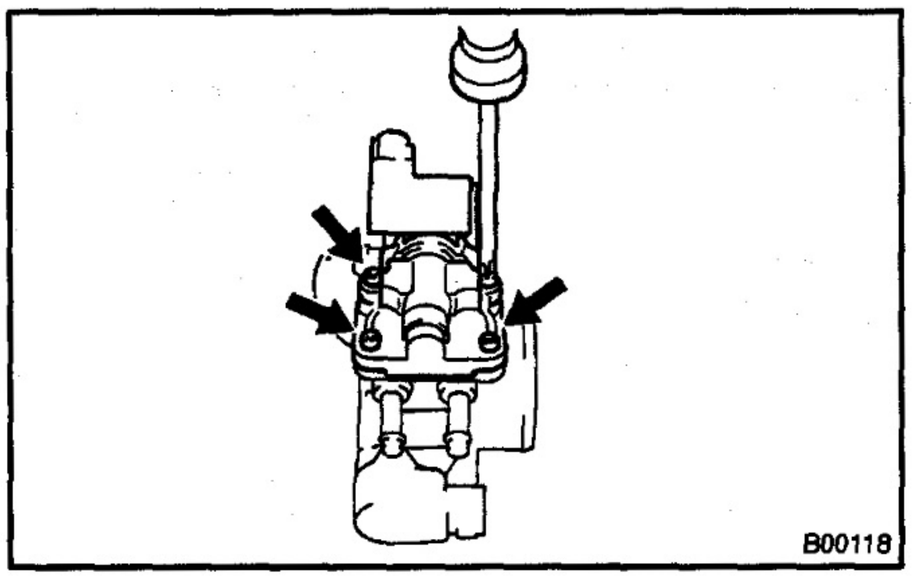


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

B09144

SF09W–02

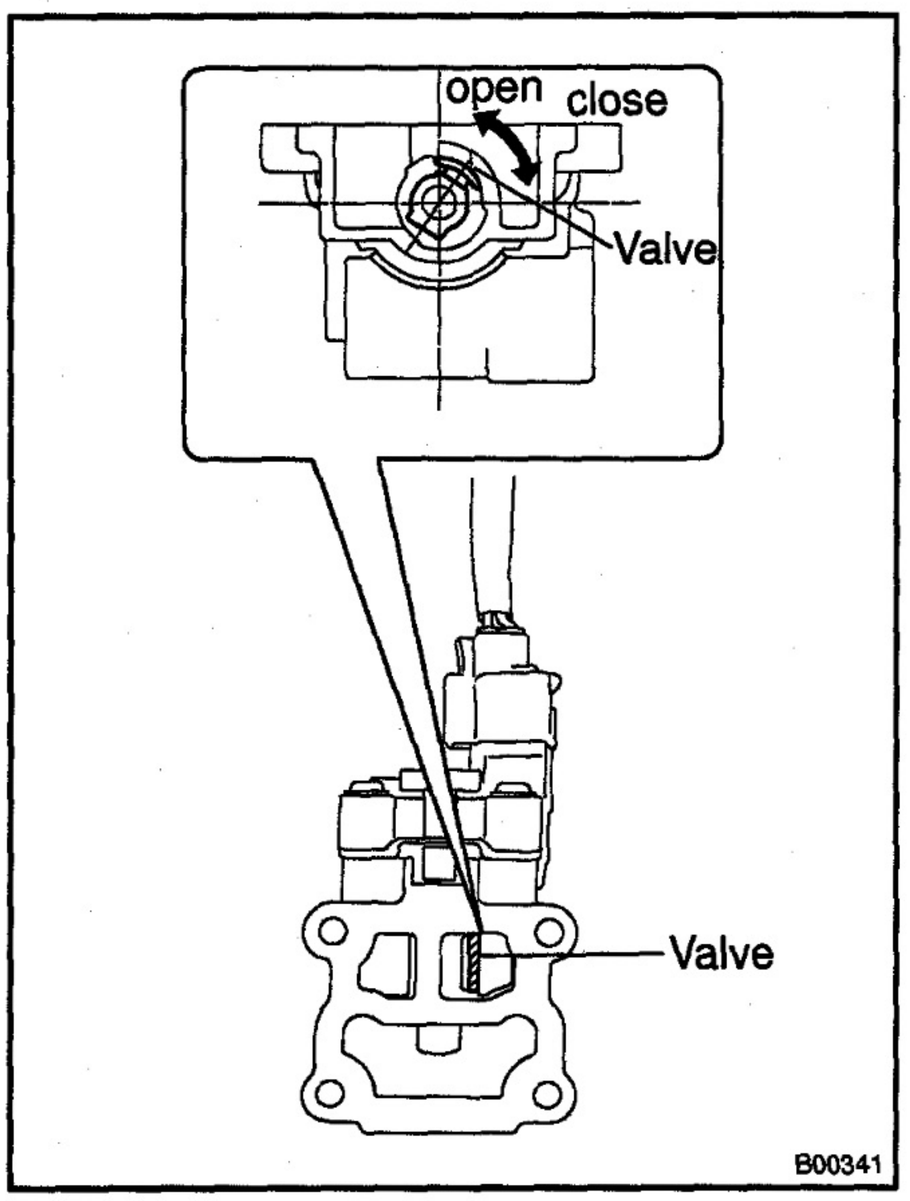


REMOVAL

1. **REMOVE THROTTLE BODY**
   (See page FI–30)
2. **REMOVE IAC VALVE**

Remove the 4 screws, ISC valve and gasket.

SF09X–03



INSPECTION

INSPECT ISC VALVE OPERATION

(a) Check that the ISC valve is half opened.
(b) Connect the ISC valve connector to the ISC valve.
(c) Disconnect the water temperature sensor connector from the water temperature sensor.
(d) Turn the ignition switch ON.
(e) Check that the ISC valve moves.

HINT:

Repeat connecting and disconnecting of ISC valve connector several times and check the operation of the valve.

If operation is not as specified, replace the ISC valve.

(f) Turn the ignition switch OFF.
(g) Connect the water temperature sensor connector to the water temperature sensor.
(h) Disconnect the ISC valve connector from the ISC valve.

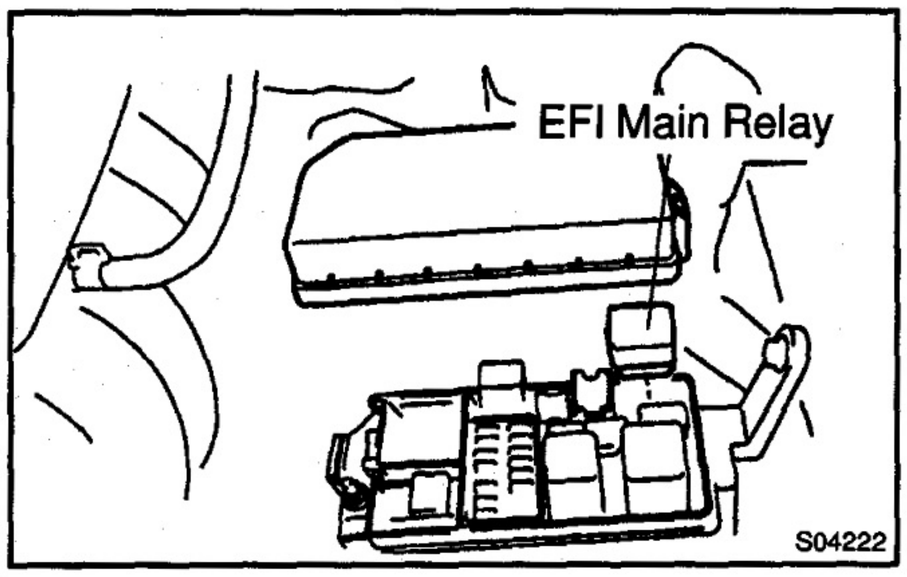
FI0CG-01

INSTALLATION

Installation is in the reverse order of removal (See page FI–36)

HINT:

Install the ISC valve with a new gasket.

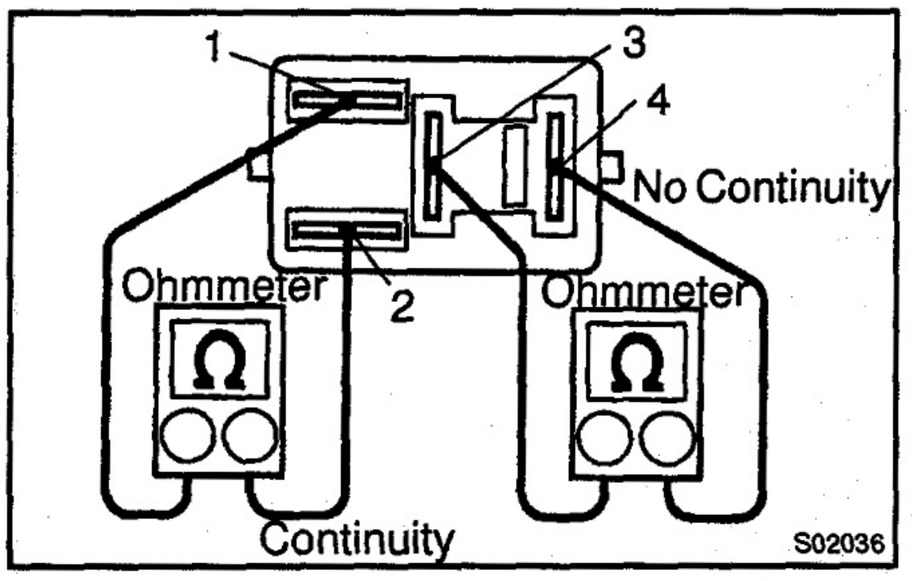


EFI MAIN RELAY

INSPECTION

FI0CJ-01

1. REMOVE EFI MAIN RELAY (Marking: EFI)



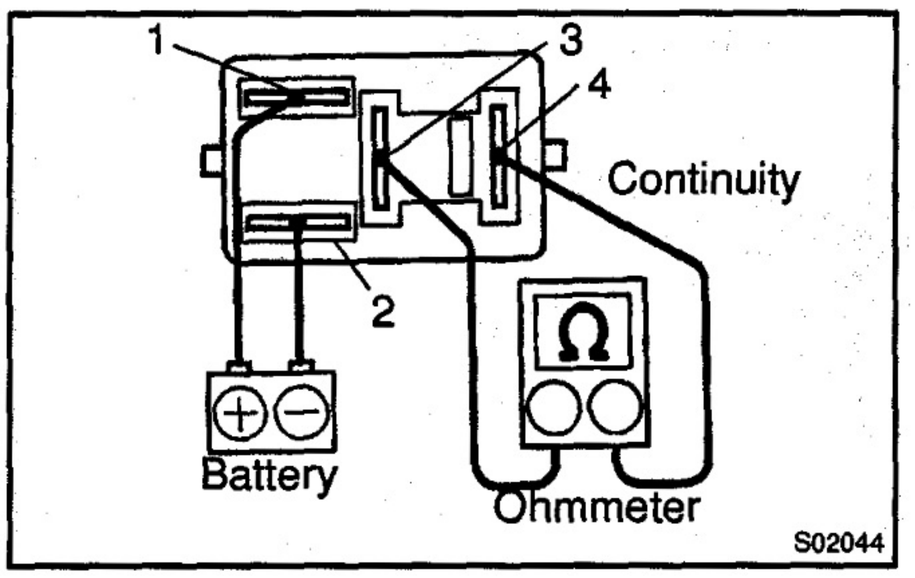
2. INSPECT EFI MAIN RELAY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.



(c) Apply battery positive voltage across terminals 1 and 2.

(d) Using an ohmmeter, check that there is continuity between terminals 3 and 4.

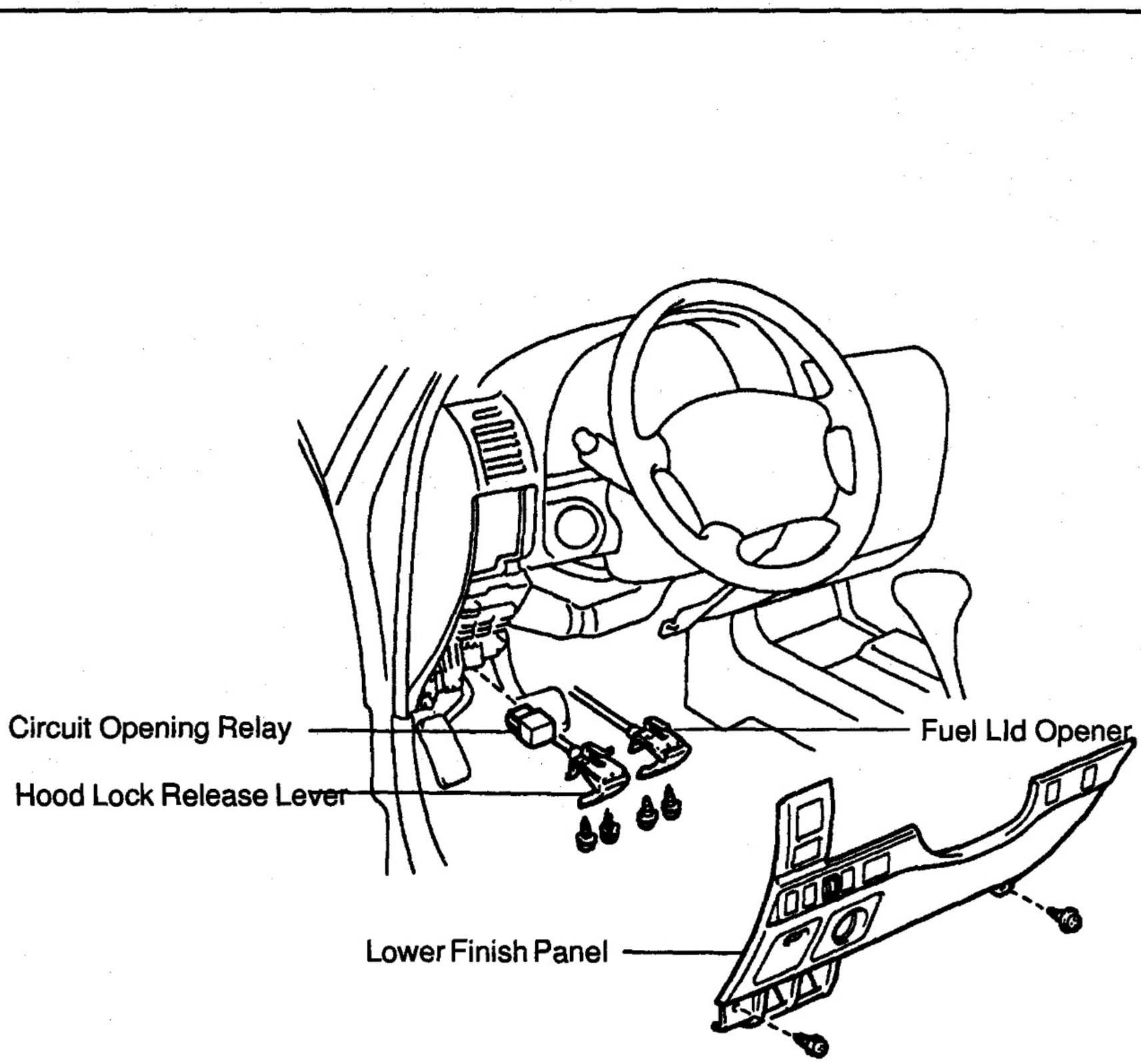
If operation is not as specified, replace the relay.

3. REINSTALL EFI MAIN RELAY

CIRCUIT OPENING RELAY

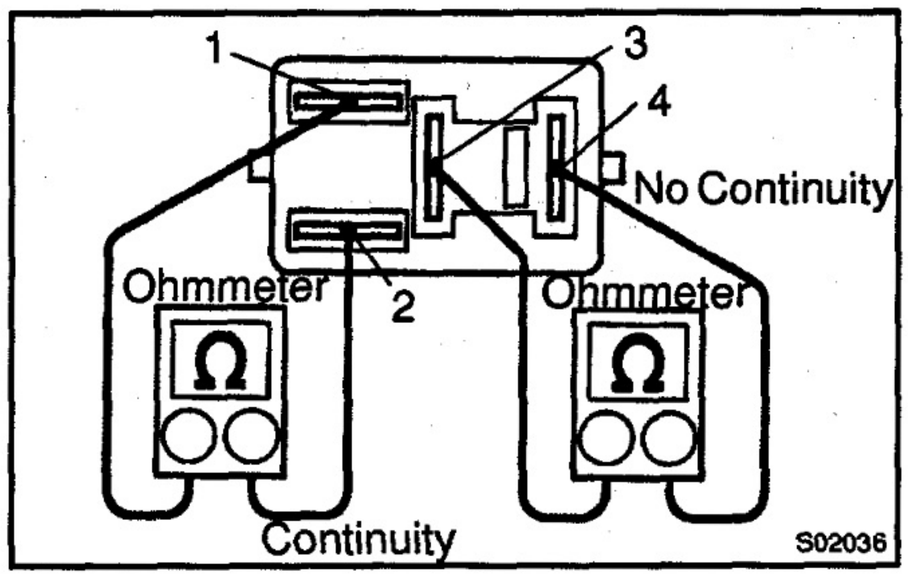
COMPONENTS

FI0CK–01



S04182

FI0OL-01



INSPECTION

1. REMOVE CIRCUIT OPENING RELAY

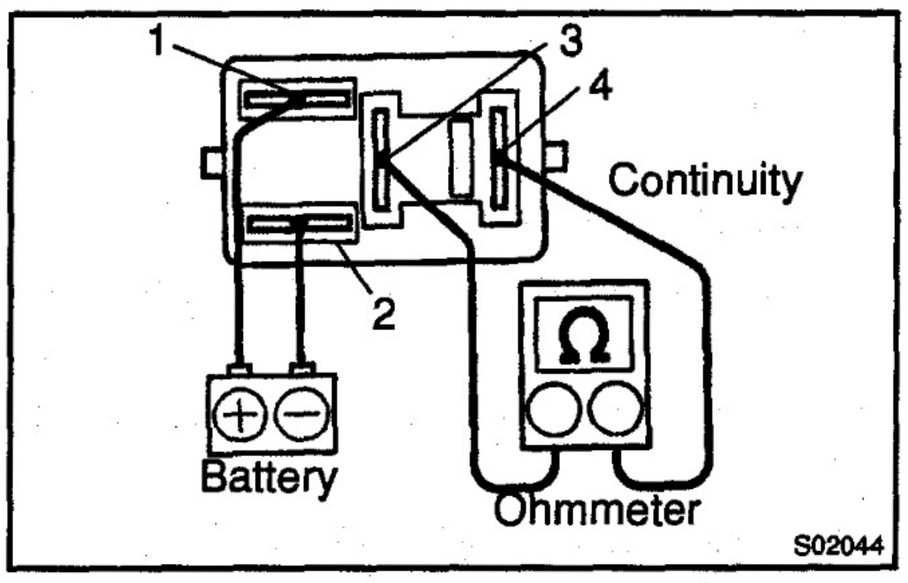
2. INSPECT CIRCUIT OPENING RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 4.

If there continuity, replace the relay.



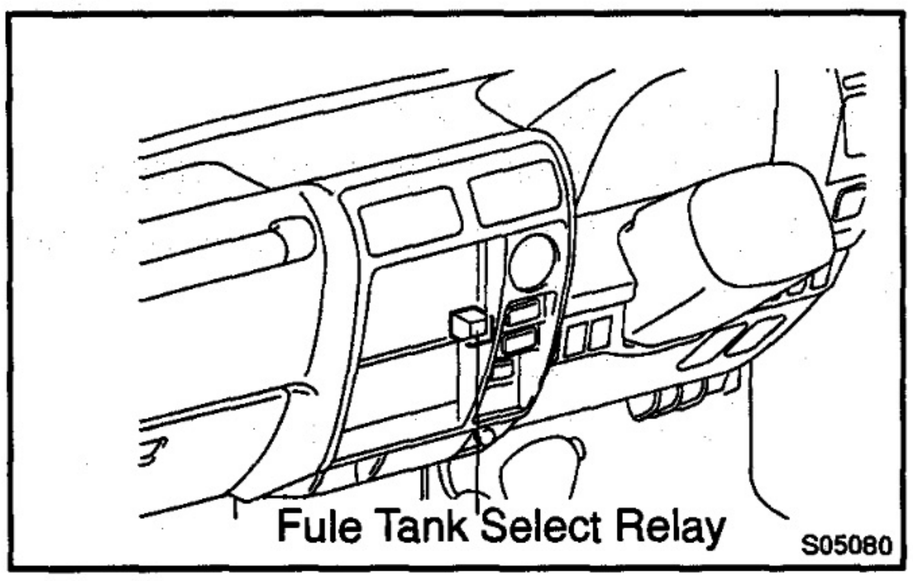
3. INSPECT CIRCUIT OPENING RELAY OPERATION

(a) Apply battery positive voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

4. REINSTALL CIRCUIT OPENING RELAY



FUEL TANK SELECT RELAY

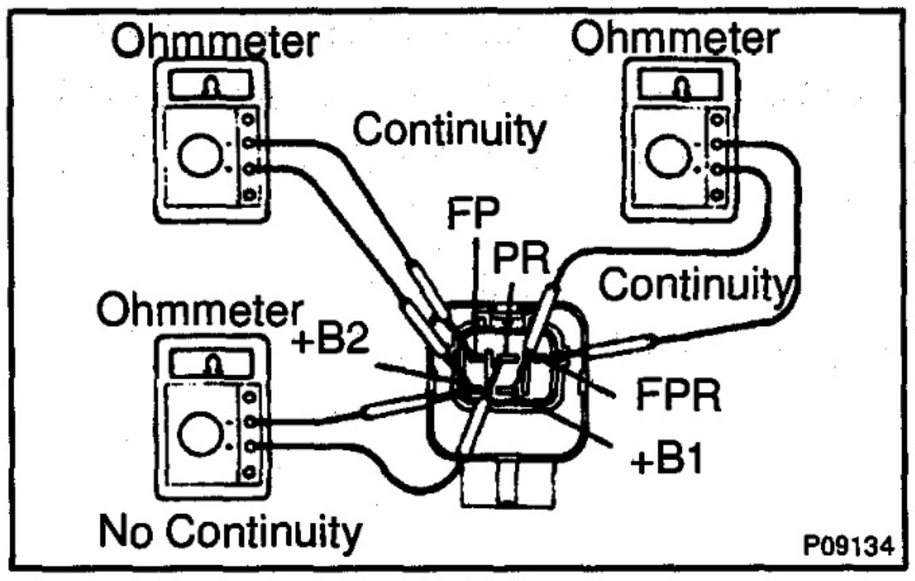
FI000-01

INSPECTION

1. REMOVE FUEL TANK SELECT RELAY

(a) Disconnect fuel tank select relay connector.

(b) Remove the bolt and fuel tank select relay.



2. INSPECT FUEL TANK SELECT RELAY

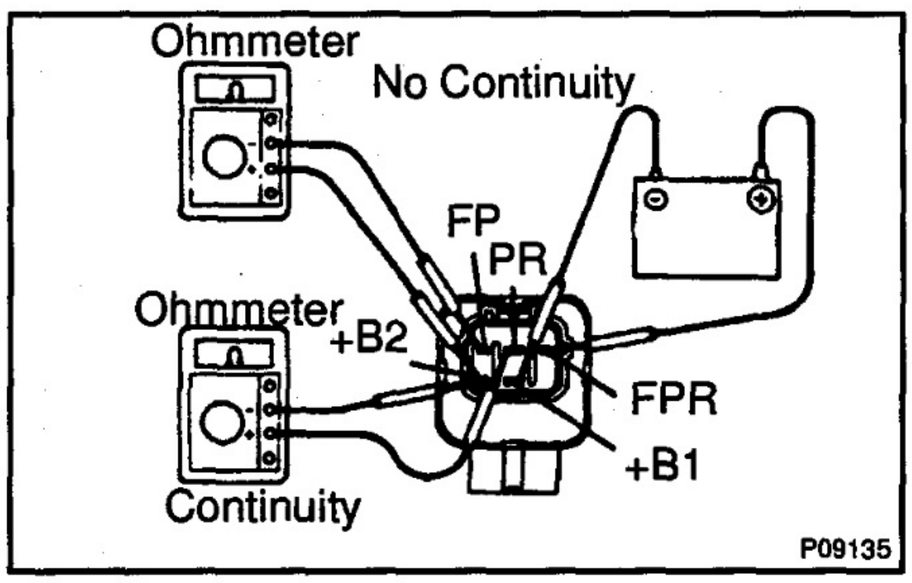
(a) Inspect relay continuity.

(1) Using an ohmmeter, check that continuity exists between terminals +B1 and FPR.

(2) Check that continuity exists between terminals +B2 and FR.

(3) Check that no continuity exists between terminals +B2 and PR.

If continuity is not as specified, replace the relay.



(b) Inspect relay operation.

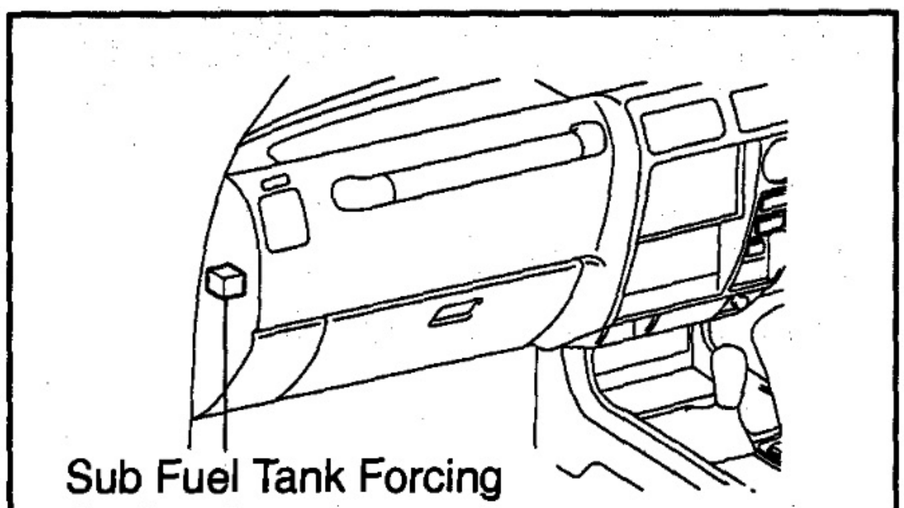
(1) Apply battery voltage across terminals +B1 and FPR.

(2) Using an ohmmeter, check that no continuity exists between the +B2 and FP.

(3) Check that continuity exits between terminals +B2 and PR.

If operation is not as specified, replace the relay.

3. INSTALL FUEL TANK SELECT RELAY

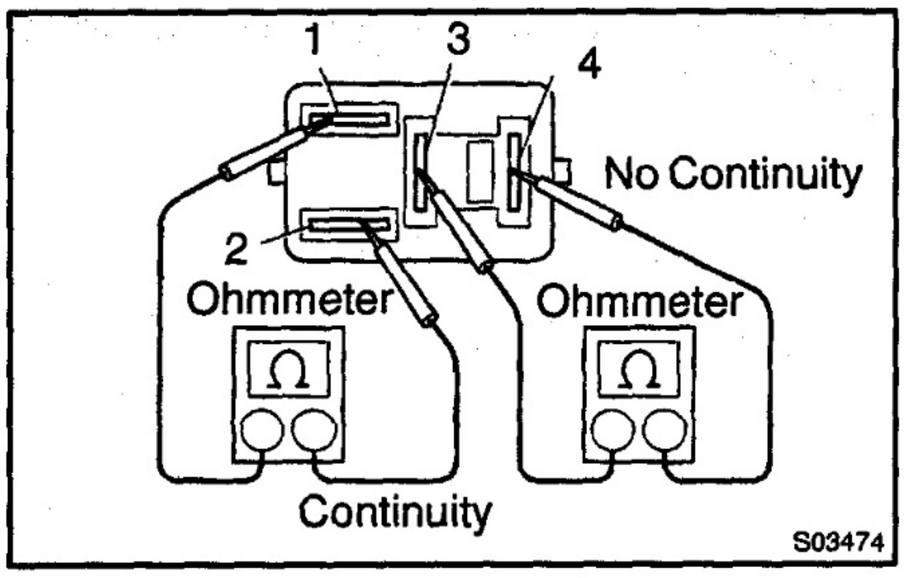


SUB FUEL TANK FORCING DRIVING RELAY

INSPECTION

FI0ON–01

1. REMOVE SUB FUEL TANK FORCING DRIVING RELAY



2. INSPECT SUB FUEL TANK FORCING DRIVING RELAY

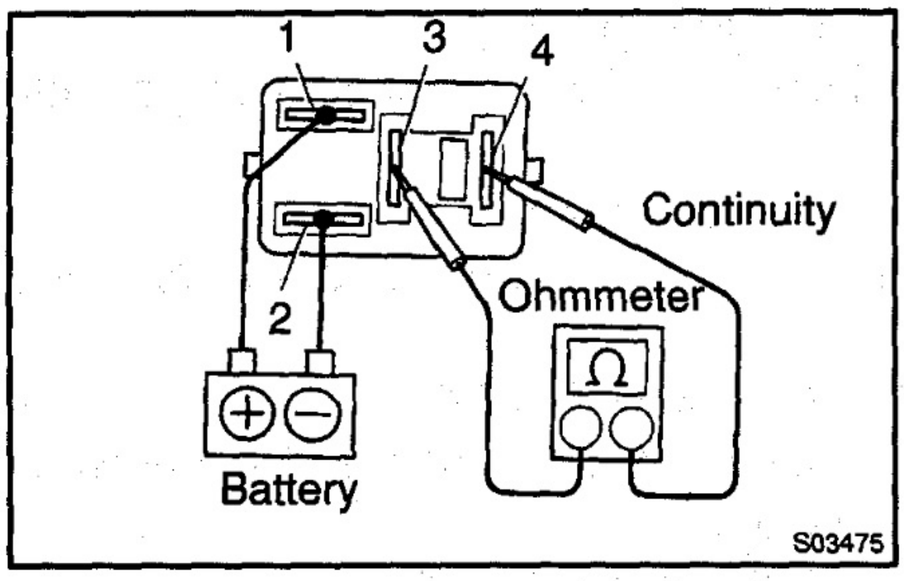
(a) Inspect relay continuity.

(1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(2) Check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.



(b) Inspect relay operation.

(1) Apply battery positive voltage across terminals 1 and 2.

(2) Using an ohmmeter, check that there is continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

3. INSTALL SUB FUEL TANK FORCING DRIVING RELAY

WATER TEMPERATURE SENSOR

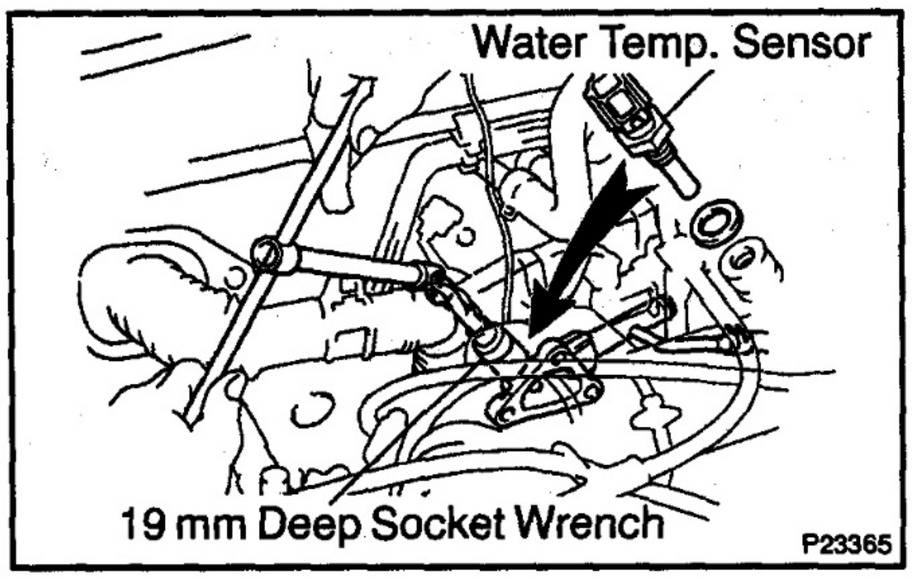
FI0OM-01

INSPECTION

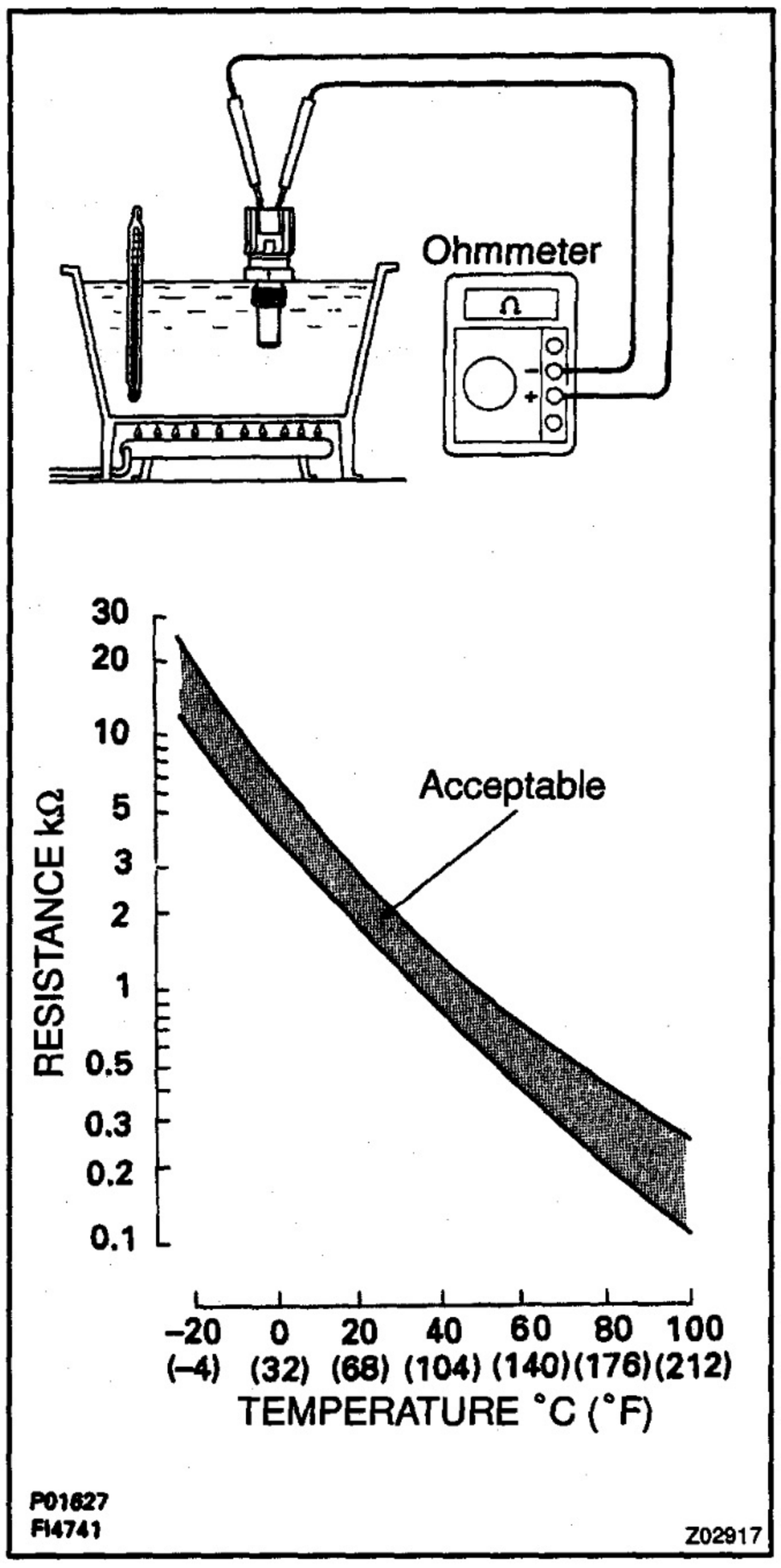
1. DRAIN ENGINE COOLANT

2. REMOVE WATER TEMP. SENSOR

(a) Disconnect the water temp. sensor connector.



(b) Using a 19 mm deep socket wrench, remove the water temp. sensor and gasket.



3. INSPECT WATER TEMP. SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the water temp. sensor.

4. REINSTALL WATER TEMP. SENSOR

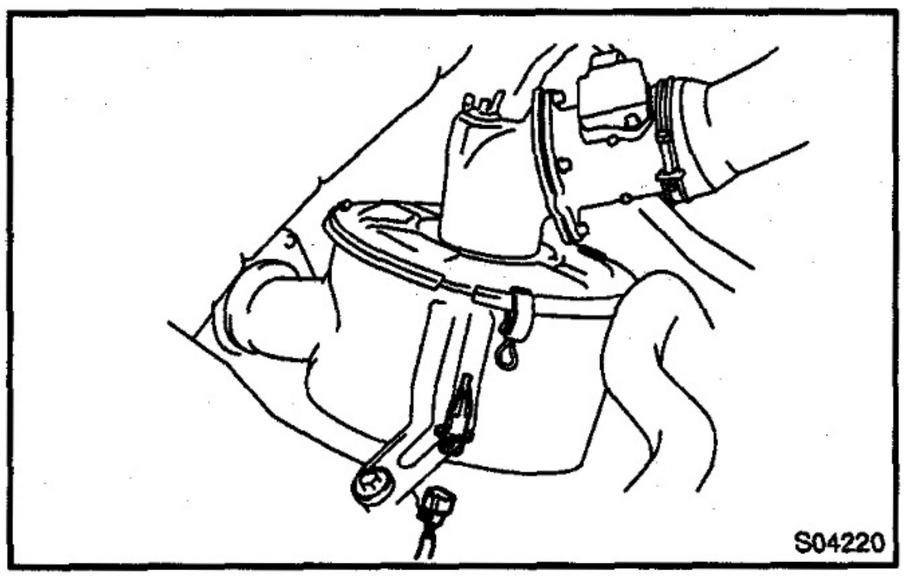
(a) Using a 19 mm deep socket wrench, install the water temp. sensor and gasket.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Connecter temp. the water temp. sensor connector.

(c) Install the engine wire protector to the 3 brackets.

5. REFILL ENGINE COOLANT



S04220

INTAKE AIR TEMPERATURE SENSOR

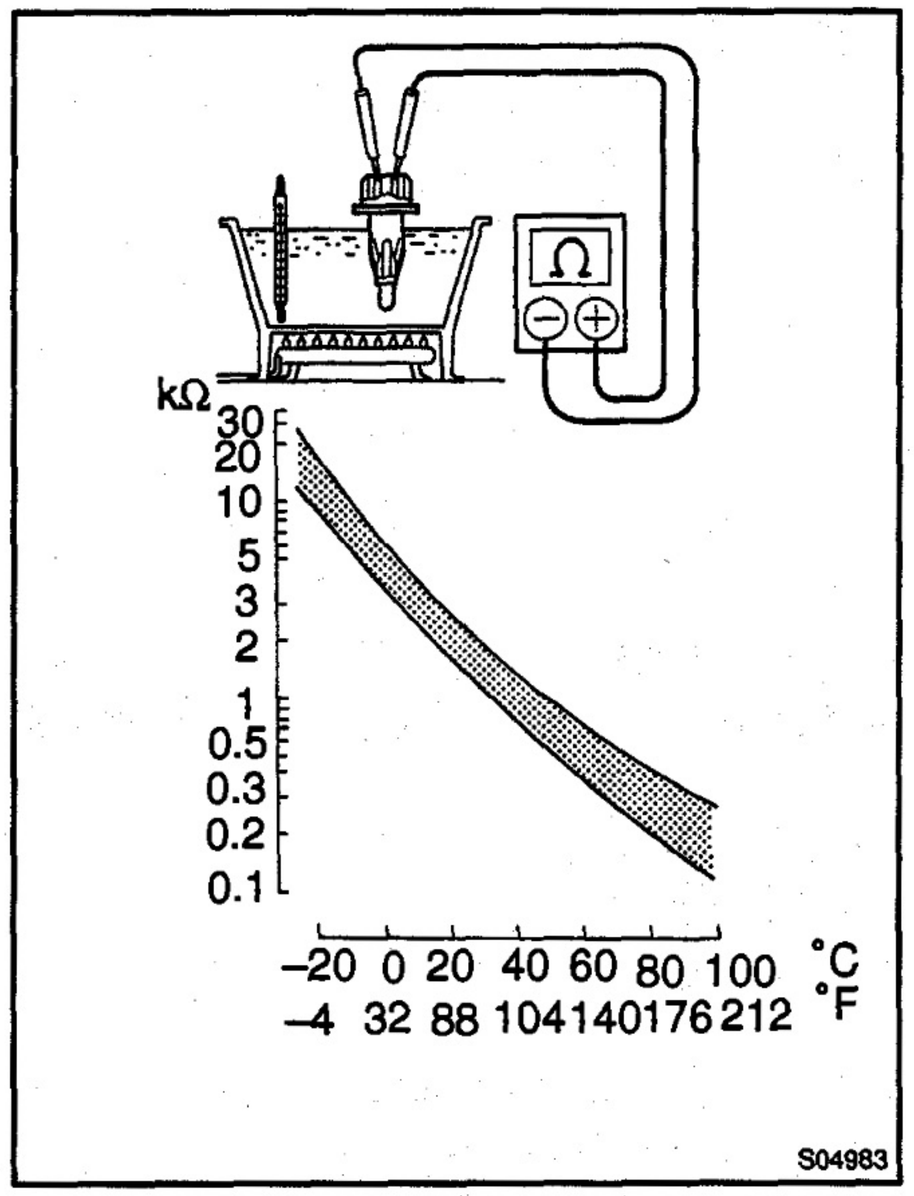
FI0OP–01

INSPECTION

1. REMOVE INTAKE AIR TEMP. SENSOR

(a) Disconnect the connector.

(b) Pull out the intake air temp. sensor.



S04983

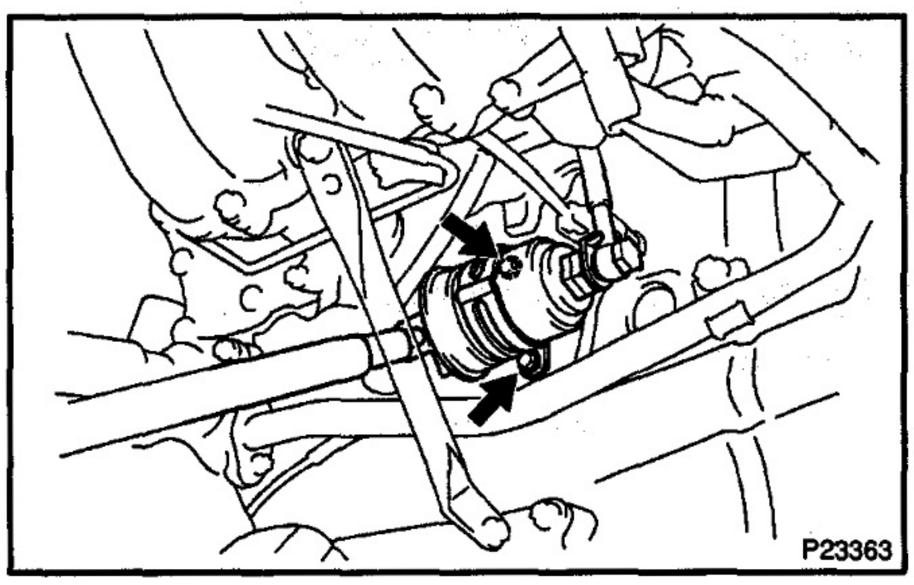
2. INSPECT INTAKE AIR TEMP. SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the intake air temp. sensor.

3. INSTALL INTAKE AIR TEMP. SENSOR



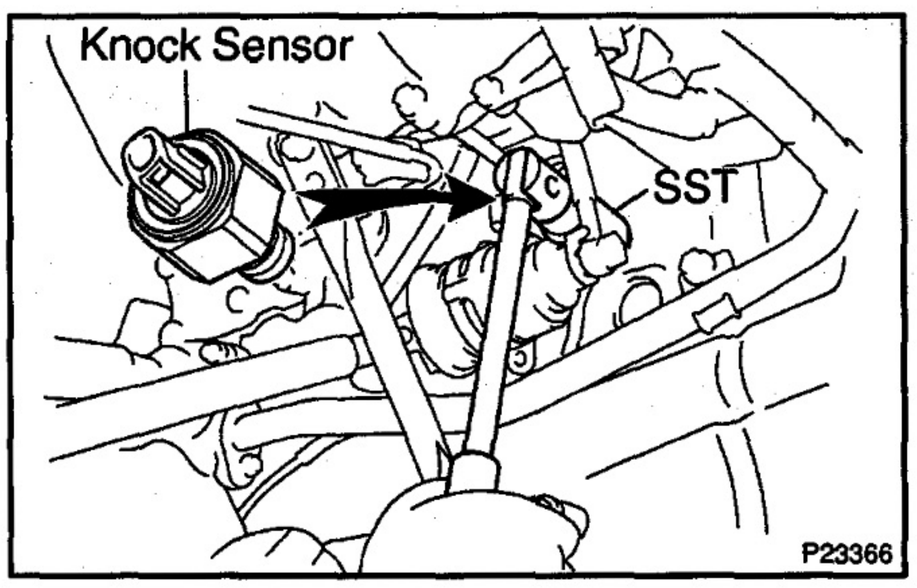
KNOCK SENSOR

FI001-01

INSPECTION

1. REMOVE STARTER

2. REMOVE FUEL FILTER SET BOLTS

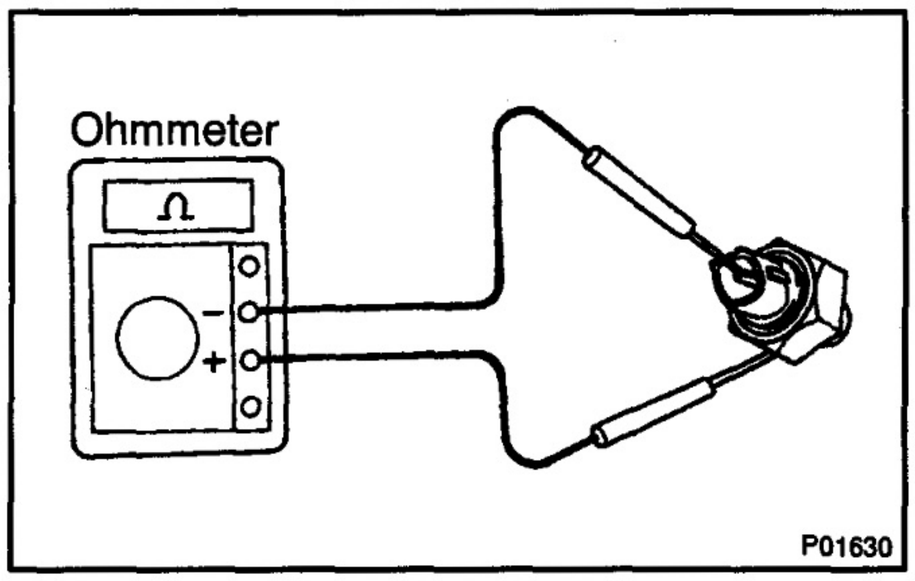


3. REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connector.

(b) Using SST, remove the knock sensor.

SST 09816–30010



4. INSPECT KNOCK SENSOR

Using an ohmmeter, check that there is no continuity between the terminal and body.

If there is continuity, replace the sensor.

5. INSTALL KNOCK SENSOR

(a) Using SST, install the knock sensor.

SST 09816–30010

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Connect the knock sensor connector.

6. INSTALL FUEL FILTER SET BOLTS

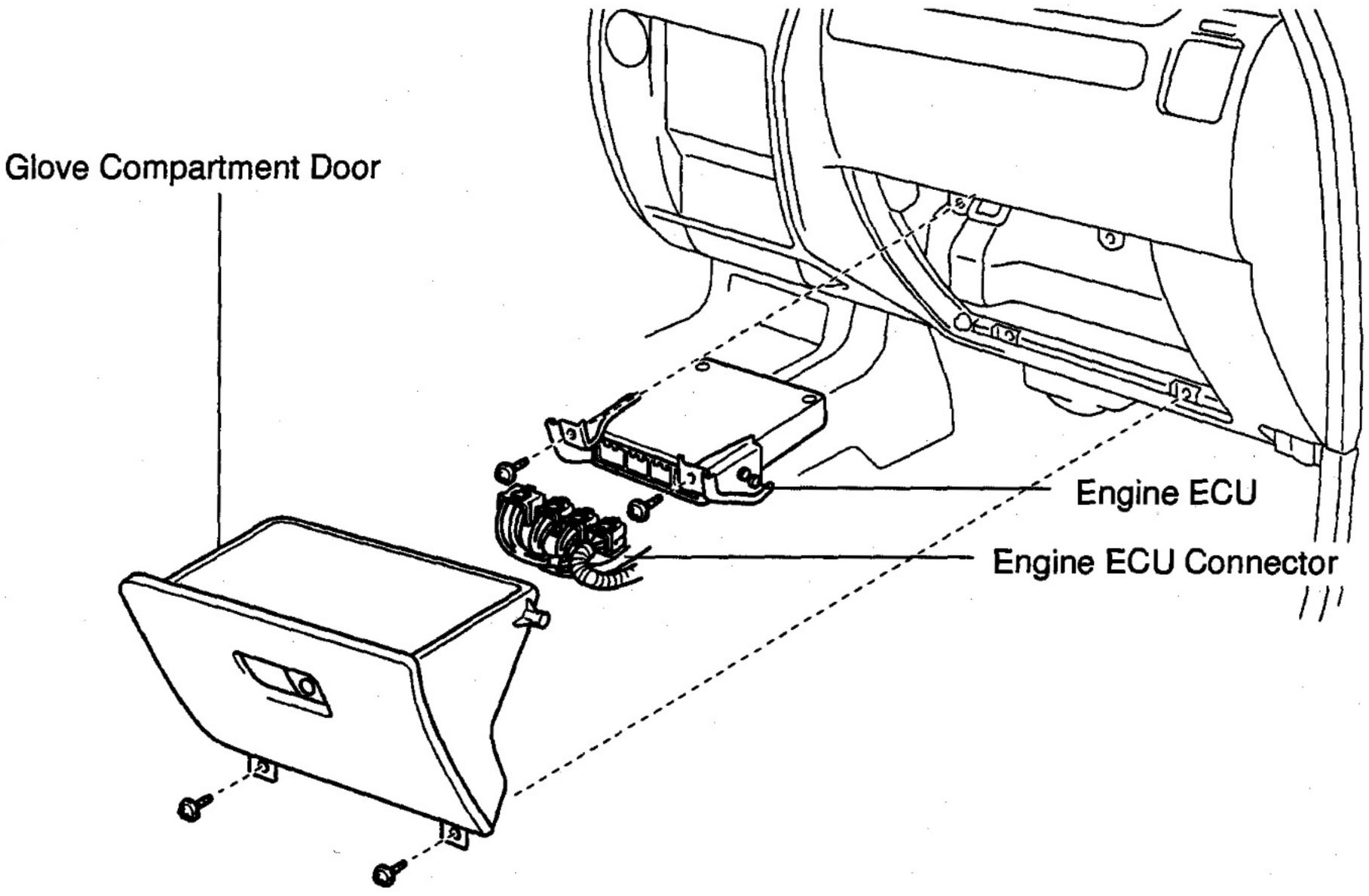
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

7. INSTALL STARTER

ENGINE ECU

COMPONENTS

FI0CC-01



S04393

FI0OR–01

INSPECTION

1. REMOVE ENGINE ECU
2. INSPECT ENGINE ECU (See page DI–18)
3. REINSTALL ENGINE ECU

FUEL CUT RPM

FI0OS-02

INSPECTION

1. WARM UP ENGINE

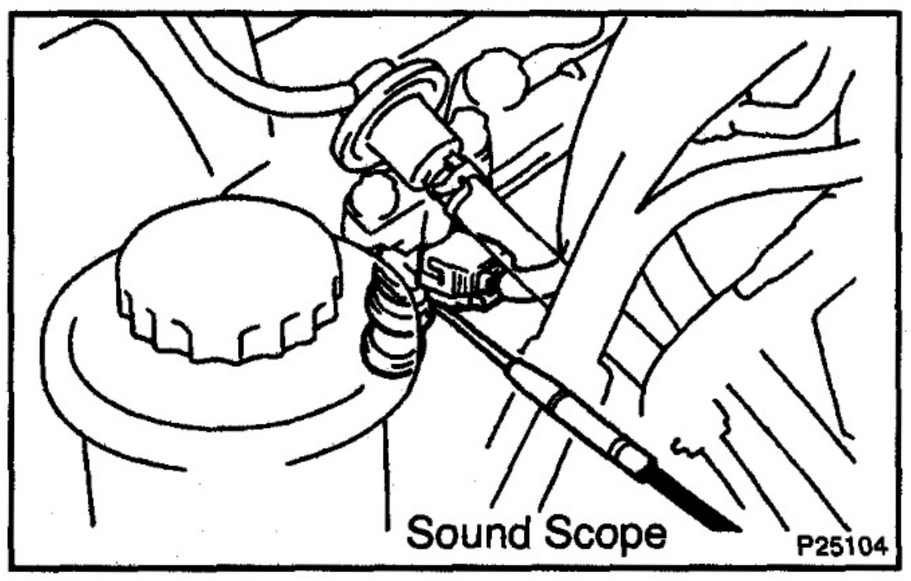
Allow the engine to warm up to normal operating temperature.

2. CONNECT TACHOMETER TO ENGINE

Connect the teat probe of a tachometer to terminal IG (–) of the check connector.

NOTICE:

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



3. INSPECT FUEL CUT OFF RPM

(a) Increase the engine speed to at least 3,500 rpm.
(b) Using a sound scope, check for injector operating noise.
(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT:

Measure with the A/C OFF.

Fuel return rpm:
M/T: 1,400 rpm
A/T: 1,500 rpm

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

IGNITION

IGNITION SYSTEM IG–1
IGNITION COIL IG–4

REFER TO 3RZ–F, 3RZ–FE ENGINE REPAIR MANUAL (Pub. No. RM521E)

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

IGNITION SYSTEM

ON–VEHICLE INSPECTION

IG0F0-01

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. INSPECT IGNITOR AND SPARK TEST

Check that the spark occurs.

(1) Disconnect the high–tension cords from the spark plugs.
(2) Remove the spark plugs.
(3) Install the spark plugs to each high–tension cord.
(4) Ground the spark plug.
(5) Check if spark occurs while engine is being cranked.

NOTICE:

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as follows:

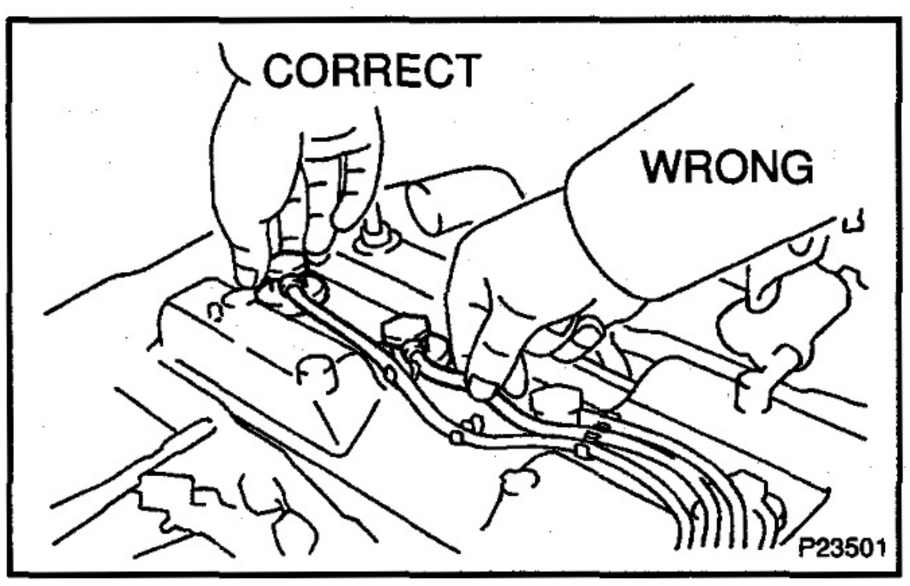
SPARK TEST
↓ NO
CHECK CONNECTION OF IGNITION COIL AND IGNITER → BAD → Connect securely.
↓ OK
CHECK RESISTANCE OF HIGH–TENSION CORD (See step 2.)
Maximum resistance; 25 kΩ per cord → BAD → Replace the cord(s).
↓ OK
CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER
1. Turn ignition switch to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.
→ BAD → Check wiring between ignition switch to ignition coil and igniter.
↓ OK
CHECK RESISTANCE OF IGNITION COIL (See step 4.)

Resistance:	Cold	Hot
Secondary	9.7 – 16.7 kΩ	12.4 – 19.6 kΩ

→ BAD → Replace the ignition coil.
↓ OK
CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR
(See Pub. No. RM521E on page IG–7)

Resistance:	Cold	Hot
NE⊕ and NE⊖	1,630 – 2,740 Ω	2,065 – 3,225 Ω

→ BAD → Replace the crankshaft position sensor.
↓ OK
CHECK IGT SIGNAL FROM ENGINE ECU (See page DI–49) → BAD → Check wiring between engine ECU, ignition coil with igniter, and then try another engine ECU.
↓
TRY ANOTHER IGNITER



2. INSPECT HIGH–TENSION CORDS

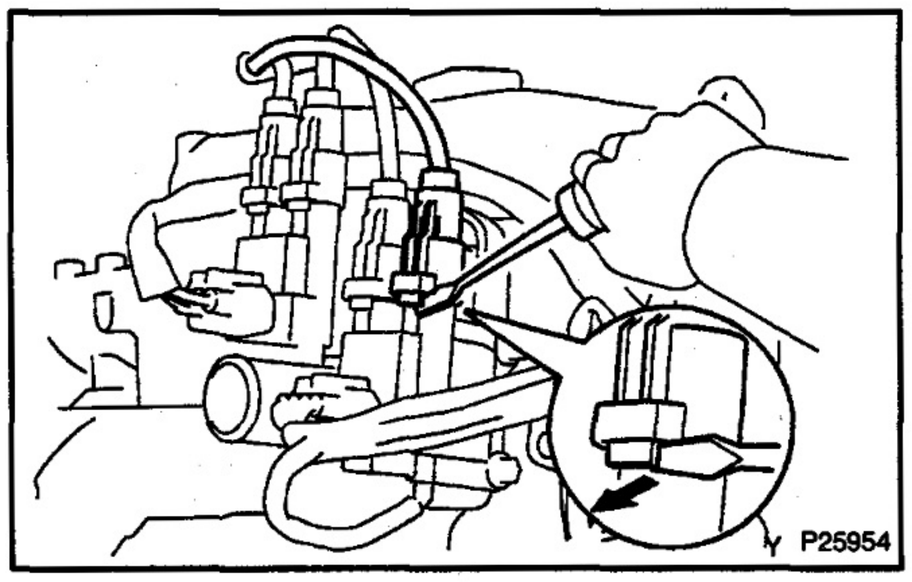
(a) Remove the air cleaner cap and MAF meter assembly.

(b) Remove the intake air connector.

(c) Disconnect the high–tension cords from the spark plugs.

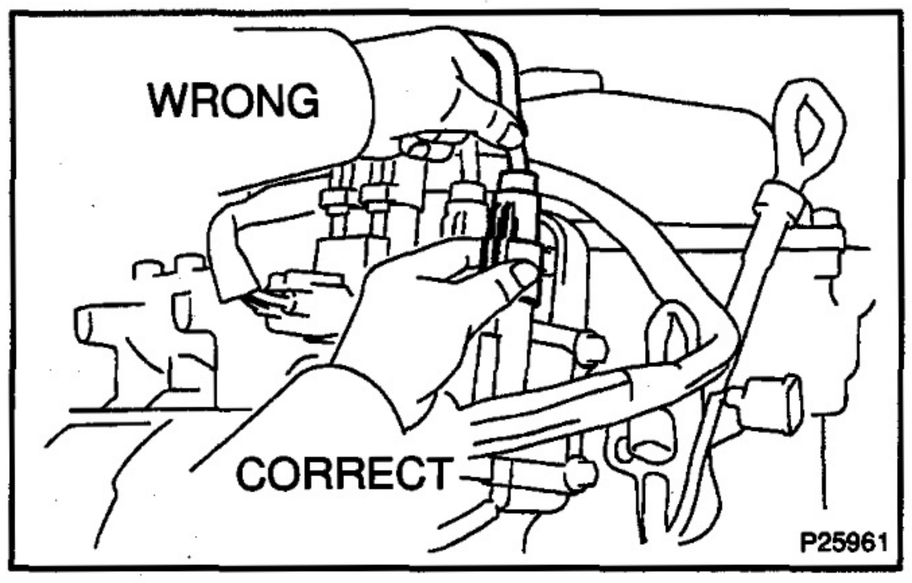
NOTICE:

Pulling on or bending the cords may damage the conductor inside.



(d) Disconnect the high–tension cords from the ignition coils.

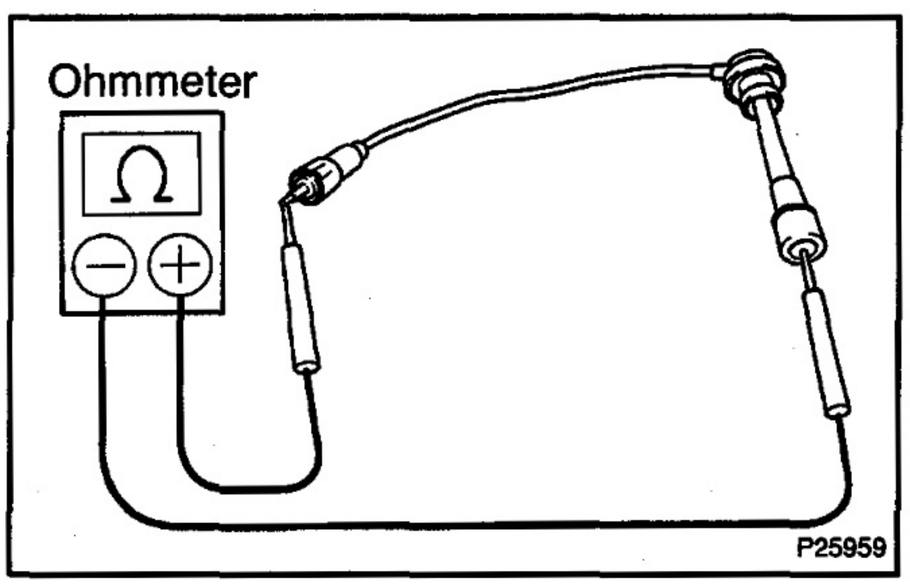
(1) Using a screwdriver, lift up the lock claw and disconnect the holder from the ignition coils.



(2) Disconnect the high–tension cord at the grommet.

NOTICE:

- **Pulling on or bending the cords may damage the conductor inside.**
- **Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**

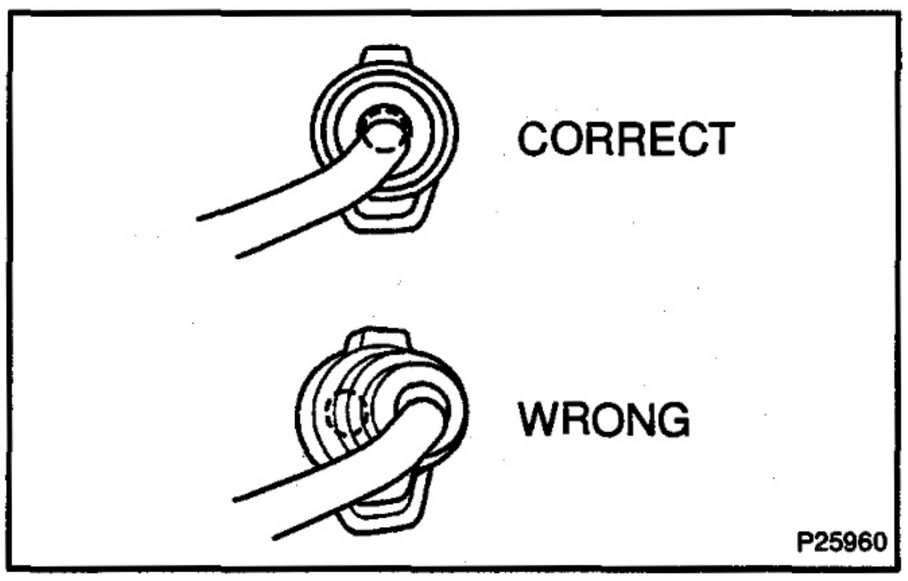


(e) Using an ohmmeter, measure the resistance.

Maximum resistance: 25 kΩ per cord

If the resistance is greater than the maximum, check the terminals.

If necessary, replace the high–tension cord.



(f) Connect the high–tension cords to the ignition coils.

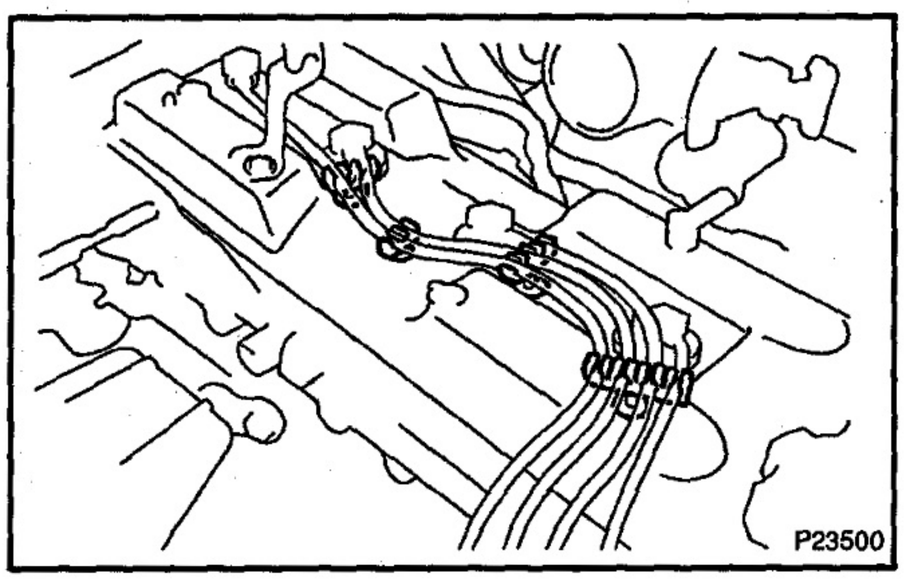
(1) Assemble the holder and grommet.

(2) Align the spline of the ignition coil with the spline of the holder, and push in the cord.

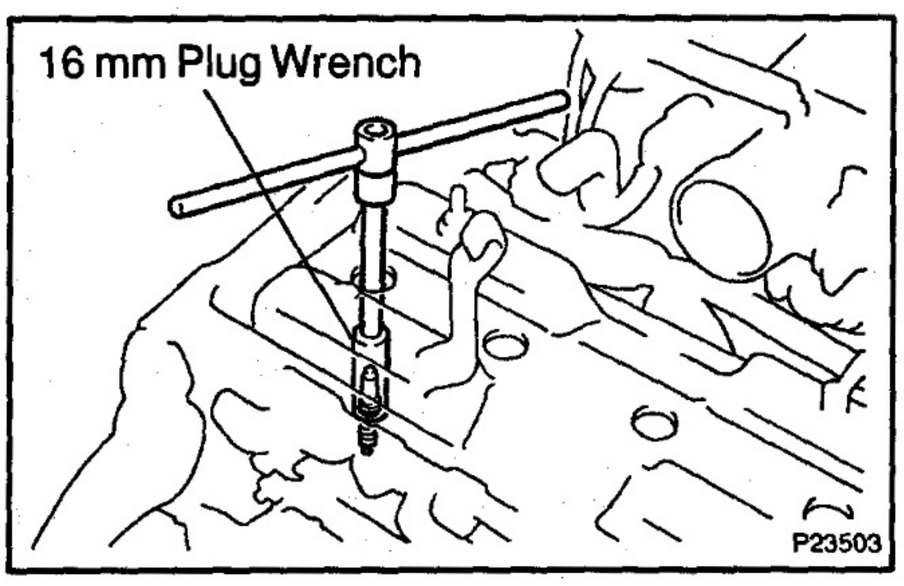
NOTICE:

Check that the holder is correctly installed to the grommet and ignition coil as shown in the illustration.

(3) Check that the lock claw of the holder is engaged by lightly pulling the holder.

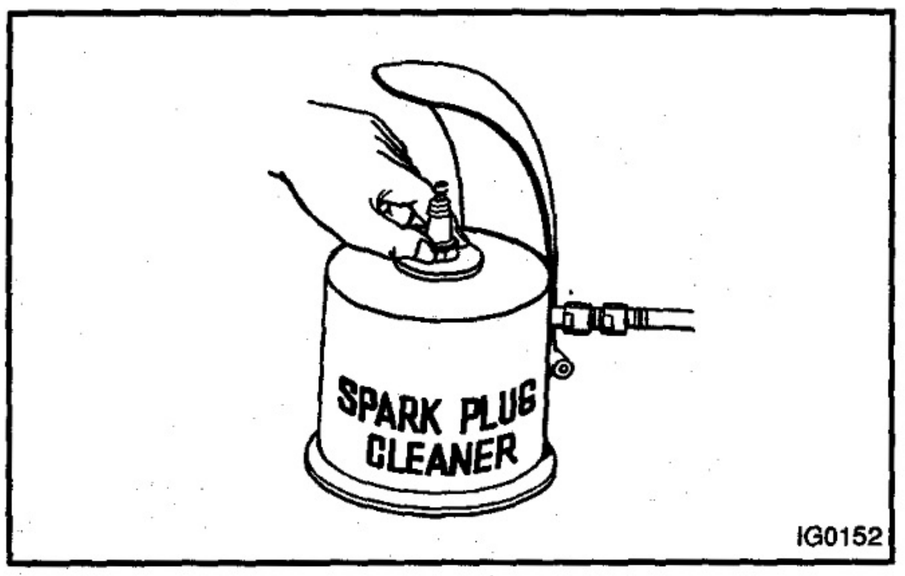


(g) Connect the high–tension cords to the spark plugs. Secure the high–tension cords with the clamps as shown in the illustration.
(h) Install the intake air connector.
(i) Install the air cleaner cap and MAF meter assembly.



3. INSPECT SPARK PLUGS

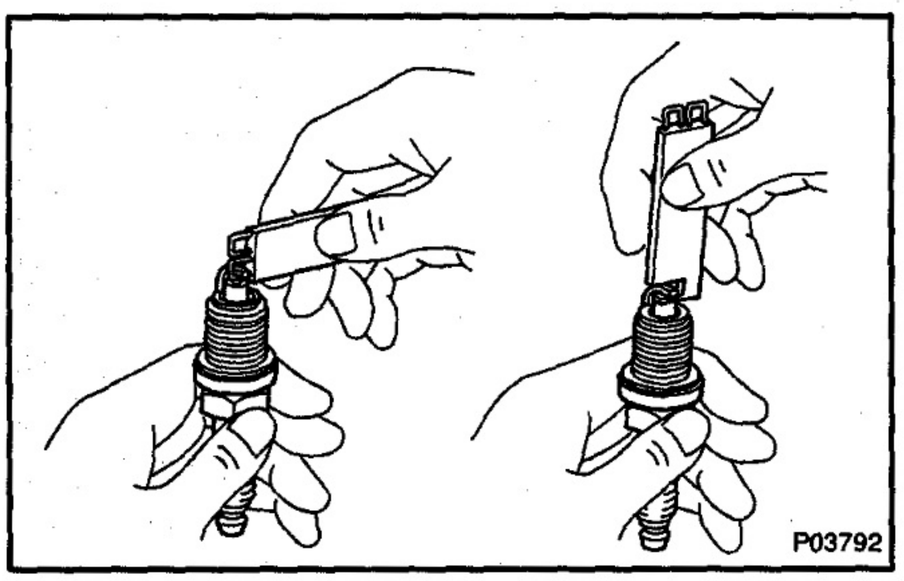
(a) Disconnect the high–tension cords from the spark plugs.
(b) Using a 16 mm plug wrench, remove the spark plug.



(c) Using a spark plug cleaner or wire brush, clean the spark plug.
(d) Check the spark plug for electrode wear, threads damage and insulator damage.

If abnormal, replace the plugs.

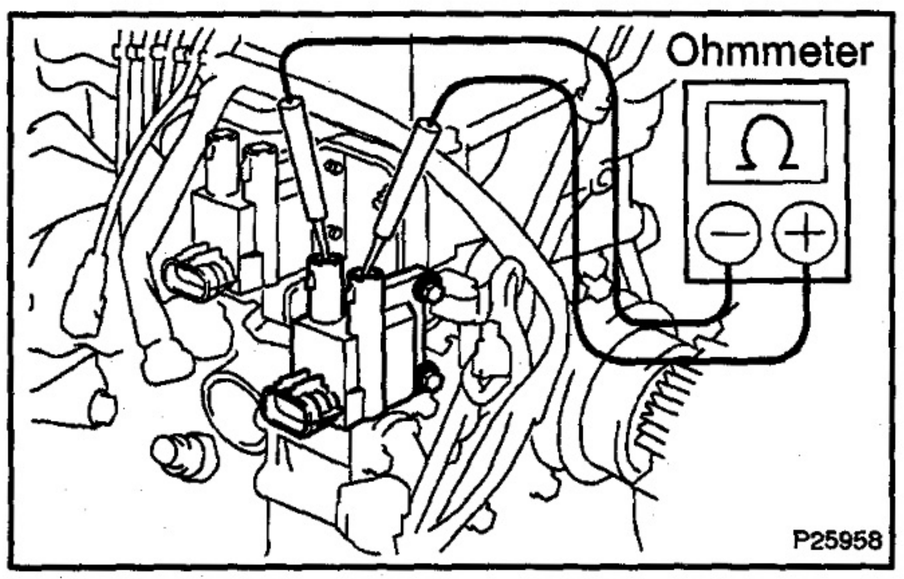
Recommended spark plugs:
ND: K16R–U
NGK: BKR5EYA



(e) Carefully bend the outer electrode to obtain the correct electrode gap.
Correct electrode gap: 0.8 mm (0.031 in.)
(f) Using a 16 mm plug wrench, install the spark plug.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
(g) Connect the high–tension cords to the spark plugs.

4. INSPECT IGNITION COIL

(a) Disconnect the high–tension cords from the ignition coil.
(b) Disconnect the ignition coil connectors.



(c) Using an ohmmeter, measure the secondary coil resistance between the positive (+) and high–tension terminals.
Secondary coil resistance:
Cold: 9.7 – 16.7 kΩ
Hot: 12.4 – 19.6 kΩ

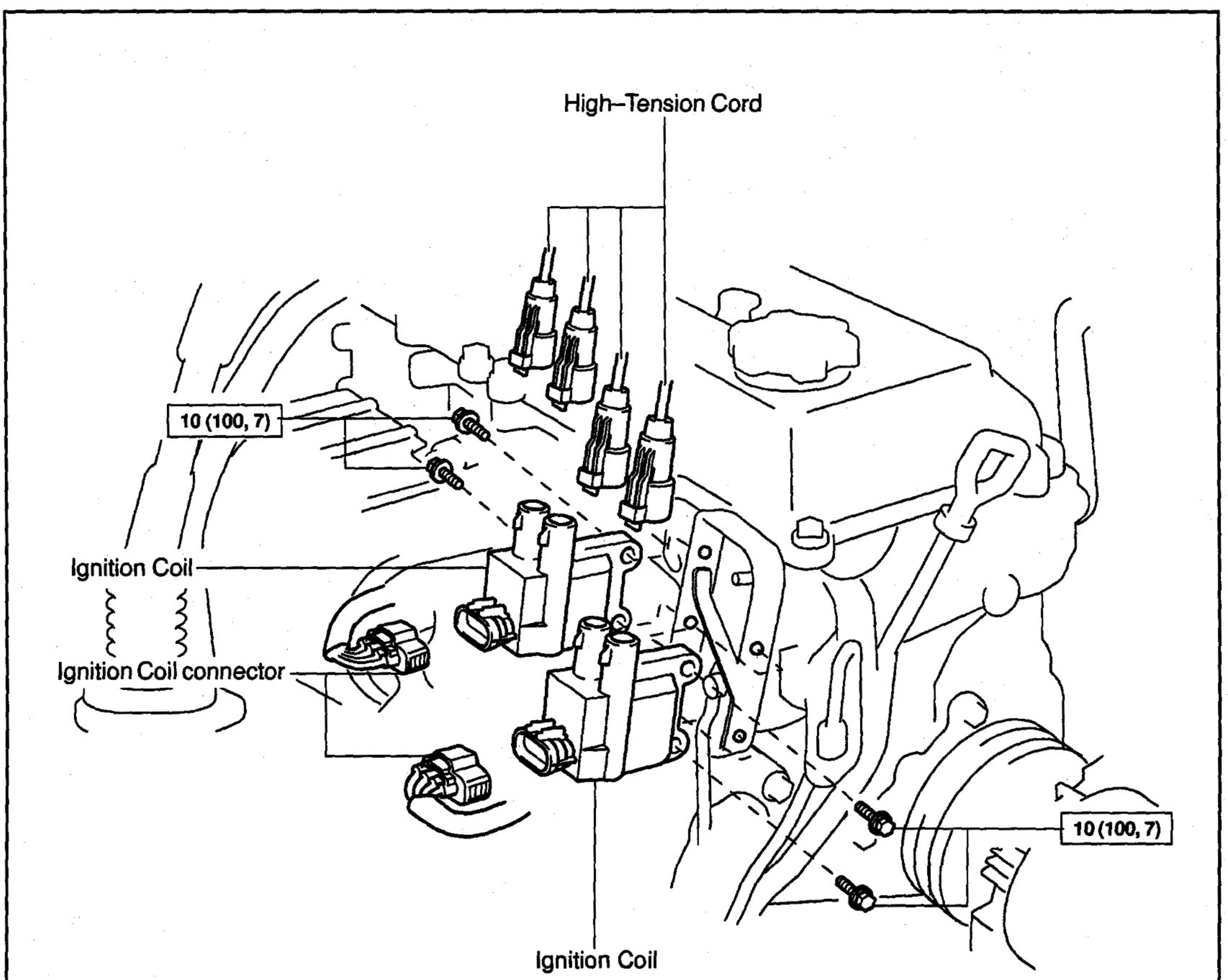
If the resistance is not as specified, replace the ignition coil.

(d) Connect ignition coil connectors.
(e) Connect the high–tension cords from the ignition coils.

IGNITION COIL

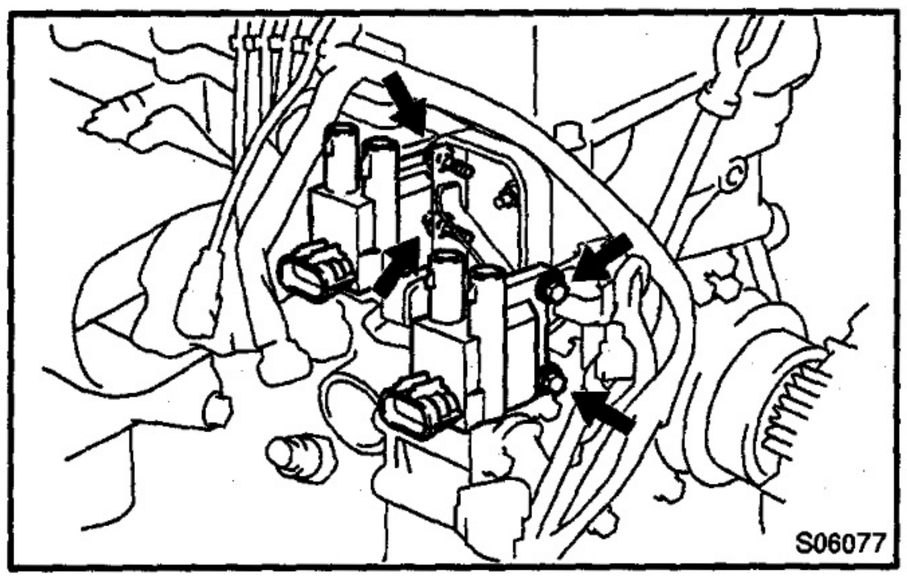
COMPONENTS

IG00K-02



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

S06079



IG00L–03

REMOVAL

1. **REMOVE AIR CLEANER HOSE**
2. **DISCONNECT HIGH–TENSION CORDS FROM IGNITION COILS**
   (See page IG–1)
3. **REMOVE IGNITION COILS**

(a) Disconnect the 2 connectors from the ignition coils.

(b) Remove the 4 bolts and 2 ignition coils from the bracket.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

HINT:
Arrange the ignition coils in correct order.

I308S–02

INSTALLATION

Installation is in the reverse order of removal. (See page IG–5)

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