HOW TO USE THIS MANUAL

GENERAL INFORMATION

IN00U–36

1. INDEX

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

2. PRECAUTION

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

Read these precautions before starting any repair task.

3. TROUBLESHOOTING

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

Be sure to read this before performing troubleshooting.

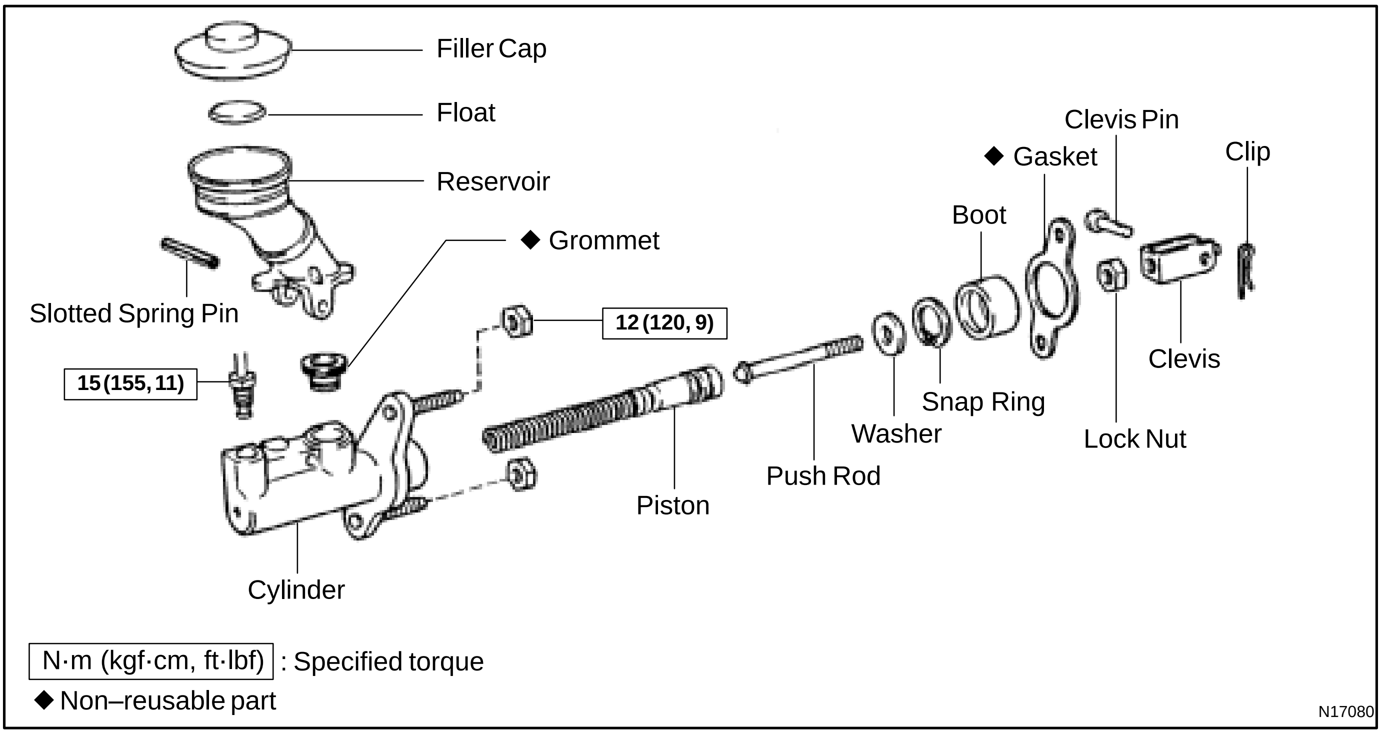
4. PREPARATION

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

5. REPAIR PROCEDURES

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

Example:



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

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

Example:

Task heading : what to do

Illustration: what to do and where

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

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

SST 09350–30020 (09350–06120)

Set part No. *Component part No.*

Detailed text : how to do task

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

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

Specification

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

6. REFERENCES

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

7. SPECIFICATIONS

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

8. CAUTIONS, NOTICES, HINTS:

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

9. SI UNIT

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

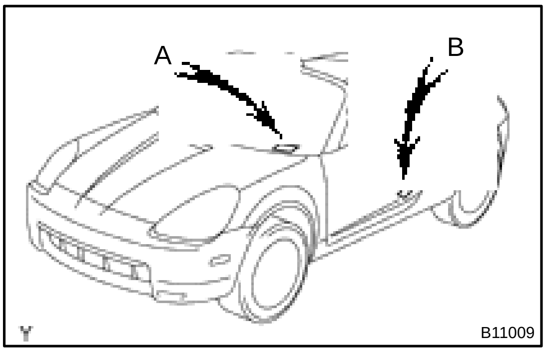
Example:

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

IDENTIFICATION INFORMATION

IN0CN–12

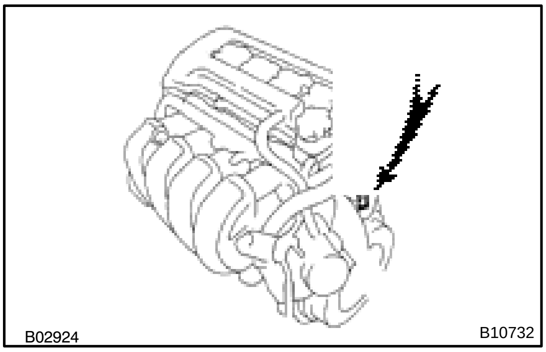
VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER



1. VEHICLE IDENTIFICATION NUMBER

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

A: Vehicle Identification Number Plate
B: Certification Label



2. ENGINE SERIAL NUMBER

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

REPAIR INSTRUCTIONS

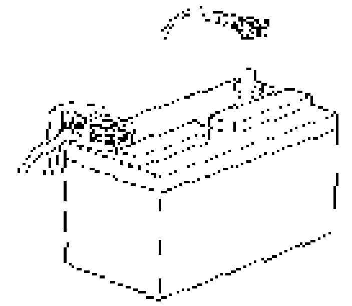
IN0CO–12

GENERAL INFORMATION

BASIC REPAIR HINT

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

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



FI1066

(c) Installation and removal of battery terminal:

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

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

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

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

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

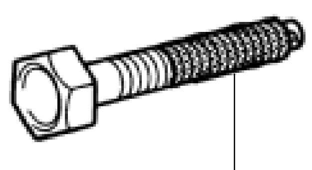
(6) Be sure the cover for the positive (+) terminal is properly in place.

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

(e) Non–reusable parts

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

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



Z11554

(f) Precoated parts

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

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

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

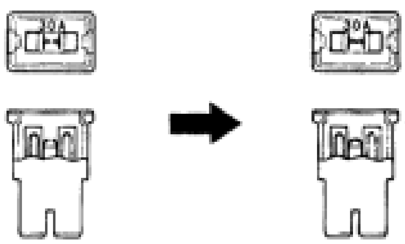
(3) Precoated parts are indicated in the component illustrations by the "★" symbol.

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

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

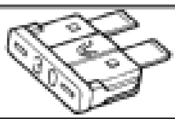
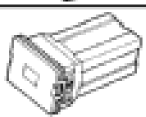
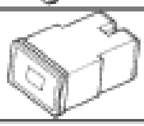
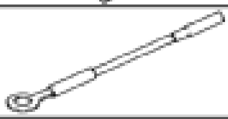
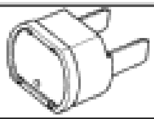
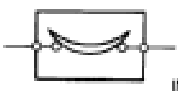
(i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in Preparation section in this manual.

Medium Current Fuse and High Current Fuse Equal Amperage Rating



BE1367

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

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

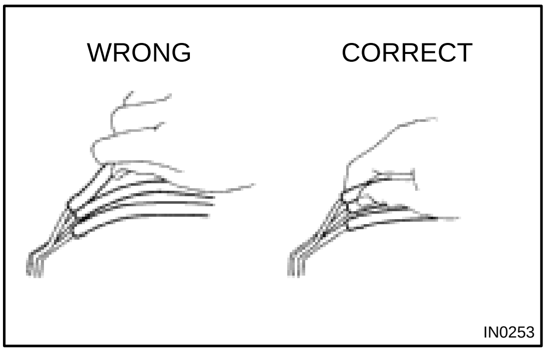
V00076

(k) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–8).

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

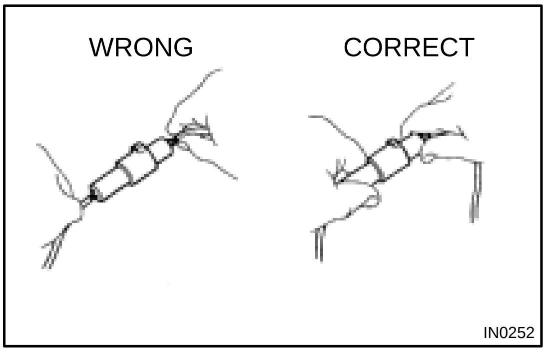
(l) Observe the following precautions to avoid damage to the following parts:

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



IN0253

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



IN0252

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

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

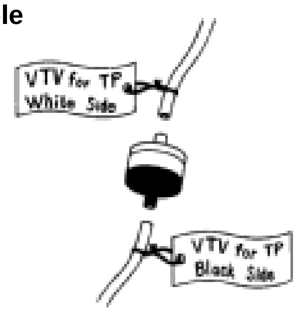
(5) When steam cleaning an engine, protect the electronic components, air filter and emission–related components from water.

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

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

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

Example



IN0002

(m) Installation and removal of vacuum hose:

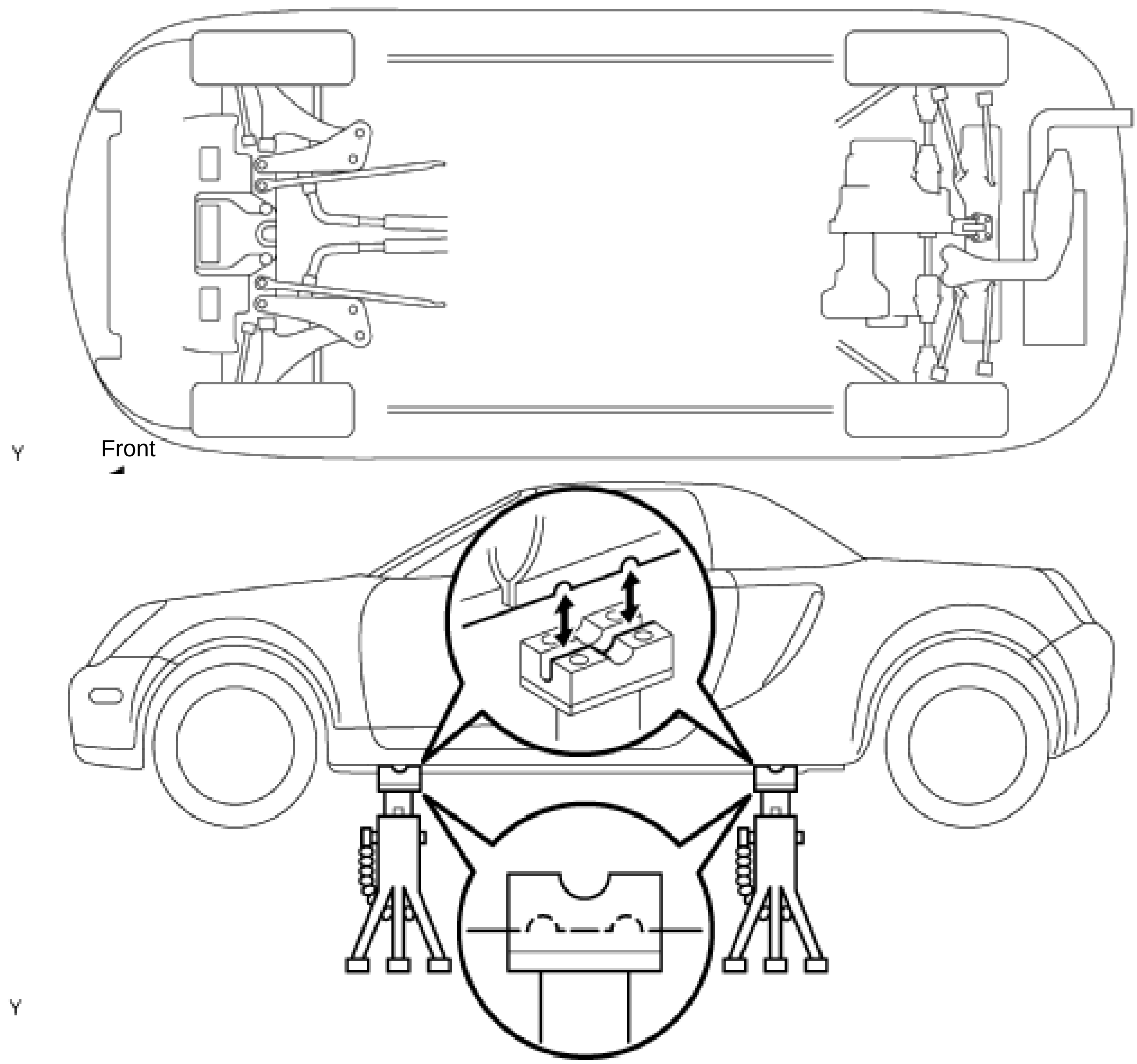
(1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to.

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

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

IN0CP–11

VEHICLE LIFT AND SUPPORT LOCATIONS



JACK POSITION

Front .... Front crossmember
Rear .... Rear axle beam

CAUTION: When jacking–up the front and rear, make sure the car is not carrying any extra weight.

PANTOGRAPH JACK POSITION

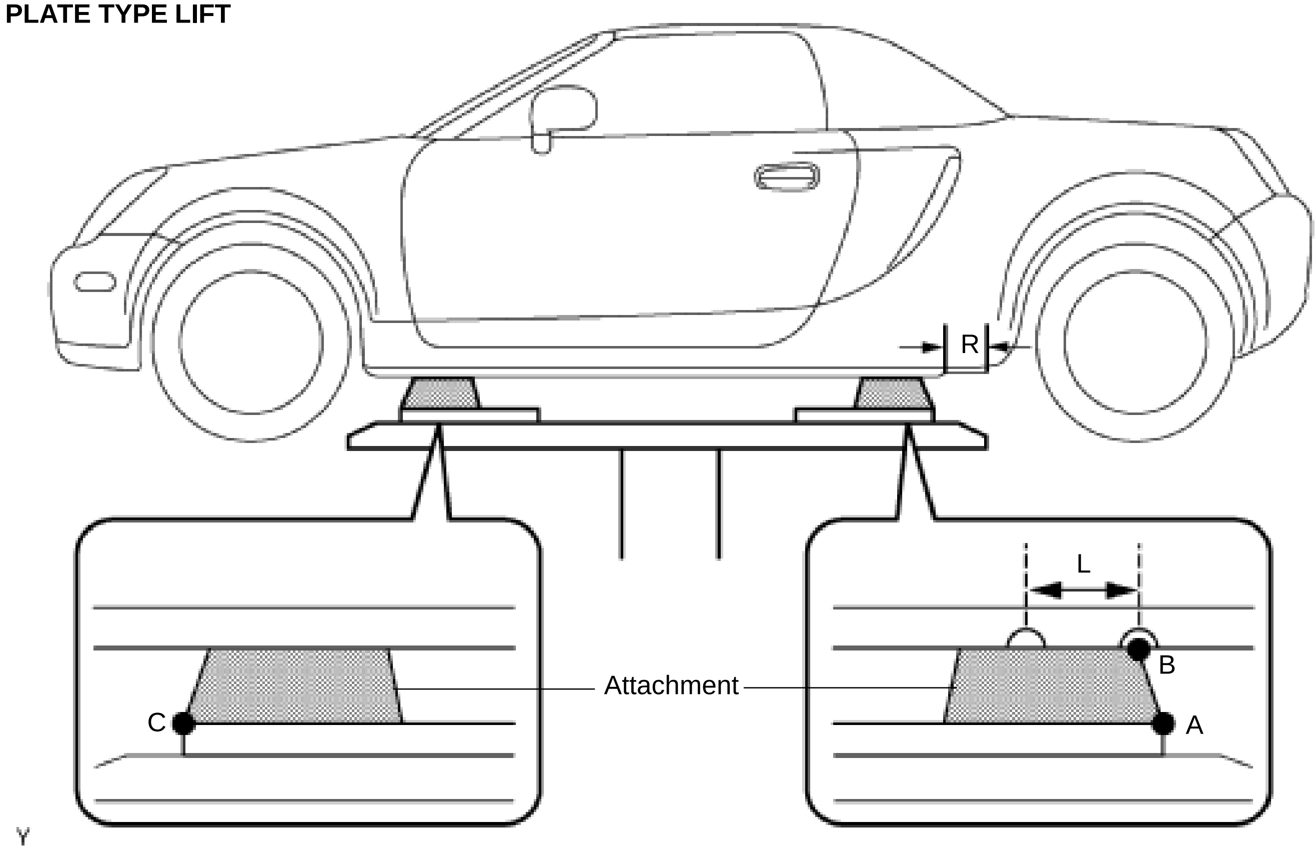
SUPPORT POSITION

Safety stand and swing arm type lift ....

B10677
B10678
B02925

B10680

PLATE TYPE LIFT

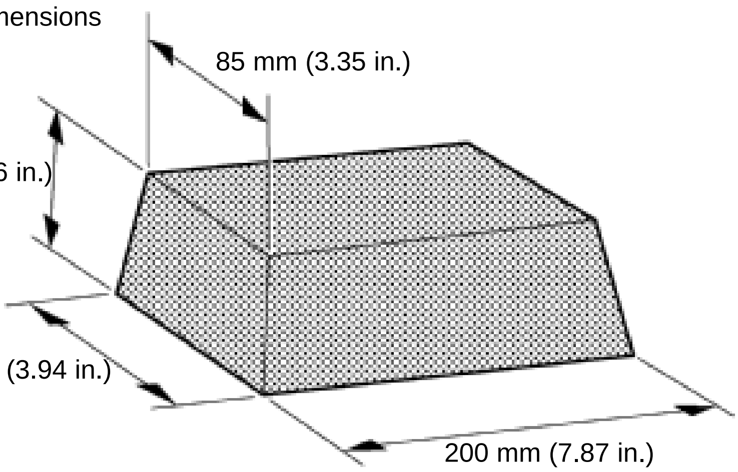


HINT:

Left and right set position	Place the vehicle over the center of the lift.
Front and rear set position	• Align the cushion gum ends of the plate with the attachment lower ends (A, C). • Align the attachment upper end (B) with the rear jack supporting point (L).

NOTICE: Do not support position ”R” at the rear side with the attachment. Also, placing the attachment at position ”R” may cause deformation of the fender.

Attachment dimensions



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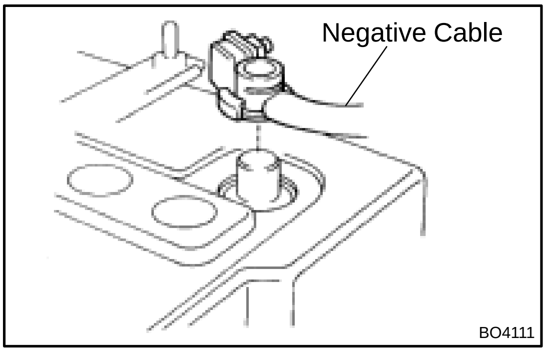
FOR ALL OF VEHICLES

IN0GH–01

PRECAUTION

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

(a) The MR2 is equipped with an SRS (Supplemental Restraint System), such as the driver airbag, front passenger airbag assembly and seat belt pretensioner.
Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident.
Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.

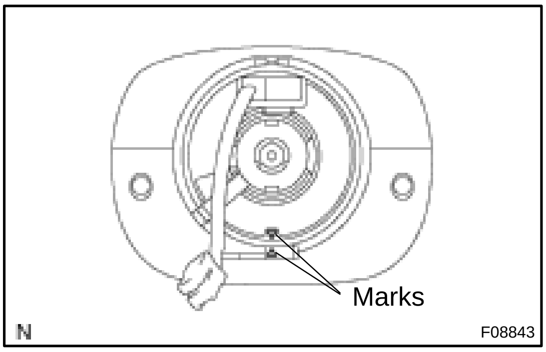


(b) GENERAL NOTICE

(1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page DI–237).

(2) Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
(The supplemental restraint system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable from the battery, the SRS may deploy.)
When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the each memory system. Then when work is finished, reset the clock and audio systems as before. To avoid erasing the memory of each memory system, never use a back–up power supply from another battery.

(3) Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad (See page RS–13), front passenger airbag assembly (See page RS–28) and seat belt pretensioner (See page BO–61) should be inspected.
(4) Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
(5) Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
(6) Never disassemble and repair the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner.
(7) If the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
(8) Do not directly expose the airbag sensor assembly, steering wheel pad, front passenger airbag assembly or seat belt pretensioner to hot air or flames.
(9) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit.
(10) Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
(11) After work on the supplemental restraint system is completed, check the SRS warning light (See page DI–237).



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

(d) STEERING WHEEL PAD (with Airbag)

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

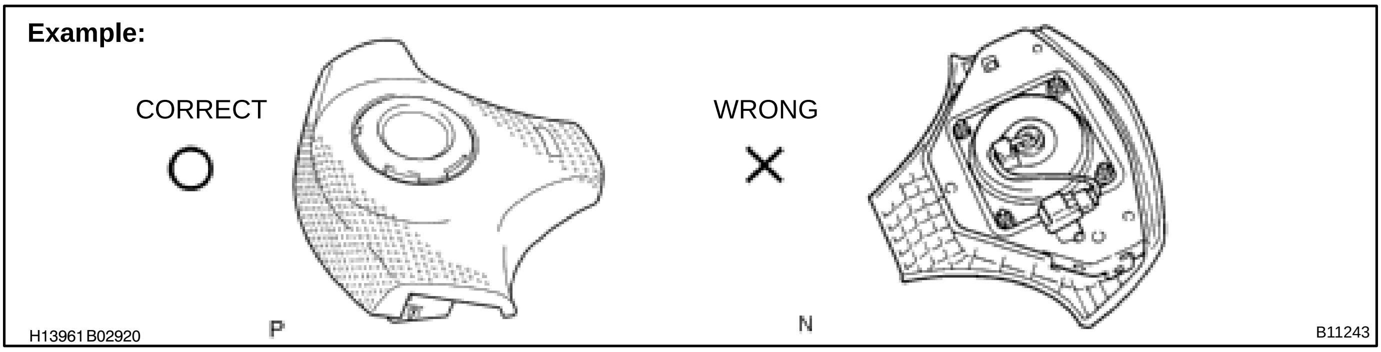
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

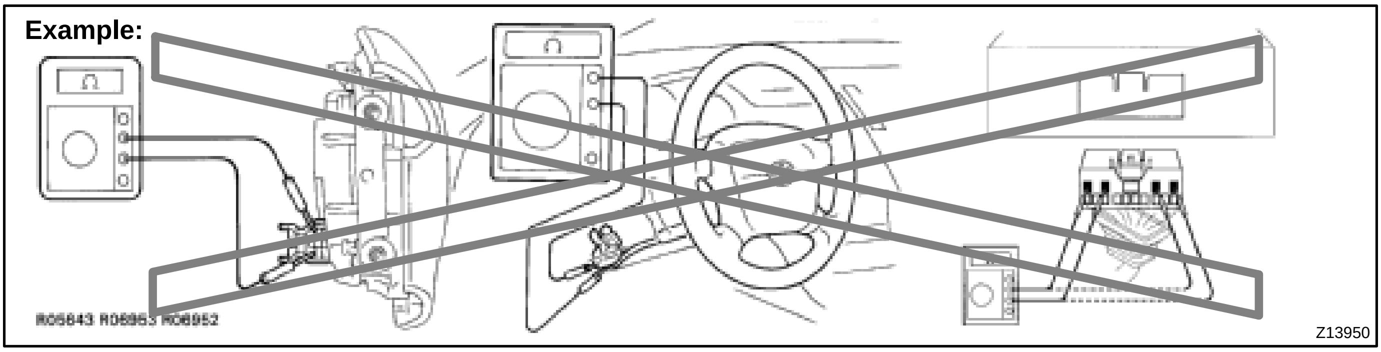
(3) Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.

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

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

(6) When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–15).
Carry out the operation in a safe place away from electrical noise.





(e) FRONT PASSENGER AIRBAG ASSEMBLY

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

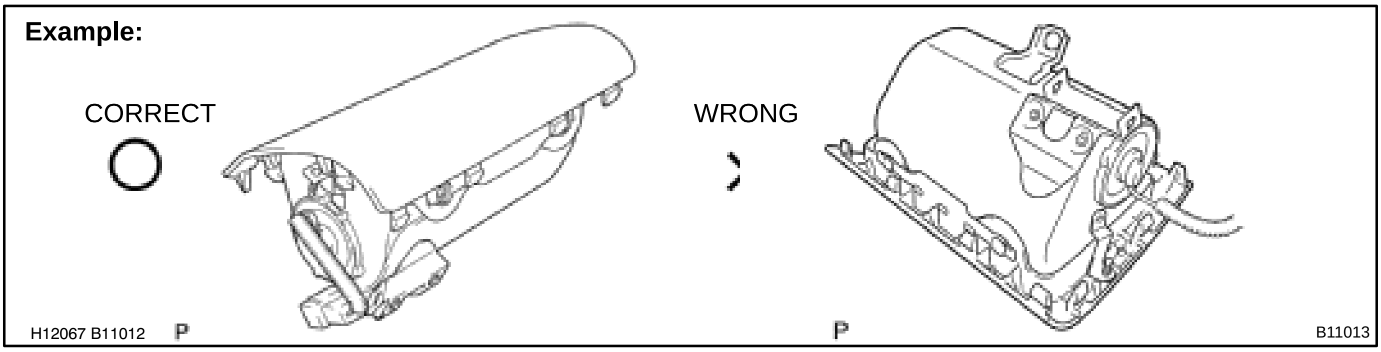
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

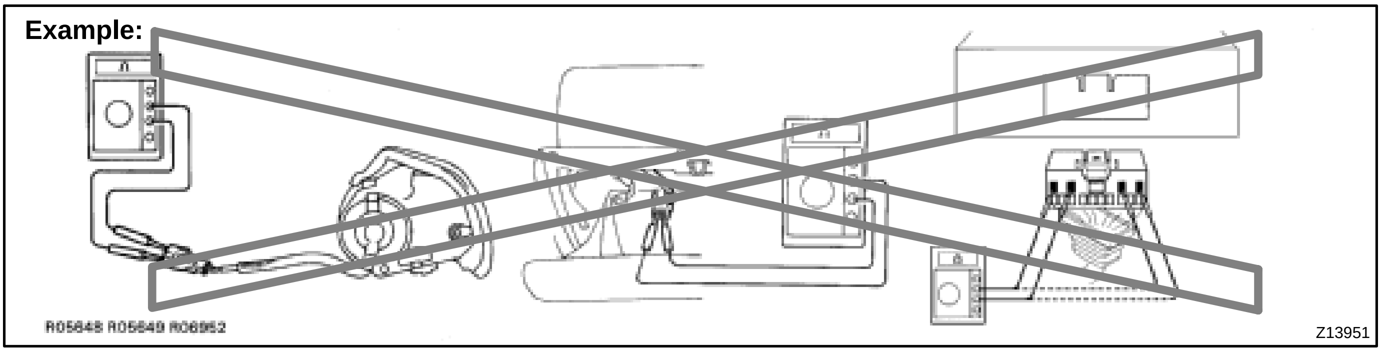
(3) Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.

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

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

(6) When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS–30).
Perform the operation in a safe place away from electrical noise.





(f) SEAT BELT PRETENSIONER

(1) Never measure the resistance of the seat belt pretensioner. (This may cause the seat belt pretensioner to activate, which is very dangerous.)

(2) Never disassemble the seat belt pretensioner.

(3) Never install the seat belt pretensioner in another vehicle.

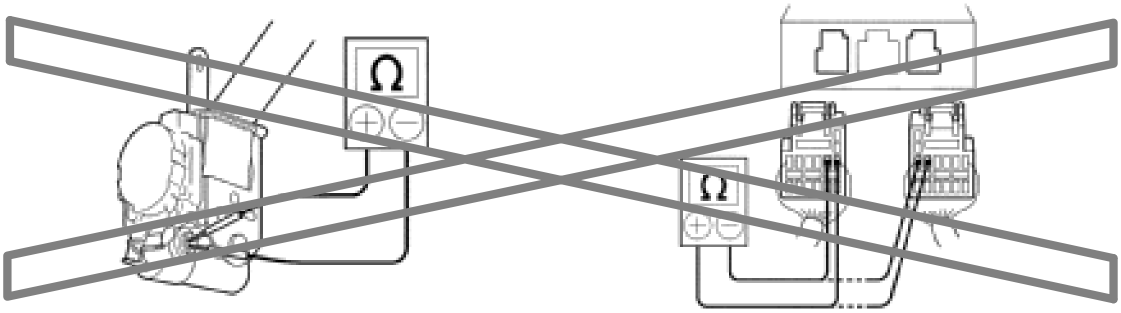
(4) Store the seat belt pretensioner where the ambient temperature remains below 80°C (176°F) and away from electrical noise without high humidity.

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

(6) When disposing of a vehicle or the seat belt pretensioner alone, the seat belt pretensioner should be activated before disposal (See page BO–62). Perform the operation in a safe place away from electrical noise.

(7) The seat belt pretensioner is hot after activation, so let it cool down sufficiently before the disposal. However never apply water to the seat belt pretensioner.

Example:



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(g) AIRBAG SENSOR ASSEMBLY

(1) Never reuse the airbag sensor assembly involved in a collision when the SRS has deployed.

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

(3) Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery, even if only loosing the set bolts of the airbag sensor assembly.

(h) WIRE HARNESS AND CONNECTOR

The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it as shown on page RS–52.

2. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION:

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

(a) Use only unleaded gasoline.

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

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

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

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

(f) Avoid coasting with ignition turned off.

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

3. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

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

  (1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system.
  (2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronic systems. For details about ECU and sensors locations, refer to the section on the applicable component.
  (3) Avoid winding the antenna feeder together with other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses.
  (4) Check that the antenna and feeder are correctly adjusted.
  (5) Do not install powerful mobile communications system.

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

CAUTION:

Observe the following items for safety reasons:

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

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

IN05Y–21

GENERAL INFORMATION

A large number of ECU controlled systems are used in the MR2. In general, the ECU controlled system is considered to be a very intricate system requiring a high level of technical knowledge and expert skill to troubleshoot. However, the fact is that if you proceed to inspect the circuits one by one, troubleshooting of these systems is not complex. If you have adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed to locate and fix the problem. This manual is designed through emphasis of the above standpoint to help service technicians perform accurate and effective troubleshooting, and is compiled for the following major ECU controlled systems:
The troubleshooting procedure and how to make use of it are described on the following pages.

System	Page
1. Engine	DI–1
2. Anti–Lock Brake System	DI–152
3. Electro–Hiydraulic Power Steering	DI–200
4. Supplemental Restraint System	DI–235
5. Engine Immobiliser System	DI–335
6. Body Control System	DI–354

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

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

IN05W–23

HOW TO PROCEED WITH TROUBLESHOOTING

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

Vehicle Brought to Workshop

1 Customer Problem Analysis

2 Symptom Confirmation and Diagnostic Trouble Code Check

3 Symptom Simulation

4 Diagnostic Trouble Code Chart

5 Problem Symptoms Table

6 Circuit Inspection or Parts Inspection

7 Repair

8 Confirmation Test

End

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

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

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

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

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

1. CUSTOMER PROBLEM ANALYSIS

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

Important Point in the Problem Analysis:

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

Important Points in the Customer Problem Analysis

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

(Sample) Engine control system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name ______________________

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

Problem Symptoms	☐ **Engine does not Start**	☐ **Engine does not crank** ☐ **No initial combustion** ☐ **No complete combustion**
	☐ **Difficult to Start**	☐ **Engine cranks slowly** ☐ **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 MR2 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 MR2.

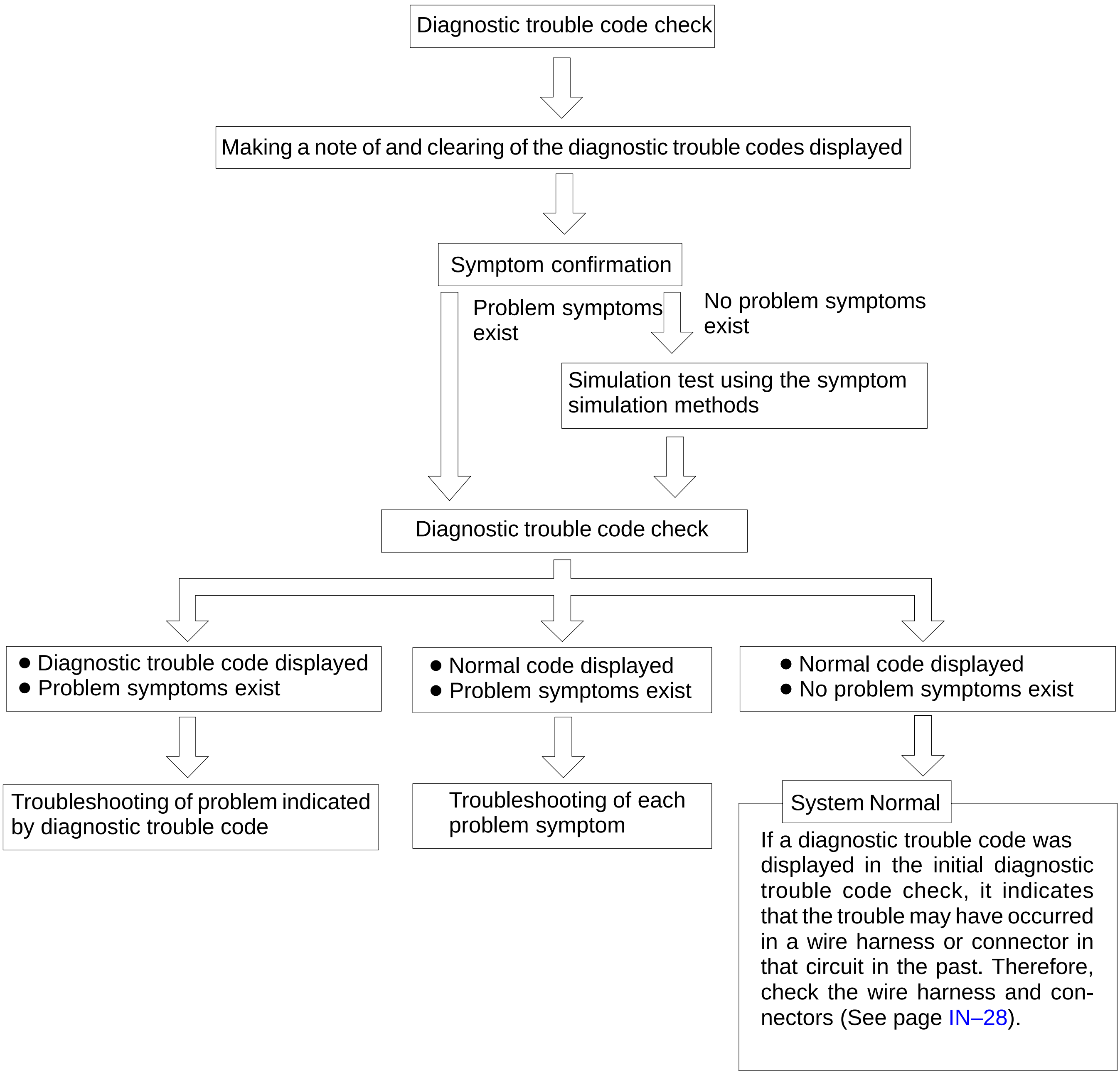
System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
1. Engine	○ (with Check Mode)	○	○
2. Anti–Lock Brake System	○	○	○
3. Electro–Hydraulic Power Steering	○	○	
4. Supplemental Restraint System	○		
5. Engine Immobiliser System	○		
6. Body Control System			

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

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

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

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

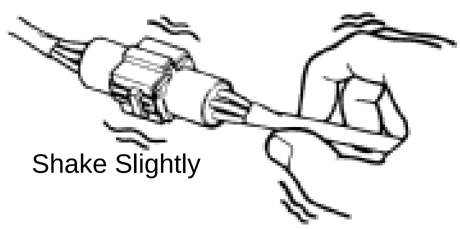
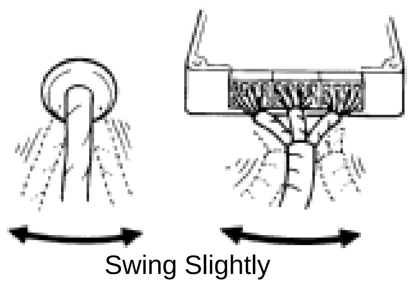
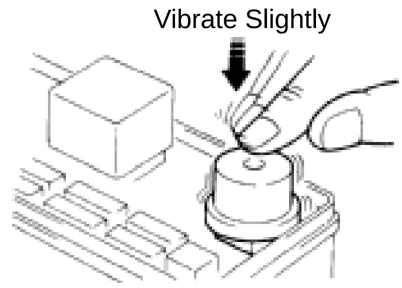


3. SYMPTOM SIMULATION

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

Important Points in the Symptom Simulation Test:

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

1	**VIBRATION METHOD: When vibration seems to be the major cause.**
CONNECTORS 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 that the malfunction occurs. HINT: Applying strong vibration to relays may result in open relays.	 FI2330

V07268

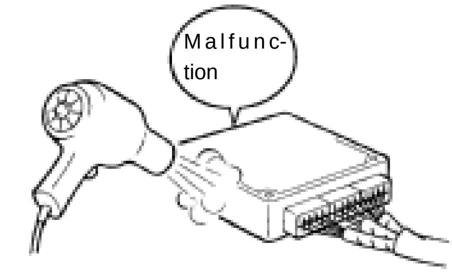
2	HEAT METHOD: When the problem seems to occur when the suspect area is heated.

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 is limited not to damage the components.)

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



FI2334

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

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

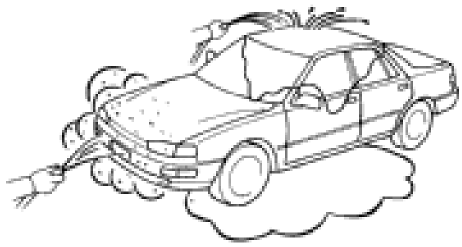
NOTICE:

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

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

HINT:

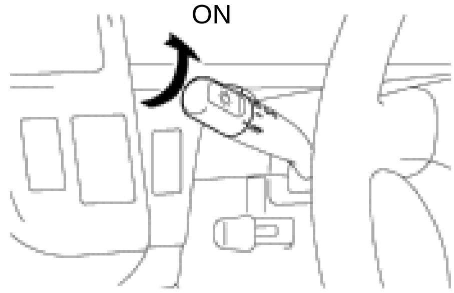
If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.



FI6649

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

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



B02389

B02390

4. DIAGNOSTIC TROUBLE CODE CHART

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

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

- Trouble Area
  Indicates the suspect area of the problem.

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

DIAGNOSTIC TROUBLE CODE CHART

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

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

SAE CONTROLLED

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

5. PROBLEM SYMPTOMS TABLE

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

HINT:

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

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

6. CIRCUIT INSPECTION

How to read and use each page is shown below.

- Diagnostic Trouble Code No. and Detection Item

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

DTC	P0325	Knock Sensor 1 Circuit Malfunction

CIRCUIT DESCRIPTION

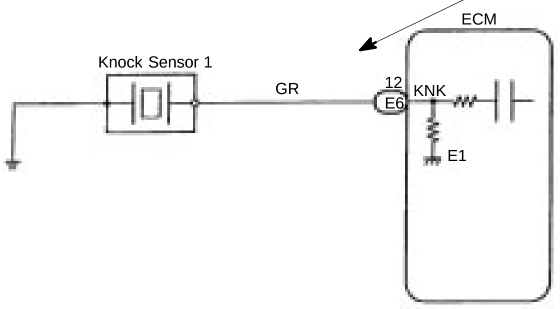
Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, 1,200 rpm or more.	• Open or short in knock sensor1 circuit • Knock sensor 1 (looseness) • ECM

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

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

WIRING DIAGRAM



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

V08423

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

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

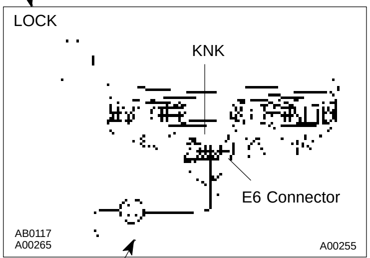
START
Ignition Switch START

ACC
Ignition Switch ACC

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

INSPECTION PROCEDURE

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



PREPARATION:

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

CHECK:

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

OK:

Resistance: 1 MΩ or higher

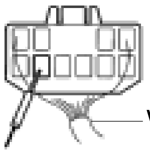
OK → **Go to step 3.**

NG

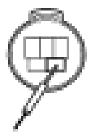
2	**Check knock sensor (See page SF–61).**

OK → **Replace knock sensor.**

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

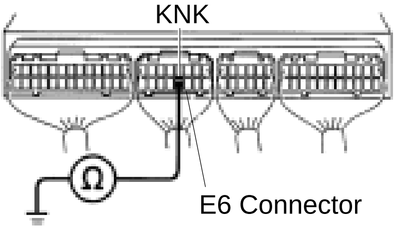


Check from the connector back side.
(with harness)

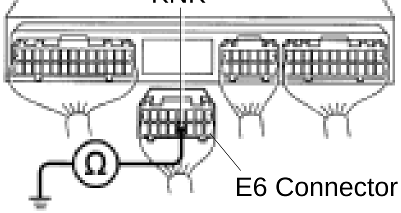


Check from the connector front side. (without harness)
In this case, care must be taken not to bend the terminals.

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



Connector being checked is connected.

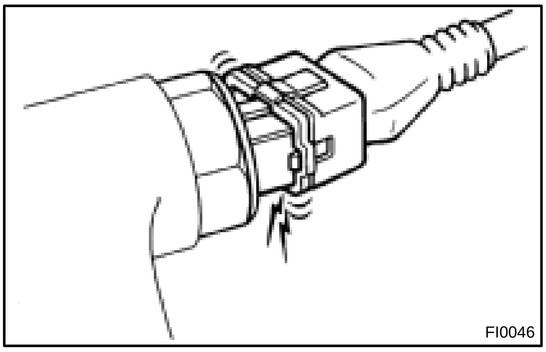


Connector being checked is disconnected.

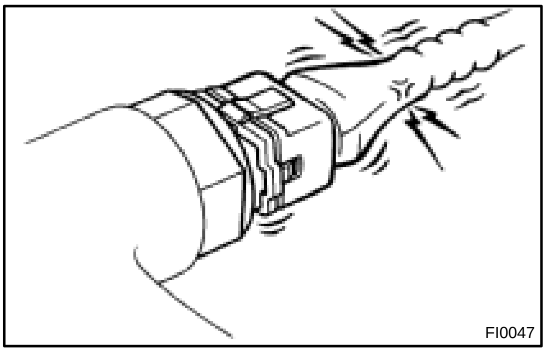
V08425

IN05X–13

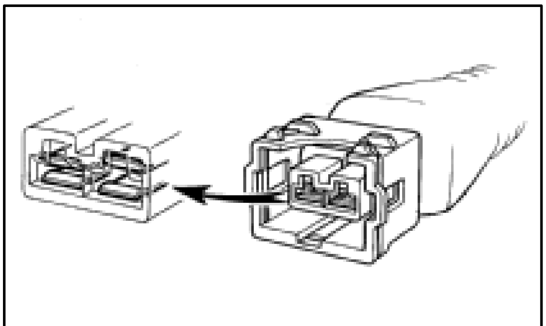
HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE



FI0046



FI0047



FI0048

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

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

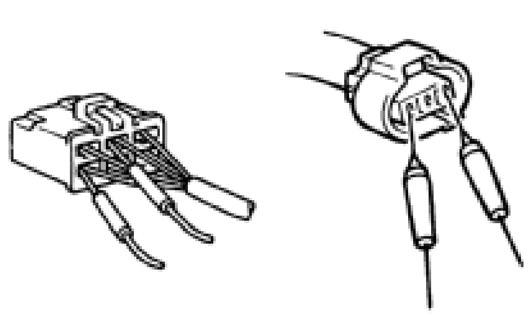
- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a deformation of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

SHORT CIRCUIT:

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

HINT:

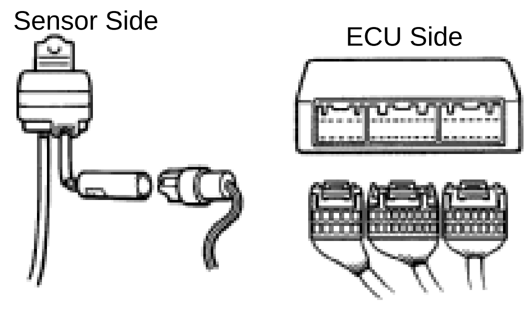
When there is a short circuit between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.



FI7187

2. CONNECTOR HANDLING

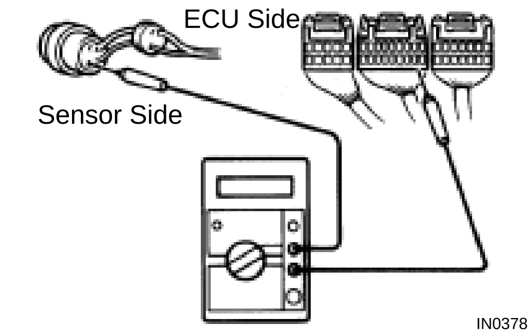
When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.



IN0379

3. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

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



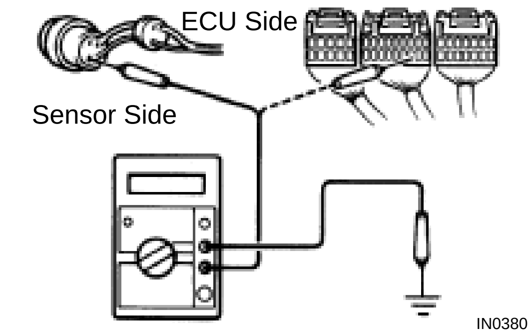
IN0378

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

Resistance: 1 Ω or less

HINT:

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



IN0380

4. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

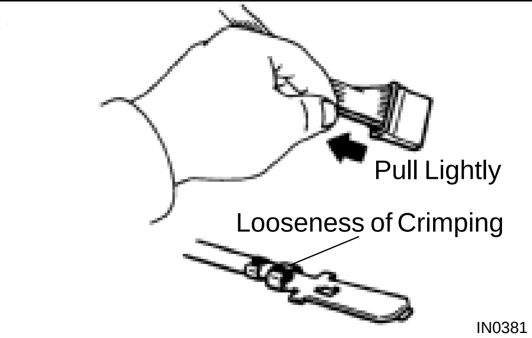
(a) Disconnect the connectors on both ends.

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

Resistance: 1 MΩ or higher

HINT:

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



IN0381

5. VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.

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

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

HINT:

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

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

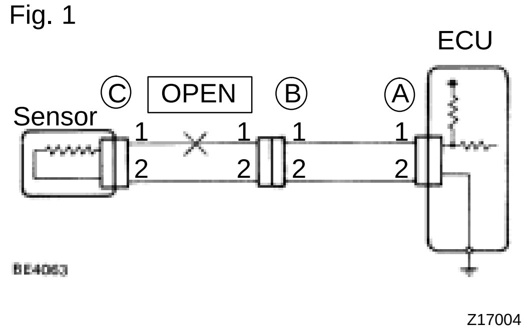
NOTICE:

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

HINT:

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

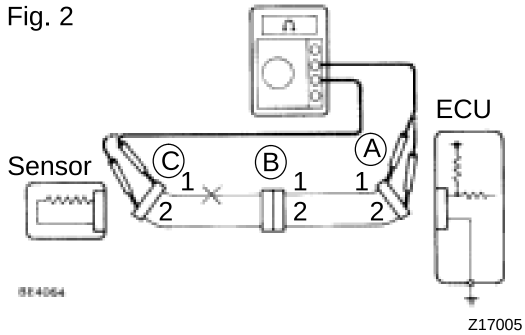
Fig. 1



6. CHECK OPEN CIRCUIT

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

Fig. 2



(a) Check the continuity.

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

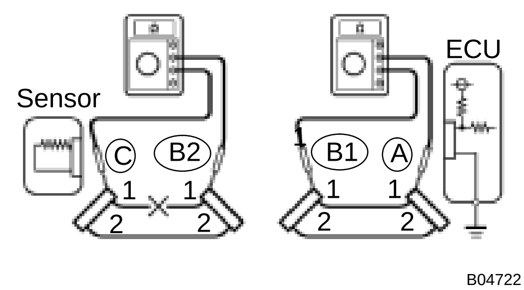
In the case of Fig. 2:

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

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

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

Fig. 3



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

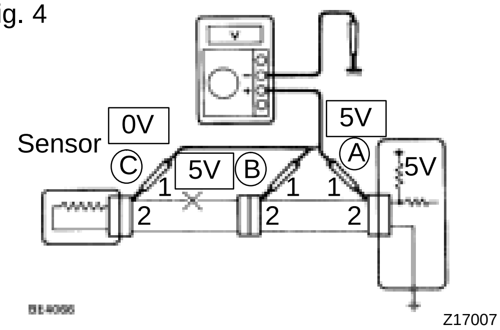
In the case of Fig. 3:

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

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

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

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.

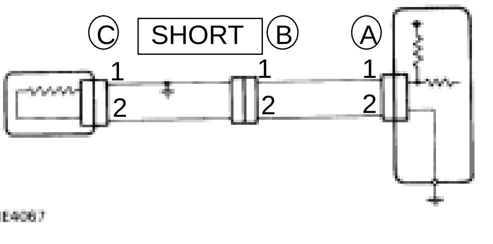
As shown in Fig. 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector ”A” at the ECU 5V output terminal, terminal 1 of connector ”B”, and terminal 1 of connector ”C”, in that order.

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”.

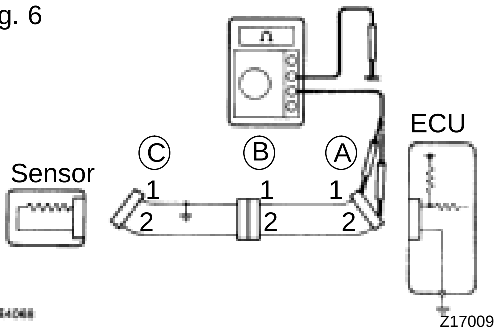
Fig. 5



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.

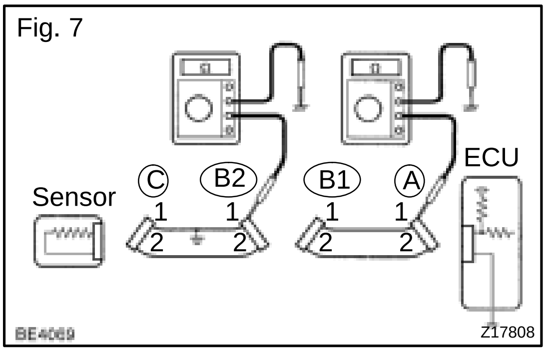
(1) Disconnect connectors ”A” and ”C” and measure the resistance between terminal 1 and 2 of connector ”A” and body ground.

In the case of Fig. 6:

Between terminal 1 of connector ”A” and body ground $\rightarrow$ Continuity (short)

Between terminal 2 of connector ”A” and body ground $\rightarrow$ No continuity

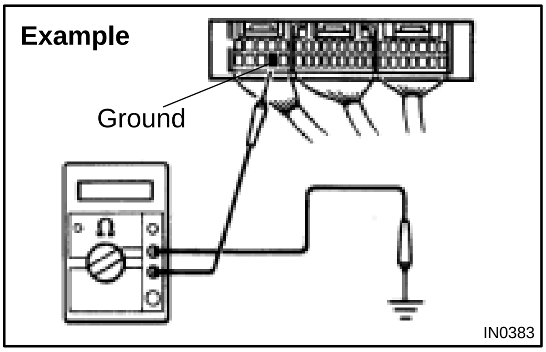
Therefore, it is found out that there is a short circuit between terminal 1 of connector ”A” and terminal 1 of connector ”C”.



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

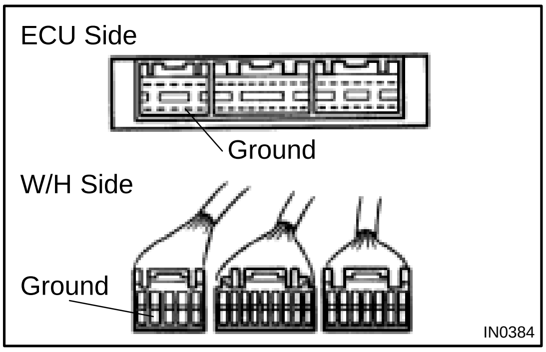
8. CHECK AND REPLACE ECU

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



(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

IN04Q–07

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

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

H–FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Head Lamp)
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IAC	Idle Air Control
IC	Integrated circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
J/B	Junction Block
J/C	Junction Connector
KD	Kick–Down
LAN	Local Area Network
LB	Liftback
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left–Hand
LHD	Left–Hand Drive
L/H/W	Length, Height, Width
LLC	Long–Life Coolant
LNG	Liquified Natural Gas
LO	Low
LPG	Liquified Petroleum Gas
LSD	Limited Slip Differential
LSP & PV	Load Sensing Proportioning And Bypass Valve
LSPV	Load Sensing Proportioning Valve
MAX.	Maximum
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MP	Multipurpose
MPX	Multiplex Communication System
M/T	Manual Transmission
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
No.	Number
O/D	Overdrive

OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTO	Power Take–Off
R & P	Rack And Pinion
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RH	Right–Hand
RHD	Right–Hand Drive
RLY	Relay
ROM	Read Only Memory
Rr	Rear
RR	Rear–Engine Rear–Wheel Drive
RRS	Rigid Rear Suspension
RWD	Rear–Wheel Drive
SDN	Sedan
SEN	Sensor
SICS	Starting Injection Control System
SOC	State Of Charge
SOHC	Single Overhead Camshaft
SPEC	Specification
SPI	Single Point Injection
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
STJ	Cold–Start Fuel Injection
SW	Switch
SYS	System
T/A	Transaxle
TACH	Tachometer
TBI	Throttle Body Electronic Fuel Injection
TC	Turbocharger
TCCS	TOYOTA Computer–Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center

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

IN0CI–02

GLOSSARY OF SAE AND TOYOTA TERMS

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

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

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

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

OUTSIDE VEHICLE

MA001–14

GENERAL MAINTENANCE

The owners are responsible for these maintenance and inspection items.
They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. TIRES

(a) Check the pressure with a gauge. If necessary, adjust.
(b) Check for cuts, damage or excessive wear.

3. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. If necessary, replace.

5. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.
(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND HOODS

(a) Check that all doors and the hoods operate smoothly, and that all latches lock securely.
(b) Check that the front hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

MA002–17

GENERAL MAINTENANCE

The owners are responsible for these maintenance and inspection items.
They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
Items and procedures for general maintenance are as follows.

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- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.
(b) Check the headlight aim.

3. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

4. HORN

Check that it is working.

5. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

6. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.
(b) Check that the wipers do not streak.

7. WINDSHIELD DEFROSTER

Check that air comes out from the defroster outlet when operating the heater or air conditioner.

8. REAR VIEW MIRROR

Check that it is mounted securely.

9. SUN VISORS

Check that they move freely and are mounted securely.

10. STEERING WHEEL

Check that it has the specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noises.

11. SEATS

(a) Check that the seat adjusters operate smoothly.
(b) Check that all latches lock securely in any position.
(c) For fold–down seat backs, check that the latches lock securely.

12. SEAT BELTS

(a) Check that the seat belt system such as the buckles, retractors and anchors operate properly and smoothly.
(b) Check that the belt webbing is not cut, frayed, worn or damaged.

13. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

14. CLUTCH PEDAL (See page CL–2)

(a) Check the pedal for smooth operation.
(b) Check that the pedal has the proper freeplay.

15. BRAKE PEDAL (See page BR–6)

(a) Check the pedal for smooth operation.
(b) Check that the pedal has the proper reserve distance and freeplay.
(c) Check the brake booster function.

16. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

17. PARKING BRAKE (See page BR–8)

(a) Check that the lever has the proper travel.
(b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

UNDER HOOD

MA003–15

GENERAL MAINTENANCE

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

3. ENGINE COOLANT LEVEL

Check that the coolant level is between the "FULL" and "LOW" lines on the see–through reservoir.

4. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
(b) Check the hoses for cracks, kinks, rot or loose connections.

5. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case.

6. BRAKE AND CLUTCH FLUID LEVELS

Check that the brake and clutch fluid levels are near the upper level line on the see–through reservoirs.

7. ENGINE DRIVE BELT

Check drive belt for fraying, cracks, wear or oiliness.

8. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

9. POWER STEERING FLUID LEVEL

- Check the level.
- The level should be in the "HOT" or "COLD" range depending on the fluid temperature.

10. EXHAUST SYSTEM

If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

ENGINE

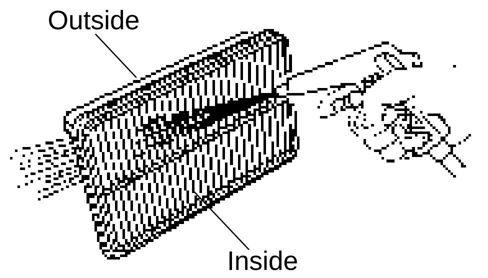
MA00R–09

INSPECTION

HINT:

Inspect these items when the engine is cold.

1. **INSPECT DRIVE BELT (See page CH–2)**
2. **REPLACE SPARK PLUGS (See page IG–1)**



B00324

3. **INSPECT AIR FILTER**

(a) Visually check that the air filter is not excessively dirty or oily.

HINT:

Oiliness may indicate a stuck PCV valve.

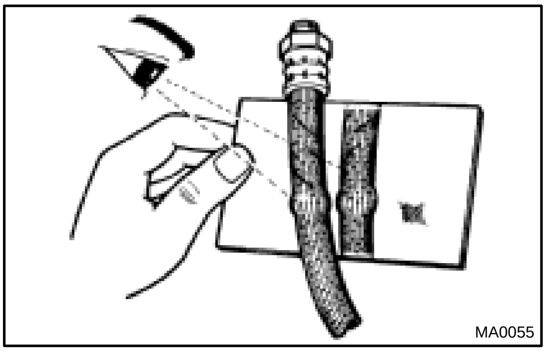
If necessary, replace the air filter.

(b) Clean the air filter with compressed air.
First blow from the inside thoroughly, then blow off the outside of the air filter.

4. **REPLACE AIR FILTER**

Replace the air filter with a new one.

5. **REPLACE ENGINE OIL AND OIL FILTER (See page LU–3)**
6. **REPLACE ENGINE COOLANT (See page CO–2)**
7. **REPLACE GASKET IN FUEL TANK CAP (See page EC–6)**
8. **INSPECT FUEL LINES AND CONNECTIONS (See page EC–6)**
9. **INSPECT EXHAUST PIPES AND MOUNTINGS (See page EC–11)**
10. **ADJUST VALVE CLEARANCE (See page EM–4)**


MA0055

BRAKE

MA00M–04

INSPECTION

1. INSPECT BRAKE LINE PIPES AND HOSES

HINT:
Check in a well lighted area. Check the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before checking the front brake.

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

(b) Check all clamps for tightness and connections for leakage.
(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.
(d) Check that the lines installed in grommets pass through the center of the grommets.

2. INSPECT FRONT BRAKE PADS AND DISCS (See page BR–20)

3. INSPECT REAR BRAKE PADS AND DISCS (See page BR–29)

CHASSIS

MA03Q–01

INSPECTION

1. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay (See page SR–7).

(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends do not have excessive play.
- Dust seals and boots are not damaged.
- Boot clamps are not loose.

2. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leakage.

3. INSPECT DRIVE SHAFT BOOTS

Check the drive shaft boots for clamp looseness, leakage or damage.

4. INSPECT BALL JOINT AND DUST COVERS

(a) Inspect the ball joints for excessive looseness.

- Jack up the front of the vehicle and place wooden blocks with a height of 180 – 200 mm (7.09 – 7.87 in.) under the front tires.
- Lower the jack until there is about half a load on the front coil spring. Place stands under the vehicle for safety.
- Check that the front wheels are pointing straight ahead, and block them with chocks.
- Using a lever, pry up the end of the lower arm, and check the amount of play.

Maximum ball joint vertical play: 0 mm (0 in.)

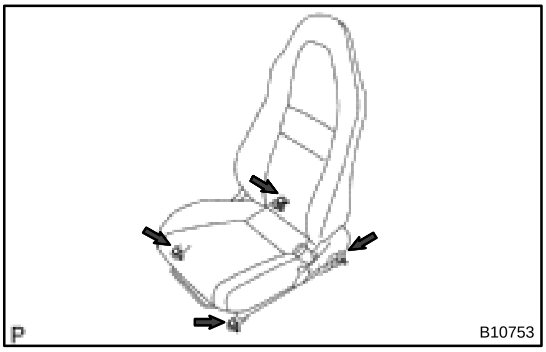
If there is play, replace the ball joint.

(b) Check the dust cover for damage.

5. CHECK TRANSAXLE OIL

Visually check the transaxle for oil leakage.
If leakage is found, check for the cause and repair.

6. REPLACE TRANSAXLE FLUID (See page MX–9)



BODY

MA03R–01

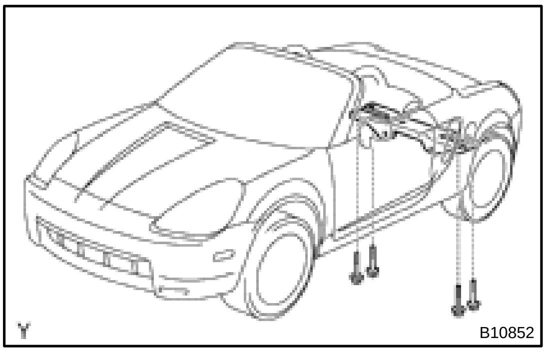
INSPECTION

1. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten these parts:

- Seat–to–body mounting bolts

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)



- Rear suspension member–to–body mounting bolts

Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

2. BODY INSPECTION

(a) Check the body exterior for dents, scratches and rust.

(b) Check the underbody for rust and damage.

If necessary, replace or repair.

3. ROAD TEST

(a) Check the engine and chassis for abnormal noises.

(b) Check that the vehicle does not wander or pull to one side.

(c) Check that the brakes work properly and do not drag.

(d) Do setting of the parking brake shoes and drum.

4. FINAL INSPECTION

(a) Check the operation of the body parts:

- Front hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Doors
  Door locks operate properly
  Doors close properly
- Engine hood
  Door lock operates properly
- Seat adjusts easily and locks securely in any position
  Seat back locks securely in any position

(b) Be sure to deliver a clean car.

Especially check:

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

MAINTENANCE

EQUIPMENT

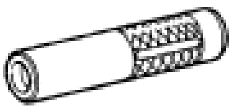
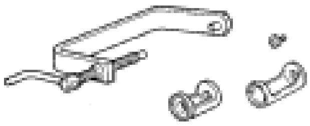
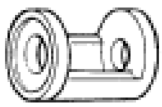
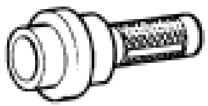
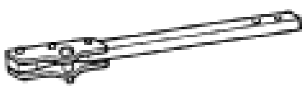
PP0E6–03

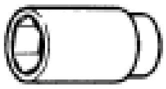
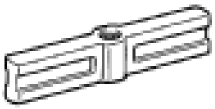
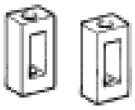
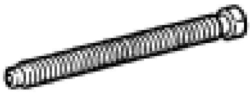
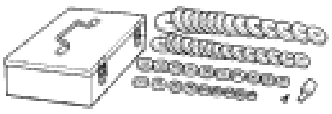
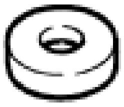
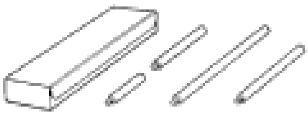
Mirror	Brake hose
Torque wrench	

ENGINE MECHANICAL

SST (Special Service Tools)

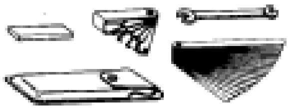
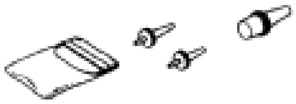
PP2NG–01

	09032–00100	Oil Pan Seal Cutter	
	09201–01055	Valve Guide Bushing Remover & Re placer 5.5	
	09201–41020	Valve Stem Oil Seal Replacer	
	09202–70020	Valve Spring Compressor	
	(09202–00010)	Attachment	
	09213–70011	Crankshaft Pulley Holding Tool	
	09222–30010	Connecting Rod Bushing Remover & Replacer	
	09223–15030	Oil Seal & Bearing Replacer	Rear crankshaft seal
	09223–22010	Crankshaft Front Oil Seal Replacer	Crankshaft timing sprocket
	09308–10010	Oil Seal Puller	Front crankshaft seal
	09309–37010	Transmission Bearing Replacer	Front crankshaft seal
	09330–00021	Companion Flange Holding Tool	Crankshaft pulley

	09816–30010	Oil Pressure Switch Socket	
	09843–18040	Diagnosis Check Wire No.2	
	09950–50012	Puller C Set	
	(09951–05010)	Hanger 150	Crankshaft pulley
	(09952–05010)	Slide Arm	Crankshaft pulley
	(09953–05020)	Center Bolt 150	Crankshaft pulley
	(09954–05020)	Claw No.2	Crankshaft pulley
	09950–60010	Handle Set	
	(09951–00240)	Handle Set	Drive belt idler pulley bearing
	(09951–00390)	Handle Set	Drive belt idler pulley bearing
	09950–70010	Handle Set	
	(09951–07100)	Handle 100	Drive belt idler pulley bearing Rear crankshaft oil seal

PP2NE–01

RECOMMENDED TOOLS

	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

PP0JS–07

EQUIPMENT

Abrasive compound	Valve
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Groove cleaning tool	Piston ring groove
Heater	
Magnetic finger	
Micrometer	
Pin hole grinder	Piston pin hole of piston
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Press	
Ridge reamer	Cylinder
Soft brush	
Solvent	
Spring tester	Valve spring
Steel square	Valve spring
Tachometer	
Thermometer	
Torque wrench	
Torx wrench socket set	Stud bolt
TOYOTA hand held tester or OBD II scan tool	
Valve seat cutter	
V–block	
Vernier calipers	
Wire brush	

PP187–03

SSM (Special Service Materials)

08826–00080	Seal Packing Black or equivalent (FIPG)	
08826–00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	

EMISSION CONTROL

EQUIPMENT

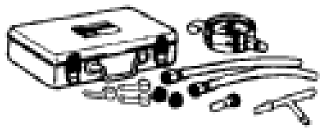
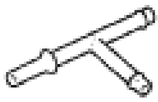
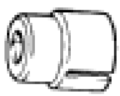
PP0JV–07

Hose clipper	
Pressure gauge	
Torque wrench	
Vacuum gauge	

SFI

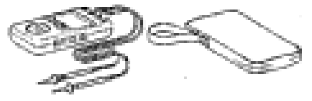
SST (Special Service Tools)

PP2NH–01

	09268–21010	Fuel Hose Puller	Metallic connector
	09268–41047	Injection Measuring Tool Set	
	(95336–08070)	Hose	
	09268–45014	EFI Fuel Pressure Gauge	
	(09268–41250)	T Joint	
	09817–16011	Back–up Light Switch Tool	Knock sensor
	09842–30080	EFI Inspection Wire ”H”	
	09843–18040	Diagnosis Check Wire No.2	

PP2NI–01

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	

PP0JY–07

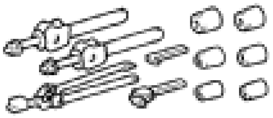
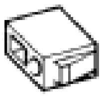
EQUIPMENT

Fuel tube connector (Part No. 90923–07009)	
Graduated cylinder	Injector
OBDII scan tool	
Soft brush	Throttle body
Sound scope	Injector
Torque wrench	
Vacuum gauge	

COOLING

SST (Special Service Tools)

PP0HL–02

	09230–01010	Radiator Service Tool Set	
	09231–14010	Punch	

PP189–01

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	

PP18A–02

EQUIPMENT

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	
Vernier calipers	

PP18B–03

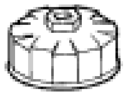
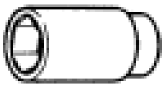
COOLANT

Item	Capacity	Classification
Engine coolant	10.4 liters (10.9 US qts, 9.2 lmp. qts)	”Toyota Long Life Coolant” or equivalent

LUBRICATION

PP2DU–01

SST (Special Service Tools)

	09228–06501	Oil Filter Wrench	
	09816–30010	Oil Pressure Switch Socket	

PP0K5–05

EQUIPMENT

Oil pressure gauge	
Torque wrench	
Feeler gauge	
Straight edge	

PP0K6–07

LUBRICANT

Item	Capacity	Classification
Engine oil Drain and refill w/ Oil filter change w/o Oil filter change Dry fill	 3.7 liters (3.9 US qts, 3.3 Imp. qts) 3.5 liters (3.7 US qts, 3.1 Imp. qts) 4.2 liters (4.4 US qts, 3.7 Imp. qts)	API grade SJ, Energy–Conserving or ILSAC multigrade engine oil. SAE 5W–30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather.

PP2DT–01

SSM (Special Service Materials)

08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Oil pressure switch

IGNITION

RECOMMENDED TOOLS

PP0K8–09

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

PP0K9–05

EQUIPMENT

Spark plug cleaner	

STARTING

SST (Special Service Tools)

PP0KA–03

	09286–46011	Injection Pump Spline Shaft Puller	
	09810–38140	Starter Magnet Switch Nut Wrench 14	
	09820–00030	Alternator Rear Bearing Replacer	

PP0KB–02

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	

PP0KC–02

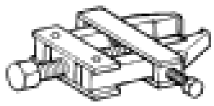
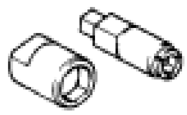
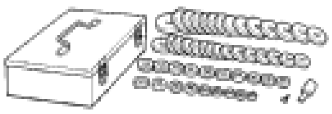
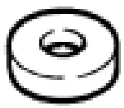
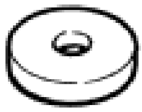
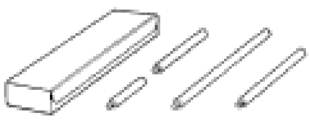
EQUIPMENT

Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Magnetic switch terminal kit part
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

CHARGING

PP2DH–01

SST (Special Service Tools)

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	
	09286–46011	Injection Pump Spline Shaft Puller	
	09820–00021	Alternator Rear Bearing Puller	
	09820–00030	Alternator Rear Bearing Replacer	
	09820–63010	Alternator Pulley Set Nut Wrench Set	
	09950–60010	Replacer Set	
	(09951–00350)	Replacer 35	
	(09951–00530)	Replacer 53	
	09950–70010	Handle Set	
	(09951–07100)	Handle 100	

PP0KE–02

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP0KF–03

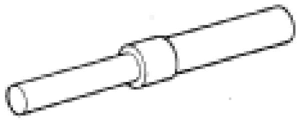
EQUIPMENT

Battery specific gravity gauge	Except maintenance free battery
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

CLUTCH

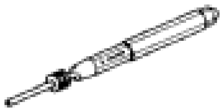
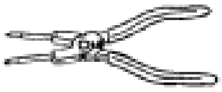
SST (Special Service Tools)

PP2LV–01

	09023–00100	Union Nut Wrench 10 mm	Clutch line
	09023–38200	Union Nut Wrench 12mm	Clutch line
	09301–00210	Clutch Guide Tool	
	09333–00013	Clutch Diaphragm Spring Aligner	

PP2E1–02

RECOMMENDED TOOLS

	09031–00030	Pin Punch .	
	09082–00040	TOYOTA Electrical Tester.	
	09905–00013	Snap Ring Pliers .	

PP0H1–02

EQUIPMENT

Vernier calipers	
Dial indicator	
Torque wrench	

PP0CK–06

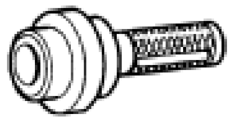
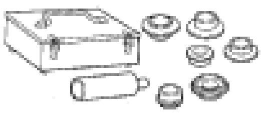
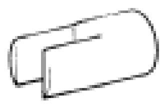
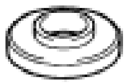
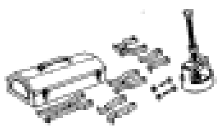
LUBRICANT

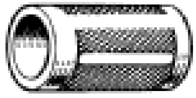
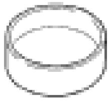
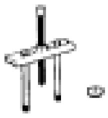
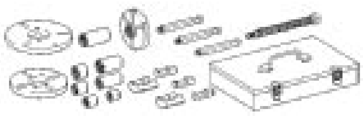
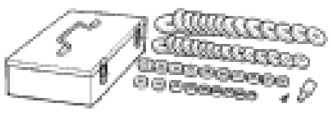
Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No. 116 DOT3

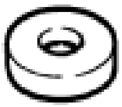
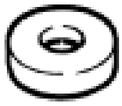
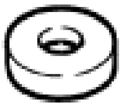
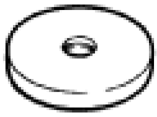
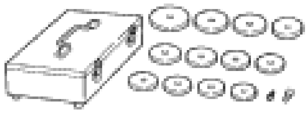
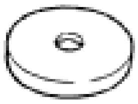
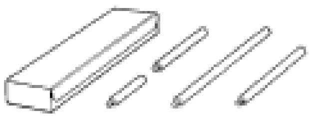
MANUAL TRANSAXLE

SST (Special Service Tools)

PP2LW–01

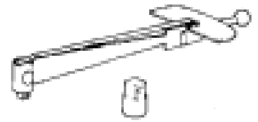
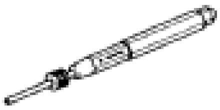
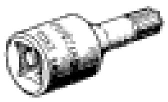
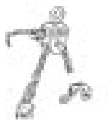
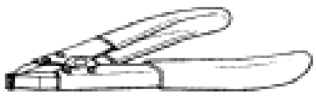
	09223–50010	Crankshaft Front oil Seal Replacer	Output shaft front bearing inner race
	09226–10010	Crankshaft Front & Rear Bearing Replacer	Transmission case oil seal
	09308–00010	Oil Seal Puller	Output shaft front bearing
	09309–12020	5th Driven Gear Replacer	
	09316–60011	Transmission & Transfer Bearing Replacer	
	(09316–00011)	Replacer Pipe	Differential tapered roller bearing Transamission case oil seal
	09350–32014	TOYOTA Automatic Transmission Tool Set	
	(09351–32120)	Overdrive Bearing Replacer	Differential tapered roller bearing
	(09351–32140)	Oil Seal Replacer	Differential tapered roller bearing
	09564–32011	Differential Preload Adaptor	
	09608–00071	Drive Pinion Rear Bearing Cone Replacer	Input shaft rear radial ball bearing Output shaft rear radial ball bearing
	09612–65014	Steering Worm Bearing Puller	Input shaft front bearing Differential tapered roller bearing outer race

	09628–62011	Ball Joint Puller	5th driven gear
	09636–20010	Upper Ball Joint Dust Cover Replacer	No.3 hub sleeve assembly
	09710–28021	Front Suspension Bushing Tool Set	
	(09710–08041)	Bushing Replacer	Transzxle case oil seal
	09950–00020	Bearing Remover	
	09950–00030	Bearing Remover Attachment	Differential tapered roller bearing
	09950–30011	Puller A Set	No.3 clutch hub
	09950–40011	Puller B Set	5th driven gear
	09950–60010	Replacer Set	
	(09951–00200)	Replacer 20	Control shaft cover bushing
	(09951–00210)	Replacer 21	Control shaft cover bushing
	(09951–00230)	Replacer 23	5th driven gear
	(09951–00270)	Replacer 27	Control shaft cover oil seal

	(09951–00350)	Replacer 35	Differential tapered roller bearing
	(09951–00360)	Replacer 36	Input shaft front oil seal Differential tapered roller bearing
	(09951–00400)	Replacer 40	Input shaft front bearing
	(09951–00560)	Replacer 56	Output shaft front bearing
	09950–60020	Replacer Set No.2	
	(09951–00680)	Replacer 68	Differential tapered roller bearing outer race (Transaxle case side)
	(09951–00710)	Replacer 71	Differential tapered roller bearing outer race (Transmission case side)
	09950–70010	Handle Set	
	(09951–07150)	Handle 150	

PP2EB–02

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	Differential preload
	09031–00030	Pin Punch .	
	09040–00011	Hexagon Wrench Set .	
	09042–00010	Torx Socket T30 .	
	09090–04020	Engine Sling Device	For suspending engine
	09905–00012	Snap Ring No.1 Expander .	

PP04Q–04

EQUIPMENT

Dial indicator with magnetic base	
Feeler gauge	
Magnetic finger	
Micrometer	
Torque wrench	
Wooden block or similar object	

PP04S–04

LUBRICANT

Item		Capacity	Classification
Manual transaxle oil	w/ LSD	1.8 liters (2.0 US qts, 1.7 Imp. qts)	API GL–4 or GL–5
	w/o LSD	1.9 liters (2.2 US qts, 1.8 Imp. qts)	SAE 75W–90

PP2EC–01

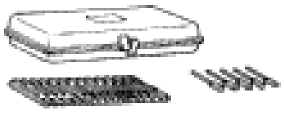
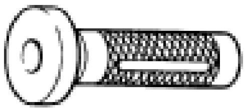
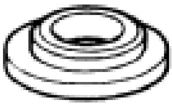
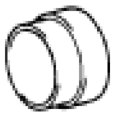
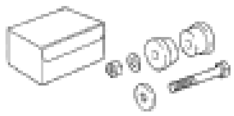
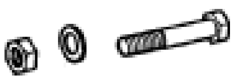
SSM (Special Service Materials)

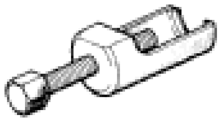
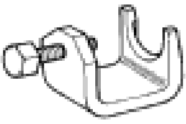
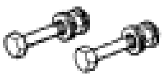
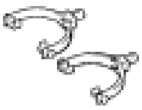
08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Transmission case x Transaxle case Transmission case x Transmission case cover
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

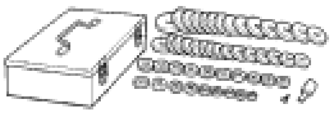
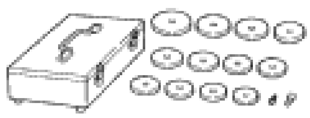
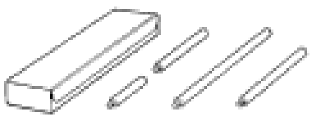
SUSPENSION AND AXLE

SST (Special Service Tools)

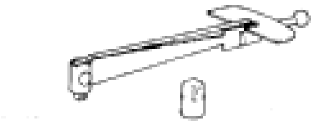
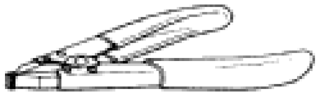
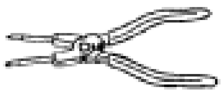
PP2DZ–02

	09240–00020	Wire Gauge Set	Rear drive shaft
	09310–35010	Countershaft Bearing Replacer	Rear axle
	09506–35010	Differential Drive Pinion Rear Bearing Replacer	Rear drive shaft
	09520–00031	Rear Axle Shaft Puller	
	(09520–00040)	Shocker	Front axle Rear axle
	(09521–00010)	Attachment	Rear axle
	(09521–00020)	Rod with Grip	Front axle Rear axle
	09521–24010	Drive Shaft Boot Clamping Tool	
	09527–10011	Rear Axle Shaft Bearing Remover	Front axle Rear axle
	09527–17011	Rear Axle Shaft Bearing Remover	Rear axle
	09608–16042	Front Hub Bearing Adjusting Tool	Rear drive shaft
	(09608–02021)	Bolt & Nut	

	(09608–02041)	Retainer	
	09608–32010	Steering Knuckle Oil Seal Replacer	Rear axle
	09610–20012	Pitman Arm Puller	Front axle Rear axle Rear drive shaft Rear suspension
	09628–10011	Ball Joint Puller	Hub bolt
	09628–62011	Ball Joint Puller	Front axle Front suspension
	09710–04101	Base	Front axle
	09710–26011	Front Suspension Bushing Tool Set	Front lower suspension arm
	(09710–05061)	Replacer	
	09710–30021	Suspension Bushing Tool Set	Rear drive shaft
	(09710–03141)	Bushing Remover Base	
	09727–30021	Coil Spring Compressor	Front suspension Rear suspension
	(09727–00010)	Bolt Set	
	(09727–00021)	Arm Set	

	(09727–00031)	Compressor	
	09930–00010	Drive Shaft Nut Chisel	Rear axle Rear drive shaft
	09950–00020	Bearing Remover	Front axle Rear axle Rear drive shaft
	09950–60010	Replacer Set	
	(09951–00380)	Replacer 38	Rear axle
	(09951–00550)	Replacer 55	Rear axle
	(09951–00650)	Replacer 65	Rear drive shaft
	09950–60020	Replacer Set No.2	
	(09951–00680)	Replacer 68	Front axle
	(09951–00730)	Replacer 73	Rear axle
	09950–70010	Handle Set	Rear axle Rear drive shaft
	(09951–07150)	Handle 150	

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	
	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	

PP08X–04

EQUIPMENT

Dial indicator with magnetic base	
Drill	
Torque wrench	
Vise	

PP08Y–05

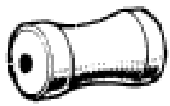
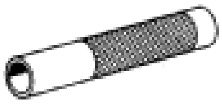
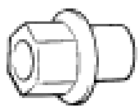
LUBRICANT

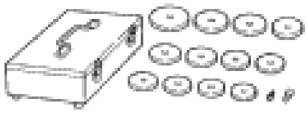
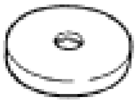
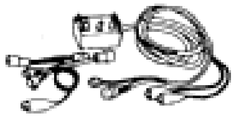
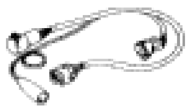
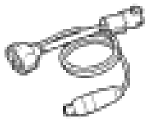
Drive shaft joint grease		Capacity	Application
Outboard side	Color=Yellow ocher	140 – 155 g (4.9 – 5.5 oz.)	
Inboard side	Color=Yellow ocher	180 – 190 g (6.3 – 6.7 oz.)	

BRAKE

PP2LX–01

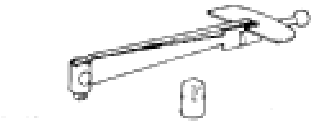
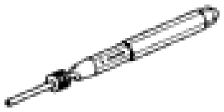
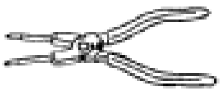
SST (Special Service Tools)

	09023–00100	Union Nut Wrench 10 mm	
	09325–12010	Transmission Oil Plug	Rear brake caliper
	09520–00031	Rear Axle Shaft Puller	Front speed sensor
	(09520–00040)	Shocker	
	(09521–00020)	Rod with Grip	
	09527–10011	Rear Axle Shaft Bearing Remover	Front speed sensor
	09612–22011	Tilt Handle Bearing Replacer	Rear brake caliper
	09710–04101	Base	Front speed sensor
	09719–14020	Rear Disc Brake Tool Set	Rear brake caliper
	(09719–00020)	Piston Driver	
	09756–00010	Adjusting Bolt Guide Nut	Rear brake caliper
	09843–18040	Diagnosis Check Wire No.2	

	09950–60020	Replacer Set No.2	Front speed sensor
	(09951–00680)	Replacer 68	
	09950–00020	Bearing Remover	Front speed sensor
	09990–00150	ABS Actuator Checker and Sub–harness	
	09990–00250	ABS Actuator Checker Sub–harness ”G”	
	09990–00300	ABS Actuator Checker Sub–harness ”I”	
	09990–00360	ABS Actuator Checker Sub–harness ”L”	

PP2LY–01

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	
	09031–00030	Pin Punch .	
	09082–00040	TOYOTA Electrical Tester.	
	09905–00013	Snap Ring Pliers .	Master cylinder

PP16E–03

EQUIPMENT

Dial indicator	Brake disc
Micrometer	Brake disc
Torque wrench	

PP16F–02

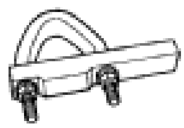
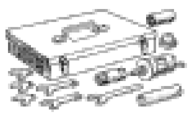
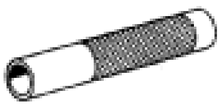
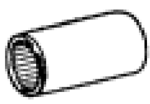
LUBRICANT

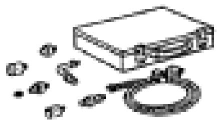
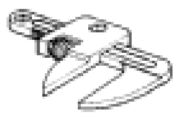
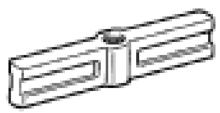
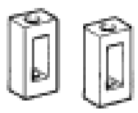
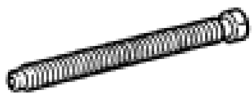
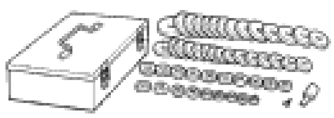
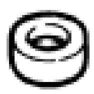
Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No. 116 DOT 3

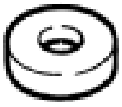
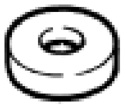
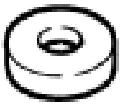
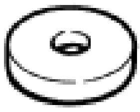
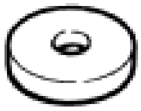
STEERING

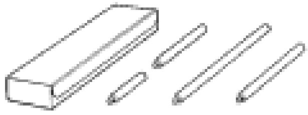
SST (Special Service Tools)

PP2LO–01

	09023–12700	Union Nut Wrench 17mm	PS vane pump PS gear
	09023–38200	Union Nut Wrench 12mm	PS gear
	09521–24010	Drive Shaft Boot Clamping Tool	PS gear
	09608–04031	Front Hub Inner Bearing Cone Replacer	Tilt steering column
	09612–00012	Rack & Pinion Steering Rack Housing Stand	PS gear
	09612–24014	Steering Gear Housing Overhaul Tool Set	
	(09613–22011)	Steering Rack Shaft Bushing Puller	PS gear
	09612–22011	Tilt Handle Bearing Replacer	PS gear
	09616–00011	Steering Worm Bearing Adjusting Socket	PS gear
	09631–12071	Steering Rack Oil Seal Test Tool	
	(09633–00010)	Packing	PS gear
	09631–10041	Steering Rack Cover ”D”	PS gear

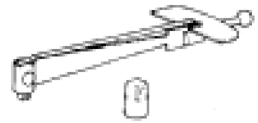
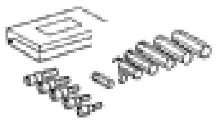
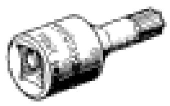
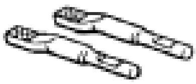
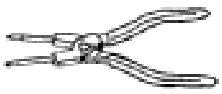
	09631–20081	Seal Ring Tool	PS gear
	09640–10010	Power Steering Pressure Gauge Set	Power steering fluid
	(09641–01010)	Gauge Assy	
	(09641–01020)	Attachment A	
	(09641–01030)	Attachment B	
	09922–10010	Variable Open Wrench	PS gear
	09950–50012	Puller C Set	Tilt steering column
	(09951–05010)	Hanger 150	
	(09952–05010)	Slide Arm	
	(09953–05020)	Center Bolt 150	
	(09954–05020)	Claw No.2	
	09950–60010	Replacer Set	
	(09951–00190)	Replacer 19	PS gear

	(09951–00210) Replacer 21	PS gear
	(09951–00220) Replacer 22	PS gear
	(09951–00240) Replacer 24	PS gear
	(09951–00260) Replacer 26	PS gear
	(09951–00280) Replacer 28	PS vane pump
	(09951–00320) Replacer 32	PS gear
	(09951–00330) Replacer 33	PS gear
	(09951–00340) Replacer 34	PS gear
	(09951–00350) Replacer 35	PS gear
	(09951–00380) Replacer 38	PS gear
	(09951–00420) Replacer 42	PS gear
	(09951–00430) Replacer 43	PS gear
	(09952–06010) Adapter	PS gear

	09950–70010	Handle Set	
	(09951–07100)	Handle 100	PS vane pump
	(09951–07200)	Handle 200	PS gear
	(09951–07360)	Handle 360	PS gear

PP2EL–02

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	PS vane pump
	09040–00011	Hexagon Wrench Set .	PS gear
	09042–00010	Torx Socket T30 .	Tilt steering column
	09904–00010	Expander Set .	
	(09904–00020)	No. 1 Claw	Tilt steering column
	09905–00013	Snap Ring Pliers .	

PP0J9–05

EQUIPMENT

Centering punch	Tilt steering column
Dial indicator	PS gear
Drill	Tilt steering column
Feeler gauge	PS vane pump
Micrometer	PS vane pump
Screw exractor	Tilt steering column
Torque wrench	
Vernier Calipers	PS vane pump

PP0JB–04

LUBRICANT

Item	Capacity	Classification
Power steering fluid Total	0.60 liters (0.63 US qts, 0.53 lmp. qts)	TOYOTA POWER STEERING FLUID EH (Part No. 08886–01206) or equivlent

PP1W4–02

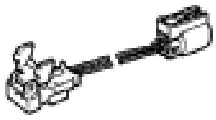
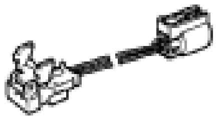
SSM (Special Service Materials)

08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	PS gear

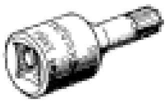
SUPPLEMENTAL RESTRAINT SYSTEM

PP0MQ–08

SST (Special Service Tools)

	09082–00700	SRS Airbag Deployment Tool	
	09082–00750	Airbag Deployment Wire Sub–harness No.3	
	09082–00760	Airbag Deployment Wire Sub–harness No.4	
	09843–18020	Diagnosis Check Wire	

RECOMMENDED TOOLS

	09042–00020	Torx Socket T40 .	Airbag sensor assembly
	09082–00050	TOYOTA Electrical Tester Set.	
	09082–00040	TOYOTA Electrical Tester.	
	(09083–00150)	Test Lead Set	

PP0MS–01

EQUIPMENT

Torque wrench	
Bolt: Length: 35 mm (1.38 in.) Pitch: 1.0 mm (0.039 in.) Diam.: 6.0 mm (0.236 in.)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360mm (14.17 in.)	Airbag disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
Vinyl bag	Airbag disposal

BODY ELECTRICAL

SST (Special Service Tools)

PP0KY–03

	09843–18020	Diagnosis Check Wire	

PP2NJ–01

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	

PP0L0–04

EQUIPMENT

Ammeter	
Bulb (3.4 W)	Fuel receiver gauge
Bulb (21 W)	Turn signal flasher relay
Masking tape	Rear window defogger wire
Syphon	Brake fluid level warning switch
Test lead	
Tin foil	Rear window defogger wire
Voltmeter	

PP26F–02

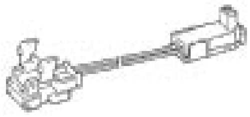
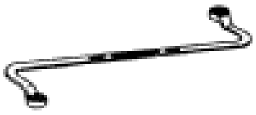
SSM (Special Service Materials)

08888–88888	DuPont Paste No. 4817 or equivalent	Rear window defogger

BODY

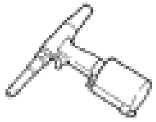
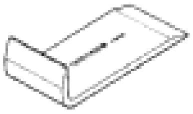
PP2DJ–02

SST (Special Service Tools)

	09082–00700	SRS Airbag Deployment Tool	
	09082–00740	Airbag Deployment Wire Sub–harness No.2	
	09812–00010	Door Hinge Set Bolt Wrench	

PP2NK–01

RECOMMENDED TOOLS

	09050–20010	Air Riveter.	
	(09050–02010)	Dust Cap.	
	(09050–02030)	Nose Piece No.2.	
	09060–60350	Revet Cutter.	
	09070–20010	Moulding Remover .	

PP0MV–07

EQUIPMENT

Clip remover	
Torque wrench	
Hog ring pliers	
Tape	To avoid surface damage
Adhesive tape	To avoid surface damage
Double – stick tape	
Adhesive	
Butyl tape	
Cleaner	
Shop rag	Regulator handle
Knife	Moulding
Heat light	Moulding
Piano wire	Windshield
Sealer gun	
Brush	
Putty spatula	
Wooden block or similar object	For tying both piano wire ends
Plastic sheet	To avoid surface damage
Rope (no projections, difficult to break)	Seat belt pretensioner disposal
Tire Width: 185 mm (7.28 in.) Inner diam: 360 mm (14.17 in.)	Seat belt pretensioner disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam 360 mm (14.17 in.)	Seat belt pretinsioner disposal
Vinyl bag	Seat belt pretensioner disposal

PP0MW–02

LUBRICANT

Item	Capacity	Classification
MP grease	–	–

PP0TC–03

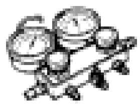
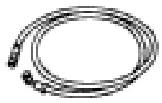
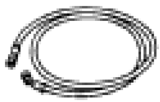
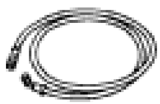
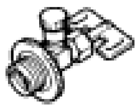
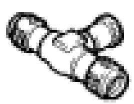
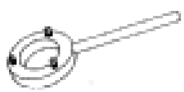
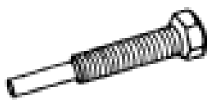
SSM (Special Service Materials)

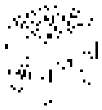
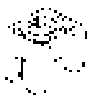
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	
08833–00030	Three cement black or equivalent	
08850–00801	Windshield Glass Adhesive Set or equivalent	

AIR CONDITIONING

SST (Special Service Tools)

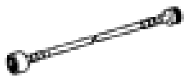
PP2NF–01

	07110–58060	Air Conditioner Service Tool Set	
	(07117–78050)	Refrigerant Charging Gauge	
	(07117–88060)	Refrigerant Charging Hose	Discharge (Red)
	(07117–88070)	Refrigerant Charging Hose	Suction (Blue)
	(07117–88080)	Refrigerant Charging Hose	Utility (Green)
	(07117–58060)	Refrigerant Drain Service Valve	
	(07117–58080)	Quick Disconnect Adapter	Discharge (diam. 16 mm)
	(07117–58090)	Quick Disconnect Adapter	Suction (diam. 13 mm)
	(07117–58070)	T–Joint	
	07116–38360	Gas Leak Detector Assembly	
	07112–76050	Magnetic Clutch Stopper	
	07112–66040	Magnetic Clutch Remover	

	07114–84020	Snap Ring Pliers	
	09870–00015	A/C Quick Joint Puller No.1	Suction tube
	09870–00025	A/C Quick Joint Puller No.2	Liquid tube

PP17X–01

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	
	09216–00021	Belt Tension Gauge .	
	09216–00030	Belt Tension Gauge Cable .	

PP0B8–02

EQUIPMENT

Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Thermometer	Thermistor, ECT switch
Torque wrench	
Dial indicator	Magnetic clutch
Plastic hammer	Magnetic clutch

PP17Y–02

LUBRICANT

Item	Capacity	Classification
Compressor oil	–	ND–OIL 8 or equivalent
When replacing condenser	40 cc (1.4 fl.oz.)	
When replacing evaporator	40 cc (1.4 fl.oz.)	
When replacing compressor	120 cc (4.1 fl.oz.)	

STANDARD BOLT

SS0ZS–01

HOW TO DETERMINE BOLT STRENGTH

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

B06431

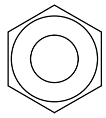
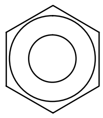
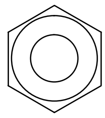
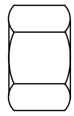
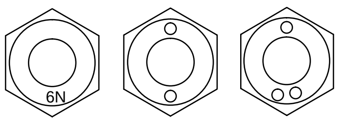
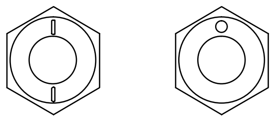
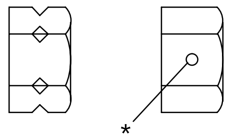
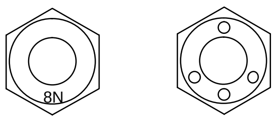
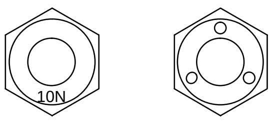
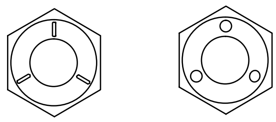
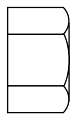
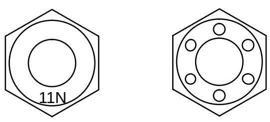
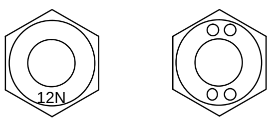
SS0ZT–01

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

MAINTENANCE

SERVICE DATA

SS0MG–02

Axle and suspension Ball joint vertical play Maximum	 0 mm (0 in.)

SS0MH–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Seat x Body	37	375	27
Rear suspension member x Body	80	816	59

ENGINE MECHANICAL

SS0MI–04

SERVICE DATA

Compression pressure		STD	1,270 kPa (13.0 kgf/cm^2, 184 psi) at 250 rpm
		Minimum	1,000 kPa (10.2 kgf/cm^2, 145 psi) at 250 rpm
		Difference of pressure between each cylinder	100 kPa (1.0 kgf/cm^2, 15 psi) or less
Valve clearance		Intake	0.15 – 0.25 mm (0.006 – 0.010 in.) at cold
		Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.) at cold
	Valve clearance adjusting shim	No. 06	5.060 mm (0.1992 in.)
		No. 08	5.080 mm (0.2000 in.)
		No. 10	5.100 mm (0.2008 in.)
		No. 12	5.120 mm (0.2016 in.)
		No. 14	5.140 mm (0.2024 in.)
		No. 16	5.160 mm (0.2031 in.)
		No. 18	5.180 mm (0.2039 in.)
		No. 20	5.200 mm (0.2047 in.)
		No. 22	5.220 mm (0.2055 in.)
		No. 24	5.240 mm (0.2063 in.)
		No. 26	5.260 mm (0.2071 in.)
		No. 28	5.280 mm (0.2079 in.)
		No. 30	5.300 mm (0.2087 in.)
		No. 32	5.320 mm (0.2094 in.)
		No. 34	5.340 mm (0.2102 in.)
		No. 36	5.360 mm (0.2110 in.)
		No. 38	5.380 mm (0.2118 in.)
		No. 40	5.400 mm (0.2126 in.)
		No. 42	5.420 mm (0.2134 in.)
		No. 44	5.440 mm (0.2142 in.)
		No. 46	5.460 mm (0.2150 in.)
		No. 48	5.480 mm (0.2157 in.)
		No. 50	5.500 mm (0.2165 in.)
		No. 52	5.520 mm (0.2173 in.)
		No. 54	5.540 mm (0.2181 in.)
		No. 56	5.560 mm (0.2189 in.)
		No. 58	5.580 mm (0.2197 in.)
		No. 60	5.600 mm (0.2205 in.)
		No. 62	5.620 mm (0.2213 in.)
		No. 64	5.640 mm (0.2220 in.)
		No. 66	5.660 mm (0.2228 in.)
		No. 68	5.680 mm (0.2236 in.)
		No. 70	5.700 mm (0.2244 in.)
		No. 72	5.720 mm (0.2252 in.)
		No. 74	5.740 mm (0.2260 in.)
Ignition timing			8 – 12° BTDC at idle
Further ignition timing			6 – 15° BTDC at idle
Idle speed			700 ± 50 rpm
Chain and timing sprocket	Chain length at 16 links	Maximum	122.6 mm (4.827 in.)
	Camshaft timing sprocket wear (w/ chain)	Minimum	97.3 mm (3.831 in.)
	Crankshaft timing sprocket wear (w/ chain)	Minimum	51.6 mm (2.031 in.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)

Cylinder head	Warpage	Maximum	0.05 mm (0.0020 in.)
	Valve seat		
	Refacing angle		30°, 45°, 75°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Residuary width	Minimum Intake	3.3 mm (0.130 in.)
		Exhaust	3.2 mm (0.126 in.)
	Valve guide busing bore diameter	STD	10.285 – 10.306 mm (0.4049 – 0.4057 in.)
		O/S 0.05	10.335 – 10.356 mm (0.4068 – 0.4077 in.)
	Cylinder head bolt diameter	at tension portion STD	9.0 – 9.2 mm (0.354 – 0.362 in.)
		Minimum	9.0 mm (0.354 in.)
Valve guide bushing	Inside diameter		5.510 – 5.530 mm (0.2169 – 0.2177 in.)
	Protrusion height		8.7 – 9.1 mm (0.342 – 0.358 in.)
Valve	Valve overall length	STD Intake	88.65 mm (3.4902 in.)
		Exhaust	88.69 mm (3.4917 in.)
		Minimum Intake	88.35 mm (3.4783 in.)
		Exhaust	88.39 mm (3.4799 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.470 – 5.485 mm (0.2154 – 0.2159 in.)
		Exhaust	5.465 – 5.480 mm (0.2152 – 0.2157 in.)
	Stem oil clearance	STD Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.7 mm (0.028 in.)
Valve spring	Deviation	Maximum	1.6 mm (0.063 in.)
	Angle (Reference)	Maximum	2°
	Free length		45.90 mm (1.807 in.)
	Installed tension at 33.6 mm (1.323 in.)		139.6 – 154.4 N (14.2 – 15.8 kgf, 31.3 – 34.8 lbf)
	Maximum working tension at 24.6 mm (0.969 in.)		244.9 – 276.1 N (25.5 – 28.1 kgf, 56.2 – 61.9 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.2191 – 1.2195 in.)
	Lifter bore diameter		31.000 – 31.025 mm (1.2205 – 1.2215 in.)
	Oil clearance	STD	0.024 – 0.059 mm (0.0009 – 0.0023 in.)
		Maximum	0.079 mm (0.0031 in.)
Camshaft	Thrust clearance	STD	0.040 – 0.095 mm (0.0016 – 0.0037 in.)
		Maximum	0.11 mm (0.0043 in.)
	Journal oil clearance	STD	0.035 – 0.072 mm (0.0014 – 0.0028 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter	No. 1	34.449 – 34.465 mm (1.3563 – 1.3569 in.)
		Others	22.949 – 22.965 mm (0.9035 – 0.9041 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Cam lobe height	STD Intake	44.578 – 44.678 mm (1.7550 – 1.7590 in.)
		Exhaust	43.761 – 43.861 mm (1.7229 – 1.7268 in.)
		Minimum Intake	44.43 mm (1.7492 in.)
		Exhaust	43.61 mm (1.7169 in.)
Intake manifold	Warpage	Maximum	0.10 mm (0.0039 in.)
Exhaust manifold	Warpage	Maximum	0.70 mm (0.0276 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	79.000 – 79.013 mm (3.1102 – 3.1107 in.)
		Maximum	79.013 mm (3.1107 in.)
	12 pointed head bearing cap sub–assembly bolt diameter at tension portion STD		7.3 – 7.5 mm (0.287 – 0.295 in.)
		Minimum	7.3 mm (0.287 in.)

Piston and piston ring	Piston diameter		
		at 25.6 mm (1.008 in.) from the piston head	78.925 – 78.935 mm (3.1073 – 3.1077 in.)
	Piston oil clearance	STD	0.065 – 0.088 mm (0.0026 – 0.0035 in.)
		Maximum	0.10 mm (0.0039 in.)
	Piston ring groove clearance		0.020 – 0.070 mm (0.0008 – 0.0028 in.)
	Piston ring end gap	STD No. 1	0.25 – 0.35 mm (0.0098 – 0.0138 in.)
		No. 2	0.35 – 0.50 mm (0.0138 – 0.0197 in.)
		Oil (Side rail)	0.15 – 0.40 mm (0.0059 – 0.0157 in.)
		Maximum No. 1	1.05 mm (0.0413 in.)
		No. 2	1.20 mm (0.0472 in.)
		Oil (side rail)	1.05 mm (0.0413 in.)
Connecting rod	Thrust clearance	STD	0.160 – 0.342 mm (0.0063 – 0.0135 in.)
		Maximum	0.342 mm (0.0135 in.)
	Connecting rod thickness		19.788 – 19.840 mm (0.7791 – 0.7811 in.)
	Connecting rod bearing center wall thickness		
	Reference	Mark 1	1.486 – 1.490 mm (0.0585 – 0.0587 in.)
		Mark 2	1.490 – 1.494 mm (0.0587 – 0.0588 in.)
		Mark 3	1.494 – 1.498 mm (0.0588 – 0.0590 in.)
	Connecting rod oil clearance	STD	0.028 – 0.060 mm (0.0011 – 0.0024 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rodout–of–alignment	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Bushing inside diameter		20.012 – 20.021 mm (0.7879 – 0.7882 in.)
	Piston pin diameter		20.004 – 20.013 mm (0.7876 – 0.7879 in.)
	Bushing oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt diameter	at tension portion STD	6.6 – 6.7 mm (0.260 – 0.264 in.)
		Minimum	6.4 mm (0.252 in.)
Crankshaft	Thrust clearance	STD	0.04 – 0.24 mm (0.0016 – 0.0094 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.430 – 2.480 mm (0.0957 – 0.0976 in.)
	Main journal oil clearance	STD	0.015 – 0.032 mm (0.0006 – 0.0013 in.)
		Maximum	0.050 mm (0.0020 in.)
	Main journal diameter	Mark 0	47.998 – 48.000 mm (1.8897 – 1.8898 in.)
		Mark 1	47.996 – 47.998 mm (1.8896 – 1.8897 in.)
		Mark 2	47.994 – 47.996 mm (1.8895 – 1.8896 in.)
		Mark 3	47.992 – 47.994 mm (1.8894 – 1.8895 in.)
		Mark 4	47.990 – 47.992 mm (1.8893 – 1.8894 in.)
		Mark 5	47.988 – 47.990 mm (1.8892 – 1.8893 in.)
	Main bearing center wall thickness		
	Reference	Mark 1	1.993 – 1.996 mm (0.0785 – 0.0786 in.)
		Mark 2	1.996 – 1.999 mm (0.0786 – 0.0787 in.)
		Mark 3	1.999 – 2.002 mm (0.0787 – 0.0788 in.)
		Mark 4	2.002 – 2.005 mm (0.0788 – 0.0789 in.)
	Crank pin diameter		43.992 – 44.000 mm (1.7320 – 1.7323 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out–of round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of round	Maximum	0.02 mm (0.0008 in.)

SS0MJ–04

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Drive belt idler pulley x Drive belt idler		43	440	32
Camshaft timing sprocket x Camshaft		54	551	40
VVT timing sprocket x Camshaft		54	551	40
Chain vibration damper x Cylinder block		9	92	80 in.·lbf
Chain tensioner slipper x Cylinder block		18.5	189	14
Timing chain cover x Cylinder head, cylinder block	Bolt A	18.5	189	14
	Bolt B	13	133	10
	Bolt C	9	92	80 in.·lbf
	Others	11	113	8
RH engine mounting bracket x Timing chain cover		47	479	35
Driver belt tensioner x Timing chain cover	Bolt	69	704	51
	Nut	29	296	21
Crankshaft position sensor x Timing chain cover		9	92	80 in.·lbf
Crankshaft pulley x Crankshaft		138	1,409	102
Chain tensioner x Timing chain cover		9	92	80 in.·lbf
Oil dipstick guide x Cylinder block		13	133	10
Cylinder head cover x Cylinder head	w/ Washer	9	92	80 in.·lbf
	w/o Washer	11	113	8
RH engine mounting insulator x RH engine mounting bracket, body		52	530	38
Drive belt idler x Engine assembly		36	370	27
Camshaft bearing cap x Cylinder head	No. 1	23	235	17
	No. 3	13	133	10
Cylinder head x Cylinder block	1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°
Water bypass pipe x Cylinder head		9	92	80 in.·lbf
Intake manifold x Cylinder head		30	306	22
Exhaust manifold x Cylinder head		37	377	27
Exhaust manifold stay x Exhaust manifold, cylinder block		37	377	27
Heated Oxygen sensor x Exhaust manifold		44	450	32
Suspension upper brace x Body	Bolt	74	755	55
	Nut	80	816	59
Transaxle x Engine	17 mm head bolt	64	650	47
	14 mm head long bolt	47	480	35
	14 mm head short bolt	23	230	19
Clutch cover x Flywheel		19	195	14
Flywheel x Crankshaft	1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°
Suspension member x Body		80	816	59
Rear engine mounting insulator throught bolt x nut		93	948	69
Front engine mounting insulator throught bolt x nut		89	908	66
LH engine mounting insulator throught bolt x nut		87	887	64
A/C compressor x Cylinder block		25	255	18
Front exhaust pipe x Tailpipe		43	438	32
Front exhaust pipe x Exhaust manifold		62	632	46
Accelerator cable x Throttle body		21	214	15

Bearing cap subassembly x Cylinder block	12 pointed head 1st 2nd 3rd 4th Hexagon head	22 44 Turn 45° Turn 45° 18.5	225 449 Turn 45° Turn 45° 189	16 32 Turn 45° Turn 45° 14
Connecting rod cap x Connecting rod	1st 2nd	20 Turn 90°	204 Turn 90°	15 Turn 90°
Oil strainer x Bearing cap assembly		9	92	80 in.·lbf
Oil pan x Bearing cap assembly		9	92	80 in.·lbf
Oil filter union x Bearing cap assembly		30	306	21
Engine coolant drain union x Cylinder block		20	204	15
Knock sensor x Cylinder block		39	400	29
Water bypass pipe x Cylinder block		9	92	80 in.·lbf
Heated oxygen sensor x Front exhaust pipe		44	450	32

EMISSION CONTROL

SS0MK–03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Charcoal canister x Body		27	275	20
Exhaust manifold x Cylinder head		37	377	27
Exhaust manifold x No.1 exhaust manifold stay		49	500	36
Exhaust manifold x No.2 exhaust manifold stay		37	377	27
Front exhaust pipe x Exhaust manifold		62	632	46
Tailpipe x Front exhaust pipe		43	438	32
Heated oxygen sensor x Exhaust manifold	for Bank 1 sensor 1	44	450	33
	for Bank 2 sensor 1	44	450	33

SFI

SS0MM–05

SERVICE DATA

Fuel pressure regulator	Fuel pressure		301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)
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 60 – 73 cm^3 (3.2 – 3.9 cu in.) per 15 seconds 13 cm^3 (0.7 cu in.) or less One drop or less per 12 minutes
Mass air flow meter	Resistance	at –20°C (–4°F) at 20°C (68°F) at 60°C (140°F)	13.6 – 18.4 kΩ 2.21 – 2.69 kΩ 0.49 – 0.67 kΩ
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
Camshaft timing oil control valve	Resistance	at 20°C (68°F)	6.9 – 7.9 Ω
VSV (EVAP)	Resistance	at 20°C (68°F)	27 – 33 Ω
VSV (CCV)	Resistance	at 20°C (68°F)	25 – 30 Ω
VSV (Pressure switching valve)	Resistance	at 20°C (68°F)	30 – 36 Ω
ECT 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
Vapor pressure sensor	Power source voltage		4.5 – 5.5 V
Heated oxygen sensor	Heater coil resistance	at 20°C (68°F) at 800°C (1,472°F)	11 – 16 Ω
Fuel cut rpm	Fuel return rpm		1,400 rpm

SS0MN–05

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Fuel pump x Fuel tank		3.4	35	30 in.·lbf
Delivery pipe x Cylinder head		19	190	13
Suspension upper brace x Body	(Bolt)	74	755	55
	(Nut)	80	816	59
No. 2 cylinder head cover x Cylinder head cover		7.0	71	62 in.·lbf
Fuel tank x Body		33	337	24
Throttle body x Intake manifold		30	306	22
Camshaft timing oil control valve x Cylinder head		9.0	92	80 in.·lbf
Engine coolant temperature sensor x Cylinder head		20.4	208	15
Knock sensor x Cylinder block		39	398	29
Intake manifold x Cylinder head		30	306	22
Heated oxygen sensor x Exhaust manifold	for Bank 1 sensor 1	44	450	33
	for Bank 2 sensoer 1	44	450	33
Heated oxygen sensor x Front exhaust pipe	for Bank 1 sensor 2	44	450	33

COOLING

SERVICE DATA

SS0MO–03

Thermostat	Valve opening temperature		80 – 84°C (176 – 183.2°F)
	Valve lift	at 90°C (194°F)	10 mm (0.39 in.) or more
Radiator cap	Relief valve opening pressure	STD	93 – 123 kPa (0.95 – 1.25 kgf/cm^2, 13.5 – 17.8 psi)
		Minimum	79 kPa (0.8 kgf/cm^2, 11.5 psi)
Electric cooling fan	Rotating amperage		5.7 – 7.7 A

SS0MP–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Drain plug x Engine coolant drain union on cylinder block	13	133	9.6
Drain plug x Radiator pipe	16.5	168	12
Water pump x Timing chain cover	9	92	80 in.·lbf
Water pump x Cylinder block	11	113	8
Water inlet x Cylinder block	9	90	80 in.·lbf
Radiator upper support x Body	12.5	128	9
Spear wheel carrier extension x Body	8	82	70 in.·lbf
Radiator x Fan shroud	5	51	44 in.·lbf
Fan x Fan motor	6.18	63	55 in.·lbf
Fan shroud x Fan motor	2.55	26	23 in.·lbf

LUBRICATION

SERVICE DATA

SS0MQ–04

Oil pressure		at idle speed	29 kPa (0.3 kgf/cm^2, 43 psi) or more
		at 3,000 rpm	294 – 539 kPa (3.0 – 5.5 kgf/cm^2, 43 – 78 psi)
Oil pump	Side clearance	STD	0.025 – 0.071 mm (0.0010 – 0.0028 in.)
		Maximum	0.71 mm (0.0028 in.)
	Tip clearance	STD	0.040 – 0.160 mm (0.0016 – 0.0063 in.)
		Maximum	0.160 mm (0.0063 in.)
	Body clearance	STD	0.200 – 0.325 mm (0.0102 – 0.0130 in.)
		Maximum	0.325 mm (0.0130 in.)

SS0MR–04

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Oil pressure switch x Bearing cap sub–assembly	13	130	9
Drain plug x Oil pan	37	378	27
Oil pump body cover x Oil pump body	10.3	105	8
Plug x Oil pump	37	375	27
Oil pump x Cylinder block	8	81.5	72 in.·lbf

IGNITION

SS0MS–09

SERVICE DATA

Spark plug	Recommended spark plug	DENSO made	SK16R11
		NGK made	IFR5A11
	Electrode gap	DENSO made	1.0 – 1.1 mm (0.039 – 0.043 in.)
		NGK made	1.0 – 1.1 mm (0.039 – 0.043 in.)
Camshaft position sensor	Resistance	at cold	835 – 1,400 Ω
		at hot	1,060 – 1,645 Ω
Crankshaft position sensor	Resistance	at cold	1,630 – 2,740 Ω
		at hot	2,065 – 3,225 Ω

SS0MT–07

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head		25	255	19
Ignition coil (w/ Igniter) x Cylinder head cover		9.0	92	80 in.·lbf
No. 2 cylinder head cover x Cylinder head cover		7.0	71	62 in.·lbf
Suspension upper brace x Body	(Bolt)	74	755	55
	(Nut)	80	816	59
Camshaft position sensor x Cylinder head		9.0	92	80 in.·lbf
Crankshaft position sensor x Timing chain cover		9.0	92	80 in.·lbf
A/C compressor x Engine block		25	255	18

STARTING

SS0MU–03

SERVICE DATA

Starter	Rated voltage and output power		12 V 1.4 kW
	No–load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load	STD	17.6 – 23.5 N (1.8 – 2.4 kgf, 4.0 – 5.3 lbf)
		Minimum	11.8 N (1.2 kgf, 2.6 lbf)
	Commutator		
	Diameter	STD	30.0 mm (1.181 in.)
		Minimum	29.0 mm (1.412 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)

SS0MV–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Starter x Transaxle	37	380	28
End cover x Brush holder	1.5	15	13 in.·lbf
Starter housing x Magnetic switch	5.9	60	52 in.·lbf
End cover x Starter housing	5.9	60	52 in.·lbf
Lead wire x Terminal C of starter	5.9	60	52 in.·lbf
Terminal nut x Terminal C of starter, Terminal 30 of starter	17	170	12
Magnetic switch end cover x Magnetic switch	2.5	26	23 in.·lbf

CHARGING

SS0MW–04

SERVICE DATA

Battery	Voltage	at 20°C (68°F)	12.5 – 12.9 V
	Specific gravity	at 20°C (68°F)	1.25 – 1.29
Generator	Rated output		12 V 80 A
	Rotor coil resistance		2.1 – 2.5 Ω
	Slip ring diameter	STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	9.5 – 11.5 mm (0.374 – 0.453 in.)
		Minimum	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage		13.2 – 14.0 V

SS0MX–04

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Bearing retainer x Drive end frame		3.0	31	27 in.·lbf
Rectifier end frame x Drive end frame	Nut A	4.5	46	40 in.·lbf
	Nut B	5.4	55	48 in.·lbf
Generator pulley x Rotor		110.5	1,125	81
Rectifier end frame x Brush holder, Voltage regulator		2.0	20	18 in.·lbf
Rectifier holder x Coil lead on rectifier end frame		2.9	30	26 in.·lbf
Rear end cover x Rectifier holder		4.4	45	39 in.·lbf
Plate terminal x Rectifier holder	Nut	4.4	45	39 in.·lbf
	Bolt	3.9	39	35 in.·lbf
Terminal insulator x Rectifier holder		4.1	42	36 in.·lbf
Generator x RH engine mount bracket		25	255	18
Generator x Cylinder block		54	550	40

CLUTCH

SS09I–04

SERVICE DATA

Pedal height from asphalt sheet		128.2 – 138.2 mm (5.047 – 5.441 in.)
Pedal freeplay		1.0 – 5.0 mm (0.039 – 0.197 in.)
Push rod play at pedal top		5.0 – 15.0 mm (0.197 – 0.591 in.)
Clutch release point from pedal full stroke end position		25 mm (0.98 in.) or more
Slotted spring pin protrusion		1.5 – 2.5 mm (0.059 – 0.098 in.)
Disc rivet head depth	Min.	0.3 mm (0.012 in.)
Disc runout	Max.	0.8 mm (0.031 in.)
Flywheel runout	Max.	0.1 mm (0.004 in.)
Diaphragm spring finger wear	Max. depth	0.5 mm (0.020 in.)
Diaphragm spring finger wear	Max. width	6.0 mm (0.236 in.)
Diaphragm spring tip non–alignment	Max.	0.5 mm (0.020 in.)

SS09J–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Clutch line union	20	204	15
for use with SST	18	185	13
Master cylinder installation nut	12	120	9
Release cylinder installation bolt	12	120	9
Flywheel set bolt	49	500	36
Clutch cover x Flywheel	19	195	14
Release fork support	37	375	27

MANUAL TRANSAXLE

SERVICE DATA

SS02P–04

Input shaft roller bearing journal diameter	Min.	24.985 mm (0.9837 in.)
Input shaft 3rd gear journal diameter	Min.	30.985 mm (1.2199 in.)
Input shaft 4th gear journal diameter	Min.	28.985 mm (1.1411 in.)
Input shaft 5th gear journal diameter	Min.	24.885 mm (0.9797 in.)
Input shaft runout	Max.	0.03 mm (0.0012 in.)
Output shaft roller bearing journal diameter	Min.	32.985 mm (1.2986 in.)
Output shaft 1st gear journal diameter	Min.	37.985 mm (1.4955 in.)
Output shaft 2nd gear journal diameter	Min.	31.985 mm (1.2592 in.)
Output shaft runout	Max.	0.03 mm (0.0012 in.)
Gear thrust clearance 1st	STD Max.	0.10 – 0.40 mm (0.0039 – 0.0157 in.) 0.40 mm (0.0157 in.)
Gear thrust clearance 2nd	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 3rd	STD Max.	0.10 – 0.35 mm (0.0039 – 0.0138 in.) 0.35 mm (0.0138 in.)
Gear thrust clearance 4th	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 5th	STD Max.	0.10 – 0.57 mm (0.0039 – 0.0224 in.) 0.57 mm (0.0224 in.)
Gear radial clearance 1st, 2nd, 3rd, 4th and 5th (KOYO made)	STD Max.	0.015 – 0.058 mm (0.0006 – 0.0023 in.) 0.058 mm (0.0023 in.)
Gear radial clearance 1st, 2nd, 3rd, 4th and 5th (NSK made)	STD Max.	0.015 – 0.056 mm (0.0006 – 0.0022 in.) 0.056 mm (0.0022 in.)
No. 3 gear shift fork to No. 3 hub sleeve clearance	Max.	0.5 mm (0.020 in.)
No. 2 gear shift fork to No. 2 hub sleeve clearance	Max.	0.35 mm (0.014 in.)
No. 1 gear shift fork to reverse gear clearance	Max.	0.35 mm (0.014 in.)
Synchronizer ring to gear clearance 1st, 4th	Min.	0.75 mm (0.0295 in.)
Synchronizer ring to gear clearance 2nd	Min.	0.70 mm (0.0276 in.)
Synchronizer ring to gear clearance 3rd	Min.	0.65 mm (0.0256 in.)
Synchronizer ring to gear clearance 5th	Min.	0.75 mm (0.030 in.)
Depth Input shaft front oil seal Input shaft front bearing Control shaft cover bushing Control shaft cover oil seal Transmission case oil seal Transaxle case oil seal Select inner lever slotted spring pin No. 1 shift inner lever slotted spring pin No. 2 shift inner lever slotted spring pin		 15.8 ± 0.2 mm (0.622 ± 0.008 in.) 0 – 0.3 mm (0 – 0.012 in.) 0.65 ± 0.25 mm (0.0256 ± 0.0098 in.) 0.70 ± 0.50 mm (0.0276 ± 0.0197 in.) 9.9 ± 0.3 mm (0.390 ± 0.012 in.) 1.9 ± 0.3 mm (0.075 ± 0.012 in.) 0 ± 0.5 mm (0 ± 0.020 in.) 0 ± 0.5 mm (0 ± 0.020 in.) 3.5 ± 0.5 mm (0.138 ± 0.020 in.)

Input shaft snap ring thickness		
No.2 clutch hub	Mark 0	2.30 mm (0.0906 in.)
	Mark 1	2.36 mm (0.0929 in.)
	Mark 2	2.42 mm (0.0953 in.)
	Mark 3	2.48 mm (0.0976 in.)
	Mark 4	2.54 mm (0.1000 in.)
	Mark 5	2.60 mm (0.1024 in.)
Rear radial ball bearing	Mark A	2.29 mm (0.0902 in.)
	Mark B	2.35 mm (0.0925 in.)
	Mark C	2.41 mm (0.0949 in.)
	Mark D	2.47 mm (0.0972 in.)
	Mark E	2.53 mm (0.0996 in.)
	Mark F	2.59 mm (0.1020 in.)
Output shaft snap ring thickness		
No.1 clutch hub	Mark A	2.50 mm (0.0984 in.)
	Mark B	2.56 mm (0.1008 in.)
	Mark C	2.62 mm (0.1031 in.)
	Mark D	2.68 mm (0.1055 in.)
	Mark E	2.74 mm (0.1079 in.)
	Mark F	2.80 mm (0.1102 in.)
Front bearing inner race	Mark 7	1.85 mm (0.0728 in.)
	Mark 8	1.90 mm (0.0748 in.)
	Mark 1	1.95 mm (0.0768 in.)
	Mark 2	2.00 mm (0.0787 in.)
	Mark 3	2.05 mm (0.0807 in.)
	Mark 4	2.10 mm (0.0827 in.)
	Mark 5	2.15 mm (0.0846 in.)
	Mark 6	2.20 mm (0.0866 in.)
No.3 clutch hub	Mark A	2.25 mm (0.0886 in.)
	Mark B	2.31 mm (0.0909 in.)
	Mark C	2.37 mm (0.0933 in.)
	Mark D	2.43 mm (0.0957 in.)
	Mark E	2.49 mm (0.0980 in.)
	Mark F	2.55 mm (0.1004 in.)
	Mark G	2.61 mm (0.1028 in.)
In case that w/o LSD Differential tapered roller bearing preload (at starting)(For use with SST)		
	New bearing	0.78 – 1.57 N·m (7.96 – 16.0 kgf·cm, 6.9 – 13.9 in.·lbf)
	Reused bearing	0.49 – 0.98 N·m (5.0 – 10.0 kgf·cm, 4.3 – 8.7 in.·lbf)
In case that w/o LSD Differential tapered roller bearing preload (at starting)(For use with SST)		
	New bearing	0.17 – 0.35 N·m (1.73 – 3.57 kgf·cm, 1.50 – 3.10 in.·lbf)
	Reused bearing	0.11 – 0.22 N·m (1.12 – 2.24 kgf·cm, 0.97 – 1.95 in.·lbf)
Differential pinion to side gear backlash		0.05 mm – 0.20 mm (0.0020 – 0.0079 in.)
Differential side gear thrust washer thickness		0.95 mm (0.0374 in.)
		1.00 mm (0.0394 in.)
		1.05 mm (0.0413 in.)
		1.10 mm (0.0433 in.)
		1.15 mm (0.0453 in.)
		1.20 mm (0.0472 in.)

Differential tapered roller bearing adjusting shim thickness	Mark AA	2.10 mm (0.0827 in.)
	Mark BB	2.15 mm (0.0846 in.)
	Mark CC	2.20 mm (0.0866 in.)
	Mark DD	2.25 mm (0.0886 in.)
	Mark EE	2.30 mm (0.0906 in.)
	Mark FF	2.35 mm (0.0925 in.)
	Mark GG	2.40 mm (0.0945 in.)
	Mark HH	2.45 mm (0.0965 in.)
	Mark JJ	2.50 mm (0.0984 in.)
	Mark KK	2.55 mm (0.1004 in.)
	Mark LL	2.60 mm (0.1024 in.)
	Mark MM	2.65 mm (0.1043 in.)
	Mark NN	2.70 mm (0.1063 in.)
	Mark PP	2.75 mm (0.1083 in.)
	Mark QQ	2.80 mm (0.1102 in.)
	Mark RR	2.85 mm (0.1122 in.)
	Mark SS	2.90 mm (0.1142 in.)
	Mark TT	2.95 mm (0.1161 in.)
	Mark UU	3.00 mm (0.1181 in.)

SS02Q–05

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Engine hood x Body		20	204	15
Suspension upper brace x Body	Bolt	74	755	55
	Nut	80	816	59
Battery carrier x Body		24	245	18
Control cable bracket x Transaxle		25	255	18
Transaxle x Engine (From transaxle side)		64	650	47
No.1 and No.2 engine hangers set bolt		38	387	28
Left engine mounting insulator	Through bolt and nut	87	887	64
	Bolt	52	530	38
Left engine mounting bracket x Transaxle		52	530	38
Filler and drain plugs		39	400	29
Clutch release cylinder x Transaxle		12	120	9
Front engine mounting bracket	Through bolt and nut	93	949	69
	Bolt	78	796	56
Front engine mounting insulator x Body		54	551	40
Starter x Transaxle		37	378	28
Rear engine mounting insulator	Through bolt and nut	93	949	69
	Bolt	89	908	66
Transaxle x Engine (From engine side)	Bolt A	47	480	35
	Bolt B	23	230	17
Back–up light switch		40	410	30
Control cable bracket x Transaxle case		25	250	18
Control shaft assembly		12	122	9
Selecting bellcrank assembly x Transaxle case		20	204	15
Shifting bellcrank assembly x Transmission case		20	204	15
Lever lock pin set nut		12	122	9
Transmission case x Transmission case cover		18	185	13
Lock ball assembly (Shift and select lever shaft side)		29	300	22
Control shaft cover x Transmission case		20	200	14
5th driven gear lock nut		118	1,200	87
No.1, No.2 and No.3 gear shift forks set bolt		16	160	12
Rear bearing retainer x Transmission case		27	280	20
Reverse idler gear shaft lock bolt		29	300	22
Straight screw plug		25	250	18
Lock ball assembly (Reverse shift fork side)		39	400	29
Transmission case x Transaxle case		29	300	22
Oil receiver pipe set bolt		17	175	13
Reverse shift arm bracket x Transaxle case		17	175	13
No.1 gear shift head set bolt		16	160	12
Output shaft front bearing lock plate set bolt		11	115	8
Transaxle case receiver x Transaxle case		11	115	8
Straight screw plug (Reverse restrict pin)		13	130	9
Differential case x Ring gear	w/o LSD	77	790	57
	w/ LSD	101	1,030	74

Shift and select control cable x Body	4.9	50	43 in.·lbf
Shift lever assembly x Body	12	50	43

SUSPENSION AND AXLE

SS04W–09

SERVICE DATA

Cold tire inflation pressure	185/55R15 81V 205/50R15 85V	Front Rear	180 kPa (1.8 kgf/cm^2, 26 psi) 220 kPa (2.2 kgf/cm^2, 32 psi)
Front Wheel alignment	Vehicle height	Front*1 Rear*2	204 mm (8.03 in.) 270 mm (10.63 in.)
	Camber	Right–left error	–0°47' ± 45' (–0.78° ± 0.75°) 45' (0.75°) or less
	Caster	Right–left error	3°08' ± 45' (3.13° ± 0.75°) 45' (0.75°) or less
	Steering axis inclination	Right–left error	14°52' ± 45' (14.87° ± 0.75°) 45' (0.75°) or less
	Toe–in (total)	Rack end length difference	0°09' ± 12' (0.15° ± 0.2°, 1.5 ± 2 mm, 0.06 ± 0.08 in.) 1.5 mm (0.059 in.) or less
	Wheel angle	Inside wheel Outside wheel: Reference	38°03' ± 2° (38.05° ± 2°) 32°56' (32.93°)
Rear wheel alignment	Camber	Right–left error	–1°05' ± 45' (–1.08° ± 0.75°) 45' (0.75°) or less
	Toe–in (total)	Right–left error	0°18' ± 12' (0.3° ± 0.2°, 3 ± 2 mm, 0.12 ± 0.08 in.) 0.3 mm (0.012 in.) or less
Front axle	Axle bearing backlash	Maximum	0.05 mm (0.0020 in.)
	Axle hub deviation	Maximum	0.07 mm (0.0028 in.)
Front suspension	Lower ball joint turning torque		0.59 – 3.43 N·m (6 – 35 kgf·cm, 5.2 – 30 in.·lbf)
	Stabilizer bar link ball joint turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)
Rear axle	Axle bearing backlash	Maximum	0.05 mm (0.0020 in.)
	Axle hub deviation	Maximum	0.07 mm (0.0028 in.)
Rear drive shaft	Drive shaft standard length	RH LH	814.1 ± 5.0 mm (32.051 ± 0.197 in.) 570.4 ± 5.0 mm (22.457 ± 0.197 in.)
Rear suspension	Stabilizer bar link ball joint turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)

*1: Front measuring point
Measure the distance from the ground to the center of the front side lower suspension arm mounting bolt.
*2: Rear measuring point
Measure the distance from the ground to the center of the front side strut rod mounting bolt.

SS04X–09

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
FRONT AXLE			
Hub nut	103	1,050	76
Tie rod end lock nut	47	479	35
Steering knuckle x Shock absorber	140	1,430	103
Brake caliper x Steering knuckle	109	1,112	80
Axle hub x Steering knuckle	56	571	41
Steering knuckle x Tie rod end	49	500	36
Lower suspension arm x Steering knuckle	98	1,000	72
FRONT SUSPENSION			
Suspension support x Body	39	400	29
Shock absorber center nut	51	520	38
Flexible hose x Shock absorber	29	296	21
ABS speed sensor wire harness x Shock absorber	8.0	82	71 in.·lbf
Lower suspension arm, suspension member brace x Body	73	745	54
Lower suspension arm x Suspension member	87	887	64
Suspension member brace x Body	75	765	55
Stabilizer bar bracket x Body	30	306	22
Stabilizer bar link x Stabilizer bar	44	449	32
Stabilizer bar link x Lower suspension arm	18	184	13
REAR AXLE			
Hub nut	103	1,050	76
Axle carrier x Shock absorber	173	1,765	128
Brake caliper x Axle carrier	59	602	34
Axle hub x Drive shaft	216	2,200	159
ABS speed sensor x Axle carrier	8.0	82	71 in.·lbf
ABS speed sensor wire harness clamp x Axle carrier	5.0	51	44 in.·lbf
Strut rod x Axle carrier	78	796	58
No. 1 lower suspension arm x Axle carrier	103	1,051	76
No. 2 lower suspension arm x Axle carrier	49	500	36
Dust cover x Axle carrier	8.3	85	74 in.·lbf
REAR DRIVE SHAFT			
Drive shaft center bearing case lock bolt	64	650	47
REAR SUSPENSION			
Flexible hose x Shock absorber	29	296	21
Suspension support x Body	80	816	59
Shock absorber center nut	73	745	54
Strut rod x Suspension member	78	796	58
No. 1 lower suspension arm x Suspension member	87	887	64
No. 2 lower suspension arm x Suspension member	87	887	64
Stabilizer bar bracket set bolt	39	398	29
Stabilizer bar link set nut	44	449	32

BRAKE

SS0LM–03

SERVICE DATA

Brake pedal height from asphalt sheet		142.1 – 152.1 mm (5.594 – 5.988 in.)
Brake pedal freeplay		1 – 6 mm (0.04 – 0.24 in.)
Stop light switch clearance		0.5 – 2.4 mm (0.020 – 0.094 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than 85 mm (3.35 in.)
Brake booster push rod to piston clearance (w/ SST)		0 mm (0 in.)
Front brake pad thickness	STD	11.0 mm (0.433 in.)
Front brake pad thickness	Minimum	1.0 mm (0.039 in.)
Front brake disc thickness	STD	20.0 mm (0.787 in.)
Front brake disc thickness	Minimum	18.0 mm (0.709 in.)
Front brake disc runout	Maximum	0.05 mm (0.0020 in.)
Rear brake pad thickness	STD	10.0 mm (0.394 in.)
Rear brake pad thickness	Minimum	1.0 mm (0.039 in.)
Rear brake disc thickness	STD	16.0 mm (0.630 in.)
Rear brake disc thickness	Minimum	15.0 mm (0.591 in.)
Rear brake disc runout	Maximum	0.10 mm (0.0039 in.)
Parking brake crank clearance	STD	0.38 – 1.02 mm (0.0150 – 0.0416 in.)
Parking brake lever travel at 196N (20 Kgf, 44.1 lbf)		5 – 8 clicks

SS0LN–03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Brake booster clevis lock nut		26	265	19
Pedal bracket x Reinforcement		20	204	15
Brake pedal x Pedal bracket		37	375	27
Parking brake adjusting nut x Lock nut		5.4	55	48 in.·lbf
Master cylinder x Brake booster		13	130	9
Brake line union nut		15	155	11
	for use with SST	14	143	10
Brake booster x Pedal bracket		13	130	9
Front disc brake caliper installation bolt		34	350	25
Hub nut		103	1,050	76
Brake caliper x Flexible hose		30	310	22
Bleeder plug		8.3	85	73 in.·lbf
Front disc brake torque plate x Steering knuckle		109	1,112	80
Rear disc brake caliper installation bolt		20	204	15
Flexible hose x Shock absorber		29	296	21
Rear disc brake torque plate x Knuckle		59	60	44
Rear caliper cable support bracket x Caliper body		47	479	35
ABS actuator x ABS actuator bracket assembly		5.4	55	48 in.·lbf
ABS actuator assembly x Body		19	195	14
Front speed sensor harness clamp bolt		5.0	51	44 in.·lbf
Rear speed sensor harness clamp bolt	Body side	19	195	14
	Lower arm side	5.0	51	44 in.·lbf
Rear speed sensor installation bolt		8.0	82	71 in.·lbf

STEERING

SS16Y–04

SERVICE DATA

POWER STEERING FLUID		
Fluid level rise	Maximum	5 mm (0.20 in.)
Fluid pressure at idle speed with valve closed	Minimum	4,900 kPa (50 kgf/cm^2, 711 psi)
STEERING WHEEL		
Steering wheel free play	Maximum	30 mm (1.18 in.)
Steering effort at idle speed	Reference	6.5 N·m (65 kgf·cm, 58 in.·lbf)
POWER STEERING VANE PUMP		
Vane plate height	Minimum	5.4 mm (0.213 in.)
Vane plate thickness	Minimum	0.882 mm (0.0347 in.)
Vane plate length	Minimum	4.596 mm (0.1809 in.)
Vane plate and vane pump rotor groove clearance	Maximum	0.023 mm (0.0009 in.)
Vane plate length	pump rotor and cam ring mark	
	0	4.604 – 4.606 mm (0.18126 – 0.18134 in.)
	1	4.602 – 4.604 mm (0.18118 – 0.18126 in.)
	2	4.600 – 4.602 mm (0.18110 – 0.18118 in.)
	3	4.598 – 4.600 mm (0.18102 – 0.18110 in.)
	4	4.596 – 4.598 mm (0.18094 – 0.18102 in.)
Spring free length	Minimum	28.7 mm (1.130 in.)
POWER STEERING GEAR		
Steering rack runout	Maximum	0.1 mm (0.004 in.)
Total preload	Turning	0.8 – 1.3 N·m (8 – 13 kgf·cm, 6.9 – 11.3 in.·lbf)

SS16Z–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
TILT STEERING COLUMN			
Adjusting nut	See page SR–16		
No. 2 tilt lever lock bolt	5.4	55	48 in.·lbf
Tilt steering support x Column tube	15	155	11
No. 2 intermediate shaft assembly x Main shaft assembly	35	360	26
Column assembly set bolt and nut	21	210	15
No. 2 intermediate shaft assembly x Control valve assembly	35	360	26
Steering wheel set nut	34	350	25
Steering wheel pad set screw (Torx screw)	8.8	90	78 in.·lbf
POWER STEERING VANE PUMP			
Rear housing set bolt	8.5	90	7.5 in.·lbf
Reservoir clamp bolt	7.0	70	61 in.·lbf
PS vane pump set bolt and nut	19	190	14
Pressure feed tube x PS vane pump assembly	39.5 (43)	400 (440)	29 (32)
POWER STEERING GEAR			
Control valve housing x Rack housing	21	210	15
Control valve self–locking nut	24.5	250	18
Rack guide spring cap lock nut x Rack housing	28 (39)	290 (400)	21 (29)
Rack end x Steering rack	62 (83)	630 (850)	46 (61)
Tie rod end lock nut	47	480	35
Turn pressure tube x Rack housing	10 (13)	100 (130)	7 (9)
Pressure feed tube assembly x PS gear assembly	22.5 (24.5)	230 (250)	17 (18)
Pressure feed tube assembly x PS vane pump assembly	39.5 (43)	400 (440)	29 (32)
PS gear assembly x Steering gear suport member	57	580	42

( ): For use without SST

SUPPLEMENTAL RESTRAINT SYSTEM

SS061–36

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Steering wheel	34	350	25
Steering wheel pad	8.8	90	78 in.·lbf
Front passenger airbag assembly x Instrument panel reinforcement	20	205	15
Airbag sensor assembly	20	205	15
Front airbag sensor	20	205	15

BODY ELECTRICAL

SS0B0–09

SERVICE DATA

Daytime running lighit relay (main)	Voltage		
	(3 – Ground)	at constant	Battery positive voltage
	(6 – Ground)	at constant	Battery positive voltage
	(9 – Ground)	at engine runninig	Battery positive voltage
	(12 – Ground)	at ignition switch position lock or ACC	No voltage
		at ignition switch position ON or START	Battery positive voltage
Combination meter (Speedometer) USA:	mhp (on vehicle)	Standard indication	Allowable range
		at 20 mhp	19 – 22 mhp
		at 40 mhp	39 – 42.5 mhp
		at 60 mhp	59.5 – 63.5 mhp
		at 80 mhp	80 – 85 mhp
		at 100 mhp	100 – 105.5 mhp
		at 120 mhp	120 – 125.5 mhp
		at 140 mhp	140 – 146 mhp
Combination meter (Speedometer)	Resistance		
	(A – B)		250 Ω
	(C – D)		250 Ω
Combination meter (Tachometer)	RPM	Standard indication (DC 13.5 V, 25°C (77°F))	Allawable range
		at 700 rpm	630 – 770 rpm
		at 1,000 rpm	900 – 1,000 rpm
		at 2,000 rpm	1,850 – 2,150 rpm
		at 3,000 rpm	2,800 – 3,200 rpm
		at 4,000 rpm	3,800 – 4,200 rpm
		at 5,000 rpm	4,800 – 5,200 rpm
		at 6,000 rpm	5,800 – 6,200 rpm
		at 7,000 rpm	6,800 – 7,200 rpm
Combination meter (Tachometer)	Resistance		
	(A – B)		250 Ω
	(C – D)		250 Ω
Combination meter (Fuel receiver gauge)	Resistance		
	(A – B)		250 Ω
	(C – D)		250 Ω
Fuel sender gauge	Resistance	Float position	
		at approx. 68.8 mm (2.71 in.)	Approx. 16.4 Ω
		at approx. 207.4 mm (8.17 in.)	Approx. 192.7 Ω
Combination meter (Engine coolant temperature reciever gauge)	Resistance		
	(A – B)		250 Ω
	(C – D)		250 Ω
Defoger switch (Wire harness side)	Voltage (Connector disconnected)		
	(4 – Ground)	at ignition switch LOCK or ACC	No voltage
	(4 – Ground)	at ignition switch ON	Battery positive voltage
Defoger switch (Wire harness side)	Voltage (Connector connected)		
	(4 – Ground)	at ignition switch ON and defogger switch OFF	Battery positive voltage
	(4 – Ground)	at ignition switch ON and defogger switch ON	No voltage

Radio reciever aseembly (Wire harness side)	Voltage	
	(A1 – Ground) at audio sounding	5 – 7 V
	(A2 – Ground) at audio sounding	5 – 7 V
	(A3 – Ground) at ignition switch ACC	Battery positive voltage
	(A4 – Ground) at constant	Battery positive voltage
	(A5 – Ground) at audio sounding	5 – 7 V
	(A6 – Ground) at audio sounding	5 – 7 V
	(A10 – Ground) at light control switch TAIL or HEAD	Battery positive voltage
	(B1 – Ground) at audio sounding	5 – 7 V
	(B2 – Ground) at audio sounding	5 – 7 V
	(B3 – Ground) at audio sounding	5 – 7 V
	(B6 – Ground) at audio sounding	5 – 7 V
Anntena motor control relay (Wire harness side)	Voltage	
	(1 – Ground) at constant	Battery positive voltage
	(4 – Ground) at ignition switch position LOCK or ACC	No voltage
	(4 – Ground) at ignition switch position ON	Battery positive voltage
	(5 – Ground) at ignition switch position LOCK	No voltage
	(5 – Ground) at ignition switch position ACC or ON	Battery positive voltage
	(7 – Ground) at radio switch and cassete OFF	No voltage
	(7 – Ground) at radio switch and cassete ON	Battery positive voltage
Clock	at per day	± 1.5 seconds

BODY

TORQUE SPECIFICATION

SS16Q–03

Part tightened		N·m	kgf·cm	ft·lbf
FRONT BUMPER		–	–	–
Front bumper reinforcement x Body		20	200	14
Front bumper x Body		5.5	56	48 in.·lbf
REAR BUMPER		–	–	–
Rear bumper reinforcement x Body		20	200	14
HOOD		–	–	–
Hood hinge x Hood		8	82	71 in.·lbf
Hood lock x Body		6.9	70	61 in.·lbf
FRONT DOOR		–	–	–
Upper window stop x Door panel		13	130	10
Door glass x Window regulator		8.0	80	70 in.·lbf
Lower plate x Door panel		5.0	50	44 in.·lbf
Window regulator x Door panel	Bolt:	8.3	85	74 in.·lbf
Window regulator x Door panel	Nut:	8.3	85	74 in.·lbf
Door glass female stabilizer x Door panel		13	130	10
Door lock x Door panel	Screw:	5.0	50	44 in.·lbf
Outside handle x Door panel		5.4	55	48 in.·lbf
Key cylinder x Outside handle		5.4	55	48 in.·lbf
Door hinge x Body		25	260	19
Door hinge x Door panel	Upper bolt:	40	410	29
Door hinge x Door panel	Lower bolt:	26	270	19
Door lock striker x Body		23	230	17
ENGINE HOOD		–	–	–
Engine hood hinge x Hood		13	130	9
Hood lock x Body		6.9	70	61 in.·lbf
FRONT WIPER AND WASHER		–	–	–
Wiper motor x Wiper link assembly		5.4	55	48 in.·lbf
Wiper motor and link assembly x Body		5.4	55	48 in.·lbf
Wiper arm x Wiper motor and link assembly		20	200	15
INSTRUMENT PANEL		–	–	–
Steering wheel set nut		34	350	25
Passenger airbag assembly x Reinforcement		20	205	15
FRONT SEAT		–	–	–
Front seat x Body		37	375	27
Seat cushion assembly x Seat adjuster		21	210	15
Seatback assembly x Seat adjuster		43	440	32
SEAT BELT		–	–	–
Front seat outer belt shoulder anchor x Body		42	420	30
Front seat outer belt floor anchor x Body		42	420	30
Front seat outer belt retractor x Body	Upper side:	7.5	76	66 in.·lbf
Front seat outer belt retractor x Body	Lower side:	42	420	30
Front seat inner belt x Front seat		42	420	30

SOFT TOP	–	–	–
Center tarpaulin bow stay catch handle x Tarpaulin	62	630	45
Tarpaulin lock x Tarpaulin	62	630	45
Tarpaulin x Body	11	115	8

AIR CONDITIONING

SERVICE DATA

SS0MB–03

Refrigerant	Charge volume		500 ± 30 g (17.64 ± 1.06 oz.)
Idle–up speed		at magnetic clutch is not engaged at magnetic clutch is engaged	700 ± 50 rpm 900 ± 50 rpm
Thermistor	Resistance	at 25˚C (77˚F)	1.700 Ω
Compressure	Resistance (1 – 2)		165 – 205 Ω
Magnetic clutch	Crearance Adjust shim thickness		0.45 ± 0.10 mm (0.018 ± 0.004 in.) 0.1 mm (0.004 in.) 0.3 mm (0.012 in.) 0.5 mm (0.020 in.)
Condenser fan	Amperage	at 20˚C (68 ˚F)	9.2 – 11.0 A
Combination meter (wire harness side)	Resistance (C1 – C4)	at evaparator temperature 25˚C (77˚F)	1.5 kΩ
Combination meter (From back side)	Voltage (B13 – Ground)	at A/C switch ON & Blower motor: operative	Below 1.0 V
		at A/C switch OFF	Battery positive voltage
	(C10 – Ground)	Mode selector: DEF.	Below 1.0 V
		Mode Selector: Except DEF.	Battery positive voltage
	(C9 – Ground)	at A/C switch ON	Below 1.0 V
		at A/C switch OFF	Battery positive voltage
	(A1 – Ground)	Blower motor: at operative	Below 2.0 V
		Blower motor: at no operative	Battery positive voltage
ECM (From back side)	Voltage (E2–12 – Ground)	at start engine. at magnetic clutch: ON	Below 1.0 V
		at start engine. magnetic clutch: OFF	Battery positive voltage
	(E3–28 – Ground)	at start engine. A/C switch ON	Battery positive voltage
		at start engine. A/C switch OFF	No voltage
	(E3–18 – Ground)	Refrigerant pressure: at 196 – 1,340 kPa	Battery positive voltage
		Refrigerant pressure: at less than 196 or more than 1,340 kPa	No voltage

SS0MC–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Condenser x Discharge tube	9.8	100	87 in.·lbf
Condenser x Liquid tube	9.8	100	87 in.·lbf
No. 1 suction Tube x Suction tube	9.8	100	87 in.·lbf
Discharge tube x Discharge tube	9.8	100	87 in.·lbf
Discharge tube x Discharge tube (Washer Bolt)	22.1	225	16
Suction tube x Suction tube (Washer Bolt)	31.9	325	24
Compressor x Discharge hose	9.8	100	87 in.·lbf
Compressor x Suction hose	9.8	100	87 in.·lbf
Expansion valve x Evaporator	3.4	35	30 in.·lbf
Steering wheel x Steering column	34	350	24
Compressor x Engine	24.5	250	18
Pressure plate x Compressor	13.2	135	10
Spare tire carrier extension x Body	8	82	70 in.·lbf
Radiator upper support x Body	12.5	128	9
Condenser x Body	8.8	90	78 in.·lbf
Condenser x Cap	12.3	125	9
Pressure switch x Liquid tube	10.8	110	8

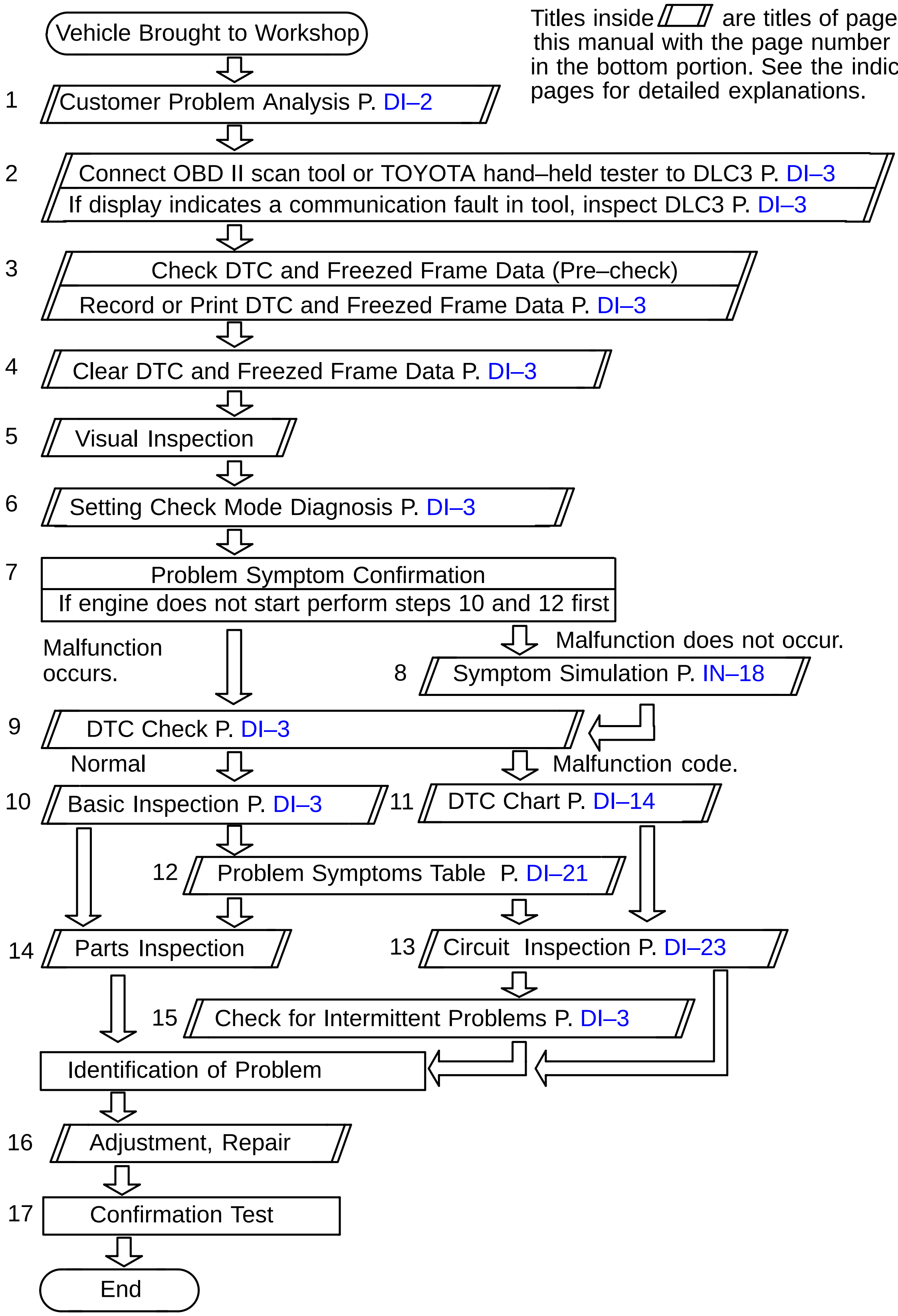
ENGINE

DI37Q–03

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

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.



DI37R–03

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name ____________________

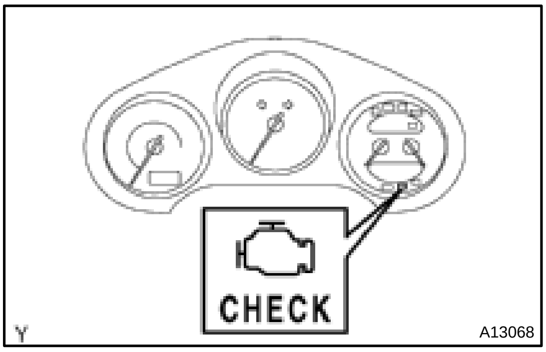
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	miles km

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 Drivability	☐ 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	

Data 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 Temperature	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temperature ☐ Other ____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other ____

Condition of MIL		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal Mode (Pre–check)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freezed frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freezed frame data ( )

DI37S–04



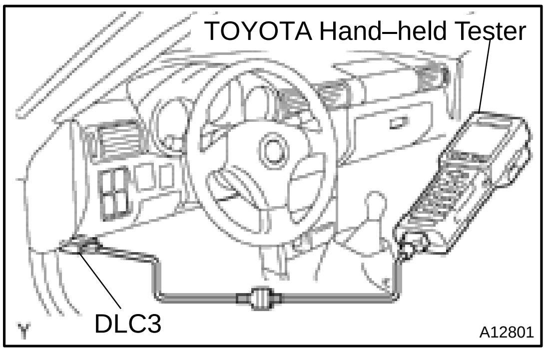
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect the vehicle to the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the emission control system/components or in the powertrain control components which affect vehicle emissions, or a malfunction in the computer. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Code (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–14).

If the malfunction does not reoccur 3 trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBD II scan tool or TOYOTA hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.).

  DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–14).

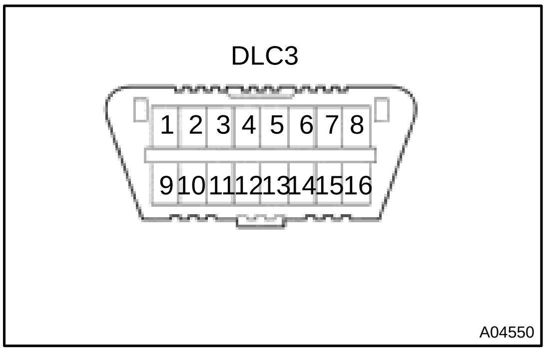
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester only)
  (See page DI–3).
- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip).

If the same malfunction is detected again during the second drive test, this second detection causes the MIL to light up (2nd trip). (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.)

- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTC P0300 – P0304) or fuel trim malfunction (DTC P0171, P0172, P0174 and P0175) or other malfunction (first malfunction only), is detected.
  Because freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

Priorities for troubleshooting:
If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.
If no instructions are given troubleshoot DTCs according to the following priorities.

(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175) and misfire (DTCs P0300 – P0304).
(2) Fuel trim malfunction (DTCs P0171, P0172, P0174 and P0175).
(3) Misfire (DTCs P0300 – P0304).

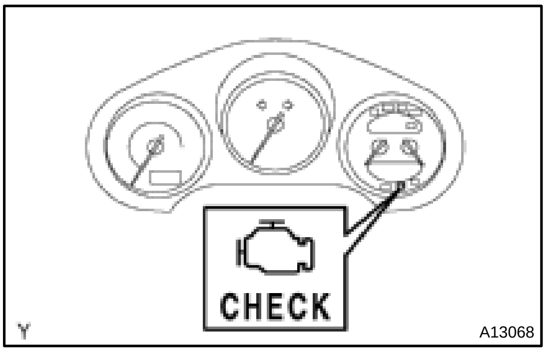


(b) Check the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

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

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

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



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter (See page BE–2).

(2) When the engine started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

- **If there is no DTC in the normal mode, check the 1st trip DTC using continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool or TOYOTA hand–held tester.**

- **TOYOTA hand–held tester only:**
  When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freezed frame data recorded in the normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.
  (1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.
  (2) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3.
  (3) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester switch ON.
  (4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data, note them down (For operating instructions, see the OBD II scan tool's instruction book).

If there is no DTC in the normal mode, check the 1st trip DTC using Continuous Test Results function (Mode 7 for SAE J1979) on the OBDII scan tool or TOYOTA hand–held tester.

(5) See page DI–3 to confirm the details of the DTCs.

NOTICE:

- **When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use the normal mode. For code on the DTC chart subject to "2 trip detection logic", perform the following either action.**
- **Turn the ignition switch OFF after the symptom is simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.**
- **Check the 1st trip DTC using Mode 7 (Continuous Test Results) for SAE J1979.**

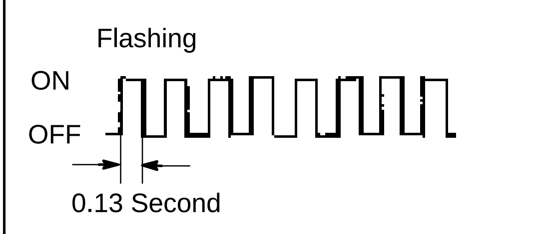
(c) Clear the DTC.
The DTC and freezed frame data will be erased by either action.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (For operating instructions, see the OBD II scan tool's instruction book).
(2) Disconnecting the battery terminals or EFI1 fuse.

NOTICE:
If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vise–verse, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.

3. INSPECT DIAGNOSIS (Check Mode)

HINT:
TOYOTA hand–held tester only:
Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

(a) Check the DTC.
  (1) Initial conditions
   - Battery positive voltage 11V or more
   - Throttle valve fully closed
   - Transmission in neutral position
   - A/C switched OFF
  (2) Turn the ignition switch OFF.
  (3) Prepare the TOYOTA hand–held tester.
  (4) Connect the TOYOTA hand–held tester to the DLC3.
  (5) Turn the ignition switch ON and push the TOYOTA hand–held tester switch ON.



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  (6) Switch the TOYOTA hand–held tester from the normal mode to the check mode.
  (7) Check if the MIL blinks.

NOTICE:
If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vise–versa, or if the ignition switch is turned from ON to ACC or LOCK during the check mode, the DTCs and freezed frame data will be erased.

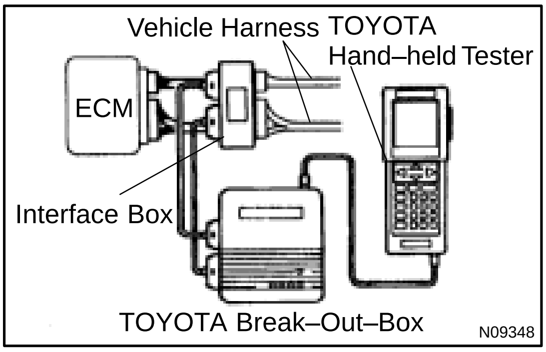
  (8) Start the engine (The MIL goes out after the engine start).
  (9) Simulate the conditions of the malfunction described by the customer.

NOTICE:
Leave the ignition switch ON until you have checked the DTC, etc.

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

HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode. So all DTCs, etc. are erased.

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



(b) The ECM terminal values measurement using TOYOTA break–out–box and TOYOTA hand–held tester
   (1) Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.
   (2) Read the ECM input/output values by following the prompts on the tester screen.

HINT:

- The TOYOTA Hand–held tester has a "Snapshot" function.This records the measured values and is effective in the diagnosis of intermittent problems.
- Please refer to the TOYOTA hand–held tester/TOYOTA break–out–box operator's manual for further details.

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0110	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively VTA ≧ × 0.1 V and ≦ 0.95 V
P0325	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 4 consecutive ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only:

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

(1) Clear the DTC (See step 2).
(2) Set the check mode (See step 3).
(3) Perform a simulation test (See page IN–18).
(4) Check the connector and terminal (See page IN–28).
(5) Handle the connector (See page IN–28).

6. BASIC INSPECTION

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

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

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO	Proceed to problems table on page DI–21.

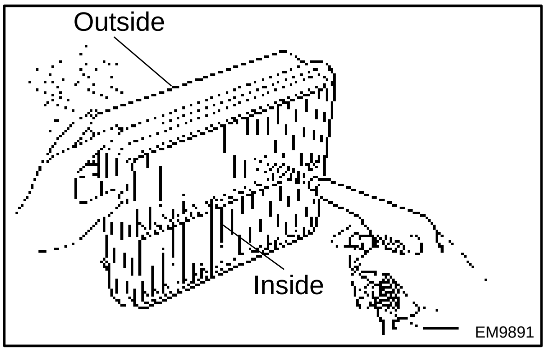
YES

3	Does engine start?

NO	Go to step 7.

YES

4	Check air filter.



PREPARATION:
Remove the air filter.
CHECK:
Visually check that the air filter is not dirty or excessive 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

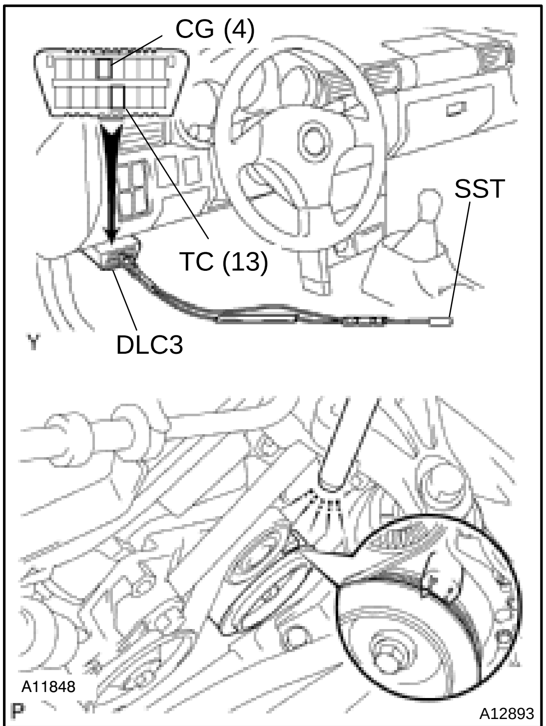
5	Check idle speed.

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the transmission into the neutral position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.
CHECK:
Use the CURRENT DATA to check the idle speed.
OK:
Idle speed: 800 ± 50 rpm

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

OK

6	**Check ignition timing.**



PREPARATION:

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

(b) Shift the transmission into the neutral position.

(c) Keep the engine speed at idle.

(d) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

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(e) Connect the timing light (See page EM–9).

CHECK:

Check the ignition timing.

OK:

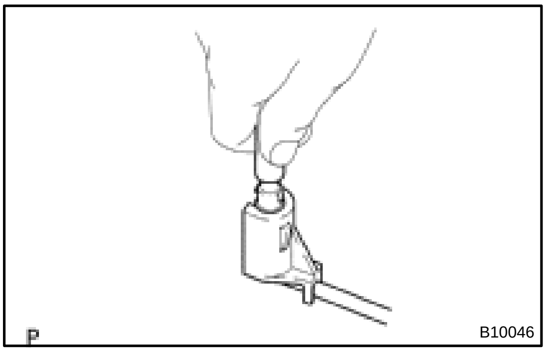
Ignition timing: 8 – 12° BTDC at idle

NG → **Proceed to page IG–1, continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–21.

7	**Check fuel pressure.**



PREPARATION:

(a) Be sure that enough fuel is in the tank.

(b) Connect the TOYOTA hand–held tester to the DLC3.

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

(d) Use the ACTIVE TEST mode to operate the fuel pump.

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

(f) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–7).

CHECK:

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

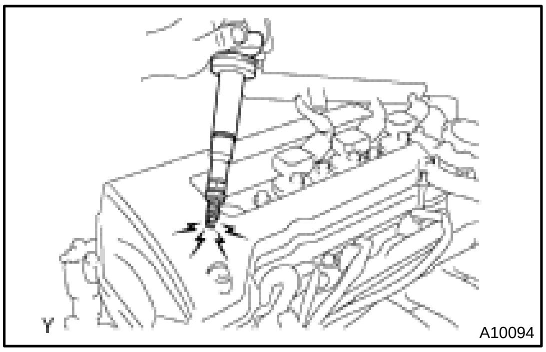
HINT:

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

NG — **Proceed to page SF–7, continue to trouble-shoot.**

OK

8	**Check for spark.**



PREPARATION:

(a) Remove the ignition coil with igniter.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil with igniter.
(d) Disconnect the 4 injector connectors.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

NOTICE:

- **To prevent excess fuel from being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.**
- **Do not crash the electrode gap.**

NG — **Proceed to page IG–1, continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–21.

7. ENGINE OPERATING CONDITION

NOTICE:

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

(a) CARB mandated signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
FUEL SYS #2	Fuel System Bank 2 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 11.3 – 16.0 % Racing without load (2,500rpm): 12.3 – 17.9 %
COOLANT TEMP	Engine Coolant Temp. Sensor Value	After warming up: 80 – 95°C (176 – 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
SHORT FT #2	Short–term Fuel Trim Bank 2	0 ± 20 %
LONG FT #2	Long–term Fuel Trim Bank 2	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 650 – 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 8 – 12°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 1.4 – 2.0 gm/sec. Racing without load (2,500 rpm): 5.4 – 7.9 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle fully closed: 6 – 16 % Throttle fully open: 64 – 98 %
O2S B1 S1	Voltage Output of Heated Oxygen Sensor Bank 1 Sensor 1	Idling: 0.1 – 0.9 V
O2S B2 S1	Voltage Output of Heated Oxygen Sensor Bank 2 Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1 S1	Heated Oxygen Sensor Fuel Trim Bank 1 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2FT B2 S1	Heated Oxygen Sensor Fuel Trim Bank 2 Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1 S2	Voltage Output of Heated Oxygen Sensor Bank 1 Sensor 2	Driving at 50 km/h (31 mph): 0.1 – 0.9 V

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

(b) TOYOTA Enhanced Signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 9 g/r
INJECTOR	Fuel injection time for cylinder No. 1	Idling: 1.1 – 2.1 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 25 – 35 %
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Signal	Throttle fully closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
ELECTCL LOAD SIG	Electrical Load Signal	Defogger S/W ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
PS OIL PRESS SW	Power Steering Oil Pressure Switch Signal	Turning steering wheel: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL#1, CYL#2, CYL#3, CYL#4	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 2,000
FUEL PUMP	Fuel Pump Signal	Idling: ON
A/C MAG CLUTCH	A/C switch signal	A/C ON: ON
EVAP (PURGE) VSV	EVAP VSV signal	VSV operating: ON
VVT CTRL	VVT control signal	VVT operating: ON
INTAKE CTRL VSV	Intake control VSV signal	VSV operating: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
TOTAL FT B2	Total Fuel Trim Bank 2: Average value for fuel trim system of bank 2	Idling: 0.8 – 1.2 V
O2 LR B1 S1	Heated Oxygen Sensor Lean Rich Bank 1 Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 LR B2 S1	Heated Oxygen Sensor Lean Rich Bank 2 Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1 S1	Heated Oxygen Sensor Rich Lean Bank 1 Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.
O2 RL B2 S1	Heated Oxygen Sensor Rich Lean Bank 2 Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

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

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DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

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

SAE CONTROLLED:

DTC No.	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–23)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–27)	Mass Air Flow Circuit Range/ Performance Problem	• Mass air flow meter	○	○
P0110 (DI–28)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (DI–32)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–36)	Engine Coolant Temp. Circuit Range/Performance Problem	• Cooling system • Engine coolant temp. sensor	○	○
P0120 (DI–37)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–41)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (DI–42)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Air induction system • Fuel pressure • Injector • Gas leakage on exhaust system • ECM	○	○
P0130 (DI–47)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 (DI–51)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0135 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (DI–56)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○

P0141 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○
P0150 (DI–47)	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0130	○	○
P0153 (DI–51)	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	• Same as DTC No. P0133	○	○
P0155 (DI–54)	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	• Same as DTC No. P0135	○	○
P0171 (DI–58)	System too Lean (Fuel Trim) (Bank 1)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • ECM	○	○
P0172 (DI–58)	System too Rich (Fuel Trim) (Bank 1)	• Injector leak, blockage • Mass air flow meter • Engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • ECM	○	○
P0174 (DI–58)	System too Lean (Fuel Trim) (Bank 2)	• Same as the DTC No. P0171	○	○
P0175 (DI–58)	System too Rich (Fuel Trim) (Bank 2)	• Same as the DTC No. P0172	○	○
P0300 (DI–63)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • ECM	○	○
P0301 (DI–63)	Cylinder 1 Misfire Detected			
P0302 (DI–63)	Cylinder 2 Misfire Detected			
P0303 (DI–63)	Cylinder 3 Misfire Detected			
P0304 (DI–63)	Cylinder 4 Misfire Detected			
P0325 (DI–68)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECM	○	○
P0335 (DI–71)	Crankshaft Position Sensor "A" Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM	○	○
P0340 (DI–73)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake Camshaft • ECM	○	○

P0420 (DI–75)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage on exhaust system • Heated oxygen sensor • Three–way catalytic converter	○	○
P0440 (DI–78)	Evaporative Emission Control System Malfunction	• Hose or tube cracked, holed, damaged or loose seal ((3) in Fig.1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0441 (DI–84)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose cracked, holed, blocked damaged or disconnected((1), (2), (3),(4),(5), (6), (7), (8), (9), (10) and (11) in Fig.1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked or damaged • ECM	○	○
P0446 (DI–84)	Evaporative Emission Control System Vent Control Malfunction	• Same as DTC No. P0441	○	○
P0450 (DI–101)	Evaporative Emission Control System Pressure Sensor Malfunction	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0451 (DI–101)	Evaporative Emission Control System Pressure Sensor Range/ Performance			
P0500 (DI–103)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○
P0505 (DI–106)	Idle Control System Malfunction	• Open or short in IAC valve circuit • IAC valve is stuck or closed • Open or short in A/C switch circuit • Air induction system • ECM	○	○

*: ○ · · · MIL lights up

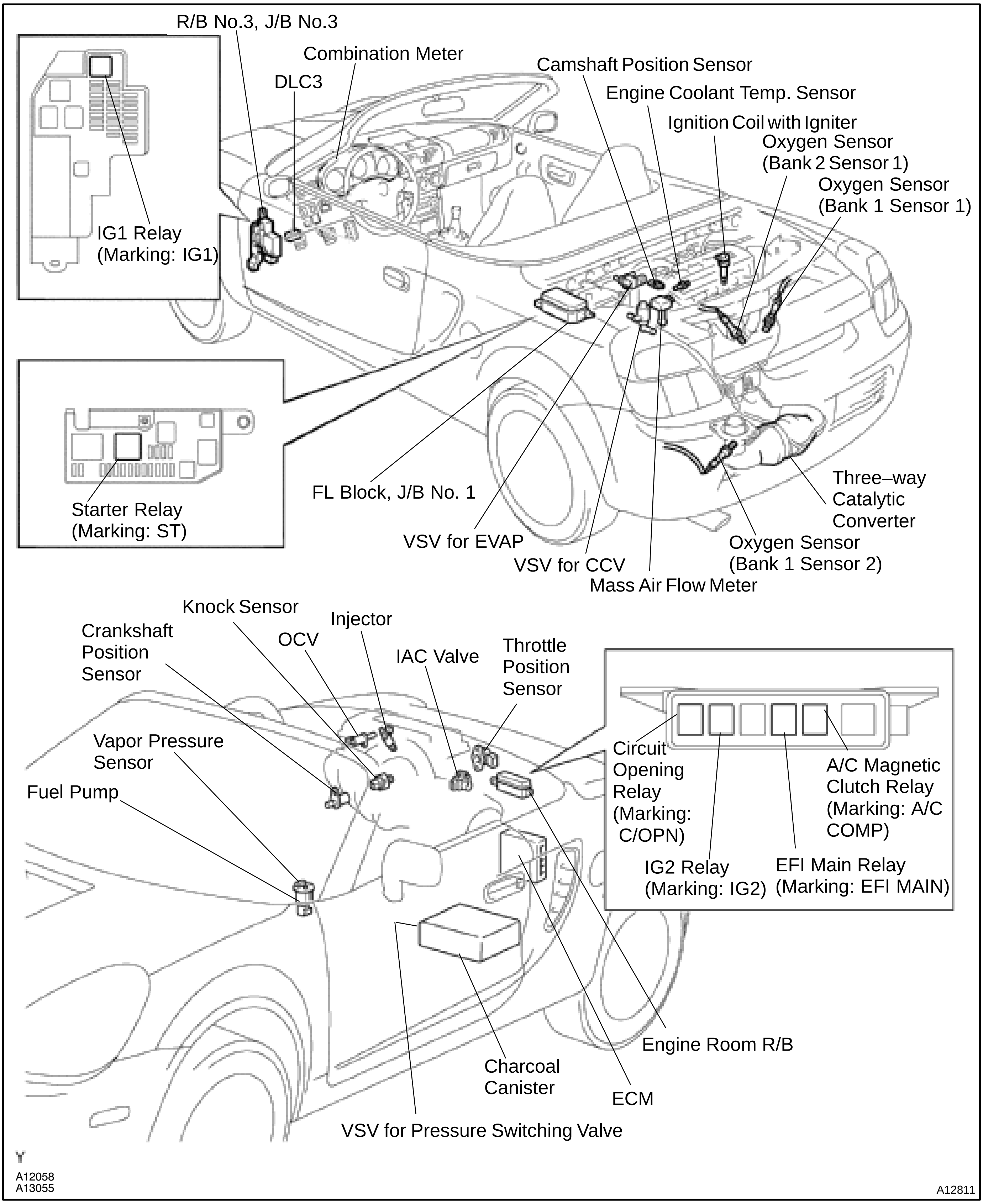
MANUFACTURER CONTROLLED:

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–109)	Igniter Circuit Malfunction (No. 1)	• Ignition system • Open or short in IGF and IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • ECM	○	○
P1305 (DI–109)	Igniter Circuit Malfunction (No. 2)	• Ignition system • Open or short in IGF and IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • ECM	○	○
P1310 (DI–109)	Igniter Circuit Malfunction (No. 3)	• Ignition system • Open or short in IGF and IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • ECM	○	○
P1315 (DI–109)	Igniter Circuit Malfunction (No. 4)	• Ignition system • Open or short in IGF and IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • ECM	○	○
P1335 (DI–115)	Crankshaft Position Sensor Circuit Malfunction (During engine running)	• Same as DTC No. P0335	–	○
P1346 (DI–116)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Jumping teeth of timing chain, chain stretched) • ECM	○	○
P1349 (DI–117)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P1600 (DI–123)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1645 (DI–125)	Body ECU Malfunction	• Body ECU • A/C ECU • Vane pump assembly with motor • ABS ECU • Combination meter • Air bag sensor assembly • Communication bus	–	–
P1656 (DI–127)	OCV Circuit Malfunction (Bank 1)	• Open or short in OCV circuit • OCV • ECM	○	○

*: ○ · · · MIL lights up. – · · · MIL does not light up.

DI37U–03

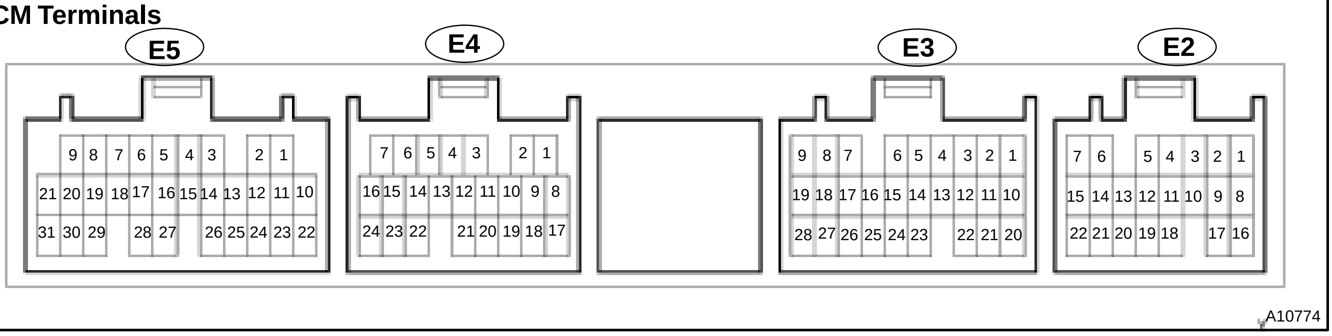
PARTS LOCATION



DI37V–05

TERMINALS OF ECM

ECM Terminals



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E2–1) – E1 (E4–17)	B–Y – BR	Always	9 – 14
IGSW (E2–8) – E1 (E4–17)	B–R – BR	IG switch ON	9 – 14
+B (E2–16) – E1 (E4–17)	B – BR		
VC (E4–2) – E2 (E4–18)	L–R – BR	IG switch ON	4.5 – 5.5
VTA (E4–23) – E2 (E4–18)	B–W – BR	IG switch ON, Accelerator pedal fully closed	0.3 – 1.0
		IG switch ON, Accelerator pedal fully open	3.2 – 4.8
THA (E4–22) – E2 (E4–18)	Y–B – BR	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E4–14) – E2 (E4–18)	R–L – BR	Idling, Water temp. 80°C (176°F)	0.2 – 1.0
STA (E3–11) – E1 (E4–17)	B – BR	Shift position in neutral, Ignition SW START	6.0 or more
#10 (E5–1) – E01 (E5–21) #20 (E5–2) – E01 (E5–21) #30 (E5–3) – E01 (E5–21) #40 (E5–4) – E01 (E5–21)	B–W – W–R B – W–B L – W–B W – W–B	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–63)
IGT1 (E5–10) – E1 (E4–17) IGT2 (E5–11) – E1 (E4–17) IGT3 (E5–12) – E1 (E4–17) IGT4 (E5–13) – E1 (E4–17)	B – BR L – BR L–W – BR L – BR	Idling	Pulse generation (See page DI–109)
IGF (E5–25) – E1 (E4–17)	B–Y – BR	IG switch ON	4.5 – 5.5
		Idling	Pulse generation (See page DI–109)
G2 (E4–15) – NE– (E4–24)	W – B	Idling	Pulse generation (See page DI–71)
NE+ (E4–16) – NE– (E4–24)	W – B		
MREL (E3–21) – E1 (E4–17)	GR – BR	IG switch ON	9 – 14
FC (E2–3) – E1 (E4–17)	G–R – BR	IG switch ON	9 – 14
STP (E3–6) – E1 (E4–17)	G – BR	Brake pedal is depressed	9 – 14
		Brake pedal is released	Below 1.5
OX1A (E4–12) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–42)
OX2A (E4–21) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–42)
OX1B (E4–9) – E1 (E4–17)	B – BR	Maintain engine speed at 2,500 rpm for 3 min. after warming up	Pulse generation (See page DI–42)
HT1A (E4–3) – E01 (E4–6) HT1B (E4–8) – E01 (E4–6) HT2A (E4–5) – E01 (E4–6)	B–Y – BR L–B – BR B–W – BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E5–27) – E1 (E4–17)	W – BR	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page DI–68)

TC (E3–5) – E1 (E4–17)	P–L – BR	IG switch ON	9 – 14
W (E2–15) – E01 (E4–6)	Y–R – BR	Idling	9 – 14
		IG switch ON	Below 3.0
OCV+ (E5–24) – OCV– (E5–23)	R – W	IG switch ON	Pulse generation (See page DI–117)
EVP1 (E4–4) – E01 (E4–6)	W – BR	IG switch ON	9 – 14
RSO (E5–18) – E1 (E4–17)	G – BR	IG switch ON	9 – 14
TBP (E3–23) – E01 (E4–6)	L–W – BR	IG switch ON	3.0 – 3.6
PTNK (E2–4) – E2 (E4–18)	G–B – BR	IG switch ON	3.0 – 3.6
SPD (E3–22) – E1 (E4–17)	V–W – BR	IG switch ON	9 – 14
PRE (E3–18) – E1 (E4–17)	W–L – BR	Refrigerant pressure is between 196 kPa and 1340 kPa	9 – 14
		Refrigerant pressure is less than 196 kPa, more than 1340 kPa	–
ACMG (E2–12) – E01 (E4–6)	L – BR	Idling, Magnetic clatch is ON	below 1.0
		Idling, Magnetic clatch is OFF	9 – 14
LCK1 (E3–28) – E1 (E4–17)	W–R – BR	Idling, A/C switch is ON	9 – 14
		Idling, A/C switch is OFF	–

DI37W–04

PROBLEM SYMPTOMS TABLE

When the malfunction 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 table and troubleshoot according to the numbered order given below.

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	7. Starter 8. Starter relay 9. Body ECU	ST–7 ST–17 DI–357
No initial combustion (Does not start)	1. ECM power source circuit 2. Ignition coil with igniter 3. Fuel control circuit 4. Injector circuit	DI–132 DI–109 DI–140 DI–63
No complete combustion (Does not start)	1. Ignition coil with igniter 2. Fuel control circuit 3. Injector circuit	DI–109 DI–140 DI–63
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Ignition coil with igniter 3. Spark plug 4. Compression 5. Injector circuit 6. Fuel control circuit 7. IAC valve circuit	DI–137 DI–109 IG–1 EM–3 DI–63 DI–140 DI–106
Cold engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil with igniter 4. Spark plug 5. Fuel control circuit 6. IAC valve circuit	DI–137 DI–63 DI–109 IG–1 DI–140 DI–106
Hot engine (Difficult to start)	1. Starter signal circuit 2. Injector circuit 3. Ignition coil 4. Spark plug 5. Fuel control circuit 6. IAC valve circuit	DI–137 DI–63 DI–109 IG–1 DI–140 DI–106
High engine idle speed (Poor idling)	1. ECM power source circuit 2. Back up power source circuit 3. IAC valve circuit	DI–132 DI–123 DI–106
Low engine idle speed (Poor idling)	1. Injector circuit 2. Back up power source circuit 3. Fuel control circuit 4. IAC valve circuit	DI–63 DI–123 DI–140 DI–106
Rough idling (Poor idling)	1. IAC valve circuit 2. Injector circuit 3. Fuel control circuit 4. Ignition coil with igniter 5. Compression	DI–106 DI–63 DI–140 DI–109 EM–3
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel control circuit 3. IAC valve circuit	DI–132 DI–140 DI–106
Hesitation/Poor acceleration (Poor driveability)	1. Injector circuit 2. Ignition coil with igniter 3. Fuel control circuit	DI–63 DI–109 DI–140

Muffler explosion, after fire (Poor driveability)	1. Ignition coil 2. Spark plug 3. Injector circuit	IG–1 IG–1 DI–63
Surging (Poor driveability)	1. Spark plug 2. Injector circuit	IG–1 DI–63
Engine stall (Soon after starting)	1. Fuel control circuit 2. IAC valve circuit	DI–140 DI–106
Engine stall (After accelerator pedal depressed)	1. Injector circuit 2. IAC valve circuit 3. ECM	DI–63 DI–106 IN–28
Engine stall (After accelerator pedal released)	1. ECM 2. IAC valve circuit	IN–28 DI–106
Engine stall (During A/C operation)	1. A/C signal circuit (Compressor circuit) 2. ECM	DI–150 IN–28

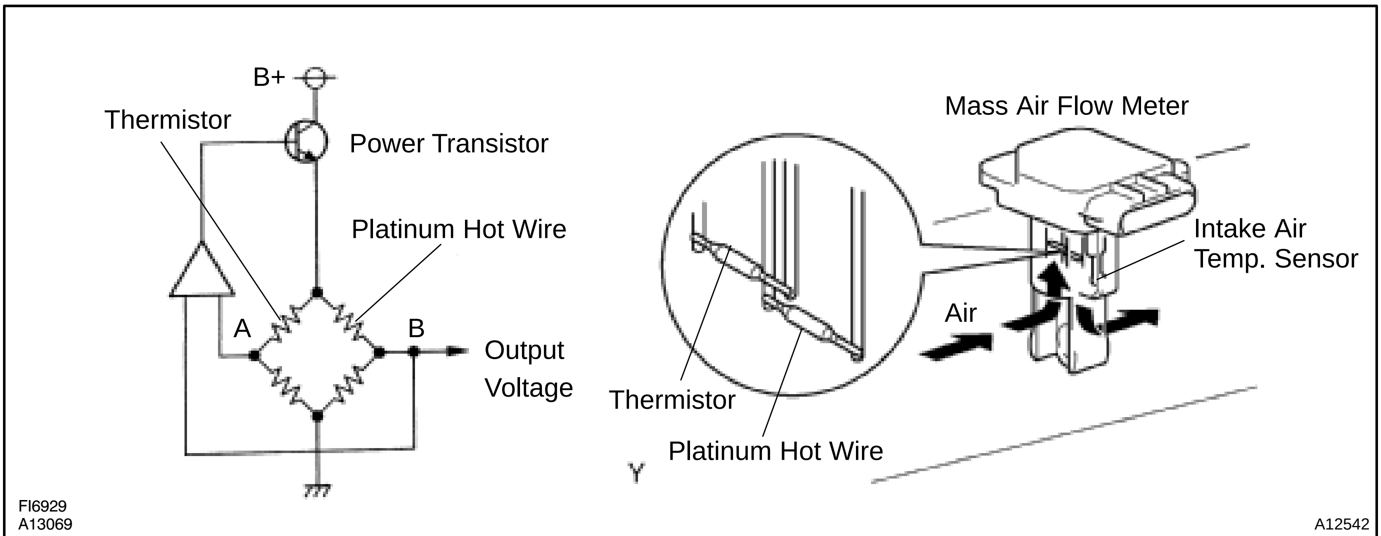
DI09B–08

CIRCUIT INSPECTION

DTC	P0100	Mass Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

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

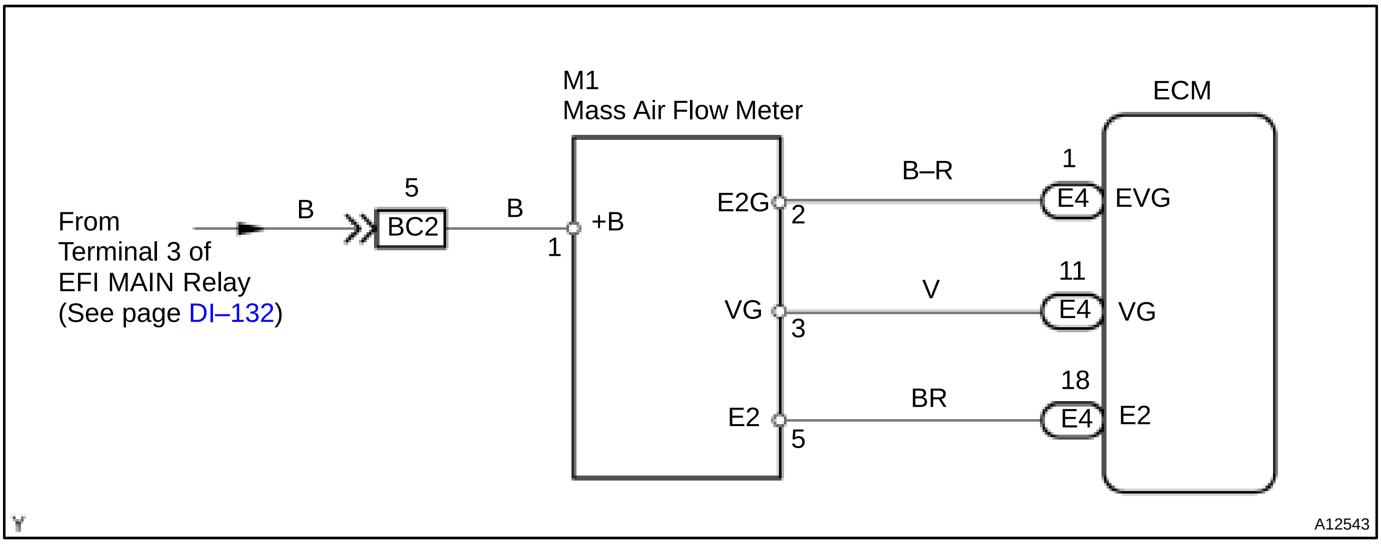


DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with more than 3 sec. engine speed 4,000 rpm or less	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:
After confirming DTC P0100, use the OBD II scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from the CURRENT DATA.

Mass Air Flow Value (gm/sec.)	Malfunction
0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Connect OBD II scan tool or TOYOTA hand–held tester, and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

(c) Start the engine.

CHECK:

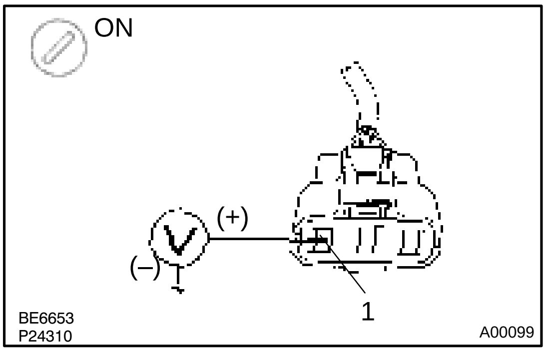
Read the mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

RESULT:

	Type I	Type II
Mass Air Flow Rate (gm/sec.)	0.0	271.0 or more

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

2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

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

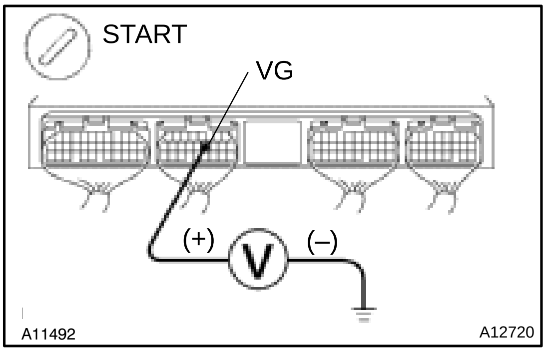
OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking: EFI MAIN) and mass air flow meter (See page IN–28).**

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Start the engine.

CHECK:

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

OK:

Voltage:

1.1 – 1.5 V (Neutral position and A/C switch OFF)

OK → **Check and replace ECM (See page IN–28).**

NG

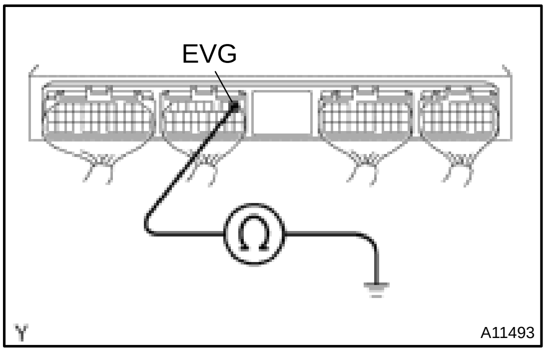
4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–28).

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

OK

Replace mass air flow meter.

5	**Check continuity between terminal EVG of ECM connector and body ground.**



PREPARATION:
Disconnect the ECM with connector from body panel (See page SF–62).
CHECK:
Check the continuity between terminal EVG of the ECM connector and body ground.
OK:
Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–28).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–28).**

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

OK

Replace mass air flow meter.

DI09C–08

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–23.

DTC No.	DTC Detection Condition	Trouble Area
P0101	Conditions (a) and (b) continue 10 sec. or more with engine speed 900 rpm or less: (2 trip detection logic) (a) Throttle valve fully closed (b) Mass air flow meter output > 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue 10 sec. or more with engine speed 1,500 rpm or more: (2 trip detection logic) (a) VTA ≧ 0.63 V (b) Mass air flow meter output < 1.06 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Are there any other codes (besides DTC P0101) being output?

NO → **Replace mass air flow meter.**

YES ↓

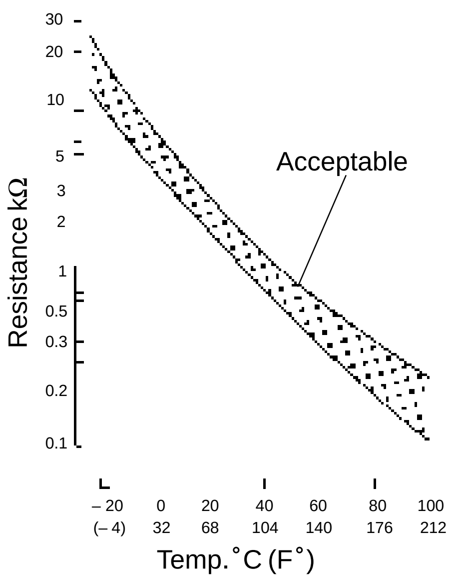
Go to relevant DTC chart (See page DI–14).

DI37Z–03

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

Fig. 1



FI4741

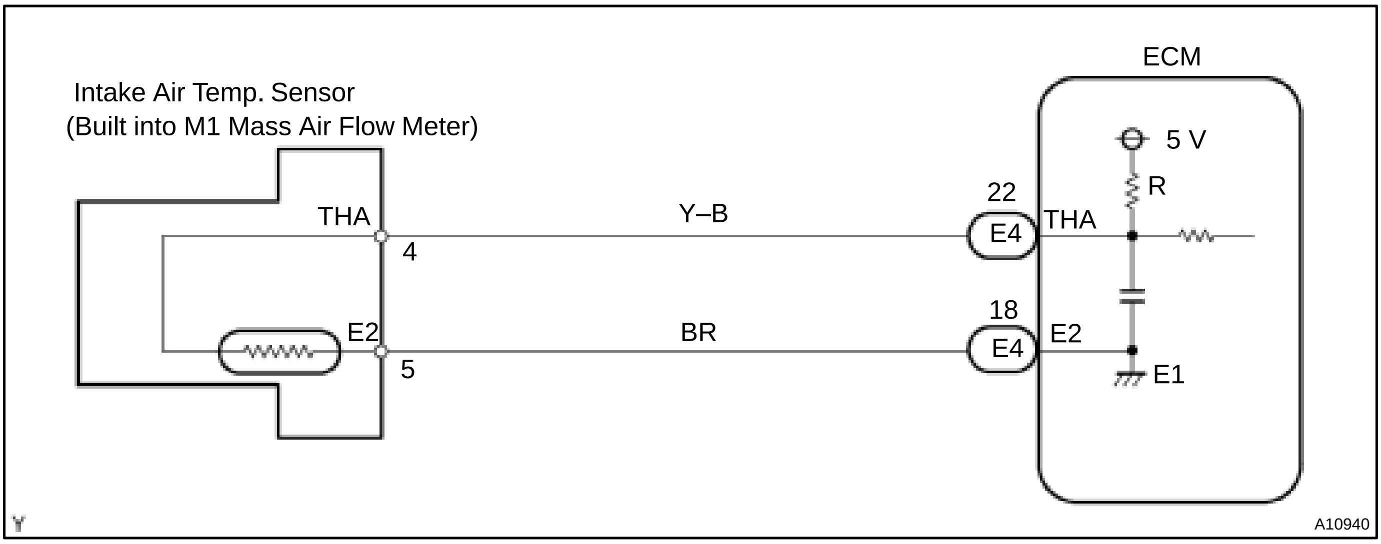
The intake air temperature sensor is built into the mass air flow meter (see page DI–23) and senses the intake air temperature. A thermistor built in the sensor changes the resistance value according to the intake air temperature, the lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See Fig. 1).
The air intake temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a resistor R.
That is, the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

DTC No.	DTC Detection Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM

HINT:
After confirming DTC P0110, use the OBD II scan tool or TOYOTA hand–held tester to confirm the intake air temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P100, P0101, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Connect OBD II scan tool or TOYOTA hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Same as actual air intake temperature.

HINT:

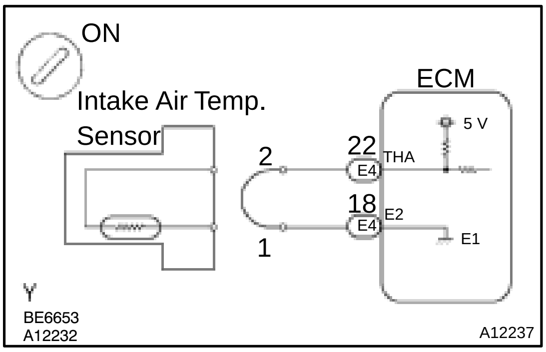
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates –40°C (–40°F).
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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

OK

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

2	**Check for open in harness or ECM.**



PREPARATION:

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

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

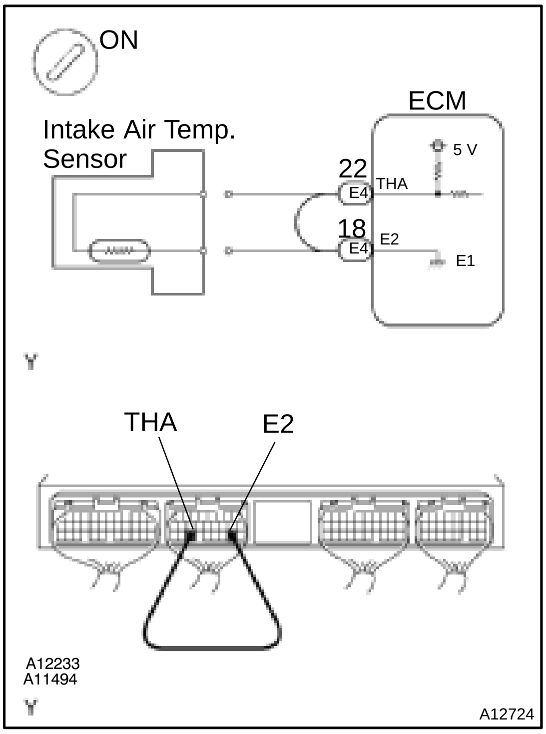
OK:

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

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

NG

3	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

The mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

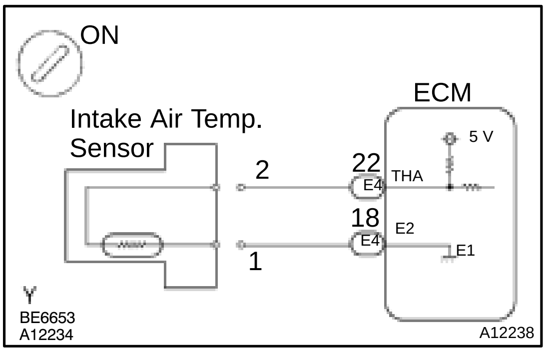
Temperature value: 140°C (284°F) or more

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

NG

Confirm good connection at ECM. If OK, check and replace ECM (See page IN–28).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

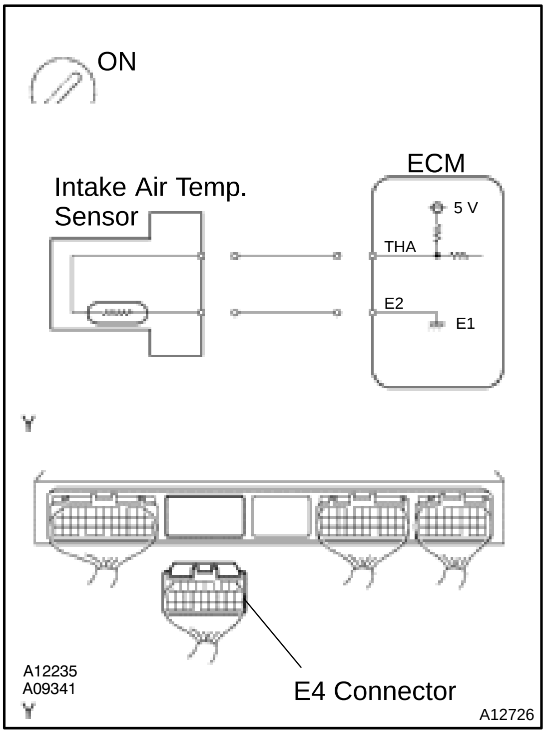
OK:

Temperature value: –40°C (–40°F)

OK → **Replace mass air flow meter.**

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E4 connector from the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temperature value: –40°C (–40°F)

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

NG

Check and replace ECM (See page IN–28).

DI380–03

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

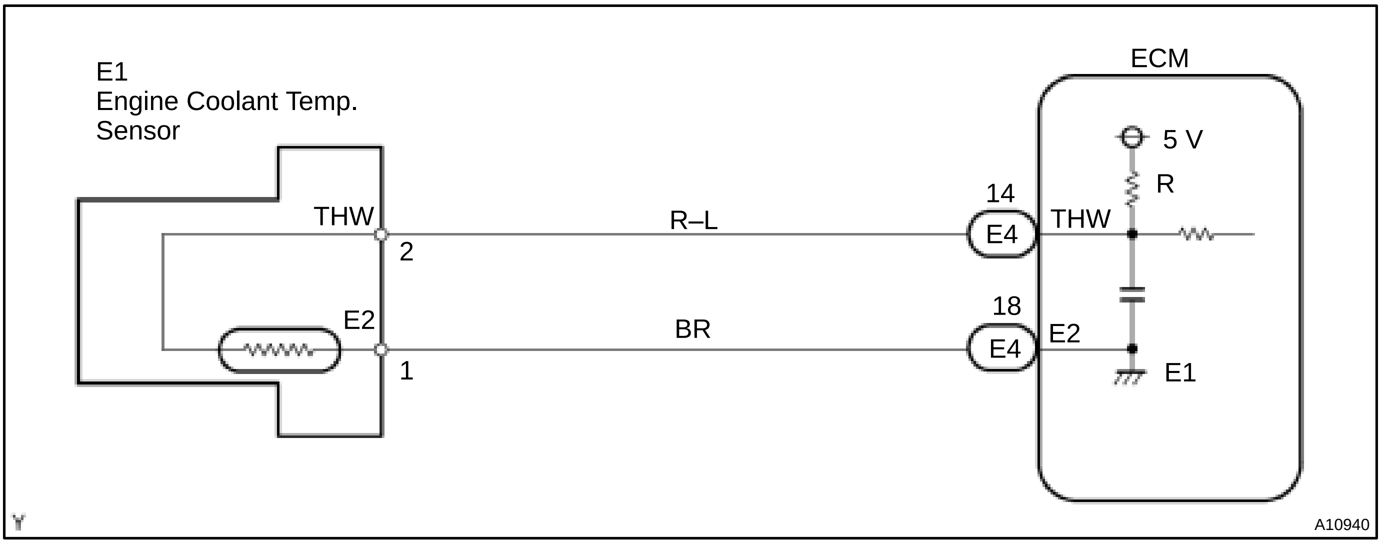
A thermistor built into the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM is the same as in the intake air temperature circuit malfunction shown on page DI–28.

DTC No.	DTC Detection Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit for 0.5 sec.	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:
After confirming DTC P0115, use the OBD II scan tool or TOYOTA hand–held tester to confirm the engine coolant temperature from the CURRENT DATA.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
- If DTCs P0100, P0101, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Connect OBD II scan tool or TOYOTA hand–held tester, and read value of engine coolant temperature.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:
Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Same as actual engine coolant temperature.

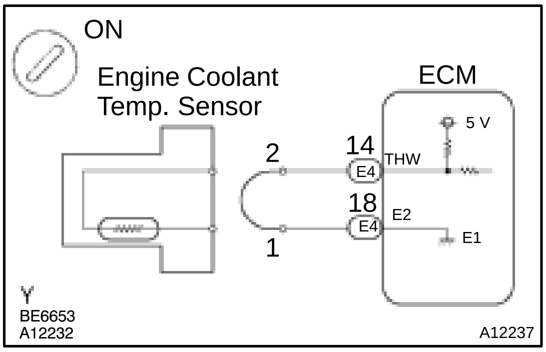
HINT:
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates –40°C (–40°F).
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

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

OK ↓

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

2	**Check for open in harness or ECM.**



PREPARATION:
(a) Disconnect the engine coolant temperature sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

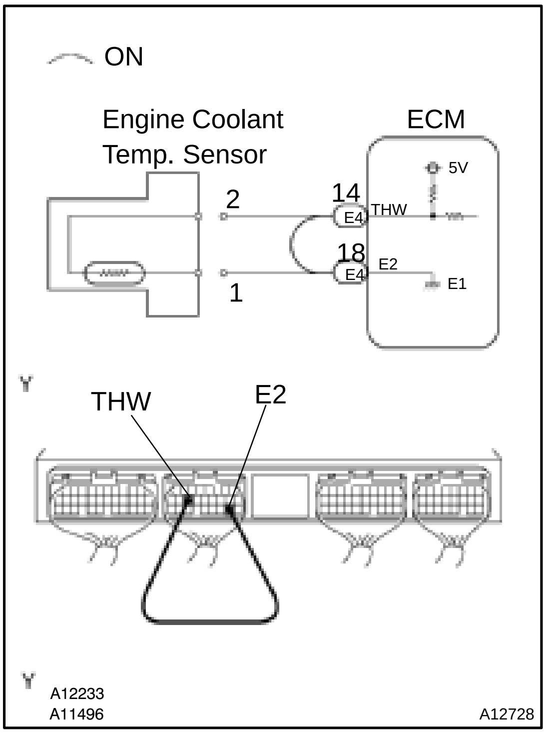
CHECK:
Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

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

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

NG ↓

3	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

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

HINT:

The engine coolant temperature sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–28).

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

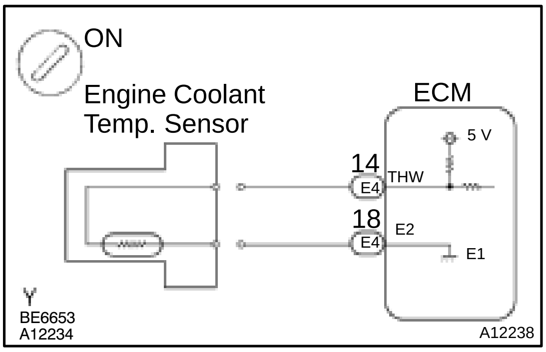
Temperature value: 140°C (284°F) or more

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

NG

Confirm good connection at ECM. If OK, check and replace ECM (See page IN–28).

4	**Check for short in harness and ECM.**



PREPARATION:

(a) Disconnect the engine coolant temperature sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

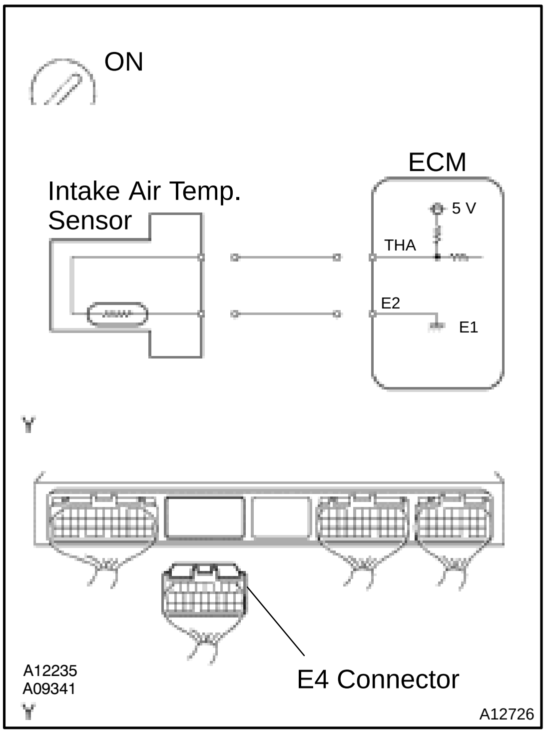
OK:

Temperature value: – 40°C (– 40°F)

OK	**Replace engine coolant temperature sensor.**

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E4 connector from the ECM.

HINT:

The engine coolant temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read the temperature value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–28).

DI381–03

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–32.

DTC No.	DTC Detection Condition	Trouble Area
P0116	When engine starts, water temp. is –7°C (20°F) or less. And, 20 min. or more after engine starts, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic) When engine starts, water temp. is between –7°C (20°F) and 10°C (50°F) And, 5 min. or more after engine starts, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	• Cooling system • Engine coolant temp. sensor

INSPECTION PROCEDURE

HINT:

- If DTCs P0115 and P0116 are output simultaneously, engine coolant temperature sensor circuit may be open. Perform troubleshooting of DTC P0115 first.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Are there any other codes (besides DTC P0116) being output?

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	Check thermostat (See page CO–10).

NG → **Replace thermostat.**

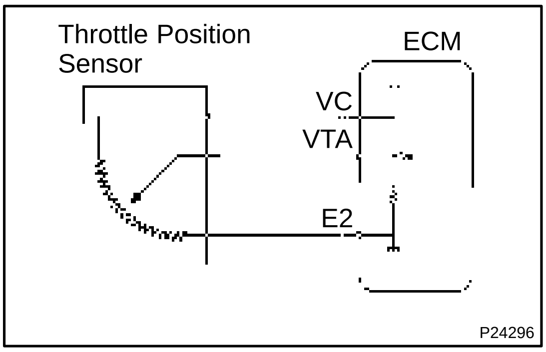
OK

Replace engine coolant temperature sensor.

DI382–05

DTC	P0120	Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction

CIRCUIT DESCRIPTION



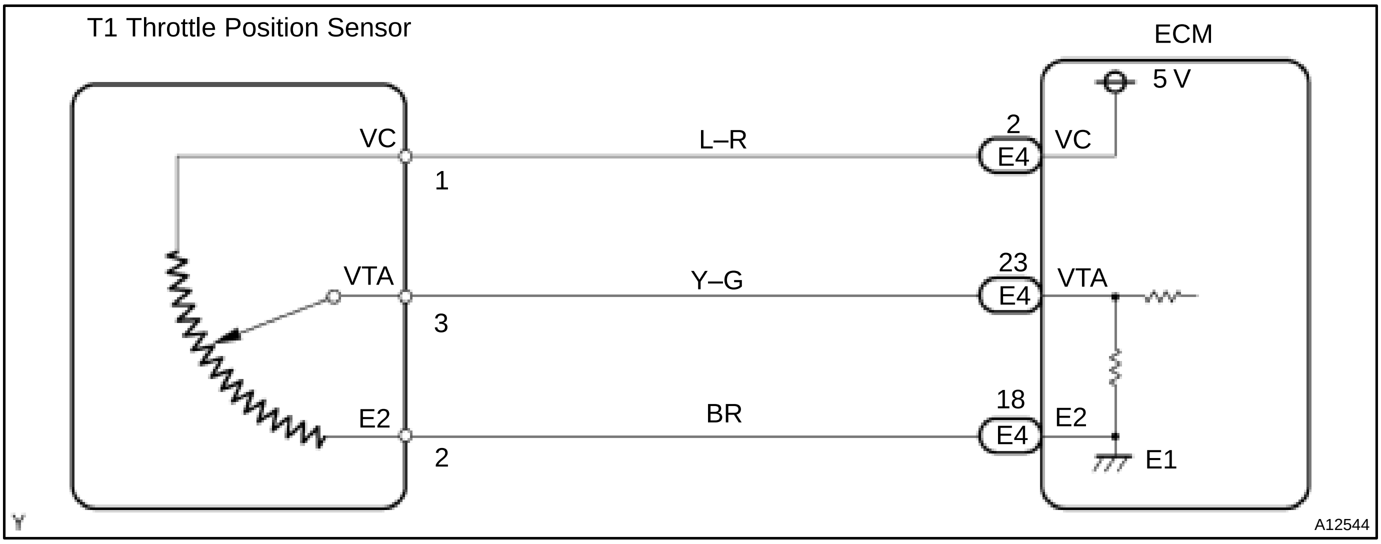
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 – 0.8 V is applied to terminal VTA of the ECM. The voltage applied to the terminals VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from this signal input from terminal VTA, and uses it as one of the conditions to decide the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detection Condition	Trouble Area
P0120	Condition (a) or (b) continues with more than 5 sec.: (a) VTA < 0.1 V (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:
After confirming DTC P0120, use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage.

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

WIRING DIAGRAM

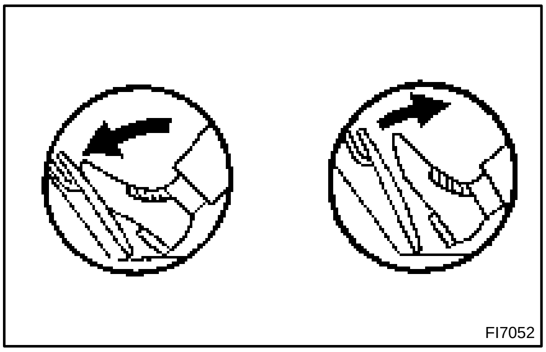


INSPECTION PROCEDURE

HINT:

- If DTCs P0100, P0106, P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1 | Connect OBD II scan tool or TOYOTA hand–held tester, read throttle valve opening percentage.



PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.

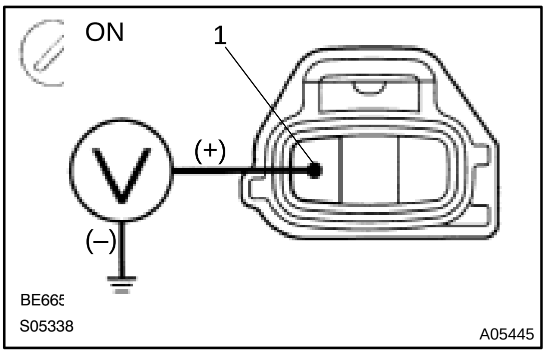
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 70 %
Fully closed	Approx. 10 %

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

NG

2 | Check voltage between terminal 1 of throttle position sensor connector and body ground.



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal 1 of the throttle position connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

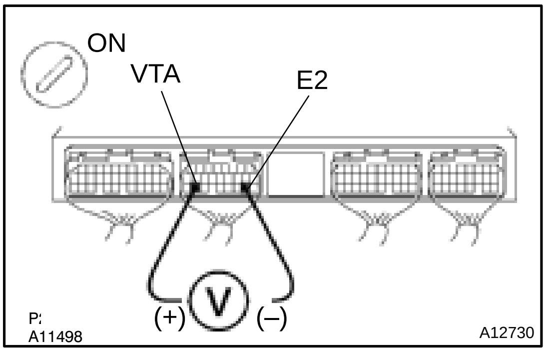
OK

3	**Check throttle position sensor (See page SF–33).**

NG → **Replace throttle position sensor.**

OK

4	**Check voltage between terminals VTA and E2 of ECM connector.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VTA and E2 of the ECM connector.

OK:

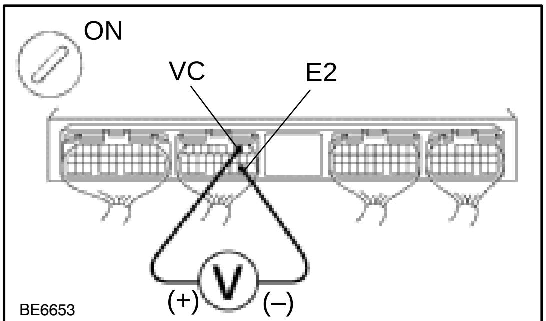
Throttle valve	Voltage
Fully closed	0.3 – 1.0 V
Fully open	3.2 – 4.9 V

OK → **Check and replace ECM (See page IN–28).**

NG

Check for open and short in harness and connector in VTA or E2 circuit between ECM and throttle position sensor (See page IN–28).

5	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–28).**

OK

Check for open in harness and connector in VC circuit between ECM and sensor (See page IN–28).

DI383–03

DTC	P0121	Throttle/Pedal Position/Switch "A" Sensor Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–37.

DTC No.	DTC Detection Condition	Trouble Area
P0121	After vehicle speed has been exceeded 30 km/h (19 mph) even once, output value of throttle position sensor is out of applicable range for vehicle speed is more than 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Are there any other codes (besides DTC P0121) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

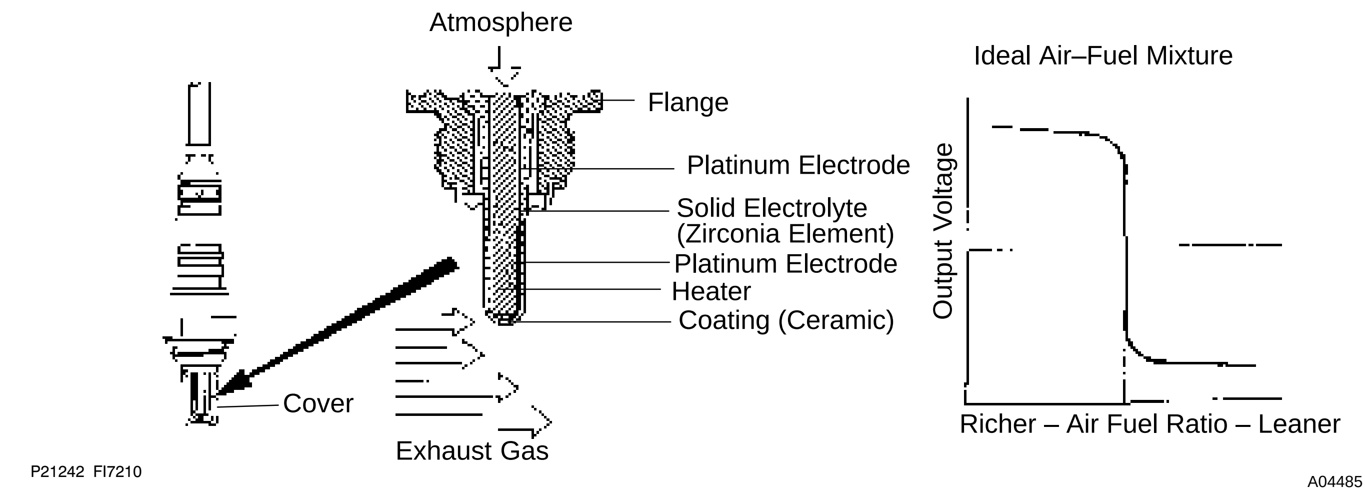
Replace throttle position sensor.

DI384–04

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

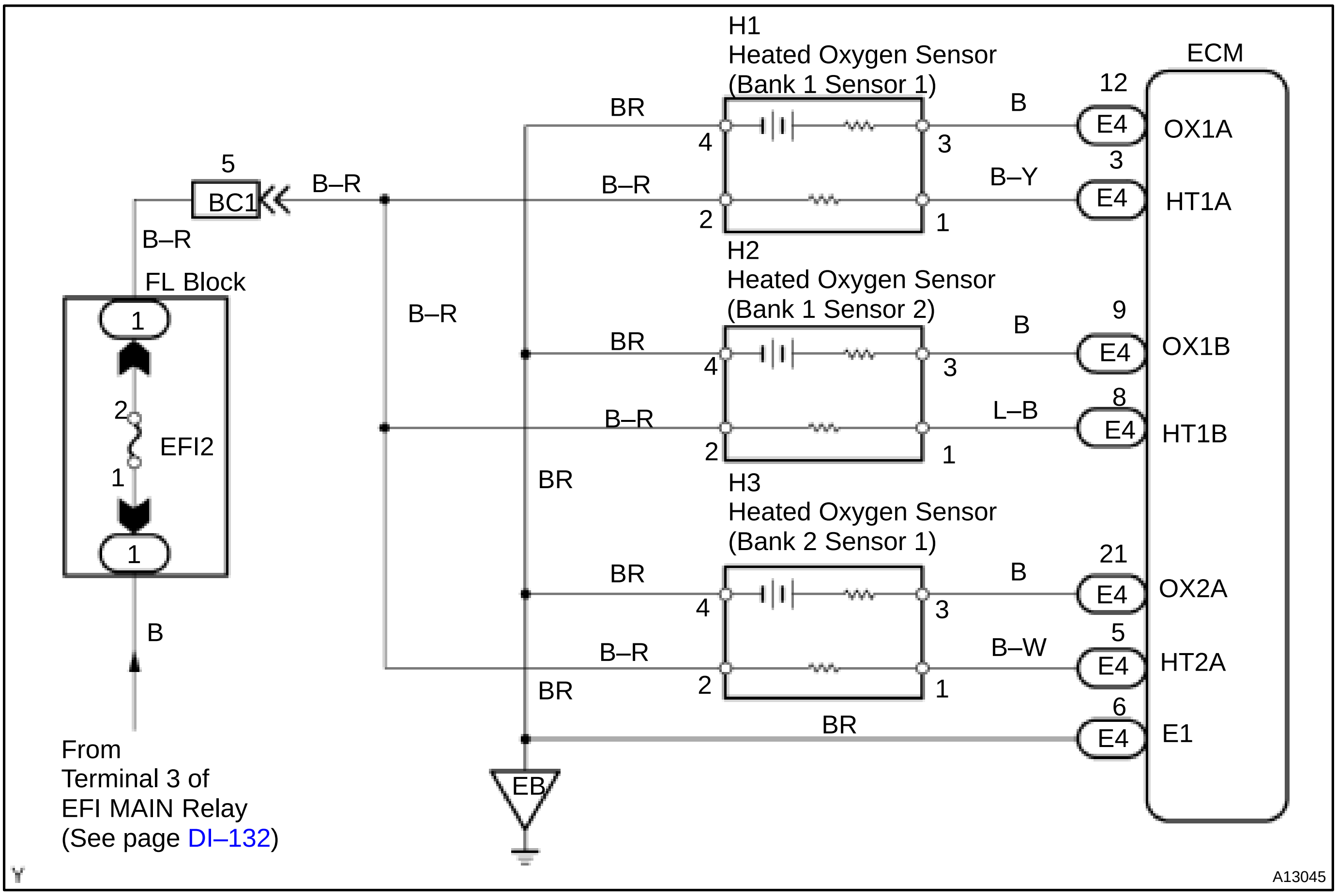
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The heated oxygen sensor (bank 1, 2 sensor 1) has the characteristic and that output voltage, which changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide the ECM with feedback to control the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the heated oxygen sensor informs the ECM of the LEAN condition (small electromotive force: < 0.45 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas in reduced and the heated oxygen sensor informs the ECM of the RICH condition (large electromotive force: > 0.45 V).
The ECM judges by the electromotive force from the heated oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the heated oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.
The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



DTC No.	DTC Detection Condition	Trouble Area
P0125	After engine is warmed up, oxygen sensor (bank 1, 2 sensor 1) output does not indicate RICH (≧ 0.45 V) even once when conditions (a), (b), and (c) continue for at least 1.5 min.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) Throttle valve does not fully closed	• Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1) • Air induction system • Fuel system • Injector • Gas leakage on exhaust system • ECM

HINT:
After confirming DTC P0125, use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of the heated oxygen sensor (bank 1, 2 sensor 1) from the CURRENT DATA.
If the voltage output of the heated oxygen sensor (bank 1, 2 sensor 1) is less than 0.1 V, the heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0125 will be recorded. The MIL then comes on.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Are there any other codes (besides DTC P0125) being output ?

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Connect OBD II scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor (bank 1, 2 sensor 1).**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temperature (above 75°C).

CHECK:

Read the voltage output of the heated oxygen sensor when the engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm for 3 times using the accelerator pedal.

OK:

Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

OK → **Go to step 9.**

NG

3	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1, 2 sensor 1) (See page IN–28).**

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

OK

4	**Check whether misfire has occurred or not by monitoring DTC and data list.**

NG → **Perform troubleshooting for misfire (See page DI–63).**

OK

5	**Check air induction system (See page SF–1).**

NG → **Repair or replace induction system.**

OK

6	Check fuel pressure (See page SF–7).

NG → Check and repair fuel pump, fuel pipe line and filter.

OK

7	Check injector injection (See page SF–24).

NG → Replace injector.

OK

8	Check gas leakage on exhaust system.

NG → Repair or replace.

OK

Replace heated oxygen sensor (bank 1, 2 sensor 1).

9	Perform confirmation driving pattern (See page DI–47).

Go

10	Is there DTC P0125 being output again?

YES → Check and replace ECM (See page IN–18).

NO

11	Did vehicle runs out of fuel in past?

NO → **Check for intermittent problems (See page DI–3).**

YES

DTC P0125 is caused by shortage of fuel.

DI385–04

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

DTC	P0150	Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
P0130 P0150	Voltage output of heated oxygen sensor remains at 0.4 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

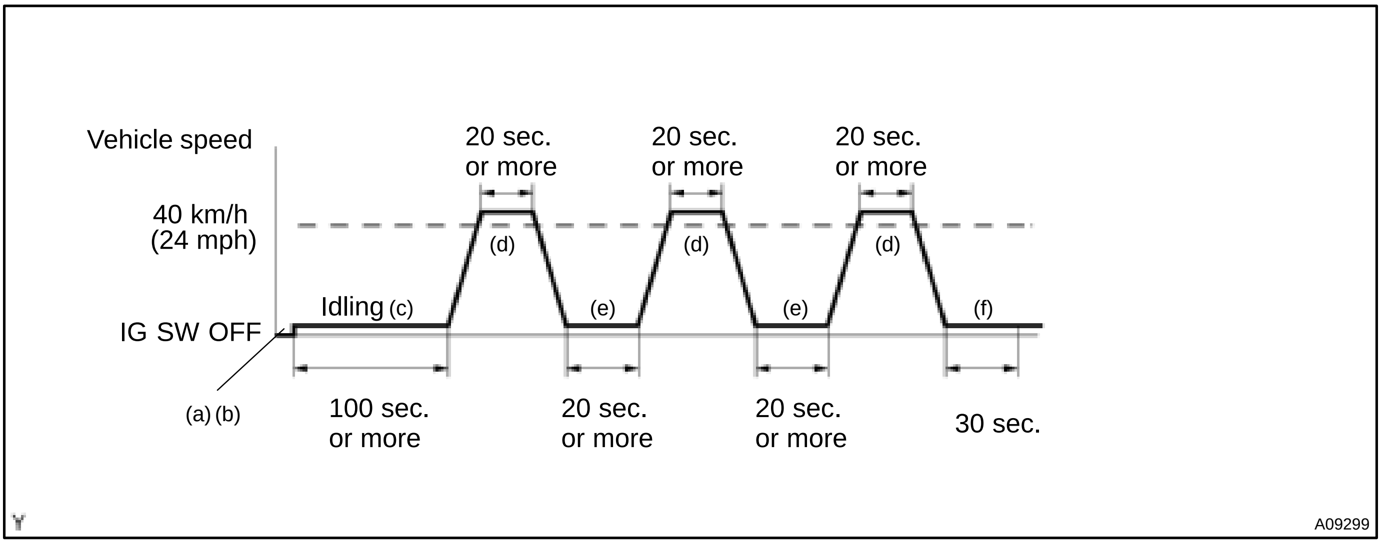
HINT:

- Bank 1 refers to the bank that includes the cylinder No. 1.
- Bank 2 refers to the bank that excludes the cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine body.
- The heated oxygen sensor's output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

CONFIRMATION DRIVING PATTERN



(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Switch the TOYOTA hand–held tester from the normal mode to the check mode (See page DI–3).
(c) Start the engine and let the engine idle for 100 sec. or more.
(d) Drive the vehicle at 40 km/h (24 mph) or more for 20 sec. or more.
(e) Let the engine idle for 20 sec. or more.

(f) Let the engine idle for 30 sec.

HINT:

If a malfunction exists, the MIL will light up during step (f).

NOTICE:

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

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Are there any other codes (besides DTC P0130 or P0150) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

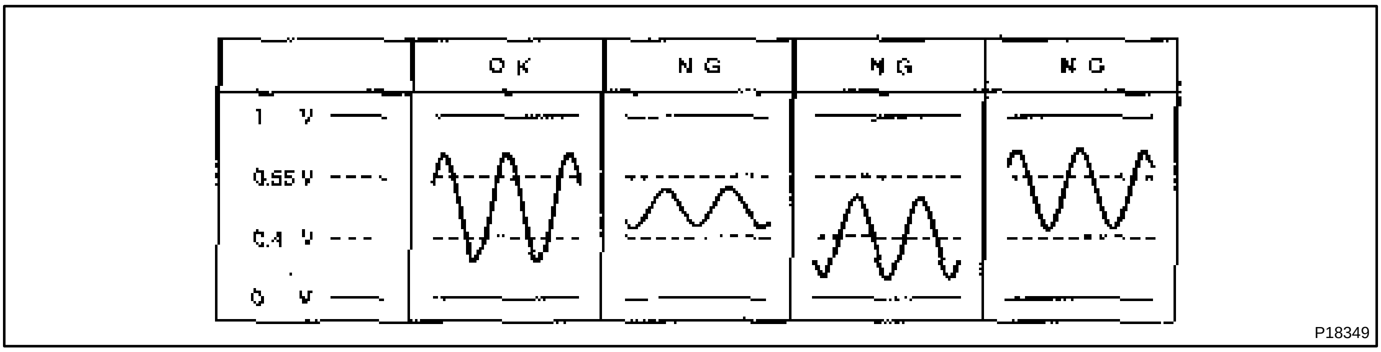
Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.

CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



OK → **Perform confirmation driving pattern (See page DI–47).**

NG

3	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–18).**

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

OK

4	**Check air induction system (See page SF–1).**

NG → **Repair or replace induction system.**

OK

5	**Check fuel pressure (See page SF–7).**

NG → **Check and repair fuel pump, fuel pipe line and filter.**

OK

6	**Check injector injection (See page SF–24).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor.

7	Perform confirmation driving pattern (See page DI–47).

Go

8	Is there DTC P0130 or P0150 being output again?

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

NO

Check and replace ECM (See page IN–28).

DI5CW–03

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

DTC	P0153	Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
P0133 P0153	Response time for heated oxygen sensor's voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Sensor 1 refers to the sensor closer to the engine body.
- Bank 1 refers to the bank that includes the cylinder No. 1.
- Bank 2 refers to the bank that excludes the cylinder No. 1.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Are there any other codes (besides DTC P0133 or P0153) being output?

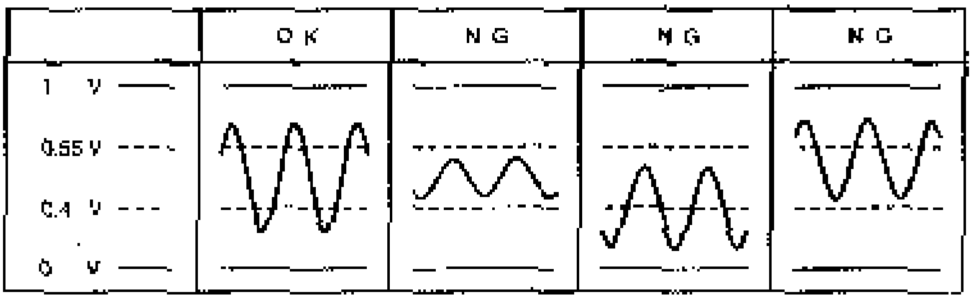
YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:
Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.
CHECK:
Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.
OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK → **Perform confirmation driving pattern (See page DI–47).**

NG ↓

3	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–18).**

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

OK ↓

4	**Check air induction system (See page SF–1).**

NG → **Repair or replace induction system.**

OK ↓

5	Check fuel pressure (See page SF–7).

NG → Check and repair fuel pump, fuel pipe line and filter (See page SF–1).

OK

6	Check injector injection (See page SF–24).

NG → Replace injector.

OK

Replace heated oxygen sensor.

7	Perform confirmation driving pattern (See page DI–47).

Go

8	Is there DTC P0133 or P0153 being output again?

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

NO

Check and replace ECM (See page IN–28).

DI1ED–08

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

DTC	P0141	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0155	Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
P0135 P0141 P0155	When heater operates, heater current exceeds 2 A (2 trip detection logic) Heater current of 0.2 A or less when heater operates (2 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM

HINT:

- Bank 1 refers to the bank that includes cylinder No. 1.
- Bank 2 refers to the bank that excludes cylinder No. 1.
- Sensor 1 refers to the sensor closer to the engine body.

WIRING DIAGRAM

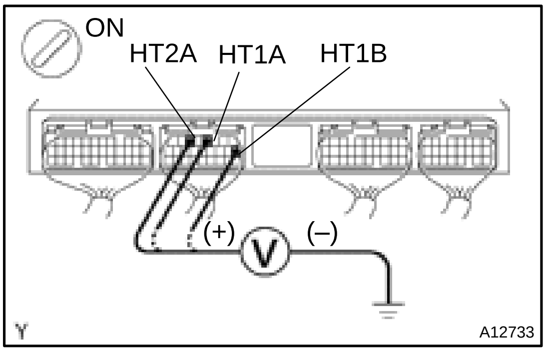
Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check voltage between terminals HT1A, HT1B and HT2A of ECM connector and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals HT1A, HT1B of the ECM connector and body ground.

HINT:

- Terminal HT1A connects to bank 1 sensor 1.
- Terminal HT1B connects to bank 2 sensor 1.
- Terminal HT2A connects to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–28).**

NG

2	Check resistance of heated oxygen sensor heater (See page SF–61).

NG → **Replace heated oxygen sensor.**

OK

Repair or replace harness or connector between EFI main relay (Marking: EFI MAIN) and heated oxygen sensor and heated oxygen sensor and ECM (See page IN–28).

DI6OR–02

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–42.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor remains at 0.40 V or more, or 0.5 V or less when vehicle is driven at 40 km/h (25 mph) or more after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor

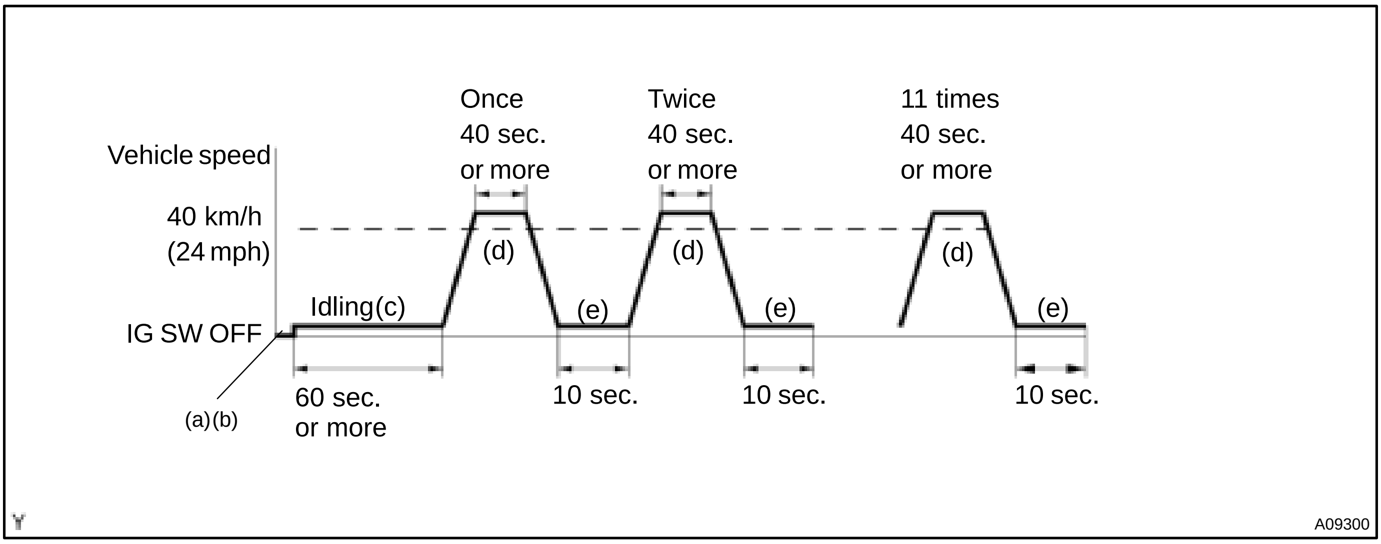
HINT:

- Bank 1 refers to the bank that includes the cylinder No. 1
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check (test) mode (See page DI–3).
(c) Start the engine and let the engine idle for 60 seconds or more.
(d) Drive the vehicle at 40 km/h (24 mph) or more for 40 seconds or more.
(e) Let the engine idle for 10 seconds or more.
(f) Preform steps (d) to (e) 9 times.

HINT:
If a malfunction exists, the MIL will be indicated on the multi information display during step (f).

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

INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Are there any other codes (besides DTC P0136) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–28).**

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

OK

3	**Check output voltage of heated oxygen sensor.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Warm up the engine to normal temperature of the operating.

CHECK:
Read the voltage output of the heated oxygen sensor when the engine is suddenly raced.
HINT:
Perform quick racing to 4,000 rpm for 3 min. using the accelerator pedal.

OK:
Heated oxygen sensor output voltage: Alternates from 0.40 V or less to 0.5 V or more.

OK → **Check that each connector is properly connected.**

NG

Replace heated oxygen sensor.

DI5CX–03

DTC	P0171	System too Lean (Fuel Trim) (Bank 1)

DTC	P0172	System too Rich (Fuel Trim) (Bank 1)

DTC	P0174	System too Lean (Fuel Trim) (Bank 2)

DTC	P0175	System too Rich (Fuel Trim) (Bank 2)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0171 P0174	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temp. sensor • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1)
P0172 P0175	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side. (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temp. sensor • Ignition system • Fuel pressure • Gas leakage on exhaust system • Open or short in heated oxygen sensor (bank 1, 2 sensor 1) circuit • Heated oxygen sensor (bank 1, 2 sensor 1)

HINT:

- When the DTC P0171 or P0174 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 or P0175 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and the DTC P0171 is recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ±38 %, the system is functioning normally.
- The heated oxygen sensor (Bank 1, 2 Sensor 1) output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–42.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check air induction system (See page SF–1).**

NG → **Repair or replace.**

OK

2	**Check injector injection (See page SF–24).**

NG → **Replace injector.**

OK

3	**Check engine coolant temperature sensor (See page SF–55) and mass air flow meter (See page SF–32).**

NG → **Repair or replace.**

OK

4	**Check for spark and ignition (See page IG–1).**

NG → **Repair or replace.**

OK

5	**Check fuel pressure (See page SF–7).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter.**

OK

6	**Check gas leakage on exhaust system.**

NG → **Repair or replace.**

OK

7	**Check output voltage of heated oxygen sensor (bank 1, 2 sensor 1) during idling.**

PREPARATION:

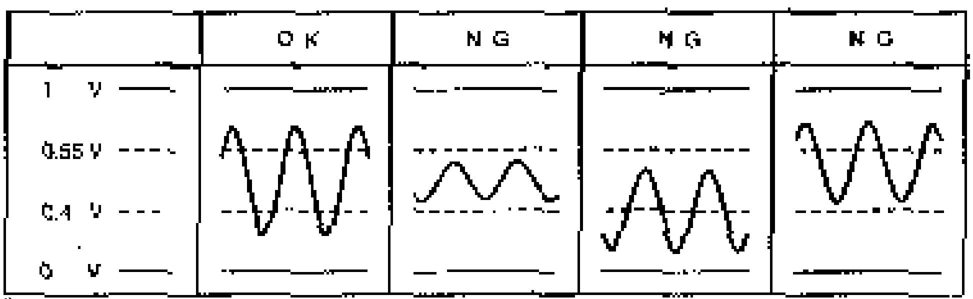
Keep the engine at 2,500 rpm for approx. 90 sec. to warm up the heated oxygen sensor.

CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester to read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).



P18349

OK → **Perform confirmation driving pattern (See page DI–47).**

NG ↓

8	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1, 2 sensor 1) (See page IN–18).

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

OK ↓

Replace heated oxygen sensor.

9	Perform confirmation driving pattern (See page DI–47).

GO ↓

10	Is there DTC P0171, P0172, P0174 or P0175 being output again?

YES → **Check and replace ECM (See page IN–28).**

NO ↓

11	Did vehicle run out of fuel in past?

NO → **Check for intermittent problems (See page DI–3).**

YES ↓

DTC P0171, P0172, P0174 or P0175 is caused by shortage of fuel.

DI7DE–01

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

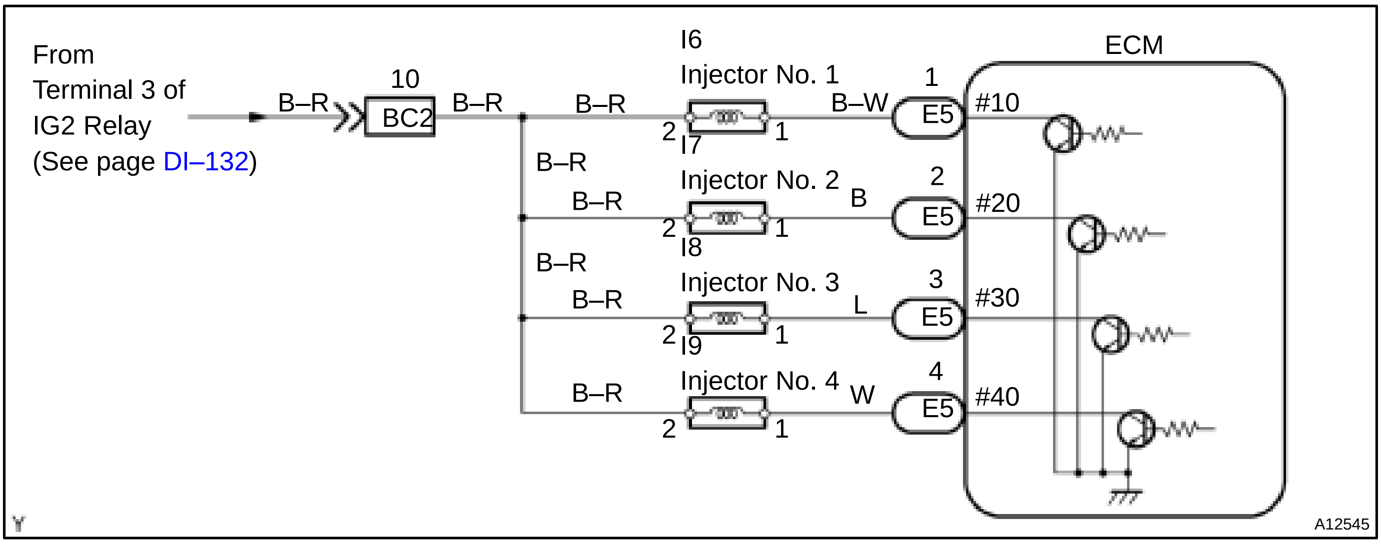
CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.
The ECM counts the number of times from the engine speed change rate, indicating that misfire has occurred. And when the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.
If the misfire rate is high enough and the driving conditions causes catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • ECM •
P0301 P0302 P0303 P0304	For any particular 200 revolutions of engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT:
When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.
(b) Record the DTC and the freeze frame data.
(c) Use the TOYOTA hand–held tester to set to the check mode (See page DI–3).
(d) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list. If you have no TOYOTA hand–held tester, turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again.

HINT:
In order to memorize DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the data list for the following period of time.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1000 rpm	4 minutes or more
2000 rpm	2 minutes and 30 seconds or more
3000 rpm	1 minute and 30 seconds or more

(e) Check whether there is misfire or not by monitoring DTC and the freeze frame data. After that, record them.
(f) Turn the ignition switch OFF and wait at least 5 seconds.

INSPECTION PROCEDURE

HINT:
- If the DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition or freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)

- When either of SHORT FT #1, LONG FT #1, SHORT FT #2 or LONG FT #2 in the freeze frame data is besides the range of ±20%, there is a possibility that the air–fuel ratio is inclining either to ”rich” (–20% or less) or ”lean” (+20% or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility or misfire only during warming up.
- In the case that misfire cannot be reproduced, this may be because of the driving with shortage of fuel, the use of improper fuel, a stain of ignition plug, and etc.

1	**Check wire harness, connector and vacuum hose in engine room.**

CHECK:

(a) Check the connection conditions of the wire harness and connector.

(b) Check the disconnection, piping and break in the vacuum hose.

NG → **Repair or replace, then confirm that there is no misfire (See the confirmation driving pattern).**

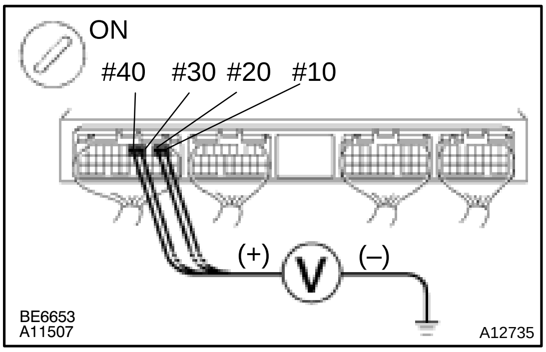
OK

2	**Check spark plug and spark of misfiring cylinder (See page IG–1).**

NG → **Replace or check ignition system (See page IG–1).**

OK

3	**Check voltage of ECM terminal for injector of faulty cylinder.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

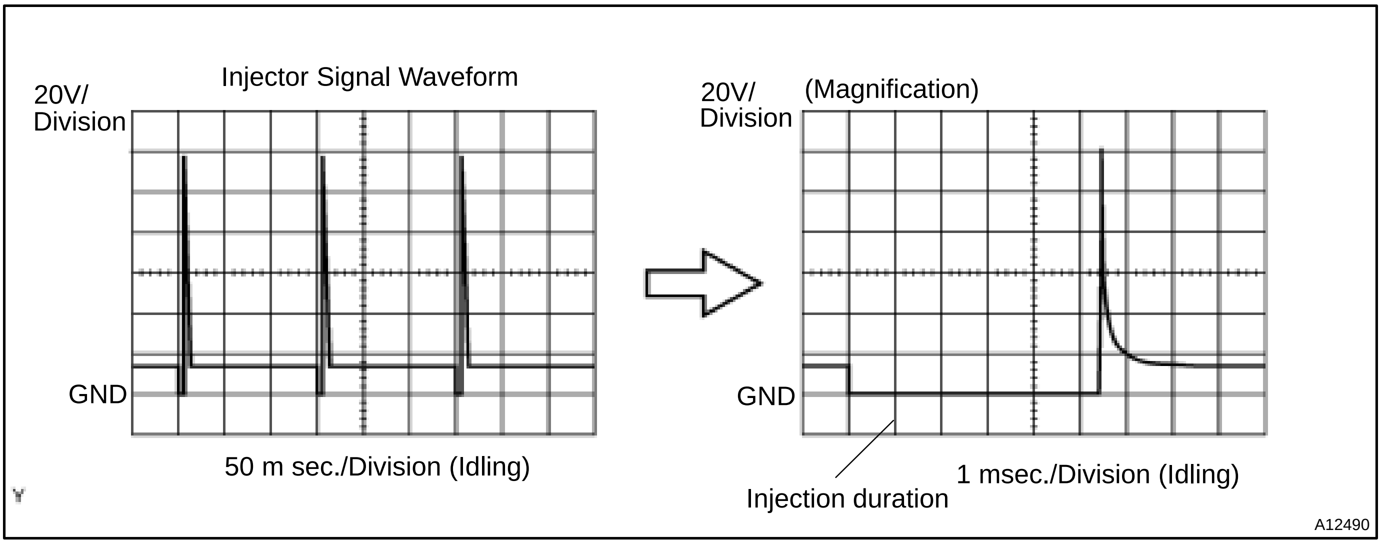
CHECK:

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

OK:

Voltage: 9 – 14 V

Reference: INSPECTION USING OSCILLOSCOPE
INJECTOR SIGNAL WAVEFORM
With the engine idling, check the waveform between terminals #10 – #40 and E01 of the ECM connector.
HINT:
The correct waveforms are shown.



OK → **Go to step 5.**

NG

4	**Check resistance of injector of misfiring cylinder (See page SF–21).**

NG → **Replace injector.**

OK

Check for open and short in harness and connector between injector and ECM (See page IN–28).

5	**Check fuel pressure (See page SF–7).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter.**

OK

6	**Check injector injection (See page SF–24).**

NG → **Replace injector.**

OK

7	**Check mass air flow meter (See page SF–31) and engine coolant temperature sensor (See page SF–55).**

NG → **Repair or replace.**

OK

Check compression pressure (See page EM–3), valve clearance (See page EM–4), and valve timing (See page EM–17).

DI38A–04

DTC	P0325	Knock Sensor 1 Circuit Malfunction (Bank 1)

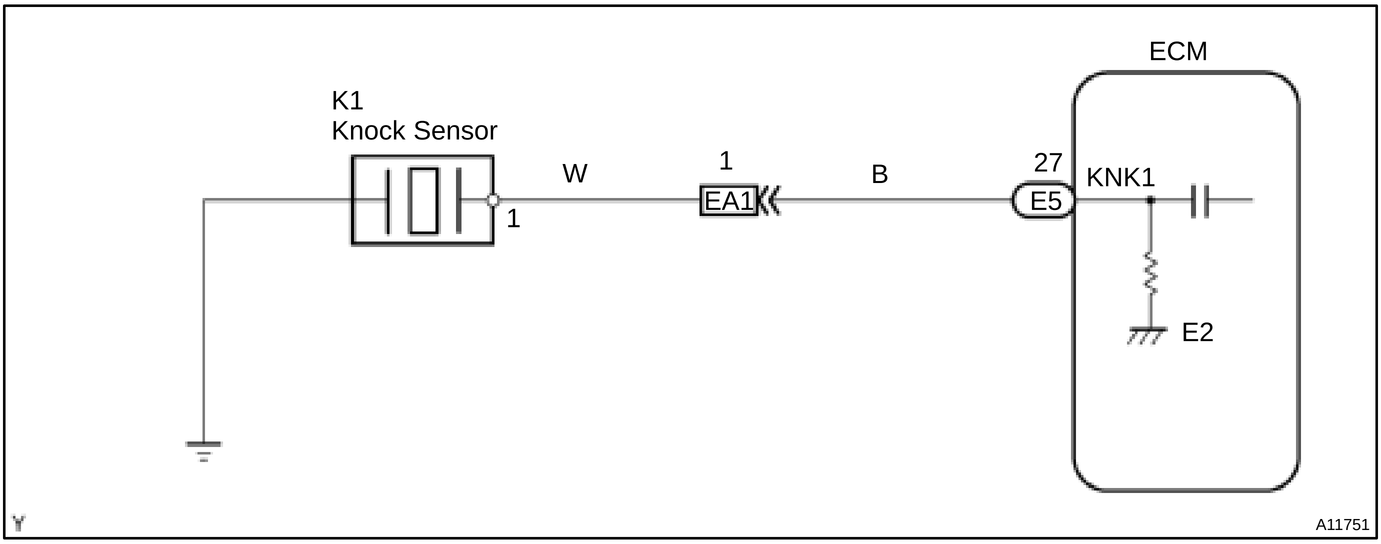
CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0325	No knock sensor signal to ECM with engine speed, 2,000 rpm or more	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECM

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

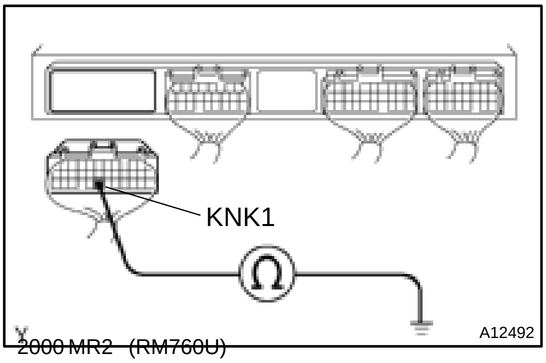
WIRING DIAGRAM



INSPECTION PROCEDURE

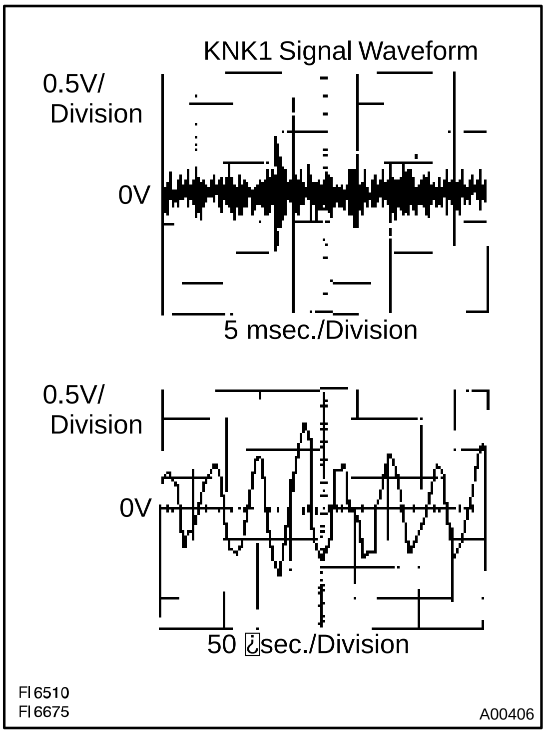
HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel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

1	Check continuity between terminal KNK1 of ECM connector and body ground.



PREPARATION:
(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Disconnect the E5 connector from the ECM.

CHECK:
Measure the resistance between terminal KNK1 of the ECM connector and body ground.



OK:

Resistance: 1 MΩ or higher

Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing at 4,000 rpm, measure the waveform between terminal KNK1 of the ECM connector and body ground.

HINT:
The correct waveforms are as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 80 μ sec. (Normal mode vibration frequency of knock sensor:
12.5 kHz)

HINT:
If normal mode vibration frequency is not 7.6 kHz the sensor is malfunctioning.

OK → **Go to step 3.**

NG

2	**Check knock sensor (See page SF–59).**

NG → **Replace knock sensor.**

OK

3	**Check for open and short in harness and connector between ECM and knock sensor (See page IN–28).**

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

OK

4	**Is malfunction corrected when a good knock sensor is installed?**

YES → **Replace knock sensor.**

NO

Check and replace ECM (See page IN–28).

DI38B–03

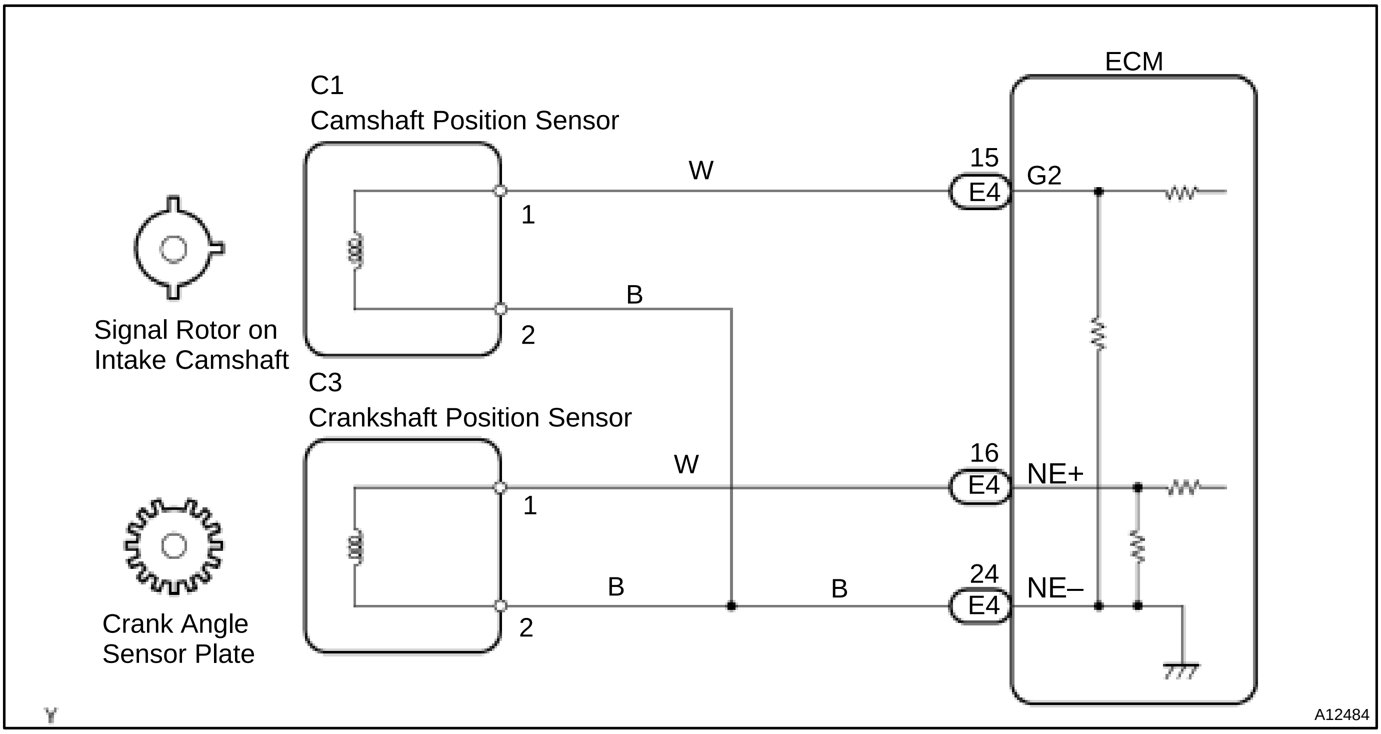
DTC	P0335	Crankshaft Position Sensor "A" Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consists of a magnet, iron core and pick up coil.
The NE signal plate (crank angle sensor plate) has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signal, the actual crankshaft angle and the engine speed by the NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

WIRING DIAGRAM



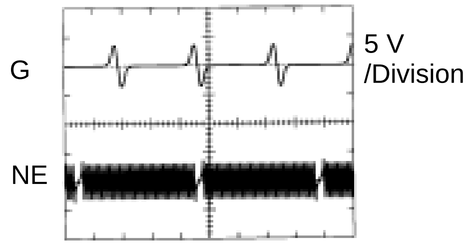
INSPECTION PROCEDURE

HINT:

- Perform troubleshooting of DTC P0335 1st. If no trouble is found, troubleshoot the following mechanical system.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check resistance of crankshaft position sensor (See page IG–1).

G and NE Signal Waveforms



20 msec./Division (Idling)

A03961

Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check the waveform between terminals G2 and NE– and NE+ and NE– of the ECM connector.

HINT:

The correct waveforms are as shown.

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–28).

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

OK

3	Inspect sensor installation and teeth of crank angle sensor plate (See page EM–11).

NG → **Tighten sensor. Replace crank angle sensor plate.**

OK

Check and replace ECM (See page IN–28).

DI38D–03

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consists of a magnet,iron core and pickup coil.
The G signal rotor has 3 teeth on its outer circumference and is mounted on the intake camshaft.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate (crank angle sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic) No camshaft position sensor signal to ECM with engine speed 600 rpm or more	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Intake camshaft • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check resistance of camshaft position sensor (See page IG–1).**

Reference: INSPECTION USING OSCILLOSCOPE
Refer to DTC P0335 on page DI–71.

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–28).**

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

OK

3	**Inspect sensor installation and signal rotor teeth of intake camshaft (See page EM–11).**

NG → **Tighten sensor. Replace intake camshaft.**

OK

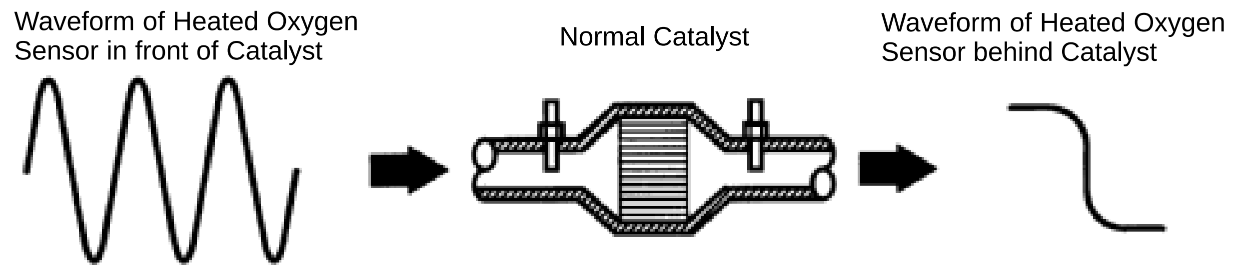
Check and replace ECM (See page IN–28).

DI38G–04

DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

CIRCUIT DESCRIPTION

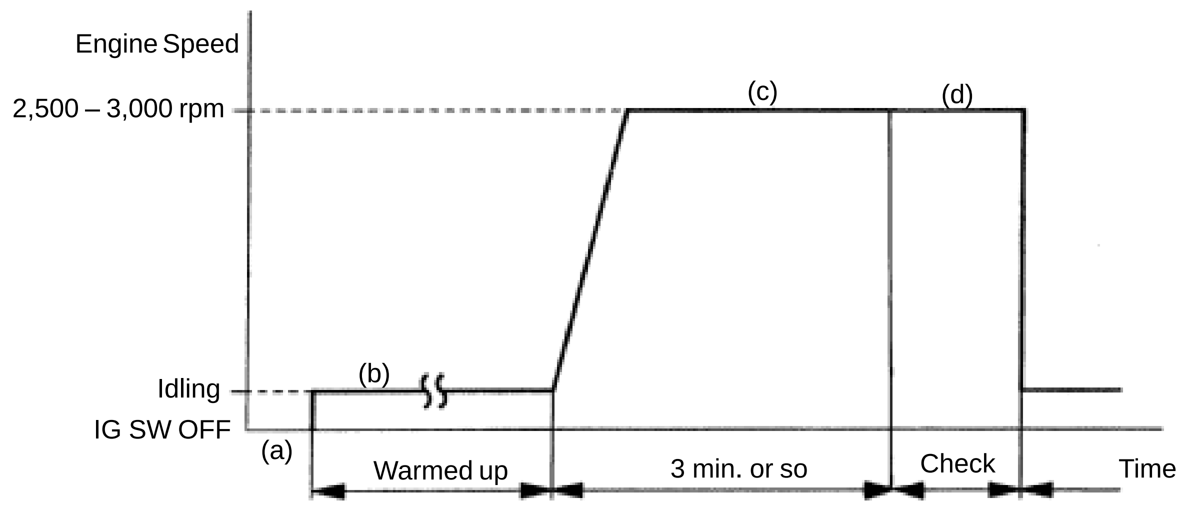
The ECM compares the waveform of the heated oxygen sensor located in front of the catalyst with the waveform of the heated oxygen sensor located behind the catalyst to determine whether or not catalyst performance has deteriorated.
Air–fuel ratio feedback compensation keeps the waveform of the heated oxygen sensor in front of the catalyst repeatedly changing back and forth from rich to lean.
If the catalyst is functioning normally, the waveform of the heated oxygen sensor behind the catalyst switches back and forth between rich and lean much more slowly than the waveform of the heated oxygen sensor in front of the catalyst.
But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



FI7081

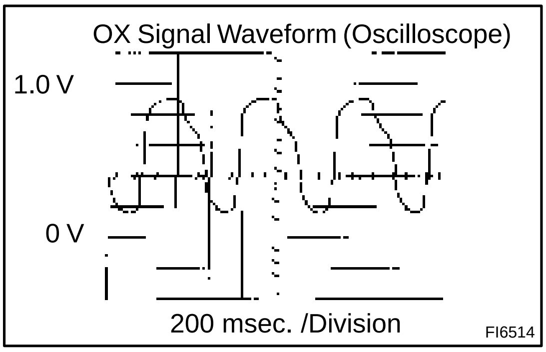
DTC No.	DTC Detection Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have same amplitude (2 trip detection logic)	• Gas leakage on exhaust system • Heated oxygen sensor • Three–way catalytic converter

CONFIRMATION ENGINE RACING PATTERN



FI7132

(a) Connect the TOYOTA hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1A, OX1B, OX2A and E1 of the ECM connector.
(b) Start the engine and warm it up with all the accessories switched OFF until water temperature is stable.
(c) Race the engine at 2,500 – 3,000 rpm for about 3 min.
(d) After confirming that the waveforms of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX1B)).



HINT:

- If there is a malfunction in the system, the waveform of the heated oxygen sensor (bank 1 sensor 2 (OX1B)), is almost the same as that of the heated oxygen sensor (bank 1, 2 sensor 1 (OX1A, OX2A)), on the left.
- There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Are there any other codes (besides DTC P0420) being output?**

YES → **Go to relevant DTC chart (See page DI–14).**

NO

2	**Check gas leakage on exhaust system.**

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1, 2 sensor 1) (See page DI–47).**

NG → **Repair or replace.**

OK

4	Check heated oxygen sensor (bank 1 sensor 2) (See page DI–56).

NG → Repair or replace.

OK

Replace three–way catalytic converter.

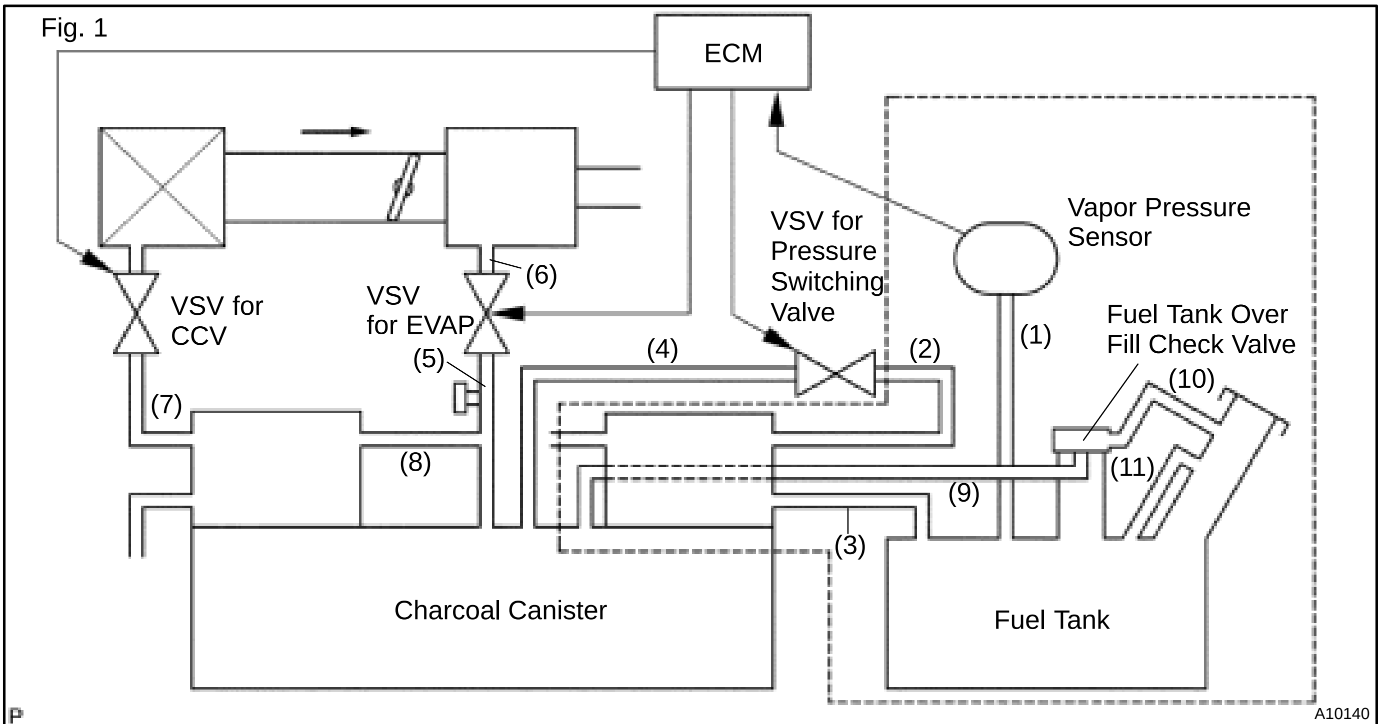
DI7DF–01

DTC	P0440	Evaporative Emission Control System Malfunction

CIRCUIT DESCRIPTION

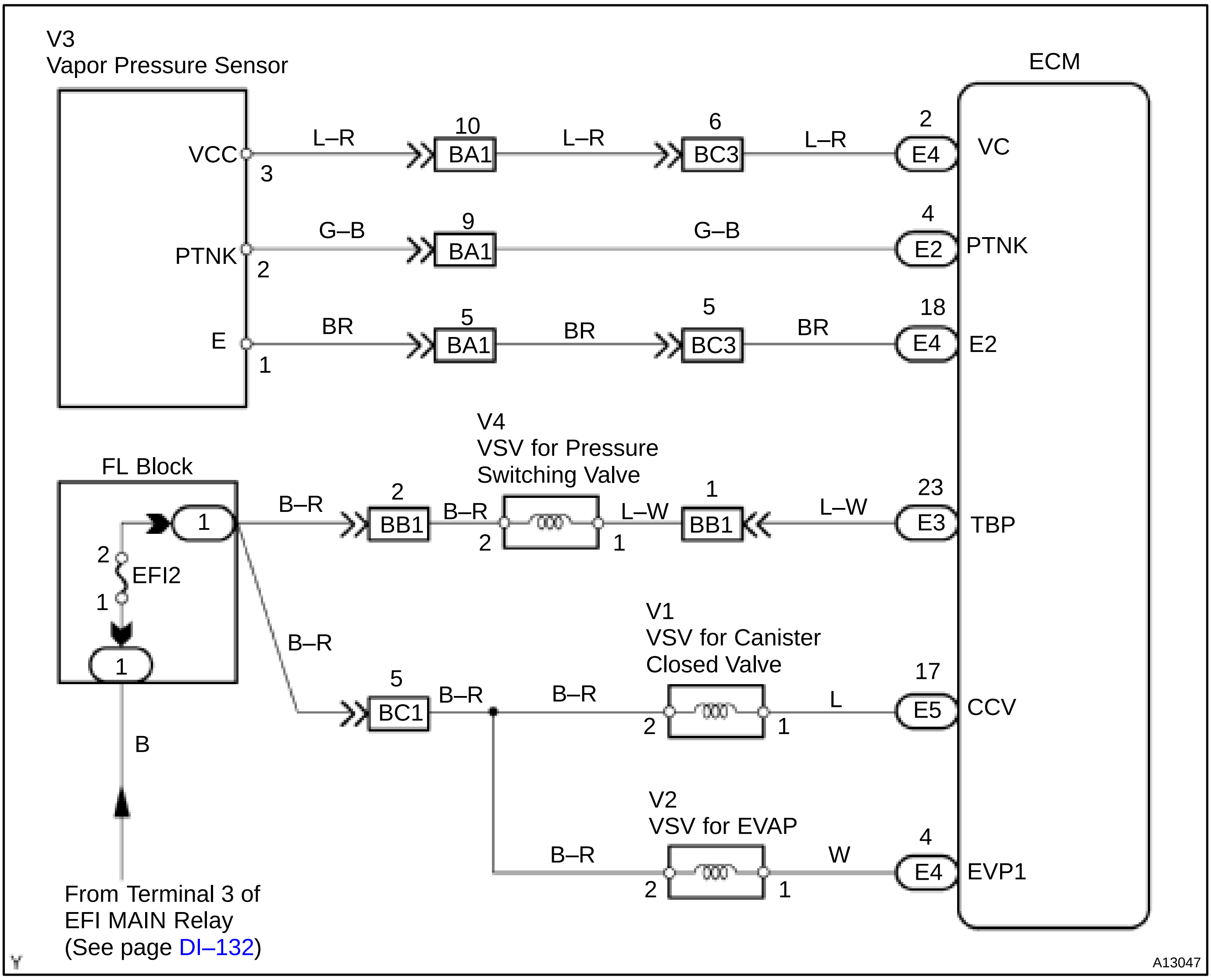
The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0440 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1



DTC No.	DTC Detection Condition	Trouble Area
P0440	Fuel tank pressure is atmospheric pressure after vehicle is driven for 20 min. (2 trip detection logic)	• Hose or tube cracked, holed, damaged or loose seal ((3) in Fig. 1) • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • ECM

WIRING DIAGRAM

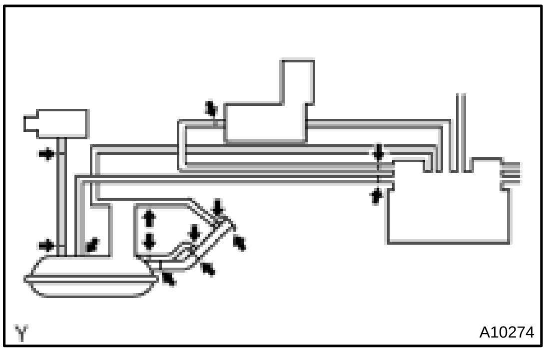


INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440, first troubleshoot DTC P0441, P0446, P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 next.
- Ask the customer whether, after the MIL came on, the customer found the fuel tank cap loose and tightened it. Also ask the customer whether the fuel tank cap was loose when refuelling. If the fuel tank cap was not loose, the DTC is suspected. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the VSV for EVAP, charcoal canister and vapor pressure sensor.

1	**Check whether hose close to fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace.**

OK

2	**Check that fuel tank cap is TOYOTA genuine parts.**

NG → **Replace with TOYOTA genuine parts.**

OK

3	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

4	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

5	**Check fuel inlet pipe for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the fuel inlet pipe for damage.

NG → **Replace fuel inlet pipe.**

OK

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and VSV for pressure switching valve.**

CHECK:
(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole and damage.

NG → **Repair or replace.**

OK

7	**Check hose and tube between fuel tank and charcoal canister.**

CHECK:
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace.**

OK

8	**Check charcoal canister for cracks, hole and damage (See page EC–6).**

NG → **Replace charcoal canister.**

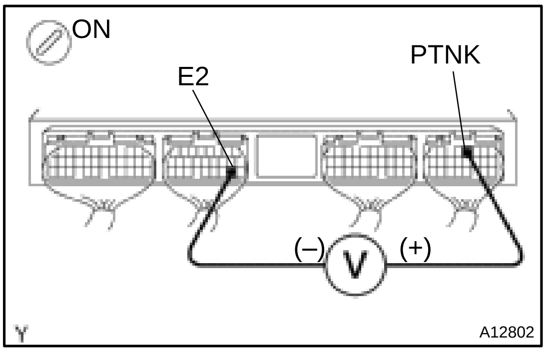
OK

9	**Check voltage between terminals VC and E2 of ECM connector (See page DI–37, step 5).**

NG → **Check and replace ECM (See page IN–28).**

OK

10	**Check voltage between terminals PTNK and E2 of ECM connectors.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Remove the fuel tank cap.

(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

OK:

Voltage: 3.0 – 3.6 V

OK → **Go to step 12.**

NG

11	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

Replace vapor pressure sensor.

12	**Check fuel tank and fuel tank over fill check valve for cracks and damage.**

NG → **Replace fuel tank or fuel tank over fill check valve.**

OK

It is likely that vehicle user did not properly close fuel tank cap. Please explain to customer how to properly install fuel tank cap.

DI6OS–02

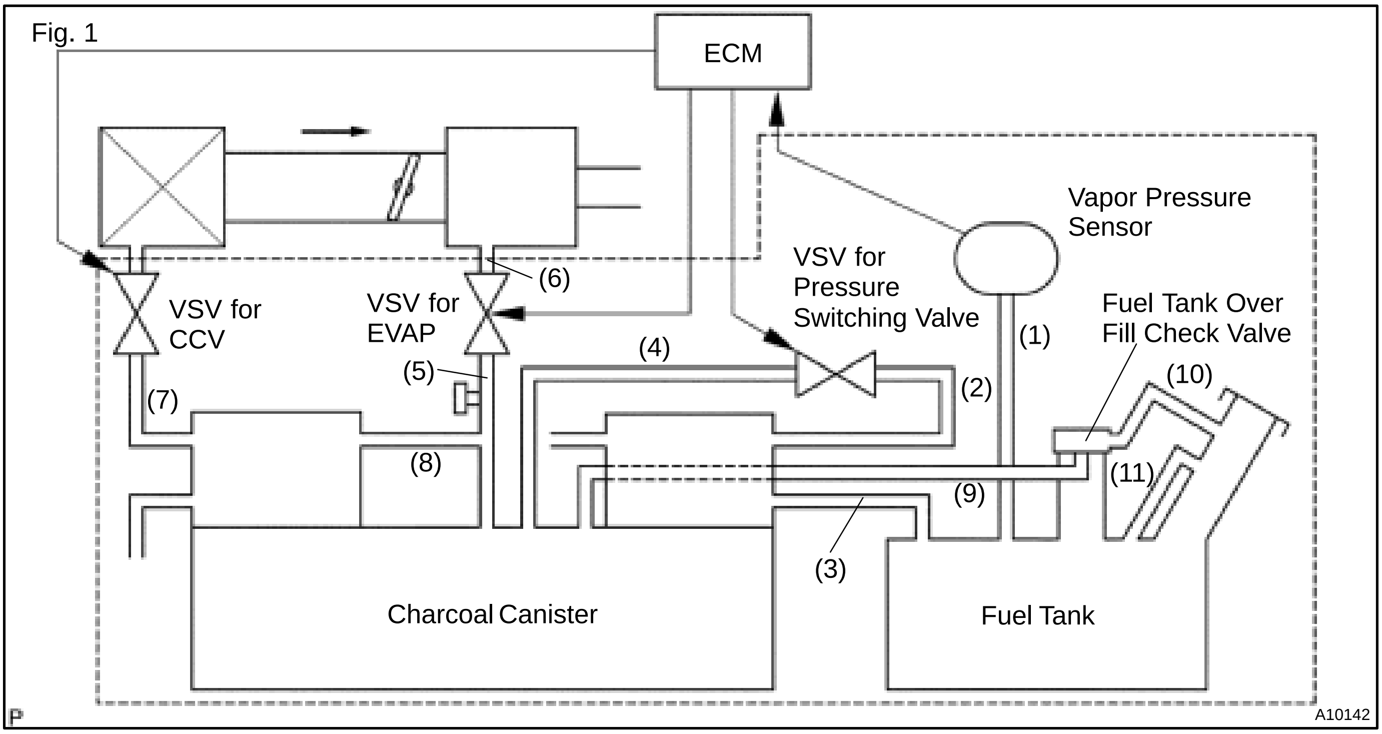
DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV), VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in the VSV for EVAP, the VSV for pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1



DTC No.	DTC Detection Condition	Trouble Area
P0441	Pressure in charcoal canister does not drop during purge control (2 trip detection logic)	• Vacuum hose cracks, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and(11) in Fig. 1) • Fuel tank cap incorrectly installed • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in VSV circuit for CCV • VSV for CCV • Open or short in VSV circuit for pressure switching valve • VSV for pressure switching valve • Fuel tank cracked, holed ordamaged • Charcoal canister cracked, holed or damaged • Fuel tank over fill check valve cracked or damaged • ECM
	During purge cut–off, pressure in charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)	
P0446	When VSV for pressure switching valve is turned OFF, pressure in fuel tank is maintained at atmospheric pressure (2 trip detection logic)	
	When VSV for pressure switching valve is OFF, ECM judges that there is no continuity between vapor pressure sensor and fuel tank (2 trip detection logic)	
	When VSV for CCV is ON, pressure in charcoal canister and fuel tank is maintained at atmospheric pressure (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0440 on page DI–78.

INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440, first troubleshoot DTC P0441, P0446, P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 next.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the VSV for EVAP, charcoal canister and vapor pressure sensor.

TOYOTA hand–held tester:

1	**Check whether hose close to fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister (See page DI–78, step 1).**

NG → **Repair or replace.**

OK

2	**Check that fuel tank cap is TOYOTA genuine parts.**

NG → **Replace with TOYOTA genuine parts.**

OK

3	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

4	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

5	**Check fuel inlet pipe for damage (See page DI–78, step 5).**

NG → **Replace fuel inlet pipe.**

OK

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and VSV for pressure switching valve.**

NG → **Repair or connect VSV or sensor connector.**

OK

7	**Check hose and tube between fuel tank and charcoal canister (See page DI–78 step 7).**

NG → **Repair or replace.**

OK

8	**Check VSV connector for EVAP, VSV connector for CCV, VSV connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

OK

9	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:
(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG → **Repair or replace.**

OK

10	**Check voltage between terminals VC and E2 of ECM connector (See page DI–78 step 9).**

NG → **Check and replace ECM (See page IN–28).**

OK

11	**Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78, step 10).**

OK → **Go to step 13.**

NG

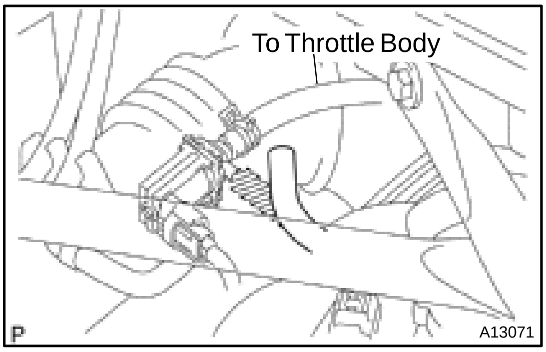
12	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

Replace vapor pressure sensor.

13 Check purge flow.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(c) Disconnect the vacuum hose from the VSV for the EVAP from the charcoal canister.
(d) Start the engine.

CHECK:

When the VSV for the EVAP is operated by the TOYOTA hand–held tester, apply the disconected hose to your finger to check the suction.

OK:

VSV is ON: Disconnected hose sucks.
VSV is OFF: Disconnected hose does not suck.

OK → **Go to step 17.**

NG

14 Check vacuum hose between intake manifold and VSV for EVAP, and VSV for EVAP and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG → **Repair or replace.**

OK

15	Check operation of VSV for EVAP (See page SF–49).

OK → **Go to step 16.**

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between throttle body and VSV for EVAP, and VSV for EVAP and charcoal canister.

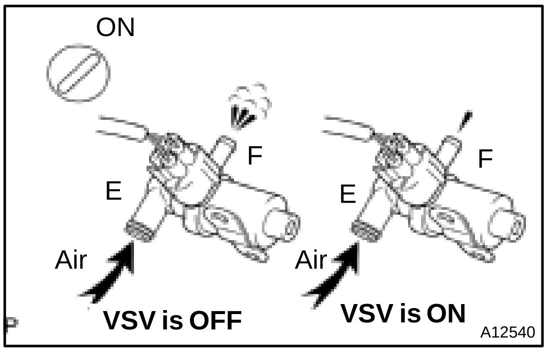
16	Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for EVAP, and VSV for EVAP and ECM (See page IN–28).

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

OK

Check and replace ECM (See page IN–28).

17	Check VSV for CCV.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the vacuum hose for the VSV for the CCV from the charcoal canister.
(c) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the VSV operation when it is operated by the TOYOTA hand–held tester.

OK:

VSV is ON: Air does not flow from port E to port F.
VSV is OFF: Air from port E flows out through port F.

OK → **Go to step 21.**

NG

18	Check vacuum hose between VSV for CCV and charcoal canister.

CHECK:
(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage and blockage.

NG → **Repair or replace.**

OK

19	Check operation of VSV for CCV (See page SF–50).

OK → **Go to step 20.**

NG

Replace VSV and charcoal canister, and then clean vacuum hose between charcoal canister and VSV for CCV.

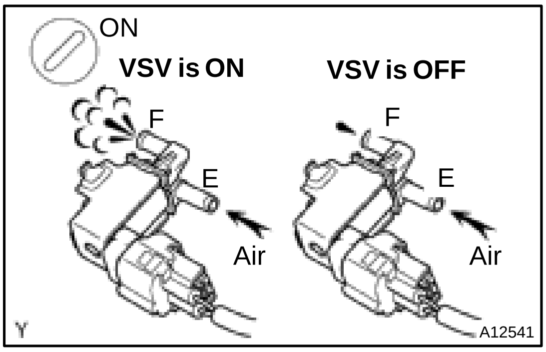
20	Check for open and short in harness and connector between EFI main relay and VSV for CCV, and VSV for CCV and ECM (See page IN–28).

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

OK

Check and replace ECM (See page IN–28).

21	Check VSV for pressure switching valve.



PREPARATION:

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

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

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the VSV operation when it is operated by the TOYOTA hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air does not flow from port E to port F.

OK	Go to step 24.

NG

22	Check operation of VSV for pressure switching valve (See page SF–53).

OK	Go to step 23.

NG

Replace VSV and charcoal canister, and then clean vacuum hose between charcoal canister and VSV for pressure switching valve, and VSV for pressure switching valve and fuel tank.

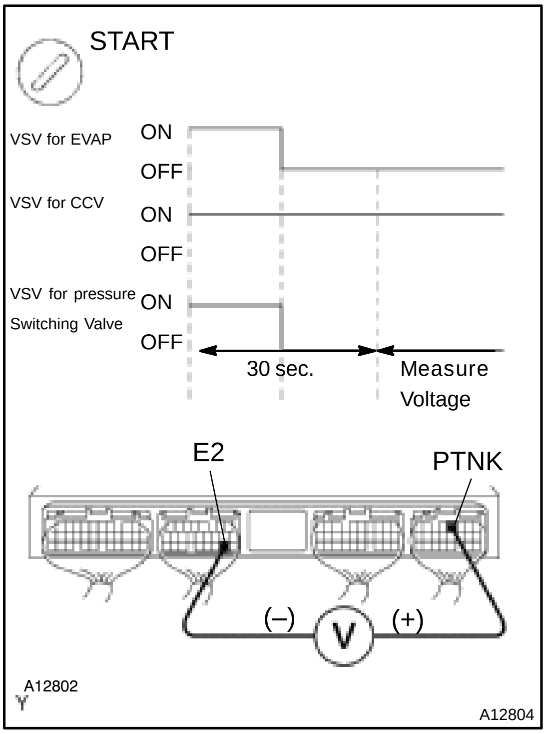
23	Check for open and short in harness and connector between EFI main relay and VSV for pressure switching valve, and VSV for pressure switching valve and ECM (See page IN–28).

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

24	Check fuel tank.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(d) Start the engine.
(e) The VSV for the CCV is ON by the TOYOTA hand–held tester.
(f) The VSV for the EVAP is OFF, and the VSV for the pressure switching valve is ON by the TOYOTA hand–held tester and remains on for 30 sec.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors after switching the VSV for the EVAP from OFF to ON, and the VSV for the pressure switching valve from ON to OFF.

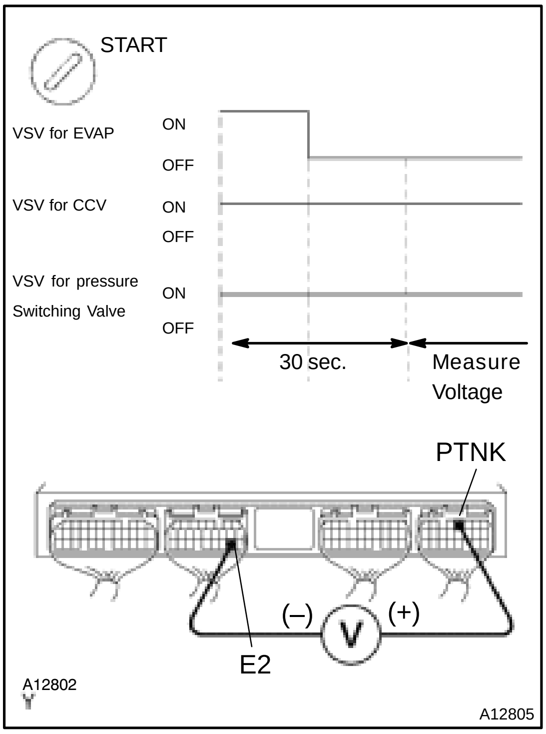
OK:

Voltage: 2.5 V or less

NG	Replace fuel tank.

OK

25	**Check charcoal canister.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Connect the TOYOTA hand–held tester to the DLC3.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

(d) Start the engine.

(e) The VSV for the CCV and the VSV for the pressure switching valve are ON by the TOYOTA hand–held tester.

(f) The VSV for the EVAP is OFF by the TOYOTA hand–held tester and remains on for 30 sec.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors after switching the VSV for the EVAP from OFF to ON.

OK:

Voltage: 2.5 V or less

NG	**Replace charcoal canister.**

OK

26	**Remove charcoal canister and check it (See page EC–6).**

NG	**Replace charcoal canister.**

OK

27	**Check fuel tank over fill check valve (See page EC–6).**

NG	**Replace fuel tank over fill check valve or fuel tank.**

OK

Check and replace charcoal canister (See page EC–5).

OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check whether hose close to fuel tank have been modified, and check whether there are signs of any accident near fuel tank or charcoal canister (See page DI–78, step 1).**

NG → **Repair or replace.**

OK

2	**Check that fuel tank cap is TOYOTA genuine parts.**

NG → **Replace with TOYOTA genuine parts.**

OK

3	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

4	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

5	**Check fuel inlet pipe neck for damage.**

NG → **Replace fuel inlet pipe.**

OK

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and VSV for pressure switching valve.**

NG → **Repair or connect VSV or sensor connector.**

OK

7	**Check hose and tube between fuel tank and charcoal canister (See page DI–78 step 7).**

NG → **Repair or replace.**

OK

8	**Check VSV connector for EVAP, VSV connector for CCV, VSV connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

OK

9	**Check vacuum hoses ((8), (9) , (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage and blockage.

NG → **Repair or replace.**

OK

10	Check voltage between terminals VC and E2 of ECM connector (See page DI–78 step 9).

NG → Check and replace ECM (See page IN–28).

OK ↓

11	Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78, step 10).

OK → Go to step 13.

NG ↓

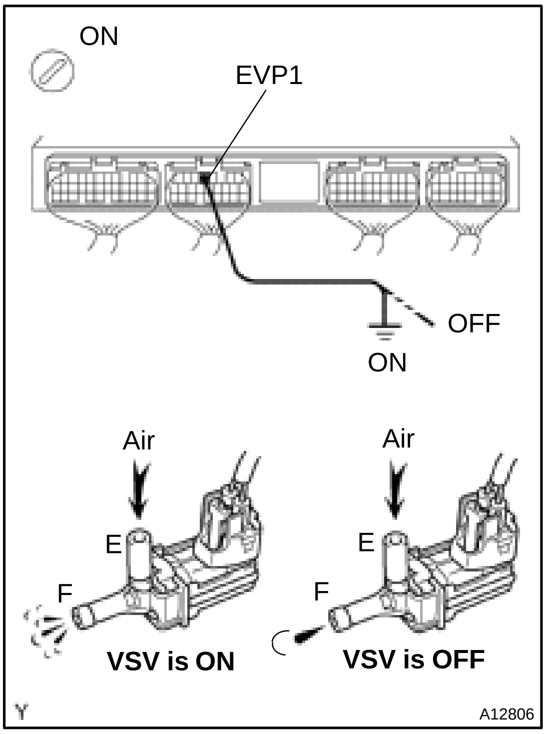
12	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).

NG → Repair or replace harness or connector.

OK ↓

Replace vapor pressure sensor.

13	Check VSV for EVAP.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air from port E flows out through port F with a little difficultly.

OK	Go to step 16.

NG

14	Check operation of VSV for EVAP (See page SF–49).

NG	Go to step 15.

NG

Replace VSV and clean vacuum hoses between throttle body and VSV for EVAP, and VSV for EVAP and charcoal canister, and then check charcoal canister.

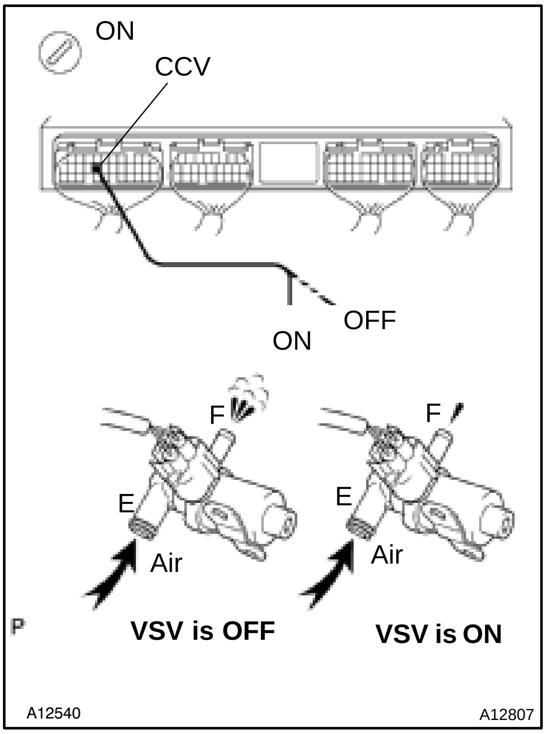
15	Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for EVAP, and VSV for EVAP and ECM (See page IN–28)

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

16	**Check VSV for CCV.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

VSV is ON:
Air does not flow from port E to port F.
VSV is OFF:
Air from port E flows out through port F.

OK → **Go to step 19.**

NG

17	**Check operation of VSV for CCV (See page SF–51).**

OK → **Go to step 18.**

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between charcoal canister and VSV for CCV.

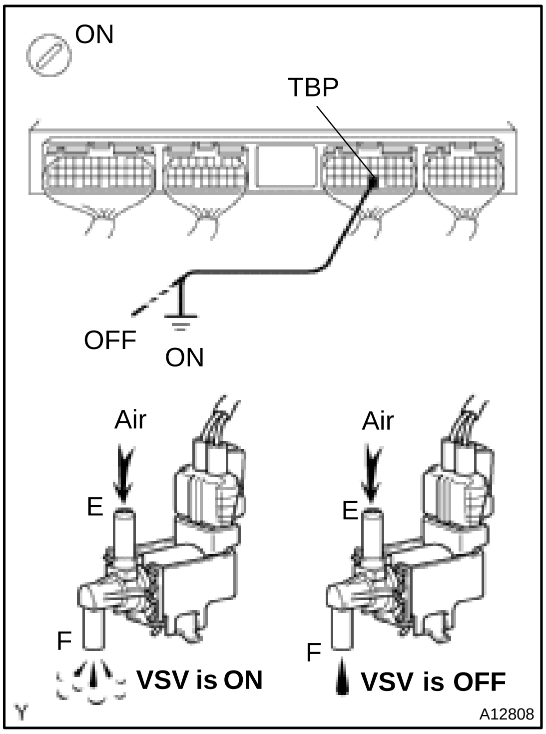
18	**Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for CCV, and VSV for CCV and ECM (See page IN–28).**

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

OK

Check and replace ECM (See page IN–28).

19	Check VSV for pressure switching valve.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → Go to step 22.

NG

20	Check operation of VSV for pressure switching valve (See page SF–53).

OK → Go to step 21.

NG

Replace VSV and charcoal canister, and then clean vacuum hoses between charcoal canister and VSV for pressure switching valve, and VSV for pressure switching valve and fuel tank.

21	Check for open and short in harness and connector between EFI main relay and VSV for pressure switching valve, and VSV for pressure switching valve and ECM (See page IN–28).

NG	Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

22	Check fuel tank over fill check valve (See page EC–6).

NG	Replace fuel tank over fill check valve or fuel tank.

OK

Check and replace charcoal canister (See page EC–5).

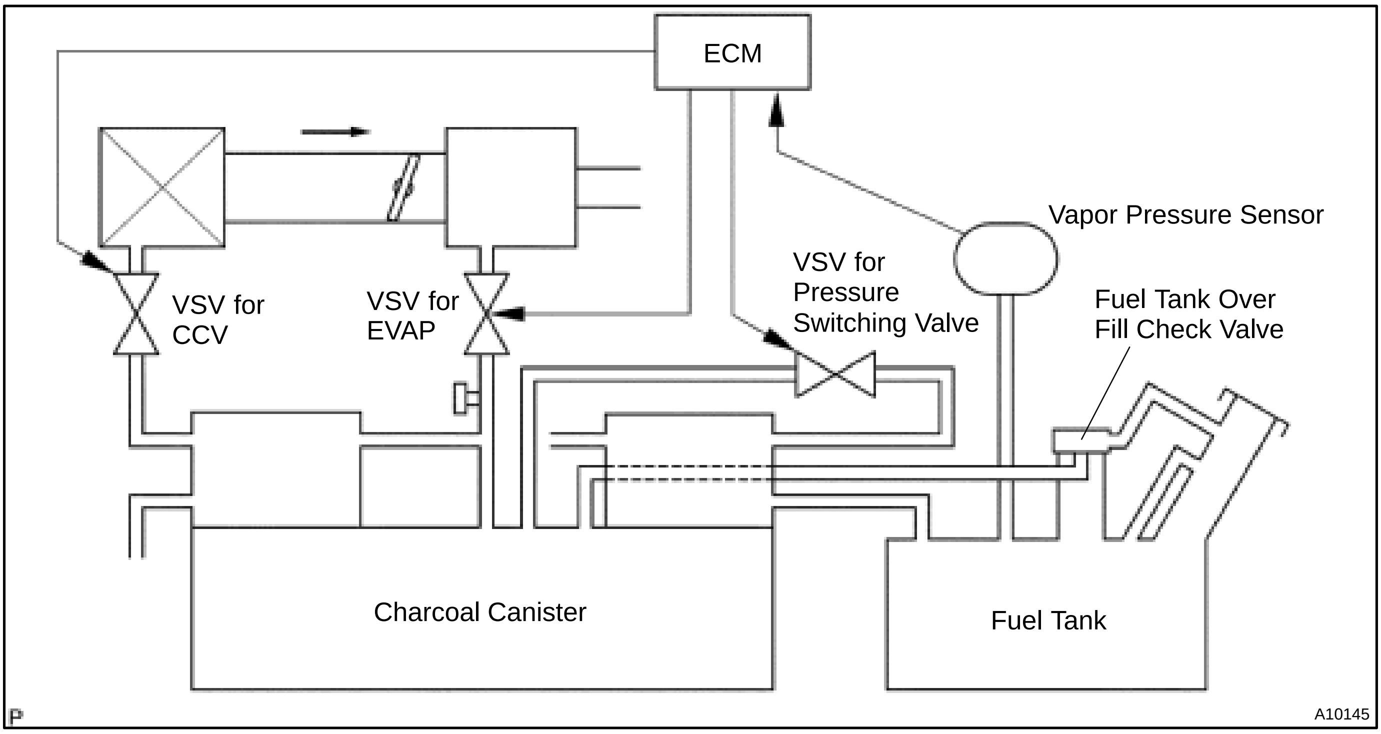
DI1K0–08

DTC	P0450	Evaporative Emission Control System Pressure Sensor Malfunction

DTC	P0451	Evaporative Emission Control System Pressure Sensor Range/Performance

CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for canister closed valve (CCV) and VSV for pressure switching valve are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0450 or P0451 is recorded by the ECM when the vapor pressure sensor malfunctions.



DTC No.	DTC Detection Condition	Trouble Area
P0450	10 seconds or less after engine starting condition (a) or (b) continues for 7 seconds or more: (2 trip detection logic) (a) Vapor pressure sensor value < –4.0 kPa (–30 mmHg, –1.2 in.Hg) (b) Vapor pressure sensor value ≧ 2.0 kPa (15 mmHg, 0.6 in.Hg)	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0451	Vapor pressure sensor output extremely changes under conditions of (a) or (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and VSV for pressure switching valve is OFF (b) High vapor pressure sensor	

WIRING DIAGRAM

Refer to DTC P0440 on page DI–78.

INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446, P0450 or P0451 is output after DTC P0440, first troubleshoot DTC P0441, P0446 P0450 or P0451. If no malfunction is detected, troubleshoot DTC P0440 next.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the VSV for EVAP, charcoal canister and vapor pressure sensor.

1	**Check voltage between terminals VC and E2 of ECM connector (See page DI–78).**

NG → **Check and replace ECM (See page IN–28).**

OK

2	**Check voltage between terminals PTNK and E2 of ECM connectors (See page DI–78).**

OK → **Check and replace ECM (See page IN–28).**

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–28).**

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

OK

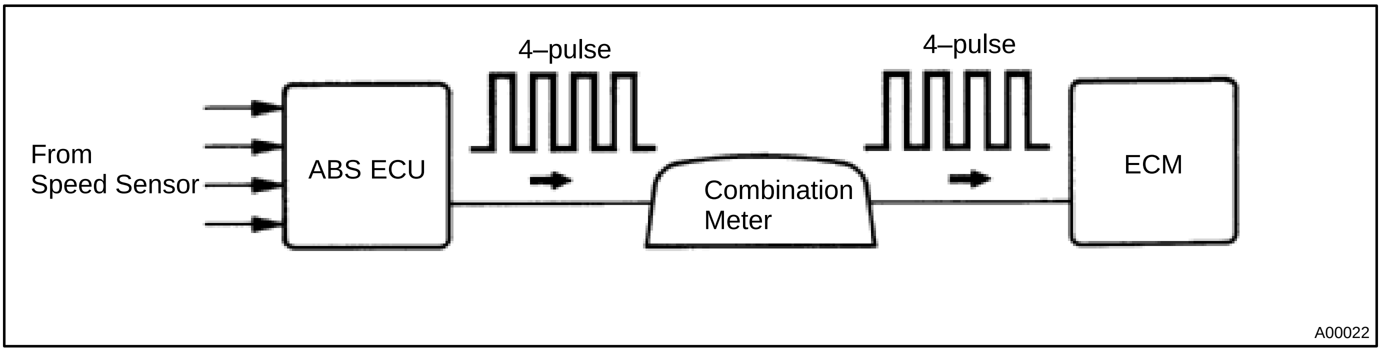
Replace vapor pressure sensor.

DI38H–03

DTC	P0500	Vehicle Speed Sensor Malfunction

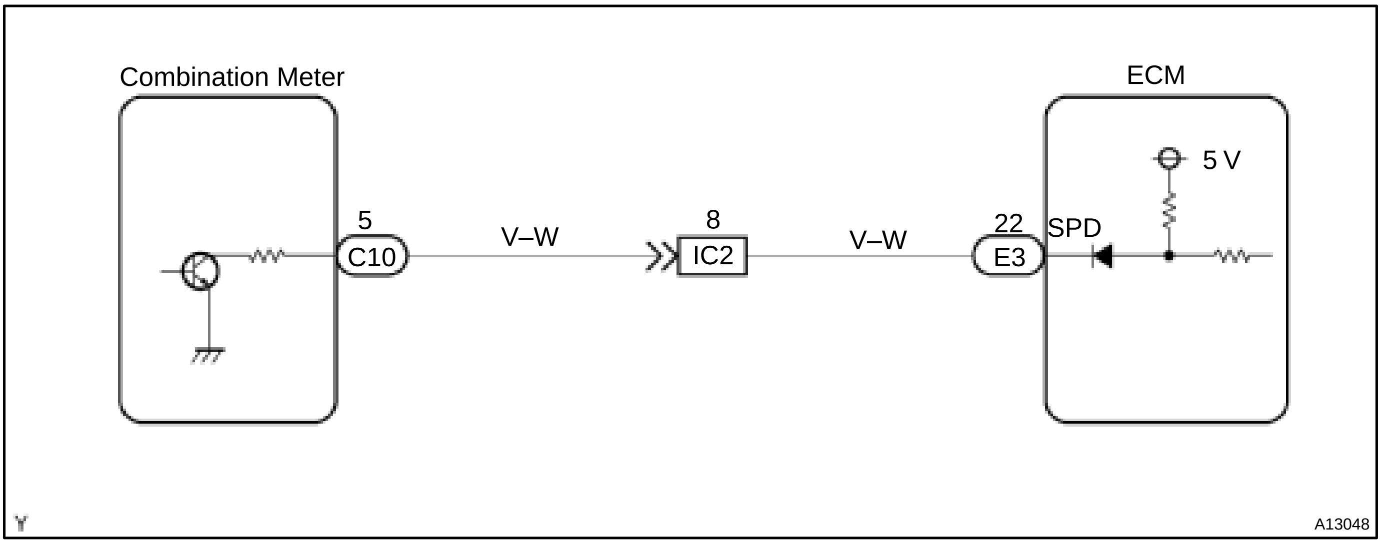
CIRCUIT DESCRIPTION

The speed sensor for ABS detects the wheel speed and sends the appropriate signals to the ABS ECU. The ECU converts these signals into a 4–pulse signal and outputs it to the combination meter.
After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under following condition: (2 trip detection logic) (a) Vehicle is being driven (b) Clutch or brake slips or gear is broken (2–trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ABS ECU • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

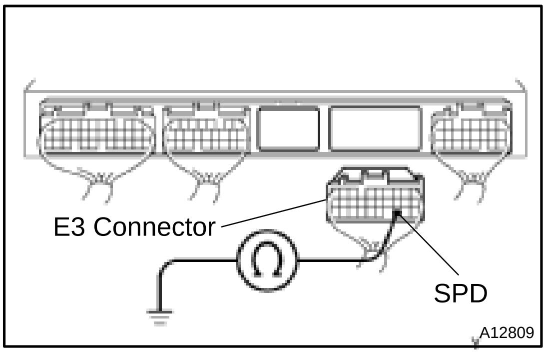
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the 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 page BE–38).**

OK

2	**Check for short in harness and connector between terminal SPD of ECM connector and body ground.**



PREPARATION:
(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Disconnect the E3 connector from the ECM.

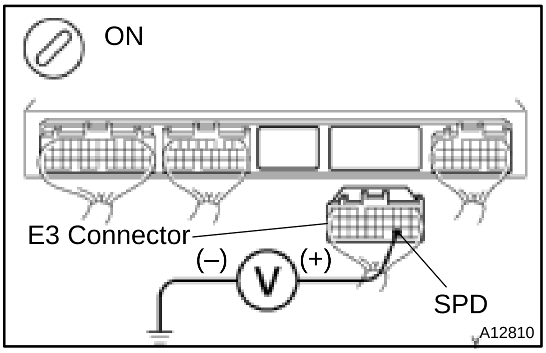
CHECK:
Check the continuity between terminal SPD of the ECM connector and body ground.

OK:
No continuity (1 MΩ or higher)

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

OK

3	**Check voltage between terminal SPD of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the E3 connector from the ECM.

(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal SPD of the ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG → **Repair or replace harness and connector between combination meter and ECM (See page IN–28).**

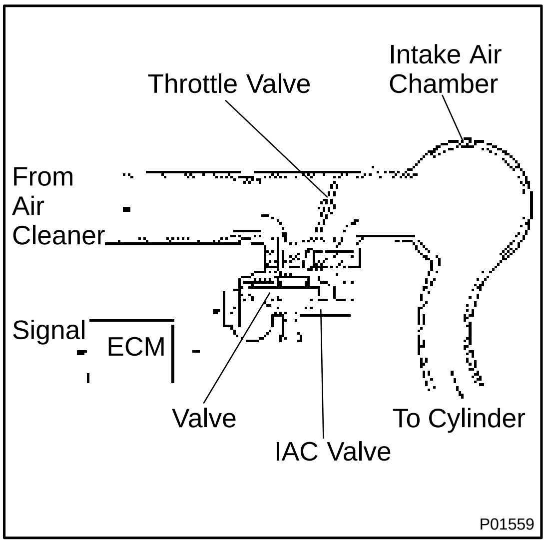
OK

Check and replace ECM (See page IN–28).

DI38I–05

DTC	P0505	Idle Control System Malfunction

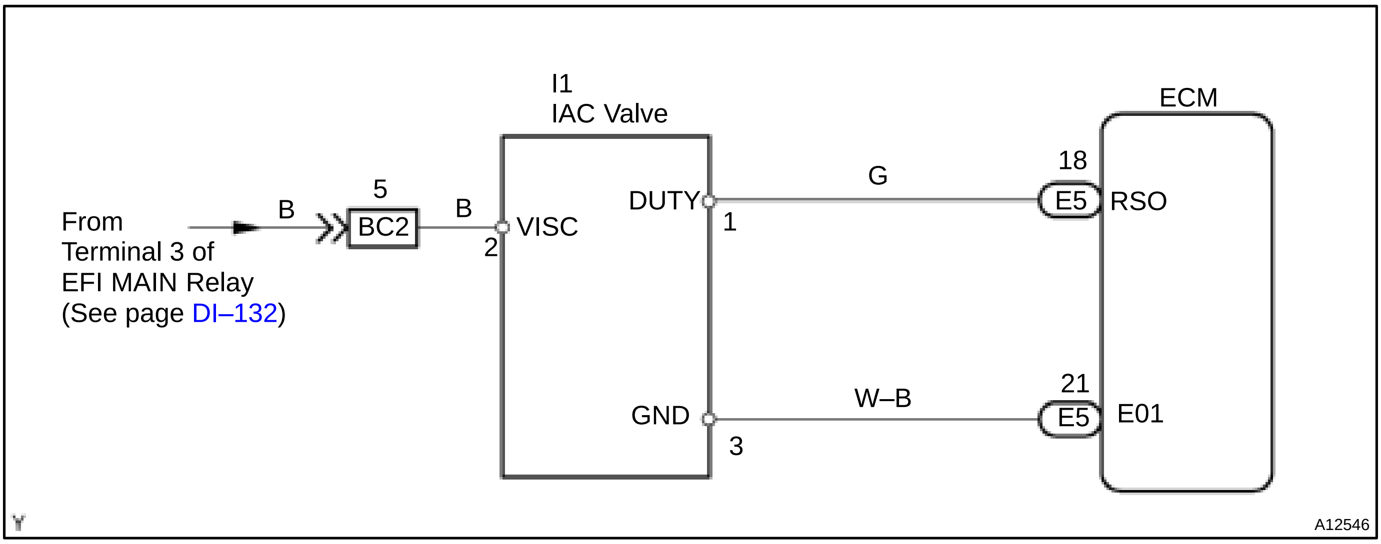
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located on the throttle body and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detection Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	• Open or short in IAC valve circuit • IAC valve is stuck or closed • Open or short in A/C switch circuit • Air induction system • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check engine idle speed.**

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the transmission into neutral position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

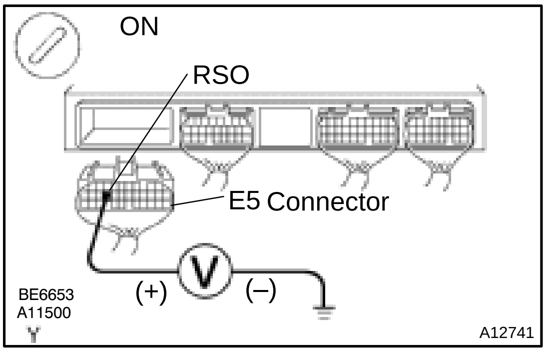
CHECK:
Check the difference of engine speed in less than 5 sec. and more than 5 sec.

OK:
Difference of engine speed: More than 100 rpm.

OK → **Go to step 6.**

NG ↓

2	**Check voltage between terminals RSO of ECM connector and body ground.**



PREPARATION:
(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Disconnect the E5 connector from ECM.
(c) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminals RSO of the ECM connector and body ground,

OK:
Voltage: 9 – 14 V

OK → **Go to step 4.**

NG ↓

3	**Check IAC valve (See page SF–38).**

NG → **Replace IAC valve.**

OK ↓

Check for open and short in harness and connector between IAC valve and ECM (See page IN–28).

4	Check operation of IAC valve (See page SF–38).

NG → Replace IAC valve.

OK

5	Check blockage of IAC valve and passage to bypass throttle valve.

NG → Replace IAC valve.

OK

Check and replace ECM (See page IN–28).

6	Check for A/C signal circuit (See page AC–84).

NG → Repair or replace.

OK

Check air induction system (See page SF–1).

DI3HD–06

DTC	P1300	Igniter Circuit Malfunction (No. 1)

DTC	P1305	Igniter Circuit Malfunction (No. 2)

DTC	P1310	Igniter Circuit Malfunction (No. 3)

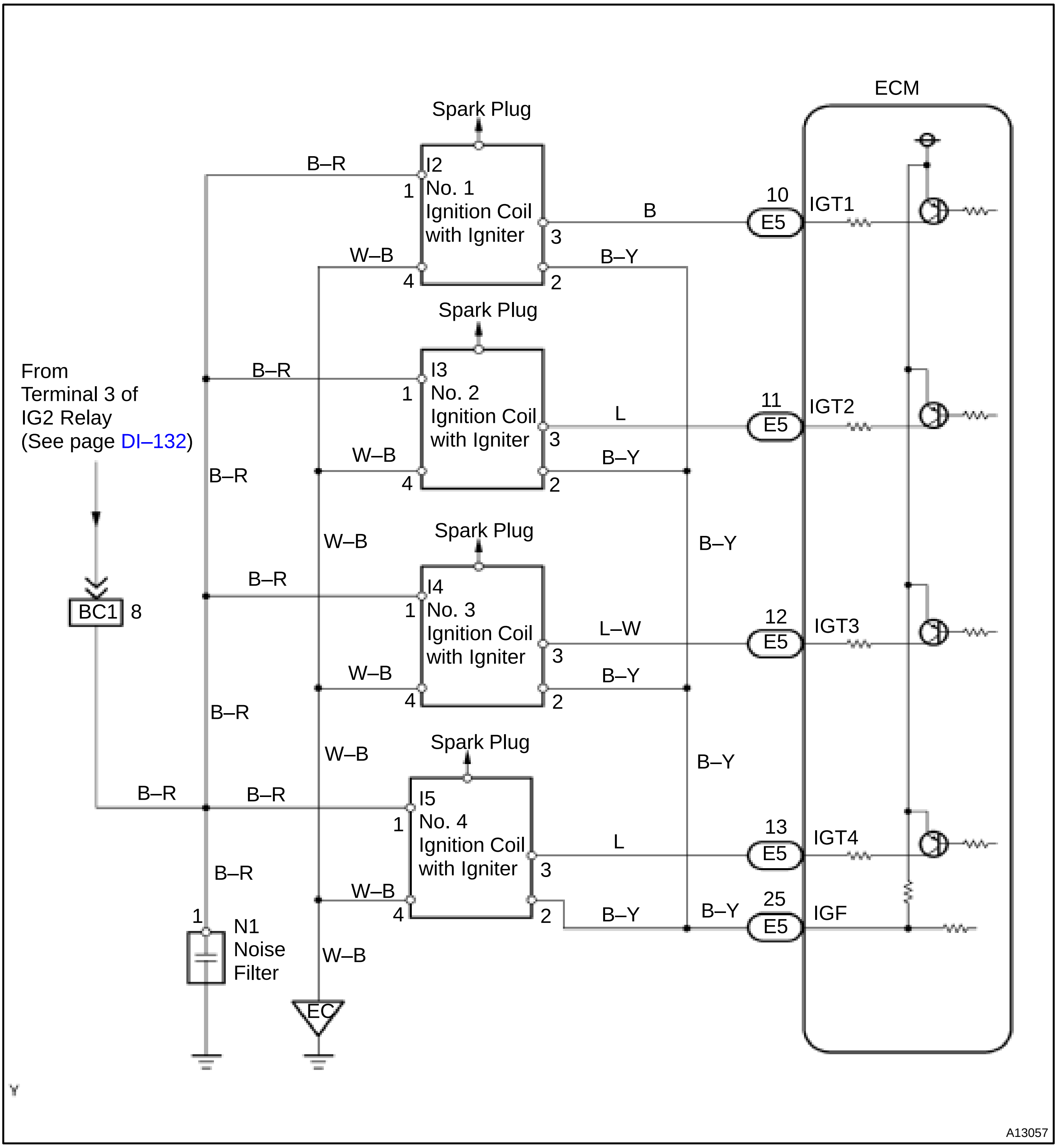
DTC	P1315	Igniter Circuit Malfunction (No. 4)

CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances overall reliability of the ignition system by eliminating the distributor.
The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes, from the center electrode to the ground electrode.
The ECM 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 supplied to the spark plug connected to the end of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P1300 P1305 P1310 P1315	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF and IGT circuit from ignition coil with igniter • ignition coil with igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P1300 is displayed, check No. 1 ignition coil with igniter circuit.
- If DTC P1305 is displayed, check No. 2 ignition coil with igniter circuit.
- If DTC P1310 is displayed, check No. 3 ignition coil with igniter circuit.
- If DTC P1315 is displayed, check No. 4 ignition coil with igniter circuit.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check spark plug and spark (See page DI–63).**

NG → **Go to step 4.**

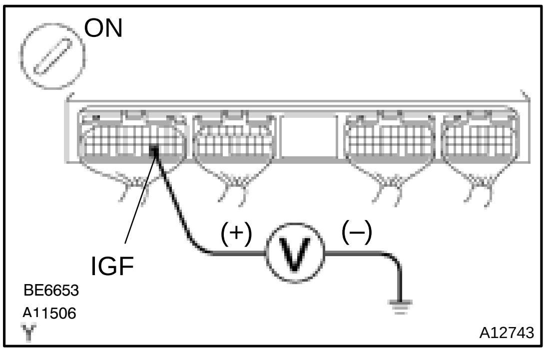
OK

2	**Check for open and short in harness and connector in IGF and IGT signal circuit between ECM and ignition coil with igniter (See page IN–28).**

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

OK

3	**Disconnect ignition coil with igniter connector and check voltage between terminals IGF of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the ignition coil with igniter connector.

(c) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals IGF of the ECM connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → **Replace ignition coil with igniter.**

NG

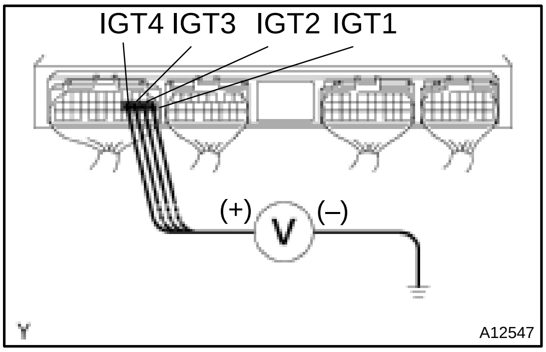
Check and replace ECM (See page IN–28).

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–28).**

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

OK

5	**Check voltage between terminals IGT1 – IGT4 of ECM connector and body ground.**



PREPARATION:

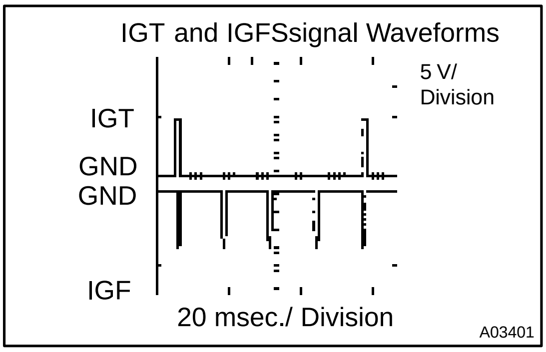
Disconnect the ECM with connector from body panel (See page SF–62).

CHECK:

Measure the voltage between terminals IGT1 – IGT4 of the ECM connector and body ground when the engine is cranked.

OK:

Voltage: More than 0.1 V and less than 4.5 V



Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check the waveform between terminals IGT1 – IGT4 and E1, IGF and E1 of the ECM connector.

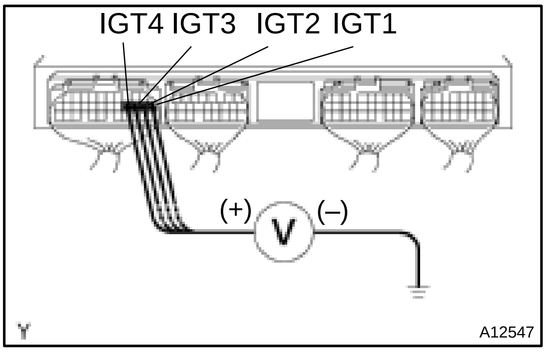
HINT:

Correct waveform appears as shown, with rectangle waves.

NG — **Check and replace ECM (See page IN–28).**

OK

6	Disconnect ignition coil with igniter connector and check voltage between terminals IGT1 – IGT4 of ECM connector and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between terminals IGT1 – IGT4 of the ECM connector and body ground when the engine is cranked.

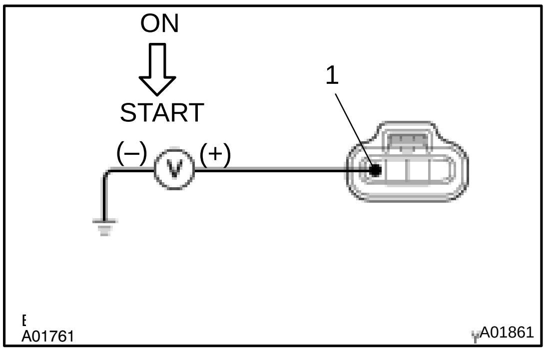
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG	**Check and replace ECM (See page IN–28).**

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between terminal 1 of the ignition coil with igniter connector and body ground when ignition switch is turned to ON and START position.

OK:

Voltage: 9 – 14 V

NG	**Repair ignition coil with igniter power source circuit.**

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page IN–28).

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

OK

9	Check IG2 relay (Marking: IG2) (See page IG–7).

NG → **Replace IG2 relay.**

OK ↓

Replace ignition coil with igniter.

DI38K–03

DTC	P1335	Crankshaft Position Sensor Circuit Malfunction (During engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–71.

DTC No.	DTC Detection Condition	Trouble Area
P1335	If conditions (a) through (c) are met: (a) NE ≧ 1,000 rpm (b) NE signal is not detected for over 50 msec. (c) Not during cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crank angle sensor plate • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–71.

DI7DG–01

DTC	P1346	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–71.

DTC No.	DTC Detection Condition	Trouble Area
P1346	Deviation in crankshaft position sensor signal and VVT sensor (bank 1) signal (2 trip detection logic)	• Mechanical system (Jumping teeth of timing chain, chain stretched) • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–71.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	**Check valve timing (Check for loose and jumping teeth of timing chain) (See page EM–13).**

NG → **Adjust valve timing (Repair or replace timing chain).**

OK

Check and replace ECM (See page IN–28).

DI3HE–10

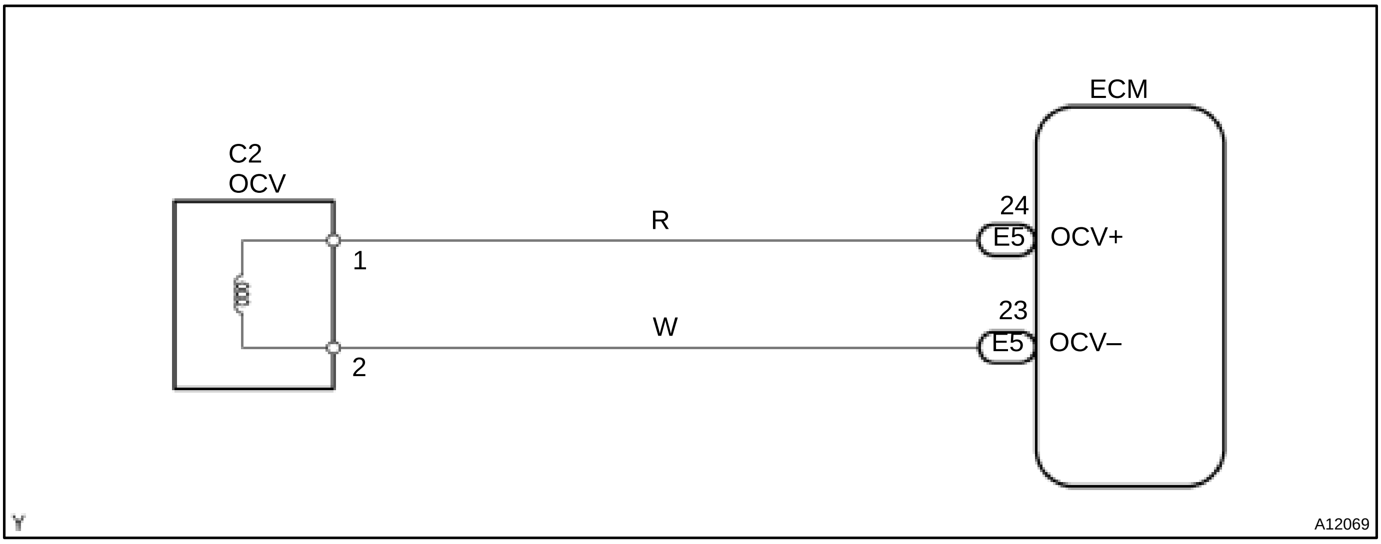
DTC	P1349	VVT System Malfunction (Bank 1)

CIRCUIT DESCRIPTION

VVT system controls the intake valve timing properly in response to driving condition.
ECM controls OCV (Oil Control Valve) to make the intake valve timing properly, and, oil pressure controlled with OCV is supplied to the VVT controller, and then, VVT controller changes relative position between the camshaft and the crankshaft.

DTC No.	DTC Detection Condition	Trouble Area
P1349	Condition (a) or (b) continues for after the engine is warmed up and engine speed at 400 – 4,000 rpm : (a) Valve timing does not change from of current valve timing (b) Current valve timing is fixed.	• Valve timing • OCV • VVT controller assembly • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P1349 is displayed, check VVT system circuit.
- Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

TOYOTA hand–held tester:

1	**Check valve timing (See page EM–13).**

NG	**Adjust valve timing.**

OK

2	**Check operation of OCV.**

PREPARATION:

(a) Start the engine and warm it up.

(b) Connect the TOYOTA hand–held tester and select VVT from ACTIVE TEST menu.

CHECK:

Check the engine speed when operating the OCV by the TOYOTA hand–held tester.

OK:

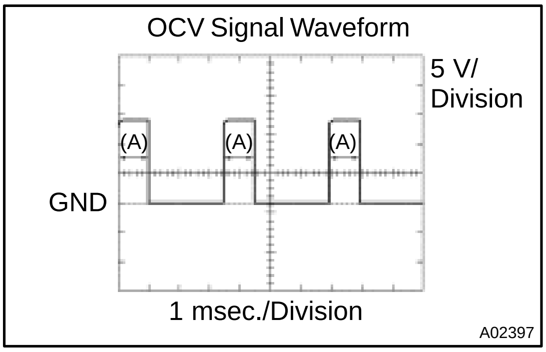
OCV is OFF: Normal engine speed
OCV is ON: Rough idle or engine stall

OK → **VVT system is OK.***

*: DTC P1349 is also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

NG ↓

3	**Check voltage between terminals OCV+ and OCV– of ECM connector.**



Reference: INSPECTION USING OSCILLOSCOPE

Turn the ignition switch ON, check waveform between terminals OCV+ and OCV– of the ECM connector.

HINT:

- The correct waveform is as shown.
- The waveform frequency (A) is lengthened as the engine speed becomes higher.

NG → **Check and replace ECM (See page IN–28).**

OK ↓

4	**Check VVT controller assembly (See page EM–33).**

NG → **Replace VVT controller assembly, and then go to step NO TAG.**

OK ↓

5	**Check OCV (See page SF–43).**

NG → **Replace OCV, and then go to step NO TAG.**

OK

6	**Check blockage of OCV, OCV valve and oil pipe No. 1.**

NG → **Repair or replace.**

OK

7	**Check whether or not DTC P1349 is stored.**

PREPARATION:
(a) Clear the DTC (See page DI–3).
(b) Perform simulation test.
CHECK:
Check whether or not DTC P1349 is stored (See page DI–3).
OK:
DTC P1349 is not stored.

OK → **VVT system is OK.***

*: DTC P1349 is also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

NG

Check and replace ECM (See page IN–28).

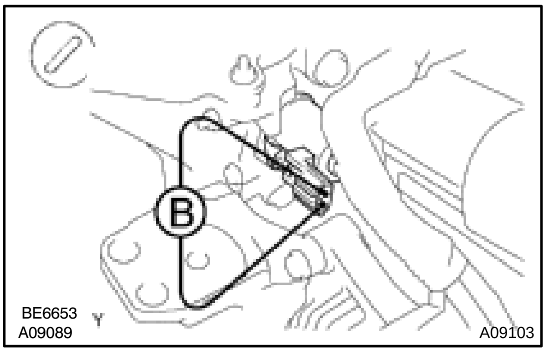
OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check valve timing (See page EM–13).**

NG → **Repair valve timing.**

OK

2	Check operation of OCV.



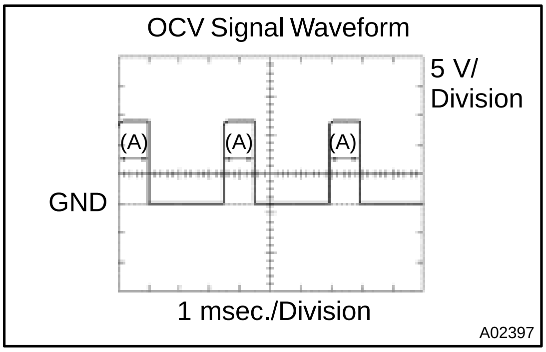
PREPARATION:
Start the engine.
CHECK:
(a) Check the engine speed when disconnecting the OCV connector.
(b) Check the engine speed when applying battery positive voltage between terminals of OCV.
RESULT:

Result	Check (a)	Check (b)
1	Normal engine speed	Rough idle or engine stall
2	Except 1	

2 → **Go to step NO TAG.**

1

3	Check voltage between terminals OCV+ and OCV– of ECM connector.



Reference: INSPECTION USING OSCILLOSCOPE
Turn the ignition switch ON, check waveform between terminals OCV+ and OCV– of the ECM connector.
HINT:
- The correct waveform is as shown.
- The waveform frequency (A) is lengthened as the engine speed becomes higher.

OK → **VVT system is OK.***

*: DTC P1349 is also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

NG

Check and replace ECM (See page IN–28).

4	**Check VVT controller assembly (See page EM–33).**

NG → **Replace VVT controller assembly, and then go to step 5.**

OK ↓

5	**Check OCV (See page SF–43).**

NG → **Replace OCV, and then go to step 6.**

OK ↓

6	**Check blockage of OCV, OCV and oil pipe No. 1.**

NG → **Repair or replace.**

OK ↓

7	**Check whether or not DTC P1349 is stored.**

PREPARATION:

(a) Clear the DTC (See page DI–3).

(b) Perform simulation test.

CHECK:

Check whether or not DTC P1349 is stored (See page DI–3).

OK:

DTC P1349 is not stored.

OK → **VVT system is OK.***

*: DTC P1349 is also output after the foreign object is caught in some part of the system in the engine oil and the system returns to normal in a short time. As ECM controls so that foreign objects are ejected, there is no problem about VVT. There is also no problem since the oil filter should get the foreign object in the engine oil.

NG

Check and replace ECM (See page IN–28).

DI38N–04

DTC	P1600	ECM BATT Malfunction

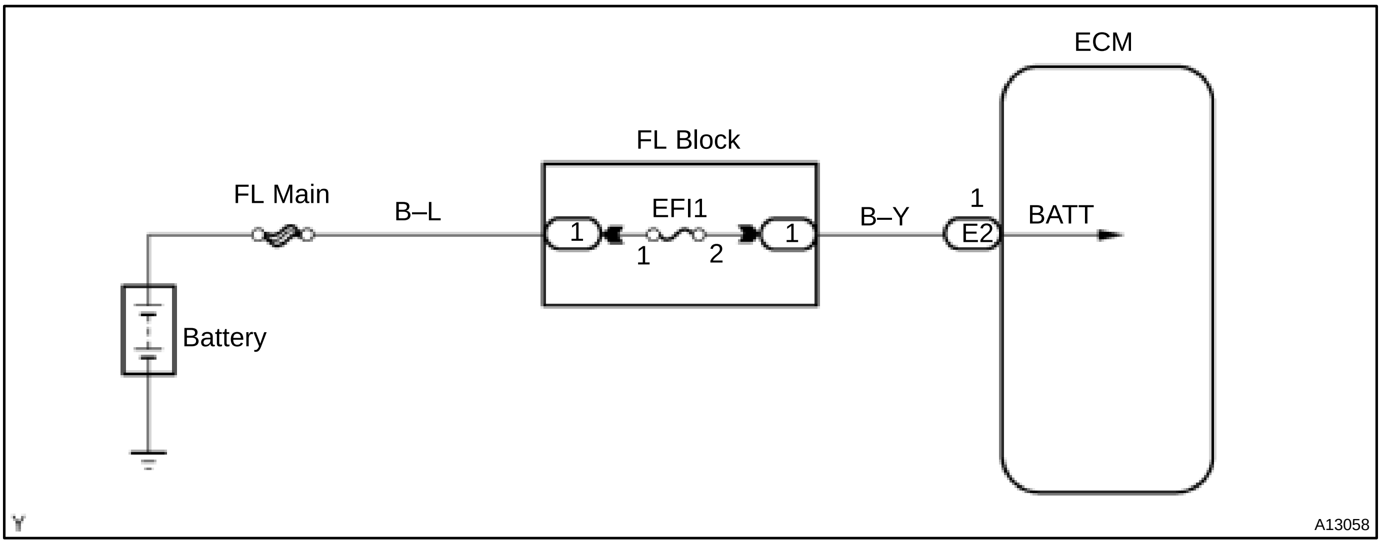
CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:
If DTC P1600 appears, the ECM does not store another DTC.

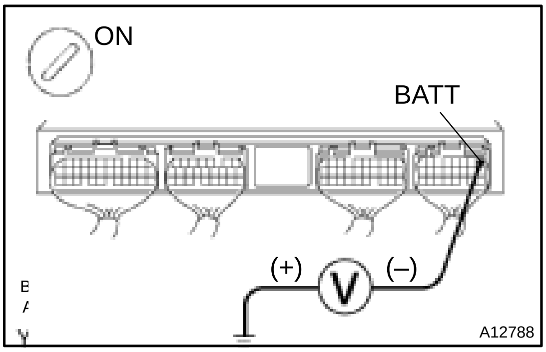
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check voltage between terminal BATT of ECM connector and body ground.



PREPARATION:
(a) Disconnect the ECM with connector from body panel (See page SF–62).
(b) Turn the ignition switch ON.

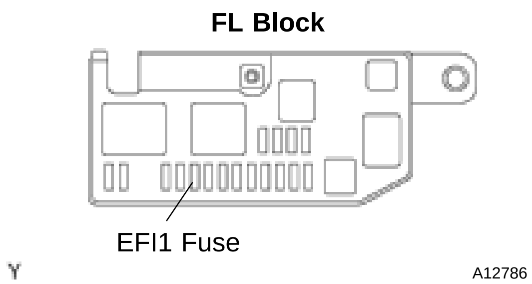
CHECK:
Measure the voltage between terminal BATT of the ECM connector and body ground.

OK:
Voltage 9 – 14 V

OK → **Check and replace ECM (See page IN–28).**

NG ↓

2	**Check EFI1 fuse.**



PREPARATION:

Remove the EFI1 fuse from the fusible link block.

CHECK:

Check the continuity of the EFI1 fuse.

OK:

Continuity

NG → **Check for short in all the harness and components connected to EFI1 fuse.**

OK ↓

Check and repair harness or connector between battery and EFI1 fuse, EFI1 fuse and ECM (See page IN–28).

DI7DH–01

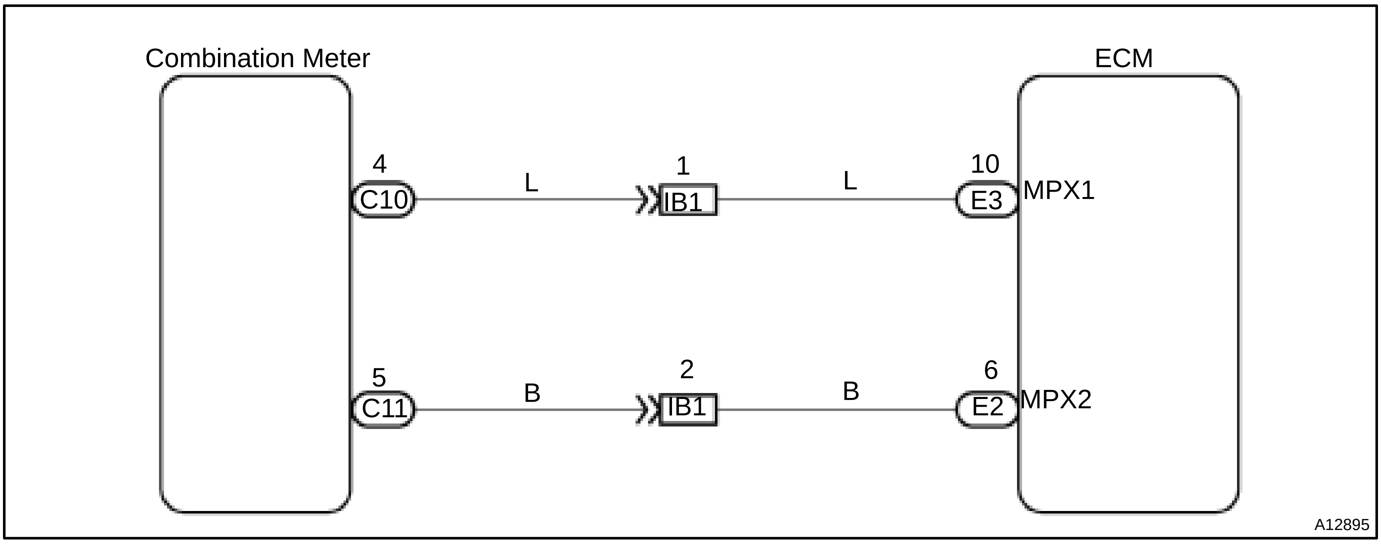
DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

The ECM receives the operating condition (ON/OFF) of the A/C from the combination meter and it also receives the electrical load information from the body ECU.
The ECM uses the information to control the engine (idle up, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P1645	Condition below continues for 3.0 sec. No communication from body ECU	• Body ECU • A/C ECU • Vane pump assembly with motor • Air bag sensor assembly • ABS ECU • Communication bus • Combination meter

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	Check body ECU (See page DI–1).

NG → **Replace body ECU.**

OK

2	Check combination meter (See page BE–40).

NG — Replace combination meter.

OK

3	Check harness and connector between combination meter and body ECU, ECM and combination meter (See page IN–28).

NG — Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

DI7DI–01

DTC	P1656	OCV Circuit Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P1349 on page DI–117.

DTC No.	DTC Detection Condition	Trouble Area
P1656	Open or short in OCV circuit	• Open or short in OCV circuit • OCV valve • ECM

WIRING DIAGRAM

Refer to DTC P1349 on page DI–117.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand–held tester or OBD II scan tool. 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 was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

TOYOTA hand–held tester:

1	**Check OCV circuit.**

PREPARATION:

(a) Start the engine and warm it up.

(b) Connect the TOYOTA hand–held tester and select VVT from the ACTIVE TEST menu.

CHECK:

Check the engine speed when operating the OCV by the TOYOTA hand–held tester.

OK:

VVT system is OFF (OCV is OFF): Normal engine speed
VVT system is ON (OCV is ON): Rough idle or engine stalled

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

NG

2	**Check operation of OCV (See page DI–117).**

NG → **Replace OCV.**

OK

3	Check voltage between terminals OCV+ and OCV– of ECM connector (See page DI–117, step 3).

NG — Check and replace ECM (See page IN–28).

OK

4	Check for open and short in harness and connector between OCV and ECM (See page IN–28).

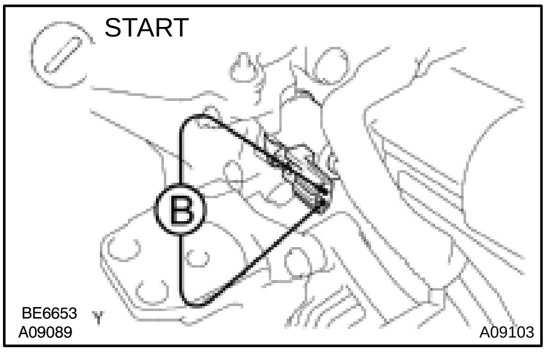
NG — Repair or replace.

OK

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

OBD II scan tool (excluding TOYOTA hand–held tester):

1	Check operation of OCV.



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery positive voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG — Replace OCV.

OK

2	Check voltage between terminals OCV+ and OCV– of ECM connector (See page DI–117, step 3).

NG | **Check and replace ECM (See page IN–28).**

OK

3	**Check for open and short in harness and connector between OCV and ECM (See page IN–28).**

NG | **Repair or replace.**

OK

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

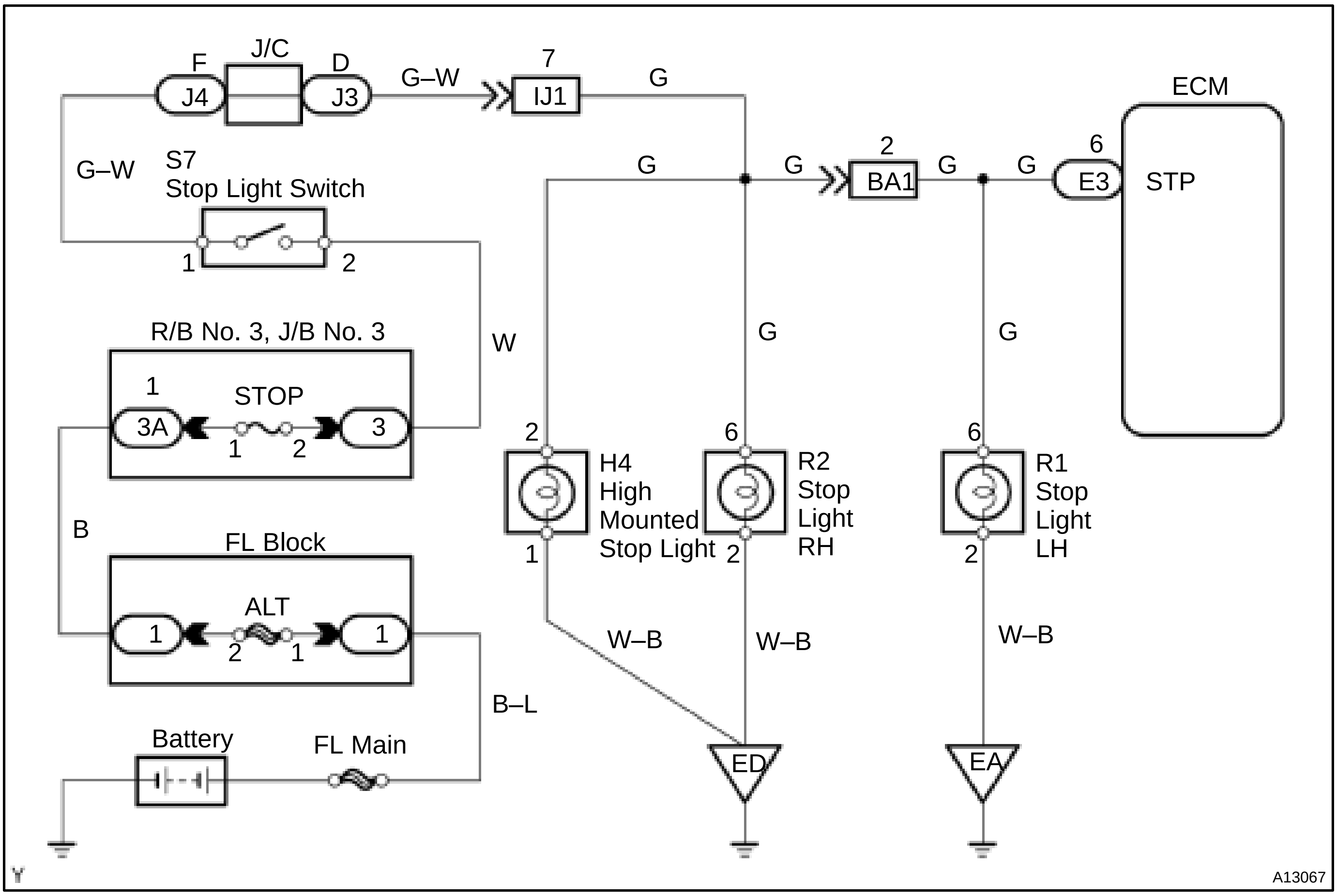
DI7DJ–01

Stop Light Switch Signal Circuit

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, when brakes are suddenly applied. When the brake pedal is depressed, this switch sends a signal to the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check operation of stop light.

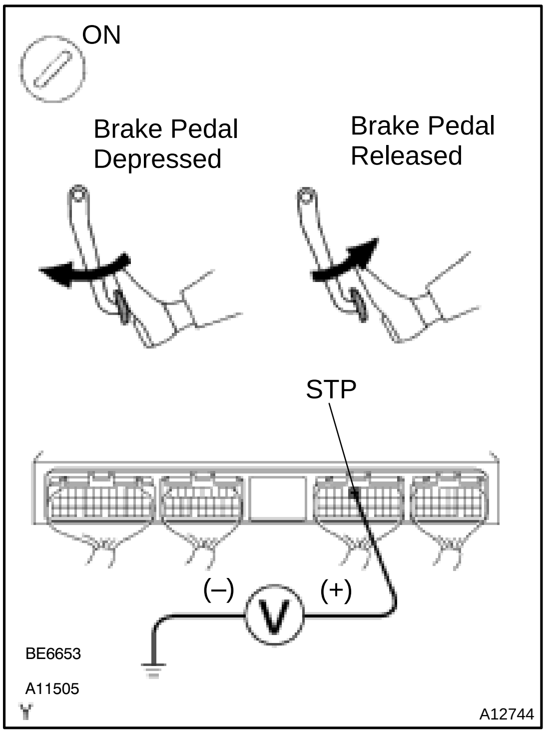
CHECK:

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

NG	Check and repair stop light circuit.

OK

2	Check STP signal.



When using TOYOTA hand–held tester:

PREPARATION:

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

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

CHECK:

Read the STP signal on the TOYOTA hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

When not using TOYOTA hand–held tester:

PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STP of the ECM connector and body ground.

OK:

Brake Pedal	Voltage
Depressed	9.0 – 14 V
Released	Below 1.5 V

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

NG

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

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

OK

Check and replace ECM (See page IN–18).

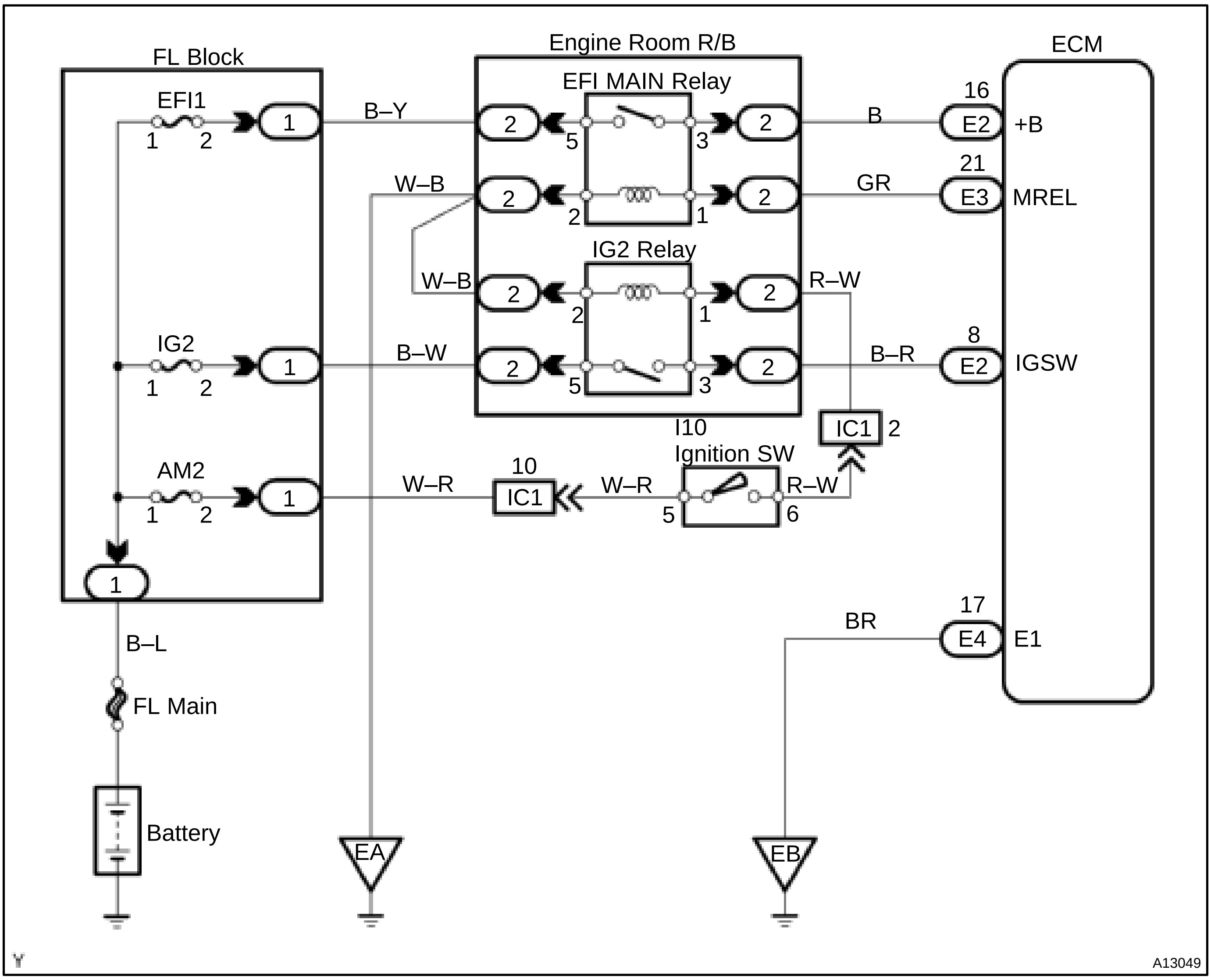
DI7DK–01

ECM Power Source Circuit

CIRCUIT INSPECTION

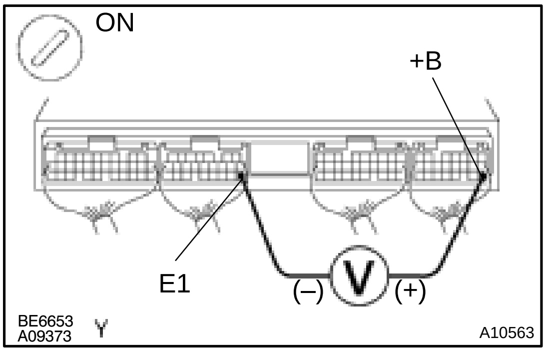
When the ignition switch is turned on, battery positive voltage is applied to IG2 Relay, terminal IGSW of the ECM and the EFI main relay (Marking: EFI MAIN) control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EFI main relay.
This signal causes current to flow to the coil, closing the contacts of the EFI main relay and supplying power to terminals +B of the ECM.
If the ignition switch is turned off, the ECM continues to switch on the EFI main relay for a maximum of 2 seconds for the initial setting of the IAC valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 or ECM connectors.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals +B and E1 of the ECM connectors.

OK:

Voltage: 9 – 14 V

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

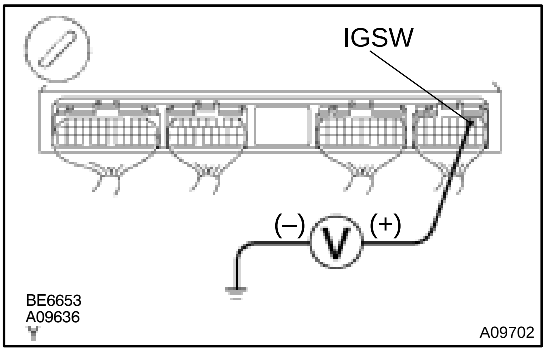
NG

2	**Check for open in harness and connector between terminal E1 of ECM connector and body ground (See page IN–28).**

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

OK

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal IGSW of the ECM connector and body ground.

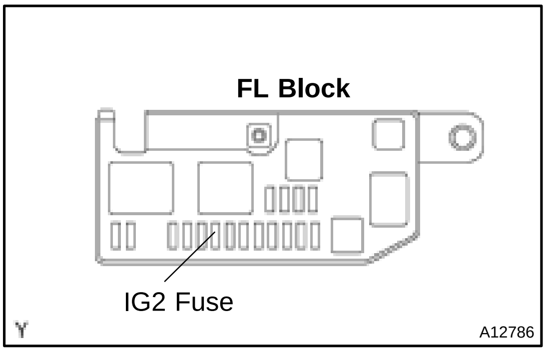
OK:

Voltage: 9 – 14 V

OK	**Go to step 6.**

NG

4	Check IG2 fuse.



PREPARATION:
Remove the IG2 fuse from the FL block.
CHECK:
Check the continuity of the IG2 fuse.
OK:
Continuity

NG	Check for short in all harness and components connected to IG2 fuse (See attached wiring diagram).

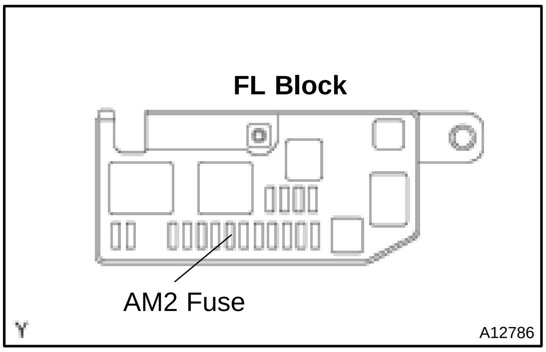
OK

5	Check IG2 relay (See page IG–7).

NG	Replace IG2 relay.

OK

6	Check AM2 fuse.



PREPARATION:
Remove the AM2 fuse from the FL block.
CHECK:
Check the continuity of the AM2 fuse.
OK:
Continuity

NG	Check for short in all harness and components connected to AM2 fuse (See attached wiring diagram).

OK

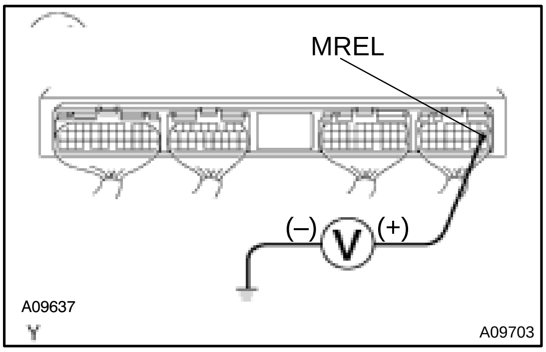
7	Check ignition switch (See page BE–15).

NG → **Replace ignition switch.**

OK

Check and repair harness and connector between battery and ignition switch, and ignition switch and ECM.

8	Check voltage between terminal MREL of ECM connector and body ground.



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal MREL of the ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG → **Check and replace ECM (See page IN–28).**

OK

9	Check EFI1 fuse (See page DI–123, step 2).

NG → **Check for short in all harness and components connected to EFI1 fuse (See attached wiring diagram).**

OK

10	Check EFI main relay (Marking: EFI MAIN) (See page SF–44).

NG → **Replace EFI main relay.**

OK

11	Check for open and short in harness and connector between terminal MREL of ECM and body ground (See page IN–28).

NG — Repair or replace harness or connector.

OK

Check and repair harness or connector between EFI1 fuse and battery.

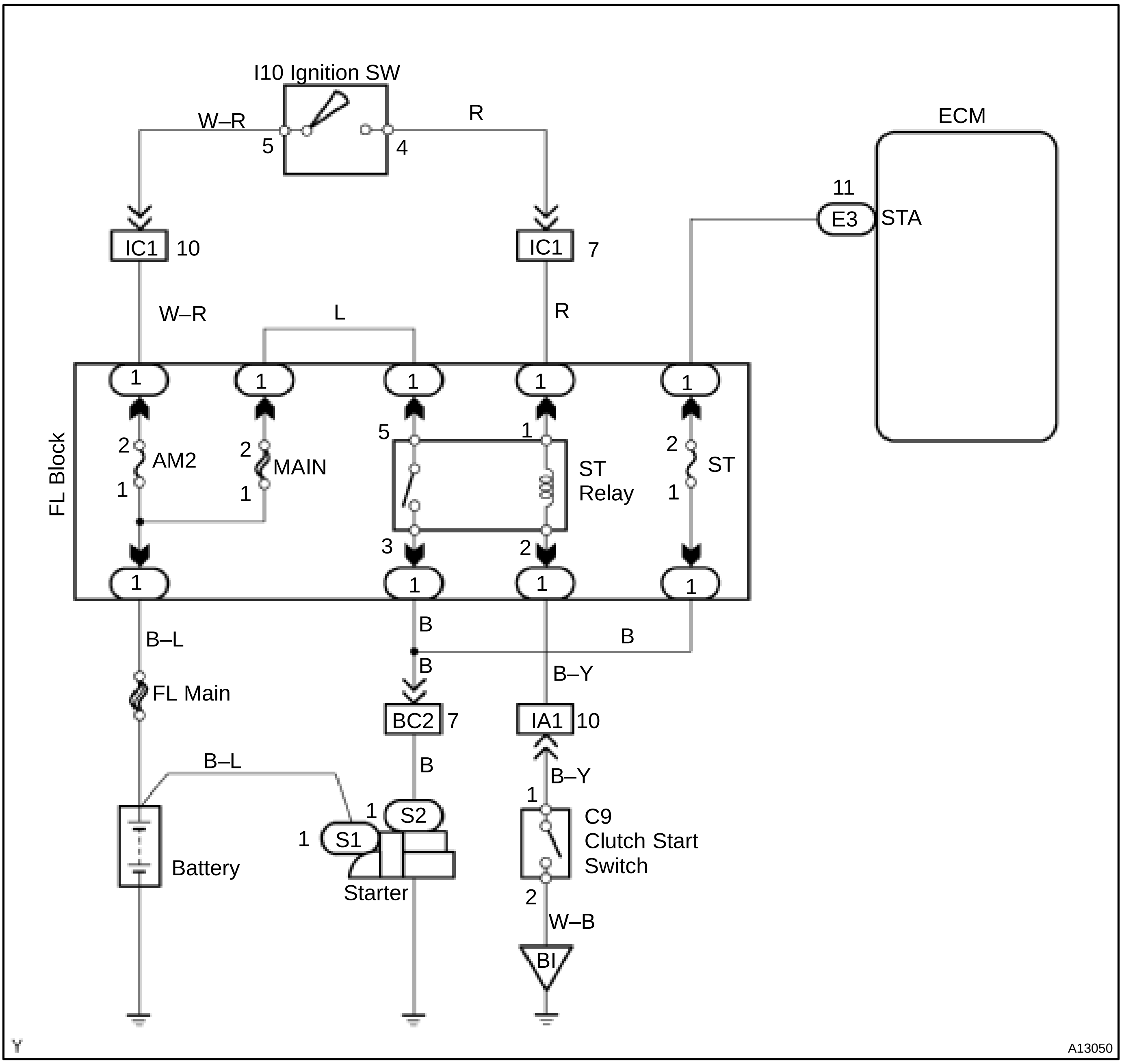
DI64N–03

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 voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

TOYOTA hand–held tester:

1	**Check STA signal.**

PREPARATION:

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

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

CHECK:

Read the STA signal on the TOYOTA hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

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

NG ↓

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–28).**

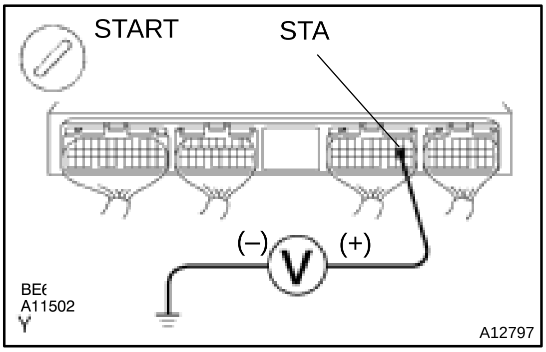
NG → **Repair or replace harness or connector.**

OK ↓

Check and replace ECM (See page IN–28).

OBD II scan tool (excluding TOYOTA hand–held tester):

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



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

Voltage: 6 V or more

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

NG

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–28).**

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

OK

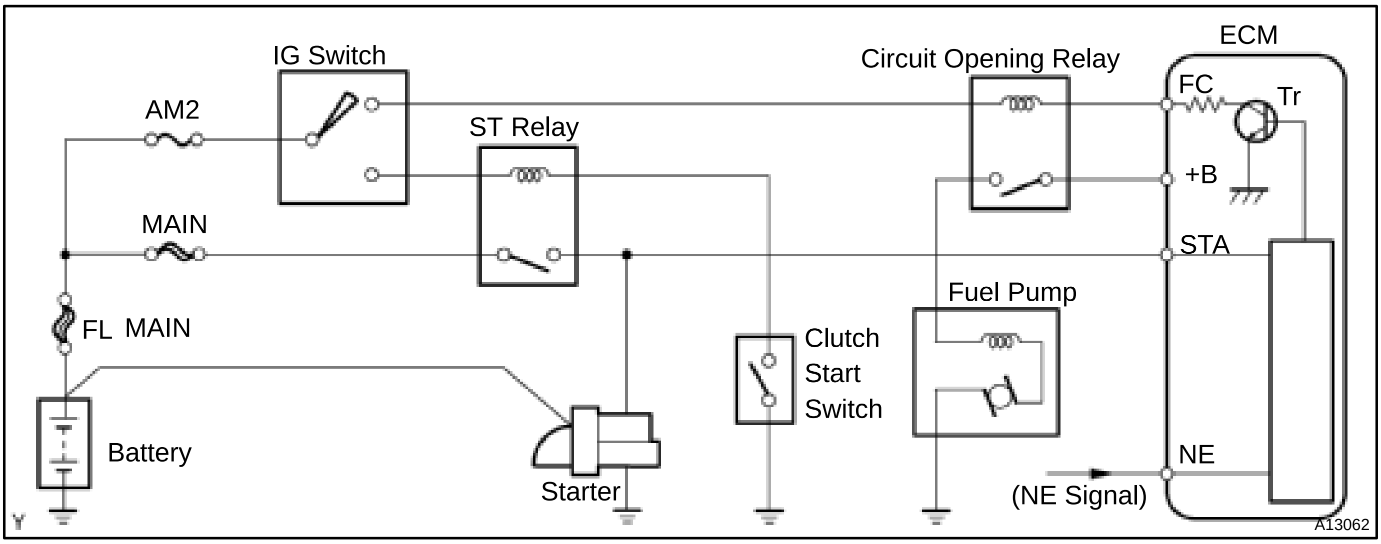
Check and replace ECM (See page IN–28).

DI38Q–05

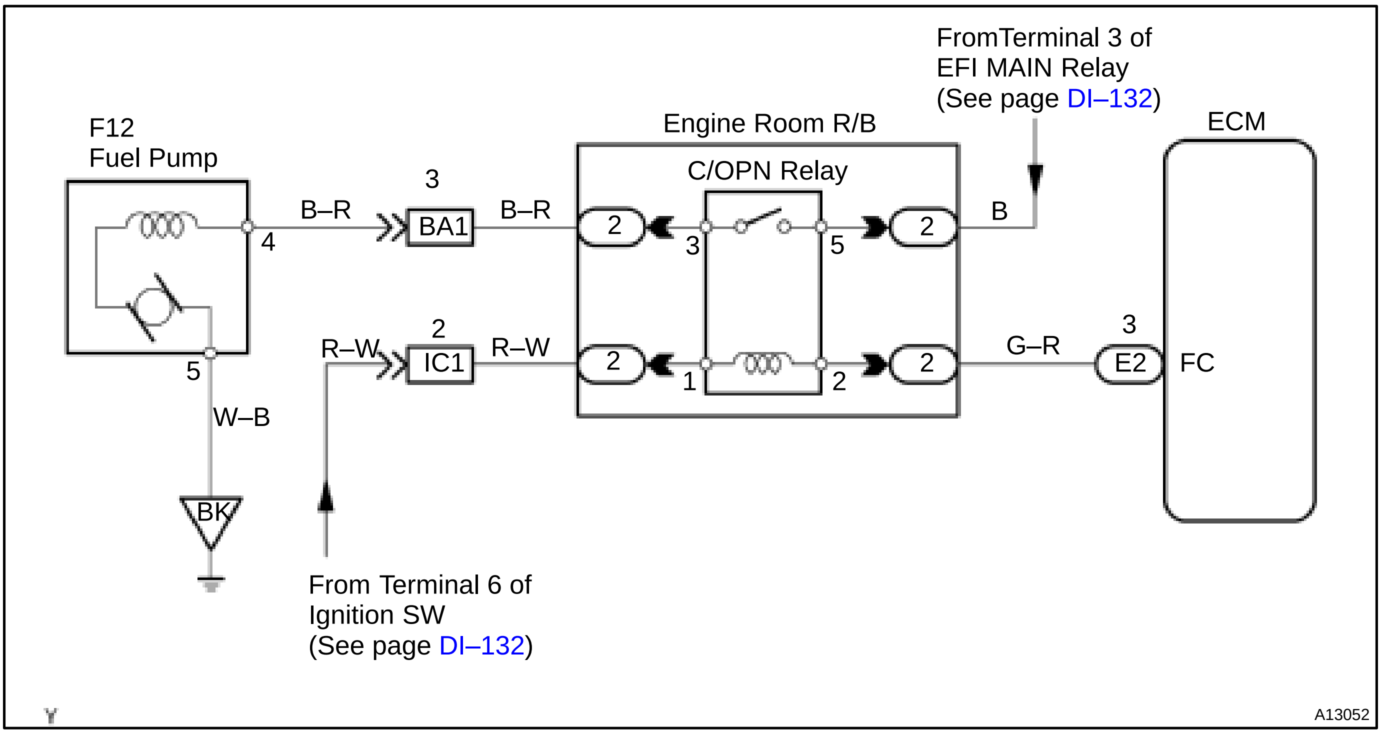
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil and also current flows to terminal STA of ECM (STA signal).
When the STA signal and NE signal are input to the ECM, 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 ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE
TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of fuel pump (See page DI–3).**

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

NG

2	**Check for ECM power source circuit (See page DI–132).**

NG → **Repair or replace.**

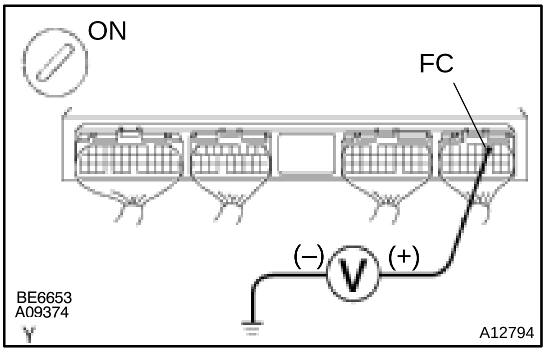
OK

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–47).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal FC of the ECM and body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 5.**

NG

Check for open in harness and connector between EFI main relay and circuit opening relay (Marking: C/OPN), circuit opening relay and ECM (See page IN–28).

5	**Check fuel pump (See page SF–7).**

NG → **Repair or replace fuel pump.**

OK

6	**Check for open in harness and connector between circuit opening relay and fuel pump and body ground (See page IN–28).**

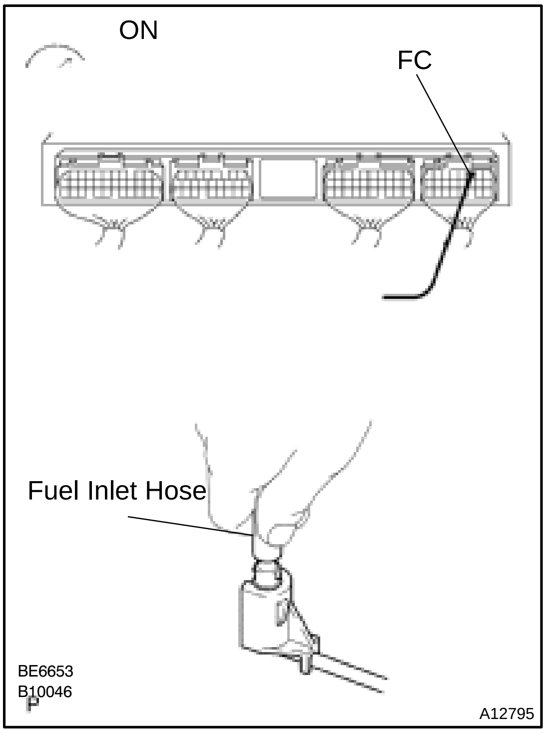
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–28).

OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check operation of fuel pump.**



PREPARATION:

(a) Disconnect the ECM with connector from body panel (See page SF–62).

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

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

OK:

There is pressure in fuel inlet hose.

HINT:

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

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

NG

2	**Check for ECM power source circuit (See page DI–132).**

NG → **Repair or replace.**

OK

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–47).**

NG → **Replace circuit opening relay.**

OK

4	Check voltage between terminal FC of ECM and body ground (See page DI–140, step 4).

OK — Go to step 5.

NG

Check for open in harness and connector between EFI main relay and circuit opening relay (Marking: C/OPN), circuit opening relay and ECM (See page IN–28).

5	Check fuel pump (See page SF–7).

NG — Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump and body ground (See page IN–28).

NG — Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–28).

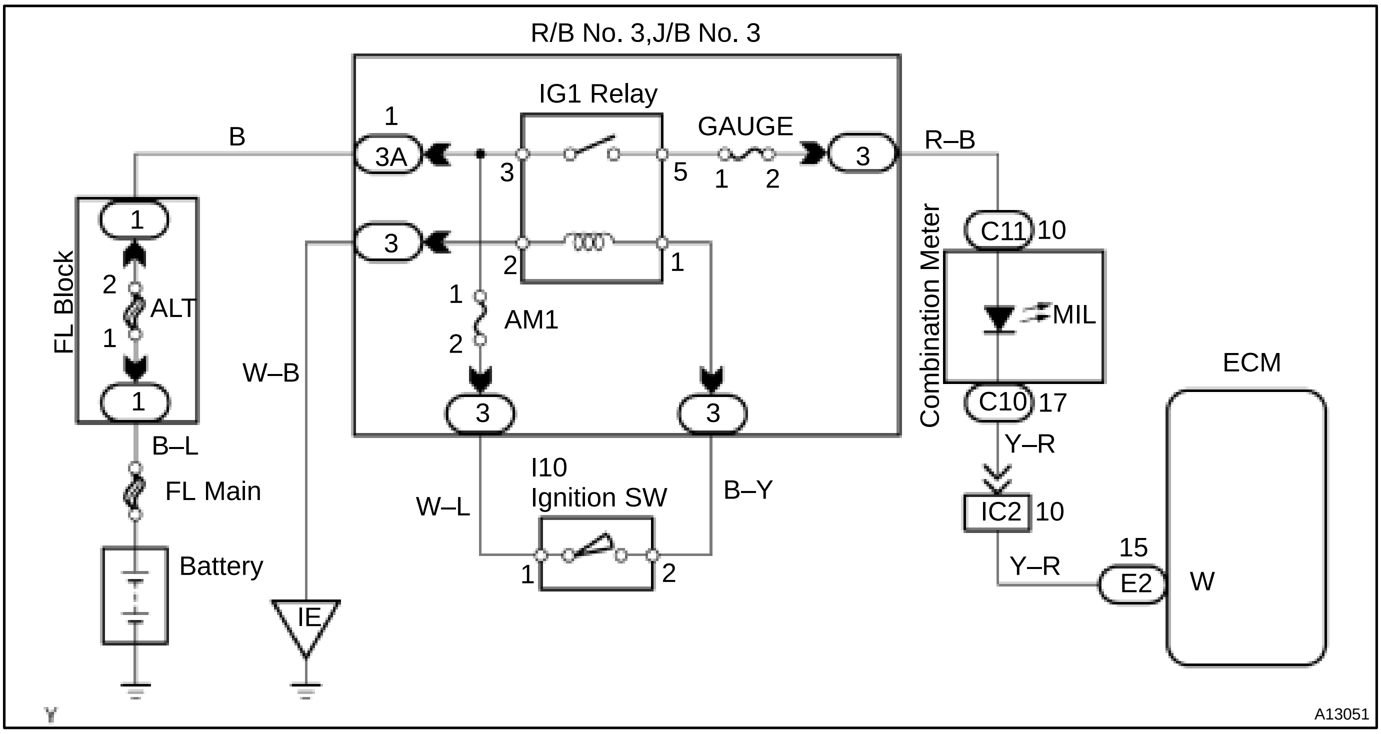
DI6MN–02

MIL Circuit Malfunction

CIRCUIT DESCRIPTION

If the ECM detects trouble, the MIL lights up. At this time, the ECM records a DTC in memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot in accordance with the chart below for each trouble symptom.

MIL does not light up	Start inspection from step 1 in case of using TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester
MIL remains on	After inspection of step 3, start inspection from step 4 in case of using TOYOTA hand–held tester and start from step 5 in case of not using TOYOTA hand–held tester

1	Inspect diagnosis (normal mode, check mode) (See page DI–3).

OK → **Check and replace ECM (See page IN–28).**

NG

2	**Check MIL.**

See combination meter troubleshooting on page BE–2.

NG → **Repair or replace bulb or combination meter assembly.**

OK

3	**Check that ECM connectors are securely connected to ECM.**

NO → **Connect connector to ECM.**

YES

Check for open circuit in harness and connector between combination meter and ECM (See page IN–28).

4	**Check operation of MIL (See step 1).**

OK → **Check and replace ECM (See page IN–28).**

NG

5	**Is any DTC output?**

Check DTC on page DI–14.

YES → **Repair circuit indicated by output code.**

NO

6	Check IG1 relay (Marking: IG1) (See page BE–15).

NG → **Replace IG1 relay.**

OK

Check for short circuit in harness and connector between DLC3 and ECM (See page IN–28).

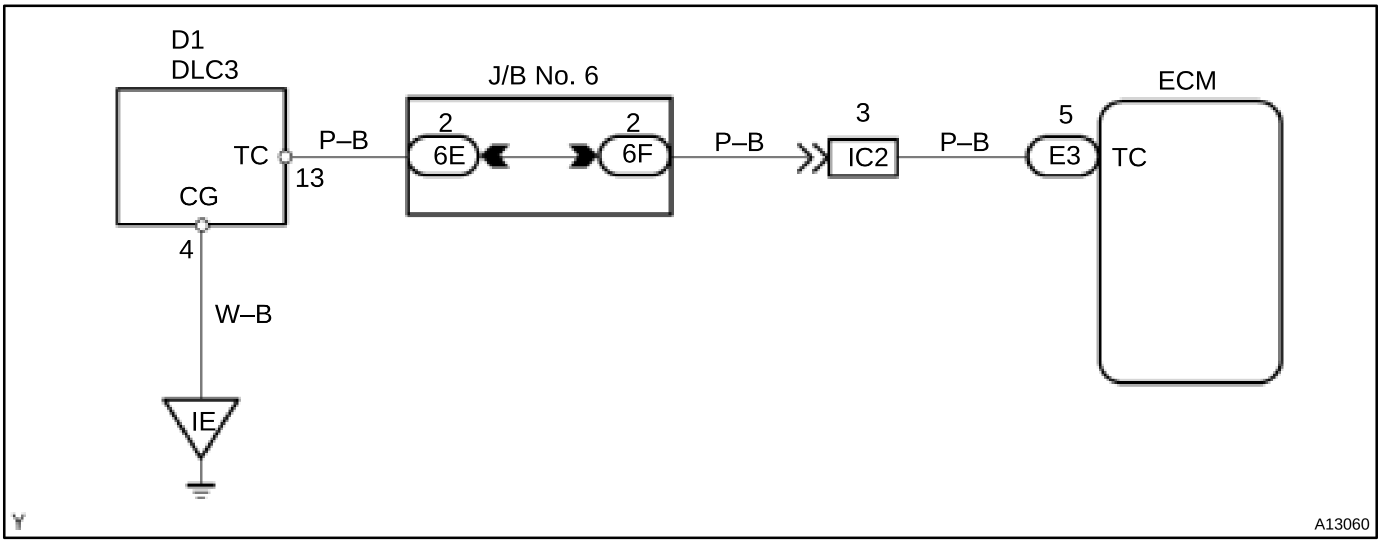
DI7DL–01

TC Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or test mode can be read through the MIL flashing in the combination meter.

WIRING DIAGRAM

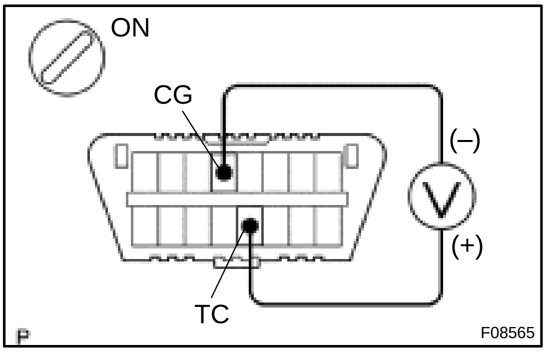


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected with terminal CG, the MIL blinks.
- For the above phenomenon,an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	Check voltage between terminals TC and CG of DLC3.



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminals TC and CG of the DLC3.
OK:
Voltage: 9 – 14 V

OK	Check and replace ECM (See page IN–28).

NG

2	Check continuity between terminal CG of DLC3 and body ground.

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

OK

3	**Check for open and short circuit in harness and connector between ECM and DLC3, and DLC3 and body ground (See page IN–28).**

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

OK

Check and replace ECM (See page IN–28).

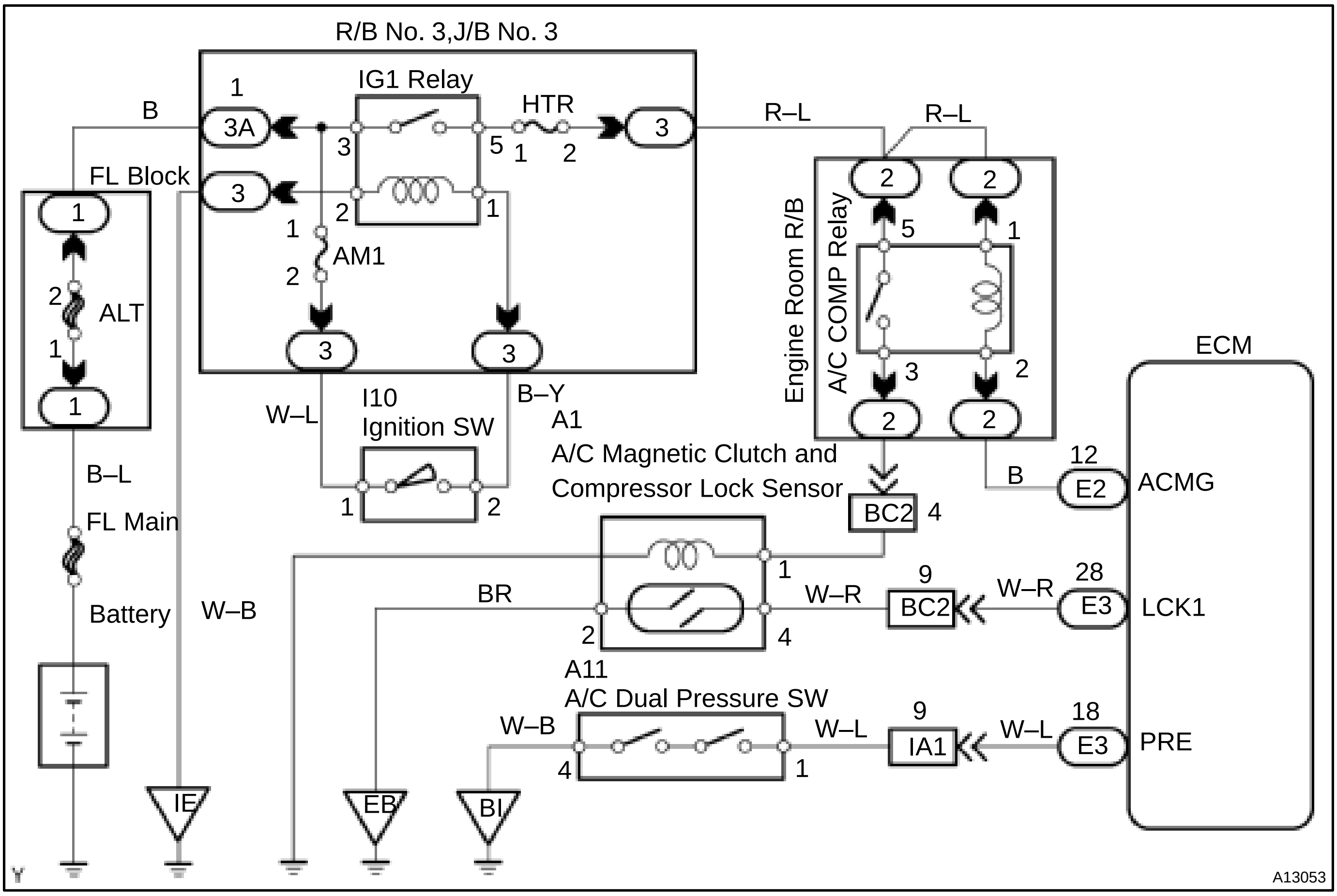
DI7DM–01

A/C Compressor Circuit

CIRCUIT DESCRIPTION

This sensor sends 1 pulse par engine revolution to the ECM. If the number ratio of the compressor speed divided by the engine speed is smaller than a predetermined value, the ECM turns the compressor off. And, the indicator flashes at about 1 second interval.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check A/C compressor.

PREPARATION:

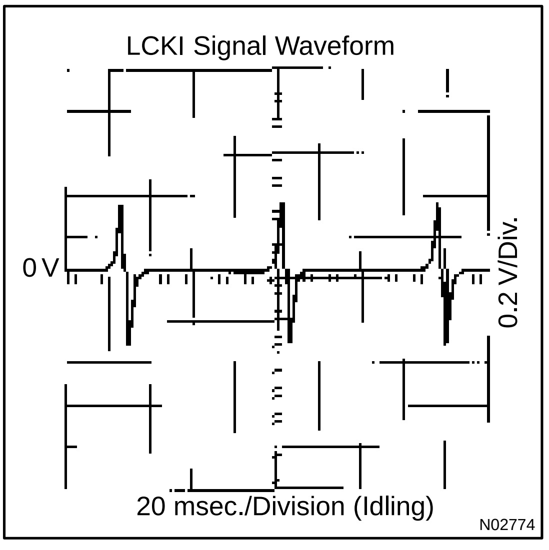
(a) Check the tension of the compressor drive belt (See page AC–16).

(b) Check if the compressor does not lock during operation with the engine started, and the blower switch and A/C switch ON.

NG	Adjust drive belt tension or repair compressor (See page AC–16).

OK

2	**Check A/C compressor lock sensor (See page AC–46).**



Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check the waveform between terminals LCKI and E1 of the ECM connector.
HINT:
The correct waveform appears as shown.

NG → **Replace compressor lock sensor (See page AC–47).**

OK

3	**Check magnetic clutch relay (Marking: A/C COMP) (See page AC–71).**

NG → **Replace magnetic clutch relay (See page AC–47).**

OK

4	**Check harness and connector between A/C compressor lock sensor and ECM (See page IN–28).**

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

OK

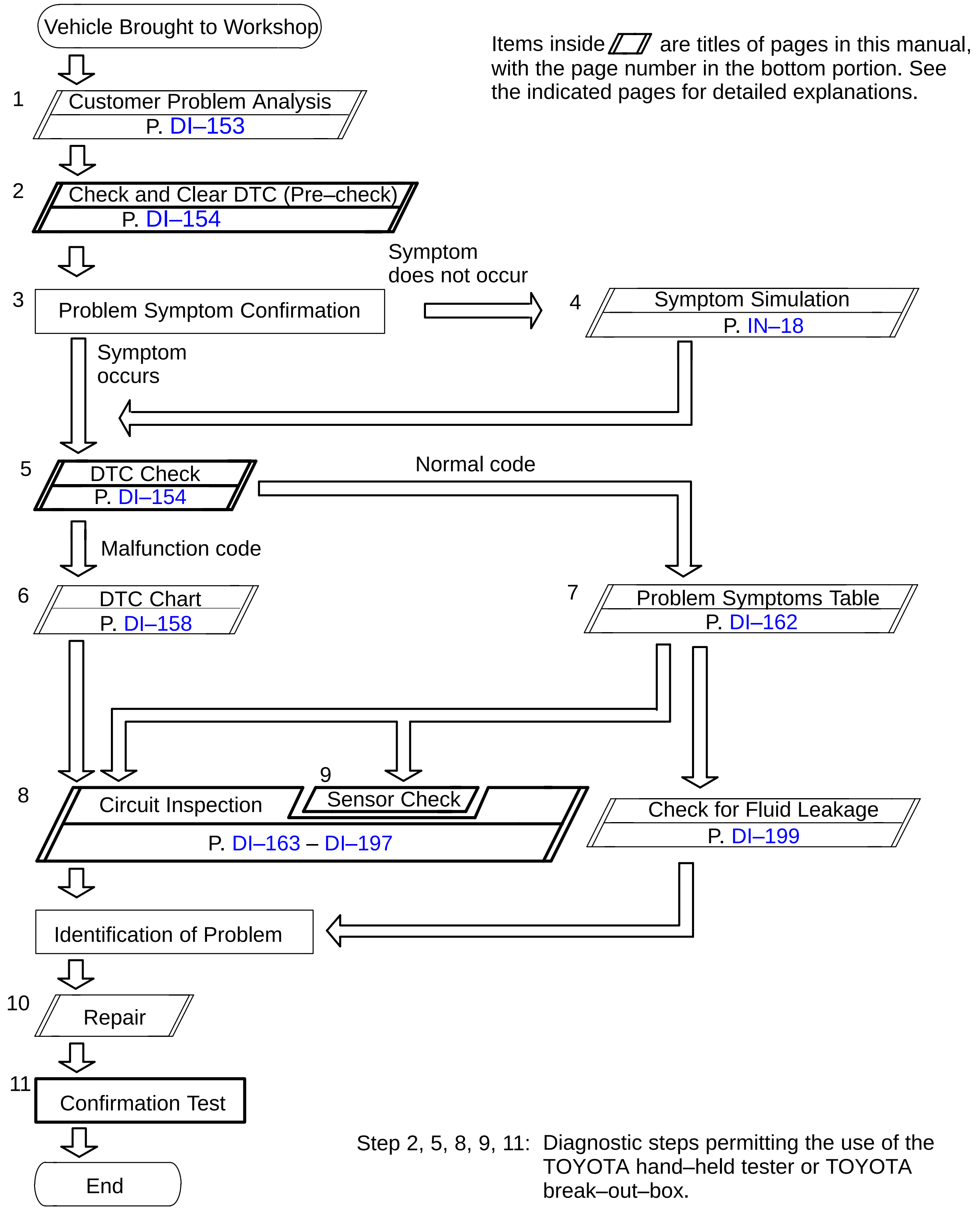
Check and replace ECM (See page IN–28).

ANTI–LOCK BRAKE SYSTEM

DI7CJ–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



Fail safe function:
When a failure occurs in the ABS system, the ABS warning light is lit and the ABS operation is prohibited.

DI7CK–01

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	□ Continuous □ Intermittent (times a day)

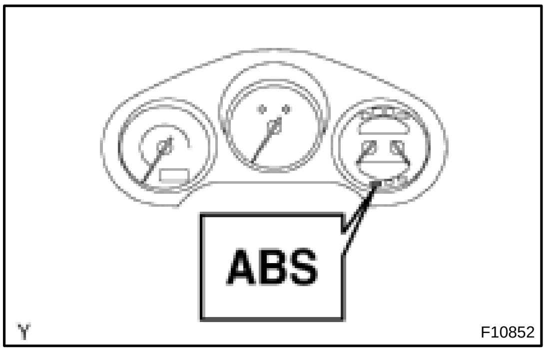
Symptoms	□ ABS does not operate.	
	□ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	□ Remains ON □ Does not Light Up

DTC Check	**1st Time**	□ Normal Code □ Malfunction Code (Code)
	2nd Time	□ Normal Code □ Malfunction Code (Code)

DI7CL–01

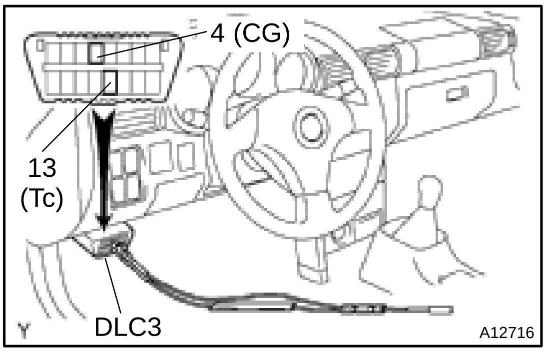
PRE–CHECK

1. DIAGNOSIS SYSTEM

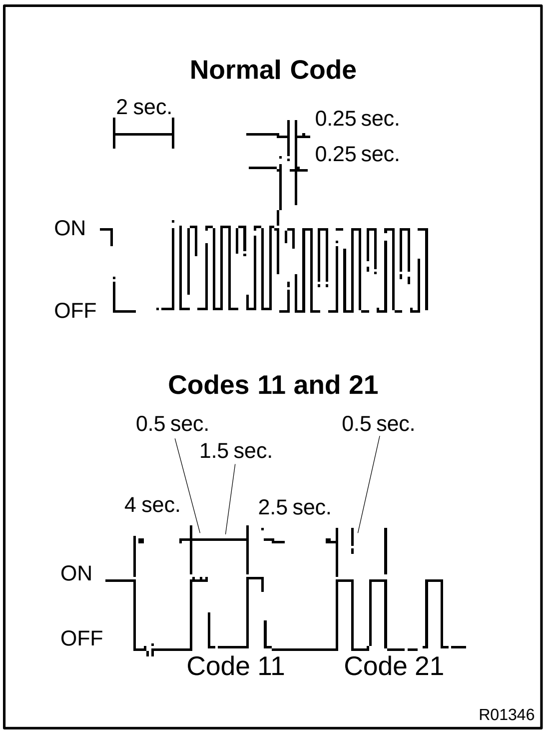


(a) Check the warning light.
When the ignition switch is turned ON, check that the ABS warning light go on for approx. 3 seconds.

HINT:
If the indicator is not normal, proceed to troubleshooting for the ABS warning light circuit (See page DI–192).



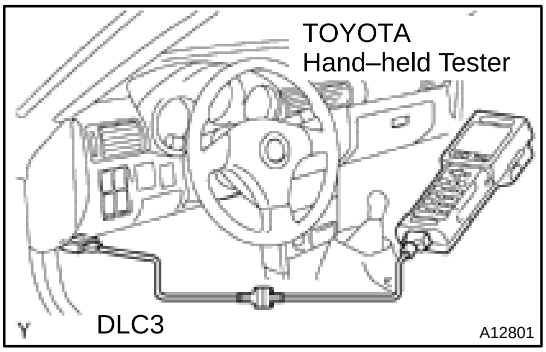
(b) In case of not using TOYOTA hand–held tester:
Check the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) Read the DTC from the ABS warning light on the combination meter.



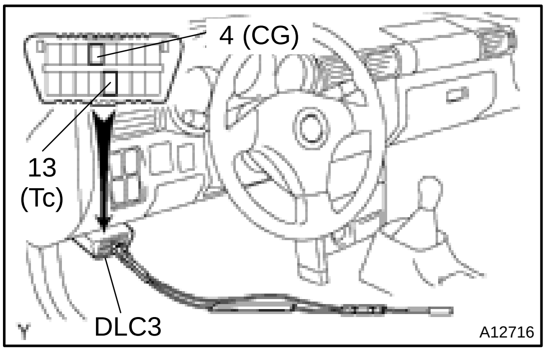
HINT:
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–195).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page DI–158.
(5) After completing the check, disconnect terminals Tc and CG of the DLC3, and turn off the display.

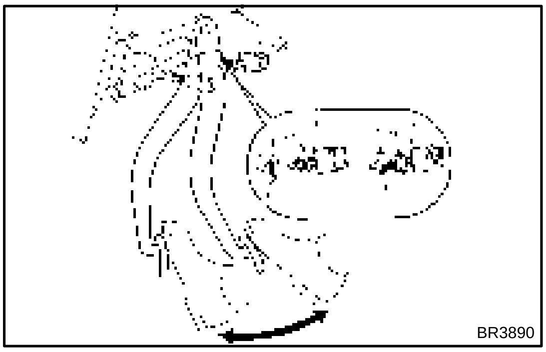
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.



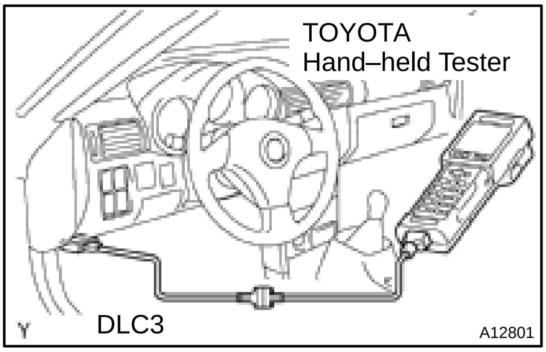
(c) In case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Read the DTC by following the prompts on the tester screen.
Please refer to the TOYOTA hand–held tester operator's manual for further details.



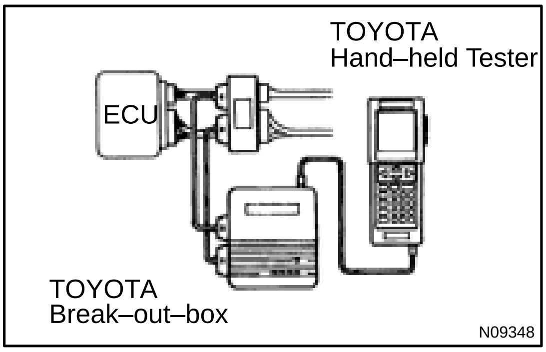
(d) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.



(3) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 5 seconds.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of the DLC3.
SST 09843–18040

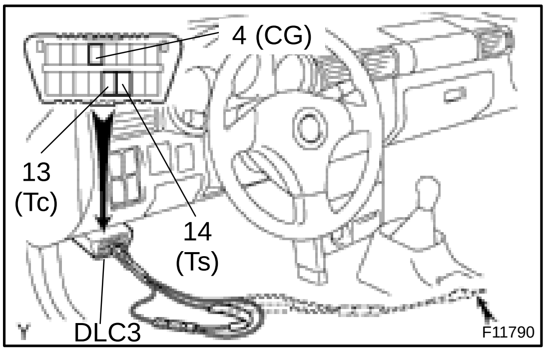


(e) In case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Operate the TOYOTA hand–held tester to erase the codes. (See hand–held tester oprater's manual.)



(f) Reference:
Using TOYOTA break–out–box and TOYOTA hand–held tester, measure the ECU terminal values.
(1) Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle.
(2) Read the ECU input/output values by following the prompts on the tester screen.

HINT:
TOYOTA hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the TOYOTA hand–held tester/TOYOTA break–out–box operator's manual for further details.



2. **SPEED SENSOR SIGNAL (TEST MODE)**

(a) In case of not using TOYOTA hand–held tester:
Check the speed sensor signal.

(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040

(3) Start the engine.

(4) Check that the ABS warning light blinks.

HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–192).

(5) Drive vehicle straight forward.

HINT:
Drive vehicle at faster than 45 km/h (28 mph) for several seconds.

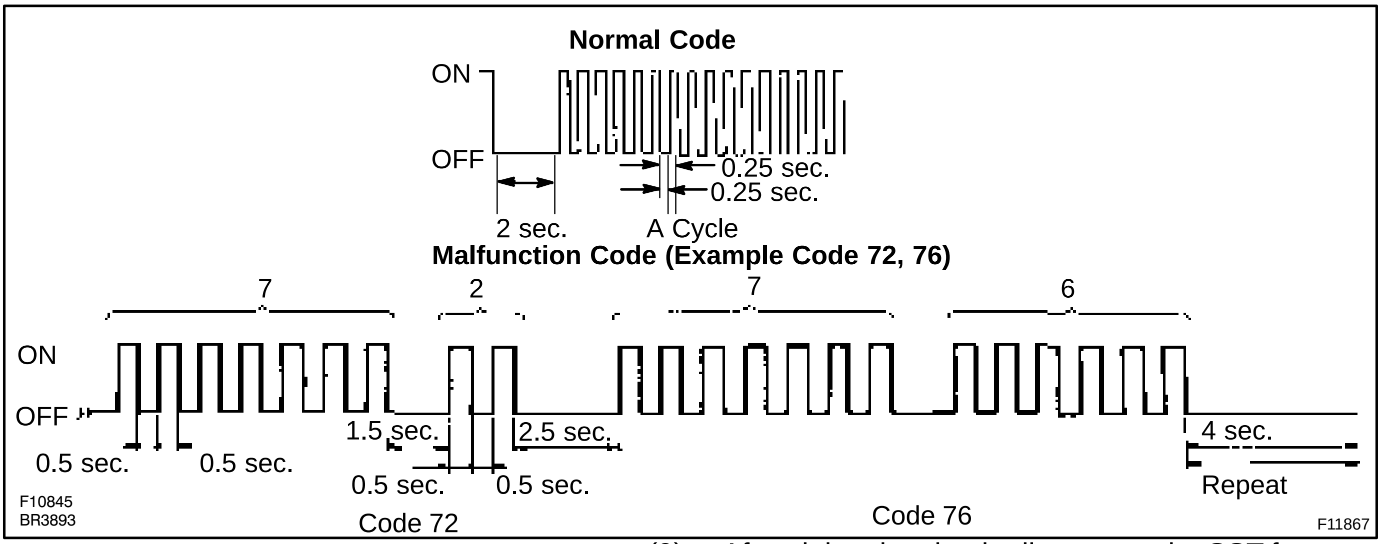
(6) Stop the vehicle.

(7) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040

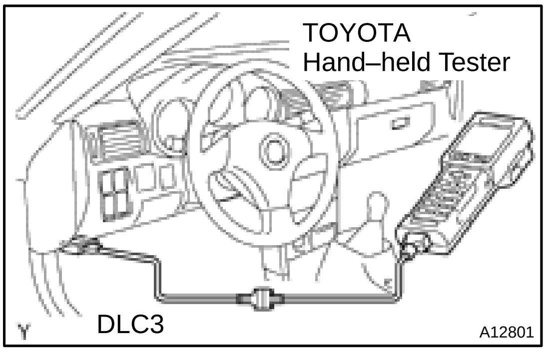
(8) Read the number of blinks of the ABS warning light.

HINT:

- See the list of DTC shown on the next page.
- If each sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



(9) After doing the check, disconnect the SST from terminals Ts, Tc and CG of the DLC3, and turn ignition switch OFF.
SST 09843–18040



(b) Using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Do steps (3) to (6) on the previous page and this page.
(3) Read the DTC by following the prompts on the tester screen.
Please refer to the TOYOTA hand–held tester operator's manual for further details.

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Right front speed sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Left front speed sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Right rear speed sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Left rear speed sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

DI7CM–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

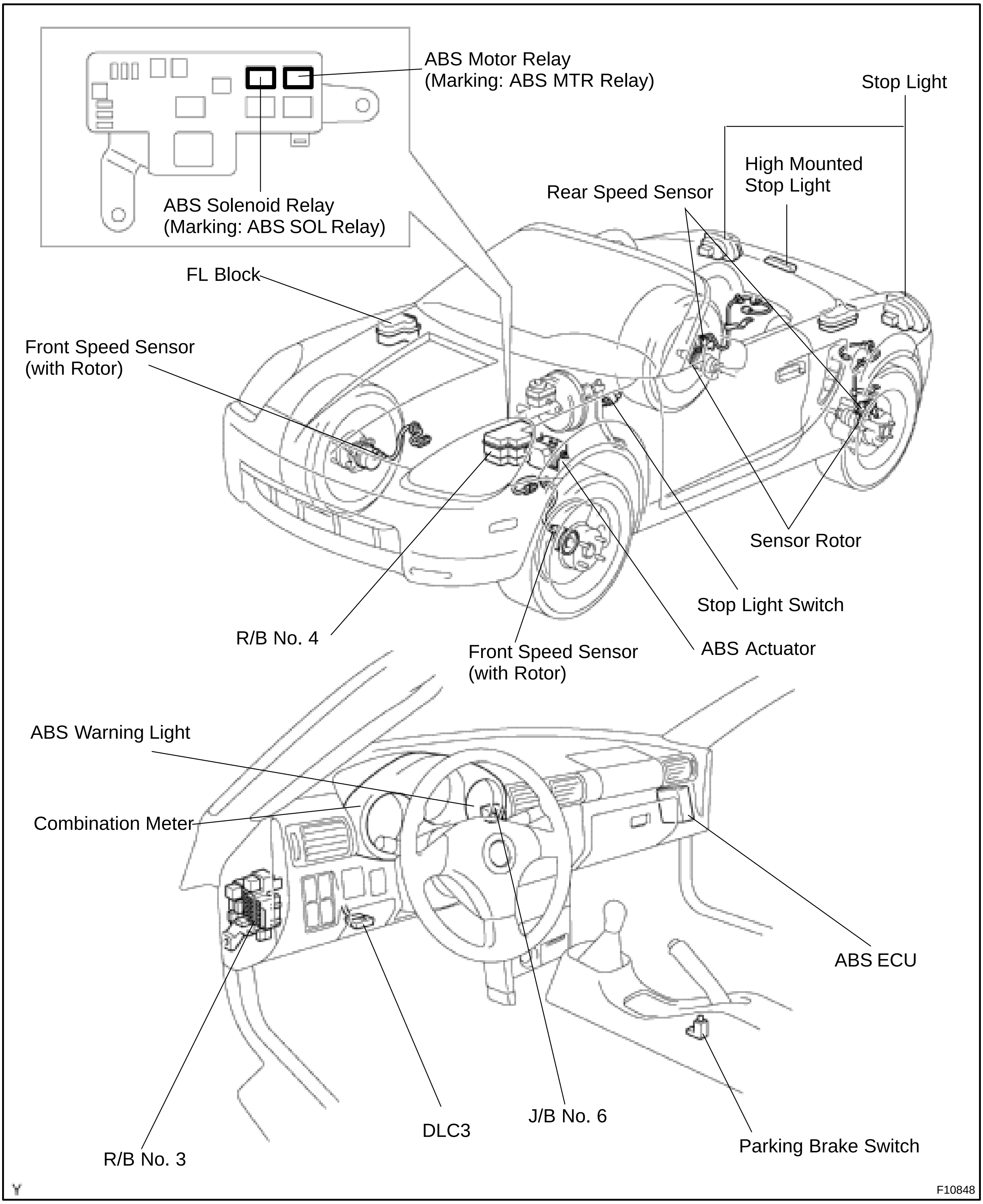
- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If any abnormality is not found in inspection parts, inspect the ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, turn to the page referred to under the ”See page” for respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C0278/11 (DI–178)	Open circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit
C0279/12 (DI–178)	Short circuit in ABS solenoid relay circuit	
C0273/13 (DI–173)	Open circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit
C0274/14 (DI–173)	Short circuit in ABS motor relay circuit	
C0226/21 (DI–170)	Open or short circuit in 2–position solenoid circuit for right front wheel	• ABS actuator • SFRR or SFRH circuit
C0236/22 (DI–170)	Open or short circuit in 2–position solenoid circuit for left front wheel	• ABS actuator • SFLR or SFLH circuit
C0246/23 (DI–170)	Open or short circuit in 2–position solenoid circuit for right rear wheel	• ABS actuator • SRRR or SRRH circuit
C0256/24 (DI–170)	Open or short circuit in 2–position solenoid circuit for left rear wheel	• ABS actuator • SRLR or SRLH circuit
C0200/31 (DI–163)	Right front wheel speed sensor signal malfunction	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0205/32 (DI–163)	Left front wheel speed sensor signal malfunction	
C0210/33 (DI–163)	Right rear wheel speed sensor signal malfunction	• Rear axle hub • Right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0215/34 (DI–163)	Left rear wheel speed sensor signal malfunction	
C1235/35 (DI–163)	Foreign matter is attached on the tip of the right front sensor	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1236/36 (DI–163)	Foreign matter is attached on the tip of the left front sensor	
C1238/38 (DI–163)	Foreign matter is attached on the tip of the right rear sensor	
C1239/39 (DI–163)	Foreign matter is attached on the tip of the left rear sensor	
C1241/41 (DI–183)	Power source voltage down	• Battery • Charging system • Power source circuit
C1249/49 (DI–186)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit

C1251/51 (DI–188)	Pump motor is locked	• ABS pump motor
Always ON (DI–190)	Malfunction in ECU	• Charging system • ABS warning light circuit • Battery • ABS ECU

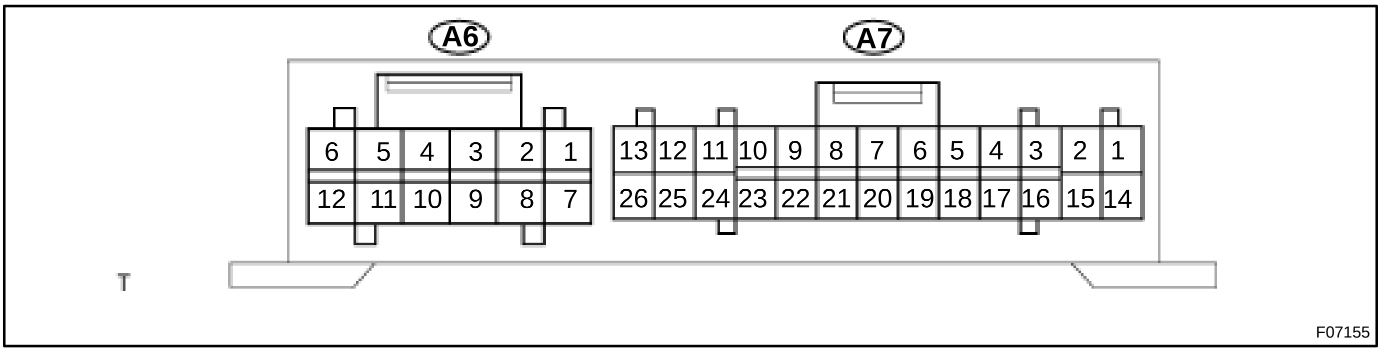
DI7CN–01

PARTS LOCATION



DI7CO–01

TERMINALS OF ECU



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
IG1 (A7–13) – GND (A7–12, 25)	B–R ↔ W–B	IG switch ON	10 – 14
R+ (A7–26) – SR (A6–7)	L ↔ R–B	IG switch ON, ABS warning light OFF	9 – 14
R+ (A7–26) – MR (A6–1)	L ↔ R–Y	IG switch ON	Below 1.0
SFRR (A7–1) – GND (A7–12, 25)	W–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFRH (A7–2) – GND (A7–12, 25)	W–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFLR (A6–6) – GND (A7–12, 25)	W ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SFLH (A6–5) – GND (A7–12, 25)	W–R ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRR (A7–12) – GND (A7–12, 25)	R–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRRH (A6–11) – GND (A7–12, 25)	R–B ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRLR (A7–14) – GND (A7–12, 25)	R–W ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
SRLH (A7–15) – GND (A7–12, 25)	R–L ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
WA (A7–11) – GND (A7–12, 25)	R–G ↔ W–B	IG switch ON, ABS warning light ON	10 – 14
		IG switch ON, ABS warning light OFF	Below 2.0
STP (A7–5) – GND (A7–12, 25)	G–W ↔ W–B	Stop light switch OFF	Below 1.5
		Stop light switch ON	8 – 14
D/G (A7–24) – GND (A7–12, 25)	W–G ↔ W–B	IG switch ON, ABS warning light OFF	10 – 14
Tc (A7–8) – GND (A7–12, 25)	P–B ↔ W–B	IG switch ON	8 – 14
Ts (A7–21) – GND (A7–12, 25)	G–R ↔ W–B	IG switch ON	8 – 14
FR+ (A6–3) – FR– (A6–9)	R ↔ G	IG switch ON, Slowly turning right front wheel	AC generation
FL+ (A6–8) – FL– (A6–2)	L ↔ P	IG switch ON, Slowly turning left front wheel	AC generation
RR+ (A7–10) – RR– (A7–23)	B ↔ W	IG switch ON, Slowly turning right rear wheel	AC generation
RL+ (A7–22) – RL– (A7–9)	Y ↔ BR	IG switch ON, Slowly turning left rear wheel	AC generation
MT (A6–10) – GND (A7–12, 25)	L–W ↔ W–B	IG switch ON	Below 1.5

DI7CP–01

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing ABS ECU, sensor or etc., turn the IG switch OFF.

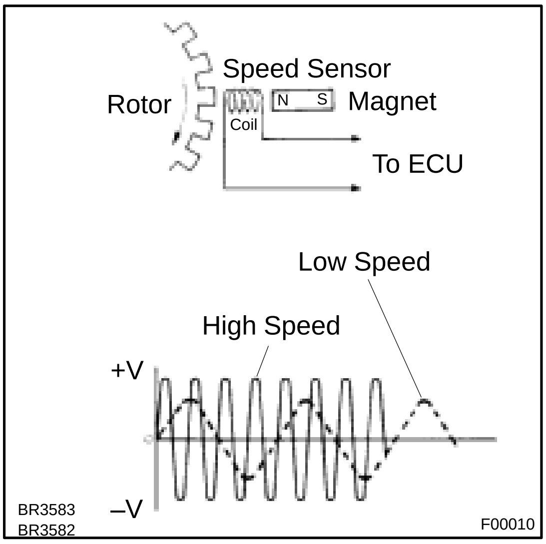
Symptom	Suspected Area	See page
ABS does not operate	Only when 1. to 4. are all normal and the problem is still occurring, replace the ABS ECU. 3. Check the DTC reconfirming that the normal code is output. 4. IG power source circuit 5. Speed sensor circuit 6. Check the ABS actuator with a checker or TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–199).	 DI–154 DI–183 DI–163 BR–42
ABS does not operate efficiently	Only when 1. to 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the ABS actuator with a checker or TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–199).	 DI–154 DI–163 DI–186 BR–42
ABS warning light abnormal	1. ABS warning light circuit 2. ABS ECU	DI–192
DTC check cannot be done	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit 2. Tc terminal circuit	 DI–192 DI–195
Speed sensor signal check cannot be done	1. Ts terminal circuit 2. ABS ECU	DI–197

DI7CQ–01

CIRCUIT INSPECTION

DTC	C0200/31 – C1239/39	Speed Sensor Circuit

CIRCUIT DESCRIPTION

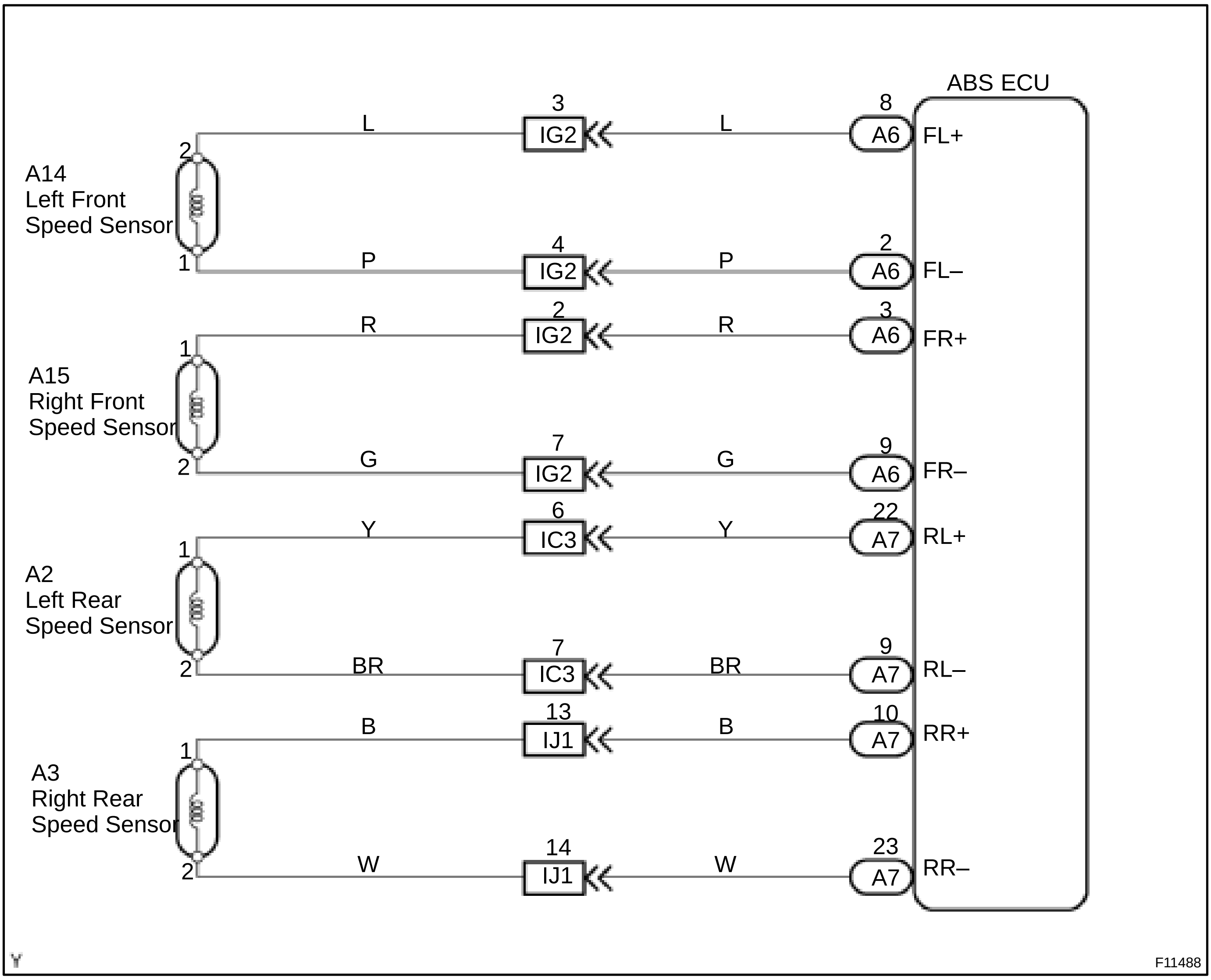


The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detection Condition	Trouble Area
C0200/31 C0205/32 C0210/33 C0215/34	Detection of any of conditions from 1. through 3.: 1. Vehicle speed is at 10 km/h (6 mph) or more and open or short of the speed sensor signal circuit continues 15 sec. or more. 2. Momentary interruption of the speed sensor signal occurs 7 times or more. 3. Open circuit condition of the speed sensor signal circuit continues for 0.5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1235/35 C1236/36 C1238/38 C1239/39	Vehicle speed is at 20 km/h (12mph) or more and interference on the speed sensor signal continues for 5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C0210/33 C0215/34	The condition that the both rear side wheels' speed is lower than the front wheels' speed at 20 km/h (12 mph) or more for 20 sec. or more when the IG switch turns ON and OFF, which is repeated in a sequence more than 8 times.	• Rear axle hub • Right rear or left rear speed sensor • Rear speed sensor circuit

HINT:
- DTC Nos. C0200/31 and C1235/35 are for the right front speed sensor.
- DTC Nos. C0205/32 and C1236/36 are for the left front speed sensor.
- DTC Nos. C0210/33 and C1238/38 are for the right rear speed sensor.
- DTC Nos. C0215/34 and C1239/39 are for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using the TOYOTA hand–held tester.

1	**Check output value of speed sensor.**

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

CHECK:
Check that there is no difference between the speed value output from the speed sensor displayed on the TOYOTA hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

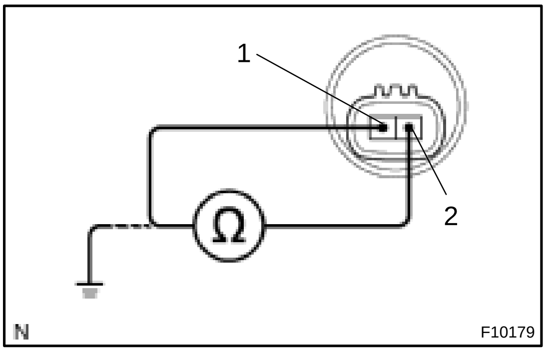
OK:
There is almost no difference from the displayed speed value.

HINT:
There is tolerance of ± 10 % in the speedometer indication.

OK → **Check and replace ABS ECU.**

NG

2	**Check speed sensor.**



Front speed sensor:

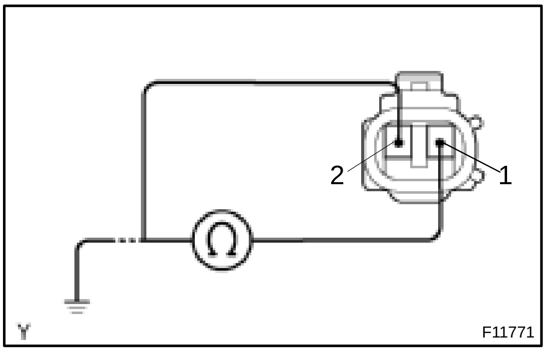
PREPARATION:
(a) Make sure that there is no looseness at the connector lock part and connecting part of the connector.
(b) Disconnect the speed sensor connector at hub bearing.

CHECK:
Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:
Resistance: 1.1 – 1.3 kΩ at 25°C

CHECK:
Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:
Resistance: 1 MΩ or higher



Rear speed sesor:

PREPARATION:

(a) Make sure the that there is no looseness at the connector lock part and connecting part of the connector.

(b) Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

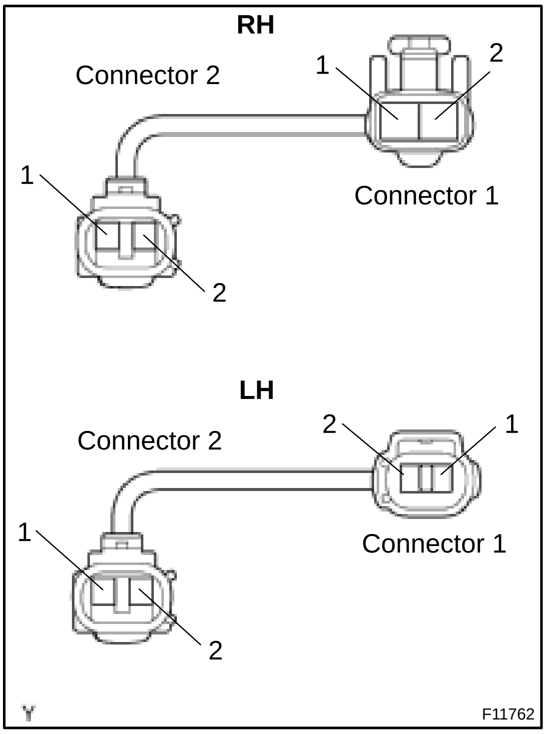
Resistance: 0.9 – 1.3 kΩ at 25 ± 5 °C

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:

Resistance: 10 MΩ or higher



Front speed sensor sub–wire:

PREPARATION:

(a) Remove the fender liner.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Disconnect the speed sensor connector inside vehicle.

CHECK:

(a) Measure the resistance between terminal 1 of connector 1 and terminal 2 of connector 2.

(b) Measure the resistance between terminal 2 of connector 1 and terminal 1 of connector 2.

OK:

Resistance: below 1 Ω

CHECK:

Measure the resistance between terminals 1 and 2 of connector 1 and body ground.

OK:

Resistance: 10 MΩ or higher

NG	Replace speed sensor or sub–wire harness.

NOTICE:

Check the speed sensor signal last (See page DI–154).

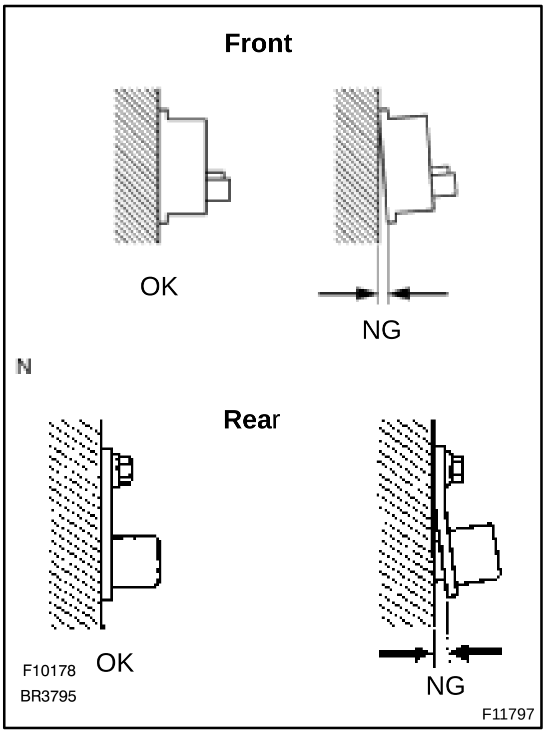
OK

3	**Check for open and short circuit in harness and connector between each speed sensor and ABS ECU (See page IN–28).**

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

OK

4	**Check speed sensor installation.**



CHECK:

Check the speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.

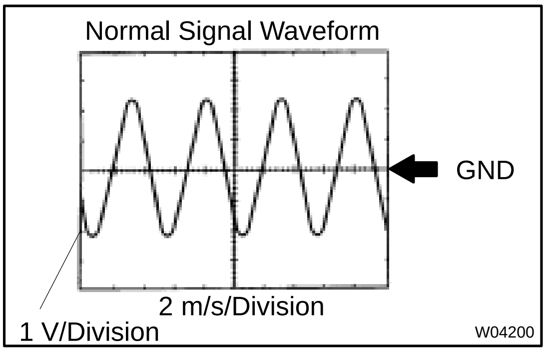
NG → **Replace speed sensor.**

NOTICE:

Check the speed sensor signal last (See page DI–154).

OK

5	**Check speed sensor and sensor rotor serrations.**



REFERENCE: INSPECTION USING OSCILLOSCOPE

PREPARATION:

(a) Remove the ABS ECU with the connectors still connected.

(b) Connect the oscilloscope to terminals FR+, FL+, RR+ or RL+ and GND of the ABS ECU.

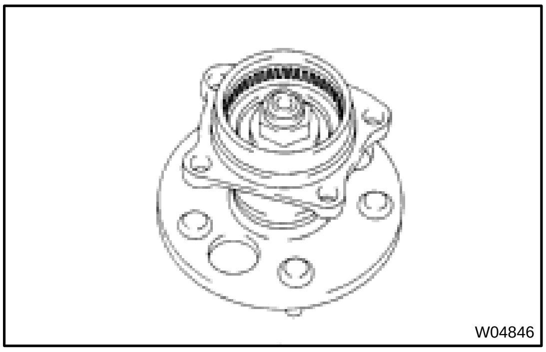
CHECK:

Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

OK	**Check and replace ABS ECU.**

NG

6	**Check sensor rotor and sensor tip.**



Front:

PREPARATION:

Remove the front speed sensor (See page BR–51).

CHECK:

Check the sensor rotor serrations.

OK:

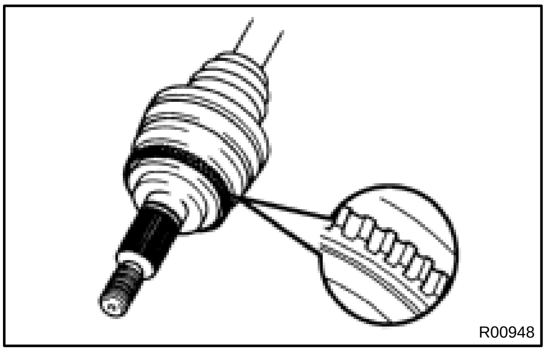
No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.


R00948

Rear:

PREPARATION:

Remove the rear drive shaft (See page SA–41).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

PREPARATION:

Remove the rear speed sensor (See page BR–56).

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

NG → **Replace sensor rotor or speed sensor.**

NOTICE:
Check the speed sensor signal last (See page DI–154).

OK

Check and replace ABS ECU.

DI7CR–01

DTC	C0226/21 – C0256/24	ABS Actuator Solenoid Circuit

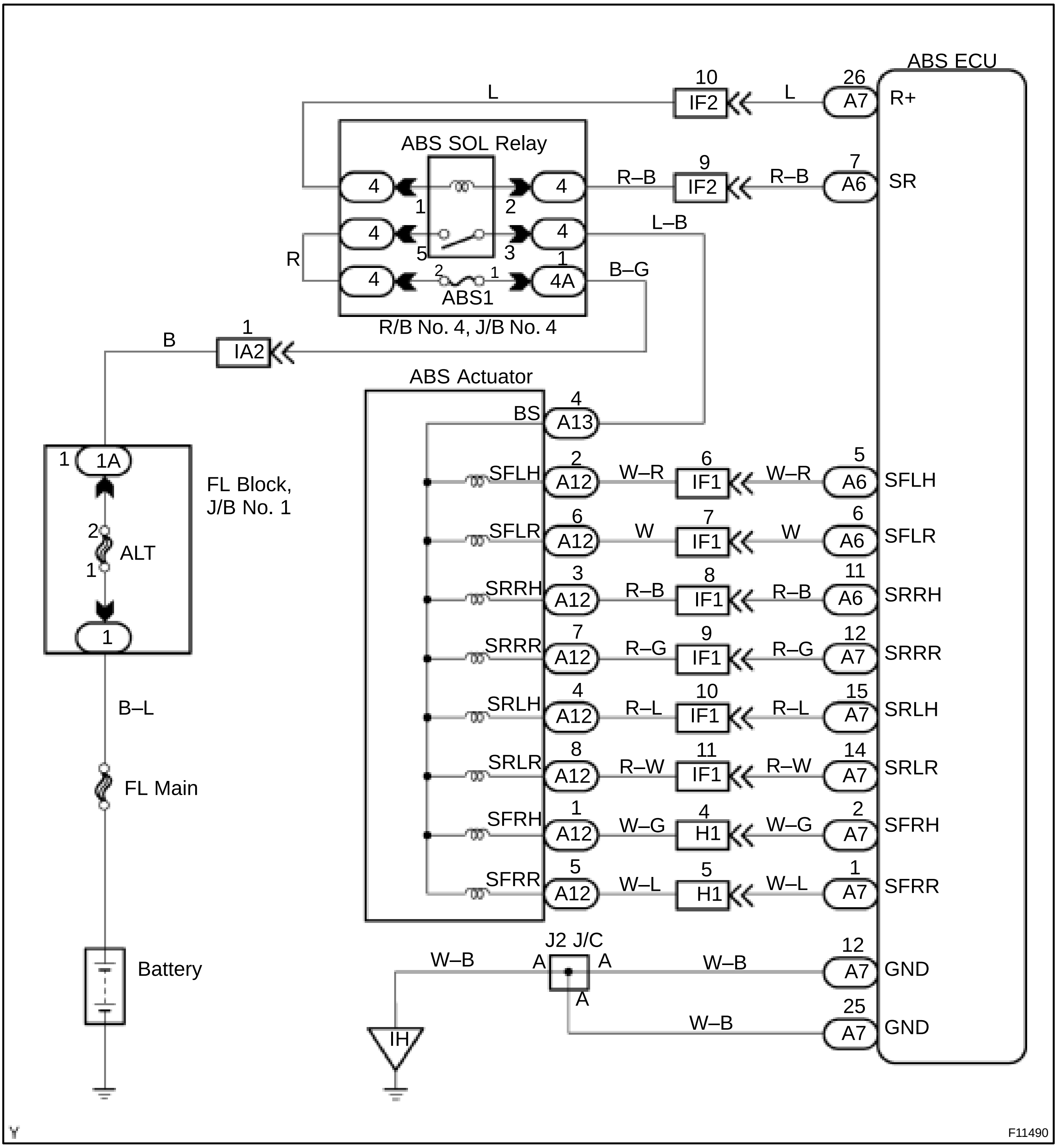
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force.

DTC No.	DTC Detection Condition	Trouble Area
C0226/21	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SFRR or SFRH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SFRR or SFRH circuit
C0236/22	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SFLR or SFLH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SFLR or SFLH circuit
C0246/23	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SRRR or SRRH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SRRR or SRRH circuit
C0256/24	Condition 1. or 2. continues for 0.05 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, there is open or short circuit in actuator solenoid SRLR or SRLH. 2. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and while ABS control is in operation.*	• ABS actuator • SRLR or SRLH circuit

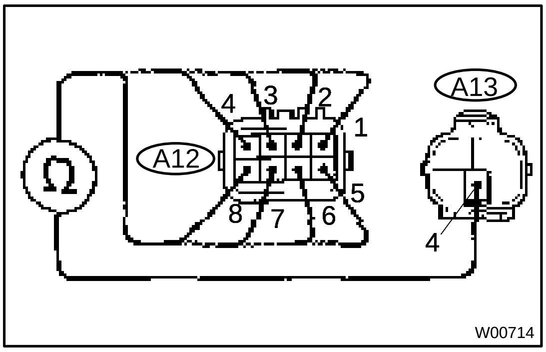
*: Solenoid relay contact ON condition:
All of solenoid terminal voltage is half or less than IG1 terminal voltage .

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS actuator solenoid.**



PREPARATION:

Disconnect the 2 connectors from the ABS actuator.

CHECK:

Check the continuity between terminals A13–4 and A12–1, 2, 3, 4, 5, 6, 7, 8 of the ABS actuator connector.

OK:

Continuity

HINT:

Resistance of each solenoid coil

SRLR, SRRR, SFLR, SFRR: 4.3 Ω

SRLH, SRRH, SFLH, SFRH: 8.8 Ω

NG	**Replace ABS actuator.**

OK

2	**Check for open and short circuit in harness and connector between ABS ECU and actuator (See page IN–28).**

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

OK

If same code is still output after DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CS–01

DTC	C0273/13, C0274/14	ABS Motor Relay Circuit

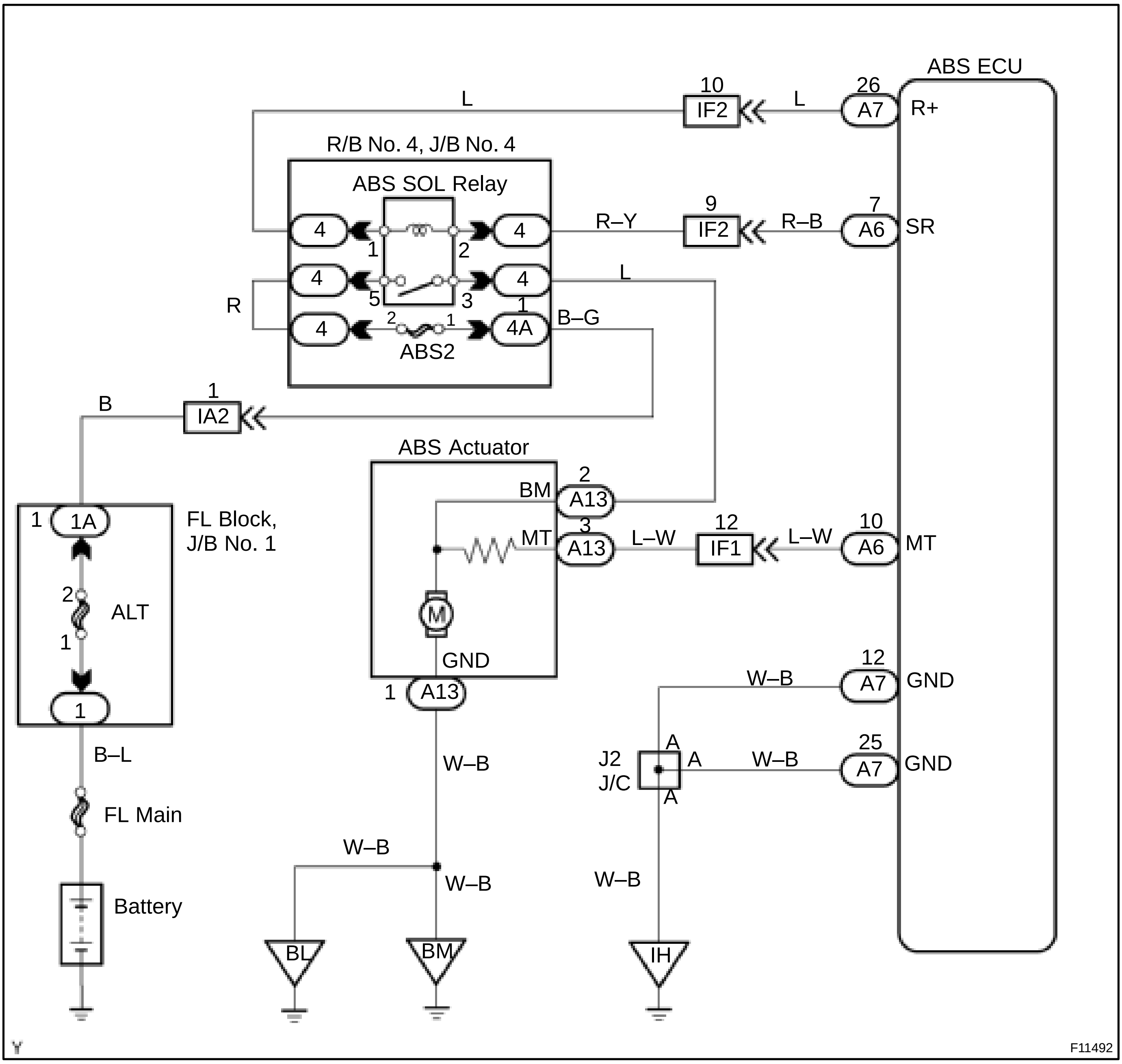
CIRCUIT DESCRIPTION

The ABS motor relay (Marking: ABS MTR) supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the ABS motor relay ON and operates the ABS pump motor.

DTC No.	DTC Detection Condition	Trouble Area
C0273/13	Condition 1. or 2. continues for 0.2 sec. or more: 1. ABS ECU terminal IG1 voltage is 9.5 V to 18.5 V, and when motor relay is ON in the midst of initial check or when ABS control is in operation.*1 2. Motor relay is ON driving in the midst of initial check or when ABS control is in operation, ABS ECU terminal IG1 voltage becomes 9.5 V or less.*2	• ABS motor relay • ABS motor relay circuit
C0274/14	Condition below continues for 4 sec. or more: When the motor relay is OFF, there is open circuit in MT terminal of ABS ECU.	

*1: Relay contact OFF condition: MT terminal voltage is below 3.6 V.
*2: Relay contact ON condition: MT terminal voltage is 3.6 V or above.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester.

1	**Check ABS motor relay (Marking: ABS MTR) operation.**

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

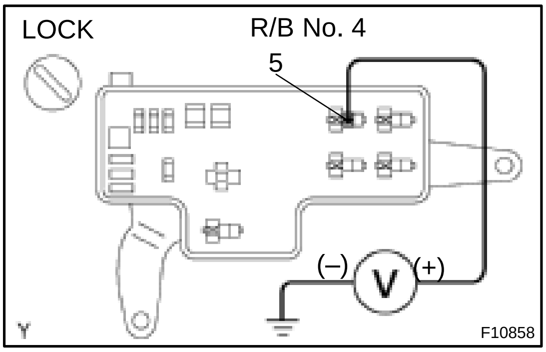
CHECK:
Check the operation sound of the ABS motor relay when operating it with the TOYOTA hand–held tester.

OK:
The operation sound of the ABS motor relay should be heard.

OK	**Go to step 5.**

NG

2	**Check voltage between terminal 5 of R/B No. 4 (for ABS motor relay (Marking: ABS MTR)) and body ground.**



PREPARATION:
Remove the ABS motor relay from the R/B No. 4.

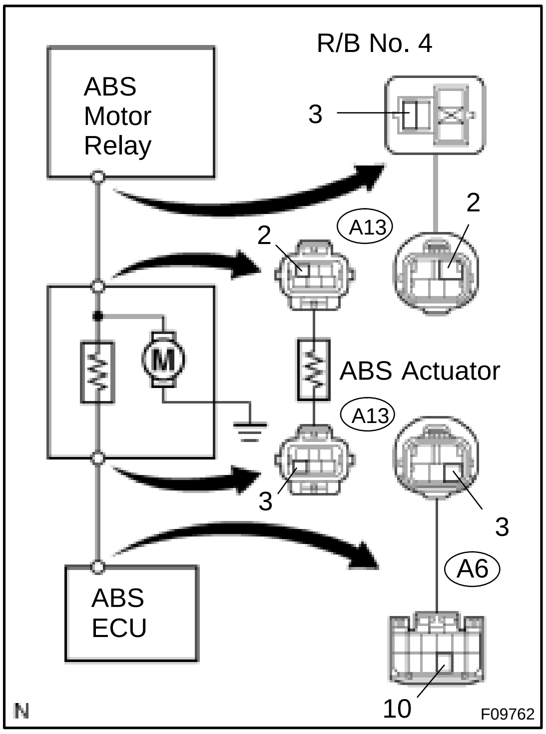
CHECK:
Measure the voltage between terminal 5 of the R/B No. 4 (for ABS motor relay) and body ground.

OK:
Voltage: 10 – 14 V

NG	**Check and repair harness or connector between R/B No. 4 and battery.**

OK

3	**Check continuity between terminal 3 of R/B No. 4 (for ABS motor relay (Marking: ABS MTR)) and terminal MT (A6–10) of ABS ECU.**



CHECK:

Check the continuity between terminal 3 of the R/B No. 4 (for ABS motor relay) and terminal MT (A6–10) of the ABS ECU.

OK:

Continuity

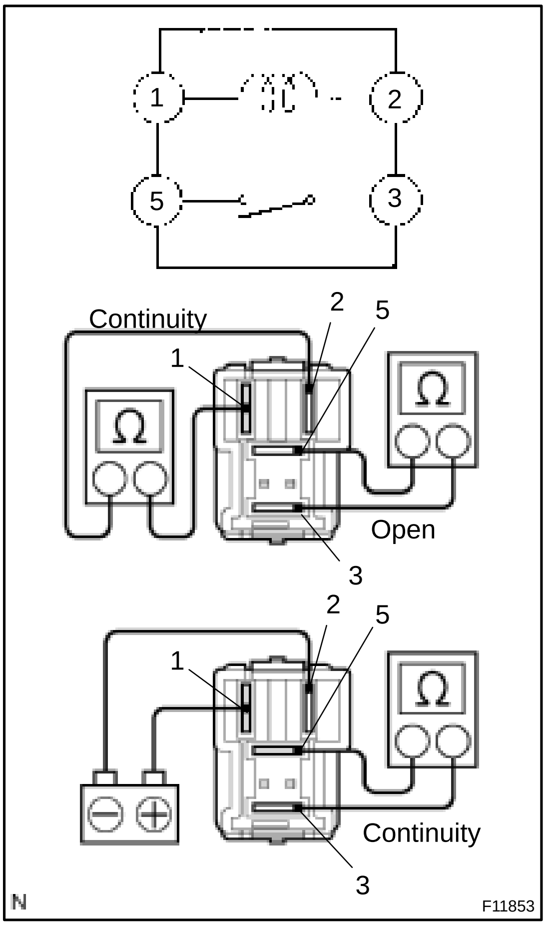
HINT:

There is a resistance of 4 – 6 Ω between terminals A13–2 and A12–3 of the ABS actuator.

NG	**Repair or replace harness or ABS actuator.**

OK

4	**Check ABS motor relay (Marking: ABS MTR).**



PREPARATION:
Remove the ABS motor relay from the R/B No. 4.

CHECK:
Check the continuity between each terminal of the ABS motor relay.

OK:

Terminals 1 and 2	Continuity (Reference value 62 Ω)
Terminals 3 and 5	Open

CHECK:
(a) Apply battery positive voltage between terminals 1 and 2.
(b) Check the continuity between terminals of the ABS motor relay.

OK:

Terminals 3 and 5	Continuity

NG → **Replace ABS motor relay.**

OK

5	**Check for open and short circuit in harness and connector between ABS motor relay (Marking: ABS MTR) and ABS ECU (See page IN–28).**

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

OK

If same code is still output after the DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CT–01

DTC	C0278/11, C0279/12	ABS Solenoid Relay Circuit

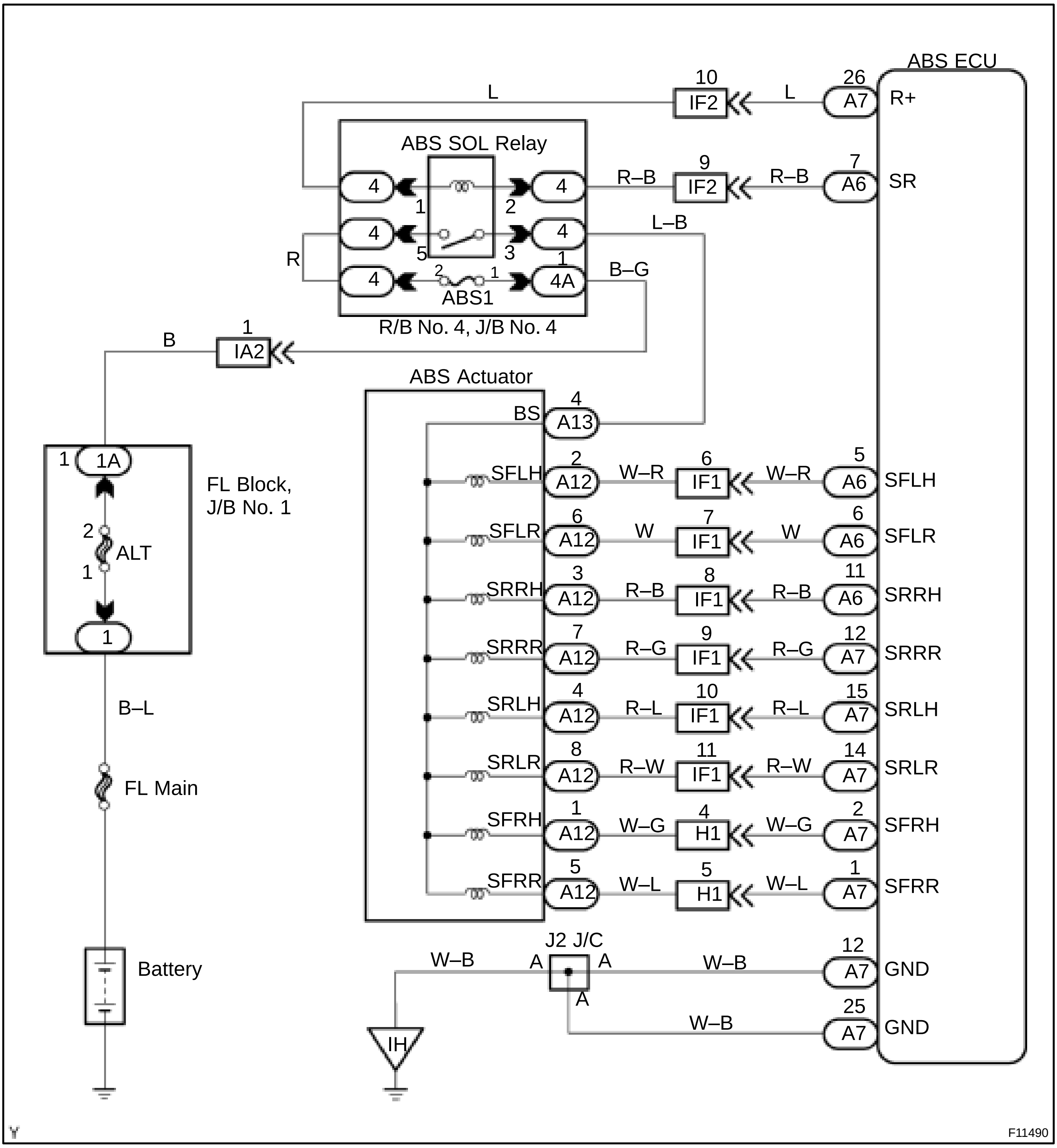
CIRCUIT DESCRIPTION

This ABS solenoid relay (Marking: ABS SOL) supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detection Condition	Trouble Area
C0278/11	Condition 1. or 2. continues for 0.2 sec. or more: 1. IG1 terminal voltage of ABS ECU is 9.5 – 18.5 V, and when the solenoid relay is ON.*1 2. With solenoid relay ON, when IG1 terminal of ABS ECU is less than 9.5 V.*1	• ABS solenoid relay • ABS solenoid relay circuit
C0279/12	Immediately after IG switch has been turned ON, when the solenoid relay is OFF.*2	

*1: Solenoid relay contact OFF condition:
All of solenoid terminal voltage is half or less than IG1 terminal voltage.
*2: Solenoid relay contact ON condition:
All of solenoid terminal voltage is half of IG1 terminal voltage or more.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using the TOYOTA hand–held tester.

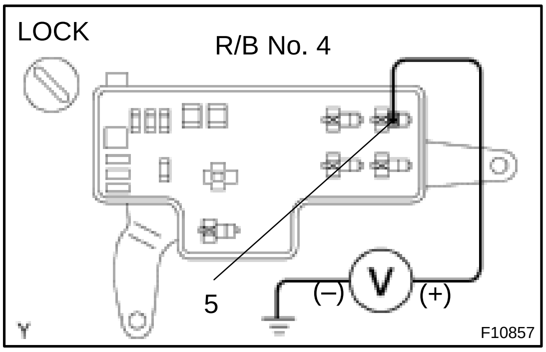
1	**Check ABS solenoid relay (Marking: ABS SOL) operation.**

PREPARATION:
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
CHECK:
Check the operation sound of the ABS solenoid relay when operating it with the TOYOTA hand–held tester.
OK:
The operation sound of the ABS solenoid relay should be heard.

OK	**Go to step 5.**

NG

2	**Check voltage between terminal 5 of R/B No. 4 (for ABS solenoid relay (Marking: ABS SOL)) and body groud.**

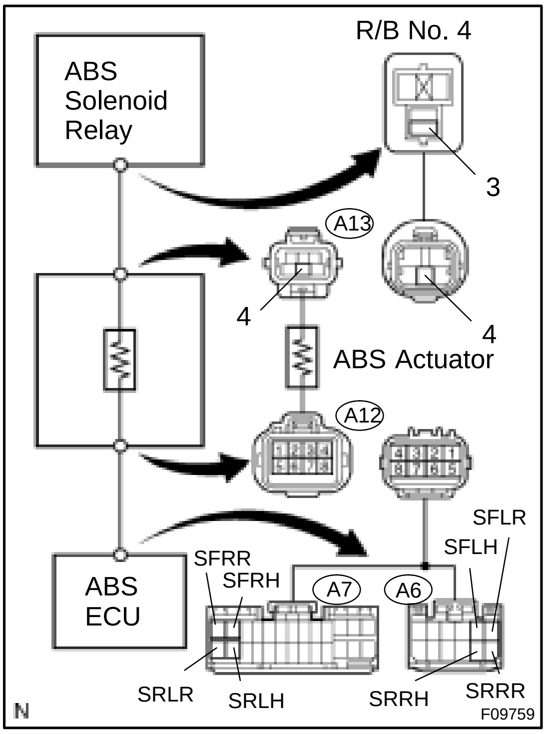


PREPARATION:
Remove the ABS solenoid relay from the R/B No. 4.
CHECK:
Measure the voltage between terminal 5 of the R/B No. 4 (for ABS solenoid relay) and body ground.
OK:
Voltage: 10 – 14 V

NG	**Check and repair harness or connector between R/B No. 4 and battery.**

OK

3	**Check continuity between terminal 3 of R/B No. 4 (for ABS solenoid relay (Marking: ABS SOL)) and each solenoid terminal of ABS ECU.**



CHECK:

Check the continuity between terminal 3 of the R/B No. 4 (for ABS solenoid relay) and terminal SRLR, SRLH, SRRR, SRRH, SFLR, SRLH, SFRR or SFRH of the ABS ECU.

OK:

Continuity

HINT:

Resistance of each solenoid coil

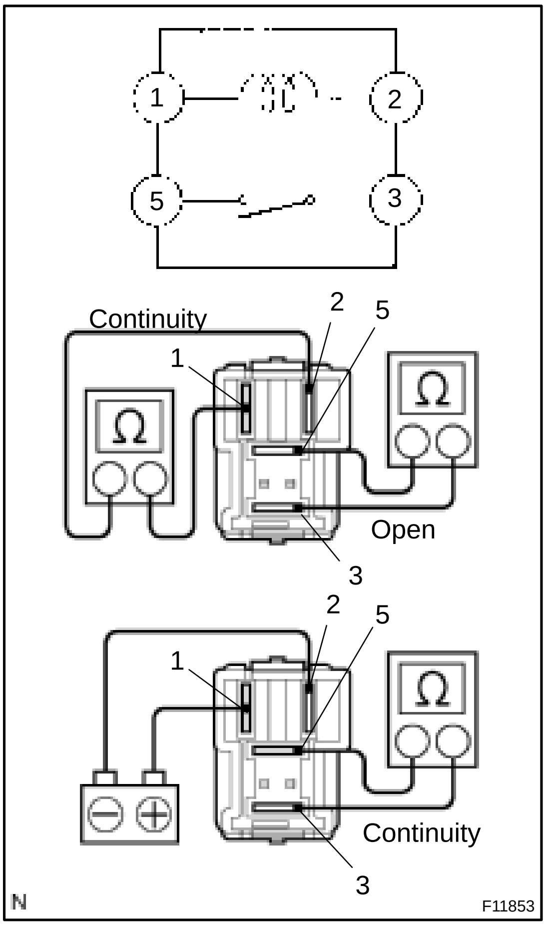
SRLR, SRRR, SFLR, SFRR: 4.3 Ω

SRLH, SRRH, SFLH, SFRH: 8.8 Ω

NG — **Repair or replace harness or ABS actuator.**

OK

4	**Check ABS solenoid relay (Marking: ABS SOL).**



PREPARATION:

Remove the ABS motor relay from the R/B No. 4.

CHECK:

Check the continuity between each terminal of ABS solenoid relay.

OK:

Terminals 1 and 2	Continuity (Reference value 100 Ω)
Terminals 3 and 5	Open

CHECK:

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

(b) Check continuity between each terminal of the ABS solenoid relay.

OK:

Terminals 3 and 5	Continuity

NG → **Replace ABS solenoid relay.**

OK

5	**Check for open and short circuit in harness and connector between ABS solenoid relay (Marking: ABS SOL) and ABS ECU (See page IN–28).**

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

OK

If same code is still output after DTC is deleted, check connections. If connections are normal, ECU may be defective.

DI7CU–01

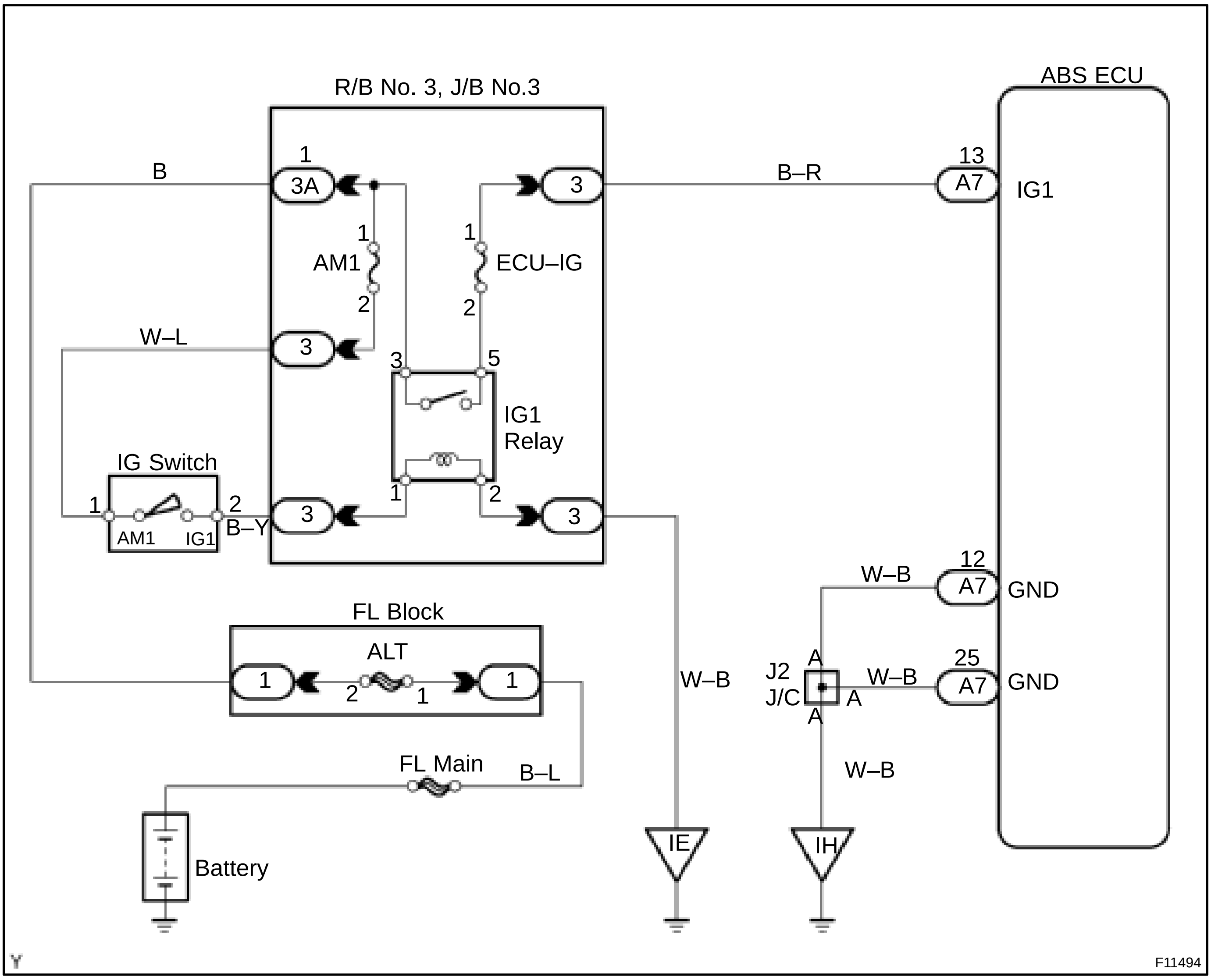
DTC	C1241/41	IG Power Source Circuit

CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the actuators.

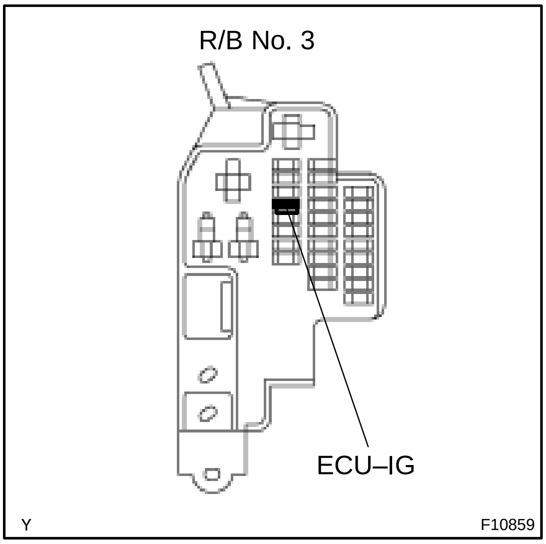
DTC No.	DTC Detection Condition	Trouble Area
C1241/41	Condition 1. or 2. is detected: 1. Vehicle speed is at 3 km/h (1.9 mph) or more and ECU terminal IG1 voltage is 9.5 V or less, which continues for 10 sec. or more. 2. When IG1 terminal voltage is less than 9.5 V, there is open circuit in the motor relay or in the solenoid relay, or the solenoid circuit malfunction.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ECU–IG fuse.**



PREPARATION:
Remove the ECU–IG fuse from the R/B No. 3.
CHECK:
Check the continuity of the ECU–IG fuse.
OK:
Continuity

NG → **Check for short circuit in all harness and components connected to ECU–IG fuse (See attached wiring diagram).**

OK

2	**Check battery positive voltage.**

OK:
Voltage: 10 – 14 V

NG → **Check and repair charging system (See page CH–2).**

OK

3	Check voltage of IG1 power source.

In case of using TOYOTA hand–held tester:

PREPARATION:

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

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

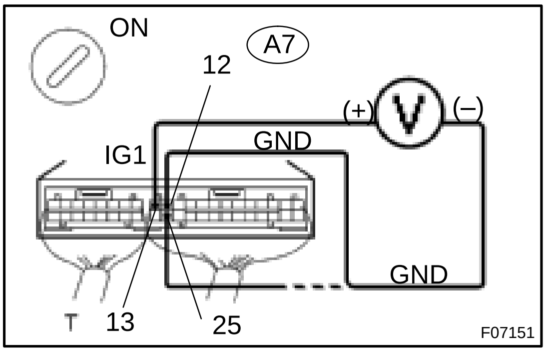
(c) Select the DATALIST mode on the TOYOTA hand–held tester.

CHECK:

Check the voltage condition output from the ECU displayed on the TOYOTA hand–held tester.

OK:

"Normal" is displayed.



F07151

In case of not using TOYOTA hand–held tester:

PREPARATION:

Remove the ABS ECU with the connectors still connected.

CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals A7–13 and A7–12, 25 of the ABS ECU connector.

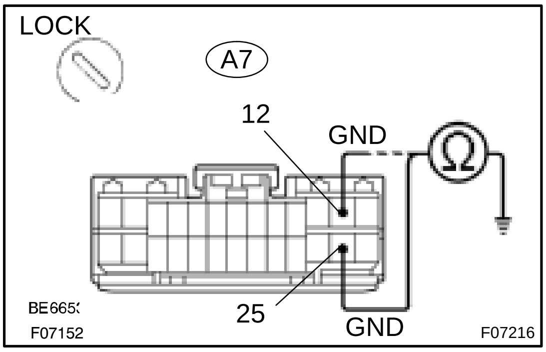
OK:

Voltage: 10 – 14 V

OK	Check and replace ABS ECU.

NG

4	Check continuity between terminals GND (A7–12, 25) of ABS ECU connector and body ground.



BE665;
F07152
F07216

PREPARATION:

Disconnect the connector from the ABS ECU.

CHECK:

Measure the resistance between terminal A7–12, 25 of the ABS ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG	Repair or replace harness or connector.

OK

Check for open circuit in harness and connector between ABS ECU and ECU–IG fuse (See page IN–28).

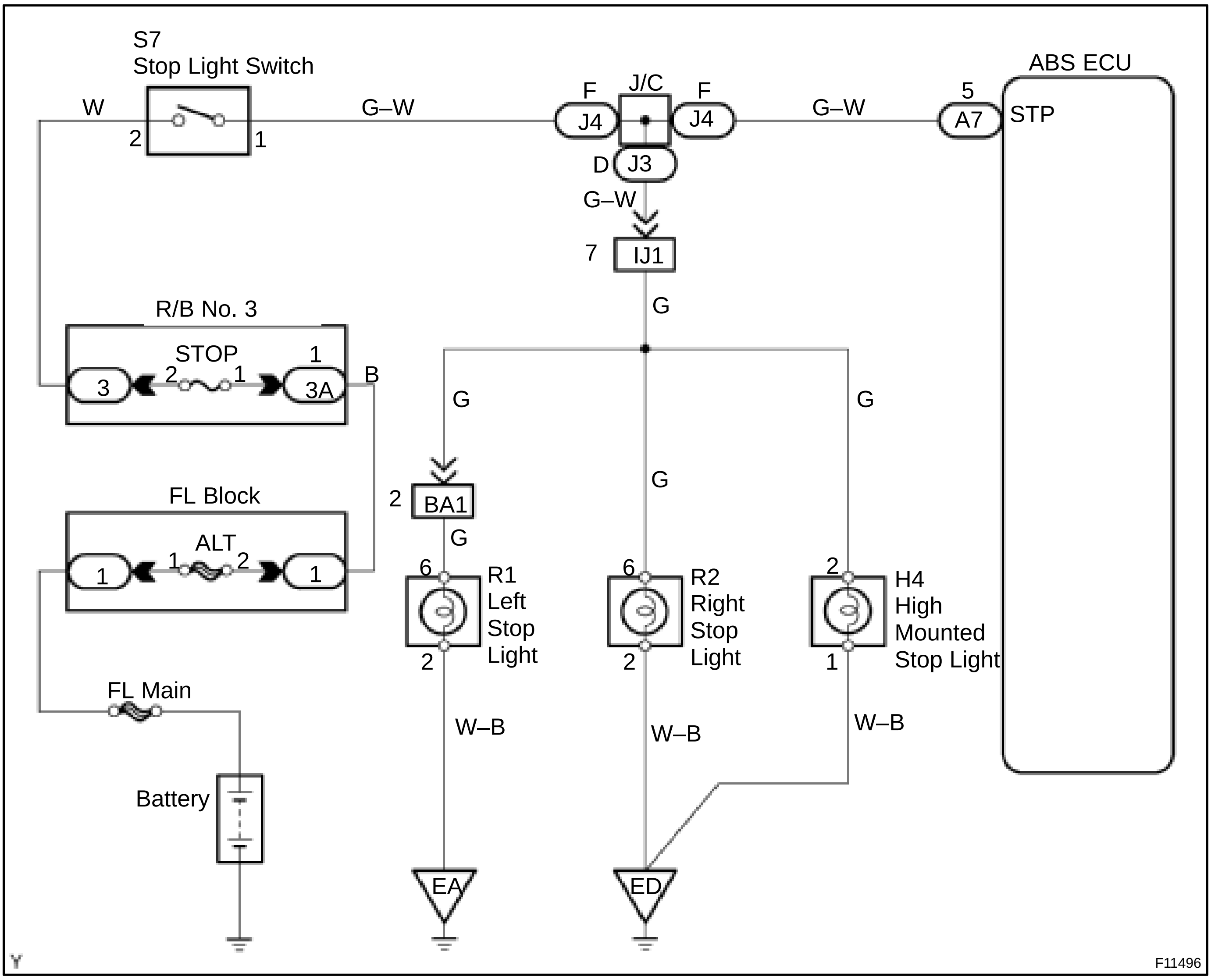
DI7CV–01

DTC	C1249/49	Stop Light Switch Circuit

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1249/49	ABS ECU terminal IG1 voltage is 9.5 V to 18.5 V and ABS is not operated, the open circuit of the stop light switch continues for 0.3 sec. or more.	• Stop light switch • Stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

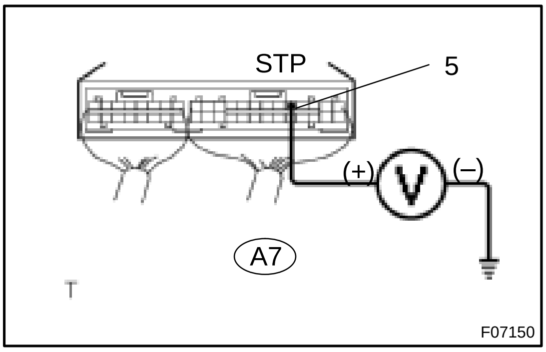
1	**Check operation of stop light.**

CHECK:
Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

NG → **Repair stop light circuit (See page BE–30).**

OK

2	**Check voltage between terminal STP (A7–5) of ABS ECU and body ground.**



PREPARATION:
Remove the ABS ECU with the connectors still connected.
CHECK:
Measure the voltage between terminal A7–5 of the ABS ECU and body ground when the brake pedal is depressed.
OK:
Voltage: 8 – 14 V

OK → **Check and replace ABS ECU.**

NG

3	**Check for open circuit in harness and connector between ABS ECU and stop light switch (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–162).

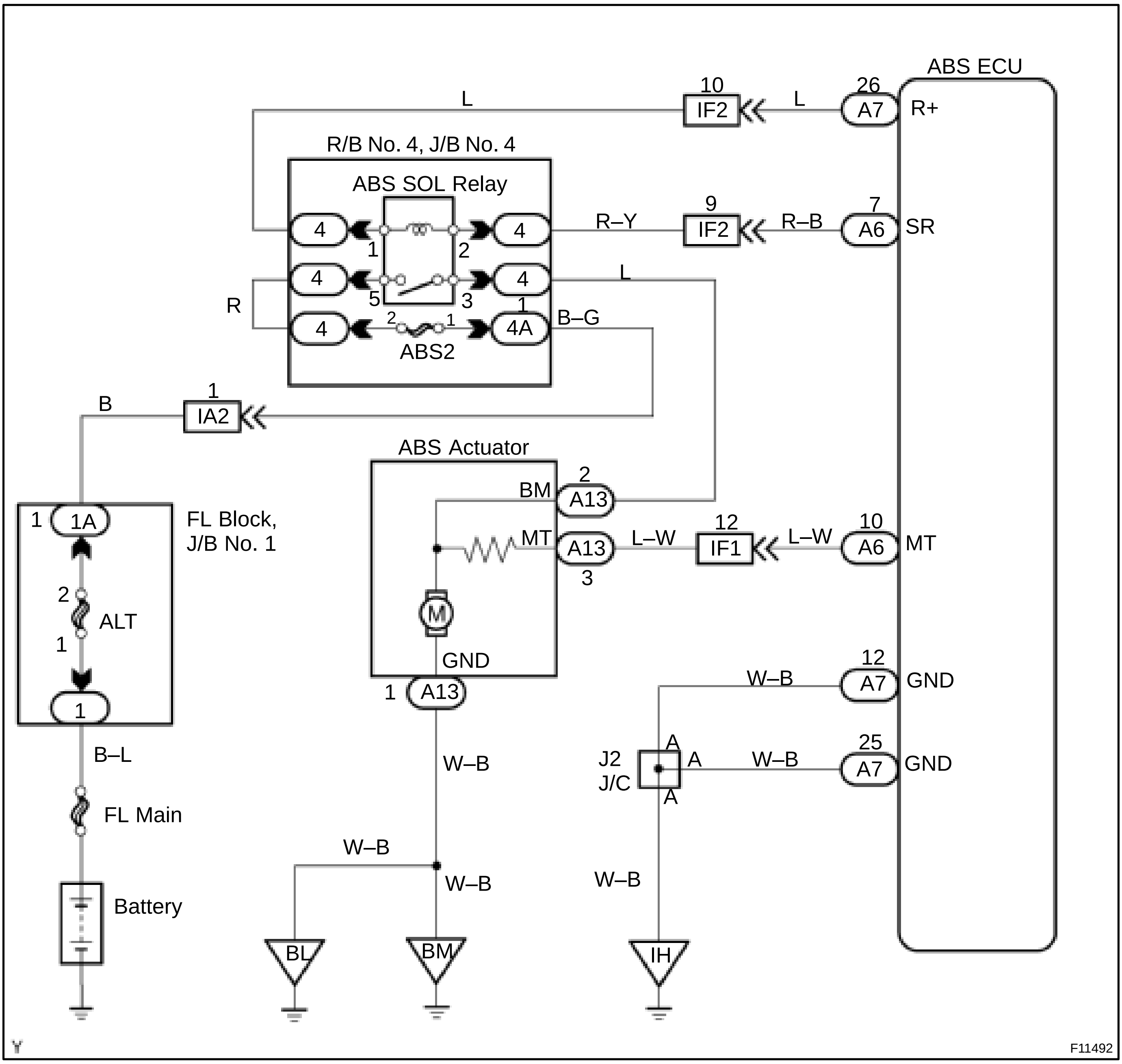
DI7CW–01

DTC	C1251/51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

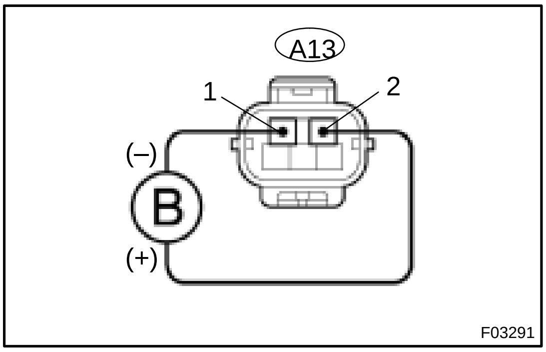
DTC No.	DTC Detection Condition	Trouble Area
C1251/51	ABS actuator pump motor is not operating normally.	ABS pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check operation of ABS pump motor.



PREPARATION:

Disconnect the ABS actuator connector.

CHECK:

Connect the positive (+) lead to terminal BM (A13–2) and the negative (–) lead to terminal GND (A13–1) of the ABS actuator connector, and check that the pump motor is operating.

OK:

The running sound of the pump motor should be heard.

NG	Replace ABS actuator.

OK

Check for open circuit in harness and connector between ABS ECU and ABS motor relay (Marking: ABS SOL), and ABS motor relay and ABS actuator (See page IN–28).

DI7CX–01

DTC	Always ON	ABS ECU Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
Always ON	ABS ECU internal malfunction is detected.	• Charging system • ABS warning light circuit • Battery • ABS ECU

INSPECTION PROCEDURE

1	Is DTC output?

Check DTC on page DI–154.

YES → **Repair circuit indicated by code output.**

NO

2	Is normal code displayed?

YES → **Check and replace ABS ECU.**

NO

3	Is ABS warning light go off?

YES → **Check and replace ABS ECU.**

NO

4	**Check battery voltage.**

CHECK:
Check the battery voltage.
OK:
Voltage: 10 – 14 V

NG → **Check and repair charging system.**

OK ↓

5	**Check ABS warning light.**

PREPARATION:
(a) Disconnect the connector from the ABS ECU.
(b) Connect terminal WA (A7–11) of the wire harness and terminal GND (A7–12, 25) of the ABS ECU connector.
(c) Turn the ignition switch ON.
CHECK:
Check the ABS warning light goes off.

OK → **Check and replace ABS ECU.**

NG ↓

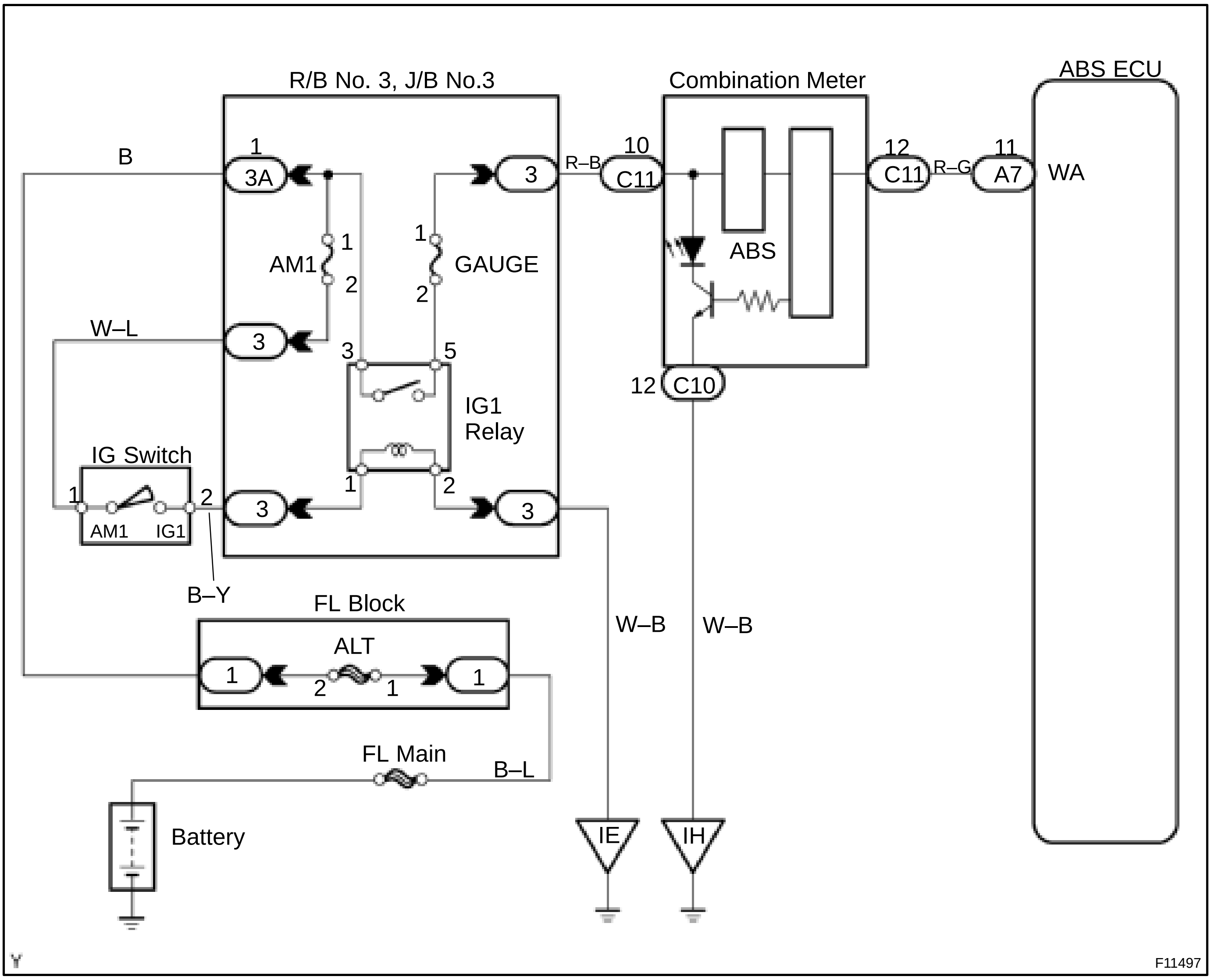
Check for short circuit in harness and connector between combination meter and ABS ECU (See page IN–28).

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, the ABS warning light lights up while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.
Connect terminals Tc and CG of the DLC3 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Troubleshoot in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	*1
ABS warning light remains on	*2

*1: Start the inspection from step 1 in case of using the TOYOTA hand–held tester and start from step 2 in case of not using TOYOTA hand–held tester.
*2: After inspection of step 3, start the inspection from step 4 in case of using the TOYOTA hand–held tester and start from step 5 in case of not using TOYOTA hand–held tester.

1	**Check operation of ABS warning light.**

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

CHECK:
Check that the ABS warning light lights up on the combination meter using the TOYOTA hand–held tester.
HINT:
ABS warning light turns ”OFF” automatically 2 seconds after it is turnd ”ON”.

OK → **Check and replace ABS ECU.**

NG

2	**Check ABS warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

3	**Check that connectors are securely connected to ABS ECU.**

NO → **Connect connector to ABS ECU.**

YES

Check for open circuit in harness and connector between combination meter and ABS ECU (See page IN–28).

4	**Check operation of the ABS warning light (See step 1).**

OK → **Check and replace ABS ECU.**

NG

5	**Is DTC output?**

Check DTC on page DI–154.

YES → **Repair circuit indicated by output code.**

NO

Check for short circuit in harness and connector between DLC3 and ABS ECU (See page IN–28).

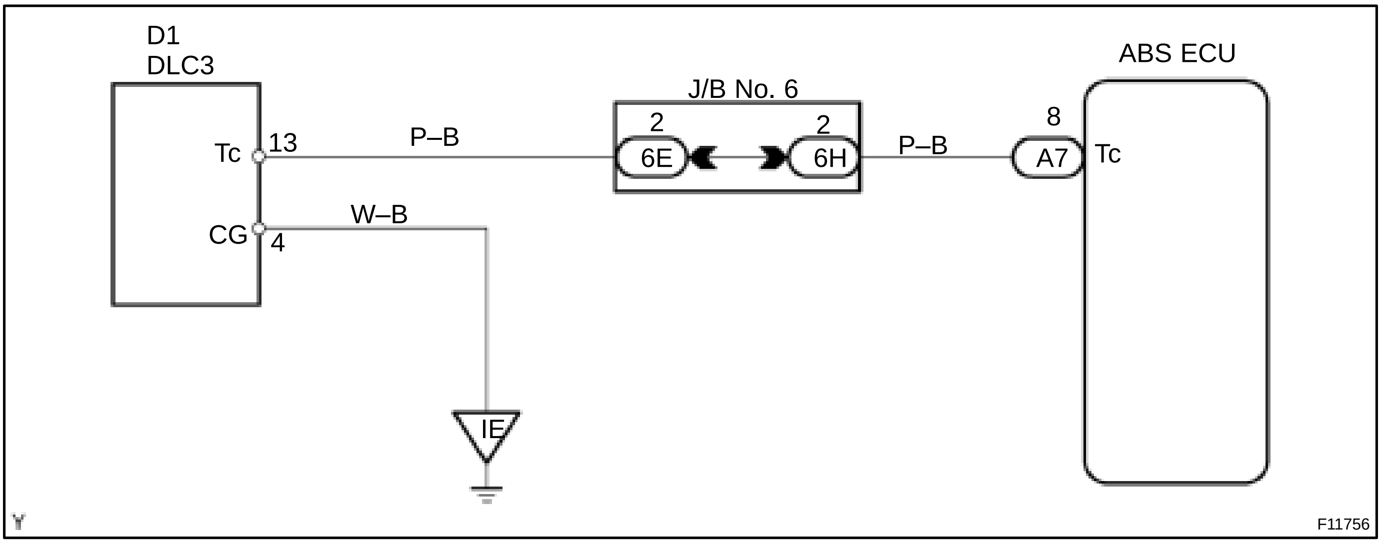
DI7CZ–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

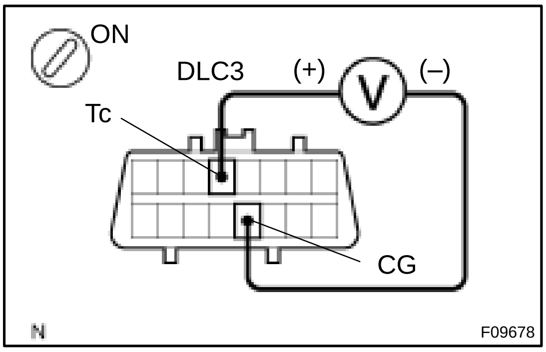
Connecting between terminals Tc and CG of the DLC3 causes the ABS ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals Tc and CG of DLC3.



CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals Tc and CG of the DLC3.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Tc and CG are connected, ECU may be defective.**

NG

2	**Check for open and short circuit in harness and connector between ABS ECU and DLC3, and DLC3 and body ground (See page IN–28).**

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

OK

Check and replace ABS ECU.

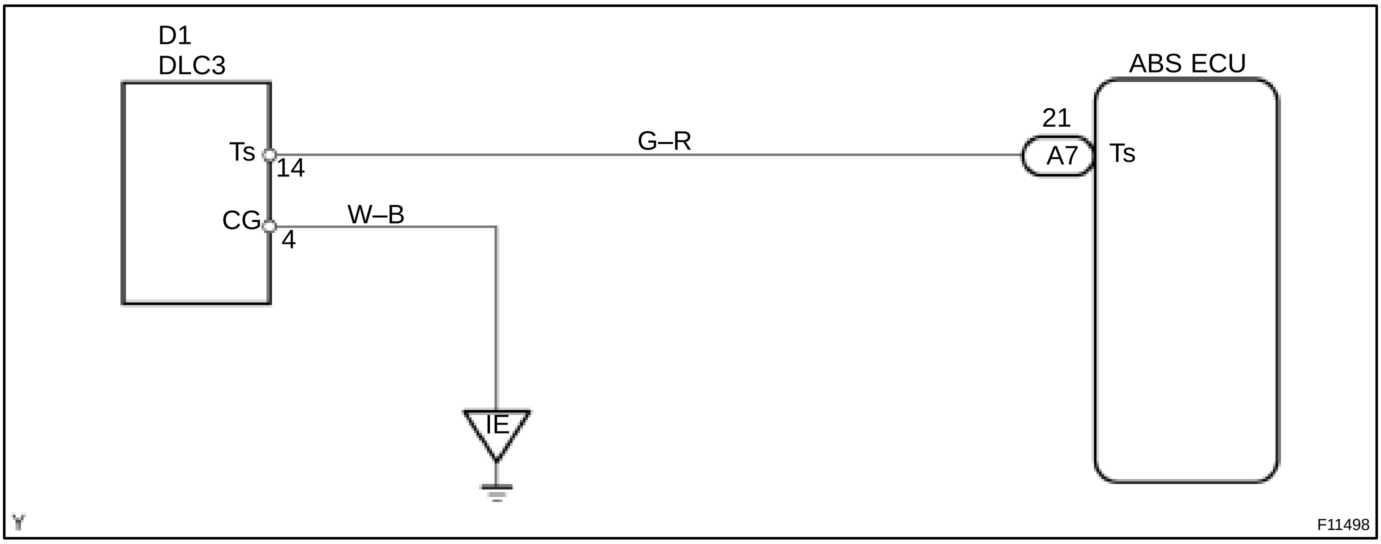
DI7D0–01

Ts Terminal Circuit

CIRCUIT DESCRIPTION

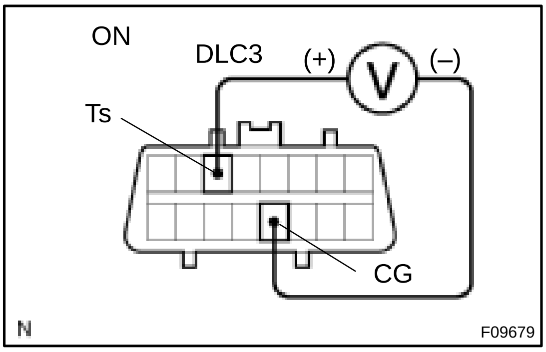
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminals Ts and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals Ts and CG of DLC3.



CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals Ts and CG of the DLC3.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Ts and CG are connected, ECU may be defective.**

NG

2	Check for open and short circuit in harness and connector between ABS ECU and DLC3, and DLC3 and body ground (See page IN–28).

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

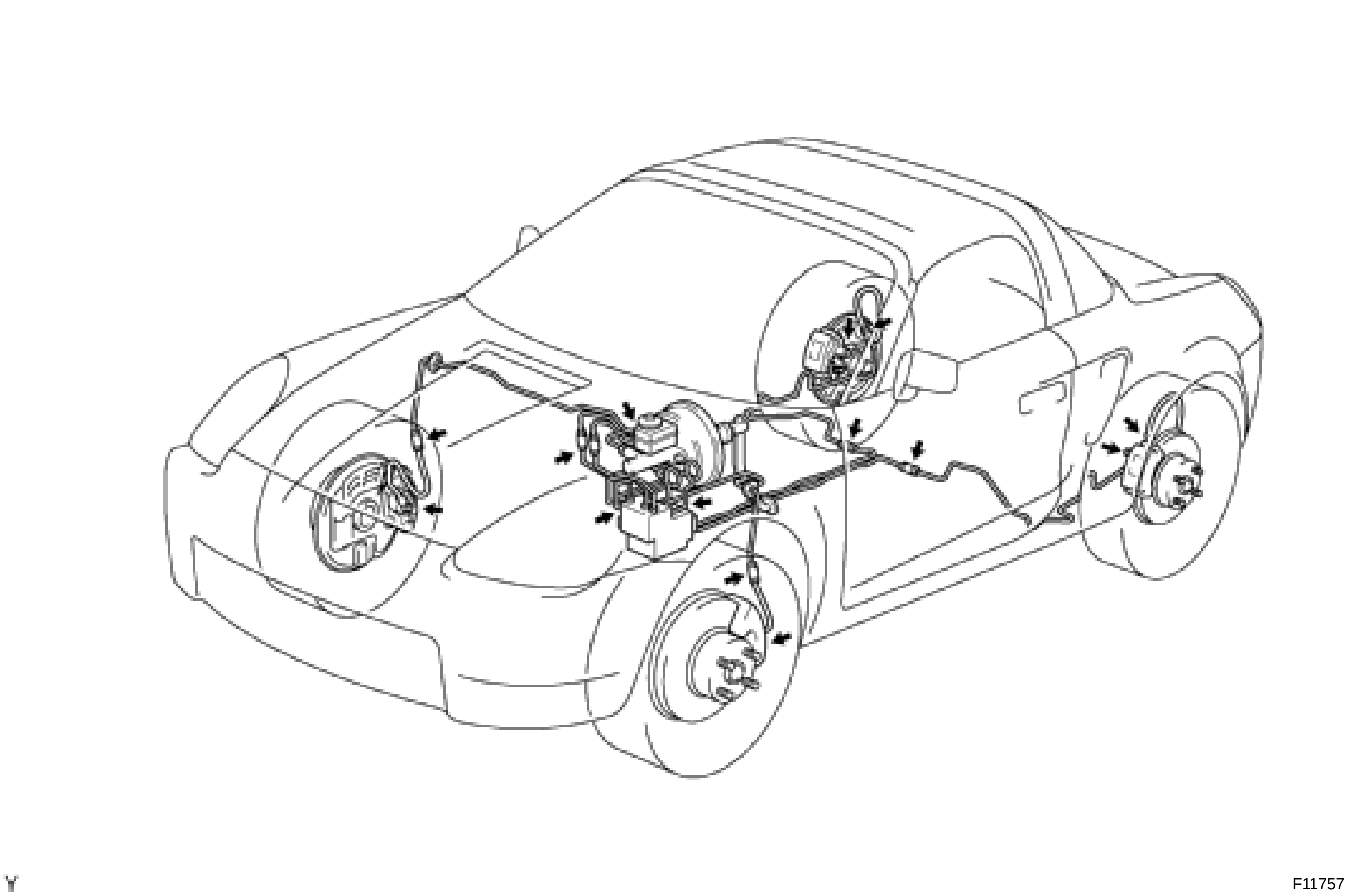
OK ↓

Check and replace ABS ECU.

DI7D1–01

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



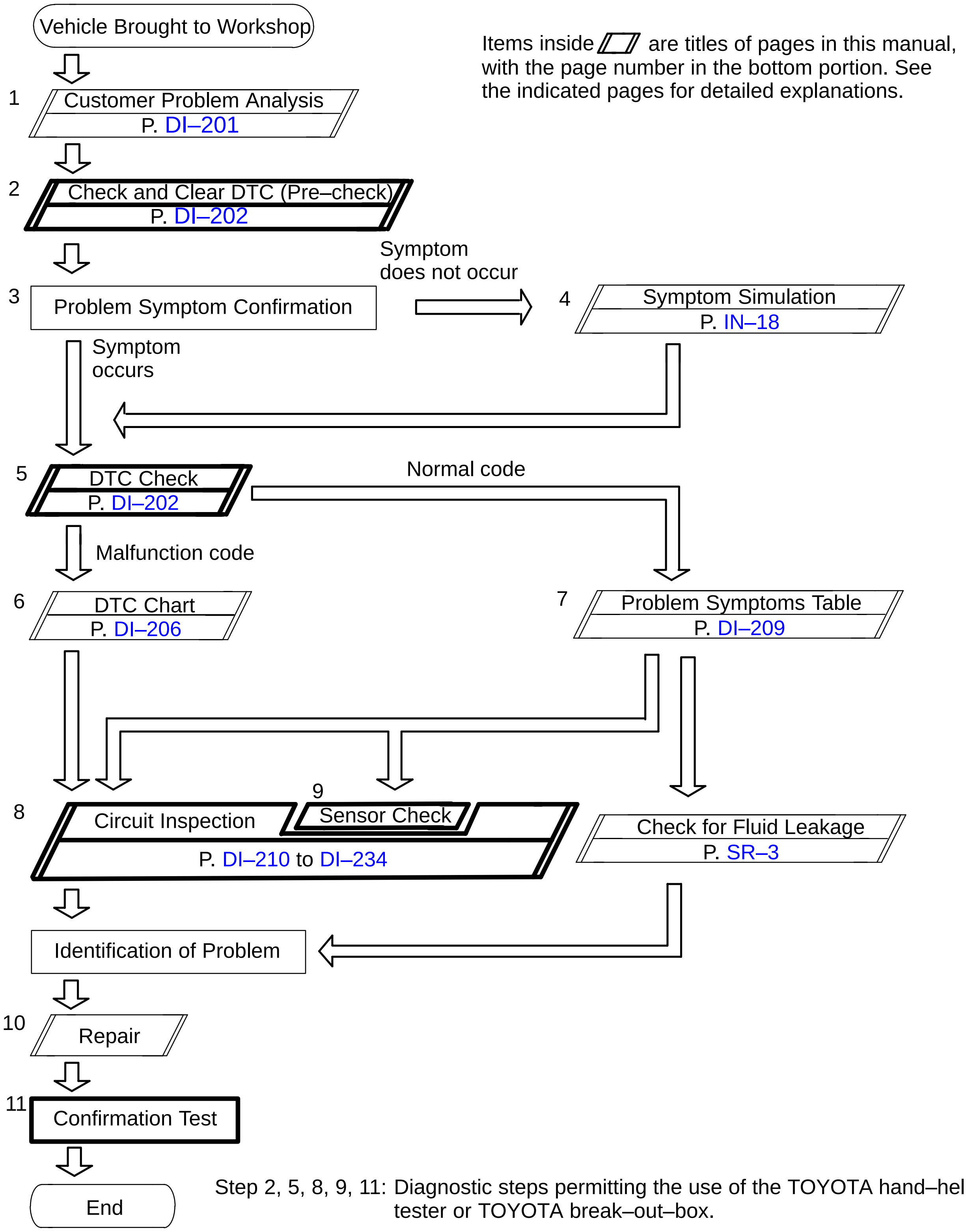
F11757

ELECTRO–HYDRAULIC POWER STEERING

HOW TO PROCEED WITH TROUBLESHOOTING

DI7C2–01

Troubleshooting in accordance with the procedure on the following pages.



Step 2, 5, 8, 9, 11: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

DI7C3–01

CUSTOMER PROBLEM ANALYSIS CHECK

EHPS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

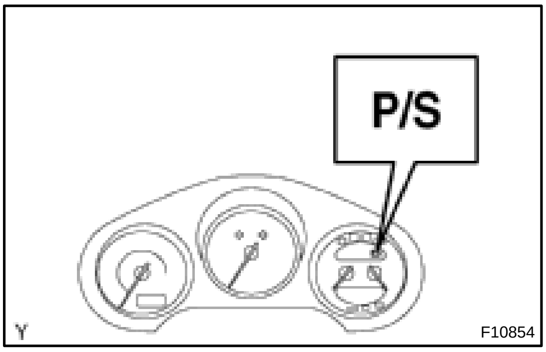
Symptoms	☐ P/S does not operate.	
	☐ P/S does not operate efficiently.	
	☐ At the time of idling, steering control force is great. (Rest swing is heavy).	
	☐ Even if the vehicle speed is increased, steering effort does not become greater.	
	P/S Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI7C4–01

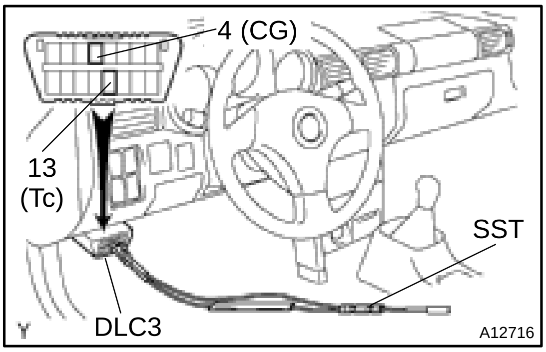
PRE–CHECK

1. DIAGNOSIS SYSTEM

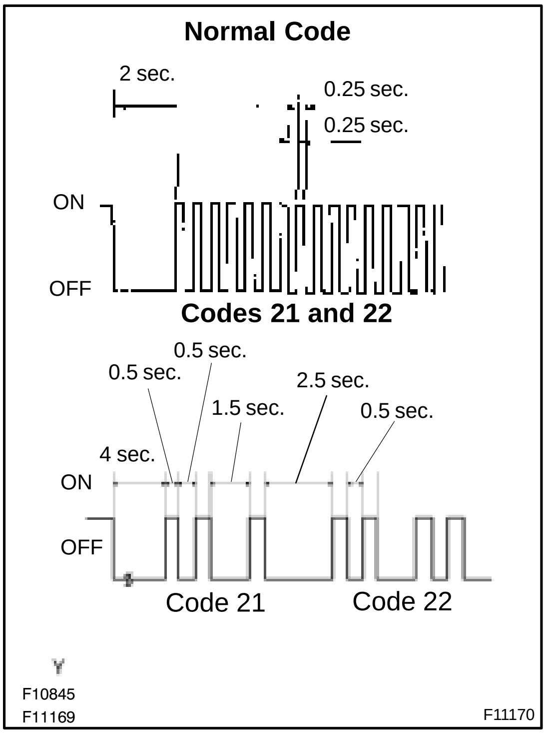


(a) Check the indicator.
When the ignition switch is turned ON, check that the P/S warning light goes on for 2 seconds.

HINT:
If the indicator check result is not normal, proceed to troubleshooting for the P/S warning light circuit (See page DI–227).

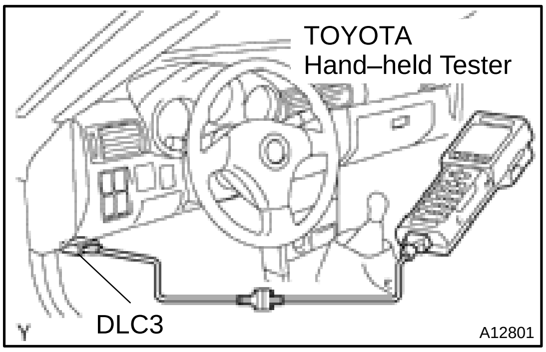


(b) In case of not using TOYOTA hand–held tester:
Check the DTC.
(1) Using SST, connect terminals Tc and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) Read the DTC from the P/S warning light on the combination meter.



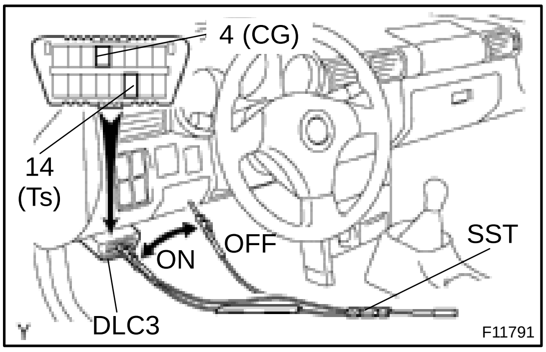
HINT:
- If no code appears, inspect the diagnostic circuit and P/S warning light circuit (See page DI–227 or DI–230).
- As an example, the blinking patterns for normal code and codes 21 and 22 are shown on the left.

(4) Codes are explained in the DTC chart on page DI–206.
(5) After completing the check, disconnect terminals Tc and CG of the DLC3, and turn off the display.
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.

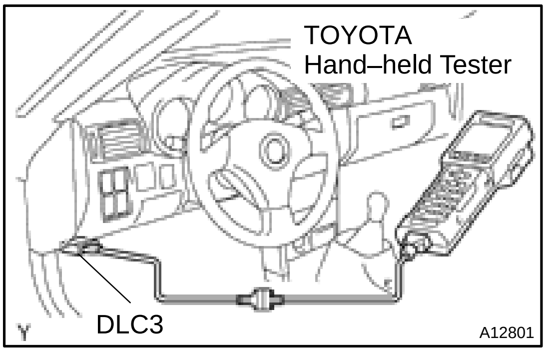


(c) In case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Read the DTC by following the prompts on the tester screen.

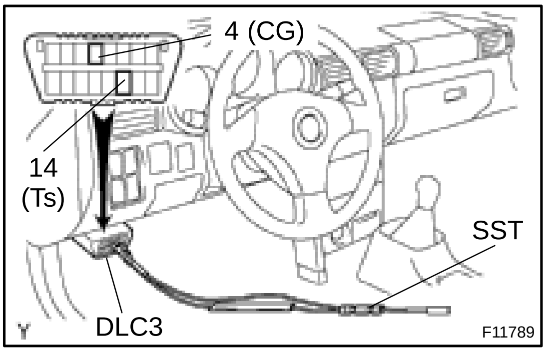
HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.



(d) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch ON.
(3) By making CG terminal ON and OFF 4 times within 8 seconds, delete DTC of the ECU.
If making CG terminal ON and OFF within 0.1 second, DTC of will not be deleted.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of the DLC3.
SST 09843–18040



(e) In case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Operate the TOYOTA hand–held tester to erase the codes. (See TOYOTA hand–held tester operator's manual.)

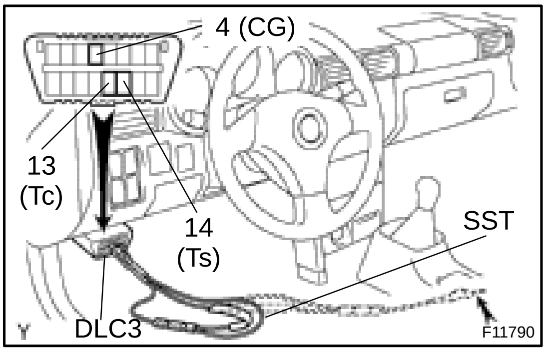


2. INPUT SIGNAL CHECK (TEST MODE)

(a) In case of not using TOYOTA hand–held tester:
Check the input signal.
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminals Ts and CG of the DLC3.
SST 09843–18040
(3) Start the engine.
(4) Check that the P/S warning light goes on.

HINT:
If the P/S warning light does not go on, inspect the P/S warning light circuit (See page DI–227).

(5) Drive vehicle straight forward at the speed faster than 20 km/h (12 mph) for several seconds.
(6) Stop the vehicle.



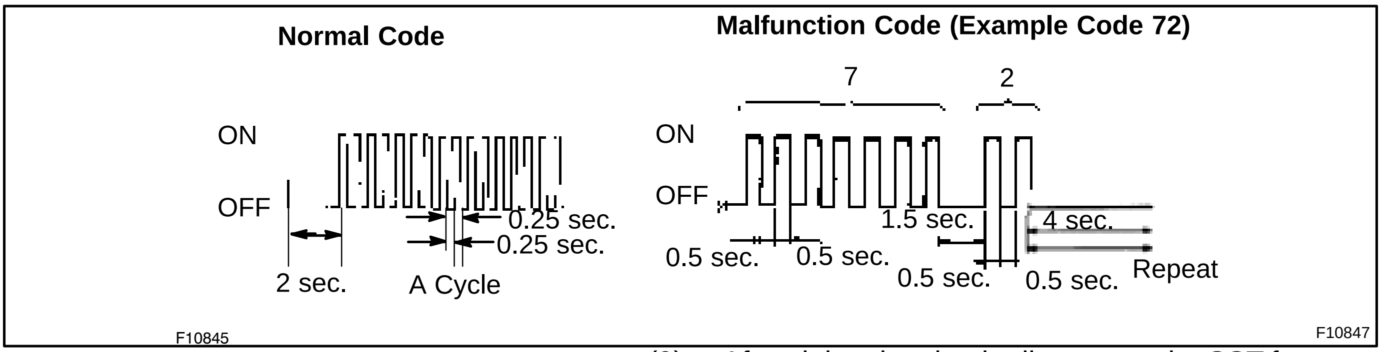
(7) Using SST, connect terminals Tc and CG of the DLC3.

SST 09843–18040

(8) Read the number of blinks of the P/S warning light.

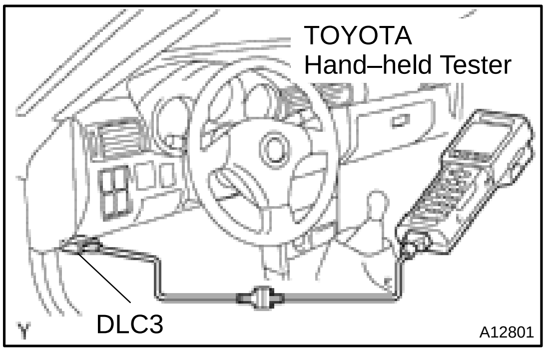
HINT:

- See the list of DTC shown on the bottom of this page.
- Even a sensor is normal, it outputs code 72 during test mode.
- Whether or not the sensor is normal can be judged if the warning light goes off during driving.



(9) After doing the check, disconnect the SST from terminals Ts, Tc and CG of the DLC3, and turn the ignition switch OFF.

SST 09843–18040



(b) In case of using TOYOTA hand–held tester:
Check the input signal.

(1) Hook up the TOYOTA hand–held tester to the DLC3.

(2) Do steps (3) to (6) on the previous page.

(3) Read the DTC by following the prompts on the tester screen.

HINT:

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

DTC of input signal check function:

Code No. (See page)	Diagnosis	Trouble Area
C1572/72 (DI–222)	Speed sensor malfunction (Test mode)	• Right front, left front, right rear, left rear or speed sensor • Sensor installation • Right front, left front, right rear, left rear or speed sensor rotor • Right front, left front, right rear, left rear or speed sensor circuit • ABS ECU • Combination meter • Vane pump assembly with motor

DI7C5–01

DIAGNOSTIC TROUBLE CODE CHART

HINT:

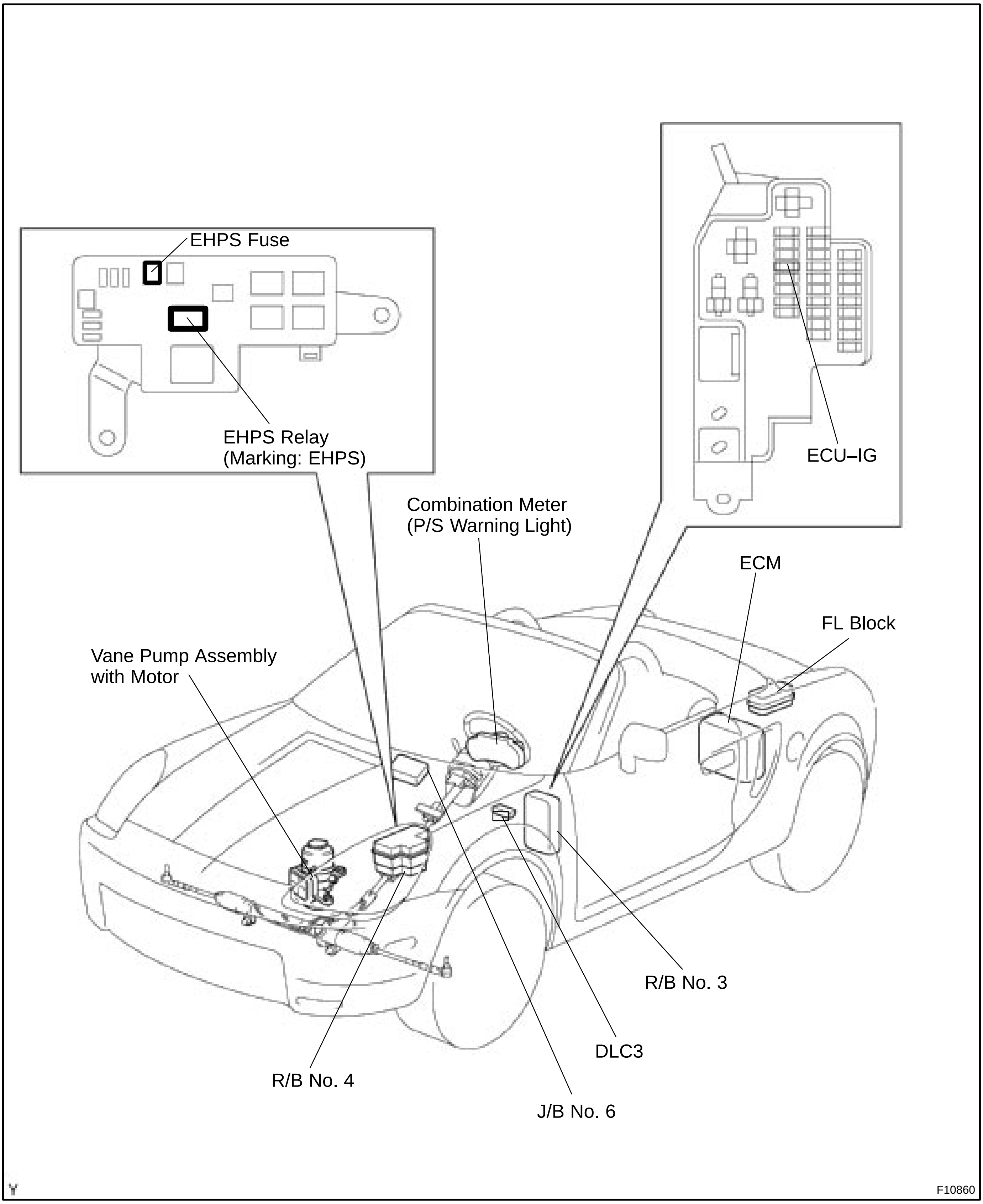
- Using SST 09843–18040, connect terminals Tc and CG of the DLC3.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, turn to the page referred to under the "See page" for respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
C1521/21 (DI–210)	Power Steering Motor Malfunction	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1522/22 (DI–210)	Power Steering Motor Malfunction	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1523/23 (DI–210)	Power Steering Motor Malfunction	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1533/33 (DI–214)	Power Steering ECU Malfunction	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1539/39 (DI–214)	Power Steering ECU Malfunction	Vane pump assembly with motor
C1552/52 (DI–218)	PIG Power Source Drop Voltage Malfunction	• Open EHPS relay circuit • EHPS relay • Vane pump assembly with motor
C1553/53 (DI–221)	When resetting voltage, vehicle is being driven	Vane pump assembly with motor
Always ON (DI–224)	Malfunction in ECU	• Charging system • Power source circuit • Vane pump assembly with motor

HINT:
There is a case that TOYOTA hand–held tester cannot be used when P/S warning light is always on.

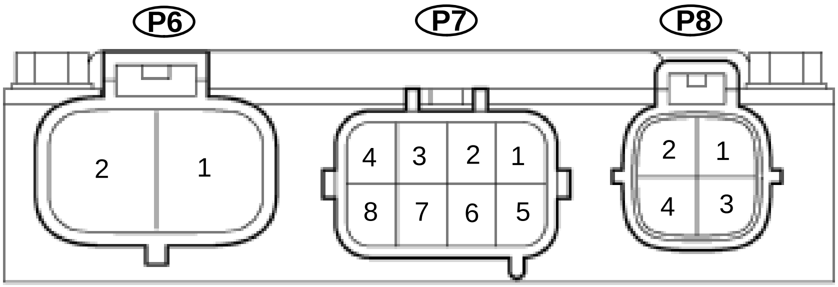
DI7C6–01

PARTS LOCATION



DI7C7–01

TERMINALS OF ECU



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
MH (P6–1) – PGND (P6–2)	W–G ↔ W–B	IG switch ON, After 1 sec. or more	10 – 14
IDUP (P7–1) – PGND (P6–2)	L–O ↔ W–B	Idling	10 – 14
SPD (P7–2) – PGND (P6–2)	V–W ↔ W–B	IG switch ON, When vehicle speed 12 mph (20 km/h)	Pulse generation (Se page DI–222)
Tc (P7–3) – PGND (P6–2)	P–B ↔ W–B	IG switch ON, Tc terminal ON	Below 1.0
		IG switch ON, Tc terminal OFF	5
MRLY (P7–5) – PGND (P6–2)	W–L ↔ W–B	IG switch ON, After 1 sec. or more	Below 1.0
EFI (P7–6) – PGND (P6–2)	W–G ↔ W–B	Idling	5
Ts (P7–7) – PGND (P6–2)	G–R ↔ W–B	IG switch ON, Ts terminal ON	Below 1.0
		IG switch ON, Ts terminal OFF	5
IGB (P8–1) – PGND (P6–2)	B–R ↔ W–B	IG switch ON	10 – 14
SIL (P8–2) – PGND (P6–2)	W–G ↔ W–B	IG switch ON	10 – 14
WL (P8–4) – PGND (P6–2)	W ↔ W–B	After IG switch ON and P/S warning light turns on for 2 sec., then it goes off	Below 1.0

DI7C8–01

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

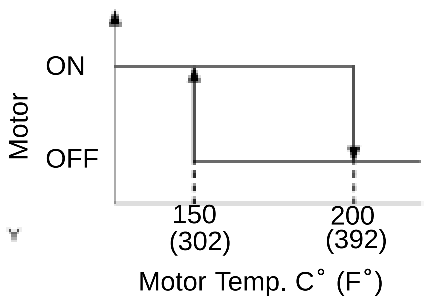
Symptom	Suspected Area	See page
At the time of idling, steering control force is great (Rest swing is heavy).	Only when 1. to 5. are all normal and the problem is still occurring, replace the vane pump assembly with motor. 1. Check the DTC reconfirming that the normal code is output. 2. Power source circuit 3. Speed sensor circuit 4. EHPS relay	DI–202 DI–218 DI–222 DI–218
Even if the vehicle speed is increased, steering effort does not become greater.	Only when 1. to 3. are all normal and the problem is still occurring, replace the vane pump assembly with motor. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. EHPS relay	DI–202 DI–222 DI–218
P/S warning light abnormal.	1. P/S warning light circuit 2. Vane pump assembly with motor	DI–227
DTC check cannot be done.	Only when 1. and 2. are all normal and the problem is still occurring, replace the vane pump assembly with motor. 1. P/S warning light circuit 2. Tc terminal circuit	DI–227 DI–230
Speed sensor signal check cannot be done.	1. Ts terminal circuit 2. Vane pump assembly with motor	DI–232

DI7C9–01

CIRCUIT INSPECTION

DTC	C1521/21 – C1523/23	Power Steering Motor Malfunction

CIRCUIT DESCRIPTION



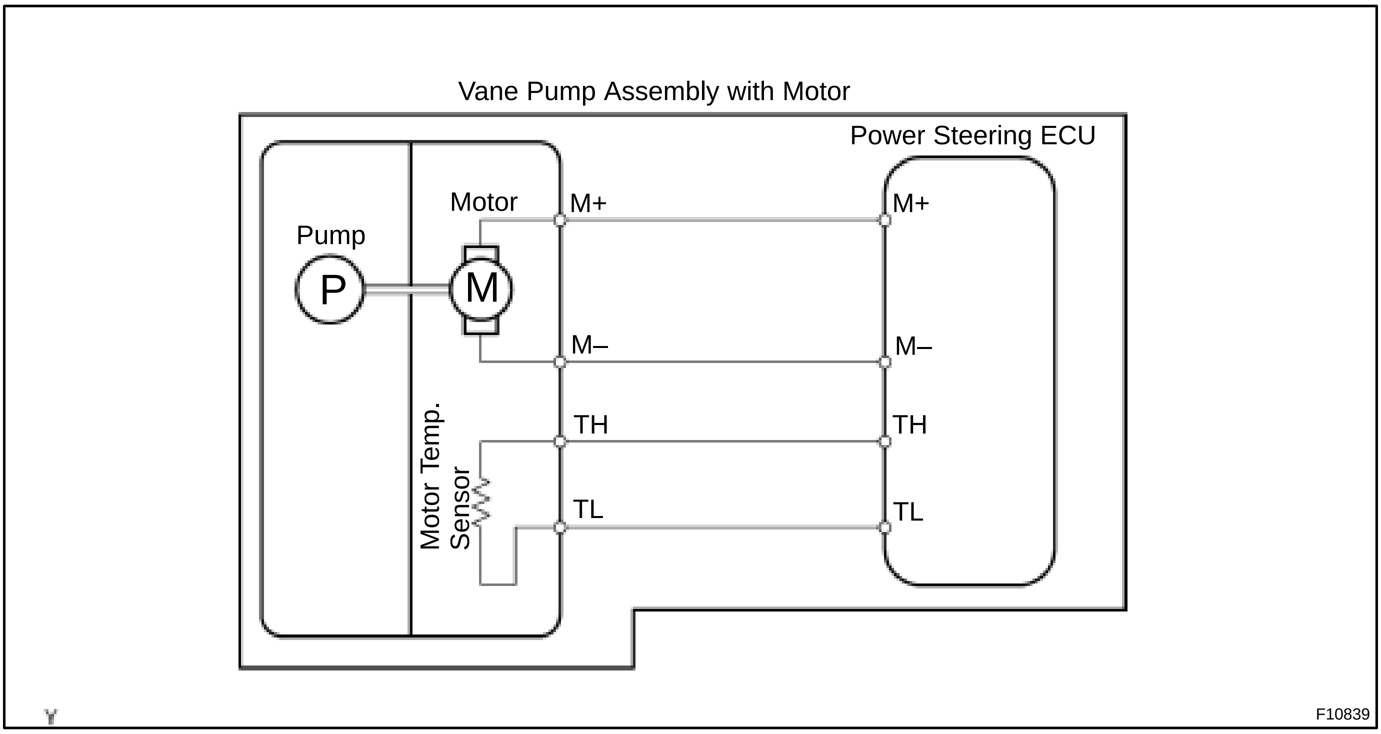
F10855

Motor temp. sensor is built in the vane pump assembly with motor and detects the motor brash holder temperature. If the motor brash holder temperature has become higher than 200˚C (390˚F) continuously for longer than 0.1 second, the system stops for a time and returns if the temperature has become lower than 150˚C (302˚F) for longer than 1 second.

DTC No.	DTC Detection Condition	Trouble Area
C1521/21	Condition 1., 2. or 3. continues: 1. Motor temp. 200˚C (390˚F) or more for 0.1 sec. or more 2. Motor average current for 96 sec. is 40 A or more 3. Motor average current for 248 sec. is 33 A or more	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1522/22	Condition below continues for 1 sec. or more: Motor temp. 250˚C (482˚F) or more	• Motor temp. sensor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1523/23	Condition below continues for 0.1 sec. or more: Motor current 100A or more	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor

Fail safe function:
C1521/21:
If vane pump assembly with motor detects the malfunction of the overheating of the motor, vane pump assembly with motor stops the motor from operating.
C1522/22:
If there is short circuit in motor temperature sensor circuit, the vane pump assembly with motor prohibits the motor from operating.
C1523/23:
If vane pump assembly with motor detects the malfunction of over current to the vane pump assembly with motor, vane pump assembly with motor stops EHPS system.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of P/S warning light.**

PREPARATION:

(a) Turn the ignition switch OFF.

(b) Turn the ignition switch ON.

CHECK:

After the ignition switch is turned on and P/S warning light turns on for two second, then it goes off.

YES → **No problem.**

NO

2	**Is DTC output?**

Check DTC on page DI–202.

YES → **Repair circuit indicated by code output.**

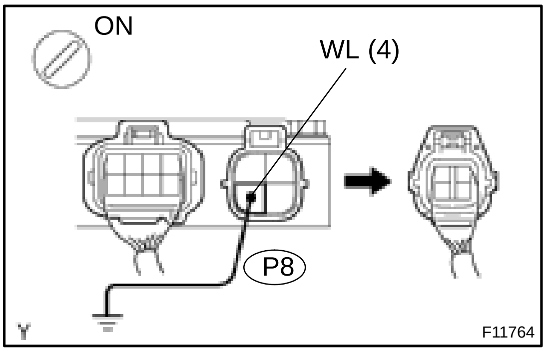
NO

3	**Is normal code displayed?**

YES → **Check and replace vane pump assembly with motor.**

NO

4	**Check P/S warning light.**



PREPARATION:

(a) Disconnect the P8 connector from the vane pump assembly with motor.

(b) Connect terminal WL (P8–4) of the vane pump assembly with motor and body ground.

(c) Turn the ignition switch ON.

CHECK:

Check the P/S warning light goes off.

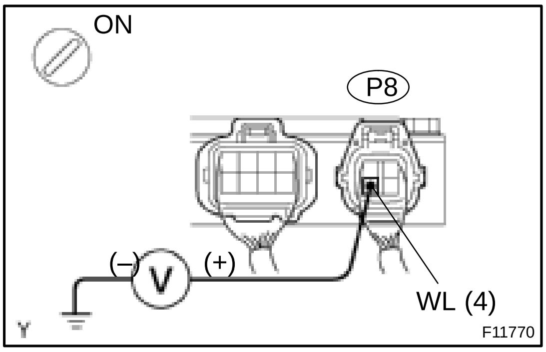
OK:

Voltage: 10 – 14 V

NO → **Check and replace bulb or combination meter assembly.**

YES

5	**Check voltage between terminal WL (P8–4) of vane pump assembly with motor connector and body ground.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal WL (P8–4) of the vane pump assembly with motor connector and body ground.

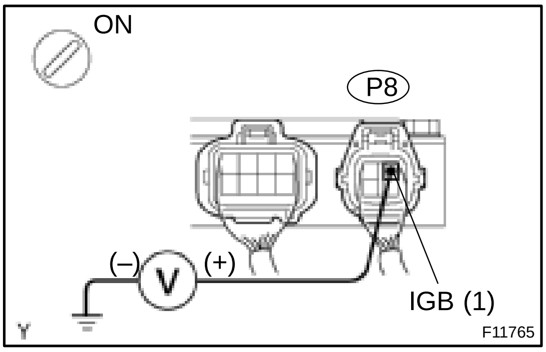
OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

YES

6	Check voltage between terminal IGB (P8–1) of vane pump assembly with motor connector and body ground.



CHECK:
Measure the voltage between terminal IGB (P8–1) of the vane pump assembly with motor connector and body ground.

OK:

Voltage: 10 – 14 V

NG → **Check DTC C1552/52 (See page DI–218).**

OK

Check and replace vane pump assembly with motor.

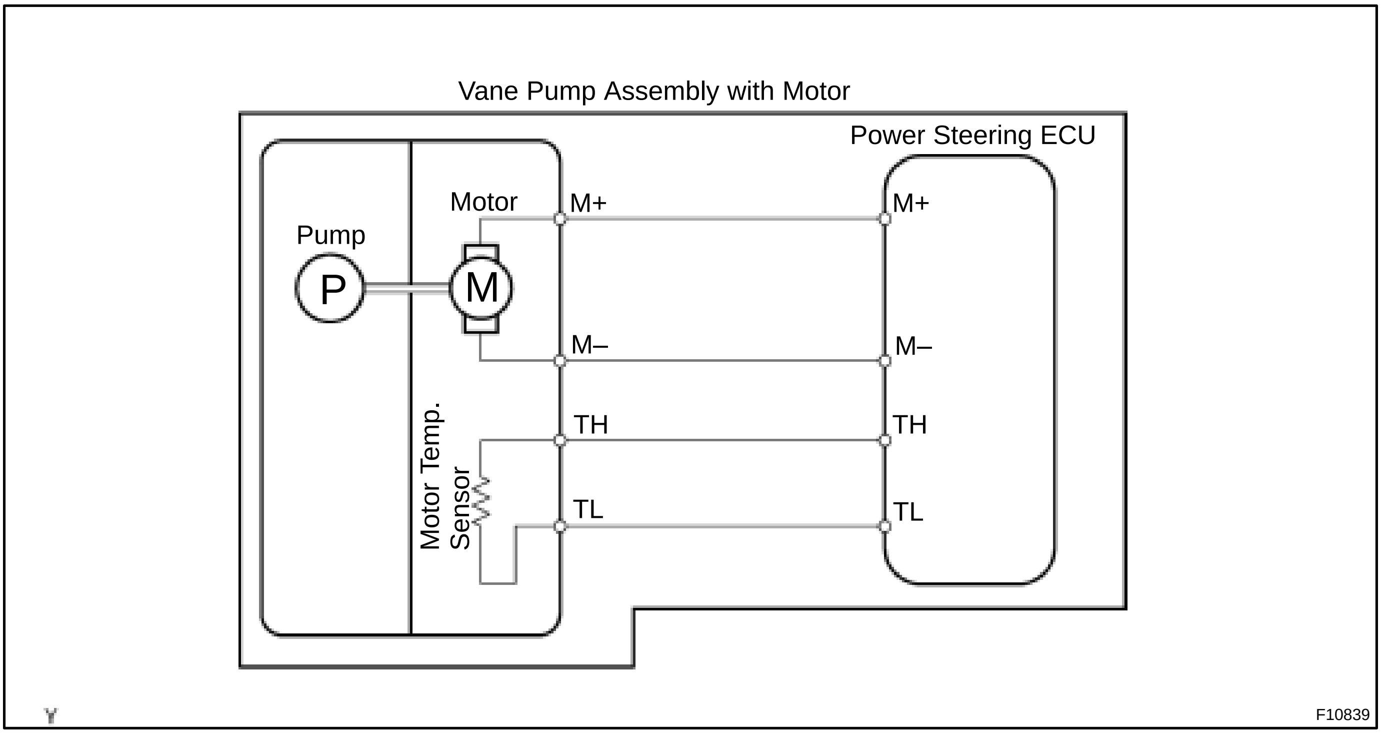
DI7CA–01

DTC	C1533/33 – C1539/39	Power Steering ECU Malfunction

DTC No.	DTC Detection Condition	Trouble Area
C1533/33	Condition below continues for 10 sec. or more: MH terminal voltage – M+ terminal voltage ≧ 10 V	• Power steering motor (built in vane pump assembly with motor) • Vane pump assembly with motor
C1539/39	When the E^2PROM of the ECU has become abnormal	• Vane pump assembly with motor

Fail safe function:
C1533/33:
The vane pump assembly with motor compare the instructed motor voltage and real motor voltage, if those are different, the vane pump assembly with motor prohibits the motor from operating.
C1539/39:
If the ECU detects the malfunction of E^2PROM, ECU fixes the operating of the EHPS system.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of P/S warning light.**

PREPARATION:

(a) Turn the ignition switch OFF.

(b) Turn the ignition switch ON.

CHECK:

After the ignition switch is turned on and P/S warning light turns on for 2 seconds, then it goes off.

YES → **No problem.**

NO ↓

2	**Is DTC output?**

Check DTC on page DI–202.

YES → **Repair circuit indicated by code output.**

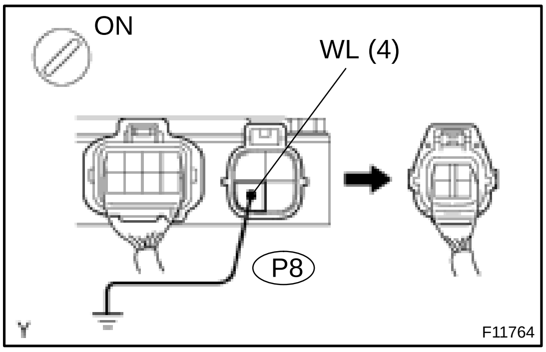
NO ↓

3	**Is normal code displayed?**

YES → **Check and replace vane pump assembly with motor.**

NO ↓

4	**Check P/S warning light.**



PREPARATION:
(a) Disconnect the P8 connector from the vane pump assembly with motor.
(b) Connect terminal WL (P8–4) of the vane pump assembly with motor and body ground.
(c) Turn the ignition switch ON.

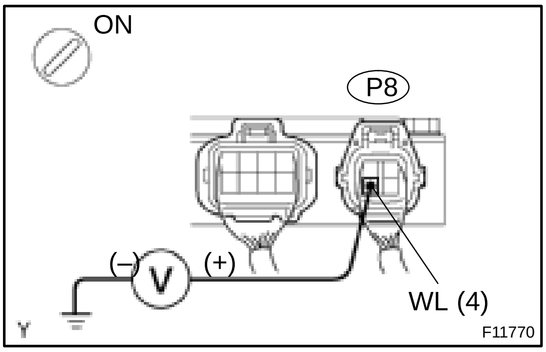
CHECK:
Check the P/S warning light goes off.

OK:
Voltage: 10 – 14 V

NO → **Check and replace bulb or combination meter assembly.**

YES

5	**Check voltage between terminal WL (P8–4) of vane pump assembly with motor connector and body ground.**



PREPARATION:
Turn the ignition switch ON.

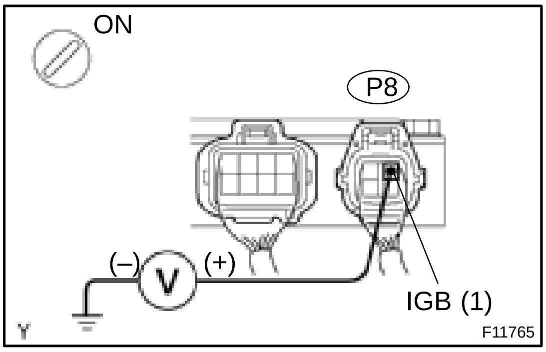
CHECK:
Measure the voltage between terminal WL (P8–4) of the vane pump assembly with motor connector and body ground.

OK:
Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

YES

6	**Check voltage between terminal IGB (P8–1) of vane pump assembly with motor connector and body ground.**



CHECK:
Measure the voltage between terminal IGB (P8–1) of the vane pump assembly with motor connector and body ground.
OK:
Voltage: 10 – 14 V

NG → **Check DTC C1552/52 (See page DI–218).**

OK

Check and replace vane pump assembly with motor.

DI7CB–01

DTC	C1552/52	PIG Power Source Drop Voltage

CIRCUIT DESCRIPTION

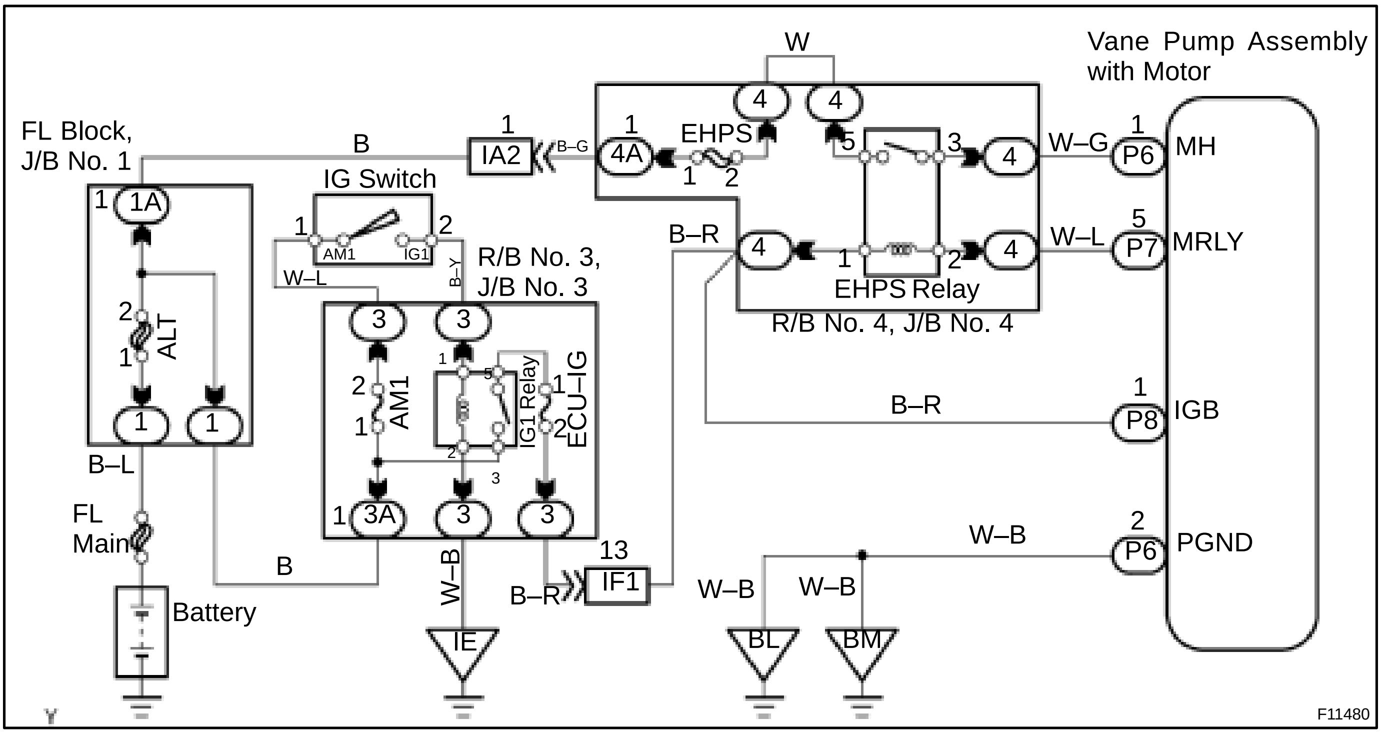
This circuit provides power to the vane pump assembly with motor.

DTC No.	DTC Detection Condition	Trouble Area
C1552/52	Conditions 1. and 2. continue for 1 sec. or more: 1. Power steering ECU terminal MH voltage is 2 V or less 2. EHPS relay is ON	• Open EHPS relay circuit • EHPS relay • Vane pump assembly with motor

Fail safe function:

If the vane pump assembly with motor detects the malfunction of the power source circuit, the vane pump assembly with motor prohibits the motor from operating and informs the malfunction by lighting up P/S warning light.

WIRING DIAGRAM



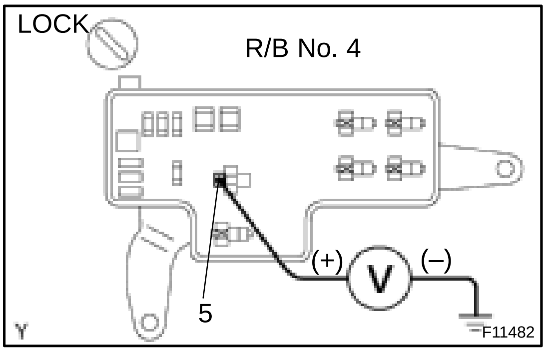
INSPECTION PROCEDURE

1	Check P/S warning light.

NG | **See combination meter troubleshooting on page BE–2.**

OK

2 Check voltage between terminal 5 of R/B No. 4 (for EHPS relay) and body ground.

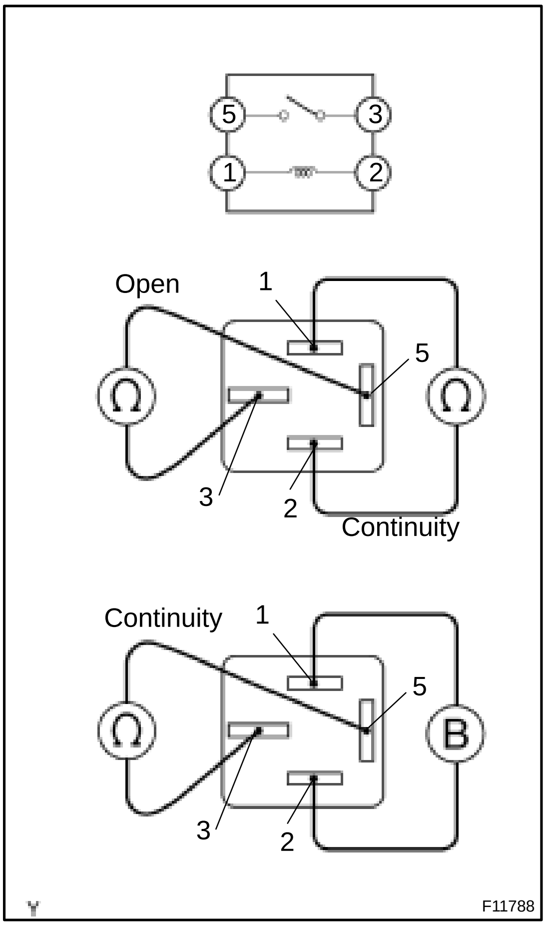


PREPARATION:
Remove the EHPS relay from the R/B No. 4.
CHECK:
Measure the voltage between terminal 5 of the R/B No. 4 (for EHPS relay) and body ground.
OK:
Voltage: 10 – 14 V

NG → **Check and repair harness or connector between R/B No. 4 and battery.**

OK

3 Check EHPS relay



PREPARATION:
Remove the EHPS relay from the R/B No. 4.
CHECK:
Check the continuity between each terminal of the EHPS relay.
OK:

Terminals 1 and 2	Continuity (Reference value 80Ω)
Terminals 3 and 5	Open

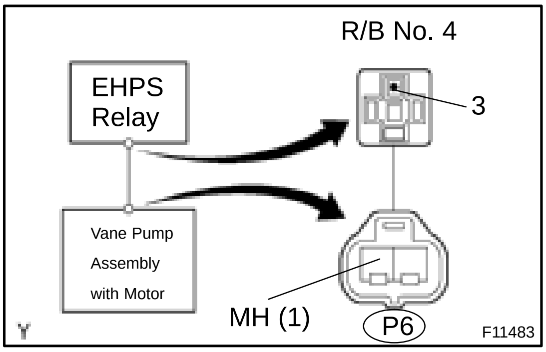
CHECK:
(a) Apply battery positive voltage between terminals 1 and 2.
(b) Check the continuity between the terminals.
OK:

Terminals 3 and 5	Continuity

NG → **Replace EHPS relay.**

OK

4	**Check continuity between terminal 3 of R/B No. 4 (for EHPS relay) and terminal MH (P6–1) of vane pump assembly with motor connector.**



CHECK:

Check the continuity between terminal 3 of the R/B No. 4 (for EHPS relay) and terminal MH (P6–1) of the vane pump assembly with motor connector.

OK:

Continuity

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

OK

Check and replace vane pump assembly with motor.

DI7CC–01

DTC	C1553/53	When resetting voltage, vehicle is being driven

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1553/53	ECU internal malfunction	• Vane pump assembly with motor

Fail safe function:
If there is resetting of the voltage of the vane pump assembly with motor, the vane pump assembly with motor prohibits the EHPS system from operating.

INSPECTION PROCEDURE

HINT:
- In case the ECU detects that the ignition switch turns ON – OFF – ON while driving and starting the system, DTC C1553/53 is output.
- Stop the vehicle and start the system by turning the ignition switch OFF – ON. Then DTC 1553/53 will not be output.

1	Check output DTC C1553/53 when turning the ignition switch from OFF to ON.

YES → **Check and replace vane pump assembly with motor.**

NO

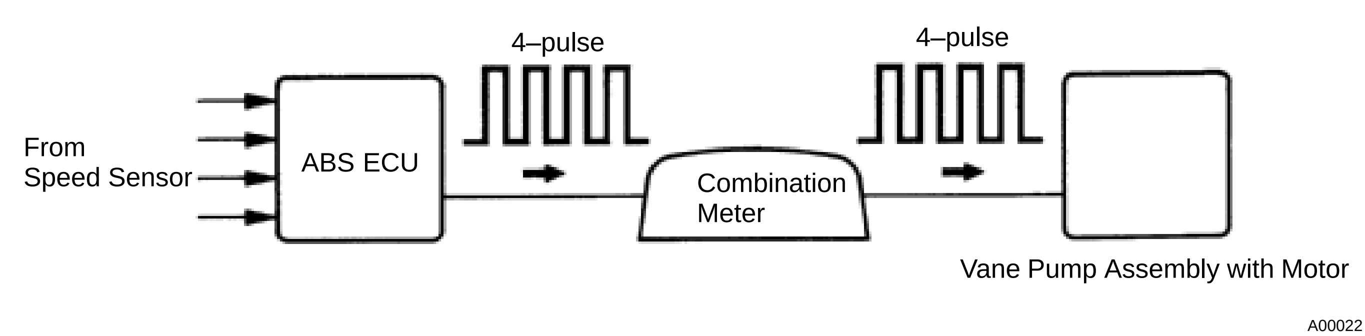
Clear DTC.

DI7CD–01

DTC	C1572/72	Speed Sensor Signal Malfunction

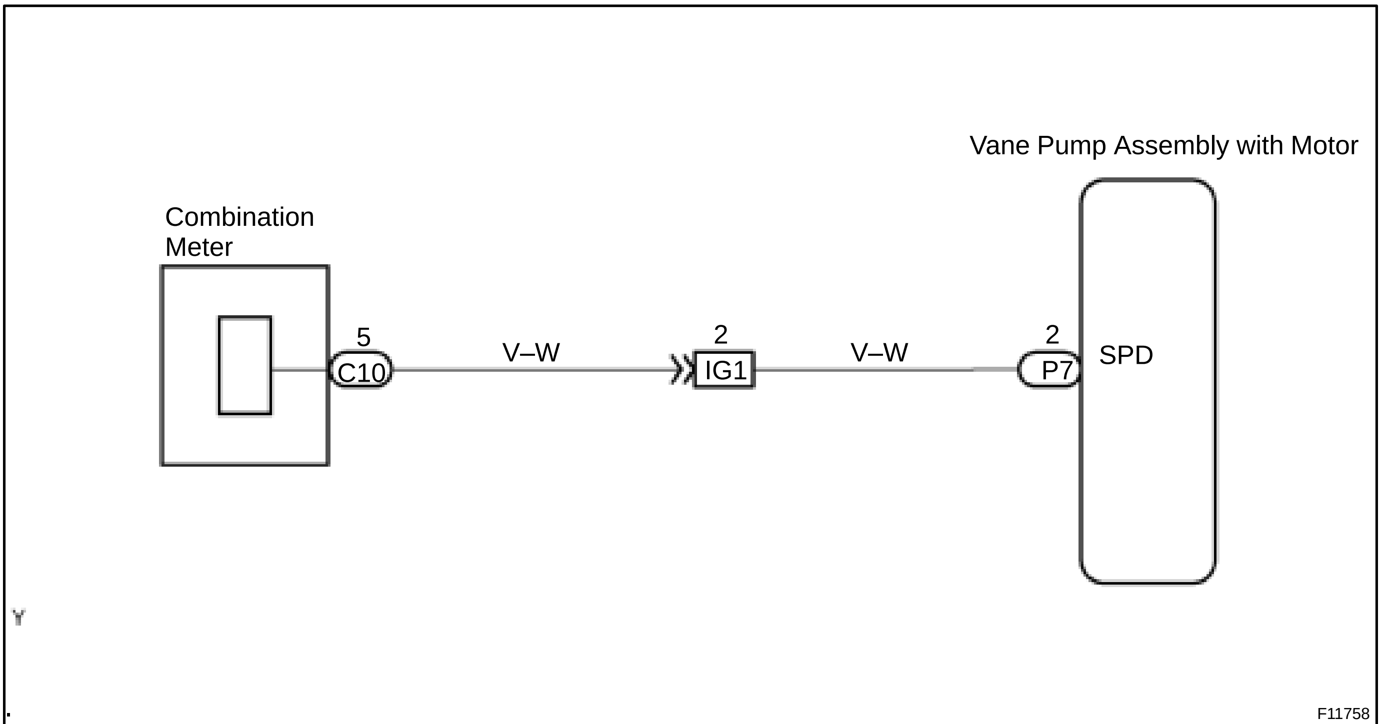
CIRCUIT DESCRIPTION

The speed sensor for ABS detects the wheel speed and sends the appropriate signals to the ABS ECU. The ECU converts these signals into a 4–pulse signal and outputs it to the combination meter.
After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the vane pump assembly with motor. The vane pump assembly with motor determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
C1572/72	Vehicle speed 12 mph (20 km/h) or higher signal is not input (Test mode)	• Right front, left front, right rear, left rear or speed sensor • Sensor installation • Right front, left front, right rear, left rear or speed sensor rotor • Right front, left front, right rear, left rear or speed sensor circuit • ABS ECU • Combination meter • Vane pump assembly with motor

WIRING DIAGRAM



INSPECTION PROCEDURE

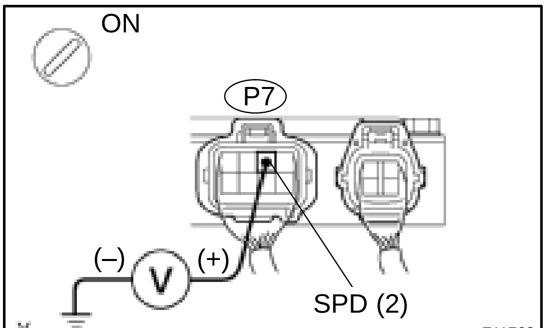
1	**Check operation of speedometer.**

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.**

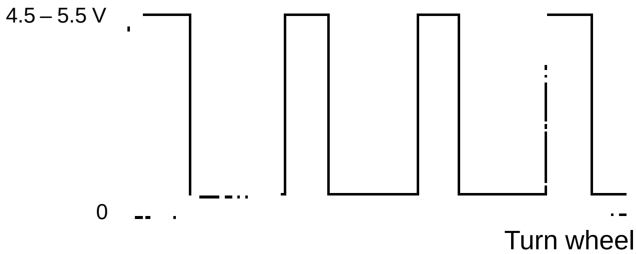
OK

2	**Check voltage between terminal SPD (P7–2) of vane pump assembly with motor connector and body ground.**



F11763

PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal SPD (P7–2) of the vane pump assembly with motor connector and body ground.
OK:
Voltage is generated intermittently



AT7809

NG → **Check and replace for open circuit in harness and connector between combination meter and vane pump assembly with motor.**

OK

Check and replace vane pump assembly with motor.

DI7CE–01

DTC	Always ON	Malfunction in ECU

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
Always ON	Either of the following 1. or 2. is detected: 1. The ECU connectors are not conneted with the ECU. 2. There is a malfunction in the ECU internal circuit.	• Charging system • Power source circuit • Vane pump assembly with motor

HINT:
There is a case where TOYOTA hand–held tester cannot be used when ECU is abnormal.

INSPECTION PROCEDURE

1	P/S warning light remains on.

GO

2	Is DTC output?

Check DTC on page DI–202.

YES → **Repair circuit indicated by code output.**

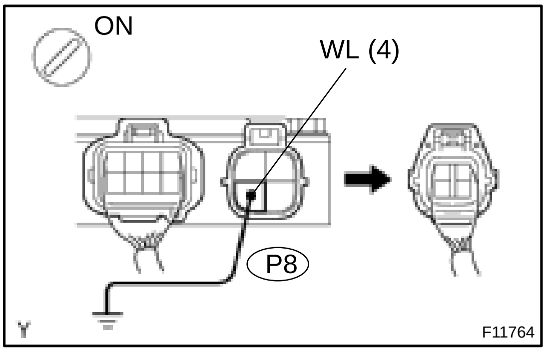
NO

3	Is normal code displayed?

YES → **Check and replace vane pump assembly with motor.**

NO

4	**Check P/S warning light.**



PREPARATION:

(a) Disconnect the P8 connector from the vane pump assembly with motor.
(b) Connect terminal WL (P8–4) of the vane pump assembly with motor and body ground.
(c) Turn the ignition switch ON.

CHECK:

Check the P/S warning light goes off.

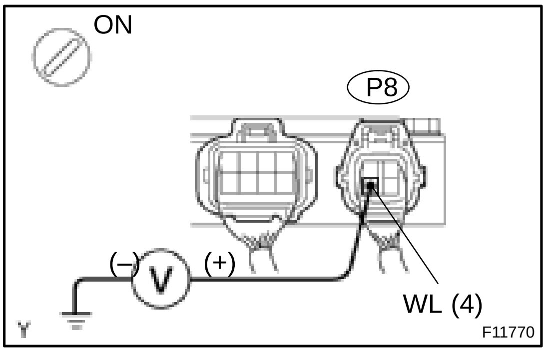
OK:

Voltage: 10 – 14 V

NO	**Check and replace bulb or combination meter assembly.**

YES

5	**Check voltage between terminal WL (P8–4) of vane pump assembly with motor connector and body ground.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal WL (P8–4) of the vane pump assembly with motor connector and body ground.

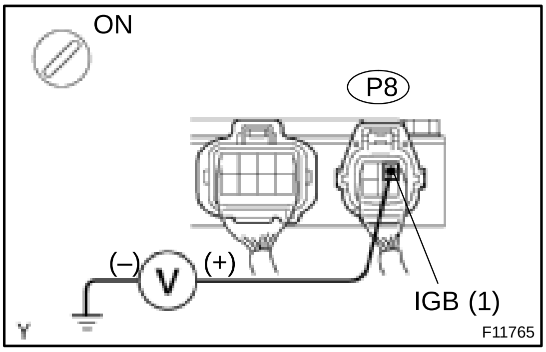
OK:

Voltage: 10 – 14 V

NG	**Check and repair harness or connector.**

YES

6	**Check voltage between terminal IGB (P8–1) of vane pump assembly with motor connector and body ground.**



CHECK:
Measure the voltage between terminal IGB (P8–1) of the vane pump assembly with motor connector and body ground.
OK:
Voltage: 10 – 14 V

NG	**Check DTC C1552/52 (See page DI–218).**

OK

Check and replace vane pump assembly with motor.

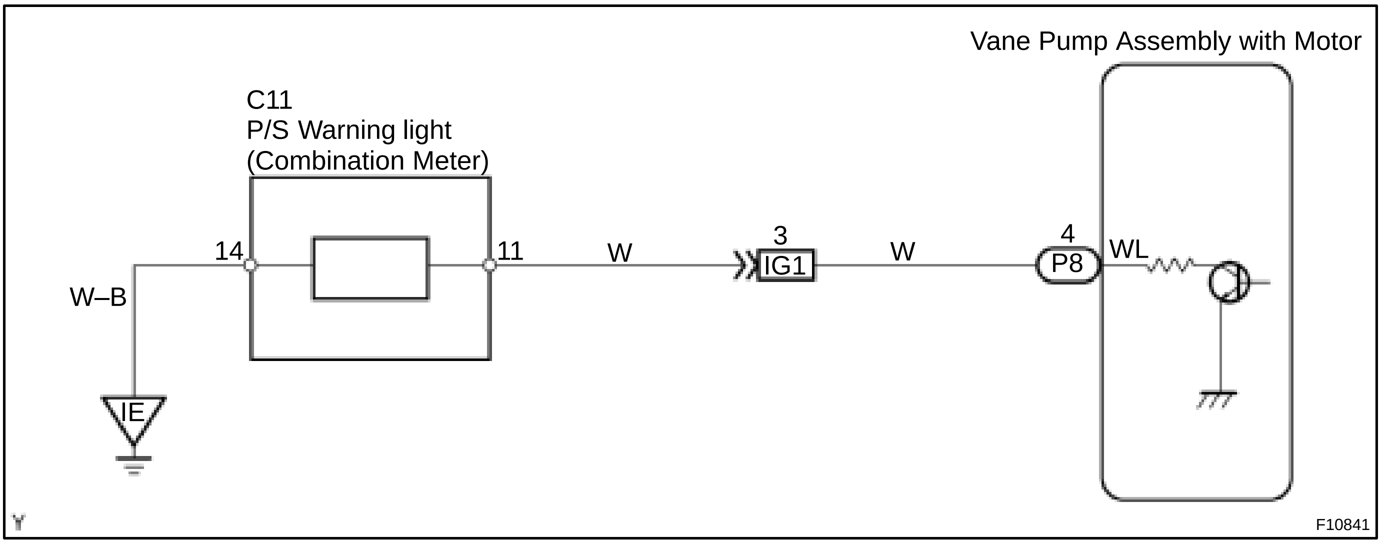
DI7CF–01

P/S Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the P/S warning light while at the same time prohibiting PS control. At this time, the ECU records a DTC in memory.
Connect terminals Tc and CG of the DLC3 to make the P/S warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Troubleshoot in accordance with the chart below for each trouble symptom.

P/S warning light does not light up	Go to step 1
P/S warning light remains on	Go to step 2

1	**Check P/S warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

2	Is DTC output?

Check DTC on page DI–202.

YES → **Repair circuit indicated by code output.**

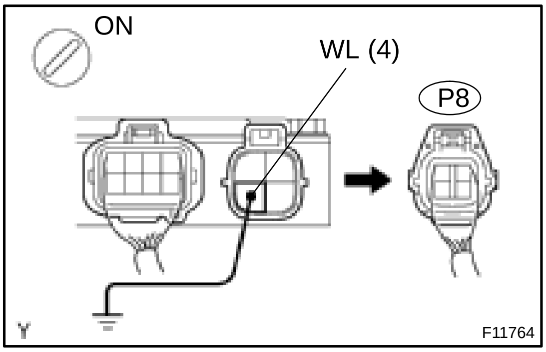
NO

3	Is normal code displayed?

YES → **Check and replace vane pump assembly with motor.**

NO

4	Check P/S warning light.



PREPARATION:

(a) Disconnect the P8 connector from the vane pump assembly with motor.

(b) Connect terminal WL (P8–4) of the vane pump assembly with motor and body ground.

(c) Turn the ignition switch ON.

CHECK:

Check the P/S warning light goes off.

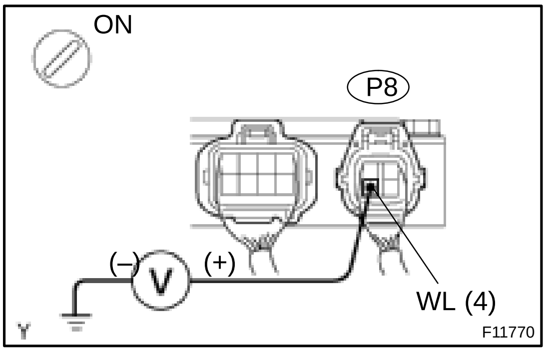
OK:

Voltage: 10 – 14 V

NO → **Check and replace bulb or combination meter assembly.**

YES

5	Check voltage between terminal WL (P8–4) of vane pump assembly with motor connector and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal WL (P8–4) of the vane pump assembly with motor connector and body ground.

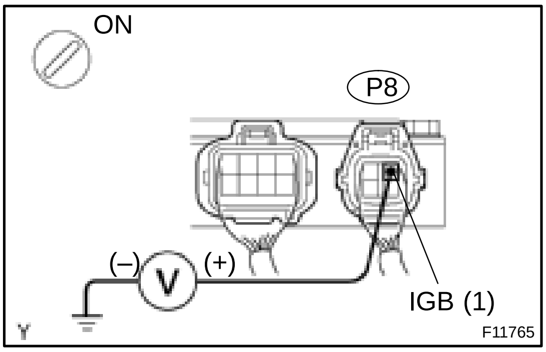
OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

YES

6	Check voltage between terminal IGB (P8–1) of vane pump assembly with motor connector and body ground.



CHECK:

Measure the voltage between terminal IGB (P8–1) of the vane pump assembly with motor connector and body ground.

OK:

Voltage: 10 – 14 V

NG → **Check DTC C1552/52 (See page DI–218).**

OK

Check and replace vane pump assembly with motor.

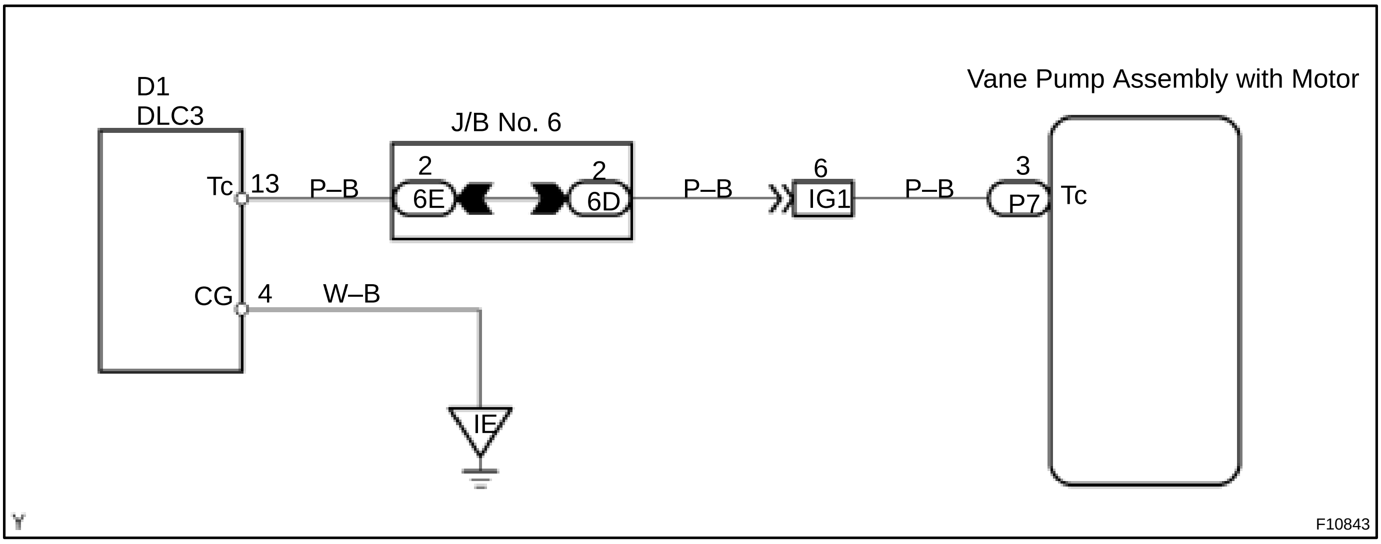
DI7CG–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

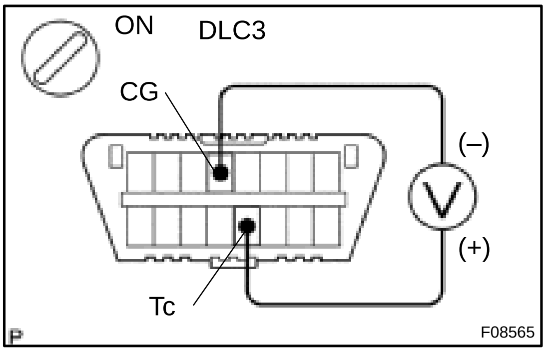
Connecting terminals Tc (13) and CG (4) of the DLC3 causes the vane pump assembly with motor to display the DTC by flashing the P/S warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals Tc (13) and CG (4) of DLC3.



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal Tc (13) and CG (4) of the DLC3.
OK:
Voltage: 5 V

OK — **If P/S warning light does not blink even after Tc and CG are connected, vane pump assembly with motor may be defective.**

NG

2	**Turn ignition switch OFF, and check for open and short circuit in harness and connector between vane pump assembly with motor and DLC3, and DLC3 and body ground (See page IN–28).**

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

OK

Check and replace vane pump assembly with motor.

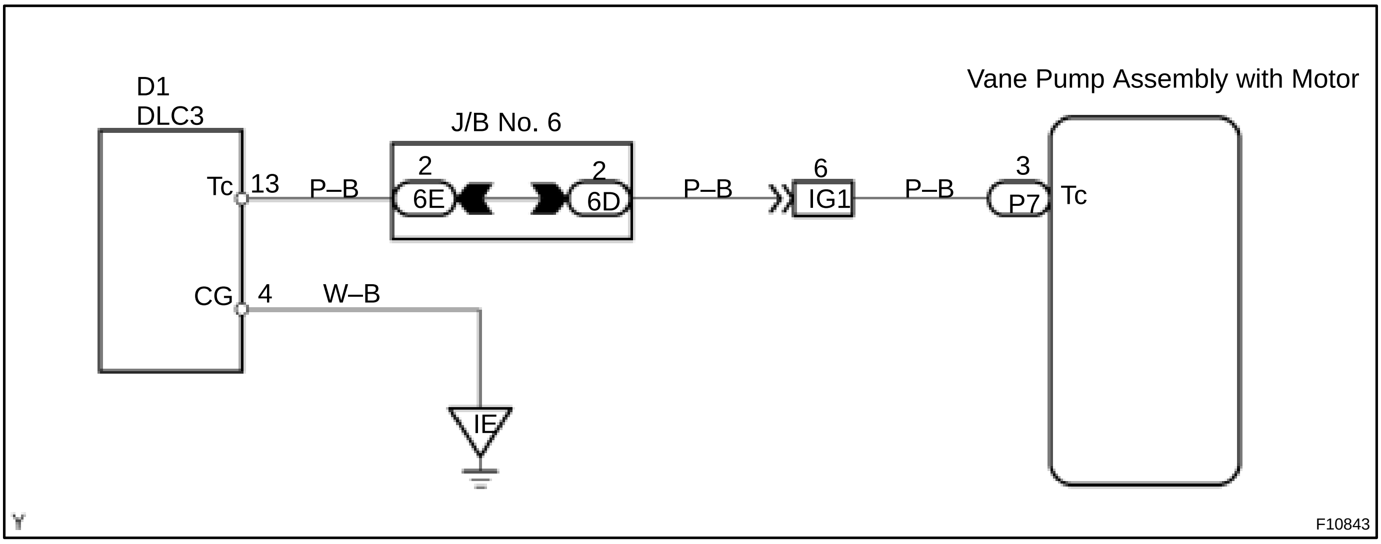
DI7CG–01

Tc Terminal Circuit

CIRCUIT DESCRIPTION

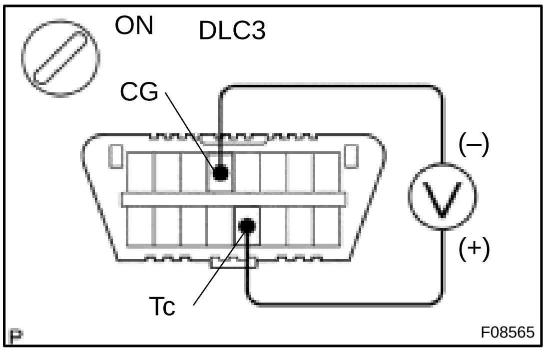
Connecting terminals Tc (13) and CG (4) of the DLC3 causes the vane pump assembly with motor to display the DTC by flashing the P/S warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals Tc (13) and CG (4) of DLC3.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal Tc (13) and CG (4) of the DLC3.

OK:

Voltage: 5 V

OK	If P/S warning light does not blink even after Tc and CG are connected, vane pump assembly with motor may be defective.

NG

2	Turn ignition switch OFF, and check for open and short circuit in harness and connector between vane pump assembly with motor and DLC3, and DLC3 and body ground (See page IN–28).

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

OK

Check and replace vane pump assembly with motor.

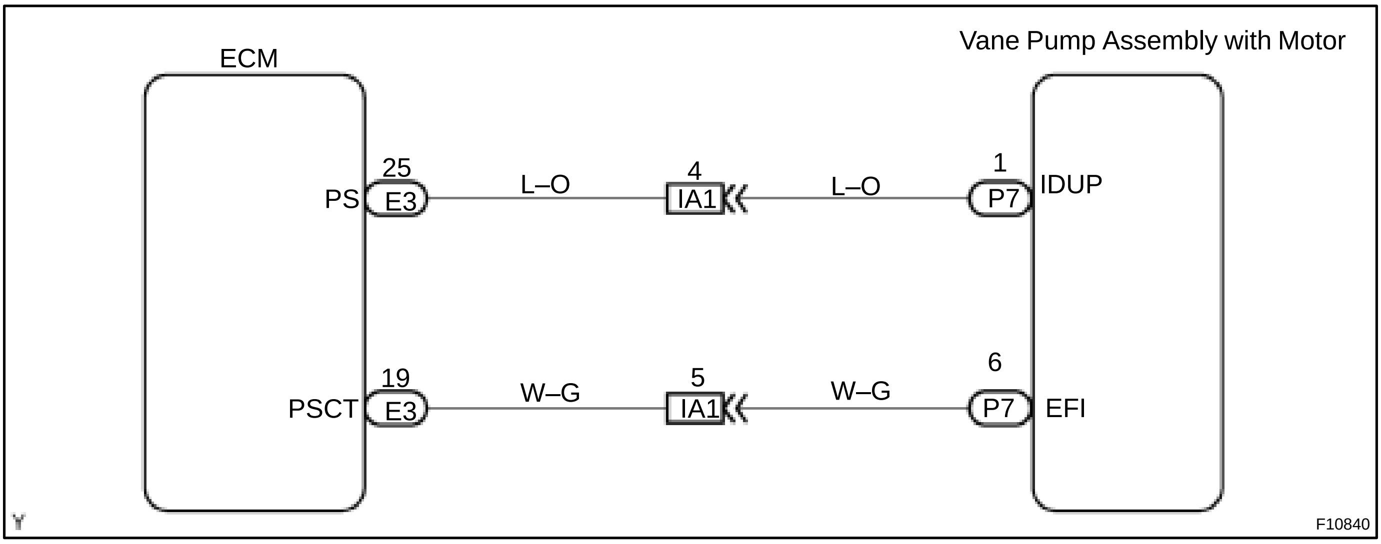
DI7CI–01

ECM Communication Circuit Malfunction

CIRCUIT DESCRIPTION

When the reduction of the engine load is necessary, ECM inputs the power steering stop signal to the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check for open and short circuit in harness and connector between vane pump assembly with motor and ECM.

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

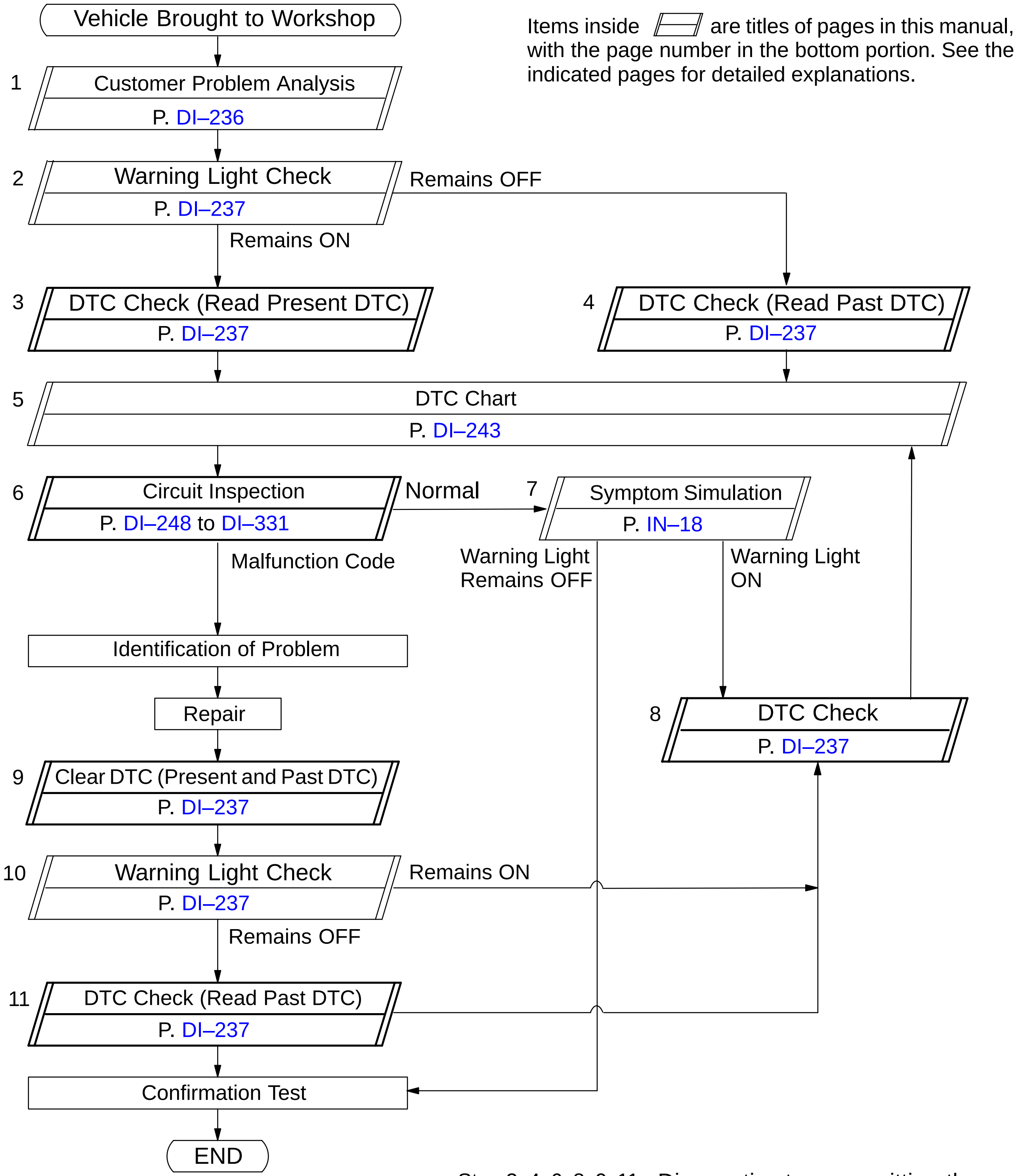
OK ↓

Check and replace vane pump assembly with motor.

SUPPLEMENTAL RESTRAINT SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI6OW–05



Step 3, 4, 6, 8, 9, 11 : Diagnostic steps permitting the use of the TOYOTA hand–held tester.

DI6OX–02

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name ____________________

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date Problem Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

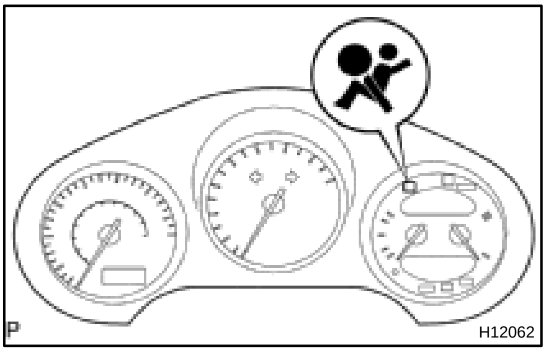
Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Conditions	
Details Of Problem	

Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnosis System Inspection

SRS Warning Light Inspection	1st Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
	2nd Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
DTC Inspection	1st Time	☐ Normal Code ☐ Malfunction Code [Code.]
	2nd Time	☐ Normal Code ☐ Malfunction Code [Code.]

DI6OY–04



PRE–CHECK

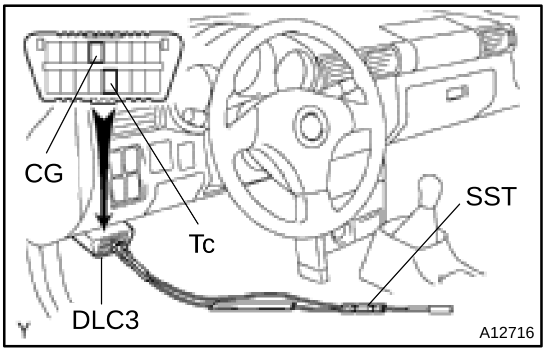
1. CHECK SRS WARNING LIGHT

(a) Turn the ignition switch ON, and check that the SRS warning light lights up.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely. Proceed to ”SRS Warning Light Circuit Malfunction” on page DI–326.



2. Using SST (diagnosis check wire No. 2): CHECK DTC

(a) Present troubles codes:
Output the DTC.

(1) Turn the ignition switch ON, and wait for approx. 20 seconds.

(2) Using SST, connect terminals Tc and CG of the DLC3.

SST 09843–18040

NOTICE:

Pay due attention to the terminal connecting position to avoid a malfunction.

(b) Past troubles codes:
Output the DTC.

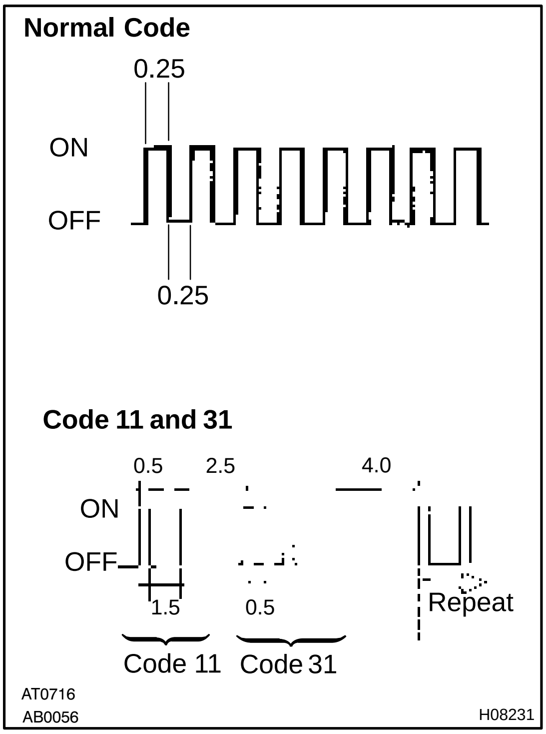
(1) Using SST, connect terminals Tc and CG of the DLC3.

SST 09843–18040

(2) Turn the ignition switch ON, and wait for approx. 20 seconds.

NOTICE:

Pay due attention to the terminal connecting position to avoid a malfunction.



(c) Read the DTC.

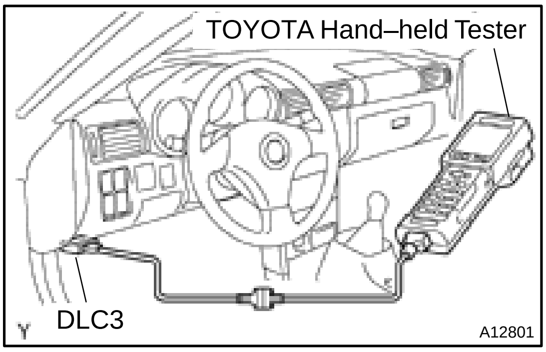
Read the 2–digit DTC as indicated by the number of times the SRS warning light blinks. As an example, the blinking patterns, normal, 11 and 31 are shown in the illustration.

- Normal code indication
  The light will blink 2 times per second.
- Malfunction code indication
  The first blinking output indicates the first digit of a 2–digit DTC. After a 1.5–second pause, the second blinking output will indicate the second digit.

If there are 2 or more codes, there will be a 2.5–second pause between each code. After all the codes have been output, there will be a 4.0–second pause and they will all be repeated.

HINT:

- In the event of a number of trouble codes, indication will start from the smallest numbered code.
- If a DTC is not output or a DTC is output without terminal connection, proceed to the Tc terminal circuit inspection on page DI–331.



3. Using TOYOTA hand–held tester: CHECK DTC

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Read the DTCs by following the prompts on the tester screen.

HINT:

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

4. Not using SST (diagnosis check wire No. 2): CLEAR DTC

When the ignition switch is turned off, the DTC is cleared.

HINT:

DTC might not be cleared by turning the ignition switch OFF. In this case, proceed to the next step.

5. Using SST (diagnosis check wire No. 2): CLEAR DTC

SST 09843–18040

(a) Connect two SST to terminals Tc and A/B of the DLC3.

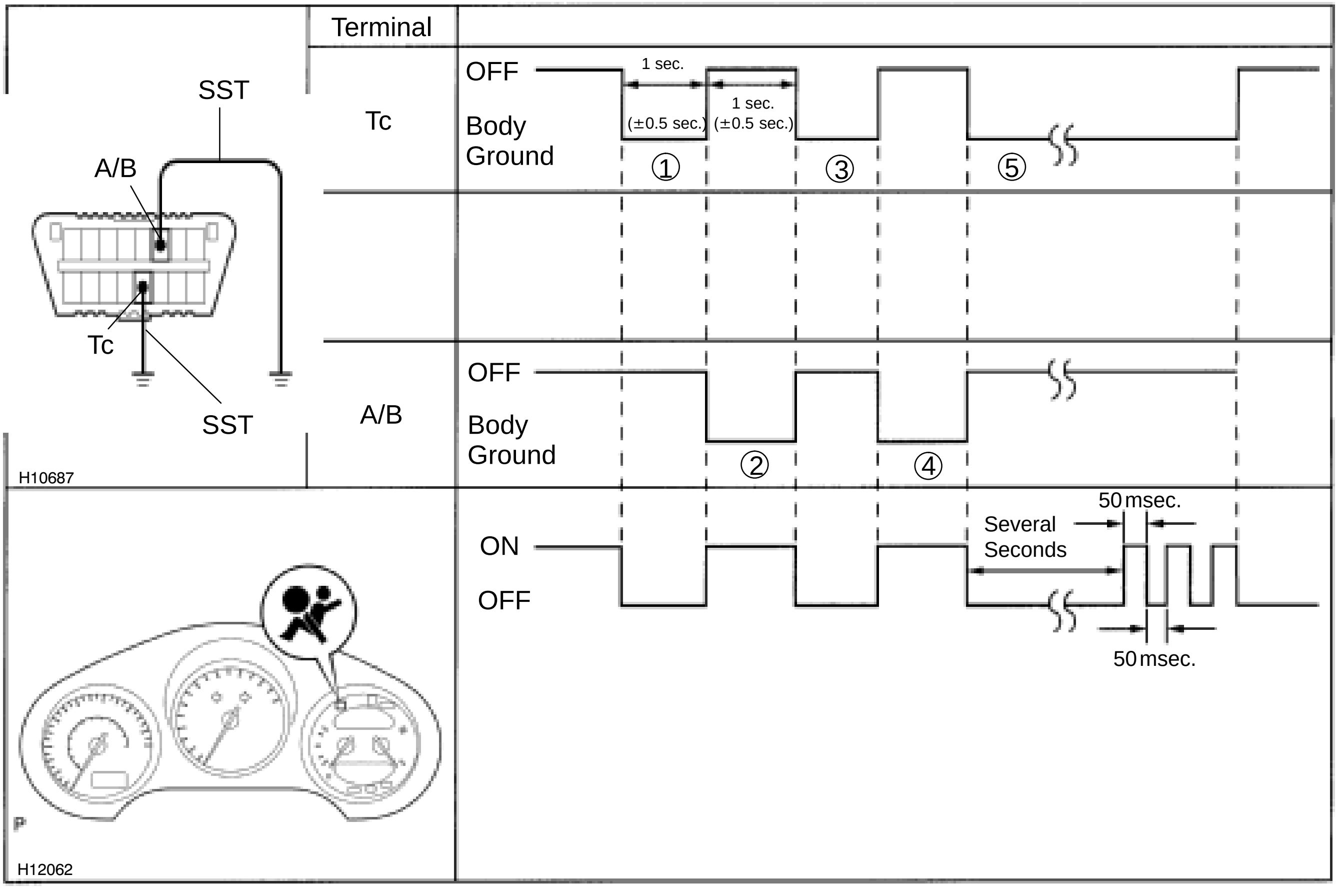
(b) Turn the ignition switch ON, and wait for approx. 6 seconds.

(c) Starting with terminal Tc, ground alternately terminal Tc and terminal A/B twice each in cycles of 1.0 second. Make sure that the terminals are grounded. Ensure terminal Tc remain grounded.

HINT:

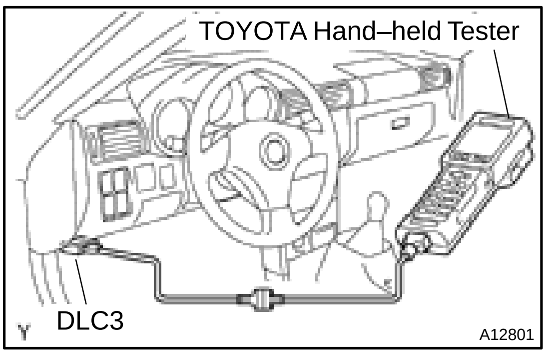
When alternately grounding terminals Tc and A/B, release ground from one terminal and immediately ground the other terminal within an interval of 0.2 seconds.

If DTCs are not cleared, repeat the above procedure until the codes are cleared.



H14068

(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 msec. cycle to indicate the codes which have been cleared.



A12801

6. Using TOYOTA hand–held tester: CLEAR DTC

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

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

7. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS.

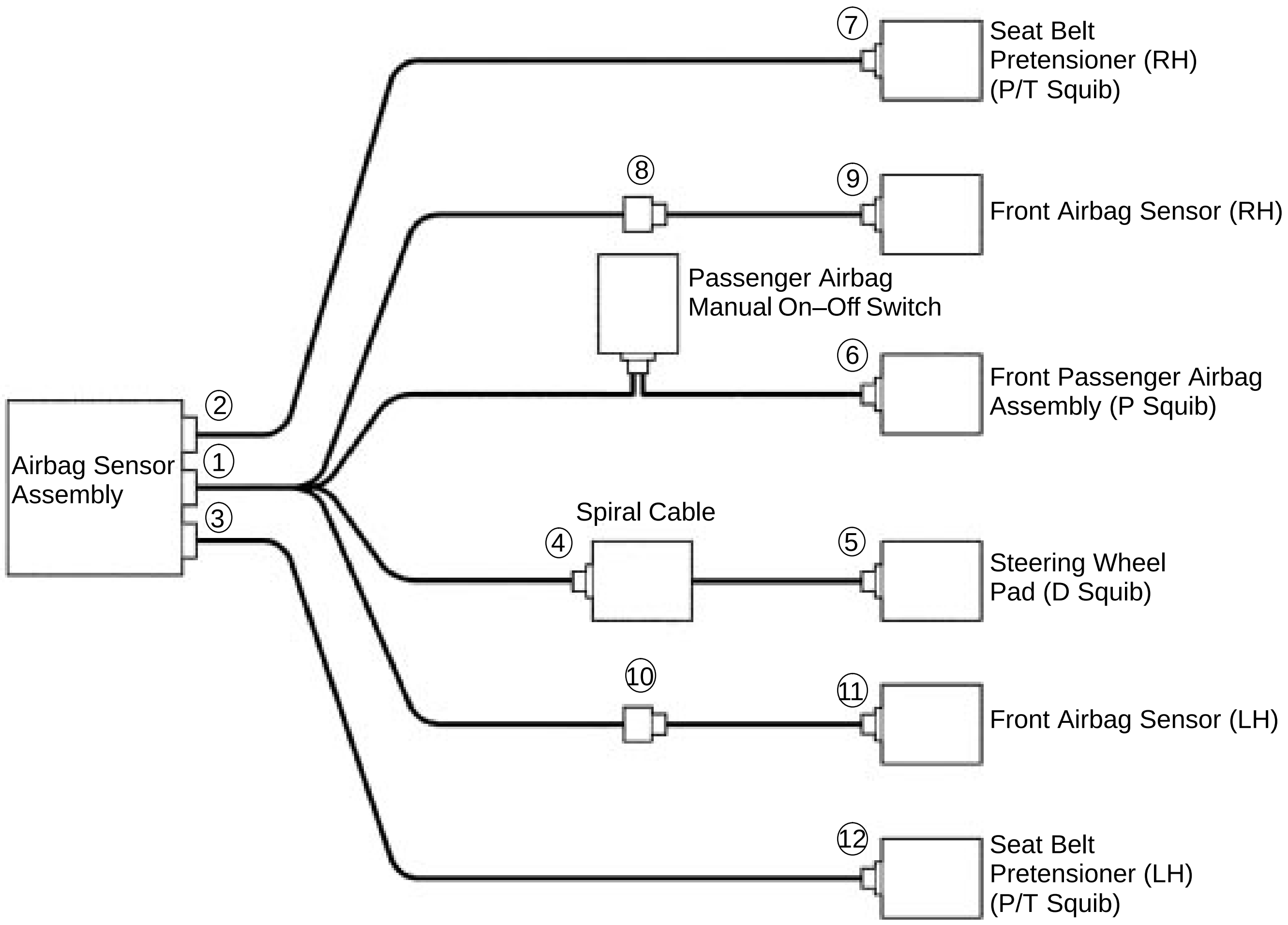
When release of the airbag activation prevention mechanism is directed in the troubleshooting procedure, as shown in the illustration of the connectors on the next pages, insert paper which has the same thickness as the male terminal between the terminal and the short spring.

CAUTION:

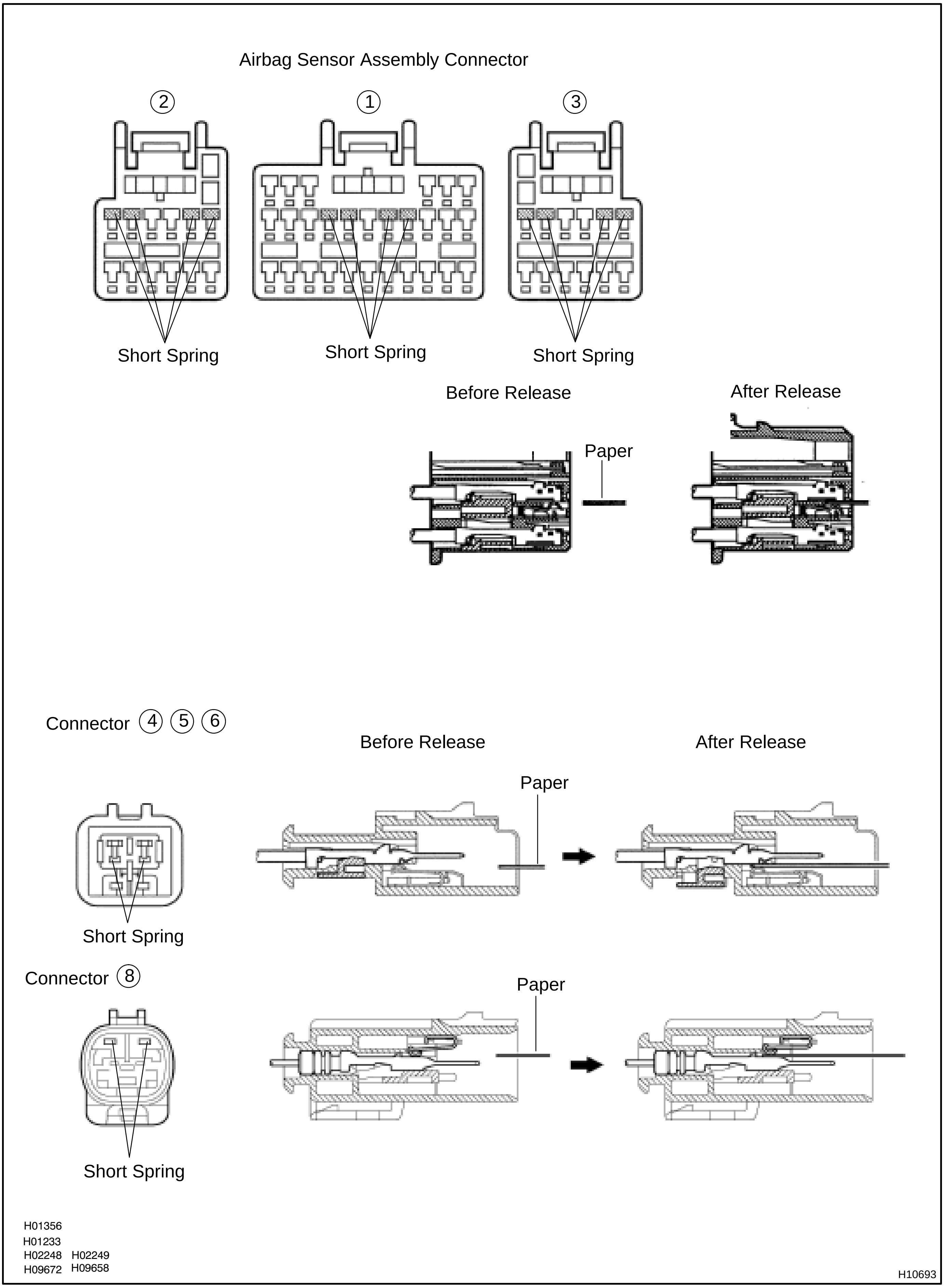
Never release the airbag activation prevention mechanism on the squib connector.

NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **If the inserted paper is too thick the terminal and short spring may be damaged, so always use paper with the same thickness as the male terminal.**


Seat Belt Pretensioner (RH) (P/T Squib)
7
8
9
Front Airbag Sensor (RH)
Passenger Airbag Manual On–Off Switch
6
Front Passenger Airbag Assembly (P Squib)
2
1
Airbag Sensor Assembly
3
Spiral Cable
4
5
Steering Wheel Pad (D Squib)
10
11
Front Airbag Sensor (LH)
12
Seat Belt Pretensioner (LH) (P/T Squib)
H12061

P


Airbag Sensor Assembly Connector
2
1
3
Short Spring
Short Spring
Short Spring
Before Release
After Release
Paper
Connector 4 5 6
Before Release
After Release
Paper
Short Spring
Connector 8
Paper
Short Spring
H01356
H01233
H02248 H02249
H09672 H09658
H10693

DI6OZ–03

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B0100/13 (DI–248)	Short in D Squib Circuit	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly	ON
B0101/14 (DI–253)	Open in D Squib Circuit	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly	ON
B0102/11 (DI–257)	Short in D Squib Circuit (to Ground)	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly	ON
B0103/12 (DI–261)	Short in D Squib Circuit (to B+)	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly	ON
B0105/53 (DI–265)	Short in P Squib Circuit	• Wire harness • Passenger airbag manual on–off switch • Front passenger airbag assembly (P squib) • Airbag sensor assembly	ON
B0106/54 (DI–269)	Open in P Squib Circuit	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly	ON
B0107/51 (DI–273)	Short in P Squib Circuit (to Ground)	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly	ON
B0108/52 (DI–277)	Short in P Squib Circuit (to B+)	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly	ON
B0130/63 (DI–281)	Short in P/T Squib (RH) Circuit	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly	Blink
B0131/64 (DI–285)	Open in P/T Squib (RH) Circuit	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly	Blink
B0132/61 (DI–288)	Short in P/T Squib (RH) Circuit (to Ground)	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly	Blink
B0133/62 (DI–291)	Short in P/T Squib (RH) Circuit (to B+)	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly	Blink
B0135/73 (DI–294)	Short in P/T Squib (LH) Circuit	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly	Blink

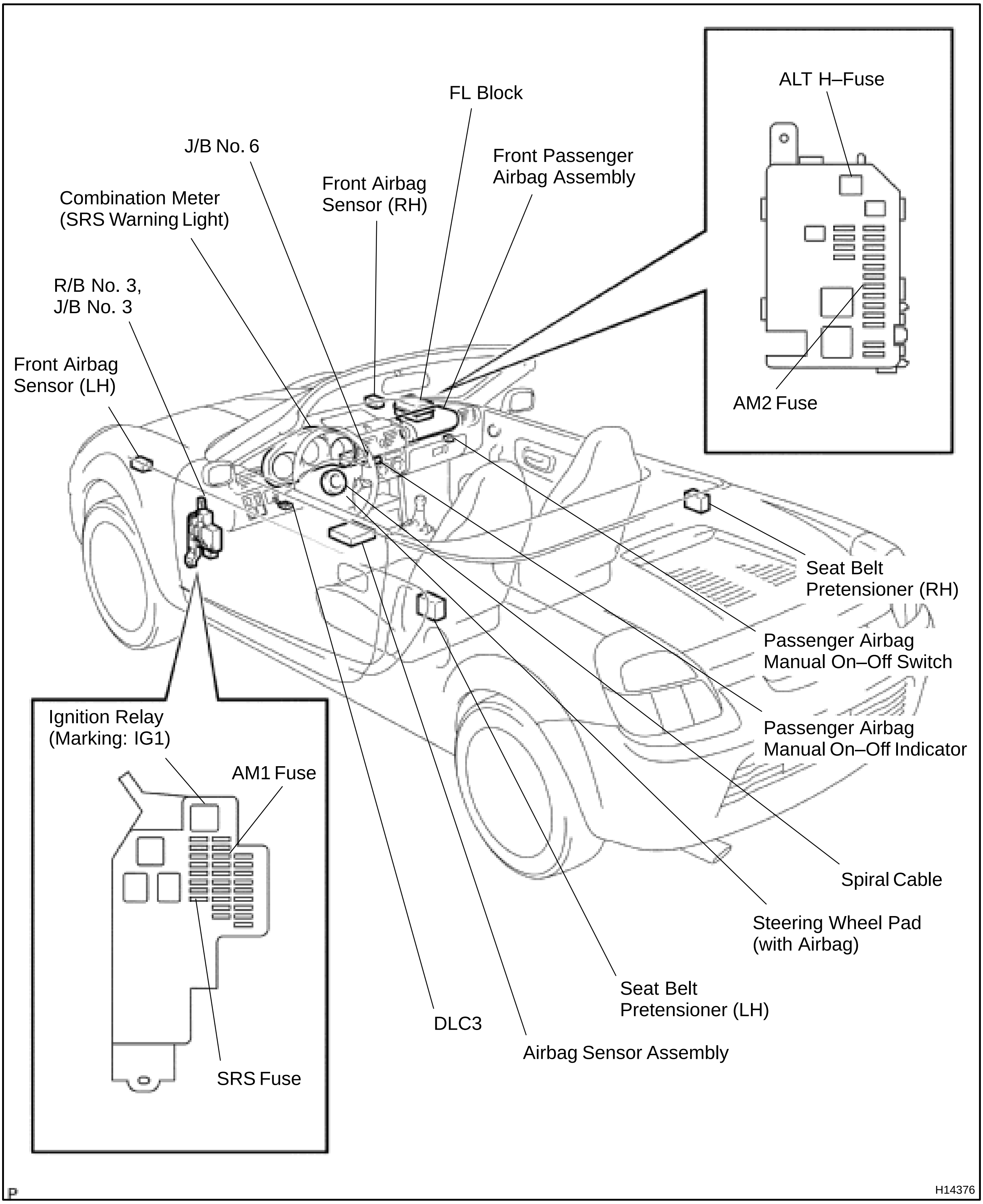
B0136/74 (DI–298)	Open in P/T Squib (LH) Circuit	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly	Blink
B0137/71 (DI–301)	Short in P/T Squib (LH) Circuit (to Ground)	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly	Blink
B0138/72 (DI–304)	Short in P/T Squib (LH) Circuit (to B+)	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly	Blink
B1100/31 (DI–307)	Airbag Sensor Assembly Malfunction	• Airbag sensor assembly	ON
B1156/B1157/ 15 (DI–309)	Front Airbag Sensor (RH) Malfunction	• Wire harness • Front airbag sensor (RH) • Airbag sensor assembly	ON
B1158/B1159/ 16 (DI–316)	Front Airbag Sensor (LH) Malfunction	• Wire harness • Front airbag sensor (LH) • Airbag sensor assembly	ON
Normal (DI–323)	System Normal	–	OFF
	Voltage Source Drop	• Battery • Airbag sensor assembly	ON

HINT:

- When the SRS warning light remains lit up and the DTC is the normal code, this means a voltage source drops.
  This malfunction is not stored in memory by the airbag sensor assembly and if the power source voltage returns to normal, the SRS warning light will automatically go out.
- When 2 or more codes are indicated, the codes will be displayed in numeral order starting from the lowest numbered code.
- If a code not listed on the chart is displayed, the airbag sensor assembly is faulty.

DI6P0–03

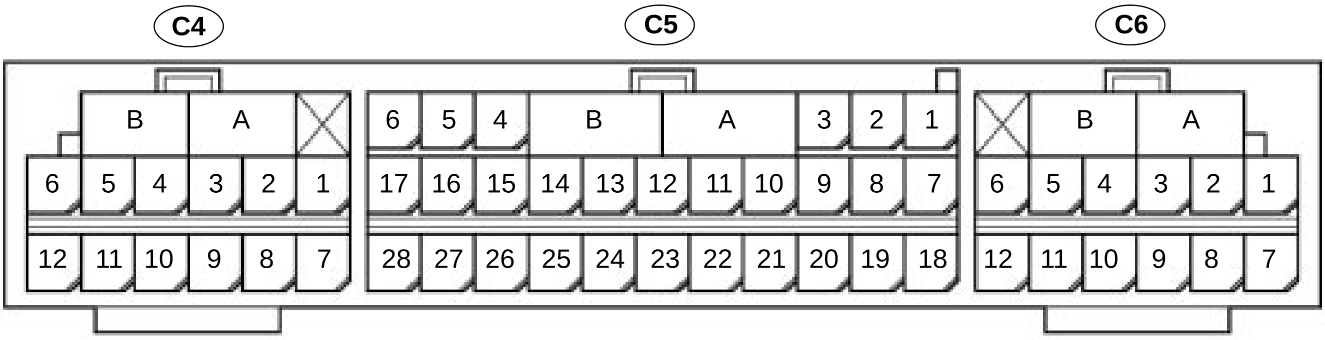
PARTS LOCATION



DI6P1–04

TERMINALS OF ECU

Airbag Sensor Assembly



H01357

Terminal No.	Symbol	Terminal Name
A	–	Electrical Connector Check Mechanism
B	–	Electrical Connector Check Mechanism
C5–3	LA	SRS Warning Light
C5–5	IG2	Power Source
C5–6	IG1	Power Source
C5–9	+SR	Front Airbag Sensor (RH)
C5–10	P+	Front Passenger Airbag Assembly (P Squib)
C5–11	P–	Front Passenger Airbag Assembly (P Squib)
C5–12	SIL	DLC3
C5–13	D–	Steering Wheel Pad (D Squib)
C5–14	D+	Steering Wheel Pad (D Squib)
C5–15	+SL	Front Airbag Sensor (LH)
C5–19	Tc	DLC3
C5–20	–SR	Front Airbag Sensor (RH)
C5–23	GSW2	ECM
C5–26	–SL	Front Airbag Sensor (LH)
C5–27	E1	Ground
C5–28	E2	Ground
C4–1	PL–	Seat Belt Pretensioner (P/T Squib) (LH)
C4–2	PL+	Seat Belt Pretensioner (P/T Squib) (LH)
C4–11	LBE+	Seat Belt Buckle Switch (Driver)
C6–5	PR+	Seat Belt Pretensioner (P/T Squib) (RH)
C6–6	PR–	Seat Belt Pretensioner (P/T Squib) (RH)

DI6P2–03

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspected Area	See page
• With the ignition switch in ON position, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed.	• SRS warning light circuit	DI–326
• SRS warning light is always lit up even when ignition switch is in the LOCK position.		
• With the ignition switch in ON position, the SRS warning light does not light up.		
• DTC is not displayed.	• Tc terminal circuit	DI–331
• SRS warning light is always lit up at the time of DTC check procedure.		
• DTC is displayed without Tc and CG terminal connection.		

DI6P3–03

CIRCUIT INSPECTION

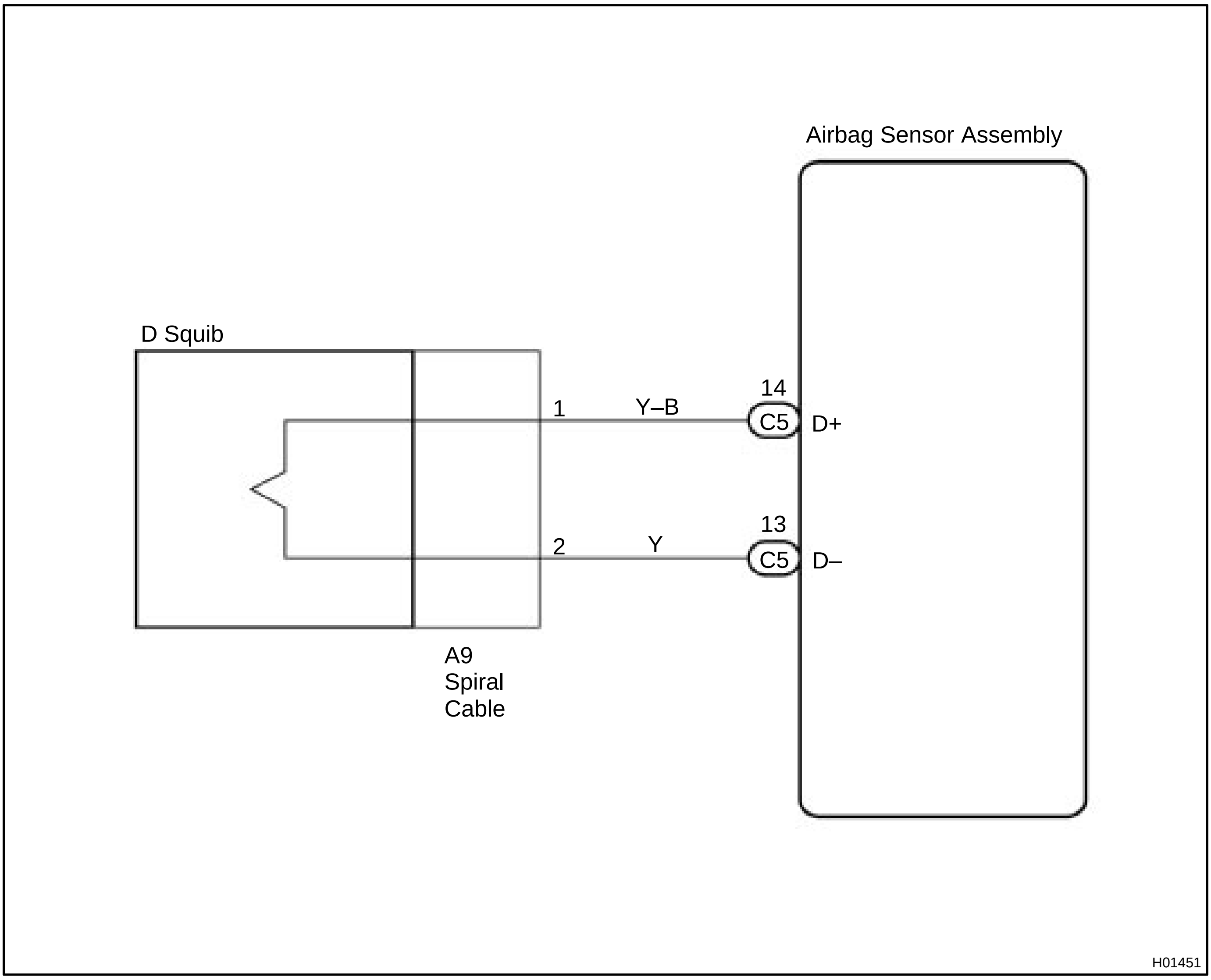
DTC	B0100/13	Short in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, spiral cable and steering wheel pad.
It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0100/13 is recorded when a short is detected in the D squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0100/13	• Short circuit between D+ or D– wire harness of squib • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly

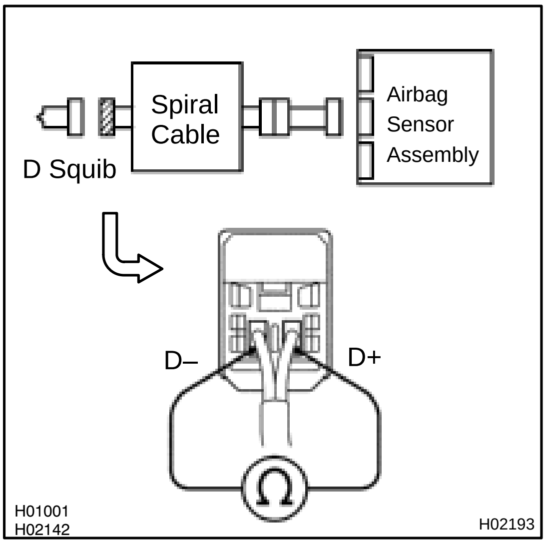
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Check D squib circuit.**



PREPARATION:
Release the airbag activation prevention mechanism of the connector (on the airbag sensor assembly side) between the airbag sensor assembly and the spiral cable (See page DI–237).

CHECK:
For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the resistance between terminals D+ and D–.

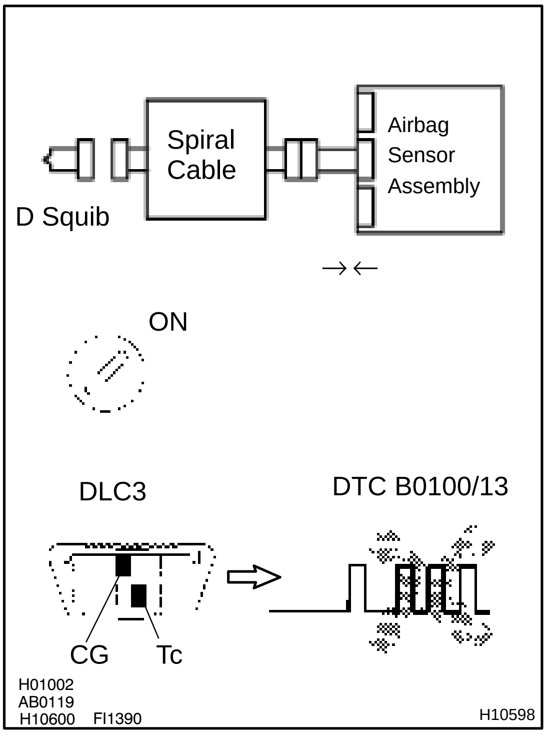
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 5.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

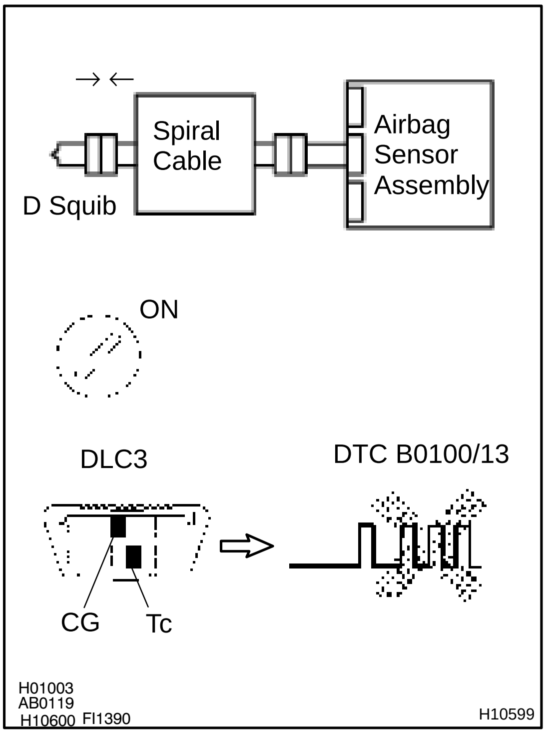
DTC B0100/13 is not output.

HINT:
Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check D squib.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the steering wheel pad connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(b) Turn the ignition switch ON, and wait at least for 20 seconds.

(c) Clear the DTC stored in memory (See page DI–237).

(d) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(e) Turn the ignition switch ON, and wait at least for 20 seconds.

(f) Check the DTC (See page DI–237).

OK:

DTC B0100/13 is not output.

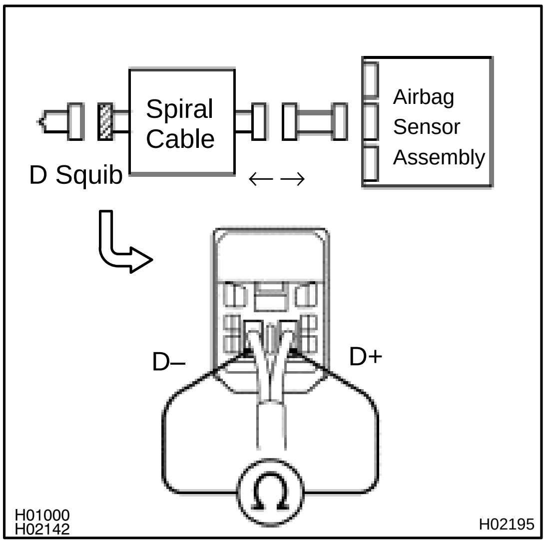
HINT:
Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

5	**Check spiral cable.**



PREPARATION:

(a) Disconnect the connector between the airbag sensor assembly and the spiral cable.

(b) Release the airbag activation prevention mechanism of the spiral cable connector on the airbag sensor assembly side (See page DI–237).

CHECK:

For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the resistance between terminals D+ and D–.

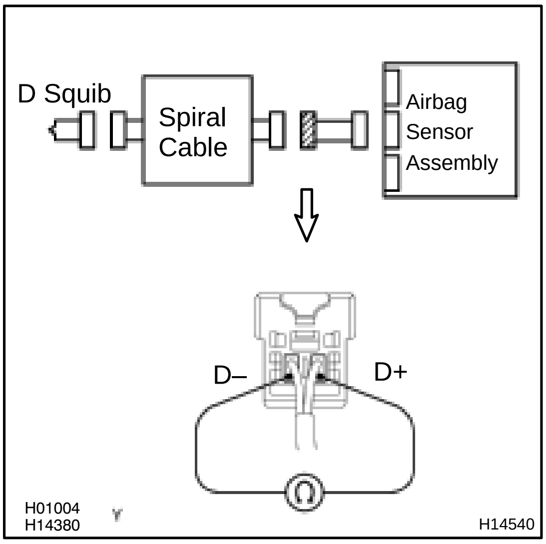
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace spiral cable.**

OK

6	**Check harness between airbag sensor assembly and spiral cable.**



PREPARATION:

Release the airbag activation prevention mechanism of the connector (on the airbag sensor assembly side) between the airbag sensor assembly and the spiral cable (See page DI–237).

CHECK:

For the connector (on the spiral cable side) between the airbag sensor assembly and the spiral cable, measure the resistance between terminals D+ and D–.

OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace harness or connector between airbag sensor assembly and spiral cable.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6P4–02

DTC	B0101/14	Open in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, spiral cable and steering wheel pad.
It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0101/14 is recorded when an opening is detected in the D squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0101/14	• Open circuit in D+ or D– wire harness of squib • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly

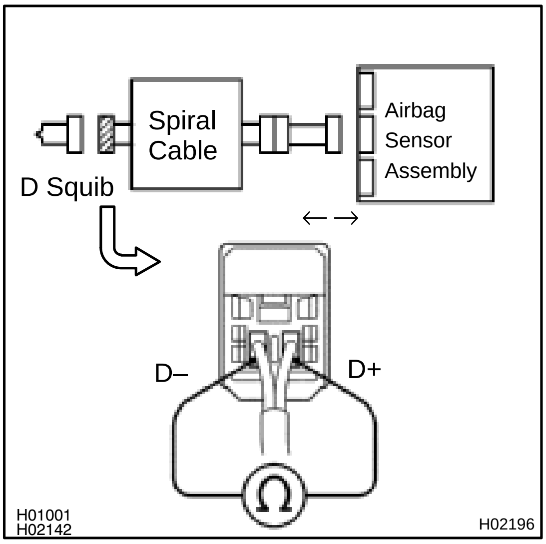
WIRING DIAGRAM

See page DI–248.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check D squib circuit.



CHECK:

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between terminals D+ and D–.

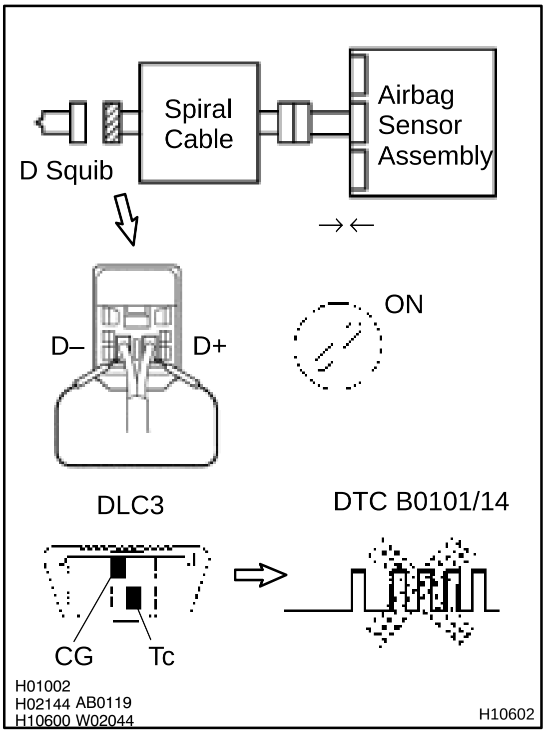
OK:

Resistance: Below 1 Ω

NG	Go to step 5.

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals D+ and D– of the connector (on the spiral cable side) between the spiral cable and the steering wheel pad.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0101/14 is not output.

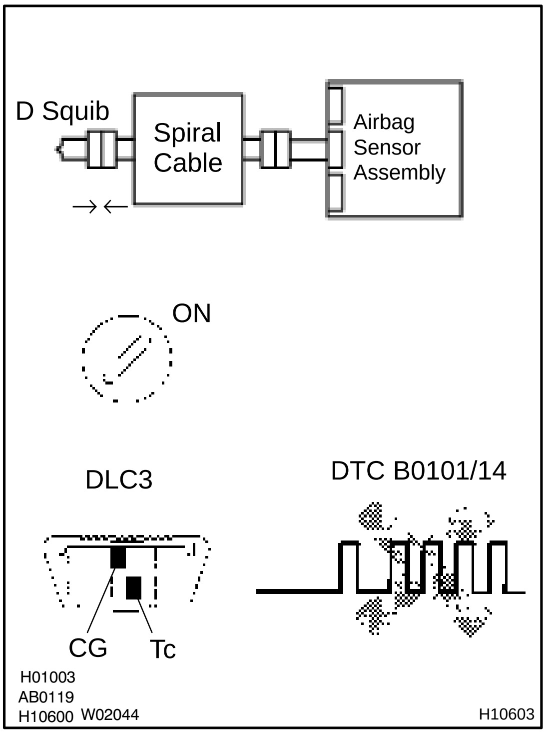
HINT:

Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check D squib.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the steering wheel pad connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0101/14 is not output.

HINT:

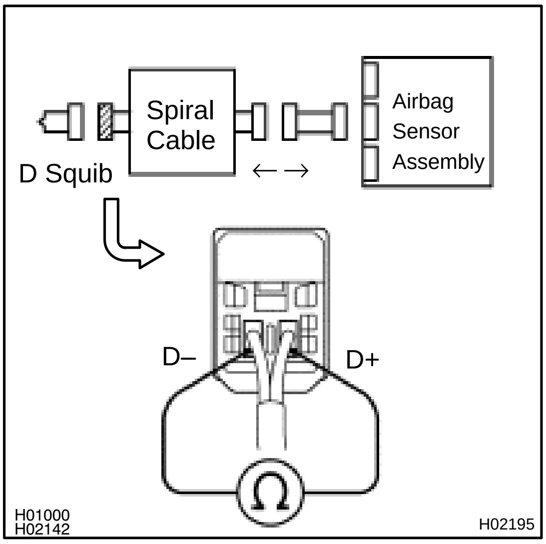
Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

5	**Check spiral cable.**



PREPARATION:

Disconnect the connector between the airbag sensor assembly and the spiral cable.

CHECK:

For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the resistance between terminals D+ and D–.

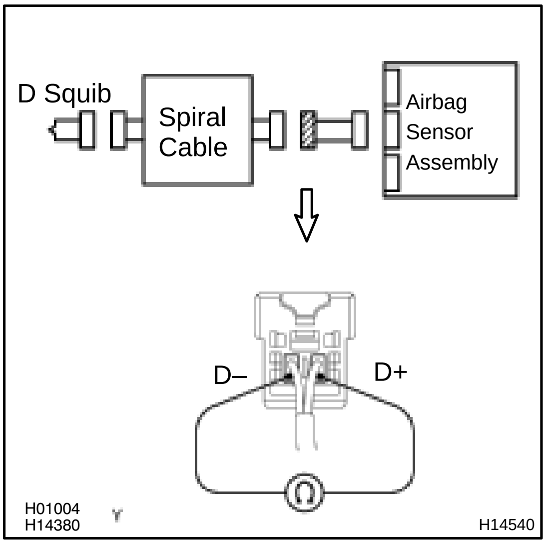
OK:

Resistance: Below 1 Ω

NG	**Repair or replace spiral cable.**

OK

6	**Check harness between airbag sensor assembly and spiral cable.**



CHECK:

For the connector (on the spiral cable side) between the airbag sensor assembly and the spiral cable, measure the resistance between terminals D+ and D–.

OK:

Resistance: Below 1 Ω

NG	**Repair or replace harness or connector between airbag sensor assembly and spiral cable.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6P5–02

DTC	B0102/11	Short in D Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, spiral cable and steering wheel pad.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0102/11 is recorded when a ground short is detected in the D squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0102/11	• Short circuit in D squib wire harness (to ground) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly

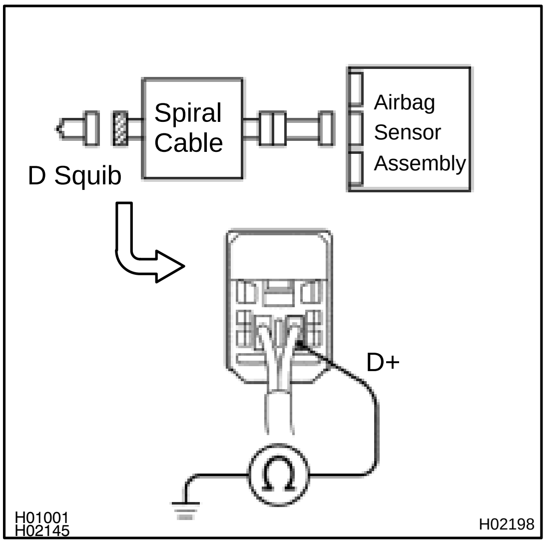
WIRING DIAGRAM

See page DI–248.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check D squib circuit.



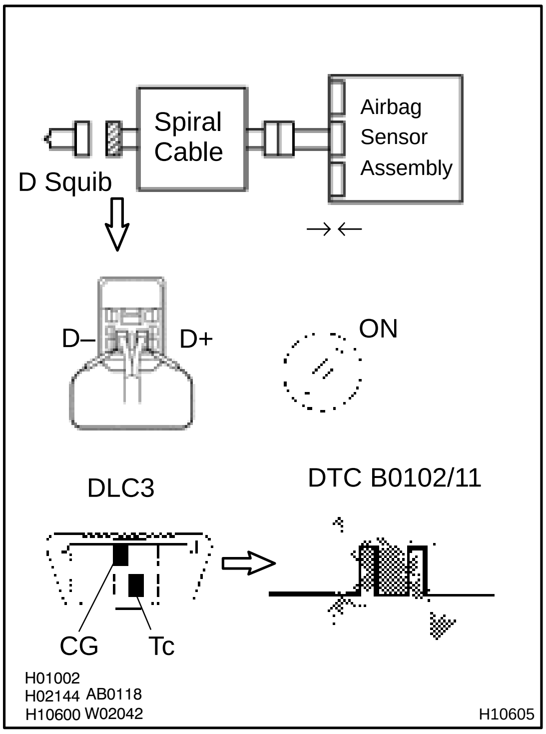
CHECK:
For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the resistance between terminal D+ and body ground.

OK:
Resistance: 1 MΩ or Higher

NG → Go to step 5.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals D+ and D– of the connector (on the spiral cable side) between the spiral cable and the steering wheel pad.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0102/11 is not output.

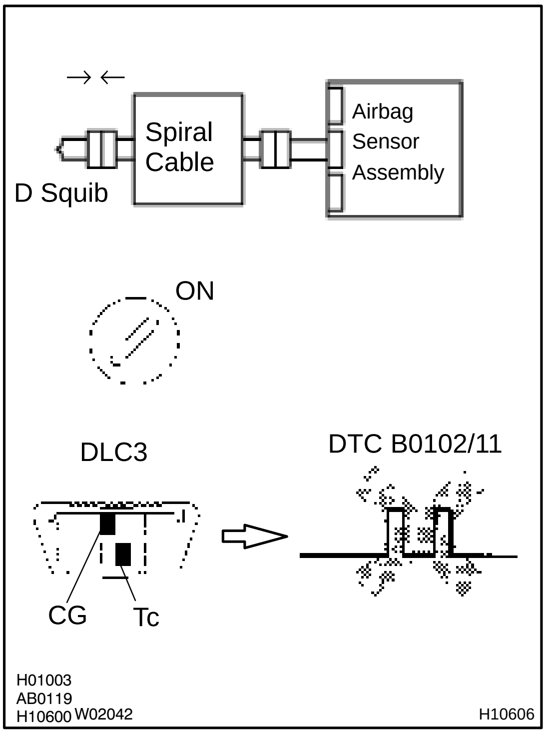
HINT:

Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	**Check D squib.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the steering wheel pad connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0102/11 is not output.

HINT:

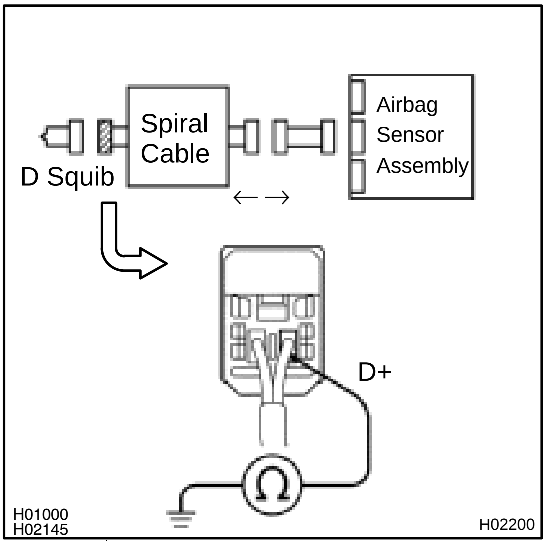
Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

5	Check spiral cable.



PREPARATION:

Disconnect the connector between the airbag sensor assembly and the spiral cable.

CHECK:

For the connector (on the spiral cable side) between the steering wheel pad and the spiral cable, measure the resistance between terminal D+ and body ground.

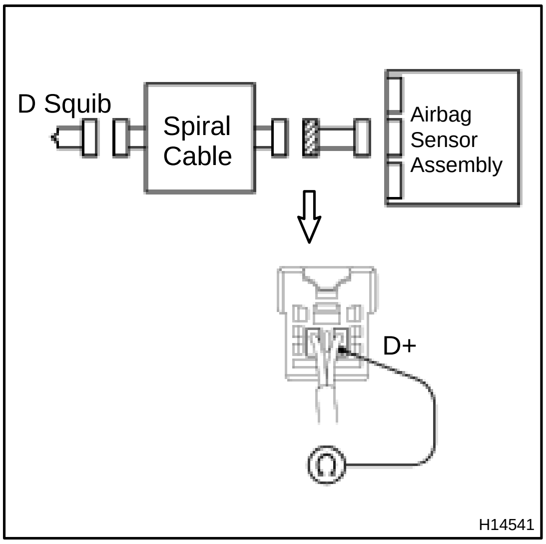
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace spiral cable.**

OK

6	Check harness between airbag sensor assembly and spiral cable.



CHECK:

For the connector (on the spiral cable side) between the spiral cable and the airbag sensor assembly, measure the resistance between terminal D+ and body ground.

OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace harness between airbag sensor assembly and spiral cable.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6P6–02

DTC	B0103/12	Short in D Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, spiral cable and steering wheel pad.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0103/12 is recorded when a B+ short is detected in the D squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0103/12	• Short circuit in D squib wire harness (to B+) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Wire harness • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly

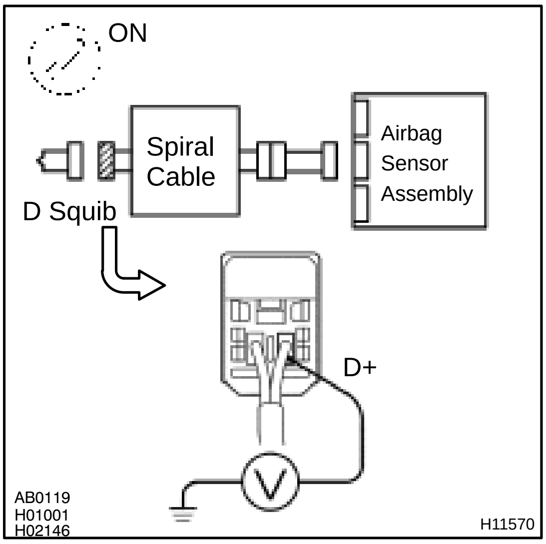
WIRING DIAGRAM

See page DI–248.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check D squib circuit.



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the voltage between terminal D+ and body ground.

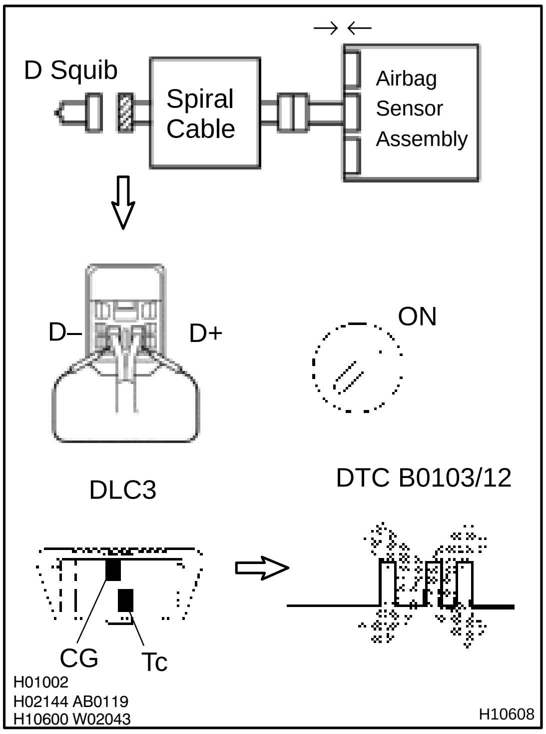
OK:

Voltage: 0 V

NG → **Go to step 5.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals D+ and D– of the connector (on the spiral cable side) between the spiral cable and the steering wheel pad.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0103/12 is not output.

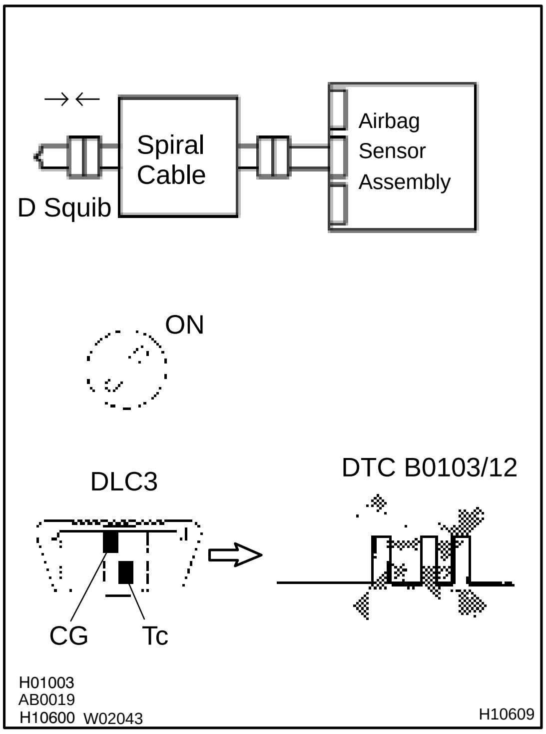
HINT:

Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check D squib.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the steering wheel pad connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0103/12 is not output.

HINT:

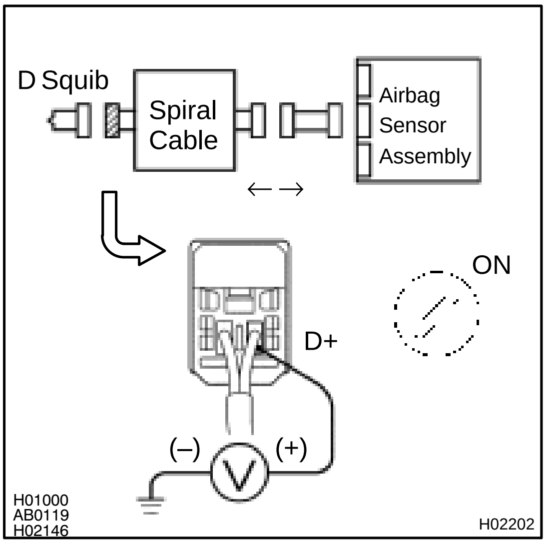
Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG	**Replace steering wheel pad.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

5	**Check spiral cable.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the connector between the airbag sensor assembly and the spiral cable.

CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the spiral cable side) between the spiral cable and the steering wheel pad, measure the voltage between terminal D+ and body ground.

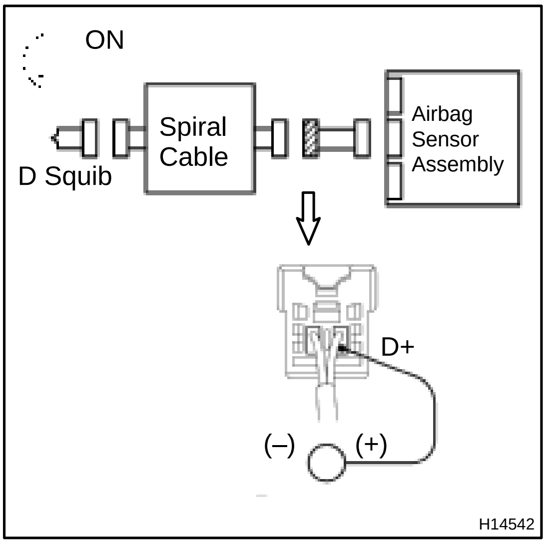
OK:

Voltage: 0 V

NG	**Repair or replace spiral cable.**

OK

6	**Check harness between airbag sensor assembly and spiral cable.**



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the spiral cable side) between the spiral cable and airbag sensor assembly, measure the voltage between terminal D+ and body ground.

OK:

Voltage: 0 V

NG	**Repair or replace harness between airbag sensor assembly and spiral cable.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6P7–03

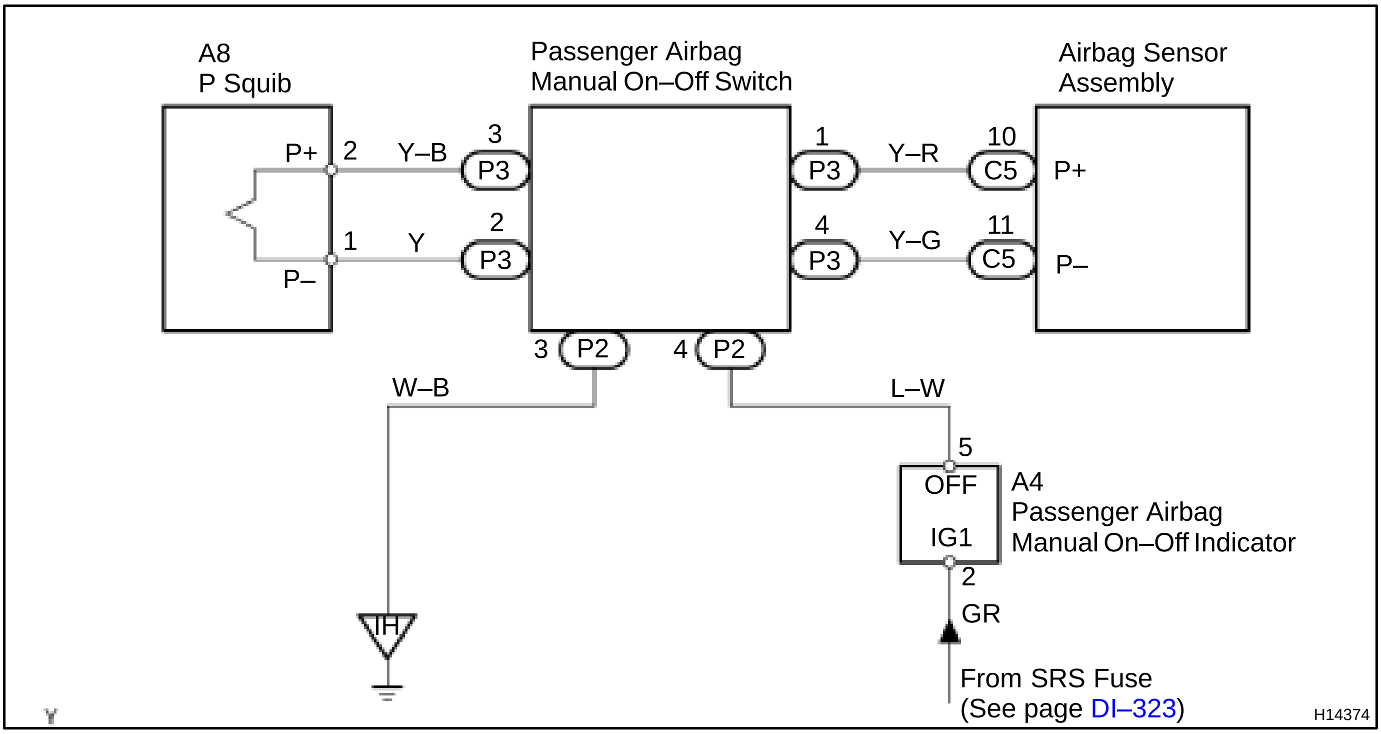
DTC	B0105/53	Short in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly, passenger airbag manual on–off switch and front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0105/53 is recorded when a short is detected in the P squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0105/53	• Short circuit in P squib wire harness • P squib malfunction • Airbag sensor assembly malfunction	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

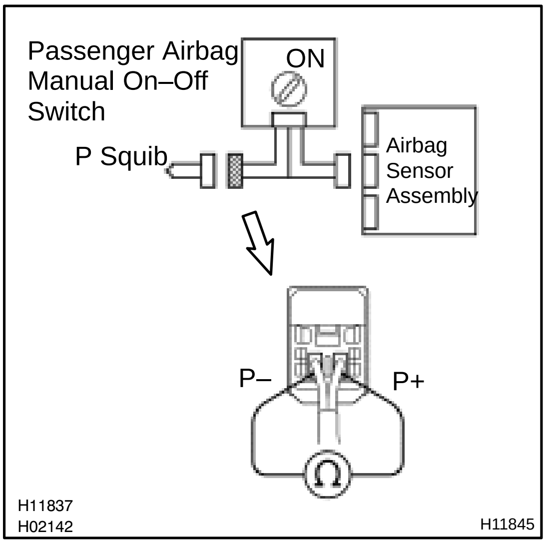
1	**Prepare for inspection (See step 1 on page DI–323).**

2	Check passenger airbag manual on–off switch (See page RS–50).

NG → **Replace passenger airbag manual on–off switch.**

OK

3	Check P squib circuit.



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.

(b) Release the airbag activation prevention mechanism of the connector (on the airbag sensor assembly side) between the front passenger airbag assembly and the airbag sensor assembly (See page DI–237).

CHECK:

For the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly, measure the resistance between terminal P+ and P–.

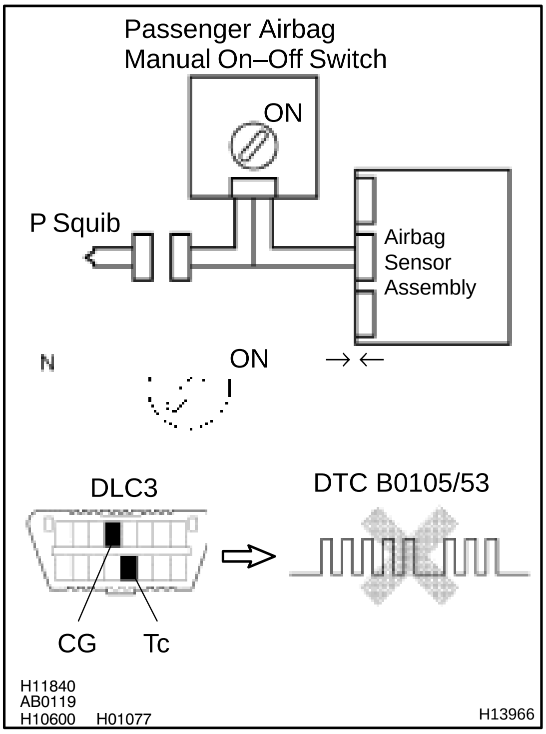
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace harness or connector between front passenger airbag assembly and airbag sensor assembly.**

OK

4	**Check airbag sensor assembly.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.

(b) Connect the connector to the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

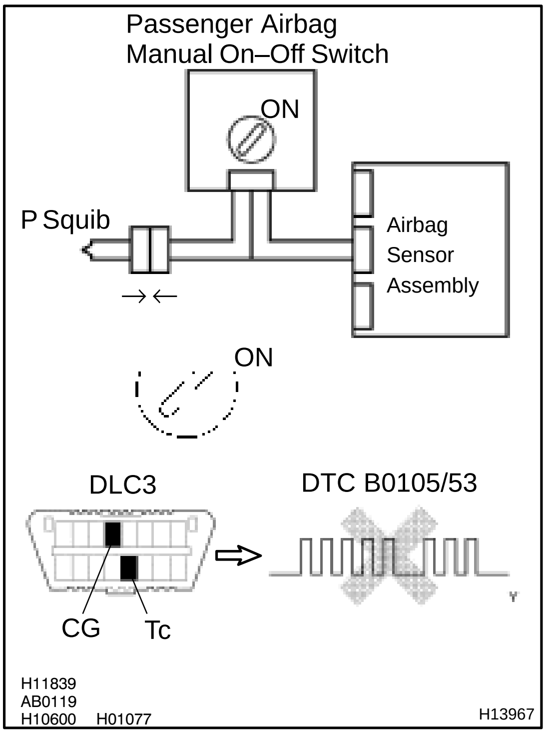
DTC B0105/53 is not output.

HINT:
Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

5	Check P squib.



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.

(b) Turn the ignition switch to LOCK.

(c) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(d) Connect the front passenger airbag assembly connector.

(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to LOOK, and wait at least for 20 seconds.

(b) Turn the ignition switch ON, and wait at least for 20 seconds.

(c) Clear the DTC stored in memory (See page DI–237).

(d) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(e) Turn the ignition switch ON, and wait at least for 20 seconds.

(f) Check the DTC (See page DI–237).

OK:

DTC B0105/53 is not output.

HINT:

Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG	Replace front passenger airbag assembly.

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6P8–02

DTC	B0106/54	Open in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0106/54 is recorded when an opening is detected in the P squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0106/54	• Open circuit in P+ or P– wire harness of squib • P squib malfunction • Airbag sensor assembly malfunction	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly

WIRING DIAGRAM

See page DI–265.

INSPECTION PROCEDURE

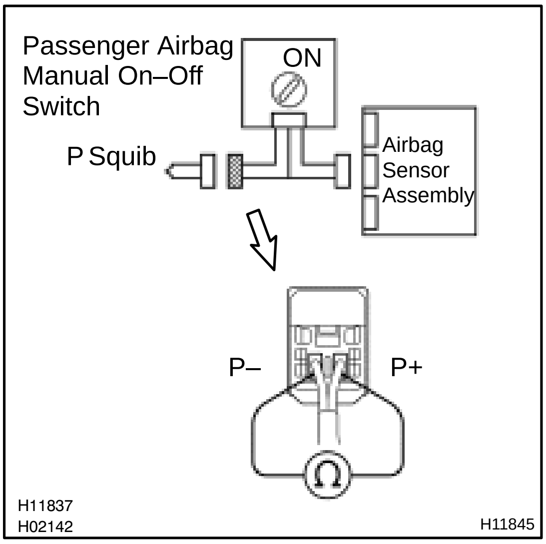
1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Check passenger airbag manual on–off switch (See page RS–50).**

NG → **Replace passenger airbag manual on–off switch.**

OK

3	**Check P squib circuit.**

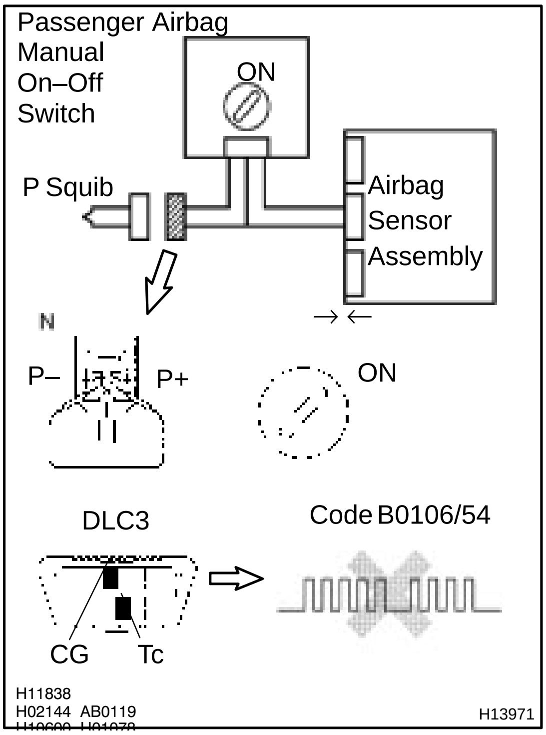


PREPARATION:
Turn the passenger airbag manual on–off switch ON.
CHECK:
For the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly, measure the resistance between terminals P+ and P–.
OK:
Resistance: Below 1 Ω

NG → **Repair or replace harness or connector between front passenger airbag assembly and airbag sensor assembly.**

OK

4	**Check airbag sensor assembly.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.
(b) Connect the connector to the airbag sensor assembly.
(c) Using a service wire, connect terminals P+ and P– of the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

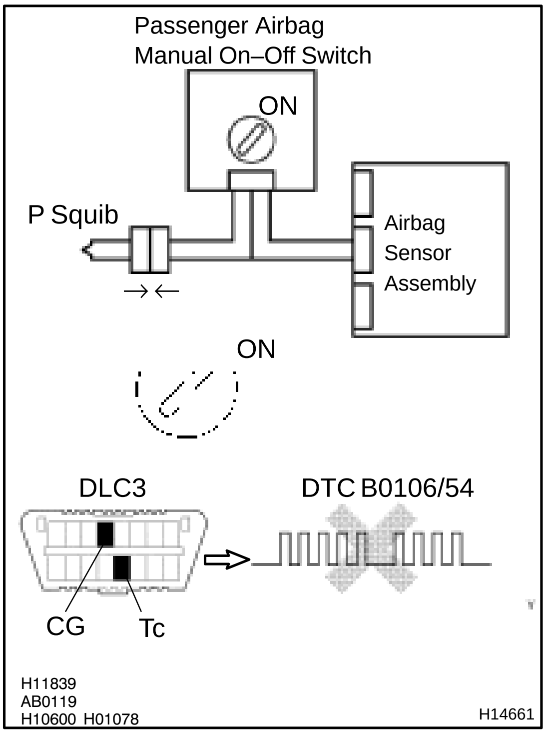
DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

5	**Check P squib.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.
(b) Turn the ignition switch to LOCK.
(c) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(d) Connect the front passenger airbag assembly connector.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

DTC B0106/54 is not output.

HINT:
Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG	**Replace front passenger airbag assembly.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6P9–02

DTC	B0107/51	Short in P Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0107/51 is recorded when ground short is detected in the P squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0107/51	• Short circuit in P squib wire harness (to ground) • P squib malfunction • Airbag sensor assembly malfunction	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly

WIRING DIAGRAM

See page DI–265.

INSPECTION PROCEDURE

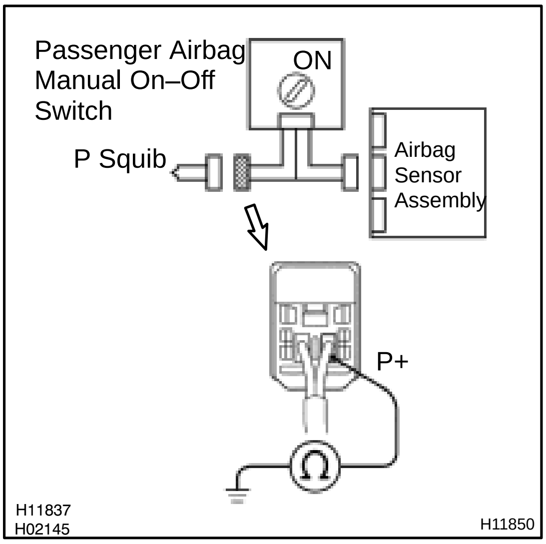
1	Prepare for inspection (See step 1 on page DI–323).

2	Check passenger airbag manual on–off switch (See page RS–50).

NG → Replace passenger airbag manual on–off switch.

OK

3	**Check P squib circuit.**



PREPARATION:

Turn the passenger airbag manual on–off switch ON.

CHECK:

For the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly, measure the resistance between terminal P+ and body ground.

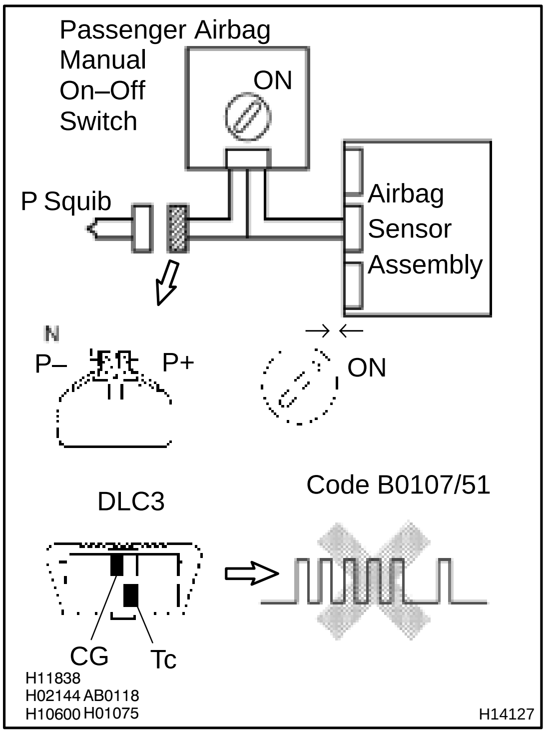
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace harness or connector between front passenger airbag assembly and airbag sensor assembly.**

OK

4	**Check airbag sensor assembly.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.
(b) Connect the connector to the airbag sensor assembly.
(c) Using a service wire, connect terminals P+ and P– of the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See step 5 on page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

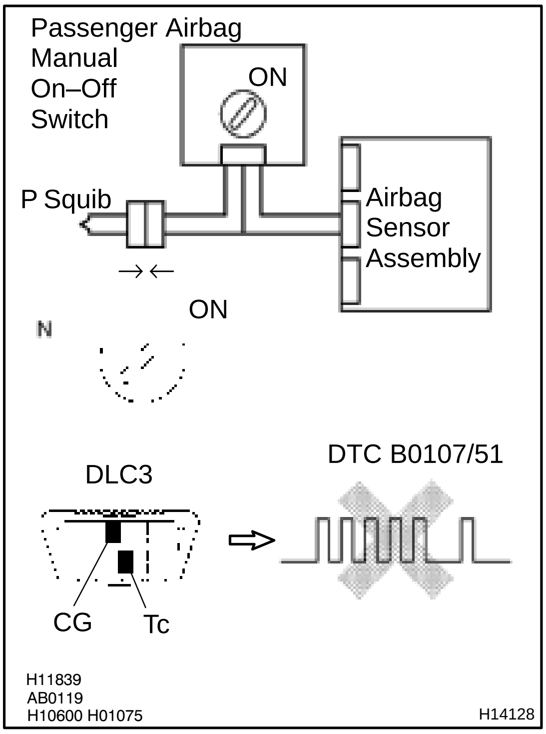
DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

5	**Check P squib.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.
(b) Turn the ignition switch to LOCK.
(c) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(d) Connect the front passenger airbag assembly connector.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See step 5 on page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

DTC B0107/51 is not output.

HINT:
Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG	**Replace front passenger airbag assembly.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PA–02

DTC	B0108/52	Short in P Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0108/52 is recorded when a B+ short is detected in the P squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0108/52	• Short circuit in P squib wire harness (to B+) • P squib malfunction • Airbag sensor assembly malfunction	• Passenger airbag manual on–off switch • Wire harness • Front passenger airbag assembly (P squib) • Airbag sensor assembly

WIRING DIAGRAM

See page DI–265.

INSPECTION PROCEDURE

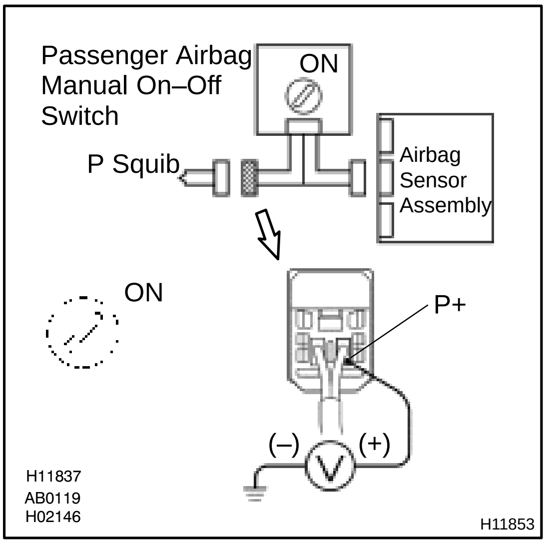
1	Prepare for inspection (See step 1 on page DI–323).

2	Check passenger airbag manual on–off switch (See page RS–50).

NG → Replace passenger airbag manual on–off switch.

OK

3	Check P squib circuit.



PREPARATION:
Turn the passenger airbag manual on–off switch ON.

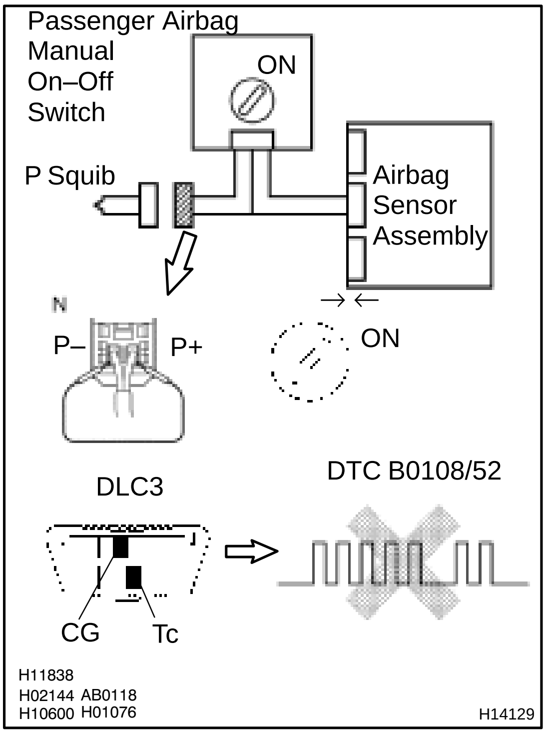
CHECK:
(a) Turn the ignition switch ON.
(b) For the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly, measure the voltage between terminal P+ and body ground.

OK:
Voltage: 0 V

NG	**Repair or replace harness or connector between front passenger airbag assembly and airbag sensor assembly.**

OK

4	**Check airbag sensor assembly.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.

(b) Connect the connector to the airbag sensor assembly.

(c) Using a service wire, connect terminals P+ and P– of the connector (on the front passenger airbag assembly side) between the front passenger airbag assembly and the airbag sensor assembly.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0108/52 is not output.

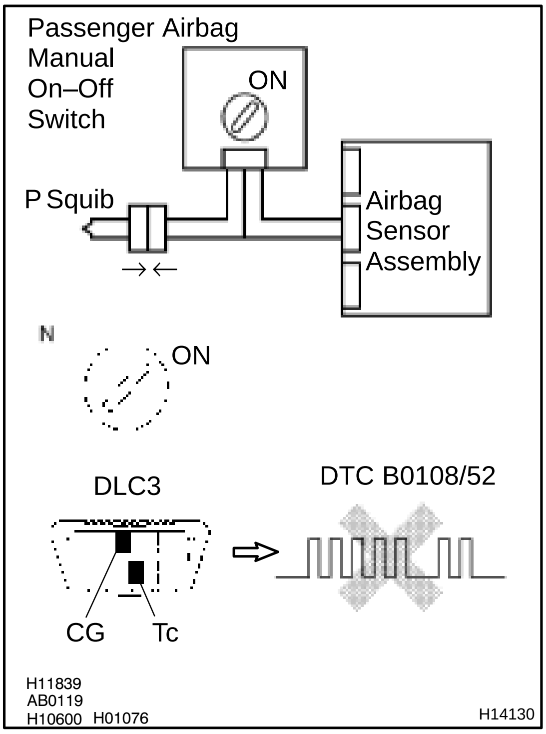
HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

5	**Check P squib.**



PREPARATION:

(a) Turn the passenger airbag manual on–off switch ON.
(b) Turn the ignition switch to LOCK.
(c) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(d) Connect the front passenger airbag assembly connector.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See step 5 on page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

DTC B0108/52 is not output.

HINT:
Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG	**Replace front passenger airbag assembly.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PJ–03

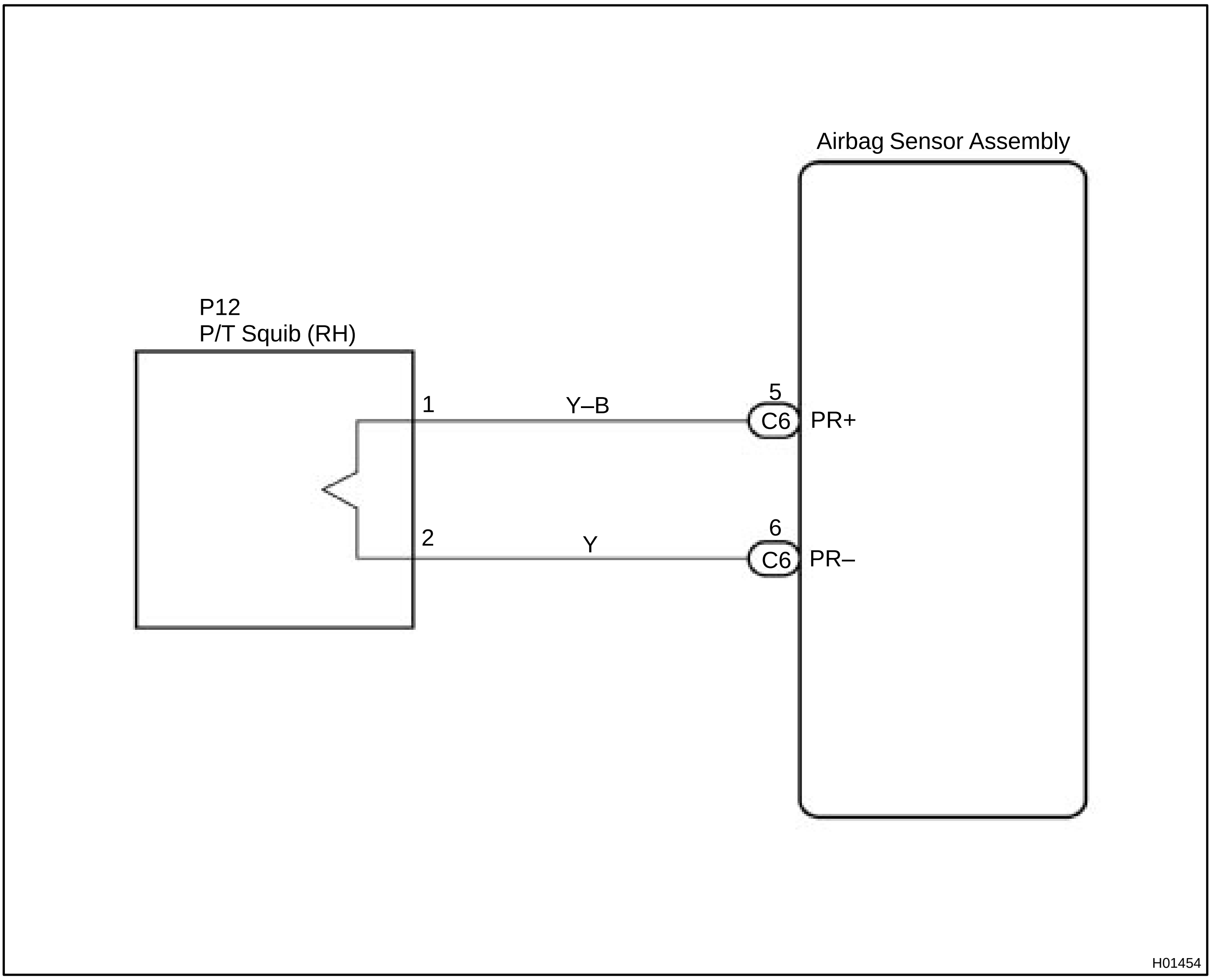
DTC	B0130/63	Short in P/T Squib (RH) Circuit

CIRCUIT DESCRIPTION

The P/T squib (RH) circuit consists of the airbag sensor assembly and seat belt pretensioner (RH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0130/63 is recorded when a short is detected in the P/T squib (RH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0130/63	• Short circuit between PR+ or PR– wire harness of squib • P/T squib (RH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly

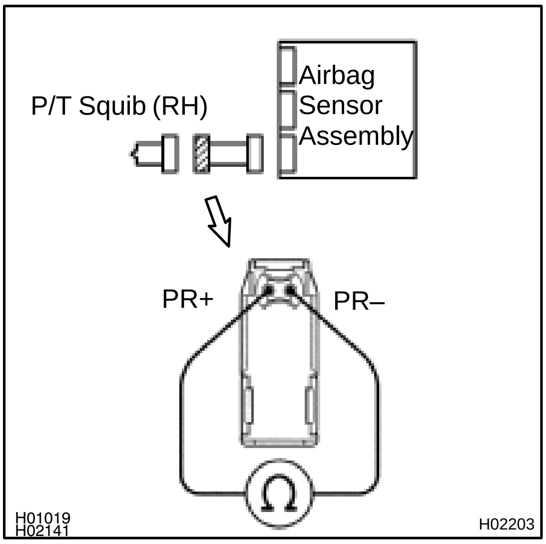
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Check P/T squib (RH) circuit.**



PREPARATION:

Release the airbag activation prevention mechanism of the connector (on the airbag sensor assembly side) between the airbag sensor assembly and the seat belt pretensioner (RH) (See page DI–237).

CHECK:

For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly, measure the resistance between terminals PR+ and PR–.

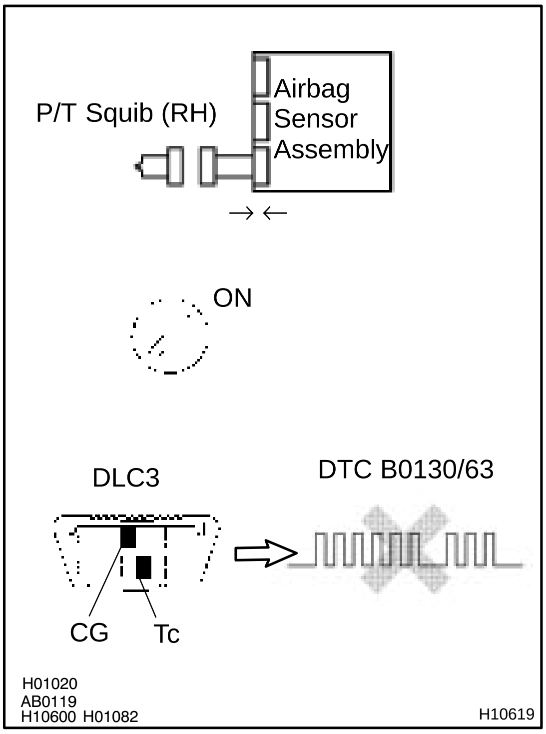
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace harness or connector between seat belt pretensioner (RH) and airbag sensor assembly.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

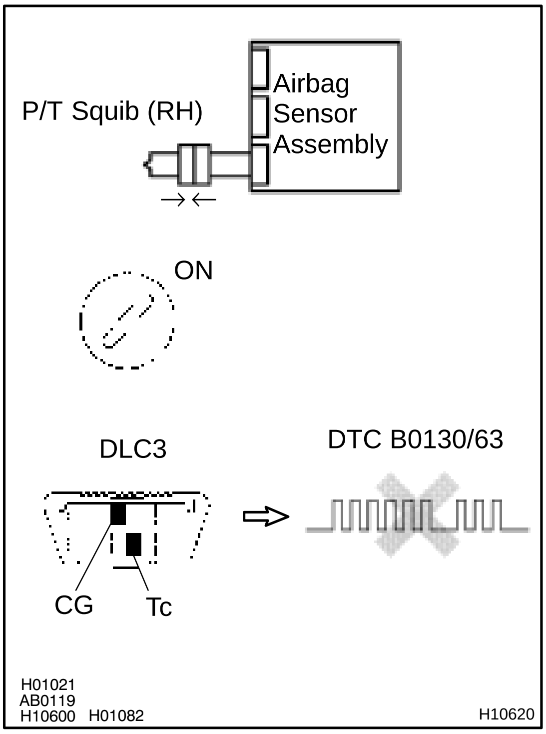
DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check P/T squib (RH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (RH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to LOOK, and wait at least for 20 second.

(b) Turn the ignition switch ON, and wait at least for 20 seconds.

(c) Clear the DTC stored in memory (See page DI–237).

(d) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(e) Turn the ignition switch ON, and wait at least for 20 seconds.

(f) Check the DTC (See page DI–237).

OK:

DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (RH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6PK–02

DTC	B0131/64	Open in P/T Squib (RH) Circuit

CIRCUIT DESCRIPTION

The P/T squib circuit (RH) consists of the airbag sensor assembly and seat belt pretensioner (RH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0131/64 is recorded when an opening is detected in the P/T squib (RH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0131/64	• Open circuit in PR+ or PR– wire harness of squib • P/T squib (RH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly

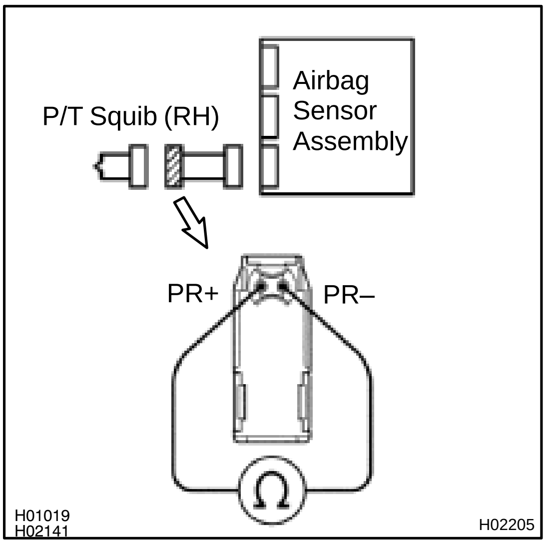
WIRING DIAGRAM

See page DI–281.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check P/T squib (RH) circuit.

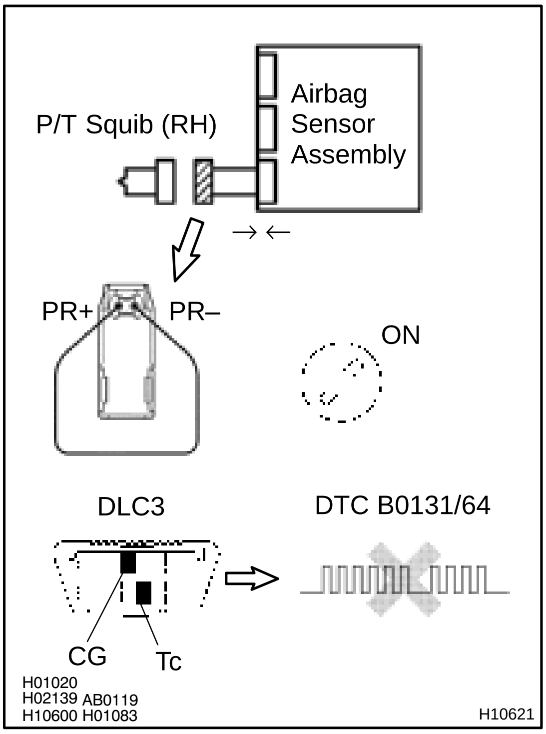


CHECK:
For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly, measure the resistance between terminals PR+ and PR–.
OK:
Resistance: Below 1 Ω

NG → **Repair or replace harness or connector between seat belt pretensioner (RH) and airbag sensor assembly.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals PR+ and PR– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0131/64 is not output.

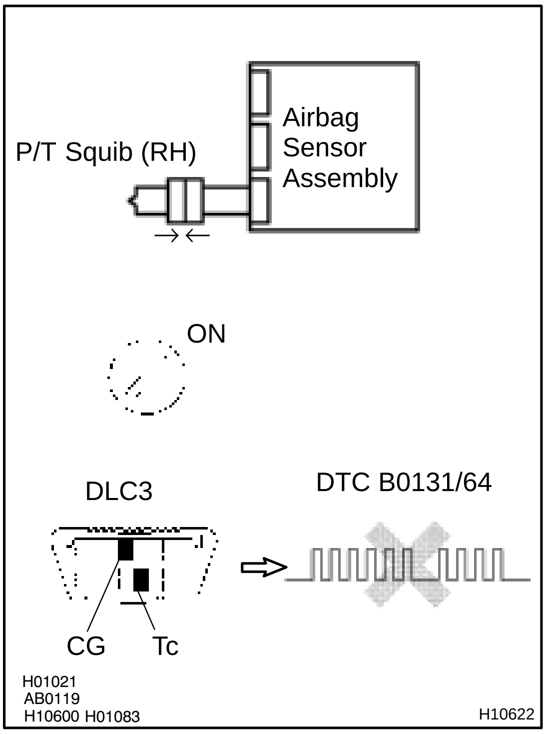
HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check P/T squib (RH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (RH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0131/64 is not output.

HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (RH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6PL–02

DTC	B0132/61	Short in P/T Squib (RH) Circuit (to Ground)

CIRCUIT DESCRIPTION

The P/T squib (RH) circuit consists of the airbag sensor assembly and seat belt pretensioner (RH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0132/61 is recorded when a ground short is detected in the P/T squib (RH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0132/61	• Short circuit in P/T squib (RH) wire harness (to ground) • P/T squib (RH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly

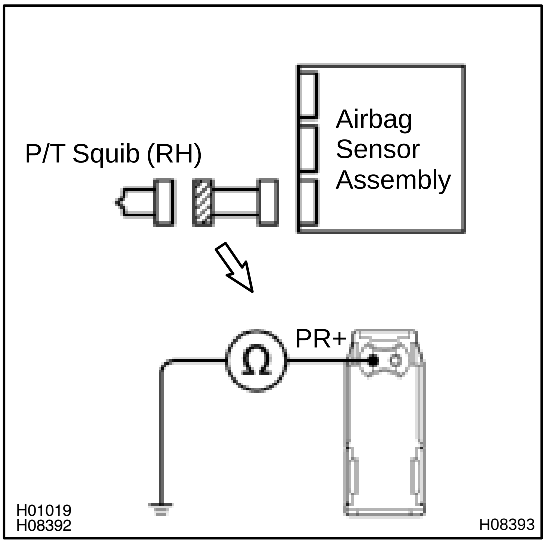
WIRING DIAGRAM

See page DI–281.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Check P/T squib (RH) circuit.**



CHECK:

For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly, measure the resistance between terminal PR+ and body ground.

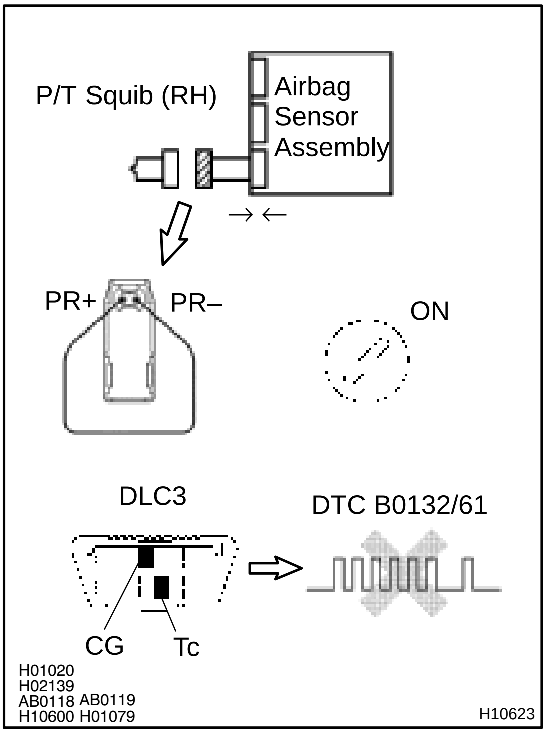
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace harness or connector between seat belt pretensioner (RH) and airbag sensor assembly.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect PR+ and PR– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

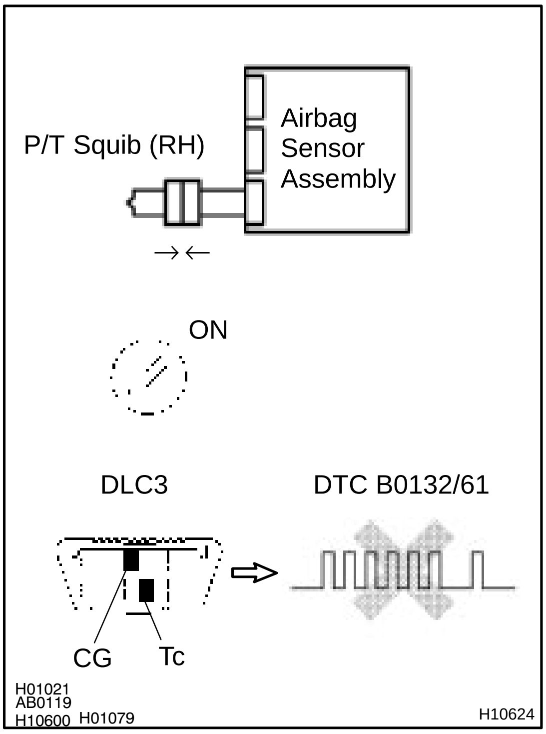
DTC B0132/61 is not output.

HINT:
Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	Check P/T squib (RH).



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (RH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0132/61 is not output.

HINT:
Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG	Replace seat belt pretensioner (RH).

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PM–02

DTC	B0133/62	Short in P/T Squib (RH) Circuit (to B+)

CIRCUIT DESCRIPTION

The P/T squib (RH) circuit consists of the airbag sensor assembly and seat belt pretensioner (RH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0133/62 is recorded when a B+ short is detected in the P/T squib (RH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0133/62	• Short circuit in seat belt pretensioner (RH) wire harness (to B+) • P/T squib (RH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (RH) • Airbag sensor assembly

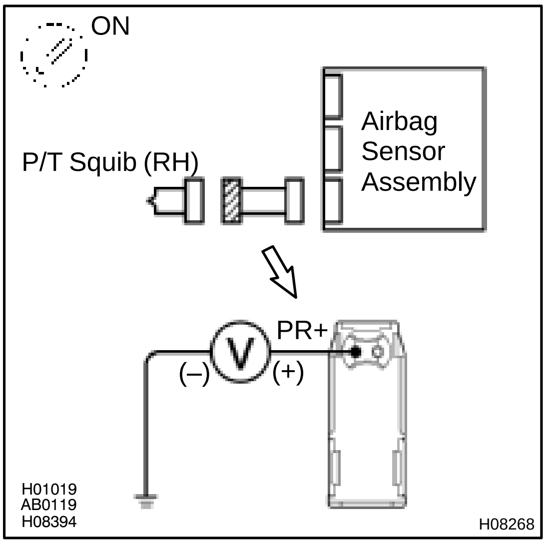
WIRING DIAGRAM

See page DI–281.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check P/T squib (RH) circuit.



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly, measure the voltage between terminal PR+ and body ground.

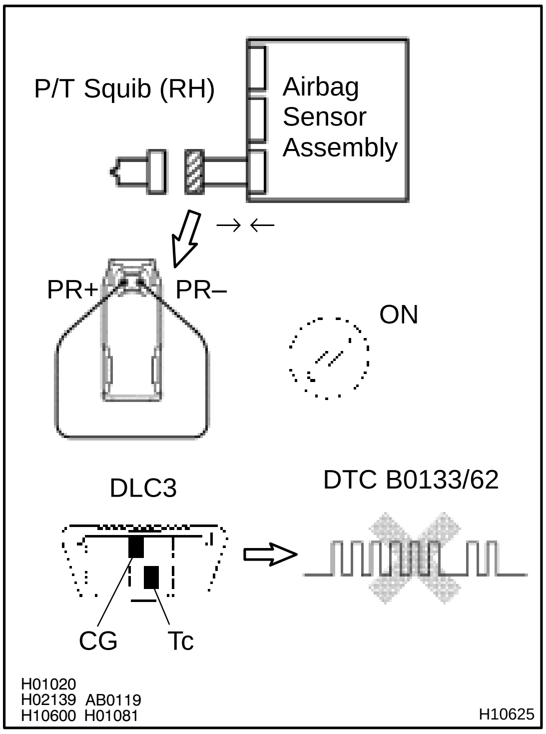
OK:

Voltage: 0 V

NG → **Repair or replace harness or connector between seat belt pretensioner (RH) and airbag sensor assembly.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals PR+ and PR– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (RH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

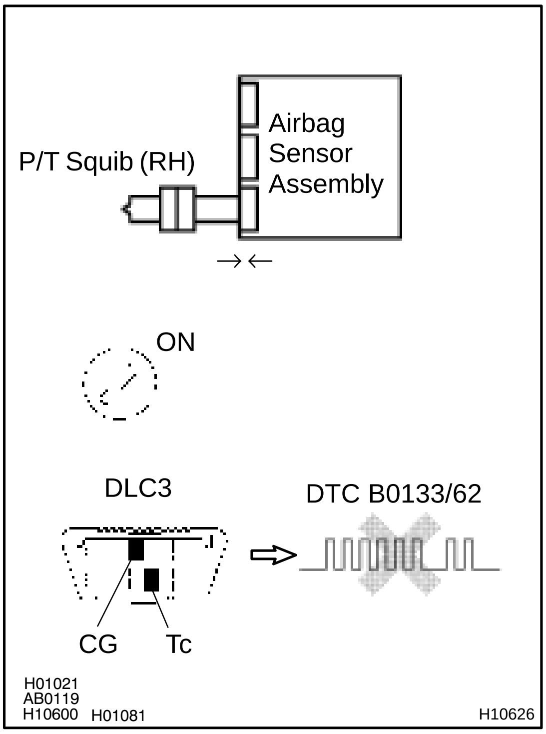
DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check P/T squib (RH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (RH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0133/62 is not output.

HINT:

Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (RH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PN–03

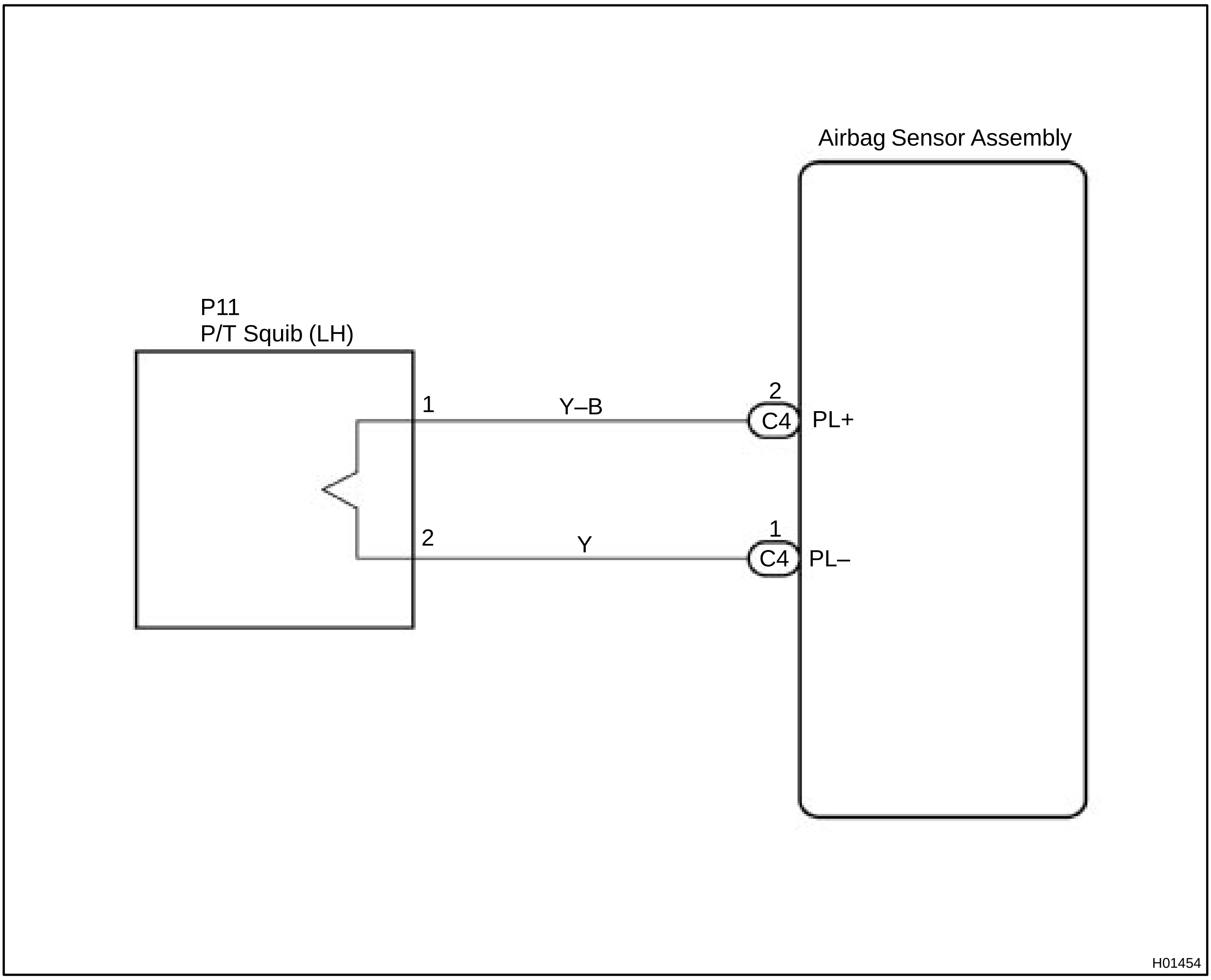
DTC	B0135/73	Short in P/T Squib (LH) Circuit

CIRCUIT DESCRIPTION

The P/T squib (LH) circuit consists of the airbag sensor assembly and seat belt pretensioner (LH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0135/73 is recorded when a short is detected in the P/T squib (LH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0135/73	• Short circuit between PL+ or PL– wire harness of squib • P/T squib (LH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly

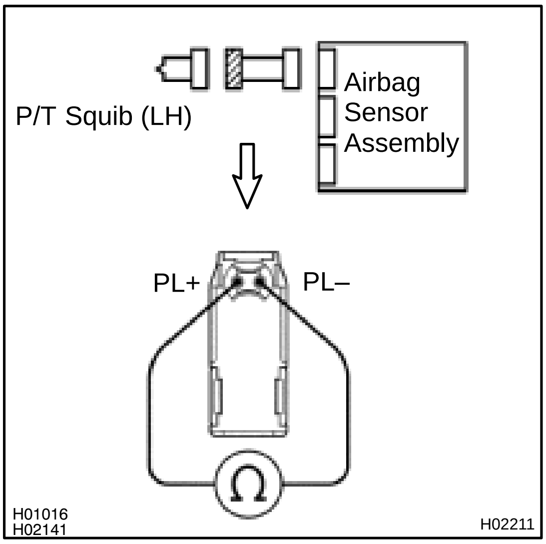
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check P/T squib (LH) circuit.



PREPARATION:

Release the airbag activation prevention mechanism of the connector (on the airbag sensor assembly side) between the airbag sensor assembly and the seat belt pretensioner (LH) (See page DI–237).

CHECK:

For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly, measure the resistance between terminals PL+ and PL–.

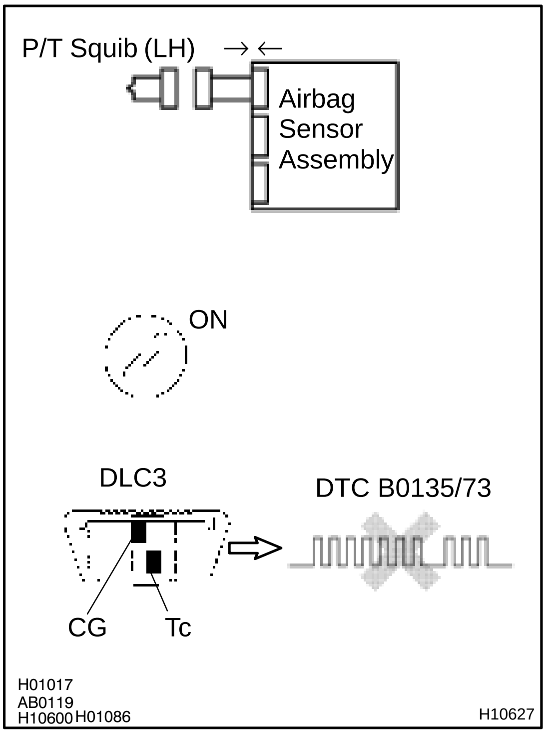
OK:

Resistance: 1 MΩ or Higher

NG	Repair or replace harness or connector between seat belt pretensioner (LH) and airbag sensor assembly.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

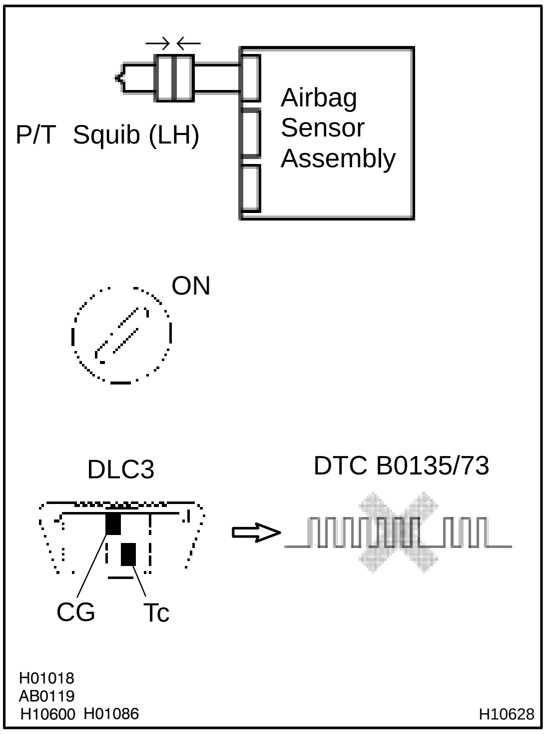
DTC B0135/73 is not output.

HINT:
Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	**Check P/T squib (LH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (LH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to LOOK, and wait at least for 20 second.

(b) Turn the ignition switch ON, and wait at least for 20 seconds.

(c) Clear the DTC stored in memory (See page DI–237).

(d) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(e) Turn the ignition switch ON, and wait at least for 20 seconds.

(f) Check the DTC (See page DI–237).

OK:

DTC B0135/73 is not output.

HINT:

Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (LH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6PO–02

DTC	B0136/74	Open in P/T Squib (LH) Circuit

CIRCUIT DESCRIPTION

The P/T squib circuit (LH) consists of the airbag sensor assembly and seat belt pretensioner (LH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0136/74 is recorded when an opening is detected in the P/T squib (LH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0136/74	• Open circuit in PL+ or PL– wire harness of squib • P/T squib (LH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly

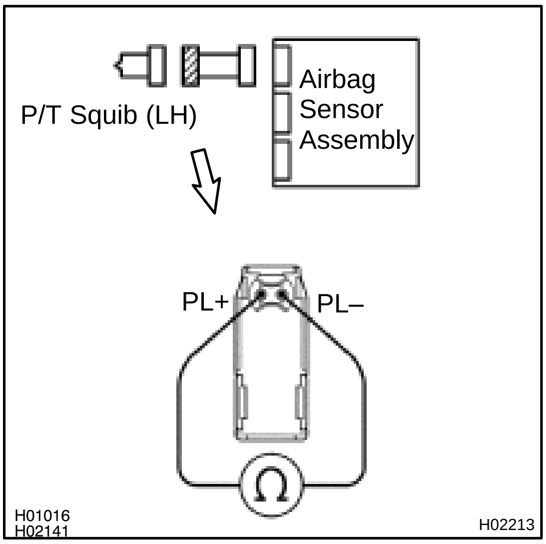
WIRING DIAGRAM

See page DI–294.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check P/T squib (LH) circuit.



CHECK:

For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly, measure the resistance between terminals PL+ and PL–.

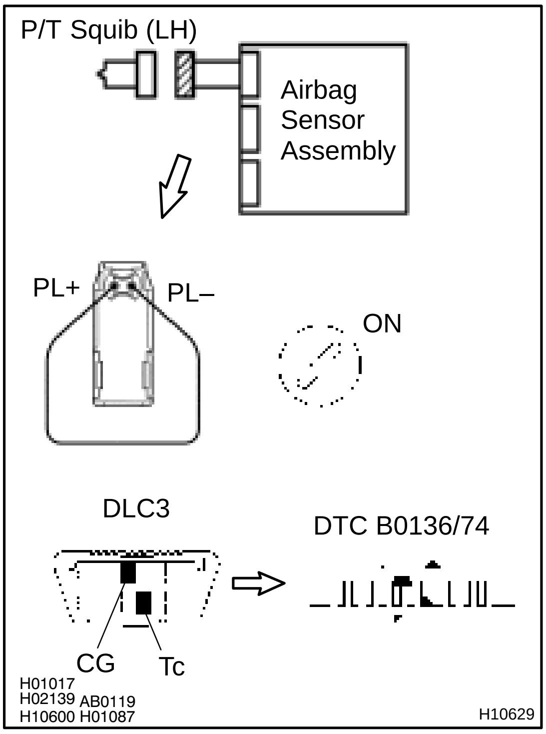
OK:

Resistance: Below 1 Ω

NG	Repair or replace harness or connector between seat belt pretensioner (LH) and airbag sensor assembly.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals PL+ and PL– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0136/74 is not output.

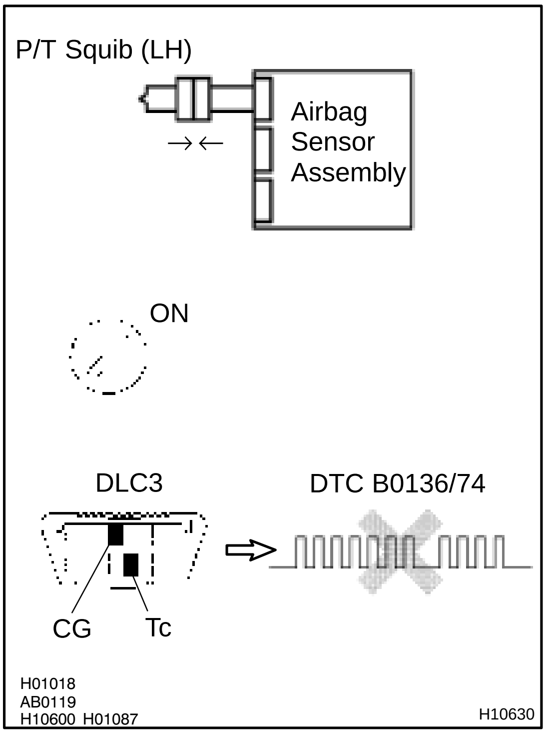
HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	**Check P/T squib (LH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (LH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0136/74 is not output.

HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (LH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

DI6PP–02

DTC	B0137/71	Short in P/T Squib (LH) Circuit (to Ground)

CIRCUIT DESCRIPTION

The P/T squib (LH) circuit consists of the airbag sensor assembly and seat belt pretensioner (LH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0137/71 is recorded when a ground short is detected in the P/T squib (LH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0137/71	• Short circuit in P/T squib (LH) wire harness (to ground) • P/T squib (LH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly

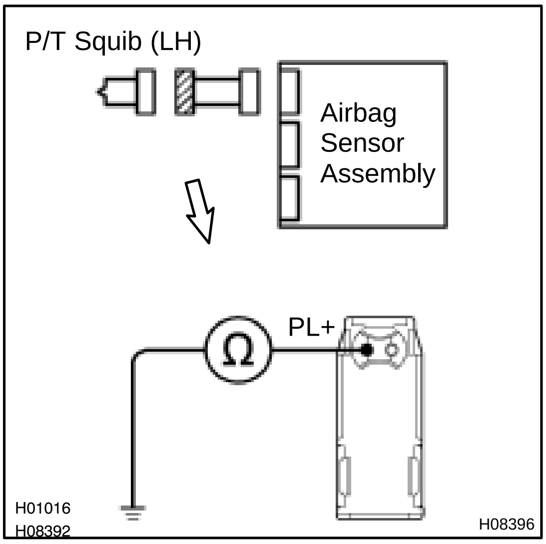
WIRING DIAGRAM

See page DI–294.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Check P/T squib (LH) circuit.**



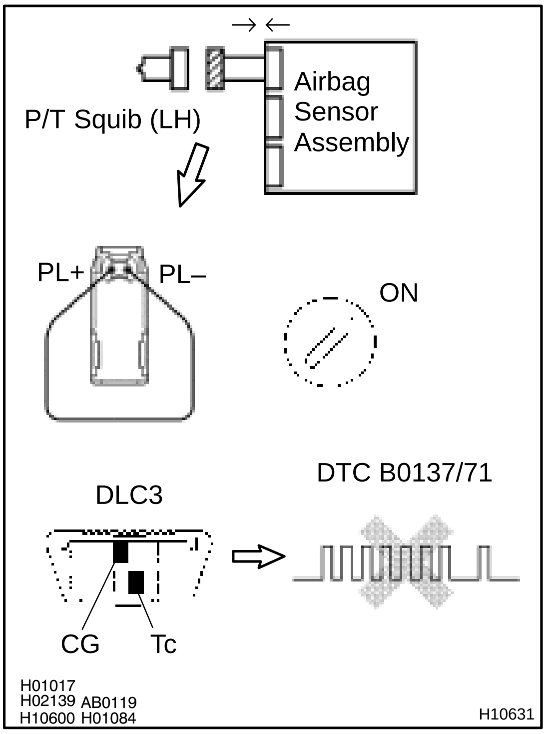
CHECK:
For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly, measure the resistance between PL+ and body ground.

OK:
Resistance: 1 MΩ or Higher

NG	**Repair or replace harness or connector between seat belt pretensioner (LH) and airbag sensor assembly.**

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals PL+ and PL– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0137/71 is not output.

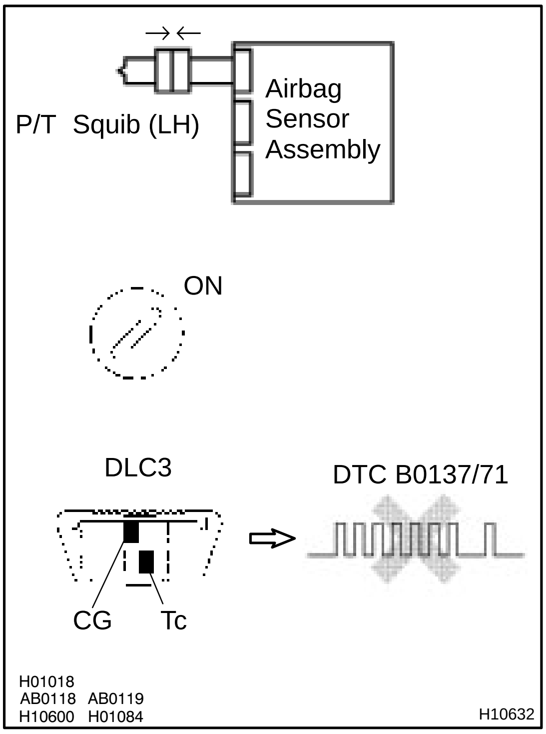
HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check P/T squib (LH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the seat belt pretensioner (LH) connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0137/71 is not output.

HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (LH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PQ–02

DTC	B0138/72	Short in P/T Squib (LH) Circuit (to B+)

CIRCUIT DESCRIPTION

The P/T squib (LH) circuit consists of the airbag sensor assembly and seat belt pretensioner (LH).
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0138/72 is recorded when a B+ short is detected in the P/T squib (LH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B0138/72	• Short circuit in seat belt pretensioner (LH) wire harness (to B+) • P/T squib (LH) malfunction • Airbag sensor assembly malfunction	• Wire harness • Seat belt pretensioner (P/T squib) (LH) • Airbag sensor assembly

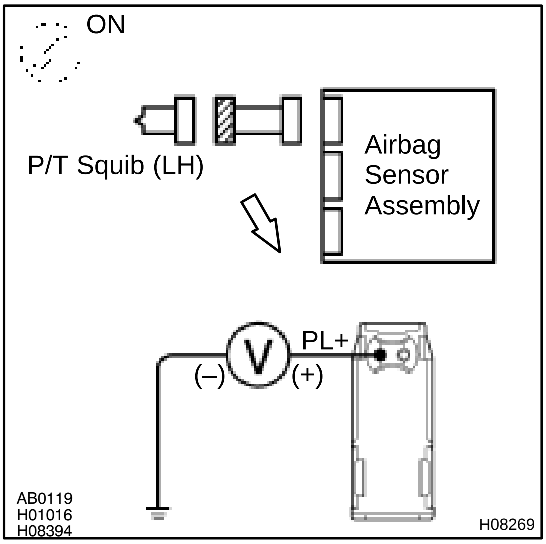
WIRING DIAGRAM

See page DI–294.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check P/T squib (LH) circuit.



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly, measure the voltage between PL+ and body ground.

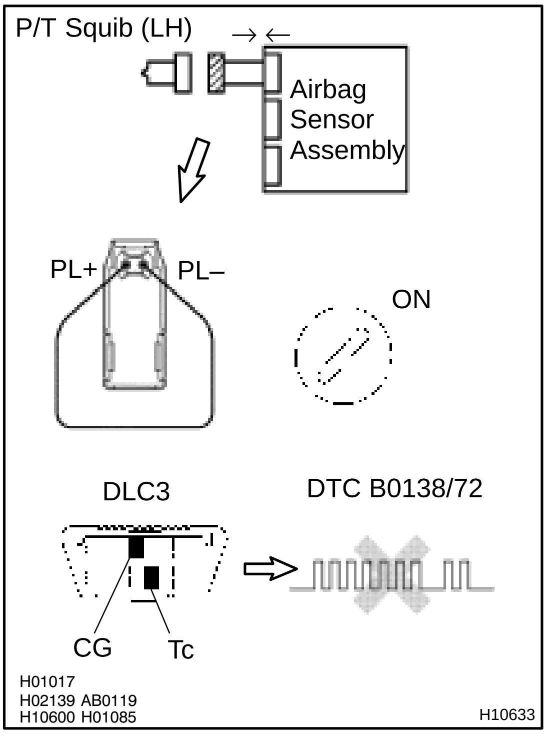
OK:

Voltage: 0 V

NG	Repair or replace harness or connector between seat belt pretensioner (LH) and airbag sensor assembly.

OK

3	**Check airbag sensor assembly.**



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect terminals PL+ and PL– of the connector (on the seat belt pretensioner side) between the seat belt pretensioner (LH) and the airbag sensor assembly.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See step 5 on page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B0138/72 is not output.

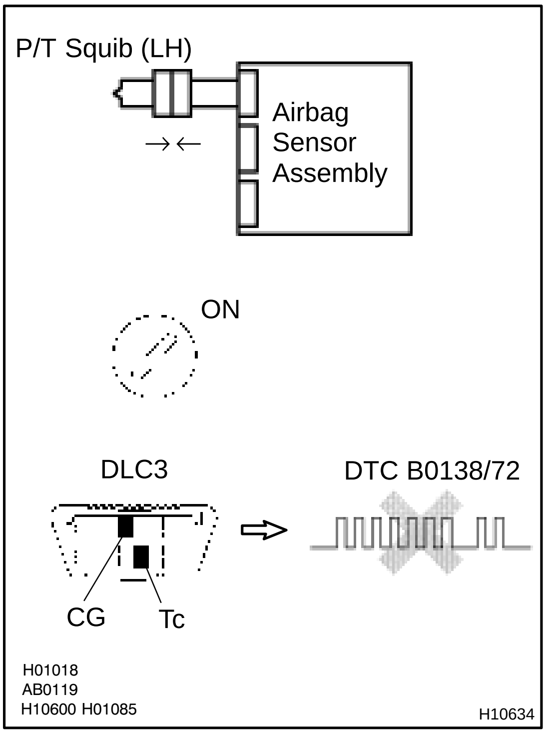
HINT:

Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

4	**Check P/T squib (LH).**



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner (LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.
(b) Clear the DTC stored in memory (See step 5 on page DI–237).
(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.
(d) Turn the ignition switch ON, and wait at least for 20 seconds.
(e) Check the DTC (See page DI–237).

OK:

DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG	**Replace seat belt pretensioner (LH).**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check. If suspected part can not be detected by simulation method, replace all SRS components including wire harness.

DI6PR–03

DTC	B1100/31	Airbag Sensor Assembly Malfunction

CIRCUIT DESCRIPTION

The airbag sensor assembly consists of a airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.
It receives signals from the airbag sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1100/31 is recorded when malfunction is detected in the airbag sensor assembly.

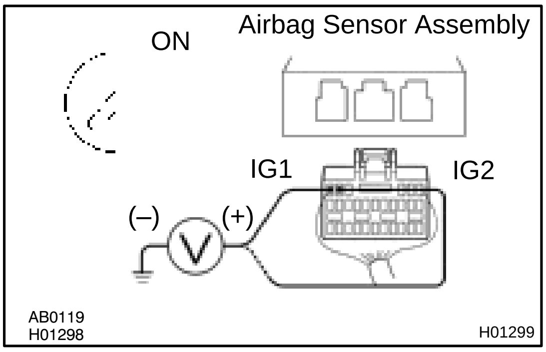
DTC No.	DTC Detection Condition	Trouble Area
B1100/31	• Airbag sensor assembly malfunction	• Airbag sensor assembly

INSPECTION PROCEDURE

HINT:
When a malfunction code other than code B1100/31 is displayed at the same time, first eliminate the malfunction indicated by the malfunction code other than code B1100/31.

1	Prepare for inspection (See step 1 on page DI–323).

2	Check voltage between terminals IG1 and IG2 of airbag sensor assembly connector.



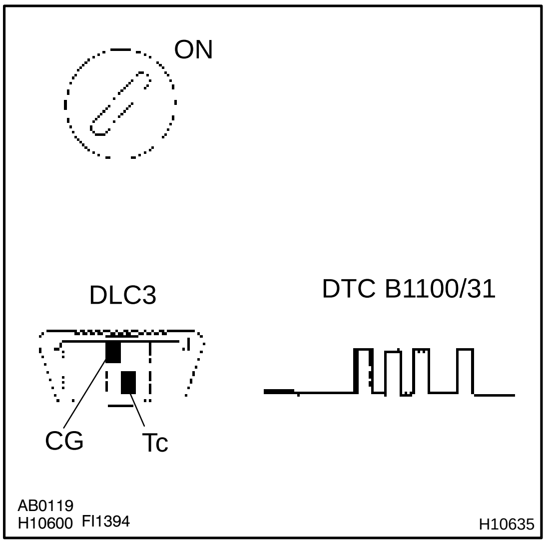
CHECK:
(a) Turn the ignition switch ON.
(b) Measure the voltage between body ground and each of terminals IG1 and IG2 of the airbag sensor assembly connector.

OK:
Voltage: 10 – 14 V

NG	Check that an abnormality occurs on battery and charging system.

OK

3	**Is DTC B1100/31 output again?**



PREPARATION:

Clear the DTC (See step 5 on page DI–237).

CHECK:

(a) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(b) Turn the ignition switch ON, and wait at least for 20 seconds.

(c) Repeat operation in step (a) and (b) at least 5 times.

(d) Check the DTC (See page DI–237).

HINT:

Codes other than code B1100/31 may be output at this time, but they are not relevant to this check.

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–18).**

YES

↓

Replace airbag sensor assembly.

DI6PW–03

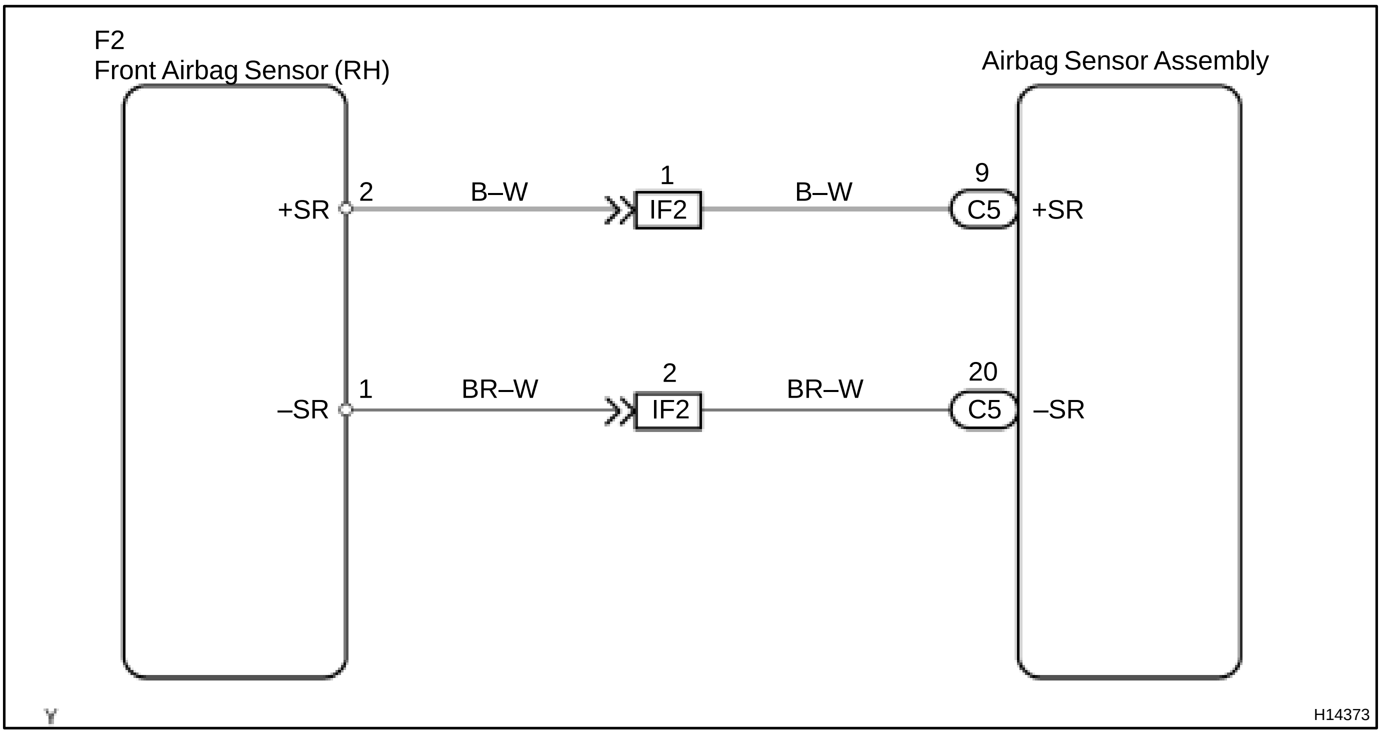
DTC	B1156/B1157/15	Front Airbag Sensor (RH) Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor (RH) circuit consists of the airbag sensor assembly and front airbag sensor (RH).
For details of the function of each component, see OPERATION on page RS–2.
DTC B1156/B1157/15 is recorded when a malfunction is detected in the front airbag sensor (RH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B1156/B1157/15	• Front airbag sensor (RH) malfunction	• Wire harness • Front airbag sensor (RH) • Airbag sensor assembly

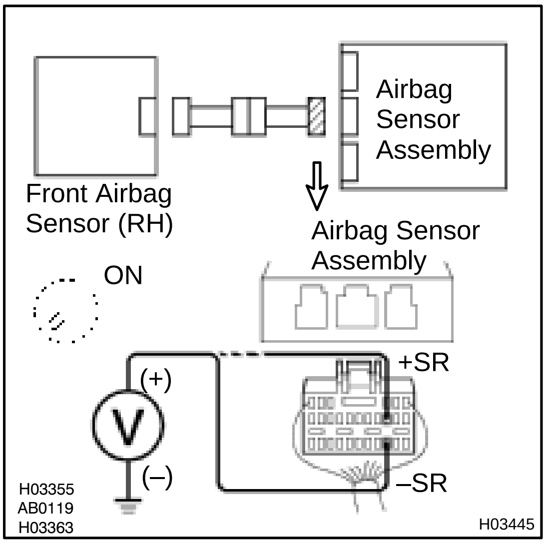
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–323).

2	Check wire harness (to B+).



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the airbag sensor assembly side) between the front airbag sensor (RH) and the airbag sensor assembly, measure the voltage between body ground and each of terminals +SR and –SR.

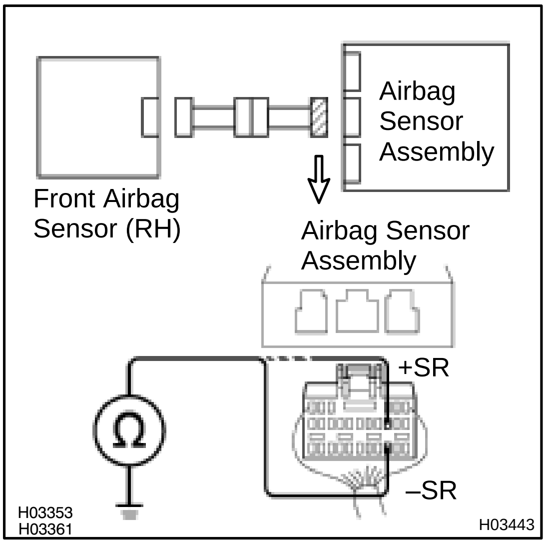
OK:

Voltage: Below 1 V

NG → **Go to step 8.**

OK

3	Check wire harness (to ground).



CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (RH) and the airbag sensor assembly, measure the resistance between body ground and each of terminals +SR and –SR.

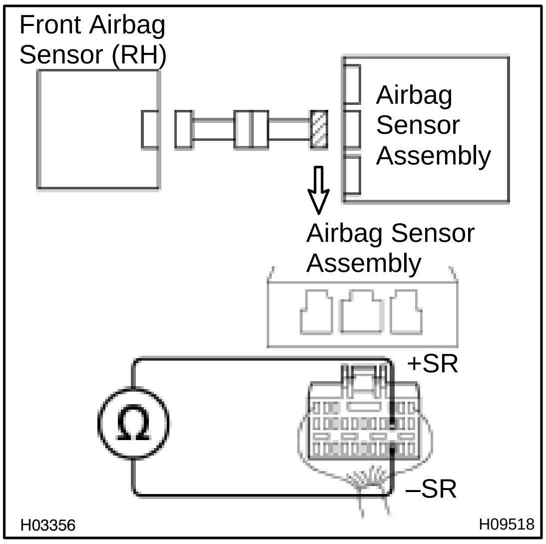
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 9.**

OK

4	**Check wire harness.**



CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (RH) and the airbag sensor assembly, measure the resistance between terminals +SR and –SR.

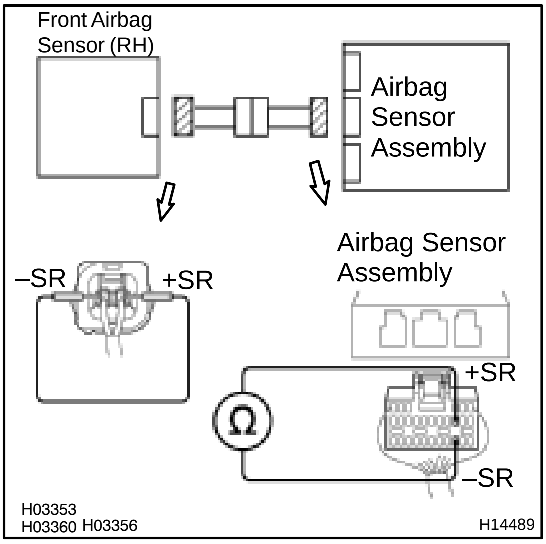
OK:

Resistance: 1 MΩ or Higher

NG **Go to step 10.**

OK

5	**Check wire harness.**



PREPARATION:

Using a service wire, connect terminals +SR and –SR of the connector (on the front airbag sensor (RH) side) between the airbag sensor assembly and the front airbag sensor (RH).

CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (RH) and the airbag sensor assembly, measure the resistance between terminals +SR and –SR.

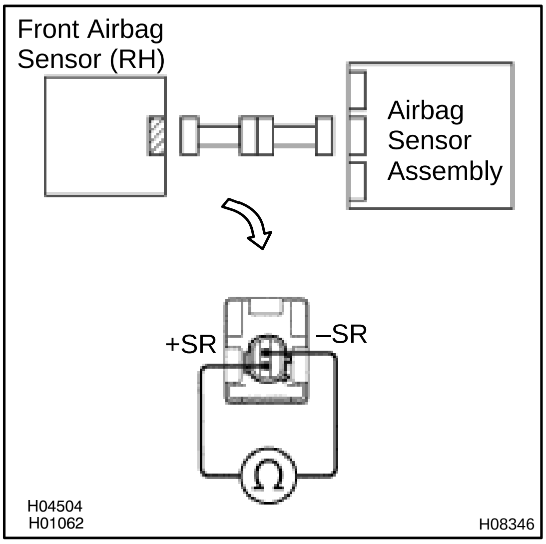
OK:

Resistance: Below 1 Ω

NG **Go to step 11.**

OK

6 Check front airbag sensor (RH).



CHECK:

For the connector of the front airbag sensor (RH), measure the resistance between terminals +SR and –SR.

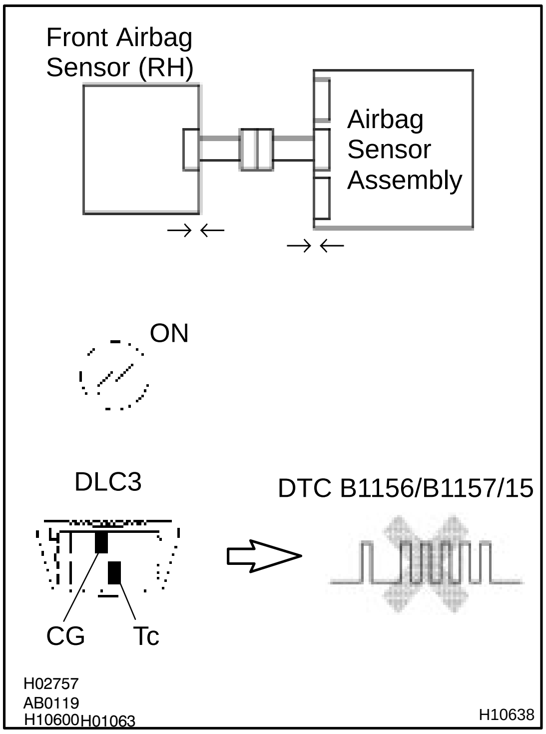
OK:

Resistance: 300 – 1,500 Ω

NG	**Replace front airbag sensor (RH).**

OK

7 Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the front airbag sensor (RH) connector and airbag sensor assembly connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B1156/B1157/15 is not output.

HINT:

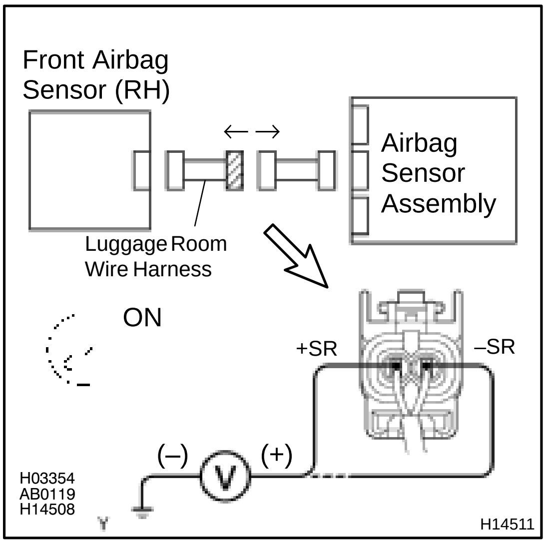
Codes other than code B1156/B1157/15 may be output at this time, but they are not relevant to this check.

NG	**Replace airbag sensor assembly.**

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

8	**Check luggage room wire harness (to B+).**



PREPARATION:

Disconnect the luggage room wire harness connector on the airbag sensor assembly side.

CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the voltage between body ground and each of terminals +SR and –SR.

OK:

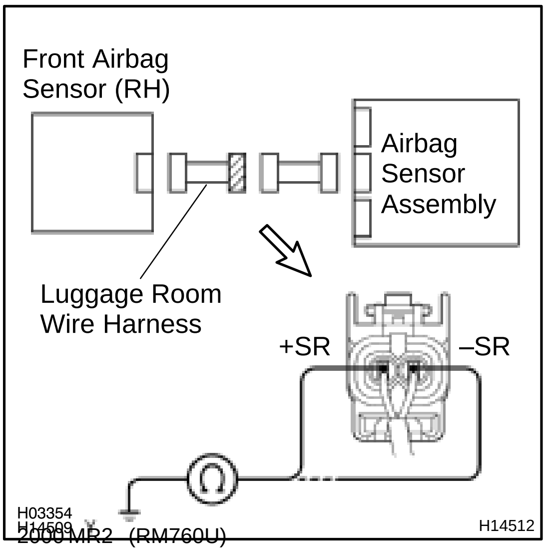
Voltage: Below 1 V

NG → **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

9	**Check luggage room wire harness (to ground).**



CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between body ground and each of terminals +SR and –SR.

OK:

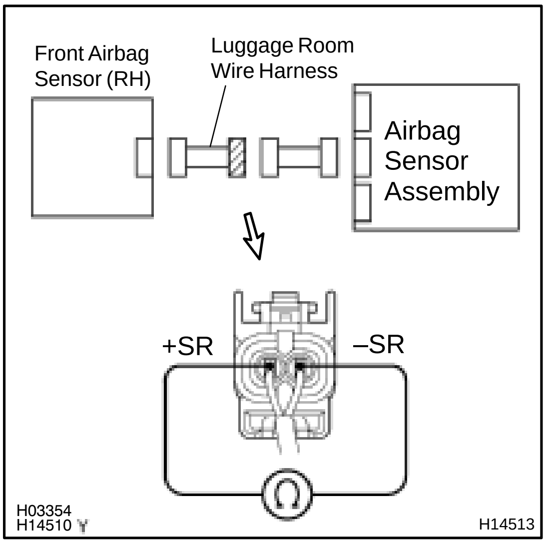
Resistance: 1 MΩ or Higher

NG → **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

10	**Check luggage room wire harness.**



CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between terminals +SR and –SR.

OK:

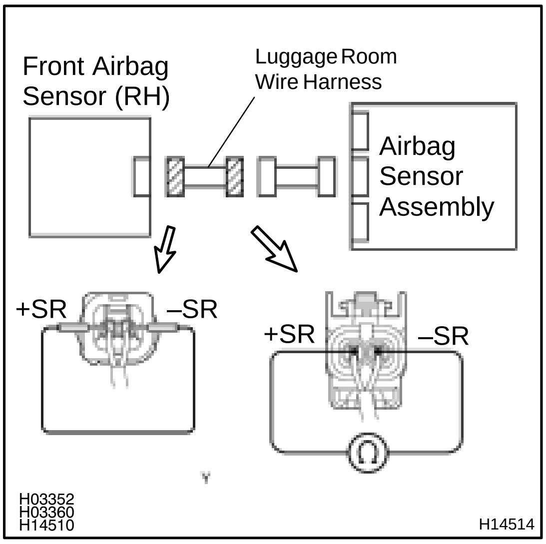
Resistance: 1 MΩ or Higher

NG — **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

11	**Check luggage room wire harness.**



PREPARATION:

Using a service wire, connect terminals +SR and –SR of the connector (on the front airbag sensor (RH) side) of the luggage room wire harness.

CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between terminals +SR and –SR.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

DI6PX–03

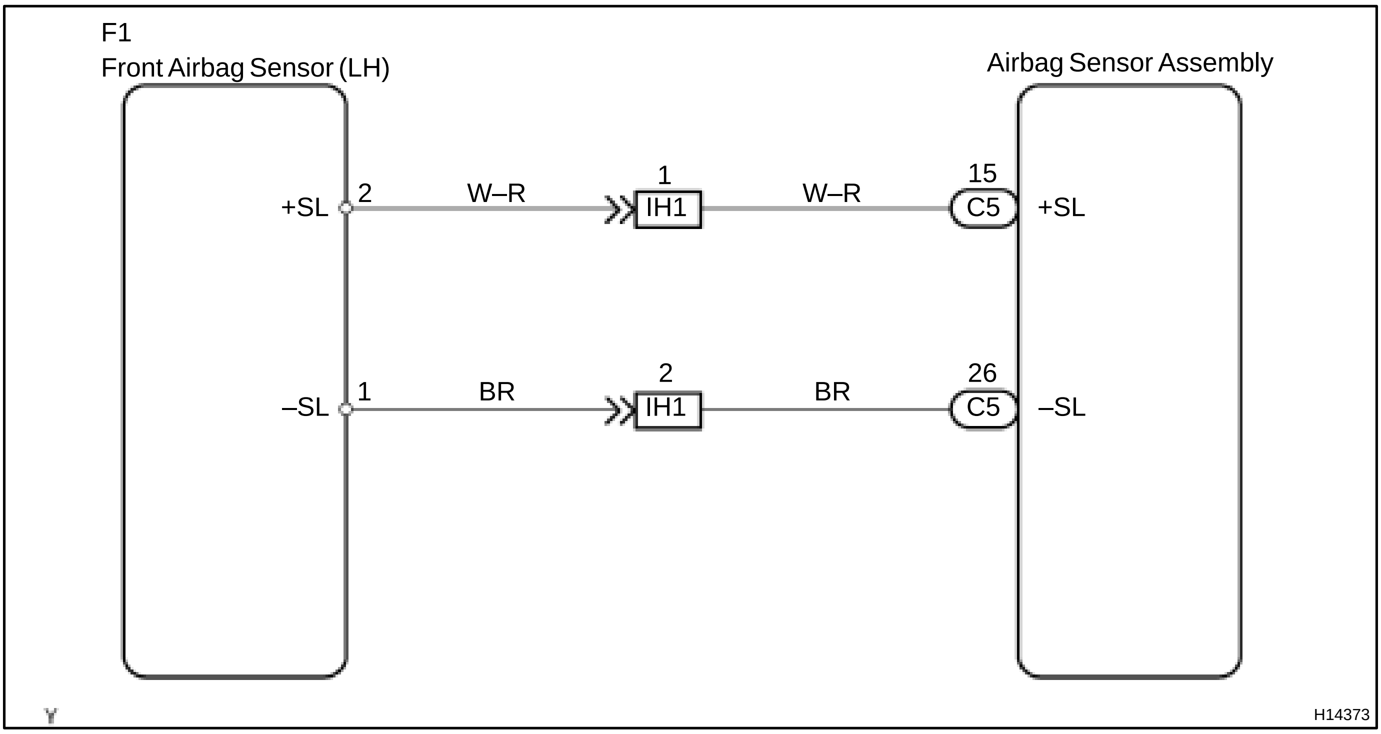
DTC	B1158/B1159/16	Front Airbag Sensor (LH) Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor (LH) circuit consists of the airbag sensor assembly and front airbag sensor (LH).
For details of the function of each component, see OPERATION on page RS–2.
DTC B1158/B1159/16 is recorded when malfunction is detected in the front airbag sensor (LH) circuit.

DTC No.	DTC Detection Condition	Trouble Area
B1158/B1159/16	• Front airbag sensor (LH) malfunction	• Wire harness • Front airbag sensor (LH) • Airbag sensor assembly

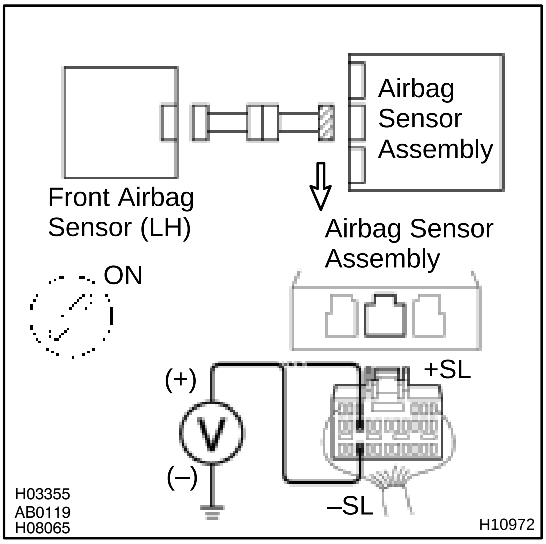
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–323).**

2	Check wire harness (to B+).



CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the airbag sensor assembly side) between the front airbag sensor (LH) and the airbag sensor assembly, measure the voltage between body ground and each of terminals +SL and –SL.

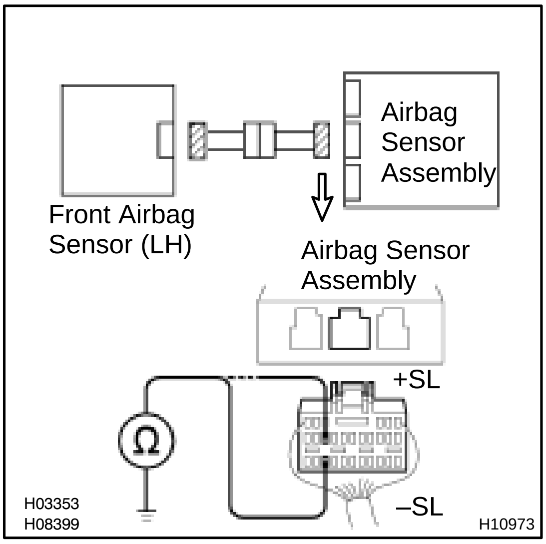
OK:

Voltage: Below 1 V

NG → **Go to step 8.**

OK

3	Check wire harness (to ground).



CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (LH) and the airbag sensor assembly, measure the resistance between body ground and each of terminals +SL and –SL.

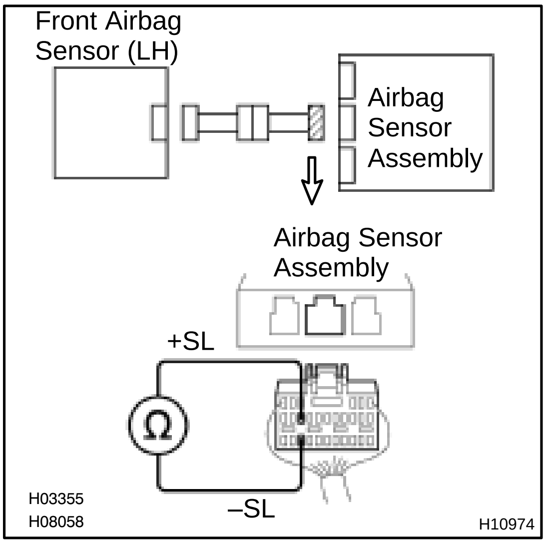
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 9.**

OK

4	Check wire harness.



CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (LH) and the airbag sensor assembly, measure the resistance between terminals +SL and –SL.

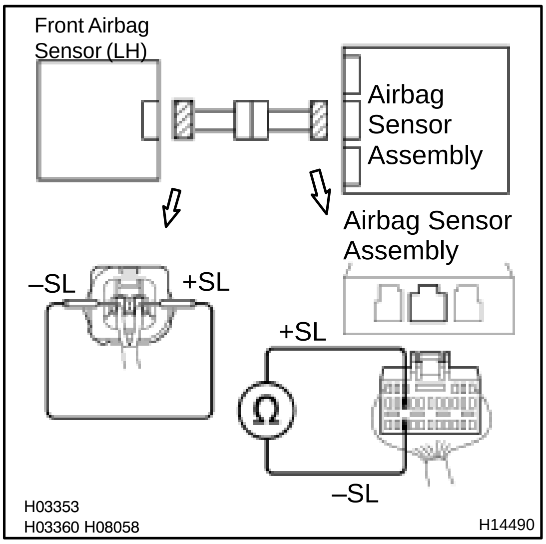
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect +SL and –SL of the connector (on the front airbag sensor (LH) side) between the airbag sensor assembly and the front airbag sensor (LH).

CHECK:

For the connector (on the airbag sensor assembly side) between the front airbag sensor (LH) and the airbag sensor assembly, measure the resistance between terminals +SL and –SL.

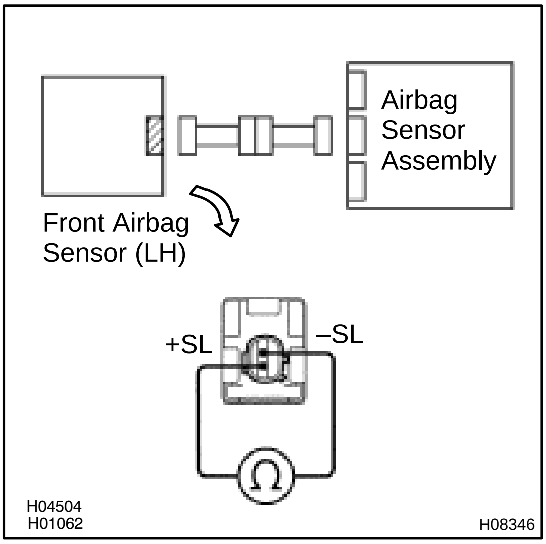
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check front airbag sensor (LH).



CHECK:

For the connector (on the front airbag sensor (LH)), measure the resistance between terminals +SL and –SL.

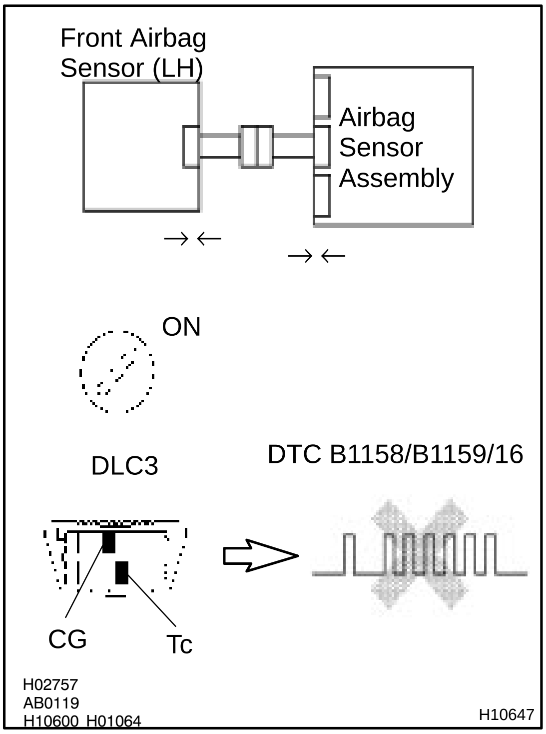
OK:

Resistance: 300 – 1500 Ω

NG	Replace front airbag sensor (LH).

OK

7	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Connect the front airbag sensor (LH) connector and airbag sensor assembly connector.

(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch ON, and wait at least for 20 seconds.

(b) Clear the DTC stored in memory (See page DI–237).

(c) Turn the ignition switch to LOCK, and wait at least for 20 seconds.

(d) Turn the ignition switch ON, and wait at least for 20 seconds.

(e) Check the DTC (See page DI–237).

OK:

DTC B1158/B1159/16 is not output.

HINT:

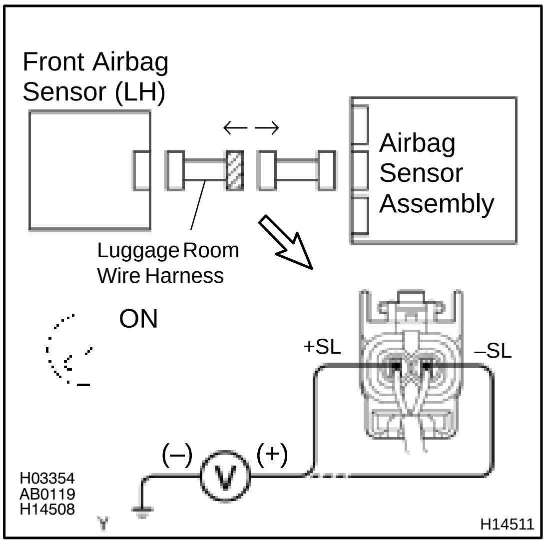
Codes other than code B1158/B1159/16 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

8	**Check luggage room wire harness (to B+).**



PREPARATION:

Disconnect the luggage room wire harness connector on the airbag sensor assembly side.

CHECK:

(a) Turn the ignition switch ON.

(b) For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the voltage between body ground and each of terminals +SL and –SL.

OK:

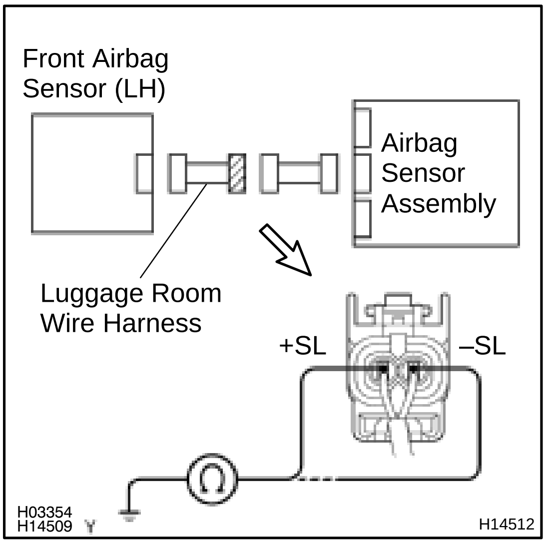
Voltage: Below 1 V

NG	**Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

9	Check luggage room wire harness (to ground).



CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between body ground and each of terminals +SL and –SL.

OK:

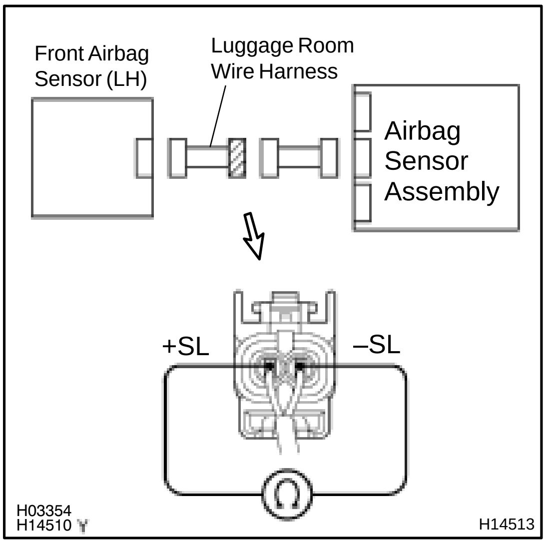
Resistance: 1 MΩ or Higher

NG → **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

10	Check luggage room wire harness.



CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between terminals +SL and –SL.

OK:

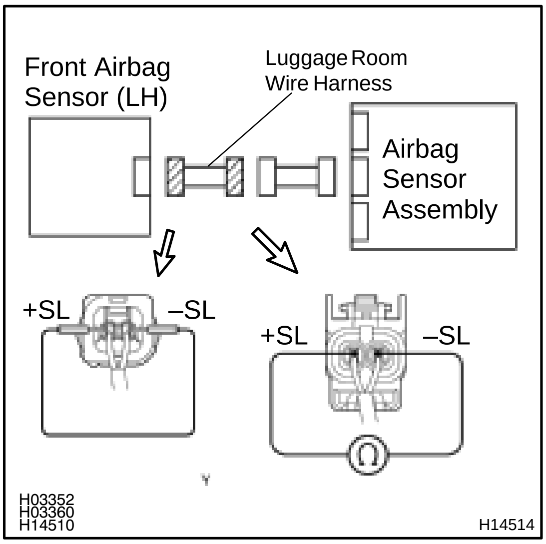
Resistance: 1 MΩ or Higher

NG → **Repair or replace luggage room wire harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

11 Check luggage room wire harness.



PREPARATION:

Using a service wire, connect terminals +SL and –SL of the connector (on the front airbag sensor (LH) side) of the luggage room wire harness.

CHECK:

For the connector (on the airbag sensor assembly side) of the luggage room wire harness, measure the resistance between terminals +SL and –SL.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace luggage room main harness.**

OK

Repair or replace harness or connector between airbag sensor assembly and luggage room wire harness.

DI6PY–03

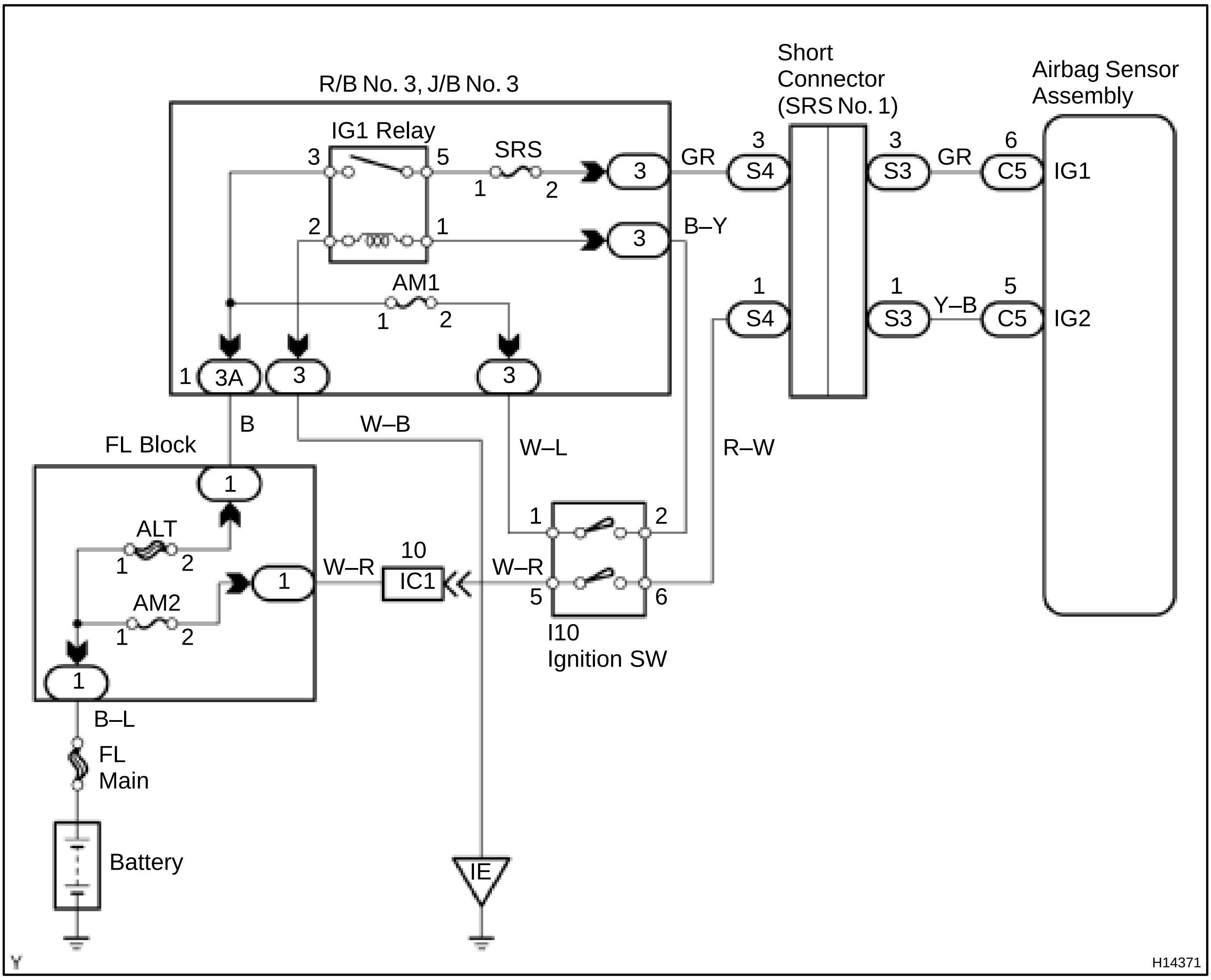
DTC	Normal	Source Voltage Drop

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the airbag sensor assembly in case the source voltage drops.
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage.
The diagnosis system malfunction display for this circuit is different from other circuits that is when the SRS warning light remains lit up and the DTC is a normal code, source voltage drop is indicated.
Malfunction in this circuit is not recorded in the airbag sensor assembly, and the source voltage returns to normal, the SRS warning light automatically goes off.

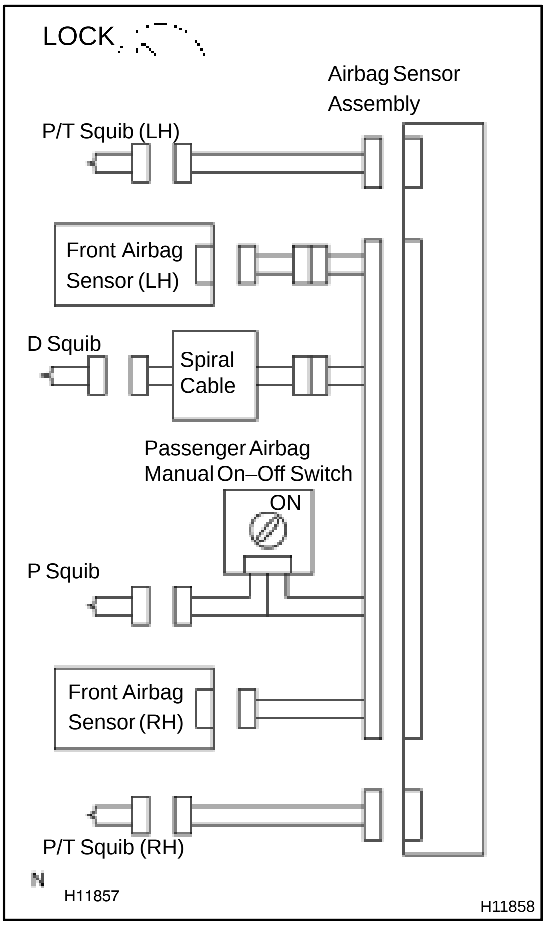
DTC No.	Diagnosis
(Normal)	Source voltage drop

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection.**



PREPARATION:

(a) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(b) Remove the steering wheel pad (See page SR–10).

(c) Disconnect the connector of the front passenger airbag assembly (See page RS–26).

(d) Disconnect the connector of the airbag sensor assembly (See page RS–41).

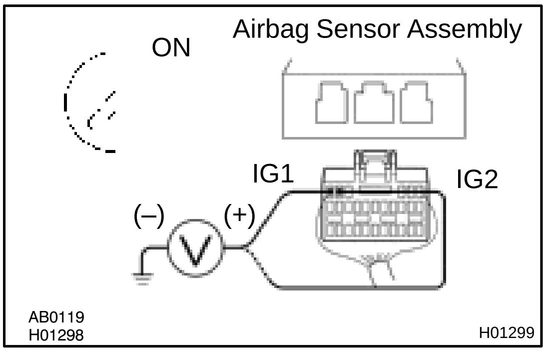
(e) Disconnect the connector of the seat belt pretensioner RH and LH (See page BO–59).

(f) Disconnect the connector of the front airbag sensor RH and LH (See page RS–46).

CAUTION:

Store the steering wheel pad with the front surface facing upward.

2	**Check source voltage.**



PREPARATION:

(a) Connect the negative (–) terminal cable to the battery.

(b) Turn the ignition switch ON.

CHECK:

While operating the electric system (defogger, wiper, headlight, heater, blower, etc.), measure the voltage between each of terminals IG1 and IG2 of the airbag sensor assembly connector and body ground.

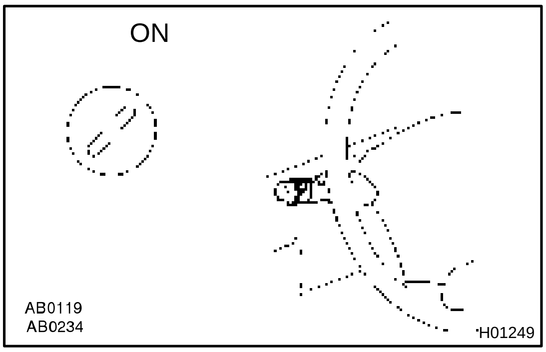
OK:

Voltage: 10 – 14 V

NG	**Check harness between battery and airbag sensor assembly, and check battery and charging system.**

OK

3	**Does SRS warning light turn OFF?**



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Connect the steering wheel pad connector.
(c) Connect the front passenger airbag assembly connector.
(d) Connect the airbag sensor assembly connector.
(e) Connect the seat belt pretensioner connector.
(f) Connect the front airbag sensor connector.
(g) Turn the ignition switch ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.) and check that SRS warning light goes off.

NO → **Check for DTCs. If a DTC is output, perform troubleshooting for DTC. If a normal code is output, replace airbag sensor assembly.**

YES

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

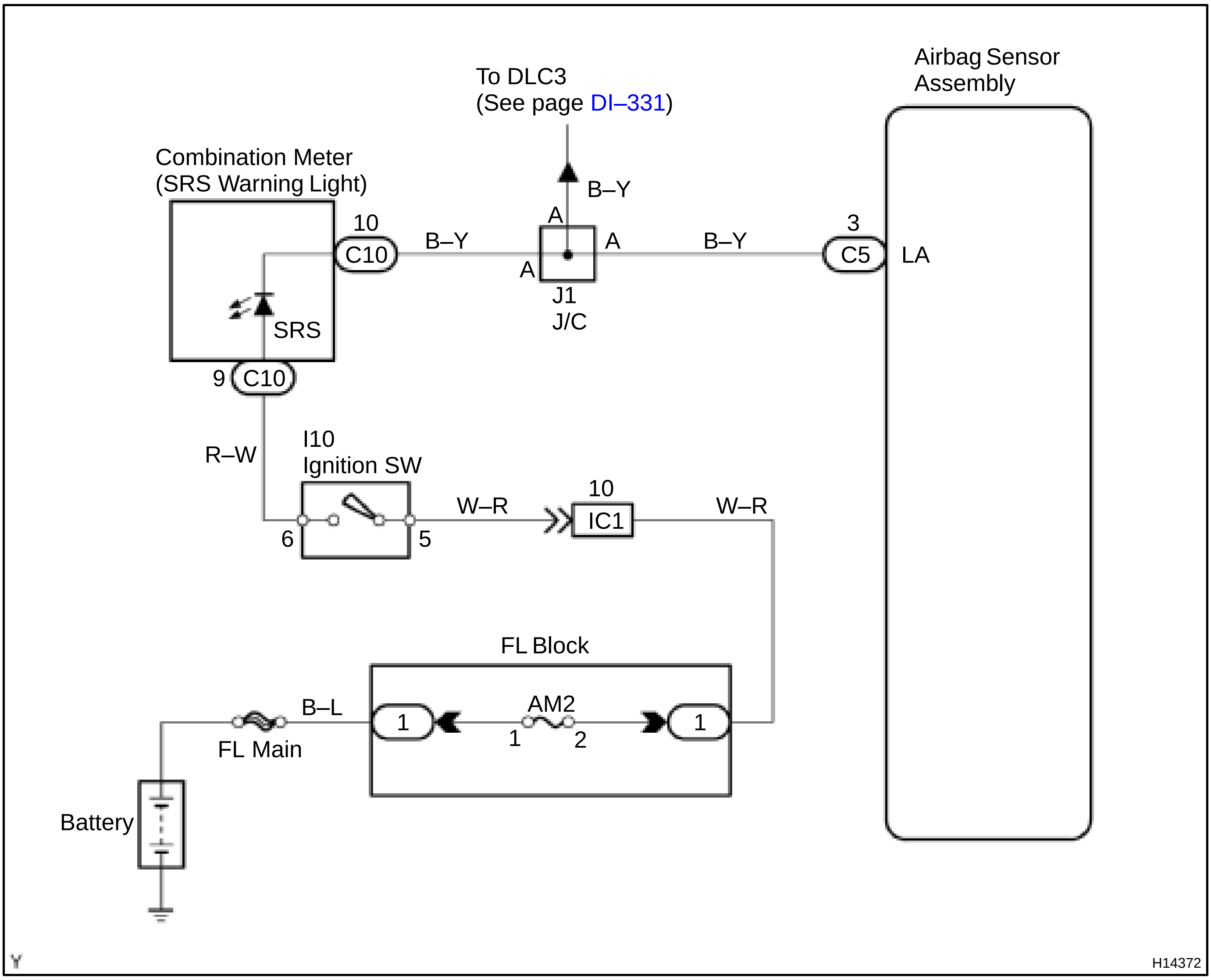
DI6PZ–03

SRS Warning Light Circuit Malfunction

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from the LOCK position to ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and CG of the DLC3 are connected, the DTC is displayed by blinking the SRS warning light.

WIRING DIAGRAM

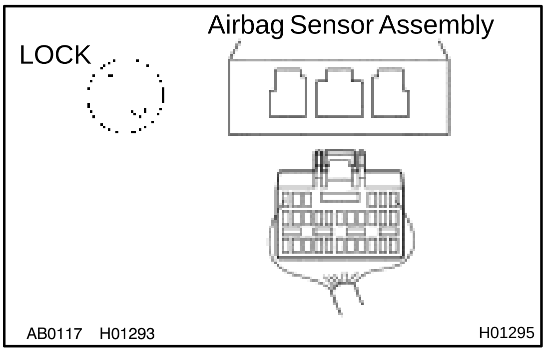


INSPECTION PROCEDURE

SRS warning light always lights up, when ignition switch is in LOCK position:

1	**Prepare for inspection (See step 1 on page DI–323).**

2	**Does SRS warning light turn off?**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Disconnect the airbag sensor assembly connector.

(d) Connect the negative (–) terminal cable to the battery.

CHECK:

Check operation of the SRS warning light.

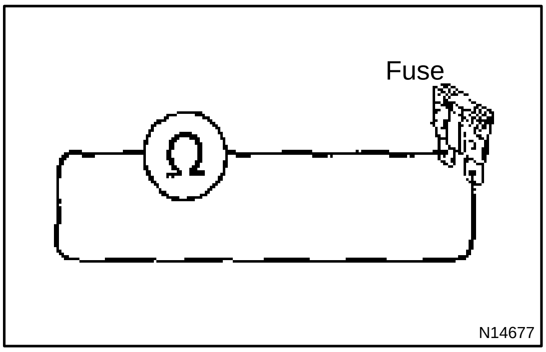
NO → **Check SRS warning light circuit or terminal A/B circuit of DLC3.**

YES

Replace airbag sensor assembly.

SRS warning light does not light up, when ignition switch is turned to ON:

1	**Check AM2 Fuse.**



PREPARATION:

Remove the AM2 fuse from the FL block.

CHECK:

Check the continuity of the AM2 fuse.

OK:

Continuity

HINT:

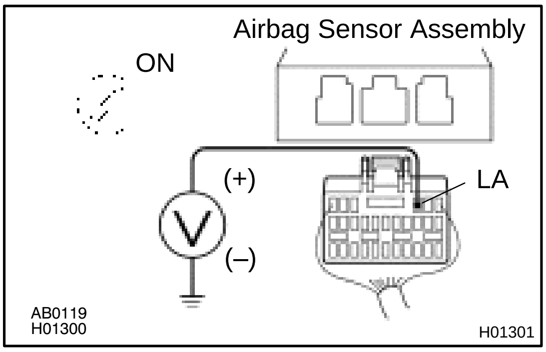
- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

NG → **Go to step 5.**

OK

2	**Prepare for inspection (See step 1 on page DI–323).**

3	**Check SRS warning light circuit.**



PREPARATION:

(a) Connect the negative (–) terminal cable to the battery.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal LA of the harness side connector of the airbag sensor assembly connector and body ground.

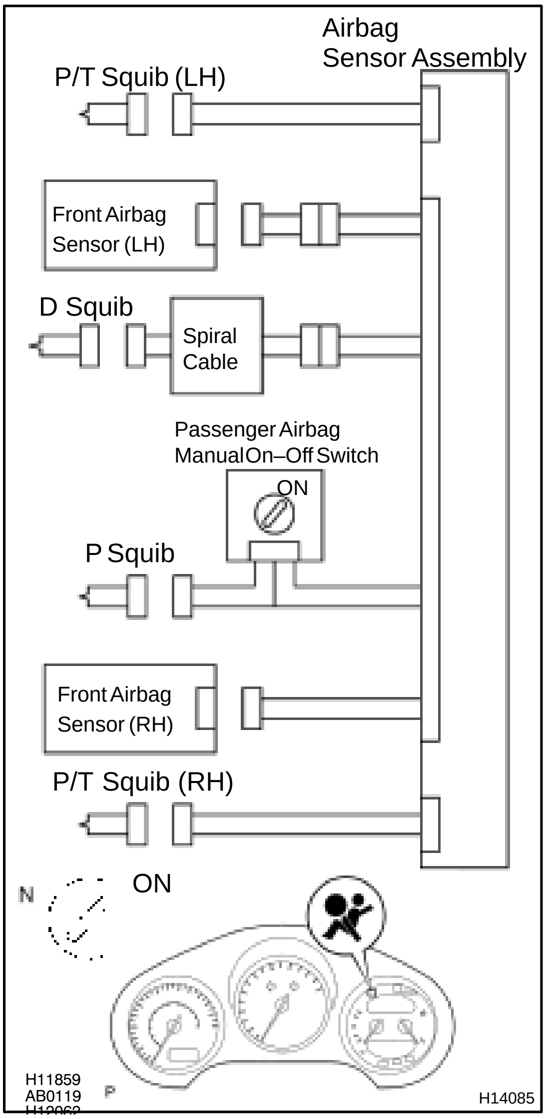
OK:

Voltage: 10 – 14 V

NG	**Check combination meter or repair SRS warning light circuit.**

OK

4	Does SRS warning light come on?



PREPARATION:

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

(b) Connect the airbag sensor assembly connector.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

(d) Turn the ignition switch ON.

CHECK:

Check operation of the SRS warning light.

NO	Check terminal LA of airbag sensor assembly. If normal, replace airbag sensor assembly.

YES

From results of above inspection, suspected part can now be considered normal. To make sure of this, use simulation method to check.

5	Is new AM2 fuse burnt out again?

NO	Using simulation method, reproduce malfunction symptoms (See page IN–18).

YES

Check harness between AM2 fuse and SRS warning light.

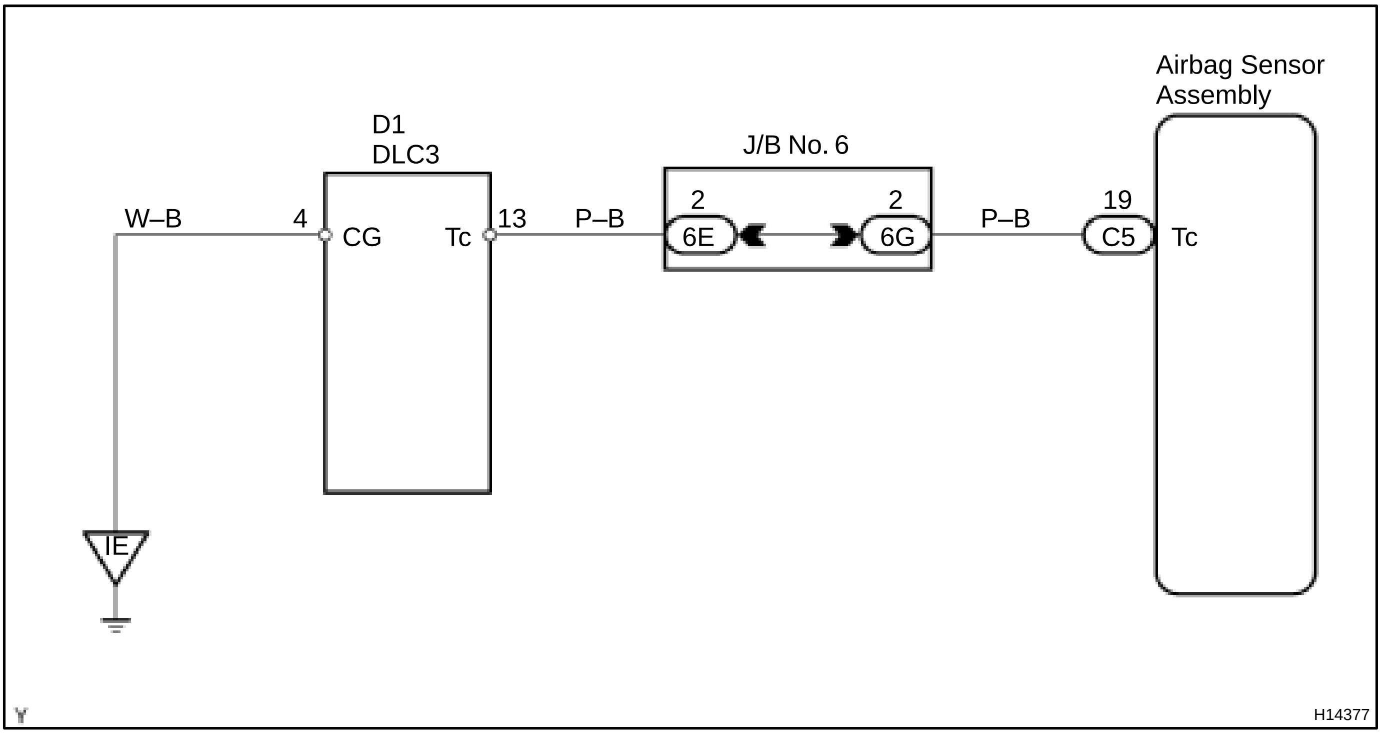
DI6Q0–03

Tc Terminal Circuit

CIRCUIT DESCRIPTION

By connecting terminals Tc and CG of the DLC3 the airbag sensor assembly is set in the DTC output mode. The DTCs are displayed by blinking the SRS warning light.

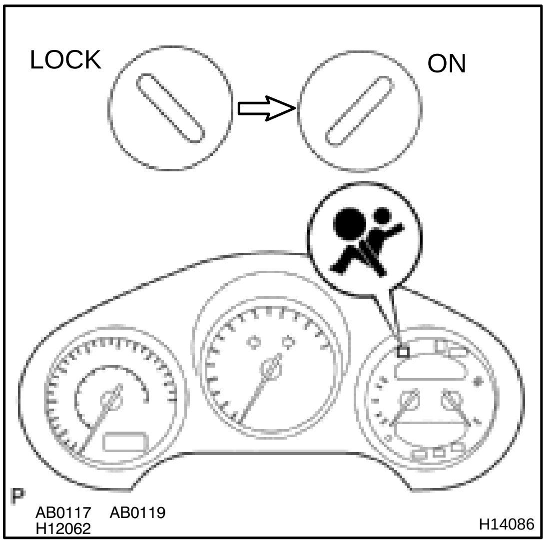
WIRING DIAGRAM



INSPECTION PROCEDURE

If the DTC is not displayed, do the following troubleshooting:

1	**Does SRS warning light light up for approx. 6 seconds?**



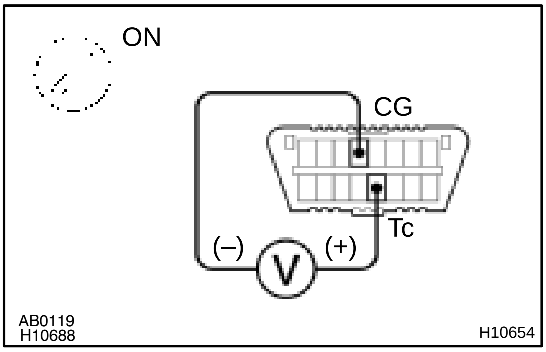
PREPARATION:

Check operation of the SRS warning light after the ignition switch is turned from LOCK position to ON position.

NO → **Check SRS warning light system (See page DI–326).**

YES

2	**Check voltage between terminals Tc and CG of DLC3.**



PREPARATION:

Turn the ignition switch to ON.

CHECK:

Measure the voltage between terminals Tc and CG of the DLC3.

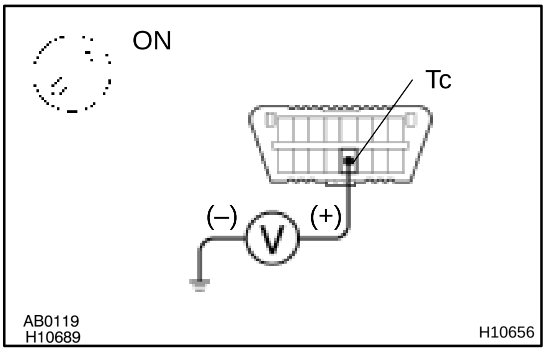
OK:

Voltage: 10 – 14 V

OK → **Go to step 4.**

NG

3	Check voltage between terminal Tc of DLC3 and body ground.

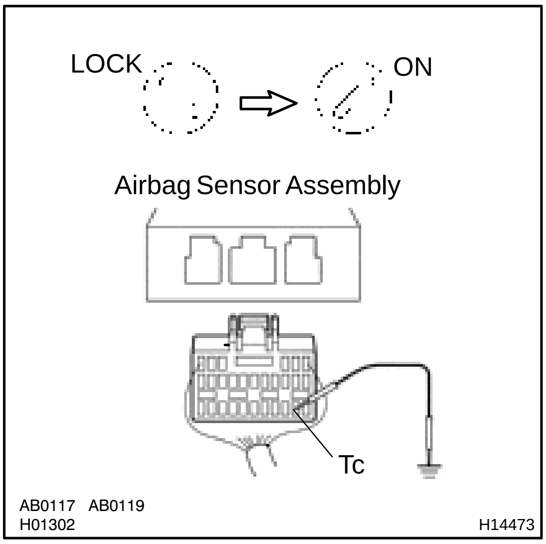


CHECK:
Measure the voltage between terminal Tc of the DLC3 and body ground.
OK:
Voltage: 10 – 14 V

OK → **Check harness between terminal CG of DLC3 and body ground.**

NG

4	Check airbag sensor assembly.



PREPARATION:
(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the airbag sensor assembly connector.
(d) Insert a service wire into terminal Tc from the back side as shown in the illustration.
(e) Connect the airbag sensor assembly connector with the service wire.
(f) Connect the negative (–) terminal cable to the battery.
(g) Turn the ignition switch ON, and wait at least for 20 seconds.
(h) Connect the service wire of terminal Tc to the body ground.

CHECK:
Check operation of the SRS warning light.
OK:
SRS waning light comes on.
NOTICE:
Pay due attention to the terminal connecting position.

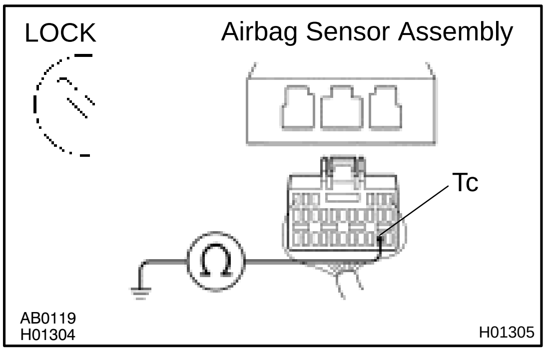
OK → **Check harness between airbag sensor assembly and DLC3.**

NG

Replace airbag sensor assembly.

If the DTC is displayed without a DTC check procedure, perform the following troubleshooting:

1	**Check resistance between terminal Tc of airbag sensor assembly and body ground.**



PREPARATION:
(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the airbag sensor assembly connector.

CHECK:
Check the resistance between terminal Tc of the airbag sensor assembly connector and body ground.

OK:
Resistance: 1 MΩ or Higher

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

OK

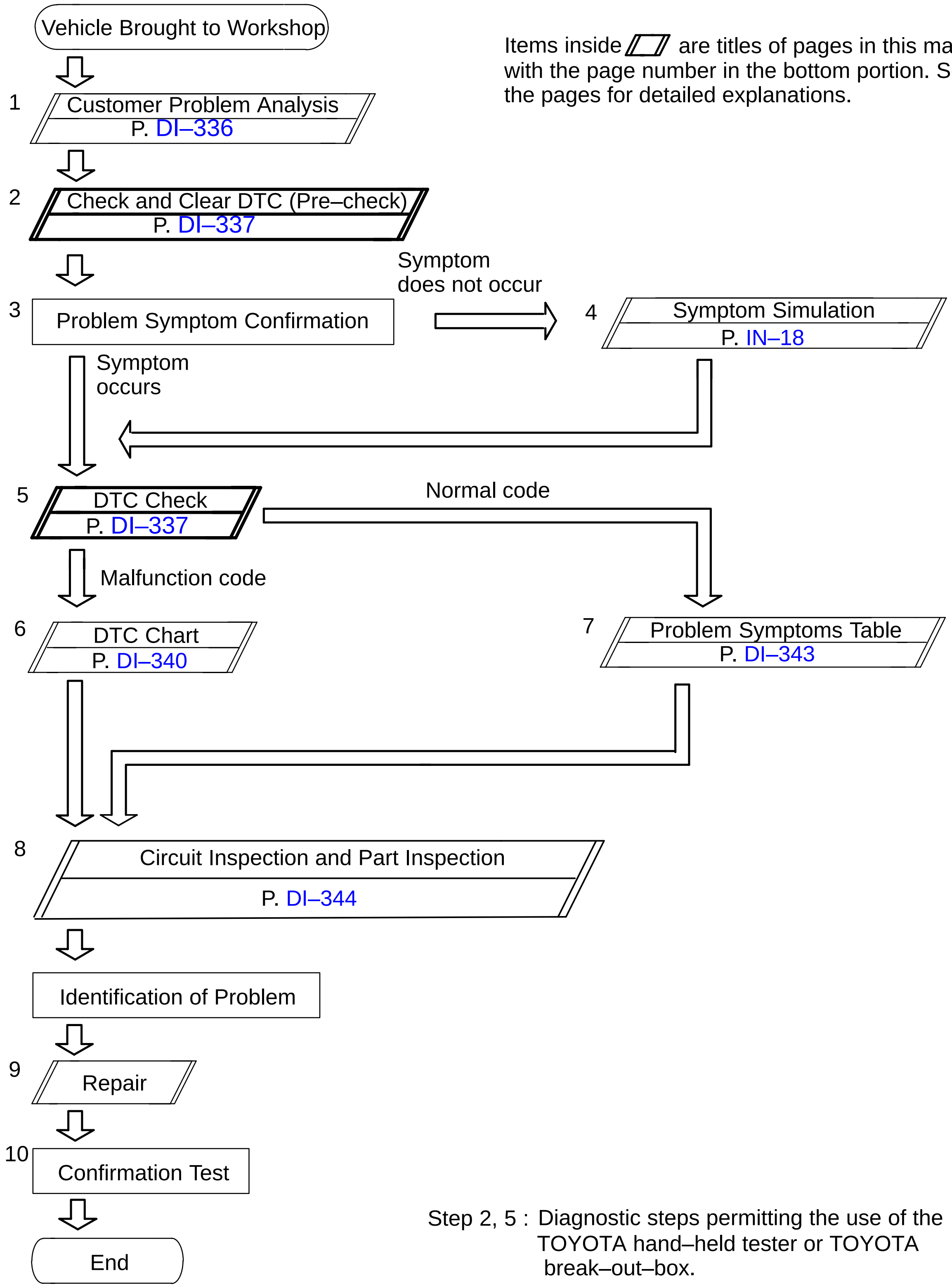
Replace airbag sensor assembly.

ENGINE IMMOBILISER SYSTEM

DI1KE–06

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshooting in accordance with the procedure on the following pages.



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

Step 2, 5 : Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

DI1KF–02

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBLISER Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

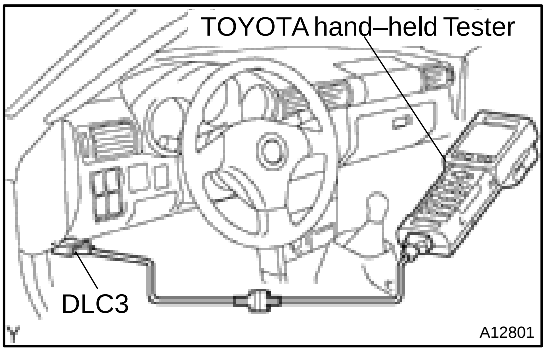
Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Immobiliser is not set. (Engine starts with key codes other than the registered key code.)
	☐ Engine does not start.

Check Item	**Malfunction Indicator Light**	☐ Normal ☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI1KG–06



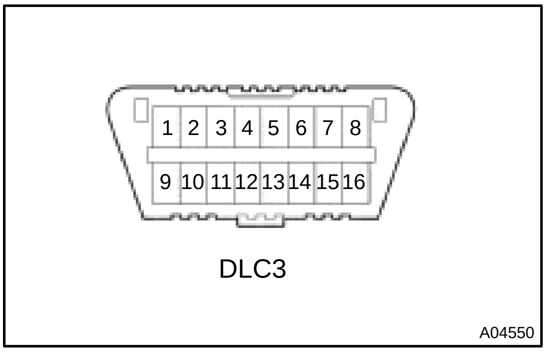
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

ECM controls the function of immobiliser on this vehicle. Data of the immobiliser or Diagnostic Trouble Code (DTC) can be read from the Data Link Connector 3 (DLC3) of the vehicle. When a trouble occurs in immobiliser, Malfunction Indicator Lamp (MIL) does not light ON but DTC inspection is performed.

Therefore when there seems to be a trouble with immobiliser, use TOYOTA hand–held tester or SST (diagnosis check wire No. 2) to check and troubleshoot it.



(b) Inspect the DLC3.

The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus ⊕ Line) – 5 (Signal Ground)	During communication	Pulse generation
4 (Chassis Ground) – Body Ground	Always	1 Ω or less
5 (Signal Ground) – Body Ground	Always	1 Ω or less
16 (B+) – Body Ground	Always	9 – 14 V

HINT:

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

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

2. INSPECT DIAGNOSIS

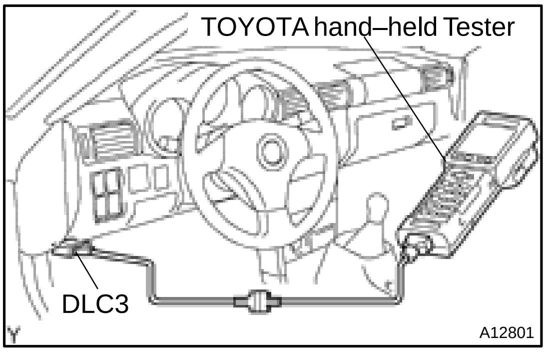
(a) Using TOYOTA hand–held tester:
Check the DTC.

NOTICE:

TOYOTA hand–held tester only:

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freezed frame data recorded in the normal mode. So before switching the modes, always check the DTCs and freezed frame data, and note them down.

(1) Prepare the OBD II scan tool (complying with SAE J 1978) or TOYOTA hand–held tester.

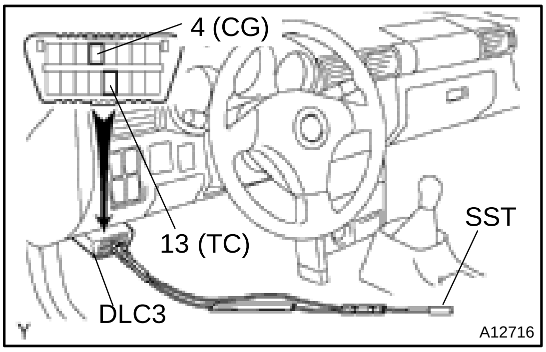


(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 under the instrument panel lower pad.

(3) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester switch ON.

(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freeze frame data; note them down. (For operating instructions, see the OBD II scan tool's instruction book.)

(5) See page DI–340 to confirm the details of DTCs.



(b) Using SST (diagnosis check wire No. 2):
Check the DTC.

(1) Turn the ignition switch ON.

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

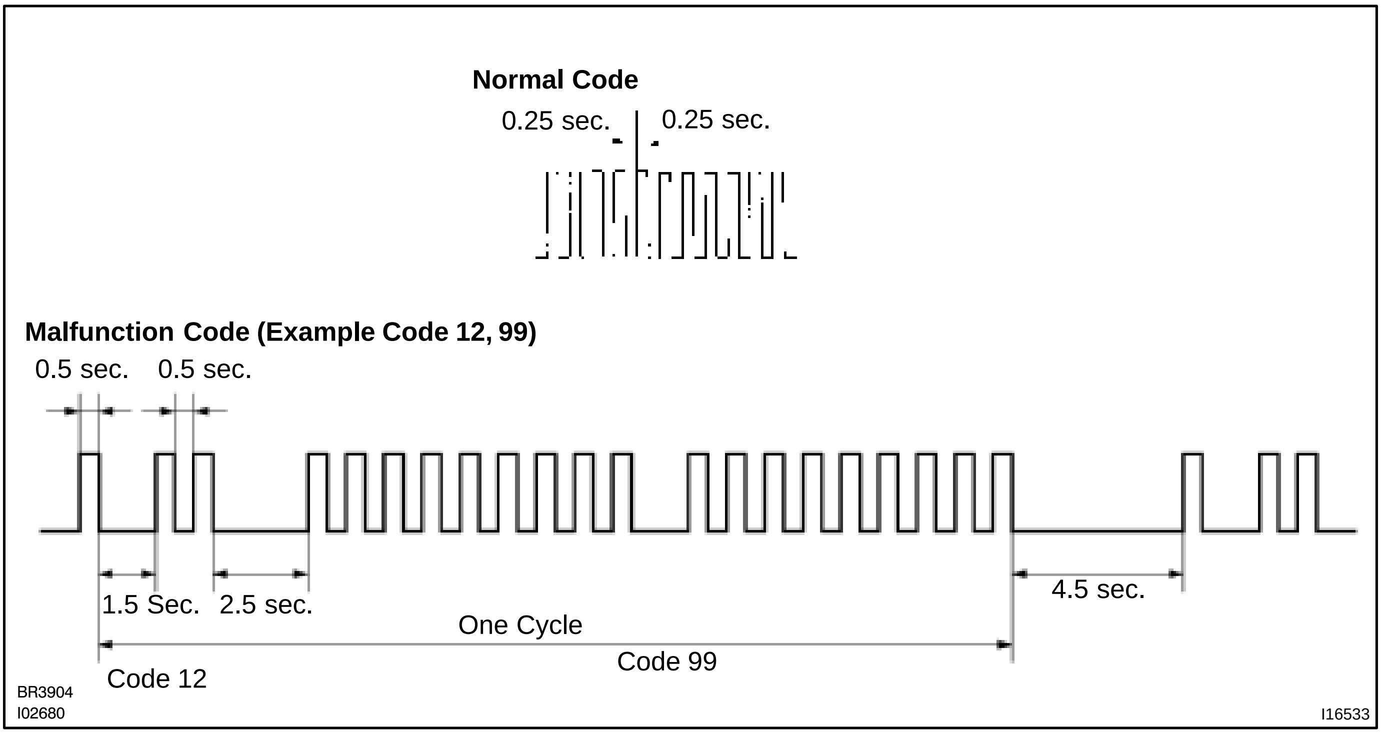
SST 09843–18040

(3) Read the DTC from the MIL.

HINT:

- If a DTC is not output, check the TC terminal circuit.
- ECM controls the immobiliser function on this vehicle, DTC is output with DTC of engine.

- As an example, the blinking patterns for codes; normal, 12 and 99 are as shown in the illustration.



(4) When DTC "99" is output, there is a trouble with immobiliser. Start troubleshooting referring to PROBLEM SYMPTOM TABLE.

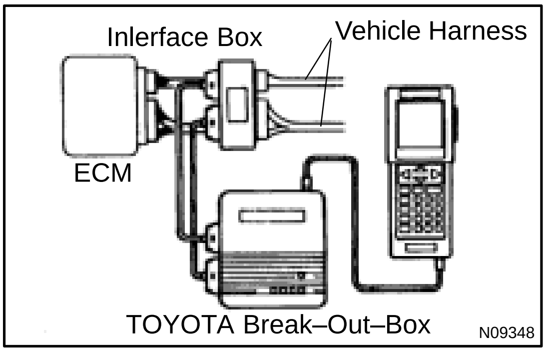
(5) After completing the check, disconnect terminals 13 (TC) and 4 (CG) of the DLC3, and turn OFF the display.

HINT:
If 2 or more malfunctions are found, the codes will be displayed from the smaller number to larger.

(c) Clear the DTC.
The following procedures will erase the DTCs and freeze frame data.

(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)

(2) Disconnecting the battery terminals or EFI1 fuse.



(d) Using TOYOTA break–out–box and TOYOTA hand–held tester, measure the ECM terminal values (See page DI–3).

DI1KH–05

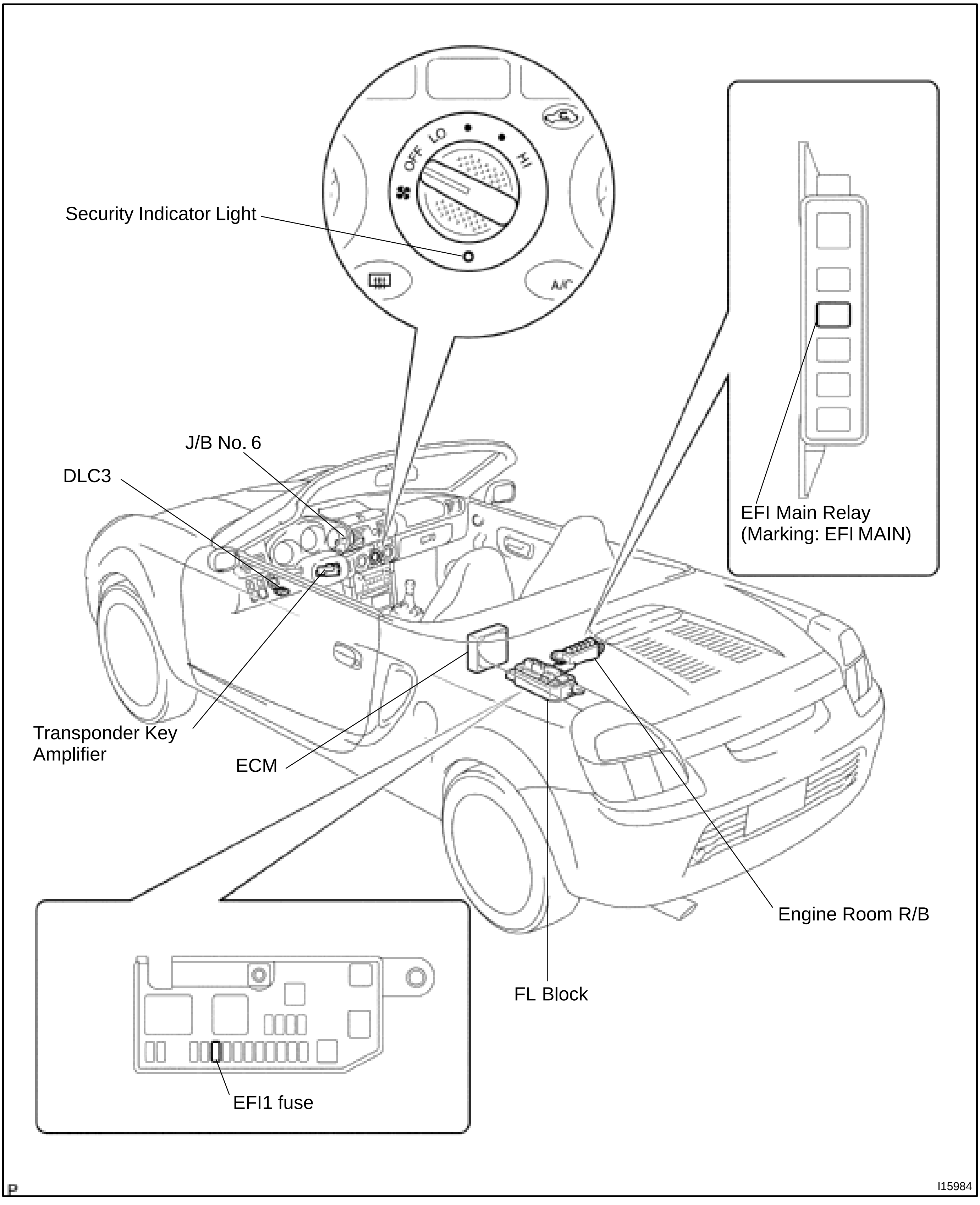
DIAGNOSTIC TROUBLE CODE CHART

DTC No. (See page)	Detection Item	Trouble Area
B2795 (DI–344)	Unmatched Key Code	• Key • Unregistered key inserted before
B2796 (DI–345)	No Communication in Immobiliser System	• Key • Transponder key amplifier • Wire harness • ECM
B2797 (DI–347)	Communication Malfunction No. 1	• Wire harness • Transponder key amplifier • Unregistered key inserted before • ECM
B2798 (DI–348)	Communication Malfunction No. 2	• Key • Transponder key amplifier • Wire harness • ECM

HINT:
To reduce the unnecessary exchange of ECM, check that a trouble occurs with the original ECM at the time of exchanging ECM and the problem will be solved with a new ECM.

DI7D7–01

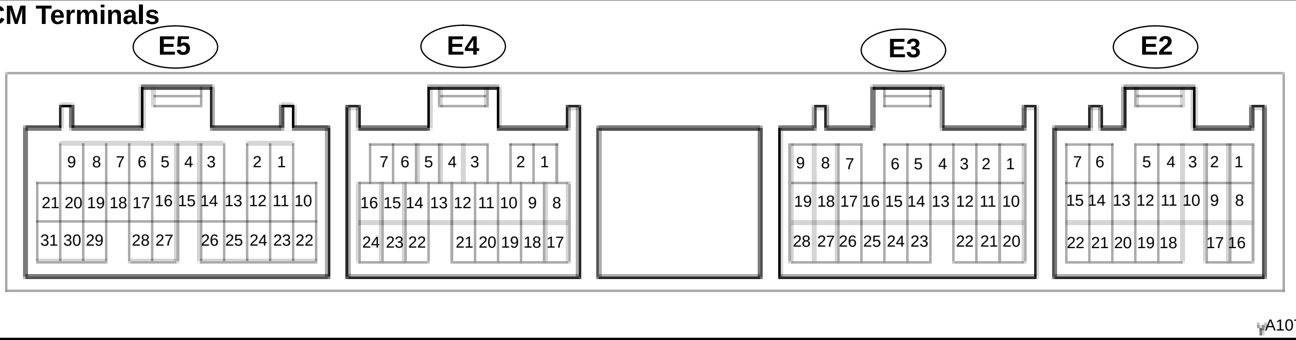
PARTS LOCATION



DI7D8–01

TERMINALS OF ECM

ECM Terminals



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
CODE (E3–7) – E1 (E4–17)	L–Y – BR	Ignition switch ON	9 – 14
RXCK 〈E3–26) – E1 (E4–17)	Y – BR	Ignition switch ON	9 – 14
TXCT 〈E3–15) – E1 (E4–17)	L–B – BR	Ignition switch ON	9 – 14
IMLD (E2–2) – E1 (E4–17)	W–G – BR	Engine immobiliser system setting	9 – 14

DI1KK–05

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See page
Immobiliser is not set (Engine starts with key codes other than the registered key code)	3. ECM	IN–28
Engine does not start	1. Key 2. Wire harness 3. Transponder key amplifier 4. ECM	*1 IN–28 – IN–28
Security indicator is always ON	1. Security indicator light 2. Wire harness 3. ECM	DI–352*2 IN–28 IN–28
Security indicator is always ON (Although code has been registered in the automatic registration mode, indicator is not OFF)	1. Wire harness 2. Transponder key amplifier 3. ECM	IN–28 – IN–28
Security indicator is OFF (When DTC of immobiliser is output)	1. Wire harness 2. Transponder key amplifier 3. ECM	IN–28 – IN–28
Security indicator is OFF (When DTC of immobiliser is not output)	1. Wire harness 2. ECM	IN–28 IN–28
Security indicator is abnormally blinking	1. Wire harness 2. Security indicator light circuit 3. ECM	IN–28 DI–352 IN–28

*1: Check that the key which did not start the engine has been registered and that it is possible to start with other already registered key codes.
*2: Finish the automatic registration mode because the mode might still remain.

DI1KN–05

CIRCUIT INSPECTION

DTC	B2795/99	Unmatched Key Code

CIRCUIT DESCRIPTION

This DTC is output when an unregistered key is inserted. When this DTC is output, delete DTC and insert the key of the customer to check that DTC B2795 is output.
When the key outputs DTC B2795/99, register this key. When DTC B2795/99 is not output, there is a possibility that the unregistered key has been inserted before. (ECM is normal.)
Inquire of a customer the condition of using the system to find the cause of the trouble.
(Example: Another key has been inserted, etc.)

DTC No.	DTC Detection Condition	Trouble Area
B2795/99	Unmatched key code	• Key • Unregistered key inserted before

INSPECTION PROCEDURE

1	Delete DTC and insert all presently available keys to check whether engine starts or not.

HINT:
When inserting the key that does not start the engine, DTC B2795/99 is stored in memory.

RESULT:

OK	All keys starts engine.
NG	A specific key does not start engine.

OK → **No problem.**

HINT:
If the result is "OK", please confirm whether or not customers have ever inserted the unregistered key or the immobiliser key (with transponder chip) of other vehicle in the ignition key cylinder, and find out the cause of detecting DTC.

NG

Register key that does not start engine.

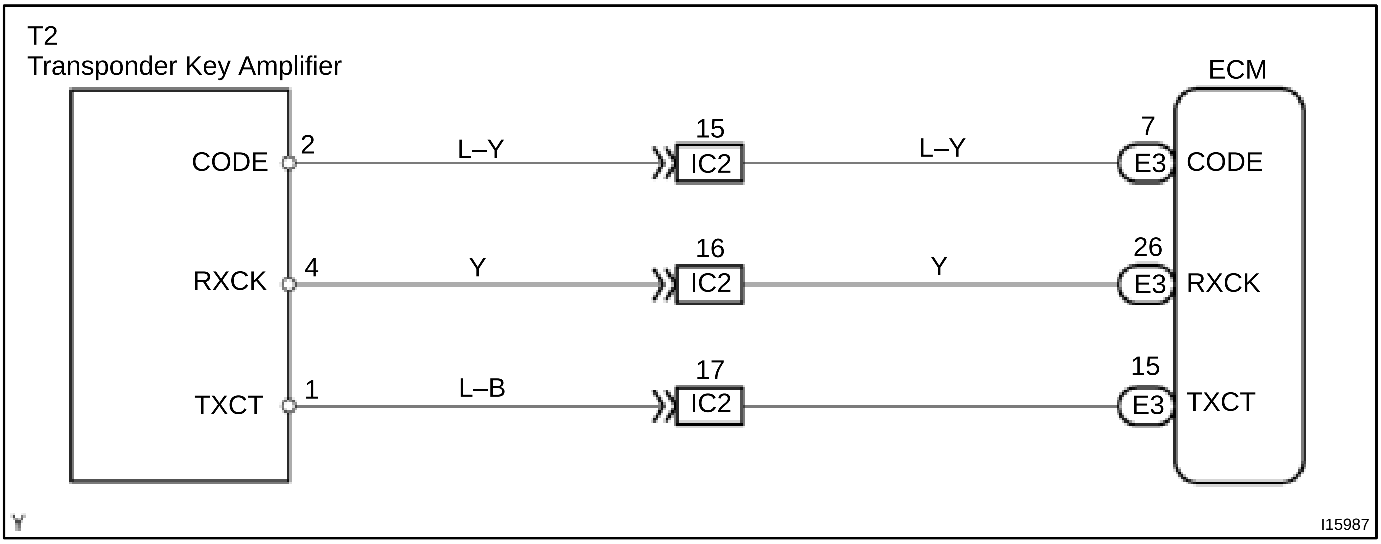
DI1KO–07

DTC	B2796/99	No Communication in Immobiliser system

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
B2796/99	No communication	• Key • Transponder key amplifier • Wire harness • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Delete DTC and insert all presently available keys to check whether engine starts or not

RESULT:

A	All keys start engine.
B	A specific key does not start engine. In this case, DTC B2796/99 is stored in memory.
C	All keys do not start engine. In this case, DTC B2796/99 is stored in memory.

A → **No problem at this time.**

HINT:
If the result is "A", please confirm whether or not customers have ever inserted the key (without transponder chip) of other vehicle in the ignition key cylinder, and find out the cause of detecting DTC.

B → **Transponder chip of a specific key is defective. Replace key.**

C ↓

2	**Check harness and connector between transponder key amplifier and ECM (See page IN–28).**

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

OK ↓

3	**Does it operate normally after replacement of transponder key amplifier?**

Yes → **Replace transponder key amplifier.**

No ↓

Check and replace ECM (See page IN–28).

DI7D9–01

DTC	B2797/99	Communication Malfunction No. 1

CIRCUIT DESCRIPTION

This code is detected when an error occurs despite of normal communication.
(Example: Some noise is included in communication line.)

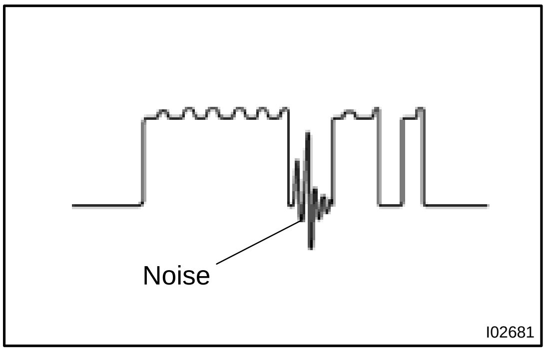
DTC No.	DTC Detection Condition	Trouble Area
B2797/99	Communication error	• Wire harness • Transponder key amplifier • Unregistered key inserted before • ECM

WIRING DIAGRAM

Refer to DTC B2796/99 on page DI–345.

INSPECTION PROCEDURE

1	**Check noise.**



PREPARATION:
Insert already registered master key in the key cylinder.
CHECK:
Using an oscilloscope or TOYOTA hand–held tester, check that noise is included in the CODE terminal of the ECM.
OK:
No noise is detected.

NG → **Try to find cause of noise and remove it.**

OK ↓

2	**Does it operate normally after replacement of transponder key amplifier?**

Yes → **Replace transponder key amplifier.**

No ↓

Check and replace ECM (See page IN–28).

DI7DA–01

DTC	B2798/99	Communication Malfunction No. 2

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
B2798/99	Communication error	• Key • Transponder key amplifier • Wire harness • ECM

WIRING DIAGRAM

Refer to DTC B2796/99 on page DI–345.

INSPECTION PROCEDURE

1	Check harness and connector between transponder key amplifier and ECM.

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

OK

2	Does it operate normally after replacement of transponder key amplifier?

Yes → **Replace transponder key amplifier.**

No

Check and replace ECM (See page IN–28).

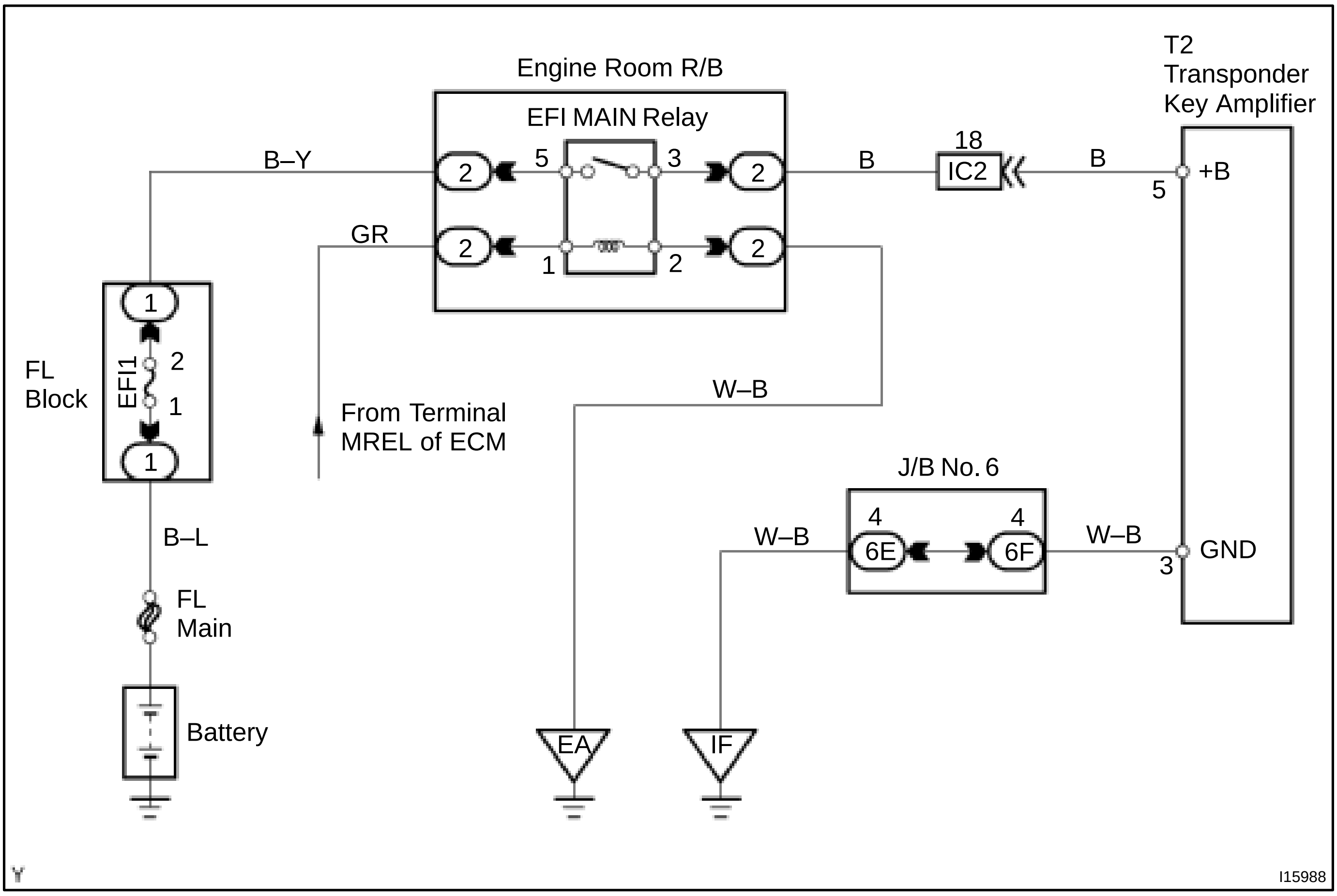
DI7DB–01

Power Source Circuit

CIRCUIT DESCRIPTION

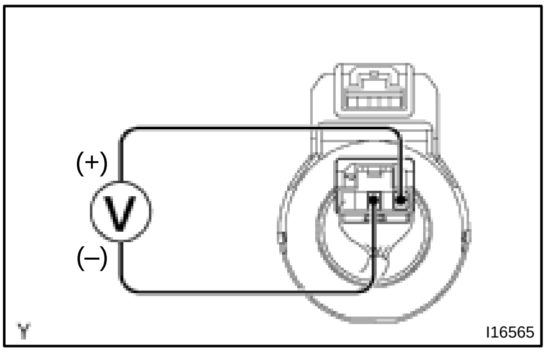
This circuit provides power to operate the transponder key amplifier.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals +B and GND of transponder key amplifier connector.



PREPARATION:

(a) Turn the ignition switch OFF.

(b) Disconnect the transponder key amplifier connector.

CHECK:

Measure the voltage between terminals +B and GND of the transponder key amplifier connector.

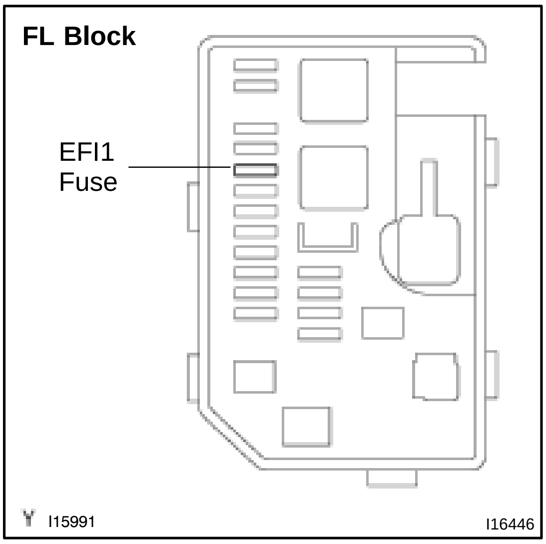
OK:

Voltage: 9 – 14 V

OK	Proceed to next circuit inspection shown in problem symptoms table (See page DI–343).

NG

2	Check EFI1 fuse.



PREPARATION:

Remove the EFI1 fuse from the FL block.

CHECK:

Check the continuity of the EFI1 fuse.

OK:

Continuity

NG	Check for short in all harness and components connected to EFI1 fuse.

OK

3	**Check harness and connector between transponder key amplifier and body ground (See page IN–28).**

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

OK

Check and repair harness and connector between transponder key amplifier and battery (See page IN–28).

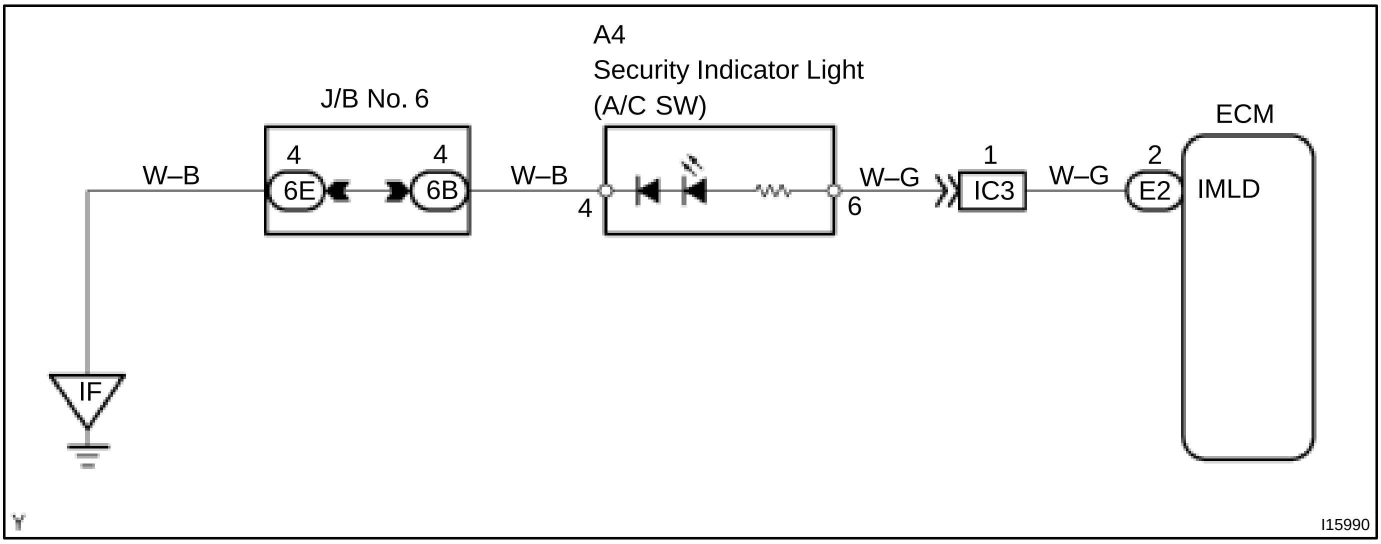
DI7DC–01

Security Indicator Light Circuit

CIRCUIT DESCRIPTION

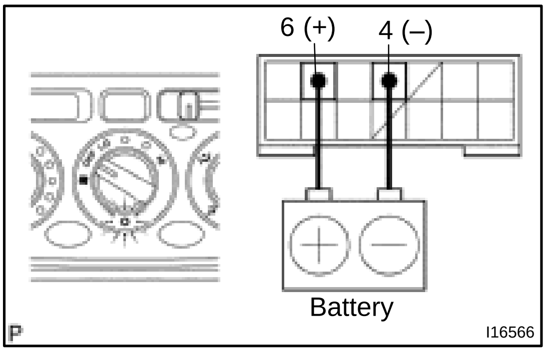
When the engine immobiliser system is preparing to set, this circuit lights up the security indicator light. When the system has been set, it continually turns the security indicator light ON for 0.8 seconds and turns it OFF for 1.2 seconds, thus blinking the security indicator light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check security indicator light.



PREPARATION:
Remove heater control assembly (A/C SW)
(See page AC–83)
CHECK:
Connect the positive (+) lead to terminal 6 and the negative (–) lead to terminal 4 of heater control connector
OK:
Security indicator light comes on.

NG	Replace heater control assembly.

OK

2	**Check harness and connector between ECM and security indicator light, and security indicator light and body ground (See page IN–28).**

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

OK ↓

Check and replace ECM*[1].

*[1]: When there is a malfunction that the engine immobiliser system cannot be set, proceed to the next numbered circuit inspection shown in problem symptoms table (See page DI–343).

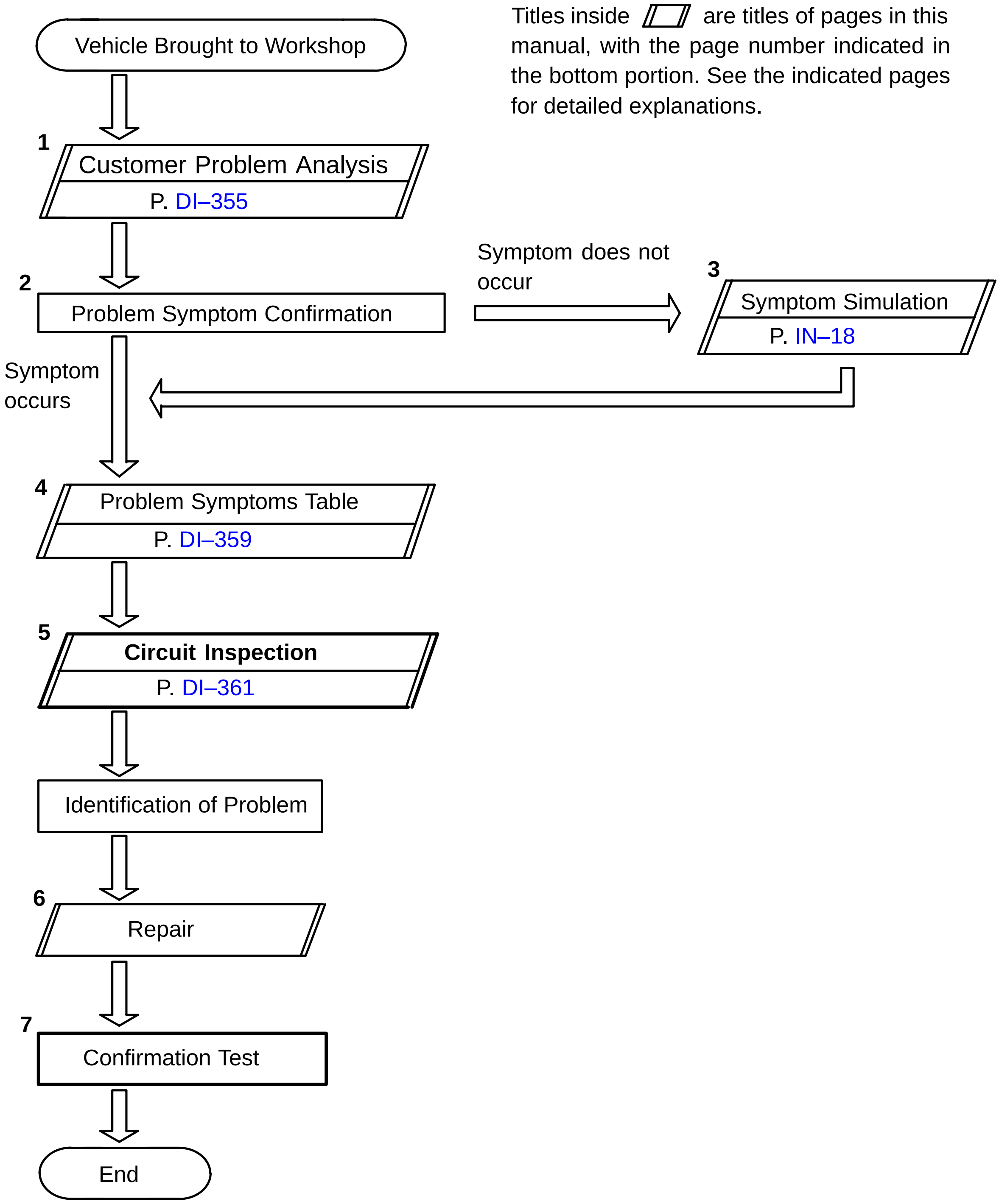
BODY CONTROL SYSTEM

DI62C–03

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

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.



DI62D–03

CUSTOMER PROBLEM ANALYSIS CHECK

BODY CONTROL SYSTEM Check Sheet

Inspector's name: ________________

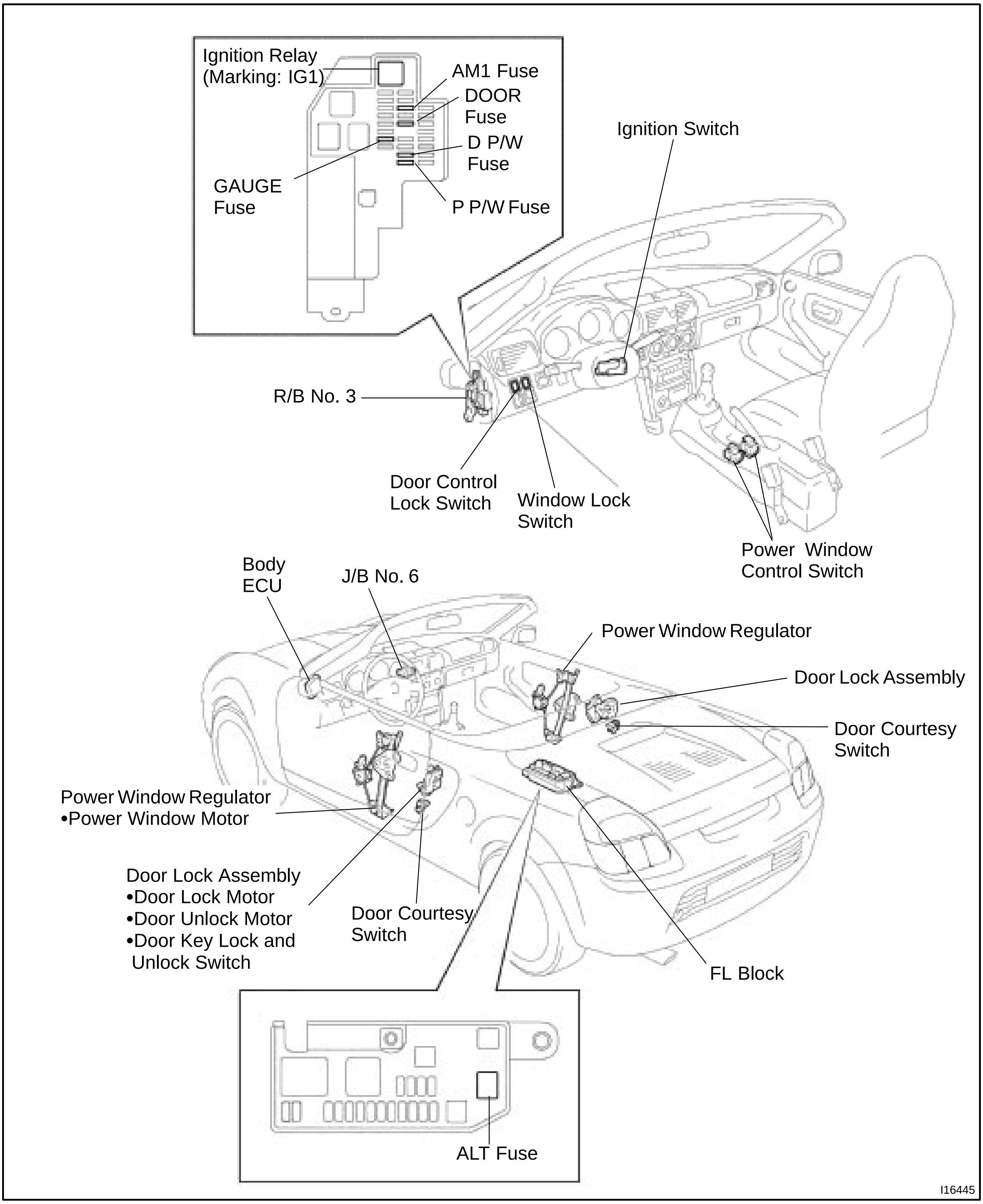
Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km** **Mile**

Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Constant ☐ Sometimes (times per day, month) ☐ Once only
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/ Others
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. ˚F (˚C))

Malfunction System	☐ Key Unlock Warning System
	☐ Combination Meter (Open door warning light)
	☐ Power Window Control System
	☐ Power Door Lock Control System
	☐ Others

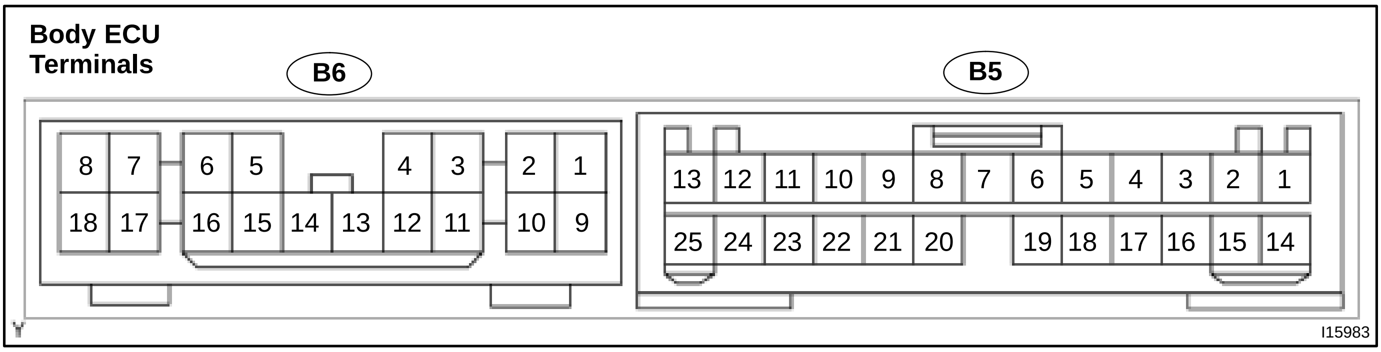
DI7D2–01

PARTS LOCATION



DI6QV–02

TERMINALS OF ECU



Symbols (Terminal No)	Wiring Color	Condition	STD Voltage (V)
B (B5–14) – E (B5–25)	L–R – W–B	Always	9 – 14
IG (B5–15) – E (B5–25)	R–B – W–B	Ignition switch OFF	Below 1
		Ignition switch ON	9 – 14
KSW (B5–19) – E (B5–25)	Y–R – W–B	Key is inserted	Below 1
		Key is not inserted	9 – 14
BDR1 (B6–13) – E (B5–25)	W–L – W–B	Always	9 – 14
BDR2 (B6–14) – E (B5–25)	B – W–B	Always	9 – 14
DMUP (B6–5) – E (B5–25)	R – W–B	Ignition switch ON, Driver power window is not operating	Below 1
		Ignition switch ON, Driver power window is operating to upward	9 – 14
DMDW (B6–4) – E (B5–25)	G – W–B	Ignition switch ON, Driver power window is not operating	Below 1
		Ignition switch ON, Driver power window is operating to downward	9 – 14
L (B6–11) – E (B5–25)	L – W–B	Always	9 – 14
PWE (B6–12) – E (B5–25)	L–O – W–B	Driver power window is not operating	Below 1
		Driver power window is operating to upward	9 – 14
DU (B5–12) – E (B5–25)	L–B – W–B	Driver power window is not operating	Below 1
		Driver power window is operating to upward	9 – 14
DDN (B5–24) – E (B5–25)	L – W–B	Driver power window is not operating	Below 1
		Driver power window is operating to downward	9 – 14
AUTO (B6–9) – E (B5–25)	L–O – W–B	Auto down switch OFF	Below 1
		Ignition switch ON, Auto down switch ON	9 – 14
LSWD (B5–21) – E (B5–25)	R–W – W–B	Driver door is unlocked	Below 1
		Driver door is locked	Approx. 5.7
LSWP (B5–23) – E (B5–25)	G–W – W–B	Passenger door is unlocked	Below 1
		Passenger door is locked	Approx. 5.7
L1 (B6–6) – E (B5–25)	BR–W – W–B	Door lock manual switch OFF or UNLOCK	Below 1
		Door lock manual switch LOCK	Approx. 5.0
UL1 (B6–15) – E (B5–25)	G–B – W–B	Door lock manual switch OFF	Below 1
		Door lock manual switch UNLOCK	Approx. 5.0
L2 (B6–7) – E (B5–25)	L–W – W–B	Door key lock and unlock switch OFF	Approx. 5
		Door key lock and unlock switch ON	Below 1
UL2 (B6–17) – E (B5–25)	L–Y – W–B	Passenger door key lock and unlock switch OFF	Approx. 5.0
		Passenger door key lock and unlock switch ON	Below 1
UL3 (B6–16) – E (B5–25)	L–Y – W–B	Driver door key lock and unlock switch OFF	Approx. 5.0
		Driver door key lock and unlock switch ON	Below 1

ACT+ (B5–13) – E (B5–25)	L–R – W–B	Door lock is operating to lock	9 – 14
ACT– (B5–1) – E (B5–25)	L–B – W–B	Door lock is operating to unlock	9 – 14
DCTY (B6–10) – E (B5–25)	R–W – W–B	Driver door opened	Below 1
		Driver door closed	9 – 14
PCTY (B6–2) – E (B5–25)	R – W–B	Passenger door opened	Below 1
		Passenger door closed	9 – 14

PROBLEM SYMPTOMS TABLE

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH:

Symptom	Suspected Area	See page
Ignition switch is not set to each position	1. Ignition switch	BE–16
"Key unlock warning system" does not operate	1. GAUGE fuse 2. Key unlock warning switch circuit 3. Door courtesy switch circuit 4. Body control system 5. Combination meter 6. Wire harness	DI–364 DI–367 DI–377 DI–354 – IN–28

Warning Lights:
COMBINATION METER

Symptom	Suspected Area	See page
Door open warning light does not light up	1. LED 2. DOME fuse 3. Door courtesy switch circuit 4. Body control system 5. Meter circuit 6. Wire harness	– BE–9 DI–377 DI–354 BE–38 IN–28

POWER WINDOW CONTROL SYSTEM

Symptom	Suspected Area	See page
Power window does not operate	1. POWER fuse 2. GAUGE fuse 3. Body control system 4. Ignition switch 5. Power window control switch circuit 6. Wire harness	BE–9 DI–364 DI–354 BE–16 DI–368 IN–28
"One touch power window system" does not operate	1. Power window control switch circuit	DI–368
Only one window glass does not move	1. Power window control switch circuit 2. Power window motor circuit 3. Wire harness	DI–368 BE–52 IN–28
"Window lock system" does not operate	1. Power window control switch circuit	DI–368
Illumination does not light up	1. Power window control switch circuit	DI–368

POWER DOOR LOCK CONTROL SYSTEM

Symptom	Suspected Area	See page
"Door lock control system" does not operate (ALL)	1. Body control system 2. DOOR fuse 3. GAUGE fuse 4. Wire harness 5. Other parts	DI–354 DI–361 DI–364 IN–28 –
Malfunction in door lock/unlock (Using door manual switch)	1. Door lock control switch circuit 2. Body control system 3. Wire harness 4. Other parts	DI–376 DI–354 IN–28 –
Malfunction in door lock/unlock (Using door manual switch and key)	1. Wire harness 2. Other parts	IN–28 –
Malfunction in door lock/unlock (Using key)	1. Door unlock detection switch circuit 2. Body control system 3. Wire harness 4. Other parts	DI–372 DI–354 IN–28 –

Fault in 2–operation unlock function of driver's side door key lock and unlock switch	1. Door unlock detection switch circuit 2. Body control system 3. Wire harness 4. Other parts	DI–372 DI–354 IN–28 –
Fault in key confinement prevention operation	1. Door unlock detection switch circuit 2. Door courtesy switch circuit 3. Door lock control switch circuit 4. Body control system 5. Wire harness 6. Other parts	DI–372 DI–377 DI–376 DI–354 IN–28 –
Only one door lock does not operate	1. Door lock motor circuit 2. Wire harness	BE–56 IN–28

OTHERS

Symptom	Suspected Area	See page
Body ECU does not operate	1. Power source circuit 2. Body control system	DI–361 IN–28

DI7D3–01

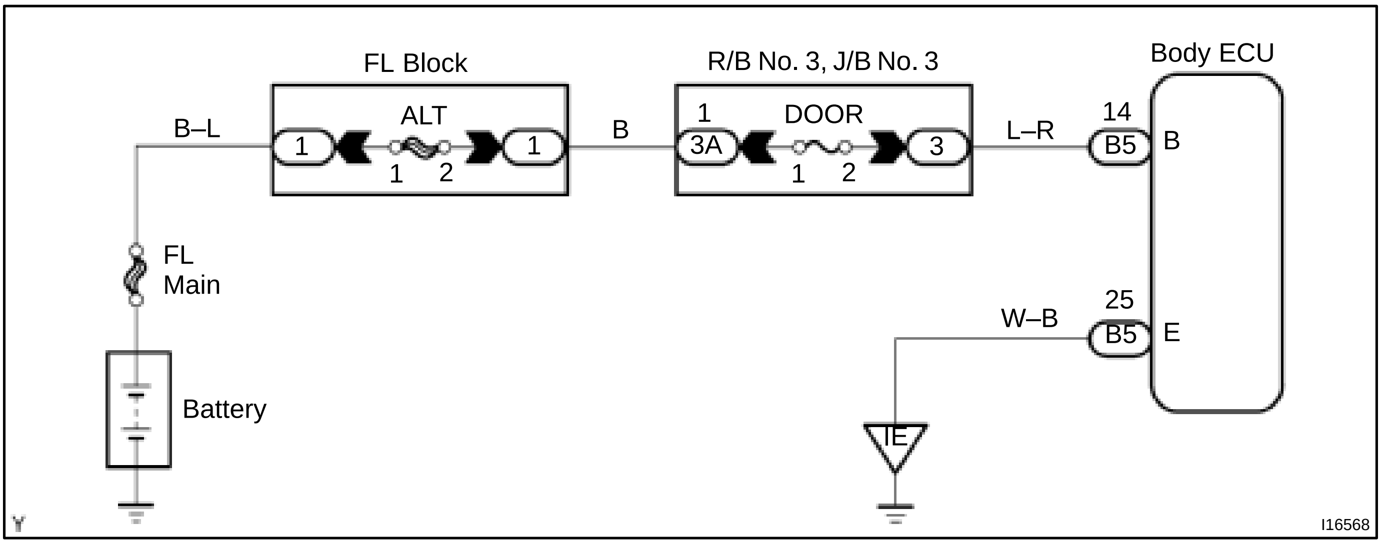
CIRCUIT INSPECTION

Power Source Circuit

CIRCUIT DESCRIPTION

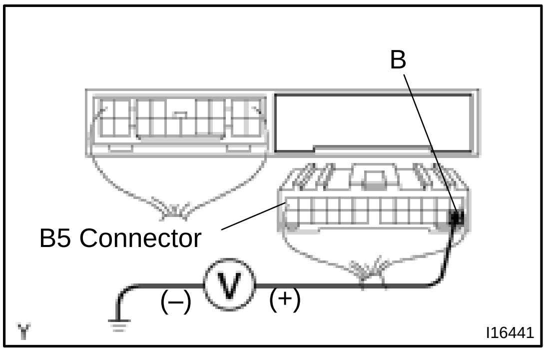
This circuit provides power to operate the body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the instrument panel (See page BO–41).

(b) Disconnect the B5 connector from the body ECU.

CHECK:

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

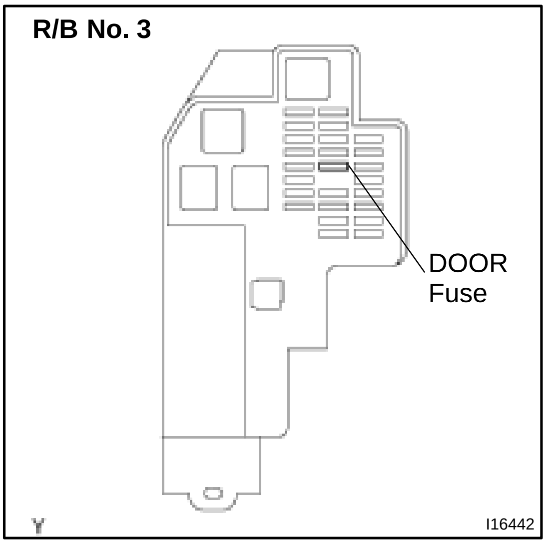
OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).**

NG

2	**Check DOOR fuse.**



PREPARATION:

Remove the DOOR fuse from the R/B No. 3.

CHECK:

Check the continuity of the DOOR fuse.

OK:

Continuity

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

OK

3	**Check harness and connector between body ECU and body ground (See page IN–28).**

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

OK

Check and repair harness or connector between body ECU and battery (See page IN–28).

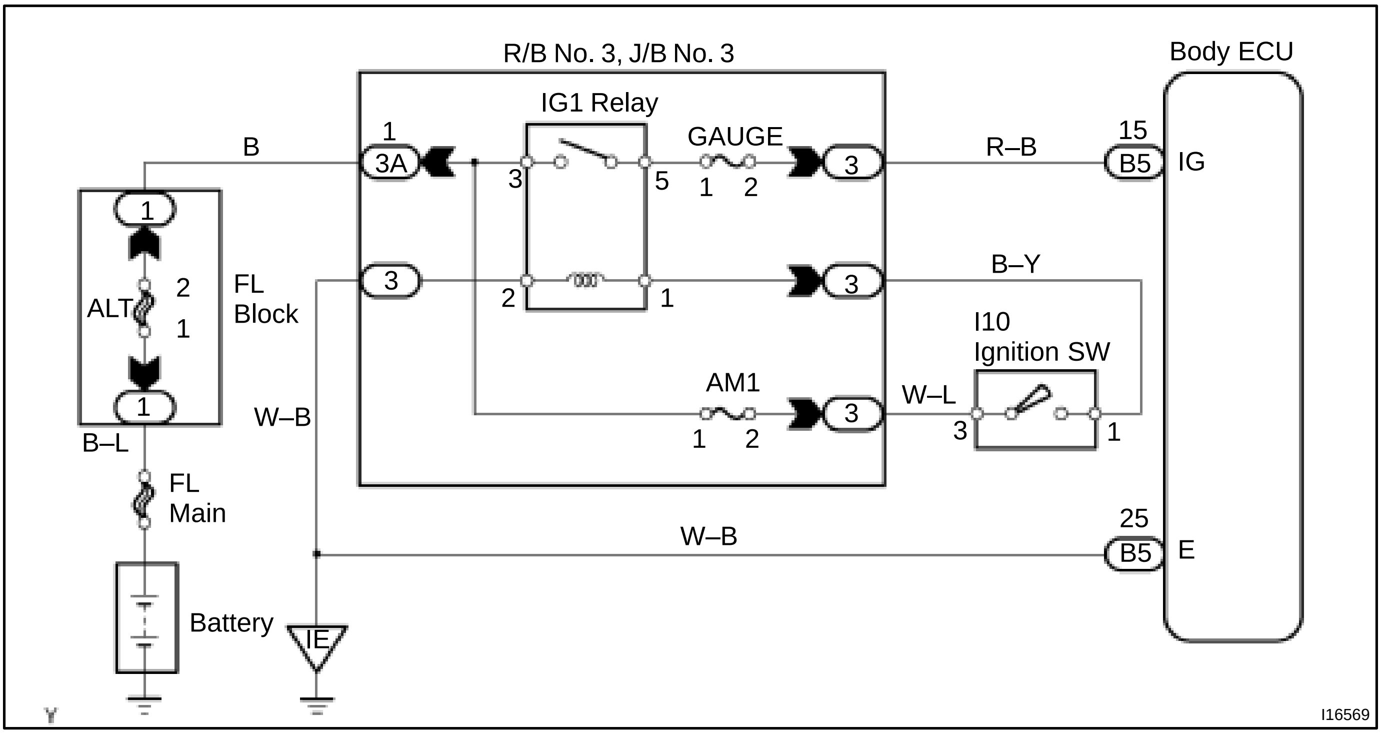
DI7D4–01

Ignition Switch Power Source Circuit

CIRCUIT DESCRIPTION

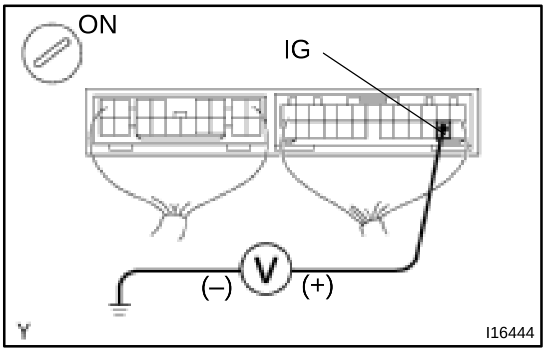
When the ignition switch is turned to the ON position, battery positive voltage is applied to terminal IG of the body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove the instrument panel (See page BO–41).

(b) Turn the ignition switch ON.

CHECK:

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

OK:

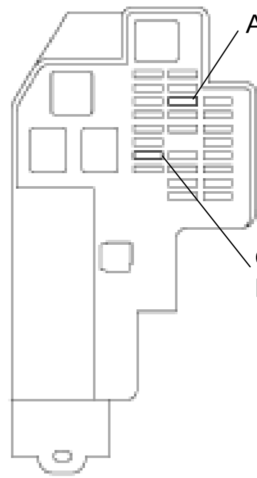
Voltage: 9 – 14 V

OK — **Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).**

NG

2	**Check AM1 and GAUGE fuses.**

R/B No. 3



PREPARATION:
Remove the AM1 and GUAGE fuses from the R/B No. 3.
CHECK:
Check the continuity of the AM1 and GAUGE fuses.
OK:
Continuity

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

OK

3	**Check ignition relay (Marking: IG1) (See page BE–16).**

NG → **Replace ignition relay.**

OK

4	**Check ignition switch (See page BE–16).**

NG → **Replace ignition switch.**

OK

5	Check harness and connector between body ECU and body ground (See page IN–28).

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

OK

Check and repair harness and connector between body ECU and battery (See page IN–28).

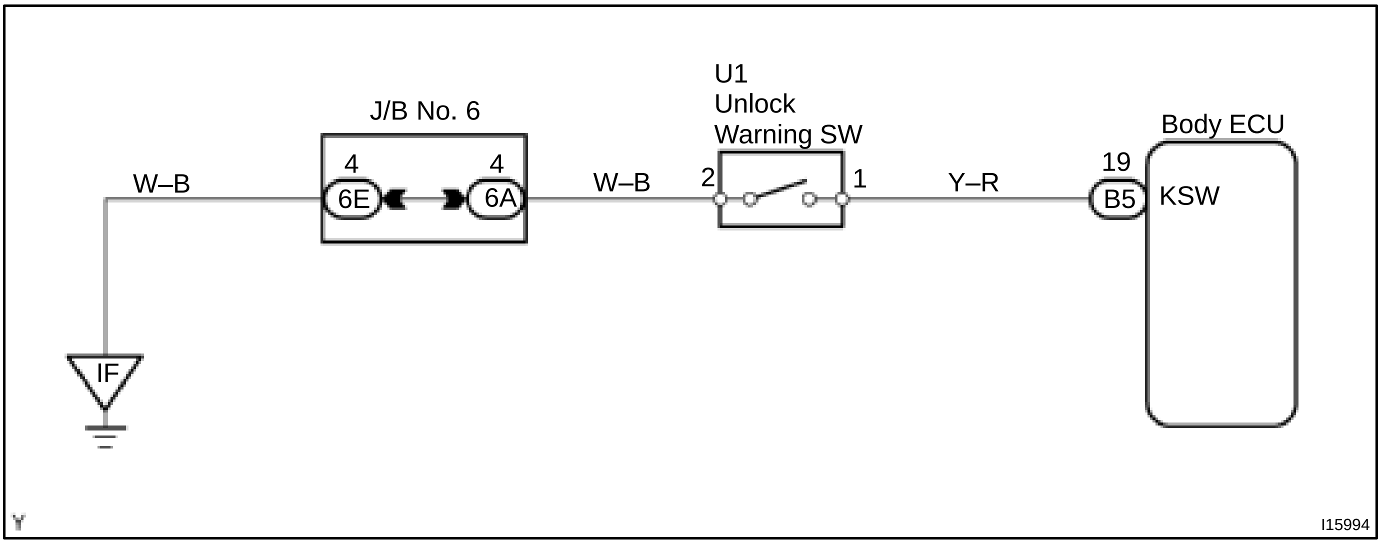
DI6R1–03

Key Unlock Warning Switch Circuit

CIRCUIT DESCRIPTION

The key unlock warning switch goes on when the ignition key is inserted in the key cylinder and goes off when the ignition key is removed.
The body ECU operates the key confinement prevention function while the key unlock warning switch is on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check key unlock warning switch (See page BE–16).

NG → **Replace key unlock warning switch.**

OK

2	Check harness and connector between key unlock warning switch and body ECU (See page IN–28).

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

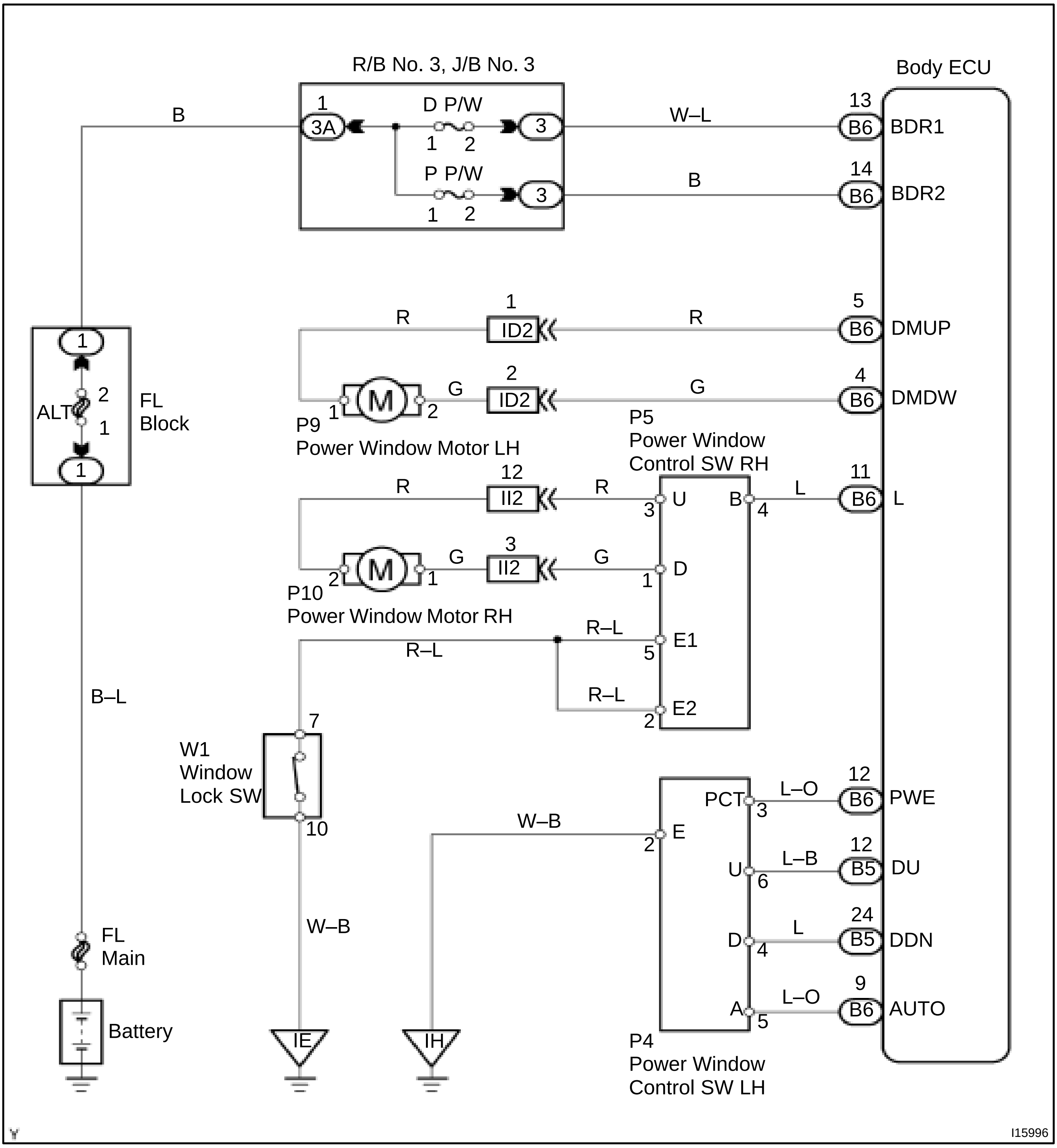
DI7D5–01

Power Window Control Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the power window control switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check power window control switch (See page BE–52).**

NG → **Replace power window control switch.**

OK

2	**Check harness and connector between power window control switch and body ECU (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

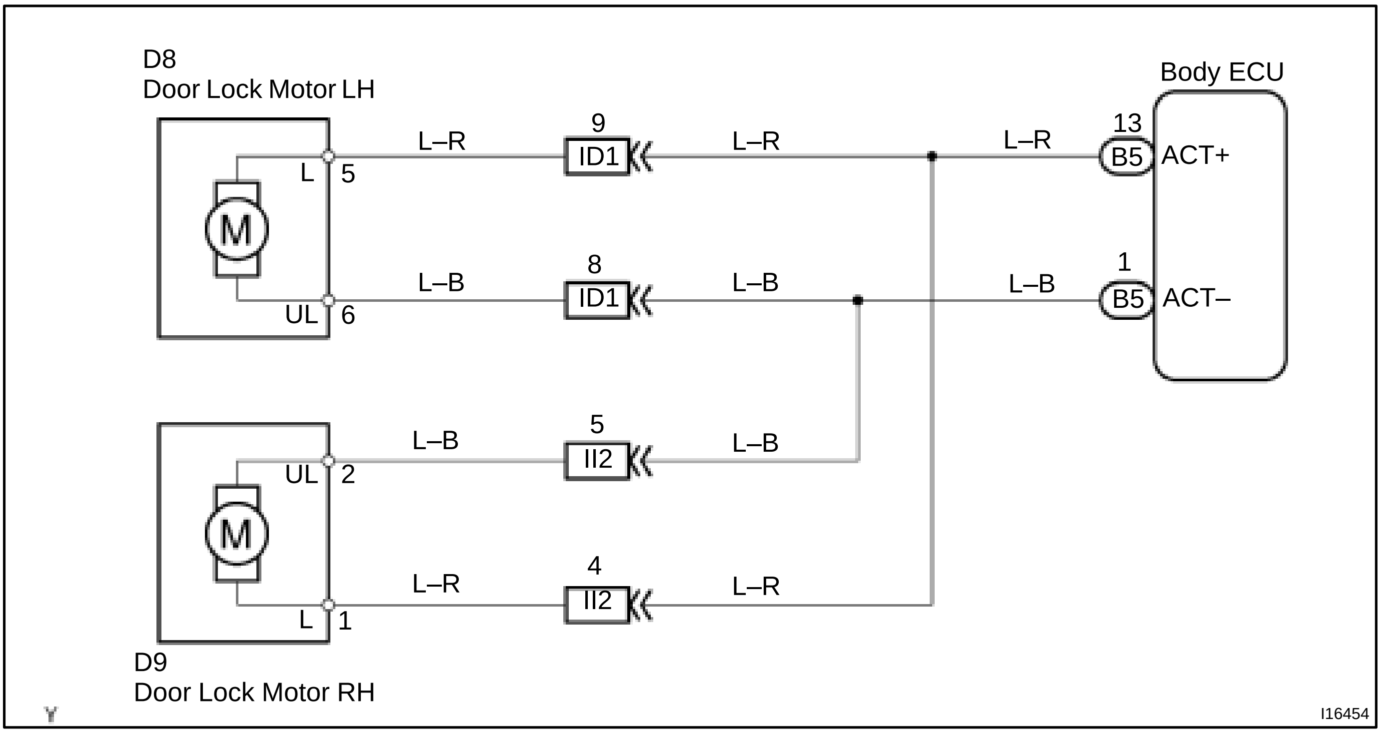
DI6R4–03

Door Lock Motor Circuit

CIRCUIT DESCRIPTION

When the door switch is set to LOCK, the body ECU outputs a signal to lock all of the doors.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check door lock motor (See page BE–56).

NG → **Replace door lock motor.**

OK

2	**Check harness and connector between door lock motor and body ECU (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

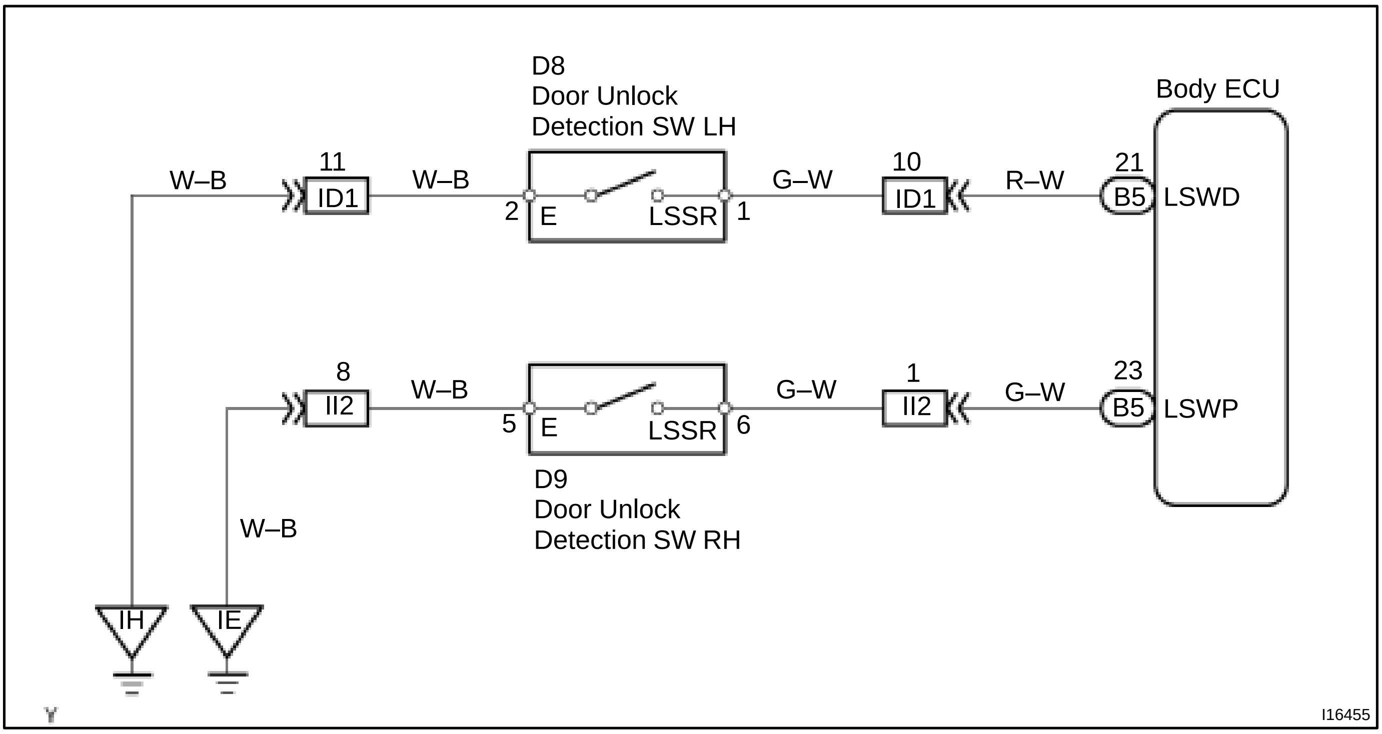
DI6R5–03

Door Unlock Detection Switch Circuit

CIRCUIT DESCRIPTION

The door unlock detection switch is built in the door lock motor assembly. This switch is ON when the door lock knob is in the unlock position and OFF when the lock knob is in the lock position. The body ECU detects the door lock knob conditions in this circuit. It is used as one of the operating conditions for the key confinement prevention function.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check door unlock detection switch (See page DI–372).**

NG → **Replace door unlock detection switch.**

OK

2	**Check harness and connector between door unlock detection switch and body ECU (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

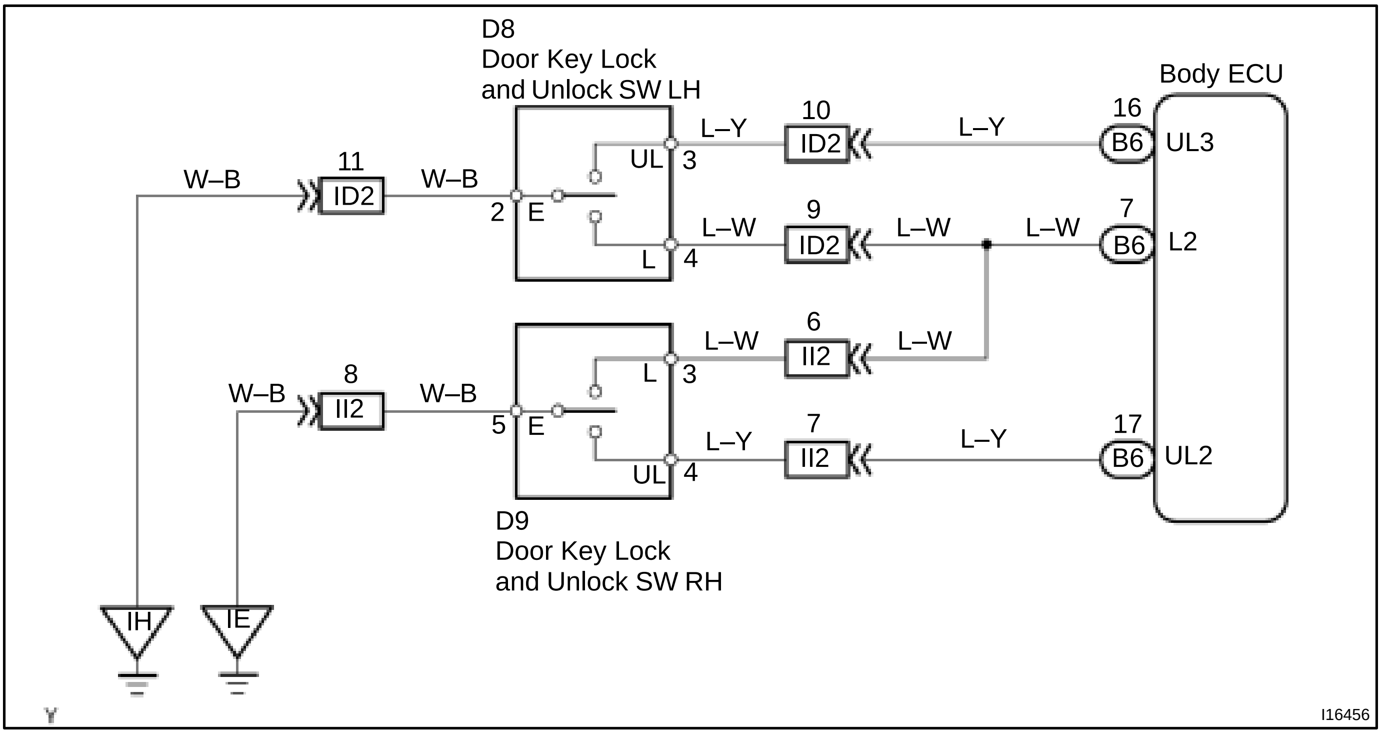
DI6R6–03

Door Key Lock and Unlock Switch Circuit

CIRCUIT DESCRIPTION

The door key lock and unlock switch is built in the door key cylinder. When the key is turned to the lock side, terminal 4 of the switch is grounded and when the key is turned to the unlock side, terminal 3 of the switch is grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check door key lock and unlock switch (See page DI–374).**

NG → **Replace door key lock and unlock switch.**

NG

2	**Check harness and connector between door key lock and unlock switch and body ECU (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

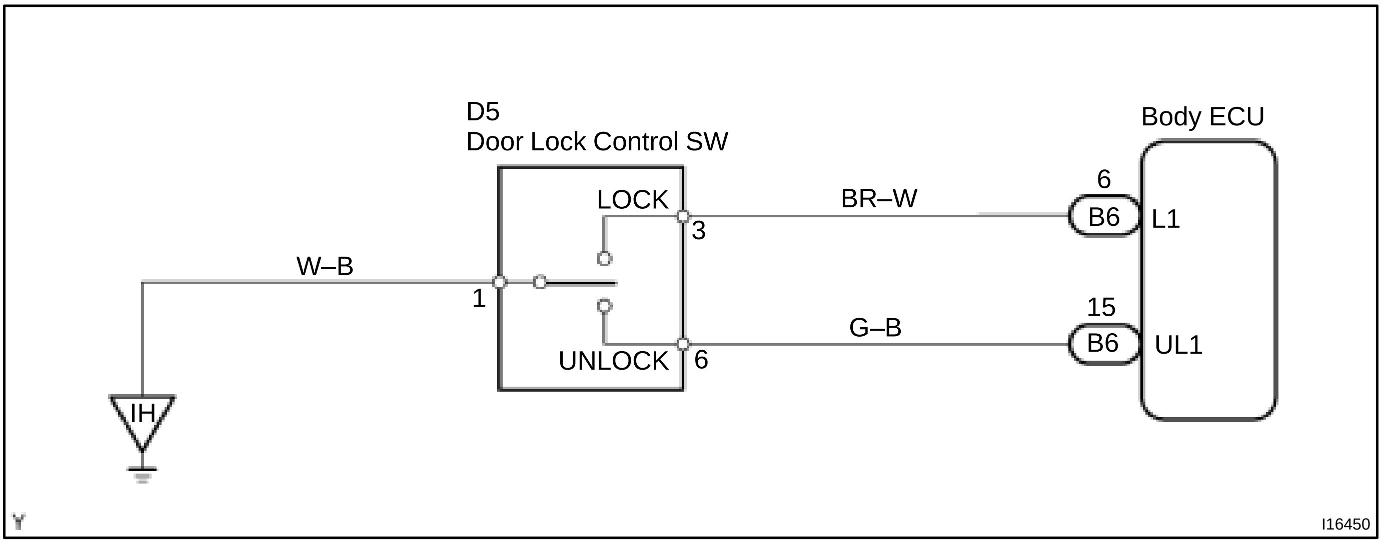
DI7D6–01

Door Lock Control Switch

CIRCUIT DESCRIPTION

The door lock control switch is ON when the door lock knob is in the lock position and OFF when the lock knob is in the unlock position.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check door lock control switch (See page BE–56).**

NG → **Replace door lock control switch.**

NG

2	**Check harness and connector between door lock control switch and body ECU (See page IN–28).**

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

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

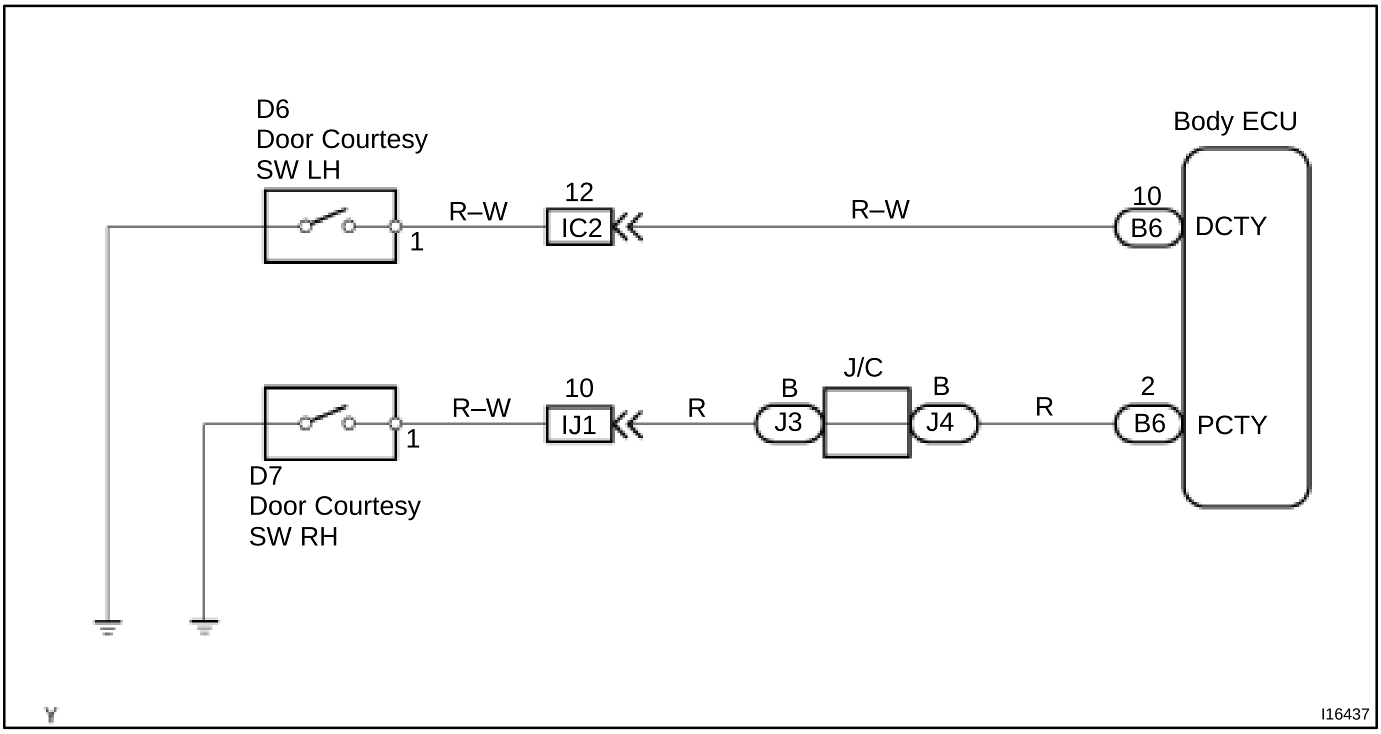
DI6R7–03

Door Courtesy Switch Circuit

CIRCUIT DESCRIPTION

The door courtesy switch goes on when the door is opened and goes off when door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check courtesy switch (See page DI–377).**

NG → **Replace courtesy switch.**

OK

2	**Check for a grounding malfunction caused by loosened screw.**

NG → **Install screw.**

OK

3	Check harness and connector between courtesy switch and body ECU, and courtesy switch and body ECU (See page IN–28).

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

OK ↓

Proceed to next circuit inspection shown on problem symptoms table (See page DI–359).

CO/HC

EM05J–08

INSPECTION

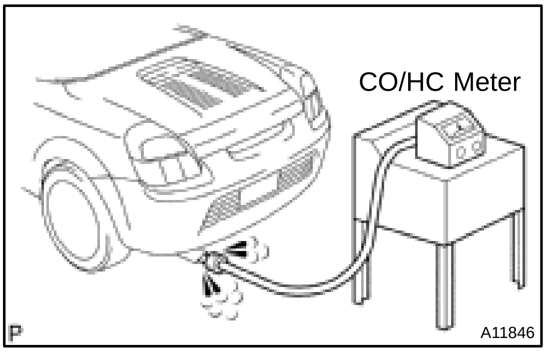
HINT:
This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) Air pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
(f) SFI system wiring connectors fully plugged
(g) Ignition timing check correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

Complete the measuring within 3 minutes.
HINT:
When doing the 2 mode (idle and 2,500 rpm) test, follow the measurement order prescribed by the applicable local regulations.

If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

- Check heated oxygen sensor operation (See page DI–47).
- See the table below for possible causes, then inspect and correct the causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	3. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs 4. Incorrect valve clearance 5. Leaky intake and exhaust valves 6. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI systems: • Faulty fuel pressure regulator • Defective ECT sensor • Defective IAT sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor

COMPRESSION

EM05K–07

INSPECTION

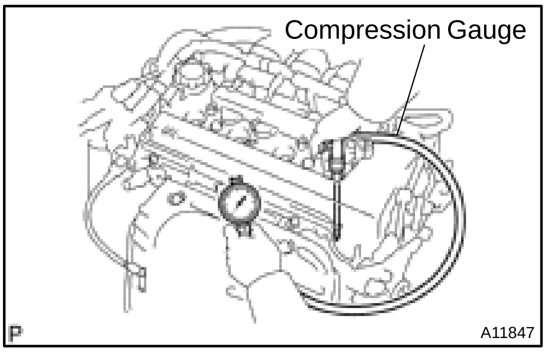
HINT:
If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE IGNITION COILS (See page IG–4)

3. REMOVE SPARK PLUGS



4. INSPECT CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.

HINT:
Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTICE:
This measurement must be done in as short a time as possible.

Compression pressure:
1,270 kPa (13.0 kgf/cm^2, 184 psi)
Minimum pressure: 1,000 kPa (10.2 kgf/cm^2, 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 15 psi) or less

(e) If the cylinder compression in one more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage through the gasket.

5. REINSTALL SPARK PLUGS

6. REINSTALL IGNITION COILS (See page IG–4)

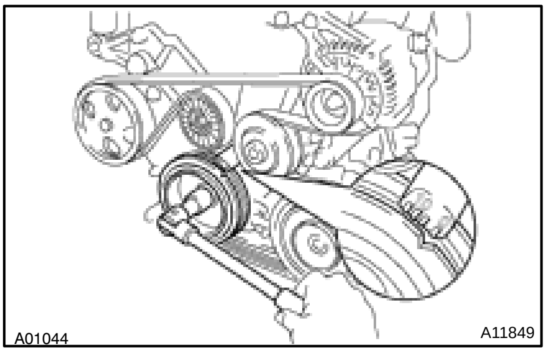
VALVE CLEARANCE

EM19B–01

ADJUSTMENT

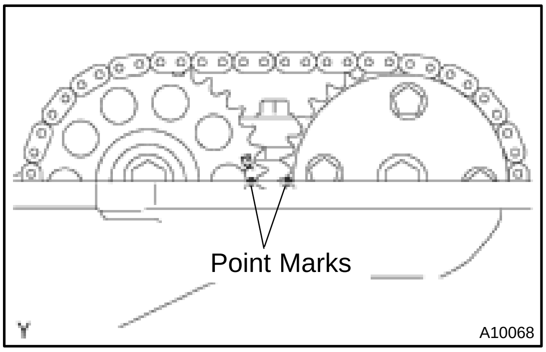
HINT:
Inspect and adjust the valve clearance when the engine is cold.

1. **REMOVE CYLINDER HEAD COVER**
(See page EM–13)



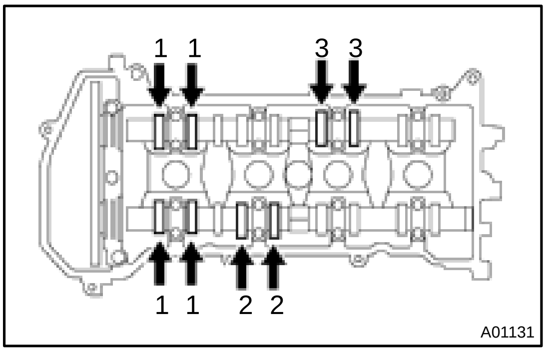
2. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley, and align its groove with the timing mark 0 of the timing chain cover.



(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



3. **INSPECT VALVE CLEARANCE**

(a) Check only the valves indicated.

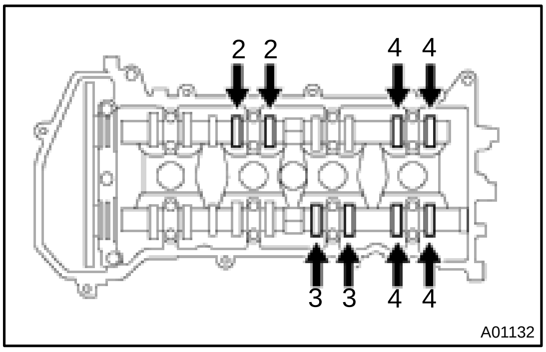
(1) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

(2) Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

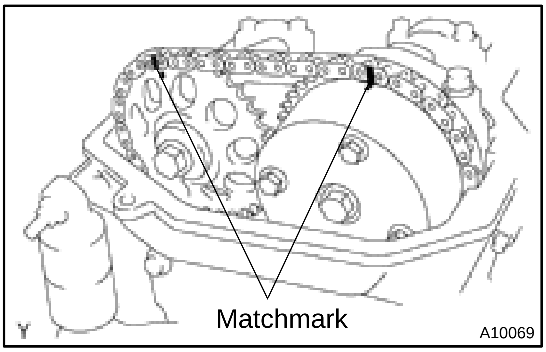
Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)

(b) Turn the crankshaft 1 revolution (360°) and align the mark as above (See step 2).



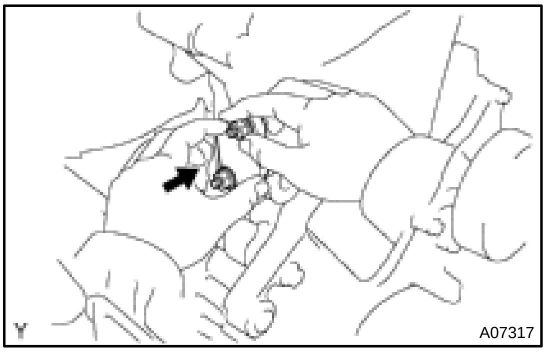
(c) Check only the valves indicated as shown.
Measure the valve clearance (See step (a)).

4. ADJUST VALVE CLEARANCE

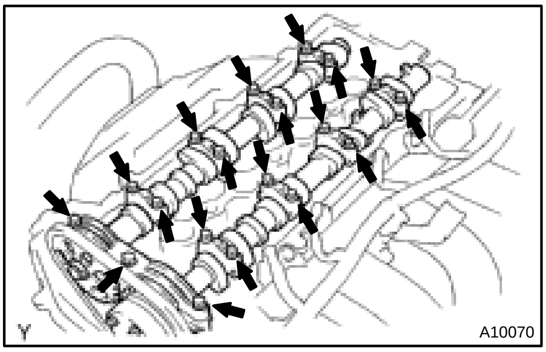


(a) Set the No. 1 cylinder to the TDC/compression (See step 2).

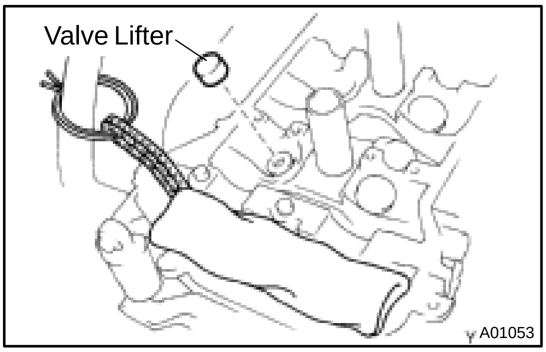
(b) Place matchmarks on the timing chain and camshaft timing sprockets.



(c) Remove the 2 nuts and chain tensioner.



(d) Remove the 2 camshaft and timing sprocket assemblies.
  (1) Remove the 19 bolts and 9 camshaft bearing caps (See page EM–20).
  (2) Remove the 2 camshaft and timing sprocket assemblies.

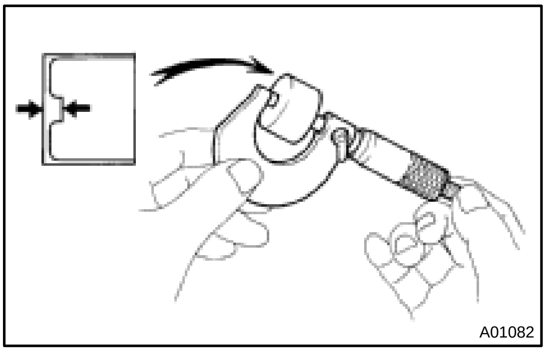


(e) Tie the timing chain as shown in the illustration.

NOTICE:

- **Be careful not to drop anything inside the timing chain cover.**
- **Do not allow the chain to come into contact with water or dust.**

(f) Remove the valve lifter.

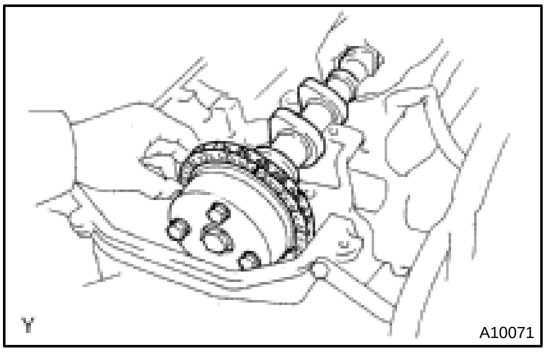


(g) Determine the replacement valve lifter size according to these Formula or Charts:
- Using a micrometer, measure the thickness of the removed lifter.
- Calculate the thickness of a new lifter so the valve clearance comes within the specified value.
  T.........Thickness of used lifter
  A.........Measured valve clearance
  N.........Thickness of new lifter

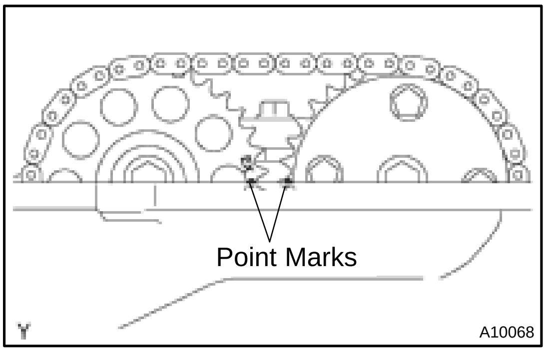
Intake: N = T + (A – 0.20 mm (0.008 in.))
Exhaust: N = T + (A – 0.30 mm (0.012 in.))
- Select a new lifter with a thickness as close as possible to the calculated values.

HINT:
Lifters are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).

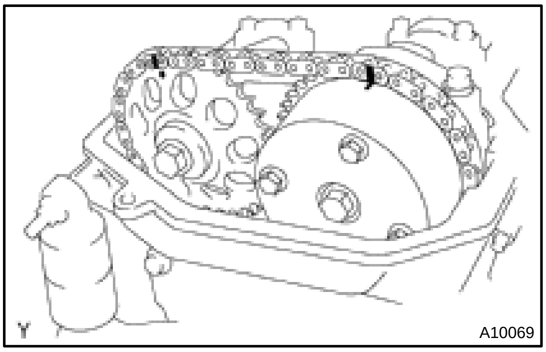
(h) Reinstall the valve lifter (See page EM–44).
(i) Align the crankshaft pulley groove with the timing mark 0 of the timing chain cover.



(j) Hold the timing chain, and place the intake camshaft and timing sprocket assembly.
(k) Align the matchmarks on the timing chain and camshaft timing sprocket.
(l) Reinstall the 2 camshaft and timing sprocket assemblies (See page EM–46).



(m) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface, as shown in the illustration.



(n) Check that the matchmarks on the timing chain and 2 timing sprockets.
(o) Install the chain tensioner (See page EM–20).
(p) Recheck the valve clearance (See step 3).
(q) Check the valve timing (See page EM–20).

5. REINSTALL CYLINDER HEAD COVER (See page EM–20)

Valve Lifter Selection Chart (Intake)

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)
0.000 – 0.030 (0.0000 – 0.0012)									06	06	06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22
0.031 – 0.050 (0.0012 – 0.0020)							06	06	06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24
0.051 – 0.070 (0.0020 – 0.0028)						06	06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26
0.071 – 0.090 (0.0028 – 0.0035)					06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28
0.091 – 0.110 (0.0036 – 0.0043)				06	06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30
0.111 – 0.130 (0.0044 – 0.0051)			06	06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32
0.131 – 0.149 (0.0052 – 0.0059)		06	06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34
0.150 – 0.250 (0.0059 – 0.0098)																												
0.251 – 0.270 (0.0099 – 0.0106)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46
0.271 – 0.290 (0.0107 – 0.0114)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48
0.291 – 0.310 (0.0115 – 0.0122)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.311 – 0.330 (0.0122 – 0.0130)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52
0.331 – 0.350 (0.0130 – 0.0138)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54
0.351 – 0.370 (0.0138 – 0.0146)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56
0.371 – 0.390 (0.0146 – 0.0154)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58
0.391 – 0.410 (0.0154 – 0.0161)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60
0.411 – 0.430 (0.0162 – 0.0169)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62
0.431 – 0.450 (0.0170 – 0.0177)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64
0.451 – 0.470 (0.0178 – 0.0185)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66
0.471 – 0.490 (0.0185 – 0.0193)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68
0.491 – 0.510 (0.0193 – 0.0201)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70
0.511 – 0.530 (0.0201 – 0.0209)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72
0.531 – 0.550 (0.0209 – 0.0217)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74
0.551 – 0.570 (0.0217 – 0.0224)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74
0.571 – 0.590 (0.0225 – 0.0232)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74
0.591 – 0.610 (0.0233 – 0.0240)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74		
0.611 – 0.630 (0.0241 – 0.0248)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74				
0.631 – 0.650 (0.0248 – 0.0256)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74						
0.651 – 0.670 (0.0256 – 0.0264)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74								
0.671 – 0.690 (0.0264 – 0.0272)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74										
0.691 – 0.710 (0.0272 – 0.0280)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74												
0.711 – 0.730 (0.0280 – 0.0287)	58	60	62	64	66	68	70	72	74	74	74	74	74	74														
0.731 – 0.750 (0.0288 – 0.0295)	60	62	64	66	68	70	72	74	74	74	74	74																
0.751 – 0.770 (0.0296 – 0.0303)	62	64	66	68	70	72	74	74	74	74																		
0.771 – 0.790 (0.0304 – 0.0311)	64	66	68	70	72	74	74	74																				
0.791 – 0.810 (0.0311 – 0.0319)	66	68	70	72	74	74	74																					
0.811 – 0.830 (0.0319 – 0.0327)	68	70	72	74	74	74																						
0.831 – 0.850 (0.0327 – 0.0335)	70	72	74	74	74																							
0.851 – 0.870 (0.0335 – 0.0343)	72	74	74	74																								
0.871 – 0.890 (0.0343 – 0.0350)	74	74	74																									
0.891 – 0.910 (0.0351 – 0.0358)	74	74																										
0.911 – 0.930 (0.0359 – 0.0366)	74																											

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 – 0.030 (0.0000 – 0.0012)	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.031 – 0.050 (0.0012 – 0.0020)	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58
0.051 – 0.070 (0.0020 – 0.0028)	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.071 – 0.090 (0.0028 – 0.0035)	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.091 – 0.110 (0.0036 – 0.0043)	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64
0.111 – 0.130 (0.0044 – 0.0051)	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.131 – 0.149 (0.0052 – 0.0059)	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.150 – 0.250 (0.0059 – 0.0098)																											
0.251 – 0.270 (0.0099 – 0.0106)	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74	
0.271 – 0.290 (0.0107 – 0.0114)	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74		
0.291 – 0.310 (0.0115 – 0.0122)	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74			
0.311 – 0.330 (0.0122 – 0.0130)	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74				
0.331 – 0.350 (0.0130 – 0.0138)	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74					
0.351 – 0.370 (0.0138 – 0.0146)	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74						
0.371 – 0.390 (0.0146 – 0.0154)	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74							
0.391 – 0.410 (0.0154 – 0.0161)	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74								
0.411 – 0.430 (0.0162 – 0.0169)	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74											
0.431 – 0.450 (0.0170 – 0.0177)	66	66	68	68	70	70	72	72	74	74	74	74	74	74													
0.451 – 0.470 (0.0178 – 0.0185)	68	68	70	70	72	72	74	74	74	74	74	74															
0.471 – 0.490 (0.0185 – 0.0193)	70	70	72	72	74	74	74	74	74	74																	
0.491 – 0.510 (0.0193 – 0.0201)	72	72	74	74	74	74	74	74																			
0.511 – 0.530 (0.0201 – 0.0209)	74	74	74	74	74	74																					
0.531 – 0.550 (0.0209 – 0.0217)	74	74	74	74																							
0.551 – 0.570 (0.0217 – 0.0224)	74	74																									

Intake valve clearance (Cold):

0.15 – 0.25 mm (0.006 – 0.010 in.)

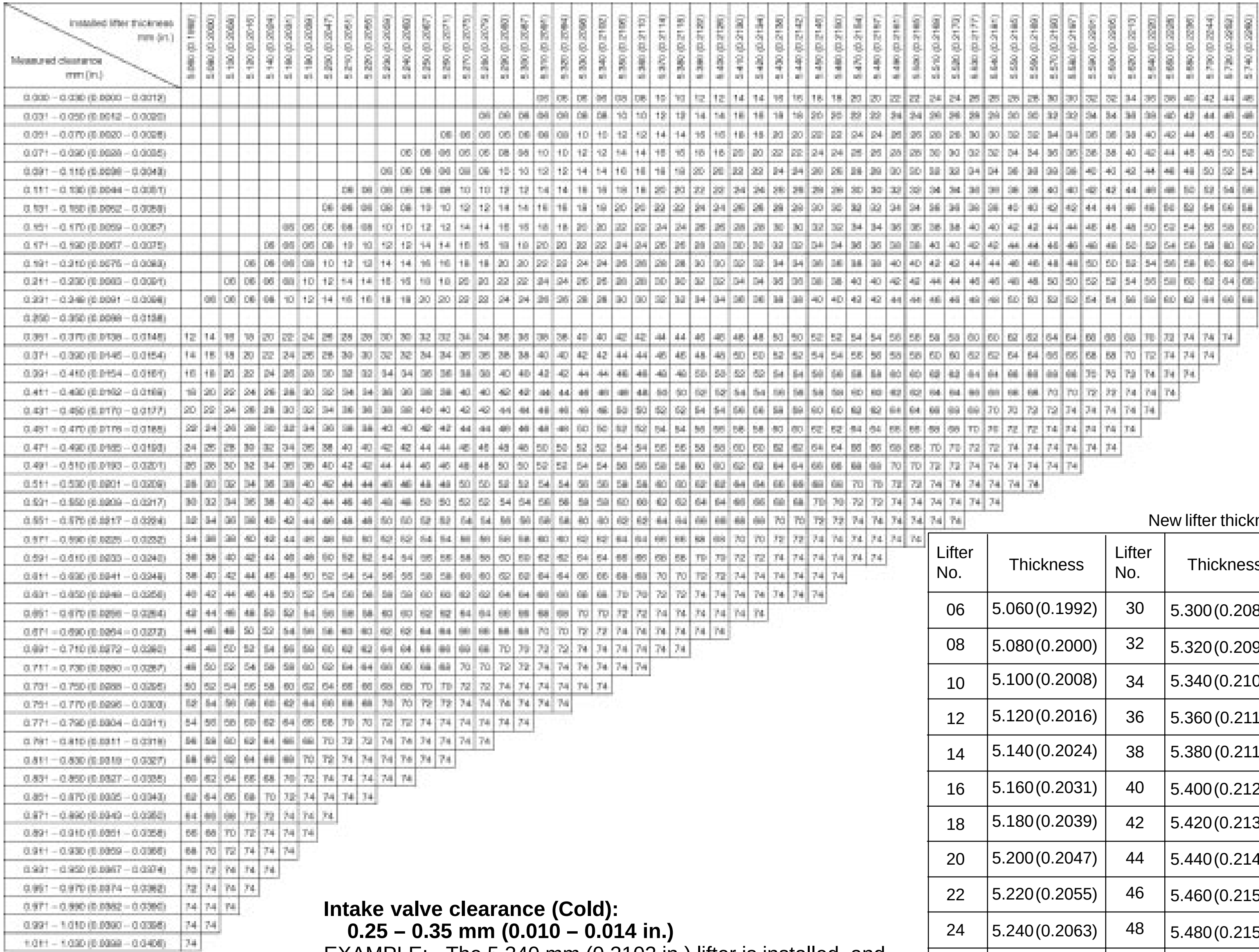
EXAMPLE: The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 5.250 mm (0.2067 in.) lifter with a new No. 46 lifter.

New Lifter Thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

A01234

Valve Lifter Selection Chart (Exhaust)



A01235

New lifter thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

Intake valve clearance (Cold):
0.25 – 0.35 mm (0.010 – 0.014 in.)

EXAMPLE: The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).
Replace the 5.340 mm (0.2102 in.) lifter with a new No. 48 lifter.

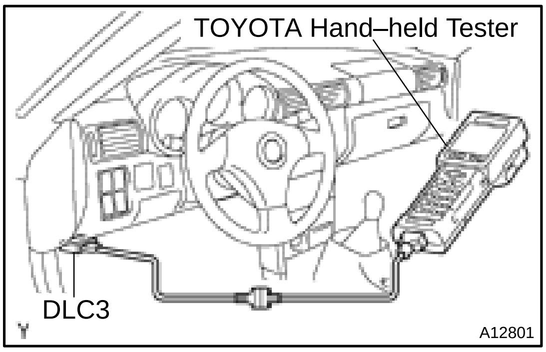
IGNITION TIMING

EM19C–01

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

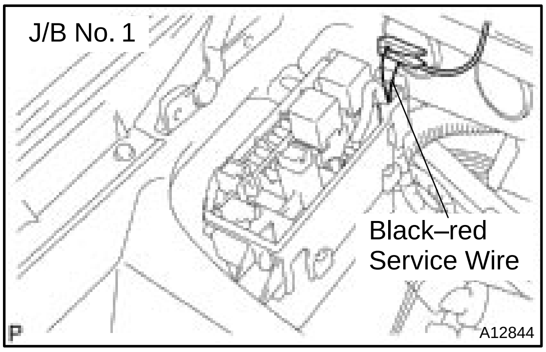


2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.

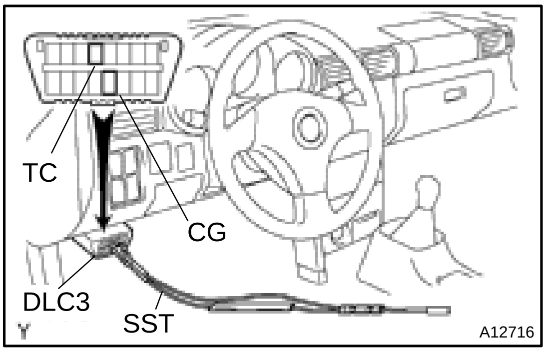
(b) Please refer to the TOYOTA hand–held tester or OBD II scan tool operator's for further details.

3. CHECK IDLE SPEED (See page EM–10)



4. CONNECT TIMING LIGHT

Connect the tester probe of a timing light to the black–red service wire in the J/B No. 1 as shown in the illustration.

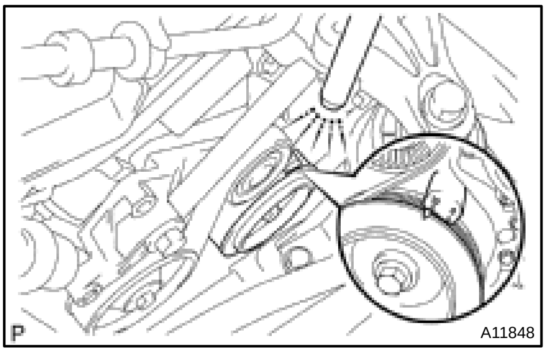


5. INSPECT IGNITION TIMING

(a) Using SST, connect terminals to TC and CG of the DLC3.
SST 09843–18040

HINT:

After engine rpm is kept at 1,000 – 1,500 rpm for 5 seconds, check that it returns to idle speed.



(b) Using a timing light, check the ignition timing.
Ignition timing: 8 – 12° BTDC @ idle

(c) Remove the SST from the DLC3.

6. FURTHER CHECK IGNITION TIMING

Ignition timing: 6 – 15° BTDC @ idle

HINT:

The timing mark moves in a range between 6° and 15°.

7. DISCONNECT TIMING LIGHT

8. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

IDLE SPEED

INSPECTION

EM19D–01

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All vacuum lines properly connected
(e) SFI system wiring connectors fully plugged
(f) All operating accessories switched OFF
(g) Ignition timing check correctly
(h) Transmission in neutral position
(i) Air conditioning switched OFF

2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL (See page EM–9)

3. INSPECT IDLE SPEED

(a) Race the engine at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.
Idle speed (w/ Cooling fan OFF): 700 ± 50 rpm

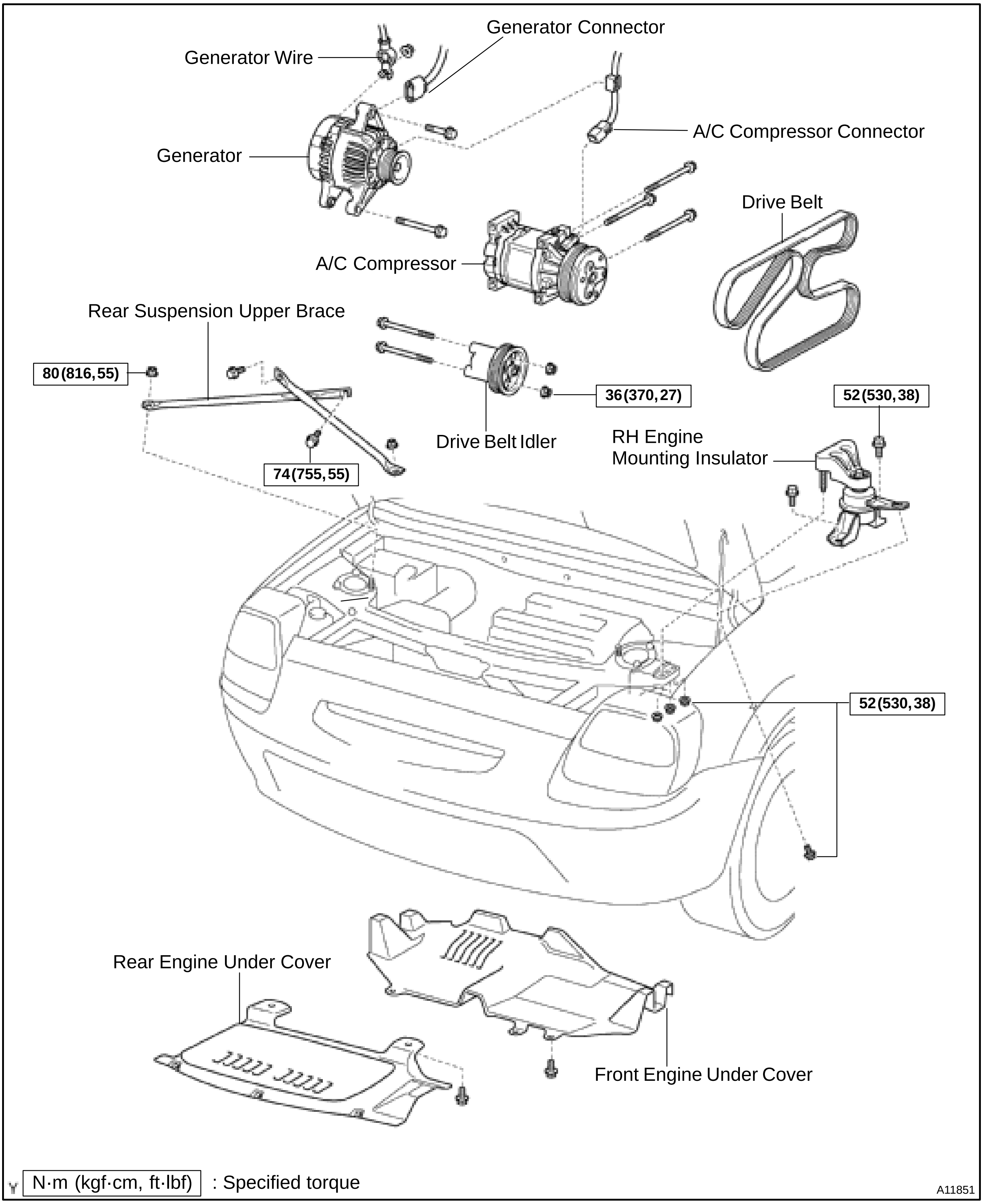
If the idle speed is not as specified, check the IAC valve and air intake system.

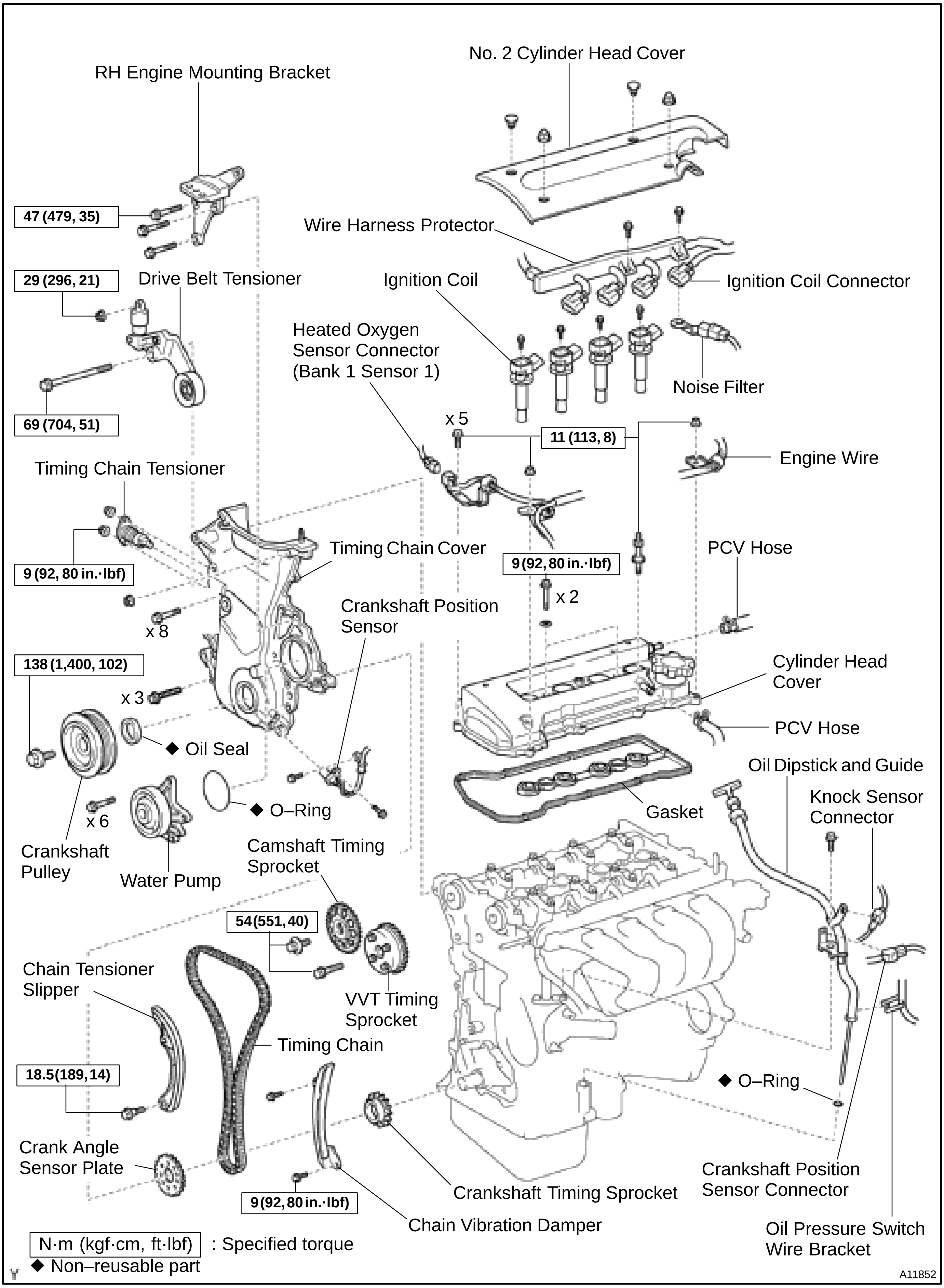
4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

TIMING CHAIN

COMPONENTS

EM19E–01

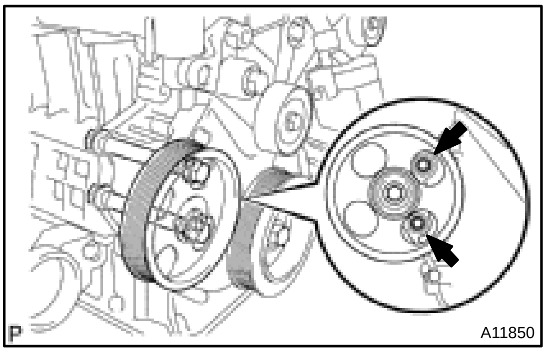



No. 2 Cylinder Head Cover
RH Engine Mounting Bracket
47 (479, 35)
Wire Harness Protector
29 (296, 21)
Drive Belt Tensioner
Ignition Coil
Ignition Coil Connector
Heated Oxygen Sensor Connector (Bank 1 Sensor 1)
Noise Filter
69 (704, 51)
x 5
11 (113, 8)
Engine Wire
Timing Chain Tensioner
Timing Chain Cover
9 (92, 80 in.·lbf)
PCV Hose
9 (92, 80 in.·lbf)
x 2
x 8
Crankshaft Position Sensor
138 (1,400, 102)
Cylinder Head Cover
x 3
PCV Hose
◆ Oil Seal
Oil Dipstick and Guide
Knock Sensor Connector
x 6
◆ O–Ring
Gasket
Camshaft Timing Sprocket
Crankshaft Pulley
Water Pump
54 (551, 40)
Chain Tensioner Slipper
VVT Timing Sprocket
Timing Chain
18.5 (189, 14)
◆ O–Ring
Crank Angle Sensor Plate
Crankshaft Timing Sprocket
Crankshaft Position Sensor Connector
9 (92, 80 in.·lbf)
Chain Vibration Damper
Oil Pressure Switch Wire Bracket
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A11852

EM05P–07

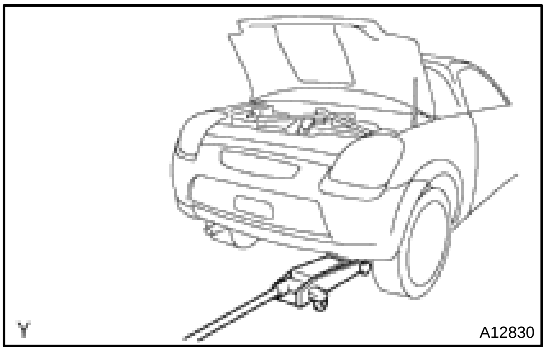
REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **REMOVE REAR SUSPENSION UPPER BRACE**
3. **REMOVE ENGINE UNDER COVERS**
4. **REMOVE DRIVE BELT AND GENERATOR**
(See page CH–7)



5. **REMOVE DRIVE BELT IDLER**

Remove the 2 bolts, 2 nuts and drive belt idler.

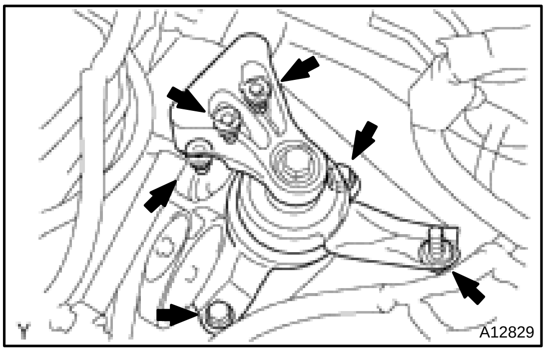


6. **REMOVE RH ENGINE MOUNTING INSULATOR**

(a) Set a jack to the oil pan.

NOTICE:

Place a wooden block or rubber block between a jack and the oil pan.



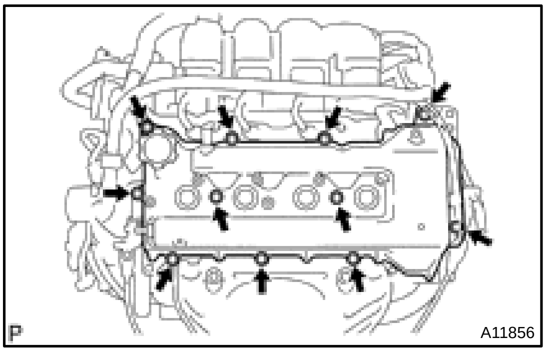
(b) Remove the 3 bolts, 3 nuts and engine mounting insulator.

7. **REMOVE IGNITION COILS (See page IG–4)**
8. **REMOVE CYLINDER HEAD COVER**

(a) Disconnect the 2 PCV hoses from the cylinder head cover.

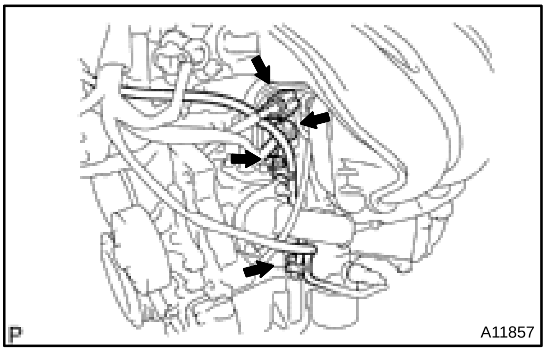
(b) Disconnect the noise filter.

(c) Disconnect the heated oxygen sensor (bank 1 sensor 1) connector.



(d) Remove the 9 bolts, 2 nuts and 2 seal washers.

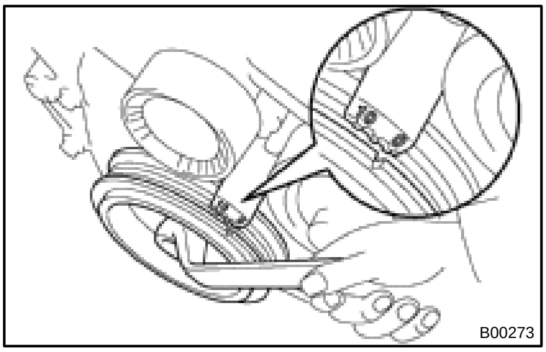
(e) Disconnect the engine wire together with the 3 engine wire brackets, and remove the cylinder head cover and gasket.



9. REMOVE OIL DIPSTICK AND GUIDE

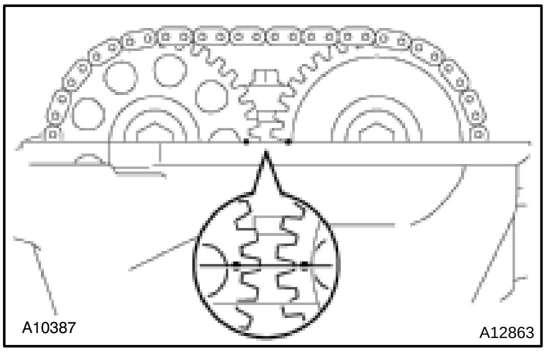
(a) Remove the bolt, and disconnect the oil dipstick and guide.

(b) Disconnect the 2 connectors and wire bracket from the oil dipstick guide, and remove the oil dipstick and O–ring.



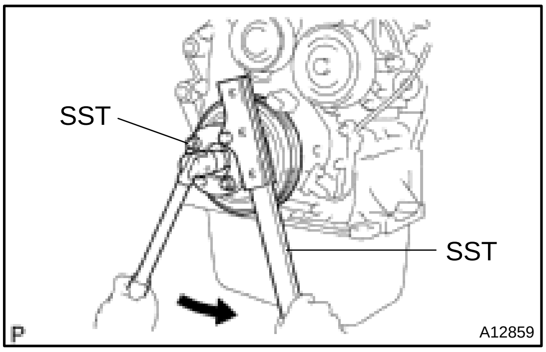
10. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark 0 of the timing chain cover.



(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

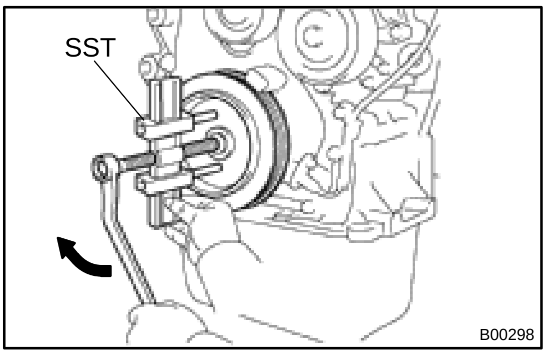
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



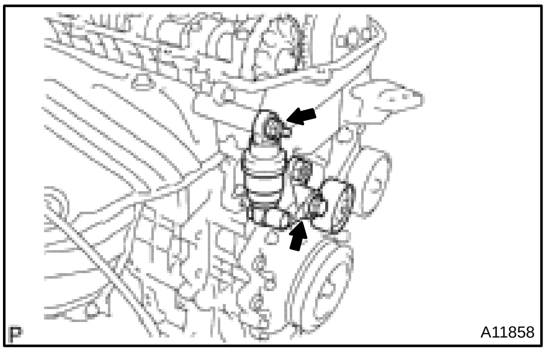
11. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.
SST 09213–70011, 09330–00021

(b) Remove the crankshaft pulley.

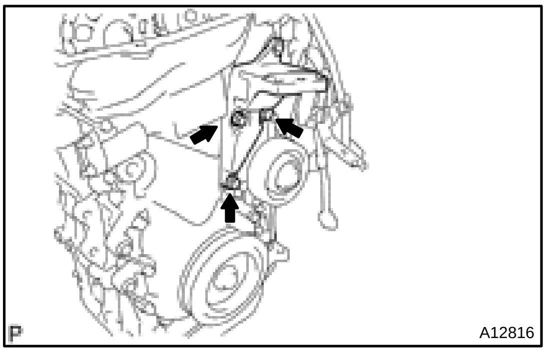


HINT:
If necessary, remove the pulley with SST.
SST 09950–50012 (09951–05010, 09952–05010, 09953–05020, 09954–05020)



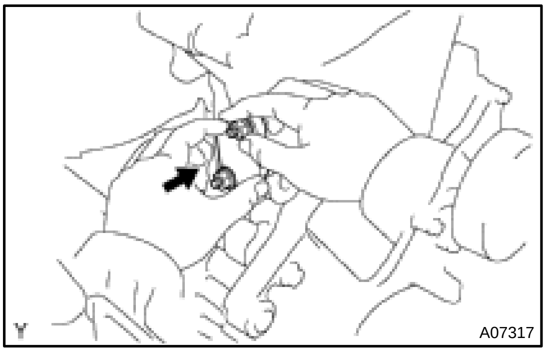
12. REMOVE DRIVE BELT TENSIONER

Remove the bolt, nut and drive belt tensioner.



13. REMOVE RH ENGINE MOUNTING BRACKET

Remove the 3 bolts and engine mounting bracket.

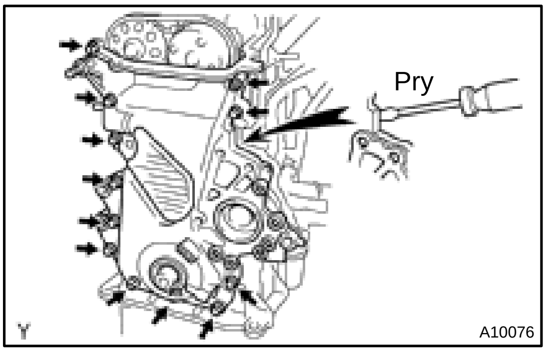


14. REMOVE CHAIN TENSIONER

Remove the 2 nuts and chain tensioner.

15. REMOVE WATER PUMP (See page CO–7)

16. REMOVE CRANKSHAFT POSITION SENSOR (See page IG–6)



17. REMOVE TIMING CHAIN COVER

(a) Remove the 11 bolts and nut.

(b) Using a screwdriver, pry between the timing chain cover and cylinder head or cylinder block.

(c) Remove the timing chain cover.

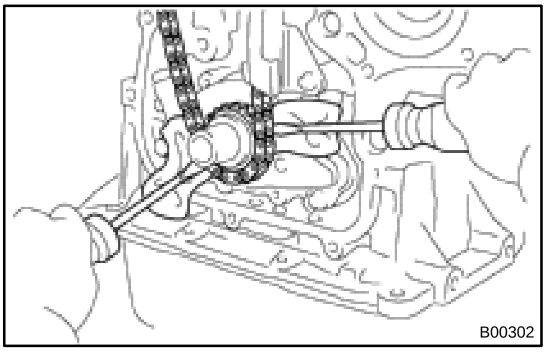
NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.

18. REMOVE CRANK ANGLE SENSOR PLATE

19. REMOVE CHAIN TENSIONER SLIPPER

Remove the bolt and slipper.


B00302

20. REMOVE TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET

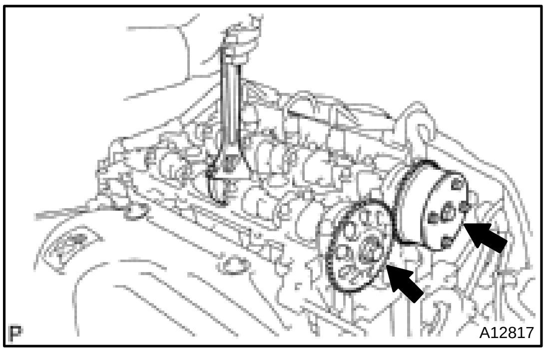
If necessary, pry between the timing chain and oil pump by 2 screwdrivers.

NOTICE:

Position shop rags as shown to prevent damage.

21. REMOVE CHAIN VIBRATION DAMPER

Remove the 2 bolts and damper.



A12817

22. REMOVE CAMSHAFT TIMING SPROCKET AND VVT TIMING SPROCKET

(a) Hold the hexagonal head wrench portion of the camshaft with a wrench, and loosen the sprocket.

NOTICE:

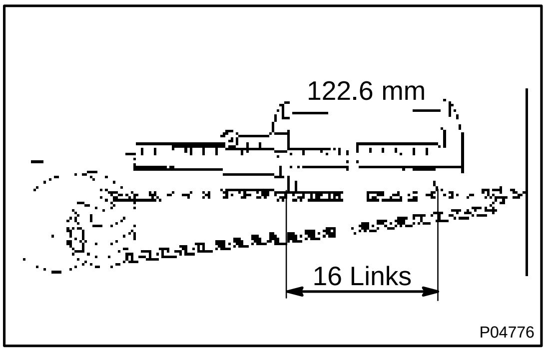
Be careful not to damage the cylinder head and valve lifter by a wrench.

(b) Remove the bolt and camshaft timing sprocket.

(c) Remove the bolt and VVT timing Sprocket.

EM05Q–05

INSPECTION



1. INSPECT TIMING CHAIN AND TIMING SPROCKETS

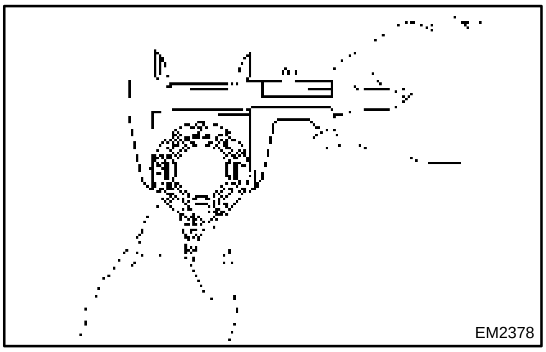
(a) Using vernier calipers, measure the length of the 16 links with the chain fully stretched.

Maximum chain elongation: 122.6 mm (4.827 in.)

If the elongation is greater than maximum, replace the chain.

HINT:

Make the same pulling measurements at 3 or more places selected at random.



(b) Wrap the chain around the timing sprocket.

(c) Using vernier calipers, measure the timing sprocket diameter with the chain.

NOTICE:

Vernier calipers contact the chain rollers for measuring.

Minimum sprocket diameter (w/ Chain):

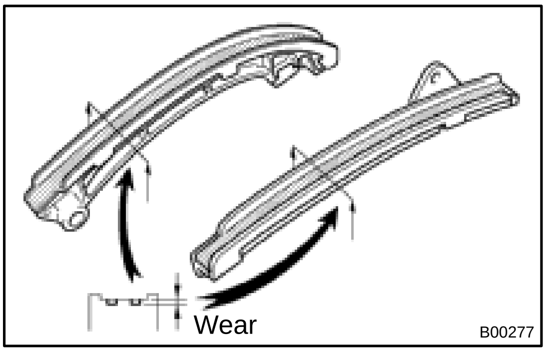
Camshaft	97.3 mm (3.831 in.)
Crankshaft	51.6 mm (2.031 in.)

If the diameter is less than minimum, replace the chain and sprockets.

2. INSPECT DRIVE BELT IDLER

Check that the pulley rotates smoothly.

If necessaly, replace the bearing (See page EM–18).

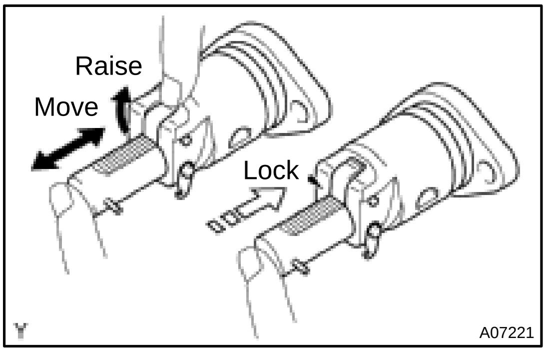


3. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

Measure the chain tensioner slipper and vibration damper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper and/or damper.



4. INSPECT CHAIN TENSIONER

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

5. INSPECT OIL JET (See page LU–10)

6. INSPECT DRIVE BELT TENSIONER

Check the oil leakage and crack.

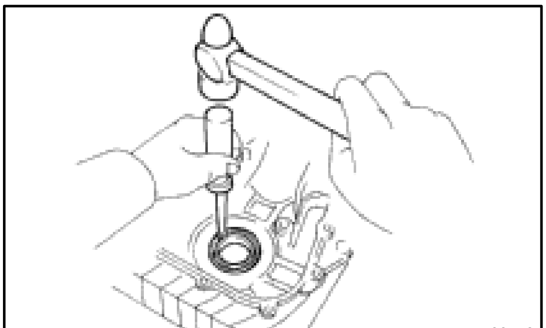
If necessary, replace the drive belt tensioner.

EM19F–01

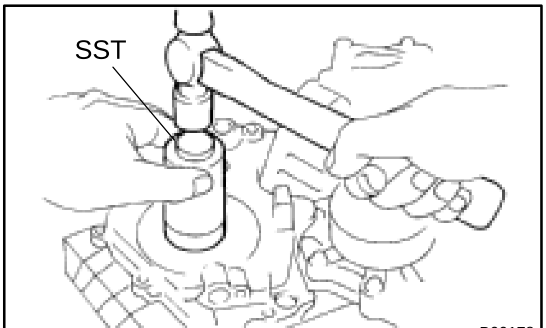
REPLACEMENT

1. REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:
There are 2 methods ((a) and (b)) to replace the oil seal.

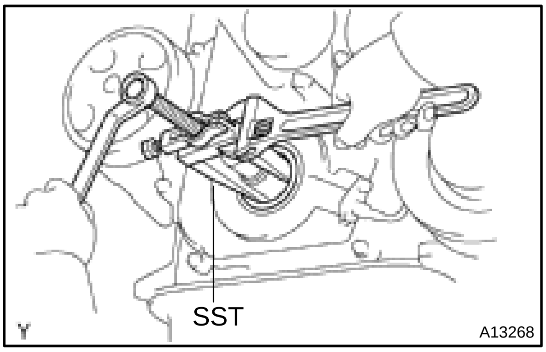

B00179

(a) If the timing chain cover is removed from the cylinder block.
(1) Using a screwdriver and a hammer, tap out the oil seal.



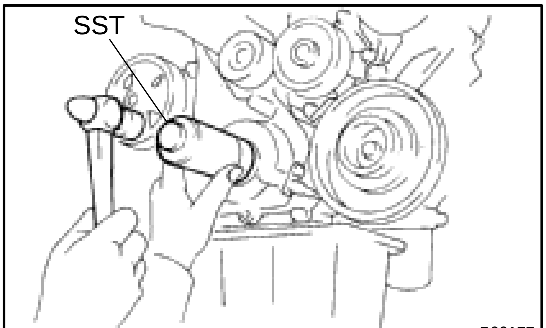
B00178

(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09309–37010
(3) Apply MP grease to the oil seal lip.



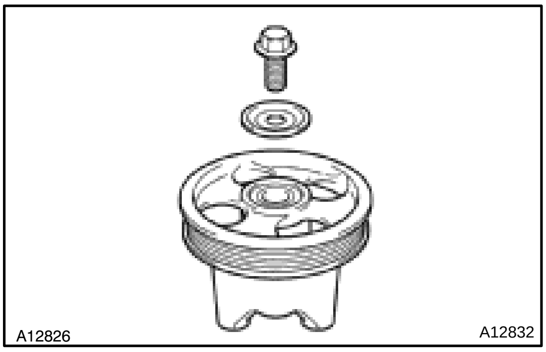
A13268

(b) If the timing chain cover is installed to the cylinder block.
(1) Using SST, remove the oil seal.
SST 09308–10010



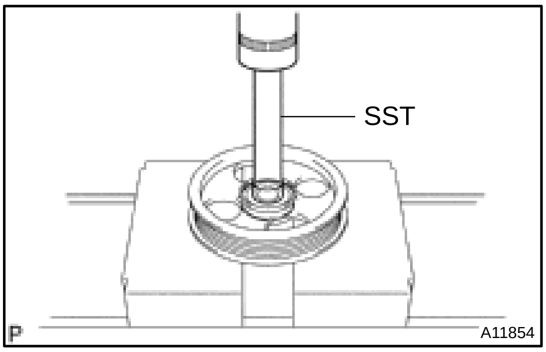
B00177

(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09309–37010

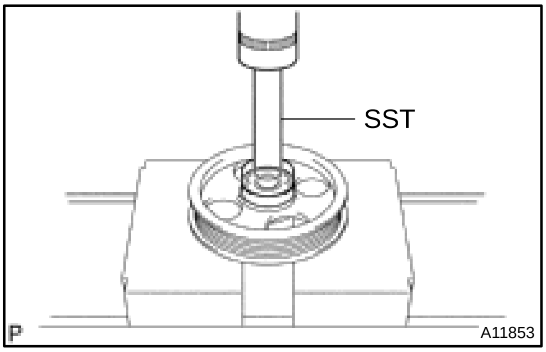


2. REPLACE DRIVE BELT IDLER BEARING

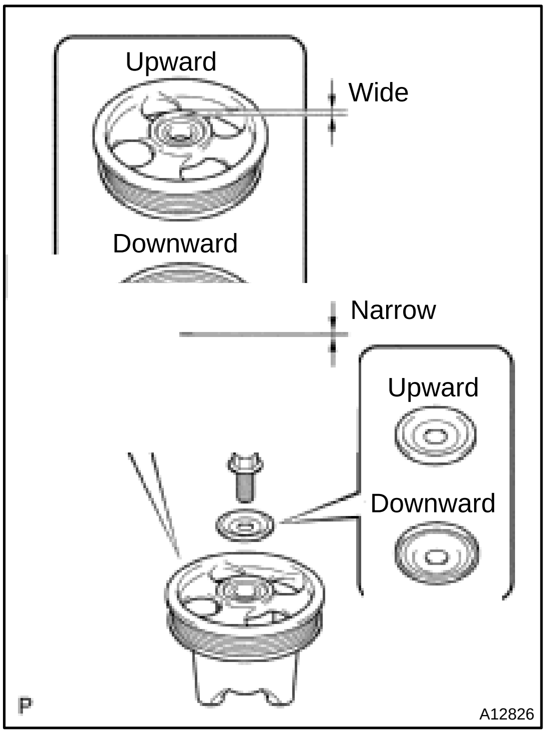
(a) Mount the drive belt idler in a vice, and remove the bolt, washer and pulley.



(b) Using SST and a press, press out the bearing.
SST 09950–60010 (09951–00240), 09950–70010 (09951–07100)



(c) Using SST and a press, press in a new bearing.
SST 09950–60010 (09951–00390), 09950–70010 (09951–07100)

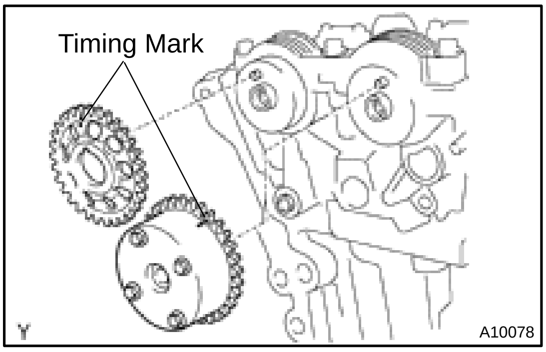


(d) Mount the drive belt idler in a vice, and reinstall the pulley with the washer and bolt.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

NOTICE:
Be careful of the installation direction of pulley and washer.

EM19G–01

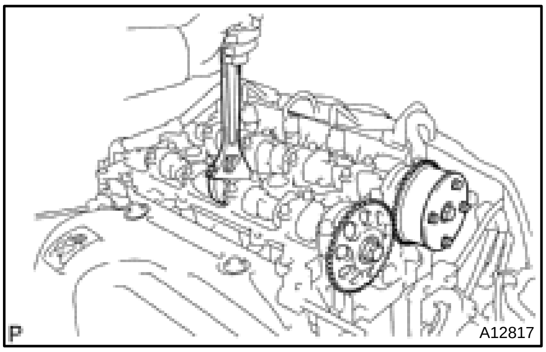
INSTALLATION



A10078

1. INSTALL CAMSHAFT TIMING SPROCKET AND VVT TIMING SPROCKET

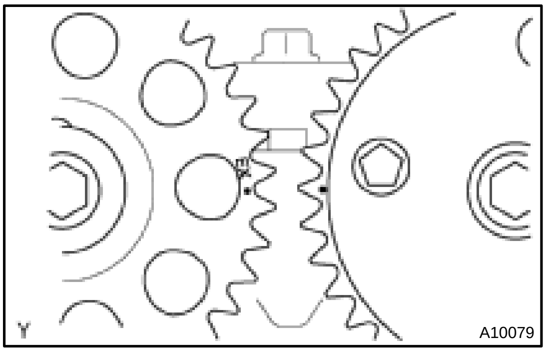
(a) Align the camshaft knock pin with the knock pin groove on the sprocket side with the timing mark, and slide on the camshaft timing sprocket and VVT timing sprocket.


A12817

(b) Temporary install the 2 timing sprocket bolts.

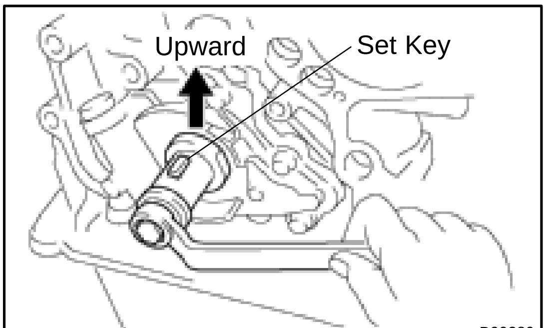
(c) Hold the hexagon wrench head portion of the camshaft with a wrench, and tighten the timing sprocket bolt.

Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)


A10079

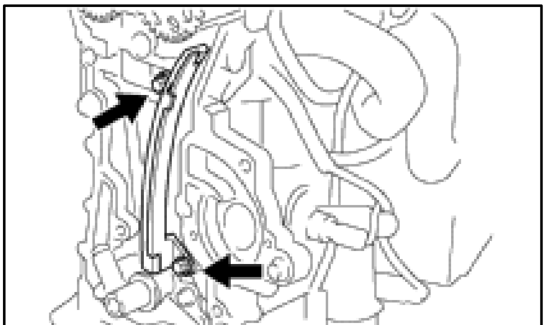
2. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the camshaft timing sprockets.



B00280

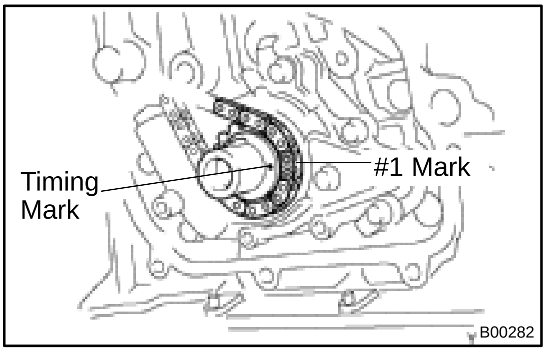
(b) Using the crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.


B00281

3. INSTALL CHAIN VIBRATION DAMPER

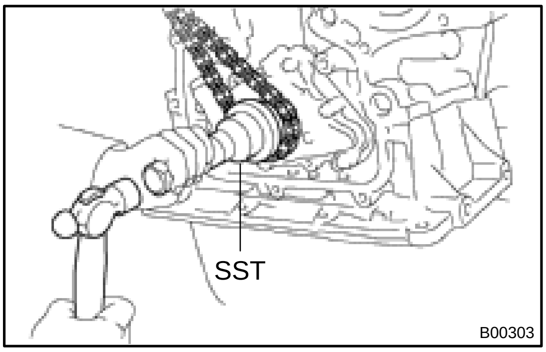
Install the damper with the 2 bolts.

Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

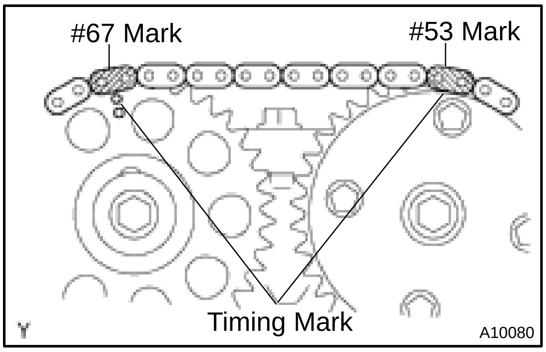


4. INSTALL TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET

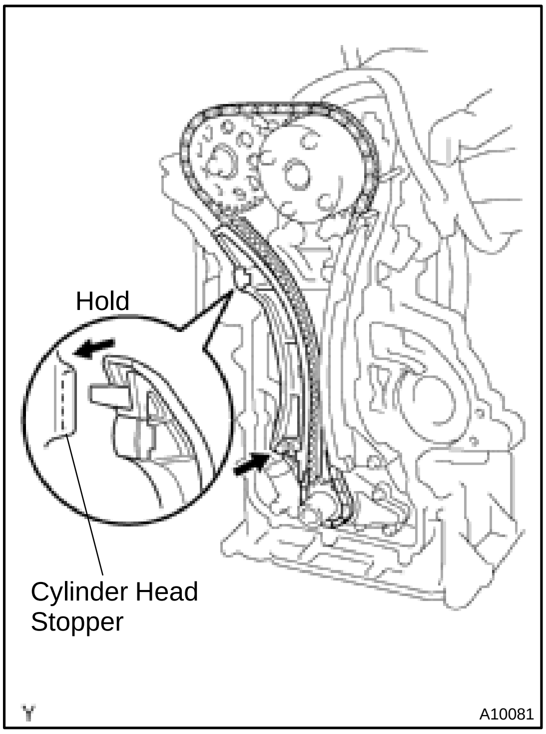
(a) Install the timing chain on the crankshaft timing sprocket with the #1 mark link aligned with the timing mark on the crankshaft timing sprocket.



HINT:
If necessary, tap in the sprocket with SST and a hammer.
SST 09223–22010



(b) Install the timing chain on the camshaft timing sprocket and VVT timing sprocket with the #53 and #67 mark links aligned with the timing marks on the camshaft timing sprocket and VVT timing sprocket.



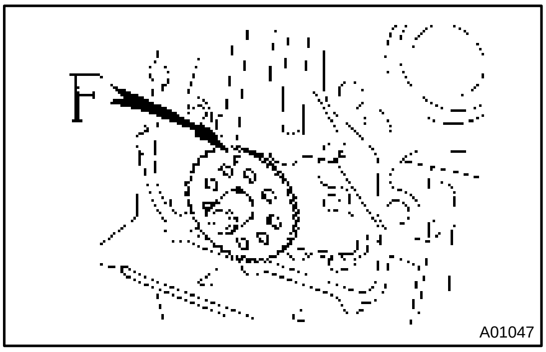
(c) Check that the tension between the VVT timing sprocket and crankshaft timing sprocket.

5. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the slipper with the bolt.
Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

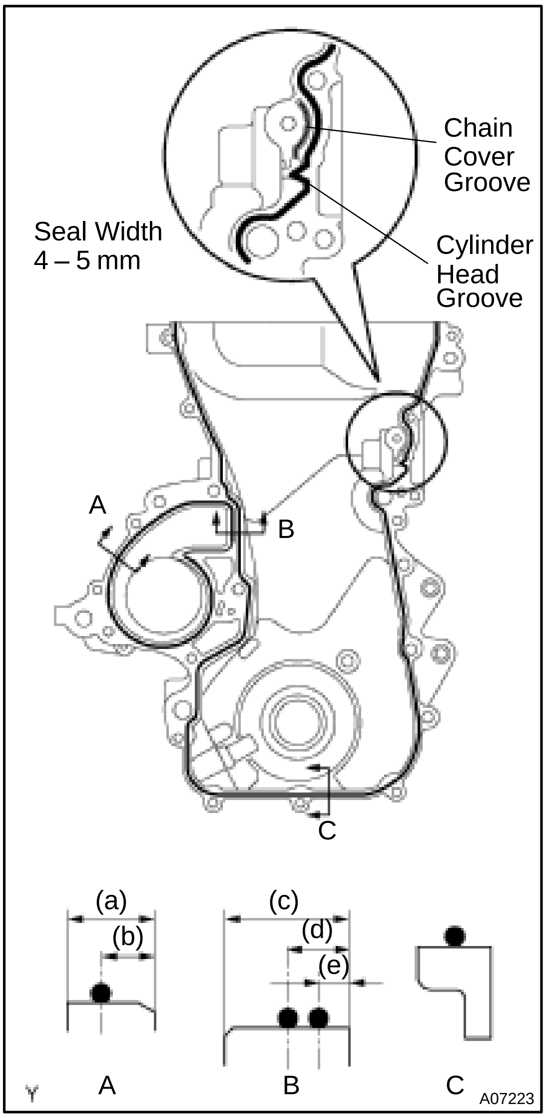
(b) Check that the slipper is held on the cylinder head stopper.

NOTICE:
Do not turn the crankshaft.



6. INSTALL CRANK ANGLE SENSOR PLATE

Install the plate with the F mark facing forward.



7. INSTALL TIMING CHAIN COVER AND WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

- Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the timing chain cover as shown in the illustration.

Seal packing position:

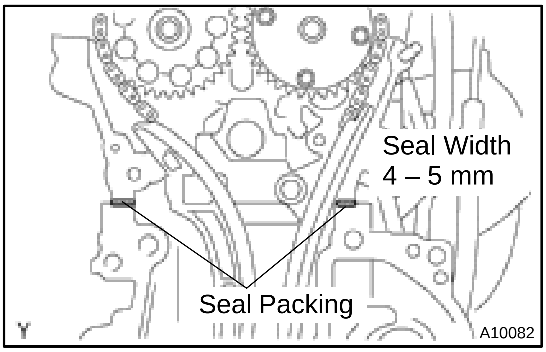
(a) of A position	7 mm (0.28 in.)
(b) of A position	4.5 mm (0.177 in.)
(c) of B position	12 mm (0.47 in.)
(d) of B position	6 mm (0.24 in.)
(e) of B position	3 mm (0.12 in.)

Seal packing: Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



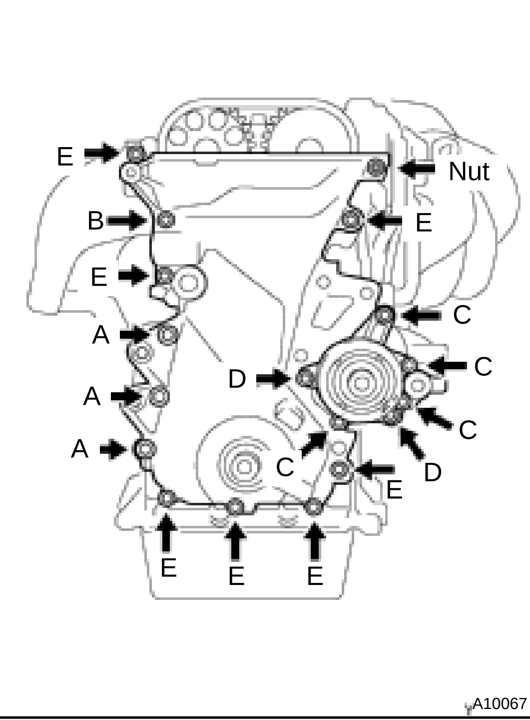
(c) Apply seal packing to 2 locations as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



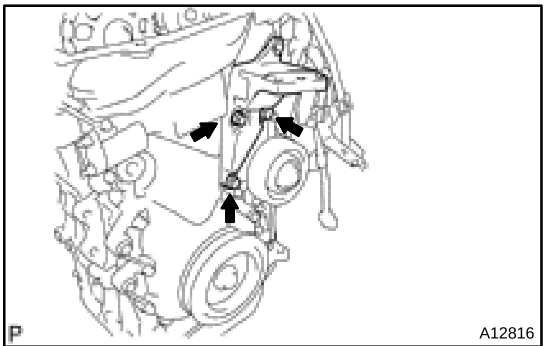
A10067

(d) Install the timing chain cover, a new O–ring and the water pump with the 17 bolts and nut. Uniformly tighten the bolts and nut in several passes.
Torque:
18.5 N·m (189 kgf·cm, 14 ft·lbf) for A
13 N·m (133 kgf·cm, 10 ft.·lbf) for B
9 N·m (92 kgf·cm, 80 in.·lbf) for C
11 N·m (113 kgf·cm, 8 ft·lbf) for others

NOTICE:
- **Pay attention not to wrap the chain and slipper over the chain cover seal line.**
- **After installing the chain cover, install the mounting bracket and water pump within 15 minutes.**

HINT:
Each bolt length in indicated in the illustration.

Bolt A	45 mm (1.77 in.) length 12 mm head
Bolt B	45 mm (1.77 in.) length 10 mm head
Bolt C	35 mm (1.38 in.) length 10 mm head
Bolt D	30 mm (1.18 in.) length 10 mm head
Bolt E	25 mm (0.98 in.) length 10 mm head

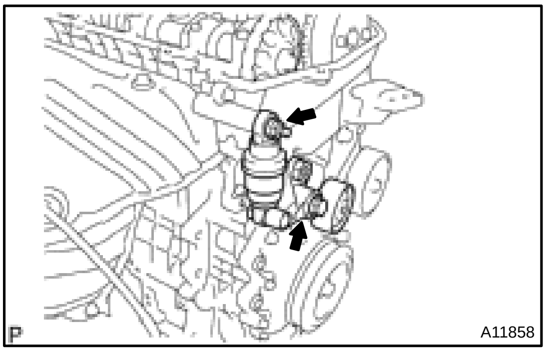

A12816

8. INSTALL RH ENGINE MOUNTING BRACKET

(a) Apply seal packing to threads of the mounting bolt.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:
Do not apply seal packing to 2 or 3 threads of the bolt end.

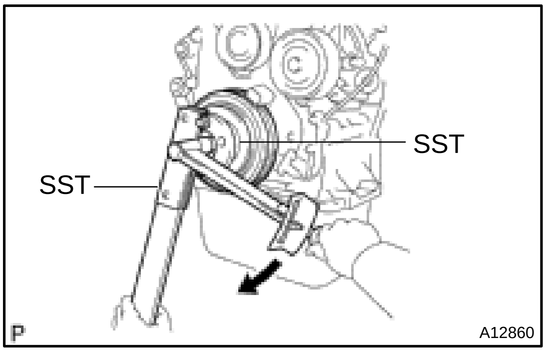
(b) Install the engine mounting bracket with the 3 bolts.
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)



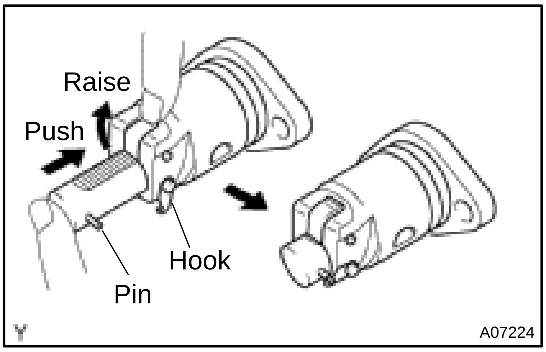
9. **INSTALL DRIVE BELT TENSIONER**
(a) Install the drive belt tensioner with the bolt and nut.
Torque:
69 N·m (704 kgf·cm, 51 ft·lbf) for bolt
29 N·m (296 kgf·cm, 21 ft·lbf) for nut
(b) Hook the tool on the hexagonal portion of the drive belt tensioner bracket and operate drive belt tensioner 3 times with full stroke.

HINT:
Take 3 seconds or more for 1 full stroke.

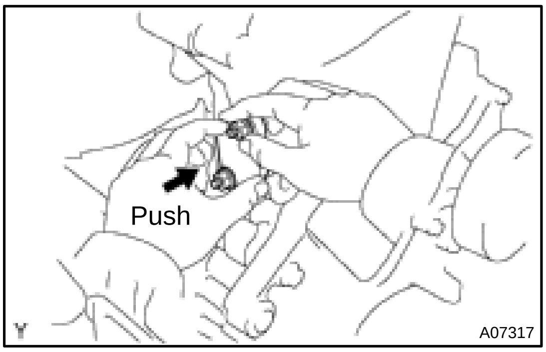
10. **INSTALL CRANKSHAFT POSITION SENSOR**
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)



11. **INSTALL CRANKSHAFT PULLEY**
(a) Clean the crankshaft pulley inside.
(b) Align the pulley set key with the key groove of the pulley, and slide on the pulley.
(c) Using SST, install the pulley bolt.
SST 09213–70011, 09330–00021
Torque: 138 N·m (1,409 kgf·cm, 102 ft·lbf)

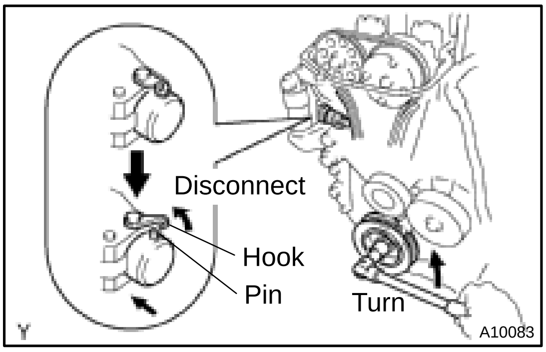


12. **INSTALL CHAIN TENSIONER**
(a) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.
(b) Install the O–ring to the chain tensioner.



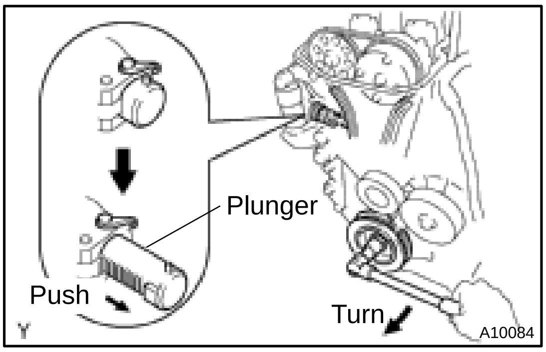
(c) Push the chain tensioner into the timing chain cover, and install the 2 nuts.
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

HINT:
- In case that the hook is released while pushing in, apply the hook again and push the tensioner in.
- Pay attention not to catch the O–ring as it is built in the chain tensioner previously.

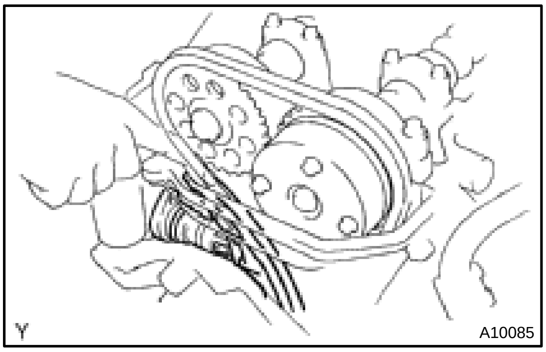


13. SET CHAIN TENSION

(a) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.



(b) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

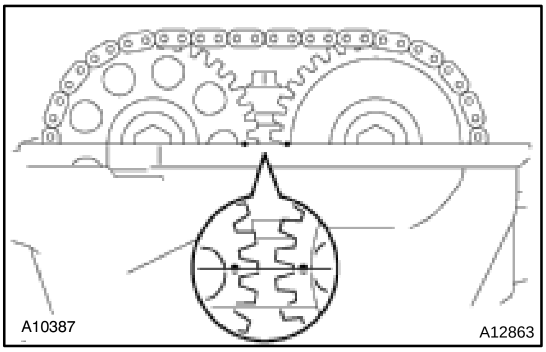


HINT:
If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released from the knock pin and the plunger springs out.

14. CHECK VALVE TIMING

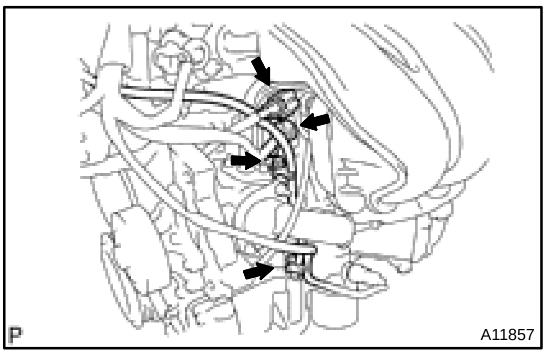
(a) Turn the crankshaft pulley, and align its groove with timing mark 0 of the timing chain cover.

NOTICE:
Always turn the crankshaft clockwise.



(b) Check that the point marks of the camshaft timing sprocket and VVT timing sprocket are in straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

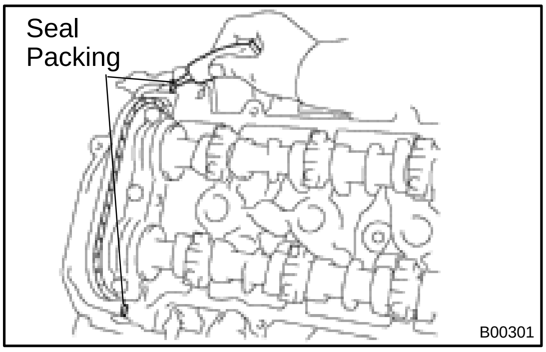


15. INSTALL OIL DIPSTICK AND GUIDE

(a) Connect the knock sensor connector, crankshaft position sensor connector and oil presssure sensor wire bracket to the oil dipstick guide.

(b) Install a new O–ring to the oil dipstick.

(c) Install the oil dipstick and guide with the nut.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



16. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.

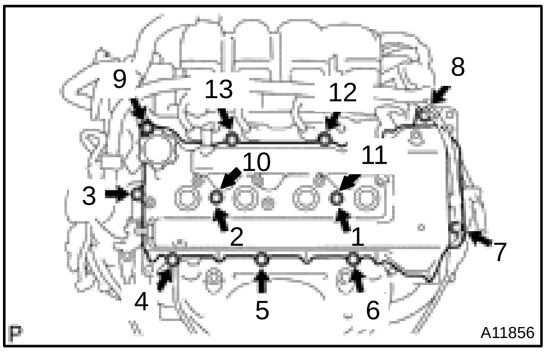
Seal packing: Part No. 08826–00080 or equivalent

(c) Install the gasket to the cylinder head cover.

If the gasket has damage, replace a new one.

HINT:

Part must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.



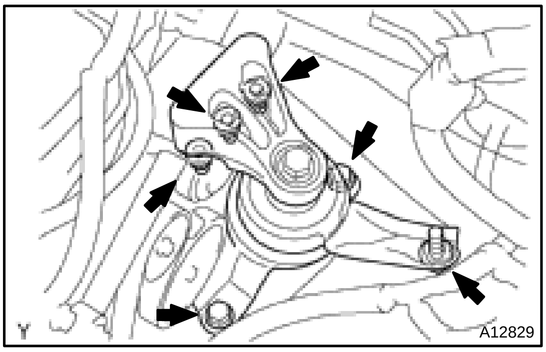
(d) Install the cylinder head cover and engine wire bracket with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts in the several passes, in the sequence shown.

Torque:
11 N·m (113 kgf·cm, 8 ft·lbf) for w/o washer
9 N·m (92 kgf·cm, 80 in.·lbf) for w/ washer

(e) Connect the noise filter.

(f) Disconnect the heated oxygen sensor (bank 1 sensor 1) connector.

(g) Connect the 2 PCV hoses to the cylinder head cover.



17. INSTALL RH ENGINE MOUNTING INSULATOR

(a) Install the engine mounting insulator with the 3 bolts and 3 nuts.

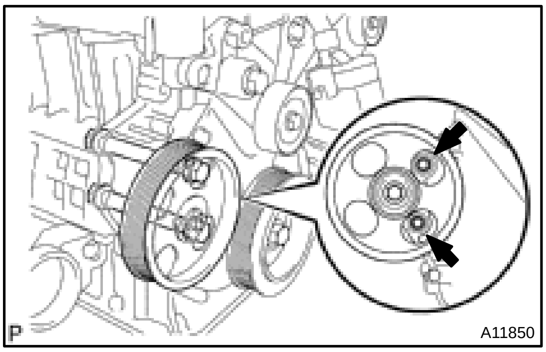
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(b) Remove the jack.

18. INSTALL IGNITION COILS (See page IG–4)

19. INSTALL NO. 2 CYLINDER HEAD COVER

Install the No. 2 cylinder head cover with the 2 nuts and 2 clips.



20. INSTALL DRIVE BELT IDLER

Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

21. INSTALL GENERATOR AND DRIVE BELT (See page CH–17)

22. INSTALL ENGINE UNDER COVERS

23. INSTALL SUSPENSION UPPER BRACE

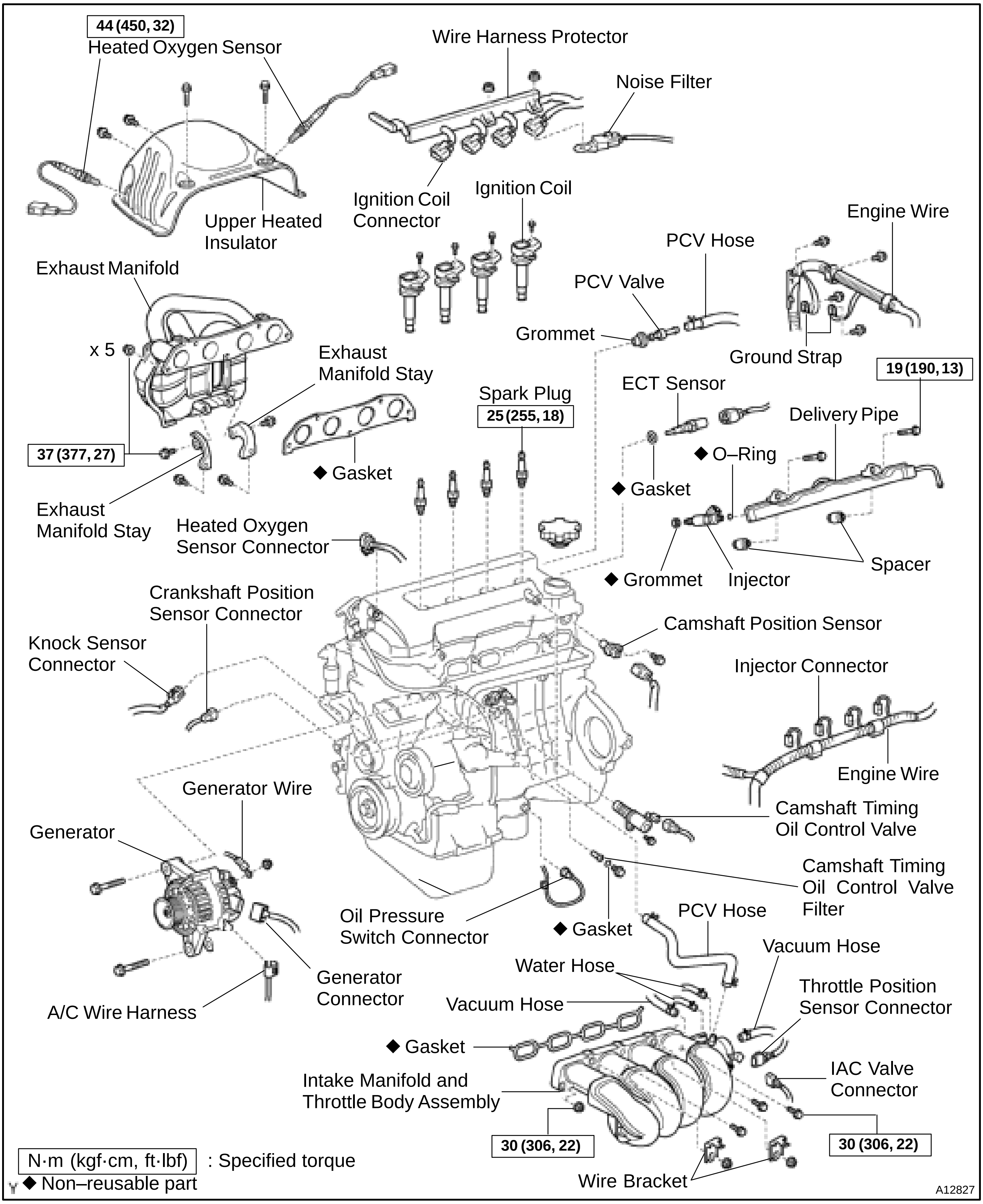
24. FILL WITH ENGINE COOLANT (See page CO–1)

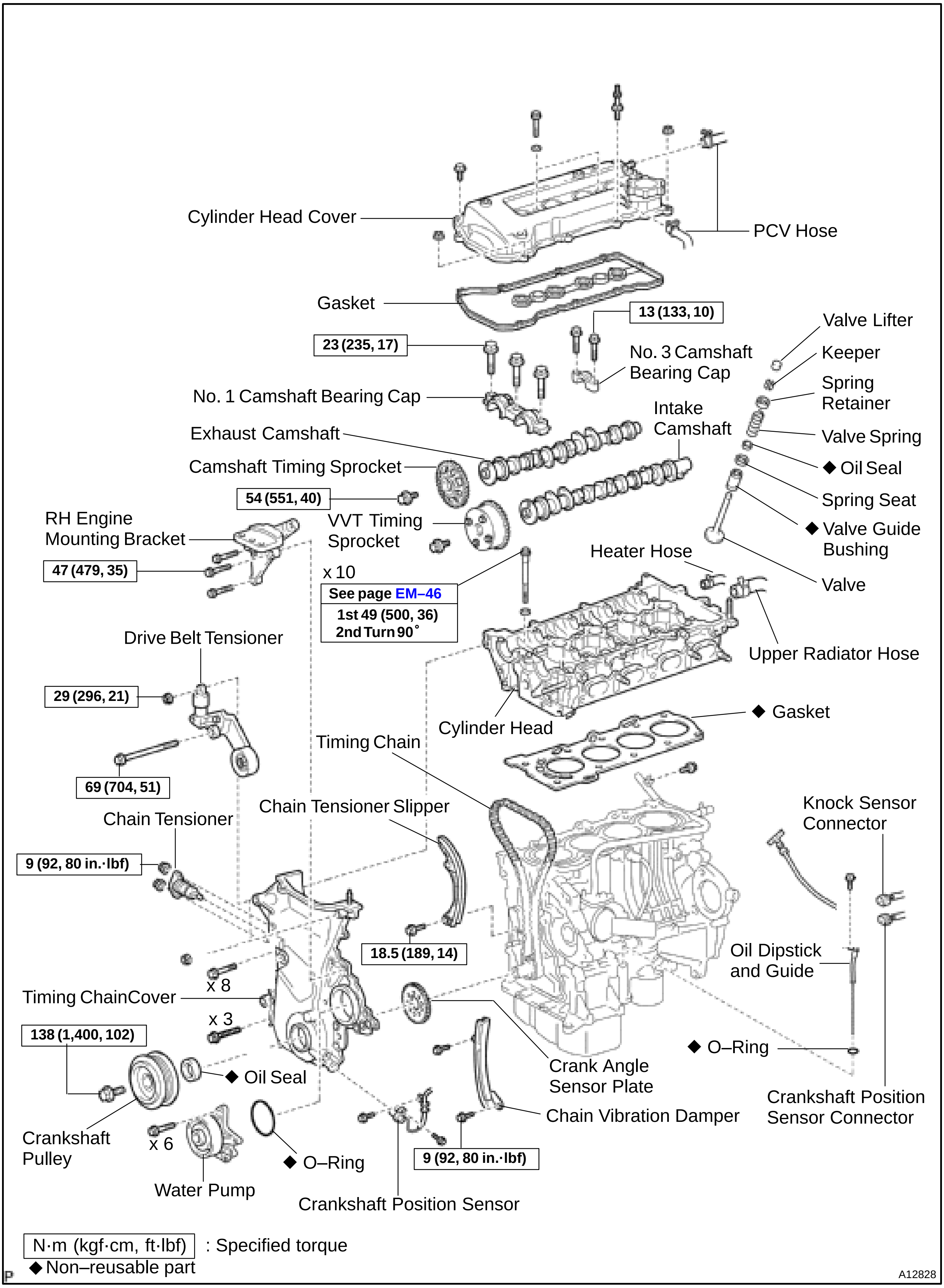
25. START ENGINE AND CHECK FOR COOLANT LEAKS

CYLINDER HEAD

COMPONENTS

EM19H–01

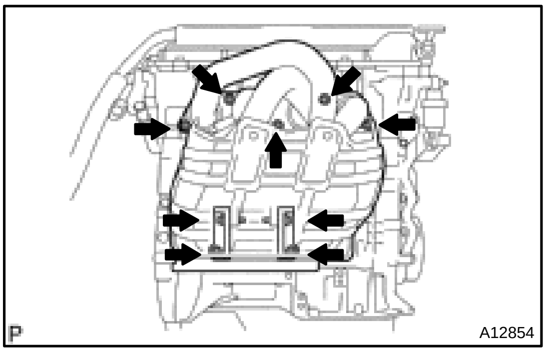



Cylinder Head Cover
PCV Hose
Gasket
13 (133, 10)
Valve Lifter
23 (235, 17)
No. 3 Camshaft Bearing Cap
Keeper
Spring Retainer
No. 1 Camshaft Bearing Cap
Intake Camshaft
Exhaust Camshaft
Valve Spring
Camshaft Timing Sprocket
◆ Oil Seal
54 (551, 40)
Spring Seat
RH Engine Mounting Bracket
VVT Timing Sprocket
◆ Valve Guide Bushing
Heater Hose
47 (479, 35)
x 10
See page EM–46
1st 49 (500, 36)
2nd Turn 90°
Valve
Drive Belt Tensioner
Upper Radiator Hose
29 (296, 21)
◆ Gasket
Cylinder Head
Timing Chain
69 (704, 51)
Knock Sensor Connector
Chain Tensioner
Chain Tensioner Slipper
9 (92, 80 in.·lbf)
18.5 (189, 14)
Oil Dipstick and Guide
x 8
Timing Chain Cover
x 3
138 (1,400, 102)
◆ O–Ring
Crank Angle Sensor Plate
◆ Oil Seal
Crankshaft Position Sensor Connector
Chain Vibration Damper
Crankshaft Pulley
x 6
9 (92, 80 in.·lbf)
◆ O–Ring
Water Pump
Crankshaft Position Sensor
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A12828

EM19I–02

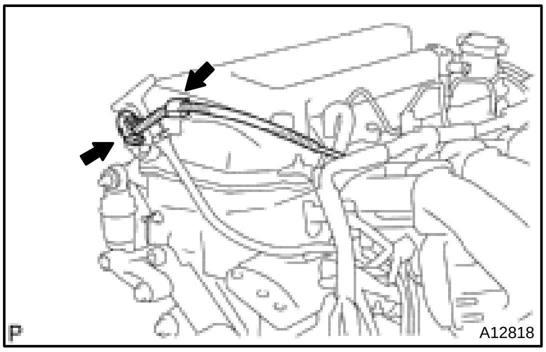
REMOVAL

1. **REMOVE ENGINE UNIT (See page EM–54)**
2. **REMOVE GENERATOR (See page CH–7)**
3. **REMOVE IGNITION COILS (See page IG–4)**
4. **REMOVE SPARK PLUGS (See page IG–1)**
5. **REMOVE INJECTORS (See page SF–23)**



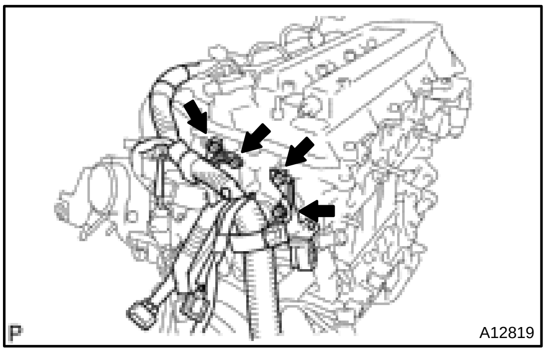
6. **REMOVE EXHAUST MANIFOLD**

(a) Disconnect the 2 heated oxygen sensor connectors, and remove the 2 heated oxygen sensors.
(b) Remove the 4 bolts and upper heat insulator.
(c) Remove the 4 bolts and 2 exhaust manifold stays.
(d) Remove the 5 nuts, exhaust manifold and gasket.



7. **DISCONNECT ENGINE WIRE**

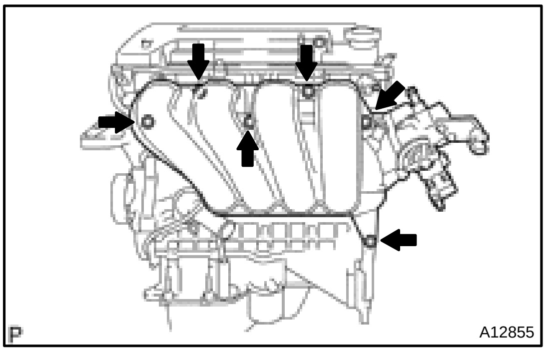
(a) Disconnect the heated oxygen sensor (bank 1 sensor 1) wire from the 2 wire brackets.
(b) Disconnect the camshaft timing oil control valve connector.
(c) Disconnect the crankshaft position sensor connector.
(d) Disconnect the knock sensor connector.
(e) Disconnect the oil pressure switch connector and wire.
(f) Disconnect the camshaft position sensor connector.
(g) Disconnect the ECT sensor connector.
(h) Disconnect the throttle position sensor connector.
(i) Disconnect the IAC valve connector.
(j) Disconnect the noise filter.



(k) Remove the 2 bolts, and disconnect the 2 ground straps.
(l) Remove the 2 bolts and engine wire.

8. **REMOVE OIL FILLER CAP**
9. **REMOVE PCV HOSES AND VALVE**

(a) Remove the 2 PCV hoses.
(b) Remove the PCV valve and grommet.



10. REMOVE INTAKE MANIFOLD AND THROTTLE BODY ASSEMBLY

(a) Disconnect the 2 water hoses from the throttle body.

(b) Disconnect the 2 vacuum hoses from the intake manifold.

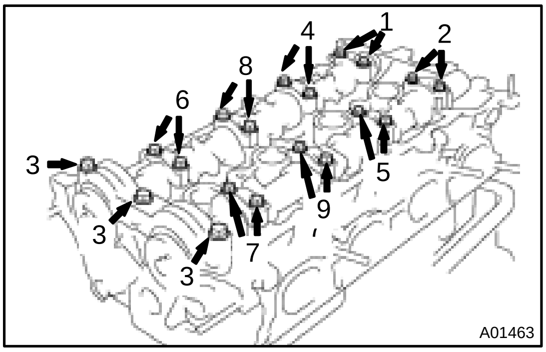
(c) Remove the 4 bolts, 2 nuts, 2 wire brackets, the intake manifold and throttle body assembly.

(d) Remove the gasket from the intake manifold and throttle body assembly.

11. REMOVE CAMSHAFT TIMING CHAIN
(See page EM–13)

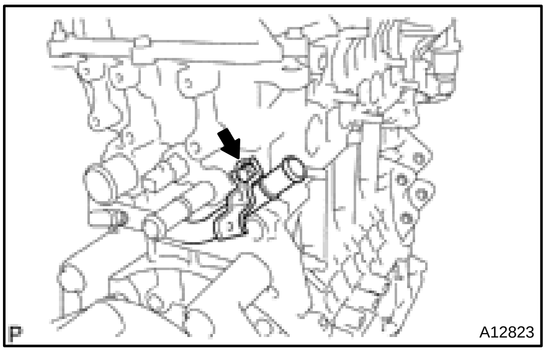
12. REMOVE TIMING SPROCKET AND VVT SPROCKET
(See page EM–13)

13. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE
(See page SF–42)



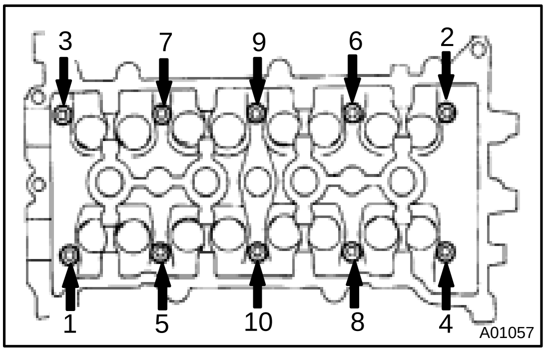
14. REMOVE CAMSHAFTS

Uniformly loosen and remove the 19 bearing cap bolts in several passes, in the sequence shown, and remove the 9 bearing caps, intake and exhaust camshafts.



15. REMOVE CYLINDER HEAD ASSEMBLY

(a) Remove the bolt of the water bypass pipe from the cylinder head.

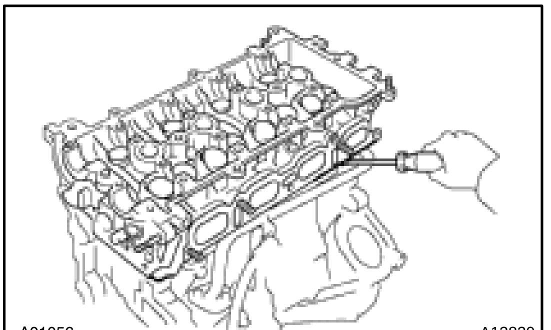


(b) Using a 10 mm bi–hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts in several passes, in the sequence shown.

NOTICE:

Head warpage or cracking could result from removing bolts in an incorrect order.

(c) Remove the 10 plate washers.


A01056 A12820

(d) Using a screwdriver, pry between the cylinder head and cylinder block, and remove the cylinder head.

NOTICE:

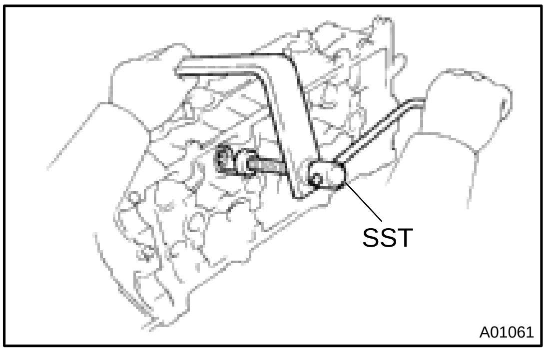
Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

16. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE FILTER (See page SF–42)

17. REMOVE CAMSHAFT POSITION SENSOR (See page IG–5)

18. REMOVE ECT SENSOR (See page SF–55)

EM19J–01



A01061

DISASSEMBLY

1. REMOVE VALVE LIFTERS

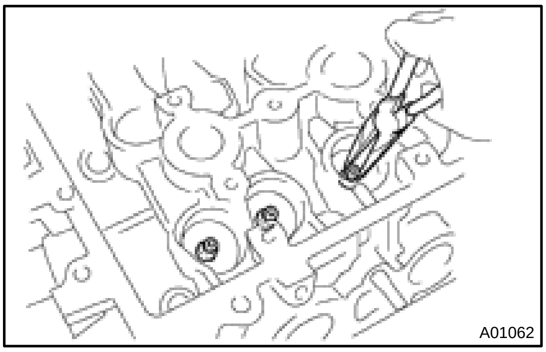
HINT:

Arrange the valve lifters in the correct order.

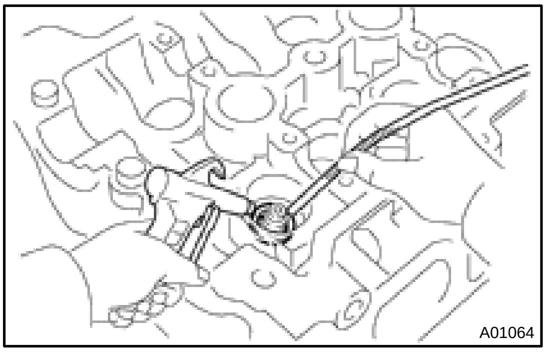
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202–70020 (09202–00010)

(b) Remove the spring retainer, valve spring and valve.


A01062

(c) Using needle–nose pliers, remove the oil seal.


A01064

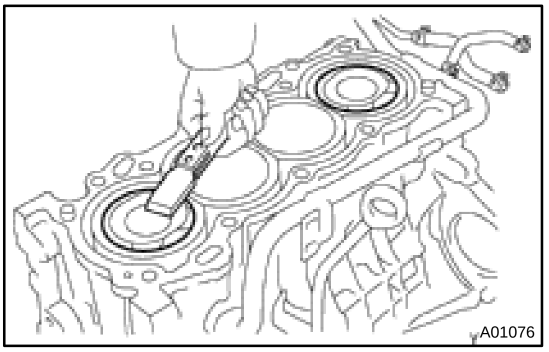
(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

HINT:

Arrange the valves, valve springs, spring seats and spring retainers in the correct order.

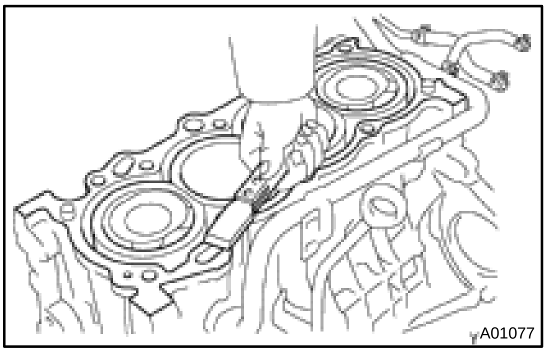
EM15W–02

INSPECTION



1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston surface.



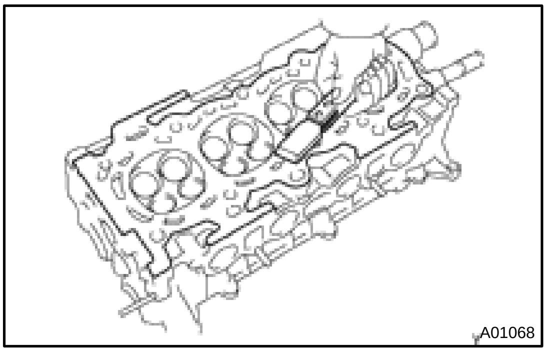
(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high pressure compressed air.

2. INSPECT CYLINDER BLOCK FOR FLATNESS
(See page EM–74)

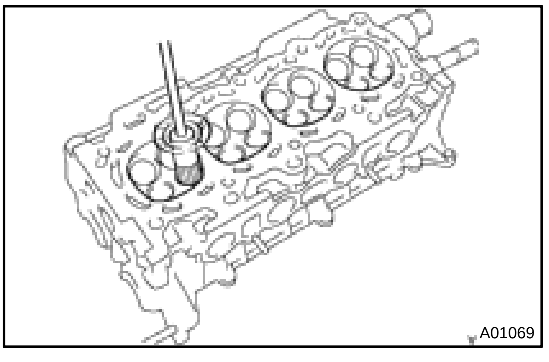


3. CLEAN CYLIDER HEAD

(a) Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE:

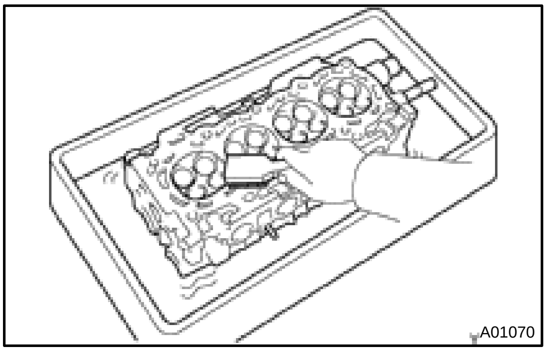
Be careful not to scratch the cylinder block contact surface.



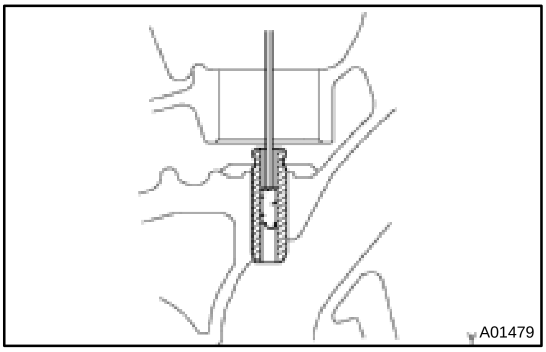
(b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

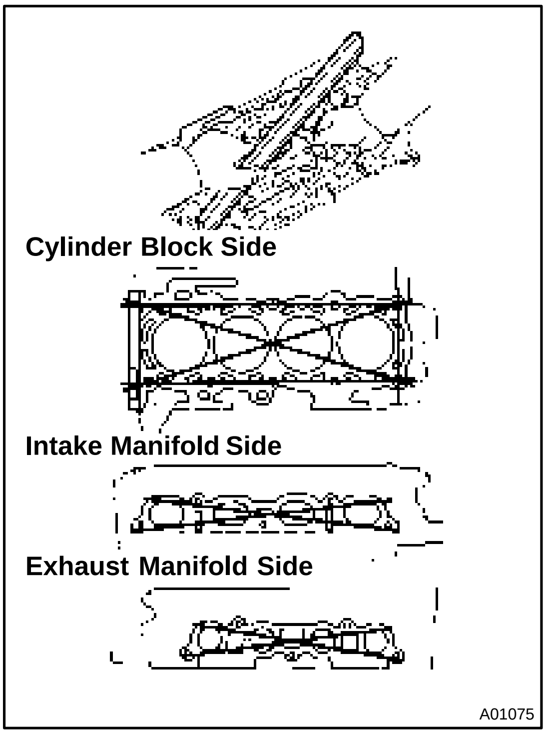
Be careful not to scratch the cylinder block contact surface.



(c) Using a soft brush and solvent, thoroughly clean the cylinder head.



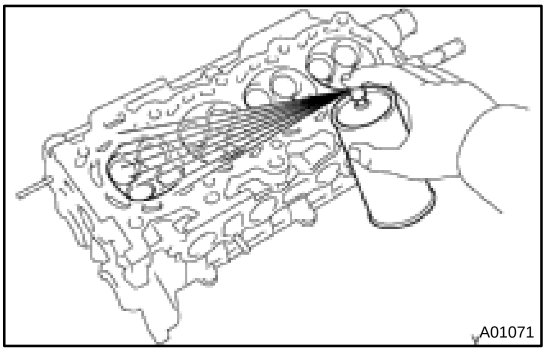
(d) Using a valve guide bushing brush and solvent, clean all the guide bushings.



4. INSPECT CYLINDER HEAD

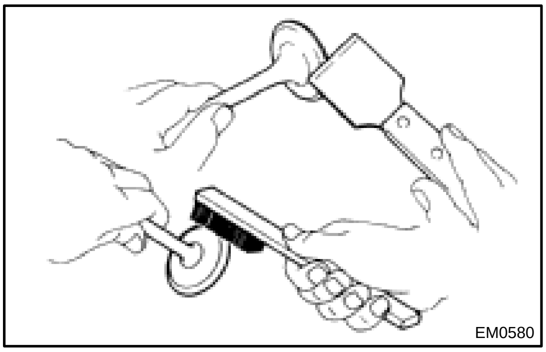
(a) Inspect for flatness.
Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.
Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder head.



(b) Inspect for cracks.
Using a dye penetrate, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

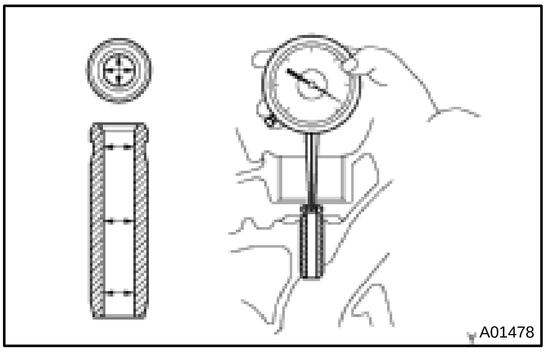
If cracked, replace the cylinder head.



5. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

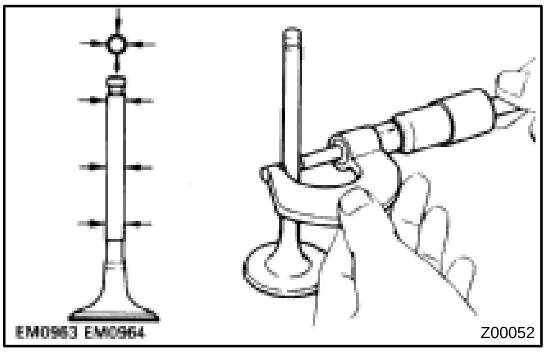


6. **INSPECT VALVE STEMS AND GUIDE BUSHINGS**

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

5.510 – 5.530 mm (0.2169 – 0.2177 in.)



(b) Using a micrometer, measure the diameter of valve stem.

Valve stem diameter:

Intake	5.470 – 5.485 mm (0.2154 – 0.2159 in.)
Exhaust	5.465 – 5.480 mm (0.2152 – 0.2157 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

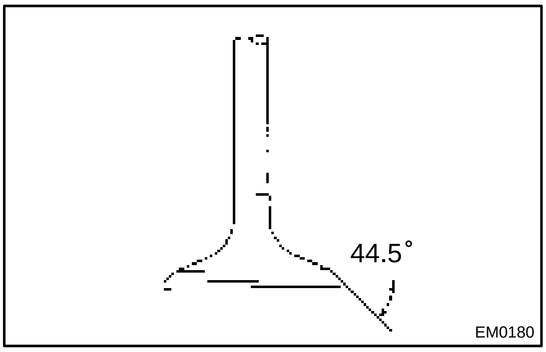
Standard oil clearance:

Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing (See page EM–42).



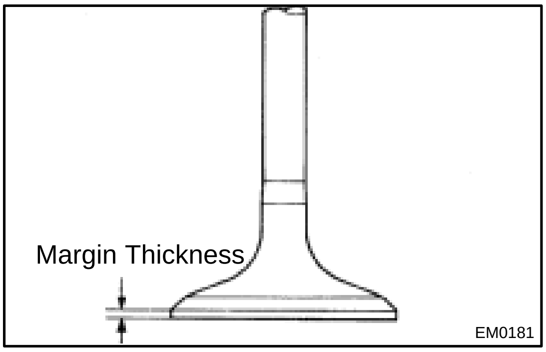
7. **INSPECT VALVES**

(a) Check the valve is ground to the correct valve face angle.

Valve face angle: 44.5°

(b) Check that the surface of the valve for wear.

If the valve face is worn, replace the valve.

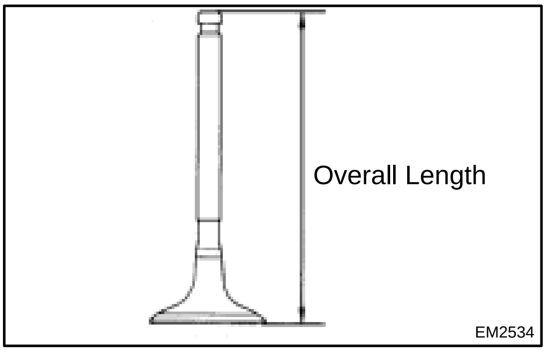


(c) Check the valve head margin thickness.

Margin thickness:

Standard	1.0 mm (0.039 in.)
Minimum	0.7 mm (0.028 in.)

If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

Standard overall length:

Intake	88.65 mm (3.4902 in.)
Exhaust	88.69 mm (3.4917 in.)

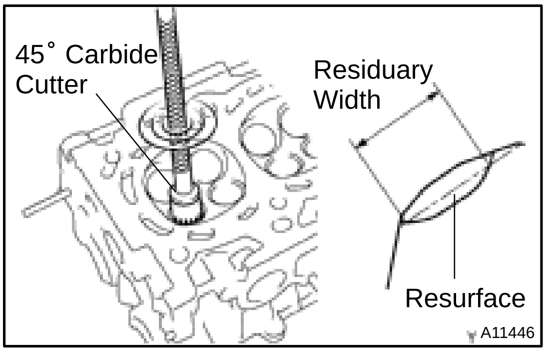
Minimum overall length:

Intake	88.35 mm (3.4783 in.)
Exhaust	88.39 mm (3.4799 in.)

If the overall length is less than minimum, replace the valve.

(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, replace the valve.



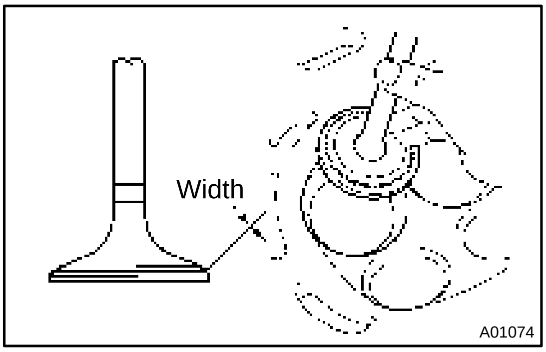
8. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

(b) After resurfacing the valve seat 45°, measure the residuary width of the valve seat 45°.

Minimum residuary width:

Intake	3.3 mm (0.130 in.)
Exhaust	3.2 mm (0.126 in.)



If the valve seat 45° residuary width is less than minimum, replace the cylinder head.

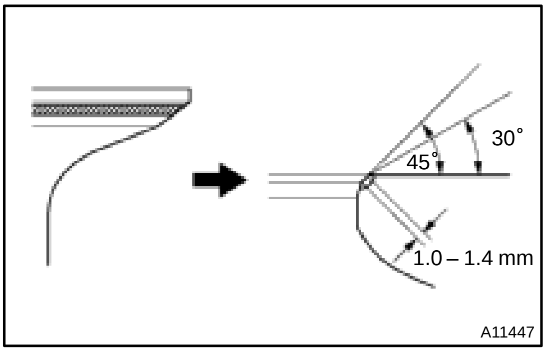
(c) Check the valve seating position.

Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

(d) Check the valve face and seat for the following:

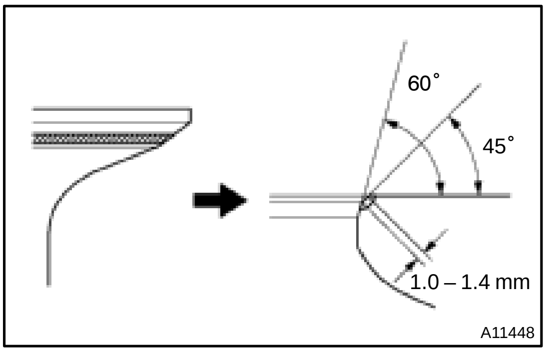
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.0 – 1.4 mm (0.039 – 0.055 in.)

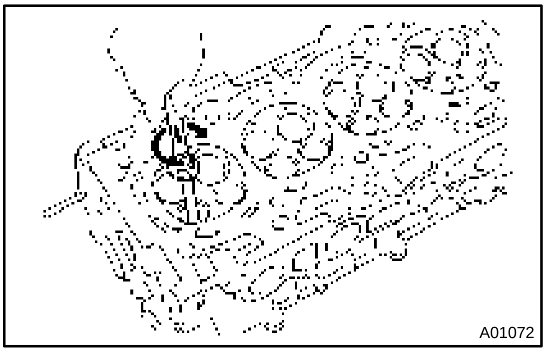


If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

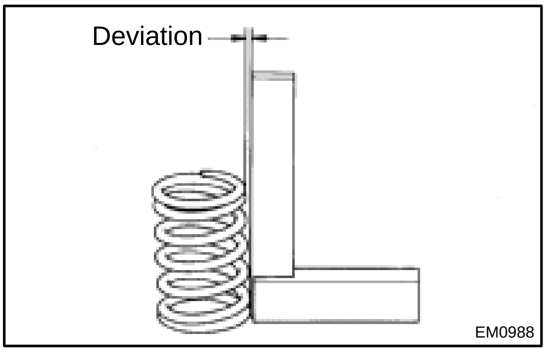


(2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(e) Hand–lap the valve and valve seat with an abrasive compound.

(f) After hand–lapping, clean the valve and valve seat.

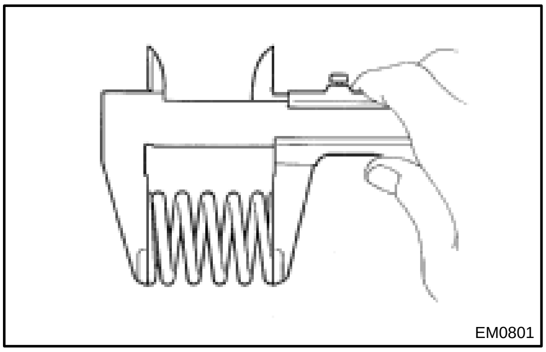


9. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation: 1.6 mm (0.063 in.)
Maximum angle (reference): 2°

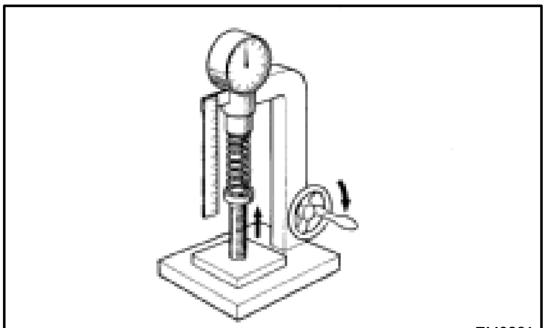
If the deviation is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.

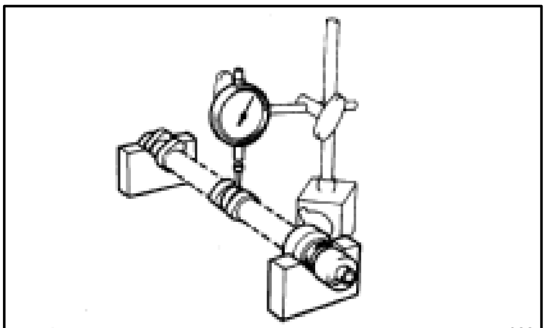
Free length: 43.40 mm (1.7087 in.)

If the free length is not as specified, replace the valve spring.


EM0281

(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
158.6 – 175.4 N (16.2 – 17.9 kgf, 35.7 – 39.5 lbf) at 33.6 mm (1.323 in.)
Maximum working tension:
335.3 – 370.7 N (34.2 – 37.8 kgf, 75.4 – 83.3 lbf) at 24.1 mm (0.949 in.)

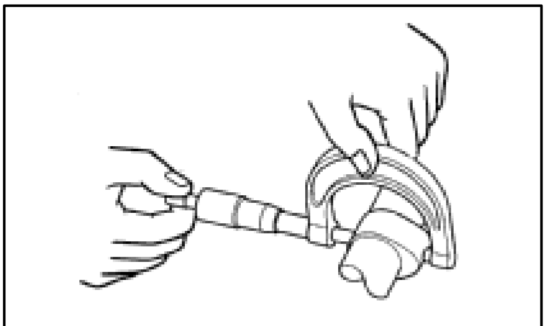
If the installed tension is not as specified, replace the valve spring.


EM1628

10. INSPECT CAMSHAFT

(a) Inspect for runout.
(1) Place the camshaft on V–blocks.
(2) Using a dial indicator, measure the circle runout at the center journal.
Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the camshaft.


EM2011

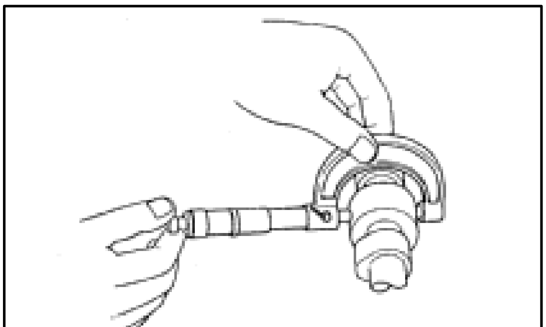
(b) Inspect the cam lobes.
Using a micrometer, measure the cam lobe height.
Standard cam lobe height:

Intake	44.578 – 44.678 mm (1.7550 – 1.7590 in.)
Exhaust	43.761 – 43.861 mm (1.7229 – 1.7268 in.)

Minimum cam lobe height:

Intake	44.43 mm (1.7492 in.)
Exhaust	43.61 mm (1.7169 in.)

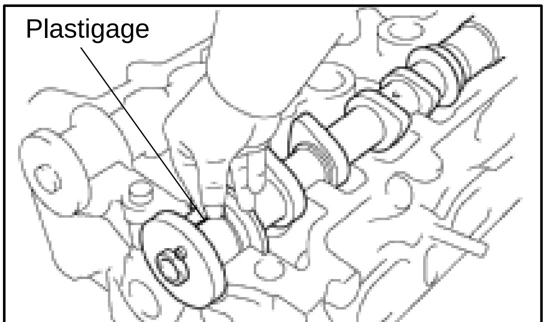
If the lobe height is less than minimum, replace the camshaft.


EM2538

(c) Inspect the camshaft journals.
Using a micrometer, measure the journal diameter.
Journal diameter:

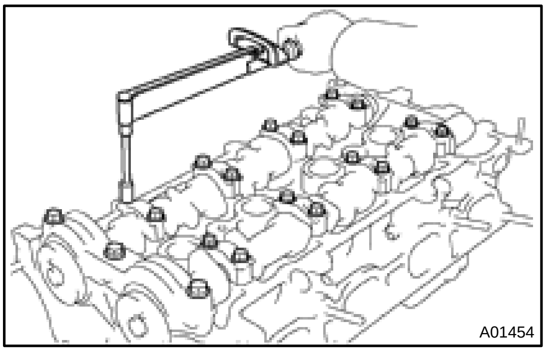
No.1	34.449 – 34.465 mm (1.3563 – 1.3569 in.)
Others	22.949 – 22.965 mm (0.9035 – 0.9041 in.)

If the journal diameter is not as specified, check the oil clearance.



A01452

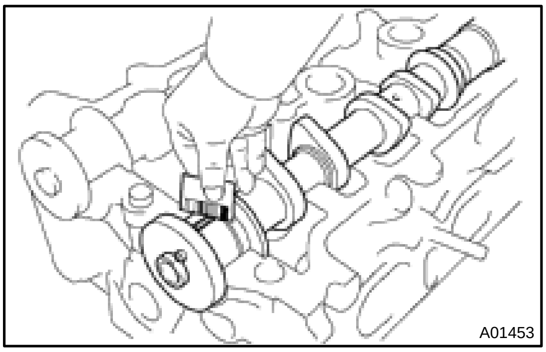
(d) Inspect the journal clearance.
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head.
(3) Lay a strip of Plastigage across each of the camshaft journal.



(4) Install the bearing caps (See page EM–46).
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) for No. 1
13 N·m (133 kgf·cm, 10 ft·lbf) for No. 3

NOTICE:
Do not turn the camshaft.

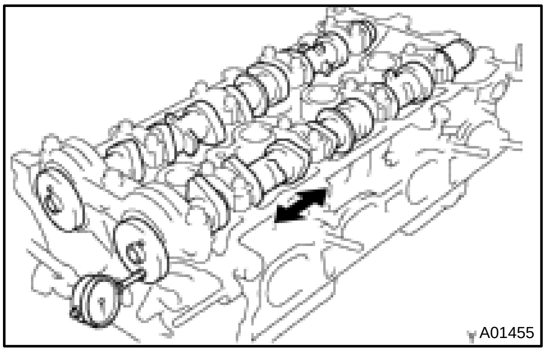
(5) Remove the bearing caps.



(6) Measure the Plastigage at its widest point.
Standard oil clearance:
0.035 – 0.072 mm (0.0014 – 0.0028 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

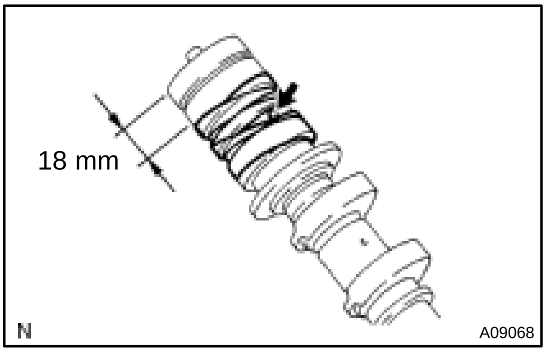
(7) Remove the Plastigage completely.
(8) Remove the camshafts.



(e) Inspect the thrust clearance.
(1) Install the camshafts (See page EM–46).
(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.040 – 0.095 mm (0.0016 – 0.0037 in.)
Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(3) Remove the camshaft.



11. INSPECT VVT TIMING SPROCKET (VALVE TIMING CONTROLLER ASSEMBLY)

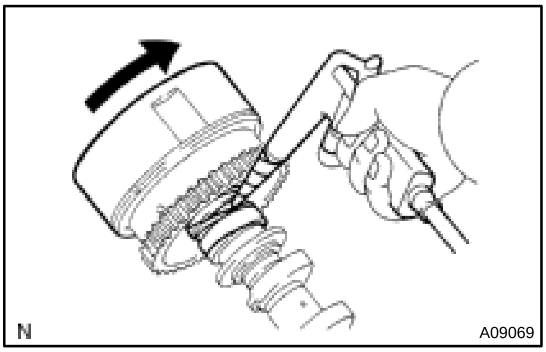
(a) Apply vinyl tape to all the ports except the one indicated by the arrow in the illustration.

NOTICE:
Do not apply tape in the range from the tip of the camshaft to 18 mm (0.71 in.) from that tip.

(b) Install the VVT timing sprocket.
Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)

NOTICE:
Do not push VVT timing sprocket to the camshaft forcibly when installing it.

(c) Check that the VVT timing sprocket will not turn.



(d) Wind tape around the tip of the air gun and apply air of approx. 100 kPa (1 kgf/cm^2, 14 psi) to the port of the camshaft.

NOTICE:
When the oil splashes, wipe it off with a shop rag and the likes.

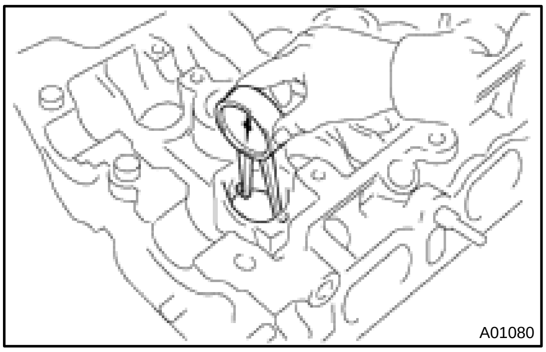
HINT:
Perform this in order to release the lock pin for the maximum delay angle locking.

(e) Under the condition of (d), turn the VVT timing sprocket to the advance angel side (the arrow marked direction in the illustration) with your hand.
Standard: Must turn

HINT:
Depending on the air pressure, the VVT timing sprocket will turn to the advance angle side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.

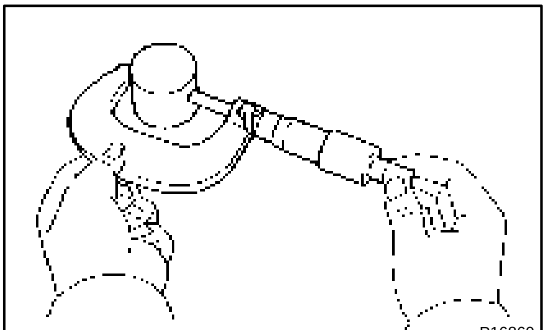
(f) Except the position where the lock pin meets at the maximum delay angle, let the VVT timing sprocket turn back and forth and check the movable range and that there is no disturbance.
Standard: Movable smoothly in the range about 30°

(g) Turn the VVT timing sprocket with your hand and lock it at the maximum delay angel position.



12. INSPECT VALVE LIFTERS AND LIFTER BORES

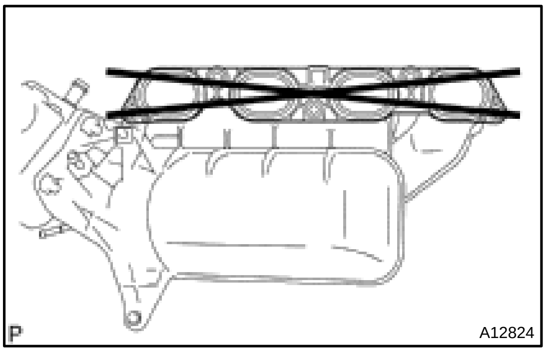
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.025 mm (1.2205 – 1.2215 in.)


P16860

(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.059 mm (0.0009 – 0.0023 in.)
Maximum oil clearance: 0.079 mm (0.0031 in.)

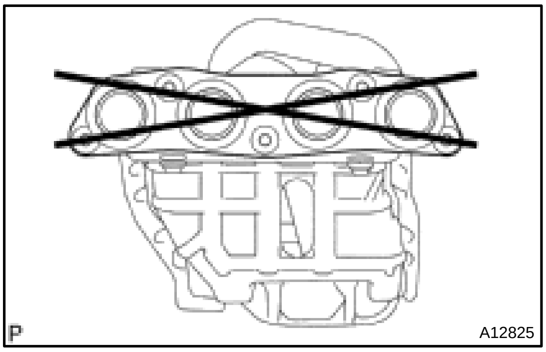
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.


P A12824

13. INSPECT INTAKE MANIFOLD

Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.10 mm (0.0039 in.)

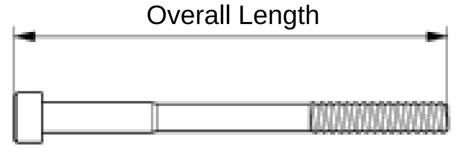
If warpage is greater than maximum, replace the intake manifold.


P A12825

14. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.70 mm (0.0276 in.)

If warpage is greater than maximum, replace the exhaust manifold.



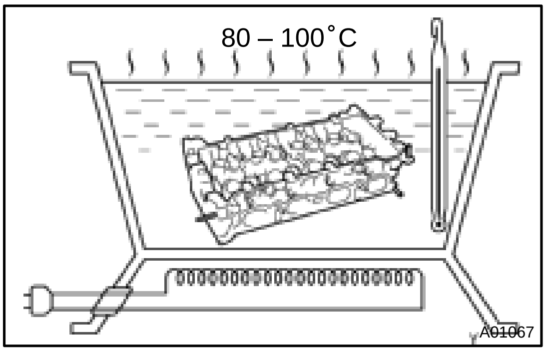
Y A11779

15. INSPECT CYLINDER HEAD BOLTS
Standard overall length:
156.0 – 159.0 mm (6.142 – 6.260 in.)
Maximum overall length: 159.5 mm (6.280 in.)

If the overall length is greater than maximum, replace the bolt.

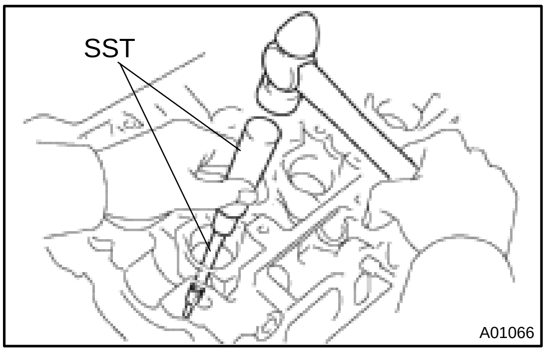
EM05X–06

REPLACEMENT

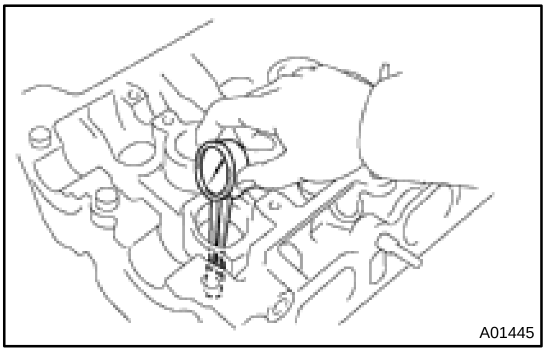


REPLACE VALVE GUIDE BUSHINGS

(a) Gradually heat the cylinder head to 80 – 100˚C (176 – 212˚F).



(b) Using SST and a hammer, tap out the guide bushing.
SST 09201–01055, 09950–70010 (09951–07100)

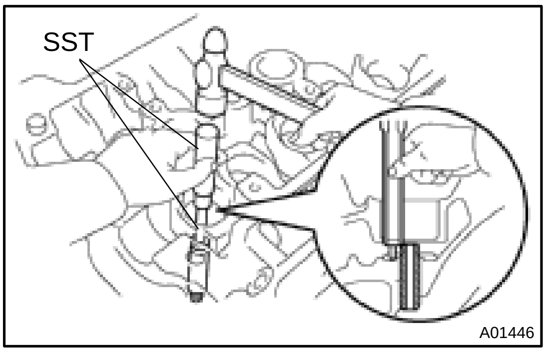


(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

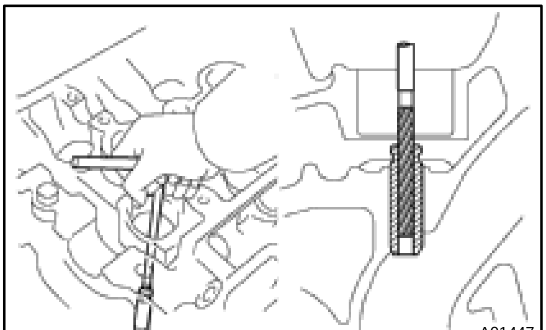
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.285 – 10.306 (0.4049 – 0.4057)	Use STD
10.335 – 10.356 (0.4068 – 0.4077)	Use O/S 0.05

(d) Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bushing bore to the following dimension:
10.335 – 10.356 mm (0.4068 – 0.4077 in.)
If the bushing bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.
(e) Gradually heat the cylinder head to 80 – 100˚C (176 – 212˚F).



(f) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201–01055, 09950–70010 (09951–07100)
Protrusion height: 8.7 – 9.1 mm (0.342 – 0.358 in.)

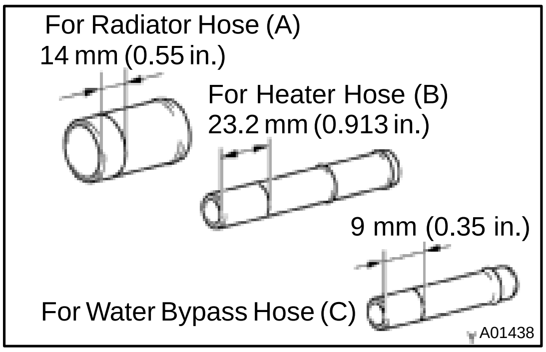

A01447

(g) Using a sharp 5.5 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–33) between the guide bushing and valve stem.

EM19K–01

REASSEMBLY

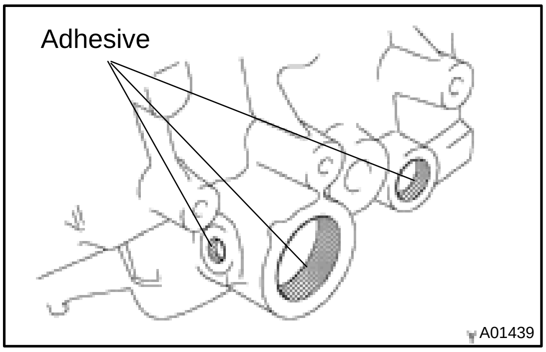
HINT:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace oil seals with new ones.



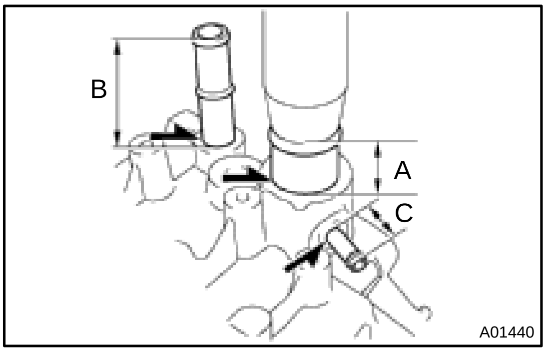
1. INSTALL WATER HOSE UNIONS

HINT:
When using a new cylinder head, water hose unions must be installed.

(a) Mark the standard position away from the edge, onto the water hose union.

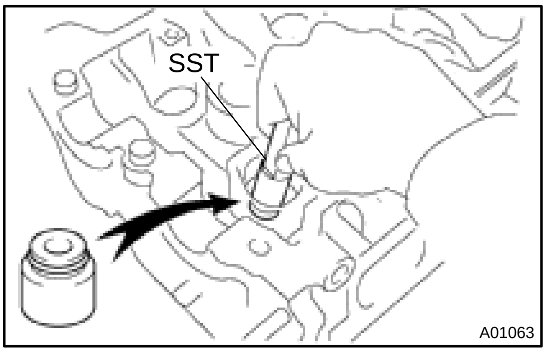


(b) Apply adhesive to the water hose union hole of the cylinder head.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent



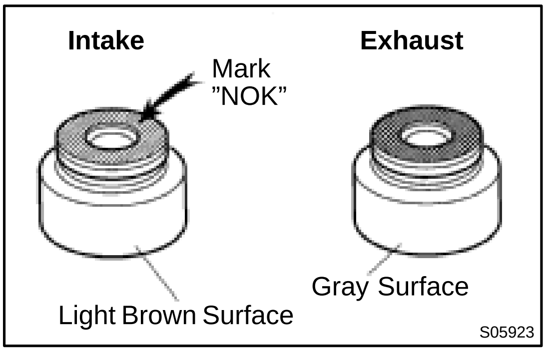
(c) Using a press, press in a new water hose union until it is protruding from the cylinder head.
Standard protrusion:
29 mm (1.14 in.) for A
66.5 mm (2.618 in.) for B
24 mm (0.95 in.) for C

NOTICE:
Avoid pressing a new water hose union in too far by measuring the amount of protrusion while pressing.



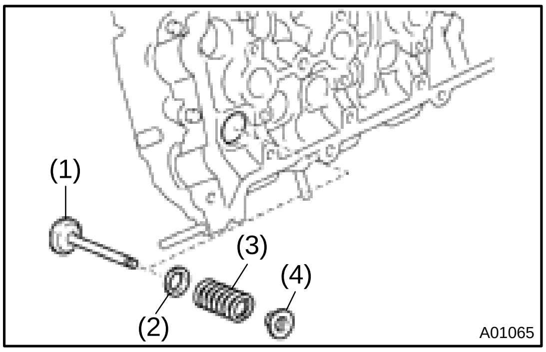
2. INSTALL VALVES

(a) Using SST, push in a new oil seal.
SST 09201–41020

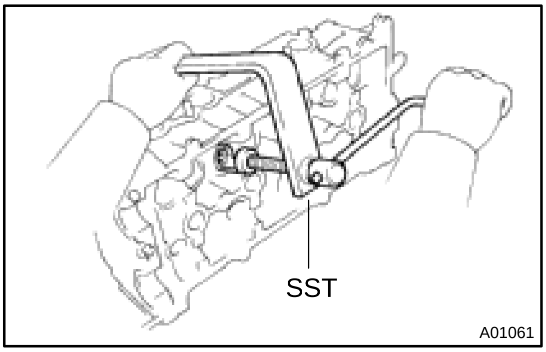


HINT:
The intake valve oil seal is light brown and the exhaust valve oil seal is gray.

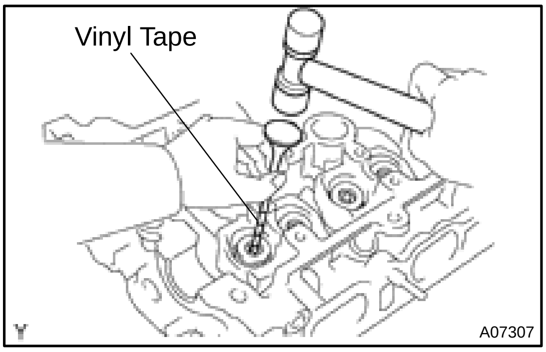
NOTICE:
Pay much attention to assemble the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.



(b) Install the valve (1), spring (2), valve spring (3) and spring retainer (4).



(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (092002–00010)



(d) Using a plastic–faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:
Be careful not to damage the valve stem tip.

3. INSTALL VALVE LIFTERS

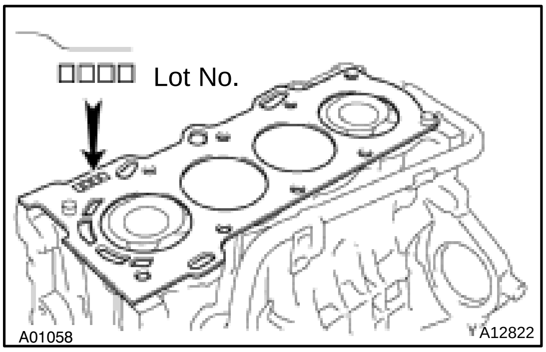
(a) Install the valve lifter.
(b) Check that the valve lifter rotates smoothly by hand.

EM19L–02

INSTALLATION

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



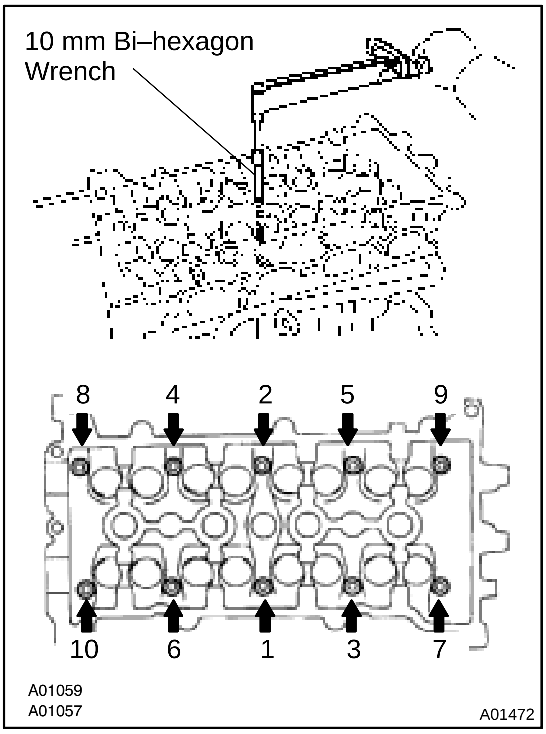
1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

(a) Place a new cylinder head gasket on the cylinder block surface with the lot No. upward.

NOTICE:

Be careful of the installation direction.

(b) Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.



2. INSTALL CYLINDER HEAD BOLTS

HINT:

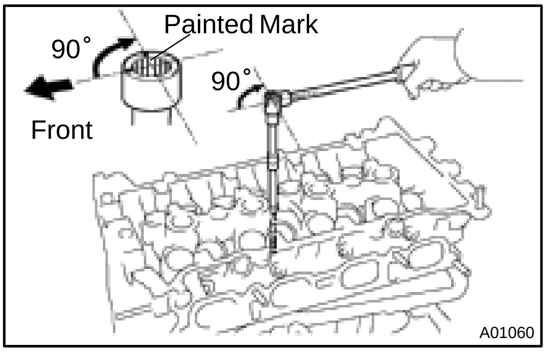
- The cylinder head bolts are tightened in 2 steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using a 10 mm bi–hexagon wrench, install and uniformly tighten the 10 cylinder head bolts and plate washers in several passes, in the sequence shown.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

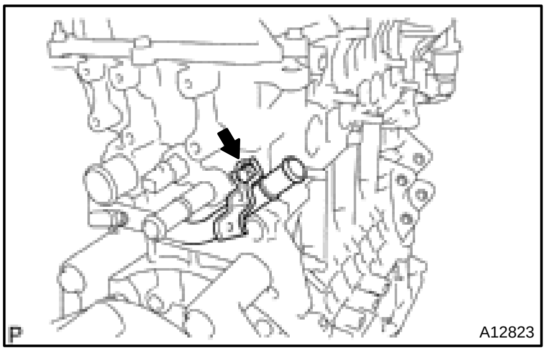
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



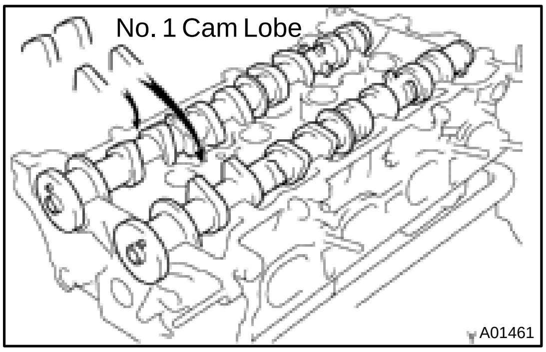
(c) Mark the front of the cylinder head bolt with paint.

(d) Retighten the cylinder head bolts 90° in the numerical order shown.

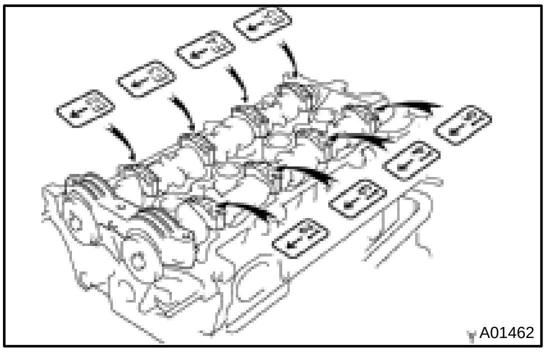
(e) Check that the painted mark is not at a 90° angle to the front.



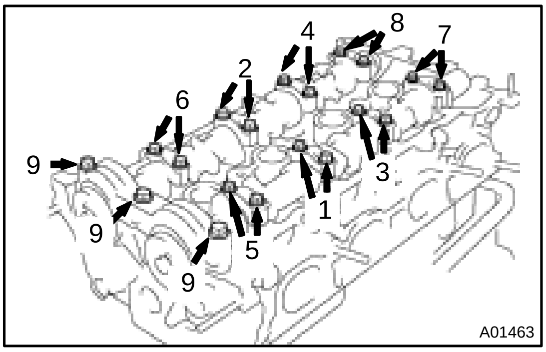
(f) Install the bolt holding the water bypass pipe to the cylinder head.
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)
(g) Connect the upper radiator hose to the water hose union.
(h) Connect the heater hose to the water hose union.



3. INSTALL CAMSHAFTS
(a) Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing as shown the illustration.



(b) Install the bearing caps in their proper locations.
HINT:
No. 3 camshaft bearing cap has a number and front mark.
(c) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



(d) Install and uniformly tighten the 19 bearing cap bolts. After tightening the No. 1 camshaft bearing cap, tighten them in several passes, in the sequence shown.
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) for No. 1
13 N·m (133 kgf·cm, 10 ft·lbf) for No. 3

4. CHECK AND ADJUST VALVE CLEARANCE (See page EM–4)

5. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE (See page SF–42)

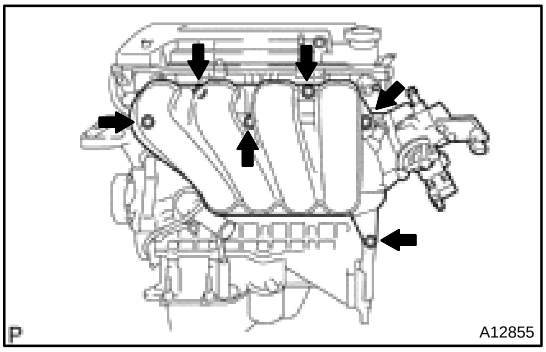
6. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE FILTER (See page SF–42)

7. INSTALL CAMSHAFT TIMING SPROCKET AND VVT TIMING SPROCKET (See page EM–20)

8. INSTALL TIMING CHAIN (See page EM–20)

9. INSTALL CAMSHAFT POSITION SENSOR (See page IG–5)

10. INSTALL OIL FILLER CAP



11. INSTALL INTAKE MANIFOLD AND THROTTLE BODY ASSEMBLY

(a) Install a new gasket to the intake manifold.

(b) Install the intake manifold and throttle body assembly with the 2 brackets, 4 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

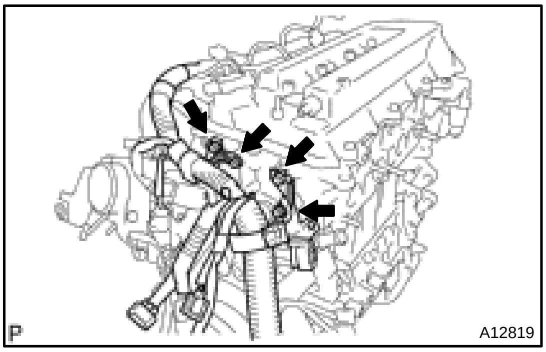
(c) Connect the 2 vacuum hoses to the intake manifold.

(d) Connect the 2 water hoses to the throttle body.

12. INSTALL PCV VALVE AND HOSES

(a) Install the PCV valve with the grommet.

(b) Install the PCV hoses.



13. CONNECT ENGINE WIRE

(a) Install the engine wire with the 2 bolts.

(b) Install the 2 ground straps with the 2 bolts.

(c) Connect the noise filter.

(d) Connect the throttle position sensor connector.

(e) Connect the IAC valve connector.

(f) Connect the ECT sensor connector.

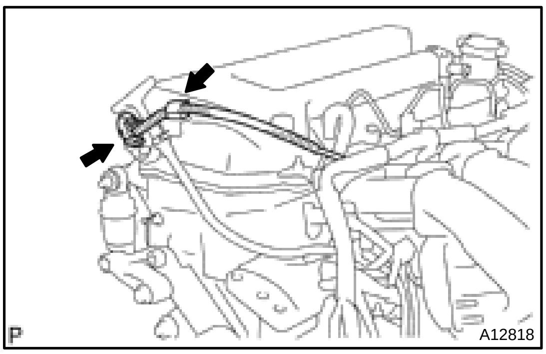
(g) Connect the camshaft position sensor connector.

(h) Connect the oil pressure switch connector and wire.

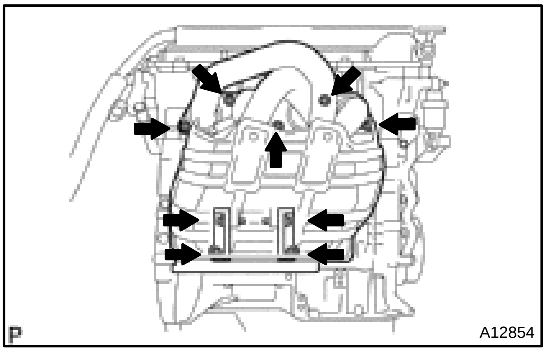
(i) Connect the knock sensor connector.

(j) Connect the crankshaft position sensor connector.

(k) Connect the camshaft timing oil contorl valve connector.



(l) Connect the heated oxygen sensor (bank 1 sensor 1) wire to the wire bracket.



14. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with the 5 nuts.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

(b) Install the 2 exhaust manifold stays with the 4 bolts.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

(c) Place the upper heat insulator on the exhaust manifold.

(d) Install the 2 heated oxygen sensors (bank 1 sensor 1, bank 2 sensor 1).

Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)

(e) Install the upper heat insulator with the 4 bolts.

(f) Connect the 2 heated oxygen sensors.

15. INSTALL INJECTORS (See page SF–27)

16. INSTALL SPARK PLUGS (See page IG–1)

17. INSTALL IGNITION COILS (See page IG–4)

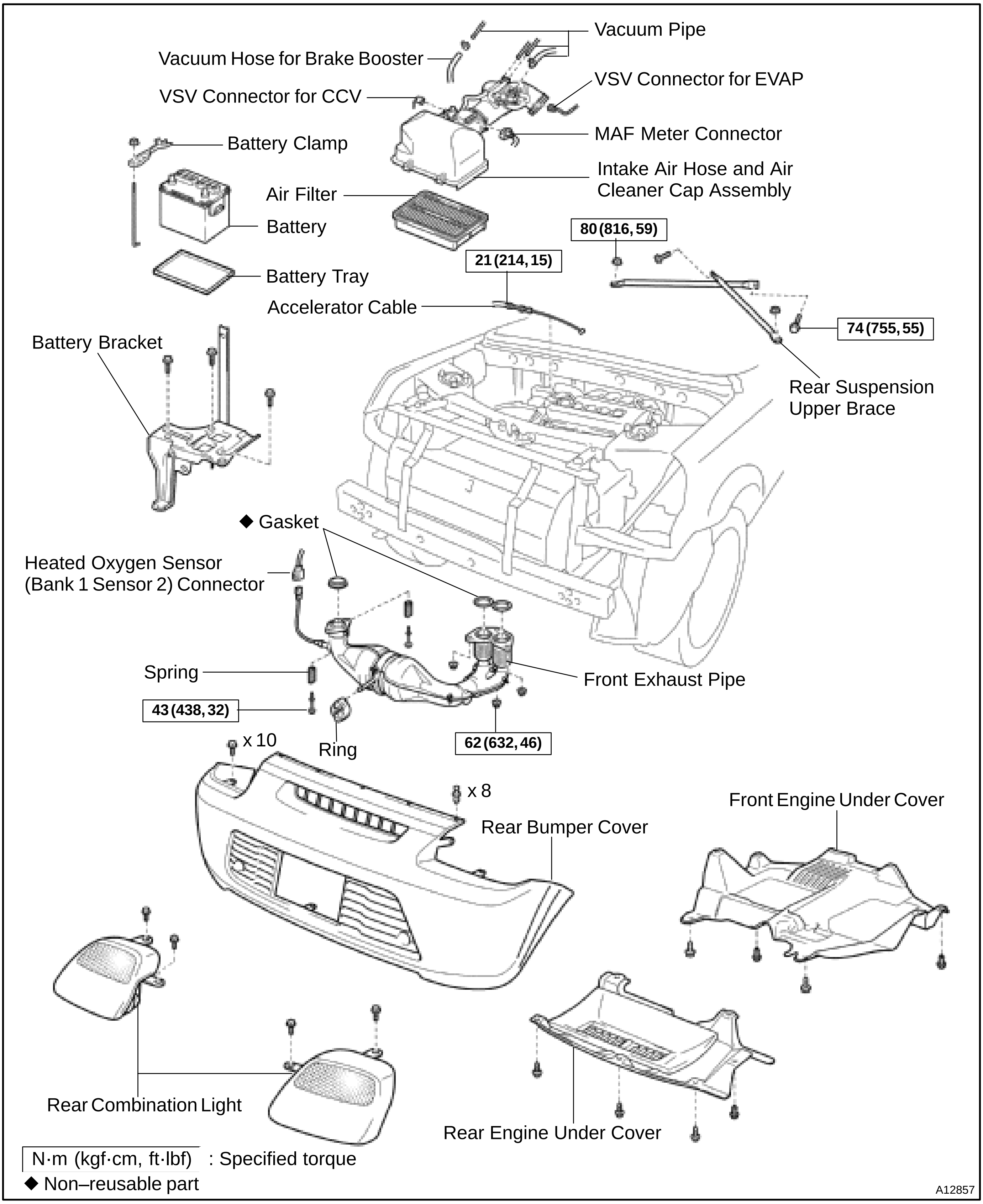
18. INSTALL GENERATOR (See page CH–17)

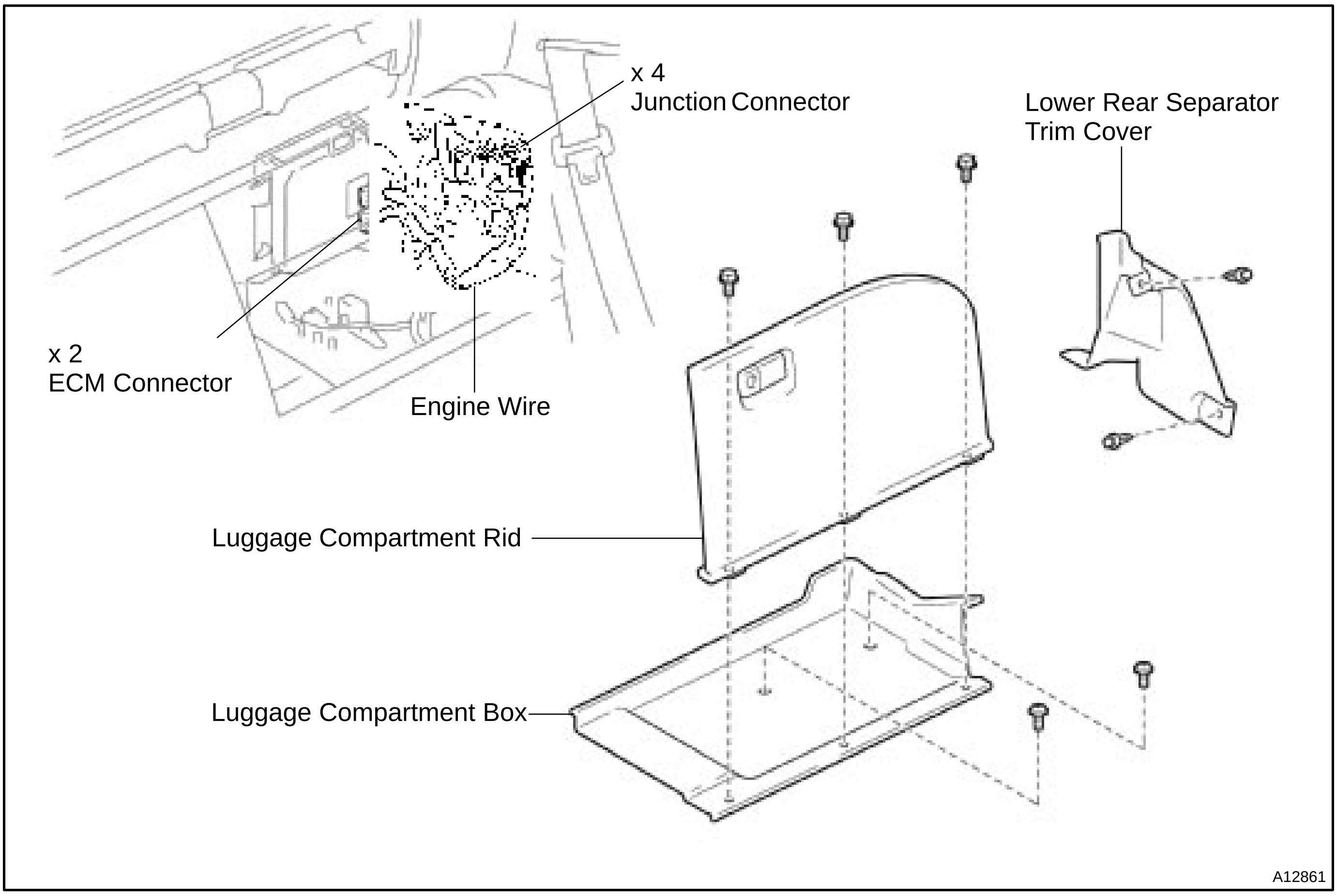
19. INSTALL ENGINE UNIT (See page EM–59)

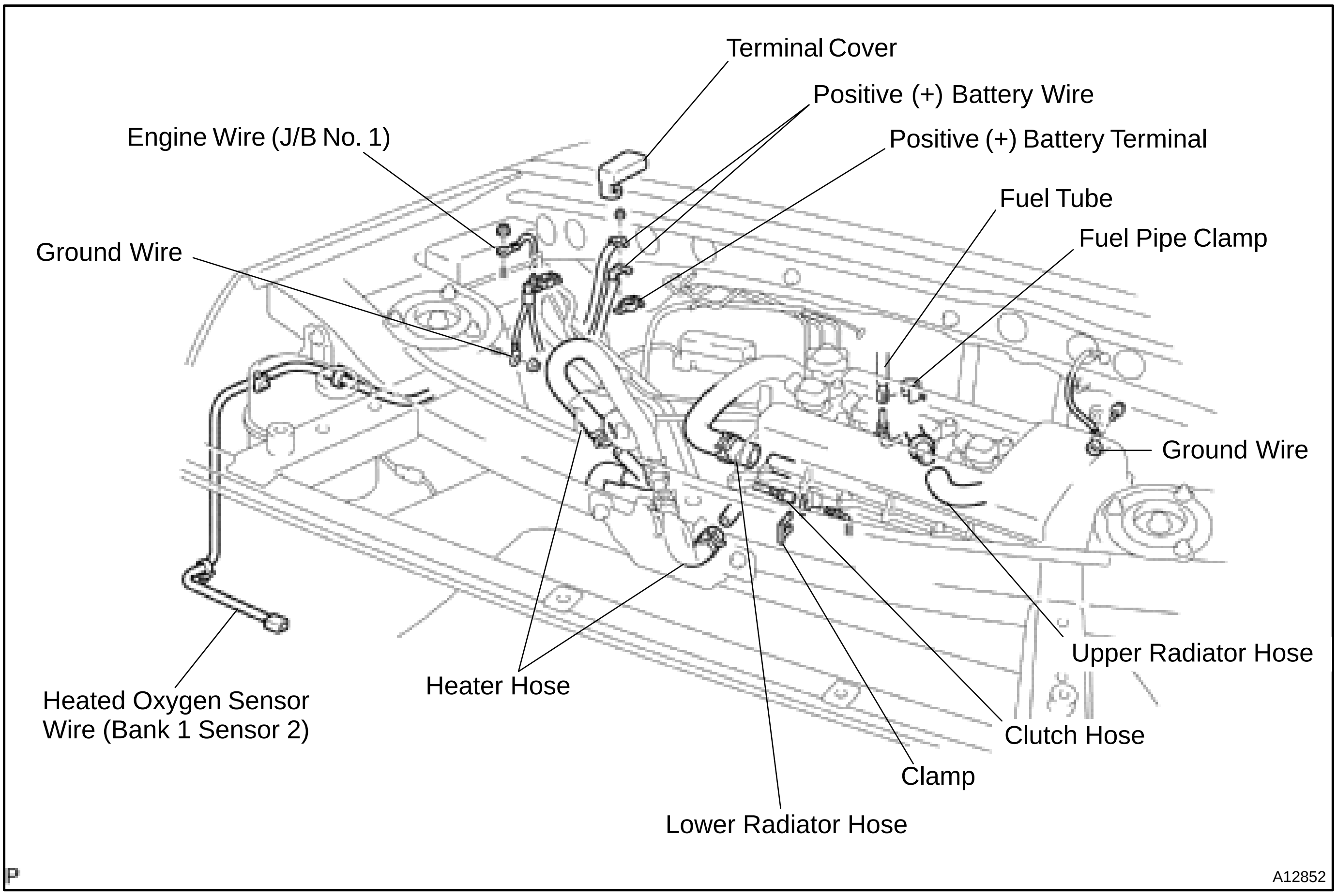
ENGINE UNIT

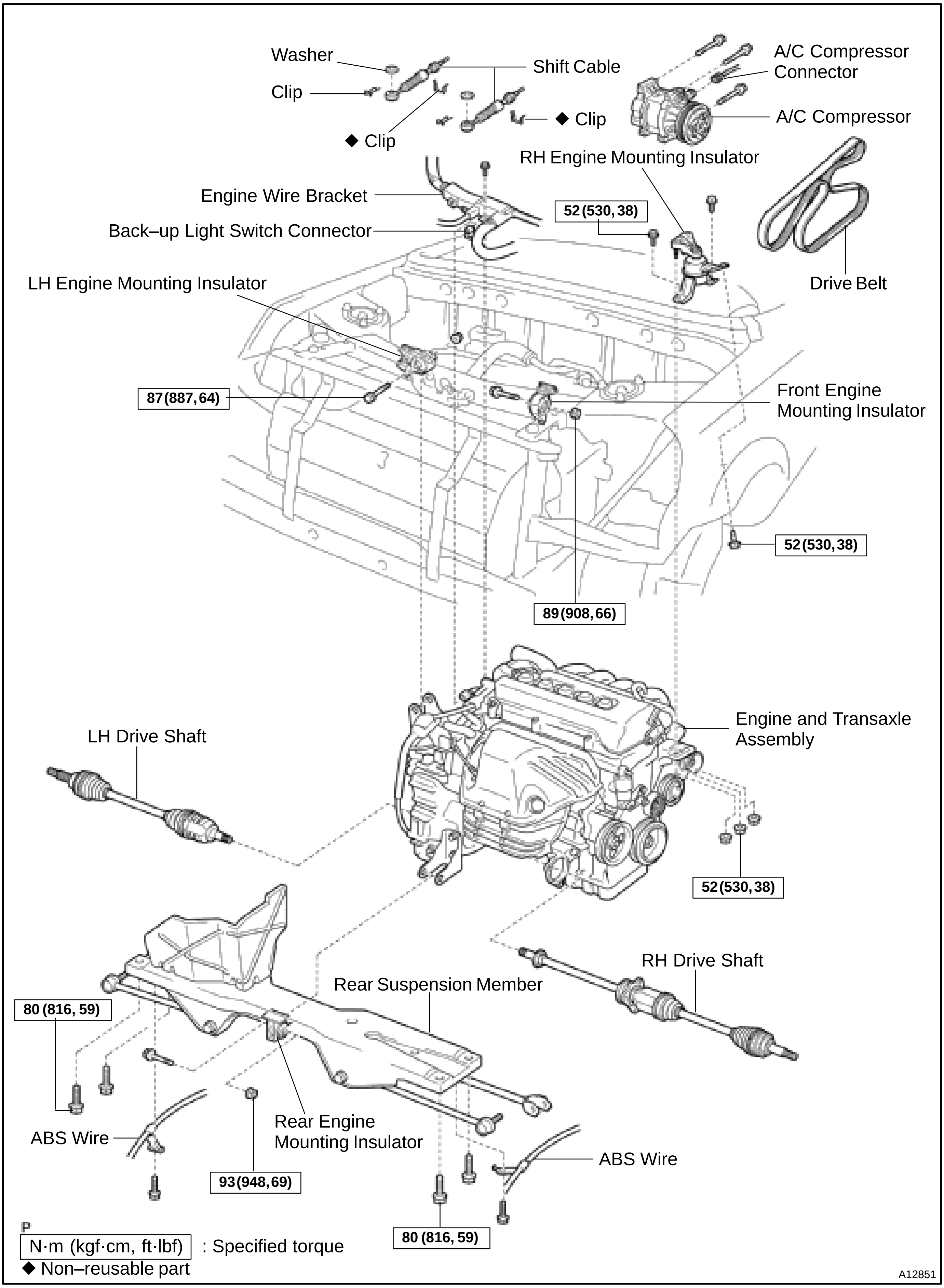
COMPONENTS

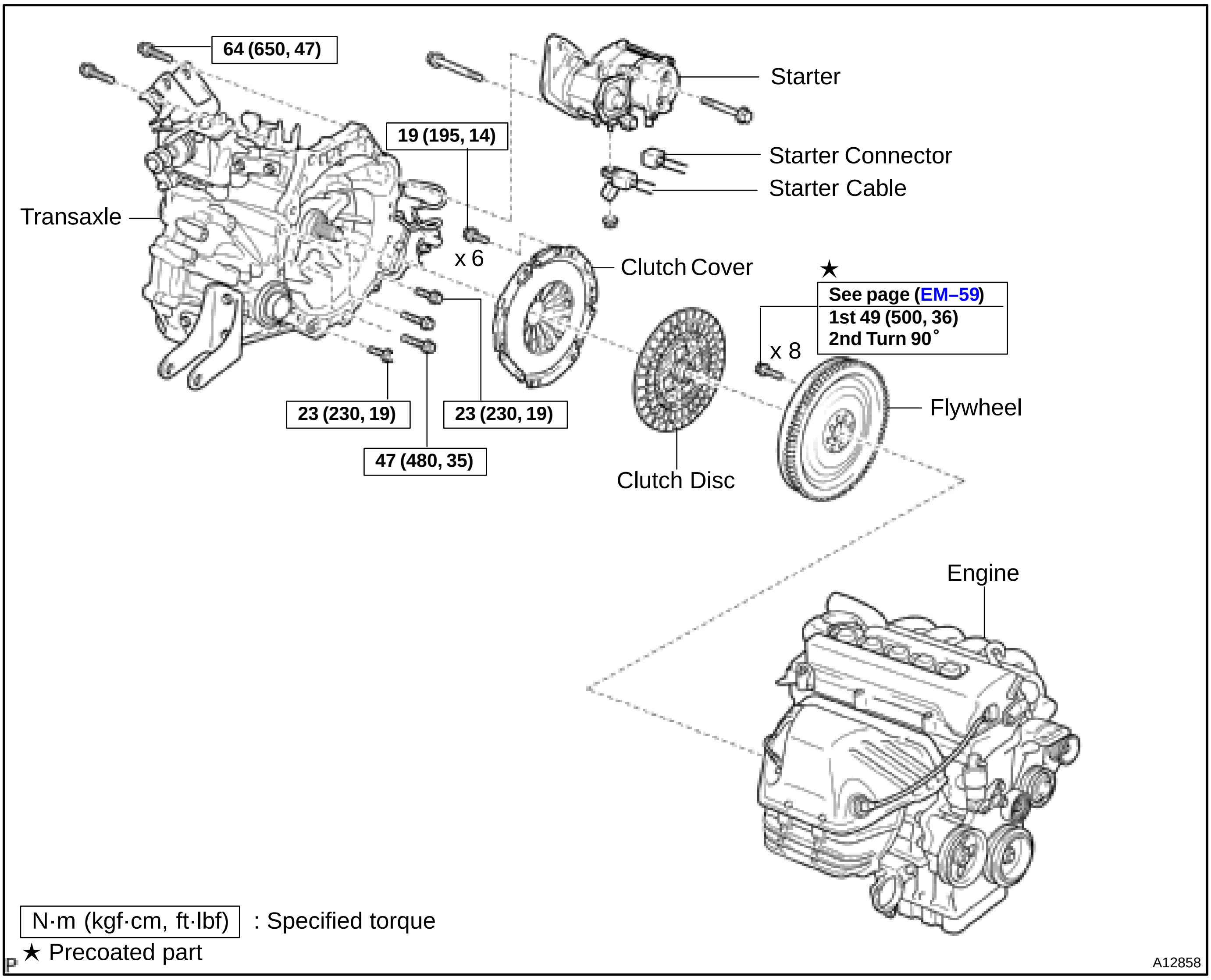
EM19M–01




x 4
Junction Connector
Lower Rear Separator
Trim Cover
x 2
ECM Connector
Engine Wire
Luggage Compartment Rid
Luggage Compartment Box
A12861


Terminal Cover
Positive (+) Battery Wire
Engine Wire (J/B No. 1)
Positive (+) Battery Terminal
Fuel Tube
Fuel Pipe Clamp
Ground Wire
Ground Wire
Upper Radiator Hose
Heated Oxygen Sensor
Wire (Bank 1 Sensor 2)
Heater Hose
Clutch Hose
Clamp
Lower Radiator Hose
P
A12852

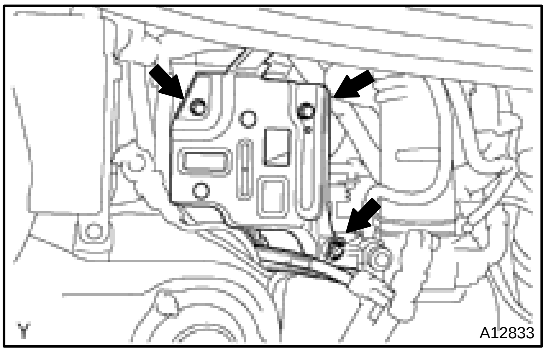

Washer
Shift Cable
A/C Compressor Connector
Clip
◆ Clip
A/C Compressor
◆ Clip
RH Engine Mounting Insulator
Engine Wire Bracket
52 (530, 38)
Back–up Light Switch Connector
LH Engine Mounting Insulator
Drive Belt
87 (887, 64)
Front Engine Mounting Insulator
52 (530, 38)
89 (908, 66)
LH Drive Shaft
Engine and Transaxle Assembly
52 (530, 38)
RH Drive Shaft
Rear Suspension Member
80 (816, 59)
ABS Wire
Rear Engine Mounting Insulator
ABS Wire
93 (948, 69)
80 (816, 59)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A12851


64 (650, 47)
Starter
19 (195, 14)
Starter Connector
Starter Cable
Transaxle
x 6
Clutch Cover
★
See page (EM–59)
1st 49 (500, 36)
2nd Turn 90°
x 8
Flywheel
23 (230, 19)
23 (230, 19)
47 (480, 35)
Clutch Disc
Engine
N·m (kgf·cm, ft·lbf) : Specified torque
★ Precoated part
A12858

EM19N–02

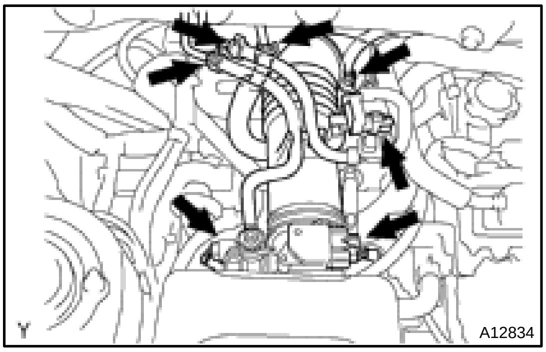
REMOVAL

1. REMOVE ENGINE HOOD
2. REMOVE REAR SUSPENSION UPPER BRACE
3. REMOVE ENGINE UNDER COVERS
4. DRAIN ENGINE COOLANT
5. DRAIN ENGINE OIL
6. DRAIN TRANSAXLE OIL



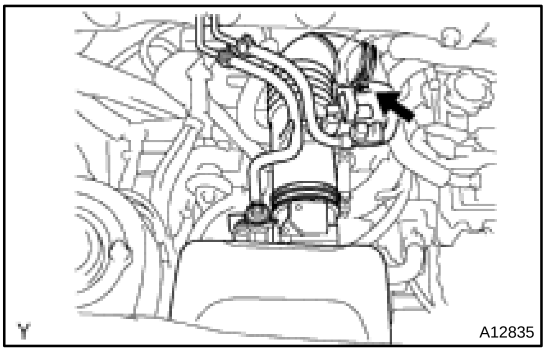
7. **REMOVE BATTERY BRACKET**

(a) Remove the battery and tray.
(b) Disconnect the battery wire from the battery bracket.
(c) Remove the 3 bolts and battery bracket.



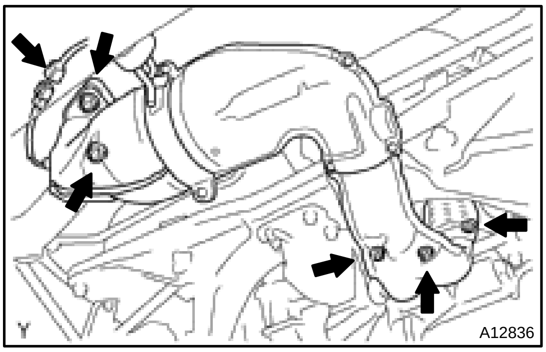
8. **REMOVE INTAKE AIR HOSE AND AIR CLEANER CAP ASSEMBLY**

(a) Disconnect the MAF meter connector, VSV connector for EVAP and VSV connector for CCV.
(b) Disconnect the 4 vacuum hoses.
(c) Disconnect the 2 clamps and air cleaner cap.



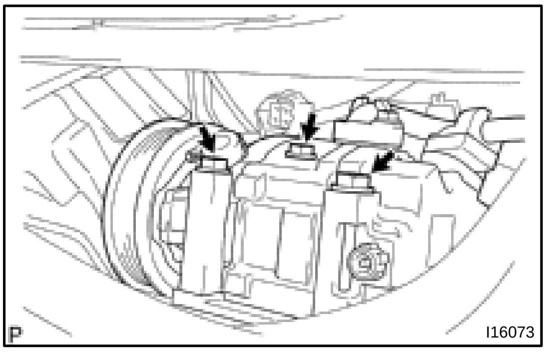
(d) Loosen the hose clamp, and remove the intake air hose and air cleaner cap assembly from the throttle body.
(e) Remove the air filter.

9. **DISCONNECT ACCELERATOR CABLE**
10. **REMOVE REAR BUMPER COVER (See page EM–50)**



11. **REMOVE FRONT EXHAUST PIPE**

(a) Disconnect the heated oxygen sensor (bank 1 sensor 2) connector.
(b) Remove the 2 bolts, 2 springs and 3 nuts.
(c) Disconnect the ring, and remove the front exhaust pipe and 3 gaskets.

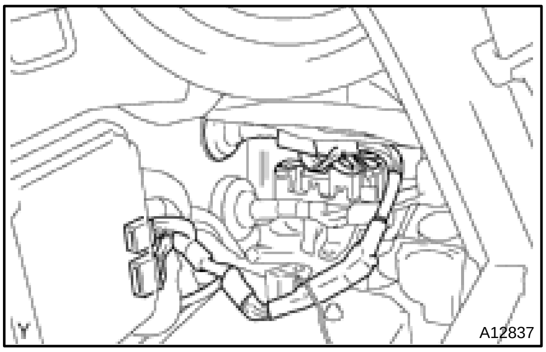


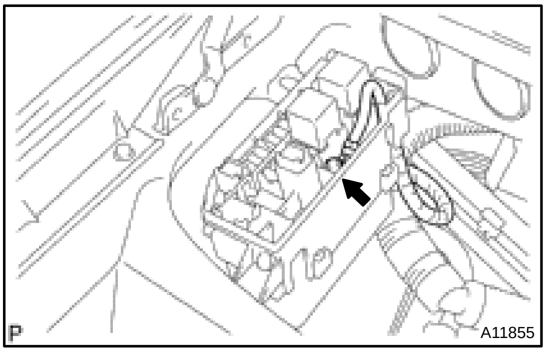
12. DISCONNECT A/C COMPRESSOR

(a) Remove the drive belt (See page CH–7).
(b) Disconnect the A/C compressor connector.
(c) Remove the 3 bolts, and disconnect the A/C compressor.
(d) Suspend the A/C compressor securely.

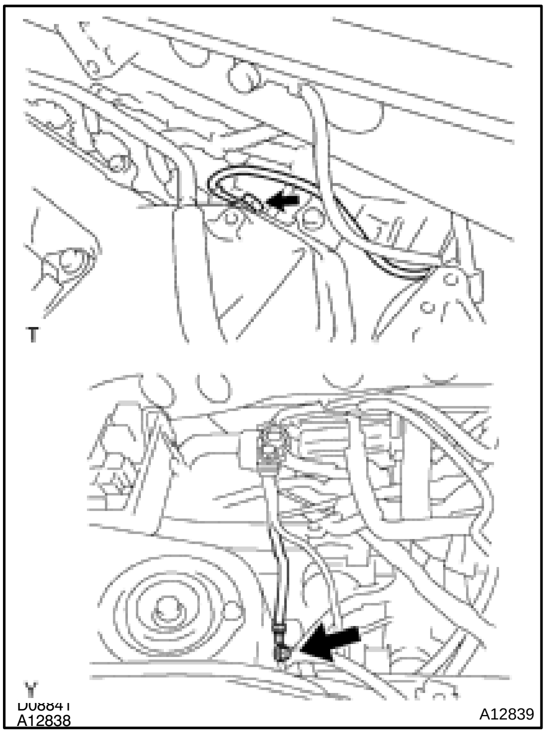
13. DISCONNECT ENGINE WIRE

(a) Disconnect the engine wire from the luggage compartment.
  (1) Remove the luggage compartment box (See page EM–50).
  (2) Disconnect the 2 ECM connectors.
  (3) Disconnect the 4 junction connectors.
  (4) Disconnect the grommet, and pull out the engine wire.

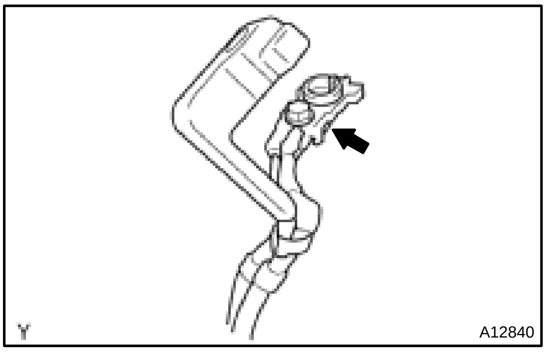




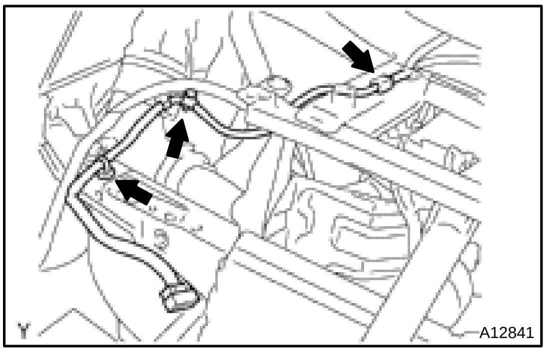
(b) Disconnect the engine wire from the J/B No. 1.
  (1) Remove the relay box cover.
  (2) Remove the nut, and disconnect the engine wire.



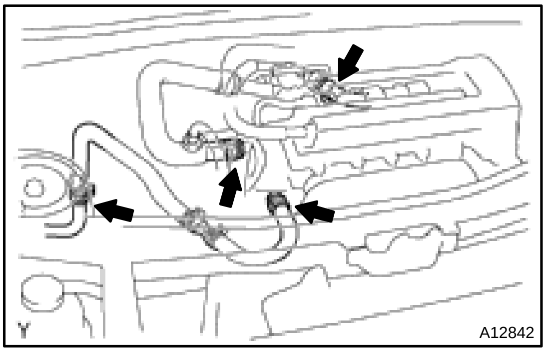
(c) Remove the 2 bolts, and disconnect the 2 ground wires.


A12840

(d) Separate the positive (+) battery wires.
(1) Remove the terminal cover.
(2) Remove the nut and terminal, and separate the battery wires.
(3) Disconnect the battery wire from the vehicle.

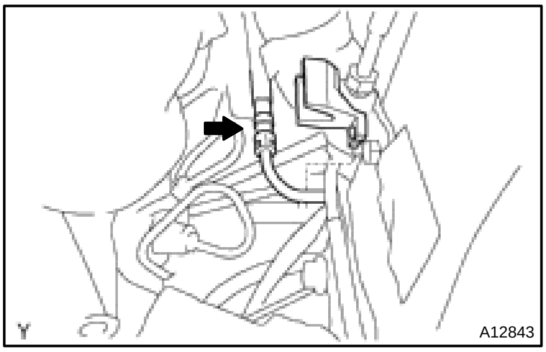

A12841

(e) Disconnect the 3 wire brackets and heated oxygen sensor (bank 1 sensor 2) wire from the vehicle.


A12842

14. DISCONNECT WATER HOSES

Disconnect the 2 radiator hoses and 2 heater hoses.


A12843

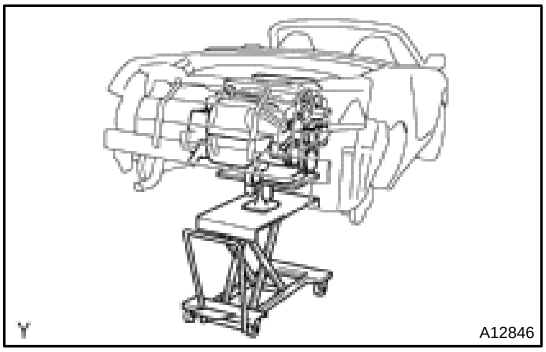
15. DISCONNECT FUEL TUBE

Remove the fuel pipe clamp, and disconnect the fuel tube from the fuel pipe.

16. DISCONNECT CLUTCH HOSE (See page CL–10)

17. DISCONNECT TRANSAXLE CONTROL CABLES (See page CL–15)

18. REMOVE DRIVE SHAFTS (See page SA–41)

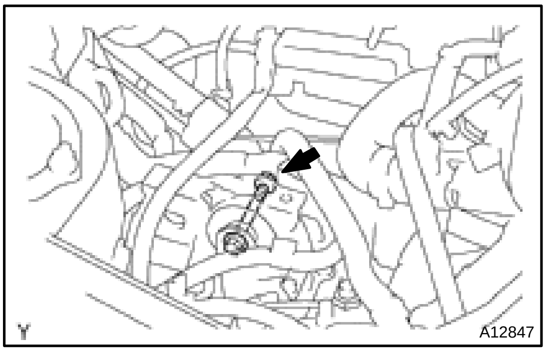

A12846

19. SET ENGINE JACK

Remove the 2 clips, 2 nuts and No. 2 cylinder head cover, and set a engine jack.

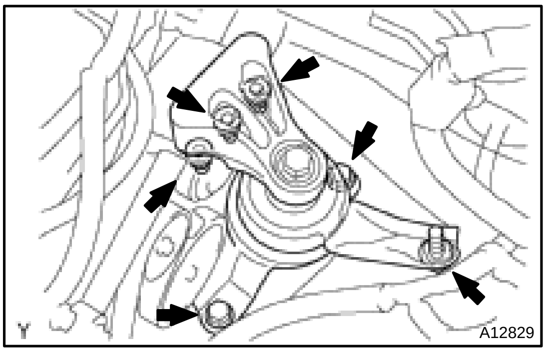
NOTICE:

Using chain, hold the engine tightly.

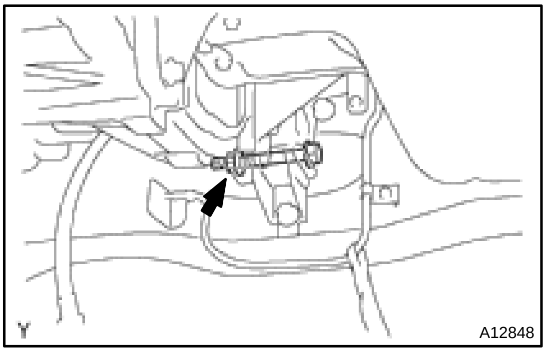


20. DISCONNECT ENGINE MOUNTING

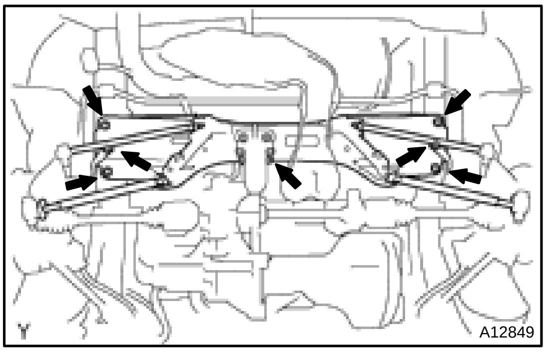
(a) Remove the through bolt and nut holding the LH engine mounting insulator to the mounting bracket.



(b) Remove the 3 bolts, 3 nuts and RH engine mounting insulator.



(c) Remove the through bolt and nut holding the front engine mounting insulator to the mounting bracket.

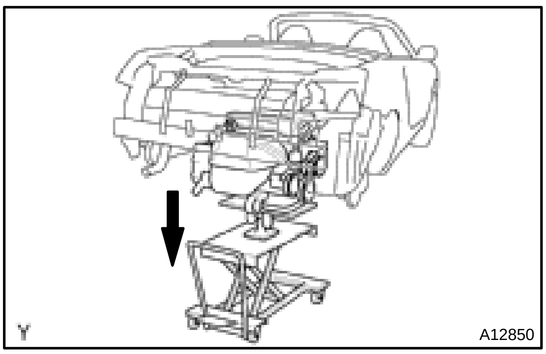


21. REMOVE SUSPENSION MEMBER

(a) Remove the 2 bolts, and disconnect the ABS wire.

(b) Remove the 4 bolts, and disconnect the suspension member.

(c) Remove the through bolt, nut and suspention member.



22. REMOVE ENGINE AND TRANSAXLE ASSEMBLY

(a) Lower the engine out of vehicle slowly and carefully.

NOTICE:

Make sure the engine is clear of all wiring, hoses and cables.

(b) Using a engine sliding device, and place the engine and transaxle assembly onto the stand.

23. SEPARATE ENGINE AND TRANSAXLE
(See pageCL–15)

(a) Remove the starter (See pageST–4).

(b) Remove the 6 bolts, and separate the engine and transaxle.

24. REMOVE CLUTCH DISC (See page MX–4)

25. REMOVE FLYWHEEL

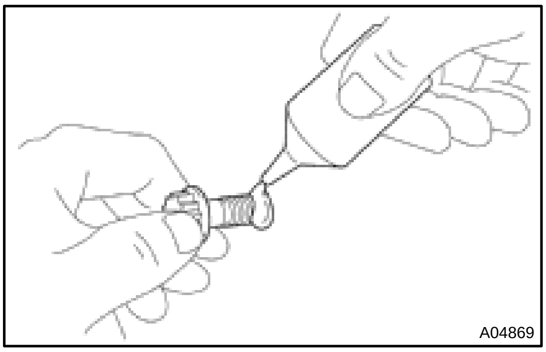
Remove the 8 bolts and flywheel.

INSTALLATION

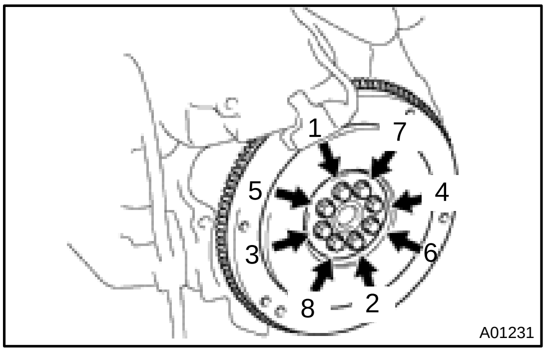
1. INSTALL FLYWHEEL

HINT:

- The mounting bolts are tightened in steps (c) and (e).
- If any one of the mounting bolts is broken or deformed, replace it.

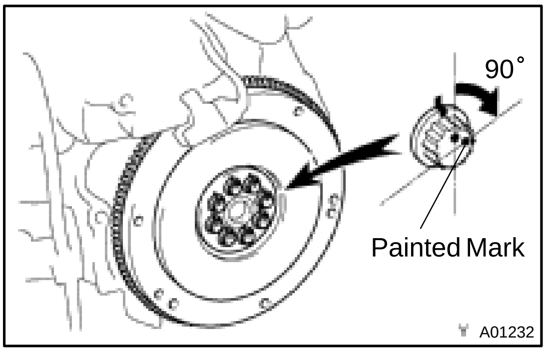


(a) Apply adhesive to 2 or 3 threads of the mounting bolt end.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Install the flywheel on the crankshaft.
(c) Install and uniformly tighten the 8 mounting bolts in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

If any one of the mounting bolts does not meet the torque specification, replace the mounting bolt.



(d) Mark the flywheel bolt with paint.
(e) Retighten the flywheel bolts by an additional 90°.

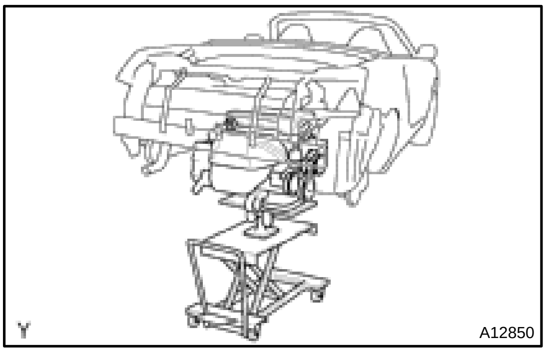
2. INSTALL CLUTCH DISC AND COVER

(See page CL–17)

3. INSTALL TRANSAXLE TO ENGINE

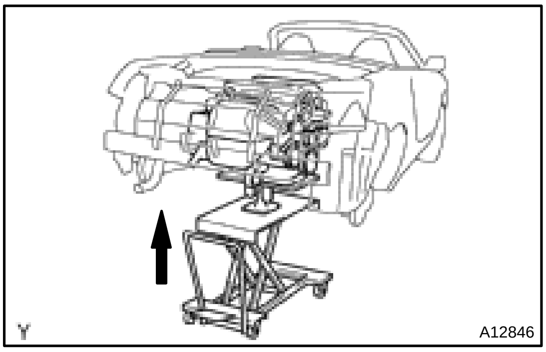
(See page CL–17)

(a) Attach the transaxle to the engine, and install the 6 bolts.
(b) Install the starter (See page ST–16).



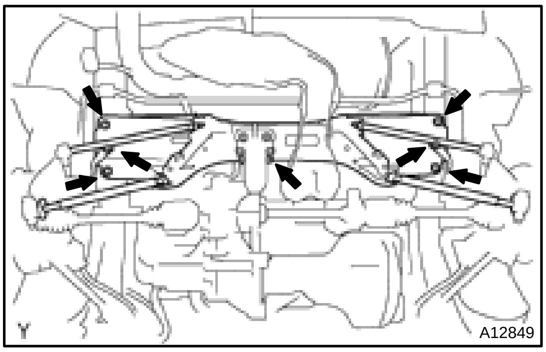
4. SET ENGINE JACK

NOTICE:
Using a chain, hold the engine tightly.



5. **INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE**

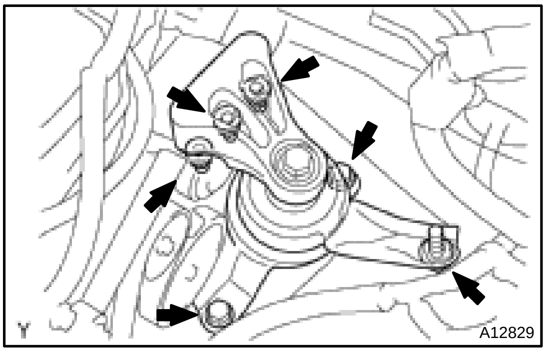
(a) Raise the engine into the engine compartment.



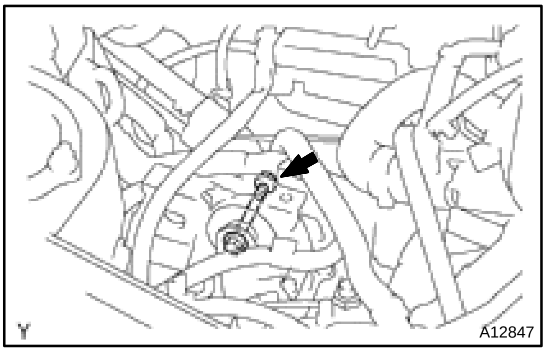
(b) Temporary install the rear suspension member to the engine with the through bolt and nut.

(c) Connect the rear suspension member with the 4 bolts.
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

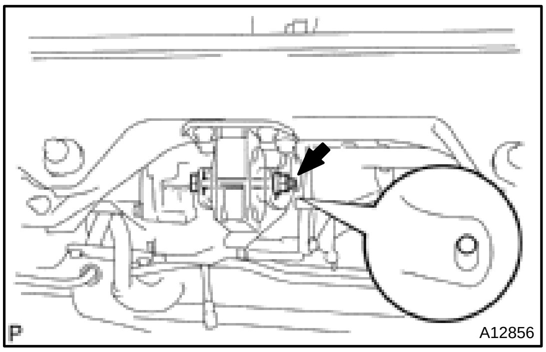
(d) Connect the ABS wire with the 2 bolts.



(e) Install the RH engine mounting insulator with the 3 bolts and 3 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

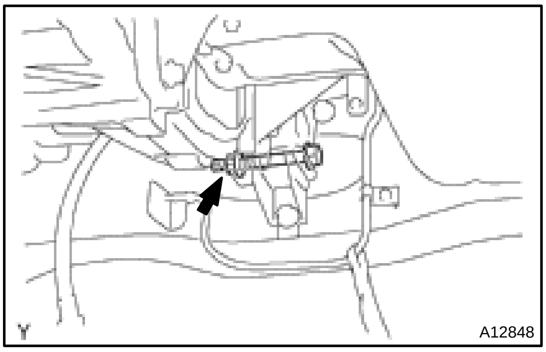


(f) Temporary install the through bolt and nut holding the LH engine mounting insulator and mounting bracket.



(g) Tighten the through bolt and nut holding the rear engine mounting insulator and mounting bracket.
Torque: 93 N·m (948 kgf·cm, 69 ft·lbf)

NOTICE:
Be sure to tighten the bolt at the upper end of slot.


A12848

(h) Install the through bolt holding the front engine mounting insulator and mounting bracket.
Torque: 89 N·m (908 kgf·cm, 66 ft·lbf)

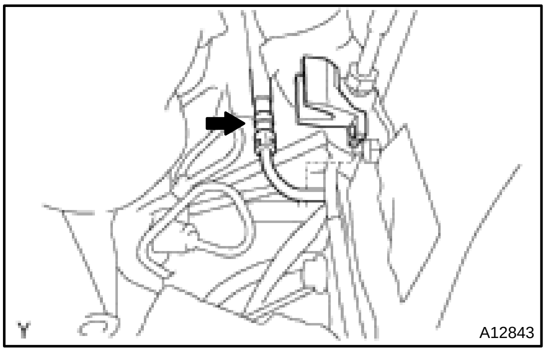
(i) Tighten the through bolt and nut holding the LH engine mounting insulator and mounting bracket.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)

(j) Remove the engine jack, and install the No. 2 cylinder head cover with the 2 clips and 2 nuts.

6. INSTALL DRIVE SHAFTS (See page SA–49)

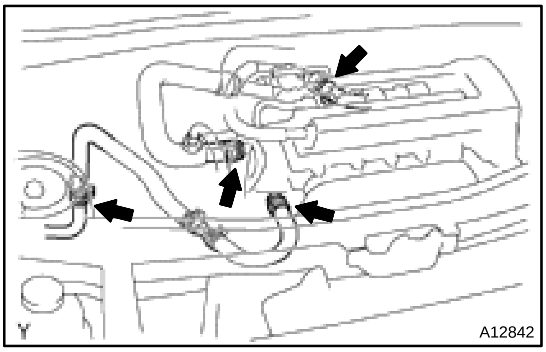
7. CONNECT TRANSAXLE CONTROL CABLES (See page CL–17)

8. CONNECT CLUTCH HOSE (See page CL–13)


A12843

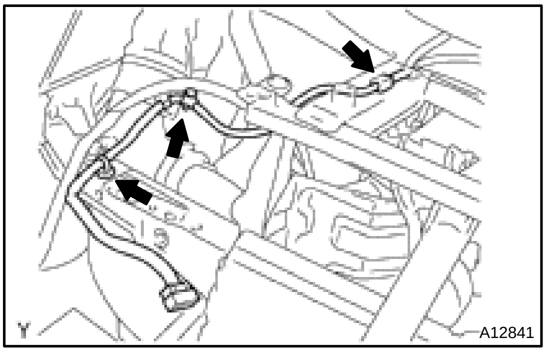
9. CONNECT FUEL TUBE

Connect the fuel tube to the fuel pipe, and install the fuel pipe clamp.


A12842

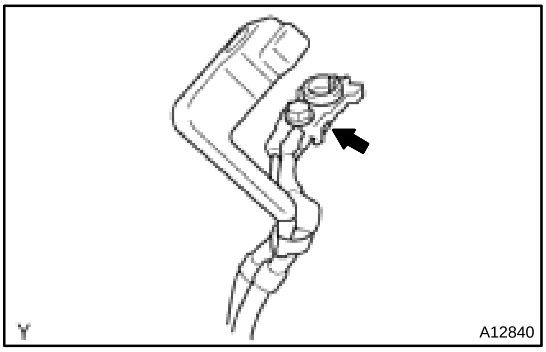
10. CONNECT WATER HOSES

Connect the 2 radiator hoses and 2 heater hoses.

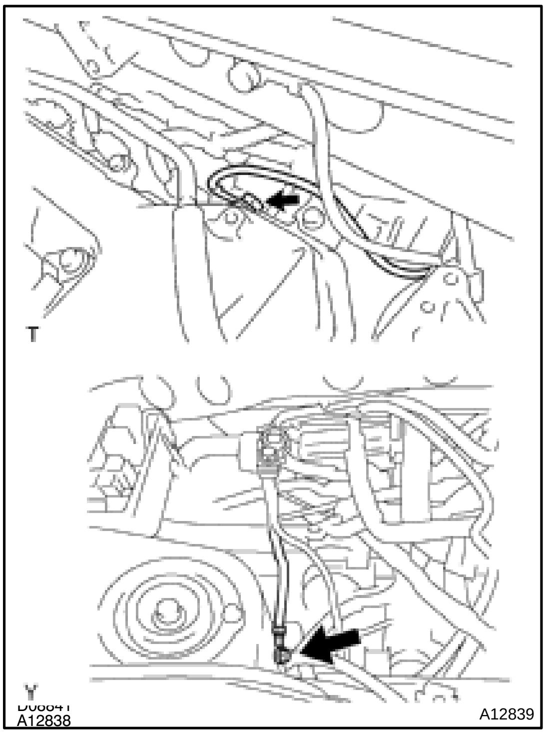

A12841

11. CONNECT ENGINE WIRE

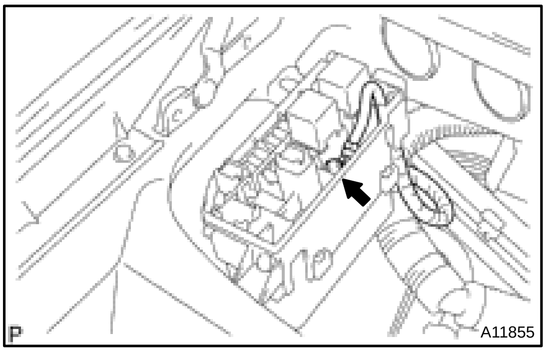
(a) Connect the 3 wire brackets and heated oxygen sensor (bank 1 sensor 2) wire to the vehicle.



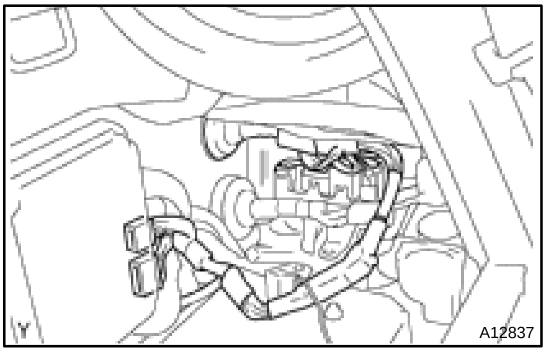
(b) Assemble the positive (+) battery wires.
 (1) Assemble the battery wires, and install the terminal with the nut.
 (2) Install the terminal cover.



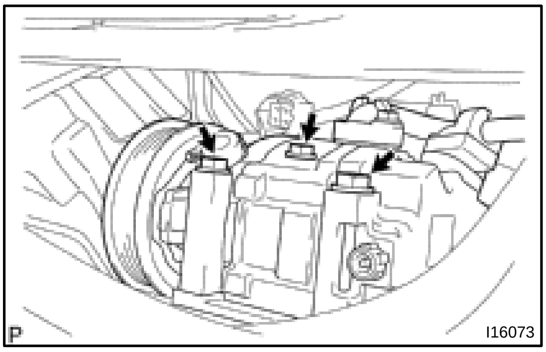
(c) Connect the 2 ground wires with the 2 bolts.



(d) Connect the engine wire to the J/B No. 1.
 (1) Connect the engine wire with the nut.
 (2) Install the relay box cover.



(e) Connect the engine wire to the luggage compartment.
 (1) Pull in the engine wire to the luggage compartment, and connect the grommet.
 (2) Connect the 4 junction connectors.
 (3) Connect the 2 ECM connectors.
 (4) Install the luggage compartment box (See page EM–50).

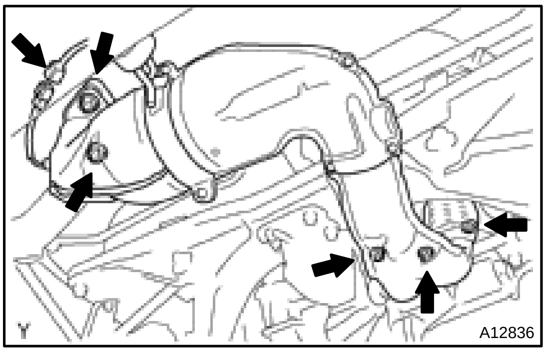


12. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the 3 bolts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

(b) Connect the A/C compressor connector.

(c) Install the drive belt (See page CH–17).



13. INSTALL FRONT EXHAUST PIPE

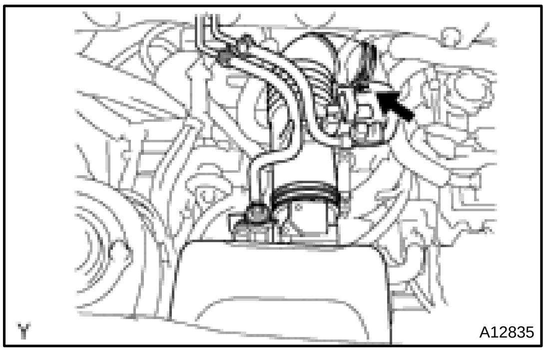
(a) Connect the ring.

(b) Install 3 new gaskets and the front exhaust pipe with the 2 bolts, 2 springs and 3 nuts.
Torque:
43 N·m (438 kgf·cm, 32 ft·lbf) for bolt
62 N·m (632 kgf·cm, 46 ft·lbf) for nut

(c) Connect the heated oxygen sensor (bank 2 sensor 1) connector.

14. INSTALL REAR BUMPER COVER AND REAR COMBINATION LIGHTS (See page EM–50)

15. CONNECT ACCELERATOR CABLE
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

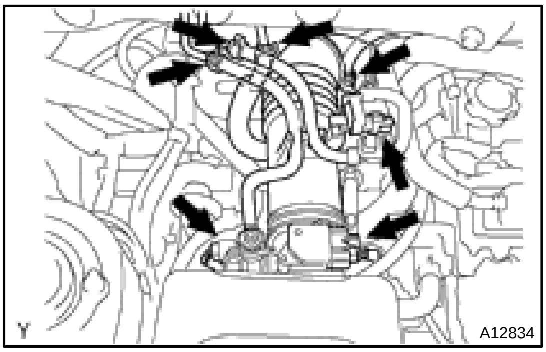


16. INSTALL INTAKE AIR HOSE AND AIR CLEANER CAP ASSEMBLY

(a) Install the air filter.

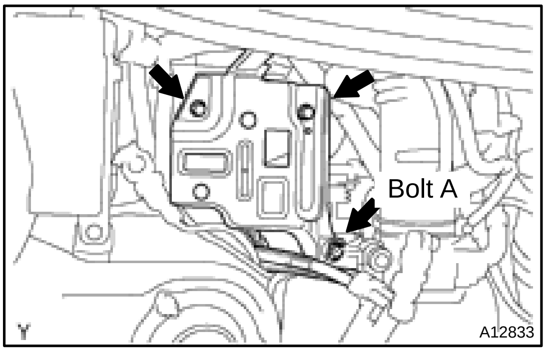
(b) Install the intake air hose and air cleaner cap assembly to the throttle body, and tighten the hose clamp.

(c) Connect the air cleaner cap with the 2 clamps.



(d) Connect the 4 hoses.

(e) Connect the MAF meter connector, VSV connector for EVAP and VSV connector for CCV.



17. INSTALL BATTERY BRACKET

(a) Install the battery bracket with the 3 bolts.

HINT:

Install bolt A with the air cleaner case.

(b) Install the tray and battery.

18. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM

19. FILL WITH TRANSAXLE OIL

20. FILL WITH ENGINE OIL

21. FILL WITH ENGINE COOLANT (See page CO–2)

22. START ENGINE AND CHECK FOR LEAKS

23. PERFORM ENGINE ADJUSTMENT

24. CHECK FRONT WHEEL ALIGNMENT

25. INSTALL ENGINE UNDER COVERS

26. INSTALL SUSPENSION UPPER BRACE

27. INSTALL ENGINE HOOD

28. ROAD TEST VEHICLE

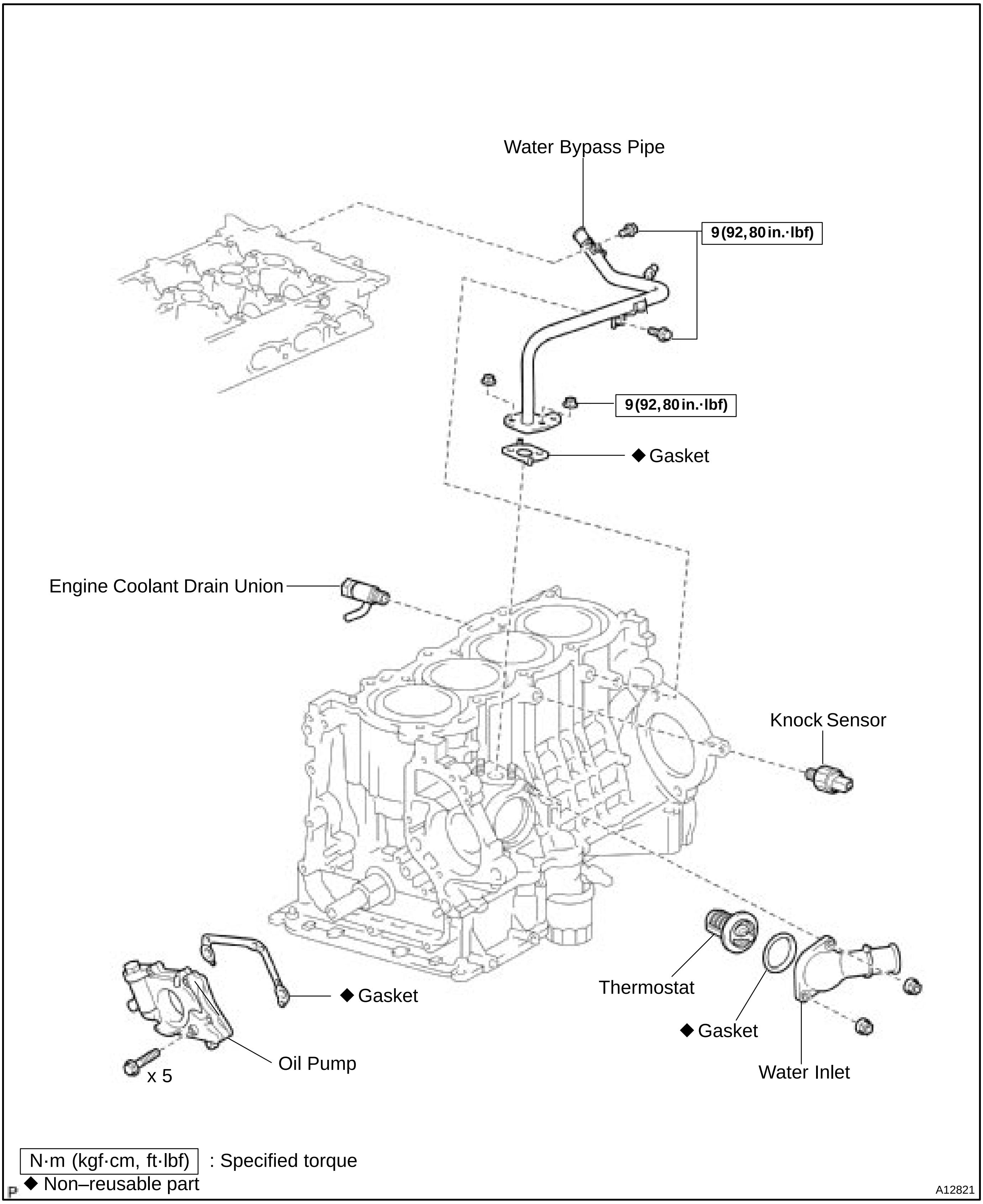
Check for abnormal noises, shock slippage, correct shift points and smooth operation.

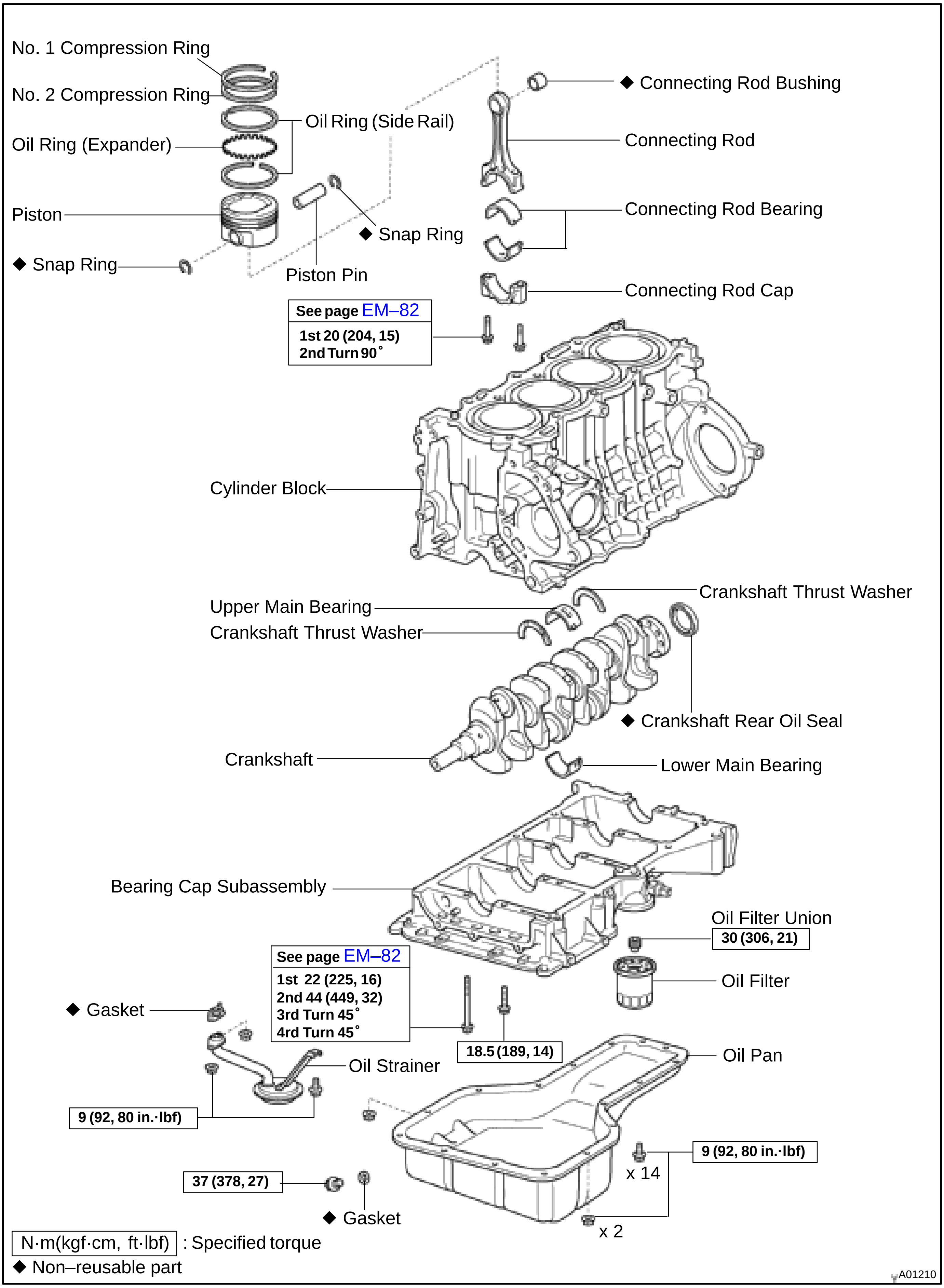
29. RECHECK ENGINE COOLANT AND OIL LEVELS

CYLINDER BLOCK

COMPONENTS

EM19P–01

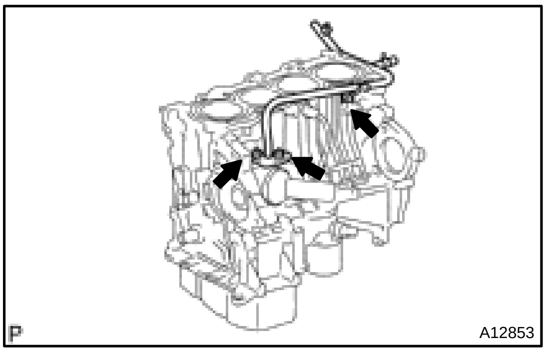



No. 1 Compression Ring
No. 2 Compression Ring
Oil Ring (Side Rail)
Oil Ring (Expander)
Piston
◆ Snap Ring
Piston Pin
◆ Snap Ring
◆ Connecting Rod Bushing
Connecting Rod
Connecting Rod Bearing
Connecting Rod Cap
See page EM–82
1st 20 (204, 15)
2nd Turn 90°
Cylinder Block
Crankshaft Thrust Washer
Upper Main Bearing
Crankshaft Thrust Washer
◆ Crankshaft Rear Oil Seal
Crankshaft
Lower Main Bearing
Bearing Cap Subassembly
Oil Filter Union
30 (306, 21)
See page EM–82
1st 22 (225, 16)
2nd 44 (449, 32)
3rd Turn 45°
4rd Turn 45°
Oil Filter
◆ Gasket
18.5 (189, 14)
Oil Pan
Oil Strainer
9 (92, 80 in.·lbf)
9 (92, 80 in.·lbf)
x 14
37 (378, 27)
◆ Gasket
x 2
N·m(kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A01210

EM19Q–01

DISASSEMBLY

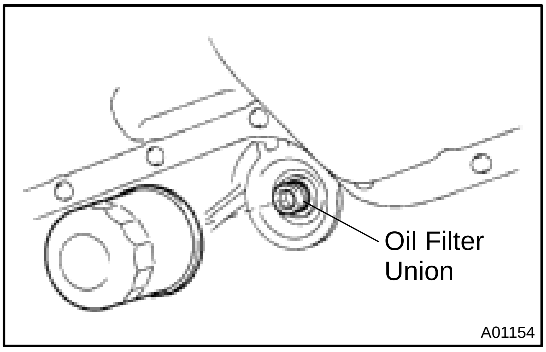
1. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
2. **REMOVE CYLINDER HEAD (See page EM–29)**



3. **REMOVE WATER BYPASS PIPE**

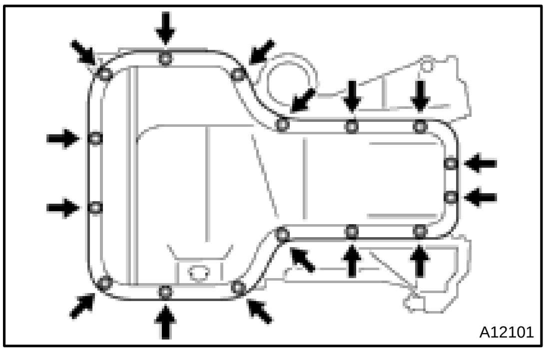
Remove the 2 nuts, bolts, water bypass pipe and gasket.

4. **REMOVE THERMOSTAT (See page CO–11)**
5. **REMOVE KNOCK SENSOR**
6. **REMOVE ENGINE COOLANT DRAIN UNION**
7. **REMOVE OIL PUMP (See page LU–8)**



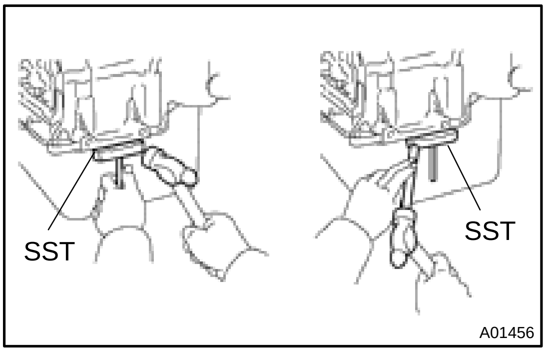
8. **REMOVE OIL FILTER (See page LU–3)**
9. **REMOVE OIL FILTER UNION**

Using a 12 mm hexagon wrench, remove the oil filter union.



10. **REMOVE OIL PAN**

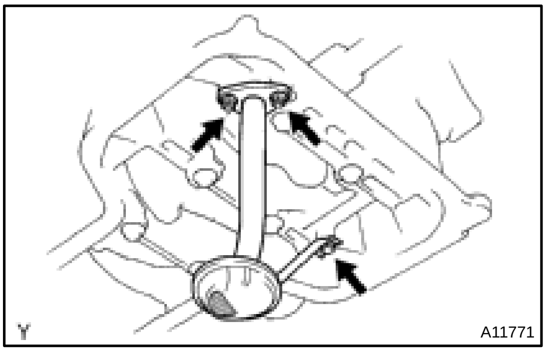
(a) Remove the 14 bolts and 2 nuts.



(b) Insert the blade of SST between the bearing cap subassembly and oil pan, and cut off applied sealer and remove the oil pan.
SST 09032–00100

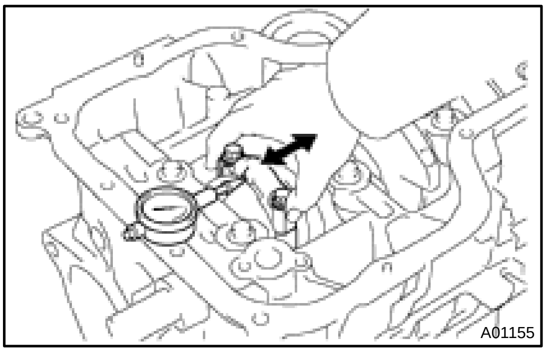
NOTICE:

- **Be careful not to the damage the oil pan contact surface of the bearing cap subassembly.**
- **Be careful not to damage the oil pan flange.**



11. REMOVE OIL STRAINER

Remove the 2 nuts, bolt, oil strainer and gasket.



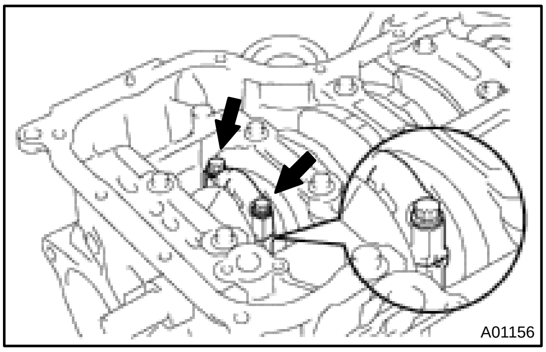
12. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.160 – 0.342 mm (0.0063 – 0.0135 in.)
Maximum thrust clearance: 0.342 mm (0.0135 in.)

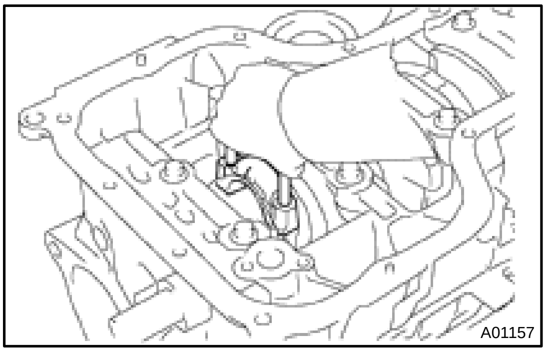
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:
19.788 – 19.840 mm (0.7791 – 0.7811 in.)



13. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
(b) Remove the 2 connecting rod cap bolts.

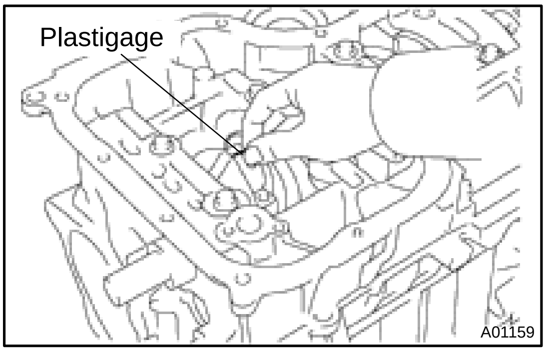


(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

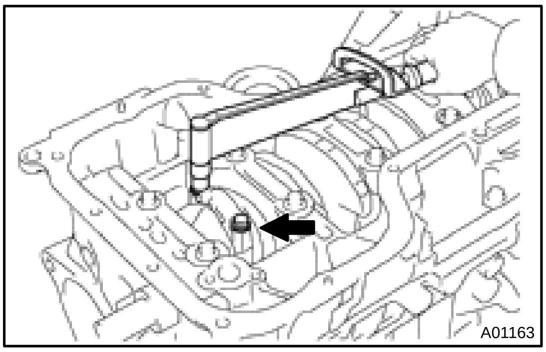
HINT:
Keep the lower bearing inserted with the connecting rod cap.

(d) Clean the crank pin and bearing.
(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



(f) Lay a strip of Plastigage on the crank pin.

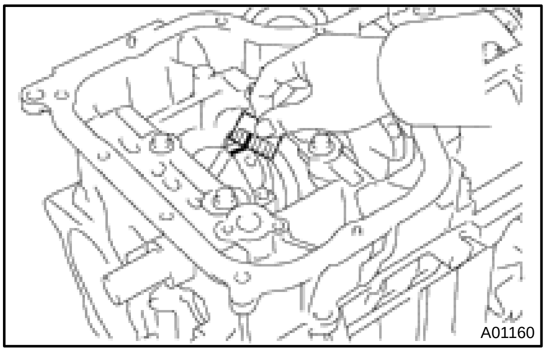


(g) Install the connecting rod cap with the 2 bolts (See page EM–82).

NOTICE:

Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing (See procedure (b) and (c) above).



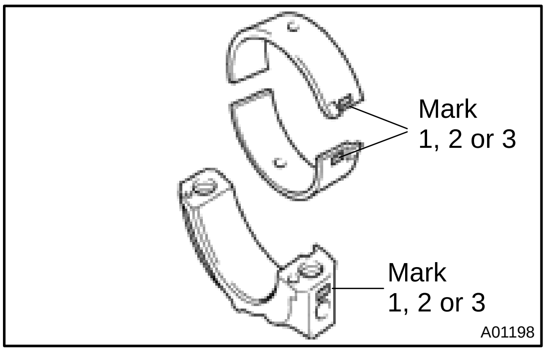
(i) Measure the Plastigage at its widest point.

Standard oil clearance:

0.028 – 0.060 mm (0.0011 – 0.0024 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



HINT:

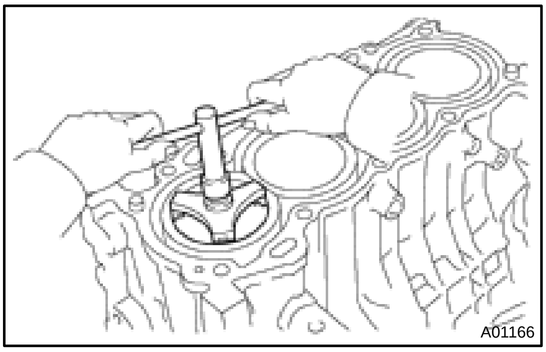
If replacing a bearing, replace it with one having the same number as marked on the connecting rod. There are 3 sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

Reference

Standard bearing center wall thickness:

Mark 1	1.486 – 1.490 mm (0.0585 – 0.0587 in.)
Mark 2	1.490 – 1.494 mm (0.0587 – 0.0588 in.)
Mark 3	1.494 – 1.498 mm (0.0588 – 0.0590 in.)

(j) Completely remove the Plastigage.


A01166

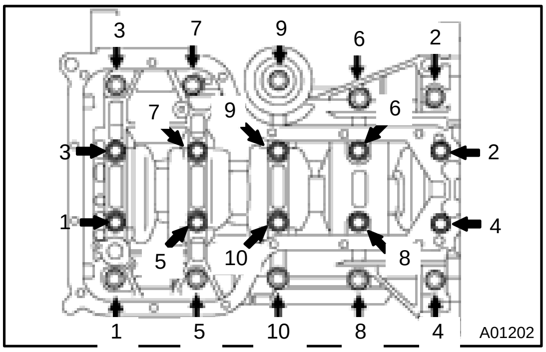
14. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

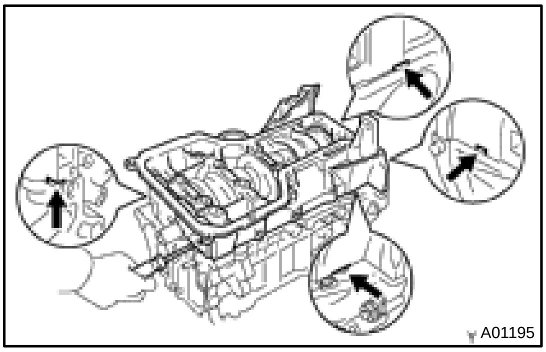


A01202

15. REMOVE BEARING CAP SUBASSEMBLY AND CRANKSHAFT REAR OIL SEAL, AND CHECK OIL CLEARANCE

(a) Remove the 10 hexagon head bearing cap bolts.

(b) Uniformly loosen and remove the 10 bearing cap bolts in several passes, in the sequence shown.


A01195

(c) Using a screwdriver, remove the bearing cap subassembly by prying the portions between the cylinder block and bearing cap subassembly. Remove the 5 lower main bearings.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and bearing cap subassembly.

HINT:

Keep the lower bearing and bearing cap subassembly together.

(d) Remove the crankshaft rear oil seal.

(e) Lift out the crankshaft.

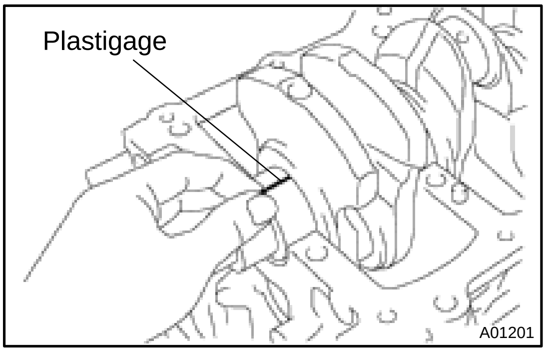
HINT:

Keep the upper bearings together with the cylinder block.

(f) Clean each main journal and bearing.

(g) Check each main journal, bearing for pitting and scratches.

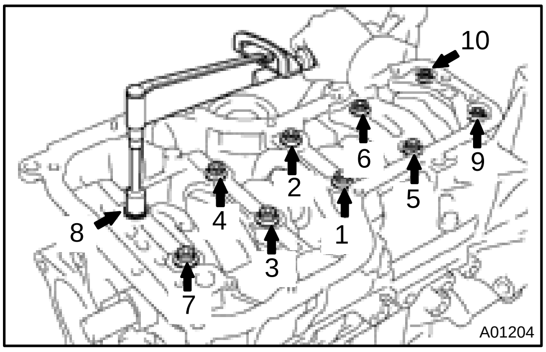
If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



A01201

(h) Place the crankshaft on the cylinder block.

(i) Lay a strip of Plastigage across each journal.

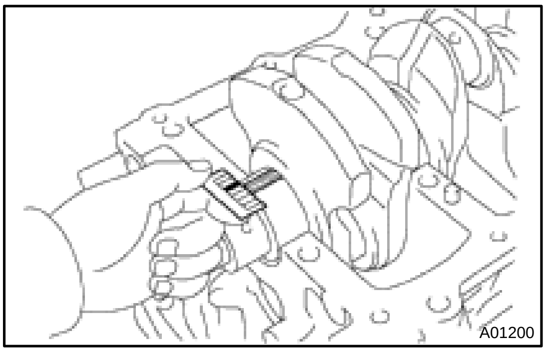


(j) Install the bearing cap subassembly (See page EM–82).

NOTICE:

Do not turn the crankshaft.

(k) Remove the bearing cap subassembly (See procedures (a) to (d) above).



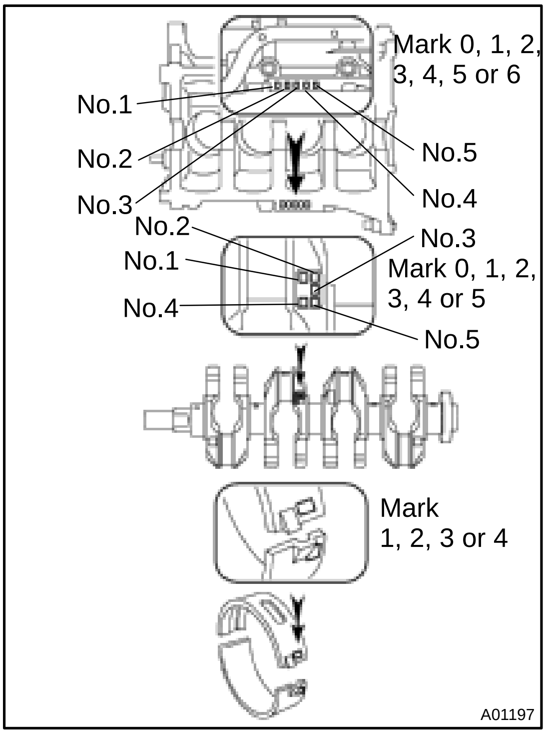
(l) Measure the Plastigage at its widest point.

Standard oil clearance:

0.015 – 0.032 mm (0.0006 – 0.0013 in.)

Maximum oil clearance: 0.050 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



(m) If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

	Total number		" ": Number mark	
Cylinder block (A) + Crankshaft (B)	0 – 2	3 – 5	6 – 8	9 –11
Use bearing	"1"	"2"	"3"	"4"

EXAMPLE: Cylinder block "4" (A)
+ Crankshaft "3" (B)
= Total number 7 (Use bearing "3")

Standard bearings selection chart

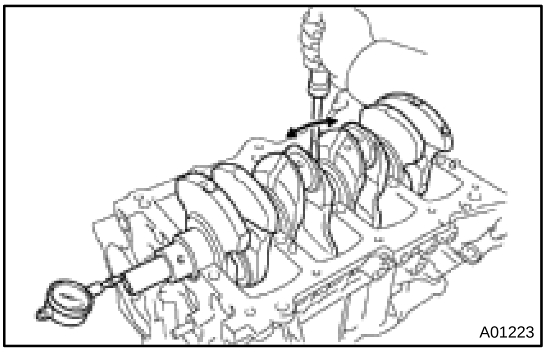
Cylinder block Number mark	Crankshaft number mark					
	0	1	2	3	4	5
0	1	1	1	2	2	2
1	1	1	2	2	2	3
2	1	2	2	2	3	3
3	2	2	2	3	3	3
4	2	3	3	3	4	4
5	3	3	3	4	4	4
6	3	3	4	4	4	5

EXAMPLE: Cylinder block ”4”, Crank shaft ”3”, Use bearing ”3”

Reference

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	0	52.000 – 52.003 (2.0472 – 2.0473)
	1	52.003 – 52.005 (2.0473 – 2.0474)
	2	52.005 – 52.007 (2.0474 – 2.0475)
	3	52.007 – 52.010 (2.0475 – 2.0476)
	4	52.010 – 52.012 (2.0476 – 2.0477)
	5	52.012 – 52.014 (2.0477 – 2.0478)
	6	52.014 – 52.016 (2.0478 – 2.0479)
Crankshaft main journal diameter (B)	0	47.998 – 48.000 (1.8897 – 1.8898)
	1	47.996 – 47.998 (1.8896 – 1.8897)
	2	47.994 – 47.996 (1.8895 – 1.8896)
	3	47.992 – 47.994 (1.8894 – 1.8895)
	4	47.990 – 47.992 (1.8893 – 1.8894)
	5	47.988 – 47.990 (1.8892 – 1.8893)
Standard bearing center wall thickness	1	1.993 – 1.996 (0.0785 – 0.0786)
	2	1.996 – 1.999 (0.0786 – 0.0787)
	3	1.999 – 2.002 (0.0787 – 0.0788)
	4	2.002 – 2.005 (0.0788 – 0.0789)

(n) Completely remove the Plastigage.



A01223

16. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.04 – 0.24 mm (0.0016 – 0.0094 in.)
Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.430 – 2.480 mm (0.0957 – 0.0976 in.)

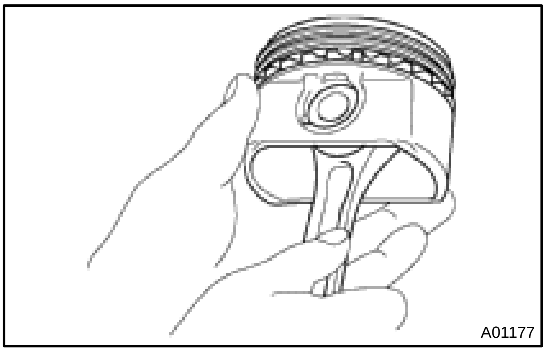
17. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 5 upper main bearings and 2 thrust washers from the cylinder block.

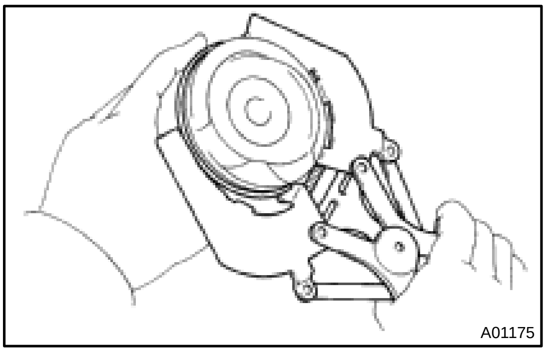
HINT:

Arrange the main bearings and thrust washers in the correct order.


A01177

18. CHECK FIT BETWEEN PISTON AND PISTON PIN

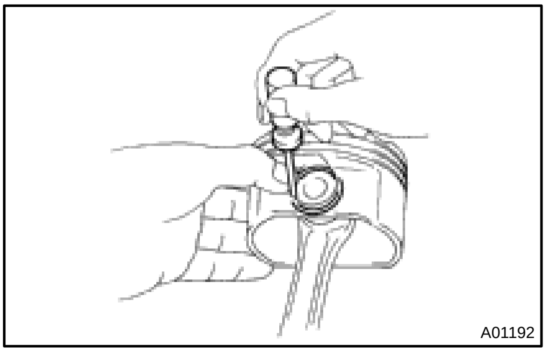
Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.


A01175

19. REMOVE PISTON RINGS

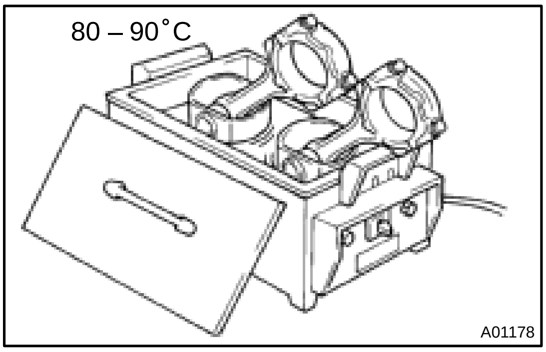
(a) Using a piston ring expander, remove the 2 compression rings.
(b) Remove the 2 side rails and oil ring by hand.

HINT:
Arrange the piston rings in the correct order only.


A01192

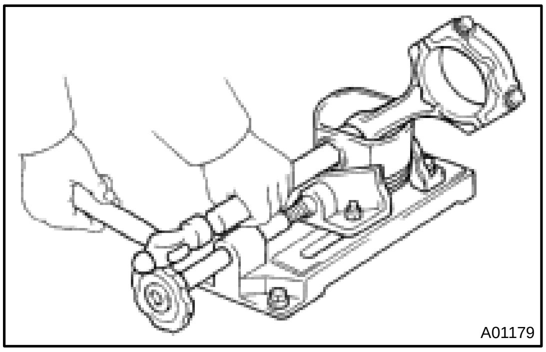
20. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.



A01178

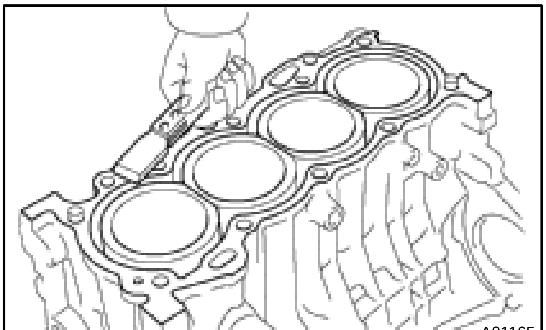
(b) Gradually heat the piston to 80 – 90˚C (176 – 194˚F).


A01179

(c) Using a plastic–faced hammer and a brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

EM19R–01


A01165

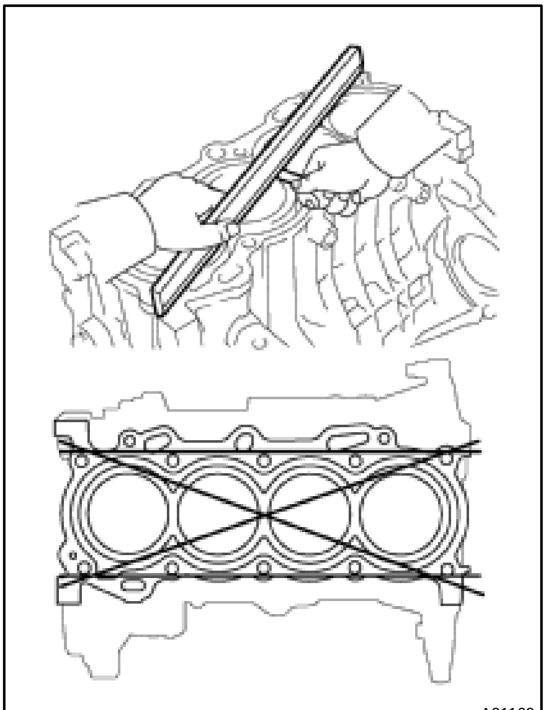
INSPECTION

1. CLEAN CYLINDER BLOCK

(a) Remove the gasket material.
Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

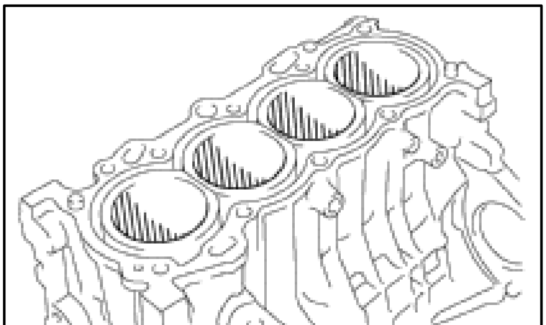
(b) Clean the cylinder block.
Using a soft brush and solvent, thoroughly clean the cylinder block.

NOTICE:
If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block, so always wash the cylinder block at a temperature of 45°C (133°F) or less.

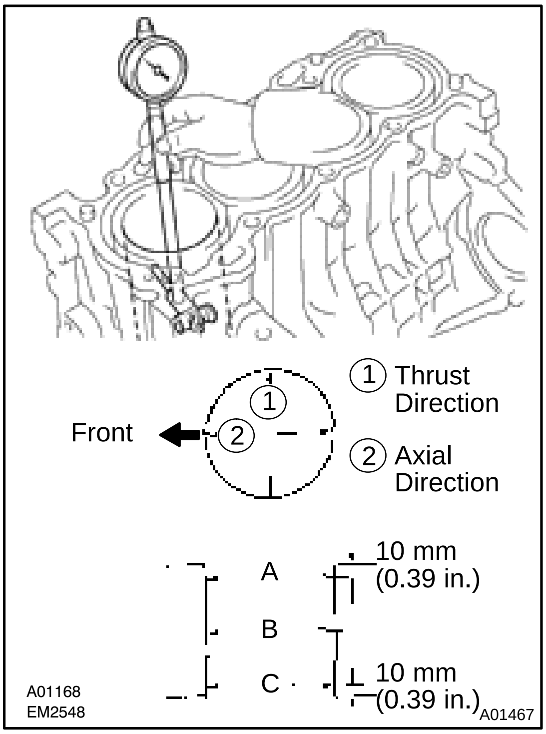

A01169

2. INSPECT CYLINDER BLOCK

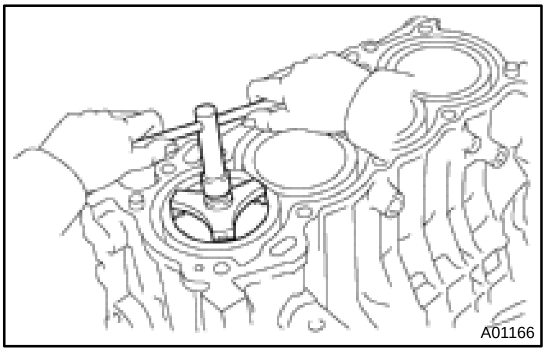
(a) Inspect for flatness.
Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder head gasket for warpage.
Maximum warpage: 0.05 mm (0.0020 in.)
If warpage is greater than maximum, replace the cylinder block.


A01167

(b) Visually check the cylinder for vertical scratches.
If deep scratches are present, replace the cylinder block.

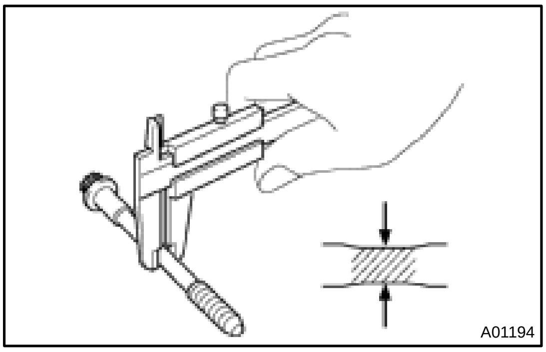


(c) Inspect the cylinder bore diameter.
Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.
Standard diameter:
79.000 – 79.013 mm (3.1102 – 3.1107 in.)
Maximum diameter: 79.013 mm (3.1107 in.)
If the diameter is greater than maximum, replace the cylinder block.



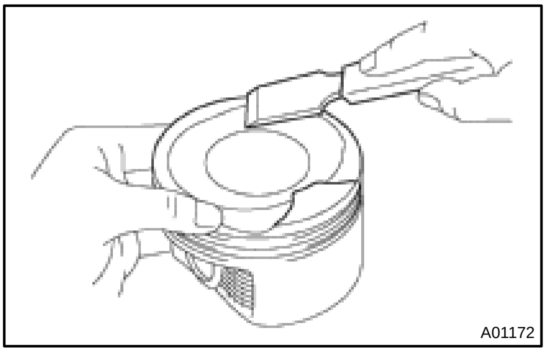
3. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



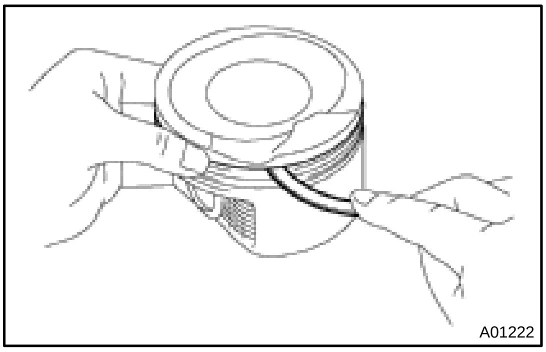
4. INSPECT 12 POINTED HEAD BEARING CAP SUB-ASSEMBLY BOLTS

Using vernier calipers, measure the tension portion diameter of the bolt.
Standard diameter: 7.3 – 7.5 mm (0.287 – 0.295 in.)
Minimum diameter: 7.3 mm (0.287 in.)
If the diameter is less than minimum, replace the bolt.

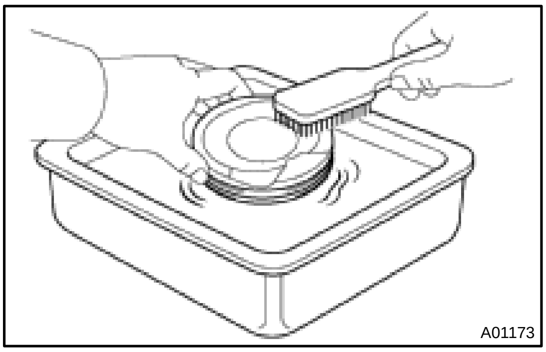


5. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

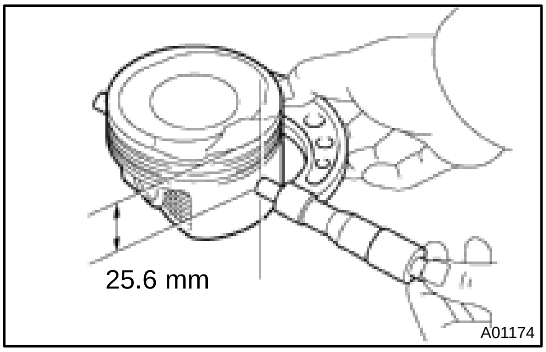


(b) Using a groove cleaning tool or a broken ring, clean the piston ring grooves.



(c) Using a brush and solvent, thoroughly clean the piston.

NOTICE:
Do not use a wire brush.



6. INSPECT PISTON

(a) Inspect the piston oil clearance.

(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 25.6 mm (1.008 in.) from the piston head.

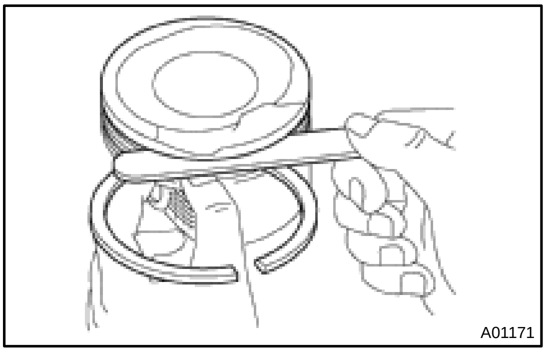
Piston diameter:
78.925 – 78.935 mm (3.1073 – 3.1077 in.)

(2) Measure the cylinder bore diameter in the thrust directions (See step 2).

(3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:
0.065 – 0.088 mm (0.0026 – 0.0035 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

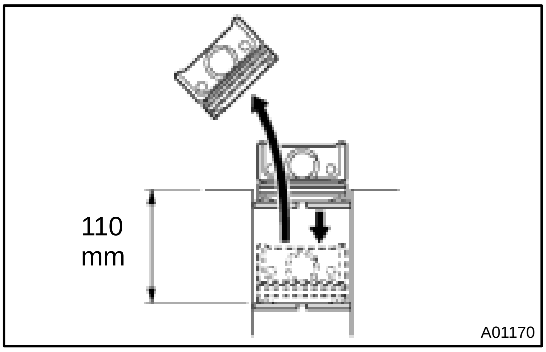
If the oil clearance is greater than maximum, replace all the 4 pistons. If necessary, replace the cylinder block.



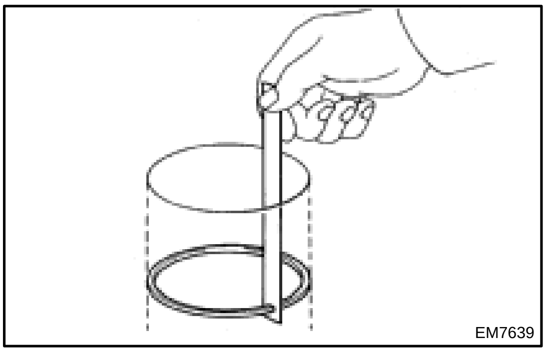
(b) Inspect the piston ring groove clearance.
Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

Ring groove clearance:
0.020 – 0.070 mm (0.0008 – 0.0028 in.)

If the clearance is not as specified, replace the piston.



(c) Inspect the piston ring end gap.
(1) Insert the piston ring into the cylinder bore.
(2) Using the piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(3) Using a feeler gauge, measure the end gap.

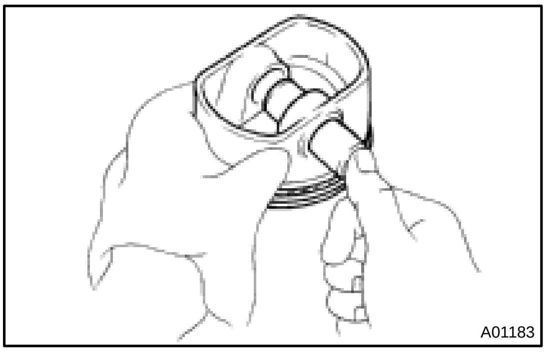
Standard end gap:

No. 1	0.25 – 0.35 mm (0.0098 – 0.0138 in.)
No. 2	0.35 – 0.50 mm (0.0138 – 0.0197 in.)
Oil ring (side rail)	0.15 – 0.40 mm (0.0059 – 0.0157 in.)

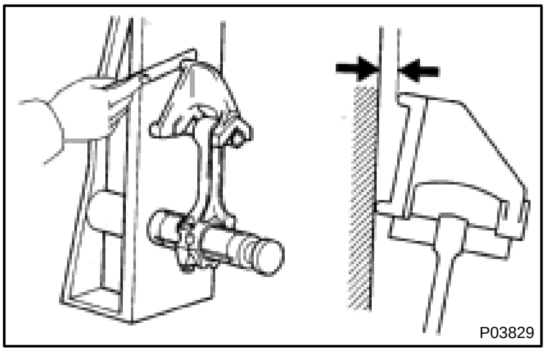
Minimum end gap:

No. 1	1.05 mm (0.0413 in.)
No. 2	1.20 mm (0.0472 in.)
Oil ring (side rail)	1.05 mm (0.0413 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



(d) Inspect the piston pin fit.
At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.

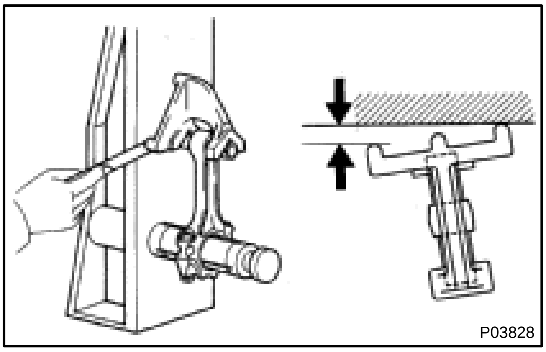


7. INSPECT CONNECTING ROD

(a) Using a rod aligner and a feeler gauge, check the connecting rod alignment.
(1) Check for out–of–alignment.

Maximum out–of–alignment:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out–of–alignment is greater than maximum, replace the connecting rod assembly.

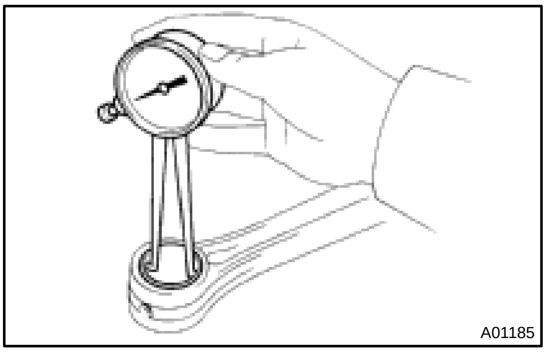

P03828

(2) Check for twist.

Maximum twist:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.

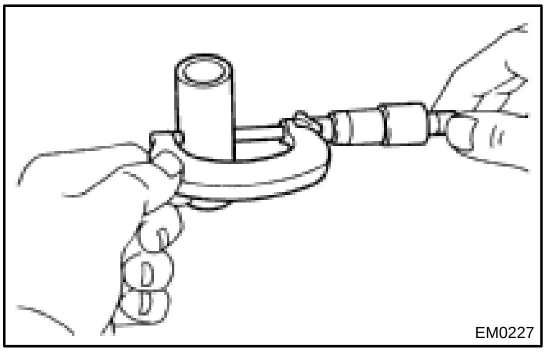

A01185

(b) Inspect the piston pin oil clearance.

(1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

20.012 – 20.021 mm (0.7879 – 0.7882 in.)


EM0227

(2) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

20.004 – 20.013 mm (0.7876 – 0.7879 in.)

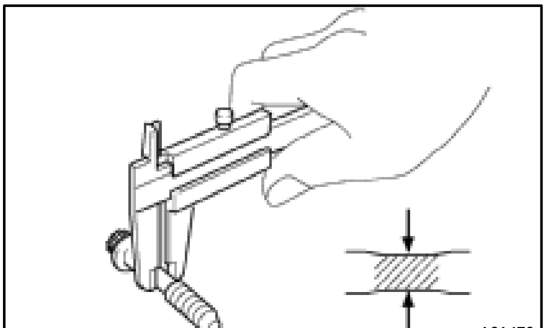
(3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance: 0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing (See page EM–80). If necessary, replace the piston and piston pin as a set.


A01470

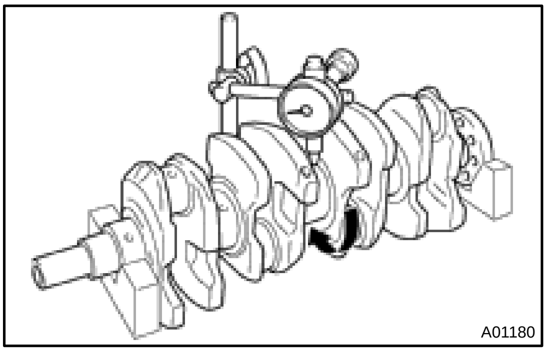
8. INSPECT CONNECTING ROD BOLTS

Using vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 6.6 – 6.7 mm (0.260 – 0.264 in.)

Minimum diameter: 6.4 mm (0.252 in.)

If the diameter is less than minimum, replace the bolt.


A01180

9. INSPECT CRANKSHAFT

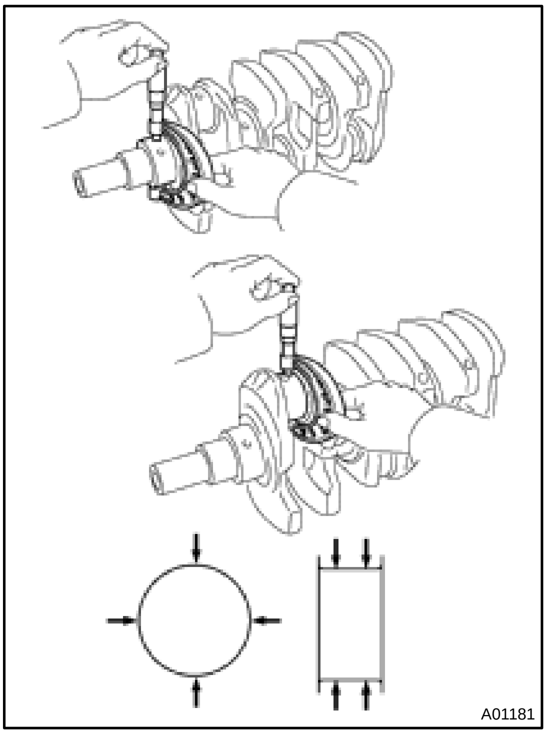
(a) Inspect for circle runout.

(1) Place the crankshaft on V–blocks.

(2) Using a dial indicator, measure the circle runout, as shown in the illustration.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the crankshaft.


A01181

(b) Inspect the main journals and crank pins.

(1) Using a micrometer, measure the diameter of each main journal and crank pin.

Diameter:

Main journal	47.988 – 48.000 mm (1.8893 – 1.8898 in.)
Crank pin	43.992 – 44.000 mm (1.7320 – 1.7323 in.)

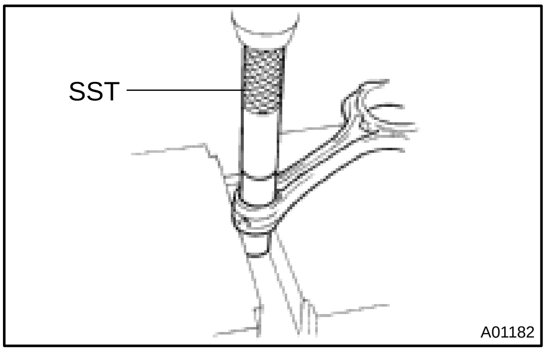
If the diameter is not as specified, check the oil clearance (See page EM–67). If necessary, replace the crankshaft.

(2) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.

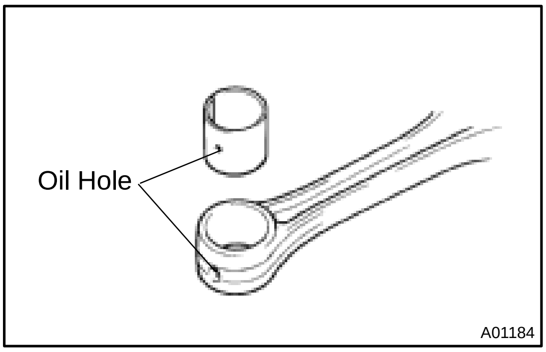
EM066–04



REPLACEMENT

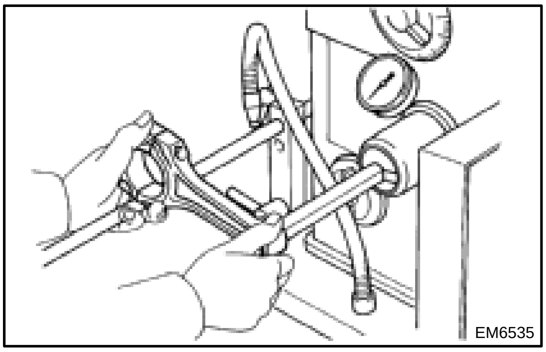
1. REPLACE CONNECTING ROD BUSHINGS

(a) Using SST and a press, press out the bushing.
SST 09222–30010

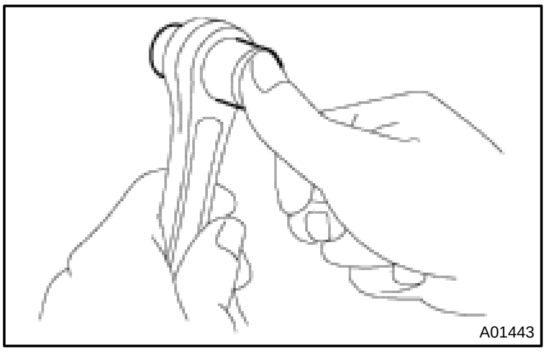


(b) Align the oil hoses of a new bushing and the connecting rod.

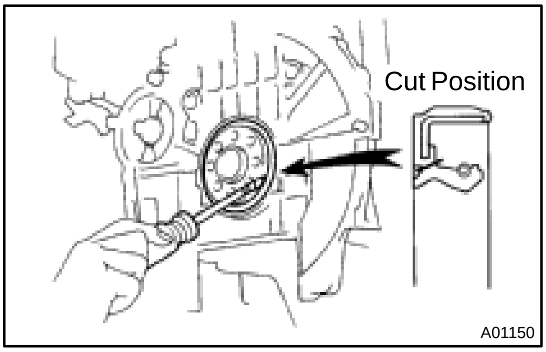
(c) Using SST and a press, press in the bushing.
SST 09222–30010



(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (See page EM–74) between the bushing and piston pin.



(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



2. REPLACE CRANKSHAFT REAR OIL SEAL

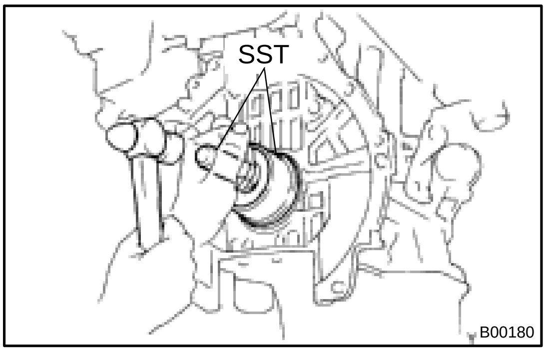
If the rear oil seal is installed to the cylinder block.

(1) Using a knife, cut off the oil seal lip.

(2) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.



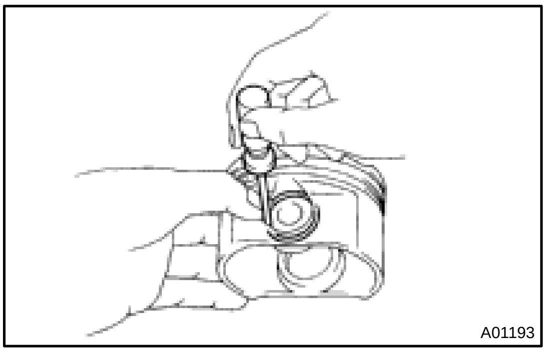
(3) Apply MP grease to a new oil seal lip.
(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07100)

EM19S–01

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



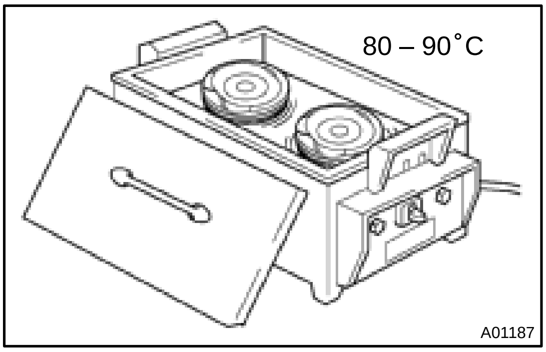
A01193

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

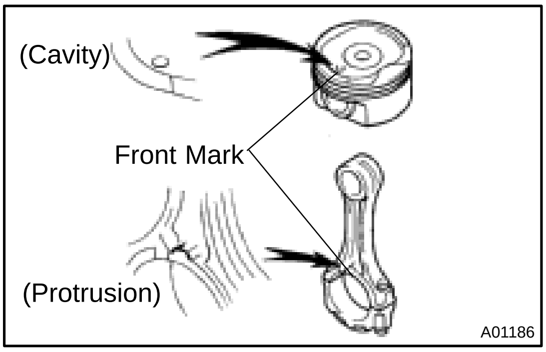
HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



A01187

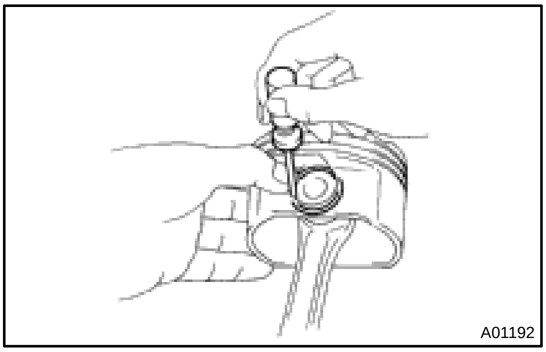
(b) Gradually heat the piston to 80 – 90˚C (176 – 194˚F).



A01186

(c) Coat the piston pin with engine oil.

(d) Align the front marks on the piston and connecting rod, and push in the piston with your thumb.

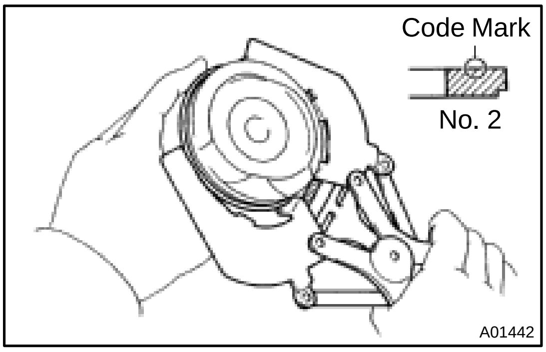


A01192

(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not as aligned with the pin hole cutout portion of the piston.



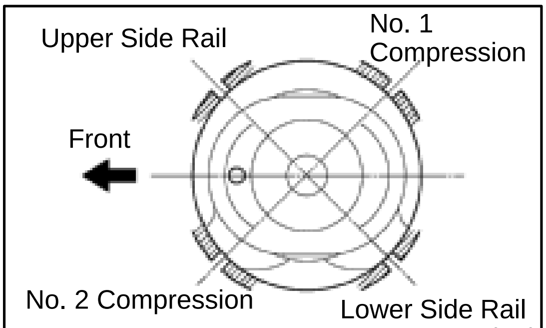
A01442

2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark (No. 2 only): T or 2R

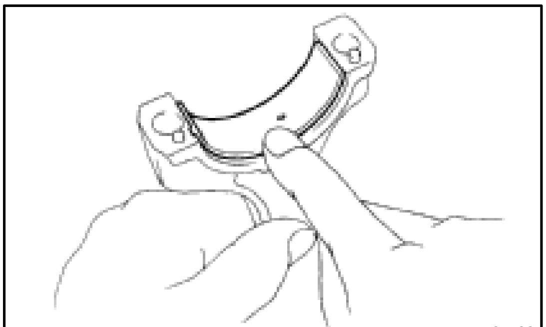


A01176

(c) Position the piston rings so that the ring ends are as shown.

NOTICE:

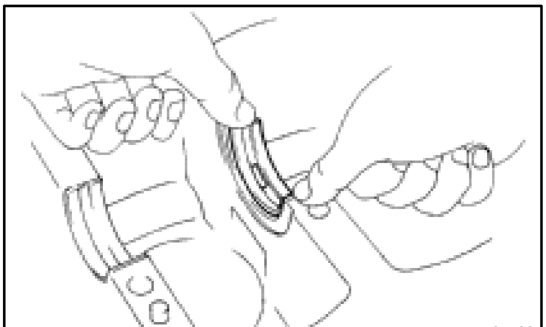
Do not align the ring ends.


A01188

3. INSTALL CONNECTING ROD BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

(b) Install the bearings in the connecting rod and connecting rod cap.


A01190

4. INSTALL MAIN BEARINGS

HINT:

Upper bearings have an oil groove and oil holes; Lower bearings do not.

(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.

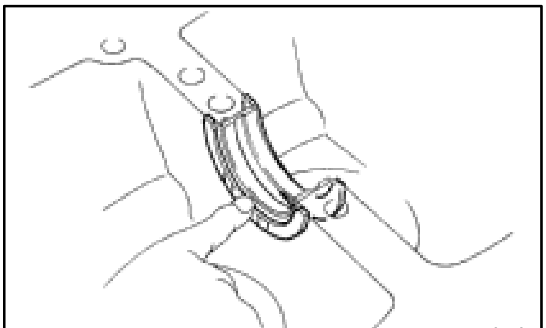
NOTICE:

- **Install the bearing with the oil hole in the cylinder block.**
- **Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oils and fats stick.**

A01189

(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

NOTICE:
Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oils and fats stick.



A01191

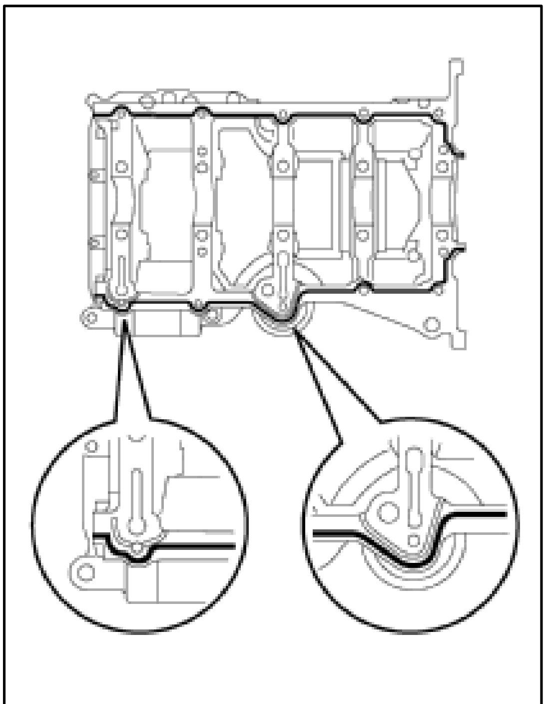
5. INSTALL THRUST WASHERS

Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK

7. PLACE BEARING CAP SUBASSEMBLY ON CYLINDER BLOCK

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the bearing cap subassembly and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–reusable solvent, clean both sealing surfaces.

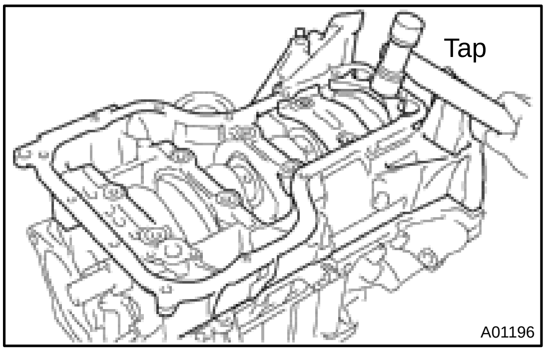


A01038

(b) Apply seal packing to the bearing cap subassembly as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to an 1 – 2 mm (0.004 – 0.08 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall cap.

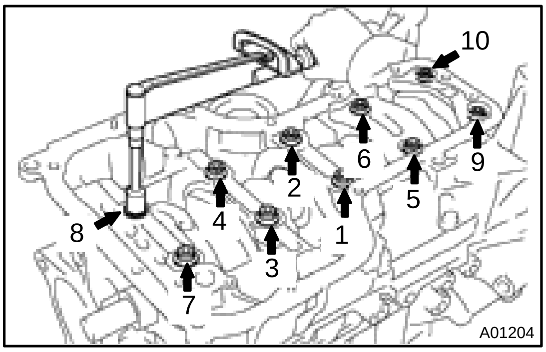


(c) Using a plastic–faced hammer, lightly tap the bearing cap subassembly to ensure a proper fit.

8. INSTALL 12 POINTED HEAD BEARING CAP SUB-ASSEMBLY BOLTS

HINT:

- The bearing cap subassembly bolts are tightened in 3 steps (steps (b), (c) and (e)).
- If any of the bearing cap subassembly bolts in broken or deformed, replace it.



(a) Apply a light coat of engine oil on the threads and under the bearing cap subassembly bolts.

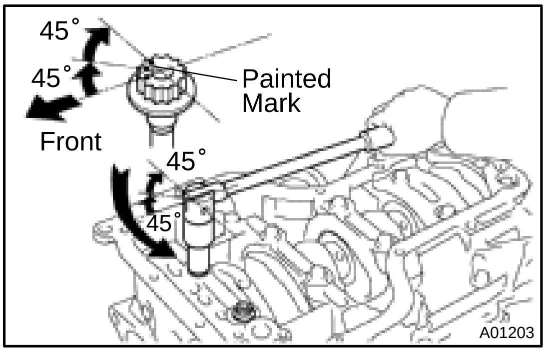
(b) Install and uniformly tighten the 10 bearing cap subassembly bolts in several passes, in the sequence shown.

Torque: 22 N·m (225 kgf·cm, 16 ft·lbf)

(c) Tighten the bearing cap subassembly bolts in several passes, in the sequence shown.

Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

If any of the bearing cap subassembly bolts does not meet the torque specification, replace the bearing cap subassembly bolt.



(d) Mark the front of the bearing cap subassembly bolts with paint.

(e) Retighten the bearing cap subassembly bolts by 45° and additional 45° in the numerical order shown.

(f) Check that the painted mark is now at a 90° angle to the front.

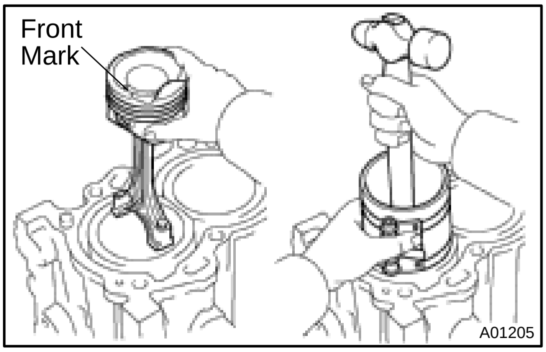
9. INSTALL HEXAGON HEAD BEARING CAP SUB-ASSEMBLY BOLTS

(a) Install and uniformly tighten the 10 bearing cap subassembly bolts in several passes.

Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

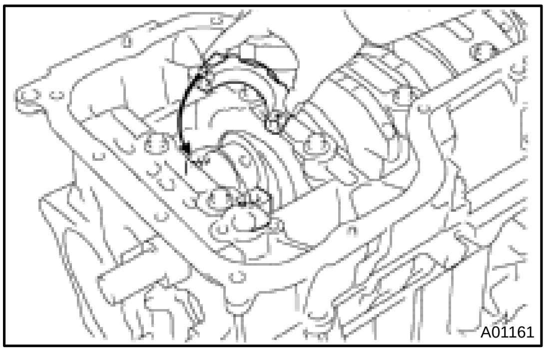
(b) Check that the crankshaft turns smoothly.

10. CHECK CRANKSHAFT THRUST CLEARANCE
(See page EM–74)



11. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



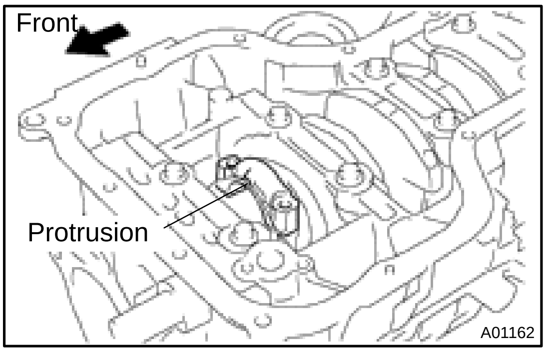
12. PLACE CONNECTING ROD CAP ON CONNECTING ROD

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Align the pin dowels of the connecting rod cap with the pins of the connecting rod, and install the connecting rod.

NOTICE:

Clean the backside of the bearing and the bearing surface of the bearing cap and do not let the oils and fats stick.



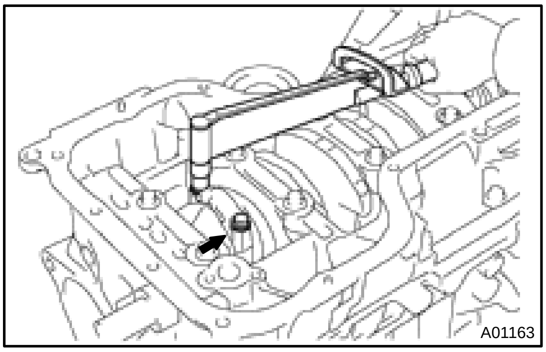
(c) Check that the protrusion of the connecting rod cap is facing in the correct direction.

13. INSTALL CONNECTING ROD CAP BOLTS

HINT:

- The connecting rod cap bolts are tightened in 2 steps (steps (b) and (d)).
- If any of the connecting rod cap bolts is broken or deformed, replace it.

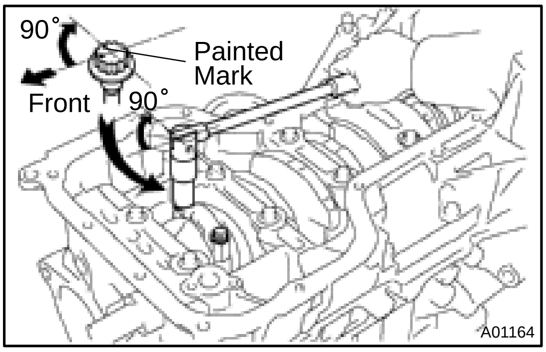
(a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.



(b) Install and alternately tighten the 2 connecting rod cap bolts in several passes.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

If any of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



(c) Mark the front of the connecting cap bolts with paint.

(d) Retighten the cap bolts by 90° as shown.

(e) Check that the painted mark is now at a 90° angle to the front.

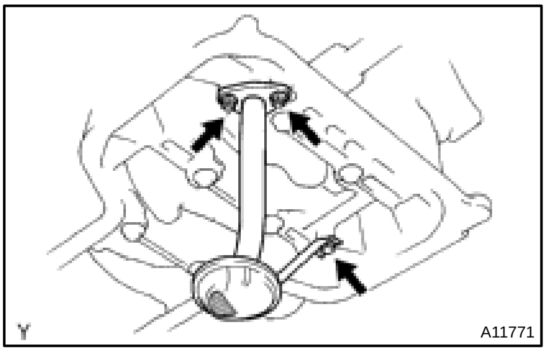
(f) Check that the crankshaft turns smoothly.

14. CHECK CONNECTING ROD THRUST CLEARANCE
(See page EM–74)

15. INSTALL REAR CRANKSHAFT OIL SEAL
(See page EM–80)

HINT:

Wipe seal packing away from the contact surface of the cylinder block assembly and oil seal.



16. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the 2 nuts and bolt.

Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

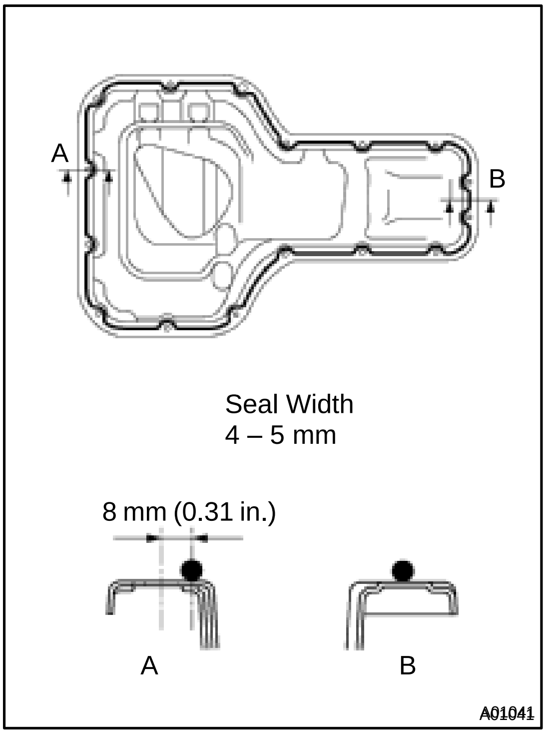
17. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the main bearing cap and oil pan.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE:

Do not use a solvent which will affect the painted surfaces.



(b) Apply seal packing to the oil pan as shown in the illustration.

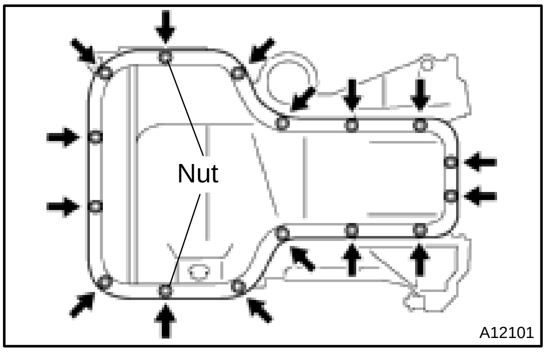
Seal packing: Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall the cap.



(c) Install the oil pan with the 14 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

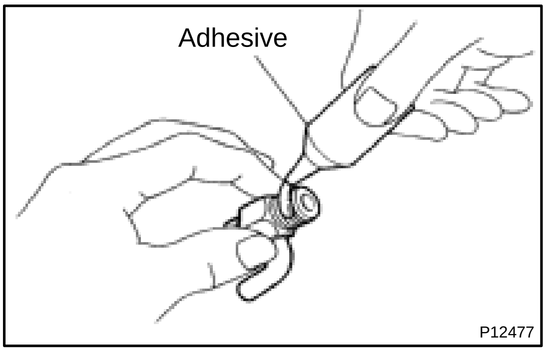
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

18. INSTALL OIL FILTER UNION

Torque: 30 N·m (306 kgf·cm, 21 ft·lbf)

19. INSTALL OIL FILTER (See page LU–3)

20. INSTALL OIL PUMP (See page LU–12)



P12477

21. INSTALL ENGINE COOLANT DRAIN UNION

(a) Apply adhesive to 2 or 3 threads.

Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the drain union.

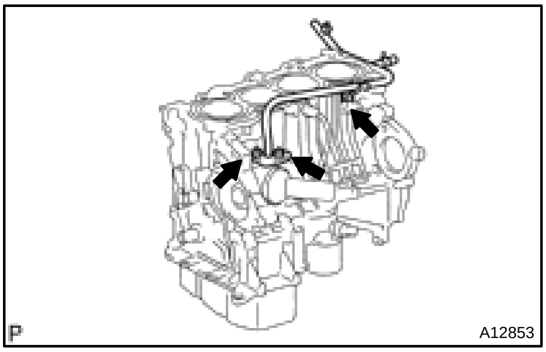
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

HINT:
After applying the specified torque, rotate the drain union clockwise until its drain port is facing downward.

22. INSTALL KNOCK SENSOR

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

23. INSTALL THERMOSTAT (See page CO–13)



A12853

24. INSTALL WATER BYPASS PIPE

Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

25. INSTALL CYLINDER HEAD (See page EM–46)

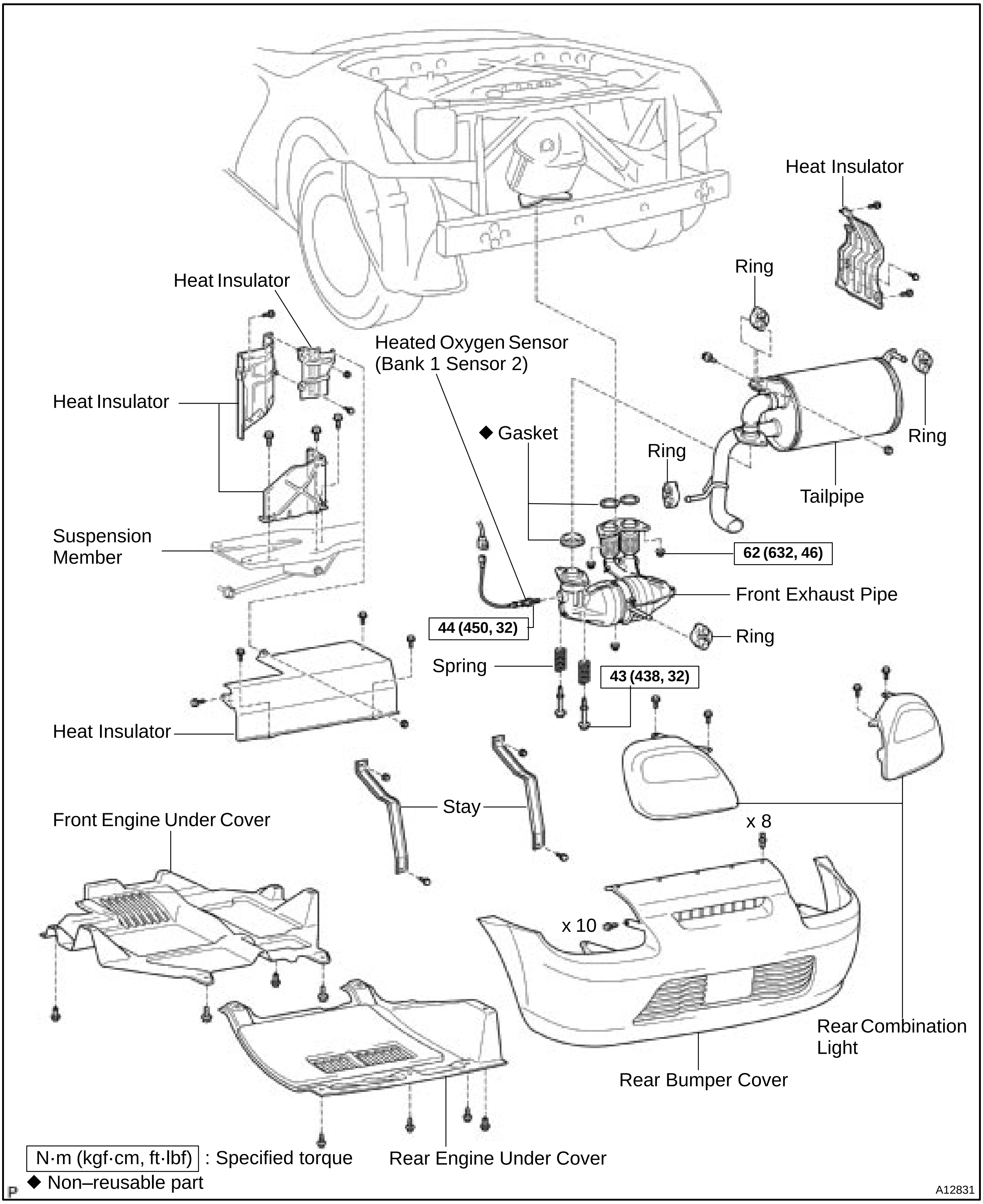
26. INSTALL TIMING SPROCKETS AND TIMING CHAIN (See page EM–20)

27. REMOVE ENGINE STAND

EXHAUST SYSTEM

COMPONENTS

EM166–02



EMISSION CONTROL SYSTEM

EC02E–04

PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NOx exhausted from the engine (3 and 4), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).
The function of each system is shown in the following table.

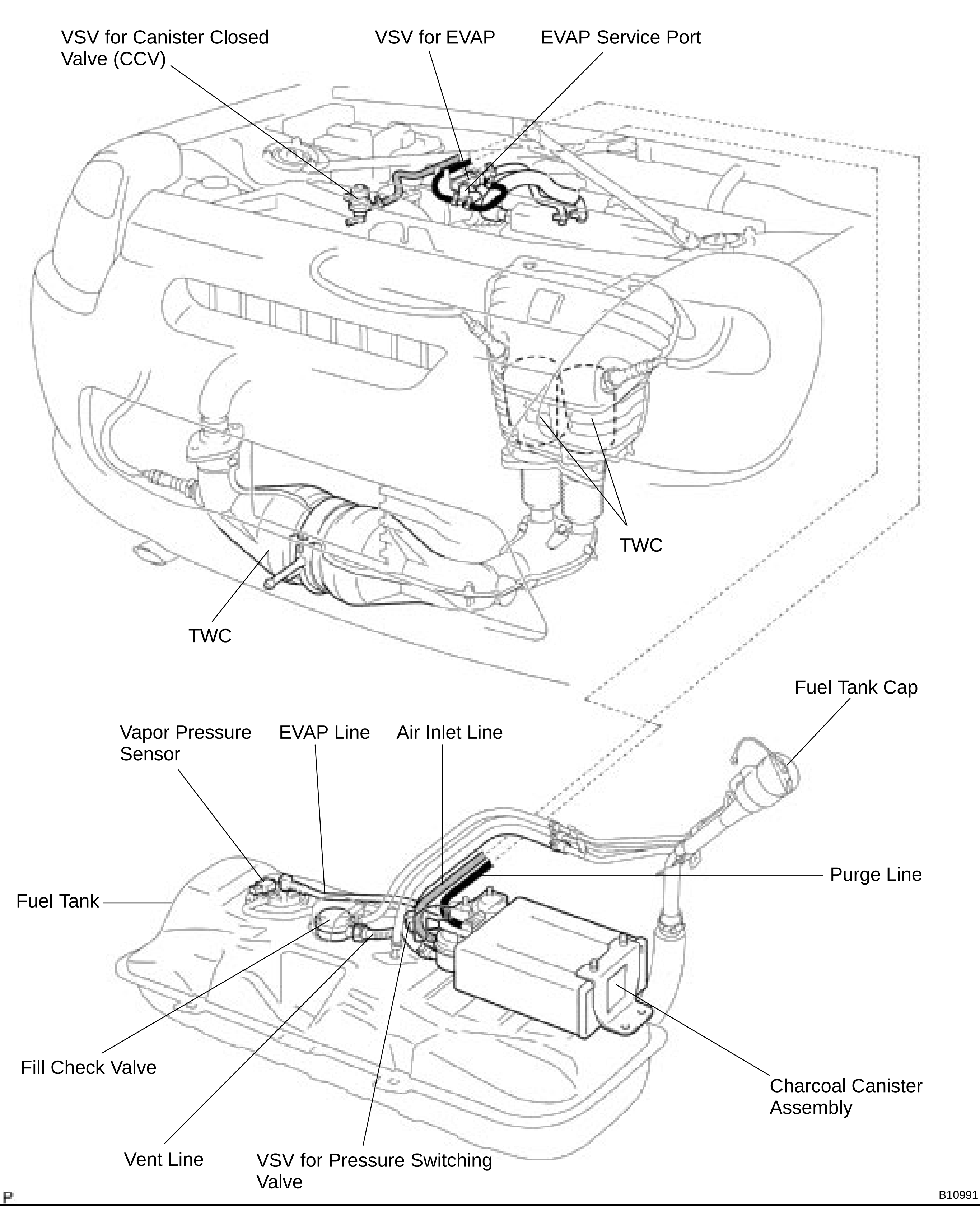
System	Abbreviation	Function
4. Positive Crankcase Ventilation	PCV	Reduces HC
5. Evaporative Emission Control	EVAP	Reduces evaporated HC
6. Three–Way Catalytic Converter	TWC	Reduces HC, CO and NOx
7. Sequential Multiport Fuel Injection*	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

Remark: *For inspection and repair of the SFI system, refer to the SFI section of this manual.

PARTS LAYOUT AND SCHEMATIC DRAWING

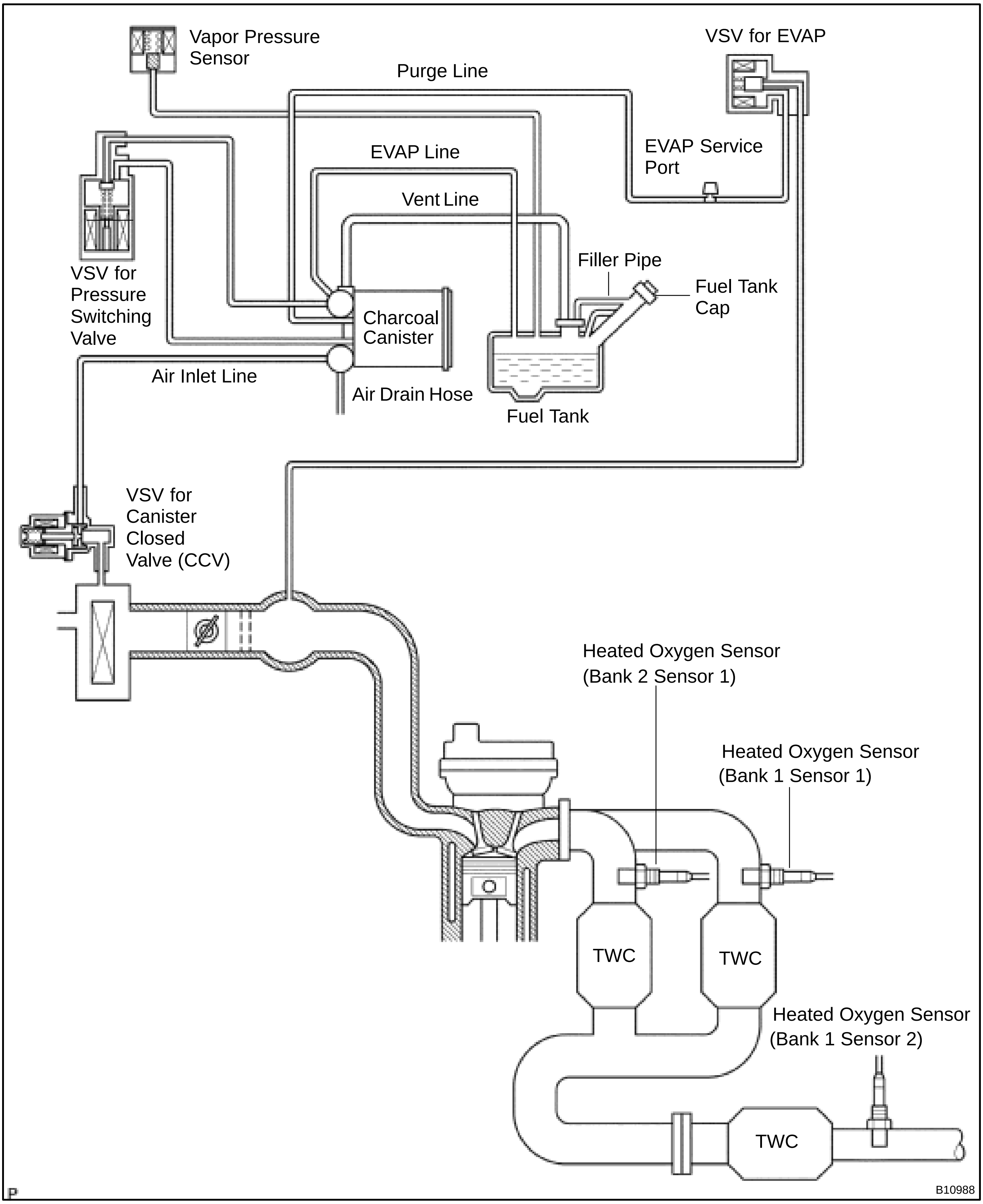
EC02F–11

LOCATION



EC02G–10

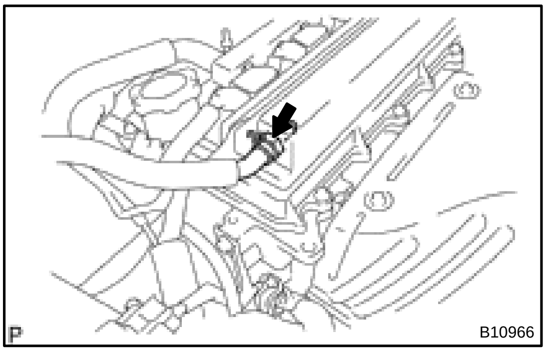
DRAWING



POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EC02H–06

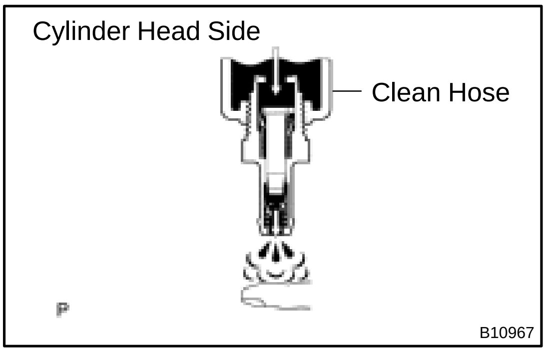
INSPECTION



1. REMOVE PCV VALVE

(a) Disconnect the PCV hose from the PCV valve.

(b) Remove the PCV valve.



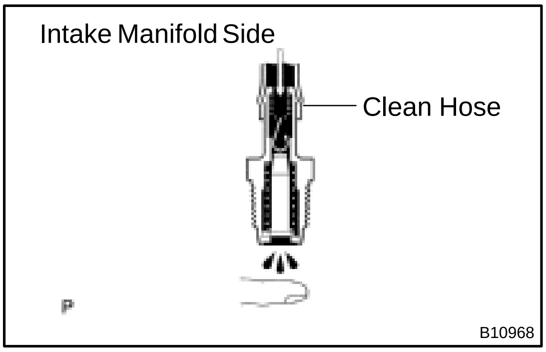
2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

(a) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are harmful.

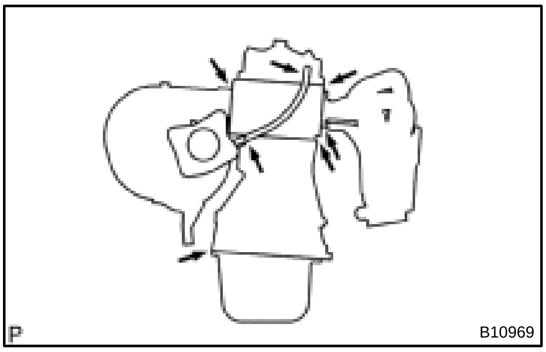


(b) Blow air into the intake manifold side, and check that it has a little difficulty for the air to pass through.

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

4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE



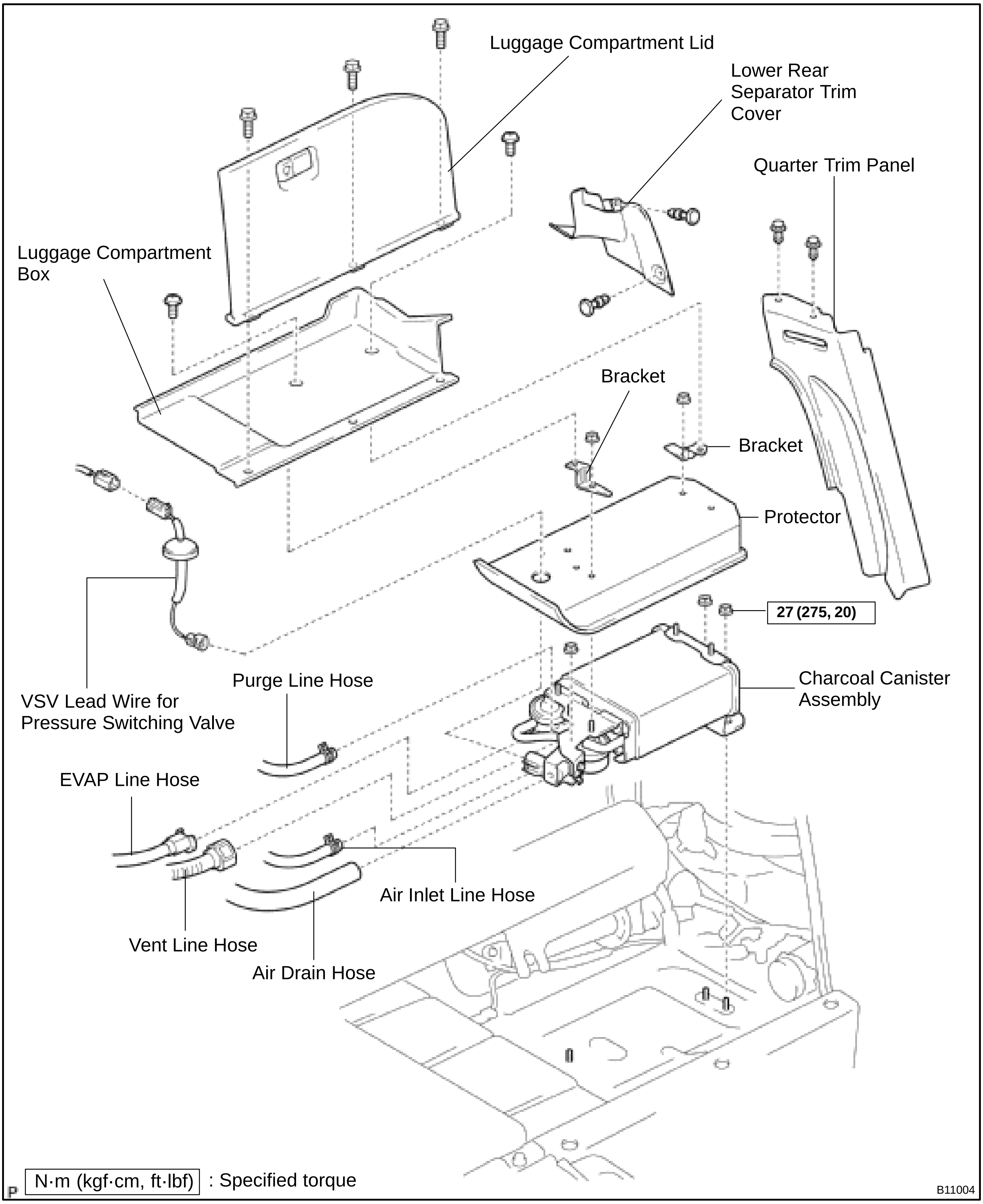
6. INSPECT HOSES, CONNECTIONS AND GASKETS

Visually check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

EC02I–07

COMPONENTS



EC0DR–02

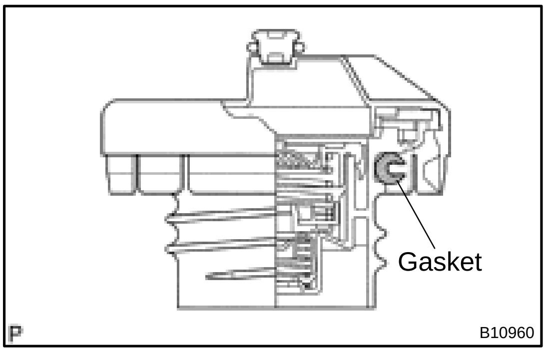
INSPECTION

1. INSPECT LINES AND CONNECTORS

Visually check for loose connections, sharp bends or damage.

2. INSPECT FUEL TANK FILLER PIPE

Visually check for deformation, cracks or fuel leakage.

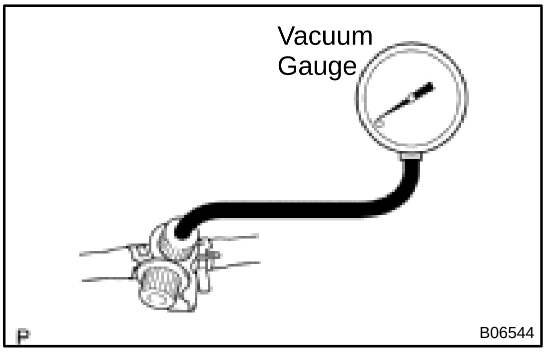


B10960

3. INSPECT FUEL TANK CAP

Visually check if the cap and/or gasket are deformed or damaged.

If necessary, repair or replace the cap.

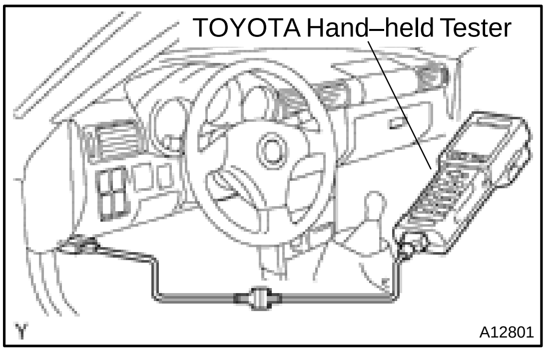


B06544

4. INSPECT EVAP SYSTEM LINE

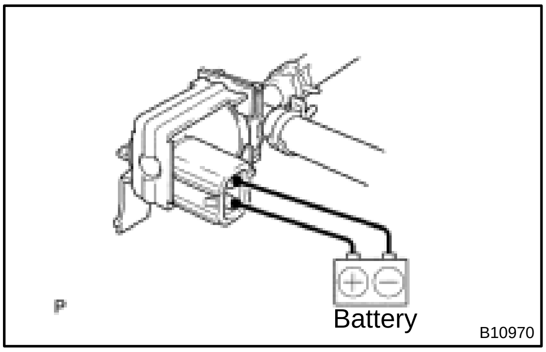
(a) Warm up the engine and stop the engine.
Allow the engine to warm up to normal operating temperature.

(b) Install a vacuum gauge (EVAP control system test equipment vacuum gauge) to the EVAP service port on the purge line.



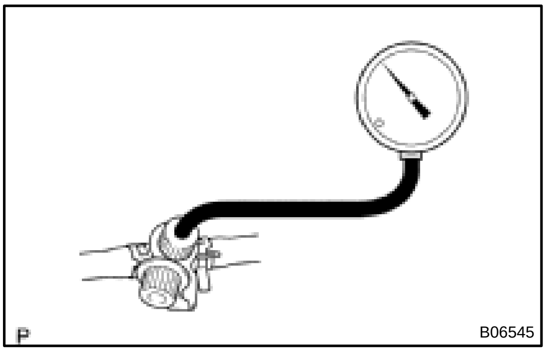
A12801

(c) When using the TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Connect a TOYOTA hand–held tester to the DLC3.
(2) Start the engine.
(3) Push the TOYOTA hand–held tester main switch ON.
(4) Use the ACTIVE TEST mode on the TOYOTA hand–held tester to operate the VSV for the EVAP.



B10970

(d) When not using the TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Disconnect the VSV connector for the EVAP.
(2) Connect the positive (+) and negative (–) leads from the battery to the VSV terminals for the EVAP.
(3) Start the engine.



(e) Check the vacuum at idle.
Vacuum:
Maintain at 0.368 – 3.678 in.Hg (5 – 50 in.Aq) for over 5 seconds

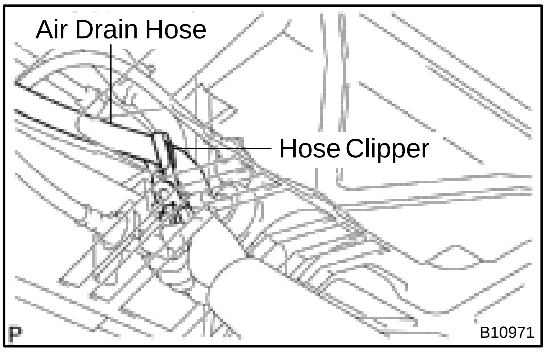
HINT:
If the vacuum does not change, it can be concluded that the hose connecting the VSV to the service port has come loose or is blocked, or the VSV is malfunctioning.

(f) When using the TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Stop the engine.
(2) Disconnect the TOYOTA hand–held tester from the DLC3.

(g) When not using the TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Stop the engine.
(2) Disconnect the positive (+) and negative (–) leads from the battery, and from the VSV terminals for the EVAP.
(3) Connect the VSV connector for the EVAP.

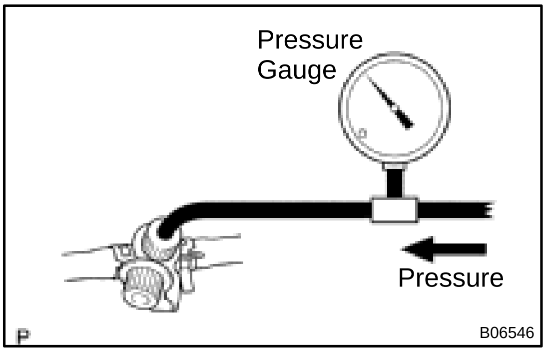
(h) Disconnect the vacuum gauge from the EVAP service port on the purge line.

(i) Connect a pressure gauge to the EVAP service port on the purge line.



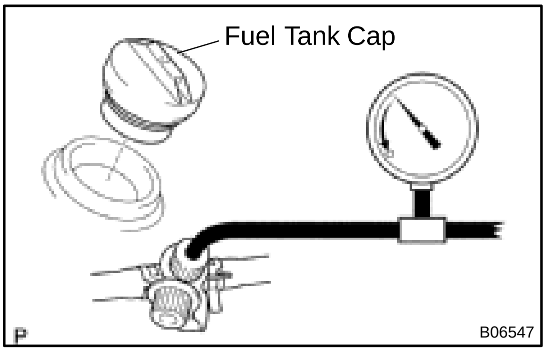
(j) Check the pressure.
(1) Close off the air drain hose at the marked position of the canister with a hose clipper or similar instrument.

HINT:
Insert the hose clipper through the clearance of the front engine under cover and pinch the white marked portion of the air drain hose.



(2) Increase the pressure (13.5 – 15.5 in.Aq) from the EVAP service port.
Pressure:
2 minutes after the pressure is increased, the gauge should be over 7.7 – 8.8 in.Aq.

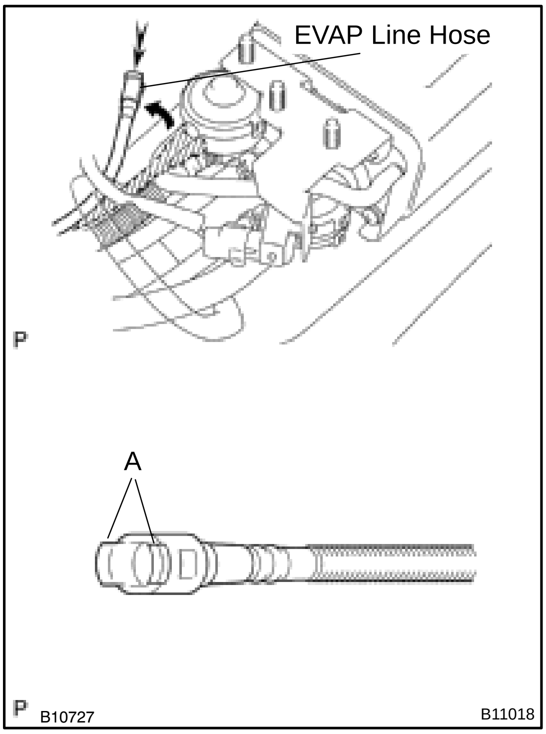
HINT:
If more pressure can not be applied, you can concluded that the hose connecting the VSV – canister – fuel tank has slipped off or the VSV is open.



(3) Check if the pressure decreases when the fuel tank cap is removed while increasing pressure.

HINT:
If the pressure does not decrease when the filler cap is removed, then it can be concluded that the hose connecting the service port to the fuel tank is blocked, etc.

(k) Disconnect the pressure gauge from the EVAP service port on the purge line.



5. CHECK AIRTIGHTNESS IN FUEL TANK AND FILLER PIPE

(a) Disconnect the EVAP line hose from the charcoal canister.
   (1) Pinch portion A.
   (2) Pull out the connector.

(b) Pressurize the internal fuel tank at 4 kPa (41 gf/cm^2, 0.58 psi).

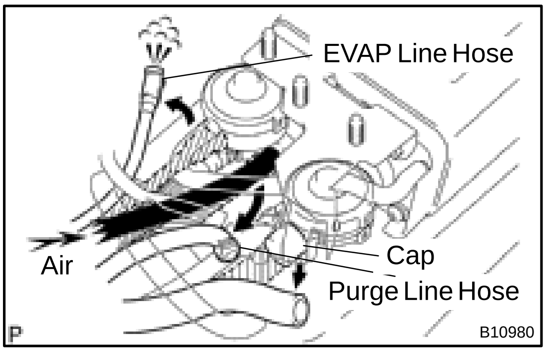
(c) Check that the internal pressure of the fuel tank can be maintained for 1 minute.

(d) Check the connected portions of each hose and pipe.

(e) Check the installed parts on the fuel tank.

If there is no abnormality, replace the fuel tank and filler pipe.

(f) Reconnect the EVAP line hose to the charcoal canister.



6. INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE

(a) Disconnect the purge line hose and EVAP line hose from the charcoal canister.

(b) Disconnect the drain hose from the charcoal canister and plug the cap to the drain port.

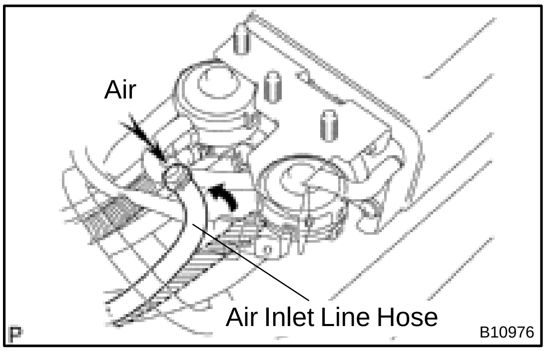
(c) Pressurize the purge port at 4 kPa (41 gf/cm^2, 0.58 psi) and check that it is ventilated through the EVAP line hose.

HINT:
In the condition that the fuel is full, as the float valve of the fill check valve is closed and has no ventilation, it is necessary to check the fuel amount (volume).

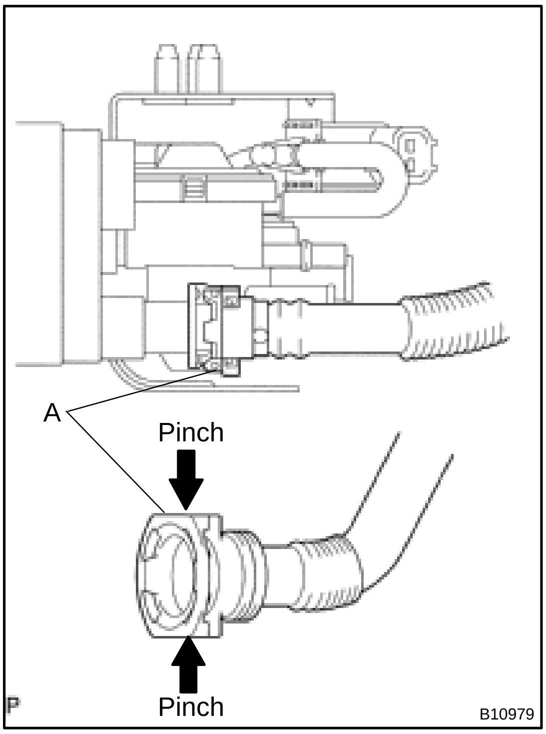
(d) Check if there is anything stuck in the vent line hose and EVAP line hose.

If there is nothing stuck in them, replace the fuel cutoff valve and fill check valve.

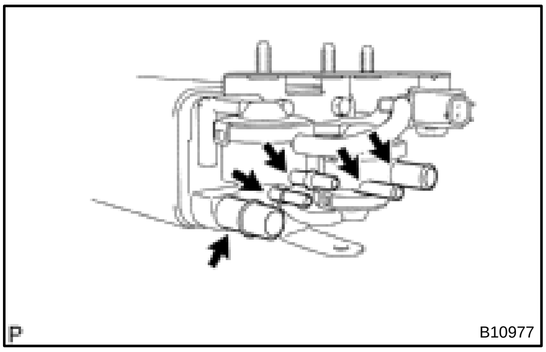
(e) Reconnect the purge line hose and EVAP line hose to the charcoal canister.



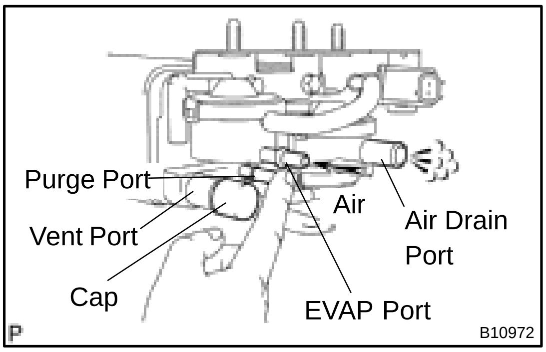
7. **CHECK AIR INLET LINE**
(a) Disconnect the air inlet line hose from the charcoal canister.
(b) Check that there is ventilation in the air inlet line.
(c) Reconnect the air inlet line hose to the charcoal canister.



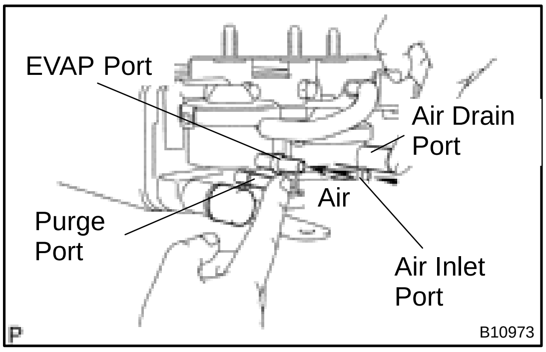
8. **REMOVE CHARCOAL CANISTER ASSEMBLY**
(a) Disconnect the VSV connector.
(b) Disconnect the purge line hose, EVAP line hose and air inlet line hose from the charcoal canister.
(c) Disconnect the vent line hose from charcoal canister.
 (1) Push the connector deep inside.
 (2) Pinch portion A.
 (3) Pull out the connector.
(d) Remove the 3 nuts and charcoal canister assembly.



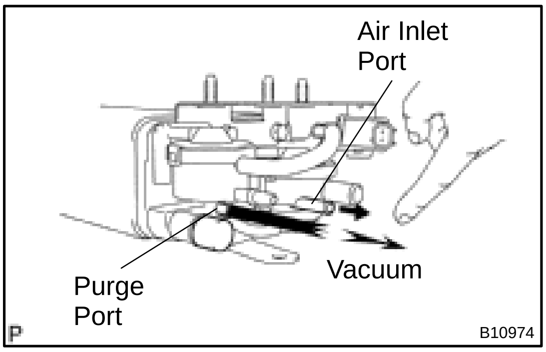
9. **INSPECT CHARCOAL CANISTER**
(a) Visually check the charcoal canister for cracks or damage.



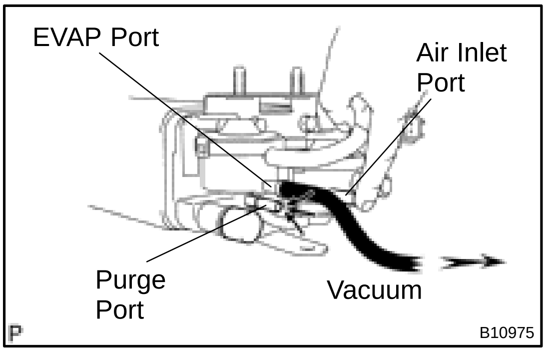
(b) Inspect the charcoal canister operation.
 (1) Plug the vent port with a cap.
 (2) While holding the purge port closed, blow air (1.76 kPa, 18 gf/cm^2, 0.26 psi) into the EVAP port and check that air flows from the air drain port.



(3) While holding the purge port with the air drain port closed, blow air (1.76 kPa, 18 gf/cm^2, 0.26 psi) into the EVAP port and check that air does not flow from the air inlet port.



(4) Apply vacuum (3.43 kPa, 25.7 mmHg, 1.01 in.Hg) to the purge port, check that the vacuum does not decrease when the air inlet port is closed, and check that the vacuum decreases when the air inlet port is released.



(5) With the air inlet port closed, apply vacuum (3.43 kPa, 25.7 mmHg, 1.01 in.Hg) to the EVAP port and check that air flows into the purge port.

If a problem is found, replace the charcoal canister.

(6) Remove the cap from the vent port.

10. INSPECT VSV FOR EVAP (See page SF–49)

11. INSPECT VSV FOR CANISTER CLOSED VALVE (CCV) (See page SF–51)

12. INSPECT VSV FOR PRESSURE SWITCHING VALVE (See page SF–53)

13. INSPECT VAPOR PRESSURE SENSOR (See page SF–57)

14. REINSTALL CHARCOAL CANISTER ASSEMBLY

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EC03H–04

ON–VEHICLE INSPECTION

1. INSPECT EXHAUST PIPE ASSEMBLY

(a) Check the connections for looseness or damage.

(b) Check the clamps for wear, cracks or damage.

2. INSPECT TWC

Check for dents or damage.

If any part of the protector is damaged or dented to the extent that it contacts the TWC, repair or replace it.

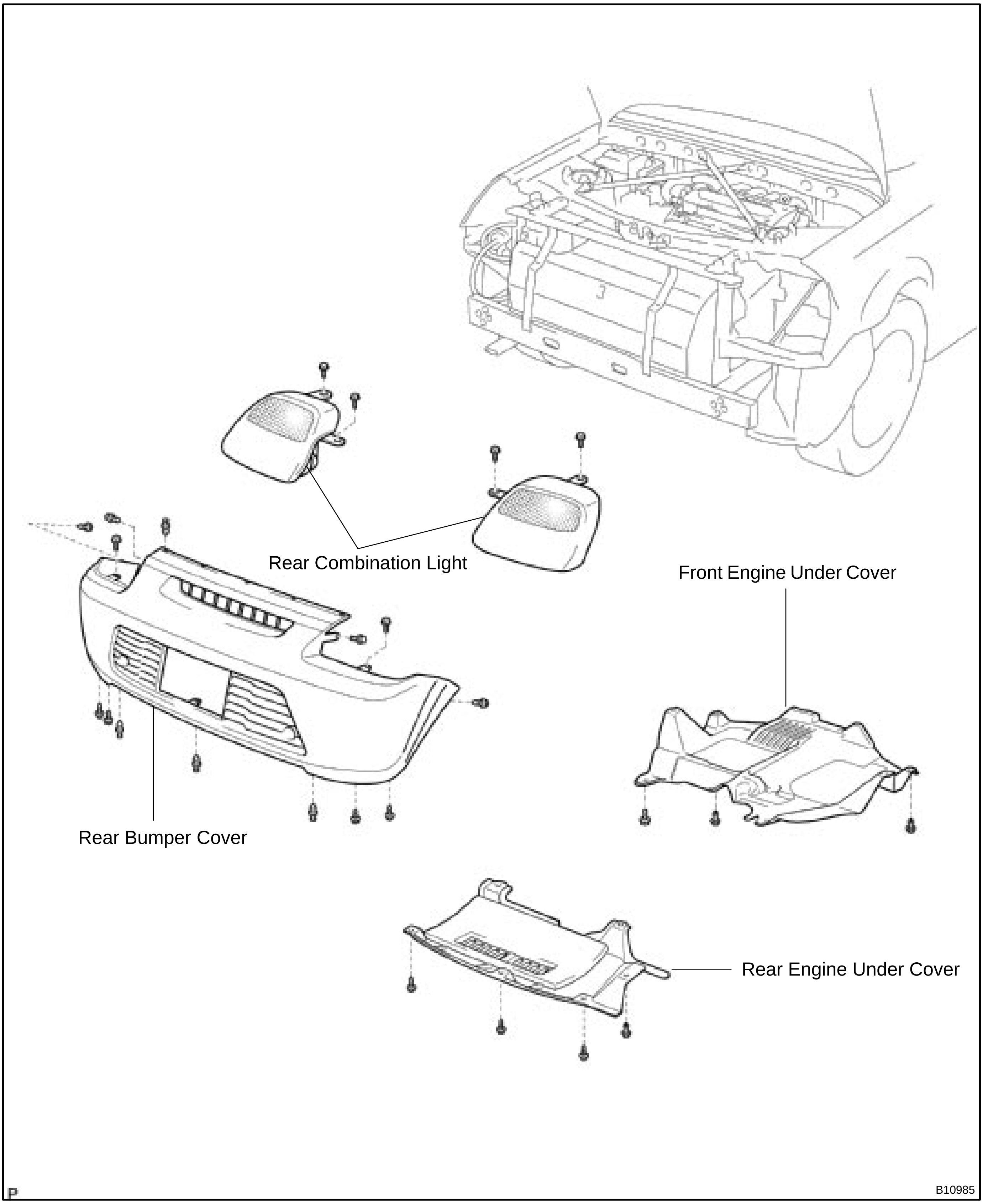
3. INSPECT HEAT INSULATOR

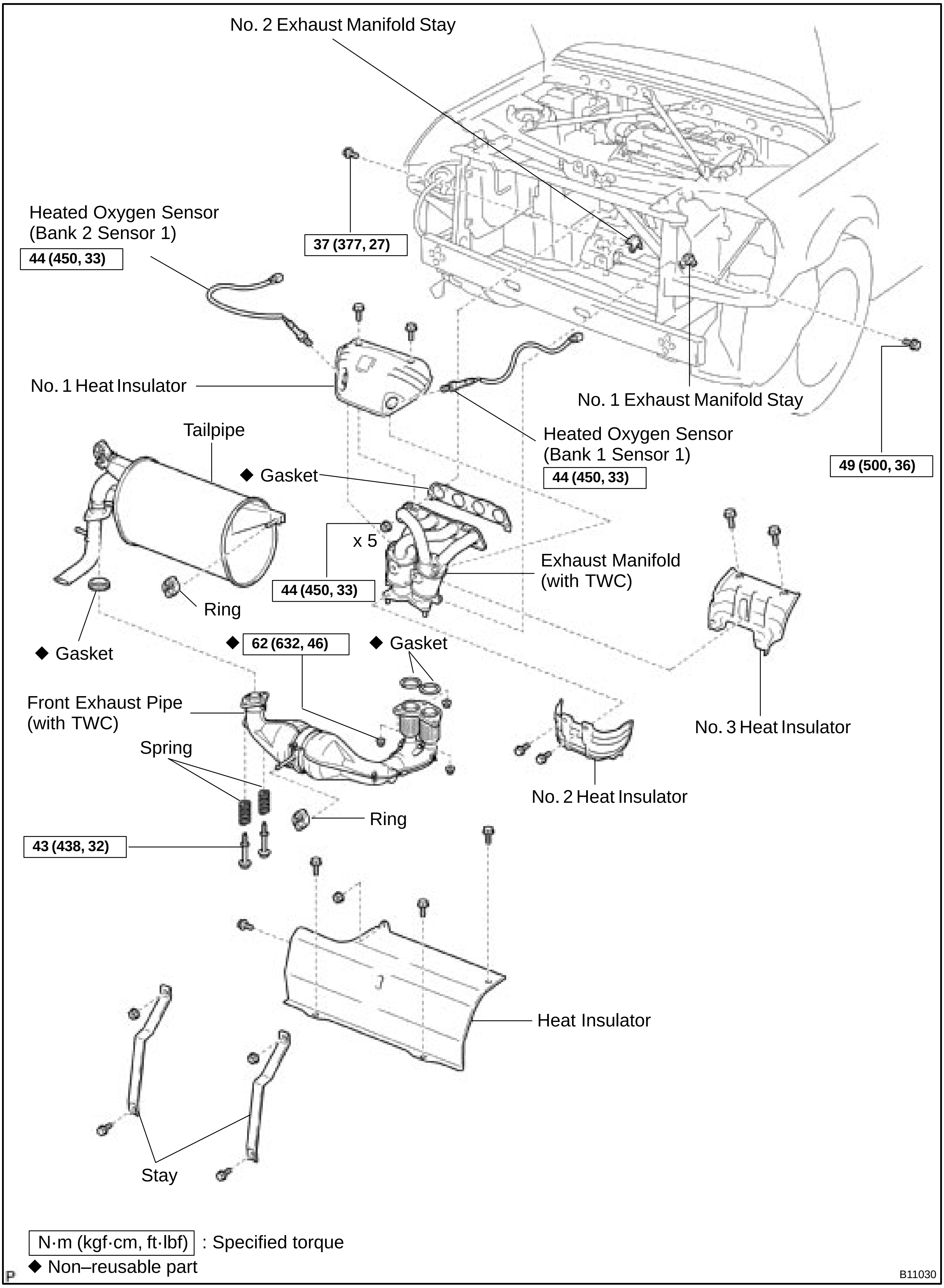
(a) Check the heat insulator for damage.

(b) Check for adequate clearance between the catalytic converter and heat insulator.

EC0ET–01

COMPONENTS





No. 2 Exhaust Manifold Stay
37 (377, 27)
Heated Oxygen Sensor (Bank 2 Sensor 1)
44 (450, 33)
No. 1 Heat Insulator
No. 1 Exhaust Manifold Stay
Heated Oxygen Sensor (Bank 1 Sensor 1)
44 (450, 33)
49 (500, 36)
Tailpipe
◆ Gasket
x 5
44 (450, 33)
Exhaust Manifold (with TWC)
Ring
◆ Gasket
◆ 62 (632, 46)
◆ Gasket
No. 3 Heat Insulator
Front Exhaust Pipe (with TWC)
Spring
No. 2 Heat Insulator
Ring
43 (438, 32)
Heat Insulator
Stay
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
B11030

SFI SYSTEM

SF19B–01

PRECAUTION

HINT:

- Any diagnostic trouble code retained by the ECM will be erased when the negative (–) terminal cable is removed from the battery.
- Therefore, if necessary, read the diagnosis before removing the negative (–) terminal cable from the battery.

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

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

3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS

4. MAINTENANCE PRECAUTIONS

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

(b) Precautions when handling the heated oxygen sensors.
  (1) Do not drop the sensor or hit it against an object.
  (2) The sensor should be free from any contact with water.

5. IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

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

6. AIR INDUCTION SYSTEM

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

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

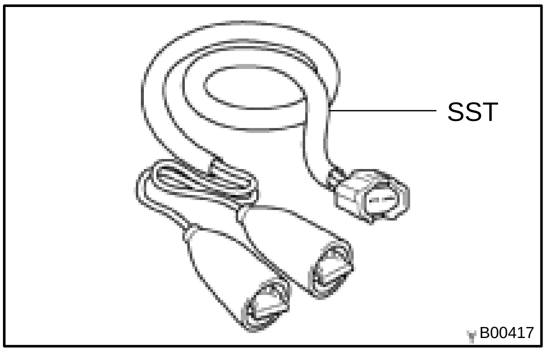
7. ELECTRONIC CONTROL SYSTEM

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

HINT:

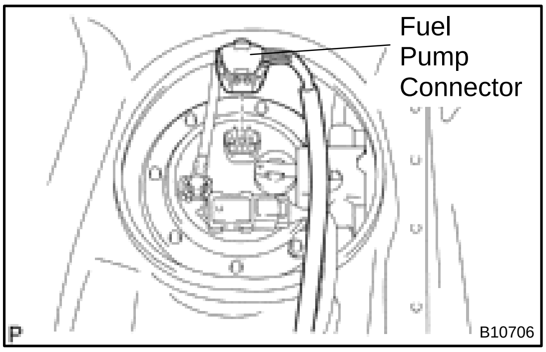
Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery.

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
(c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
(d) Be careful during troubleshooting as there are numerous transistor circuit, and even slight terminal contact can cause further troubles.
(e) Do not open the ECM cover.
(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
(g) Parts should be taken when pulling out and inserting wiring connectors.
(h) Care should be taken 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.



B00417

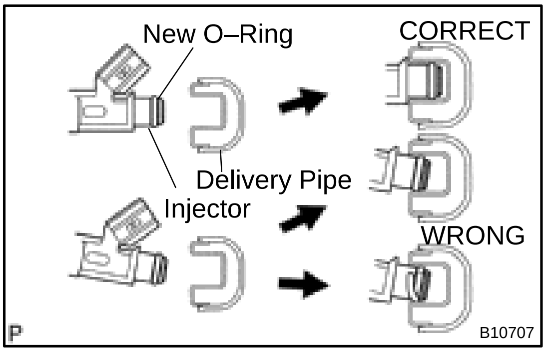
(i) Use SST for inspection or test of the injector or its wiring connector.
SST 09842–30080



B10706

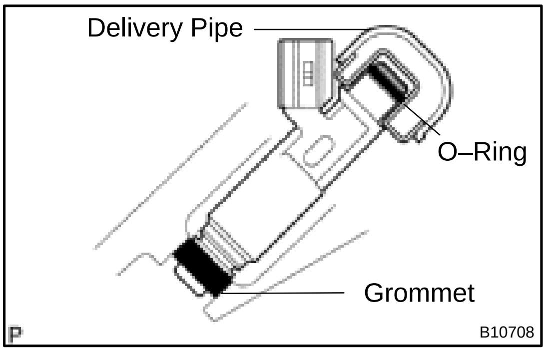
8. FUEL SYSTEM

(a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe these procedures.
  (1) Disconnect the fuel pump connector.
  (2) Start the engine. After the engine has stopped on its own, turn the ignition switch OFF.
  (3) Put a container under the connection.
  (4) Reconnect the fuel pump connector.

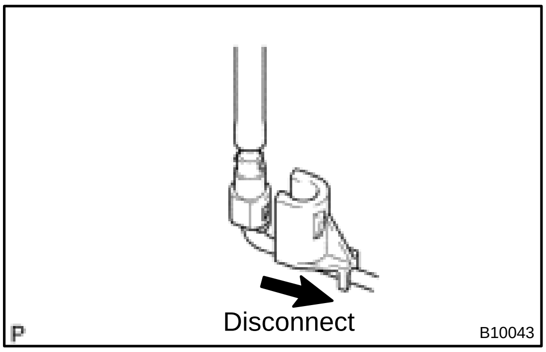


B10707

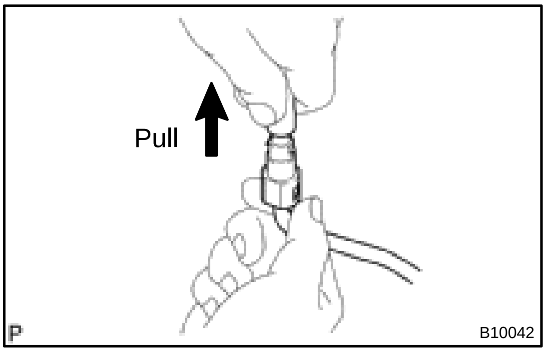
(b) Observe these precautions when removing and installing the injector.
  (1) Never reuse the O–ring.
  (2) When placing a new O–ring on the injector, take care not to damage it in any way.
  (3) Coat a new O–ring with spindle oil or gasoline before installing and never use engine, gear or brake oil.



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

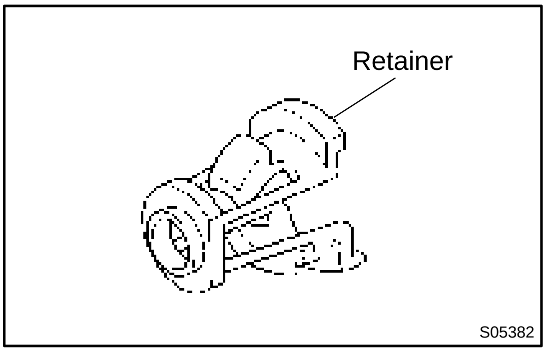


(d) Observe these precautions when disconnecting the fuel tube connector (quick type):
   (1) Disconnect the fuel pipe clamp from the connector.
   (2) Check if there is any dirt like mud on the pipe and around the connector before disconnecting them and clean the dirt away.

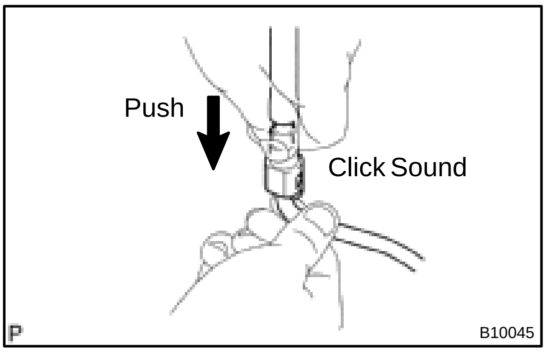


   (3) Be sure to disconnect with hands.
   (4) When the connector and the pipe are stuck, pinch the retainer between the hands, push and pull the connector to free the connection and pull it out. Do not use any tool at this time.
   (5) Inspect if there is any dirt or the likes on the seal surface of the disconnected pipe and clean it away.
   (6) Prevent the disconnected pipe and connector from being damaged and mixing in of foreign objects by covering them with a vinyl bag.

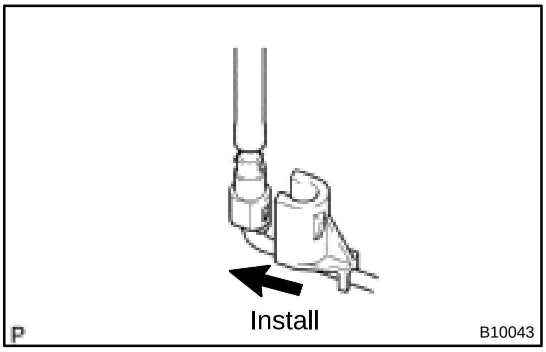
(e) Observe these precautions when connecting the fuel tube connector (quick type):



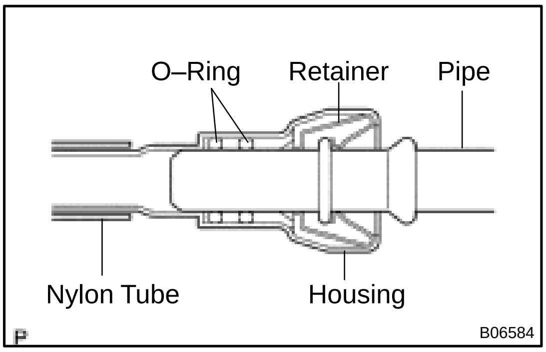
   (1) Do not reuse the retainer removed from the pipe.
   (2) Remove the retainer from the pipe with hands. Do not use tools.
   (3) Check if there is any damage or foreign objects on the connected part of the pipe.



   (4) Match the axis of the connector with axis of the pipe, and push in the connector until the retainer makes a ”click” sound. In case that the connections is tight, apply little amount of new engine oil on the tip of the pipe.
   (5) After having finished the connection, check if the pipe and the connector are securely connected by pulling them.



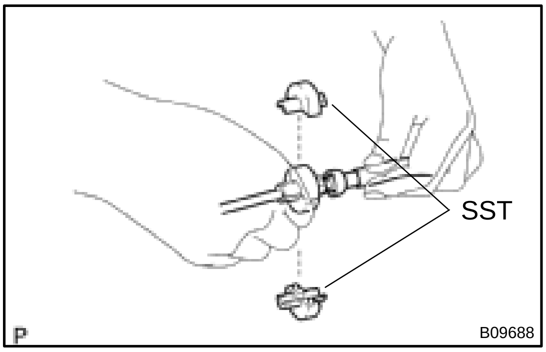
(6) Install the fuel pipe clamp to the connector.
(7) Check if there is any fuel leakage.



(f) Observe these precautions when disconnecting the fuel tube connector (metallic type):

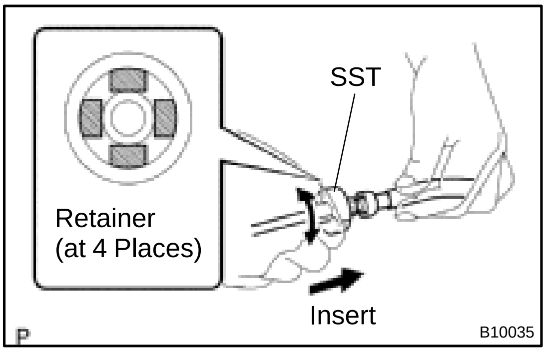
HINT:
The structure of the metallic connector is shown as left.

(1) Check that there is any dirt like mud in the pipe and around the connector before disconnecting them and clean the dirt away.

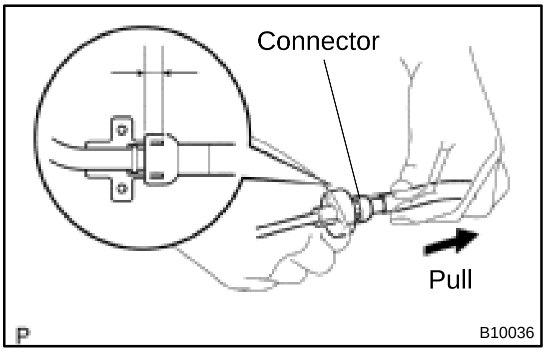


(2) Assemble SST to the connection as shown in the illustration.

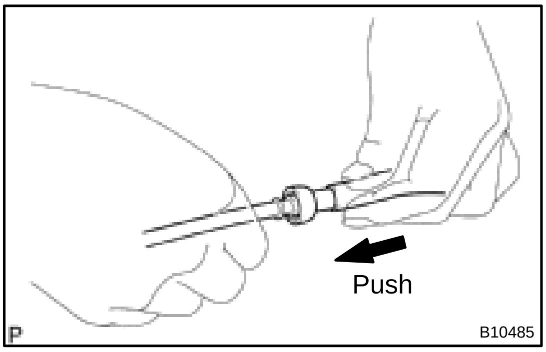
SST 09268–21010



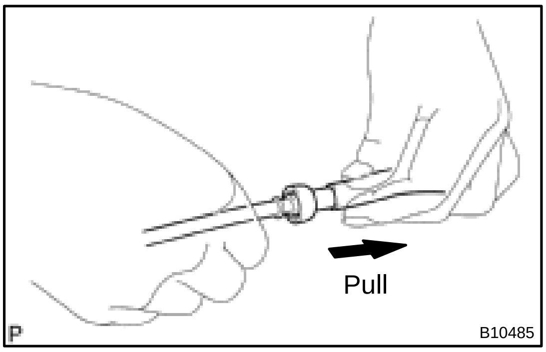
(3) Turn SST, align the retainers inside the connector with SST chamfered parts and insert SST into the connector.



(4) While holding SST, pull the connector towards SST to put the retainers on SST chamfered parts.
(5) Slide SST and the connector together towards the fuel tube assembly.

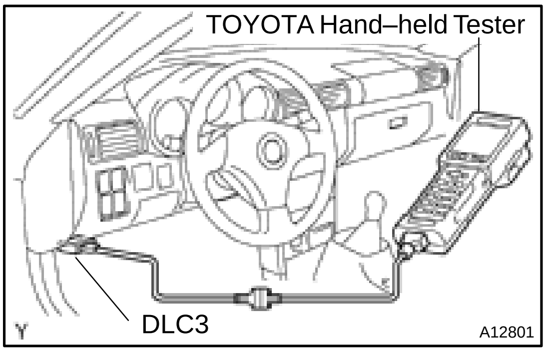


(g) Observe these precautions when connecting the fuel tube connector (metallic type):
  (1) Check that there is any damage or foreign objects in the connected part of the pipe.
  (2) Match the axis of the connector with axis of the pipe, and push in the connector until the connector makes a ”click” sound. In case that the connections is tight, apply little amount of fresh engine oil on the tip of the pipe.



  (3) After having finished the connection, check if the pipe and the connector are securely connected by pulling them.
  (4) Check that there is any fuel leakage.

(h) Observe these precautions when handling nylon tube:
  (1) Pay attention not to turn the connected part of the nylon tube and the quick connector with force when connecting them.
  (2) Pay attention not to kink the nylon tube.
  (3) Do not remove the nylon tube.
  (4) Must not close the piping with the nylon tube by bending it.



(i) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
  (1) Connect a TOYOTA hand–held tester to the DLC3.
    - Connect the TOYOTA hand–held tester to the DLC3.
    - Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
    - Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

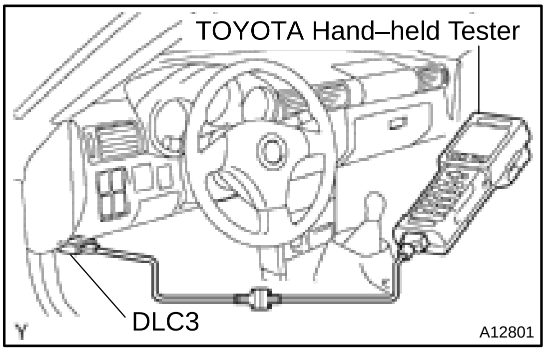
NOTICE:
Do not start the engine.

    - Please refer to the TOYOTA hand–held tester operator’s manual for further details.

If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–7).

  (2) Check that there are no leaks from any part of the fuel system.
  (3) Turn the ignition switch OFF.

(4) Disconnect the TOYOTA hand–held tester from the DLC3.



FUEL PUMP

SF19C–01

ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

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

(1) Connect the TOYOTA hand–held tester to the DLC3.

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

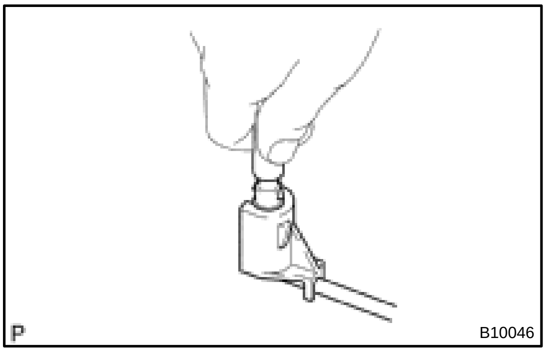
NOTICE:

Do not start the engine.

(3) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

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

If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See step 3).



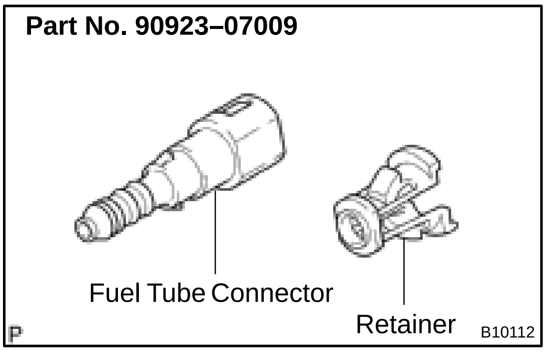
(b) Check that there is pressure in the fuel inlet tube from the fuel line.

HINT:

If there is fuel pressure, you will hear the sound if fuel flowing. If there is no pressure, check the fusible link, fuses, EFI Main relay, fuel pump, ECM and wiring connector.

(c) Turn the ignition switch OFF.

(d) Disconnect the TOYOTA hand–held tester from the DLC3.

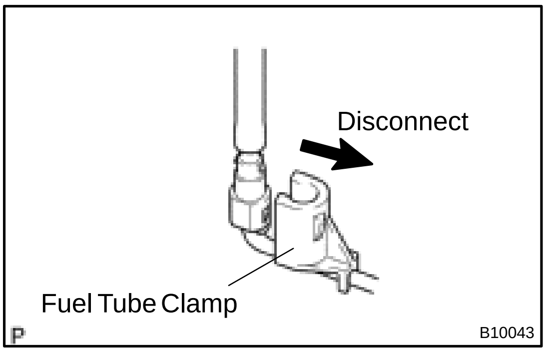


2. CHECK FUEL PRESSURE

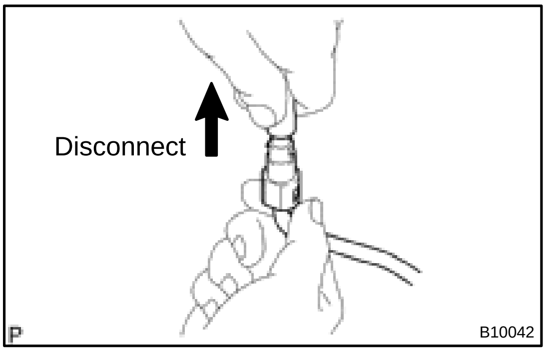
(a) Check the battery positive voltage is above 12 V.

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

(c) Purchase a new fuel tube connector.
Part No. 90923–07009



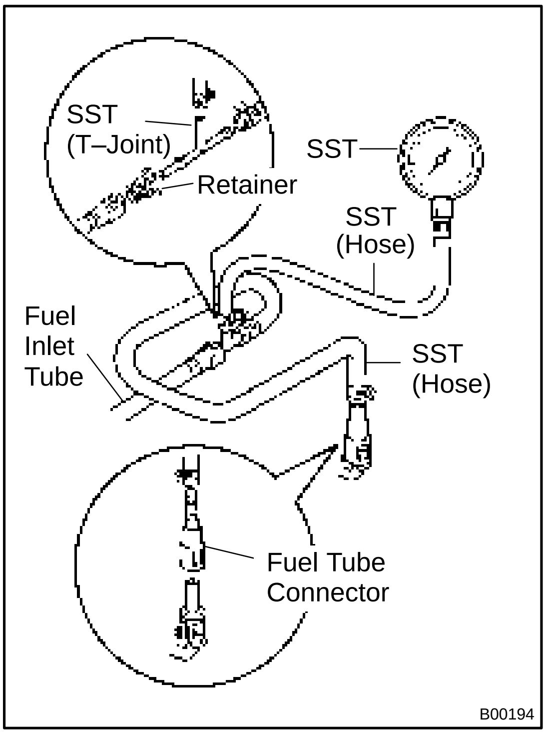
(d) Disconnect the fuel tube clamp from the fuel tube connector.



(e) Disconnect the fuel inlet tube (fuel tube connector) from the fuel pipe.

CAUTION:

- **Disconnect the fuel tube connector (quick type) observing the precaution (See page SF–1).**
- **As there is retained pressure in the fuel line, prevent if from splashing inside the engine compartment.**



(f) Install SST (pressure gauge) as shown in the illustration by using SST and fuel tube connector.
SST 09268–41047, 09268–45014 (09268–41250)

(g) Wipe off any splattered gasoline.

(h) Reconnect the negative (–) terminal cable to the battery.

(i) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3 (See step 1).

(j) Measure the fuel pressure.

Fuel pressure:

301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the fuel hoses and connections, fuel pump, fuel filter and fuel pressure regulator.

(k) Disconnect the TOYOTA hand–held tester or OBDII scan tool from the DLC3.

(l) Start the engine.

(m) Measure the fuel pressure at idle.

Fuel pressure:

301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)

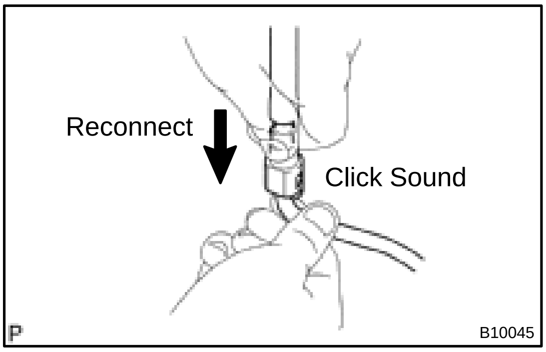
(n) Stop the engine.

(o) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

Fuel pressure: 147 kPa (1.5 kgf/cm^2, 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.

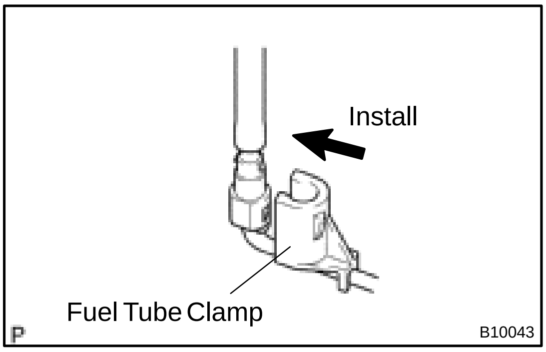
(p) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully, remove the SST and fuel tube connector to prevent gasoline from splashing.
SST 09268–41047, 09268–45014



(q) Reconnect the fuel inlet tube (fuel tube connector).

CAUTION:

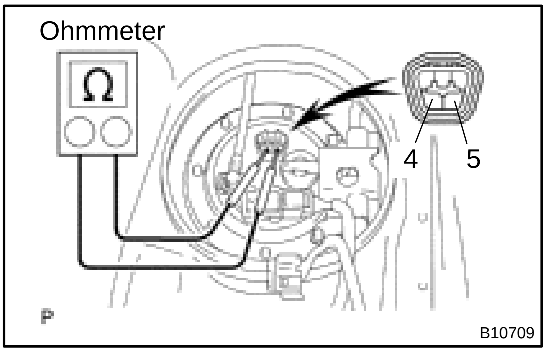
Connect the fuel tube connector (quick type) observing the precaution (See page SF–1).



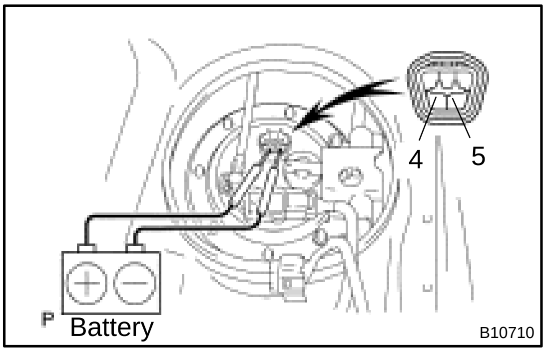
(r) Install the fuel tube clamp to the fuel tube connector.
(s) Reconnect the negative (–) terminal cable to the battery.
(t) Check for fuel leaks (See page SF–1).

3. INSPECT FUEL PUMP

(a) Remove the luggage compartment.
(b) Remove the floor service hole cover.
(c) Disconnect the fuel pump & sender gauge connector.



(d) Using an ohmmeter, measure the resistance between terminals 4 and 5.
Resistance: 0.2 – 3.0 Ω at 20°C (68°F)
If the resistance is not as specified, replace the fuel pump.



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

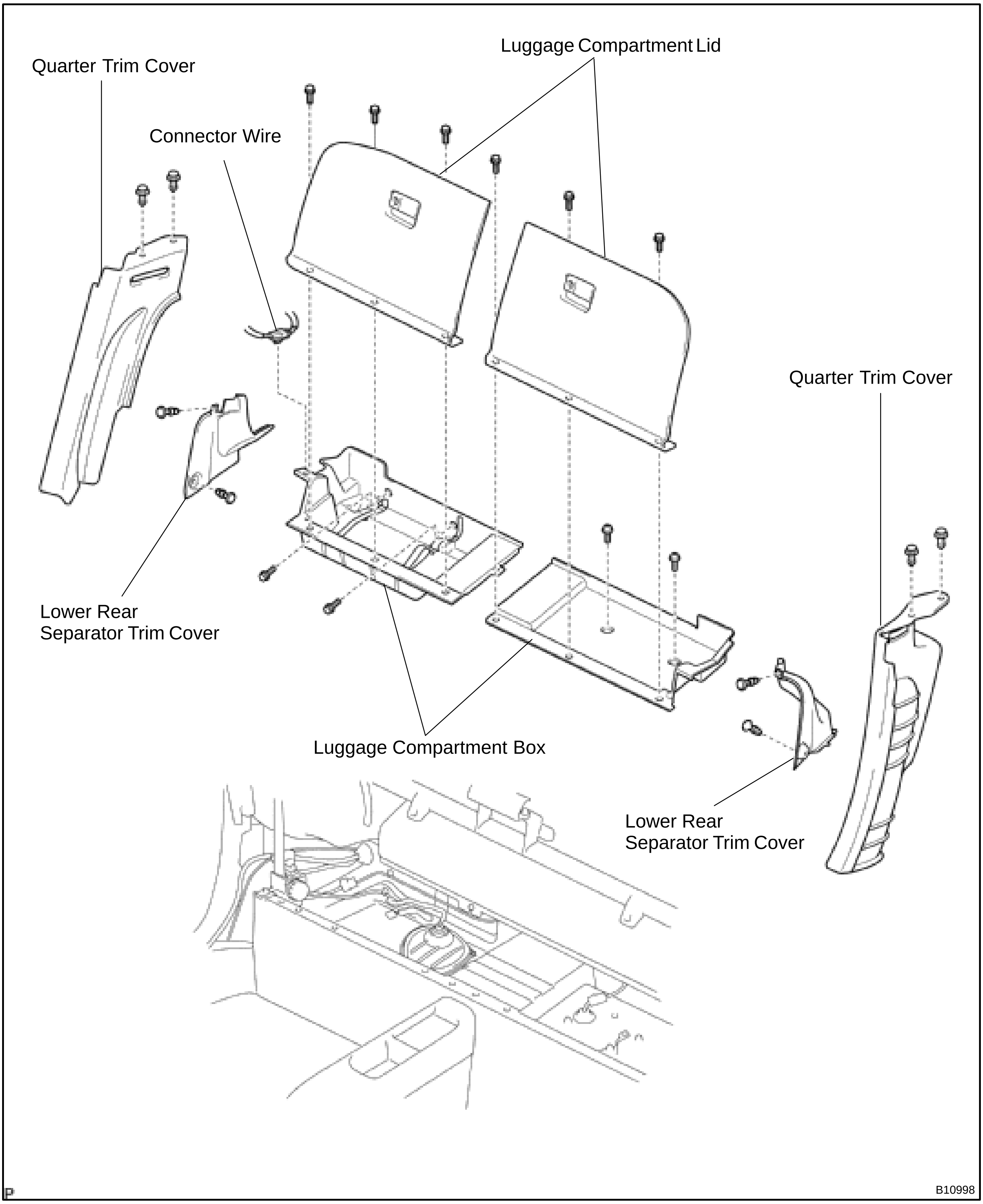
NOTICE:

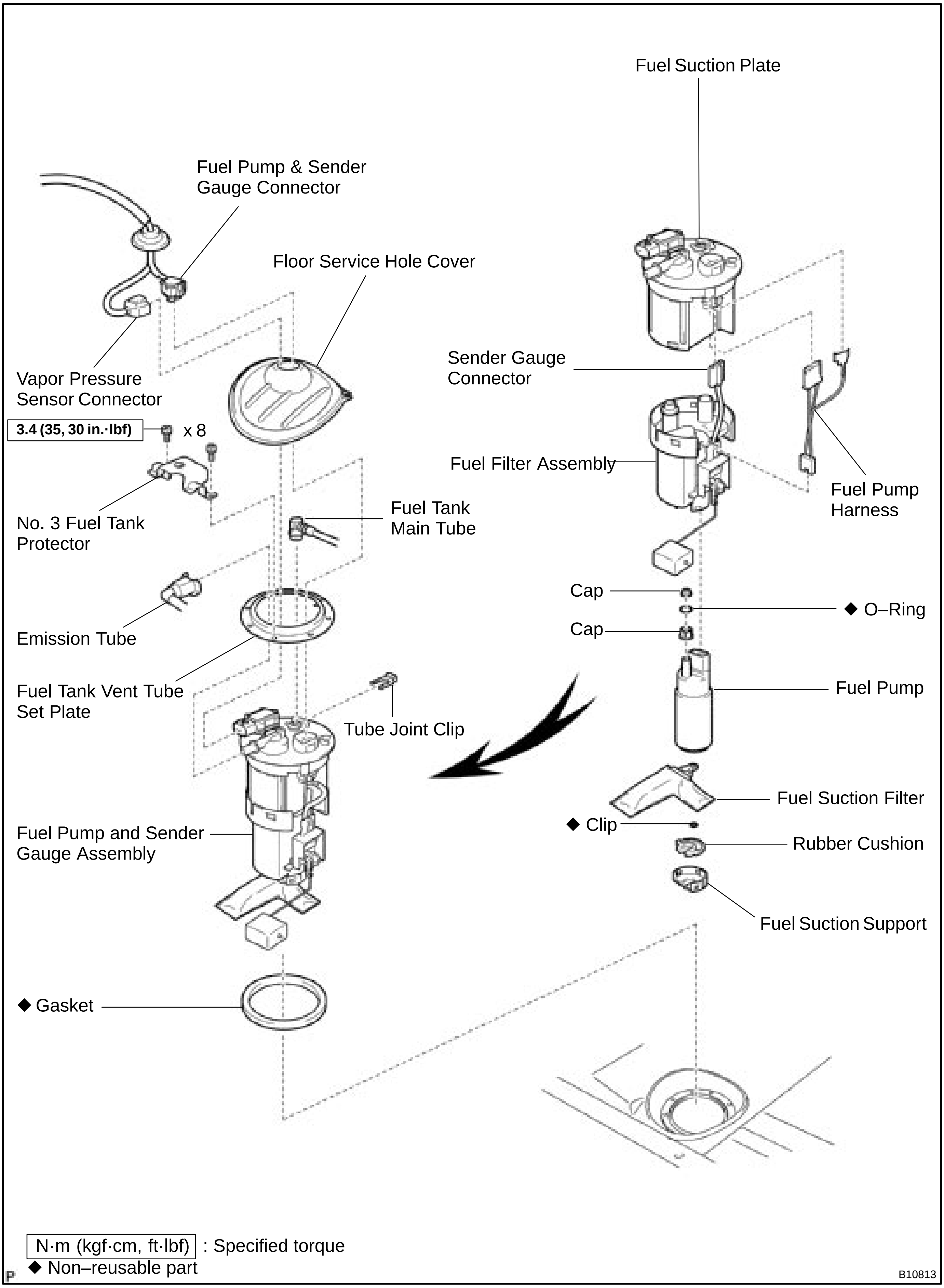
- **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

If operation is not as specified, replace the fuel pump.
(f) Reconnect the fuel pump & sender gauge connector.
(g) Reinstall the floor service hole cover.
(h) Reinstall the luggage compartment.

SF19D–01

COMPONENTS




Fuel Suction Plate
Fuel Pump & Sender Gauge Connector
Floor Service Hole Cover
Vapor Pressure Sensor Connector
3.4 (35, 30 in.·lbf)
x 8
Sender Gauge Connector
Fuel Filter Assembly
No. 3 Fuel Tank Protector
Fuel Tank Main Tube
Fuel Pump Harness
Cap
◆ O–Ring
Emission Tube
Cap
Fuel Pump
Fuel Tank Vent Tube Set Plate
Tube Joint Clip
Fuel Suction Filter
◆ Clip
Rubber Cushion
Fuel Pump and Sender Gauge Assembly
Fuel Suction Support
◆ Gasket
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
B10813

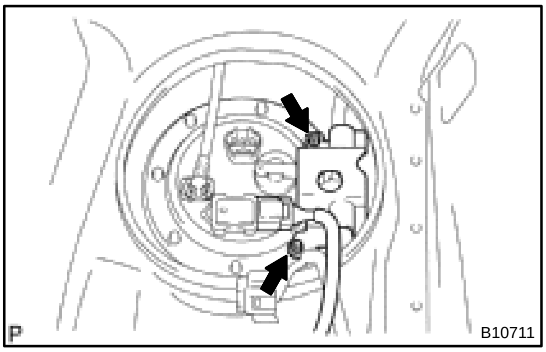
SF19E–01

REMOVAL

CAUTION:

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

1. **REMOVE LUGGAGE COMPARTMENT BOX (See page BO–72)**
2. **REMOVE FLOOR SERVICE HOLE COVER**
3. **DISCONNECT FUEL PUMP & SENDER GAUGE CONNECTOR**

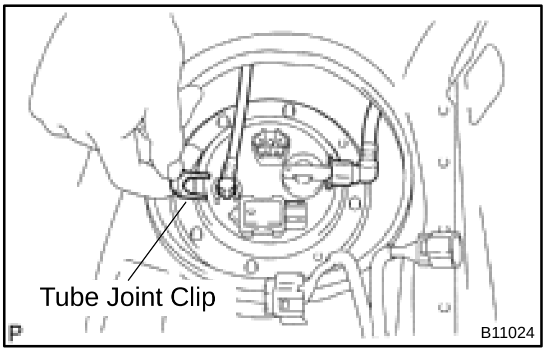


B10711

4. **DISCONNECT VAPOR PRESSURE SENSOR CONNECTOR**

(a) Remove the 2 bolts and No. 3 fuel tank protector.

(b) Disconnect the sensor connector.



B11024

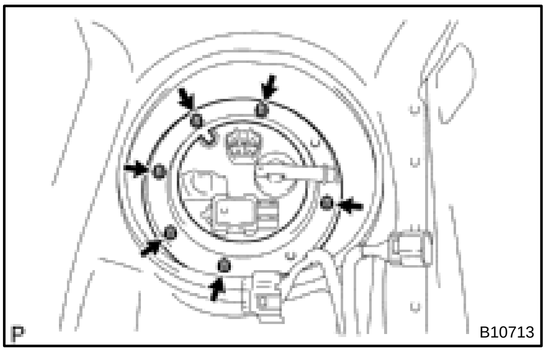
5. **DISCONNECT FUEL TANK MAIN TUBE AND EMISSION TUBE**

CAUTION:

- **Disconnect the fuel tube connector (quick type) observing the precaution (See page SF–1).**
- **As there is retained pressure in the fuel line, prevent if from splashing inside the luggage compartment.**

(a) Remove the tube joint clip and disconnect the main tube.

(b) Disconnect the emission tube.



B10713

6. **REMOVE FUEL PUMP AND SENDER GAUGE ASSEMBLY FROM FUEL TANK**

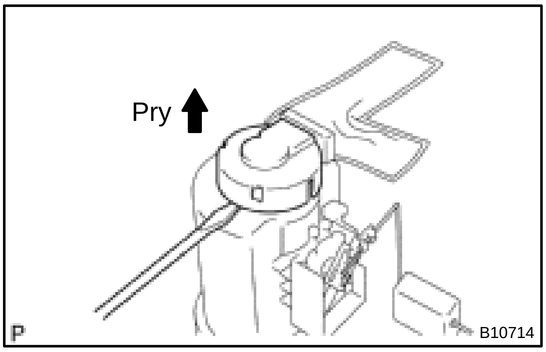
(a) Remove the 6 bolts and fuel tank vent tube set plate.

(b) Remove the fuel pump and sender gauge assembly.

NOTICE:

- **Do not damage the fuel suction filter.**
- **Be careful that the arm of the sender gauge should not bent.**

(c) Remove the gasket from the pump and sender gauge assembly.



B10714

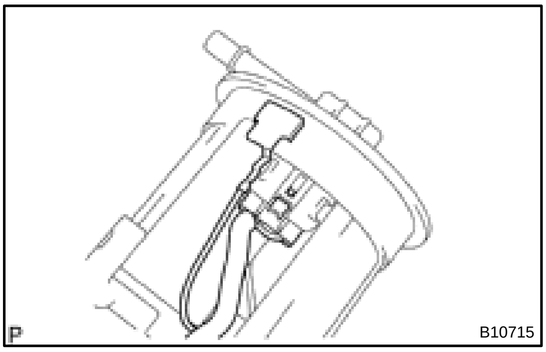
7. **REMOVE FUEL SUCTION SUPPORT**

(a) Using a screwdriver, pry out the fuel suction support.

NOTICE:

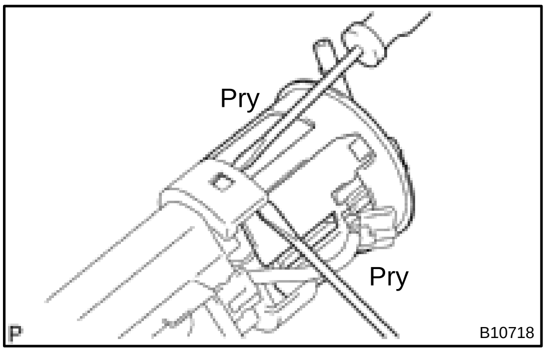
Be careful not to damage the suction support.

(b) Remove the rubber cushion.



8. REMOVE FUEL SUCTION PLATE

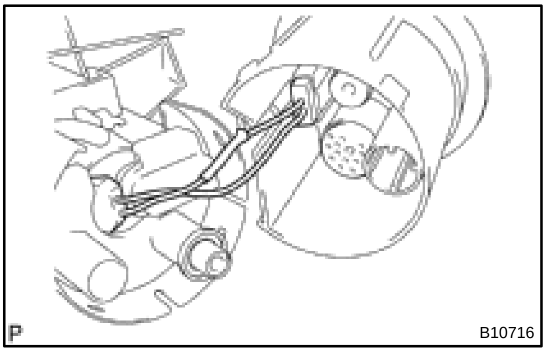
(a) Disconnect the fuel sender gauge connector and ground plate.



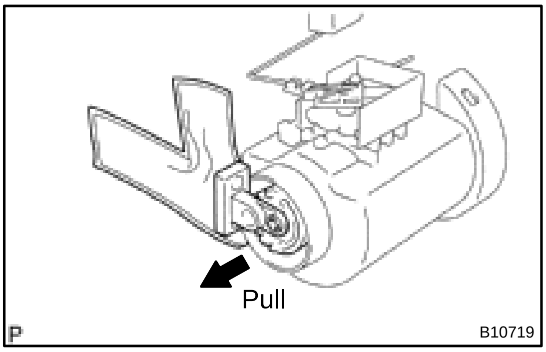
(b) Using 2 screwdrivers, pry out the fuel suction plate.

NOTICE:

Be careful not to damage the suction support and suction plate.

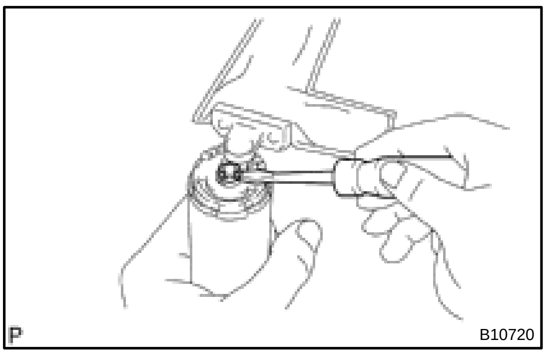


(c) Remove the fuel pump harness.



9. REMOVE FUEL PUMP

Pull out the fuel pump.



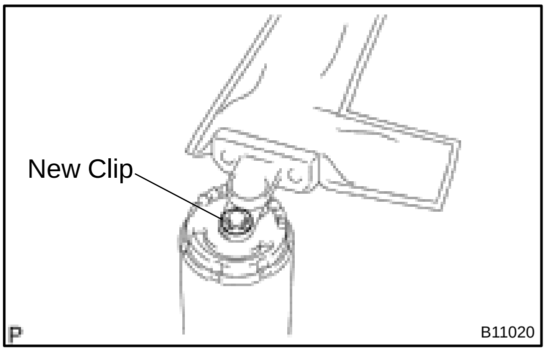
10. REMOVE FUEL SUCTION FILTER FROM FUEL PUMP

(a) Using a small screwdriver, pry out the clip.

(b) Pull out the suction filter.

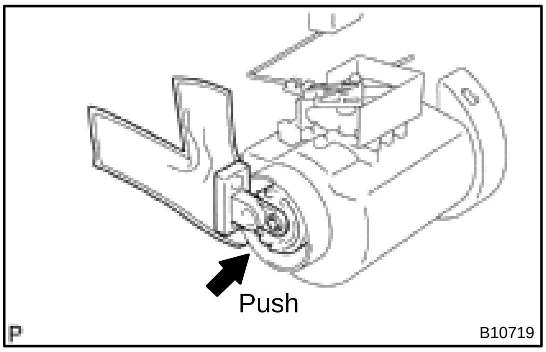
SF19F–01

INSTALLATION



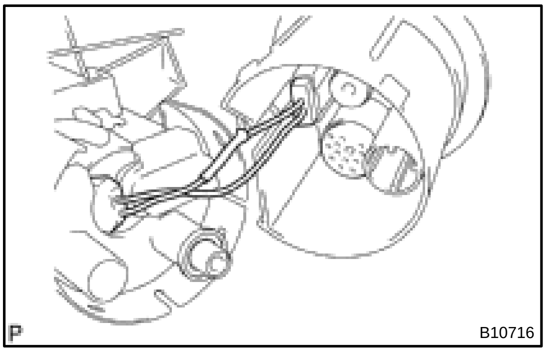
1. INSTALL FUEL SUCTION FILTER

Install the suction filter with a new clip.



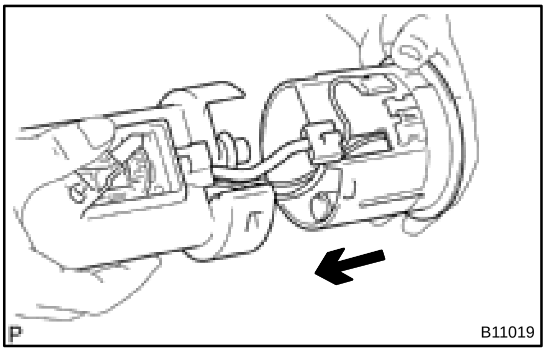
2. INSTALL FUEL PUMP

Push into the fuel pump.

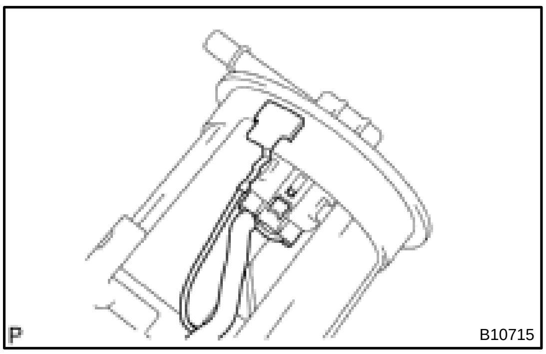


3. INSTALL FUEL SUCTION PLATE

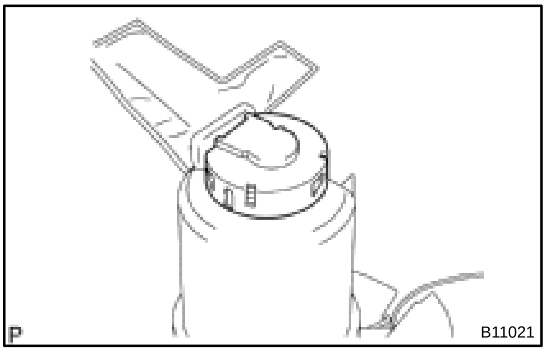
(a) Connect the fuel pump harness.



(b) Install the fuel suction plate to the fuel filter assembly.



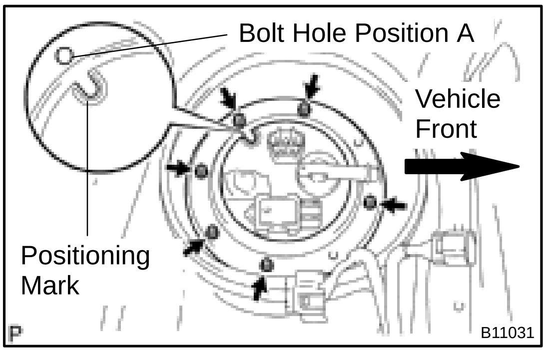
(c) Connect the fuel sender gauge connector and ground plate.



4. INSTALL FUEL SUCTION SUPPORT

(a) Install the rubber cushion.

(b) Install the fuel suction support to the fuel filter assembly.



5. INSTALL FUEL PUMP AND SENDER GAUGE ASSEMBLY TO FUEL TANK

(a) Install a new gasket to the fuel pump and sender gauge assembly.

(b) Insert the fuel pump assembly into the fuel tank.

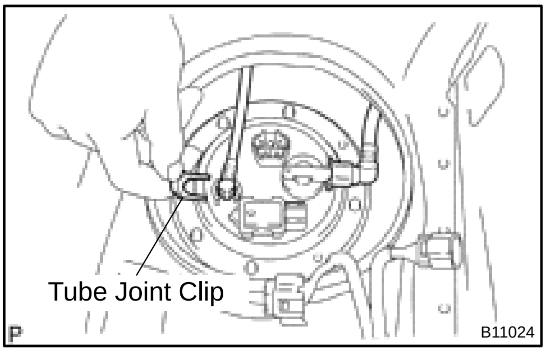
NOTICE:

- **Do not damage the fuel suction filter.**
- **Be careful that the arm of the sender gauge should not bent.**

(c) Align the positioning mark of the set plate with bolt hole position A.

(d) Install the fuel tank vent tube set plate with the 6 bolts.

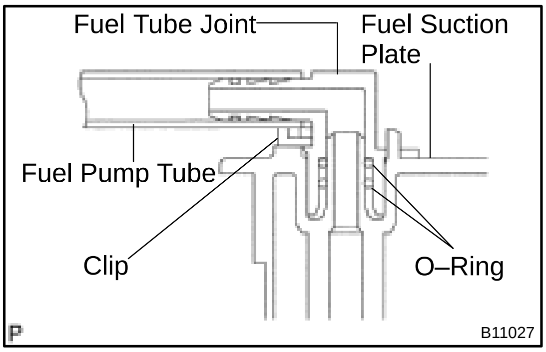
Torque: 3.4 N·m (35 kgf·cm, 30 in.·lbf)



6. CONNECT FUEL TANK MAIN TUBE AND EMISSION TUBE

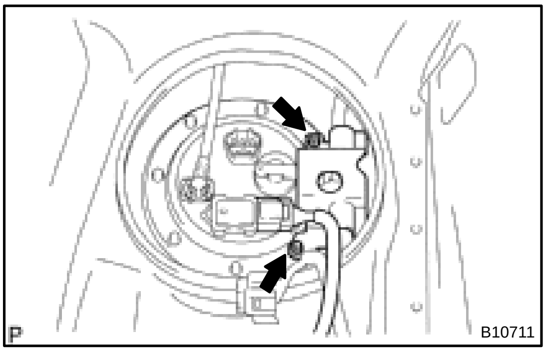
(a) Connect the main tube with the tube joint clip.

(b) Connect the emission tube to the fuel pump assembly.



NOTICE:

- **Check that the connector is inserted fully and securely.**
- **Check that the clip of the tube joint is on the collar of the connector.**
- **After the installation of the clip of the tube joint, check that the connector is not pulled off.**



7. CONNECT VAPOR PRESSURE SENSOR CONNECTOR

(a) Connect the sensor connector.

(b) Install the No. 3 fuel tank protector with the 2 bolts.

8. CONNECT FUEL PUMP & SENDER GAUGE CONNECTOR

9. CHECK FOR FUEL LEAKS (See page SF–1)

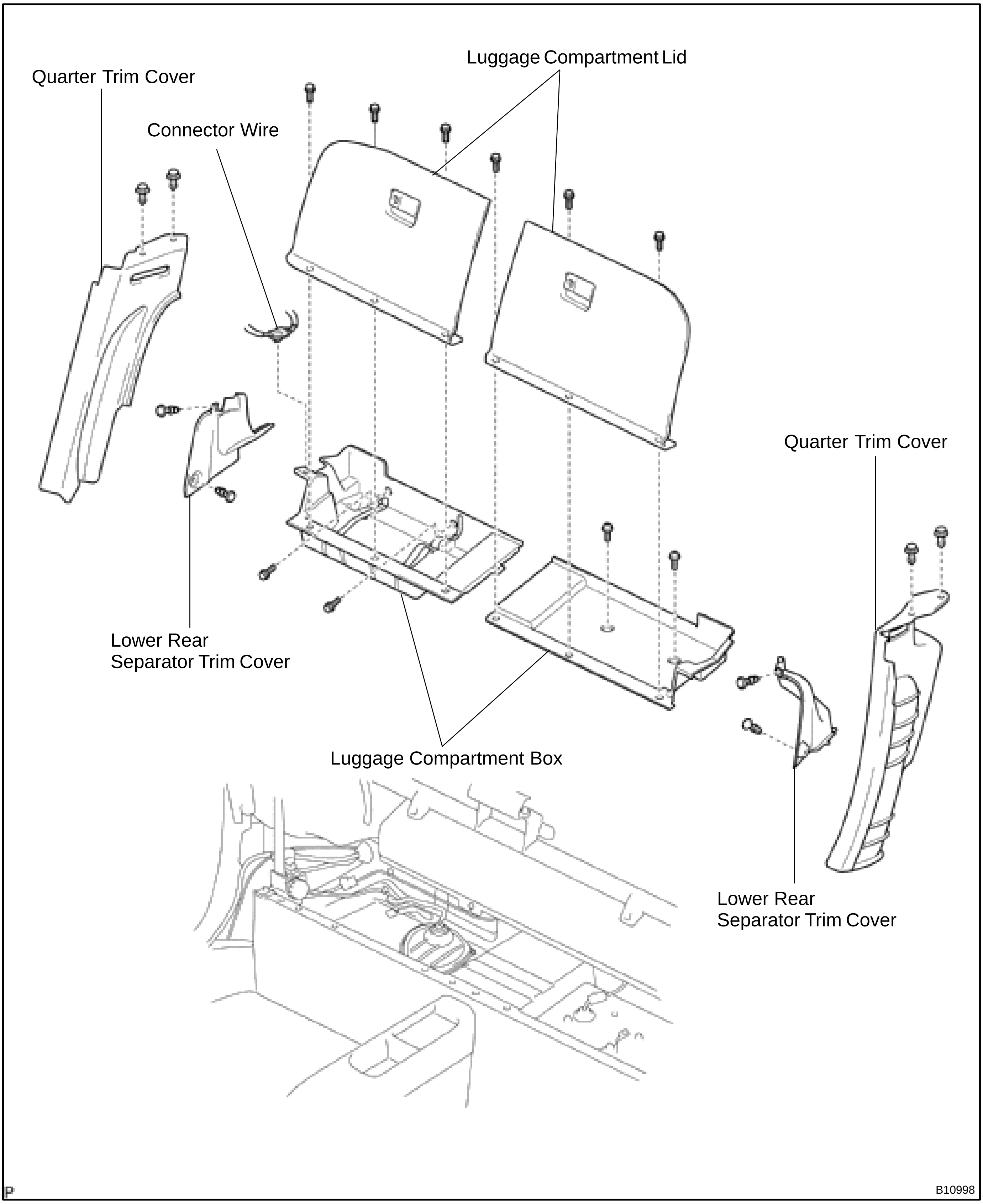
10. INSTALL FLOOR SERVICE HOLE COVER

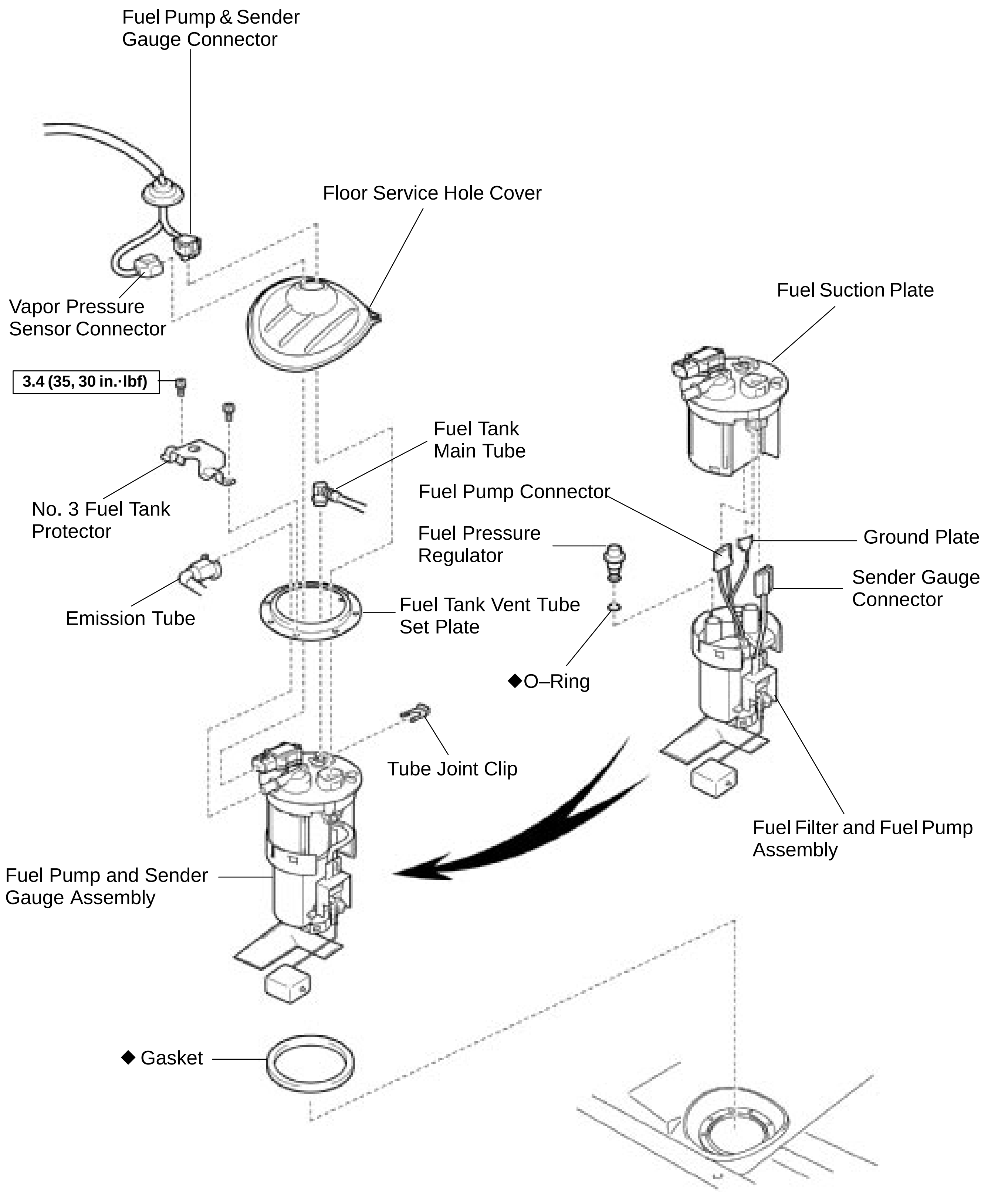
11. INSTALL LUGGAGE COMPARTMENT BOX (See page BO–86)

FUEL PRESSURE REGULATOR

COMPONENTS

SF19G–01





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

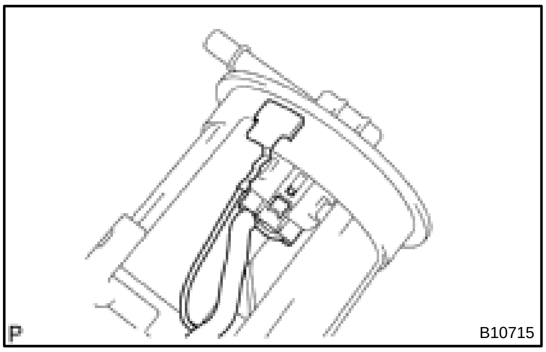
◆ Non–reusable part

B10817

SF19H–01

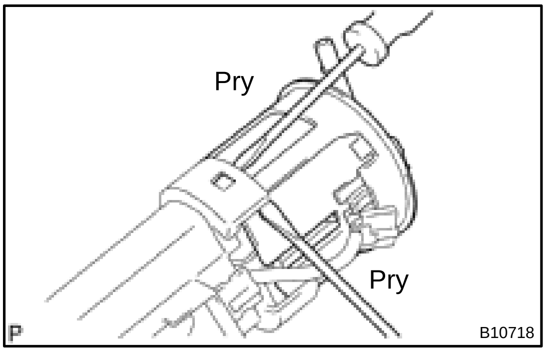
REMOVAL

1. REMOVE FUEL PUMP AND SENDER GAUGE ASSEMBLY FROM FUEL TANK (See page SF–12)



2. REMOVE FUEL SUCTION PLATE

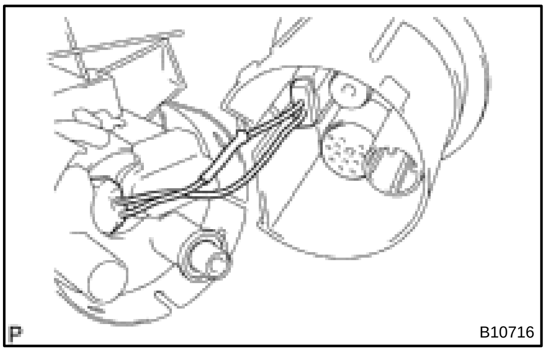
(a) Disconnect the fuel sender gauge connector and ground plate.



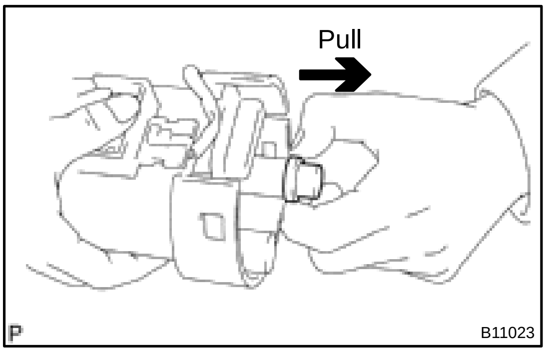
(b) Using 2 screwdrivers, pry out the fuel suction plate.

NOTICE:

Be careful not to damage the suction support and fuel suction plate.



(c) Disconnect the fuel pump connector.

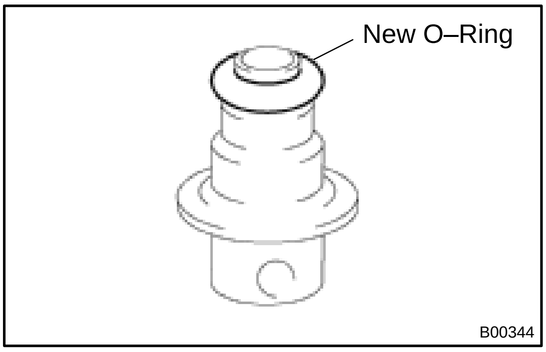


3. REMOVE FUEL PRESSURE REGULATOR

(a) Pull out the pressure regulator.

(b) Remove the O–ring from the pressure regulator.

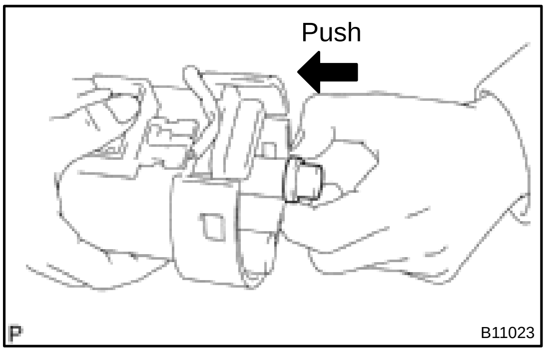
SF19I–01



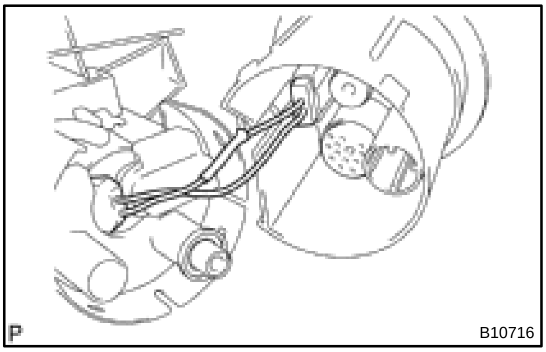
INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

(a) Install a new O–ring to the pressure regulator.

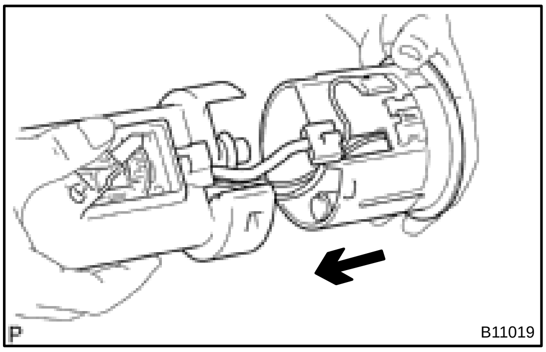


(b) Apply a light coat of gasoline to the O–ring, and push in the pressure regulator.

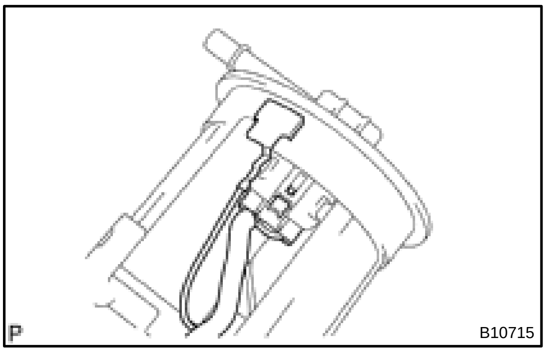


2. INSTALL FUEL SUCTION PLATE

(a) Connect the fuel pump connector.



(b) Install the fuel suction plate to the fuel filter and fuel pump assembly.



(c) Connect the fuel sender gauge connector and ground plate.

3. INSTALL FUEL PUMP AND SENDER GAUGE ASSEMBLY TO FUEL TANK (See page SF–14)

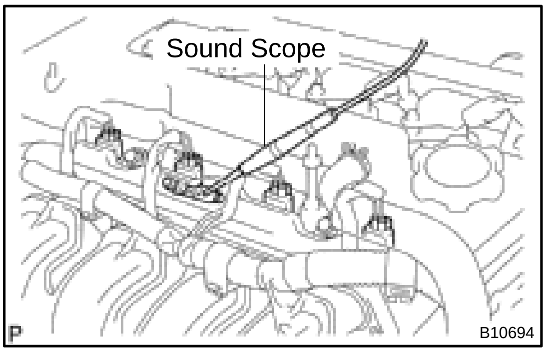
INJECTOR

SF15O–02

ON–VEHICLE INSPECTION

1. REMOVE SUSPENSION UPPER BRACE

2. REMOVE NO. 2 CYLINDER HEAD COVER



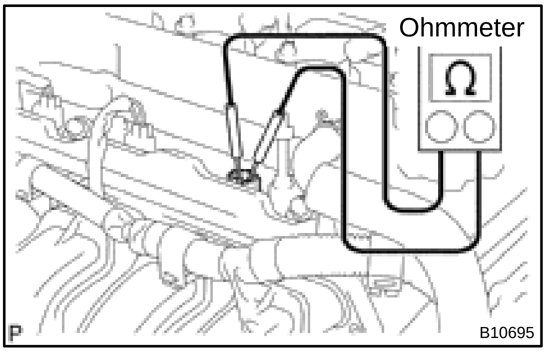
3. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

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

(2) If you have no sound scope, you can check the injector operating vibration with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



4. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

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

Resistance: 13.4 – 14.2 Ω at 20˚C (68˚F)

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

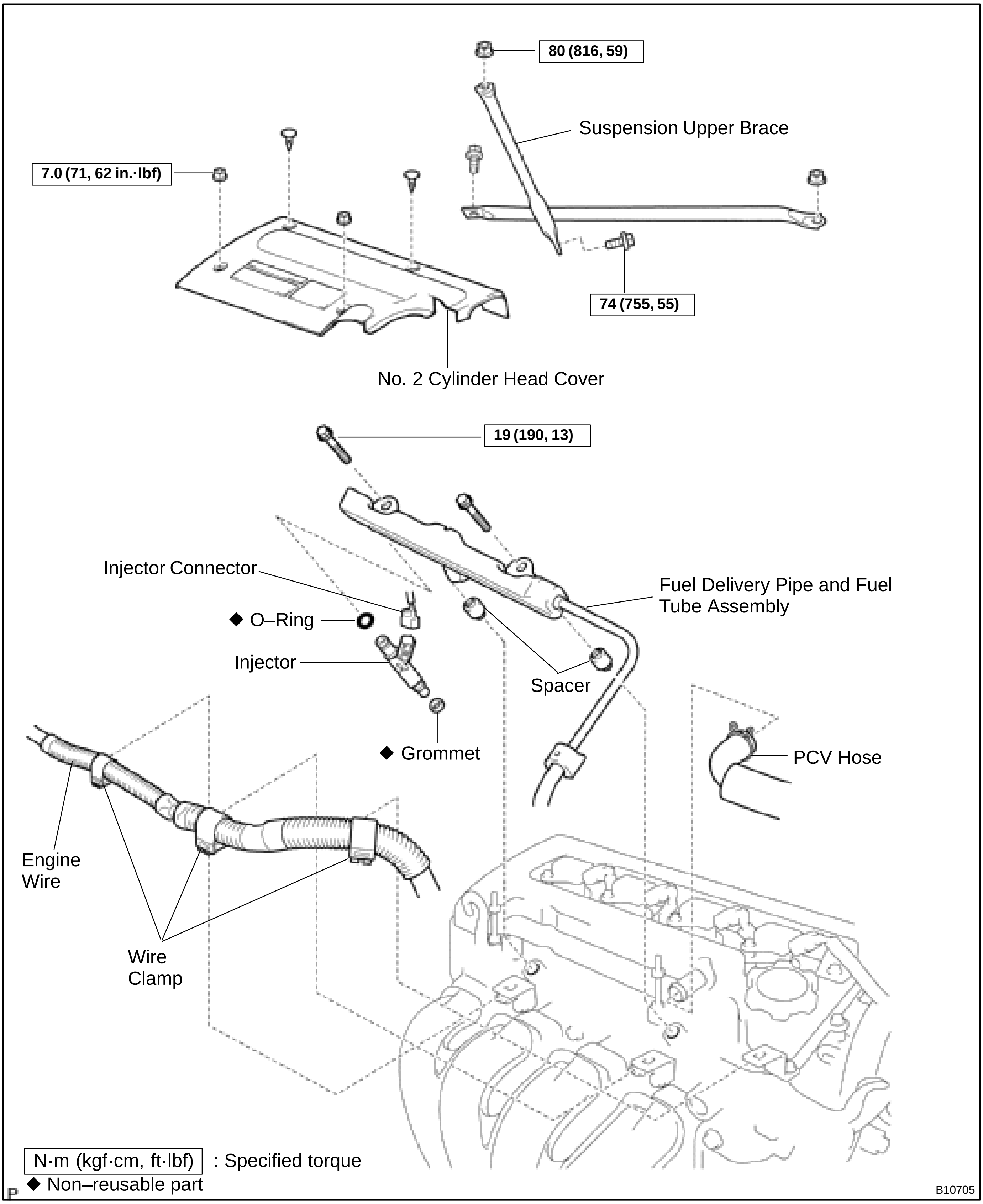
(c) Reconnect the injector connector.

5. REINSTALL NO. 2 CYLINDER HEAD COVER

6. REINSTALL SUSPENSION UPPER BRACE

SF19J–01

COMPONENTS



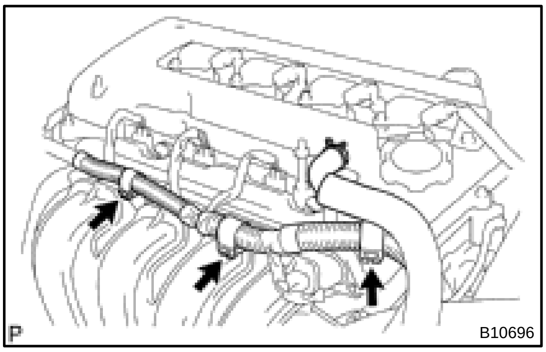
SF15Q–02

REMOVAL

1. REMOVE SUSPENSION UPPER BRACE

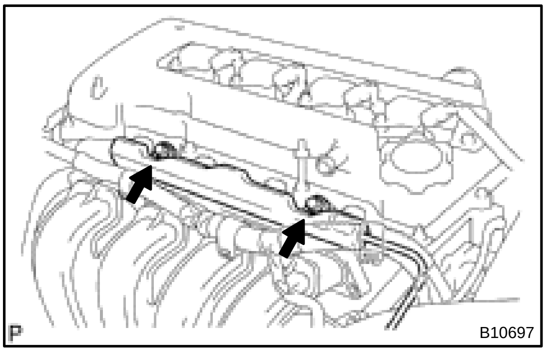
2. REMOVE NO. 2 CYLINDER HEAD COVER

3. DISCONNECT PCV HOSE



4. DISCONNECT WIRE HARNESS CLAMPS

Disconnect the wire harness 3 clamps from the clamp brackets.



5. REMOVE INJECTORS

(a) Disconnect the 4 injector connectors.

(b) Remove the 2 bolts holding the delivery pipe to the cylinder head.

(c) Disconnect the delivery pipe together with the 4 injectors from the cylinder head.

NOTICE:

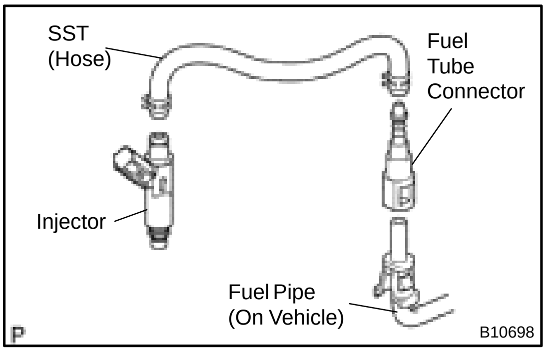
Be careful not to drop the injectors when disconnecting the delivery pipe.

(d) Remove the 2 spacers and 4 grommets.

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

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

SF19K–01

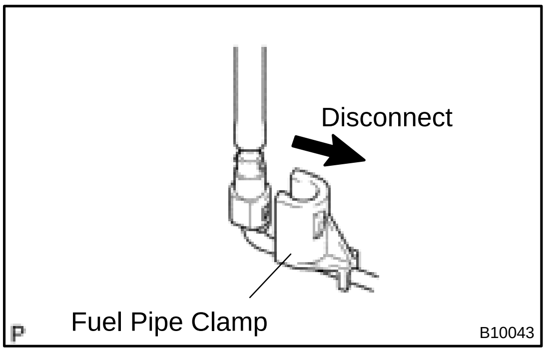


INSPECTION

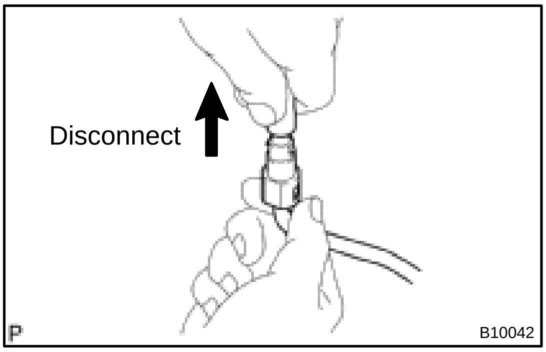
1. INSPECT INJECTOR INSPECTION

CAUTION:

Keep injector clear of sparks during the test.



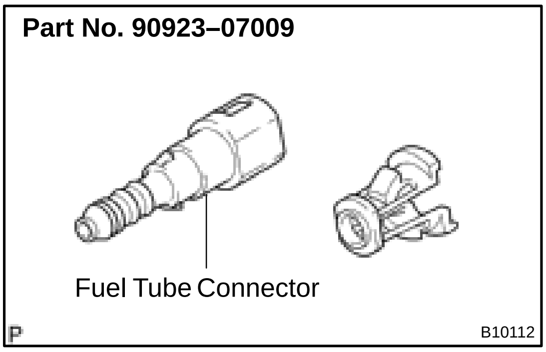
(a) Disconnect the fuel pipe clamp from the fuel tube connector.



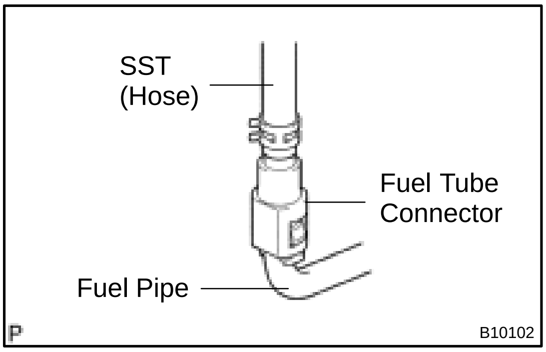
(b) Disconnect the fuel inlet tube (fuel tube connector) from the fuel pipe.

CAUTION:

- **Disconnect the fuel tube connector (quick type) observing the precaution (See page SF–1).**
- **As there is retained pressure in the fuel line, prevent if from splashing inside the engine compartment.**



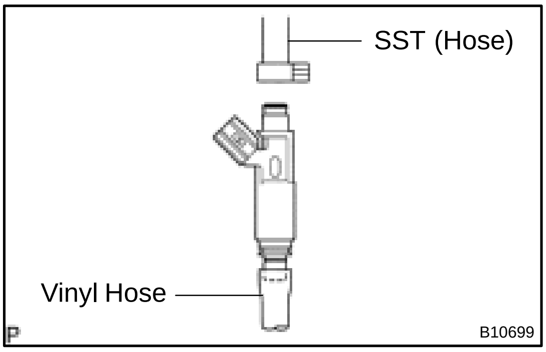
(c) Purchase a new fuel tube connector.
Part No. 90923–07009



(d) Connect SST (hose) and fuel tube connector to the fuel pipe.
SST 09268–41047 (90467–13001, 95336–08070)

CAUTION:

Connect the fuel tube connector (quick type) observing the precautions (See page SF–1).

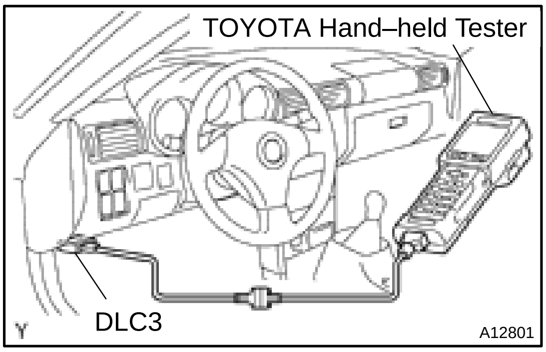


(e) Connect SST (hose) to the injector.
SST 09268–41407 (90467–13001, 95336–08070)

(f) Put the injector into a graduated cylinder.

CAUTION:

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



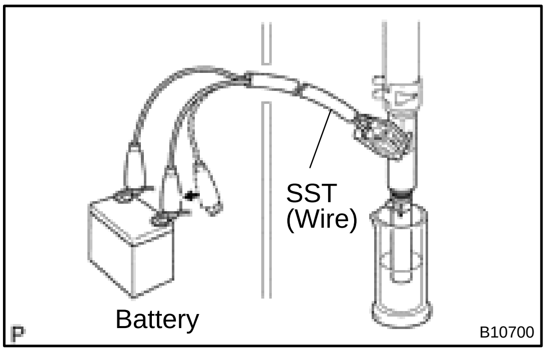
(g) Connect a TOYOTA hand–held tester to the DLC3.
- (1) Connect the TOYOTA hand–held tester to the DLC3.
- (2) Connect the battery negative (–) terminal cable to the battery.
- (3) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

NOTICE:

Do not start the engine.

- (4) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
- (5) Please refer to the TOYOTA hand–held tester operator's manual for further details.

If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–7).



(h) 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 09842–30080

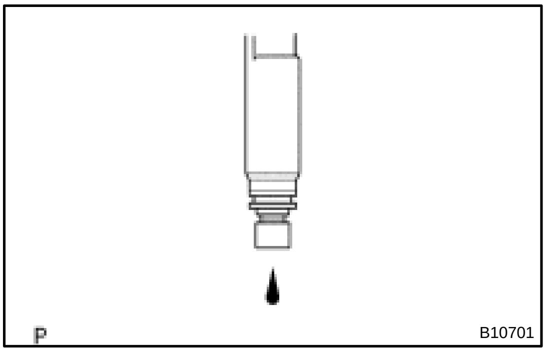
Injection volume:

60 – 73 cm^3 (3.2 – 3.9 cu in.) per 15 seconds

Difference between each injector:

13 cm^3 (0.7 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 tester probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30080

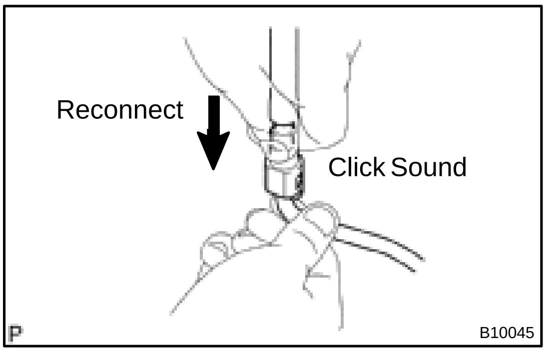
Fuel drop: 1 drop or less per 12 minutes

(b) Turn the ignition switch OFF.

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

(d) Remove the SST and fuel tube connector.
SST 09268–41047 (90467–13001, 95336–08070)

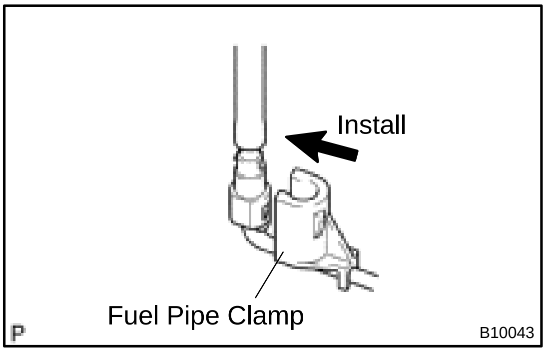
(e) Disconnect the TOYOTA hand–held tester from the DLC3.



(f) Reconnect the fuel inlet tube (fuel tube connector).

CAUTION:

Connect the fuel tube connector (quick type) observing the precaution (See page SF–1).

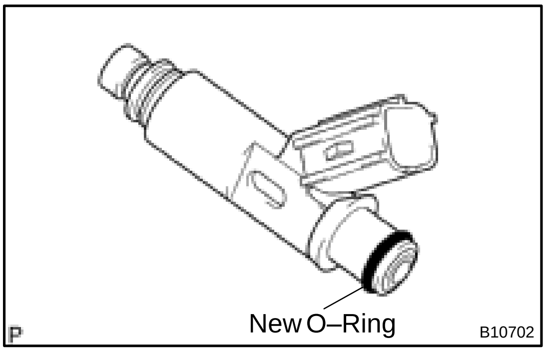


(g) Install the fuel pipe clamp to the fuel tube connector.

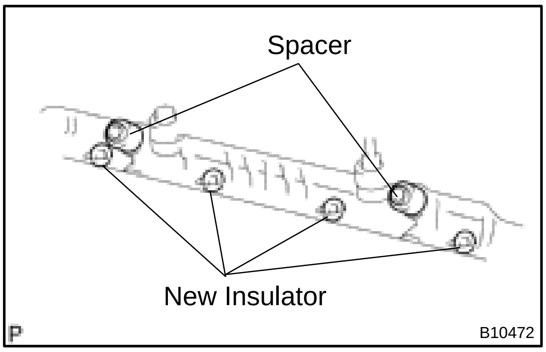
SF09L–06

INSTALLATION

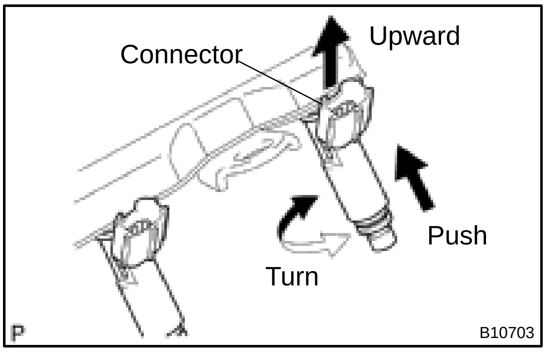
1. INSTALL INJECTORS AND DELIVERY PIPES



(a) Apply a light coat of spindle oil or gasoline onto a new O–ring, and install it to each injector.



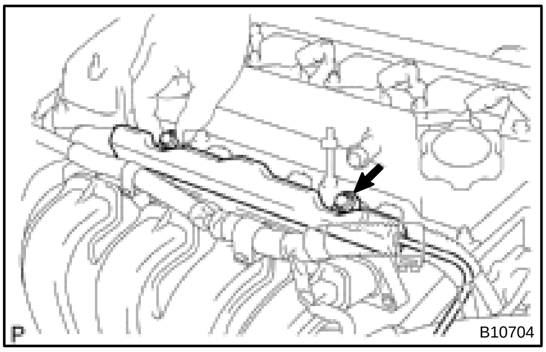
(b) Install the 2 spacers and 4 new insulators to the cylinder head.



(c) Apply a light coat of spindle oil or gasoline on the place where a delivery pipe touches the O–ring.

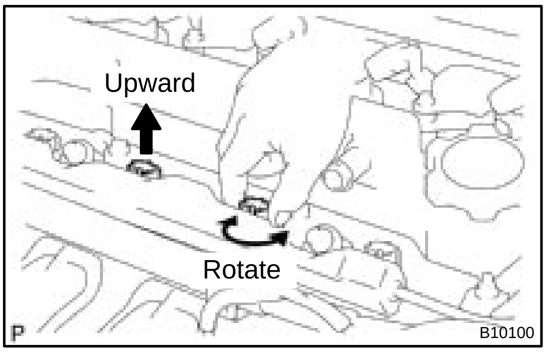
(d) While turning the injector clockwise and counterclockwise, push it to the delivery pipes. Install the 4 injectors.

(e) Position the injector connector upward.



(f) Attach the delivery pipe together with the 4 injectors to the cylinder head.

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

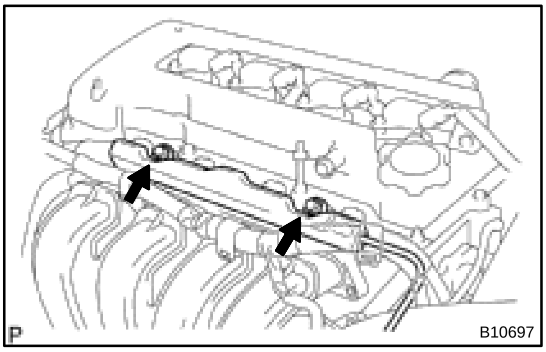


(h) Check that the injectors rotate smoothly.

HINT:

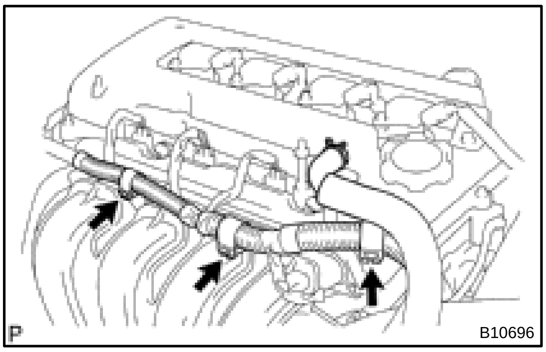
If injectors do not rotate smoothly, the probable cause is incorrect installation of O–ring. Replace the O–ring.

(i) Position the injector connector upward.



(j) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 19 N·m (190 kgf·cm, 13 ft·lbf)

(k) Connect the 4 injector connectors.



2. CONNECT WIRE HARNESS CLAMPS

Connect the 3 wire harness clamps to the clamp brackets.

3. CONNECT PCV HOSE

4. INSTALL NO. 2 CYLINDER HEAD COVER

5. INSTALL SUSPENSION UPPER BRACE

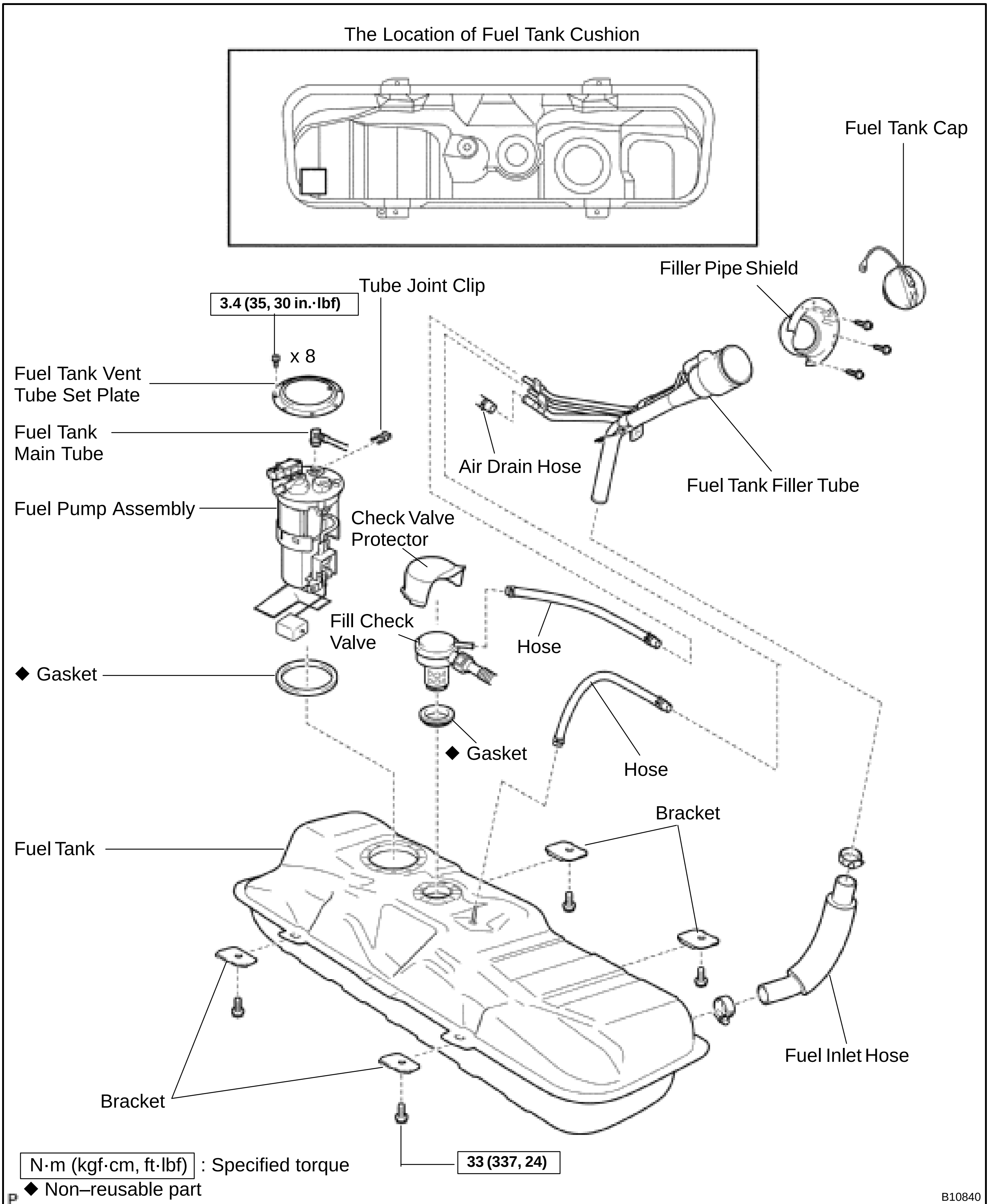
FUEL TANK AND LINE

SF09N–06

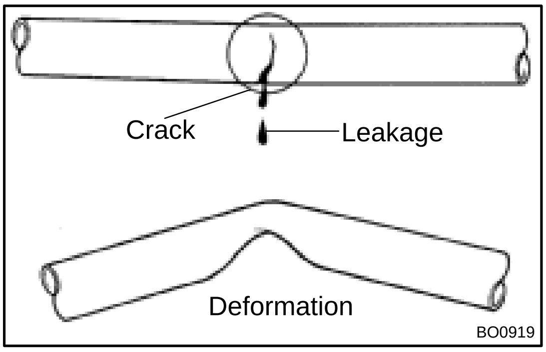
COMPONENTS

CAUTION:

- **Always use new gaskets when replacing the fuel tank or component parts.**
- **Apply the proper torque to all parts tightened.**



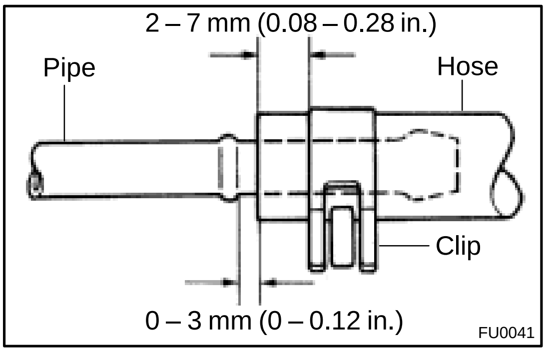
SF09O–05



INSPECTION

INSPECT FUEL TANK AND LINE

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank for deformation, cracks fuel leakage or tank band looseness.
(c) Check the filter neck for damage or fuel leakage.



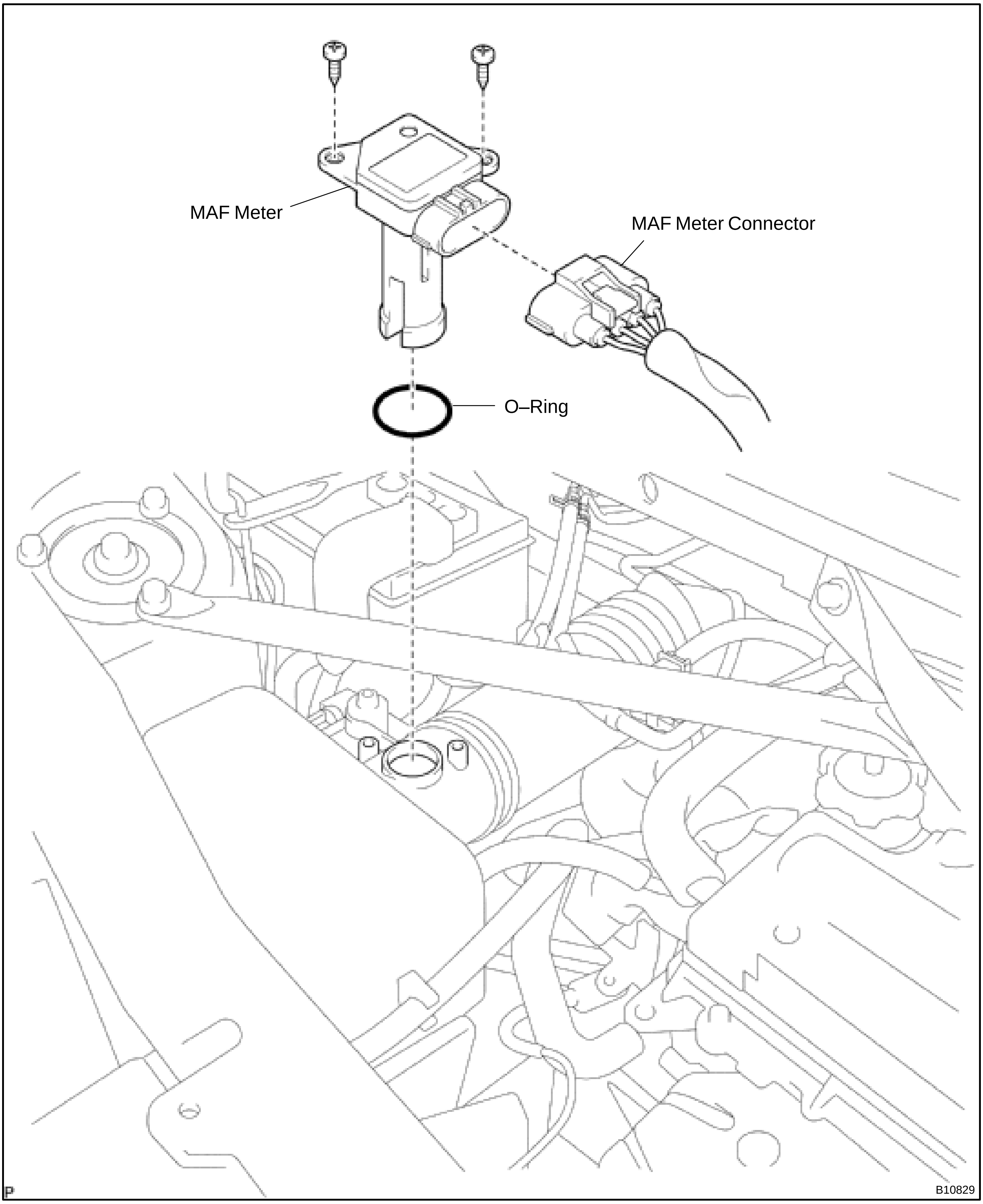
(d) Hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the part as necessary.

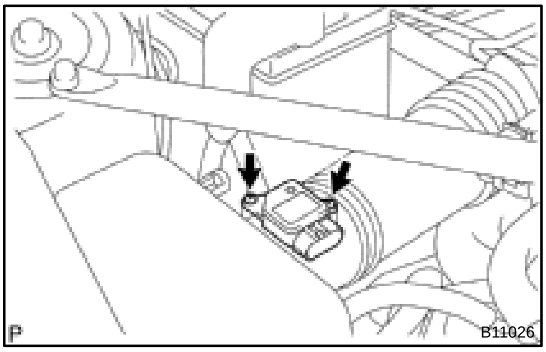
MASS AIR FLOW (MAF) METER

COMPONENTS

SF07P–06



FI0S9–01

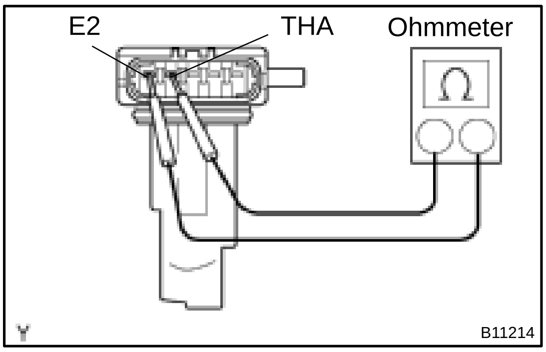


INSPECTION

1. DISCONNECT MAF METER CONNECTOR

2. REMOVE MAF METER

Remove the 2 screws and MAF meter.

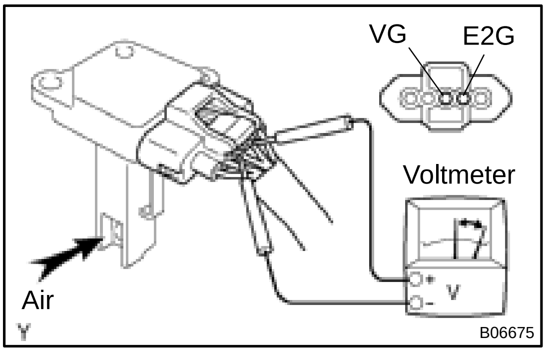


3. INSPECT MAF METER

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

Temperature	Resistance
–20°C (–4°F)	13.6 – 18.4 kΩ
20°C (68°F)	2.21 – 2.69 kΩ
60°C (140°F)	0.49 – 0.67 kΩ

If the resistance is not as specified, replace the MAF meter.



(b) Inspect operation.

(1) Connect the MAF meter connector.

(2) Connect the negative (–) terminal cable to the battery.

(3) Turn the ignition switch ON.

(4) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.

(5) Blow air into the MAF meter, and check that the voltage fluctuates.

If operation is not as specified, replace the MAF meter.

(6) Turn the ignition switch OFF.

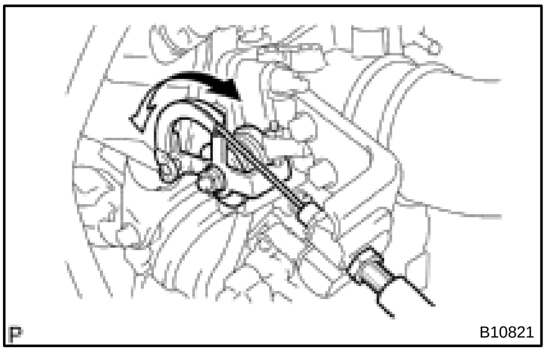
(7) Disconnect the negative (–) terminal cable to the battery.

(8) Disconnect the MAF meter connector.

4. REINSTALL MAF METER

Install the MAF meter with the 2 screws.

5. RECONNECT MAF METER CONNECTOR



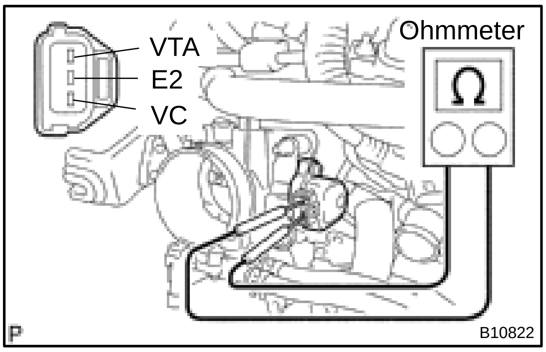
THROTTLE BODY

SF09P–09

ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

Check that the throttle linkage moves smoothly.



2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

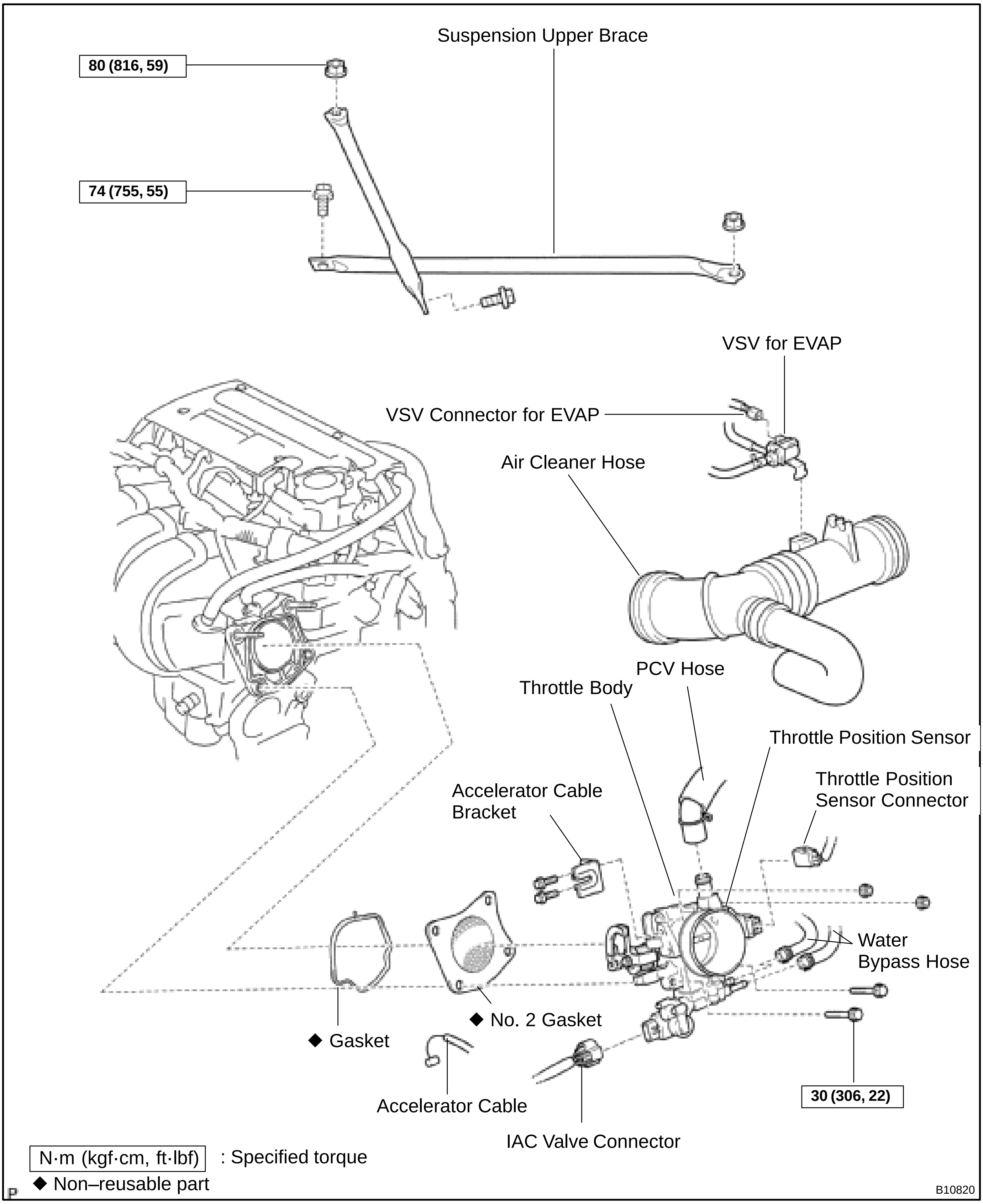
(b) Using an ohmmeter, measure the resistance between each terminal.

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

(c) Reconnect the sensor connector.

SF19L–01

COMPONENTS



SF19M–01

REMOVAL

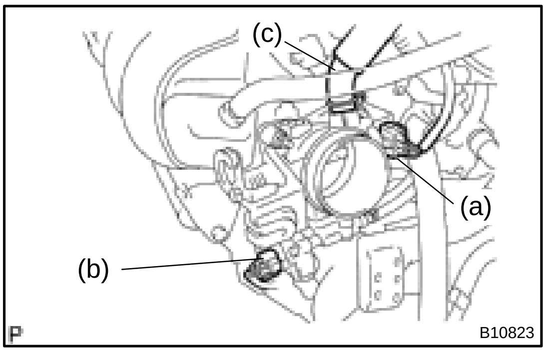
1. DRAIN ENGINE COOLANT

2. REMOVE SUSPENSION UPPER BRACE

3. DISCONNECT VSV FOR EVAP FROM AIR CLEANER HOSE

4. REMOVE AIR CLEANER HOSE

5. DISCONNECT ACCELERATOR CABLE

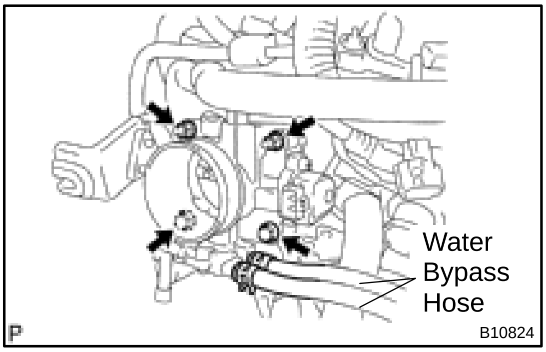


6. REMOVE THROTTLE BODY

(a) Disconnect the throttle position sensor connector.

(b) Disconnect the IAC valve connector.

(c) Disconnect the PCV hose from the throttle body.

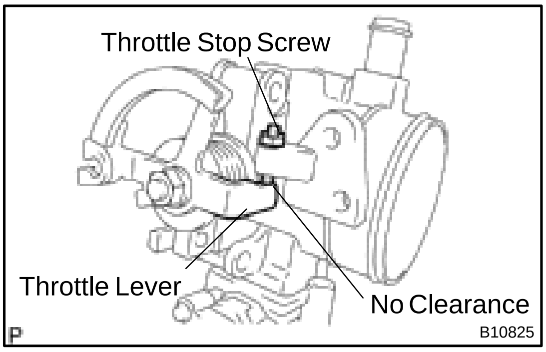


(d) Disconnect the 2 water bypass hoses from the throttle body.

(e) Remove the 2 bolts, 2 nuts, throttle body and 2 gaskets from the intake manifold.

(f) Remove the 2 bolts and accelerator cable bracket from the throttle body.

SF19N–01



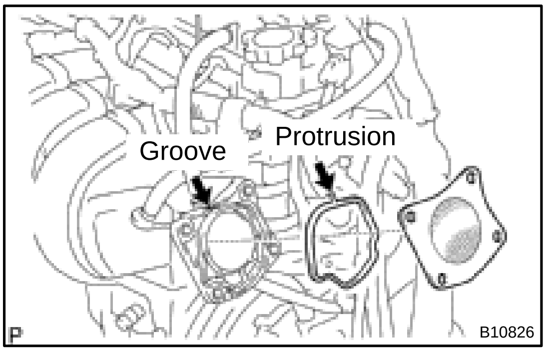
INSPECTION

INSPECT THROTTLE VALVE

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

SF19O–01

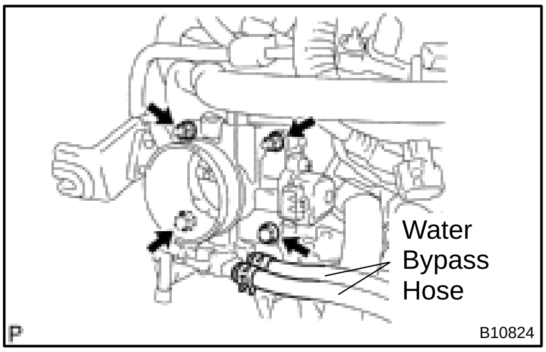
INSTALLATION



1. INSTALL THROTTLE BODY

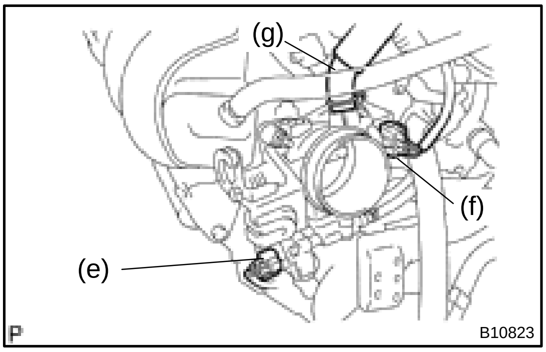
(a) Install 2 new gaskets to the intake manifold as shown in the illustration.

(b) Install the accelerator cable bracket to the throttle body with the 2 bolts.



(c) Install the throttle body with the 2 bolts and 2 nuts bolts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(d) Connect the 2 water bypass hoses to the throttle body.



(e) Connect the IAC valve connector.

(f) Connect the throttle position sensor connector.

(g) Connect the PCV hose to the throttle body.

2. CONNECT ACCELERATOR CABLE

3. INSTALL AIR CLEANER HOSE

4. INSTALL VSV FOR EVAP

5. INSTALL SUSPENSION UPPER BRACE

6. FILL RADIATOR WITH ENGINE COOLANT

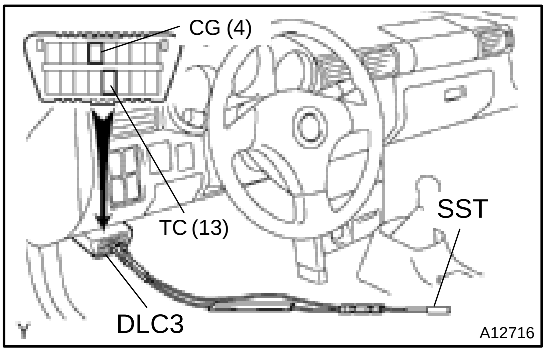
IDLE AIR CONTROL (IAC) VALVE

SF09U–05

ON–VEHICLE INSPECTION

INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral
- A/C switch OFF



(b) Using SST, connect terminals TC (13) and CG (4) of the DLC3.
SST 09843–18040

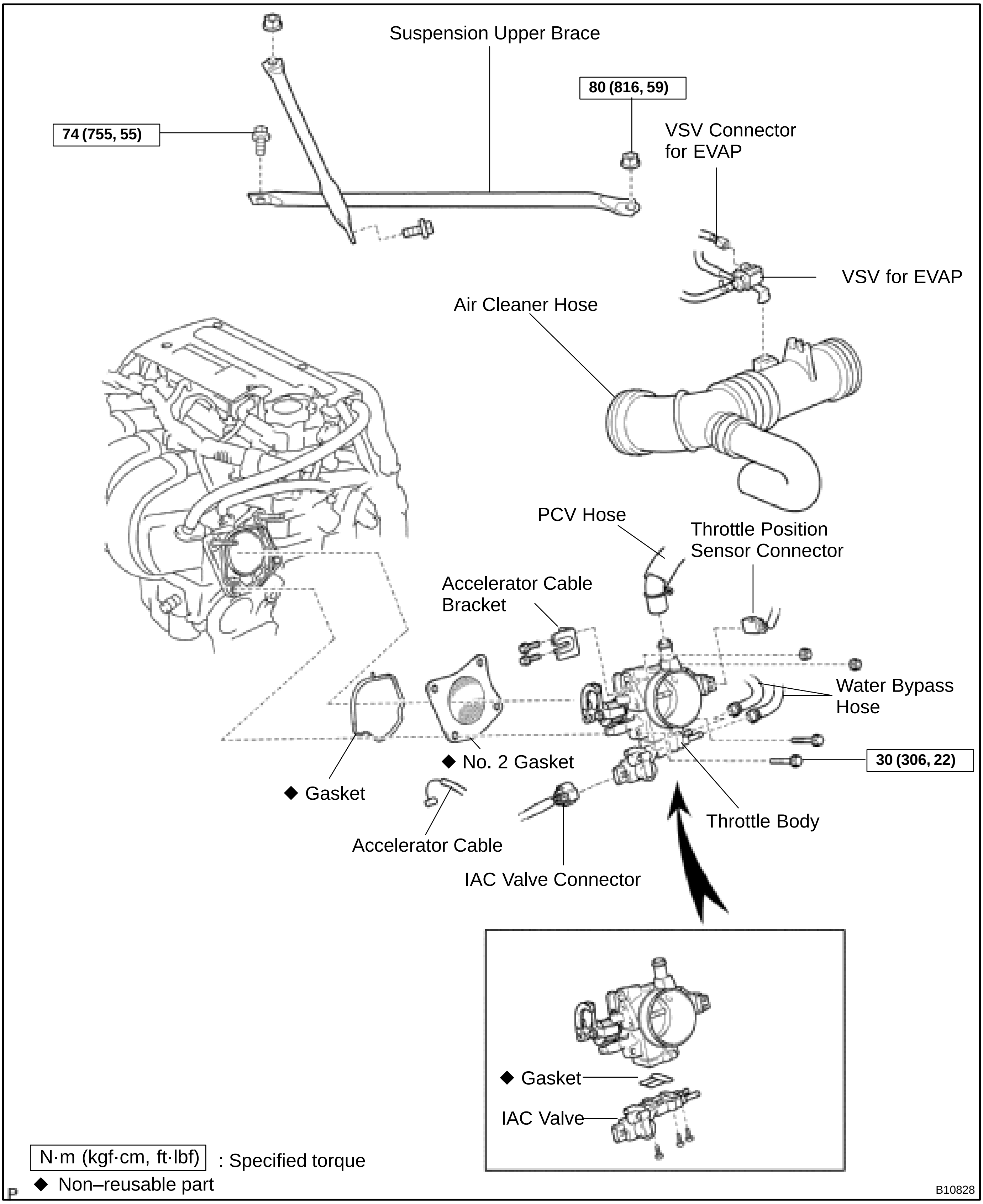
(c) After the engine speed is kept at 1,000 – 1,500 rpm for 5 seconds, check that it returns to idle speed.

If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.

(d) Remove the SST from the DLC3.
SST 09843–18040

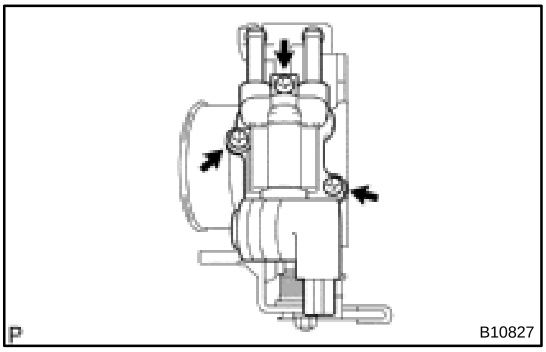
SF19P–01

COMPONENTS



SF19Q–01

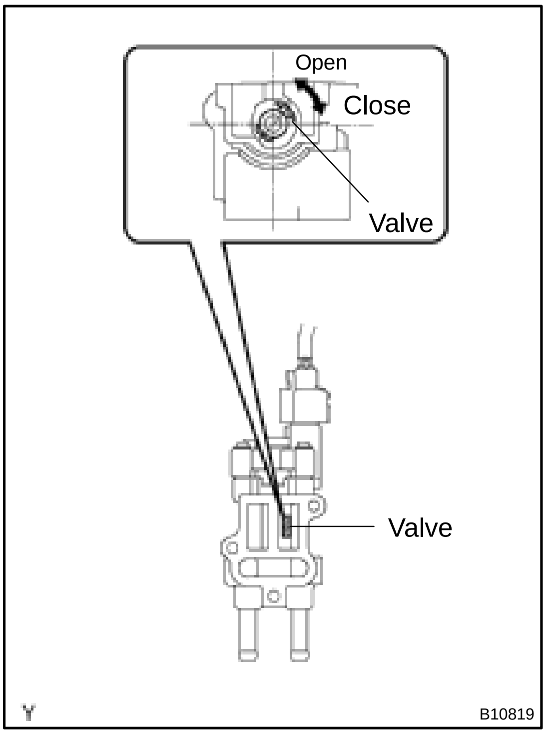
INSPECTION



1. REMOVE THROTTLE BODY (See page SF–35)

2. REMOVE IAC VALVE

Remove the 3 screws, IAC valve and gasket.



3. INSPECT IAC VALVE OPERATION

(a) Check that the IAC valve is half–opened.

(b) Connect the IAC valve connector.

(c) Turn the ignition switch ON.

(d) Check that the IAC valve operates in the sequence, half open, fully close, fully open and then half open, within 0.5 seconds.

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

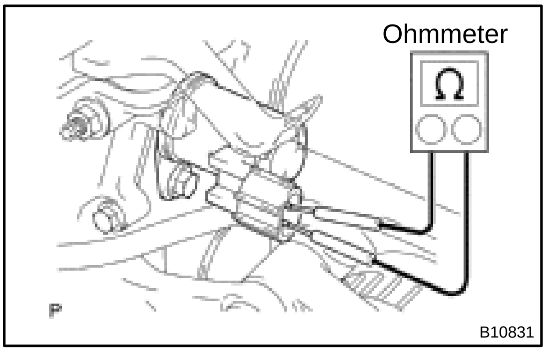
(e) Turn the ignition switch OFF.

(f) Disconnect the IAC valve connector.

4. REINSTALL IAC VALVE

Install a new gasket and the IAC valve with the 3 screws.

5. REINSTALL THROTTLE BODY (See page SF–37)



CAMSHAFT TIMING OIL CONTROL VALVE

SF0SL–10

ON–VEHICLE INSPECTION

INSPECT CAMSHAFT TIMING OIL CONTROL VALVE (OCV) RESISTANCE

(a) Disconnect the ocv connector.

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

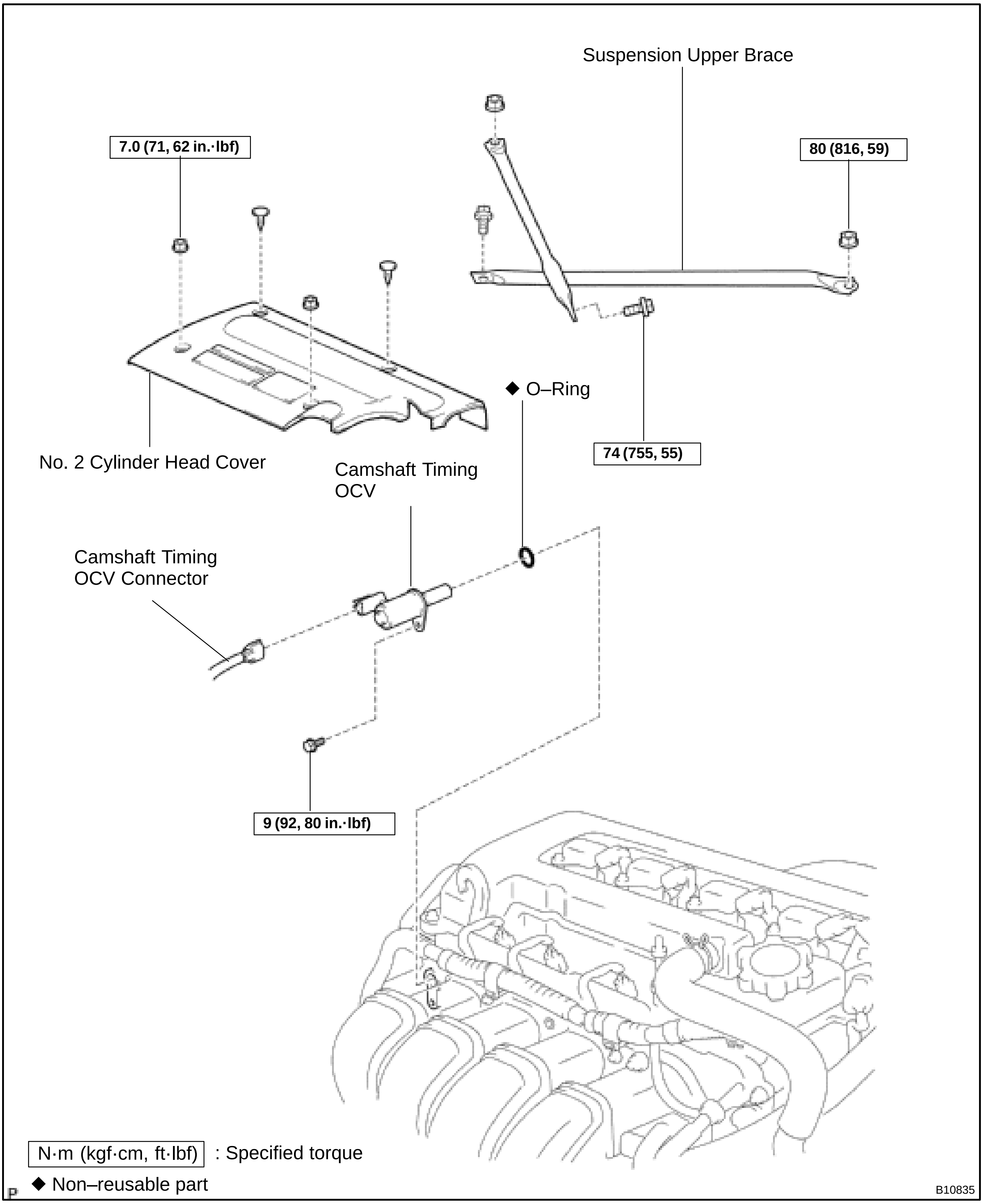
Resistance: 6.9 – 7.9 Ω at 20˚C (68˚F)

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

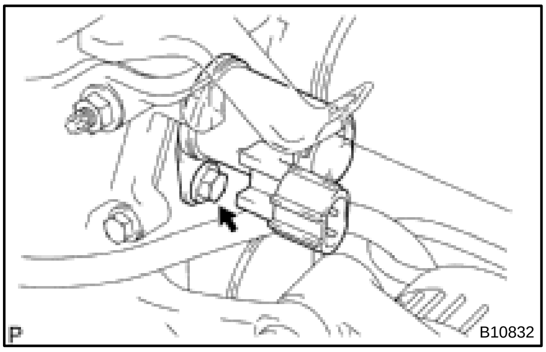
(c) Reconnect the ocv connector.

SF19R–01

COMPONENTS



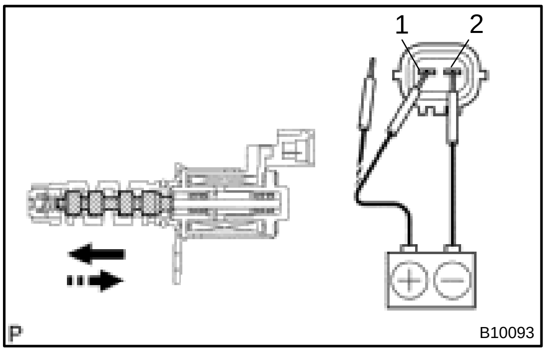
SF19S–01



INSPECTION

1. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE (OCV)

(a) Remove the suspension upper brace.
(b) Remove the No. 2 cylinder head cover.
(c) Disconnect the ocv connector.
(d) Remove the bolt and ocv.
(e) Remove the O–ring from the ocv.



2. INSPECT CAMSHAFT TIMING OIL CONTROL VALVE (OCV) OPERATION

Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, and check the movement of the valve.

Battery positive voltage is applied	Valve moves in ← direction
Battery positive voltage is cut off	Valve moves in ⇢ direction

If operation is not as specified, replace the ocv.

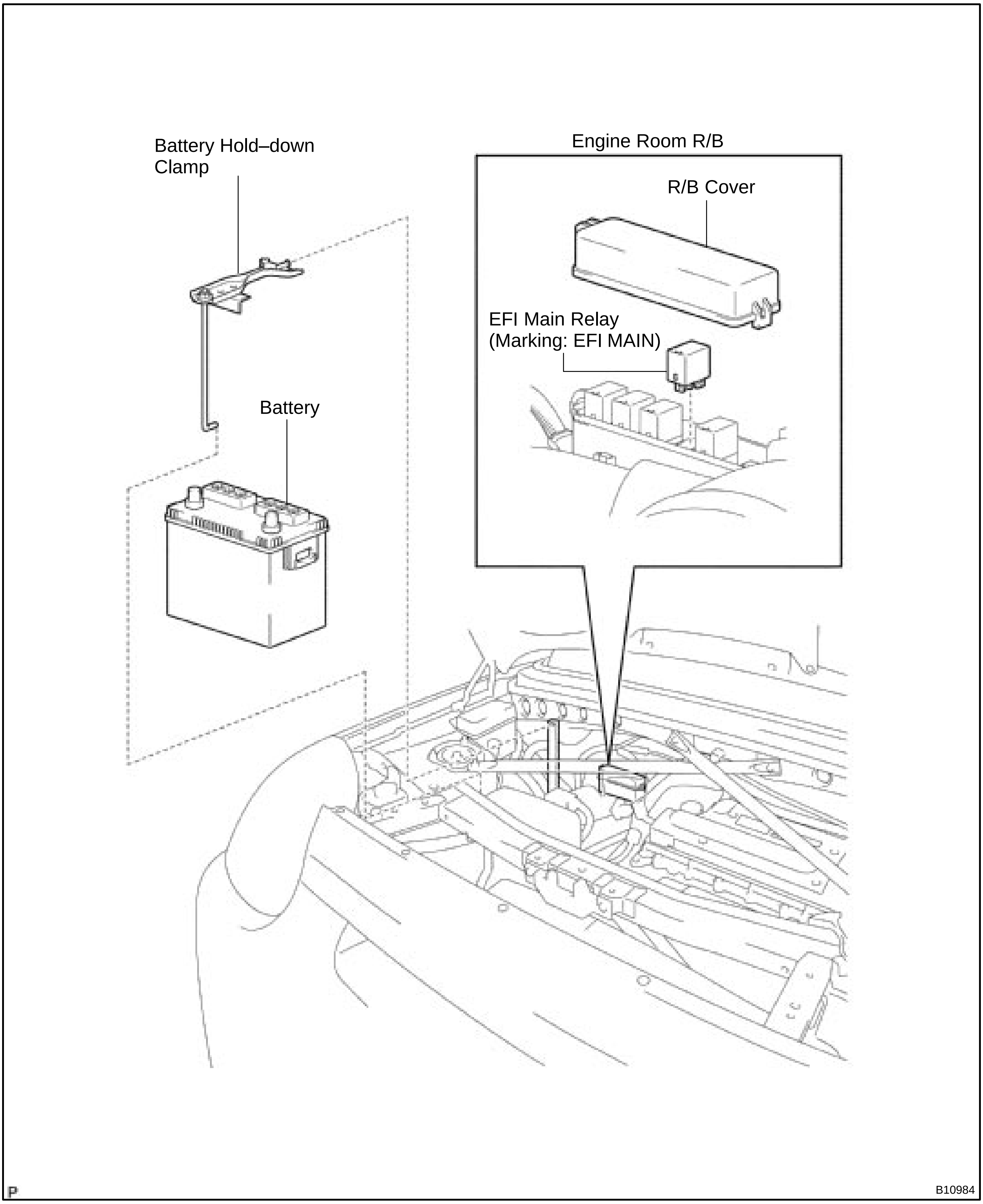
3. REINSTALL CAMSHAFT OIL CONTROL VALVE

(a) Install a new O–ring to the ocv.
(b) Install the ocv with the bolt.
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)
(c) Connect the ocv connector.
(d) Install the No. 2 cylinder head cover.
(e) Install the suspension upper brace.

EFI MAIN RELAY

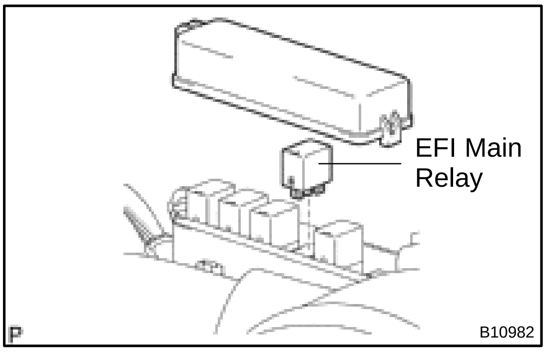
COMPONENTS

SF19T–01

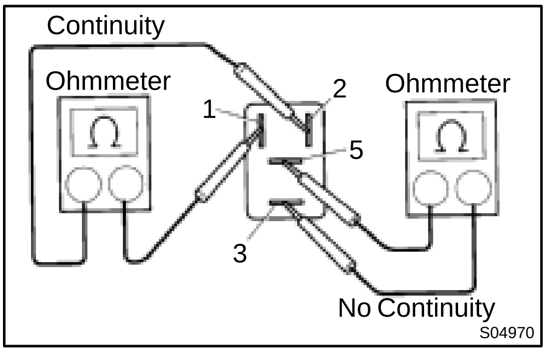


SF09Z–10

INSPECTION



1. REMOVE EFI MAIN RELAY (Marking: EFI MAIN)



2. INSPECT EFI MAIN RELAY

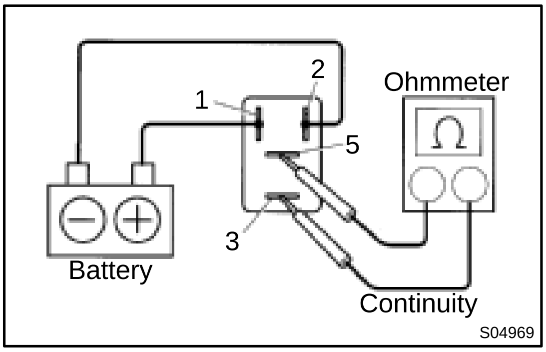
(a) Inspect the relay continuity.

(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 5.

If there is continuity, replace the relay.



(b) Inspect the 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 5.

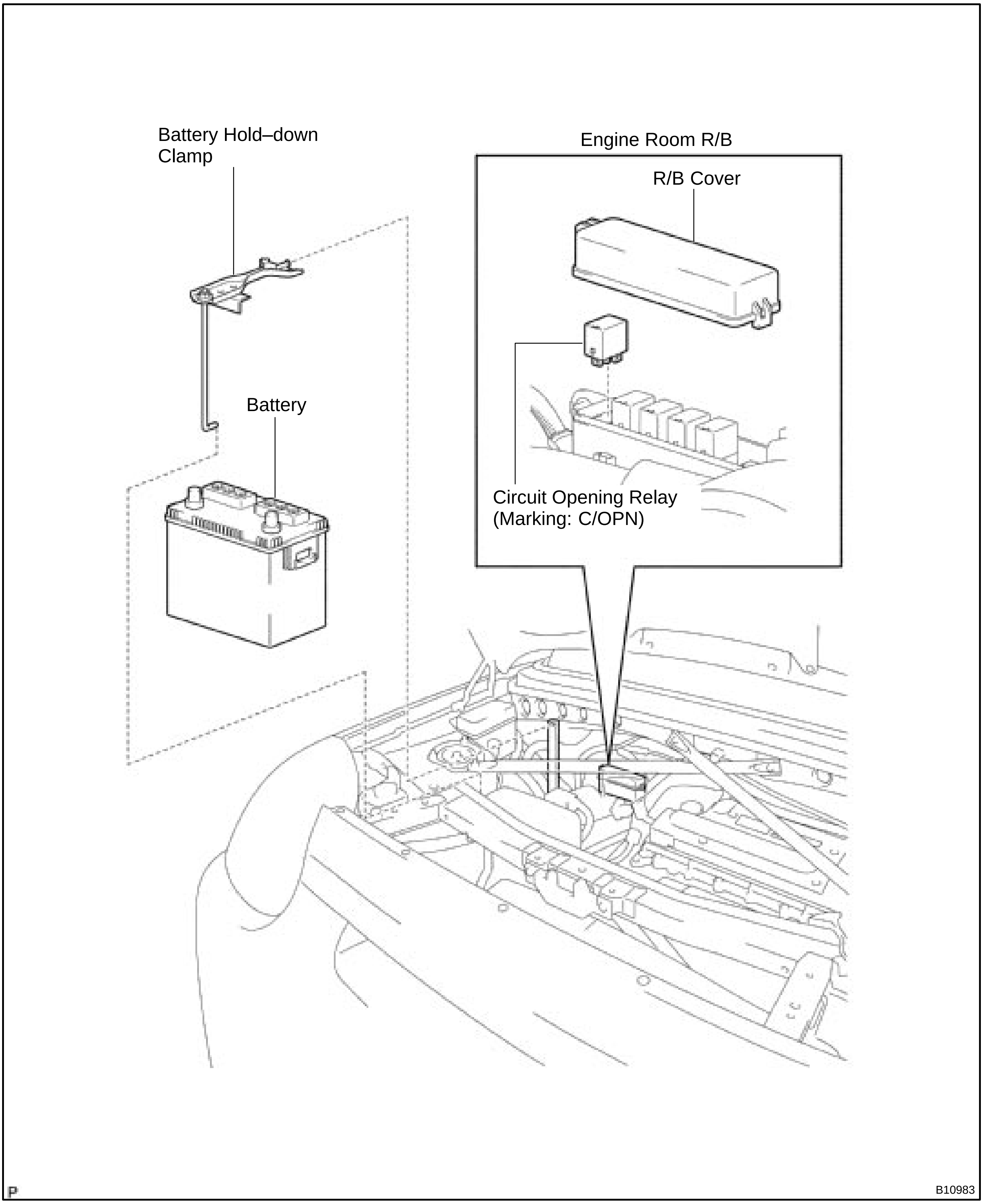
If there is no continuity, replace the relay.

3. REINSTALL EFI MAIN RELAY

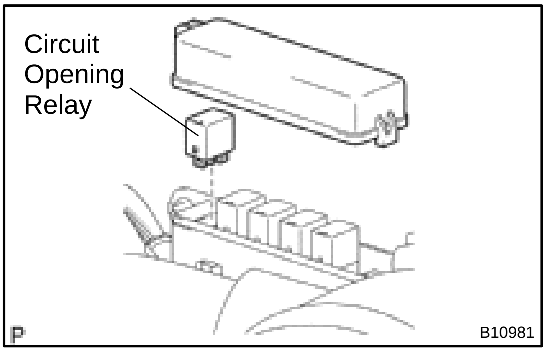
CIRCUIT OPENING RELAY

COMPONENTS

SF19U–01

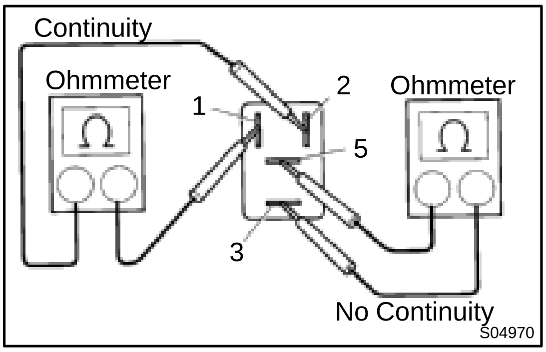


SF0A0–09



INSPECTION

1. REMOVE CIRCUIT OPENING RELAY (Marking: C/OPN)



2. INSPECT CIRCUIT OPENING RELAY

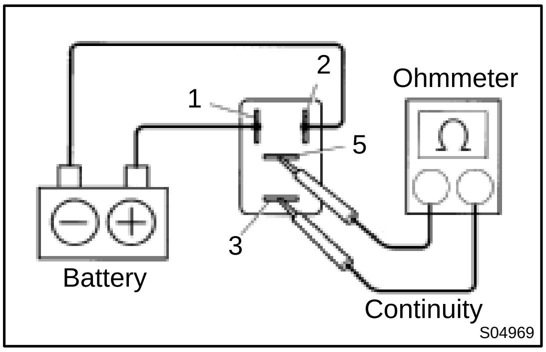
(a) Inspect the relay continuity.

(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 5.

If there is continuity, replace the relay.



(b) Inspect the 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 5.

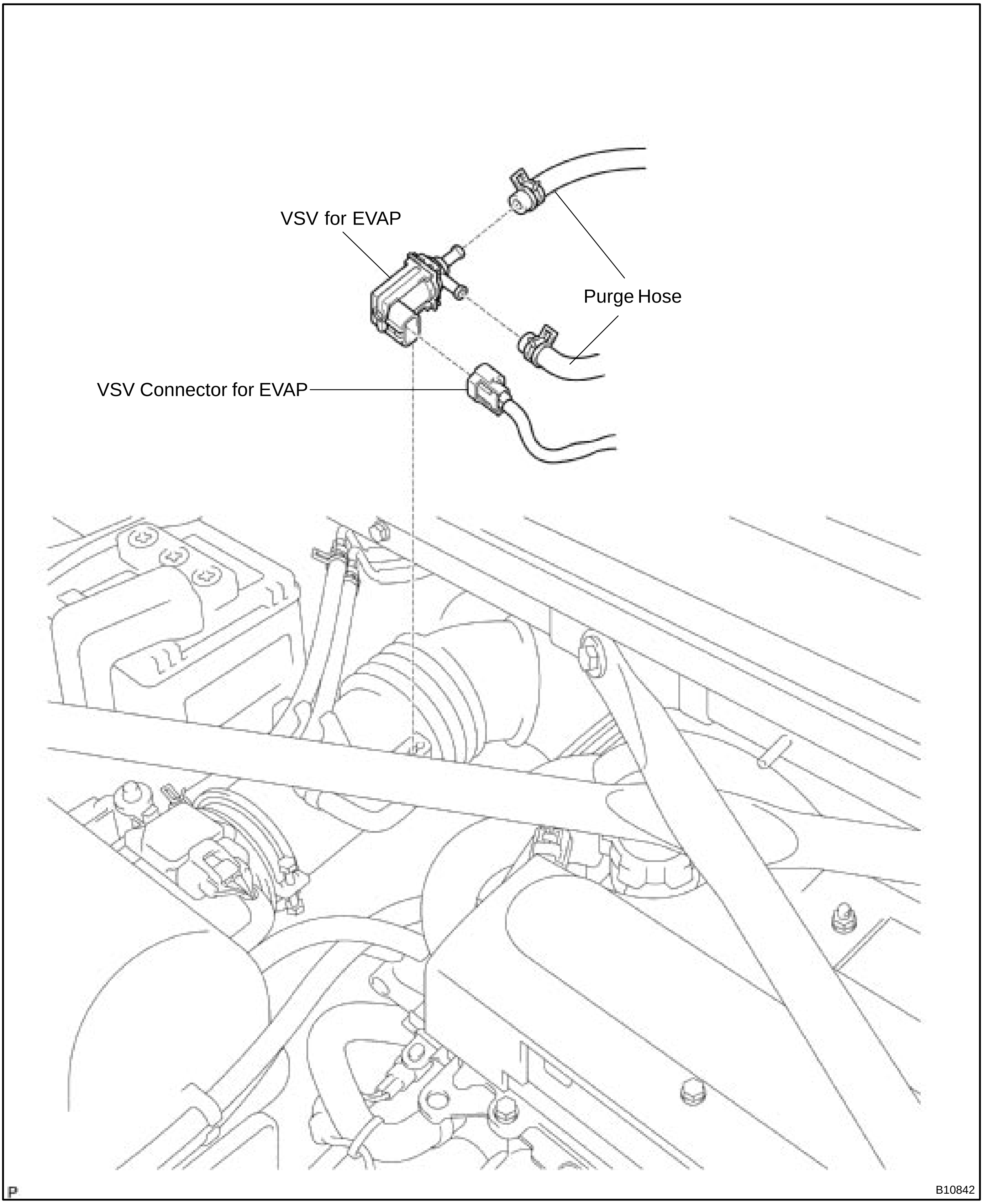
If there is no continuity, replace the relay.

3. REINSTALL CIRCUIT OPENING RELAY

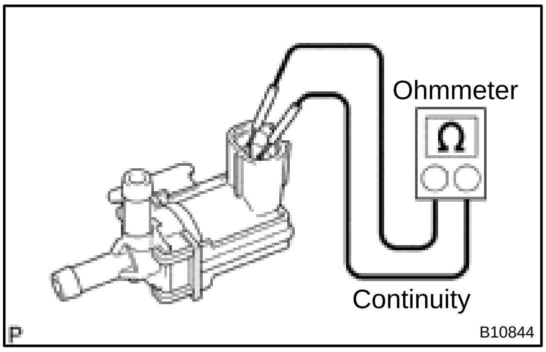
VSV FOR EVAPORATIVE EMISSION (EVAP)

SF15W–02

COMPONENTS



SF15X–02



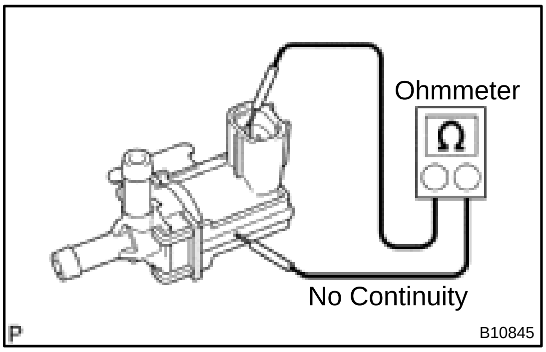
INSPECTION

1. REMOVE VSV

2. INSPECT VSV

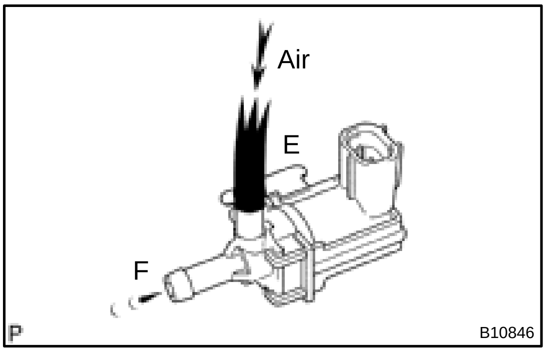
(a) Inspect the VSV for open circuit.
Using an ohmmeter, check that there is continuity between the terminals.
Resistance: 27 – 33 Ω at 20°C (68°F)

If there is no continuity, replace the VSV.

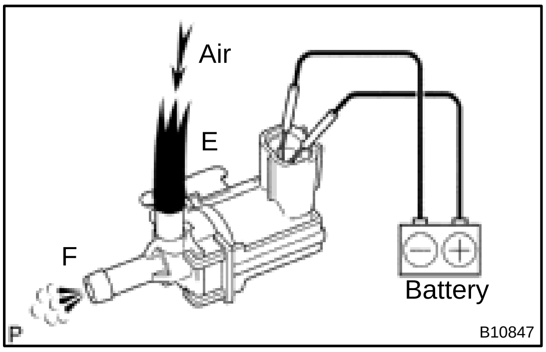


(b) Inspect the VSV for ground.
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



(c) Inspect the VSV operation.
(1) Check that air flows with a little difficulty from ports E to F.



(2) Apply battery positive voltage across the terminals.
(3) Check that air flows from ports E to F.

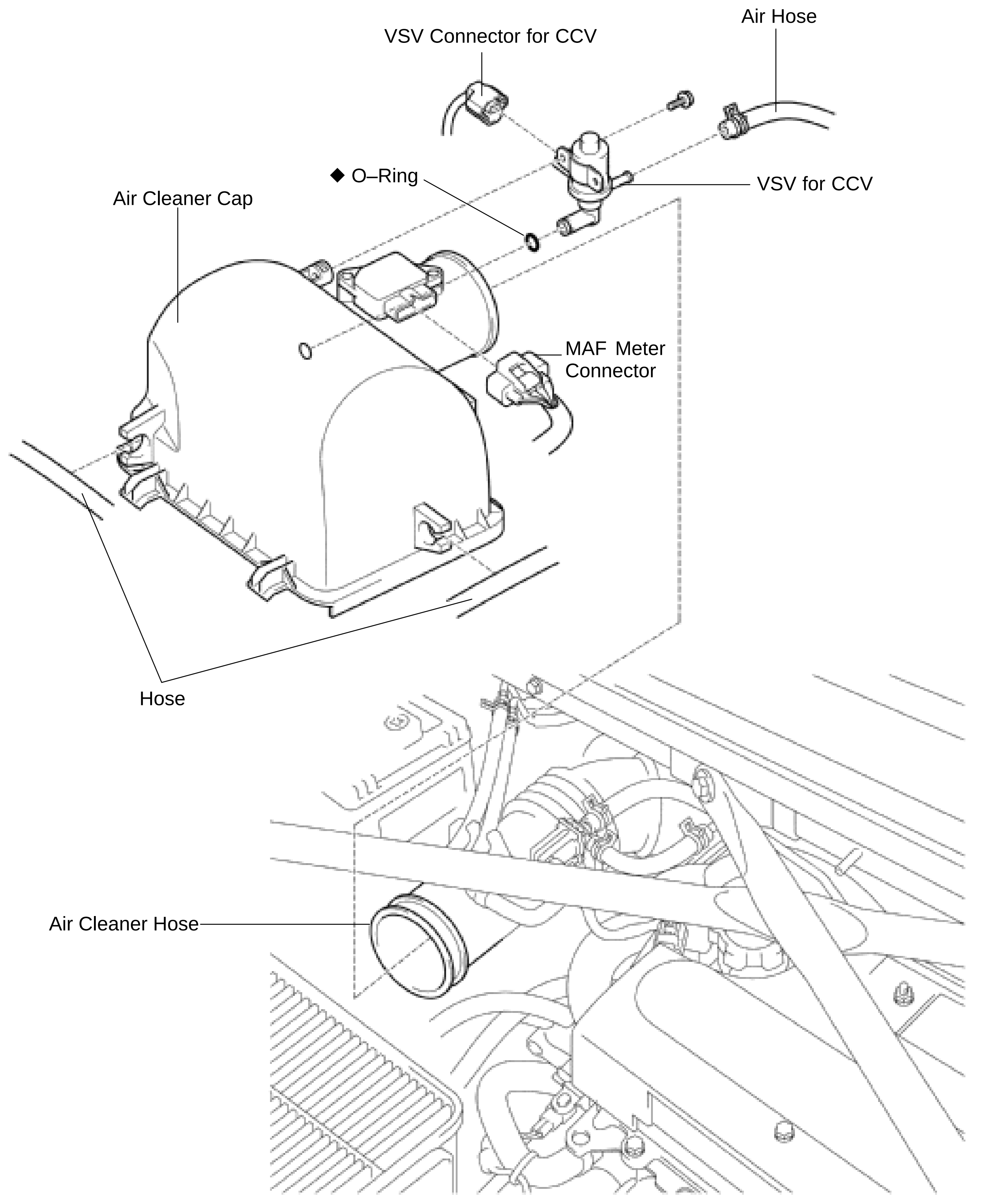
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR CANISTER CLOSED VALVE (CCV)

SF15Y–02

COMPONENTS

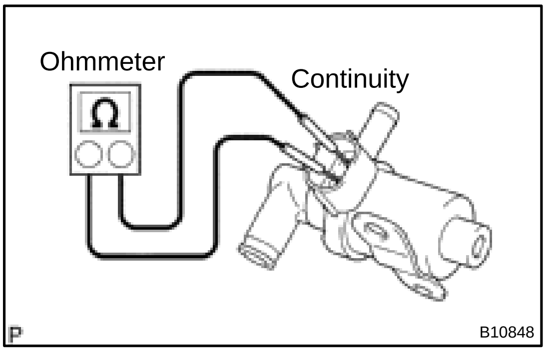


◆ Non–reusable part

B10841

SF15Z–02

INSPECTION

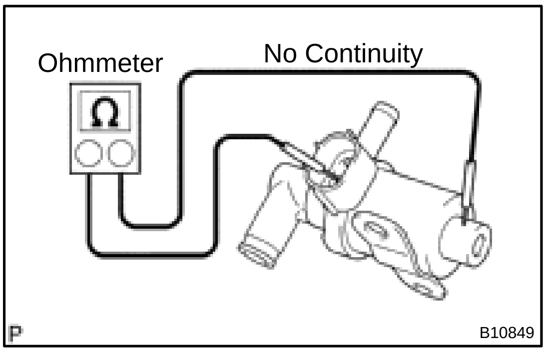


1. REMOVE VSV

2. INSPECT VSV

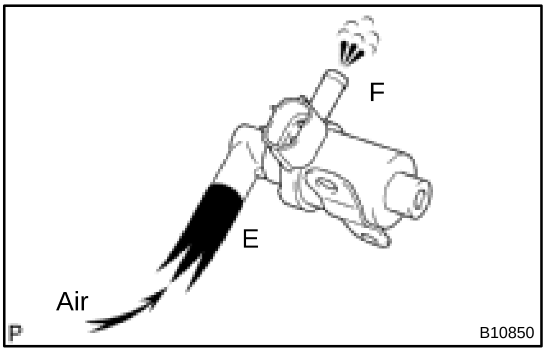
(a) Inspect the VSV for open circuit.
Using an ohmmeter, check that there is continuity between the terminals.
Resistance: 25 – 30 Ω at 20°C (68°F)

If there is no continuity, replace the VSV.

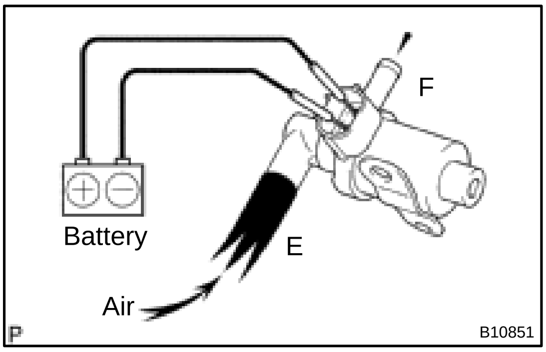


(b) Inspect the VSV for ground.
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is no continuity, replace the VSV.



(c) Inspect the VSV for operation.
(1) Check that air flows from ports E to F.



(2) Apply battery positive voltage across the terminals.
(3) Check that air does not flow from ports E to F.

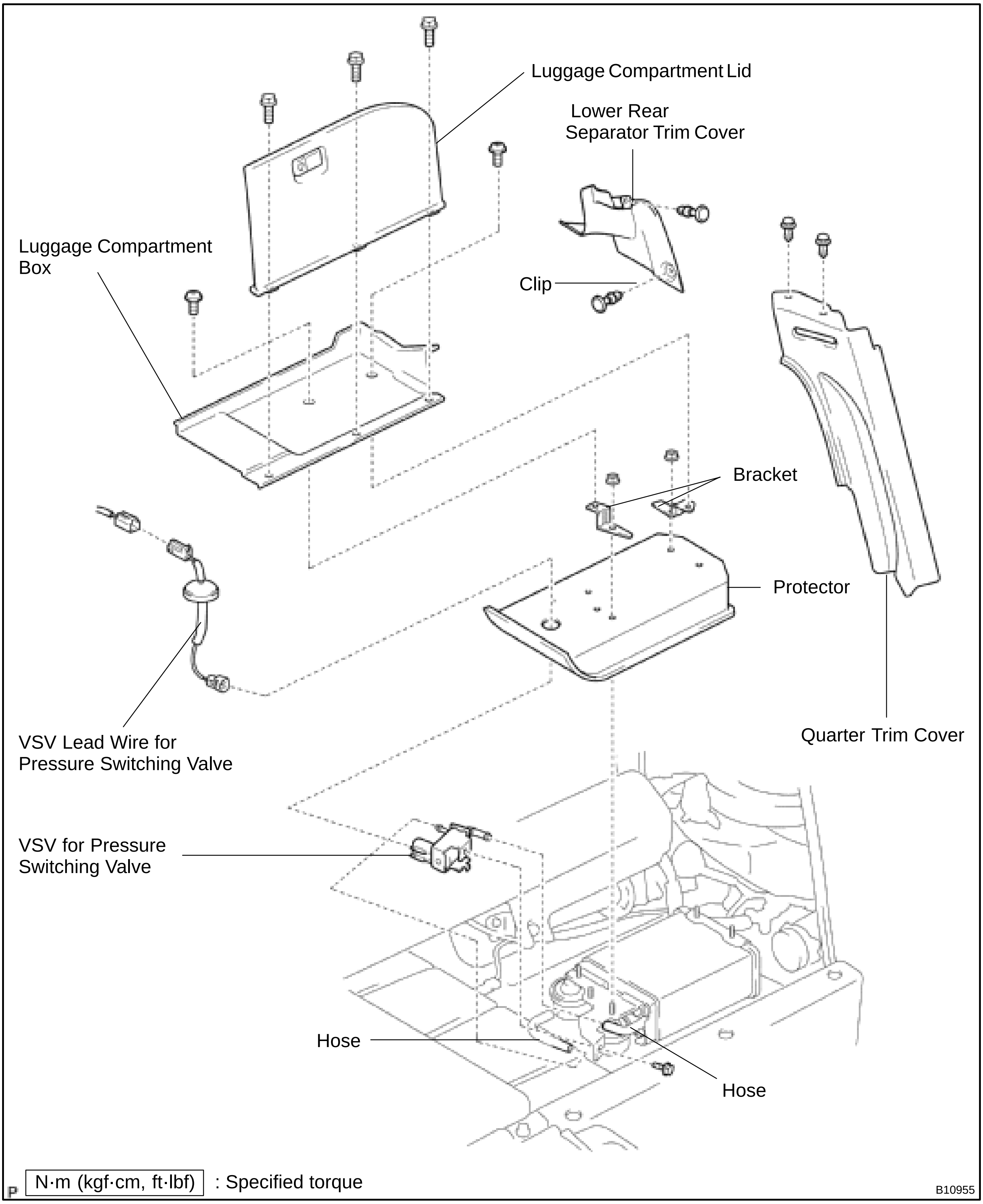
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

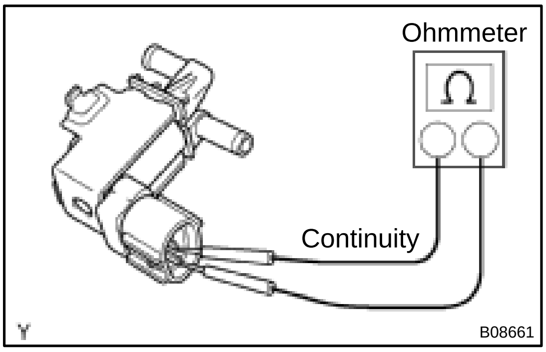
VSV FOR PRESSURE SWITCHING VALVE

COMPONENTS

SF160–02



SF161–02



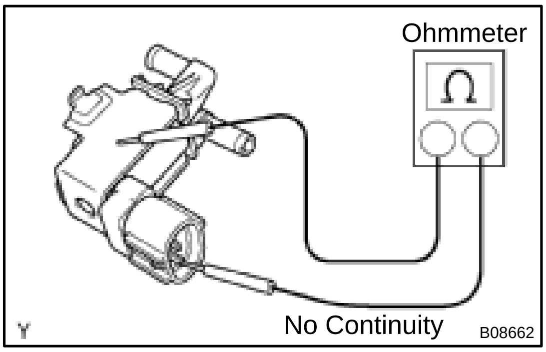
INSPECTION

1. REMOVE VSV

2. INSPECT VSV

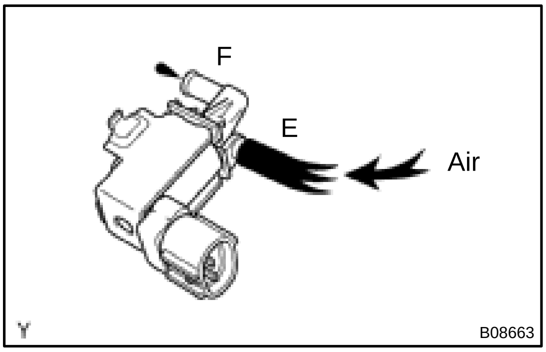
(a) Inspect the VSV for open circuit.
Using an ohmmeter, check that there is continuity between the terminals.
Resistance: 30 – 36 Ω at 20˚C (68˚F)

If there is no continuity, replace the VSV.

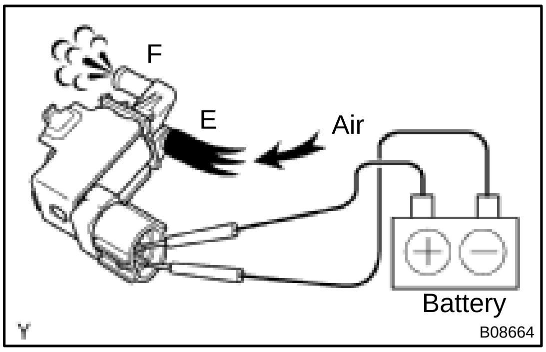


(b) Inspect the VSV for ground.
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is no continuity, replace the VSV.



(c) Inspect the VSV operation.
(1) Check that air does not flow from ports E to F.



(2) Apply battery positive voltage across the terminals.
(3) Check that air flows from ports E to F.

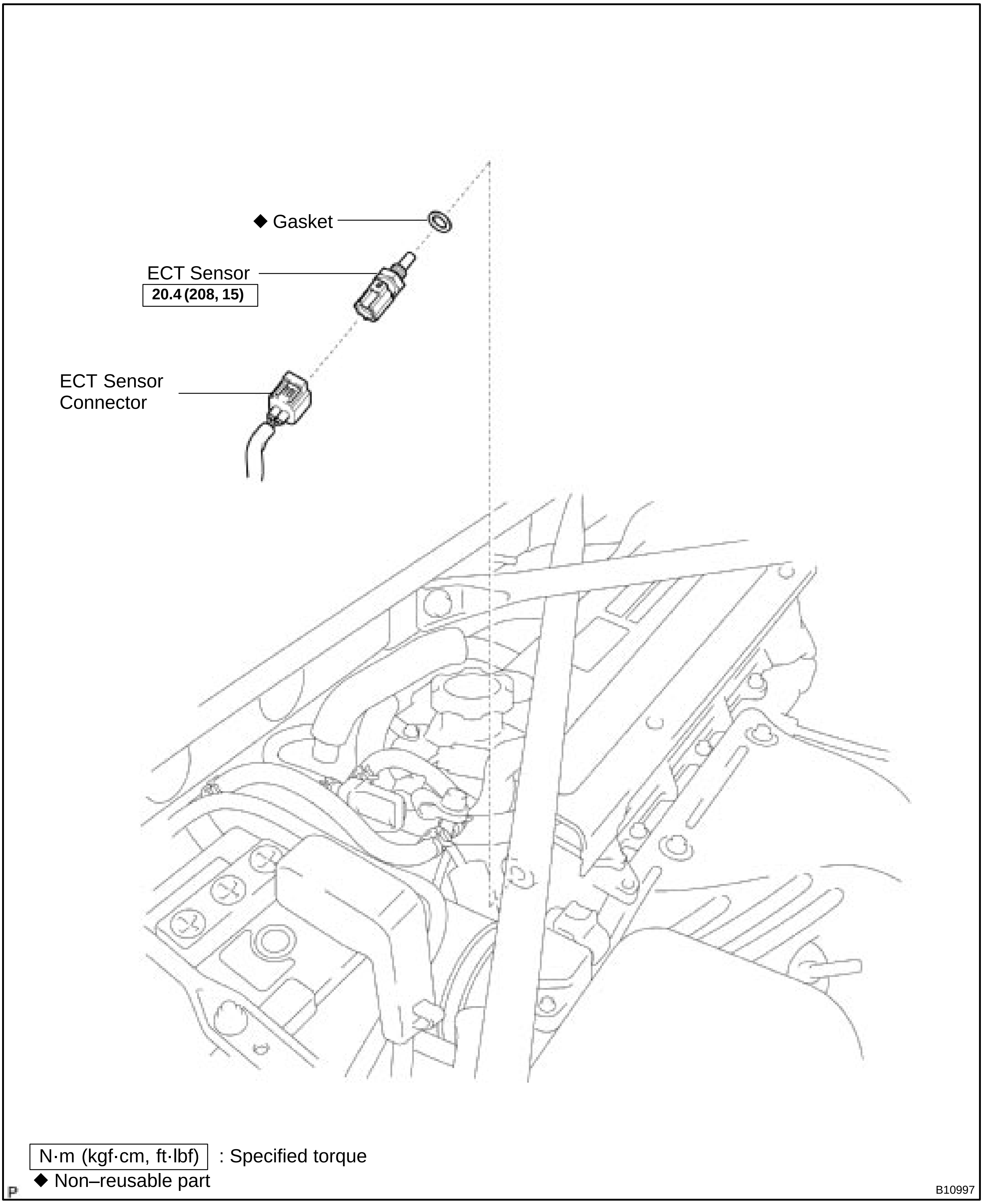
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

COMPONENTS

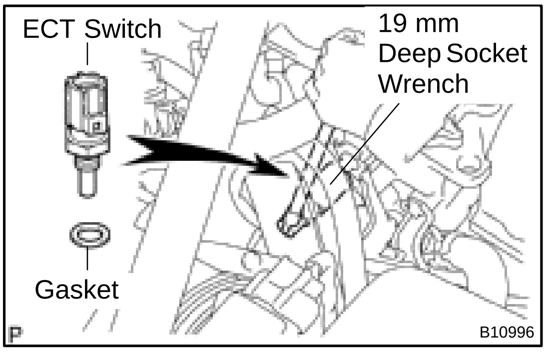
SF162–02



ENGINE COOLANT TEMPERATURE (ECT) SENSOR

SF19V–01

INSPECTION

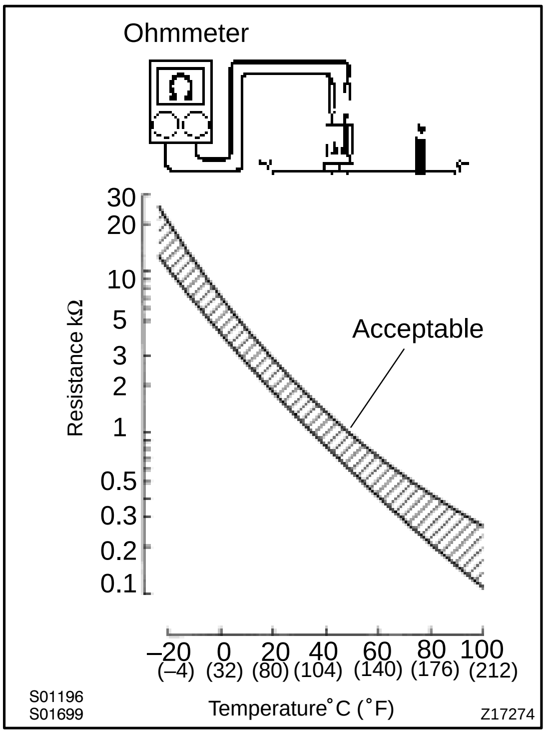


1. DRAIN ENGINE COOLANT

2. REMOVE ECT SENSOR

(a) Disconnect the sensor connector.

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



3. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between terminals.

Resistance: Refer to the graph

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

4. REINSTALL ECT SENSOR

(a) Install a new gasket to the sensor.

(b) Using a 19 mm deep socket wrench, install the sensor.

Torque: 20.4 N·m (208 kgf·cm, 15 ft·lbf)

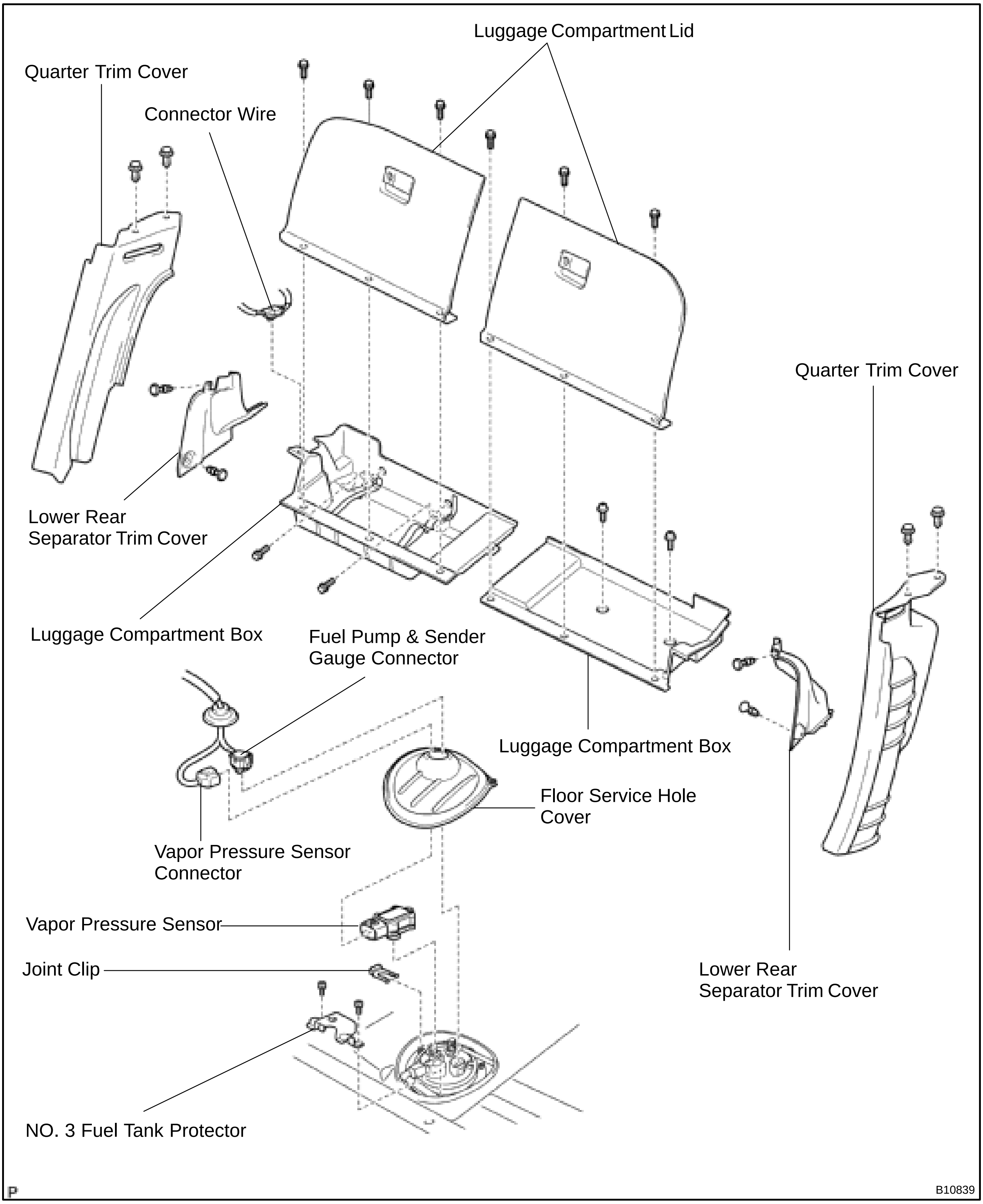
(c) Connect the sensor connector.

5. REFILL WITH ENGINE COOLANT

VAPOR PRESSURE SENSOR

COMPONENTS

SF164–02



SF18V–02

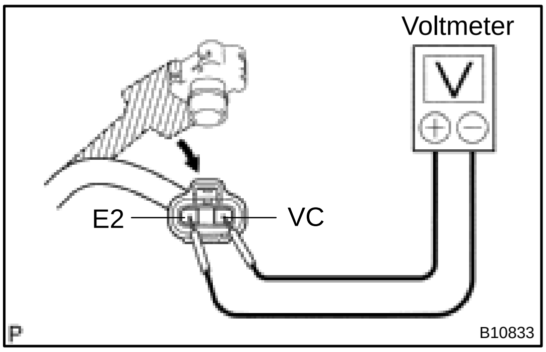
INSPECTION

1. REMOVE LUGGAGE COMPARTMENT BOX

2. REMOVE FLOOR SERVICE HOLE COVER

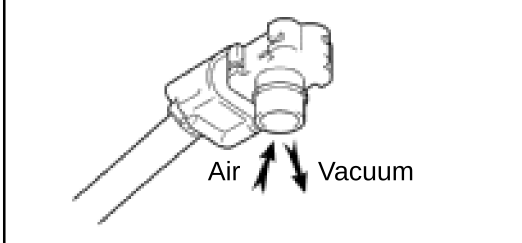
3. REMOVE VAPOR PRESSURE SENSOR

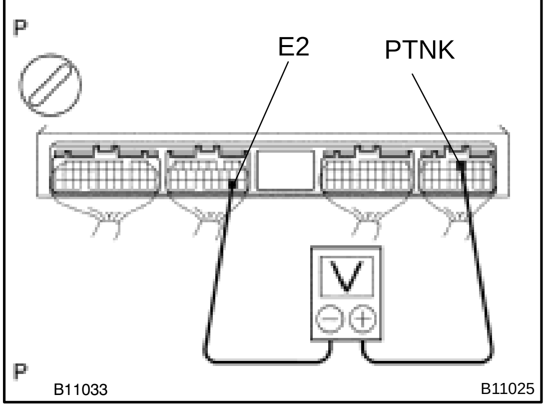
(a) Remove the 2 bolts and No. 3 fuel tank protector.
(b) Disconnect the vapor pressure sensor connector.
(c) Remove the clip and vapor pressure sensor.



4. INSPECT VAPOR PRESSURE SENSOR

(a) Turn the ignition switch ON.
(b) Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.
Voltage: 4.5 – 5.5 V
(c) Turn the ignition switch OFF.





5. INSPECT POWER OUTPUT OF VAPOR PRESSURE SENSOR

(a) Connect the vapor pressure sensor connector.
(b) Turn the ignition switch ON.
(c) Connect a voltmeter to terminals PTNK and E2 of the ECM, and measure the output voltage under the following conditions:
(1) Apply vacuum (2.0 kPa (15 mmHg, 0.59 in.Hg)) to the vapor pressure sensor.
Voltage: 1.3 – 2.1 V
(2) Release the vacuum from the vapor pressure sensor.
Voltage: 3.0 – 3.6 V
(3) Apply pressure (1.5 kPa (15 gf/cm^2, 0.22 psi)) to the vapor pressure sensor.
Voltage: 4.2 – 4.8 V
(d) Turn the ignition switch OFF.

6. REINSTALL VAPOR PRESSURE SENSOR

(a) Reinstall the vapor pressure sensor and clip.
(b) Reconnect the vapor pressure sensor connector.
(c) Reinstall the 2 bolts and No. 3 fuel tank protector.

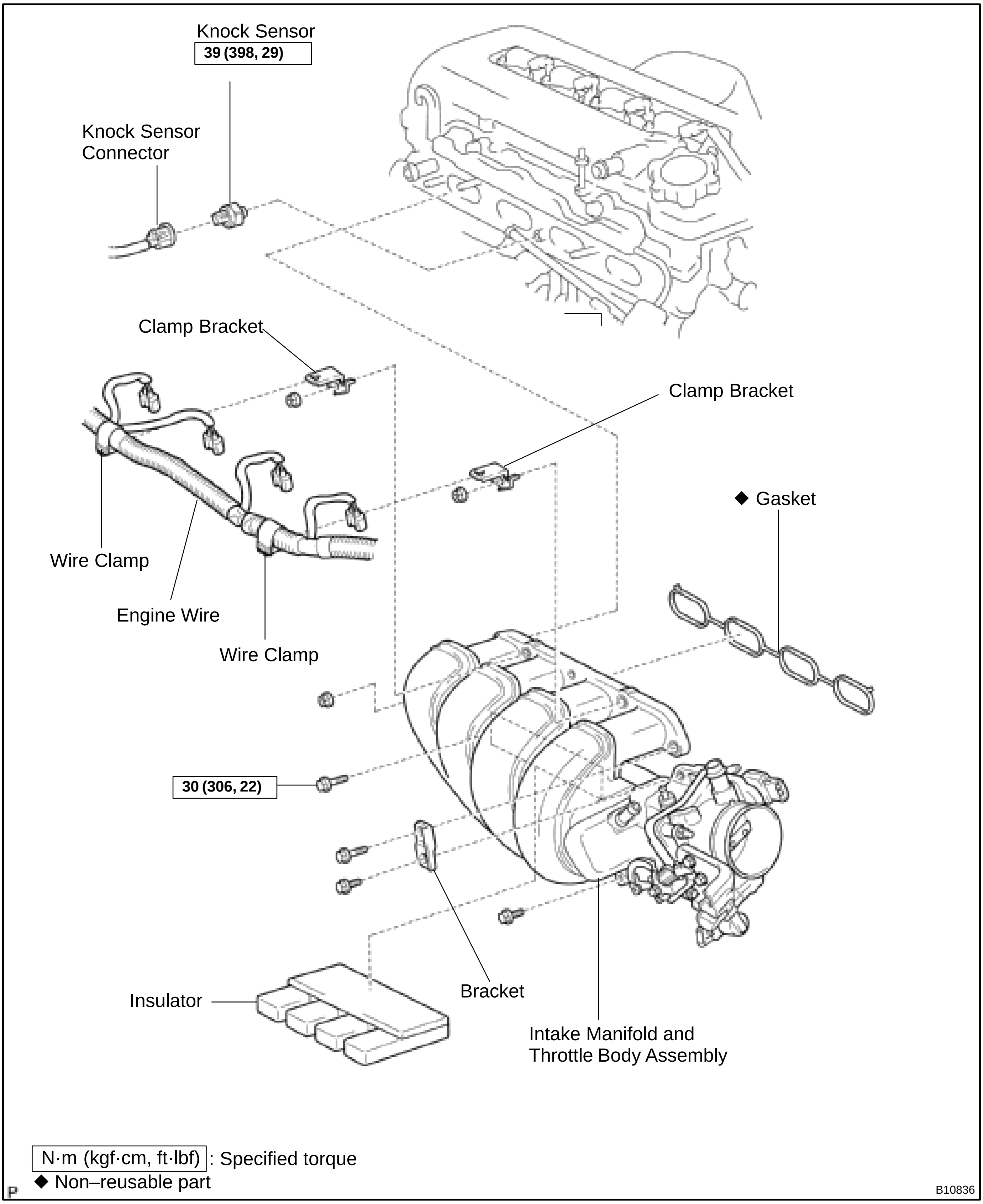
7. REINSTALL FLOOR SERVICE HOLE COVER

8. REINSTALL LUGGAGE COMPARTMENT BOX

KNOCK SENSOR

COMPONENTS

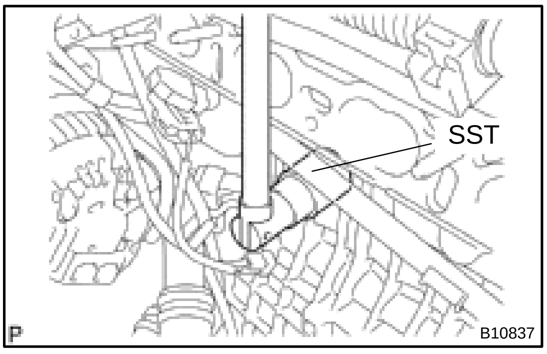
SF19W–01



SF0A9–05

INSPECTION

1. **REMOVE ENGINE FROM VEHICLE (See page EM–54)**
2. **REMOVE INTAKE MANIFOLD AND THROTTLE BODY ASSEMBLY (See page EM–29)**

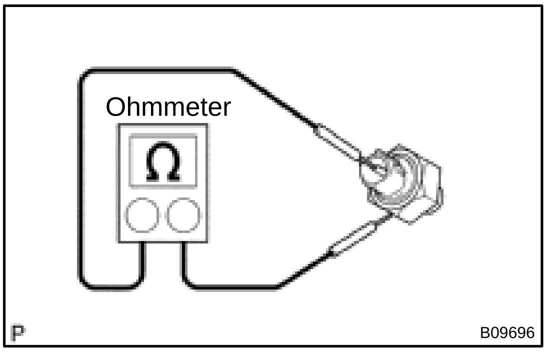


3. **REMOVE KNOCK SENSOR**

(a) Disconnect the knock sensor connector.

(b) Using SST, remove the sensor.

SST 09817–16011



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. **REINSTALL KNOCK SENSOR**

(a) Using SST, install the sensor.

SST 09817–16011

Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

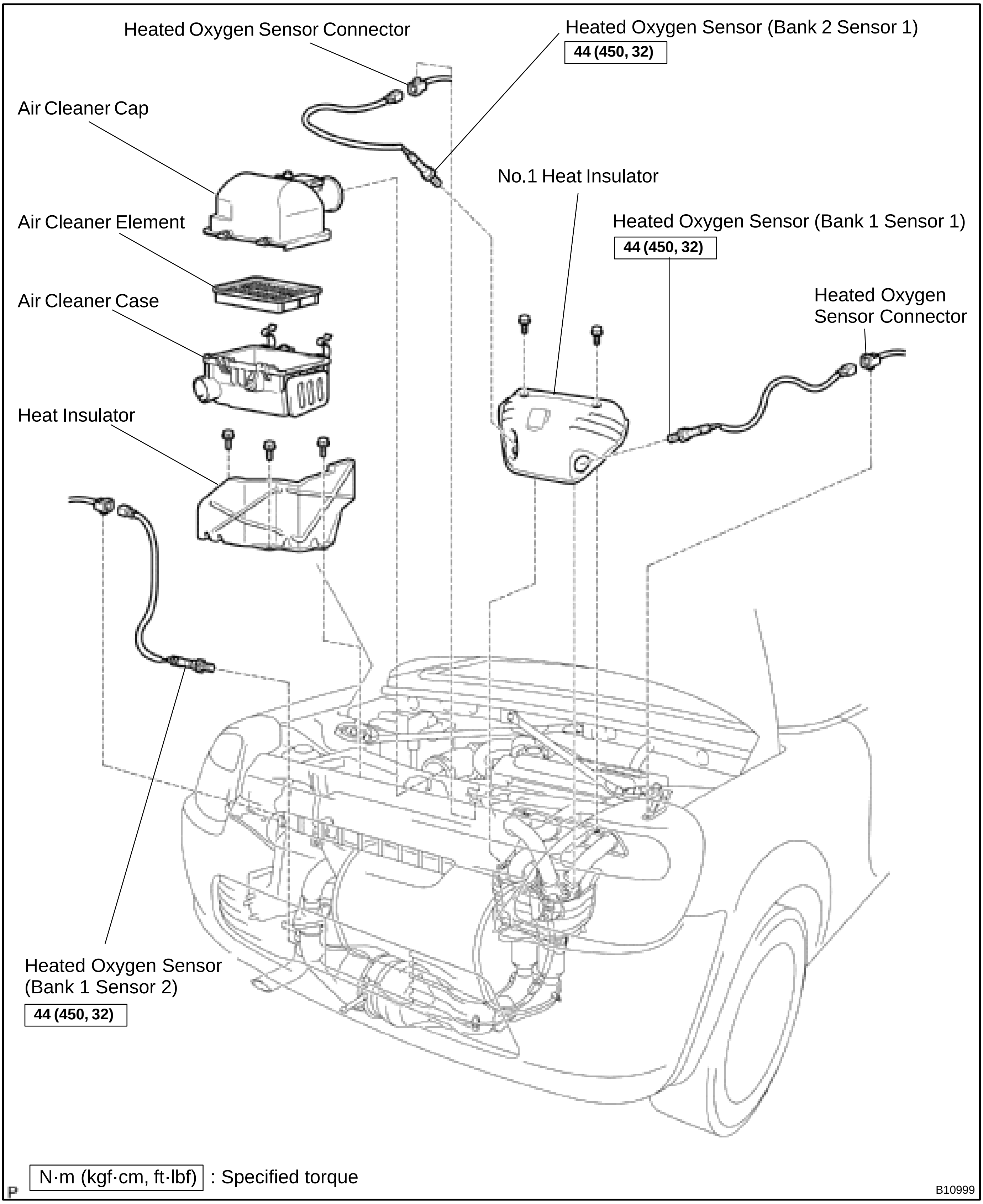
(b) Connect the sensor connector.

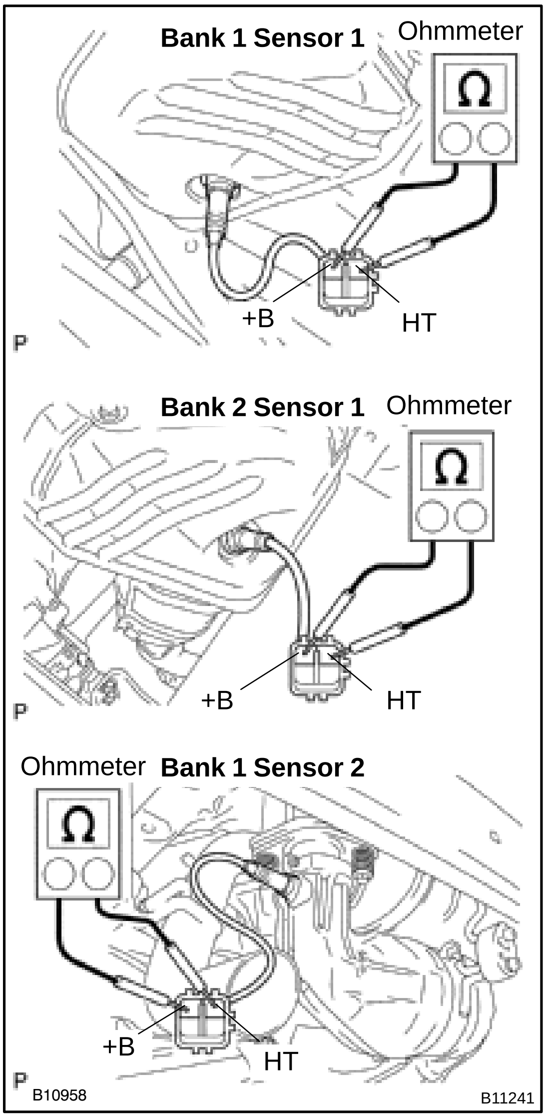
6. **REINSTALL INTAKE MANIFOLD AND THROTTLE BODY ASSEMBLY (See page EM–46)**
7. **INSTALL ENGINE TO VEHICLE (See page EM–59)**

HEATED OXYGEN SENSOR

COMPONENTS

SF167–02





SF19X–01

INSPECTION

INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

(a) Disconnect the sensor connector.

(b) Using an ohmmeter, measure the resistance between terminals +B and HT.

Temperature	Resistance
at 20˚C (68˚F)	11 – 16 Ω
at 800˚C (1,472˚F)	23 – 32 Ω

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

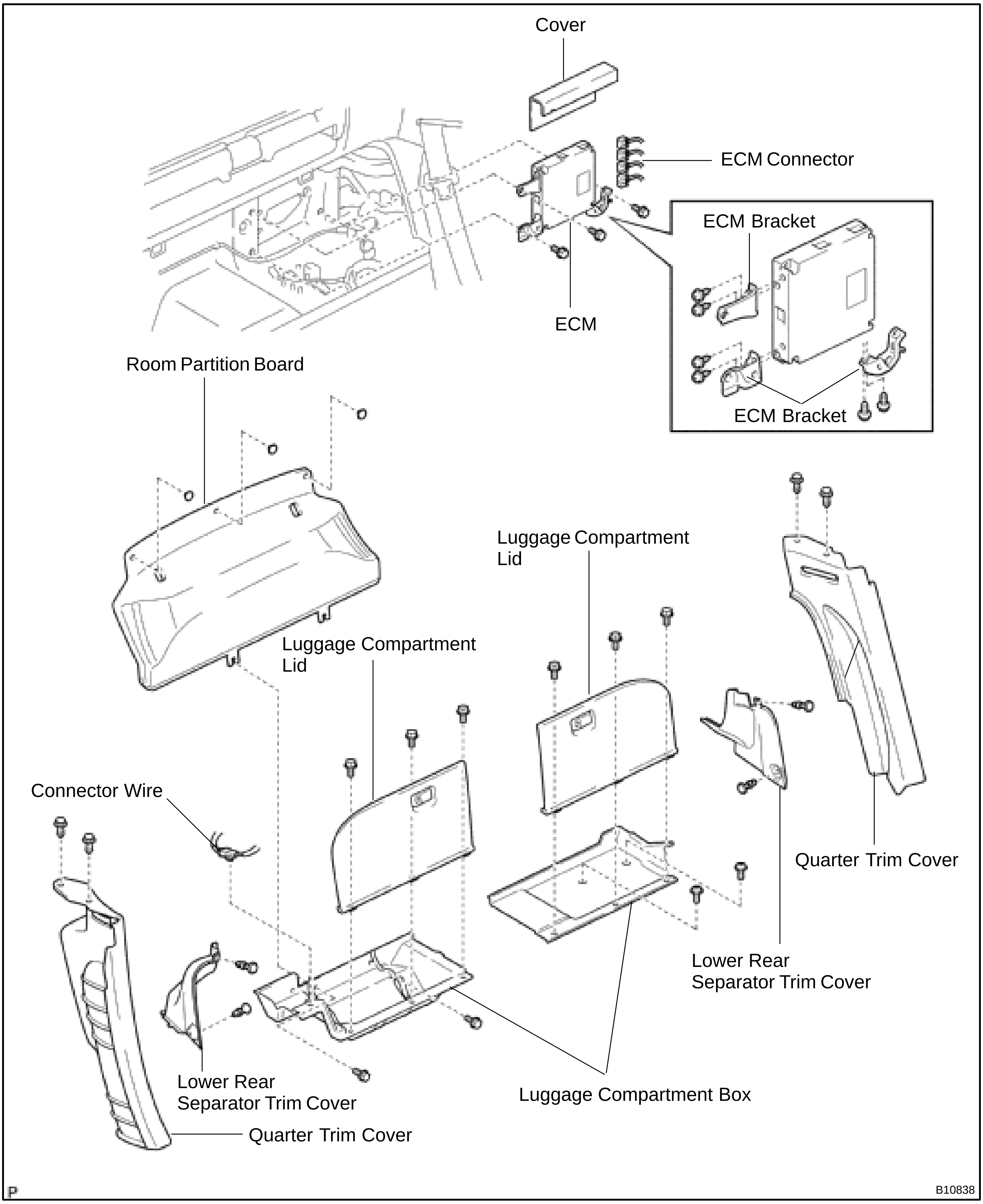
Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)

(c) Reconnect the sensor connector.

ENGINE CONTROL MODULE (ECM)

COMPONENTS

SF0OF–03



SF0OG–03

INSPECTION

INSPECT ECM (See page DI–19)

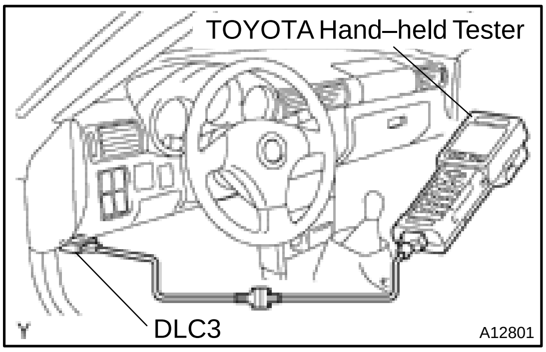
FUEL CUT RPM

SF0AD–09

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

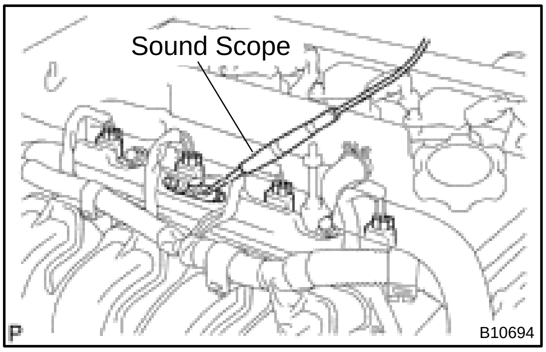


A12801

2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL TO DLC3

(a) Connect a TOYOTA hand–held tester or OBDII scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operator's manual for further details.



B10694

3. INSPECT FUEL CUTOFF RPM

(a) Increase the engine speed to at least 3,500 rpm.

(b) Use a sound scope to check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT:

Measure with the A/C OFF.

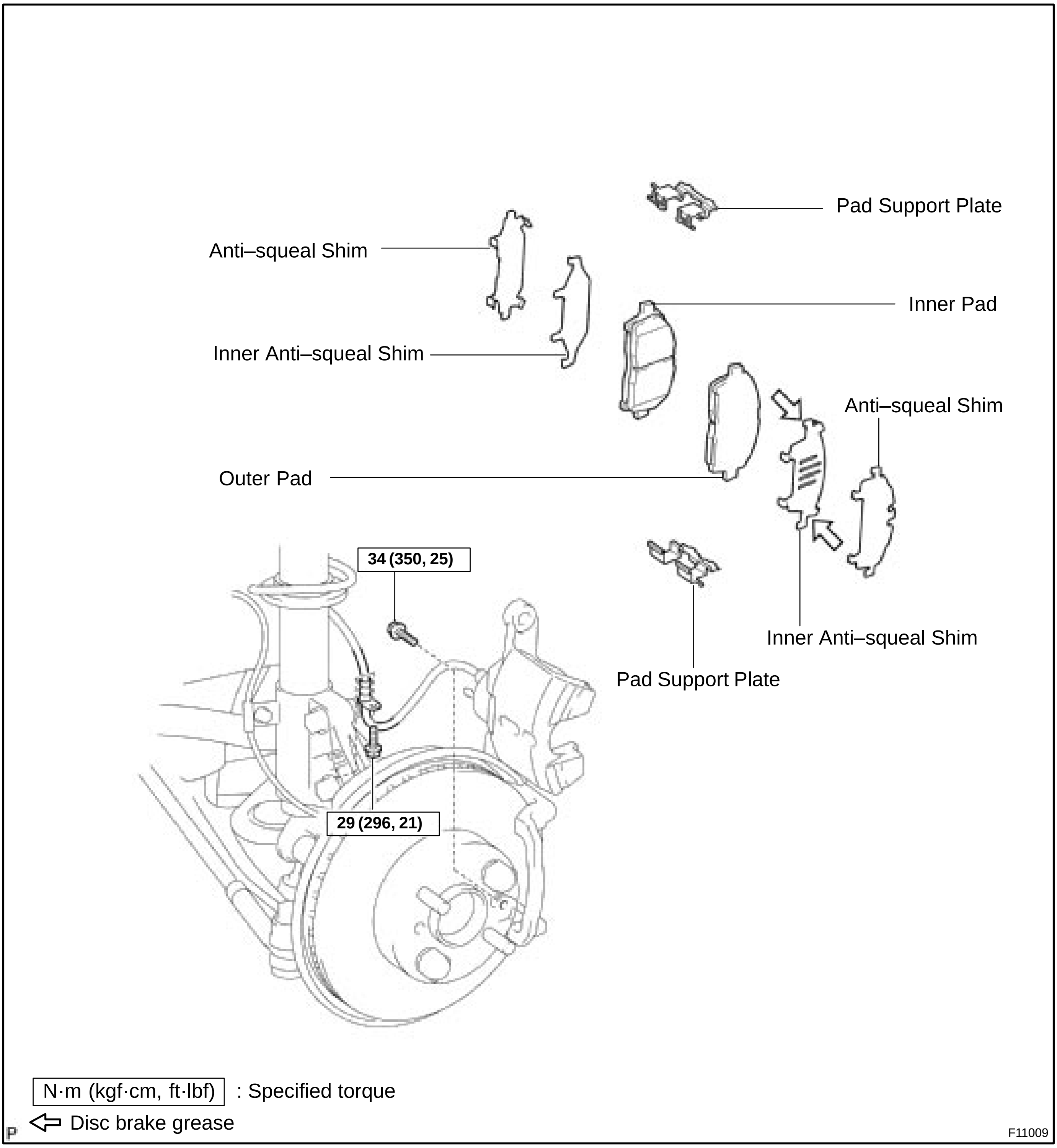
Fuel return rpm: 1,400 rpm

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL FROM DLC3

FRONT BRAKE PAD

COMPONENTS

BR0QB–03



COOLANT

CO04D–04

INSPECTION

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

The engine coolant level should be between the ”LOW” and ”FULL” line.

If low, check for leaks and add ”Toyota Long Life Coolant” or equivalent up to the ”FULL” line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the reservoir cap.

CAUTION:

To avoid the danger of being burned, do not remove the reservoir the cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) There should not be any excessive deposits of rust or scale around the reservoir cap or reservoir filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

(c) Reinstall the reservoir cap.

CO0WX–03

REPLACEMENT

CAUTION:

Be sure to perform the operation after the engine and coolant are completely cool down because there is a fear of burning.

NOTICE:

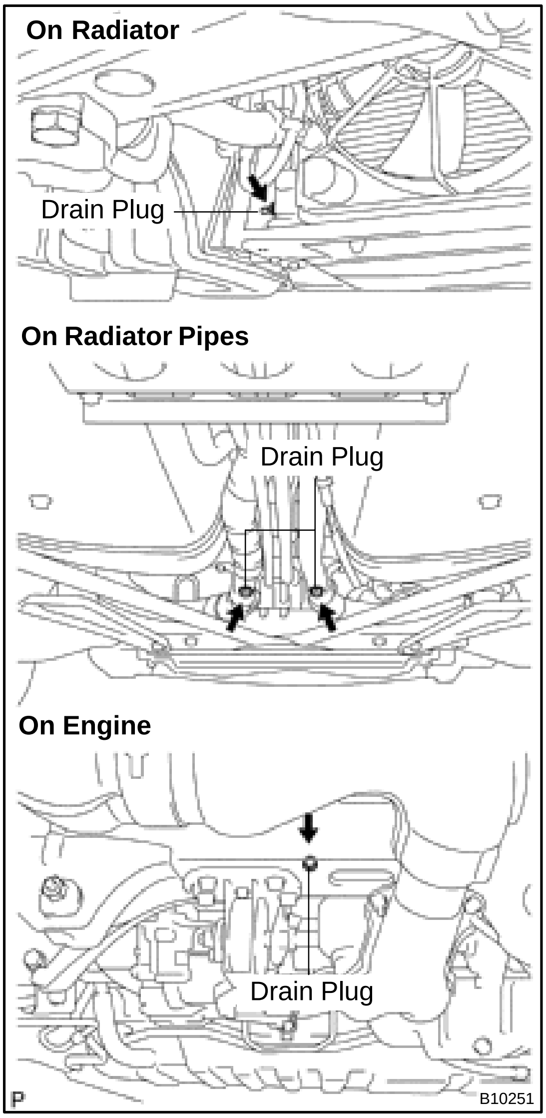
- **In order to do sure filling of the coolant, perform the operation where the vehicle can be kept evenly flat.**
- **In order to replace the coolant securely, must keep the following operation procedure. Also, after replacing the coolant, driving within 500 km (311 miles) or within a week, check the water level of the reservoir tank once or twice.**

1. DRAIN ENGINE COOLANT

(a) Remove the luggage under cover.

(b) Remove the tool box and luggage compartment trim box cover.

(c) Remove the reservoir tank cap.



(d) Remove the drain plugs (radiator, radiator pipes and engine), and drain the coolant.

NOTICE:

Check the drain plug and the gasket of the radiator pipes. When they are damaged, replace them. At the same time, check the hoses and hose clamps. When there are any misregistration and deformation of the hose clamps or damage of the hoses, replace them.

HINT:

We recommend to replace the gaskets at the same time when to replace the coolant.

(e) Close the drain plugs.

Torque:

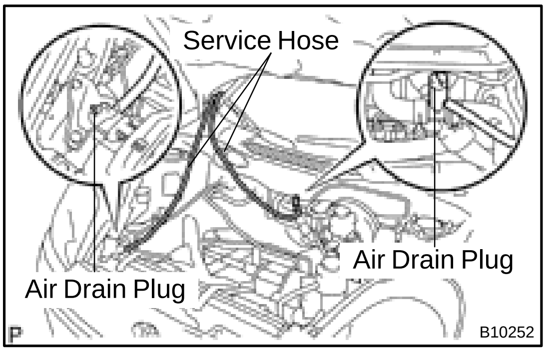
Engine: 13 N·m (133 kgf·cm, 9.6 ft·lbf)

Radiator pipes: 16.5 N·m (168 kgf·cm, 12 ft·lbf)

2. REFILL WITH ENGINE COOLANT

(a) Set the service hoses.

(1) Connect the service hoses to the air drain plug of the radiator and heater water valve.



(2) Suspend the opposite ends the front hood as shown in the illustration.

NOTICE:
Do not close–off or pinch any of the service hoses.

(b) Fill the engine coolant.

(1) Turn each air drain plugs of the radiator and heater water valve counterclockwise and make it open.

(2) Slowly fill the system with coolant.

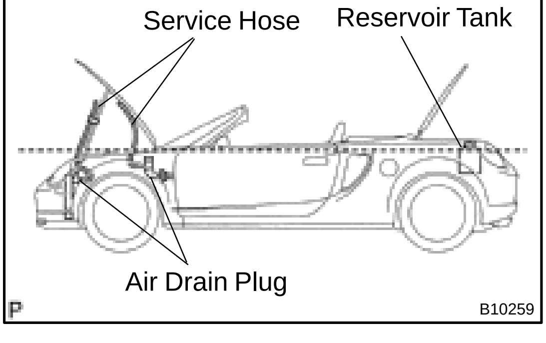
- Use of improper coolants may damage engine cooling system.
- Use ”Toyota Long Life Coolant” or equivalent and mix it with plain water according to the manufacturer's directions.
- Using of coolant which includes more than 50 % (freezing protection down to –35°C (–31°F)) or 60 % (freezing protection down to –50°C (–58°F)) of ethylene–glycol is recommended but not more than 70 %.

NOTICE:
- **Do not use an alcohol type coolant or plain water alone.**
- **The coolant should be mixed with plain water (preferably demineralized water or distilled water).**

Capacity: 10.4 liters (10.9 US qts, 9.2 Imp. qts)

(3) Check that air is bleeding from the air drain service hoses of the radiator and heater water valve.

(4) When filling coolant into the reservoir tank, do it an the height as near to the filling inlet (by making the water surface by or more than 1/2 of the reservoir tank) as possible and fill the coolant until the level keeps A line of the filling inlet.



(5) Check with your eyes that the water level of the air drain service hoses of radiator and heater water valve is as high as that of the reservoir tank.

When the water level of the air drain service hoses of the radiator and heater water valve is obviously lower, fix the crash and bent of the air drain service hoses, check the air bleed and perform step (4).

(6) Turn the air drain plugs of the radiator and heater water valve clockwise and make it close.

(7) Never have any leakage from each drain plugs of the radiator, radiator pipes or engine. Make sure that the air drain plugs of the radiator and heater water valve are closed and turn the reservoir tank cap to close until the lock position until it clicks.
(8) Remove the service hoses of the radiator and heater water valve and collect the coolant remained in the service hoses.
(9) Start the engine, check that the air is bleeding to the reservoir tank and warm up the engine sufficiently.
(10) Check that the water level of the reservoir tank after the warming up of the engine is over the FULL.
(11) After complete cooling of the engine, the level shall be between LOW and FULL.

(c) Replace the service hoses to the original place.
(d) Reinstall the tool box and luggage compartment trim box cover.
(e) Reinstall the luggage under cover.

WATER PUMP

CO0XL–02

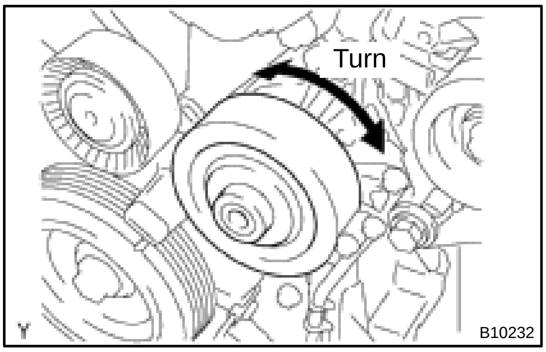
ON–VEHICLE INSPECTION

INSPECT WATER PUMP

NOTICE:

Be sure to do checking when the engine coolant is charged.

(a) Remove the drive belt (See page CH–7).



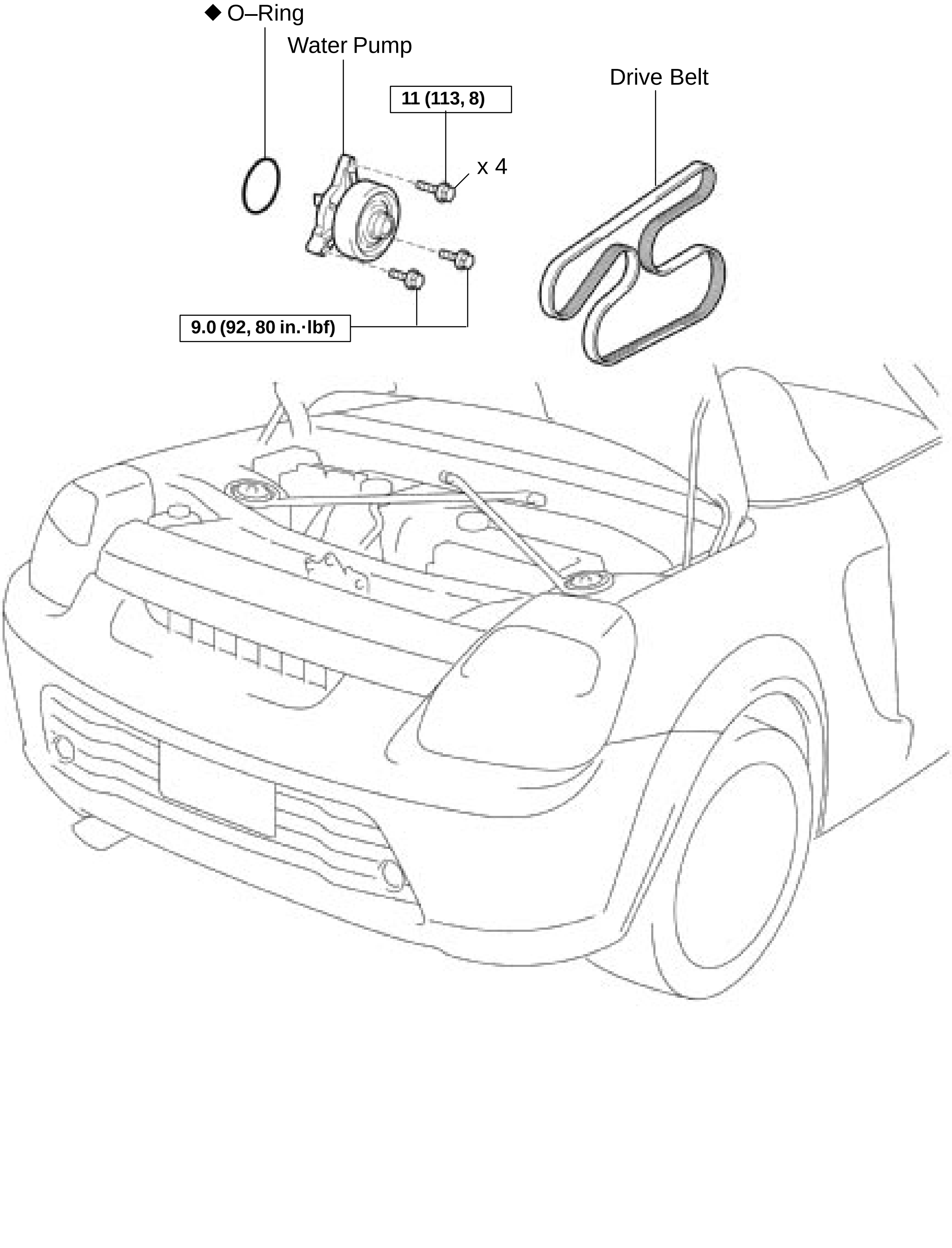
(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.

(c) Reinstall the drive belt (See page CH–17).

CO04F–07

COMPONENTS



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

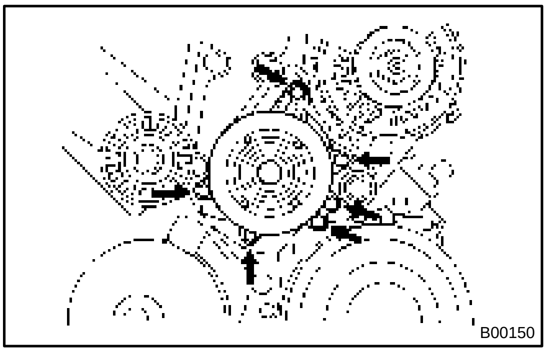
◆ Non–reusable part

B10235

CO0Y9–01

REMOVAL

1. **DRAIN ENGINE COOLANT (See page CO–2)**
2. **REMOVE DRIVE BELT (See page CH–7)**



B00150

3. **REMOVE WATER PUMP**

(a) Remove the 6 bolts, water pump and gasket.

(b) Clean up the engine coolant from the water chamber room.

NOTICE:

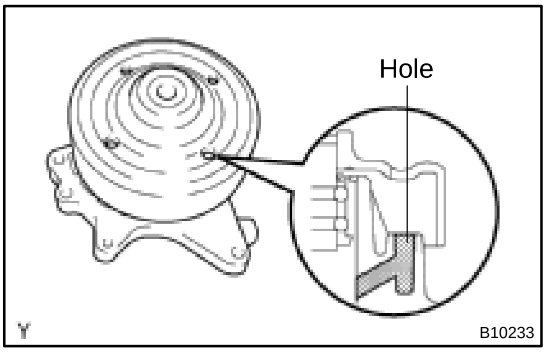
Do not remove the RH engine mounting bracket and generator when the water pump alone is replaced.

CO04H–07

INSPECTION

NOTICE:

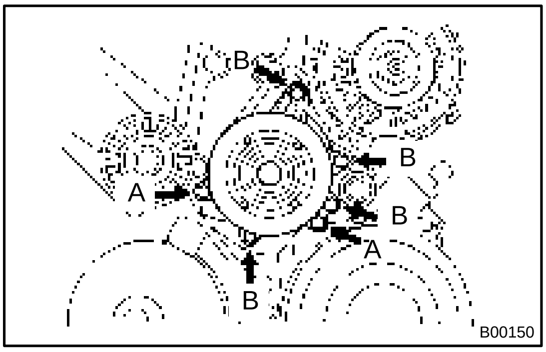
Never rotate the pulley in a condition with a single unit of the water pump.



INSPECT WATER PUMP

Visually check the drain hole for coolant leakage.

If leakage is found, replace the water pump.



CO0YA–01

INSTALLATION

1. INSTALL WATER PUMP

(a) Place a new O–ring on the timing chain cover.

(b) Install the water pump with the 6 bolts.

Torque:

Bolt A: 9 N·m (92 kgf·cm, 80 in.·lbf)

Bolt B: 11 N·m (113 kgf·cm, 8 ft·lbf)

HINT:

Each bolt length is indicated in the illustration.

Bolt ”A”	30 mm (1.18 in.)
Bolt ”B”	35 mm (1.38 in.)

2. INSTALL DRIVE BELT (See page CH–17)

3. FILL WITH ENGINE COOLANT (See page CO–2)

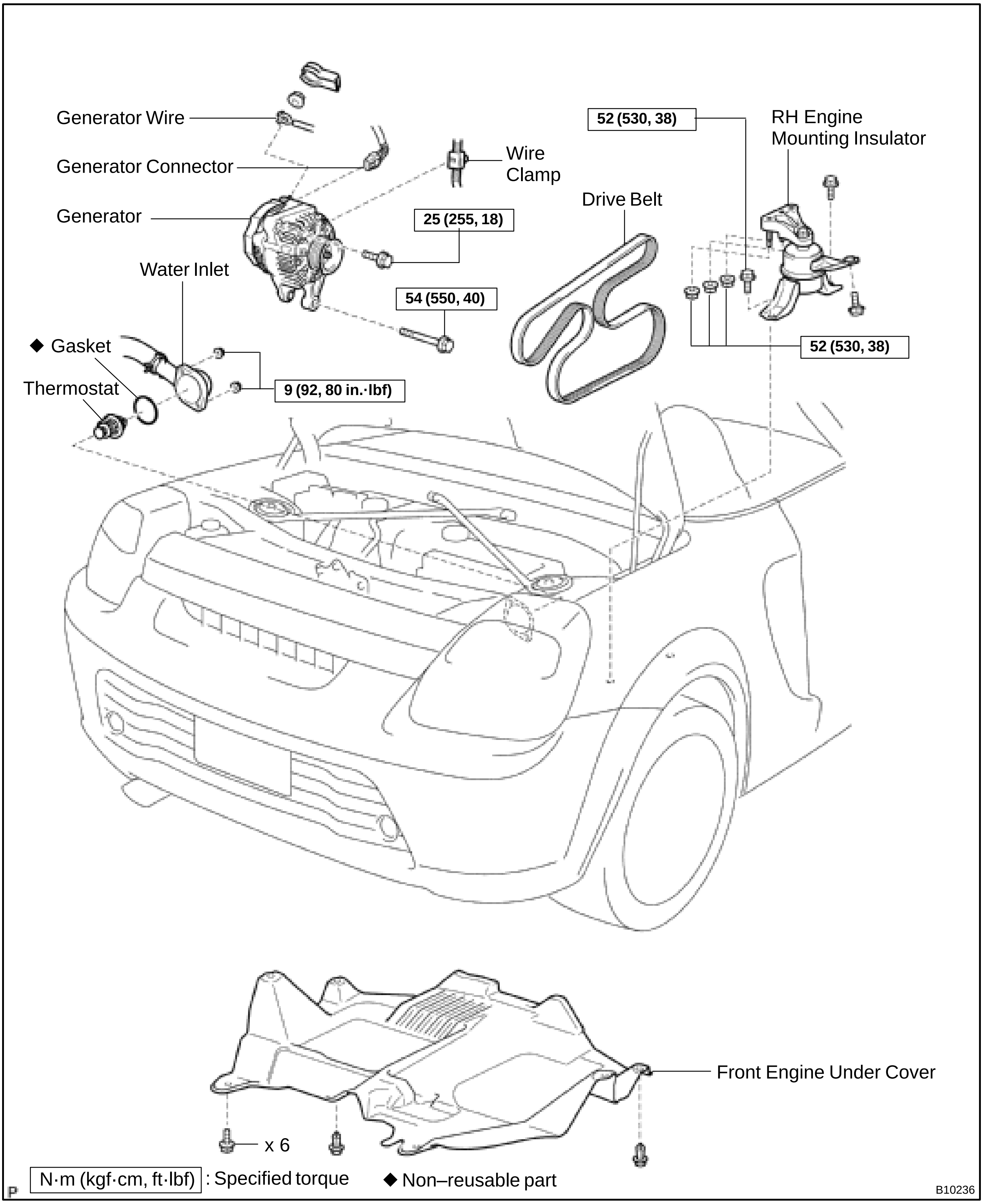
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE COOLANT LEVEL

THERMOSTAT

COMPONENTS

CO04J–08

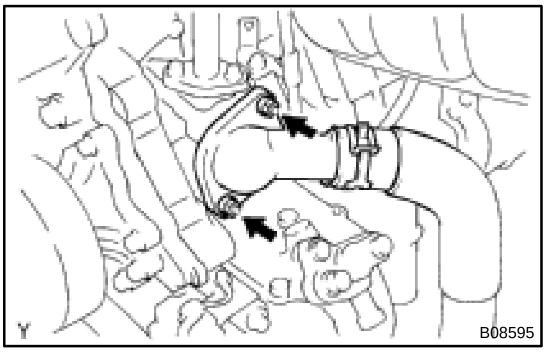


CO0YB–01

REMOVAL

HINT:
Removal of the thermostat would have an adverse effect. causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. **DRAIN ENGINE COOLANT (See page CO–2)**
2. **REMOVE DRIVE BELT AND GENERATOR (See page CH–7)**
3. **REMOVE FRONT ENGINE UNDER COVER**



4. **REMOVE WATER INLET AND THERMOSTAT**

(a) Remove the 2 nuts, and disconnect the water inlet from the cylinder block.
(b) Remove the thermostat.
(c) Remove the gasket from the thermostat.

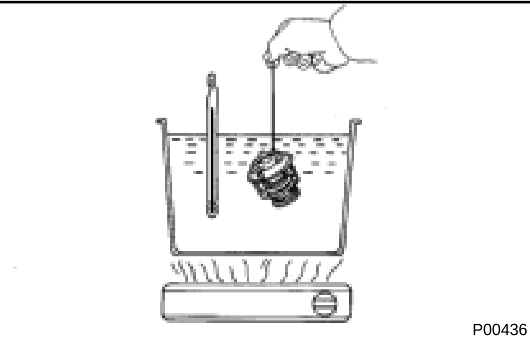
CO04L–06

INSPECTION

P13560

INSPECT THERMOSTAT

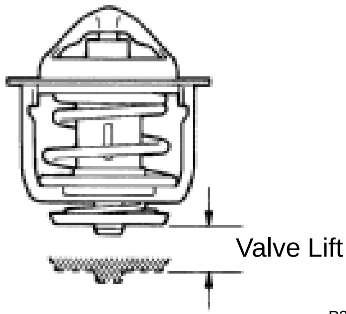
HINT:
The thermostat is numbered with the valve opening temperature.


P00436

(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.
Valve opening temperature: 80 – 84˚C (176 – 183.2˚F)

If the valve opening temperature is not as specified, replace the thermostat.



P24125

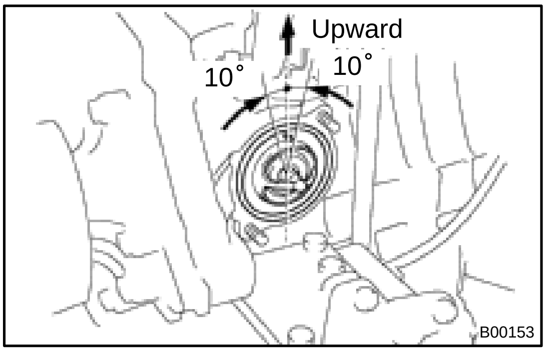
(c) Check the valve lift.
Valve lift: 10 mm (0.39 in.) or more at 90˚C (194˚F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40˚C (104˚F)).

If not closed, replace the thermostat.

CO0YC–01



INSTALLATION

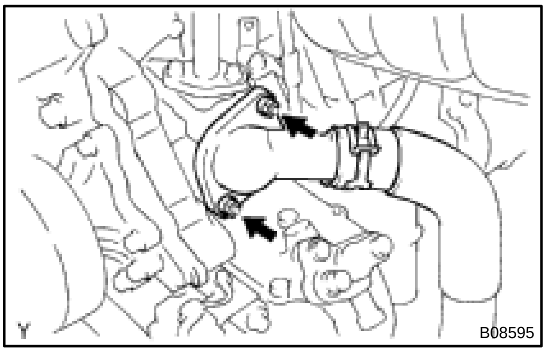
1. PLACE THERMOSTAT IN CYLINDER BLOCK

(a) Install a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve upward.

HINT:

The jiggle valve may be set within 10˚ of either side of the prescribed position.



2. INSTALL WATER INLET

Install the water inlet with the 2 nuts.

Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)

3. INSTALL FRONT ENGINE UNDER COVER

4. INSTALL GENERATOR AND DRIVE BELT (See page CH–17)

5. FILL WITH ENGINE COOLANT (See page CO–2)

6. START ENGINE AND CHECK FOR LEAKS

7. RECHECK ENGINE COOLANT LEVEL

RADIATOR

CO04N–01

ON–VEHICLE CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE:

If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core.)

CO04O–07

ON–VEHICLE INSPECTION

1. REMOVE RESERVOIR CAP

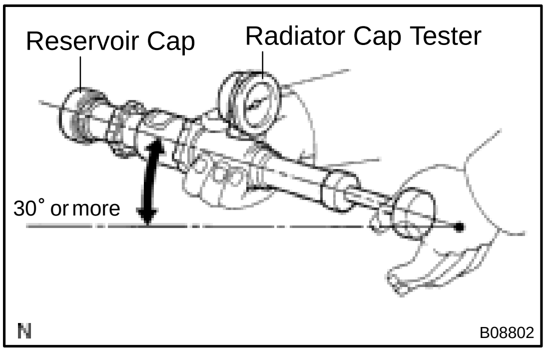
CAUTION:

To avoid the danger of being burned, do not remove the reservoir cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

2. INSPECT RESERVOIR CAP

NOTICE:

- **If the reservoir cap has contaminations, always rinse it with water.**
- **Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.**
- **When performing steps (a) and (b) below, keep the radiator cap tester at an angle of over 30° above the horizontal.**



(a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

Pump speed: 1 push/(3 seconds or more)

NOTICE:

Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the reservoir cap.

(b) Pump the tester and measure the relief valve opening pressure.

Pump speed: 1 push within 1 seconds

NOTICE:

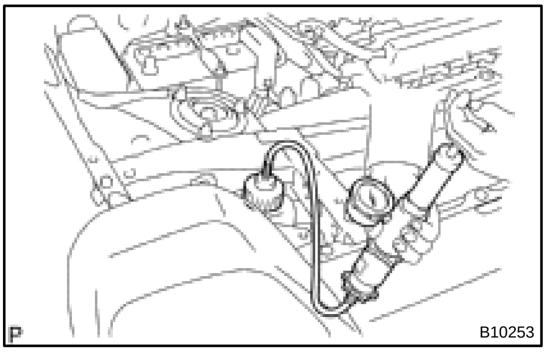
This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Standard opening pressure:
93 – 123 kPa (0.95 – 1.25 kgf/cm^2, 13.5 – 17.8 psi)
Minimum opening pressure:
79 kPa (0.8 kgf/cm^2, 11.5 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the reservoir cap.



3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

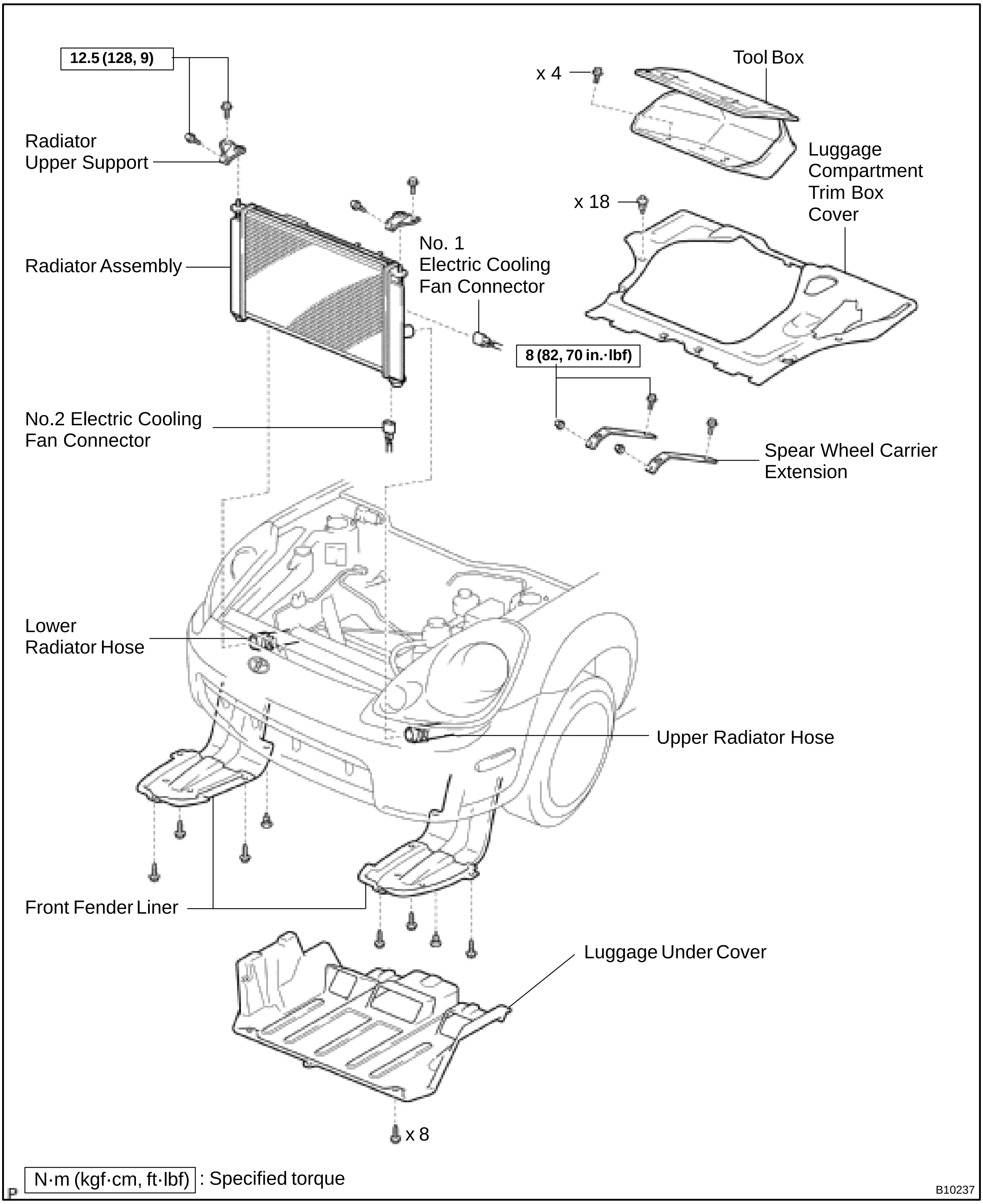
(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

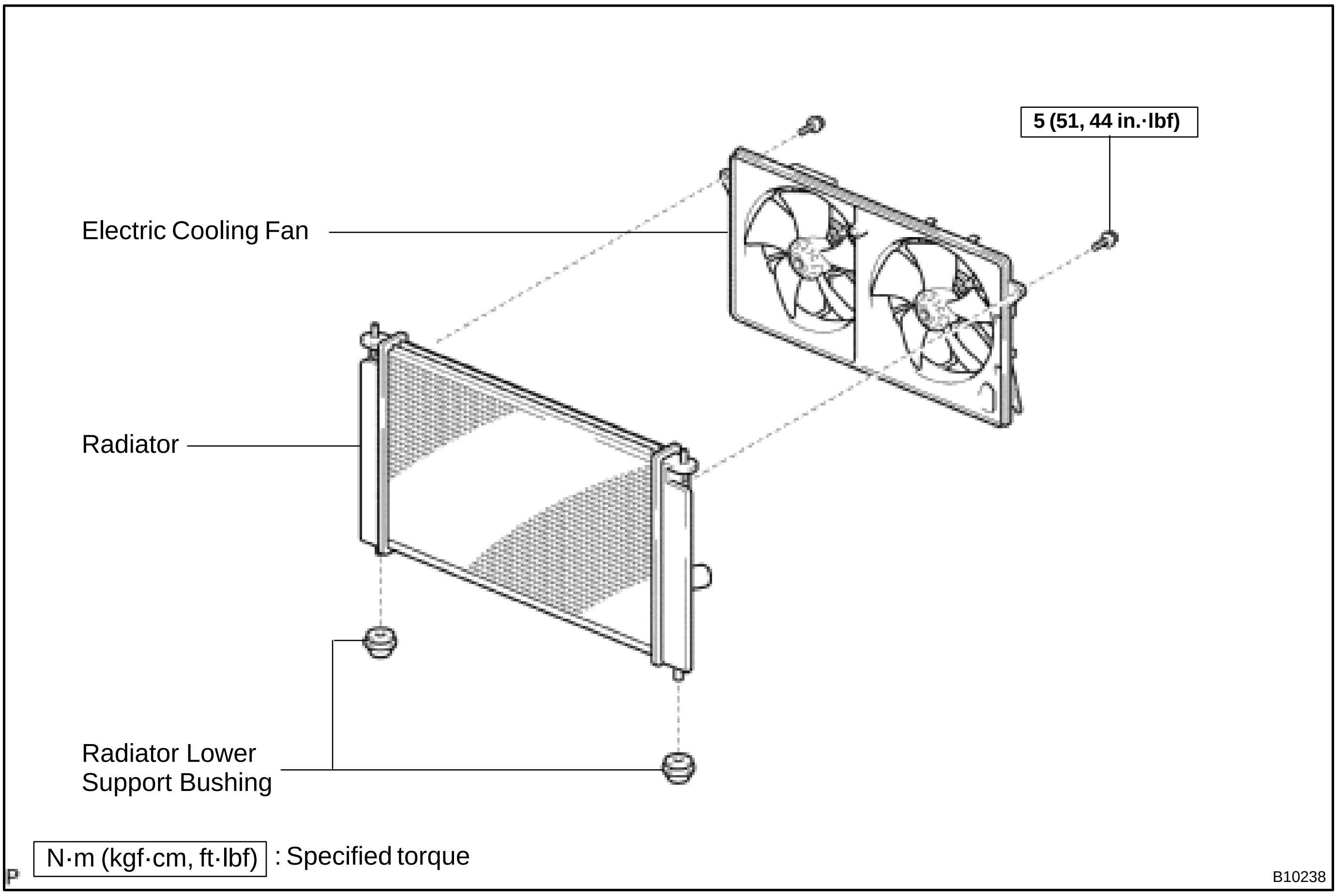
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

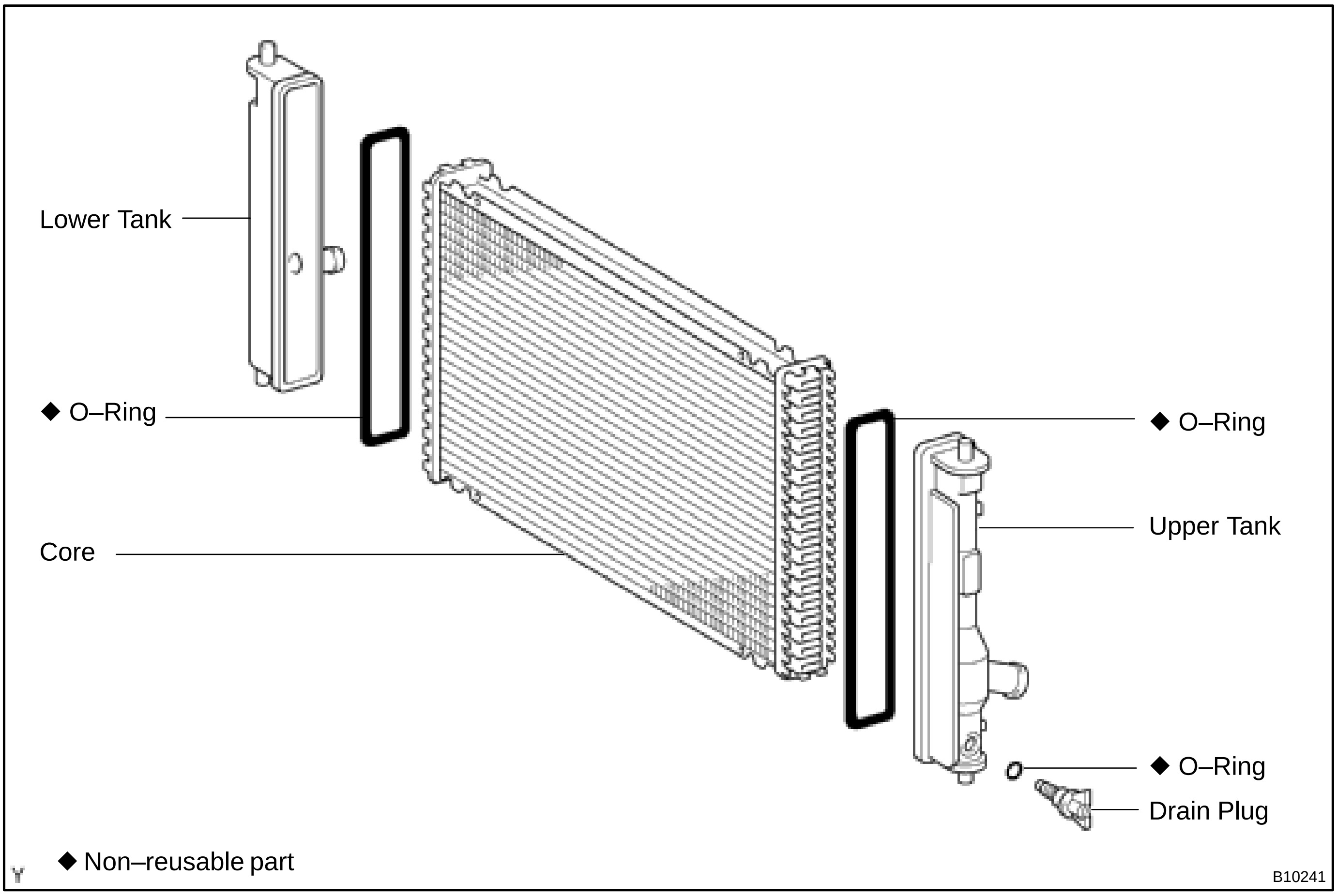
4. REINSTALL RESERVOIR CAP

CO04P–04

COMPONENTS



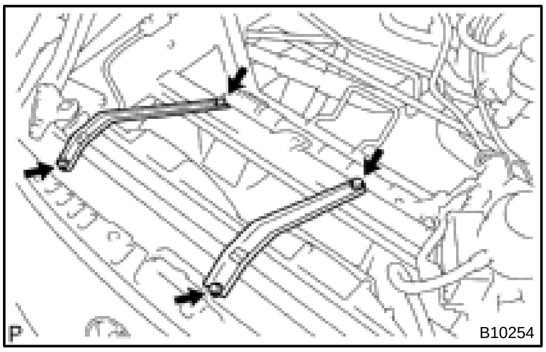

5 (51, 44 in.·lbf)
Electric Cooling Fan
Radiator
Radiator Lower
Support Bushing
N·m (kgf·cm, ft·lbf) : Specified torque
P
B10238


Lower Tank
◆ O–Ring
Core
◆ O–Ring
Upper Tank
◆ O–Ring
Drain Plug
◆ Non–reusable part
B10241

CO0X4–03

REMOVAL

1. **DRAIN ENGINE COOLANT (See page CO–2)**
2. **REMOVE TOOL BOX AND LUGGAGE COMPARTMENT TRIM BOX COVER**

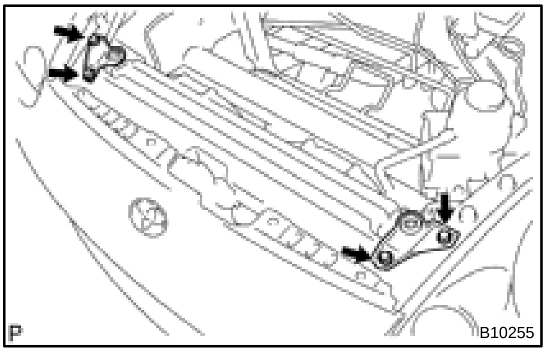


3. **REMOVE RADIATOR ASSEMBLY**

(a) Remove the 2 bolts, 2 nuts and 2 spear wheel carrier extensions.

(b) Disconnect the 2 electric cooling fan connectors.

(c) Disconnect the 2 radiator hoses.



(d) Remove the 4 bolts and 2 radiator upper supports.

(e) Remove the 2 radiator lower support bushings.

4. **REMOVE ELECTRIC COOLING FAN FROM RADIATOR**

Remove the 2 bolts and electric cooling fan assembly.

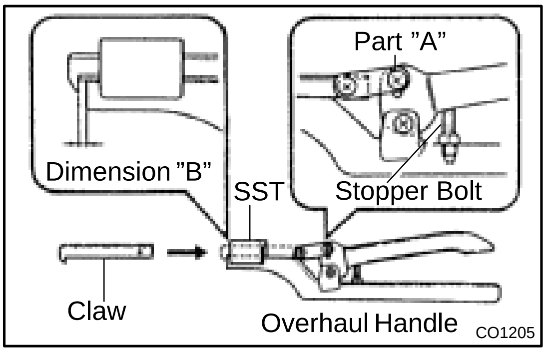
CO0YD–01

DISASSEMBLY

1. REMOVE DRAIN PLUG

(a) Remove the drain plug.

(b) Remove the O–ring.



2. ASSEMBLE SST

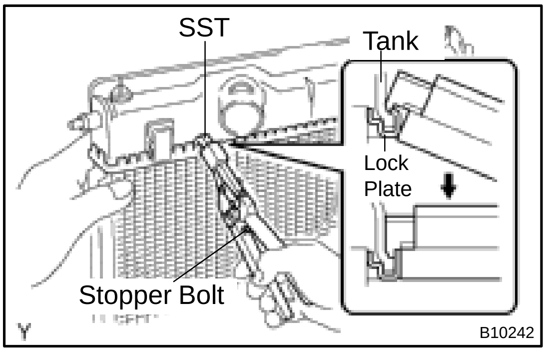
SST 09230–01010

(a) Install the claw to the overhaul handle, inserting it in the hole in part ”A” as shown in the diagram.

(b) While gripping the handle, adjust the stopper bolts so that dimension ”B” shown in the diagram is 0.2 – 0.3 mm (0.008 – 0.012 in.).

NOTICE:

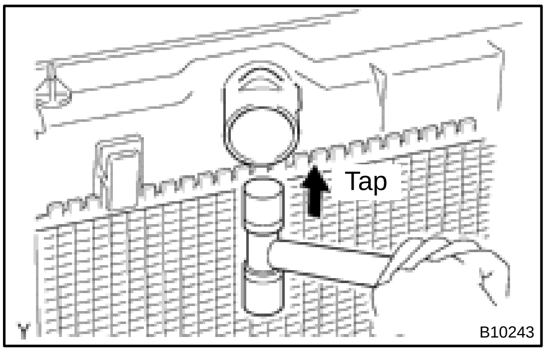
If this adjustment is not done the claw may be damaged.



3. UNCAULK LOCK PLATES

Using SST to release the caulking, squeeze the handle until stopped by the stopper bolts.

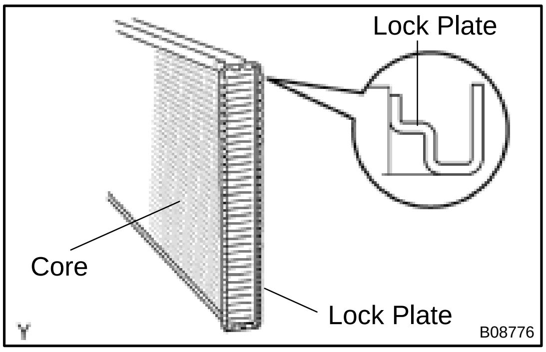
SST 09230–01010



4. REMOVE TANKS AND O–RINGS

Lightly tap the bracket of the radiator (or radiator inlet or outlet) with a soft–faced hammer, and remove the tank and the O–ring.

CO04S–07



INSPECTION

INSPECT LOCK PLATE FOR DAMAGE

HINT:

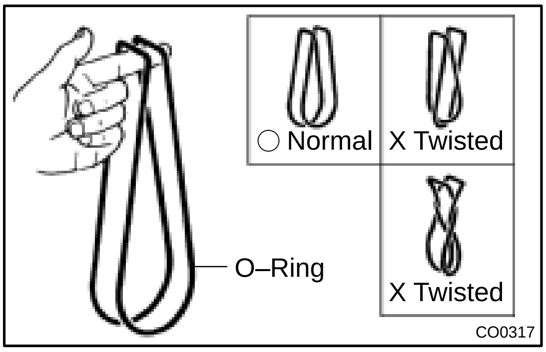
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged.

NOTICE:

The radiator can only be recaulked 2 times. After the 2nd time, the radiator core must be replaced.

CO0YE–01

REASSEMBLY



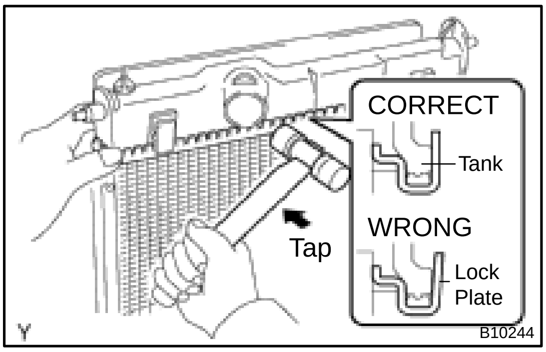
1. INSTALL NEW O–RINGS AND TANKS

(a) After checking that there are no foreign objects in the lock plate groove, install the new O–ring without twisting it.

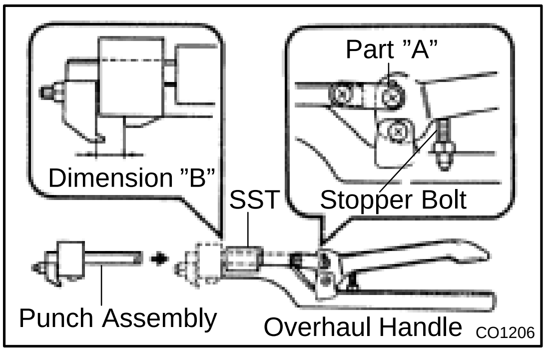
HINT:

When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.

(b) Install the tank without damaging the O–ring.



(c) Tap the lock prate with a soft–faced hammer so that there is no gap between it and the tank.



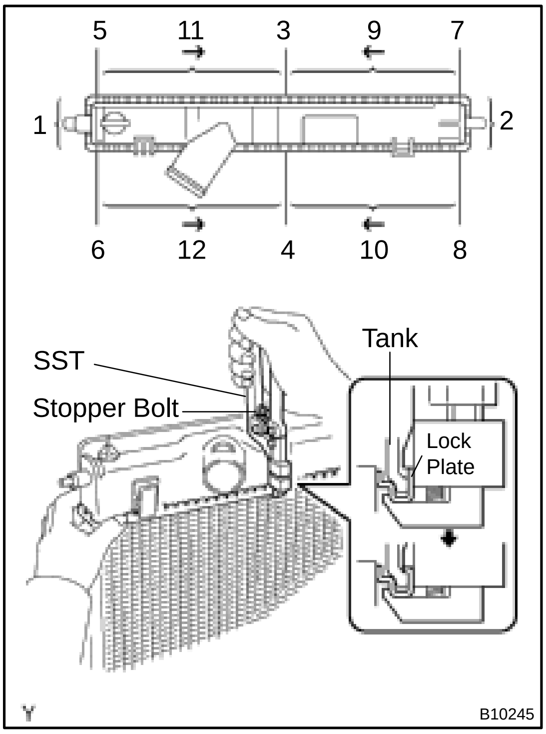
2. ASSEMBLE SST

SST 09230–01010, 09231–14010

(a) Install the punch assembly to the overhaul handle, inserting it in the hole in part "A" as shown in the illustration.

(b) While gripping the handle, adjust the stopper bolt so that dimension "B" is as shown in the illustration.

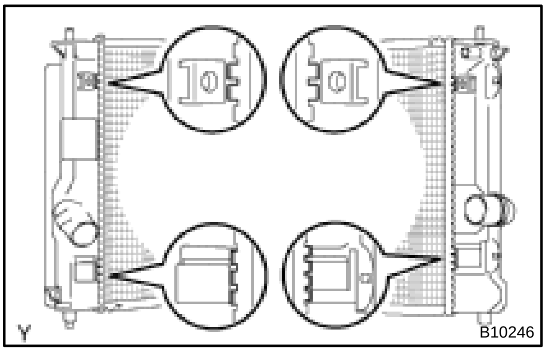
Dimension: 8.4 mm (0.331 in.)



3. CAULK LOCK PLATE

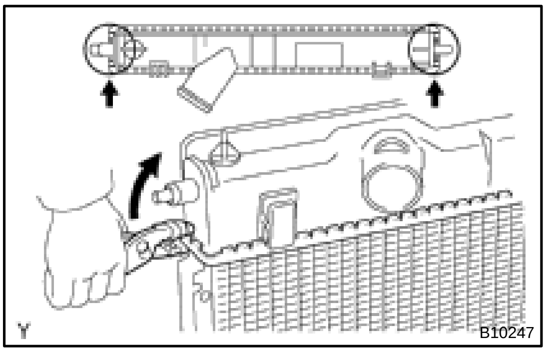
(a) Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopped plate.

SST 09230–01010

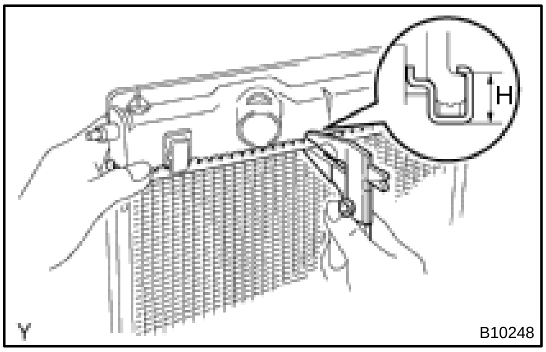


HINT:

- Do not stake the areas protruding around the pipes, brackets or tank rids.



- The points shown in the illustration cannot be staked with SST. Use wrap vinyl tape around the tip of a pair or similar object and be careful not to damage the core plates.

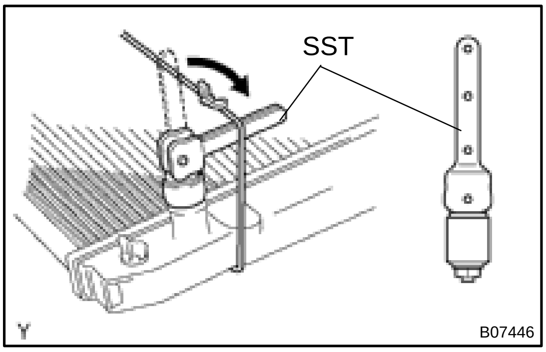


(b) Check the lock plate height (H) after completing the caulking.
Plate height: 7.4 – 7.8 mm (0.2913 – 0.3071 in.)

If not within the specified height, adjust the stopper bolt of the handle again and caulk again.

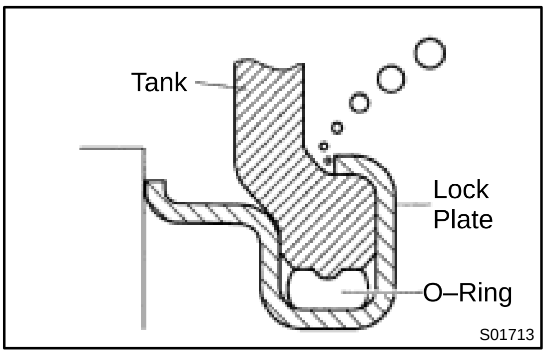
4. INSTALL DRAIN PLUG

(a) Install a new O–ring to the drain plug.
(b) Install the drain plug.



5. INSPECT FOR WATER LEAKS

(a) Tighten the drain plug.
(b) Install the engine coolant reservoir.
(c) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230–01010
(d) Using a radiator cap tester, apply pressure to the radiator.
Test pressure: 177 kPa (1.8 kgf/cm^2, 26 psi)
(e) Submerge the radiator in water.



(f) Inspect for leaks.

HINT:

On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. therefore, before doing the water leak test, first swish the radiator around in the water until all bubbles disappear.

CO0X3–03

INSTALLATION

1. INSTALL ELECTRIC COOLING FAN TO RADIATOR

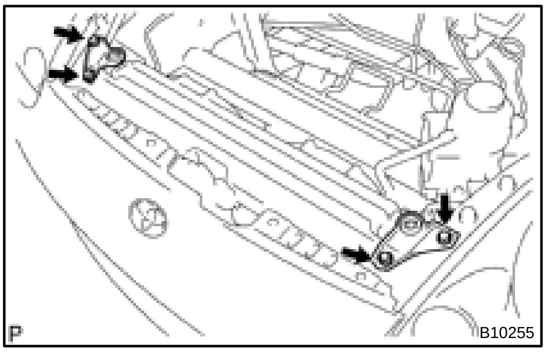
Install the electric cooling fan with the 2 bolts.

Torque: 5 N·m (51 kgf·cm, 44 in.·lbf)

2. INSTALL RADIATOR ASSEMBLY

(a) Install the 2 radiator lower support bushings.

(b) Place the radiator assembly to the body.



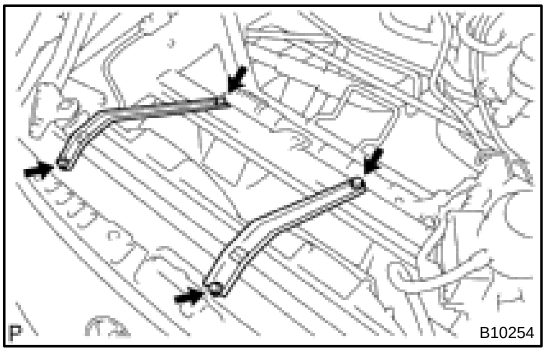
B10255

(c) Install the 2 radiator upper supports with the 4bolts.

Torque: 12.5 N·m (128 kgf·cm, 9 ft·lbf)

(d) Connect the 2 radiator hoses.

(e) Connect the 2 electric cooling fan connectors.



B10254

(f) Install the 2 spear wheel carrier extensions with the 2 bolts and 2 nuts.

Torque: 8 N·m (82 kgf·cm, 70 in.·lbf)

3. FILL WITH ENGINE COOLANT (See page CO–2)

4. INSTALL LUGGAGE COMPARTMENT TRIM BOX COVER AND TOOL BOX

5. START ENGINE AND CHECK FOR LEAKS

6. RECHECK ENGINE COOLANT LEVEL

ELECTRIC COOLING FAN

CO0YF–01

ON–VEHICLE INSPECTION

1. CHECK COOLING FAN OPERATION WITH LOW TEMPERATURE (Below 83°C (181°F))

(a) Turn the ignition switch ON.
(b) Check that the cooling fan stops.

If not, check the cooling fan relay and ECT sensor, and check for separated connector or severed wire between the cooling fan relay and ECT sensor.

(c) Disconnect the ECT sensor connector.
(d) Check that the cooling fan rotates.

If not, check the fuses, cooling fan relay, ECM and cooling fan, and check for a short circuit between the cooling fan relay and ECT sensor.

(e) Reconnect the ECT sensor connector.

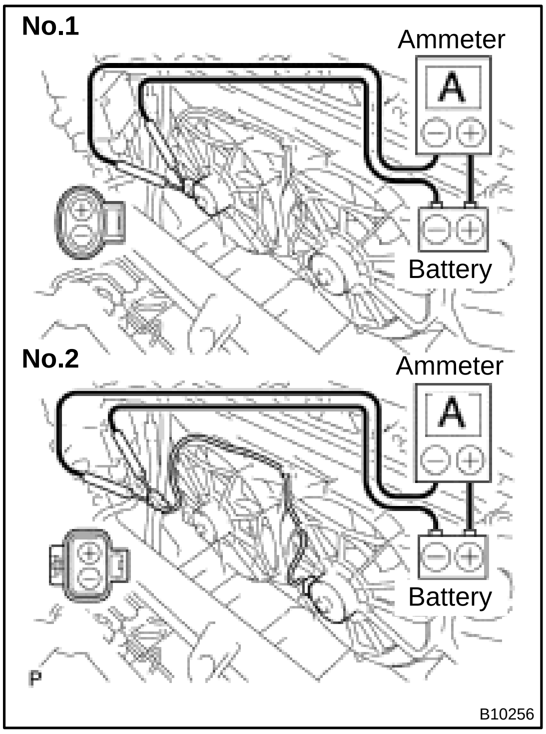
2. CHECK COOLING FAN OPERATION WITH HIGH TEMPERATURE (Above 93°C (199°F))

(a) Start the engine, and raise coolant temperature to above 93°C (199°F).

HINT:
Coolant temperature is the detected value by the ECT sensor on the water outlet.

(b) Check that the cooling fan rotates.

If not, replace the ECT sensor.



3. INSPECT COOLING FANS

(a) Disconnect the cooling fan connector.
(b) Connect battery and ammeter to the connector.
(c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage: 5.7 – 7.7 A

(d) Reconnect the cooling fan connector.

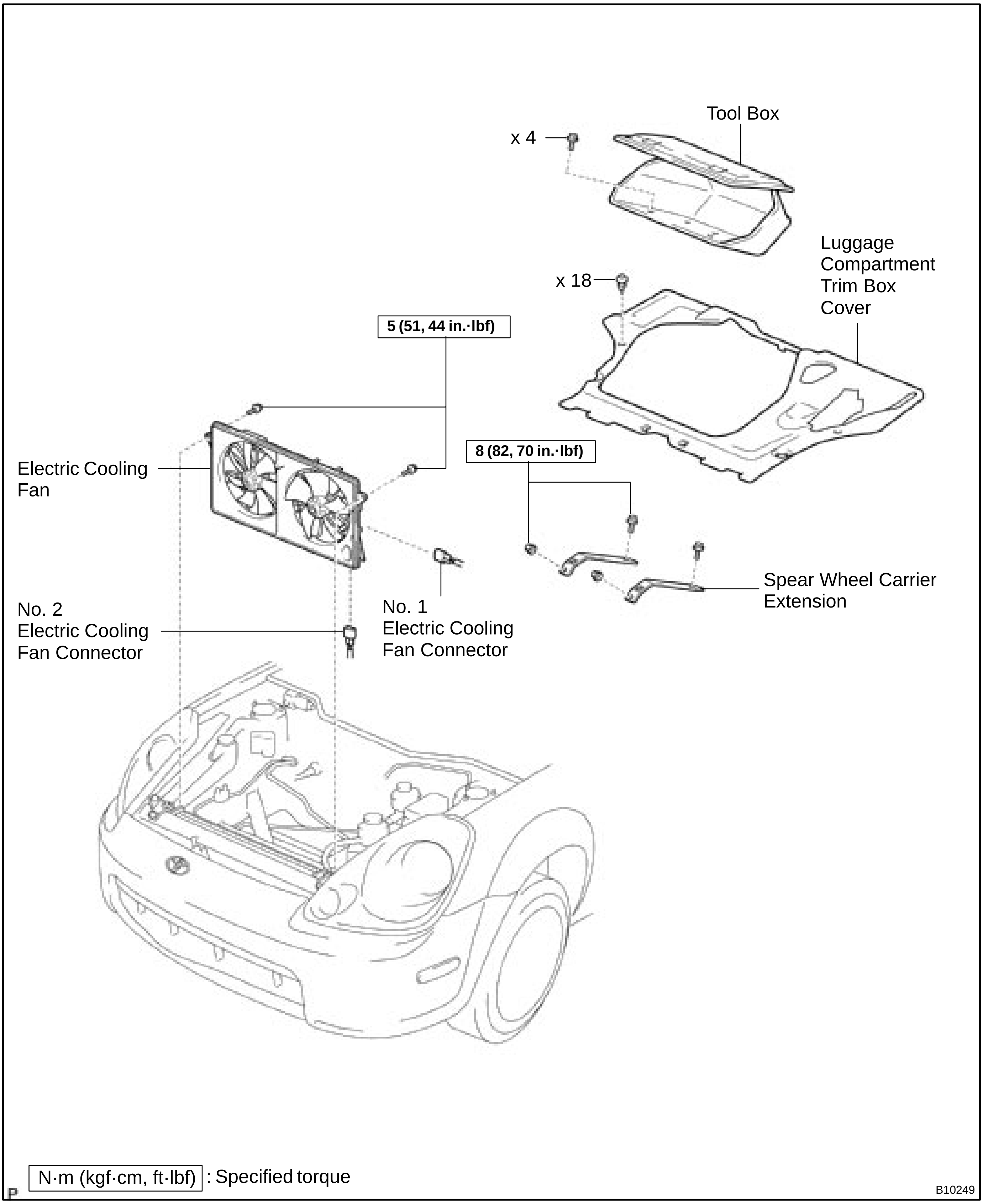
4. INSPECT ECT SENSOR (See page SF–55)

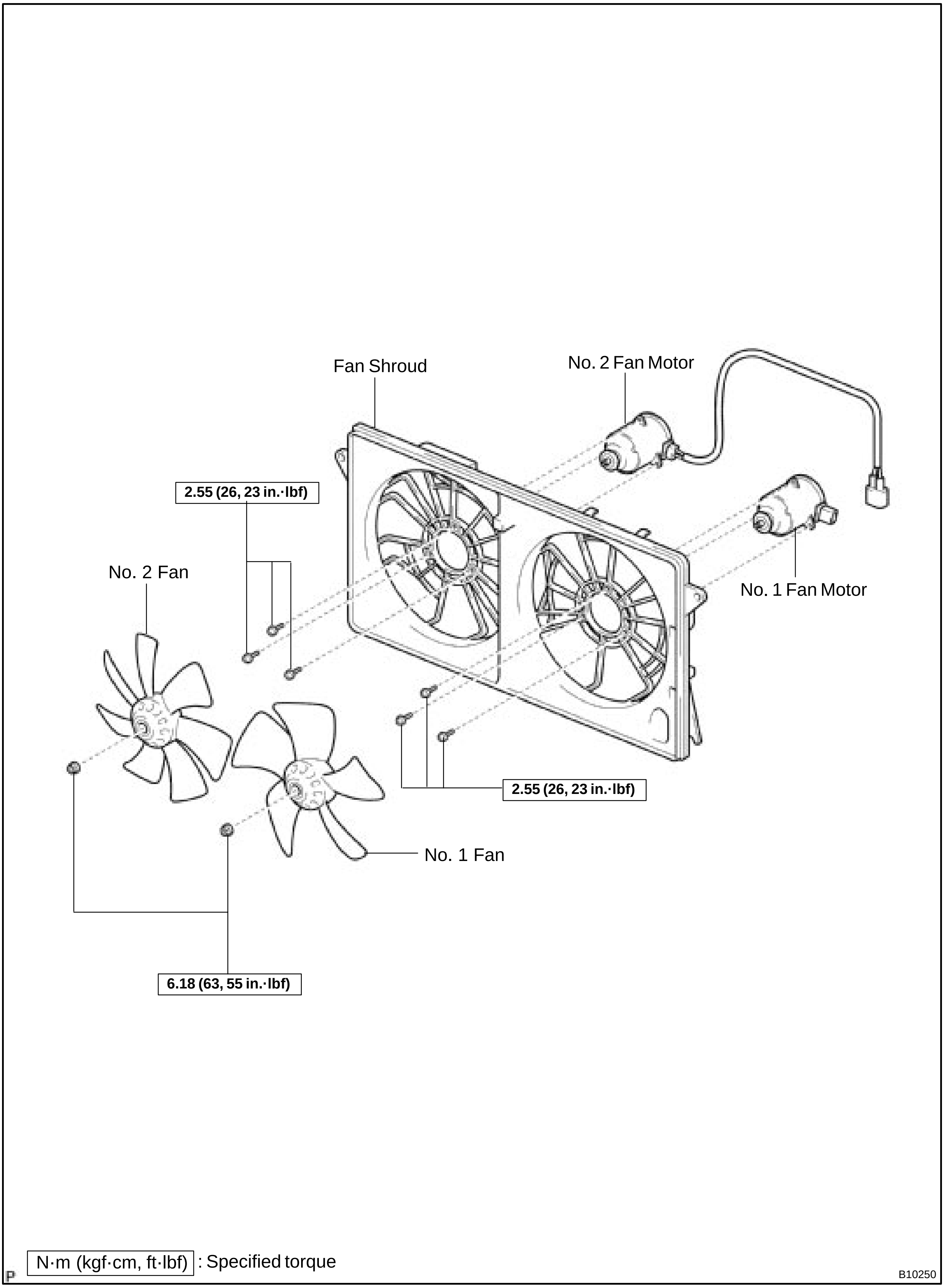
5. INSPECT ECM

Check the voltage between ECM terminals FAN and E1 (See page DI–19).

CO04W–05

COMPONENTS




Fan Shroud
No. 2 Fan Motor
2.55 (26, 23 in.·lbf)
No. 2 Fan
No. 1 Fan Motor
2.55 (26, 23 in.·lbf)
No. 1 Fan
6.18 (63, 55 in.·lbf)
N·m (kgf·cm, ft·lbf) : Specified torque
B10250

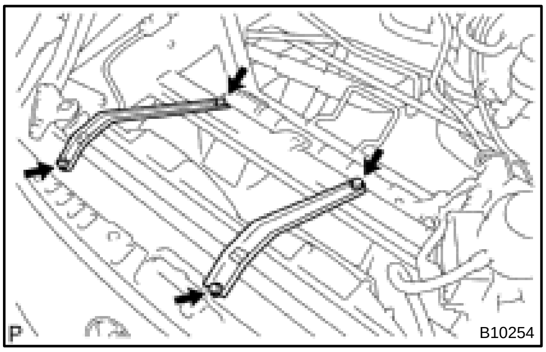
CO0YG–01

REMOVAL

1. REMOVE TOOL BOX AND LUGGAGE COMPARTMENT TRIM BOX COVER

2. REMOVE ELECTRIC COOLING FAN

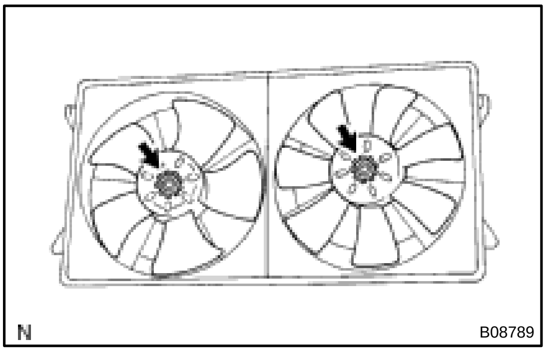
(a) Disconnect the 2 electric cooling fan connectors.



(b) Remove the 2 bolts, 2 nuts and 2 spear wheel carrier extensions.

(c) Remove the 2 bolts and electric cooling fan.

CO04Y–05



DISASSEMBLY

1. REMOVE FANS

Remove the nut and fan.

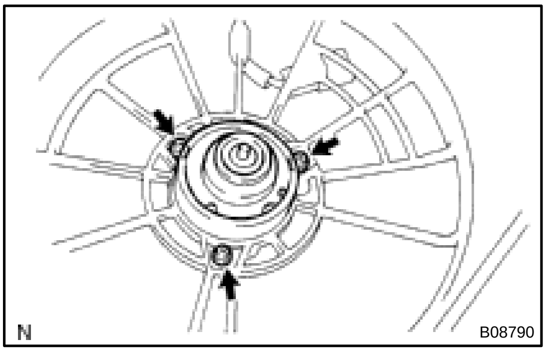
2. REMOVE FAN MOTORS

(a) Disconnect the wire and connector holder from the fan shroud.

(b) Remove the 3 screws and fan motor.

CO0YH–01

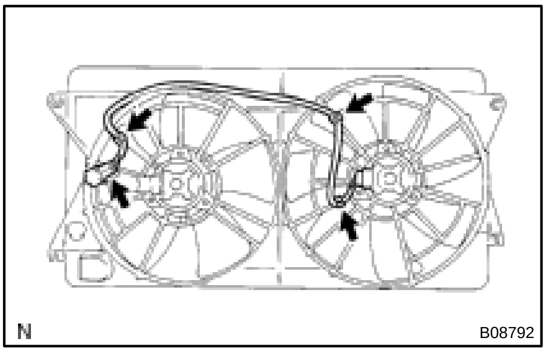
REASSEMBLY



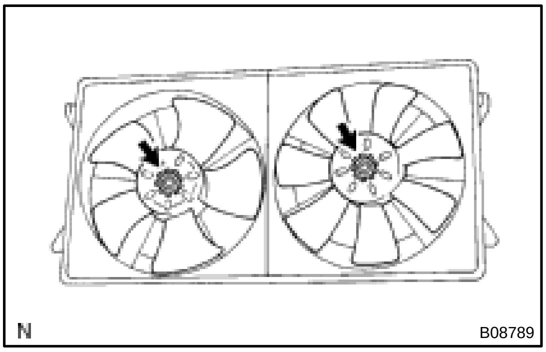
1. INSTALL FAN MOTORS

(a) Install the fan motor with the 3 screws.

Torque: 2.55 N·m (26 kgf·cm, 23 in.·lbf)



(b) Install the wire and connector holder to the fan shroud.



2. INSTALL FANS

Install the fan with the nut.

Torque: 6.18 N·m (63 kgf·cm, 55 in.·lbf)

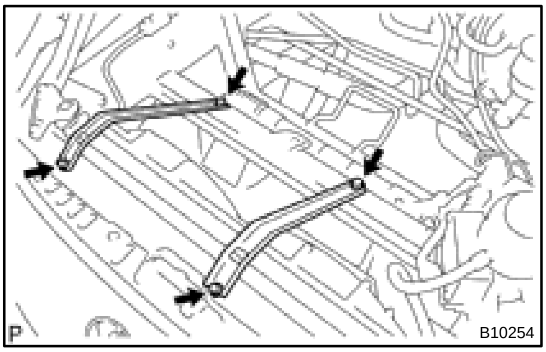
CO0YI–01

INSTALLATION

1. INSTALL ELECTRIC COOLING FAN

(a) Install the electric cooling fan with the 2 bolts.

Torque: 5 N·m (51 kgf·cm, 44 in.·lbf)

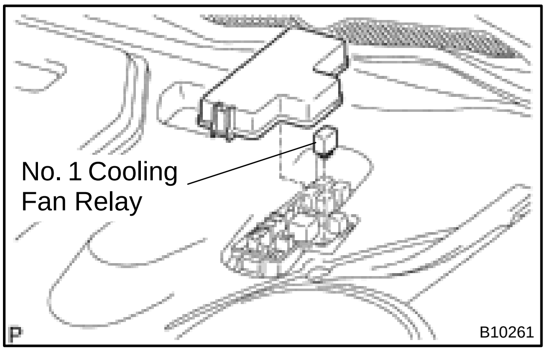


(b) Install the 2 spear wheel carrier extensions with the 2 bolts and 2 nuts.

Torque: 8 N·m (82 kgf·cm, 70 in.·lbf)

(c) Connect the 2 electric cooling fan connectors.

2. INSTALL LUGGAGE COMPARTMENT TRIM BOX COVER AND TOOL BOX



COOLING FAN RELAY

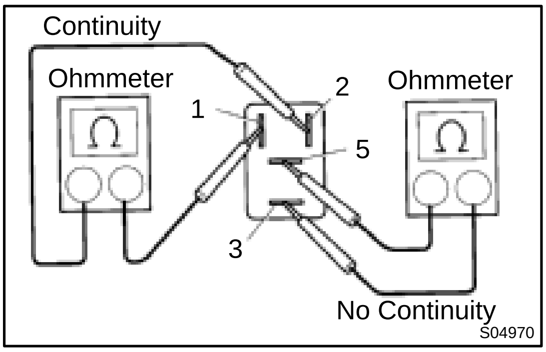
CO0YJ–01

INSPECTION

1. INSPECT NO. 1 COOLING FAN RELAY

(a) Remove the R/B No. 4 cover.

(b) Remove the No. 1 cooling fan relay. (Marking: FAN No. 1)



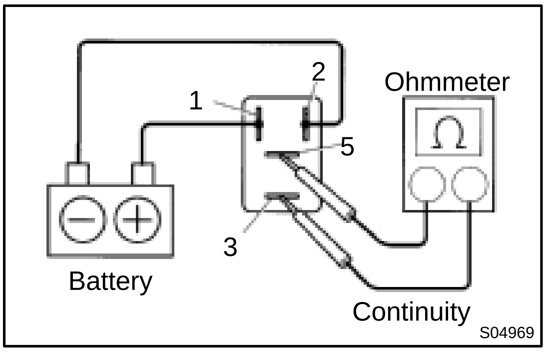
(c) Inspect the No. 1 cooling fan relay continuity.

(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 5.

If there is continuity, replace the relay.



(d) Inspect the No. 1 cooling fan 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 5.

If there is no continuity, replace the relay.

(e) Reinstall the No. 1 cooling fan relay.

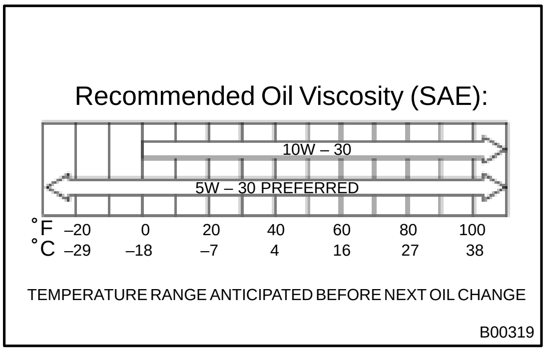
(f) Reinstall the R/B No. 4 cover.

2. INSPECT NO. 2 AND NO. 3 COOLING FAN RELAY (**See page AC–73****)**

OIL AND FILTER

LU0JB–01

INSPECTION



1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade or SJ, Energy–Conserving or ILSAC multigrade engine oil is recommended. SAE 5W–30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather.

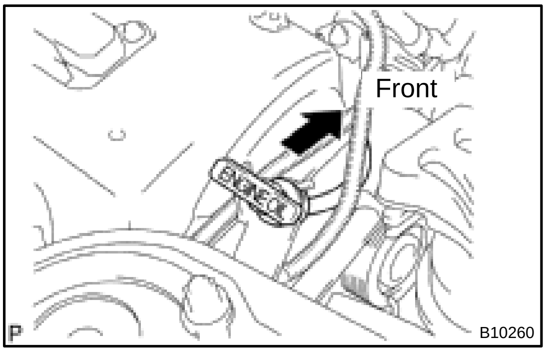
2. CHECK ENGINE OIL LEVEL

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the ”L” and ”F” marks on the dipstick.

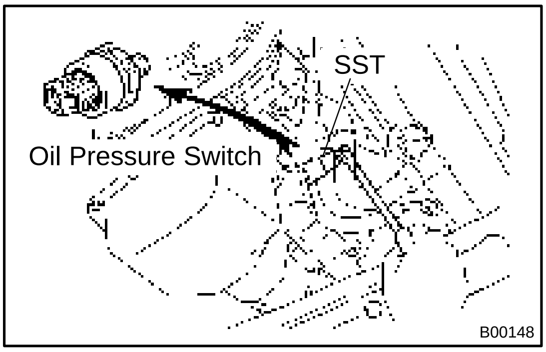
If low. check for leakage and add oil up to the ”F” mark.

NOTICE:

- **Do not fill with engine oil above the ”F” mark.**



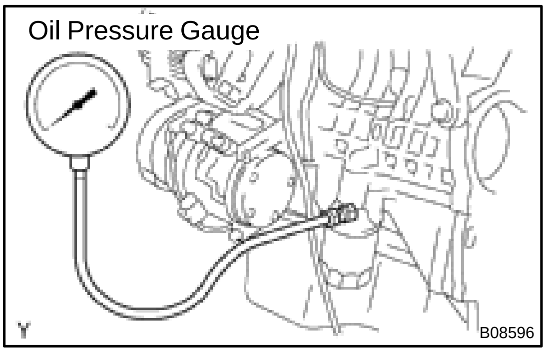
- **Install the oil dipstick facing the direction shown in the illustration.**



3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

(a) Using SST, remove the oil pressure switch.

SST 09816–30010



(b) Install the oil pressure gauge.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

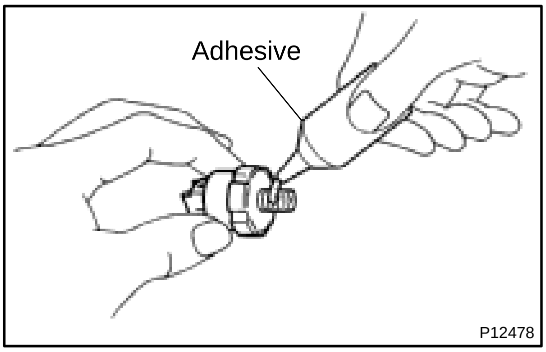
5. CHECK OIL PRESSURE

Oil pressure:

At idle	29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
At 3,000 rpm	294 – 539 kPa (3.0 – 5.5 kgf/cm^2, 43 – 78 psi) or more

6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.



(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

7. START ENGINE AND CHECK FOR LEAKS

LU02L–05

REPLACEMENT

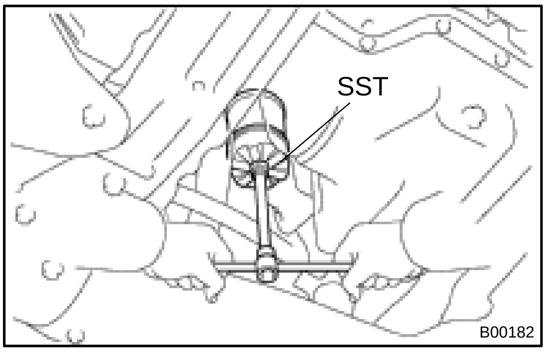
CAUTION:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**

1. DRAIN ENGINE OIL

(a) Remove the oil filter cap.

(b) Remove the oil drain plug, and drain the oil into a container.



B00182

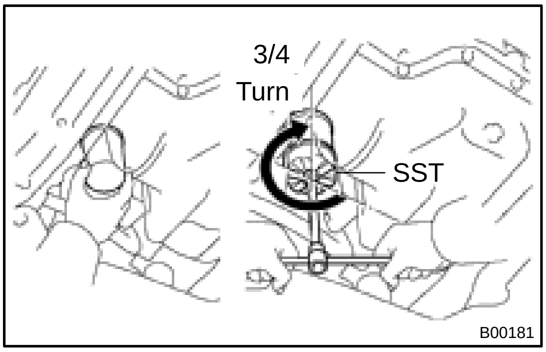
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–06501

(b) Check and clean the oil filter installation surface.

(c) Check the part number of the new oil filter is as same as old one.

(d) Apply clean engine oil to the gasket of a new oil filter.



B00181

(e) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(f) Using SST, tighten it an additional 3/4 turn.
SST 09228–06501

3. REFILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 37 N·m (378 kgf·cm, 27 ft·lbf)

(b) Fill with fresh engine oil.

Capacity:

Drain and refill w/ Oil filter change w/o Oil filter change	 3.7 liters (3.9 US qts, 3.3 Imp. qts) 3.5 liters (3.7 US qts, 3.1 Imp. qts)
Dry fill	4.2 liters (4.4 US qts, 3.7 Imp. qts)

(c) Install the oil filler cap.

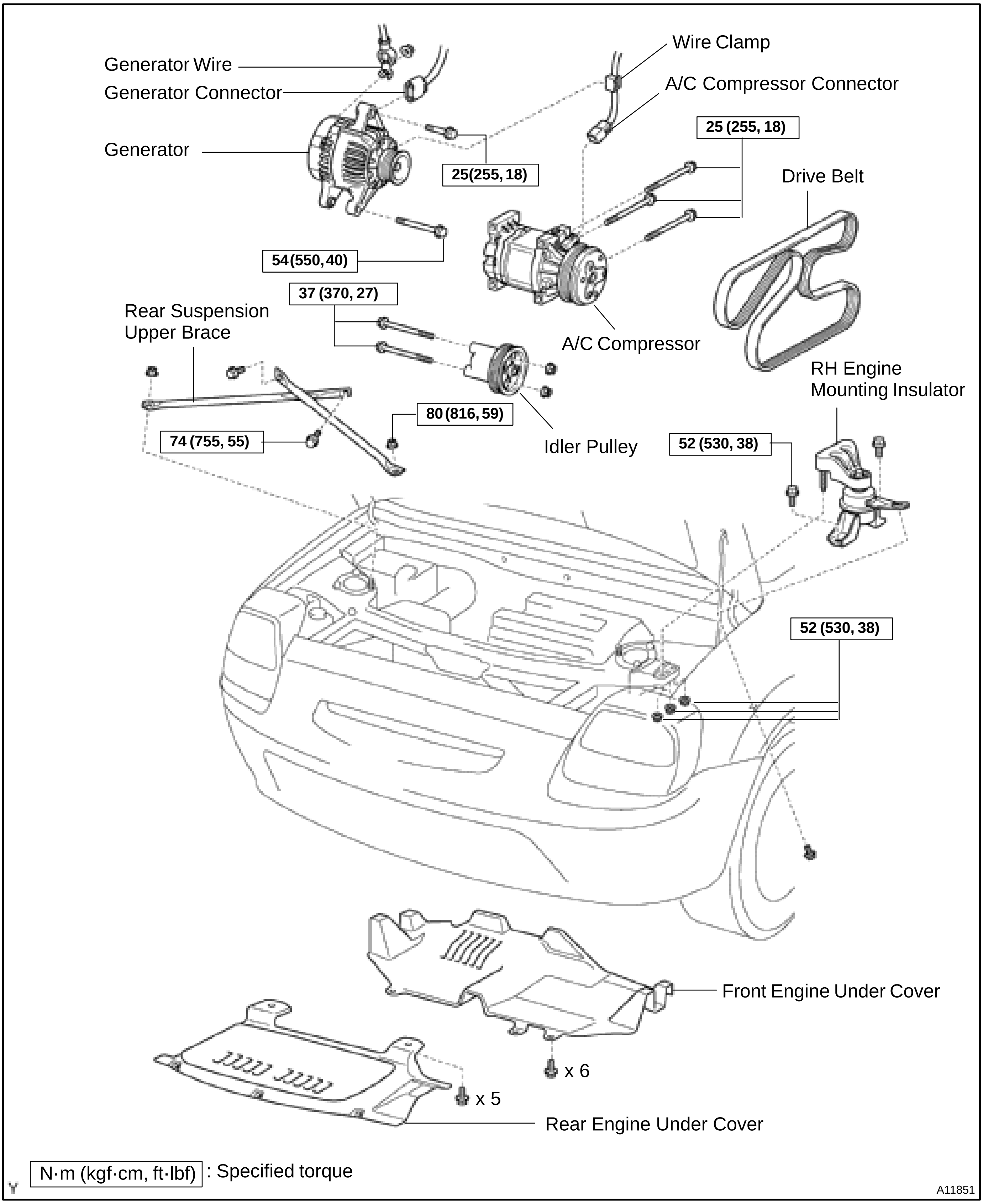
4. START ENGINE AND CHECK FOR OIL LEAKS

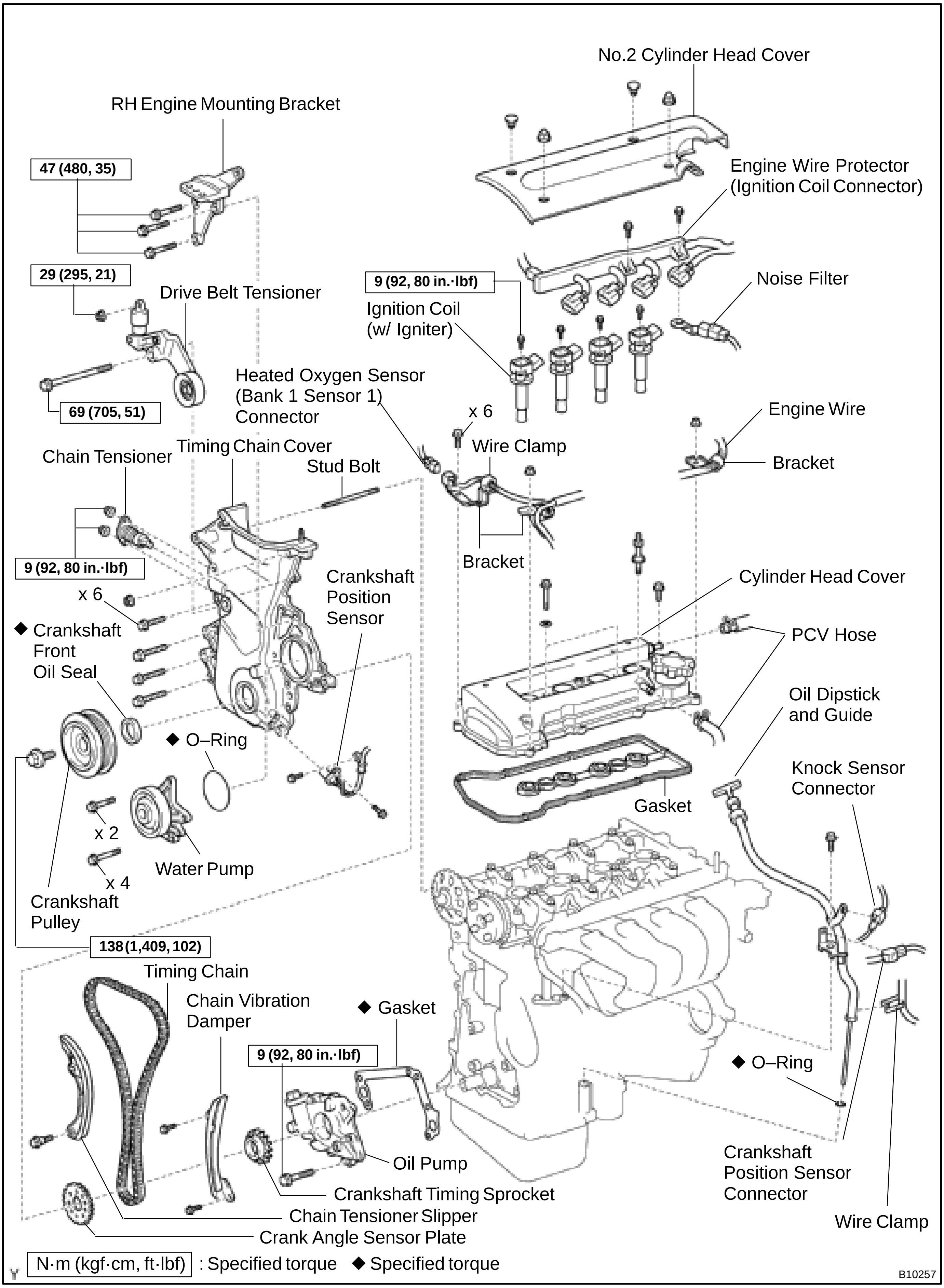
5. RECHECK ENGINE OIL LEVEL

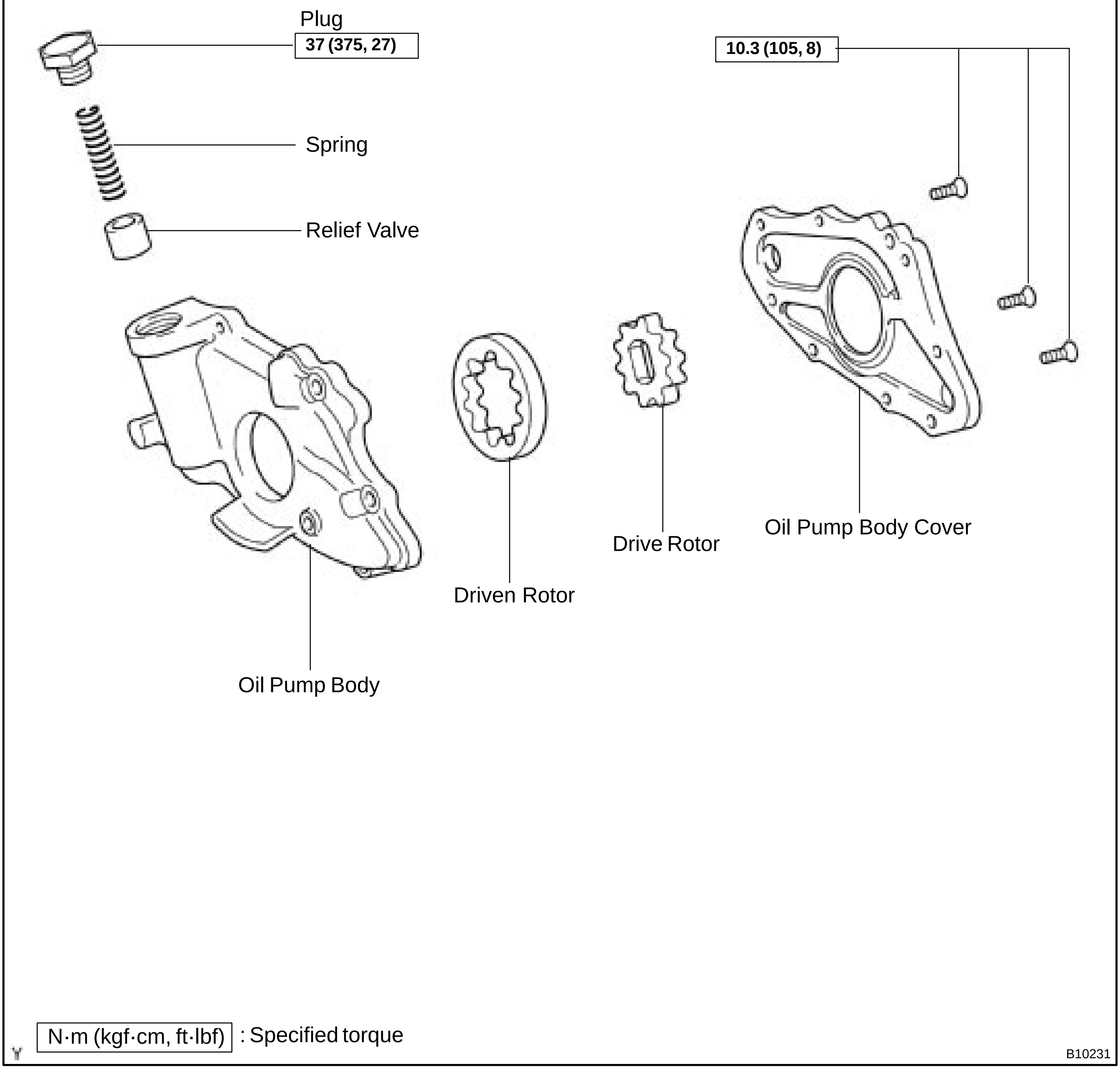
OIL PUMP

COMPONENTS

LU0JC–01



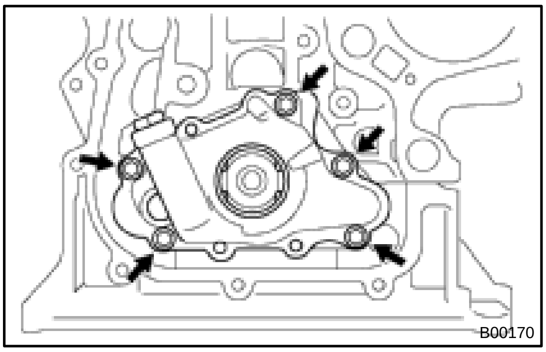

No.2 Cylinder Head Cover
RH Engine Mounting Bracket
47 (480, 35)
Engine Wire Protector
(Ignition Coil Connector)
29 (295, 21)
Drive Belt Tensioner
9 (92, 80 in.·lbf)
Noise Filter
Ignition Coil
(w/ Igniter)
Heated Oxygen Sensor
(Bank 1 Sensor 1)
Connector
69 (705, 51)
x 6
Engine Wire
Chain Tensioner
Timing Chain Cover
Wire Clamp
Stud Bolt
Bracket
9 (92, 80 in.·lbf)
Bracket
Crankshaft
Position
Sensor
Cylinder Head Cover
x 6
◆ Crankshaft
Front
Oil Seal
PCV Hose
Oil Dipstick
and Guide
◆ O–Ring
Knock Sensor
Connector
Gasket
x 2
Water Pump
x 4
Crankshaft
Pulley
138 (1,409, 102)
Timing Chain
Chain Vibration
Damper
◆ Gasket
9 (92, 80 in.·lbf)
◆ O–Ring
Oil Pump
Crankshaft
Position Sensor
Connector
Crankshaft Timing Sprocket
Chain Tensioner Slipper
Wire Clamp
Crank Angle Sensor Plate
N·m (kgf·cm, ft·lbf) : Specified torque ◆ Specified torque
B10257


Plug
37 (375, 27)
10.3 (105, 8)
Spring
Relief Valve
Drive Rotor
Oil Pump Body Cover
Driven Rotor
Oil Pump Body
N·m (kgf·cm, ft·lbf) : Specified torque
B10231

LU02N–04

REMOVAL

1. **DRAIN ENGINE OIL**
2. **REMOVE TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET (See page EM–13)**


B00170

3. **REMOVE OIL PUMP**

Remove the 5 bolts, oil pump and gasket.

LU02O–01

DISASSEMBLY

1. REMOVE RELIEF VALVE

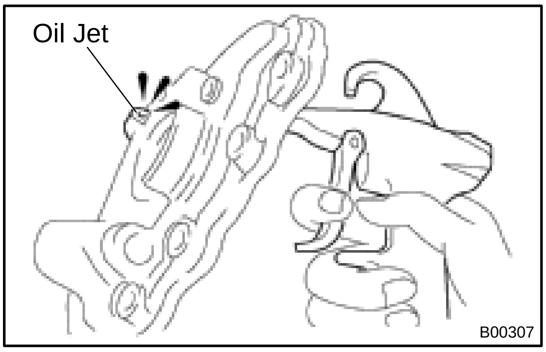
Remove the plug, spring and relief valve.

2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 3 screws, pump body cover, drive and driven rotors.

LU02P–03

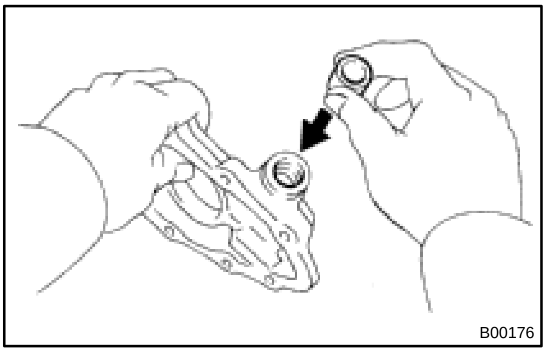
INSPECTION



B00307

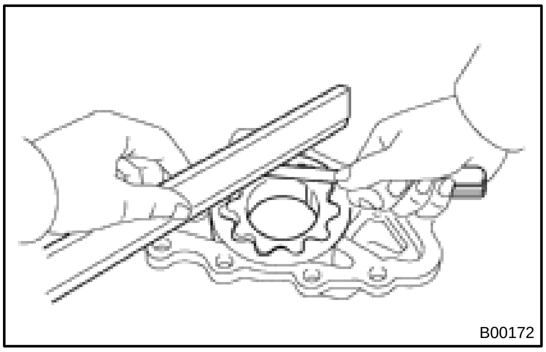
1. INSPECT OIL JET

Check the oil jet for damage or clogging.
If necessary, replace the oil pump assembly.


B00176

2. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.

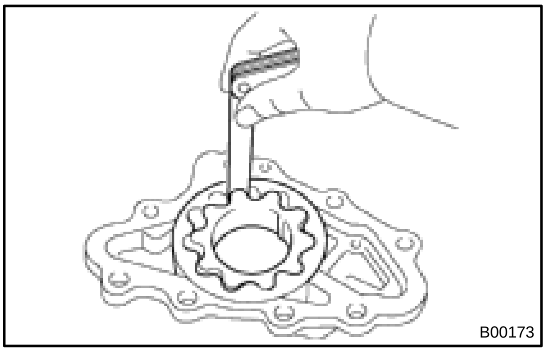

B00172

3. INSPECT ROTOR SIDE CLEARANCE

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:
0.025 – 0.071 mm (0.0010 – 0.0028 in.)
Maximum side clearance: 0.071 mm (0.0028 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

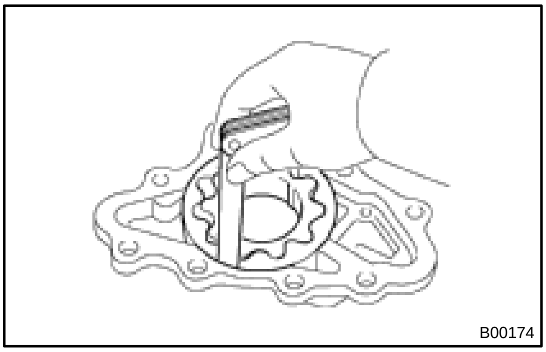

B00173

4. INSPECT ROTOR TIP CLEARANCE

Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:
0.040 – 0.160 mm (0.0016 – 0.0063 in.)
Maximum tip clearance: 0.160 mm (0.0063 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

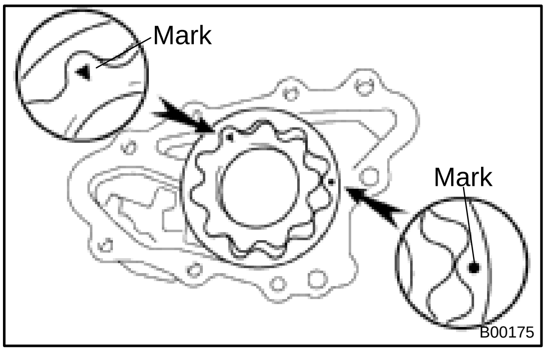

B00174

5. INSPECT ROTOR BODY CLEARANCE

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance:
0.260 – 0.325 mm (0.0102 – 0.0130 in.)
Maximum body clearance: 0.325 mm (0.0130 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



LU02Q–03

REASSEMBLY

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

(b) Install the pump body cover with the 3 screws.

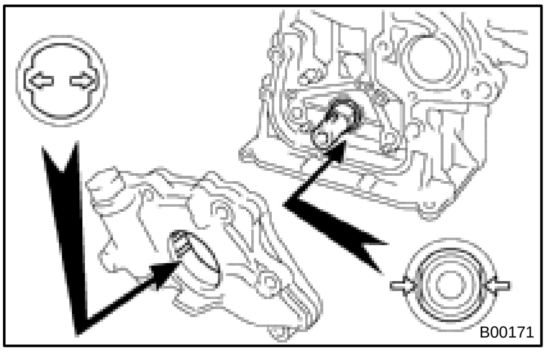
Torque: 10.3 N·m (105 kgf·cm, 8 ft·lbf)

2. INSTALL RELIEF VALVE

Insert the relief valve and spring into the pump body hole, and install the plug.

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

LU02R–03



INSTALLATION

1. **INSTALL OIL PUMP**
   (a) Place a new gasket on the cylinder block.
   (b) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and slide the oil pump.
   (c) Install the oil pump with the 5 bolts.
   Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)
2. **INSTALL CRANKSHAFT TIMING SPROCKET AND TIMING CHAIN (See pages EM–20)**
3. **FILL ENGINE WITH OIL**
4. **START ENGINE AND CHECK FOR LEAKS**
5. **RECHECK ENGINE OIL LEVEL**

IGNITION SYSTEM

IG0G2–01

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in these 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 IGNITION COIL (WITH IGNITER) AND SPARK TEST

Check that the spark occurs.

(1) Remove the ignition coils (See page IG–4).

(2) Remove the spark plugs.

(3) Install the spark plugs to each ignition coil, and connect the ignition coil connector.

(4) Disconnect the 4 injector connectors

(5) Ground the spark plug.

(6) 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 5 – 10 seconds at time.

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

SPARK TEST

↓ NO

CHECK CONNECTION OF IGNITION COIL (WITH IGNITER) CONNECTOR — BAD → Connect securely.

↓ OK

CHANGE IT TO NORMAL IGNITION COIL (WITH IGNITER) AND PERFORM SPARK TEST AGAIN — OK → Replace the ignition coil.

↓ NO

CHECK POWER SUPPLY TO IGNITION COIL (WITH IGNITER)
1. Turn ignition switch to ON.
2. Check that there is battery positive voltage at ignition coil positive (+) terminal.

— BAD → Check wiring between ignition switch and ignition coil.

↓ OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR (See step 3)

	Cold	Hot
Resistance:	**835 – 1,400 Ω**	**1,060 – 1,645 Ω**

— BAD → Replace the camshaft position sensor.

↓ OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR (See step 4)

	Cold	Hot
Resistance:	**1,630 – 2,740 Ω**	**2,065 – 3,225 Ω**

— BAD → Replace the crankshaft position sensor.

↓ OK

CHECK IGT SIGNAL FROM ECM (See page DI–109) — BAD → Check wiring between ECM and ignition coil, and then try another ECM.

↓ OK

TRY ANOTHER IGNITION COIL (WITH IGNITER)

(7) Using a 16 mm plug wrench, reinstall the spark plugs.

Torque: 25 N·m (255 kgf·cm, 19 ft·lbf)

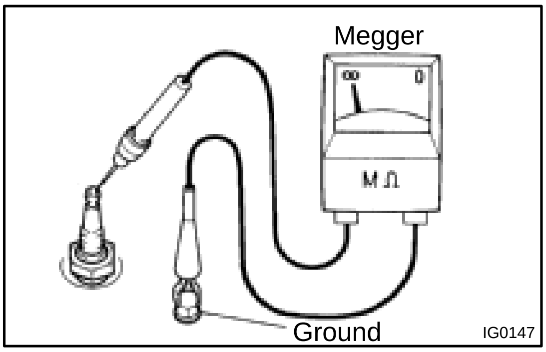
(8) Reinstall the ignition coils (See page IG–4).

2. INSPECT SPARK PLUGS

NOTICE:

- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on used spark plug.**
- **Spark plug should be replaced every 200,000 km (120,000 miles).**

(a) Remove the ignition coils (See page IG–4).



IG0147

(b) Check the electrode.

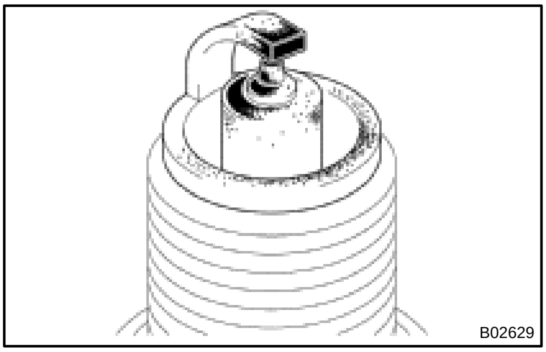
- Using a megger (insulation resistance meter), measure the insulation resistance.

Correct insulation resistance: 10 MΩ or more

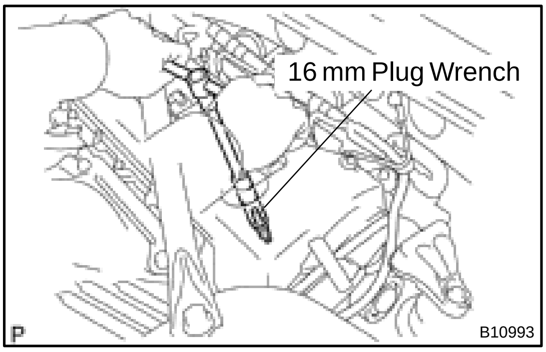
If the resistance is less than specified, proceed to step (d).

HINT:

If a megger is not available, the following simple method of inspection provides fairly accurate results.


B02629

- Simple Method:
  - Quickly race the engine to 4,000 rpm 5 times.
  - Remove the spark plug (See step (c)).
  - Visually check the spark plug.
    If the electrode is dry ... OK.
    If the electrode is wet ... Proceed to step (d).
  - Reinstall the spark plug (See step (g)).



B10993

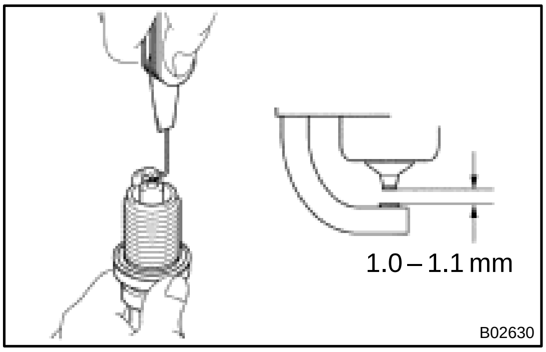
(c) Using a 16 mm plug wrench, remove the spark plugs.

(d) Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

DENSO made	SK16R11
NGK made	IFR5A11



B02630

(e) Check the spark plug electrode gap.

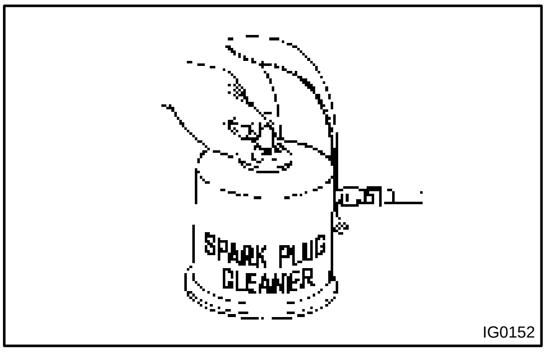
Maximum electrode gap for used spark plug:
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for new spark plug:
1.0 – 1.1 mm (0.039 – 0.043 in.)

NOTICE:

If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.



IG0152

(f) Clean the spark plugs.

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 588 kPa (6 kgf/cm^2, 85 psi)

Duration: 20 seconds or less

HINT:

If there are traces of oil, remove it with gasoline before using the spark plug cleaner.

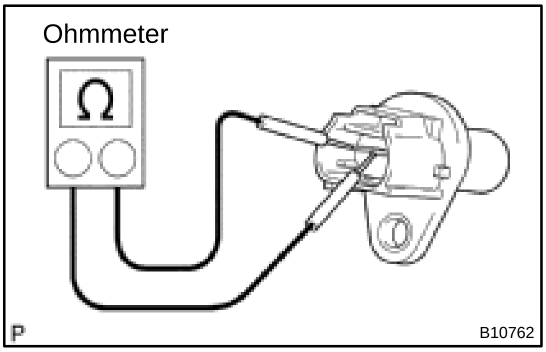
(g) Using a 16 mm plug wrench, install the spark plugs.

Torque: 25 N·m (255 kgf·cm, 19 ft·lbf)

(h) Reinstall the ignition coils (See page IG–4).

3. INSPECT CAMSHAFT POSITION SENSOR

(a) Remove the camshaft position sensor (See page IG–5).



B10762

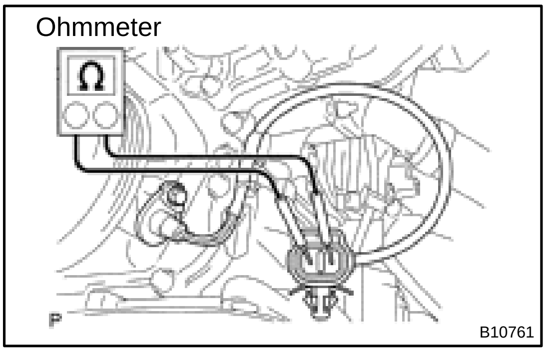
(b) Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold	835 – 1,400 Ω
Hot	1,060 – 1,645 Ω

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

(c) Reconnect the camshaft position sensor connector.



B10761

4. INSPECT CRANKSHAFT POSITION SENSOR

(a) Remove the front engine under cover.

(b) Disconnect the A/C compressor (See page AC–49).

(c) Disconnect the connector from the oil level gauge clamp.

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

Resistance:

Cold	1,630 – 2,740 Ω
Hot	2,065 – 3,225 Ω

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

(e) Reinstall the connector with the oil level gauge clamp.

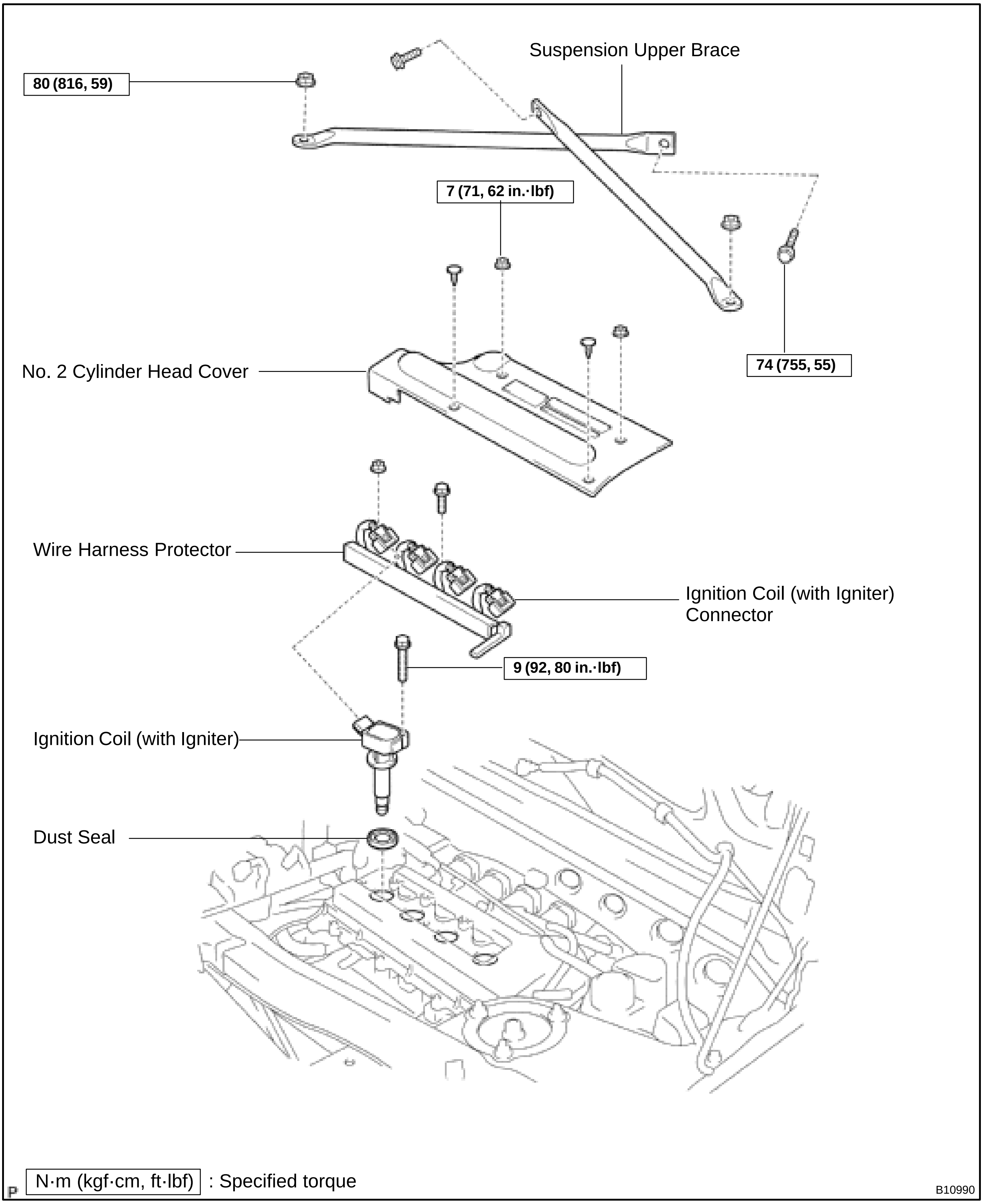
(f) Reconnect the A/C compressor (See page AC–55).

(g) Reinstall the front engine under cover.

IGNITION COIL

COMPONENTS

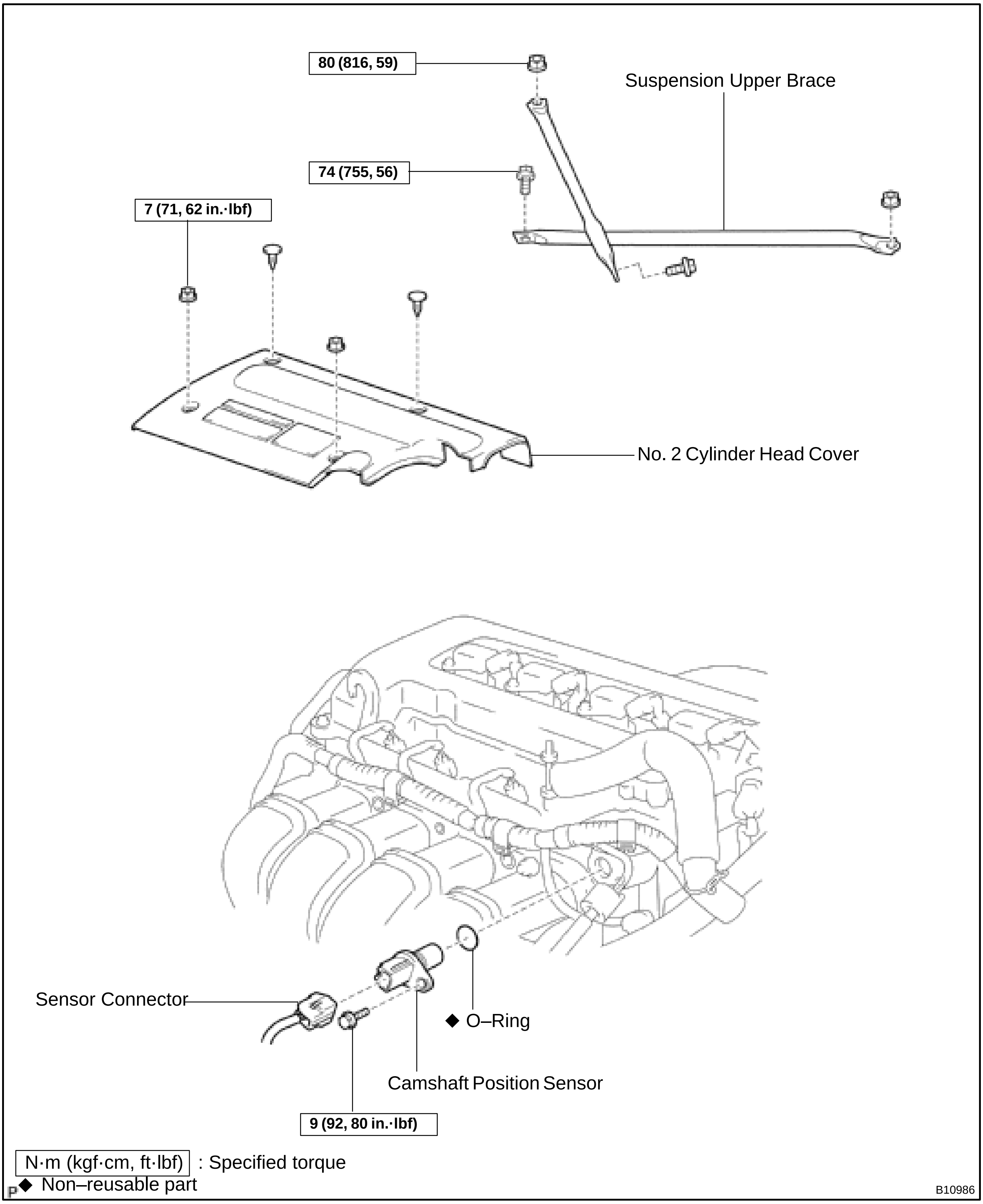
IG0BO–05



CAMSHAFT POSITION SENSOR

COMPONENTS

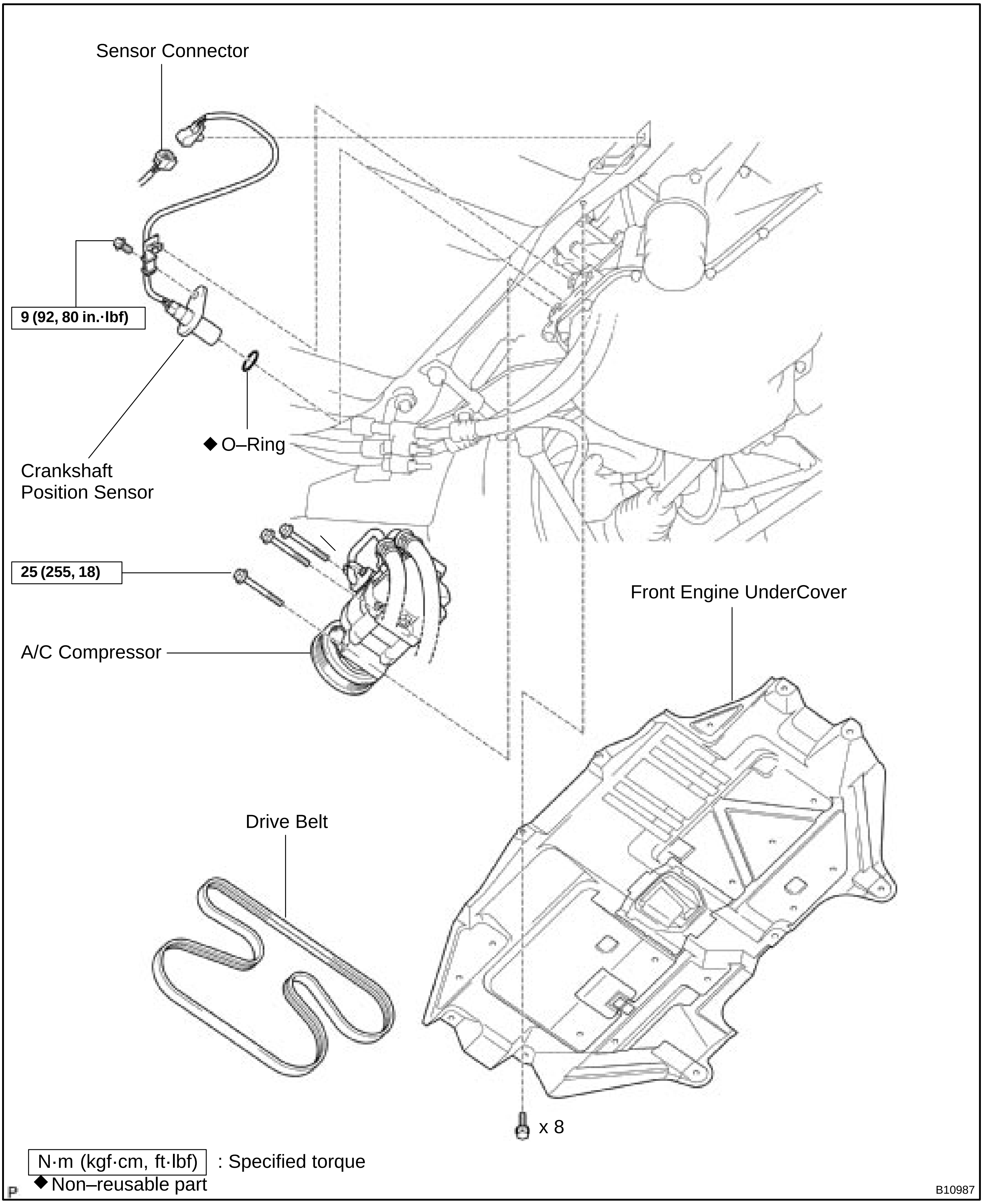
IG0BR–05



CRANKSHAFT POSITION SENSOR

COMPONENTS

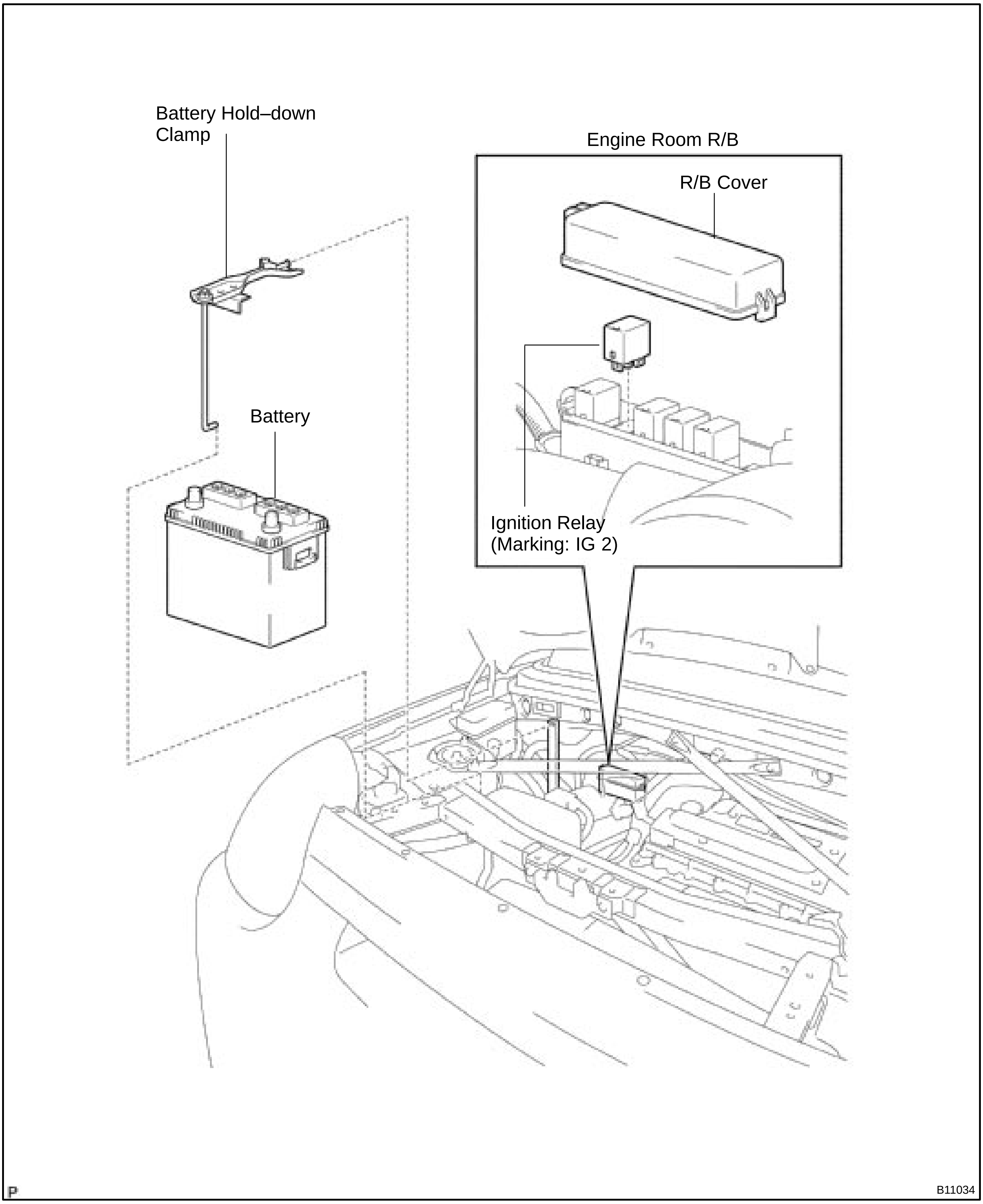
IG0G3–01



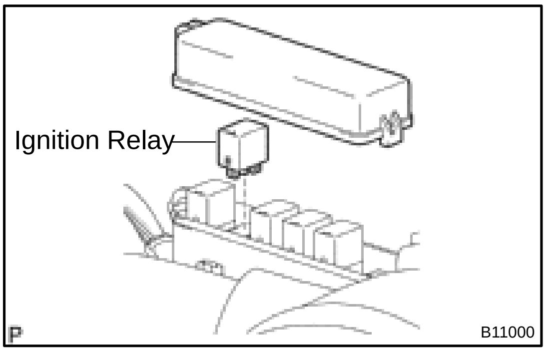
IGNITION RELAY (No.2)

COMPONENTS

IG0G4–01

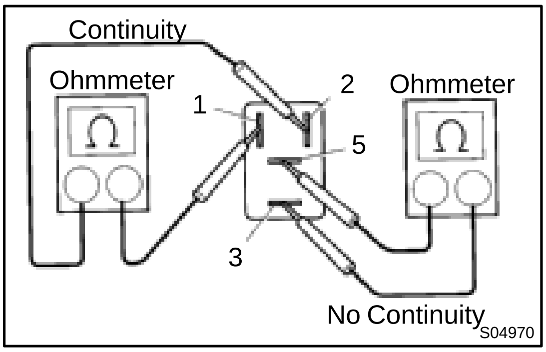


IG0G5–01



INSPECTION

1. REMOVE IGNITION RELAY (Marking: IG2)



2. INSPECT IGNITION RELAY

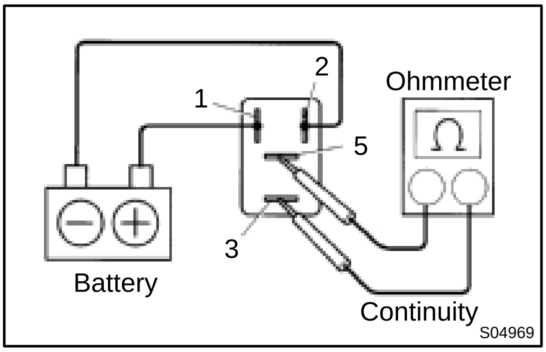
(a) Inspect the relay continuity.

(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 5.

If there is continuity, replace the relay.



(b) Inspect the 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 5.

If there is no continuity, replace the relay.

3. REINSTALL IGNITION RELAY

STARTING SYSTEM

ST02L–01

ON–VEHICLE INSPECTION

NOTICE:

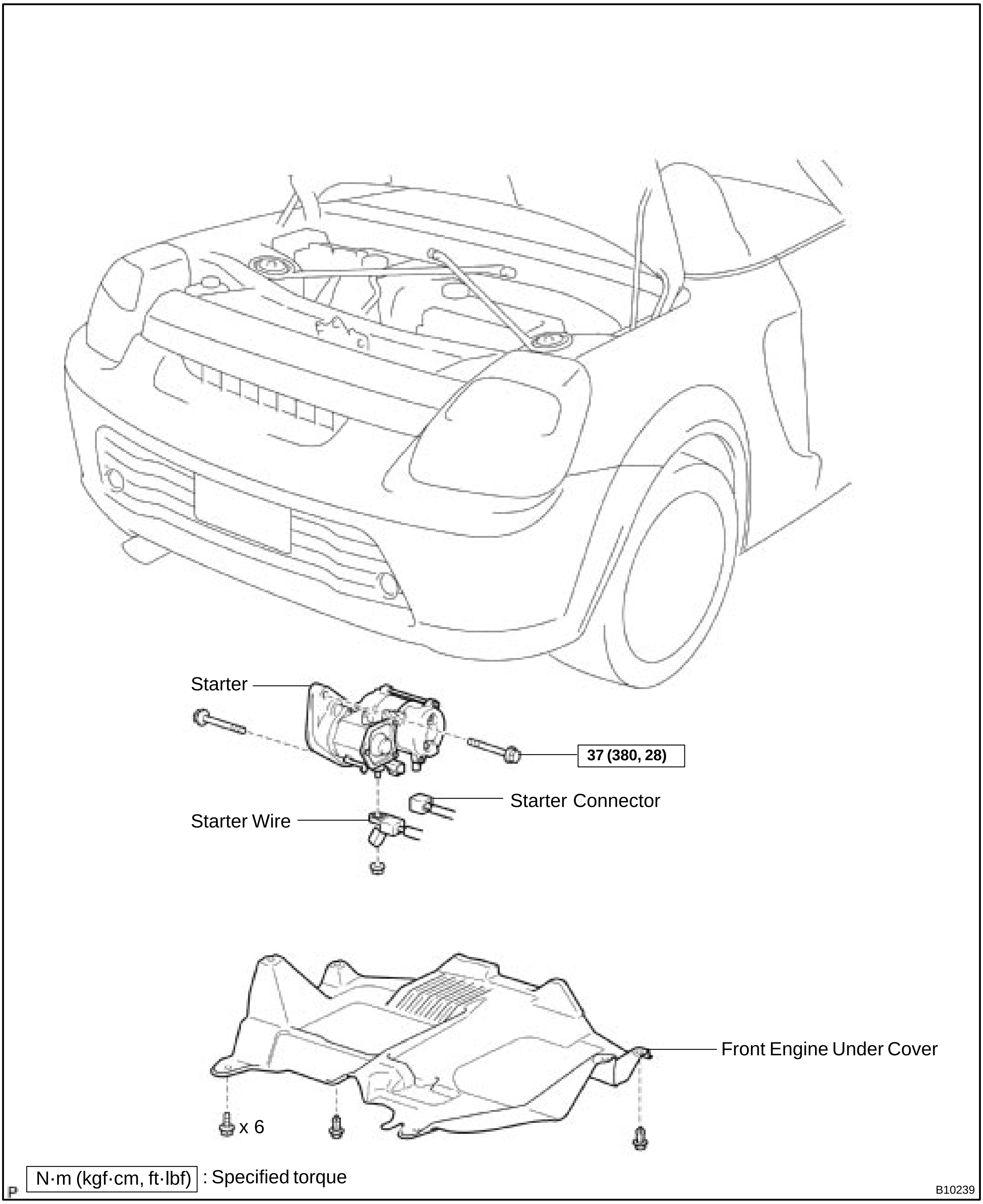
Before changing the starter, check these items again:

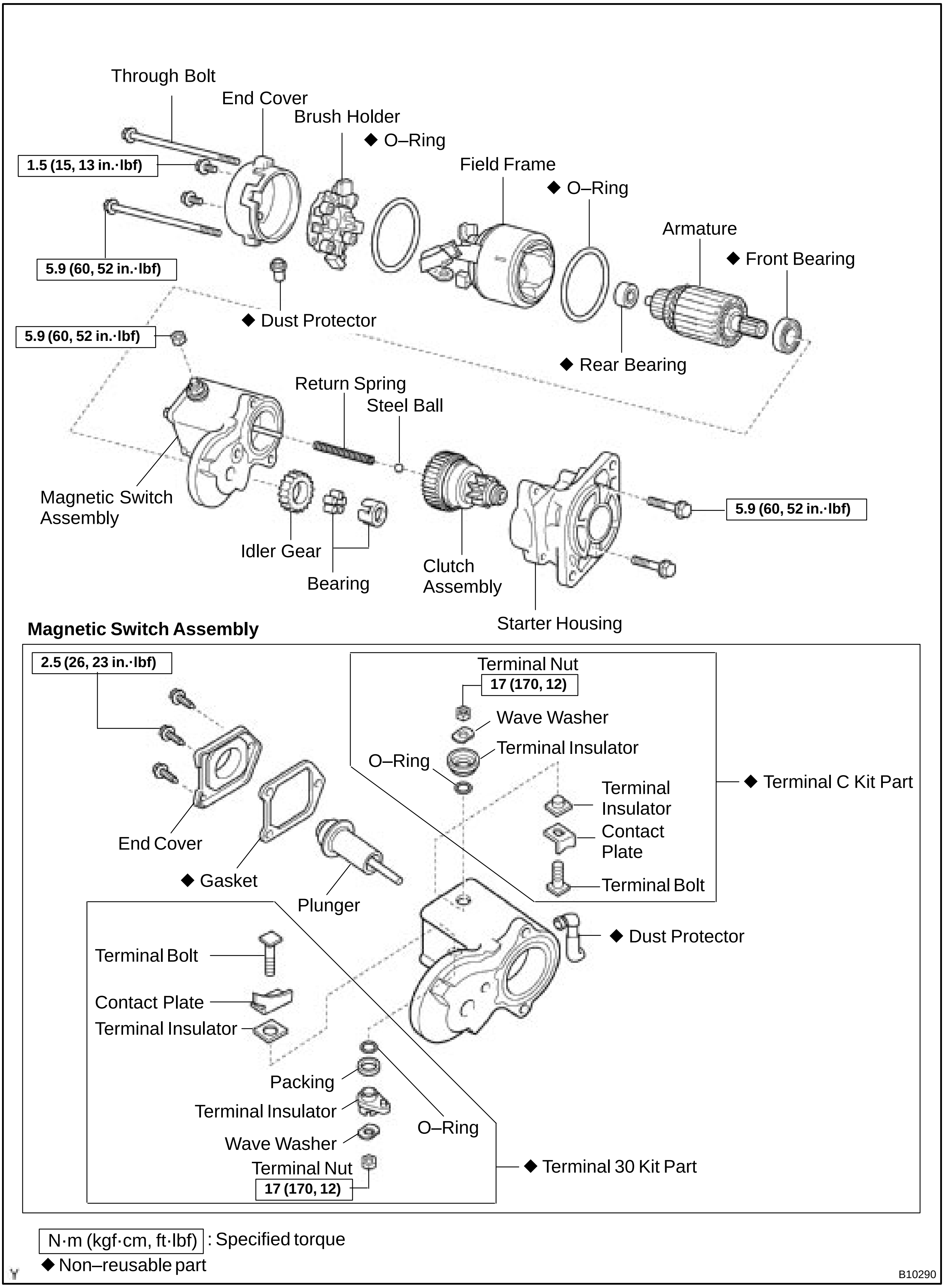
- **Connector connection**
- **Accessory installation, e.g.:theft deterrent system**

STARTER

COMPONENTS

ST02M–04

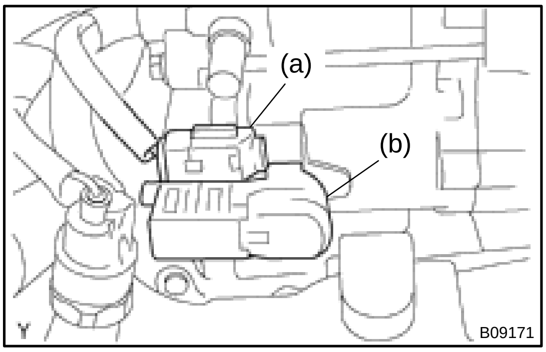



Through Bolt
End Cover
Brush Holder
◆ O–Ring
Field Frame
◆ O–Ring
Armature
◆ Front Bearing
1.5 (15, 13 in.·lbf)
5.9 (60, 52 in.·lbf)
◆ Dust Protector
5.9 (60, 52 in.·lbf)
◆ Rear Bearing
Return Spring
Steel Ball
Magnetic Switch Assembly
Idler Gear
Bearing
Clutch Assembly
5.9 (60, 52 in.·lbf)
Starter Housing
Magnetic Switch Assembly
2.5 (26, 23 in.·lbf)
Terminal Nut
17 (170, 12)
Wave Washer
Terminal Insulator
O–Ring
Terminal Insulator
Contact Plate
Terminal Bolt
◆ Terminal C Kit Part
End Cover
◆ Gasket
Plunger
◆ Dust Protector
Terminal Bolt
Contact Plate
Terminal Insulator
Packing
Terminal Insulator
O–Ring
Wave Washer
Terminal Nut
17 (170, 12)
◆ Terminal 30 Kit Part
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
B10290

ST0HO–02

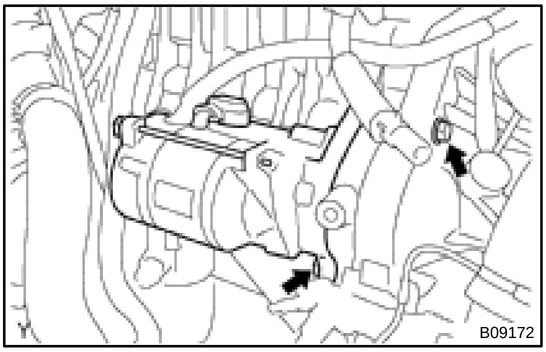
REMOVAL

1. REMOVE FRONT ENGINE UNDER COVER



2. REMOVE STARTER

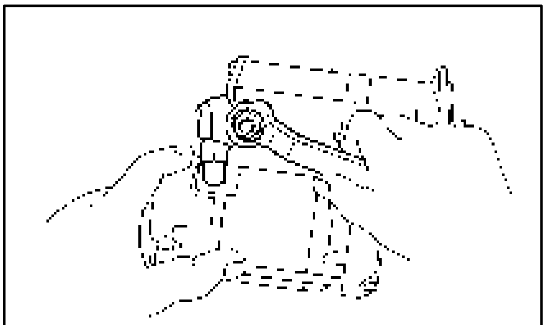
(a) Disconnect the starter connector.
(b) Remove the nut, and disconnect the starter wire.



(c) Remove the 2 bolts and starter.

ST0J3–01

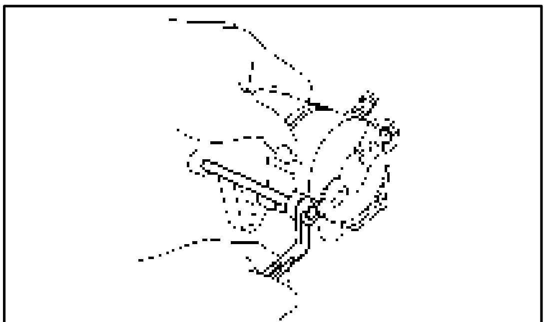
DISASSEMBLY



B00545

1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

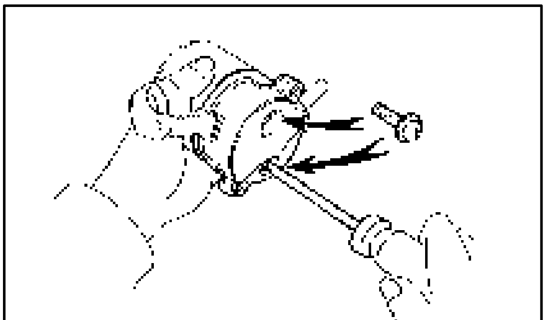


B00229

(b) Remove the 2 through bolts.

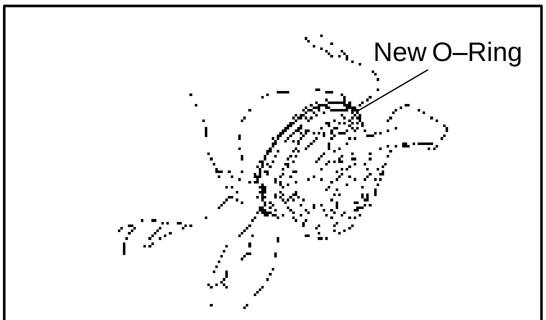
(c) Pull out the field frame with the armature from the magnetic switch assembly.

(d) Remove the O–ring.



S06137

(e) Remove the 2 screws and end cover from the field frame.

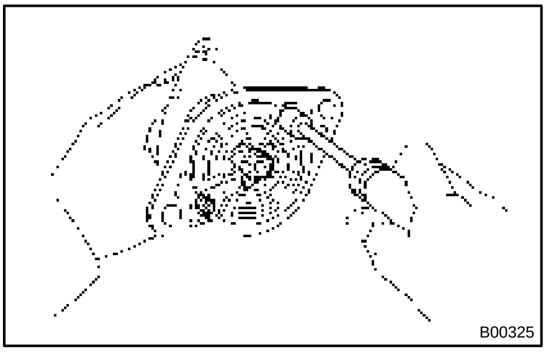


B00529

(f) Remove the O–ring from the field frame.

P07382

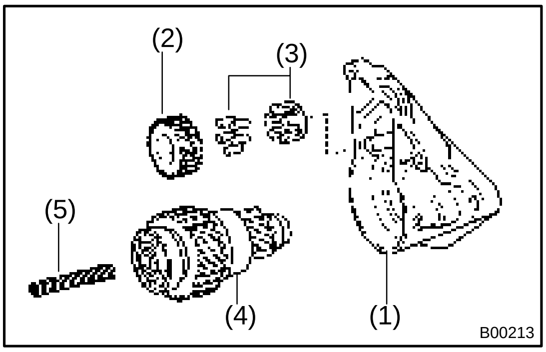
(g) Using a screwdriver, hold the spring tank back and disconnect the brush from the brush holder. Disconnect the 4 brushes and remove the brush holder.



B00325

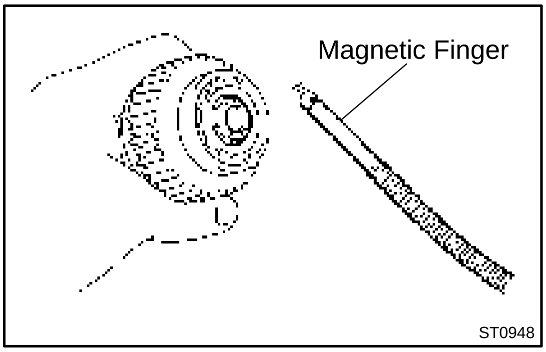
2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

(a) Remove the 2 bolts.



B00213

(b) Remove the starter housing (1), idler gear (2), bearing (3), clutch assembly (4) and return spring (5) from the magnetic switch assembly.



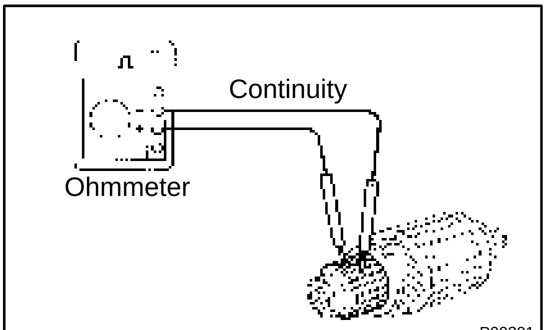
ST0948

3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.

ST0FP–03

INSPECTION

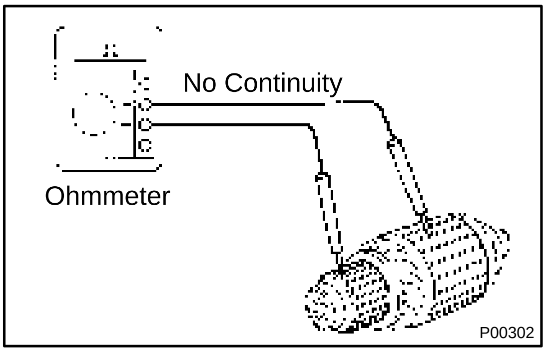


P00301

1. INSPECT ARMATURE COIL

(a) Check the commutator for open circuit.
Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



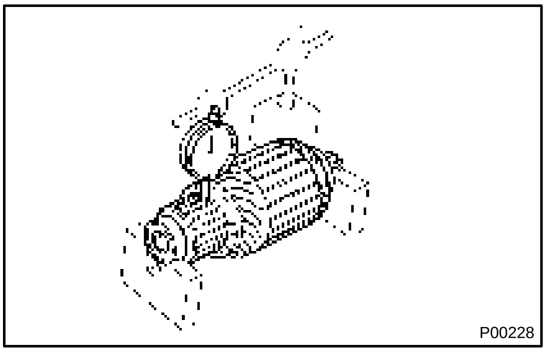
P00302

(b) Check the commutator for ground.
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

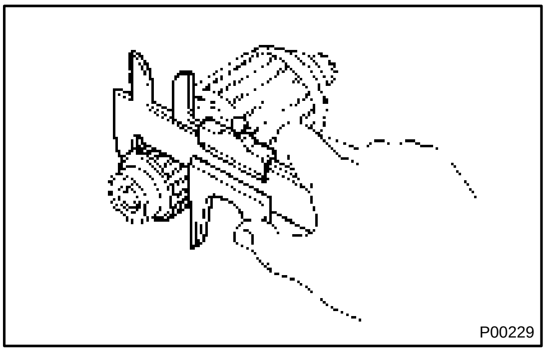
2. INSPECT COMMUTATOR

If the surface is dirty or burnt, correct with sandpaper (No.400) or a lathe.


P00228

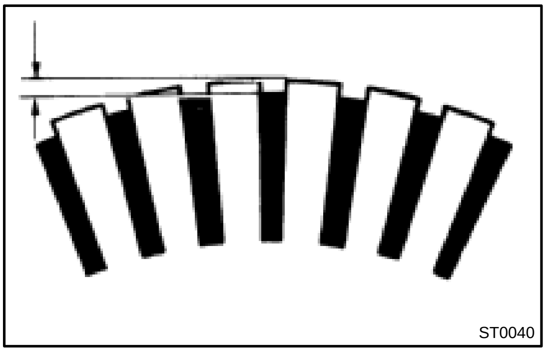
(a) Check for the commutator circle runout.
(1) Place the commutator on V–blocks.
(2) Using a dial gauge, measure the circle runout.
Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.


P00229

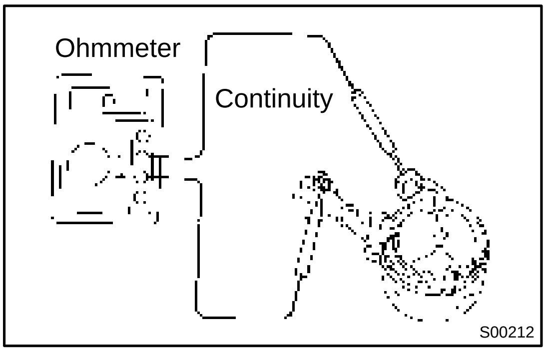
(b) Using vernier calipers,measure the commutator diameter.
Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)

If the diameter is less than minimum, replace the armature.


ST0040

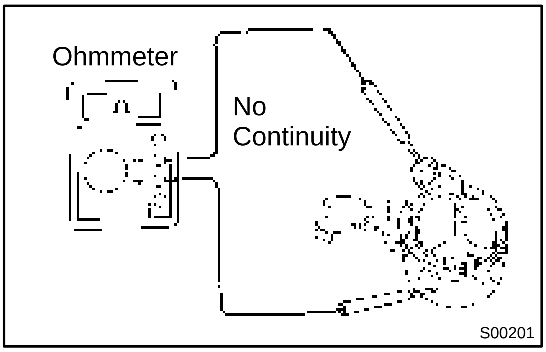
(c) Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.
Standard undercut depth: 0.6 mm (0.024 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

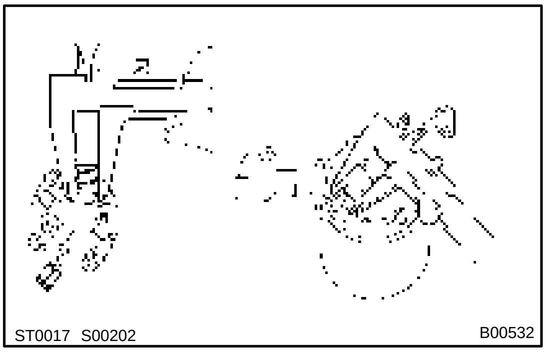


3. INSPECT FIELD COIL

(a) Check the field coil for open circuit.
Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.
If there is no continuity, replace the field frame.

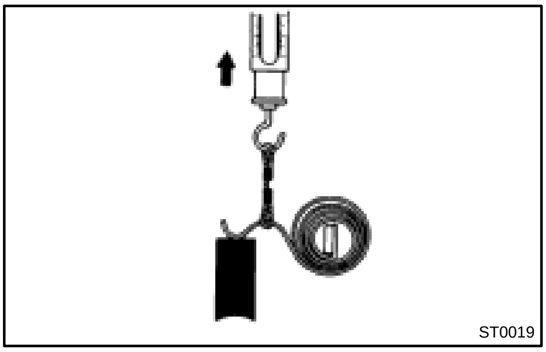


(b) Check for field coil for ground.
Using an ohmmeter, check that there is no continuity between the field coil end and field frame.
If the is continuity, repair or replace the field frame.



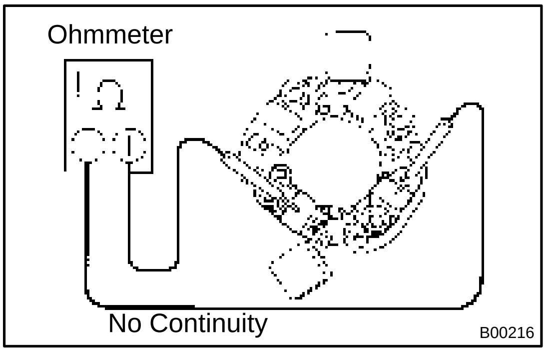
4. INSPECT BRUSHES

Using vernier calipers, measure the brush length.
Standard length: 15.5 mm (0.610 in.)
Minimum length: 10.0 mm (0.394 in.)
If the length is less than minimum, replace the brush holder and field frame.



5. INSPECT BRUSH SPRINGS

Check the brush spring load.
Take the pull scale reading the instant the brush spring separates from the brush.
Standard spring installed load:
17.6 – 23.5 N (1.8 – 2.4 kgf, 4.0 – 5.3 lbf)
Minimum spring installed load: 11.8 N (1.2 kgf, 2.6 lbf)
If the installed load is not within specification, replace the brush springs.



6. INSPECT BRUSH HOLDER

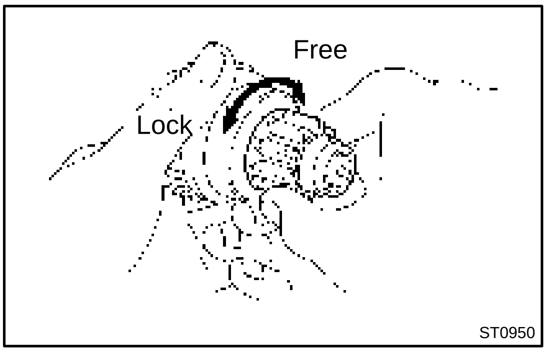
Check the brush holder insulation.
Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.
If there is continuity, repair or replace the brush holder.

7. INSPECT CLUTCH AND GEAR

(a) Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

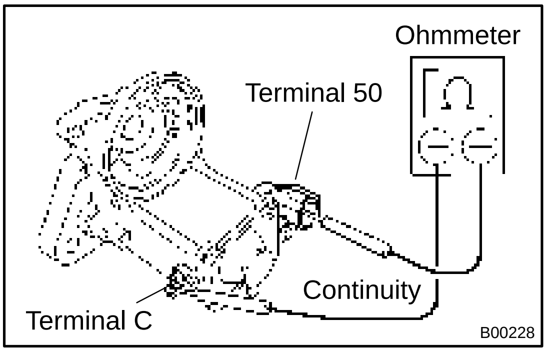
If damaged, also check the drive plate ring gear for wear or damage.



ST0950

(b) Check the clutch pinion gear.
Rotate the clutch pinion gear clockwise, and check that it turns freely. Try to rotate the clutch pinion gear counter–clockwise and check that it locks.

If necessary, replace the clutch assembly.

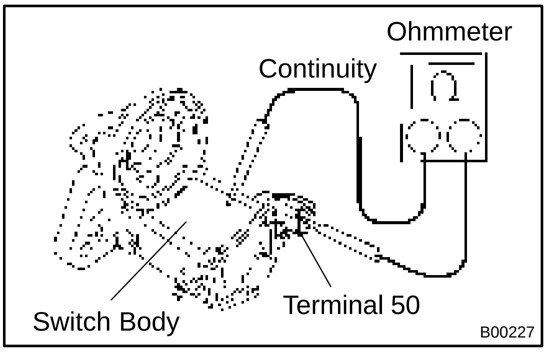


B00228

8. INSPECT MAGNETIC SWITCH

(a) Check the pull–in coil for open circuit.
Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.



B00227

(b) Check the hold–in coil for open circuit.
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

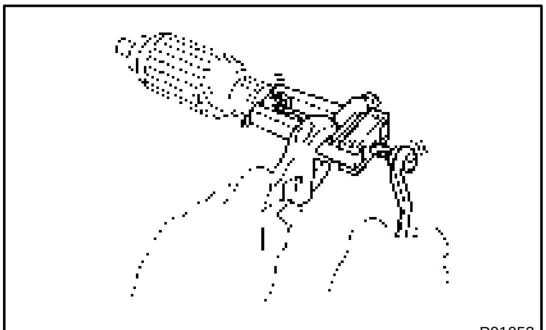
If there is no continuity, replace the magnetic switch.

9. INSPECT BEARING

Turn the bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing (See page ST–10).

ST0FQ–03



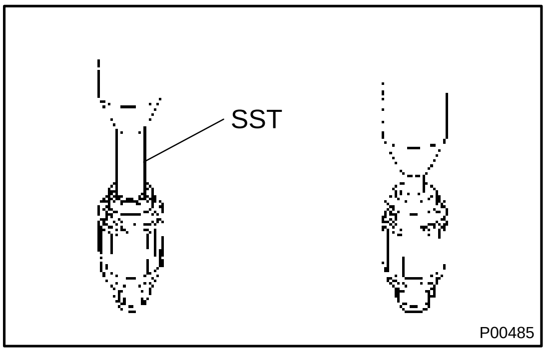
P01052

REPLACEMENT

1. REPLACE BEARINGS

(a) Using SST, remove the bearing.

SST 09286–46011

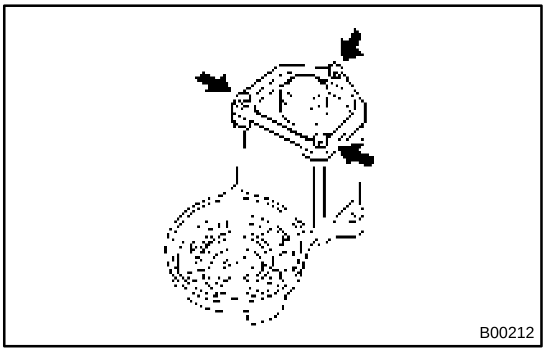


P00485

(b) Using SST and a press, press in a new front bearing.

SST 09820–00030

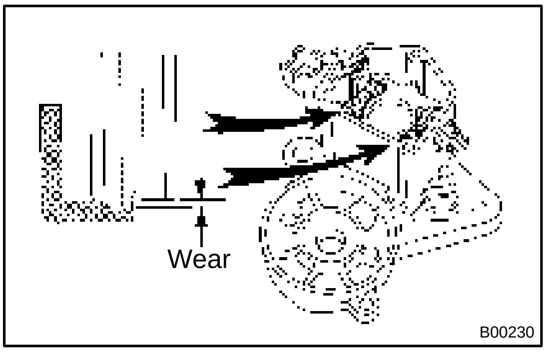
(c) Using a press, press in a new rear bearing.



B00212

2. REPLACE MAGNETIC SWITCH TERMINAL KIT PARTS

(a) Remove the 3 bolts, end cover, gasket and plunger.

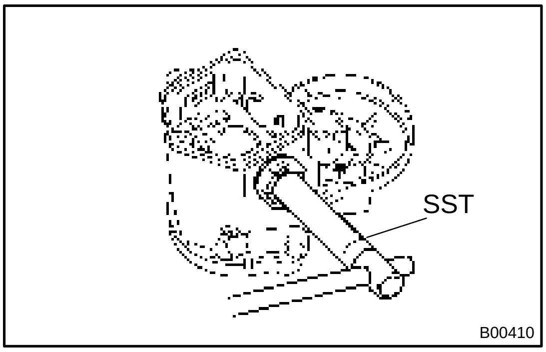


B00230

(b) Using vernier calipers, measure the contact plate for depth of wear.

Maximum wear: 0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



B00410

(c) Remove the terminal kit parts.

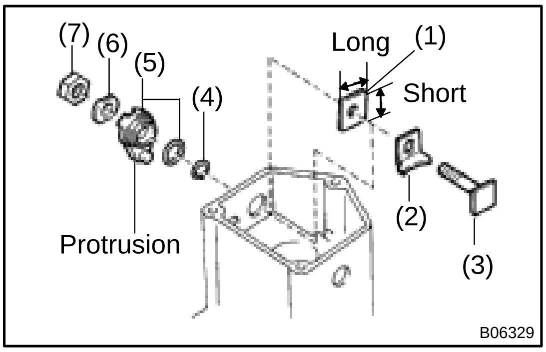
(1) Using SST, loosen the terminal nuts.

SST 09810–38140

(2) Terminal C:

Remove the terminal nut,wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside).

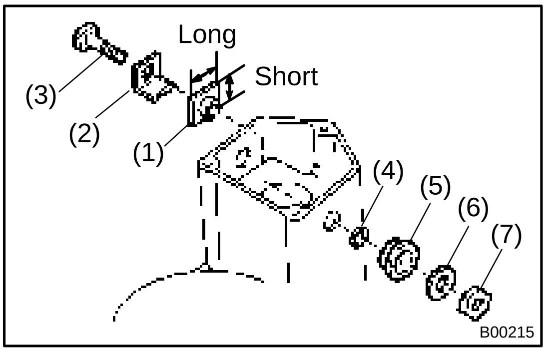
(3) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, and terminal insulator (inside).



(d) Temporarily install a new terminal 30 kit parts.
   (1) Install a terminal insulator (inside).
   (2) Install a contact plate.
   (3) Install a terminal bolt.
   (4) Install a O–ring.
   (5) Install a packing and terminal insulator (outside). Install the packing to the terminal insulator, and install them.

HINT:
Match the protrusion of the insulator with the indentation of the housing.
   (6) Install a wave washer.
   (7) Install a terminal nut.

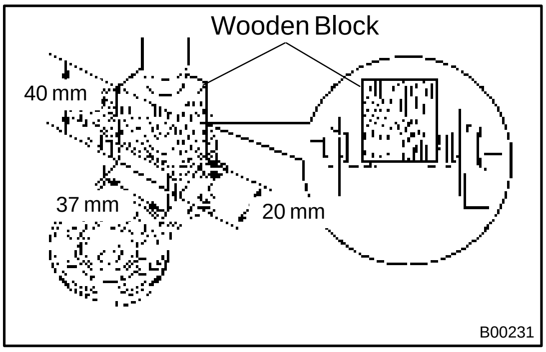
NOTICE:
Be careful to install the terminal insulator in the correct direction.



(e) Temporarily install new terminal C kit parts.
   (1) Install a terminal insulator (inside).
   (2) Install a contact plate.
   (3) Install a terminal bolt.
   (4) Install a O–ring.
   (5) Install a terminal insulator (outside).
   (6) Install a wave washer.
   (7) Install a terminal nut.

NOTICE:
Be careful to install the terminal insulator (inside) in the correct direction.

(f) Temporarily tighten the terminal nuts.



(g) Tighten terminal nut.

(1) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:
20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)
Press force:
981 N (100 kgf, 221 lbf)

NOTICE:
Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.

Gauge pressure:

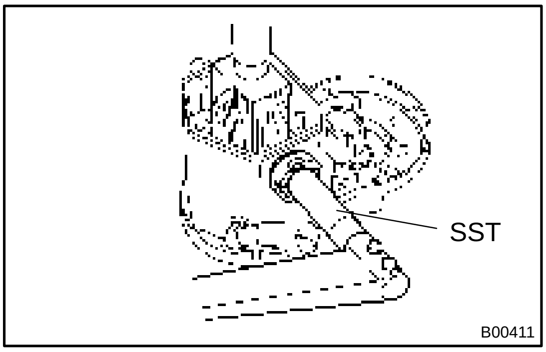
$$(\text{kgf/cm}^2) = \frac{100\ \text{kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14(\pi)}$$

$$(\text{psi}) = \frac{221\ \text{ibf}}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

$$(\text{kpa}) = (\text{kgf/cm}^2) \times 98.1$$

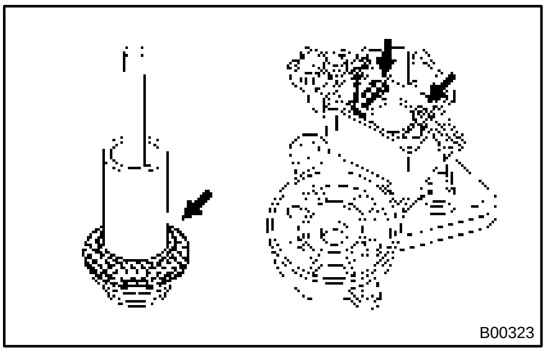
$$(\text{kpa}) = (\text{psi}) \times 6.9$$

If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.



(2) Using SST, tighten the nuts to the specified torque.
SST 09810–38140
Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)

NOTICE:
If the nut is over tightened, it may cause cracks on the inside of the insulator.



(h) Clean contact surfaces of contact plate and plunger.
Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

(i) Reinstall magnetic switch end cover.
Install the plunger, new gasket, end cover with the 3 bolts.
Torque: 2.5 N·m (26 kgf·cm, 23 in.·lbf)

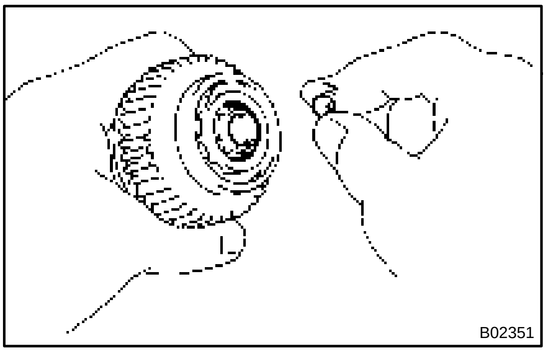
ST0J4–01

REASSEMBLY

HINT:
Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

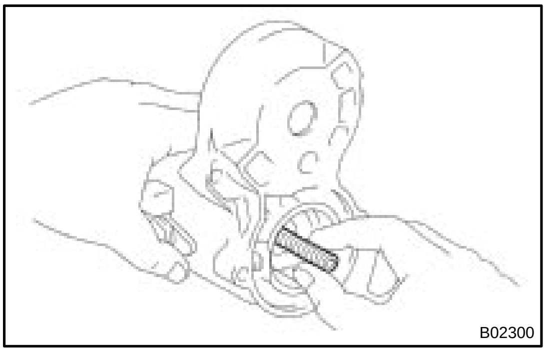
1. INSTALL ARMATURE TO MAGNETIC SWITCH ASSEMBLY

(a) Apply grease to the armature bearings.
(b) Install the armature to the magnetic switch assembly.



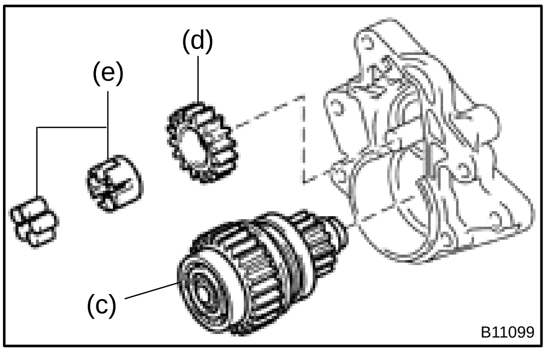
2. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.



3. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic switch hole.



(c) Place the starter clutch assembly on the starter housing.
(d) Place idler on the starter housing.
(e) Place bearing on the starter housing.
(f) Install the starter housing to the magnetic switch with the 2 bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

4. INSTALL FIELD FRAME

(a) Install a new O–ring to the groove of the filed frame.
(b) Align the protrusion of the field frame with the groove of the magnetic switch, and install the field frame.

5. INSTALL BRUSH HOLDER

(a) Place the brush holder on the field frame.
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the 4 brushes.

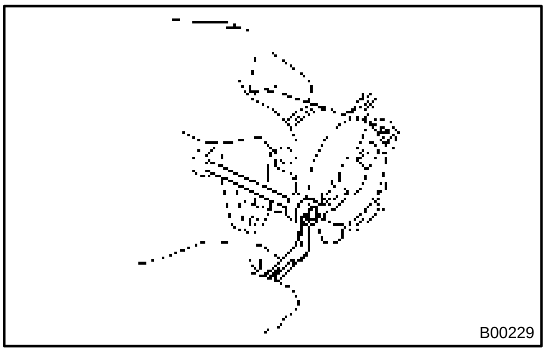
NOTICE:
Check that the positive (+) lead wires are not grounded.

6. INSTALL END COVER

(a) Install a new O–ring to the groove of the field frame.

(b) Install the end cover to the field frame with the 2 screws.

Torque: 1.5 N·m (15 kgf·cm, 13 in.·lbf)



(c) Install the field frame and armature assembly with the 2 through bolts.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

(d) Connect the lead wire to terminal C with the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

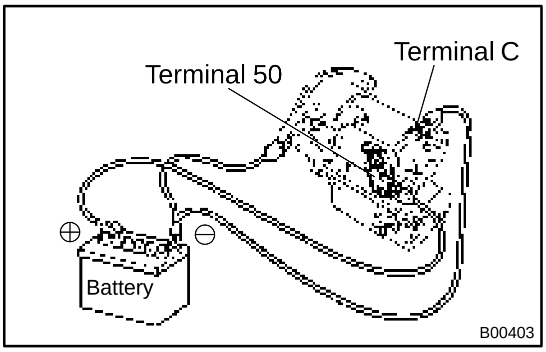
7. INSTALL NEW DUST PROTECTOR

ST02S–02

TEST

NOTICE:

These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



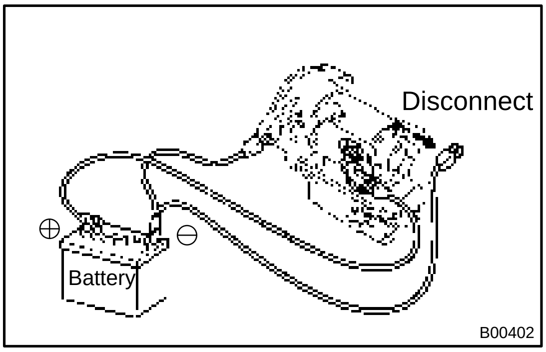
B00403

1. DO PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

If the clutch pinion gear does not move.

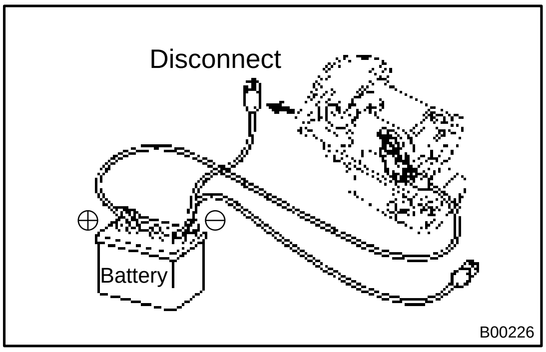


B00402

2. DO HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C.

If the clutch pinion gear returns inward.



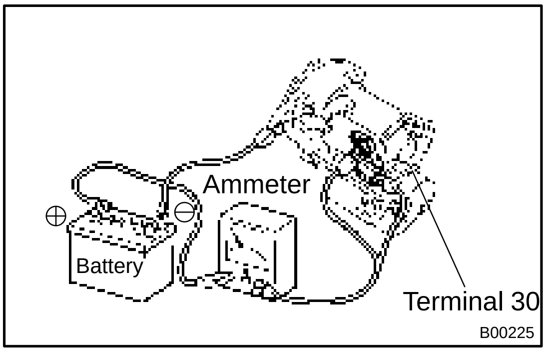
B00226

3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body.

Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return.



B00225

4. DO NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

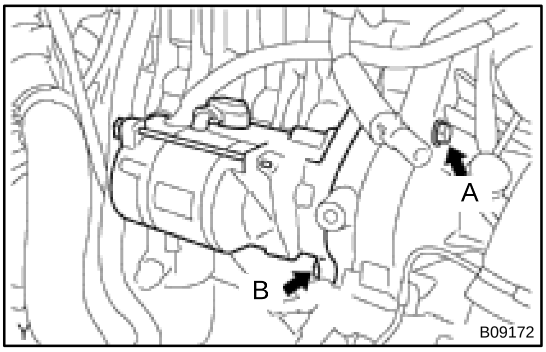
(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out.

Check that the ammeter shows the specified current.

Specified current: 90 A or less at 11.5 V

ST0HR–02

INSTALLATION



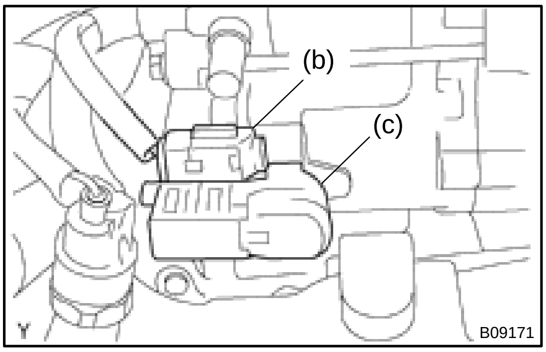
1. INSTALL STARTER

(a) Install the 2 bolts and starter.

HINT:

Each bolt length is indicated in the illustration.

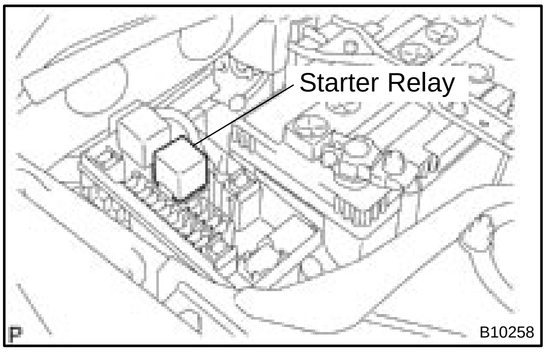
Bolt ”A”	64 mm (2.72 in.)
Bolt ”B”	54 mm (2.13 in.)



(b) Connect the starter wire, and install the nut.

(c) Connect the starter connector.

2. INSTALL FRONT ENGINE UNDER COVER



STARTER RELAY

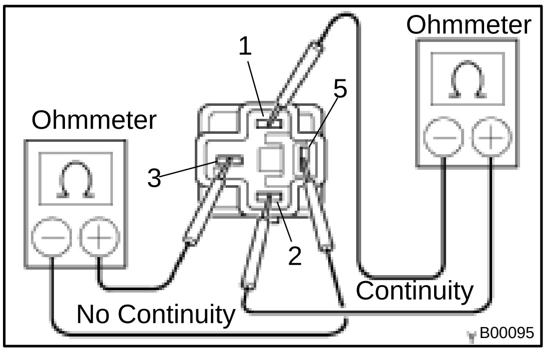
ST0J5–01

INSPECTION

1. REMOVE STARTER RELAY

(a) Remove the fusible link block cover.

(b) Remove the starter relay (Marking: ST).



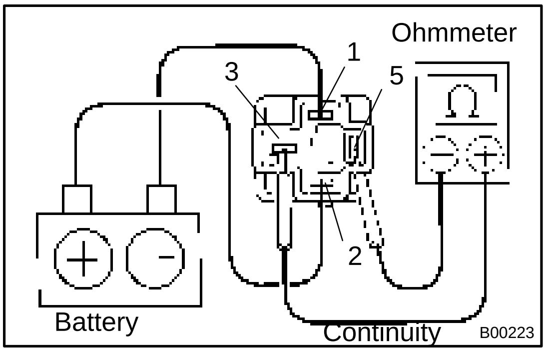
2. INSPECT STARTER RELAY CONTINUITY

(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 5.

If there is continuity, replace the relay.



3. INSPECT STARTER 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 5.

If there is continuity, replace the relay.

4. REINSTALL STARTER RELAY

(a) Reinstall the starter relay.

(b) Reinstall the fusible link block cover.