TOYOTA MOTOR CORPORATION

FOREWORD

This supplement has been prepared to provide information covering general service repairs for COROLLA which underwent changes in August, 2004.

Applicable models: NDE 120 series

First Printing: Aug. 2, 2004 01-040802-00

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

Manual Name	Pub. No.
• COROLLA Repair Manual	RM925E
• COROLLA Repair Manual Supplement (Jan., 2002)	RM939E
• COROLLA Repair Manual Supplement (Jan., 2003)	RM1028E
• COROLLA Repair Manual Supplement (May, 2004)	RM1106E
• 1ND-TV Engine Repair Manual	RM1118E
• C53, C53A Manual Transaxle Repair Manual	RM1117E
• COROLLA Electrical Wiring Diagram Supplement (Aug., 2004)	EWD626E
• COROLLA New Car Featurer Supplement (May, 2004)	NCF266E

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

CAUTION

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

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

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

TOYOTA COROLLA
REPAIR MANUAL SUPPLEMENT 1129E
MAIN INDEX

INTRODUCTION

HOW TO USE THIS MANUAL

010XJ-02

GENERAL INFORMATION

1. GENERAL DESCRIPTION

(a) This manual is written in accordance with SAE J2008.
  (1) Diagnosis
  (2) Removing/Installing, Replacing, Disassembling/Reassembling, Checking and Adjusting
  (3) Final Inspection

(b) This manual explains (1) (see "Diagnostics" section) and (2). (3) is omitted.

(c) The following procedures are omitted from this manual. However, these procedures must be performed.
  (1) Using a jack or lift to perform operations
  (2) Cleaning a removed part
  (3) Performing a visual check

2. INDEX

(a) An alphabetical INDEX section is provided at the end of the manual as a reference to help you find the item to be repaired.

3. PREPARATION

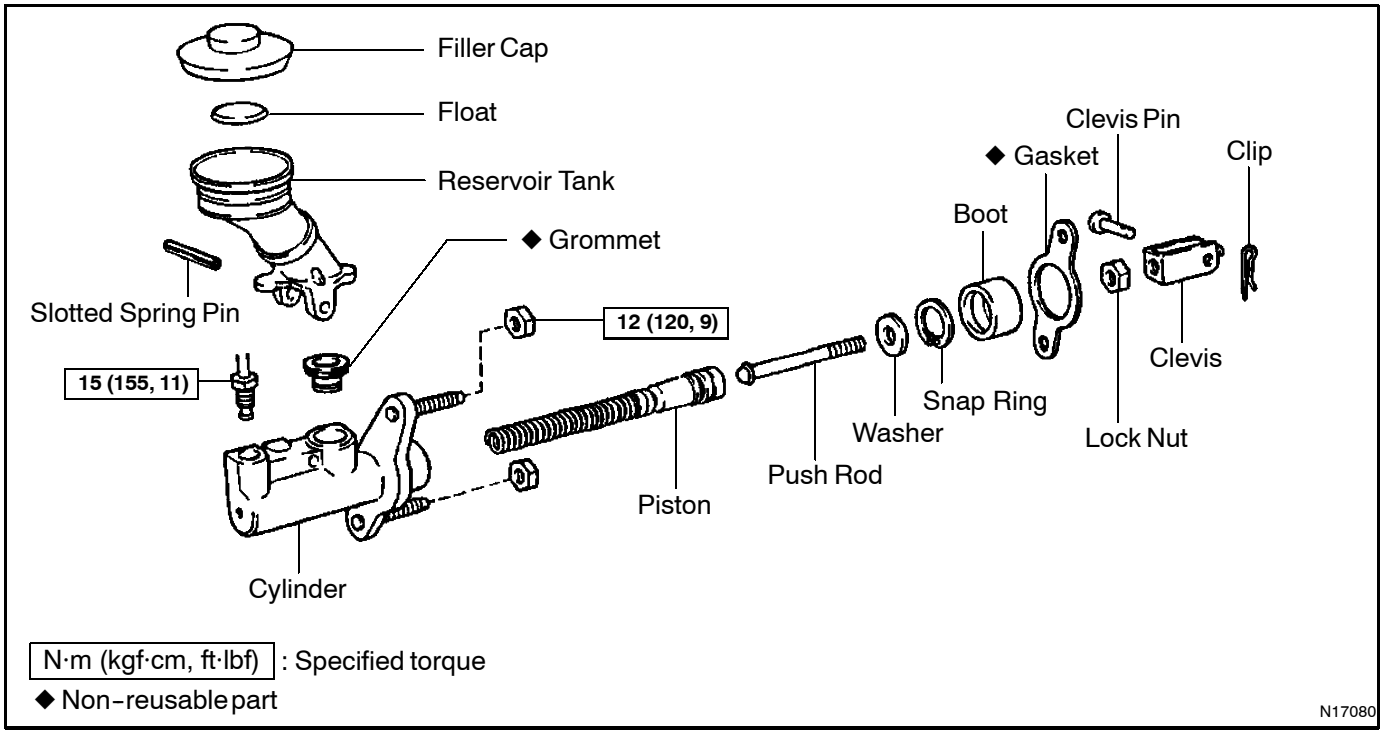
(a) Use of Special Service Tools (SST) and Special Service Materials (SSM) may be required, depending on the repair procedure. Be sure to use SST and SSM when they are required and follow the working procedure properly. A list of SST and SSM is in the "Preparation" section of this manual.

4. REPAIR PROCEDURES

(a) A component illustration is placed under the title where necessary.

(b) Non-reusable parts, grease application areas, precoated parts and torque specifications are noted in the component illustrations.

Example:



(c) Torque specifications, grease application areas and non-reusable parts are emphasized in the procedures.

NOTICE:

There are cases where such information can only be explained by using an illustration. In these cases, all the information such as torque, oil, etc. are described in the illustration.

(d) Only items with key points are described in the text. What to do and other details are placed in illustrations next to the text. Both the text and illustrations are accompanied by standard values and notices.

(e) Illustrations of similar vehicle models are sometimes used. In those cases, minor details may be different from the actual vehicle.

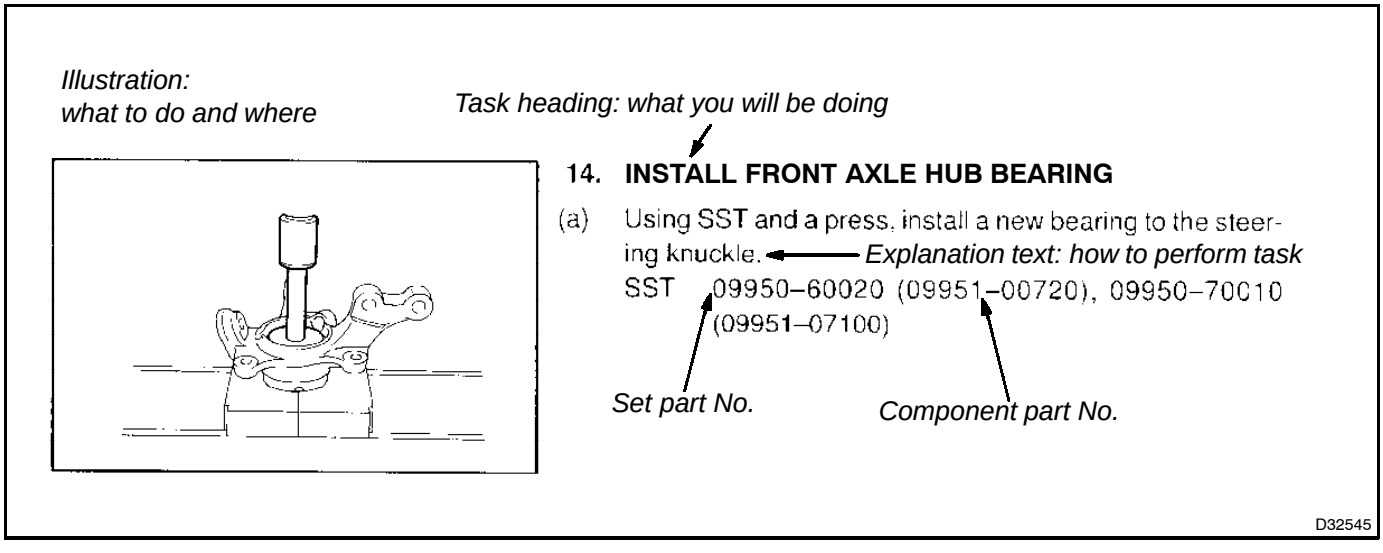
(f) Procedures are presented in a step-by-step format:

(1) The illustration shows what to do and where to do it.

(2) The task heading tells what to do.

(3) The explanation text tells how to perform the task. It also has information such as specifications and warnings.

Example:



HINT:

This format provides an experienced technician with a FAST TRACK to the necessary information. The task headings are easy to read and the text below the task heading provides detailed information. Important specifications and warnings are always written in bold type.

5. SERVICE SPECIFICATIONS

(a) SPECIFICATIONS are presented in bold-faced text throughout the manual. The specifications are also found in the "Service Specifications" section for quick reference.

6. TERMS DEFINITION

CAUTION	Possibility of injury to you or other people.
NOTICE	Possibility of damage to components being repaired.
HINT	Provides additional information to help you perform repairs.

7. SI UNIT

(a) The units used in this manual comply with the SI UNIT (International System of Units) standard. Units from the metric system and the English system are also provided.

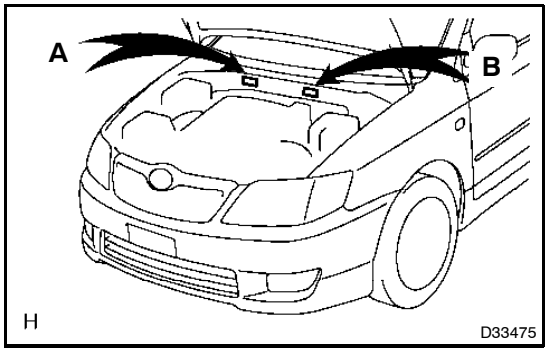
Example:

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

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION AND SERIAL NUMBERS

010XK-02

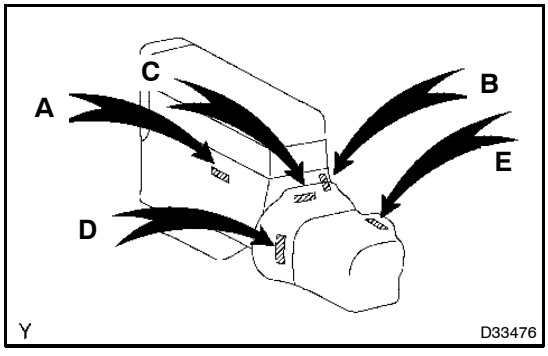


1. VEHICLE IDENTIFICATION NUMBER

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

A: Vehicle Identification Number Plate

B: Certification Label



2. ENGINE SERIAL NUMBER AND TRANSAXLE SERIAL NUMBER

(a) The engine serial number is stamped on the cylinder block of the engine and the transaxle serial number is stamped on the housing as shown in the illustration.

A: 1CD-FTV, 1ND-TV

B: 2ZZ-GE, 3ZZ-FE, 4ZZ-FE

C: C50, C53, C53A, C64, C150

D: E351, E357

E: A246E

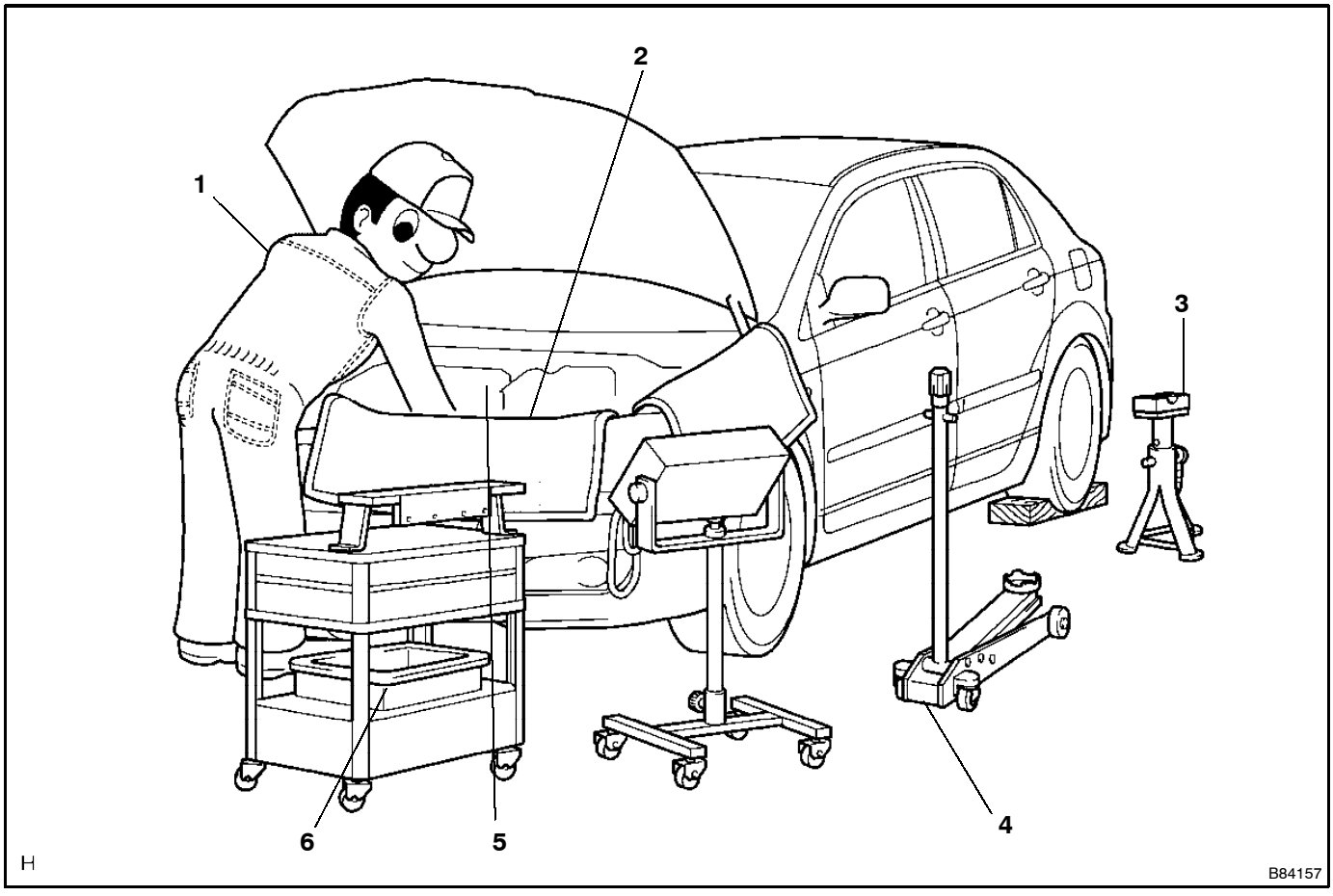
REPAIR INSTRUCTION

PRECAUTION

010XL-02

1. BASIC REPAIR HINT

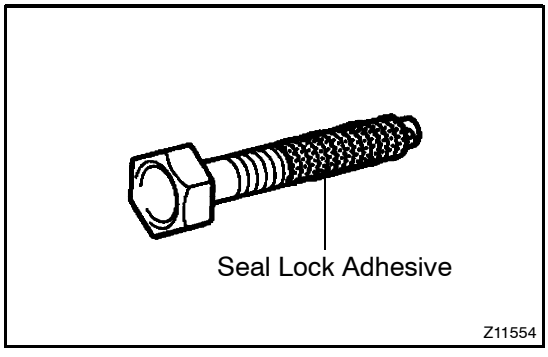
(a) HINTS ON OPERATIONS



1	Attire	• Always wear a clean uniform. • Hat and safety shoes must be worn.
2	Vehicle protection	Prepare a grille cover, fender cover, seat cover and floor mat before starting the operation.
3	Safe operation	• When working with 2 or more persons, be sure to check safety for one another. • When working with the engine running, make sure to provide ventilation for exhaust fumes in the workshop. • If working on high temperature, high pressure, rotating, moving, or vibrating parts, wear appropriate safety equipment and take extra care not to injure yourself or others. • When jacking up the vehicle, be sure to support the specified location with a safety stand. • When lifting up the vehicle, use appropriate safety equipment.
4	Preparation of tools and measuring gauge	Before starting operation, prepare a tool stand, SST, gauge, oil and parts for replacement.
5	Removal and installation, disassembly and assembly operations	• Diagnose with a thorough understanding of proper procedures and of the reported problem. • Before removing the parts, check the general condition of the assembly and for deformation and damage. • When the assembly is complicated, take notes. For example, note the total number of electrical connections bolts, or hoses removed. Add matchmarks to insure reassembly of components in the original positions. Temporarily mark hoses and their fittings if needed. • Clean and wash the removed parts if necessary and assemble them after a thorough check.
6	Removed parts	• Place the removed parts in a separate box to avoid mixing them up with the new parts or contaminating the new parts. • For non-reusable parts such as gaskets, O-rings, and self-locking nuts, replace them with new ones as instructed in this manual. • Retain the removed parts for customer inspection, if requested.

(b) JACKING UP AND SUPPORTING VEHICLE

(1) 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 01-19].



(c) PRECOATED PARTS

(1) Precoated parts are bolts and nuts that are coated with a seal lock adhesive at the factory.

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

(3) When reusing a precoated part, clean off the old adhesive and dry the part with compressed air. Then apply new seal lock adhesive appropriate to that part.

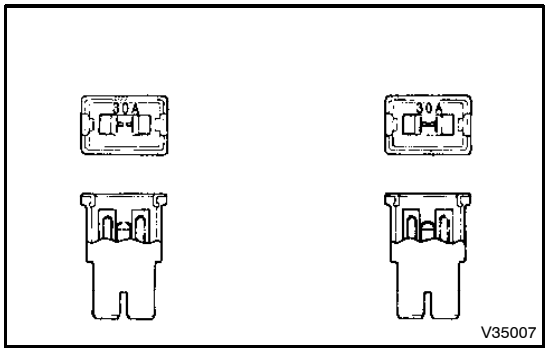
(4) Some seal lock agents harden slowly. You may have to wait for the seal lock agent to harden.

(d) GASKETS

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

(e) BOLTS, NUTS AND SCREWS

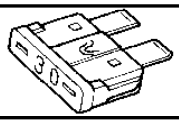
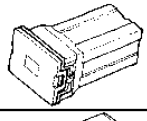
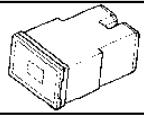
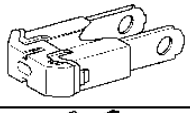
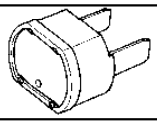
(1) Carefully follow all the specifications for tightening torques. Always use a torque wrench.



(f) FUSES

(1) When inspecting a fuse, check that the wire of the fuse is not broken.

(2) When replacing fuses, be sure that 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
 D25628	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

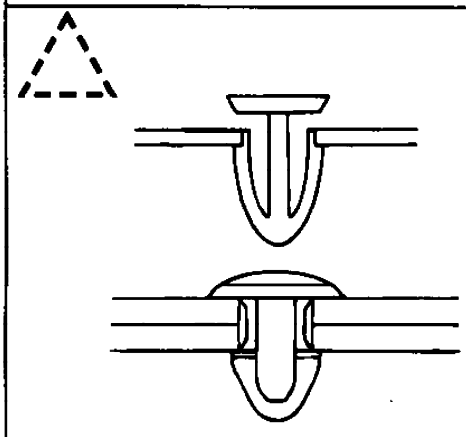
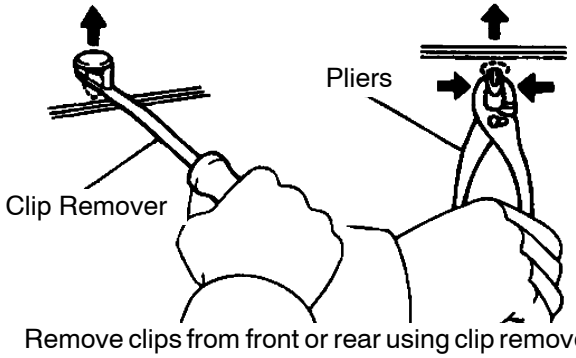
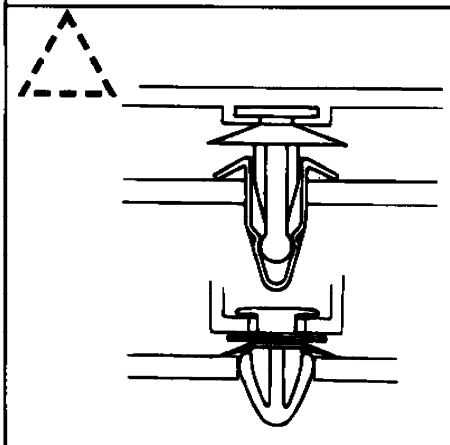
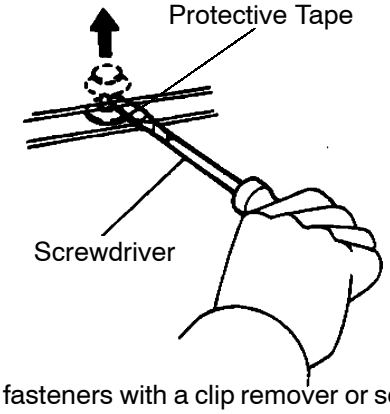
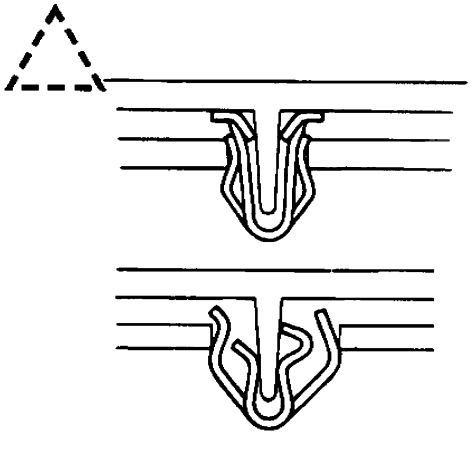
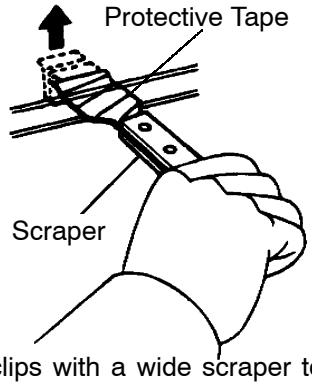
V35008

(g) CLIPS

(1) The removal and installation methods of typical clips used for vehicle body parts are shown in the table below.

HINT:

If clips are damaged during a procedure, always replace the damaged clip with a new clip.

Shape (Example)	Removal/Installation
	 Remove clips from front or rear using clip remover or pliers.
	 Remove fasteners with a clip remover or screwdriver.
	 Remove clips with a wide scraper to prevent panel damage.

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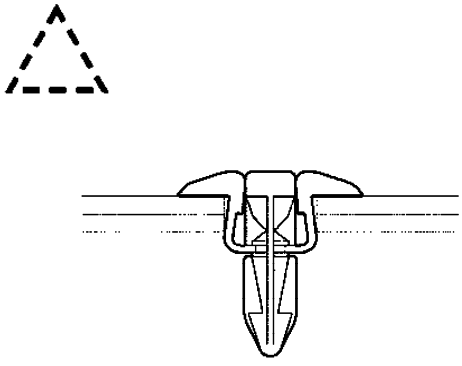
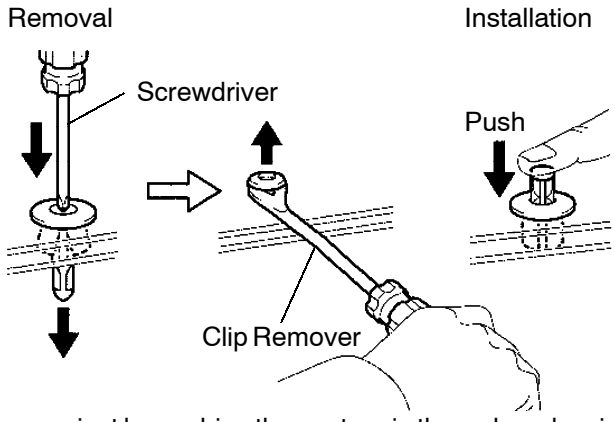
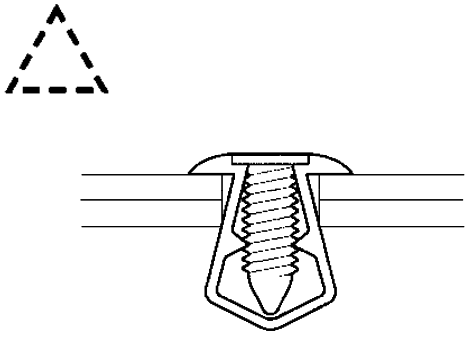
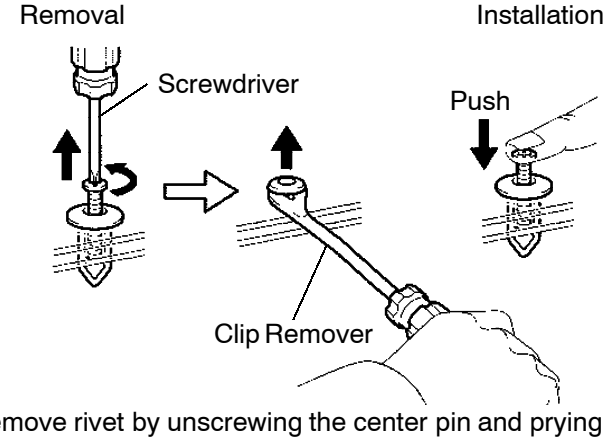
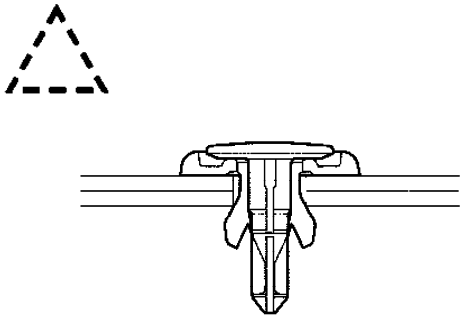
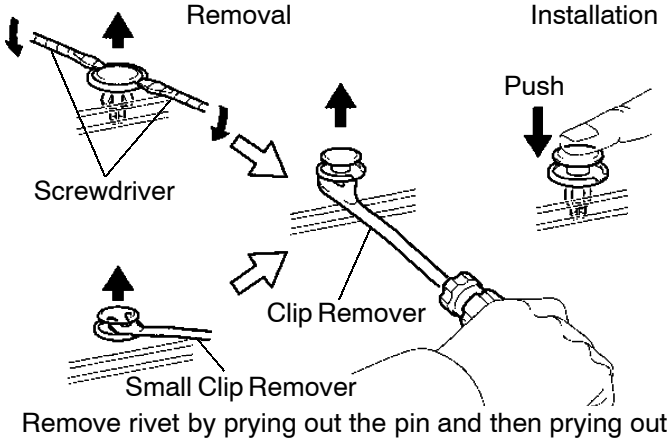
Shape (Example)	Removal/Installation
	 Remove rivet by pushing the center pin through and prying out the rivet shell.
	 Remove rivet by unscrewing the center pin and prying out the rivet shell.
	 Remove rivet by prying out the pin and then prying out the rivet shell.

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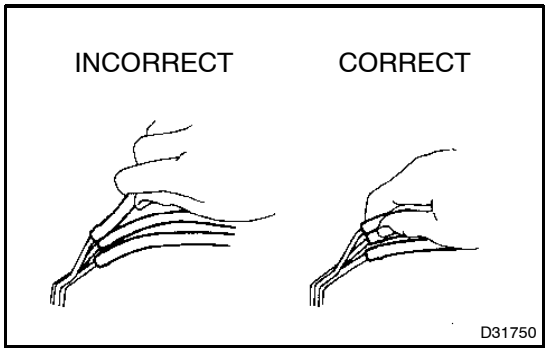
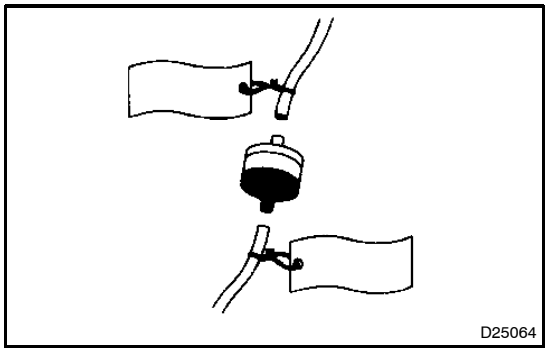


(h) REMOVAL AND INSTALLATION OF VACUUM HOSES

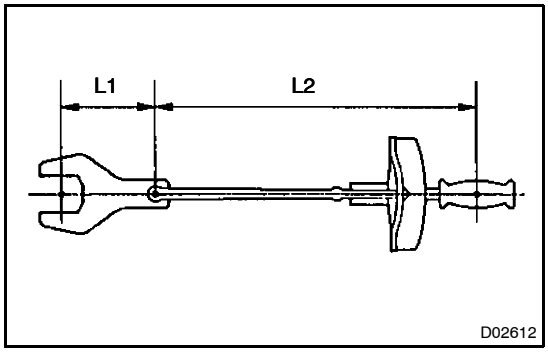
(1) To disconnect a vacuum hose, pull and twist from the end of the hose. Do not pull from the middle of the hose as this may cause damage.



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

(3) After completing any hose related repairs, double check that the vacuum hoses are properly connected. The label under the hood shows the proper layout.

(4) When using a vacuum gauge, never force the hose onto a connector that is too large. If a hose has been stretched, it may leak air. Use a step-down adapter if necessary.

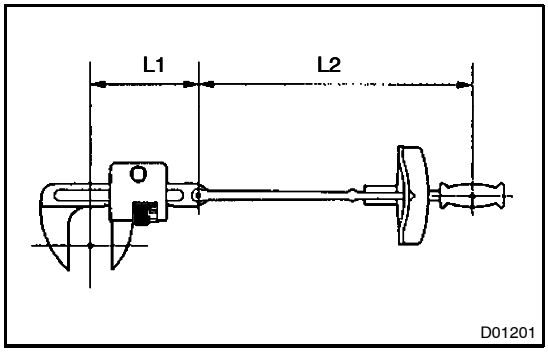


(i) TORQUE WHEN USING TORQUE WRENCH WITH EXTENSION TOOL

(1) Use the formula below to calculate special torque values for situations where SST or an extension tool is combined with the torque wrench.

Formula: T' = T x L2/(L1 + L2)

T'	Reading of torque wrench {N·m (kgf·cm, ft·lbf)}
T	Torque {N·m (kgf·cm, ft·lbf)}
L1	Length of SST or extension tool {cm (in.)}
L2	Length of torque wrench {cm (in.)}



NOTICE:

If an extension tool or SST is combined with a torque wrench and the wrench is tightened to the torque specification in this manual, the actual torque will be excessive and parts will be damaged.

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

The COROLLA is equipped with a Supplemental Restraint System (SRS).

CAUTION:

Failure to carry out the service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing and lead to serious injury.

Furthermore, if a mistake is made when servicing the SRS, it is possible that the SRS may fail to operate properly. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following section carefully.

(a) GENERAL NOTICE

(1) As the malfunction symptoms of the SRS are difficult to confirm, the Diagnostic Trouble Codes (DTCs) become the most important source of information when troubleshooting. When troubleshooting the SRS, always check the DTCs before disconnecting the battery (see Pub. No.RM925, page 05-942).

(2) Work must be started at least 90 seconds after the ignition switch is turned OFF and the negative (-) terminal cable is disconnected from the battery.
(The SRS is equipped with a back-up power source. If work is started within 90 seconds after turning the ignition switch OFF and disconnecting the cable from the negative (-) battery terminal, the SRS may deploy).
When the disconnecting the cable from the negative (-) battery terminal, clock and audio system memory is erased. Before starting work, make a note of the settings of each memory system. When work is finished, reset the clock and audio systems as before.

CAUTION:

Never use a backup power source (battery or other) to avoid erasing system memory. The backup power source may inadvertently power the SRS and cause it to deploy.

(3) In minor collisions where the SRS does not deploy, the horn button assembly (see Pub. No. RM925E, page 60-14), front passenger airbag assembly (see Pub. No. RM925E, page 60-27), front seat airbag assembly (see Pub. No. RM925E, page 60-32), curtain shield airbag assembly (see Pub. No. RM1028E, page 60-24) and seat belt pretensioner should be inspected before further use of the vehicle.

(4) Never use SRS parts from another vehicle. When replacing parts, use new parts.

(5) Before repairs, remove the airbag sensor assemblies if impacts are likely to be applied to the sensor during repairs.

(6) Never disassemble and attempt to repair the airbag sensor assemblies, horn button assembly, front passenger airbag assembly, curtain shield airbag assembly, front seat airbag assembly or seat belt pretensioner.

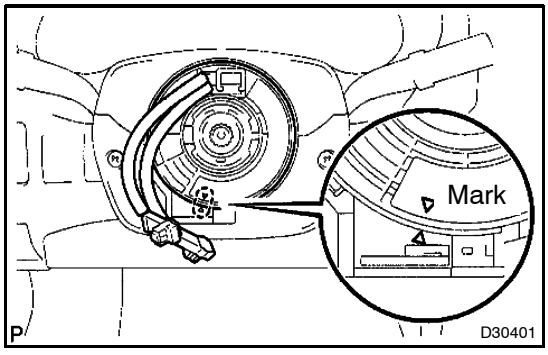
(7) Replace the airbag sensor assemblies, horn button assembly, front passenger airbag assembly, curtain shield airbag assembly or front seat airbag assembly or instrument panel lower airbag assembly if: 1) damage has occurred from being dropped, or 2) cracks, dents or other defects in the case, bracket or connector are present.

(8) Do not directly expose the airbag sensor assemblies, horn button assembly, front airbag assembly, front seat airbag assembly, curtain shield airbag assembly or seat belt pretensioner to hot air or flames.

(9) Use a voltmeter/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting electrical circuits.

(10) Information labels are attached to the SRS components. Follow the instructions on the labels.

(11) After work on the SRS is completed, check the SRS warning lamp (see Pub. No. RM925E, page 05-947).



(b) SPIRAL CABLE (in Combination Switch)

(1) The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other problems may occur.

See Pub. No. RM925E, page 60-22 for information about correct installation of the steering wheel.

(c) HORN BUTTON ASSEMBLY (with Airbag)

(1) When removing the horn button or handling a new horn button, it should be placed with the pad surface facing up. See the illustration below.
Placing the horn button with the pad surface facing down may lead to a serious accident if the airbag accidently inflates. Also, do not place anything on top of the horn button.

(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.

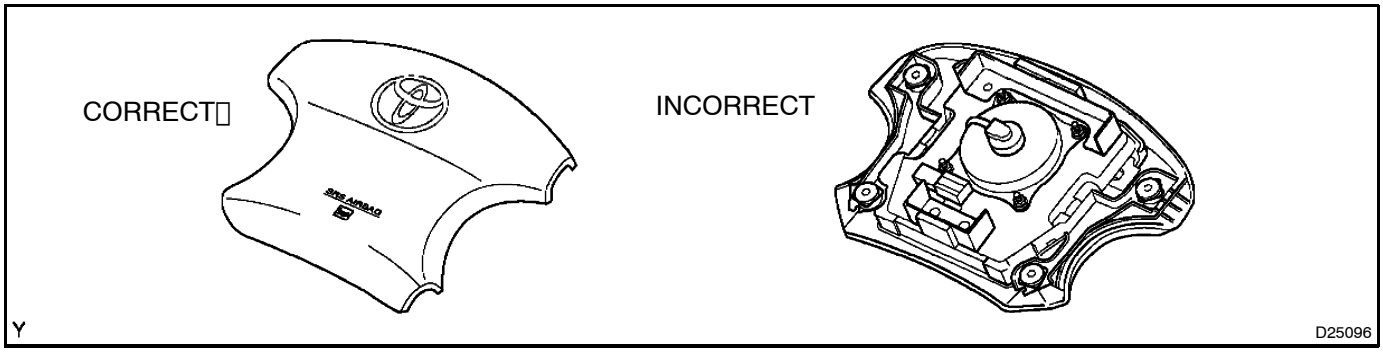
(3) Grease or detergents of any kind should not be applied to the steering wheel pad.

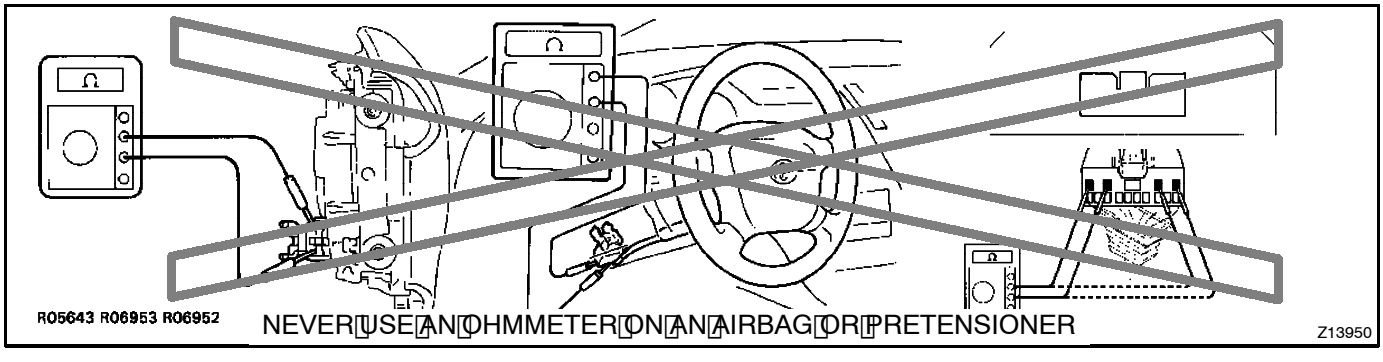
(4) Store the horn button in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (4 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of the vehicle or the horn button by itself, the airbag should be inflated using SST before disposal (see Pub. No. RM925E, page 60-14). Activate in a safe place away from electrical noise.

Example:





(d) FRONT PASSENGER AIRBAG ASSEMBLY

(1) Always place a removed or new airbag assembly with the airbag inflation direction facing up. Placing the airbag assembly with the airbag inflation 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 inflate, which could cause serious injury.

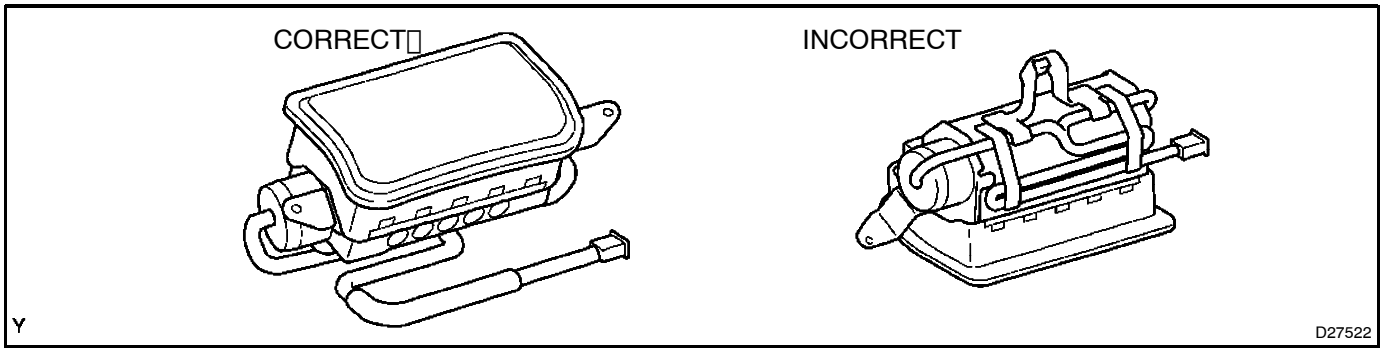
(3) Grease or detergents of any kind should not be applied to the airbag assembly.

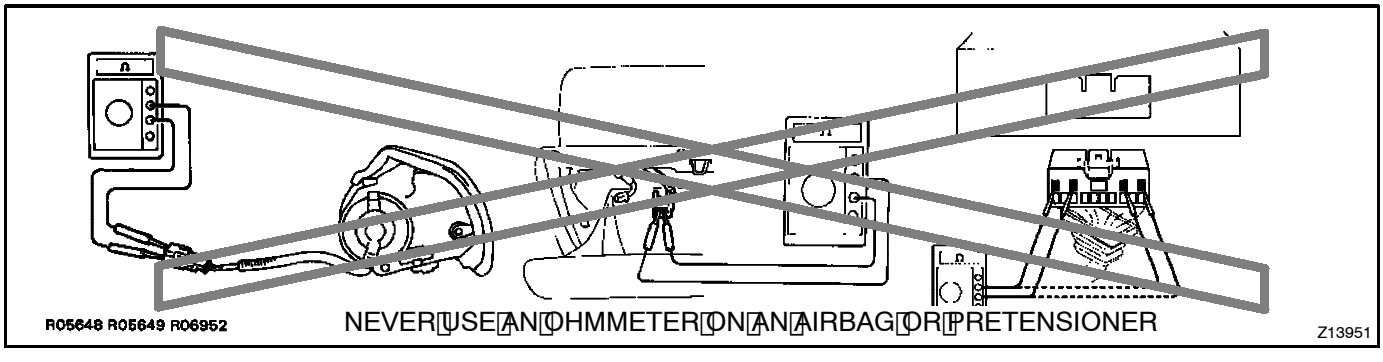
(4) Store the airbag assembly in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (4 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the airbag assembly unit by itself, the airbag should be deployed using SST before disposal (see Pub. No. RM925E, page 60-27).
Activate in a safe place away from electrical noise.

Example:





(e) CURTAIN SHIELD AIRBAG ASSEMBLY

(1) Always place the removed or new airbag assembly in a clear plastic bag, and keep it in a safe place.

NOTICE:

The plastic bag is not reuseable.

CAUTION:

Never disassemble the curtain shield airbag assembly.

(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.

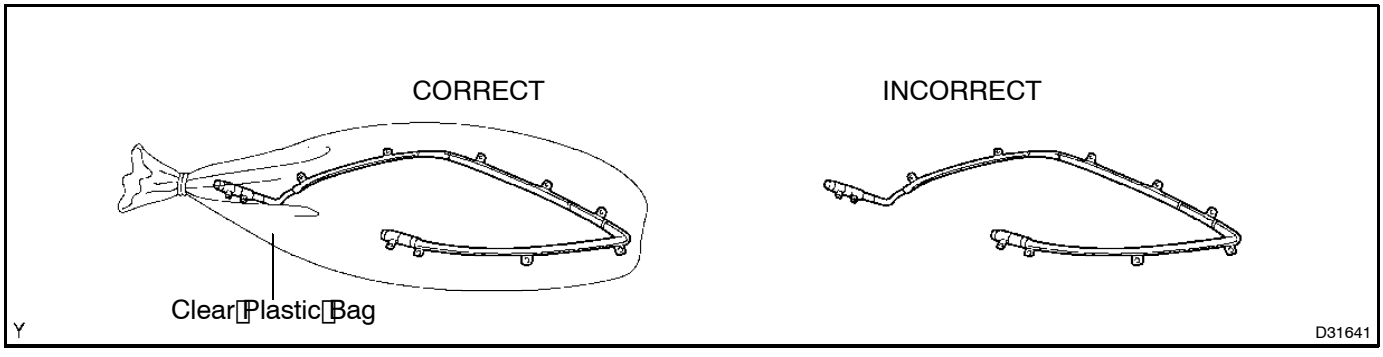
(3) Grease or detergents of any kind should not be applied to the airbag assembly.

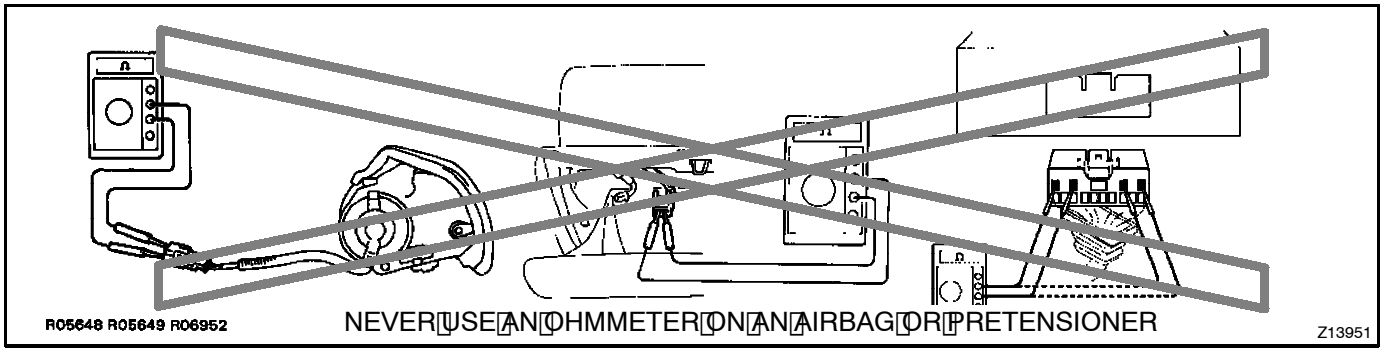
(4) Store the airbag assembly in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the airbag assembly unit by itself, the airbag should be deployed using SST before disposal (see Pub. No. RM925E, page 60-24).
Activate in a safe place away from electrical noise.

Example:





(f) FRONT SEAT AIRBAG ASSEMBLY

(1) Always place a removed or new airbag assembly with the airbag inflation direction facing up. Placing the airbag assembly with the airbag inflation direction facing down could cause a serious accident if the airbag deploys.

(2) Never measure the resistance of the airbag squib. This may cause the airbag to inflate, which could cause serious injury.

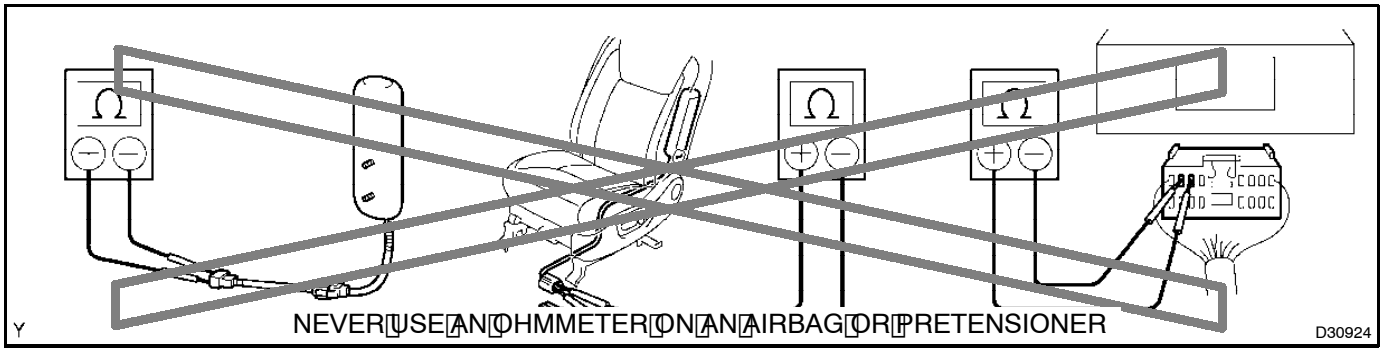
(3) Grease or detergents of any kind should not be applied to the airbag assembly.

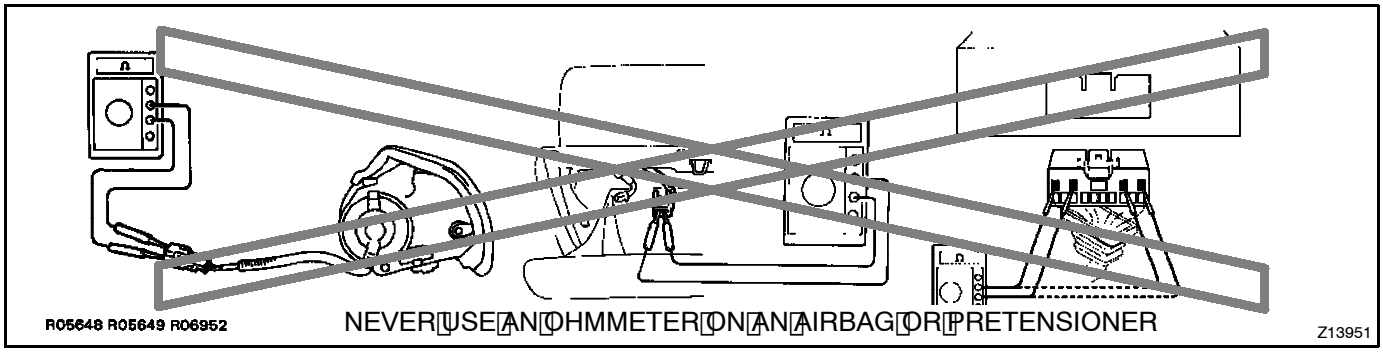
(4) Store the airbag assembly in an area where the ambient temperature is below 93°C (200°F), the humidity is not high and electrical noise is not nearby.

(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the airbag deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the airbag assembly unit by itself, the airbag should be deployed using SST before disposal (See Pub. No. RM925E, page 60-32).
Activate in a safe place away from electrical noise.

Example:





(g) SEAT BELT PRETENSIONER

(1) Never measure the resistance of the seat belt pretensioner. This may cause the seat belt pretensioner to activate, which could cause serious injury.

(2) Never disassemble the seat belt pretensioner.

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

(4) Store the seat belt pretensioner in an area where the ambient temperature is below 80°C (176°F), the humidity is not high and electrical noise is not nearby.

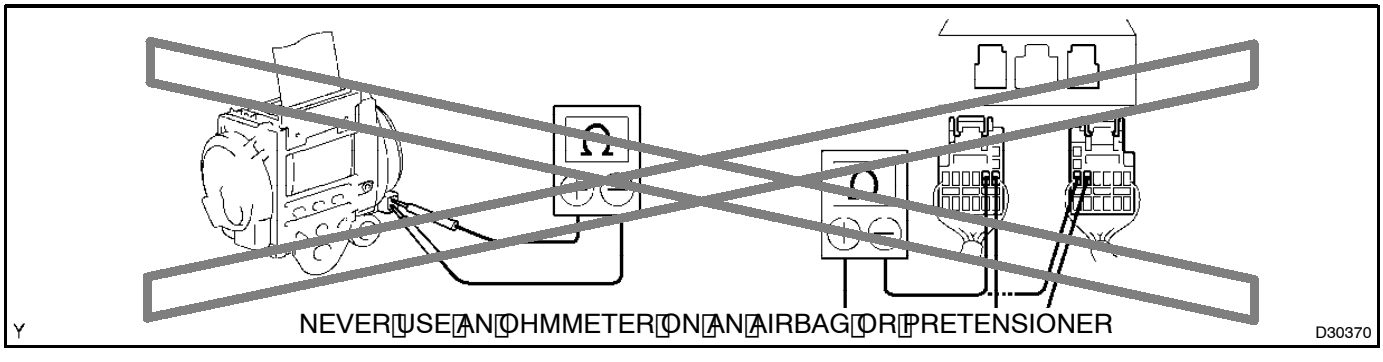
(5) When using electric welding anywhere on the vehicle, disconnect the airbag ECU connectors (2 pins). These connectors contain shorting springs. This feature reduces the possibility of the seat belt pretensioner deploying due to currents entering the squib wiring.

(6) When disposing of a vehicle or the seat belt pretensioner unit by itself, the seat belt pretensioner should be activated before disposal (see Pub. No. RM925E, page 61-4). Activate in a safe place away from electrical noise.

(7) As the seat belt pretensioner is hot after being activated, allow some time for it to cool down sufficiently before disposal. Never apply water to try to cool down the seat belt pretensioner.

(8) Grease, detergents, oil or water should not be applied to the front seat outer belt.

Example:



(h) AIRBAG SENSOR ASSEMBLY

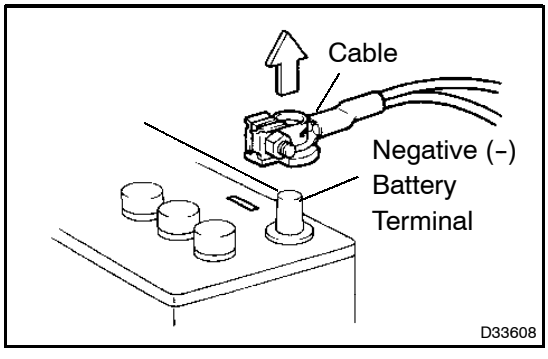
(1) Never reuse an airbag sensor assembly that has been involved in a collision where the SRS has deployed.

(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 on the floor, the SRS may activate.

(3) Work must be started at least 90 seconds after the ignition switch is turned OFF and the cable from the negative (-) battery terminal is disconnected, even if only loosening the set bolts of the airbag sensor assembly.

(i) WIRE HARNESS AND CONNECTOR

(1) 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, repair or replace it.



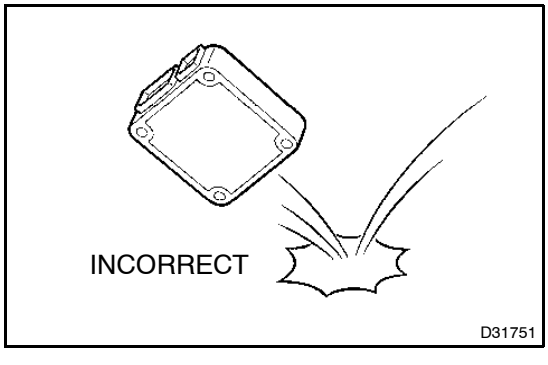
3. ELECTRONIC CONTROL

(a) REMOVAL AND INSTALLATION OF BATTERY CABLE

(1) Before performing electronic work, disconnect cable from the negative (-) battery terminal to prevent component and wire damage caused by accidental short circuits.

(2) When disconnecting the terminal cable, turn the ignition switch and headlamp dimmer switch OFF and loosen the terminal nut completely. Perform these operations without twisting or prying the terminal. Remove the battery cable from the battery terminal.

(3) Clock settings, radio settings, audio system memory, DTCs and other data are erased when the battery cable is disconnected. Write down any necessary data before disconnecting the battery cable.



(b) HANDLING OF ELECTRONIC 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 rendered inoperative by static electricity.

(2) Do not pull the wires when disconnecting electronic connectors. Pull the connector itself.

(3) Be careful not to drop electronic components, such as sensors or relays. If they are dropped on a hard surface, they should be replaced.

(4) When cleaning the engine with steam, protect the electronic components, air filter and emission-related components from water.

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

(6) When measuring the resistance of a wire connector, insert the tester probe carefully to prevent terminals from bending.

4. REMOVAL AND INSTALLATION OF FUEL SYSTEM PARTS

(a) PLACE FOR REMOVING AND INSTALLING OF FUEL SYSTEM PARTS

(1) Work in a location with good air ventilation that does not have welders, grinders, drills, electric motors, stoves, or any other ignition sources.

(2) Never work in a pit or near a pit as vaporized fuel will collect in those places.

(b) REMOVING AND INSTALLING OF FUEL SYSTEM PARTS

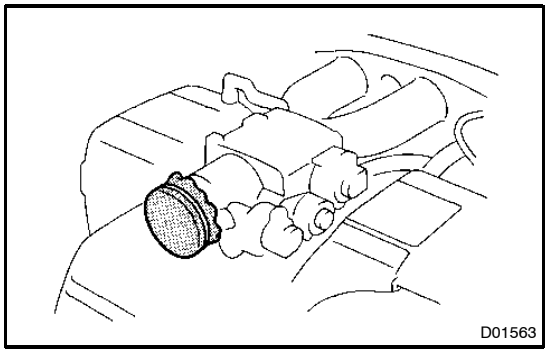
(1) Prepare a fire extinguisher before starting operation.

(2) To prevent static electricity, install a ground wire to the fuel changer, vehicle and fuel tank, and do not spray the surrounding area with water. Be careful when performing work in this area, as the work surface will become slippery. Do not clean up gasoline spills with water, as this may cause the gasoline to spread, and possibly create a fire hazard.

(3) Avoid using electric motors, working lights and other electric equipment that can cause sparks or high temperatures.

(4) Avoid using iron hammers as they may create sparks.

(5) Dispose of fuel-contaminated cloth separately using a fire resistant container.

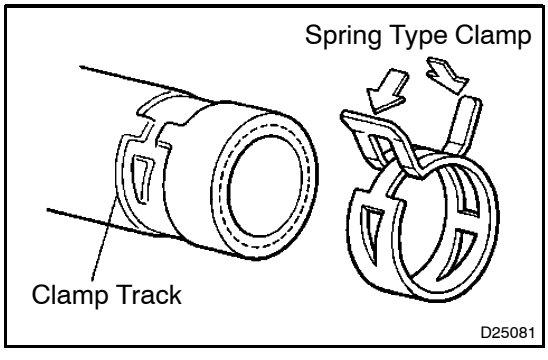


5. REMOVAL AND INSTALLATION OF ENGINE INTAKE PARTS

(a) If any metal particles enter inlet pass, this may damage the engine.

(b) When removing and installing inlet system parts, cover the openings of the removed parts and engine openings. Use gummed tape or other suitable materials.

(c) When installing inlet system parts, check that no metal particles have entered the engine or the installed part.



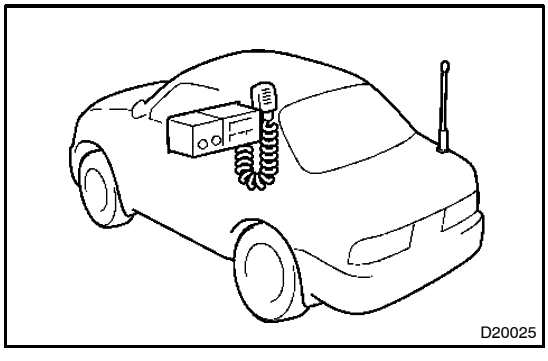
6. HANDLING OF HOSE CLAMPS

(a) Before removing the hose, check the clamp position so that it can be reinstalled in the same position.

(b) Replace any deformed or dented clamps with new ones.

(c) When reusing a hose, attach the clamp on the clamp track portion of the hose.

(d) For a spring type clamp, you may want to spread the tabs slightly after installation by pushing in the direction of the arrow marks as shown in the illustration.



7. FOR VEHICLES EQUIPPED WITH MOBILE COMMUNICATION SYSTEMS

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

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

(c) Keep the antenna and feeder separate from other wirings as much as possible. This will prevent signals from the

communication equipment from affecting vehicle equipment and vice-versa.

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

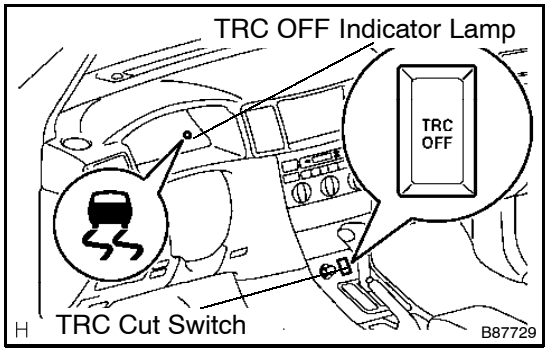
(e) Do not install any high-powered mobile communication system.

8. FOR VEHICLES EQUIPPED WITH TRACTION CONTROL (TRC) SYSTEM

When testing with a 2-wheel drum tester such as a speedometer tester, a combination tester of the speedometer and brake, a chassis dynamometer, or when jacking up the front wheels and driving the wheels, always turn the TRC system OFF via the TRC cut (TRC OFF) switch before testing.

NOTICE:

TRC system OFF condition can be confirmed by the TRC OFF warning indicator in the combination meter.



(a) Confirm that the TRC system is OFF.

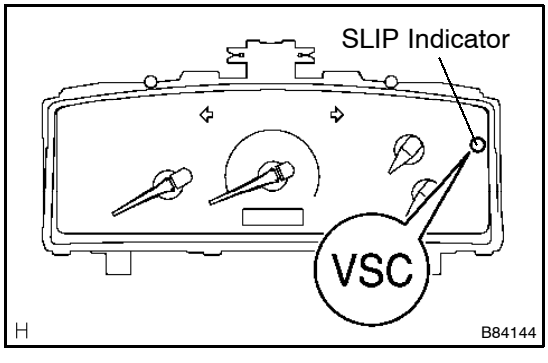
(1) Press the TRC cut (TRC OFF) switch to turn off the TRC system.

(2) Check that the TRC OFF indicator illuminates.

HINT:

The SLIP indicator should always operate right after the engine is restarted.

(3) Begin testing.

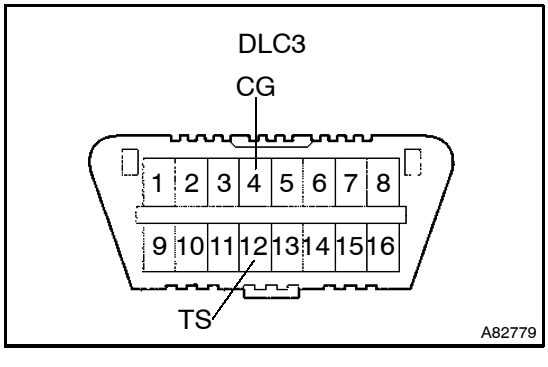


(4) Press the TRC cut (TRC OFF) switch to turn on the TRC system and check that the TRC OFF indicator turns off.

HINT:

The SLIP indicator lamp blinks when the TRC system is operating.

(5) Be sure to follow the instructions for work preparation and final confirmation of proper operation of the VSC system.



9. FOR VEHICLES EQUIPPED WITH VEHICLE STABILITY CONTROL (VSC) SYSTEM

(a) NOTICES WHEN USING DRUM TESTER

(1) Before beginning testing, disable the Vehicle Stability Control (VSC) system. To disable the VSC, turn the ignition switch OFF and connect SST to terminals TS and CG of the DLC3.

SST 09843-18040

NOTICE:

- **Confirm that the VSC warning lamp blinks.**
- **The VSC system will be reset when the engine is restarted.**
- **For safety, secure the vehicle with restraint chains while using a wheel dynamometer.**

(b) NOTICES OF RELATED OPERATIONS TO VSC

(1) Do not carry out unnecessary installation and removal as it might affect the adjustment of the VSC related parts.

(2) Be sure to follow the instructions for work preparation and final confirmation of proper operation of the VSC system.

10. FOR VEHICLES EQUIPPED WITH CATALYTIC CONVERTER

CAUTION:

If a large amount of unburned gasoline or gasoline vapors flow into the converter, it may cause overheating and create a fire hazard. To prevent this, perform the following precautions.

(a) Use only unleaded gasoline.

(b) Avoid prolonged idling.
Avoid idling the engine for more than 20 minutes.

(c) Avoid a spark jump test.

(1) Perform a spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(2) While testing, never race the engine.

(d) Avoid a prolonged engine compression measurement.
Engine compression measurements must be performed as rapidly as possible.

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

010XM-02

VEHICLE LIFT AND SUPPORT LOCATIONS

1. NOTICE ABOUT VEHICLE CONDITION WHEN JACKING UP

(a) The vehicle must be unloaded before jacking up the vehicle. Never jack up/lift up a heavily loaded vehicle.

(b) When removing heavy parts such as the engine and transmission, the center of gravity of the vehicle may shift. To stabilize the vehicle, place a balance weight in a location where it will not roll or shift, or use a mission jack to hold the jacking support.

2. NOTICE FOR USING 4 POST LIFT

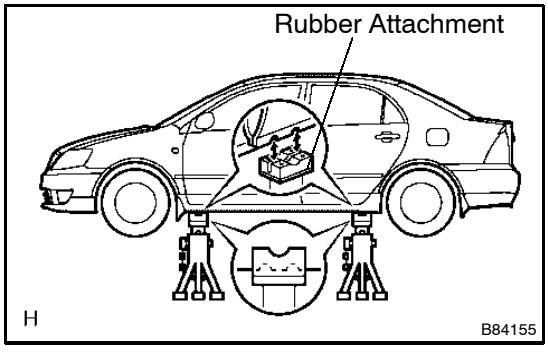
(a) Follow the safety procedures outlined in its instruction manual.

(b) Use precautionary measures to prevent the free beam from damaging tires or wheels.

(c) Use wheel chocks to secure the vehicle.

3. NOTICE FOR USING JACK AND SAFETY STAND

(a) Work on a level surface using wheel chocks at all times.



(b) Use a rigid rack with a rubber attachment, as shown in the illustration.

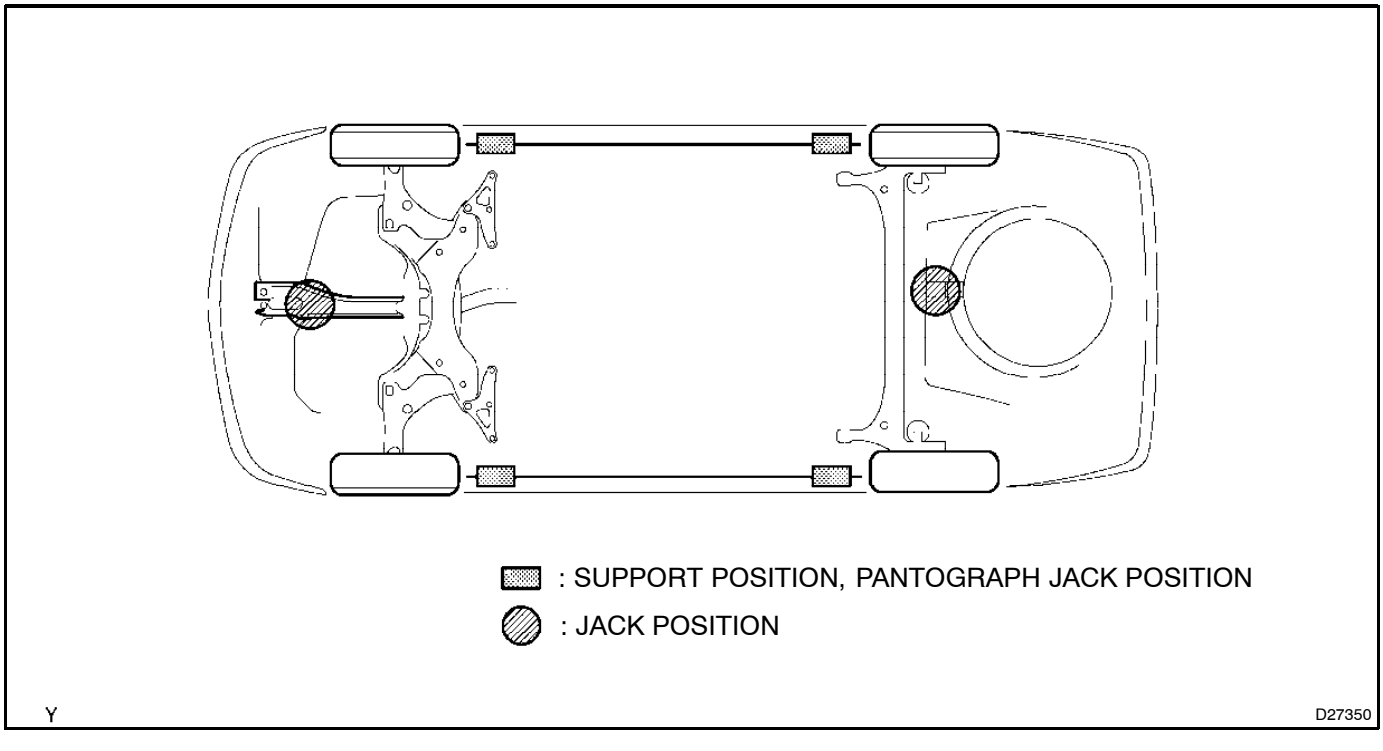
(c) Apply the jack and rigid rack to the specified location on the vehicle.

(d) When jacking up the front wheels, release the parking brake and place wheel chocks only behind the rear wheels. When jacking up the rear wheels, place wheel chocks only in front of the front wheels.

(e) The jack should not be used without the rigid rack.

(f) When jacking up only the front wheels or only the rear wheels, place wheel chocks on both sides of the wheels touching the ground.

(g) When lowering the vehicle with its front wheels jacked up, release the parking brake and place wheel chocks only in front of the rear wheels. When lowering a vehicle with its rear wheels jacked up, place wheel chocks only behind the front wheels.



4. NOTICE FOR USING SWING ARM TYPE LIFT

(a) Follow safety procedures outlined in its instruction manual.

(b) Use a swing arm equipped with a rubber attachment, as shown in the illustration.

(c) When using the lift, make sure that the vehicle is stablized so that it will not tilt while work is being performed. Stabilize the vehicle by adjusting the lift arm's length and vehicle's position.

(d) When using the lift, its center should be as close to the vehicle's center of gravity as possible (length of "L" should be as short as possible).

(e) Set the vehicle on the lift as level as possible. Then match the groove of the cradle to the rigid rack support location.

(f) Be sure to lock the swing arms before lifting and during work (if equipped with arm locks).

(g) Use the lift to lift the vehicle up off the ground. Stand at a safe distance and shake the vehicle to check its stability.

5. NOTICE FOR USING PLATE TYPE LIFT

(a) Follow the safety procedures outlined in its instruction manual.

(b) Use plate lift attachments (rubber lifting blocks) on top of the plate surface.

(c) Refer to the table below to determine how to properly set the vehicle.

Right and left set position	Place the vehicle over the center of the lift.
Front and rear set position	Place the attachments at the ends of the rubber plate surface, under the vehicle lift pad (A and C in the illustration). Raise the plate slightly and reposition the vehicle so the top of the attachment (B in the illustration) is aligned with the front side notch in the vehicle rocker flange.

(d) Use the lift to lift the vehicle up off the ground. Stand at a safe distance and shake the vehicle to check its stability.

Swing Arm Type Lift

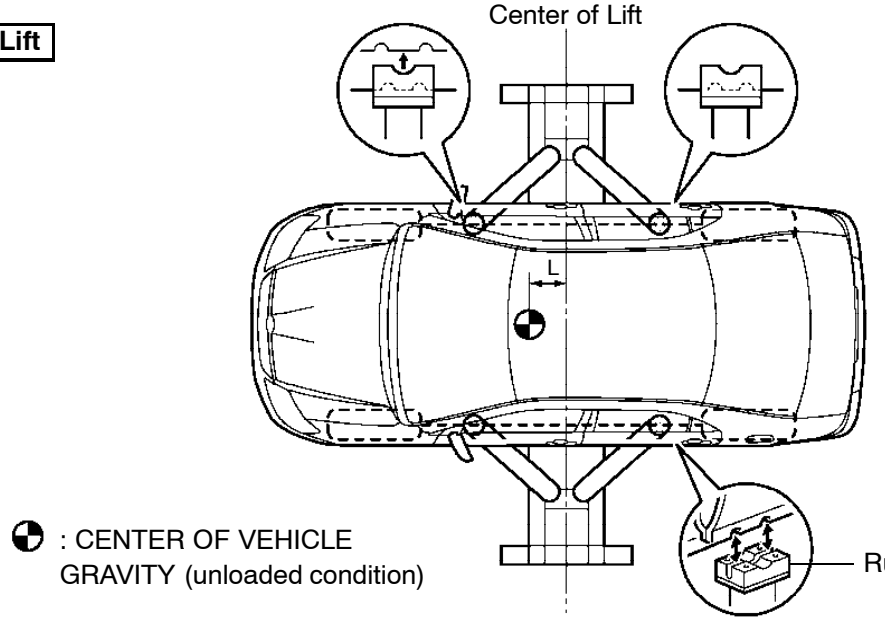
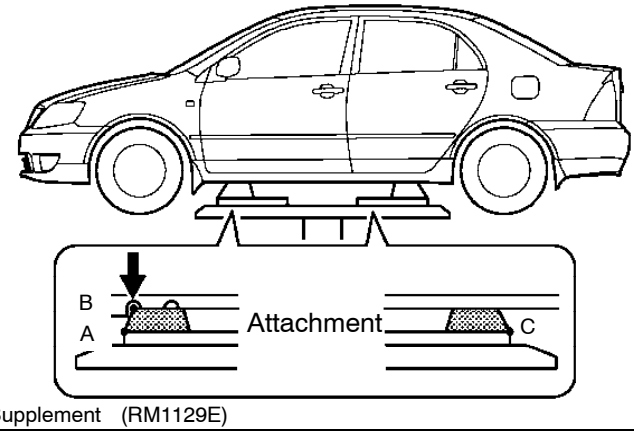
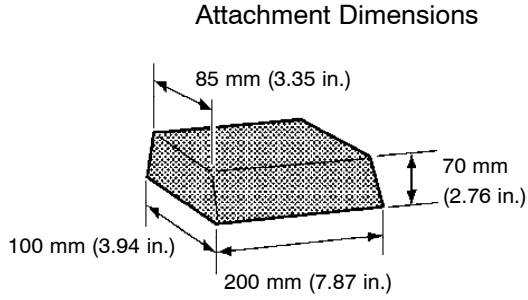


Plate Type Lift





HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

010XN-02

GENERAL INFORMATION

A large number of ECU controlled systems are used in the COROLLA. In general, ECU controlled systems are considered to be very intricate, requiring a high level of technical knowledge to troubleshoot. However, most problem checking procedures only involve inspecting the ECU controlled system's circuits one by one. An adequate understanding of the system and a basic knowledge of electricity is enough to perform effective troubleshooting, accurate diagnoses and necessary repairs. Detailed information and troubleshooting procedures on the main ECU controlled systems in this vehicle are outlined below:

System	See Page
1. ECD System [1ND-TV]	05-1
2. Multi-mode Manual Transmission System	05-172
3. Combination Meter	05-370
4. Engine Immobilizer System	05-378

FOR USING INTELLIGENT TESTER II

- Before using the intelligent tester II, the tester operator's manual should be read thoroughly.
- If the tester cannot communicate with the ECU controlled systems when you have connected the cable of the tester to the DLC3 with the ignition switch and tester turned ON, there is a problem on the vehicle side or tester side.
  (1) If communication is normal when the tester 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 tester is connected to another vehicle, the problem is probably in the tester itself. Perform the Self Test procedures outlined in the tester operator's manual.

010XQ-02

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Perform troubleshooting in accordance with the procedures below. The following is an outline of basic troubleshooting procedures. Details in the "Diagnostics" section show the most effective methods for each circuit. Confirm the troubleshooting procedures for the circuit you are working on before beginning troubleshooting.

1 VEHICLE BROUGHT TO WORKSHOP

NEXT

2 CUSTOMER PROBLEM ANALYSIS

(a) Ask the customer about the conditions and environment when the problem occurred.

NEXT

3 SYMPTOM CONFIRMATION AND DTC (AND FREEZE FRAME DATA) CHECK

(a) Measure the battery positive voltage.
Standard: 11 to 14 V (Engine stopped)

(b) Visually check the wire harness, connectors and fuses for open and short circuits.

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

(d) Confirm the problem symptoms and conditions, and check for DTCs.
Result:

Result	Proceed to
DTC is output	A
DTC is not output	B

B → **Go to step 5**

A

4 DTC CHART

(a) Reconfirm the results obtained in step 3. Then confirm the circuit or part using the DTC chart.

NEXT → **Go to step 6**

5 PROBLEM SYMPTOMS CHART

(a) Reconfirm the results obtained in step 3. Then confirm the circuit or part using the problem symptoms table.

NEXT

6 CIRCUIT INSPECTION OR PARTS INSPECTION

(a) Confirm the malfunctioning circuit or part.

NEXT

7	REPAIR

(a) Repair the malfunctioning circuit or part.

NEXT

8	CONFIRMATION TEST

(a) After completing repairs, confirm that the malfunction no longer exists. If the malfunction does not reoccur, perform a confirmation test under the same conditions and in the same environment as when it occurred the first time.

NEXT

END

CUSTOMER PROBLEM ANALYSIS

HINT:

- In troubleshooting, confirm that the problem symptoms have been accurately identified. Preconceptions should be discarded in order to give an accurate judgement. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.
- As much information as possible should be gathered for reference. Past problems that seem unrelated may also help in some cases. In the "Diagnostics" section, a Customer Problem Analysis Check sheet is provided for each system.
- 5 items are important points in the problem analysis:

Important Points with 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

Example:

CUSTOMER PROBLEM ANALYSIS CHECK

SUPPLEMENTAL RESTRAINT SYSTEM Check Sheet

Inspector's Name

Customer's Name		**VIN**	
		Production Date	/ /
		License Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]

SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE

HINT:

The diagnostic system in the COROLLA has various functions.

- The first function is the Diagnostic Trouble Code (DTC) check. A DTC is a code stored in the ECU memory whenever a malfunction in the signal circuits to the ECU occurs. In a DTC check, a previous malfunction's DTC can be checked by a 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 functions, the problem areas can be narrowed down and troubleshooting is more effective. Diagnostic functions are incorporated in the following systems in the COROLLA:

System	DTC Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
ECD System [IND-IV]	(with Check Mode)		
Multi-mode Manual Transmission System			
Engine Immobilizer System			

- In the DTC check, it is very important to determine whether the problem indicated by the DTC is: 1) still occurring, or 2) occurred in the past but has since returned to normal. In addition, the DTC should be compared to the problem symptom to see if they are related. For this reason, DTCs should be checked before and after confirmation of symptoms (i.e., whether or not problem symptoms exist) to determine current system conditions, as shown in the flowchart below.

  Never skip the DTC check. Failing to check DTCs may, depending on the case, result in unnecessary troubleshooting for systems operating normally or lead to repairs not pertinent to the problem. Follow the procedures listed in the flowchart in the correct order.
- A flowchart showing how to proceed with troubleshooting using the DTC check is shown below. Directions from the flowchart will indicate how to proceed either to DTC troubleshooting or to the troubleshooting of each problem symptom.

1	**DTC CHECK**

NEXT

2	**MAKE A NOTE OF DTCS DISPLAYED AND THEN CLEAR MEMORY**

NEXT

3	**SYMPTOM CONFIRMATION**

Result:

Result	Proceed to
Symptoms exist	A
No symptoms exist	B

A → **Go to step 5**

B

4	**SIMULATION TEST USING SYMPTOM SIMULATION METHODS**

NEXT

5	DTC CHECK

Result:

Result	Proceed to
DTC is output	A
DTC is not output	B

A → TROUBLESHOOTING OF PROBLEM INDICATED BY DTC

B

6	SYMPTOM CONFIRMATION

Result:

Result	Proceed to
Symptoms exist	A
No symptoms exist	B

If a DTC was displayed in the initial DTC check, the problem may have occurred in a wire harness or connector in that circuit in the past. Check the wire harness and connectors (see page 01-32).

B → SYSTEM NORMAL

A

TROUBLESHOOTING OF EACH PROBLEM SYMPTOM

The problem is still occurring in a place other than the diagnostic circuit (the DTC displayed first is either for a past problem or a secondary problem).

SYMPTOM SIMULATION

HINT:

The most difficult case in troubleshooting is when no problem symptoms occur. In such cases, a thorough problem analysis must be carried out. A simulation of the same or similar conditions and environment in which the problem occurred in the customer's vehicle should be carried out. No matter how much skill or experience a technician has, troubleshooting without confirming the problem symptoms will lead to important repairs being overlooked and mistakes or delays.

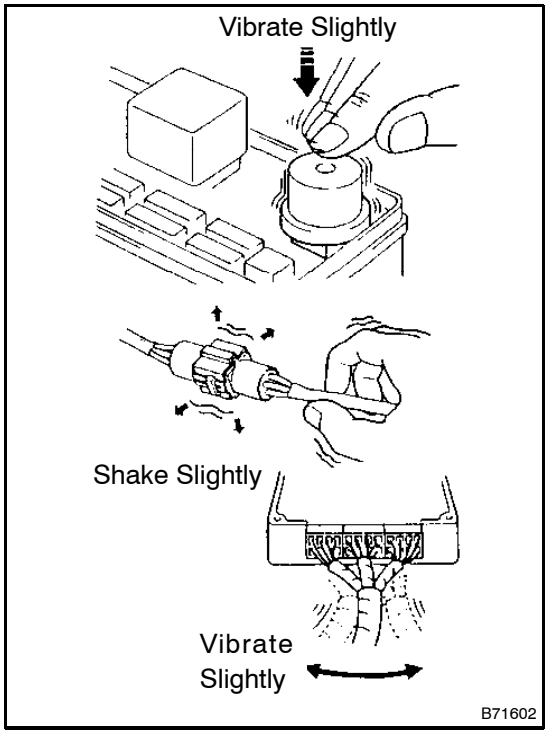
For example:

With a problem that only occurs when the engine is cold or occurs as a result of vibration caused by the road during driving, the problem can never be determined if the symptoms are being checked on a stationary vehicle or a vehicle with a warmed-up engine.

Vibration, heat or water penetration (moisture) is difficult to reproduce. The symptom simulation tests below are effective substitutes for the conditions and can be applied on a stationary vehicle.

Important points in the symptom simulation test:

In the symptom simulation test, the problem symptoms as well as the problem area or parts must be confirmed. First, narrow down the possible problem circuits according to the symptoms. Then, connect the tester and carry out the symptom simulation test, judging whether the circuit being tested is defective or normal. Also, confirm the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes.



1. VIBRATION METHOD: When vibration seems to be the major cause.

(a) PART AND SENSOR

(1) Apply slight vibration with a finger to the part of the sensor considered to be the cause of the problem and check whether or not the malfunction occurs.

HINT:

Applying strong vibration to relays may open relays.

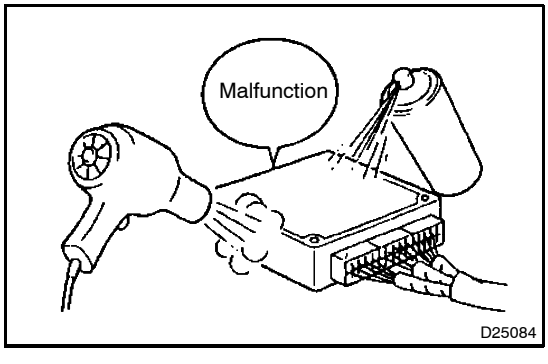
(b) CONNECTORS

(1) Slightly shake the connector vertically and horizontally.

(c) WIRE HARNESS

(1) Slightly shake the wire harness vertically and horizontally.

The connector joint and fulcrum of the vibration are the major areas that should be checked thoroughly.

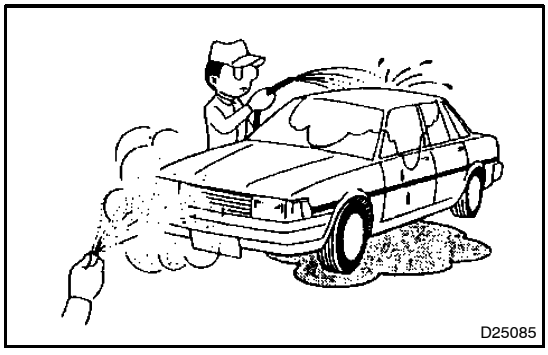


2. HEAT METHOD: If the problem seems to occur when the area in question is heated.

(a) Heat the component that is the possible cause of the malfunction with a hair dryer or similar device. Check if the malfunction occurs.

NOTICE:

- **Do not heat to more than 60°C (140°F). Exceeding this temperature may damage components.**
- **Do not apply heat directly to the parts in the ECU.**



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

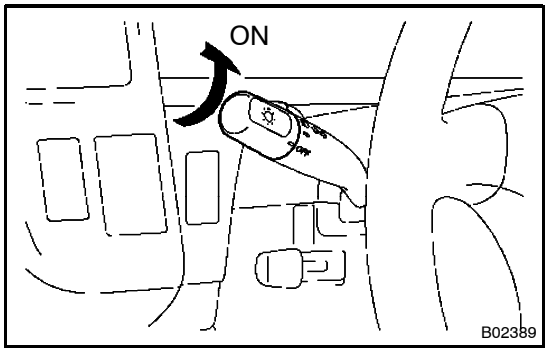
(a) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE:

- **Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by applying water spray onto the front of the radiator.**
- **Never apply water directly onto the electronic components.**

HINT:

If the vehicle has or had a water leakage problem, the leakage may have damaged the ECU or connections. Look for evidence of corrosion or short circuits. Proceed with caution during water tests.



4. HIGH ELECTRICAL LOAD METHOD: When a malfunction seems to occur when electrical load is excessive.

(a) Turn on the heater blower, headlamps, rear window defogger and all other electrical loads. Check if the malfunction reoccurs.

DIAGNOSTIC TROUBLE CODE CHART

Use Diagnostic Trouble Codes (DTCs) (from the DTC checks) in the table below to determine the trouble area and proper inspection procedure. The Supplemental Restraint System (SRS) DTC chart is shown below as an example.

- DTC No.
  Indicates the DTC.
- Page or Instructions
  Indicates the page where you can find either the inspection procedures for each circuit, or the instructions for checking and repairs.

- Trouble Area
  Indicates the suspected problem areas.

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

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit for that code listed in the table below. Proceed to the page given for that circuit.

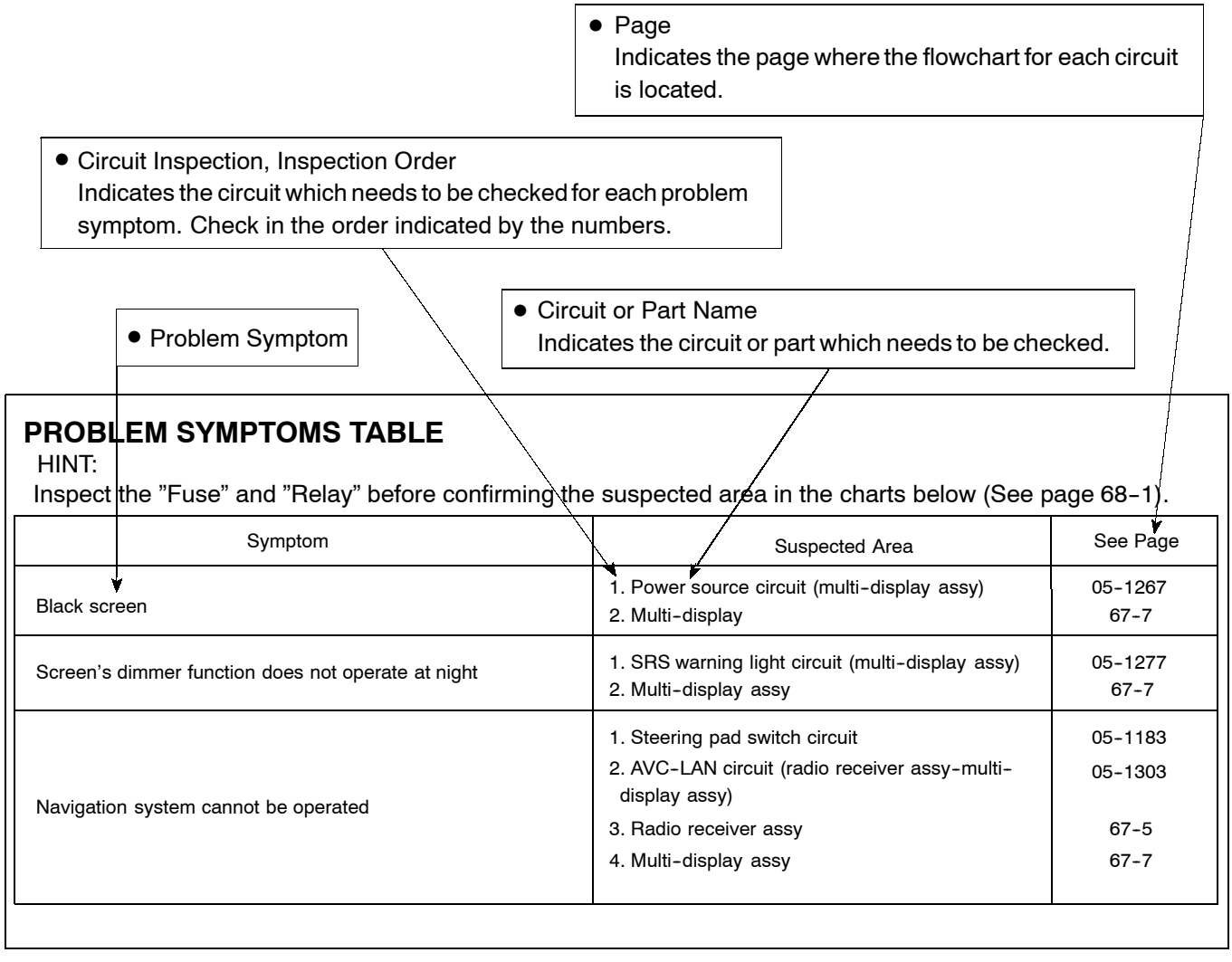
DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Lamp
B0100/13 (05-119)	Short in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0101/14 (05-124)	Open in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0102/11 (05-128)	Short in D squib circuit (to ground)	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0103/12 (05-132)	Short in D squib circuit (to B+)	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0105/53 (05-136)	Short in P squib circuit	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	ON
B0106/54	Open in P squib circuit	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	
	b circuit (to Ground)	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	

PROBLEM SYMPTOMS TABLE

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

HINT:

In some cases, the problem is not detected by the diagnostic system even though a problem symptom is present. It is possible that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a completely different system.



PROBLEM SYMPTOMS TABLE

HINT:

Inspect the "Fuse" and "Relay" before confirming the suspected area in the charts below (See page 68-1).

Symptom	Suspected Area	See Page
Black screen	1. Power source circuit (multi-display assy) 2. Multi-display	05-1267 67-7
Screen's dimmer function does not operate at night	1. SRS warning light circuit (multi-display assy) 2. Multi-display assy	05-1277 67-7
Navigation system cannot be operated	1. Steering pad switch circuit 2. AVC-LAN circuit (radio receiver assy-multi-display assy) 3. Radio receiver assy 4. Multi-display assy	05-1183 05-1303 67-5 67-7

CIRCUIT INSPECTION

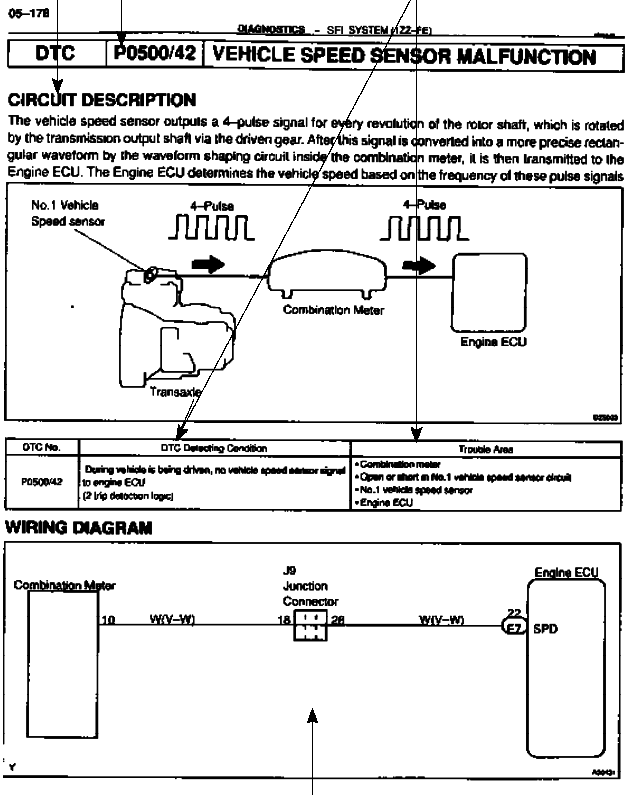
How to read and use each page is shown below.

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

● DTC No. and Detection Item

● Indicates DTCs, DTC settings and suspected problem.

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


05-178

DIAGNOSTICS - SFI SYSTEM (1ZZ-FE)

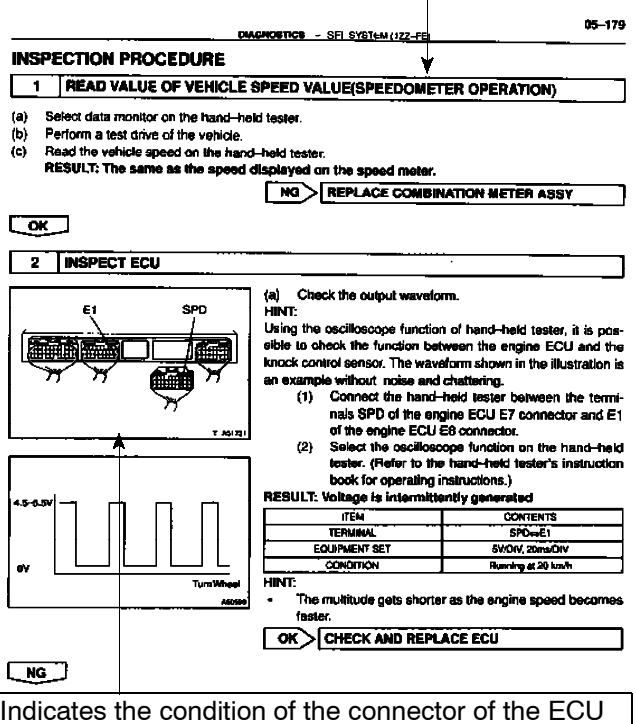
DTC P0500/42 VEHICLE SPEED SENSOR MALFUNCTION

CIRCUIT DESCRIPTION

The vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the Engine ECU. The Engine ECU determines the vehicle speed based on the frequency of these pulse signals

DTC No.	DTC Detecting Condition	Trouble Area
P0500/42	During vehicle is being driven, no vehicle speed sensor signal to engine ECU (2 trip detection logic)	• Combination meter • Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Engine ECU

WIRING DIAGRAM


DIAGNOSTICS - SFI SYSTEM (1ZZ-FE) 05-179

INSPECTION PROCEDURE

1 READ VALUE OF VEHICLE SPEED VALUE(SPEEDOMETER OPERATION)

(a) Select data monitor on the hand-held tester.
(b) Perform a test drive of the vehicle.
(c) Read the vehicle speed on the hand-held tester.
RESULT: The same as the speed displayed on the speed meter.

NG → **REPLACE COMBINATION METER ASSY**

OK

2 INSPECT ECU

(a) Check the output waveform.
HINT:
Using the oscilloscope function of hand-held tester, it is possible to check the function between the engine ECU and the knock control sensor. The waveform shown in the illustration is an example without noise and chattering.
(1) Connect the hand-held tester between the terminals SPD of the engine ECU E7 connector and E1 of the engine ECU E8 connector.
(2) Select the oscilloscope function on the hand-held tester. (Refer to the hand-held tester's instruction book for operating instructions.)
RESULT: Voltage is intermittently generated

ITEM	CONTENTS
TERMINAL	SPD↔E1
EQUIPMENT SET	5V/DIV, 20ms/DIV
CONDITION	Running at 20 km/h

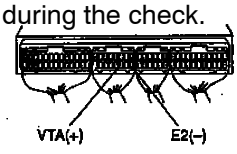
HINT:
- The multitude gets shorter as the engine speed becomes faster.

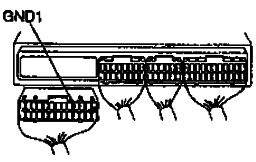
OK → **CHECK AND REPLACE ECU**

NG

● 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.

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





Connector being checked is connected.

Connections of tester are indicated by (+) or (-) after terminal name.

Connector being checked is disconnected.

For inspection of connector with body ground, there is nothing about the body ground written down.

D25842

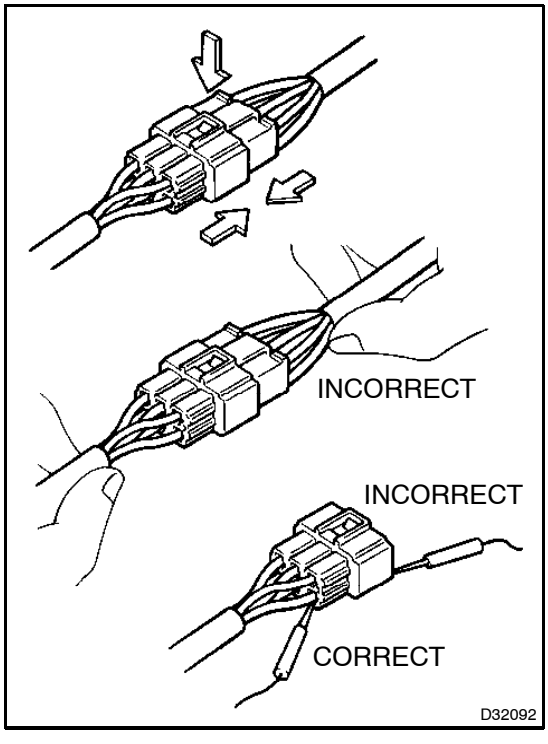
010XP-02

ELECTRONIC CIRCUIT INSPECTION PROCEDURE

1. BASIC INSPECTION

(a) WHEN MEASURING RESISTANCE OF ELECTRONIC PARTS

(1) Unless stated, all resistance measurements should be made at an ambient temperature of 20°C (68°F). Resistance measurements may be outside the specifications if measured at high temperatures, i.e. immediately after the vehicle has been running. Measurements should be made after the engine has cooled down.



(b) HANDLING CONNECTORS

(1) When disconnecting a connector, first squeeze the mating halves tightly together to release the lock, and then press the lock claw and separate the connector.

(2) When disconnecting a connector, do not pull on the harnesses. Grasp the connector directly and separate it.

(3) Before connecting a connector, check that there are no deformed, damaged, loose or missing terminals.

(4) When connecting a connector, press firmly until you hear the lock close with a "click" sound.

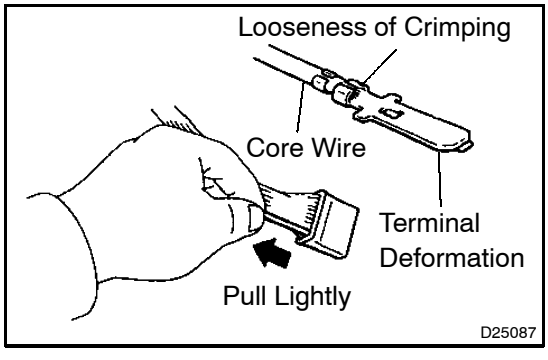
(5) If checking a connector with a TOYOTA electrical tester, check the connector from the backside (harness side) using a mini test lead.

NOTICE:

- **As a waterproof connector cannot be checked from the backside, check by connecting a sub-harness.**
- **Do not damage the terminals by moving the inserted tester needle.**

(c) CHECKING CONNECTORS

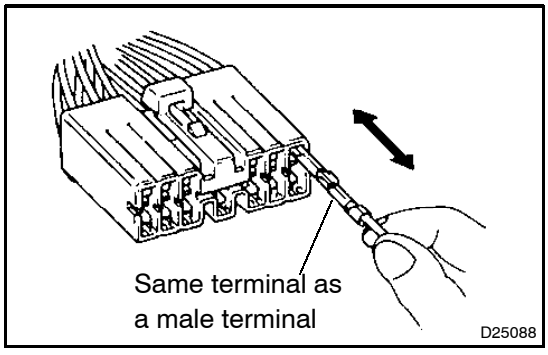
(1) Checking when a connector is connected:
Squeeze the connector together to confirm that it is fully connected and locked.



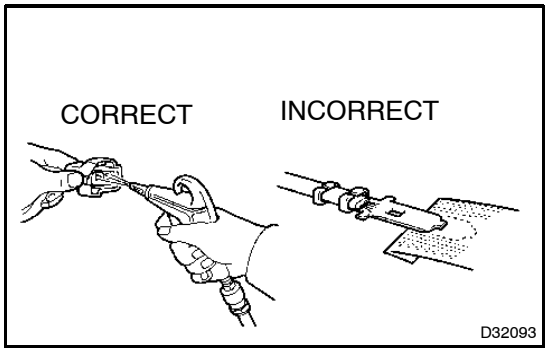
(2) Checking when a connector is disconnected:
Check by pulling the wire harness lightly from the backside of the connector. Look for unlatched terminals, missing terminals, loose crimps or broken conductor wires.
Check visually for corrosion, metallic or foreign objects and water; and bent, rusted, overheated, contaminated, and deformed terminals.

NOTICE:

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



(3) Checking the contact pressure of the terminal:
Prepare a spare male terminal. Insert it into a female terminal, and check for ample tension when inserting and after full engagement.

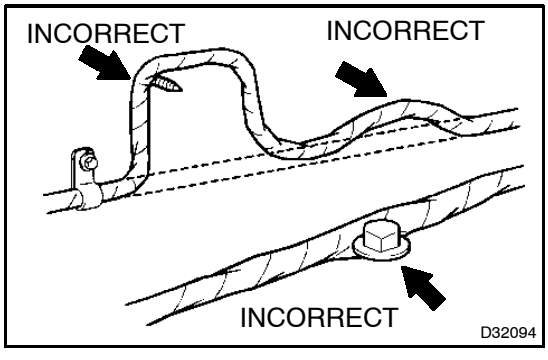


(d) REPAIR METHOD OF CONNECTOR TERMINAL

(1) If there is any dirt on the terminal, clean the contact point using an air gun or cloth. Never rub the contact point using sandpaper as the plating may come off.

(2) If there is abnormal contact pressure, replace the female terminal. If the male terminal is gold-plated (gold color), use a gold-plated female terminal; if it is silver-plated (silver color), use a silver-plated female terminal.

(3) Damaged, deformed, or corroded terminals should be replaced. If the terminal will not lock into the housing, the housing may have to be replaced.



(e) HANDLING OF WIRE HARNESS

(1) If removing a wire harness, check the wiring and clamping before proceeding so that it can be restored in the same way.

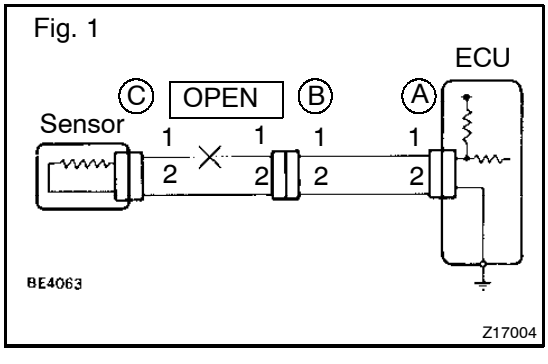
(2) Never twist, pull or slacken the wire harness more than necessary.

(3) The wire harness should never come into contact with a high temperature part, or rotating, moving, vibrating or sharp-edged parts. Avoid contact with panel edges, screw tips and other sharp items.

(4) When installing parts, never pinch the wire harness.

(5) Never cut or break the cover of the wire harness. If it is cut or broken, replace it or securely repair it with vinyl tape.

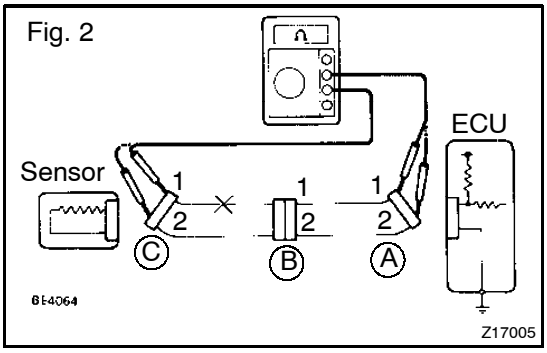
Fig. 1



2. CHECK OPEN CIRCUIT

(a) For an open circuit in the wire harness in Fig. 1, perform a resistance check (step b) or a voltage check (step c).

Fig. 2



(b) Check the resistance.

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

Standard (Fig. 2):

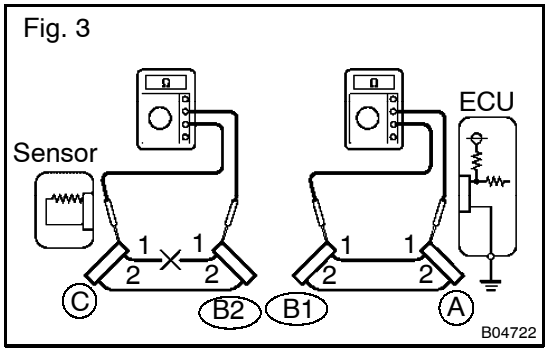
Tester Connection	Specified Condition
Connector A terminal 1 - Connector C terminal 1	10 kΩ or higher
Connector A terminal 2 - Connector C terminal 2	Below 1 Ω

HINT:

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

If your results match the examples above, an open circuit exists between terminal 1 of connector A and terminal 1 of connector C.

Fig. 3



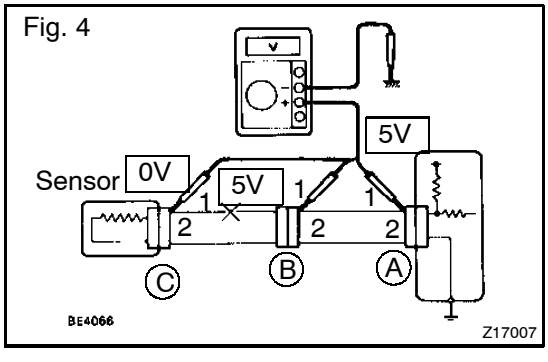
(2) Disconnect connector B and measure the resistance between the connectors.

Standard (Fig. 3):

Tester Connection	Specified Condition
Connector A terminal 1 - Connector B1 terminal 1	Below 1 Ω
Connector B2 terminal 1 - Connector C terminal 1	10 kΩ or higher

If your results match the examples above, an open circuit exists between terminal 1 of connector B2 and terminal 1 of connector C.

Fig. 4



(c) Check the voltage.

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

Fig. 4:

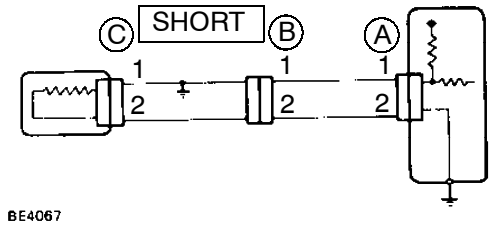
With each connector still connected, measure the voltage between the body ground and these terminals (in this order): 1) terminal 1 of connector A, 2) terminal 1 of connector B, and 3) terminal 1 of connector C.

Example results:

Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	5 V
Connector B terminal 1 - Body ground	5 V
Connector C terminal 1 - Body ground	0 V

If your results match the examples above, an open circuit exists in the wire harness between terminal 1 of connector B and terminal 1 of connector C.

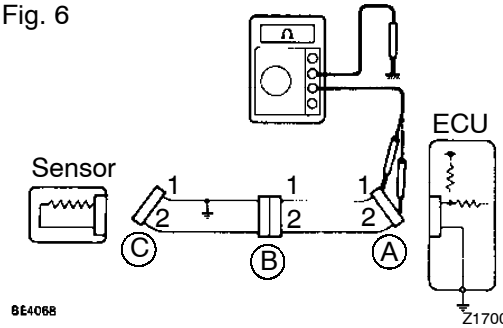
Fig. 5



3. CHECK SHORT CIRCUIT

(a) If the wire harness is ground shorted (Fig. 5), locate the section by conducting a resistance check with the body ground (below).

Fig. 6



(b) Check the resistance with the body ground.

(1) Disconnect connectors A and C, and measure the resistance.

Standard (Fig. 6):

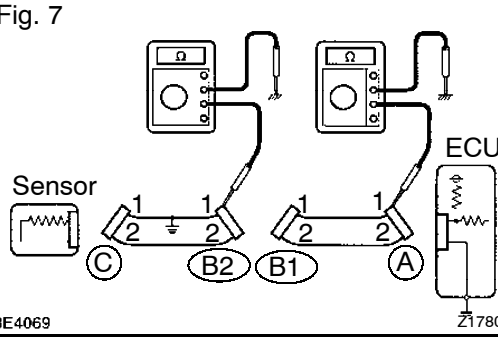
Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	Below 1 Ω
Connector A terminal 2 - Body ground	10 kΩ or higher

HINT:

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

If your results match the examples above, a short circuit exists between terminal 1 of connector A and terminal 1 of connector C.

Fig. 7



(2) Disconnect connector B and measure the resistance.

Standard (Fig. 7):

Tester Connection	Specified Condition
Connector A terminal 1 - Body ground	10 kΩ or higher
Connector B2 terminal 1 - Body ground	Below 1 Ω

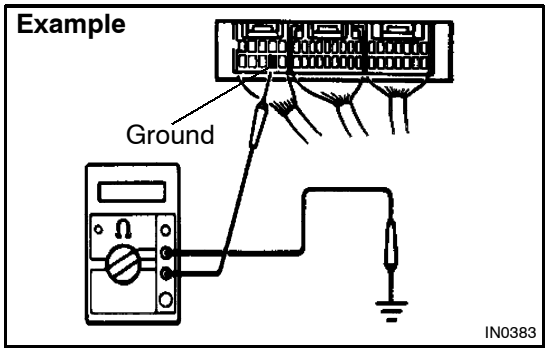
If your results match the examples above, a short circuit exists between terminal 1 of connector B2 and terminal 1 of connector C.

4. CHECK AND REPLACE ECU

NOTICE:

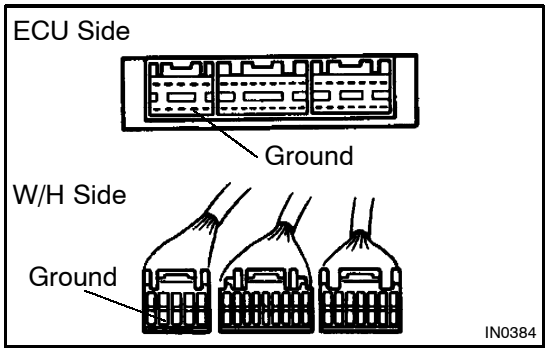
- **The connector should not be disconnected from the ECU. Perform the inspection from the backside of the connector on the wire harness side.**
- **When no measuring condition is specified, perform the inspection with the engine stopped and the ignition switch ON.**
- **Check that the connectors are fully seated. Check for loose, corroded or broken wires.**

(a) First, check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty. Replace the ECU with a functioning one and check if the symptoms occur. If the trouble symptoms stop, replace the ECU.



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

Standard: Below 1 Ω



(2) Disconnect the ECU connector. Check the ground terminals (on the ECU side and wire harness side) for evidence of bending, corrosion or foreign material. Lastly, check the contact pressure of the female terminals.

TERMS

ABBREVIATIONS USED IN MANUAL

010XQ-02

Abbreviations	Meaning
ABS	Anti-Lock Brake System
A/C	Air Conditioner
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACM	Active Control Engine Mount
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
ASSY	Assembly
A/T, ATM	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
B+	Battery Voltage
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
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CCV	Canister Closed Valve
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
CKD	Complete Knock Down
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

Abbreviations	Meaning
DC	Direct Current
DEF	Defogger
DFL	Deflector
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLC	Data Link Connector
DLI	Distributorless Ignition
DOHC	Double Overhead Camshaft
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
DTC	Diagnostic Trouble Code
DVD	Digital Versatible Disc
EBD	Electric Brake Force Distribution
EC	Electrochoromic
ECAM	Engine Control And Measurement System
ECD	Electronically Controlled Diesel
ECDY	Eddy Current Dynamometer
ECT	Electronic Controlled Automatic Transmission
ECU	Electronic Control Unit
ED	Electro-Deposited Coating
EDU	Electronic Driving Unit
EDIC	Electric Diesel Injection Control
EFI	Electronic Fuel Injection
E/G	Engine
EGR	Exhaust Gas Recirculation
EGR-VM	EGR-Vacuum Modulator
ELR	Emergency Locking Retractor
EMPS	Electric Motor Power Steering
ENG	Engine
ESA	Electronic Spark Advance
ETCS-i	Electronic Throttle Control System-intelligent
EVAP	Evaporative Emission Control
EVP	Evaporator
E-VRV	Electric Vacuum Regulating Valve
EX	Exhaust
FE	Fuel Economy
FF	Front-Engine Front-Wheel-Drive
F/G	Fuel Gauge
FIPG	Formed In Place Gasket
FL	Fusible Link
F/P	Fuel Pump
FPU	Fuel Pressure Up
FR	Front
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GND	Ground
GPS	Global Positioning System

Abbreviations	Meaning
HAC	High Altitude Compensator
H/B	Hatchback
H-FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Headlamp)
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
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
ISC	Idle Speed Control
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
MAP	Manifold Absolute Pressure
MAX.	Maximum
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MG1	Motor Generator No. 1
MG2	Motor Generator No. 2
MP	Multipurpose
MPI	Multipoint Electronic Injection
MPX	Multiplex Communication System
M/T, MTM	Manual Transmission (Transaxle)
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
NO.	Number

Abbreviations	Meaning
O2S	Oxygen Sensor
O/D	Overdrive
OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
ORVR	On-board Refilling Vapor Recovery
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
P/W	Power Window
R & P	Rack And Pinion
RAM	Random Access Memory
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
RRS	Rigid Front 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

Abbreviations	Meaning
TEMS	TOYOTA Electronic Modulated Suspension
TFT	TOYOTA Free-Tronic
TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMIN	PT. TOYOTA Motor Manufacturing Indonesia
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
TMT	TOYOTA Motor Thailand Co. Ltd.
TRC	Traction Control System
TURBO	Turbocharge
TWC	Three-Way Catalyst
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIM	Vehicle Interface Module
VIN	Vehicle Identification Number
VPS	Variable Power Steering
VSC	Vehicle Skid Control
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
VVT-i	Variable Valve Timing-intelligent
W/	With
WGN	Wagon
W/H	Wire Harness
W/O	Without
1ST	First
2ND	Second
2WD	Two Wheel Drive Vehicle (4 x 2)
3RD	Third
4TH	Fourth
4WD	Four Wheel Drive Vehicle (4 x 4)
4WS	Four Wheel Steering System
5TH	Fifth

010XR-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	Direct Injection (DI/INJ)
DI	Distributor Ignition	-
DLC3	Data Link Connector 3	OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Trouble Code
DTM	Diagnostic Test Mode	-
ECL	Engine Coolant 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	Distributorless Ignition (DLI)
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 Airflow	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
OL	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 Airflow	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	-

PREPARATION

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM939E
COROLLA Repair Manual Supplement	RM1028E
COROLLA Repair Manual Supplement	RM1106E

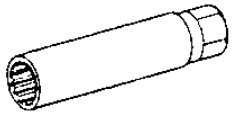
NOTE: The above pages contain only the points which differ from the above listed manuals.

ENGINE CONTROL SYSTEM

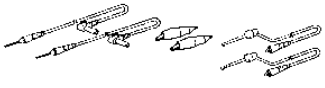
0249N-01

PREPARATION

SST

	09817-33190	Sensor Socket Wrench	ENGINE COOLANT TEMPERATURE SENSOR(1ND-TV)

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	ECD SYSTEM(1ND-TV)
	(09083-00150)	Test Lead Set	ECD SYSTEM(1ND-TV)

Equipment

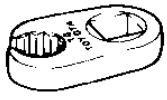
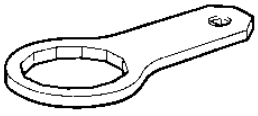
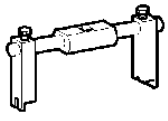
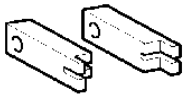
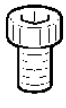
Ohmmeter	
Service wire	
Torque wrench	
Voltmeter	

FUEL

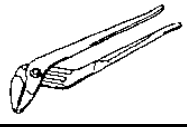
PREPARATION

0249W-01

SST

	09023-38401	Union Nut Wrench 14mm	INJECTOR ASSY(1ND-TV) INJECTION OR SUPPLY PUMP ASSY(1ND-TV) COMMON RAIL ASSY(1ND-TV)
	09228-64030	Fuel Filter Wrench	FUEL FILTER ASSY(1ND-TV)
	09808-14020	Fuel Pump Retainer Tool	FUEL TANK ASSY(1ND-TV(HATCH BACK))
	(09808-01410)	Holder	FUEL TANK ASSY(1ND-TV(HATCH BACK))
	(09808-01420)	Claw	FUEL TANK ASSY(1ND-TV(HATCH BACK))
	(09808-01430)	Bolt	FUEL TANK ASSY(1ND-TV(HATCH BACK))

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	FUEL SYSTEM(1ND-TV)
	09130-00150	Water Pump Pliers	FUEL FILTER ASSY(1ND-TV)

Equipment

Ohmmeter	
Radiator cap tester	
Torque wrench	

EMISSION CONTROL

PREPARATION

024A4-01

Equipment

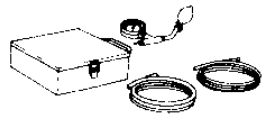
Intelligent tester II	
Ohmmeter	
Service wire harness	
Torque wrench	
Radiator cap testor	

INTAKE

PREPARATION

0249M-01

SST

	09992-00242	Turbocharger Pressure Gauge	TURBOCHARGER SYSTEM (1ND-TV)

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	TURBOCHARGER SYSTEM (1ND-TV)
	(09083-00140)	Base Lead	TURBOCHARGER SYSTEM (1ND-TV)

Equipment

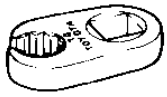
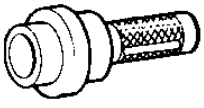
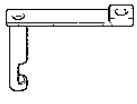
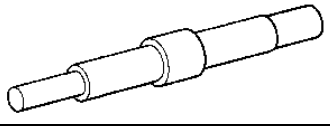
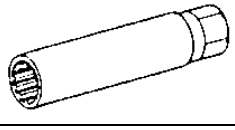
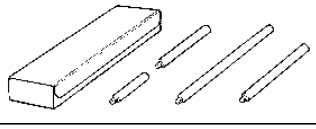
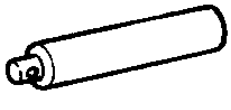
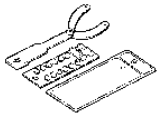
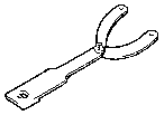
Plastic-faced hammer	
Service wire	
Torque wrench	
Vacuum pump	
Vernier calipers	
Voltmeter	
Wooden block	

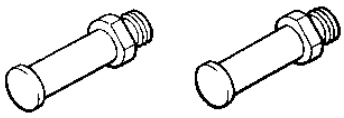
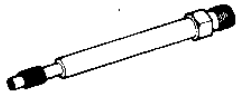
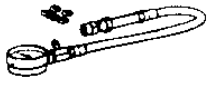
ENGINE MECHANICAL

PREPARATION

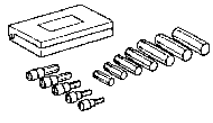
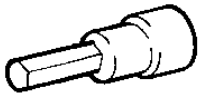
0249Y-01

SST

	09023-38401	Union Nut Wrench 14mm	CAMSHAFT(1ND-TV) CYLINDER HEAD GASKET(1ND-TV) PARTIAL ENGINE ASSY(1ND-TV)
	09223-15030	Oil Seal & Bearing Replacer	ENGINE REAR OIL SEAL(1ND-TV)
	09223-22010	Crankshaft Front Oil Seal Replacer	CHAIN SUB-ASSY(1ND-TV) OIL PUMP SEAL(1ND-TV) CYLINDER HEAD GASKET(1ND-TV)
	09248-56010	Lock Nut Wrench	CAMSHAFT(1ND-TV) VALVE CLEARANCE(1ND-TV)
	09301-00220	Clutch Guide Tool	ENGINE REAR OIL SEAL(1ND-TV) PARTIAL ENGINE ASSY(1ND-TV)
	09817-33190	Sensor Socket Wrench	PARTIAL ENGINE ASSY(1ND-TV)
	09843-18040	Diagnosis Check Wire No. 2	ENGINE(1ND-TV)
	09950-70010	Handle Set	ENGINE REAR OIL SEAL(1ND-TV)
	(09951-07100)	Handle 100	ENGINE REAR OIL SEAL(1ND-TV)
	09960-10010	Variable Pin Wrench Set	CHAIN SUB-ASSY(1ND-TV) OIL PUMP SEAL(1ND-TV) ENGINE REAR OIL SEAL(1ND-TV) CYLINDER HEAD GASKET(1ND-TV) PARTIAL ENGINE ASSY(1ND-TV)
	(09962-01000)	Variable Pin Wrench Arm Assy	CHAIN SUB-ASSY(1ND-TV) OIL PUMP SEAL(1ND-TV) ENGINE REAR OIL SEAL(1ND-TV) CYLINDER HEAD GASKET(1ND-TV) PARTIAL ENGINE ASSY(1ND-TV)
	(09963-00700)	Pin 7	CHAIN SUB-ASSY(1ND-TV) CYLINDER HEAD GASKET(1ND-TV)

	(09963-01000)	Pin 10	CHAIN SUB-ASSY(1ND-TV) OIL PUMP SEAL(1ND-TV) ENGINE REAR OIL SEAL(1ND-TV) CYLINDER HEAD GASKET(1ND-TV) PARTIAL ENGINE ASSY(1ND-TV)
	09992-00025	Cylinder Compression Check Gauge Set	ENGINE(1ND-TV)
	(09992-00121)	No. 4 Attachment	ENGINE(1ND-TV)
	(09992-00211)	Gauge Assy	ENGINE(1ND-TV)

Recommended Tools

	09040-00011	Hexagon Wrench Set	CAMSHAFT(1ND-TV)
	(09043-20080)	Socket Hexagon Wrench 8	CAMSHAFT(1ND-TV)
	09090-04020	Engine Sling Device	PARTIAL ENGINE ASSY(1ND-TV)

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	CHAIN SUB-ASSY(1ND-TV) CAMSHAFT(1ND-TV) VALVE CLEARANCE(1ND-TV) CYLINDER HEAD GASKET(1ND-TV)
	08826-00100	"Seal Packing 1282B" THREE BOND 1282B or equivalent (FIPG)	CHAIN SUB-ASSY(1ND-TV) CYLINDER HEAD GASKET(1ND-TV)
	08833-00070	"Adhesive 1324" THREE BOND 1324 or equivalent	CAMSHAFT(1ND-TV) ENGINE REAR OIL SEAL(1ND-TV)

Equipment

Belt tension gauge	
Dial indicator	
Feeler gauge	
Precision straight edge	
Radiator cap tester	
Tachometer	
Torque wrench	
Vernier calipers	

Dial indicator with magnetic base	
Tire pressure gauge	
Alignment tester	
Toe-in gauge	
Sandpaper (#400)	
Chain block	
Angle gauge	

EXHAUST

PREPARATION

0249I-01

Equipment

Plastic-faced hammer	
Torque wrench	
Vernier calipers	
Wooden block	

COOLING

PREPARATION

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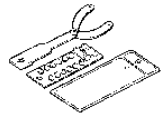
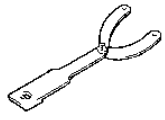
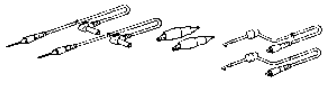
	09960-10010	Variable Pin Wrench Set	WATER PUMP ASSY(1ND-TV)
	(09962-01000)	Variable Pin Wrench Arm Assy	WATER PUMP ASSY(1ND-TV)
	(09963-00700)	Pin 7	WATER PUMP ASSY(1ND-TV)

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	COOLING FAN SYSTEM(1ND-TV)
	(09083-00150)	Test Lead Set	COOLING FAN SYSTEM(1ND-TV)

Equipment

Belt tension gauge	
Ohmmeter	
Radiator cap tester	
Torque wrench	
Vernier calipers	

Coolant

Item		Capacity	Classification
Engine coolant	w/ heater	5.5 liters (5.8 US qts, 4.8 Imp. qts)	"TOYOTA SUPER LONG LIFE Antifreeze Coolant" or equivalent
	w/o heater	5.3 liters (5.6 US qts, 4.7 Imp. qts)	

LUBRICATION

PREPARATION

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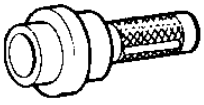
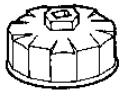
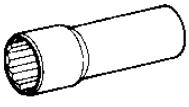
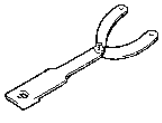
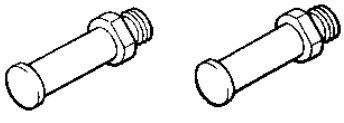
	09223-22010	Crankshaft Front Oil Seal Replacer	OIL PUMP ASSY(1ND-TV)
	09228-07501	Oil Filter Wrench	OIL FILTER SUB-ASSY(1ND-TV) OIL COOLER ASSY(1ND-TV)
	09229-55010	Oil Cooler Relief Valve Wrench	OIL COOLER ASSY(1ND-TV)
	09960-10010	Variable Pin Wrench Set	OIL PUMP ASSY(1ND-TV)
	(09962-01000)	Variable Pin Wrench Arm Assy	OIL PUMP ASSY(1ND-TV)
	(09963-00700)	Pin 7	OIL PUMP ASSY(1ND-TV)
	(09963-01000)	Pin 10	OIL PUMP ASSY(1ND-TV)

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	OIL PUMP ASSY(1ND-TV)
	08826-00100	"Seal Packing 1282B" THREE BOND 1282B or equivalent (FIPG)	OIL PUMP ASSY(1ND-TV)

Equipment

Belt tension gauge	
Radiator cap tester	
Torque wrench	

Lubricant

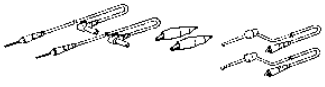
Item	Capacity	Classification
Oil grade	-	Use ACEA B1, API grade CF-4, CF or G-DLD-1.(You may also use API CE or CD.)
Drain and refill w/ oil filter change w/o oil filter change	4.3 liters (4.5 US qts, 3.8 Imp. qts) 3.8 liters (4.0 US qts, 3.3 Imp. qts)	-
Dry fill	4.8 liters (5.1 US qts, 4.2 Imp. qts)	-

STARTING & CHARGING

0249L-01

PREPARATION

Recommended Tools

	09082-00040	TOYOTA Electrical Tester	PRE-HEATING SYSTEM(1ND-TV) STARTING SYSTEM(1ND-TV)
	(09083-00150)	Test Lead Set	PRE-HEATING SYSTEM(1ND-TV) STARTING SYSTEM(1ND-TV)

Equipment

Ammeter	
Ohmmeter	
Service wire	
Torque wrench	
Voltmeter	

DRIVE SHAFT / PROPELLER SHAFT

PREPARATION

024A3-01

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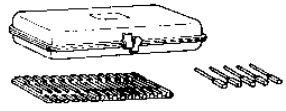
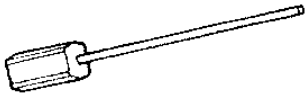
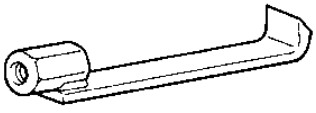
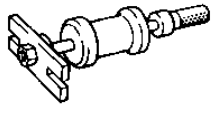
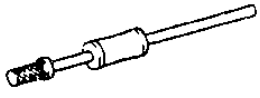
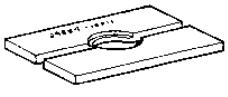
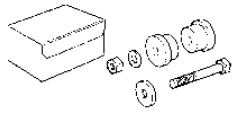
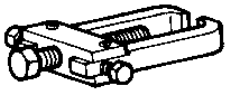
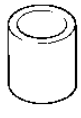
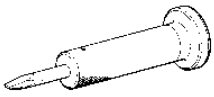
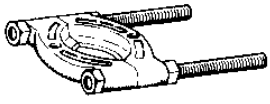
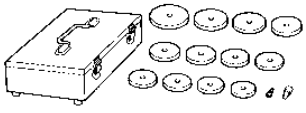
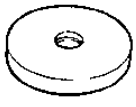
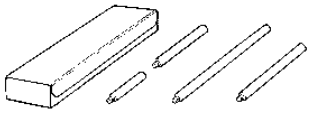
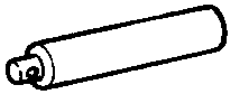
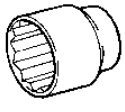
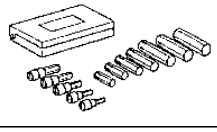
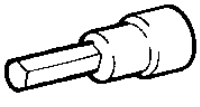
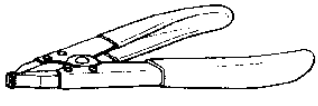
	09240-00020	Wire Gauge Set	FRONT DRIVE SHAFT(1ND-TV)
	(09242-00080)	Wire Gauge 0.8 mm (0.031 in.)	FRONT DRIVE SHAFT(1ND-TV)
	09520-01010	Drive Shaft Remover Attachment	FRONT DRIVE SHAFT(1ND-TV)
	09520-24010	Differential Side Gear Shaft Puller	FRONT DRIVE SHAFT(1ND-TV)
	(09520-32040)	Shocker Set	FRONT DRIVE SHAFT(1ND-TV)
	09521-24010	Rear Axle Shaft Puller	FRONT DRIVE SHAFT(1ND-TV)
	09527-10011	Rear Axle Shaft Bearing Remover	FRONT DRIVE SHAFT(1ND-TV)
	09608-16042	Front Hub Bearing Adjusting Tool	FRONT DRIVE SHAFT(1ND-TV)
	(09608-02021)	Bolt & Nut	FRONT DRIVE SHAFT(1ND-TV)
	(09608-02041)	Retainer	FRONT DRIVE SHAFT(1ND-TV)
	09628-62011	Ball Joint Puller	FRONT DRIVE SHAFT(1ND-TV)
	09710-04081	Base	FRONT DRIVE SHAFT(1ND-TV)

	09726-40010	Lower Control Shaft Bearing Replacer	FRONT DRIVE SHAFT(1ND-TV)
	09930-00010	Drive Shaft Nut Chisel	FRONT DRIVE SHAFT(1ND-TV)
	09950-00020	Bearing Remover	FRONT DRIVE SHAFT(1ND-TV)
	09950-60020	Replacer Set No.2	FRONT DRIVE SHAFT(1ND-TV)
	(09951-00710)	Replacer 71	FRONT DRIVE SHAFT(1ND-TV)
	09950-70010	Handle Set	FRONT DRIVE SHAFT(1ND-TV)
	(09951-07100)	Handle 100	FRONT DRIVE SHAFT(1ND-TV)

Recommended Tools

	09011-12301	Socket Wrench 30 mm	FRONT DRIVE SHAFT(1ND-TV)
	09040-00011	Hexagon Wrench Set	FRONT DRIVE SHAFT(1ND-TV)
	(09043-20060)	Socket Hexagon Wrench 6	FRONT DRIVE SHAFT(1ND-TV)
	09905-00012	Snap Ring No.1 Expander	FRONT DRIVE SHAFT(1ND-TV)

Equipment

Torque wrench	

Lubricant

Item		Capacity
Front drive shaft	Outboard joint grease:	152.0 to 162.0 g (5.4 to 5.7 oz.)
	Inboard joint grease:	160.0 to 180.0 g (5.6 to 6.3 oz.)

BRAKE

PREPARATION

02487-01

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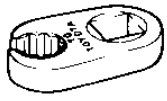
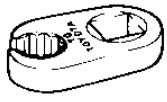
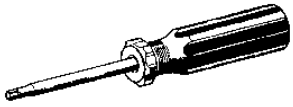
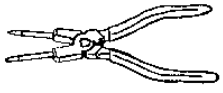
	09023-00101	Union Nut Wrench 10 mm	BRAKE BOOSTER ASSY(1ND-TV) BRAKE MASTER CYLINDER SUB-ASSY(1ND-TV)
	09023-38401	Union Nut Wrench 14mm	BRAKE BOOSTER ASSY(1ND-TV) BRAKE MASTER CYLINDER SUB-ASSY(1ND-TV)

Recommended Tools

	09041-00030	Torx Driver T30	BRAKE MASTER CYLINDER SUB-ASSY(1ND-TV)
	09905-00013	Snap Ring Pliers	BRAKE MASTER CYLINDER SUB-ASSY(1ND-TV)

Torx is registered trademark of Textron Inc.

Equipment

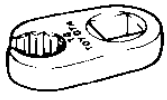
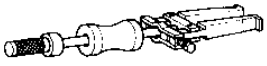
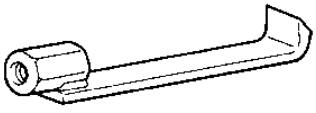
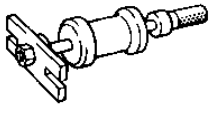
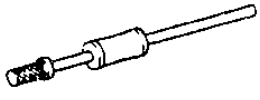
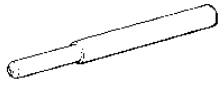
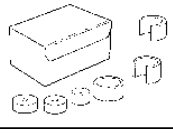
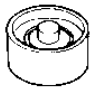
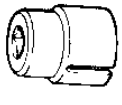
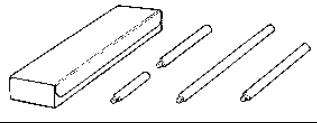
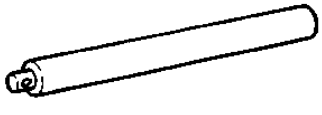
Torque wrench	

MANUAL TRANSMISSION/TRANSAXLE

PREPARATION

024A2-01

SST

	09023-00101	Union Nut Wrench 10 mm	MANUAL TRANSAXLE ASSY(C53)
	09308-00010	Oil Seal Puller	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	09520-01010	Drive Shaft Remover Attachment	MANUAL TRANSAXLE ASSY(C53) MANUAL TRANSAXLE ASSY(C53A) FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	09520-24010	Differential Side Gear Shaft Puller	MANUAL TRANSAXLE ASSY(C53) MANUAL TRANSAXLE ASSY(C53A) FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	(09520-32040)	Shocker Set	MANUAL TRANSAXLE ASSY(C53) MANUAL TRANSAXLE ASSY(C53A) FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	09670-00010	Front Crossmember Guide Tool	MANUAL TRANSAXLE ASSY(C53) MANUAL TRANSAXLE ASSY(C53A)
	09710-20011	Front Suspension Bushing Tool Set	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	(09710-06071)	Replacer	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	09726-36010	Lower Control Arm Bushing Replacer	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	09817-16011	Back-up Light Switch Tool	PARK/NEUTRAL POSITION SWITCH ASSY(C53A) BACK UP LAMP SWITCH ASSY(C53A/C53)
	09950-70010	Handle Set	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)
	(09951-07200)	Handle 200	FRONT DIFFERENTIAL OIL SEAL(C53A/C53)

	09991-00510	Lance Canceling Tool M	FLOOR SHIFT SHIFT LEVER ASSY(C53A)

Recommended Tools

	09082-00050	TOYOTA Electrical Tester Set	FLOOR SHIFT SHIFT LEVER ASSY(C53A)
	09090-04020	Engine Sling Device	MANUAL TRANSAXLE ASSY(C53) MANUAL TRANSAXLE ASSY(C53A)

Equipment

Torque wrench	

Lubricant

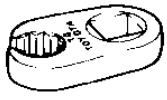
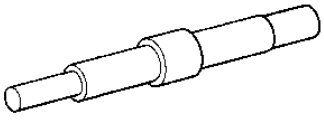
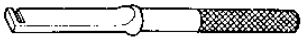
Item	Capacity	Classification
Manual transaxle oil (C53A/C53) (w/ Differential oil)	1.9 liters (2.0 US qts, 1.7 Imp. qts)	API GL-4 or GL-5 SAE 75W-90

CLUTCH

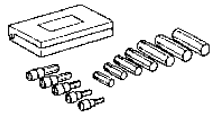
PREPARATION

024A1-01

SST

	09023-00101	Union Nut Wrench 10 mm	CLUTCH MASTER CYLINDER ASSY(C53) CLUTCH RELEASE CYLINDER ASSY(C53) CLUTCH ACCUMULATOR ASSY(C53)
	09301-00220	Clutch Guide Tool	CLUTCH UNIT(C53A/C53)
	09333-00013	Universal Joint Bearing Remover & Replacer	CLUTCH UNIT(C53A/C53)

Recommended Tools

	09040-00011	Hexagon Wrench Set	CLUTCH PEDAL SUB-ASSY(C53)
	09082-00040	TOYOTA Electrical Tester	CLUTCH START SWITCH ASSY(C53)

Equipment

Torque wrench	
Vernier calipers	
Dial indicator with magnetic base	

Lubricant

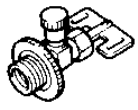
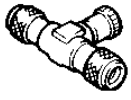
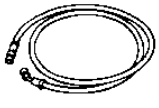
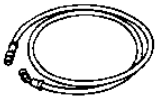
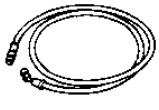
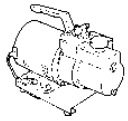
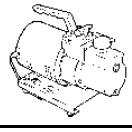
Item	Capacity	Classification
Brake fluid	-	SAE J1704 or FMVSS No.116 DOT 4

HEATER & AIR CONDITIONER

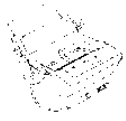
PREPARATION

02493-01

SST

	07110-58060	Air Conditioner Service Tool Set	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-58060)	Refrigerant Drain Service Valve	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-58070)	T-Joint	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-58080)	Quick Disconnect Adapter	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-58090)	Quick Disconnect Adapter	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-78050)	Refrigerant Charging Gauge	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-88060)	Refrigerant Charging Hose	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-88070)	Refrigerant Charging Hose	COOLER ASSY(1ND-TV) COMPRESSOR
	(07117-88080)	Refrigerant Charging Hose	COOLER ASSY(1ND-TV) COMPRESSOR
	07117-48130	Vacuum Pump (220 V)	COOLER ASSY(1ND-TV) COMPRESSOR
	07117-48140	Vacuum Pump (240 V)	COOLER ASSY(1ND-TV) COMPRESSOR

Recommended Tools

	09904-00010	Expander Set	COOLER COMPRESSOR ASSY(1ND-TV)
	(09904-00050)	No. 4 Claw	COOLER COMPRESSOR ASSY(1ND-TV)
	95416-00140	Gas Leak Detector (Halogen Leak Detector) (DENSO Part No.)	COOLER COMPRESSOR ASSY(1ND-TV)

Equipment

Vinyl tape	
Vise pliers	
Gas leak detector	
Belt tension gauge	
Dial indicator	
Torque wrench	

Lubricant

Item	Capacity	Classification
Compressor oil	-	ND-OIL 8 or equivalent

SERVICE SPECIFICATIONS

REFER TO FOLLOWING REPAIR MANUALS:

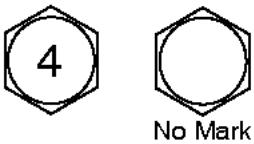
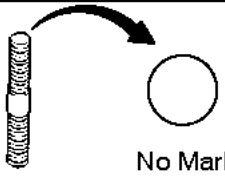
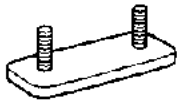
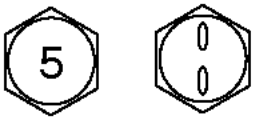
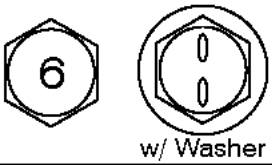
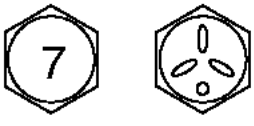
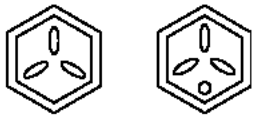
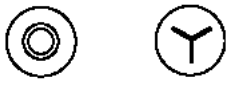
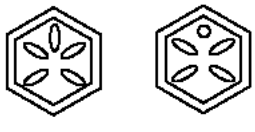
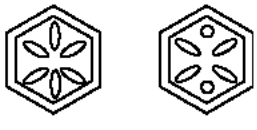
Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM939E
COROLLA Repair Manual Supplement	RM1028E
COROLLA Repair Manual Supplement	RM1106E

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

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

032AI-02

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

B06431

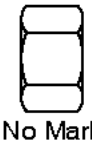
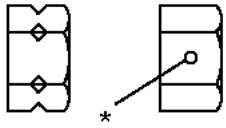
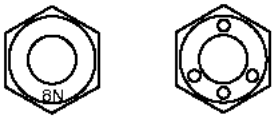
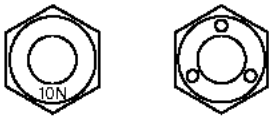
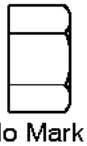
032AJ-02

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

032AK-02

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forged Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/Washer)	 No Mark (w/Washer)	 No Mark	5N (4T)
 6N			6N
		 *	7N (5T)
 8N			8N
 10N		 No Mark	10N (7T)
 11N			11N
 12N			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 greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

ENGINE CONTROL SYSTEM

SERVICE DATA

032IK-01

Accelerator pedal assy		
Voltage	Standard (Accelerator POS No. 1)	0.5 to 1.1 V for released 3.0 to 4.6 V for depressed
	(Accelerator POS No. 2)	0.9 to 2.3 V for released 3.4 to 5.0 V for depressed
Resistance	LHD Steering position type Standard 3 (EP1) - 6 (VCP1)	1.5 to 6.0 kΩ
	1 (EP2) - 4 (VCP2)	1.5 to 6.0 kΩ
	RHD Steering position type Standard 1 (EP1) - 4 (VCP1)	1.5 to 6.0 kΩ
	3 (EP2) - 6 (VCP2)	1.5 to 6.0 kΩ
Camshaft position sensor		
Voltage	Standard 1 (EG) - 3 (+B)	4.75 to 5.25 V
Mass air flow meter		
Resistance	Standard 4 (THA) - 5 (E2)	13.6 to 18.4 kΩ at -20°C (-4°F) 2.21 to 2.69 kΩ at 20°C (68°F) 0.493 to 0.667 kΩ at 60°C (140°F)
Engine coolant temperature sensor		
Resistance	Standard 1 (E2) - 2 (THW)	2.32 to 2.59 kΩ at 20°C (68°F) 0.310 to 0.326 kΩ at 80°C (176°F)
Throttle control motor		
Resistance	Standard 1 (DUTY) - 3 (E)	0.3 to 100 Ω at 20°C (68°F)
Crankshaft position sensor		
Resistance	Standard 1 (Ne+) - 2 (Ne-)	1,630 to 2,740 Ω at cold 2,065 to 3,225 Ω at hot
Main relay		
Resistance	Standard 3 - 5	10 kΩ or higher Below 1 Ω (Apply battery voltage to terminal 1 to 2)

032IL-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Negative battery terminal x Battery	5.4	55	44 in.·lbf
Engine coolant temperature sensor x Cylinder head sub-assy	19.6	200	14
Diesel throttle body x Intake air connector	20	205	15
Air hose No. 4 x Diesel throttle body	6.0	60	53 in.·lbf
Air hose No. 4 x Air tube No. 2	6.0	60	53 in.·lbf
Air hose No. 2 x Air tube No. 1	25	255	18
Accelerator pedal assy x Body	5.4	55	44 in.·lbf
Camshaft position sensor x Vacuum pump assy	8.0	80	71 in.·lbf
Crankshaft position sensor x Cylinder block sub-assy	8.0	80	71 in.·lbf
ECM bracket No. 1 x ECM	3.0	30	27 in.·lbf
ECM bracket No. 3 x ECM	3.0	30	27 in.·lbf
ECM bracket No. 2 x ECM	3.0	30	27 in.·lbf
ECM x Blower assy	3.0	30	27 in.·lbf

FUEL

SERVICE DATA

032IQ-01

Supply pump assy		
Resistance (Fuel mertering unit)	at 20°C (68°F)	2.60 to 3.15 Ω
Resistance (Fuel temperature sensor)	at -20°C (-4°F)	13.92 to 17.01 Ω
	at 0°C (32°F)	5.31 to 6.49 Ω
	at 20°C (68°F)	2.25 to 2.75 Ω
	at 40°C (104°F)	1.06 to 1.29 Ω
	at 60°C (140°F)	0.54 to 0.66 Ω
	at 80°C (176°F)	0.29 to 0.36 Ω
	at 100°C (212°F)	0.17 to 0.20 Ω
Injector assy		
Resistance	at 20°C (68°F)	0.215 to 0.295 Ω
Common rail assy		
Resistance (Fuel pressure control valve)	at 20°C (68°F)	3.42 to 3.78 Ω
Fuel heater assy		
Resistance	at 20°C (68°F)	0.5 to 2.0 Ω
Level warning switch		
Resistance	When the float is up	Below 1 Ω
	When the float is down	10 kΩ or higher
Compression spring (Exhaust pipe assy front x Exhaust manifold)		
Free length	Minimum	41.5 mm (1.6339 in.)
Compression spring (Exhaust pipe assy tail x Exhaust pipe assy front)		
Free length	Minimum	38.5 mm (1.5157 in.)

032IR-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Battery negative terminal x Battery	5.4	55	48 in.·lbf
Nozzle holder camp x Cylinder head sub-assy	26	265	19
Injection pipe sub-assy No. 1 - No. 4 x Injector assy			
With SST	23	235	17
Without SST	25	255	18
Injection pipe sub-assy No. 1 - No. 4 x Common rail assy			
With SST	23	235	17
Without SST	25	255	18
Injection pipe clamp No. 2 x Injection pipe sub-assy	9.0	92	80 in.·lbf
Injection pipe clamp No. 1 x Injection pipe sub-assy x Fuel inlet pipe	9.0	92	80 in.·lbf
Intake air connector bracket x Cylinder head sub-assy	20	204	15
Intake air connector bracket x Intake air connector	20	204	15
Supply pump assy x Cylinder head sub-assy	20	204	15
Fuel inlet pipe sub-assy x Common rail assy			
With SST	23	235	17
Without SST	25	255	18
Fuel inlet pipe sub-assy x Supply pump assy			
With SST	23	235	17
Without SST	25	255	18
Common rail assy x Cylinder head sub-assy	26	265	19
Fuel filter assy x Fuel filter support	18	178	13
Fuel tank band No. 1 x Body (HATCH BACK)	40	408	30
Fuel tank band No. 1 x Body (SEDAN /STATION WAGON)	39	398	29
Parking brake cable assy No. 3 x Body	5.4	55	48 in.·lbf
Parking brake cable assy No. 2 x Body	5.4	55	48 in.·lbf
Fuel tank protector No. 1 x Body	5.4	55	48 in.·lbf
Exhaust pipe assy front x Exhaust manifold	43	440	32
Exhaust pipe assy front x Exhaust pipe assy tail	43	440	32
Fuel tank filler pipe sub-assy lower x Fuel tank assy	3.5	36	31 in.·lbf
Fuel tank vent tube set plate x Fuel tank assy	6.0	61	53 in.·lbf

EMISSION CONTROL

032AL-02

SERVICE DATA

1ND-TV:

EGR valve assy		
Resistance	+B1 - EGR1	19.6 ± 1.4 Ω at 20°C (68°F)
	+B1 - EGR3	19.6 ± 1.4 Ω at 20°C (68°F)
	+B2 - EGR2	19.6 ± 1.4 Ω at 20°C (68°F)
	+B2 - EGR4	19.6 ± 1.4 Ω at 20°C (68°F)

032IU-01

TORQUE SPECIFICATION

1ND-TV:

Part Tightened	N·m	kgf·cm	ft·lbf
Battery negative terminal x Battery	5.4	55	48 in.·lbf
EGR valve assy x Intake air connector	20	204	15
EGR cooler assy x EGR connector	20	204	15
EGR cooler assy x EGR valve assy	11	112	8
EGR cooler assy x Cylinder head sub-assy	11	112	8

INTAKE

SERVICE DATA

0321I-01

Turbo pressure sensor		
Pressure	Standard	15 to 45 kPa (0.15 to 0.46 kgf/cm2, 2.2 to 6.5 psi)
Voltage	Standard 1 (E2) - 3 (VC)	4.5 to 5.5 V
Voltage up	Standard	0.1 to 0.4 V (Apply pressure 19.6 kPa (0.20 kgf/cm2, 2.84 psi))
		0.4 to 0.7 V (Apply pressure 39.2 kPa (0.40 kgf/cm2, 5.69 psi))
		0.7 to 1.0 V (Apply pressure 58.8 kPa (0.60 kgf/cm2, 8.53 psi))
		1.0 to 1.3 V (Apply pressure 78.5 kPa (0.80 kgf/cm2, 11.4 psi))
		1.3 to 1.6 V (Apply pressure 98.0 kPa (1.00 kgf/cm2, 14.2 psi))
Vacuum regulating valve		
Resistance	Standard 1 - 2	10 to 14 Ω at 20°C (68°F)
	1 - Body	10 kΩ or higher
	2 - Body	10 kΩ or higher
Compression spring		
Free length	Minimum	41.5 mm (1.634 in.) for front
		38.5 mm (1.516 in.) for rear

032IJ-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Intercooler assy x Body	7.0	70	62 in.·lbf
Air hose No. 3 x Air tube No. 2	6.0	60	53 in.·lbf
Air hose No. 3 x Intercooler assy	6.0	60	53 in.·lbf
Air hose No. 2 x Air tube No. 1	6.0	60	53 in.·lbf
Air hose No. 2 x Intercooler assy	6.0	60	53 in.·lbf
Intercooler cooling air duct sub-assy x Intercooler assy	5.0	50	44 in.·lbf
Negative battery terminal x Battery	5.4	55	44 in.·lbf
Turbocharger sub-assy x Exhaust manifold	53	540	39
Intercooler air hose x Turbocharger sub-assy	6.0	60	53 in.·lbf
Intercooler air hose x Air tube No. 1	6.0	60	53 in.·lbf
Turbo oil inlet pipe x Turbocharger sub-assy	24	245	18
Turbo oil inlet pipe x Cylinder block sub-assy	24	245	18
Turbo oil inlet pipe x Cylinder block sub-assy	11	110	8
Turbo oil outlet pipe x Turbocharger sub-assy	11	110	8
Turbo oil outlet pipe x Cylinder block sub-assy	13.5	140	10
Exhaust manifold converter sub-assy x Turbocharger sub-assy	26	265	19
Manifold support bracket x Exhaust manifold converter sub-assy	37	375	27
Manifold support bracket x Cylinder block sub-assy	37	375	27
Turbo insulator No. 1 x Turbocharger sub-assy	6.0	60	53 in.·lbf
Turbo insulator No. 1 x Exhaust manifold converter sub-assy	6.0	60	53 in.·lbf
Exhaust pipe x Heater assy (w / Cold area)	7.5	75	66 in.·lbf
Exhaust pipe x Body (w / Cold area)	7.5	75	66 in.·lbf
Exhaust pipe assy front x Exhaust manifold converter sub-assy	43	440	32
Exhaust pipe assy front x Exhaust pipe assy tail	43	440	32
Vacuum regulating valve x Intake air connector bracket	3.4	35	30 in.·lbf
Turbo pressure sensor x Turbo pressure sensor bracket	5.0	50	44 in.·lbf
Turbo pressure sensor x Fan shroud sub-assy	5.0	50	44 in.·lbf

ENGINE MECHANICAL

SERVICE DATA

0329T-03

New drive belt deflection Pressing force: 98 N (10 kgf, 22 lbf) Used drive belt deflection Pressing force: 98 N (10 kgf, 22 lbf)		 5.0 to 6.0 mm (0.197 to 0.236 in.) 7.0 to 8.5 mm (0.276 to 0.335 in.)
New drive belt tension Used drive belt tension		980 to 1176 N (100 to 120 kgf, 220 to 264 lb) 490 to 686 N (50 to 70 kgf, 110 to 154 lb)
Idle speed		720 to 820 rpm
Maximum speed		5100 to 5250 rpm
Compression pressure		2700 kPa (27.5 kgf/cm^2, 391 psi) or more
Minimum pressure		2200 kPa (22.5 kgf/cm^2, 320 psi)
Difference between each cylinder		500 kPa (5.0 kgf/cm^2, 71 psi) or less
Valve clearance (cold)	Intake Exhaust	0.11 to 0.17 mm (0.004 to 0.007 in.) 0.14 to 0.20 mm (0.006 to 0.008 in.)
Cylinder head set bolt outer diameter	Standard Minimum	11.7 to 12.0 mm (0.461 to 0.472 in.) 11.5 mm (0.453 in.)

0329U-03

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
Generator V belt x Fan belt adjusting bar	Bolt A	19	189	14
	Bolt B	32	326	24
Cylinder head cover sub-assy x Cylinder head assy		13	133	10
Cylinder head cover sub-assy x Vacuum reservoir tube		11	112	8
Glow plug assy x Glow plug No. 1 connector		1.6	16	14 in.·lbf
Cylinder head assy x Engine hanger		40	408	30
Oil pan x Oil pan cover		5.5	56	49 in.·lbf
Oil pan assy x Engine oil level sensor		7	71	62 in.·lbf
Crankshaft position sensor x Cylinder block assy		8	82	71 in.·lbf
Cylinder block side cover x Cylinder block assy		6.5	66	58 in.·lbf
Exhaust manifold x Cylinder head assy		43	438	32
Exhaust manifold x Heat insulator		6	60	53 in.·lbf
Exhaust manifold x Manifold stay		37	377	27
Engine coolant temperature sensor x Cylinder head assy		20	204	15
Water by-pass pipe No. 1 x Cylinder block assy, Cylinder head assy		9	92	80 in.·lbf
Cylinder head assy x EGR pipe connector		20	204	15
Cylinder head assy x Intake air connector		20	204	15
Cylinder head cover sub-assy x Cylinder head cover No. 2		5.5	56	49 in.·lbf
Engine mounting insulator FR x Engine mounting bracket FR		52	530	38
Engine mounting insulator RR x Engine mounting bracket RR		87	887	64
Front suspension member brace rear LH, RH x Body	Nut, Bolt A	133	1356	98
	Bolt B	80	816	59
Engine mounting member sub-assy center x Body		39	398	29
Engine mounting insulator LH x Engine mounting bracket LH		80	816	59
Engine mounting insulator RH x Engine mounting bracket RH		52	530	38
Engine mounting insulator RH x Body		52	530	38
Camshaft timing sprocket x Camshaft		20	204	15
Chain vibration damper No. 1 x Cylinder head, Cylinder block assy		20	204	15
Chain tensioner assy x Cylinder block assy		9	92	80 in.·lbf
Battery negative terminal x Battery negative cable		5.4	55	48 in.·lbf
Front wheel x Front axle		103	1050	76
Cylinder head assy x Cylinder block assy	1st	68	693	50
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
Diesel throttle body assy x Oil level gage guide		11	112	8.1
Camshaft bearing cap x Cylinder head assy		19	194	14
Flywheel sub-assy x Crankshaft	1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°

EXHAUST

SERVICE DATA

032IG-01

Compression spring		
Free length	Minimum Front	41.5 mm (1.634 in.)
	Rear	38.5 mm (1.516 in.)

032IH-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Exhaust pipe assy front x Exhaust manifold converter sub-assy	43	440	32
Exhaust pipe assy tail x Exhaust pipe assy front	43	440	32
Front panel brace front x Body	29.6	300	22

COOLING

SERVICE DATA

0329V-02

Thermostat		
Valve opening temperature		80 to 84°C (176 to 183°F)
Valve lift	at 95°C (203°F)	8.5 mm (0.33 in.)
Reserve tank cap sub-assy		
Standard opening pressure		95 to 125 kPa (0.97 to 1.27 kgf/cm^2, 13.8 to 18.1 psi)
Minimum opening pressure		79 kPa (0.8 kgf/cm^2, 11.5 psi)
Cooling fan		
Standard amperage		11.7 to 14.7 A
Cooling fan relay		
Specified condition	Between terminals 3 - 5	10 kΩ or higher
	Between terminals 3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)
Cooling fan relay No. 2		
Specified condition	Between terminals 3 - 4	Below 1Ω
	Between terminals 3 - 4	10 kΩ or higher (Apply battery voltage to terminals 1 and 2)
	Between terminals 3 - 5	10 kΩ or higher
	Between terminals 3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)
Cooling fan resistor		
Specified condition	at 20°C (68°F)	1.17 to 1.43 Ω

0329W-02

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Water pump assy x Cylinder block assy	11	112	8
Water pump pulley x Water pump assy	15	153	11
Water inlet x Cylinder block assy	9	92	80 in.·lbf
Fun shroud assy x Radiator assy	7.5	76	66 in.·lbf
Radiator support upper x Body	19	194	14
Relay block x Radiator support upper	5.4	55	48 in.·lbf
Pressure sensor x Fun shroud assy	5	51	44 in.·lbf

LUBRICATION

SERVICE DATA

032IS-01

Oil pressure	at idle speed	29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
	at 3000 rpm	150 to 550 kPa (1.5 to 5.6 kgf/cm^2, 22 to 80 psi)

032AO-02

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block assy		15	153	11
Oil cooler assy x Oil pan		66	673	49
Timing chain cover No. 2 x Oil pump assy		5.5	56	49 in.·lbf
Oil pan drain plug x Oil pan No. 2		38	387	28
Engine mounting bracket x Cylinder block assy, Cylinder head assy		55	561	41
Oil pump assy x Cylinder block assy, Cylinder head assy	Bolt A	11	112	8.1
	Bolt B	24	245	18
	Bolt C	11	112	8.1
	Bolt D	24	245	18
	Nut	24	245	18
Engine mounting insulator sub assy x Body		52	530	38
Crankshaft damper sub-assy x Crankshaft		180	1835	133
Battery negative terminal x Battery negative cable		5.4	55	48 in.·lbf
Front wheel x Front axle		103	1050	76

STARTING & CHARGING

SERVICE DATA

032IE-01

Starter assy Current	Standard	90 A or less 11.5 V for 1.4 kW 100 A or less 11.5 V for 2.0 kW
Starter relay assy Resistance	Standard 3 - 5	10 kΩ or higher Below 1 Ω (Apply battery voltage to terminal 1 to 2)
Battery Voltage	Standard	12.5 to 12.9 V at 20°C (68°F)
Charging circuit without load Amperage Voltage	Standard Standard	10 A or less 13.2 to 14.8 V
Charging circuit with load Amperage	Standard	30 A or less
Glow plug assy Resistance	Standard Glow plug terminal - Ground	0.6 Ω at 20°C (68°F)
Glow plug relay assy Resistance	Standard 1 - 2	10 kΩ or higher Below 1 Ω (Apply battery voltage to terminal 3 to 4)

032IF-01

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Starter assy x Front transaxle case	37	380	27
Starter wire x Starter assy	5.9	60	52 in.·lbf
Negative battery terminal x Battery	5.4	55	44 in.·lbf
Fan belt adjusting bar x Oil pump assy	11	110	8.1
Generator assy x Fan belt adjusting bar	18.5	190	14
Generator assy x Cylinder block sub-assy	32	325	24
Wire harness protector x Fan belt adjusting bar	12.8	130	9
Generator wire x Generator assy	9.8	100	7.2
Glow plug assy x Cylinder head sub-assy	12.5	125	9
Glow plug connector x Glow plug assy	1.6	15	14 in.·lbf
Glow terminal x Glow plug connector	3.8	40	34 in.·lbf

DRIVE SHAFT / PROPELLER SHAFT / AXLE

TORQUE SPECIFICATION

032IT-01

Part Tightened		N·m	kgf·cm	ft·lbf
Front wheel set bolt		103	1,050	76
Tie rod end x Steering knuckle		49	500	36
Stabilizer bar link set nut	TMUK/TMMT made:	44	449	32
	TMC made:	74	755	55
Speed sensor x Steering knuckle		8.0	82	71 in.·lbf
Axle hub x Front drive shaft		216	2,200	159
Manual transaxle oil drain plug		39	400	29
Steering knuckle x Suspension lower arm		89	908	66
Front drive shaft bearing case set bolt		64	650	47
Flexible hose and speed sensor wire harness x Shock absorber				
	TMC/TMMT made:	29	296	21
	TMUK made:	19	194	14

BRAKE

SERVICE DATA

03212-01

Negative pressure of vacuum pump assy	More than 86 kPa (650 mmHg)

032I3-01

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
Brake booster clevis lock nut		19	194	14
Brake master cylinder x Reservoir		8.0	82	71 in.·lbf
Brake master cylinder x Brake booster		25	255	18
Brake line union nut	10 mm	15.2	155	11
	14 mm	29	296	21
Brake booster x Body		12.7	130	9
Vacuum pump x Engine		21	214	15
Vacuum pump x Cam position sensor		9.0	92	80 in.·lbf

MANUAL TRANSMISSION / TRANSAXLE

SERVICE DATA

03267-02

C53A, C53		
Transmission case oil seal drive in depth		9.6 to 10.2 mm (0.378 to 0.402 in.)
Transaxle case oil seal drive in depth		1.6 to 2.2 mm (0.063 to 0.087 in.)
C53A		
Shift lock solenoid	Resistance (2 - 6): at 20°C (68°F)	30 to 35 Ω
Transmission shift main switch	Resistance (4 - 8): for M position	Below 1 Ω
	for E position	10 kΩ or higher
Shift lever position sensor	Resistance (4 - 9 - 10 - 13): for R position	Below 1 Ω
	(2 - 4 - 6 - 10): for N position	Below 1 Ω
	(2 - 3 - 4 - 13): for E and M position	Below 1 Ω
	(5 - 11): for + position	Below 1 Ω
	(5 - 11 - 12): for M position	10 kΩ or higher
	(11 - 12): for - position	Below 1 Ω

03268-02

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
TRANSMISSION CONTROL CABLE ASSY (C53A)				
Floor shift transmission control cable assy x Body		5.0	51	44 in.·lbf
FLOOR SHIFT SHIFT LEVER ASSY (C53A/C53)				
Floor shift shift lever assy x Body		12	122	9
TRANSMISSION REVOLUTION SENSOR (C53A)				
Manual transmission case protector x Transaxle		8.0	82	71 in.·lbf
BACK UP LAMP SWITCH ASSY (C53A/C53)				
Back up lamp switch x Manual transmission case		40	410	30
PARK/NEUTRAL POSITION SWITCH ASSY (C53A)				
Park/neutral position switch x Manual transmission case		29	300	22
TRANSMISSION CONTROL ECU ASSY (C53A)				
Transmission control ECU set bolt		5.0	51	44 in.·lbf
MANUAL TRANSAXLE ASSY (C53A)				
Filler and drain plugs		39	400	29
Engine hanger set bolt		38	387	28
Clutch actuator bracket No.1 x Transaxle		20	199	14
Engine mounting bracket RR x Transaxle		64	653	47
Engine mounting bracket RR x Engine mounting insulator RR		87	887	64
Engine mounting bracket FR x Transaxle		64	653	47
Engine mounting bracket FR x Engine mounting insulator FR		52	530	38
Manual transaxle assy x Engine		33	340	24
Engine mounting bracket LH x Transaxle		52	530	38
Engine mounting insulator LH set bolt	Bolt A: Bolt B:	52 80	530 816	38 59
Transaxle x Wire harness clamp	Bolt A: Bolt B:	26 25	260 255	19 18
Transaxle x Wire harness clamp		9.0	92	80 in.·lbf
Transaxle x Wire harness clamp		13	130	9
Fuel filter assy set bolt		18	180	13
Air tube No.1 x Transaxle	Bolt, Nut: Clamp:	25 6.0	255 61	18 53 in.·lbf
Air tube No.2 x Transaxle	Bolt: Clamp:	25 6.0	255 61	18 53 in.·lbf
Battery carrier x Body		13	131	9
Battery clamp sub-assy x Body	Bolt: Nut:	5.0 3.5	51 36	44 in.·lbf 31 in.·lbf
Hood set bolt		13	133	10
MANUAL TRANSAXLE ASSY (C53)				
Filler and drain plugs		39	400	29
Engine hanger set bolt		38	387	28
Engine mounting bracket RR x Transaxle		64	653	47
Engine mounting bracket RR x Engine mounting insulator RR		87	887	64
Engine mounting bracket FR x Transaxle		64	653	47
Engine mounting bracket FR x Engine mounting insulator FR		52	530	38
Manual transaxle assy x Engine		33	340	24
Engine mounting bracket LH x Transaxle		52	530	38
Engine mounting insulator LH set bolt	Bolt A: Bolt B:	52 80	530 816	38 59
Flexible hose tube x Transaxle	Bolt A: Bolt B:	25 5.0	255 51	18 44 in.·lbf

Part Tightened		N·m	kgf·cm	ft·lbf
Transaxle x Wire harness clamp	Bolt A:	26	260	19
	Bolt B:	25	255	18
Fuel heater assy set bolt		18	180	13
Air tube No.1 x Transaxle	Bolt, Nut:	25	255	18
	Clamp:	6.0	61	53 in.·lbf
Air tube No.2 x Transaxle	Bolt:	25	255	18
	Clamp:	6.0	61	53 in.·lbf
Battery carrier x Body		13	131	9
Battery clamp sub-assy x Body	Bolt:	5.0	51	44 in.·lbf
	Nut:	3.5	36	31 in.·lbf
Hood set bolt		13	132	10
Front wheel set nut		103	1,050	76

CLUTCH

SERVICE DATA

030L1-05

Pedal height from asphalt sheet LHD steering position type		139.5 to 149.5 mm (5.492 to 5.886 in.)
Pedal height from asphalt sheet RHD steering position type		147.6 to 157.6 mm (5.811 to 6.205 in.)
Clutch pedal free play		5.0 to 15.0 mm (0.197 to 0591 in.)
Clutch pedal push rod play at pedal top		1.0 to 5.0 mm (0.039 to 0.197 in.)
Clutch release point from pedal full stroke end position		25 mm (0.98 in.) or more
Clutch disc rivet head depth	Minimum	0.3 mm (0.012 in.)
Clutch disc assy runout	Maximum	0.8 mm (0.031 in.)
Diaphragm spring finger wear	Maximum depth: Maximum width:	0.5 mm (0.020 in.) 6.0 mm (0.236 in.)
Flywheel sub-assy runout	Maximum	0.1 mm (0.004 in.)
Diaphragm tip alignment	Maximum	0.5 mm (0.020 in.)

030L2-06

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
Clutch pedal support x Stopper bolt	25	250	18
Clutch pedal sub-assy x Clutch pedal support	37	375	27
Clutch pedal support x Body	19	195	14
Clutch pedal support x Clutch start switch assy	16	160	12
Clutch master cylinder push rod clevis lock nut	12	120	9
Clutch master cylinder x Flexible hose tube	15	155	11
Clutch master cylinder x Body	12	120	9
Clutch release cylinder bleeder plug	8.4	85	74 in.·lbf
Clutch release cylinder x Transaxle housing	12	120	9
Clutch line clamp x Clutch release cylinder	12	120	9
Clutch release cylinder x Flexible hose tube	15	155	11
Clutch actuator assy set bolt	17	173	13
Flexible hose tube clamp x Clutch accumulator assy LHD steering position type:	12	120	9
Clutch accumulator assy x Flexible hose tube	15	155	11
Clutch cover assy x Flywheel sub-assy	19	194	14
Release fork support x Transaxle assy	37	375	27

HEATER & AIR CONDITIONER

032AQ-02

SERVICE DATA

Refrigerant charge volume	Standard:	450 ± 30 g (15.9 ± 1.1 oz.)
Magnetic clutch clearance	(1ND-TV)	0.20 - 0.45 mm (0.008 - 0.018 in.)

032AR-02

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
COOLER COMPRESSOR ASSY (1CD-FTV)			
Magnet clutch hub x Cooler compressor assy	13	134	9.7
Compressor and magnetic clutch x Engine	29	295	21
Cooler refrigerant discharge hose No.1 x Compressor and magnetic clutch	9.8	100	87 in.·lbf
Cooler refrigerant suction hose No.1 x Compressor and magnetic clutch	9.8	100	87 in.·lbf

DIAGNOSTICS

DIAGNOSTICS

REFER TO FOLLOWING REPAIR MANUALS:

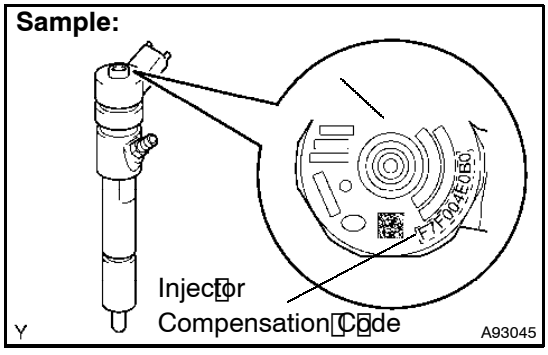
Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM939E
COROLLA Repair Manual Supplement	RM1028E
COROLLA Repair Manual Supplement	RM1106E

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

ECD SYSTEM (1ND-TV)

PRECAUTION

05DVB-10



1. INJECTOR COMPENSATION CODE

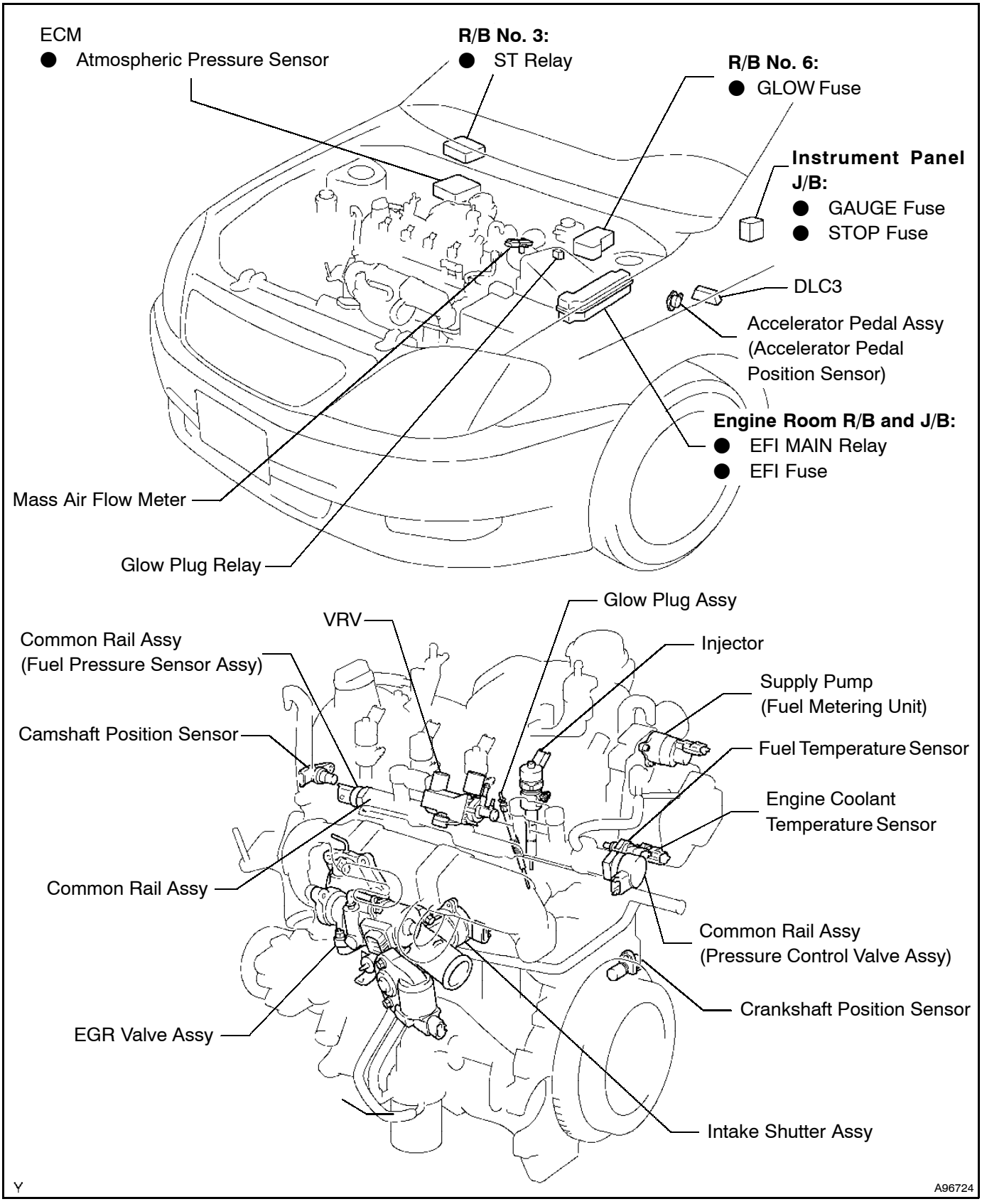
(a) Each injector has different fuel injection characteristics. In order to optimize fuel injection performance, the ECM compensates for these differences by adjusting the fuel injection duration of each injector according to its compensation code. Injector compensation codes are unique, 10-digit alphanumeric codes printed on the head portion of each injector.

(b) When an injector is replaced, the injector's compensation code must be input into the ECM. When the ECM is changed, all of the existing injector compensation codes must be input into the new ECM.
(see page 14 - 1 ,14-6).

(c) If an incorrect injector compensation code is input into the ECM, the engine assembly may rattle or engine idling may become rough. In addition, engine failure may occur and the life of the engine may be shortened.

054JE-32

LOCATION



054JB-38

HOW TO PROCEED WITH TROUBLESHOOTING

The Intelligent tester II can be used at steps 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS (See page 05-6)

NEXT

3	CONNECT INTELLIGENT TESTER II TO DLC3

HINT:
If the display indicates a communication fault in the tester, inspect the DLC3.

NEXT

4	CHECK DTC AND FREEZE FRAME DATA (See page 05-33)

HINT:
Record or print DTCs and freeze frame data, if necessary.

NEXT

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05-33)

NEXT

6	CONDUCT VISUAL INSPECTION

NEXT

7	SET CHECK MODE DIAGNOSIS (See page 05-34)

NEXT

8	CONFIRM PROBLEM SYMPTOMS

HINT:
If the engine does not start, perform steps 10 and 12 first.

Result	Proceed To
Malfunction does not occur	A
Malfunction occurs	B

B → GO TO STEP 10

A

9	SIMULATE SYMPTOMS

NEXT

10	CHECK DTC (See page 05-33)

Result	Proceed To
Malfunction code	A
No code	B

B → GO TO STEP 12

A

11	REFER TO DTC CHART (See page 05-41)

NEXT

GO TO STEP 14

12	CONDUCT BASIC INSPECTION (See page 05-8)

Result	Proceed To
Malfunctioning parts not confirmed	A
Malfunctioning parts confirmed	B

B → GO TO STEP 17

A

13	REFER TO PROBLEM SYMPTOMS TABLE (See page 05-10)

Result	Proceed To
Malfunctioning circuit confirmed	A
Malfunctioning parts confirmed	B

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05-161)

NEXT

15	CONDUCT CIRCUIT INSPECTION

Result	Proceed To
Malfunction not confirmed	A
Malfunction confirmed	B

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05-7)

NEXT

GO TO STEP 18

17	CONDUCT PARTS INSPECTION

NEXT

18	IDENTIFY PROBLEM

NEXT

19	ADJUST AND/OR REPAIR

NEXT

20	CONDUCT CONFIRMATION TEST

NEXT

END

054JC-40

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Driver's Name		VIN	
Date Vehicle Brought in		Production Date	
License Plate No.		Odometer Reading	km / miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ Incomplete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect initial idling ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stalling	☐ 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. ____ °C/____ °F)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ Warmed up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Revving-up ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of MIL (Malfunction Indicator Lamp)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal mode (Pre-check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

05DVY-01

CHECK FOR INTERMITTENT PROBLEMS

HINT:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect with an intelligent tester II when the ECM is in check mode. In check mode, the ECM uses 1 trip detection logic, which is more sensitive to malfunctions than normal mode (default), that uses 2 trip detection logic.

(a) Clear DTCs (see page 05-33).

(b) Switch the ECM from normal mode to check mode using the intelligent tester II (see page 05-34).

(c) Perform a simulation test (see page 01-22).

(d) Check and wiggle the harness(es), connector(s) and terminal(s) (see page 01-32).

05I7H-01

BASIC INSPECTION

When a malfunction is not confirmed by the DTC (Diagnostic Trouble Code) check, troubleshooting should be carried out in all circuits considered to be possible causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location of the problem can be found quickly and efficiently. Therefore, using this check is essential when engine troubleshooting.

1	CHECK BATTERY VOLTAGE

NOTICE:
Carry out this check with the engine stopped and ignition switch OFF.

	OK	NG
Voltage	11 V or more	Less than 11 V

NG → **CHARGE OR REPLACE BATTERY**

OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-10**

OK

3	CHECK AIR FILTER

(a) Visually check that the air filter is not excessively contaminated with dirt or oil.

NG → **CLEAN OR REPLACE**

OK

4	CHECK FUEL QUALITY

(a) Check that only diesel fuel has been used.
(b) Check that the fuel does not contain any impurities.

NG → **REPLACE FUEL**

OK

5	CHECK FUEL FOR AIR

NG → **BLEED FUEL OF AIR (See page 11-25)**

OK

6	CHECK FUEL PIPES AND HOSES

(a) Check that the fuel pipes and fuel hoses are not blocked, damaged, disconnected and bent.

NG → REPAIR OR REPLACE

OK

7	CHECK FUEL FILTER FOR BLOCKAGE

NG → REPAIR OR REPLACE

OK

8	CHECK ENGINE OIL (See page 17-1)

NG → ADD OR REPLACE

OK

9	CHECK ENGINE COOLANT (See page 16-1)

NG → ADD OR REPLACE ENGINE COOLANT (See page 16-7)

OK

10	CHECK IDLING SPEED AND MAXIMUM SPEED (See page 14-1)

NG → REPLACE INJECTION OR SUPPLY PUMP ASSY (See page 11-16)

OK

11	CHECK DIAGNOSTIC CIRCUIT

NG → REPAIR OR REPLACE

OK

12	CHECK VACUUM PUMP

NG → REPAIR OR REPLACE VACUUM PUMP

OK

PROCEED TO PROBLEM SYMPTOMS TABLE (See page 05-10)

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PROBLEM SYMPTOMS TABLE

When a malfunction is not confirmed by a DTC (Diagnostic Trouble Code) check and the cause of the problem cannot be identified through a basic inspection, troubleshoot according to the priority order indicated in the table below.

Symptom	Suspect Area	See Page
Engine does not crank (Does not start)	5. Starter	19-1
	6. Starter relay	19-1
	7. STA signal circuit	05-166
	8. Ignition switch	05-166
	9. Battery voltage	19-1
Difficult to start with cold engine	1. STA signal circuit	05-166
	2. Injector	11-8
	3. Fuel filter	11-25
	4. Compression	14-1
	5. EC	10-15
	6. Supply pump	11-16
	7. Fuel pressure sensor	11-20
	8. Intake shutter (throttle valve)	10-9
	9. Glow system	19-12
	10.Low fuel tank level	—
	11.Engine coolant temperature sensor	10-2
	12.Intake air temperature sensor	10-2
	13.Crankshaft position sensor	10-2
	14.Camshaft position sensor	10-2
	15.Pressure control valve	11-5
Difficult to start with warm engine	1. STA signal circuit	05-166
	2. Injector	11-8
	3. Fuel filter	11-25
	4. Compression	14-1
	5. EC	10-15
	6. Supply pump	11-16
	7. Fuel pressure sensor	11-20
	8. Intake shutter (throttle valve)	10-9
	9. Low fuel tank level	—
	10.Engine coolant temperature sensor	10-2
	11.Intake air temperature sensor	10-2
	12.Crankshaft position sensor	10-2
	13.Camshaft position sensor	10-2
	14.Pressure control valve	11-5
Engine stalls soon after starting	1. Fuel filter	11-25
	2. Injector	11-8
	3. EC power source circuit	05-161
	4. EC	10-15
	5. Supply pump	11-16
	6. Fuel pressure sensor	11-20
	7. Intake shutter (throttle valve)	10-9
	8. Immobilizer	—
	9. Pressure control valve	11-5

Symptom	Suspect Area	See Page
Engine stalls (Other than the condition listed above)	1. EC power source circuit	05-161
	2. Injector	11-8
	3. EC	10-15
	4. Supply pump	11-16
	5. Fuel pressure sensor	11-20
	6. Intake shutter (throttle valve)	10-9
	7. Pressure control valve	11-5
	8. Ignition switch	—
	9. Alternator	19-6
	10.Crankshaft position sensor	10-2
Abnormal initial idling (Poor idling)	1. Fuel filter	11-25
	2. Injector	11-8
	3. EC	10-15
	4. Supply pump	11-16
	5. Fuel pressure sensor	11-20
	6. Pressure control valve	11-5
	7. Engine coolant temperature sensor	10-2
	8. Fuel temperature sensor	11-5
High engine idling speed (Poor idling)	1. A/C signal circuit	—
	2. Injector	11-8
	3. STA signal circuit	05-166
	4. EC	10-15
	5. Supply pump	11-16
	6. Fuel pressure sensor	11-20
	7. Pressure control valve	11-5
	8. Engine coolant temperature sensor	10-2
	9. Fuel temperature sensor	11-5
Low engine idling speed (Poor idling)	1. A/C signal circuit	—
	2. Injector	11-8
	3. EGR system	12-4
	4. Compression	14-1
	5. Valve clearance	14-6
	6. Fuel line (Air bleeding)	—
	7. EC	10-15
	8. Supply pump	11-16
	9. Fuel pressure sensor	11-20
	10.Intake shutter (throttle valve)	10-9
	11.Pressure control valve	11-5
	12.Engine coolant temperature sensor	10-2
	13.Fuel temperature sensor	11-5
Rough idling (Poor idling)	1. Injector	11-8
	2. Fuel line (Air bleeding)	—
	3. EGR system	12-4
	4. Compression	14-1
	5. Valve clearance	14-6
	6. EC	10-15
	7. Supply pump	11-16
	8. Fuel pressure sensor	11-20
	9. Intake shutter (throttle valve)	10-9
	10.Pressure control valve	11-5
	11.Engine coolant temperature sensor	10-2
	12.Fuel temperature sensor	11-5

Symptom	Suspect Area	See Page
Hunting with hot engine (Poor idling)	1. Injector	11-8
	2. EC power source circuit	05-161
	3. Compression	14-1
	4. Fuel line (Air bleeding)	—
	5. Valve clearance	14-6
	6. EC	10-15
	7. Supply pump	11-16
	8. Fuel pressure sensor	11-20
	9. Intake shutter (throttle valve)	10-9
	10.Pressure control valve	11-5
	11.Engine coolant temperature sensor	10-2
	12.Fuel temperature sensor	11-5
Hunting with cold engine (Poor idling)	1. Injector	11-8
	2. EC power source circuit	05-161
	3. Compression	14-1
	4. Fuel line (Air bleeding)	—
	5. Valve clearance	14-6
	6. EC	10-15
	7. Supply pump	11-16
	8. Fuel pressure sensor	11-20
	9. Intake shutter (throttle valve)	10-9
	10.Pressure control valve	11-5
	11.Engine coolant temperature sensor	10-2
	12.Fuel temperature sensor	11-5
Hesitation/ Poor acceleration (Poor driveability)	1. Injector	11-8
	2. Fuel filter	11-25
	3. EGR system	12-4
	4. Compression	14-1
	5. EC	10-15
	6. Supply pump	11-16
	7. Fuel pressure sensor	11-20
	8. Intake shutter (throttle valve)	10-9
	9. Pressure control valve	11-5
	10.Turbocharger	13-3
	11.Manifold absolute pressure sensor	13-3
Knocking (Poor driveability)	1. Injector	11-8
	2. EGR system	12-4
	3. EC	10-15
	4. Supply pump	11-16
	5. Fuel pressure sensor	11-20
	6. Pressure control valve	11-5
	7. Mass air flow meter	10-2
	8. Manifold absolute pressure sensor	13-3
Black smoke emitted (Poor driveability)	1. Injector	11-8
	2. EGR system	12-4
	3. EC	10-15
	4. Supply pump	11-16
	5. Fuel pressure sensor	11-20
	6. Intake shutter (throttle valve)	10-9
	7. Pressure control valve	11-5
	8. Mass air flow meter	10-2
	9. Manifold absolute pressure sensor	13-3

Symptom	Suspect Area	See Page
White smoke emitted (Poor driveability)	1. EGR system	12-4
	2. Injector	11-8
	3. Fuel filter	11-25
	4. EC	10-15
	5. Supply pump	11-16
	6. Fuel pressure sensor	11-20
	7. Intake shutter (throttle valve)	10-9
	8. Pressure control valve	11-5
Surging/ Hunting (Poor driveability)	1. Injector	11-8
	2. EC	10-15
	3. Supply pump	11-16
	4. Fuel pressure sensor	11-20
	5. Pressure control valve	11-5
	6. Fuel filter	—
	7. Vehicle speed sensor	—
	8. Clutch switch	05-139

05L6N-07

READING REGISTERED DATA

NOTICE:

- **When an injector is replaced, the injector's code number must be input into the ECM. When the ECM is changed, all of the existing injector code numbers must be input into the new ECM.**
- **An injector code number is unique. The 10-digit alphanumeric code imprinted on the head portion of an injector is its code number. If an incorrect injector code number is input into the ECM, the engine assembly may rattle or engine idling may become rough. In addition, engine failure may occur and the life of the engine may be shortened.**

1. After replacing the injector(s) with a new one(s), input the code number(s) of the injector(s) into the ECM as follows:

(a) Input the code number(s), which is/are imprinted on the head portion(s) of the new injector(s), to the intelligent tester II.

(b) Input the new code number(s) into the ECM using the tester (see page 05-19).

(c) Turn the tester OFF and then turn the ignition switch to OFF.

(d) Wait for at least 30 seconds.

(e) Turn the ignition switch to ON and then turn the tester ON.

(f) Clear DTC P0603 stored in the ECM using the tester (see page 05-33).

2. When you replace the ECM with a new one, input all the injectors' compensation codes into the new ECM as follows:

(a) Prior to replacing the ECM, read and save each injector's compensation code, stored in the original ECM, using the intelligent tester II (see page 05-14).

(b) After installing a new ECM, input the saved compensation codes into the new ECM using the tester (see page 05-19).

(c) Turn the tester OFF and then turn the ignition switch to OFF.

(d) Wait for at least 30 seconds.

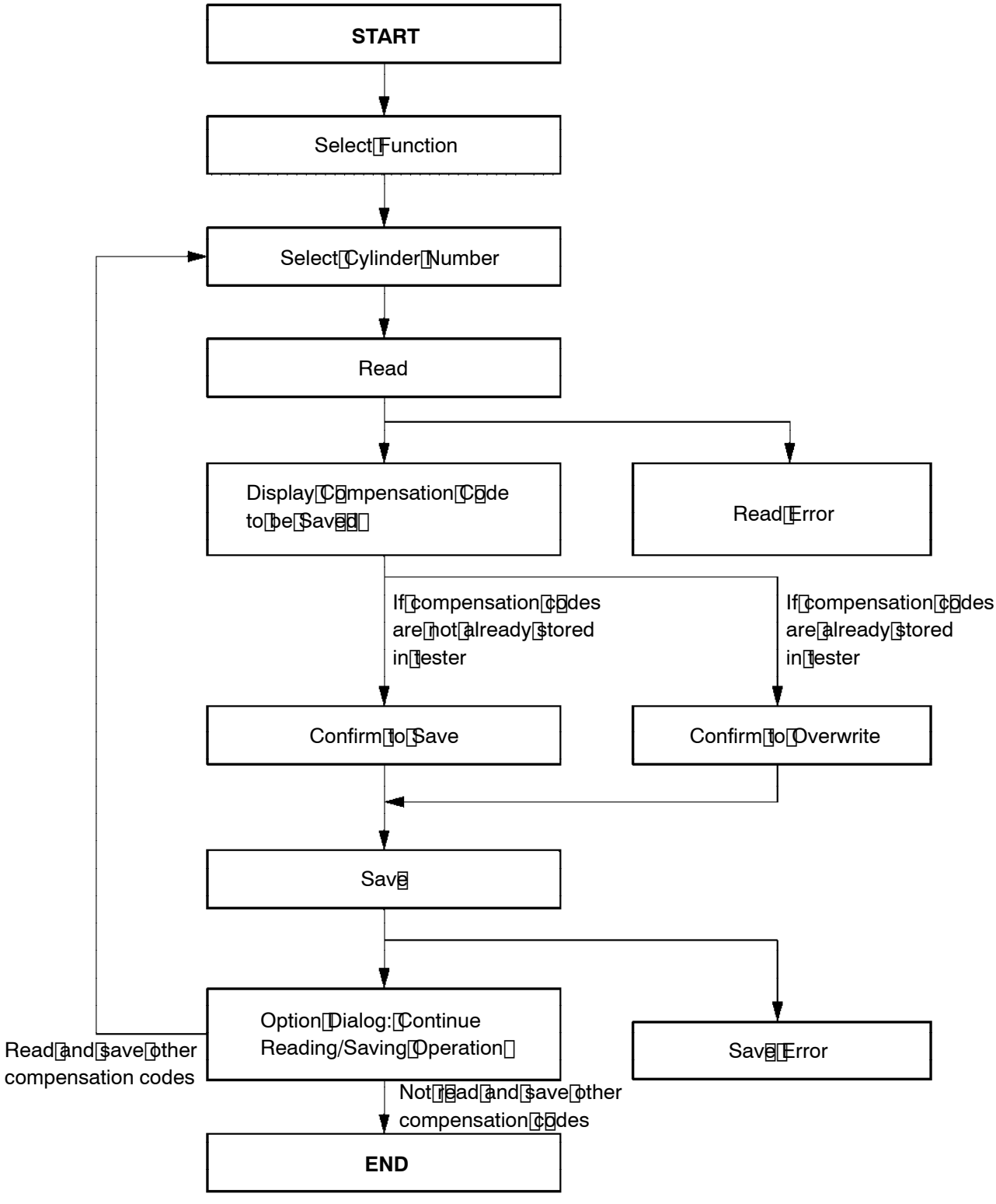
(e) Turn the ignition switch to ON and then turn the tester ON.

(f) Clear DTC P0603 stored in the ECM using the tester (see page 05-33).

HINT:

- Each injector has different fuel injection characteristics. In order to optimize the fuel injections, the ECM uses the compensation codes to balance the different fuel injections between each injector.
- When you first turn the ignition switch to ON after replacing the ECM or an injector(s), DTC P0603 is set. This is to inform you that an injector compensation code(s) is/are required to be registered. Manually clear the DTC upon completion of the compensation code registration.

How to Read and Save Injector Compensation Codes Using Intelligent Tester II (Conduct prior to replacing ECM)



Proceed to Registration Procedure (See page 05-19)

Y

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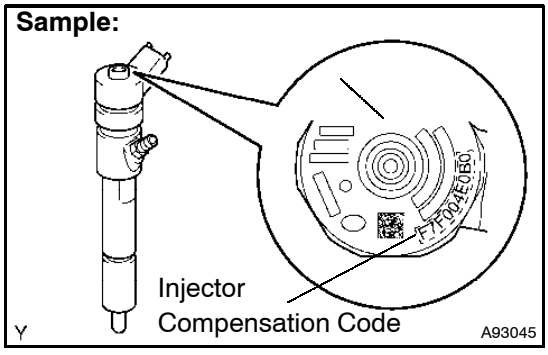
HINT:
The following operation is available with ECMs that can transmit the registered injector compensation codes to the intelligent tester II.



3. READ AND SAVE INJECTOR COMPENSATION CODES

(a) Connect the intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the tester ON.

NOTICE:

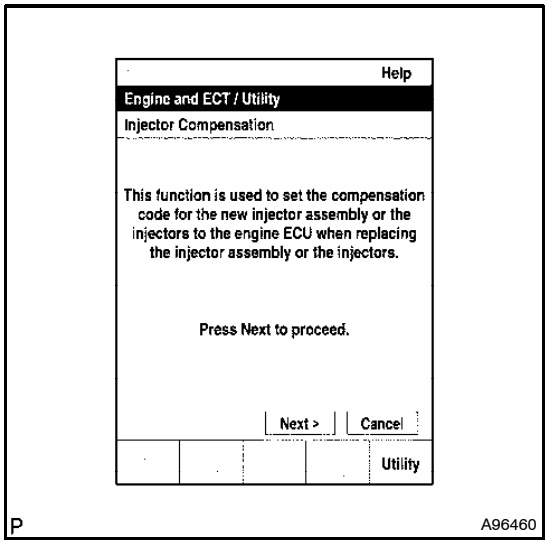
Do not start the engine during this operation.

HINT:

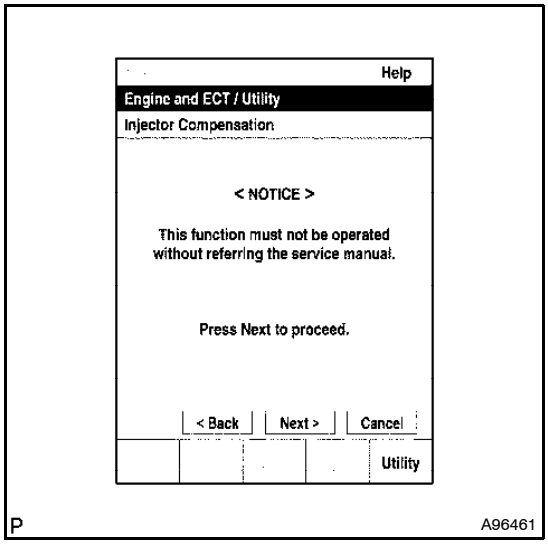
An injector compensation code is imprinted on the head portion of each injector.

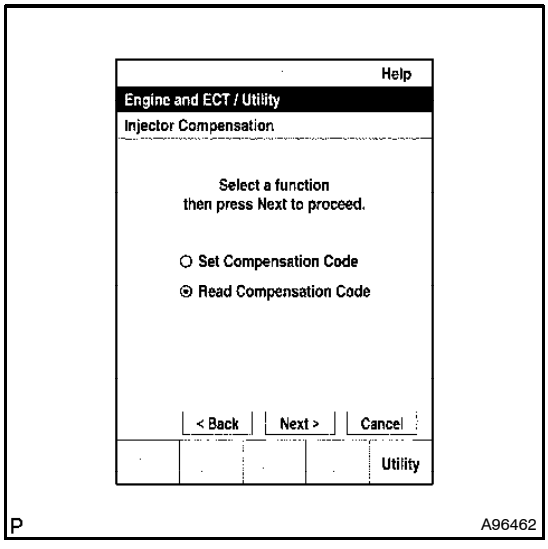
(d) Select the following menu items: Enter / Powertrain / Engine and ECT / Utility/Injector Compensation.

(e) Press the Next button on the tester screen.



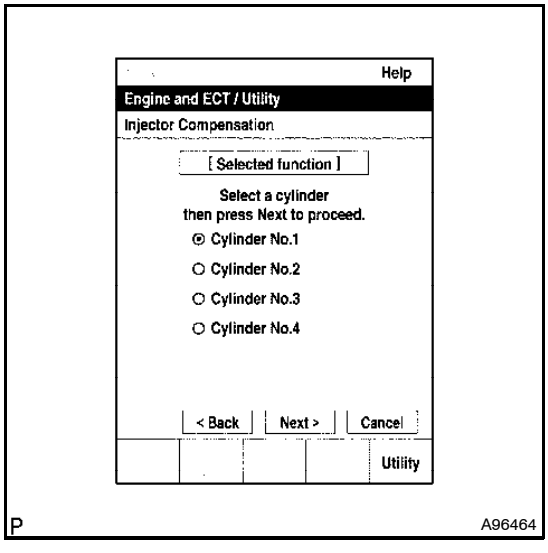
(f) Press the Next button again to proceed.





(g) Select the following menu items: Read Compensation Code.

(h) Press the Next button.

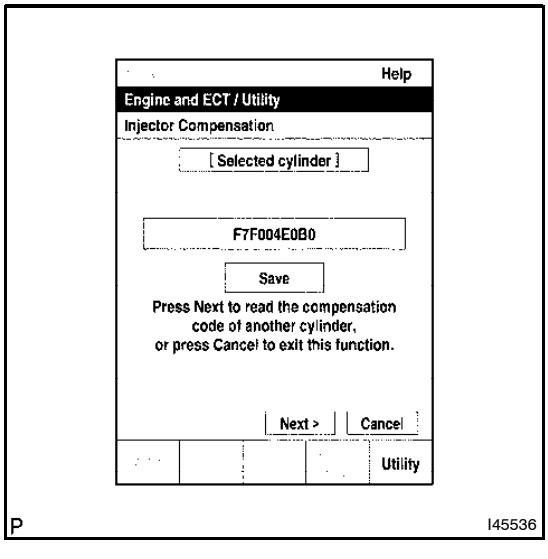


(i) Select the number of the cylinder corresponding to the injector compensation code that you want to read.

(j) Press the Next button.

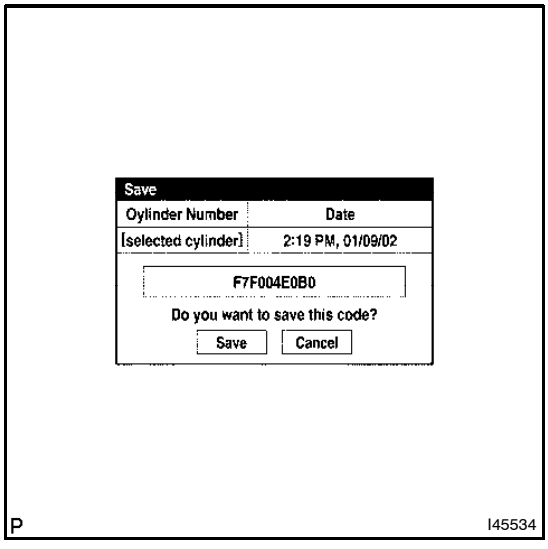
HINT:

The reading process may fail due to a problem with the wire harness or a bad connection with the DLC3. Check the wire harness and the DLC3 connection. If no problem is found with either, it is supposed that the ECM is malfunctioning. Check the ECM and restart this operation.



(k) Check the injector compensation code in the form of a 10-digit alphanumeric code, which is displayed on the tester screen.

(l) Press the Save button on the screen.



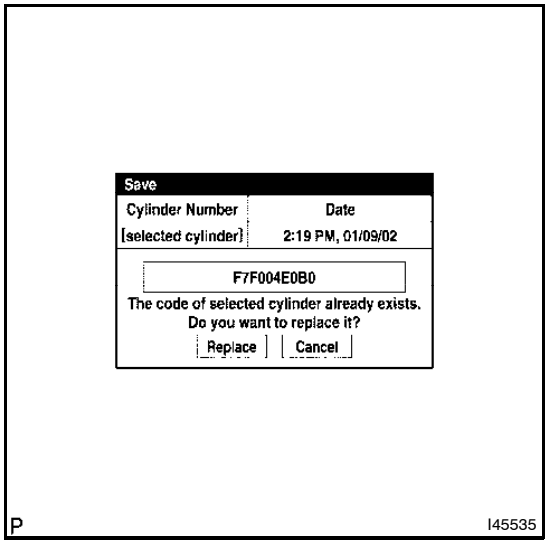
(m) If no injector compensation code for the cylinder exists in the tester:

(1) Ascertain that the compensation code displayed on the tester screen is correct.

(2) Press the Save button (proceed to step "o").

HINT:

The saving process may fail due to a problem with the wire harness or a bad connection with the DLC3. Check the wire harness and the DLC3 connection. If no problem is found with either, it is supposed that the ECM is malfunctioning. Check the ECM and restart this operation.



(n) If another injector compensation code already exists in the tester:

(1) Ascertain that the compensation code displayed on the tester screen is correct.

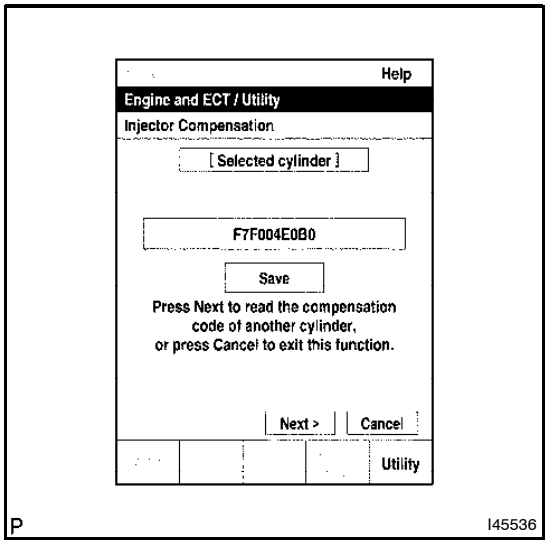
HINT:

The existing compensation code is overwritten with the new compensation code and deleted from the tester.

(2) Press the Replace button on the screen.

HINT:

The saving process may fail due to a problem with the wire harness or a bad connection with the DLC3. Check the wire harness and the DLC3 connection. If no problem is found with either, it is supposed that the ECM is malfunctioning. Check the ECM and restart this operation.



(o) If you want to read and save other injector compensation codes for other cylinders, press the Next button to continue. To finish this operation, press the Cancel button.

05L6O-07

REGISTRATION

NOTICE:

- **When an injector is replaced, the injector's compensation code must be input into the ECM. When the ECM is changed, all of the existing injector compensation codes must be input into the new ECM.**
- **An injector compensation code is unique. The 10-digit alphanumeric code imprinted on the head portion of an injector is its compensation code. If an incorrect injector compensation code is input into the ECM, the engine assembly may rattle or engine idling may become rough. In addition, engine failure may occur and the life of the engine may be shortened.**

1. When you replace the ECM with a new one, input all the injectors' compensation codes into the new ECM as follows:

(a) Prior to replacing the ECM, read and save each injector's compensation code, stored in the original ECM, using the intelligent tester II (see page 05-14).

(b) After installing a new ECM, input the saved compensation codes into the new ECM using the tester (see page 05-19).

(c) Turn the tester OFF and then turn the ignition switch to OFF.

(d) Wait for at least 30 seconds.

(e) Turn the ignition switch to ON and then turn the tester ON.

(f) Clear DTC P0603 stored in the ECM using the tester (see page 05-33).

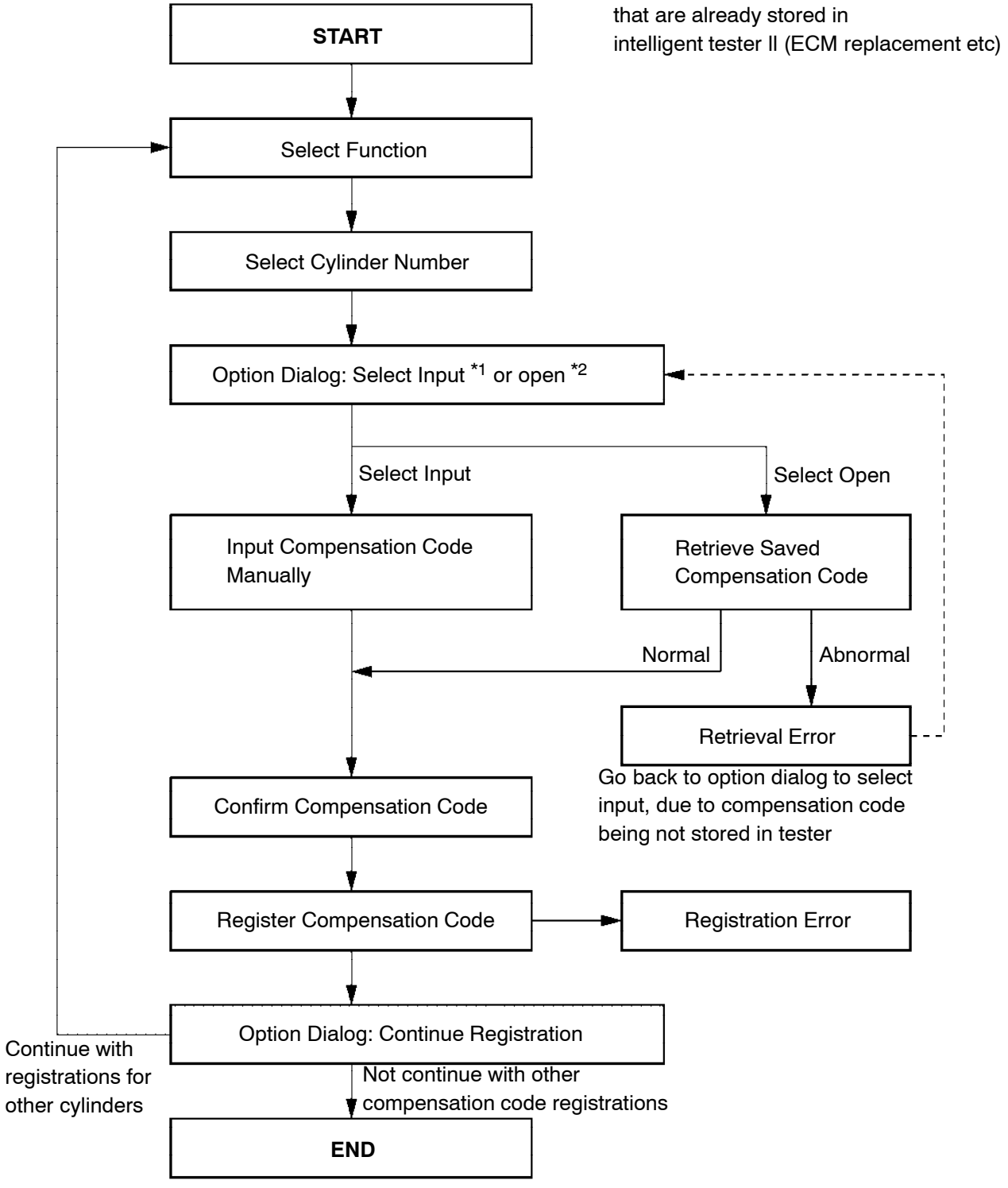
HINT:

- Each injector has different fuel injection characteristics. In order to optimize the fuel injections, the ECM uses the compensation codes to balance the different fuel injections between each injector.
- When you first turn the ignition switch to ON after replacing the ECM or an injector(s), DTC P0603 is set. This is to inform you that an injector compensation code(s) is/are required to be registered. Manually clear the DTC upon completion of the compensation code registration.

How to Register Injector Compensation Codes Using Intelligent Tester II (Conduct prior to replacing injector)

*1: When registering compensation codes by manual input (Injector replacement etc)

*2: When registering compensation codes that are already stored in intelligent tester II (ECM replacement etc)



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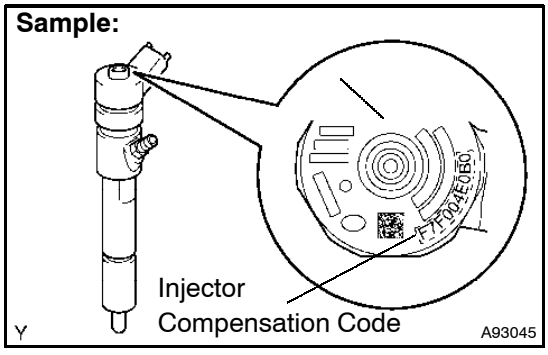


2. REGISTER COMPENSATION CODES

(a) Connect the intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON.

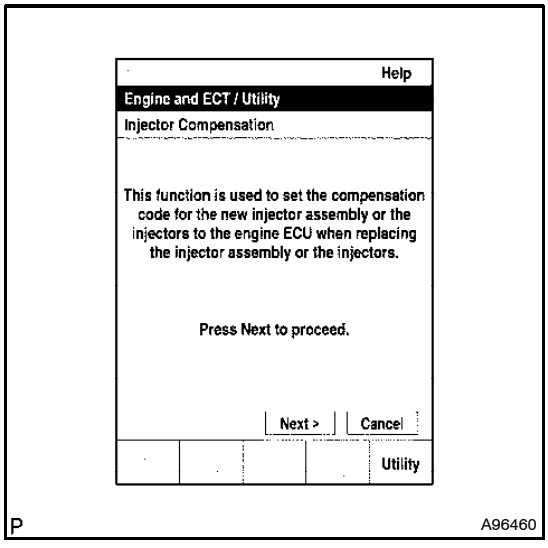
(c) Turn the tester ON.

NOTICE:

Do not start the engine during this operation.

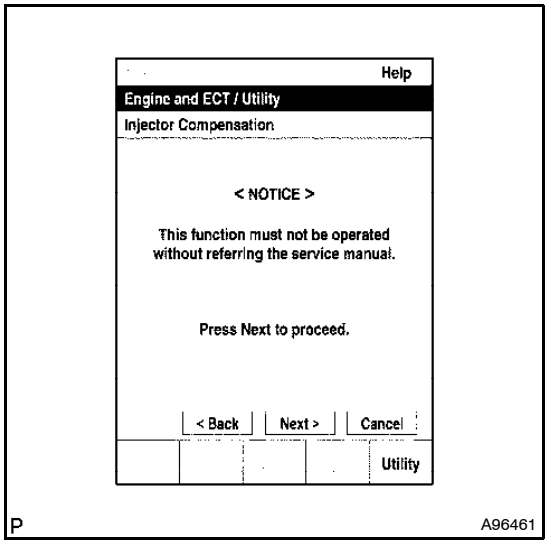
HINT:

An injector compensation code is imprinted on the head portion of each injector.

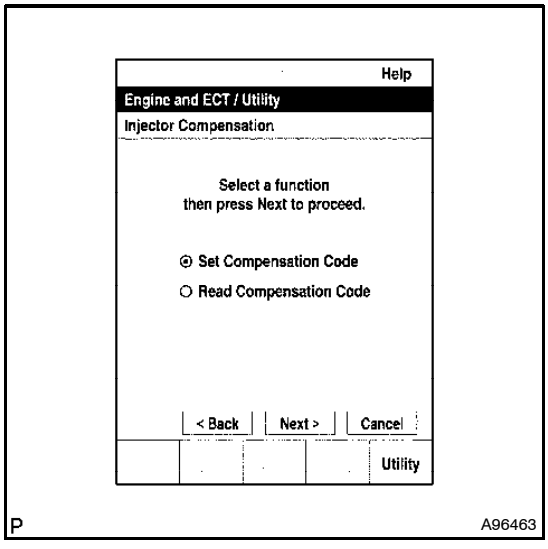


(d) Select the following menu items: Enter / Powertrain / Engine and ECT / Utility/Injector Compensation.

(e) Press the Next button on the tester screen.

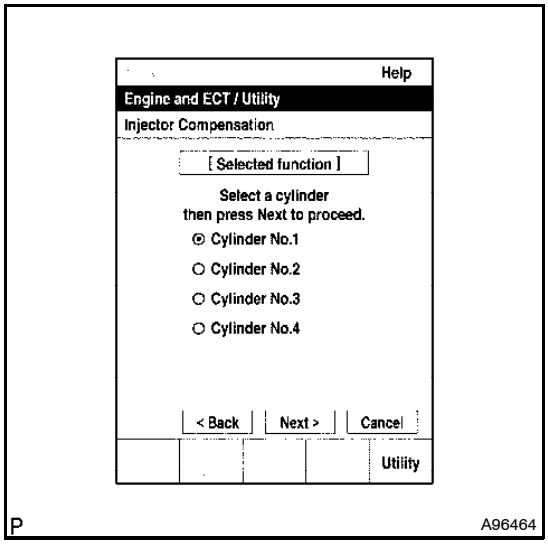


(f) Press the Next button again to proceed.



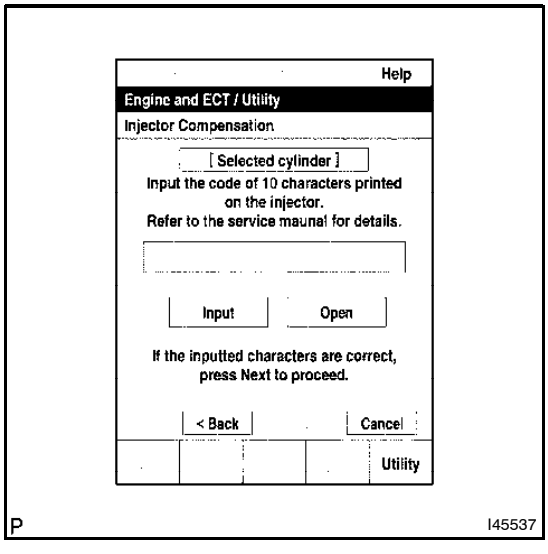
(g) Select the following menu items: Set Compensation Code.

(h) Press the Next button.



(i) Select the number of the cylinder corresponding to the injector compensation code that you want to read.

(j) Press the Next button.



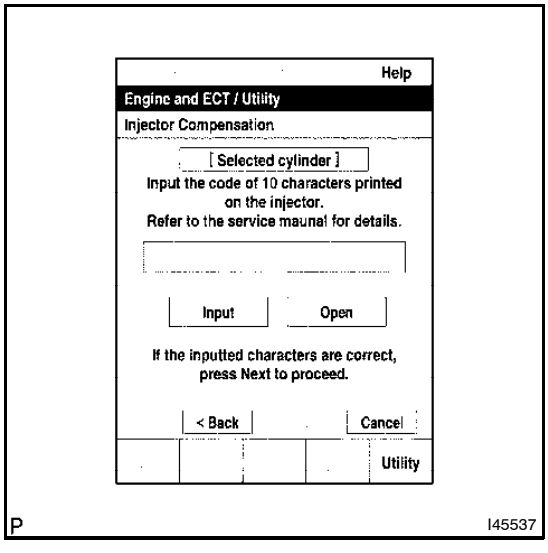
(k) If a new injector(s) was/were installed (the injector compensation code for the selected cylinder does not exist in the tester):

(1) Press the Input button on the screen.

(2) Manually input the compensation code, in the form of a 10-digit alphanumeric code imprinted on injector's head portion, for the cylinder, using the keyboard on the tester screen.

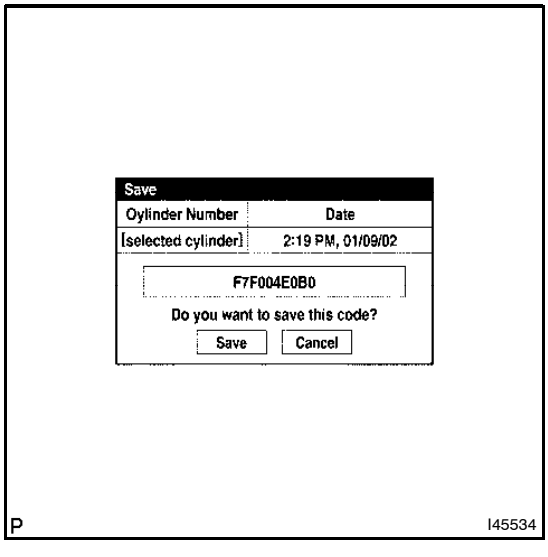
HINT:
Each injector compensation code is unique. The correct compensation code must be input into each cylinder selected on the tester.

(3) Check the compensation code is correct for the selected cylinder, and then press the OK button on the screen (proceed to step "m").



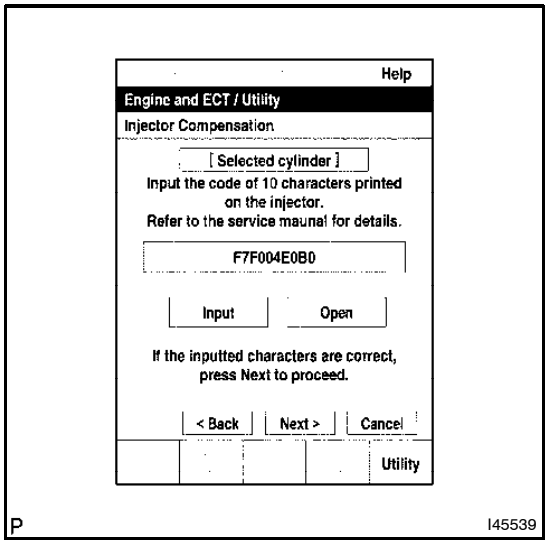
(l) If a new ECM was installed (and all the injectors' compensation codes have been saved in the tester):

(1) Press the Open button on the screen.



(2) Press the Open button again to retrieve the saved compensation code.

HINT:
If the retrieving process fails, a manual input with the tester is the alternative option. Refer to step (k).



(m) Ascertain that the compensation code displayed on the screen is correct, by comparing with the 10-digit alphanumeric code on the head portion of the injector.

NOTICE:

If an incorrect injector compensation code was input into the ECM, the engine assembly may rattle or engine idling may become rough. In addition, engine failure may occur and the life of the engine may be shortened.

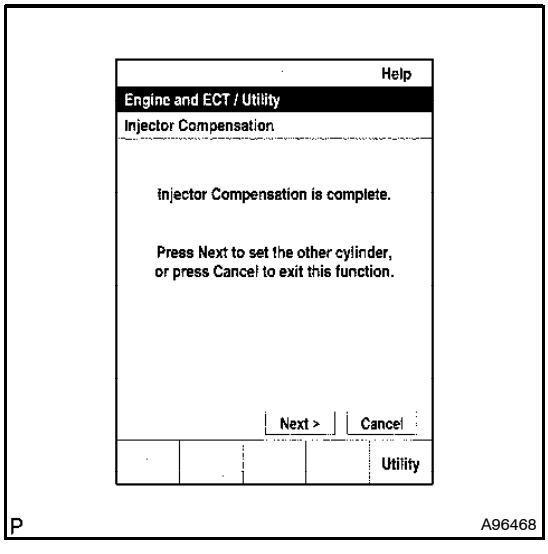
HINT:

If a wrong compensation code was input or read, return to the Input Value screen by pressing the Input button. The saving process may fail due to a problem with the wire harness or a bad connection with the DLC3. Check the wire harness and the DLC3 connection. If no problem is found with either, it is supposed that the ECM is malfunctioning. Check the ECM and restart this operation.

(n) Press the Next button on the screen to set the compensation code to the ECM.

HINT:

- If the setting process fails, the compensation code may be incorrect. Ascertain the compensation code again.
- If the attempted compensation code is correct, a problem with the wire harness or a bad connection with the DLC3 may cause the failure. Check the wire harness and the DLC3 connection. If no problem is found with either, it is supposed that the ECM is malfunctioning. Check the ECM and restart this operation.



(o) If you want to continue with other compensation code registrations, press the Next button. To finish the registration, press the Cancel button.

(p) Turn the tester OFF and then turn the ignition switch to OFF.

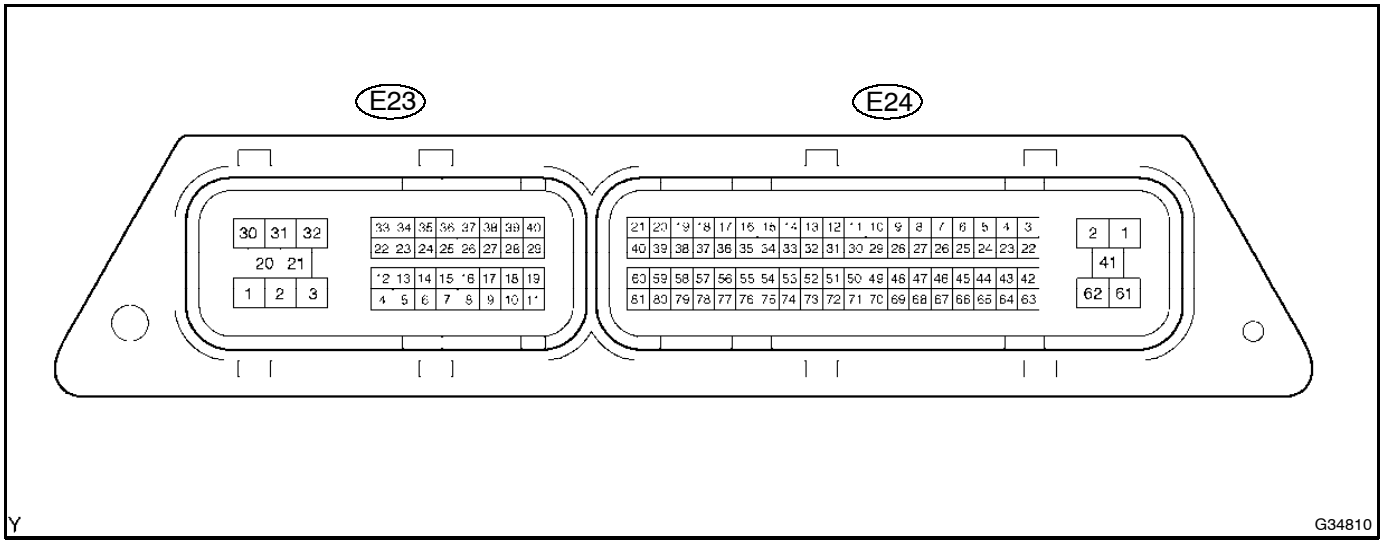
(q) Wait for at least 30 seconds.

(r) Turn the ignition switch to ON and then turn the tester ON.

(s) Clear DTC P0603 stored in the ECM using the tester (see page 05-33).

05MRK-01

TERMINALS OF ECM



HINT:

The standard normal voltage between each pair of ECM terminals is shown in the table below. The appropriate conditions for checking each pair of terminals is also indicated.

The result of checks should be compared with the standard normal voltage for that pair of terminals, displayed in the STD Voltage column.

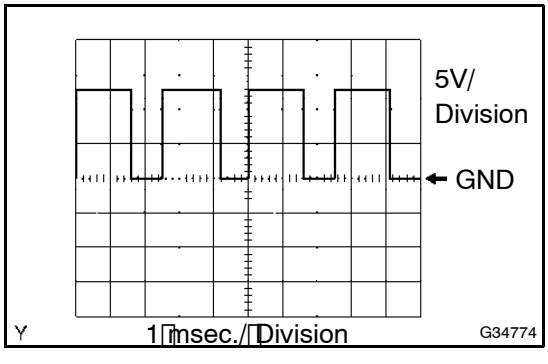
The illustration above can be used as a reference to identify the ECM terminal locations.

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
+B (E24-61) - E1 (E24-2)	B-W - W-B	Power source of ECM	Ignition switch ON	9 to 15
+B (E24-1) - E1 (E24-2)	B-W - W-B	Power source of ECM	Ignition switch ON	9 to 15
IGSW (E24-70) - E1 (E24-2)	SB (B-O) - W-B	Ignition switch	Ignition switch ON	9 to 15
MREL (E24-42) - E1 (E24-2)	GR - W-B	EFI MAIN Relay	Ignition switch ON	9 to 15
MREL (E24-42) - E1 (E24-2)	GR - W-B	EFI MAIN Relay	Ignition switch OFF	0 to 1.5
GREL (E24-81) - E1 (E24-2)	G-R - W-B	Glow plug relay	Ignition switch ON at cold engine (Engine coolant temperature is less than 20°C (68°F))	5 to 15
GREL (E24-81) - E1 (E24-2)	G-R - W-B	Glow plug relay	Idling at warmed engine	0 to 1.5
VPA1 (E24-15) - EVPA1 (E24-54)	G - Y *1 Y - L *2	Accelerator pedal position sensor (for engine control)	Ignition switch ON, accelerator pedal fully released	0.5 to 1.1
VPA1 (E24-15) - EVPA1 (E24-54)	G - Y *1 Y - L *2	Accelerator pedal position sensor (for engine control)	Ignition switch ON, accelerator pedal fully depressed	3.0 to 4.6
VPA2 (E24-14) - EVPA2 (E24-53)	W - Y *1 B - L *2	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, accelerator pedal fully released	0.9 to 2.3
VPA2 (E24-14) - EVPA2 (E24-53)	W - Y *1 B - L *2	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, accelerator pedal fully depressed	3.4 to 5.0
VVPA1 (E24-34) - EVPA1 (E24-54)	B - Y *1 W - L *2	Power source of accelerator pedal position sensor (for VPA1)	Ignition switch ON	4.5 to 5.5
VVPA2 (E24-33) - EVPA2 (E24-53)	B - Y *1 L - L *2	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5
VG (E23-36) - EVG (E23-15)	G - L - Y	Mass air flow meter	Idling	0.5 to 3.4
THAF (E23-7) - ETHAF (E23-6)	G-R - BR	Intake air temperature sensor	Idling, intake air temperature at 20 °C (68 °F)	0.5 to 3.4

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
VPC (E23-26) - EPC (E23-16)	R-W - P	Power source of sensor (a specific voltage)	Ignition switch ON	4.5 to 5.5
PC (E23-37) - EPC (E23-16)	BR - P	Common rail pressure sensor	Idling	1.1 to 1.4
VNT (E23-33) - E1 (E24-2)	W - W-B	VRV (for VN turbocharger)	Idling	Pulse generation (See waveform 1)
PCV (E23-12) - E1 (E24-2)	B-W - W-B	Supply pump (fuel metering unit)	Idling	Pulse generation (See waveform 2)
CLSW (E24-9) - E1 (E24-2)	R-W - W-B *1 LG-B - W-B *2	Clutch switch	Clutch pedal depressed	9 to 15
CLSW (E24-9) - E1 (E24-2)	R-W - W-B *1 LG-B - W-B *2	Clutch switch	Clutch pedal released	0 to 1.5
EGR1 (E24-12) - E1 (E24-2)	G - W-B	EGR valve	Racing engine	Pulse generation (See waveform 3)
EGR2 (E24-11) - E1 (E24-2)	Y-G - W-B	EGR valve	Racing engine	Pulse generation (See waveform 3)
EGR3 (E24-31) - E1 (E24-2)	R-L - W-B	EGR valve	Racing engine	Pulse generation (See waveform 3)
EGR4 (E24-30) - E1 (E24-2)	G-B - W-B	EGR valve	Racing engine	Pulse generation (See waveform 3)
#10 (E23-21) - PINJ1 (E23-1)	R *3, *4 - W R-B *5 - W	Injector	Idling	Pulse generation
#20 (E23-30) - PINJ2 (E23-2)	R *3 - L R-L *4, *5 - L	Injector	Idling	Pulse generation
#30 (E23-31) - PINJ3 (E23-3)	W - B *3 L-R - B *4 R-L - W *5	Injector	Idling	Pulse generation
#40 (E23-32) - PINJ4 (E23-20)	B-W - Y *3, *4 R-L - R-B *5	Injector	Idling	Pulse generation
THF (E23-39) - ETHF (E23-18)	R - W	Fuel temperature sensor	Idling	0.5 to 3.4
THW (E23-40) - ETHW (E23-29)	B-W - L	Engine coolant temperature sensor	Idling, engine coolant temperature at 80°C (176°F)	0.2 to 1.0
ALT (E23-5) - E1 (E24-2)	B-R - W-B *3 B-L - W-B *4, *5	Generator (alternator) duty ratio	Idling	Pulse generation
LUSL (E23-13) - E1 (E24-2)	B-W - W-B	Intake shutter duty signal	Racing engine	Pulse generation (See waveform 4)
PRV (E23-4) - E1 (E24-2)	W - W-B	Pressure regulator valve signal	Drive vehicle at 50 km/h (31 mph) with third gear, and then decelerate by releasing accelerator pedal	Pulse generation (See waveform 5)
G (E23-23) - EG (E23-34)	P - L	Camshaft position sensor	Idling	Pulse generation (See waveform 6)
NE+ (E23-10) - NE- (E23-11)	G - R	Crankshaft position sensor	Idling	Pulse generation (See waveform 6)
VVLU (E23-24) - EVLU (E23-14)	W - R	Power source of sensor (a specific voltage)	Ignition switch ON	4.5 to 5.5
VLU (E23-35) - EVLU (E23-14)	B - R	Intake shutter position sensor	Ignition switch ON, intake shutter fully opened	3.5 to 4.5
VLU (E23-35) - EVLU (E23-14)	B - R	Intake shutter position sensor	Ignition switch ON, intake shutter fully closed	0.4 to 1.0
THWO (E24-3) - E1 (E24-2)	W (Y-R) - W-B	Engine coolant temperature for combination meter	Idling, engine coolant temperature at 80°C (176°F)	Pulse generation
PIM (E23-38) - EPIM (E23-17)	W-R - BR	Intake manifold pressure	Ignition switch ON (Same as atmospheric pressure)	2.0 to 2.6
VPIM (E23-27) - EPIM (E23-17)	R - BR	Power source of sensor (a specific voltage)	Ignition switch ON	4.5 to 5.5

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
TACH (E24-20) - E1 (E24-2)	W (B) - W-B	Engine speed	Idling	Pulse generation
STP1 (E24-8) - E1 (E24-2)	SB (GR-W) - W-B	Stop lamp switch	Brake pedal depressed	9 to 15
STP1 (E24-8) - E1 (E24-2)	SB (GR-W) - W-B	Stop lamp switch	Brake pedal released	0 to 1.5
STP2 (E24-27) - E1 (E24-2)	G-R - W-B	Stop lamp switch (opposite to STP)	Brake pedal depressed	0 to 1.5
STP2 (E24-27) - E1 (E24-2)	G-R - W-B	Stop lamp switch (opposite to STP)	Brake pedal released	7.5 to 15
TC (E24-28) - E1 (E24-2)	W (P-B) - W-B	Terminal TC of DLC3	Ignition switch ON	9 to 15
SIL (E24-5) - E1 (E24-2)	W (L-R) - W-B	Terminal SIL of DLC3	Connect intelligent tester II to DLC3	Pulse generation
SPD (E24-6) - E1 (E24-2)	V-R - W-B	Speed signal from combination meter	Ignition switch ON, rotate driving wheel slowly	Pulse generation (See waveform 7)
STA (E24-9) - E1 (E24-2)	SB (B-W) *4 - W-B SB (B-R) *3, *5 - W-B	Starter signal	Cranking	6.0 or more
CE (E24-79) - E1 (E24-2)	W (R-Y) - W-B	MIL	MIL illuminated	0 to 3
CE (E24-79) - E1 (E24-2)	W (R-Y) - W-B	MIL	MIL not illuminated	9 to 15
GIND (E24-19) - E1 (E24-2)	W (R) - W-B	Glow lamp	Glow lamp illuminated	0 to 3
GIND (E24-19) - E1 (E24-2)	W (R) - W-B	Glow lamp	Glow lamp not illuminated	9 to 15

*1: LHD
*2: RHD
*3: TMUK MADE
*4: TMC MADE
*5: TMMT MADE



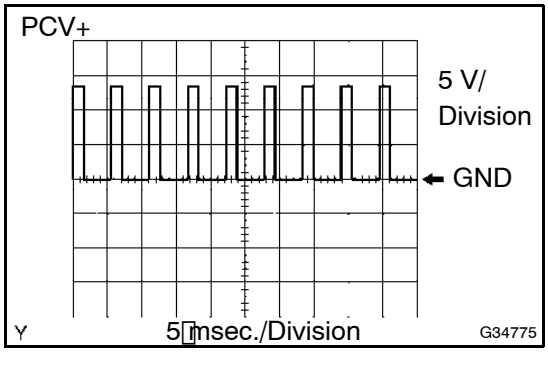
WAVEFORM 1

VRV for turbocharger signal

ECM Terminal Name	Between VNT and E1
Tester Range	5 V/Division, 1 msec./Division
Condition	Idling with warm engine

HINT:

The waveform changes depending on the VRV for turbocharger operation.



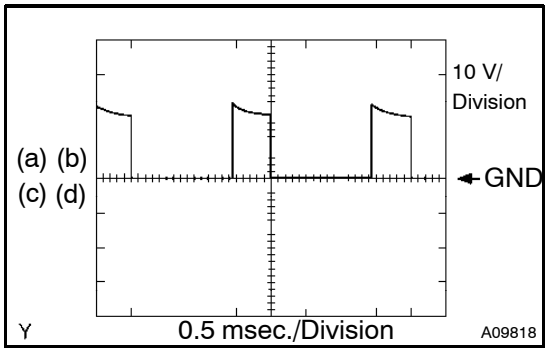
WAVEFORM 2

Fuel metering unit (supply pump) signal

ECM Terminal Name	Between PCV and E1
Tester Range	5 V/Division, 5 msec./Division
Condition	Idling with warm engine

HINT:

The waveform varies depending on the fuel metering unit operation.



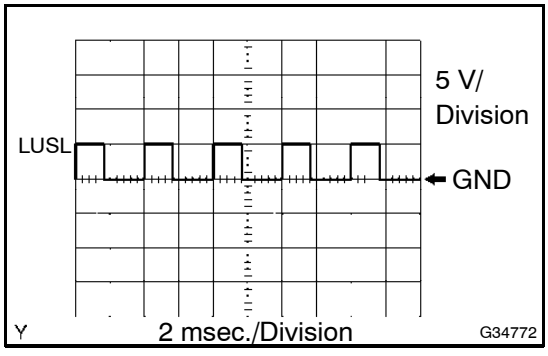
WAVEFORM 3

EGR valve signal

ECM Terminal Name	(a) Between EGR1 and E1 (b) Between EGR2 and E1 (c) Between EGR3 and E1 (d) Between EGR4 and E1
Tester Range	10 V/Division, 0.5 msec./Division
Condition	Repeating quick engine RPM acceleraions

HINT:

- The waveform varies depending on the EGR valve operation.
- When driving conditions become stable (e.g. while the engine is idling), the EGR valve closes and the waveform may disappear.



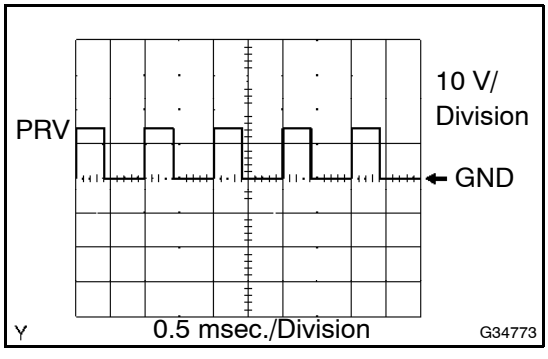
WAVEFORM 4

Intake shutter signal

ECM Terminal Name	Between LUSL and E1
Tester Range	5 V/Division, 2 msec./Division
Condition	Idling with warm engine

HINT:

The waveform varies depending on the intake shutter operation.



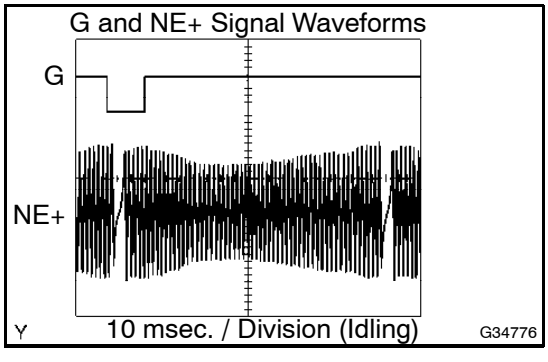
WAVEFORM 5

Pressure regulator valve signal

ECM Terminal Name	Between PRV and E1
Tester Range	10 V/Division, 0.5 msec./Division
Condition	Idling with warm engine

HINT:

The waveform varies depending on the pressure discharge valve operation.



WAVEFORM 6

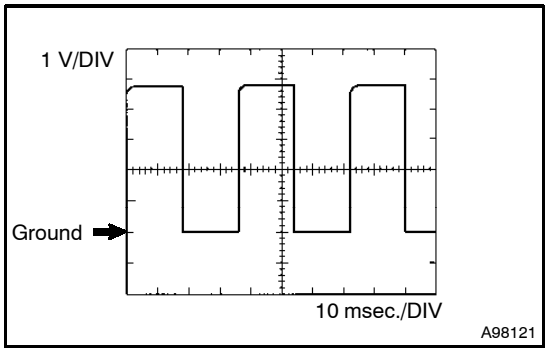
(a) Crankshaft position sensor signal

(b) Camshaft position sensor signal

ECM Terminal Name	(a) Between NE+ and NE (b) Between G and EG
Tester Range	10 msec./Division
Condition	Engine runnung

HINT:

The waveform varies depending on the engine revolution.



WAVEFORM 7

Vehicle speed signal

ECM Terminal Name	Between SPD and E1
Tester Range	1 V/Division, 10 msec./Division
Condition	Rotate driving wheel

HINT:

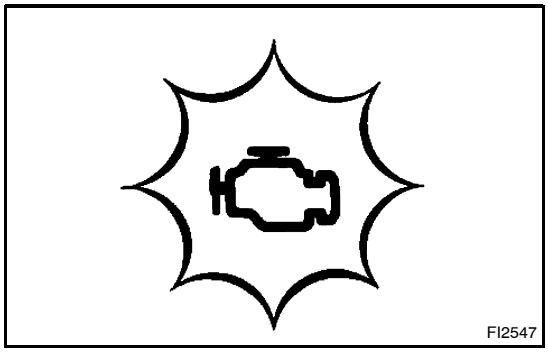
The wavelength becomes shorter as the vehicle speed increases.

05L7I-04

DIAGNOSIS SYSTEM

1. DESCRIPTION

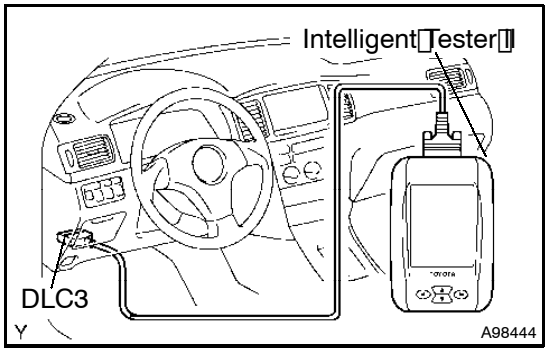
When troubleshooting Euro-OBD (On-Board Diagnostic) vehicle, an intelligent tester II or OBD scan tool must be connected to the DLC3 (Data Link Connector 3) of the vehicle. Various data in the vehicle's ECM (Engine Control Module) can be then read.


FI2547

Euro-OBD regulations require that the vehicle's on-board computer illuminates the MIL (Malfunction Indicator Lamp) in the instrument panel when the computer detects a malfunction in:

1) The emission control system and components.
2) The power train control components (which affect vehicle emissions).
3) The computer itself.

In addition, the applicable DTCs (Diagnostic Trouble Codes) prescribed by ISO 15031-4 are recorded in the ECM memory. If the malfunction does not recur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.



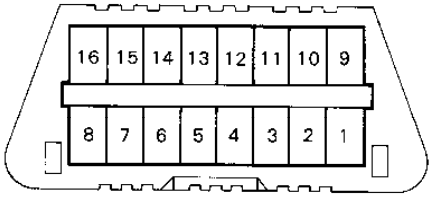
To check the DTCs, connect an intelligent tester II to the DLC3. The tester displays DTCs, freeze frame data, and variety of engine data. The DTCs and freeze frame data can be erased with the tester (refer to DTC CHECK/CLEAR on page 05-33).

2. NORMAL MODE AND CHECK MODE

The diagnosis system operates in normal mode during normal vehicle use. In normal mode, 2 trip detection logic is used to ensure accurate detection of malfunctions. Check mode is also available as an option for technicians. In check mode, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent problems (see page 05-7).

3. FREEZE FRAME DATA

The freeze frame data record the engine conditions (fuel system, calculated engine load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc) when a malfunction is detected. When troubleshooting, the freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.



DLC3

C52361

4. DLC3 (Data Link Connector 3)

The vehicle's ECM uses the ISO 9141-2 (Euro-OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031-03 and matches the ISO 9141-2 format.

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	9 to 14 V	Always

HINT:

The DLC3 is the interface prepared for reading various data from the vehicle's ECM. After connecting the cable of an intelligent tester II, turn the ignition switch to ON and turn the tester on.

If a communication failure message, NO INFORMATION AVAILABLE, is displayed on the tester, and the bus check also failed, a problem exists in either the vehicle or tester. In order to identify the location of the problem, connect the tester to another vehicle.

- If communication is normal: Inspect the DLC3 on the original vehicle.
- If communication is impossible: The trouble is probably with the tester itself. Consult the Service Department listed in the instruction manual.

5. BATTERY VOLTAGE

Battery voltage: 11 to 14 V

If the voltage is below 11 V, recharge the battery before proceeding.

6. MIL (Malfunction Indicator Lamp)

(a) The MIL illuminates when the ignition switch is turned to ON and the engine is not running.

HINT:

If the MIL is not illuminated, check the MIL circuit (refer to MIL CIRCUIT on page 05-1169).

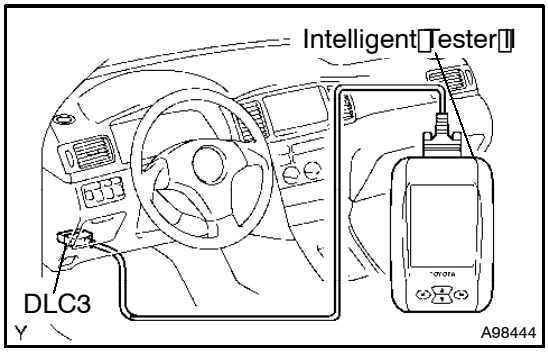
(b) The MIL should turn off when the engine is started. If the MIL remains illuminated, the diagnosis system has detected a malfunction or abnormality in the system.

05L6Q-04

DTC CHECK/CLEAR

NOTICE:

When the diagnosis system is changed from normal mode to check mode, or vice versa, all the DTCs and freeze frame data recorded in normal mode are erased. Before changing modes, always check and make a note of any DTCs and freeze frame data.



1. CHECK DTC (using an intelligent tester II)

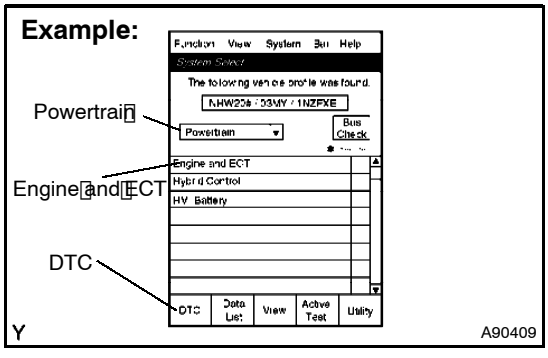
(a) Connect an intelligent tester II to the DLC3.

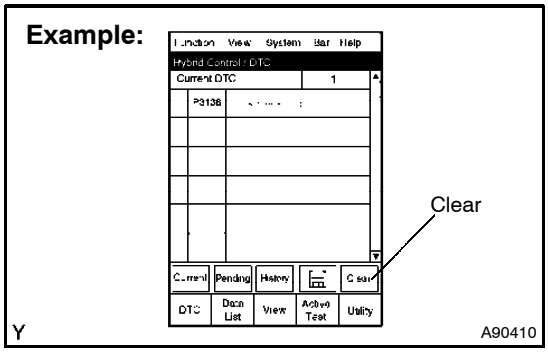
(b) Turn the ignition switch to ON and turn the tester ON.

(c) Select the following menu items: Powertrain / Engine and ECT / DTC.

(d) Check the DTC(s) and freeze frame data, and then write them down.

(e) See page 05-41 to confirm the details of the DTCs.





2. CLEAR DTCS AND FREEZE FRAME DATA (using the intelligent tester II)

(a) Connect the intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON (do not start the engine) and turn the tester ON.

(c) Select the following menu items: Powertrain / Engine and ECT / DTC / Clear.

(d) Erase DTCs and freeze frame data by pressing the yes button on the tester.

3. CLEAR DTCS AND FREEZE FRAME DATA (without using an intelligent tester II)

(a) Perform either one of the following operations.

(1) Disconnect the battery cable for more than 1 minute.

(2) Remove the EFI and ETCS fuses from the Relay Block (R/B) located inside the engine compartment for more than 1 minute.

NOTICE:

When disconnecting the battery cable, perform the INITIALIZE procedure.

05L6R-07

CHECK MODE PROCEDURE

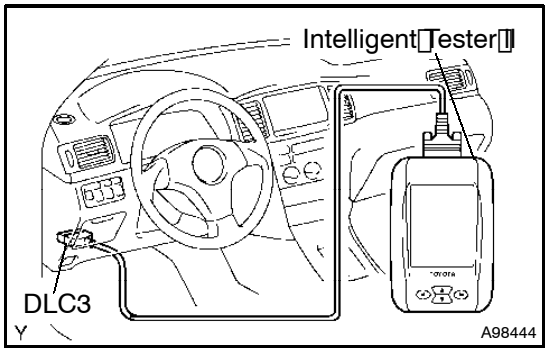
HINT:

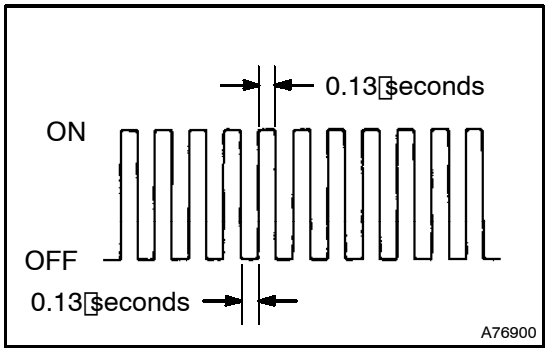
Compared to normal mode, check mode is more sensitive to malfunctions. Therefore, check mode can detect the malfunctions that cannot be detected by normal mode.

In check mode, the ECM sets DTCs using 1 trip detection logic.

NOTICE:

All the stored DTCs and freeze frame data are erased if: 1) the ECM is changed from normal mode to check mode or vice versa; 2) the ignition switch is turned from ON to ACC or OFF while in check mode. Before changing modes, always check and make a note of any DTCs and freeze frame data.





CHECK MODE PROCEDURE

(a) Make sure that the vehicle is in the following condition:
  (1) Battery voltage 11 V or more.
  (2) Throttle valve fully closed.
  (3) Transmission in the neutral position.
  (4) A/C switched OFF.

(b) Turn the ignition switch to OFF (where to ON).

(c) Connect an intelligent tester II to the DLC3.

(d) Turn the ignition switch to ON and turn the tester ON.

(e) Select the following menu items: Powertrain / Engine and ECT / Check Mode.

(f) Make sure the MIL flashes as shown in the illustration.

(g) Start the engine (the MIL should turn off).

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

(i) Check the DTC(s) and freeze frame data using the tester.

(j) After checking the DTC, inspect the applicable circuits (see page 05-41).

05DVX-11

FAIL-SAFE CHART

1. FAIL-SAFE CHART

If any of the following DTCs are set, the ECM enters fail-safe mode to allow the vehicle to be driven temporarily.

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0016 (05-47)	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A)	Stalls engine	Pass condition detected
P0045 (05-49)	Turbo/Super Charger Boost Control Solenoid Circuit / Open	Limits engine power	Ignition switch OFF
P0046 (05-51)	Turbo/Super Charger Boost Control Solenoid Circuit Range/Performance	Limits engine power	Ignition switch OFF
P0089 (05-52)	Fuel Pressure Regulator 1 Performance	Limits engine power	Ignition switch OFF
P0100 (05-55)	Mass or Volume Air Flow Circuit	Limits engine power	Ignition switch OFF
P0101 (05-61)	Mass or Volume Air Flow Circuit Range/Performance Problem	Limits engine power	Ignition switch OFF
P0110 (05-64)	Intake Air Temperature Circuit	—	—
P0115 (05-68)	Engine Coolant Temperature Circuit	—	—
P0116 (05-68)	Engine Coolant Temperature Circuit Range/Performance Problem	—	—
P0121 (05-73)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	Limits engine power	Ignition switch OFF
P0122 (05-77)	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	Limits engine power	Ignition switch OFF
P0123 (05-77)	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	Limits engine power	Ignition switch OFF
P0182 (05-80)	Fuel Temperature Sensor "A" Circuit Low Input	—	—
P0183 (05-80)	Fuel Temperature Sensor "A" Circuit High Input	—	—
P0190 (05-83)	Fuel Rail Pressure Sensor Circuit	Limits engine power	Ignition switch OFF
P0191 (05-86)	Fuel Rail Pressure Sensor Circuit Range/Performance	Limits engine power	Ignition switch OFF
P0201 (05-87)	Injector Circuit / Open - (Cylinder 1)	Stalls engine • 2 or more malfunctioning cylinders detected	Ignition switch OFF
P0202 (05-87)	Injector Circuit / Open - (Cylinder 2)	Stalls engine • 2 or more malfunctioning cylinders detected	Ignition switch OFF
P0203 (05-87)	Injector Circuit / Open - (Cylinder 3)	Stalls engine • 2 or more malfunctioning cylinders detected	Ignition switch OFF
P0204 (05-87)	Injector Circuit / Open - (Cylinder 4)	Stalls engine • 2 or more malfunctioning cylinders detected	Ignition switch OFF
P0234 (05-91)	Turbo/Super Charger Overboost Condition	Limits engine power	Ignition switch OFF
P0236 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit Range/Performance	Limits engine power	Ignition switch OFF
P0237 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit Low	Limits engine power	Ignition switch OFF
P0238 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit High	Limits engine power	Ignition switch OFF

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0252 (05-100)	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/ Injector)	Limits engine power	Ignition switch OFF
P0263 (05-103)	Cylinder 1 Contribution/Balance	—	—
P0266 (05-103)	Cylinder 2 Contribution/Balance	—	—
P0269 (05-103)	Cylinder 3 Contribution/Balance	—	—
P0272 (05-103)	Cylinder 4 Contribution/Balance	—	—
P0299 (05-91)	Turbo/Super Charger Underboost	Limits engine power	Ignition switch OFF
P0300 (05-103)	Random/Multiple Cylinder Misfire Detected	—	—
P0335 (05-107)	Crankshaft Position Sensor "A" Circuit	Stalls engine	Pass condition detected
P0340 (05-111)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	—	—
P0380 (05-114)	Glow Plug/Heater Circuit "A"	—	—
P0400 (05-117)	Exhaust Gas Recirculation Flow	—	—
P0403 (05-122)	Exhaust Gas Recirculation Control Circuit	—	—
P0487 (05-73)	Exhaust Gas Recirculation Throttle Position Control Circuit	Limits engine power	Ignition switch OFF
P0488 (05-73)	Exhaust Gas Recirculation Throttle Position Control Range/Performance	Limits engine power	Ignition switch OFF
P0500 (05-124)	Vehicle Speed Sensor "A"	—	—
P0603 (05-127)	Internal Control Module Keep Alive Memory (KAN) Error	—	—
P0605 (05-51)	Internal Control Module Read Only Memory (ROM) Error	Stalls engine or limits engine power	Ignition switch OFF
P0642 (05-128)	Sensor Reference Voltage "A" Circuit Low	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF
P0643 (05-128)	Sensor Reference Voltage "A" Circuit High	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF
P0652 (05-131)	Sensor Reference Voltage "B" Circuit Low	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF
P0653 (05-131)	Sensor Reference Voltage "B" Circuit High	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF
P0685 (05-133)	ECM/PCM Power Relay Control Circuit / Open	—	—
P0698 (05-136)	Sensor Reference Voltage "C" Circuit Low	Limits engine power	Ignition switch OFF
P0699 (05-136)	Sensor Reference Voltage "C" Circuit High	Limits engine power	Ignition switch OFF
P0704 (05-139)	Clutch Switch Input Circuit Malfunction	—	—
P1120 (05-141)	Accelerator Pedal Position Sensor Circuit Malfunction	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P1121 (05-145)	Accelerator Pedal Position Sensor Range/Performance Problem	Limits engine power • Accelerator position sensor is fixed at 0 %	Ignition switch OFF
P1228 (05-100)	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/ Injector)	Limits engine power	Ignition switch OFF
P1229 (05-146)	Fuel Pump System	Stalls engine or limits engine power	Ignition switch OFF
P1271 (05-52)	Fuel Regulator Circuit Malfunction (EDU Drive)	Stalls engine	Ignition switch OFF
P1272 (05-153)	Fuel Pressure Regulator Malfunction	Stalls engine or limits engine power	Ignition switch OFF
P1520 (05-153)	Stop Light Switch Circuit Malfunction	—	—
P1600 (05-157)	ECM BATT Malfunction	—	—
P1633 (05-51)	ECM Malfunction (ETCs Circuit)	Stalls engine	Ignition switch OFF
P2146 (05-87)	Fuel Injector Group "A" Supply Voltage Circuit / Open	Stalls engine	Ignition switch OFF
P2227 (05-160)	Barometric Pressure Circuit Range/ Performance	—	—

05DVU-11

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

By reading the Data List displayed on an intelligent tester II, you can check values, including those of the switches, sensors, and actuators, without removing any parts. Reading the Data List as the first step of troubleshooting is one method of shortening diagnostic time.

NOTICE:

In the table below, the values listed under Normal Conditions are for reference only. Do not depend solely on these values when determining whether or not a part is faulty.

(a) Warm up the engine.
(b) Turn the ignition switch to OFF.
(c) Connect an intelligent tester II to the DLC3.
(d) Turn the ignition switch to ON.
(e) Turn the tester ON.
(f) Select the following menu items: Powertrain / Engine and ECT / Data List.
(g) Check the values by referring to the following table.

Intelligent Tester II Display (Abbreviation)	Measurement Item: Range (Display)	Normal Conditions *	Diagnostic Notes
Injection Volume (INJ VOLUME)	Injection volume: Min.: 0 mm^3, Max.: 1279.98 mm^3	3 to 8 mm^3: Idling	—
Engine SPD (ENGINE SPD)	Engine speed: Min.: 0 rpm, Max.: 16383.75 rpm	720 to 820 rpm: Idling	—
MAF (MAF)	Air flow rate from Mass Air Flow (MAF) meter status: Min.: 0 gm/s, Max.: 655.35 gm/s	• 5.0 to 6.0 gm/s: Idling • 13.1 to 18.9 gm/s: Running without load (2,500 rpm)	If value approximately 0.0 gm/s: • MAF meter power source circuit open • VG circuit open or shorted If valve 135 gm/s or more: • E2G circuit open
PIM (PIM)	Absolute pressure inside intake manifold: Min.: 0 kPa, Max.: 255 kPa	• 85 to 110 kPa: Idling • 90 to 115 kPa: Engine running at 2,000 rpm	—
Coolant Temp (COOLANT TEMP)	Engine coolant temperature: Min.: -40°C, Max.: 215°C	80° to 95°C (176° to 203°F): After warming up engine	If value -40°C or 140°C, sensor circuit open or shorted
Intake Air (INTAKE AIR)	Intake air temperature: Min.: -40°C, Max.: 215°C	Equivalent to temperature at intake manifold	
Accel Position (ACCEL POSITION)	Accelerator position status: Min.: 0 %, Max.: 100 %	• 0 %: Accelerator pedal released • 100 %: Accelerator pedal depressed	Read value with ignition switch ON (Do not start engine)
Vehicle SPD (VEHICLE SPD)	Vehicle speed: Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
Throttle POS (THROTTLE POS)	Throttle step position: Min.: 0 %, Max.: 100 %	• 100 %: Throttle fully closed • 0 %: Throttle fully open	Read value with ignition switch ON (Do not start engine)
Common Rail Pressure (COMN RAIL PRESS)	Common rail pressure: Min.: 0 MPa, Max.: 255 MPa	25 to 36 MPa: Idling	—
Revised Injection Volume #1 (INJ VOL FB #1)	Injection volume correction for cylinder 1: Min.: -10 mm^3, Max.: 40 mm^3	-2.0 to 2.0 mm^3: Idling	—
Revised Injection Volume #2 (INJ VOL FB #2)	Injection volume correction for cylinder 2: Min.: -10 mm^3, Max.: 40 mm^3	-2.0 to 2.0 mm^3: Idling	—

Intelligent Tester II Display (Abbreviation)	Measurement Item: Range (Display)	Normal Conditions *	Diagnostic Notes
Revised Injection Volume #3 (INJ VOL FB #3)	Injection volume correction for cylinder 3: Min.: -10 mm^3, Max.: 40 mm^3	-2.0 to 2.0 mm^3: Idling	—
Revised Injection Volume #4 (INJ VOL FB #4)	Injection volume correction for cylinder 4: Min.: -10 mm^3, Max.: 40 mm^3	-2.0 to 2.0 mm^3: Idling	—
M-INJ/PILOT ON (M-INJ/PILOT ON)	M-INJ/PILOT ON: Min.: 0 μs, Max.: 65,535 μs	450 to 750 us: Idling	—
Pilot-Injection (PILOT-INJ)	Pilot-injection: Min.: 0 μs, Max.: 65,535 μs	350 to 550 μs: Idling	—
Stop Light SW (STOP LIGHT SW)	Stop lamp switch: ON or OFF	• ON: Brake pedal depressed • OFF: Brake pedal released	—
Starter SIG (STARTER SIG)	Starter signal: ON or OFF	ON: Cranking	—
Check Mode (CHECK MODE)	Check mode: ON or OFF	ON: Check mode ON	—
EGR Step POS (EGR STEP POS)	EGR step position status: Min.: 0 step, Max.: 125 step	45 to 65 step: Idling	—
Electrical Load Signal (ELECT LOAD SIG)	Electrical load signal: ON or OFF	ON: Deffoger switch ON	—
Clutch Upper Switch (CLUTCH UPPER SW)	Clutch switch: ON or OFF	• ON: Clutch pedal depressed • OFF: Clutch pedal released	—
MIL ON Run Distance (MIL ON RUN DIST)	Distance since activation of MIL: Min.: 0 km, Max.: 65,535 km	0 km: When ther is no DTC	—
#Codes (#CODES)	Number of memoriesed DTC codes	0	—

*: If no idling conditions are specified, the shift lever should be in the neutral position, the A/C switch and all accessory switches should be OFF.

2. ACTIVE TEST

HINT:

Performing an Active Test enables components including the relays, VSV (Vacuum Switching Valve), and actuators, to be operated without removing any parts. The Active Test can be performed with an intelligent tester II. Active Test as a first step of troubleshooting is one method of shortening diagnostic time.

The Data List can be displayed during Active Tests.

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON.
(c) Turn the tester ON.
(d) Select the following menu items: Powertrain / Engine and ECT / Active Test.
(e) Perform the Active Tests by referring to the following table.

Intelligent Tester II Display (Abbreviation)	Test Details	Control Range	Diagnostic Notes
Fuel leak test (FUEL LEAK TEST)	Pressurize common rail internal fuel pressure, in order to see if fuel leaks	ON/OFF	• Fuel pressure inside common rail pressurized to 135 MPa and engine speed increased to 2,000 rpm when ON selected • Above conditions preserved while test ON
Injector cut #1 (INJECTOR CUT #1)	Cut off fuel injection from No. 1 injector	ON/OFF	Fuel injection stopped while test ON
Injector cut #2 (INJECTOR CUT #2)	Cut off fuel injection from No. 2 injector	ON/OFF	As above
Injector cut #3 (INJECTOR CUT #3)	Cut off fuel injection from No. 3 injector	ON/OFF	As above
Injector cut #4 (INJECTOR CUT #4)	Cut off fuel injection from No. 4 injector	ON/OFF	As above

054JD-07

DIAGNOSTIC TROUBLE CODE CHART

HINT:

The parameters listed in the chart are for reference only. Factors such as instrument type may cause readings to differ slightly from the stated values.

If any DTCs are displayed during a check mode DTC check, check the circuit for the DTCs listed in the table below. For details of each DTC, refer to the page indicated.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0016 (05-47)	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system malfunction (jumped teeth of timing chain, chain stretched) • Camshaft timing gear • Sensor plate (crankshaft timing gear) • Timing chain • Valve Clearance • ECM	○	○
P0045 (05-49)	Turbo/Super Charger Boost Control Solenoid Circuit / Open	• VRV (Vacuum Regulating Valve) itself • Open or short in VRV circuit • ECM	○	○
P0046 (05-51)	Turbo/Super Charger Boost Control Solenoid Circuit Range/Performance	• ECM	○	○
P0089 (05-52)	Fuel Pressure Regulator 1 Performance	• Open or short in pressure control valve circuit • Open or short in pressure control valve • ECM	○	○
P0100 (05-55)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • Contamination in mass air flow meter • ECM	○	○
P0101 (05-61)	Mass or Volume Air Flow Circuit Range/Performance Problem	• Open or short in mass air flow meter circuit • Mass air flow meter • Contamination in mass air flow meter • EGR valve assembly • Open or short in EGR circuit • EGR passage • Open or short in intake shutter control motor circuit • Intake shutter • Vacuum hose • ECM	○	○
P0110 (05-64)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Short in power source circuit • Intake air temperature sensor (built into mass air flow meter) • ECM	○	○
P0115 (05-68)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (05-68)	Engine Coolant Temperature Circuit Range/Performance Problem	• Engine coolant temperature sensor • ECM	○	○
P0121 (05-73)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Intake shutter stuck • Intake shutter does not move smoothly • Open or short in intake shutter circuit • Open or short in intake shutter position sensor circuit • Intake shutter position sensor (built in intake shutter valve) • ECM	○	○
P0122 (05-77)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Intake shutter position sensor • Open or short in VLU circuit • Open in VC circuit • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0123 (05-77)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Intake shutter position sensor • Open in E2 circuit • VC and VLU circuits are short-circuited • ECM	○	○
P0182 (05-80)	Fuel Temperature Sensor "A" Circuit Low Input	• Open or short in fuel temperature sensor circuit • Fuel temperature sensor • ECM	○	○
P0183 (05-80)	Fuel Temperature Sensor "A" Circuit High Input	• Open or short in fuel temperature sensor circuit • Fuel temperature sensor • ECM	○	○
P0190 (05-83)	Fuel Rail Pressure Sensor Circuit	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM	○	○
P0191 (05-86)	Fuel Rail Pressure Sensor Circuit Range/Performance	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in pressure control valve circuit • Pressure control valve • ECM	○	○
P0201 (05-87)	Injector Circuit / Open - (Cylinder 1)	• Open or short in injector circuit (cylinder No. 1) • Injector (cylinder No. 1) • ECM	○	○
P0202 (05-87)	Injector Circuit / Open - (Cylinder 2)	• Open or short in injector circuit (cylinder No. 2) • Injector (cylinder No. 2) • ECM	○	○
P0203 (05-87)	Injector Circuit / Open - (Cylinder 3)	• Open or short in injector circuit (cylinder No. 3) • Injector (cylinder No. 3) • ECM	○	○
P0204 (05-87)	Injector Circuit / Open - (Cylinder 4)	• Open or short in injector circuit (cylinder No. 4) • Injector (cylinder No. 4) • ECM	○	○
P0234 (05-91)	Turbo/Super Charger Overboost Condition	• VRV (Vacuum Regulating Valve) • Open or short in VRV circuit • Turbocharger assembly • EGR valve assembly • Manifold absolute pressure sensor • Vacuum hose • ECM	○	○
P0236 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit Range/Performance	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0237 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit Low	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0238 (05-97)	Turbo/Super Changer Boost Sensor "A" Circuit High	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0252 (05-100)	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/Injector)	• Open or short in fuel metering unit circuit • Fuel metering unit • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0263 (05-103)	Cylinder 1 Contribution/Balance	Main Trouble Area • Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance Related Trouble Area • Valve timing • ECM • Low quality fuel • Injector compensation code	○	○
P0266 (05-103)	Cylinder 2 Contribution/Balance	Main Trouble Area • Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance Related Trouble Area • Valve timing • ECM • Low quality fuel • Injector compensation code	○	○
P0269 (05-103)	Cylinder 3 Contribution/Balance	Main Trouble Area • Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance Related Trouble Area • Valve timing • ECM • Low quality fuel • Injector compensation code	○	○
P0272 (05-103)	Cylinder 4 Contribution/Balance	Main Trouble Area • Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance Related Trouble Area • Valve timing • ECM • Low quality fuel • Injector compensation code	○	○
P0299 (05-91)	Turbo/Super Charger Under-boost	• VRV (Vacuum Regulating Valve) • Open or short in VRV circuit • Turbocharger assembly • EGR valve assembly • Intake shutter • Manifold absolute pressure sensor • Vacuum hose • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0300 (05-103)	Random/Multiple Cylinder Misfire Detected	Main Trouble Area • Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance Related Trouble Area • Valve timing • ECM • Low quality fuel • Injector compensation code	○	○
P0335 (05-107)	Crankshaft Position Sensor "A" Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft position sensor plate • ECM	○	○
P0340 (05-111)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	• Open or short in CMP sensor circuit • CMP sensor • Camshaft timing gear or sprocket • ECM	○	○
P0380 (05-114)	Glow Plug/Heater Circuit "A"	• Glow plug relay • ECM	○	○
P0400 (05-117)	Exhaust Gas Recirculation Flow	• Open or short in EGR circuit • EGR valve assembly • EGR passage • Intake shutter • Mass air flow meter • Contamination in mass air flow meter • ECM	○	○
P0403 (05-122)	Exhaust Gas Recirculation Control Circuit	• Open or short in EGR circuit • EGR valve assembly • ECM	○	○
P0487 (05-73)	Exhaust Gas Recirculation Throttle Position Control Circuit	• Open or short in intake shutter circuit • ECM	○	○
P0488 (05-73)	Exhaust Gas Recirculation Throttle Position Control Range/ Performance	• Intake shutter stuck • Intake shutter does not move smoothly • Open or short in intake shutter circuit • Open or short in intake shutter position sensor circuit • Intake shutter position sensor (built in intake shutter valve) • ECM	○	○
P0500 (05-124)	Vehicle Speed Sensor "A"	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM	○	○
P0603 (05-127)	Internal Control Module Keep Alive Memory (KAN) Error	• Injector compensation code • ECM	○	○
P0605 (05-51)	Internal Control Module Read Only Memory (ROM) Error	• ECM	○	○
P0642 (05-128)	Sensor Reference Voltage "A" Circuit Low	• Intake shutter position sensor • Open or short in intake shutter position sensor circuit • Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM	○	○
P0643 (05-128)	Sensor Reference Voltage "A" Circuit High	• Intake shutter position sensor • Open or short in intake shutter position sensor circuit • Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0652 (05-131)	Sensor Reference Voltage "B" Circuit Low	• Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM	○	○
P0653 (05-131)	Sensor Reference Voltage "B" Circuit High	• Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM	○	○
P0685 (05-133)	ECM/PCM Power Relay Control Circuit / Open	• Open in EFI MAIN relay circuit • EFI MAIN relay • ECM	—	○
P0698 (05-136)	Sensor Reference Voltage "C" Circuit Low	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0699 (05-136)	Sensor Reference Voltage "C" Circuit High	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○	○
P0704 (05-139)	Clutch Switch Input Circuit Malfunction	• Open or short in clutch switch circuit • Clutch switch circuit • ECM	○	○
P1120 (05-141)	Accelerator Pedal Position Sensor Circuit Malfunction	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P1121 (05-145)	Accelerator Pedal Position Sensor Range/Performance Problem	• Accelerator pedal position sensor	○	○
P1228 (05-100)	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/Injector)	• Open or short in fuel metering unit circuit • Fuel metering unit • ECM	○	○
P1229 (05-146)	Fuel Pump System	• Supply pump (fuel metering unit) • Short in supply pump (fuel metering unit) circuit • Open in pressure regulator valve circuit • Pressure regulator valve • Fuel filter element is clogged • Fuel leak • Injector • Lack of fuel • ECM	○	○
P1271 (05-52)	Fuel Regulator Circuit Malfunction (EDU Drive)	• Open or short in pressure control valve circuit • Open or short in pressure control valve • ECM	○	○
P1272 (05-153)	Fuel Pressure Regulator System Malfunction	• Supply pump (fuel metering unit) • Short in supply pump (fuel metering unit) circuit • Open in pressure regulator valve circuit • Pressure regulator valve • Fuel filter element is clogged • Fuel leak • Injector • Lack of fuel • ECM	○	○
P1520 (05-153)	Stop Light Switch Circuit Malfunction	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM	○	○

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1600 (05-157)	ECM BATT Malfunction	• Open or short in +B terminal circuit • Tired battery • Electrical overwork • Generator • Battery (If 24 V battery is fitted, DTC P1600 is output) • ECM	○	○
P1633 (05-51)	ECM Malfunction (ETCS Circuit)	• ECM	○	○
P2146 (05-87)	Fuel Injector Group "A" Supply Voltage Circuit / Open	• Open or short in injector circuit • Injector • ECM	○	○
P2227 (05-160)	Barometric Pressure Circuit Range/Performance	• ECM	○	○

*: "○": MIL (Malfunction Indicator Lamp) illuminates, "—": MIL does not illuminate.

DTC	P0016	CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A)

CIRCUIT DESCRIPTION

Refer to DTCs P0335 on page 05-107 and DTC P0340 on page 05-111.

DTC No.	DTC Detection Condition	Trouble Areas
P0016	Phase deviation in crankshaft and camshaft position sensor signals (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Mechanical system malfunction (jumped teeth of timing chain, chain stretched) • Camshaft timing gear • Sensor plate (crankshaft timing gear) • Timing chain • Valve Clearance • ECM

HINT:

- DTC P0016 is set when the engine is cranked 12 revolutions or more.
- This DTC shows that the camshaft has been installed toward the crankshaft at an incorrect angle (for example: due to a jumped tooth of the timing chain)

WIRING DIAGRAM

Refer to DTCs P0335 on page 05-107 and DTC P0340 on page 05-111.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK VALVE CLEARANCE (See page 14-6)

NG → ADJUST VALVE CLEARANCE (See page 14-6)

OK

2	CHECK CHAIN SUB-ASSY (See page 14-45)

NG → REPAIR OR REPLACE

OK

3	CHECK CAMSHAFT TIMING GEAR ASSY (TOOTH OF SENSOR PLATE)

(a) Check the tooth of the sensor plate.
OK: No deformation on the tooth of the sensor plate.

NG → **REPLACE CAMSHAFT TIMING GEAR ASSY (See page 14-45)**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE (TEETH OF SENSOR PLATE (CRANCSHAFT TIMING GEAR))

(a) Check the tooth of the sensor plate.
OK: No deformation on the tooth of the sensor plate.

NG → **REPLACE CRANKSHAFT POSITION SENSOR PLATE (CRANKSHAFT TIMING GEAR) (See page 14-45)**

OK

REPLACE ECM (See page 10-15)

DTC	P0045	TURBO/SUPER CHARGER BOOST CONTROL SOLENOID CIRCUIT / OPEN

CIRCUIT DESCRIPTION

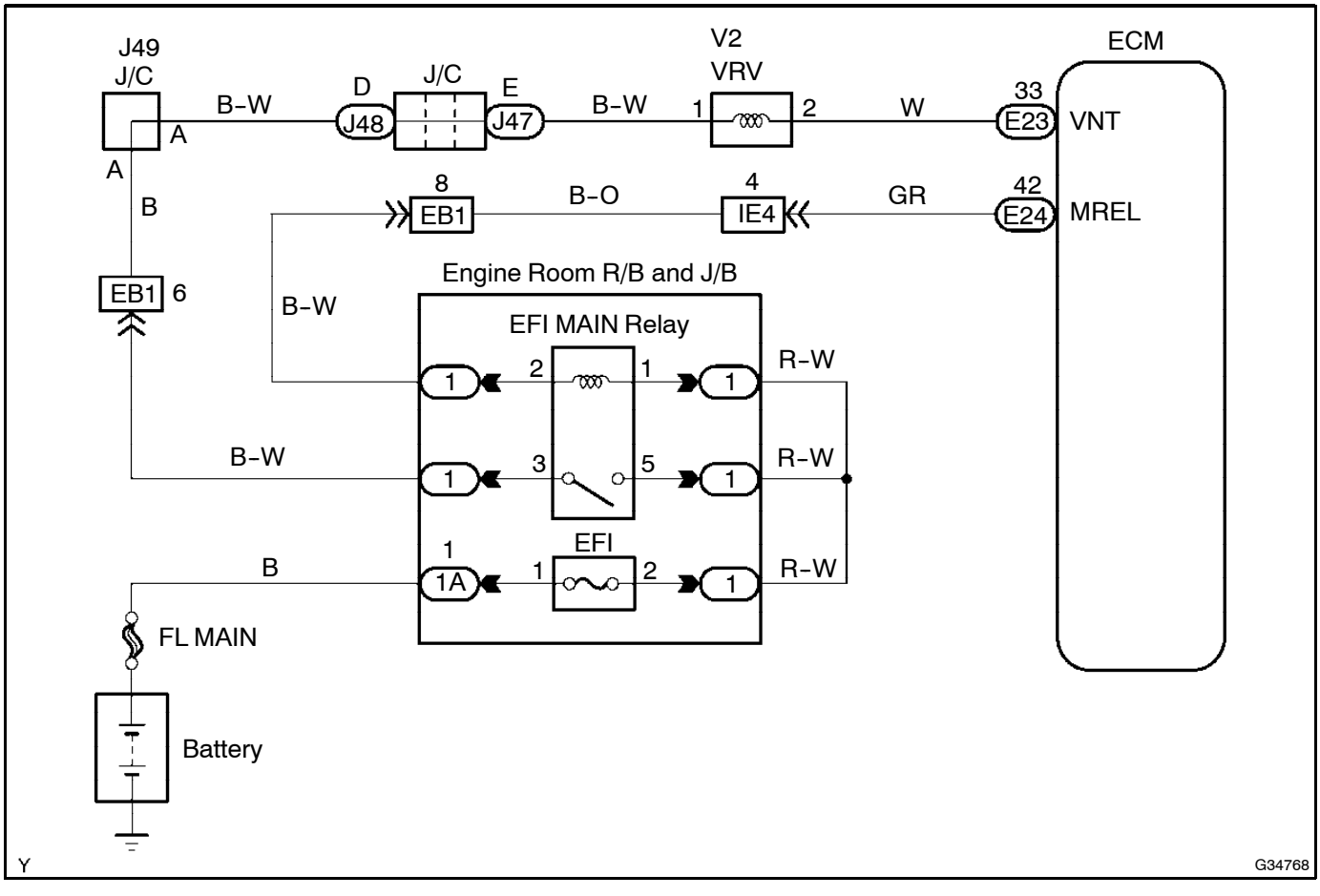
The ECM optimizes the balance between the back pressure and boost pressure so that the balance is most appropriate for the engine speed and load, by performing two functions. It signals the VRV (Vacuum Regulating Valve) to open and close the variable nozzle vane that is built around the circumference of the turbine, and adjusts the flow rate and pressure of the exhaust gas that is input to the turbocharger.

DTC No.	DTC Detection Condition	Trouble Areas
P0045	Open or short in VRV circuit for 3.0 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• VRV (Vacuum Regulating Valve) itself • Open or short in VRV circuit • ECM

HINT:

DTC P0045 is set when the ignition switch is in the ON position.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	INSPECT VACUUM REGULATING VALVE ASSY (See page 13-5)

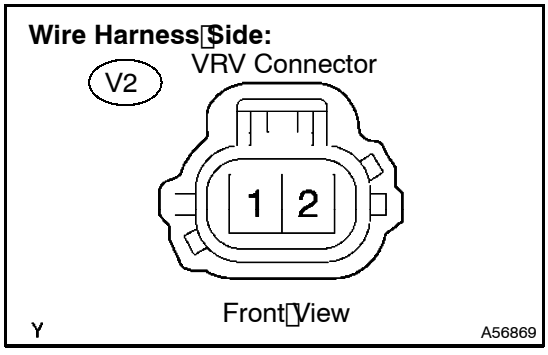
OK:

The VRV (Vacuum Regulating Valve) resistance is within the standard range and the VRV operates normally.

NG	REPLACE VACUUM REGULATING VALVE ASSY (See page 11-8)

OK

2	CHECK HARNESS AND CONNECTOR (VRV - EFI MAIN RELAY)



(a) Disconnect the V2 VRV connector.
(b) Disconnect the E23 ECM connector.
(c) Remove the EFI MAIN relay from the engine room R/B.
(d) Check the resistance.

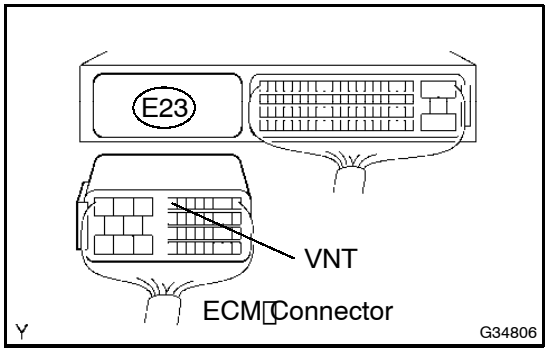
Standard (Check for open):

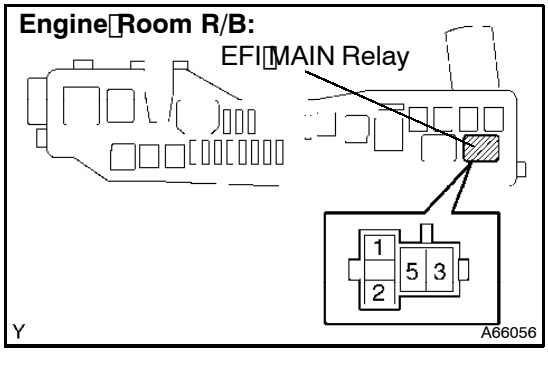
Tester Connection	Specified Condition
VNT (E23-33) - (V2-2)	Below 1 Ω
EFI MAIN relay (3) - (V2-1)	

Standard (Check for short):

Tester Connection	Specified Condition
VNT (E23-33) or (V2-2) - Body ground	10 kΩ or higher
EFI MAIN relay (3) or (V2-1) - Body ground	

(e) Reconnect the VRV connector.
(f) Reconnect the ECM connector.
(g) Reinstall the EFI MAIN relay.





NG	REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM (See page 10-15)

DTC	P0046	TURBO/SUPER CHARGER BOOST CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE

DTC	P0605	INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

DTC	P1633	ECM MALFUNCTION (ETCS CIRCUIT)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0046 P0605 P1633	ECM internal error (The MIL is illuminated as well as a DTC being set immediately if ECM malfunction is detected)	• ECM

HINT:

These DTCs are set when the ignition switch is in the ON position.

INSPECTION PROCEDURE

REPLACE ECM (See page 10-15)

DTC	P0089	FUEL PRESSURE REGURATOR 1 PERFORMANCE

DTC	P1271	FUEL REGULATOR CIRCUIT MALFUNCTION (EDU DRIVE)

CIRCUIT DESCRIPTION

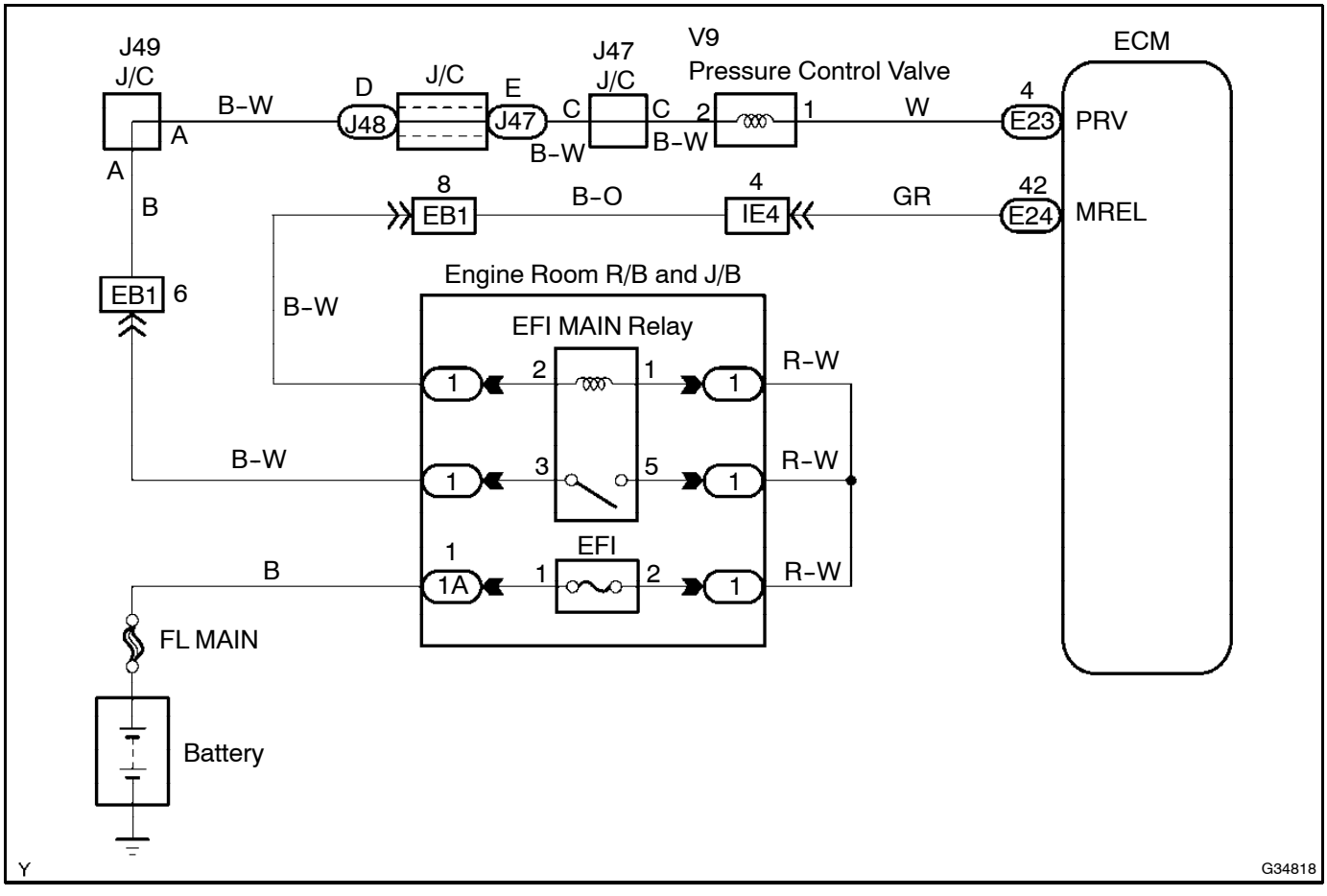
Based on signals from the ECM, the pressure control valve opens when sudden deceleration occurs, or when the ignition switch is OFF, to prevent the fuel pressure from becoming too high.

DTC No.	DTC Detection Condition	Trouble Areas
P0089	• Open or short in pressure control valve circuit (DTC P1271 set simultaneously) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected) • ECM internal error (DTC P1271 not set) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in pressure control valve circuit • Open or short in pressure control valve • ECM
P1271	• Open or short in pressure control valve circuit (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in pressure control valve circuit • Open or short in pressure control valve • ECM

HINT:

These DTCs are set when the ignition switch is in the ON position.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ OUTPUT DTCS (DTC P0089 AND/OR P1271)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

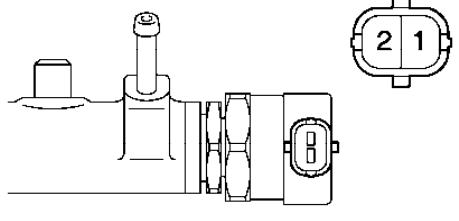
Display (DTC Output)	Proceed To
P1271, or "P0089 and P1271"	A
Only P0089	B

B → REPLACE ECM (See page 10-15)

A

2	INSPECT COMMON RAIL ASSY (PRESSURE CONTROL VALVE ASSY)

Component Side:



Pressure Control Valve

T A98723

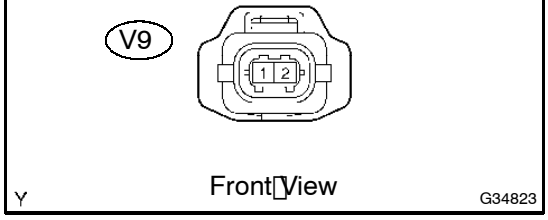
(a) Disconnect the V9 pressure control valve connector.
(b) Measure the resistance between the terminals of the pressure control valve.
Standard: 3.42 to 3.78 Ω at 20°C (68°F)
(c) Reconnect the pressure control valve connector.

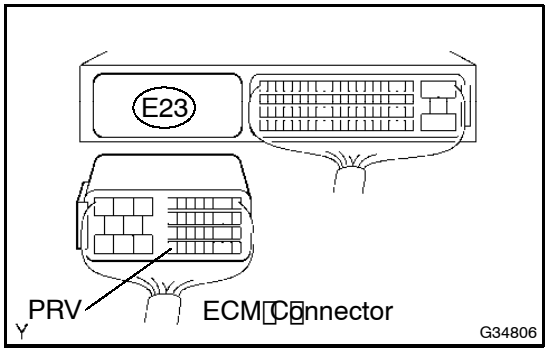
NG → REPLACE COMMON RAIL ASSY (PRESSURE CONTROL VALVE) (See page 11-20)

OK

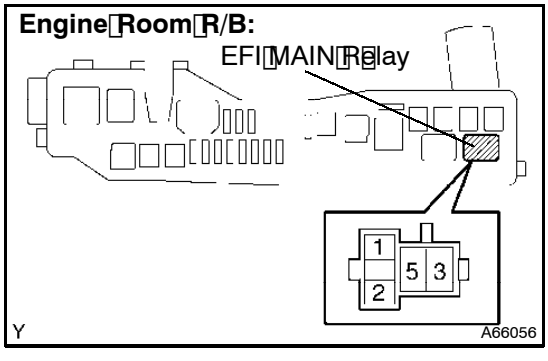
3	CHECK HARNESS AND CONNECTOR (PRESSURE CONTROL VALVE - ECM, PRESSURE CONTROL VALVE valve - EFI MAIN RELAY)

Wire Harness Side:





Engine Room R/B:



(a) Disconnect the V9 pressure control valve connector.
(b) Disconnect the E23 ECM connector.
(c) Remove the EFI MAIN relay from the engine room R/B.
(d) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PRV (E23-4) - (V9-1)	Below 1 Ω
EFI MAIN relay (3) - (V9-2)	

Standard (Check for short):

Tester Connection	Specified Condition
PRV (E23-4) or (V9-1) - Body ground	10 kΩ or higher
EFI MAIN relay (3) or (V9-2) - Body ground	

(e) Reconnect the pressure control valve connector.
(f) Reconnect the ECM connector.
(g) Reinstall the EFI MAIN relay.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK →

REPLACE ECM (See page 10-15)

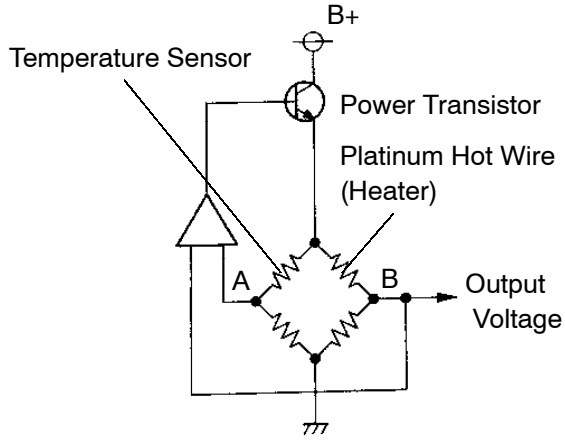
DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

CIRCUIT DESCRIPTION

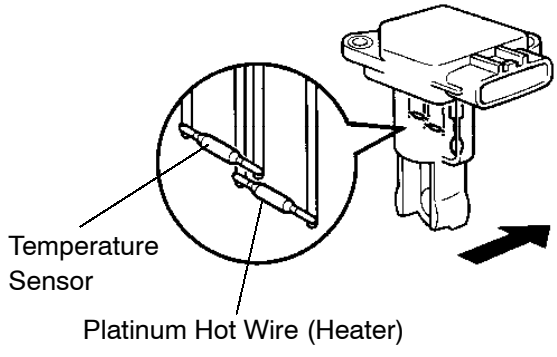
The Mass Air Flow (MAF) meter is a sensor that measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provides a proper air-fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the flow of the air passing through the sensor. The ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, and the power transistor is controlled so that the potential of A and B remains equal to maintain the predetermined temperature.



FI6929
A09074



A94508

HINT:

When the mass air flow meter output is outside the normal range, the ECM determines this as a malfunction.

DTC No.	DTC Detection Condition	Trouble Area
P0100	Condition (a) or (b) continues for 2.0 seconds or more: (a) VG less than 0.14 V (b) VG more than 4.8 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in mass air flow meter circuit • Mass air flow meter • Contamination in mass air flow meter • ECM

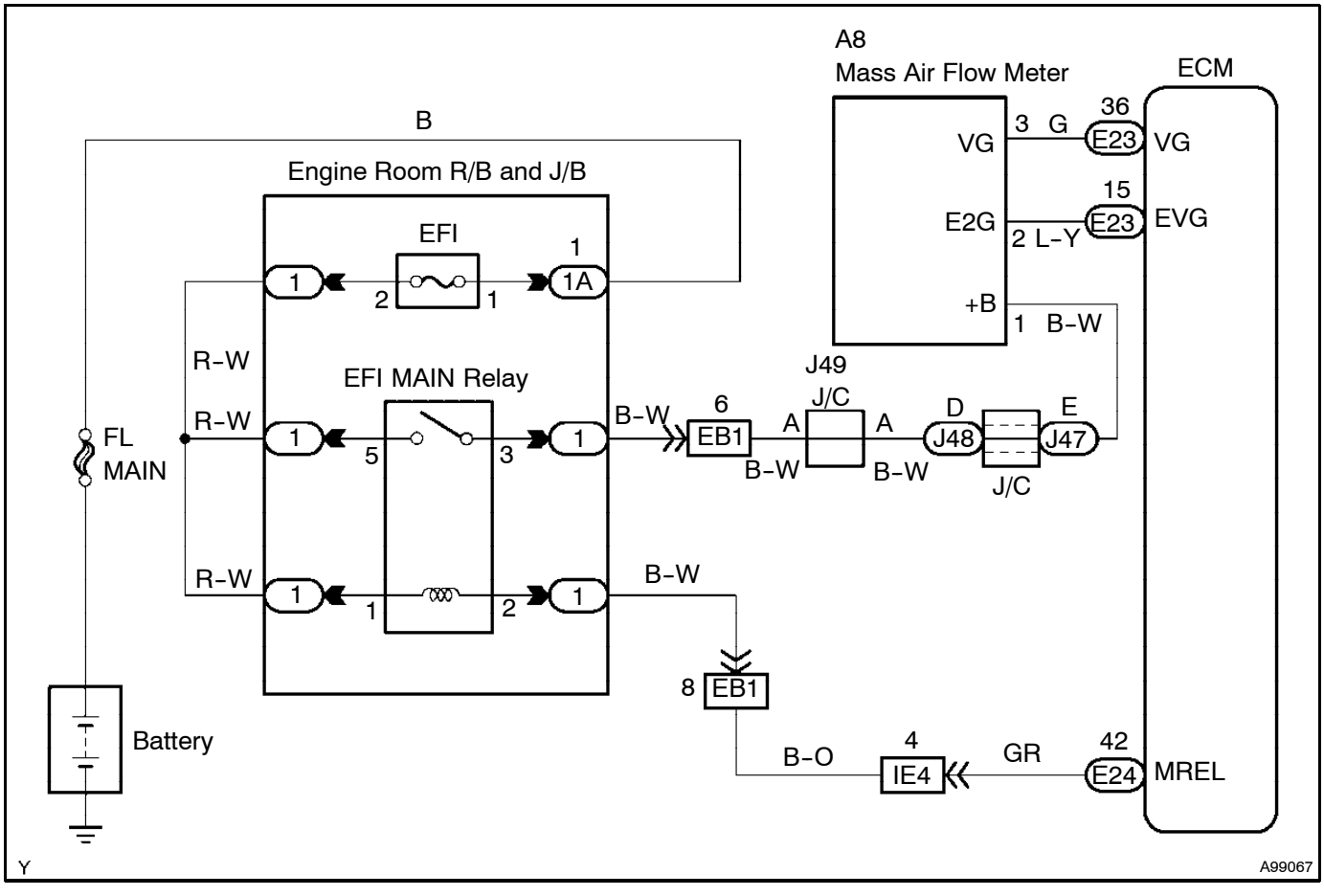
HINT:

DTC P0100 is set while idling for 10 seconds or more after the engine was revved up to 3,000 rpm.

HINT:
When DTC P0100 is detected, check the air-flow ratio by selecting Powertrain / Engine and ECT / Data List / AFM on the intelligent tester II.

Air Flow Value (g/second)	Malfunction
Always approximately 0.3 or less	• Open in mass air flow meter power source circuit • Open or short in VG circuit
Always 110.0 or more	• Open in EVG circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ VALUE USING INTELLIGENT TESTER II (MASS AIR FLOW RATE)

(a) Connect an intelligent tester II to the DLC3.
(b) Start the engine.
(c) Turn the intelligent tester II ON.
(d) Select the following menu items: Powertrain / Engine and ECT / Data List / AFM.
(e) Read the value.

Result:

Mass Air Flow Rate (g/second)	Proceed To
Always approximately 0.3 or less	A
Always 110.0 or more	B
Between 1.0 and 109.0 (*1)	C

*1: The value must be changed when the throttle valve is open or closed.

B → **Go to step 7**

C → **CHECK FOR INTERMITTENT PROBLEMS** (See page 05-7)

A

2	INSPECT MASS AIR FLOW METER (VISUAL INSPECTION)

OK: The sensor area of the mass air flow meter has not been contaminated.

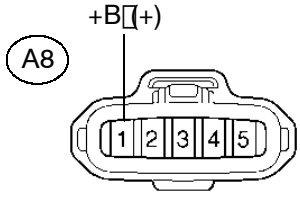
NG → **REPLACE MASS AIR FLOW METER**

OK

3	INSPECT MASS AIR FLOW METER (POWER SOURCE)

Wire Harness Side:

Mass Air Flow Meter Connector



Front View

A84809

(a) Disconnect the A8 mass air flow meter connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the terminal of the wire harness side connector and body ground.

Standard:

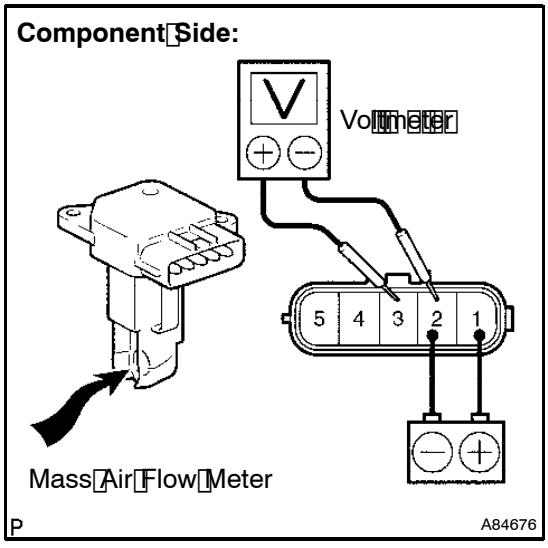
Tester Connection	Specified Condition
+B (A8-1) - Body ground	9 to 14 V

(d) Reconnect the mass air flow meter connector.

NG → **Go to step 6**

OK

4	INSPECT MASS AIR FLOW METER

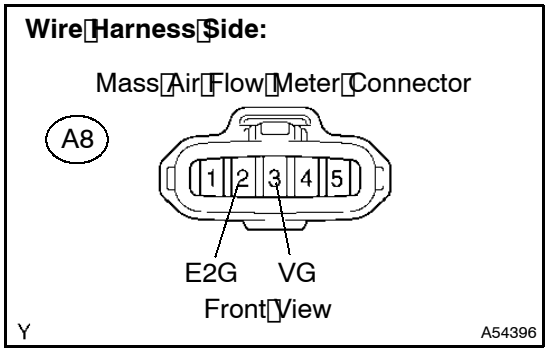


(a) Remove the mass air flow meter.
(b) Apply battery voltage across terminals 1 (+B) and 2 (E2G).
(c) Using a voltmeter, connect the positive (+) tester probe to terminal 3 (VG), and negative (-) tester probe to terminal 2 (E2G).
(d) Blow air into the mass air flow meter.
OK: The voltage fluctuates.
(e) Reinstall the mass air flow meter.

NG → **REPLACE MASS AIR FLOW METER**

OK

5	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)



(a) Disconnect the A8 mass air flow meter connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

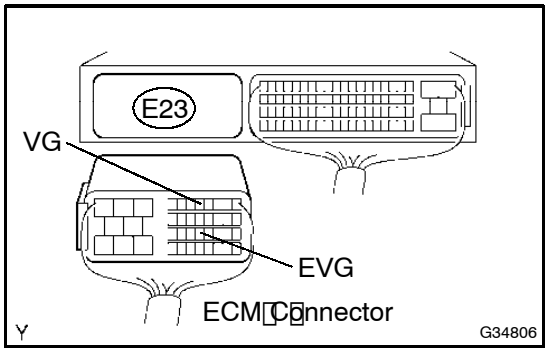
Standard (Check for open):

Tester Connection	Specified Condition
VG (A8-3) - VG (E23-36)	Below 1 Ω
E2G (A8-2) - EVG (E23-15)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VG (A8-3) or VG (E23-36) - Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.



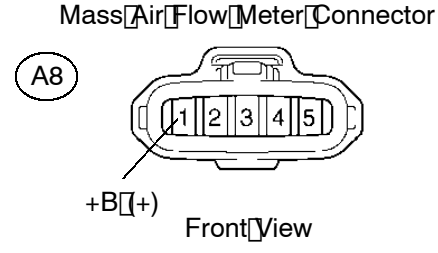
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

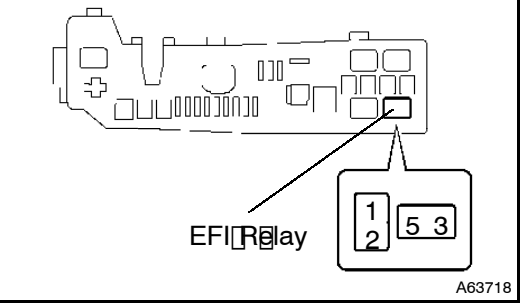
REPLACE ECM (See page 10-15)

6 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER - EFI RELAY)

Wire Harness Side:



Engine Room R/B:



(a) Disconnect the A8 mass air flow meter connector.
(b) Remove the EFI relay from the engine room R/B.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
+B (A8-1) - EFI relay (3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
+B (A8-1) or EFI relay (3) - Body ground	10 kΩ or higher

(d) Reconnect the mass air flow meter connector.
(e) Reinstall the EFI relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

INSPECT ECM POWER SOURCE CIRCUIT (See page 05-161)

7 INSPECT MASS AIR FLOW METER(VISUAL INSPECTION)

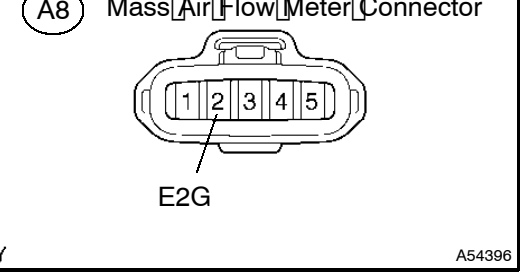
OK: The sensor area of the mass air flow meter has not been contaminated.

NG → **REPLACE MASS AIR FLOW METER**

OK

8 CHECK HARNESS AND CONNECTOR(SENSOR GROUND)

Wire Harness Side:



(a) Disconnect the A8 mass air flow meter connector.
(b) Check the resistance.

Standard (Check for open):

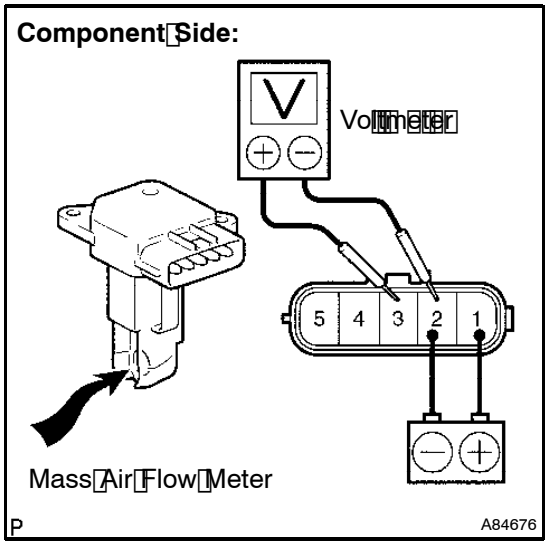
Tester Connection	Specified Condition
E2G (A8-2) - Body ground	Below 1 Ω

(c) Reconnect the mass air flow meter connector.

NG → **Go to step 10**

OK

9	INSPECT MASS AIR FLOW METER



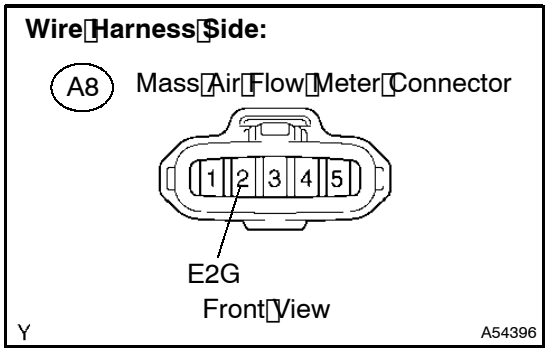
(a) Remove the mass air flow meter.
(b) Apply battery voltage across terminals 1 (+B) and 2 (E2G).
(c) Using a voltmeter, connect the positive (+) tester probe to terminal 3 (VG), and negative (-) tester probe to terminal 2 (E2G).
(d) Blow air into the mass air flow meter.
OK: The voltage fluctuates.
(e) Reinstall the mass air flow meter.

NG	REPLACE MASS AIR FLOW METER

OK

REPLACE ECM (See page 10-15)

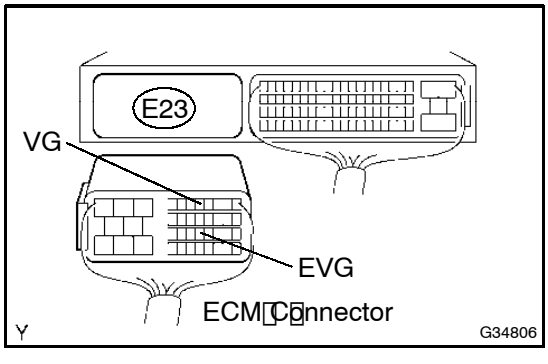
10	CHECK HARNESS AND CONNECTOR(MASS AIR FLOW METER - ECM)



(a) Disconnect the A8 mass air flow meter connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.
Standard (Check for open):

Tester Connection	Specified Condition
E2G (A8-2) - EVG (E23-15)	Below 1 Ω

(d) Reconnect the mass air flow meter connector.
(e) Reconnect the ECM connector.



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MASS AIR FLOW METER

DTC	P0101	MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05-55.

DTC No.	DTC Detection Condition	Trouble Areas
P0101	Either of following conditions is met: • MAF meter output does not change to less than 1.6 V within approximately 10 seconds of ignition switch being turned from ON to OFF (while EFI MAIN relay is ON) (Determination of a malfunction is conducted within a given time after the ignition switch is turned from ON to OFF. If a malfunction is detected within this time, the MIL is illuminated and a DTC is set when the ignition switch is next turned to ON) • Actual value of MAF rate is implausible (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in mass air flow meter circuit • Mass air flow meter • Contamination in mass air flow meter • EGR valve assembly • Open or short in EGR circuit • EGR passage • Open or short in intake shutter control motor circuit • Intake shutter • Vacuum hose • ECM

HINT:

This DTC is set in either of the following conditions:

- When the ignition switch is turned from OFF to ON.
- When the vehicle decelerates while driving.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0101)

(a) Connect an intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON and turn the intelligent tester II ON.

(c) Select the following menu items: Powertrain / Engine and ECT / DTC.

(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0101	A
P0101 and other DTCs	B

HINT:

If any DTCs other than P0101 are output, troubleshoot those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-41)

A

2	CHECK CONNECTION OF VACUUM HOSES

HINT:

(a) Check the vacuum hose connection of the manifold absolute pressure sensor.

(b) Check that there is no air leak of the manifold absolute pressure sensor vacuum hose .

OK: The vacuum hoses have been appropriately connected to each other.

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

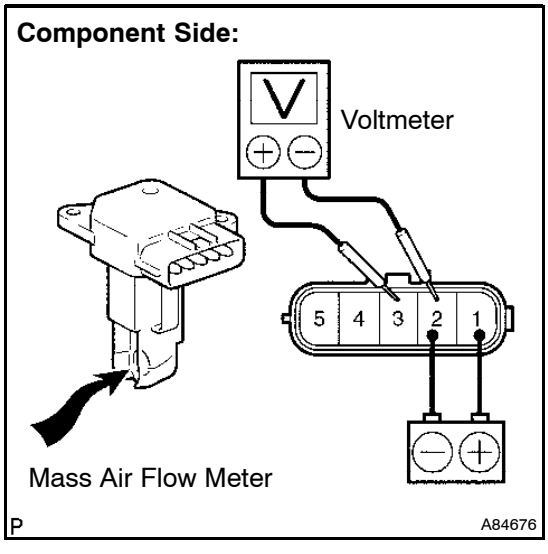
3	INSPECT MASS AIR FLOW METER(VISUAL INSPECTION)

OK: The sensor area of the mass air flow meter has not been contaminated.

NG → **REPLACE MASS AIR FLOW METER**

OK

4	INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.

(b) Apply battery voltage across terminals 1 (+B) and 2 (E2G).

(c) Using a voltmeter, connect the positive (+) tester probe to terminal 3 (VG), and negative (-) tester probe to terminal 2 (E2G).

(d) Blow air into the mass air flow meter.

OK: The voltage fluctuates.

(e) Reinstall the mass air flow meter.

NG → **REPLACE MASS AIR FLOW METER**

OK

5	CHECK CHECK INTAKE AND EXHAUST SYSTEM

(a) Check for air leakage and any blockages between the air cleaner and the turbocharger.

(b) Check for air leakage and any blockages between the turbocharger and the intake manifold.

OK: No air leakage or blockages.

NG → **REPAIR OR REPLACE**

OK

6	CHECK INTAKE SHUTTER ASSY (See page 10-2)

B → REPLACE INTAKE SHUTTER ASSY (See page 10-9)

A

7	CHECK EGR VALVE (See page 12-4)

NG → REPLACE EGR VALVE (See page 14-26)

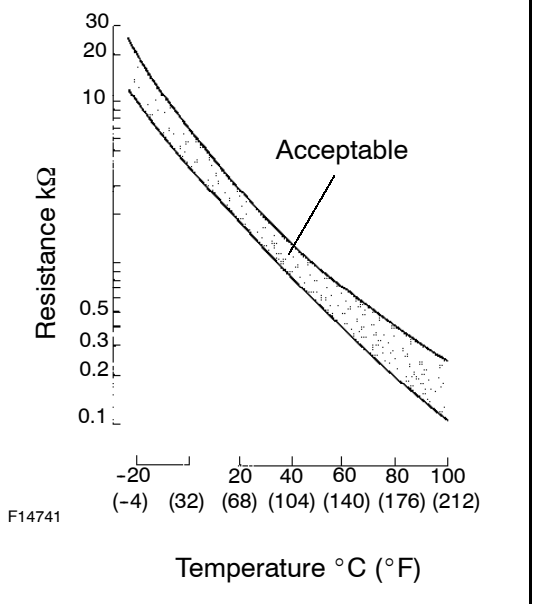
OK

REPLACE MASS AIR FLOW METER

DTC P0110 INTAKE AIR TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

(Figure 1)



The Intake Air Temperature (IAT) sensor is built into the Mass Air Flow (MAF) meter, and monitors the intake air temperature. The IAT sensor has a built-in thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected as voltage changes to the ECM terminal (see figure 1).

The IAT sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the IAT sensor from terminal THA via resistor R.

Resistor R and the IAT sensor are connected in series. When the resistance value of the IAT sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

HINT:

When the IAT sensor output is outside the normal range, the ECM determines this as a malfunction.

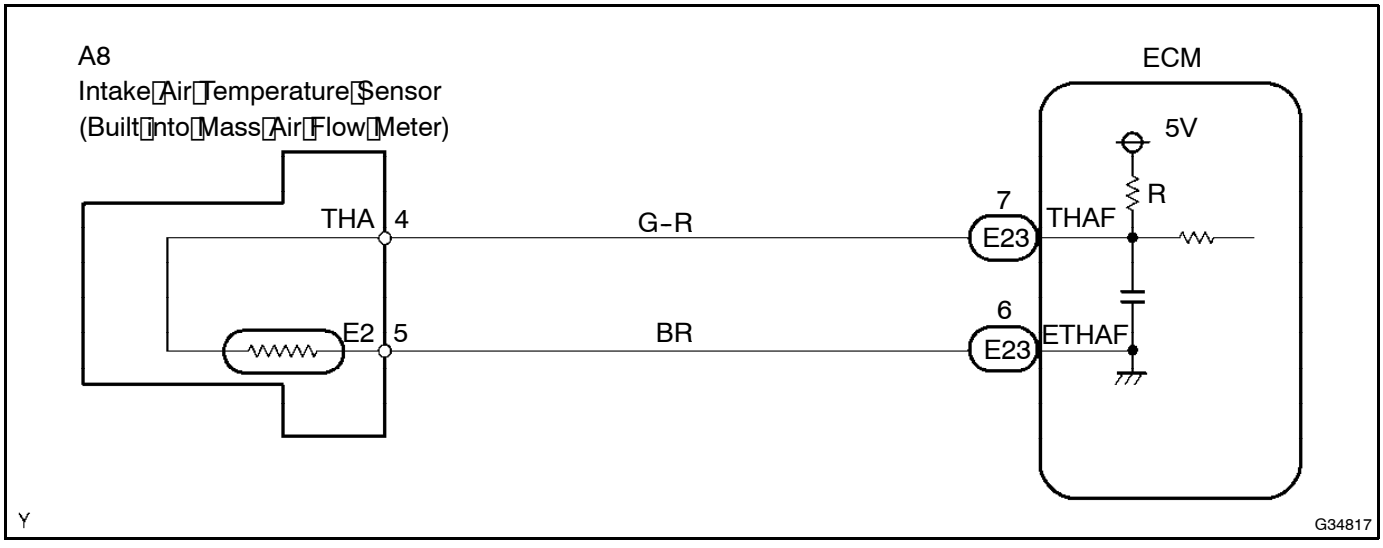
DTC No.	DTC Detecting Condition	Trouble Area
P0110	Condition (a) or (b) continues for 2.0 seconds or more: (a) IAT sensor output is less than -40°C (-40°F) (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF) (b) IAT sensor output is more than 135°C (275°F) (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in intake air temperature sensor circuit • Short in power source circuit • Intake air temperature sensor (built into mass air flow meter) • ECM

HINT:

- DTC P0110 is set when the engine idles for approximately 15 seconds.
- When DTC P0110 is set, check the intake air temperature by selecting Powertrain / Engine and ECT / Data List / Intake Air on the intelligent tester II.

Temperature Displayed	Malfunction
Less than -40°C (-40°F)	Open circuit or short +B circuit
More than 135°C (275°F)	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ VALUE USING INTELLIGENT TESTER II (INTAKE AIR TEMPERATURE)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Intake Air.
(d) Read the value.

OK:

Temperature value: Same as the actual intake air temperature.

Result:

Temperature Displayed	Proceed To
Less than -40°C (-40°F)	A
More than 135°C (275°F)	B
OK (Same as actual intake air temperature)	C

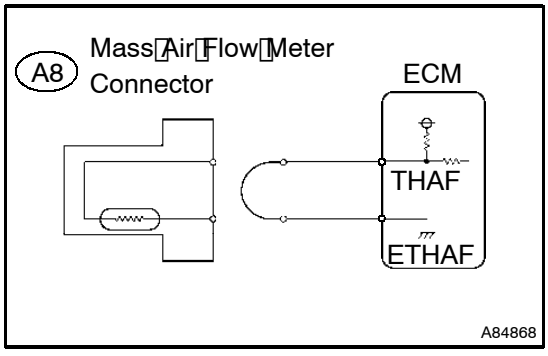
HINT:

- If there is an open circuit, the intelligent tester II indicates less than -40°C (-40°F).
- If there is a short circuit, the intelligent tester II indicates more than 135°C (275°F).

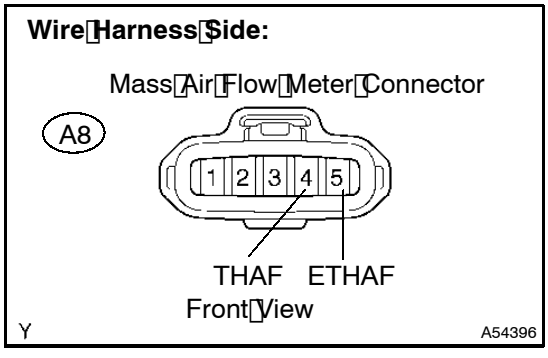
B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-77)

A

2	READ VALUE USING INTELLIGENT TESTER II (CHECK FOR OPEN IN WIRE HARNESS)



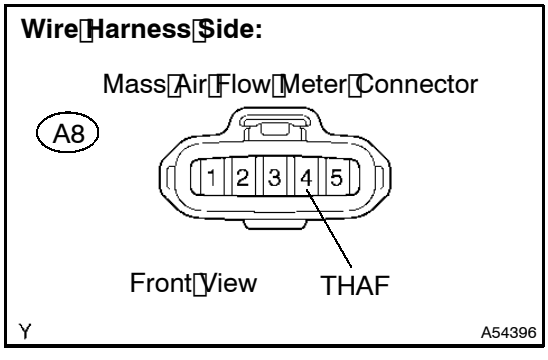
(a) Disconnect the A8 mass air flow meter connector.
(b) Connect terminals THAF and ETHAF of the mass air flow meter wire harness side connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the ignition switch to ON and turn the intelligent tester II ON.
(e) Select the following menu items: Powertrain / Engine and ECT / Data List / Intake Air.
(f) Read the value.
Standard:
Temperature value: 135°C (275°F) or more
(g) Reconnect the mass air flow meter connector.



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

NG

3	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

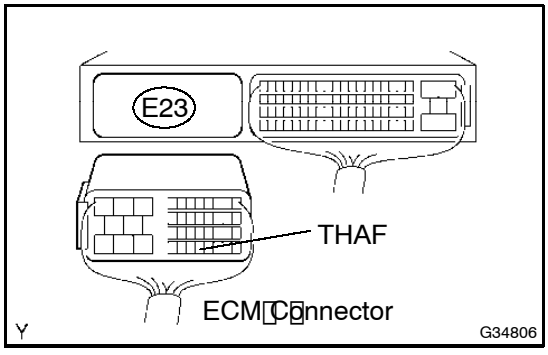


(a) Disconnect the A8 mass air flow meter connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.
Standard (Check for open):

Tester Connection	Specified Condition
THA (A8-4) - THAF (E23-7)	Below 1 Ω

(d) Reconnect the mass air flow meter connector.

(e) Reconnect the ECM connector.

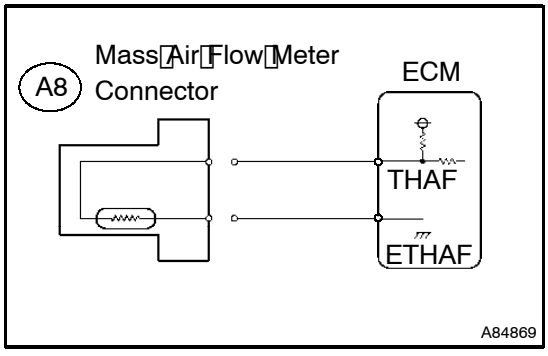


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

4	READ VALUE USING INTELLIGENT TESTER II (CHECK FOR SHORT IN WIRE HARNESS)

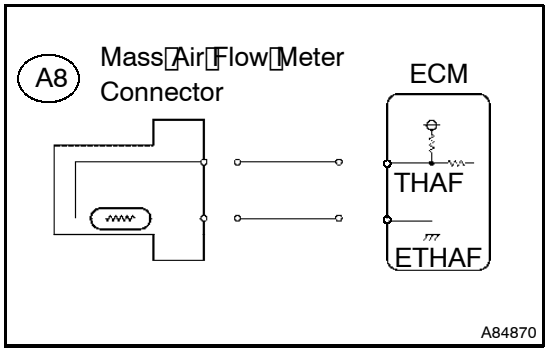


(a) Disconnect the A8 mass air flow meter connector.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the ignition switch to ON and turn the intelligent tester II ON.
(d) Select the following menu items: Powertrain / Engine and ECT / Data List / Intake Air.
(e) Read the value.
Standard:
Temperature value: Less than -40°C (-40°F)
(f) Reconnect the mass air flow meter connector.

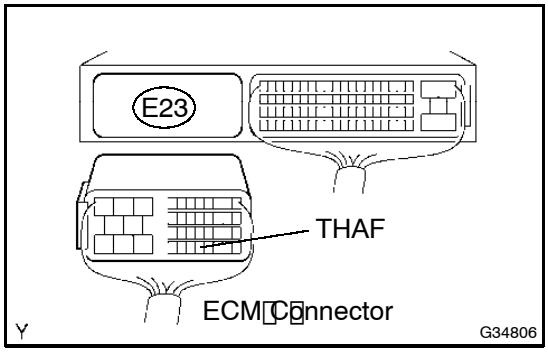
OK	REPLACE MASS AIR FLOW METER

NG

5	READ VALUE USING INTELLIGENT TESTER II (CHECK FOR SHORT IN ECM)



(a) Disconnect the E23 ECM connector.
(b) Disconnect the A8 mass air flow meter connector.
(c) Turn the ignition switch to ON and turn the intelligent tester II ON.
(d) Select the following menu items: Powertrain / Engine and ECT / Data List / Intake Air.
(e) Read the value.
Standard:
Temperature value: Less than -40°C (-40°F)
(f) Reconnect the ECM sensor connector.
(g) Reconnect the mass air flow meter connector.



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10-15)

DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

A thermistor is built into the engine coolant temperature sensor and changes its resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as those of the intake air temperature sensor.

HINT:

- When the engine coolant temperature sensor output is outside the normal range, the ECM determines this as a malfunction.
- If DTC P0115 or P0116 is detected, the ECM performs engine control using an estimated engine coolant temperature calculated from the intake air temperature and the intake air volume at the time of engine start.

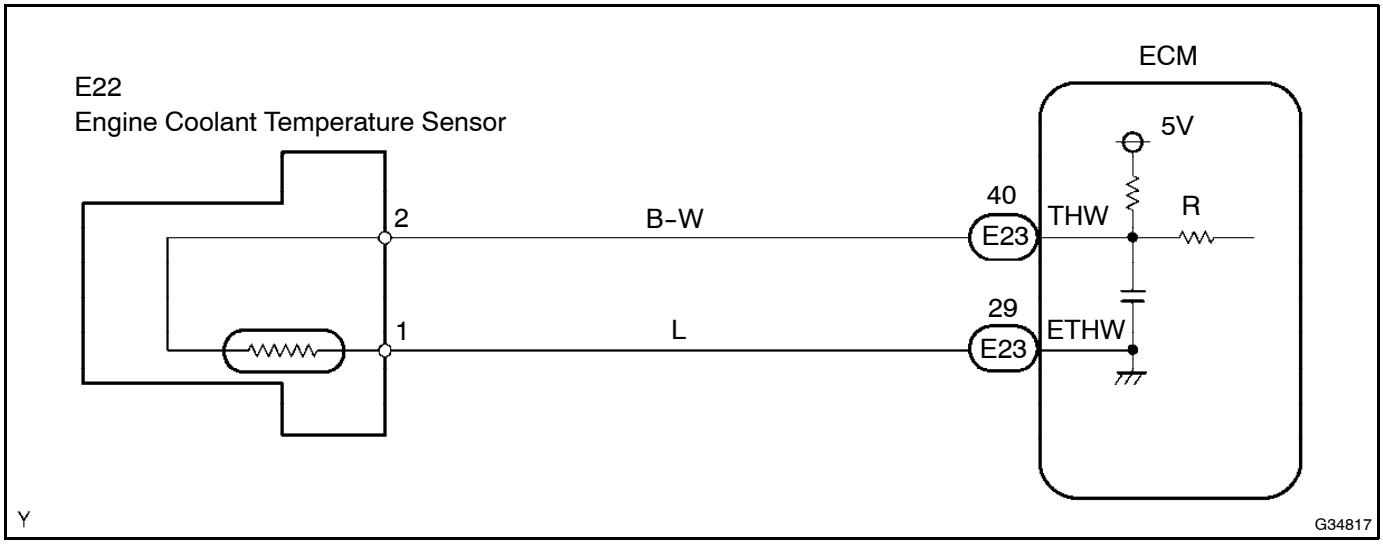
DTC No.	DTC Detection Condition	Trouble Areas
P0115	Condition (a) or (b) continues for 2 seconds or more: (a) ECT sensor output is less than -40°C (-36°F) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected) (b) ECT sensor output is more than 140°C (280°F) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0116	• When engine coolant temperature is less than 35°C (95°F) at engine start, engine coolant temperature change for 240 seconds is less than 1°C (34°F) on while engine coolant temperature sensor vehicle is highly loaded (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF) • When engine coolant temperature is more than 98°C (208°F) at engine start, engine coolant temperature sensor shows a change of less than 3°C (37°F) for 240 seconds while vehicle carries light load that is equal to that when the engine is idling (The MIL is illuminated and a DTC is set when the same malfunction is detected on 6 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Engine coolant temperature sensor • ECM

HINT:

- DTC P0115 is set when the engine idles for approximately 15 seconds.
- DTC P0116 is set when the vehicle idles for more than 5 minutes after driving at a vehicle speed of 100 to 120 km/h for more than 5 minutes.
- When DTC P0115 or P0116 is detected, check the engine coolant temperature by selecting Powertrain / Engine and ECT / Data List / Coolant Temp on the intelligent tester II.

Temperature Displayed	Malfunction
Less than -40°C (-40°F)	Open or short to +B circuit
More than 140°C (284°F)	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ OUTPUT DTCS(DTC P0115 AND/OR P0116)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0115, or P0115 and P0116	A
P0116	B

B → REPLACE ENGINE COOLANT TEMPERATURE SENSOR

A

2	READ VALUE USING INTELLIGENT TESTER II(ENGINE COOLANT TEMPERATURE)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Coolant Temp.
(d) Read the value.

OK:

Temperature value: 80°C to 97°C (176°F to 207°F) after warming up the engine.

Result:

Temperature Displayed	Proceed To
Less than -40°C (-40°F)	A
More than 140°C (284°F)	B
OK (Same as actual engine coolant temperature)	C

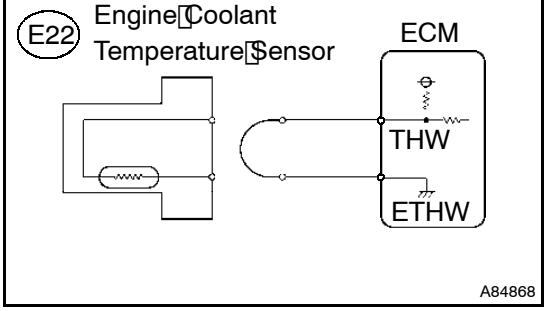
HINT:

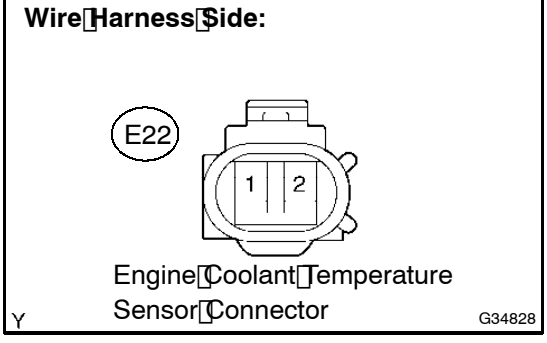
- If there is an open circuit, the intelligent tester II indicates less than -40°C (-40°F).
- If there is a short circuit, the intelligent tester II indicates more than 140°C (284°F).

B	Go to step 5
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-71)

A

3	READ VALUE USING INTELLIGENT TESTER II(CHECK FOR OPEN IN WIRE HARNESS)





(a) Disconnect the E22 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the ignition switch to ON and turn the intelligent tester II ON.
(e) Select the following menu items: Powertrain / Engine and ECT / Data List / Coolant Temp.
(f) Read the value.

Standard:

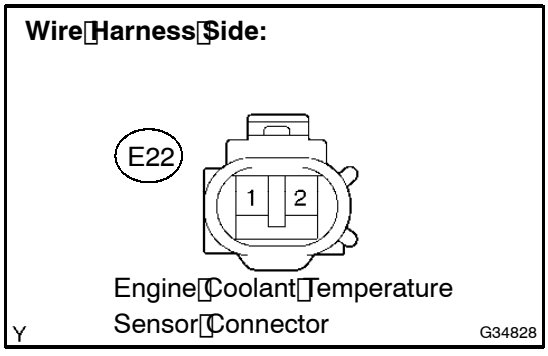
Temperature value: More than 140°C (284°F)

(g) Reconnect the engine coolant temperature sensor connector.

OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

4	CHECK HARNESS AND CONNECTOR(ENGINE COOLANT TEMPERAYURE SENSOR - ECM)

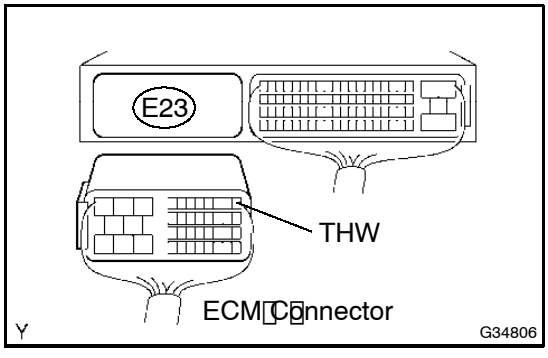


(a) Disconnect the E22 engine coolant temperature sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
THW (E22-2) - THW (E23-40)	Below 1 Ω

(d) Reconnect the engine coolant temperature sensor connector.
(e) Reconnect the ECM connector.

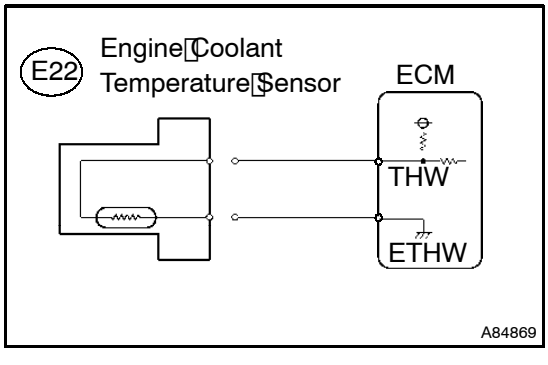


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

5	READ VALUE USING INTELLIGENT TESTER II(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E22 engine coolant temperature sensor connector.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Coolant Temp.
(d) Read the value.

Standard:

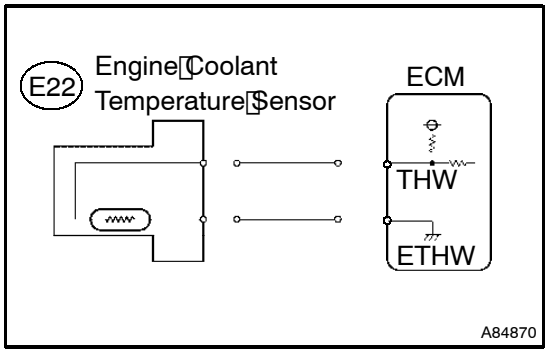
Temperature value: Less than -40°C (-40°F)

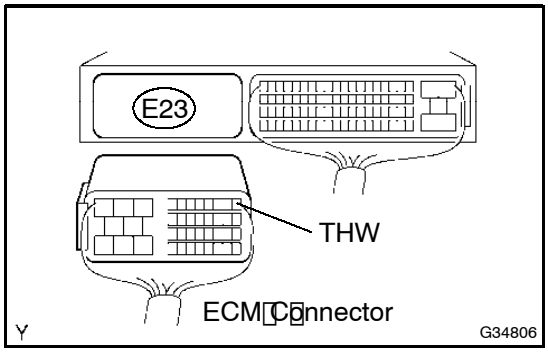
(e) Reconnect the engine coolant temperature sensor connector.

OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

6	READ VALUE USING INTELLIGENT TESTER II (CHECK FOR SHORT IN ECM)





(a) Disconnect the E22 engine coolant temperature sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the ignition switch to ON and turn the intelligent tester II ON.
(e) Select the following menu items: Powertrain / Engine and ECT / Data List / Coolant Temp.
(f) Read the value.
Standard:
Temperature value: Less than -40°C (-40°F)
(g) Reconnect the engine coolant temperature sensor connector.
(h) Reconnect the ECM connector.

OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

REPLACE ECM (See page 10-15)

DTC	P0121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE PROBLEM

DTC	P0487	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL CIRCUIT

DTC	P0488	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

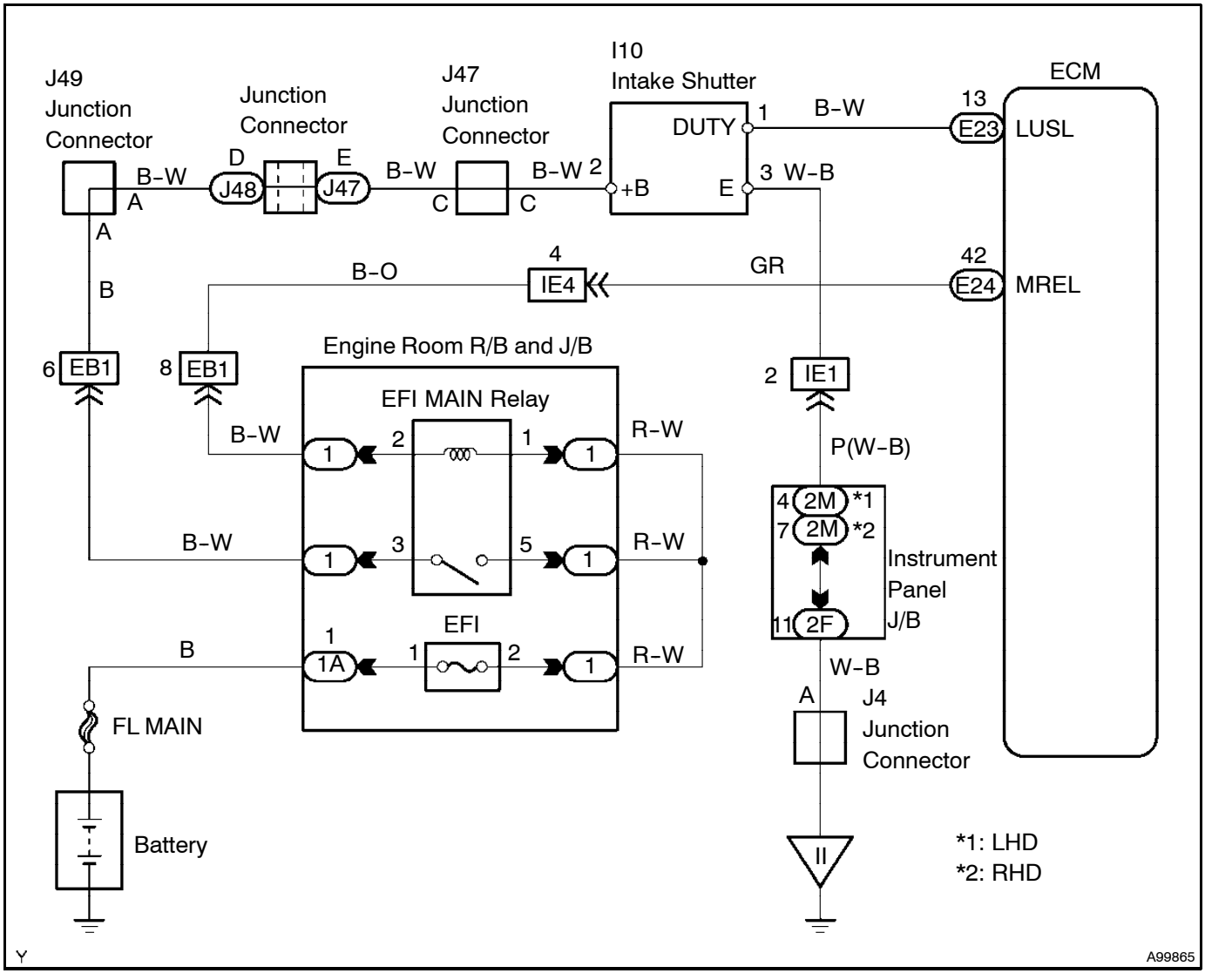
The ECM opens and closes the intake shutter valve (throttle valve) using the rotary solenoid type actuator. Upon opening and closing the valve, the exhaust gas recirculation volume is properly controlled. Also, engine vibration and noise are reduced by closing the valve when the engine is stopped.

DTC No.	DTC Detection Condition	Trouble Area
P0121	Learning value of intake shutter is abnormal (Determination of a malfunction is conducted within a given time after the ignition switch is turned from ON to OFF. If a malfunction is detected within this time, the MIL is illuminated and a DTC is set when the ignition switch is next turned to ON)	• Intake shutter stuck • Intake shutter does not move smoothly • Open or short in intake shutter circuit • Open or short in intake shutter position sensor circuit • Intake shutter position sensor (built in intake shutter valve) • ECM
P0487	Open or short in intake shutter circuit (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in intake shutter circuit • ECM
P0488	Target and actual positions of intake shutter are different (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Intake shutter stuck • Intake shutter does not move smoothly • Open or short in intake shutter circuit • Open or short in intake shutter position sensor circuit • Intake shutter position sensor (built in intake shutter valve) • ECM

HINT:

- DTC P0121 is set when the ignition switch is turned from ON to OFF.
- DTC P0487 is set when idling for more than 30 seconds after engine start.
- DTC P0488 is set when engine idling.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO P0121, P0487 AND/OR P0488)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

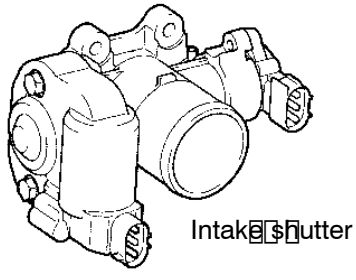
Display (DTC output)	Proceed to
P0121, P0487 and/or P0488	A
"P0121, P0487 and/or P0488" and "P0122 and/or P0123"	B

B → GO TO RELEVANT DTC CHART (See page 05-41)

A

2	INSPECT INTAKE SHUTTER ASSY

Component Side:



P G34835

(a) Disconnect the I10 intake shutter connector.
(b) Measure the resistance between the terminals of the intake shutter.

Standard:

Tester Connection	Specified Condition
DUTY (1) - E (3)	0.3 to 100 Ω at 20°C (68°F)

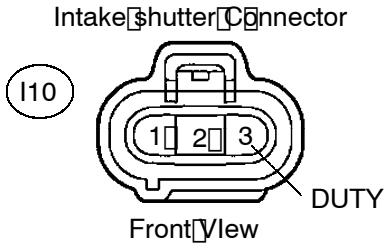
(c) Reconnect the intake shutter connector.

NG → REPLACE INTAKE SHUTTER ASSY (See page 10-9)

OK

3	CHECK HARNESS AND CONNECTOR (INTAKE SHUTTER (THROTTLE VALVE) - ECM)

Wire Harness Side:



(a) Disconnect the I10 intake shutter connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

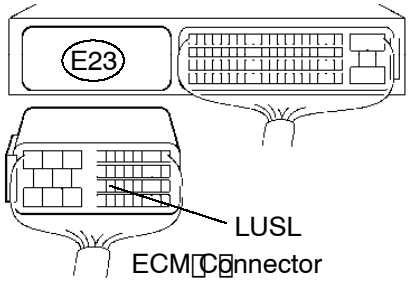
Standard (Check for open):

Tester Connection	Specified Condition
LUSL (E23-13) - DUTY (I10-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
LUSL (E23-13) or DUTY (I10-1) - Body ground	10 kΩ or higher

(d) Reconnect the intake shutter connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE INTAKE SHUTTER ASSY (See page 10-9)

DTC	P0122	THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

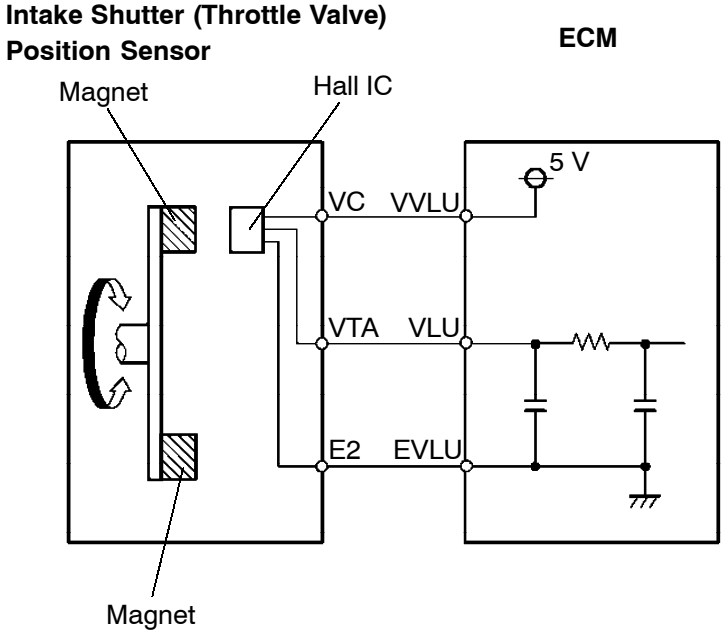
DTC	P0123	THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

HINT:

- These DTCs related to the intake shutter (throttle valve) position sensor.
- This electronic throttle system does not use a throttle cable.
- This intake shutter position sensor is a non-contact type.

CIRCUIT DESCRIPTION

The intake shutter (throttle valve) position sensor is mounted on the intake shutter body and it detects the opening angle of the intake shutter. This sensor is electronically controlled and uses Hall-effect elements.



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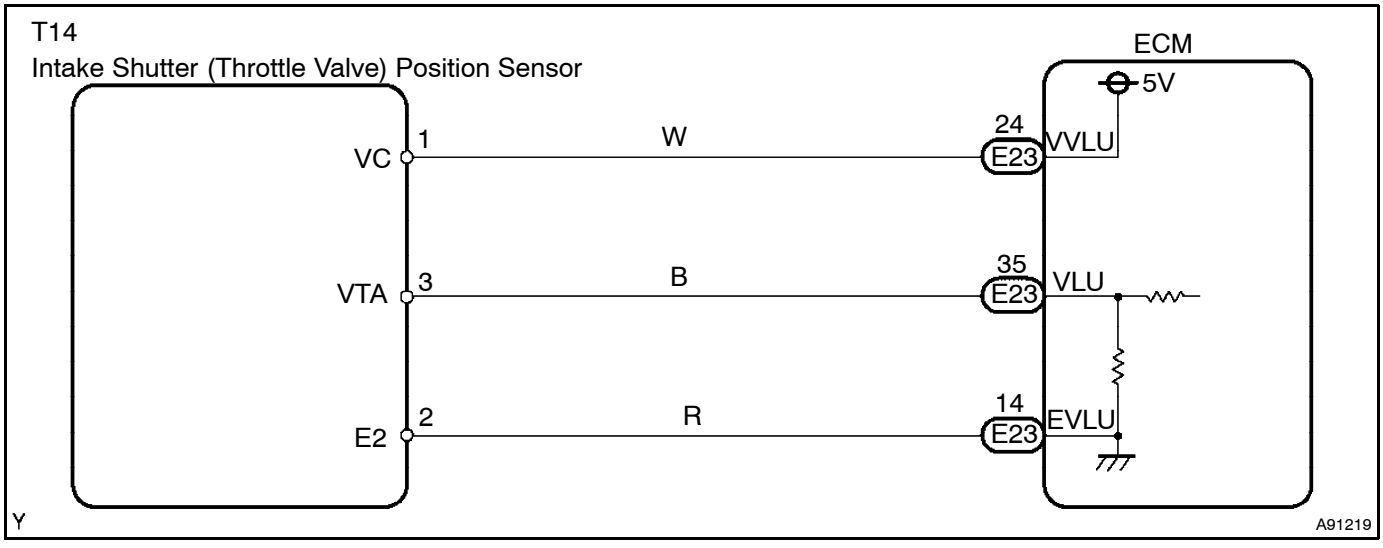
DTC No.	DTC Detection Condition	Trouble Area
P0122	Intake shutter position sensor output (VLU) is less than 0.2 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Intake shutter position sensor • Open or short in VLU circuit • Open in VC circuit • ECM
P0123	Intake shutter position sensor output (VLU) is more than 4.8 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Intake shutter position sensor • Open in E2 circuit • VC and VLU circuits are short-circuited • ECM

HINT:

These DTCs are set when the ignition switch is in the ON position.

WIRING DIAGRAM

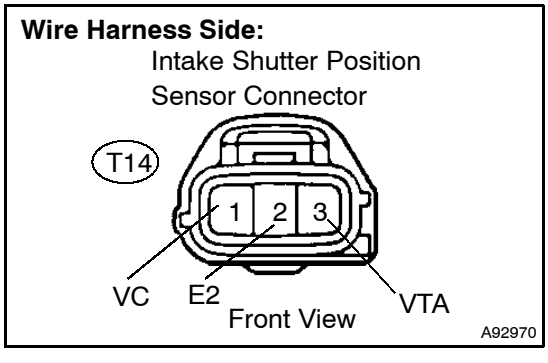


INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER (THROTTLE VALVE) POSITION SENSOR - ECM)



(a) Disconnect the T14 intake shutter position sensor connector.

(b) Disconnect the E23 ECM connectors.

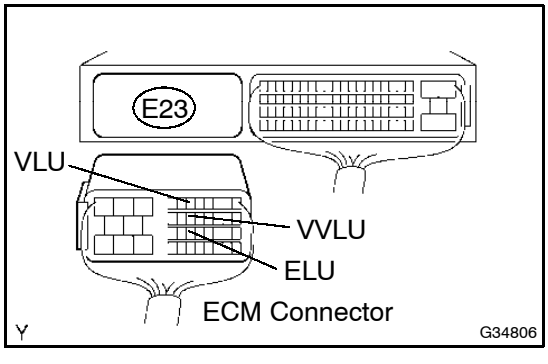
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VVLU (E23-24) - VC (T14-1)	Below 1 Ω
VLU (E23-35) - VTA (T14-3)	
ELU (E23-14) - E2 (T14-2)	

Standard (Check for short):

Tester Connection	Specified Condition
VVLU (E23-24) or VC (T14-1) - Body ground	10 kΩ or higher
VLU (E23-35) or VTA (T14-3) - Body ground	
ELU (E23-14) or E2 (T14-2) - Body ground	



(d) Reconnect the intake shutter position sensor connector.

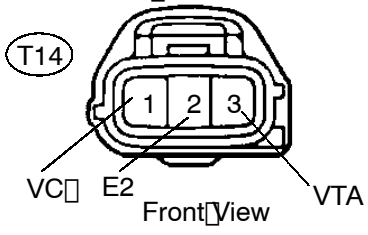
(e) Reconnect the ECM connectors.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	INSPECT ECM (VC VOLTAGE)

Wire Harness Side:
Intake Shutter Position Sensor Connector



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(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the T14 intake shutter position sensor connector.

Standard:

Tester Connection	Specified Condition
VC (T14-1) - E2 (T14-2)	4.5 to 5.5 V

NG → REPLACE ECM (See page 10-15)

OK

3	REPLACE INTAKE SHUTTER ASSY (THROTTLE VALVE) (See page 10-9)

GO

4	CHECK IF DTC OUTPUT RECURS (DTC P0122 AND/OR P0123)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC / Clear.
(d) Clear DTCs.
(e) Let the engine idle for 60 seconds, and repeat quick engine RPM accelerations (to 2,500 rpm) for 30 seconds.
(f) Select the following menu items: Powertrain / Engine and ECT / DTC.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0122 and/or P0123	A
No output	B

B → SYSTEM OK

A

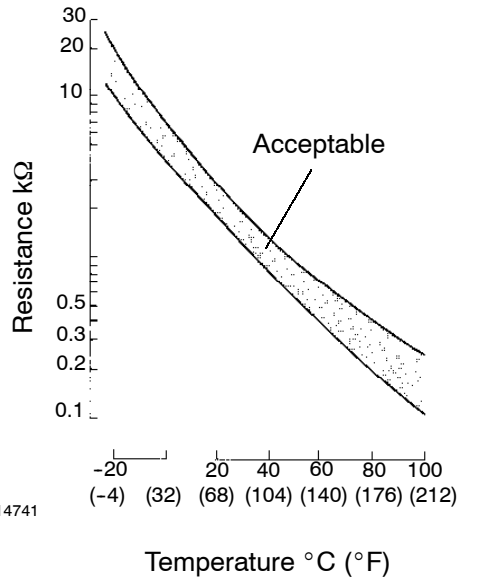
REPLACE ECM (See page 10-15)

DTC	P0182	FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

DTC	P0183	FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Figure 1)



The fuel temperature sensor monitors the fuel temperature. A thermistor built into the sensor changes the resistance value according to the fuel temperature. The lower the fuel temperature is, the greater the thermistor resistance becomes, and the higher the temperature is, the lower the resistance becomes (see figure 1).

The fuel temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the fuel temperature sensor from terminal THF via resistor R. Resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with the fuel temperature, the voltage at terminal THF also changes. Based on this signal, the ECM corrects the pressure control compensation of the supply pump and errors.

HINT:

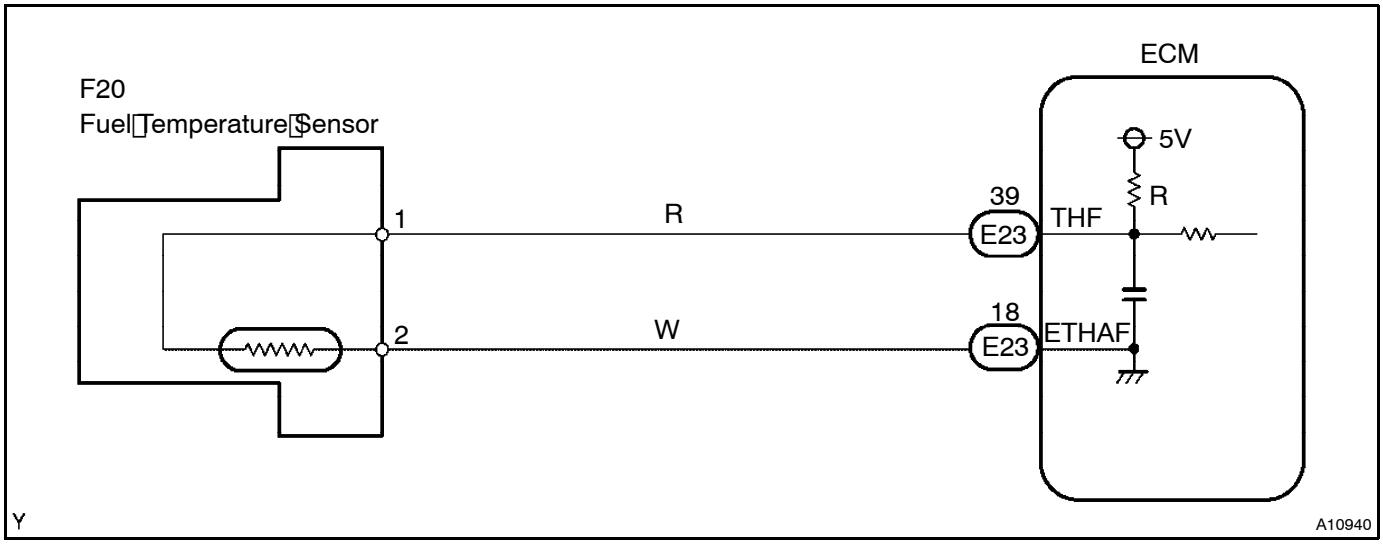
When the fuel temperature sensor output is outside the normal range, the ECM determines this as a malfunction.

DTC No.	DTC Detection Condition	Trouble Area
P0182	Open or short in fuel temperature sensor circuit for 2.0 seconds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel temperature sensor circuit • Fuel temperature sensor • ECM
P0183	Open or short in fuel temperature sensor circuit for 2.0 seconds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel temperature sensor circuit • Fuel temperature sensor • ECM

HINT:

These DTCs are set when the engine idles for approximately 15 seconds.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

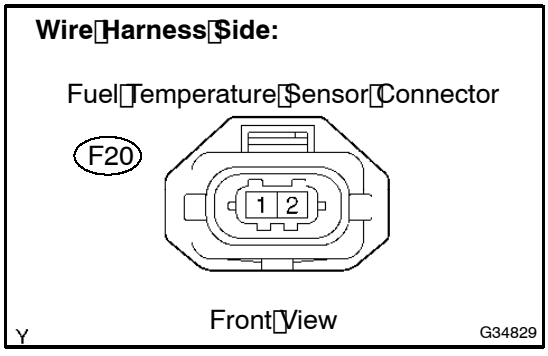
1	INSPECT FUEL TEMPERATURE SENSOR (See page 11-5)

OK: The fuel temperature sensor resistance is within the standard range.

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (FUEL TEMPERATURE SENSOR) (See page 11-16)**

OK

2	CHECK HARNESS AND CONNECTOR (FUEL TEMPERATURE SENSOR - ECM)

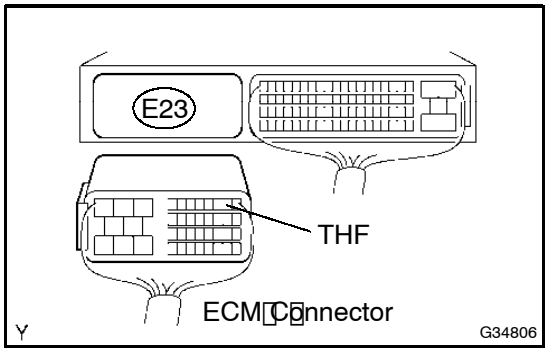


(a) Disconnect the F20 fuel temperature sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
THF (E23-39) - (F20-1)	Below 1 Ω

(d) Reconnect the fuel temperature sensor connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC P0190 FUEL RAIL PRESSURE SENSOR CIRCUIT

CIRCUIT DESCRIPTION

The ECM monitors the internal fuel pressure of the common rail using the fuel pressure sensor and controls the fuel metering unit to regulate the internal pressure and maintain it at the target pressure.
The pressure sensor is a semiconductor pressure sensor with an electric resistance with varies when pressure is applied to its silicon. The output of this sensor varies in accordance with the internal fuel pressure.

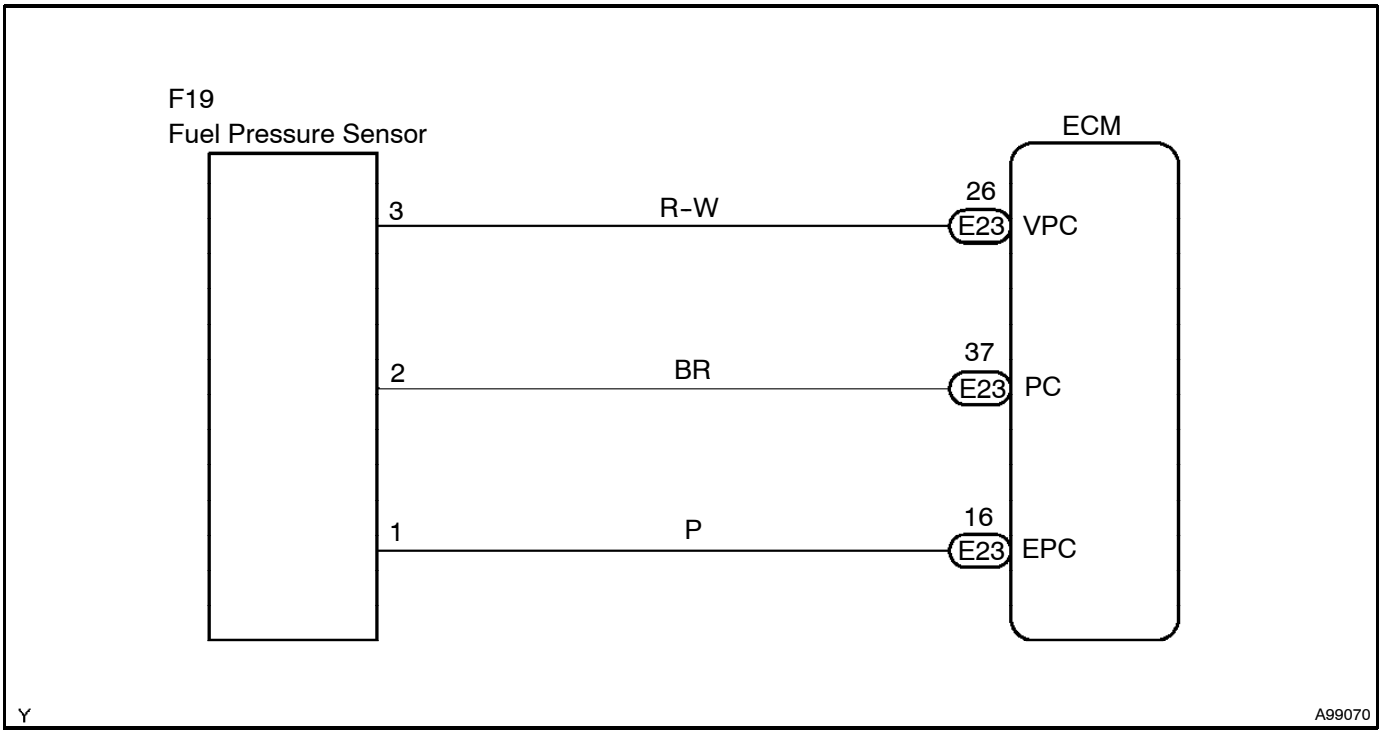
DTC No.	DTC Detection Condition	Trouble Areas
P0190	Fuel pressure sensor output voltage 0.2 V or less, or 4.8 V or more for 0.5 seconds (The MIL is illuminated as well as a DTC being set when a malfunction is detected)	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM

HINT:

- DTC P0190 is set when the engine idles for approximately 15 seconds.
- When DTC P0190 is set, check the internal fuel pressure of the common rail by selecting the following menu items on the intelligent tester II: Powertrain / Engine and ECT / Data List / Common Rail Pressure.
  Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 25 to 36
2,000 rpm (No engine load)	Approximately 27 to 46
3,000 rpm (No engine load)	Approximately 34 to 69

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1 READ VALUE USING INTELLIGENT TESTER II (FUEL PRESSURE)

(a) Connect an intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) On the intelligent tester II, select the following menu items: Powertrain / Engine and ECT / Data List / Common Rail Pressure.
(d) Check that the internal fuel pressure of the common rail is within the specification below.

Standard:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 25 to 36
2,000 rpm (No engine load)	Approximately 27 to 46
3,000 rpm (No engine load)	Approximately 34 to 69

NG → Go to step 3

OK

2 CHECK IF DTC OUTPUT RECURS (FUEL PRESSURE SENSOR DTCS)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC / Clear.
(d) Clear DTCs.
(e) Let the engine idle for 60 seconds, and accelerate the engine speed repeatedly (to 2,500 rpm) for 30 seconds.
(f) Select the following menu items: Powertrain / Engine and ECT / DTC.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0190	A
No output	B

B → **CHECK FOR INTERMITTENT PROBLEMS** (See page 05-77)

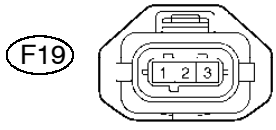
A

REPLACE ECM (See page 10-115)

3	CHECK HARNESS AND CONNECTOR(FUEL PRESSURE SENSOR - ECM)

Wire Harness Side:

Fuel Pressure Sensor Connector



Front View

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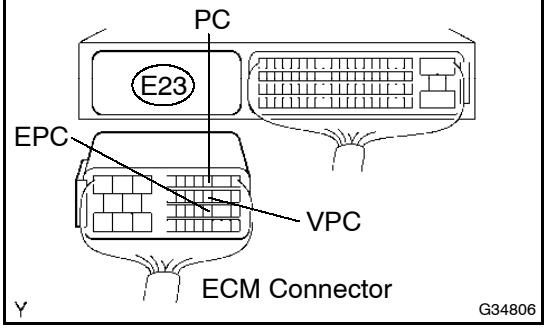


(a) Disconnect the F19 fuel pressure sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PC (E23-37) - (F19-2)	Below 1 Ω
VPC (E23-26) - (F19-3)	
EPC (E23-16) - (F19-1)	

Standard (Check for short):

Tester Connection	Specified Condition
PC (E23-37) or (F19-2) - Body ground	10 kΩ or higher
VPC (E23-26) or (F19-3) - Body ground	
EPC (E23-16) or (F19-1) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the fuel pressure sensor connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11-20)

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

The ECM controls the internal fuel pressure of the common rail by using the supply pump and pressure control valve.

DTC No.	DTC Detection Condition	Trouble Areas
P0191	After certain period of time has elapsed after engine stop (pressure control valve releases common rail internal pressure during this period), common rail internal pressure deviates from normal range. (Determination of a malfunction is conducted within a given time after the ignition switch is turned from ON to OFF. If a malfunction is detected within this time, the MIL is illuminated and a DTC is set when the ignition switch is next turned to ON)	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in pressure control valve circuit • Pressure control valve • ECM

HINT:

DTC P0191 is set when the engine idles for 30 seconds after the ignition switch was turned to OFF.

WIRING DIAGRAM

Refer to DTC P0089 on page 05-52 and DTC P0190 on page 05-83.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0191)

(a) Connect an intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON and turn the intelligent tester II ON.

(c) Select the following menu items: Powertrain / Engine and ECT / DTC.

(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0191	A
P0191 and other DTCs	B

HINT:

If any DTCs other than P0191 are output, troubleshoot those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-41)

A →

REPLACE COMMON RAIL ASSY (PRESSURE CONTROL VALVE AND FUEL PRESSURE SENSOR) (See page 11-20)

DTC	P0201	INJECTOR CIRCUIT / OPEN - (CYLINDER 1)

DTC	P0202	INJECTOR CIRCUIT / OPEN - (CYLINDER 2)

DTC	P0203	INJECTOR CIRCUIT / OPEN - (CYLINDER 3)

DTC	P0204	INJECTOR CIRCUIT / OPEN - (CYLINDER 4)

DTC	P2146	FUEL INJECTOR GROUP "A" SUPPLY VOLTAGE CIRCUIT / OPEN

CIRCUIT DESCRIPTION

The injectors are installed in the cylinder head, and inject fuel into the cylinders based on the signals from the ECM.

HINT:

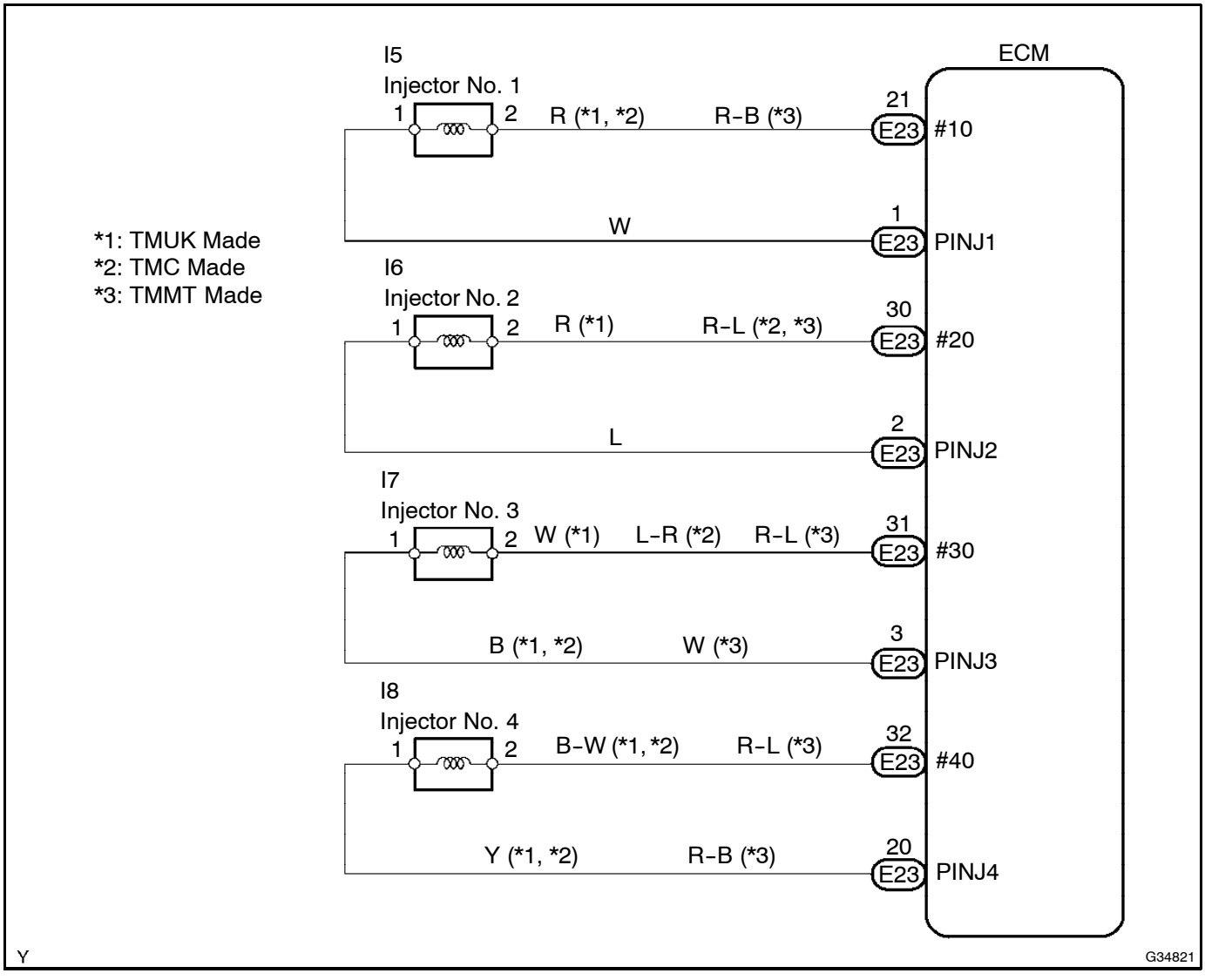
Injector driver is in the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0201	Open or short in injector circuit (cylinder No. 1) for 0.5 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in injector circuit (cylinder No. 1) • Injector (cylinder No. 1) • ECM
P0202	Open or short in injector circuit (cylinder No. 2) for 0.5 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in injector circuit (cylinder No. 2) • Injector (cylinder No. 2) • ECM
P0203	Open or short in injector circuit (cylinder No. 3) for 0.5 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in injector circuit (cylinder No. 3) • Injector (cylinder No. 3) • ECM
P0204	Open or short in injector circuit (cylinder No. 4) for 0.5 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in injector circuit (cylinder No. 4) • Injector (cylinder No. 4) • ECM
P2146	• Open or short in injector circuit for 0.5 seconds or more (DTC P0201, P0202, P0203 and/or P0204 set simultaneously) • ECM internal error (DTC P0201, P0202, P0203 and/or P0204 not set) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in injector circuit • Injector • ECM

HINT:

- These DTCs are set when the engine idles for approximately 15 seconds.
- If DTC P0201 is displayed, check the No. 1 injector circuit.
- If DTC P0202 is displayed, check the No. 2 injector circuit.
- If DTC P0203 is displayed, check the No. 3 injector circuit.
- If DTC P0204 is displayed, check the No. 4 injector circuit.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ OUTPUT DTC (DTC P0201, P0202, P0203, P0204 AND/OR P2146)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

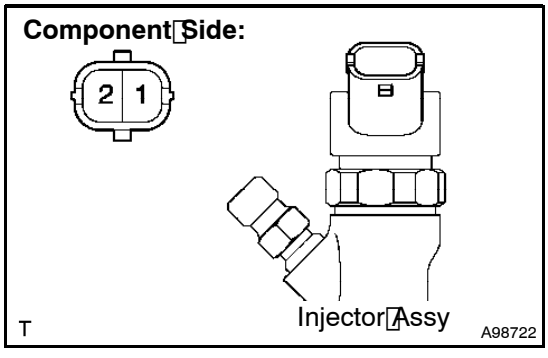
Result:

Display (DTC Output)	Proceed To
"P0201, P0202, P0203 and/or P0204" and "P2146"	A
Only P2146	B

B → **REPLACE ECM (See page 10-15)**

A

2	INSPECT FUEL INJECTOR ASSY

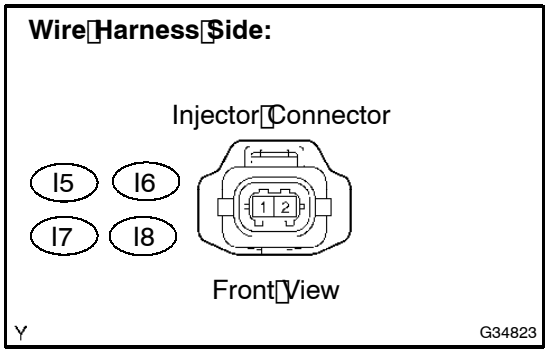


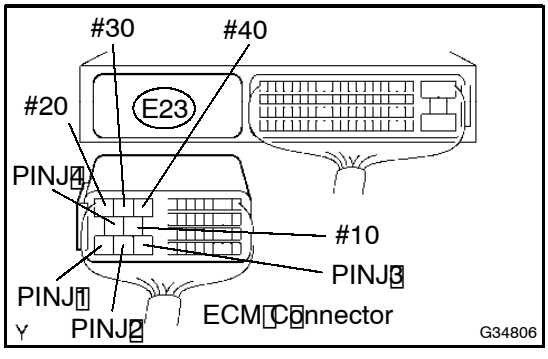
(a) Disconnect the #5, #6, #7 and/or #8 injector connector.
(b) Measure the resistance between the terminals of the injector assy.
Standard: 0.215 to 0.295 Ω at 20°C (68°F)
(c) Reconnect the injector connector.

NG → **REPLACE FUEL INJECTOR ASSY (See page 11-8)**

OK

3 CHECK HARNESS AND CONNECTOR (ECM - INJECTOR ASSY)





(a) Disconnect the I5, I6, I7 and/or I8 injector connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
#10 (E23-21) - (I5-2)	Below 1 Ω
#20 (E23-30) - (I6-2)	Below 1 Ω
#30 (E23-31) - (I7-2)	Below 1 Ω
#40 (E23-32) - (I8-2)	Below 1 Ω
PINJ1 (E23-1) - (I5-1)	Below 1 Ω
PINJ2 (E23-2) - (I6-1)	Below 1 Ω
PINJ3 (E23-3) - (I7-1)	Below 1 Ω
PINJ4 (E23-20) - (I8-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
#10 (E23or21) or (I5-2) - Body ground	10 kΩ or higher
#20 (E23-30) or (I6-2) - Body ground	10 kΩ or higher
#30 (E23-31) or (I7-2) - Body ground	10 kΩ or higher
#40 (E23-32) or (I8-2) - Body ground	10 kΩ or higher
PINJ1 (E23-1) or (I5-1) - Body ground	10 kΩ or higher
PINJ2 (E23-2) or (I6-1) - Body ground	10 kΩ or higher
PINJ3 (E23-3) or (I7-1) - Body ground	10 kΩ or higher
PINJ4 (E23-20) or (I8-1) - Body ground	10 kΩ or higher

(d) Reconnect the injector connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 10-15)

DTC	P0234	TURBO/SUPERCHARGER OVERBOOST CONDITION

DTC	P0299	TURBO/SUPERCHARGER UNDERBOOST

CIRCUIT DESCRIPTION

Refer to DTC P0045 on page 05-49.

DTC No.	DTC Detection Condition	Trouble Areas
P0234	Actual turbocharger pressure higher than target pressure for about 10 seconds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• VRV (Vacuum Regulating Valve) • Open or short in VRV circuit • Turbocharger assembly • EGR valve assembly • Intake shutter • Manifold absolute pressure sensor • Vacuum hose • ECM
P0299	Actual turbocharger pressure lower than target pressure for about 10 seconds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• VRV (Vacuum Regulating Valve) • Open or short in VRV circuit • Turbocharger assembly • EGR valve assembly • Intake shutter • Manifold absolute pressure sensor • Vacuum hose • ECM

HINT:
These DTCs are set while steady speed driving with a highly engine load (at an engine speed of 3,000 rpm or more)

WIRING DIAGRAM

Refer to DTC P0045 on page 05-49.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0234 AND/OR P0299)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0234 and/or P0299	A
P0234 and/or P0299 and other DTCs	B

B → **GO TO RELEVANT DTC CHART** (See page 05-41)

A

2	CHECK CONNECTION OF VACUUM HOSES

HINT:
Check the vacuum hose connection of the turbocharger system.

OK: The vacuum hoses have been appropriately connected to each other.

NG → REPAIR OR REPLACE VACUUM HOSES

OK

3	CHECK VACUUM HOSES (CHECK VACUUM BETWEEN TURBOCHARGER + VRV FOR TURBOCHARGER)

(a) Using a three-way connector, connect a vacuum gauge to the hoses between the VRV (Vacuum Regulating Valve) and turbocharger.
(b) Warm up the engine coolant temperature to more than 75°C (167°F).
(c) Check the vacuum at the engine speed of idling.

Result:

Vacuum	Proceed To
0 kPa (0 mmHg, 0 in.Hg) to 50 kPa (375 mmHg, 14.8 in.Hg)	A
Above 50 kPa (375 mmHg, 14.8 in.Hg)	B

B → Go to step 7

A

4	INSPECT VACUUM REGULATING VALVE ASSY (OPERATION) (See page 13-5)

OK: The VRV operates normally.

NG → REPLACE VACUUM REGULATING VALVE (See page 11-8)

OK

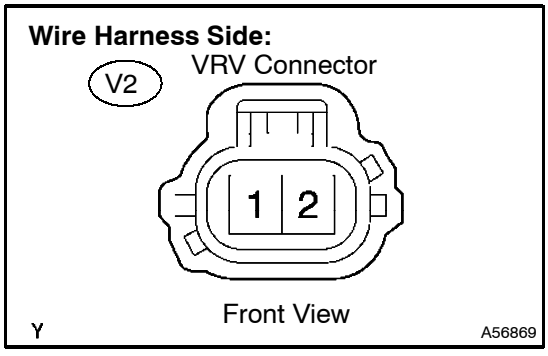
5	INSPECT VACUUM REGULATING VALVE ASSY (RESISTANCE) (See page 13-5)

OK: The VRV resistance is within the standard range.

NG → REPLACE VACUUM REGULATING VALVE ASSY (See page 11-8)

OK

6 CHECK HARNESS AND CONNECTOR(VRV - ECM, VRV - EFI MAIN RELAY)



(a) Disconnect the V2 VRV connector.
(b) Disconnect the E23 ECM connector.
(c) Remove the EFI MAIN relay from the engine room R/B.
(d) Check the resistance.

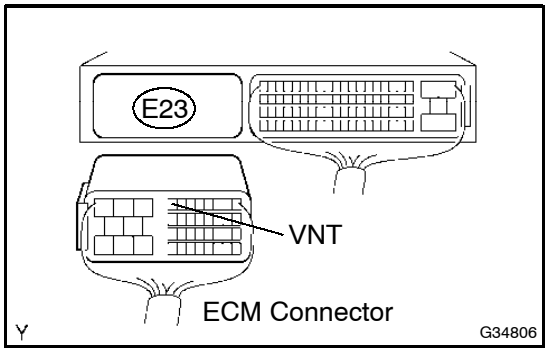
Standard (Check for open):

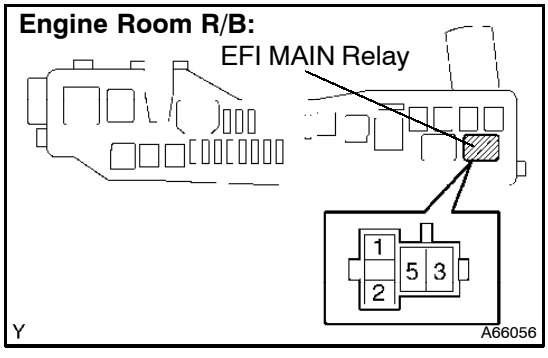
Tester Connection	Specified Condition
VNT (E23-33) - (V2-2)	Below 1 Ω
EFI MAIN relay (3) - (V2-1)	

Standard (Check for short):

Tester Connection	Specified Condition
VNT (E23-33) or (V2-2) - Body ground	10 kΩ or higher
EFI MAIN relay (3) or (V2-1) - Body ground	

(e) Reconnect the VRV connector.
(f) Reconnect the ECM connector.
(g) Reinstall the EFI MAIN relay.





NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

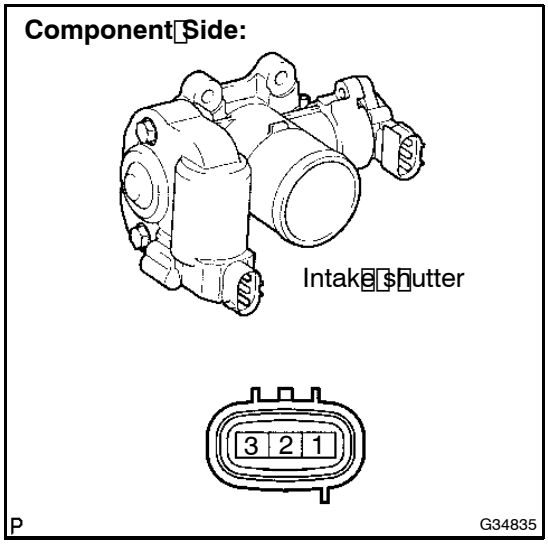
7	INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 13-3)

OK: The manifold absolute pressure sensor resistance is within the standard range.

NG → REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 16-12)

OK

8	INSPECT INTAKE SHUTTER ASSY



(a) Disconnect the I10 intake shutter connector.
(b) Measure the resistance between the terminals of the intake shutter.

Standard:

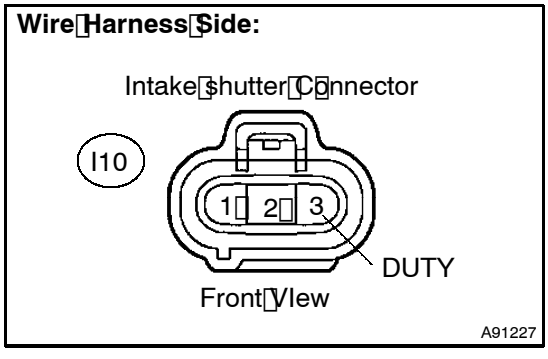
Tester Connection	Specified Condition
DUTY (1) - E (3)	0.3 to 100 Ω at 20°C (68°F)

(c) Reconnect the intake shutter connector.

NG → REPLACE INTAKE SHUTTER ASSY (See page 10-9)

OK

9	CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER - ECM)



(a) Disconnect the I10 intake shutter connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance between the wire harness side connectors.

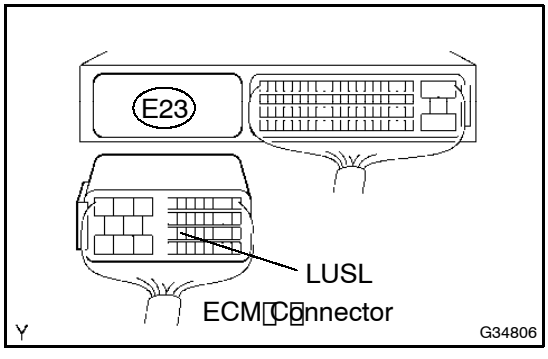
Standard (Check for open):

Tester Connection	Specified Condition
LUSL (E23-13) - DUTY (I10-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
LUSL (E23-13) or DUTY (I10-1) - Body ground	10 kΩ or higher

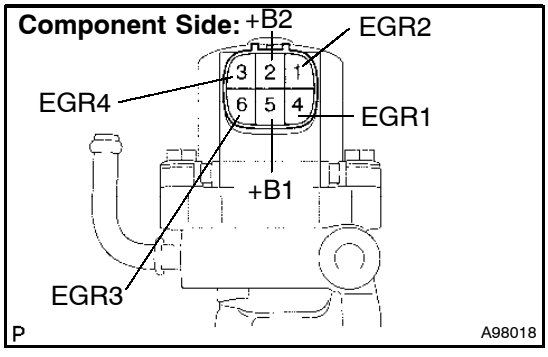
(d) Reconnect the intake shutter connector.
(e) Reconnect the ECM connector.



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

10 INSPECT EGR VALVE ASSY



(a) Disconnect E21 EGR valve connector.
(b) Measure the resistance between the terminals of the EGR valve.

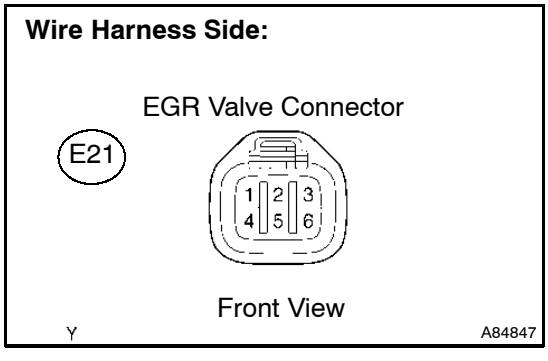
Standard:

Tester Connection	Specified Condition
+B1 (5) - EGR1 (4)	19.6 ± 1.4 Ω
+B1 (5) - EGR3 (6)	19.6 ± 1.4 Ω
+B2 (2) - EGR2 (1)	19.6 ± 1.4 Ω
+B2 (2) - EGR4 (3)	19.6 ± 1.4 Ω

NG	REPLACE EGR VALVE ASSY (See page 14-26)

OK

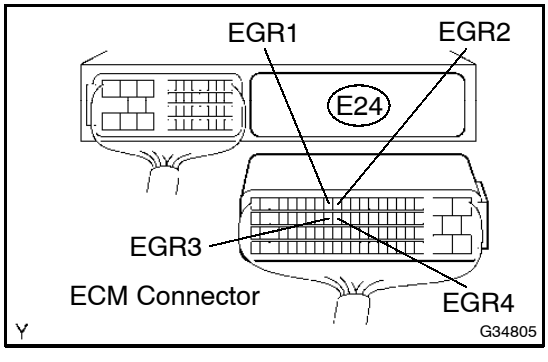
11 CHECK HARNESS AND CONNECTOR(EGR VALVE ASSY - ECM)



(a) Disconnect the E21 EGR valve connector.
(b) Disconnect the E24 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EGR1 (E24-12) - (E21-4)	Below 1 Ω
EGR2 (E24-11) - (E21-1)	Below 1 Ω
EGR3 (E24-31) - (E21-6)	Below 1 Ω
EGR4 (E24-30) - (E21-3)	Below 1 Ω



Standard (Check for short):

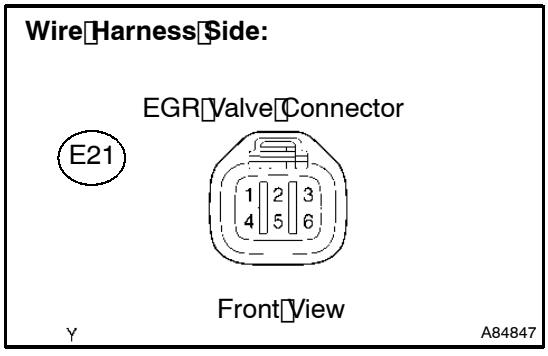
Tester Connection	Specified Condition
EGR1 (E24-12) or (E21-4) - Body ground	10 kΩ or higher
EGR2 (E24-11) or (E21-1) - Body ground	10 kΩ or higher
EGR3 (E24-31) or (E21-6) - Body ground	10 kΩ or higher
EGR4 (E24-30) or (E21-3) - Body ground	10 kΩ or higher

(d) Reconnect the EGR valve connector.
(e) Reconnect the ECM connector.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

12	INSPECT ECM (EGR VOLTAGE)

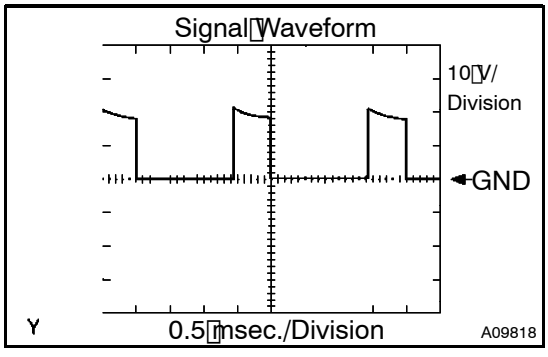


(a) Disconnect the E21 EGR valve connector.
(b) Inspect the ECM using an oscilloscope.
(c) While repeating quick engine RPM accelerations, check the waveform between the terminals of the E21 EGR valve connector.

Standard:

Tester Connection	Specified Condition
(E21-6) - Body ground	Correct waveform shown
(E21-5) - Body ground	Correct waveform shown
(E21-4) - Body ground	Correct waveform shown
(E21-3) - Body ground	Correct waveform shown

(d) Reconnect the EGR valve connector.



NG → REPLACE ECM (See page 10-15)

OK

13	CHECK FOR DEPOSIT (EGR VALVE ASSY)

OK: No deposit

NG → REMOVE FOREIGN OBJECT AND CLEAN EGR VALVE

OK

14	CHECK FOR DEPOSIT (EGR PSSAGE)

OK: No deposit

NG → REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA

OK

15	CHECK FOR EXHAUST GAS LEAKS

OK: No leakage

NG → CHECK EXHAUST GAS LEAKAGE POINT

OK

REPLACE EGR VALVE ASSY (See page 14-26)

DTC	P0236	TURBO/SUPER CHARGER BOOST SENSOR "A" CIRCUIT RANGE/PERFORMANCE

DTC	P0237	TURBO/SUPER CHARGER BOOST SENSOR "A" CIRCUIT LOW

DTC	P0238	TURBO/SUPER CHARGER BOOST SENSOR "A" CIRCUIT HIGH

CIRCUIT DESCRIPTION

The manifold absolute pressure sensor detects the intake manifold pressure. The ECM determines the basic injection duration and injection advance timing based on the voltage output from the manifold absolute pressure sensor.

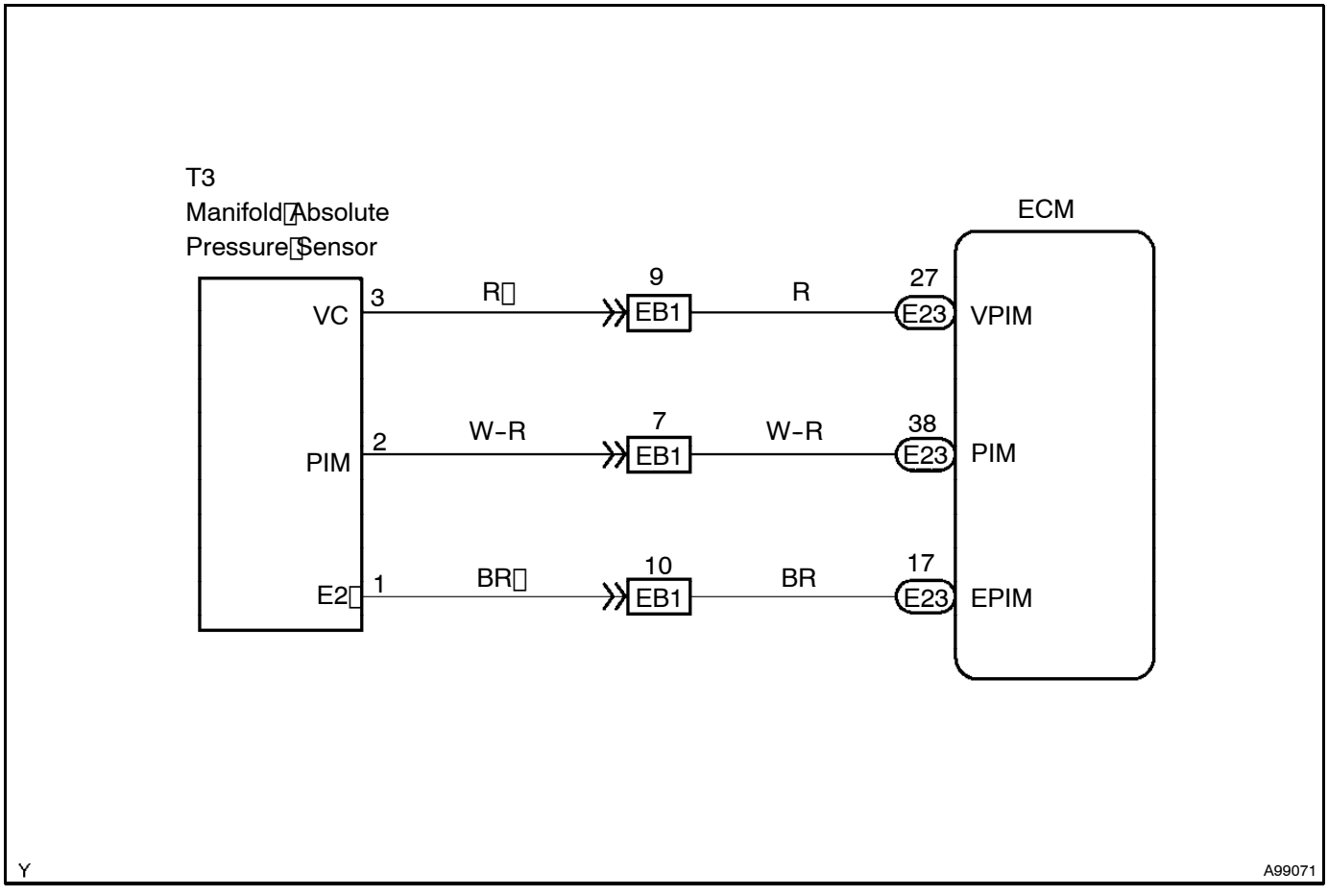
DTC No.	DTC Detection Condition	Trouble Area
P0236	The manifold absolute pressure sensor output differs from atmospheric pressure sensor output by more than threshold for 2 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM
P0237 P0238	Open or short in manifold absolute pressure sensor circuit for 2 seconds or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM

HINT:

- DTC P0236 is set while idling for 10 seconds or more.
- DTC P0237 is set when the ignition switch is in the ON position.
- DTC P0238 is set when the ignition switch is in the ON position.
- When DTCs P0236, P0237 and/or P0238 are set, check the intake manifold pressure by selecting the following menu items on the intelligent tester II: Powertrain / Engine and ECT / Data List / PIM.
  Reference:

Intake Manifold Pressure (kPa)	Malfunction
Approximately 0	• Short in PIM circuit
250 or more	• Open or short in VC circuit • Open in PIM circuit • Open in E2 circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	**READ VALUE USING INTELLIGENT TESTER II (MANIFOLD ABSOLUTE PRESSURE)**

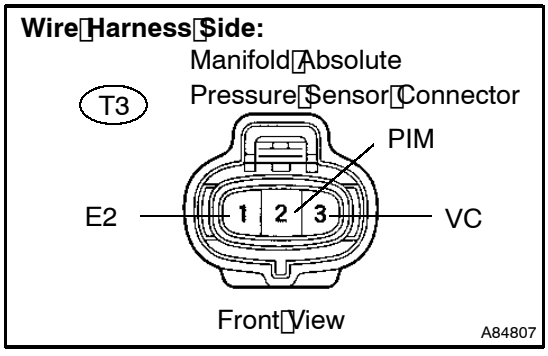
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / PIM.
(d) Read the value.

OK: Same value as the actual atmospheric pressure.

OK → **Go to step 3**

NG

2	CHECK HARNESS AND CONNECTOR (MANIFOLD ABSOLUTE PRESSURE SENSOR - ECM)



(a) Disconnect the T3 manifold absolute pressure sensor connector.

(b) Disconnect the E23 ECM connector.

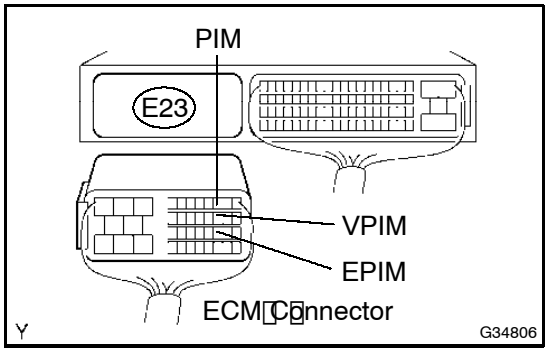
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E23-38)	Below 1 Ω
VC (T3-3) - VPIM (E23-27)	
E2 (T3-1) - EPIM (E23-17)	

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E23-38) - Body ground	10 kΩ or higher
VC (T3-3) or VPIM (E23-27) - Body ground	
E2 (T3-1) or EPIM (E23-17) - Body ground	



(d) Reconnect the manifold absolute pressure sensor connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 16-12)

GO

4	CHECK IF DTC OUTPUT RECURS (DTC P0236)

HINT:

After clearing the DTC(s), conduct the following driving patterns:

- Start the engine and idling for 60 seconds or more.

GO

5	READ OUTPUT DTC (DTC P0236)

(a) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0236	A
No output	B

B → **END**

A

REPLACE ECM (See page 10-15)

DTC	P0252	INJECTION PUMP FUEL METERING CONTROL "A" RANGE/PERFORMANCE (CAM/ROTOR/INJECTOR)

DTC	P1228	INJECTION PUMP FUEL METERING CONTROL "A" RANGE/PERFORMANCE (CAM/ROTOR/INJECTOR)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0252	• Open or short in fuel metering unit circuit for more than 0.5 seconds (DTC P1228 set simultaneously) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected) • ECM internal error (DTC P1228 not set) (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel metering unit circuit • Fuel metering unit • ECM
P1228	Open or short in fuel metering unit circuit for more than 0.5 seconds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel metering unit circuit • Fuel metering unit • ECM

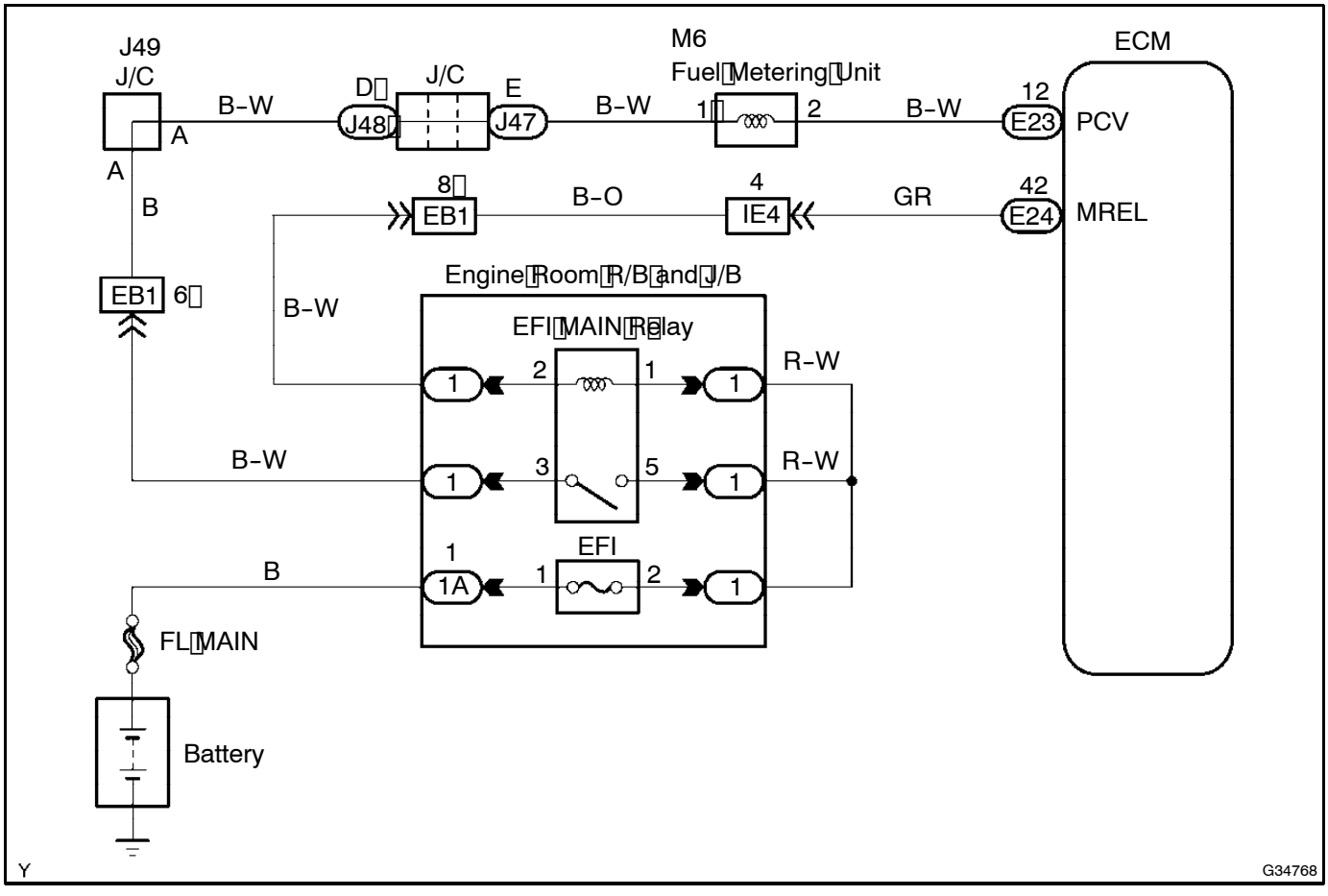
HINT:

- These DTCs are set when the engine idles for approximately 60 seconds.
- When DTC P0252 and/or P1228 is set, check the internal fuel pressure of the common rail by selecting the following menu items on the intelligent tester II: Powertrain / Engine and ECT / Data List / Common Rail Pressure.

  Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 25 to 36
2,000 rpm (No engine load)	Approximately 27 to 46
3,000 rpm (No engine load)	Approximately 34 to 69

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	READ OUTPUT DTCS (DTC P0252 AND/OR P1228)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

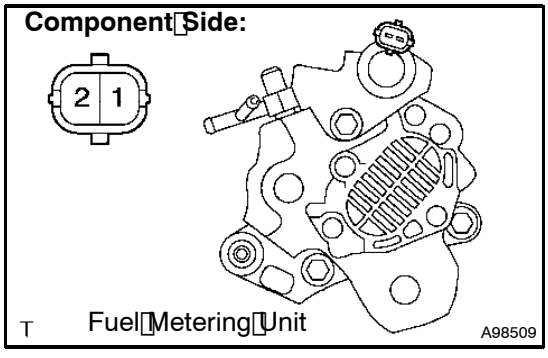
Result:

Display (DTC Output)	Proceed To
P1228 or "P0252 and P1228"	A
Only P0252	B

NG → REPLACE ECM (See page 10-15)

OK

2 INSPECT INJECTION OR SUPPLY PUMP ASSY (FUEL METERING UNIT)

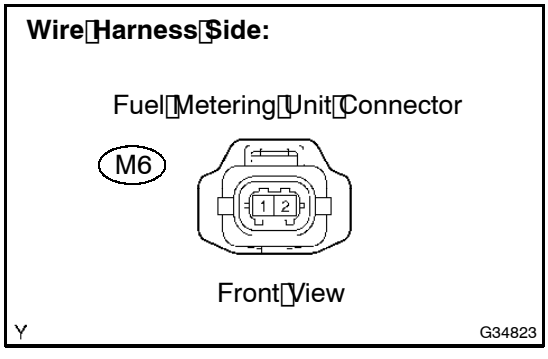


(a) Disconnect the M6 fuel metering unit connector.
(b) Measure the resistance between the terminals of the fuel metering unit valve.
Standard: 2.60 to 3.15 Ω at 20°C (68°F)
(c) Reconnect the fuel metering unit connector.

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (FUEL METERING UNIT) (See page 11-16)**

OK

3 CHECK HARNESS AND CONNECTOR (FUEL METERING UNIT - ECM)



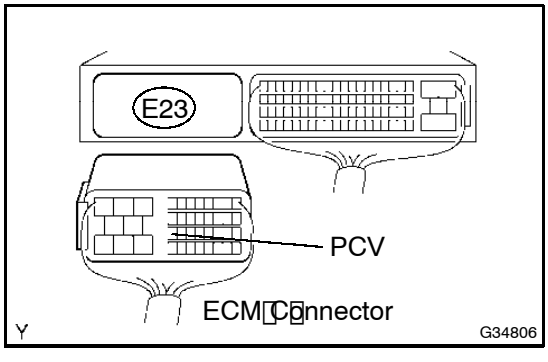
(a) Disconnect the M6 fuel metering unit connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.
Standard (Check for open):

Tester Connection	Specified Condition
PCV (E23-12) - (M6-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PCV (E23-12) or (M6-2) - Body ground	10 kΩ or higher

(d) Reconnect the fuel metering unit connector.
(e) Reconnect ECM connector.



NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P0263	CYLINDER 1 CONTRIBUTION/BALANCE

DTC	P0266	CYLINDER 2 CONTRIBUTION/BALANCE

DTC	P0269	CYLINDER 3 CONTRIBUTION/BALANCE

DTC	P0272	CYLINDER 4 CONTRIBUTION/BALANCE

DTC	P0300	RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED

HINT:

- If DTC P0263 is displayed, check the No. 1 cylinder.
- If DTC P0266 is displayed, check the No. 2 cylinder.
- If DTC P0269 is displayed, check the No. 3 cylinder.
- If DTC P0272 is displayed, check the No. 4 cylinder.

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.
The ECM counts the number of times the engine speed change rate indicates that a misfire has occurred. And when the misfire rate equals or exceeds the threshold indicating that the engine condition has deteriorated, the CHK ENG (MIL) lights up.
HINT:

- The cylinder, which has the compensation value for Revised Injection Volume #1, #2, #3 and #4 that varies from other cylinders, may be malfunctioning.
- If only DTCs P0263, P0266, P0269, P0272 and/or P0300 are present, an injector mechanical malfunction (valve clearance etc) or insufficient compression has probably occurred. An open or short malfunction of the ECM or injector circuit is unlikely.

DTC No.	DTC Detection Condition	Main Trouble Area	Related Trouble Area
P0263 P0266 P0269 P0272 P0300	Significant fluctuations in engine speed while idling (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Injector • Open or short in engine wire harness. • Connector connection • Compression pressure • Valve clearance	• Valve timing • ECM • Low quality fuel • Injector compensation code

HINT:
These DTCs are set when the engine idles for 10 minutes or more with warmed up engine.

WIRING DIAGRAM

Refer to DTCs P0201, P0202, P0203, P0204 and P2146 on page 05-87.

INSPECTION PROCEDURE

HINT:

- If any DTCs other than P0263, P0266, P0269, P0272 and/or P0300 are set simultaneously, troubleshoot those DTCs first.
- Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	**CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0263, P0266, P0269, P0272 AND/OR P0300)**

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
Result:

Display (DTC Output)	Proceed To
P0263, P0266, P0269, P0272 and/or P0300	A
"P0263, P0266, P0269, P0272 and/or P0300" and other DTCs	B

HINT:
If any DTCs other than P0263, P0266, P0269, P0272 and/or P0300 are output, troubleshoot those DTCs first.

B → **GO TO RELEVANT DTC CHART** (See page 05-41)

A

2	**CHECK INJECTOR COMPENSATION CODE** (See page 05-14)

OK: The compensation codes stored in the ECM match the compensation codes of the installed injectors.

NG → **REGISTER INJECTOR COMPENSATION CODE** (See page 05-19)

OK

3	**CHECK WIRE HARNESS AND CONNECTOR IN ENGINE ROOM**

(a) Check the wire harnesses and connectors connections.
OK: The wire harnesses and connectors have been connected securely and there are good connections.

NG → **REPAIR OR REPLACE**

OK

4	READ VALUE USING INTELLIGENT TESTER II (COMPENSATORY INJECTION VOLUME BETWEEN CYLINDERS FOR IDENTIFYING MALFUNCTIONING CYLINDER)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Revised Injection Volume #1, #2, #3 and #4.
(d) Read the value.
Standard: The compensatory injection volume is between -2.0 mm^3 and 2.0 mm^3.

HINT:
- If the injector is malfunctioning, the compensatory injection volume remains at -5.0 mm^3 or 5.0 mm^3.
- The compensatory injection volume is usually between -2.0 mm^3 and 2.0 mm^3.

(e) Any cylinders that have a higher compensatory injection volume than shown above are considered to be faulty. Use the following steps to inspect and repair the cylinders.
Result:

Result	Proceed To
Faulty cylinder not identified	A
Faulty cylinder identified	B

B → **Go to step 6**

A

5	PERFORM ACTIVE TEST USING INTELLIGENT TESTER II (INJECTION CUT FOR IDENTIFYING MALFUNCTIONING CYLINDER)

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Active Test / Injector cut #1, #2, #3 and #4.
(d) Check the four cylinders in sequence to identify a faulty cylinder by performing the power balance inspection.

HINT:
If the engine idling remains normal despite cutting off the fuel injection, the cylinder is malfunctioning.

GO

6	CHECK CYLINDER COMPRESSION PRESSURE OF MALFUNCTIONING CYLINDER (See page 14-1)

(a) Measure the compression pressure.
Standard (minimum pressure): 2,200 kPa (22.5 kgf/cm^2, 320 psi)
Standard (difference between each cylinder): 500 kPa (5.0 kgf/cm^2, 71 psi)
OK: The cylinder compression pressure is within the standard range.

NG → **REPAIR OR REPLACE (VALVE SPRING, PISTON RING AND/OR VALVE TIMING)**

OK

7	CHECK VALVE CLEARANCE OF MALFUNCTIONING CYLINDER (See page 14-6)

OK: The valve clearance is within the standard range.

NG → ADJUST VALVE CLEARANCE (See page 14-6)

OK

8	CHECK IF DTC OUTPUT RECURS (DTC P0263, P0266, P0269, P0272 AND/OR P0300)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warming up, and then confirm that DTC P0263, P0266, P0269, P0272 and/or P0300 is not present again.

OK: No DTC output.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05-7)

NG

9	REPLACE INJECTOR ASSY (See page 11-8)

GO

CHECK IF DTC OUTPUT RECURS (DTC P0263, P0266, P0269, P0272 AND/OR P0300)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warming up, and then confirm that DTC P0263, P0266, P0269, P0272 and/or P0300 is not present again.

DTC	P0335	CRANKSHAFT POSITION SENSOR "A" CIRCUIT

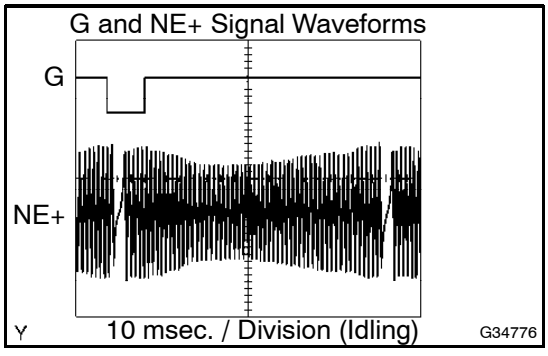
CIRCUIT DESCRIPTION

The crankshaft position sensor system consists of a crankshaft position sensor plate and a pickup coil. The sensor plate has 58 teeth and is installed on the crankshaft. The pickup coil is made of an iron core and magnet. The sensor plate rotates and as each tooth passes through the pickup coil, a pulse signal is created. The pickup coil generates 58 signals per engine revolution. Based on these signals, the ECM calculates the crankshaft position and engine speed. Using these calculations, the common rail system is controlled.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM while cranking (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft position sensor plate • ECM

HINT:

DTC P0335 is detected when the engine cranks 8 revolutions or more.



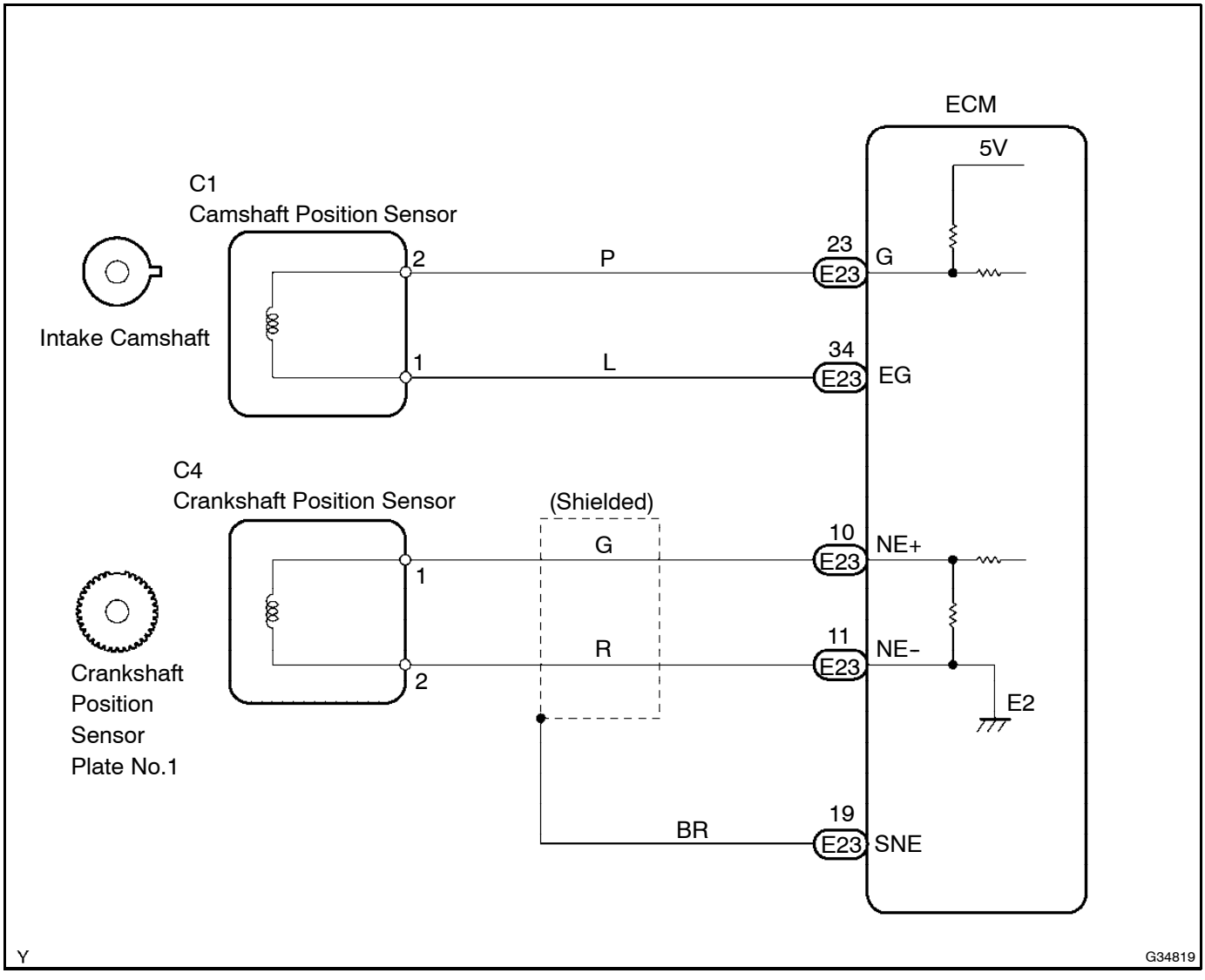
Reference: Inspection using the oscilloscope.

HINT:

- The correct waveform is as shown on the left.
- G stands for the camshaft position sensor signal, and NE+ stands for the crankshaft position sensor signal.

Item	Contents
Terminal	CH1: G - EG CH2: NE+ - NE-
Equipment Setting	10ms/Division
Condition	While cranking or idling

WIRING DIAGRAM

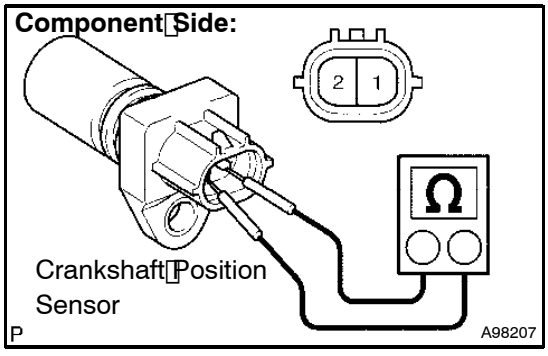


INSPECTION PROCEDURE

HINT:

- Check the value on an intelligent tester II.
  (a) Connect an intelligent tester II to the DLC3.
  (b) Start the engine and turn the intelligent tester II ON.
  (c) Select the following menu items: Powertrain / Engine and ECT / Data List / Engine SPD.
- The engine speed can be confirmed in the Data List using the intelligent tester II. If there are no NE signals from the crankshaft position sensor despite the engine revolving, the engine speed will be indicated as zero. If the voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower than the actual engine rpm.

1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)



(a) Disconnect the C4 crankshaft position sensor connector.
(b) Measure the resistance between terminals 1 and 2.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
1 - 2	2,065 to 3,225 Ω at hot

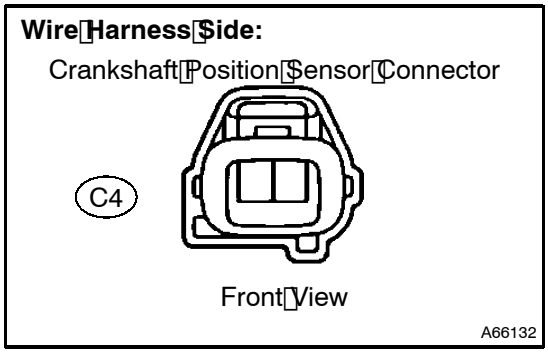
HINT:
Terms "cold" and "hot" refer to the temperature of the coils. "Cold" means approximately -10° to 50°C (14° to 122°F). "Hot" means approximately 50° to 100°C (122° to 212°F).

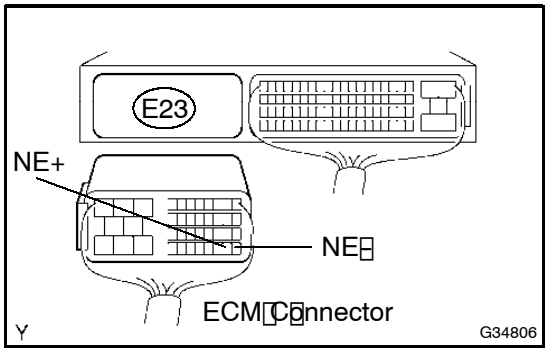
(c) Reconnect the crankshaft position sensor connector.

NG → **REPLACE CRANKSHAFT POSITION SENSOR (See page 10-13)**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR - ECM)





(a) Disconnect the C4 crankshaft position sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) - NE+ (E23-10)	Below 1 Ω
Crankshaft position sensor (C4-2) - NE- (E23-11)	Below 1 Ω

Standard (Check for short):

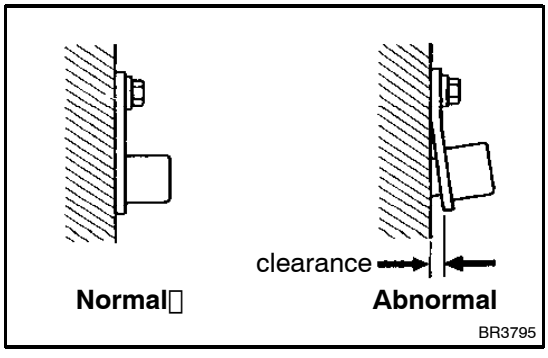
Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) or NE+ (E23-10) - Body ground	10 kΩ or higher
Crankshaft position sensor (C4-2) or NE- (E23-11) - Body ground	Below 1 Ω

(d) Reconnect the crankshaft position sensor connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)



(a) Check the crankshaft position sensor installation.
OK: The sensor has been installed correctly.

NG → SECURELY REINSTALL SENSOR

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT))

(a) Check the teeth of the sensor plate.
OK: The plate does not have any cracks or deformation.

NG → REPLACE CRANKSHAFT POSITION SENSOR (CRANKSHAFT)

OK

5	REPLACE CRANKSHAFT POSITION SENSOR

GO

6	CHECK IF DTC OUTPUT RECURS(DTC P0335)

(a) Start the engine.
(b) Connect the intelligent tester II to the DLC3.
(c) Select the following menu item: Powertrain / Engine and ECT / DTC / Pending codes.
Result:

Display (DTC Output)	Proceed To
No output	A
P0335	B

HINT:
If the engine does not start, replace the ECM.

B → REPLACE ECM (See page 10-15)

A

END

DTC	P0340	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

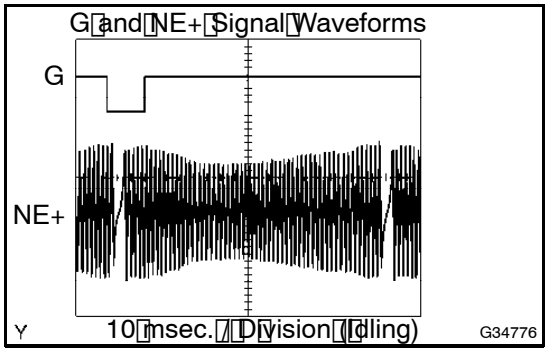
CIRCUIT DESCRIPTION

The Camshaft Position (CMP) sensor installed on the cylinder head. The sensor plate has one tooth on its circumference, and is installed on the camshaft timing pulley. When the camshaft rotates, the tooth on the camshaft timing pulley passes through the CMP sensor. The generated voltage in the sensor acts as a signal. The ECM locates each cylinder position based on the combination of this signal and crankshaft position sensor output.

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM while cranking (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in CMP sensor circuit • CMP sensor • Camshaft timing gear or sprocket • ECM

HINT:

DTC P0340 is detected when the engine cranks 5 revolutions or more and also detected when idling.



Reference: Inspection using the oscilloscope.

HINT:

- The correct waveform is as shown on the left.
- G stands for the camshaft position sensor signal, and NE+ stands for the crankshaft position sensor signal.

Item	Contents
Terminal	CH1: G - EG CH2: NE+ - NE-
Equipment Setting	10ms/Division
Condition	While cranking or idling

WIRING DIAGRAM

Refer to DTC P0335 on page 05-107.

INSPECTION PROCEDURE

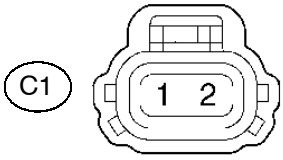
HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK HARNESS AND CONNECTOR (CAMSHAFT POSITION SENSOR - ECM)

Wire Harness Side:

Camshaft Position Sensor C Connector



Front View

Y A85349

(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

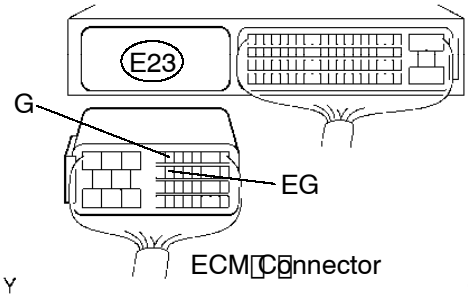
Standard (Check for open):

Tester Connection	Specified Condition
Camshaft position sensor (C1-2) - G (E23-23)	Below 1 Ω
Camshaft position sensor (C1-1) - EG (E23-34)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Camshaft position sensor (C1-2) or G (E23-23) - Body ground	10 kΩ or higher
Camshaft position sensor (C1-1) or EG (E23-34) - Body ground	Below 1 Ω

(d) Reconnect the camshaft position sensor connector.
(e) Reconnect the ECM connector.



ECM Connector

Y G34806

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2	CHECK SENSOR INSTALLATION (CAMSHAFT POSITION SENSOR)

(a) Check the camshaft position sensor installation.
OK: The sensor has been installed correctly.

NG → **SECURELY REINSTALL SENSOR**

OK

3	CHECK CAMSHAFT TIMING GEAR OR SPROCKET

(a) Check the teeth of the camshaft timing gear or sprocket.
OK: The teeth do not have any cracks or deformation.

NG → **REPLACE CAMSHAFT TIMING GEAR OR SPROCKET** (See page 14-45)

OK

4	REPLACE CAMSHAFT POSITION SENSOR

GO

5	CHECK IF DTC OUTPUT RECURS (DTCS P0340)

(a) Start the engine.
(b) Stop the engine and wait for at least 10 seconds.
(c) Connect an intelligent tester II to the DLC3.
(d) Select the following menu item: Powertrain / Engine and ECT / DTC / Pending codes.

Result:

Display (DTC Output)	Proceed To
No output	A
P0340	B

B → REPLACE ECM (See page 10-15)

A

END

DTC	P0380	GLOW PLUG/HEATER CIRCUIT "A"

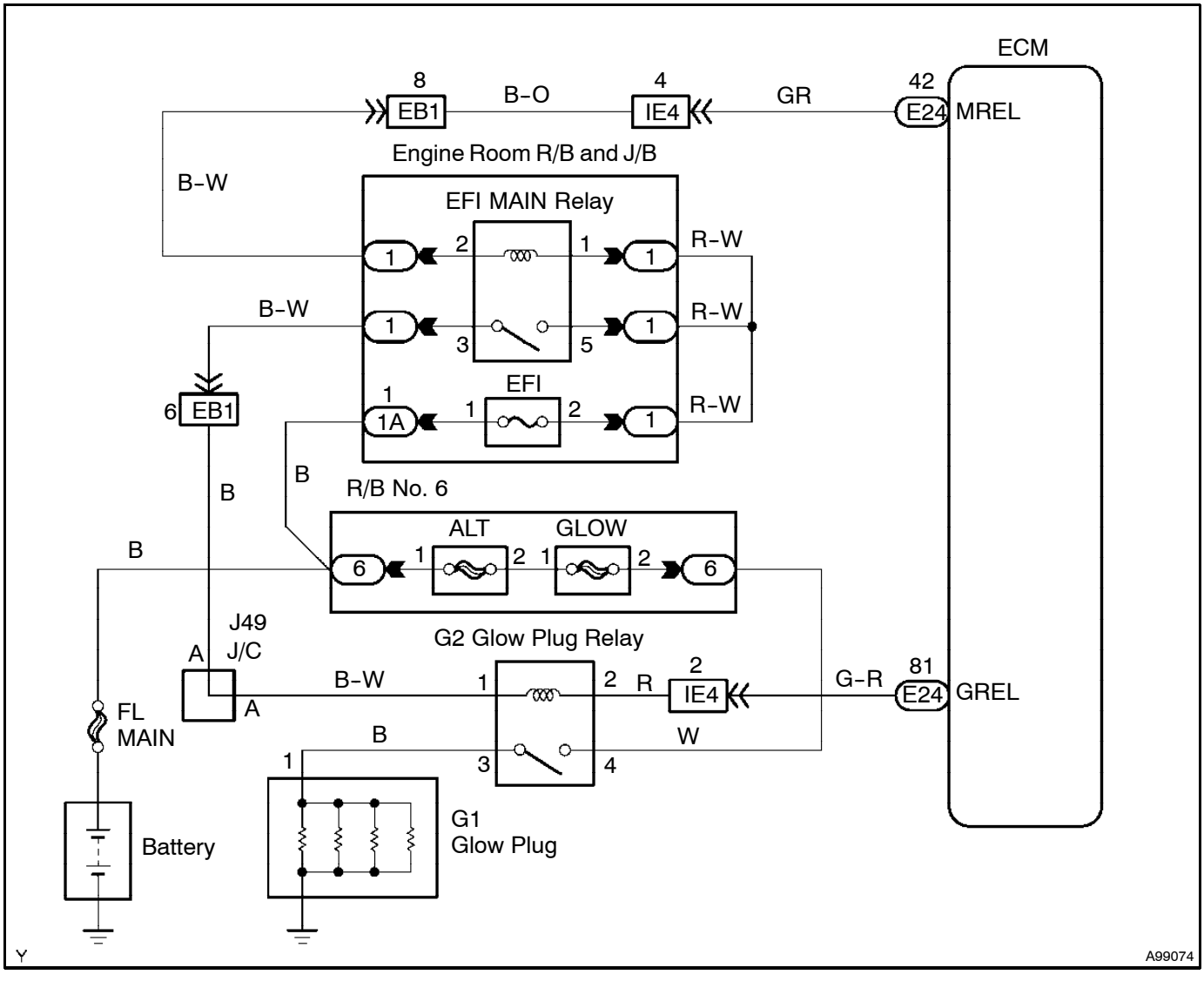
CIRCUIT DESCRIPTION

The glow plug is mounted inside the engine combustion chamber. To ensure efficient engine starting with a cold engine, the ECM calculates the time interval the current needs to flow through the glow plug, depending on the starting engine coolant temperature when the ignition switch is turned to ON. The ECM then turns on the glow plug relay and permits the current to flow through the glow plug based on the ECM's calculated time. The glow plug is then heated, and enhances fuel combustion with a cold engine.

DTC No.	DTC Detection Condition	Trouble Area
P0380	When glow plug is turned from OFF to ON, current does not flow through glow plug relay (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Glow plug relay • ECM

HINT:
DTC P0380 is set when the ignition switch is in the ON position after cold soak.

WIRING DIAGRAM

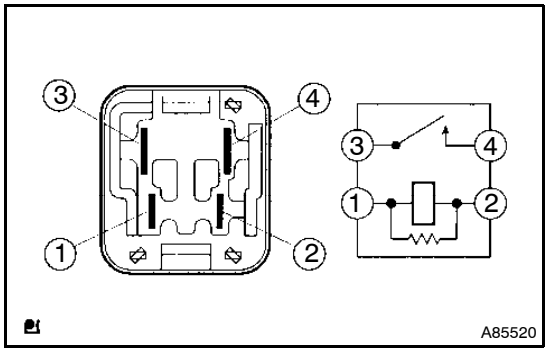


INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1 INSPECT GLOW PLUG RELAY ASSY



(a) Remove the glow plug relay.

(b) Check the glow plug relay resistance.

Standard:

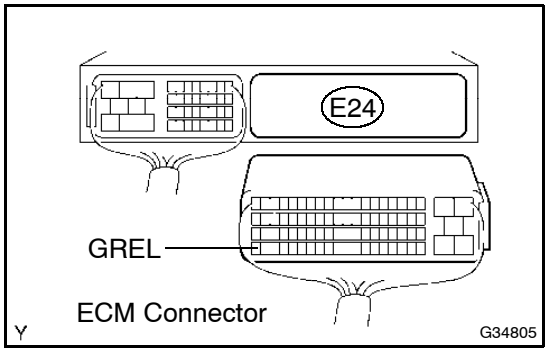
Tester Connection	Specified Condition
3 - 4	10 kΩ or higher
3 - 4	Below 1 Ω (When battery voltage applied to terminals 1 and 2)

(c) Reinstall the glow plug relay.

NG → **REPLACE GLOW PLUG RELAY ASSY**

OK

2 CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY - ECM)



(a) Disconnect the E24 ECM connector.

(b) Remove the glow plug relay.

(c) Check the resistance.

Standard (Check for open):

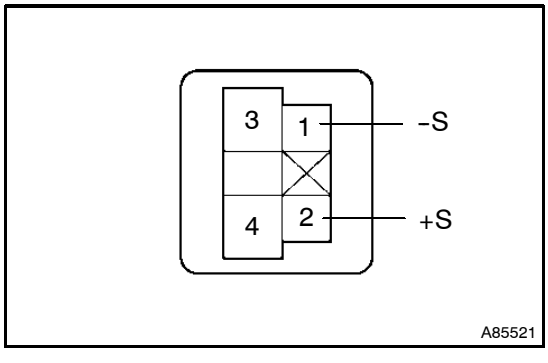
Tester Connection	Specified Condition
+S (Glow plug relay terminal 2) - GREL (E24-81)	Below 1 Ω
-S (Glow plug relay terminal 1) - Body ground	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
GREL (E24-81) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.

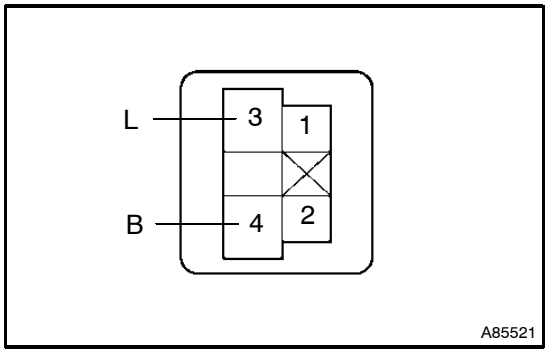
(e) Reinstall the glow plug relay.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	CHECK HARNESS AND CONNECTOR (GLOW PLUG RELAY - GLOW PLUG, AND GLOW PLUG RELAY - BATTERY)



(a) Remove the glow plug relay.
(b) Disconnect the glow plug wire.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
L (Glow plug relay terminal 3) - Glow plug wire	Below 1 Ω
B (Glow plug relay terminal 4) - Battery positive terminal	Below 1 Ω

(d) Reinstall the glow plug relay.
(e) Reconnect the glow plug wire.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (See page 10-15)

DTC	P0400	EXHAUST GAS RECIRCULATION FLOW

CIRCUIT DESCRIPTION

The EGR (Exhaust Gas Recirculation) system recirculates exhaust gases, which are controlled to the proper volume in accordance with driving conditions. The recirculated gas mingles with the intake air, therefore slowing down the engine combustion and lowering the combustion temperature. This helps reduce nitrogen oxide (NOx) emissions.

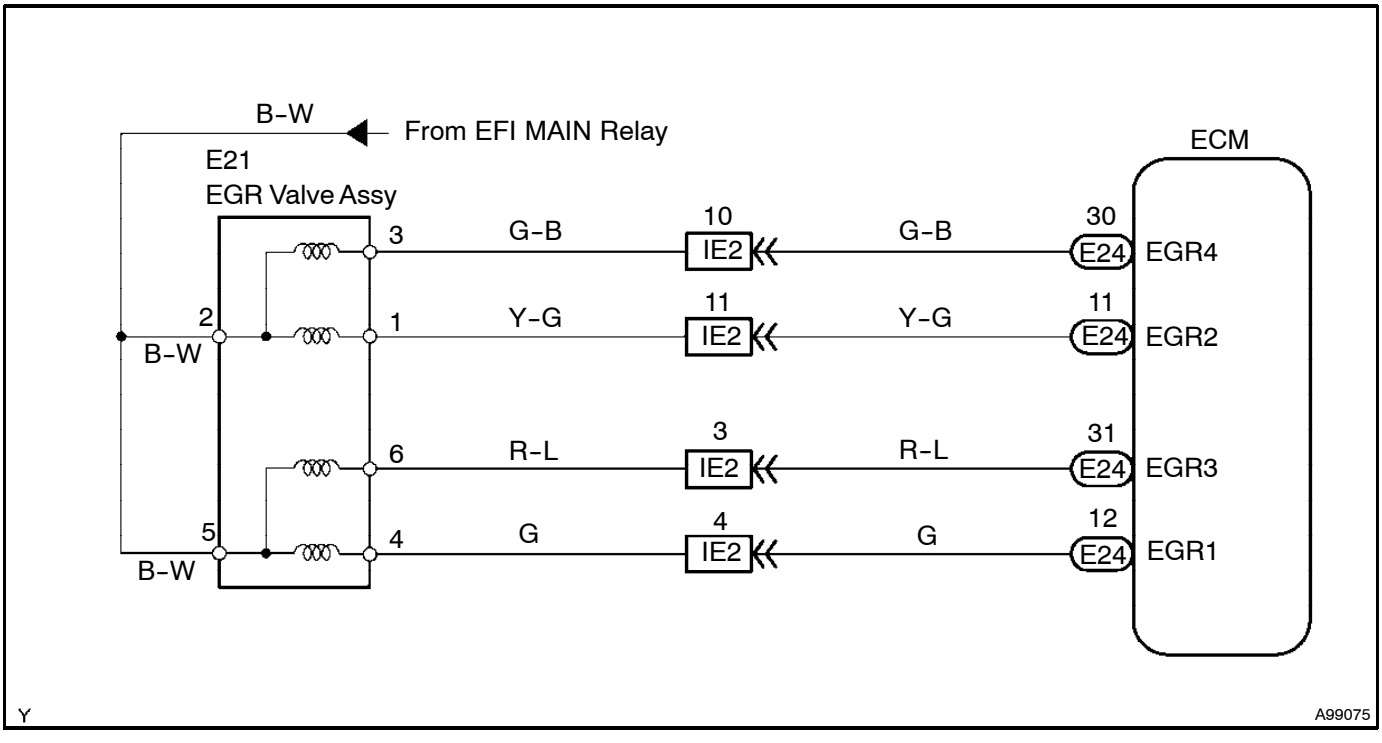
In order to increase circulatory efficiency, the ECM adjusts the lift of the EGR valve and intake shutter valve (throttle valve).

DTC No.	DTC Detection Condition	Trouble Areas
P0400	Target and actual mass air flow rates differ (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in EGR circuit • EGR valve assembly • EGR passage • Intake shutter • Mass air flow meter • Contamination in mass air flow meter • ECM

HINT:

- DTC P0400 is set while the engine is running in steady condition.
- If DTC P0403 has already been set, P0400 is not set.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO P0400)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

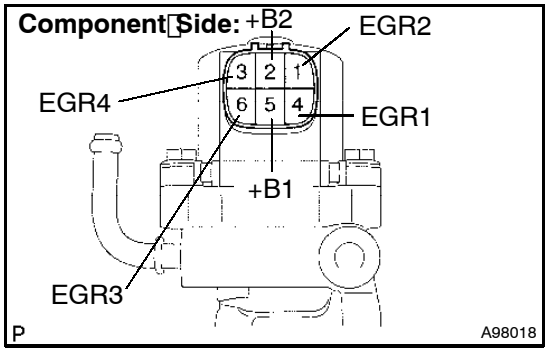
Display (DTC Output)	Proceed To
P0400	A
P0400 and other DTCs	B

HINT:
If any DTCs other than P0400 are output, troubleshoot those DTCs first.

B → **GO TO RELEVANT DTC CHART** (See page 05-141)

A

2	INSPECT EGR VALVE ASSY



(a) Disconnect E21 EGR valve connector.
(b) Measure the resistance between the terminals of the EGR valve.

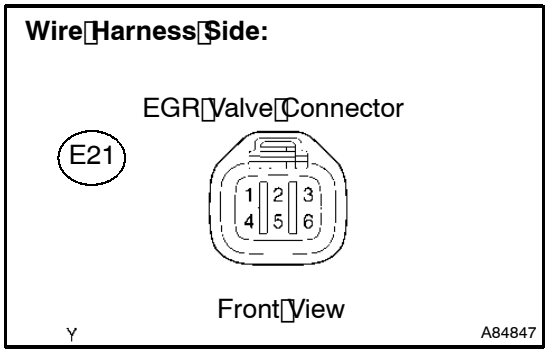
Standard:

Tester Connection	Specified Condition
+B1 (5) - EGR1 (4)	19.6 ± 1.4 Ω
+B1 (5) - EGR3 (6)	19.6 ± 1.4 Ω
+B2 (2) - EGR2 (1)	19.6 ± 1.4 Ω
+B2 (2) - EGR4 (3)	19.6 ± 1.4 Ω

NG → **REPLACE EGR VALVE ASSY** (See page 14-26)

OK

3 CHECK HARNESS AND CONNECTOR (EGR VALVE ASSY - ECM)



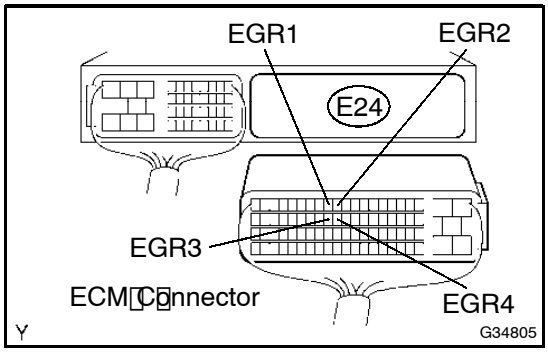
(a) Disconnect the E21 EGR valve connector.
(b) Disconnect the E24 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EGR1 (E24-12) - (E21-4)	Below 1 Ω
EGR2 (E24-11) - (E21-1)	Below 1 Ω
EGR3 (E24-31) - (E21-6)	Below 1 Ω
EGR4 (E24-30) - (E21-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EGR1 (E24-12) or (E21-4) - Body ground	10 kΩ or higher
EGR2 (E24-11) or (E21-1) - Body ground	10 kΩ or higher
EGR3 (E24-31) or (E21-6) - Body ground	10 kΩ or higher
EGR4 (E24-30) or (E21-3) - Body ground	10 kΩ or higher

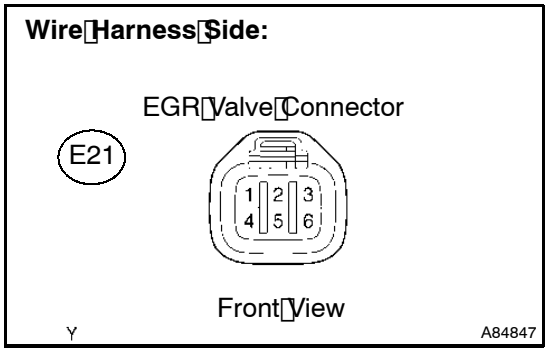


(d) Reconnect the EGR valve connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT ECM (EGR VALVE ASSY VOLTAGE)

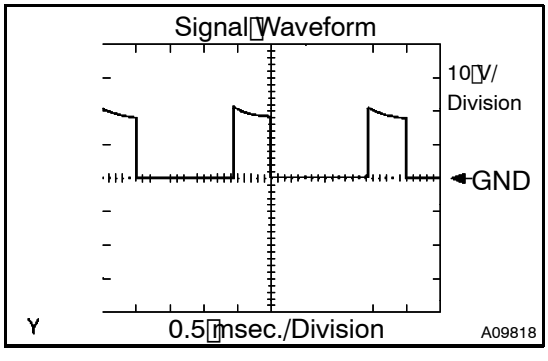


(a) Disconnect the E21 EGR valve connector.
(b) Inspect the ECM using an oscilloscope.
(c) While repeating quick engine RPM accelerations, check the waveform between the terminals of the E21 EGR valve connector.

Standard:

Tester Connection	Specified Condition
(E21-6) - Body ground	Correct waveform shown
(E21-5) - Body ground	Correct waveform shown
(E21-4) - Body ground	Correct waveform shown
(E21-3) - Body ground	Correct waveform shown

(d) Reconnect the EGR valve connector.



NG → **REPLACE ECM (See page 10-15)**

OK

5	CHECK FOR DEPOSIT (EGR VALVE ASSY)

OK: No deposit

NG → REMOVE FOREIGN OBJECT AND CLEAN EGR VALVE

OK

6	CHECK FOR DEPOSIT (EGR PASSAGE)

OK: No deposit

NG → REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENTS AND AREA

OK

7	CHECK FOR EXHAUST GAS LEAKS

OK: No leakage

NG → REPAIR EXHAUST GAS LEAKAGE POINT

OK

8	INSPECT INTAKE SHUTTER ASSY (See page 10-1)

OK: No malfunction

NG → REPLACE MASS AIR FLOW METER

OK

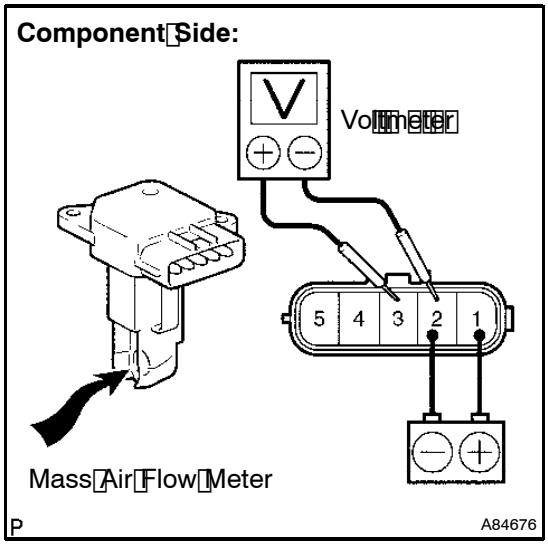
9	INSPECT MASS AIR FLOW METER (VISUAL INSPECTION)

OK: The sensor area of the mass air flow meter has not been contaminated.

NG → REPLACE MASS AIR FLOW METER

OK

10	INSPECT MASS AIR FLOW METER



(a) Remove the mass air flow meter.
(b) Apply battery voltage across terminals 1 (+B) and 2 (E2G).
(c) Using a voltmeter, connect the positive (+) tester probe to terminal 3 (VG), and negative (-) tester probe to terminal 2 (E2G).
(d) Blow air into the mass air flow meter.
OK: The voltage fluctuates.
(e) Reinstall the mass air flow meter.

NG → **REPLACE MASS AIR FLOW METER**

OK →

REPLACE EGR VALVE ASSY (See page 14-26)

DTC	P0403	EXHAUST GAS RECIRCULATION CONTROL CIRCUIT

CIRCUIT DESCRIPTION

Refer to DTC P0400 on page 05-117.

DTC No.	DTC Detection Condition	Trouble Area
P0403	Open or short in EGR valve circuit (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in EGR circuit • EGR valve assembly • ECM

HINT:

DTC P0403 is set when the ignition switch is in the ON position.

WIRING DIAGRAM

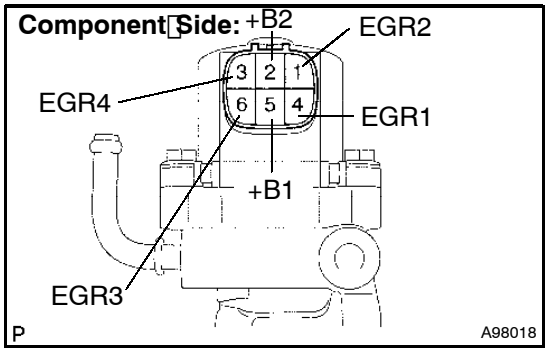
Refer to DTC P0400 on page 05-117.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	INSPECT EGR VALVE ASSY



(a) Disconnect E21 EGR valve connector.

(b) Measure the resistance between the terminals of the EGR valve.

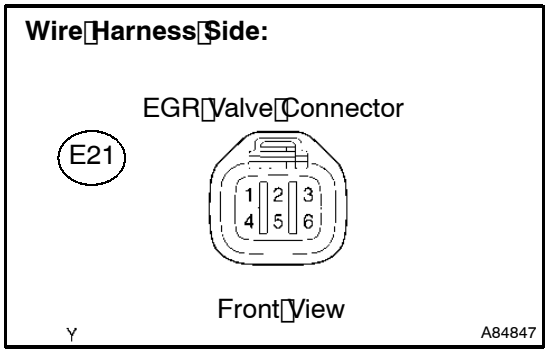
Standard:

Tester Connection	Specified Condition
+B1 (5) - EGR1 (4)	19.6 ± 1.4 Ω
+B1 (5) - EGR3 (6)	19.6 ± 1.4 Ω
+B2 (2) - EGR2 (1)	19.6 ± 1.4 Ω
+B2 (2) - EGR4 (3)	19.6 ± 1.4 Ω

NG → **REPLACE EGR VALVE ASSY** (See page 14-26)

OK

2 CHECK HARNESS AND CONNECTOR (EGR VALVE ASSY - ECM)



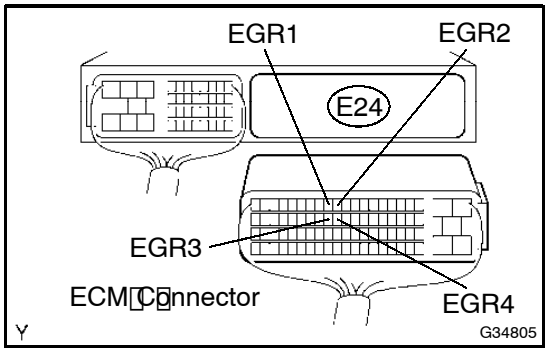
(a) Disconnect the E21 EGR valve connector.
(b) Disconnect the E24 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EGR1 (E24-12) - (E21-4)	Below 1 Ω
EGR2 (E24-11) - (E21-1)	Below 1 Ω
EGR3 (E24-31) - (E21-6)	Below 1 Ω
EGR4 (E24-30) - (E21-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EGR1 (E24-12) or (E21-4) - Body ground	10 kΩ or higher
EGR2 (E24-11) or (E21-1) - Body ground	10 kΩ or higher
EGR3 (E24-31) or (E21-6) - Body ground	10 kΩ or higher
EGR4 (E24-30) or (E21-3) - Body ground	10 kΩ or higher



(d) Reconnect the EGR valve connector.
(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

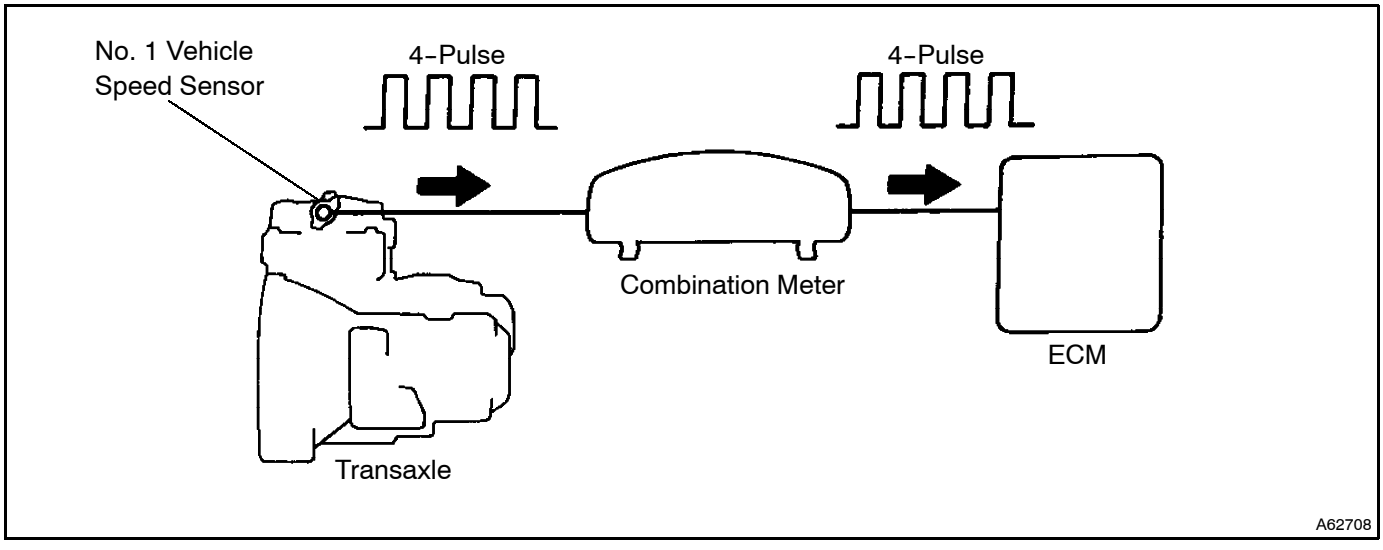
OK

REPLACE ECM (See page 10-15)

DTC	P0500	VEHICLE SPEED SENSOR "A"

CIRCUIT DESCRIPTION

The vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular 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.

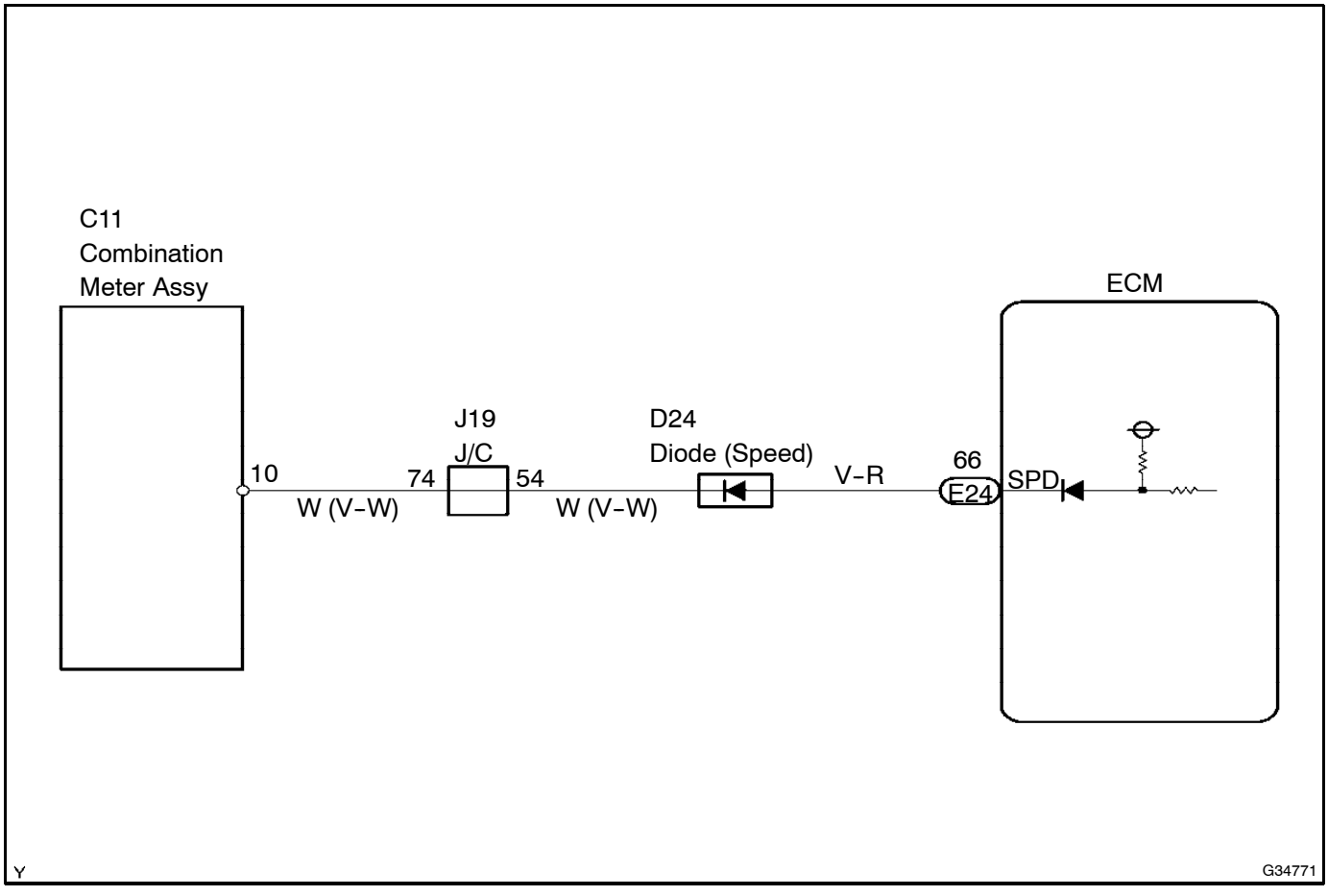


DTC No.	DTC Detection Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM While vehicle driven with highly loaded engine and in high gear (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in speed sensor circuit • Speed sensor • Combination meter • ECM

HINT:

DTC P0500 is set when the vehicle is driven with highly loaded engine and in high gear.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OPERATION OF SPEEDOMETER

(a) Check the speedometer reading in the combination meter.

HINT:

If the vehicle speed sensor has any malfunctions, the speedometer shows abnormal readings.

OK: The speedometer operates normally.

NG → **CHECK SPEEDOMETER CIRCUIT (INCLUDE SPEED SENSOR)**

OK

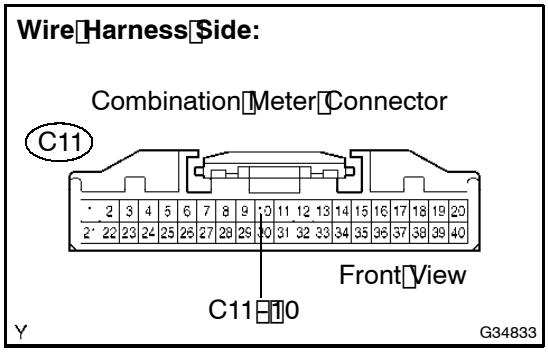
2	READ VALUE USING INTELLIGENT TESTER II (VEHICLE SPEED)

(a) Connect an intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Vehicle SPD.
(d) Check the vehicle speed at the engine speed of 2,000 rpm or more while the vehicle is running.
OK: Same value as the actual vehicle speed.

YES → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-7)**

NO

3	CHECK HARNESS AND CONNECTOR (ECM - COMBINATION METER)



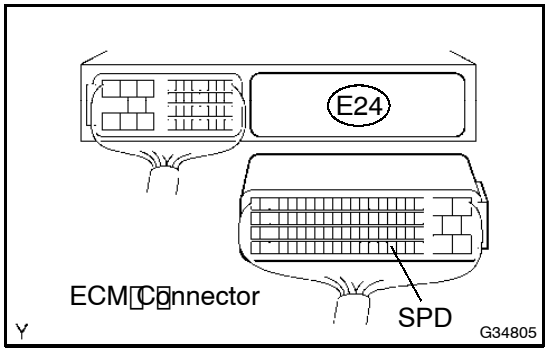
(a) Disconnect the E24 ECM connector.
(b) Disconnect the C11 combination meter connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
SPD (E24-66) - Combination meter (C11-10)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
SPD (E24-66) or Combination meter (C11-10) - Body ground	10 kΩ or higher



(d) Reconnect the ECM connector.
(e) Reconnect the combination meter connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P0603	INTERNAL CONTROL MODULE KEEP ALIVE MEMORY (KAM) ERROR

NOTICE:

- **When an injector is replaced, the injector's compensation code must be input into the ECM. When the ECM is changed, all of the existing injector compensation codes must be input into the new ECM.**
- **An injector compensation code is unique. The 10-digit alphanumeric code imprinted on the head portion of an injector is its compensation code. If an incorrect injector compensation code is input into the ECM, the engine assembly may rattle or engine idling may become rough. In addition, engine failure may occur and the life of the engine may be shortened.**

1. When you replace the ECM with a new one, input all the injectors' compensation codes into the new ECM as follows:

(a) Prior to replacing the ECM, read and save each injector's compensation code, stored in the original ECM, using an intelligent tester II (see page 05-14).
(b) After installing a new ECM, input the saved compensation codes into the new ECM using the tester (see page 05-19).
(c) Turn the tester OFF and then turn the ignition switch to OFF.
(d) Wait for at least 30 seconds.
(e) Turn the ignition switch to ON and then turn the tester ON.
(f) Clear DTC P0603 stored in the ECM using the tester (see page 05-33).

HINT:

- Each injector has different fuel injection characteristics. In order to optimize the fuel injections, the ECM uses the compensation codes to balance the different fuel injections between each injector.
- When you first turn the ignition switch to ON after replacing the ECM or an injector(s), DTC P0603 is set. This is to inform you that an injector compensation code(s) is/are required to be registered. Manually clear the DTC upon completion of the compensation code registration.

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0603	Injector compensation code not registered (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Injector compensation code • ECM

HINT:

DTC P0603 is set when the ignition switch is in the ON position.

INSPECTION PROCEDURE

1	CHECK INJECTOR COMPENSATION CODE (See page 05-14)

OK: The compensation codes stored in the ECM match the compensation codes of the installed injectors.

NG → **REGISTER INJECTOR COMPENSATION CODE (See page 05-19)**

OK →

REPLACE ECM (See page 10-15)

DTC	P0642	SENSOR REFERENCE VOLTAGE "A" CIRCUIT LOW

DTC	P0643	SENSOR REFERENCE VOLTAGE "A" CIRCUIT HIGH

CIRCUIT DESCRIPTION

Refer to DTC P0122 on page 05-77 and DTC P1120 on page 05-141.

DTC No.	DTC Detection Condition	Trouble Area
P0642	Power voltages (5 V as standard) supplied from ECM to both intake shutter position and accelerator pedal position sensors are lower than appropriate thresholds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Intake shutter position sensor • Open or short in intake shutter position sensor circuit • Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM
P0643	Power voltages (5 V as standard) supplied from ECM to both intake shutter position and accelerator pedal position sensors are higher than appropriate thresholds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Intake shutter position sensor • Open or short in intake shutter position sensor circuit • Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM

HINT:
These DTCs are set when the ignition switch is in the ON position.

WIRING DIAGRAM

Refer to DTC P0122 on page 05-77 and DTC P1120 on page 05-141.

INSPECTION PROCEDURE

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0642 AND/OR P0643)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.
Result:

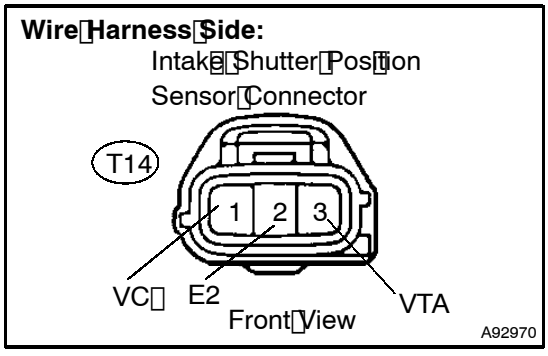
Display (DTC Output)	Proceed To
P0642 and/or P0643	A
P0642 and/or P0643 and other DTCs	B

HINT:
If any DTCs other than P0642 and/or P0634 are output, troubleshoot those DTCs first.

B	GO TO RELEVANT DTC CHART (See page 05-141)

A

2	CHECK HARNESS AND CONNECTOR (INTAKE SHUTTER (THROTTLE VALVE) POSITION SENSOR - ECM)



(a) Disconnect the T14 intake shutter position sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

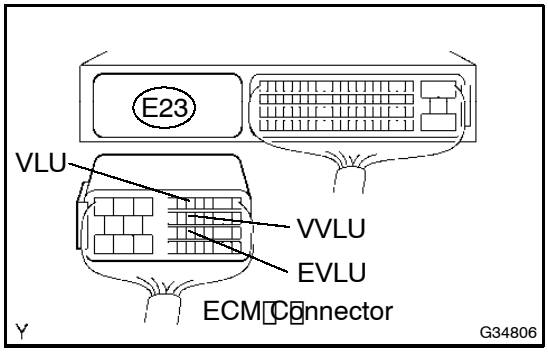
Standard (Check for open):

Tester Connection	Specified Condition
VVLU (E23-24) - VC (T14-1)	Below 1 Ω
VLU (E23-35) - VTA (T14-3)	Below 1 Ω
EVLU (E23-14) - E2 (T14-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VVLU (E23-24) or VC (T14-1) - Body ground	10 kΩ or higher
VLU (E23-35) or VTA (T14-3) - Body ground	10 kΩ or higher
EVLU (E23-14) or E2 (T14-2) - Body ground	10 kΩ or higher

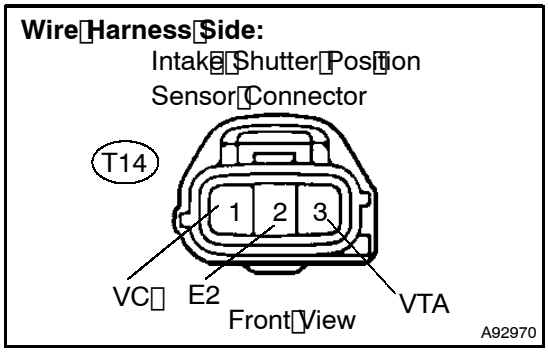
(d) Reconnect the intake shutter position sensor connector.
(e) Reconnect the ECM connector.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT ECM



(a) Turn the ignition switch to ON.
(b) Measure the voltage between the terminals of the T14 intake shutter position sensor connector.

Standard:

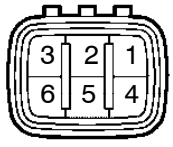
Tester Connection	Specified Condition
VC (T14-1) - E2 (T14-2)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-15)**

OK

4	INSPECT ACCELERATOR PEDAL ASSY (ACCELERATOR PEDAL POSITION SENSOR)

Component Side:



Accelerator Pedal Position Sensor

A84814

(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Measure the resistance between each pair of terminals.

Standard:

Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	1.5 kΩ to 6.0 kΩ at 20°C (68°F)
EP2 (3) - VCP2 (6)	1.5 kΩ to 6.0 kΩ at 20°C (68°F)

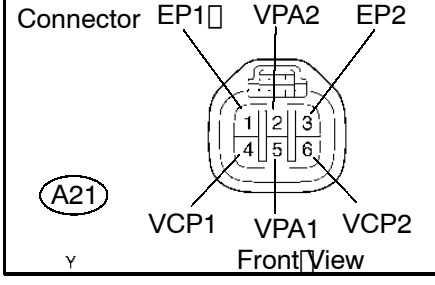
(c) Reconnect the accelerator pedal position sensor connector.

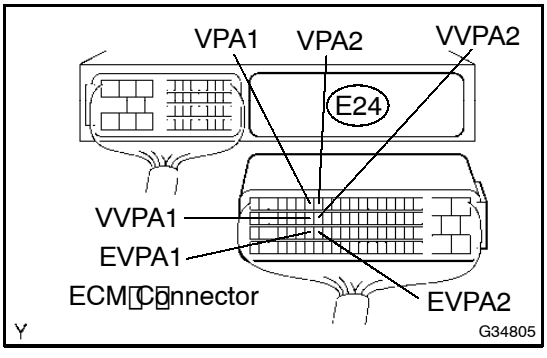
NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

5	CHECK HARNESS AND CONNECTOR (ACCELERATOR PEDAL POSITION SENSOR - ECM)

Wire Harness Side:





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect the E24 ECM connector.

(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA1 (E24-15)	Below 1 Ω
EP1 (A21-1) - EVPA1 (E24-54)	Below 1 Ω
VCP1 (A21-4) - VVPA1 (E24-34)	Below 1 Ω
VPA2 (A21-2) - VPA2 (E24-14)	Below 1 Ω
EP2 (A21-3) - EVPA2 (E24-53)	Below 1 Ω
VCP2 (A21-6) - VVPA2 (E24-33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA1 (E24-15) - Body ground	10 kΩ or higher
EP1 (A21-1) or EVPA1 (E24-54) - Body ground	10 kΩ or higher
VCP1 (A21-4) or VVPA1 (E24-34) - Body ground	10 kΩ or higher
VPA2 (A21-2) or VPA2 (E24-14) - Body ground	10 kΩ or higher
EP2 (A21-3) or EVPA2 (E24-53) - Body ground	10 kΩ or higher
VCP2 (A21-6) or VVPA2 (E24-33) - Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P0652	SENSOR REFERENCE VOLTAGE "B" CIRCUIT LOW

DTC	P0653	SENSOR REFERENCE VOLTAGE "B" CIRCUIT HIGH

CIRCUIT DESCRIPTION

Refer to DTC P1120 on page 05-141.

DTC No.	DTC Detection Condition	Trouble Area
P0652	Power voltage (5 V as standard) supplied from ECM to accelerator pedal position sensor is lower than threshold (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM
P0653	Power voltage (5 V as standard) supplied from ECM to accelerator pedal position sensor is higher than threshold (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Accelerator pedal position sensor • Open or short in accelerator pedal position sensor circuit • ECM

HINT:

These DTCs are set when the ignition switch is in the ON position.

WIRING DIAGRAM

Refer to DTC P1120 on page 05-141.

INSPECTION PROCEDURE

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0652 AND/OR P0653)

(a) Connect an intelligent tester II to the DLC3.

(b) Turn the ignition switch to ON and turn the intelligent tester II ON.

(c) Select the following menu items: Powertrain / Engine and ECT / DTC.

(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0652 and/or P0653	A
P0652 and/or P0653 and other DTCs	B

HINT:

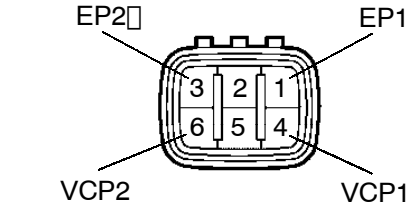
If any DTCs other than P0652 and/or P0653 are output, troubleshoot those DTCs first.

B → **GO TO RELEVANT DTC CHART** (See page 05-141)

A

2	INSPECT ACCELERATOR PEDAL ASSY (ACCELERATOR PEDAL POSITION SENSOR)

Component Side:



(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Measure the resistance between each pair of terminals.

Standard:

Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) - VCP2 (6)	2.25 to 4.75 kΩ at 20°C (68°F)

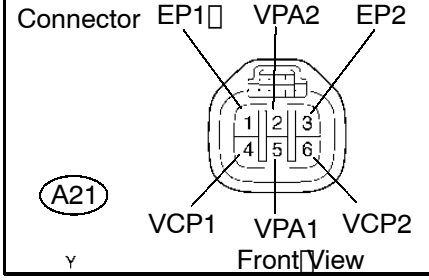
(c) Reconnect the accelerator pedal position sensor connector.

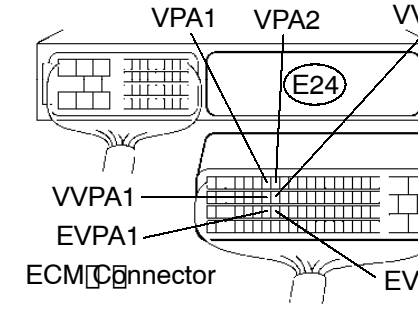
NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

3	CHECK HARNESS AND CONNECTOR (ACCELERATOR PEDAL POSITION SENSOR - ECM)

Wire Harness Side:





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect the E24 ECM connector.

(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA1 (E24-15)	Below 1 Ω
EP1 (A21-1) - EVPA1 (E24-54)	Below 1 Ω
VCP1 (A21-4) - VVPA1 (E24-34)	Below 1 Ω
VPA2 (A21-2) - VPA2 (E24-14)	Below 1 Ω
EP2 (A21-3) - EVPA2 (E24-53)	Below 1 Ω
VCP2 (A21-6) - VVPA2 (E24-33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA1 (E24-15) - Body ground	10 kΩ or higher
EP1 (A21-1) or EVPA1 (E24-54) - Body ground	10 kΩ or higher
VCP1 (A21-4) or VVPA1 (E24-34) - Body ground	10 kΩ or higher
VPA2 (A21-2) or VPA2 (E24-14) - Body ground	10 kΩ or higher
EP2 (A21-3) or EVPA2 (E24-53) - Body ground	10 kΩ or higher
VCP2 (A21-6) or VVPA2 (E24-33) - Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P0685	ECM/PCM POWER RELAY CONTROL CIRCUIT / OPEN

CIRCUIT DESCRIPTION

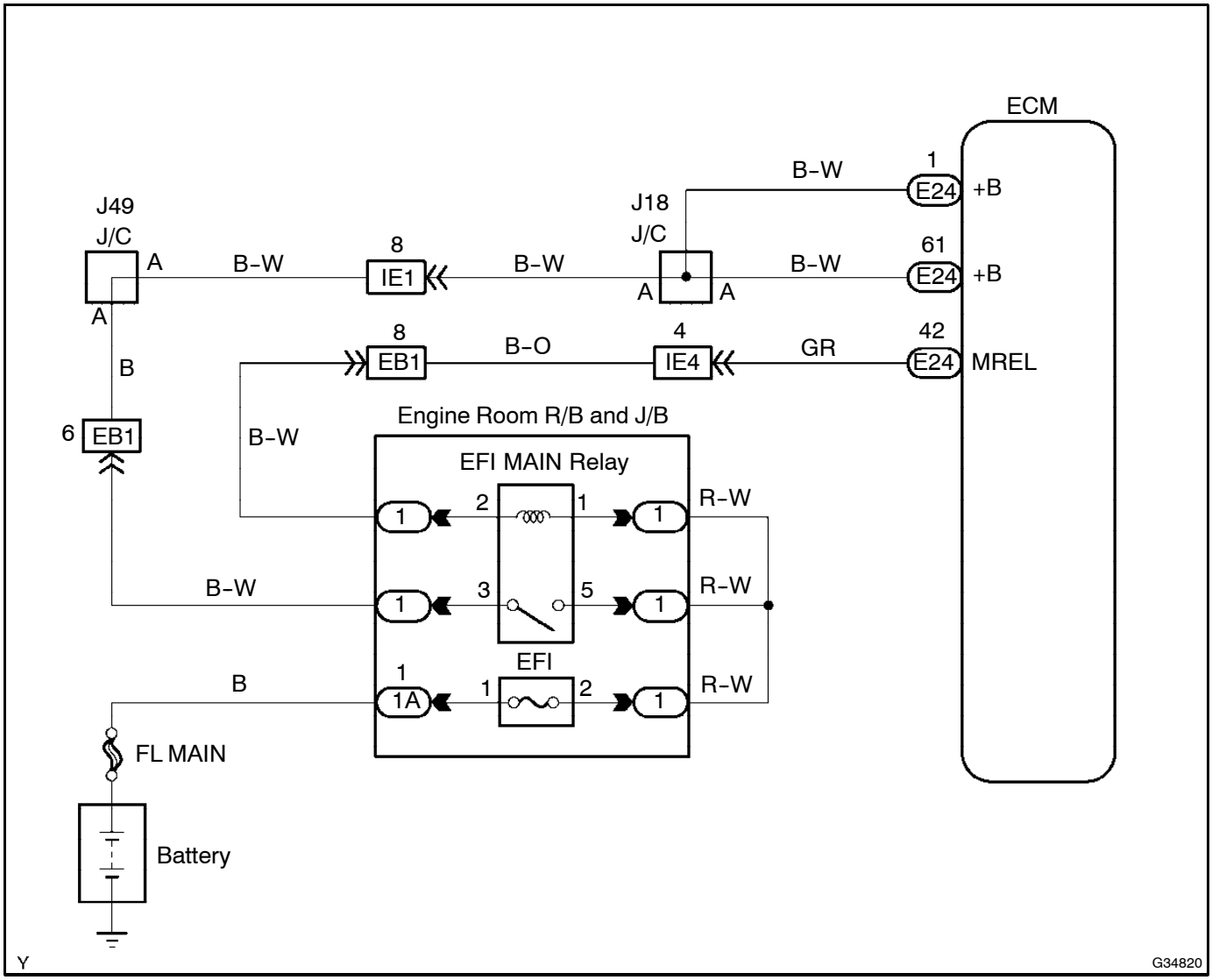
The battery supplies power to terminal +B of the ECM even when the ignition switch is turned to OFF (up to 15 seconds).

DTC No.	DTC Detection Condition	Trouble Area
P0685	• After ignition switch is turned to OFF, voltage supplied to terminal +B is cut earlier than minimum threshold duration (A DTC is set when a malfunction is detected, but the MIL is not illuminated) • After ignition switch is turned to OFF, voltage supplied to terminal +B continues after threshold duration elapsed (A DTC is set when a malfunction is detected, but the MIL is not illuminated)	• Open in EFI MAIN relay circuit • EFI MAIN relay • ECM

HINT:

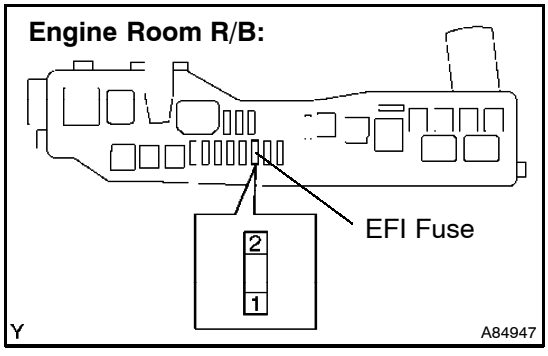
- DTC P0685 is set when the ignition switch is turned to OFF.
- If DTC P0685 is set, the ECM does not store other DTCs.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FUSE(EFI FUSE)

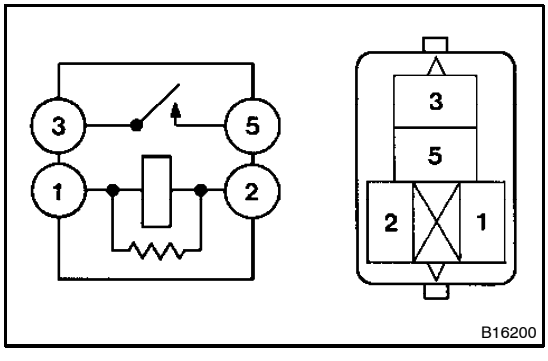


(a) Remove the EFI fuse from the engine room R/B.
(b) Check the EFI fuse resistance.
Standard: Below 1 Ω
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

2 INSPECT EFI MAIN RELAY



(a) Remove the EFI MAIN relay from the engine room R/B.
(b) Check the EFI MAIN relay resistance.
Standard:

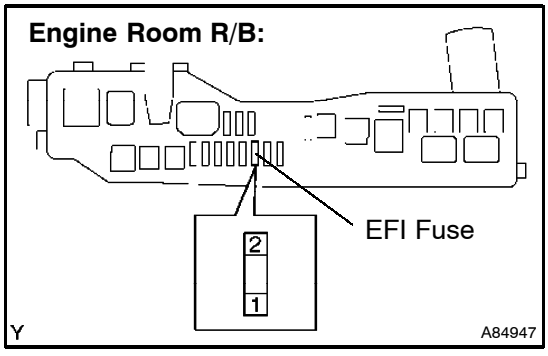
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (When battery voltage applied to terminals 1 and 2)

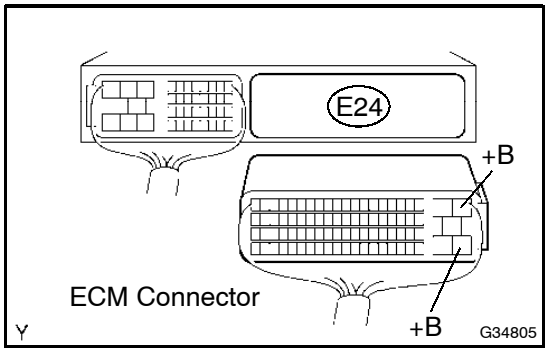
(c) Reinstall the EFI MAIN relay.

NG → **REPLACE EFI MAIN RELAY**

OK

3	CHECK HARNESS AND CONNECTOR(EFI FUSE - ECM, EFI FUSE - BATTERY)





(a) Check the harness and connectors between the EFI fuse and ECM.

(1) Remove the EFI fuse from the engine room R/B.

(2) Disconnect the E24 ECM connector.

(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EFI fuse (2) - +B (E24-1)	Below 1 Ω
EFI fuse (2) - +B (E24-61)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI fuse (2) or +B (E24-1) - Body ground	10 kΩ or higher
EFI fuse (2) or +B (E24-61) - Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.

(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EFI fuse and battery.

(1) Remove the EFI fuse from the engine room R/B.

(2) Disconnect the positive battery cable.

(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
Positive battery cable terminal - EFI fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Positive battery cable terminal or EFI fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.

(5) Reconnect the battery cable.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ENGINE ROOM RELAY BLOCK

DTC	P0698	SENSOR REFERENCE VOLTAGE "C" CIRCUIT LOW

DTC	P0699	SENSOR REFERENCE VOLTAGE "C" CIRCUIT HIGH

CIRCUIT DESCRIPTION

Refer to DTC P0190 on page 05-83 and DTC P0236 on page 05-97.

DTC No.	DTC Detection Condition	Trouble Area
P0698	Power voltages (5 V as standard) supplied from ECM to both fuel pressure and manifold pressure sensors are lower than appropriate thresholds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM
P0699	Power voltages (5 V as standard) supplied from ECM to both fuel pressure and manifold pressure sensors are higher than appropriate thresholds (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM

HINT:
These DTCs are set when the ignition switch is in the ON position.

WIRING DIAGRAM

Refer to DTC P0190 on page 05-83 and DTC P0236 on page 05-97.

INSPECTION PROCEDURE

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0698 AND/OR P0699)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0698 and/or P0699	A
P0698 and/or P0699 and other DTCs	B

HINT:
If any DTCs other than P0698 and/or P0699 are output, troubleshoot those DTCs first.

B → **GO TO RELEVANT DTC CHART** (See page 05-41)

A

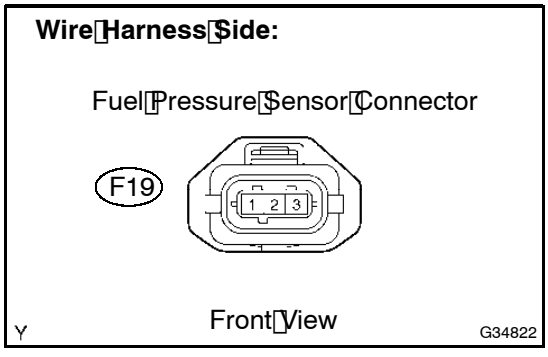
2	INSPECT COMMON RAIL ASSY (FUEL PRESSURE SENSOR)

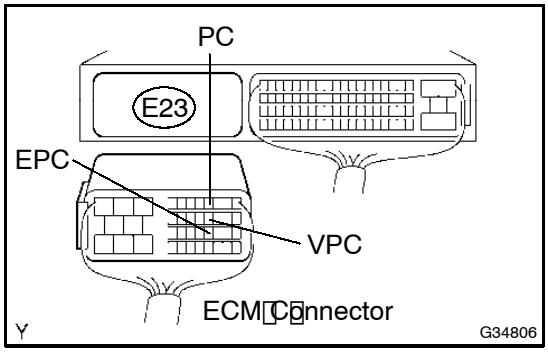
OK: The fuel pressure sensor resistance is within the standard range.

NG	REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11-20)

OK

3	CHECK HARNESS AND CONNECTOR (FUEL PRESSURE SENSOR - ECM)





(a) Disconnect the F19 fuel pressure sensor connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PC (E23-37) - (F19-2)	Below 1 Ω
VPC (E23-26) - (F19-3)	Below 1 Ω
EPC (E23-16) - (F19-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PC (E23-37) or (F19-2) - Body ground	10 kΩ or higher
VPC (E23-26) or (F19-3) - Body ground	10 kΩ or higher
EPC (E23-16) or (F19-1) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the fuel pressure sensor connector.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4	INSPECT MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 13-3)

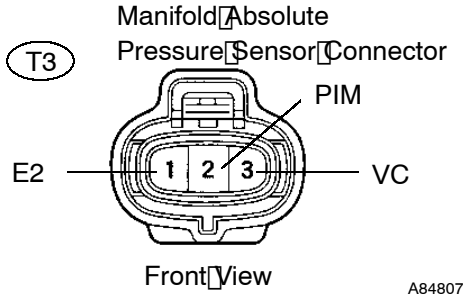
OK: The manifold absolute pressure sensor resistance is within the standard range.

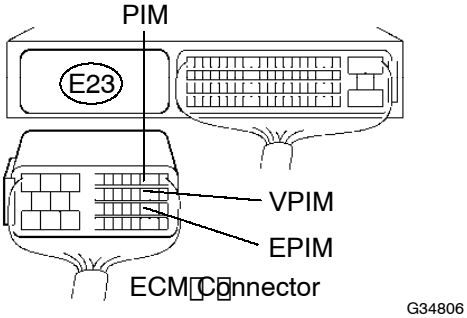
NG	REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR (See page 16-12)

OK

5	CHECK HARNESS AND CONNECTOR (MANIFOLD ABSOLUTE PRESSURE SENSOR - ECM)

Wire Harness Side:





(a) Disconnect the T3 manifold absolute pressure sensor connector.

(b) Disconnect the E23 ECM connector.

(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E23-38)	Below 1 Ω
VC (T3-3) - VPIM (E23-27)	Below 1 Ω
E2 (T3-1) - EPIM (E23-17)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E23-38) - Body ground	10 kΩ or higher
VC (T3-3) or VPIM (E23-27) - Body ground	10 kΩ or higher
E2 (T3-1) or EPIM (E23-17) - Body ground	10 kΩ or higher

(d) Reconnect the manifold absolute pressure sensor connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P0704	CLUTCH SWITCH INPUT CIRCUIT MALFUNCTION (Only M/T vehicle)

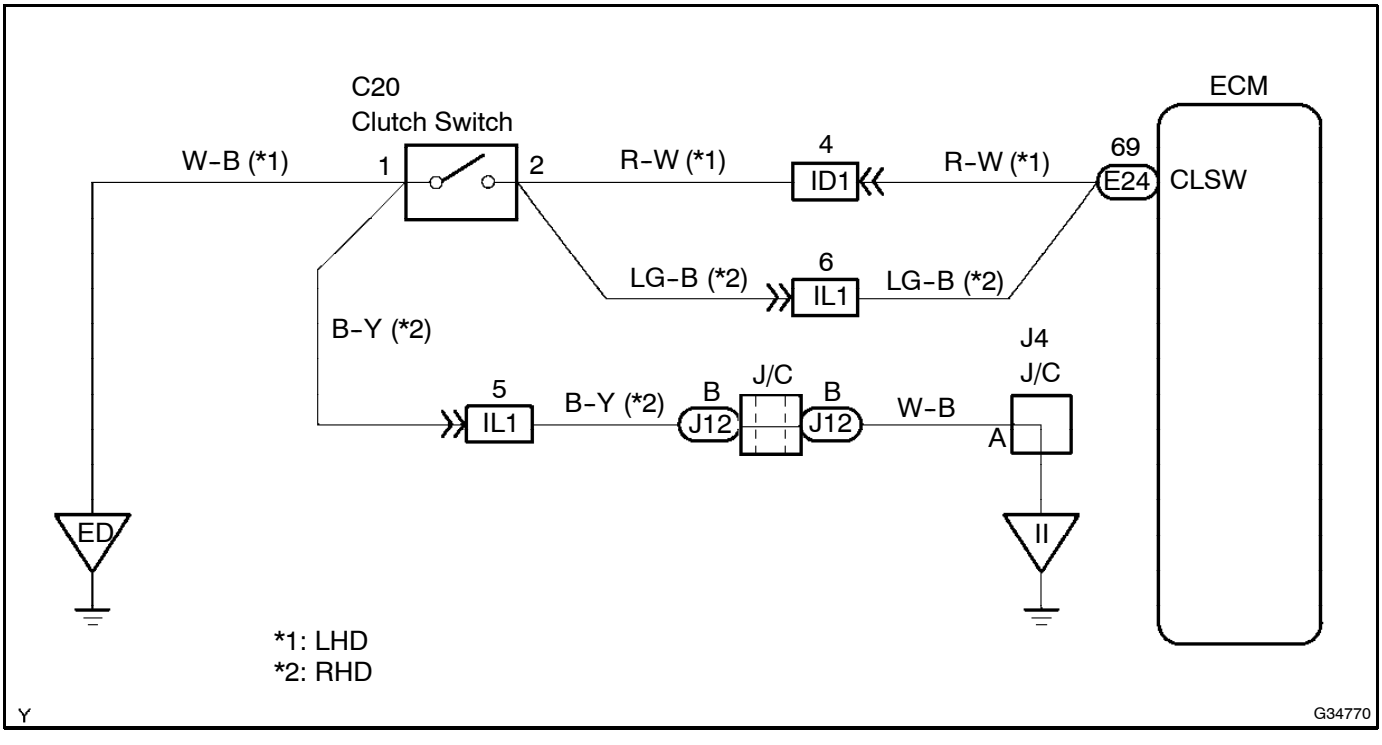
CIRCUIT DESCRIPTION

The clutch switch is mounted on the clutch pedal. The switch is turned ON when depressing the clutch pedal, and transmits a signal to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0704	No clutch switch signals to ECM despite gears being shifted (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Open or short in clutch switch circuit • Clutch switch circuit • ECM

HINT:
DTC P0704 is set when the gears are shifted more than 10 times.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE USING INTELLIGENT TESTER II(CLUTCH UPPER SWITCH)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Clutch Upper Switch.
(d) Read the value.

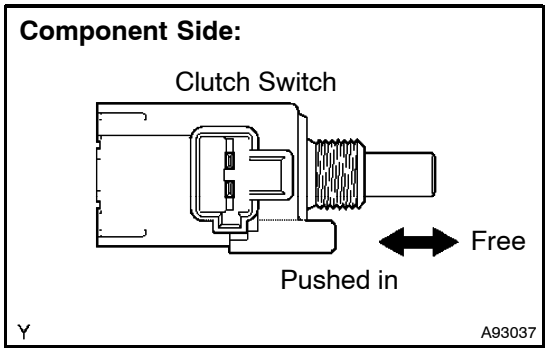
OK:

Clutch Pedal Operation	Specified Condition
Depressed	ON
Released	OFF

OK	CHECK FOR INTERMITTENT PROBLEMS (See page 05-7)

NG

2 INSPECT CLUTCH SWITCH ASSY



(a) Remove the C20 clutch switch.
(b) Check the resistance.

Standard:

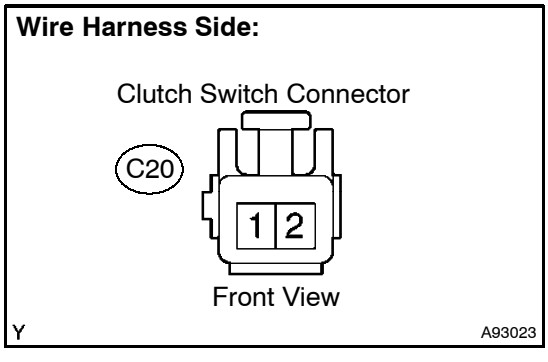
Switch Position	Specified Condition
Switch pin free	10 kΩ or higher
Switch pin pushed in	Below 1 Ω

(c) Reinstall the clutch switch.

NG	REPLACE CLUTCH SWITCH ASSY

OK

3 CHECK HARNESS AND CONNECTOR(CLUTCH SWITCH - ECM)



(a) Disconnect the C20 clutch switch connector.
(b) Disconnect the E24 ECM connector.
(c) Check the resistance.

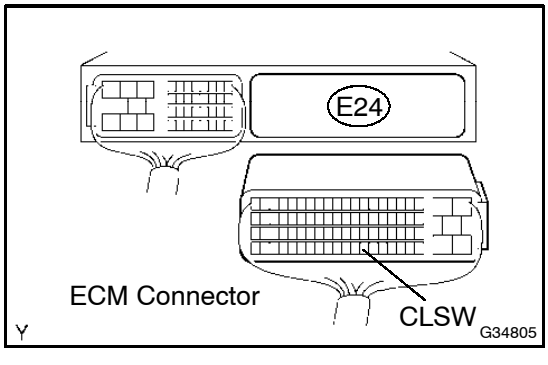
Standard (Check for open):

Tester Connection	Specified Condition
CLSW (E24-69) - (C20-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
CLSW (E24-69) or (C20-2) - Body ground	10 kΩ or higher

(d) Reconnect the clutch switch connector.
(e) Reconnect the ECM connector.



NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

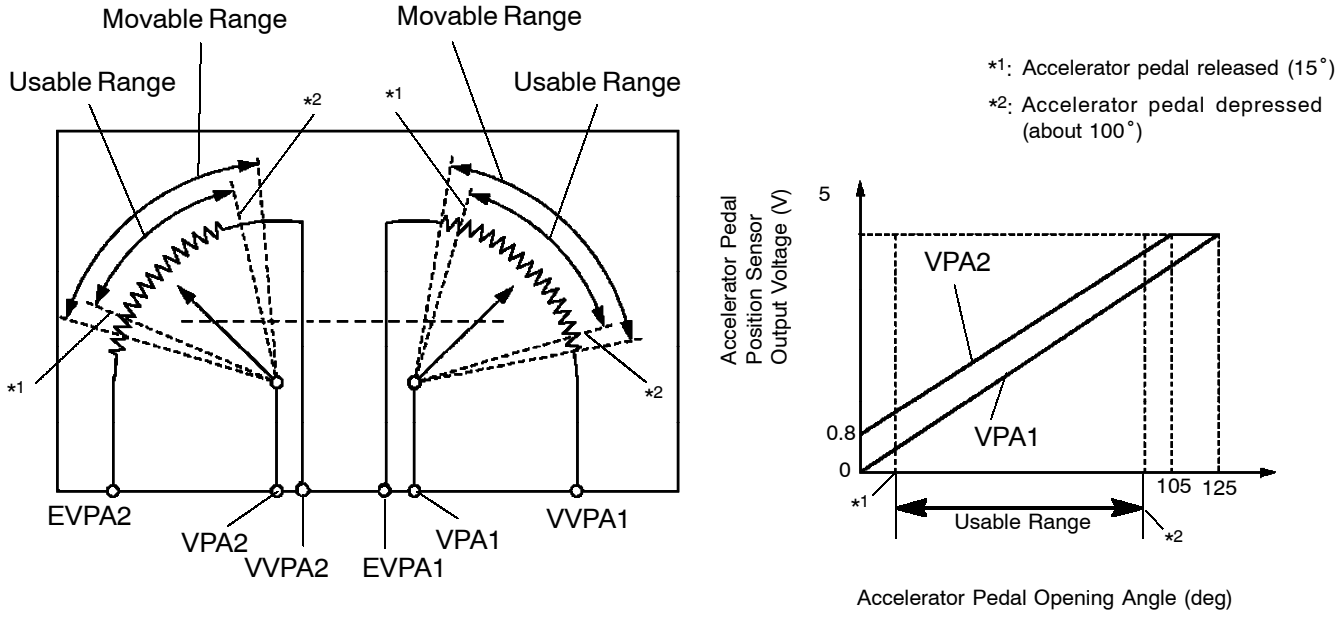
REPLACE ECM (See page 10-15)

DTC	P1120	ACCELERATOR PEDAL POSITION SENSOR CIRCUIT MALFUNCTION

HINT:
This DTC relates to the accelerator pedal position sensor.

CIRCUIT DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and has the 2 sensors to detect the accelerator position and malfunctions of the accelerator position sensor itself.
In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for engine control, and the VPA2 is a signal which is used for detecting a malfunction in the sensor.



DTC No.	DTC Detection Condition	Trouble Area
P1120	• Condition (a) or (b) continues for 0.5 seconds or more: (a) VPA1 less than 0.2 V when accelerator pedal fully released or VPA1 more than 4.8 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected) (b) VPA2 less than 0.5 V when accelerator pedal fully released or VPA2 more than 4.8 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

HINT:
This DTC is set when the ignition switch is in the ON position.

HINT:

When DTC P1120 is set, check the accelerator pedal position sensor output voltage by selecting the following menu items on the intelligent tester II: Powertrain / Engine and ECT / Data List / Accel Position.

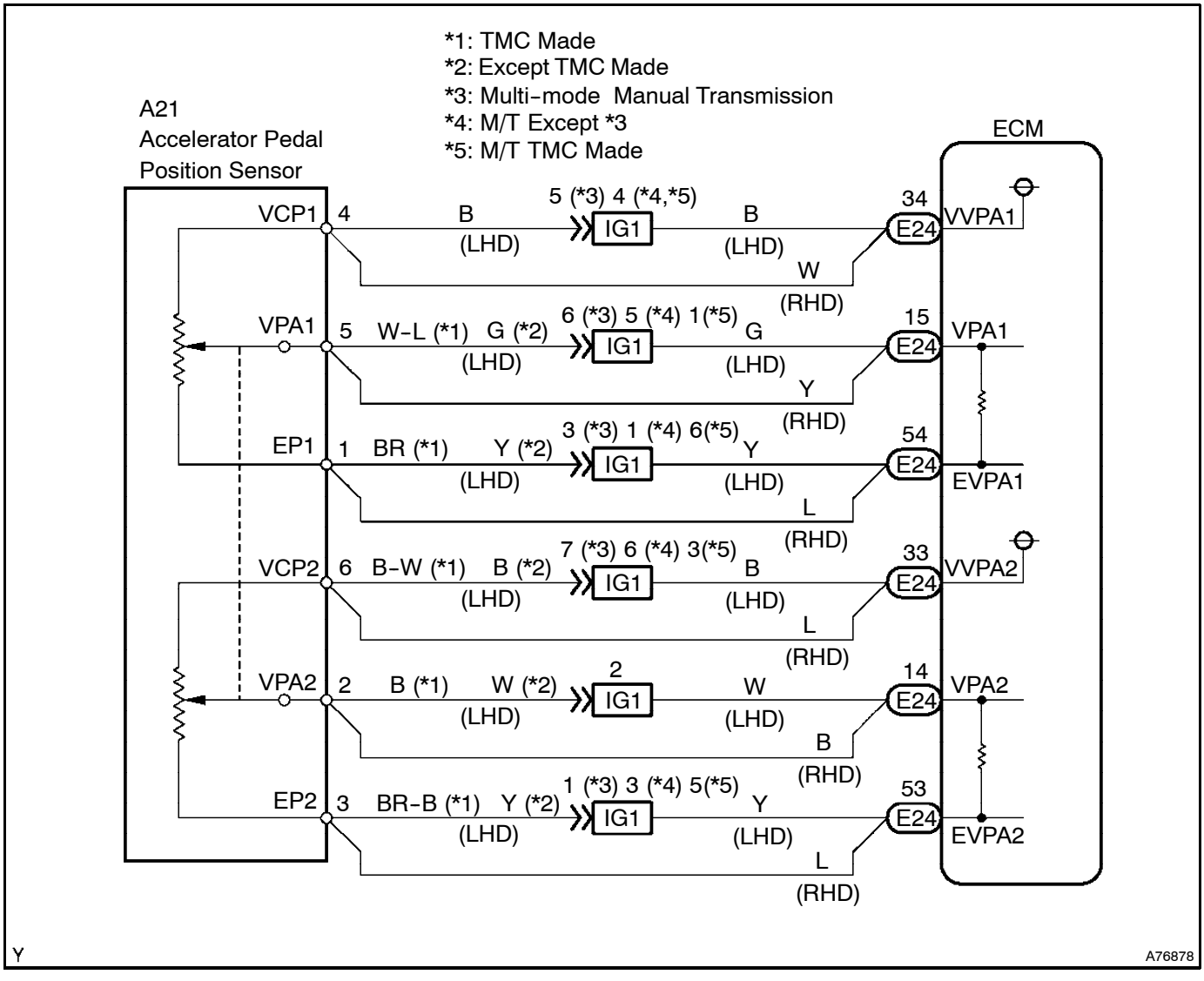
Reference:

Accelerator Pedal Position		Trouble Area
Fully Closed	Fully Open	
0 %	0 %	• Open in VVPA1 or VVPA2 circuit • Open or short in VPA1 or VPA2 circuit
Approximately 100 %	Approximately 100 %	• Open in EVPA1 or EVPA2 circuit

HINT:

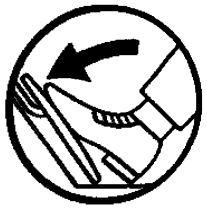
Accelerator pedal positions are expressed as voltages.

WIRING DIAGRAM

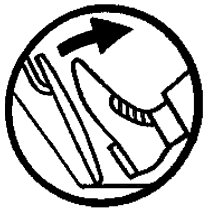


INSPECTION PROCEDURE

1	READ VALUE USING INTELLIGENT TESTER II(ACCEL POSITION)



Depressed



Released

FI7052

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Accel Position.
(d) Read the value.

Standard:

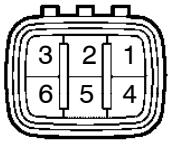
Accelerator Pedal Operation	Specified Condition
Depressed	100 %
Released	0 %

OK → **REPLACE ECM (See page 10-15)**

NG

2	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)

Component Side:



Accelerator Pedal Position Sensor

A84814

(a) Disconnect the A21 accelerator pedal position sensor connector.
(b) Measure the resistance between each pair of terminals.

Standard :

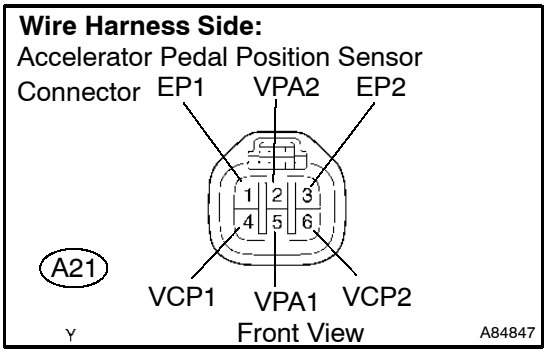
Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	1.5 kΩ to 6.0 kΩ at 20°C (68°F)
EP2 (3) - VCP2 (6)	1.5 kΩ to 6.0 kΩ at 20°C (68°F)

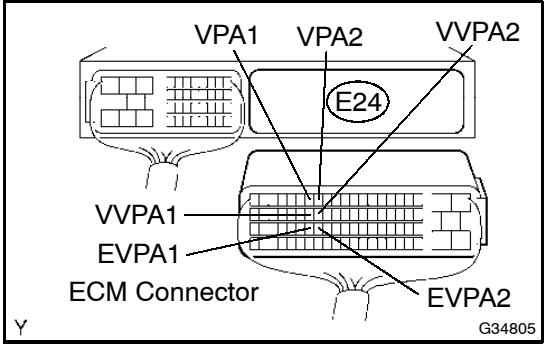
(c) Reconnect the accelerator pedal position sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

3	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect the E24 ECM connector.

(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA1 (E24-15)	Below 1 Ω
EP1 (A21-1) - EVPA1 (E24-54)	Below 1 Ω
VCP1 (A21-4) - VVPA1 (E24-34)	Below 1 Ω
VPA2 (A21-2) - VPA2 (E24-14)	Below 1 Ω
EP2 (A21-3) - EVPA2 (E24-53)	Below 1 Ω
VCP2 (A21-6) - VVPA2 (E24-33)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA1 (E24-15) - Body ground	10 kΩ or higher
EP1 (A21-1) or EVPA1 (E24-54) - Body ground	10 kΩ or higher
VCP1 (A21-4) or VVPA1 (E24-34) - Body ground	10 kΩ or higher
VPA2 (A21-2) or VPA2 (E24-14) - Body ground	10 kΩ or higher
EP2 (A21-3) or EVPA2 (E24-53) - Body ground	10 kΩ or higher
VCP2 (A21-6) or VVPA2 (E24-33) - Body ground	10 kΩ or higher

(d) Reconnect the accelerator pedal position sensor connector.

(e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10-15)

DTC	P1121	ACCELERATOR PEDAL POSITION SENSOR RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P1120 on page 05-141.

DTC No.	DTC Detection Condition	Trouble Area
P1121	Condition (a) continues for 0.5 seconds or more: (a) VPA1 - VPA2 < 0.03 V (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Accelerator pedal position sensor

HINT:
This DTC is set when the engine idles for approximately 60 seconds.

WIRING DIAGRAM

Refer to DTC P1120 on page 05-141.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT (IN ADDITION DTC P1121)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P1121	A
P1121 and other DTCs	B

HINT:
If any DTCs other than P1121 are output, troubleshoot those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-141)

A → REPLACE ACCELERATOR PEDAL ASSY (ACCELERATOR PEDAL POSITION SENSOR) (See page 10-14)

DTC	P1229	FUEL PUMP SYSTEM

DTC	P1272	FUEL PRESSURE REGULATOR SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

Refer to DTC P0089 on page 05-52 and DTC P0252 on page 05-100.

DTC No.	DTC Detection Condition	Trouble Areas
P1229	When common rail internal pressure is regulated using fuel metering unit, it does not reach target pressure level or it exceeds target level by too much (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Supply pump (fuel metering unit) • Short in supply pump (fuel metering unit) circuit • Open in pressure regulator valve circuit • Pressure regulator valve • Fuel filter element is clogged • Fuel leak • Injector • Lack of fuel • ECM
P1272	When common rail internal pressure is regulated using pressure control valve, it does not reach target pressure level or it exceeds target level by too much (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Supply pump (fuel metering unit) • Short in supply pump (fuel metering unit) circuit • Open in pressure regulator valve circuit • Pressure regulator valve • Fuel filter element is clogged • Fuel leak • Injector • Lack of fuel • ECM

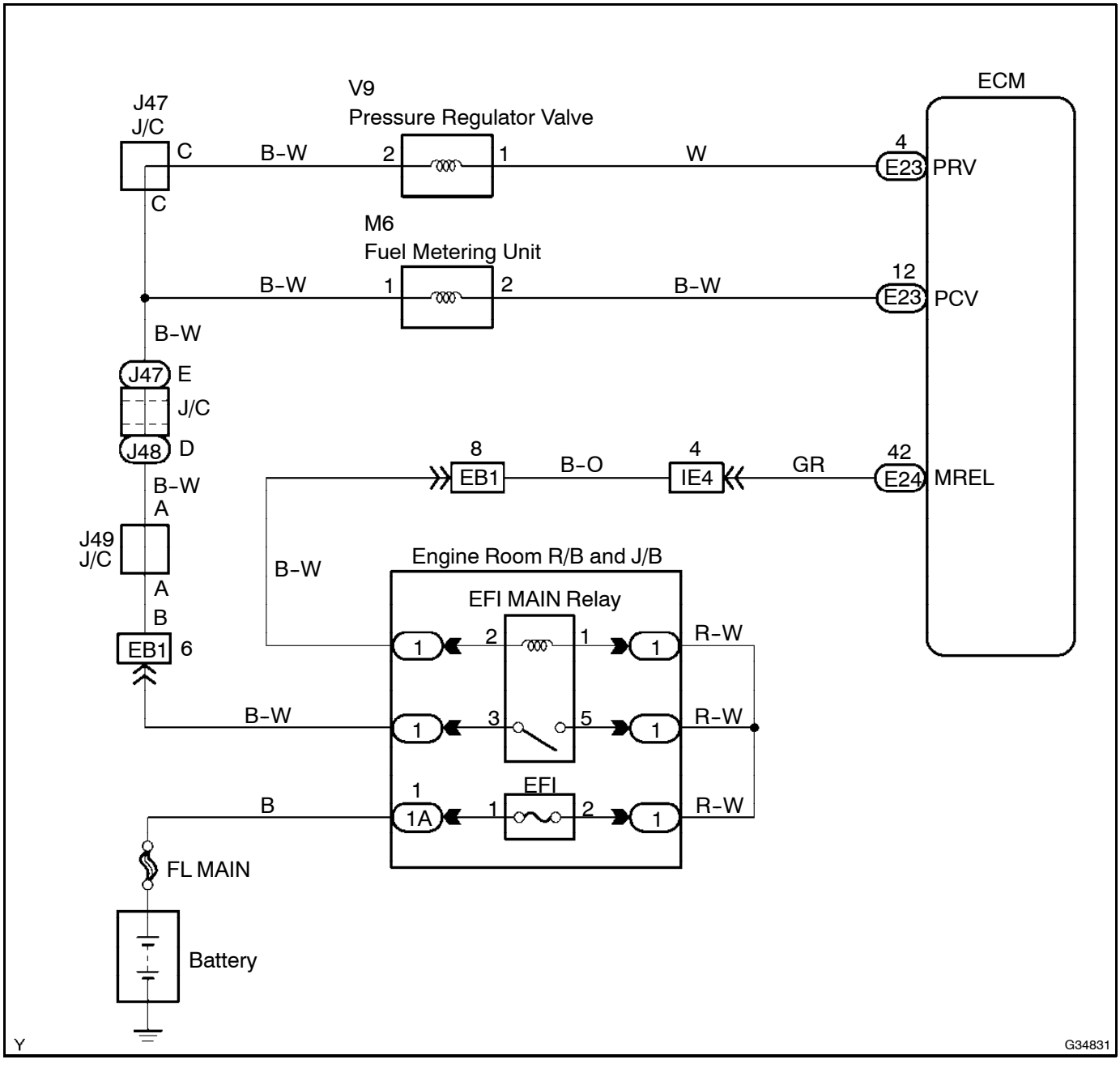
HINT:

- DTC P1299 is set when the vehicle is driven (including acceleration and deceleration) at vehicle speed of over 50 km/h for more than 5 minutes, while the fuel temperature is more than 10°C and the engine coolant temperature is higher than the fuel temperature.
- DTC P1272 is set when the vehicle is driven (including acceleration and deceleration) at vehicle speed of over 50 km/h for more than 5 minutes, while the fuel temperature is more than 10°C and the engine coolant temperature is higher than the fuel temperature.
- DTCs P1299 and/or P1272 may be set if the vehicle is driven with insufficient fuel.
- With cold engine, the internal pressure of the common rail is regulated by the pressure regulator valve. With warm engine, it is regulated by the fuel metering unit.
- When DTC P1229 and/or P1272 is set, check the internal fuel pressure of the common rail by selecting the following menu items on the intelligent tester II: Powertrain / Engine and ECT / Data List / Common Rail Pressure.

  Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 25 to 36
2,000 rpm (No engine load)	Approximately 27 to 46
3,000 rpm (No engine load)	Approximately 34 to 69

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1229 AND/OR P1272)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P1229 and/or P1272	A
P1229 and/or P1272 and other DTCs	B

B → **GO TO RELEVANT DTC CHART** (See page 05-41)

A

2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER II(FUEL LEAK TEST)

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Active Test / Fuel leak test.
(d) Visually check the supply pump, injector and fuel line located between the supply pump and common rail for fuel leaks. Also, perform the same check on the fuel line between the common rail and the injector

HINT:
There may be fuel leaks inside the components, such as the supply pump.

OK: No leakage.

NG → **REPAIR OR REPLACE**

OK

3	CHECK COMMON RAIL SYSTEM (FUEL BLOCKAGES)

(a) Check for fuel any blockages between the fuel filter and injector.

OK: No malfunctions.

NG → **REPAIR OR REPLACE**

OK

4	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

(a) Ask the customer whether the fuel has run out recently.
(b) Ask the customer whether repetitive quick turns were made while the fuel was low.

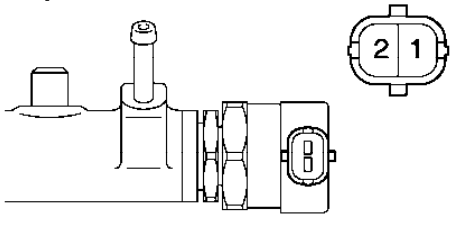
Result	Proceed To
• Fuel not run out recently • Quick turns not repeated when fuel low	A
• Fuel run out recently • Quick turns repeated when fuel low	B

B → DTC IS CAUSED BY RUNNING OUT OF FUEL

A

5	INSPECT COMMON RAIL ASSY(PRESSURE REGULATOR VALVE ASSY)

Component Side:



Pressure Regulator Valve

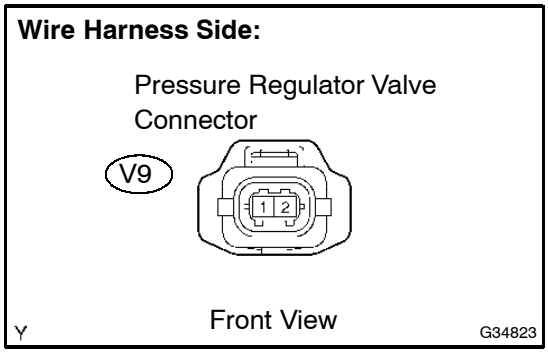
T A98723

(a) Disconnect the V9 pressure regulator valve connector.
(b) Measure the resistance between the terminals of the pressure regulator valve.
Standard: 3.42 to 3.78 Ω at 20°C (68°F)
(c) Reconnect the pressure regulator valve connector.

NG → REPLACE COMMON RAIL ASSY (PRESSURE REGULATOR VALVE) (See page 11-20)

OK

6 CHECK HARNESS AND CONNECTOR(PRESSURE REGULATOR VALVE - ECM, PRESSURE REGULATOR VALVE - EFI MAIN RELAY)



(a) Disconnect the V9 pressure regulator valve connector.
(b) Disconnect the E23 ECM connector.
(c) Remove the EFI MAIN relay from the engine room R/B.
(d) Check the resistance.

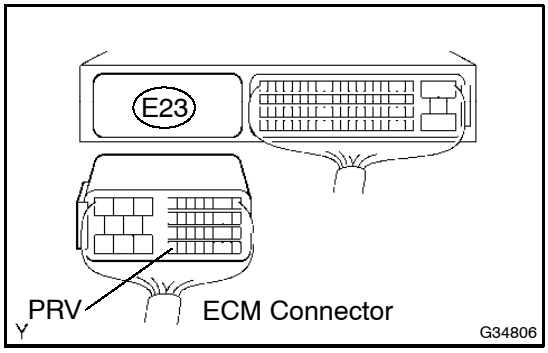
Standard (Check for open):

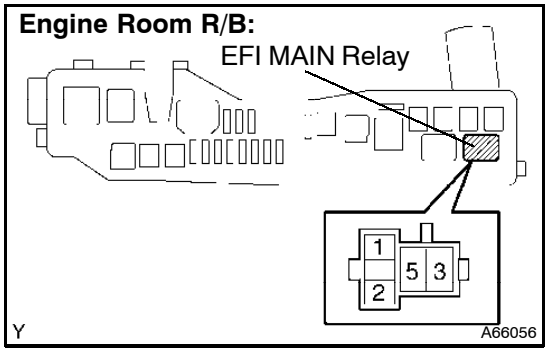
Tester Connection	Specified Condition
PRV (E23-4) - (V9-1)	Below 1 Ω
EFI MAIN relay (3) - (V9-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PRV (E23-4) or (V9-1) - Body ground	10 kΩ or higher
EFI MAIN relay (3) or (V9-2) - Body ground	10 kΩ or higher

(e) Reconnect the pressure regulator valve connector.
(f) Reconnect the ECM connector.
(g) Reinstall the EFI MAIN relay.

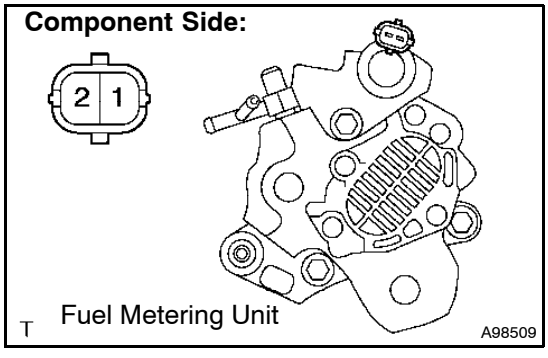




NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7 INSPECT INJECTION OR SUPPLY PUMP ASSY(FUEL METERING UNIT)



(a) Disconnect the M6 fuel metering unit connector.
(b) Measure the resistance between the terminals of the fuel metering unit.
Standard: 2.60 to 3.15 Ω at 20°C (68°F)
(c) Reconnect the fuel metering unit connector.

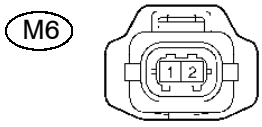
NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (FUEL METERING UNIT) (See page 11-16)**

OK

8	CHECK HARNESS AND CONNECTOR(FUEL METERING UNIT - ECM)

Wire Harness Side:

Fuel Metering Unit Connector



Front View

Y G34823

(a) Disconnect the M6 fuel metering unit connector.
(b) Disconnect the E23 ECM connector.
(c) Check the resistance.

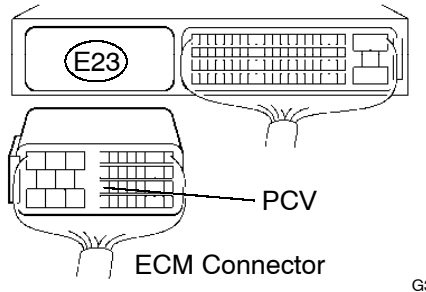
Standard (Check for open):

Tester Connection	Specified Condition
PCV (E23-12) - (M6-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
PCV (E23-12) or (M6-2) - Body ground	10 kΩ or higher

(d) Reconnect the fuel metering unit connector.
(e) Reconnect ECM connector.



ECM Connector

Y G34806

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9	REPLACE COMMON RAIL ASSY(PRESSURE REGULATOR VALVE) (See page 11-20)

GO

10	CHECK IF DTC OUTPUT RECURS(DTC P1229 AND/OR P1272)

HINT:
After clearing the DTC(s), conduct the following driving patterns:

- The vehicle is driven at a vehicle speed of 50 km/h for more than 5 minutes while the fuel temperature is more than 10°C.
- The vehicle is drive at a vehicle speed of 50 km/h for more than 5 minutes while the fuel temperature is less than 10°C.

GO

11	READ OUTPUT DTC(DTC P1229 AND/OR P1272)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.
Result:

Display (DTC Output)	Proceed To
P1229 and/or P1272	A
No output	B

B → END

A

12	REPLACE INJECTION OR SUPPLY PUMP ASSY (FUEL METERING UNIT) (See page 11-16)

GO

13	CHECK IF DTC OUTPUT RECURS(DTC P1229 AND/OR P1272)

HINT:
After clearing the DTC(s), conduct the following driving patterns:

- The vehicle is driven at a vehicle speed of 50 km/h for more than 5 minutes while the fuel temperature is more than 10°C.
- The vehicle is drive at a vehicle speed of 50 km/h for more than 5 minutes while the fuel temperature is less than 10°C.

GO

14	READ OUTPUT DTC(DTC P1229 AND/OR P1272)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.
Result:

Display (DTC Output)	Proceed To
P1229 and/or P1272	A
No output	B

B → END

A

REPLACE INJECTOR ASSY (See page 11-8)

DTC	P1520	STOP LIGHT SWITCH CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

In this system, the signal transmitted from the stop lamp switch is used to determine whether or not the brake system is normal.

The stop lamp switch has a duplex system (signals STP1 and STP2) to detect abnormalities. When the signals of depressing and releasing the brake pedal are detected simultaneously, the ECM interprets this as a malfunction of the stop lamp switch.

HINT:

Normal condition is shown in the table below.

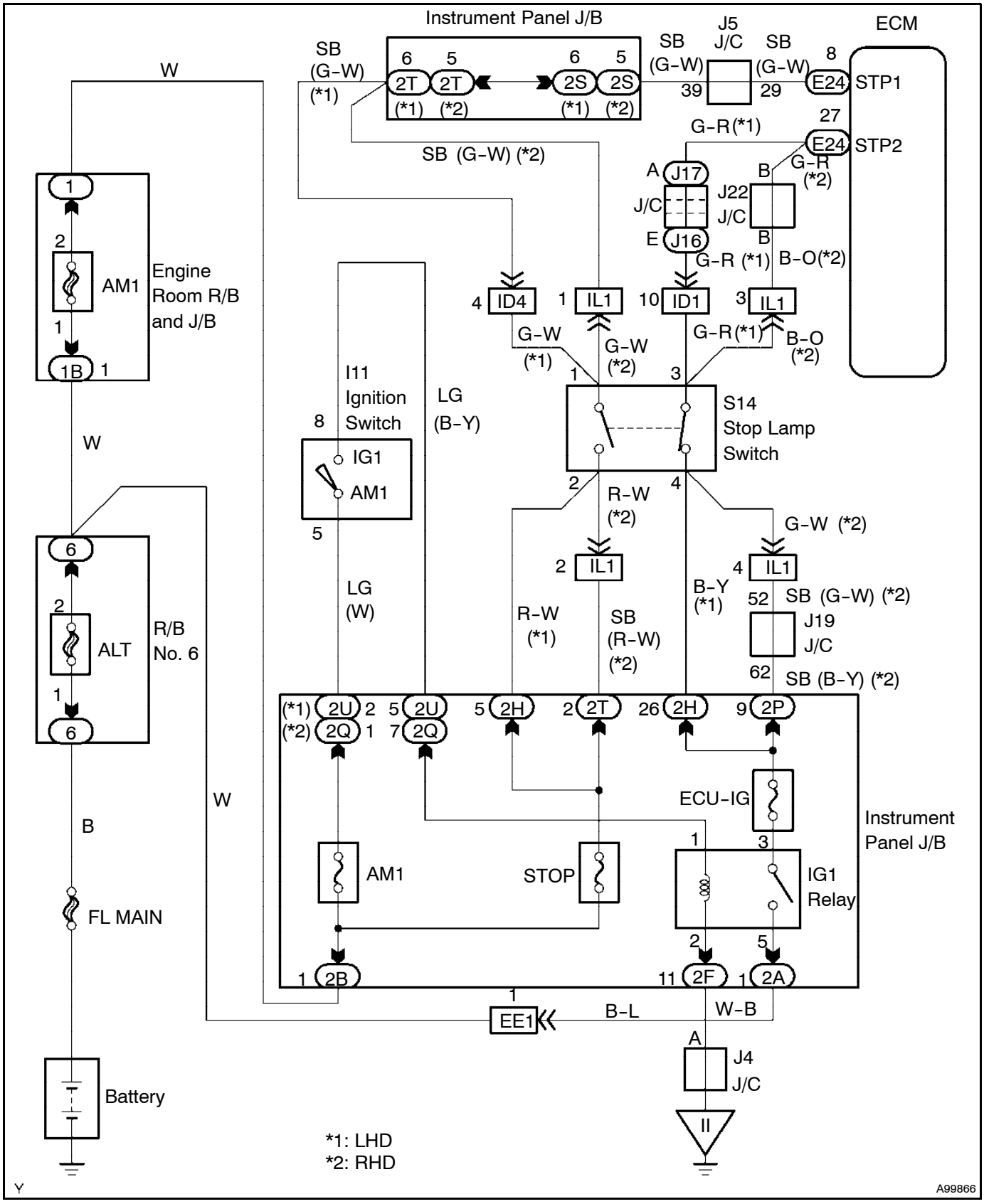
Signal	Brake Pedal Released	In Transition	Brake Pedal Depressed
STP1	OFF	ON	ON
STP2	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P1520	Conditions (a), (b) and (c) continue for 5.0 seconds or more: (a) Ignition switch ON (b) Brake pedal depressed (c) STP1 signal OFF when STP2 signal OFF (The MIL is illuminated and a DTC is set when the same malfunction is detected on 2 consecutive trips* *: One trip is counted when the ignition switch is turned from OFF to ON and back to OFF)	• Short in stop lamp switch signal circuit • Stop lamp switch • ECM

HINT:

DTC P1520 is set when the ignition switch is in the ON position.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using an intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

1	CHECK OPERATION OF STOP LAMP

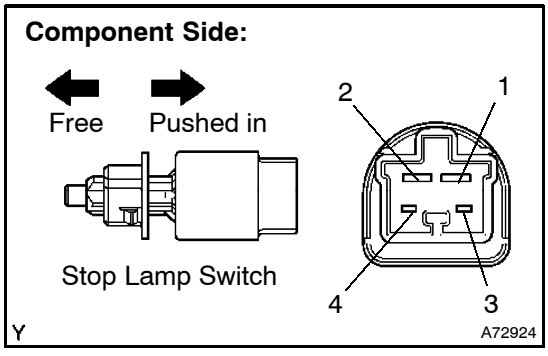
(a) Check that the stop lamps illuminate when the brake pedal is depressed, and turn off when the brake pedal is released.

OK: The stop lamps illuminate and turn off according to the brake pedal operation.

OK → **CHECK FOR INTERMITTENT PROBLEMS** (See page 05-7)

NG

2	INSPECT STOP LAMP SWITCH ASSY



(a) Remove the S14 stop lamp switch.

(b) Check the resistance.

Standard:

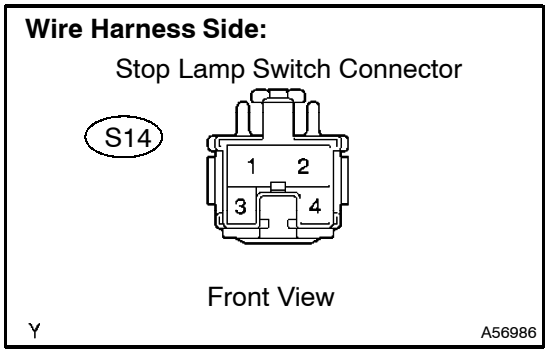
Switch Position	Tester Connection	Specified Condition
Switch pin free	1 - 2	Below 1 Ω
Switch pin free	3 - 4	10 kΩ or higher
Switch pin pushed in	1 - 2	10 kΩ or higher
Switch pin pushed in	3 - 4	Below 1 Ω

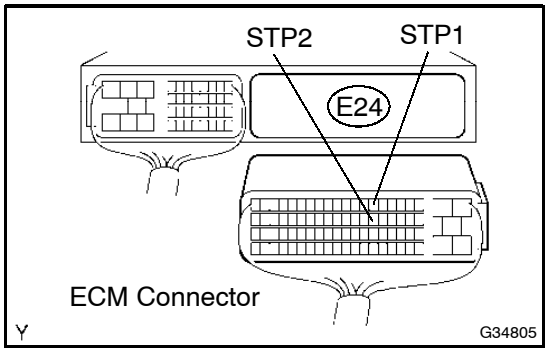
(c) Reinstall the stop lamp switch.

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH - ECM)





(a) Disconnect the S14 stop lamp switch connector.
(b) Disconnect the E24 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) - STP1 (E24-8)	Below 1 Ω
Stop lamp switch (S14-3) - STP2- (E24-27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) or STP1 (E24-8) - Body ground	10 kΩ or higher
Stop lamp switch (S14-3) or STP2- (E24-27) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the stop lamp switch connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM **(See page 10-15)**

DTC	P1600	ECM BATT MALFUNCTION

CIRCUIT DESCRIPTION

Refer to DTC P0685 on page 05-133.

DTC No.	DTC Detection Condition	Trouble Area
P1600	Battery voltage is 4 V or less, or 17 V or more (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• Open or short in +B terminal circuit • Tired battery • Electrical overwork • Generator • Battery (If 24 V battery is fitted, DTC P1600 is output) • ECM

HINT:
DTC P1600 is set when the engine idles for 60 seconds or more.

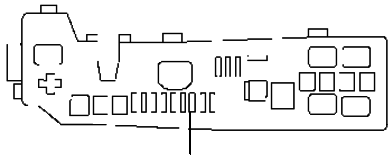
WIRING DIAGRAM

Refer to DTC P0685 on page 05-133.

INSPECTION PROCEDURE

1	CHECK FUSE(EFI FUSE)

Engine Room R/B:



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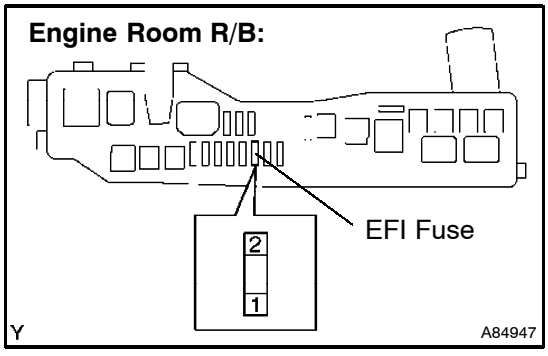
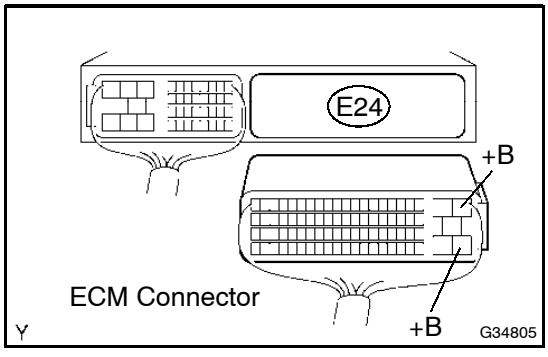
(a) Remove the EFI fuse from the engine room R/B.
(b) Check the EFI fuse resistance.
Standard: Below 1 Ω
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

2 CHECK HARNESS AND CONNECTOR(ECM - EFI FUSE, EFI FUSE - BATTERY)





(a) Check the harness and connectors between the EFI fuse and ECM.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the E24 ECM connector.
(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EFI fuse (2) - +B (E24-1)	Below 1 Ω
EFI fuse (2) - +B (E24-61)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI fuse (2) or +B (E24-1) - Body ground	10 kΩ or higher
EFI fuse (2) or +B (E24-61) - Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EFI fuse and battery.
(1) Remove the EFI fuse from the engine room R/B.
(2) Disconnect the positive battery cable.
(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
Positive battery cable terminal - EFI fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Positive battery cable terminal or EFI fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.
(5) Reconnect the battery cable.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT GENERATOR ASSY (See page 19-6)

HINT:
- If +B voltage drop is caused by generator malfunctions, the charge lamp illuminates.
- If the voltage at the terminal of the generator is more than 17 V, the generator malfunctions.

NG → **REPAIR OR REPLACE GENERATOR ASSY** **(See page 19-9)**

OK

4	CHECK BATTERY (See page 19-6)

NG → REPAIR OR REPLACE BATTERY

OK

REPLACE ECM (See page 10-15)

DTC	P2227	BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

To detect atmospheric pressure, the built-in atmospheric pressure sensor in the ECM is used for the common rail system. According to changes in the atmospheric pressure, the ECM corrects the fuel injection volume, timing and duration, and adjusts the common rail internal fuel pressure in order to optimize engine combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2227	Atmospheric pressure sensor malfunction (The MIL is illuminated as well as a DTC being set immediately malfunction is detected)	• ECM

HINT:

DTC P2227 is set when the ignition switch is in the ON position.

INSPECTION PROCEDURE

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2227)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2227 and other DTCs	A
P2227	B

HINT:

If any DTCs other than P2227 are output, troubleshoot those DTCs first.

B → **REPLACE ECM** **(See page 10-15)**

A

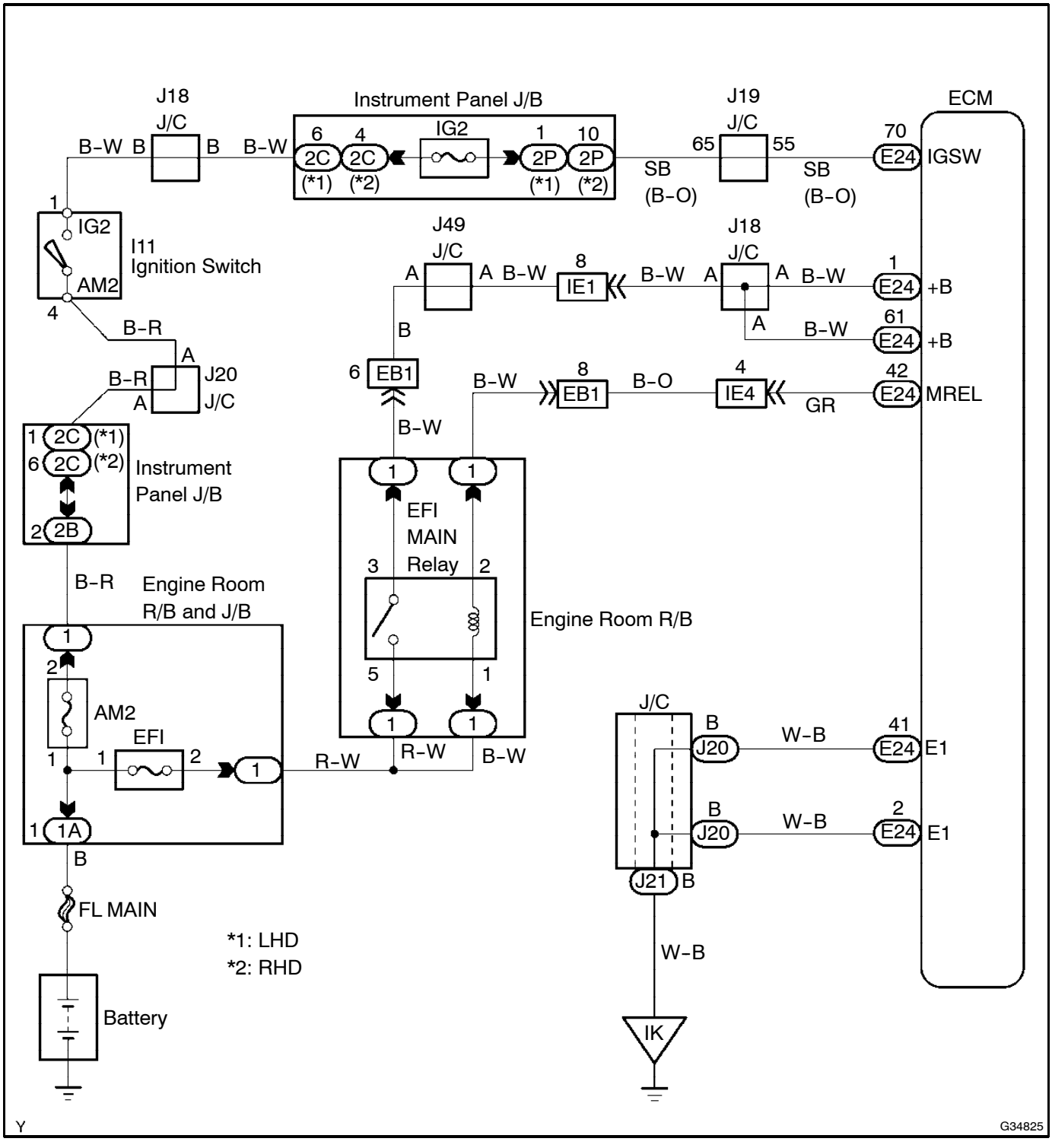
GO TO RELEVANT DTC CHART **(See page 05-41)**

ECM POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

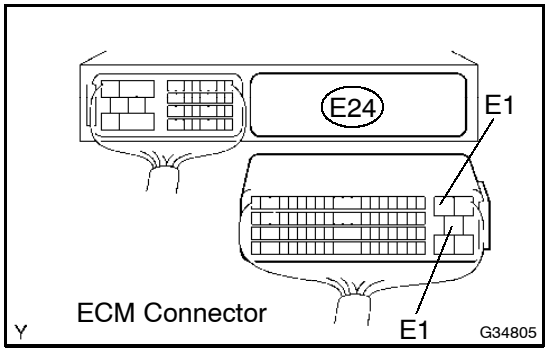
When the ignition switch is turned to ON, the battery voltage is applied to terminal IGSW of the ECM. The ECM MREL output signal causes a current to flow to the coil, closing the contacts of the EFI MAIN relay and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR(ECM - BODY GROUND)



(a) Disconnect the E24 ECM connector.
(b) Check the resistance.
Standard (Check for open):

Tester Connection	Specified Condition
E1 (E24-2) - Body ground	Below 1 Ω
E1 (E24-41) - Body ground	Below 1 Ω

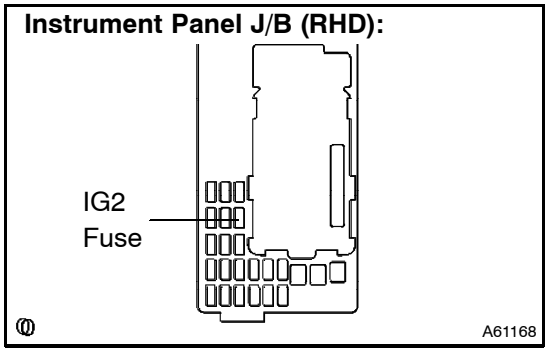
(c) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

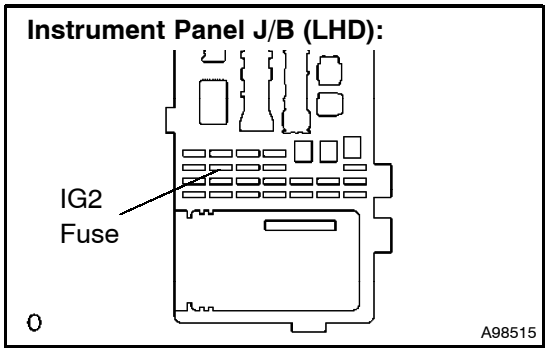
2 INSPECT FUSE(IG2 FUSE)

Instrument Panel J/B (RHD):



(a) Remove the IG2 fuse from the instrument panel J/B.
(b) Check the IG2 fuse resistance.
Standard: Below 1 Ω
(c) Reinstall the IG2 fuse.

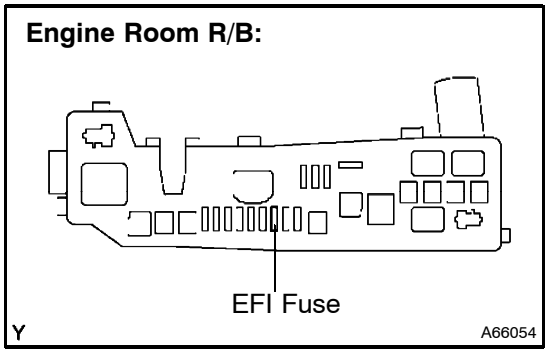
Instrument Panel J/B (LHD):



NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

3 INSPECT FUSE(EFI FUSE)

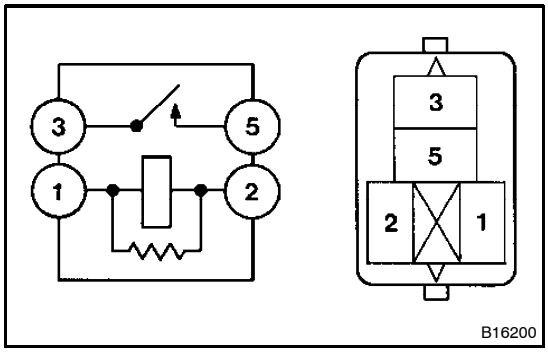


(a) Remove the EFI fuse from the engine room R/B.
(b) Check the EFI fuse resistance.
Standard: Below 1 Ω
(c) Reinstall the EFI fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

4 INSPECT EFI MAIN RELAY



(a) Remove the EFI MAIN relay from the engine room R/B.
(b) Check the EFI MAIN relay resistance.
Standard:

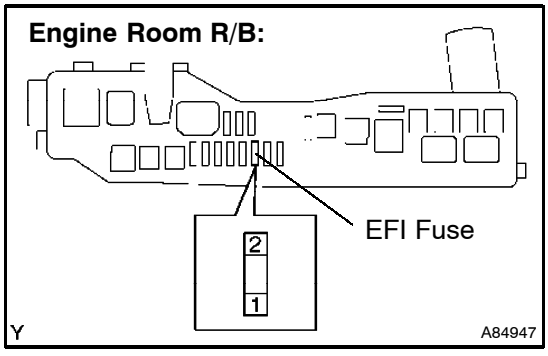
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (When battery voltage applied to terminals 1 and 2)

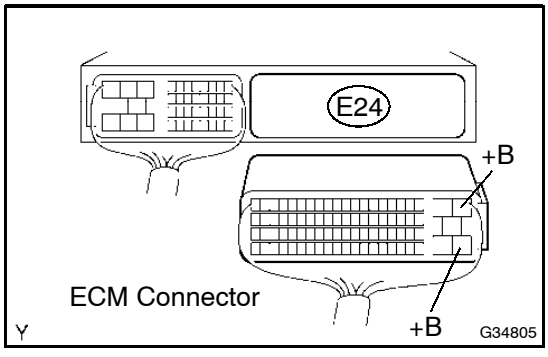
(c) Reinstall the EFI MAIN relay.

NG → **REPLACE EFI MAIN RELAY**

OK

5 CHECK HARNESS AND CONNECTOR(EFI FUSE - ECM, EFI FUSE - BATTERY)





(a) Check the harness and connectors between the EFI fuse and ECM.

(1) Remove the EFI fuse from the engine room R/B.

(2) Disconnect the E24 ECM connector.

(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EFI fuse (2) - +B (E24-1)	Below 1 Ω
EFI fuse (2) - +B (E24-61)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI fuse (2) or +B (E24-1) - Body ground	10 kΩ or higher
EFI fuse (2) or +B (E24-61) - Body ground	10 kΩ or higher

(4) Reinstall the EFI fuse.

(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EFI fuse and battery.

(1) Remove the EFI fuse from the engine room R/B.

(2) Disconnect the positive battery cable.

(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
Positive battery cable terminal - EFI fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Positive battery cable terminal or EFI fuse (1) - Body ground	10 kΩ or higher

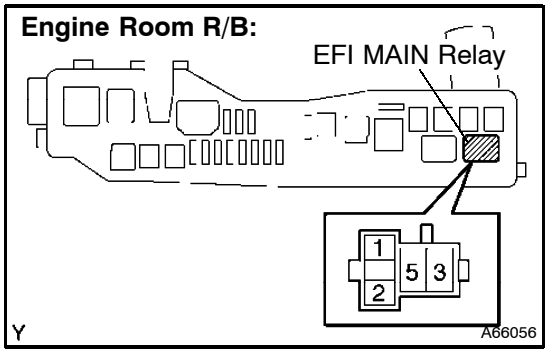
(4) Reinstall the EFI fuse.

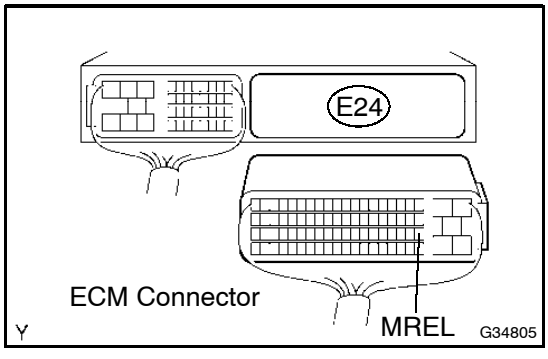
(5) Reconnect the battery cable.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 CHECK HARNESS AND CONNECTOR(EFI MAIN RELAY - ECM)





(a) Check the resistance between the EFI MAIN relay and ECM.

(1) Remove the EFI MAIN relay from the engine room R/B.

(2) Disconnect the E24 ECM connector.

(3) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EFI MAIN relay (2) - MREL (E24-42)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EFI MAIN relay (1) or MREL (E24-42) - Body ground	10 kΩ or higher

(4) Reinstall the EFI MAIN relay.

(5) Reconnect the ECM connector.

(b) Check the resistance between the EFI MAIN relay and body ground.

(1) Remove the EFI MAIN relay from the engine room R/B.

(2) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
EFI MAIN relay (2) - Body ground	Below 1 Ω

(3) Reinstall the EFI MAIN relay.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE HARNESS AND CONNECTOR (TERMINAL +B OF ECM - BATTERY POSITIVE TERMINAL)

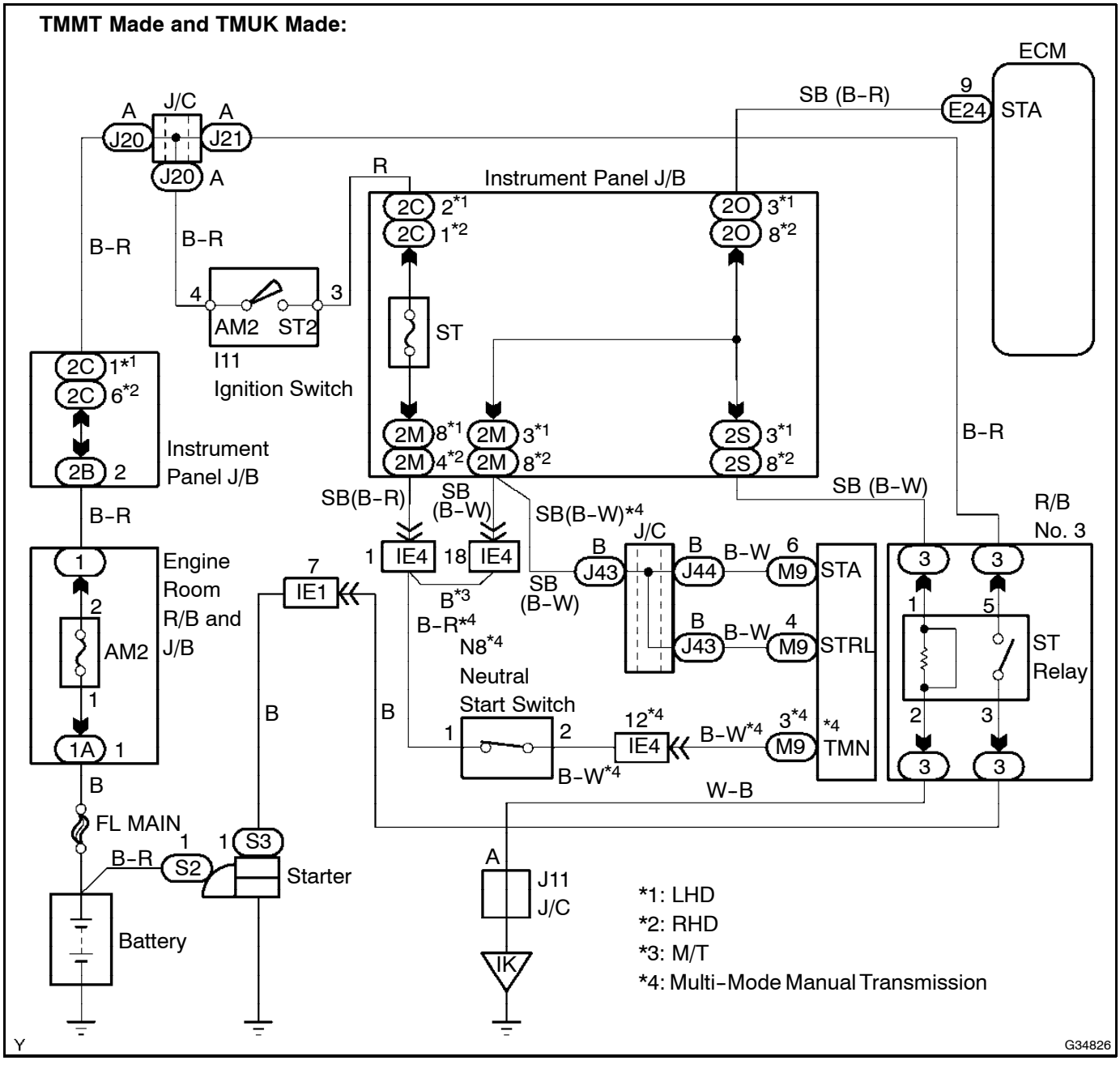
STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

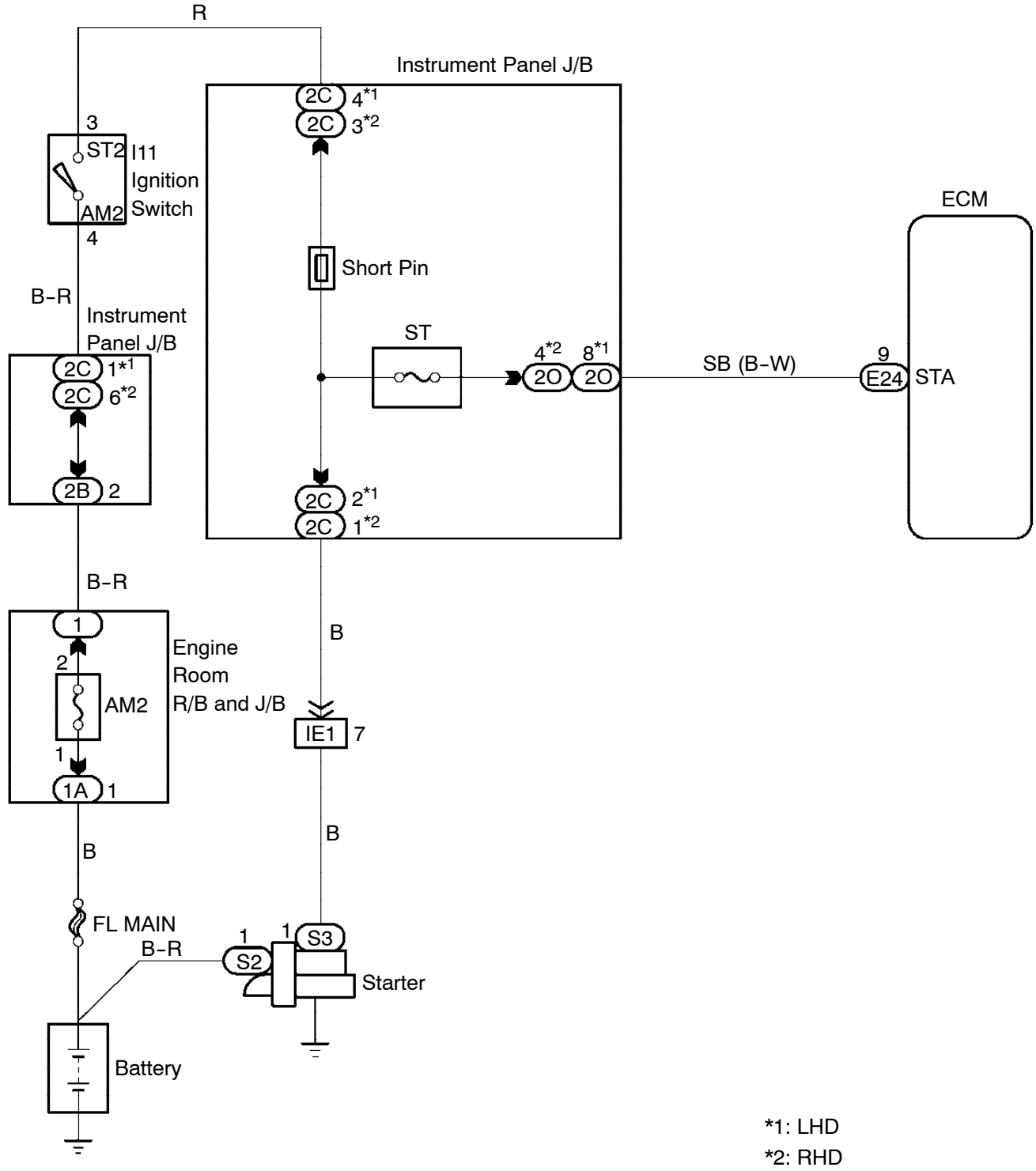
While the engine is being cranked, a current flows from terminal ST2 of the ignition switch to the ST relay fuse and also flows to terminal STA of the ECM (STA signal).

WIRING DIAGRAM

TMMT Made and TMUK Made:



TMC Made:


R
Instrument Panel J/B
2C 4*1
2C 3*2
3
ST2
I11
Ignition
Switch
AM2
4
ECM
Short Pin
B-R
Instrument
Panel J/B
ST
4*2
8*1
2C 1*1
2C 6*2
2O
2O
SB (B-W)
9
E24
STA
2B 2
2C 2*1
2C 1*2
B-R
1
2
AM2
1
1A 1
Engine
Room
R/B and J/B
B
IE1 7
B
B
FL MAIN
B-R
1
1
S2
S3
Starter
Battery
*1: LHD
*2: RHD
Y
G34827

INSPECTION PROCEDURE

HINT:

This chart assumes that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05-10.

1	READ VALUE USING INTELLIGENT TESTER II(STA SIGNAL)

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Starter SIG.
(d) Read the value.

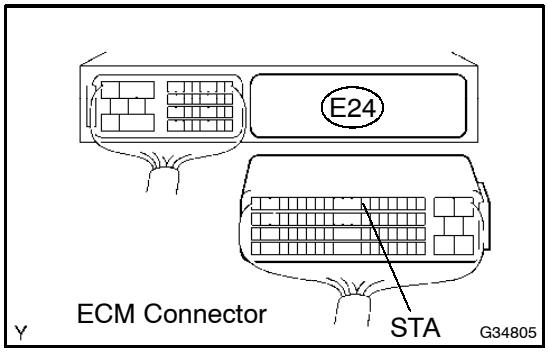
OK:

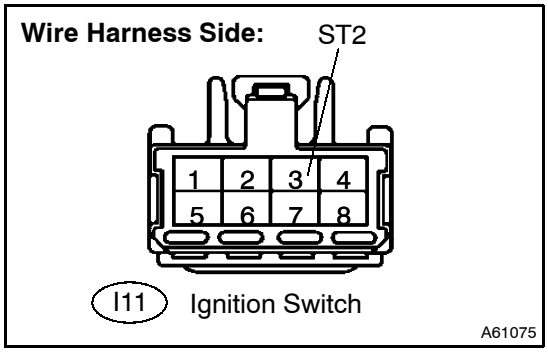
Ignition Switch Position	ON	START
Starter SIG	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See page 05-10)**

NG

2	CHECK HARNESS AND CONNECTOR(ECM - IGNITION SWITCH)





(a) Disconnect the E24 ECM connector.
(b) Disconnect the I11 ignition switch connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
STA (E24-9) - Ignition switch connector ST2 (I11-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
STA (E24-9) or Ignition switch connector ST2 (I11-3) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the ignition switch connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

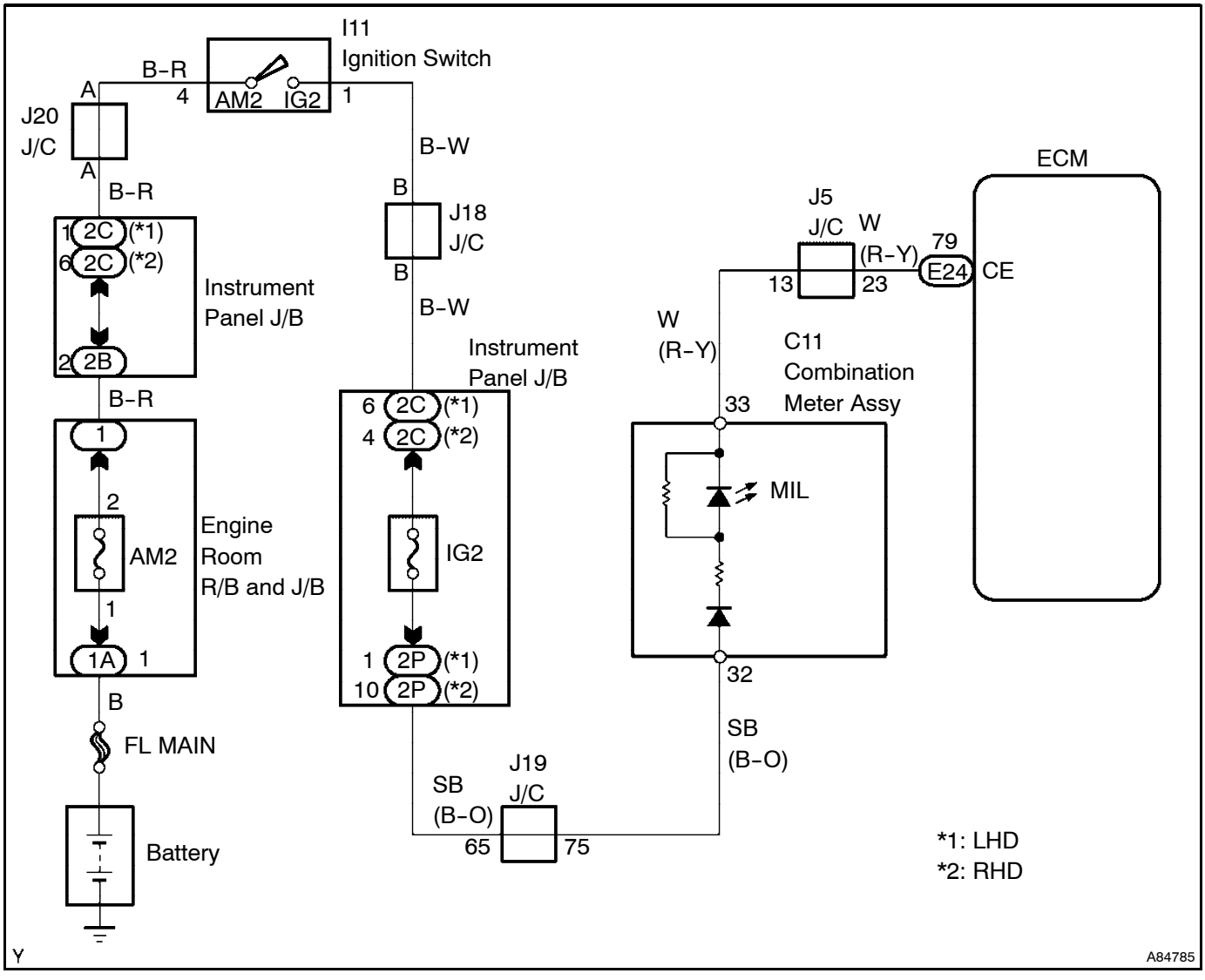
REPLACE ECM (See page 10-15)

MIL CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a malfunction, the MIL is illuminated. At this time, the ECM records the DTC in its memory.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below.

Reference:

Condition	Proceed To
MIL remains on	Start inspection from step 1
MIL not illuminated	Start inspection from step 3

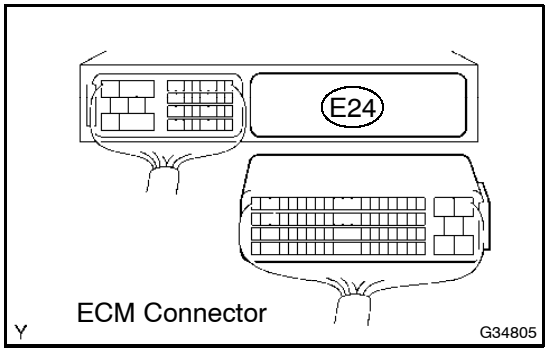
1 CHECK IF MIL TURNS OFF

(a) Connect an intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Check if DTCs have been stored. Note down if there are DTCs.
(e) Select the following menu items: Powertrain / Engine and ECT / DTC / Clear.
(f) Clear DTCs.
(g) Check if the MIL turns off.
OK: The MIL should turn off.

OK → **REPAIR CIRCUIT INDICATED BY OUTPUT DTC (See page 05-41)**

NG

2 CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E24 ECM connector.
(b) Turn the ignition switch to ON.
(c) Check that the MIL is not illuminated.
OK: The MIL is not illuminated.
(d) Reconnect the ECM connector.

OK → **REPLACE ECM (See page 10-15)**

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3 CHECK IF MIL ILLUMINATES

(a) Check if the MIL illuminates when the ignition switch is turned to ON.
OK: The MIL should illuminate.

OK → **NORMAL**

NG

4	INSPECT COMBINATION METER ASSY(MIL CIRCUIT)

OK: The combination meter circuit is normal.

NG → **REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY**

OK ↓

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER - ECM)

MULTI-MODE MANUAL TRANSMISSION SYSTEM

05MPX-01

PRECAUTION

1. PRECAUTION FOR ON-VEHICLE INSPECTION

(a) When racing the engine, make sure that the gear is in neutral.

2. PRECAUTIONS WHEN PARTS TO BE REPLACED OR REMOVED AND INSTALLED

(a) When replacing the following parts, proceed with the operation according to the order listed in the table below.

Operation timing	Parts to be replaced or removed and installed	Operation	See page
Before removal	• CLUTCH ACTUATOR • TRANSMISSION ASSY • TRANSMISSION PARTS (INSIDE GEAR BOX) • CLUTCH DISC AND CLUTCH DISC COVER • CLUTCH RELEASE BEARING • CLUTCH RELEASE FORK • FLYWHEEL • END PLATE • CRANKSHAFT	CLAMP POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
Additional operation when installing new clutch actuator	CLUTCH ACTUATOR (New	CLAMP POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
After installation	• TRANSMISSION CONTROL ECU • CLUTCH ACTUATOR • CLUTCH DISC AND CLUTCH DISC COVER • FLYWHEEL • CRANKSHAFT • CLUTCH RELEASE BEARING • CLUTCH RELEASE FORK • END PLATE • When the clutch actuator is removed from the transmission assy during installation of any of the following parts. • TRANSMISSION ASSY • TRANSMISSION PARTS (INSID GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (ECU) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196
	CLUTCH STROKE SENSOR	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (CLUTCH) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM	05-190 05-190
	• SHIFT STROKE SENSOR • SELECT STROKE SENSOR • SHIFT AND SELECT ACTUATOR • TRANSMISSION PARTS (INSIDE GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (TRANSMISSION) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196

NOTICE:

- **Make sure to always replace the clutch disc and the clutch disc cover together. If either is replaced without the other, the adjustment system of the clutch disc cover does not function properly. It may cause clutch drag or clutch slipping, which can result in deterioration of driveability or a defect in the system parts.**
- **Before proceeding with calibration of the multi-mode manual transmission system, be sure to clear the previously stored calibration values.**

3. PRECAUTIONS WHEN USING SHIFT LOCK RELEASE BUTTON

(a) When the vehicle is parked with the shift lever in a position other than N:

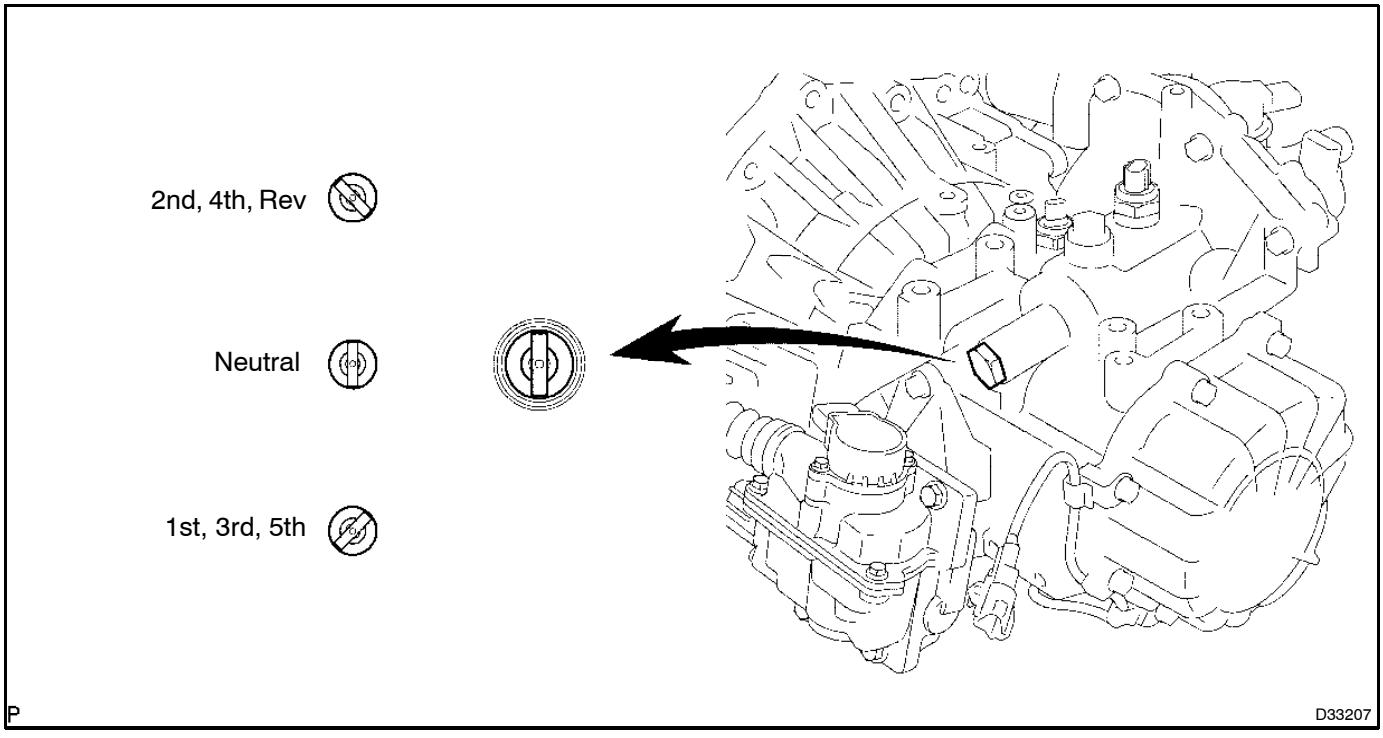
- If the shift lock is released by the shift lock release button, the engine cannot be started even if the shift lever is moved to another position as the gear is not in neutral.
- The engine can be started after matching the gear position and shift lever position by moving the shift lever back to the position it was parked to, and then moving it to the N position.

(b) When the vehicle is parked with the shift lever in the N position:

- If the shift lock is released by the shift lock release button, the engine can be started even if the shift lever is moved to another position as the gear position is in neutral.
- The multi-mode manual transmission system will not operate, as the gear position and shift lever position do not match.
- The multi-mode manual transmission system will operate after matching the gear position and shift lever position by moving the shift lever back to the N position.

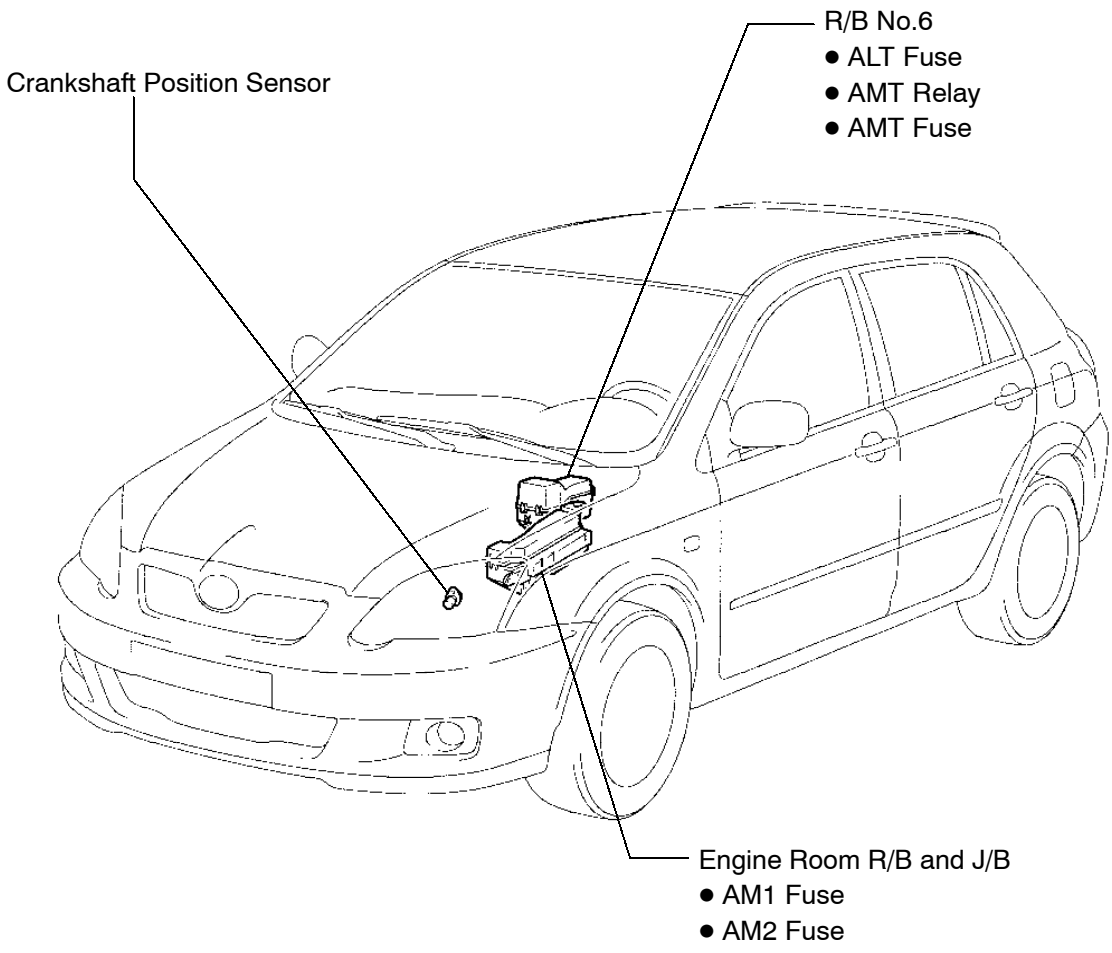
4. OTHER PRECAUTIONS

- When racing the engine, make sure that the gear is in neutral.
- Make sure to set the gear position to neutral before removing the shift & select actuator. In case that the gear cannot be shifted to the neutral position due to malfunctions of the actuator and/or transaxle gear, remove the plug from the transmission case and observe the positioning of the shift slit within. If the slit is in a position other than neutral, use a screwdriver to set it to neutral.



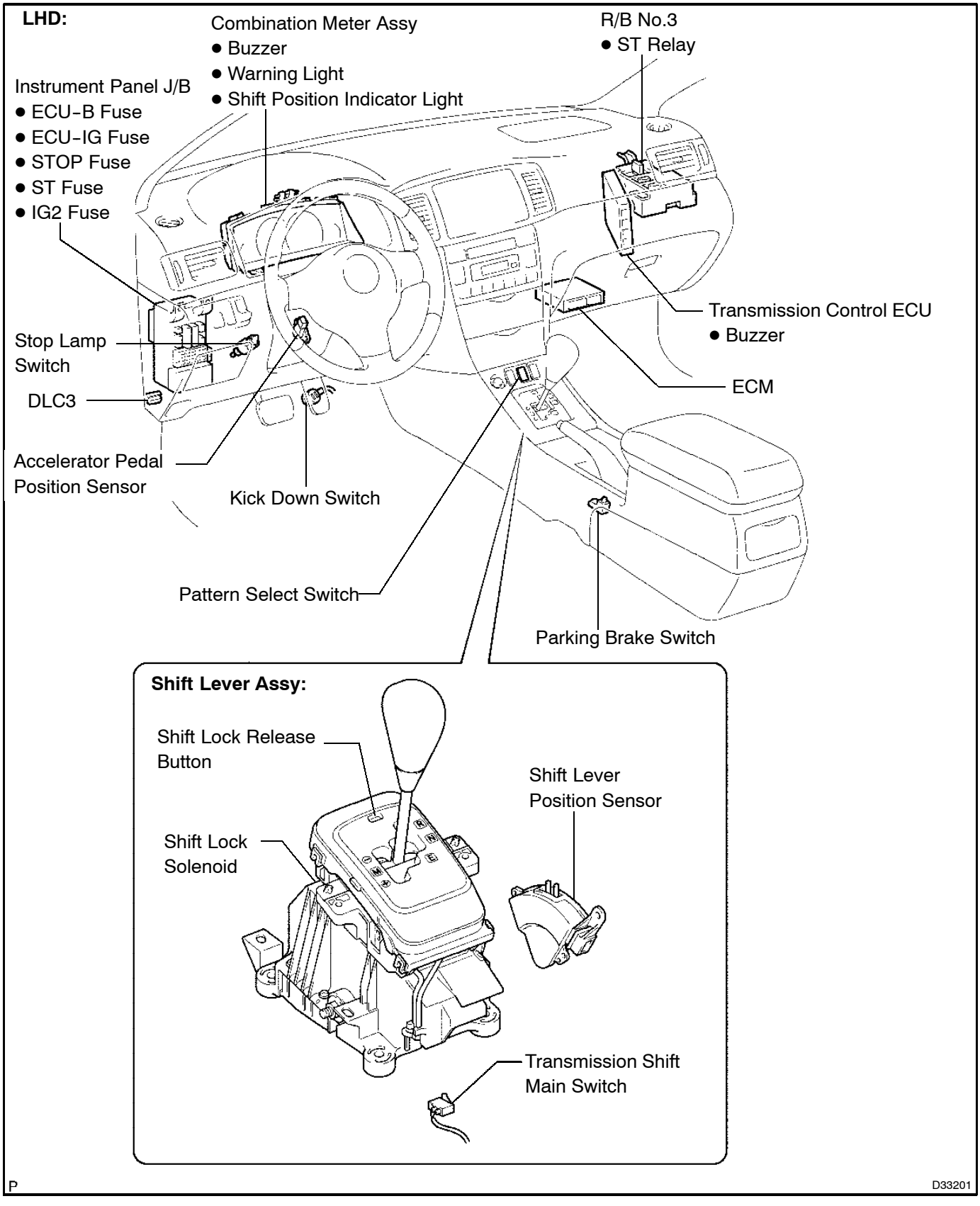
05MPY-01

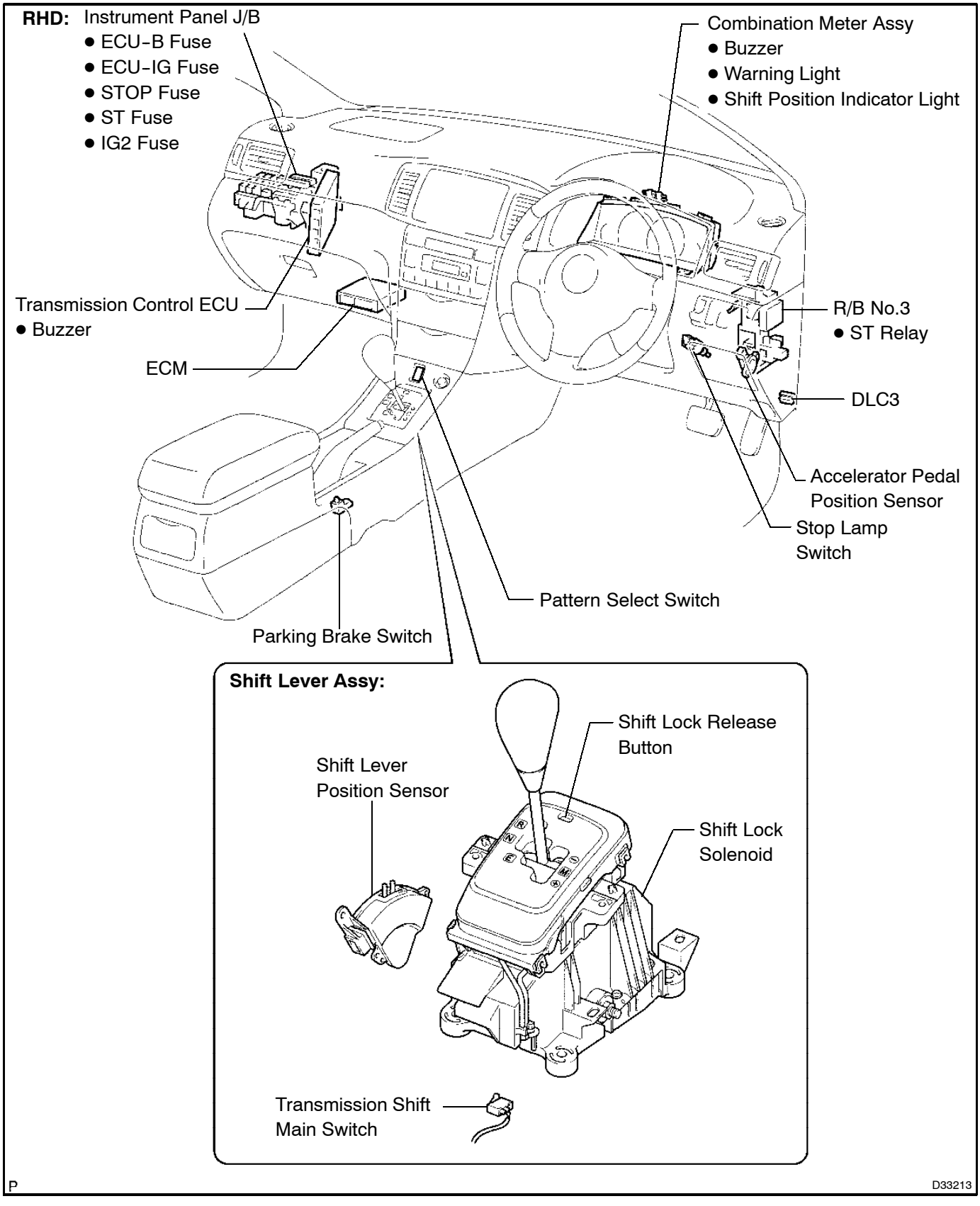
LOCATION

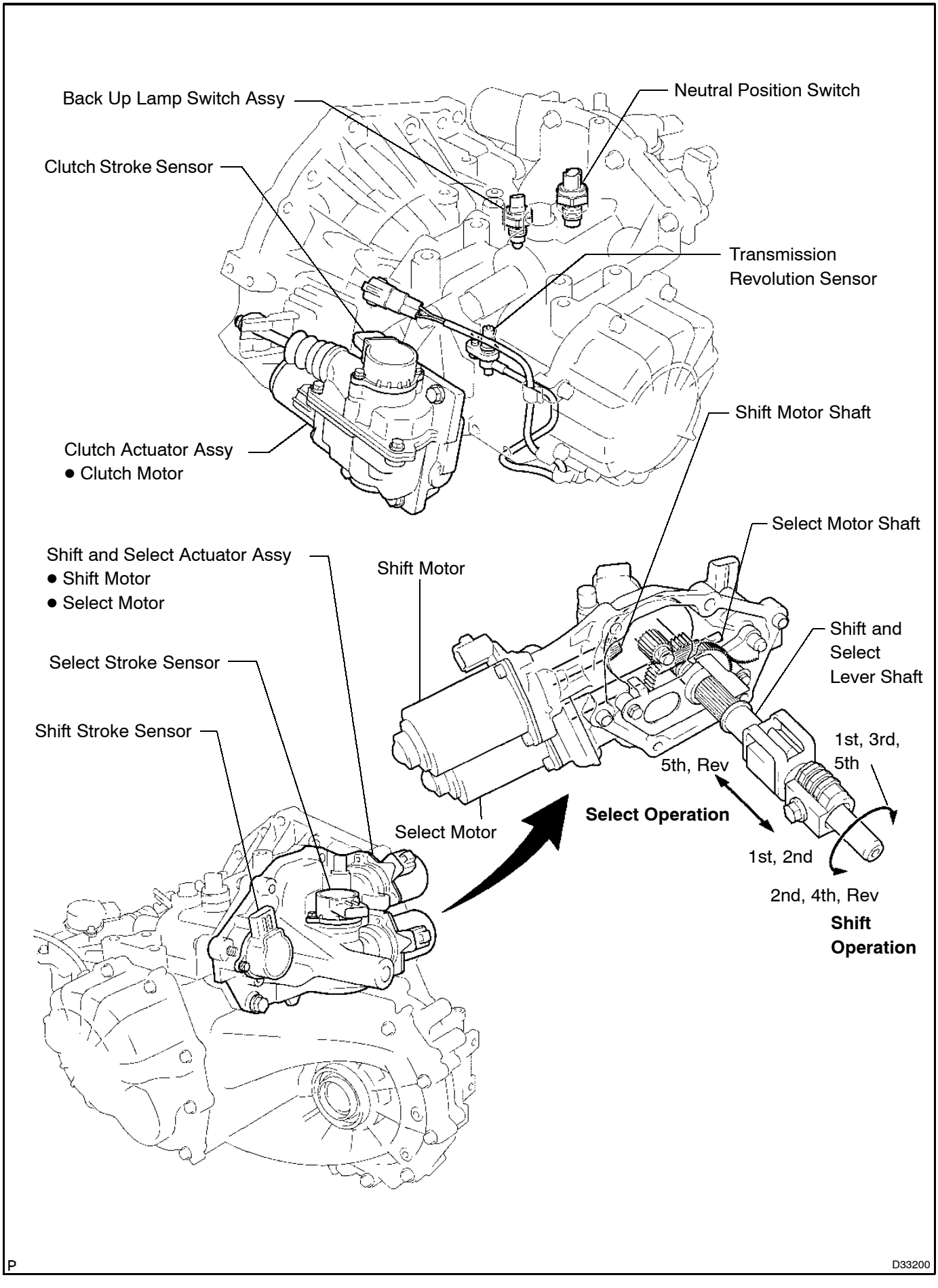


P

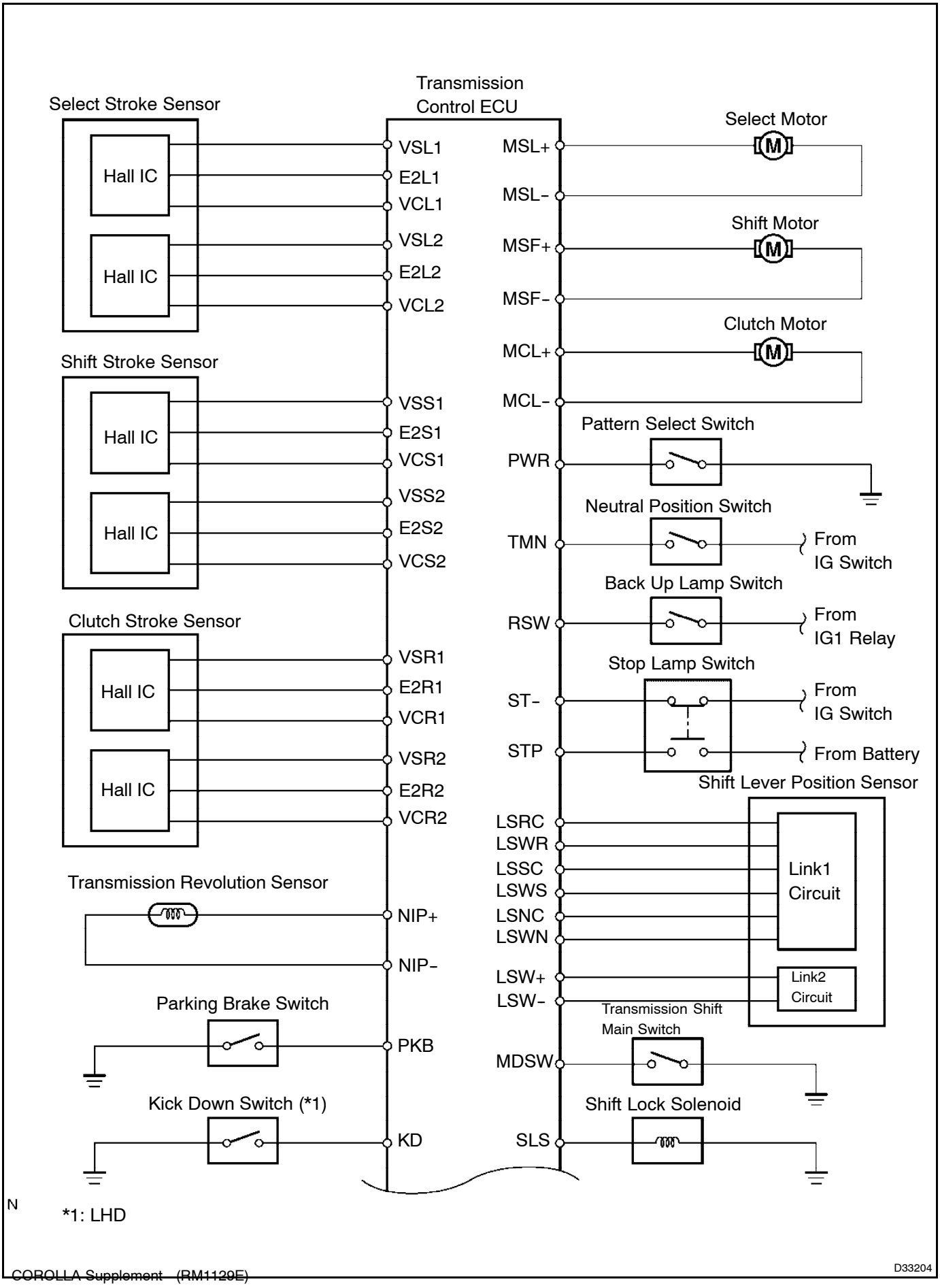
D33199

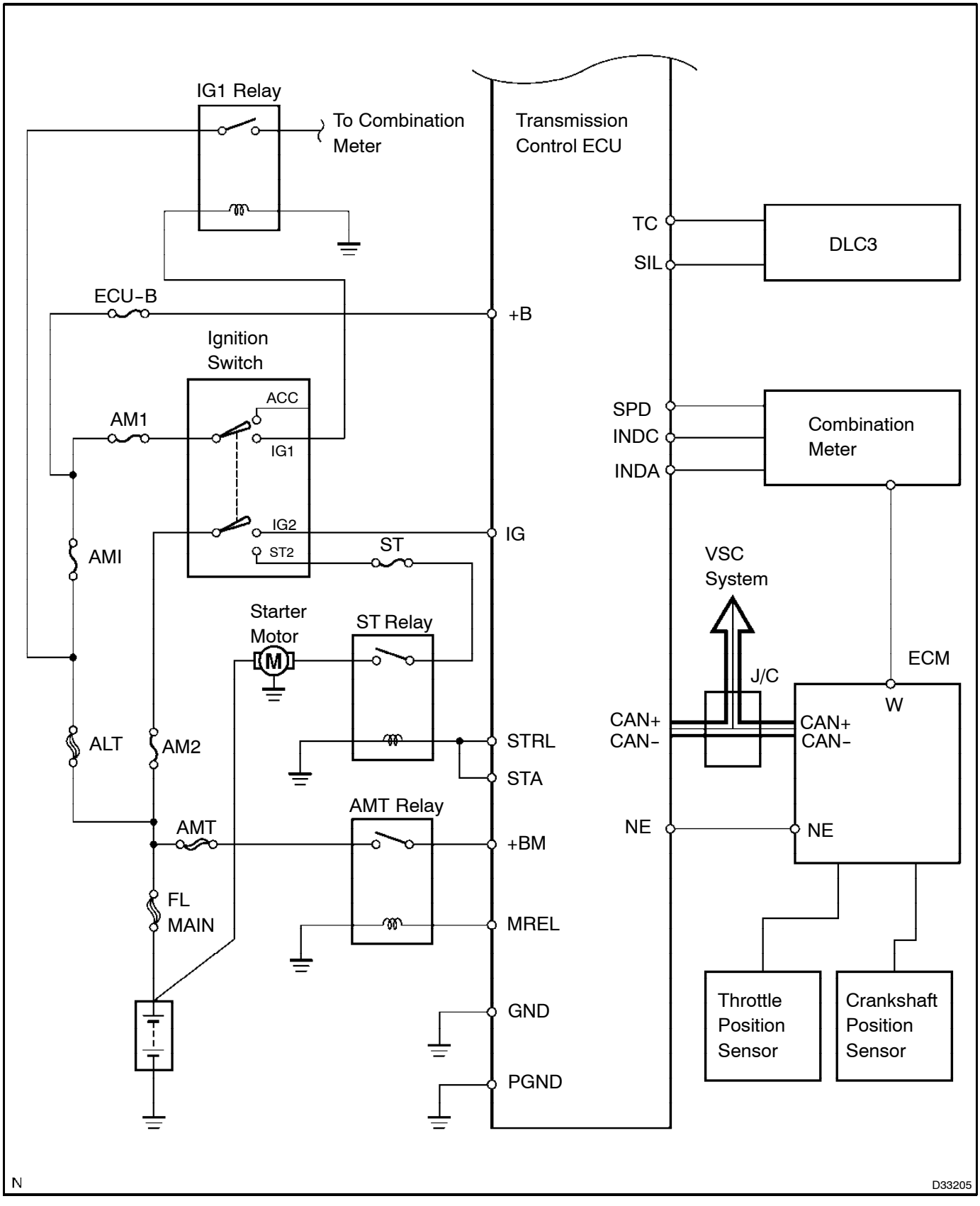

LHD:
Combination Meter Assy
● Buzzer
● Warning Light
● Shift Position Indicator Light
R/B No.3
● ST Relay
Instrument Panel J/B
● ECU-B Fuse
● ECU-IG Fuse
● STOP Fuse
● ST Fuse
● IG2 Fuse
Transmission Control ECU
● Buzzer
ECM
Stop Lamp Switch
DLC3
Accelerator Pedal Position Sensor
Kick Down Switch
Pattern Select Switch
Parking Brake Switch
Shift Lever Assy:
Shift Lock Release Button
Shift Lever Position Sensor
Shift Lock Solenoid
Transmission Shift Main Switch
P
D33201


RHD:
Instrument Panel J/B
● ECU-B Fuse
● ECU-IG Fuse
● STOP Fuse
● ST Fuse
● IG2 Fuse
Combination Meter Assy
● Buzzer
● Warning Light
● Shift Position Indicator Light
Transmission Control ECU
● Buzzer
ECM
R/B No.3
● ST Relay
DLC3
Accelerator Pedal Position Sensor
Stop Lamp Switch
Pattern Select Switch
Parking Brake Switch
Shift Lever Assy:
Shift Lock Release Button
Shift Lever Position Sensor
Shift Lock Solenoid
Transmission Shift Main Switch
P
D33213


Back Up Lamp Switch Assy
Neutral Position Switch
Clutch Stroke Sensor
Transmission Revolution Sensor
Shift Motor Shaft
Clutch Actuator Assy
● Clutch Motor
Select Motor Shaft
Shift and Select Actuator Assy
● Shift Motor
● Select Motor
Shift Motor
Shift and Select Lever Shaft
Select Stroke Sensor
Shift Stroke Sensor
1st, 3rd, 5th
5th, Rev
Select Operation
Select Motor
1st, 2nd
2nd, 4th, Rev
Shift Operation
P
D33200

SYSTEM DIAGRAM




IG1 Relay
To Combination Meter
Transmission Control ECU
TC
SIL
DLC3
ECU-B
+B
Ignition Switch
ACC
AM1
IG1
IG2
ST2
IG
ST
AMI
SPD
INDC
INDA
Combination Meter
VSC System
Starter Motor
ST Relay
M
ECM
J/C
W
ALT
AM2
STRL
STA
CAN+
CAN-
AMT Relay
AMT
+BM
NE
FL
MAIN
MREL
GND
PGND
Throttle Position Sensor
Crankshaft Position Sensor
N
D33205

SYSTEM DESCRIPTION

1. MULTI-MODE MANUAL TRANSMISSION SYSTEM OUTLINE

(a) The multi-mode manual transmission has been developed from the conventional manual transmission by adding actuators directly controlled by electric motors. In addition, an electronic throttle control system, sensors, a shift lever, and a transmission control ECU are installed to the vehicle. The system offers automatic clutch operation and two driving modes: automatic shifting (E) mode and manual shifting (M) mode.

(b) Each actuator stroke sensor is a double non-contact sensor.

(c) Actuators which have one motor for the clutch and two motors for the shift and select lever shaft (one for shifting and the other for selecting) have been added to the conventional manual transmission. The actuators operate to adjust the clutch and move the lever shaft in the selecting or shifting direction. The transmission control ECU receives information from the ECM and sensors, and simultaneously controls the engine and multi-mode manual transmission.

(d) The shift lever features a "shift-by-wire system" that operates the transmission according to electric signals.

(e) The shift lever features an electrical shift lock mechanism. When the engine switch is off or the shift lever is in "N" with the engine running and the brake pedal released, the shift lever is locked in the current position. The transmission gear and shift position always correspond.

(f) The multi-mode manual transmission system has a fail-safe function.
When the transmission control ECU detects a malfunction in the system, the ECU illuminates the check engine warning light (MIL) or sounds the buzzer to let the driver know that a malfunction has occurred. Under such conditions, the fail-safe function makes it possible to operate the vehicle and avoid an emergency situation.

2. FUNCTION OF MAIN COMPONENT

Component	Outline
Meter ECU (Combination Meter)	• Controls the operation of the indicator lights, warning light, and buzzer. • Outputs the vehicle speed signal from the skid control ECU to the transmission control ECU.
Multi-mode Manual Transmission Indicator (Combination Meter)	Lights up to alert the driver when a malfunction occurs in the multi-mode manual transmission system.
Gear Position Indicator Light (Combination Meter)	Indicates the present gear position. In addition, this indicator lights flashes if the actual gear position and the shift lever position do not match.
Es Indicator Light (Combination Meter)	Illuminates the indicator, when the sporty [Es] pattern is selected during the normal [E] pattern driving in E-mode. Not illuminate the indicator while the normal [E] pattern is selected.
Mode Indicator Light (Combination Meter)	Indicates E-mode or M-mode.
Buzzer (Combination Meter)	Sounds if the driver door is opened while the engine is running or the shift lever is in the E, M, or R position.
Shift Lever Position Sensor (Shift Lever Assembly)	Outputs the shift lever position or shift request (+ or -) from the ON/OFF combination of 8-contact switch that is built into the transmission control ECU.
Transmission Shift Main Switch (Shift Lever Assembly)	Outputs the shift mode (M-mode or E-mode) from the ON/OFF signal to the transmission control ECU.
Shift Lock Solenoid (Shift Lever Assembly)	Actuated by the transmission control ECU and restricts the movement of the shift lever.
Shift Motor (Shift & Select Actuator)	Actuated by transmission control ECU and effects the select operation of the shift & select lever shaft.
Shift Stroke Sensor (Shift & Select Actuator)	Detects the length of the shift stroke of the gear shift fork from the rotation angle of the shift & select lever shaft and relays this information to the transmission control ECU in the form of feedback signals.
Select Motor (Shift & Select Actuator)	Actuated by transmission control ECU and effects the select operation of the shift & select lever shaft.
Select Stroke Sensor (Shift & Select Actuator)	Detects the length of the select stroke of the gear shift fork from the position of the shift & select lever shaft and relays this information to the transmission control ECU in the form of feedback signals.
Clutch Motor (Clutch Actuator)	Actuated by transmission control ECU and engages and disengages the clutch.

Component	Outline
Clutch Stroke Sensor (Clutch Actuator)	Detects the amount of the clutch stroke from rotational angle of the worm wheel in the clutch actuator and relays and sends information to the transmission control ECU in the form of feedback signals.
LCC (Load Controlled Clutch cover)	Actuated by the clutch motor, the pressure plate height of the LCC is adjusted to a predetermined position, in order to apply a constant load to the clutch motor.
Transmission Revolution Sensor	Detects the input shaft speed of the transaxle and outputs it to the transmission control ECU.
Pattern Select [Es] Switch	Outputs the driving pattern (Normal [E] pattern or Sporty [Es] pattern) in E-mode from the ON/OFF condition to the transmission control ECU.
Kick Down Switch (only for LHD)	Detects beyond the full-throttle opening and outputs it to the transmission control ECU.
Neutral Position Switch	Detects the neutral position and outputs it to the transmission control ECU.
Back Up Lamp Switch	Detects the reverse position and outputs it to the transmission control ECU, and illuminates the back-up lamps.
Stop Lamp Switch	Detects the brake pedal being depressed and outputs it to the transmission control ECU and illuminates the stop lamps.
Parking Brake Switch	Detects the parking brake lever being pulled and outputs it to the transmission control ECU.
Transmission Control ECU	• Controls the multi-mode transmission system; in addition, requests the ECM to effect fuel injection control during up-shift or downshift via CAN (Controller Area Network) communication. • When the transmission control ECU detects a malfunction, the transmission control ECU makes a diagnosis and memorizes the failed section. Furthermore, the multi-mode manual transmission warning light and check engine warning light illuminate or blink to inform the driver.
Transmission Control ECU (Buzzer)	Sounds a built-in buzzer during system warning.
ECM	• Outputs each sensor information via CAN communication to transmission control ECU. • Effects fuel injection control per request from transmission control ECU.
Air Flow Meter (Intake Air Temp. Sensor)	Detects the external air temperature and outputs it to the transmission control ECU via the ECM.
Accelerator Pedal Position Sensor	Detects the accelerator pedal position and outputs it to the ECM.
Crankshaft Position Sensor	Detects the engine speed and outputs it to the transmission control ECU via the ECM.
Water Temp. Sensor	Detects the water temperature and outputs it to the transmission control ECU via the ECM.
Starter Relay	The transmission control ECU restricts operation of the starter relay in accordance with the gear position and the braking conditions, in order to control operation of the starter.

3. MULTI-MODE MANUAL TRANSMISSION SYSTEM CONTROL

(a) System start:

The multi-mode manual transmission system starts when the ignition switch is turned on. The shift lever can be operated with the ignition switch on and the brake pedal depressed. The engine starts when the ignition switch is turned on with the brake pedal depressed and the gear in neutral.

(b) Take off/reverse control:

If the brake pedal is not depressed with the gear in 1st, 2nd, or reverse, the clutch is half-engaged, even if the accelerator pedal is not depressed.

[Take off assist control]

If the brake pedal is not depressed with the gear in 1st, 2nd, or reverse, the clutch is half-engaged, even if the accelerator pedal is not depressed. This will assist the vehicle in preparing to move.

The take off assist control is cancelled while the parking brake switch is on.

HINT:

When shifting to reverse at a vehicle speed of 9 km/h (5.59 mph) or more, the reverse warning buzzer sounds, but the gear is not shifted to reverse.

(c) Shift control:
When upshifting with the accelerator pedal depressed, the ECM restrains engine rev-up by reducing the fuel injection volume according to the request signal from the multi-mode manual transmission.

[Automatic shift control (E and Es modes)]
When the shift lever is in the E position, the most appropriate gear is automatically selected according to the accelerator pedal opening angle and vehicle speed. In addition to the above automatic shift control, LHD vehicles have a kick down switch. When the kick down switch is on, the most appropriate gear is automatically selected according to the vehicle speed. The kick down switch can also detect when the throttle valve is fully open.
Shift control can be switched between normal (E) and sports (Es) modes by pressing the pattern select switch.
Normal (E) mode: Economical automatic shift control with emphasis on fuel economy
Sports (Es) mode: Automatic shift control with emphasis on driving performance
HINT:
The system always starts in the normal (E) mode.
[Sequential shift control (M mode)]
Moving the shift lever to the M position enables the "+"/"-" position. The driver can freely select gears by shifting to the "+"/"-" position.

(d) Incline/decline shift control:
While driving in the normal (E) or sports (Es) mode, the system operates to prevent unnecessary shifting and obtain proper driving force and engine brake power by estimating road inclination based on the vehicle conditions.

[Incline shift control]
On an incline, upshifting to 3rd, 4th, or 5th gear is prohibited, depending on the degree of road inclination.
[Decline shift control]
On a decline, the current gear position is maintained, depending on the degree of road inclination to obtain engine brake power. When the brake pedal is depressed, the transmission control ECU automatically downshifts to improve vehicle (driving force) control performance.

(e) AI (Artificial Intelligence) - SHIFT CONTROL:
In addition to the switching of the shift pattern through the pattern select switch, the AI-SHIFT control enables the transmission control ECU to estimate the road conditions and the driver's intention in order to automatically select the optimal shift pattern. This improves ride comfort.

[Accelerator pedal rapid open control]
When the accelerator pedal is rapidly depressed, the system interprets it as an acceleration demand and advances the downshift timing.
[Accelerator pedal sudden close control]
When the accelerator pedal is suddenly released, the system interprets it as a deceleration demand and ensures engine brake power without changing gear. This also ensures there is sufficient driving force for the next acceleration stage.

(f) Control when the vehicle stops (stopping control):
The transmission control ECU automatically disengages the clutch when the input speed of the transmission revolution sensor falls below a specified speed. This enables the vehicle to stop without stalling. If the shift lever is in the "E" or "M" position, the transmission control ECU shifts to the most appropriate gear when the vehicle speed becomes less than a specified speed.

HINT:
If the shift lever is kept in the "N" position for 2 seconds with the brake pedal released at a specified vehicle speed or less, the transmission control ECU locks the shift lever to prevent improper shift lever operation. The shift lever can then be unlocked by depressing the brake pedal.

(g) Control when the vehicle is parked (parking control):
When the ignition switch is turned off, the transmission control ECU locks the shift lever at the current position, and 1 second later engages the clutch to park the vehicle with the gear engaged.

HINT:

The shift lever can be in any position (N, E, M or R) to park the vehicle. The multi-mode manual transmission system does not have a park position. The vehicle can be parked with the gear engaged when the shift lever is in the "E", "M", or "R" position. The vehicle may not be parked if the ignition switch is turned off before gear-shift is complete.

4. REMOVAL AND INSTALLATION PROCEDURES OF MULTI-MODE MANUAL TRANSMISSION SYSTEM

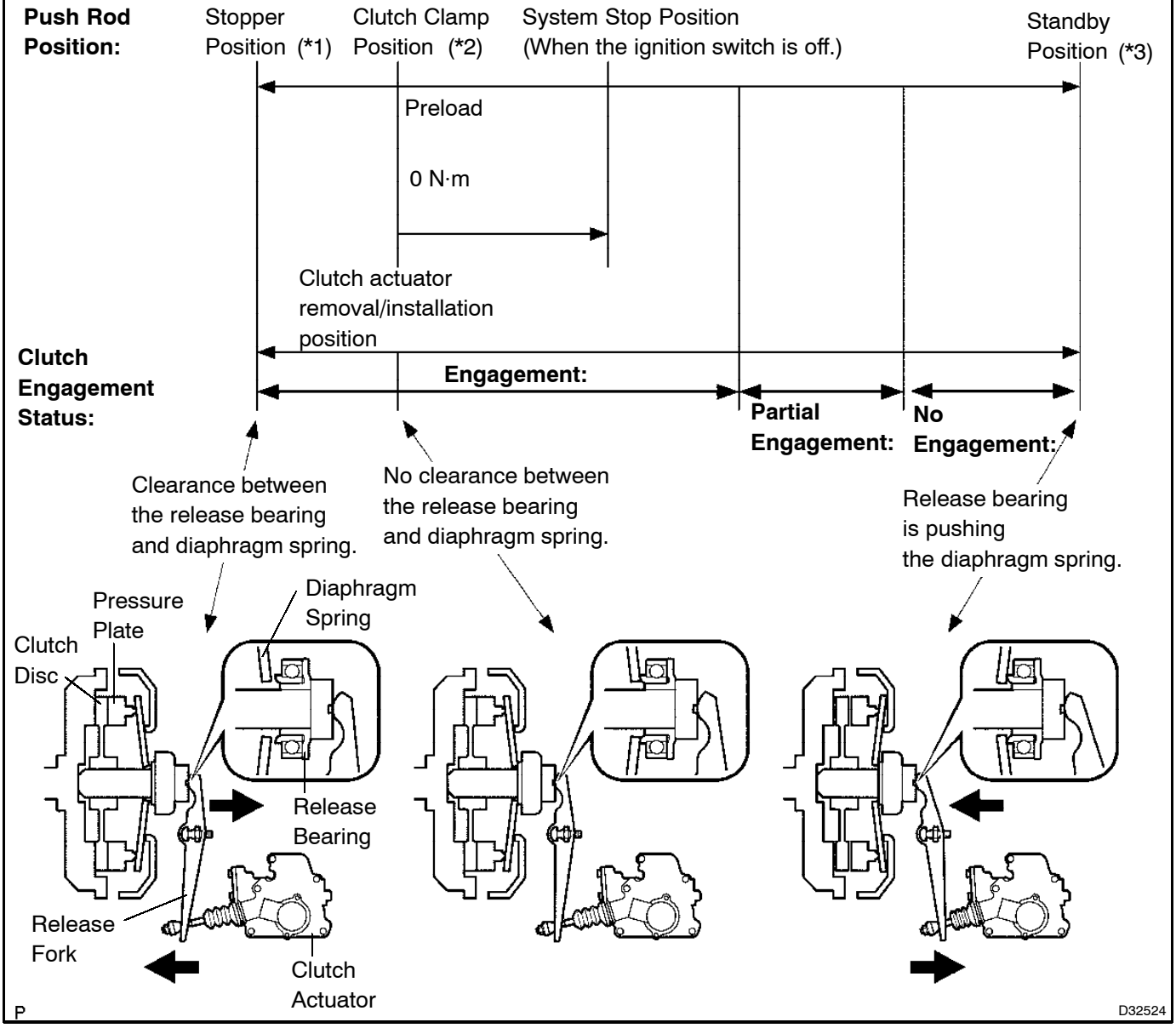
HINT:

The multi-mode manual transmission differs from the conventional manual transmission. The following operations are necessary when removing and installing the component parts.

(a) CLUTCH POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)

- Preload is applied to the clutch actuator push rod installed on the vehicle.
- Clutch position adjustment is necessary to position the push rod so that the clutch actuator can be reinstalled.
- The push rod position of a new clutch actuator or a clutch actuator installed on the vehicle is not suitable for clutch actuator reinstallation. Installation preparation must be performed when removing the clutch actuator.
- For details of replacement, see page 05-186.

CLUTCH ACTUATOR OPERATION



*1: The stopper position is where the clutch actuator push rod is fully extended.
*2: The clutch clamp position is where the preload applied to the diaphragm spring is 0 N·m. Removal/installation of the clutch actuator is possible at this point.
The clutch clamp position is where removal/installation of the clutch actuator is possible.
*3: The standby position is where the clutch actuator push rod is compressed and the clutch is not engaged.

(b) REPLACEMENT OR REMOVAL/INSTALLATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM PARTS
Refer to the respective pages.

(c) INITIALIZATION AND LEARNING
1) INITIALIZATION OF TRANSMISSION SYSTEM:
- The transmission control ECU stores information from each component, such as sensors or motors, to control the system.
- Every sensor and motor is different, even for parts that are the same. The transmission control ECU cannot control the system correctly because information from sensors or motors differs due to a difference from removal/installation of parts. Therefore, the transmission control ECU learning values must be cleared.
- Learning of the multi-mode manual transmission system is performed when there is no learning value in the ECU. It is therefore necessary to perform initialization of the multi-mode manual transmission ECU before performing learning of the multi-mode manual transmission system.
- For details of replacement, see page 05-190.

2) LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM:
- This operation is performed to store the positions of components such as sensors or motors in the transmission control ECU.
- For details of replacement, see page 05-190.

NOTICE:
Be sure to perform this operation after initialization of the multi-mode manual transmission system.

(d) SYNCHRONIZATION POSITION CALIBRATION
- Every transmission component is different. The ECU memorizes individual differences and adjusts the shift points to perform constant shift/select/clutch control.
Synchronization position calibration corrects and learns the individual differences.
- For details of replacement, see page 05-196.

05MQ0-01

CLAMP POSITION ADJUSTMENT

1. USING INTELLIGENT TESTER II: CLAMP POSITION ADJUSTMENT (CLUTCH POSITION ADJUSTMENT)

HINT:

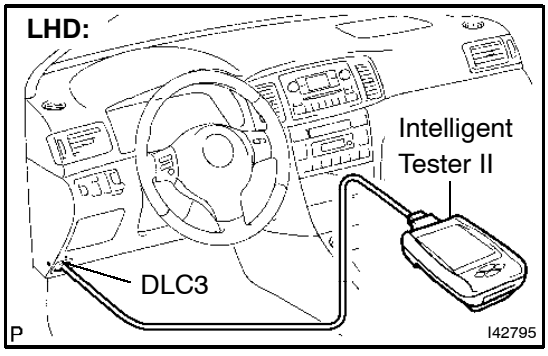
- The multi-mode manual transmission system has a load controlled clutch cover (adjustment system). The pressure plate moves depending on the runout of the clutch disc lining.
- When removing or installing any part related to the multi-mode manual transmission system, move the clutch actuator to the clutch clamp position. This is for normal operation of the load controlled clutch cover (adjustment system).
- If the clutch position adjustment operation input has failed, perform the operation again from step (a) more than 15 seconds after turning the ignition switch off.

NOTICE:

Do not depress the brake pedal while using the intelligent tester II.

(a) Prepare the vehicle:

- Stop the vehicle.
- Shift the lever into the "N" position.
- Turn the ignition switch off.
- Make sure that the engine is stopped.
- Apply the parking brake.



(b) Connect the intelligent tester II to the DLC3.

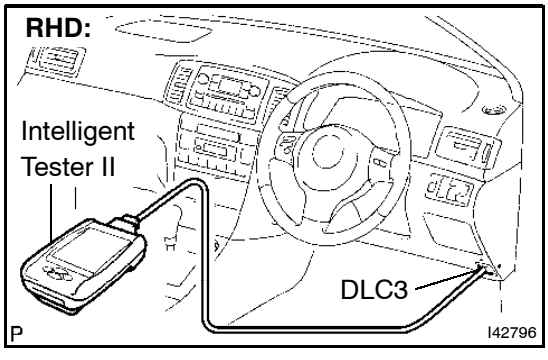
(c) Turn the ignition switch on.

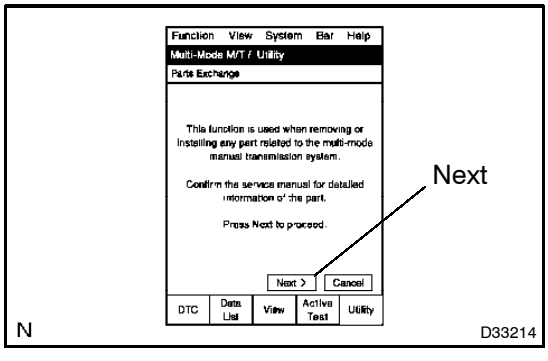
(d) Turn the main switch of the intelligent tester II on and follow the prompts on the screen.

HINT:

For details, refer to the operator's manual for the intelligent tester II (Reference).

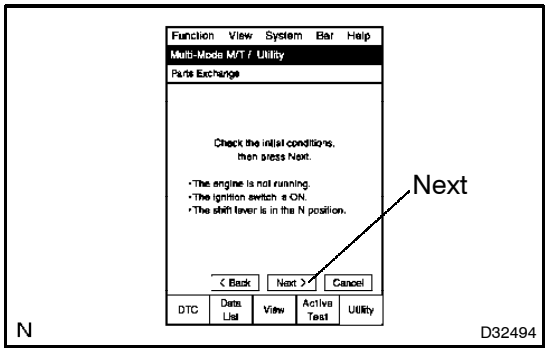
(e) Select "Parts Exchange" from "Function".



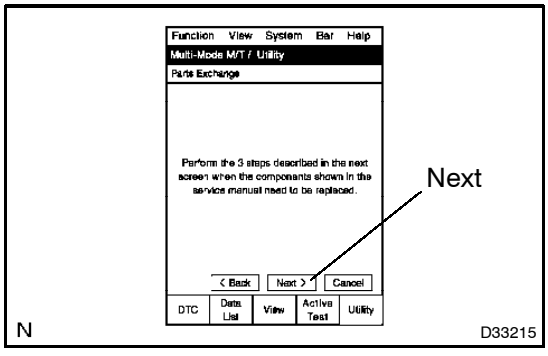


(f) Read information.

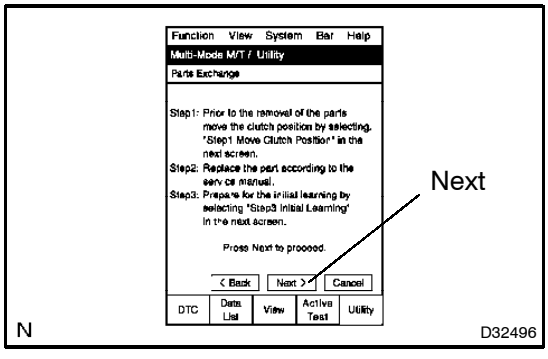
(g) Press the "Next" key.



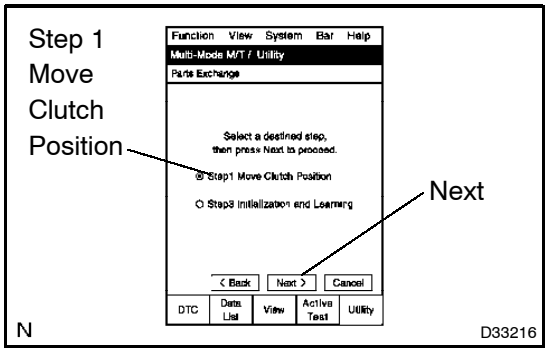
(h) Read information.
(i) After checking the vehicle condition, press the "Next" key.



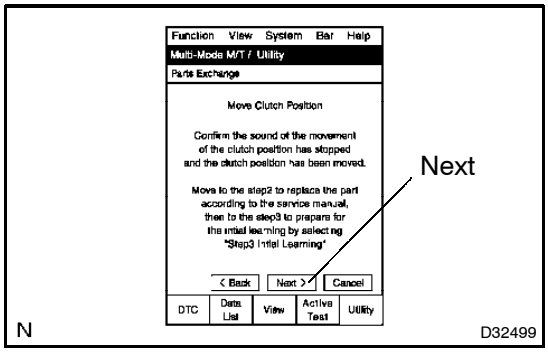
(j) Read information.
(k) Press the "Next" key.



(l) Read information.
(m) Press the "Next" key.



(n) On the "Multi-Mode M/T / Utility" screen, select "Step 1 Move Clutch Position".
(o) Press the "Next" key.



(p) Read information.
(q) Press the "Next" key.
(r) Complete "clutch position adjustment".
(s) Turn the main switch of the intelligent tester II off.
(t) Turn the ignition switch off.
(u) Replace the parts.

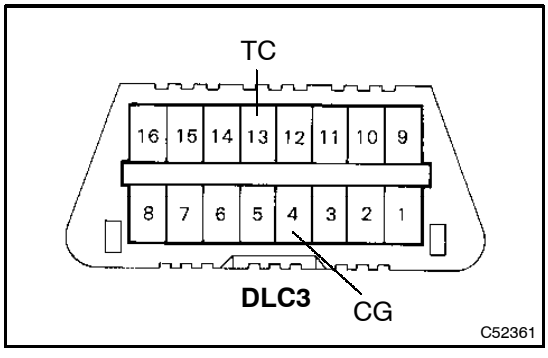
2. NOT USING INTELLIGENT TESTER II: CLAMP POSITION ADJUSTMENT (CLUTCH POSITION ADJUSTMENT)

HINT:

- The multi-mode manual transmission system has a load controlled clutch cover (adjustment system). The pressure plate moves depending on the runout of the clutch disc lining.
- When removing or installing any part related to the multi-mode manual transmission system, move the clutch actuator to the clutch clamp position. This is for normal operation of the load controlled clutch cover (adjustment system).
- If the clutch position adjustment operation input has failed, perform the operation again from step (a) more than 15 seconds after turning the ignition switch off.

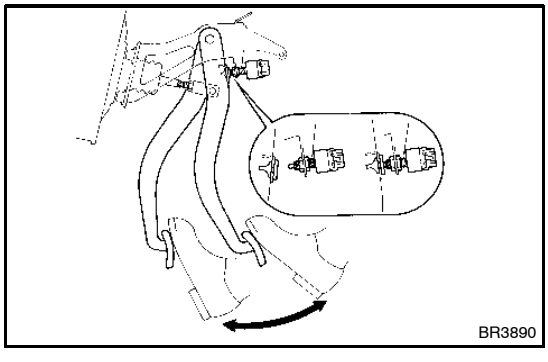
(a) Prepare the vehicle:

- Stop the vehicle.
- Shift the lever into the "N" position.
- Turn the ignition switch off.
- Make sure that the engine is stopped.
- Apply the parking brake.



(b) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040

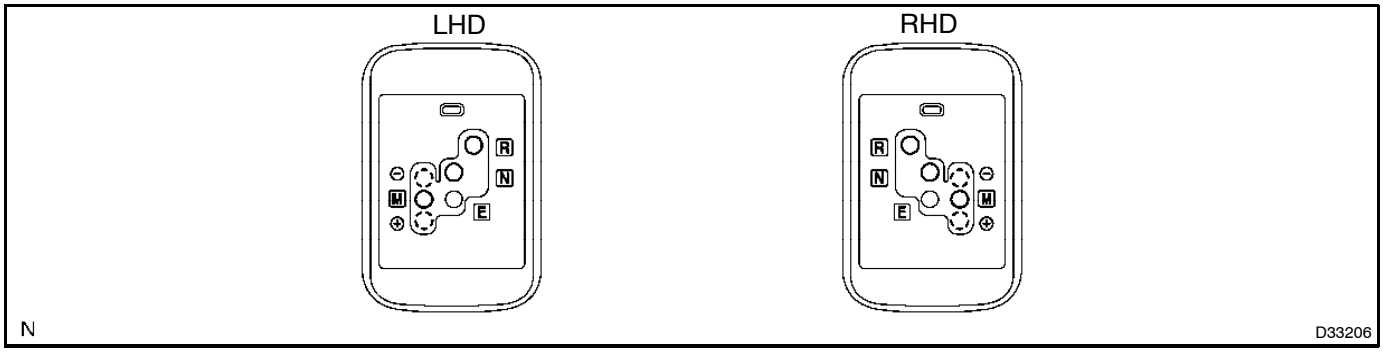
(c) Turn the ignition switch on.



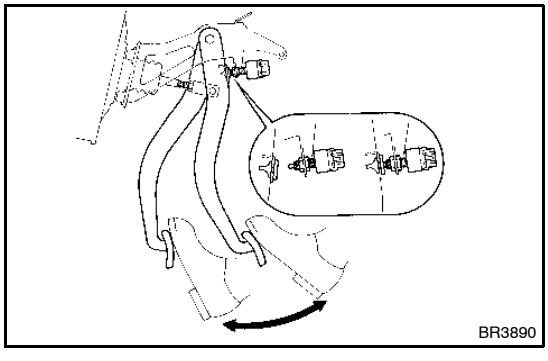
(d) Depress the brake pedal 7 times or more within 3 seconds.

(1) The buzzer sounds twice at intervals of 0.25 seconds.

(e) Prepare the vehicle:
(1) Depress the brake pedal.
(2) Shift lever operation: "N → E → M → + → M → + → M → + → M → + → M → E → N"



(3) Release the brake pedal.



(f) Depress the brake pedal.
(1) The buzzer sounds once.

HINT:
Wait at least 15 seconds after turning the ignition switch off and perform the procedures from step (a) again if the buzzer does not sound once.

(g) Depress the brake pedal 3 times or more within 2 seconds.
(1) The buzzer sounds twice at intervals of 0.25 seconds.

(h) Prepare the vehicle:
(1) Depress the brake pedal.
(2) Shift the lever to the "-" position.
(3) Release the brake pedal.
(i) Turn the ignition switch off.
(j) Wait at least 10 seconds.
(k) Complete clutch position adjustment.
(l) Disconnect the SST from terminals TC and CG of the DLC3.

INITIALIZATION AND LEARNING

1. USING INTELLIGENT TESTER II: INITIALIZATION OF TRANSMISSION CONTROL ECU AND LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM

NOTICE:

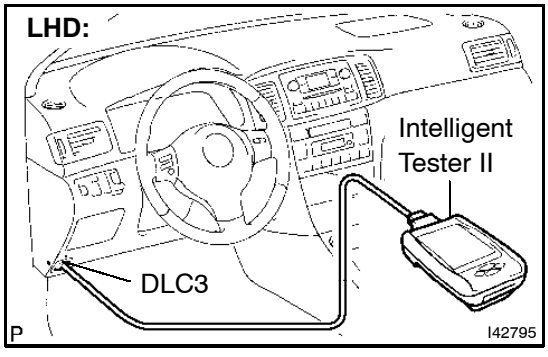
When using the intelligent tester II, calibration of the multi-mode manual transmission system is subsequently performed after initialization of the transmission control ECU.

HINT:

- The calibration values and the DTC history of the multi-mode manual transmission system are stored in the EEP ROM in the transmission control ECU. The stored information will not be cleared even when the negative terminal of the battery is removed. To clear all the stored information, initialize the transmission control ECU.
- Perform the procedure below to ensure that the initialized transmission control ECU memorizes the adjusted clutch position or gear position.
- There may be a malfunction with the shift lever position sensor, NE signals, or CAN communication when initialization cannot be performed normally.

(a) Prepare the vehicle:

- Stop the vehicle.
- Shift the lever into the "N" position.
- Turn the ignition switch off.
- Make sure that the engine is stopped.



(b) Connect the intelligent tester II to the DLC3.

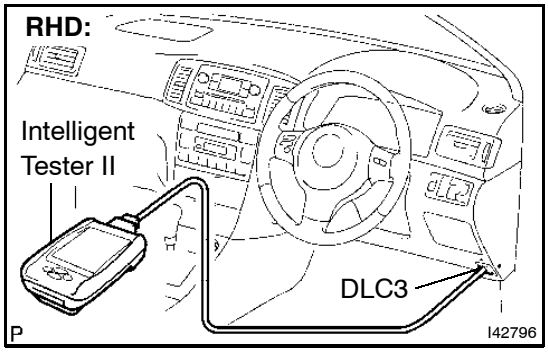
(c) Turn the ignition switch on.

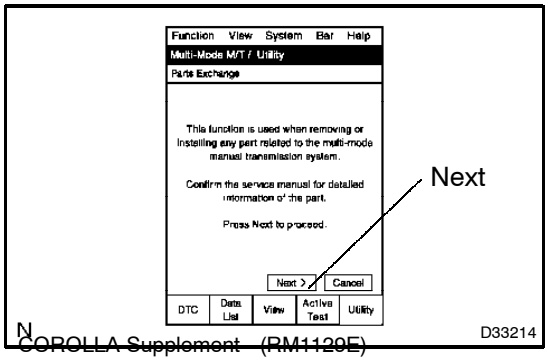
(d) Turn the main switch of the intelligent tester II on and follow the prompts on the screen.

HINT:

For details, refer to the operator's manual for the intelligent tester II (Reference).

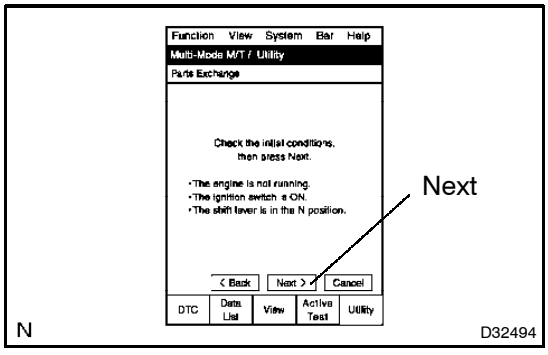
(e) Select "Parts Exchange" from "Function".



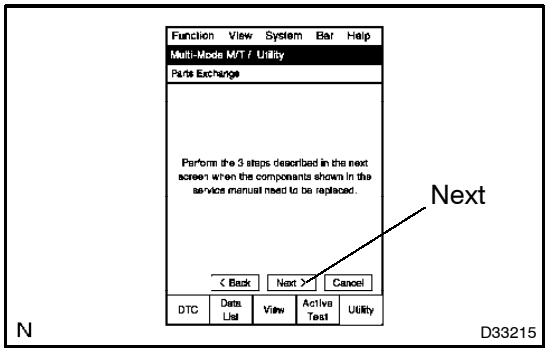


(f) Read information.

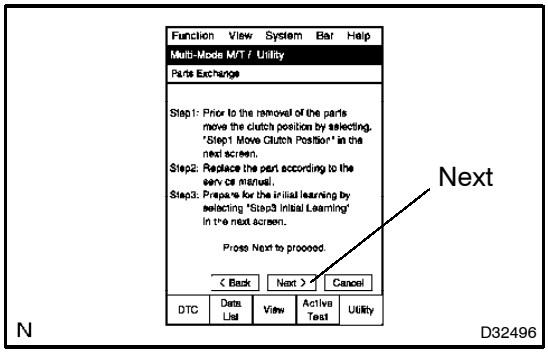
(g) Press the "Next" key.



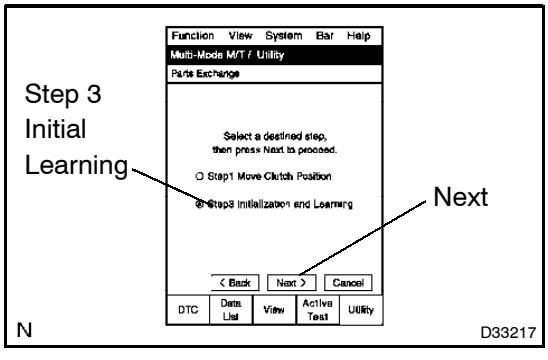
(h) Read information.
(i) After checking the vehicle condition, press the "Next" key.



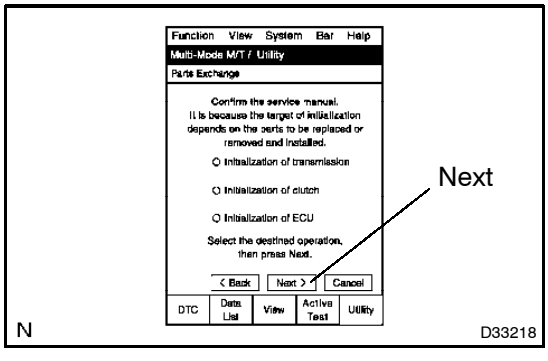
(j) Read information.
(k) Press the "Next" key.



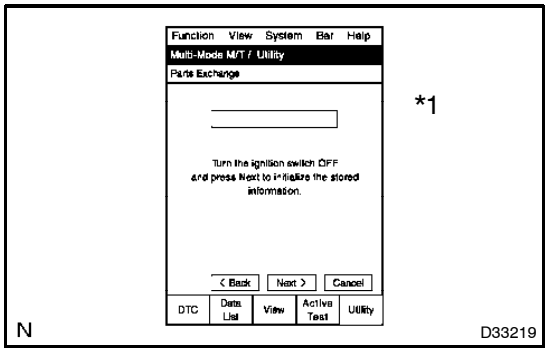
(l) Read information.
(m) Press the "Next" key.



(n) On the "Multi-Mode M/T / Utility" screen, select "Step 3 Initial Learning".
(o) Press the "Next" key.



(p) Select an operation.
(q) Press the "Next" key.

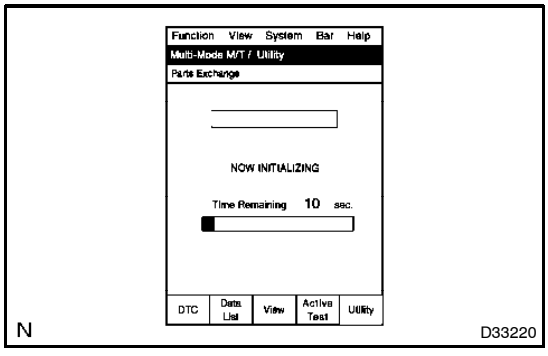


(r) Read information.

HINT:

The corresponding display appears.

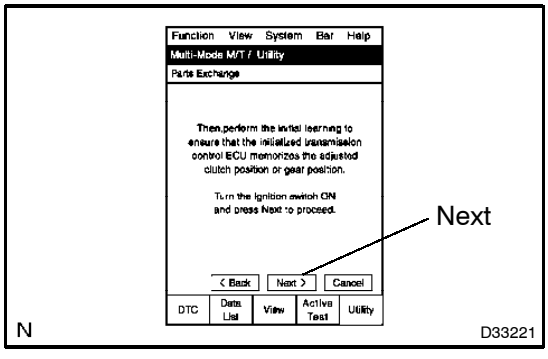
(s) Press the "Next" key.



(t) Wait 10 seconds.

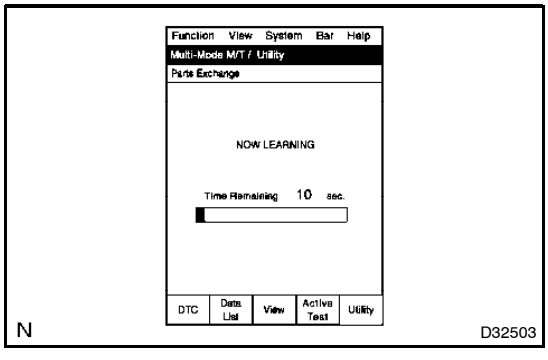
HINT:

Countdown from 10 seconds to 0.



(u) Read information.

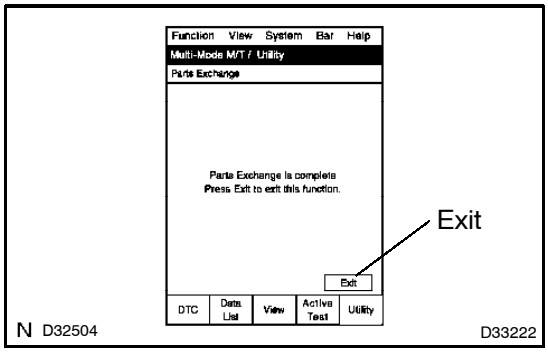
(v) Press the "Next" key.



(w) Wait 40 seconds.

HINT:

Countdown from 40 seconds to 0.



(x) Press the "Exit" key.

(y) Complete "initialization and learning".

(z) Turn the main switch of the intelligent tester II off.

(aa) Turn the ignition switch off.

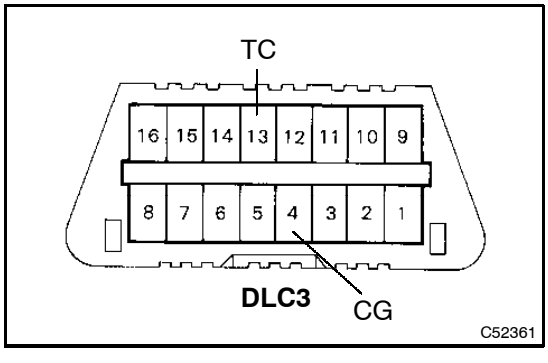
2. NOT USING INTELLIGENT TESTER II: INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM

HINT:

- The calibration values and the DTC history of the multi-mode manual transmission system are stored in the EEP ROM in the transmission control ECU. The stored information will not be cleared even when the negative terminal of the battery is removed. To clear all the stored information, initialize the transmission control ECU.
- If the input of initialization of the multi-mode manual transmission system has failed, perform the operation again from step (a) more than 15 seconds after turning the ignition switch off.
- There may be a malfunction with the shift lever position sensor, NE signals, or CAN communication when initialization cannot be performed normally.

Parts to be replaced or removed and installed	Operation
TRANSMISSION CONTROL ECU CLUTCH ACTUATOR CLUTCH DISC AND CLUTCH DISC COVER FLYWHEEL CRANKSHAFT CLUTCH RELEASE BEARING CLUTCH RELEASE FORK END PLATE • When the clutch actuator is removed from the transmission assy during installation of any of the following parts. TRANSMISSION ASSY TRANSMISSION PARTS (INSIDE GEAR BOX)	Initialization of multi-mode manual transmission system (ECU)
CLUTCH STROKE SENSOR	Initialization of multi-mode manual transmission system (clutch)
SHIFT STROKE SENSOR SELECT STROKE SENSOR SHIFT AND SELECT ACTUATOR TRANSMISSION PARTS (INSIDE GEAR BOX)	Initialization of multi-mode manual transmission system (transmission)

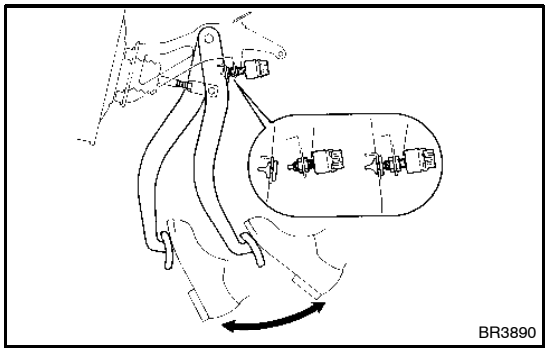
(a) Prepare the vehicle:
- Stop the vehicle.
- Shift the lever into the "N" position.
- Turn the ignition switch off.
- Make sure that the engine is stopped.



(b) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040

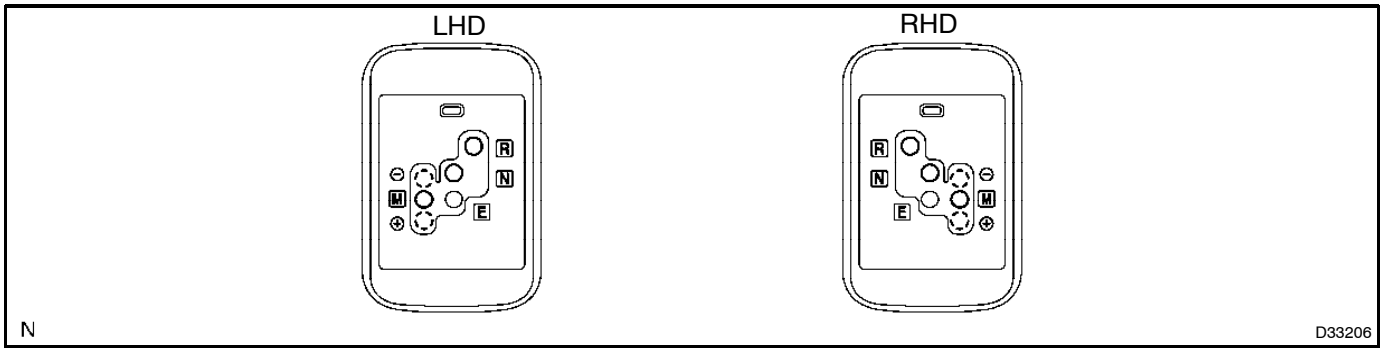
(c) Wait at least 10 seconds or more.

(d) Turn the ignition switch on.

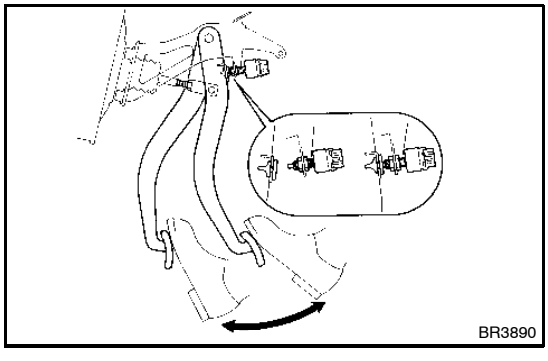


(e) Depress the brake pedal 7 times or more within 3 seconds.
(1) The buzzer sounds twice at intervals of 0.25 seconds.

(f) Prepare the vehicle:
(1) Depress the brake pedal.
(2) Move the shift lever as follows:
- When initializing the ECU: "N → E → M → - → M → - → M → - → M → - → E → N"
- When initializing the clutch: "N → E → M → + → M → - → M → + → M → - → E → N"
- When initializing the transmission: "N → E → M → - → M → - → M → + → M → + → E → N"



(3) Release the brake pedal.



(g) Depress the brake pedal.
(1) The buzzer sounds at intervals of 0.5 seconds as follows. (An interval of 0.25 seconds exists for each cycle.)
- Twice when initializing the ECU (one cycle)
- Three times when initializing the clutch (one cycle)
- Four times when initializing the transmission (one cycle)

HINT:

- Wait at least 15 seconds after turning the ignition switch off and perform the procedures from step (a) again if the buzzer does not sound as specified.
- Wait at least 15 seconds after turning the ignition switch off and perform the procedures from step (a) again if the buzzer sounds at intervals of 1 second (not at intervals of 0.5 seconds).

(h) Depress the brake pedal 3 times or more within 2 seconds.
  (1) The buzzer sounds twice at intervals of 0.25 seconds.

(i) Turn the ignition switch off.

(j) Complete "initialization of multi-mode manual transmission system".

(k) Disconnect the SST from terminals TC and CG of the DLC3.

3. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM

HINT:

- Perform the procedure below to ensure that the initialized transmission control ECU memorizes the adjusted clutch position or gear position.
- If the input of learning of the multi-mode manual transmission system has failed, perform the operation again from step (a) more than 15 seconds after turning the ignition switch off.

(a) Prepare the vehicle:
  - Stop the vehicle.
  - Shift the lever into the "N" position.
  - Turn the ignition switch off.
  - Make sure that the engine is stopped.

(b) Turn the ignition switch on.

(c) Wait at least 40 seconds or more.

(d) Start the engine under the following conditions:
  - Shift lever is in the "N" position.
  - Brake pedal is depressed.

HINT:

After starting the engine, the shift "N" position indicator changes from blinking to constant.

(e) Turn the ignition switch off.

(f) Wait at least 15 seconds or more.

(g) Complete "learning of multi-mode manual transmission system".

05L3Y-02

SYNCHRONIZATION POSITION CALIBRATION

1. SYNCHRONIZATION POSITION CALIBRATION

(a) Drive the vehicle and shift up in order from 1st to 5th. Then, shift down in order from 5th to 1st.

(b) While driving, check that the gear shifts up smoothly from 1st to 5th and shifts down smoothly from 5th to 1st.

Recommendation value

Gear Change	Gear Position	Vehicle Speed
UP SHIFT	1st → 2nd 2nd → 3rd 3rd → 4th 4th → 5th	More than 25 km/h (15.5 mph) More than 47 km/h (29.2 mph) More than 69 km/h (42.9mph) More than 93 km/h (57.8 mph)
DOWN SHIFT	5th → 4th 4th → 3rd 3rd → 2nd 2nd → 1st	More than 93 km/h (57.8 mph) More than 69 km/h (42.9 mph) More than 47 km/h (29.2 mph) More than 25 km/h (15.5 mph)

HINT:

- Interval between gear changes is more than 2 seconds.
- If there is a shock when changing gears after synchronization position calibration, perform synchronization position calibration again.

05L3Z-02

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05-199)

NEXT

3	CONNECT INTELLIGENT TESTER II TO DLC3

HINT:
If the display indicates a communication fault in the tool, inspect the DLC3.

NEXT

4	CHECK CAN COMMUNICATION SYSTEM

(a) Check for output DTCs.
HINT:
The ECM of this system is connected to the CAN communication system. Therefore, before starting trouble-shooting, make sure to check that there is no trouble in the CAN communication system.

	CAN SYSTEM DTC IS OUTPUT (PROCEED TO "CAN COMMUNICATION SYSTEM")
	NO CAN SYSTEM DTC (GO TO STEP 5)

5	CHECK DTC AND FREEZE FRAME DATA (SEE PAGE 05-200 AND 05-203)

HINT:
Record or print DTCs and freeze frame data, if needed.

NEXT

6	CLEAR DTC AND FREEZE FRAME DATA (SEE PAGE 05-203)

NEXT

7	VISUAL INSPECTION

NEXT

8	SET THE CHECK MODE DIAGNOSIS (SEE PAGE 05-205)

NEXT

9	PROBLEM SYMPTOM CONFIRMATION

SYMPTOM DOES NOT OCCUR: Go to step 10

SYMPTOM OCCURS: Go to step 11

10	SYMPTOM SIMULATION (SEE PAGE 01-22)

NEXT

11	DTC CHECK (SEE PAGE 05-203)

TROUBLE CODE: Go to step 12

NO CODE: Go to step 13

12	DTC CHART (SEE PAGE 05-221)

NEXT

Go to step 14

13	PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

NEXT

14	CIRCUIT INSPECTION (SEE PAGE 05-225 TO 05-364)

NEXT

15	IDENTIFICATION OF PROBLEM

NEXT

16	ADJUSTMENT, REPAIR

NEXT

17	CONFIRMATION TEST

NEXT

END

05L40-02

CUSTOMER PROBLEM ANALYSIS CHECK

MULTI-MODE MANUAL TRANSMISSION SYSTEM
Check Sheet

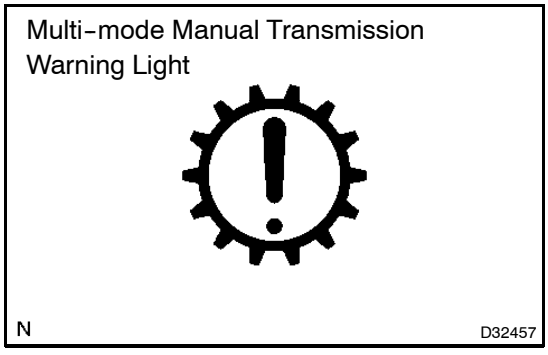
Inspector's Name

Customer's Name		VIN	
Driver's Name		Production Date	
Date Vehicle Brought In		License Plate No.	
		Odometer Reading	miles km

Symptoms	☐ Vehicle does not move	☐ Vehicle does not run normally (Vehicle can run in fail-safe mode in 1st or Rev) ☐ Starter does not operate ☐ Starter operates but engine does not start ☐ Other ( )
	☐ No up shift	☐ 1st→2nd ☐ 2nd→3rd ☐ 3rd→4th ☐ 4th→5th
	☐ No down-shift	☐ 5th→4th ☐ 4th→3rd ☐ 3rd→2nd ☐ 2nd→1st
	☐ Gear does not change in a particular range	☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th ☐ Rev
	☐ Shift lever cannot be operated	☐ N→E ☐ N→R ☐ E→N ☐ R→N ☐ E→M ☐ M→E ☐ Other ( )
	☐ Noise	☐ Motor ☐ Shifting ☐ Gear ☐ Clutch ☐ Other ( )
	☐ Shudder ☐ Slip	
	☐ Other	
Date and Time Problem Occurred		
Problem Frequency	☐ Constantly ☐ Sometimes (times per day/week) ☐ Once only ☐ Other ( )	
Condition When Problem Occurred	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other ( )
	Place	☐ Inner city ☐ Suburbs ☐ Highway ☐ Incline ☐ Decline ☐ Steep slope ☐ Slight slope ☐ Paved road ☐ Rough road
	Engine	☐ Cold ☐ During warming up (min. after engine start) ☐ After warming up
	Warning Lamp	☐ On ☐ Off ☐ Uncertain
	Warning Buzzer	☐ On (Sound pattern:) ☐ Off ☐ Uncertain
	Shift Indicator	☐ R ☐ N ☐ E ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ M ☐ Blinking ☐ Off ☐ Uncertain ☐ On
	Shift lever Position	☐ R ☐ N ☐ E ☐ M ☐ + ☐ -
	Engine	☐ Just after starting ☐ Idling ☐ Racing ☐ Just before starting ☐ Starting ☐ ( ) km/h (mph) ☐ From ( ) km/h (mph) ☐ Sudden ☐ Slow ☐ Acceleration ☐ Deceleration ☐ Stopping ☐ Right ☐ Left ☐ Curve ☐ Gear position ( ) → ( ) when up/down-shifting ☐ Shift position:
Simulation	Condition	☐ Problem cannot be simulated ☐ Problem can be simulated (How?)
	DTC	☐ No code exists when vehicle was brought in ☐ Code _____ exists when vehicle was brought in ☐ No code exists after the deletion ☐ Code _____ exists after the deletion

Check whether the fail safe function of the output DTC coincides with the problem symptom described by the customer.
DTC:
Fail Safe Function:
Symptom:

DIAGNOSIS SYSTEM

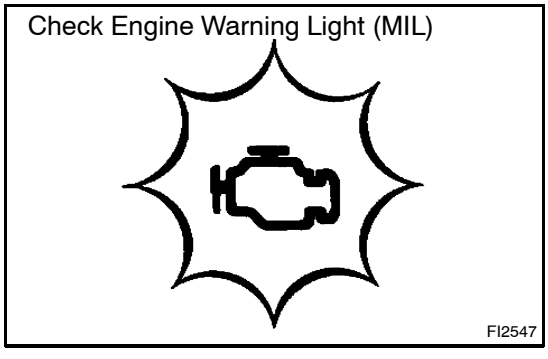


1. DESCRIPTION

(a) The transmission control ECU has a self-diagnosis system. If the computer, the multi-mode manual transmission system or the components operate improperly, the ECU detects a malfunction, and illuminates the multi-mode manual transmission warning light in the combination meter.

HINT:

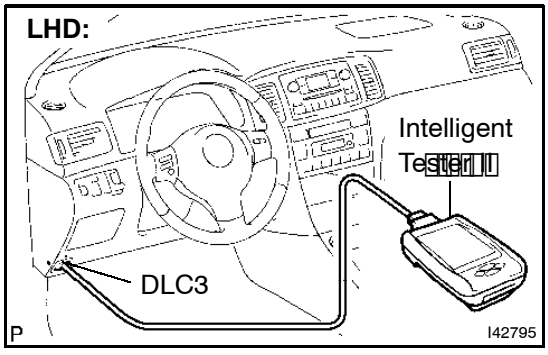
The multi-mode manual transmission warning light illuminates when the multi-mode manual transmission system malfunctions and blinks when in inspection mode.

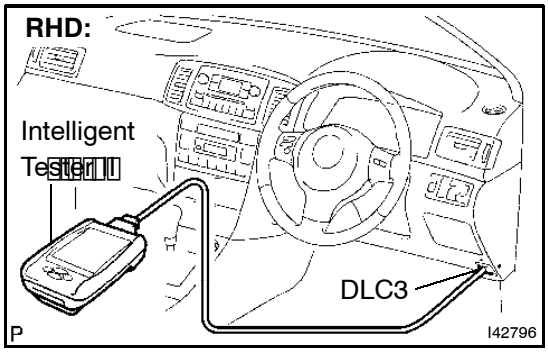


(b) Description for Euro-OBD (European spec.)

- When troubleshooting Euro-OBD vehicles, the only difference from the usual troubleshooting procedure is that the OBD scan tool complying with ISO 15031-4 or the intelligent tester II have to be connected to the vehicle, and various data output from the vehicle's ECUs have to be read out.
- Euro-OBD regulations require that the vehicle's on-board computer illuminates the check engine warning light (MIL) in the combination meter when the ECU detects a malfunction in: 1) the emission control systems/components, or 2) the powertrain control components (which affect vehicle emissions), or 3) the ECU. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031-4 are recorded in the transmission control ECU memory (see page 05-221).

If the malfunction does not recur in 3 consecutive trips, the MIL will go off automatically. However, the DTCs remain recorded in the transmission control ECU memory.





- To check the DTCs, connect the intelligent tester II or OBD scan tool to the Data Link Connector 3 (DLC3) of the vehicle. By using the intelligent tester II or OBD scan tool, the DTCs can be erased and the freeze frame data and various forms of the multi-mode manual transmission system data can be checked (for operating instructions, refer to their respective instruction manuals). The DTCs include ISO controlled codes and manufacturer controlled codes. ISO controlled codes must be set as prescribed by the ISO, while manufacturer controlled codes can be set by a manufacturer within the prescribed limits (see the DTC chart on page 05-2221).

2. NORMAL MODE AND CHECK MODE

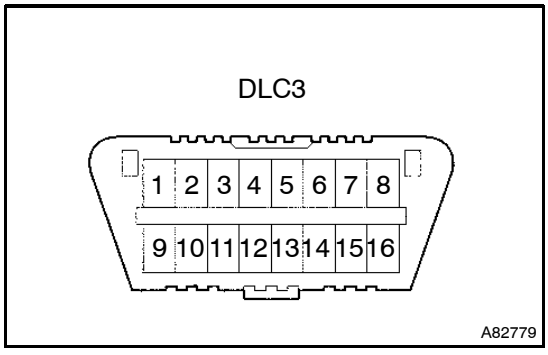
(a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1-trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions (Intelligent Tester II only).

3. 2-TRIP DETECTION LOGIC

(a) When a malfunction is first detected, the malfunction is temporarily stored in the memory (1st trip). If the engine switch is turned off and then on again, and the same malfunction is detected again, the MIL will illuminate.

4. FREEZE FRAME DATA

(a) Freeze frame data record the fuel system conditions and the engine conditions (calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air/fuel ratio was lean or rich, and other data from the time the malfunction occurred.



5. DLC3 (Data Link Connector 3)

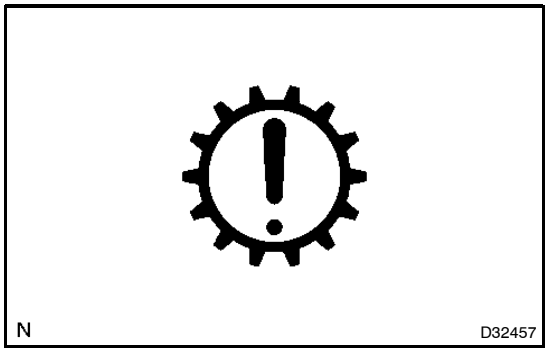
(a) The transmission control ECU uses the ISO 9141-2 (Euro-OBD) communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031-03 and matches the ISO 9141-2 format.

HINT:

Connect the cable of the Intelligent Tester II to the DLC3, turn the ignition switch ON and attempt to use the Intelligent Tester II. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists either on the vehicle side or the tester 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. Consult the Service Department listed in the tool's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	1 Ω or less	Always
SG	5	Signal ground	Body ground	1 Ω or less	Always
BAT	16	Battery positive	Body ground	9 to 14 V	Always



6. CHECK MULTI-MODE MANUAL TRANSMISSION WARNING LIGHT

(a) Turn the ignition switch on.

(b) Check that the warning light illuminates for 5 seconds.

If the warning light does not illuminate, proceed to troubleshooting the multi-mode manual transmission warning light circuit (see page 05-349).

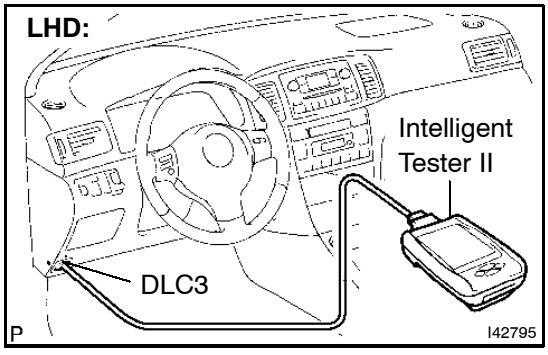
7. INSPECT BATTERY

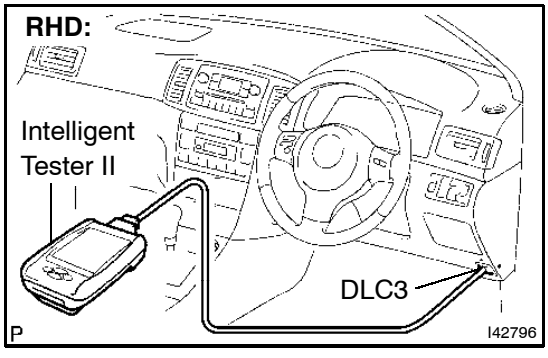
(a) Measure the voltage of the battery.

Voltage: 11 to 14 V

(b) Inspect the battery, fuses, fusible links, wiring harness, connectors and ground.

DTC CHECK/CLEAR





1. CHECK DTC (Using intelligent tester II)

(a) DTCs which are stored in the transmission control ECU can be displayed with the Intelligent Tester II and generic OBD scan tool.

HINT:

These scan tools can display pending DTCs and current DTCs. Some DTCs are not stored if the transmission control ECU does not detect a malfunction during constant driving. However, the detected malfunction during a driving cycle is stored as a pending DTC.

(b) Connect the Intelligent Tester II to the Data Link Connector 3 (DLC3).

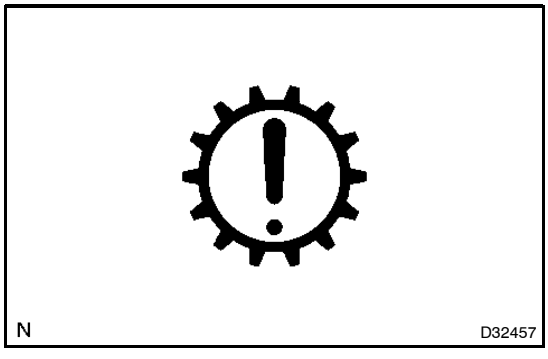
(c) Turn the ignition switch on.

(d) Confirm the DTCs and freeze frame data and then write them down.

(e) See page 05-221 to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the scan tool to check the DTCs, use normal mode. For codes on DIAGNOSTIC TROUBLE CODE CHART subjected to "2-trip detection logic", perform the following actions.



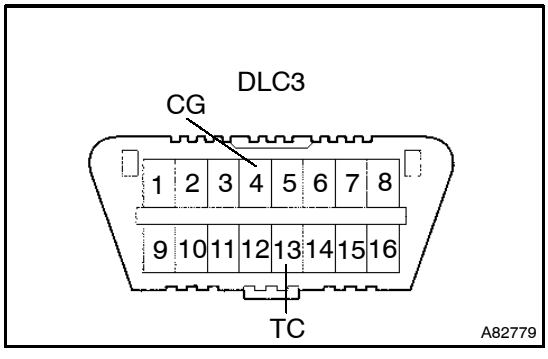
(f) Turn the ignition switch off after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the multi-mode manual transmission warning light illuminates and the DTCs are recorded in the transmission control ECU.

2. CHECK DTC (Not using intelligent tester II)

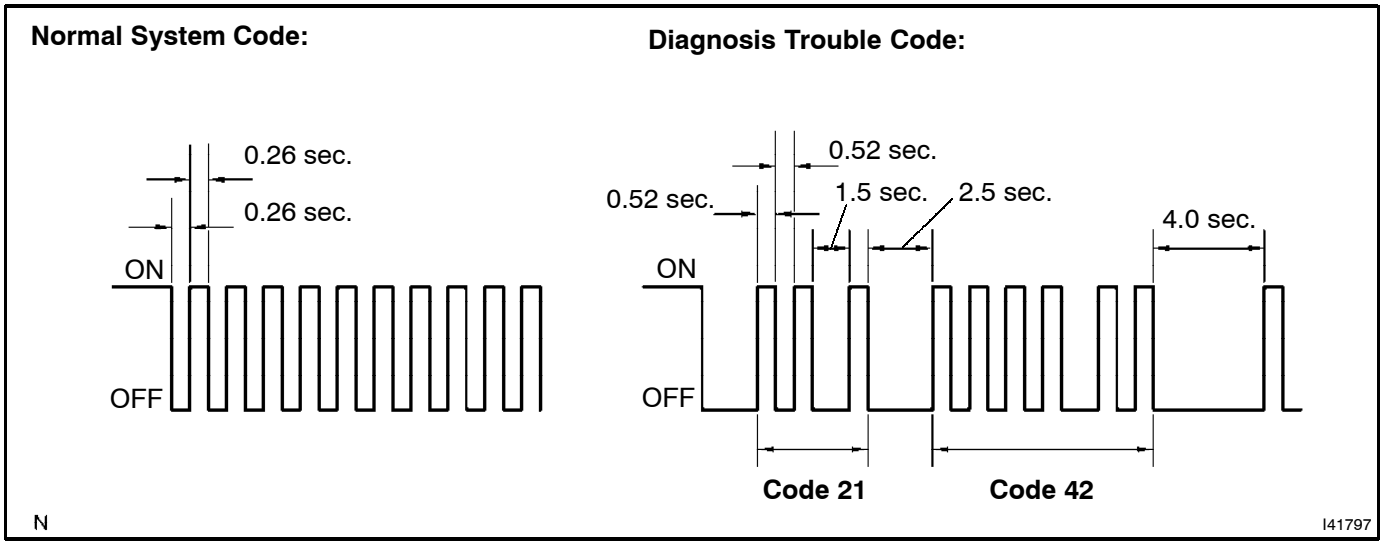
(a) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

(b) Turn the ignition switch on.



(c) Read and record DTCs from the multi-mode manual transmission warning light on the combination meter. As examples, refer to the chart below for the normal system code and trouble codes 21 and 42 blinking patterns.



HINT:
If the multi-mode manual transmission warning light does not blink in DTC blinking patterns, or in the normal system code blinking pattern, inspect the following circuits.

Relevant Circuit	See page
TC circuit	05-354
Multi-mode manual transmission warning light circuit	05-349

3. CLEAR DTC WITH INTELLIGENT TESTER II

(a) Connect the Intelligent Tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Clear the DTCs following the prompts on the tester screen.

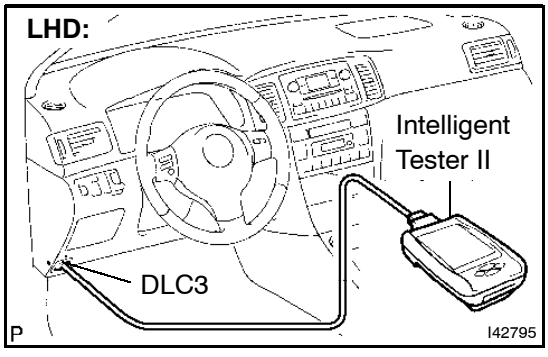
HINT:
Refer to the intelligent tester II operator's manual for further details.

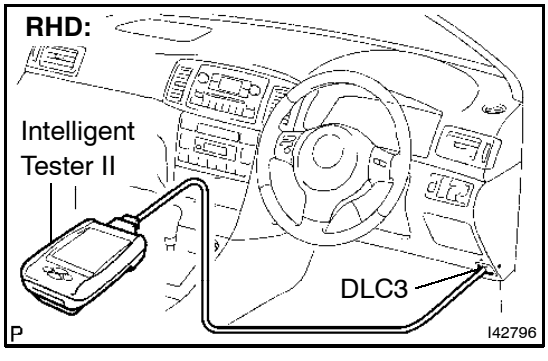
05MQ4-01

CHECK MODE PROCEDURE

1. DESCRIPTION

(a) Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are detected with 1-trip detection logic.





2. CHECK MODE PROCEDURE

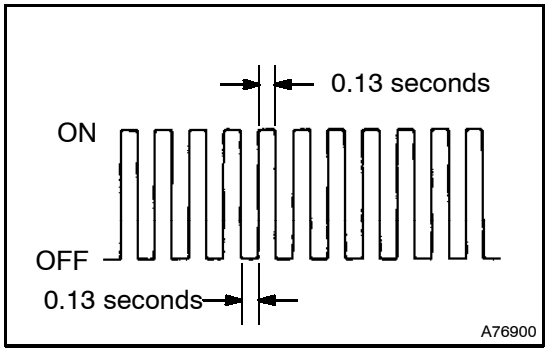
(a) Make sure that the following conditions are met:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the N position
  (4) A/C switched off

(b) Turn the ignition switch OFF.

(c) Connect the Intelligent Tester II to the DLC3.

(d) Turn the ignition switch on.

(e) Enter the following menu: Utility/Check Mode.



(f) Change the transmission control ECU to check mode. Make sure the multi-mode manual transmission warning light flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if: 1) the intelligent tester II is used to change the transmission control ECU from normal mode to check mode or vice versa; or 2) during check mode, the ignition switch is switched from ON to ACC or OFF.

Before entering check mode, make notes of the DTCs and freeze frame data.

(g) Start the engine. The multi-mode manual transmission warning light should turn off after the engine starts.

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

(i) After simulating the malfunction conditions, use the Intelligent Tester II diagnosis selector to check the DTCs and freeze frame data.

(j) After checking the DTCs, inspect the applicable circuit.

FAIL-SAFE CHART

1. FAIL-SAFE CHART

(a) If any of the following codes is recorded, the transmission control ECU enters the fail-safe mode.

DTC No.	Item	Fail-safe Function	Fail-safe Deactivation Condition
• P0806/29 • P0807/25 and P0807/27 • P0808/26 and P0808/28 • P0810/35 • P0900/21	• Clutch stroke sensor circuit • Clutch actuator assy circuit	• Gear does not change • Engine cannot be started • Vehicle does not start moving after the vehicle stops	(d) All of the following conditions are met: • "Pass" condition is detected • Shift lever "N" position • Transmission gear in neutral • Vehicle speed < 9 km/h (5.59 mph) (e) "Pass" condition is detected and the ignition switch is OFF
• P0905/59 • P0906/55 and P0906/57 • P0907/56 and P0907/58 • P0909/37 • P0910/51 • P0915/49 • P0916/45 and P0916/47 • P0917/46 and P0917/48 • P0919/36 • P0920/41	• Shift stroke sensor circuit • Shift actuator assy circuit • Select stroke sensor circuit • Select actuator assy circuit	• Gear does not change • Vehicle does not start moving after the vehicle stops • Engine cannot be started	(a) All of the following conditions are met: • "Pass" condition is detected • Shift lever "N" position • Vehicle speed < 9 km/h (5.59 mph) (b) "Pass" condition is detected and the ignition switch is OFF
• P0725/13	Engine speed input circuit	• Convert the engine revolution signal into the CAN communication signal • No effect	(a) All of the following conditions are met: • "Pass" condition is detected • Clutch position adjustment is performed (b) "Pass" condition is detected and the ignition switch is OFF
• P0500/42 • P0715/19	• Transmission revolution sensor circuit • Vehicle speed sensor circuit	• Does not shift down while driving • Possible to drive only in 1st or reverse gear after the vehicle stops	(a) All of the following conditions are met: • "Pass" condition is detected • Vehicle is stopped • Accelerator pedal released • Brake pedal depressed (b) "Pass" condition is detected and the ignition switch is OFF
• P0603/98 • P0885/17	• Transmission control ECU • Clutch actuator, shift actuator, select actuator power source circuit	• Gear does not change • Engine cannot be started • When vehicle stops, transmission control ECU stops the engine	"Pass" condition is detected and the ignition switch is OFF
• P0820/71 • P0820/72 • P0820/73 • P0820/77 • P0821/79	• Shift lever position sensor circuit • Transmission shift main switch circuit	• M-mode cannot be used • Does not shift to 1st or reverse (and forward gears or backward)	"Pass" condition is detected and the ignition switch is OFF

• P0807/25 • P0807/27 • P0808/26 • P0808/28 • P0906/55 • P0906/57 • P0907/56 • P0907/58 • P0916/45 • P0916/47 • P0917/46 • P0917/48	• Clutch stroke sensor circuit • Select stroke sensor circuit • Shift stroke sensor circuit	• Limit to 3rd or lower gears	(a) All of the following conditions are met: • "Pass" condition is detected • Vehicle is stopped • Shift lever "N" position • Transmission gear in neutral (b) "Pass" condition is detected and the ignition switch is OFF
• P0335 • P0339	Crankshaft position sensor circuit	• Gear does not change	"Pass" condition is detected and the engine switch is OFF
• U0001/A2	CAN communication signal circuit	• Gear does not change • Possible to drive only in 1st or reverse gear after the vehicle stops	(a) All of the following conditions are met: • "Pass" condition is detected • Vehicle is stopped • Accelerator pedal released • Brake pedal depressed (b) "Pass" condition is detected and the ignition switch is OFF
• P0562/96	Transmission control ECU power source circuit	• Buzzer sounds in the transmission control ECU when ignition switch is turned OFF	"Pass" condition is detected
• P0703/95	Stop lamp switch circuit	• Nothing	-
• P1875/22	Transmission control ECU (Buzzer circuit)	• Nothing	-
• P0812/67 • P0812/68	• Back up lamp switch circuit	• Nothing	-

DATA LIST/ACTIVE TEST

1. DATA LIST

When using the intelligent tester II:

HINT:

By accessing the DATA LIST displayed by the intelligent tester II, the value and status of the switch, sensor, actuator and so on can be checked without removing any parts.

Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten labor time.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the intelligent tester II to the DLC3. Do not depress the brake pedal after this operation.

(d) Turn the ignition switch on.

(e) Following the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
MIL status	MIL status/ ON or OFF	MIL comes on: ON	-
Engine Coolant Temperature	Coolant temperature/ Min.: -40°C, Max.: 140°C or more	After warning up: 75 to 95°C (167 to 203°F)	If the value is "-40°C (-40°F) " or "140°C (284°F) or more", sensor circuit is open or shorted.
Engine Revolution	Engine revolution/ Min.: 0 rpm, Max.: 16,383.75 rpm	Idling: 650 to 750 rpm	Even if the NE signal circuit has a short or open circuit, back-up engine speed from CAN communication can be shown.
Vehicle Speed	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph) HINT: Actual vehicle speed is displayed	When vehicle speed signal has any malfunction, value calculated by input revolution signal will be shown.
Drive Mile after Malfunction	Accumulated driving mileage after the malfunction/ Min.: 0 km, Max.: 65,535 km	Normal: 0 km (0 mile)	The driving distance from the occurrence of the diagnosis malfunction is displayed.
Vehicle Speed Signal	Vehicle speed signal/ Min.: 0 km/h, Max.: 327.675 km/h	Vehicle stopped: 0 km/h (0 mph)	When vehicle speed signal has any malfunction, value calculated by input revolution signal will be shown.
Input Revolution	Transmission input revolution/ Min.: 0 rpm, Max.: 12,800 rpm	Vehicle stopped: 0 rpm	When input revolution signal has any malfunction, value calculated by vehicle speed signal will be shown.
Current Gear Position	Current gear position/ N, 1st, 2nd, 3rd, 4th, 5th, R	Actual gear position	-
Backup Engine Speed	Back-up engine speed/ Min.: 0 rpm, Max.: 8,160 rpm	Vehicle stopped: 0 rpm	0 rpm is displayed when there is a malfunction in CAN communication.
Accelerator Pedal Angle	Accelerator pedal angle/ Min.: 0%, Max.:100%	Accelerator pedal released: 0 %	0% is displayed when there is a malfunction in CAN communication.
Theoretical Engine Torque	Theoretical engine torque/ MIn.: 0 N·m, Max.: 255 N·m	Idling: 0 N·m	-
Clutch Position (Current)	Clutch position (current)/ Min.: 0 mm, Max.: 127.998 mm	Normal value: 34.0 mm (1.34 in.) to 44.0 mm (1.73 in.)	Learning value of clutch clamp position is displayed

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
Shift Position (Current)	Shift position (current)/ Min.: 0 mm, Max.: 34 mm	Normal value: 5.0 mm (0.20 in.) to 34.0 mm (1.34 in.)	Learning value of gear point is displayed when not operating shift lever
Select Position (Current)	Select position (current)/ Min.: 0 mm, Max.: 31.999 mm	Normal value: 14.0 mm (0.55 in.) to 36.0 mm (1.42 in.)	Learning value of gear point is displayed when not operating shift lever
Clutch Motor Current MMT	Clutch motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	Clutch clamp position: 0 A
Shift Motor Current MMT	Shift motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 32 A	When not operating shift lever: 0 A
Select Motor Current MMT	Select motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	When not operating shift lever: 0 A
Gear Position (Current)	Gear position current/ Min.: 0, Max.: 7	When not operating shift lever: Gear Position (Current) = Gear Position (Target)	-
Gear Position (Target)	Gear position current/ Min.: 0, Max.: 7	When not operating shift lever: Gear Position (Current) = Gear Position (Target)	-
Shift Lever Position Judge	Shift lever position/ INVALID POSITION, P, R, N, E, M	Actual shift lever position is displayed	-
Clutch Touch Position	Clutch touch position/ Min.: 0 mm, Max.: 127.998 mm	Learning value is shown	The differences between "Clutch Clamp Position" and "Clutch Touch Position" (within (4.0 mm (0.16 in.) to 15.0 mm (0.59 in.)) are acceptable.
Clutch Clamp Position	Clutch clamp position/ Min.: 0 mm, Max.: 127.998 mm	Learning value is shown	The differences between "Clutch Touch Position" and "Clutch Clamp Position" (within 36.0 mm (1.42 in.) to 44.0 mm (1.73 in.)) are acceptable.
Neutral Position (Shift)	Neutral position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	The middle value between "3rd Gear Position (Select)" and "4th Gear Position (Shift)" is displayed.
Neutral Position (Select)	Neutral position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The same value as those of "3rd Gear Position (Select)" and "4th Gear Position (Select)" is displayed.
1st Gear Position (Shift)	1st gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	• The differences between "2nd Gear Position (Shift)" and "1st Gear Position (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable. • The differences between "3rd Gear Position (Select)" and "1st Gear Position (Shift)" (within 2.5 mm (0.10 in.)) are acceptable.
1st Gear Position (Select)	1st gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "3rd Gear Position (Select)" and "1st Gear Position (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
2nd Gear Position (Shift)	2nd gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	The differences between "1st Gear Position (Shift)" and "2nd Gear Position (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable.

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
2nd Gear Position (Select)	2nd gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "4th Gear Position (Select)" and "2nd Gear Position (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
3rd Gear Position (Shift)	3rd gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	The differences between "4th Gear position (Shift)" and "3rd Gear Position (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable. • The differences between "5th Gear Position (Shift)" and "3rd Gear Position (Shift)" (within 2.5 mm (0.10 in.)) are acceptable.
3rd Gear Position (Select)	3rd gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "5th Gear Position (Select)" and "3rd Gear Position (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
4th Gear Position (Shift)	4th gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	• The differences between "3rd Gear Position (Shift)" and "4th Gear Position (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable. • The differences between "Reverse Gear Position (Shift)" and "4th Gear Position (Shift)" (within 2.5 mm (0.10 in.)) are acceptable.
4th Gear Position (Select)	4th gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "Reverse Gear Position (Select)" and "4th Gear Position (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
5th Gear Position (Shift)	5th gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	• The differences between "Reverse Gear Position (Shift)" and "5th Gear Position (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable. • The differences between "3rd Gear Position (Shift)" and "5th Gear Position (Shift)" (within 2.5 mm (0.10 in.)) are acceptable.
5th Gear Position (Select)	5th gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "3rd Gear Position (Select)" and "5th Gear Position (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
Reverse Gear Pos (Shift)	R gear position (shift position)/ Min.: 0 mm, Max.: 34 mm	Learning value is shown	• The differences between "5th Gear Position (Shift)" and "Reverse Gear Pos (Shift)" (within 17.0 mm (0.67 in.) to 21.5 mm (0.85 in.)) are acceptable. • The differences between "4th Gear Position (Shift)" and "Reverse Gear Pos (Shift)" (within 2.5 mm (0.10 in.)) are acceptable.

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
Reverse Gear Pos (Select)	R gear position (select position)/ Min.: 0 mm, Max.: 31.999 mm	Learning value is shown	The differences between "4th Gear Position (Select)" and "Reverse Gear Pos (Select)" (within 5.5 mm (0.22 in.) to 8.5 mm (0.34 in.)) are acceptable.
Cold Condition Judgment	Cold condition/ Min.: -128°C, Max.: 127°C	10 seconds after engine start, the lower intake air temperature or water temperature is shown	-
Shift Lever Check Signal 3	Shift lever check signal 3/ GND (OFF), OPEN (ON)	R: GND, N: OPEN, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Check Signal 2	Shift lever check signal 2/ GND (OFF), OPEN (ON)	R: GND, N: GND, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Check Signal 1	Shift lever check signal 1/ GND (OFF), OPEN (ON)	R: OPEN, N: GND, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 5	Shift lever switch signal 5/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: OPEN, M: OPEN, +: OPEN, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 4	Shift lever switch signal 4/ GND (ON), OPEN (OFF)	R: OPEN, N: GND, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 3	Shift lever switch signal 3/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 2	Shift lever switch signal 2/ GND (ON), OPEN (OFF)	R: GND, N: OPEN, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 1	Shift lever switch signal 1/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: OPEN, M: OPEN, +: GND, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
T/M Reverse Switch Signal	T/M reverse signal/ OPEN (ON), IG (OFF)	Shift "R" position: ON	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Ignition Signal	Ignition signal/ OPEN (OFF), IG (ON)	Ignition switch ON: ON	Always ON or OFF
Brake Switch Signal 1	Brake switch signal 1/ OPEN (OFF), IG (ON)	Brake pedal depressed: ON Brake pedal released: OFF	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the switch position is.
Brake Switch Signal 2	Brake switch signal 2/ OPEN (ON), IG (OFF)	Brake pedal depressed: OFF Brake pedal released: ON	Always ON or OFF

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
STA Switch Signal	STA signal/ OFF, ON	When starting engine: ON	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the switch position is.
STP Switch Signal	STP switch signal/ OFF, ON	Brake operation: ON	Always ON or OFF
Xtest Switch Signal	Diagnosis normal mode: NORMAL, CHECK	Diagnosis normal mode: NORMAL	-
Mode Changes	Mode changes/ Min.: 0, Max.: 255	-	-
Diagnosis Mode	Diagnosis check mode: Min.: 0, Max.: 2	Diagnosis check mode: 2	-
Possibility of T/M Uplock	Possibility of T/M lock-up generation/ NO, YES	NO is displayed when calibration procedure is complete	If only YES is displayed even after retrying several times, the assembly must be faulty.
Learn - Clutch Standby Point	Clutch standby position calibration/ NOTEXEC, FAIL, EXEC	EXEC is displayed when calibration procedure is complete	If only FAIL is displayed even after retrying several times, the assembly must be faulty.
Learning - T/M	Learning of T/M system NOTEXET, FAIL, EXEC	EXEC is displayed when calibration procedure is complete	If only FAIL is displayed even after retrying several times, the assembly must be faulty.
Learn - Clutch Stopper Point	Clutch stopper position calibration/ NOTEXET, FAIL, EXEC	EXEC is displayed when calibration procedure is complete	If only FAIL is displayed even after retrying several times, the assembly must be faulty.

2. ACTIVE TEST

HINT:

Perform the ACTIVE TEST using the intelligent tester II to operate the relays, VSV, actuator and so on without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten labor time. It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the ignition switch on.
(e) Following the display on the tester, perform the ”ACTIVE TEST”.

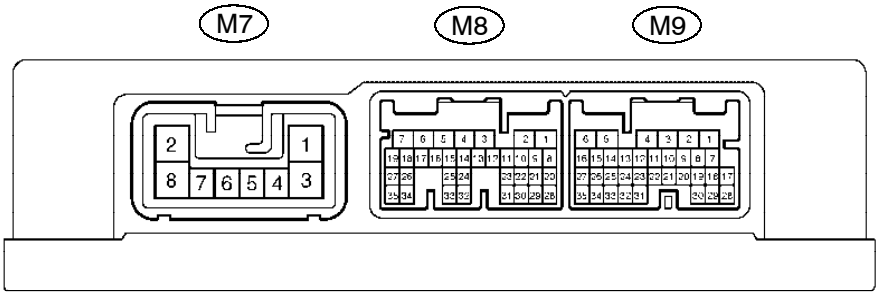
Item	Test Details/Vehicle Condition	Diagnostic Note
Target Gear Position Control	[Test Details] Target gear position control (Gear position) N, 1st, 2nd, 3rd, 4th, 5th, R [Vehicle Condition] Ignition switch ON, Engine stopped, Vehicle stopped, Shift lever ”N” position	When the shift and select actuator assy does not move to the gear indicated, there could be some malfunctions in the following parts. • Shift stroke sensor • Select stroke sensor • Shift and select actuator assy (Shift motor, Select motor) • AMT Relay (Shift motor and select motor main relay) • Transmission • Transmission control ECU • Poor attachment of shift and select actuator assy
Target Clutch Control	[Test Details] Target clutch control Standby position: Standby (*1) Clutch position: Clamp (*1) [Vehicle Condition] Ignition switch ON, Engine stopped, Vehicle stopped, Shift lever ”N” position	When the clutch actuator assy does not move to the position indicated, there could be some malfunctions in the following parts. • Clutch stroke sensor • Clutch actuator assy (Clutch motor) • AMT Relay (Clutch motor main relay) • Clutch release bearing • Clutch release fork • Transmission control ECU • Poor attachment of clutch actuator assy

*1: For details of the standby position and clutch clamp position, see page 05-180.

05L46-02

TERMINALS OF ECU

1. Transmission Control ECU:



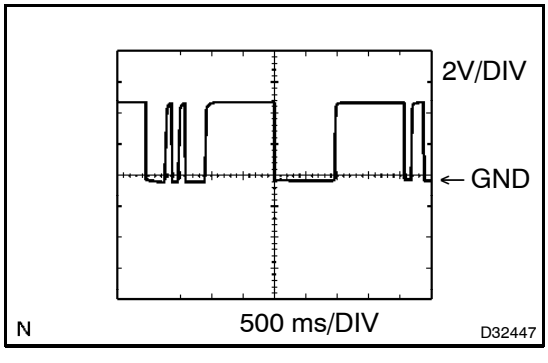
N

D32439

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+B - GND (M8-1 - M8-6)	SB (R-G) - W-B	Battery (ECU power source)	Always	10 to 14 V
IG - GND (M8-3 - M8-6)	SB (B-O) - W-B	Ignition switch	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
PKB - GND (M8-4 - M8-6)	R-Y - W-B	Parking brake switch	Ignition switch ON, Parking brake switch OFF (Parking brake lever pulled) → Parking brake switch ON (Parking brake lever released)	10 to 14 V → Below 1 V
SLS - GND (M8-5 - M8-6)	LG - W-B	Shift lock solenoid	Ignition switch ON, Brake pedal depressed → Released	10 to 14 V → Below 1 V
GND - Body ground (M8-6 - Body ground)	W-B - Body ground	Ground	Always	Below 1 Ω
MDSW - GND (M8-10 - M8-6)	L-W - W-B	Transmission shift main switch	Ignition switch ON, Shift lever position E → M	10 to 14 V → Below 1 V
LSNC - GND (M8-11 - M8-6)	B-O - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position N → Non-N	10 to 14 V → Below 1 V
LSSC - GND (M8-12 - M8-6)	W-R - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position E, M, +, - → R, N	10 to 14 V → Below 1 V
LSRC - GND (M8-13 - M8-6)	GR-R - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position R → Non-R	10 to 14 V → Below 1 V
LSW- - GND (M8-15 - M8-6)	R-L - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position non-"-" → -	10 to 14 V → Below 1 V
LSWN - GND (M8-16 - M8-6)	G-Y - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position non-N → N	10 to 14 V → Below 1 V
LSWS - GND (M8-17 - M8-6)	B-L - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position R, N → Non-R, N	10 to 14 V → Below 1 V
LSWR - GND (M8-18 - M8-6)	W-L - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position non-R → R	10 to 14 V → Below 1 V
LSW+ - GND (M8-19 - M8-6)	GR - W-B	Shift lever position sensor	Ignition switch ON, Shift lever position non-"+" → +	10 to 14 V → Below 1 V

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
PWR - GND (M8-23 - M8-6)	LG - W-B	Pattern select switch	Ignition switch ON, Pattern select switch OFF → ON	10 to 14 V → Below 1.8 V
DG - GND (M8-25 - M8-6)	W (P-B) - W-B	Terminal TC of DLC3	Ignition switch ON → Connect terminals TC and CG of DLC3	10 to 14 V → Below 1 V
KD - GND (M8-27 - M8-6)	W - W-B	Kick down switch	Ignition switch ON, Kick down switch OFF → ON	10 to 14 V → Below 1.8 V
INDC - GND (M8-29 - M8-6)	SB (L-Y) - W-B	Multi-mode manual transmission warning light	Always	Below 1.44 V
INDA - GND (M8-31 - M8-6)	SB (LG) - W-B	Shift position indicator light	Ignition switch ON	Pulse generation (see waveform 1)
STP - GND (M8-34 - M8-6)	SB (G-R) - W-B	Stop lamp switch	Brake pedal depressed → Released	10 to 14 V → Below 1 V
ST1- - GND (M8-35 - M8-6)	G-R - W-B	Stop lamp switch	Ignition switch ON, Brake pedal released → depressed	10 to 14 V → Below 1 V
CAN+ - CAN- (M9-1 - M9-2)	B - W	CAN communication	Ignition switch ON	Pulse generation (see waveform 2)
TMN - GND (M9-3 - M8-6)	B-W - W-B	Neutral position switch	Ignition switch ON, Shift lever position non-N → N	Below 1 V → 10 to 14 V
STRL - GND (M9-4 - M8-6)	B-W - W-B	Starter relay operate signal (output)	Ignition switch OFF, Shift lever position N, starter operates	Below 1 V → 10 to 14 V
MREL - GND (M9-5 - M8-6)	L-R - W-B	AMT relay (motor power source)	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
STA - GND (M9-6 - M8-6)	B-W - W-B	Starter relay operate signal (input)	Ignition switch OFF → Shift lever position N, starter operates, brake pedal depressed	Below 1 V → 10 to 14 V
RSW - GND (M9-9 - M8-6)	R-B - W-B	Back up lamp switch	Ignition switch ON, Shift lever position non-R → R	Below 1 V → 10 to 14 V
NE - GND (M9-10 - M8-6)	B - W-B	Crankshaft position sensor	Engine idling	Pulse generation (see waveform 3)
NIP- - NIP+ (M9-15 - M9-16)	V - P	Transmission revolution sensor	Ignition switch ON Engine idling, Clutch engaged (during driving)	Pulse generation (see waveform 4)
E2S1 - GND (M9-17 - M8-6)	G - W-B	Shift stroke sensor ground (Main)	Always	Below 1 Ω
VSS1 - GND (M9-18 - M8-6)	B - W-B	Shift stroke sensor voltage monitor (Main)	Ignition switch ON	0.5 to 4.5 V
VCS1 - GND (M9-19 - M8-6)	W - W-B	Shift stroke sensor battery (Main)	Ignition switch ON	Approx. 5 V
VCL1 - GND (M9-20 - M8-6)	W-L - W-B	Select stroke sensor battery (Main)	Ignition switch ON	Approx. 5 V
VSL1 - GND (M9-21 - M8-6)	B-L - W-B	Select stroke sensor voltage monitor (Main)	Ignition switch ON	0.5 to 4.5 V
E2L1 - GND (M9-22 - M8-6)	G-R - W-B	Select stroke sensor ground (Main)	Always	Below 1 Ω
SPD - GND (M9-23 - M8-6)	W (V-W) - W-B	Vehicle speed signal	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (see page 05-225)
E2L2 - GND (M9-24 - M8-6)	GR-R - W-B	Select stroke sensor ground (Sub)	Always	Below 1 Ω

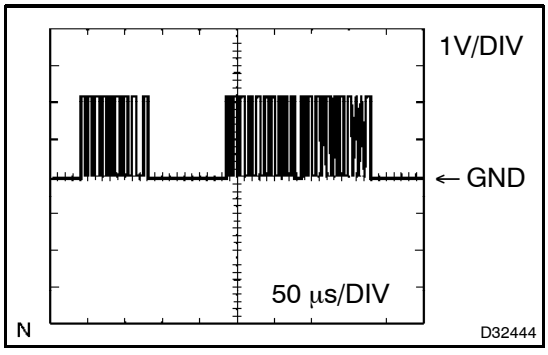
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
E2R1 - GND (M9-25 - M8-6)	G-Y - W-B	Clutch stroke sensor ground (Main)	Always	Below 1 Ω
VSR1 - GND (M9-26 - M8-6)	B-Y - W-B	Clutch stroke sensor voltage monitor (Main)	Ignition switch ON	0.5 to 4.5 V
VCR1 - GND (M9-27 - M8-6)	W-R - W-B	Clutch stroke sensor battery (Main)	Ignition switch ON	Approx. 5 V
E2S2 - GND (M9-28 - M8-6)	GR - W-B	Shift stroke sensor ground (Sub)	Always	Below 1 Ω
VSS2 - GND (M9-29 - M8-6)	BR - W-B	Shift stroke sensor voltage monitor (Sub)	Ignition switch ON	0.5 to 4.5 V
VCS2 - GND (M9-30 - M8-6)	R - W-B	Shift stroke sensor battery (Sub)	Ignition switch ON	Above 5 V
VCL2 - GND (M9-31 - M8-6)	R-L - W-B	Select stroke sensor battery (Sub)	Ignition switch ON	Above 5 V
VSL2 - GND (M9-32 - M8-6)	BR-W - W-B	Select stroke sensor voltage monitor (Sub)	Ignition switch ON	0.5 to 4.5 V
E2R2 - GND (M9-33 - M8-6)	GR-G - W-B	Clutch stroke sensor ground (Sub)	Always	Below 1 Ω
VSR2 - GND (M9-34 - M8-6)	BR-Y - W-B	Clutch stroke sensor voltage monitor (Sub)	Ignition switch ON	0.5 to 4.5 V
VCR2 - GND (M9-35 - M8-6)	R-Y - W-B	Clutch stroke sensor battery (Sub)	Ignition switch ON	Approx. 5 V
MSF+ - GND (M7-1 - M8-6)	B - W-B	Shift actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
+BM - GND (M7-2 - M8-6)	B-R - W-B	AMT relay (motor power source)	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
MSF- - GND (M7-3 - M8-6)	W - W-B	Shift actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
MSL- - GND (M7-4 - M8-6)	L - W-B	Select actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
MSL+ - GND (M7-5 - M8-6)	B - W-B	Select actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
MCL- - GND (M7-6 - M8-6)	W-L - W-B	Clutch actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
MCL+ - GND (M7-7 - M8-6)	B-Y - W-B	Clutch actuator	Ignition switch OFF → ON	Below 1 V → 5 to 10 V
PGND - Body ground (M7-8 - Body ground)	W-B - Body ground	Ground	Always	Below 1 Ω



Waveform 1:

Shift Position Indicator Terminal

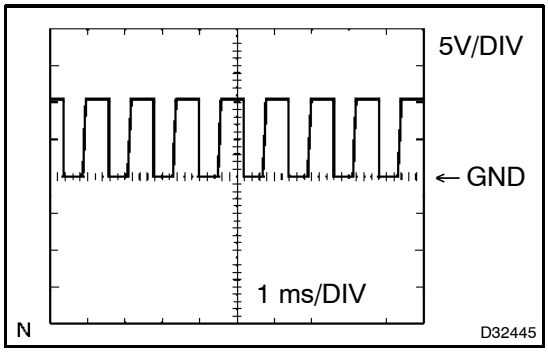
- Terminal: INDA - GND
- Gauge set: 2V/DIV, 500 ms/DIV
- Condition: Ignition switch ON



Waveform 2:

CAN Communication Terminal

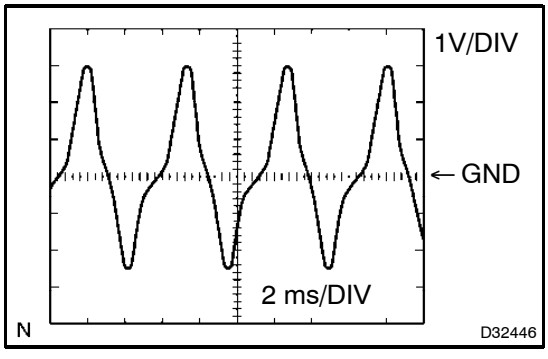
- Terminal: CAN+ - CAN-
- Gauge set: 1 V/DIV, 50 μs/DIV
- Condition: Ignition switch ON



Waveform 3:

Crankshaft Position Sensor Terminal

- Terminal: NE - GND
- Gauge set: 5 V/DIV, 1 ms/DIV
- Condition: Engine idling

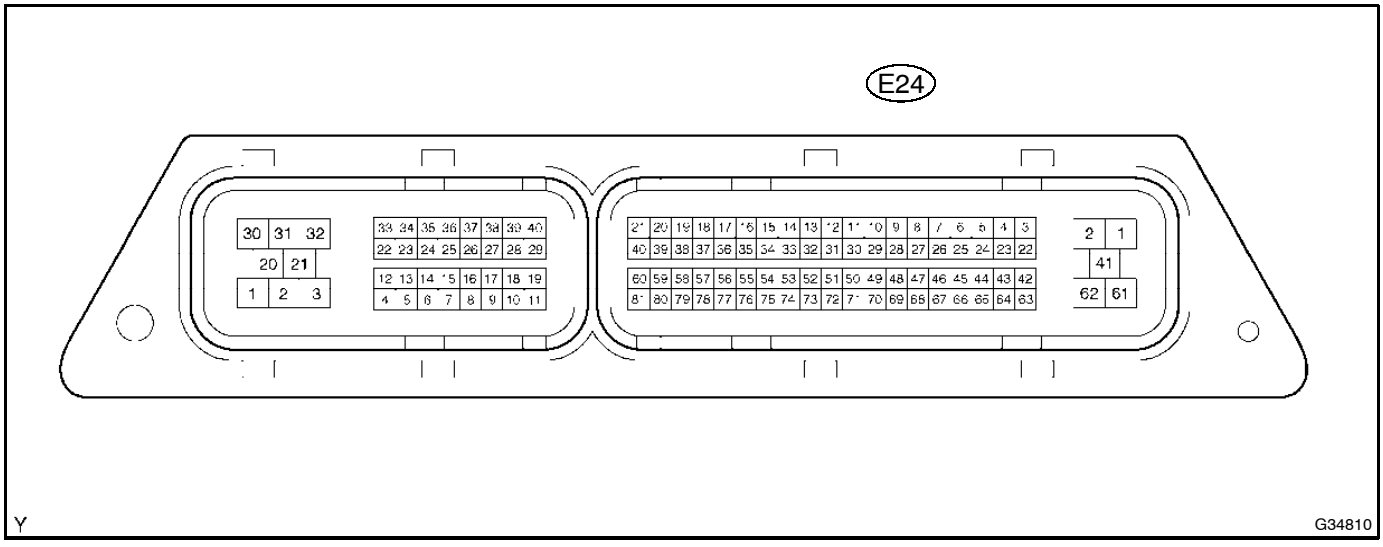


Waveform 4:

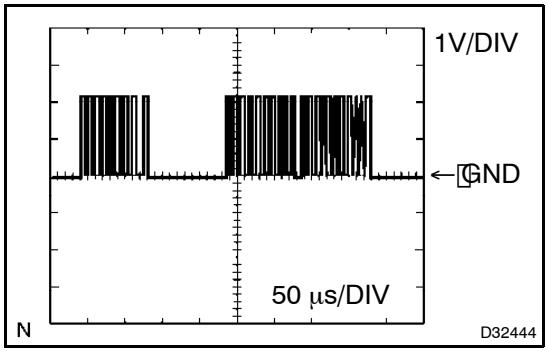
Transmission Revolution Sensor

- Terminal: NIP- -NIP+
- Gauge set: 1 V/DIV, 2 ms/DIV
- Condition: Vehicle speed at about 30 km/h (19 mph)

2. ECM:



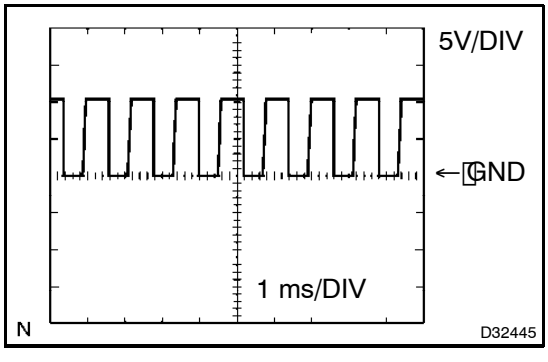
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CAN-H - CAN-L (E24-24 - E24-44)	B - W	CAN communication	Ignition switch ON	Pulse generation (see waveform 1)
NEO - E1 (E24-22 - E24-62)	B - W-B	Crankshaft position sensor	Engine idling	Pulse generation (see waveform 2)
E1 - Body ground (E24-62 - Body ground)	W-B - Body ground	Ground	Always	Below 1 Ω



Waveform 1:

CAN Communication Terminal

- Terminal: CAN-H - CAN-L
- Gauge set: 1 V/DIV, 50 µs/DIV
- Condition: Ignition switch ON



Waveform 2:

Crankshaft Position Sensor Terminal

- Terminal: NEO - E1
- Gauge set: 5 V/DIV, 1 ms/DIV
- Condition: Engine idling

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PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuit for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.
Inspect the "Fuse" and "Relay" before confirming the suspected areas as shown in the chart below.
Inspect each suspected area for the corresponding symptom in numerical order.

NOTICE:

When removing the following parts, perform the operations correctly by following the precautions on the relevant pages.

Symptom	Suspected Area	See page
No up-shift No down-shift	1. Transmission	★1
	2. Clutch disc (Clutch disc cover)	42-29
	3. Clutch stroke sensor	42-23
	4. Clutch actuator assy	42-20
	5. Shift stroke sensor	41-25
	6. Select stroke sensor	41-27
	7. Shift and select actuator	★1
	8. Shift lever position sensor	41-11
	9. Shift lever assy	41-11
	10.Speed sensor	★2
	11.Transmission control ECU	41-33
Multi-mode manual transmission warning light is defective.	1. Multi-mode manual transmission warning light circuit	05-349
	2. IG signal circuit	05-342
	3. ECU power source circuit	05-231
	4. Transmission control ECU	41-33
Shift position indicator light is defective.	1. Multi-mode manual transmission warning light circuit	05-349
	2. IG signal circuit	05-342
	3. Transmission control ECU	41-33
DTC check cannot be performed.	1. Multi-mode manual transmission warning light circuit	05-349
	2. TC terminal circuit	05-354
Transmission control ECU buzzer does not sound when an incorrect operation occurs. (Built in ECU)	1. Transmission control ECU	41-33
Multi-mode manual transmission system buzzer does not sound when an incorrect operation occurs. (Built in combination meter)	1. Multi-mode manual transmission warning light circuit (Buzzer in combination meter)	05-349
	2. IG signal circuit	05-342
	3. Transmission control ECU	41-33
Unable to shift to any gear.	1. Transmission	★1
	2. Shift stroke sensor	41-25
	3. Select stroke sensor	41-27
	4. Shift and select actuator	★1
	5. Shift lever position sensor	41-11
	6. Clutch disc (Clutch disc cover)	42-29
	7. Clutch stroke sensor	42-23
	8. Clutch actuator assy	42-29
	9. Transmission control ECU	41-33
It takes too much time to change gear position.	1. Transmission	★1
	2. Clutch disc (Clutch disc cover)	42-29
	3. Clutch stroke sensor	42-23
	4. Clutch actuator assy	42-20
	5. Shift stroke sensor	41-25
	6. Select stroke sensor	41-27
	7. Shift and select actuator	★1
	8. Shift lever position sensor	41-11
	9. Shift lock solenoid circuit	05-344
	10.Shift lever assy	41-11
	11.Speed sensor	★2
	12.Transmission control ECU	41-33

Poor acceleration	1. Pattern select switch	05-358
Engine stalls when starting off or stopping.	1. Transmission revolution sensor 2. Transmission control ECU	41-29 41-33
Gear is not automatically shifted up or down during E or Es mode driving.	1. CAN communication circuit 2. Transmission control ECU	05-336 41-33
Mode cannot be switched from E (or Es) to M.	1. Transmission shift main switch 2. Shift lever assy 3. Transmission control ECU	41-11 41-11 41-33
Transmission cannot be set to 1st or R position.	1. Shift lever position sensor 2. Transmission control ECU	41-11 41-33
Shift-down timing delays occur during M mode driving.	1. Kick down switch (LHD) 2. Acceleration pedal position sensor 3. Transmission control ECU	05-361 05-3 41-33
Engine cannot be started.	1. ECD system (1ND-TV) 2. Starter circuit 3. Neutral position switch 4. Stop lamp switch 5. Shift position sensor 6. Starter assy 7. Transmission control ECU	05-3 05-364 05-347 05-234 41-11 19-3 41-33
Assist control does not operate when engine is started.	1. Parking brake switch circuit 2. Transmission control ECU	05-368 41-33

★1: Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E.

★2: Refer to COROLLA Repair Manual Pub. No. RM925E.

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DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a trouble code is displayed during the DTC check, check the circuit indicated by the DTC. For details of each code, turn to the page for the respective "DTC No." in the DTC chart.

Inspect the "Fuse" and "Relay" before inspecting the suspected areas as shown in the chart below.

DTC (See Page)	Detection Item	Trouble Area	MIL	Warning Light (*1)	MEMORY
P0500/42 (05-225)	VEHICLE SPEED SENSOR "A"	• Open or short in speed sensor circuit • Speed sensor • Combination meter • Transmission control ECU • Skid control ECU	-	○	○
P0562/96 (05-231)	SYSTEM VOLTAGE	• Open in power source circuit • Transmission control ECU	○	○	○
P0603/98 (05-233)	INTERNAL CONTROL MODULE KEEP ALIVE MEMORY (KAM) ERROR	• Transmission control ECU	-	○	○
P0613/99 (05-233)	TCM PROCESSOR	• Transmission control ECU	-	○	-
P0703/95 (05-234)	BRAKE SWITCH "B" CIRCUIT	• ECU-IG fuse • STOP fuse • Stop lamp switch • Open in STP or ST1- signal circuit • Transmission control ECU	-	○	○
P0715/19 (05-238)	INPUT/TURBINE SPEED SENSOR "A" CIRCUIT	• Open or short in transmission revolution sensor circuit • Transmission revolution sensor • Transmission control ECU	-	○	○
P0725/13 (05-241)	ENGINE SPEED INPUT CIRCUIT	• Crankshaft position sensor • Open or short in NE circuit • Transmission control ECU • ECM	-	○	○
P0806/29 (05-246)	CLUTCH POSITION SENSOR CIRCUIT (RANGE/PERFORMANCE)	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU	-	○	○
P0807/25 (05-246)	CLUTCH POSITION SENSOR CIRCUIT (LOW)	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU	○	○	○
P0807/27 (05-246)	CLUTCH POSITION SENSOR CIRCUIT (LOW)	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU	○	○	○
P0808/26 (05-246)	CLUTCH POSITION SENSOR CIRCUIT (HIGH)	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU	○	○	○
P0808/28 (05-246)	CLUTCH POSITION SENSOR CIRCUIT (HIGH)	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU	○	○	○

P0810/35 (05-252)	CLUTCH POSITION CONTROL ERROR	• Clutch stroke sensor • Clutch actuator assy (Clutch motor) • Open or short in clutch stroke sensor circuit • Open or short in clutch motor circuit • Clutch disc (Clutch disc cover) • Clutch release fork • Clutch release fork lever • Clutch release bearing • Transmission control ECU	-	○	○
P0812/67 (05-264)	REVERSE INPUT CIRCUIT (OPEN)	• Shift stroke sensor • Select stroke sensor • Back up lamp switch • Open in back up lamp switch circuit • Transmission control ECU	-	○	○
P0812/68 (05-264)	REVERSE INPUT CIRCUIT (SHORT)	• Shift stroke sensor • Select stroke sensor • Back up lamp switch • Short in back up lamp switch circuit • Transmission control ECU	-	○	○
P0820/71 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/72 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/73 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/74 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Short in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/75 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Short in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/76 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Short in shift lever position signal circuit • Transmission control ECU	-	○	○
P0820/77 (05-272)	GEAR LEVER X-Y POSITION SENSOR CIRCUIT	• Shift lever position sensor • Short in shift lever position signal circuit • Transmission control ECU	-	○	○
P0821/79 (05-280)	GEAR LEVER X POSITION CIRCUIT	• Transmission shift main switch (Built into shift lever assy) • Short in MDSW signal circuit • Transmission control ECU	-	○	○

P0885/17 (05-282)	TCM POWER RELAY CONTROL CIRCUIT (OPEN)	• AMT fuse • AMT relay • Open in MREL signal circuit • Open in PGND signal circuit • Open in +BM signal circuit • Transmission control ECU	-	○	○
P0887/18 (05-282)	TCM POWER RELAY CONTROL CIRCUIT (SHORT)	• AMT fuse • AMT relay • Short in MREL signal circuit • Short in PGND signal circuit • Short in +BM signal circuit • Transmission control ECU	-	○	○
P0900/21 (05-288)	CLUTCH ACTUATOR CIRCUIT	• Clutch actuator assy (Clutch motor) • Open or short in clutch motor circuit • Transmission control ECU	-	○	○
P0905/59 (05-291)	GATE SELECT POSITION CIRCUIT (RANGE/PERFORMANCE)	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU	-	○	○
P0906/55 (05-291)	GATE SELECT POSITION CIRCUIT (LOW)	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU	○	○	○
P0906/57 (05-291)	GATE SELECT POSITION CIRCUIT (LOW)	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU	○	○	○
P0907/56 (05-291)	GATE SELECT POSITION CIRCUIT (HIGH)	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU	○	○	○
P0907/58 (05-291)	GATE SELECT POSITION CIRCUIT (HIGH)	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU	○	○	○
P0909/37 (05-297)	GATE SELECT CONTROL ERROR	• Select stroke sensor • Shift and select actuator assy (Select motor) • Open or short in select stroke sensor circuit • Open or short in select motor circuit • Shift head • Transmission control ECU	-	○	○
P0910/51 (05-309)	GATE SELECT ACTUATOR CIRCUIT	• Shift and select actuator assy (Select motor) • Open or short in select motor circuit • Transmission control ECU	-	○	○
P0915/49 (05-313)	GEAR SHIFT POSITION CIRCUIT (RANGE/PERFORMANCE)	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU	-	○	○
P0916/45 (05-313)	GEAR SHIFT POSITION CIRCUIT (LOW)	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU	○	○	○

P0916/47 (05-313)	GEAR SHIFT POSITION CIRCUIT (LOW)	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU	○	○	○
P0917/46 (05-313)	GEAR SHIFT POSITION CIRCUIT (HIGH)	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU	○	○	○
P0917/48 (05-313)	GEAR SHIFT POSITION CIRCUIT (HIGH)	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU	○	○	○
P0919/36 (05-319)	GEAR SHIFT POSITION CONTROL ERROR	• Shift stroke sensor • Shift and select actuator assy (Shift motor) • Open or short in shift stroke sensor circuit • Open or short in shift motor circuit • Synchronizer ring • Shift fork • Hub sleeve • Transmission control ECU	-	○	○
P0920/41 (05-331)	GEAR SHIFT FORWARD ACTUATOR CIRCUIT	• Shift and select actuator assy (Shift motor) • Open or short in shift motor circuit • Transmission control ECU	-	○	○
P1875/22 (05-335)	BUZZER MALFUNCTION	• Transmission control ECU	-	○	○
U0001/A2 *2 (05-336)	HIGH SPEED CAN COMMUNICATION BUS	• Open or short in CAN signal circuit • ECM • Transmission control ECU	○	○	○

*1: Multi-mode Manual Transmission Warning Light

*2: A2 is the condition below.

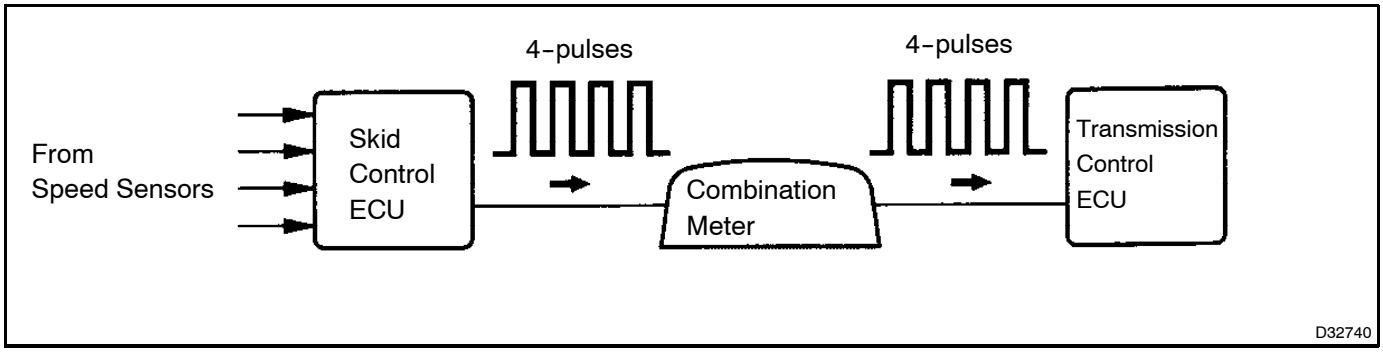
The multi-mode manual transmission warning light blinks ten times at 0.5 second intervals. After 1.5 seconds blank, the light blinks twice at the same interval as before.

DTC P0500/42 VEHICLE SPEED SENSOR "A"

CIRCUIT DESCRIPTION

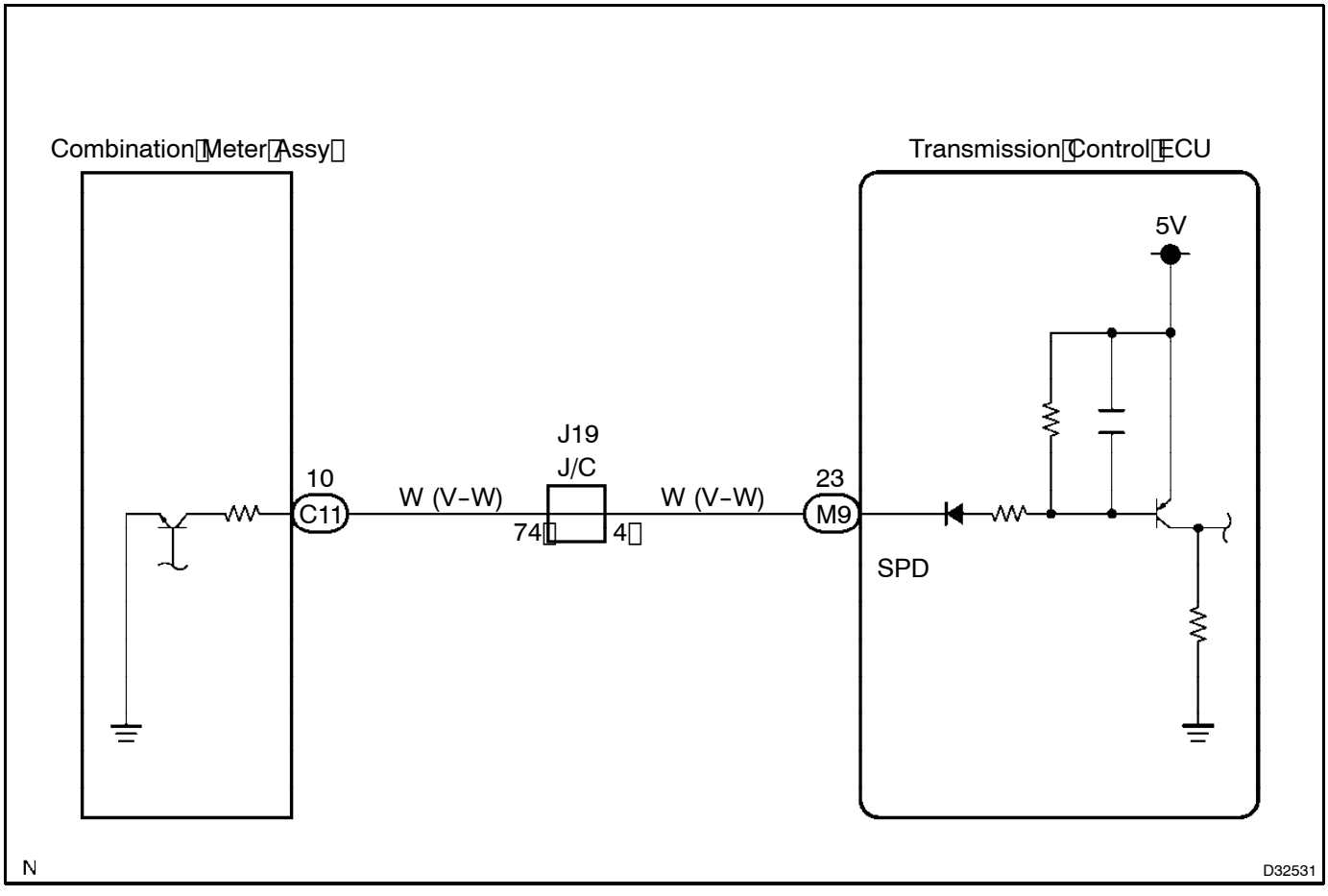
The speed sensor for the skid control ECU detects wheel speed and sends the appropriate signals to the skid control ECU.

The skid control ECU converts these signals into 4-pulse signals and sends them 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 transmission control ECU. The transmission control ECU determines vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500/42	The transmission control ECU detects the following conditions simultaneously: (a) Vehicle is being driven: Transmission revolution sensor signal is less than 1,650 rpm (b) Vehicle speed signal is more than 9 km/h (5.6 mph) (c) Gear is engaged (d) 4 seconds or more	• Open or short in speed sensor circuit • Speed sensor • Combination meter • Transmission control ECU • Skid control ECU

WIRING DIAGRAM



HINT:
When a DTC P0500/45 is output, a ground short in the wiring of terminal SPD or an internal ground short in the relevant ECU is suspected.

INSPECTION PROCEDURE

1	CHECK OPERATION OF SPEEDOMETER

(a) Drive the vehicle and check if the function of the speedometer in the combination meter is normal.
OK:
Actual vehicle speed and the speed indicated on the speedometer are the same.

HINT:
The vehicle speed sensor is functioning normally when the indication on the speedometer is normal.

NG → **CHECK SPEEDOMETER CIRCUIT (Refer to COROLLA Repair Manual Pub. No. RM1106E)**

OK

2	READ VALUE OF INTELLIGENT TESTER II

(a) Connect the Intelligent Tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the items "Vehicle Speed" and "Vehicle Speed Signal" in the DATA LIST and check that the speed displayed on the tester screen is the same as the one indicated on the combination meter.

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
Vehicle Speed	Vehicle speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) HINT: Actual vehicle speed is displayed	When the vehicle speed signal has any malfunction, the value calculated by the input revolution signal will be shown.
Vehicle Speed Signal	Vehicle speed signal/ Min.: 0 km/h (0 mph) Max.: 327.625 km/h	Vehicle stopped: 0 km/h (0 mph) HINT: Actual vehicle speed is displayed	When the vehicle speed signal has any malfunction, the value calculated by the input revolution signal will be shown.

OK:
The speed displayed on the tester screen is almost the same as that indicated on the combination meter.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

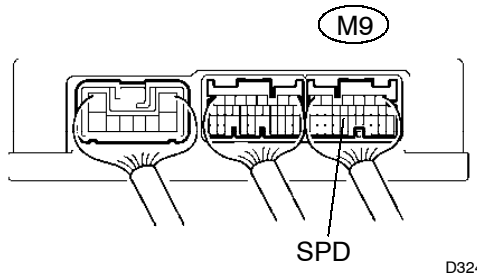
C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

3	INSPECT TRANSMISSION CONTROL ECU ASSY (SPD VOLTAGE)

Wire Harness View:

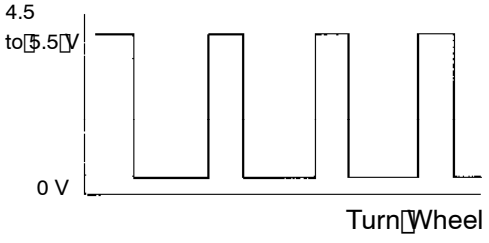


(a) Turn the ignition switch on.
(b) Move the shift lever to neutral.
(c) Jack up the vehicle.
(d) Measure the voltage between terminal SPD of the transmission control ECU and body ground.

Standard:

Symbol (Terminal No.)	Specified Condition
SPD (M9-23) - Body ground	Waveform appears

HINT:
The output voltage fluctuates up and down, similar to the diagram on the left, when the wheel is turned slowly.



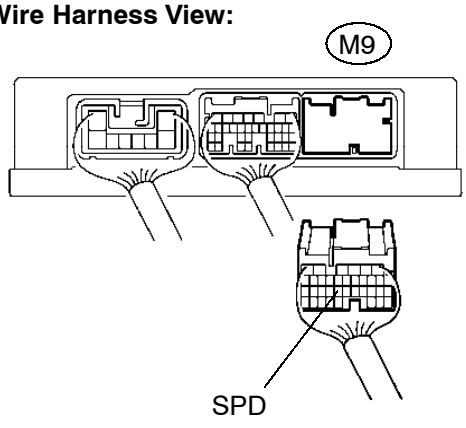
NG → Go to step 4

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

4	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - COMBINATION METER)

Transmission Control ECU Wire Harness View:



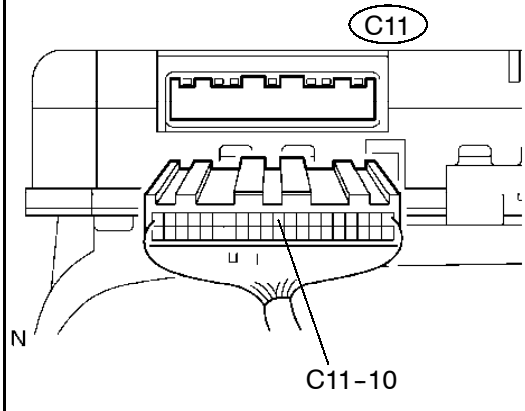
(a) Disconnect the M9 connector of the transmission control ECU and the C11 connector of the combination meter.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
SPD (M9-23) - C11-10	Always	Below 1 Ω

Combination Meter Wire Harness View:

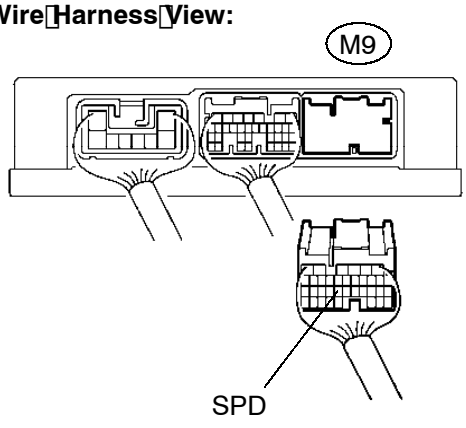


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BODY GROUND)

Transmission Control ECU Wire Harness View:



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
SPD (M9-23) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE WIRE HARNESS OR EACH ECU**

OK

REPLACE COMBINATION METER ASSY
(Refer to COROLLA Repair Manual Pub. No. RM1106E on page 71-6)

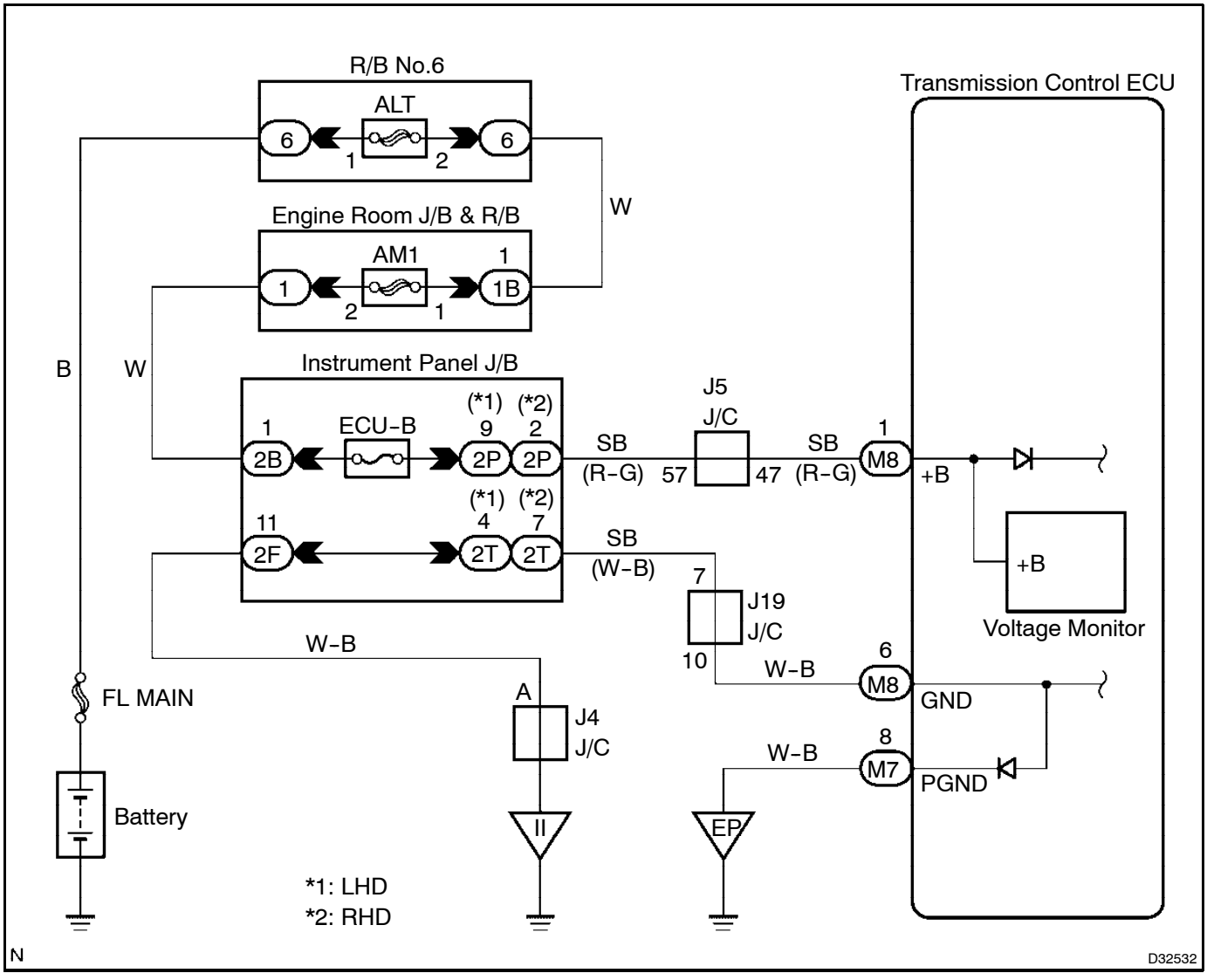
DTC	P0562/96	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

This is the power source for the transmission control ECU.
The multi-mode manual transmission system can be activated with terminal GND disconnected.
The power is supplied to the transmission control ECU via terminal +B or IG.
If an open circuit occurs in +B with the ignition switch on, DTC P0562/92 is recorded and the multi-mode manual transmission warning light comes on.
The transmission control ECU stops operating immediately when the ignition switch is turned from on to off with the +B terminal circuit open or shorted.

DTC No.	DTC Detecting Condition	Trouble Area
P0562/96	• +B terminal input voltage is 7.0 V or less for 0.5 seconds or more	• Open in power source circuit • Transmission control ECU

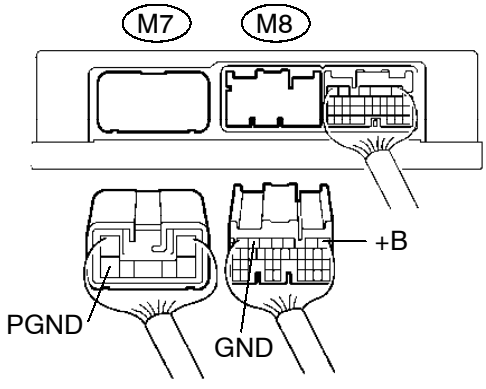
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Disconnect the transmission control ECU M8 and M7 connectors.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Tester No.)	Condition	Specified value
GND (M8-6) - Body ground	Always	Below 1 Ω
PGND (M7-8) Body ground	Always	Below 1 Ω

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Tester No.)	Condition	Specified value
+B (M8-1) - GND (M8-6)	Always	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (TRANSMISSION CONTROL ECU - BATTERY OR BODY GROUND)**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0603/98	INTERNAL CONTROL MODULE KEEP ALIVE MEMORY (KAM) ERROR

DTC	P0613/99	TCM PROCESSOR

CIRCUIT DESCRIPTION

This DTC indicates a malfunction in the transmission control ECU. When this DTC is output, it is necessary to replace the transmission control ECU.

DTC No.	DTC Detecting Condition	Trouble Area
P0603/98	• Check errors	• Transmission control ECU
P0613/99	• CPU communication malfunction	• Transmission control ECU

INSPECTION PROCEDURE

1	REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC P0703/95 BRAKE SWITCH "B" CIRCUIT

CIRCUIT DESCRIPTION

The stop lamp switch signal (STP) turns on and the stop lamp switch (ST1-) negative (-) signal turns off by depressing the brake pedal.

The stop lamp switch signal (STP) is used as a signal, in case of clutch-out, etc., to release the gear when the vehicle is parked.

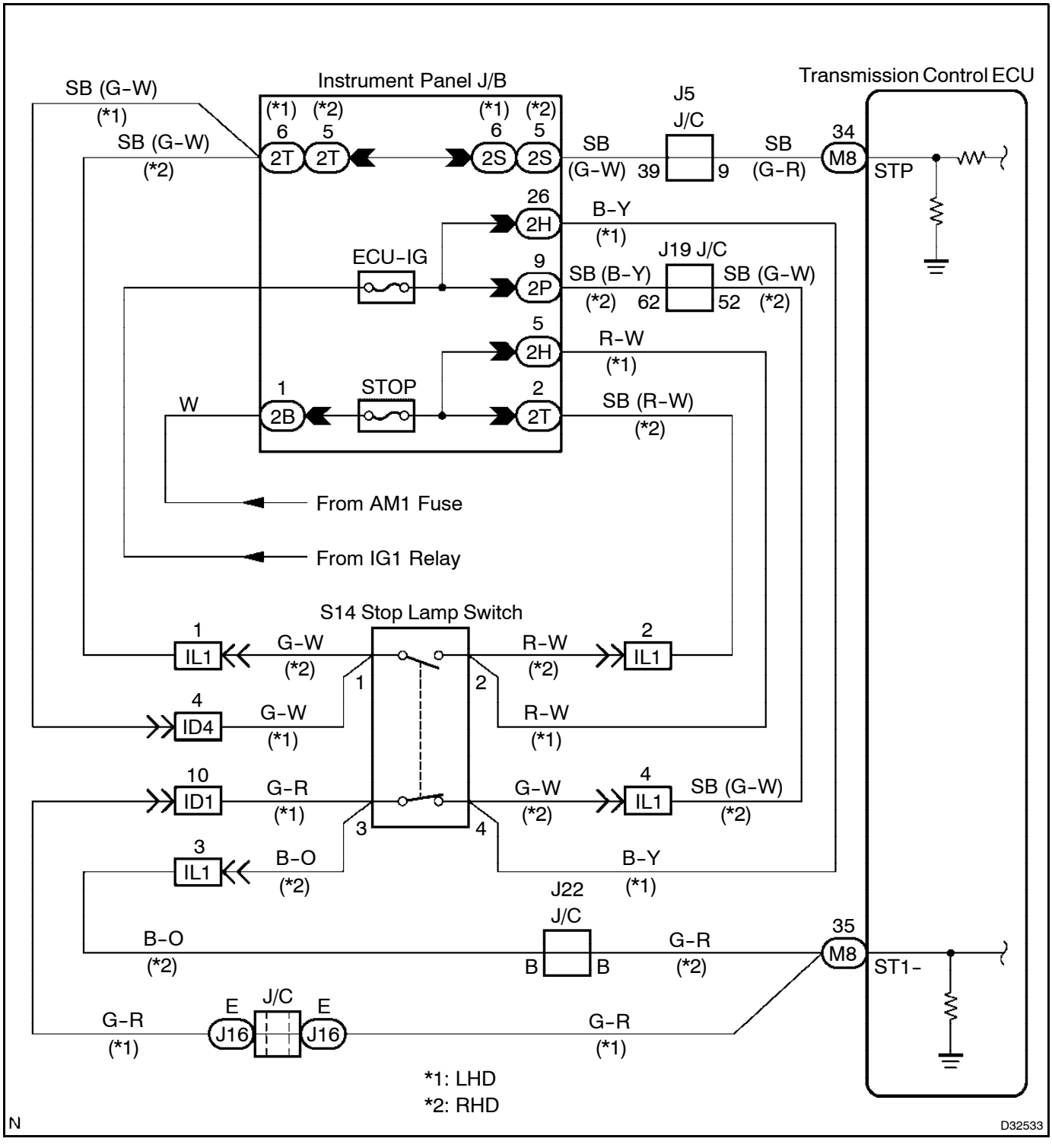
The fail-safe function operates to enable normal driving even if there is a malfunction in the stop lamp signal circuit.

HINT:

Before performing the inspection procedure, depress the brake pedal and check that the stop lamps come on.

DTC No.	DTC Detection Condition	Trouble Area
P0703/95	Conditions (a), (b) and (c) are detected simultaneously for 1.0 second or more (a) Ignition switch ON (b) STP signal OFF (c) ST1- signal OFF	• ECU-IG fuse • STOP fuse • Stop lamp switch • Open in STP or ST1- signal circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on, and turn the intelligent tester II main switch on.
(c) Select the item "Brake Switch Signal 1", "Brake Switch Signal 2" or "STP Switch Signal" in the DATA LIST, and read its value displayed on the intelligent tester II.
(d) Check that the stop lamps come on when the brake pedal is depressed, and go off when the brake pedal is released.

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
Brake Switch Signal 1	Brake switch signal 1/ ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the switch position is.
Brake Switch Signal 2	Brake switch signal 2/ ON or OFF	ON: Brake pedal released OFF: Brake pedal depressed	Always ON or OFF
STP Switch Signal	STP switch signal/ ON or OFF	ON: Brake operation	Always ON or OFF

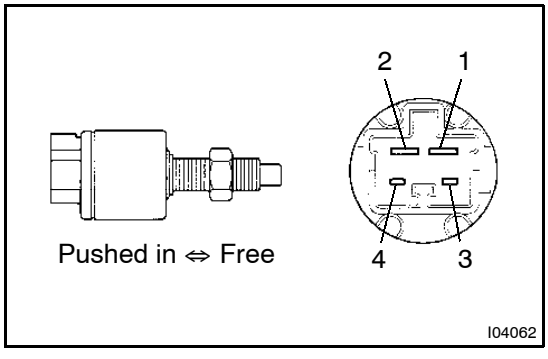
OK: When the brake pedal is operated, the normal conditions listed above are shown on the display.

NG → **Go to step 2**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY **(SEE PAGE 41-33)**

2 INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the stop lamp switch assy connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

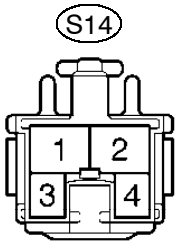
Switch condition	Tester connection	Specified value
Switch pin free	1 - 2	Below 1 Ω
Switch pin free	3 - 4	10 kΩ or higher
Switch pin pushed in	1 - 2	10 kΩ or higher
Switch pin pushed in	3 - 4	Below 1 Ω

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3 CHECK HARNESS AND CONNECTOR (STOP LAMP SWITCH - BATTERY)

Stop Lamp Switch Wire Harness Connector Front View:



(a) Measure the voltage according to the value(s) in the table below.

Standard:

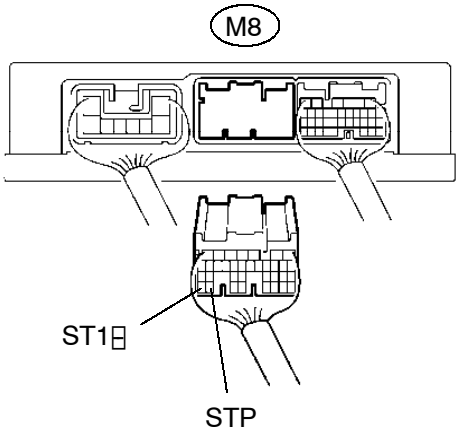
Tester connection	Condition	Specified value
S14-2 - Body ground	Always	10 to 14 V
S14-3 - Body ground	Engine SW ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the stop lamp switch connector.
(b) Disconnect the M8 connector from the transmission control ECU.
(c) Turn the ignition switch on.
(d) Measure the voltage according to the value(s) in the table below.

Standard:

Pedal condition	Tester connection (Symbol)	Specified value
Depressed	M8-34 (STP) - Body ground	10 to 14 V
Released	M8-34 (STP) - Body ground	Below 1 V
Depressed	M8-35 (ST1-) - Body ground	Below 1 V
Released	M8-35 (ST1-) - Body ground	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (STOP LAMP SWITCH - TRANSMISSION CONTROL ECU)**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0715/19	INPUT/TURBINE SPEED SENSOR "A" CIRCUIT

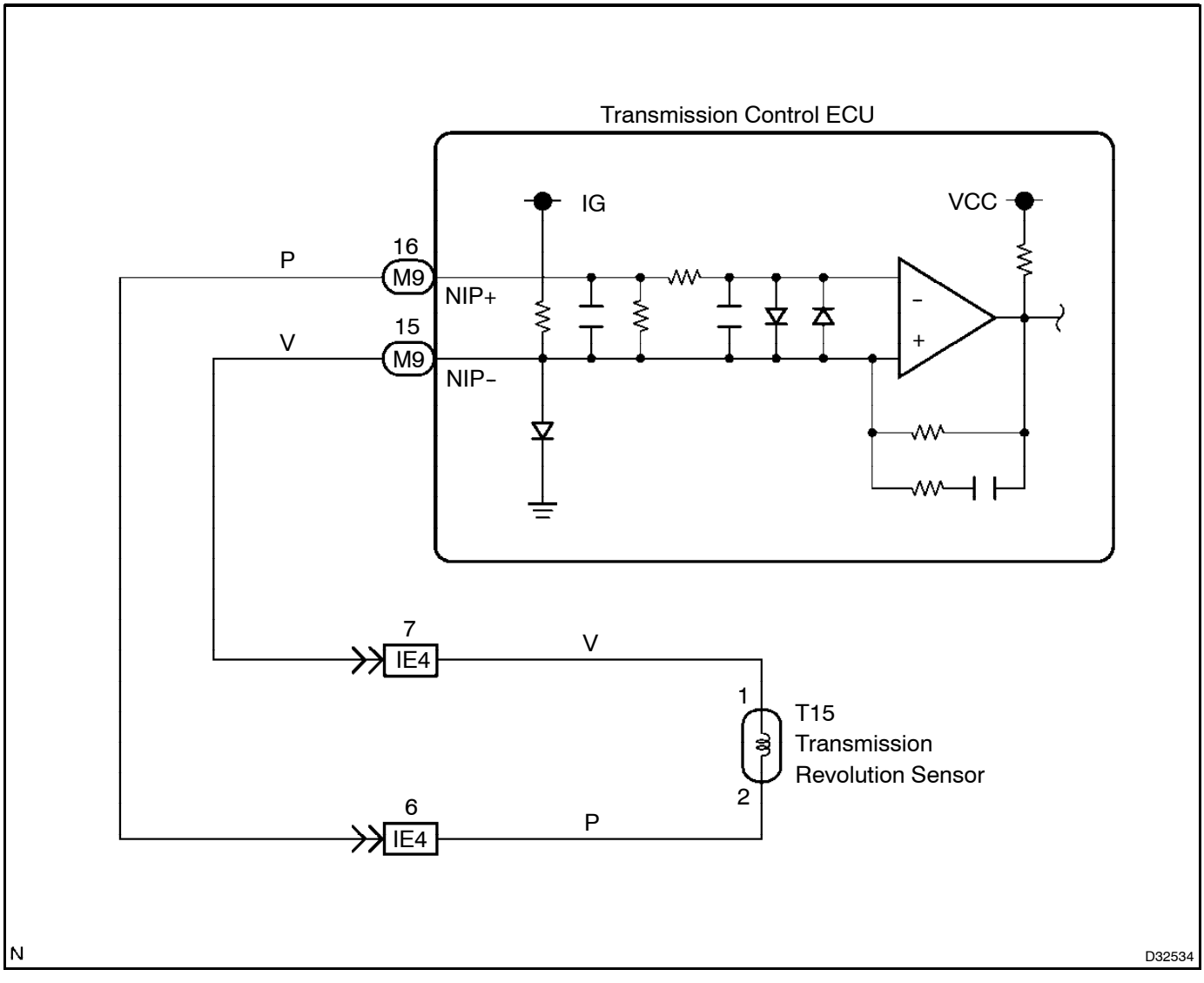
CIRCUIT DESCRIPTION

The transmission revolution sensor is located in the transmission. The transmission control ECU calculates the input shaft speed of the transmission using the sensor. The ECU applies voltage (maximum 5 volts) to the sensor. The voltage varies when the input shaft rotates. The ECU calculates the input shaft speed based on the voltage.

If the input shaft speed falls below a threshold when the vehicle is running, the ECU interprets this as a malfunction. The ECU sets this DTC and illuminates the multi-mode manual transmission warning light.

DTC No.	DTC Detection Condition	Trouble Area
P0715/19	The transmission control ECU detects the following conditions simultaneously: (a) Vehicle speed is 11 km/h or more (b) Transmission revolution speed is 175 rpm or less for 4 sec.	• Open or short in transmission revolution sensor circuit • Transmission revolution sensor • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

By accessing the DATA LIST displayed by the intelligent tester II, the value and status of the switch, sensor, actuator and so on can be read without removing any parts.

Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten labor time.

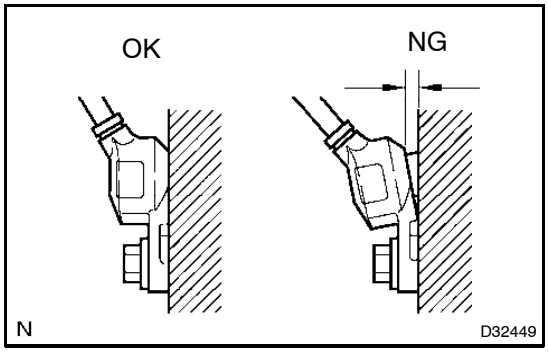
(a) Connect the intelligent tester II to the DLC3.

(b) Turn the ignition switch on, and turn the intelligent tester II main switch on.

(c) Select the item "Input Revolution" in the DATA LIST, and read its value displayed on the intelligent tester II.

Item	Measurement Item / Display	Normal Condition	Diagnostic Note
Input Revolution	Transmission input revolution / Min.: 0 rpm, Max.: 12,800 rpm	Vehicle stopped: 0 rpm	When the input revolution signal has any malfunction, the value calculated by the vehicle speed signal will be shown.

1 CHECK TRANSMISSION REVOLUTION SENSOR



(a) Check the transmission revolution sensor installation.

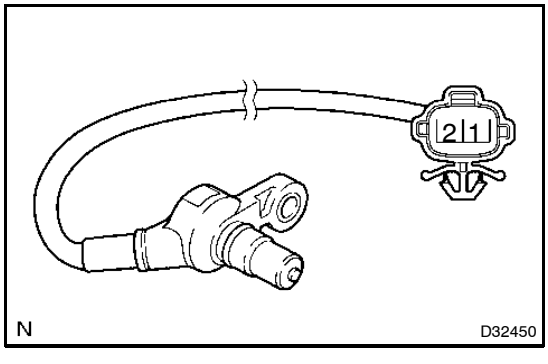
OK:

The installation bolt is tightened properly and there is no clearance between the sensor and gear box housing.

NG → **REPLACE TRANSMISSION REVOLUTION SENSOR (SEE PAGE 41-29)**

OK

2 INSPECT TRANSMISSION REVOLUTION SENSOR



(a) Disconnect the transmission revolution sensor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

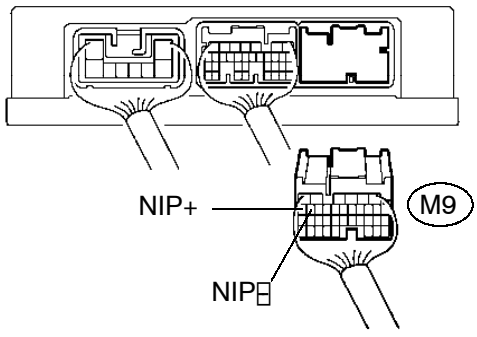
Tester Connection	Condition	Specified value
1 - 2	at 20°C (68°F)	560 to 680 Ω

NG → **REPLACE TRANSMISSION REVOLUTION SENSOR (SEE PAGE 41-29)**

OK

3	CHECK HARNESS AND CONNECTOR (TRANSMISSION REVOLUTION SENSOR - TRANSMISSION CONTROL ECU)

Wire Harness View:



N D32443

(a) Reconnect the transmission revolution connector.
(b) Disconnect the transmission control ECU connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
NIP+ (M9-16) - NIP- (M9-15)	at 20°C (68°F)	560 to 680 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (TRANSMISSION REVOLUTION SENSOR - TRANSMISSION CONTROL ECU)

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC P0725/13 ENGINE SPEED INPUT CIRCUIT

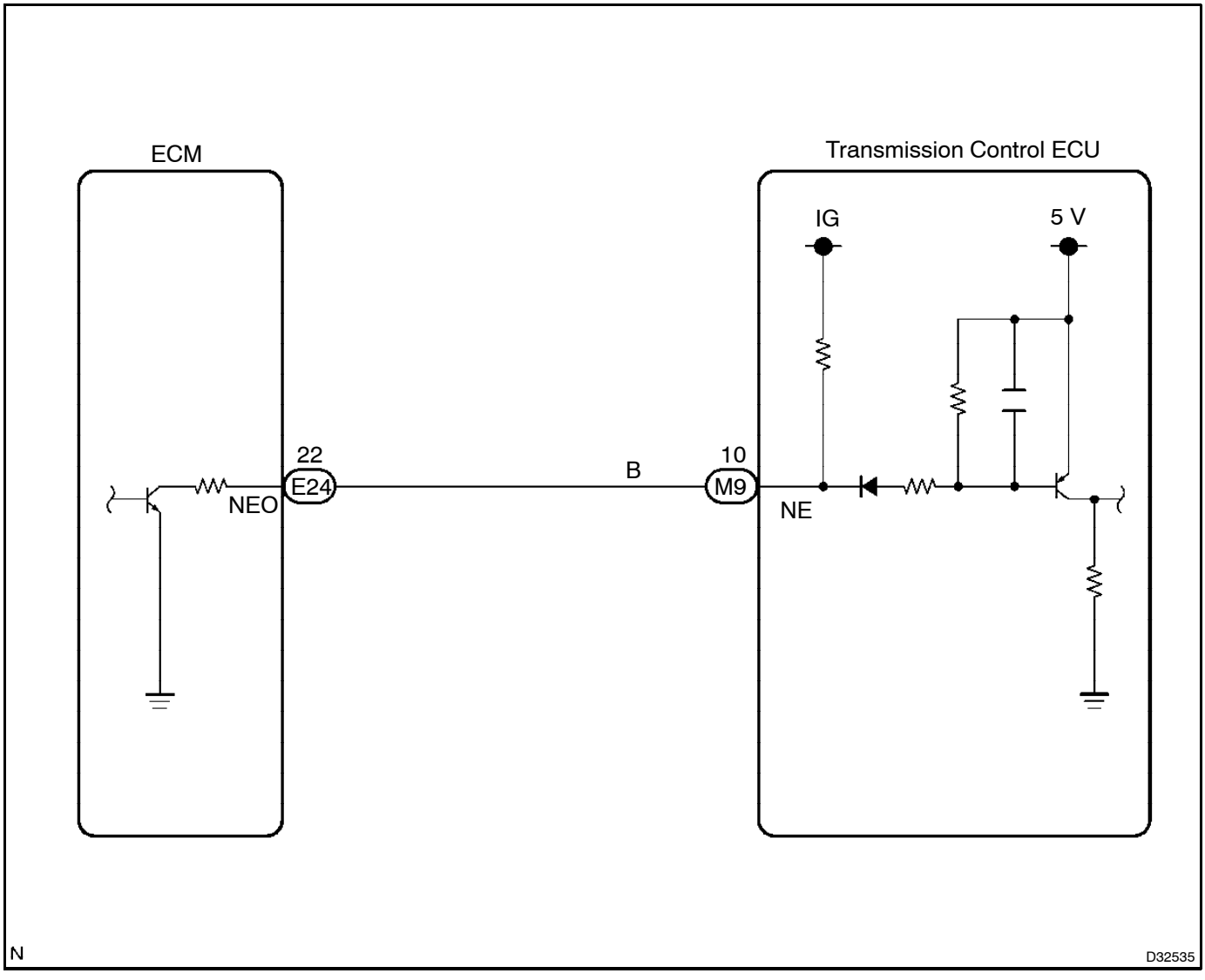
CIRCUIT DESCRIPTION

The ECM detects the engine revolution signals (NE) using the crankshaft position (CKP) sensor. The transmission control ECU receives two engine revolution signals to control the transmission. One signal is received directly from the ECM. The other signal is received from the ECM via the Communication Area Network (CAN).

If the transmission control ECU detects no engine revolution signal when the engine revolution signal of CAN is received (the vehicle is running), the ECU interprets this as a malfunction. The ECU sets this DTC and illuminates the multi-mode manual transmission warning light.

DTC No.	DTC Detection Condition	Trouble Area
P0725/13	• When the following condition lasts for a certain period, the transmission control ECU detects this DTC. The engine speed signal which is sent to the transmission control ECU from the ECM by the CAN communication differs from the engine speed signal from terminal NEO of the ECM. • The transmission control ECU detects the following conditions simultaneously: (a) Engine speed is 400 rpm or less (NEO circuit) (b) Engine speed is 400 rpm or more (CAN circuit) (c) The engine speed difference between (a) and (b) is 400 rpm or more for 1.0 sec.	• Crankshaft position sensor • Open or short in NE circuit • Transmission control ECU • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

If DTC P0335 is set, perform the inspection procedure for DTC P0335 first (see page 05-368).

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Engine Revolution" in the DATA LIST and check that the speed displayed on the tester screen is the same as the one indicated on the combination meter.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
Engine Revolution	Engine revolution/ Min.: 0 rpm Max.: 16, 383.75 rpm	Idling: 650 to 750 rpm	Even if the NE signal circuit is open or shorted, the back-up engine speed from the CAN communication can be shown.

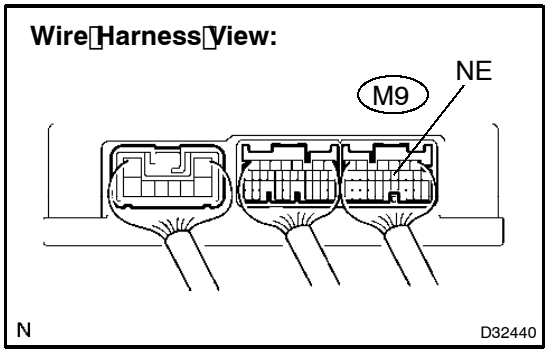
OK:
The engine speed displayed on the tester screen is almost the same as that indicated on the combination meter.

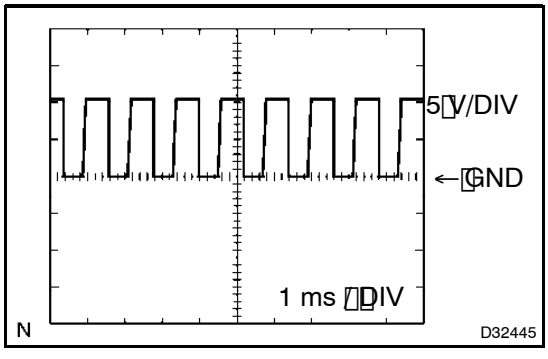
OK → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

NG

2	INSPECT TRANSMISSION CONTROL ECU ASSY





(a) Turn the ignition switch on.

(b) Check the signal waveform between terminal NE and body ground.

OK:

A waveform similar to that in the illustration to the left is output.

HINT:

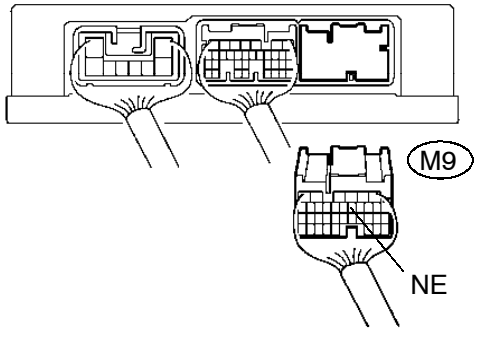
- Terminal: NE - Body ground
- Gauge set: 5 V/DIV, 1 ms/DIV
- Condition: Engine idling

OK → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

NG

3	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - ECM)

Transmission Control ECU Wire Harness View:



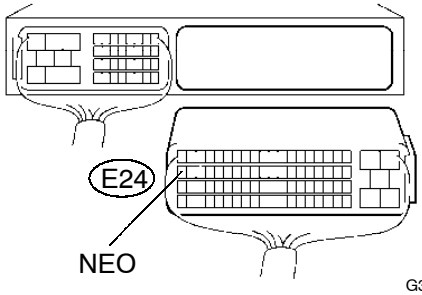
(a) Disconnect the M9 connector of the transmission control ECU and the E24 connector of the ECM.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
NE (M9-10) - NEO (E24-22)	Always	Below 1 Ω
NE (M9-10) - Body ground	Always	10 kΩ or higher

ECM Wire Harness View:



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE ECM (SEE PAGE 10-15)

DTC	P0806/29	CLUTCH POSITION SENSOR CIRCUIT (RANGE/PERFORMANCE)

DTC	P0807/25	CLUTCH POSITION SENSOR (LOW)

DTC	P0807/27	CLUTCH POSITION SENSOR (LOW)

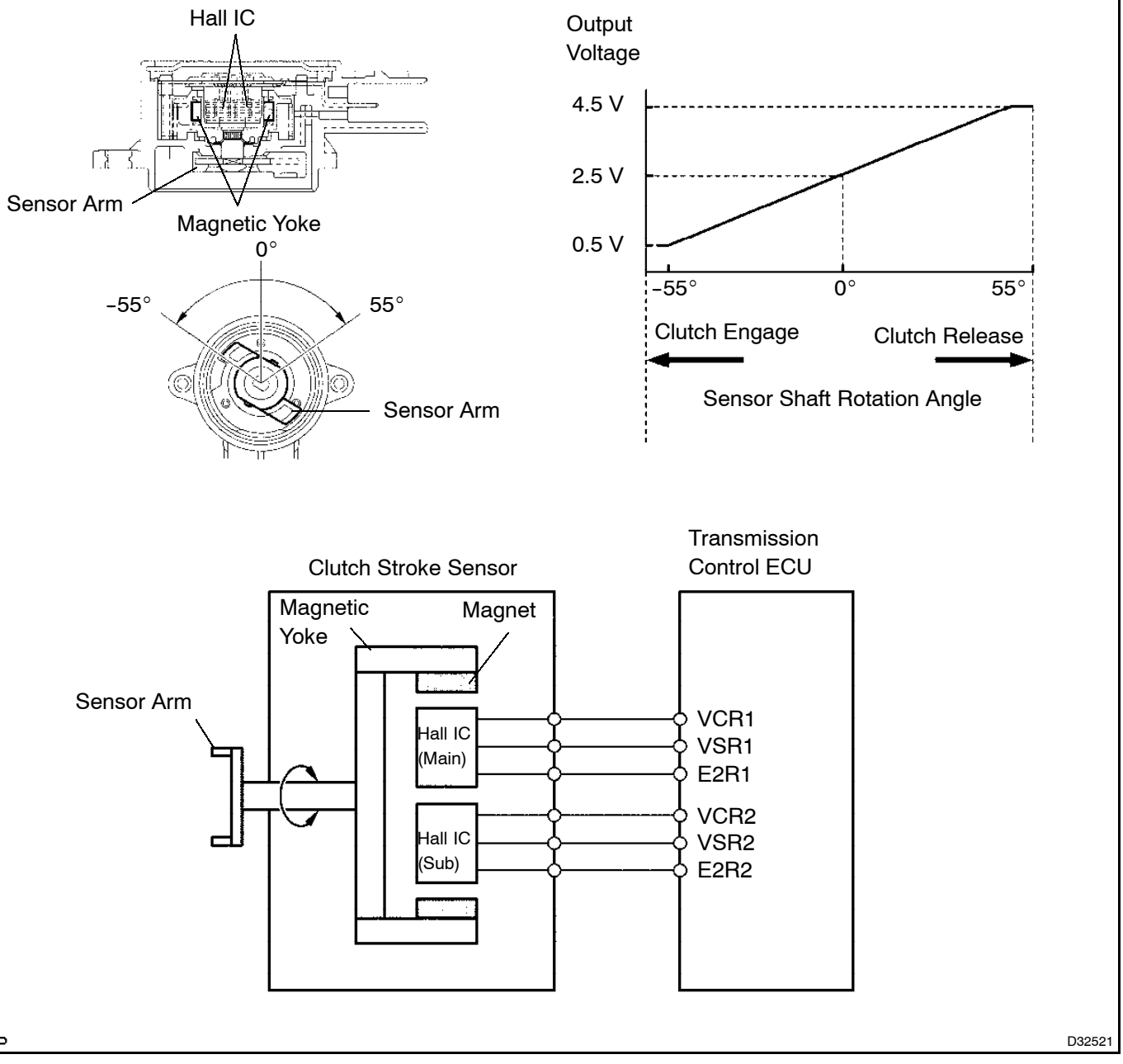
DTC	P0808/26	CLUTCH POSITION SENSOR (HIGH)

DTC	P0808/28	CLUTCH POSITION SENSOR (HIGH)

CIRCUIT DESCRIPTION

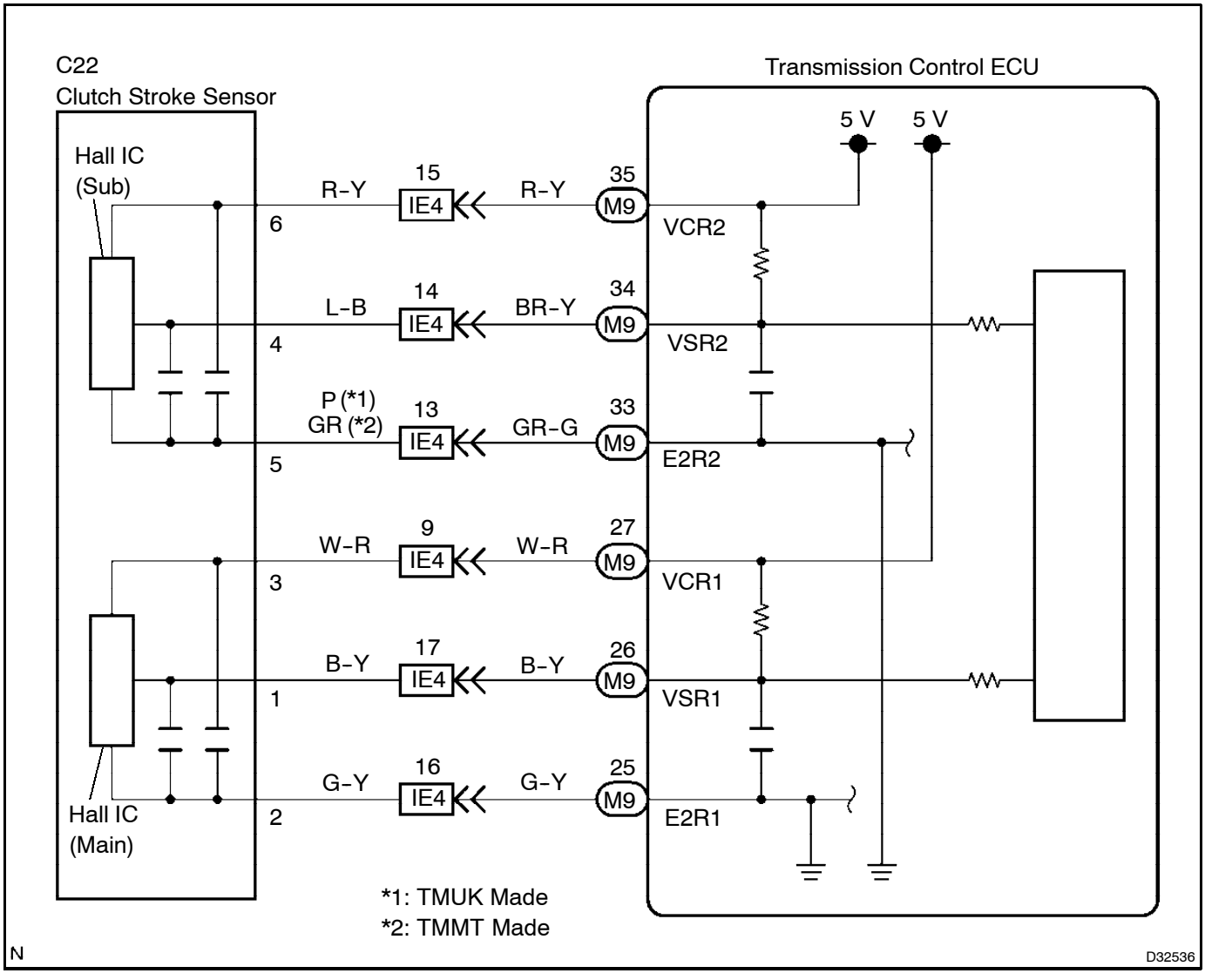
The clutch stroke sensor rotates the sensor arm when the clutch motor starts.
The transmission control ECU applies a maximum of 5 V to the clutch stroke sensor.
The transmission control ECU determines the strokes of the clutch motor by detecting the change in voltage that occurs with changes in the sensor arm rotation angle.
The clutch stroke sensor utilizes the main sensor and sub sensor to correctly determine the strokes of the clutch motor.
HINT:

- The clutch stroke sensor consists primarily of 2 Hall ICs (main and sub), and a magnetic yoke that rotates together with the rotation of the clutch motor.
- The 2 Hall ICs convert the changes in the magnetic flux that are caused by the rotation of the clutch motor (hence, the rotation of the magnetic yoke) into electric signals, and output them to the transmission control ECU. The transmission control ECU determines the extent of the clutch stroke from these electric signals.
- The main and sub circuits in the clutch stroke sensor have the same output characteristics.



DTC No.	DTC Detection Condition	Trouble Area
P0806/29	Deviation between sensor signal 1 (main) and sensor signal 2 (sub) is 2.0 mm (0.078 in.) or more for 1.0 sec. or more.	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU
P0807/25	Clutch stroke sensor (main) voltage is 0.2 V or less for 0.5 sec or more.	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU
P0807/27	Clutch stroke sensor (sub) voltage is 0.2 V or less for 0.5 sec. or more.	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU
P0808/26	Clutch stroke sensor (main) voltage is 4.8 V or more for 0.5 sec. or more.	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU
P0808/28	Clutch stroke sensor (sub) voltage is 4.8 V or more for 0.5 sec. or more.	• Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Clutch Position (Current)" in the DATA LIST and check the clutch position on the tester screen.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Clutch Position (Current)	Clutch position (current)/ Min.: 0 mm, Max.: 127.998 mm	Normal value: 34.0 mm (1.34 in.) to 44.0 mm (1.73 in.)	Learning value of clutch clamp position is displayed

OK:
The value on the display is within the normal range.

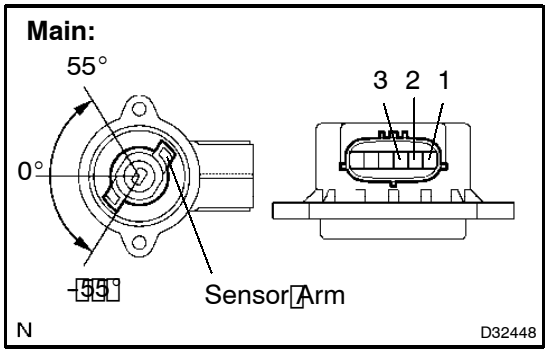
HINT:
0 A is shown on the display when the clutch actuator assy is not operating.
The value changes when the actuator is operating, although it will only operate momentarily.
There may be a short in the actuator circuit if 1 A or more is shown for several seconds.

OK → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

NG

2	INSPECT CLUTCH STROKE SENSOR



(a) Remove the clutch stroke sensor.

(b) Check the voltage of the clutch stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

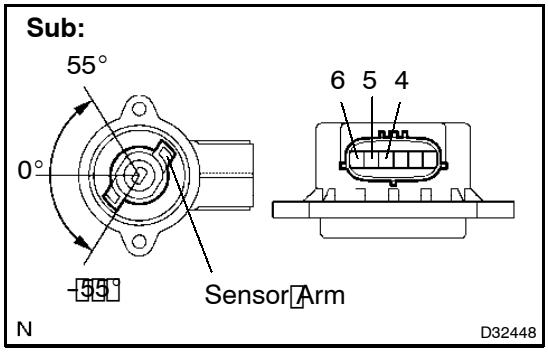
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the clutch stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage at 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage at 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

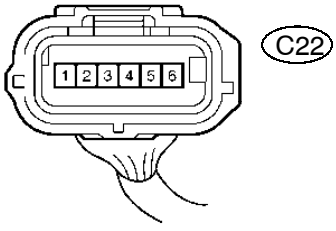
- **Do not apply more than 6 V.**
- **Do not drop the clutch stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE CLUTCH STROKE SENSOR**
(SEE PAGE 42-23)

OK

3	CHECK HARNESS AND CONNECTOR (CLUTCH STROKE SENSOR - TRANSMISSION CONTROL ECU)

Clutch Stroke Sensor Wire Harness Connector Front View:



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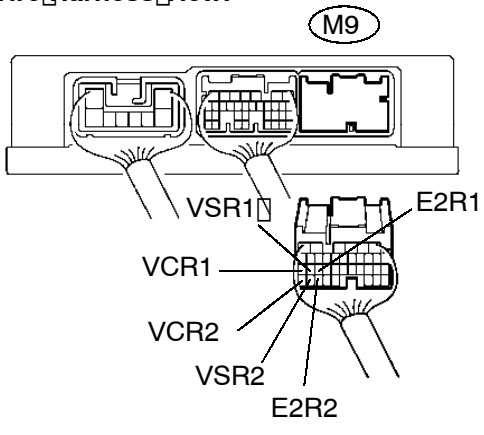
Transmission Control ECU Wire Harness View:



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(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCR2 (M9-35) - (C22-6)	Always	Below 1 Ω
VSR2 (M9-34) - (C22-4)	Always	Below 1 Ω
E2R2 (M9-33) - (C22-5)	Always	Below 1 Ω
VCR1 (M9-27) - (C22-3)	Always	Below 1 Ω
VSR1 (M9-26) - (C22-1)	Always	Below 1 Ω
E2R1 (M9-25) - (C22-2)	Always	Below 1 Ω
VCR2 (M9-35) - Body ground	Always	10 kΩ or higher
VSR2 (M9-34) - Body ground	Always	10 kΩ or higher
E2R2 (M9-33) - Body ground	Always	10 kΩ or higher
VCR1 (M9-27) - Body ground	Always	10 kΩ or higher
VSR1 (M9-26) - Body ground	Always	10 kΩ or higher
E2R1 (M9-25) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0810/35	CLUTCH POSITION CONTROL ERROR

CIRCUIT DESCRIPTION

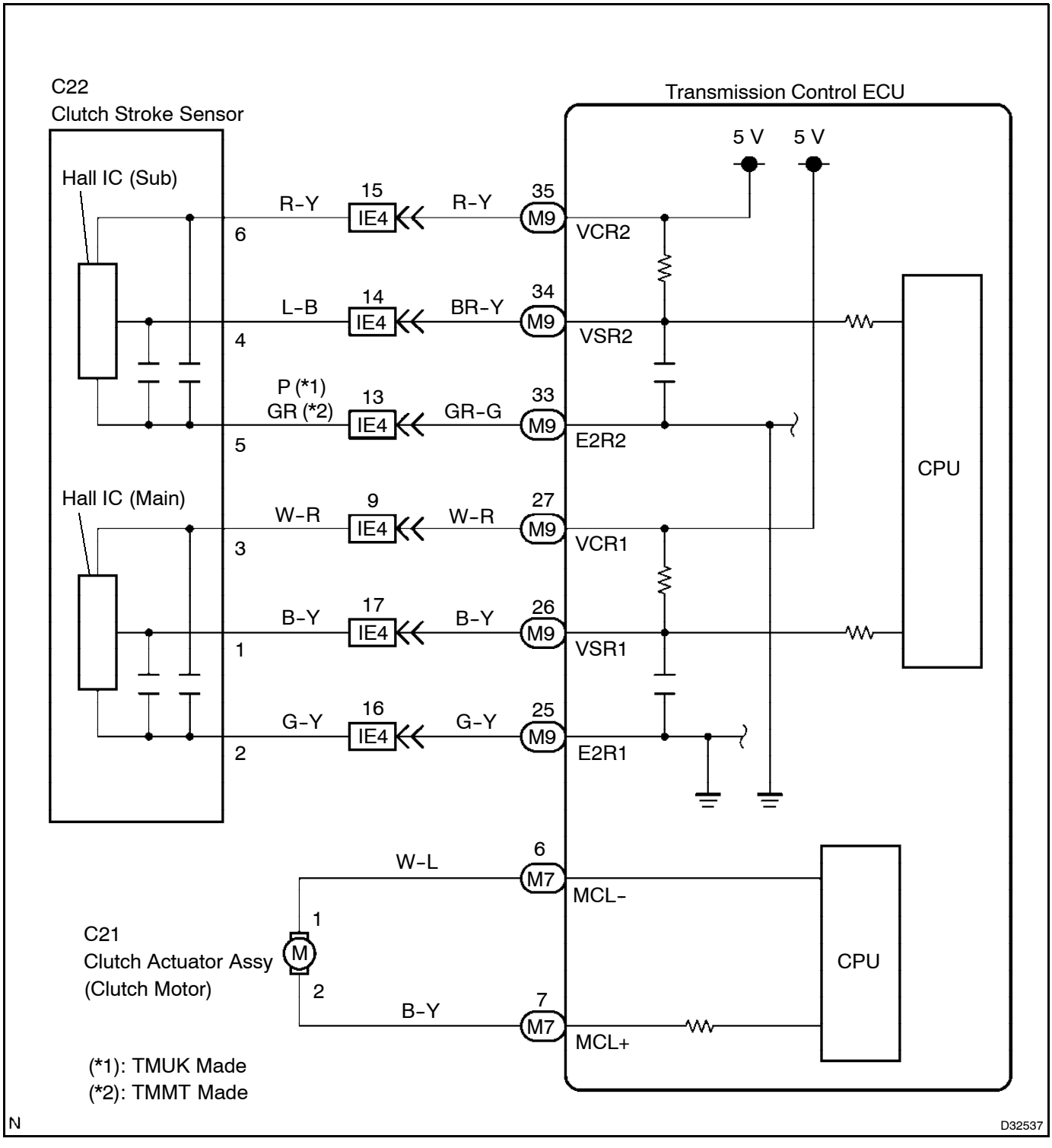
Refer to DTC P0806/29 on page 05-246 and DTC P0900/21 on page 05-288.

HINT:

This DTC is detected according to the stroke speed of the clutch actuator or the difference between the clutch position memorized in the ECU and the actual clutch position. This DTC, therefore, is not detected together with DTC P0806/29 (P0807/25, P0807/26, P0807/27, P0807/28) or P0900/21, which indicates electrical malfunctions.

DTC No.	DTC Detection Condition	Trouble Area
P0810/35	The transmission control ECU detects the following conditions simultaneously: (a) Clutch motor current is 22 A or more for 2.0 sec. (b) The difference between the target clutch position and the actual clutch position is 0.3 mm (0.0118 in.) or more. (c) The amount of clutch stroke movement is 122 mm (4.80 in.)/sec. or less.	• Clutch stroke sensor • Clutch actuator assy (Clutch motor) • Open or short in clutch stroke sensor circuit • Open or short in clutch motor circuit • Clutch disc (Clutch disc cover) • Clutch release fork • Clutch release fork lever • Clutch release bearing • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the items "Clutch Motor Current MMT" and "Clutch Position (Current)" in the DATA LIST, and read its value displayed on the tester.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Clutch Motor Current MMT	Clutch motor current Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	Clutch clamp position: 0 A
Clutch Position (Current)	Clutch position (current)/ Min.: 0 mm, Max.: 127.998 mm	Normal value: 34.0 mm (1.34 in.) to 44.0 mm (1.73 in.)	Learning value of clutch clamp position is displayed

OK:
The value on the display is within the normal range.

HINT:
0 A is shown on the display when the clutch actuator assy is not operating.
The value changes when the actuator is operating, although it will only operate momentarily.
There may be a short in the actuator circuit if 1 A or more is shown for several seconds.

Result:

NG ("Clutch Motor Current MMT" is defective)	A
NG ("Clutch Position (Current)" is defective)	B
NG (Both items are defective)	C
OK	D

B → **Go to step 5**

C → **Go to step 8**

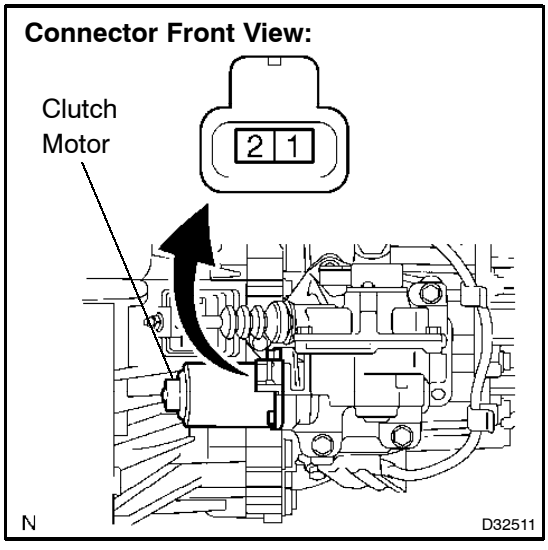
D → **OPERATION CHECK**

HINT:
If the symptom still occurs even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Clutch Disc and Clutch Disc Cover (see page 42-29)
- Release Bearing (see page 42-29)
- Clutch Release Fork (see page 42-29)

A

2 INSPECT CLUTCH ACTUATOR ASSY



(a) Disconnect the clutch motor connector.
(b) Measure the resistance according to the value(s) in the table below.

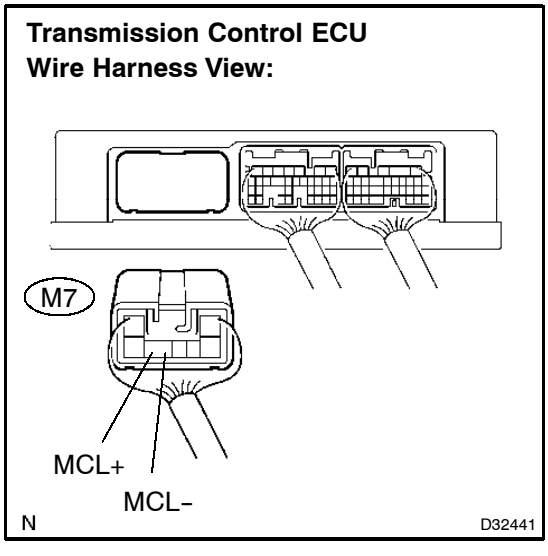
Standard:

Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE CLUTCH ACTUATOR ASSY (SEE PAGE 42-26)**

OK

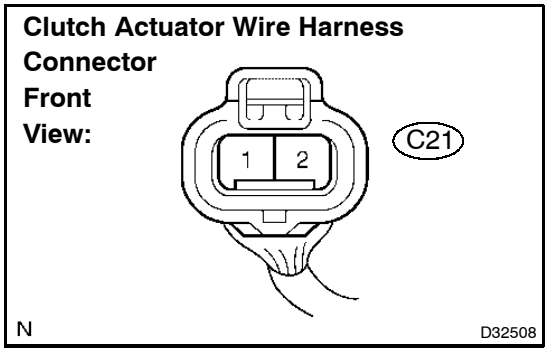
3 CHECK HARNESS AND CONNECTOR (CLUTCH ACTUATOR ASSY - TRANSMISSION CONTROL ECU)



(a) Disconnect the M7 connector of the transmission control ECU.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

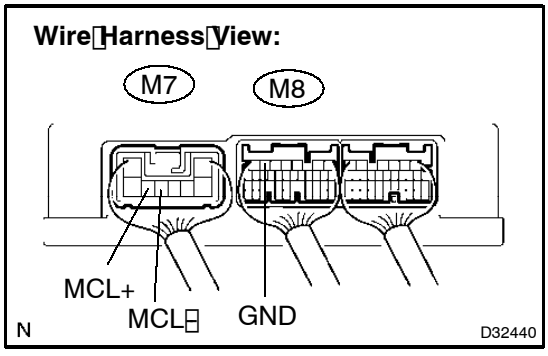
Symbol (Terminal No.)	Condition	Specified value
MCL- (M7-6) - C21-1	Always	Below 1 Ω
MCL+ (M7-7) - C21-2	Always	Below 1 Ω
MCL- (M7-6) - Body ground	Always	10 kΩ or higher
MCL+ (M7-7) - Body ground	Always	10 kΩ or higher



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT TRANSMISSION CONTROL ECU ASSY



(a) Reconnect the transmission control ECU connector and clutch motor connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
MCL- (M7-6) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MCL+ (M7-7) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

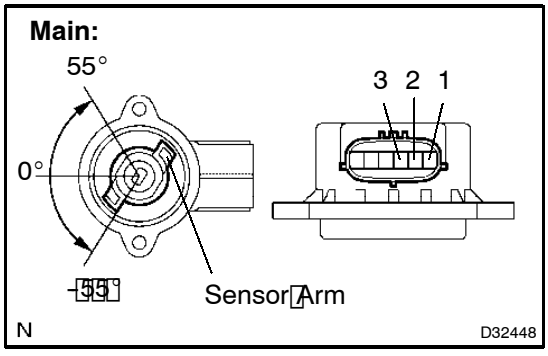
OPERATION CHECK

HINT:

If the symptom still occurs even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Clutch Disc and Clutch Disc Cover (see page 42-29)
- Release Bearing (see page 42-29)
- Clutch Release Fork (see page 42-29)

5	INSPECT CLUTCH STROKE SENSOR



(a) Remove the clutch stroke sensor.

(b) Check the voltage of the clutch stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

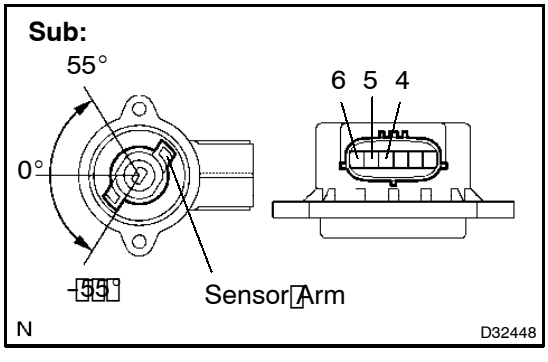
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the clutch stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

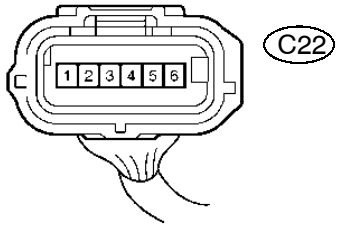
- **Do not apply more than 6 V.**
- **Do not drop the clutch stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE CLUTCH STROKE SENSOR**
(SEE PAGE 42-23)

OK

6	CHECK HARNESS AND CONNECTOR (CLUTCH STROKE SENSOR - TRANSMISSION CONTROL ECU)

Clutch Stroke Sensor
Wire Harness Connector Front View:



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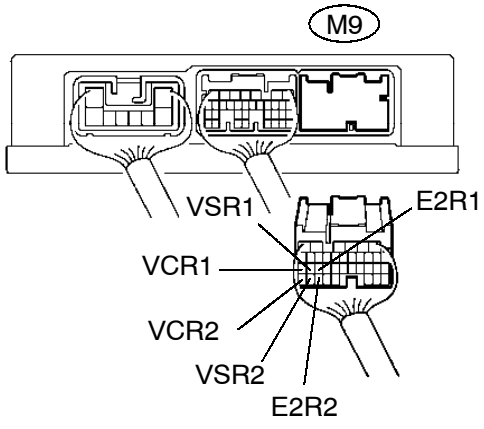
Transmission Control ECU
Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

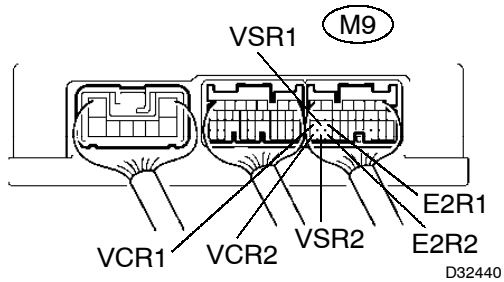
Symbol (Terminal No.)	Condition	Specified value
VCR2 (M9-35) - (C22-6)	Always	Below 1 Ω
VSR2 (M9-34) - (C22-4)	Always	Below 1 Ω
E2R2 (M9-33) - (C22-5)	Always	Below 1 Ω
VCR1 (M9-27) - (C22-3)	Always	Below 1 Ω
VSR1 (M9-26) - (C22-1)	Always	Below 1 Ω
E2R1 (M9-25) - (C22-2)	Always	Below 1 Ω
VCR2 (M9-35) - Body ground	Always	10 kΩ or higher
VSR2 (M9-34) - Body ground	Always	10 kΩ or higher
E2R2 (M9-33) - Body ground	Always	10 kΩ or higher
VCR1 (M9-27) - Body ground	Always	10 kΩ or higher
VSR1 (M9-26) - Body ground	Always	10 kΩ or higher
E2R1 (M9-25) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the transmission control ECU connector.
(b) Turn the ignition switch on.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Always	Specified value
VCR2 (M9-35) - E2R2 (M9-33)	Ignition SW ON	Approx. 5 V
VSR2 (M9-34) - E2R2 (M9-33)	Ignition SW ON	0.5 to 4.5 V
VCR1 (M9-27) - E2R1 (M9-25)	Ignition SW ON	Approx. 5 V
VSR1 (M9-26) - E2R1 (M9-25)	Ignition SW ON	0.5 to 4.5 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

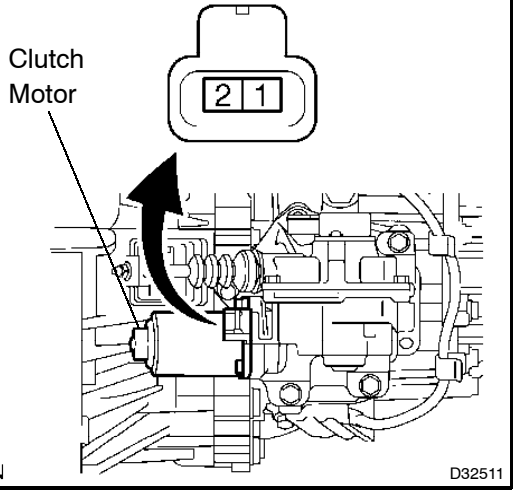
OPERATION CHECK

HINT:
If the symptom still occurs even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Clutch Disc and Clutch Disc Cover (see page 42-29)
- Release Bearing (see page 42-29)
- Clutch Release Fork (see page 42-29)

8 INSPECT CLUTCH ACTUATOR ASSY

Connector Front View:



(a) Disconnect the clutch motor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

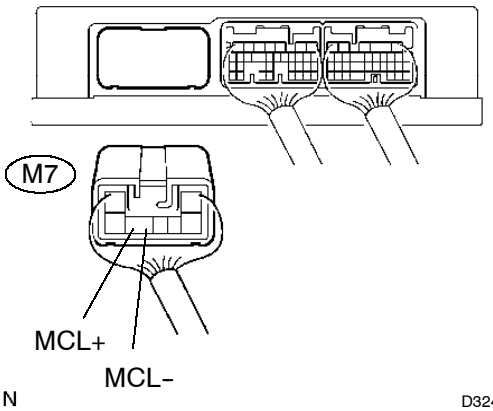
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE CLUTCH ACTUATOR ASSY (SEE PAGE 42-20)**

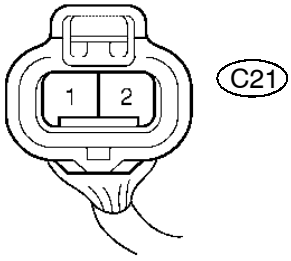
OK

9	CHECK HARNESS AND CONNECTOR (CLUTCH ACTUATOR ASSY - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



Clutch Actuator Wire Harness Connector Front View:



(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

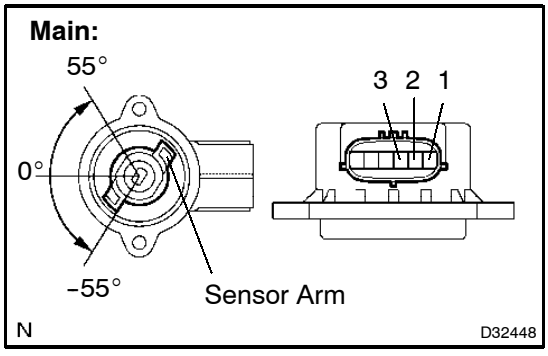
Standard:

Symbol (Terminal No.)	Condition	Specified value
MCL- (M7-6) - C21-1	Always	Below 1 Ω
MCL+ (M7-7) - C21-2	Always	Below 1 Ω
MCL- (M7-6) - Body ground	Always	10 kΩ or higher
MCL+ (M7-7) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	INSPECT CLUTCH STROKE SENSOR



(a) Remove the clutch stroke sensor.

(b) Check the voltage of the clutch stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

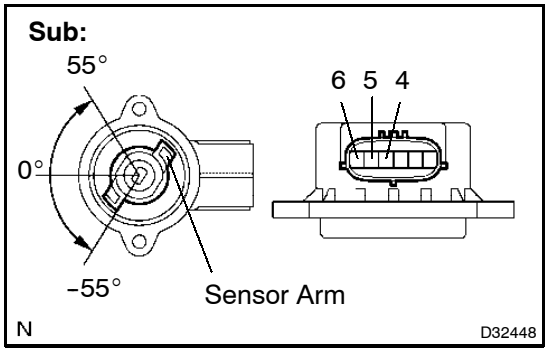
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the clutch stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

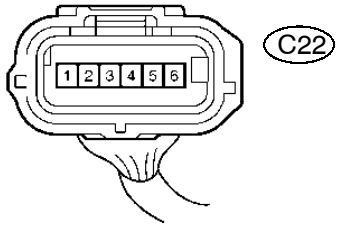
- **Do not apply more than 6 V.**
- **Do not drop the clutch stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE CLUTCH STROKE SENSOR**
(SEE PAGE 42-23)

OK

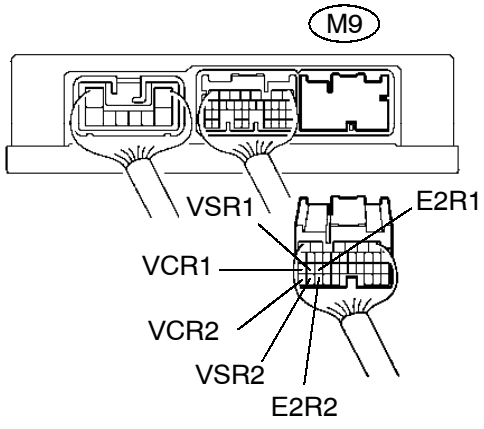
11	CHECK HARNESS AND CONNECTOR (CLUTCH STROKE SENSOR - TRANSMISSION CONTROL ECU)

Clutch Stroke Sensor
Wire Harness Connector Front View:



N D32509

Transmission Control ECU
Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

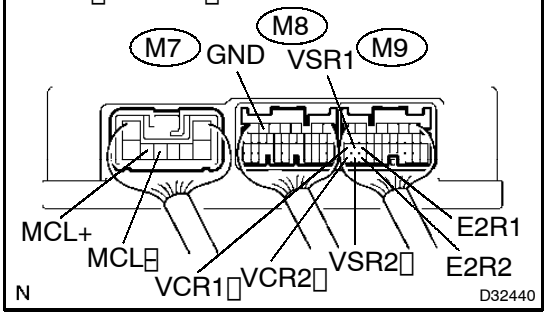
Symbol (Terminal No.)	Condition	Specified value
VCR2 (M9-35) - (C22-6)	Always	Below 1 Ω
VSR2 (M9-34) - (C22-4)	Always	Below 1 Ω
E2R2 (M9-33) - (C22-5)	Always	Below 1 Ω
VCR1 (M9-27) - (C22-3)	Always	Below 1 Ω
VSR1 (M9-26) - (C22-1)	Always	Below 1 Ω
E2R1 (M9-25) - (C22-2)	Always	Below 1 Ω
VCR2 (M9-35) - Body ground	Always	10 kΩ or higher
VSR2 (M9-34) - Body ground	Always	10 kΩ or higher
E2R2 (M9-33) - Body ground	Always	10 kΩ or higher
VCR1 (M9-27) - Body ground	Always	10 kΩ or higher
VSR1 (M9-26) - Body ground	Always	10 kΩ or higher
E2R1 (M9-25) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

12	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the transmission control ECU connector and clutch motor connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MCL- (M7-6) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MCL+ (M7-7) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
VCR2 (M9-35) - E2R2 (M9-33)	Ignition SW ON	Approx. 5 V
VSR2 (M9-34) - E2R2 (M9-33)	Ignition SW ON	0.5 to 4.5 V
VCR1 (M9-27) - E2R1 (M9-25)	Ignition SW ON	Approx. 5 V
VSR1 (M9-26) - E2R1 (M9-25)	Ignition SW ON	0.5 to 4.5 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

OPERATION CHECK

HINT:

If the symptom still occurs even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Clutch Disc and Clutch Disc Cover (see page 42-29)
- Release Bearing (see page 42-29)
- Clutch Release Fork (see page 42-29)

DTC	P0812/67	REVERSE INPUT CIRCUIT (OPEN)

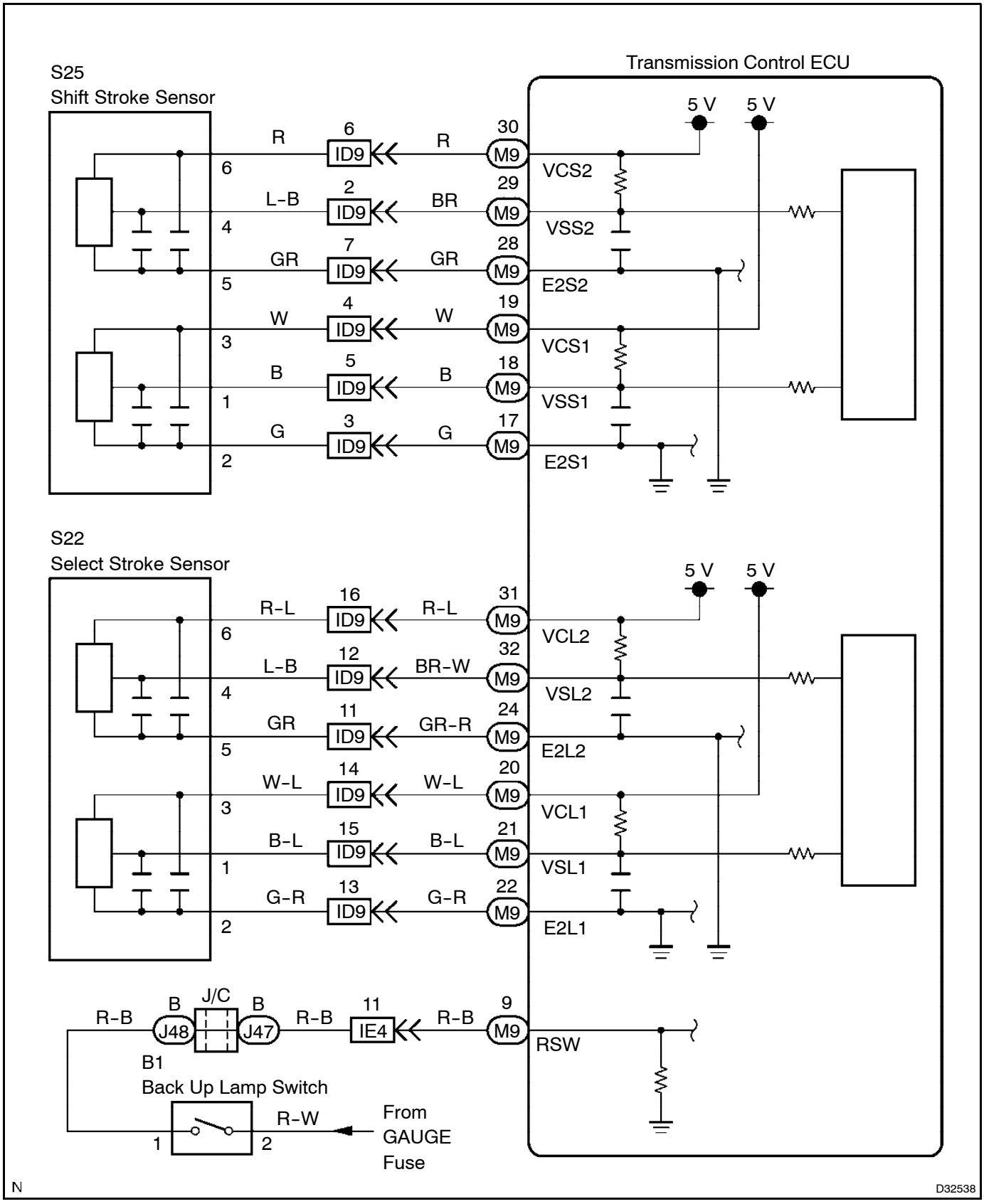
DTC	P0812/68	REVERSE INPUT CIRCUIT (SHORT)

CIRCUIT DESCRIPTION

Receiving the signal from the back up lamp switch, the transmission control ECU detects the reverse signal.
Refer to DTC P0905/59 on page 05-2291 and DTC P0915/49 on page 05-3313.

DTC No.	DTC Detection Condition	Trouble Area
P0812/67 P0812/68	• When the following condition lasts for a certain period, the transmission control ECU detects these DTCs. The gear position that the transmission control ECU detects from the shift sensor and the select sensor differs from the signal from the back up lamp switch. • The transmission control ECU detects the following conditions: (a) (1) Shift and select stroke sensors send R position signal to transmission control ECU. (2) Back up lamp switch is OFF for 0.5 seconds. (b) (1) Shift and select stroke sensors send non-R position signal to transmission control ECU. (2) Back up lamp switch is ON for 0.5 seconds.	• Shift stroke sensor • Select stroke sensor • Back up lamp switch • Open or short in back up lamp switch circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "T/M Reverse Switch Signal 1" in the DATA LIST, and read its value displayed on the tester display.

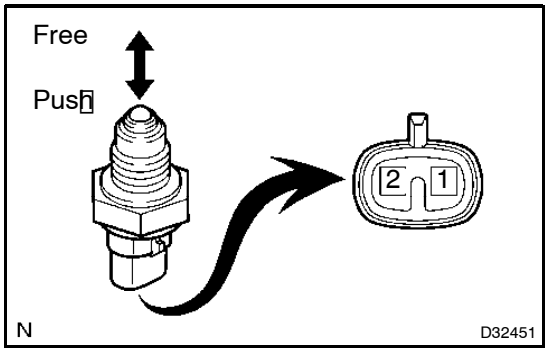
Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
T/M Reverse Switch Signal 1	T/M reverse signal/ GND (ON), OPEN (OFF)	Shift "R" position: ON	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the gear position is.

OK:
When the shift lever is operated, the normal condition listed above is shown on the display.

OK	Go to step 4

NG

2 INSPECT BACK UP LAMP SWITCH ASSY



(a) Remove the back up lamp switch.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

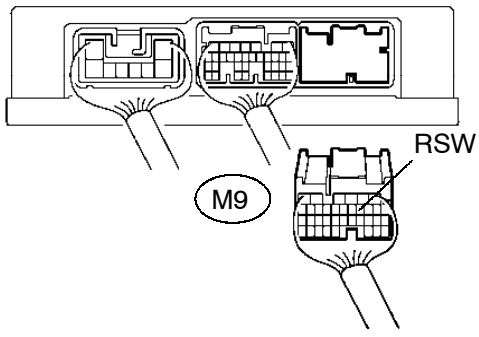
Terminal No.	Switch position	Specified value
1 - 2	Free	10 kΩ or higher
1 - 2	Push	Below 1 Ω

NG	REPLACE BACK UP LAMP SWITCH ASSY (SEE PAGE 41-31)

OK

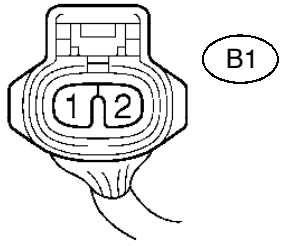
3	CHECK HARNESS AND CONNECTOR (BACK UP LAMP SWITCH - TRANSMISSION CONTROL ECU, BATTERY)

Transmission Control ECU
Wire Harness View:



N D32443

Back Up Lamp Switch
Wire Harness Connector Front View:



N D32517

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
RSW (M9-9) - (B1-1)	Always	Below 1 Ω
RSW (M9-9) - Body ground	Always	10 kΩ or higher

(c) Turn the ignition switch on.

(d) Measure the voltage according to the value(s) in the table below.

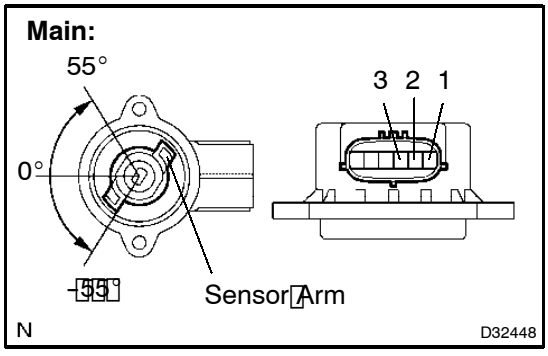
Standard:

Terminal No.	Condition	Specified value
B1-2 - Body ground	Ignition SW ON	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 INSPECT SHIFT STROKE SENSOR



(a) Remove the shift stroke sensor.

(b) Check the voltage of the shift stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

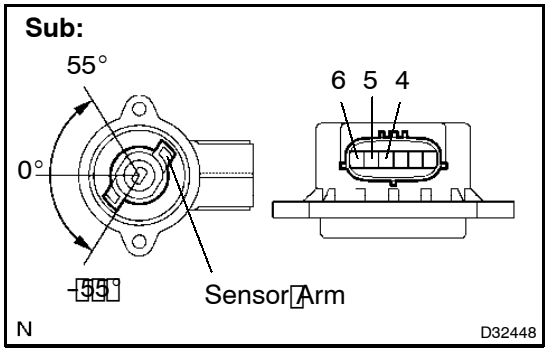
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the shift stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

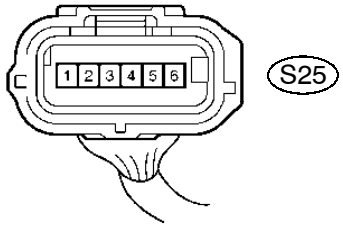
- **Do not apply more than 6 V.**
- **Do not drop the shift stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SHIFT STROKE SENSOR**
(SEE PAGE 41-25)

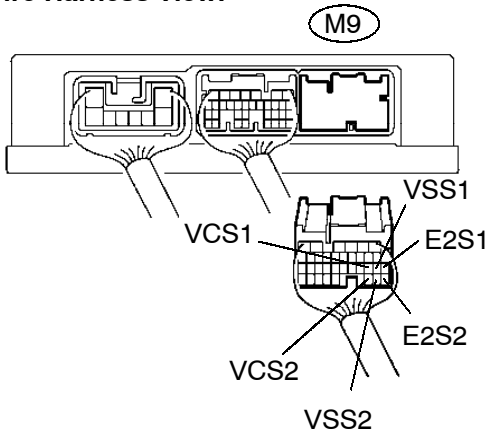
OK

5	CHECK HARNESS AND CONNECTOR (SHIFT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Shift Stroke Sensor
Wire Harness Connector Front View:



Transmission Control ECU
Wire Harness View:



(a) Measure the resistance according to the value(s) in the table below.

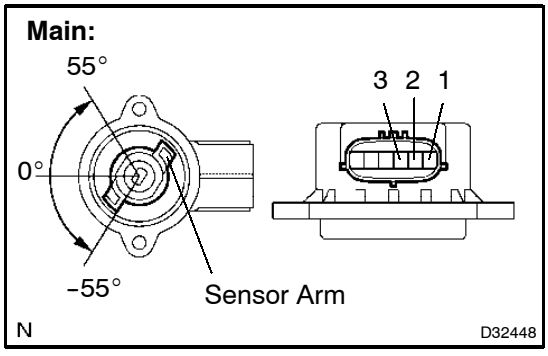
Standard:

Symbol (Terminal No.)	Condition	Specified value
VCS2 (M9-30) - (S25-6)	Always	Below 1 Ω
VSS2 (M9-29) - (S25-4)	Always	Below 1 Ω
E2S2 (M9-28) - (S25-5)	Always	Below 1 Ω
VCS1 (M9-19) - (S25-3)	Always	Below 1 Ω
VSS1 (M9-18) - (S25-1)	Always	Below 1 Ω
E2S1 (M9-17) - (S25-2)	Always	Below 1 Ω
VCS2 (M9-30) - Body ground	Always	10 kΩ or higher
VSS2 (M9-29) - Body ground	Always	10 kΩ or higher
E2S2 (M9-28) - Body ground	Always	10 kΩ or higher
VCS1 (M9-19) - Body ground	Always	10 kΩ or higher
VSS1 (M9-18) - Body ground	Always	10 kΩ or higher
E2S1 (M9-17) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6 INSPECT SELECT STROKE SENSOR



(a) Remove the select stroke sensor.

(b) Check the voltage of the select stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

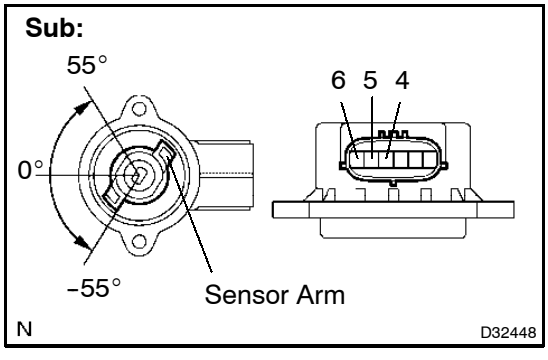
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the select stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

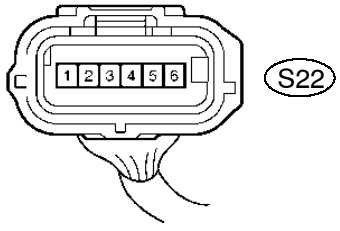
- **Do not apply more than 6 V.**
- **Do not drop the select stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SELECT STROKE SENSOR** **(SEE PAGE 41-27)**

OK

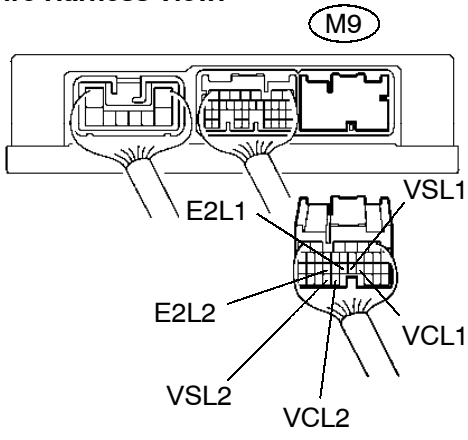
7	CHECK HARNESS OR CONNECTOR (SELECT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Select Stroke Sensor
Wire Harness Connector Front View:



N D32509

Transmission Control ECU
Wire Harness View:



N D32443

(a) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCL2 (M9-31) - (S22-6)	Always	Below 1 Ω
VSL2 (M9-32) - (S22-4)	Always	Below 1 Ω
E2L2 (M9-24) - (S22-5)	Always	Below 1 Ω
VCL1 (M9-20) - (S22-3)	Always	Below 1 Ω
VSL1 (M9-21) - (S22-1)	Always	Below 1 Ω
E2L1 (M9-22) - (S22-2)	Always	Below 1 Ω
VCL2 (M9-31) - Body ground	Always	10 kΩ or higher
VSL2 (M9-32) - Body ground	Always	10 kΩ or higher
E2L2 (M9-24) - Body ground	Always	10 kΩ or higher
VCL1 (M9-20) - Body ground	Always	10 kΩ or higher
VSL1 (M9-21) - Body ground	Always	10 kΩ or higher
E2L1 (M9-22) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0820/71	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/72	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/73	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/74	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/75	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/76	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

DTC	P0820/77	GEAR LEVER X-Y POSITION SENSOR CIRCUIT

CIRCUIT DESCRIPTION

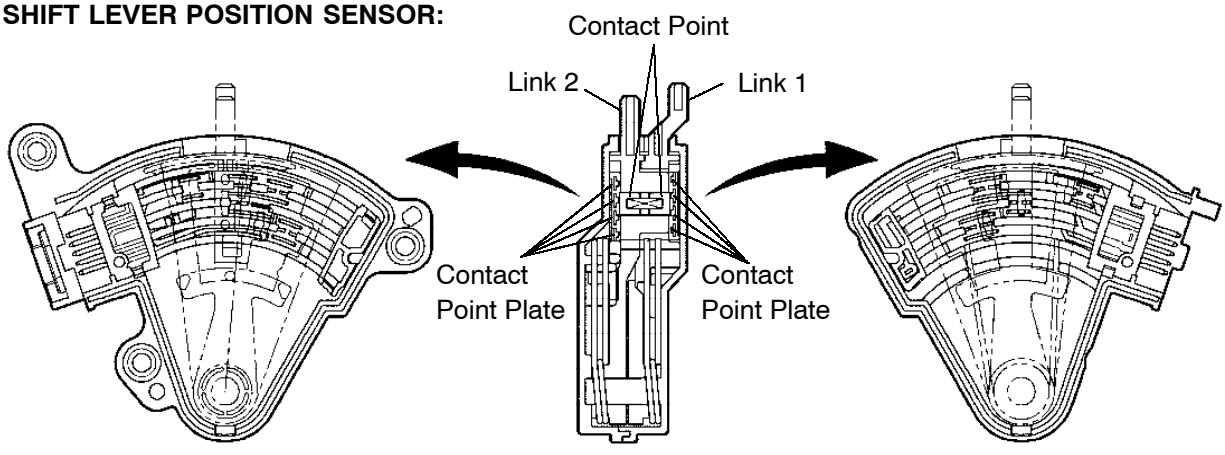
The transmission control ECU detects the switch position of the shift lever position sensor and operates each actuator.

The shift lever position sensor has two functions; the switch for detecting and the switch for monitoring. The transmission control ECU receives the signals from these switches.

- The shift lever position sensor consists of a Link 1 circuit that detects the R, N, E, and M positions of the shift lever, and a Link 2 circuit that detects the "+" and "-" positions. The circuits are connected to the shift lever via the respective links. The contact switches (6-contact switches for Link 1, and 2-contact switches for Link 2) of the circuits turn on and off in accordance with the fore-aft movement of the shift lever. The transmission control ECU determines the present shift lever position in accordance with the ON/OFF status of these contact switches.
- The transmission shift main switch detects the side-to-side movement of the shift lever. It turns off when the shift lever is in the R, N, or E position, and turns on in the M, +, or - position.
- The shift lever position sensor and the transmission shift main switch convert the shift lever position into electric signals and output them to the transmission control ECU. The transmission control ECU determines the present shift lever position from these signals and operates the actuators to change the gear position.

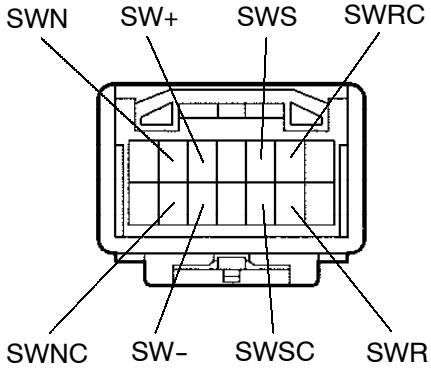
Contact Point		Shift Lever Position					
		R	N	E	M	-	+
Link 1	SWRC	OFF	ON	ON	ON	ON	ON
	SWR	ON	OFF	OFF	OFF	OFF	OFF
	SWSC	ON	ON	OFF	OFF	OFF	OFF
	SWS	OFF	OFF	ON	ON	ON	ON
	SWNC	ON	OFF	ON	ON	ON	ON
	SWN	OFF	ON	OFF	OFF	OFF	OFF
Link 2	SW-	OFF	OFF	OFF	OFF	ON	OFF
	SW+	OFF	OFF	OFF	OFF	OFF	ON
Transmission Shift Main Switch		OFF	OFF	OFF	ON	ON	ON

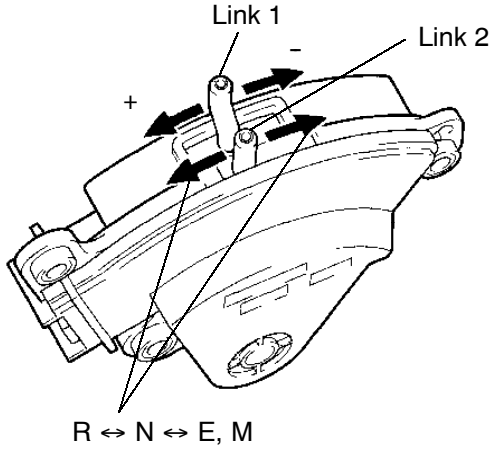
SHIFT LEVER POSITION SENSOR:



Contact Point for SWR, SWSC SWNC and SW-

Contact Point for SWRC, SWS, SWN and SW+



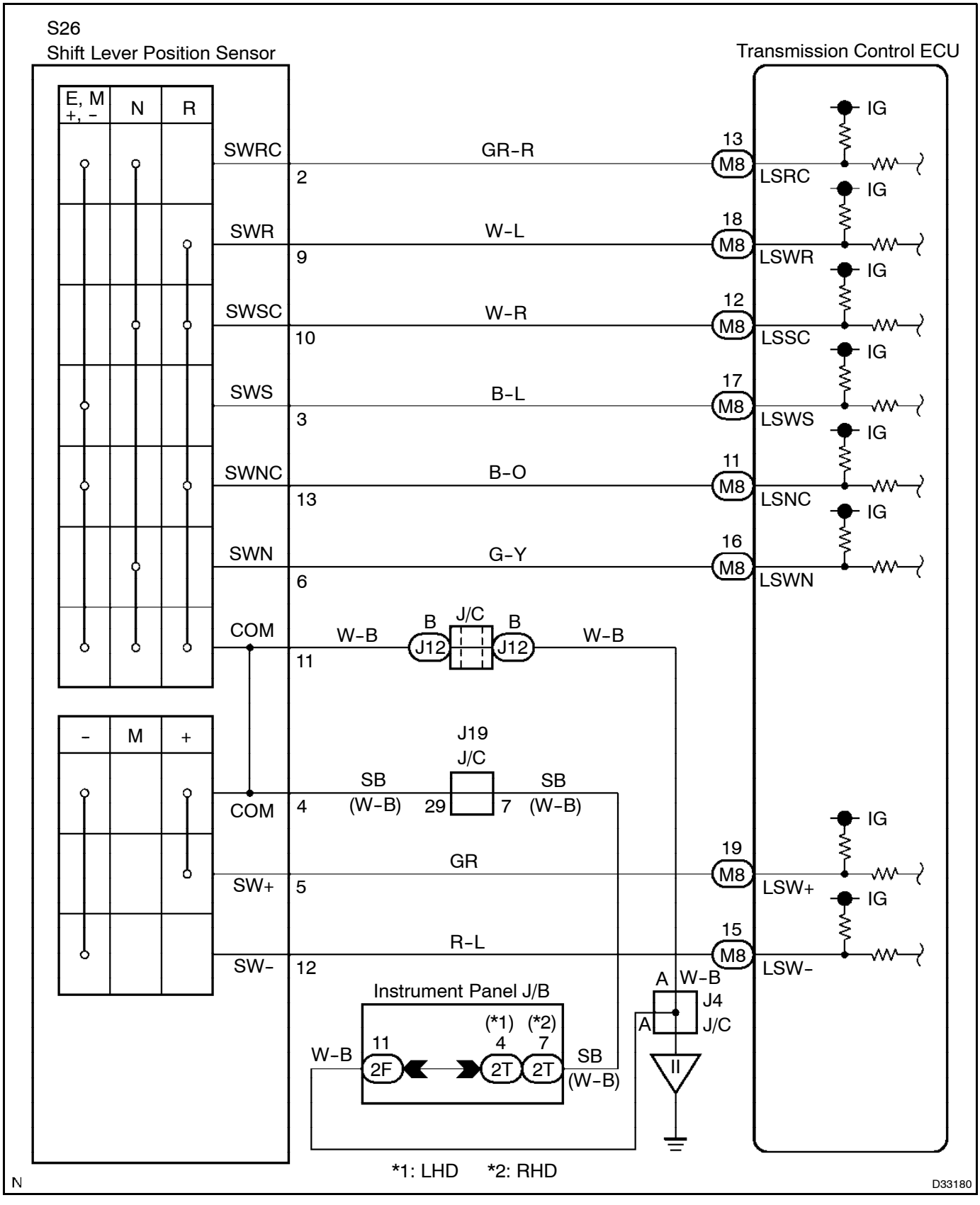


P

D32522

DTC No.	DTC Detecting Condition	Trouble Area
P0820/71 P0820/74	The transmission control ECU detects the following condition (a), (b) or (c). (a) Both the LSWN signal and the LSNC signal are OFF for 5.0 seconds. (b) Both the LSWN signal and the LSNC signal are ON for 30.0 seconds. (c) The condition that both the LSWN signal and the LSNC signal are ON is detected 10 times within 15.0 seconds.	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU
P0820/72 P0820/75	The transmission control ECU detects the following condition (a), (b) or (c). (a) Both the LSWS signal and the LSSC signal are OFF for 5.0 seconds. (b) Both the LSWS signal and the LSSC signal are ON for 30.0 seconds. (c) The condition that both the LSWS signal and the LSSC signal are ON is detected 10 times within 15.0 seconds.	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU
P0820/73 P0820/76	The transmission control ECU detects the following condition (a), (b) or (c). (a) Both the LSWR signal and the LSRC signal are OFF for 5.0 seconds. (b) Both the LSWR signal and the LSRC signal are ON for 30.0 seconds. (c) The condition that both the LSWR signal and the LSRC signal are ON is detected 10 times within 15.0 seconds.	• Shift lever position sensor • Open in shift lever position signal circuit • Transmission control ECU
P0820/77	The transmission control ECU detects the following conditions simultaneously. (a) Shift lever position is N or R (b) LSW+ signal or LSW- signal is ON for 1.0 second.	• Shift lever position sensor • Short in shift lever position signal circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) According to the display on the tester, read the "DATA LIST".
(d) Check that the normal condition specified in the following table is shown on the display when moving the shift lever to each position (R, N, E, M, + and -).

Item	Measurement Item/ Display	Normal Condition	Diagnostic Note
Shift Lever Check Signal 3	Shift lever check signal 3/ GND (OFF), OPEN (ON)	R: GND, N: OPEN, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Check Signal 2	Shift lever check signal 2/ GND (OFF), OPEN (ON)	R: GND, N: GND, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Check Signal 1	Shift lever check signal 1/ GND (OFF), OPEN (ON)	R: OPEN, N: GND, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 5	Shift lever switch signal 5/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: OPEN, M: OPEN, +: OPEN, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 4	Shift lever switch signal 4/ GND (ON), OPEN (OFF)	R: OPEN, N: GND, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 3	Shift lever switch signal 3/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: GND, M: GND, +: GND, -: GND	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 2	Shift lever switch signal 2/ GND (ON), OPEN (OFF)	R: GND, N: OPEN, E: OPEN, M: OPEN, +: OPEN, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.
Shift Lever Switch Signal 1	Shift lever switch signal 1/ GND (ON), OPEN (OFF)	R: OPEN, N: OPEN, E: OPEN, M: OPEN, +: GND, -: OPEN	When there is any malfunction, the indicator keeps showing either ON or OFF no matter where the lever position is.

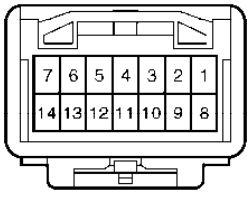
OK: When the shift lever is operated, the conditions listed above are shown on the display.

OK → **Go to step 4**

NG

2 INSPECT SHIFT LEVER POSITION SENSOR

Connector Front View:



N D32459

(a) Disconnect the shift lever position sensor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

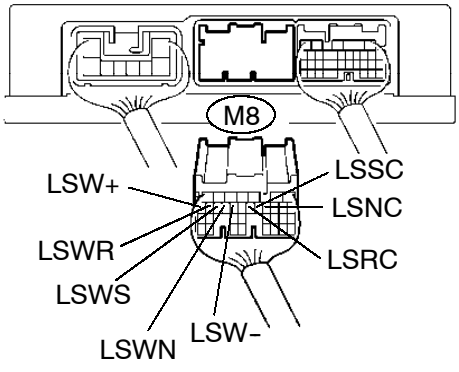
Shift Lever Position	Shift Lever Terminals	Specified Value
R position	4 - 9, 4 - 10, 4 - 11, 4 - 13, 9 - 10, 9 - 11, 9 - 13, 10 - 11, 10 - 13, 11 - 13	Below 1 Ω
N position	2 - 4, 2 - 6, 2 - 10, 2 - 11, 4 - 6, 4 - 10, 4 - 11, 6 - 10, 6 - 11, 10 - 11	Below 1 Ω
E position	2 - 3, 2 - 4, 2 - 11, 2 - 13, 3 - 4, 3 - 11, 3 - 13, 4 - 11, 4 - 13, 11 - 13	Below 1 Ω
M position	2 - 3, 2 - 4, 2 - 11, 2 - 13, 3 - 4, 3 - 11, 3 - 13, 4 - 11, 4 - 13, 11 - 13	Below 1 Ω
+ position	2 - 3, 2 - 4, 2 - 11, 2 - 13, 3 - 4, 3 - 11, 3 - 13, 4 - 11, 4 - 12, 4 - 13, 11 - 12. 11 - 13	Below 1 Ω
- position	2 - 3, 2 - 4, 2 - 11, 2 - 13, 3 - 4, 3 - 11, 3 - 13, 4 - 5, 4 - 11, 4 - 13, 5 - 11, 11 - 13	Below 1 Ω

NG → **REPLACE SHIFT LEVER POSITION SENSOR** **(SEE PAGE 41-11)**

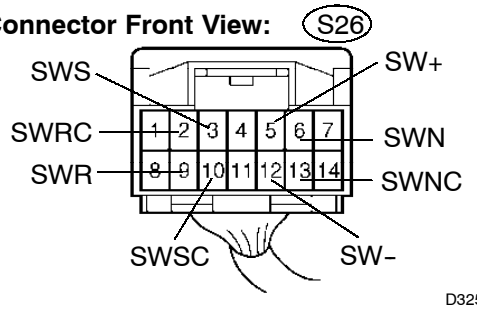
OK

3	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - SHIFT LEVER POSITION SENSOR)

Transmission Control ECU
Wire Harness View:



Shift Lever Position Sensor
Connector Front View: S26



(a) Disconnect the M8 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
SWNC (S26-13) - LSNC (M8-11)	Always	Below 1 Ω
SW- (S26-12) - LSW- (M8-15)	Always	Below 1 Ω
SWSC (S26-10) - LSSC (M8-12)	Always	Below 1 Ω
SWR (S26-9) - LSWR (M8-18)	Always	Below 1 Ω
SWN (S26-6) - LSWN (M8-16)	Always	Below 1 Ω
SW+ (S26-5) - LSW+ (M8-19)	Always	Below 1 Ω
SWS (S26-3) - LSWS (M8-17)	Always	Below 1 Ω
SWRC (S26-2) - LSRC (M8-13)	Always	Below 1 Ω
LSNC (M8-11) - Body ground	Always	10 kΩ or higher
LSW- (M8-15) - Body ground	Always	10 kΩ or higher
LSSC (M8-12) - Body ground	Always	10 kΩ or higher
LSWR (M8-18) - Body ground	Always	10 kΩ or higher
LSWN (M8-16) - Body ground	Always	10 kΩ or higher
LSW+ (M8-19) - Body ground	Always	10 kΩ or higher
LSWS (M8-17) - Body ground	Always	10 kΩ or higher
LSRC (M8-13) - Body ground	Always	10 kΩ or higher

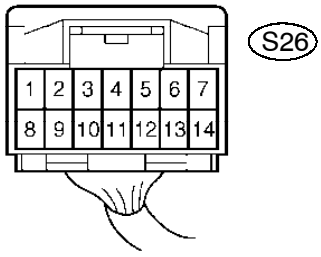
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

4	CHECK HARNESS AND CONNECTOR

Connector Front View:



N D32519

(a) Disconnect the shift lever position sensor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
COM (S26-4) - Body ground	Always	Below 1 Ω
COM (S26-11) - Body ground	Always	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC P0821/79 GEAR LEVER X POSITION CIRCUIT

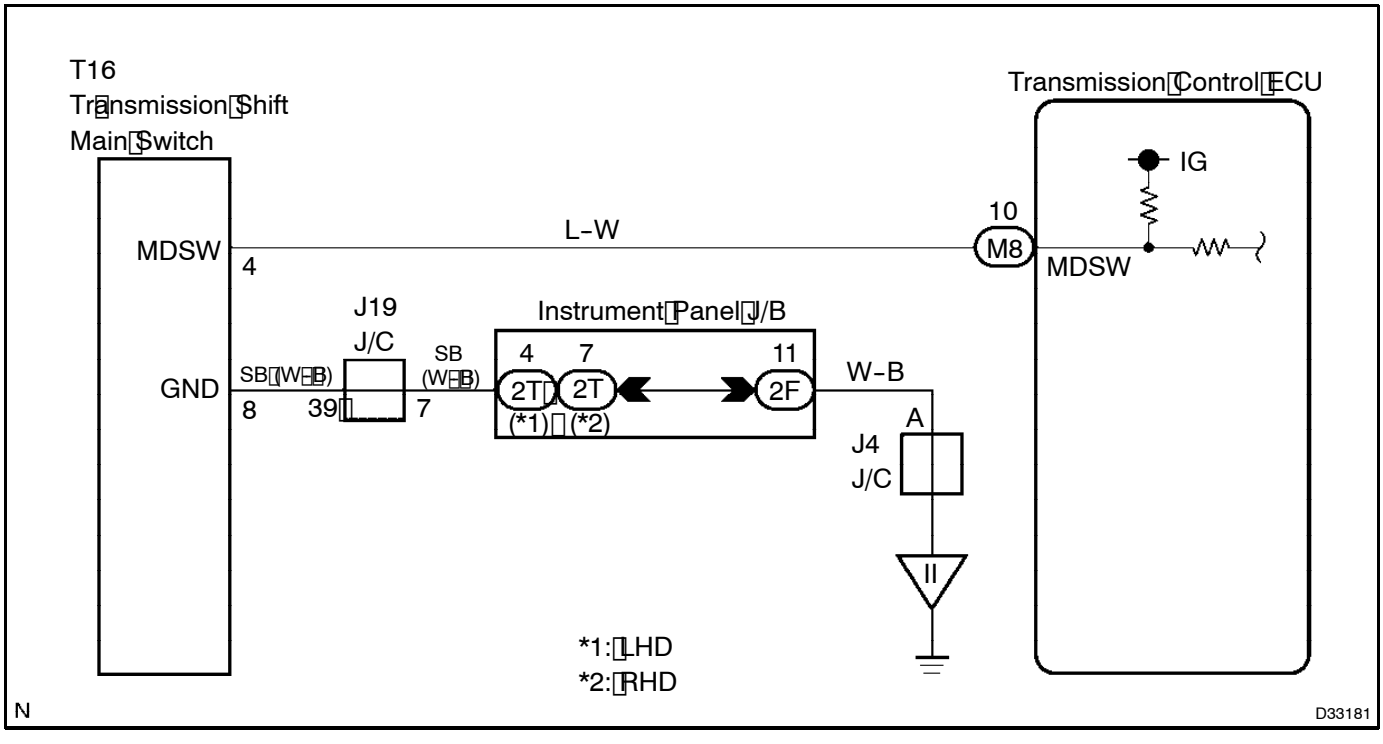
CIRCUIT DESCRIPTION

Based on the signal from the transmission shift main switch, the transmission control ECU detects whether the shift lever position is in the "E" or "M" position.

Refer to DTC P0820/71 on page 05-272.

DTC No.	DTC Detecting Condition	Trouble Area
P0821/79	The transmission control ECU detects the following conditions simultaneously: (a) Shift lever position is N or R. (b) MDSW signal is ON for 1.0 second.	• Transmission shift main switch (Built into shift lever assy) • Short in MDSW signal circuit • Transmission control ECU

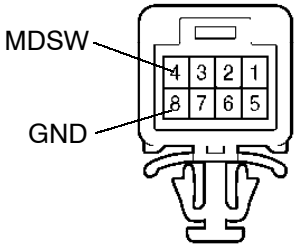
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION SHIFT MAIN SWITCH

Connector Front View:



(a) Disconnect the shift main switch connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

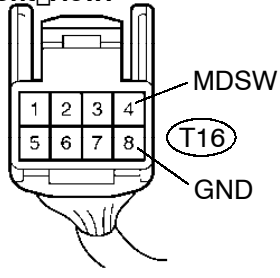
Symbol (Terminal No.)	Shift position	Specified value
MDSW (T16-4) - GND (T16-8)	R, N, E side	10 kΩ or higher
MDSW (T16-4) - GND (T16-8)	M, +, - side	Below 1 Ω

NG → REPLACE TRANSMISSION SHIFT MAIN SWITCH (SEE PAGE 41-11)

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION SHIFT MAIN SWITCH - BODY GROUND, TRANSMISSION CONTROL ECU)

Transmission Shift Main Switch Connector Front View:



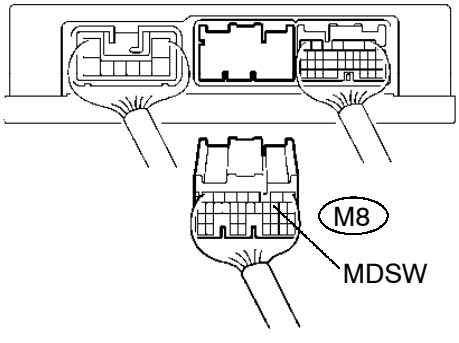
(a) Disconnect the M8 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MDSW (T16-4) - MDSW (M8-10)	Always	Below 1 Ω
GND (T16-8) - Body ground	Always	Below 1 Ω
MDSW (T16-4) - Body ground	Always	10 kΩ or higher

Transmission Control ECU Wire Harness View:



Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

B → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

C → REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

A

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P0885/17	TCM POWER RELAY CONTROL CIRCUIT(OPEN)

DTC	P0887/18	TCM POWER RELAY CONTROL CIRCUIT(SHORT)

CIRCUIT DESCRIPTION

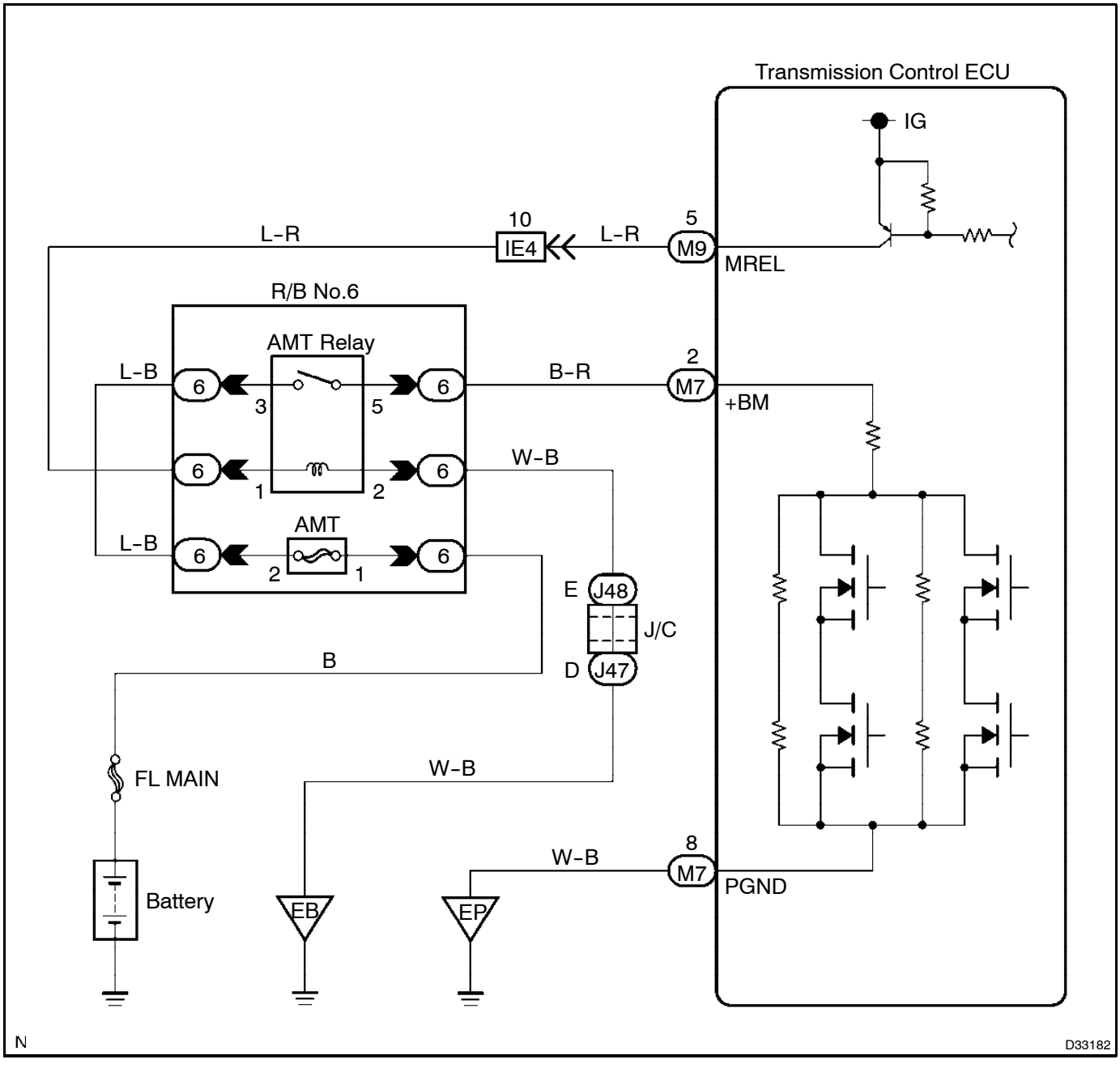
When the ignition switch is on, battery positive voltage is applied to terminal MREL in the transmission control ECU.

When battery positive voltage is applied to terminal MREL, the AMT relay turns on and then battery positive voltage is applied to terminal +BM of the transmission control ECU.

The operations of the clutch motor, shift motor and select motor stop if terminal PGND of the transmission control ECU is open or disconnected.

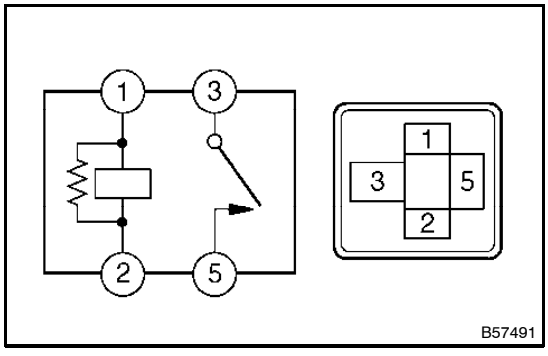
DTC No.	DTC Detecting Condition	Trouble Area
P0885/17	The transmission control ECU detects the following conditions simultaneously: (a) Voltage is supplied to MREL circuit (b) +BM voltage is 6.29 V or less for 0.5 seconds.	• AMT fuse • AMT relay • Open in MREL signal circuit • Open in PGND signal circuit • Open in +BM signal circuit • Transmission control ECU
P0887/18	The transmission control ECU detects the following conditions simultaneously: (a) No voltage is supplied to MREL circuit (b) +BM voltage is 6.29 V or more for 0.1 seconds.	• AMT fuse • AMT relay • Short in MREL signal circuit • Short in PGND signal circuit • Short in +BM signal circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT RELAY (AMT)



(a) Remove the AMT relay from the engine room R/B No.4.
(b) Check for continuity of the AMT relay.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

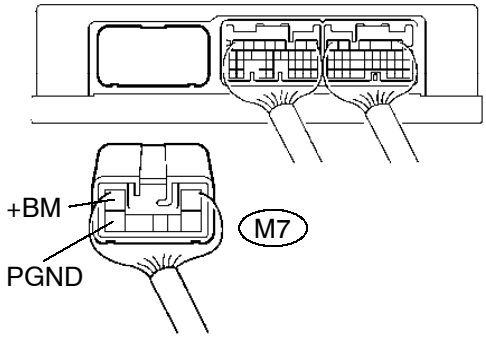
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (When battery voltage is applied to terminals 1 and 2)

NG → **REPLACE RELAY**

OK

2 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Disconnect the M7 connector from the transmission control ECU.
(b) Turn the ignition switch on.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
+BM (M7-2) - PGND (M7-8)	Ignition SW ON	10 to 14 V

NG → **Go to step 3**

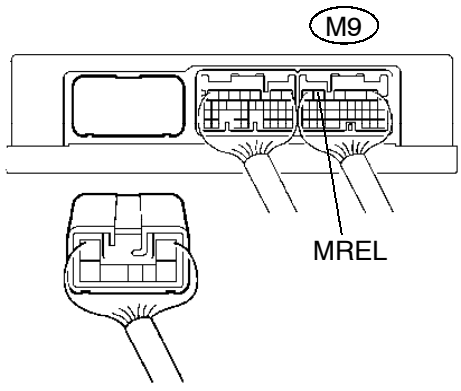
OK

END (NO FAULT DETECTED)

NOTICE:
The symptom may be intermittent. Carefully check harness and connectors and retest.

3	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



N D32441

(a) Turn the ignition switch on.

(b) Measure the voltage according to the value(s) in the table below.

Standard:

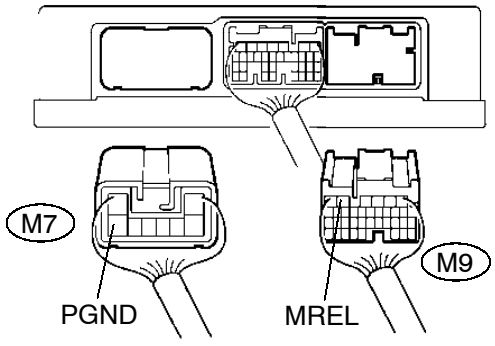
Symbol (Terminal No.)	Condition	Specified value
MREL (M9-5) - Body ground	Turn ignition SW OFF → ON	Below 1 V → 10 to 14 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

4	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BODY GROUND)

Transmission Control ECU Wire Harness View:



N D32443 D32441 D32530

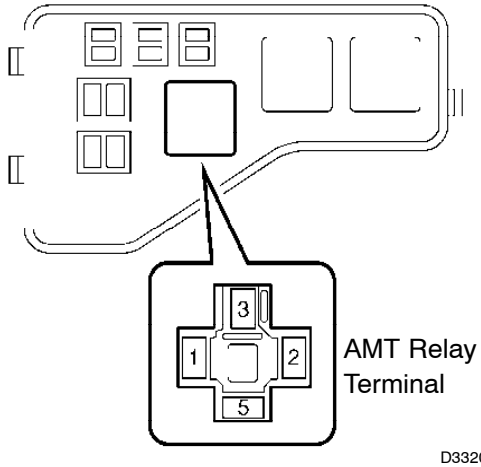
(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MREL (M9-5) - AMT relay terminal 1	Always	Below 1 Ω
AMT relay terminal 2 - Body ground	Always	Below 1 Ω
PGND (M7-8) - Body ground	Always	Below 1 Ω
MREL (M9-5) - Body ground	Always	10 kΩ or higher

Engine Room R/B No.6:



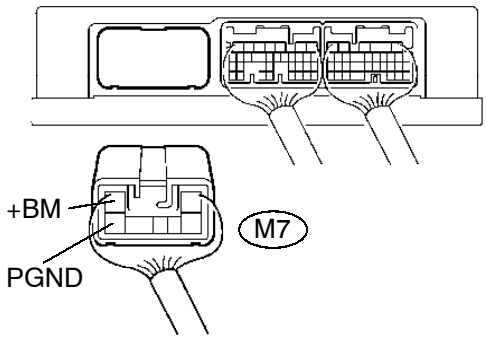
N D33208

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



N D32441

(a) Reconnect the M9 connector to the transmission control ECU.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
+BM (M7-2) - PGND (M7-8)	Turn ignition SW OFF → ON	Below 1 V → 10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY **(SEE PAGE 41-33)**

DTC P0900/21 CLUTCH ACTUATOR CIRCUIT

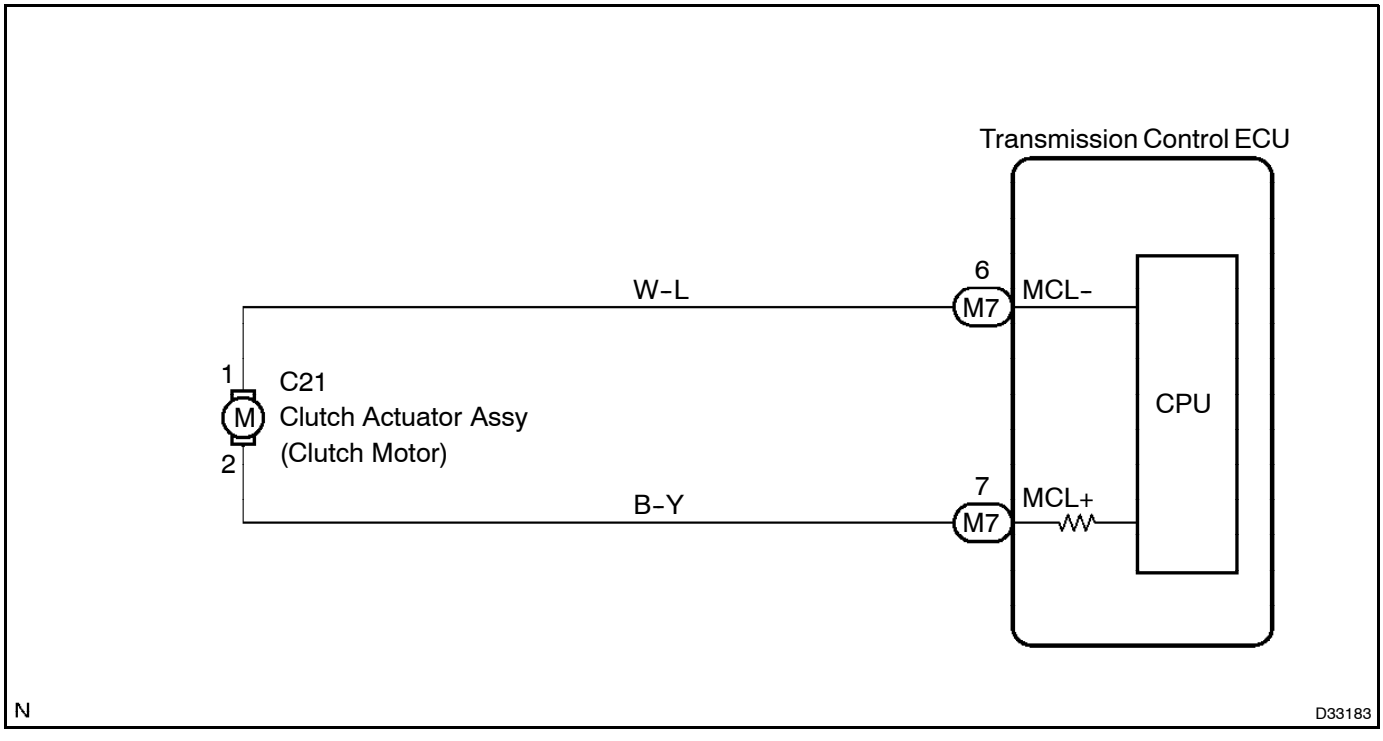
CIRCUIT DESCRIPTION

Detecting the signal from the shift lever position sensor or the speed sensor, the transmission control ECU starts the clutch motor.

Refer to DTC P0885/17 on page 05-282.

DTC No.	DTC Detecting Condition	Trouble Area
P0900/21	The transmission control ECU detects the following condition (a), (b) or (c). (a) (1) Clutch motor voltage is 0.5 V or less or 14 V or more for 0.5 seconds. (2) +BM voltage is 10 V or more. (b) (1) Voltage is supplied to clutch motor. (2) Clutch motor current is 5 A or more. (3) Clutch motor current is 1 A or less. (4) +BM voltage is 10 V or more. (c) (1) No voltage is supplied to clutch motor. (2) Difference of maximum and minimum voltage of clutch motor terminal MCL+ or MCL- is 10 V or more for 0.5 seconds.	• Clutch actuator assy (Clutch motor) • Open or short in clutch motor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the Intelligent Tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Clutch Motor Current MMT" in the DATA LIST and check the clutch motor current.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Clutch Motor Current MMT	Clutch motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	Clutch clamp position: 0 A

OK:
The value on the display is within the normal range.

HINT:
0 A is shown on the display when the clutch actuator assy is not operating.
The value changes when the actuator is operating, although it will only operate momentarily.
There may be a short in the actuator circuit if 1 A or more is shown for several seconds.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

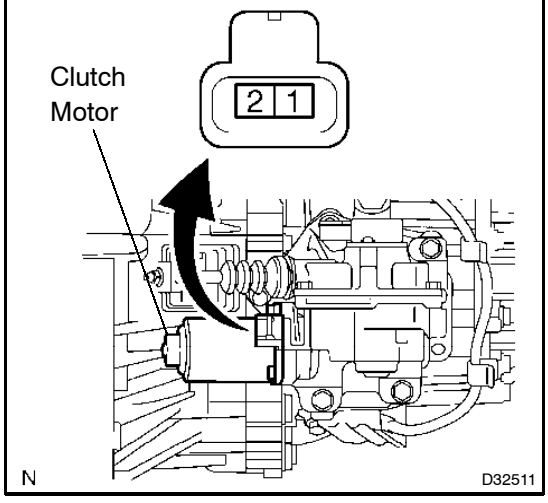
C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

2 INSPECT CLUTCH ACTUATOR ASSY

Connector Front View:



(a) Disconnect the clutch motor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

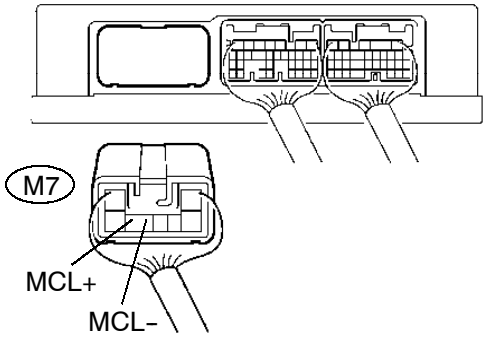
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE CLUTCH ACTUATOR ASSY (SEE PAGE 42-20)**

OK

3 CHECK HARNESS AND CONNECTOR (CLUTCH ACTUATOR ASSY - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:

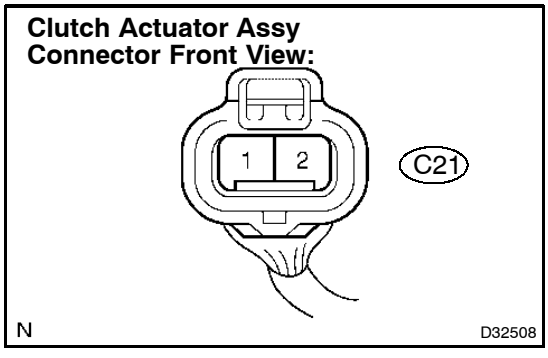


(a) Disconnect the M7 connector of the transmission control ECU.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MCL- (M7-6) - C21-1	Always	Below 1 Ω
MCL+ (M7-7) - C21-2	Always	Below 1 Ω
MCL- (M7-6) - Body ground	Always	10 kΩ or higher
MCL+ (M7-7) - Body ground	Always	10 kΩ or higher

Clutch Actuator Assy Connector Front View:



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0905/59	GATE SELECT POSITION CIRCUIT (RANGE/PERFORMANCE)

DTC	P0906/55	GATE SELECT POSITION CIRCUIT (LOW)

DTC	P0906/57	GATE SELECT POSITION CIRCUIT (LOW)

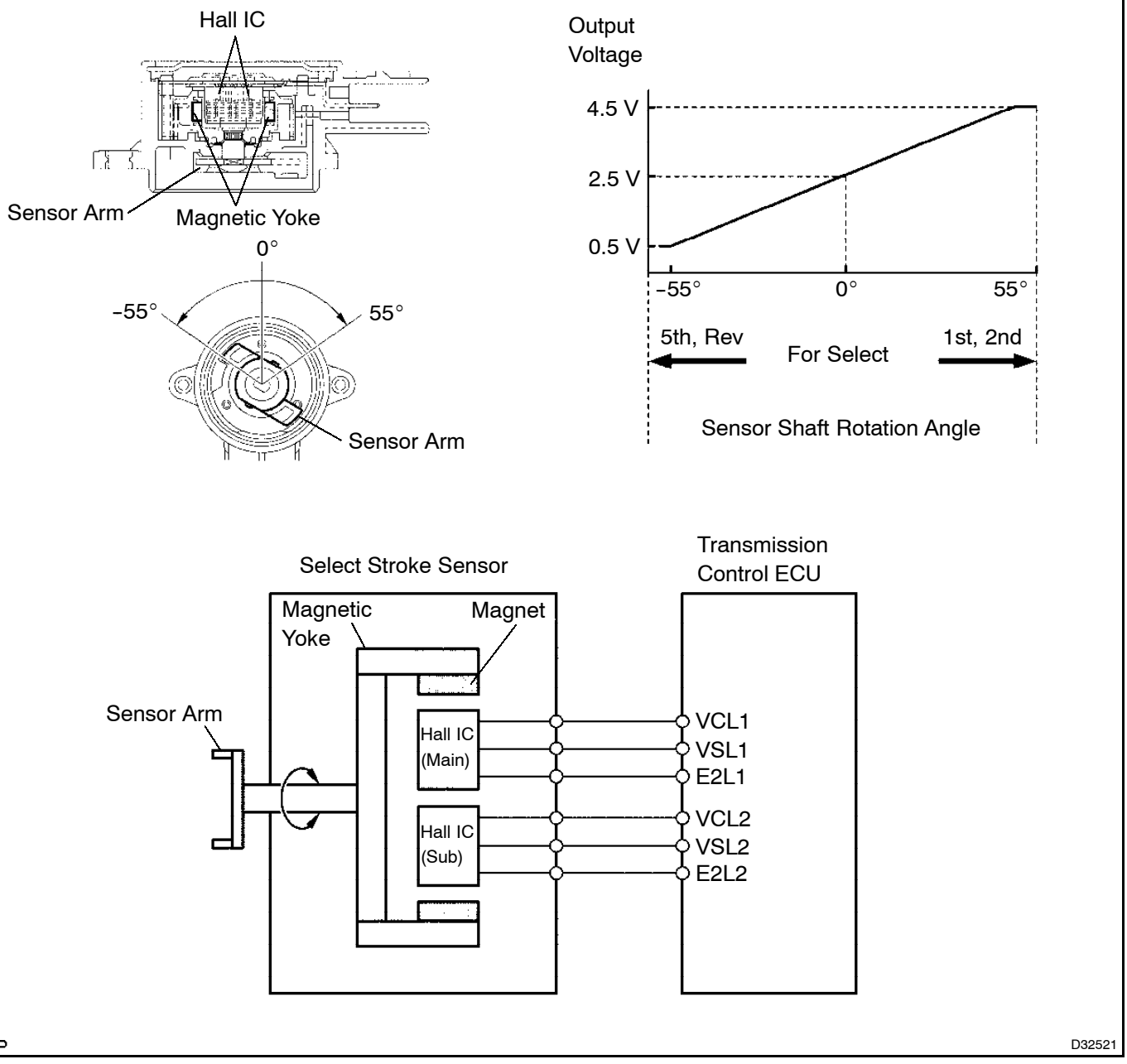
DTC	P0907/56	GATE SELECT POSITION CIRCUIT (HIGH)

DTC	P0907/58	GATE SELECT POSITION CIRCUIT (HIGH)

CIRCUIT DESCRIPTION

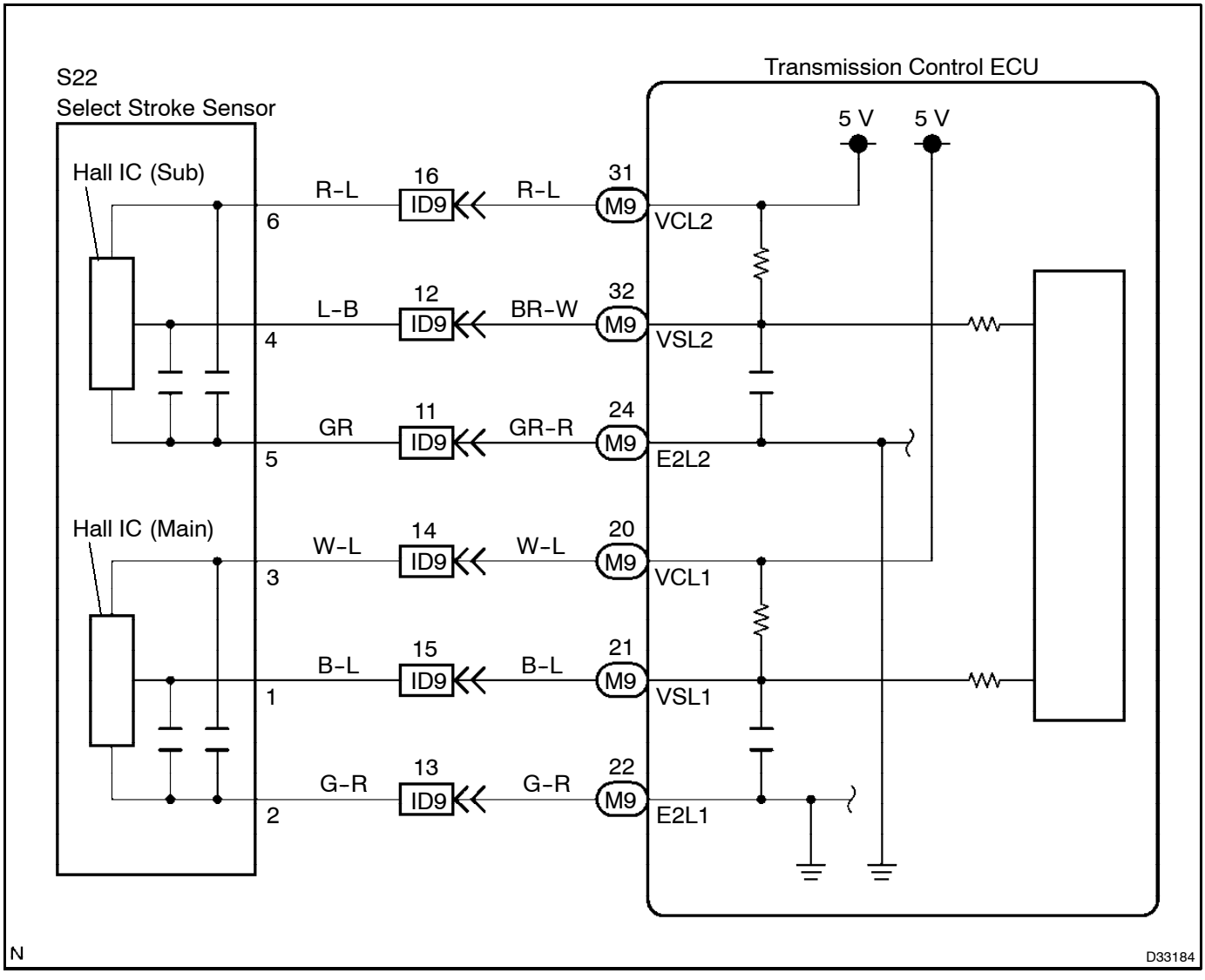
The select stroke sensor rotates the sensor arm when the select motor starts.
The transmission control ECU applies a maximum of 5 V to the select stroke sensor.
The transmission control ECU determines the strokes of the select motor by detecting the change in voltage that occurs with changes in the sensor arm rotation angle.
The select stroke sensor consists of the main sensor and sub sensor to correctly determine the strokes of the select motor.

- The shift and select stroke sensors consist of 2 Hall ICs and a magnetic yoke that rotates together with the select motor. The shift and select stroke sensors convert the changes in the magnetic flux that are caused by the rotation of the shift motor and the selector motor (hence, the rotation of the magnetic yoke) into electric signals, and output them to the transmission control ECU. The transmission control ECU determines the extent of the shift stroke and the select stroke from these electric signals in order to determine the present gear position.
- The basic construction and operation of the shift and select stroke sensors are the same as those of the clutch stroke sensor.
- The main and sub circuits in the shift stroke sensor and the select stroke sensor have the same output characteristics.



DTC No.	DTC Detecting Condition	Trouble Area
P0905/59	• Deviation between sensor signal 1 (main) and sensor signal 2 (sub) is 2.0 mm (0.078 in.) or more for 1.0 second.	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU
P0906/55	• Select stroke sensor (main) voltage is 0.2 V for 0.5 seconds or more.	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU
P0906/57	• Select stroke sensor (sub) voltage is 0.2 V for 0.5 seconds or more.	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU
P0907/56	• Select stroke sensor (main) voltage is 4.8 V for 0.5 seconds or more.	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU
P0907/58	• Select stroke sensor (sub) voltage is 4.8 V for 0.5 seconds or more.	• Select stroke sensor • Open or short in select stroke sensor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the Intelligent Tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Select Position (Current)" in the DATA LIST and check the select position on the tester screen.

Item	Measurement Item	Normal Condition	Diagnostic Note
Select Position (Current)	Select position (current)/ Min.: 0 mm, Max.: 31.999 mm	Normal value: 14.0 mm (0.55 in.) to 36.0 mm (1.42 in.)	Learning value of gear point is displayed when not operating shift lever

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

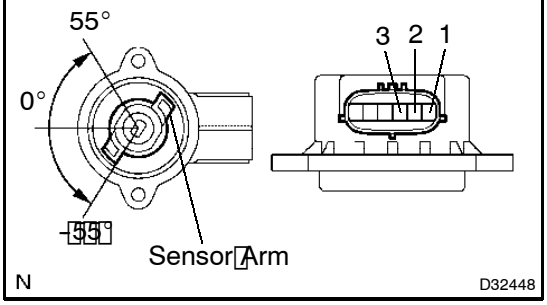
C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

2 INSPECT SELECT STROKE SENSOR

Main:



(a) Remove the select stroke sensor.

(b) Check the voltage of the select stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

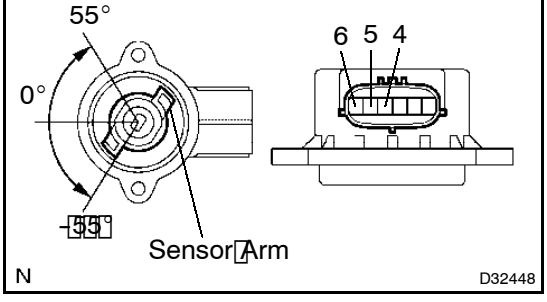
Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

Sub:



(c) Check the voltage of the select stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

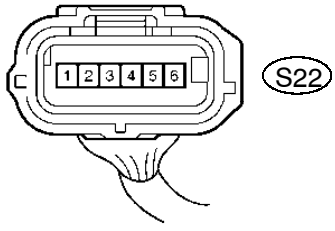
- **Do not apply more than 6 V.**
- **Do not drop the select stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SELECT STROKE SENSOR**
(SEE PAGE 41-25)

OK

3	CHECK HARNESS AND CONNECTOR (SELECT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Select Stroke Sensor
Wire Harness Connector Front View:



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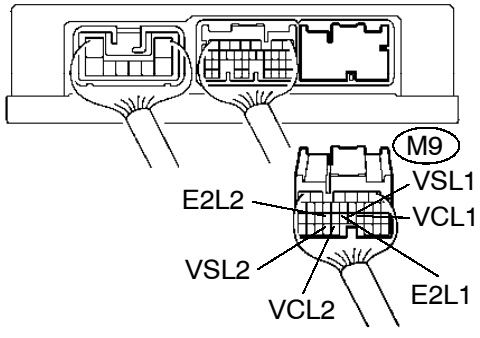
Transmission Control ECU
Wire Harness View:



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(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCL2 (M9-31) - (S22-6)	Always	Below 1 Ω
VSL2 (M9-32) - (S22-4)	Always	Below 1 Ω
E2L2 (M9-24) - (S22-5)	Always	Below 1 Ω
VCL1 (M9-20) - (S22-3)	Always	Below 1 Ω
VSL1 (M9-21) - (S22-1)	Always	Below 1 Ω
E2L1 (M9-22) - (S22-2)	Always	Below 1 Ω
VCL2 (M9-31) - Body ground	Always	10 kΩ or higher
VSL2 (M9-32) - Body ground	Always	10 kΩ or higher
E2L2 (M9-24) - Body ground	Always	10 kΩ or higher
VCL1 (M9-20) - Body ground	Always	10 kΩ or higher
VSL1 (M9-21) - Body ground	Always	10 kΩ or higher
E2L1 (M9-22) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ↓

REPLACE TRANSMISSION CONTROL ECU ASSY **(SEE PAGE 41-33)**

DTC	P0909/37	GATE SELECT CONTROL ERROR

CIRCUIT DESCRIPTION

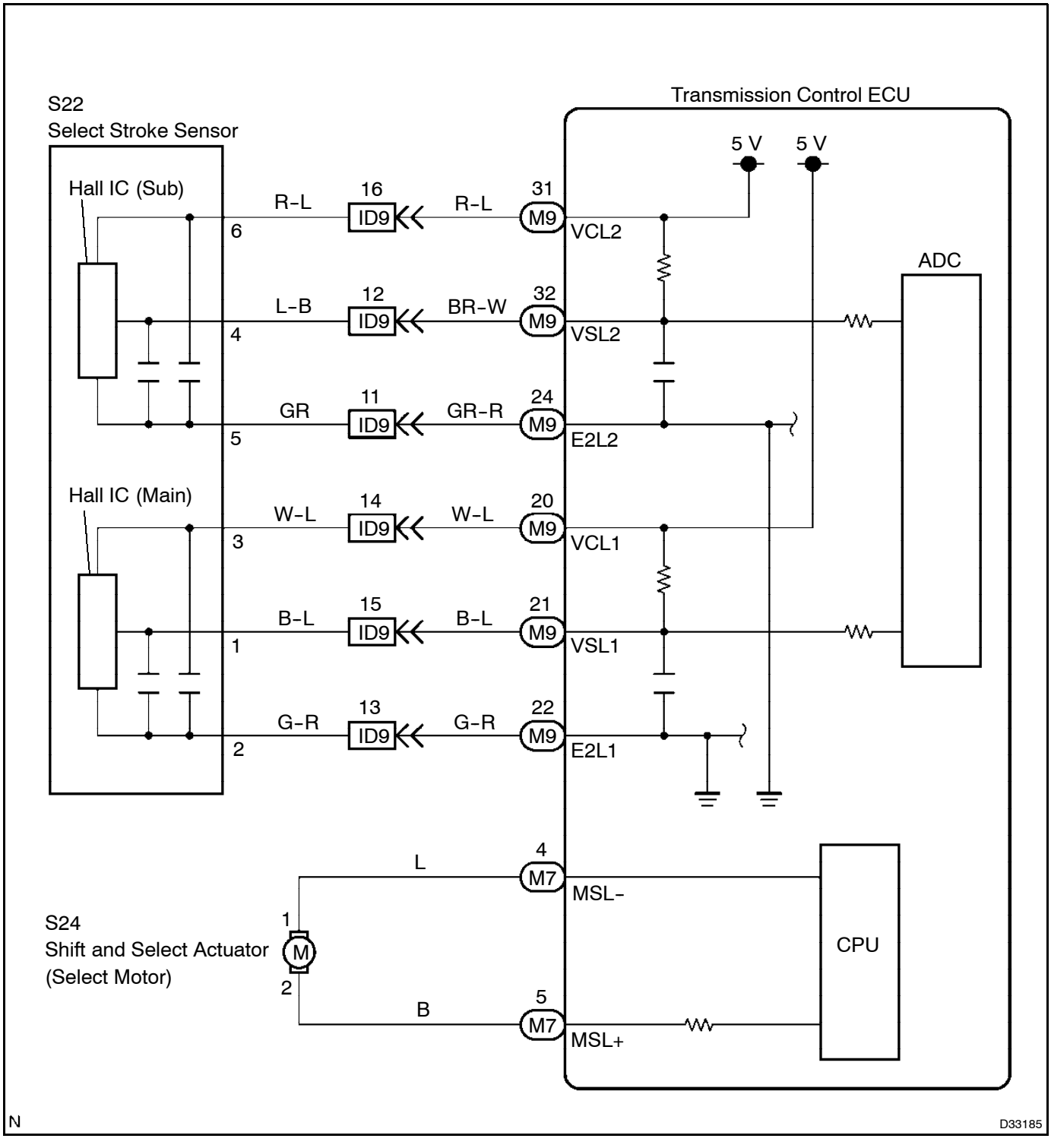
Refer to DTC P0905/59 on page 05-291 and DTC P0910/51 on page 05-309.

HINT:

This DTC is detected according to the stroke speed of the select actuator or the difference between the select position memorized in the ECU and the actual select position. This DTC, therefore, is not detected together with DTC P0905/59 or P0910/51, which indicates electrical malfunctions.

DTC No.	DTC Detecting Condition	Trouble Area
P0909/37	The transmission control ECU detects the following conditions simultaneously: (a) Select motor current is 20 A or more for 2.0 seconds. (b) A difference between the target select stroke and the actual select stroke is 0.3 mm (0.0118 in.) or more. (c) The amount of select stroke movements is 125 mm (4.92 in.)/sec. or less.	• Select stroke sensor • Shift and select actuator assy (Select motor) • Open or short in select stroke sensor circuit • Open or short in select motor circuit • Shift head • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the items "Select Position (Current)" and "Select Motor Current MMT" in the DATA LIST and check the tester screen.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Select Position (Current)	Select position (current)/ Min.: 0 mm, Max.: 31.999 mm	Normal value: 14.0 mm (0.55 in.) to 36.0 mm (1.42 in.)	Learning value of gear point is displayed when not operating shift lever
Select Motor Current MMT	Select motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	When not operating shift lever: 0 A

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG ("Select Motor Current MMT" is defective)	A
NG ("Select Position" is defective)	B
NG (Both items are defective)	C
OK	D

B → **Go to step 5**

C → **Go to step 8**

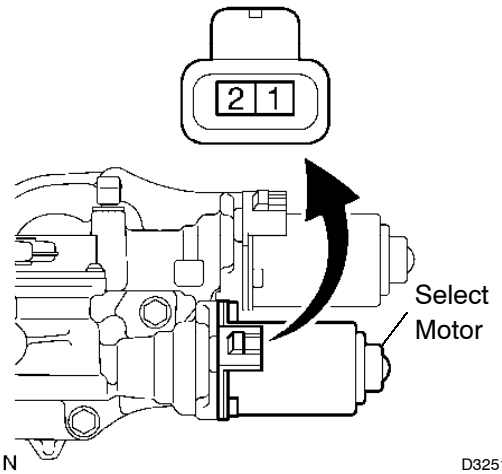
D → **OPERATION CHECK**

HINT:
If symptoms still occur even after checking the shift head for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.
When a malfunction is found with the shift head, replace the select actuator assy (refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E).

A

2 INSPECT SHIFT & SELECT ACTUATOR ASSY

Connector Front View:



(a) Disconnect the select motor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

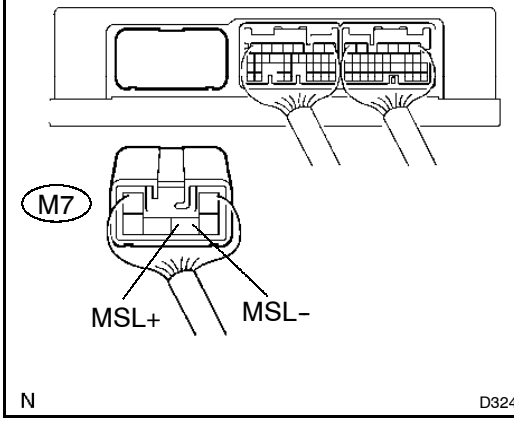
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

3 CHECK HARNESS AND CONNECTOR (SELECT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



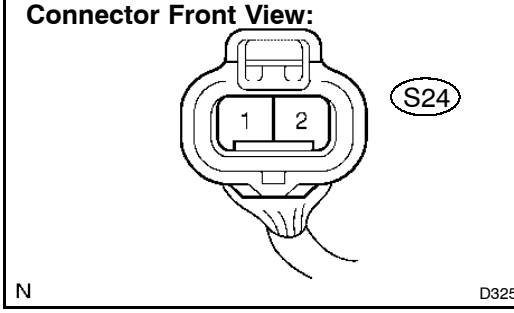
(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSL- (M7-4) - (S24-1)	Always	Below 1 Ω
MSL+ (M7-5) - (S24-2)	Always	Below 1 Ω
MSL- (M7-4) - Body ground	Always	10 kΩ or higher
MSL+ (M7-5) - Body ground	Always	10 kΩ or higher

Select Motor Connector Front View:

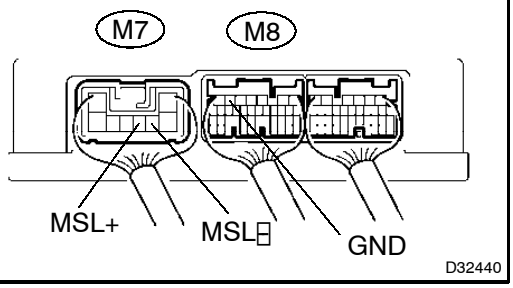


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the M7 connector to the transmission control ECU and select motor connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
MSL+ (M7-5) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MSL- (M7-4) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY** **(SEE PAGE 41-33)**

OK

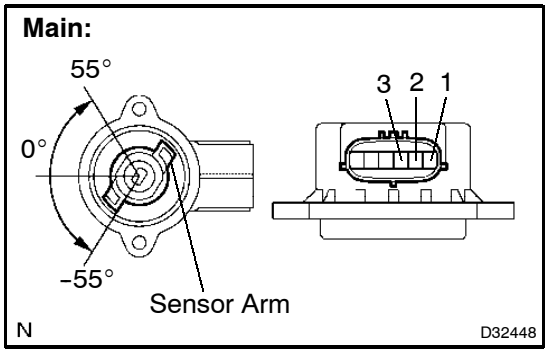
OPERATION CHECK

HINT:

If symptoms still occur even after checking the shift head for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

When a malfunction is found with the shift head, replace the shift and select actuator assy (refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E).

5 INSPECT SELECT STROKE SENSOR



(a) Remove the select stroke sensor.

(b) Check the voltage of the select stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

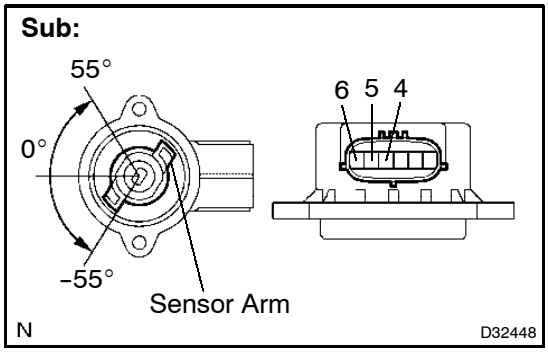
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the select stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

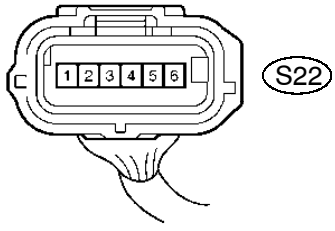
- **Do not apply more than 6 V.**
- **Do not drop the select stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SELECT STROKE SENSOR** **(SEE PAGE 41-27)**

OK

6	CHECK HARNESS AND CONNECTOR (SELECT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Select Stroke Sensor
Wire Harness Connector Front View:



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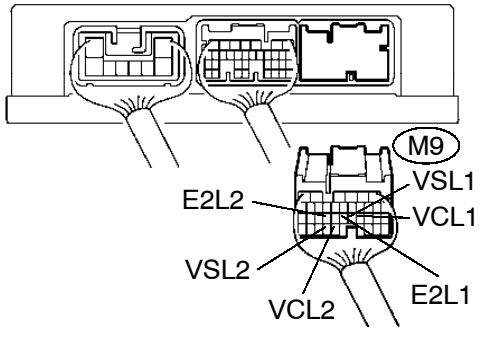
Transmission Control ECU
Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

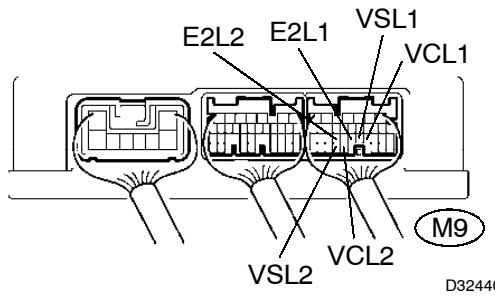
Symbol (Terminal No.)	Condition	Specified value
VCL2 (M9-31) - (S22-6)	Always	Below 1 Ω
VSL2 (M9-32) - (S22-4)	Always	Below 1 Ω
E2L2 (M9-24) - (S22-5)	Always	Below 1 Ω
VCL1 (M9-20) - (S22-3)	Always	Below 1 Ω
VSL1 (M9-21) - (S22-1)	Always	Below 1 Ω
E2L1 (M9-22) - (S22-2)	Always	Below 1 Ω
VCL2 (M9-31) - Body ground	Always	10 kΩ or higher
VSL2 (M9-32) - Body ground	Always	10 kΩ or higher
E2L2 (M9-24) - Body ground	Always	10 kΩ or higher
VCL1 (M9-20) - Body ground	Always	10 kΩ or higher
VSL1 (M9-21) - Body ground	Always	10 kΩ or higher
E2L1 (M9-22) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the M9 connector to the transmission control ECU.
(b) Turn the ignition switch on.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCL2 (M9-31) - E2L2 (M9-24)	Ignition SW ON	Approx. 5 V
VCL1 (M9-20) - E2L1 (M9-22)	Ignition SW ON	Approx. 5 V
VSL2 (M9-32) - E2L2 (M9-24)	Ignition SW ON	0.5 to 4.5 V
VSL1 (M9-21) - E2L1 (M9-22)	Ignition SW ON	0.5 to 4.5 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

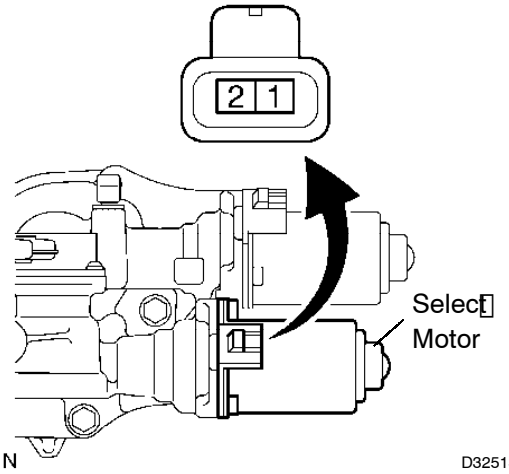
OK

OPERATION CHECK

HINT:
If symptoms still occur even after checking the shift head for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.
When a malfunction is found with the shift head, replace the shift and select actuator assy (refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E).

8	INSPECT SHIFT & SELECT ACTUATOR ASSY

Connector Front View:



(a) Disconnect the select motor connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

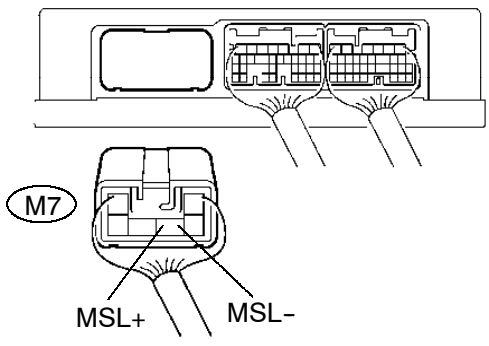
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

9	CHECK HARNESS AND CONNECTOR (SELECT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



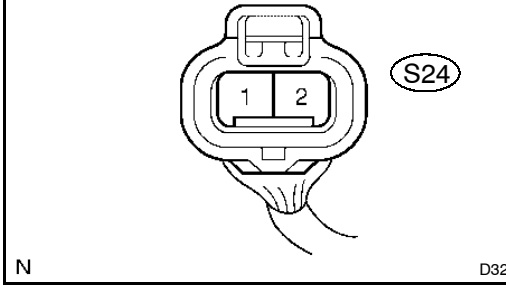
(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSL- (M7-4) - (S24-1)	Always	Below 1 Ω
MSL+ (M7-5) - (S24-2)	Always	Below 1 Ω
MSL- (M7-4) - Body ground	Always	10 kΩ or higher
MSL+ (M7-5) - Body ground	Always	10 kΩ or higher

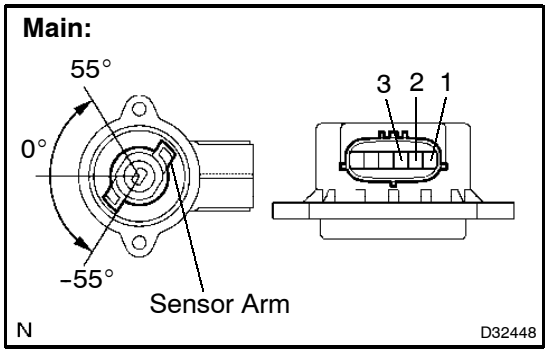
Select Motor Connector Front View:



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10 INSPECT SELECT STROKE SENSOR



(a) Remove the select stroke sensor.

(b) Check the voltage of the select stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

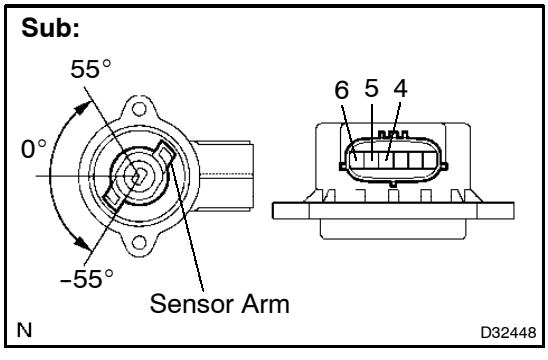
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the select stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

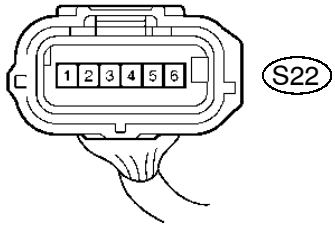
- **Do not apply more than 6 V.**
- **Do not drop the select stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SELECT STROKE SENSOR** **(SEE PAGE 41-27)**

OK

11	CHECK HARNESS AND CONNECTOR (SELECT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Select Stroke Sensor
Wire Harness Connector Front View:



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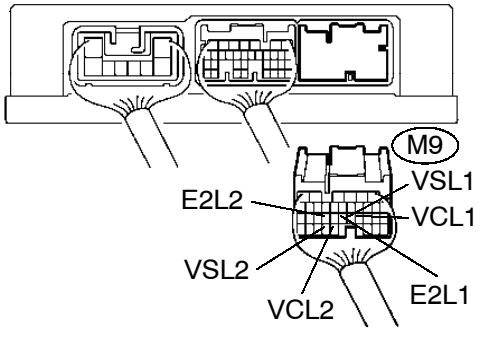
Transmission Control ECU
Wire Harness View:



N D32443

(a) Reconnect the M7 connector.
(b) Disconnect the M9 connector of the transmission control ECU.
(c) Measure the resistance according to the value(s) in the table below.

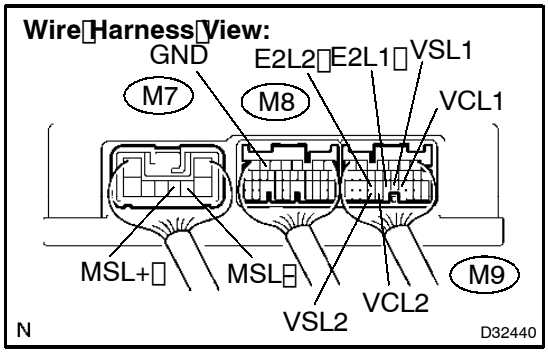
Standard:

Symbol (Terminal No.)	Condition	Specified value
VCL2 (M9-31) - (S22-6)	Always	Below 1 Ω
VSL2 (M9-32) - (S22-4)	Always	Below 1 Ω
E2L2 (M9-24) - (S22-5)	Always	Below 1 Ω
VCL1 (M9-20) - (S22-3)	Always	Below 1 Ω
VSL1 (M9-21) - (S22-1)	Always	Below 1 Ω
E2L1 (M9-22) - (S22-2)	Always	Below 1 Ω
VCL2 (M9-31) - Body ground	Always	10 kΩ or higher
VSL2 (M9-32) - Body ground	Always	10 kΩ or higher
E2L2 (M9-24) - Body ground	Always	10 kΩ or higher
VCL1 (M9-20) - Body ground	Always	10 kΩ or higher
VSL1 (M9-21) - Body ground	Always	10 kΩ or higher
E2L1 (M9-22) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

12 INSPECT TRANSMISSION CONTROL ECU ASSY



(a) Reconnect the M9 connector to the transmission control ECU.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
VCL2 (M9-31) - E2L2 (M9-24)	Ignition SW ON	Approx. 5 V
VCL1 (M9-20) - E2L1 (M9-22)	Ignition SW ON	Approx. 5 V
VSL2 (M9-32) - E2L2 (M9-24)	Ignition SW ON	0.5 to 4.5 V
VSL1 (M9-21) - E2L1 (M9-22)	Ignition SW ON	0.5 to 4.5 V
MSL+ (M7-5) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MSL- (M7-4) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY** **(SEE PAGE 41-33)**

OK

OPERATION CHECK

HINT:

If symptoms still occur even after checking the shift head for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

When a malfunction is found with the shift head, replace the shift and select actuator assy (refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E).

DTC P0910/51 GATE SELECT ACTUATOR CIRCUIT

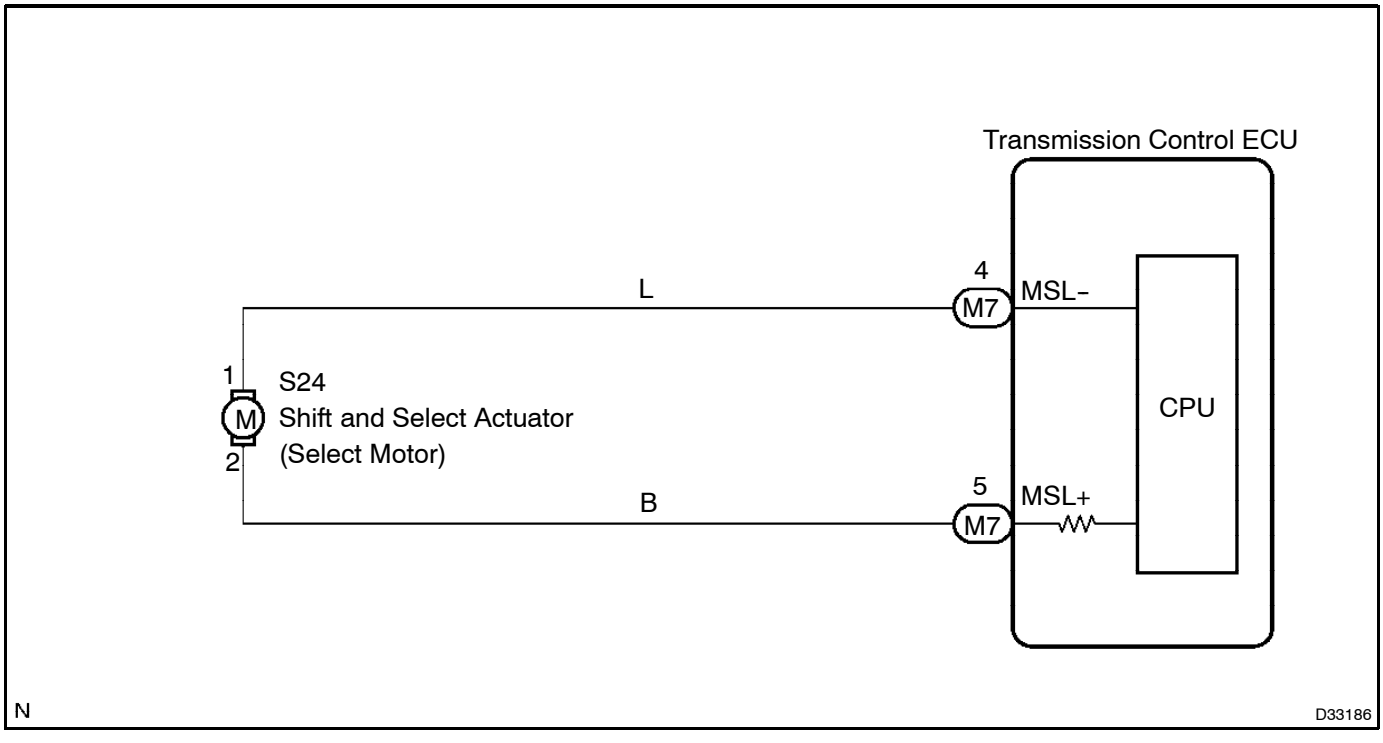
CIRCUIT DESCRIPTION

Detecting the signal from the shift lever position sensor, the transmission control ECU starts the select motor.

Refer to DTC P0885/17 on page 05-282.

DTC No.	DTC Detecting Condition	Trouble Area
P0910/51	The transmission control ECU detects the following condition (a), (b) or (c). (a) (1) Select motor voltage is 0.5 V or less or 14 V or more for 0.5 seconds. (2) +BM voltage is 10 V or more. (b) (1) Voltage is supplied to select motor. (2) Select motor current is 5 A or more. (3) Select motor current is 1 A or less. (4) +BM voltage is 10 V or more. (c) (1) No voltage is supplied to select motor. (2) Difference of maximum and minimum voltage of select motor terminal MSL+ or MSL- is 10 V or more for 0.5 seconds.	• Shift and select actuator assy (Select motor) • Open or short in select motor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Select Motor Current MMT" in the DATA LIST and check the tester screen.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Select Motor current MMT	Select motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 20 A	When not operating shift lever: 0 A

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

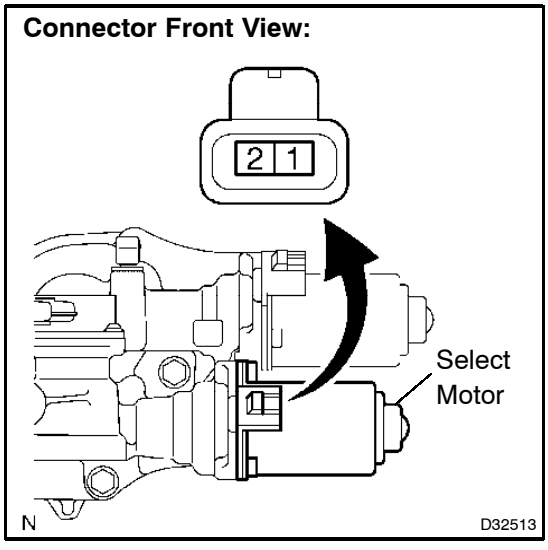
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

2 INSPECT SHIFT & SELECT ACTUATOR ASSY



(a) Disconnect the select motor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

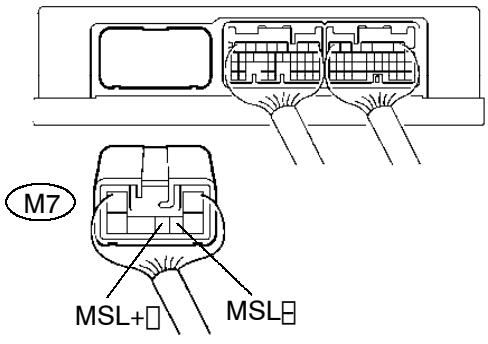
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

3	CHECK HARNESS AND CONNECTOR (SELECT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



N D32441

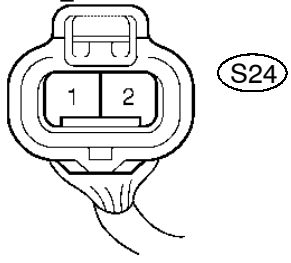
(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSL- (M7-4) - (S24-1)	Always	Below 1 Ω
MSL+ (M7-5) - (S24-2)	Always	Below 1 Ω
MSL- (M7-4) - Body ground	Always	10 kΩ or higher
MSL+ (M7-5) - Body ground	Always	10 kΩ or higher

Select Motor Connector Front View:



N D32508

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0915/49	GEAR SHIFT POSITION CIRCUIT (RANGE/PERFORMANCE)

DTC	P0916/45	GEAR SHIFT POSITION CIRCUIT (LOW)

DTC	P0916/47	GEAR SHIFT POSITION CIRCUIT (LOW)

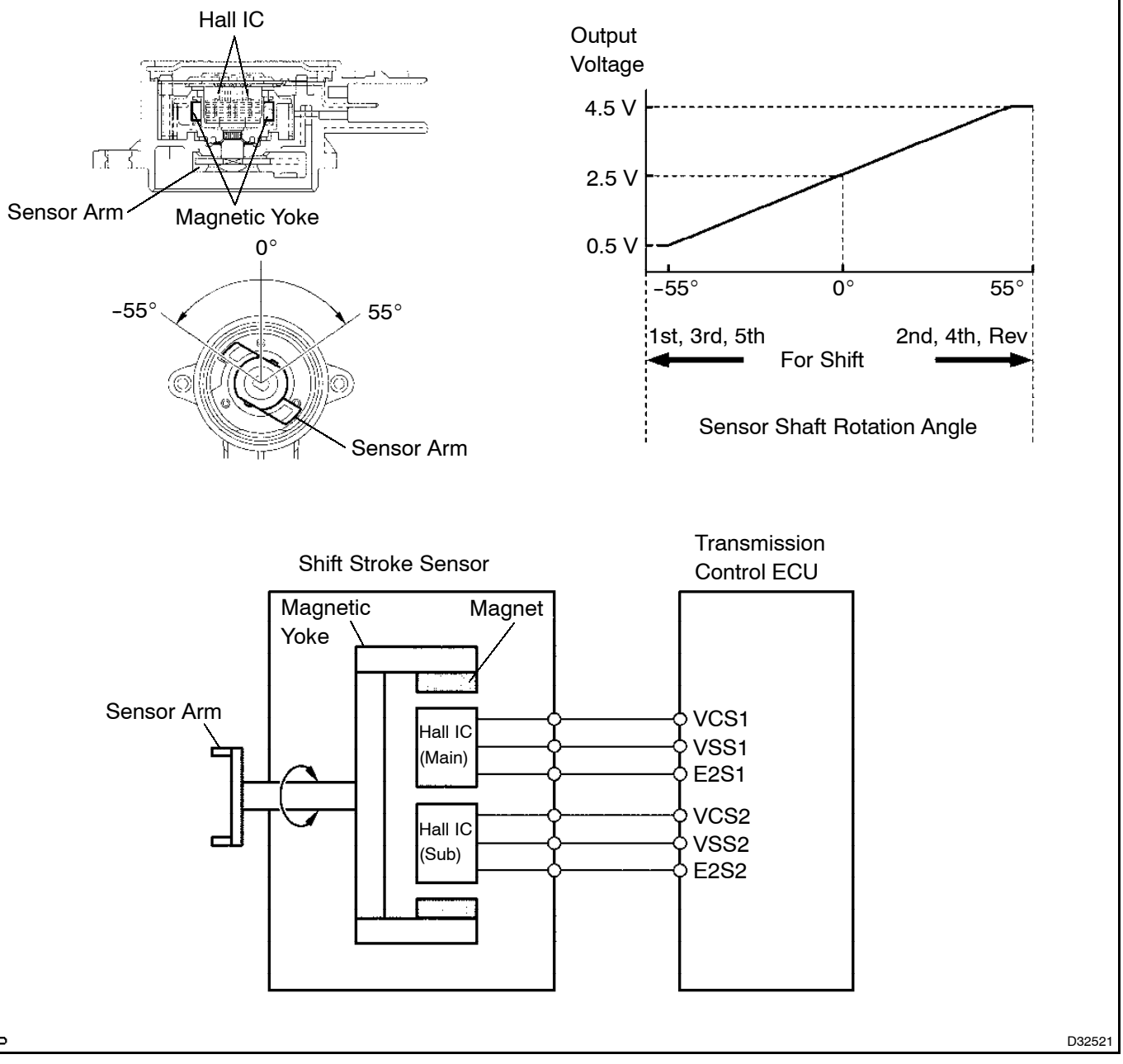
DTC	P0917/46	GEAR SHIFT POSITION CIRCUIT (HIGH)

DTC	P0917/48	GEAR SHIFT POSITION CIRCUIT (HIGH)

CIRCUIT DESCRIPTION

Detecting the signal from the shift lever position sensor, the transmission control ECU starts the shift motor.
The shift stroke sensor rotates the sensor arm when the shift motor starts.
The transmission control ECU applies a maximum of 5 V to the shift stroke sensor.
The transmission control ECU determines the strokes of the shift motor by detecting the change in voltage that occurs with changes in the sensor arm rotation angle.
The shift stroke sensor consists of the main sensor and sub sensor to correctly determine the strokes of the select motor.

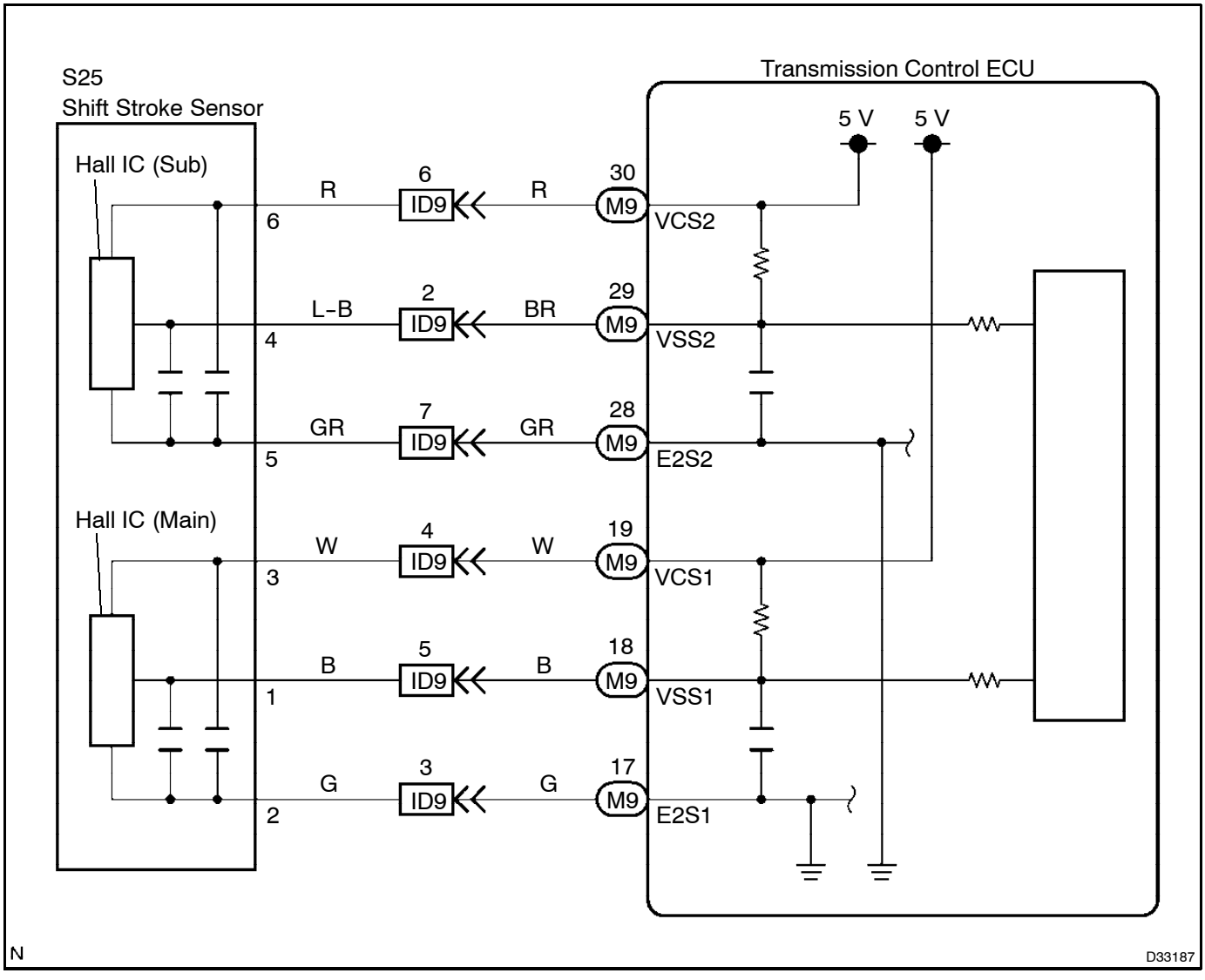
- The shift and select stroke sensors consist of 2 Hall ICs and a magnetic yoke that rotates together with the shift motor. The shift and select stroke sensors convert the changes in the magnetic flux that are caused by the rotation of the shift motor and the selector motor (hence, the rotation of the magnetic yoke) into electric signals, and output them to the transmission control ECU. The transmission control ECU determines the extent of the shift stroke and the select stroke from these electric signals in order to determine the present gear position.
- The basic construction and operation of the shift and select stroke sensors are the same as those of the clutch stroke sensor.
- The main and sub circuits in the shift stroke sensor and the select stroke sensor have the same output characteristics.



P D32521

DTC No.	DTC Detecting Condition	Trouble Area
P0915/49	• Deviation between sensor signal 1 (main) and sensor signal 2 (sub) is 2.0 mm (0.078 in.) for 1.0 second or more.	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU
P0916/45	• Shift stroke sensor (main) voltage is 0.2 V for 0.5 seconds or more.	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU
P0916/47	• Shift stroke sensor (sub) voltage is 0.2 V for 0.5 seconds or more.	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU
P0917/46	• Shift stroke sensor (main) voltage is 4.8 V for 0.5 seconds or more.	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU
P0917/48	• Shift stroke sensor (sub) voltage is 4.8 V for 0.5 seconds or more.	• Shift stroke sensor • Open or short in shift stroke sensor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Shift Position (Current)" in the DATA LIST and check the shift position on the tester screen.

Item	Measurement Item	Normal Condition	Diagnostic Note
Shift Position (Current)	Shift position (current)/ Min.: 0 mm, Max.: 34 mm	Normal value: 5.0 mm (0.20 in.) to 34.0 mm (1.34 in.)	Learning value of gear point is displayed when not operating shift lever

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

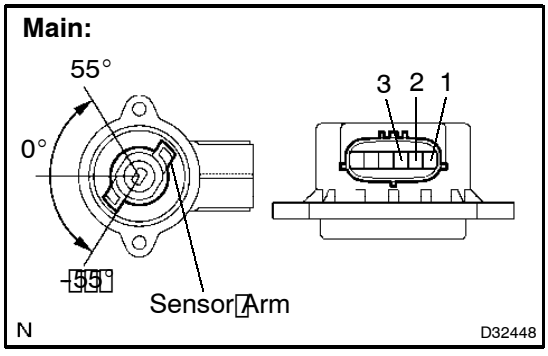
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

2 INSPECT SHIFT STROKE SENSOR



(a) Remove the shift stroke sensor.

(b) Check the voltage of the shift stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

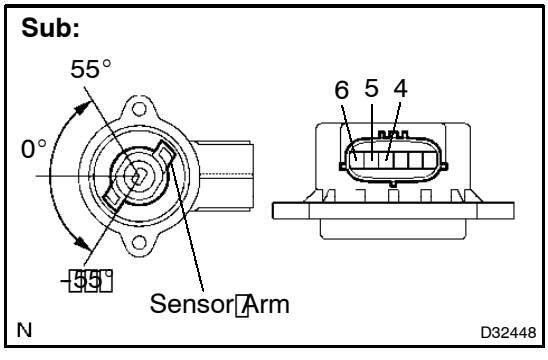
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the shift stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

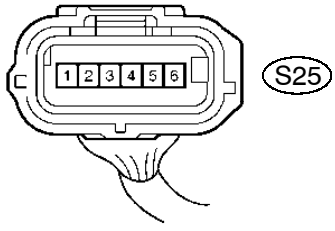
- **Do not apply more than 6 V.**
- **Do not drop the shift stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SHIFT STROKE SENSOR**
(SEE PAGE 41-25)

OK

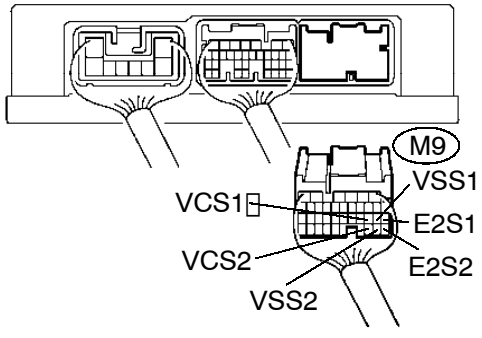
3	CHECK HARNESS AND CONNECTOR (SHIFT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Shift Stroke Sensor Wire Harness Connector Front View:



N D32509

Transmission Control ECU Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
VCS2 (M9-30) - (S25-6)	Always	Below 1 Ω
VSS2 (M9-29) - (S25-4)	Always	Below 1 Ω
E2S2 (M9-28) - (S25-5)	Always	Below 1 Ω
VCS1 (M9-19) - (S25-3)	Always	Below 1 Ω
VSS1 (M9-18) - (S25-1)	Always	Below 1 Ω
E2S1 (M9-17) - (S25-2)	Always	Below 1 Ω
VCS2 (M9-30) - Body ground	Always	10 kΩ or higher
VSS2 (M9-29) - Body ground	Always	10 kΩ or higher
E2S2 (M9-28) - Body ground	Always	10 kΩ or higher
VCS1 (M9-19) - Body ground	Always	10 kΩ or higher
VSS1 (M9-18) - Body ground	Always	10 kΩ or higher
E2S1 (M9-17) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK →

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC	P0919/36	GEAR SHIFT POSITION CONTROL ERROR

CIRCUIT DESCRIPTION

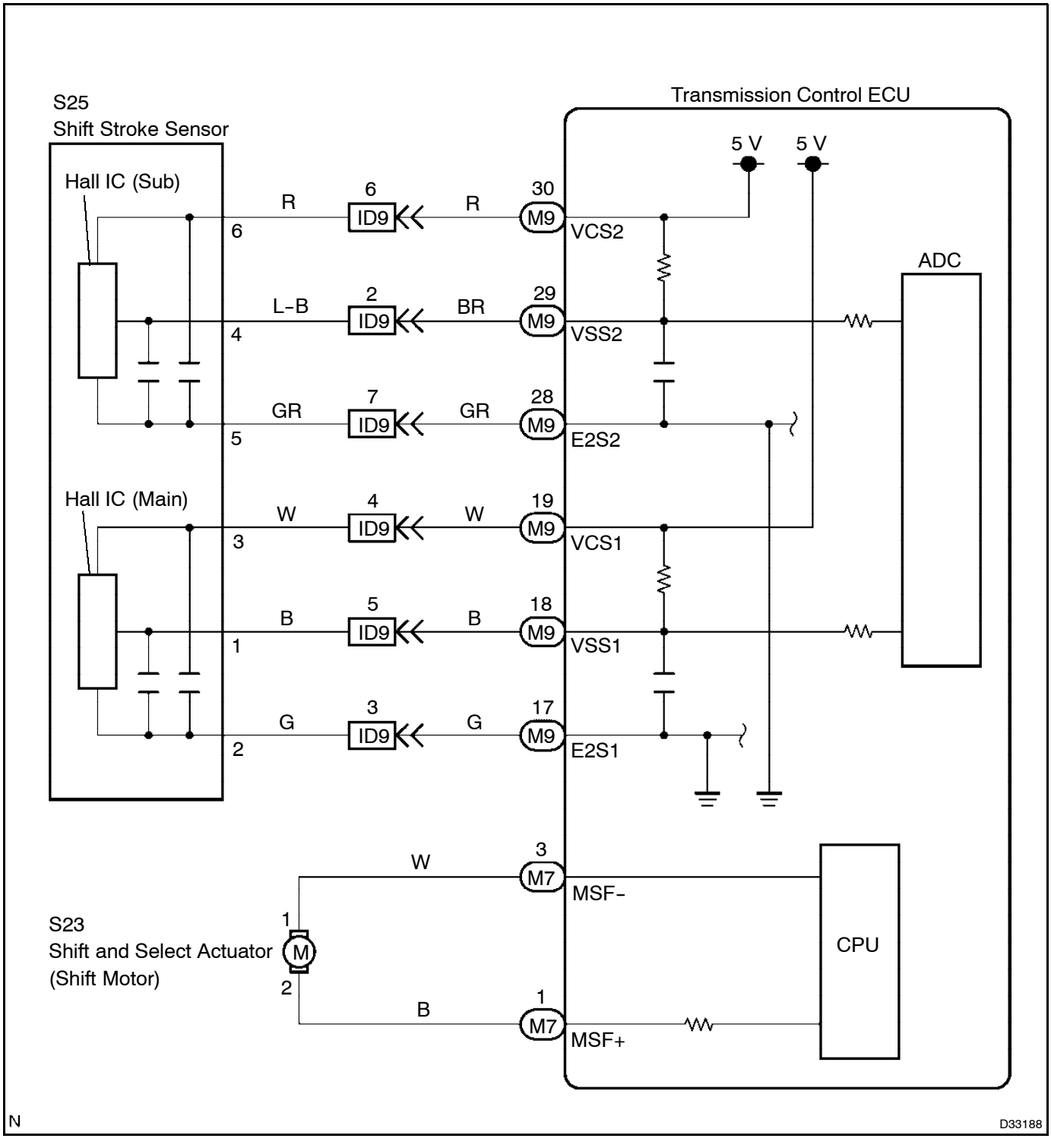
Refer to DTC P0915/49 on page 05-313 and DTC P0920/41 on page 05-331.

HINT:

This DTC is detected according to the stroke speed of the shift actuator or the difference between the shift position memorized in the ECU and the actual shift position. This DTC, therefore, is not detected together with DTC P0915/49 or P0920/41, which indicates electrical malfunctions.

DTC No.	DTC Detecting Condition	Trouble Area
P0919/36	The transmission control ECU detects the following conditions simultaneously: (a) Shift motor current is 32 A or more for 2.0 seconds. (b) A difference between the target shift stroke and the actual shift stroke is 0.3 mm (0.0118 in.) or more. (c) The amount of shift stroke movements is 125 mm (4.92 in.) /sec. or less.	• Shift stroke sensor • Shift and select actuator assy (Shift motor) • Open or short in shift stroke sensor circuit • Open or short in shift motor circuit • Synchronizer ring • Shift fork • Hub sleeve • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the items "Shift Position (Current)" and "Shift Motor Current MMT" in the DATA LIST and check the tester screen.

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Shift Position (Current)	Shift position (current)/ Min.: 0 mm, Max.: 34 mm	Normal value: 5.0 mm (0.20 in.) to 34.0 mm (1.34 in.)	Learning value of gear point is displayed when not operating shift lever
Shift Motor Current MMT	Shift motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 32 A	when not operating shift lever: 0 A

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG ("Shift Motor Current MMT" is defective)	A
NG ("Shift Position" is defective)	B
NG (Both items are defective)	C
OK	D

B → **Go to step 5**

C → **Go to step 8**

D → **OPERATION CHECK**

HINT:
If symptoms still occur even after checking the shift head for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

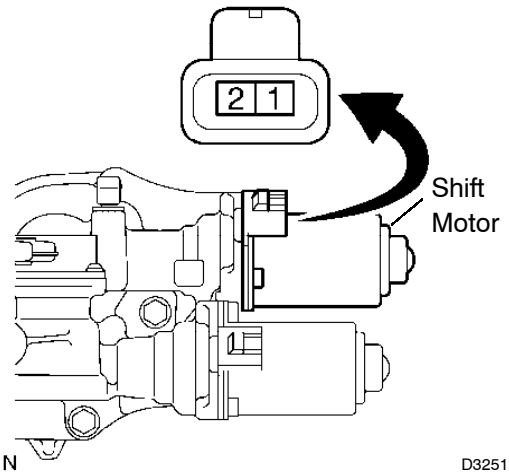
- Synchronizer Ring
- Shift Fork
- Hub Sleeve

Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E.

A

2 INSPECT SHIFT & SELECT ACTUATOR ASSY

Connector Front View:



(a) Disconnect the shift motor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

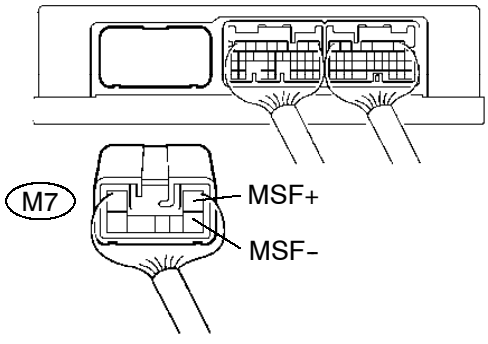
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

3 CHECK HARNESS AND CONNECTOR (SHIFT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



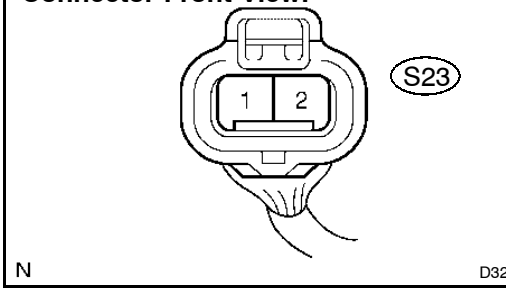
(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSF- (M7-3) - (S23-1)	Always	Below 1 Ω
MSF+ (M7-1) - (S23-2)	Always	Below 1 Ω
MSF- (M7-3) - Body ground	Always	10 kΩ or higher
MSF+ (M7-1) - Body ground	Always	10 kΩ or higher

Shift Motor Connector Front View:

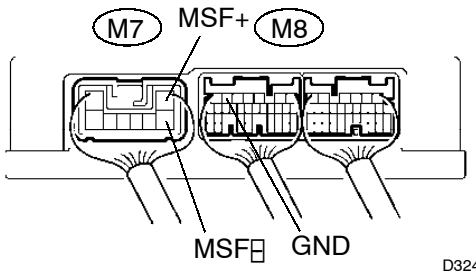


NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the M7 connector of the transmission control ECU and shift motor connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSF+ (M7-1) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MSF- (M7-3) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY** **(SEE PAGE 41-33)**

OK

OPERATION CHECK

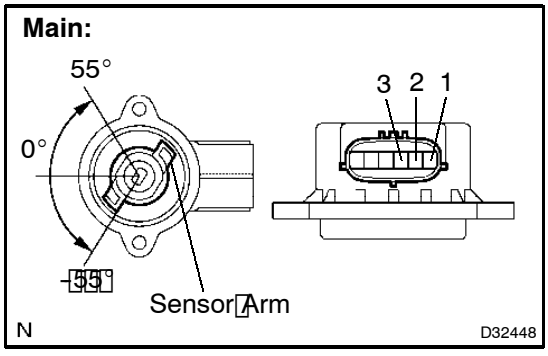
HINT:

If symptoms still occur even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Synchronizer Ring
- Shift Fork
- Hub sleeve

Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E.

5	INSPECT SHIFT STROKE SENSOR



(a) Remove the shift stroke sensor.

(b) Check the voltage of the shift stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

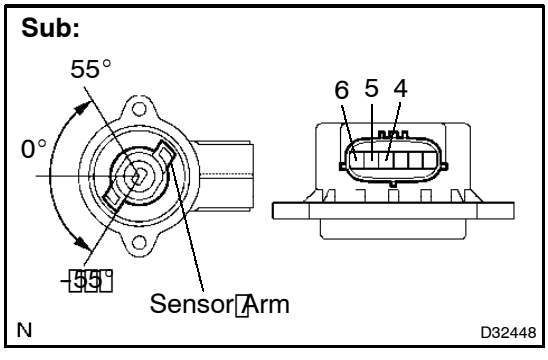
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the shift stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

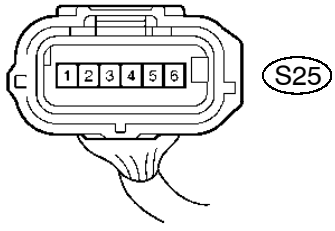
- **Do not apply more than 6 V.**
- **Do not drop the shift stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SHIFT STROKE SENSOR**
(SEE PAGE 41-25)

OK

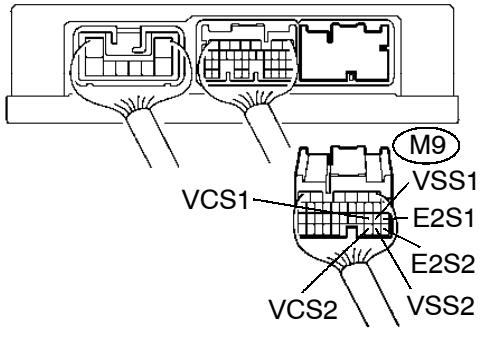
6	CHECK HARNESS AND CONNECTOR (SHIFT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Shift Stroke Sensor
Wire Harness Connector Front View:



N D32509

Transmission Control ECU
Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

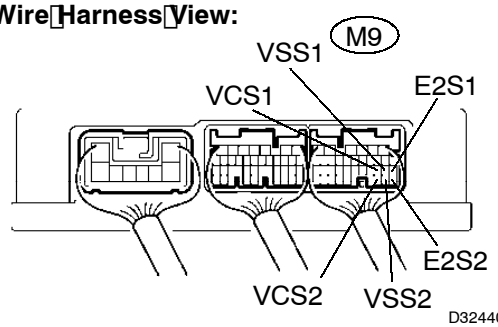
Symbol (Terminal No.)	Condition	Specified value
VCS2 (M9-30) - (S25-6)	Always	Below 1 Ω
VSS2 (M9-29) - (S25-4)	Always	Below 1 Ω
E2S2 (M9-28) - (S25-5)	Always	Below 1 Ω
VCS1 (M9-19) - (S25-3)	Always	Below 1 Ω
VSS1 (M9-18) - (S25-1)	Always	Below 1 Ω
E2S1 (M9-17) - (S25-2)	Always	Below 1 Ω
VCS2 (M9-30) - Body ground	Always	10 kΩ or higher
VSS2 (M9-29) - Body ground	Always	10 kΩ or higher
E2S2 (M9-28) - Body ground	Always	10 kΩ or higher
VCS1 (M9-19) - Body ground	Always	10 kΩ or higher
VSS1 (M9-18) - Body ground	Always	10 kΩ or higher
E2S1 (M9-17) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

7 INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the M9 connector to the transmission control ECU.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCS2 (M9-30) - E2S2 (M9-28)	Ignition SW ON	Approx. 5 V
VCS1 (M9-19) - E2S1 (M9-17)	Ignition SW ON	Approx. 5 V
VSS2 (M9-29) - E2S2 (M9-28)	Ignition SW ON	0.5 to 4.5 V
VSS1 (M9-18) - E2S1 (M9-17)	Ignition SW ON	0.5 to 4.5 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

OPERATION CHECK

HINT:

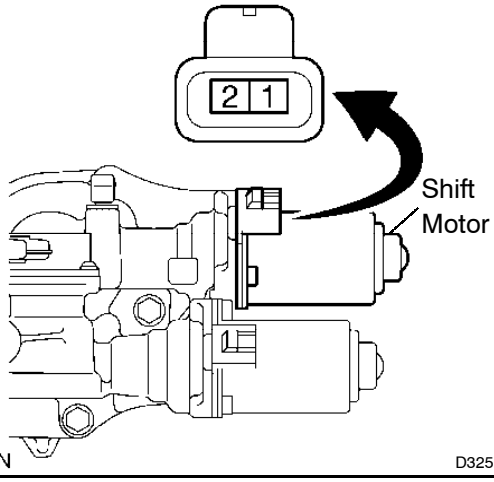
If symptoms still occur even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Synchronizer Ring
- Shift Fork
- Hub sleeve

Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E.

8 INSPECT SHIFT & SELECT ACTUATOR ASSY

Connector Front View:



(a) Disconnect the shift motor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

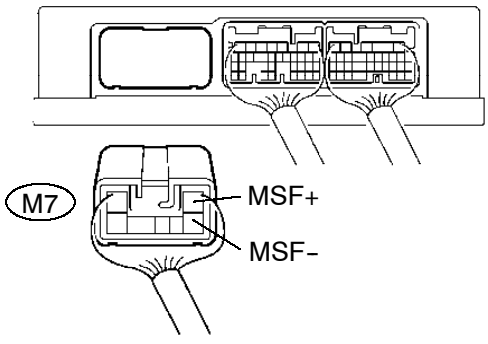
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

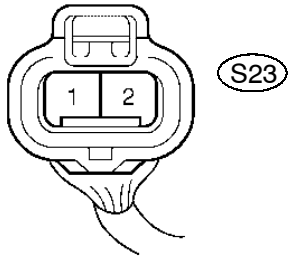
9	CHECK HARNESS AND CONNECTOR (SHIFT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



N D32441

Shift Motor Connector Front View:



N D32508

(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

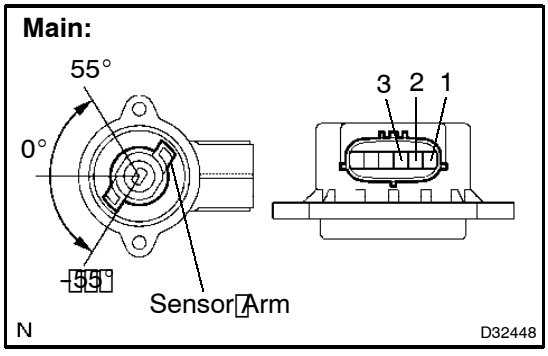
Standard:

Symbol (Terminal No.)	Condition	Specified value
MSF- (M7-3) - (S23-1)	Always	Below 1 Ω
MSF+ (M7-1) - (S23-2)	Always	Below 1 Ω
MSF- (M7-3) - Body ground	Always	10 kΩ or higher
MSF+ (M7-1) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

10	INSPECT SHIFT STROKE SENSOR



(a) Remove the shift stroke sensor.

(b) Check the voltage of the shift stroke sensor (main).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 3 and the negative battery (-) lead to terminal 2.

(3) Check the voltage between terminals 1 and 2 when moving the sensor arm.

Standard:

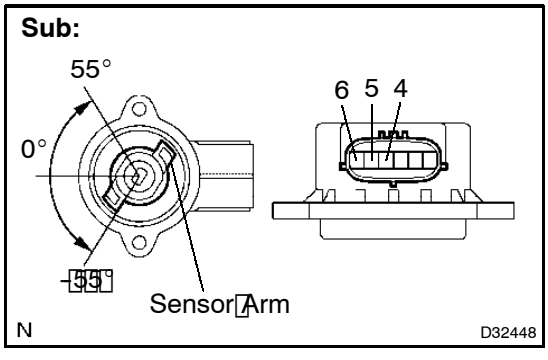
Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (1 - 2) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V



(c) Check the voltage of the shift stroke sensor (sub).

(1) Connect 3 dry cell batteries (1.5 V) in series.

(2) Connect the positive battery (+) lead to terminal 6 and the negative battery (-) lead to terminal 5.

(3) Check the voltage between terminals 4 and 5 when moving the sensor arm.

Standard:

Combined dry cell battery voltage of 4.5 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.05 V
0°	Approx. 2.25 V
-55°	Approx. 0.45 V

Reference:

Combined dry cell battery voltage of 5.0 ± 0.3 V:

Sensor angle (degree)	Terminal (4 - 5) output voltage (V)
55°	Approx. 4.5 V
0°	Approx. 2.5 V
-55°	Approx. 0.5 V

NOTICE:

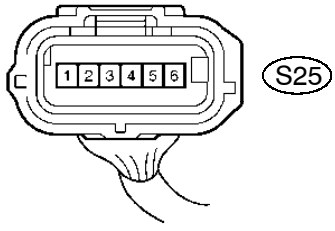
- **Do not apply more than 6 V.**
- **Do not drop the shift stroke sensor. If it is dropped, replace it with a new one.**

NG → **REPLACE SHIFT STROKE SENSOR**
(SEE PAGE 41-25)

OK

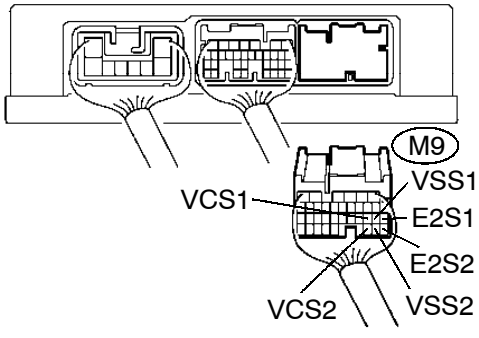
11	CHECK HARNESS AND CONNECTOR (SHIFT STROKE SENSOR - TRANSMISSION CONTROL ECU)

Shift Stroke Sensor
Wire Harness Connector Front View:



N D32509

Transmission Control ECU
Wire Harness View:



N D32443

(a) Reconnect the M7 connector.
(b) Disconnect the M9 connector of the transmission control ECU.
(c) Measure the resistance according to the value(s) in the table below.

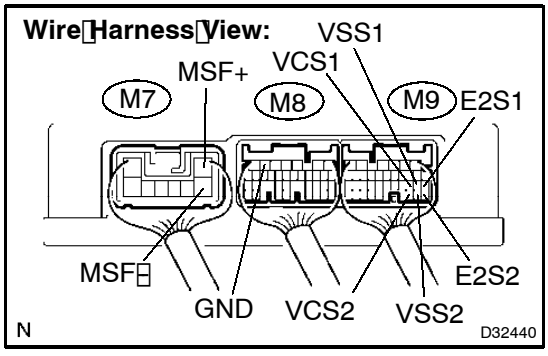
Standard:

Symbol (Terminal No.)	Condition	Specified value
VCS2 (M9-30) - (S25-6)	Always	Below 1 Ω
VSS2 (M9-29) - (S25-4)	Always	Below 1 Ω
E2S2 (M9-28) - (S25-5)	Always	Below 1 Ω
VCS1 (M9-19) - (S25-3)	Always	Below 1 Ω
VSS1 (M9-18) - (S25-1)	Always	Below 1 Ω
E2S1 (M9-17) - (S25-2)	Always	Below 1 Ω
VCS2 (M9-30) - Body ground	Always	10 kΩ or higher
VSS2 (M9-29) - Body ground	Always	10 kΩ or higher
E2S2 (M9-28) - Body ground	Always	10 kΩ or higher
VCS1 (M9-19) - Body ground	Always	10 kΩ or higher
VSS1 (M9-18) - Body ground	Always	10 kΩ or higher
E2S1 (M9-17) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

12 INSPECT TRANSMISSION CONTROL ECU ASSY



(a) Reconnect the M9 connector of the transmission control ECU and shift motor connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
VCS2 (M9-30) - E2S2 (M9-28)	Ignition SW ON	Approx. 5 V
VCS1 (M9-19) - E2S1 (M9-17)	Ignition SW ON	Approx. 5 V
MSF+ (M7-1) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
MSF- (M7-3) - GND (M8-6)	Ignition SW OFF → ON	Below 1 V → 5 to 10 V
VSS2 (M9-29) - E2S2 (M9-28)	Ignition SW ON	0.5 to 4.5 V
VSS1 (M9-18) - E2S1 (M9-17)	Ignition SW ON	0.5 to 4.5 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY** **(SEE PAGE 41-33)**

OK

OPERATION CHECK

HINT:

If symptoms still occur even after checking the following parts for dirt, wear, etc. and replacing the defective parts, replace the transmission control ECU.

- Synchronizer Ring
- Shift Fork
- Hub sleeve

Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E.

DTC	P0920/41	GEAR SHIFT FORWARD ACTUATOR CIRCUIT

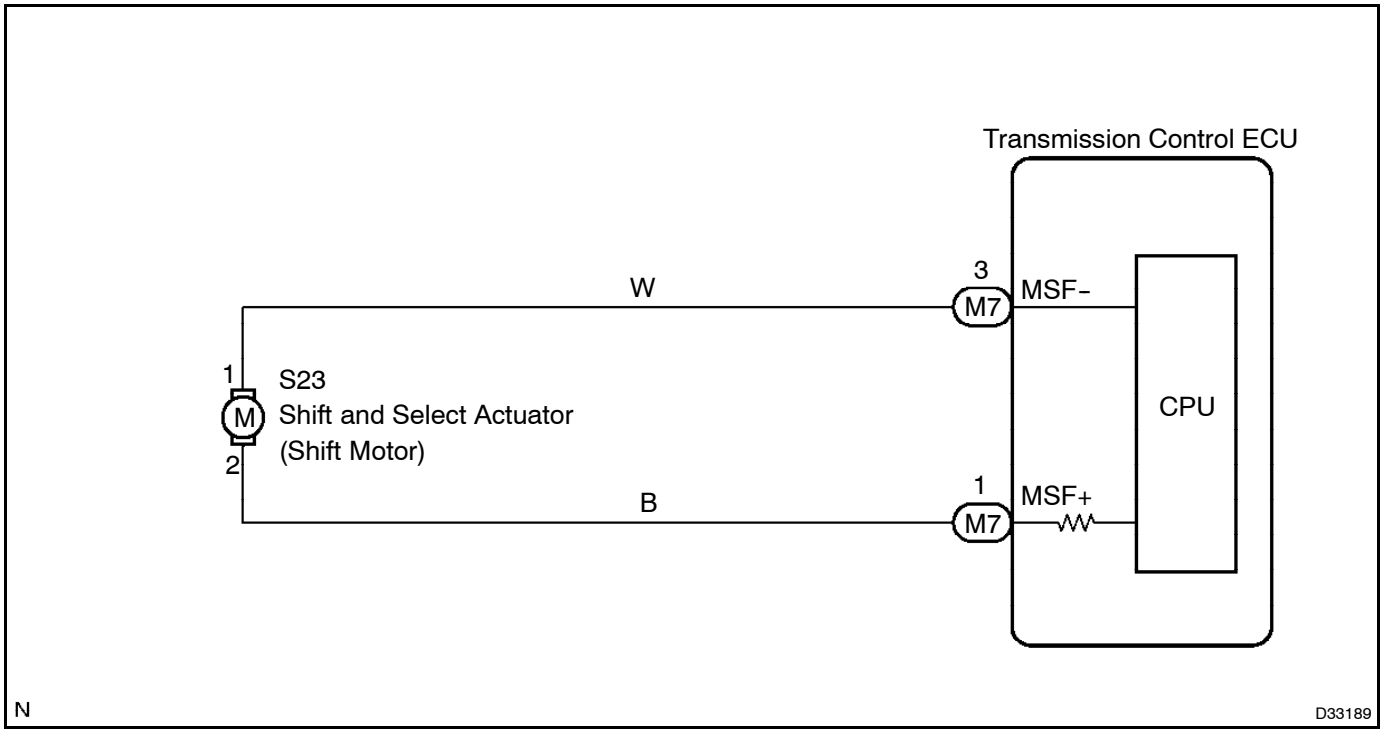
CIRCUIT DESCRIPTION

Detecting the signal from the shift lever position sensor, the transmission control ECU starts the shift motor.

Refer to DTC P0885/17 on page 05-282.

DTC No.	DTC Detecting Condition	Trouble Area
P920/41	The transmission control ECU detects the following condition (a), (b) or (c). (a) (1) Shift motor voltage is 0.5 V or less or 14 V or more for 0.5 seconds. (2) +BM voltage is 10 V or more. (b) (1) Voltage is supplied to shift motor. (2) Shift motor current is 5 A or more. (3) Shift motor current is 1 A or less. (4) +BM voltage is 10 V or more. (c) (1) No voltage is supplied to shift motor. (2) Difference of maximum and minimum voltage of shift motor terminal MSF+ or MSF- is 10 V or more for 0.5 seconds.	• Shift and select actuator assy (Shift motor) • Open or short in shift motor circuit • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON INTELLIGENT TESTER II

(a) Connect the Intelligent Tester II to the DLC3.
(b) Turn the ignition switch on.
(c) Select the item "Shift Motor Current MMT" in the DATA LIST and check the tester screen.

Standard:

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Shift motor current MMT	Shift motor current/ Min.: -50 A, Max.: 50 A	Normal value: 0 to 32 A	When not operating shift lever: 0 A

OK: The value on the display is within the normal range when moving the shift lever.

Result:

NG	A
OK (When troubleshooting according to the PROBLEM SYMPTOM TABLE)	B
OK (When troubleshooting according to the DTC chart)	C

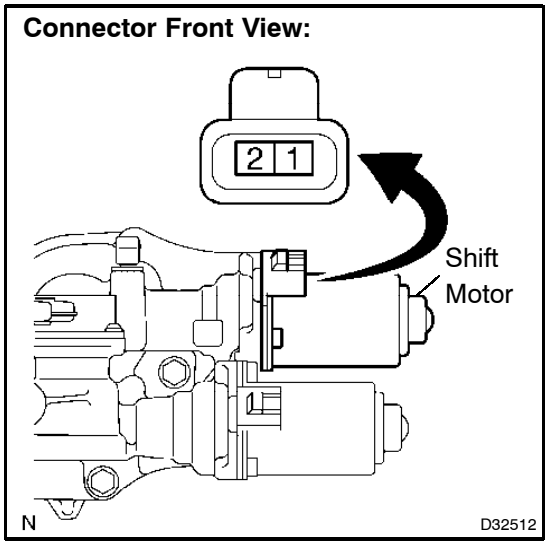
B → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

C → **CHECK FOR INTERMITTENT PROBLEMS**

HINT:
Intelligent Tester II only:
Inspect the vehicle's ECU using check mode. Intermittent problems are easier to detect when the Intelligent Tester II is in check mode. In check mode, the Intelligent Tester II uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

A

2 INSPECT SHIFT & SELECT ACTUATOR ASSY



(a) Disconnect the shift motor connector.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

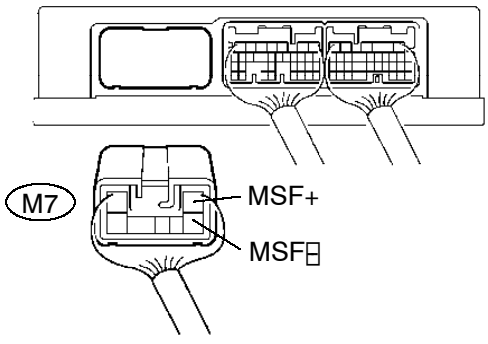
Terminal No.	Specified value
1 - 2	0.1 to 100 Ω

NG → **REPLACE SHIFT & SELECT ACTUATOR ASSY (Refer to C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)**

OK

3	CHECK HARNESS AND CONNECTOR (SHIFT MOTOR - TRANSMISSION CONTROL ECU)

Transmission Control ECU Wire Harness View:



N D32441

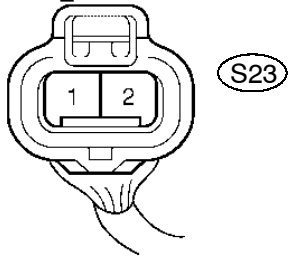
(a) Disconnect the M7 connector of the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
MSF- (M7-3) - (S23-1)	Always	Below 1 Ω
MSF+ (M7-1) - (S23-2)	Always	Below 1 Ω
MSF- (M7-3) - Body ground	Always	10 kΩ or higher
MSF+ (M7-1) - Body ground	Always	10 kΩ or higher

Shift Motor Connector Front View:



N D32508

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

DTC P1875/22 BUZZER MALFUNCTION

CIRCUIT DESCRIPTION

The buzzer inside the transmission control ECU sounds an alarm when the shift lever is moved into reverse or upon mis-operation.

This DTC is detected and output when power is not supplied to the buzzer built into the transmission control ECU.

HINT:

There are 2 buzzers in the multi-mode manual transmission control system, which are built into the combination meter and the transmission control ECU. The buzzer built into the combination meter sounds when any door is opened with the transmission set in any gear while the system is operating. The buzzer built into the ECU sounds when the shift lever is moved to the R position.

DTC No.	DTC Detecting Condition	Trouble Area
P1875/22	The transmission control ECU detects the following conditions simultaneously: (a) The buzzer does not sound. (b) Buzzer operation voltage is 3 V or less for 5.0 seconds.	• Transmission control ECU

INSPECTION PROCEDURE

1 CHECK BUZZER

(a) Turn the ignition switch on.

(b) Shift the lever into reverse.

OK: The buzzer sounds.

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

2 CHECK OTHER DTCs OUTPUT (IN ADDITION TO DTC P1875/22)

(a) Connect the the intelligent tester II to the DLC3.

(b) Turn the ignition switch on and turn the intelligent tester II main switch on.

(c) Read the DTCs using the intelligent tester II.

Result:

Display (DTC output)	Proceed to
"P1875/22" only	A
"P1875/22" and other DTCs	B

HINT:

If any other codes besides "P1875/22" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (SEE PAGE 05-221)**

A

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

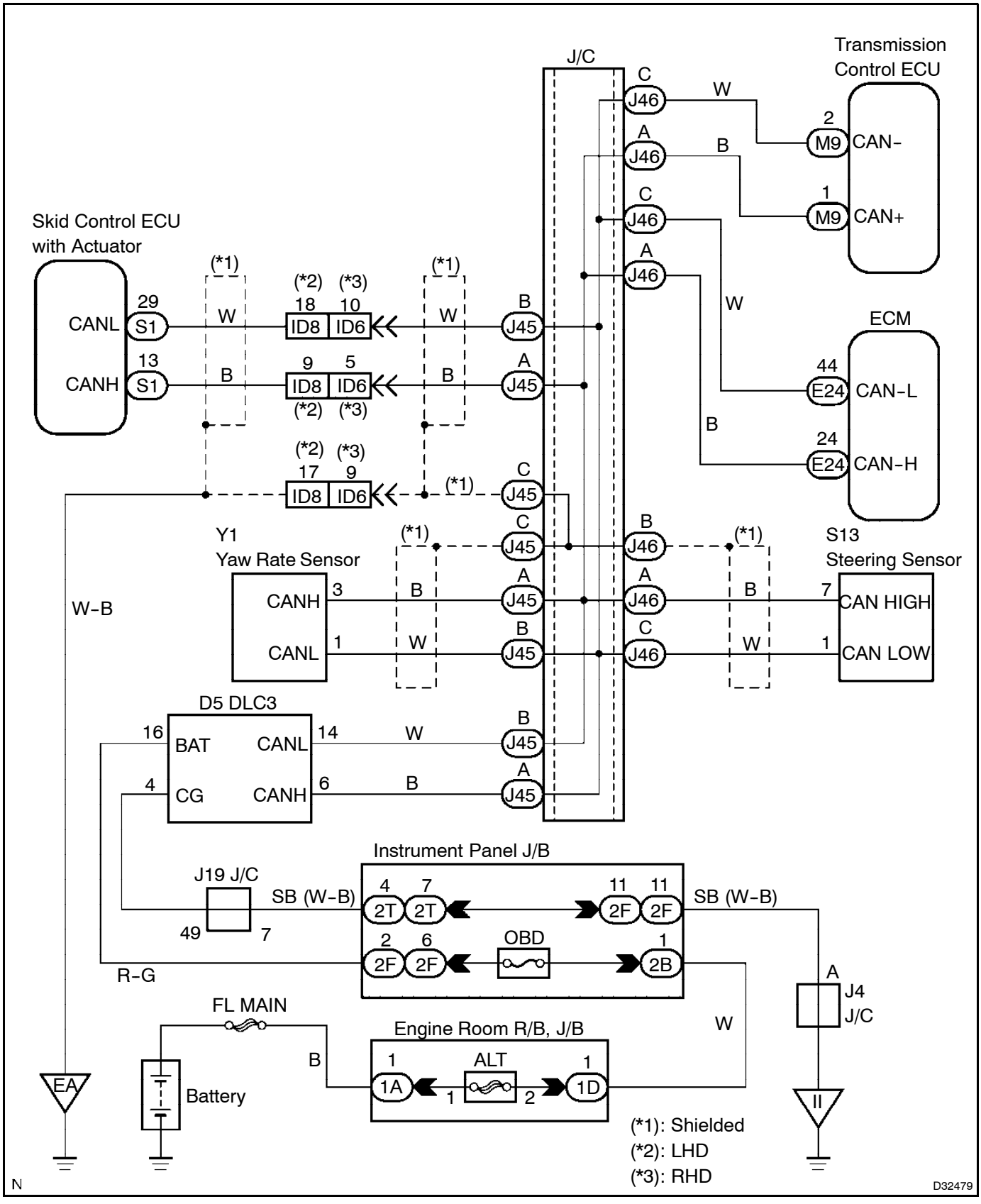
DTC U0001/A2 HIGH SPEED CAN COMMUNICATION BUS

CIRCUIT DESCRIPTION

The transmission control ECU and ECM communicate with each other via the CAN communication line.

DTC No.	DTC Detecting Condition	Trouble Area
U0001/A2	• No communication from the ECM.	• Open or short in CAN signal circuit • ECM • Transmission control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If the CAN communication line malfunctions, there is no data output from the ECM. In this case, some of the freeze frame data is not correct or identical to the ECM data, even though the ECM data is correct.

According to the DATA LIST displayed by the intelligent tester II, the value of the switch, sensor, actuator and so on can be read without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.

(b) Turn the ignition switch off.

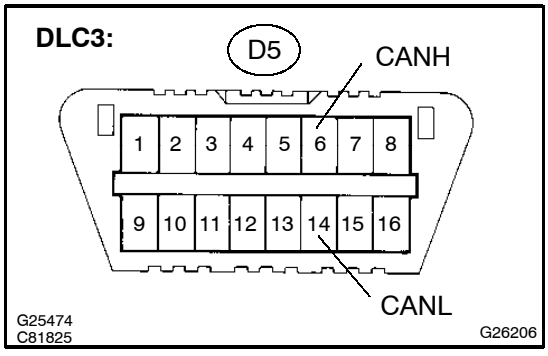
(c) Connect the intelligent tester II to the DLC3.

(d) Turn the ignition switch on.

(e) Following the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range	Normal Condition	Diagnostic Note
Backup Engine Speed	Back-up engine speed/ Min.: 0 rpm, Max.: 8,160 rpm	Vehicle stopped: 0 rpm	0 rpm is displayed when there is a malfunction in CAN communication.
Accelerator Pedal Angle	Accelerator pedal angle/ Min.: 0%, Max.: 100%	Accelerator pedal released: 0%	0% is displayed when there is a malfunction in CAN communication.

1	CHECK CAN BUS LINE(MAIN BUS LINE FOR DISCONNECTION, BUS LINES FOR SHORT CIRCUIT, DLC3 SUB BUS LINE FOR DISCONNECTION)



(a) Turn the ignition switch to the LOCK position.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

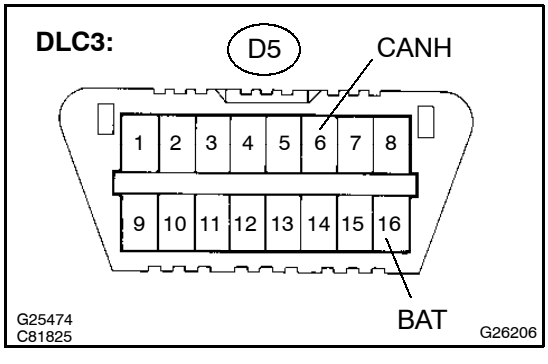
Tester connection	Condition	Specified value	Result
D5-6 (CANH) - D5-14 (CANL)	Ignition SW OFF	54 to 69 Ω	OK
D5-6 (CANH) - D5-14 (CANL)	Ignition SW OFF	67 Ω or more	NG-A
D5-6 (CANH) - D5-14 (CANL)	Ignition SW OFF	54 Ω or less	NG-B

NG-A → **CHECK CAN MAIN BUS LINE FOR DISCONNECTION**

NG-B → **CHECK CAN BUS LINES FOR SHORT CIRCUIT**

OK

2	CHECK CAN BUS LINE (CAN-H) FOR SHORT TO +B



(a) Measure the resistance according to the value(s) in the table below.

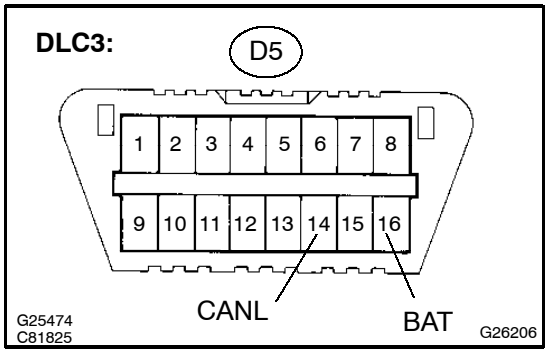
Standard:

Tester connection	Condition	Specified value
D5-6 (CANH) - D5-16 (BAT)	Ignition SW OFF	1 MΩ or more

NG → **CHECK CAN BUS LINE (CAN-H) FOR SHORT TO +B**

OK

3 CHECK CAN BUS LINE (CAN-L) FOR SHORT TO +B



(a) Measure the resistance according to the value(s) in the table below.

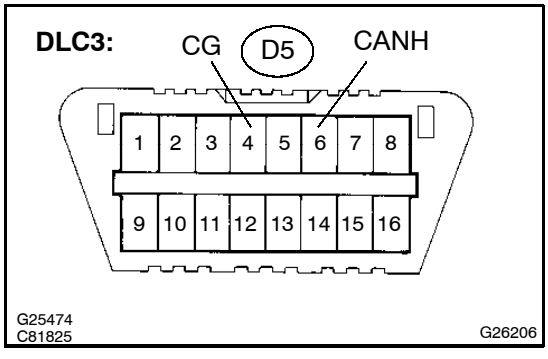
Standard:

Tester connection	Condition	Specified value
D5-14 (CANL) - D5-16 (BAT)	Ignition SW OFF	1 MΩ or more

NG → **CHECK CAN BUS LINE (CAN-L) FOR SHORT TO +B**

OK

4 CHECK CAN BUS LINE (CAN-H) FOR SHORT TO GND



(a) Measure the resistance according to the value(s) in the table below.

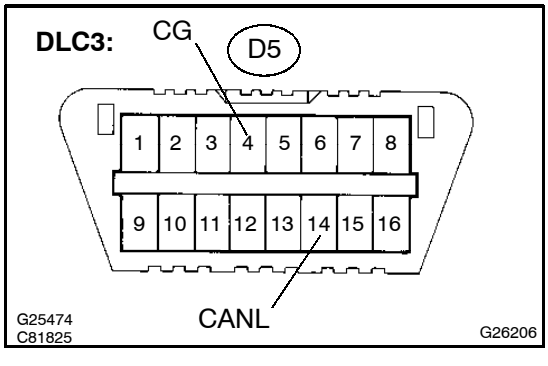
Standard:

Tester connection	Condition	Specified value
D5-4 (CG) - D5-6 (CANH)	Ignition SW OFF	100 Ω or more

NG → **CHECK CAN BUS LINE (CAN-H) FOR SHORT TO GND**

OK

5 CHECK CAN BUS LINE (CAN-L) FOR SHORT TO GND



(a) Measure the resistance according to the value(s) in the table below.

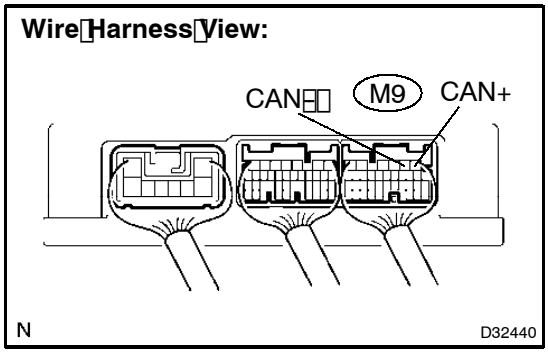
Standard:

Tester connection	Condition	Specified value
D5-4 (CG) - D5-14 (CANL)	Ignition SW OFF	100 Ω or more

NG → **CHECK CAN BUS LINE (CAN-L) FOR SHORT TO GND**

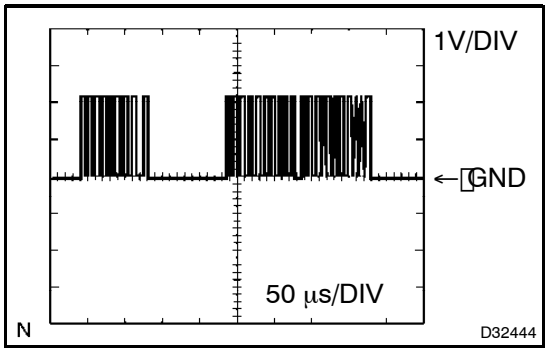
OK

6	INSPECT TRANSMISSION CONTROL ECU ASSY



(a) Turn the ignition switch on.
(b) Check the waveform between terminals CAN+ and CAN- of the transmission control ECU.
OK: The correct waveforms are as shown on the left.

HINT:
Gauge set: 1 V/DIV, 50 μs/DIV



NG → **REPLACE ECM (SEE PAGE 10-15)**

OK

REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

OK

GO TO VSC SYSTEM (Refer to COROLLA Repair Manual Pub. No. RM925E on page 05-662)

If the problem reoccurs even after replacement, replace the ECM.

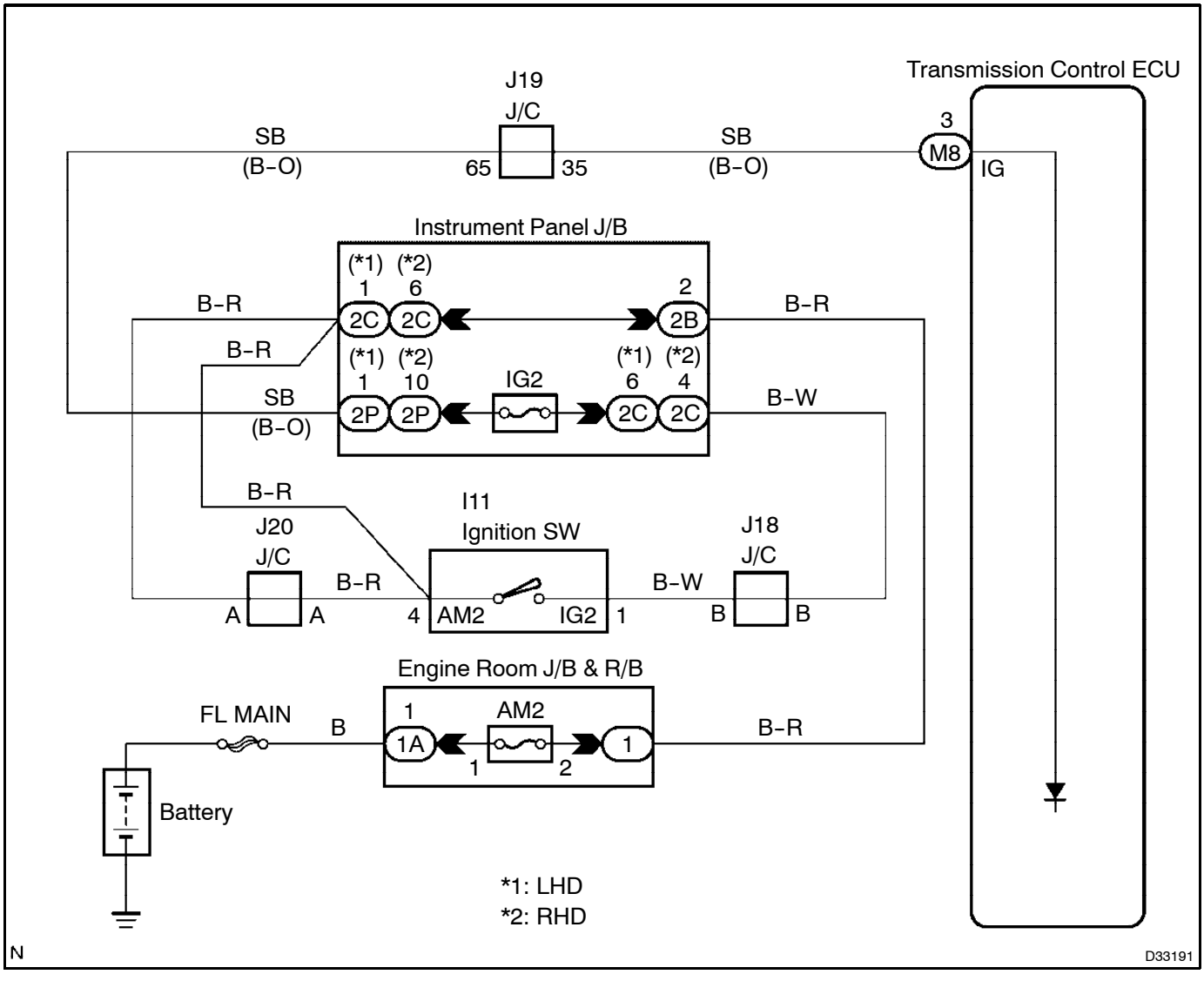
IG SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

When the ignition switch is turned on, positive battery voltage is applied to terminal IG of the transmission control ECU.

Power is supplied to the transmission control ECU via terminal +B or IG.

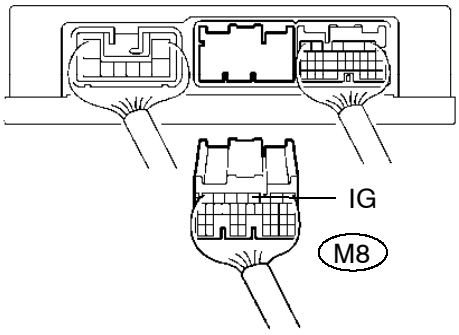
WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



N D32442

(a) Disconnect the M8 connector of the transmission control ECU.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbols (Terminal No.)	Condition	Voltage
IG (M8-3) - B Body ground	Ignition SW OFF → ON	Below 1 V → 10 to 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

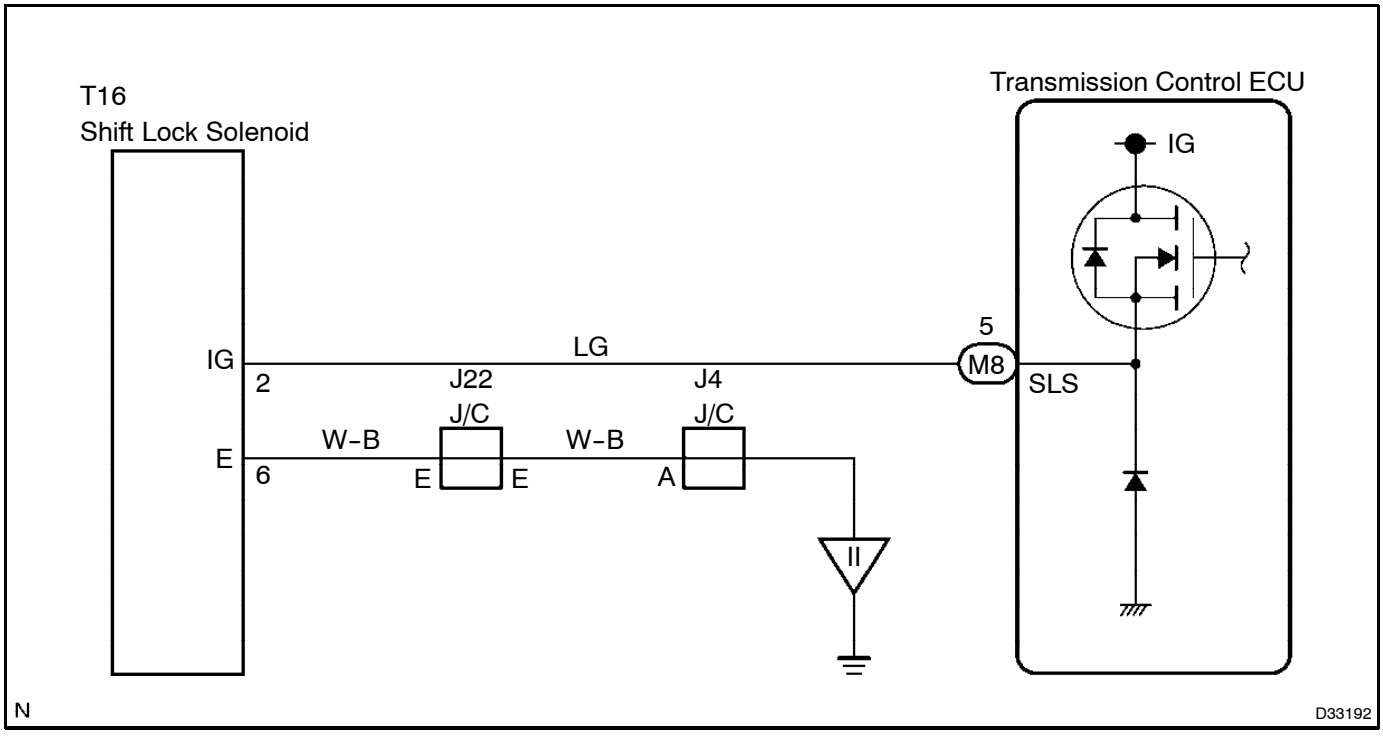
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-219)

SHIFT LOCK SOLENOID CIRCUIT

CIRCUIT DESCRIPTION

Receiving the shift lock cancellation signal from the transmission control ECU, the shift lock solenoid (built into shift lever assy) starts working.

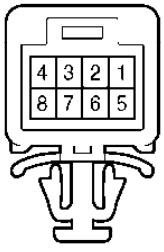
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT SHIFT LOCK SOLENOID

Connector Front View:



N D32458

(a) Disconnect the shift lock solenoid connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

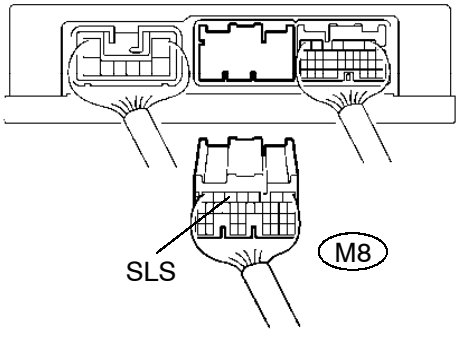
Terminal No.	Condition	Specified value
2 - 6	at 20°C (68°F)	30 to 35 Ω

NG → **REPLACE SHIFT LOCK SOLENOID (SEE PAGE 41-11)**

OK

2 CHECK HARNESS AND CONNECTOR (SHIFT LOCK SOLENOID - TRANSMISSION CONTROL ECU, BODY GROUND)

Transmission Control ECU Wire Harness View:



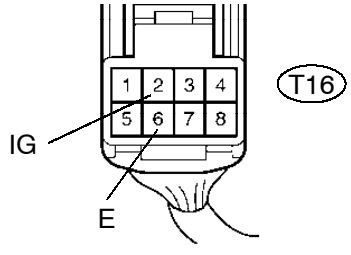
N D32442

(a) Disconnect the M8 connector of the transmission control ECU.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
SLS (M8-5) - IG (T16-2)	Always	Below 1 Ω
E (T16-6) - Body ground	Always	Below 1 Ω
SLS (M8-5) - Body ground	Always	10 kΩ or higher

Shift Lock Solenoid Wire Harness Connector Front View:



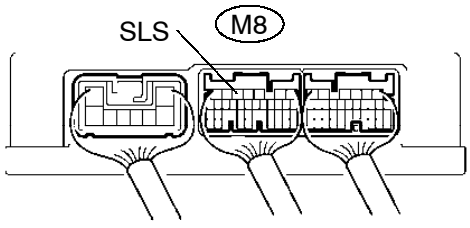
N D32518

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



N D32440

(a) Reconnect the transmission control ECU connector and shift lock solenoid connector.

(b) Turn the ignition switch on.

(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
SLS (M8-5) - Body ground	Brake pedal depressed → Released	10 to 14 V → Below 1 V

NG → REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 41-33)

NEUTRAL POSITION SWITCH ASSY CIRCUIT

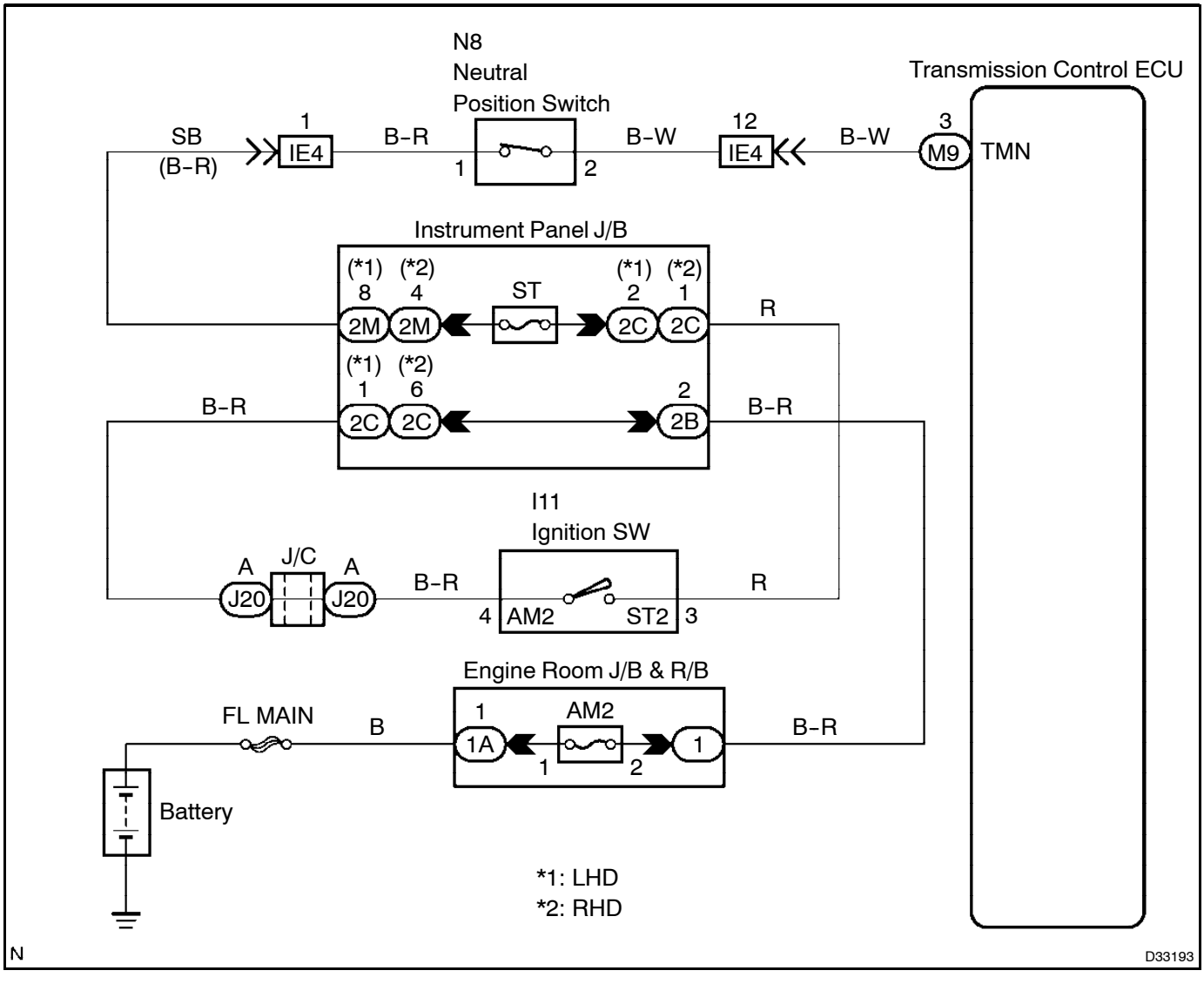
CIRCUIT DESCRIPTION

The neutral switch detects the "neutral" of the transmission gear position and sends a signal to the transmission control ECU.

Based on the signal, the ECU detects the gear position "neutral".

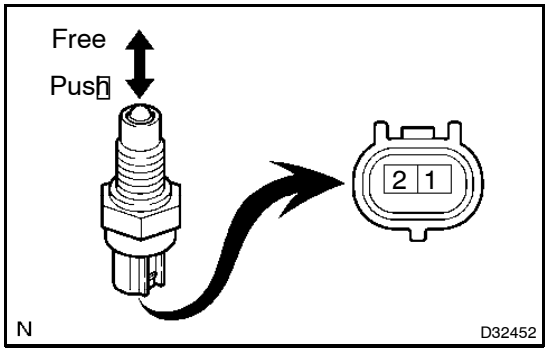
The engine starts when the ignition switch is turned on with the brake pedal depressed and the gear in neutral.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT NEUTRAL POSITION SWITCH ASSY



(a) Remove the neutral position switch.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

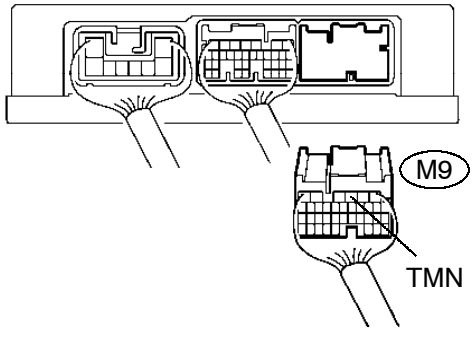
Terminal No.	Switch position	Specified value
1 - 2	Free	10 kΩ or higher
1 - 2	Push	Below 1 Ω

NG → **REPLACE NEUTRAL POSITION SWITCH ASSY (SEE PAGE 41-32)**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BATTERY)

Transmission Control ECU Wire Harness View:



(a) Reconnect the neutral position switch connector.
(b) Disconnect the M9 connector of the transmission control ECU.
(c) Turn the ignition switch on.
(d) Measure the resistance according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
TMN (M9-3) - Body ground	Shift lever position from N → N	Below 1 V → 10 to 14 V

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

MULTI-MODE MANUAL TRANSMISSION WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

- DTCs can be read from the multi-mode manual transmission warning light on the combination meter by shorting terminals TC and CG of the DLC3 (see page 05-203).
- Power is constantly applied to the INDC terminal circuit. When the INDC circuit is open, the combination meter detects a malfunction and the multi-mode manual transmission warning light comes on. The INDC circuit is used to send the multi-mode manual transmission warning light signal when the ignition switch is off.
- Power is supplied to the INDA circuit when the ignition switch is turned on. The combination meter detects a malfunction when the ignition switch is on and the multi-mode manual transmission warning light comes on. The INDA circuit is used to send the multi-mode manual transmission warning light signal or shift position indicator signal when the ignition switch is on.
- The combination meter detects the state of the multi-mode manual transmission system according to information from the INDC and INDA circuits, and illuminates the warning light or sounds the buzzer inside the meter.

The contents of signals from the INDC and INDA circuits, and the states of the multi-mode manual transmission warning light and buzzer are shown in the table below.

When ignition switch is ON:

INDA circuit state	When signal is normal.		When inconsistent signal is received for 3 sec. or more.		When communication interruption signal is received for 3 sec. or more.	
INDC circuit state	Normal	+B short or open	Normal	+B short or open	Normal	+B short or open
LCD indication (*1)	ON by signal	ON by signal	OFF	OFF	OFF	OFF
LCD back light (*2)	ON	ON	ON	ON	ON	ON
Multi-mode manual transmission warning light	ON by signal	ON by signal	ON	ON	ON	ON
Buzzer (Built in combination meter) (*3)	ON	ON	ON	ON	ON	ON

*1: When the LCD indication is on, the number or letter of the shift position indicator light comes on.

*2: When the LCD back light is on, the number or letter of the shift position indicator light blinks.

*3: The buzzer sounds when the following conditions are met in addition to those above.

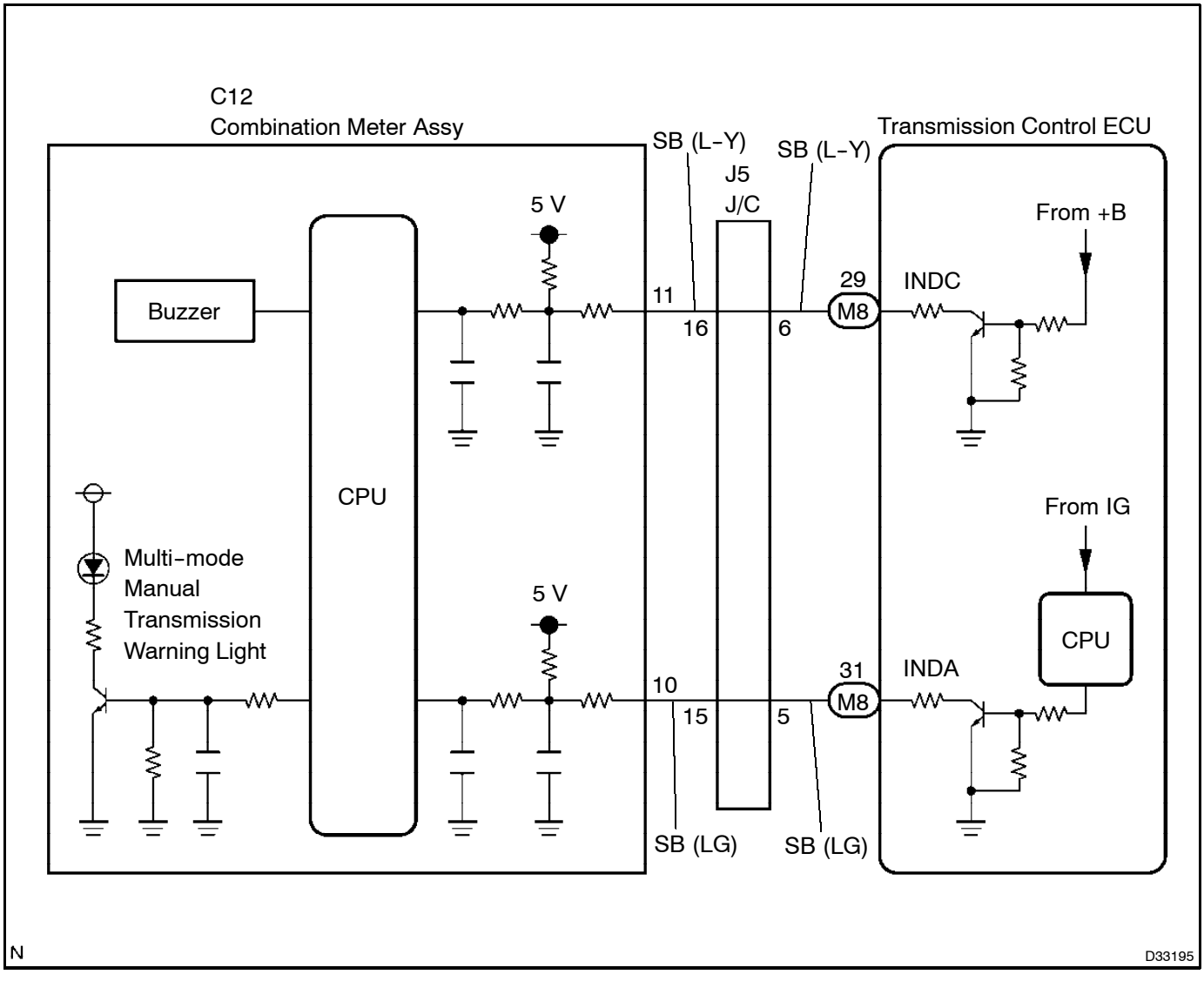
- The shift lever is in any position except N.
- The driver's door is open.
- Vehicle speed is 10 km/h or less.
- Engine speed is 400 rpm or more.

When ignition switch is OFF:

INDA circuit state	When signal is normal.		When inconsistent signal is received for 3 sec. or more.		When communication interruption signal is received for 3 sec. or more.	
INDC circuit state	Normal	+B short or open	Normal	+B short or open	Normal	+B short or open
LCD indication (*1)	ON by signal	ON by signal	OFF	OFF	OFF	OFF
LCD back light (*2)	ON when LCD indication is ON	ON when LCD indication is ON	OFF	OFF	OFF	OFF
Multi-mode manual transmission warning light	ON by signal	ON by signal	ON	ON	OFF	ON
Buzzer (Built in combination meter)	OFF	OFF	OFF	ON	OFF	ON
Condition for sleep mode	When receiving communication interruption signal from INDC circuit	When receiving communication interruption signal from INDC circuit	-	-	8 sec. after receiving communication interruption signal from INDA circuit	-
Vehicle state when ignition switch is off	-	Open or short in INDC circuit	Noise occurs when receiving	• Transmission control ECU malfunction • Parking control malfunction	-	• Open or short in INDC circuit • Parking control malfunction

*1: When the LCD indication is on, the number or letter of the shift position indicator light comes on.
*2: When the LCD back light is on, the number or letter of the shift position indicator light blinks.

WIRING DIAGRAM



INSPECTION PROCEDURE

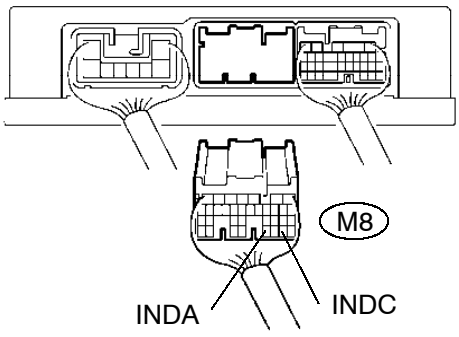
HINT:

Before performing circuit inspection, check that the multi-mode manual transmission warning light and shift position indicator light come on.

If the shift position indicator light does not come on, there may be a malfunction in the INDA circuit. If the multi-mode manual transmission warning light does not come on, there may be a malfunction in the INDA and/or INDC circuits.

1	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - COMBINATION METER)

Transmission Control ECU Wire Harness View:



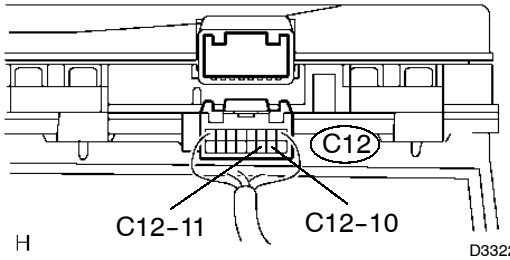
(a) Disconnect the M8 connector of the transmission control ECU and the combination meter connector.

(b) Measure the resistance according to the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
INDC (M8-29) - (C12-11)	Always	Below 1 Ω
INDA (M8-31) - (C12-10)	Always	Below 1 Ω
INDC (M8-29) - Body ground	Always	10 kΩ or higher
INDA (M8-31) - Body ground	Always	10 kΩ or higher

Combination Meter Wire Harness View:

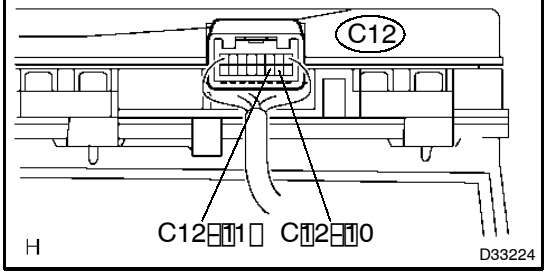


NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	INSPECT COMBINATION METER ASSY

Wire Harness View:



(a) Reconnect the combination meter connector.

(b) Measure the voltage according to the value(s) in the table below.

Standard:

Terminal No.	Condition	Specified value
C12-10 - Body ground	Ignition SW OFF → ON	Approx. 3.64 V → Approx. 1.44 V
C12-11 - Body ground	Always	Approx. 1.44 V

NG → **REPLACE COMBINATION METER ASSY (Refer to COROLLA Repair Manual Pub. No. RM1106E on page 71-6)**

OK

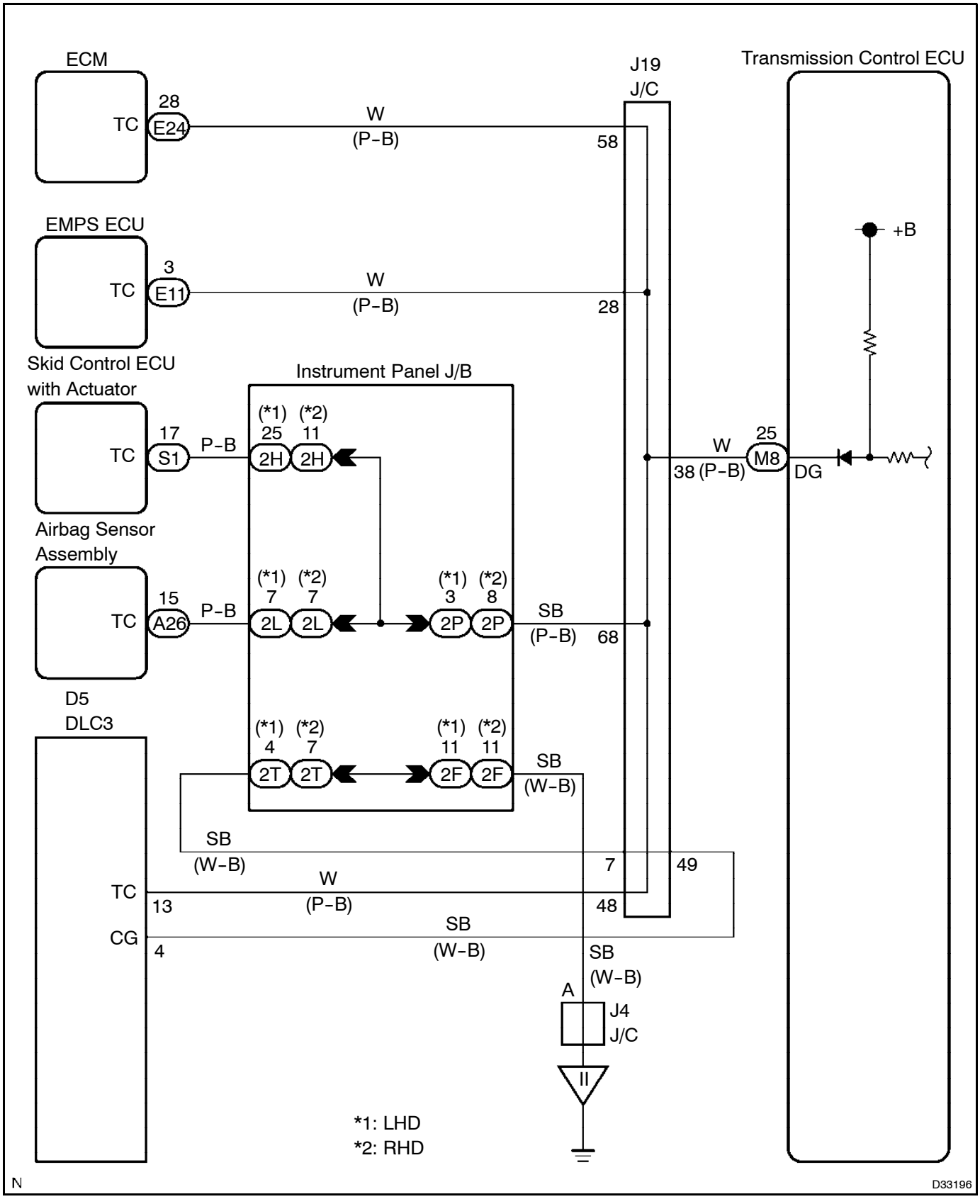
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

TC TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

This circuit outputs trouble codes on the combination meter when terminals TC and CG of the DLC3 are connected.

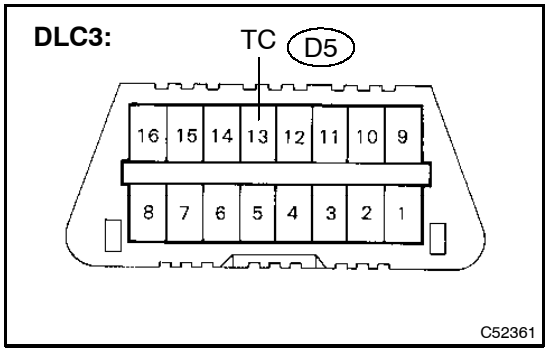
WIRING DIAGRAM



HINT:
When a particular warning light stays blinking, a ground short in the wiring of terminal TC of the DLC3 or an internal ground short in the relevant ECU is suspected.

INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR (TC of DLC3 - TRANSMISSION CONTROL ECU)

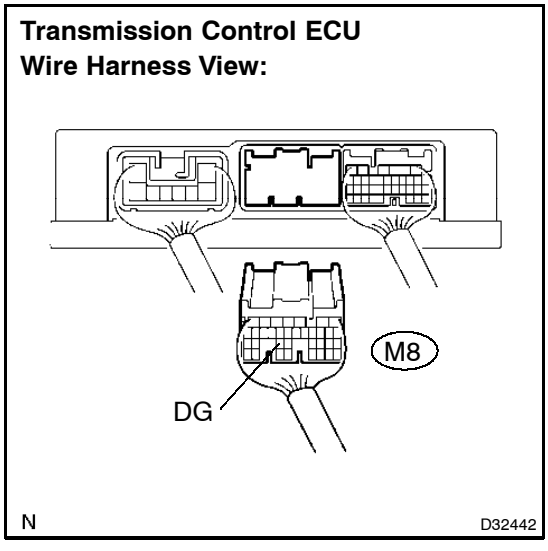


(a) Disconnect the M8 connector from the transmission control ECU.

(b) Measure the resistance according to the value(s) in the table below.

Standard:

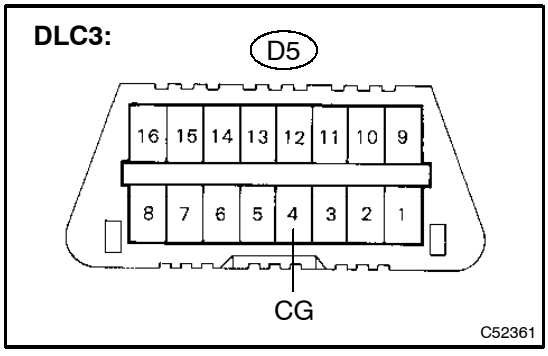
Tester connection	Condition	Specified condition
DG (M8-25) - TC (D5-13)	Always	Below 1 Ω



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (DLC3 - TRANSMISSION CONTROL ECU)

OK

2	CHECK HARNESS AND CONNECTOR (CG of DLC3 - BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.

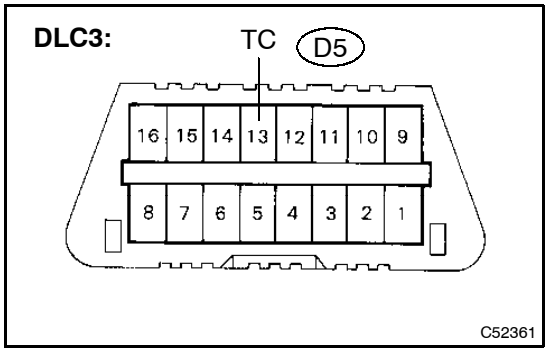
Standard:

Tester connection	Condition	Specified condition
CG (D5-4) - Body ground	Always	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR (DLC3 - BODY GROUND)**

OK

3	CHECK HARNESS AND CONNECTOR (TC of DLC3 - BODY GROUND)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
TC (D5-13) - Body ground	Always	10 kΩ or higher

NG → **REPAIR OR REPLACE WIRE HARNESS OR EACH ECU**

OK

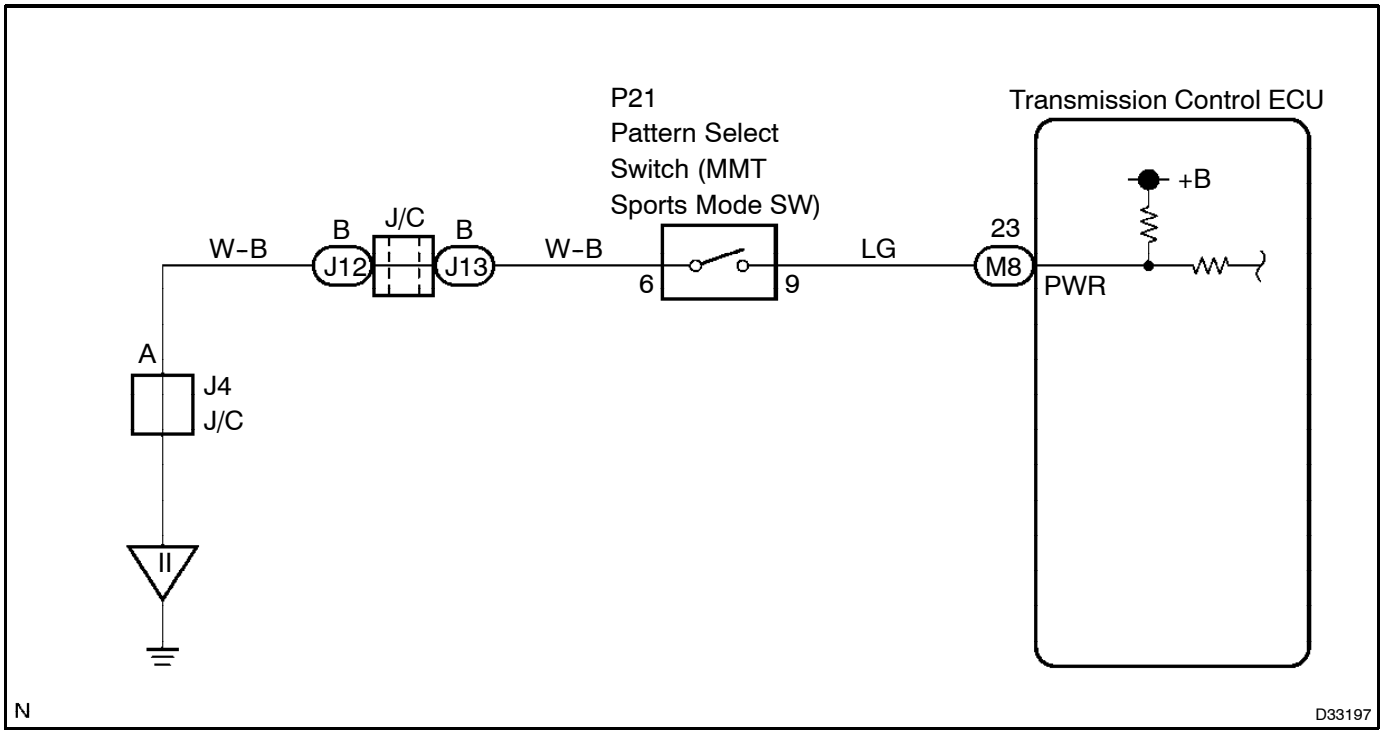
REPLACE TRANSMISSION CONTROL ECU ASSY **(SEE PAGE 41-33)**

PATTERN SELECT SWITCH CIRCUIT

CIRCUIT DESCRIPTION

When the shift lever is in the E position, the most appropriate gear is automatically selected according to the accelerator pedal opening angle and vehicle speed. During automatic shift control, shift control can be switched between normal (E) and sports (Es) modes by pressing the pattern select switch.

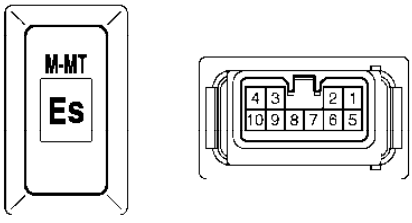
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT PATTERN SELECT SWITCH ASSY

Connector Front View:



N D33209

(a) Disconnect the pattern select switch connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

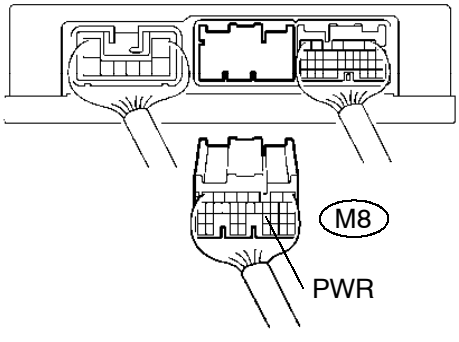
Terminal No.	Switch condition	Specified value
6 - g	ON	Below 1 Ω
6 - g	OFF	10 kΩ or higher

NG → **REPLACE PATTERN SELECT SWITCH ASSY (SEE PAGE 41-11)**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BODY GROUND)

Wire Harness View:



N D32442

(a) Reconnect the pattern select switch connector.
(b) Disconnect the M8 connector of the transmission control ECU.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

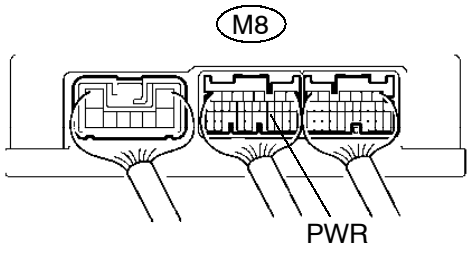
Symbol (Terminal No.)	Condition	Specified value
PWR (M8-23) - Body ground	Pattern select switch OFF → ON	10 kΩ or higher → Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the transmission control ECU connector.
(b) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified value
PWR (M8-23) - Body ground	Ignition SW ON, pattern select SW OFF → ON	10 to 14 V → Below 1.8 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

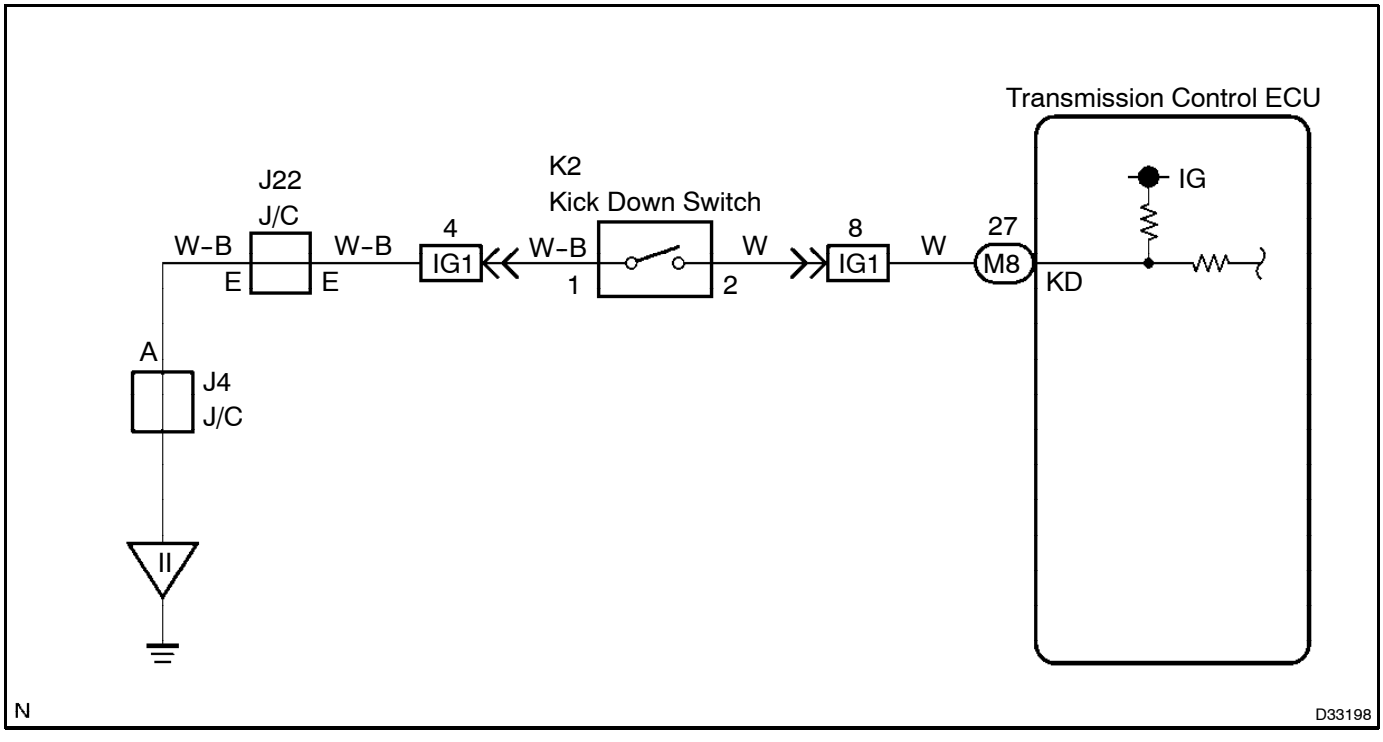
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

KICK DOWN SWITCH CIRCUIT

CIRCUIT DESCRIPTION

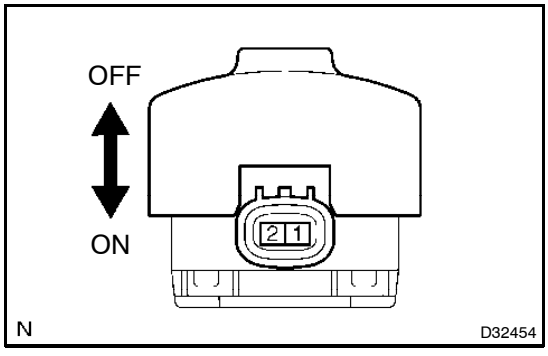
LHD vehicles are equipped with a kick-down switch along with the normal automatic shift control (E position). When the kick down switch is turned on, the most appropriate gear is automatically selected according to the vehicle speed. The kick down switch can also detect when the throttle valve is fully open.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT KICK DOWN SWITCH



(a) Disconnect the kick down switch connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

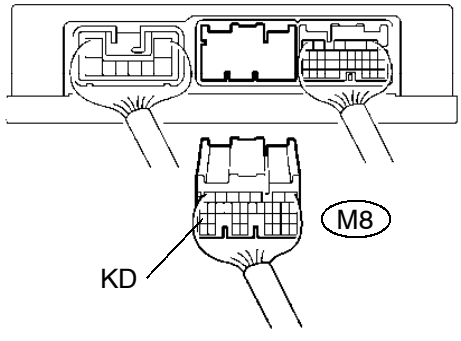
Terminal No.	Switch condition	Specified value
1 - 2	OFF → ON	10 kΩ or higher → Below 1 Ω

NG → **REPLACE KICK DOWN SWITCH**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BODY GROUND)

Wire Harness View:



(a) Reconnect the kick down switch connector.
(b) Disconnect the M8 connector of the transmission control ECU.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

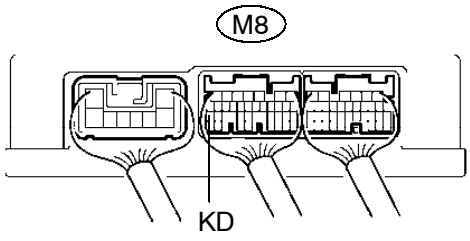
Symbol (Terminal No.)	Condition	Specified value
KD (M8-27) - Body ground	Kick down SW OFF → ON	10 kΩ or higher → Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



N D32440

(a) Reconnect the transmission control ECU connector.
(b) Turn the ignition switch on.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
KD (M8-27) - Body ground	Ignition SW ON, kick down SW OFF → ON	10 to 14 V → Below 1.8 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

STARTER SIGNAL CIRCUIT

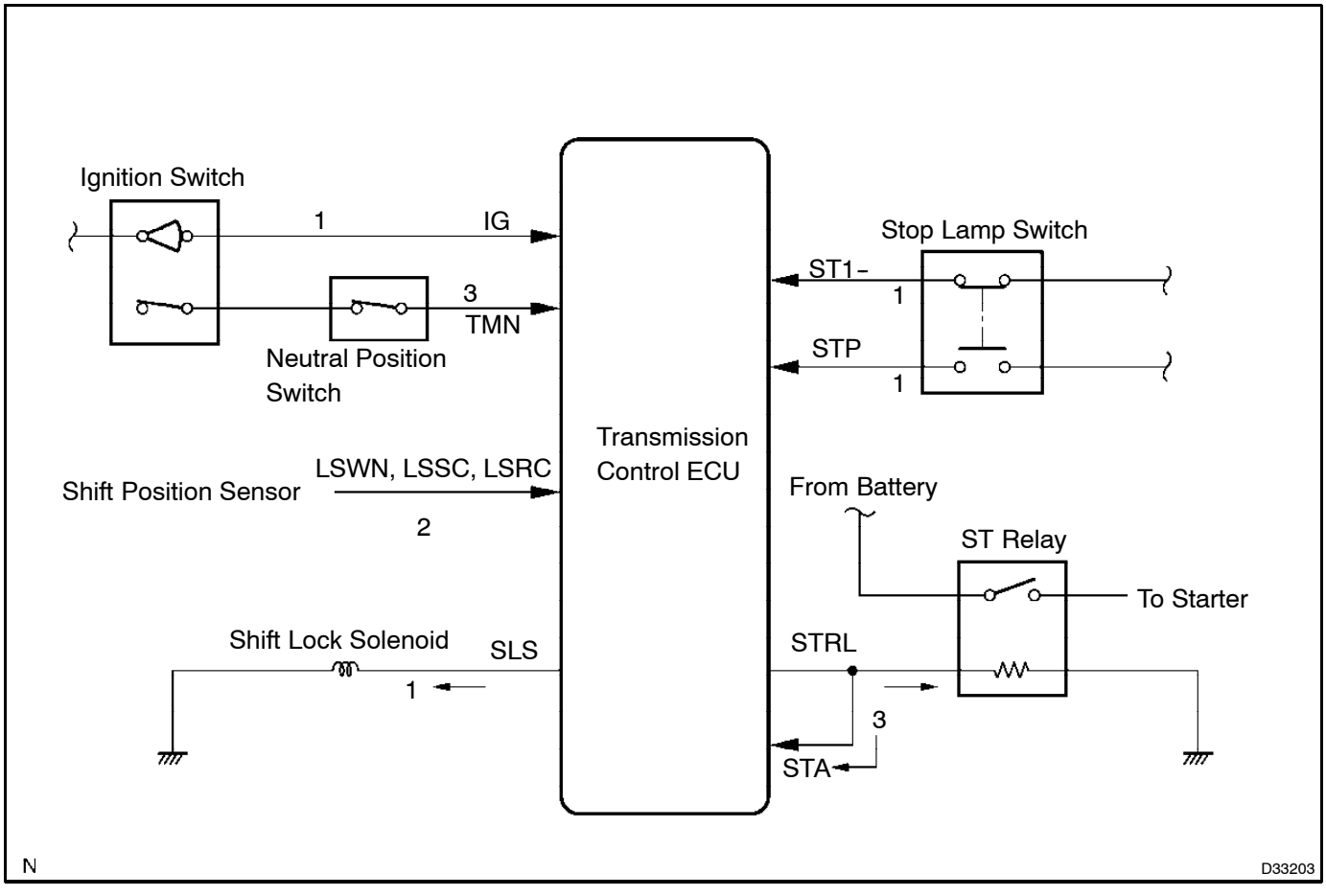
CIRCUIT DESCRIPTION

Engine Starting Control

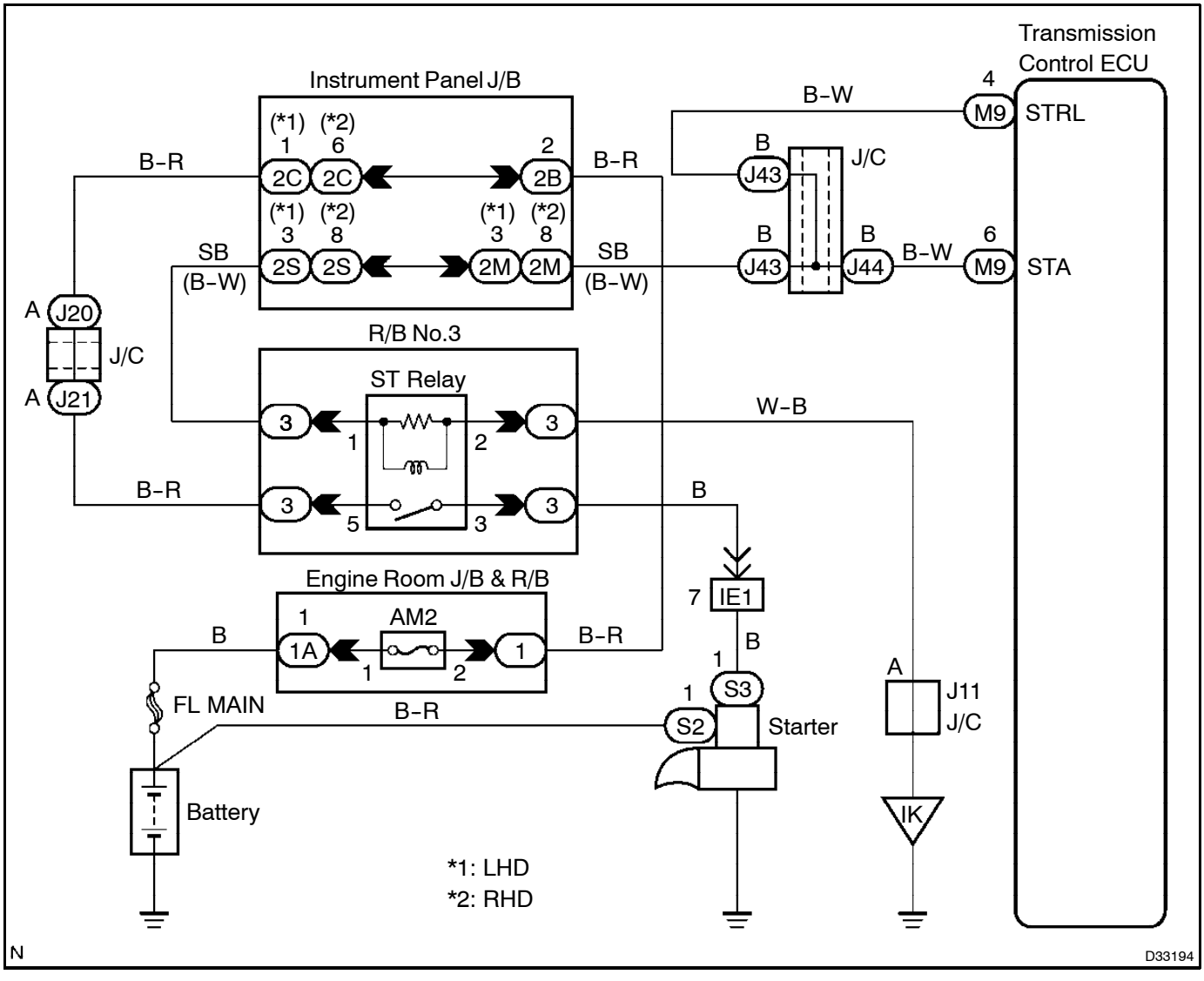
(a) When the ignition switch is turned on and the brake pedal is pressed, the transmission control ECU turns on the shift lock solenoid in order to release shift lock.

(b) When the shift lever is shifted into the N position, the transmission control ECU detects that the shift lever position is N using the shift position sensor.

(c) When the ignition switch is turned to the START position, the start signal is sent to the transmission control ECU through the neutral start switch. When the ECU receives the signal, the starter relay is turned on to cause the engine start.

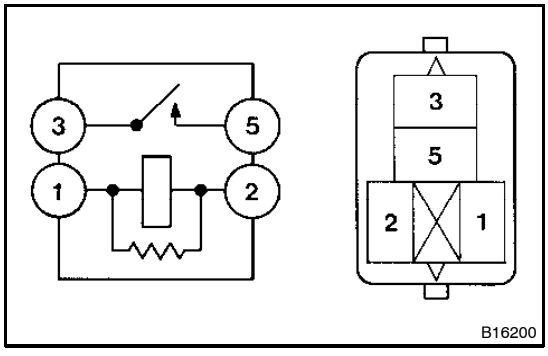


WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT RELAY (ST)



(a) Remove the ST relay from the R/B No.3.
(b) Check for continuity of the ST relay.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

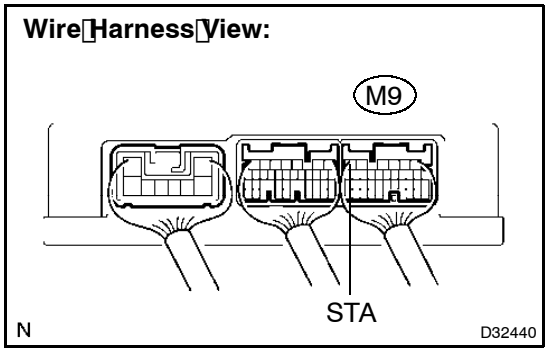
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (When battery voltage is applied to terminals 1 - 2)

NG → **REPLACE RELAY**

OK

2 INSPECT TRANSMISSION CONTROL ECU ASSY (STA)

Wire Harness View:



(a) Install the ST relay.
(b) Turn the ignition switch to the START position.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

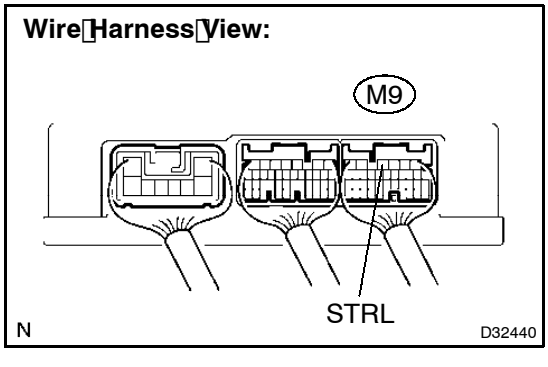
Symbol (Terminal No.)	Condition	Specified Value
STA (M9-6) - Body ground	Ignition SW OFF → START	Below 1 V → 10 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

NG

3 INSPECT TRANSMISSION CONTROL ECU ASSY (STRL)

Wire Harness View:



(a) Turn the ignition switch to the START position.
(b) Measure the voltage according to the value(s) in the table below.

Standard:

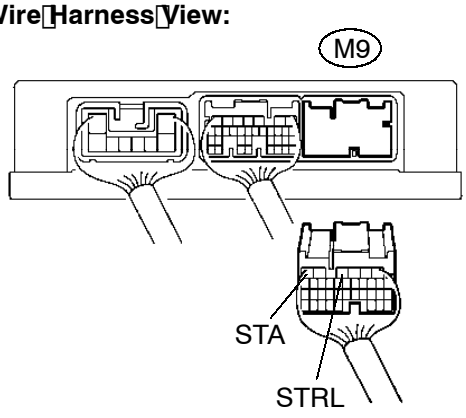
Symbol (Terminal No.)	Condition	Specified Value
STRL (M9-4) - Body ground	Ignition SW OFF → START	Below 1 V → 10 to 14 V

NG → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE** **(SEE PAGE 05-219)**

OK

4	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BATTERY, BODY GROUND)

Transmission Control ECU
Wire Harness View:



N D32443

(a) Disconnect the M9 connector of the transmission control ECU and S3 connector of the starter.

(b) Remove the ST relay.

(c) Measure the resistance according to the value(s) in the table below.

Standard:

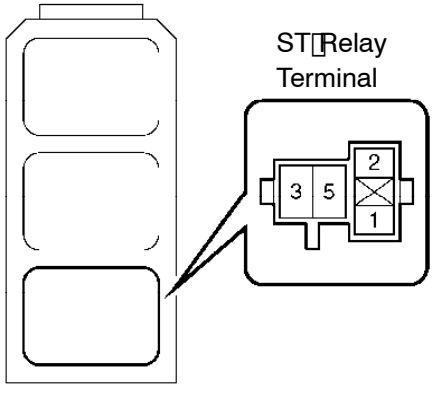
Symbol (Terminal No.)	Condition	Specified value
STRL (M9-4) - STA (M9-6)	Always	Below 1 Ω
STRL (M9-4) - ST relay terminal 1	Always	Below 1 Ω
STRL (M9-4) - Body ground	Always	10 kΩ or higher
ST relay terminal 2 - Body ground	Always	Below 1 Ω
ST relay terminal 3 - S3-1	Always	Below 1 Ω
ST relay terminal 3 - Body ground	Always	10 kΩ or higher

(d) Measure the voltage according to the value(s) in the table below.

Standard:

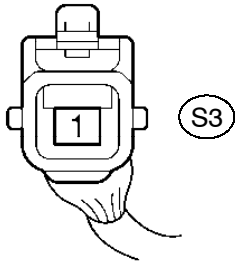
Symbol (Terminal No.)	Condition	Specified value
ST relay terminal 5 - Body ground	Always	10 to 14 V

R/B No.3



N D33211

Starter Wire Harness Side Connector
Front View:



N D33212

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

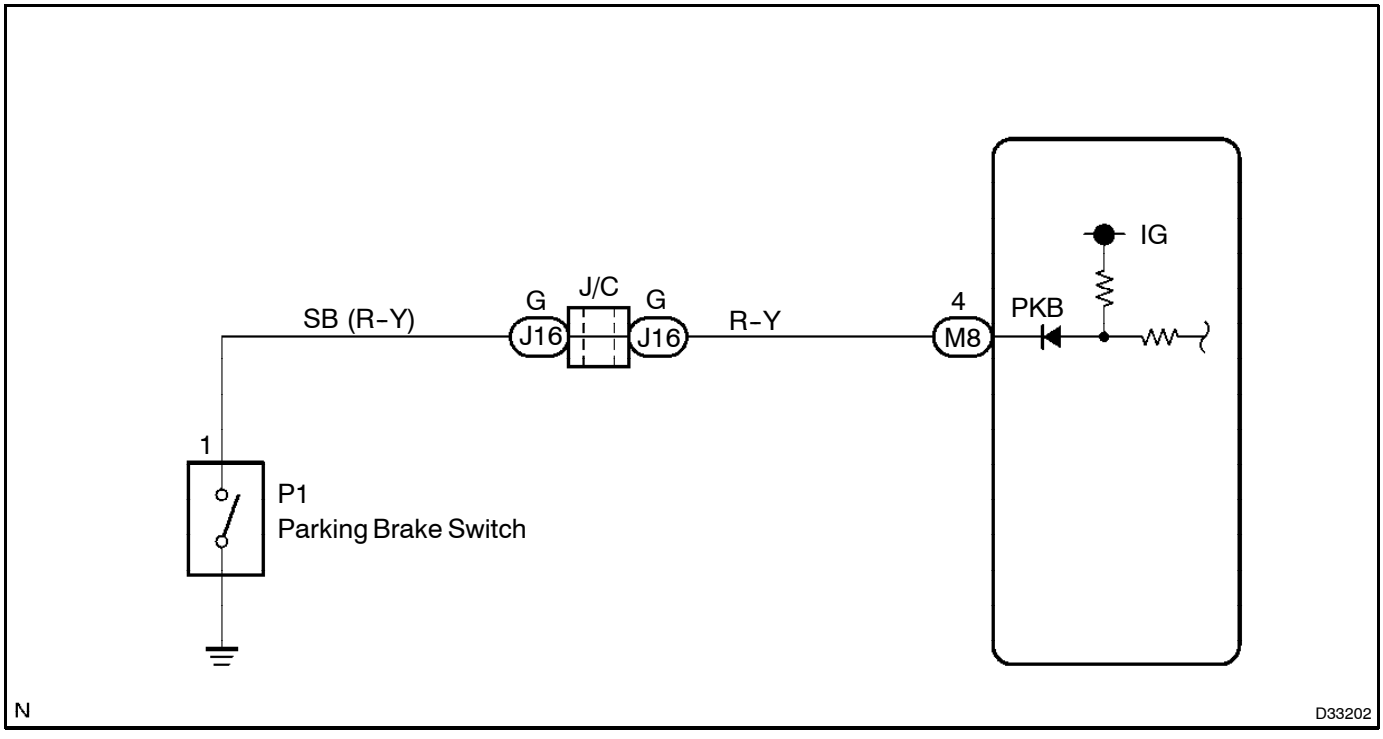
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-219)

PARKING BRAKE SWITCH CIRCUIT

CIRCUIT DESCRIPTION

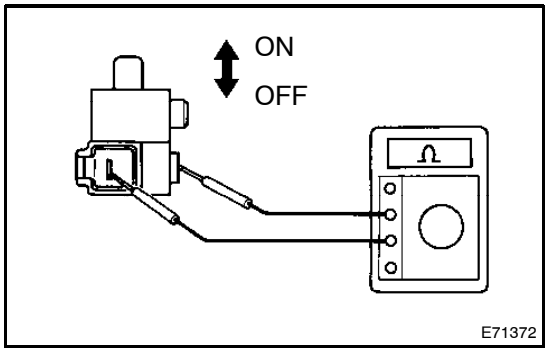
The transmission control ECU detects the ON/OFF status of the parking brake switch.
After detecting the ON status of the switch, the transmission control ECU cancels the take off assist control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT PARKING BRAKE SWITCH ASSY



(a) Remove the parking brake switch.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

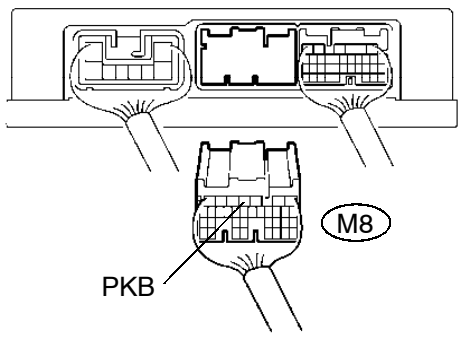
Tester connection	Condition	Specified resistance
1 - Switch body	OFF (When shaft is pressed)	10 kΩ or higher
1 - Switch body	ON (When shaft is not pressed)	Below 1 Ω

NG → REPLACE PARKING BRAKE SWITCH ASSY

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL ECU - BODY GROUND)

Wire Harness View:



(a) Reconnect the parking brake switch connector.
(b) Disconnect the M8 connector of the transmission control ECU.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

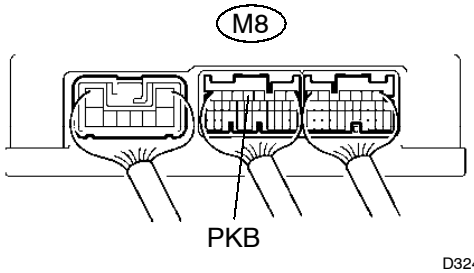
Symbol (Terminal No.)	Condition	Specified Value
PKB (M8-4) - Body ground	Parking Brake SW OFF → ON	10 kΩ or higher → Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3	INSPECT TRANSMISSION CONTROL ECU ASSY

Wire Harness View:



(a) Reconnect the transmission control ECU connector.
(b) Turn the ignition switch on.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Symbol (Terminal No.)	Condition	Specified Value
PKB (M8-4) - Body ground	Ignition SW ON, Parking Brake SW OFF → ON	10 to 14 V → Below 1 V

NG → **REPLACE TRANSMISSION CONTROL ECU ASSY (SEE PAGE 41-33)**

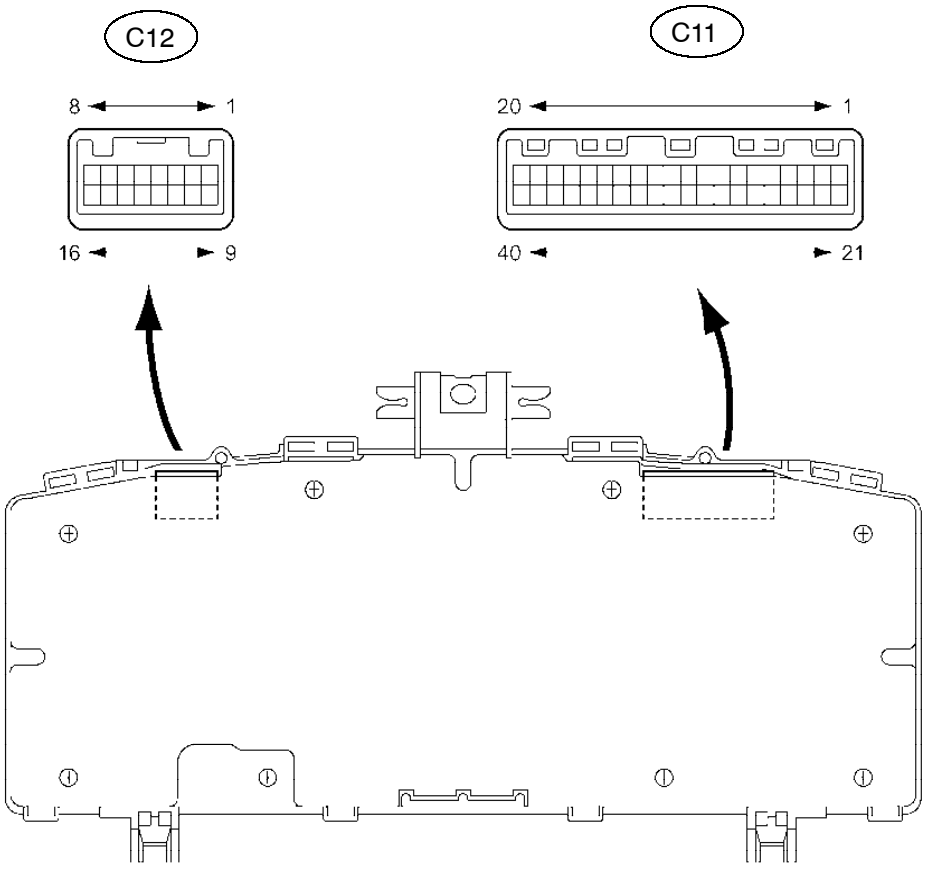
OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (SEE PAGE 05-219)

COMBINATION METER (1ND-TV)

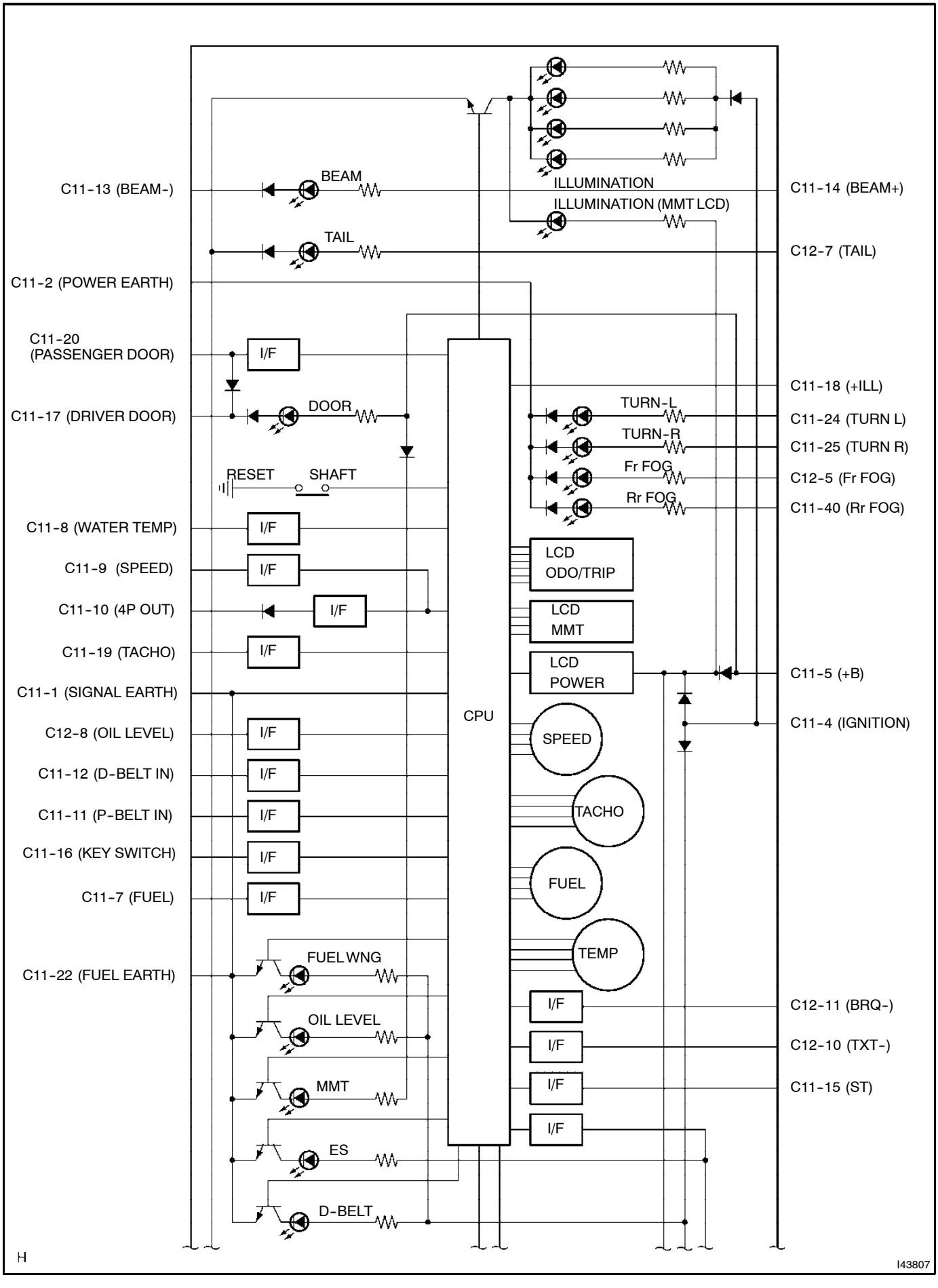
SYSTEM DIAGRAM

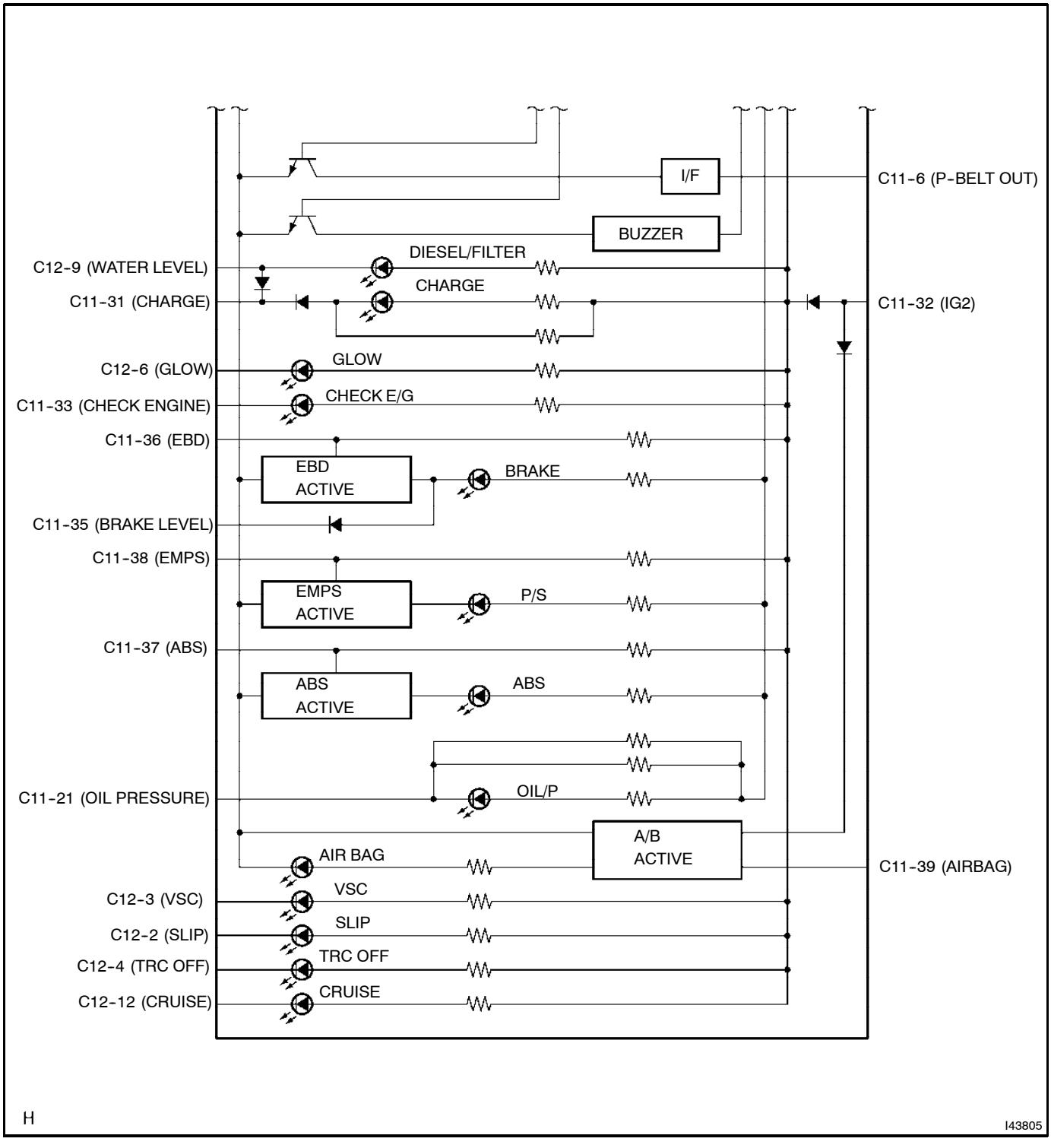
05MSK-01



H

I43802


C11-13 (BEAM-)
BEAM
ILLUMINATION
ILLUMINATION (MMT LCD)
C11-14 (BEAM+)
TAIL
C12-7 (TAIL)
C11-2 (POWER EARTH)
C11-20
(PASSENGER DOOR)
I/F
C11-18 (+ILL)
C11-17 (DRIVER DOOR)
DOOR
TURN-L
C11-24 (TURN L)
TURN-R
C11-25 (TURN R)
RESET
SHAFT
Fr FOG
C12-5 (Fr FOG)
Rr FOG
C11-40 (Rr FOG)
C11-8 (WATER TEMP)
C11-9 (SPEED)
C11-10 (4P OUT)
C11-19 (TACHO)
LCD
ODO/TRIP
LCD
MMT
LCD
POWER
C11-5 (+B)
C11-1 (SIGNAL EARTH)
CPU
C11-4 (IGNITION)
C12-8 (OIL LEVEL)
SPEED
C11-12 (D-BELT IN)
C11-11 (P-BELT IN)
TACHO
C11-16 (KEY SWITCH)
FUEL
C11-7 (FUEL)
TEMP
C11-22 (FUEL EARTH)
FUEL WNG
C12-11 (BRQ-)
OIL LEVEL
C12-10 (TXT-)
MMT
C11-15 (ST)
ES
D-BELT
H
I43807


I/F
C11-6 (P-BELT OUT)
BUZZER
DIESEL/FILTER
C12-9 (WATER LEVEL)
CHARGE
C11-31 (CHARGE)
C11-32 (IG2)
GLOW
C12-6 (GLOW)
CHECK E/G
C11-33 (CHECK ENGINE)
C11-36 (EBD)
EBD
ACTIVE
BRAKE
C11-35 (BRAKE LEVEL)
C11-38 (EMPS)
EMPS
ACTIVE
P/S
C11-37 (ABS)
ABS
ACTIVE
ABS
OIL/P
C11-21 (OIL PRESSURE)
A/B
ACTIVE
AIR BAG
C11-39 (AIRBAG)
VSC
C12-3 (VSC)
SLIP
C12-2 (SLIP)
TRC OFF
C12-4 (TRC OFF)
CRUISE
C12-12 (CRUISE)
H
I43805

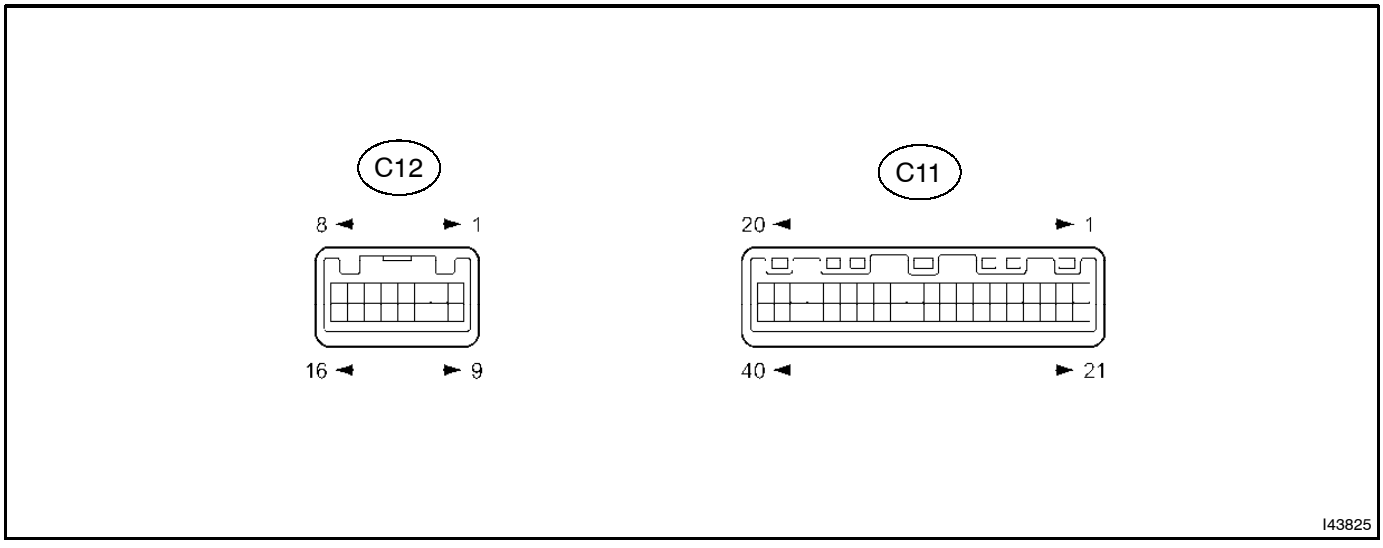
Terminal No.		Wire harness side
C11	1	Ground (Signal Ground)
	2	Ground (Power Ground)
	3	-
	4	GAUGE Fuse
	5	DOME Fuse
	6	A/C Control Assy
	7	Fuel Sender Gauge Assy
	8	ECM (Water Temp.)
	9	Brake Actuator Assy (ABS) (*1), ABS & Traction Actuator Assy (VSC) (*2)
	10	Diode
	11	Front Seat Inner Belt Assy (Passenger Side)
	12	Front Seat Inner Belt Assy (Driver Side)
	13	Ground (w/ DRL Relay), Dimmer Relay (w/o DRL Relay)
	14	Headlight Dimmer Relay
	15	ECM
	16	Key Unlock Warning Switch
	17	Front Door Courtesy Switch Assy (Driver Side)
	18	Daytime Running Light Relay (*3), Light Control Switch (*4)
	19	ECM (Tacho)
	20	Door Courtesy Switch (Except Driver Door)
	21	Low Oil Pressure Warning Switch
	22	Ground (Fuel Ground)
	23	-
	24	Turn Signal Flasher (L)
	25	Turn Signal Flasher (R)
	26	-
	27	-
	28	-
	29	-
	30	-
	31	Ignition Switch
	32	IG2 Fuse
	33	ECM (Check Engine)
	34	-
	35	Brake Fluid Level Warning Switch
	36	Brake Actuator Assy (ABS) (*1), ABS & Traction Actuator Assy (VSC) (*2)
	37	Brake Actuator Assy (ABS) (*1), ABS & Traction Actuator Assy (VSC) (*2)
	38	EMPS ECU
	39	Airbag Sensor Assy Center
	40	Rear Fog Lamp Switch (*5), Fog Lamp Switch (*6)
C12	1	-
	2	ABS & Traction Actuator Assy (VSC) (*2)
	3	ABS & Traction Actuator Assy (VSC) (*2)
	4	ABS & Traction Actuator Assy (VSC) (*2)
	5	Fog Lamp Relay
	6	ECM (Glow)
	7	Tail Lamp Relay (*3), Light Control Switch (*4)
	8	Engine Oil Level Switch (*5)
	9	Fuel Filter Warning Switch (*5)
	10	MMT ECU (TXT-)
	11	MMT ECU (BRQ-)
	12	ECM (Cruise)
	13	-
	14	-
	15	-
	16	-

*1: w/ ABS only, *2: w/ VSC, *3: w/ Daytime Running Light Relay, *4: w/o Daytime Running Light Relay, *5: Diesel

05MS-01

TERMINALS OF ECU

1. COMBINATION METER ASSY



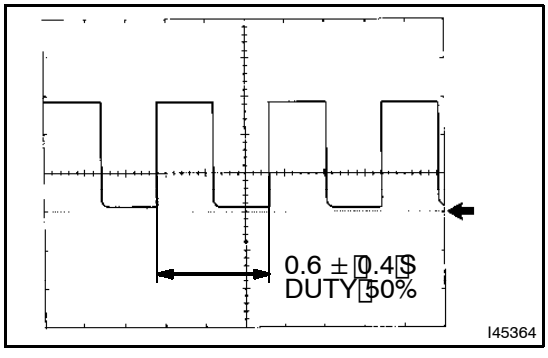
I43825

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
SIGNAL EARTH (C11-1) - Body ground	SB (BR) - Body ground	Ground	Always	Below 1 Ω
POWER EARTH (C11-2) - Body ground	SB (W-B) - Body ground	Ground	Always	Below 1 Ω
IGNITION (C11-4) - Body ground	SB (R-L) - Body ground	Ignition switch signal (ON)	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
+B (C11-5) - Body ground	SB (L-Y) - Body ground	Battery	Always	10 to 14 V
P-BELT OUT (C11-6) - Body ground	SB (Y) - Body ground	Seat belt condition signal (Passenger side)	Passenger seat belt indicator light is OFF → Blinks	10 to 14 V → Pulse generation (See wave form 1)
FUEL (C11-7) - Body ground	W (Y-B) - Body ground	Fuel level signal	Turn the ignition switch ON, fuel level is FULL → EMPTY	Below 1 V → 4 to 7 V
WATER TEMP (C11-8) - Body ground	W (Y-R) - Body ground	Coolant temperature signal	Turn the ignition switch ON, coolant temperature is 80 to 95°C (176 to 203°F)	Pulse generation (See wave form 2)
SI (C11-9) - Body ground	W - Body ground	Speed signal (Input)	Turn the ignition switch ON and turn the wheel slowly	Pulse generation (See wave form 3)
4P OUT (C11-10) - Body ground	W - Body ground	Speed signal (Output)	Turn the ignition switch ON and turn the wheel slowly	Pulse generation (See wave form 3)
P-BELT IN (C11-11) - Body ground	SB (L-Y) - Body ground	Seat belt condition signal (Passenger Side)	Passenger seat belt indicator light is Blinking → OFF	Below 1 V → 10 to 14 V
D-BELT IN (C11-12) - Body ground	SB (R) - Body ground	Seat belt condition signal (Driver Side)	Driver seat belt indicator light is Blinking → OFF	Below 1 V → 10 to 14 V
BEAM- (C11-13) - Body ground	W (W-B) (*1) SB (R-G) (*2) - Body ground	Hi-Beam signal	Hi-Beam ON → OFF	Below 1 Ω
BEAM+ (C11-14) - Body ground	SB (R-L) (*1) SB (L-Y) (*2) - Body ground	Hi-Beam signal	Hi-Beam OFF → ON	Below 1 V → 10 to 14 V
ST (C11-15) - Body ground	W (B-W) - Body ground	Starting signal	Ignition switch OFF → START	Below 1 V → 7 to 14 V

KEY SW (C11-16) - Body ground	SB (L-B) - Body ground	KEY switch signal	Ignition key is inserted → Not inserted	Below 1 V → 10 to 14 V
D DOOR (C11-17) - Body ground	SB (R-W) - Body ground	D door condition signal	Driver door OPEN → CLOSED	Below 1 V → 10 to 14 V
ILL+ (C11-18) - Body ground	SB (G) - Body ground	Tail light signal	Light control switch OFF → ON	Below 1 V → 10 to 14 V
TACHO (C11-19) - Body ground	W (B) - Body ground	Tachometer signal	Engine idle speed	Pulse generation (See wave form 4)
P DOOR (C11-20) - Body ground	SB (R-G) - Body ground	Door condition signal (Except for D door)	Any door except driver door OPEN → CLOSED	Below 1 V → 10 to 14 V
OIL PRESSURE (C11-21) - Body ground	W (W) - Body ground	Oil pressure signal	OIL/P warning light ON → OFF	Below 1 V → 10 to 14 V
FUEL EARTH (C11-22) - Body ground	SB (BR) - Body ground	Ground (Fuel sender gauge)	Always	Below 1 Ω
TURN R (C11-24) - Body ground	W (G-B) - Body ground	Turn signal R	Turn the ignition switch ON, turn signal RH indicator light OFF → ON	Below 1 V → 10 to 14 V
TURN L (C11-25) - Body ground	W (G-Y) - Body ground	Turn signal L	Turn the ignition switch ON, turn signal LH indicator light OFF → ON	Below 1 V → 10 to 14 V
CHARGE (C11-31) - Body ground	W (Y) - Body ground	Charge signal	Engine running → Stopped	10 to 14 V → Below 1 V
IG2 (C11-32) - Body ground	SB (B-O) - Body ground	Charge signal	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
CHECK ENGINE (C11-33) - Body ground	W (R-Y) - Body ground	CHECK ENGINE signal	CHECK ENGINE warning light ON → OFF	Below 2 V → 8 to 14 V
BRAKE LEVEL SW (C11-35) - Body ground	W (R-Y) - Body ground	Brake fluid level signal	Brake fluid level warning light ON → OFF	Below 1 V → 8 to 14 V
EBD (C11-36) - Body ground	W (R-W) - Body ground	ABS or VSC signal	EBD warning light ON → OFF	5 to 9 V → Below 1 V
ABS (C11-37) - Body ground	W (W-R) - Body ground	ABS signal	ABS warning light ON → OFF	5 to 9 V → Below 1 V
EMPS (C11-38) - Body ground	W (R-Y) - Body ground	EMPS signal	EMPS indicator light ON → OFF	6.7 to 12 V → Below 1 V
AIR BAG (C11-39) - Body ground	SB (B-Y) - Body ground	AIR BAG signal	AIR BAG warning light OFF → ON	8 to 14 V → Below 1 V
Rr FOG (C11-40) - Body ground	SB (R) - Body ground	Rear fog signal	Rr FOG indicator light OFF → ON	8 to 14 V → Below 1 V
SLIP (C12-2) (*3) - Body ground	SB (R-G) - Body ground	SLIP signal	SLIP indicator light ON → OFF	Below 1 V → 10 to 14 V
VSC (C12-3) (*3) - Body ground	SB (L-B) - Body ground	VSC signal	VSC indicator light ON → OFF	Below 1 V → 10 to 14 V
TRC OFF (C12-4) (*3) - Body ground	SB (R-Y) - Body ground	TRC OFF signal	TRC OFF indicator light OFF → ON	10 to 14 V → Below 1 V
Fr FOG (C12-5) - Body ground	SB (R) - Body ground	Front fog signal	Fr FOG indicator light ON → OFF	Below 1 V → 10 to 14 V
GLOW (C12-6) (*4) - Body ground	W (R) - Body ground	GLOW signal	GLOW indicator light OFF → ON	10 to 14 V → Below 1 V
TAIL (C12-7) - Body ground	SB (G) - Body ground	TAIL signal	TAIL indicator light OFF → ON	Below 1 V → 10 to 14 V
OIL LEVEL (C12-8) (*4) - Body ground	W (L) - Body ground	OIL LEVEL signal	OIL LEVEL indicator light OFF → ON	Below 1 V → 10 to 14 V

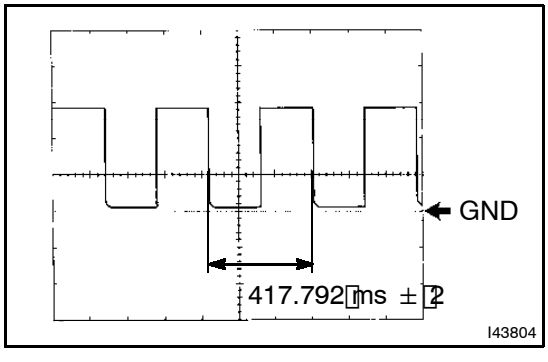
WATER LEVEL (C12-9) (*4) - Body ground	W (LG) - Body ground	DIESEL/FILTER signal	DIESEL/FILTER indicator light OFF → ON	10 to 14 V → Below 1 V
TXT (C12-10) - Body ground	SB (LG) - Body ground	Multi-mode switch signal (Communication circuit)	Ignition switch OFF ON	Pulse generation (See wave form 5)
BRQ - (C12-11) - Body ground	SB (L-Y) - Body ground	Multi-mode switch signal	Ignition switch ON (IG), MMT indicator light ON → OFF	Below 1 V → 10 to 14 V
CRUISE (C12-12) - Body ground	SB (R) - Body ground	CRUISE signal	Ignition switch ON and CRUISE indicator light ON → OFF	Below 1 V → 10 to 14 V

(*1): w/ Daytime running light
(*2): w/o Daytime running light
(*3): w/ VSC
(*4): Diesel
( ): The wiring color differs depending on the vehicle.



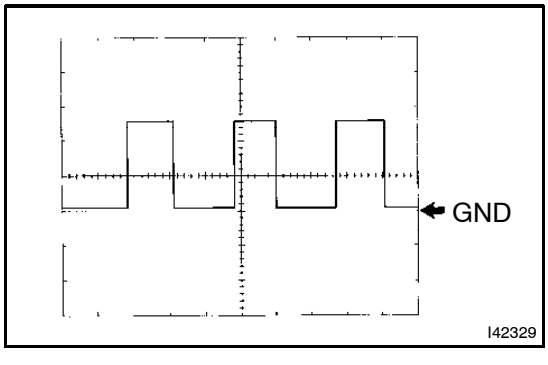
Wave Form 1: Reference: Using oscilloscope:

Item	Condition
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Passenger seat belt indicator light blinks



Wave Form 2: Reference: Using oscilloscope:

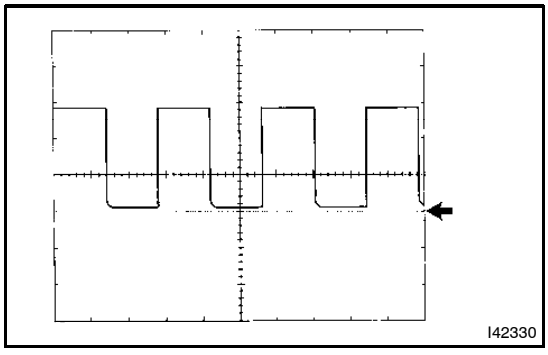
Item	Condition
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Ignition switch ON



Wave Form 3: Reference: Using oscilloscope:

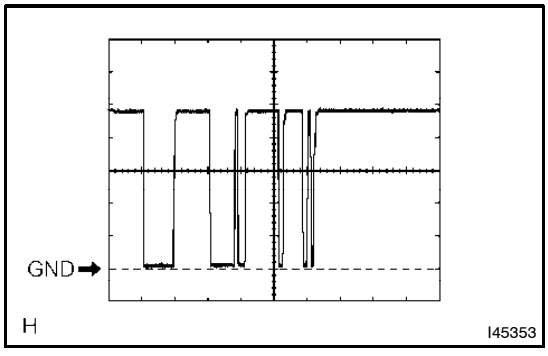
Item	Condition
Tool setting	5 V/ DIV, 20 ms/ DIV
Vehicle condition	Driving at approx. 20 km/h (12 mph)

HINT:
As vehicle speed increases, the cycle of the signal wave form narrows.



Wave Form 4: Reference: Using oscilloscope:

Item	Condition
Tool setting	5 V/ DIV, 10 ms/ DIV
Vehicle condition	Engine idle speed



Wave Form 5: Reference: Using oscilloscope:

Item	Condition
Tool setting	1 V/ DIV, 1 ms/ DIV
Vehicle condition	Ignition switch ON

ENGINE IMMOBILIZER SYSTEM (1ND-TV)

054CF-16

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the engine immobilizer system.
- The intelligent tester II should be used in steps 4 and 7.

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK (See page 05-380)

NEXT

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

NEXT

4	CHECK FOR DTC

(a) Check if DTC B2799 is output or not.

Result:

Result	Proceed to
DTC B2799 is not output	A
DTC B2799 is output	B

B → Go to step 7

A

5	CHECK FOR CODE

(a) Check for codes and note any codes that are output.

(b) Turn the ignition switch OFF.

(c) Recheck for codes. Based on the code output in (a), try to force output of the same code by simulating the operation indicated by the code.

Result:

Result	Proceed to
Code does not reoccur	A
Code reoccurs	B

B → Go to step 7

A

6	PROBLEM SYMPTOMS TABLE (See page 05-392)

Result:

Result	Proceed to
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B → Go to step 8

A

7	OVERALL ANALYSIS AND TROUBLESHOOTING

(a) Pre-check (see page 05-381)
(b) Terminals of ECU (see page 05-387)

NEXT

8	REPAIR OR REPLACE

NEXT

9	CONFIRMATION TEST

NEXT

END

054CG-16

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBILIZER SYSTEM Check Sheet

Inspector's Name :

Customer's Name		**VIN**	
		Production Date	/ /
		License Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

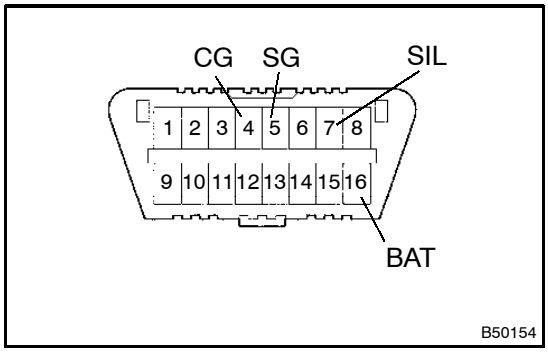
Date Problem First Occurred		/ /
Frequency Problem Occurs		☐ Always ☐ Intermittent (times a day/month) ☐ Only once
Weather Conditions When Problem Occurred	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold Approx. °C (°F)
Symptoms	☐ Immobilizer is not set (Engine starts with unregistered key codes)	
	☐ Engine does not start	
Code Check	**1st Time**	☐ Normal code ☐ Malfunction code (Code)
	2nd Time	☐ Normal code ☐ Malfunction code (Code)

PRE-CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) Engine immobilizer system data and Diagnostic Trouble Codes (DTCs) can be read through the vehicle's Data Link Connector 3 (DLC3). In some cases, a malfunction may be occurring in the immobilizer system even though the security indicator is not illuminated. When the system seems to be malfunctioning, use the intelligent tester II to check for malfunctions and perform repairs.

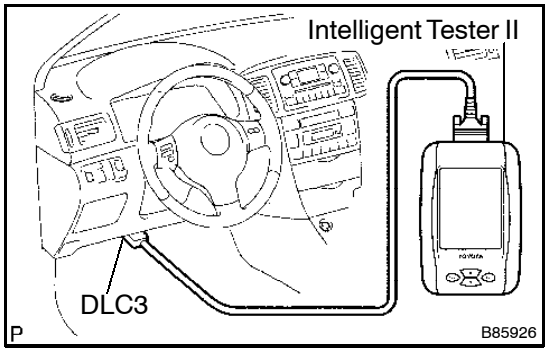


(b) Inspect the DLC3.

The vehicle uses ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031-03 and matches ISO 15765-4 format.

Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V

If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.



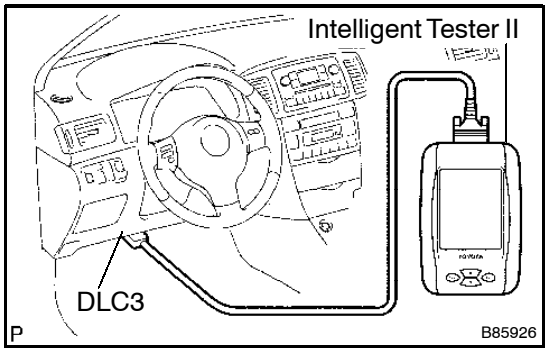
HINT:

Connect the cable of the intelligent tester II to the DLC3, turn the ignition switch ON and attempt to use the tester. If the display indicates that a communication error has occurred, there may be a problem either with the vehicle or with the tester.

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

(c) Check the battery voltage.
Standard: 11 to 14 V

If the voltage is below 11 V, replace the battery before proceeding.

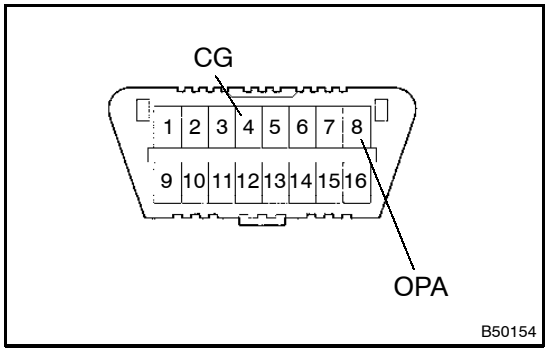


2. CHECK DTC (USING INTELLIGENT TESTER II)

HINT:
Use the intelligent tester II to detect the output of DTC B2799 from the ECM. The outputs of the other codes are detected using SST.

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch ON.
(c) Read the DTCs by following the directions on the tester's screen.

HINT:
Refer to the intelligent tester II operator's manual for further details.



3. CHECK TRANSPONDER KEY ECU CODE (NOT USING INTELLIGENT TESTER II)

(a) Using SST, connect terminal 8 (OPA) and 4 (CG) of the DLC3.
SST 09843-18040
(b) Turn the ignition switch ON.
(c) Read the code from the security indicator.

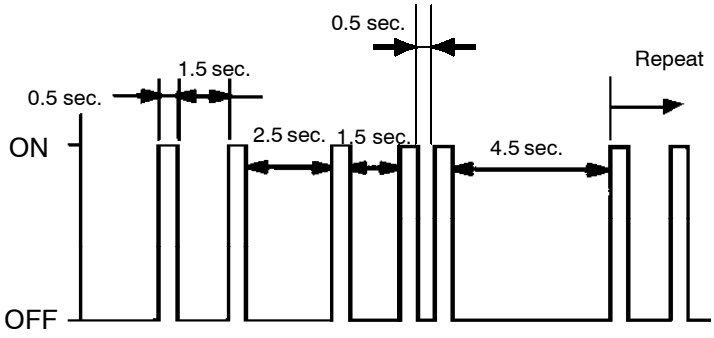
HINT:

- If 2 or more codes are detected at the same time, the lowest numbered code will be displayed first.
- If no code appears, check the diagnostic circuit and the security indicator circuit.

Trouble Area	See Page
OPA and CG terminal circuit	05-410
Security indicator circuit	05-408

- As an example, the blinking patterns for codes 11 and 12 are shown on the illustration below.

Example: Codes 11 and 12 are output



Normal Code: 11, 12, 13, 21 and 22
Malfunction Code: 31, 32, 33, and 34

B61490 B86992

(d) After completing the check, disconnect terminals OPA and CG of the DLC3.

Code chart:

Code	Output Condition
11	Unlock warning switch ON (Ignition key inserted).
12	Any door is open (Door courtesy switch ON).
13	Ignition switch ON.
21	Master key is inserted in ignition key cylinder and immobilizer system is OFF.
22	Sub-key is inserted in ignition key cylinder and immobilizer system is OFF.
31	Key code recorded in transponder key ECU differs from code of key inserted in ignition key cylinder.
32	Transponder key code cannot be read.
33	Key code cannot be read because format of chip inside key is wrong.
34	Transponder key ECU has no memory space to register key code.

4. CLEAR DTC (USING INTELLIGENT TESTER II)

HINT:

Use the intelligent tester II to delete DTC B2799.

(a) Connect the intelligent tester II to the DLC3.

(b) Turn the ignition switch ON.

(c) Erase the DTCs by following the directions on the tester's screen.

HINT:

Refer to the intelligent tester II operator's manual for further details.

054CI-16

DIAGNOSTIC TROUBLE CODE CHART

1. ECM DTC CHART

NOTICE:

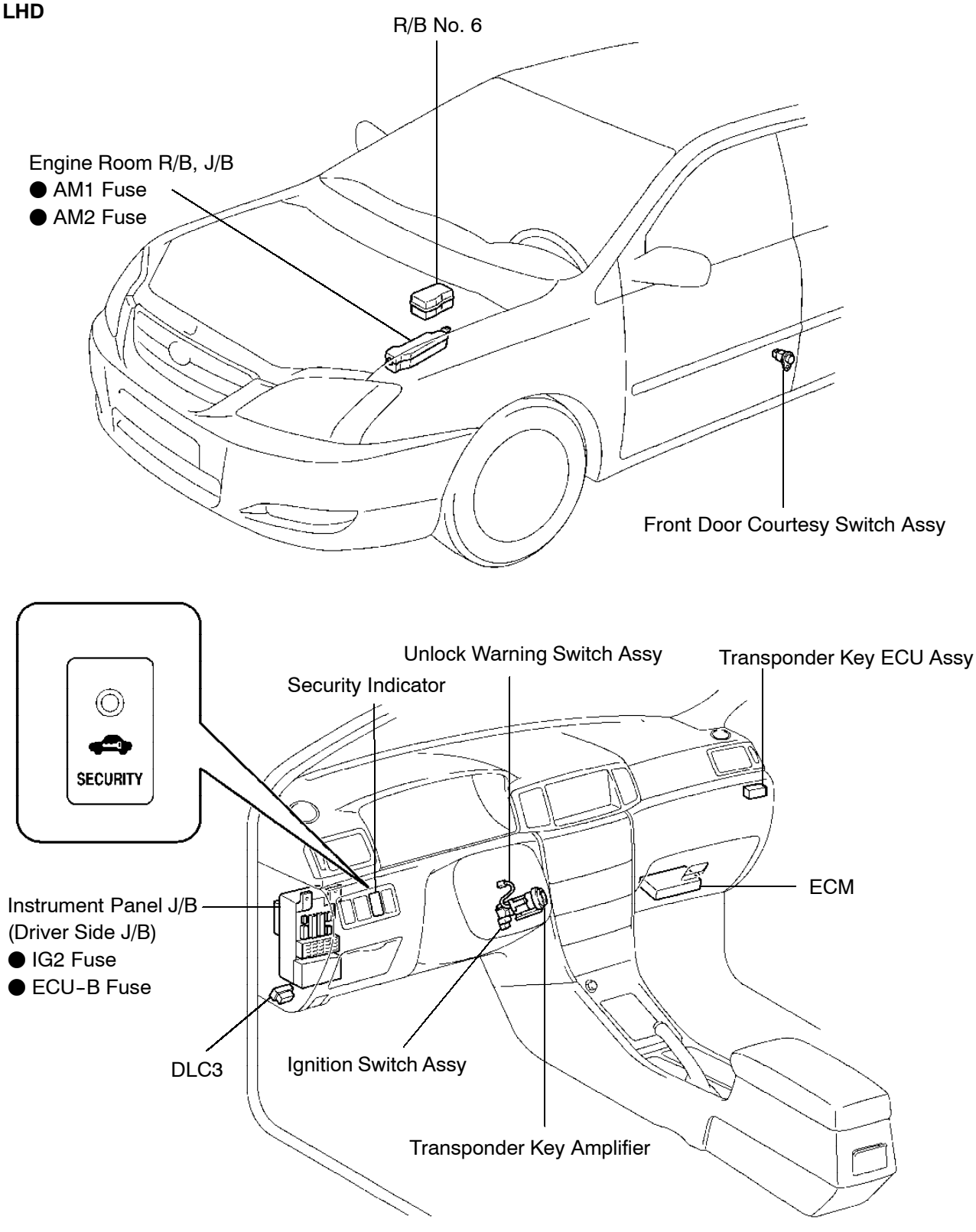
The DTC for the immobilizer system is specified. If other codes are output, check the DTC chart of the ECD system.

DTC No. (See Page)	Detection Item	Trouble Area
B2799 (05-393)	Engine Immobiliser System Malfunction	• Wire harness • ECM

05MPV-01

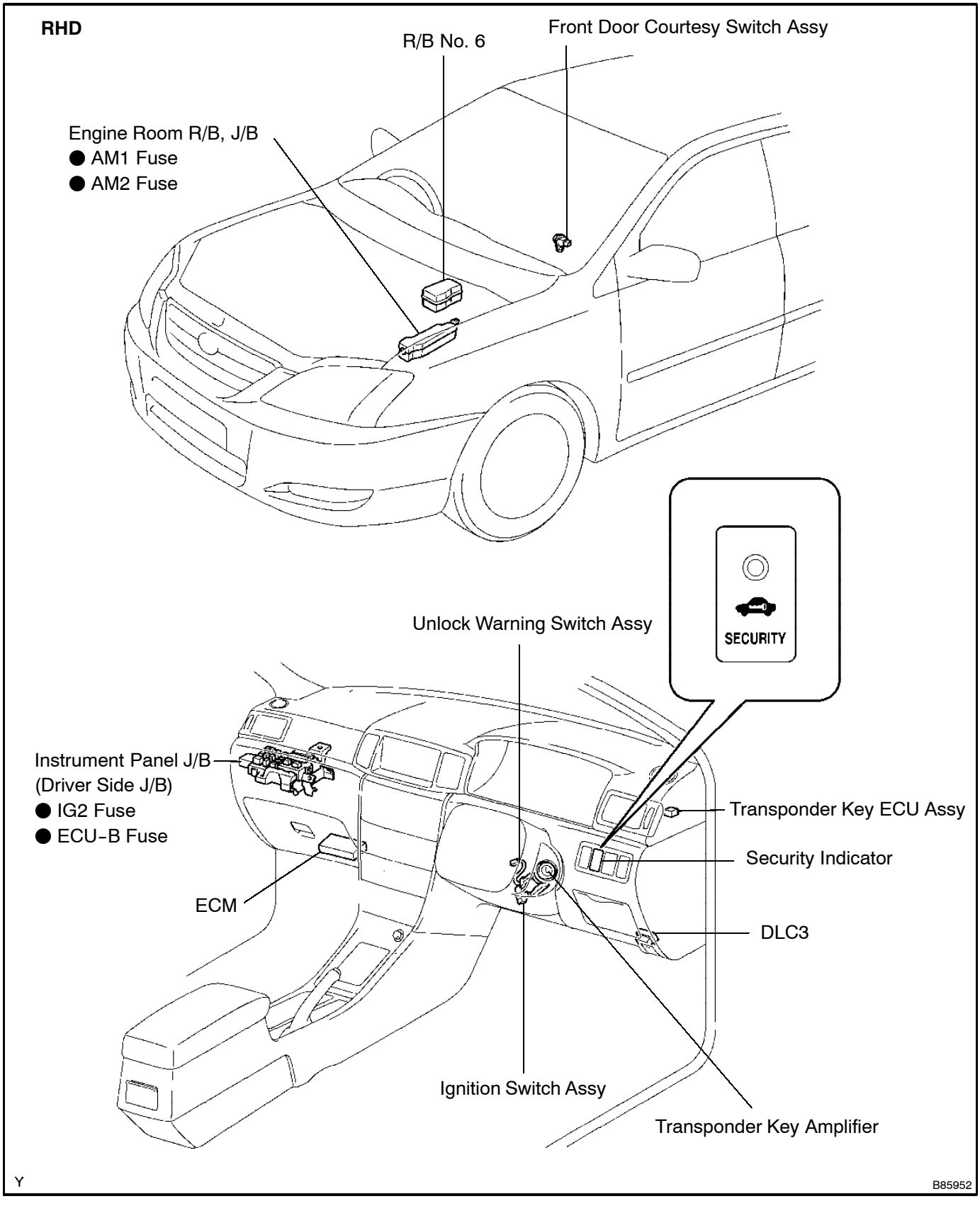
LOCATION

LHD



Y

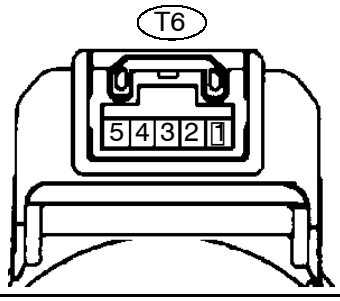
B85951


RHD
R/B No. 6
Front Door Courtesy Switch Assy
Engine Room R/B, J/B
● AM1 Fuse
● AM2 Fuse
SECURITY
Unlock Warning Switch Assy
Instrument Panel J/B
(Driver Side J/B)
● IG2 Fuse
● ECU-B Fuse
Transponder Key ECU Assy
Security Indicator
ECM
DLC3
Ignition Switch Assy
Transponder Key Amplifier
Y
B85952

05LVE-02

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER



B58084

(a) Disconnect the T6 amplifier connector.

(b) Measure the resistance of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T6-3) - Body ground	R - Body ground	Ground	Always	Below 1 Ω

If the result is not as specified, there may be a malfunction on the wire harness side.

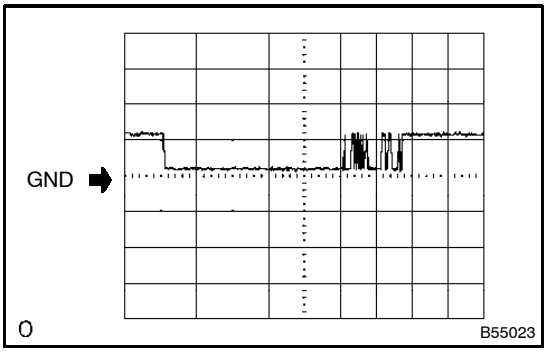
(c) Reconnect the T6 amplifier connector.

(d) Measure the voltage of the connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+B (T6-5) - GND (T6-3)	B - R	Power source	No key in ignition key cylinder	0 V
+B (T6-5) - GND (T6-3)	B - R	Power source	Key inserted	10 to 14 V
CODE (T6-2) - GND (T6-3)	P - R	Demodulated signal of transponder ID data	No key in ignition key cylinder	Pulse generation (see waveform 1)
CODE (T6-2) - GND (T6-3)	P - R	Demodulated signal of transponder ID data	Key inserted	Pulse generation (see waveform 1)
RXCK (T6-4) - GND (T6-3)	V - R	Clock signal	No key in ignition key cylinder	Pulse generation (see waveform 2)
RXCK (T6-4) - GND (T6-3)	V - R	Clock signal	Key inserted	Pulse generation (see waveform 2)
TXCT (T6-1) - GND (T6-3)	G - R	Key code output signal	No key in ignition key cylinder	Pulse generation (see waveform 3)
TXCT (T6-1) - GND (T6-3)	G - R	Key code output signal	Key inserted	Pulse generation (see waveform 3)

If the result is not as specified, the amplifier may have a malfunction.

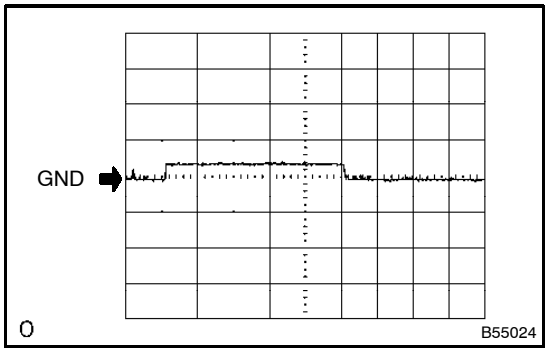


B55023

(e) Inspect using an oscilloscope.

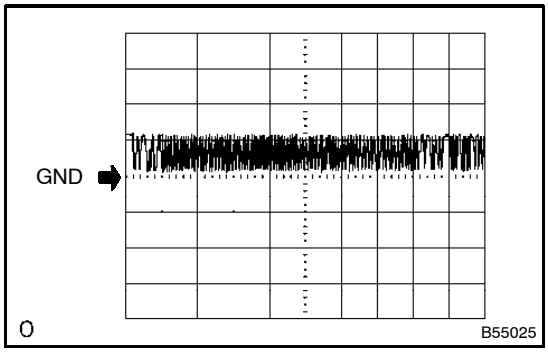
Waveform 1 (Reference):

Terminal	CODE - GND
Tool Setting	10 V/DIV., 10 msec./DIV.
Condition	No key in ignition key cylinder → key inserted



Waveform 2 (Reference):

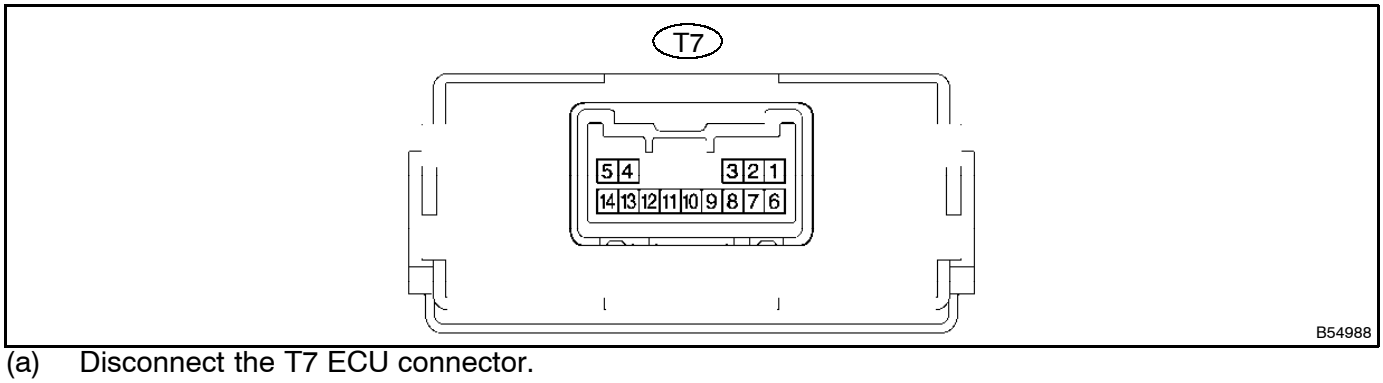
Terminal	RXCK - GND
Tool Setting	10 V/DIV., 10 msec./DIV.
Condition	No key in ignition key cylinder → key inserted



Waveform 3 (Reference):

Terminal	TXCT - GND
Tool Setting	10 V/DIV., 10 msec./DIV.
Condition	No key in ignition key cylinder → key inserted

2. CHECK TRANSPONDER KEY ECU ASSY



(a) Disconnect the T7 ECU connector.

(b) Measure the resistance and voltage of the wire harness side connector.

Standard:

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+B (T7-1) - GND (T7-14)	SB (R-G) - W-B	Battery	Always	10 to 14 V
IG (T7-2) - GND (T7-14)	B-W*1 - W-B SB (B-W)*2 - W-B	Ignition power supply	Ignition switch OFF	0 V
IG (T7-2) - GND (T7-14)	B-W*1 - W-B SB (B-W)*2 - W-B	Ignition power supply	Ignition switch ON	10 to 14 V
KSW (T7-9) - GND (T7-14)	L-B - W-B	Unlock warning switch	No key in ignition key cylinder	10 kΩ or higher
KSW (T7-9) - GND (T7-14)	L-B - W-B	Unlock warning switch	Key inserted	Below 1 Ω
AGND (T7-12) - GND (T7-14)	R - W-B	Ground	Always	Below 1 Ω
GND (T7-14) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω

HINT:

*1: LHD

*2: RHD

If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the T7 ECU connector.

(d) Measure the voltage of the connector.

Standard:

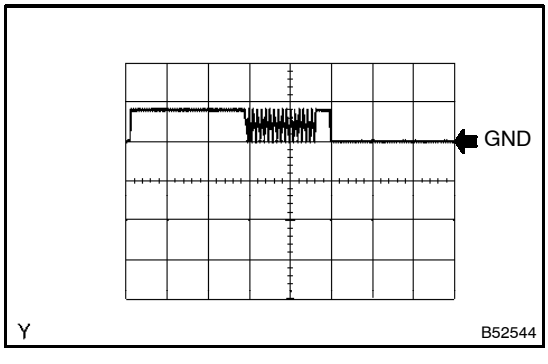
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
KSW (T7-9) - GND (T7-14)	L-B - W-B	Unlock warning switch	No key in ignition key cylinder	10 to 14 V
KSW (T7-9) - GND (T7-14)	L-B - W-B	Unlock warning switch	Key inserted	Below 1 V
VC12 (T7-6) - GND (T7-14)	B - W-B	Power source of transponder key amplifier	No key in ignition key cylinder	0 V
VC12 (T7-6) - GND (T7-14)	B - W-B	Power source of transponder key amplifier	Key inserted	10 to 14 V
TXCT (T7-13) - AGND (T7-12)	G - R	Transponder key amplifier communication signal	No key in ignition key cylinder	Pulse generation (see waveform 1)
TXCT (T7-13) - AGND (T7-12)	G - R	Transponder key amplifier communication signal	Key inserted	Pulse generation (see waveform 1)
CODE (T7-4) - AGND (T7-12)	P - R	Transponder key amplifier communication signal	No key in ignition key cylinder	Pulse generation (see waveform 2)
CODE (T7-4) - AGND (T7-12)	P - R	Transponder key amplifier communication signal	Key inserted	Pulse generation (see waveform 2)
RXCK (T7-5) - AGND (T7-12)	V - R	Transponder key amplifier communication signal	No key in ignition key cylinder	Pulse generation (see waveform 3)
RXCK (T7-5) - AGND (T7-12)	V - R	Transponder key amplifier communication signal	Key inserted	Pulse generation (see waveform 3)
EFIO (T7-11) - GND (T7-14)	LG-R - W-B	ECM output signal	Ignition switch OFF	Pulse generation (see waveform 4)
EFIO (T7-11) - GND (T7-14)	LG-R - W-B	ECM output signal	Ignition switch ON	Pulse generation (see waveform 4)
EFII (T7-10) - GND (T7-14)	LG-B - W-B	ECM input signal	Ignition switch OFF	Pulse generation (see waveform 5)
EFII (T7-10) - GND (T7-14)	LG-B - W-B	ECM input signal	Ignition switch ON	Pulse generation (see waveform 5)
CTY (T7-8) - GND (T7-14)	R-W*1 - W-B R-G*2 - W-B	Door courtesy switch	Driver's door fully closed	10 to 14 V
CTY (T7-8) - GND (T7-14)	R-W*1 - W-B R-G*2 - W-B	Door courtesy switch	Driver's door fully open	Below 1 V
IND (T7-7) - GND (T7-14)	W(W-R) - W-B	Security indicator	Engine immobilizer system is set (indicator is blinking)	Alternating between 10 to 14 V (0.2 sec.) and 0 V (1.8 sec.)

HINT:

*1: LHD

*2: RHD

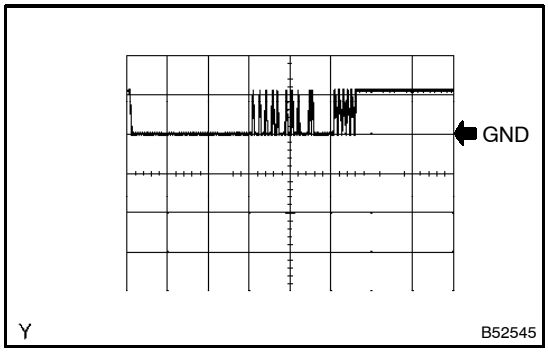
If the result is not as specified, the ECU may have a malfunction.



(e) Inspect using an oscilloscope.

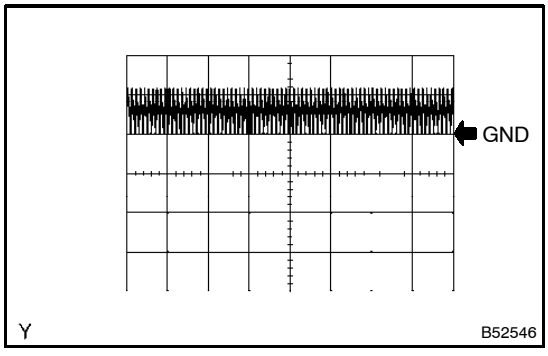
Waveform 1 (Reference):

Terminal	TXCT - GND
Tool Setting	5 V/DIV., 20 msec./DIV.
Condition	No key in ignition key cylinder → key inserted



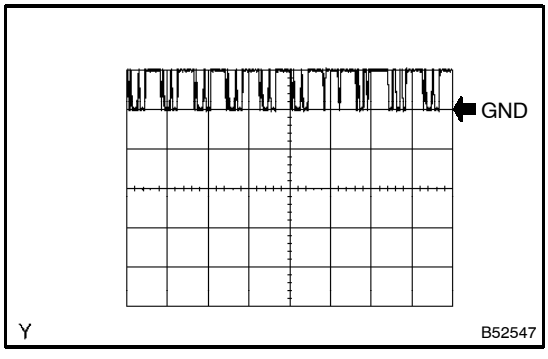
Waveform 2 (Reference):

Terminal	CODE - GND
Tool Setting	10 V/DIV., 20 msec./DIV.
Condition	No key in ignition key cylinder → key inserted



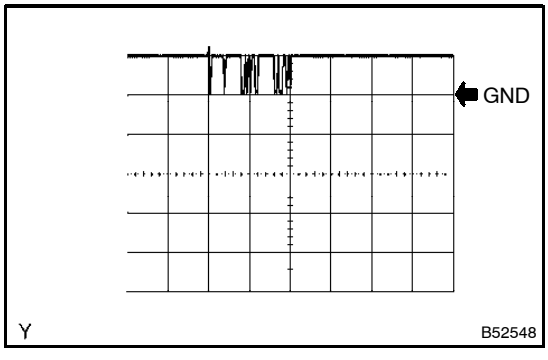
Waveform 3 (Reference):

Terminal	RXCK - GND
Tool Setting	10 V/DIV., 20 msec./DIV.
Condition	No key in ignition key cylinder → key inserted



Waveform 4 (Reference):

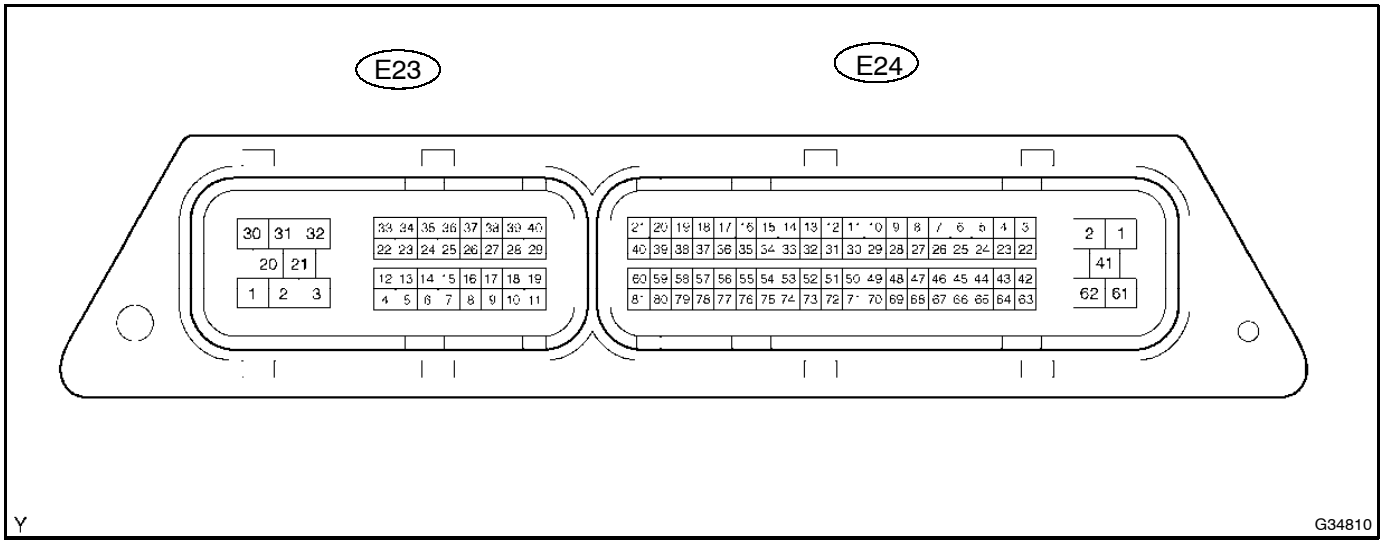
Terminal	EFIO - GND
Tool Setting	5 V/DIV., 5 msec./DIV.
Condition	Ignition switch OFF → ON



Waveform 5 (Reference):

Terminal	EFII - GND
Tool Setting	5 V/DIV., 5 msec./DIV.
Condition	Ignition switch OFF → ON

3. CHECK ECM

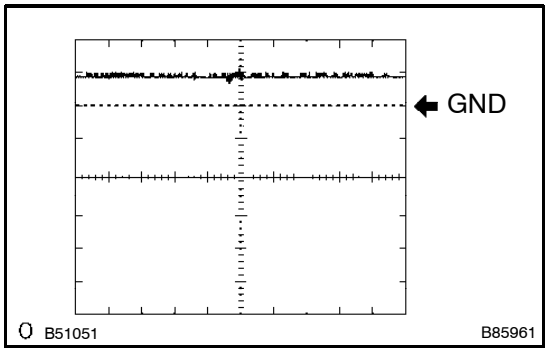


(a) Measure the voltage of the connectors.

Standard:

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+B (E24-1) - E1 (E24-2)	B-W - W-B	Battery	Ignition switch ON	10 to 14 V
+B (E24-61) - E1 (E24-2)	B-W - W-B	Battery	Ignition switch ON	10 to 14 V
IMO (E24-4) - E1 (E24-2)	LG-B - W-B	Transponder key ECU input signal	Ignition switch ON	Pulse generation (see waveform 1)
IMI (E24-6) - E1 (E24-2)	LG-R - W-B	Transponder key ECU input signal	Ignition switch ON	Pulse generation (see waveform 2)
E1 (E24-2) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
E1 (E24-41) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
E1 (E24-62) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω

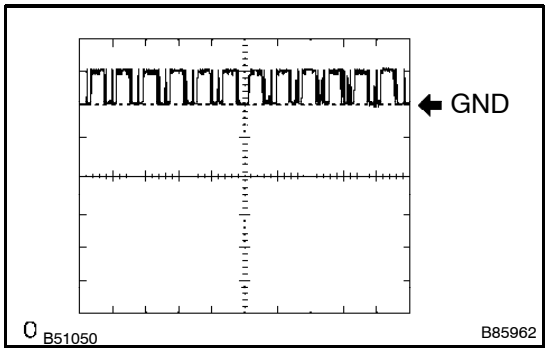
If the result is not as specified, the ECM may have a malfunction.



(b) Inspect using an oscilloscope.

Waveform 1 (Reference):

Terminal	IMO - E1
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON



Waveform 2 (Reference):

Terminal	IMI - E1
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON

054CK-16

PROBLEM SYMPTOMS TABLE

HINT:

Use the table below to help determine the cause of the problem symptom. The potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

Symptom	Suspected Area	See Page
Engine does not start	3. ECU power source circuit • ECU-B fuse • Wire harness • Transponder key ECU assy 4. IG circuit • IG2 fuse • AM2 fuse • Wire harness • Transponder key ECU assy 5. ECD system	05-401 05-403 05-10
Key is inserted into ignition key cylinder but code 11 is not output (unlock warning switch circuit may be malfunctioning)	1. Unlock warning switch circuit • Unlock warning switch assy • Wire harness • Transponder key ECU assy	05-392
Driver side door is opened but code 12 is not output (front door courtesy lamp switch assy circuit may be malfunctioning)	1. Front door courtesy lamp switch assy circuit • Front door courtesy lamp switch assy • Wire harness • Transponder key ECU assy	05-412
Ignition switch is ON but code 13 is not output (ignition or starter switch assy circuit may be malfunctioning)	1. Ignition switch assy circuit • IG2 Fuse • Wire harness • Transponder key ECU assy	05-403
Master key is used to turn ignition switch ON but code 21 is not output (transponder key amplifier circuit may be malfunctioning)	1. Master key 2. Transponder key amplifier circuit • Wire harness • Transponder key amplifier • Transponder key ECU assy	- 05-406
Sub-key is used to turn ignition switch ON but 22 is not output (transponder key amplifier circuit may be malfunctioning)	1. Sub-key 2. Transponder key amplifier circuit • Wire harness • Transponder key amplifier • Transponder key ECU assy	- 05-406
Code 31 is output (unmatched key code)	Key	-
Code 32 is output (no communication in immobilizer system)	1. Key 2. Wire harness 3. Transponder key amplifier 4. Transponder key ECU assy	- - - -
Code 33 is output (no communication in immobilizer system)	1. Key 2. Wire harness 3. Transponder key amplifier 4. Transponder key ECU assy	- - - -
Code 34 is output	Transponder key ECU has no memory space to register key code	-

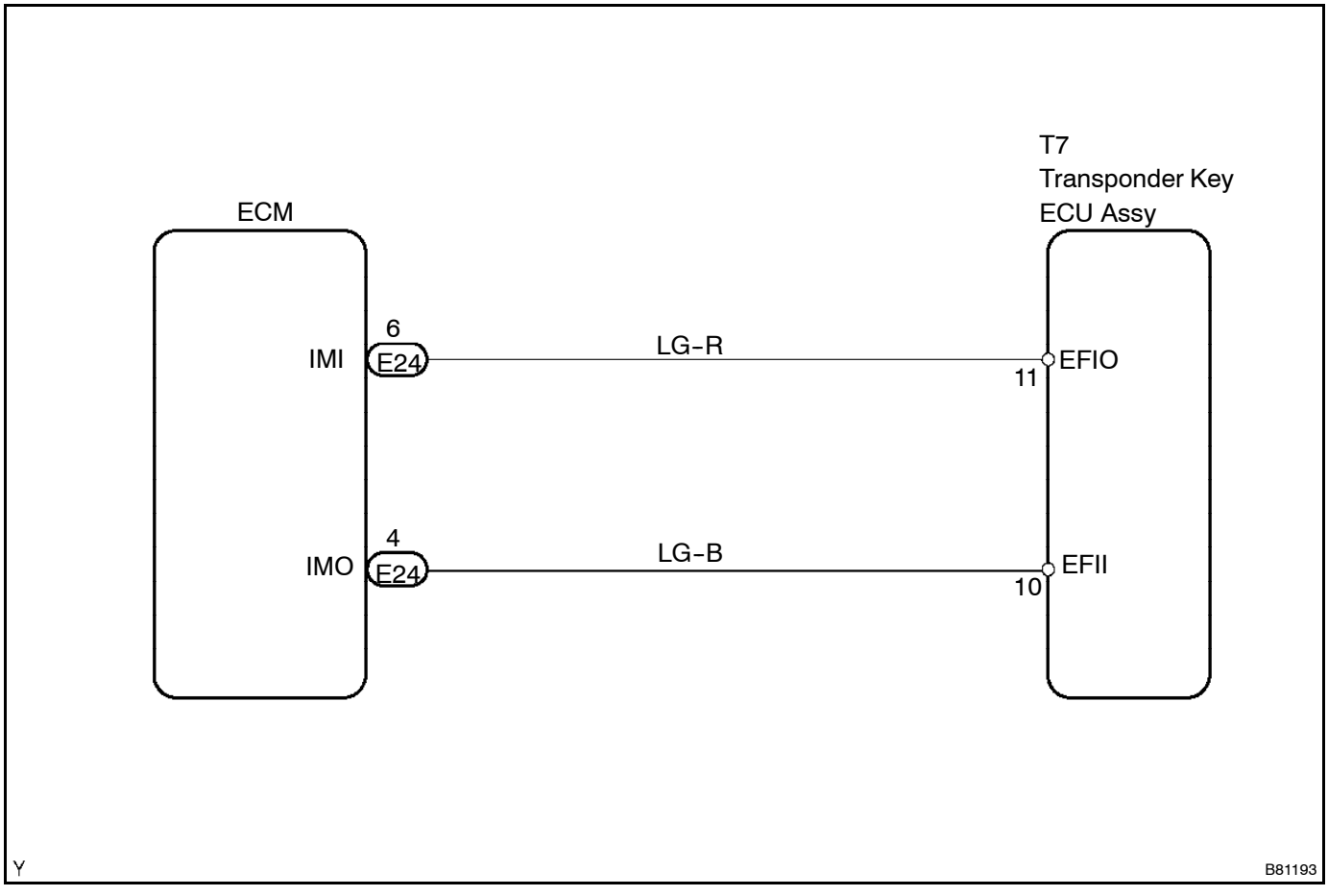
DTC	B2799	ENGINE IMMOBILISER SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

This DTC is output when: 1) the ECM detects errors in its own communications with the transponder key ECU; 2) the ECM detects errors in the communication lines; and 3) the ECU communication ID of the transponder key ECU and the ECM are different.

DTC No.	DTC Detection Condition	Trouble Area
B2799	• Error in communication between ECM and transponder key ECU assy • Error in communication line • Communication ID is different during communication between transponder key ECU and ECM	• Wire harness • ECM

WIRING DIAGRAM

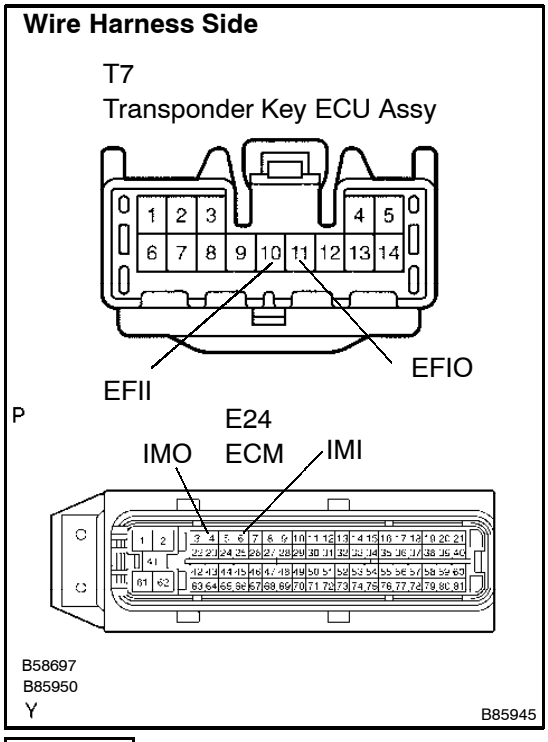


INSPECTION PROCEDURE

HINT:

Before troubleshooting for this DTC, make sure no transponder key ECU codes are present. If a transponder key ECU code is present, troubleshoot it first.

1	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY - ECM)



(a) Disconnect the T7 ECU connector.

(b) Disconnect the E24 ECM connector.

(c) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T7-11 (EFIO) - E24-6 (IMI)	Below 1 Ω
T7-10 (EFII) - E24-4 (IMO)	Below 1 Ω
T7-11 (EFIO) or E24-6 (IMI) - Body ground	10 kΩ or higher
T7-10 (EFII) or E24-4 (IMO) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

CODE 31 IS OUTPUT (UNMATCHED KEY CODE)

CIRCUIT DESCRIPTION

This code is output when a key with a key code that has not been registered in the ECU is inserted into the ignition key cylinder.

Code No.	Detection Condition	Trouble Area
31	Key with unregistered key code is inserted	Key

INSPECTION PROCEDURE

1	REREGISTER KEY

(a) Reregister the key and check that the engine starts with the key.
OK: Engine starts

NG → REPLACE KEY

OK

END

CODE 32 IS OUTPUT (NO COMMUNICATION IN IMMOBILIZER SYSTEM)

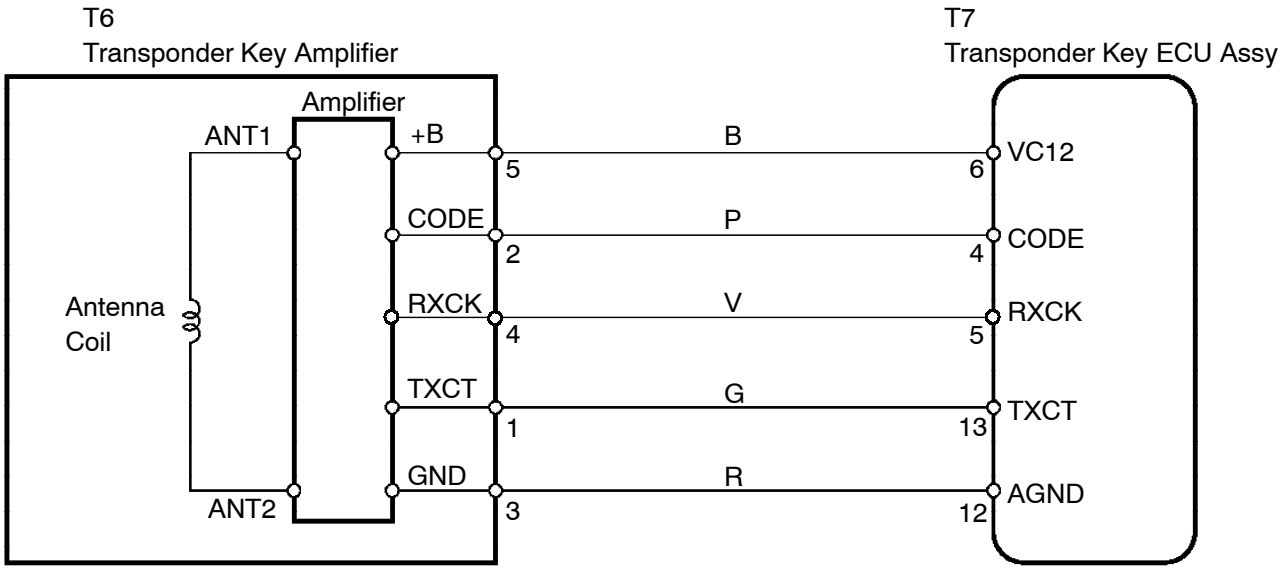
CODE 33 IS OUTPUT (COMMUNICATION IN MALFUNCTION)

CIRCUIT DESCRIPTION

When a key is inserted into the ignition key cylinder but no communication occurs between the key and transponder key ECU, code 32 is output.
When a key is inserted into the ignition key cylinder but a communication error occurs between the key and transponder key ECU, code 33 is output.

Code No.	Detection Condition	Trouble Area
32	No communication	• Wire harness • Transponder key amplifier • Transponder key ECU assy
33	Communication error	Key

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK WHETHER ENGINE STARTS WITH OTHER KEYS

(a) Try to start the engine with each of the vehicle's other keys.
Check that the engine can be started with at least 1 key.
OK: Engine can be started with at least 1 key.

NG → **Go to step 2**

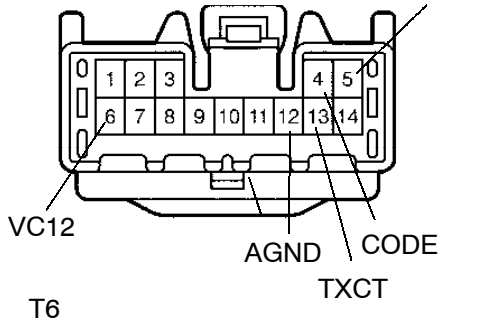
OK

REREGISTER OR REPLACE KEY THAT CANNOT START ENGINE

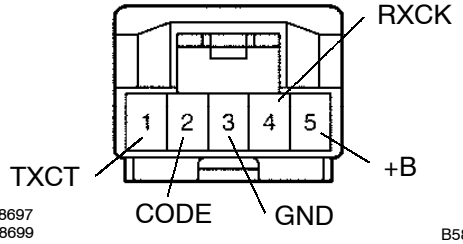
2	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side

T7
Transponder Key ECU Assy



T6
Transponder Key Amplifier



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(a) Disconnect the T7 ECU connector.
(b) Disconnect the T6 amplifier connector.
(c) Measure the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T7-6 (VC12) - T6-5 (+B)	Below 1 Ω
T7-4 (CODE) - T6-2 (CODE)	Below 1 Ω
T7-13 (TXCT) - T6-1 (TXCT)	Below 1 Ω
T7-12 (AGND) - T6-3 (GND)	Below 1 Ω
T7-5 (RXCK) - T6-4 (RXCK)	Below 1 Ω
T7-6 (VC12) or T6-5 (+B) - Body ground	10 kΩ or higher
T7-4 (CODE) or T6-2 (CODE) - Body ground	10 kΩ or higher
T7-13 (TXCT) or T6-1 (TXCT) - Body ground	10 kΩ or higher
T7-12 (AGND) or T6-3 (GND) - Body ground	10 kΩ or higher
T7-5 (RXCK) or T6-4 (RXCK) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

3	CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier with a normally functioning transponder key amplifier, check that the engine starts.
OK: Engine starts.

NG → REPLACE TRANSPONDER KEY ECU ASSY

OK

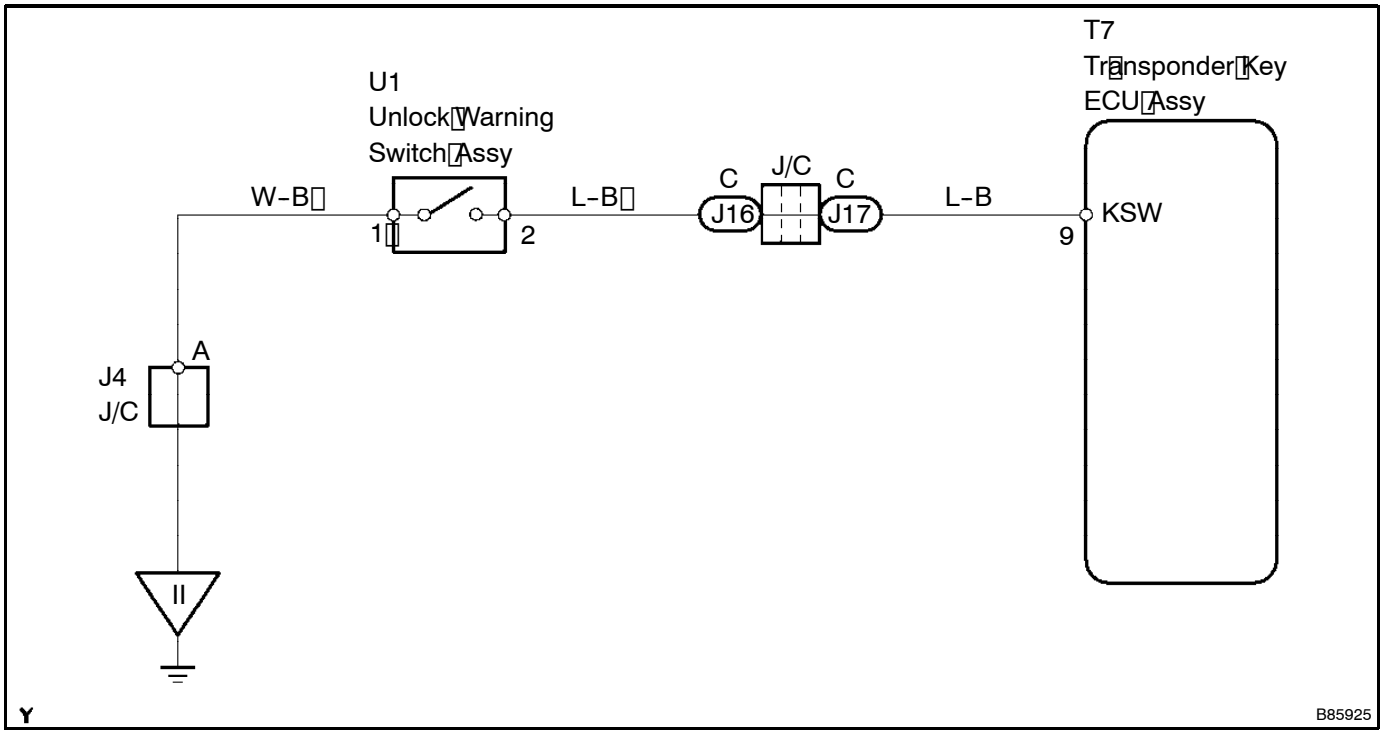
END (TRANSPONDER KEY AMPLIFIER DEFECTIVE)

UNLOCK WARNING SWITCH CIRCUIT

CIRCUIT DESCRIPTION

The unlock warning switch is ON while the key is in the ignition key cylinder.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FOR CODE

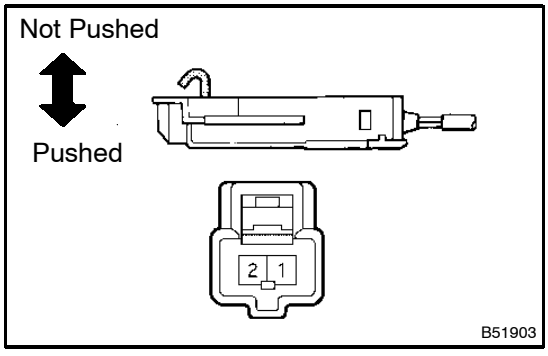
(a) Insert the key into the ignition key cylinder.
(b) Check for code (see page 05-381).
OK: Code 11 is output.

NG → **Go to step 2**

OK

END (NORMAL)

2 INSPECT UNLOCK WARNING SWITCH ASSY



(a) Remove the switch.
(b) Measure the resistance of the switch.

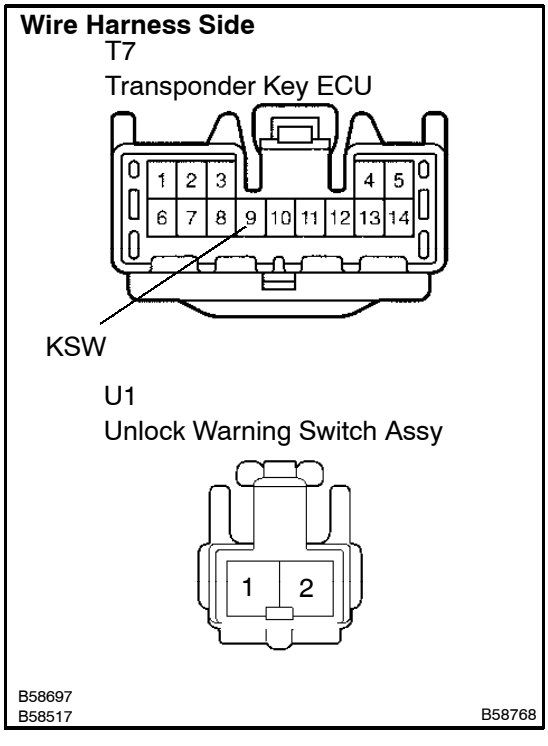
Standard:

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pushed	Below 1 Ω
1 - 2	Not pushed	10 kΩ or higher

NG → **REPLACE UNLOCK WARNING SWITCH ASSY**

OK

3 CHECK WIRE HARNESS (UNLOCK WARNING SWITCH ASSY - TRANSPONDER KEY ECU ASSY AND BODY GROUND)



(a) Disconnect the T7 ECU connector.
(b) Disconnect the U1 switch connector.
(c) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
T7-9 (KSW) - U1-2	Below 1 Ω
U1-1 - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

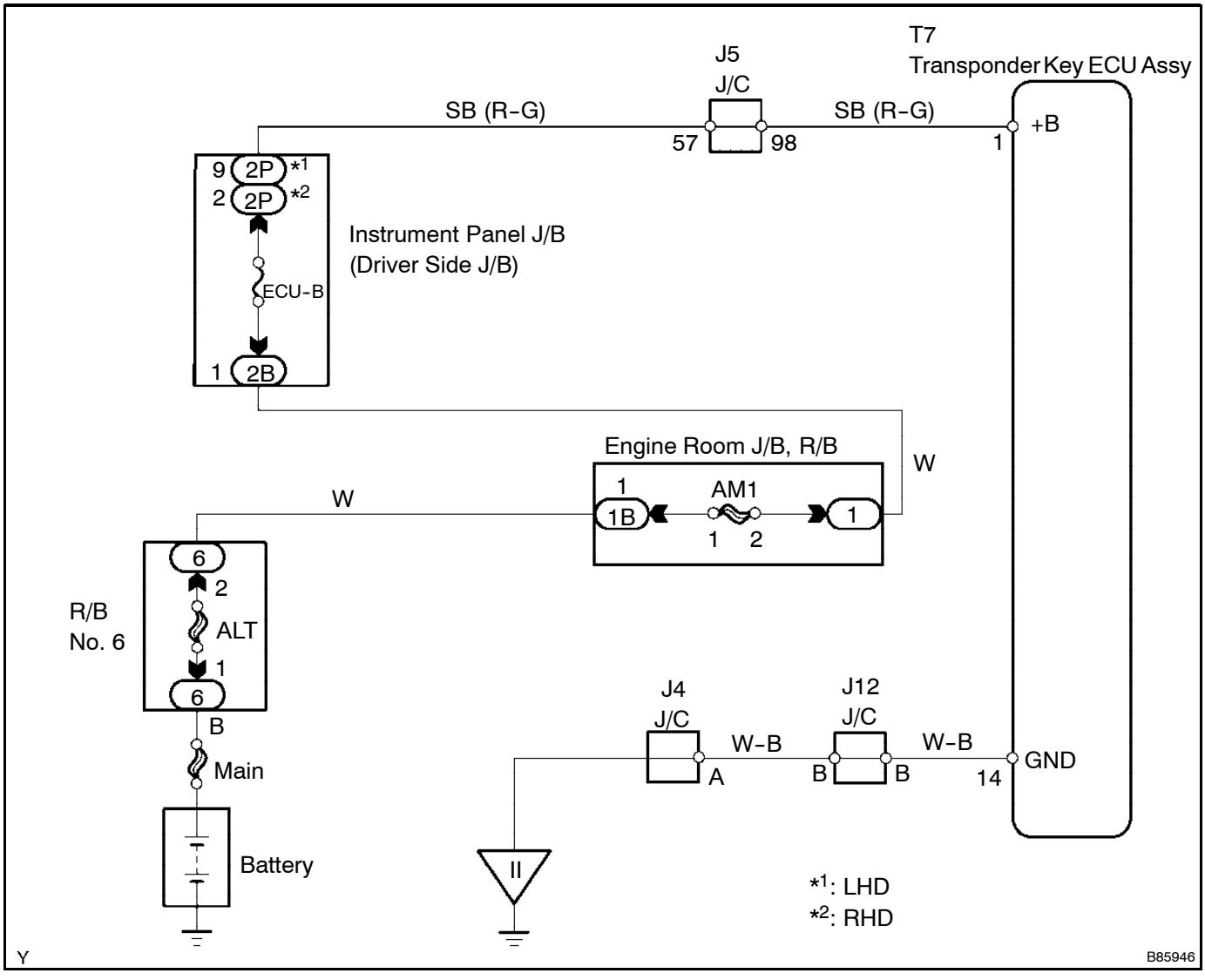
REPLACE TRANSPONDER KEY ECU ASSY

ECU POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This circuit provides power to the transponder key ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

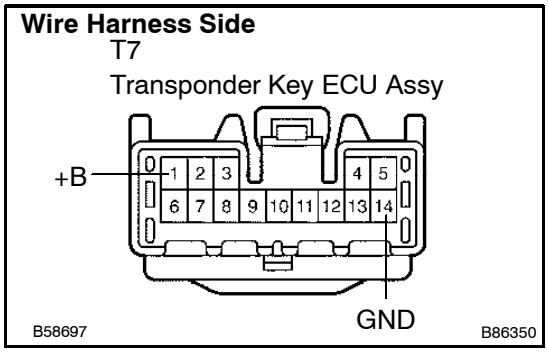
1	INSPECT FUSE (ECU-B)

(a) Remove the ECU-B fuse from the instrument panel J/B.
(b) Measure the resistance of fuse.
Standard: Below 1 Ω

NG → **REPLACE FUSE**

OK

2	CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY - BATTERY AND BODY GROUND)



(a) Disconnect the T7 ECU connector.
(b) Measure the resistance and voltage of the wire harness side connector.
Standard:

Tester Connection	Specified Condition
T7-1 (+B) - Body ground	10 to 14 V
T7-14 (GND) - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

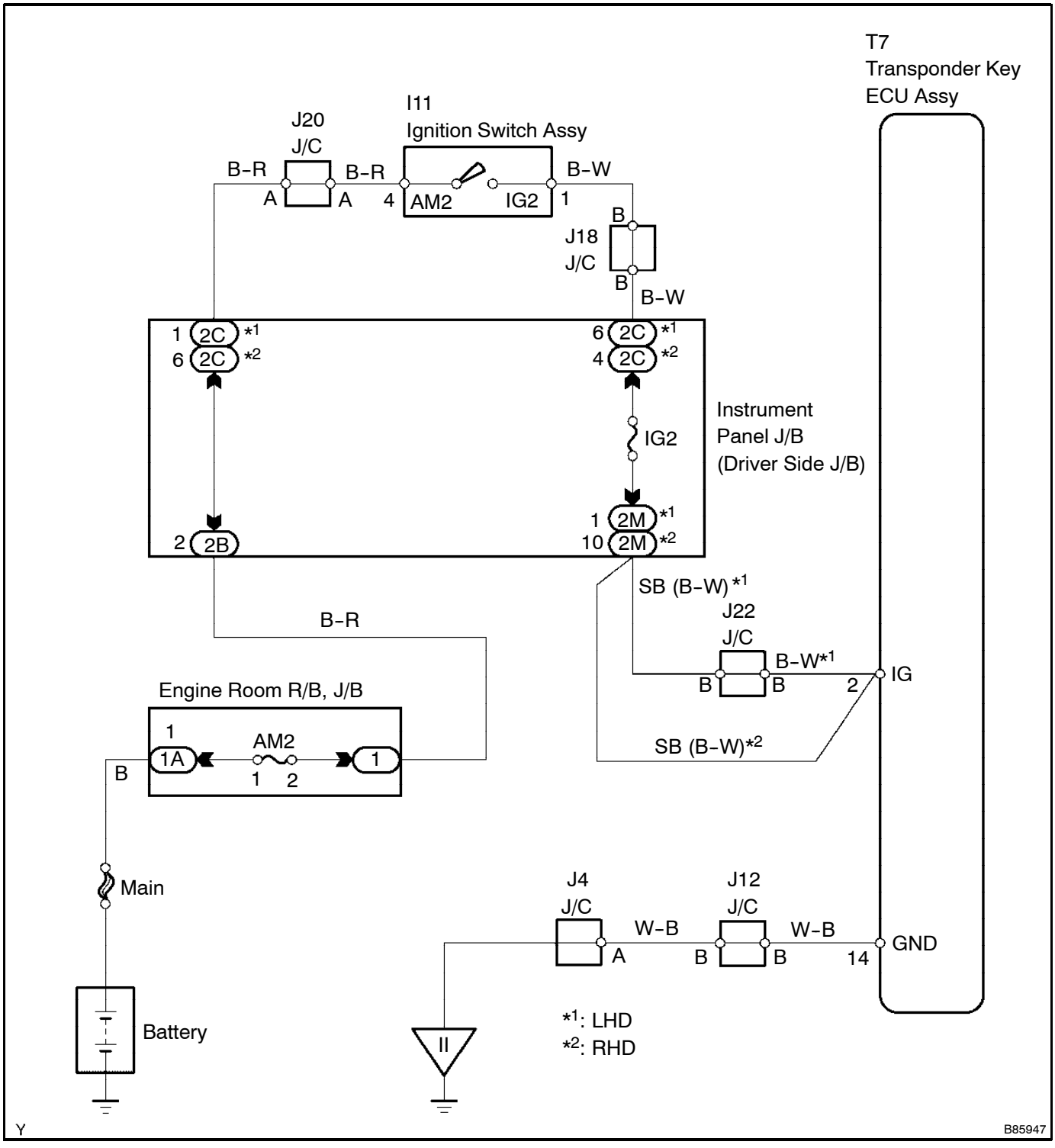
REPLACE TRANSPONDER KEY ECU ASSY

IGNITION SWITCH CIRCUIT

CIRCUIT DESCRIPTION

This circuit provides power to operate the transponder key ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FOR CODE

(a) Turn the ignition switch ON.
(b) Check for code (see page 05-381).
OK: Code 13 is output.

NG → **Go to step 2**

OK

END

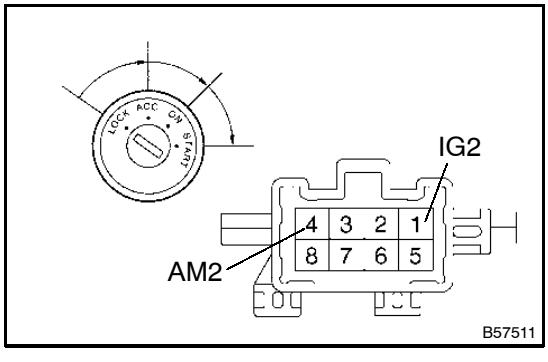
2	INSPECT FUSE (IG2, AM2)

(a) Remove the IG2 fuse from the instrument panel J/B.
(b) Remove the AM2 fuse from the engine room R/B.
(c) Measure the resistance of the fuses.
Standard: Below 1 Ω

NG → **REPLACE FUSE**

OK

3	CHECK WIRE HARNESS (TRANSPONDER KEY ECU - BATTERY AND BODY GROUND)



(a) Measure the resistance of the switch.
Standard:

Tester Connection	Switch Condition	Specified Condition
1 (IG2) - 4 (AM2)	LOCK	10 kΩ or higher
1 (IG2) - 4 (AM2)	ON	Below 1 Ω

NG → **REPLACE IGNITION SWITCH ASSY**

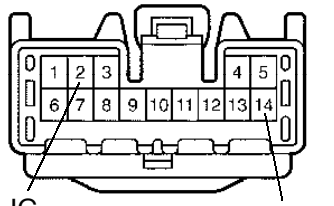
OK

4	CHECK WIRE HARNESS(TRANSPONDER KEY ECU - BATTERY AND BODY GROUND)

Wire Harness Side

T7

Transponder Key ECU Assy



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(a) Disconnect the T7 ECU connector.

(b) Measure the resistance and voltage of the wire harness side connector.

Standard:

Tester Connection	Condition	Specified Condition
T7-2 (IG) - Body ground	Ignition switch OFF	0 V
T7-2 (IG) - Body ground	Ignition switch ON	10 to 14 V
T7-14 (GND) - Body ground	Always	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

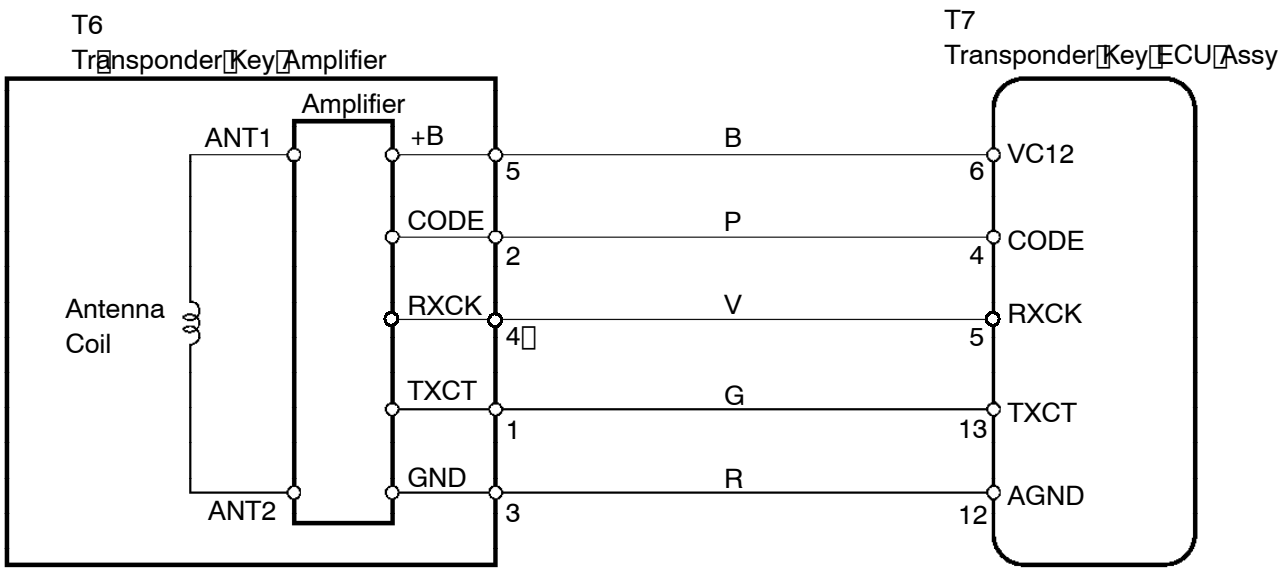
REPLACE TRANSPONDER KEY ECU ASSY

TRANSPONDER KEY AMPLIFIER CIRCUIT

CIRCUIT DESCRIPTION

Inserting the key into the ignition key cylinder will activate the transponder key ECU, and it will begin communication with the transponder key amplifier.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK FOR CODE

(a) Insert the master key or sub-key into the ignition key cylinder.

(b) Check for code (see page 05-381).

OK: Code 21 or 22 is output.

NG → **Go to step 2**

OK

END

2 CHECK WHETHER ENGINE STARTS WITH OTHER KEYS

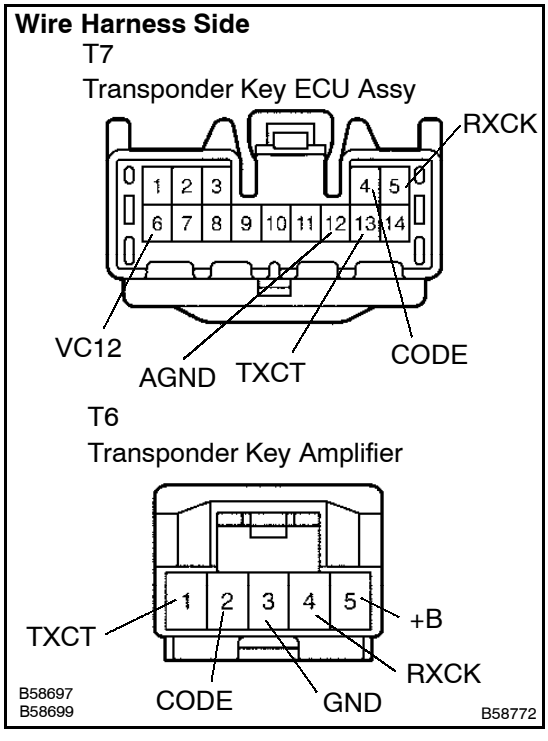
(a) Insert the vehicle's other key into the ignition key cylinder.
(b) Check that the engine starts with the key.
OK: Engine starts.

NG → **Go to step 3**

OK

REREGISTER OR REPLACE KEY THAT CANNOT START ENGINE

3 CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSY - TRANSPONDER KEY AMPLIFIER)



(a) Disconnect the T7 ECU connector.
(b) Disconnect the T6 amplifier connector.
(c) Measure the resistance of the wire harness side connectors.
Standard:

Tester Connection	Specified Condition
T7-6 (VC12) - T6-5 (+B)	Below 1 Ω
T7-4 (CODE) - T6-2 (CODE)	Below 1 Ω
T7-13 (TXCT) - T6-1 (TXCT)	Below 1 Ω
T7-12 (AGND) - T6-3 (GND)	Below 1 Ω
T7-5 (RXCK) - T6-4 (RXCK)	Below 1 Ω
T7-6 (VC12) or T6-5 (+B) - Body ground	10 kΩ or higher
T7-4 (CODE) or T6-2 (CODE) - Body ground	10 kΩ or higher
T7-13 (TXCT) or T6-1 (TXCT) - Body ground	10 kΩ or higher
T7-12 (AGND) or T6-3 (GND) - Body ground	10 kΩ or higher
T7-5 (RXCK) or T6-4 (RXCK) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

4 CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier with a normally functioning transponder key amplifier, check that the engine starts.
OK: Engine starts.

NG → **REPLACE TRANSPONDER KEY ECU ASSY**

OK

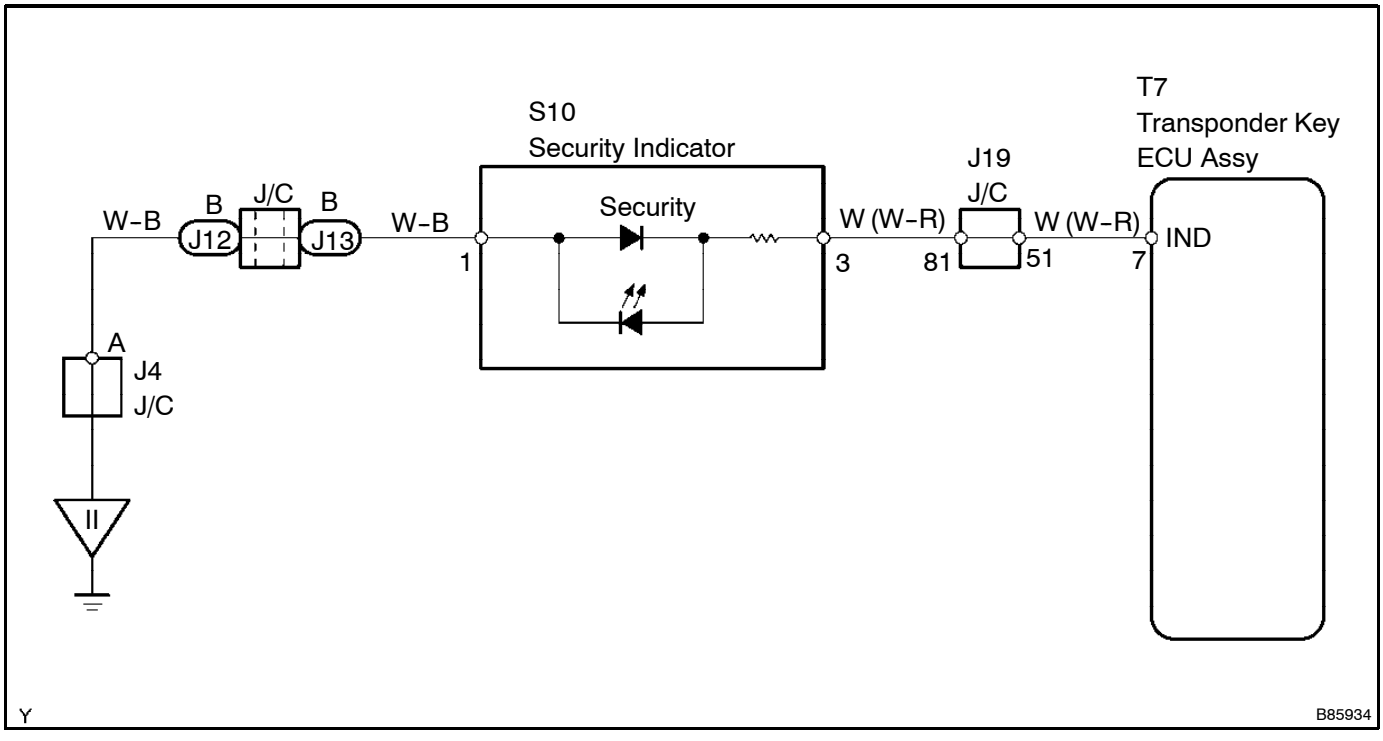
END (TRANSPONDER KEY AMPLIFIER DEFECTIVE)

SECURITY INDICATOR CIRCUIT

CIRCUIT DESCRIPTION

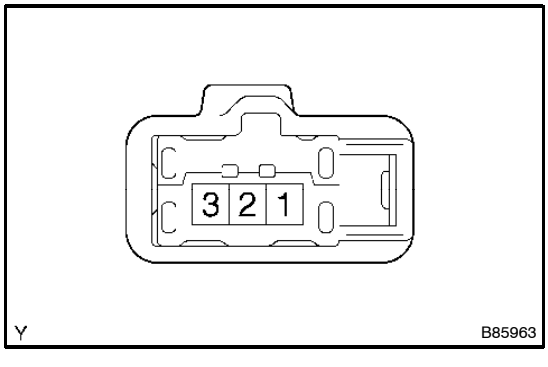
The transponder key ECU operates the security indicator.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT SECURITY INDICATOR



(a) Apply 12 V to the terminals of the indicator, and check the lighting condition of the security indicator.

OK:

Tester Connection	Specified Condition
Battery potitive (+) → 3 (IND) Battery negative (-) → 1 (GND)	Illuminates

NOTICE:

- **If the positive (+) lead and the negative (-) lead are incorrectly connected, the security indicator does not illuminate.**
- **If the voltage is too low, the security indicator will not illuminate.**

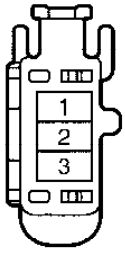
NG → **REPLACE SECURITY INDICATOR**

OK

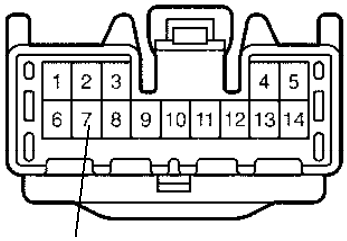
2	CHECK WIRE HARNESS (SECURITY INDICATOR - TRANSPONDER KEY ECU ASSY AND BODY GROUND)

Wire Harness Side

S10
Security Indicator



P T7
Transponder Key ECU Assy



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(a) Disconnect the S10 indicator connector.
(b) Disconnect the T7 ECU connector.
(c) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
S10-3 - T7-7 (IND)	Below 1 Ω
S10-1 - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

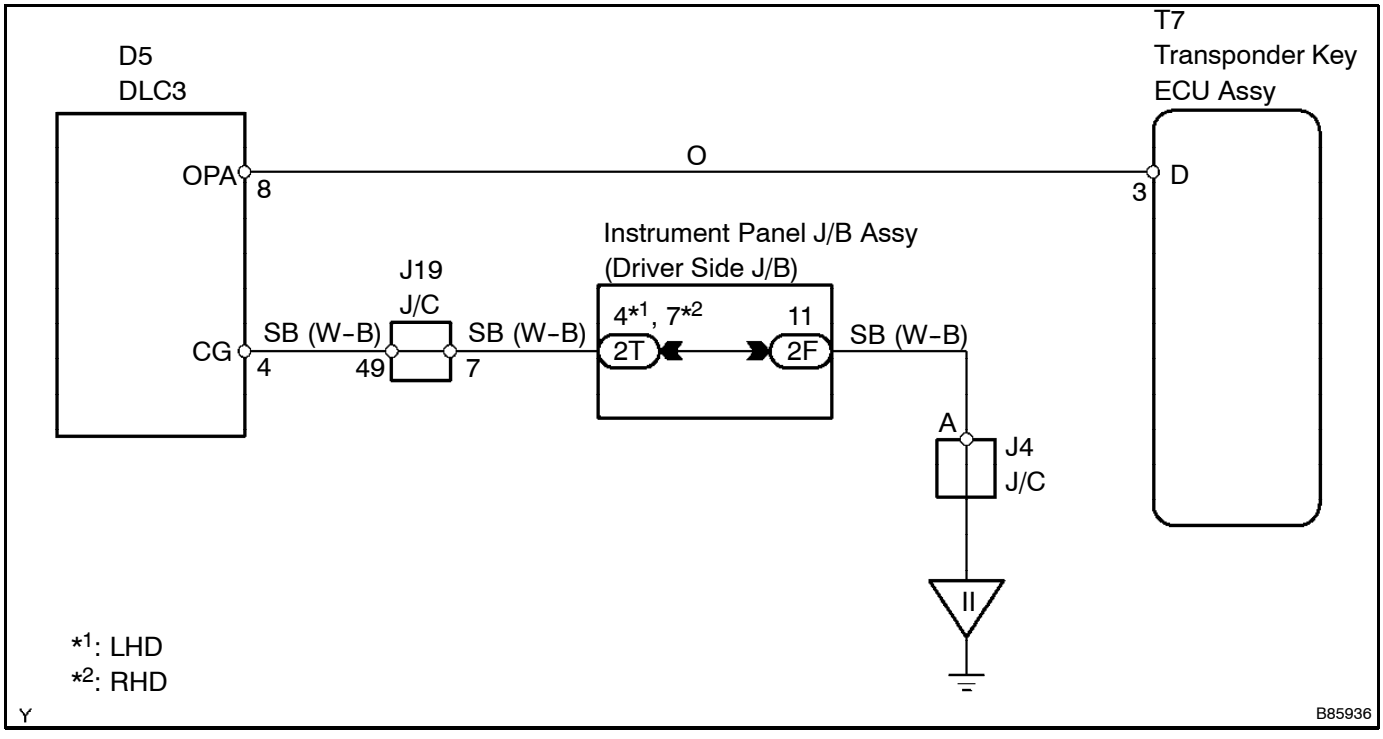
REPLACE TRANSPONDER KEY ECU ASSY

OPA AND CG TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

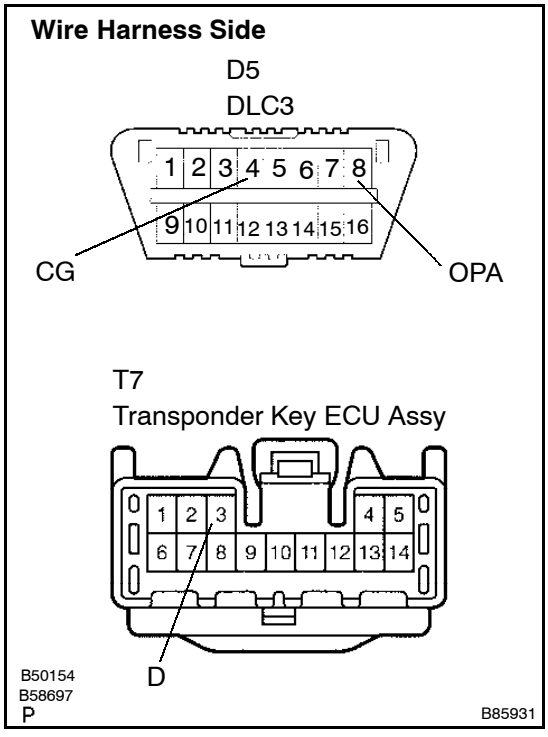
Connecting terminals OPA and CG of the DLC3 causes the transponder key ECU to display the DTC through security indicator blinking patterns.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK WIRE HARNESS (DLC3 - TRANSPONDER KEY ECU ASSY AND BODY GROUND)



(a) Disconnect the T7 ECU connector.

(b) Measure the resistance of the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
D5-8 (OPA) - T7-3 (D)	Below 1 Ω
D5-4 (CG) - Body ground	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

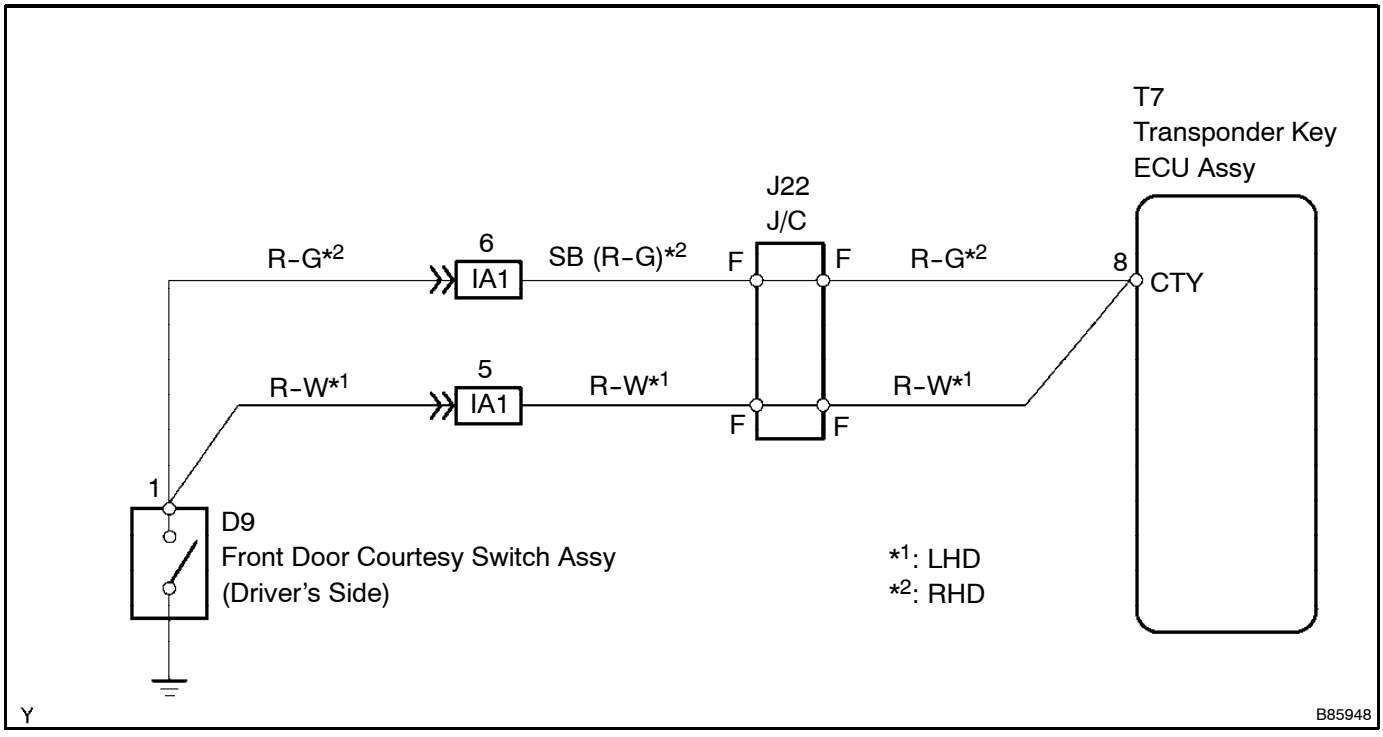
REPLACE TRANSPONDER KEY ECU ASSY

FRONT DOOR COURTESY LAMP SWITCH ASSY CIRCUIT (DRIVER SIDE)

CIRCUIT DESCRIPTION

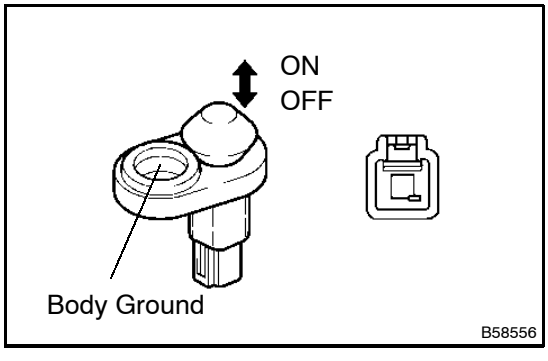
The switch turns ON when the driver side door is opened and turns OFF when the driver side door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FRONT DOOR COURTESY LAMP SWITCH ASSY (DRIVER SIDE)



(a) Measure the resistance of the switch.

Standard:

Tester Connection	Switch Condition	Specified Condition
1 - Body ground	OFF	Below 1 Ω
1 - Body ground	ON	10 kΩ or higher

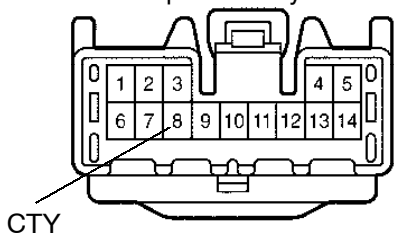
NG → **REPLACE FRONT DOOR COURTESY LAMP SWITCH ASSY**

OK

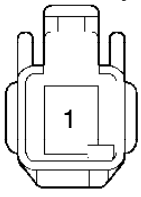
2	CHECK WIRE HARNESS (TRANSPONDER KEY ECU - FRONT DOOR COURTESY LAMP SWITCH ASSY)

Wire Harness Side

T7
Transponder Key ECU



D9
Front Door Courtesy Switch Assy



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(a) Disconnect the T7 ECU connector.
(b) Disconnect the D9 switch connector.
(c) Measure the resistance of the wire harness side connector.

Standard:

Tester Connection	Specified Condition
T7-8 (CTY) - D9-1	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE TRANSPONDER KEY ECU ASSY

ENGINE CONTROL SYSTEM

REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)

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

ECD SYSTEM (1ND-TV)

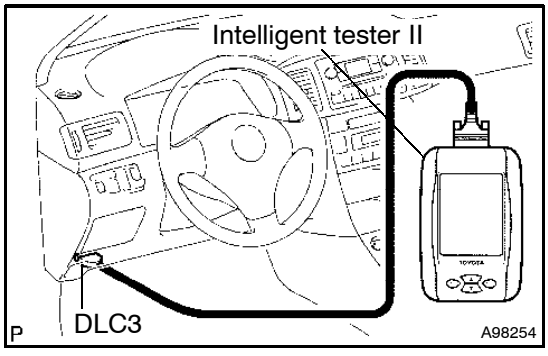
100SR-01

ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY ASSY

(a) Listen to the throttle control motor operating sounds.
  (1) Turn the ignition switch to ON.
  (2) When pressing the accelerator pedal, listen to the running sound of the motor. Make sure that no friction noises come from the motor.

If friction noises exist, check the throttle body, wire harness and ECM.



2. INSPECT ACCELERATOR PEDAL ASSY

(a) Check the voltage.
  (1) Connect the intelligent tester II to the DLC3.
  (2) Turn the ignition switch to ON.
  (3) Turn the intelligent tester II ON.
  (4) Select the following menu menu items: Powertrain / Engine and ECT / Data List / Accelerator POS No. 1, Accelerator POS No. 2.
  (5) Operate the accelerator pedal, then check that the Accelerator POS No. 1 and Accelerator POS No. 2 values is within the specifications.

Standard:

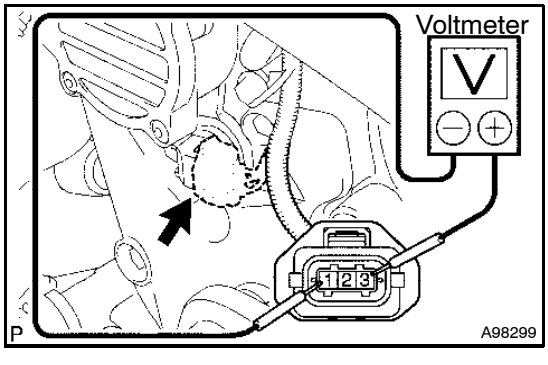
Accelerator POS No. 1:

Accelerator Pedal Condition	Specified Condition
Released	0.5 to 1.1 V
Depressed	3.0 to 4.6 V

Accelerator POS No. 2:

Accelerator Pedal Condition	Specified Condition
Released	0.9 to 2.3 V
Depressed	3.4 to 5.0 V

If the result is not as specified, check the accelerator pedal, wire harness and ECM.



3. INSPECT CAMSHAFT POSITION SENSOR

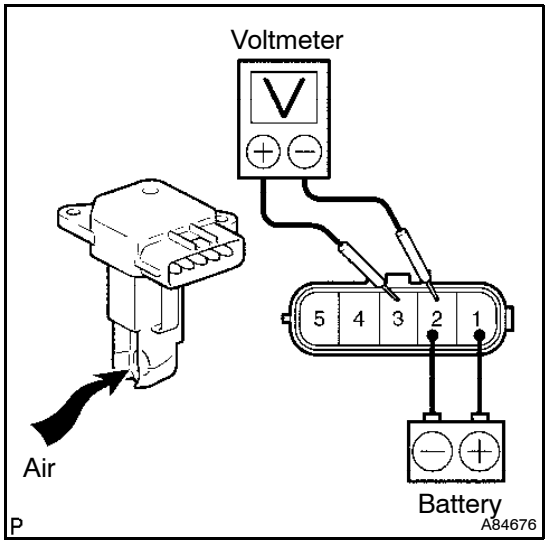
(a) Check the voltage.
  (1) Disconnect the camshaft position sensor connector.
  (2) Turn the ignition switch to ON.
  (3) Using a voltmeter, measure the voltage between the terminals on the wire harness side.

Standard:

Tester Connection	Specified Condition
1 (EG) - 3 (+B)	4.75 to 5.25 V

If the voltage is not as specified, check the wire harness and ECM.

INSPECTION



1. INSPECT MASS AIR FLOW METER

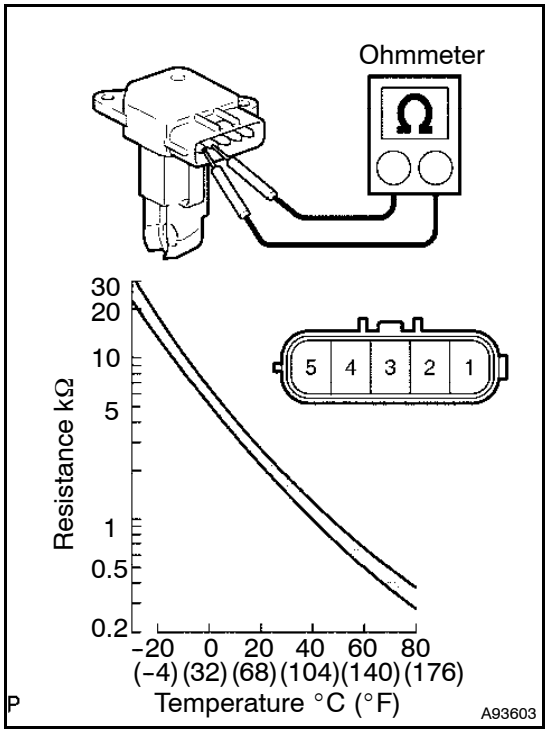
(a) Check the operation.

(1) Apply battery voltage across terminals 1 (+B) and 2 (EG2).

(2) Using an ohmmeter, connect the positive (+) tester prove to terminal 3 (VG) and the negative (-) tester prove to terminal 2 (E2G).

(3) Blow air into the mass air flow meter, then check that the voltage fluctuates.

If the voltage does not fluctuate, replace the mass air flow meter.



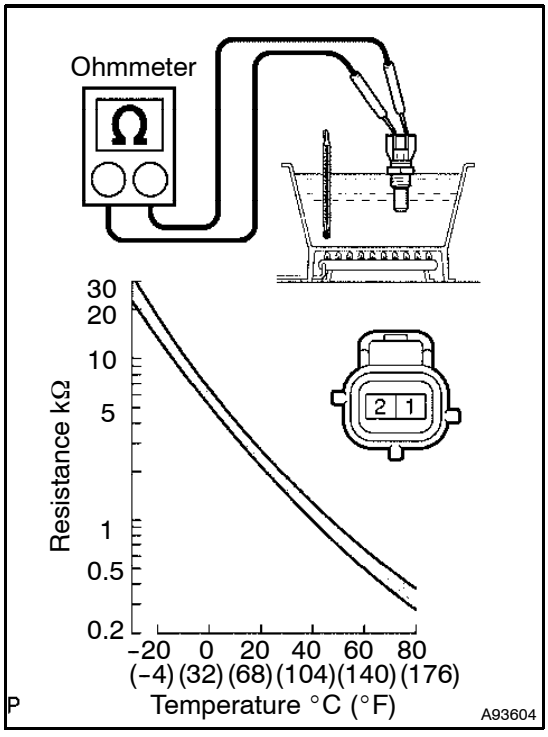
(b) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
4 (THA) - 5 (E2)	13.6 to 18.4 kΩ at -20°C (-4°F)
4 (THA) - 5 (E2)	2.21 to 2.69 kΩ at 20°C (68°F)
4 (THA) - 5 (E2)	0.493 to 0.667 kΩ at 60°C (140°F)

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



2. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(a) Check the resistance.

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

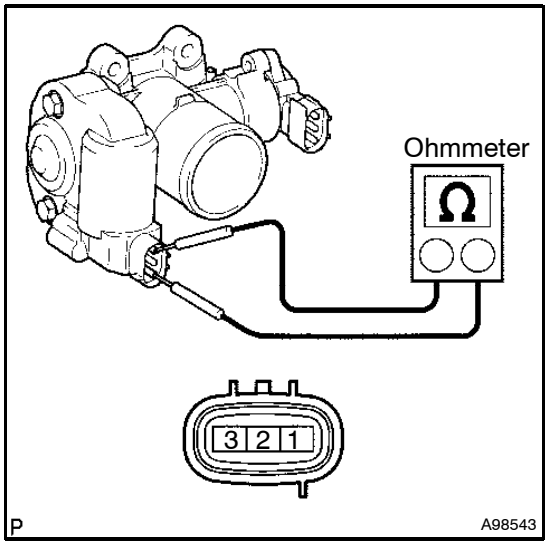
Standard:

Tester Connection	Specified Condition
1 (E2) - 2 (THW)	2.32 to 2.59 kΩ at 20°C (68°F)
1 (E2) - 2 (THW)	0.310 to 0.326 kΩ at 80°C (176°F)

NOTICE:

If checking the engine coolant temperature sensor in water, be careful not to allow water to intrude into the terminals. After checking, wipe water off on the engine coolant temperature sensor.

If the result is not as specified, replace the engine coolant temperature sensor.



3. INSPECT DIESEL THROTTLE BODY ASSY

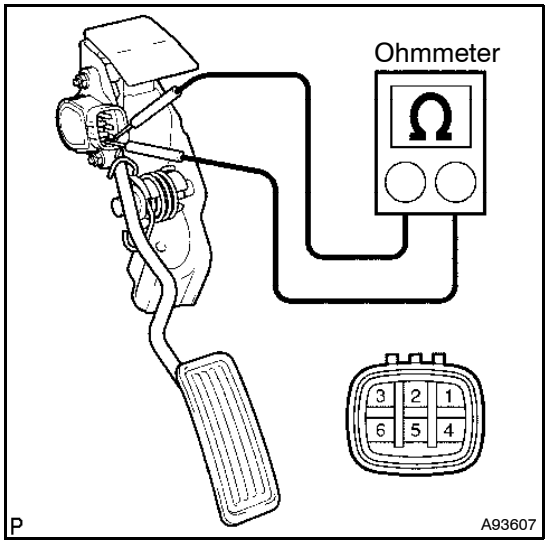
(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
1 (DUTY) - 3 (E)	0.3 to 100 Ω at 20°C (68°F)

If the result is not as specified, replace the diesel throttle body.



4. INSPECT ACCELERATOR PEDAL ASSY

(a) Check the resistance.

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

Standard:

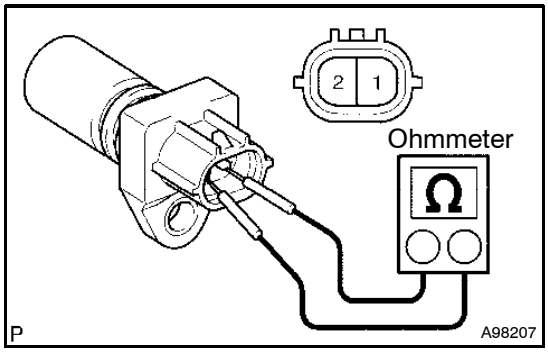
LHD Steering Position Type:

Tester Connection	Specified Condition
3 (EP1) - 6 (VCP1)	1.5 to 6.0 kΩ
1 (EP2) - 4 (VCP2)	1.5 to 6.0 kΩ

RHD Steering Position Type:

Tester Connection	Specified Condition
1 (EP1) - 4 (VCP1)	1.5 to 6.0 kΩ
3 (EP2) - 6 (VCP2)	1.5 to 6.0 kΩ

If the result is not as specified, replace the accelerator pedal.



5. INSPECT CRANKSHAFT POSITION SENSOR

(a) Check the resistance.

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

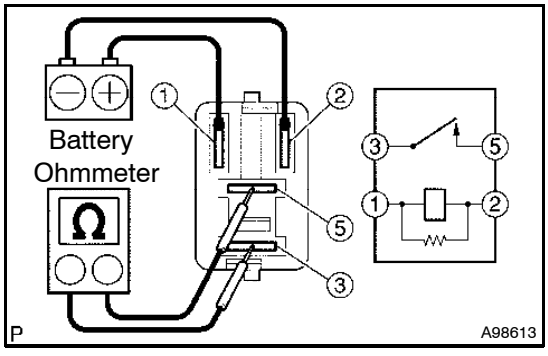
Standard:

Tester Connection	Specified Condition
1 (Ne+) - 2 (Ne-)	1,630 to 2,740 Ω at cold
1 (Ne+) - 2 (Ne-)	2,065 to 3,225 Ω at hot

NOTICE:

Cold and Hot mean the temperature of the coils themselves. Cold is from -10 to 50°C (14 to 122°F) and Hot is from 50 to 100°C (122 to 212°F).

If the result is not as specified, replace the crankshaft position sensor.



6. INSPECT MAIN RELAY

(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminal 1 and 2)

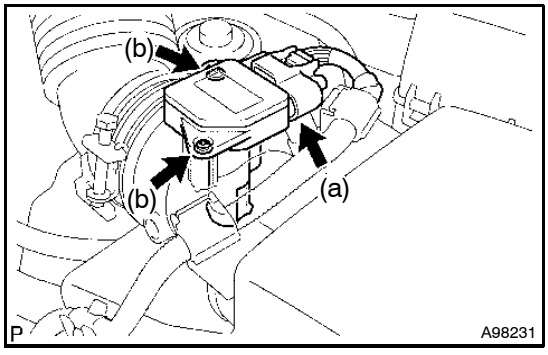
If the result is not as specified, replace the main relay.

MASS AIR FLOW METER (1ND-TV)

100SJ-01

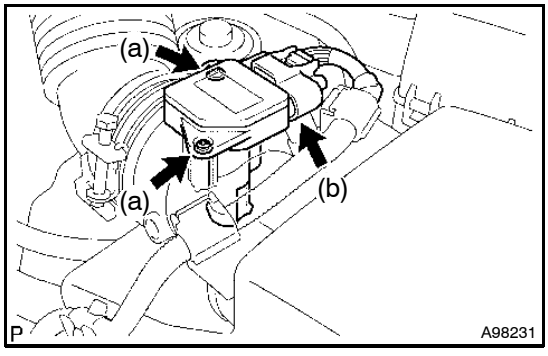
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL



2. REMOVE MASS AIR FLOW METER

(a) Disconnect the mass air flow meter connector.
(b) Remove the 2 screws and mass air flow meter.



3. INSTALL MASS AIR FLOW METER

(a) Install the mass air flow meter with the 2 screws.

NOTICE:

Make sure that the O-ring is not cracked or jammed when installing.

(b) Connect the mass air flow meter connector.

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

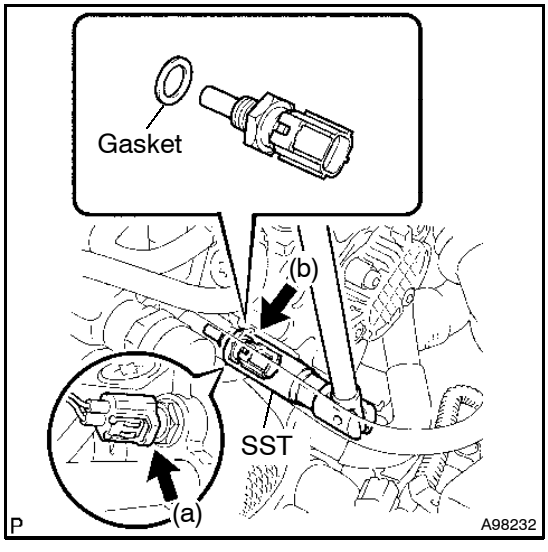
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

ENGINE COOLANT TEMPERATURE SENSOR (1ND-TV)

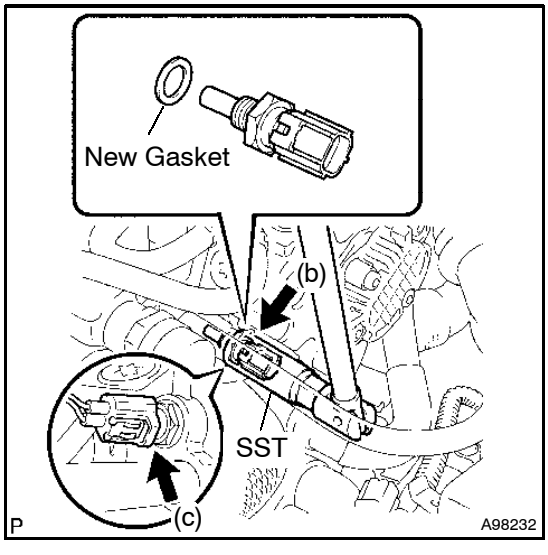
100SK-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-7)



3. REMOVE ENGINE COOLANT TEMPERATURE SENSOR
(a) Disconnect the engine coolant temperature sensor connector.
(b) Using SST, remove the engine coolant temperature sensor and gasket.
SST 09817-33190



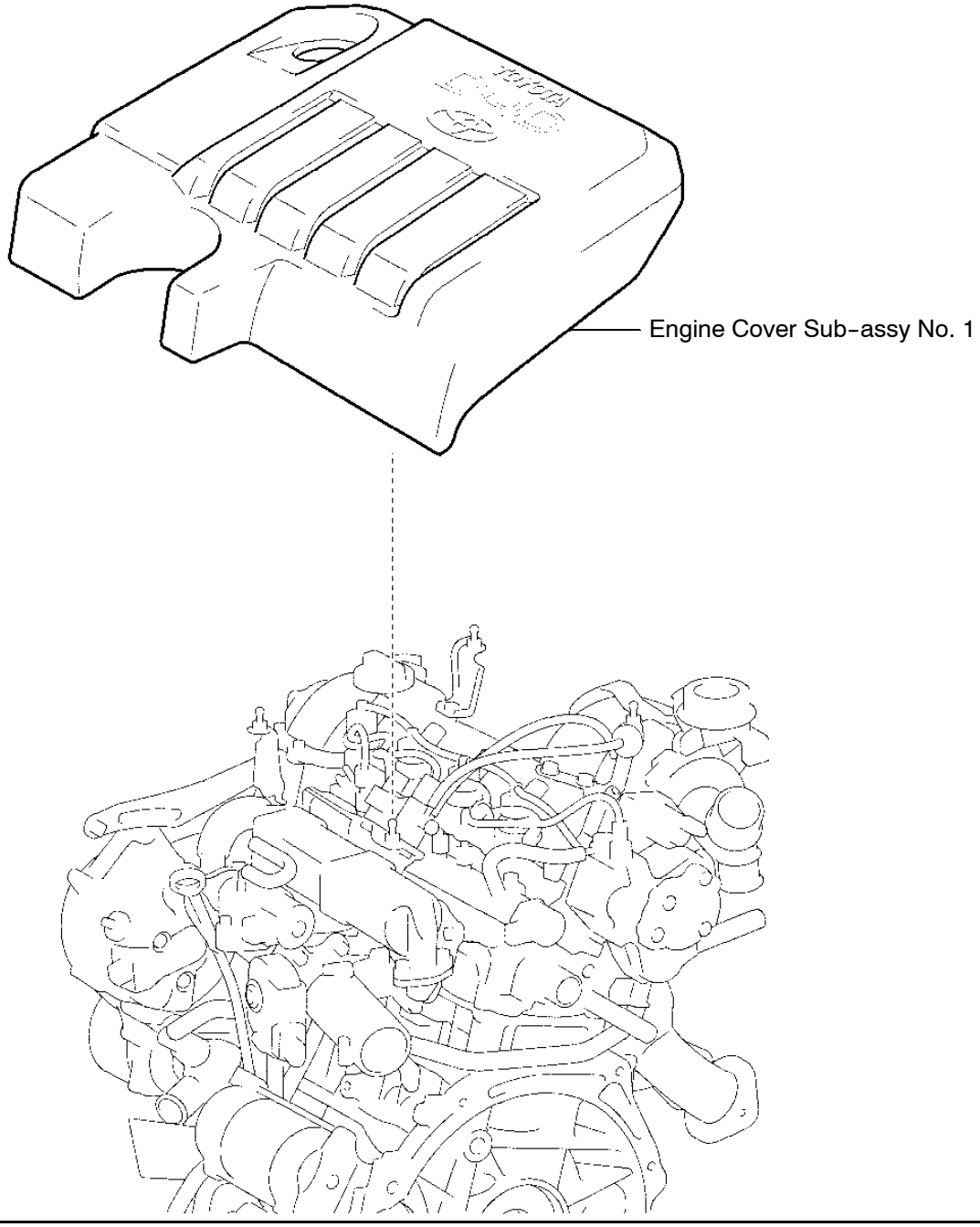
4. INSTALL ENGINE COOLANT TEMPERATURE SENSOR
(a) Install a new gasket onto the engine coolant temperature sensor.
(b) Using SST, install the engine coolant temperature sensor.
SST 09817-33190
Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)
(c) Connect the engine coolant temperature sensor connector.

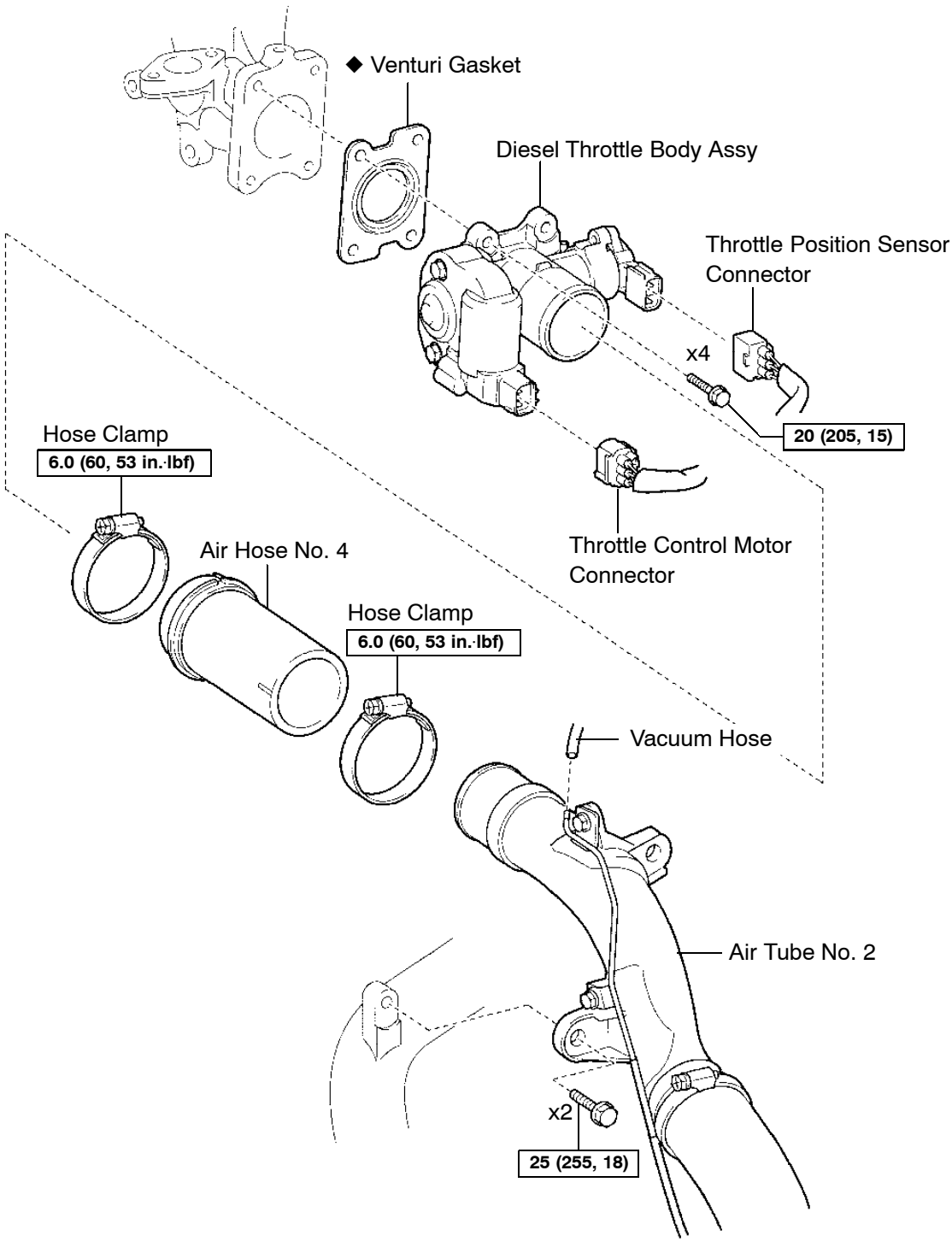
5. ADD ENGINE COOLANT (See page 16-7)
6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
7. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)

DIESEL THROTTLE BODY ASSY (1ND-TV)

COMPONENTS

100SO-01





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

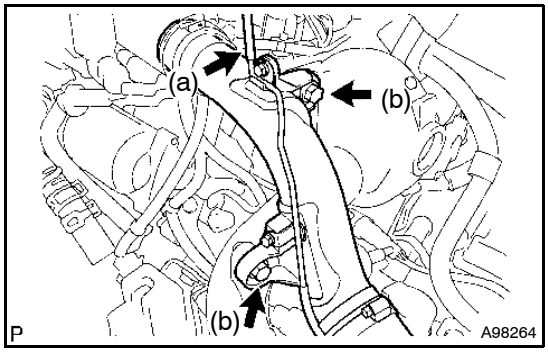
P ◆ Non-reusable part

A98263

100SP-01

REPLACEMENT

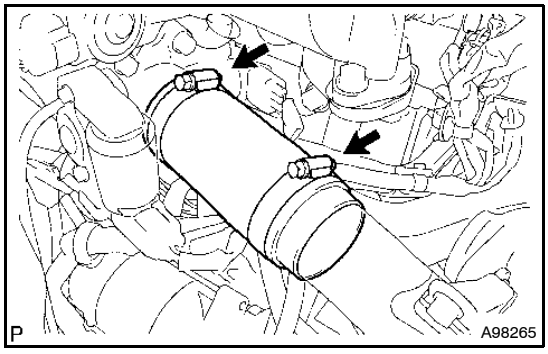
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 13-17)



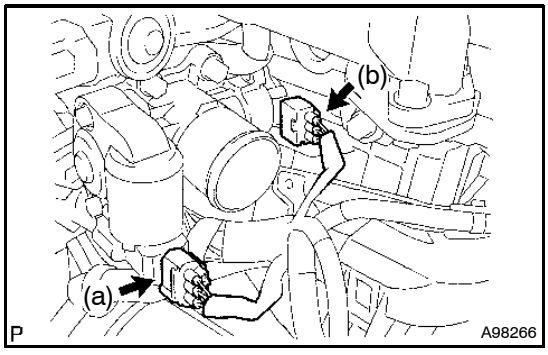
3. REMOVE AIR HOSE NO.4

(a) Disconnect the vacuum hose from the vacuum transmitting pipe No. 1.

(b) Remove the 2 bolts.



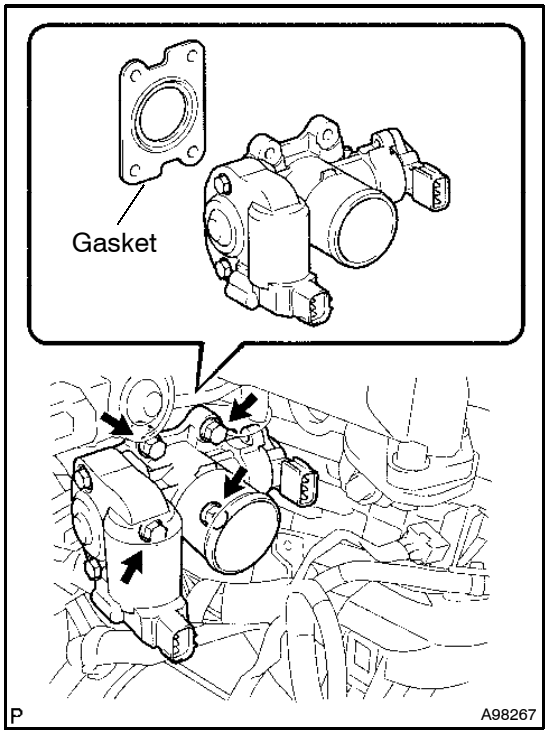
(c) Loosen the 2 hose clamp bolts and remove the air hose No. 4.



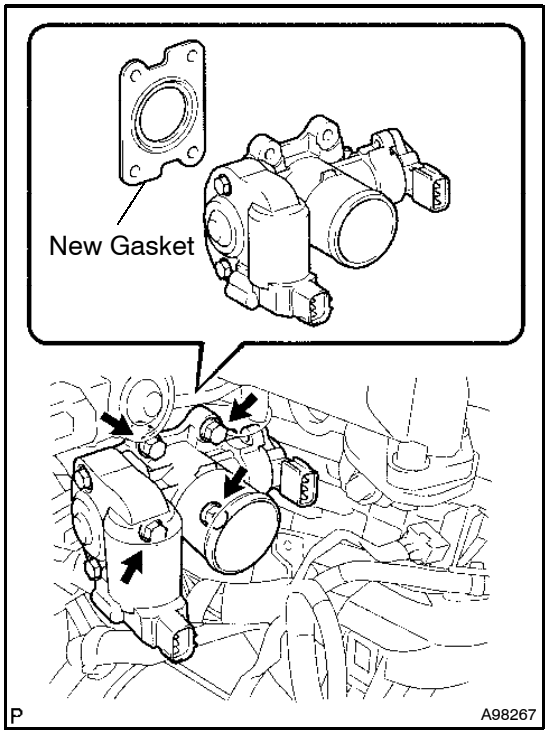
4. REMOVE DIESEL THROTTLE BODY ASSY

(a) Disconnect the throttle control motor connector.

(b) Disconnect the throttle position sensor connector.



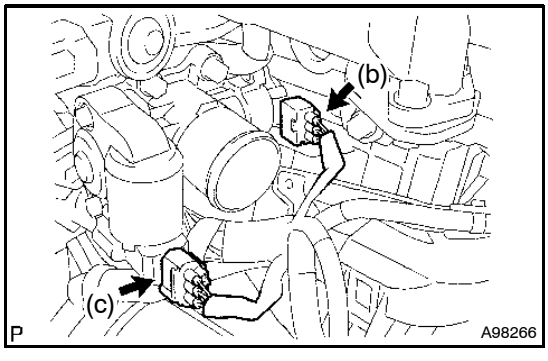
(c) Remove the 4 bolts, diesel throttle body and gasket.



5. INSTALL DIESEL THROTTLE BODY ASSY

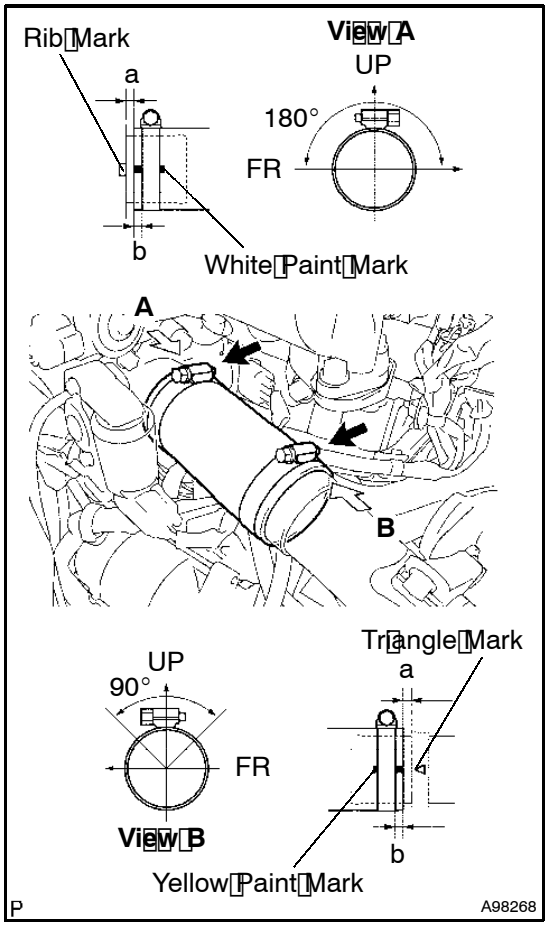
(a) Install a new gasket and the diesel throttle body with the 4 bolts.

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



(b) Connect the throttle position sensor connector.

(c) Connect the throttle control motor connector.



6. INSTALL AIR HOSE NO.4

(a) Install the air hose No. 4 with the 2 hose clamps.

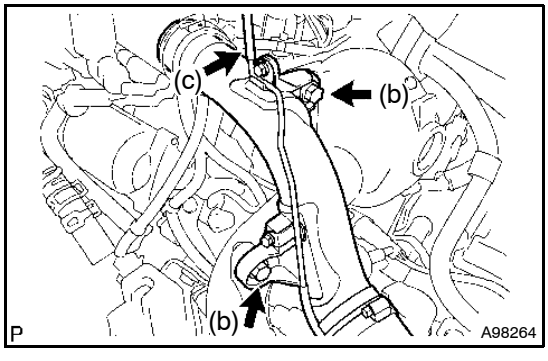
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)

Spcification:

Area	Measurement
a	0 to 2 mm (0 to 0.079 in.)
b	2 to 5 mm (0.079 to 0.197 in.)

NOTICE:

- **Align the paint mark of the air hose No. 4 with triangle mark of the air tube No. 2.**
- **Align the paint mark of the air hose No. 4 with rib mark of the diesel throttle body.**
- **Make sure that the hose clamp is at the correct angle when installing.**



(b) Install the air tube No. 2 with the 2 bolts.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

(c) Connect the vacuum hose to the vacuum transmitting pipe No. 1.

7. INSTALL ENGINE COVER SUB-ASSY NO.1 **(See page 13-17)**

8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

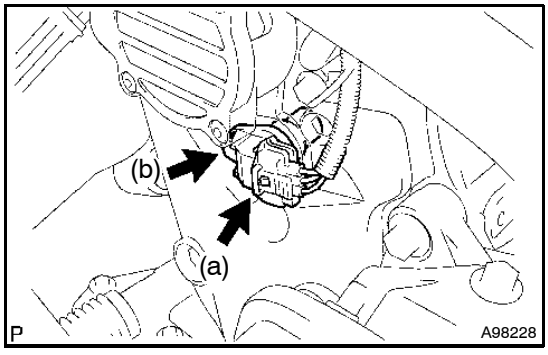
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

CAMSHAFT POSITION SENSOR (1ND-TV)

100SM-01

REPLACEMENT

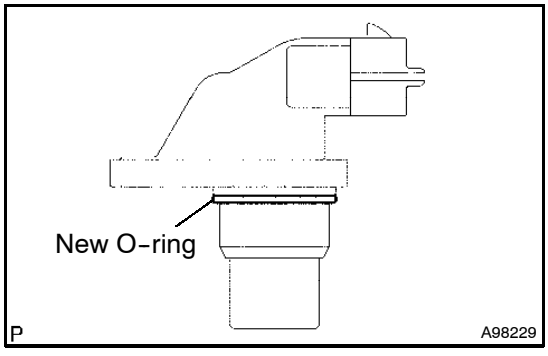
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL



2. REMOVE CAMSHAFT POSITION SENSOR

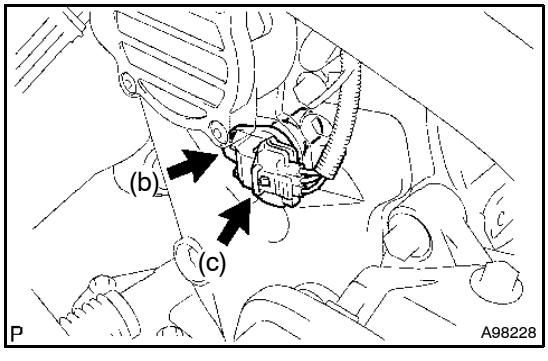
(a) Disconnect the camshaft position sensor connector.

(b) Remove the bolt and camshaft position sensor.



3. INSTALL CAMSHAFT POSITION SENSOR

(a) Apply a light coat of gasoline or spindle oil to a new O-ring, then install it onto the camshaft position sensor.



(b) Apply a light coat of gasoline or spindle oil to the O-ring of the camshaft position sensor again, then install the camshaft position sensor with the bolt.

Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)

NOTICE:

Make sure that the O-ring is not cracked or jammed when installing.

(c) Connect the camshaft position sensor connector.

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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

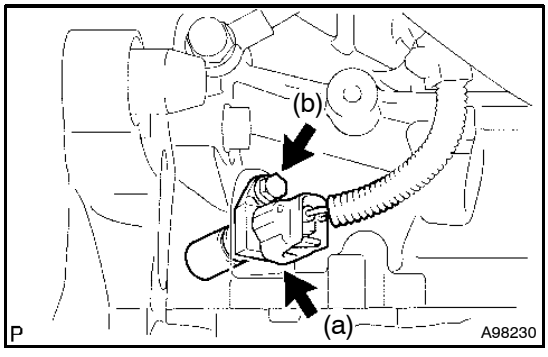
5. CHECK FOR ENGINE OIL LEAKAGE

CRANKSHAFT POSITION SENSOR (1ND-TV)

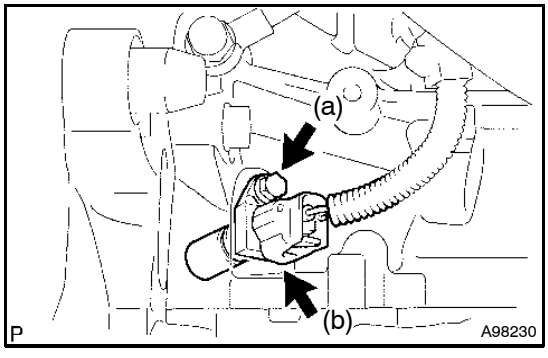
100SN-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)



5. REMOVE CRANKSHAFT POSITION SENSOR
(a) Disconnect the crankshaft position sensor connector.
(b) Remove the bolt and crankshaft position sensor.



6. INSTALL CRANKSHAFT POSITION SENSOR
(a) Install the crankshaft position sensor with the bolt.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)
(b) Connect the crankshaft position sensor connector.

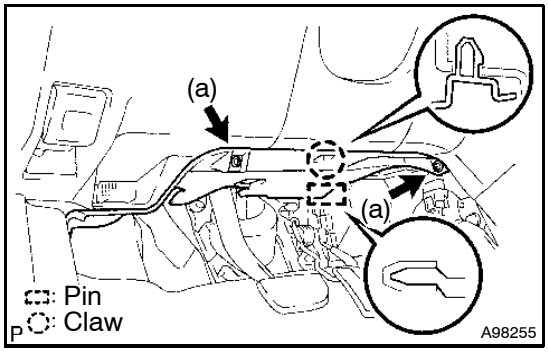
7. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
8. INSTALL ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
9. INSTALL ENGINE UNDER COVER (TMC MADE) (See page 13-17)
10. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

ACCELERATOR PEDAL ASSY (1ND-TV)

100SL-01

REPLACEMENT

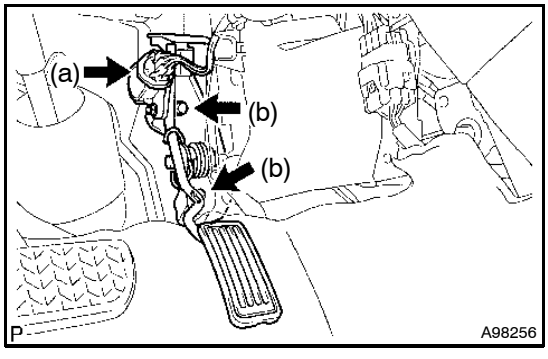
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL



2. REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.1

(a) Remove the 2 screws.

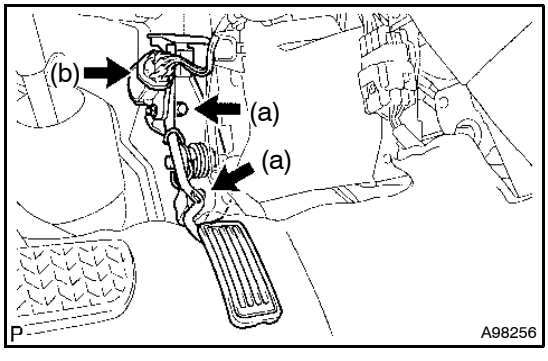
(b) Disengage the claw and pin and remove the instrument panel under cover No. 1.



3. REMOVE ACCELERATOR PEDAL ASSY

(a) Disconnect the accelerator position sensor connector.

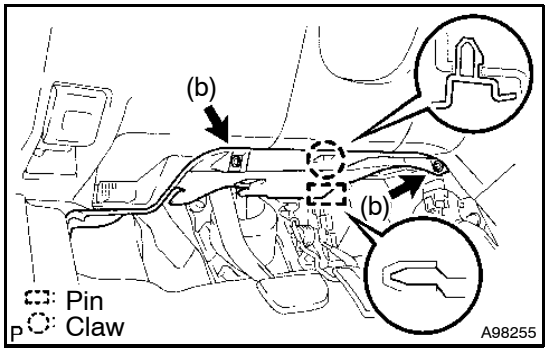
(b) Remove the 2 bolts and accelerator pedal.



4. INSTALL ACCELERATOR PEDAL ASSY

(a) Install the accelerator pedal with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Connect the accelerator position sensor connector.



5. INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.1

(a) Engage the claw and pin and install the instrument panel under cover No. 1.

(b) Tighten the 2 screws.

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

ECM (1ND-TV)

REPLACEMENT

100SQ-01

NOTICE:

- **If an incorrect injector compensation code was registered with the ECM, the engine assembly may rattle or the engine idling may become rough. In addition, the engine may stall or the life of the engine may be shortened.**
- **When replacing the ECM with a new one, register all the injectors' injector compensation codes with the new ECM as follows.**
- **Before replacing the ECM, read all the compensation codes stored in the existing ECM using the intelligent tester II, then note them down (see page 05-14).**
- **After replacing the ECM, enter the noted compensation codes into the new ECM using the intelligent tester II (see page 05-19).**
- **Turn the ignition switch to OFF, then wait for 30 seconds or more.**
- **Turn the ignition switch to ON, then clear DTC P0603 using the intelligent tester II (see page 05-33).**

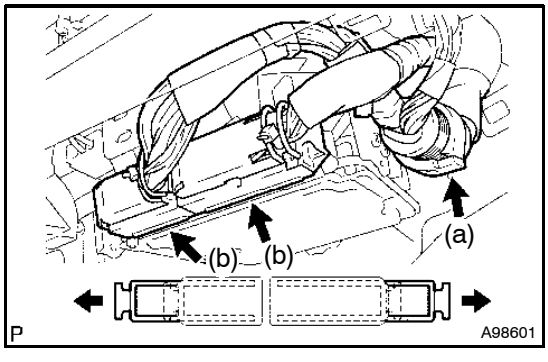
HINT:

- In order to optimize the injector's fuel injection performance, the ECM adjusts the injection duration of each cylinder. The ECM stores and uses compensation data in the form of a 10-digit-alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- When installing a new injector, its individual injector compensation code needs to be registered with the ECM. Also, when replacing the ECM, the compensation codes of all the injectors need to be registered with the new ECM.
- Once the ECM is replaced, DTC P0603 will be present when turning the ignition switch to ON. This injector compensation codes need to be registered with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch to OFF and wait for 30 seconds or longer.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. REMOVE GLOVE COMPARTMENT DOOR ASSY (See Pub No. RM925E, page 71-26)

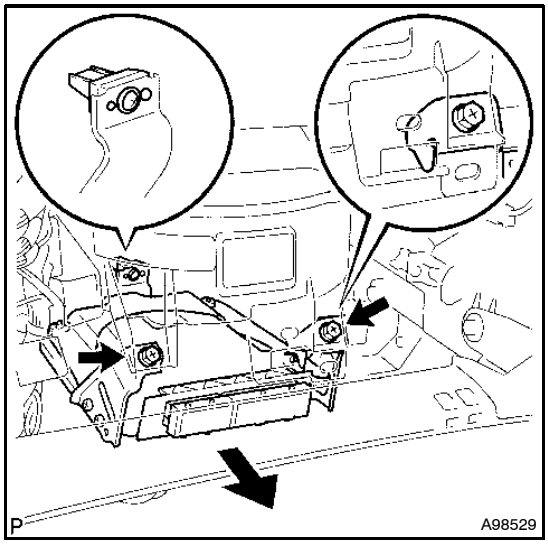
3. REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2 (See Pub No. RM925E, page 71-29)



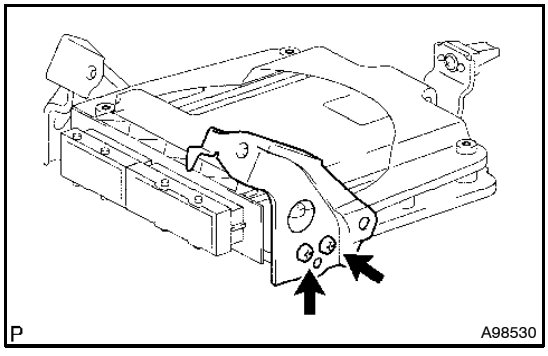
4. REMOVE ECM

(a) Remove the wire harness from the wire harness clamp.

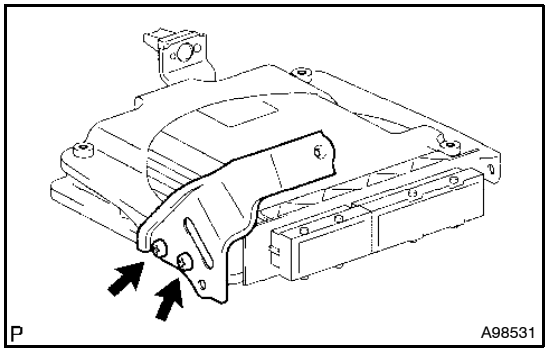
(b) Slide the slider and disconnect the 2 ECM connectors.



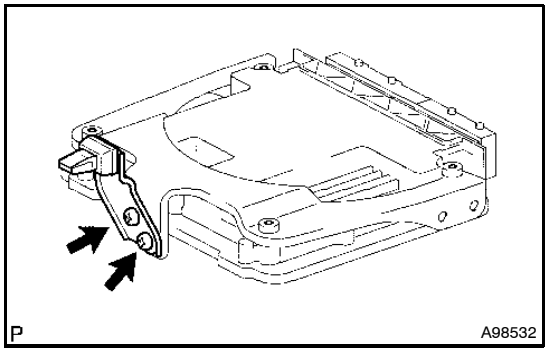
(c) Remove the 2 bolts and ECM.



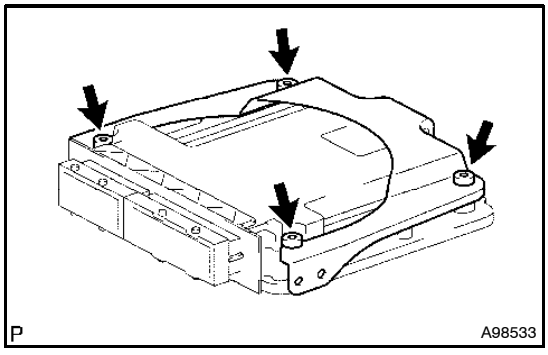
(d) Remove the 2 screws and ECM bracket No. 1.



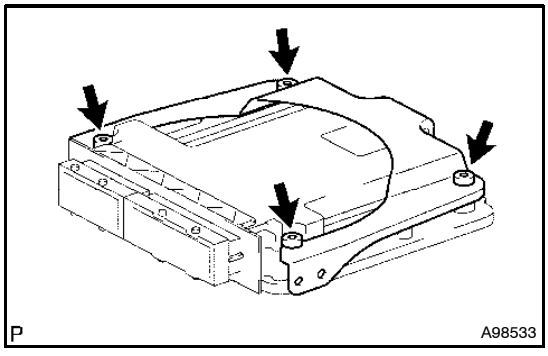
(e) Remove the 2 screws and ECM bracket No. 2.



(f) Remove the 2 screws and ECM bracket No. 3.

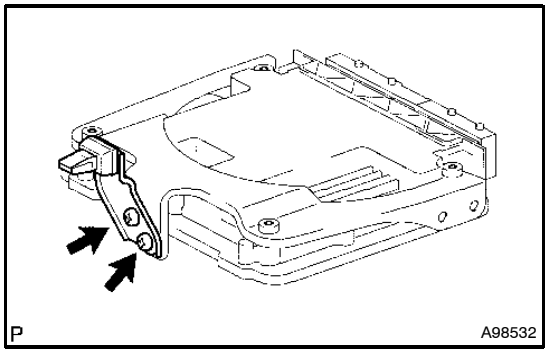


(g) Using Torx® socket wrench T25, remove the 4 screws. Then remove the ECM bracket No.1.

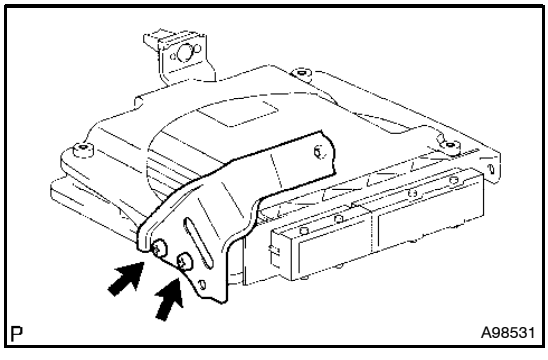


5. INSTALL ECM

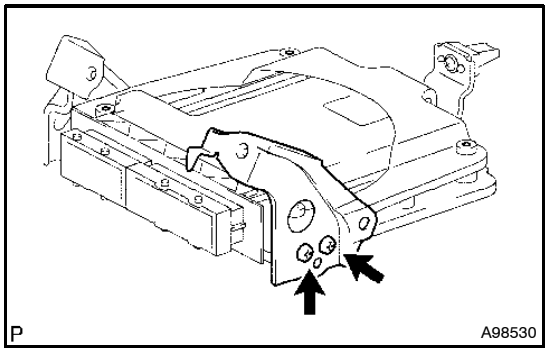
(a) Using Torx® socket wrench T25, install the ECM bracket No.1 with the 4 screws.
Torque: 3.0 N·m (30 kgf·cm, 27 in.·lbf)



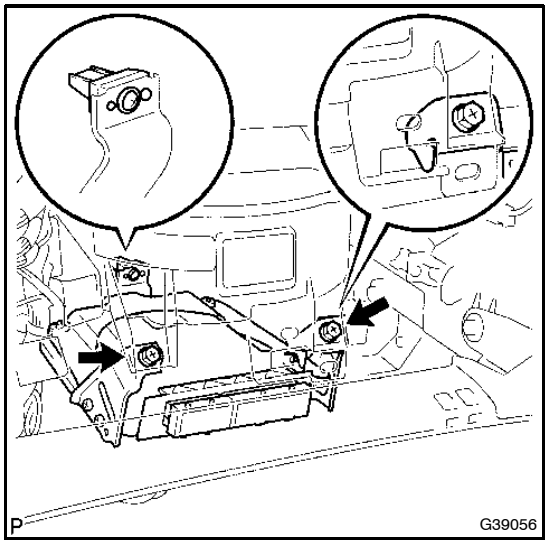
(b) Install the ECM bracket No. 3 with the 2 screws.
Torque: 3.0 N·m (30 kgf·cm, 27 in.·lbf)



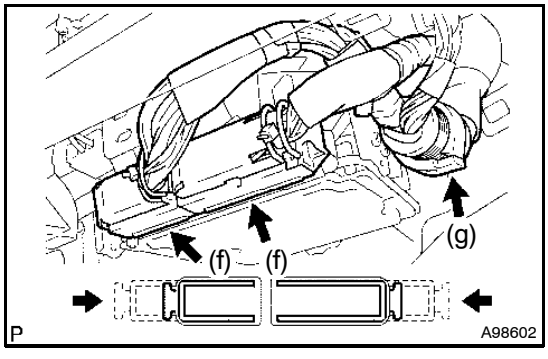
(c) Install the ECM bracket No. 2 with the 2 screws.
Torque: 3.0 N·m (30 kgf·cm, 27 in.·lbf)



(d) Install the ECM bracket No. 1 with the 2 screws.
Torque: 3.0 N·m (30 kgf·cm, 27 in.·lbf)



(e) Install the ECM with the 2 bolts.
Torque: 8.0 N·m (80 kgf·cm, 71 in.·lbf)



(f) Connect the 2 ECM connectors, then slide the slider.
(g) Install the wire harness into the wire harness clamp.

6. INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2
7. INSTALL GLOVE COMPARTMENT DOOR ASSY
8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
9. REGISTRATION OF INJECTOR COMPENSATION CODE (See page 05-19)
10. CLEAR DTC
(a) Turn the ignition switch to OFF, then wait for 30 seconds or longer.
(b) Turn the ignition switch to ON, then clear DTC P0603 using the intelligent tester II (see page 05-33).

FUEL

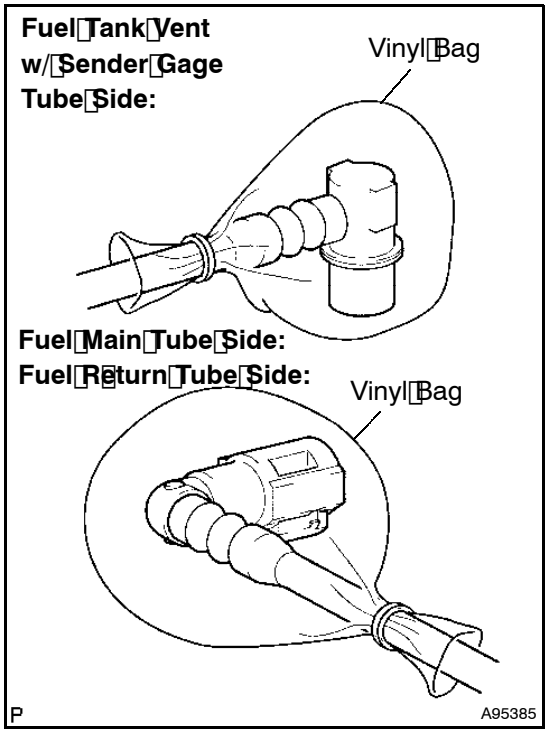
REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)

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

FUEL SYSTEM (1ND-TV)

PRECAUTION

1117R01



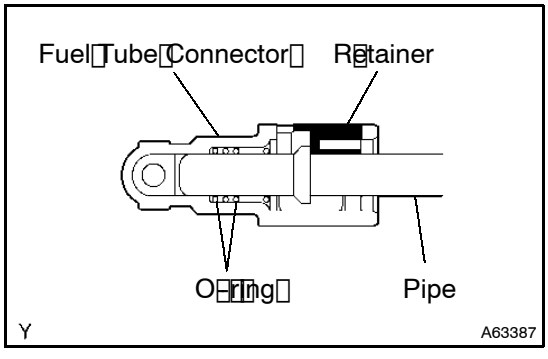
1. FUEL SYSTEM

(a) When disconnecting the fuel line, fuel will splash. So take the following precautions.

(1) Disconnect the fuel tube (see page 11-32, 11-47).

(2) Release the pressure remaining in the fuel tank main tube.

(3) Cover the disconnected fuel tank main tube (fuel tube joint and fuel tube connector) with a vinyl bag to prevent damage and the intrusion of foreign objects.



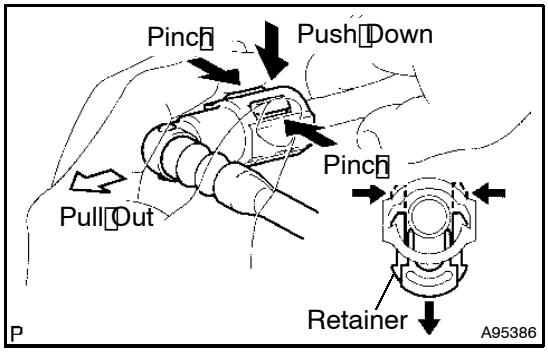
(b) Take the following precautions when disconnecting the fuel tube connector (quick type A).

HINT:

The structure of the fuel tube connector is as shown in the illustration.

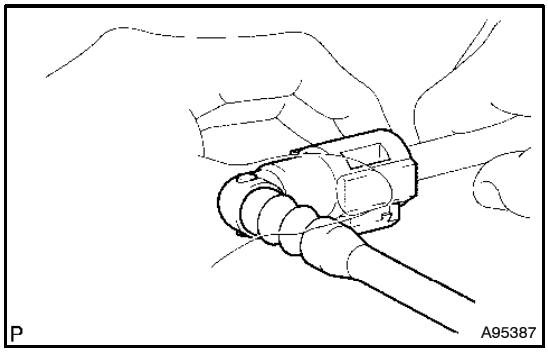
(1) Check the fuel tube connector and pipe for dirt and mud before removing the fuel tube connector.

If dirty, wipe it with a shop rag.



(2) Pinch the tab on the retainer of the fuel tube connector to disengage the lock claws. Push it down as shown in the illustration.

(3) Pull out the fuel tank main tube from the pipe.



(4) If the fuel tube connector and pipe are stuck, pinch the pipe, then push and pull the fuel tube connector to release and disconnect the fuel tube connector.

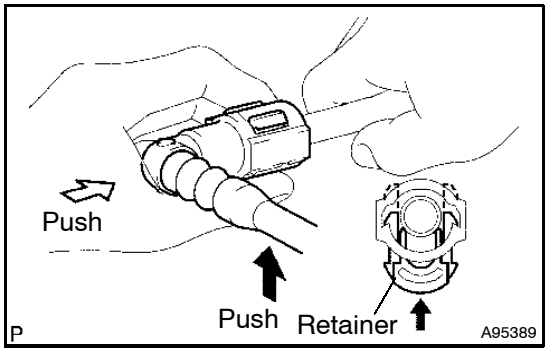
NOTICE:

Perform this work by hand. Never use any tools.

(5) After removing the fuel tube, check the sealing surface of the pipe for dirt and mud.

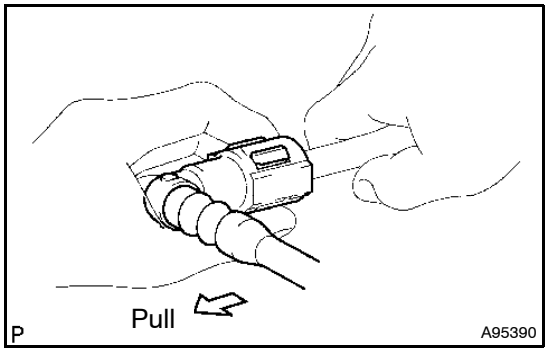
If dirty, wipe it with a shop rag.

(6) Cover the disconnected fuel tube connector and pipe with a vinyl bag to prevent damage and the intrusion of foreign objects.



(c) Take the following precautions when connecting the fuel tube connector (quick type A).

(1) Align the fuel tube connector with the pipe, then push the fuel tube connector in until it comes into contact with the seat, then push the retainer up until the claws lock.

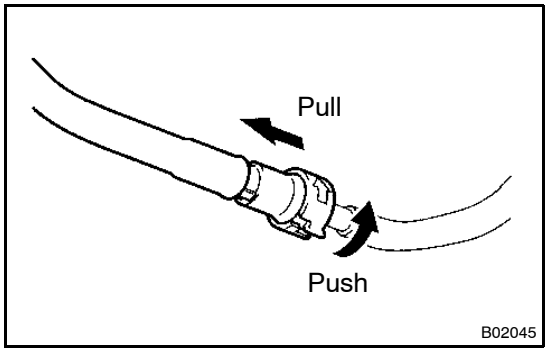


(2) After connecting the fuel tube connector, check that the fuel tube connector and pipe are securely connected by pulling them.

(d) Take the following precautions when disconnecting the fuel tube connector (quick type B).

(1) Check the pipe and around the connector for dirt and mud before disconnecting them. Clean them if necessary.

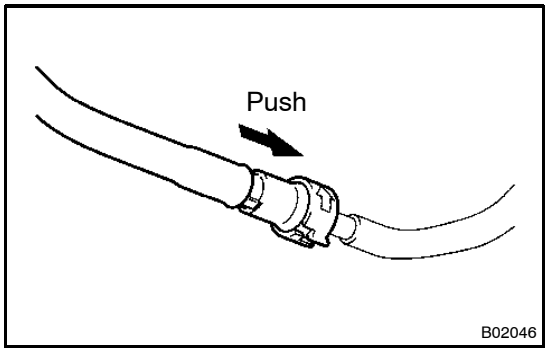
(2) Disconnect the connector from the pipe by hand.

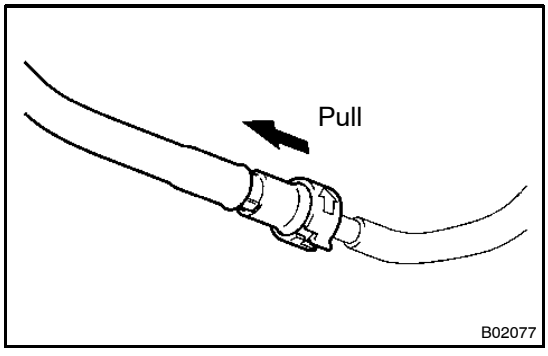


(3) When the connector and pipe are stuck, push and pull the connector to release it. Disconnect the connector carefully. Do not use any tool.

(4) Check the sealing surface of the disconnected pipe for dirt and mud. If dirty, wipe it with a shop rag.

(5) Cover the disconnected pipe and connector with a vinyl or plastic bag to prevent damage and the intrusion of foreign objects.



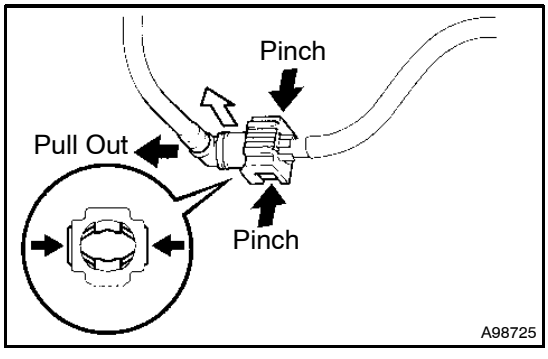


(e) Take the following precautions when connecting the fuel tube connector (quick type B).
(1) Check the disconnected part of the pipe for any damage or foreign objects.
(2) Align the axis of the connector with that of the pipe, then push the connector in until the connector makes a "click" sound. If the connection is tight, apply a light coat of fresh engine oil on the tip of the pipe.
(3) After connecting the fuel tube connector, check if the pipe and the connector are securely connected by pulling them.
(4) Check for fuel leakage.

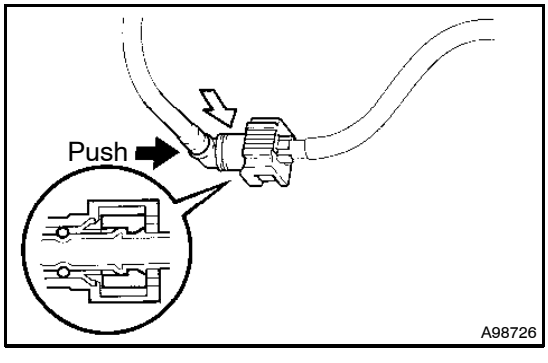
(f) Take the following precautions when handling a nylon tube.

CAUTION:

- **Be careful not to turn the connection part of the nylon tube and the quick connector when connecting them.**
- **Do not bend or twist the nylon tube.**
- **Do not remove the EPDM protector on the outside of the nylon tube.**
- **Do not close the piping by bending the nylon tube.**



(g) Take the following precautions when disconnecting the fuel tube connector (quick type C).
(1) Check the pipe and around the connector for dirt and mud before disconnecting them. Clean them if necessary.
(2) Remove the checker of the fuel tube connector from the pipe.
(3) Pinch the retainer of the fuel tube connector, then pull out the fuel tube connector to disconnect the fuel tube from the pipe.
(4) Check the sealing surface of the disconnected pipe for dirt or mud. If dirty, wipe it with a shop rag.
(5) Cover the disconnected pipe and connector in order to prevent damage and the intrusion of foreign objects.



(h) Take the following precautions when connecting the fuel tube connector (quick type C).
(1) Check the disconnected part of the pipe for any damage and foreign objects.
(2) Align the fuel tube connector with the pipe, then insert the tube connector into the pipe to the end. If the connection is tight, apply a light coat of fresh engine oil to the tip of the pipe.
(3) Install the checker onto the pipe.

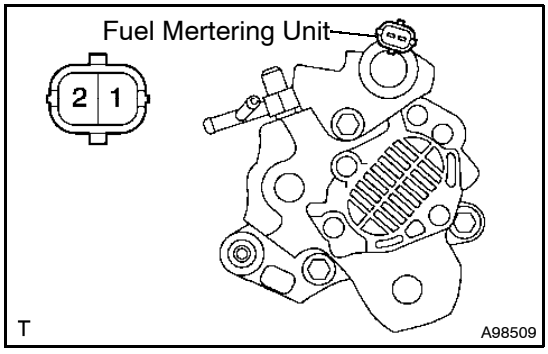
(4) Check for fuel leakage.

2. CHECK FOR FUEL LEAKAGE

(a) Check that there are no fuel leakage after doing maintenance on the fuel system (see page 11-8).

1117S-01

INSPECTION



1. INSPECT INJECTION OR SUPPLY PUMP ASSY

(a) Check the resistance of the fuel mertering unit.

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

Standard:

Tester Connection	Specified Condition
1 - 2	2.60 to 3.15 Ω at 20°C (68°F)

If the result is not as specified, replace the supply pump assembly.

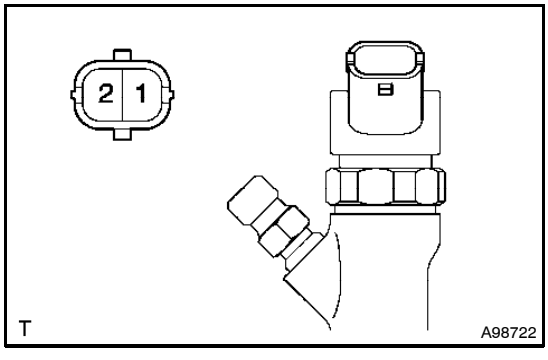
(b) Check the resistance of the fuel temperature sensor.

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

Standard:

Tester Connection	Specified Condition
1 - 2	13.92 to 17.01 Ω at -20°C (-4°F)
1 - 2	5.31 to 6.49 Ω at 0°C (32°F)
1 - 2	2.25 to 2.75 Ω at 20°C (68°F)
1 - 2	1.06 to 1.29 Ω at 40°C (104°F)
1 - 2	0.54 to 0.66 Ω at 60°C (140°F)
1 - 2	0.29 to 0.36 Ω at 80°C (176°F)
1 - 2	0.17 to 0.20 Ω at 100°C (212°F)

If the result is not as specified, replace the supply pump assembly.



2. INSPECT INJECTOR ASSY

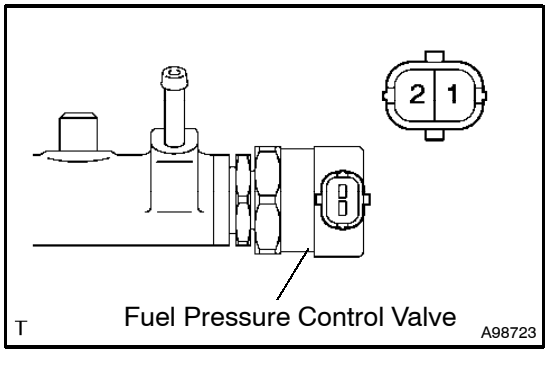
(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
1 - 2	0.215 to 0.295 Ω at 20°C (68°F)

If the result is not as specified, replace the injector assembly.



3. INSPECT COMMON RAIL ASSY

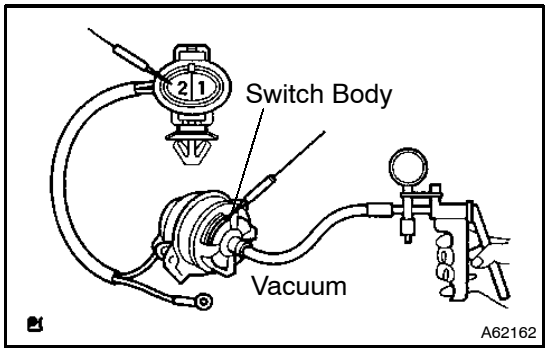
(a) Check the resistance of the fuel pressure control valve.

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

Standard:

Tester Connection	Specified Condition
1 - 2	3.42 to 3.78 Ω at 20°C (68°F)

If the result is not as specified, replace the common rail assembly.



4. INSPECT FUEL HEATER ASSY

(a) Check the resistance.

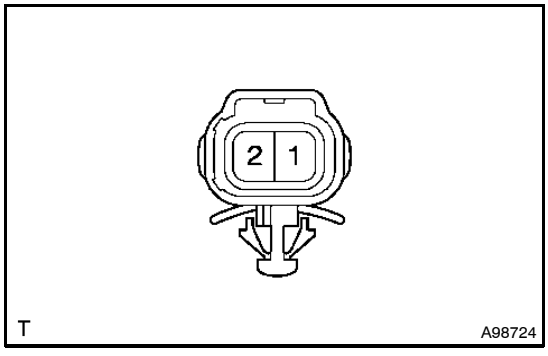
(1) Apply a vacuum of 34.7 ± 5.3 kPa (260 ± 40 mmHg, 10.24 ± 1.57 in Hg) to the vacuum switch port.

(2) Using an ohmmeter, measure the resistance between terminal 2 and the switch body.

Standard:

Tester Connection	Specified Condition
1 - 2	0.5 to 20 Ω at 20°C (68°F)

If the result is not as specified, replace the fuel heater assembly.



5. INSPECT LEVEL WARNING SWITCH

(a) Check the resistance.

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

Specified condition:

When the float is up: Below 1 Ω

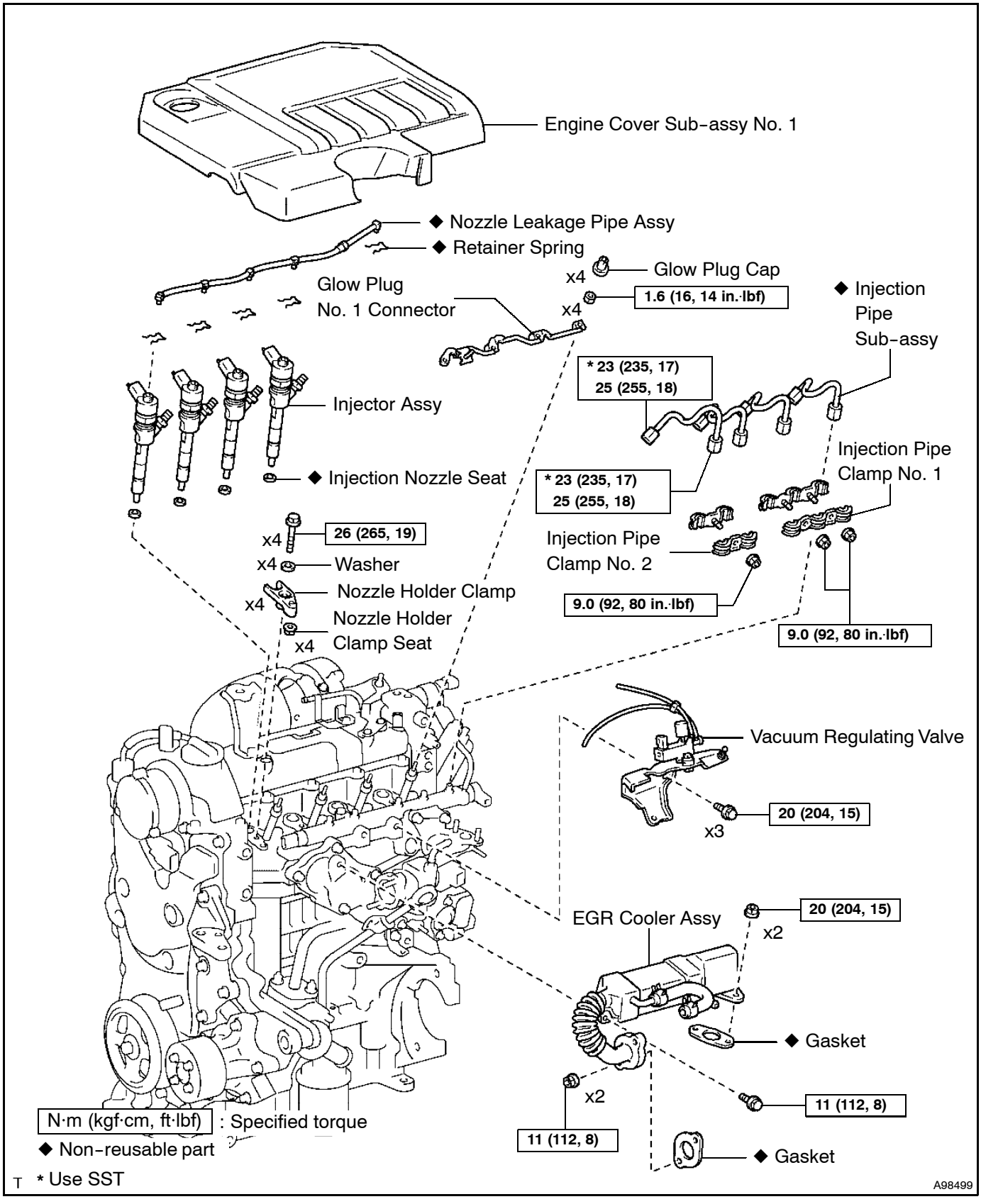
When the float is down: 10 kΩ or higher

If the result is not as specified, replace the level warning switch.

INJECTOR ASSY (1ND-TV)

COMPONENTS

1117T-01



1117U-01

REPLACEMENT

NOTICE:

If an incorrect injector compensation code is registered with the ECM, the engine assembly may rattle or the engine idling may become rough. In addition, the engine may stall or the life of the engine may be shortened.

HINT:

- In order to optimize the injector's fuel injection performance, the ECM adjusts the injection duration of each cylinder. The ECM stores and uses compensation data in the form of a 10-digit alphanumeric number that is imprinted on the head portion of each injector as the injector compensation code.
- When installing a new injector, its individual injector compensation code needs to be registered with the ECM. Also, when replacing the ECM, the compensation codes of all the injectors need to be registered with the ECM because the new ECM has no codes until they are registered.
- When the ECM is replaced, DTC P0603 will be present when turning the ignition switch to ON. The injector compensation codes need to be registered with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch to OFF and wait for 30 seconds or longer.

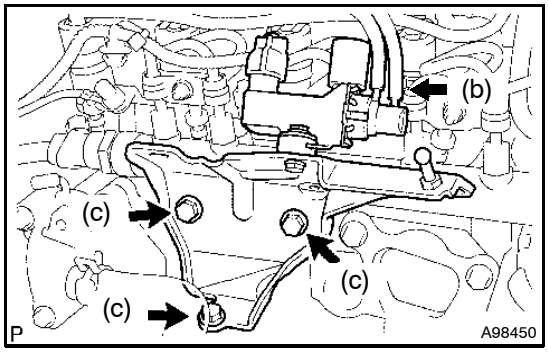
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. DRAIN ENGINE COOLANT (See page 16-7)

3. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)

4. REMOVE GLOW PLUG NO.1 CONNECTOR (See page 19-14)

5. REMOVE EGR COOLER ASSY (See page 12-5)

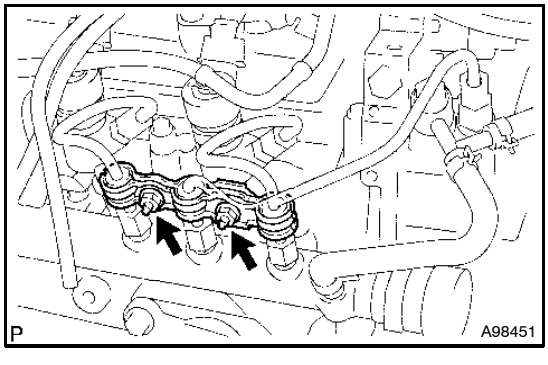


6. REMOVE VACUUM REGULATING VALVE

(a) Disconnect the connector clamp and connector.

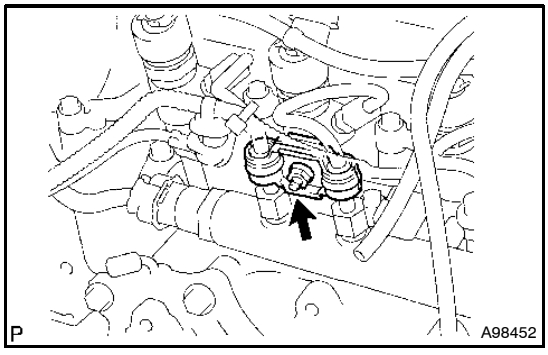
(b) Disengage the 2 hose clamps and disconnect the 2 vacuum hoses.

(c) Remove the 3 bolts, then remove the vacuum regulating valve together with the bracket.



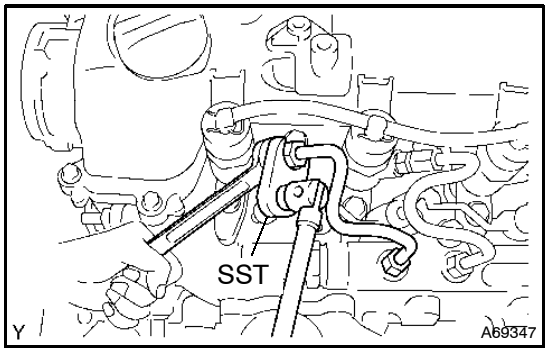
7. REMOVE INJECTION PIPE CLAMP NO.1

(a) Remove the 2 nuts, then remove the injection pipe clamp No. 1.



8. REMOVE INJECTION PIPE CLAMP NO.2

(a) Remove the nut, then remove the injection pipe clamp No. 2.



9. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Using a spanner (13 mm), hold the injector steadily, and using SST, remove the injection pipe from the injector side.

SST 09023-38401

(b) Using SST, remove the injection pipe from the common rail side.

SST 09023-38401

(c) After removing the injection pipe, cover the common rail with vinyl tape and cover the injector inlet with a vinyl or plastic bag in order to prevent dust and foreign objects from entering.

10. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-38401

HINT:

Perform the same procedures as for injection pipe No. 1.

11. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-38401

HINT:

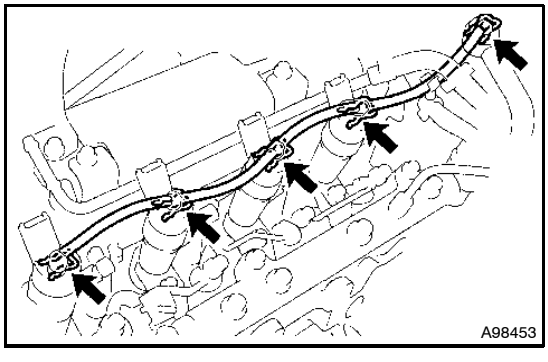
Perform the same procedures as for injection pipe No. 1.

12. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-38401

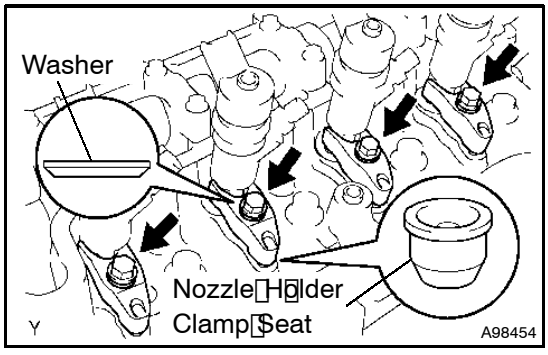
HINT:

Perform the same procedures as for injection pipe No. 1.



13. REMOVE NOZZLE LEAKAGE PIPE ASSY

(a) Remove the 5 retainer springs, then remove the nozzle leakage pipe.



14. REMOVE INJECTOR ASSY

HINT:

- Each injector assembly has its own fuel injection part number. When replacing the injector assembly, store them in the correct order so that they can be returned to the original locations when reassembling.
- Arrange the injectors, clamps, washers, bolts and clamp seats in the correct order.

(a) Remove the 4 bolts, 4 washers, 4 nozzle holder clamps and 4 nozzle holder clamp seats.

(b) Disconnect the 4 injector connectors.

(c) Remove the 4 injectors from the cylinder head.

(d) Remove the 4 injection nozzle seats from the injector or cylinder head.

NOTICE:

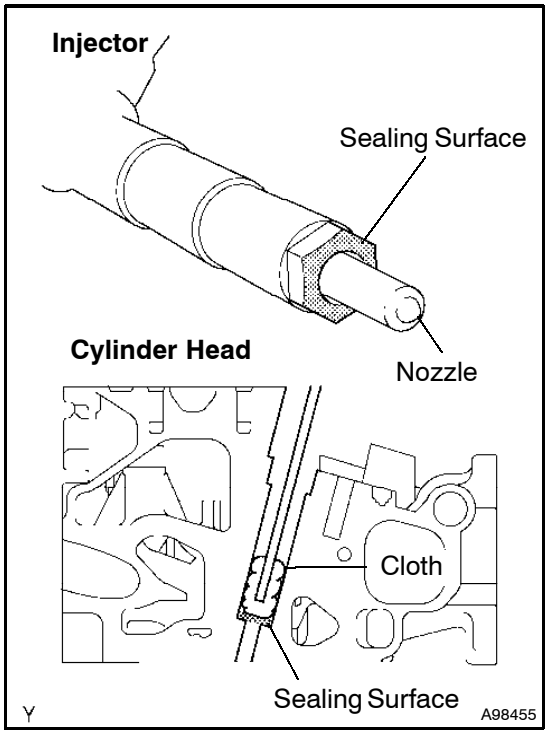
When removing the injector, check that the injector nozzle seat is not attached to the injector, or remaining in the cylinder head.

15. REGISTRATION OF INJECTOR COMPENSATION CODE (REPLACEMENT OF THE NEW INJECTORS) (See page 05-19)

16. INSTALL INJECTOR ASSY

NOTICE:

- **When installing, clean the sealing surface of the injector, injection pipe and common rail.**
- **When replacing the injectors, the injection pipes must also be replaced.**
- **Replace the injection pipe with a new one when the injection pipe has been removed and reinstalled for more than 5 times.**
- **Replace the injector with that of the same part number and install it onto each cylinder.**



(a) Using a cloth and solvent, wipe away any carbon from the sealing surface of the injector and injector installation hole, as shown in the illustration.

NOTICE:

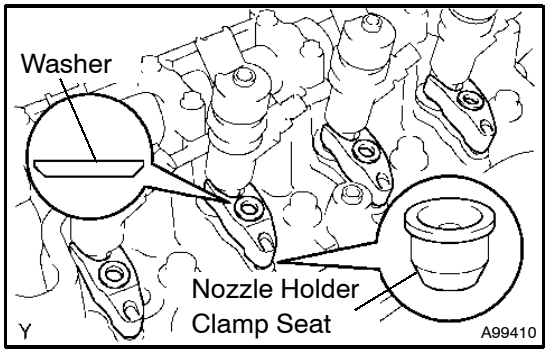
- **Be careful not to damage the sealing surface.**
- **Do not touch the injector nozzle.**

(b) Install 4 new nozzle seats onto the cylinder head.

(c) Install the injector onto the cylinder head.

NOTICE:

Fit the injectors into the seats.

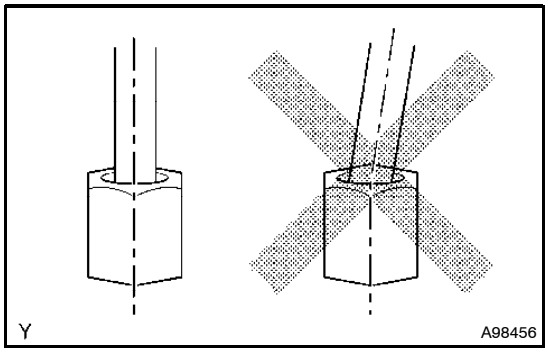


(d) Install the 4 nozzle holder clamp seats onto the cylinder head.

(e) Install the 4 nozzle holder clamps onto the injectors.

(f) Set the washer on the nozzle holder clamp, as shown illustration.

(g) Temporarily tighten the 4 nozzle holder clamp bolts.



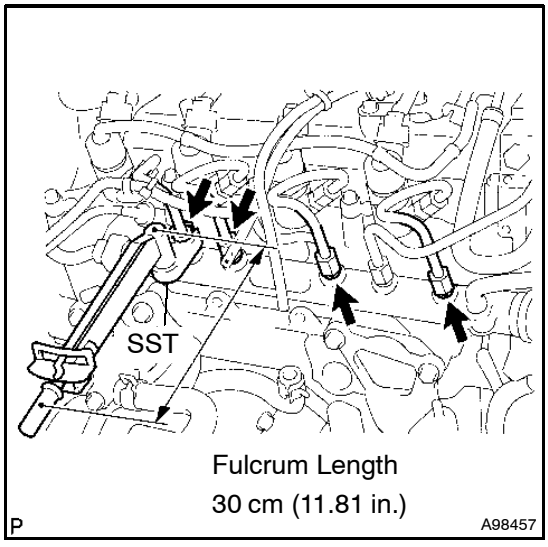
(h) Temporarily install the 4 injection pipes onto the injector and common rail.

NOTICE:

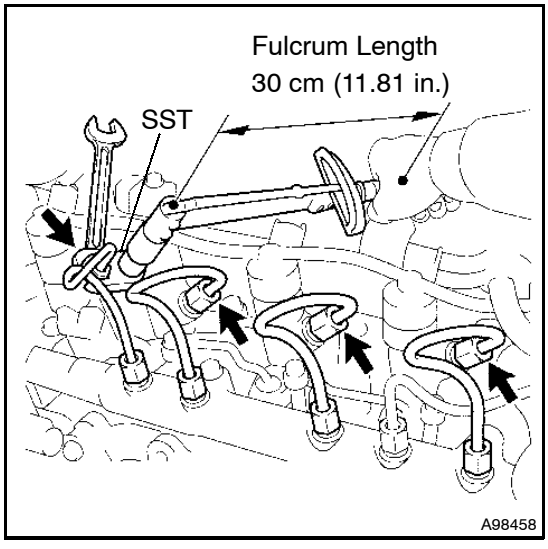
Install the pipe and union nut vertically, not at a tilt.

(i) Tighten the 4 nozzle holder clamp bolts.

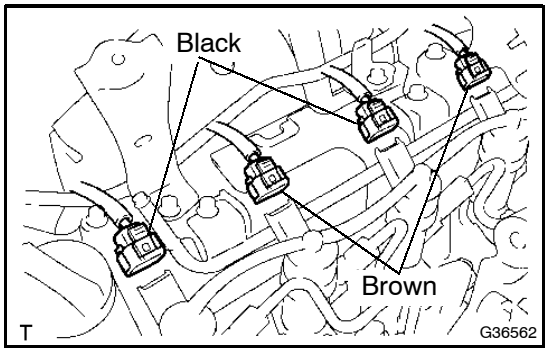
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)



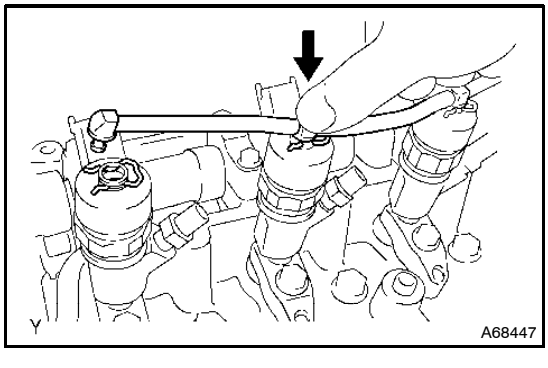
(j) Using SST, tighten the injection pipe union nut of the injection pipe on the common rail side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST
HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the injection pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.



(k) Using a spanner (13 mm), hold the injector steadily, and using SST, tighten the injection pipe union nut of the injection pipe on the injector side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST
HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the injection pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.



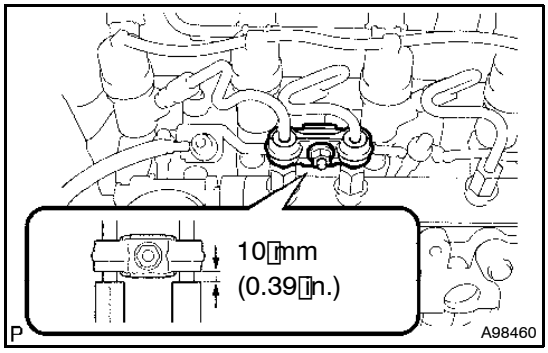
(l) Connect the 4 injector connectors.
NOTICE:
Connect the black connector of the injector to injector No. 1 and No. 3, and brown connector to No. 2 and No. 4.



17. INSTALL NOZZLE LEAKAGE PIPE ASSY
NOTICE:
- **Never reuse the nozzle leakage pipe once it has been removed from the injectors and supply pump.**
- **Push the nozzle leakage pipe until it makes a click sound.**

(a) Install 5 new retainer springs onto the injectors and supply pump.

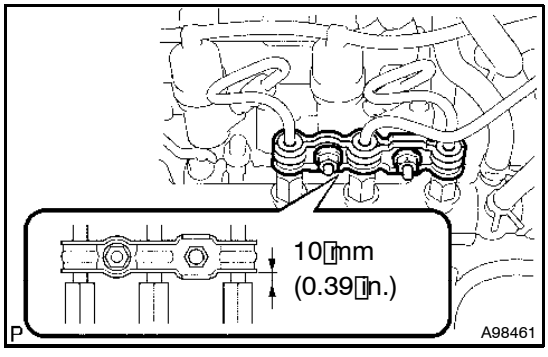
(b) Push the new nozzle leakage pipe into each injectors and supply pump.



18. INSTALL INJECTION PIPE CLAMP NO.2

(a) Install the injection pipe clamp No.2 with the nut as shown in the illustration.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



19. INSTALL INJECTION PIPE CLAMP NO.1

(a) Install the injection pipe clamp No.1 with the 2 nuts as shown in the illustration.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

20. INSTALL VACUUM REGULATING VALVE

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

21. INSTALL GLOW PLUG NO.1 CONNECTOR (See page 19-14)

22. INSTALL EGR COOLER ASSY (See page 12-5)

23. ADD ENGINE COOLANT (See page 16-7)

24. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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

25. CHECK FOR FUEL LEAKAGE

CAUTION:

Since the fuel pressure in the common rail becomes 160 MPa (1,632 kgf/cm^2, 23, 205 psi), check the fuel leakage with great care to avoid the fuel from spraying on your eyes, hands and body.

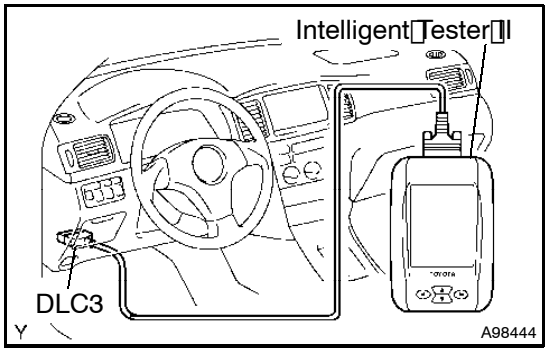
HINT:

Wipe off any fuel on the parts completely before checking for fuel leakage.

(a) Check that there are no fuel leakage from any part of the fuel system when the engine stops.

HINT:

If fuel leakage could be found on any specific parts, replace them with new parts.



(b) While cranking or starting the engine, check that there are no leakage from any part of the fuel system.

HINT:

If fuel leakage could be found on any specific parts, replace them with new parts.

(c) Connect the intelligent tester II to the DLC3.

(d) Start the engine, then switch the intelligent tester II main switch ON.

(e) Select the following menu items: Powertrain / Engine and ECT / Active test / Fuel Leak Test.

(f) If you do not have an intelligent tester II, depress the accelerator pedal to increase the engine speed to 3,000 rpm to 3,800 rpm and keep it for 15 seconds.

(g) Check that there are no leakage from any part of the fuel system.

HINT:

If fuel leakage could be found on any specific parts, replace them with new parts.

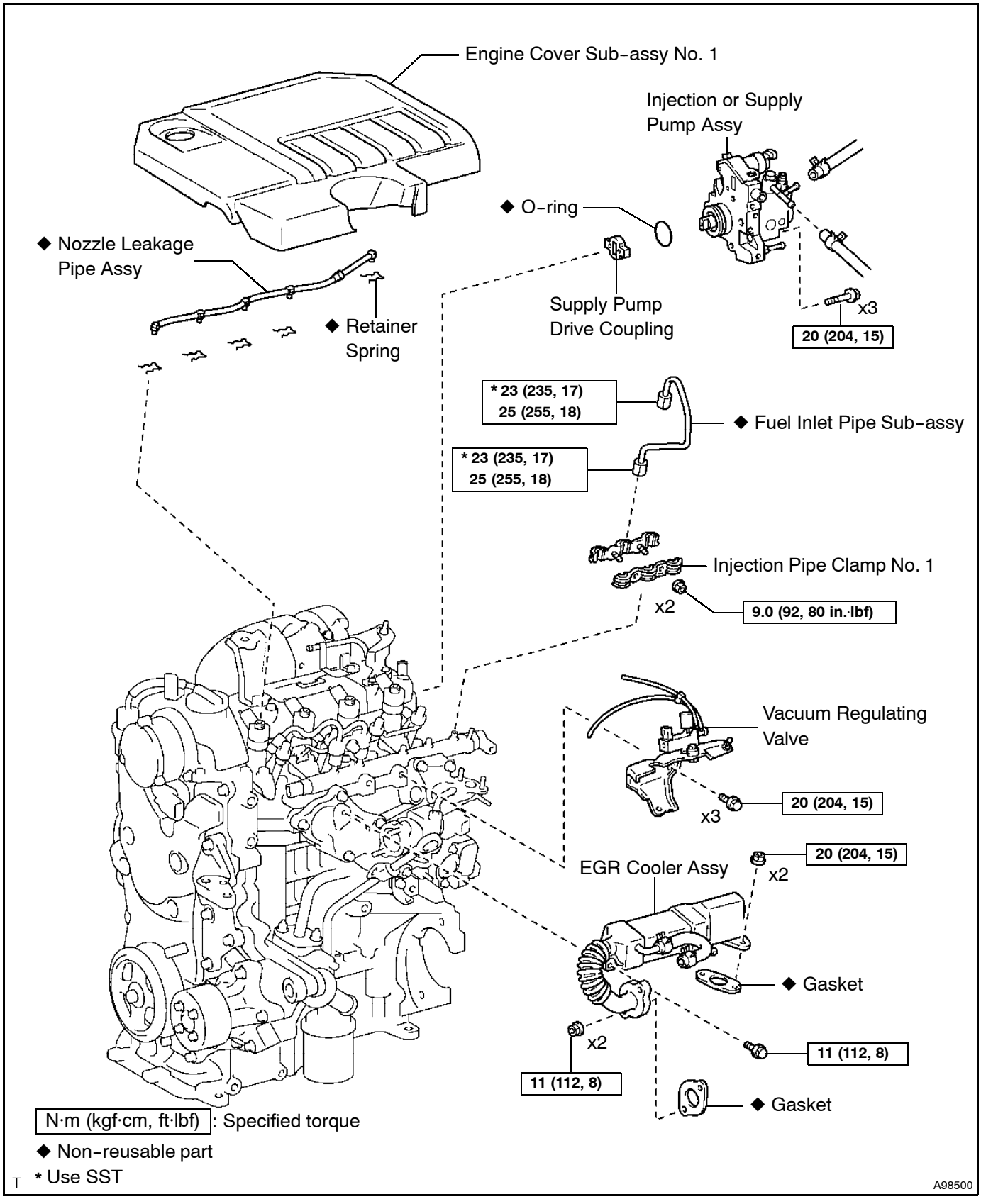
26. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)

27. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)

INJECTION OR SUPPLY PUMP ASSY (1ND-TV)

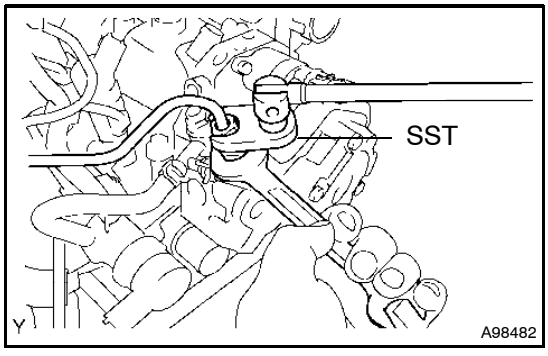
COMPONENTS

1117V-01



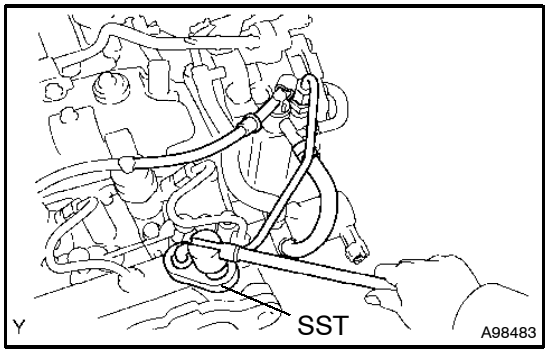
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-7)
3. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)
4. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
5. REMOVE EGR COOLER ASSY (See page 12-5)
6. REMOVE VACUUM REGULATING VALVE (See page 11-8)
7. REMOVE INJECTION PIPE CLAMP NO.1 (See page 11-8)
8. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-8)



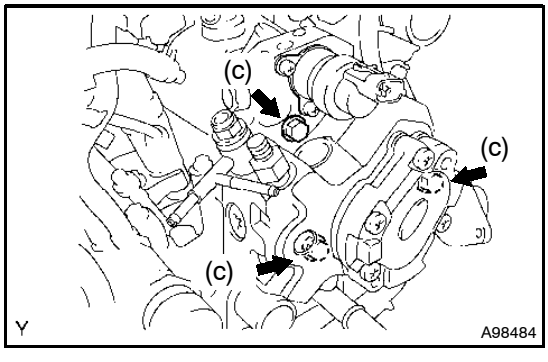
9. REMOVE FUEL INLET PIPE SUB-ASSY

(a) Using a spanner (17 mm), hold the supply pump steadily, and using SST, remove the fuel inlet pipe from the supply pump side.
SST 09023-38401



(b) Using SST, remove the fuel inlet pipe from the common rail side.
SST 09023-38401

(c) After removing the fuel inlet pipe, cover the common rail with vinyl tape and cover the injector inlet with a vinyl or plastic bag in order to prevent dust and foreign objects from entering.



10. REMOVE INJECTION OR SUPPLY PUMP ASSY

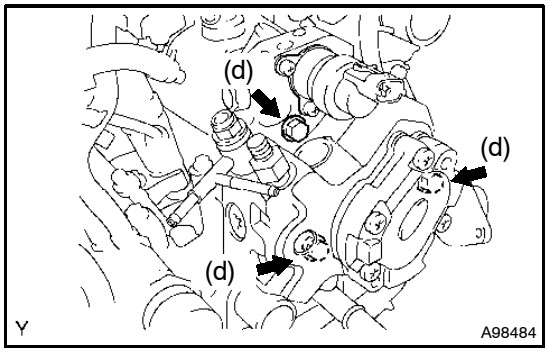
(a) Disconnect the 2 fuel hoses.
(b) Disconnect the 2 connectors.
(c) Remove the 3 bolts, then remove the supply pump.
(d) Remove the supply pump driving coupling.
(e) Remove the O-ring.

NOTICE:
When removing the supply pump, make sure that the drive coupling dose not fall off, as it can be easily removed.
If the drive coupling falls off, replace it with a new one.

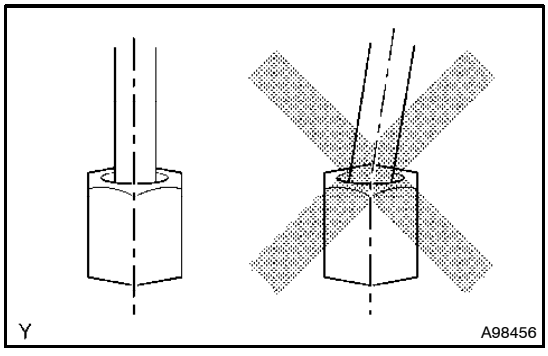
11. INSTALL INJECTION OR SUPPLY PUMP ASSY

NOTICE:
When installing, clean the seal surface of the fuel inlet pipe, supply pump and common rail.

(a) Apply a light coat of engine oil to a new O-ring.
(b) Install the O-ring onto the supply pump.
(c) Install the supply pump drive coupling onto the supply pump drive shaft.



(d) Temporality install the supply pump with the 3 bolts.
(e) Remove the vinyl bag and rubber band from the supply pump.
(f) Connect the 2 connectors.
(g) Connect the 2 fuel hoses.



12. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

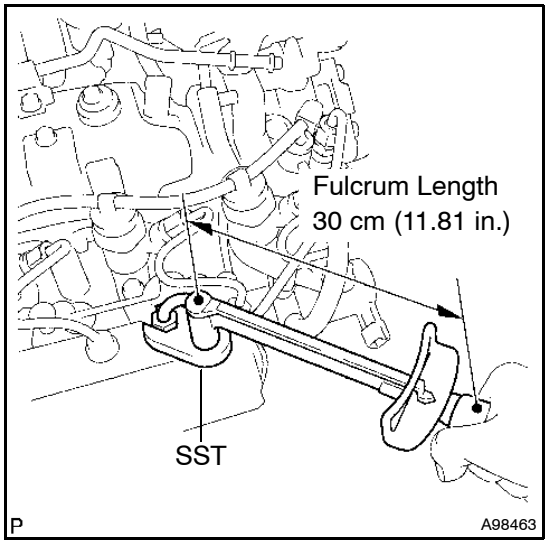
- **When replacing the supply pump, the fuel inlet pipe must also be replaced.**
- **Replace the fuel inlet pipe with a new one when the fuel inlet pipe has been removed and reinstalled for more than 5 times.**

(a) Temporarily install the fuel inlet pipe to supply pump and common rail.

NOTICE:

Install the pipe and union nut vertically, not at a tilt.

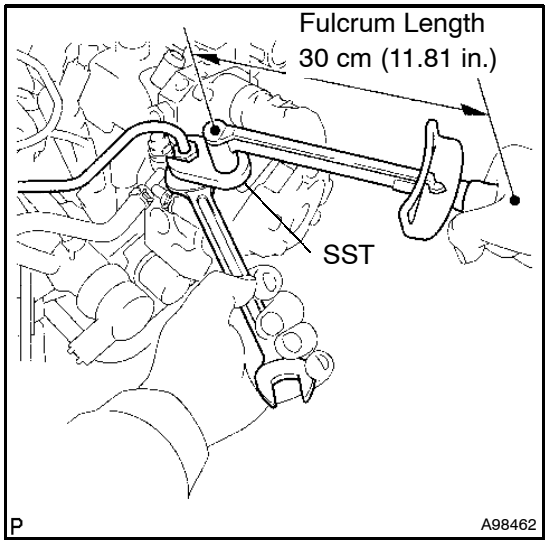
(b) Tighten the 3 bolts of the supply pump.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



(c) Using SST, tighten the fuel inlet pipe union nut of the fuel inlet pipe on the common rail side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:

- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the fuel inlet pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.



(d) Using a spanner (17 mm), hold the supply pump steadily, and using SST, tighten the fuel inlet pipe union nut of the fuel inlet pipe on the supply pump side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:

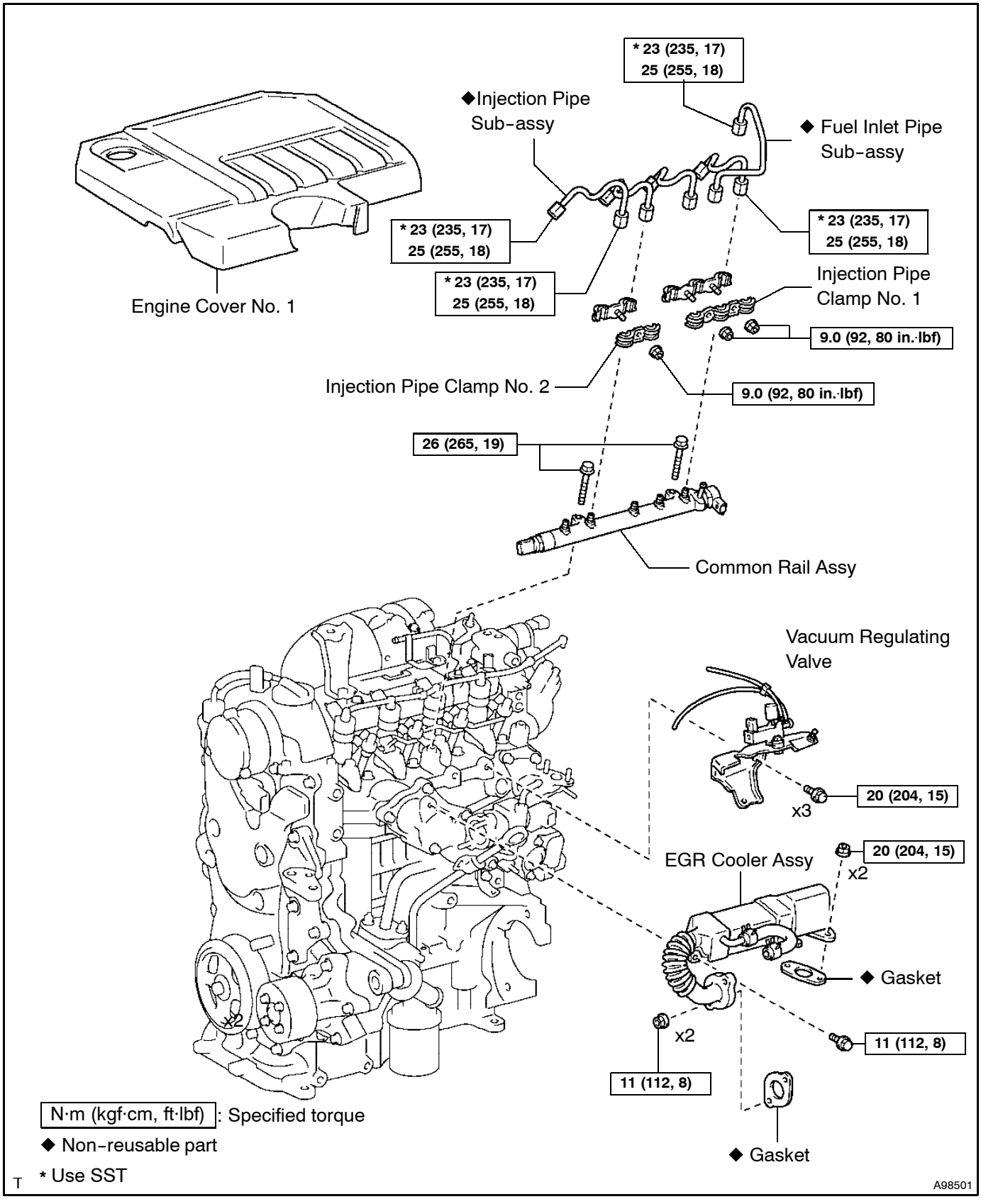
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the fuel inlet pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.

13. **INSTALL NOZZLE LEAKAGE PIPE ASSY** (See page 11-8)
14. **INSTALL INJECTION PIPE CLAMP NO.1** (See page 11-8)
15. **INSTALL VACUUM REGULATING VALVE** (See page 11-8)
16. **INSTALL EGR COOLER ASSY** (See page 12-5)
17. **INSTALL AIR CLEANER CAP SUB-ASSY** (See page 13-17)
18. **ADD ENGINE COOLANT** (See page 16-7)
19. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
    Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
20. **CHECK FOR FUEL LEAKAGE** (See page 11-8)
21. **CHECK FOR ENGINE COOLANT LEAKAGE** (See page 16-1)
22. **INSTALL ENGINE COVER SUB-ASSY NO.1** (See page 14-6)

COMMON RAIL ASSY (1ND-TV)

COMPONENTS

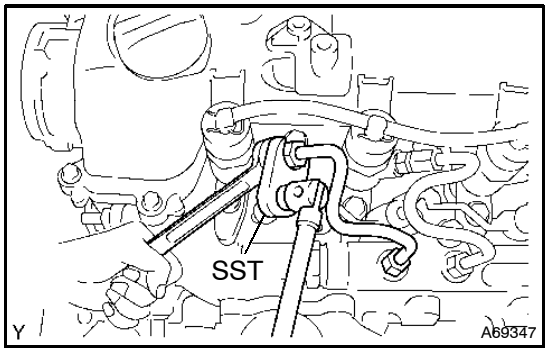
1117X-01



1117Y-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-7)
3. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
4. REMOVE EGR COOLER ASSY (See page 12-5)
5. REMOVE VACUUM REGULATING VALVE (See page 11-8)
6. REMOVE INJECTION PIPE CLAMP NO.1 (See page 11-8)
7. REMOVE INJECTION PIPE CLAMP NO.2 (See page 11-8)



8. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Using a spanner (13 mm), hold the injector steadily, and using SST, remove the injection pipe from the injector side.

SST 09023-38401

(b) Using SST, remove the injection pipe from the common rail side.

SST 09023-38401

(c) After removing the injection pipe, cover the common rail with vinyl tape and cover the injector inlet with a vinyl or plastic bag in order to prevent dust and foreign objects from entering.

9. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-38401

HINT:

Perform the same procedures as for injection pipe No. 1.

10. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-38401

HINT:

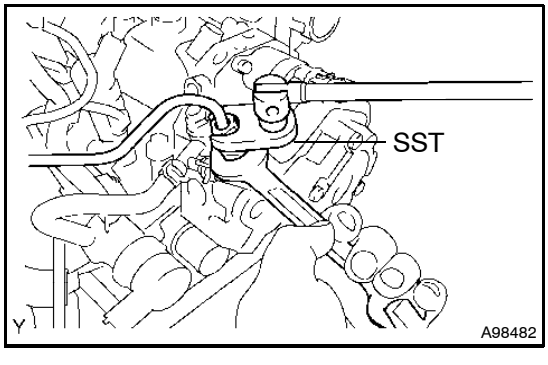
Perform the same procedures as for injection pipe No. 1.

11. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-38401

HINT:

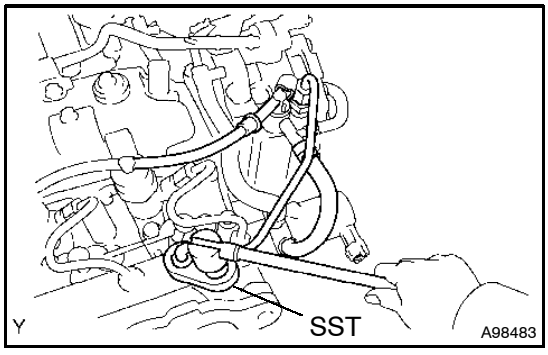
Perform the same procedures as for injection pipe No. 1.



12. REMOVE FUEL INLET PIPE SUB-ASSY

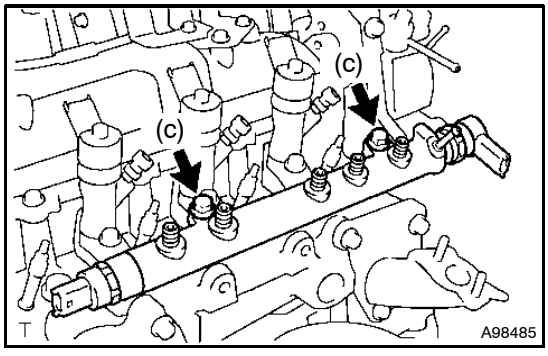
(a) Using a spanner (17 mm), hold the supply pump steadily, and using SST, remove the fuel inlet pipe from the supply pump side.

SST 09023-38401



(b) Using SST, remove the fuel inlet pipe from the common rail side.
SST 09023-38401

(c) After removing the fuel inlet pipe, cover the common rail with vinyl tape and cover the injector inlet with a vinyl or plastic bag in order to prevent dust and foreign objects from entering.



13. REMOVE COMMON RAIL ASSY

(a) Disconnect the 2 connectors.

(b) Disconnect the fuel hose.

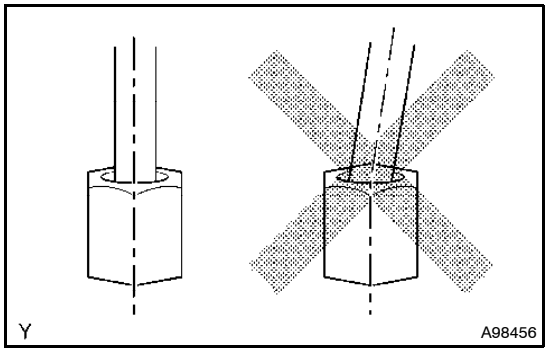
(c) Remove the 2 bolts and common rail.

NOTICE:

Do not remove the fuel pressure sensor and fuel pressure regulator.

14. INSTALL COMMON RAIL ASSY

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)



15. INSTALL FUEL INLET PIPE SUB-ASSY

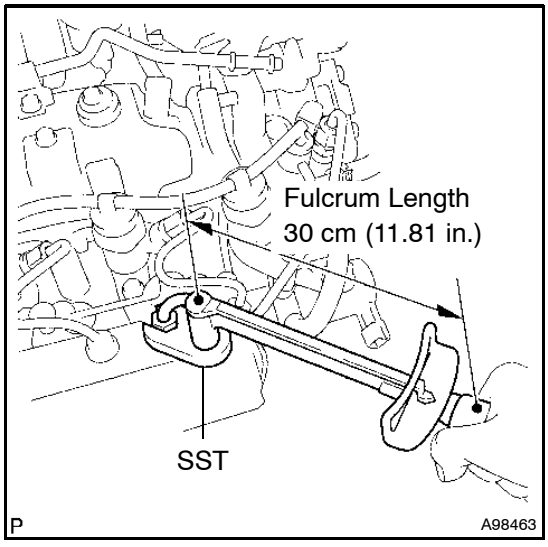
NOTICE:

- **When replacing the common rail, the fuel inlet pipe must also be replaced.**
- **Replace the fuel inlet pipe with a new one when the fuel inlet pipe has been removed and reinstalled for more than 5 times.**

(a) Temporarily install the fuel inlet pipe onto the supply pump and common rail.

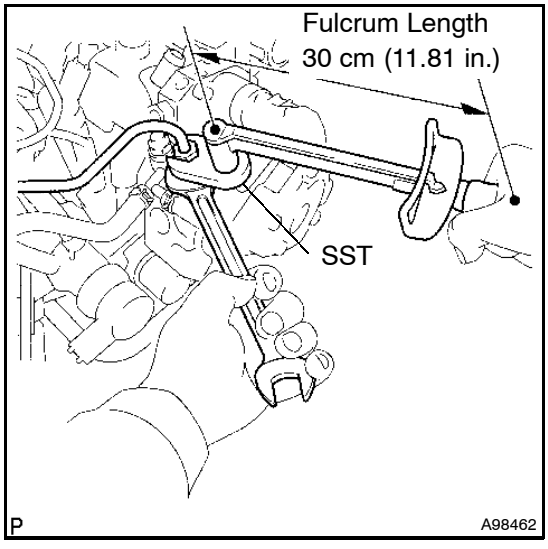
NOTICE:

Install the pipe and union nut vertically, not at a tilt.



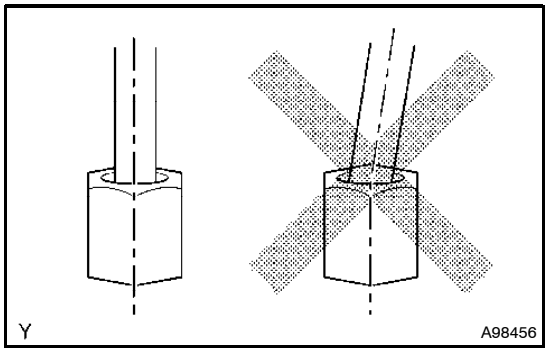
(b) Using SST, tighten the fuel inlet pipe union nut of the fuel inlet pipe on the common rail side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the fuel inlet pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.



(c) Using a spanner (17 mm), hold the supply pump steadily, and using SST, tighten the fuel inlet pipe union nut of the fuel inlet pipe on the supply pump side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the fuel inlet pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.

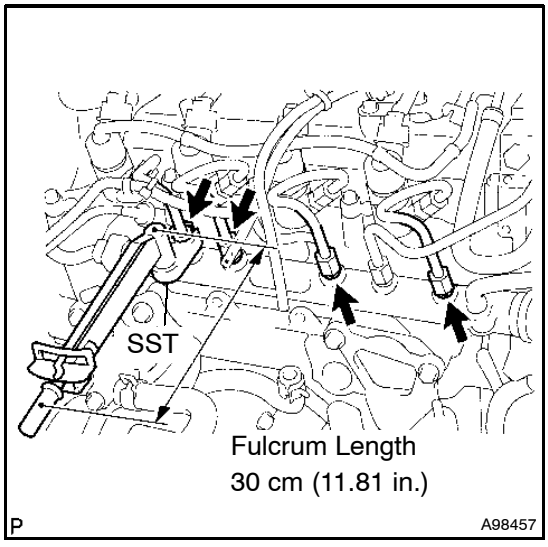


16. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:
- **When replacing the common rail, the injection pipes must also be replaced.**
- **Replace the injection pipe with a new one when the injection pipe has been removed and reinstalled for more than 5 times.**

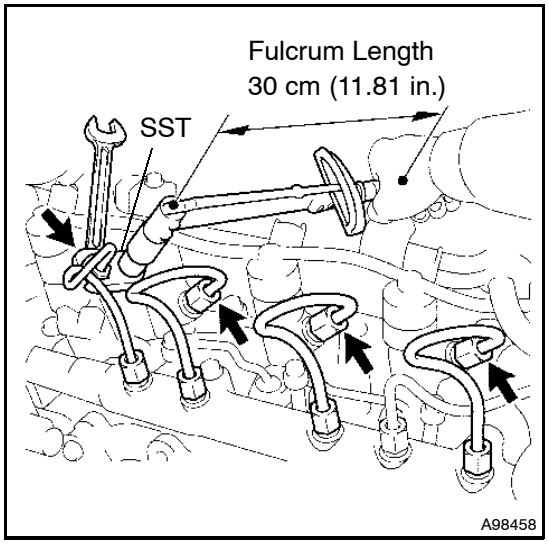
(a) Temporarily install the 4 injection pipes onto the injector and common rail.

NOTICE:
Install the pipe and union nut vertically, not at a tilt.



(b) Using SST, tighten the injection pipe union nut of the injection pipe on the common rail side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the injection pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.



(c) Using a spanner (13 mm), hold the injector steadily, and using SST, tighten the injection pipe union nut of the injection pipe on the injector side.
SST 09023-38401
Torque:
23 N·m (235 kgf·cm, 17 ft·lbf) with SST
25 N·m (255 kgf·cm, 18 ft·lbf) without SST

HINT:
- Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).
- After the injection pipe has been reassembled, check that the used pipe has no deflection and is installed properly. If it has deflection or could not be installed properly, replace the used pipe with a new one.

17. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-38401

HINT:
Perform the same procedures as for injection pipe No. 1.

18. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-38401

HINT:
Perform the same procedures as for injection pipe No. 1.

19. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-38401

HINT:
Perform the same procedures as for injection pipe No. 1.

20. INSTALL INJECTION PIPE CLAMP NO.2 **(See page 11-8)**
21. INSTALL INJECTION PIPE CLAMP NO.1 **(See page 11-8)**
22. INSTALL VACUUM REGULATING VALVE **(See page 11-8)**
23. INSTALL EGR COOLER ASSY **(See page 12-5)**
24. ADD ENGINE COOLANT **(See page 16-7)**
25. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

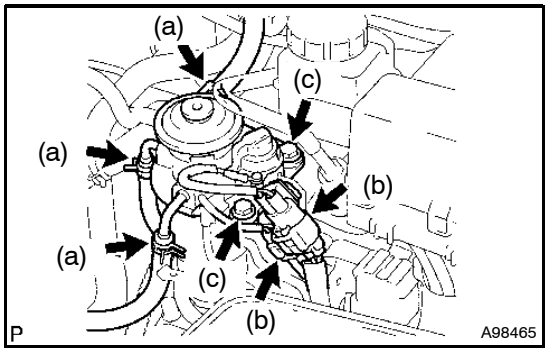
26. CHECK FOR FUEL LEAKAGE (See page 11-8)
27. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
28. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)

FUEL FILTER ASSY (1ND-TV)

1117Z-01

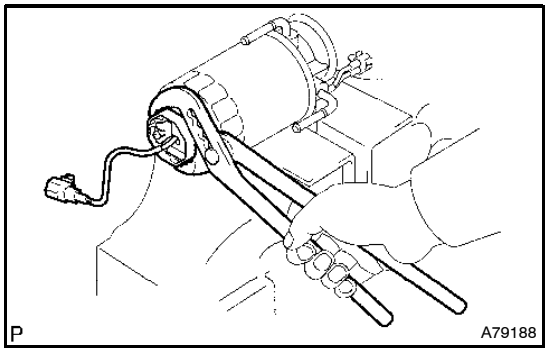
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)



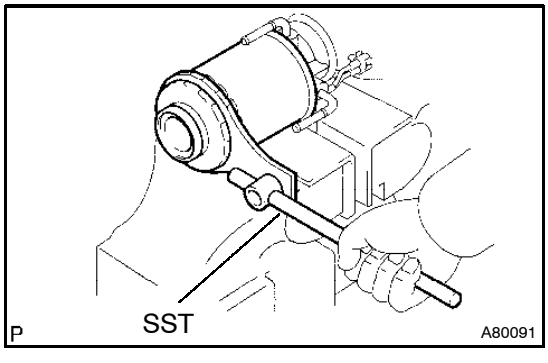
3. REMOVE FUEL FILTER ASSY
(a) w/ stove heater:
Disconnect the 3 fuel hoses from the fuel filter.
(b) w/o stove heater:
Disconnect the 2 fuel hoses from the fuel filter.
(c) Disconnect the 2 connectors.
(d) Remove the 2 bolts, then remove the fuel filter.

4. DRAIN FUEL
(a) Loosen the drain plug, then drain the fuel from the fuel filter.

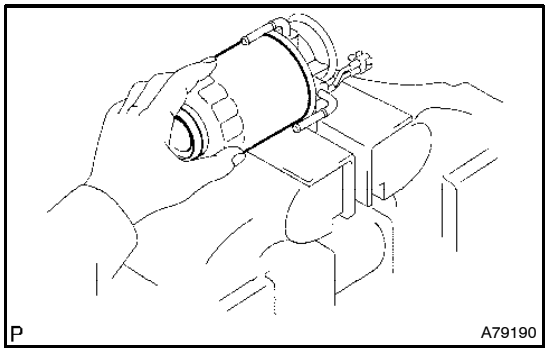


5. REMOVE LEVEL WARNING SWITCH
(a) Clamp the fuel filter in a soft jaw vise.
(b) Using pliers, remove the level warning switch.

NOTICE:
Be careful not to damage the level warning switch.



6. REMOVE FUEL FILTER ELEMENT
(a) Using SST, remove the fuel filter element.
SST 09228-64030

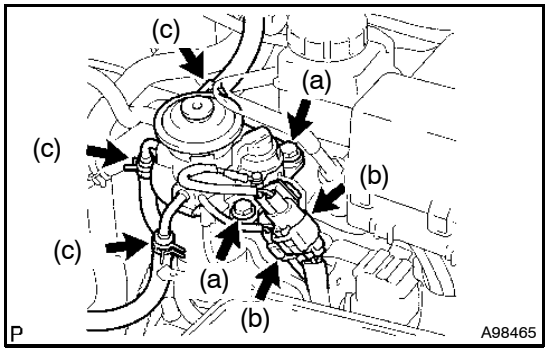


7. INSTALL FUEL FILTER ELEMENT

(a) Check and clean the fuel filter installation surface.
(b) Apply fuel to the gasket of a new fuel filter element.
(c) Lightly screw the fuel filter element into place, and tighten it until the gasket comes into contact with the seat.
(d) Tighten it additional 3/4 turn by hand.

8. INSTALL LEVEL WARNING SWITCH

(a) Install a new O-ring onto the level warning switch.
(b) Apply fuel to the O-ring of the level warning switch.
(c) Install the level warning switch onto the fuel filter by hand.



9. INSTALL FUEL FILTER ASSY

(a) Install the fuel filter with the 2 bolts.
Torque: 18 N·m (178 kgf·cm, 13 ft·lbf)
(b) Connect the 2 connectors.
(c) w/ stove heater:
Connect the 3 fuel hoses onto the fuel filter.
(d) w/o stove heater:
Connect the 2 fuel hoses onto the fuel filter.
(e) Carry out priming work until the hand pump is felt hard while pushing it since filling a fuel filter with fuel is required after replacement of the fuel filter.

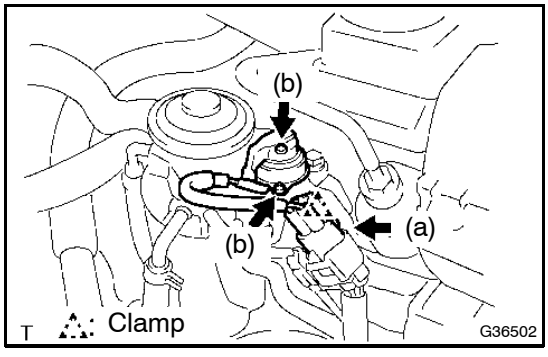
10. INSTALL AIR CLEANER CAP SUB-ASSY (See page 13-17)
11. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
12. CHECK FOR FUEL LEAKAGE (See page 11-8)

FUEL HEATER ASSY (1ND-TV)

11180-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)



3. REMOVE FUEL HEATER ASSY
(a) Disconnect the connector and connector clamp.
(b) Remove the 2 screws, then remove the fuel heater assembly.

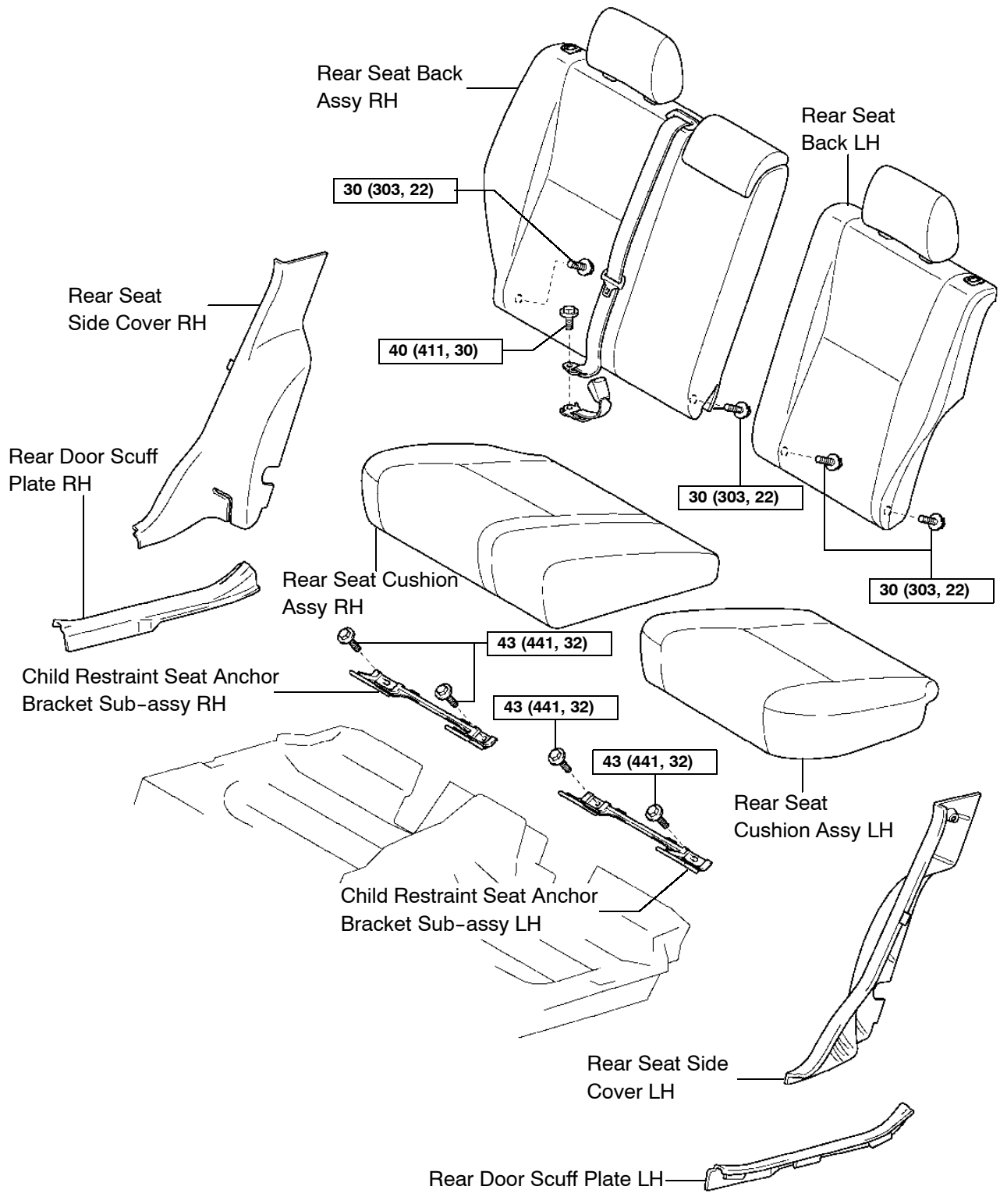
4. INSTALL FUEL HEATER ASSY
5. INSTALL AIR CLEANER CAP SUB-ASSY (See page 13-17)
6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
7. CHECK FOR FUEL LEAKAGE (See page 11-8)

FUEL TANK ASSY (1ND-TV(HATCH BACK))

COMPONENTS

11181-01

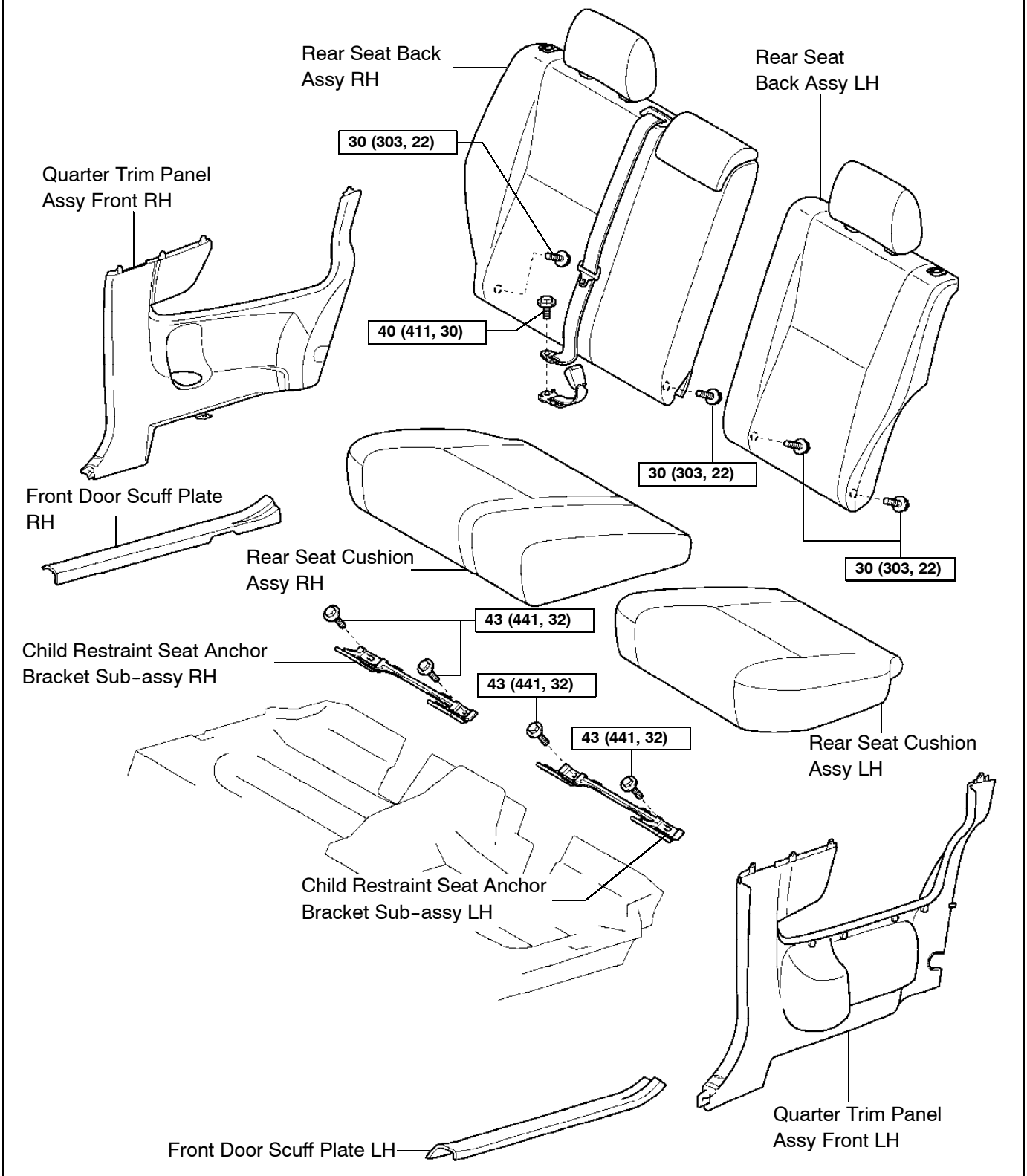
5 Door Hatch Back:



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

A98507

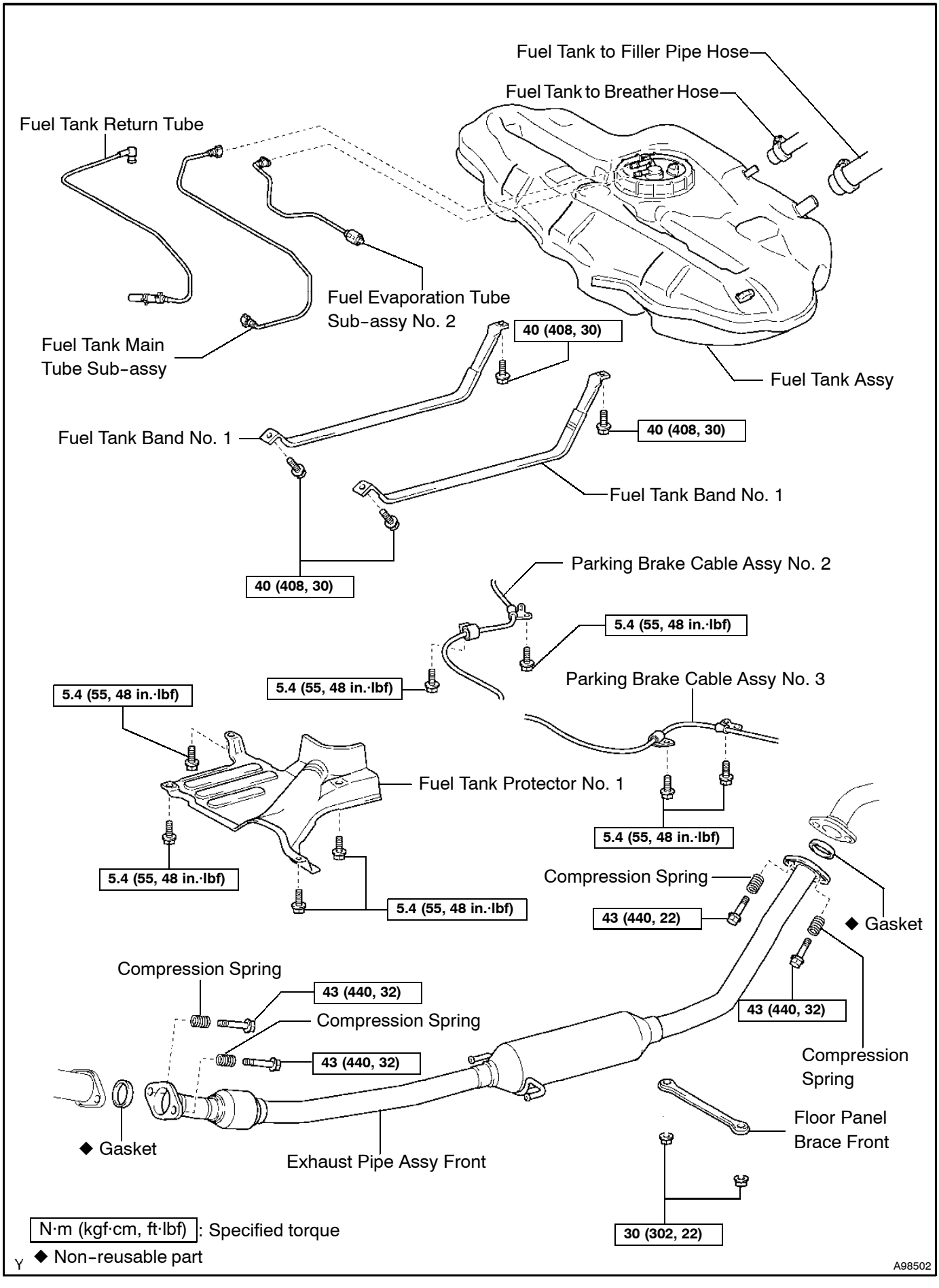
3 Door Hatch Back:

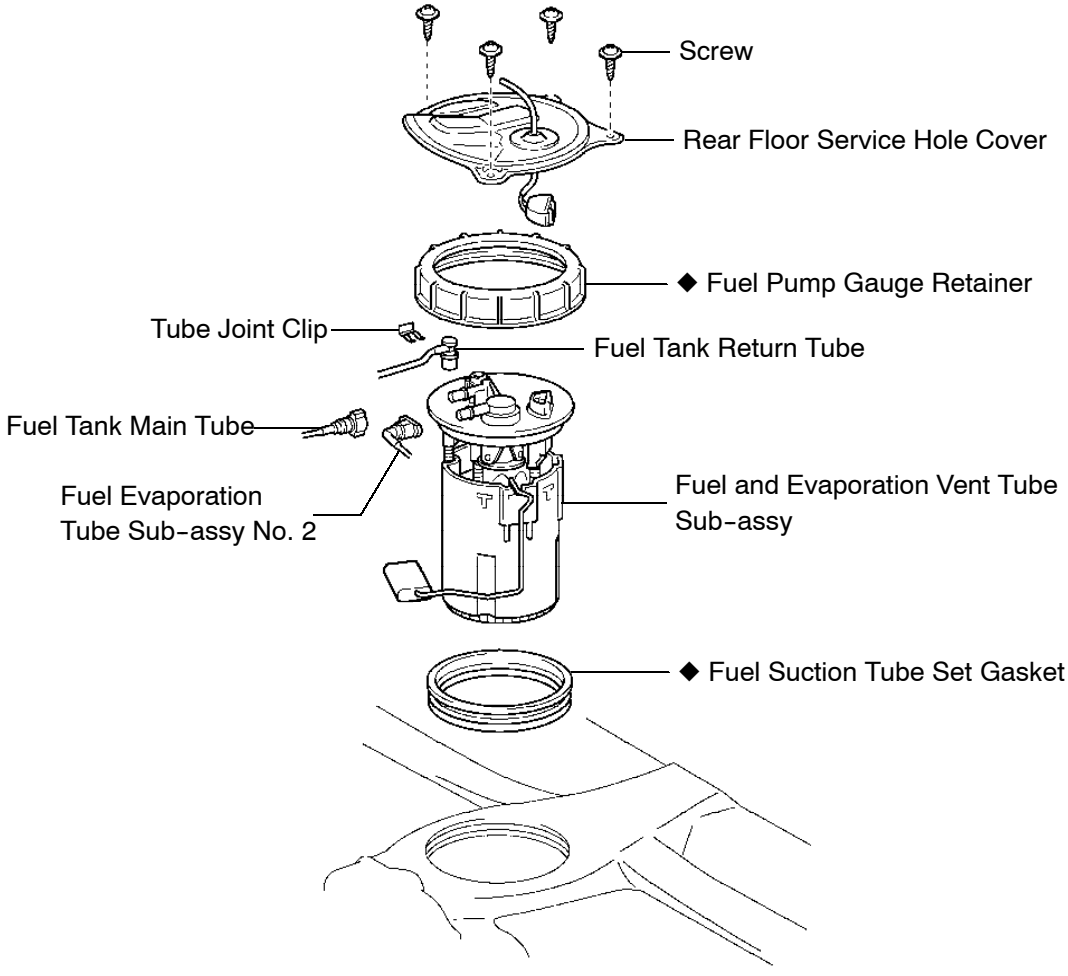


Y

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

A98508


Fuel Tank to Filler Pipe Hose
Fuel Tank to Breather Hose
Fuel Tank Return Tube
Fuel Evaporation Tube Sub-assy No. 2
40 (408, 30)
Fuel Tank Main Tube Sub-assy
Fuel Tank Assy
Fuel Tank Band No. 1
40 (408, 30)
Fuel Tank Band No. 1
40 (408, 30)
Parking Brake Cable Assy No. 2
5.4 (55, 48 in.·lbf)
5.4 (55, 48 in.·lbf)
Parking Brake Cable Assy No. 3
5.4 (55, 48 in.·lbf)
Fuel Tank Protector No. 1
5.4 (55, 48 in.·lbf)
5.4 (55, 48 in.·lbf)
Compression Spring
43 (440, 22)
◆ Gasket
Compression Spring
43 (440, 32)
Compression Spring
43 (440, 32)
43 (440, 32)
Compression Spring
Floor Panel Brace Front
◆ Gasket
Exhaust Pipe Assy Front
30 (302, 22)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
A98502



Y ◆ Non-reusable part

A63368

11182-01

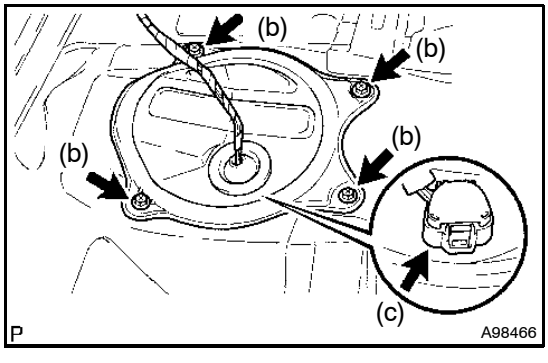
Removal & Installation and Disassembly & Reassembly

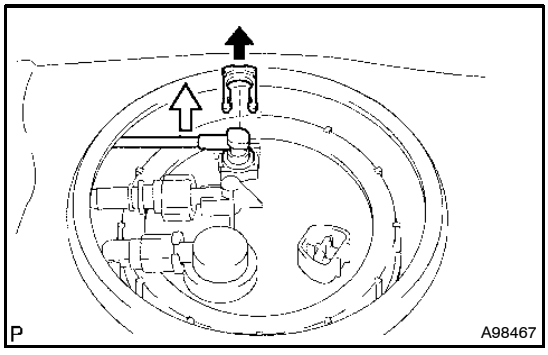
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REAR SEAT CUSHION ASSY LH (See Pub No. RM925E on page 72-20)
3. REAR SEAT CUSHION ASSY RH (See Pub No. RM925E on page 72-20)
4. REMOVE REAR SEAT BACK ASSY LH (See Pub No. RM925E on page 72-26)
5. REMOVE REAR SEAT BACK ASSY RH (See Pub No. RM925E on page 72-26)
6. REMOVE CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY LH (See Pub No. RM925E on page 61-28)
7. REMOVE CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY RH (See Pub No. RM925E on page 61-28)
8. REMOVE FRONT DOOR SCUFF PLATE LH (3 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-48)
9. REMOVE FRONT DOOR SCUFF PLATE RH (3 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-48)
10. REMOVE QUARTER TRIM PANEL ASSY FRONT LH (3 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-48)
11. REMOVE QUARTER TRIM PANEL ASSY FRONT RH (3 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-48)
12. REMOVE REAR DOOR SCUFF PLATE LH (5 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-56)
13. REMOVE REAR DOOR SCUFF PLATE RH (5 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-56)
14. REMOVE REAR SEAT SIDE COVER LH (5 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-56)
15. REMOVE REAR SEAT SIDE COVER RH (5 DOOR HATCH BACK BODY TYPE) (See Pub No. RM925E on page 76-56)
16. REMOVE REAR FLOOR SERVICE HOLE COVER

(a) Pull up the floor carpet assembly front.

(b) Remove the 4 screws, then remove the rear floor service hole cover.

(c) Disconnect the fuel sender gauge connector.



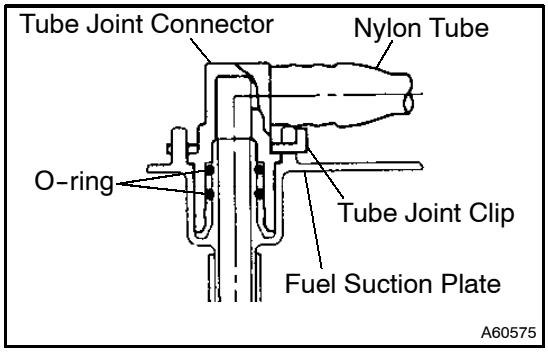


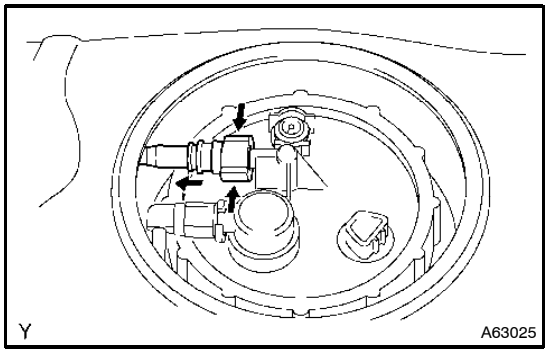
17. DISCONNECT FUEL TANK RETURN TUBE

(a) Remove the tube joint clip, then pull out the fuel tank return tube.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**



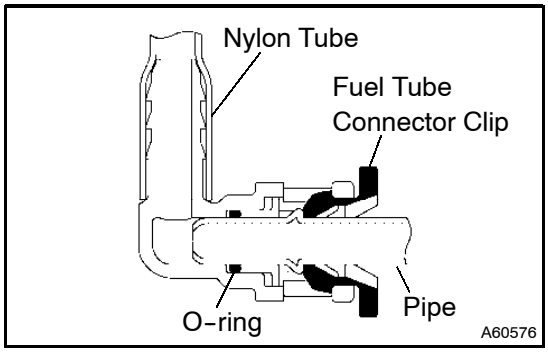


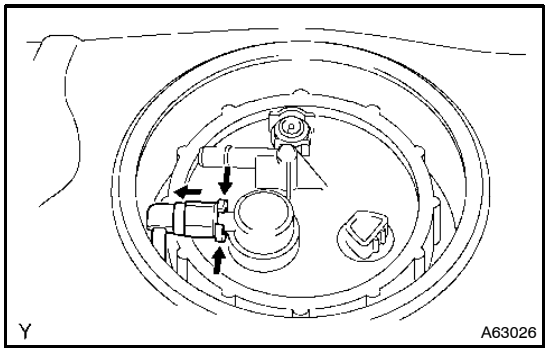
18. DISCONNECT FUEL TANK MAIN TUBE SUB-ASSY

(a) Pinch the tube connector and pull out the fuel tank main tube.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**
- **When the connector and pipe are stuck, push and pull the connector to release it. Pull out the connector from the pipe carefully.**



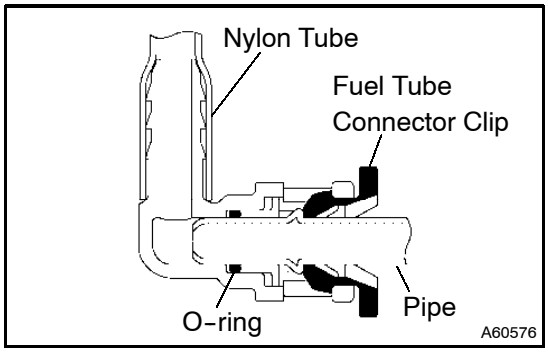


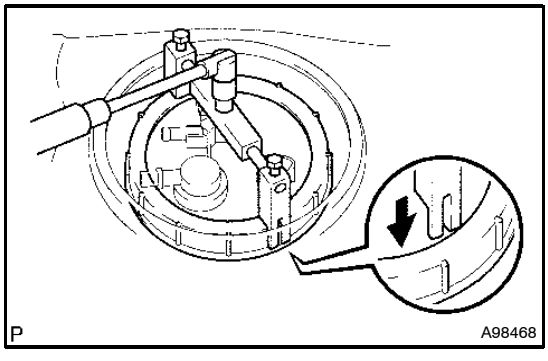
19. DISCONNECT FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Pinch the tube connector then pull out the fuel evaporation tube sub-assembly No. 2.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**
- **When the connector and pipe are stuck, push and pull the connector to release it. Pull out the connector from the pipe carefully.**





20. REMOVE FUEL AND EVAPORATION VENT TUBE SUB-ASSY

(a) Using SST, loosen the retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)

(b) Remove the retainer.

(c) Pull out the fuel and evaporation vent tube sub-assembly.

NOTICE:

Make sure that the fuel sender gauge arm does not bend.

(d) Remove the gasket from the fuel and evaporation vent tube sub-assembly.

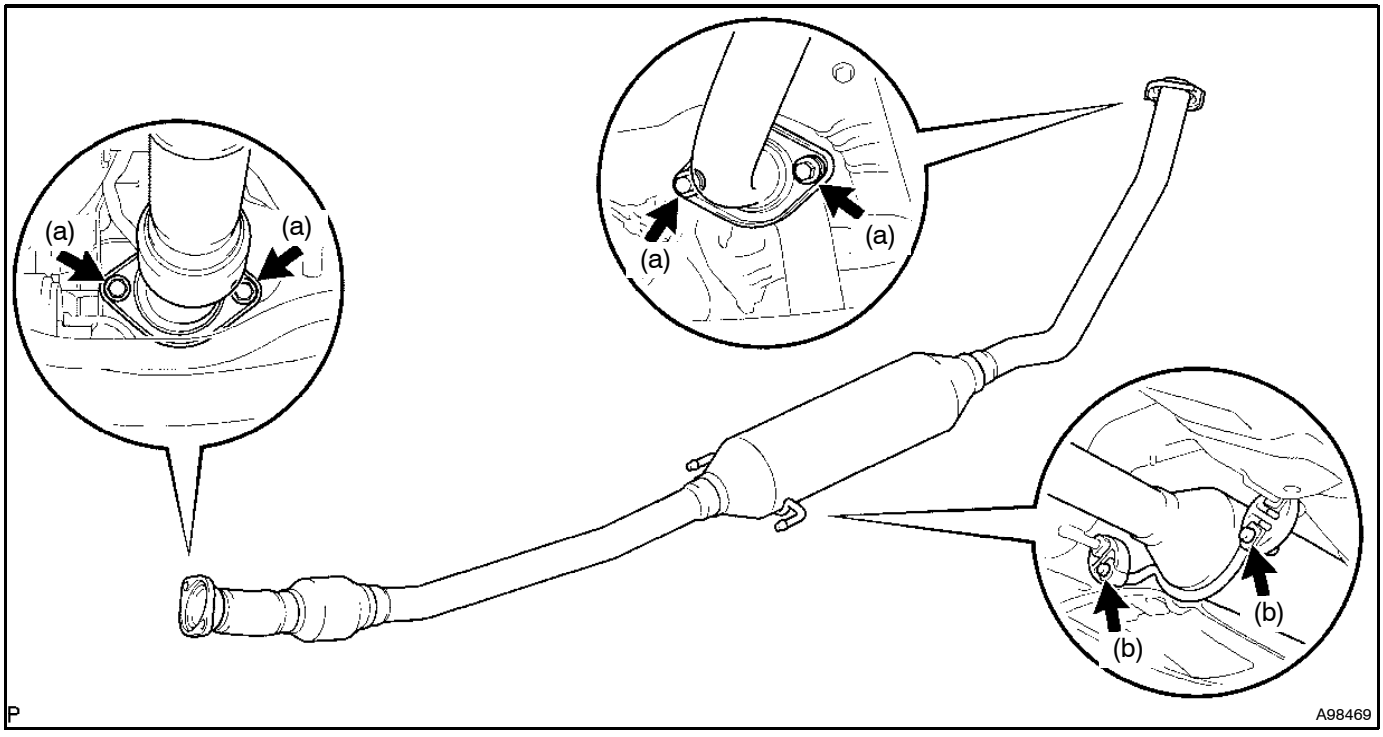
21. DRAIN FUEL

22. REMOVE FLOOR PANEL BRACE FRONT (See page 15-2)

23. REMOVE EXHAUST PIPE ASSY FRONT

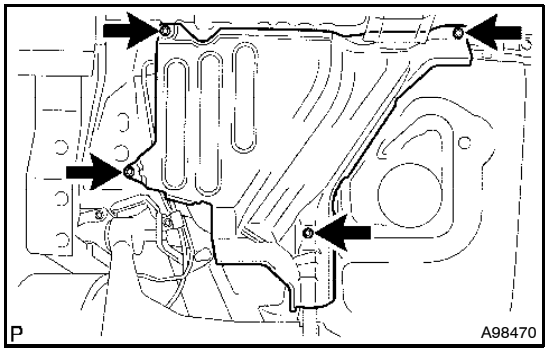
(a) Remove the 4 bolts and 4 compression springs.

(b) Remove the exhaust pipe front from the 2 exhaust pipe supports No. 5.



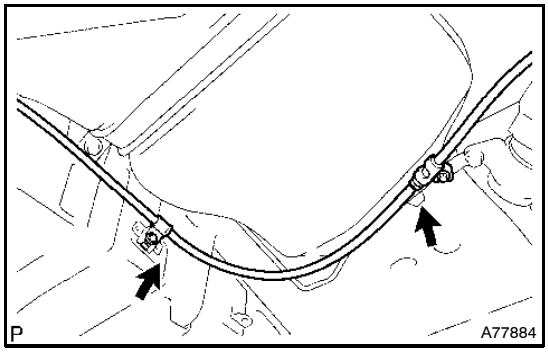
(c) Remove the gasket from the exhaust manifold.

(d) Remove the gasket from the exhaust pipe front.



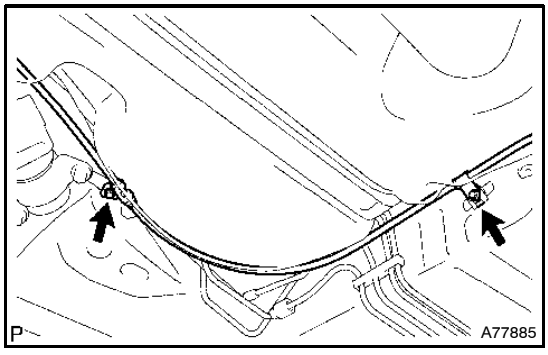
24. REMOVE FUEL TANK PROTECTOR NO.1

(a) Remove the 4 bolts, then remove the fuel tank protector No. 1.



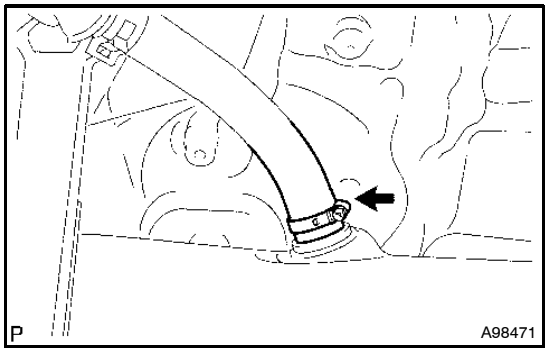
25. DISCONNECT PARKING BRAKE CABLE ASSY NO.2

(a) Remove the 2 bolts, then disconnect the parking brake cable No. 2.



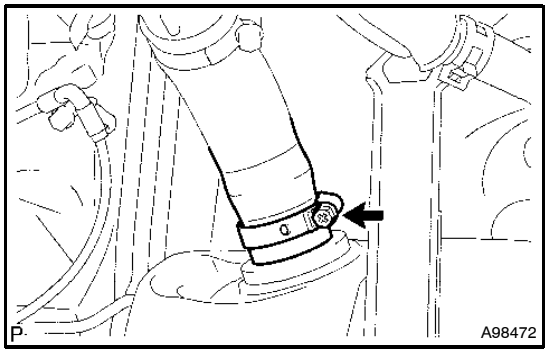
26. DISCONNECT PARKING BRAKE CABLE ASSY NO.3

(a) Remove the 2 bolts, then disconnect the parking brake cable No. 3.

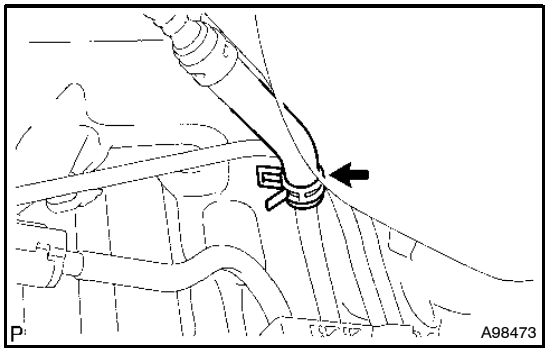


27. REMOVE FUEL TANK ASSY

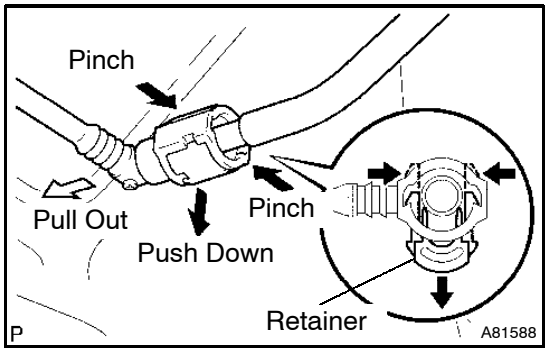
(a) Loosen the hose clamp, then disconnect the fuel tank breather hose.



(b) Loosen the hose clamp, then disconnect the fuel tank to filler pipe hose.



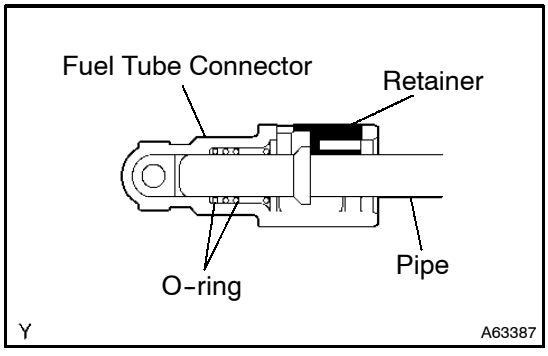
(c) Disconnect the fuel tank return tube.

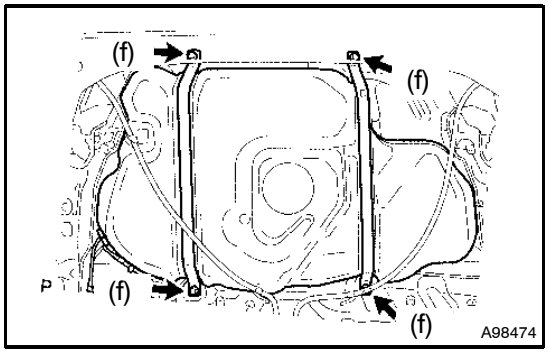


(d) Disconnect the fuel tank main tube sub-assembly.
(1) Pinch the tab of the retainer of the fuel tube connector to remove the lock claws and push it down as shown in the illustration.
(2) Pull out the fuel tank main tube from the pipe.

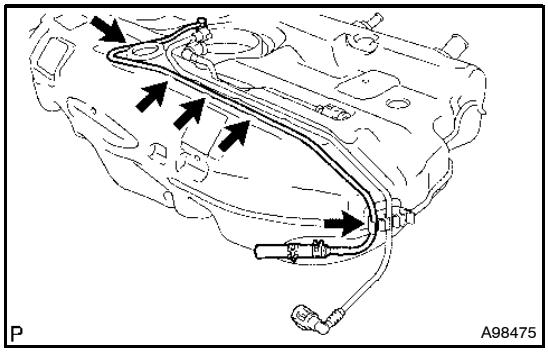
NOTICE:

- **Remove any dirt or foreign objects on the fuel tube connector before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube connector has the O-ring that seals the pipe.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the connected part by covering it with a vinyl bag after disconnecting the fuel tank main tube.**
- **If the fuel tube connector and pipe are stuck, push and pull to release them .**



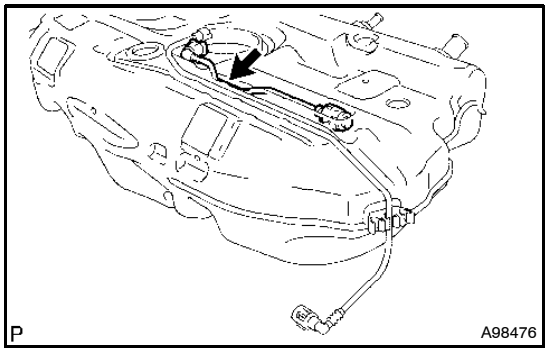


(e) Hold the fuel tank using a transmission jack.
(f) Remove the 4 bolts, then remove the 2 fuel tank bands No. 1.
(g) Operate the transmission jack, then remove the fuel tank.



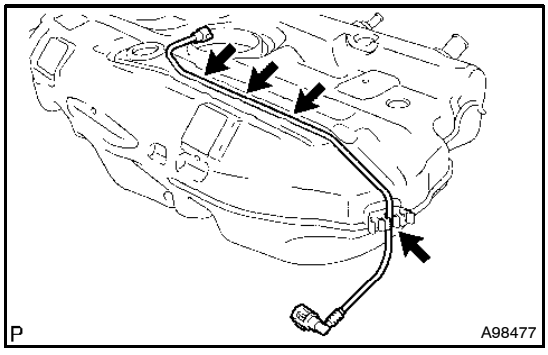
28. REMOVE FUEL TANK RETURN TUBE

(a) Disengage the 5 claws, then remove the fuel tank return tube from the fuel tank.



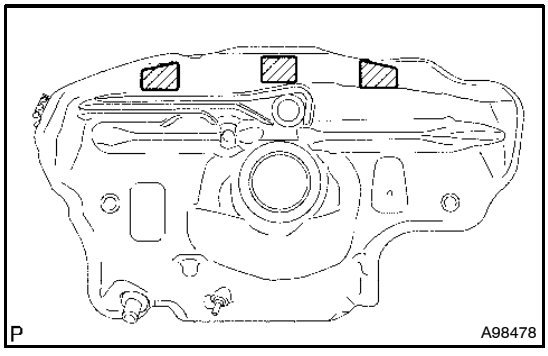
29. REMOVE FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Disengage the claw, then remove the fuel evaporation tube sub-assembly No. 2 from the fuel tank.



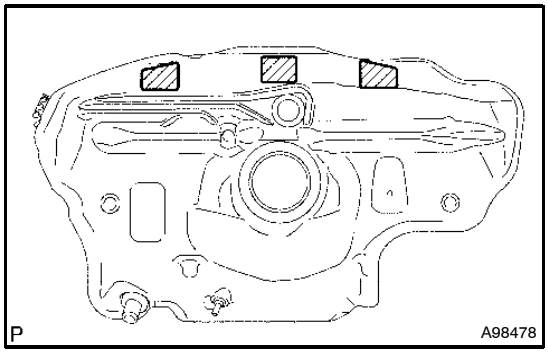
30. REMOVE FUEL TANK MAIN TUBE SUB-ASSY

(a) Disengage the 4 claws, then remove the fuel tank main tube from the fuel tank.



31. REMOVE FUEL TANK CUSHION NO.1

(a) Remove the 3 fuel tank cushions No. 1 from the fuel tank.



32. INSTALL FUEL TANK CUSHION NO.1

(a) Install 2 new fuel tank cushions No. 1 onto the fuel tank.

33. INSTALL FUEL TANK MAIN TUBE SUB-ASSY

34. INSTALL FUEL EVAPORATION TUBE SUB-ASSY NO.2

35. INSTALL FUEL TANK RETURN TUBE

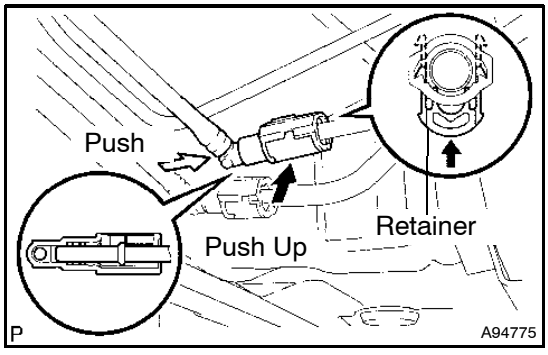
36. INSTALL FUEL TANK ASSY

(a) Set the fuel tank on a transmission jack.

(b) Operate the transmission jack and install the fuel tank into the vehicle.

(c) Install the 2 fuel tank bands No. 1 with the 4 bolts.

Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)



(d) Connect the fuel tank main tube.
(1) Align the fuel tube connector with the pipe, then push the fuel tube connector in until it comes into contact with the seat to connect the fuel tank main tube to the pipe, then push the retainer up until the claws lock.

NOTICE:

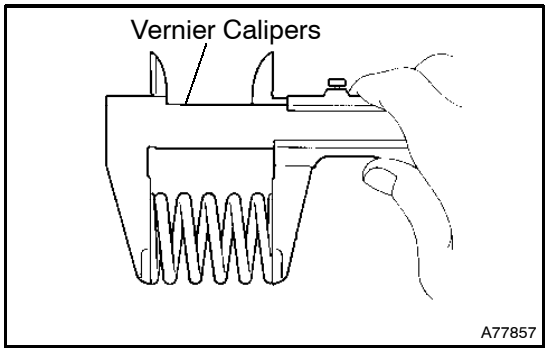
- **Check that there are no scratches or foreign objects around the disconnected part of the fuel tube connector and pipe before performing this work.**
- **After connecting the fuel tank main tube, check that the fuel tank main tube is securely connected by pulling the fuel tube connector.**

(e) Connect the fuel tank return tube.
(f) Connect the fuel tank to filler pipe hose.
(g) Connect the fuel tank breather hose.

37. INSTALL PARKING BRAKE CABLE ASSY NO.3
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

38. INSTALL PARKING BRAKE CABLE ASSY NO.2
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

39. INSTALL FUEL TANK PROTECTOR NO.1
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

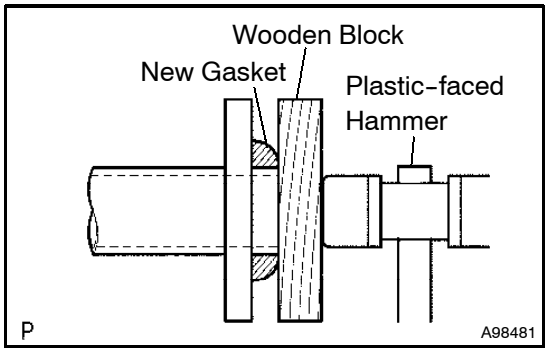


40. INSTALL EXHAUST PIPE ASSY FRONT

(a) Check the free length.
(1) Using vernier calipers, measure the free length of the compression spring.

Minimum:
41.5 mm (1.6339 in.) for exhaust manifold side
38.5 mm (1.5157 in.) for exhaust pipe tail side

If the free length is less than the minimum, replace the compression spring.



(b) Using a wooden block and plastic-faced hammer, tap a new gasket into the exhaust manifold.

NOTICE:

- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse the removed gasket.**
- **Never push the gasket into the exhaust manifold by installing the exhaust pipe front onto the exhaust manifold.**

(c) Install a new gasket into the exhaust pipe front.

NOTICE:

- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse the removed gasket.**

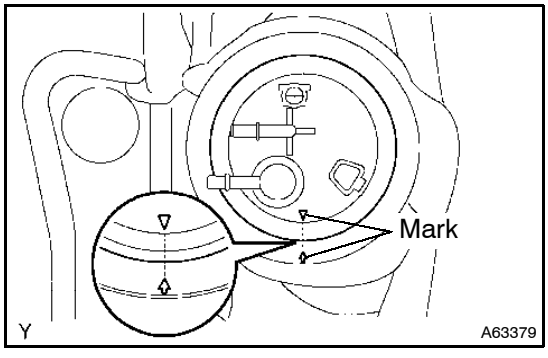
(d) Install the exhaust pipe front onto the 2 exhaust pipe supports No. 5.

(e) Tighten the 4 compression springs and 4 bolts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

41. INSTALL FLOOR PANEL BRACE FRONT (See page 15-2)

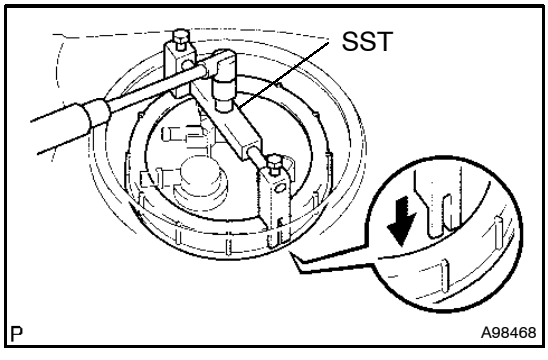
42. ADD FUEL



43. INSTALL FUEL AND EVAPORATION VENT TUBE SUB-ASSY

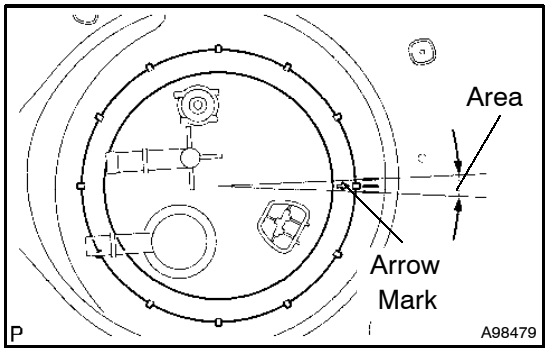
(a) Align the arrow marks of the fuel pump bracket and the fuel tank.

(b) Temporarily install the retainer.



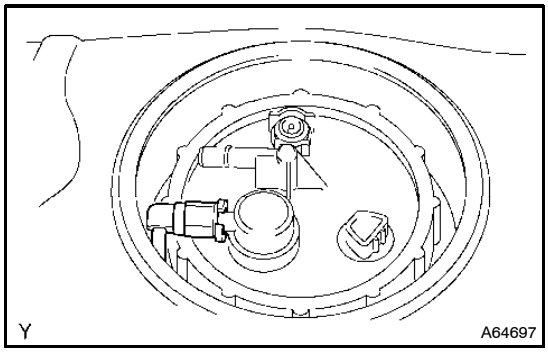
(c) Mount SST to the retainer.

SST 09808-14020 (09808-01410, 09808-01420, 09808-01430)



(d) Tighten the retainer until the arrow mark located on the retainer is positioned within the area shown in the illustration.

(e) Check that the arrow marks of the fuel pump bracket and fuel tank are aligned.

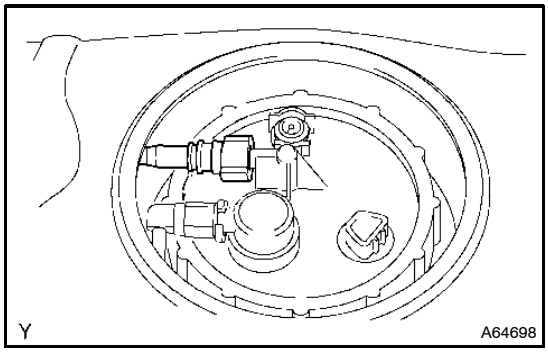


44. CONNECT FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Push the quick connector into the pipe until the connector makes a "click" sound.

NOTICE:

- **Check if there is any damage or foreign objects on the connected part of the pipe.**
- **After connecting, check if the pipe and the connector are securely connected by pulling on them.**

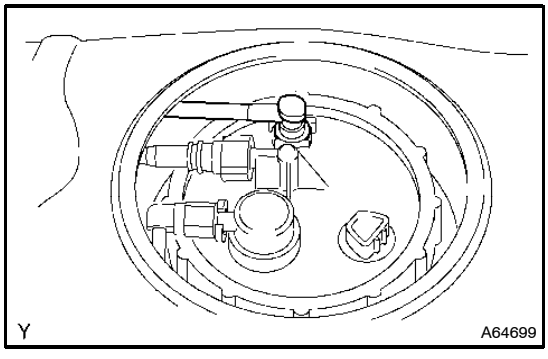


45. CONNECT FUEL TANK MAIN TUBE SUB-ASSY

(a) Push the quick connector into the pipe until the connector makes a "click" sound.

NOTICE:

- **Check if there is any damage or foreign objects on the connected part of the pipe.**
- **After connecting, check if the pipe and the connector are securely connected by pulling them.**



46. CONNECT FUEL TANK RETURN TUBE

(a) Connect the fuel tank return tube with the tube joint clip.

NOTICE:

- **Check that there is no scratch or foreign objects on the connecting parts.**
- **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 installing the tube joint clip, check that the connector cannot be pulled out.**

47. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

48. CHECK FOR FUEL LEAKAGE (See page 11-8)

49. CHECK FOR EXHAUST GAS LEAKAGE

50. INSTALL REAR FLOOR SERVICE HOLE COVER

51. INSTALL REAR SEAT SIDE COVER RH (5 DOOR HATCH BACK BODY TYPE)

52. INSTALL REAR SEAT SIDE COVER LH (5 DOOR HATCH BACK BODY TYPE)

53. INSTALL REAR DOOR SCUFF PLATE RH (5 DOOR HATCH BACK BODY TYPE)

54. INSTALL REAR DOOR SCUFF PLATE LH (5 DOOR HATCH BACK BODY TYPE)

55. INSTALL QUARTER TRIM PANEL ASSY FRONT RH (3 DOOR HATCH BACK BODY TYPE)

56. INSTALL QUARTER TRIM PANEL ASSY FRONT LH (3 DOOR HATCH BACK BODY TYPE)

57. INSTALL FRONT DOOR SCUFF PLATE RH (3 DOOR HATCH BACK BODY TYPE)

58. INSTALL FRONT DOOR SCUFF PLATE LH (3 DOOR HATCH BACK BODY TYPE)

59. INSTALL CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY RH (See Pub No. RM925E on page 61-28)

60. INSTALL CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY LH (See Pub No. RM925E on page 61-28)

61. INSTALL REAR SEAT BACK ASSY RH (See Pub No. RM925E on page 72-26)

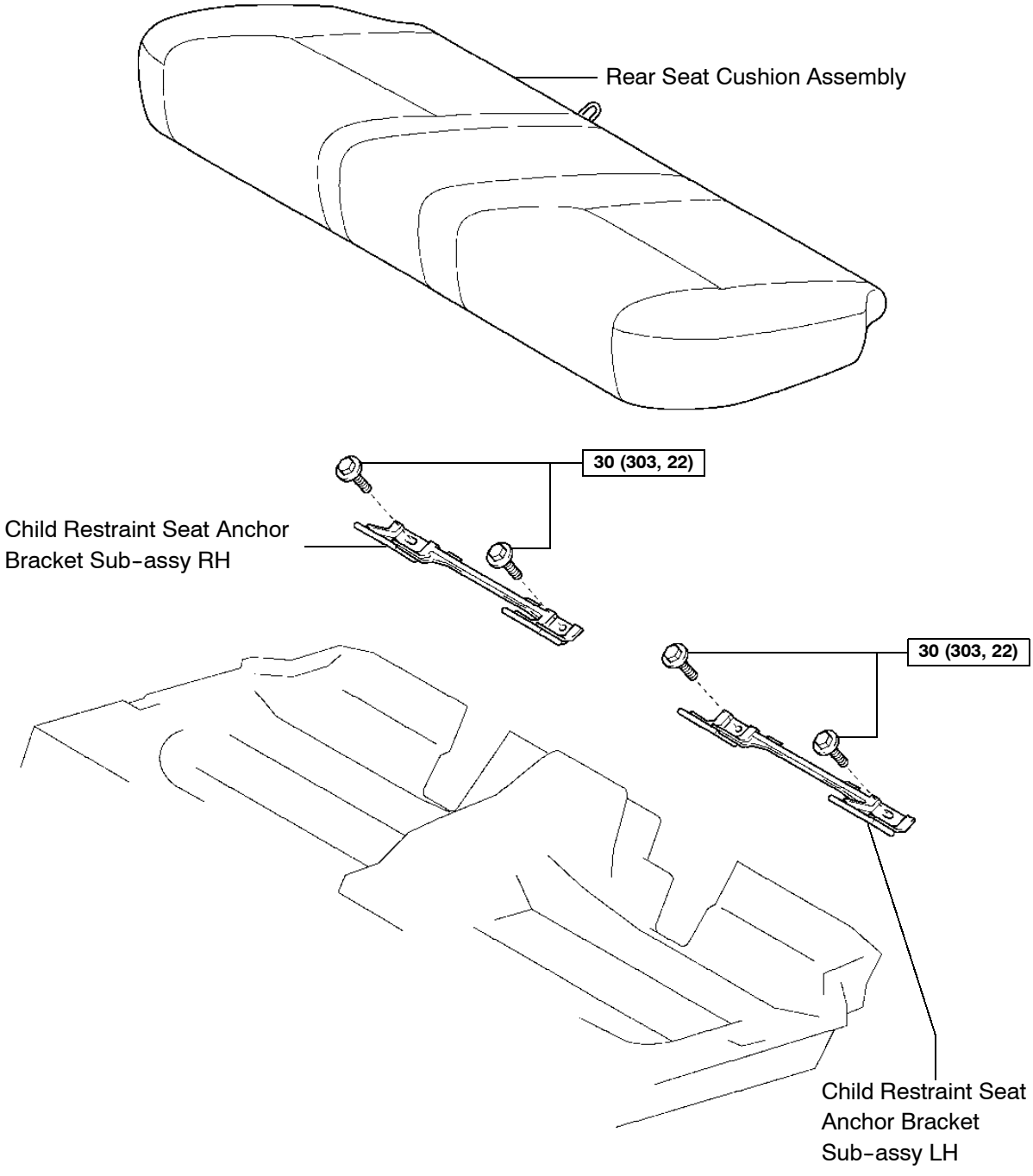
62. **INSTALL REAR SEAT BACK ASSY LH (See Pub No. RM925E on page 72-26)**
63. **REAR SEAT CUSHION ASSY RH**
64. **REAR SEAT CUSHION ASSY LH**

FUEL TANK ASSY (1ND-TV(SEDAN/STATION WAGON))

COMPONENTS

11183-01

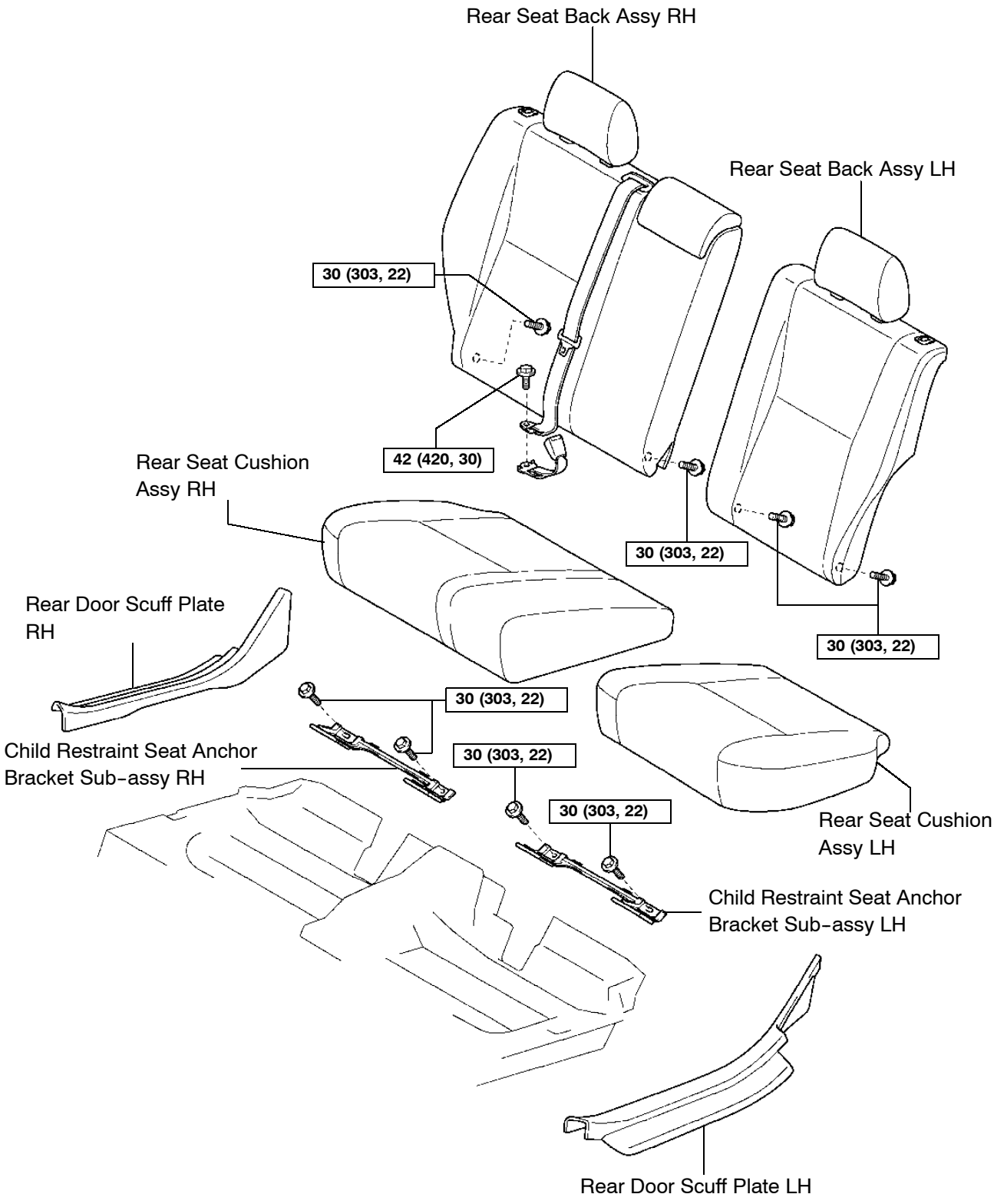
Sedan:



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

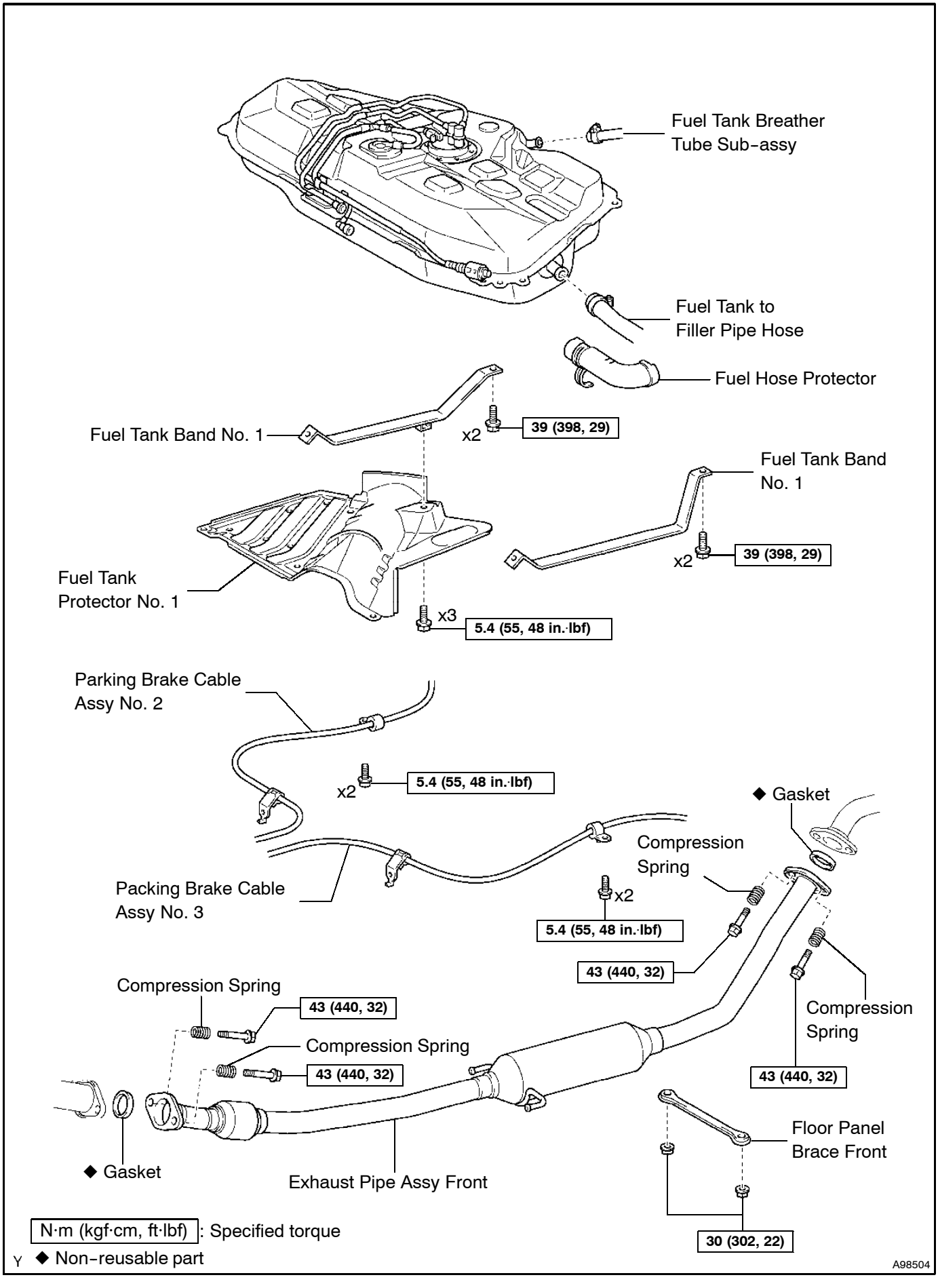
A98503

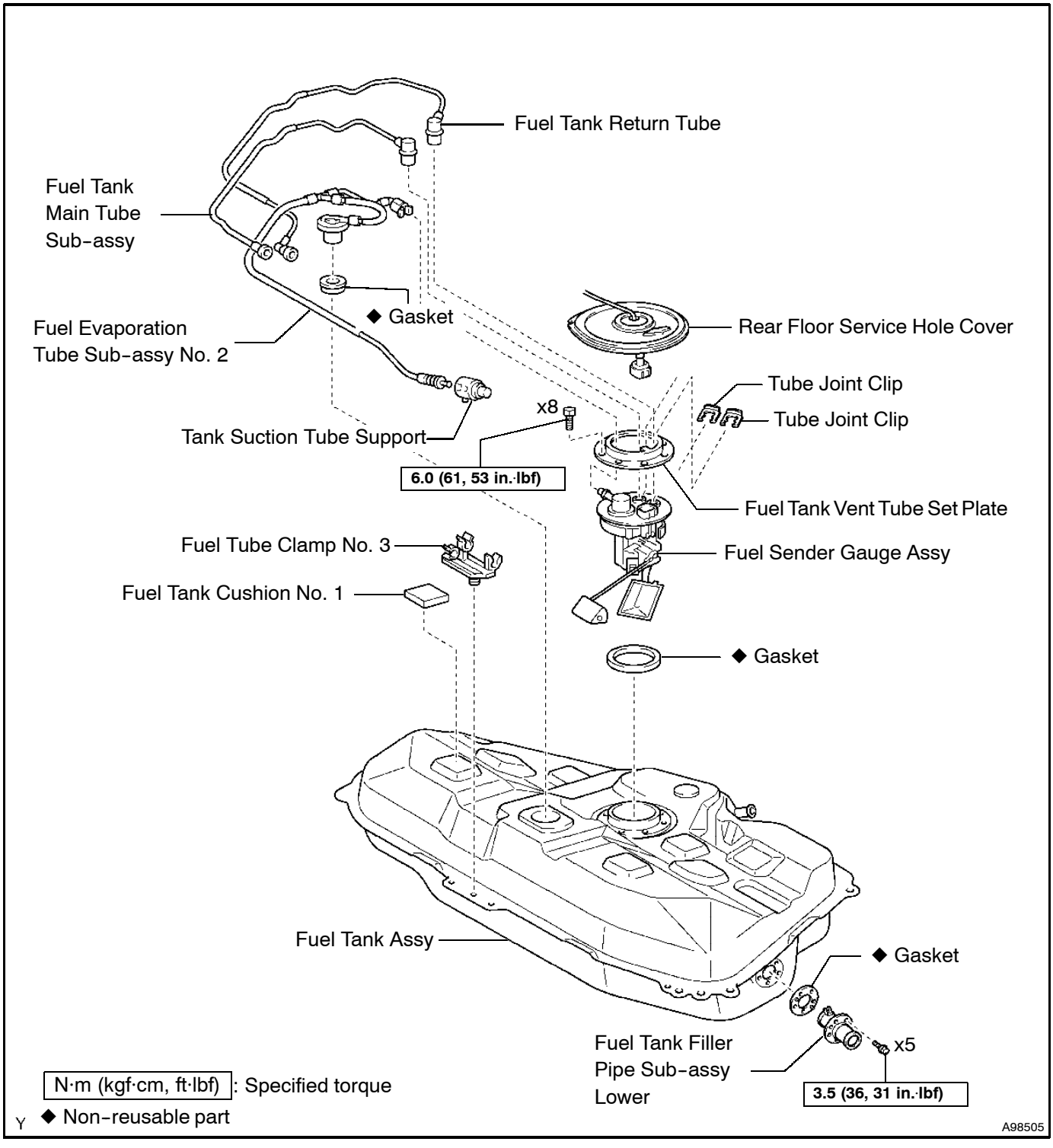
Station Wagon:



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

G36560


Fuel Tank Breather Tube Sub-assy
Fuel Tank to Filler Pipe Hose
Fuel Hose Protector
Fuel Tank Band No. 1
x2
39 (398, 29)
Fuel Tank Band No. 1
x2
39 (398, 29)
Fuel Tank Protector No. 1
x3
5.4 (55, 48 in.·lbf)
Parking Brake Cable Assy No. 2
x2
5.4 (55, 48 in.·lbf)
◆ Gasket
Compression Spring
Packing Brake Cable Assy No. 3
x2
5.4 (55, 48 in.·lbf)
43 (440, 32)
Compression Spring
43 (440, 32)
Compression Spring
43 (440, 32)
Compression Spring
43 (440, 32)
◆ Gasket
Exhaust Pipe Assy Front
Floor Panel Brace Front
30 (302, 22)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
A98504


Fuel Tank Return Tube
Fuel Tank
Main Tube
Sub-assy
◆ Gasket
Fuel Evaporation
Tube Sub-assy No. 2
Rear Floor Service Hole Cover
Tube Joint Clip
Tube Joint Clip
x8
Tank Suction Tube Support
6.0 (61, 53 in.·lbf)
Fuel Tank Vent Tube Set Plate
Fuel Tube Clamp No. 3
Fuel Sender Gauge Assy
Fuel Tank Cushion No. 1
◆ Gasket
Fuel Tank Assy
◆ Gasket
Fuel Tank Filler
Pipe Sub-assy
Lower
x5
3.5 (36, 31 in.·lbf)
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
A98505

11184-01

Removal & Installation and Disassembly & Reassembly

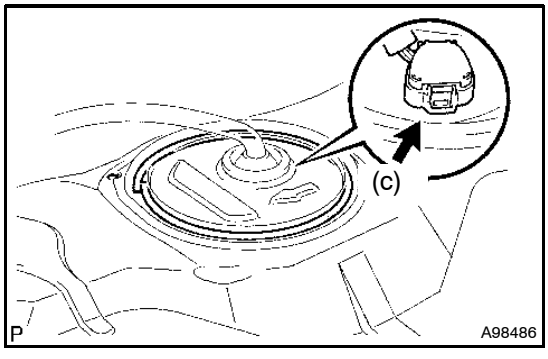
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE REAR SEAT CUSHION ASSEMBLY (SEDAN BODY TYPE)
   (See Pub No. RM925E on page 72-16)
3. REAR SEAT CUSHION ASSY LH (WAGON BODY TYPE) (See Pub No. RM925E on page 72-20)
4. REAR SEAT CUSHION ASSY RH (WAGON BODY TYPE) (See Pub No. RM925E on page 72-20)
5. REMOVE REAR SEAT BACK ASSY LH (WAGON BODY TYPE)
   (See Pub No. RM925E on page 72-20)
6. REMOVE REAR SEAT BACK ASSY RH (WAGON BODY TYPE)
   (See Pub No. RM925E on page 72-20)
7. REMOVE CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY LH
   (See Pub No. RM925E on page 61-22)
8. REMOVE CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY RH
   (See Pub No. RM925E on page 61-22)
9. REMOVE REAR DOOR SCUFF PLATE LH (WAGON BODY TYPE)
   (See Pub. No. RM925E on page 76-40)
10. REMOVE REAR DOOR SCUFF PLATE RH (WAGON BODY TYPE)
    (See Pub. No. RM925E on page 76-40)

11. REMOVE REAR FLOOR SERVICE HOLE COVER

(a) Pull up the floor carpet assembly front.

(b) Remove the butyl tape, then remove the rear floor service hole cover.

(c) Disconnect the fuel sender gage connector.

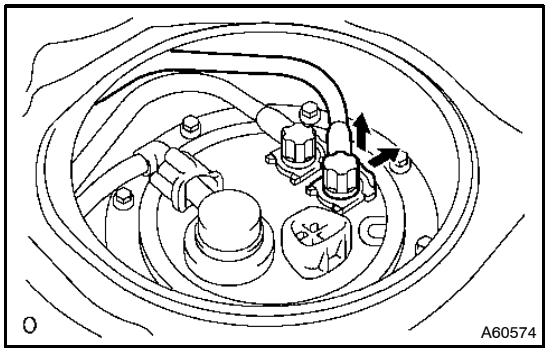


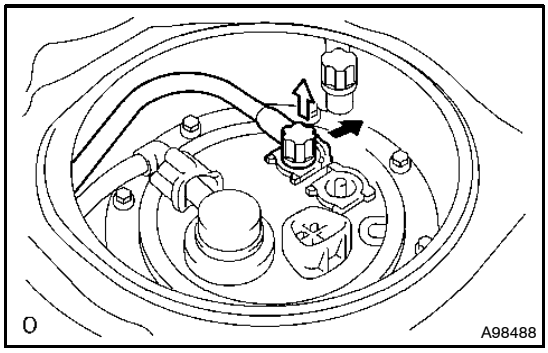
12. DISCONNECT FUEL TANK RETURN TUBE

(a) Remove the tube joint clip, then pull out the fuel tank return tube.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**



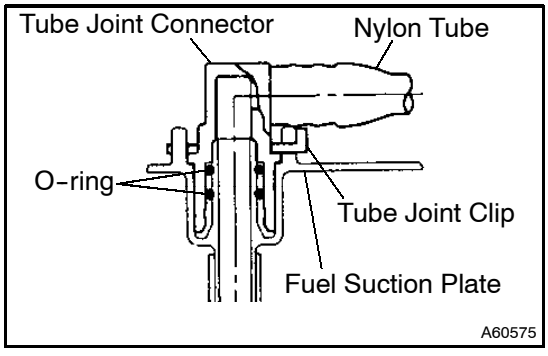


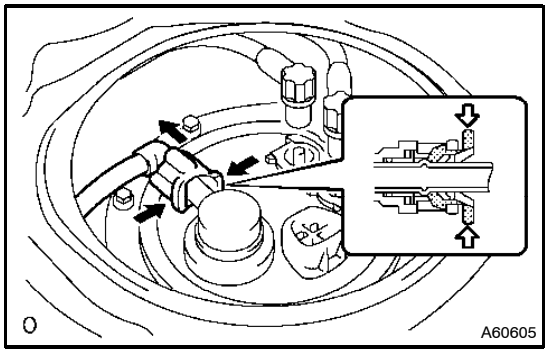
13. DISCONNECT FUEL TANK MAIN TUBE SUB-ASSY

(a) Remove the tube joint clip, then pull out the fuel tank main tube.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**



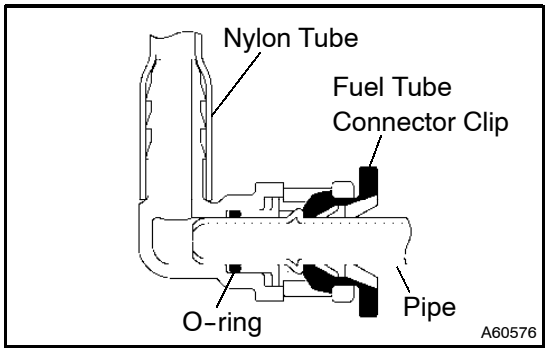


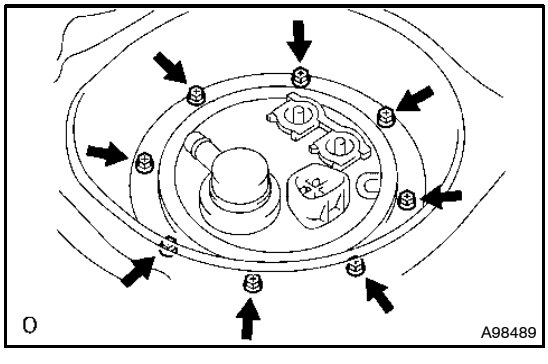
14. DISCONNECT FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Pinch the tube connector then pull out the fuel evaporation tube sub-assembly No. 2.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube joint before performing this work.**
- **Avoid any scratches or foreign objects on the parts when disconnecting as the fuel tube joint has the O-ring that seals the plug.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag and gum tape after disconnecting the fuel tube.**
- **When connector and the pipe are stuck, push and pull the connector to release it. Pull out the connector from the pipe carefully.**





15. REMOVE FUEL TANK VENT TUBE SET PLATE

(a) Remove the 8 bolts, then remove the fuel tank vent tube set plate.

16. REMOVE FUEL SENDER GAGE ASSY

(a) Pull out the fuel tank sender gauge.

NOTICE:

- **Do not damage the fuel suction tube filter.**
- **Make sure that the fuel sender gauge arm does not bend.**

(b) Remove the gasket from the fuel tank sender gauge.

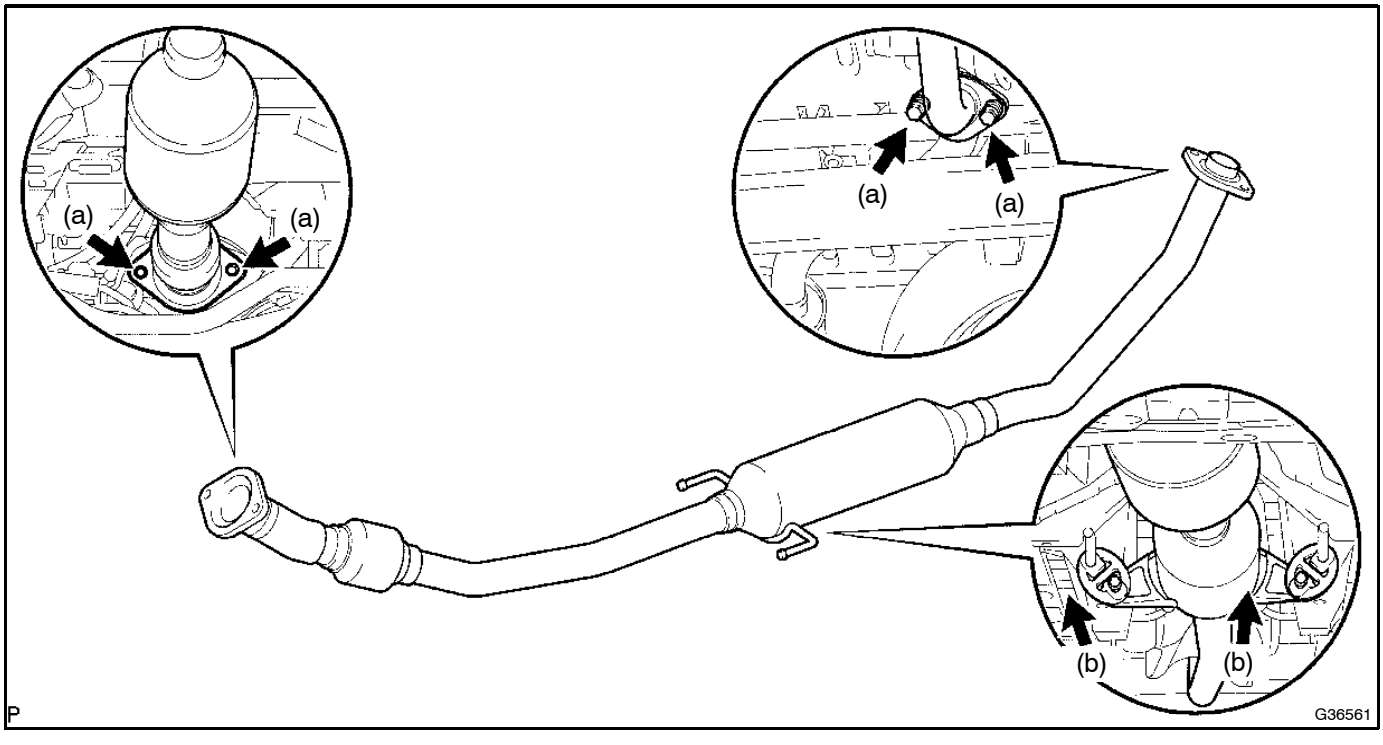
17. DRAIN FUEL

18. REMOVE FLOOR PANEL BRACE FRONT (See page 15-2)

19. REMOVE EXHAUST PIPE ASSY FRONT

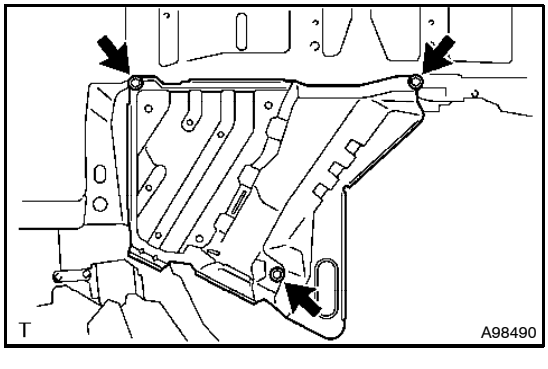
(a) Remove the 4 bolts and 4 compression springs.

(b) Remove the exhaust pipe front from the 2 exhaust pipe supports No. 5.



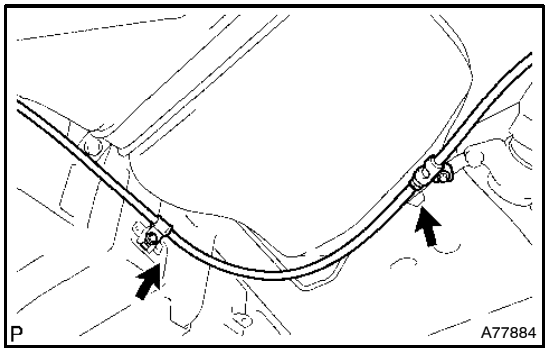
(c) Remove the gasket from the exhaust manifold.

(d) Remove the gasket from the exhaust pipe front.



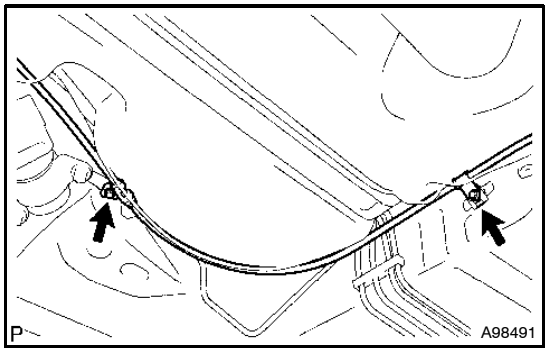
20. REMOVE FUEL TANK PROTECTOR NO.1

(a) Remove the 3 bolts, then remove the No. 1 fuel tank protector.



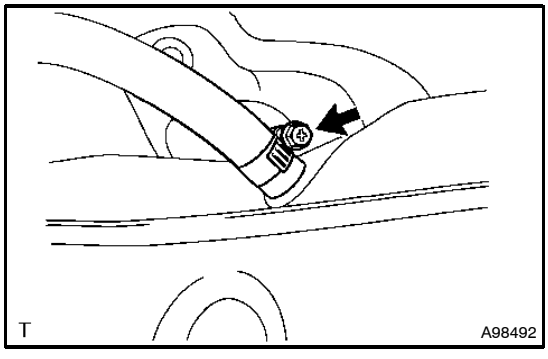
21. DISCONNECT PARKING BRAKE CABLE ASSY NO.2

(a) Remove the 2 bolts, then disconnect the parking brake cable No. 2.



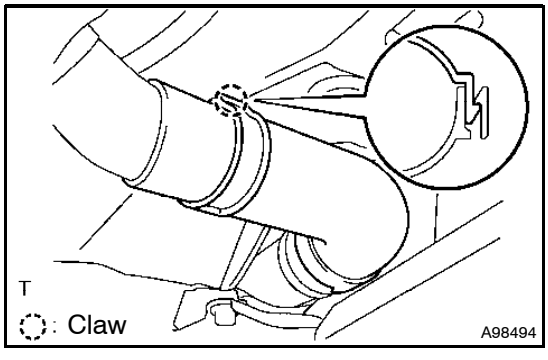
22. DISCONNECT PARKING BRAKE CABLE ASSY NO.3

(a) Remove the 2 bolts, then disconnect the parking brake cable No. 3.

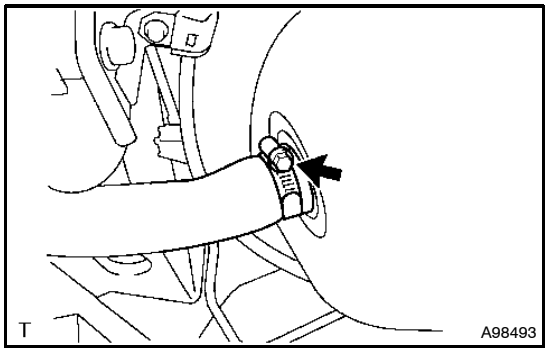


23. REMOVE FUEL TANK ASSY

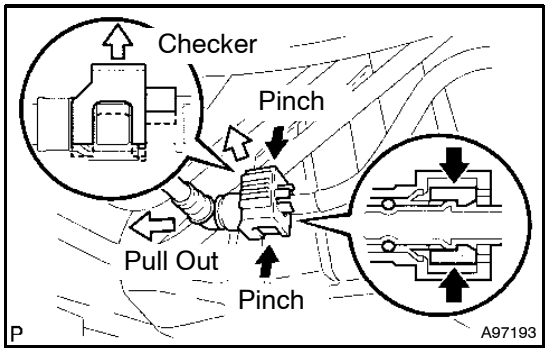
(a) Loosen the hose clamp bolt, then disconnect the breather tube fuel hose from the fuel tank.



(b) Disengage the claw fitting, then remove the fuel hose protector.



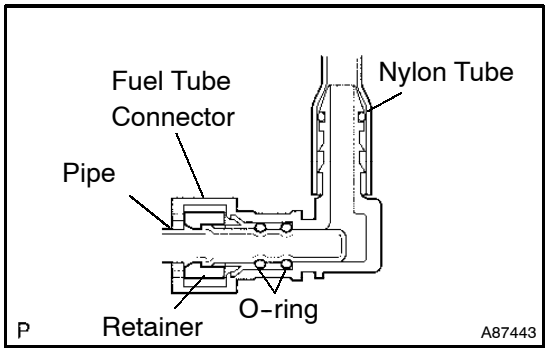
(c) Loosen the hose clamp bolt, then disconnect the fuel tank to filler pipe hose from the fuel tank.

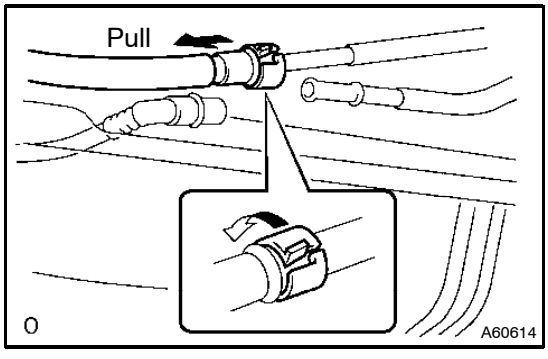


(d) Disconnect the fuel tank return tube.
(1) Remove the checker of the fuel tube connector from the pipe.
(2) Pinch the retainer of the fuel tube connector, then pull out the fuel tube connector to disconnect the fuel tank main tube from the pipe.

NOTICE:

- **Remove any dirt or foreign objects on the fuel tube connector before performing this work.**
- **Do not allow any scratches or foreign objects on the parts when disconnecting as the fuel tube connector has the O-ring that seals the pipe.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank main tube.**
- **If the fuel tube connector and pipe are stuck, push and pull to release them.**

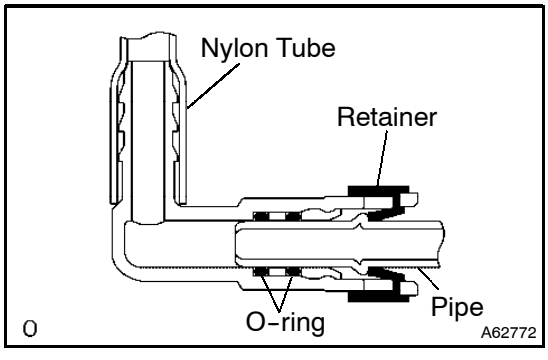


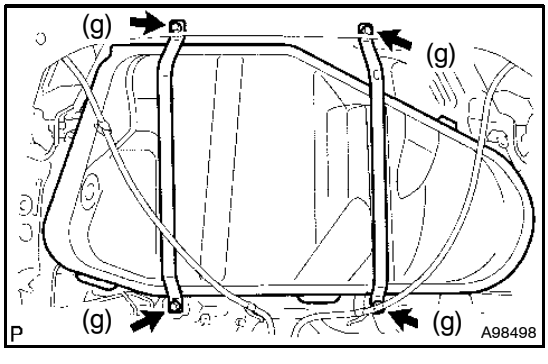


(e) Disconnect the fuel tank main tube sub-assembly.
(1) Pinch the projections of the retainer to remove the lock claws, then pull out the fuel tank main tube.

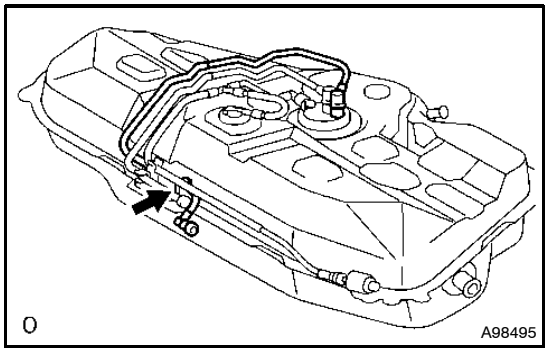
NOTICE:

- **Remove any dirt or foreign objects on the fuel tube connector before performing this work.**
- **Do not allow any scratches or foreign objects on the parts when disconnecting as the fuel tube connector has the O-ring that seals the pipe.**
- **Perform this work by hand. Do not use any tools.**
- **Do not forcibly bend, twist or turn the nylon tube.**
- **Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank breather tube.**
- **If the fuel tube connector and pipe are stuck, push and pull to release them.**



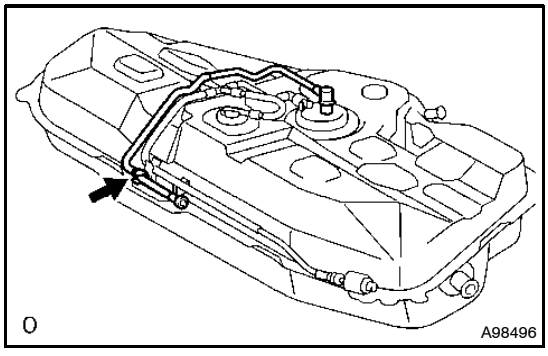


(f) Hold the fuel tank using a transmission jack.
(g) Remove the 4 bolts, then remove the 2 fuel tank bands No. 1.
(h) Operate the transmission jack, then remove the fuel tank.



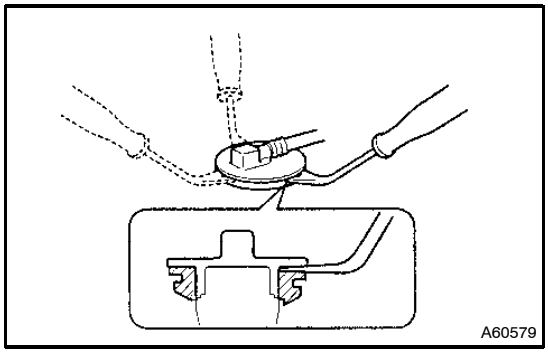
24. REMOVE FUEL TANK RETURN TUBE

(a) Remove the fuel tank return tube from the fuel tube clamp No. 3.



25. REMOVE FUEL TANK MAIN TUBE SUB-ASSY

(a) Remove the fuel tank main tube from the fuel tube clamp No. 3.



26. REMOVE FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Remove the fuel emission tube No. 1 from the fuel tube clamp No. 3 and tank suction tube support.

(b) Insert a clip remover between the fuel cut off valve and gasket, then remove the fuel cut off valve by lifting it little by little.

NOTICE:

- **The fuel cut off valve is made of resin and easily damaged if removed or installed forcibly. Handle the part properly when removing the sealing.**
- **After removing, check that the contact surface of the fuel cut off valve on the fuel tank is not damaged.**

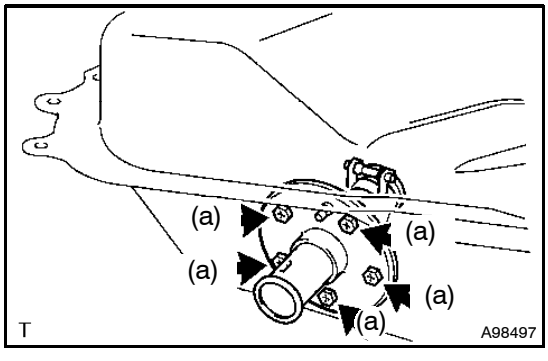
(c) Remove the gasket from the fuel tank.

27. REMOVE TANK SUCTION TUBE SUPPORT

(a) Remove the tank suction tube support from the fuel tank.

28. REMOVE FUEL TUBE CLAMP No.3

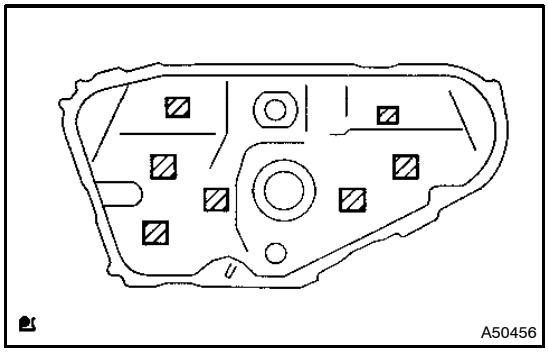
(a) Separate the clip fittings, then remove the fuel tube clamp,No. 3.



29. REMOVE FUEL TANK FILLER PIPE SUB-ASSY LOWER

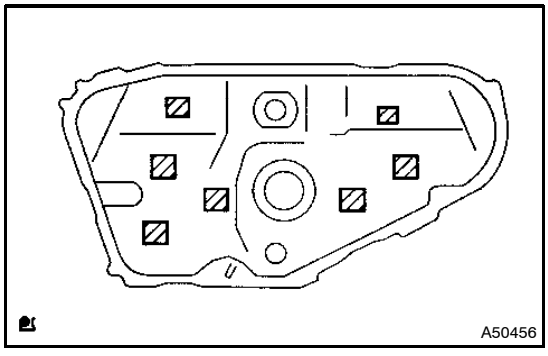
(a) Remove the 5 bolts, then remove the fuel tank filler pipe sub-assembly lower.

(b) Remove the gasket.



30. REMOVE FUEL TANK CUSHION NO.1

(a) Remove the 7 fuel tank cushion No. 1 from the fuel tank.



31. INSTALL FUEL TANK CUSHION NO.1

(a) Install 7 new fuel tank cushions No. 1 onto the fuel tank.

32. INSTALL FUEL TANK FILLER PIPE SUB-ASSY LOWER

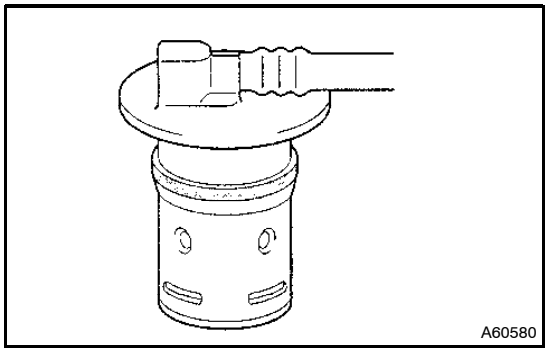
(a) Install a new gasket onto the fuel tank.

(b) Install the fuel tank filler pipe sub-assembly lower with the 5 bolts.

Torque: 3.5 N·m (36 kgf·cm, 31 in.·lbf)

33. INSTALL FUEL TUBE CLAMP No.3

34. INSTALL TANK SUCTION TUBE SUPPORT



35. INSTALL FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Install a new gasket onto the fuel tank.

(b) Apply a light coat of oil around the new fuel cut off valve as shown in the illustration, then insert it into the tank without force.

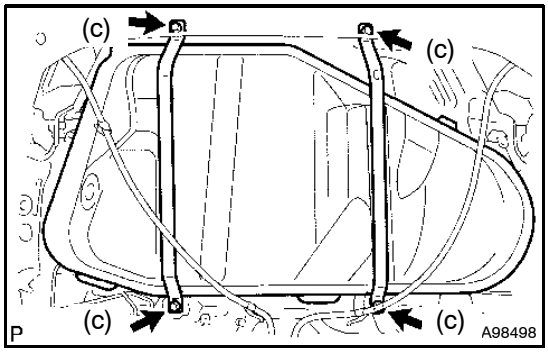
NOTICE:

Make sure that the gasket does not drop into the fuel tank.

(c) Check that the there is no gap between the bottom surface of the fuel cut off valve and the gasket, then check that the fuel cut off valve is securely inserted.

36. INSTALL FUEL TANK MAIN TUBE SUB-ASSY

37. INSTALL FUEL TANK RETURN TUBE



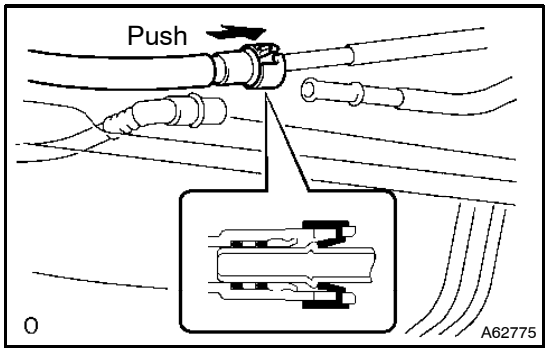
38. INSTALL FUEL TANK ASSY

(a) Set the fuel tank on a transmission jack.

(b) Operate the transmission jack, then install the fuel tank into the vehicle.

(c) Install the 2 fuel tank bands No. 1 with the 4 bolts.

Torque: 39 N·m (398 kgf·cm, 29 ft.·lbf)

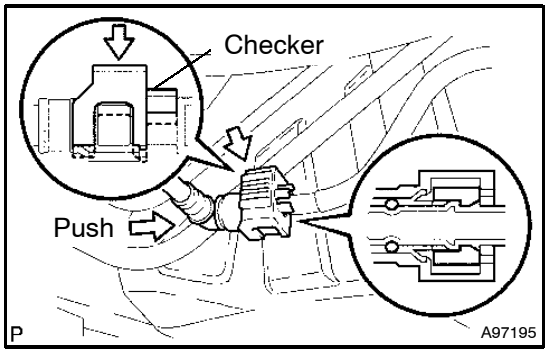


(d) Connect the fuel tank main tube sub-assembly.

(1) Push the tube connector into the pipe until it makes a "click" sound and install the retainer.

NOTICE:

- **Check that there are no scratches or foreign objects around the disconnected part of the fuel tube connector and pipe before performing this work.**
- **After connecting the fuel tank main tube, check that the fuel tank main tube is securely connected by pulling the fuel tube connector.**



(e) Connect the fuel tank return tube.

(1) Align the fuel tube connector with the pipe, then push in the fuel tube connector until the retainer makes a "click" sound to connect the fuel tank main tube to the pipe.

NOTICE:

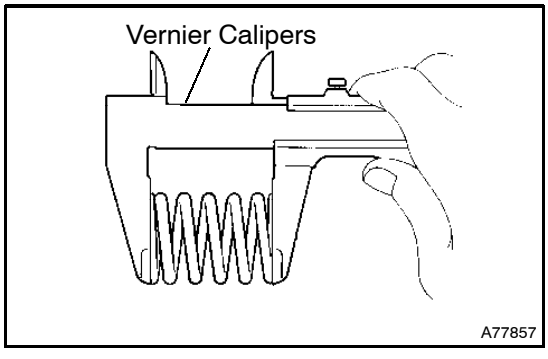
- **Check that there are no scratches or foreign objects around the disconnected part of the fuel tube connector and pipe before performing this work.**
- **After connecting and pipe fuel tank main tube, check that the fuel pump tube is securely connected by pulling the fuel tube connector and pipe.**

(2) Install the checker onto the pipe.

39. INSTALL PARKING BRAKE CABLE ASSY NO.3
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

40. INSTALL PARKING BRAKE CABLE ASSY NO.2
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

41. INSTALL FUEL TANK PROTECTOR NO.1
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)



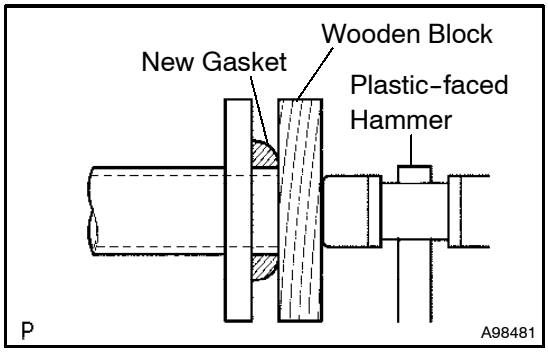
42. INSTALL EXHAUST PIPE ASSY FRONT

(a) Inspect the free length.

(1) Using vernier calipers, measure the free length of the compression spring.

Minimum:
41.5 mm (1.6339 in.) for exhaust manifold side
38.5 mm (1.5157 in.) for exhaust pipe tail side

If the free length is less than the minimum, replace the compression spring.



(b) Using a wooden block and plastic-faced hammer, tap a new gasket into the exhaust manifold.

NOTICE:

- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse the removed gasket.**
- **Never push the gasket into the exhaust manifold by installing the exhaust pipe front onto the exhaust manifold.**

(c) Install a new gasket into the exhaust pipe front.

NOTICE:

- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse the removed gasket.**

(d) Install the exhaust pipe front onto the 2 exhaust pipe supports No. 5.

(e) Tighten the 4 compression springs and 4 bolts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

43. INSTALL FLOOR PANEL BRACE FRONT (See page 15-2)

44. ADD FUEL

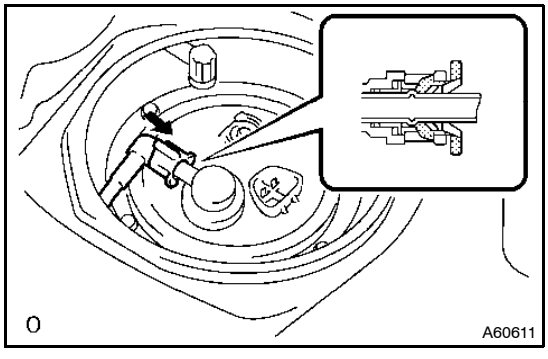
45. INSTALL FUEL TANK SENDER GAUGE ASSY

(a) Install a new gasket onto the fuel tank sender gauge assembly.

(b) Install the fuel tank sender gauge assembly onto the fuel tank.

46. INSTALL FUEL TANK VENT TUBE SET PLATE

Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

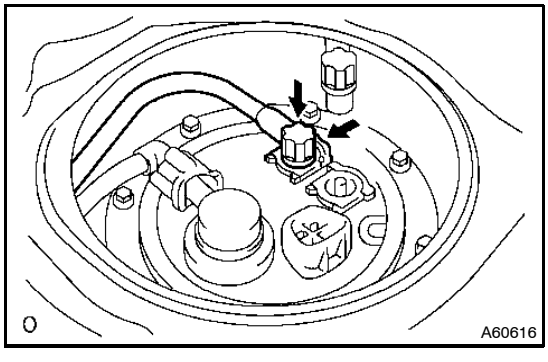


47. CONNECT FUEL EVAPORATION TUBE SUB-ASSY NO.2

(a) Push the tube connector into the pipe until the connector makes a "click" sound.

NOTICE:

- **Check if there is any damage or foreign objects on the disconnected part of the pipe.**
- **After connecting, check if the pipe and the connector are securely connected by pulling them.**

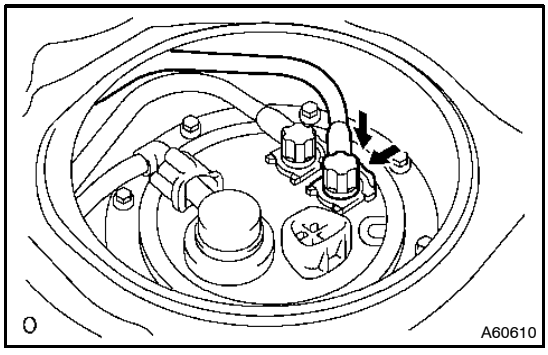


48. CONNECT FUEL TANK MAIN TUBE SUB-ASSY

(a) Connect the fuel tank main tube with the tube joint clip.

NOTICE:

- **Check that there is no scratch or foreign objects on the connecting parts.**
- **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 installing the tube joint clip, check that the connector cannot be pulled out.**

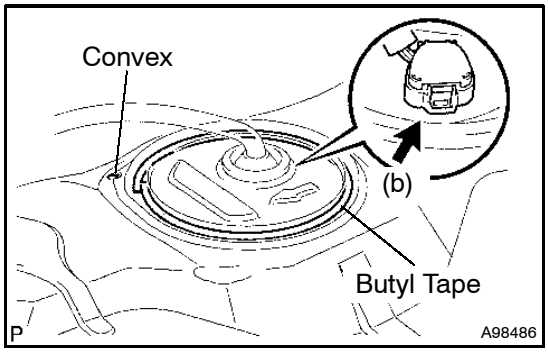


49. CONNECT FUEL TANK RETURN TUBE

(a) Connect the fuel tank return tube with the tube joint clip.

NOTICE:

- **Check that there is no scratch or foreign objects on the connecting parts.**
- **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 installing the tube joint clip, check that the connector cannot be pulled out.**



50. INSTALL REAR FLOOR SERVICE HOLE COVER

(a) Attach new butyl tape to the rear service hole cover.

(b) Connect the fuel tank sender gauge connector.

(c) Install the rear floor service hole cover, making sure it is aligned with the convex of the floor panel.

NOTICE:

- **Make sure that the rear floor service hole cover does not mount on the convex of the floor panel when installing.**

(d) Install the floor carpet front.

51. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

52. CHECK FOR FUEL LEAKAGE **(See page 11-8)**

NOTICE:

Check for fuel leakage with the fuel tank sender gauge connector connected.

53. CHECK FOR EXHAUST GAS LEAKAGE

54. INSTALL REAR DOOR SCUFF PLATE RH (WAGON BODY TYPE)

55. INSTALL REAR DOOR SCUFF PLATE LH (WAGON BODY TYPE)

56. INSTALL CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY RH
(See Pub No. RM925E on page 61-22)

57. INSTALL CHILD RESTRAINT SEAT ANCHOR BRACKET SUB-ASSY LH
(See Pub No. RM925E on page 61-22)

58. INSTALL REAR SEAT BACK ASSY RH (WAGON BODY TYPE)
(See Pub No. RM925E on page 72-20)

59. INSTALL REAR SEAT BACK ASSY LH (WAGON BODY TYPE)
(See Pub No. RM925E on page 72-20)

60. REAR SEAT CUSHION ASSY RH (WAGON BODY TYPE)

61. REAR SEAT CUSHION ASSY LH (WAGON BODY TYPE)

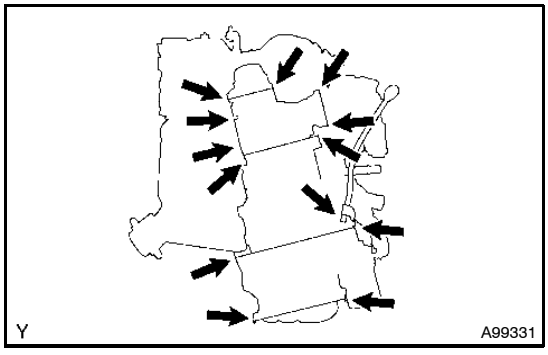
62. INSTALL REAR SEAT CUSHION ASSEMBLY (SEDAN BODY TYPE)

EMISSION CONTROL

EMISSION CONTROL SYSTEM (1ND-TV)

ON-VEHICLE INSPECTION

120FU-02



1. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

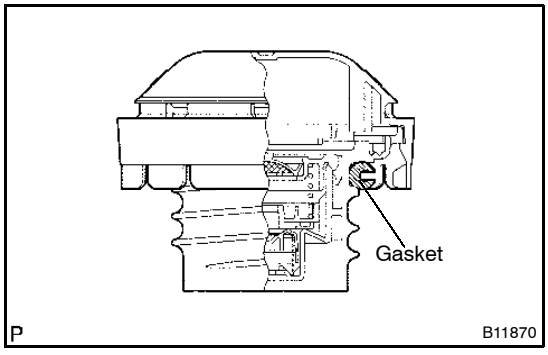
(a) Check for cracks, leakage and damage.

(1) Check whether the fitting points of the engine assembly are cracked, leaking or damaged.

HINT:

Air induction other than air intake system such as disconnection of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run improperly. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run improperly.

INSPECTION



1. INSPECT FUEL TANK CAP ASSY

(a) Check the appearance.

(1) Visually check whether the fuel tank cap and gasket are deformed or damaged.

If necessary, replace the fuel tank cap.

EGR SYSTEM (1ND-TV)

ON-VEHICLE INSPECTION

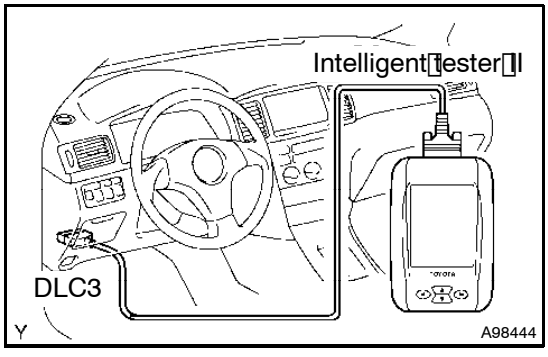
120H2501

HINT:

A malfunction causing constant operation of the EGR system may cause black or white smoke to be emitted from the exhaust pipe.

1. INSPECT SEATING OF EGR VALVE

(a) Start the engine and check that it starts and idles.



2. INSPECT EGR SYSTEM

(a) Warm up the engine.

(b) Turn the ignition switch to OFF.

(c) Connect the intelligent tester II to the DLC3.

(d) EGR valve operation (Full Close).

(1) Disconnect the EGR valve connector.

(2) Start the engine and let it idle.

(3) Turn the intelligent tester II ON.

(4) Select the following menu items: Powertrain / Engine and ECT / Data List / MAF.

(5) Check the MAF reading with the engine idling.

Standard: MAF reading is between 7.5 g/s and 9.5 g/s

(6) Stop the engine with turning the engine switch to OFF, then connect the EGR valve connector.

(7) Clear the DTC(s). (See page 05-33)

(e) EGR valve operation (Full Open).

(1) Start the engine and let it idle.

(2) Turn the intelligent tester II ON.

(3) Select the following menu items: Powertrain / Engine and ECT / Data List / MAF and EGR Step POS.

(4) Warm up the engine. The coolant temperature should be between 75°C (167°F) and 90°C (194°F).

(5) Check the MAF reading when EGR Step POS is step 125.

Standard: MAF reading is between 4.0 g/s and 5.0 g/s

If the MAF reading is out of range in either step (d) - (5) or (e) - (5), replace the EGR valve.

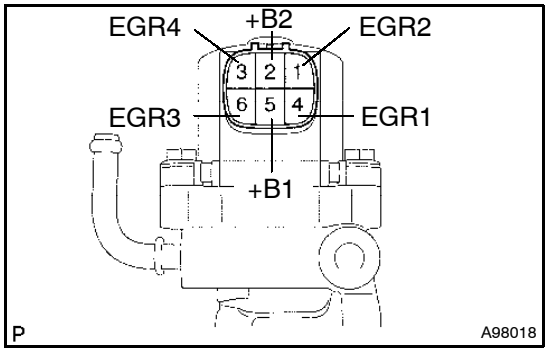
If the MAF reading is out of range in both steps (d) - (5) and (e) - (5), check the air flow meter (see page 10-2).

(f) Stop the engine with the engine switch OFF.

(g) Disconnect the intelligent tester II from the DLC3.

120FT-02

INSPECTION



1. INSPECT EGR VALVE ASSY

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

Terminal	Resistance at 20 °C (68 °F)
5 (+B1) - 4 (EGR1)	19.6 ± 1.4 Ω
5 (+B1) - 6 (EGR3)	19.6 ± 1.4 Ω
2 (+B2) - 1 (EGR2)	19.6 ± 1.4 Ω
2 (+B2) - 3 (EGR4)	19.6 ± 1.4 Ω

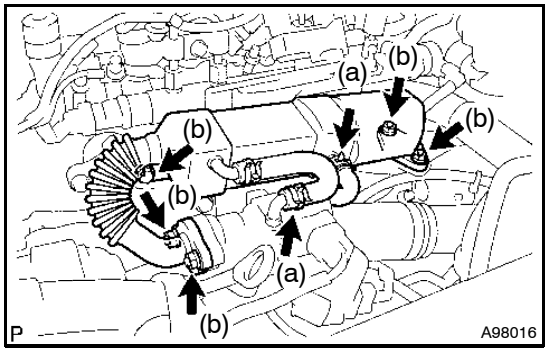
If the result is not as specified, replace the EGR valve assembly.

EGR VALVE ASSY (1ND-TV)

120FW-02

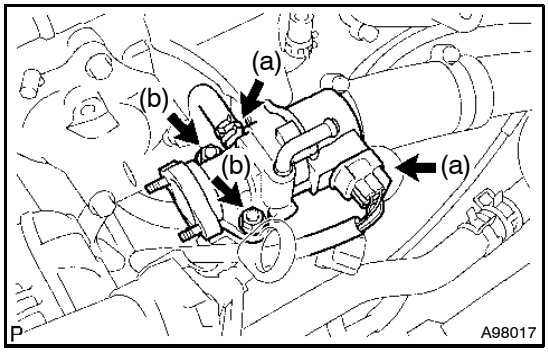
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. DRAIN ENGINE COOLANT (See page 16-7)



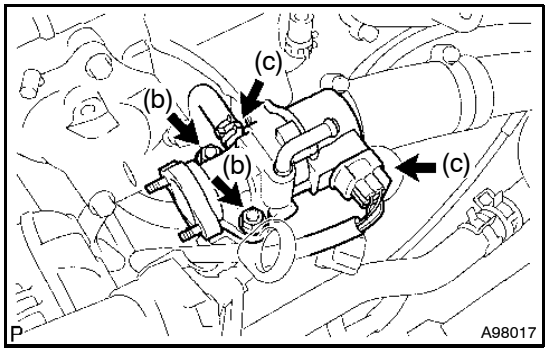
3. REMOVE EGR COOLER ASSY

(a) Disconnect the 2 water by-pass hoses.
(b) Remove the bolt and 4 nuts, then remove the EGR cooler assy.
(c) Remove the 2 gaskets.



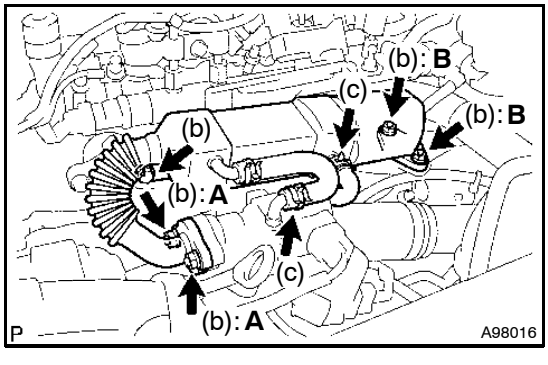
4. REMOVE EGR VALVE ASSY

(a) Disconnect the EGR valve connector and hose.
(b) Remove the 2 nuts, then remove the EGR valve assy.
(c) Remove the gasket.



5. INSTALL EGR VALVE ASSY

(a) Install a new gasket.
(b) Install the EGR valve assy with the 2 nuts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
(c) Connect the EGR valve connector and hose.



6. INSTALL EGR COOLER ASSY

(a) Install 2 new gaskets.
(b) Install the EGR cooler assy with the bolt and 4 nuts.
Torque:
11 N·m (112 kgf·cm, 8 ft·lbf) for Bolt
11 N·m (112 kgf·cm, 8 ft·lbf) for Nut A
20 N·m (204 kgf·cm, 15 ft·lbf) for Nut B
(c) Connect the 2 water by-pass hoses.

7. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
   Torque: 5.4 N·m (55kgf·cm, 48 in.·lbf)
8. ADD ENGINE COOLANT (See page 16-7)
9. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
10. CHECK FOR EXHAUST GAS LEAKAGE

INTAKE

REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)

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

TURBOCHARGER SYSTEM (1ND-TV)

130AH-01

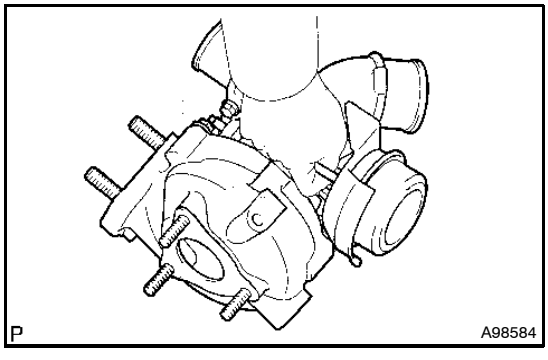
PRECAUTION

1. MAINTENANCE PRECAUTIONS

(a) Do not stop the engine immediately after pulling a trailer, or after high speed or uphill driving. Let the engine idle for 20 to 120 seconds before turning the ignition switch to OFF. (The appropriate idling time varies according to the driving condition.)

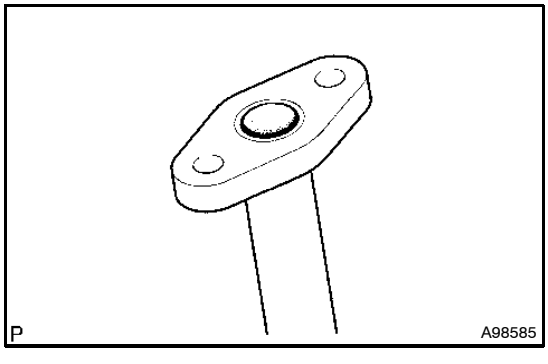
(b) Avoid quick acceleration and increases in engine speed immediately after starting a cold engine.

(c) If the turbocharger is found to be defective, it must be replaced. Also, investigate the cause of the trouble including the conditions in which the turbocharger has been used. Repair or replace the following if necessary.
  (1) Engine oil (level and quality)
  (2) Oil lines leading to the turbocharger



(d) Pay due attention when removing and reinstalling the turbocharger assembly. Do not drop, grasp, or shock easily-deformed assembly parts, such as the actuator or push rod, when removing or reinstalling the assembly.

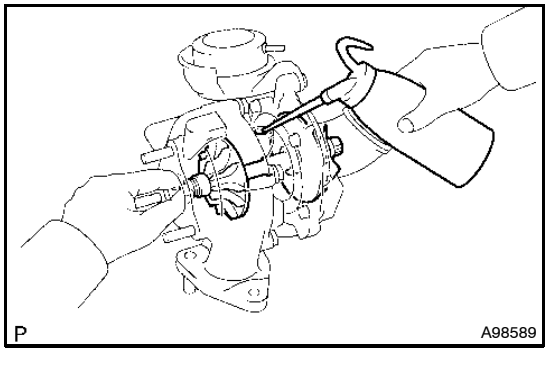
(e) Before removing, cover both the intake and exhaust ports and the oil inlet to prevent dirt or foreign objects from being introduced.



(f) If replacing the turbocharger, check the oil pipe for deposits. If necessary, replace the oil pipe, too.

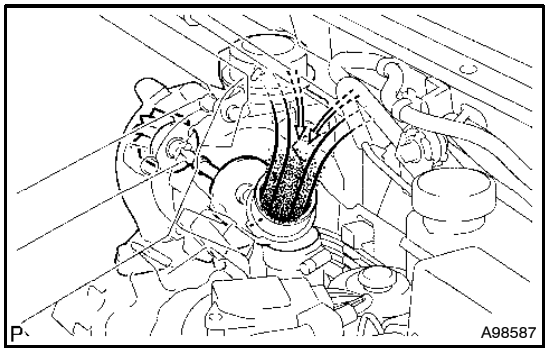
(g) Thoroughly remove any old gasket sticking to the lubrication oil pipe flange and turbocharger oil flange.

(h) If replacing the bolt(s) or nut(s), Toyota genuine parts must be used to prevent breakage or deformation.



(i) If replacing the turbocharger, put 20 cm^3 (1.2 cu in.) of fresh oil into the turbocharger oil inlet hole, then turn the turbine wheel by hand to spread the oil to the bearing.

(j) If overhauling or replacing the engine, cut the fuel supply after reassembling, and crank the engine for 30 seconds to feed oil throughout the engine. Idle the engine for 60 seconds.



(k) Since the turbine wheels run at an extremely high speed, running the engine without the air cleaner, case cover and hose damages the turbine wheel due to the introduction of foreign particles.

130AI-01

ON-VEHICLE INSPECTION

1. INSPECT INTAKE AIR SYSTEM

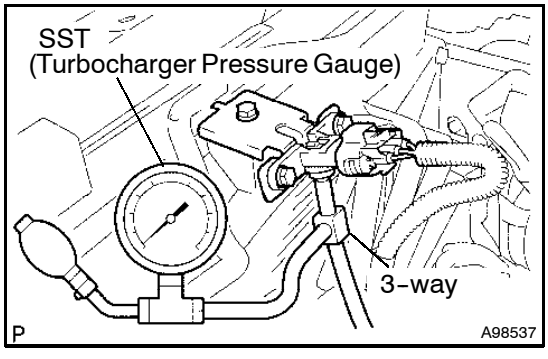
(a) Check for leakage and clogging between the air cleaner housing and turbocharger inlet and between the turbocharger outlet and cylinder head.

Condition	Operation
Clogged air cleaner	Clean or replace element
Collapsed or deformed hoses	Repair or replace
Leakage from connections	Check each connection and repair
Cracked in components	Check and replace

2. INSPECT EXHAUST SYSTEM

(a) Check for leakage or clogging between the cylinder head and turbocharger inlet and between the turbocharger outlet and exhaust pipe.

Condition	Operation
Deformed components	Repair or replace
Foreign objects in passages	Remove
Leakage from components	Repair or replace
Cracked in components	Check and replace



3. CHECK TURBOCHARGING PRESSURE

(a) Warm up the engine.

(b) Using a 3-way connector, connect SST (turbocharger pressure gauge) to the hose leading to the intake air connector.

SST 09992 - 00242

(c) While depressing the clutch pedal, press the accelerator pedal down fully. Measure the turbocharging pressure at the maximum speed (5,100 to 5,250 rpm).

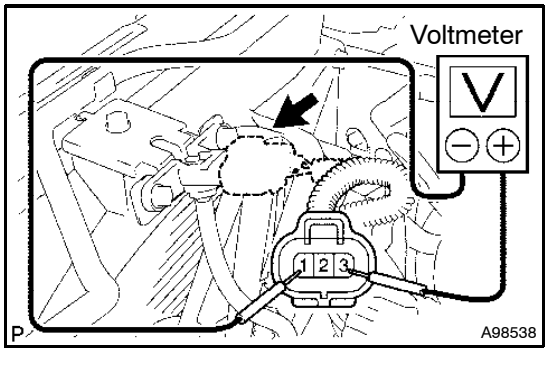
Standard:

15 to 45 kPa (0.15 to 0.46 kgf/cm^2, 2.2 to 6.5 psi)

If the pressure is lower than the specified level, check both the intake air and exhaust systems for leakage.

If there is no leakage, check whether the actuator hose is disconnected. If not, check the turbocharger.

If the pressure is greater than the specified level, check whether the actuator hose is disconnected or cracked. If not, check the turbocharger.



4. INSPECT TURBO PRESSURE SENSOR

(a) Check the voltage.

(1) Disconnect the turbo pressure sensor connector.

(2) Turn the ignition switch to ON.

(3) Using a voltmeter, measure the voltage between the terminals of the wire harness side.

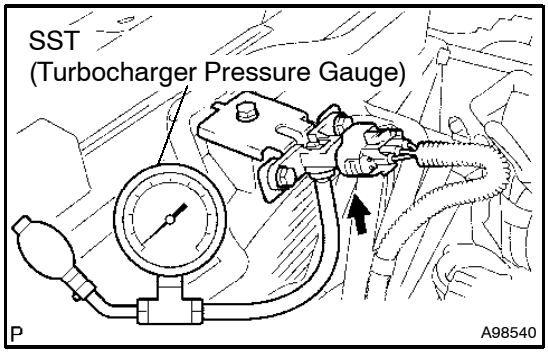
Voltage:

Tester Connection	Specified Condition
1 (E2) - 3 (VC)	4.5 to 5.5 V

(4) Turn the ignition switch to OFF.

(5) Reconnect the turbo pressure sensor connector.

If the result is not as specified, check the wiring and ECM.



(6) Using SST (a turbocharger pressure gauge), apply pressure to the turbo pressure sensor of 19.6 kPa (0.20 kgf/cm^2, 2.84 psi) to 98.0 kPa (1.00 kgf/cm^2, 14.2 psi).

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(7) Measure the voltage increase between step (3) and step (6).

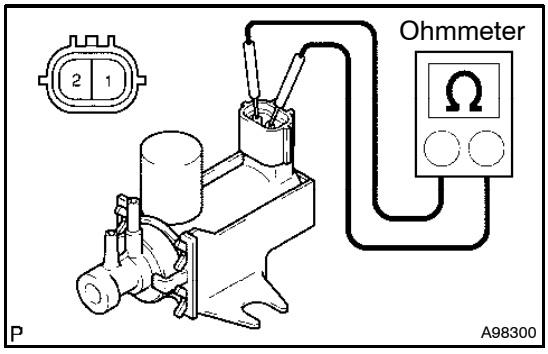
Voltage up:

Applied Pressure [kPa (kgf/cm^2, psi)]	Voltage Increase [V]
19.6 (0.20, 2.84)	0.1 to 0.4
39.2 (0.40, 5.69)	0.4 to 0.7
58.8 (0.60, 8.53)	0.7 to 1.0
78.5 (0.80, 11.4)	1.0 to 1.3
98.0 (1.00, 14.2)	1.3 to 1.6

If the result is not as specified, check the wiring and ECM.

130AJ-01

INSPECTION



1. INSPECT VACUUM REGULATING VALVE

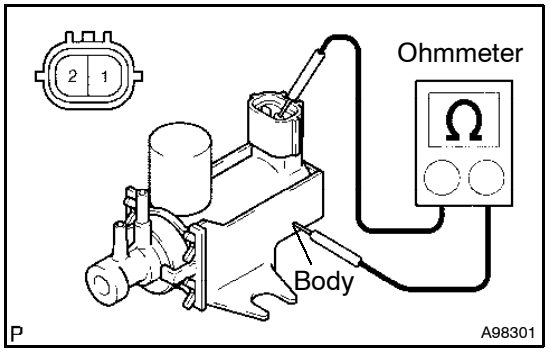
(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
1 - 2	11 to 13 Ω at 20°C (68°F)

If the result is not as specified, replace the vacuum regulation valve.

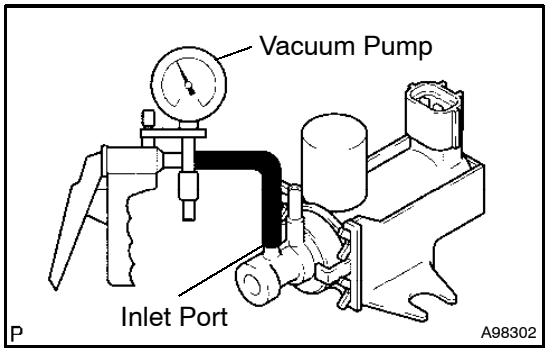


(2) Using an ohmmeter, measure the resistance between each terminal and the body.

Standard:

Tester Connection	Specified Condition
1 - Body	1 MΩ or higher
2 - Body	1 MΩ or higher

If the result is not as specified, replace the vacuum regulation valve.

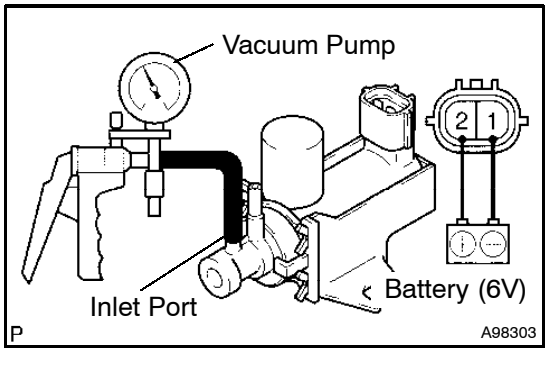


(b) Check the air tightness.

(1) Apply a vacuum to the vacuum inlet port.

(2) Check that the needle of the vacuum pump indicates decrease of 66.7 kPa (500 mmHg, 19.7 in.Hg) or less.

If the air tightness is not as specified, replace the vacuum regulation valve.



(c) Check the operation.

(1) Apply 4 dry batteries of 1.5 V in series.

(2) Check that the needle does not move when a vacuum is applied to the vacuum inlet port.

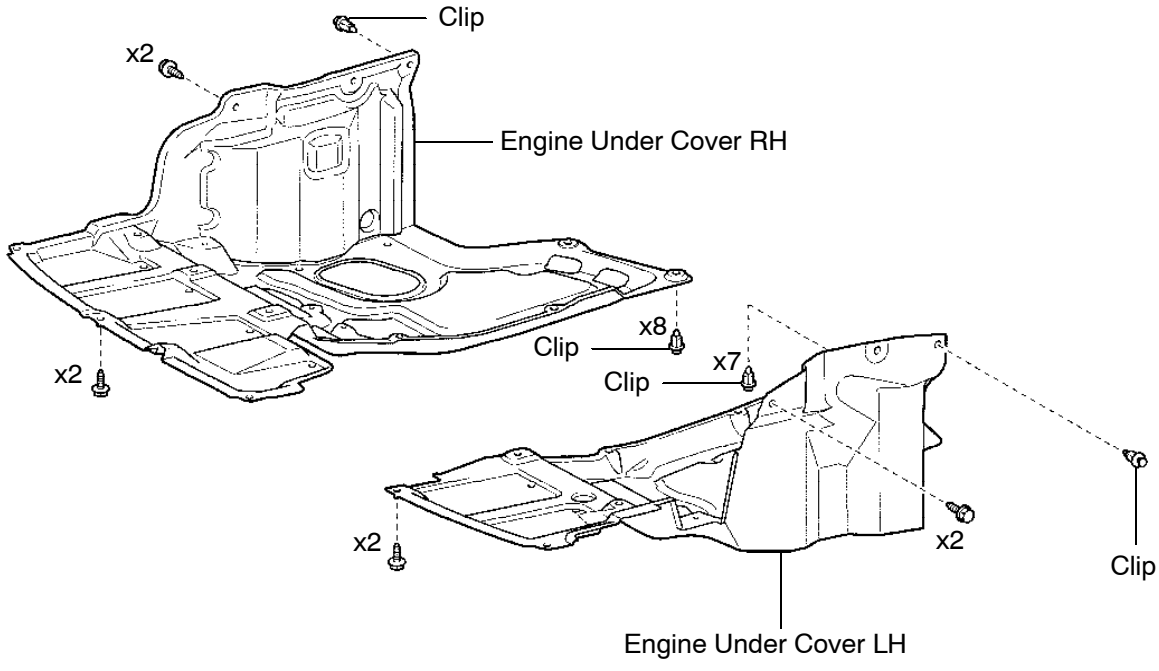
If the operation is not as specified, replace the vacuum regulation valve.

INTERCOOLER ASSY (1ND-TV)

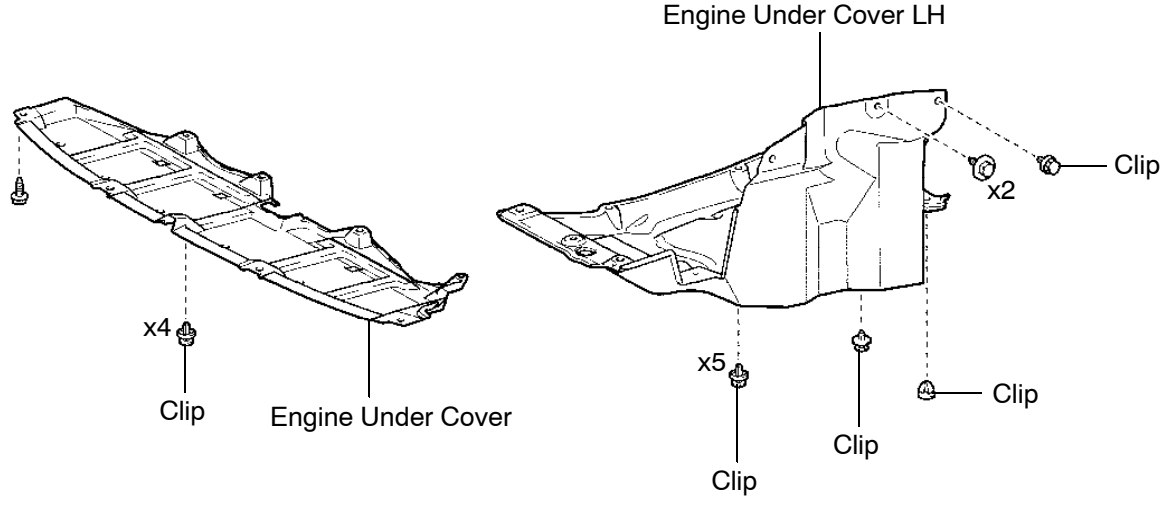
COMPONENTS

130AK-01

Except TMC Made:



TMC Made:



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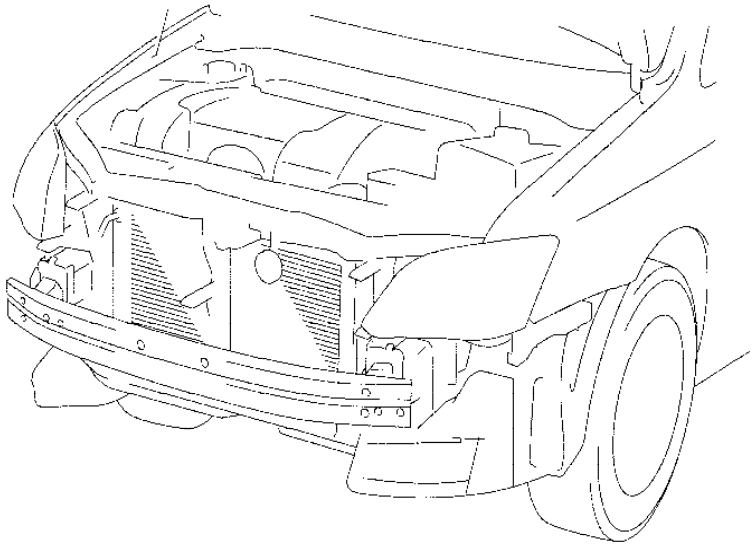
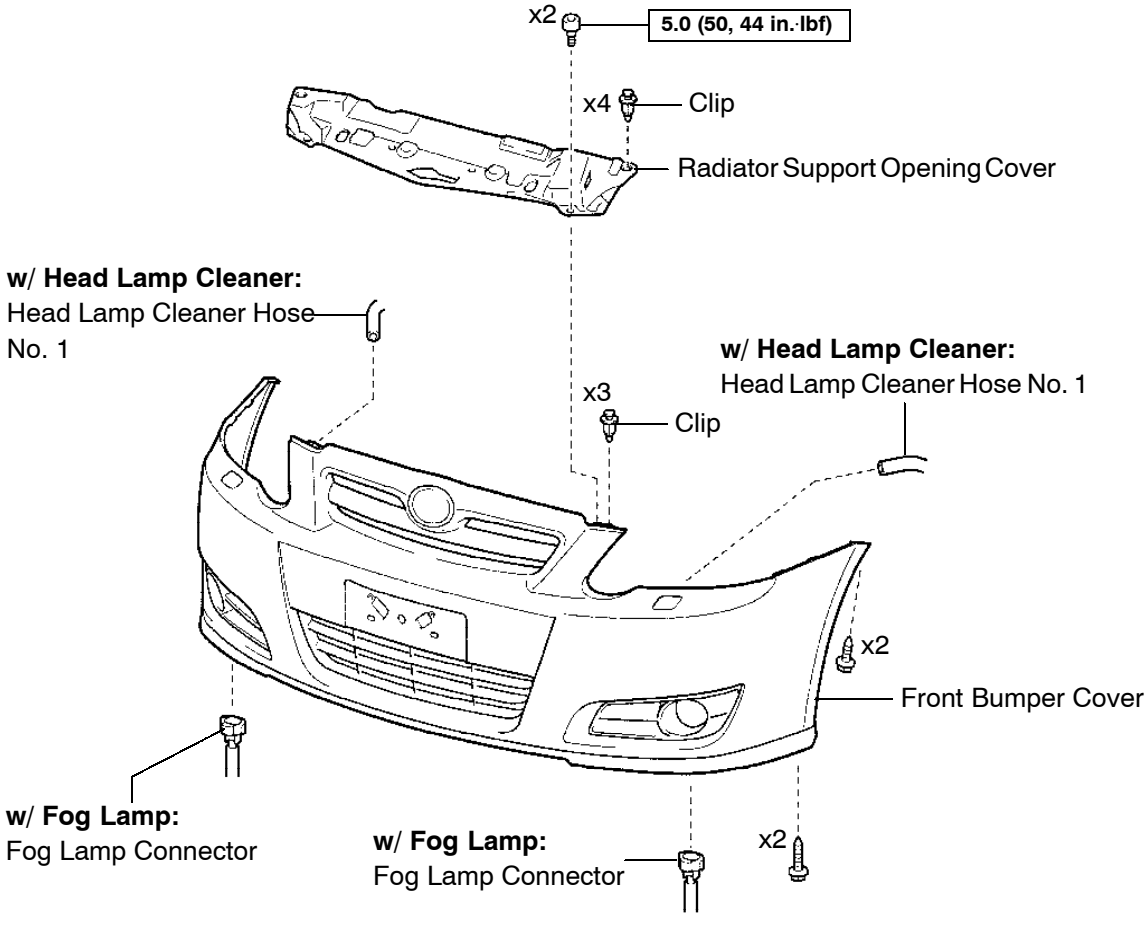
Hatchback:





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

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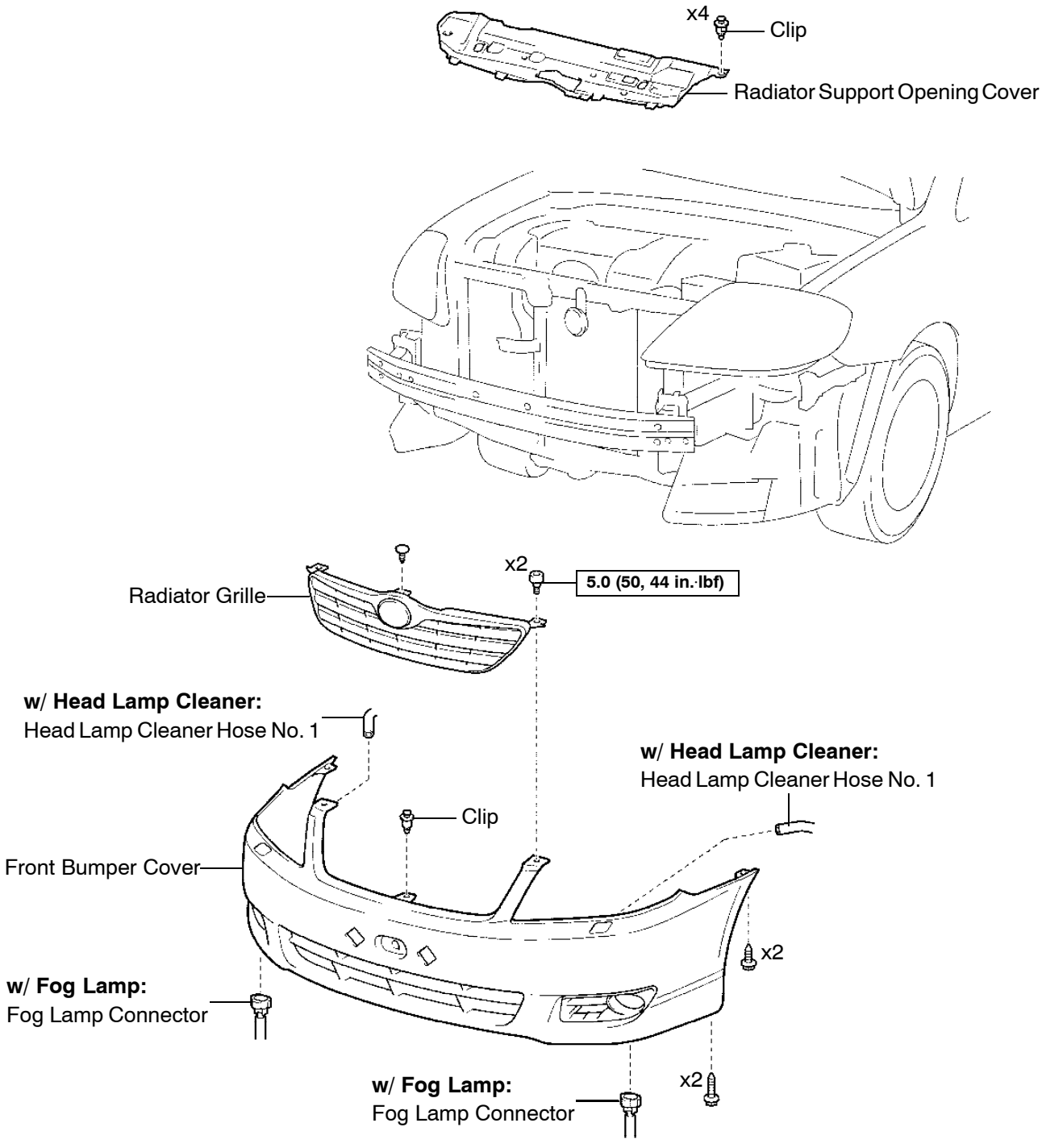
Sedan / Station Wagon:



P

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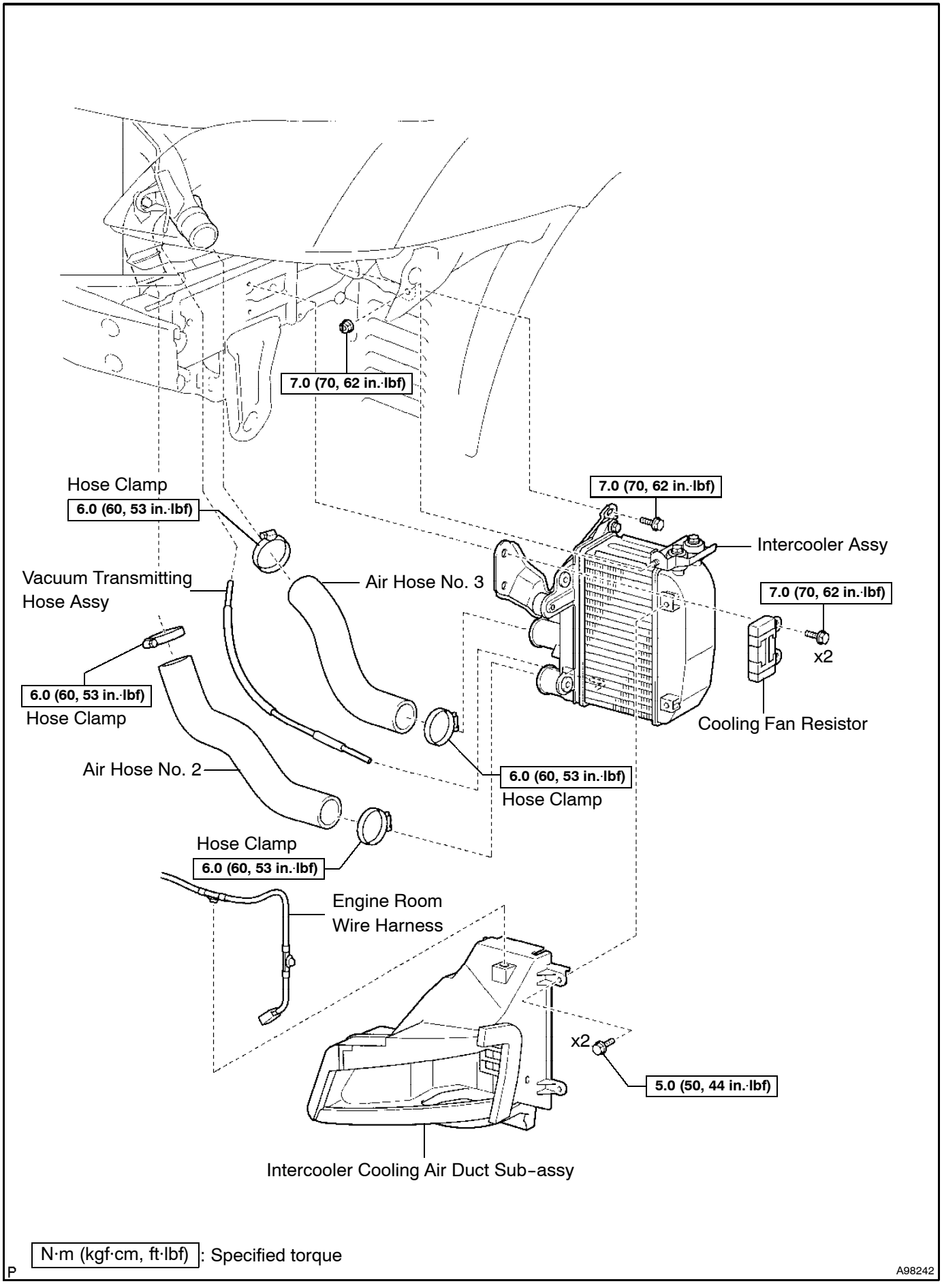

N·m (kgf·cm, ft·lbf) : Specified torque

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130A-01

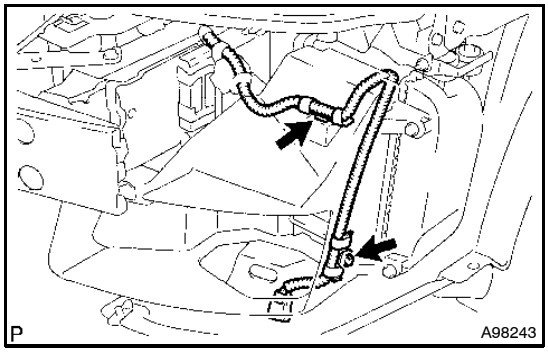
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
6. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
7. REMOVE RADIATOR GRILLE (SEDAN/STATION WAGON BODY TYPE) (See Pub. No. RM 925E, page 76-2)
8. REMOVE FRONT FENDER LINER LH (See Pub. No. RM925E, page 76-2, 76-5)

HINT:

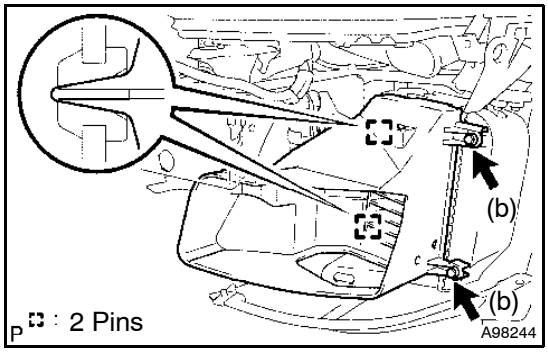
Follow the same procedures as those for the front fender liner LH.

9. REMOVE FRONT FENDER LINER RH
10. REMOVE FRONT BUMPER COVER (See Pub. No. RM925E, page 76-2, 76-5)



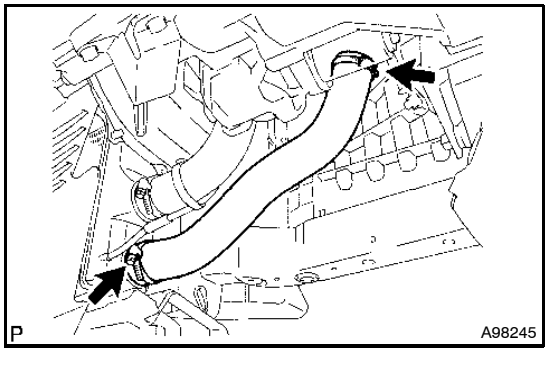
11. REMOVE INTERCOOLER COOLING AIR DUCT SUB-ASSY

(a) Remove the 2 wire harness clamps.



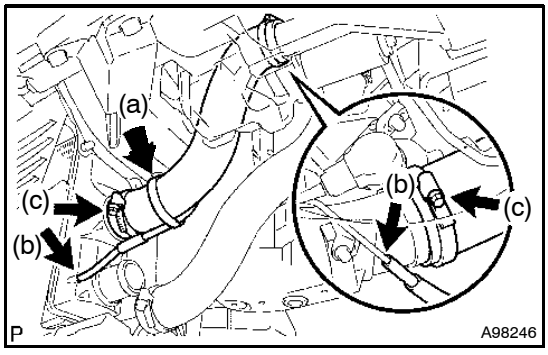
(b) Remove the 2 bolts.

(c) Disengage the 2 pins and remove the inter cooler cooling air duct.



12. REMOVE AIR HOSE NO.2

(a) Loosen the 2 hose clamps and remove the air hose No. 2.

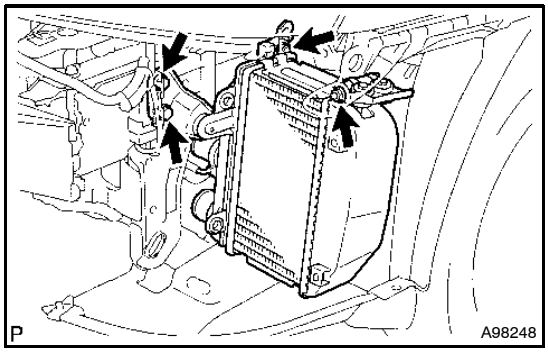


13. REMOVE AIR HOSE NO.3

(a) Peel off the vinyl tape.

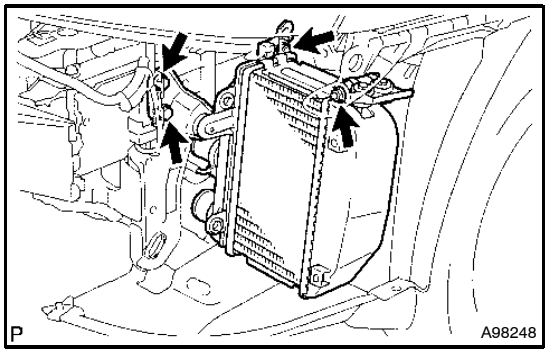
(b) Remove the vacuum transmitting hose from the intercooler and vacuum transmitting pipe.

(c) Loosen the 2 hose clamps and remove the air hose No. 3.



14. REMOVE INTERCOOLER ASSY

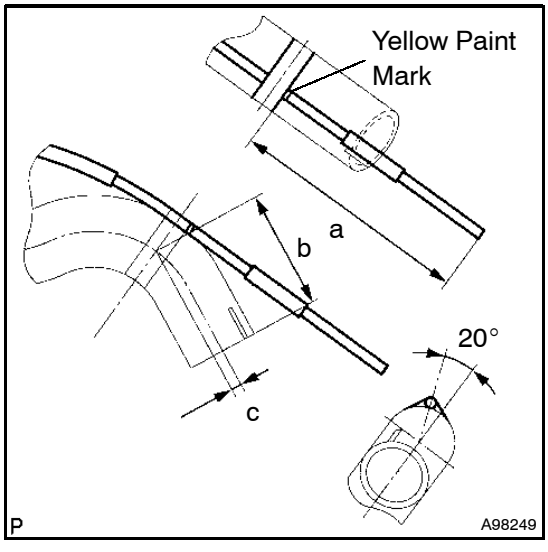
(a) Remove the 3 bolts, nut and cooling fan resistor and inter cooler.



15. INSTALL INTERCOOLER ASSY

(a) Install the inter cooler and cooling fan resistor with the 3 bolts and nut.

Torque: 7.0 N·m (70 kgf·cm, 62 in.·lbf)



16. INSTALL AIR HOSE NO.3

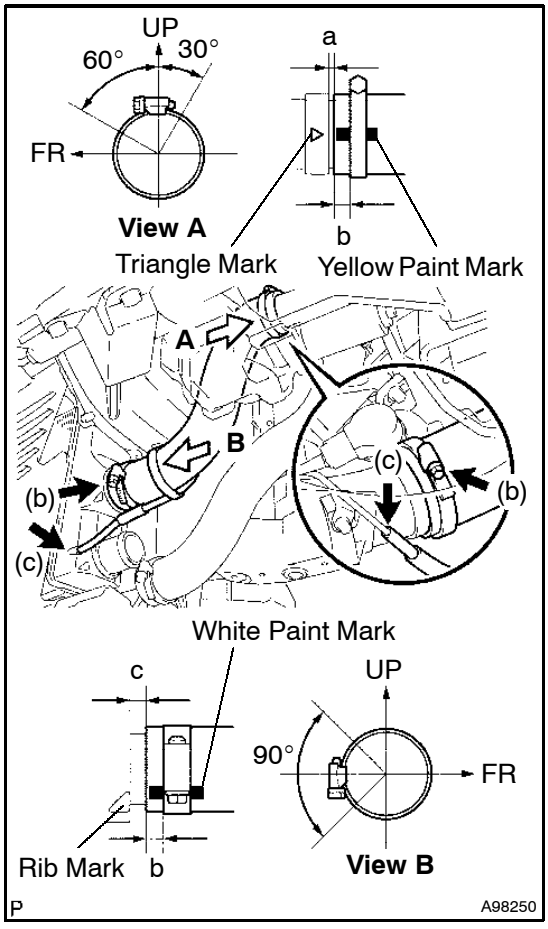
(a) Install the vacuum transmitting hose onto the air hose No.3 with vinyl tape as shown in the illustration.

Specification:

Area	Measurement
a	182 mm (7.165 in.)
b	89.8 mm (3.535 in.)
c	7.4 mm (0.291 in.)

NOTICE:

Wind vinyl tape more than 5 times around the air hose No.3.



(b) Install the air hose No. 3 with the 2 hose clamps.
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)
Specification:

Area	Measurement
a	0 to 2 mm (0 to 0.079 in.)
b	2 to 7 mm (0.079 to 0.276 in.)
c	0 to 5 mm (0 to 0.197 in.)

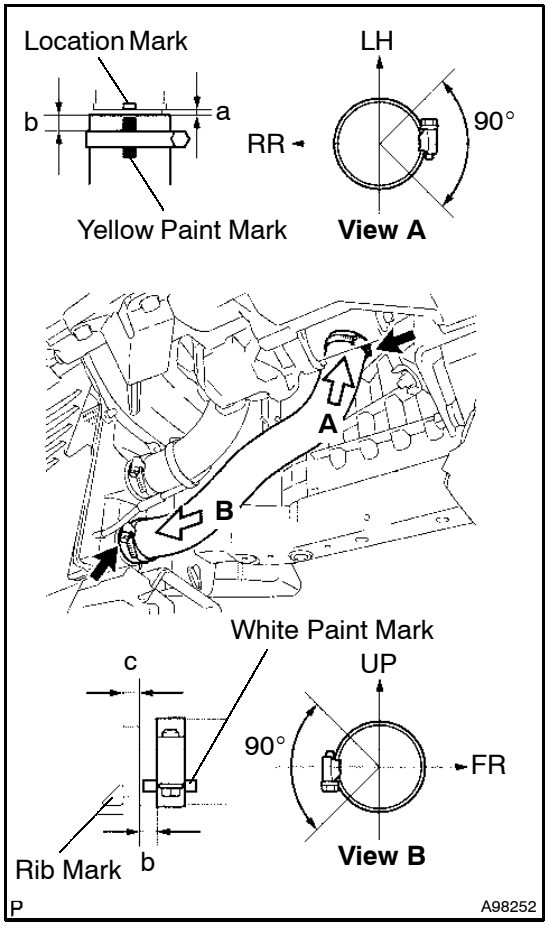
NOTICE:

- **Align the paint mark of the air hose No. 3 with rib mark of the inter cooler.**
- **Align the paint mark of the air hose No. 3 with triangle mark of the air tube No. 2**
- **Make sure that the hose clamp is at the correct angle when installing.**

(c) Connect the vacuum transmitting hose to the inter cooler and vacuum transmitting pipe.

NOTICE:

- **Insert the vacuum transmitting hose into the corner-end of the intercooler.**
- **Insert the vacuum transmitting hose into the marking of the vacuum transmitting pipe.**



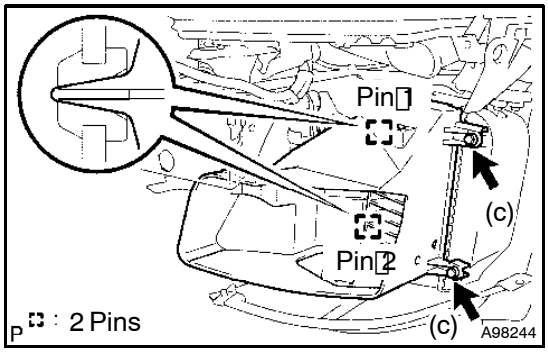
17. INSTALL AIR HOSE NO.2

(a) Install the air hose No. 2 with the 2 hose clamps.
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)
Specification:

Area	Measurement
a	0 to 2 mm (0 to 0.079 in.)
b	2 to 7 mm (0.079 to 0.276 in.)
c	0 to 5 mm (0 to 0.197 in.)

NOTICE:

- **Align the paint mark of the air hose No. 2 with rib mark of the inter cooler.**
- **Align the paint mark of the air hose No. 3 with location mark of the air tube No. 1.**
- **Make sure that the hose clamp is at the correct angle when installing.**



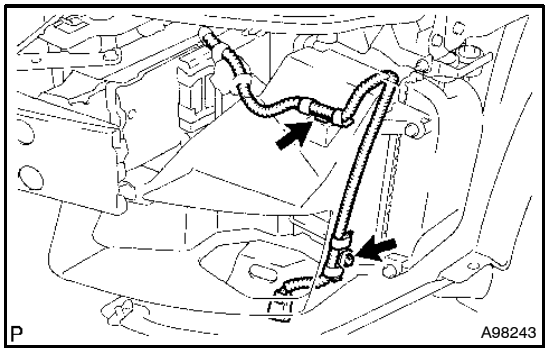
18. INSTALL INTERCOOLER COOLING AIR DUCT SUB-ASSY

(a) Insert the pin 1 of the inter cooler cooling air duct in the illustration hole.

(b) Rotate the inter cooler cooling air duct with the pin 1 inserted, then insert the pin 2.

(c) Tighten the 2 bolts.

Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)



(d) Install the 2 wire harness clamps.

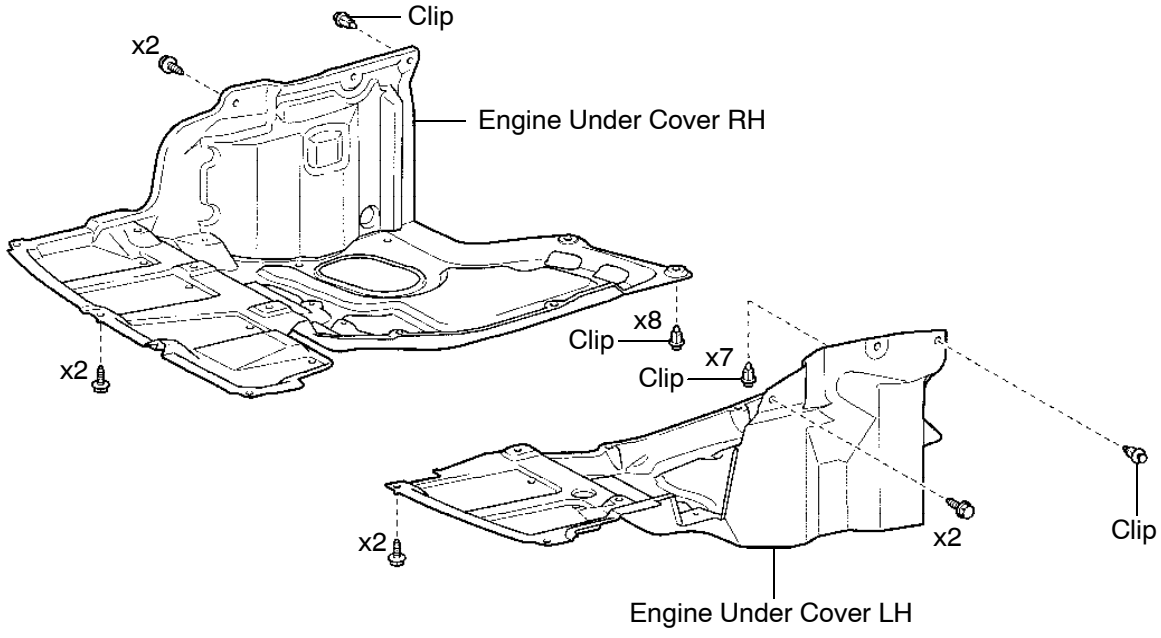
19. INSTALL FRONT BUMPER COVER
20. INSTALL FRONT FENDER LINER LH
21. INSTALL FRONT FENDER LINER RH
22. INSTALL RADIATOR GRILLE (SEDAN/STATION WAGON BODY TYPE)
23. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)
24. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE MT) (See page 13-17)
25. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
26. INSTALL ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
27. INSTALL ENGINE UNDER COVER (TMC MADE) (See page 13-17)
28. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

TURBOCHARGER SUB-ASSY (1ND-TV)

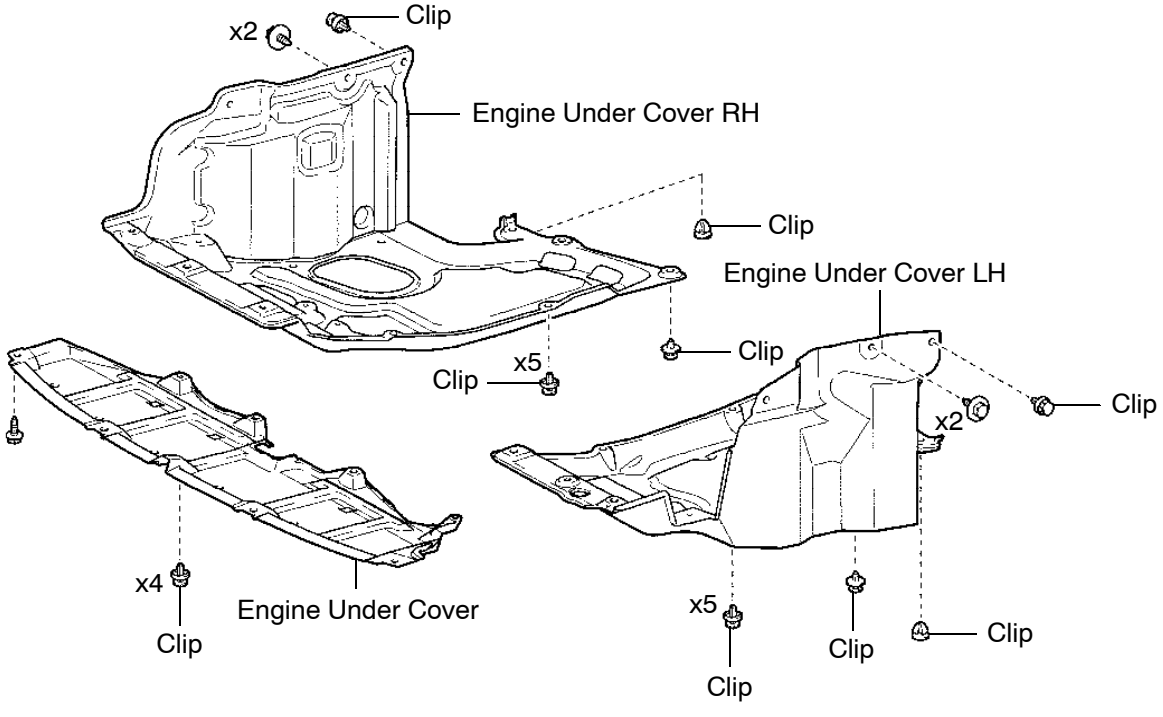
130AO-01

COMPONENTS

Except TMC Made:



TMC Made:



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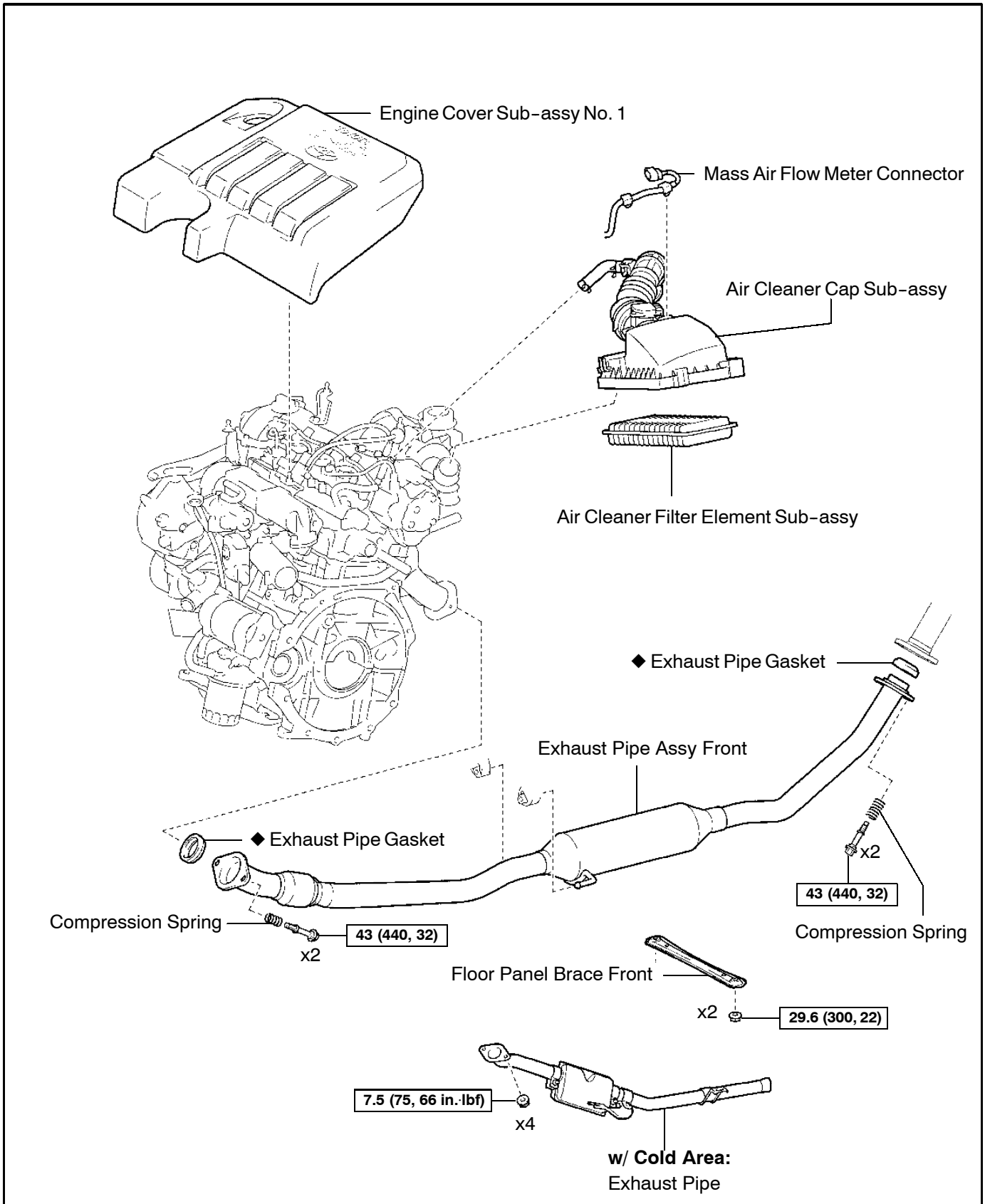
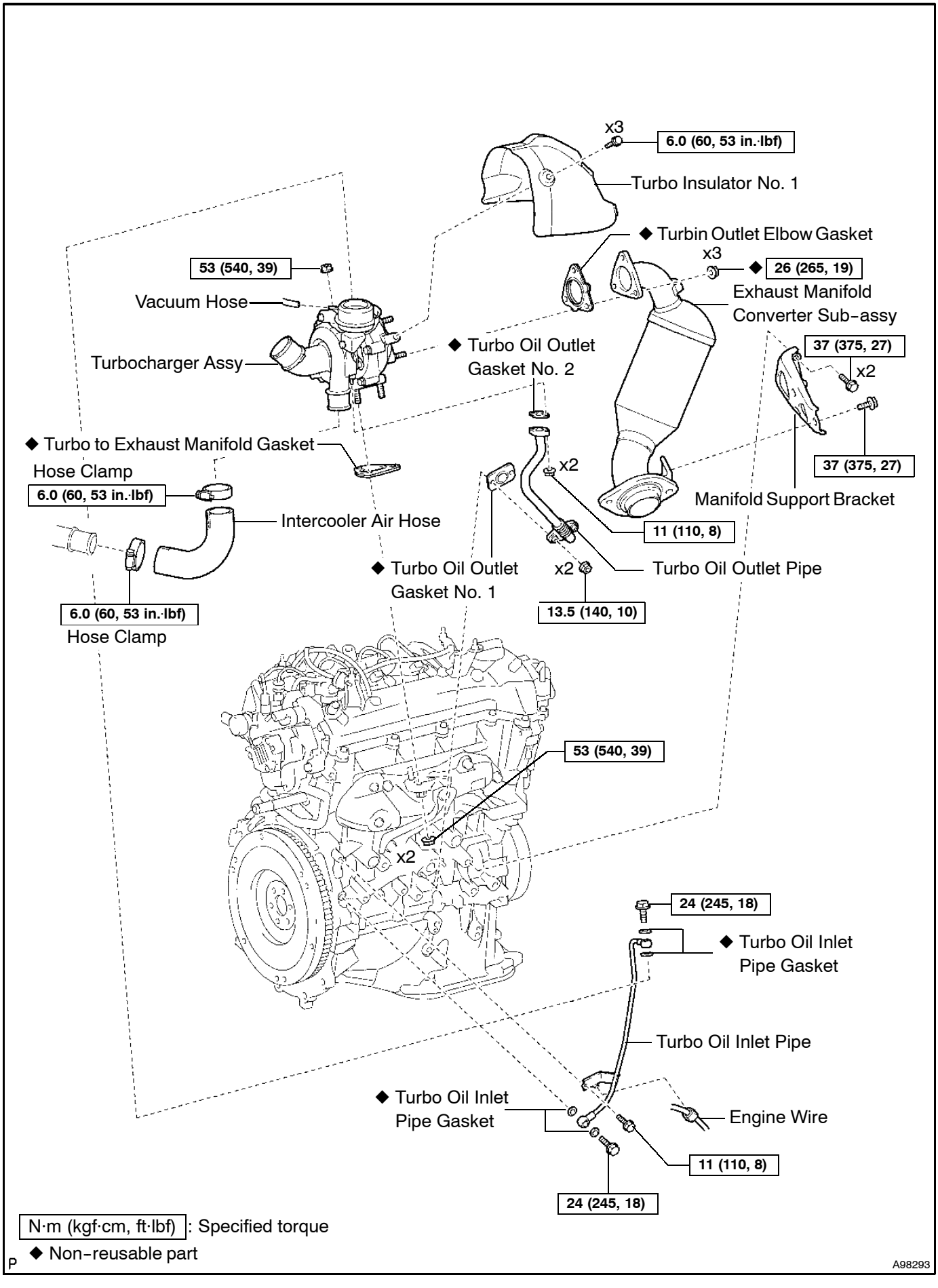


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

P A98294



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

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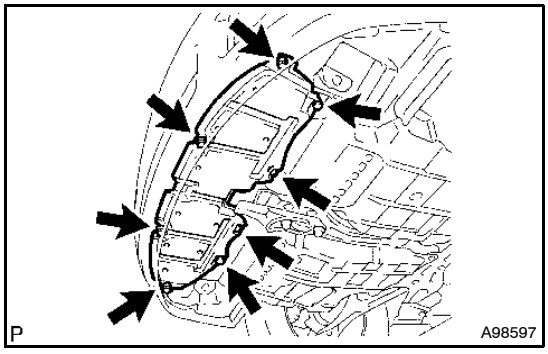
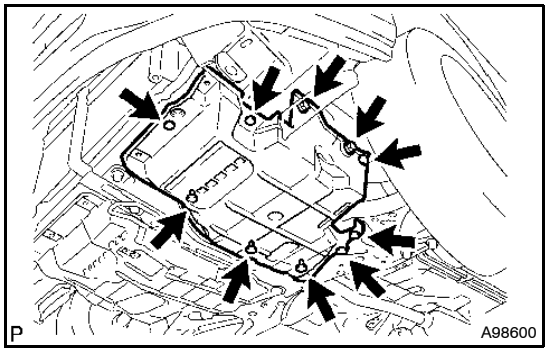
REPLACEMENT



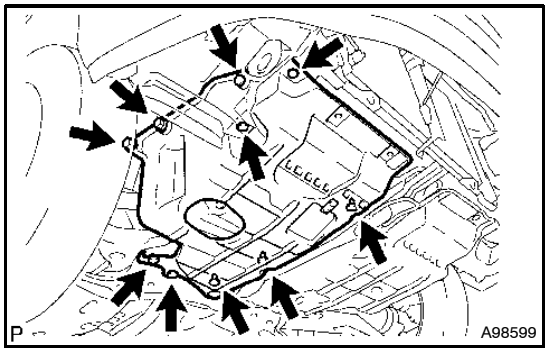
1. REMOVE ENGINE UNDER COVER (TMC MADE)

(a) Remove the 4 screws, 4 clips and engine under cover.



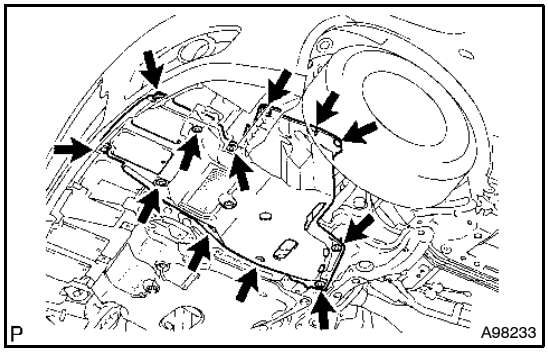
2. REMOVE ENGINE UNDER COVER LH (TMC MADE)

(a) Remove the 2 screws, 8 clips and engine under cover.



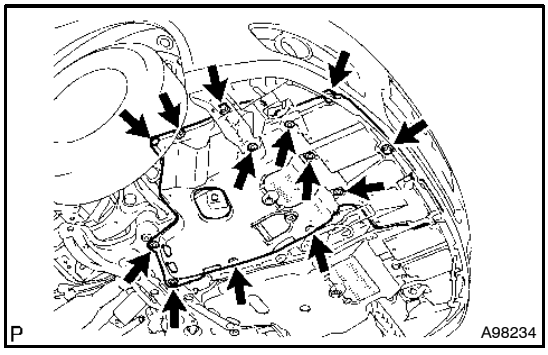
3. REMOVE ENGINE UNDER COVER RH (TMC MADE)

(a) Remove the 2 screws, 8 clips and engine under cover.



4. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE)

(a) Remove the 4 screws, 8 clips and engine under cover.

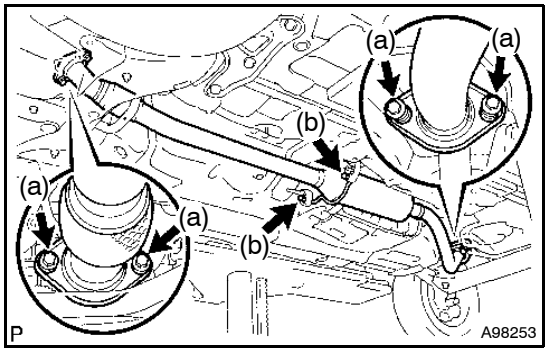


5. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE)

(a) Remove the 4 screws, 9 clips and engine under cover.

6. DRAIN ENGINE OIL (See page 17-11)

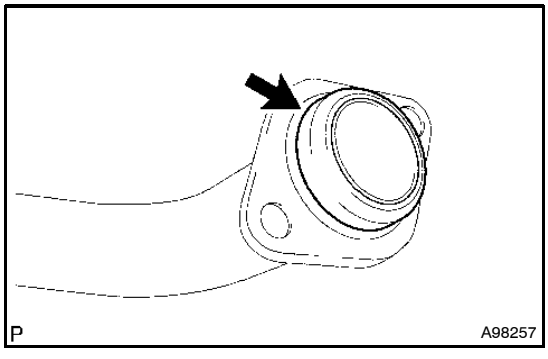
7. REMOVE FLOOR PANEL BRACE FRONT (See page 15-2)



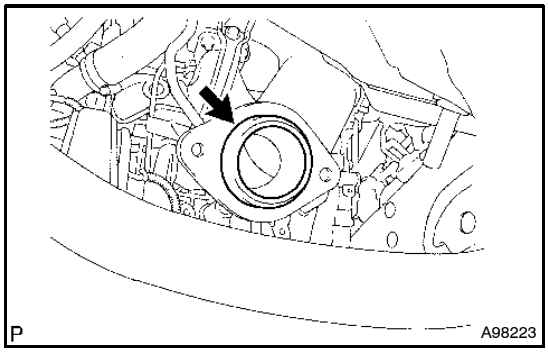
8. REMOVE EXHAUST PIPE ASSY FRONT

(a) Remove the 4 bolts and 4 compression springs.

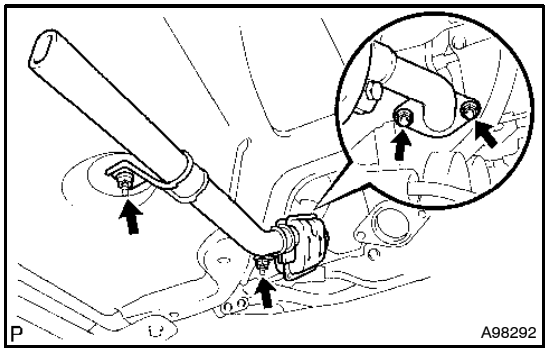
(b) Remove the exhaust pipe front from the 2 exhaust pipe supports No. 5.



(c) Remove the gasket from the exhaust pipe front.

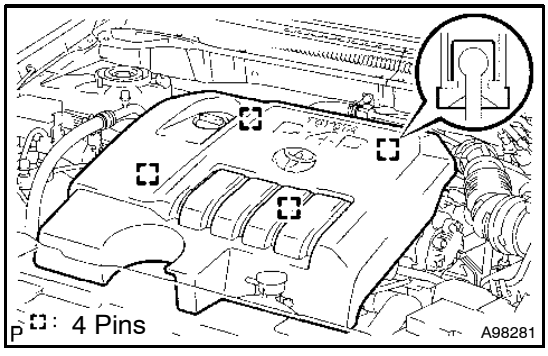


(d) Remove the gasket from the exhaust manifold convertor.



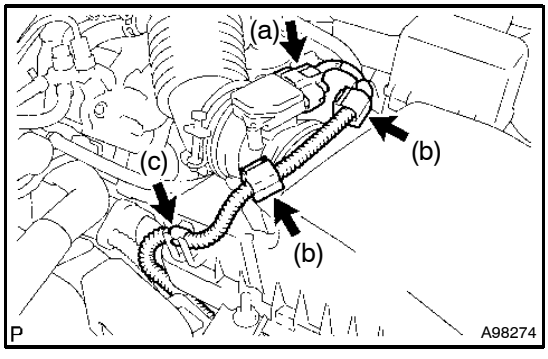
9. REMOVE EXHAUST PIPE (W/ COLD AREA)

(a) Remove the 4 nuts and exhaust pipe.



10. REMOVE ENGINE COVER SUB-ASSY NO.1

(a) Disengage the 4 pins and remove the engine cover No. 1.

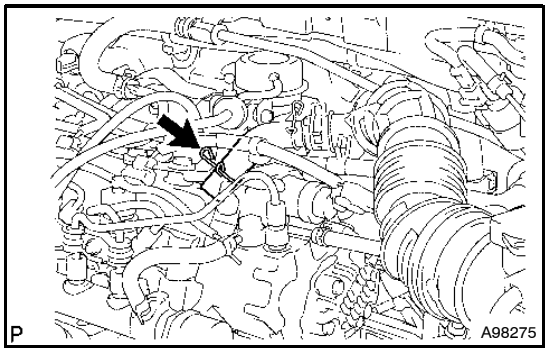


11. REMOVE AIR CLEANER CAP SUB-ASSY

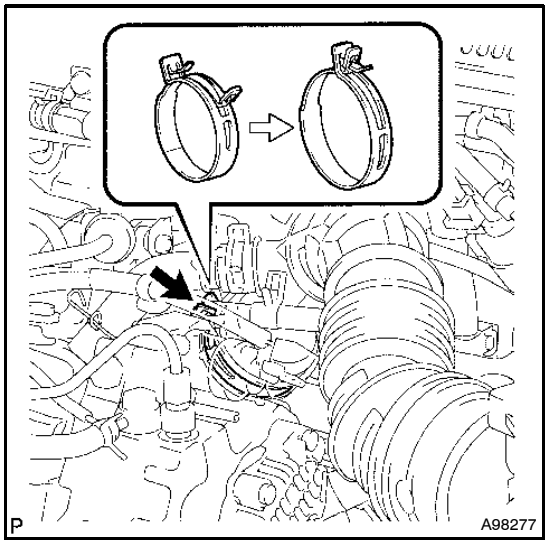
(a) Disconnect the mass air flow meter connector.

(b) Remove the 2 wire harness clamps.

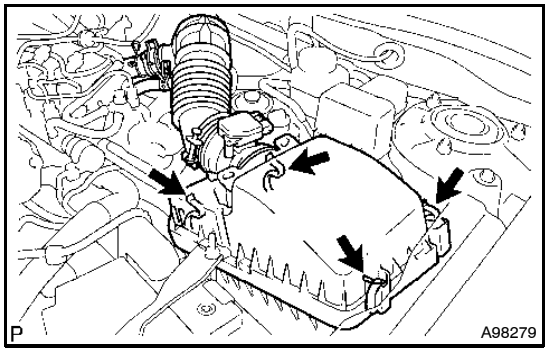
(c) Remove the wire harness from the air cleaner cap.



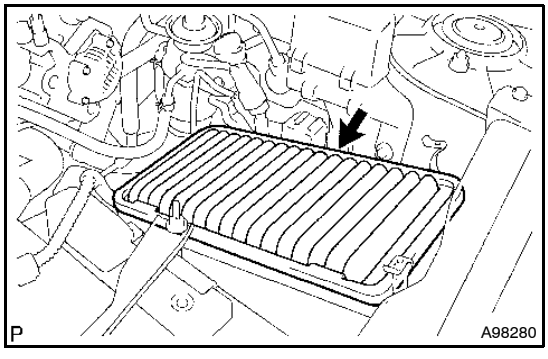
(d) Disconnect the ventilation hose from the cylinder head cover.



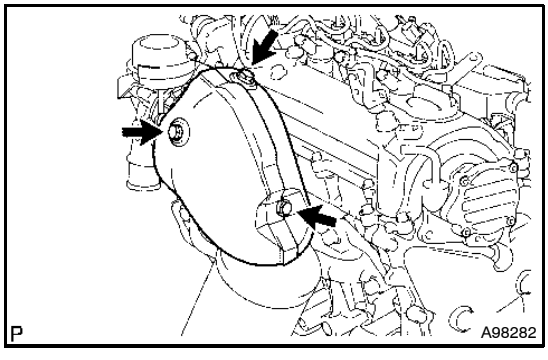
(e) Lock the air cleaner hose clamp No. 1 and disconnect the air cleaner hose No. 1 from the turbocharger.



(f) Unfasten the 4 hook clamps and remove the air cleaner cap.

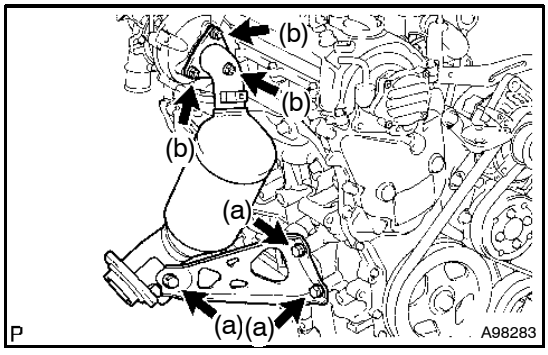


(g) Remove the air cleaner filter element from the air cleaner case.



12. REMOVE TURBO INSULATOR NO.1

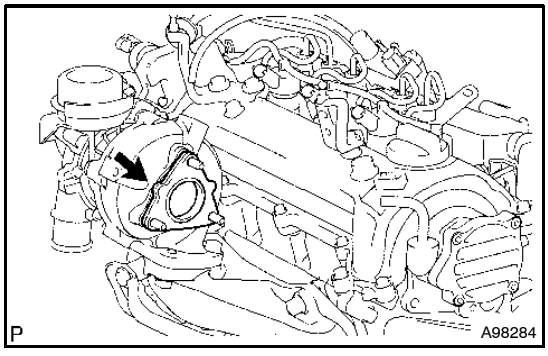
(a) Remove the 3 bolts and turbo insulator No. 1.



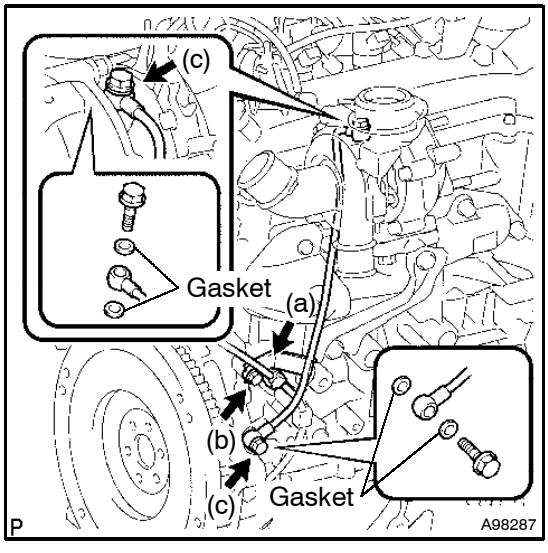
13. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Remove the 3 bolts and manifold support bracket.

(b) Remove the 3 nuts and exhaust manifold converter.



(c) Remove the gasket from the turbocharger.

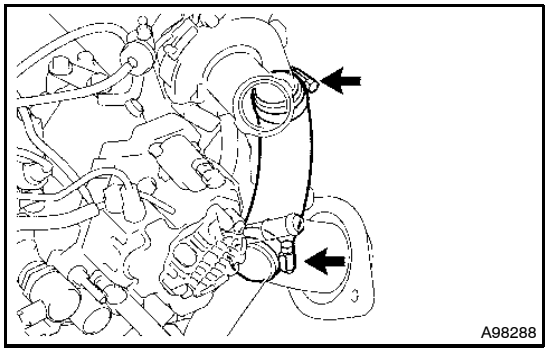


14. REMOVE TURBO OIL INLET PIPE

(a) Remove the wire harness clamp.

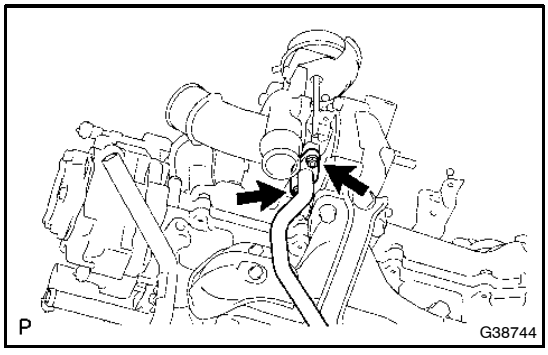
(b) Remove the bolt.

(c) Remove the 2 union bolts, oil inlet pipe and 4 gaskets.



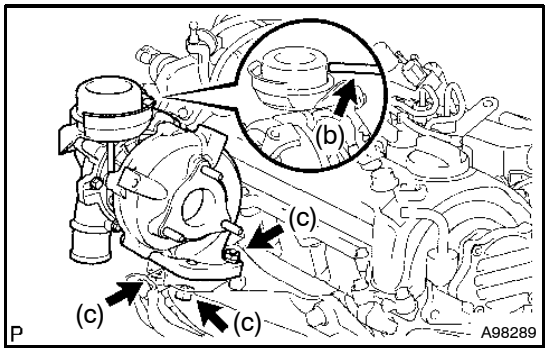
15. REMOVE INTERCOOLER AIR HOSE

(a) Loosen the 2 hose clamp bolts and remove the intercooler air hose.



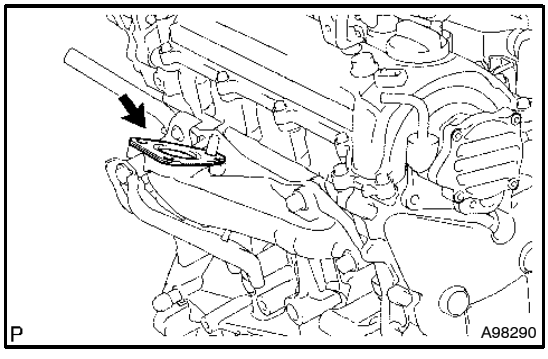
16. REMOVE TURBOCHARGER SUB-ASSY

(a) Remove the 2 nuts.

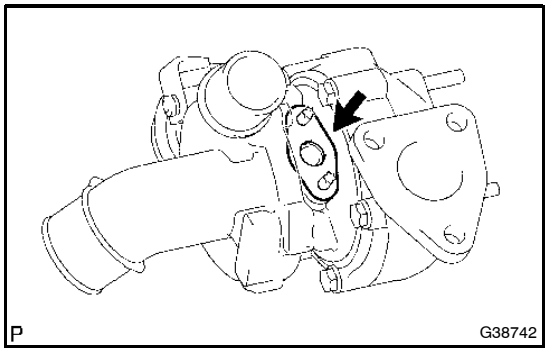


(b) Disconnect the vacuum hose from the turbocharger.

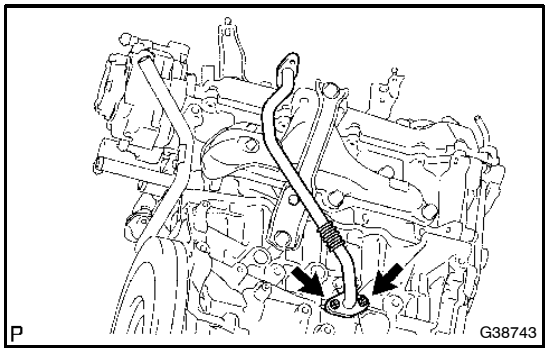
(c) Remove the 3 nuts and turbocharger.



(d) Remove the gasket from the exhaust manifold.

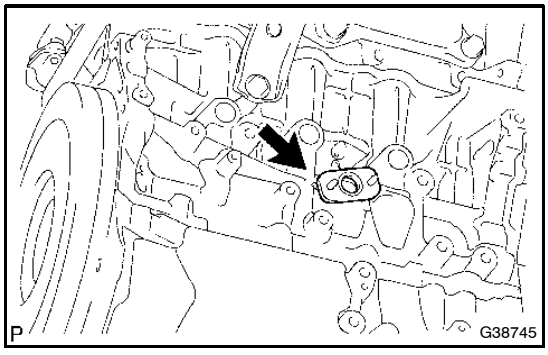


(e) Remove the gasket from the turbocharger.

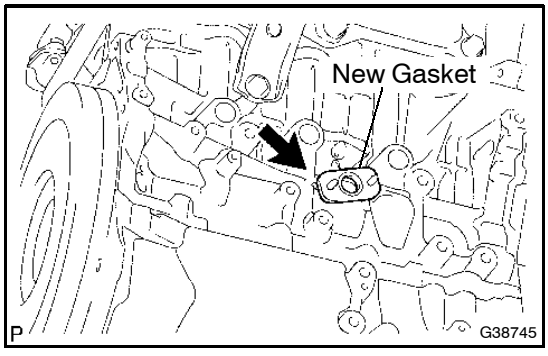


17. REMOVE TURBO OIL OUTLET PIPE

(a) Remove the 2 nuts and turbo oil outlet pipe.

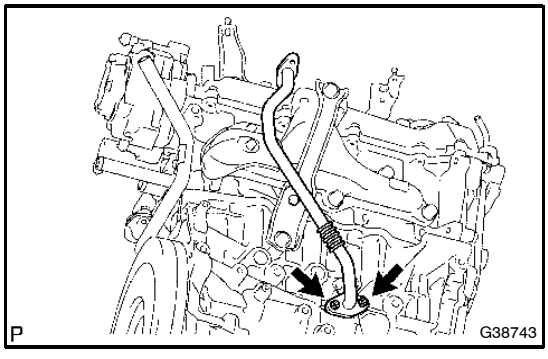


(b) Remove the gasket from the cylinder block.

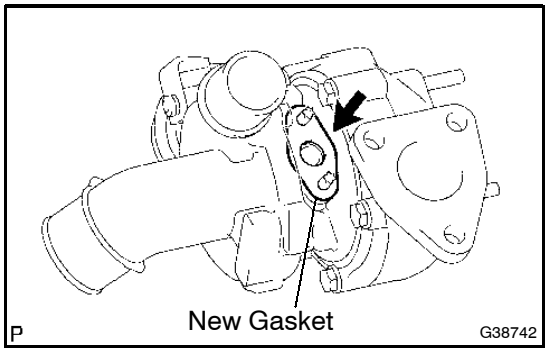


18. INSTALL TURBO OIL OUTLET PIPE

(a) Install a new gasket onto the cylinder block.

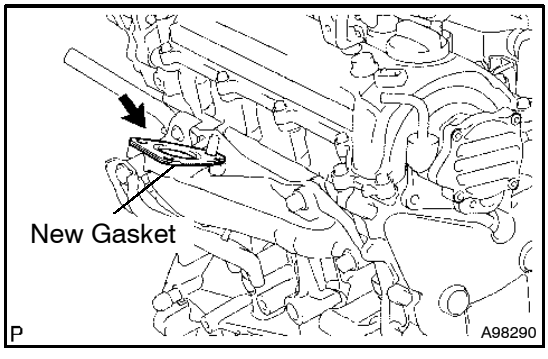


(b) Temporary install the turbo oil outlet pipe with the 2 new nuts.

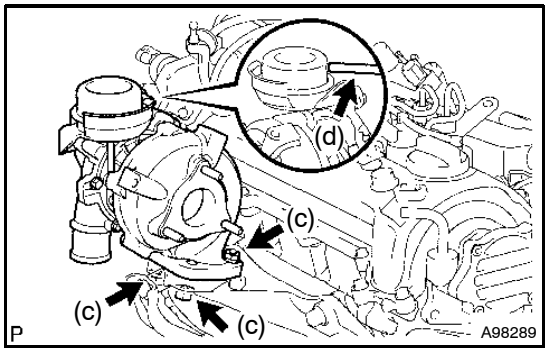


19. INSTALL TURBOCHARGER SUB-ASSY

(a) Install a new gasket onto the turbocharger

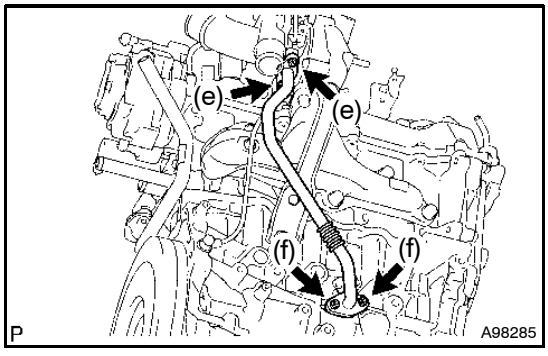


(b) Install a new gasket onto the exhaust manifold.



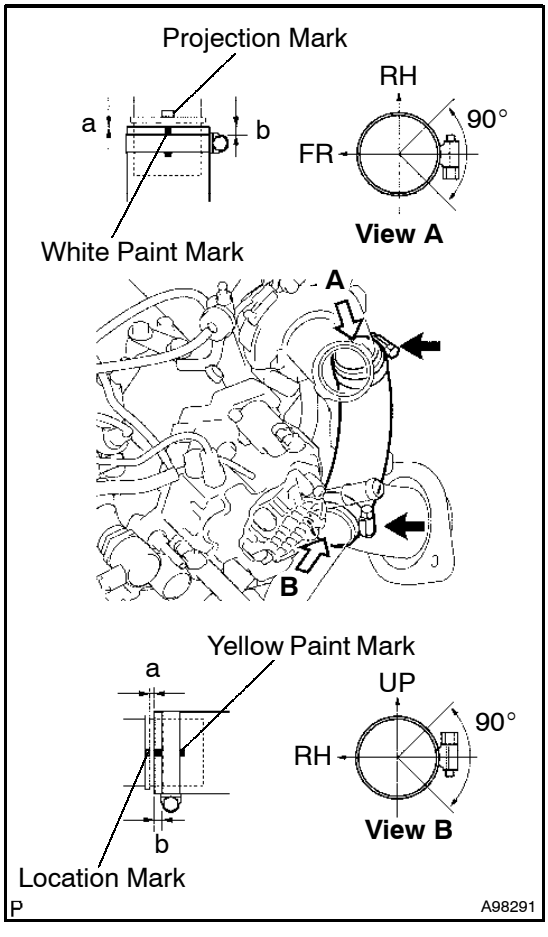
(c) Install the turbocharger with the 3 nuts.
Torque: 53 N·m (540 kgf·cm, 39 ft·lbf)

(d) Connect the vacuum hose to the turbocharger.



(e) Tighten the 2 new nuts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

(f) Tighten the 2 new nuts.
Torque: 13.5 N·m (140 kgf·cm, 10 ft·lbf)



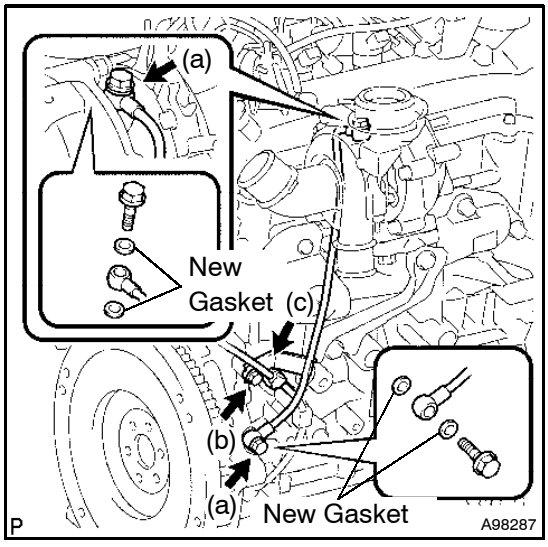
20. INSTALL INTERCOOLER AIR HOSE

(a) Install the inter cooler air hose with the 2 hose clamps.
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)
Specification:

Area	Measurement
a	0 to 2 mm (0 to 0.079 in.)
b	2 to 7 mm (0.079 to 0.276 in.)

NOTICE:

- **Align the paint mark of the inter cooler air hose with location mark of the turbocharger.**
- **Align the paint mark of the inter cooler air hose with location mark of the air tube No. 1.**
- **Make sure that the hose clamp is at the correct angle when installing.**

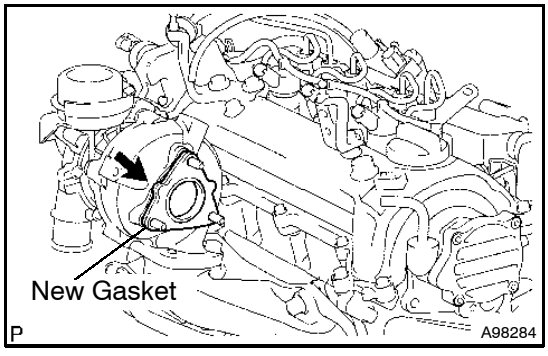


21. INSTALL TURBO OIL INLET PIPE

(a) Install 4 new gaskets and the turbo oil inlet pipe with 2 union bolts.
Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

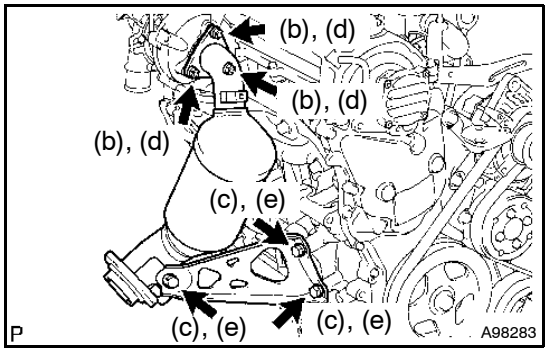
(b) Tighten the bolt.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

(c) Install the wire harness clamp.



22. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Install a new gasket onto the turbocharger.

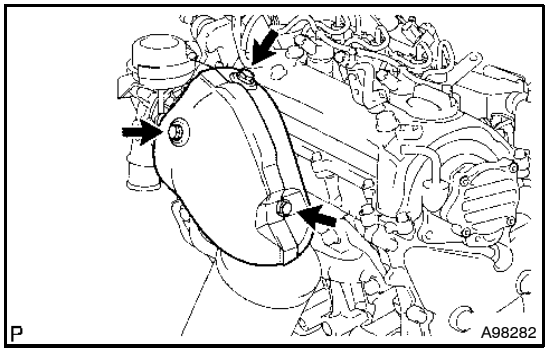


(b) Temporarily install the exhaust manifold convertor with 3 new nuts.

(c) Temporarily install the manifold support bracket with the 3 bolts.

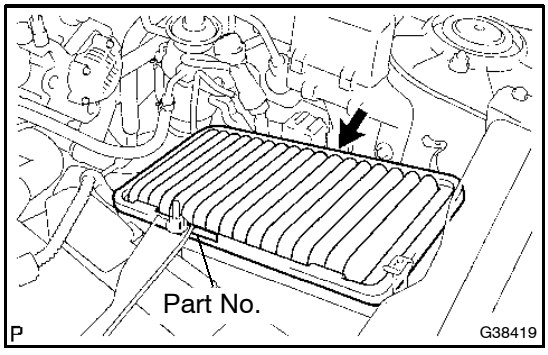
(d) Tighten the 3 nuts.
Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

(e) Tighten the 3 bolts.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)



23. INSTALL TURBO INSULATOR NO.1

(a) Install the turbo insulator No. 1 with the 3 bolts.
Torque: 6.0 N·m (60 kgf·cm, 53 in.·lbf)

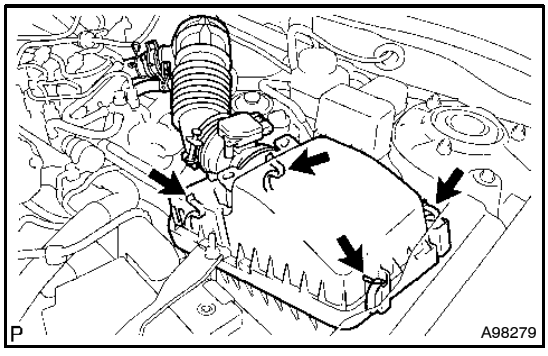


24. INSTALL AIR CLEANER CAP SUB-ASSY

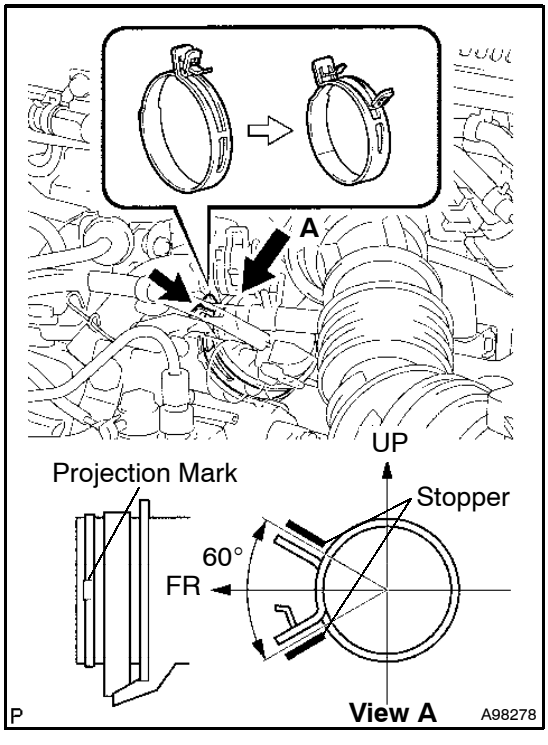
(a) Install the air cleaner filter element onto the air cleaner case.

NOTICE:

Make sure that air cleaner filter element is in the correct direction when installing.



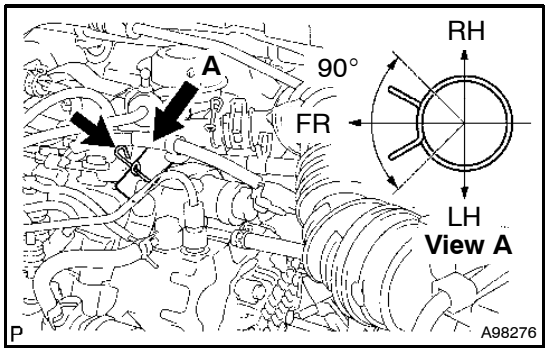
(b) Install the air cleaner cap onto the air cleaner case, then hung the 4 hook clamps.



(c) Align the matchmarks of the air cleaner hose No. 1 and turbocharger, and connect the air cleaner hose No. 1 to the turbocharger and unfasten the air cleaner hose clamp No. 1.

NOTICE:

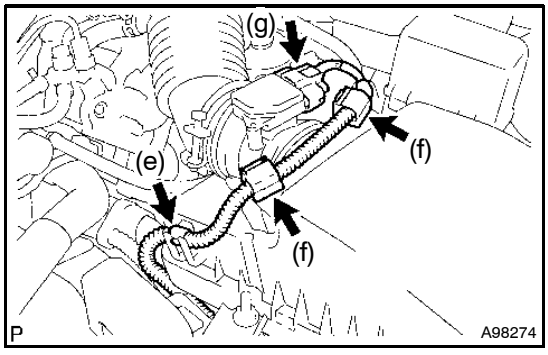
Make sure that the hose clamp is at the correct angle when installing.



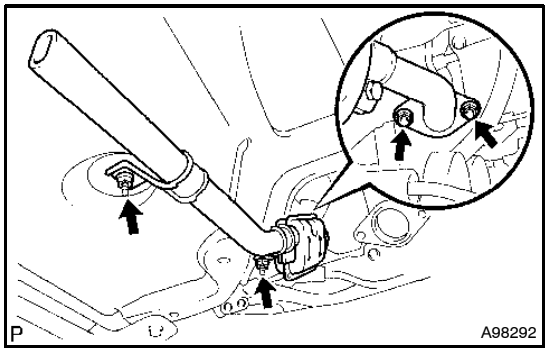
(d) Connect the ventilation hose to the cylinder head cover.

NOTICE:

Mark sure that the hose clamp is at the correct angle when installing.

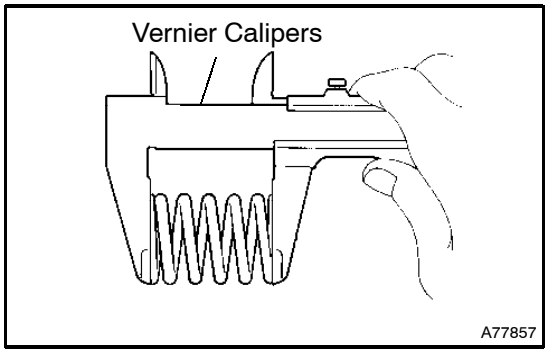


(e) Fit the wire harness into the air cleaner cap.
(f) Install the 2 wire harness clamps.
(g) Connect the mass air flow meter connector.



25. INSTALL EXHAUST PIPE (W/ COLD AREA)

(a) Install the exhaust pipe with the 4 nuts.
Torque: 7.5 N·m (75 kgf·cm, 66 in.·lbf)

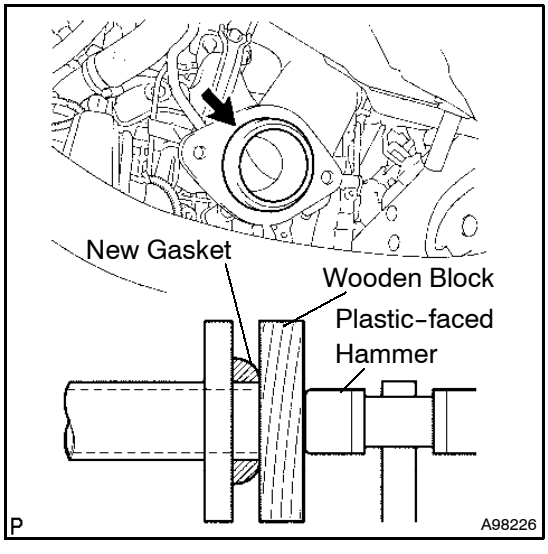


26. INSTALL EXHAUST PIPE ASSY FRONT

(a) Check the free length.
(1) Using vernier calipers, measure the free length of the compression spring.
Minimum:

Areas	Measurement
Exhaust Pipe Front x Exhaust Manifold Convertor	41.5 mm (1.634 in.)
Exhaust Pipe Front x Exhaust Pipe Tail	38.5 mm (1.516 in.)

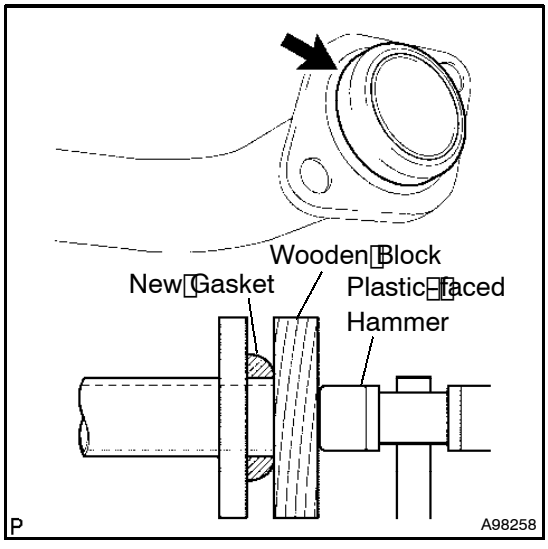
If the free length is less than the minimum, replace the compression spring.



(b) Using a wooden block and plastic-faced hammer, tap in a new gasket until it is flush with the exhaust manifold convertor.

NOTICE:

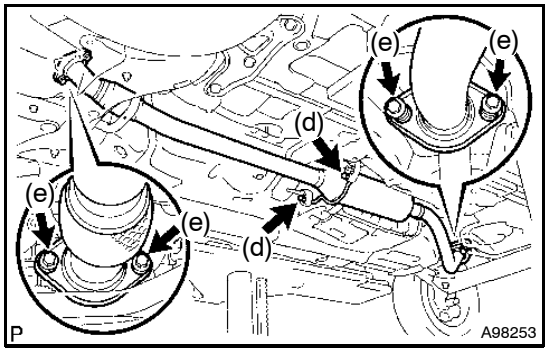
- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse a removed gasket.**
- **Never push the gasket into the exhaust manifold convertor by installing the exhaust pipe front onto the exhaust manifold convertor.**



(c) Using a wooden block and plastic-faced hammer, tap in a new gasket until it is flush with the exhaust pipe front.

NOTICE:

- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse a removed gasket.**
- **Never push the gasket into the exhaust pipe front by installing the exhaust pipe front onto the exhaust pipe tail.**



(d) Install the exhaust pipe front onto the 2 exhaust pipe support No. 5.

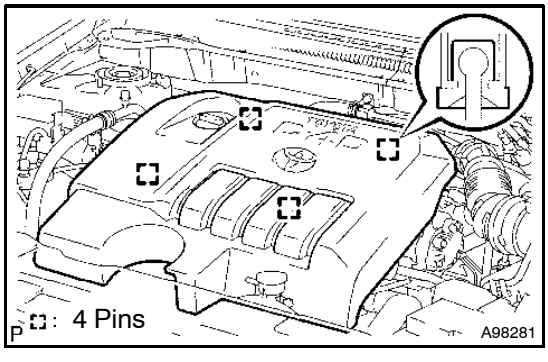
(e) Tighten the 4 compression springs and 4 bolts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

27. ADD ENGINE OIL (See page 17-11)

28. CHECK FOR ENGINE OIL LEAKAGE

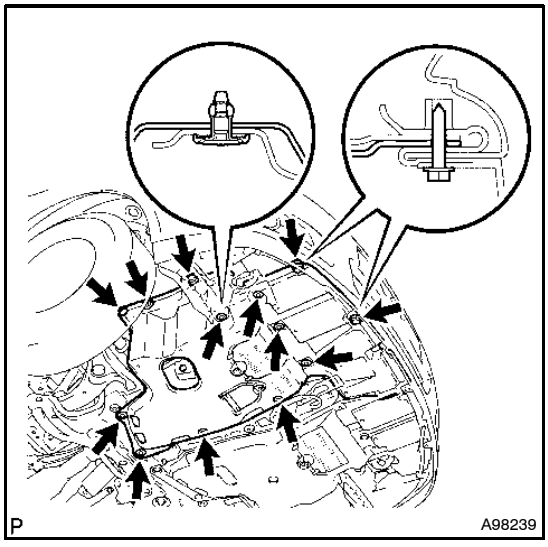
29. CHECK FOR EXHAUST GAS LEAKAGE



30. INSTALL ENGINE COVER SUB-ASSY NO.1

(a) Engage the 4 pins and install the engine cover No. 1.

31. INSTALL FLOOR PANEL BRACE FRONT (See page 15-2)

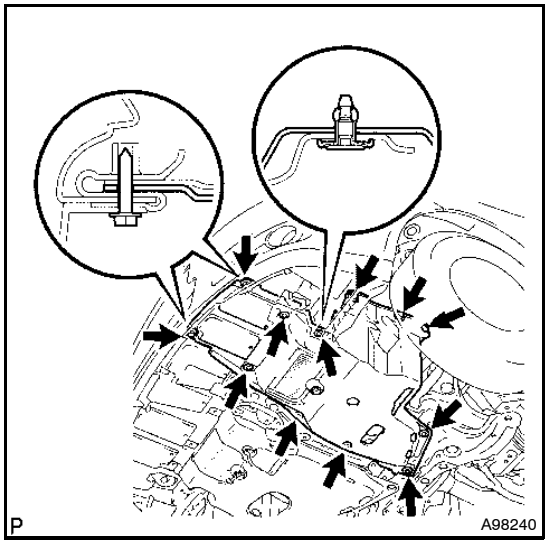


32. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE)

(a) Install the engine under cover with the 4 screws and 9 clips.

NOTICE:

Completely pierce the screw through the engine under cover.

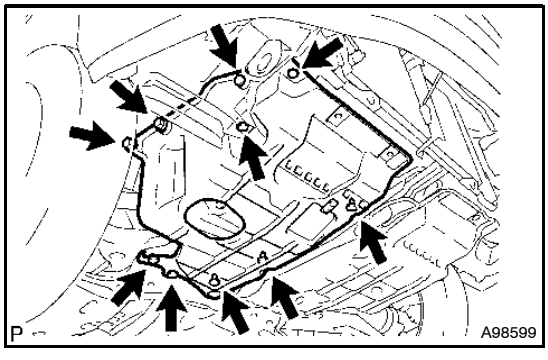


33. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE)

(a) Install the engine under cover with the 4 screws and 8 clips.

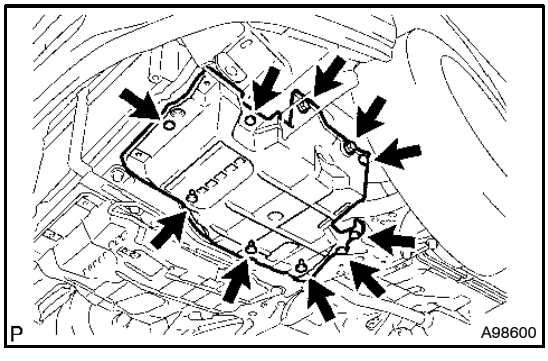
NOTICE:

Completely pierce the screw through the engine under cover.



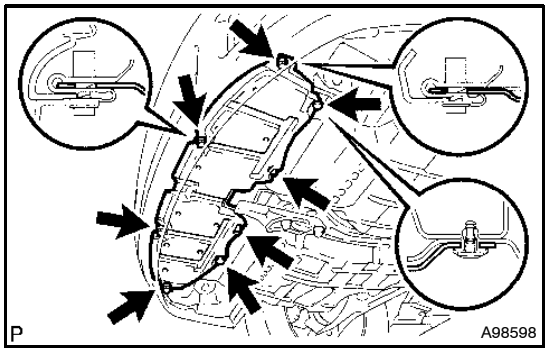
34. INSTALL ENGINE UNDER COVER RH (TMC MADE)

(a) Install the engine under cover with the 2 screws and 8 clips.



35. INSTALL ENGINE UNDER COVER LH (TMC MADE)

(a) Install the engine under cover with the 2 screws and 8 clips.



36. INSTALL ENGINE UNDER COVER (TMC MADE)

(a) Install the engine under cover with the 4 screws and 4 clips.

NOTICE:

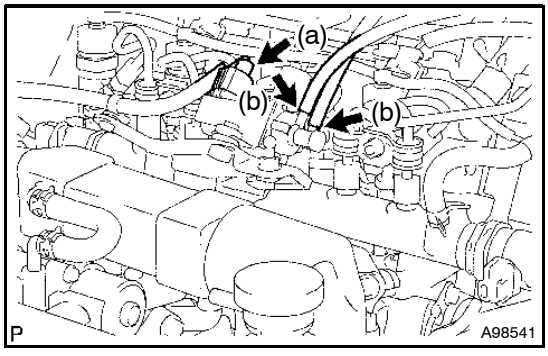
Completely pierce the screw through the engine under cover.

VACUUM REGULATING VALVE (1ND-TV)

130AM-01

REPLACEMENT

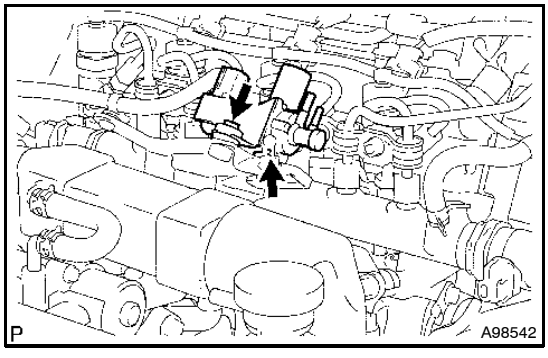
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE CYLINDER HEAD COVER NO.2 (See page 13-17)



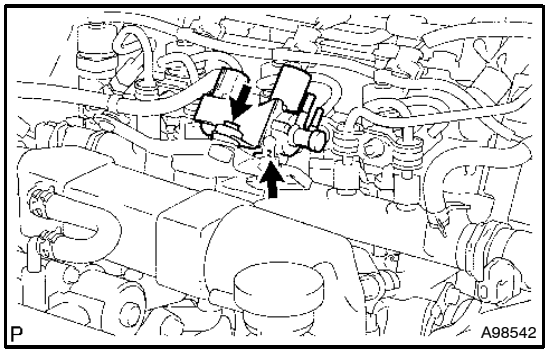
3. REMOVE VACUUM REGULATING VALVE

(a) Disconnect the vacuum regulation valve connector.

(b) Disconnect the 2 vacuum hoses from the vacuum regulation valve.



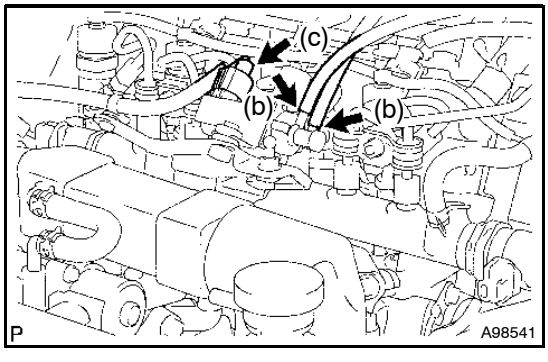
(c) Remove the 2 bolts and vacuum regulation valve.



4. INSTALL VACUUM REGULATING VALVE

(a) Install the vacuum regulation valve with the 2 bolts.

Torque: 3.4 N·m (35 kgf·cm, 30 in.·lbf)



(b) Connect the 2 vacuum hoses to the vacuum regulation valve.

(c) Connect the vacuum regulation valve connector.

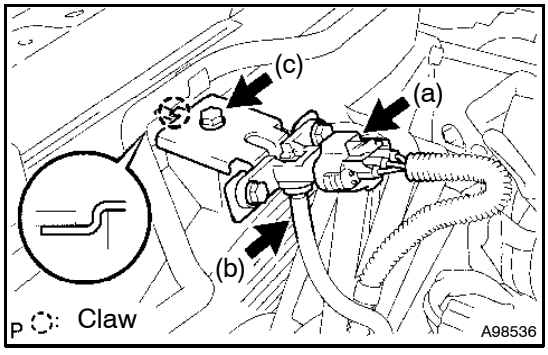
5. INSTALL CYLINDER HEAD COVER NO.2 (See page 13-17)
6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

TURBO PRESSURE SENSOR ASSY (1ND-TV)

130AN-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)

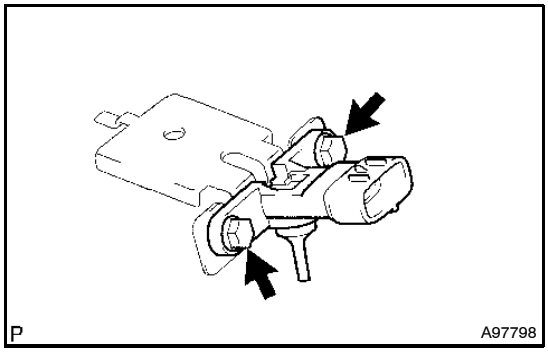


3. REMOVE TURBO PRESSURE SENSOR ASSY

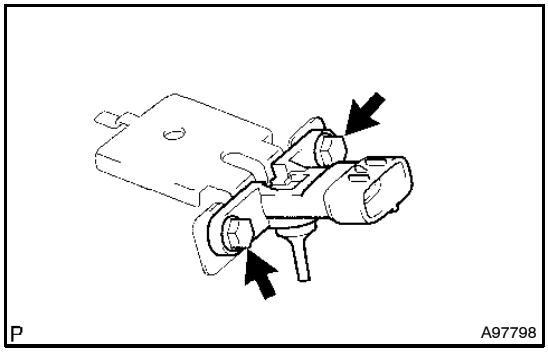
(a) Disconnect the turbo pressure sensor connector.

(b) Disconnect the vacuum hose from the turbo pressure sensor.

(c) Remove the bolt and turbo pressure sensor bracket.

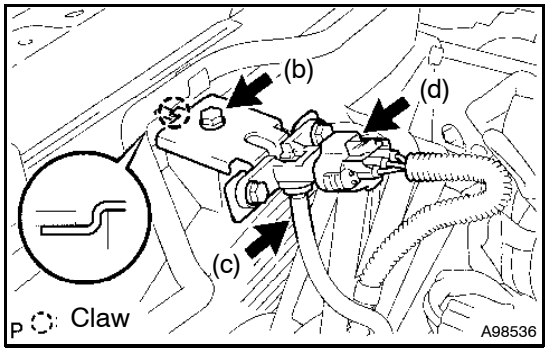


(d) Remove the 2 bolts and turbo pressure sensor.



4. INSTALL TURBO PRESSURE SENSOR ASSY

(a) Install the turbo pressure sensor bracket with 2 bolts.
Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)



(b) Install the turbo pressure sensor with the bolt.
Torque: 5.0 N·m (50 kgf·cm, 44 in.·lbf)

(c) Connect the vacuum hose to the turbo pressure sensor.

(d) Connect the turbo pressure sensor connector.

5. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)
6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
   Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

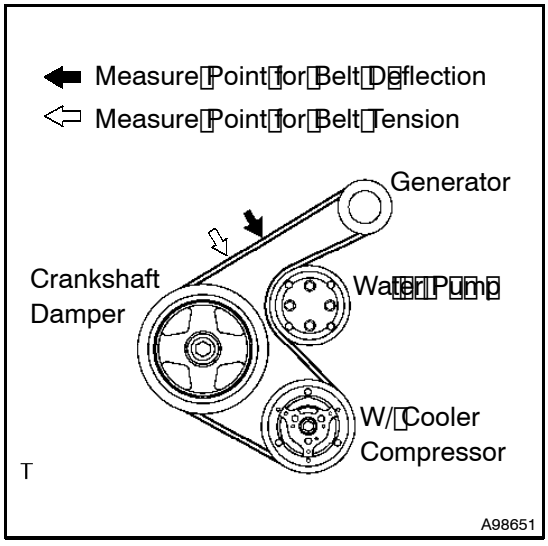
ENGINE MECHANICAL

ENGINE (1ND-TV)

141ZZ-01

INSPECTION

1. INSPECT ENGINE COOLANT (See page 16-1)
2. INSPECT ENGINE OIL (See page 17-1)
3. INSPECT BATTERY (See page 19-6)
4. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSY



5. INSPECT FAN AND GENERATOR V BELT

(a) Inspect fan and generator V belt deflection.

Pressing force: 98 N (10 kgf, 221 lbf)

	New belt mm (in.)	Used belt mm (in.)
Fan and generator V belt	5.0 to 6.0 (0.197 to 0.236)	7.0 to 8.5 (0.276 to 0.335)

(b) Inspect fan and generator V belt tension.

	New belt N (kg, lb)	Used belt N (kg, lb)
Fan and generator V belt	980 to 1176 (100 to 120, 220 to 264)	490 to 686 (50 to 70, 110 to 154)

NOTICE:

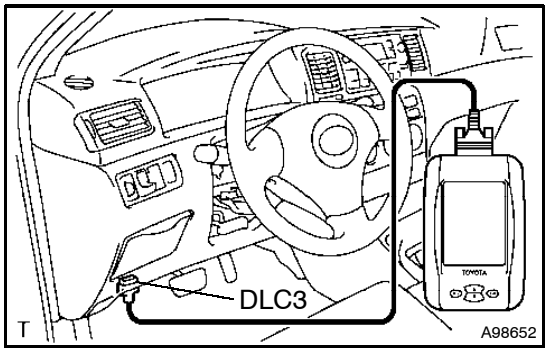
- **Check the V belt deflection at the specified point.**
- **When installing a new belt, set its tension value to as specified.**
- **When checking a belt used for over 5 minutes, confirm that the deflection value is within the specified range.**
- **When reinstalling a belt used for over 5 minutes, check whether its deflection value is within the specified range for the used belt.**
- **When using a belt tension gauge, confirm its accuracy first by using a master gauge.**

6. CHECK ENGINE IDLE SPEED AND MAXIMUM SPEED

NOTICE:

- **Turn all the electrical systems and the A/C OFF.**
- **Inspect the ignition timing with the cooling fan OFF.**

(a) Warm up and stop the engine.



(b) When using the intelligent tester II:

(1) Connect the intelligent tester II to the DLC3.
(2) Turn the engine switch to ON.
(3) Select the following menu items:
Powertrain / Engine and ECT / Data List / Engine SPD.

HINT:

Refer to the intelligent tester II operator's manual for further information regarding the selection of Data List.

(4) Inspect the engine idling speed.

Idling speed: 720 to 820 rpm

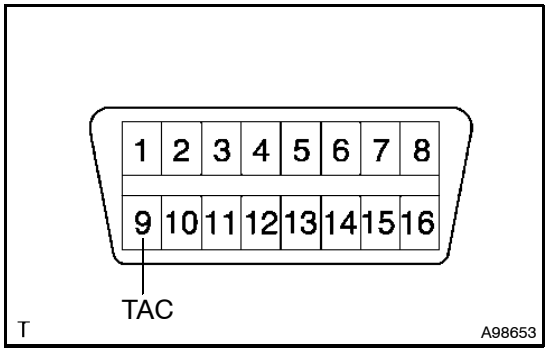
(5) Depress the accelerator pedal all the way fully depress the accelerator pedal.

(6) Check the maximum speed.

Maximum speed: 5100 to 5250 rpm

(7) Turn the engine switch to OFF.

(8) Disconnect the intelligent tester II from the DLC3.



(c) When not using the intelligent tester II:

(1) Install SST to terminal 9 (TAC) of DLC3, then connect a tachometer.

SST 09843-18040

NOTICE:

Make sure of the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.

(2) Turn the engine switch to ON.

(3) Inspect the engine idling speed.

Idle speed: 720 to 820 rpm

(4) Fully depress the accelerator pedal.

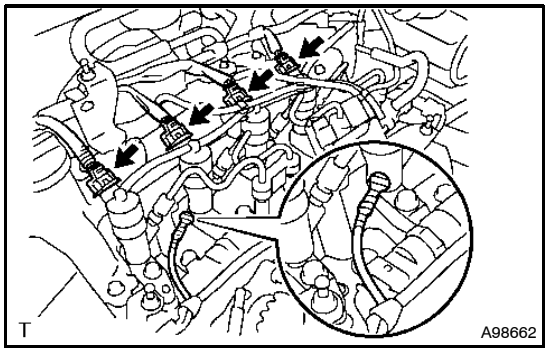
(5) Check the maximum speed.

Maximum speed: 5100 to 5250 rpm

(6) Turn the engine switch to OFF.

(7) Disconnect the tachometer.

(8) Remove SST from terminal 9.



7. INSPECT COMPRESSION

(a) Warm up and stop the engine.

(b) Remove the 4 glow plugs (see page 19-14).

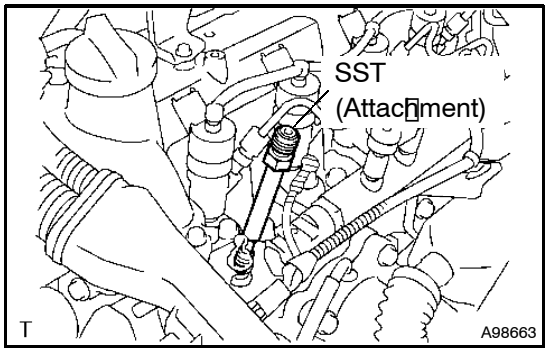
NOTICE:

In order to avoid shorting the circuit of the wire harness connected to the glow plug No. 1 connector, wind vinyl tape around the wire harness terminal portion.

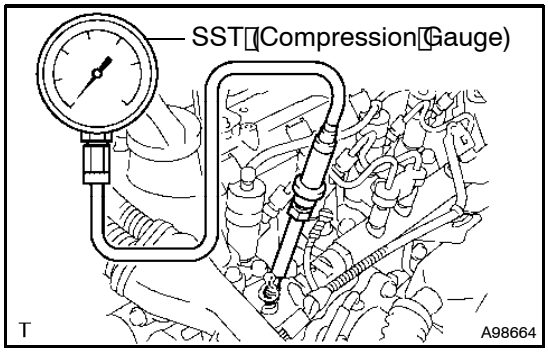
(c) Disconnect all the connectors from the 4 injectors.

(d) Connect the battery negative terminal.

(e) Turn the starter before measuring the compression and discharge the foreign objects.



(f) Install the attachment into the glow plug hole.
SST 09992-00025 (09992-00121)
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



(g) Connect a compression gauge to the attachment.
SST 09992-00025 (09992-00211)

(h) While cranking the engine, measure the compression pressure.
Compression pressure:
2,700 kPa (27.5 kgf/cm², 391 psi) or more
Minimum pressure:
2,200 kPa (22.5 kgf/cm², 320 psi)
Difference between each cylinder:
500 kPa (5.0 kgf/cm², 71 psi) or less

NOTICE:

- **Use a fully-charged battery so that the engine speed can be increased to 250 rpm or more.**
- **Inspect the other cylinders in the same way.**
- **Measure the compression pressure in as short a time as possible.**

If the cylinder compression is low, pour a light coat of engine oil into the cylinder through the glow plug hole, then inspect it again.

HINT:

- If adding oil increases the compression, the piston rings and/or cylinder bore may be worn or damaged.
- If the pressure stays low, a valve may be stuck or seated improperly, or there may be leakage from the gasket.

(i) Remove the compression gauge and attachment.

(j) Disconnect cable from negative battery terminal.

(k) Connect all the connectors to the 4 injectors.

(l) Install the 4 glow plugs (see page 19-14).

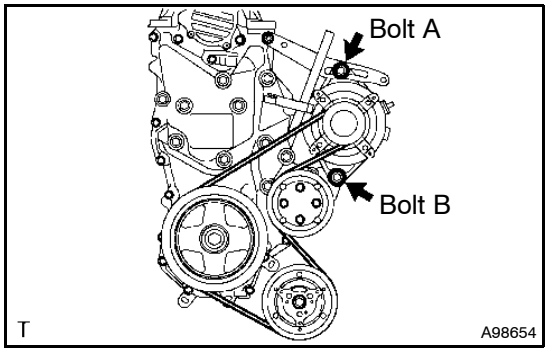
8. INSPECT DIESEL SMOKE

FAN AND GENERATOR V BELT (1ND-TV)

141ZW-01

REPLACEMENT

1. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
2. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)

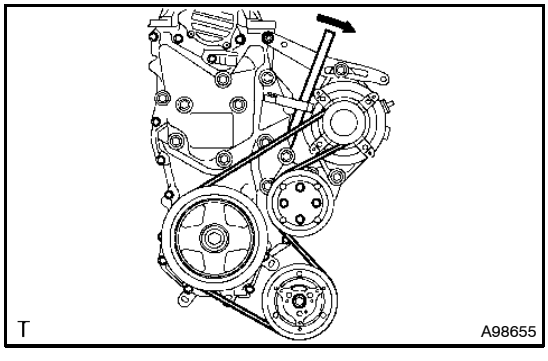


3. **REMOVE FAN AND GENERATOR V BELT**
(a) Loosen bolt A and B.
(b) Remove the fan and generator V belt.

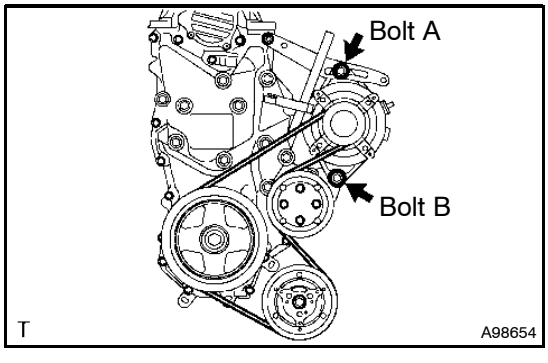
4. **INSTALL FAN AND GENERATOR V BELT**
(a) Temporarily install the fan and generator V belt onto each pulley.

NOTICE:

- **Before installing the V belt, check each pulley for any adhesion of foreign materials such as oil, any kind of liquid, and chips.**
- **Check that the ribs of the V belt are correctly fitted into the grooves of the pulleys.**



5. **ADJUST FAN AND GENERATOR V BELT**
(a) Insert a bar between the generator and the engine. Pull the bar toward the front of the vehicle and adjust the tension.



(b) Tighten bolt A, then tighten bolt B.
19 N·m (189 kgf·cm, 14 ft·lbf) for bolt A
32 N·m (326 kgf·cm, 24 ft·lbf) for bolt B

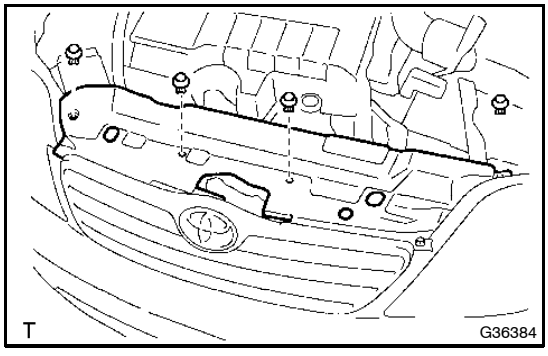
6. INSPECT FAN AND GENERATOR V BELT (See page 14-1)
7. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
8. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)

VALVE CLEARANCE (1ND-TV)

141ZV-01

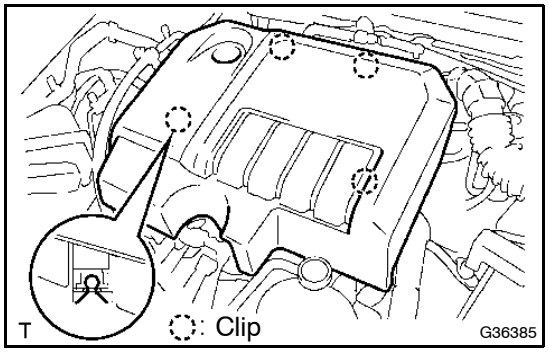
ADJUSTMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)



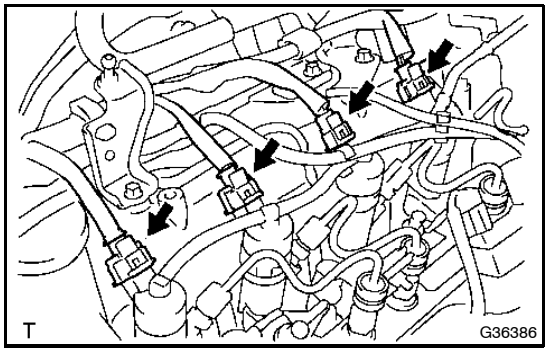
4. REMOVE RADIATOR SUPPORT OPENING COVER

(a) Remove the 4 clips, then remove the radiator support opening cover.



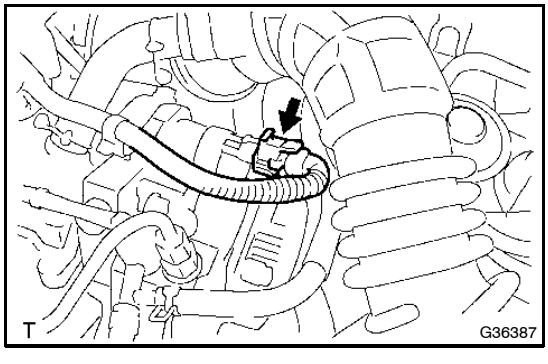
5. REMOVE ENGINE COVER SUB-ASSY NO.1

(a) Disengage the 4 clips and remove the engine cover sub-assy No. 1.

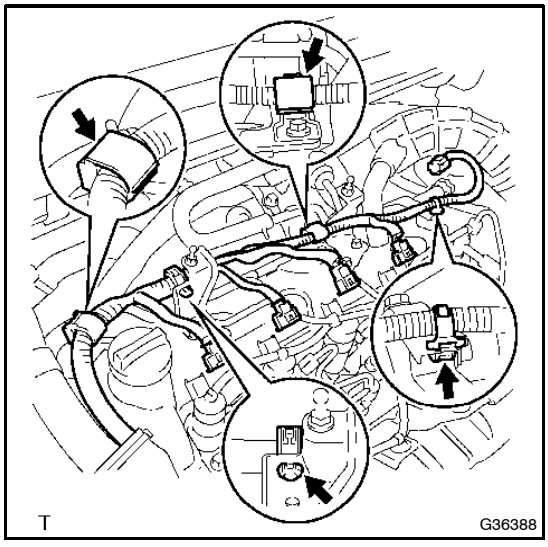


6. REMOVE CYLINDER HEAD COVER SUB-ASSY

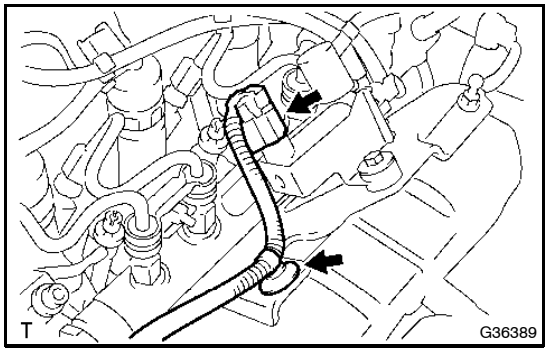
(a) Disconnect the injector connectors.



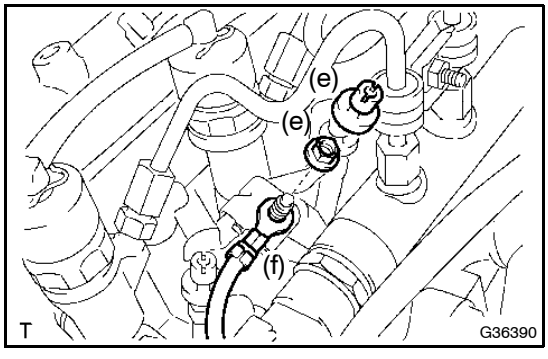
(b) Disconnect the supply pump connector.



(c) Disengage the wire harness clamps shown in the illustration.

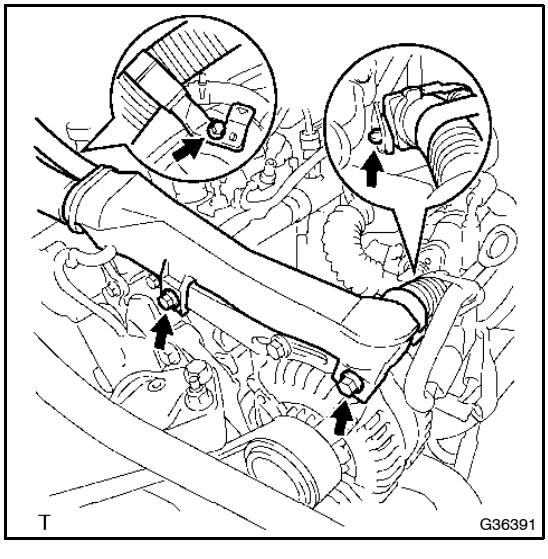


(d) Disconnect the VSV connector shown in the illustration, and disengage the wire harness clamp shown in the illustration.

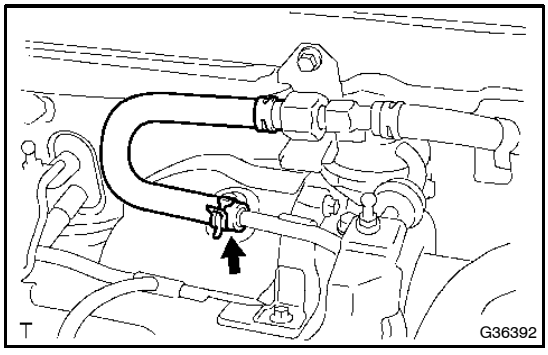


(e) Remove the screw grommet and nut, then separate the wire harness.

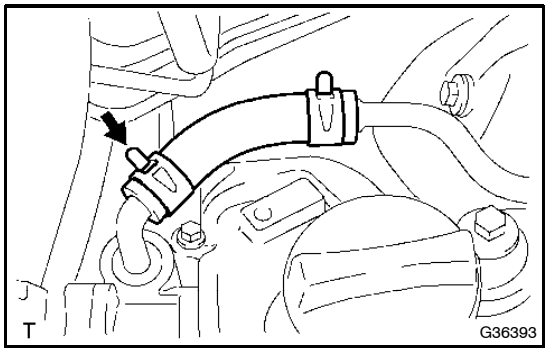
(f) Disconnect the common rail connector.



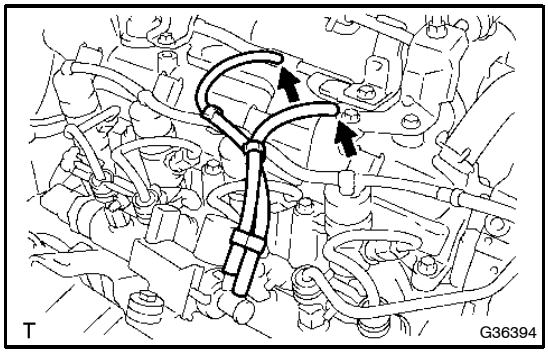
(g) Remove the 3 bolts and the wire harness clamp shown in the illustration and disconnect the engine wire harness.



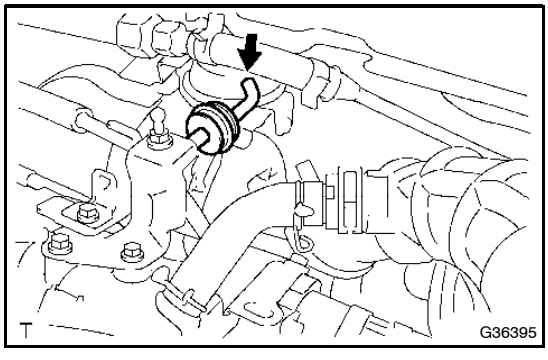
(h) Disconnect the hose shown in the illustration.



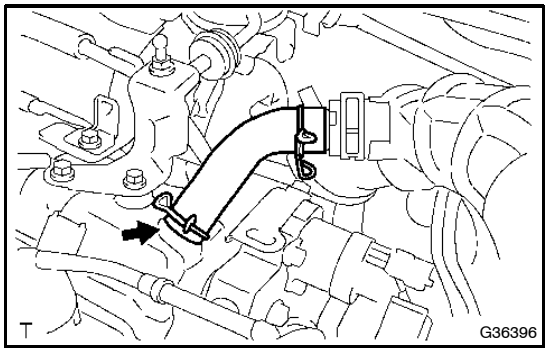
(i) Disconnect the hose shown in the illustration.



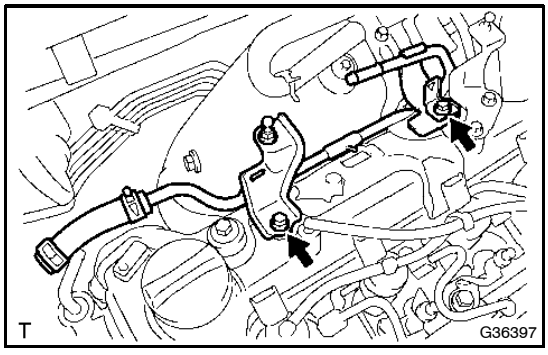
(j) Disconnect the 2 vacuum hoses shown in the illustration.



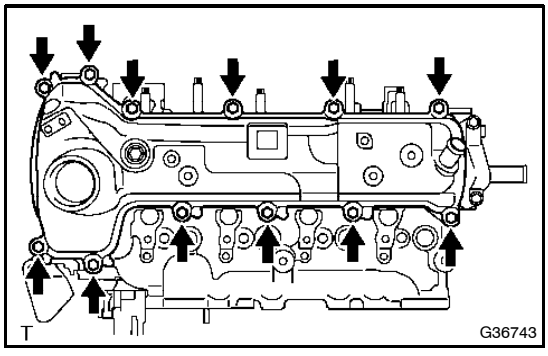
(k) Disconnect the vacuum hose shown in the illustration.



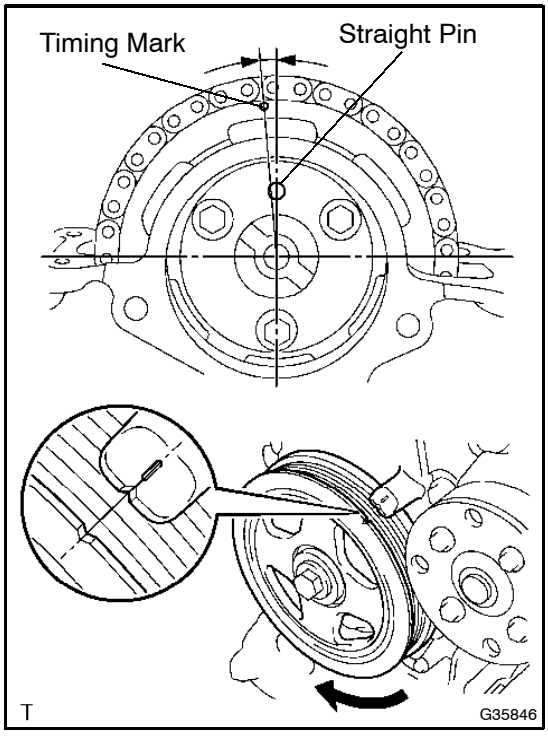
(l) Disconnect the ventilation hose from the cylinder head.



(m) Remove the 2 bolts, then remove the connector to vacuum reservoir tube.



(n) Remove the 12 bolts, then remove the cylinder head cover.



7. INSPECT CHECK VALVE CLEARANCE

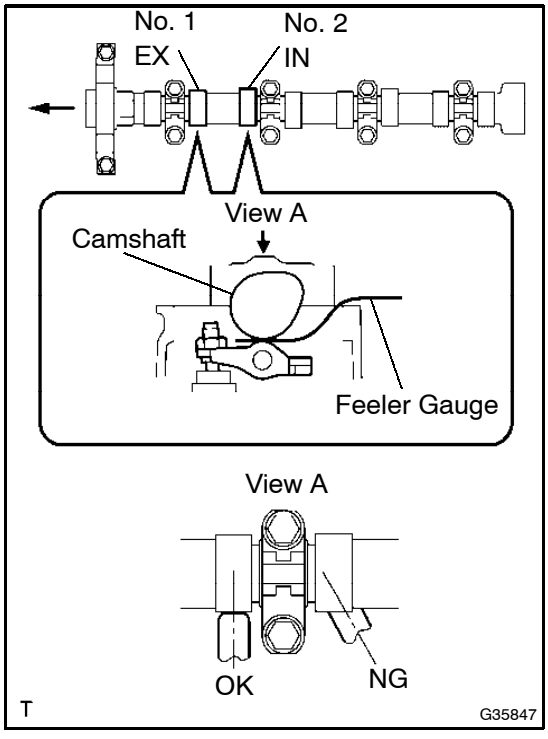
(a) Set the No. 1 cylinder to TDC/Compression.

(1) Turn the crankshaft pulley until the grooves of the crankshaft damper and oil pump are aligned.

(2) Check that the timing mark of the camshaft timing sprocket and the straight pin hole of the crankshaft timing sprocket are in the positions shown in the illustration.

HINT:

If not, turn the crankshaft damper 1 revolution (360°) to align them as above.



(b) Check the valve clearance of the No. 1 cylinder exhaust valve and the No. 2 cylinder intake valve.

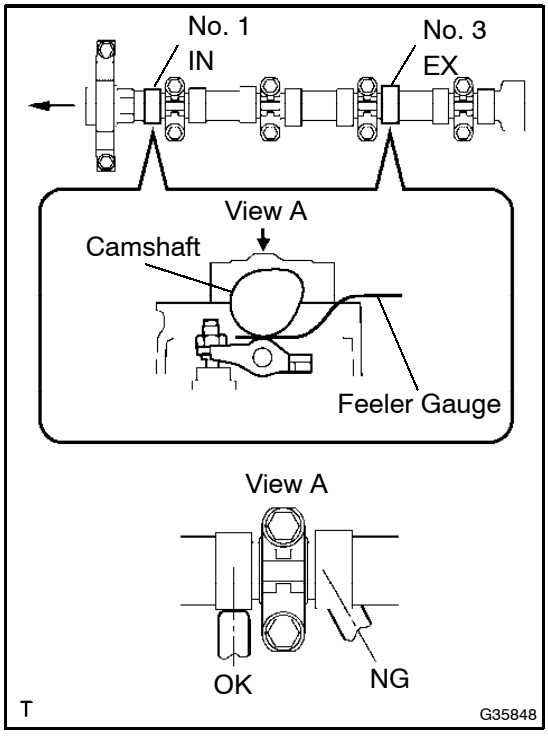
(1) Using a feeler gauge, measure the clearance between the camshaft and valve rocker arm No. 1.

Valve clearance (Cold):
0.11 to 0.17 mm (0.004 to 0.007 in.) for intake
0.14 to 0.20 mm (0.006 to 0.008 in.) for exhaust

NOTICE:

- **Insert the feeler gauge into the center of the roller surface, parallel to the valve rocker arm No. 1.**
- **Take care not to apply excessive force to the valve adjusting screw when using adjusting tools such as SST and a screwdriver.**

HINT:
If the clearance is not as specified, record the out-of-specification measurement, then adjust the valve clearance.



(c) Check the valve clearance of the No. 1 cylinder intake valve and the No. 3 cylinder exhaust valve.

(1) Turn the crankshaft by a further 180° clockwise.

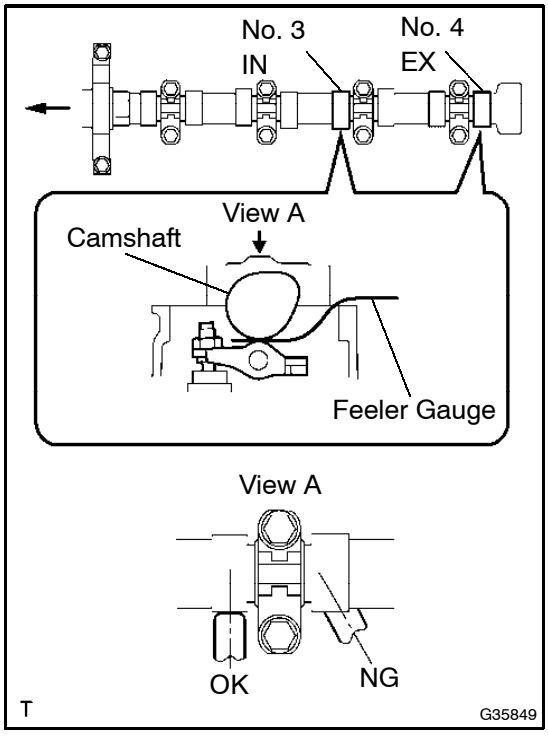
(2) Using a feeler gauge, measure the clearance between the camshaft and valve rocker arm No. 1 as shown in the illustration.

Valve clearance (Cold):
0.11 to 0.17 mm (0.004 to 0.007 in.) for intake
0.14 to 0.20 mm (0.006 to 0.008 in.) for exhaust

NOTICE:

- **Insert the feeler gauge into the center of the roller surface, parallel to the valve rocker arm No. 1.**
- **Take care not to apply force to the valve adjusting screw with adjusting tools when measuring or adjusting.**

HINT:
If the clearance is not as specified, record the out-of-specification measurement, then adjust the valve clearance.



(d) Check the valve clearance of the No. 3 cylinder intake valve and No. 4 cylinder exhaust valve.

(1) Turn the crankshaft by a further 180° clockwise.

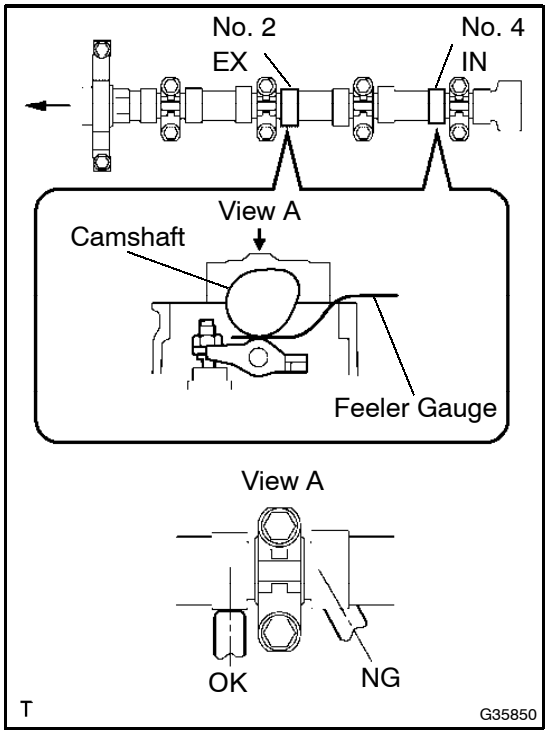
(2) Using a feeler gauge, measure the clearance between the camshaft and valve rocker arm No. 1 as shown in the illustration.

Valve clearance (Cold):
0.11 to 0.17 mm (0.004 to 0.007 in.) for intake
0.14 to 0.20 mm (0.006 to 0.008 in.) for exhaust

NOTICE:

- **Insert the feeler gauge into the center of the roller surface, parallel to the valve rocker arm No. 1.**
- **Take care not to apply force to the valve adjusting screw with adjusting tools when measuring or adjusting.**

HINT:
If the clearance is not as specified, record the out-of-specification measurement, then adjust the valve clearance.



(e) Check the valve clearance of the No. 2 cylinder exhaust valve and No. 4 cylinder intake valve.

(1) Turn the crankshaft by a further 180° clockwise.

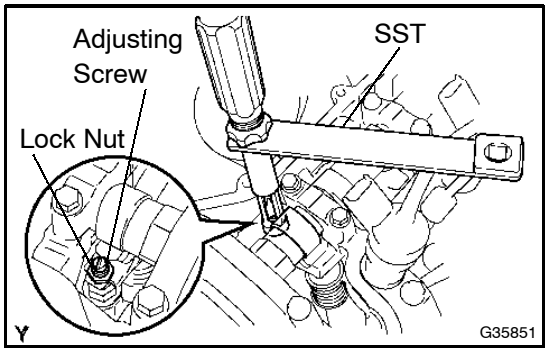
(2) Using a feeler gauge, measure the clearance between the camshaft and valve rocker arm No. 1.

Valve clearance (Cold):
0.11 to 0.17 mm (0.004 to 0.007 in.) for intake
0.14 to 0.20 mm (0.006 to 0.008 in.) for exhaust

NOTICE:

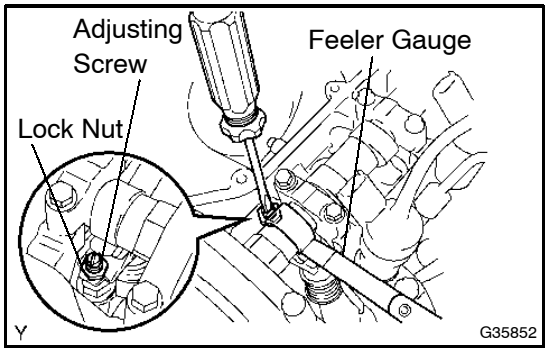
- **Insert the feeler gauge into the center of the roller surface, parallel to the valve rocker arm No. 1.**
- **Take care not to apply force to the valve adjusting screw with adjusting tools when measuring or adjusting.**

HINT:
If the clearance is not as specified, record the out-of-specification measurement, then adjust the valve clearance.



8. ADJUST VALVE CLEARANCE

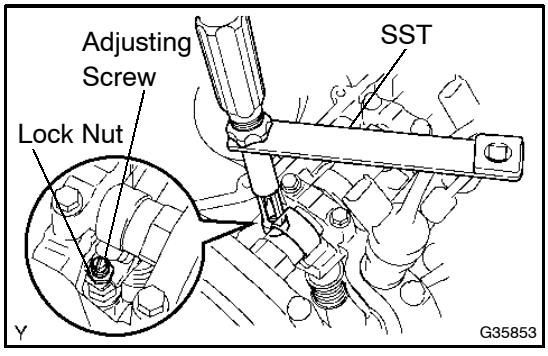
(a) Using SST and a screwdriver, loosen the valve adjusting nut while keeping the valve adjusting screw in position.
SST 09248-56010



(b) Adjust the valve clearance (intake side).

(1) Insert a thickness gauge (0.14 mm (0.006 in.)) between the camshaft and valve rocker arm No. 1, and turn the valve adjusting screw to adjust it.

Valve clearance (Cold): 0.14 mm (0.006 in.)



(2) Using SST and a screwdriver, tighten the valve adjusting nut while keeping the valve adjusting screw in position.

SST 09248-56010

Torque:

20 N·m (204 kgf·cm, 15 ft·lbf)

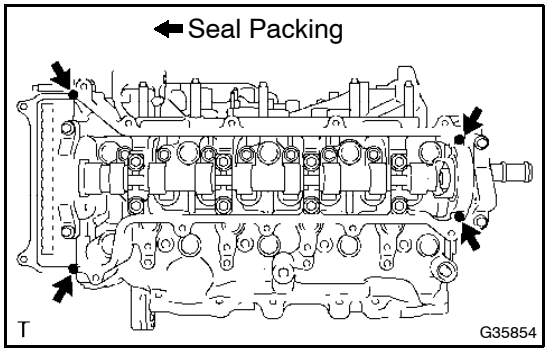
13 N·m (133 kgf·cm, 9.6 ft·lbf) for use with SST

(c) Adjust the valve clearance (exhaust side).

Valve clearance (Cold): 0.17 mm (0.007 in.)

HINT:

Perform the same procedure as for the intake valve clearance adjustment.



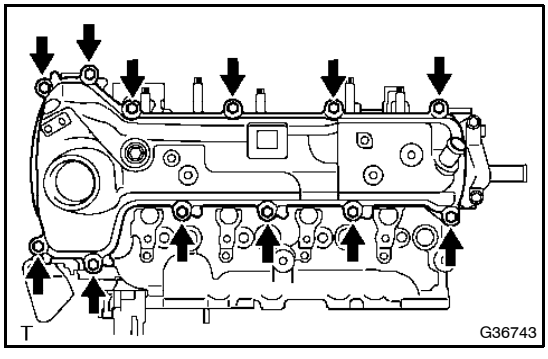
9. INSTALL CYLINDER HEAD COVER SUB-ASSY

(a) Apply seal packing to the 4 locations as shown in the illustration, then install the cylinder head cover.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

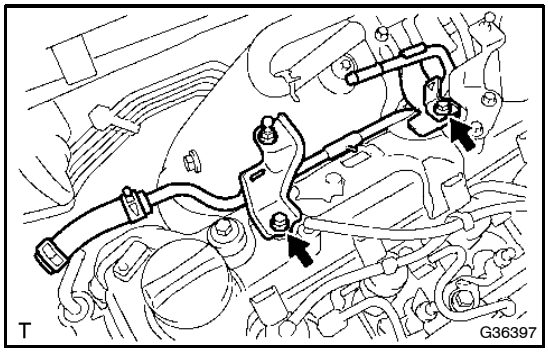
- **Remove any oil from the contact surface.**
- **Install the cylinder head cover within 3 minutes, and tighten the bolts within 15 minutes after applying seal packing.**



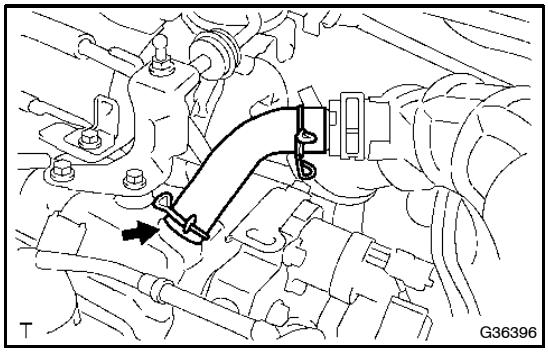
(b) Temporarily tighten the 12 bolts on the cylinder head cover.

(c) Using several steps, tighten the bolts to the specified torque in the sequence shown in the illustration.

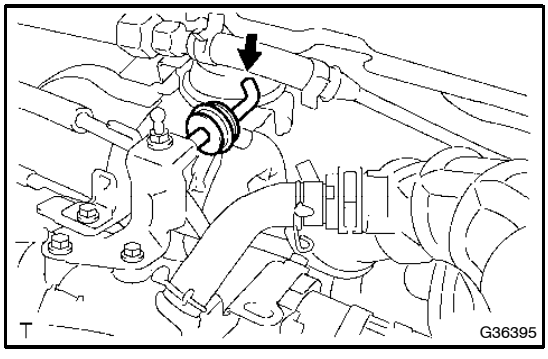
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)



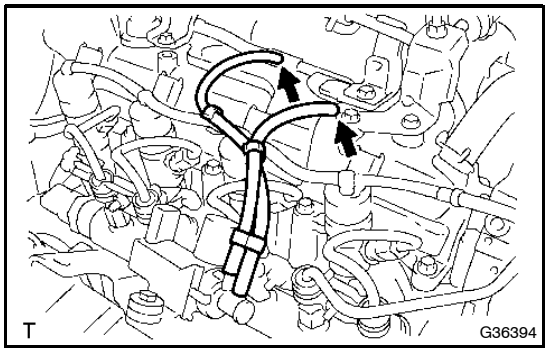
(d) Install the connector to vacuum reservoir tube with the 2 bolts.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)



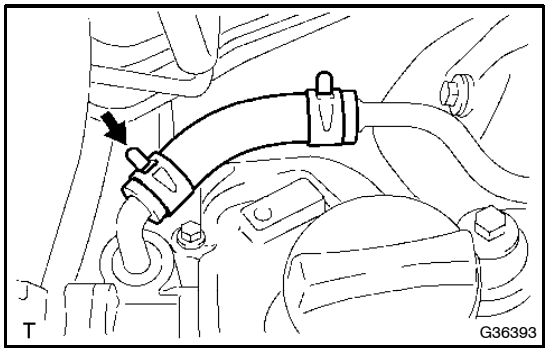
(e) Connect the ventilation hose to the cylinder head.



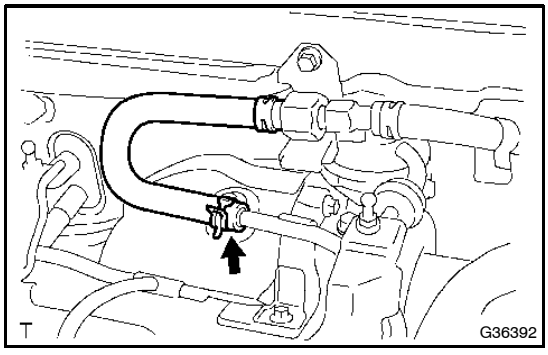
(f) Connect the vacuum hose shown in the illustration.



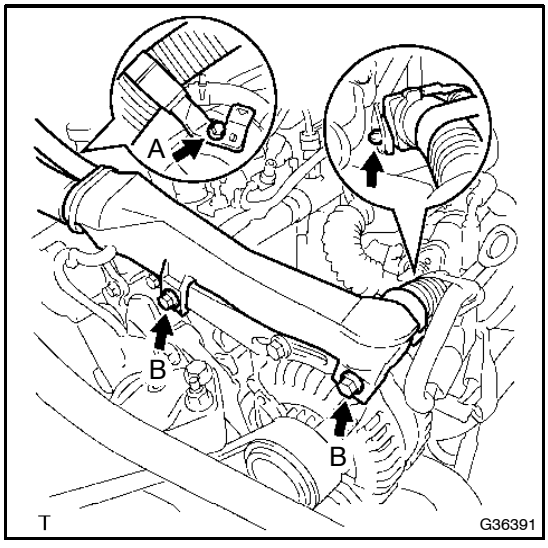
(g) Connect the 2 vacuum hoses shown in the illustration.



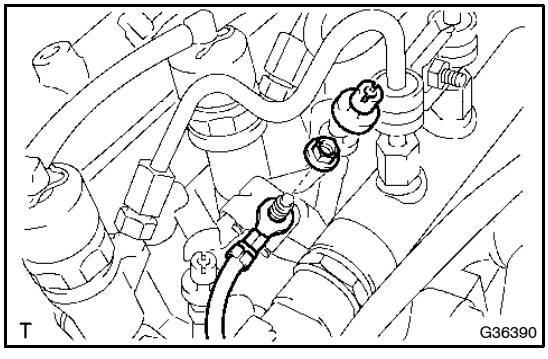
(h) Connect the hose shown in the illustration.



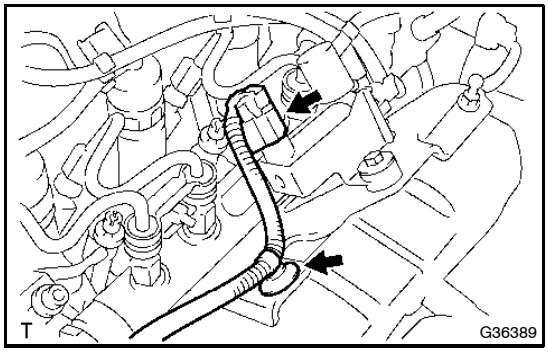
(i) Connect the hose shown in the illustration.



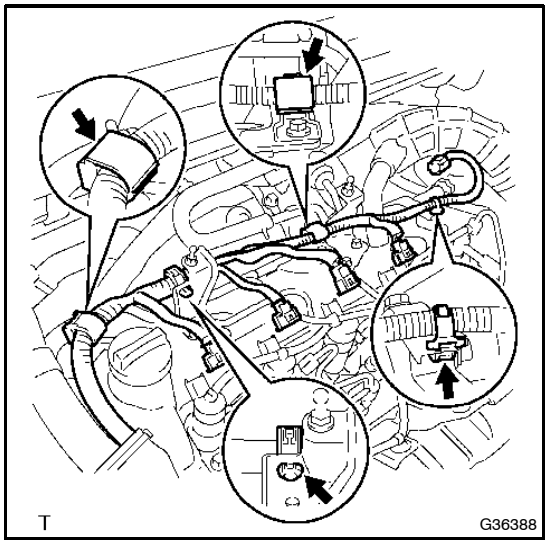
(j) Install the 3 bolts and wire harness clamp shown in the illustration, and connect the engine wire harness.
Torque:
11 N·m (112 kgf·cm, 8.1 ft·lbf) for bolt A
13 N·m (131 kgf·cm, 9.5 ft·lbf) for bolt B



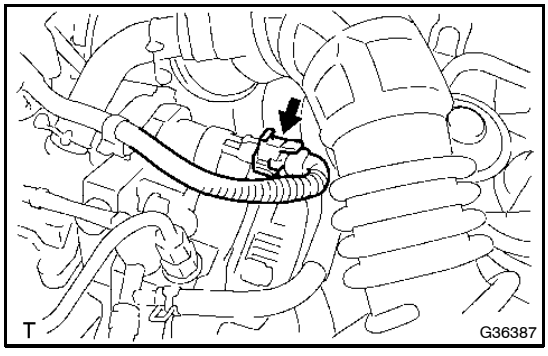
(k) Connect the common rail connector.
(l) Install the wire harness with the screw grommet and nut.
Torque: 1.6 N·m (16 kgf·cm, 14 in.·lbf)



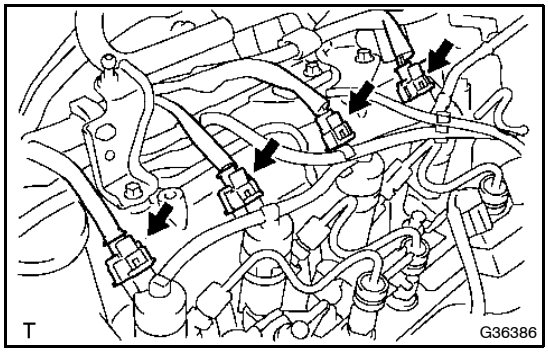
(m) Connect the VSV connector and wire harness clamp shown in the illustration.



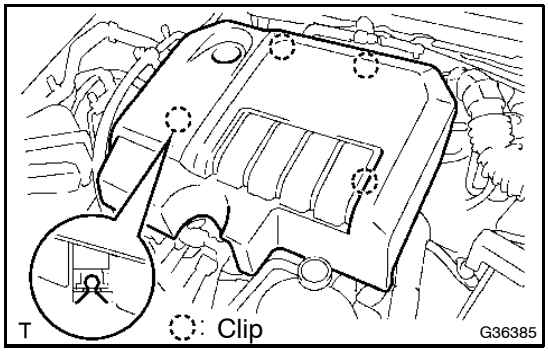
(n) Connect the wire harness clamps shown in the illustration.



(o) Connect the supply pump connector.

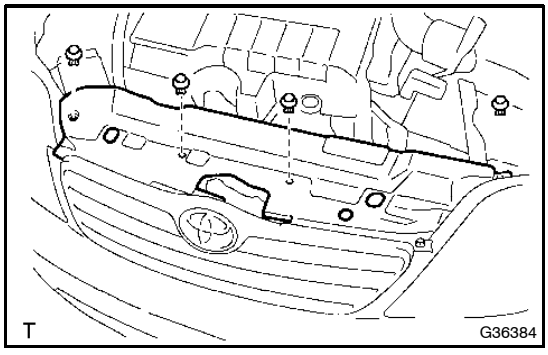


(p) Connect the injector connectors.



10. INSTALL ENGINE COVER SUB-ASSY NO.1

(a) Engage the 4 clips and install the engine cover sub-assy No. 1.



11. INSTALL RADIATOR SUPPORT OPENING COVER

(a) Install the radiator support opening cover with the 4 clips.

12. INSTALL ENGINE UNDER COVER RH (TMC MADE) **(See page 13-17)**

13. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) **(See page 13-17)**

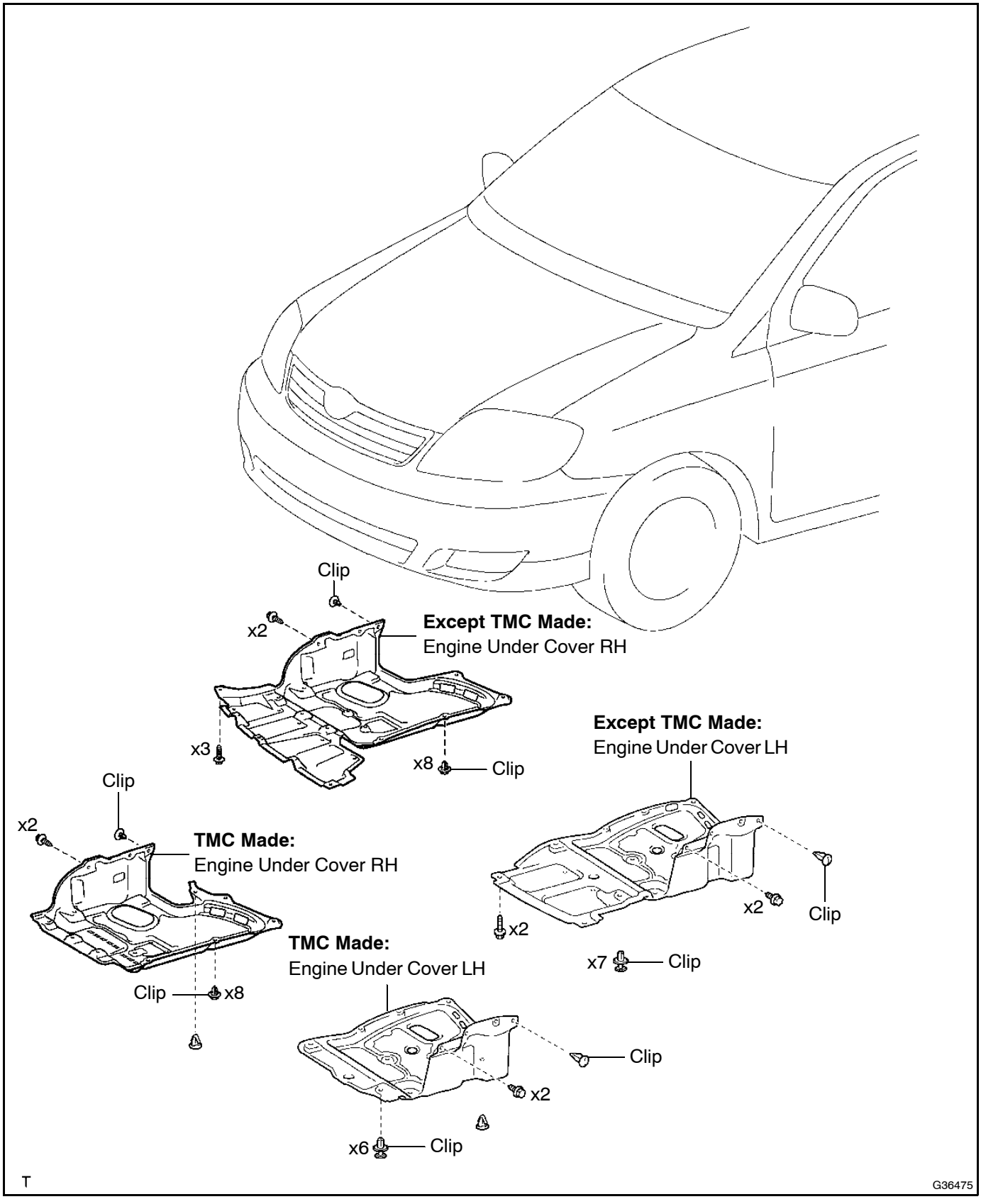
14. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

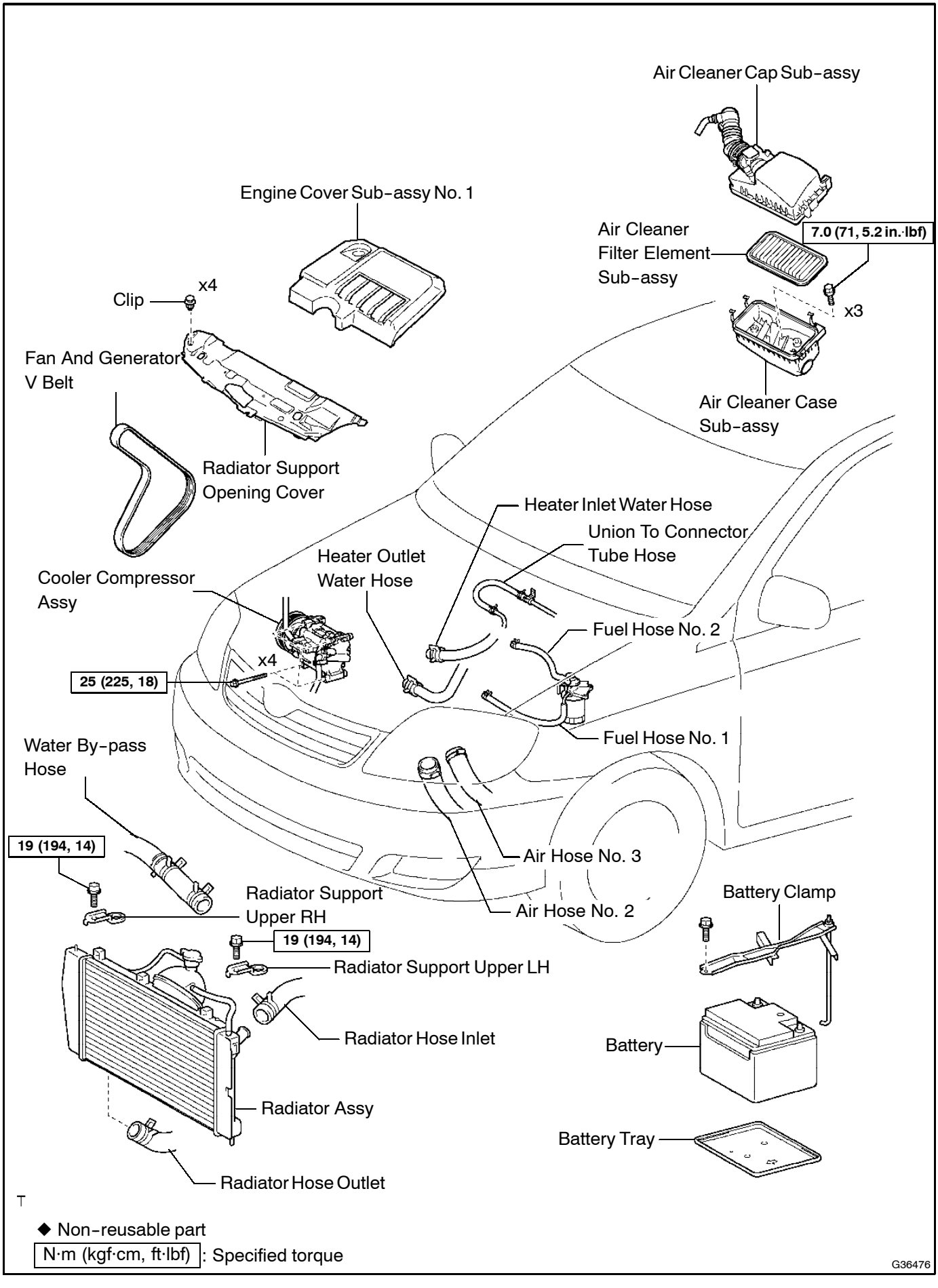
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

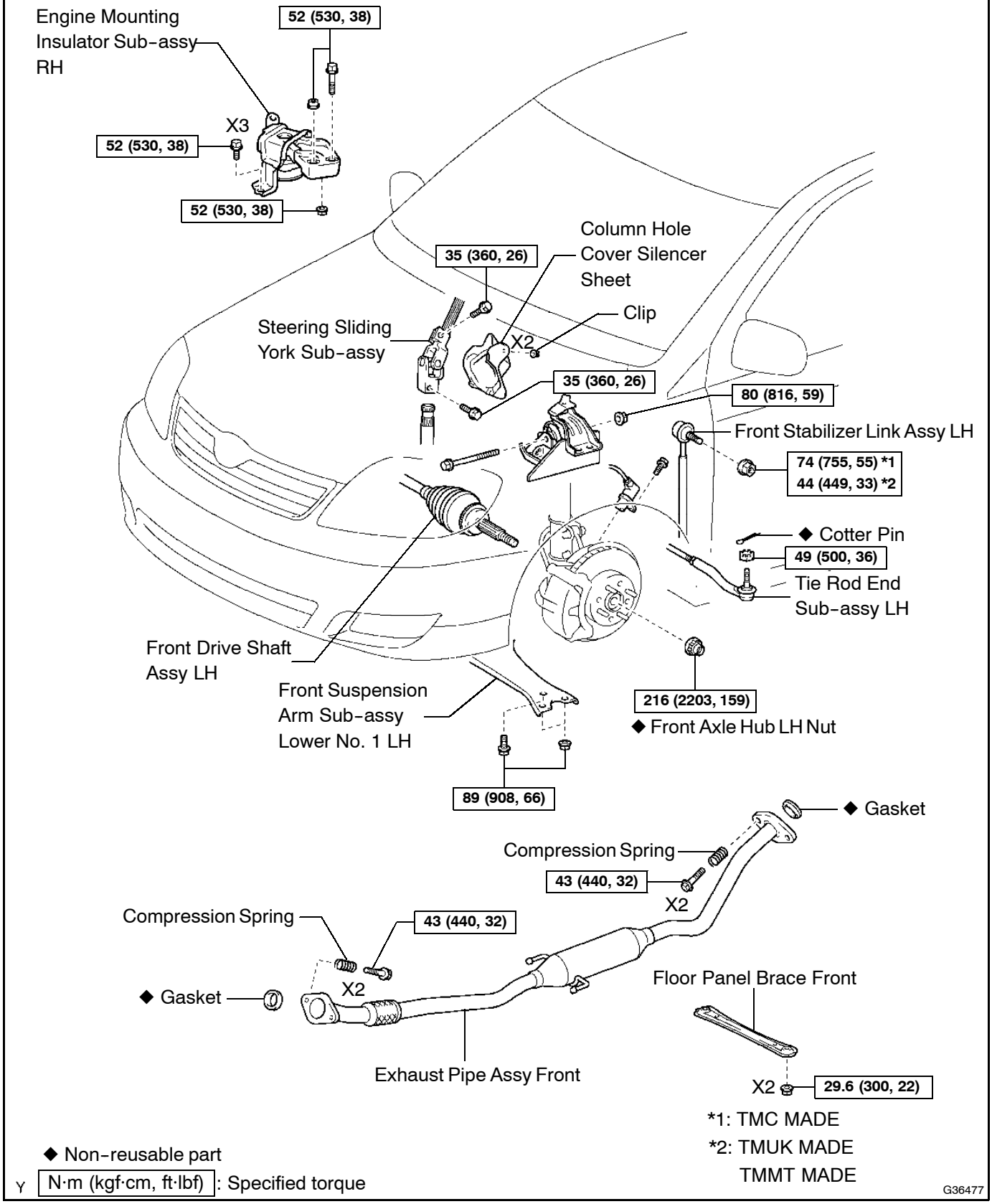
PARTIAL ENGINE ASSY (1ND-TV)

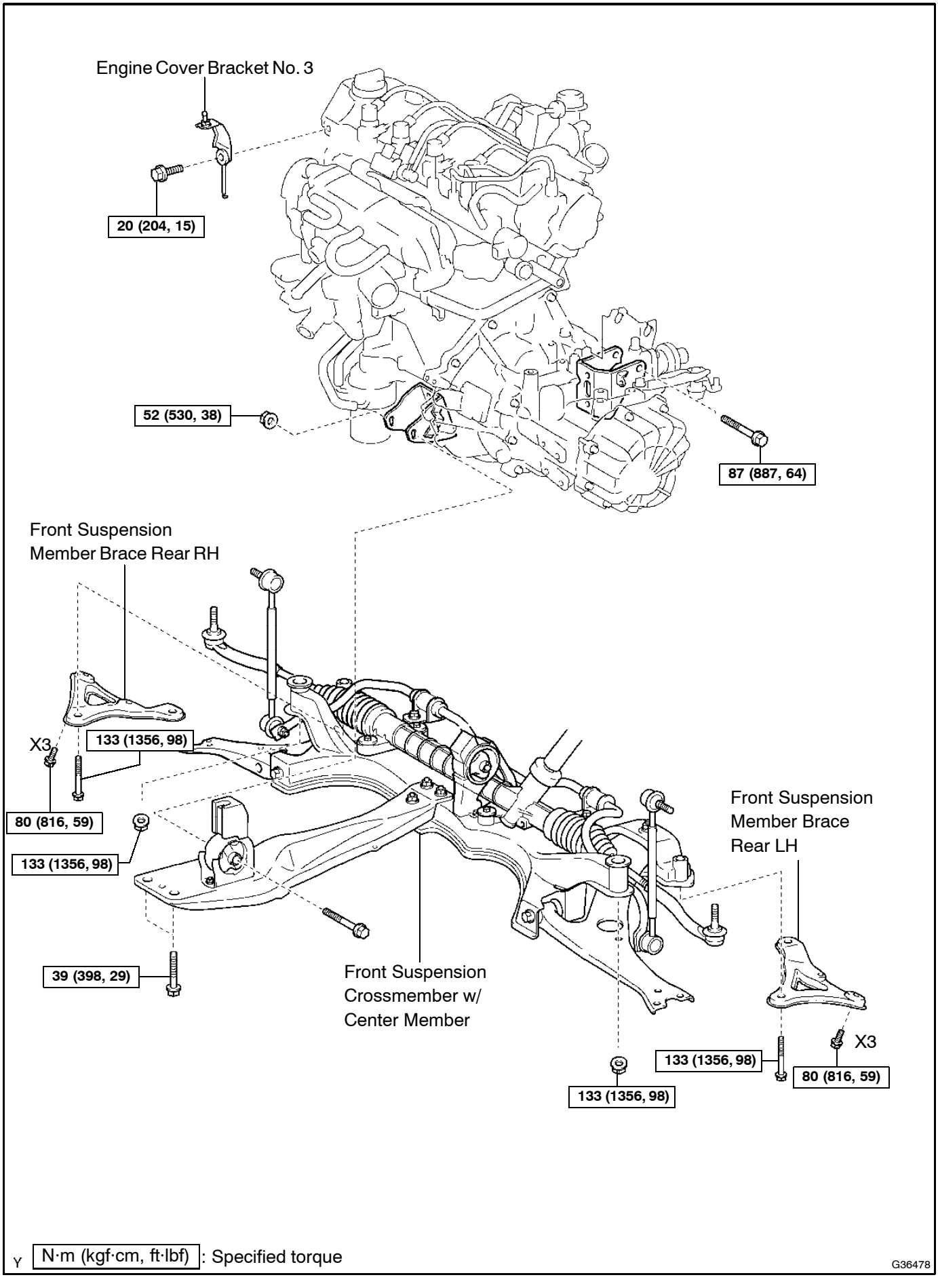
COMPONENTS

14202-01



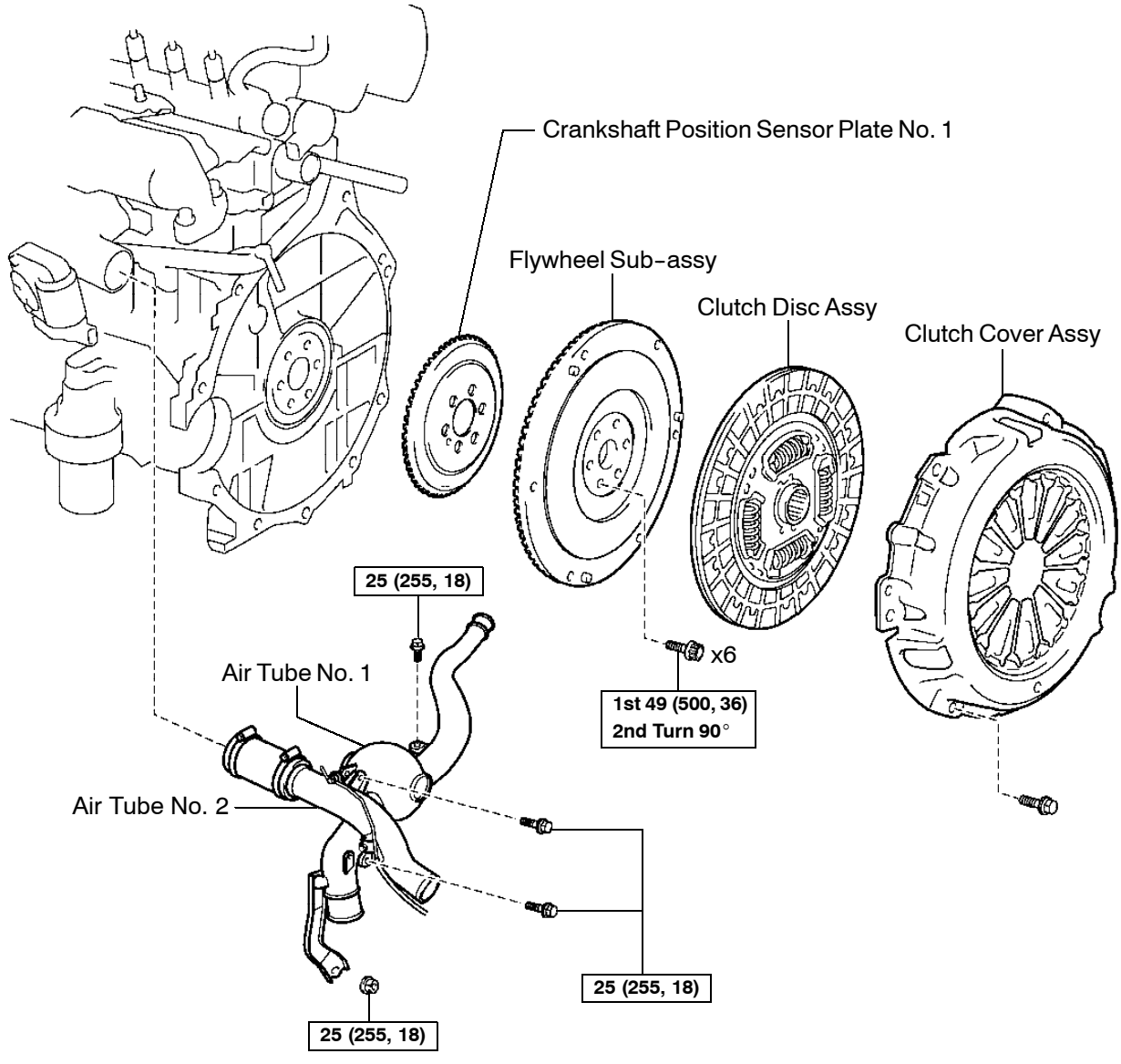

Air Cleaner Cap Sub-assy
Engine Cover Sub-assy No. 1
Air Cleaner Filter Element Sub-assy
7.0 (71, 5.2 in.·lbf)
x3
Clip
x4
Fan And Generator V Belt
Radiator Support Opening Cover
Air Cleaner Case Sub-assy
Heater Inlet Water Hose
Union To Connector Tube Hose
Heater Outlet Water Hose
Cooler Compressor Assy
Fuel Hose No. 2
x4
25 (225, 18)
Fuel Hose No. 1
Water By-pass Hose
19 (194, 14)
Air Hose No. 3
Radiator Support Upper RH
Air Hose No. 2
Battery Clamp
19 (194, 14)
Radiator Support Upper LH
Radiator Hose Inlet
Battery
Radiator Assy
Battery Tray
Radiator Hose Outlet
T
◆ Non-reusable part
N·m (kgf·cm, ft·lbf) : Specified torque
G36476


Engine Mounting Insulator Sub-assy RH
52 (530, 38)
X3
52 (530, 38)
52 (530, 38)
Column Hole Cover Silencer Sheet
35 (360, 26)
Clip
Steering Sliding York Sub-assy
X2
35 (360, 26)
80 (816, 59)
Front Stabilizer Link Assy LH
74 (755, 55) *1
44 (449, 33) *2
◆ Cotter Pin
49 (500, 36)
Tie Rod End Sub-assy LH
Front Drive Shaft Assy LH
Front Suspension Arm Sub-assy Lower No. 1 LH
216 (2203, 159)
◆ Front Axle Hub LH Nut
89 (908, 66)
◆ Gasket
Compression Spring
43 (440, 32)
X2
Compression Spring
43 (440, 32)
X2
◆ Gasket
Floor Panel Brace Front
Exhaust Pipe Assy Front
X2
29.6 (300, 22)
*1: TMC MADE
*2: TMUK MADE
TMMT MADE
◆ Non-reusable part
Y N·m (kgf·cm, ft·lbf): Specified torque
G36477



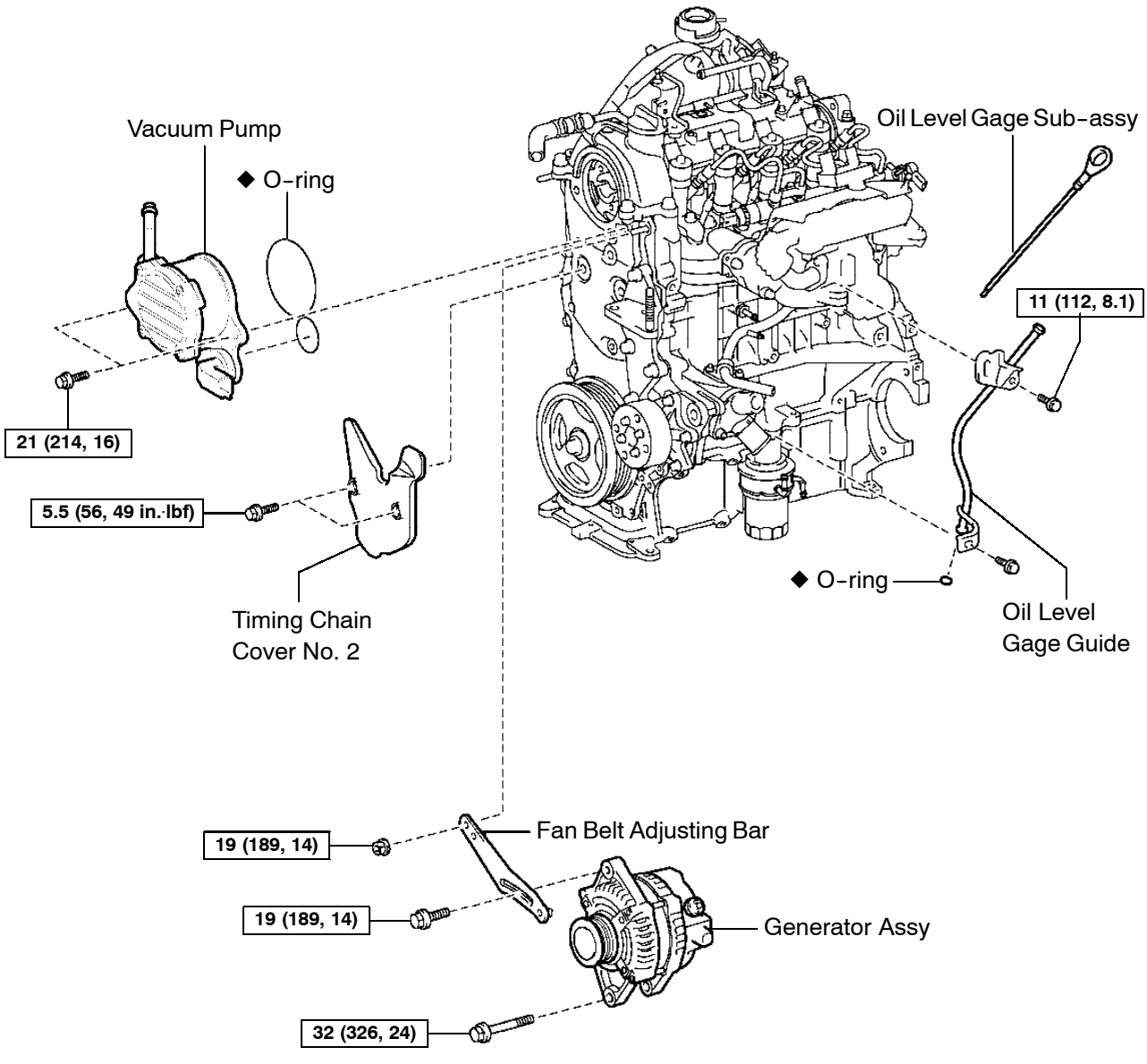
Y N·m (kgf·cm, ft·lbf) : Specified torque

G36478



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

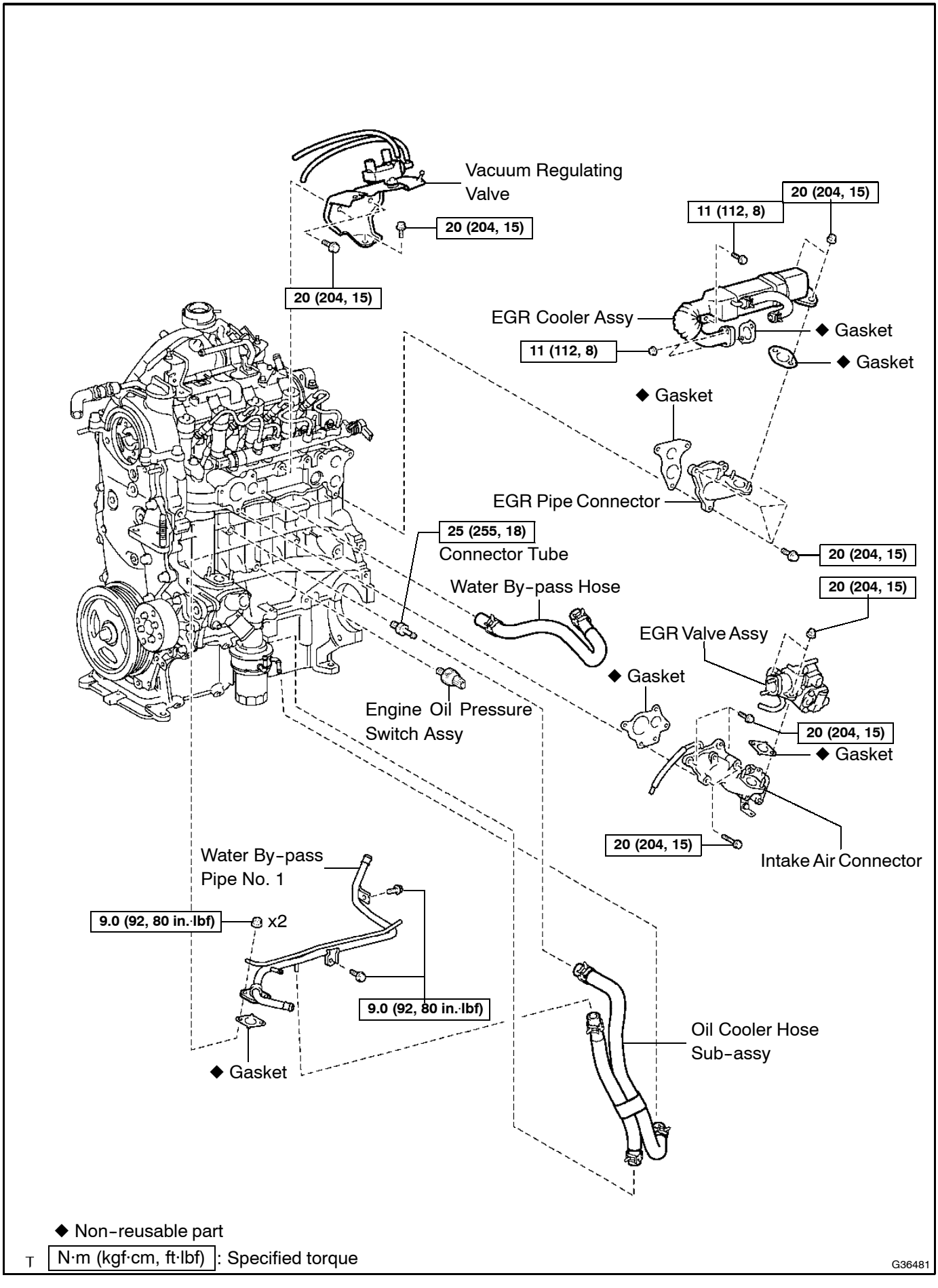
G36479



◆ Non-reusable part

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

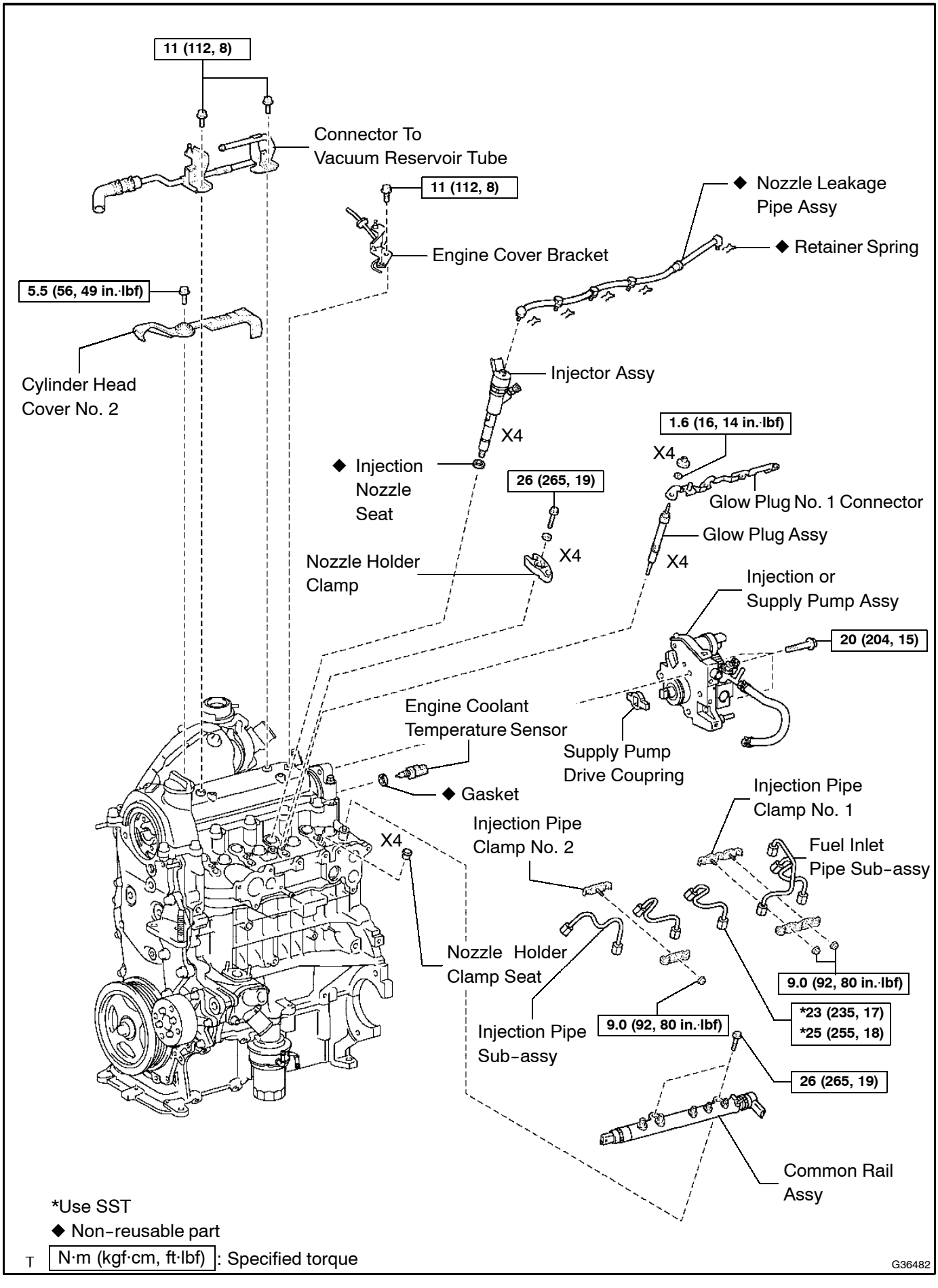
G36480

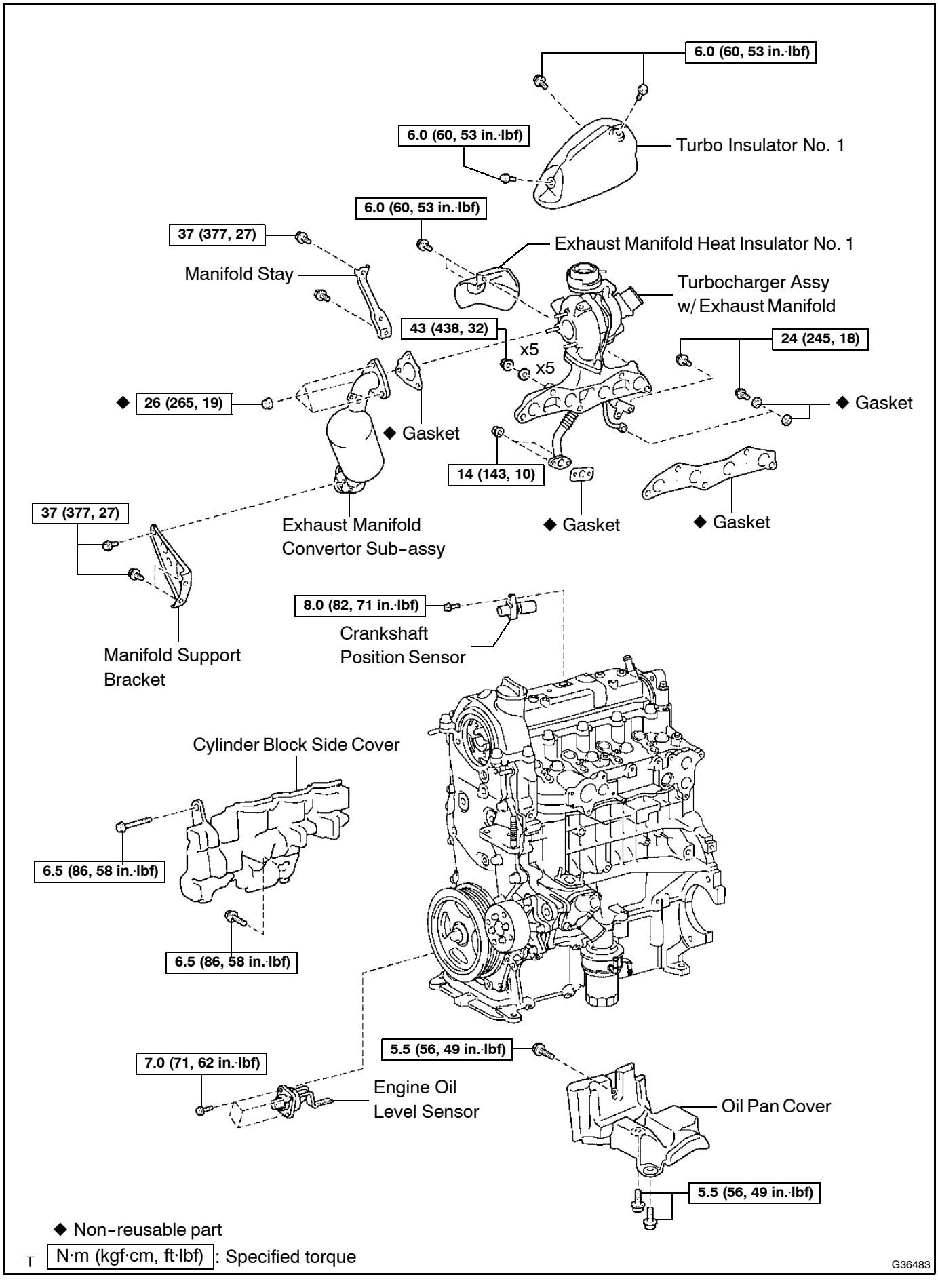


◆ Non-reusable part

T 20 (204, 15) : N·m (kgf·cm, ft·lbf): Specified torque

G36481

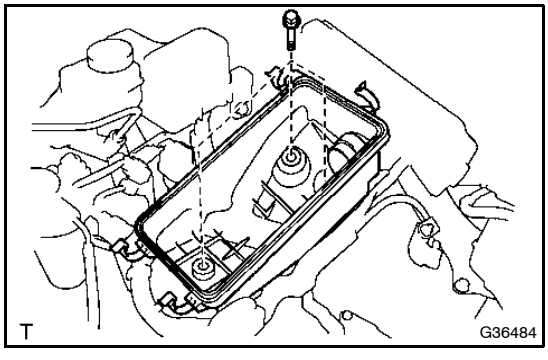

11 (112, 8)
Connector To
Vacuum Reservoir Tube
11 (112, 8)
◆ Nozzle Leakage
Pipe Assy
Engine Cover Bracket
◆ Retainer Spring
5.5 (56, 49 in.·lbf)
Cylinder Head
Cover No. 2
Injector Assy
X4
1.6 (16, 14 in.·lbf)
X4
◆ Injection
Nozzle
Seat
26 (265, 19)
Glow Plug No. 1 Connector
Glow Plug Assy
X4
X4
Nozzle Holder
Clamp
Injection or
Supply Pump Assy
20 (204, 15)
Engine Coolant
Temperature Sensor
Supply Pump
Drive Coupring
◆ Gasket
Injection Pipe
Clamp No. 1
Injection Pipe
Clamp No. 2
X4
Fuel Inlet
Pipe Sub-assy
Nozzle Holder
Clamp Seat
9.0 (92, 80 in.·lbf)
*23 (235, 17)
*25 (255, 18)
Injection Pipe
Sub-assy
9.0 (92, 80 in.·lbf)
26 (265, 19)
Common Rail
Assy
*Use SST
◆ Non-reusable part
T N·m (kgf·cm, ft·lbf): Specified torque
G36482


6.0 (60, 53 in.·lbf)
6.0 (60, 53 in.·lbf)
Turbo Insulator No. 1
6.0 (60, 53 in.·lbf)
37 (377, 27)
Exhaust Manifold Heat Insulator No. 1
Manifold Stay
Turbocharger Assy
w/ Exhaust Manifold
43 (438, 32)
x5
x5
24 (245, 18)
◆ 26 (265, 19)
◆ Gasket
◆ Gasket
14 (143, 10)
◆ Gasket
◆ Gasket
37 (377, 27)
Exhaust Manifold
Convertor Sub-assy
8.0 (82, 71 in.·lbf)
Crankshaft
Position Sensor
Manifold Support
Bracket
Cylinder Block Side Cover
6.5 (86, 58 in.·lbf)
6.5 (86, 58 in.·lbf)
7.0 (71, 62 in.·lbf)
5.5 (56, 49 in.·lbf)
Engine Oil
Level Sensor
Oil Pan Cover
5.5 (56, 49 in.·lbf)
◆ Non-reusable part
T N·m (kgf·cm, ft·lbf): Specified torque
G36483

14203-01

REPLACEMENT

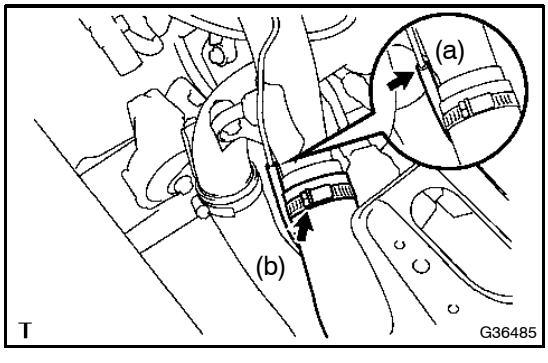
1. REMOVE FRONT WHEELS
2. REMOVE ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
6. DRAIN ENGINE COOLANT (See page 16-7)
7. DRAIN MANUAL TRANSAXLE OIL (See page 30-3)
8. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
9. REMOVE BATTERY
10. REMOVE BATTERY TRAY
11. REMOVE RADIATOR ASSY (See page 16-12)
12. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
13. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)
14. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSY



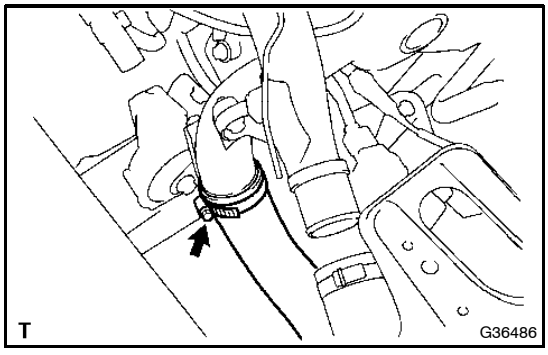
15. REMOVE AIR CLEANER CASE SUB-ASSY
(a) Remove 3 bolts, then remove the air cleaner case.

16. REMOVE FAN AND GENERATOR V BELT (See page 14-4)
17. SEPARATE COOLER COMPRESSOR ASSY (W/ AIR CONDITIONING)
(a) Disconnect the cooler compressor connector.
(b) Remove the 4 bolts, then separate the cooler compressor.

HINT:
Separate the cooler compressor together with the discharge hose and suction hose, then secure it to the vehicle side with a rope.

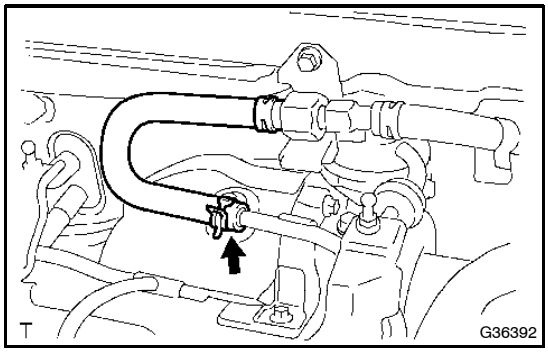


18. DISCONNECT AIR HOSE NO.3
(a) Disconnect the vacuum hose from the vacuum transmitting pipe.
(b) Disconnect the air hose No. 3 from the air tube No. 2.



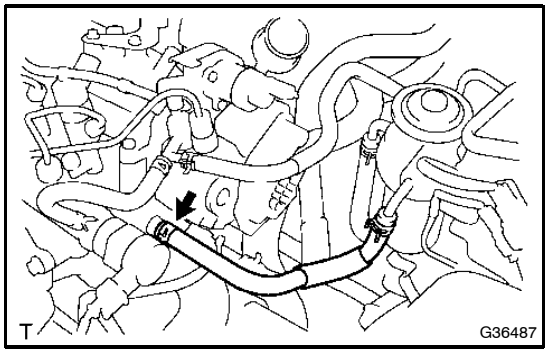
19. DISCONNECT AIR HOSE NO.2

(a) Disconnect the air hose No.2 from the air tube No.1.



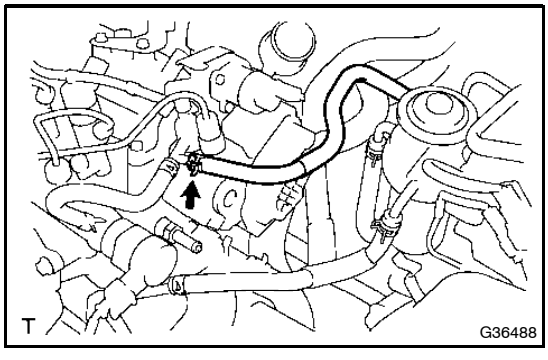
20. DISCONNECT UNION TO CONNECTOR TUBE HOSE

(a) Disconnect the union to connector tube hose.



21. DISCONNECT FUEL HOSE NO.1

(a) Disconnect the fuel hose No.1 from the supply pump.



22. DISCONNECT FUEL HOSE NO.2

(a) Disconnect the fuel hose No.2 from the supply pump.

23. DISCONNECT HEATER INLET WATER HOSE

24. DISCONNECT HEATER OUTLET WATER HOSE

25. DISCONNECT ENGINE WIRE

(a) Disconnect the engine wire harness from the ECM and junction block.

(b) Pull the engine wire harness, disconnected from the ECM and junction block, out toward the engine room.

(c) Disconnect the engine wire from the engine room.

26. REMOVE COLUMN HOLE COVER SILENCER SHEET **(See Pub. No. RM1106E on Page 50-6)**

27. DISCONNECT STEERING SLIDING YOKE SUB-ASSY **(See Pub No. RM1106E on Page 50-6)**

28. REMOVE FLOOR PANEL BRACE FRONT **(See page 15-2)**

29. REMOVE EXHAUST PIPE ASSY FRONT **(See page 15-2)**

30. REMOVE FRONT AXLE HUB LH NUT **(See page 30-3)**

31. REMOVE FRONT AXLE HUB RH NUT

HINT:

Perform the same procedure as above on the opposite side.

32. DISCONNECT SPEED SENSOR FRONT LH **(See page 30-3)**

33. DISCONNECT SPEED SENSOR FRONT RH

HINT:

Perform the same procedure as above on the opposite side.

34. DISCONNECT FRONT STABILIZER LINK ASSY LH **(See page 30-3)**

35. DISCONNECT FRONT STABILIZER LINK ASSY RH

HINT:

Perform the same procedure as above on the opposite side.

36. DISCONNECT TIE ROD END SUB-ASSY LH **(See page 30-3)**

37. DISCONNECT TIE ROD END SUB-ASSY RH

HINT:

Perform the same procedure as above on the opposite side.

38. DISCONNECT FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH **(See page 30-3)**

39. DISCONNECT FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH

HINT:

Perform the same procedure as above on the opposite side.

40. DISCONNECT FRONT AXLE ASSY LH **(See page 30-3)**

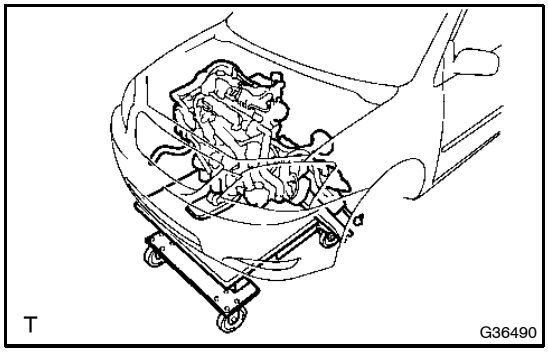
41. DISCONNECT FRONT AXLE ASSY RH

HINT:

Perform the same procedure as above on the opposite side.

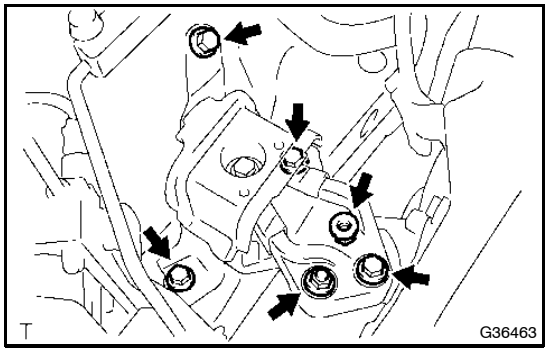
42. REMOVE FRONT DRIVE SHAFT ASSY LH **(See page 30-3)**

43. REMOVE FRONT DRIVE SHAFT ASSY RH **(See page 30-3)**

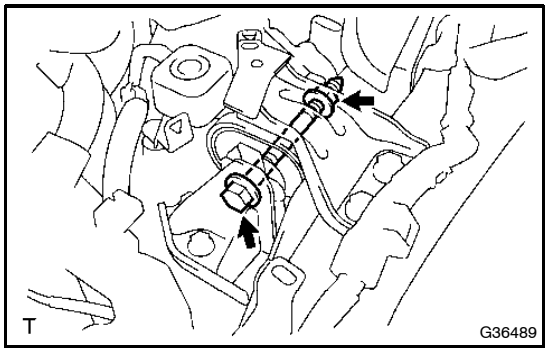


44. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

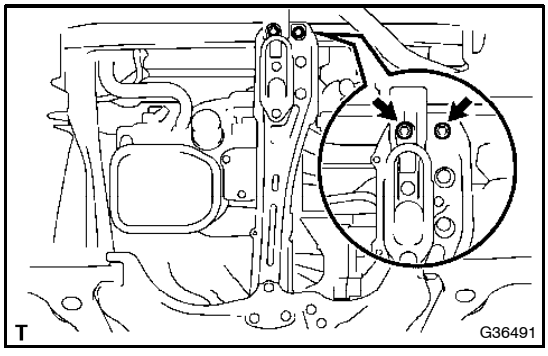
(a) Set the engine lifter.



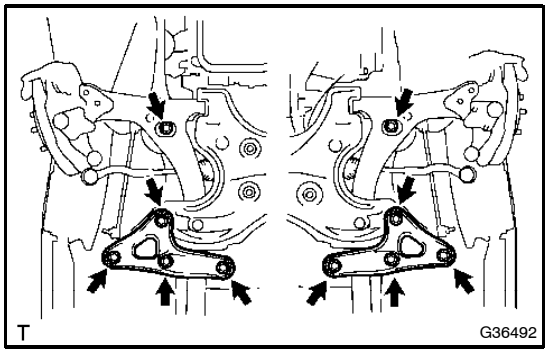
(b) Remove the 4 bolts and 2 nuts, then remove the engine mounting insulator RH.



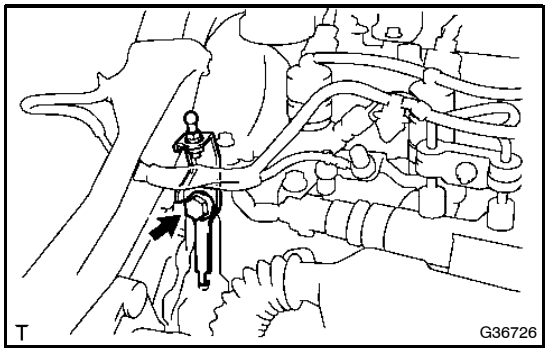
(c) Remove the through bolt and nut, then separate the engine mounting insulator LH.



(d) Remove the 2 bolts shown in the illustration.

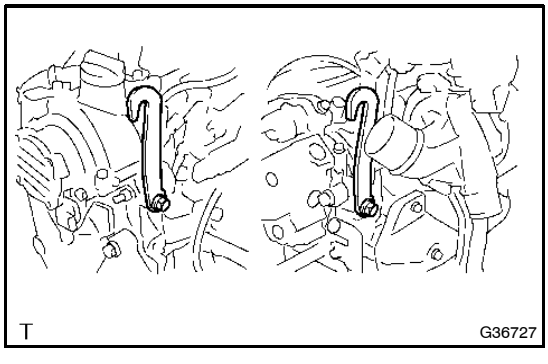


(e) Remove the 8 bolts, then remove the front suspension member brace rear LH and RH.
(f) Remove the 2 nuts shown in the illustration.
(g) Operate the engine lifter, then remove the engine with transaxle from the vehicle.



45. REMOVE FRONT SUSPENSION CROSSMEMBER W/CENTER MEMBER

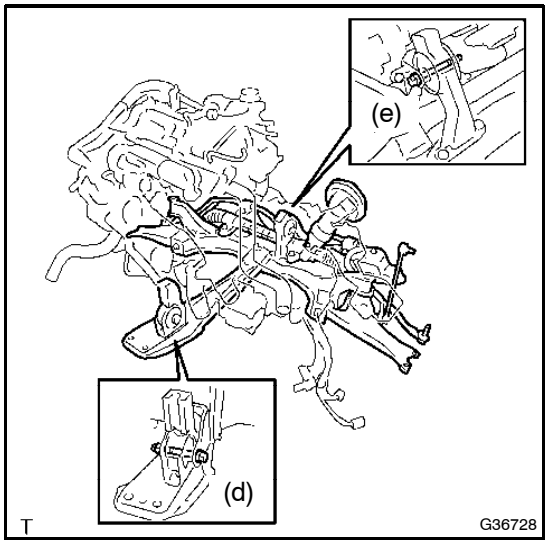
(a) Remove the bolt, then remove the engine cover bracket No. 3.



(b) Install the engine hanger and bolt.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

NOTICE:
Be sure to use new bolts to install the engine hanger.

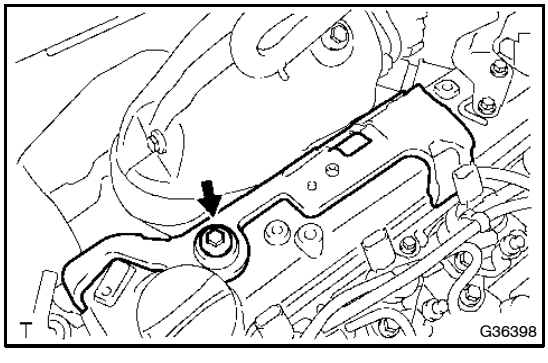
(c) Using a chain block and engine sling device, hold engine with transaxle.



(d) Remove the through bolt and nut, then detach the engine mounting insulator FR from the engine mounting bracket FR.
(e) Remove the through bolt, then detach the engine mounting insulator RR from the engine mounting bracket RR.
(f) Remove front suspension crossmember with center member from the engine with transaxle.

46. REMOVE AIR TUBE NO.2
(a) Disconnect the vacuum hose from the air tube No.2.
(b) Remove the 2 bolts and loosen the hose clamp, then remove the air tube No.2.
47. REMOVE AIR TUBE NO.1
(a) Remove the nut, then detach the air tube support from the engine mounting bracket FR.
(b) Remove the bolt and loosen the hose clamp, then remove the air tube No.1.
48. REMOVE STARTER ASSY (See page 19-3)
49. REMOVE MANUAL TRANSAXLE ASSY
HINT:
- Manual transaxle C53 (See page 41-49)
- Manual transaxle C53A (See page 41-36)

50. REMOVE CLUTCH COVER ASSY (See page 42-29)
51. REMOVE CLUTCH DISC ASSY (See page 42-29)
52. REMOVE FLYWHEEL SUB-ASSY (See page 14-82)
SST 09960-10010 (09962-01000, 09963-01000)
53. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1 (See page 14-82)
54. REMOVE ENGINE WIRE

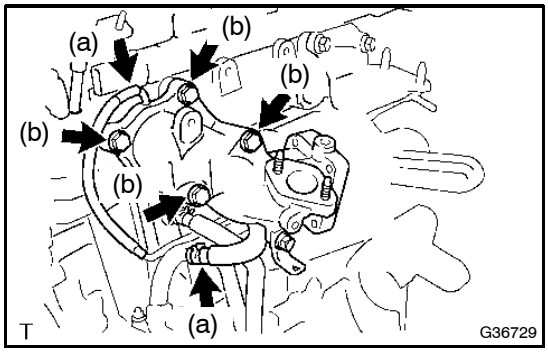


55. REMOVE CYLINDER HEAD COVER NO.2
(a) Remove the bolt, then remove the cylinder head cover No. 2.

56. REMOVE GENERATOR ASSY (See page 19-9)
57. REMOVE TIMING CHAIN COVER NO.2 (See page 17-5)
58. REMOVE VACUUM PUMP ASSY (See page 32-3)
59. REMOVE OIL LEVEL GAGE GUIDE (See page 14-70)
60. REMOVE EGR COOLER ASSY (See page 12-5)

61. REMOVE VACUUM REGULATING VALVE (See page 11-8)

62. REMOVE EGR VALVE ASSY (See page 12-5)

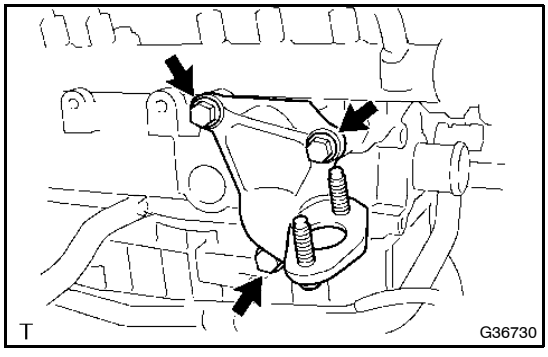


63. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect the vacuum hose and the water hose.

(b) Remove the 4 bolts, then remove the intake air connector

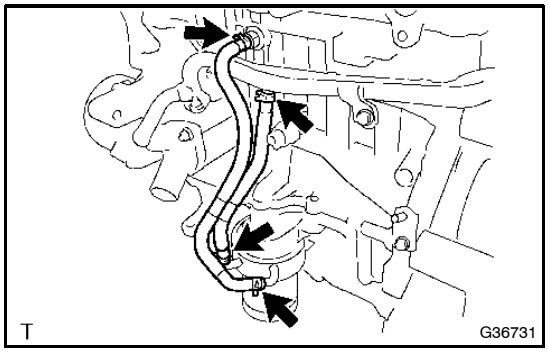
.



64. REMOVE EGR PIPE CONNECTOR

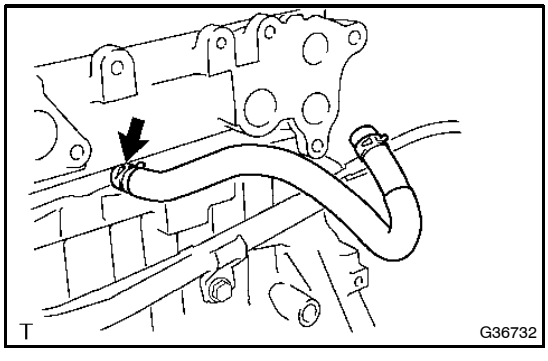
(a) Remove the 3 bolts, then remove the EGR pipe connec tor.

-



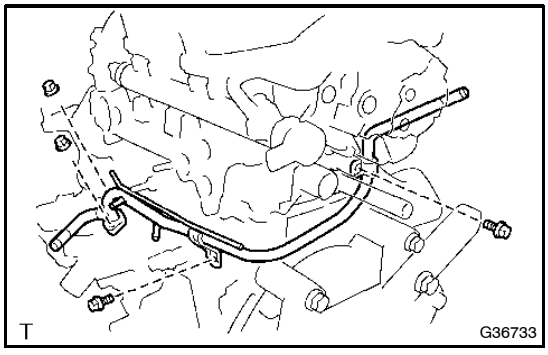
65. REMOVE OIL COOLER HOSE SUB-ASSY

(a) Remove the oil cooler hose.



66. REMOVE EGR PIPE, NO.1 HOSE

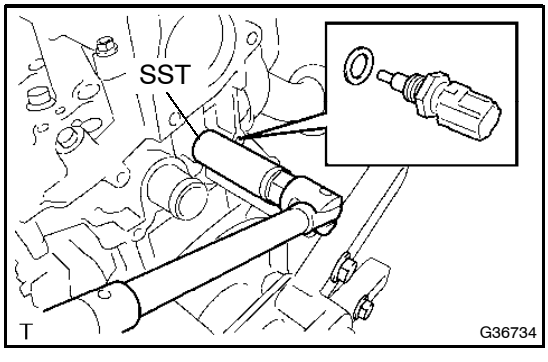
(a) Remove the water by-pass hose.



67. REMOVE WATER BY-PASS PIPE NO.1

(a) Remove the 2 nuts and 2 bolts, then remove the water by-pass pipe No. 1.

68. REMOVE ENGINE OIL PRESSURE SWITCH ASSY (See page 17-1)
69. REMOVE GLOW PLUG NO.1 CONNECTOR (See page 19-14)
70. REMOVE GLOW PLUG ASSY (See page 19-14)
71. REMOVE INJECTION PIPE CLAMP NO.1 (See page 11-8)
72. REMOVE INJECTION PIPE CLAMP NO.2 (See page 11-8)
73. REMOVE INJECTION PIPE SUB-ASSY NO.1 (See page 11-8)
SST 09023-38401
74. REMOVE INJECTION PIPE SUB-ASSY NO.2 (See page 11-8)
SST 09023-38401
75. REMOVE INJECTION PIPE SUB-ASSY NO.3 (See page 11-8)
SST 09023-38401
76. REMOVE INJECTION PIPE SUB-ASSY NO.4 (See page 11-8)
SST 09023-38401
77. REMOVE FUEL INLET PIPE SUB-ASSY (See page 11-16)
SST 09023-38401
78. REMOVE COMMON RAIL ASSY (See page 11-20)
79. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-8)
80. REMOVE INJECTOR ASSY (See page 11-8)
81. REMOVE INJECTION OR SUPPLY PUMP ASSY (See page 11-16)



82. REMOVE DIESEL ENGINE ENGINE COOLANT TEMPERATURE SENSOR

(a) Using SST, remove the engine coolant temperature sensor.
SST 09817-33190

83. REMOVE ENGINE COVER BRACKET

(a) Disconnect the vacuum hose.
(b) Remove the 2 bolts, then remove the engine cover bracket.

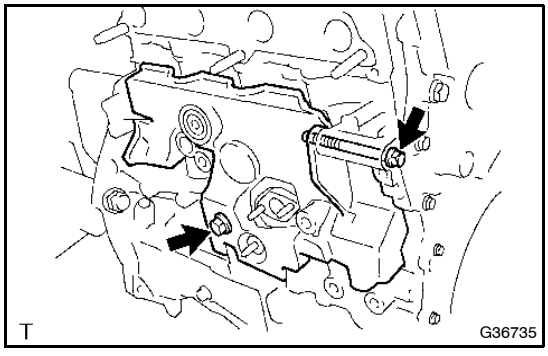
84. REMOVE CONNECTOR TO VACUUM RESERVOIR TUBE (See page 14-6)
85. REMOVE CYLINDER HEAD COVER NO.2 (See page 14-6)
86. REMOVE TURBO INSULATOR NO.1 (See page 13-17)
87. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-17)
88. REMOVE TURBO OIL INLET PIPE (See page 13-17)
89. REMOVE TURBO OIL OUTLET PIPE (See page 13-17)

90. REMOVE EXHAUST MANIFOLD

(a) Remove the 2 bolts, then remove the manifold stay.

(b) Remove the 2 bolts, then remove the exhaust manifold heat insulator No.1.

(c) Remove the 5 nuts, then remove the exhaust manifold w/ turbocharger.

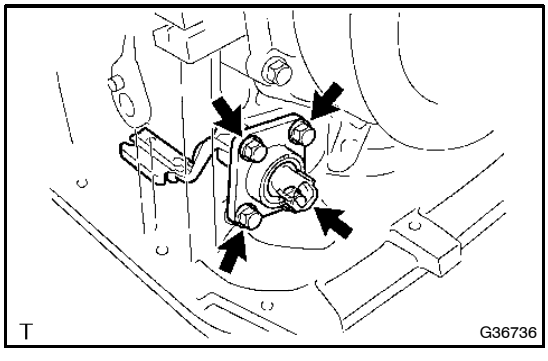


91. REMOVE CYLIVDER BLOCK SIDE COVER

(a) Remove 2 bolts, then remove the cylinder block side cover.

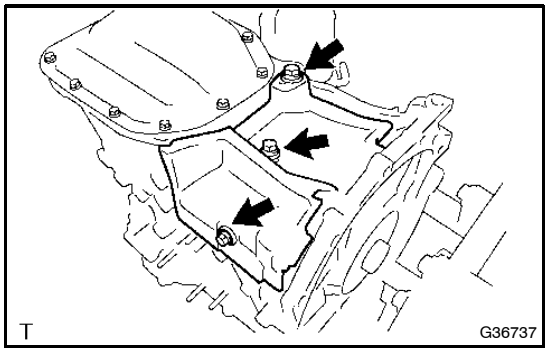
92. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt, then remove the crankshaft position sensor.



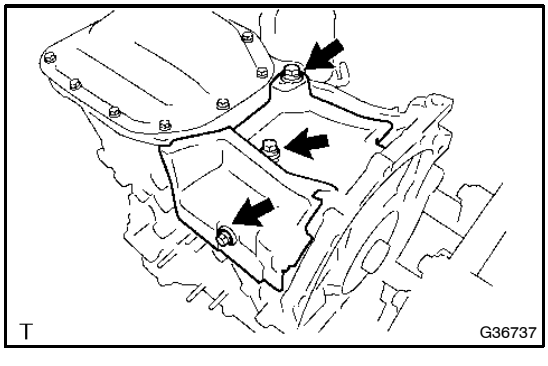
93. REMOVE ENGINE OIL LEVEL SENSOR

(a) Remove the 4 bolts, then remove the engine oil level sensor.



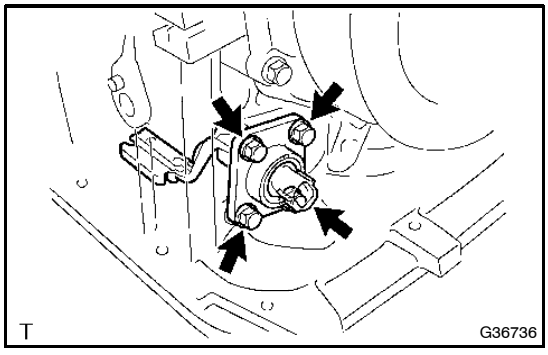
94. REMOVE OIL PAN COVER

(a) Remove the 3 bolts, then remove the oil pan cover.



95. INSTALL OIL PAN COVER

(a) Install the oil pan cover with the 3 bolts.
Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

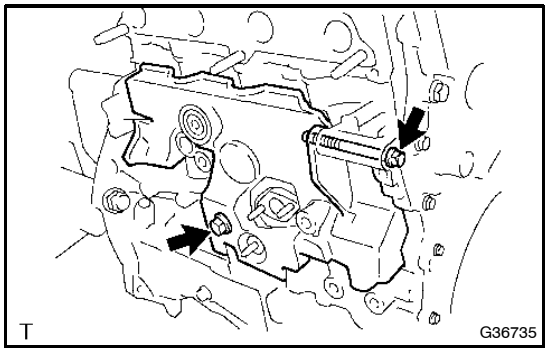


96. INSTALL ENGINE OIL LEVEL SENSOR

(a) Install the engine level sensor with the 4 bolts.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

97. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install the crankshaft position sensor with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



98. INSTALL CYLIVDER BLOCK SIDE COVER

(a) Install the cylinder block side cover with the 2 bolts.
Torque: 6.5 N·m (66 kgf·cm, 58 in.·lbf)

99. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket, then install the exhaust manifold w/ turbocharger with the 5 nuts.
Torque: 43 N·m (438 kgf·cm, 32 ft.·lbf)

(b) Install the exhaust manifold heat insulator No.1 with the 2 bolts.
Torque: 6 N·m (61 kgf·cm, 53 in.·lbf)

(c) Install the manifold stay with the 2 bolts.
Torque: 37 N·m (377 kgf·cm, 27 ft.·lbf)

100. INSTALL TURBO OIL OUTLET PIPE (See page 13-17)

101. INSTALL TURBO OIL INLET PIPE (See page 13-17)

102. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-17)

103. INSTALL TURBO INSULATOR NO.1 (See page 13-17)

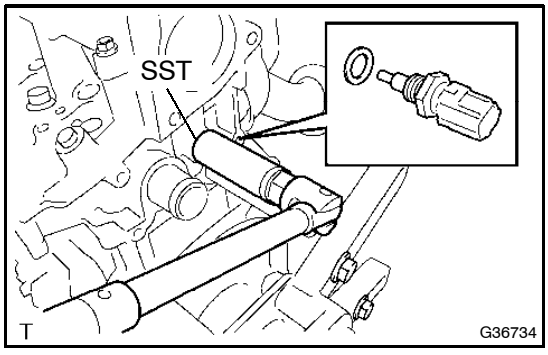
104. INSTALL CYLINDER HEAD COVER NO.2 (See page 14-6)

105. INSTALL CONNECTOR TO VACUUM RESERVOIR TUBE (See page 14-6)

106. INSTALL ENGINE COVER BRACKET

(a) Install the engine cover bracket with the 2 bolts.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)

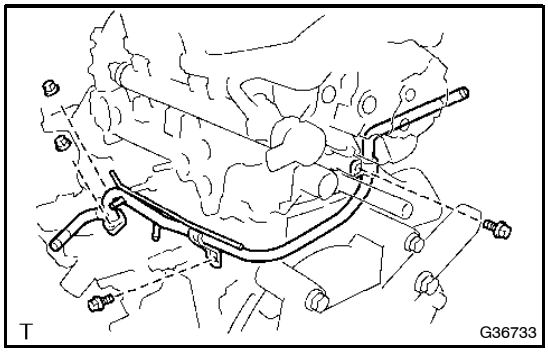
(b) Connect the vacuum hose.



107. INSTALL DIESEL ENGINE ENGINE COOLANT TEMPERATURE SENSOR

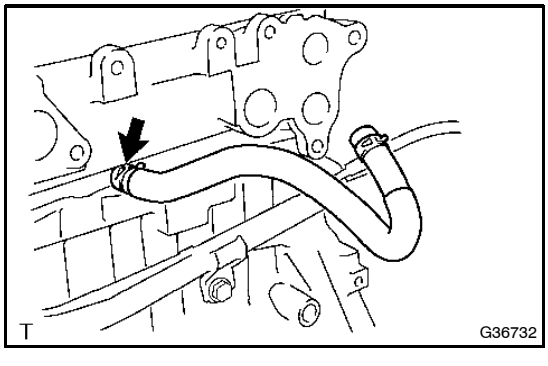
(a) Using SST, install the engine coolant temperature sensor.
SST 09817-33190
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

108. INSTALL INJECTION OR SUPPLY PUMP ASSY **(See page 11-16)**
109. INSTALL INJECTOR ASSY **(See page 11-8)**
110. INSTALL NOZZLE LEAKAGE PIPE ASSY **(See page 11-8)**
111. INSTALL COMMON RAIL ASSY **(See page 11-20)**
112. INSTALL FUEL INLET PIPE SUB-ASSY **(See page 11-16)**
SST 09023-38401
113. INSTALL INJECTION PIPE SUB-ASSY NO.1 **(See page 11-8)**
SST 09023-38401
114. INSTALL INJECTION PIPE SUB-ASSY NO.2 **(See page 11-8)**
SST 09023-38401
115. INSTALL INJECTION PIPE SUB-ASSY NO.3 **(See page 11-8)**
SST 09023-38401
116. INSTALL INJECTION PIPE SUB-ASSY NO.4 **(See page 11-8)**
SST 09023-38401
117. INSTALL INJECTION PIPE CLAMP NO.1 **(See page 11-8)**
118. INSTALL INJECTION PIPE CLAMP NO.2 **(See page 11-8)**
119. INSTALL GLOW PLUG ASSY **(See page 19-14)**
120. INSTALL GLOW PLUG NO.1 CONNECTOR **(See page 19-14)**
121. INSTALL ENGINE OIL PRESSURE SWITCH ASSY **(See page 17-1)**



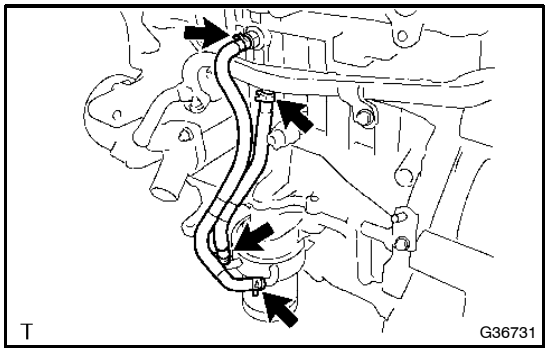
122. INSTALL WATER BY-PASS PIPE NO.1

(a) Install a new gasket, then install the water by-pass pipe No. 1 with the 2 nuts and 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



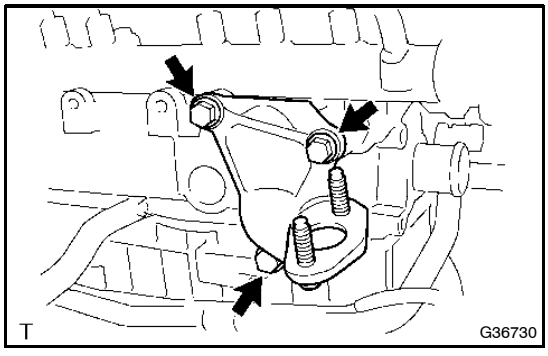
123. INSTALL EGR PIPE, NO.1 HOSE

(a) Install the water by-pass hose.



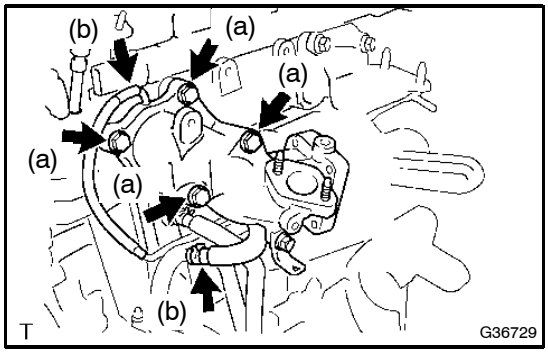
124. INSTALL OIL COOLER HOSE SUB-ASSY

(a) Install the oil cooler hoses.



125. INSTALL EGR PIPE CONNECTOR

(a) Install a new gasket, then install the EGR pipe connector with the 3 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

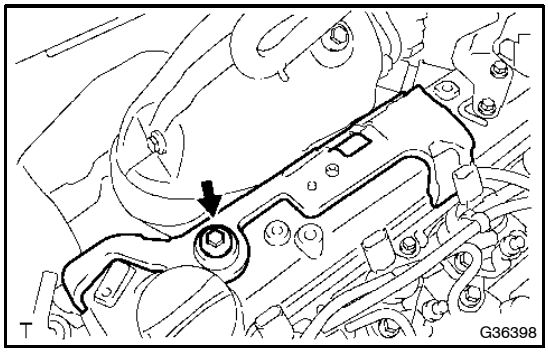


126. INSTALL INTAKE AIR CONNECTOR

(a) Install a new gasket, then install the intake air connector with the 4 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(b) Connect the vacuum hose and water hose.

127. INSTALL EGR VALVE ASSY **(See page 12-5)**
128. INSTALL VACUUM REGULATING VALVE **(See page 11-8)**
129. INSTALL EGR COOLER ASSY **(See page 12-5)**
130. INSTALL OIL LEVEL GAGE GUIDE **(See page 14-70)**
131. INSTALL VACUUM PUMP ASSY **(See page 32-3)**
132. INSTALL TIMING CHAIN COVER NO.2 **(See page 17-5)**
133. INSTALL GENERATOR ASSY **(See page 19-9)**



134. INSTALL CYLINDER HEAD COVER NO.2

(a) Install the cylinder head cover No. 2 with the bolt.
Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

135. INSTALL ENGINE WIRE

136. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1 **(See page 14-82)**

137. INSTALL FLYWHEEL SUB-ASSY **(See page 14-82)**

SST 09960-10010 (09962-01000, 09963-01000)

138. INSTALL CLUTCH DISC ASSY **(See page 42-29)**

SST 09301-00220

139. INSTALL CLUTCH COVER ASSY **(See page 42-29)**

140. INSTALL MANUAL TRANSAXLE ASSY

HINT:

- Manual transaxle C53 (See page 41-49)
- Manual transaxle C53A (See page 41-36)

141. INSTALL STARTER ASSY **(See page 19-3)**

142. INSTALL AIR TUBE NO.1

(a) Install the air tube No. 1 with the bolt and nut.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

NOTICE:

Use a new air hose.

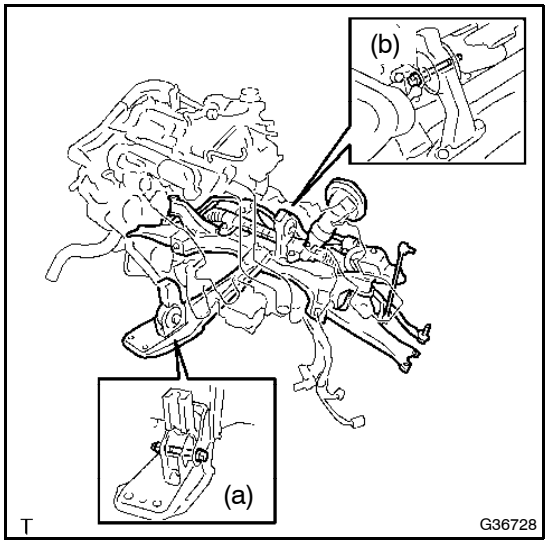
143. INSTALL AIR TUBE NO.2

(a) Install the air tube No. 2 with the 2 bolts.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

NOTICE:

Use a new air hose.



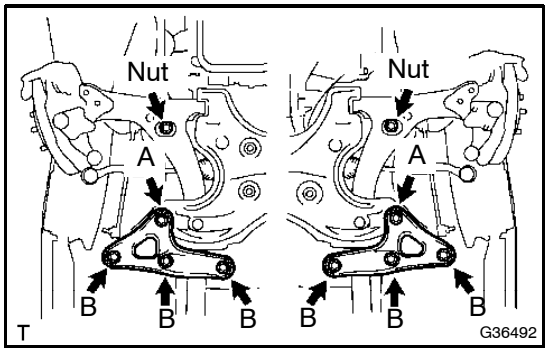
144. INSTALL FRONT SUSPENSION CROSSMEMBER W/CENTER MEMBER

(a) Install the engine mounting insulator FR and Engine mounting bracket FR with the through bolt and nut.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(b) Install the engine mounting insulator RR and Engine mounting bracket RR with the through Bolt.

Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



145. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine lifter.

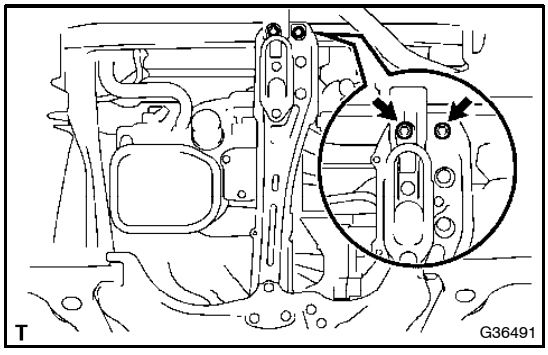
(b) Operate the engine lifter, then install the engine with transaxle to the vehicle.

(c) Install the front suspension member and front suspension member brace rear LH and RH with the 8 bolts and 2 nuts.

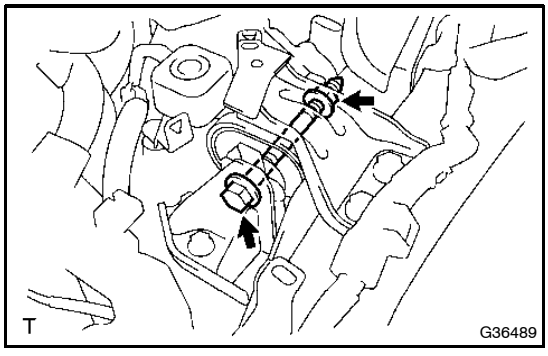
Torque:

133 N·m (1356 kgf·cm, 98 ft·lbf) for bolt A and nut

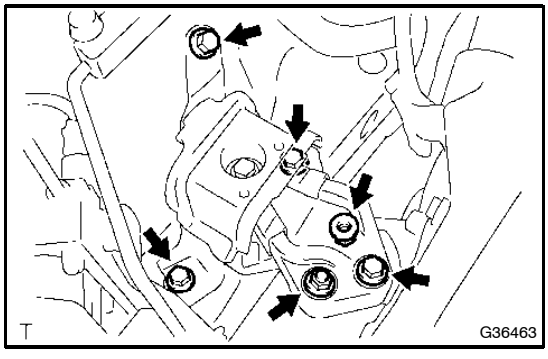
80 N·m (816 kgf·cm, 59 ft·lbf) for bolt B



(d) Install the 2 bolts as shown in the illustration.
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)



(e) Install the engine mounting insulator LH with the through bolt and nut.
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)



(f) Install the engine mounting insulator RH with the 4 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

146. INSTALL FRONT DRIVE SHAFT ASSY LH **(See page 30-3)**
147. INSTALL FRONT DRIVE SHAFT ASSY RH **(See page 30-3)**
148. INSTALL FRONT AXLE ASSY LH **(See page 30-3)**
149. INSTALL FRONT AXLE ASSY RH
HINT:
Perform the same procedure as above on the opposite side.
150. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH **(See page 30-3)**
151. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 RH
HINT:
Perform the same procedure as above on the opposite side.
152. INSTALL TIE ROD END SUB-ASSY LH **(See page 30-3)**
153. INSTALL TIE ROD END SUB-ASSY RH
HINT:
Perform the same procedure as above on the opposite side.
154. INSTALL FRONT STABILIZER LINK ASSY LH **(See page 30-3)**
155. INSTALL FRONT STABILIZER LINK ASSY RH
HINT:
Perform the same procedure as above on the opposite side.
156. INSTALL SPEED SENSOR FRONT LH **(See page 30-3)**

157. INSTALL SPEED SENSOR FRONT RH

HINT:

Perform the same procedure as above on the opposite side.

158. INSTALL FRONT AXLE HUB LH NUT **(See page 30-3)**

159. INSTALL FRONT AXLE HUB RH NUT

HINT:

Perform the same procedure as above on the opposite side.

160. INSTALL EXHAUST PIPE ASSY FRONT **(See page 15-2)**

161. INSTALL FLOOR PANEL BRACE FRONT **(See page 15-2)**

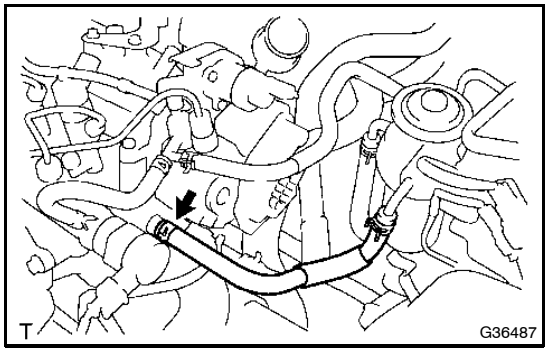
162. INSTALL STEERING SLIDING YOKE SUB-ASSY **(See Pab. No. RM1106E on Page 50-6)**

163. INSTALL COLUMN HOLE COVER SILENCER SHEET **(See Pab. No. RM1106E on Page 50-6)**

164. INSTALL ENGINE WIRE

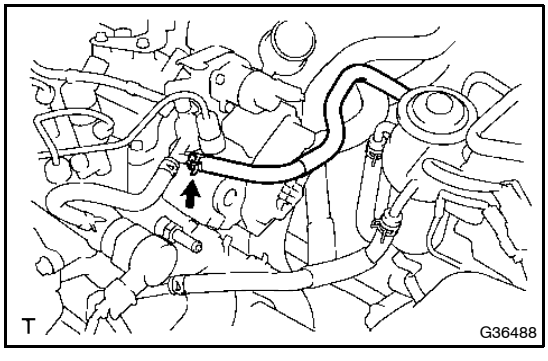
165. INSTALL HEATER OUTLET WATER HOSE

166. INSTALL HEATER INLET WATER HOSE



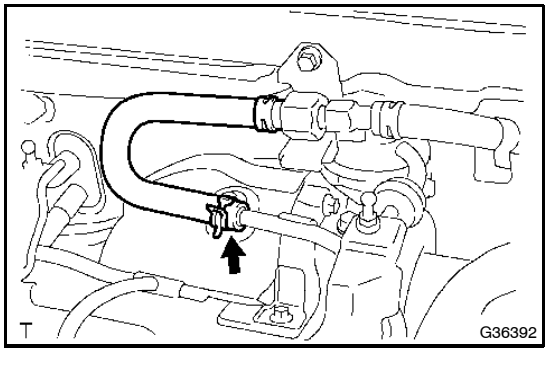
167. INSTALL FUEL HOSE NO.1

(a) Connect the fuel hose No. 1 to the supply pump.



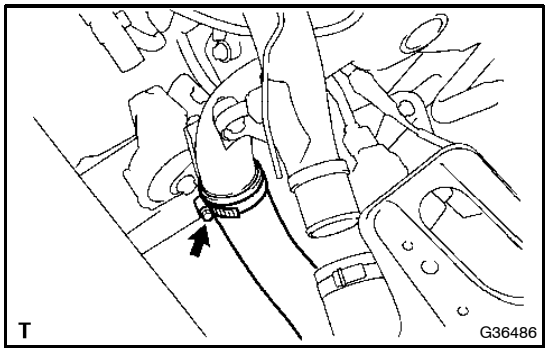
168. INSTALL FUEL HOSE NO.2

(a) Connect the fuel hose No. 2 to the supply pump.



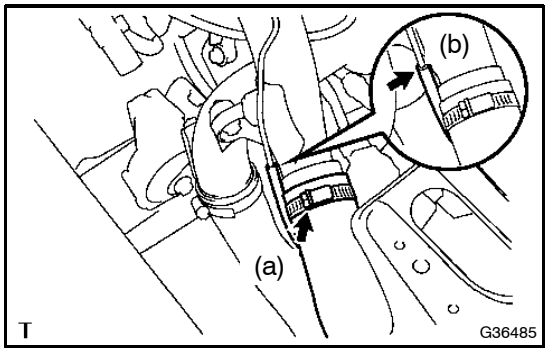
169. INSTALL UNION TO CONNECTOR TUBE HOSE

(a) Connect the union to connector tube hose.



170. INSTALL AIR HOSE NO.2

(a) Connect the air hose No. 2 to the air tube No. 1.



171. INSTALL AIR HOSE NO.3

(a) Connect the air hose No. 3 to the air tube No. 2.

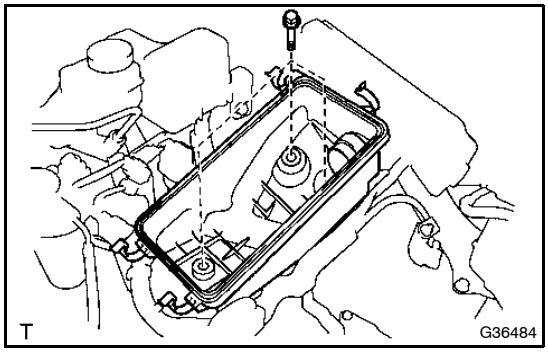
(b) Connect the vacuum hose to the vacuum transmitting pipe.

172. INSTALL COOLER COMPRESSOR ASSY (W/ AIR CONDITIONING)

(a) Install the cooler compressor with the 4 bolts.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

173. INSTALL FAN AND GENERATOR V BELT (See page 14-4)



174. INSTALL AIR CLEANER CASE SUB-ASSY

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

Torque: 7.0 N·m (71 kgf·cm, 5.2 in·lbf)

175. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSY

176. INSTALL AIR CLEANER CAP SUB-ASSY (See page 13-17)

177. INSTALL RADIATOR ASSY (See page 16-12)

178. INSTALL BATTERY TRAY

179. INSTALL BATTERY

180. ADD MANUAL TRANSAXLE OIL

181. ADD ENGINE OIL

182. ADD ENGINE COOLANT (See page 16-7)

183. INSPECT MANUAL TRANSAXLE OIL LEVEL (See page 41-4)

184. CHECK ENGINE OIL LEVEL

185. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)

186. CHECK FOR FUEL LEAKAGE

187. CHECK FOR EXHAUST GAS LEAKAGE

188. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)

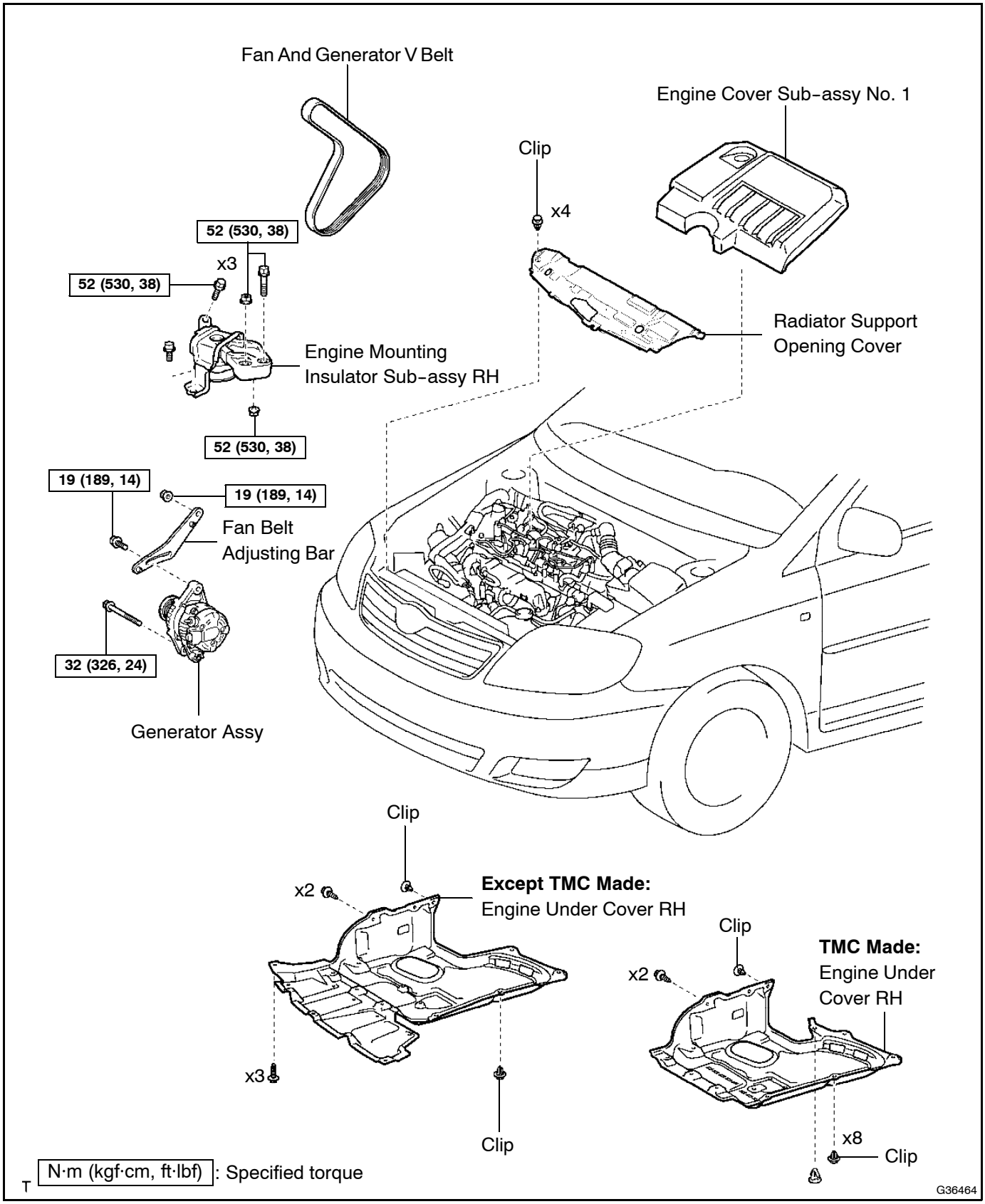
189. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)

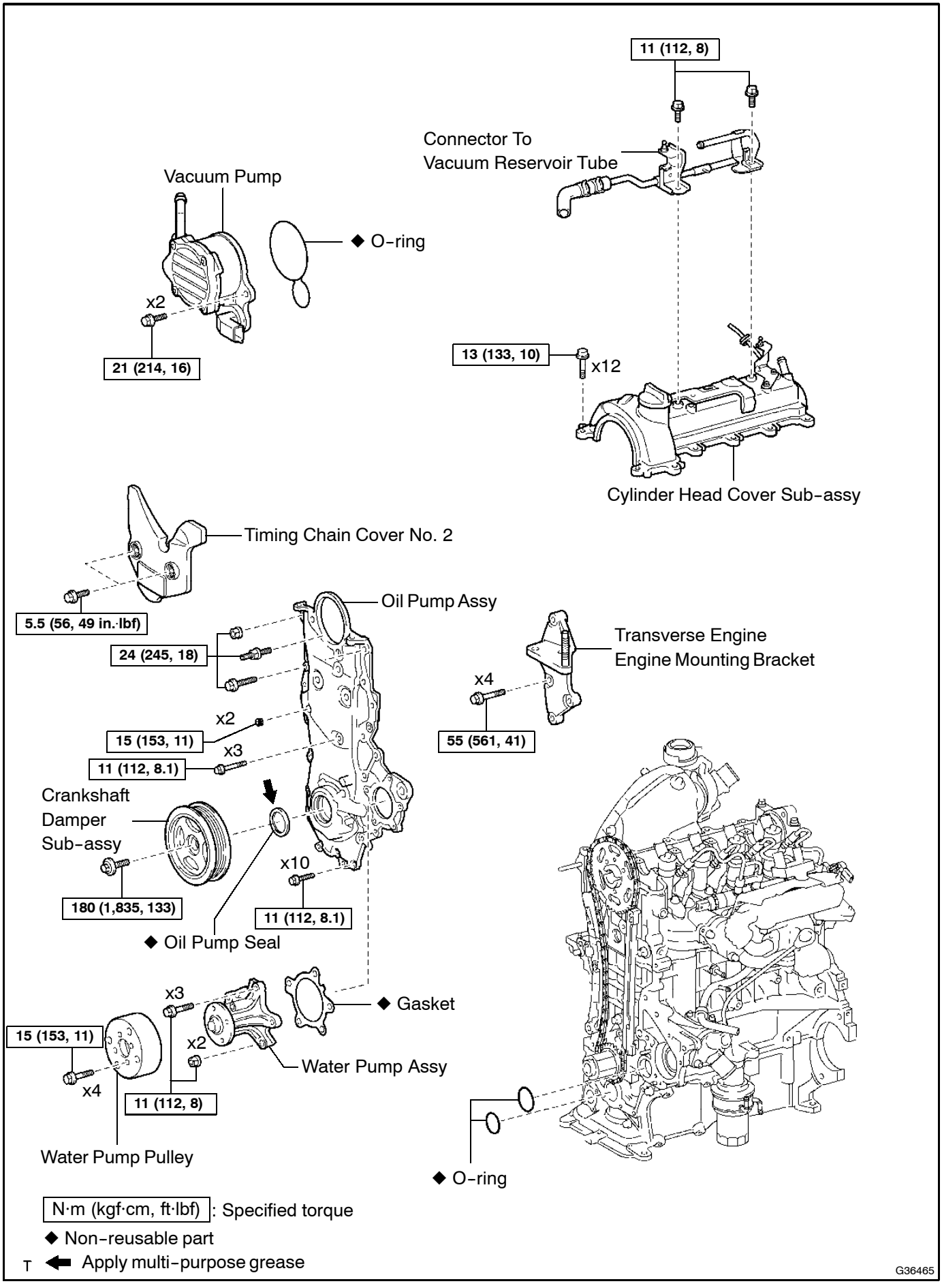
190. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
191. INSTALL ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
192. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
193. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
194. INSTALL FRONT WHEELS
     Torque: 103 N·m (1050 kgf·cm, 76 ft·lbf)
195. ADJUST FRONT WHEEL ALIGNMENT (See Pab. No. RM1106E on Page 26-1)

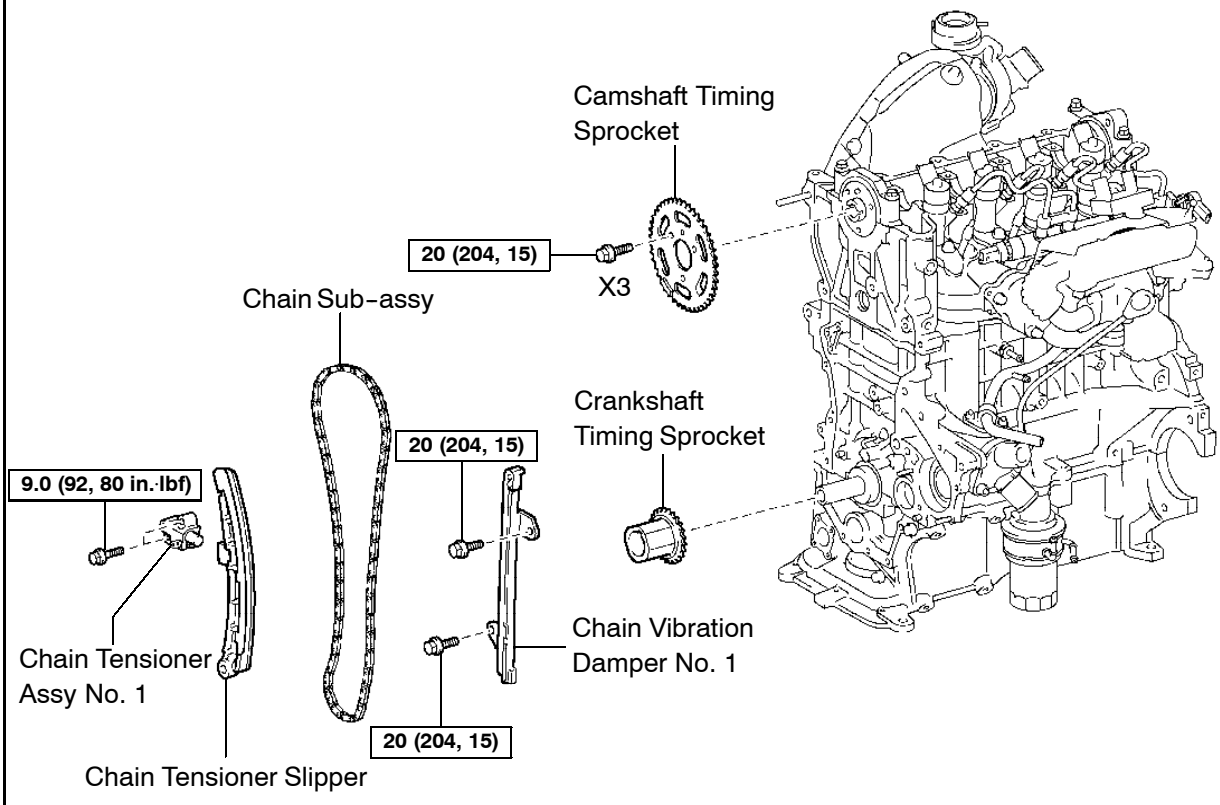
CHAIN SUB-ASSY (1ND-TV)

COMPONENTS

141ZR-01




11 (112, 8)
Connector To
Vacuum Reservoir Tube
Vacuum Pump
◆ O-ring
x2
21 (214, 16)
13 (133, 10)
x12
Cylinder Head Cover Sub-assy
Timing Chain Cover No. 2
5.5 (56, 49 in.·lbf)
Oil Pump Assy
24 (245, 18)
Transverse Engine
Engine Mounting Bracket
x4
55 (561, 41)
x2
15 (153, 11)
x3
11 (112, 8.1)
Crankshaft
Damper
Sub-assy
x10
180 (1,835, 133)
11 (112, 8.1)
◆ Oil Pump Seal
x3
◆ Gasket
15 (153, 11)
x2
Water Pump Assy
x4
11 (112, 8)
Water Pump Pulley
◆ O-ring
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
T Apply multi-purpose grease
G36465



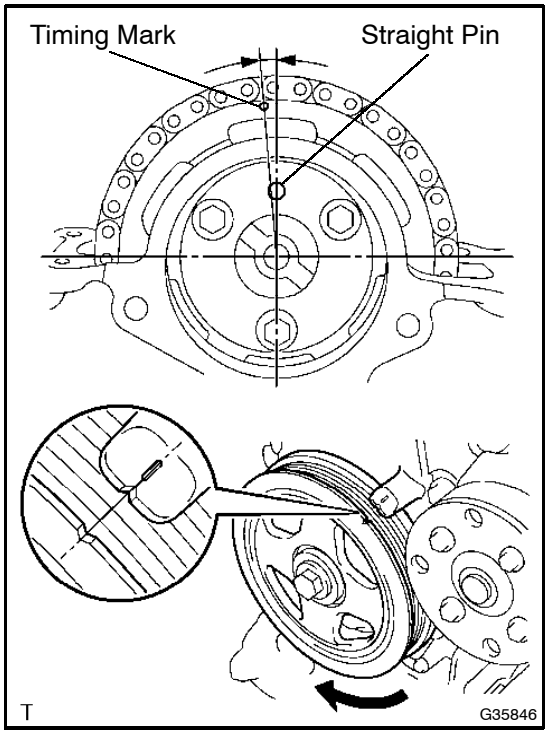
T N·m (kgf·cm, ft·lbf): Specified torque

G36466

141ZS-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
6. DRAIN ENGINE COOLANT (See page 16-7)
7. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
8. REMOVE FAN AND GENERATOR V BELT (See page 14-4)
9. REMOVE GENERATOR ASSY (See page 19-9)
10. REMOVE WATER PUMP PULLEY (See page 16-9)
    SST 09960-10010 (09962-01000, 09963-00700)
11. REMOVE WATER PUMP ASSY (See page 16-9)
12. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-6)
13. REMOVE VACUUM PUMP ASSY (See page 32-3)

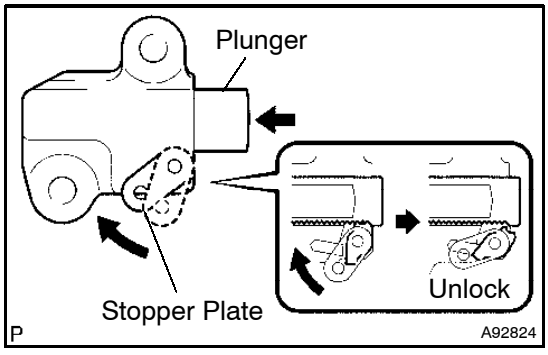


14. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Set the No. 1 cylinder to TDC/Compression.
   (1) Turn the crankshaft pulley until the grooves of the crankshaft damper and oil pump are aligned.
   (2) Check that the timing mark of the camshaft timing sprocket and the straight pin hole of the camshaft timing sprocket are in the positions shown in the illustration.

HINT:
If not, turn the crankshaft damper 1 revolution (360°) to align them as above.

15. REMOVE CRANKSHAFT DAMPER SUB-ASSY (See page 17-5)
    SST 09960-10010 (09962-01000, 09963-01000)
16. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 17-5)
17. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 17-5)
18. REMOVE TIMING CHAIN COVER NO.2 (See page 17-5)
19. REMOVE OIL PUMP ASSY (See page 17-5)
20. REMOVE OIL PUMP SEAL (See page 17-5)



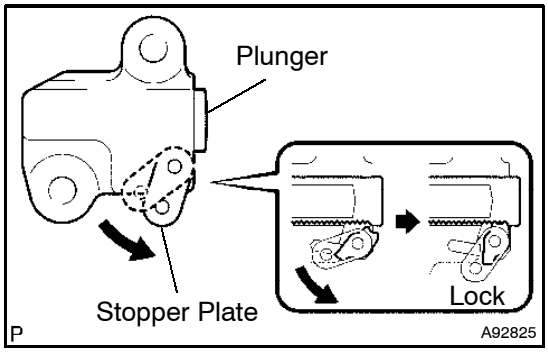
21. REMOVE CHAIN TENSIONER ASSY NO.1

NOTICE:

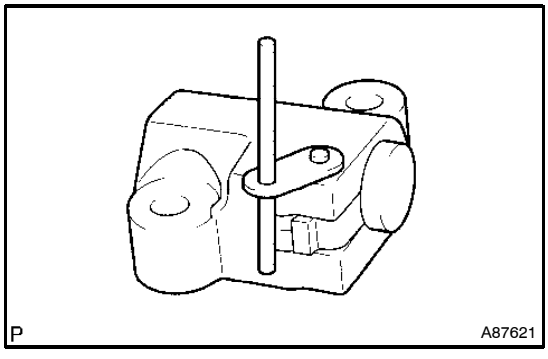
Do not rotate the crankshaft without the chain tensioner.

(a) Pull up the stopper plate to unlock the plunger.

(b) Push in the plunger to the end with the plunger unlocked.



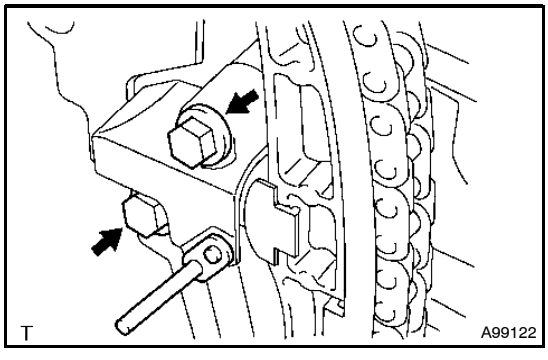
(c) Pull down the stopper plate with the plunger pushed to the end to lock the plunger.



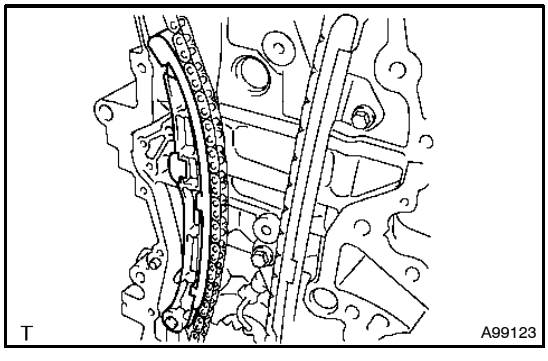
(d) Insert a 2.5 mm (0.098 in.) diameter bar into the hole of the stopper plate with the plunger locked.

HINT:

If the stopper plate is not completely pulled down and a 2.5 mm (0.098 in.) diameter bar cannot be inserted, unlock and pull out the plunger slightly. The stopper plate could then be completely pulled down and a 2.5 mm (0.098 in.) diameter bar could be inserted easily.

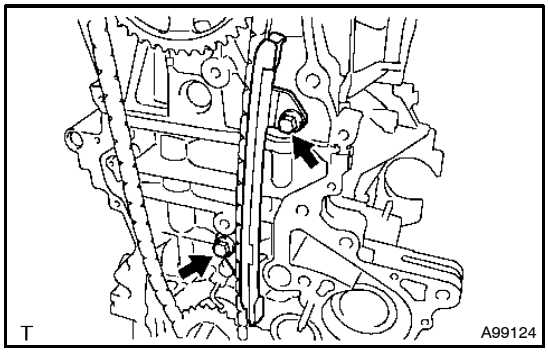


(e) Remove the 2 bolts and chain tensioner No. 1.



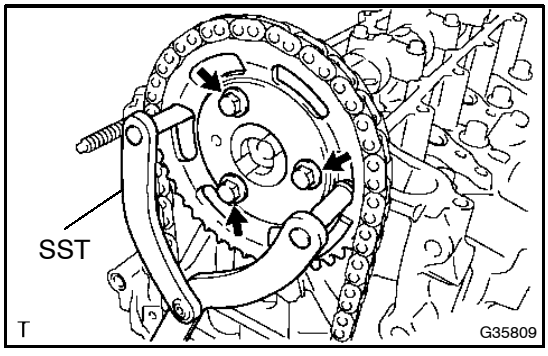
22. REMOVE CHAIN TENSIONER SLIPPER

(a) Remove the chain tensioner slipper from the cylinder block.



23. REMOVE CHAIN VIBRATION DAMPER NO.1

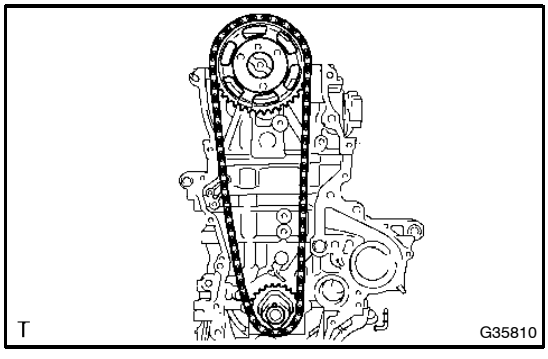
(a) Remove the 2 bolts and chain vibration damper.



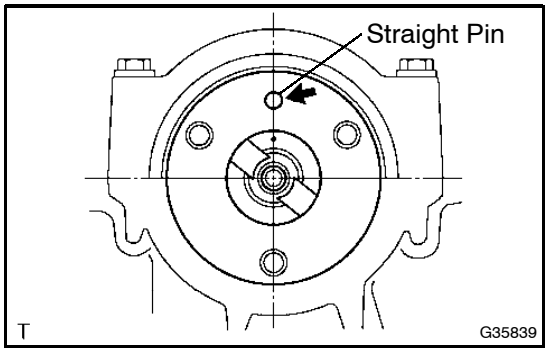
24. REMOVE CHAIN SUB-ASSY

(a) Using SST, hold the camshaft timing sprocket.
SST 09960-10010 (09962-01000, 09963-01000)

(b) Remove the 3 bolts, then remove the camshaft timing sprocket.



(c) Remove the camshaft timing sprocket, crankshaft timing sprocket and chain together.

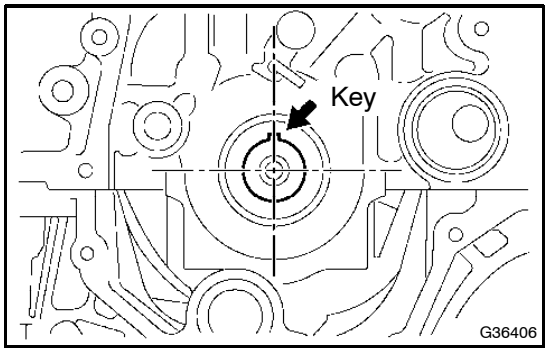


25. INSTALL CHAIN SUB-ASSY

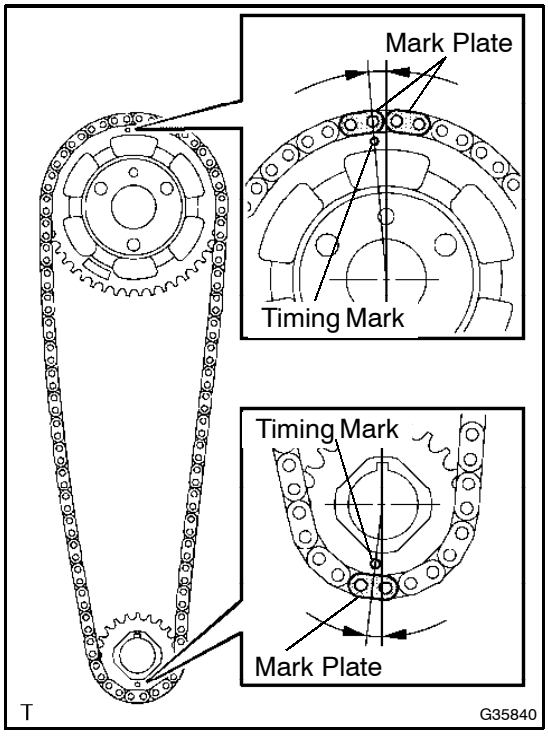
(a) Turn the camshaft to set the straight pin in the position shown in the illustration.

NOTICE:

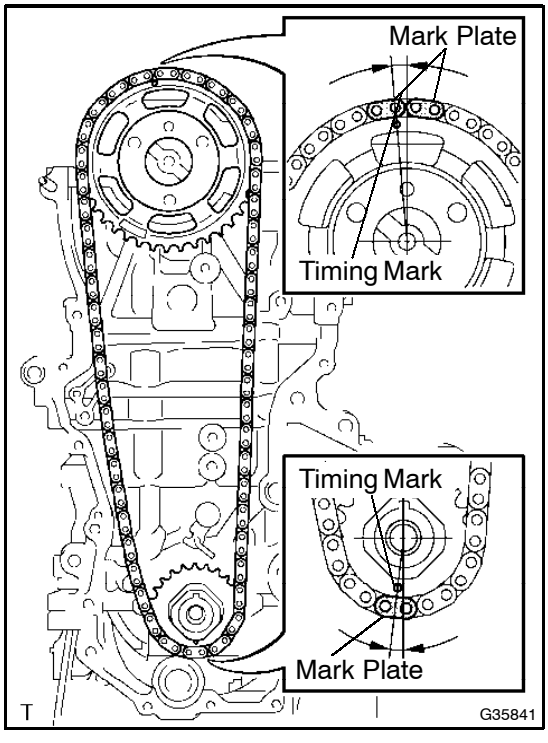
When turning the camshaft to set the position, turn the crankshaft to set the key in the 70° BTDC position.



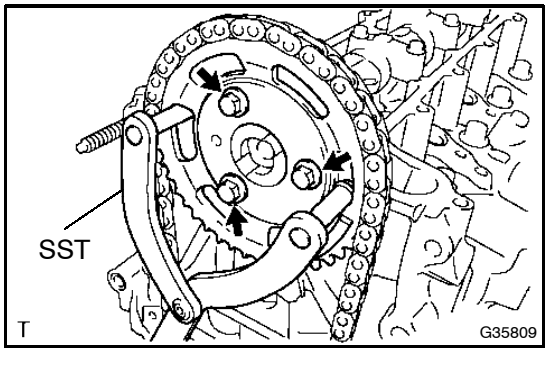
(b) Turn the crankshaft to set the key in the position shown in the illustration.



(c) Align the yellow mark plates on the chain with the timing marks on the camshaft timing sprocket and crankshaft timing sprocket.



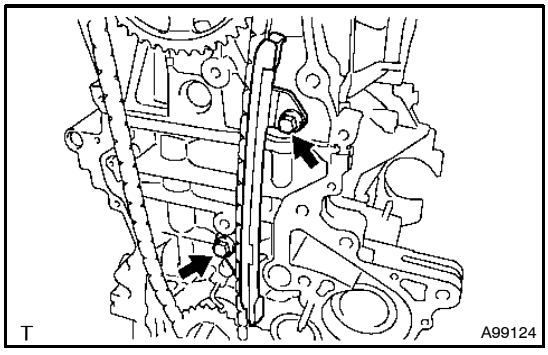
(d) Install the chain, camshaft timing sprocket and crankshaft timing sprocket together onto the engine.



(e) Fix the camshaft timing sprocket, using SST and install the camshaft timing sprocket with the 3 bolts.

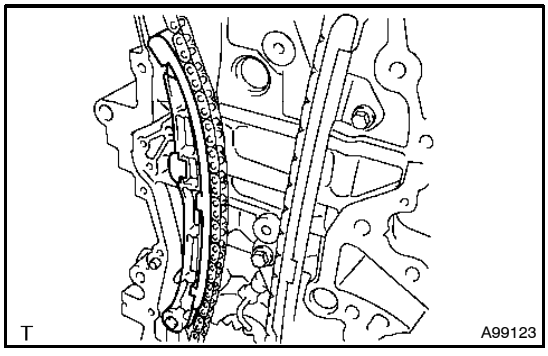
SST 09960-10010 (09962-01000, 09963-01000)

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



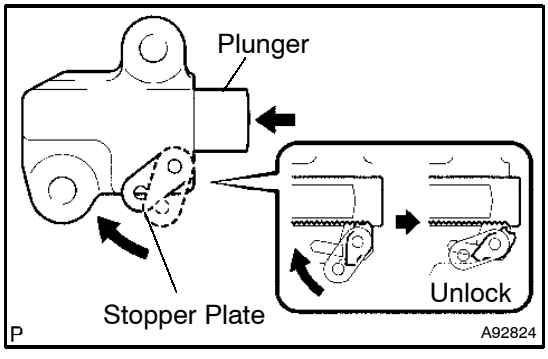
26. INSTALL CHAIN VIBRATION DAMPER NO.1

(a) Install the chain vibration damper with the 2 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



27. INSTALL CHAIN TENSIONER SLIPPER

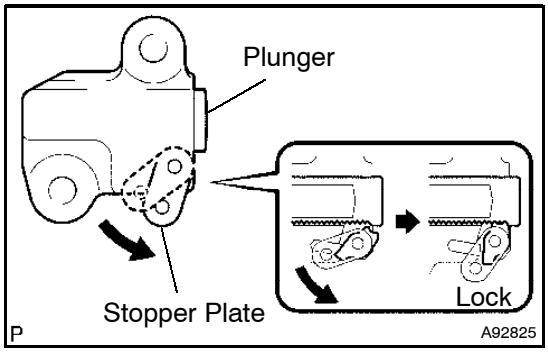
(a) Install the chain tensioner slipper onto the cylinder block.



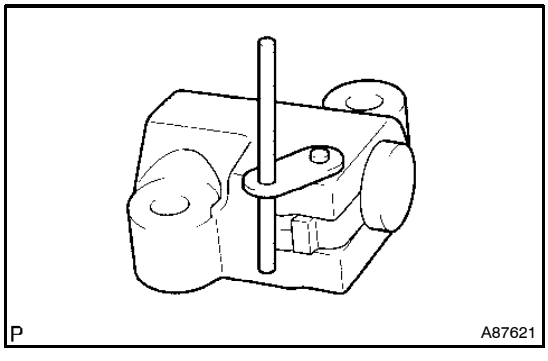
28. INSTALL CHAIN TENSIONER ASSY NO.1

(a) Pull up the stopper plate to unlock the plunger.

(b) Push in the plunger to the end with the plunger unlocked.



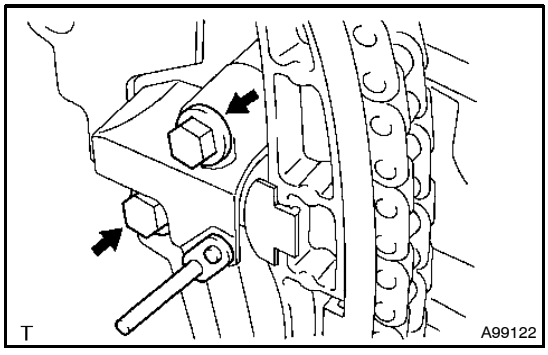
(c) Pull down the stopper plate with the plunger pushed to the end to lock the plunger.



(d) Insert a 2.5 mm (0.098 in.) diameter bar into the hole of the stopper plate with the plunger locked.

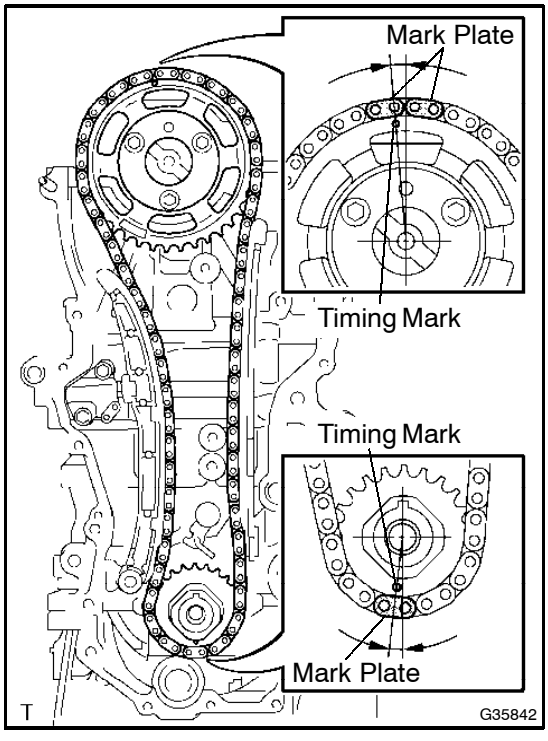
HINT:

If the stopper plate is not completely pulled down and a 2.5 mm (0.098 in.) diameter bar cannot be inserted, unlock and pull out the plunger slightly. The stopper plate could then be completely lifted down and a 2.5 mm (0.098 in.) diameter bar could be inserted easily.



(e) Install the chain tensioner with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(f) Remove the 2.5 mm (0.098 in.) diameter bar from the chain tensioner.



(g) Check that the mark plates and timing marks are in the positions shown in the illustration.

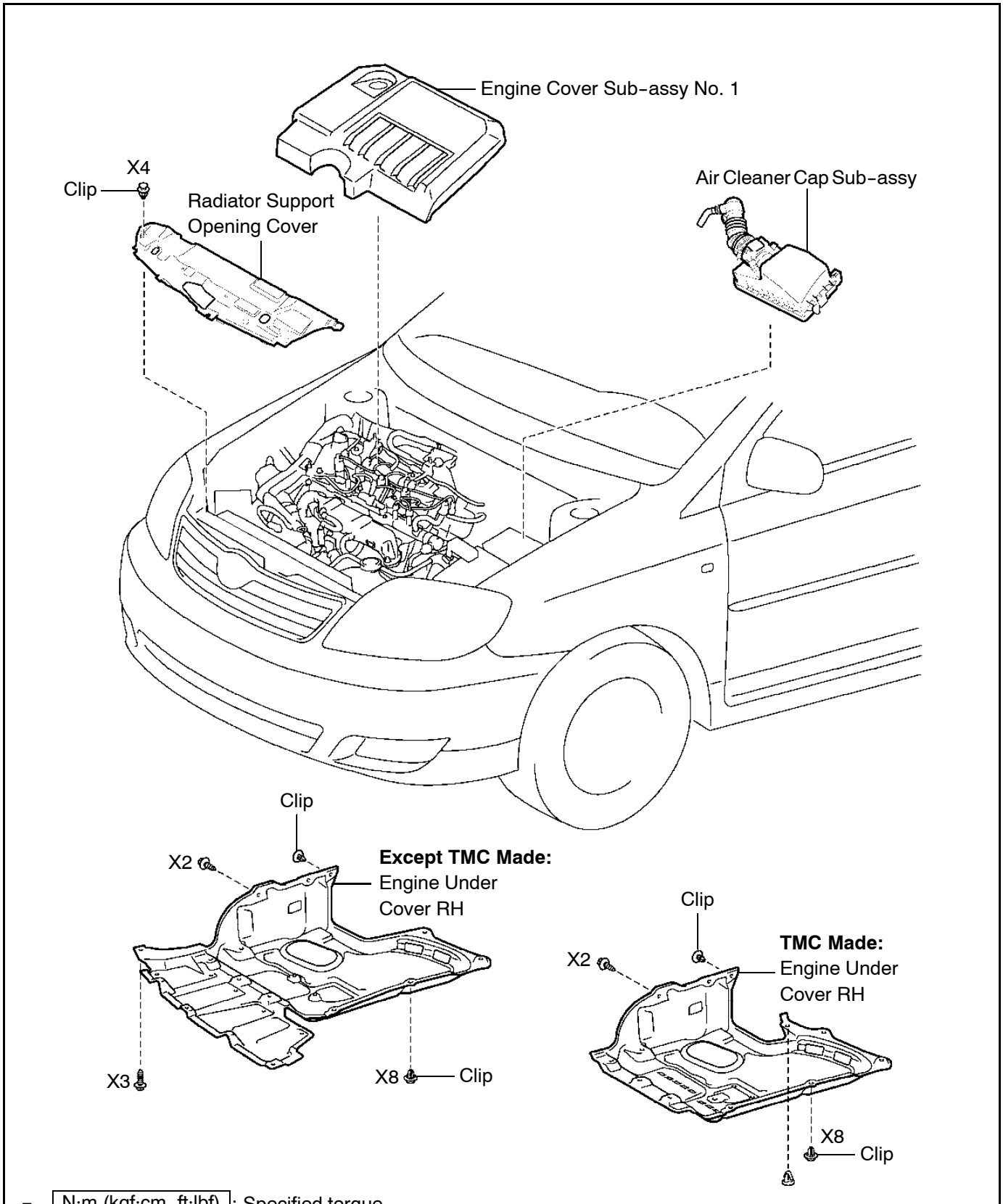
29. **INSTALL OIL PUMP SEAL** (See page 17-5)
SST 09223-22010
30. **INSTALL OIL PUMP ASSY** (See page 17-5)
31. **INSTALL TIMING CHAIN COVER NO.2** (See page 17-5)
32. **INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET** (See page 17-5)
33. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH** (See page 17-5)
34. **INSTALL CRANKSHAFT DAMPER SUB-ASSY** (See page 17-5)
SST 09960-10010 (09962-01000, 09963-01000)
35. **INSTALL VACUUM PUMP ASSY** (See page 32-3)
36. **INSTALL CYLINDER HEAD COVER SUB-ASSY** (See page 14-6)
37. **INSTALL WATER PUMP ASSY** (See page 16-9)
38. **INSTALL WATER PUMP PULLEY** (See page 16-9)
SST 09960-10010 (09962-01000, 09963-00700)
39. **INSTALL GENERATOR ASSY** (See page 19-9)
40. **INSTALL FAN AND GENERATOR V BELT** (See page 14-4)
41. **ADJUST FAN AND GENERATOR V BELT** (See page 14-4)
42. **INSPECT FAN AND GENERATOR V BELT** (See page 14-1)
43. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
44. **ADD ENGINE COOLANT** (See page 16-7)

45. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
46. INSPECT ENGINE OIL LEVEL
47. CHECK FOR ENGINE OIL LEAKAGE
48. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
49. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)
50. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
51. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
52. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1050 kgf·cm, 76 ft·lbf)

CAMSHAFT (1ND-TV)

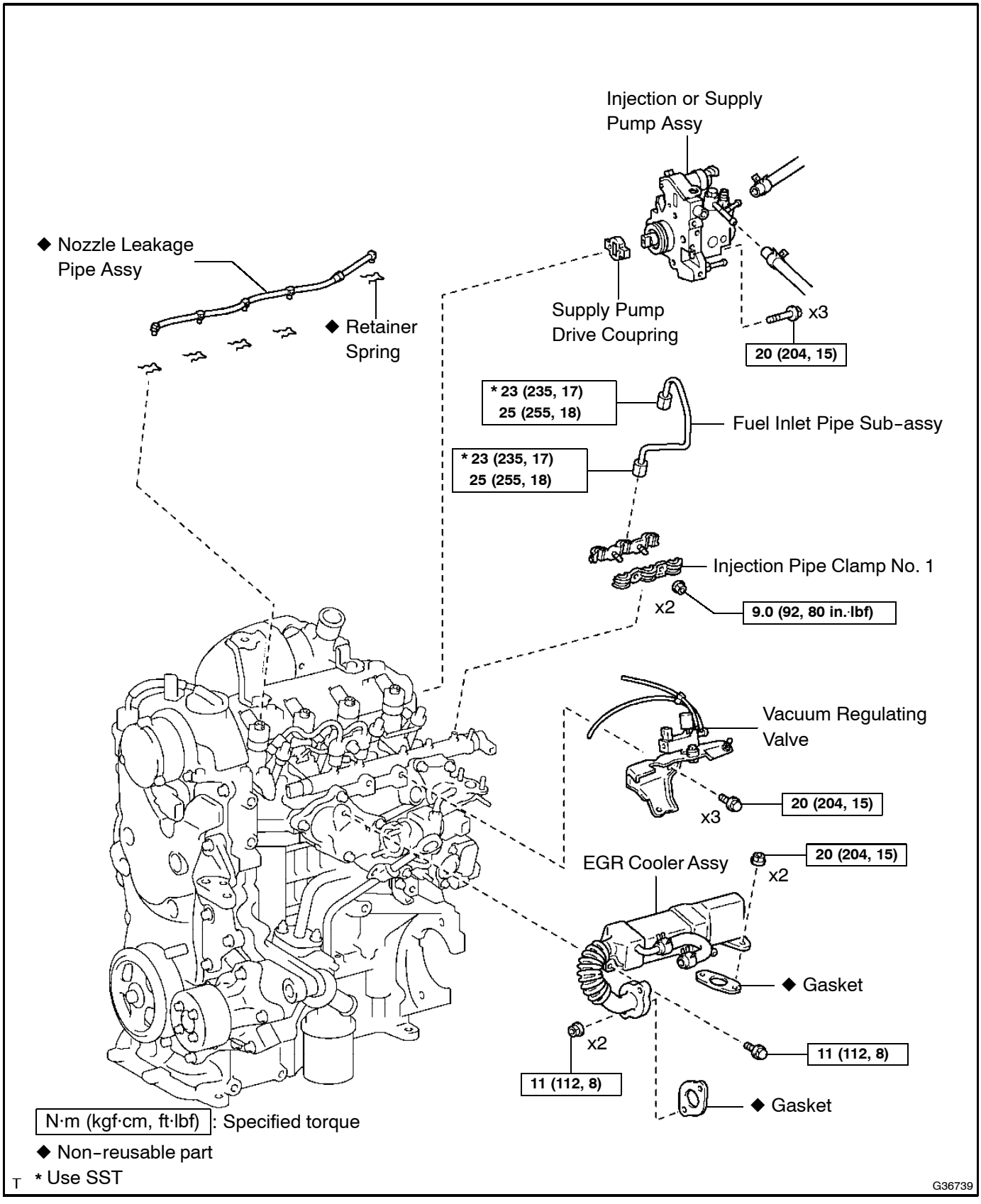
COMPONENTS

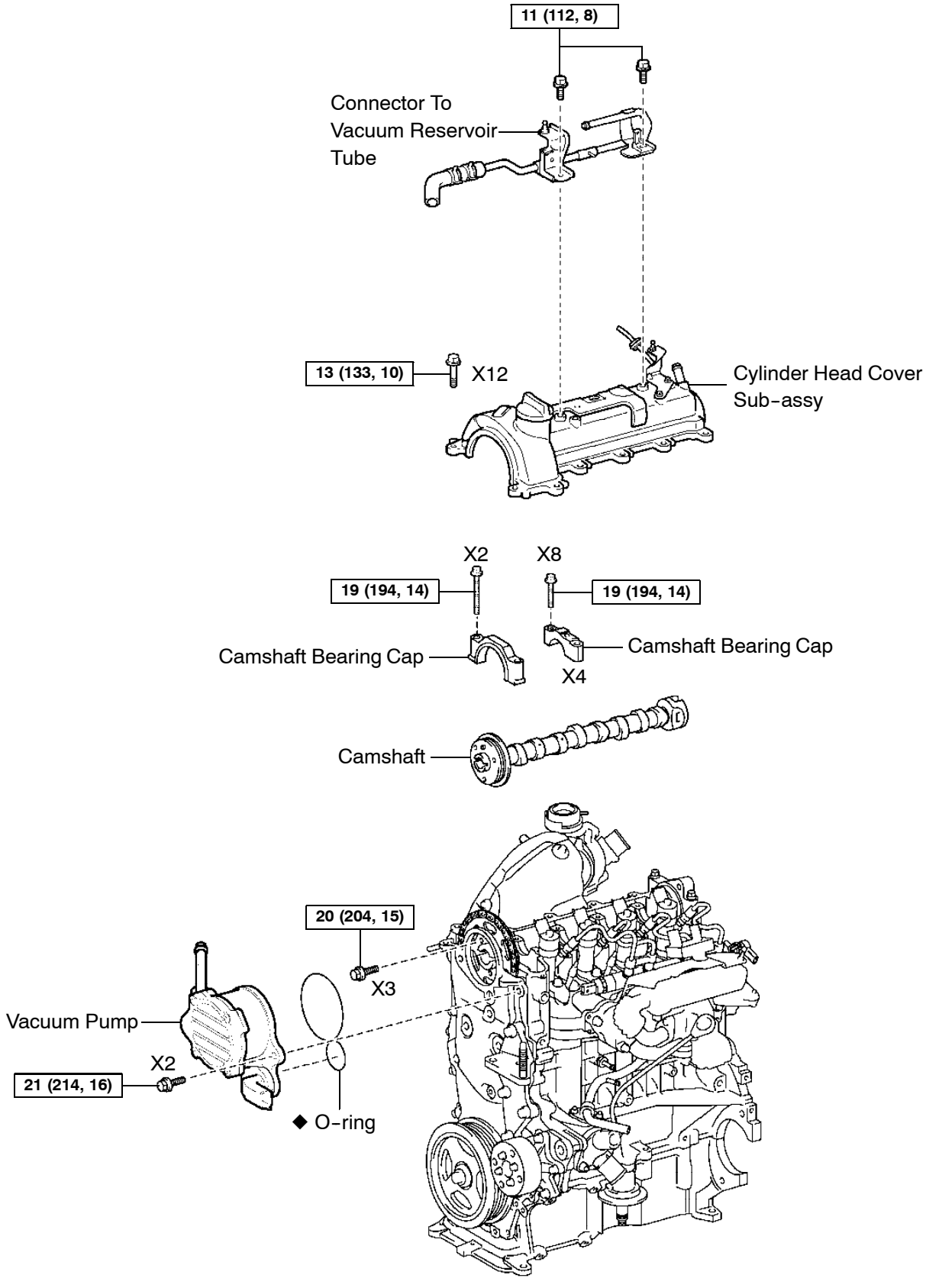
141ZT-01



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

G36404


Injection or Supply Pump Assy
◆ Nozzle Leakage Pipe Assy
◆ Retainer Spring
Supply Pump Drive Coupring
x3
20 (204, 15)
* 23 (235, 17) 25 (255, 18)
Fuel Inlet Pipe Sub-assy
* 23 (235, 17) 25 (255, 18)
Injection Pipe Clamp No. 1
x2
9.0 (92, 80 in.·lbf)
Vacuum Regulating Valve
20 (204, 15)
x3
EGR Cooler Assy
20 (204, 15)
x2
◆ Gasket
x2
11 (112, 8)
11 (112, 8)
◆ Gasket
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
* Use SST
G36739



◆ Non-reusable part

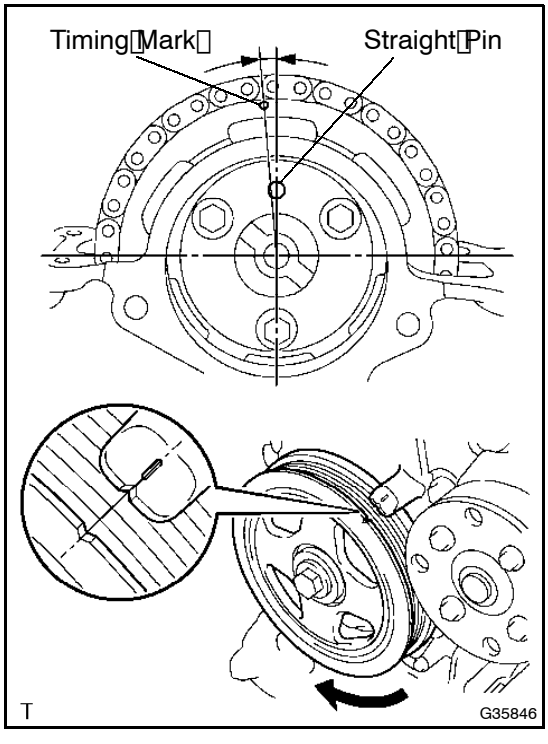
T N·m (kgf·cm, ft·lbf): Specified torque

G36405

141ZU-01

REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
6. DRAIN ENGINE COOLANT (See page 16-7)
7. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
8. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-6)
9. REMOVE VACUUM PUMP ASSY (See page 32-3)
10. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)
11. REMOVE EGR COOLER ASSY (See page 12-5)
12. REMOVE VACUUM REGULATING VALVE (See page 11-8)
13. REMOVE INJECTION PIPE CLAMP NO.1 (See page 11-8)
14. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-8)
15. REMOVE FUEL INLET PIPE SUB-ASSY (See page 11-16)
    SST 09023-38401
16. REMOVE INJECTION OR SUPPLY PUMP ASSY (See page 11-16)



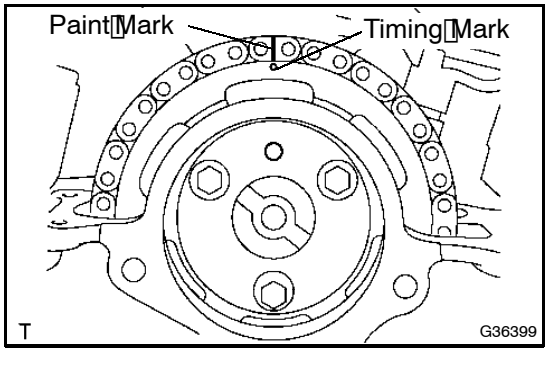
17. REMOVE CAMSHAFT

(a) Set the No. 1 cylinder to TDC/Compression.

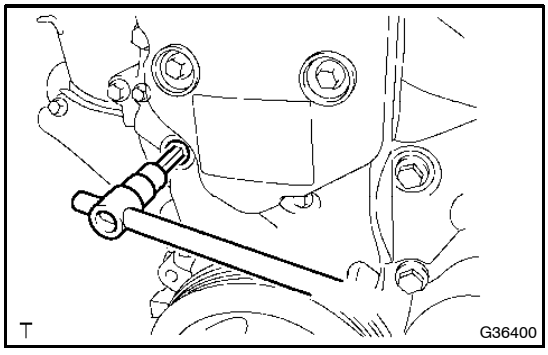
(1) Turn the crankshaft pulley until the grooves of the crankshaft damper and oil pump are aligned.

(2) Check that the timing mark of the camshaft timing sprocket and the straight pin hole of the camshaft timing sprocket are in the positions shown in the illustration.

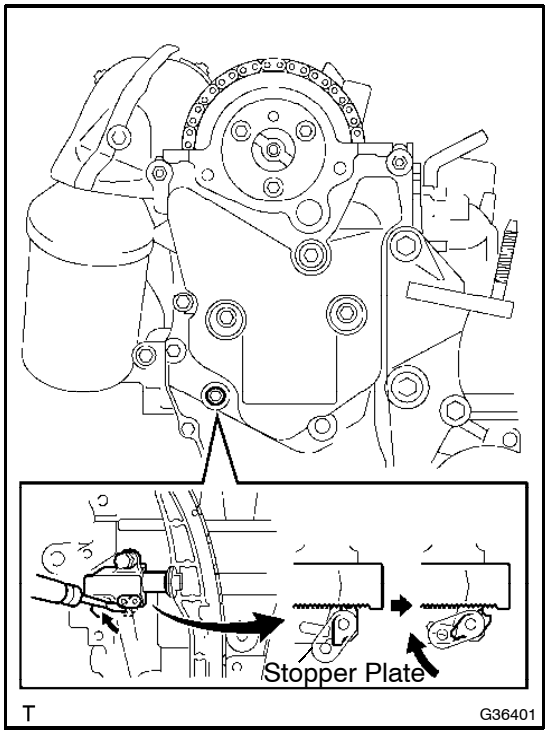
HINT:
If not, turn the crankshaft damper 1 revolution (360°) to align them as above.



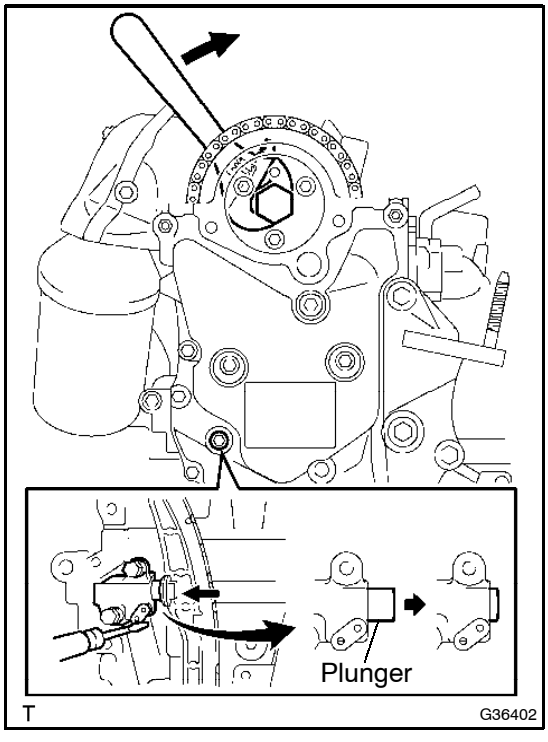
(b) Put paint marks on the timing chain plates which align with the timing marks of the camshaft timing sprocket.



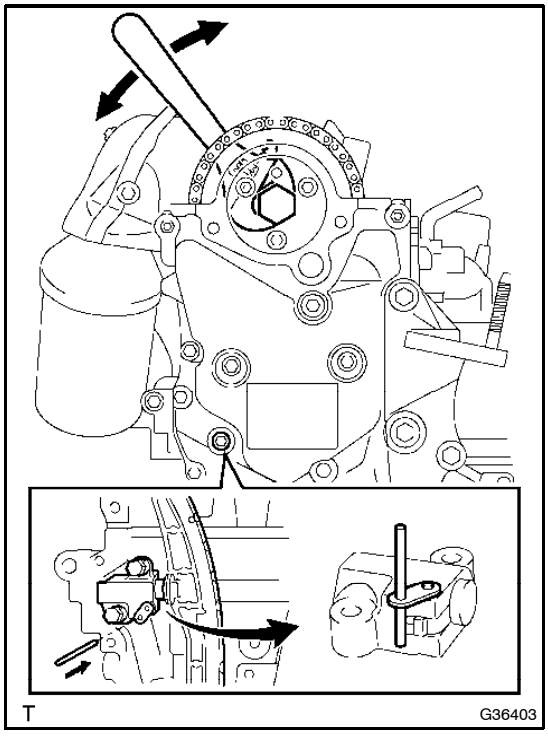
(c) Using 8 mm socket hexagon wrench, remove the service hole screw plug.



(d) Insert a flathead screwdriver from the chain tensioner service hole and hold the chain tensioner stopper plate in a raised position.



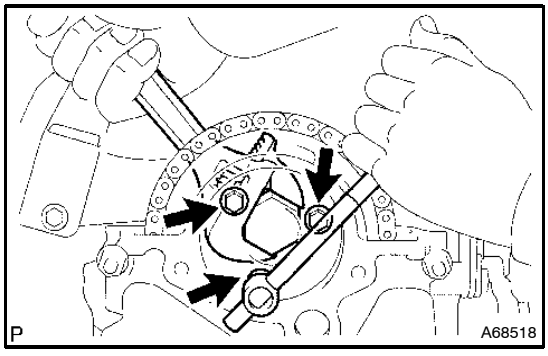
(e) Use a wrench to turn the hexagonal service portion of the camshaft and keep the chain tensioner plunger depressed.



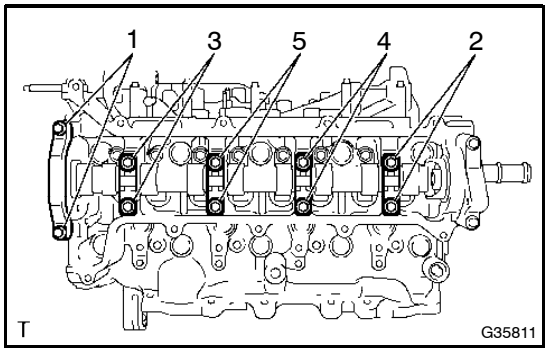
(f) Remove the flathead screwdriver from the chain tensioner service hole. Insert a 2.5 mm (0.098 in.) diameter bar into the hole of the stopper plate with the stopper plate lowered.

HINT:

- The stopper plate can be easily pulled down and an hexagon key wrench can be easily inserted by turning the camshaft counterclockwise slightly and then turning it clockwise again.
- Secure the 2.5 mm (0.098 in.) diameter bar using tape or equivalent to keep it from falling off.



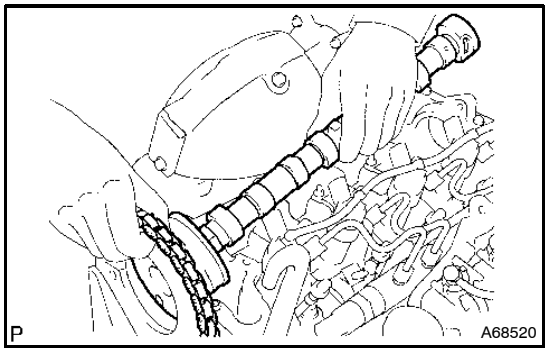
(g) While holding the hexagonal service portion of the camshaft with a wrench, loosen the 3 bolts.



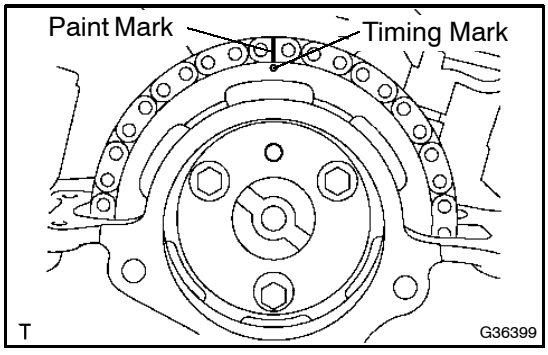
(h) Remove the 10 bolts of the camshaft bearing caps in the sequence shown in the illustration, and then remove the 5 camshaft bearing caps.

NOTICE:

- **Using several steps, uniformly loosen the bolts while keeping the camshaft level.**
- **Take care not to remove the camshaft bearing cap No. 3.**



(i) Separate the camshaft timing gear together with the chain in one piece, and remove the camshaft.



18. INSTALL CAMSHAFT

(a) Apply engine oil to the camshaft journal portion and cam portion.

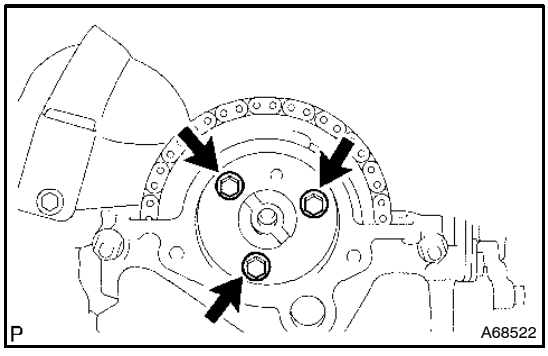
(b) Confirm that the timing mark of the timing sprocket and the paint mark of the timing chain are aligned.

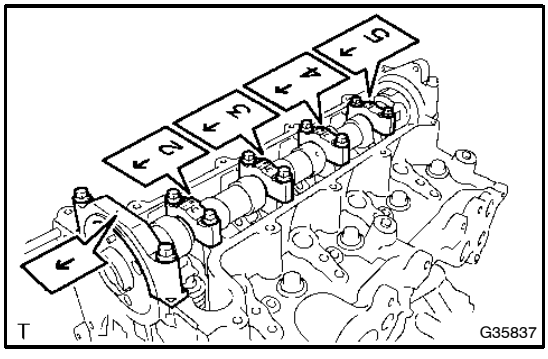
(c) Install the camshaft with the camshaft timing sprocket and chain together.

NOTICE:

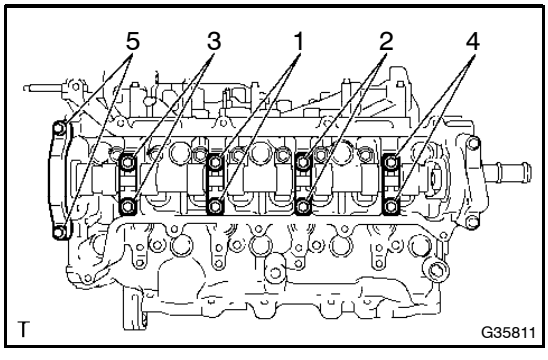
Take care not to tilt the valve rocker arm when installing the camshaft onto the cylinder head.

(d) Temporarily install the camshaft timing sprocket and camshaft with the 3 bolts.



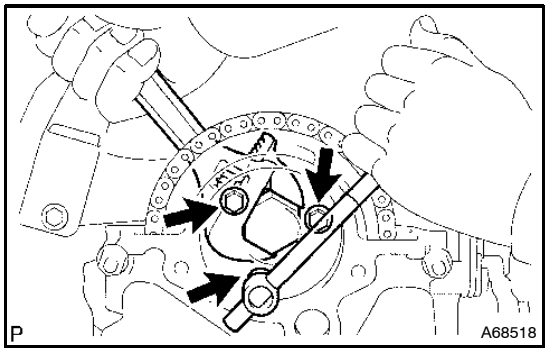


(e) Examine the front marks and numbers and check that the sequence order is as shown in the illustration. Then, temporarily tighten the camshaft with the camshaft bearing caps and bolts.



(f) Using several steps, temporarily tighten the bolts in the sequence shown in the illustration and then tighten the bolts to the specified torque.

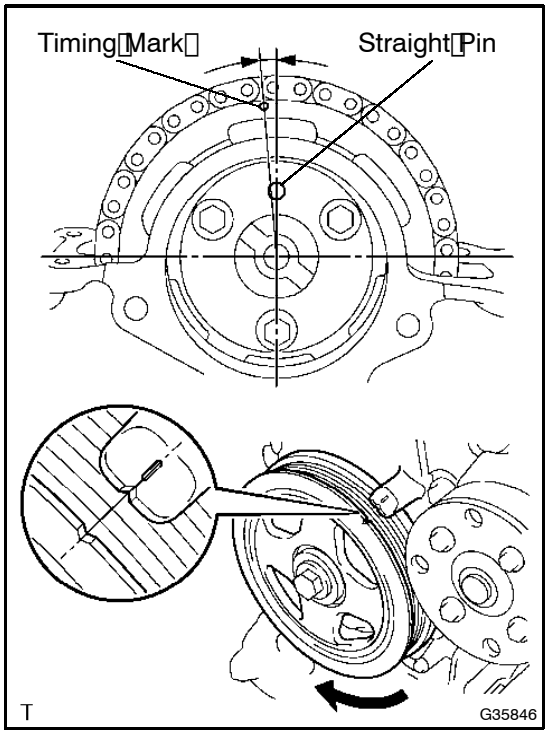
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



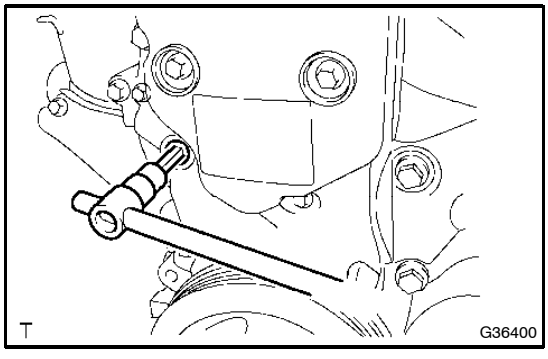
(g) Holding the hexagonal service portion of the camshaft with a wrench, tighten the 3 bolts to the specified torque.

Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(h) Remove the 2.5 mm (0.098 in.) diameter bar from the chain tensioner.



(i) Check that the timing mark of the camshaft timing sprocket and the straight pin hole of the camshaft timing sprocket are in the position shown in the illustration.



(j) Apply adhesive to 2 or 3 threads of the service hole screw plug bolt end.
Adhesive:
Part No. 08833-00070, THREE BOND 1324, or equivalent

NOTICE:
Remove any oil from the bolts and bolt holes.

(k) Using an 8 mm socket hexagon wrench, install the service hole screw plug.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

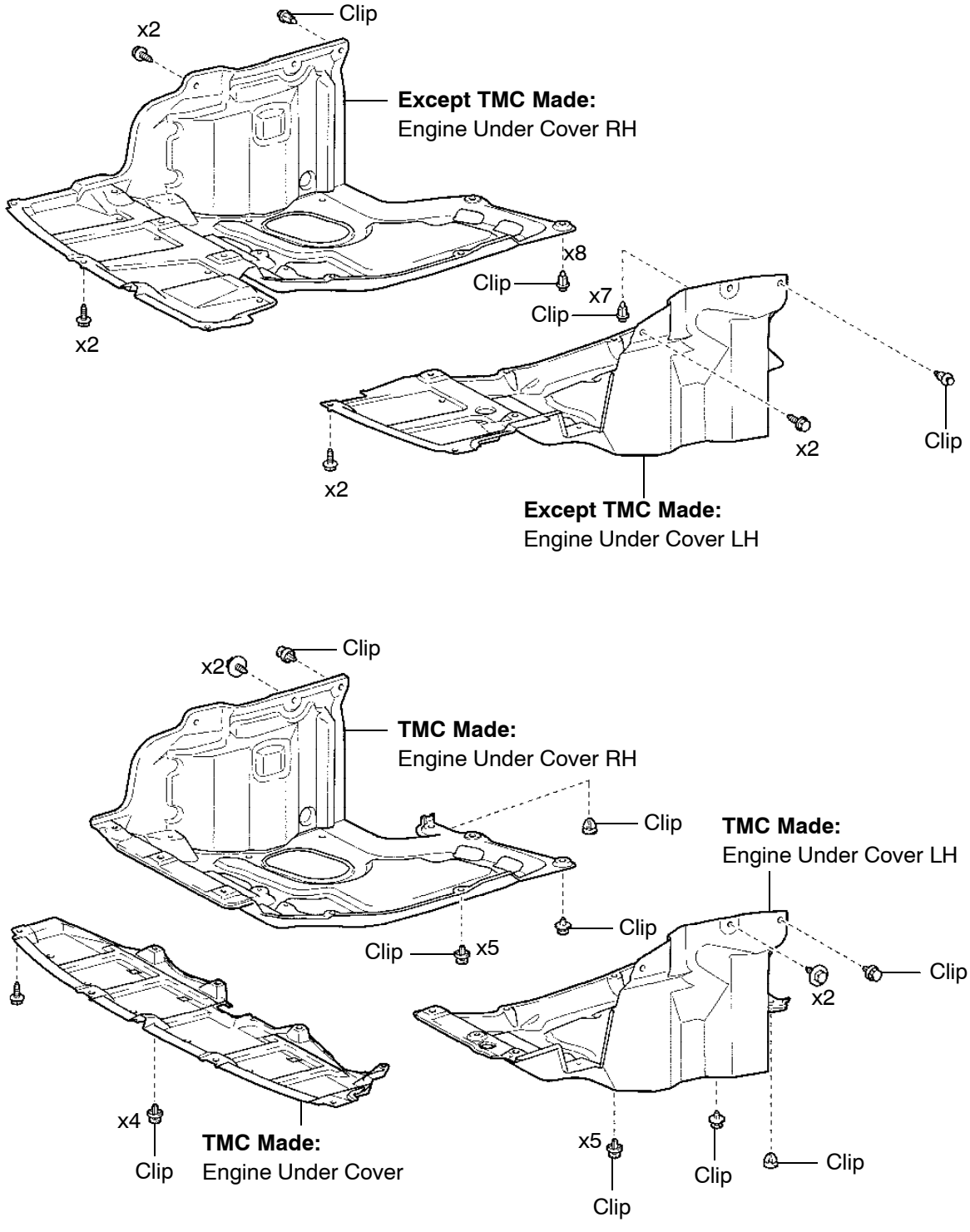
19. **INSPECT VALVE CLEARANCE (See page 14-6)**
20. **ADJUST VALVE CLEARANCE (See page 14-6)**
    SST 09248-55010
21. **INSTALL INJECTION OR SUPPLY PUMP ASSY (See page 11-16)**
22. **INSTALL FUEL INLET PIPE SUB-ASSY (See page 11-16)**
    SST 09023-38401
23. **INSTALL NOZZLE LEAKAGE PIPE ASSY (See page 11-8)**
24. **INSTALL INJECTION PIPE CLAMP NO.1 (See page 11-8)**
25. **INSTALL VACUUM REGULATING VALVE (See page 11-8)**
26. **INSTALL EGR COOLER ASSY (See page 12-5)**
27. **INSTALL AIR CLEANER CAP SUB-ASSY (See page 13-17)**
28. **INSTALL VACUUM PUMP ASSY (See page 32-3)**
29. **INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-6)**
30. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
    Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
31. **ADD ENGINE COOLANT (See page 16-7)**
32. **CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)**
33. **CHECK FOR FUEL LEAKAGE (See page 11-8)**
34. **INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)**
35. **INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)**

36. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
37. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
38. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1050 kgf·cm, 76 ft·lbf)

CYLINDER HEAD GASKET (1ND-TV)

COMPONENTS

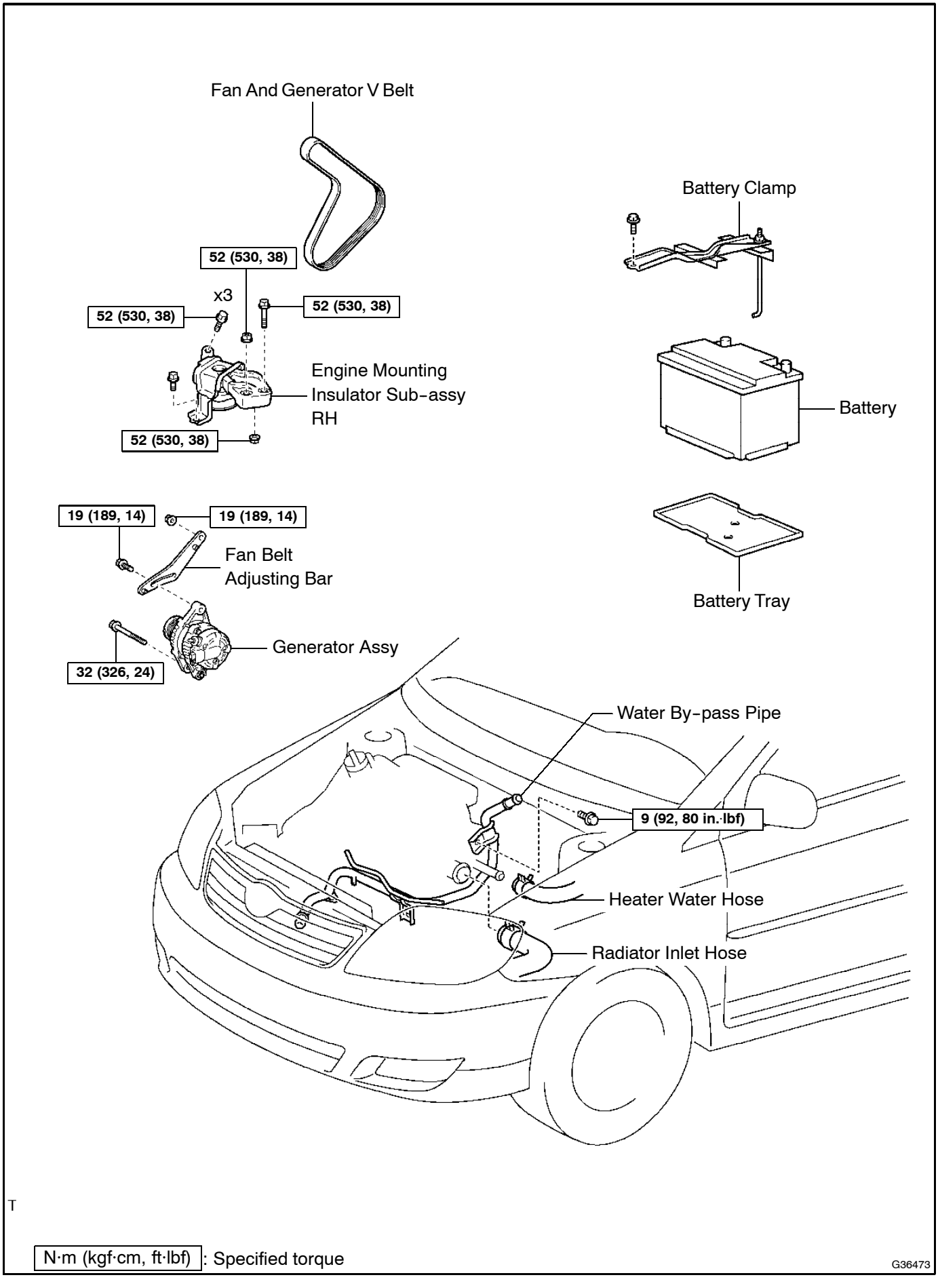
14200-01



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

P ◆ Non-reusable part

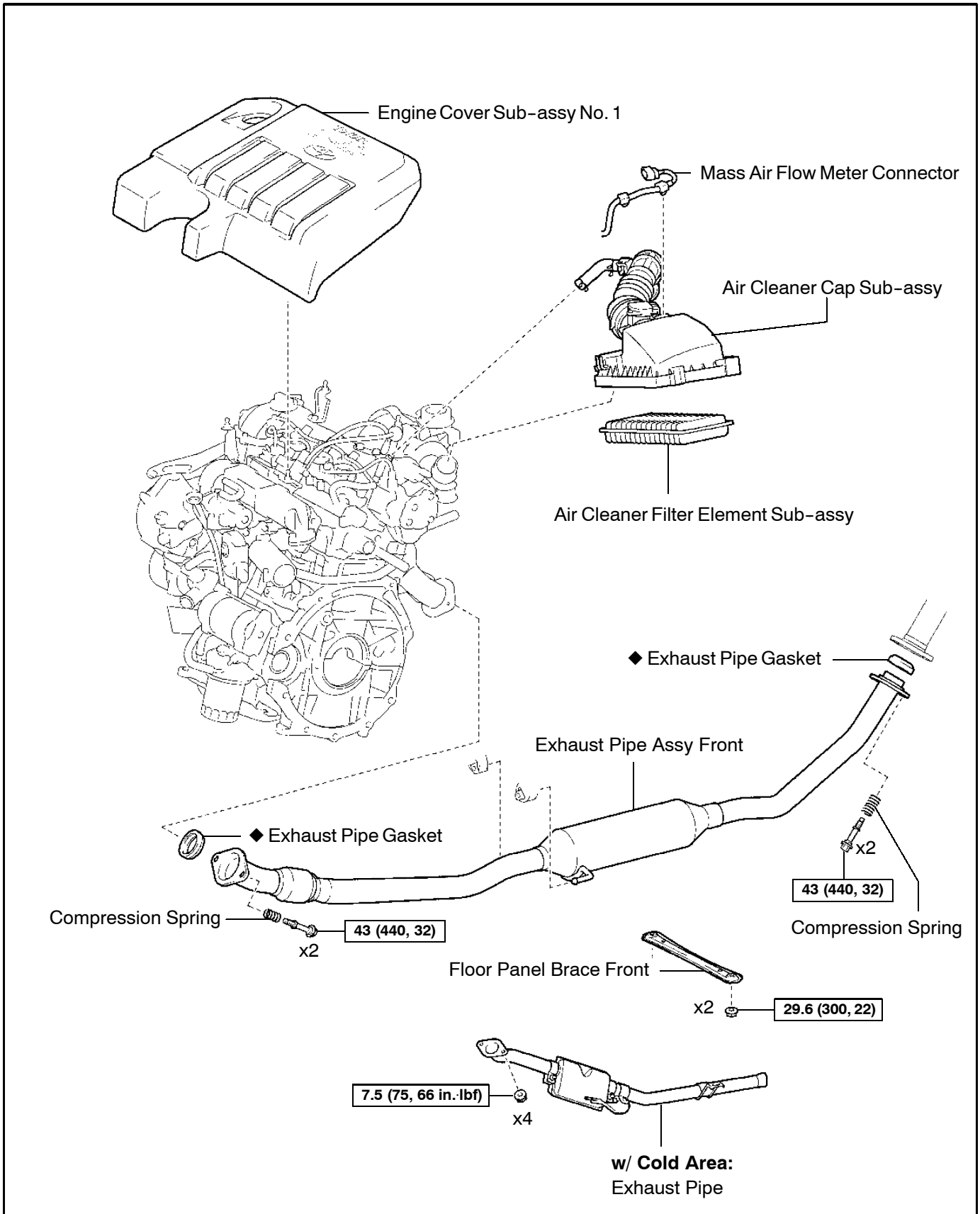
A98596



T

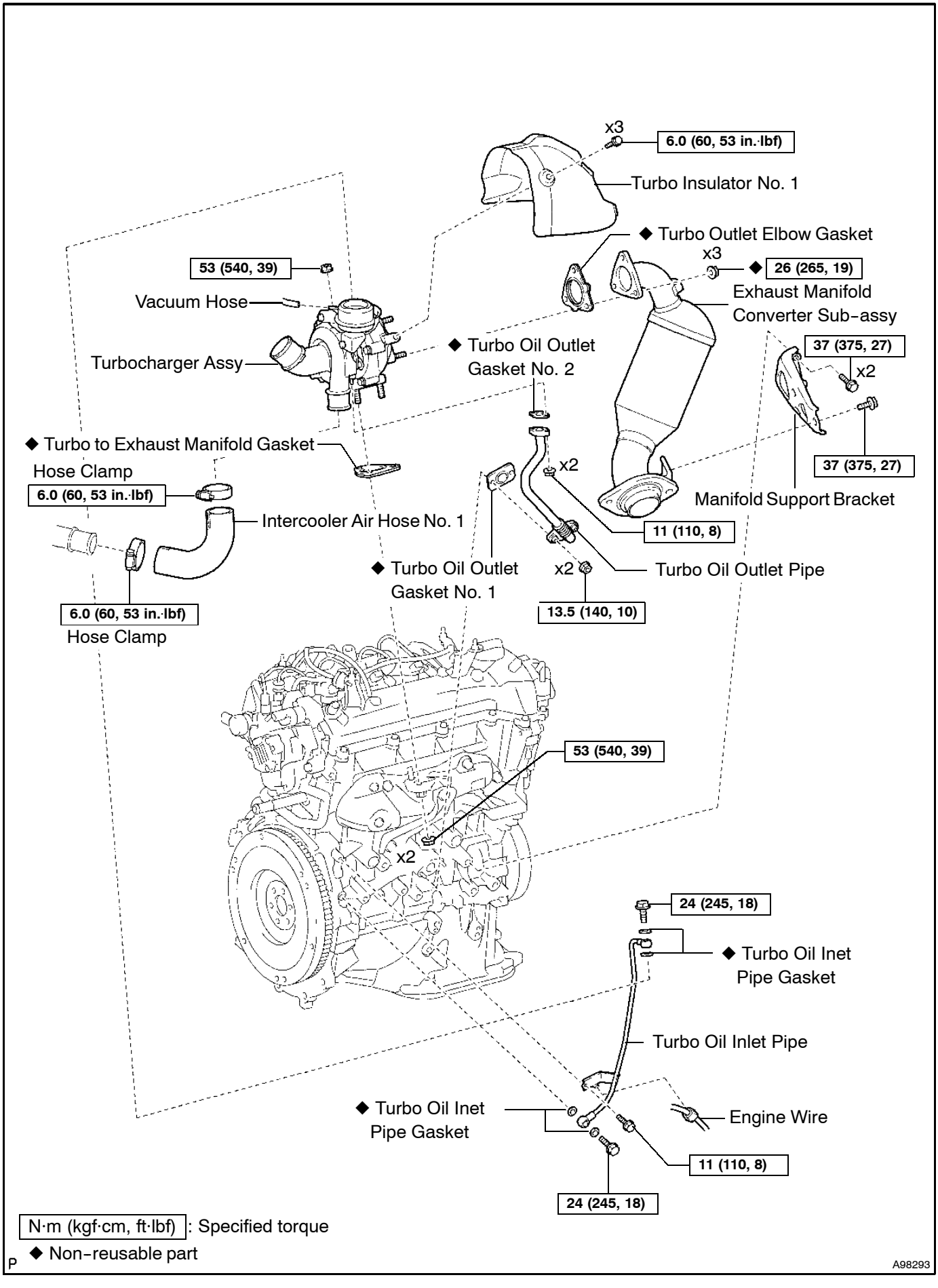
N·m (kgf·cm, ft·lbf) : Specified torque

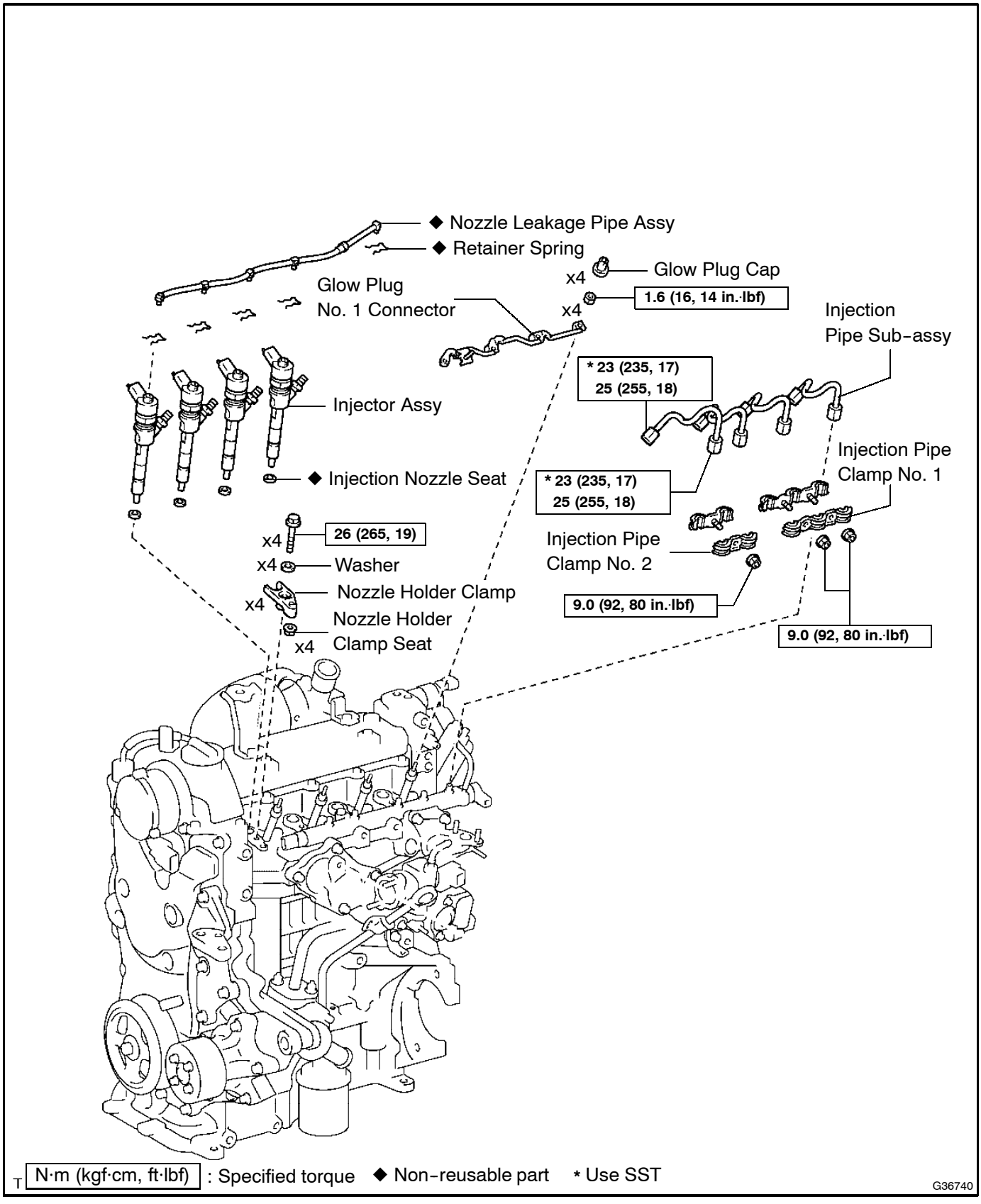
G36473

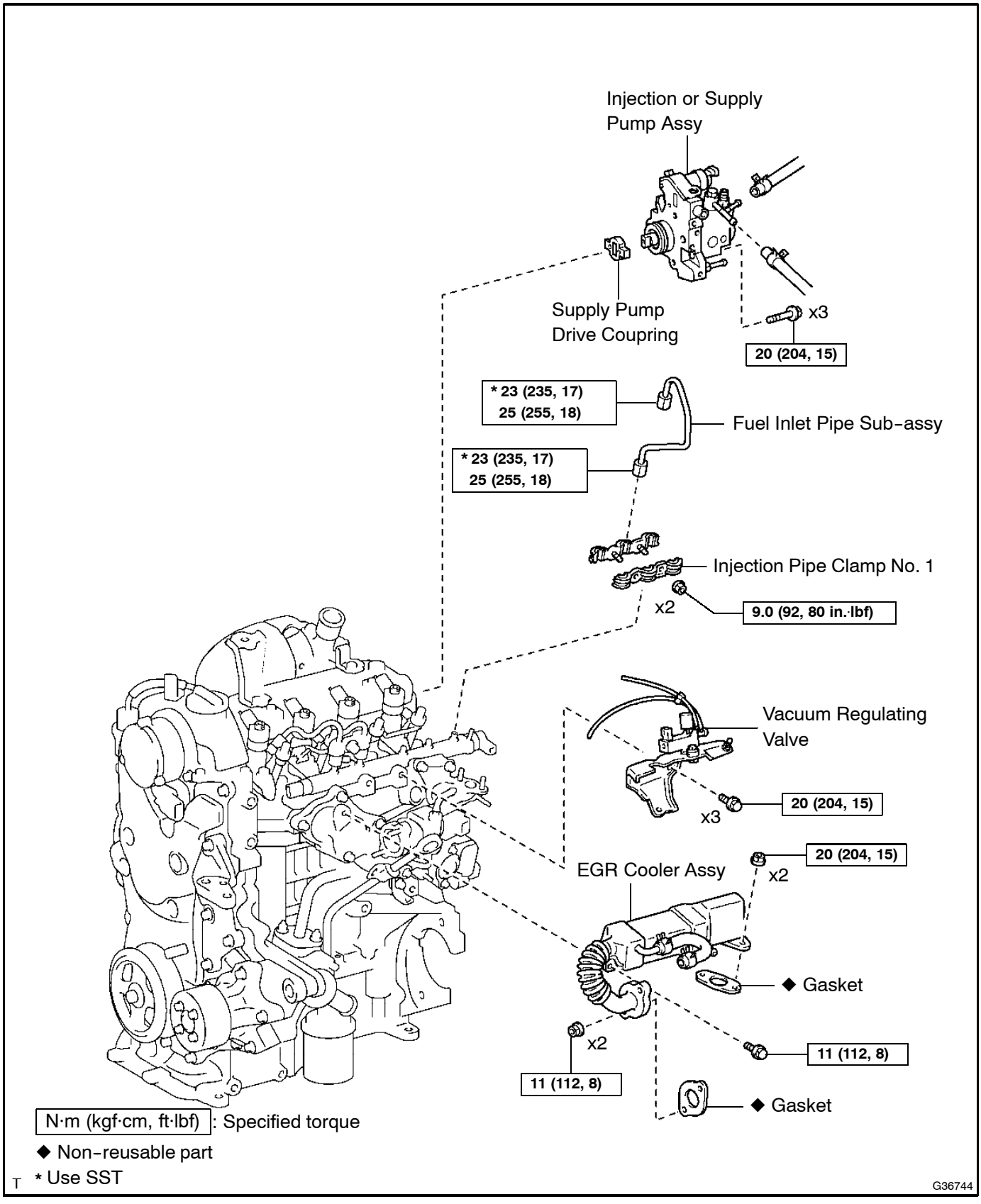


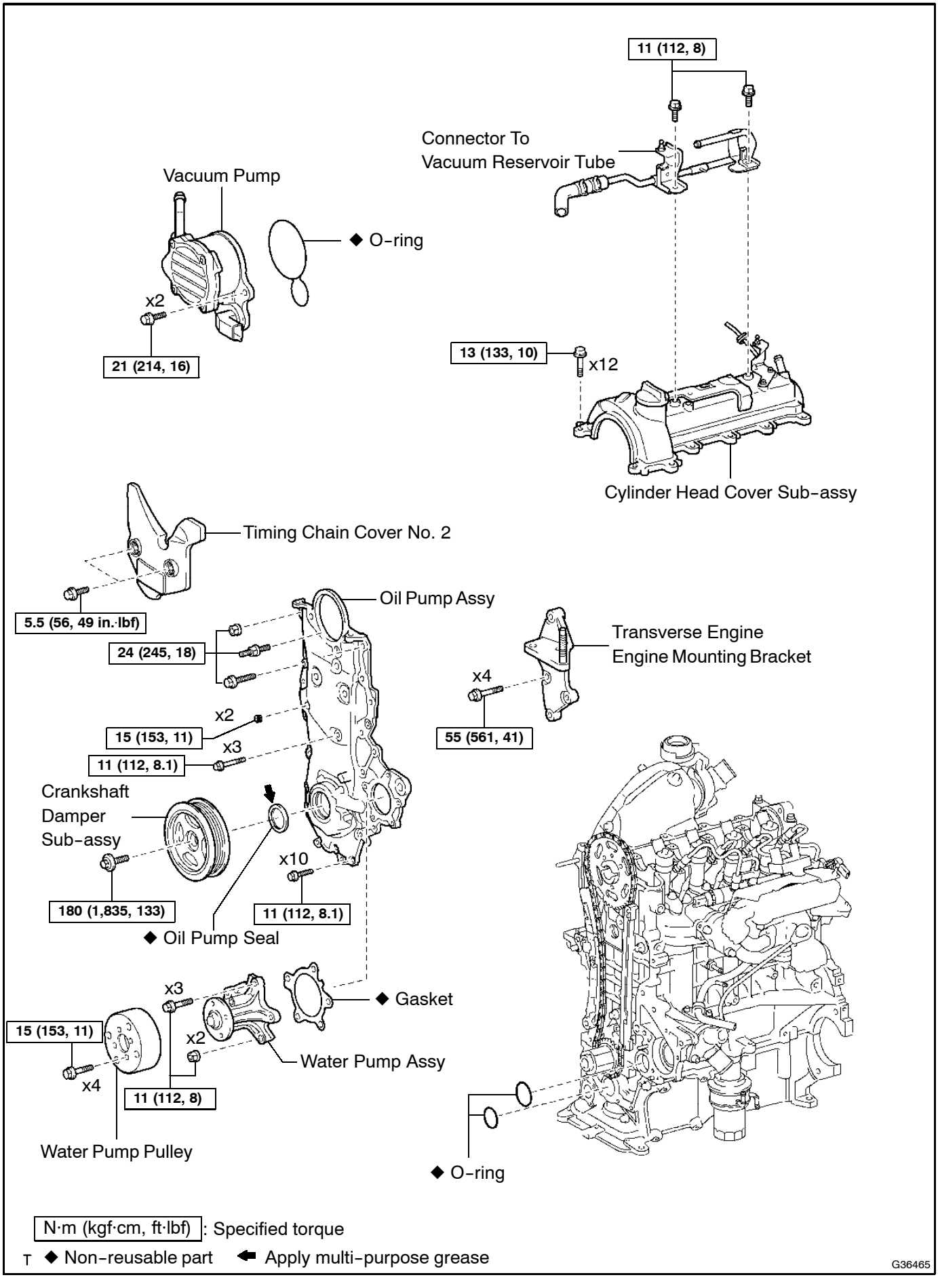
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

P A98294


x3
6.0 (60, 53 in.·lbf)
Turbo Insulator No. 1
◆ Turbo Outlet Elbow Gasket
x3
◆ 26 (265, 19)
Exhaust Manifold Converter Sub-assy
53 (540, 39)
Vacuum Hose
Turbocharger Assy
◆ Turbo Oil Outlet Gasket No. 2
37 (375, 27)
x2
37 (375, 27)
◆ Turbo to Exhaust Manifold Gasket
Hose Clamp
6.0 (60, 53 in.·lbf)
Intercooler Air Hose No. 1
x2
11 (110, 8)
Manifold Support Bracket
◆ Turbo Oil Outlet Gasket No. 1
x2
Turbo Oil Outlet Pipe
13.5 (140, 10)
6.0 (60, 53 in.·lbf)
Hose Clamp
53 (540, 39)
x2
24 (245, 18)
◆ Turbo Oil Inet Pipe Gasket
Turbo Oil Inlet Pipe
◆ Turbo Oil Inet Pipe Gasket
Engine Wire
11 (110, 8)
24 (245, 18)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
A98293


◆ Nozzle Leakage Pipe Assy
◆ Retainer Spring
x4
Glow Plug Cap
1.6 (16, 14 in.·lbf)
Glow Plug
No. 1 Connector
x4
Injection
Pipe Sub-assy
* 23 (235, 17)
25 (255, 18)
Injector Assy
◆ Injection Nozzle Seat
* 23 (235, 17)
25 (255, 18)
Injection Pipe
Clamp No. 1
x4
26 (265, 19)
x4
Washer
Injection Pipe
Clamp No. 2
x4
Nozzle Holder Clamp
9.0 (92, 80 in.·lbf)
Nozzle Holder
Clamp Seat
x4
9.0 (92, 80 in.·lbf)
T N·m (kgf·cm, ft·lbf) : Specified torque ◆ Non-reusable part * Use SST
G36740

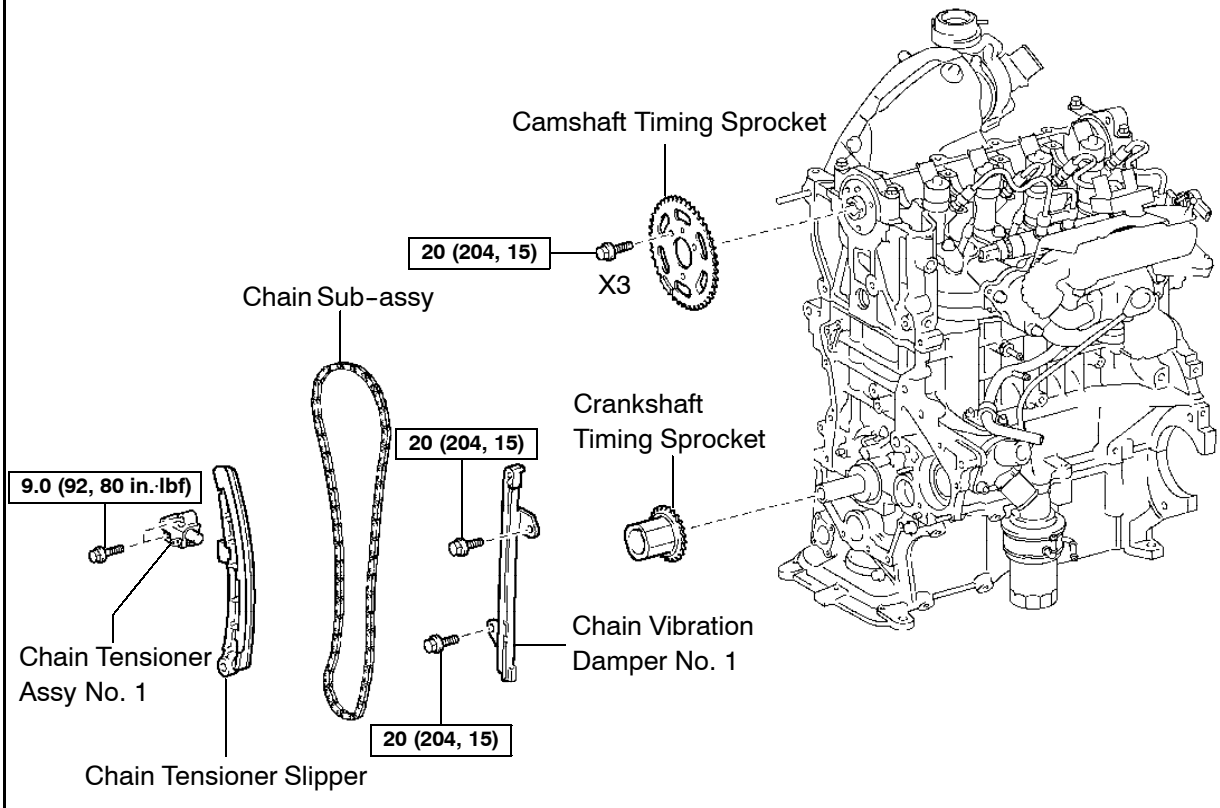

Injection or Supply Pump Assy
Supply Pump Drive Coupring
x3
20 (204, 15)
* 23 (235, 17)
25 (255, 18)
Fuel Inlet Pipe Sub-assy
* 23 (235, 17)
25 (255, 18)
Injection Pipe Clamp No. 1
x2
9.0 (92, 80 in.·lbf)
Vacuum Regulating Valve
20 (204, 15)
x3
EGR Cooler Assy
20 (204, 15)
x2
◆ Gasket
x2
11 (112, 8)
11 (112, 8)
◆ Gasket
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
T * Use SST
G36744



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

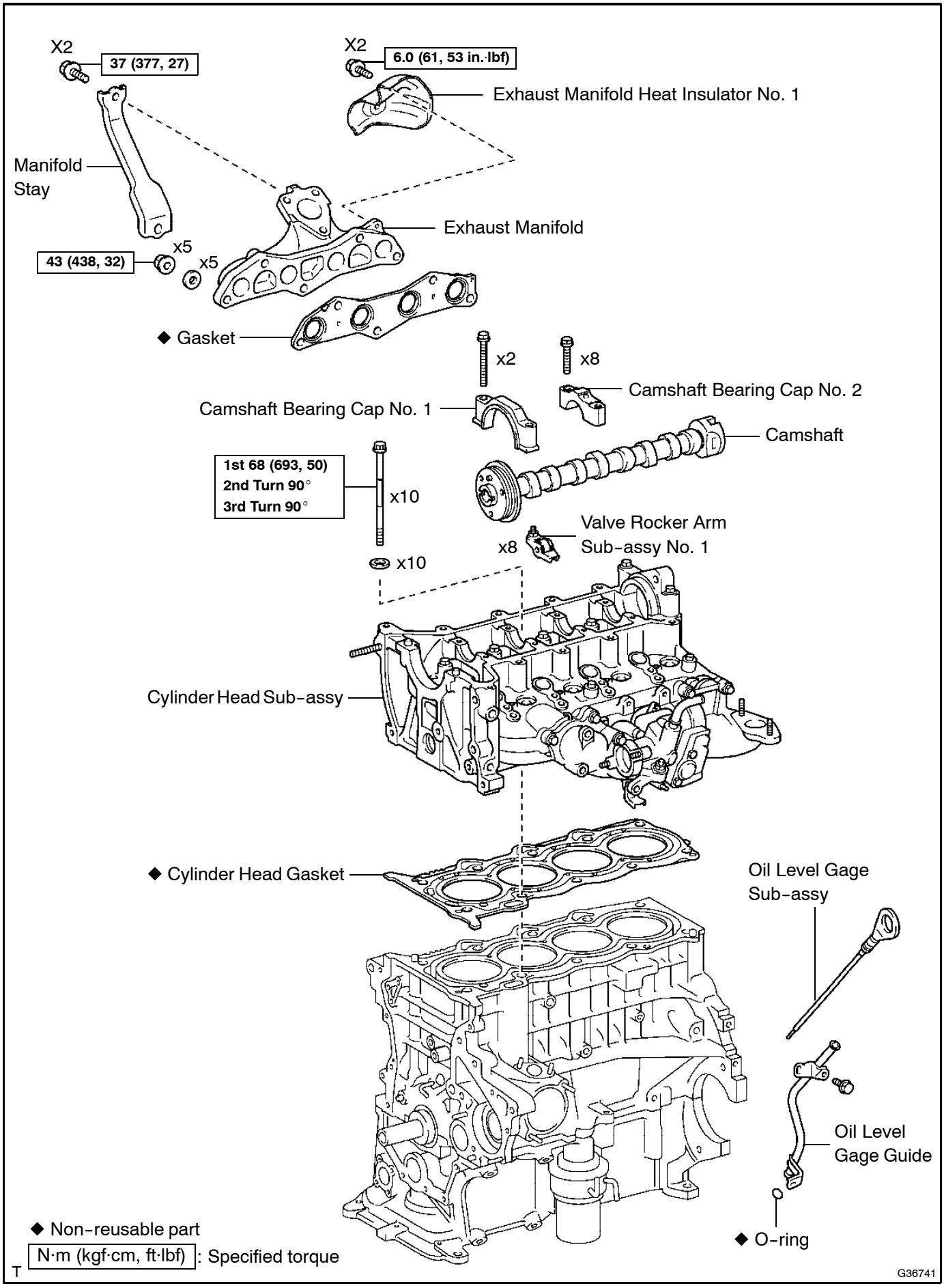
T ◆ Non-reusable part ⬅ Apply multi-purpose grease

G36465



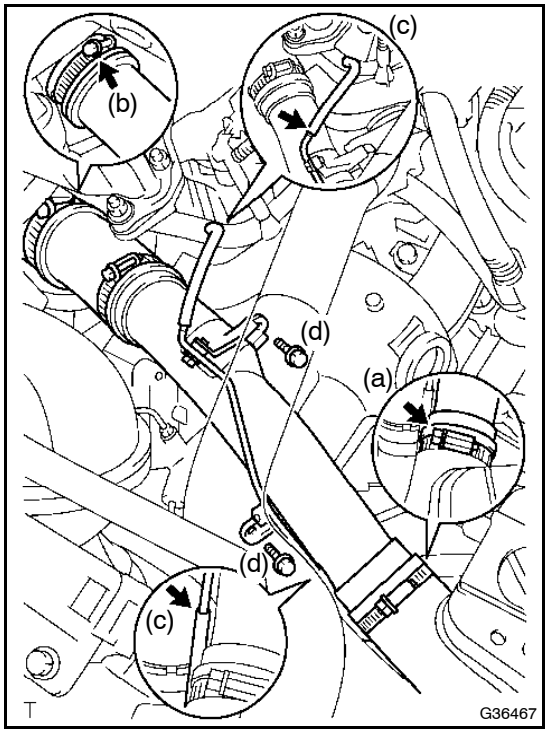
N·m (kgf·cm, ft·lbf): Specified torque

G36466


X2
37 (377, 27)
X2
6.0 (61, 53 in.·lbf)
Exhaust Manifold Heat Insulator No. 1
Manifold Stay
Exhaust Manifold
43 (438, 32)
x5
x5
◆ Gasket
x2
x8
Camshaft Bearing Cap No. 2
Camshaft Bearing Cap No. 1
Camshaft
1st 68 (693, 50)
2nd Turn 90°
3rd Turn 90°
x10
x8
Valve Rocker Arm Sub-assy No. 1
x10
Cylinder Head Sub-assy
◆ Cylinder Head Gasket
Oil Level Gage Sub-assy
Oil Level Gage Guide
◆ O-ring
◆ Non-reusable part
N·m (kgf·cm, ft·lbf): Specified torque
T
G36741

REPLACEMENT

1. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
2. REMOVE BATTERY
3. REMOVE FRONT WHEEL RH
4. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
5. REMOVE ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
6. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
7. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
8. DRAIN ENGINE OIL
9. DRAIN ENGINE COOLANT (See page 16-7)
10. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)



11. REMOVE AIR TUBE NO.2
(a) Loosen the hose clamp and separate the air hose No. 3 from the air tube No. 2.
(b) Loosen the hose clamp shown in the illustration.
(c) Separate the vacuum hose from the vacuum transmitting pipe No. 1.
(d) Remove the 2 bolts and air tube No. 2 with air hose No. 4.

12. REMOVE AIR CLEANER CAP SUB-ASSY (See page 13-17)
13. REMOVE GLOW PLUG NO.1 CONNECTOR (See page 19-14)
14. REMOVE GLOW PLUG ASSY (See page 19-14)
15. REMOVE EGR COOLER ASSY (See page 12-5)
16. REMOVE VACUUM REGULATING VALVE (See page 11-8)
17. REMOVE INJECTION PIPE CLAMP NO.1 (See page 11-8)
18. REMOVE INJECTION PIPE CLAMP NO.2 (See page 11-8)
19. REMOVE INJECTION PIPE SUB-ASSY NO.1 (See page 11-8)
SST 09023-38401
20. REMOVE INJECTION PIPE SUB-ASSY NO.2 (See page 11-8)
SST 09023-38401
21. REMOVE INJECTION PIPE SUB-ASSY NO.3 (See page 11-8)
SST 09023-38401
22. REMOVE INJECTION PIPE SUB-ASSY NO.4 (See page 11-8)
SST 09023-38401

23. REMOVE NOZZLE LEAKAGE PIPE ASSY **(See page 11-8)**

24. REMOVE INJECTOR ASSY **(See page 11-8)**

25. REMOVE FUEL INLET PIPE SUB-ASSY **(See page 11-16)**

SST 09023-38401

26. REMOVE INJECTION OR SUPPLY PUMP ASSY **(See page 11-16)**

27. REMOVE FLOOR PANEL BRACE FRONT **(See page 15-2)**

28. REMOVE EXHAUST PIPE ASSY FRONT **(See page 13-17)**

29. REMOVE EXHAUST PIPE **(See page 13-17)**

30. REMOVE TURBO INSULATOR NO.1 **(See page 13-17)**

31. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY **(See page 13-17)**

32. REMOVE TURBO OIL INLET PIPE **(See page 13-17)**

33. REMOVE TURBO OIL OUTLET PIPE **(See page 13-17)**

34. REMOVE INTERCOOLER AIR HOSE **(See page 13-17)**

35. REMOVE TURBOCHARGER SUB-ASSY **(See page 13-17)**

36. REMOVE EXHAUST MANIFOLD

(a) Remove the 2 bolts, then remove the manifold stay.

(b) Remove the 2 bolts, then remove the exhaust manifold heat insulator No. 1.

(c) Remove the 5 nuts, then remove the exhaust manifold w/ turbocharger.

37. REMOVE FAN AND GENERATOR V BELT **(See page 14-4)**

38. REMOVE GENERATOR ASSY **(See page 19-9)**

39. REMOVE WATER PUMP PULLEY **(See page 16-9)**

SST 09960-10010 (09962-01000, 09963-00700)

40. REMOVE WATER PUMP ASSY **(See page 16-9)**

41. REMOVE CYLINDER HEAD COVER SUB-ASSY **(See page 14-6)**

42. REMOVE VACUUM PUMP ASSY **(See page 32-3)**

43. SET NO. 1 CYLINDER TO TDC/COMPRESSION **(See page 14-45)**

44. REMOVE CRANKSHAFT DAMPER SUB-ASSY **(See page 17-5)**

SST 09960-10010 (09962-01000, 09963-01000)

45. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH **(See page 17-5)**

46. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET **(See page 17-5)**

47. REMOVE TIMING CHAIN COVER NO.2 **(See page 17-5)**

48. REMOVE OIL PUMP ASSY **(See page 17-5)**

49. REMOVE OIL PUMP SEAL **(See page 17-5)**

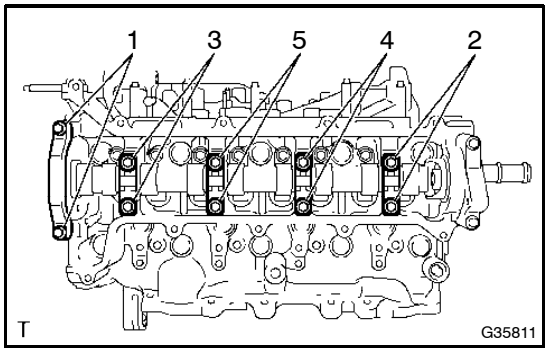
50. REMOVE CHAIN TENSIONER ASSY NO.1 **(See page 14-45)**

51. REMOVE CHAIN TENSIONER SLIPPER **(See page 14-45)**

52. REMOVE CHAIN VIBRATION DAMPER NO.1 **(See page 14-45)**

53. REMOVE CHAIN SUB-ASSY **(See page 14-45)**

SST 09960-10010 (09962-01000, 09963-01000)

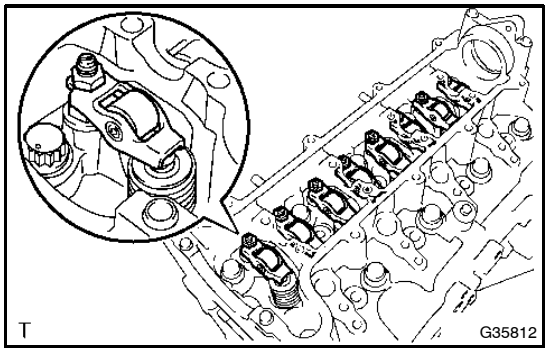


54. REMOVE CAMSHAFT

(a) Remove the 10 bolts of the camshaft bearing caps in the sequence shown in the illustration, and then remove the 5 camshaft bearing caps.

NOTICE:

- **Using several steps, uniformly loosen the bolts while keeping the camshaft level.**
- **Take care not to remove the camshaft bearing cap No. 3.**



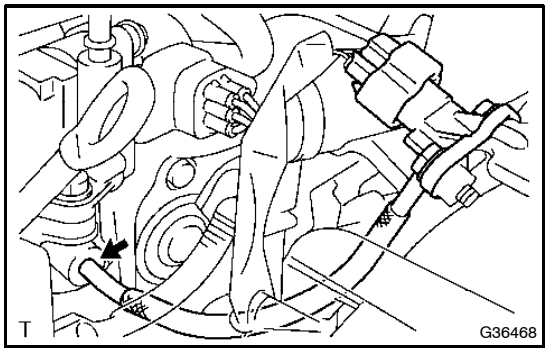
55. REMOVE VALVE ROCKER ARM SUB-ASSY NO.1

(a) Remove the 8 valve rocker arms from the cylinder head.

56. REMOVE OIL LEVEL GAGE GUIDE

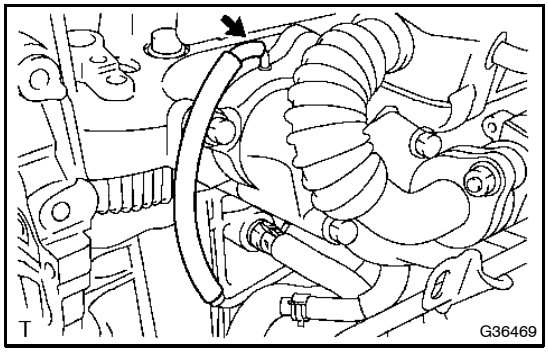
(a) Remove the oil level gage from the oil level gage guide.

(b) Remove the bolt, then remove the oil level gage guide.

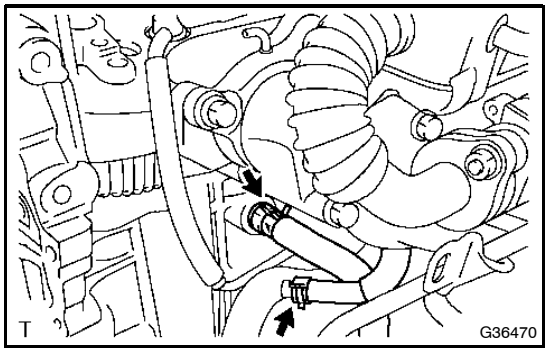


57. REMOVE CYLINDER HEAD SUB-ASSY

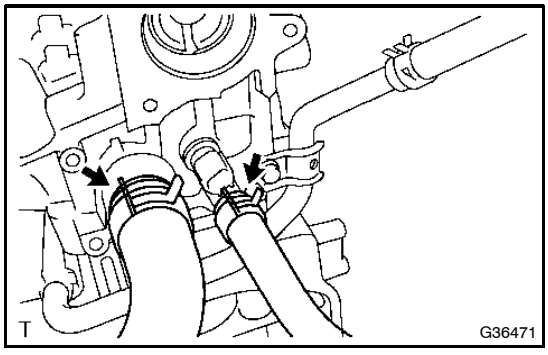
(a) Disconnect the vacuum hose shown in the illustration.



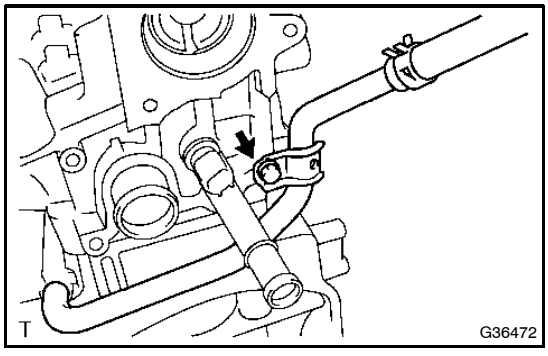
(b) Disconnect the vacuum hose shown in the illustration.



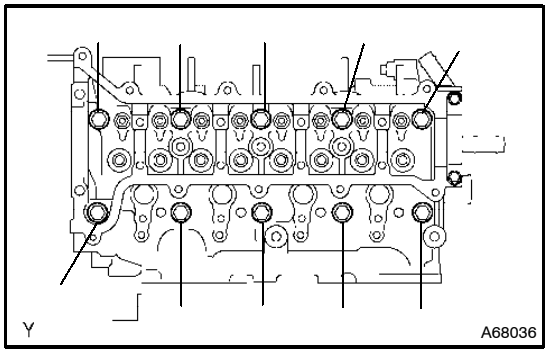
(c) Disconnect the 2 water hoses shown in the illustration.



(d) Disconnect the radiator inlet hose and the heater water hose.



(e) Remove the bolt, then separate the water by-pass pipe.
(f) Disconnect each connector and wire harness from the cylinder head.

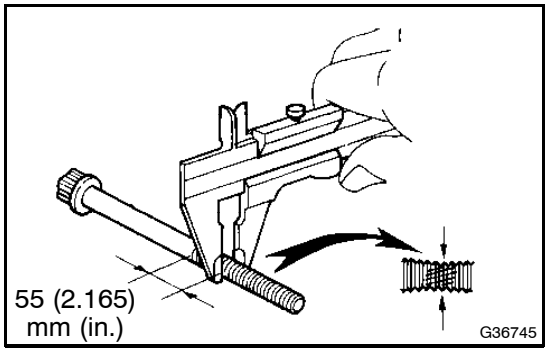


(g) Using several steps, loosen the 10 bolts in the sequence shown in the illustration, and then remove the bolts and washers.

NOTICE:

- **When removing the bolts, do not drop the washer into the engine.**
- **Removing the cylinder head bolts in the wrong order may cause damage to the cylinder head.**

58. REMOVE CYLINDER HEAD GASKET

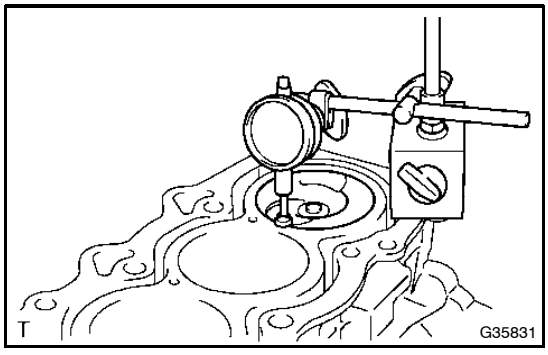


59. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the minimum outer diameter of the compressed thread at the measuring point.

Standard outer diameter:
11.7 to 12.0 mm (0.461 to 0.472 in.)
Minimum outer diameter: 11.5 mm 0.453 in.)

If the outer diameter is less than the minimum, replace the cylinder head bolt.



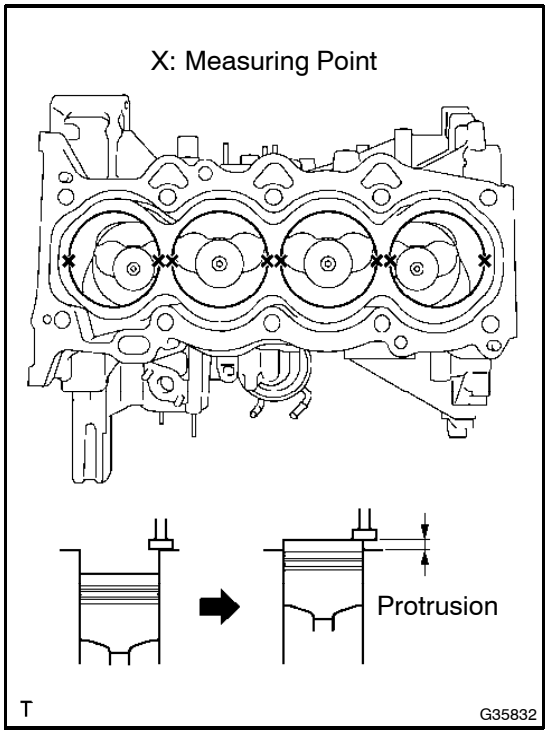
60. INSTALL CYLINDER HEAD GASKET

(a) Inspect the protrusion height of the piston heads.

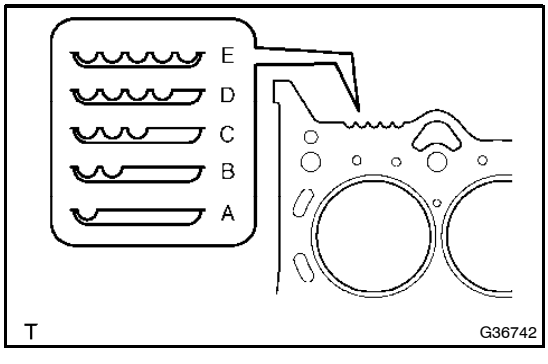
(1) Place a dial indicator on the cylinder block as shown in the illustration.

NOTICE:

Make sure that the dial indicator is at right angles to the cylinder block top surface.



(2) Measure the protrusion height of the piston head of each cylinder at 2 places as shown in the illustration.



(b) Select a new cylinder head gasket.

(1) Select the highest protrusion height among the 8 measurement records. Use it to select a new cylinder head gasket.

Piston protrusion:

Piston protrusion mm (in.)	Gasket cutout	Gasket size
0.375 to 0.425	1	A
0.425 to 0.475	2	B
0.475 to 0.525	3	C
0.525 to 0.575	4	D
0.575 to 0.625	5	E

(c) Install the cylinder head gasket.

(1) Apply seal packing (Diameter 3.5 to 4.5 mm (0.138 to 0.177 in.)) to the cylinder block side as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Remove any oil from the contact surface.

(2) Place a new cylinder head gasket on the cylinder block with the Lot No. stamp facing upward.

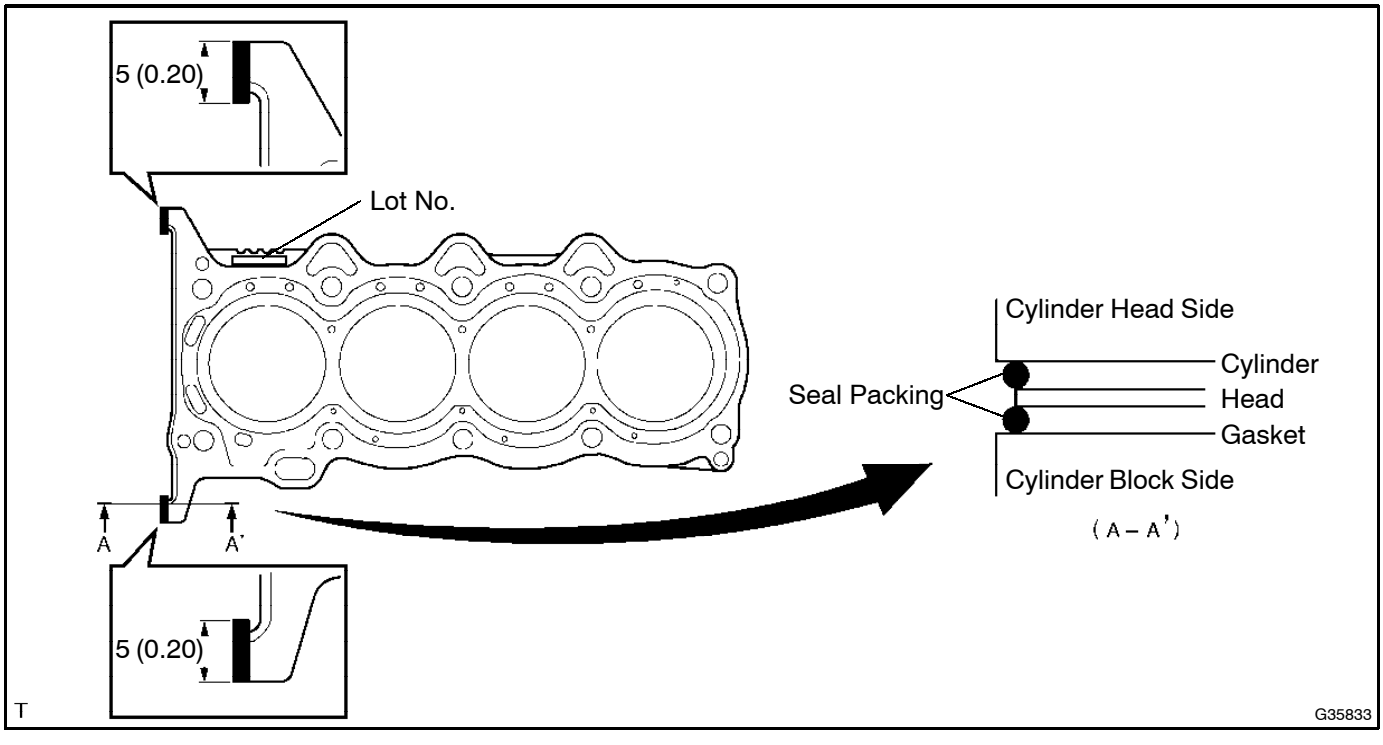
(3) Apply seal packing (Diameter 3.5 to 4.5 mm (0.138 to 0.177 in.)) to the top surface of the cylinder head again as shown in the illustration.

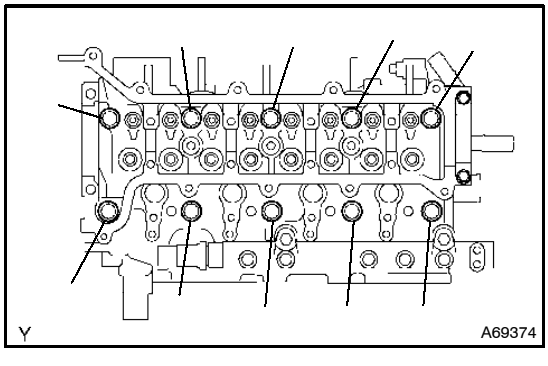
Seal packing: Part No. 08826-00080 or equivalent

(4) Install the cylinder head onto the cylinder block.

NOTICE:

- **Remove any oil from the contact surface.**
- **Install the cylinder head within 3 minutes, and tighten the bolts within 15 minutes of applying seal packing.**





61. INSTALL CYLINDER HEAD SUB-ASSY

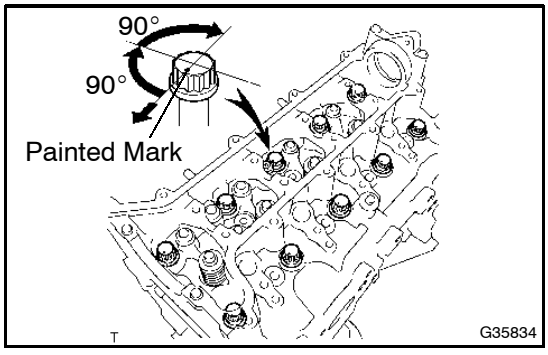
HINT:

The cylinder head bolts are tightened in 2 successive steps.

(a) Apply a light coat of engine oil to the threads of the cylinder head bolts.

(b) Using several steps, uniformly install and tighten the 10 cylinder head bolts and plate washers in the sequence shown in the illustration.

Torque: 68 N·m (693 kgf·cm, 50 ft·lbf)

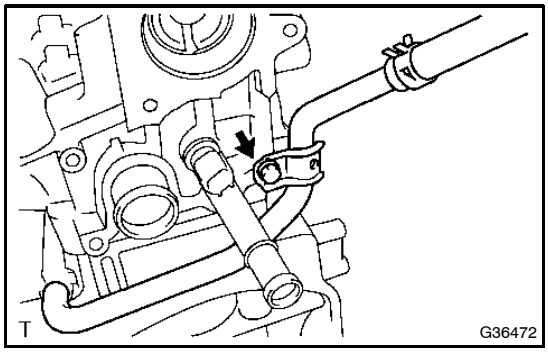


(c) Mark the front of he cylinder head bolts with paint.

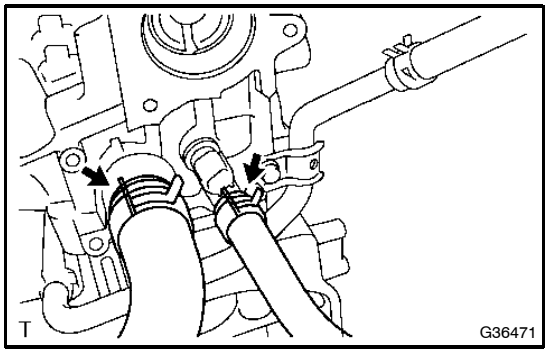
(d) Using the same sequence as step (b), retighten the cylinder head bolts by additional 90° and one more additional 90° as shown in the illustration.

(e) Check that each paint mark is now 180° opposite from the front.

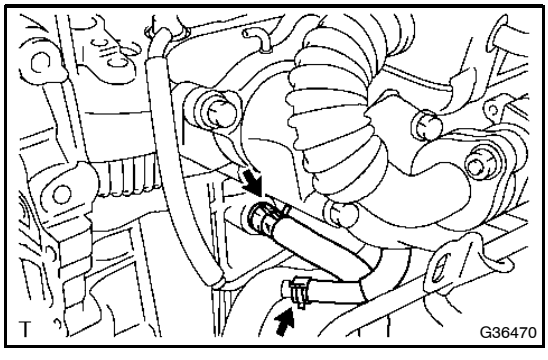
(f) Connect each connector and wire harness to the cylinder head.



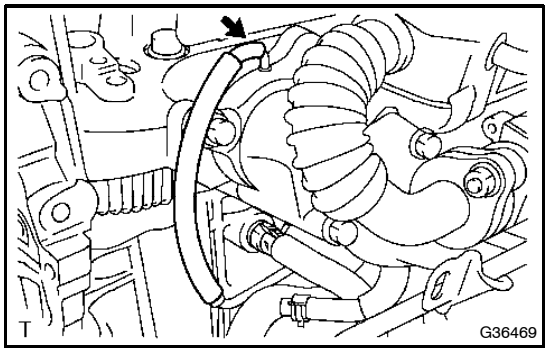
(g) Install the water by-pass pipe with the bolt.
Torque: 9 N·m (92 kgf·cm, 80 in.·lbf)



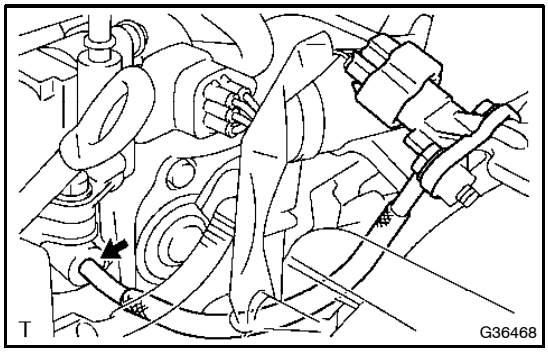
(h) Connect the radiator inlet hose and the heater water hose.



(i) Connect the 2 water hoses shown in the illustration.



(j) Connect the vacuum hose shown in the illustration.



(k) Connect the vacuum hose shown in the illustration.

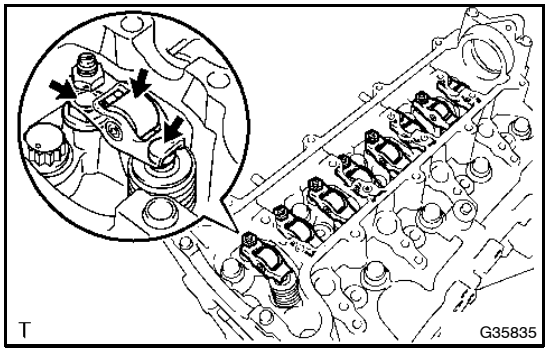
62. INSTALL OIL LEVEL GAGE GUIDE

(a) Apply engine oil to a new O-ring, then install it onto the oil level gage guide.

(b) Install the oil level gage guide with the bolt.

Torque: 11 N·m (112 kgf·cm, 8.1 ft·lbf)

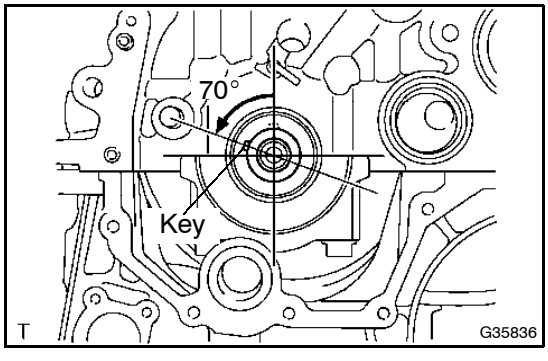
(c) Install the oil level gage.



63. INSTALL VALVE ROCKER ARM SUB-ASSY NO.1

(a) Apply engine oil to the stem end cap, valve rocker arm pivot top surface and valve rocker arm roller portion.

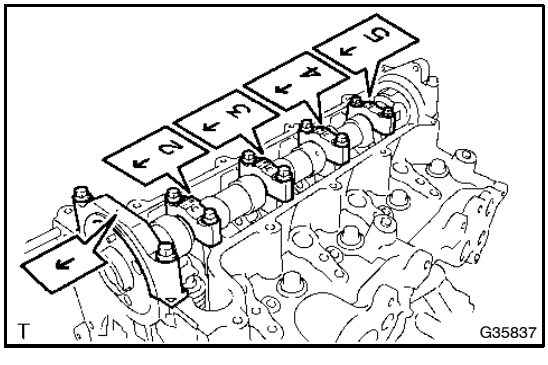
(b) Install the 8 valve rocker arms.



64. INSTALL CAMSHAFT

(a) Turn the crankshaft to set the key at the 70° BTDC position.

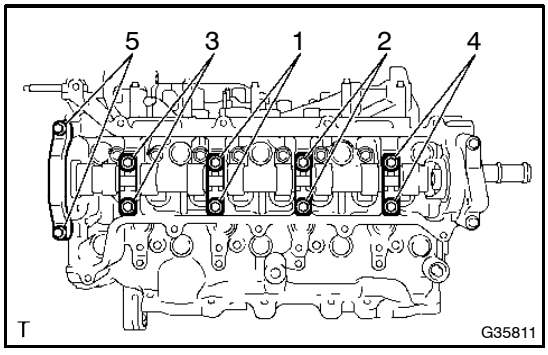
(b) Apply engine oil to the camshaft journal portion and cam portion.



(c) Examine the front marks and numbers and check that the sequence order is as shown in the illustration. Then, temporarily tighten the camshaft with the camshaft bearing caps and bolts.

NOTICE:

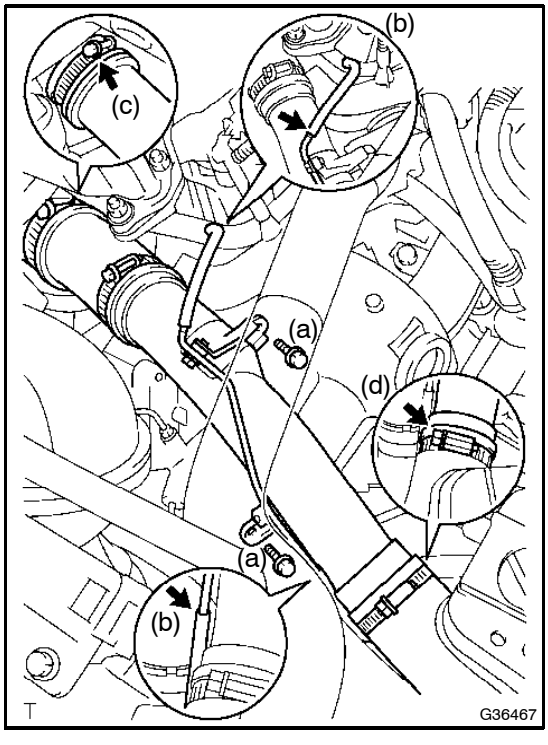
Take care not to tilt the valve rocker arm when installing the camshaft onto the cylinder head.



(d) Using several steps, temporarily tighten the bolts in the sequence shown in the illustration, and then tighten the bolts to the specified torque.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

65. INSTALL CHAIN SUB-ASSY (See page 14-45)
SST 09960-10010 (09962-01000, 09963-01000)
66. INSTALL CHAIN VIBRATION DAMPER NO.1 (See page 14-45)
67. INSTALL CHAIN TENSIONER SLIPPER (See page 14-45)
68. INSTALL CHAIN TENSIONER ASSY NO.1 (See page 14-45)
69. INSTALL OIL PUMP SEAL (See page 17-5)
SST 09223-22010
70. INSTALL OIL PUMP ASSY (See page 17-5)
71. INSTALL TIMING CHAIN COVER NO.2 (See page 17-5)
72. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 17-5)
73. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 17-5)
74. INSTALL CRANKSHAFT DAMPER SUB-ASSY (See page 17-5)
SST 09960-10010 (09962-01000, 09963-01000)
75. INSTALL VACUUM PUMP ASSY (See page 32-3)
76. INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 14-6)
77. INSTALL WATER PUMP ASSY (See page 16-9)
78. INSTALL WATER PUMP PULLEY (See page 16-9)
SST 09960-10010 (09962-01000, 09963-00700)
79. INSTALL GENERATOR ASSY (See page 19-9)
80. INSTALL FAN AND GENERATOR V BELT (See page 14-4)
81. ADJUST FAN AND GENERATOR V BELT (See page 14-4)
82. INSPECT FAN AND GENERATOR V BELT (See page 14-11)
83. REMOVE EXHAUST MANIFOLD
(a) Install a new gasket, then install the exhaust manifold with the 5 nuts.
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)
(b) Install the exhaust manifold heat insulator No. 1 with the 2 bolts.
Torque: 6 N·m (61 kgf·cm, 53 in.·lbf)
(c) Install the manifold stay with the 2 bolts.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)
84. INSTALL TURBOCHARGER SUB-ASSY (See page 13-17)
85. INSTALL INTERCOOLER AIR HOSE (See page 13-17)
86. INSTALL TURBO OIL OUTLET PIPE (See page 13-17)
87. INSTALL TURBO OIL INLET PIPE (See page 13-17)
88. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-17)
89. INSTALL TURBO INSULATOR NO.1 (See page 13-17)
90. INSTALL EXHAUST PIPE (See page 13-17)
91. INSTALL EXHAUST PIPE ASSY FRONT (See page 13-17)
92. INSTALL FLOOR PANEL BRACE FRONT (See page 15-2)
93. INSTALL INJECTION OR SUPPLY PUMP ASSY (See page 11-16)

94. **INSTALL FUEL INLET PIPE SUB-ASSY** **(See page 11-16)**
SST 09023-38401
95. **INSTALL INJECTOR ASSY** **(See page 11-8)**
SST 09023-38401
96. **INSTALL NOZZLE LEAKAGE PIPE ASSY** **(See page 11-8)**
97. **INSTALL INJECTION PIPE SUB-ASSY NO.4** **(See page 11-8)**
SST 09023-38401
98. **INSTALL INJECTION PIPE SUB-ASSY NO.3** **(See page 11-8)**
SST 09023-38401
99. **INSTALL INJECTION PIPE SUB-ASSY NO.2** **(See page 11-8)**
SST 09023-38401
100. **INSTALL INJECTION PIPE SUB-ASSY NO.1** **(See page 11-8)**
SST 09023-38401
101. **INSTALL INJECTION PIPE CLAMP NO.2** **(See page 11-8)**
102. **INSTALL INJECTION PIPE CLAMP NO.1** **(See page 11-8)**
103. **INSTALL VACUUM REGULATING VALVE** **(See page 11-8)**
104. **INSTALL EGR COOLER ASSY** **(See page 12-5)**
105. **INSTALL GLOW PLUG ASSY** **(See page 19-14)**
106. **INSTALL GLOW PLUG NO.1 CONNECTOR** **(See page 19-14)**
107. **INSTALL AIR CLEANER CAP SUB-ASSY** **(See page 13-17)**



108. **INSTALL AIR TUBE NO.2**
(a) Install air tube No. 2 with air hose No. 4 with the 2 bolts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)
(b) Connect the vacuum hose to the vacuum transmitting pipe No. 1.
(c) Tighten the hose clamp shown in the illustration to the specified torque.
Torque: 6.0 N·m (61 kgf·cm, 53 in·lbf)
(d) Tighten the hose clamp to the specified torque and connect the air hose No. 3 to the air tube No. 2.
Torque: 6.0 N·m (61 kgf·cm, 53 in·lbf)

109. **INSTALL BATTERY**
110. **ADD ENGINE OIL**
111. **ADD ENGINE COOLANT** **(See page 16-7)**
112. **INSPECT ENGINE OIL LEVEL**
113. **CHECK FOR ENGINE OIL LEAKAGE**

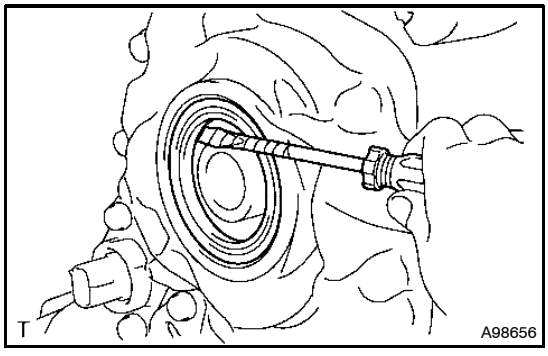
114. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
115. CHECK FOR FUEL LEAKAGE
116. CHECK FOR EXHAUST GAS LEAKAGE
117. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)
118. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
119. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
120. INSTALL ENGINE UNDER COVER LH (TMC MADE) (See page 13-17)
121. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
122. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
123. INSTALL FRONT WHEEL RH
     Torque: 103 N·m (1050 kgf·cm, 76 ft·lbf)

OIL PUMP SEAL (1ND-TV)

141ZX-01

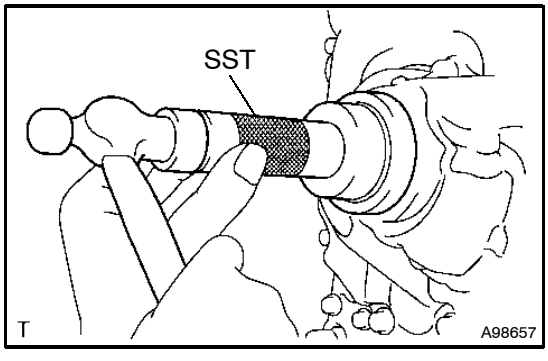
REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
4. REMOVE FAN AND GENERATOR V BELT (See page 14-4)
5. REMOVE CRANKSHAFT DAMPER SUB-ASSY (See page 17-5)
   SST 09960-10010 (09962-01000, 09963-01000)



6. REMOVE OIL PUMP SEAL
(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver with its tip wrapped in tape, pry out the oil seal.

NOTICE:
After removing, check the crankshaft for any damage. If damaged, smooth the surface with 400-grit sandpaper.



7. INSTALL OIL PUMP SEAL
(a) Apply multi-purpose grease to a new oil seal lip.

NOTICE:
Keep the lip free of foreign objects.

(b) Using SST and a hammer, tap in the new oil seal until its surface is flush with the oil pimp edge.
SST 09223-22010

NOTICE:
- **Tap in the oil seal from a vertical position.**
- **Wipe any extra grease off the crankshaft.**

8. INSTALL CRANKSHAFT DAMPER SUB-ASSY (See page 17-5)
   SST 09960-10010 (09962-01000, 09963-01000)
9. INSTALL FAN AND GENERATOR V BELT (See page 14-4)
10. ADJUST FAN AND GENERATOR V BELT (See page 14-4)
11. INSPECT FAN AND GENERATOR V BELT (See page 14-1)
12. CHECK FOR ENGINE OIL LEAKAGE
13. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
14. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
15. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

ENGINE REAR OIL SEAL (1ND-TV)

141ZY-01

REPLACEMENT

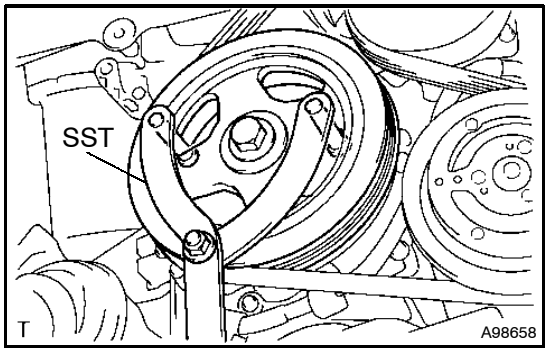
1. REMOVE MANUAL TRANSAXLE ASSY

HINT:

- Manual transaxle C53 (See page 41-49)
- Manual transaxle C53 A (See page 41-36)

2. REMOVE CLUTCH COVER ASSY (See page 42-29)

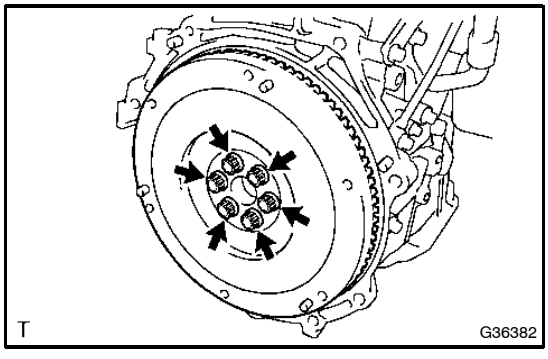
3. REMOVE CLUTCH DISC ASSY (See page 42-29)



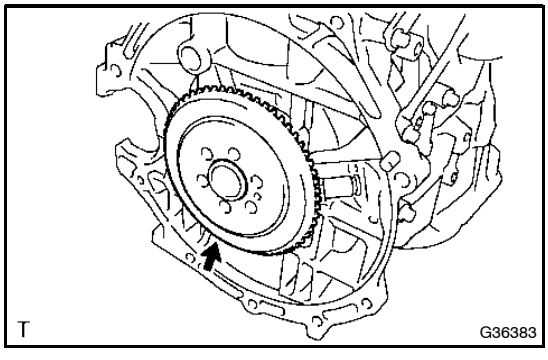
4. REMOVE FLYWHEEL SUB-ASSY

(a) Using SST, hold the crankshaft.

SST 09960-10010 (09962-01000, 09963-01000)

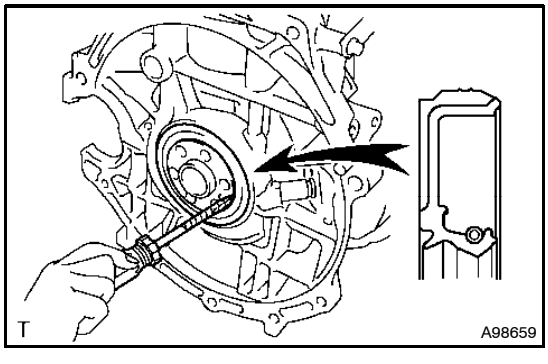


(b) Remove the 6 bolts and flywheel.



5. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Remove the crank angle sensor plate No. 1 from the crankshaft.



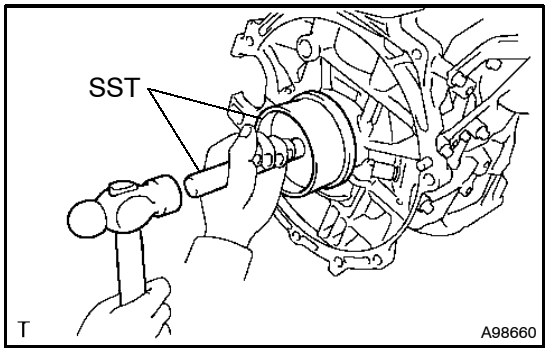
6. REMOVE ENGINE REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver with its tip wrapped in tape, pry out the oil seal.

NOTICE:

After removing, check the crankshaft for any damage. If damaged, smooth the surface with 400-grit sandpaper.



7. INSTALL ENGINE REAR OIL SEAL

(a) Apply multi-purpose grease to a new oil seal lip.

NOTICE:

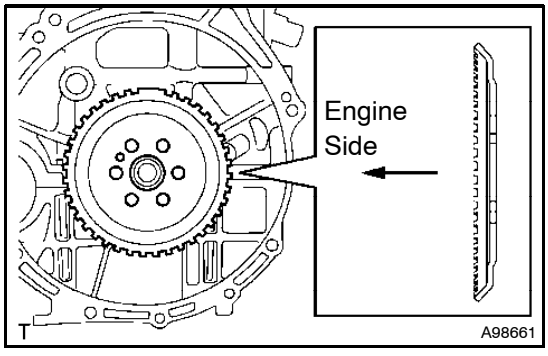
Keep the lip free of foreign objects.

(b) Using SST and a hammer, tap in the new oil seal until its surface is flush the cylinder block edge.

SST 09223-15030, 09950-70010 (09951-07100)

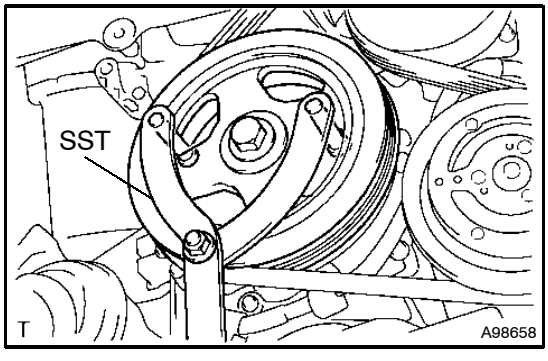
NOTICE:

- **Tap the oil seal from a vertical position.**
- **Wipe any extra grease off the crankshaft.**



8. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Install the crank angle sensor plate No. 1 to the crankshaft as shown in the illustration.



9. INSTALL FLYWHEEL SUB-ASSY

(a) Clean the 6 bolts and 6 bolt holes.

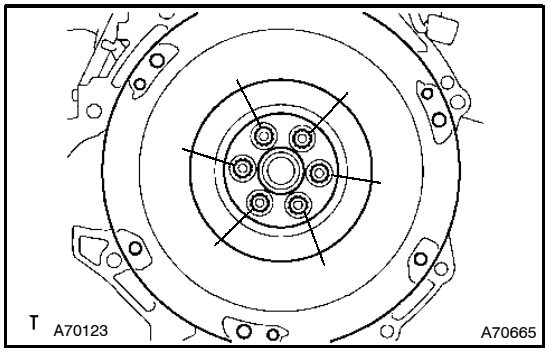
(b) Apply adhesive to 2 or 3 threads of the 8 bolts.

Adhesive:

Part No. 08833-00070, THREE BOND 1324, or equivalent

(c) Using SST, hold the crankshaft.

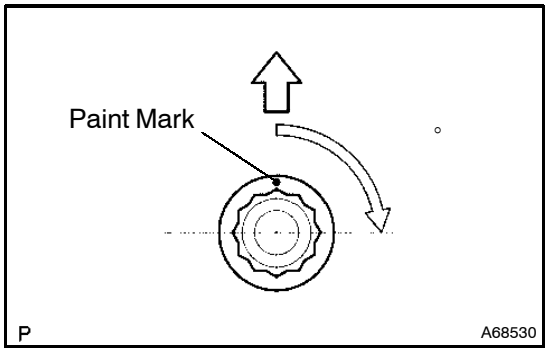
SST 09960-10010 (09962-01000, 09963-01000)



(d) Using several steps, uniformly install and tighten the 8 bolts in the sequence shown in the illustration.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(e) Put paint marks on the bolts, as shown in the illustration.



(f) Tighten the bolts by a further 90° in the same sequence as step (d).

(g) Check that the paint mark of each bolt is at a 90° angle from its original position.

NOTICE:

Do not start the engine within 1 hour of installation.

10. INSTALL CLUTCH DISC ASSY (See page 42-29)

SST 09301-00220

11. INSTALL CLUTCH COVER ASSY (See page 42-29)

12. INSTALL MANUAL TRANSAXLE ASSY

HINT:

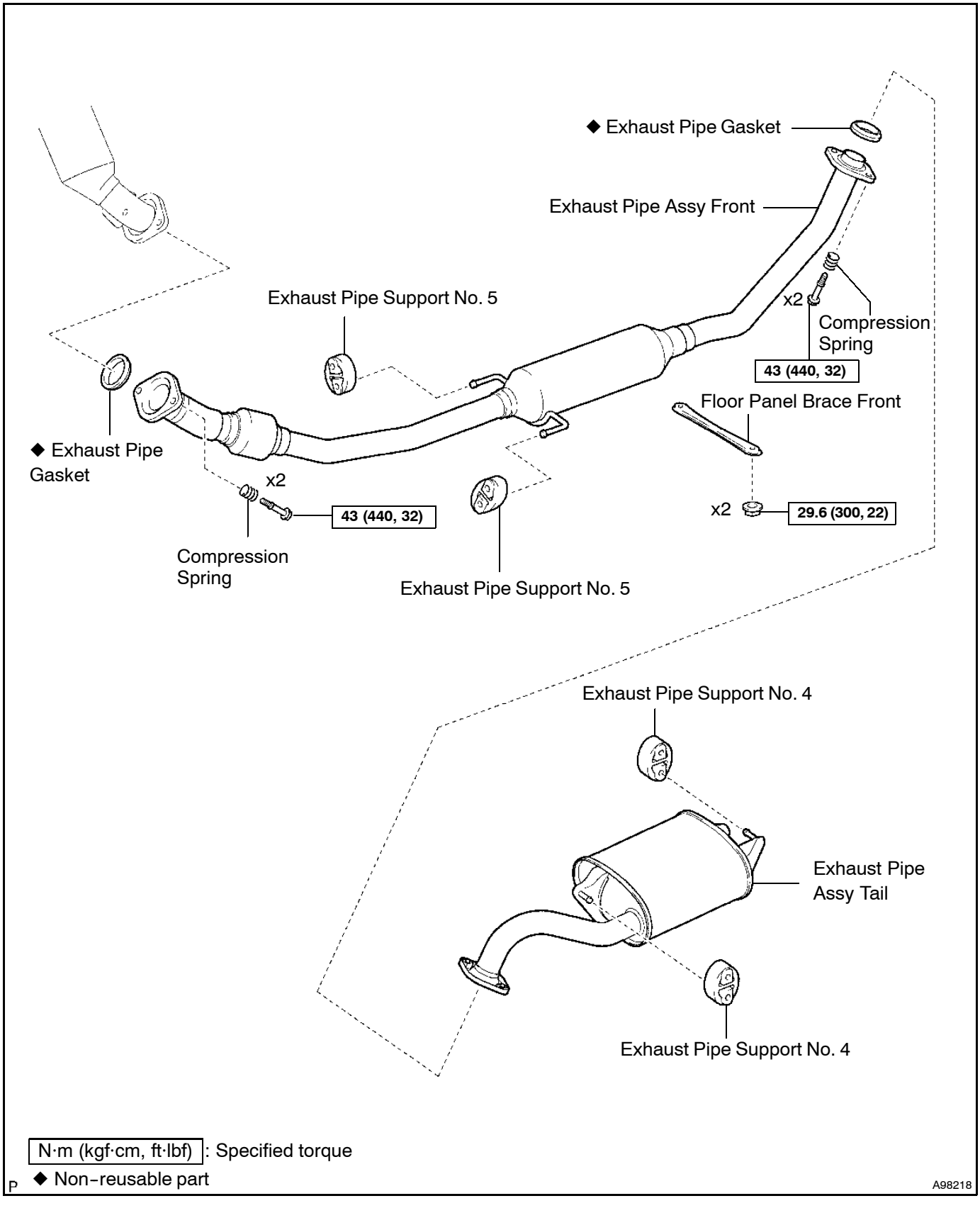
- Manual transaxle C53 (See page 41-49)
- Manual transaxle C53 A (See page 41-36)

EXHAUST

EXHAUST PIPE ASSY (1ND-TV)

COMPONENTS

150DX-01



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

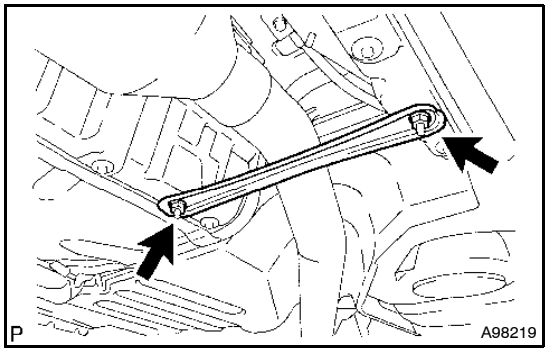
◆ Non-reusable part

P

A98218

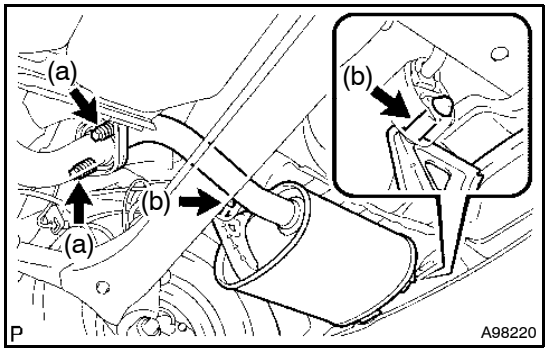
150DY-01

Removal & Installation and Disassembly & Reassembly



1. REMOVE FLOOR PANEL BRACE FRONT

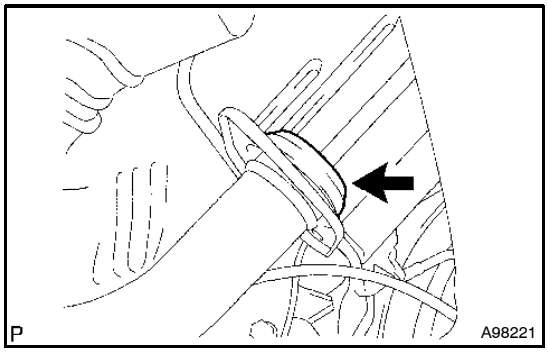
(a) Remove the 2 nuts and floor panel brace front.



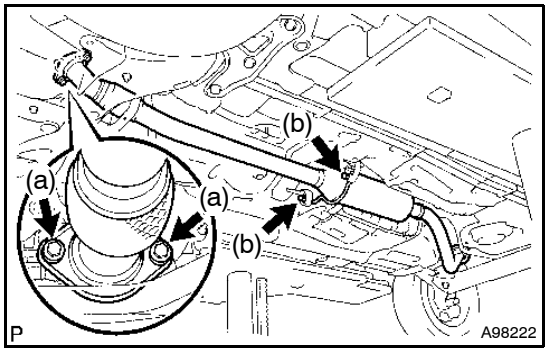
2. REMOVE EXHAUST PIPE ASSY TAIL

(a) Remove the 2 bolts and 2 compression springs.

(b) Remove the exhaust pipe tail from the 2 exhaust pipe supports No. 4.



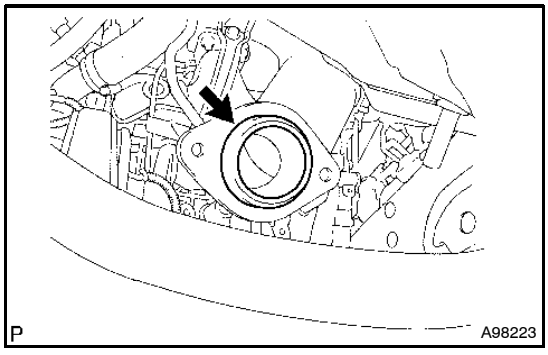
(c) Remove the gasket from the exhaust pipe front.



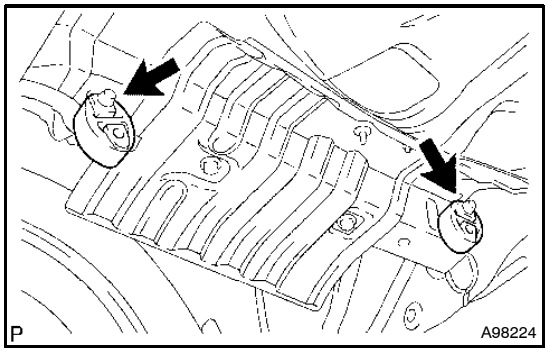
3. REMOVE EXHAUST PIPE ASSY FRONT

(a) Remove the 2 bolts and 2 compression springs.

(b) Remove the exhaust pipe front from the 2 exhaust pipe supports No. 5.

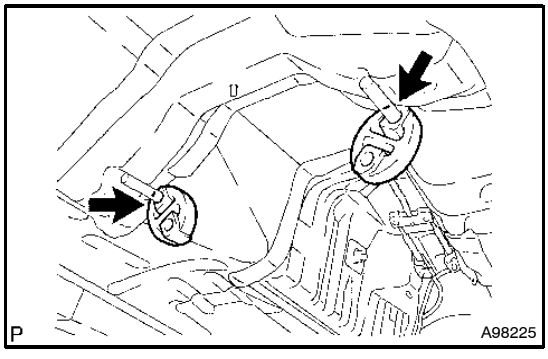


(c) Remove the gasket from the exhaust manifold.



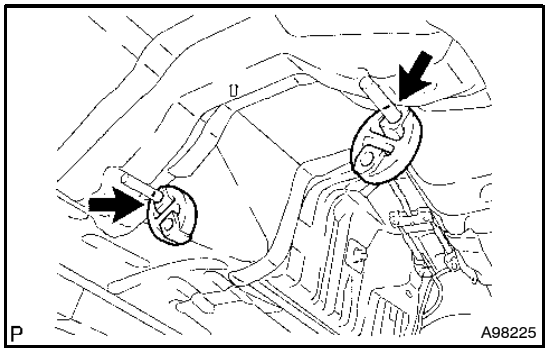
4. REMOVE EXHAUST PIPE SUPPORT NO.4

(a) Remove the 2 exhaust pipe supports No. 4 from the body.



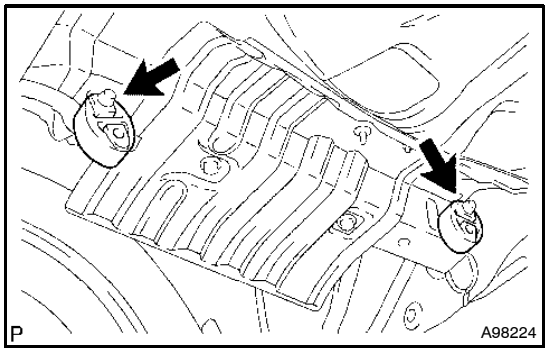
5. REMOVE EXHAUST PIPE SUPPORT NO.5

(a) Remove the 2 exhaust pipe supports No. 5 from the body.



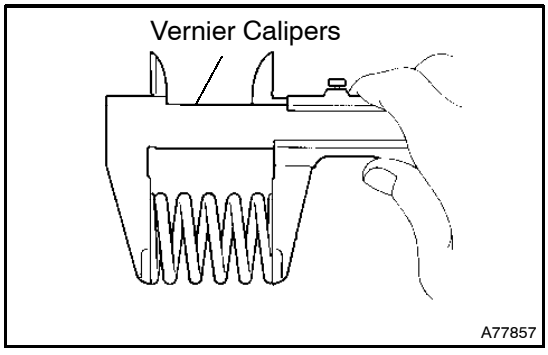
6. INSTALL EXHAUST PIPE SUPPORT NO.5

(a) Install the 2 exhaust pipe supports No. 5 onto the body.



7. INSTALL EXHAUST PIPE SUPPORT NO.4

(a) Install the 2 exhaust pipe supports No. 4 onto the body.



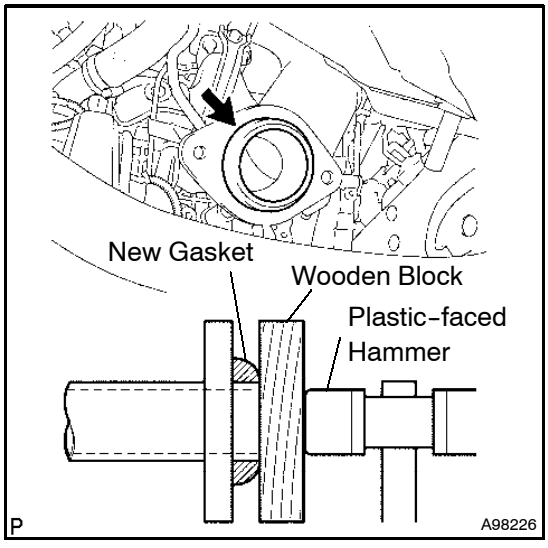
8. INSTALL EXHAUST PIPE ASSY FRONT

(a) Check the free length.

(1) Using vernier calipers, measure the free length of the compression spring.

Minimum: 41.5 mm (1.634 in.)

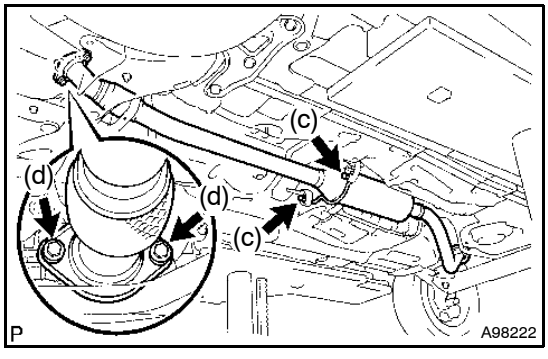
If the free length is less than the minimum, replace the compression spring.



(b) Using a wooden block and plastic-faced hammer, tap in a new gasket until it is flush with the exhaust manifold converter.

NOTICE:

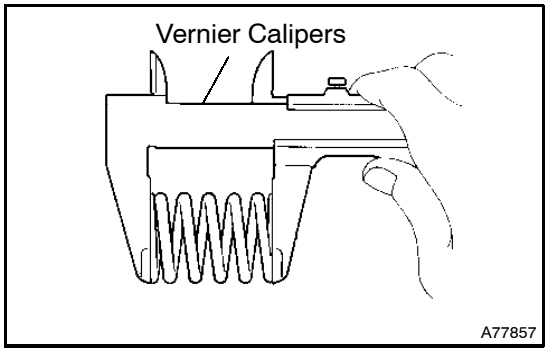
- **Make sure that the gasket is in the correct direction when installing.**
- **Do not reuse a removed gasket.**
- **Never push the gasket into the exhaust manifold by installing the exhaust pipe front onto the exhaust manifold converter.**



(c) Install the exhaust pipe front onto the 2 exhaust pipe supports No. 5.

(d) Tighten the 2 compression springs and 2 bolts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



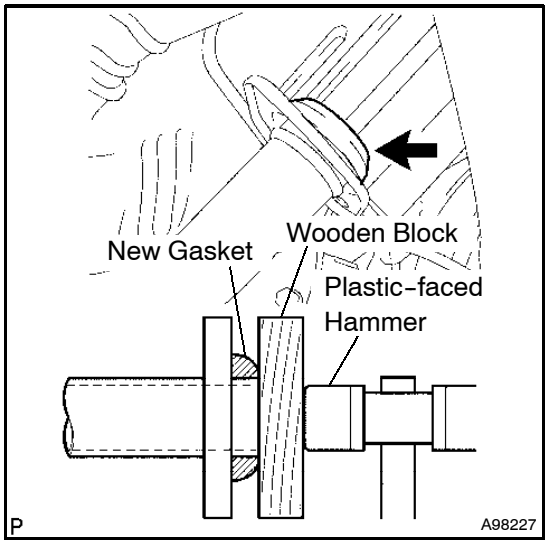
9. INSTALL EXHAUST PIPE ASSY TAIL

(a) Check the free length.

(1) Using vernier calipers, measure the free length of the compression spring.

Minimum: 38.5 mm (1.516 in.)

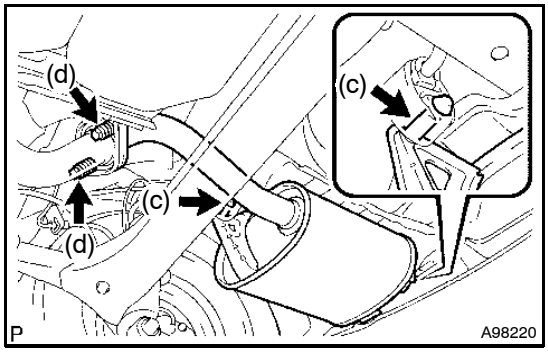
If the free length is less than the minimum, replace the compression spring.



(b) Using a wooden block and plastic-faced hammer, top in a new gasket until it is flush with the exhaust pipe front.

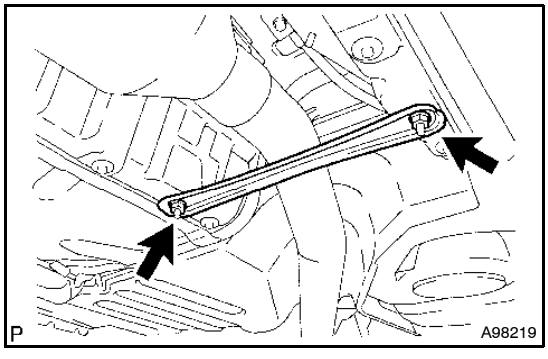
NOTICE:

- **Make sure that the gasket is installed in the correct direction.**
- **Do not reuse a removed gasket.**
- **Never push the gasket into the exhaust pipe front by installing the exhaust pipe tail onto the exhaust pipe front.**



(c) Install the exhaust pipe tail onto the 2 exhaust pipe supports No. 4.

(d) Tighten the 2 compression springs and 2 bolts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



10. INSTALL FLOOR PANEL BRACE FRONT

(a) Install the floor panel brace front with the 2 nuts.
Torque: 29.6 N·m (300 kgf·cm, 22 ft·lbf)

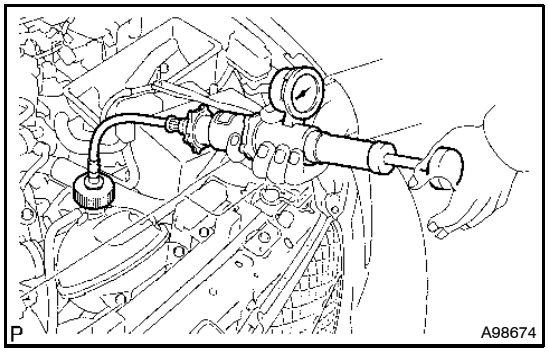
11. CHECK FOR EXHAUST GAS LEAKAGE

COOLING

COOLING SYSTEM (1ND-TV)

ON-VEHICLE INSPECTION

160ZR-01



1. INSPECT COOLING SYSTEM FOR LEAKS

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

(b) Fill the radiator with coolant, then attach a radiator cap tester.

(c) Warm up the engine.

(d) Pump it to 108 kPa (1.1 kgf/cm^2, 15.7 psi), then check that the pressure does not drop.

If the pressure drops, check the hoses, radiator and water pump for leakage. If there are no signs or traces of external coolant leaks, check the heater core, cylinder block and head.

(e) Reinstall the radiator cap.

2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

(a) The engine coolant should be between the LOW and FULL lines when the engine is cold.

If low, check for leakage and add Toyota Super Long Life Coolant or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology up to the FULL line.

3. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

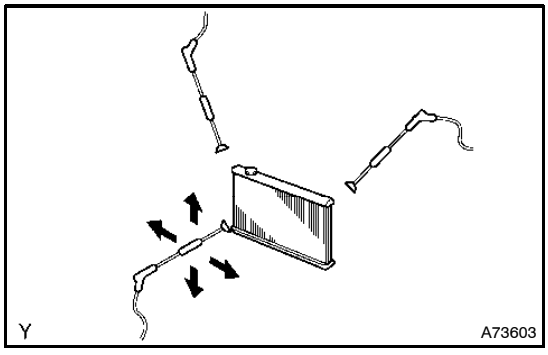
CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

(b) Check if there are any excessive deposits of rust or scale around the radiator cap and radiator filler hole the coolant should be free of oil.

If excessively dirty, replace the coolant.

(c) Reinstall the radiator cap.



4. CHECK FIN BLOCKAGE

(a) If the fins are clogged, wash them with water or a steam cleaner, then dry them with compressed air.

NOTICE:

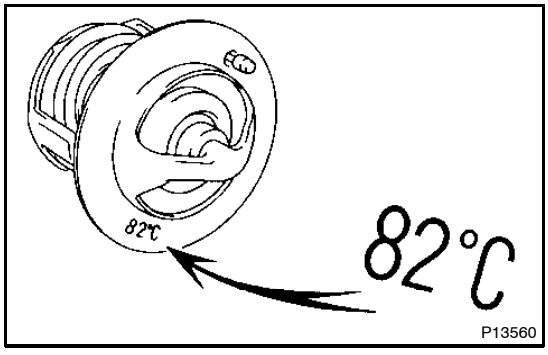
- **If the distance between the steam cleaner and core is too small, there is a possibility of damaging the fins, so keep to the following injection distances.**

Injection Pressure kPa (kgf/cm^2, psi)	Injection Distance mm (in.)
2,942 to 4,903 (30 to 50, 427 to 711)	300 (11.811)
4,903 to 7,845 (50 to 80, 711 to 1,138)	500 (19.685)

- **If the fins are bent, straighten them with a screwdriver or pliers.**
- **Be careful not to expose electronic components to water.**

160ZS-01

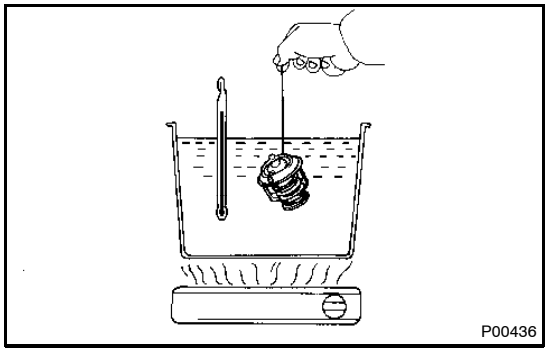
INSPECTION



1. INSPECT THERMOSTAT

HINT:

The valve opening temperature is inscribed on the thermostat.

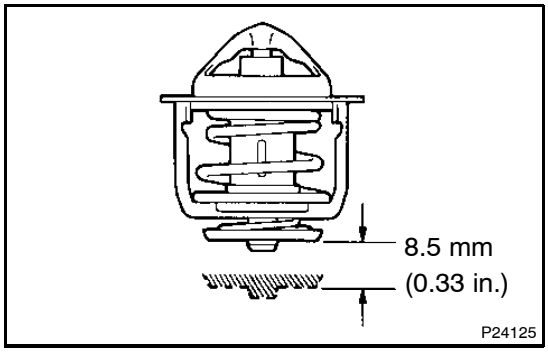


(a) Immerse the thermostat in water, then gradually heat the water.

(b) Check the valve opening temperature of the thermostat.

Valve opening temperature: 80 to 84°C (176 to 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



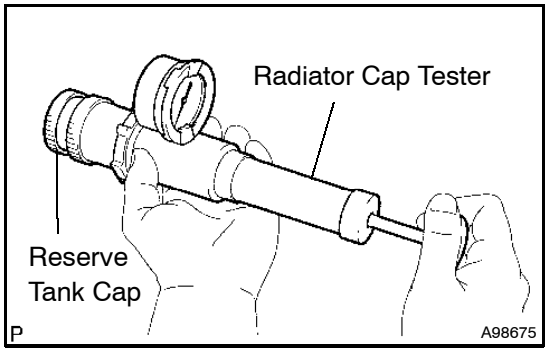
(c) Check the valve lift.

Valve lift: 8.5 mm (0.33 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 77°C (171°F)).

If not fully closed, replace the thermostat.



2. INSPECT RESERVE TANK CAP SUB-ASSY

NOTICE:

- **If the radiator cap is contaminated, rinse it with water.**
- **Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.**

(a) Using a radiator cap tester, slowly pump the tester, then check that air comes from the vacuum valve.

Pumping speed: 1 push / 3 seconds or more

NOTICE:

Push the pump at a constant speed.

If air does come from the vacuum valve, replace the radiator cap.

(b) Pump the tester, then measure the relief valve opening pressure.

Pumping speed: 1 push every 1 second

NOTICE:

The above pumping speed is for the first pumping only (in order to close the vacuum valve). After the first pumping, the pumping speed can be reduced.

Standard opening pressure:

95 to 125 kPa (0.97 to 1.27 kgf/cm^2, 13.8 to 18.1 psi)

Minimum opening pressure:

79 kPa (0.8 kgf/cm^2, 11.5 psi)

If the opening pressure is less than the minimum, replace the radiator cap.

HINT:

Use the tester's maximum reading as the opening pressure.

COOLING FAN SYSTEM (1ND-TV)

ON-VEHICLE INSPECTION

160ZT-01

HINT:

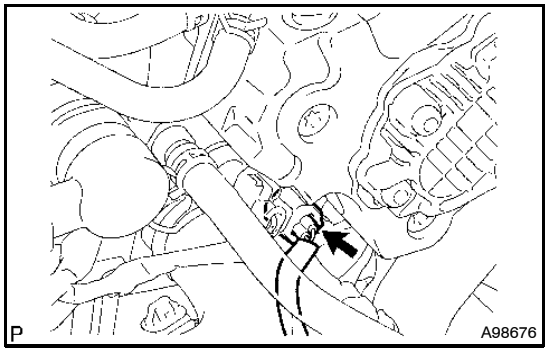
If is normal for the cooling fan sometimes to rotate when the engine switch is turned ON (IG).

1. CHECK COOLING FAN OPERATION AT LOW TEMPERATURE (Below 94°C (201°F))

(a) Turn the engine switch ON (START) with the A/C switch OFF.

(b) Check that the cooling fan stops.

If not, check the cooling fan relays and engine coolant temperature sensor, then check for disconnection of the connector or wire break between the cooling fan relay and engine coolant temperature sensor.



(c) Disconnect the engine coolant temperature sensor connector.

(d) Check that the cooling fan rotates.

If not, check the fuses, cooling fan relays, ECM and cooling fan, then check for a short circuit between the cooling fan relay and engine coolant temperature sensor.

(e) Reconnect the engine coolant temperature sensor connector.

2. CHECK COOLING FAN OPERATION AT HIGH TEMPERATURES (Above 96°C (205°F))

(a) Start the engine, then raise the coolant temperature to above 96°C (205°F).

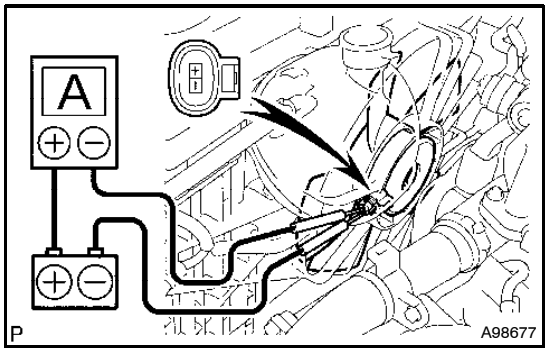
HINT:

Coolant temperature is the value detected by the engine coolant temperature sensor on the cylinder head.

(b) Check that the A/C switch is OFF.

(c) Check that the cooling fan rotates.

If not, replace the engine coolant temperature sensor.



3. INSPECT FAN

(a) Disconnect the fan connector.

(b) Connect the battery and ammeter to the fan connector.

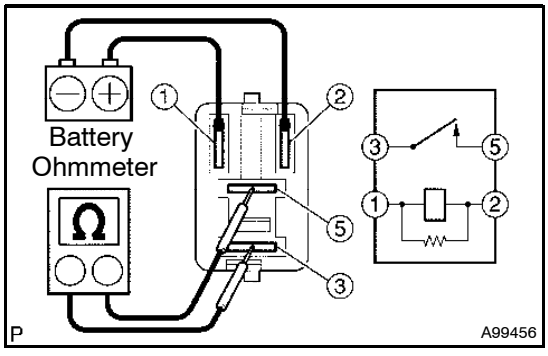
(c) Check that the fan rotates smoothly, then check the reading on the ammeter.

Standard amperage: 11.7 to 14.7 A

If the amperage is not as specified, replace the cooling fan motor.

(d) Reconnect the fan connector.

INSPECTION



1. INSPECT COOLING FAN RELAY

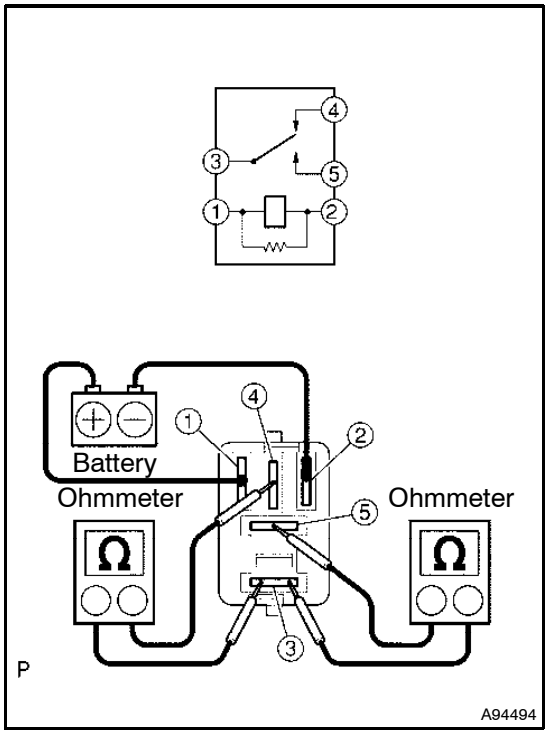
(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

If the result is not as specified, replace the relay.



2. INSPECT COOLING FAN RELAY NO.2

(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
3 - 4	Below 1 Ω
3 - 4	10 kΩ or higher (Apply battery voltage to terminals 1 and 2)
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (Apply battery voltage to terminals 1 and 2)

If the result is not as specified, replace the relay.

3. INSPECT COOLING FAN RESISTOR

(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
Positive (+) - Negative (-)	1.17 to 1.43 Ω at 20°C (68°F)

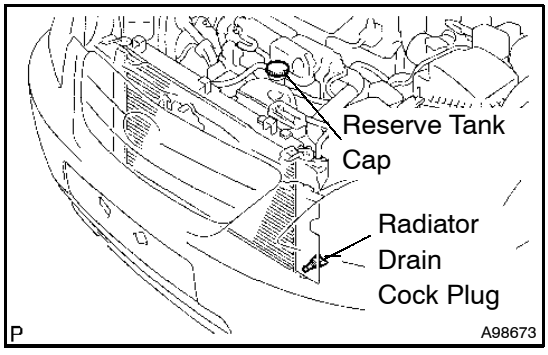
If the result is not as specified, replace the cooling fan resister.

ENGINE COOLANT (1ND-TV)

160ZV-01

REPLACEMENT

1. REMOVE RADIATOR SUPPORT OPENING COVER **(See page 14-6)**

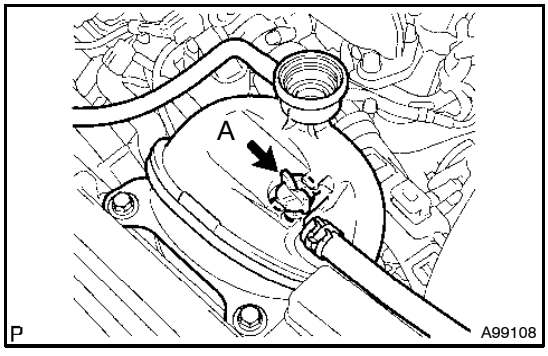


2. DRAIN ENGINE COOLANT

CAUTION:

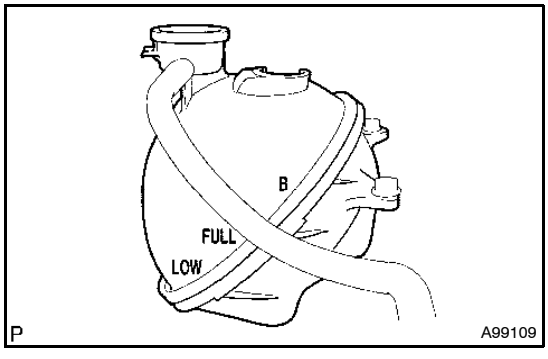
To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

(a) Loosen the radiator drain cock plug.
(b) Remove the reserve tank cap and drain the coolant.
(c) Close the radiator drain cock plug.



3. ADD ENGINE COOLANT

(a) Loosen air bleed valve A.



(b) Fill the cooling system with coolant up to line B.
Capacity:
With heater: 5.5 liters (5.8 US qts, 4.8 lmp. qts)
Without heater: 5.3 liters (5.6 US qts, 4.7 lmp. qts)

HINT:

- Use of improper coolants may damage the engine cooling system.
- Only use Toyota Super Long Life Coolant or similar high quality ethlene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).
- New Toyota vehicles are filled with Toyota Super Long Life Coolant. When replacing the coolant, Toyota Super Long Life Coolant (color is pink, premixed ethyleneglycol concentration is approximately 50 % and freezing temperature is -35°C (-31°F)) is recommended.

NOTICE:

Do not substitute plain water for engine coolant.

(c) Tighten the air bleed valve A.
(d) Install the radiator cap.
(e) Warm up the engine.
(f) Run the engine at 3,000 rpm for 5 seconds and idling for 45 seconds alternately.

(g) Do the above operation for 7 minutes or more.
(h) After the engine cools down, check that the coolant level is between LOW and FULL lines.

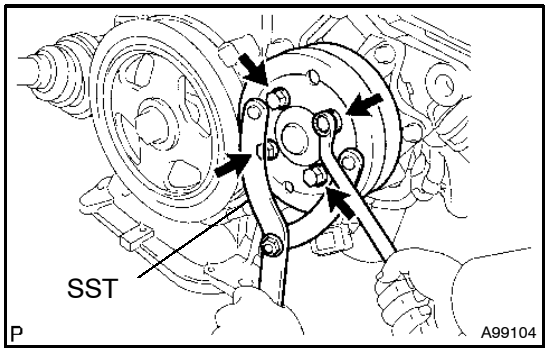
4. **CHECK FOR ENGINE COOLANT LEAKAGE** **(See page 16-1)**
5. **INSTALL RADIATOR SUPPORT OPENING COVER** **(See page 14-6)**

WATER PUMP ASSY (1ND-TV)

160ZW-01

REPLACEMENT

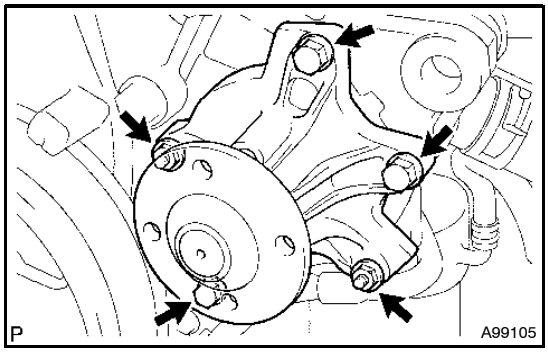
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
5. DRAIN ENGINE COOLANT (See page 16-7)
6. REMOVE FAN AND GENERATOR V BELT (See page 14-4)
7. REMOVE GENERATOR ASSY (See page 19-9)



8. REMOVE WATER PUMP PULLEY

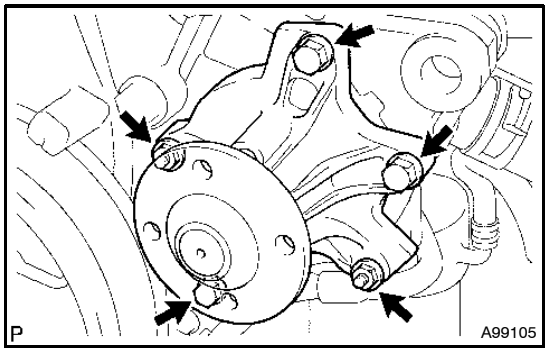
(a) Using SST, hold the water pump pulley.
SST 09960-10010 (09962-01000, 09963-00700)

(b) Remove the 4 bolts, then remove the water pump pulley.



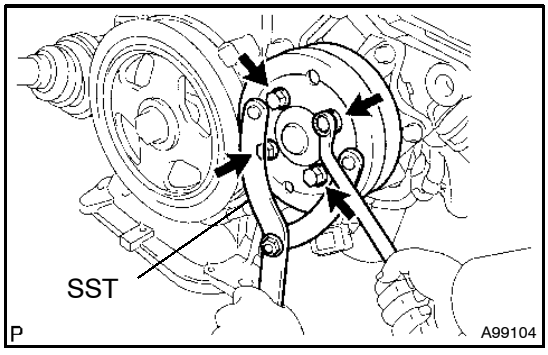
9. REMOVE WATER PUMP ASSY

(a) Remove the 3 bolts and 2 nuts, then remove the water pump.



10. INSTALL WATER PUMP ASSY

(a) Install a new gasket and the water pump with the 3 bolts and 2 nuts.
Torque: 11 N·m (112 kgf·cm, 8 ft·lbf)



11. INSTALL WATER PUMP PULLEY

(a) Temporarily install the water pump pulley with the 4 bolts.

(b) Using SST, hold the water pump pulley.

SST 09960-10010 (09962-01000, 09963-00700)

(c) Tighten the 4 bolts to the specified torque.

Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

12. INSTALL GENERATOR ASSY **(See page 19-9)**

13. INSTALL FAN AND GENERATOR V BELT **(See page 14-4)**

14. ADJUST FAN AND GENERATOR V BELT **(See page 14-4)**

15. INSPECT FAN AND GENERATOR V BELT **(See page 14-1)**

16. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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

17. ADD ENGINE COOLANT **(See page 16-7)**

18. CHECK FOR ENGINE COOLANT LEAKAGE **(See page 16-1)**

19. INSTALL ENGINE UNDER COVER RH (TMC MADE) **(See page 13-17)**

20. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) **(See page 13-17)**

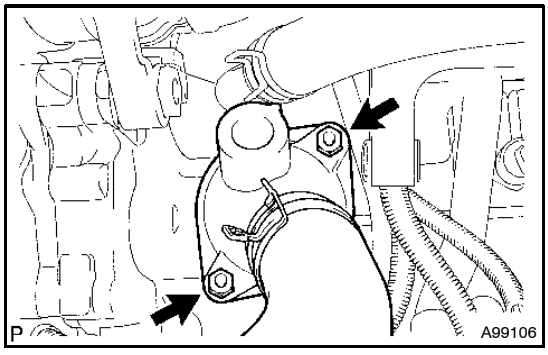
21. INSTALL RADIATOR SUPPORT OPENING COVER **(See page 14-6)**

THERMOSTAT (1ND-TV)

160ZX-01

REPLACEMENT

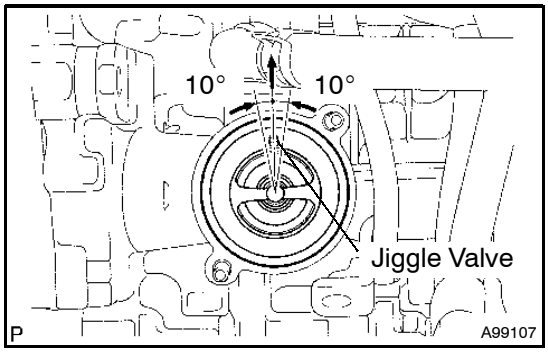
1. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
2. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
4. DRAIN ENGINE COOLANT (See page 16-7)



5. REMOVE WATER INLET

(a) Remove the 2 nuts, then remove the water inlet.

6. REMOVE THERMOSTAT



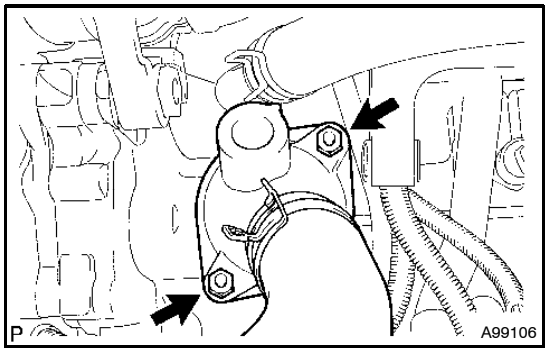
7. INSTALL THERMOSTAT

(a) Install a new gasket onto the thermostat.

(b) Install the thermostat with the jiggle valve upward.

HINT:

The jiggle valve may be set to within 10° on either side of the prescribed position.



8. INSTALL WATER INLET

(a) Install the water inlet with the 2 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

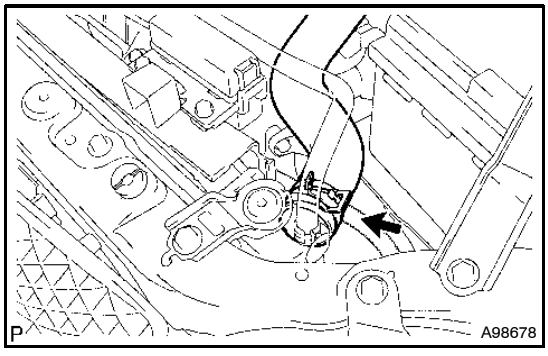
9. ADD ENGINE COOLANT (See page 16-7)
10. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
11. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
12. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
13. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)

RADIATOR ASSY (1ND-TV)

160ZY-01

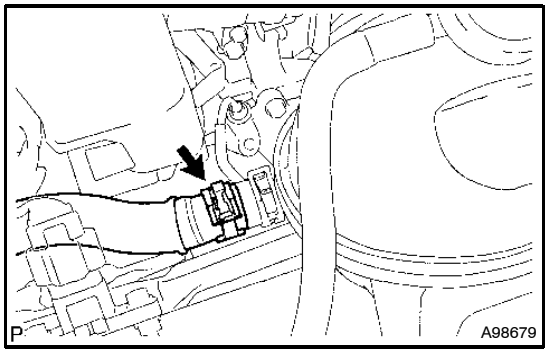
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
3. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
4. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
5. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
6. DRAIN ENGINE COOLANT (See page 16-7)

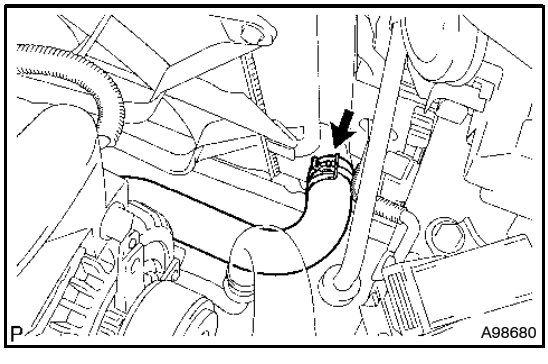


7. REMOVE RADIATOR ASSY

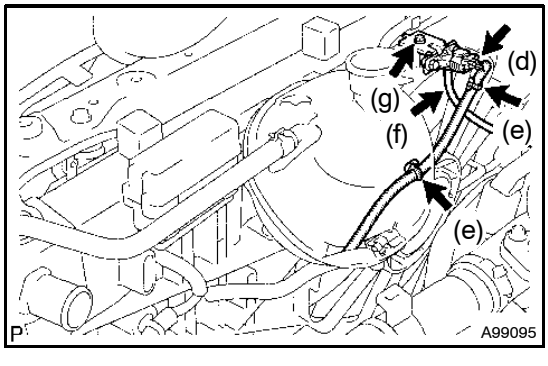
(a) Disconnect the radiator hose inlet from the radiator.



(b) Disconnect the water by-pass hose from the radiator reserve tank.



(c) Disconnect the radiator hose outlet from the radiator.

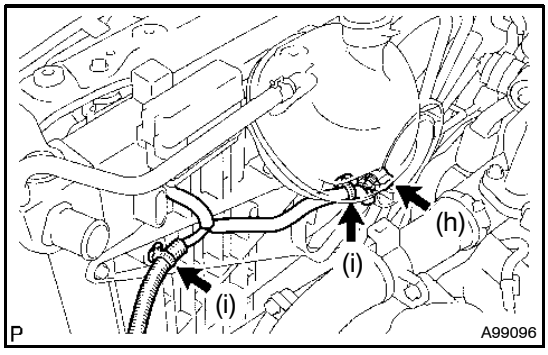


(d) Disconnect the turbo pressure sensor connector.

(e) Disconnect the 2 wire harness clamps from the fan shroud.

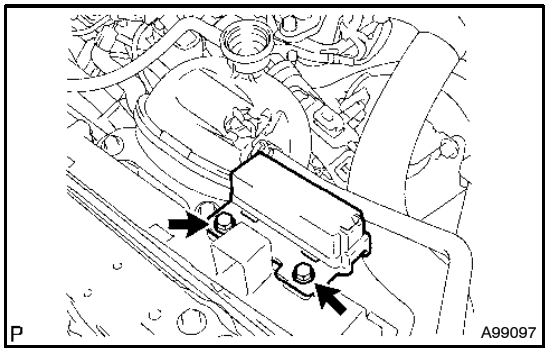
(f) Disconnect the vacuum hose from the turbo pressure sensor.

(g) Remove the bolt, then remove the turbo pressure sensor.

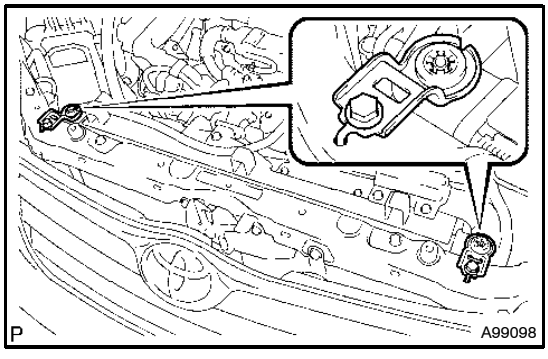


(h) Disconnect the fan motor connector.

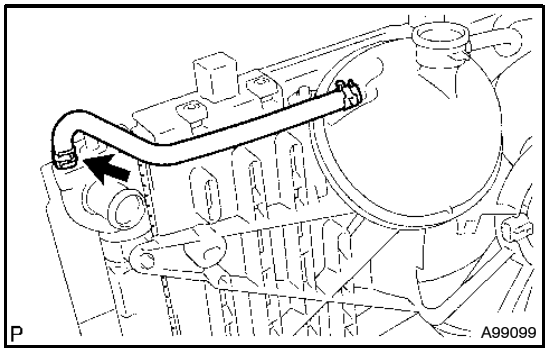
(i) Disconnect the 2 wire harness clamps from the fan shroud.



(j) Remove the 2 bolts, then separate the engine room relay block.

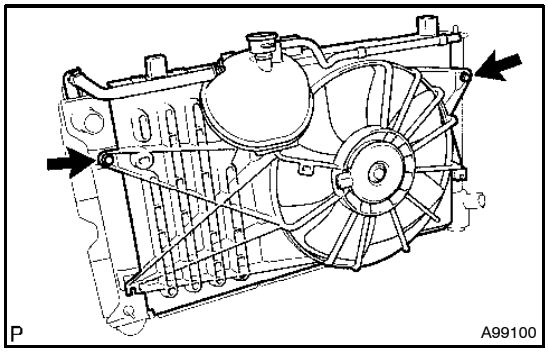


(k) Remove the 2 bolts, then remove the radiator support upper LH and RH.

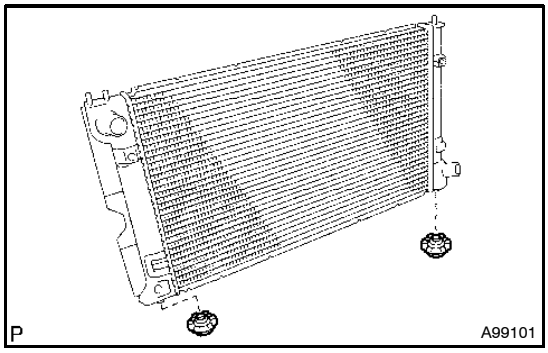


8. REMOVE W/MOTOR FAN ASSY

(a) Disconnect the water by-pass hose from the radiator.

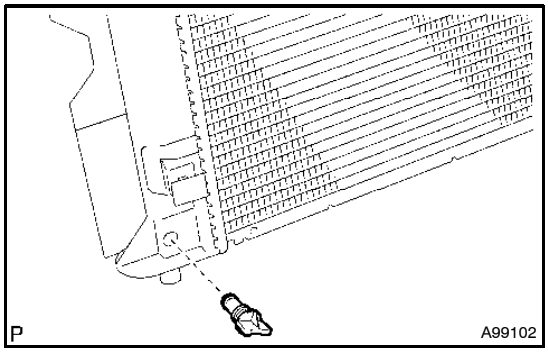


(b) Remove the 2 bolts, then remove the w/motor fan.



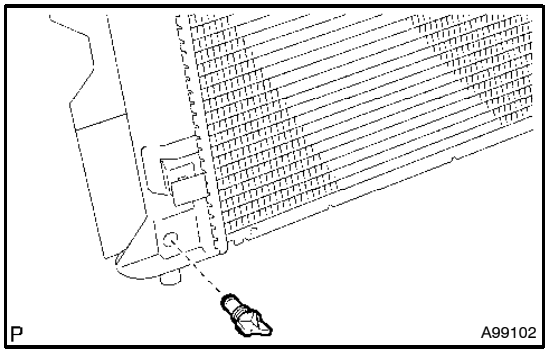
9. REMOVE RADIATOR SUPPORT LOWER

(a) Remove the radiator support lower from the radiator.



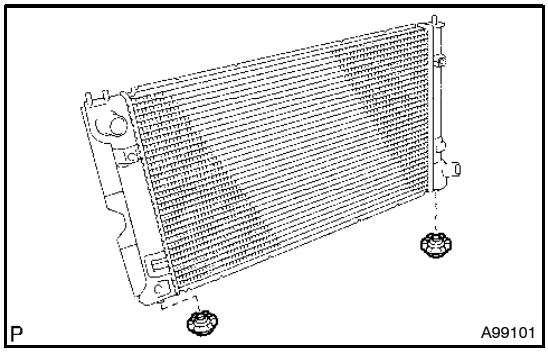
10. REMOVE RADIATOR DRAIN COCK PLUG

(a) Remove the radiator drain cock plug from the radiator.



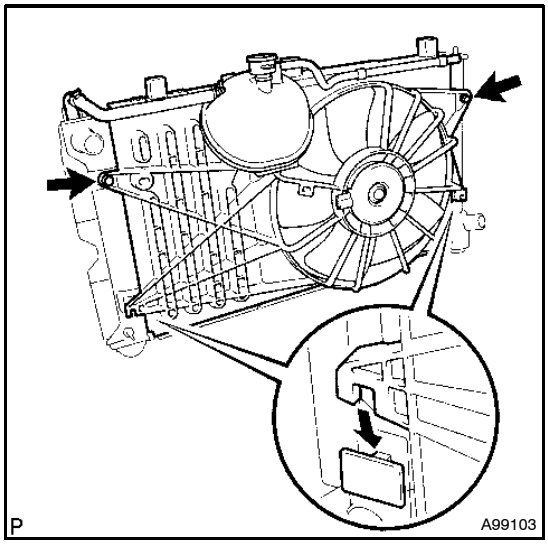
11. INSTALL RADIATOR DRAIN COCK PLUG

(a) Install the radiator drain cock plug onto the radiator.



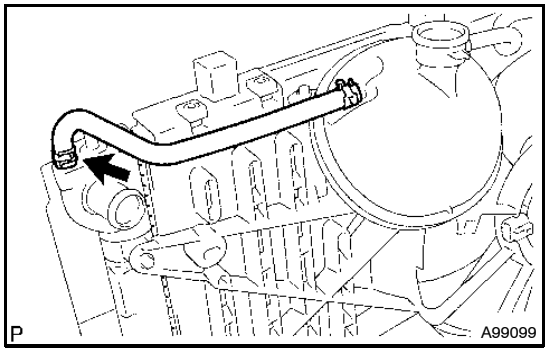
12. INSTALL RADIATOR SUPPORT LOWER

(a) Install the radiator support lower onto the radiator.

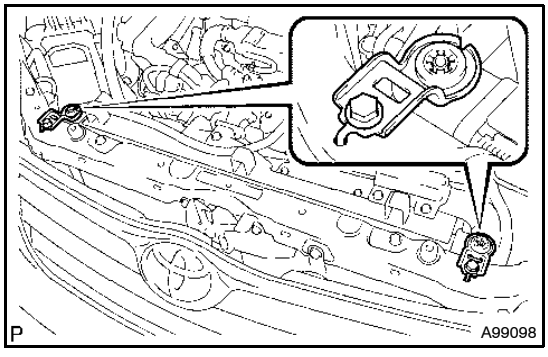


13. INSTALL W/MOTOR FAN ASSY

(a) Install the w/motor fan with the 2 bolts.
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)

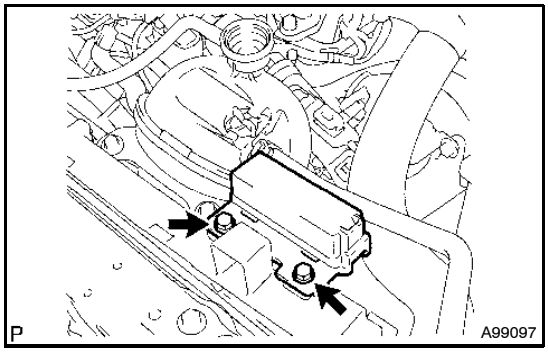


(b) Connect the water by-pass hose to the radiator.

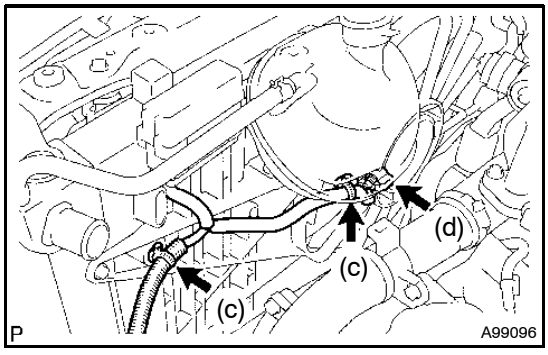


14. INSTALL RADIATOR ASSY

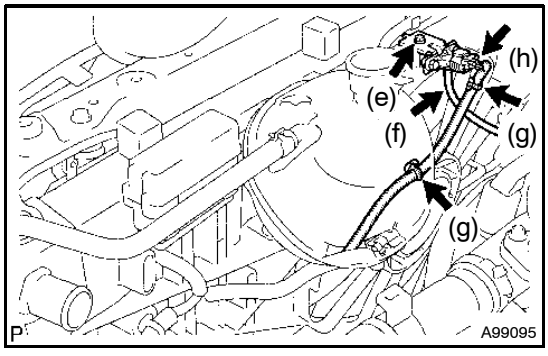
(a) Install the radiator support upper LH and RH with the 2 bolts.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



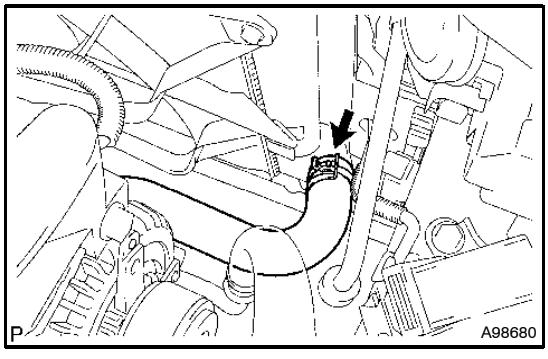
(b) Install the engine room relay block with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)



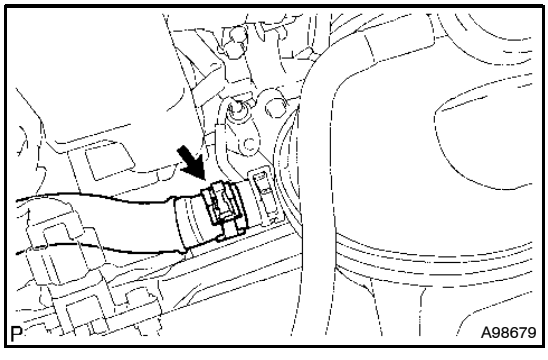
(c) Connect the 2 wire harness clamps to the fan shroud.
(d) Connect the fan motor connector.



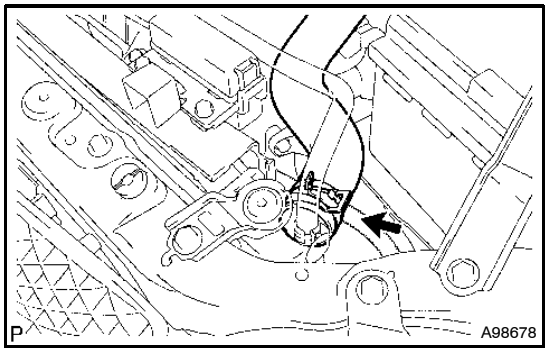
(e) Install the turbo pressure sensor with the bolt.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
(f) Connect the vacuum hose to the turbo pressure sensor.
(g) Connect the 2 wire harness clamps to the fan shroud.
(h) Connect the turbo pressure sensor connector.



(i) Connect the radiator hose outlet to the radiator.



(j) Connect the water by-pass hose to the radiator reserve tank.



(k) Connect the radiator hose inlet to the radiator.

15. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
    Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
16. ADD ENGINE COOLANT (See page 16-7)
17. CHECK FOR ENGINE COOLANT LEAKAGE (See page 16-1)
18. INSTALL ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
19. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
20. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
21. INSTALL RADIATOR SUPPORT OPENING COVER (See page 14-6)

LUBRICATION

LUBRICATION SYSTEM (1ND-TV)

170MZ-01

ON-VEHICLE INSPECTION

1. CHECK ENGINE OIL LEVEL

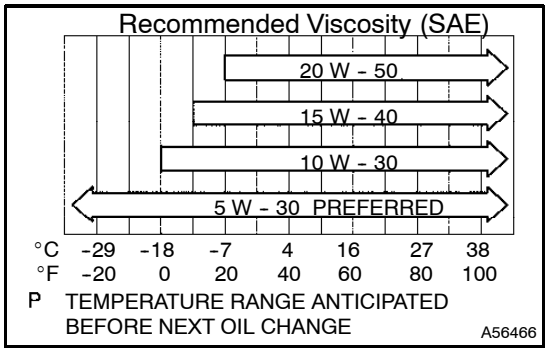
(a) Warm up the engine. Then stop the engine, and wait for 5 minutes.

(b) Check that the engine oil level is between the 2 marks on the oil level gage.

If low, check for leakage and top oil up oil to the upper mark.

NOTICE:

Do not add engine oil to above the upper mark.



2. CHECK ENGINE OIL QUALITY

(a) Check the engine oil for deterioration, water intrusion, discoloration or thinning.

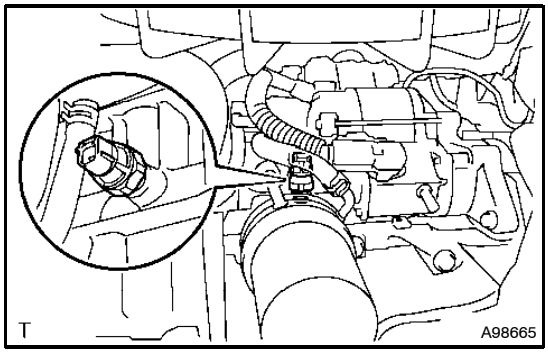
If the oil quality is visibly poor, replace the oil.

Oil grade:

Use ACEA B1, API grade CF-4, CF or G-DLD-1.

(You may also use API CE or CD.)

SAE 5W-30 is the best choice for your vehicle in terms of good fuel economy and good starting in cold weather.



3. INSPECT OIL PRESSURE

(a) Remove the engine under cover RH (TMC made) (see page 13-17).

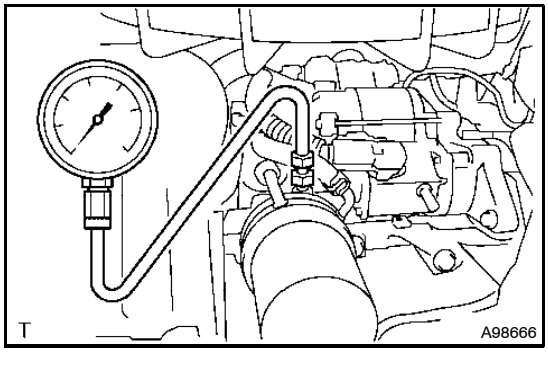
(b) Remove the engine under cover RH (except TMC made) (see page 13-17).

(c) Disconnect the oil pressure switch connector.

(d) Using a deep socket wrench 22 or 24 mm, remove the oil pressure switch.

HINT:

As there are 2 kinds of oil pressure switches, select and use either a 22 mm or 24 mm deep socket wrench as appropriate.



(e) Install the oil pressure gauge.

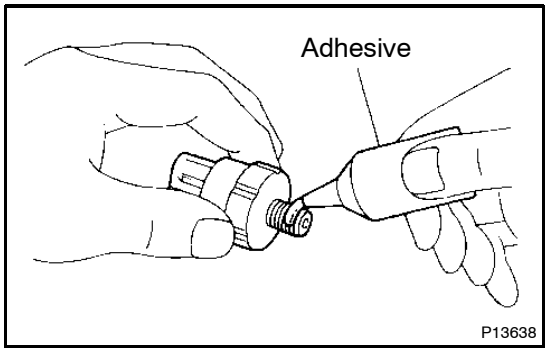
(f) Warm up the engine.

(g) Check the oil pressure.

Oil pressure:

At idle	29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
At 3,000 rpm	150 to 550 kPa (1.5 to 5.6 kgf/cm^2, 22 to 80 psi)

(h) Remove the oil pressure gauge.



(i) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(j) Using a deep socket wrench 22 or 24 mm, install the oil pressure switch.
Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

NOTICE:
Do not start the engine for at least 1 hour after installation.

(k) Connect the oil pressure switch connector.

(l) Check for engine oil leakage.

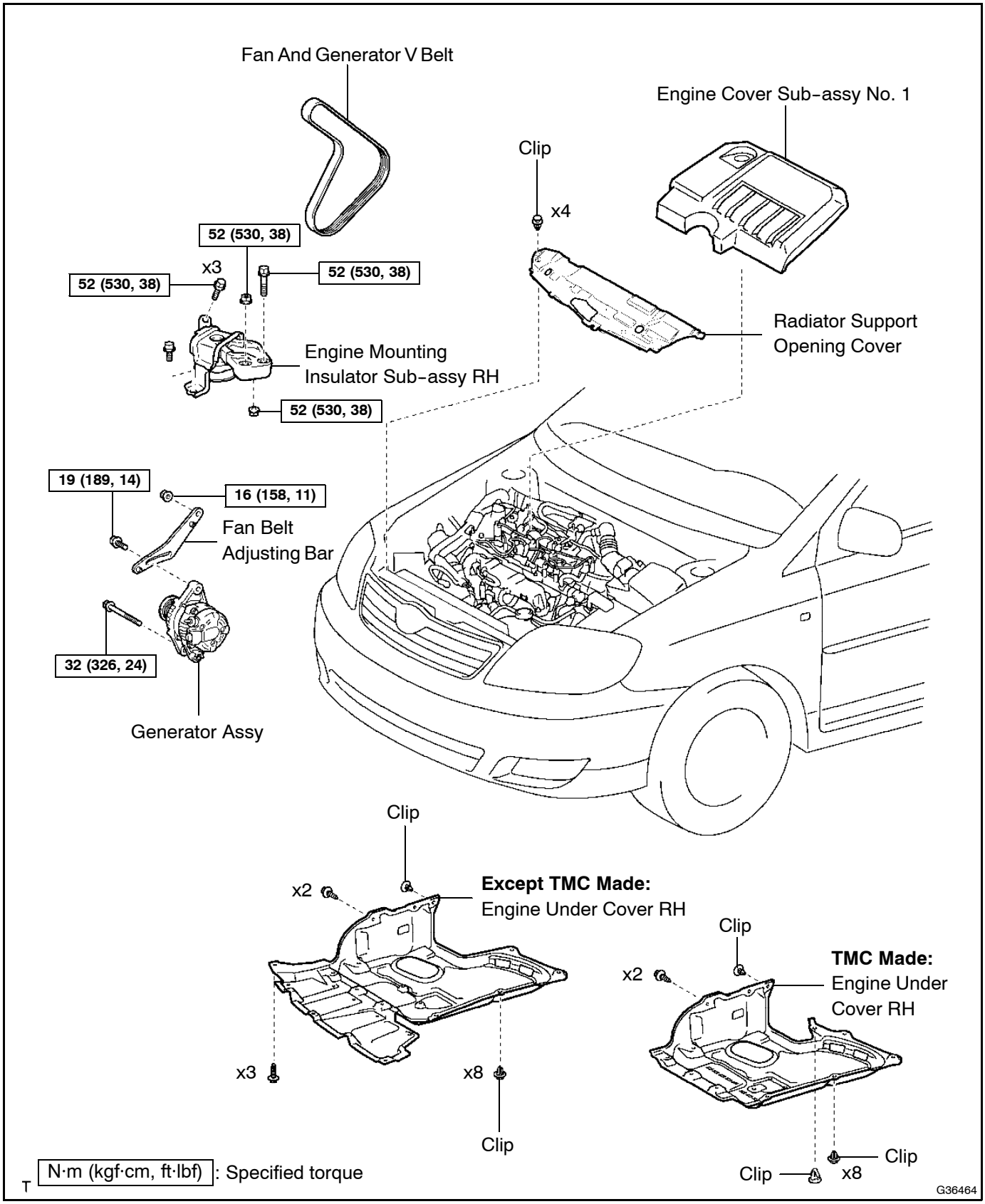
(m) Install the engine under cover RH (TMC made) (see page 13-17).

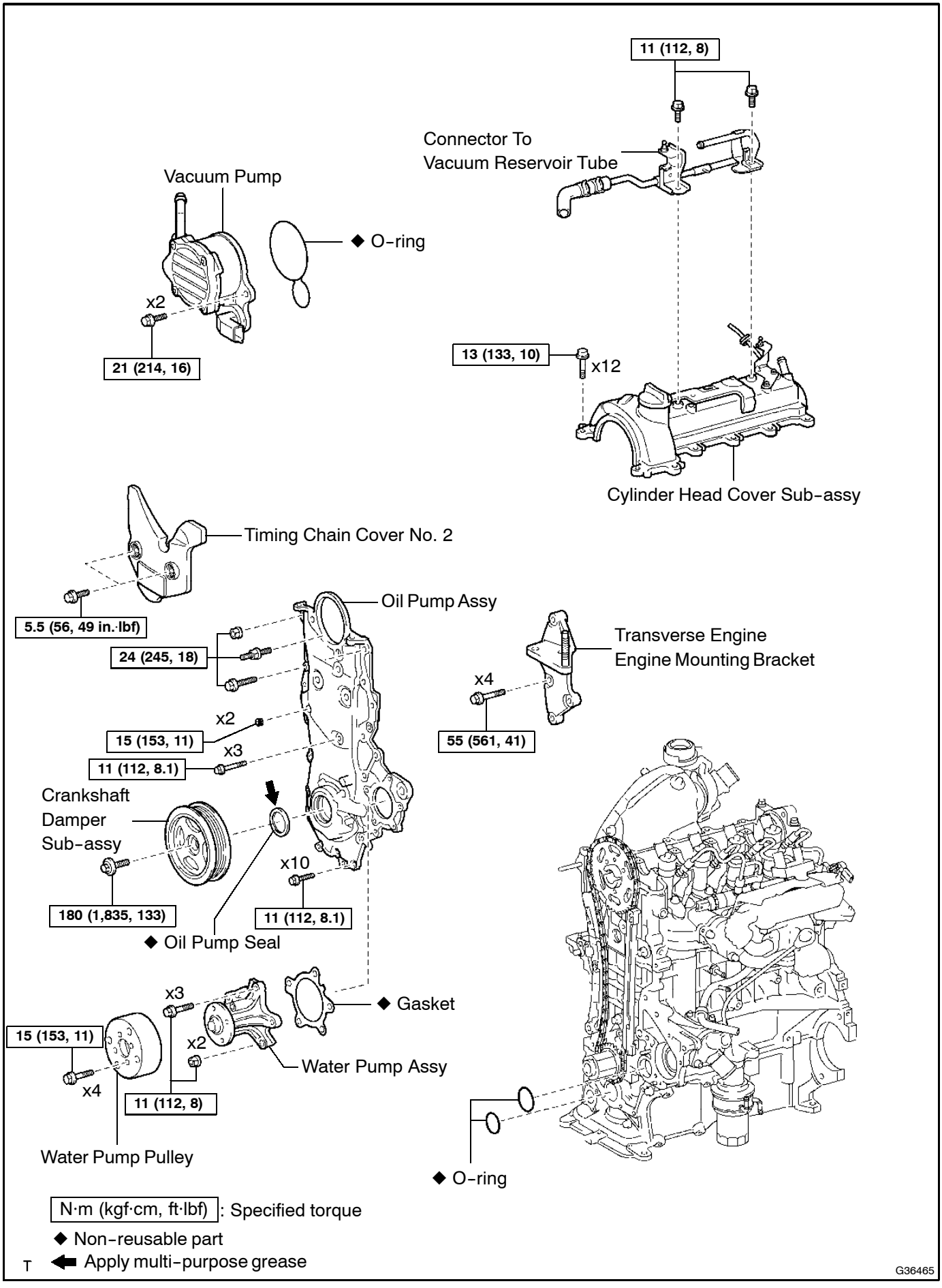
(n) Install the engine under cover RH (except TMC made) (see page 13-17).

OIL PUMP ASSY (1ND-TV)

COMPONENTS

170N1-01

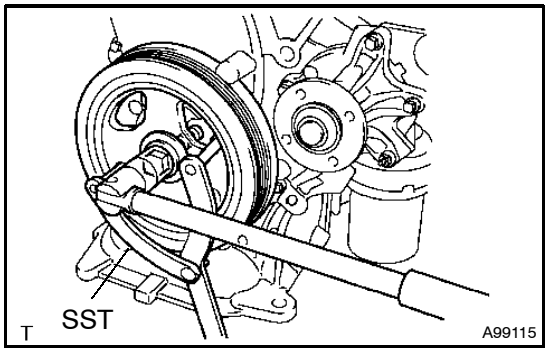



11 (112, 8)
Connector To
Vacuum Reservoir Tube
Vacuum Pump
◆ O-ring
x2
21 (214, 16)
13 (133, 10)
x12
Cylinder Head Cover Sub-assy
Timing Chain Cover No. 2
5.5 (56, 49 in.·lbf)
Oil Pump Assy
24 (245, 18)
Transverse Engine
Engine Mounting Bracket
x4
55 (561, 41)
x2
15 (153, 11)
x3
11 (112, 8.1)
Crankshaft
Damper
Sub-assy
x10
180 (1,835, 133)
11 (112, 8.1)
◆ Oil Pump Seal
x3
◆ Gasket
15 (153, 11)
x2
Water Pump Assy
x4
11 (112, 8)
Water Pump Pulley
◆ O-ring
N·m (kgf·cm, ft·lbf): Specified torque
◆ Non-reusable part
T Apply multi-purpose grease
G36465

170N2-01

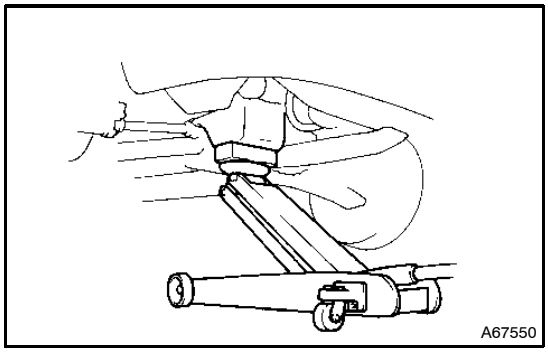
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE FRONT WHEEL RH
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-6)
6. DRAIN ENGINE COOLANT (See page 16-7)
7. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-6)
8. REMOVE FAN AND GENERATOR V BELT (See page 14-4)
9. REMOVE GENERATOR ASSY (See page 19-9)
10. REMOVE WATER PUMP PULLEY (See page 16-9)
    SST 09960-10010 (09962-01000, 09963-00700)
11. REMOVE WATER PUMP ASSY (See page 16-9)
12. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 14-6)
13. REMOVE VACUUM PUMP ASSY (See page 32-3)



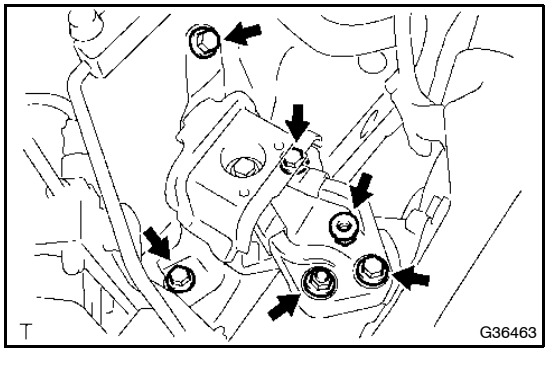
14. REMOVE CRANKSHAFT DAMPER SUB-ASSY

(a) Using SST, hold the crankshaft damper and loosen the crankshaft bolt.
SST 09960-10010 (09962-01000, 09963-01000)

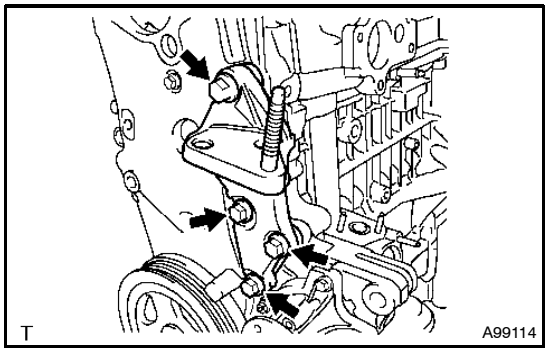


15. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH

(a) Place a wooden block on a jack underneath the engine.

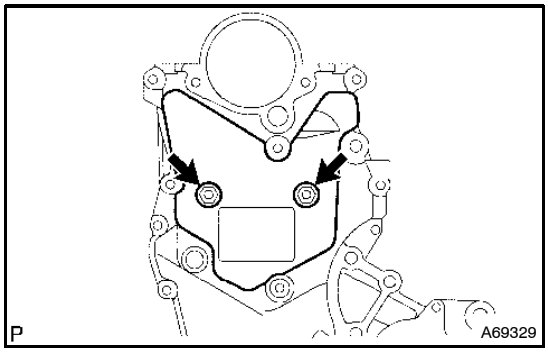


(b) Remove the 4 bolts and 2 nuts, then remove the engine mounting insulator RH.



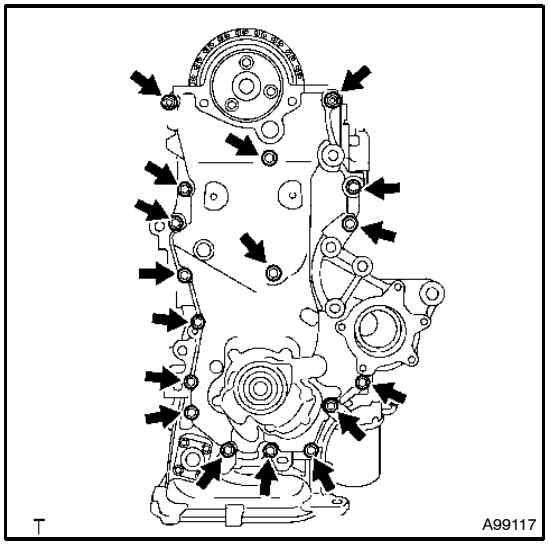
16. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 4 bolts, then remove the engine mounting bracket.



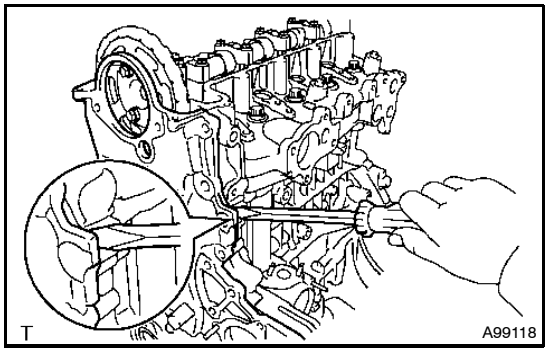
17. REMOVE TIMING CHAIN COVER NO.2

(a) Remove the 2 bolts, then remove the timing cover No. 2.



18. REMOVE OIL PUMP ASSY

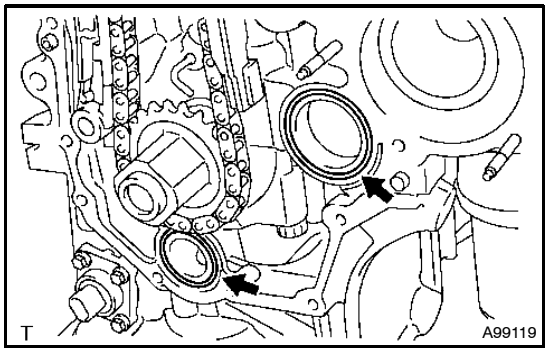
(a) Remove the 16 bolts and nut.



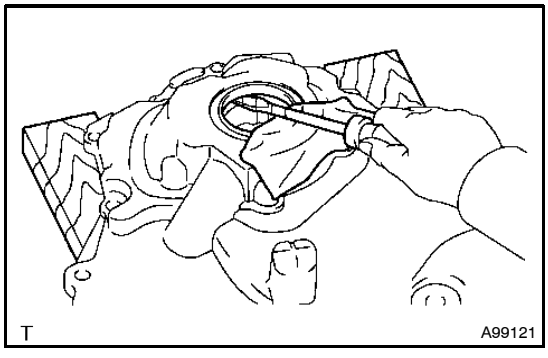
(b) Using a screwdriver with its tip wrapped in tape, remove the oil pump by prying out between the cylinder head and cylinder block.

NOTICE:

Be careful not to damage the contact surfaces of the oil pump assembly, cylinder head and cylinder block.

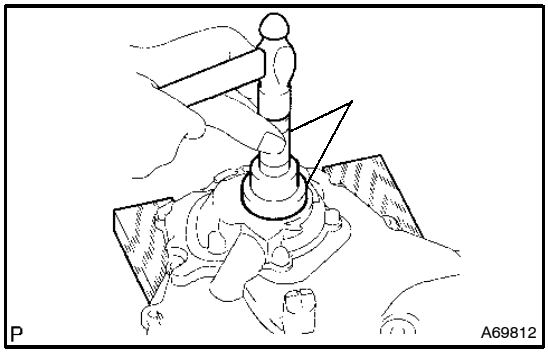


(c) Remove the 2 O-rings from the cylinder block and oil pan.



19. REMOVE OIL PUMP SEAL

(a) Using a screwdriver with its tip wrapped in tape, remove the oil pump seal.



20. INSTALL OIL PUMP SEAL

(a) Using SST and a hammer, tap in the new oil seal until its surface is flush with the oil pump edge.

SST 09223-22010

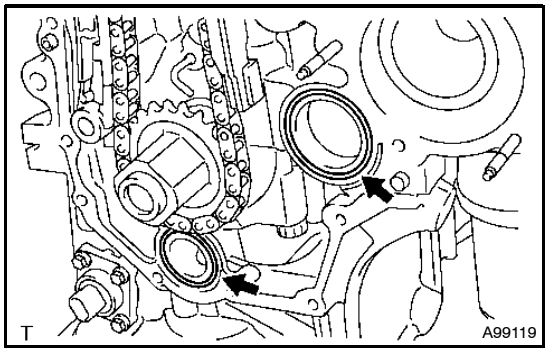
NOTICE:

Tap in the oil seal vertically.

(b) Apply multi-purpose grease to a new oil seal lip.

NOTICE:

Keep the lip free of foreign objects.



21. INSTALL OIL PUMP ASSY

(a) Install 2 new O-rings onto the 2 portions as shown in the illustration.

(b) Apply seal packing to the engine body and oil pump as shown in the illustration below.

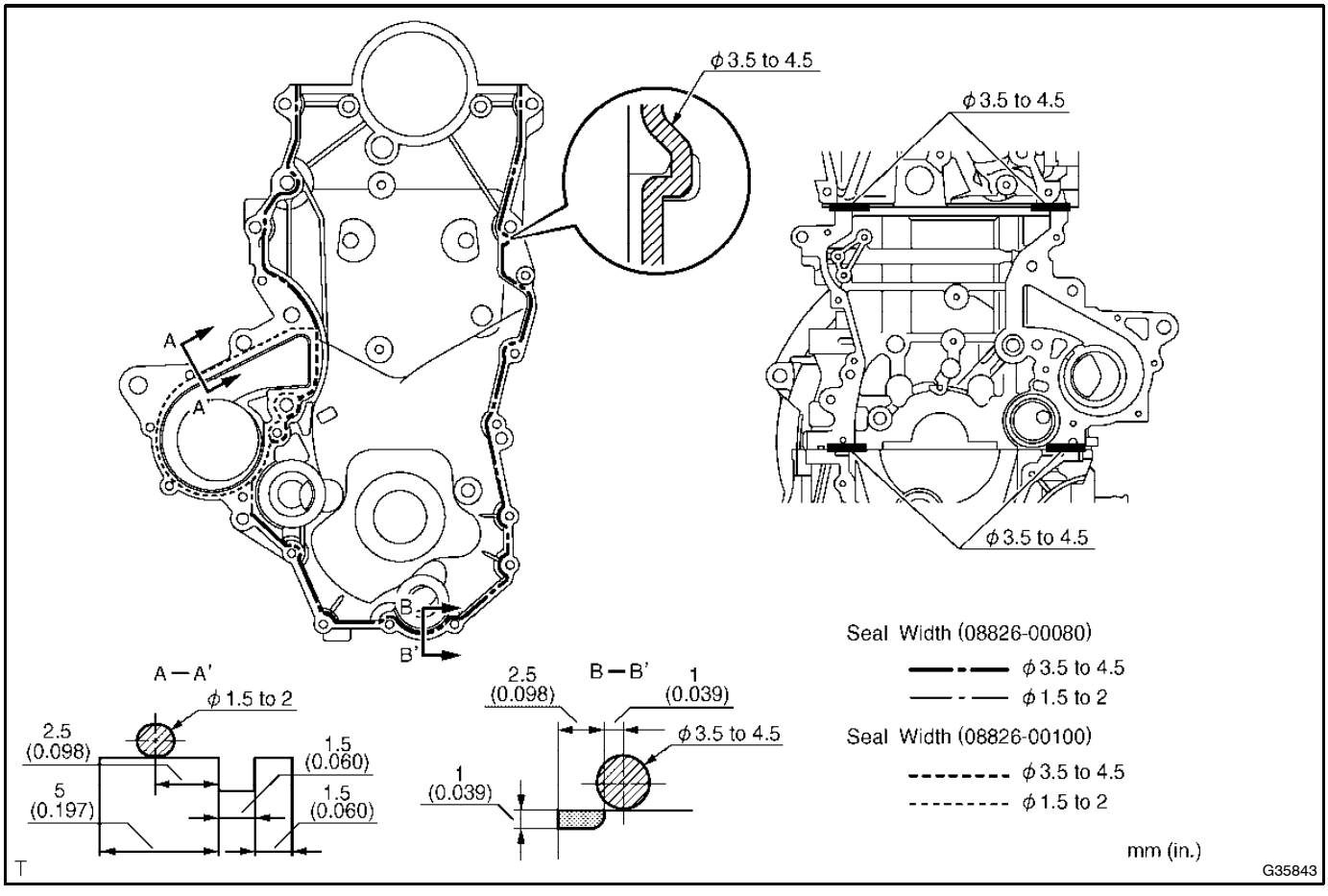
Seal packing:

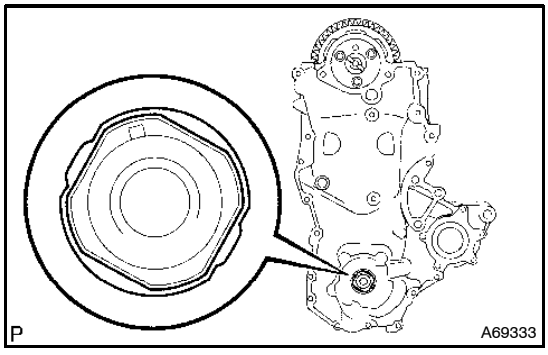
Part No. 08826-00100 or equivalent for Water pump

Part No. 08826-00080 or equivalent for Others

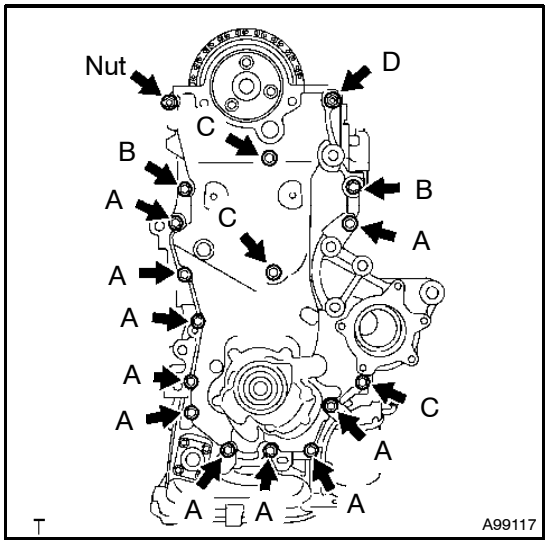
NOTICE:

- **Remove any oil from the contact surface.**
- **Install the oil pan within 3 minutes, and tighten the bolts within 15 minutes of applying seal packing.**





(c) Align the keyway of the oil pump drive rotor with the rectangular portion of the crankshaft, then slide the oil pump into place.



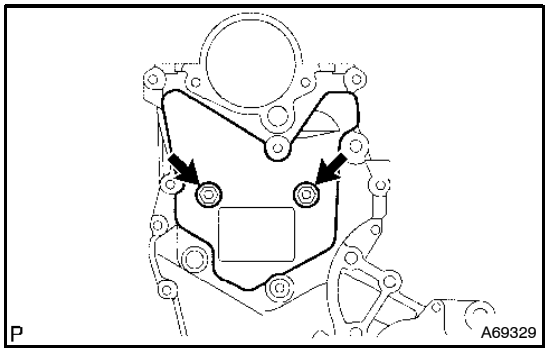
(d) Install the oil pump assembly with the 16 bolts and nut as shown in the illustration.

Torque:
11 N·m (112 kgf·cm, 8.1 ft·lbf) for bolt A
24 N·m (245 kgf·cm, 18 ft·lbf) for bolt B
11 N·m (112 kgf·cm, 8.1 ft·lbf) for bolt C
24 N·m (245 kgf·cm, 18 ft·lbf) for bolt D
24 N·m (245 kgf·cm, 18 ft·lbf) for nut

NOTICE:

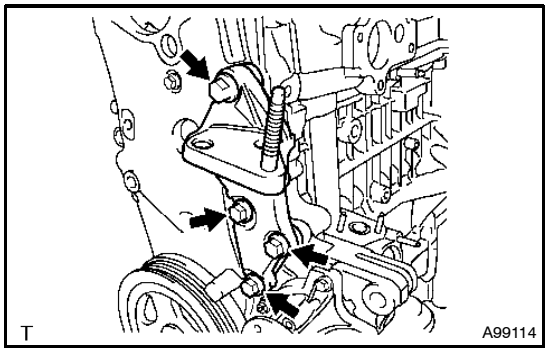
- **Be careful not to let the chain come into contact with seal packing when installing the oil pump.**
- **Install the engine mounting bracket RH and water pump within 15 minutes of installing the oil pump.**

HINT:
The bolt lengths are as follows.
Bolt A: 20 mm (0.79 in.)
Bolt B: 30 mm (1.18 in.)
Bolt C: 35 mm (1.38 in.)
Bolt D (double ended bolt): 20 and 14 mm (0.79 and 0.55 in.)



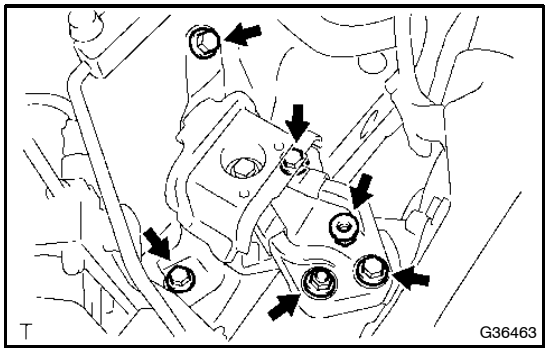
22. INSTALL TIMING CHAIN COVER NO.2

(a) Install the timing cover No. 2 with the 2 bolts.
Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)



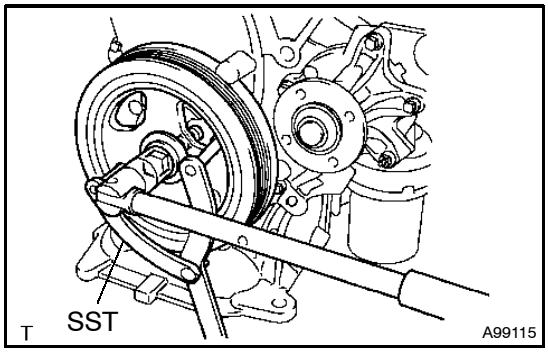
23. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Install the engine mounting bracket with the 4 bolts.
Torque: 55 N·m (561 kgf·cm, 41 ft·lbf)



24. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH

(a) Install the engine mounting insulator RH with the 4 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



25. INSTALL CRANKSHAFT DAMPER SUB-ASSY

(a) Align the key with the key groove of the crankshaft damper, and slide the crankshaft damper to the crankshaft.

(b) Using SST, fix the crankshaft damper.
SST 09960-10010 (09962-01000, 09963-01000)

(c) Tighten the bolt to the specified torque.
Torque: 170 N·m (1,733 kgf·cm, 126 ft·lbf)

26. INSTALL VACUUM PUMP ASSY **(See page 32-3)**
27. INSTALL CYLINDER HEAD COVER SUB-ASSY **(See page 14-6)**
28. INSTALL WATER PUMP ASSY **(See page 16-9)**
29. INSTALL WATER PUMP PULLEY **(See page 16-9)**
SST 09960-10010 (09962-01000, 09963-00700)
30. INSTALL GENERATOR ASSY **(See page 19-9)**
31. INSTALL FAN AND GENERATOR V BELT **(See page 14-4)**
32. ADJUST FAN AND GENERATOR V BELT **(See page 14-4)**
33. INSPECT FAN AND GENERATOR V BELT **(See page 14-1)**
34. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
35. ADD ENGINE COOLANT **(See page 16-7)**
36. CHECK FOR ENGINE COOLANT LEAKAGE **(See page 16-1)**
37. INSPECT ENGINE OIL LEVEL
38. CHECK FOR ENGINE OIL LEAKAGE
39. INSTALL ENGINE COVER SUB-ASSY NO.1 **(See page 14-6)**
40. INSTALL RADIATOR SUPPORT OPENING COVER **(See page 14-6)**
41. INSTALL ENGINE UNDER COVER RH (TMC MADE) **(See page 13-17)**
42. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) **(See page 13-17)**
43. INSTALL FRONT WHEEL RH
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

OIL FILTER SUB-ASSY (1ND-TV)

170N0-01

REPLACEMENT

CAUTION:

- **Prolonged and repeated contact with engine oil will cause removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Precautions should be taken when replacing engine oil to minimize the risk of your skin coming into contact with used engine oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use a waterless hand cleaner to remove any used engine oil. Do not use gasoline, thinners or solvents.**
- **For environmental protection, used oil and used oil filters must be disposed of at designated disposal sites.**

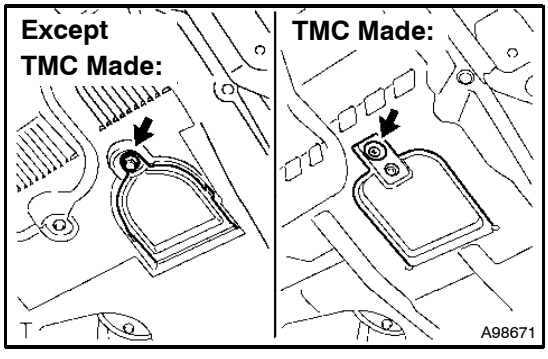
1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

(b) Remove the oil drain plug, and drain the oil into a container.

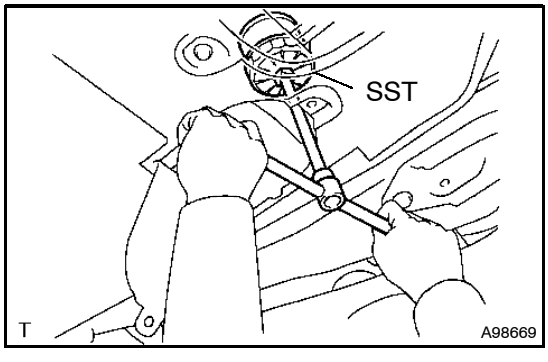
(c) Clean and install the oil drain plug with a new gasket.

Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)



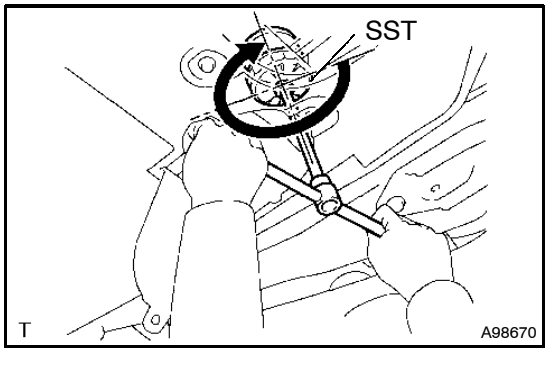
2. REMOVE OIL FILTER SUB-ASSY

(a) Remove the screw and open the service cover.



(b) Using SST, remove the oil filter.

SST 09228-07501



3. INSTALL OIL FILTER SUB-ASSY

(a) Check and clean the oil filter installation surface.

(b) Apply clean engine oil to the gasket of a new oil filter.

(c) Lightly screw the oil filter into place, then tighten it until the gasket comes into contact with the seat.

(d) Using SST, tighten it an additional 3/4 turn.

SST 09228-07501

Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

(e) Close the service cover and install the screw.

4. ADD ENGINE OIL

(a) Fill the engine with fresh engine oil.

Capacity:

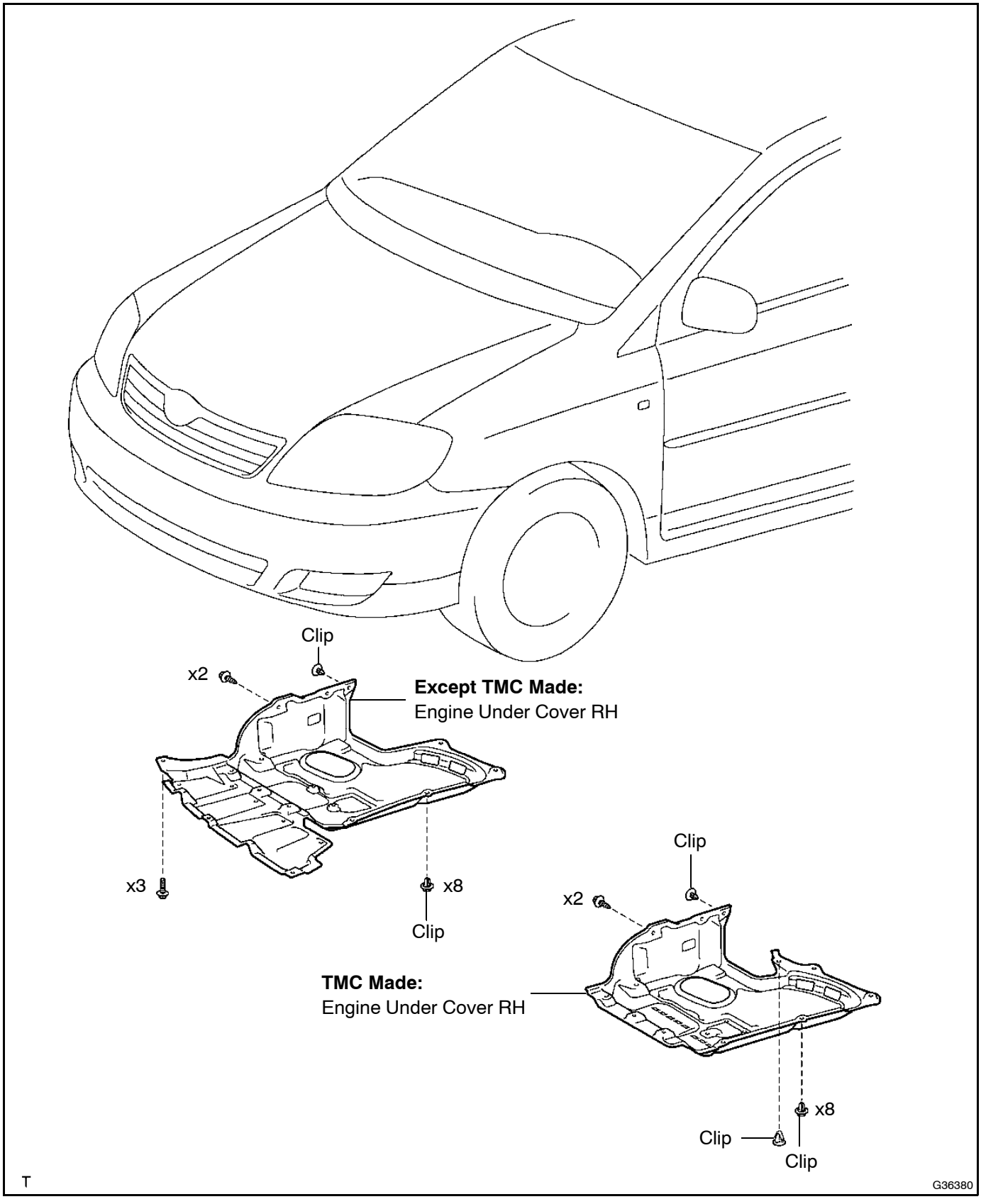
Drain and refill with oil filter change	4.3 liters (4.5 US qts, 3.8 Imp. qts)
Drain and refill without oil filter change	3.8 liters (4.0 US qts, 3.3 Imp. qts)
Dry fill	4.8 liters (5.1 US qts, 4.2 Imp. qts)

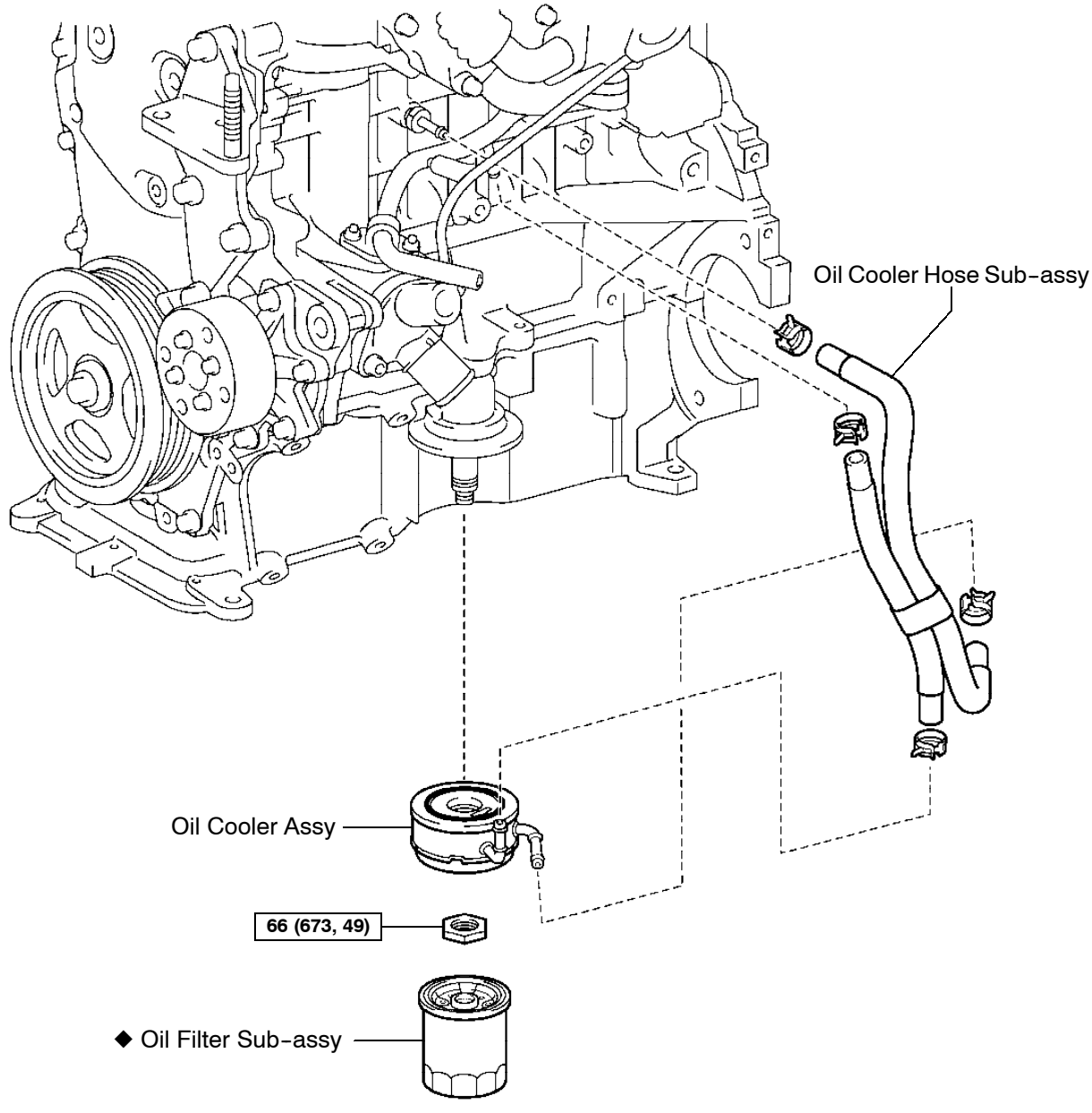
5. CHECK FOR ENGINE OIL LEAKAGE

OIL COOLER ASSY (1ND-TV)

COMPONENTS

170N3-01





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

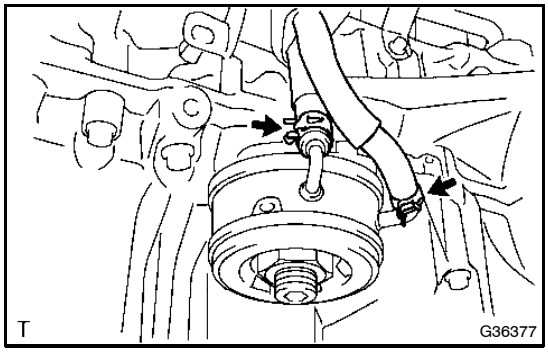
◆ Non-reusable part

G36381

170N4-01

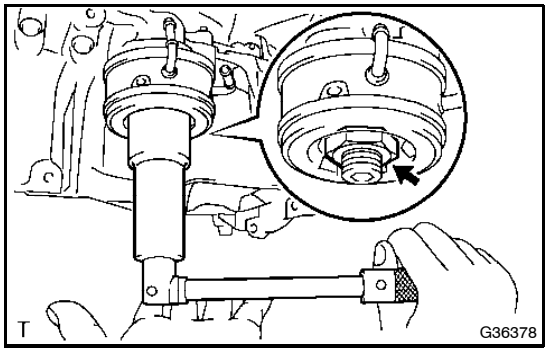
REPLACEMENT

1. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
2. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)
3. DRAIN ENGINE OIL (See page 17-11)
4. DRAIN ENGINE COOLANT (See page 16-7)
5. REMOVE OIL FILTER SUB-ASSY (See page 17-11)
   SST 09228-07501

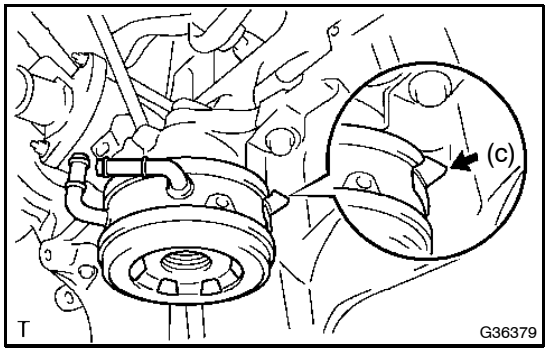


6. REMOVE OIL COOLER ASSY

(a) Disconnect oil cooler hose from the oil cooler.



(b) Using SST, remove the nut, then remove oil cooler.
SST 09229-55010

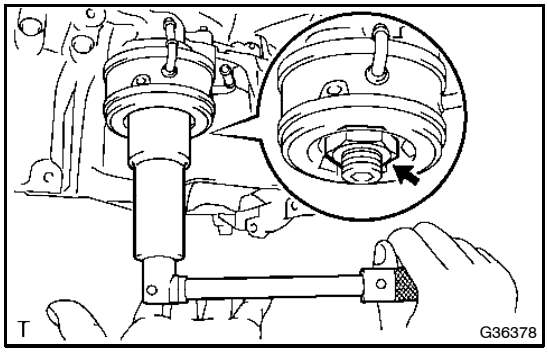


7. INSTALL OIL COOLER ASSY

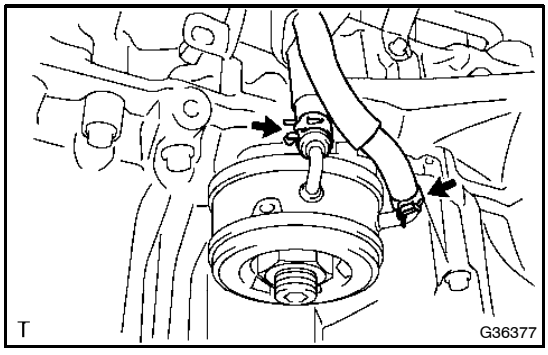
(a) Check and clean the oil cooler installation surface.

(b) Apply new engine oil to the O-ring of a new oil cooler.

(c) With the antirotation bracket of the oil cooler in contact with the oil pan side, temporarily install the oil cooler with a nut.



(d) Using SST, tighten the nut to the specified torque.
SST 09229-55010
Torque: 66 N·m (673 kgf·cm, 49 ft·lbf)



(e) Connect the oil cooler hose to the oil cooler.

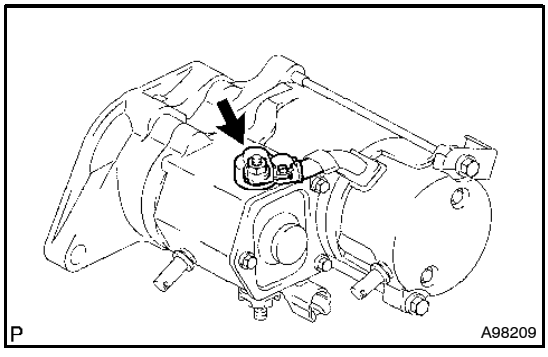
8. **INSTALL OIL FILTER SUB-ASSY** **(See page 17-11)**
   SST 09228-07501
9. **ADD ENGINE OIL** **(See page 17-11)**
10. **ADD ENGINE COOLANT** **(See page 16-7)**
11. **CHECK FOR ENGINE OIL LEAKAGE**
12. **CHECK FOR ENGINE COOLANT LEAKAGE** **(See page 16-1)**
13. **INSTALL ENGINE UNDER COVER RH (TMC MADE)** **(See page 13-17)**
14. **INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE)** **(See page 13-17)**

STARTING & CHARGING

STARTING SYSTEM (1ND-TV)

INSPECTION

1911Y-01



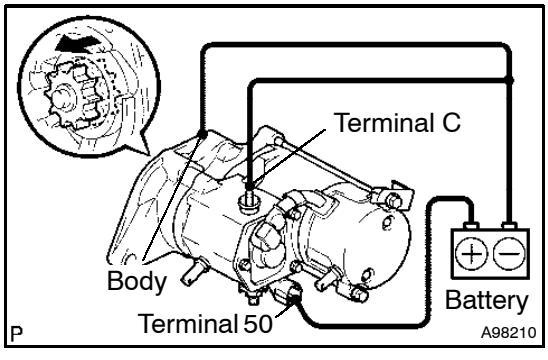
1. INSPECT STARTER ASSY

NOTICE:

These tests must be performed within 3 to 5 seconds to prevent burnout of the coil.

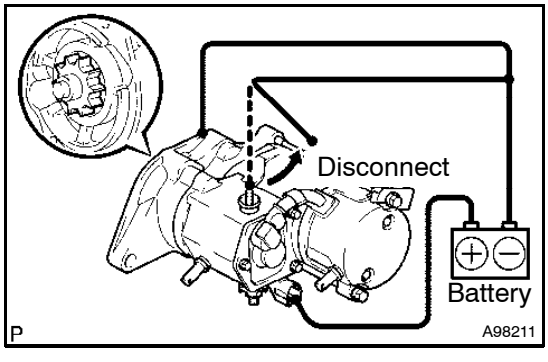
(a) Perform the pull-in test.

(1) Remove the nut, then disconnect the lead wire from terminal C.



(2) Connect the battery to the starter magnetic switch as shown in the illustration. Check that the clutch pinion gear is extended.

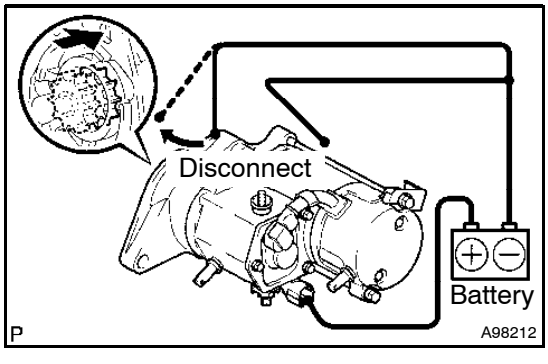
If the clutch pinion gear does not move, replace the starter magnetic switch.



(b) Perform the hold-in test.

(1) Disconnect the negative (-) lead from terminal C. Check that the clutch pinion gear remains extended.

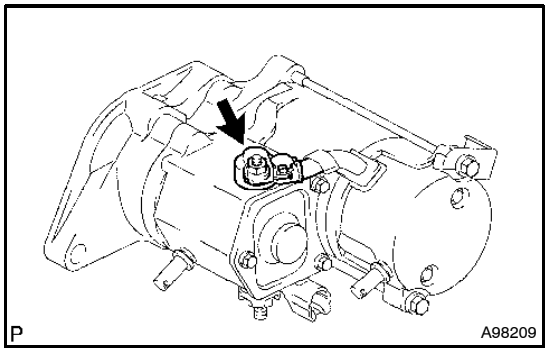
If the clutch pinion gear returns inward, replace the starter magnetic switch.



(c) Check the operation.

(1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns.

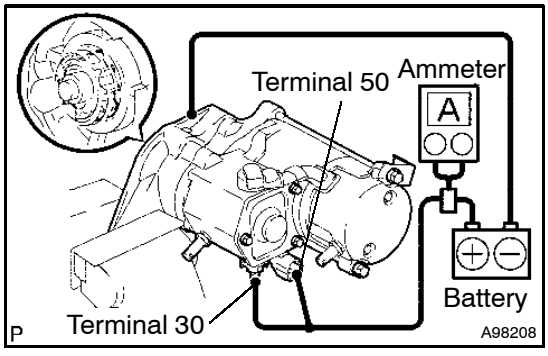
If the clutch pinion gear does not return inward, replace the starter magnetic switch.



(d) Perform the no-load performance test.

(1) Connect the lead wire to terminal C. Make sure that the lead is not grounded.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



(2) Clamp the starter in a vise.

(3) Connect the battery and an ammeter to the starter as shown in the illustration.

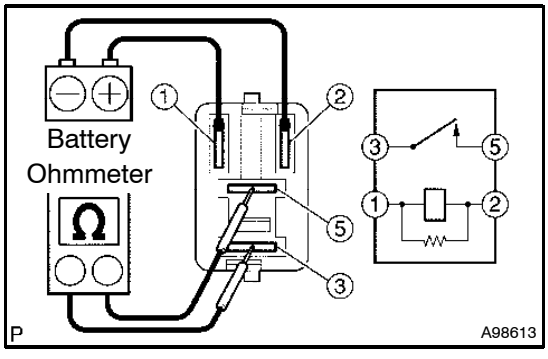
(4) Check that the starter rotates smoothly and steadily with the clutch pinion gear extended. Check that the ammeter reads the specified current.

Specified current:

90 A or less at 11.5 V for 1.4 kW

100 A or less at 11.5 V for 2.0 kW

If the result is not as specified, replace the starter.



2. INSPECT STARTER RELAY ASSY

(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1Ω (Apply battery voltage to terminals 1 and 2)

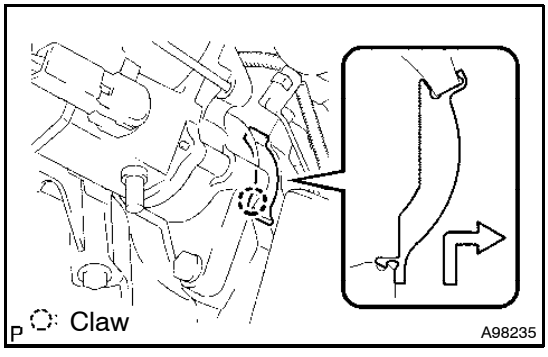
If the result is not as specified, replace the starter relay.

STARTER ASSY (1ND-TV)

1911Z-01

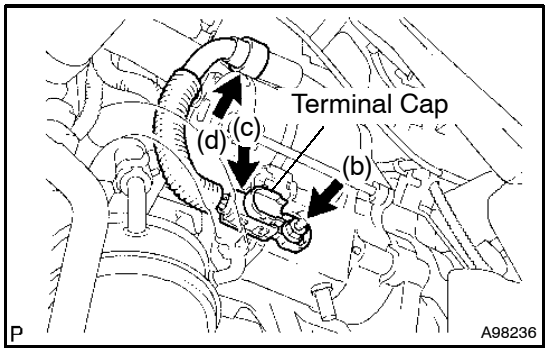
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER (TMC MADE) (See page 13-17)
3. REMOVE ENGINE UNDER COVER RH (TMC MADE) (See page 13-17)
4. REMOVE ENGINE UNDER COVER LH (EXCEPT TMC MADE) (See page 13-17)
5. REMOVE ENGINE UNDER COVER RH (EXCEPT TMC MADE) (See page 13-17)



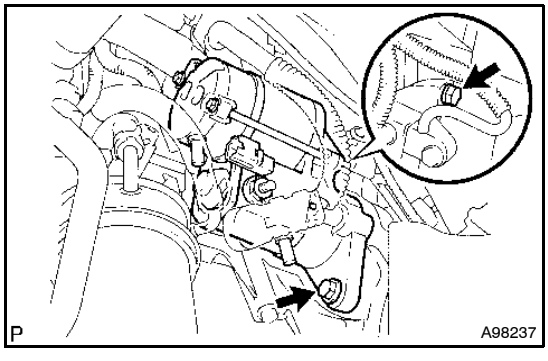
6. REMOVE FLYWHEEL HOUSING SIDE COVER

(a) Remove the flywheel housing side cover by raising up and pulling out as shown in the illustration.

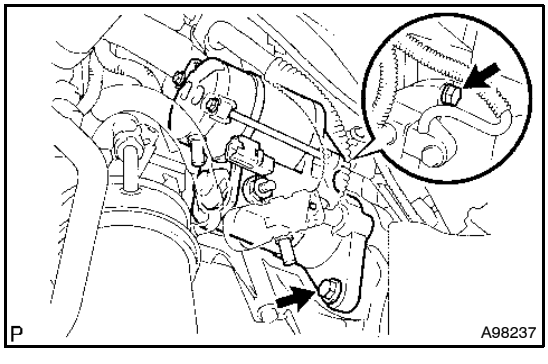


7. REMOVE STARTER ASSY

(a) Open the terminal cap.
(b) Remove the nut and disconnect the starter terminal.
(c) Disconnect the starter connector.
(d) Remove the wire harness clamp.

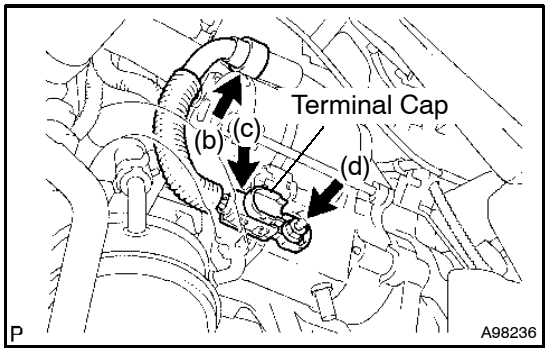


(e) Remove the 2 bolts and starter.

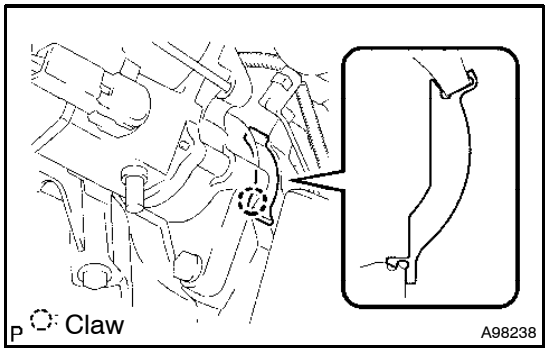


8. INSTALL STARTER ASSY

(a) Install the starter with the 2 bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



(b) Install the wire harness clamp.
(c) Connect the starter connector.
(d) Connect the starter terminal with the nut.
Torque: 12.8 N·m (130 kgf·cm, 9.0 ft·lbf)
(e) Close the terminal cap.



9. INSTALL FLYWHEEL HOUSING SIDE COVER
(a) Install the flywheel housing cover.
NOTICE:
- **Confirm that the claw is accurately inserted by hearing a click sound when installing the flywheel housing side cover.**
- **If the claw is deformed, replace the flywheel housing side cover.**

10. INSTALL ENGINE UNDER COVER RH (EXCEPT TMC MADE) **(See page 13-17)**
11. INSTALL ENGINE UNDER COVER LH (EXCEPT TMC MADE) **(See page 13-17)**
12. INSTALL ENGINE UNDER COVER RH (TMC MADE) **(See page 13-17)**
13. INSTALL ENGINE UNDER COVER (TMC MADE) **(See page 13-17)**
14. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

CHARGING SYSTEM (1ND-TV)

19120-01

PRECAUTION

1. PRECAUTION

(a) Check that the battery cables are connected to the correct terminals.
(b) Disconnect the battery cables if a quick charge is given to the battery.
(c) Do not perform tests with a high voltage insulation resistance tester.
(d) Never disconnect the battery while the engine is running.
(e) Check that the charging cable is tightly connected onto terminal B of the generator and the fuse box.
(f) Do not check whether the generator generates current or not while terminal F is connected to the other terminals.

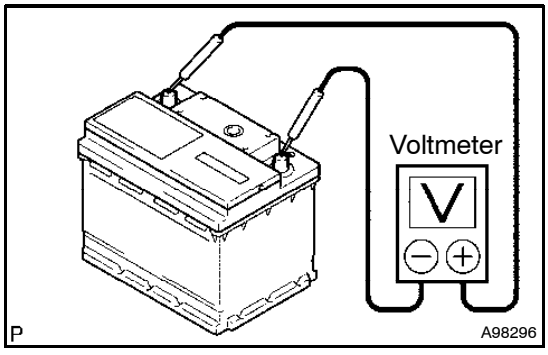
ON-VEHICLE INSPECTION

1. INSPECT BATTERY (MAINTENANCE-FREE BATTERY)

(a) Check the battery electrolyte level.

(1) Check the volume of electrolyte in each cell.

If the electrolyte volume is below the recommended amount, replace the battery.



(b) Check the voltage.

(1) If it has been less than 20 minutes since you stopped driving the vehicle or since the engine was stopped, turn the ignition switch and electrical systems (headlight, blower motor, rear defogger etc.) to the ON position for 60 seconds. This will remove the surface charge on the battery.

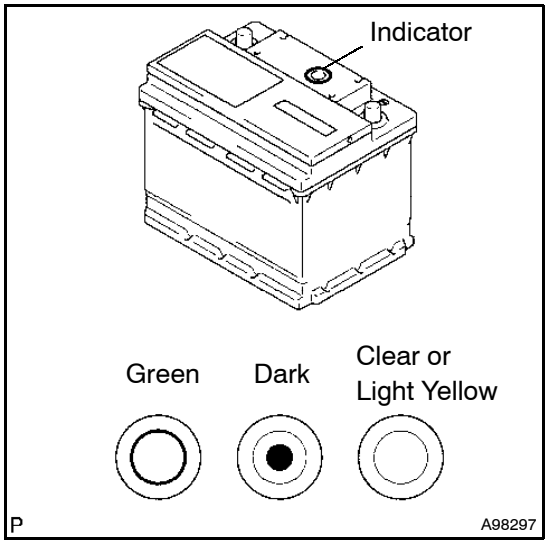
(2) Turn the ignition switch to OFF.

(3) Turn the electrical systems to OFF.

(4) Using a voltmeter, measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

Standard: 12.5 to 12.9 V at 20°C (68°F)

If the result is not as specified, replace the battery.



(c) Check the indicator is as shown in the illustration.

Indicator Color	Condition
Green	Ready
Dark	Charging Necessary
Clear or Light Yellow	Add Distilled Water

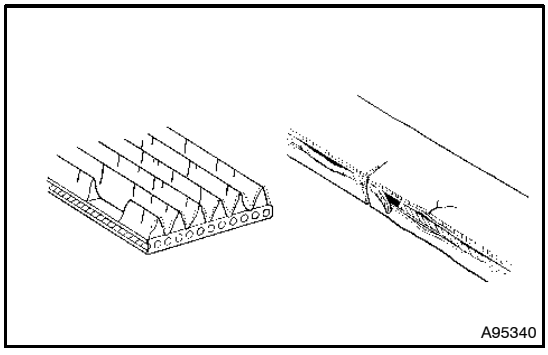
2. INSPECT BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Visually check the battery terminals.

(1) Check that the battery terminals are not loose or corroded.

(b) Visually check the fusible link and fuses.

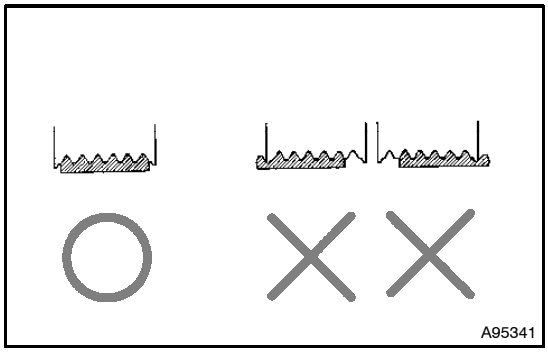
(1) Check that there is continuity of the fusible links, high current fuses and regular fuses.



3. INSPECT V-RIBBED BELT

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

- If any defects are found, replace the V-ribbed belt.
- Cracks on the rib side of the belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Check that the belt fits properly in the ribbed grooves.

Confirm by hand that the belt has not slipped out of the grooves on the bottom of the pulley.

4. INSPECT GENERATOR WIRING

(a) Visually check the generator wiring.

(1) Check that the wiring is in good condition.

5. INSPECT ABNORMAL NOISES

(a) Listen for abnormal noises from generator.

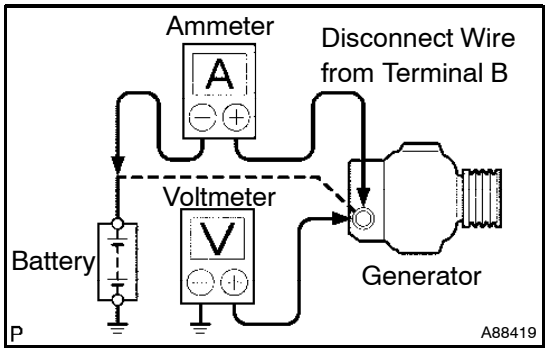
(1) Check that no abnormal noises are heard from the generator while the engine is running.

6. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch to ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

If the light does not operate as specified, troubleshoot the charge warning light circuit.



7. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows.

(1) Disconnect the wire from terminal B of the generator, then connect it to the negative (-) lead of the ammeter.

(2) Connect the positive (+) lead of the ammeter to terminal B of the generator.

(3) Connect the positive (+) lead of the voltmeter to terminal B of the generator.

(4) Ground the negative (-) lead of the voltmeter.

(b) Check the charging circuit.

(1) Keep the engine speed at 2,000 rpm and check the reading on the ammeter and voltmeter.

Standard:

10 A or less for amperage

13.2 to 14.8 V for voltage

8. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn the high beam headlights ON and turn the heater blower switch to the HI position.

(b) Check the reading on the ammeter.

Standard: 30 A or more

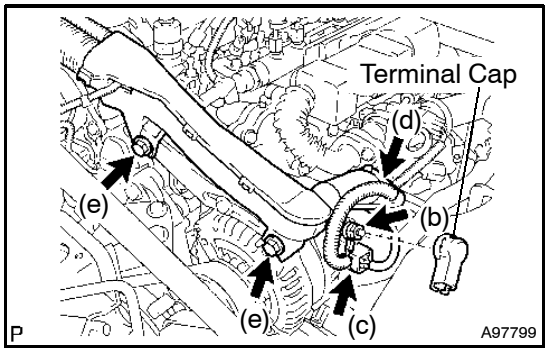
- If the ammeter reading is less than the standard amperage, repair the generator.
- If the battery is fully charged, the indication will sometimes be less than the standard amperage.

GENERATOR ASSY (1ND-TV)

19122-01

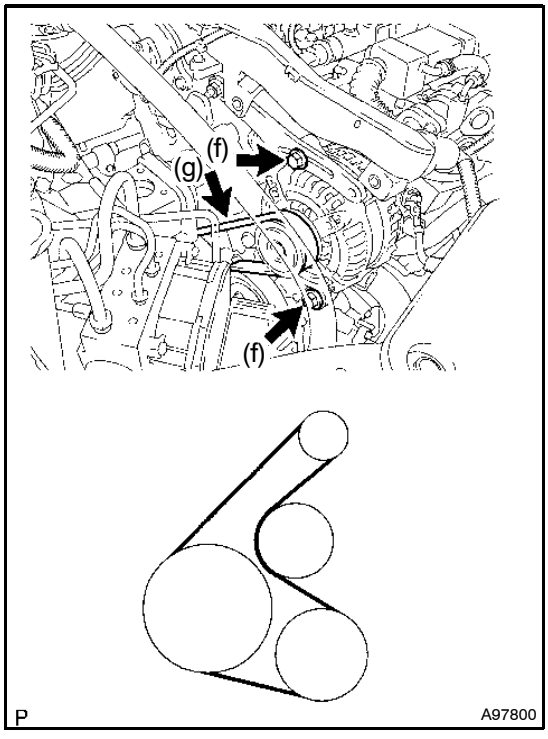
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 13-17)

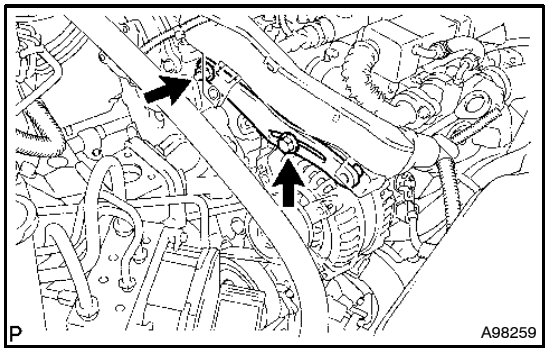


3. REMOVE GENERATOR ASSY

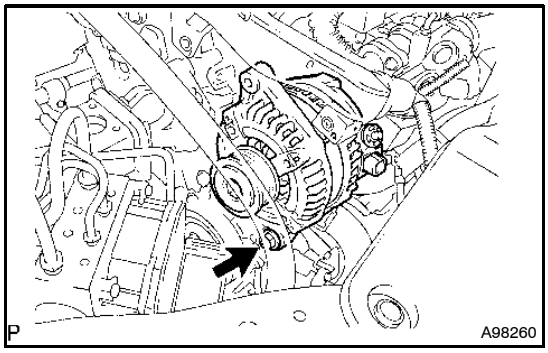
(a) Remove the terminal cap.
(b) Remove the nut and disconnect the generator terminal.
(c) Disconnect the generator connector.
(d) Remove the wire harness clamp.
(e) Remove the 2 bolts and wire harness protector.



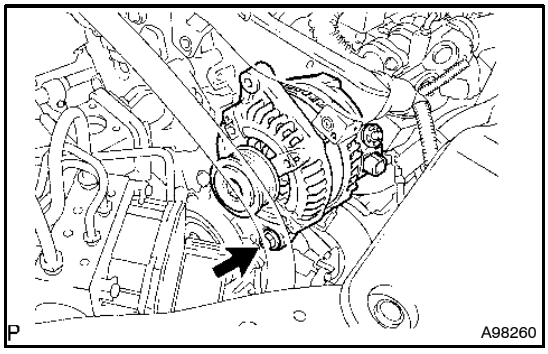
(f) Loosen the 2 bolts.
(g) Release the fan and generator V-ribbed belt tension and remove the fan and generator V-ribbed belt from each pulley.



(h) Remove the bolt, nut and fan belt adjusting bar.

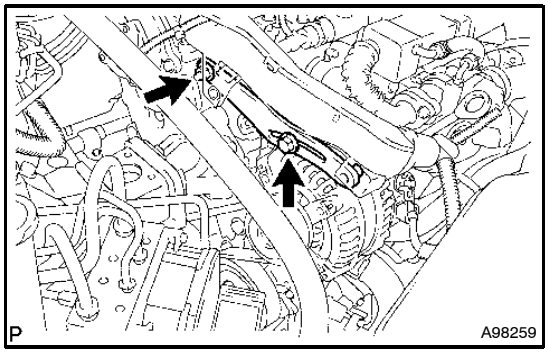


(i) Remove the bolt and generator.

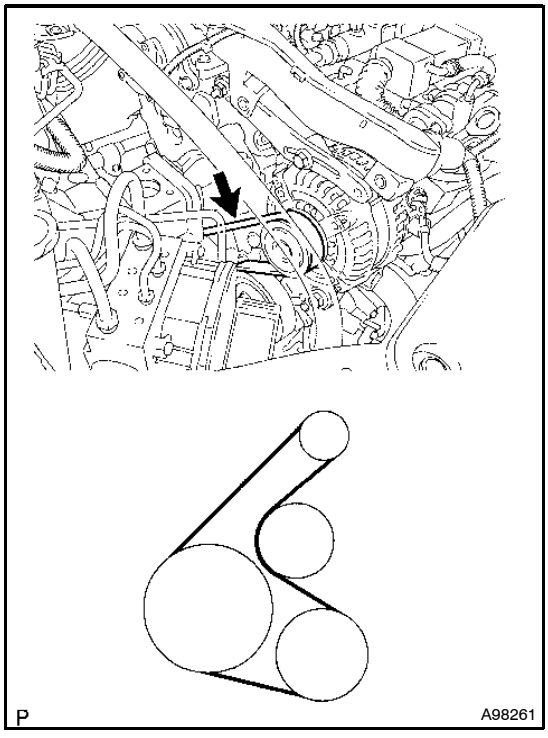


4. INSTALL GENERATOR ASSY

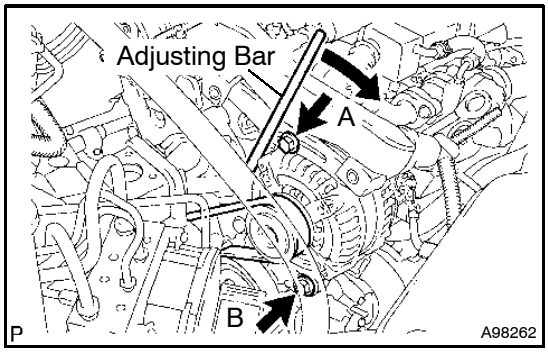
(a) Temporarily install the generator with the bolt.



(b) Temporarily install the fan belt adjusting bar with the bolt and tighten the nut to the specified torque.
Torque: 18.5 N·m (190 kgf·cm, 14 ft·lbf)

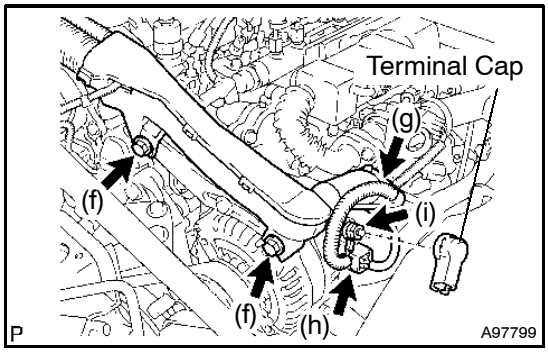


(c) Temporarily install the fan and generator V-ribbed belt onto each pulley.



(d) Insert the adjusting bar between the engine mounting bracket and generator. Push the adjusting bar towards the vehicle front to adjust the fan and generator V-ribbed belt tension.

(e) First tighten bolt A, then tighten bolt B.
Torque:
18.5 N·m (190 kgf·cm, 14 ft·lbf) for bolt A
32 N·m (325 kgf·cm, 24 ft·lbf) for bolt B



(f) Install the wire harness protector with the 2 bolts.
Torque: 12.8 N·m (130 kgf·cm, 9 ft·lbf)

(g) Install the wire harness clamp.

(h) Connect the generator connector.

(i) Connect the generator terminal with the nut.
Torque: 9.8 N·m (100 kgf·cm, 7.2 ft·lbf)

(j) Install the terminal cap.

5. INSTALL ENGINE COVER SUB-ASSY NO.1 **(See page 13-17)**

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

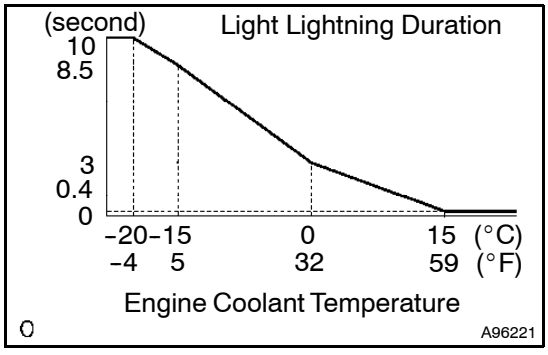
PRE-HEATING SYSTEM (1ND-TV)

19123-01

ON-VEHICLE INSPECTION

NOTICE:

Turn the ignition switch to OFF for 60 seconds before performing the following procedures.



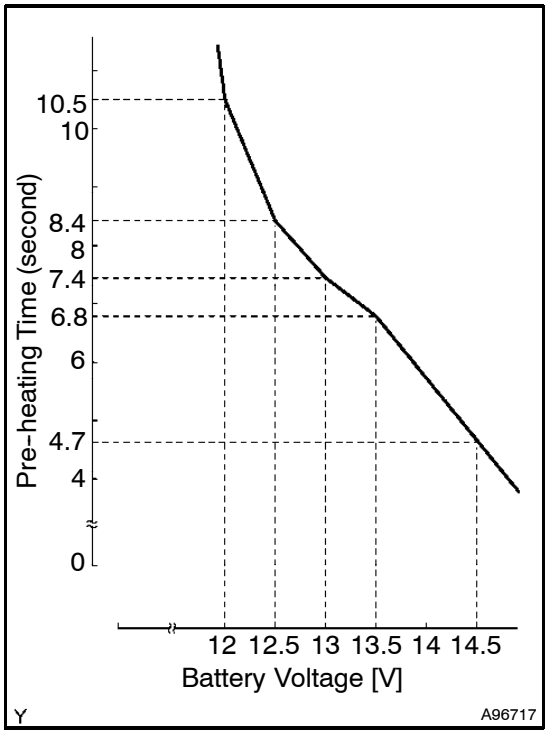
1. INSPECT LIGHTING DURATION OF GLOW INDICATOR LIGHT

(a) Turn the ignition switch to ON and measure the lighting duration.

Standard:

The glow indicator lights up depending on the engine coolant temperature.

If the result is not as specified, check the ECM, engine coolant temperature sensor, glow plug and glow plug relay.



2. INSPECT PRE-HEATING

(a) Turn the ignition switch to ON and measure the how long it takes for the battery voltage to be applied to the glow plugs.

Standard:

Engine Coolant Temperature	Pre-heating Time
40°C (104°F) or higher	1 second
40°C (104°F) or lower	As indicated in the illustration (15 seconds at the longest)

If the result is not as specified, check the ECM, engine coolant temperature sensor, glow plug and glow plug relay.

(b) Turn the ignition switch to STA and check the battery voltage is applied to the glow plugs.

(c) While cranking the engine,measure the how long it takes for the battery voltage to be applied to the glow plugs.

Standard:

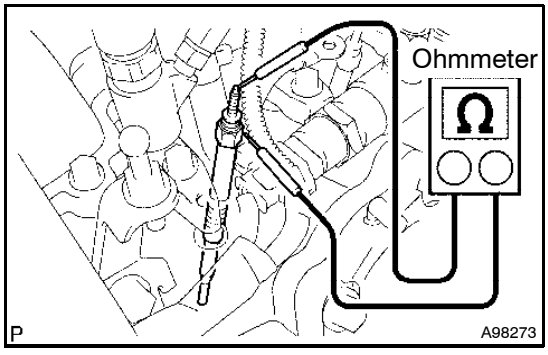
Engine Coolant Temperature	Pre-heating Time
40°C (104°F) or higher	1 second
40°C (104°F) or lower	As indicated in the illustration (15 seconds at the longest)

NOTICE:

Do not start the engine.

If the result is not as specified, check the ECM, engine coolant temperature sensor, glow plug and glow plug relay.

INSPECTION



1. INSPECT GLOW PLUG ASSY

(a) Check the resistance.

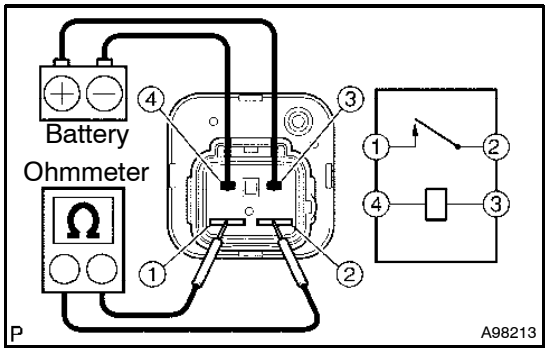
(1) Using an ohmmeter, measure the resistance between the glow plug terminal and ground.

Standard: 0.6 Ω at 20°C (68°F)

NOTICE:

- **Be careful not to damage the glow plug pipes as this could cause an open circuit or shorten the life of the glow plugs.**
- **Be careful to prevent oil and gasoline from spraying onto the glow plugs when cleaning.**
- **Wipe any oil off the terminal and the Bakelite washer with a dry cloth if they are stained with oil during inspection.**
- **Be careful not to apply more than 11 V to the glow plugs as this could cause an open circuit.**

If the result is not as specified, replace the glow plug.



2. INSPECT GLOW PLUG RELAY ASSY

(a) Check the resistance.

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

Standard:

Tester Connection	Specified Condition
1 - 2	10 kΩ or higher
1 - 2	Below 1 Ω (Apply battery voltage to terminal 3 and 4)

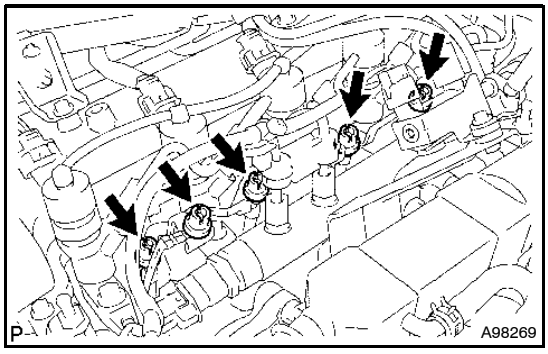
If the result is not as specified, replace the glow plug relay.

GLOW PLUG ASSY (1ND-TV)

19125-01

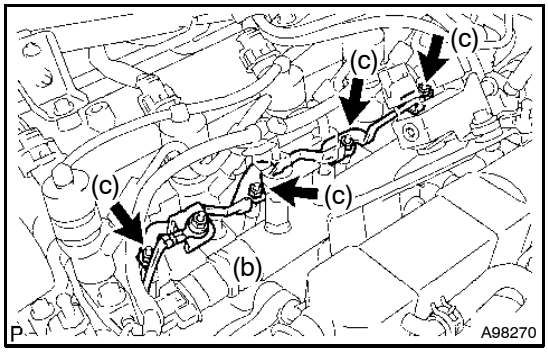
REPLACEMENT

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 13-17)



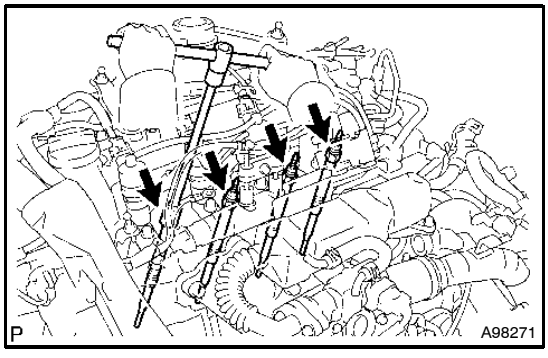
3. REMOVE GLOW PLUG NO.1 CONNECTOR

(a) Remove the 5 screw grommets.



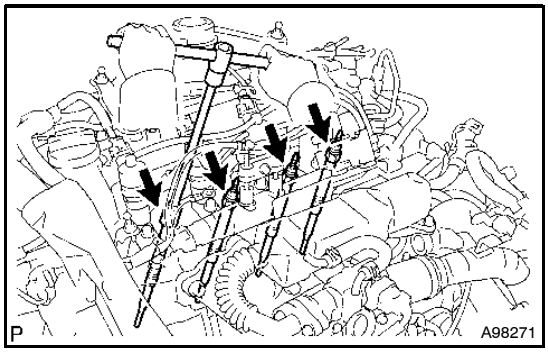
(b) Remove the nut and disconnect the glow terminal.

(c) Remove the 4 nuts and glow plug connector No. 1.



4. REMOVE GLOW PLUG ASSY

(a) Using a deep socket wrench 10 mm, remove the 4 glow plugs.

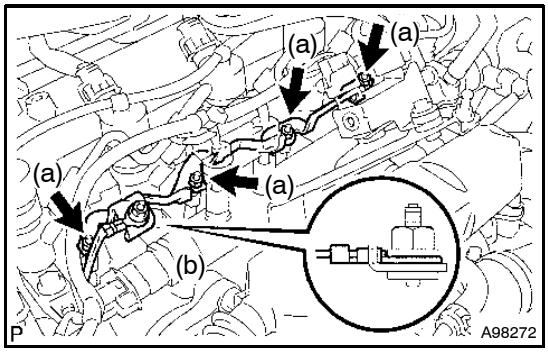


5. INSTALL GLOW PLUG ASSY

(a) Clean the installation hole of the glow plug of the cylinder head.

(b) Using a deep socket wrench 10 mm, install the 4 glow plugs.

Torque: 12.5 N·m (125 kgf·cm, 9 ft·lbf)

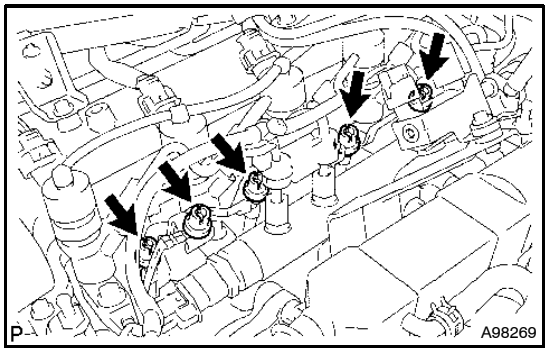


6. INSTALL GLOW PLUG NO.1 CONNECTOR

(a) Install the glow plug connector No. 1 with the 4 nuts.
Torque: 1.6 N·m (15 kgf·cm, 14 in.·lbf)

(b) Connect the glow terminal with the nut.
Torque: 3.8 N·m (40 kgf·cm, 34 in.·lbf)

NOTICE:
Be careful that the glow terminal is at the correct direction when installing.



(c) Install the 5 screw grommets.

NOTICE:
Push the screw grommet into the threaded portion of the glow plug by hand, and then turn it clockwise.

7. INSTALL ENGINE COVER SUB-ASSY NO.1 **(See page 13-17)**

8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

DRIVE SHAFT / PROPELLER SHAFT

REFER TO FOLLOWING REPAIR MANUALS:

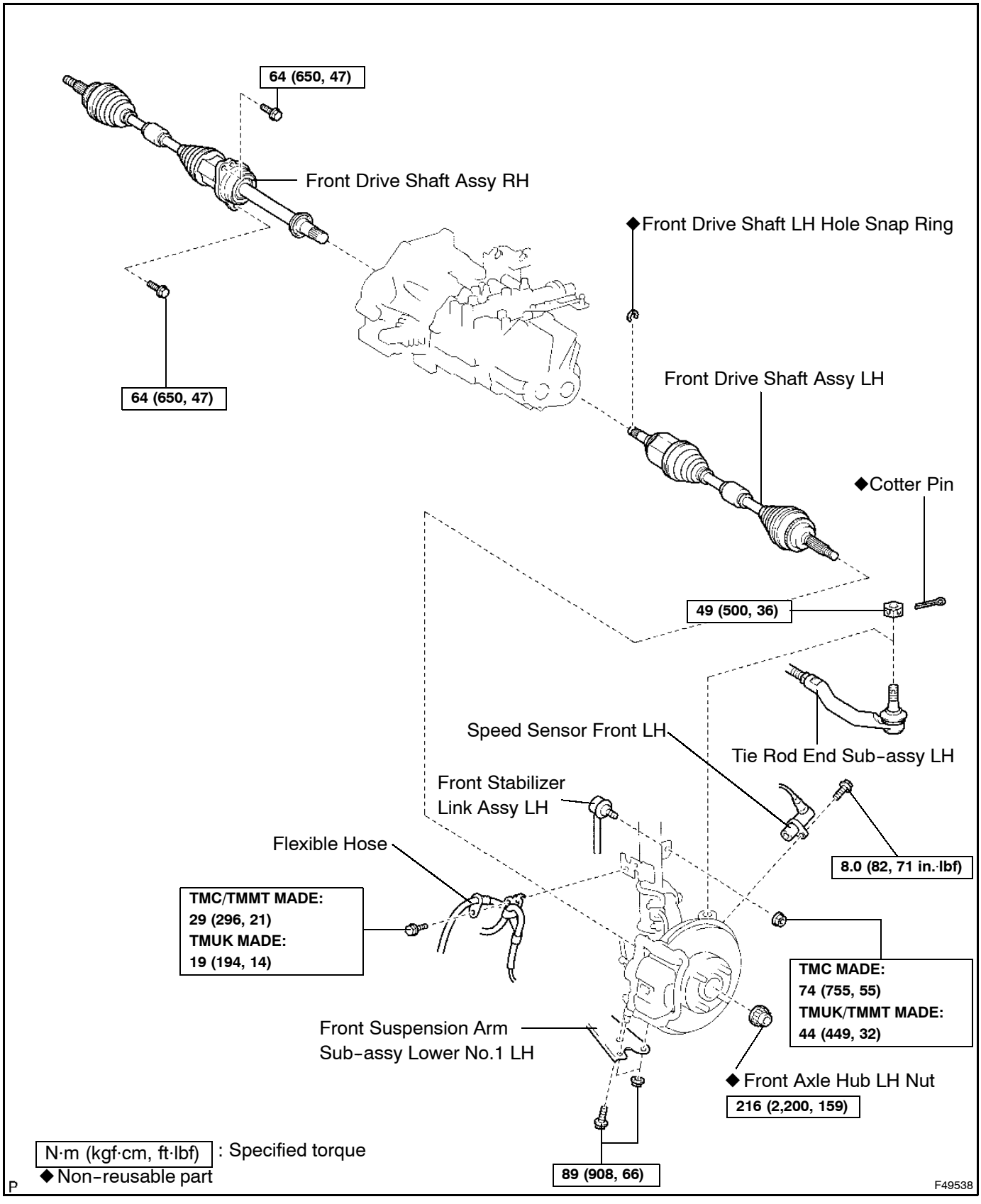
Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM1106E

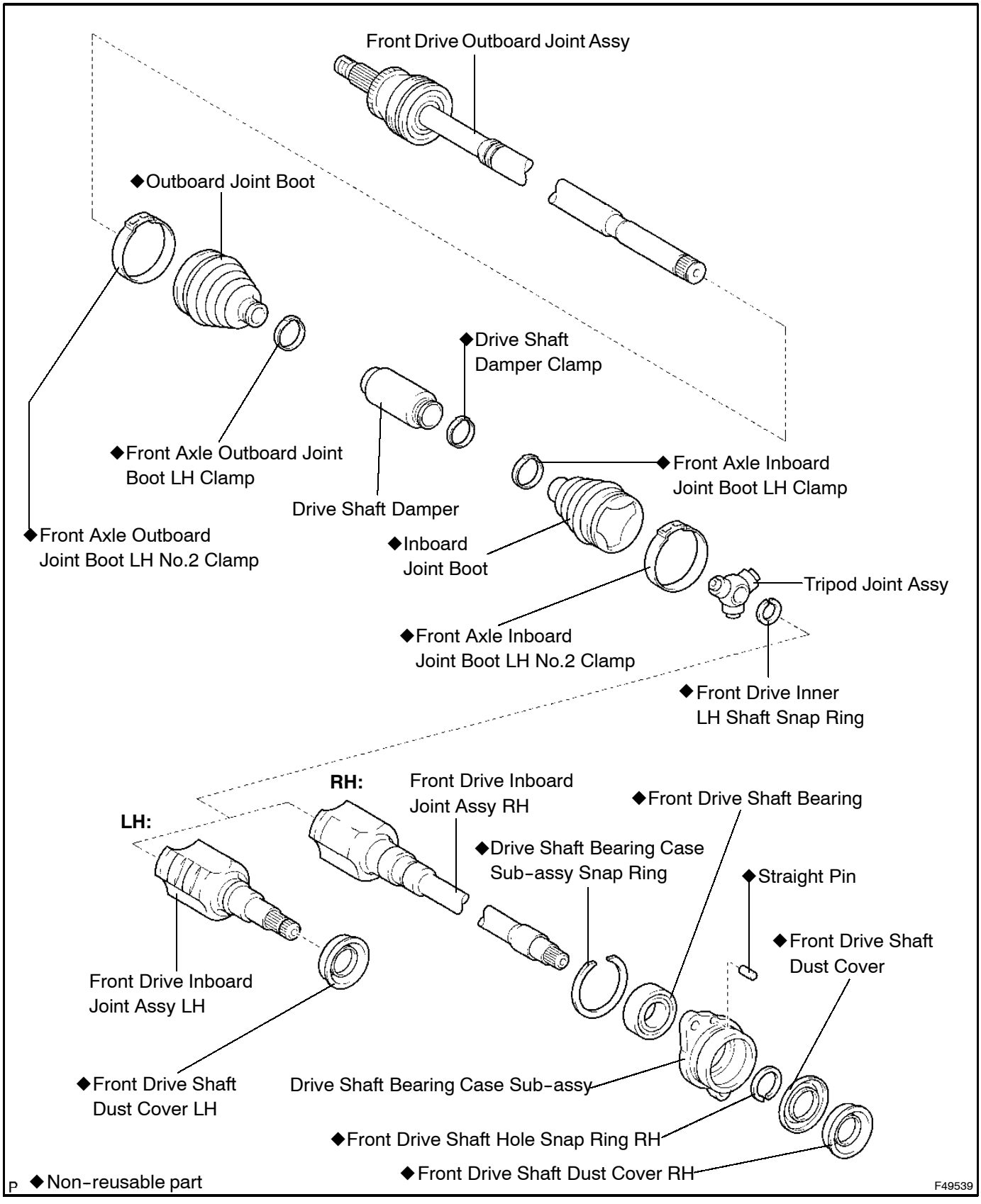
NOTE: The above pages contain only the points which differ from the above listed manuals.

FRONT DRIVE SHAFT (1ND-TV)

COMPONENTS

3008U-04




Front Drive Outboard Joint Assy
◆Outboard Joint Boot
◆Drive Shaft
Damper Clamp
◆Front Axle Outboard Joint
Boot LH Clamp
Drive Shaft Damper
◆Front Axle Inboard
Joint Boot LH Clamp
◆Front Axle Outboard
Joint Boot LH No.2 Clamp
◆Inboard
Joint Boot
Tripod Joint Assy
◆Front Axle Inboard
Joint Boot LH No.2 Clamp
◆Front Drive Inner
LH Shaft Snap Ring
RH:
Front Drive Inboard
Joint Assy RH
◆Front Drive Shaft Bearing
LH:
◆Drive Shaft Bearing Case
Sub-assy Snap Ring
◆Straight Pin
◆Front Drive Shaft
Dust Cover
Front Drive Inboard
Joint Assy LH
◆Front Drive Shaft
Dust Cover LH
Drive Shaft Bearing Case Sub-assy
◆Front Drive Shaft Hole Snap Ring RH
◆Front Drive Shaft Dust Cover RH
P ◆Non-reusable part
F49539

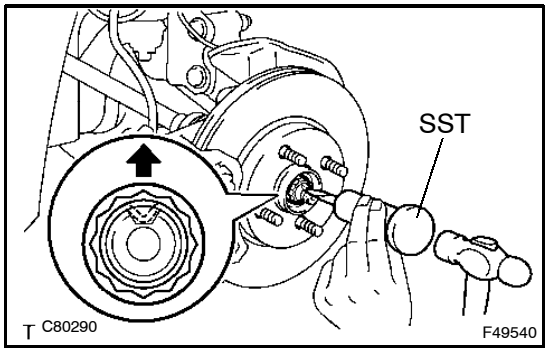
300S0-01

OVERHAUL

HINT:

- Use the same procedures for the RH side and LH side.
- The procedures listed below are for the LH side.

1. **DRAIN MANUAL TRANSAXLE OIL** **(SEE PAGE 41-5)**
   Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
2. **REMOVE FRONT WHEEL**
3. **REMOVE ENGINE UNDER COVER LH**

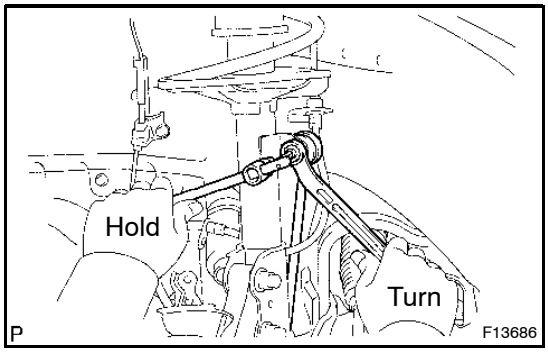


4. **REMOVE FRONT AXLE HUB LH NUT**

(a) Using SST and a hammer, unstake the staked part of the hub LH nut.
SST 09930-00010

(b) While applying the brakes, remove the hub LH nut.

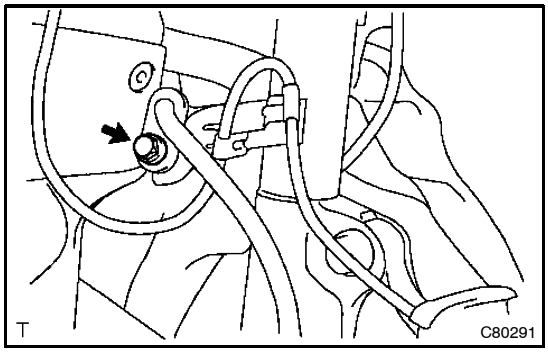
NOTICE:
Loosen the staked part of the nut completely, otherwise the screw of the drive shaft may be damaged.



5. **SEPARATE FRONT STABILIZER LINK ASSY LH**

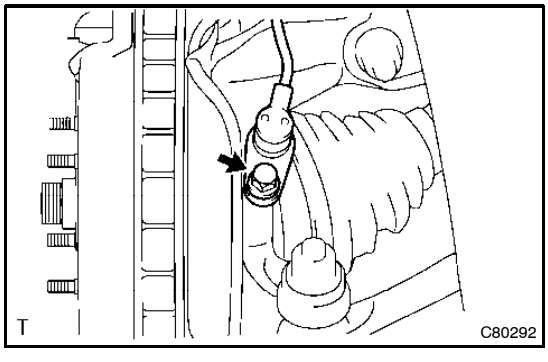
(a) Remove the nut and separate the front stabilizer link assy LH from the shock absorber assy front LH.

HINT:
If the ball joint turns together with the nut, use a hexagon wrench (6 mm) to hold the stud.

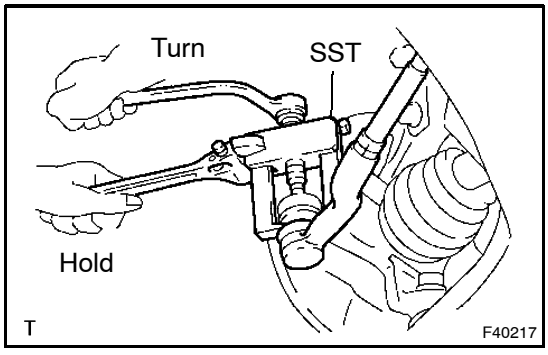


6. **SEPARATE SPEED SENSOR FRONT LH**

(a) Remove the bolt, and separate the speed sensor front LH and flexible hose from the shock absorber assy front LH.



(b) Remove the bolt, and separate the speed sensor front LH from the steering knuckle.

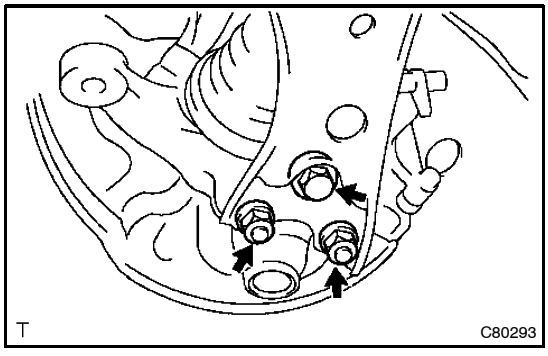


7. SEPARATE TIE ROD END SUB-ASSY LH

(a) Remove the cotter pin and nut.

(b) Using SST, separate the tie rod end sub-assy LH from the steering knuckle.

SST 09628-62011



8. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH

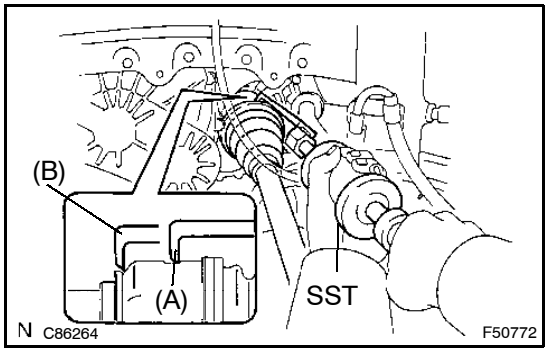
(a) Remove the bolt and 2 nuts, and separate the front suspension arm sub-assy lower No.1 LH from the lower ball joint.

9. SEPARATE FRONT AXLE ASSY LH

(a) Using a plastic hammer, separate the front drive shaft assy LH from the front axle assy LH.

NOTICE:

Be careful not to damage the boot and speed sensor rotor.



10. REMOVE FRONT DRIVE SHAFT ASSY LH

(a) Using SST, remove the front drive shaft assy LH.

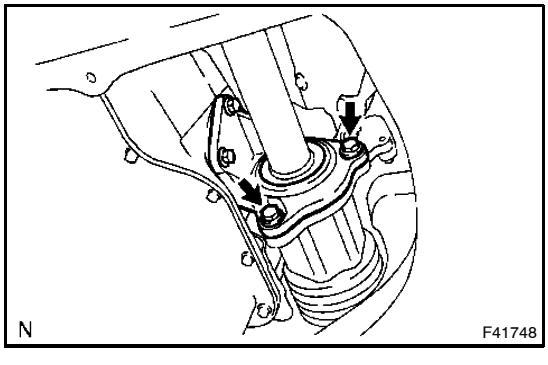
SST 09520-01010, 09520-24010 (09520-32040)

NOTICE:

Be careful not to damage the dust cover, boot or oil seal.

HINT:

In case of not being able to remove the drive shaft by hooking the SST claw to the position (A) in the illustration, hook it to the position (B) and remove.

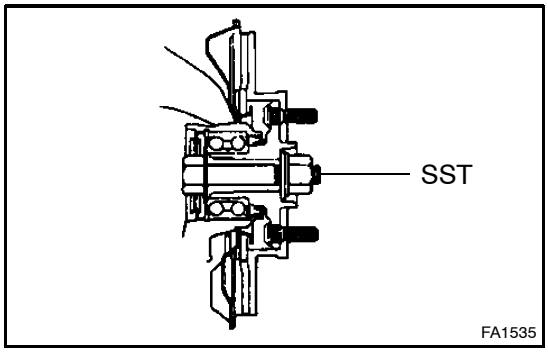


11. REMOVE FRONT DRIVE SHAFT ASSY RH

(a) Remove the 2 bearing lock bolts, and pull out the front drive shaft assy RH.

NOTICE:

Be careful not to damage the dust cover, boot or oil seal.



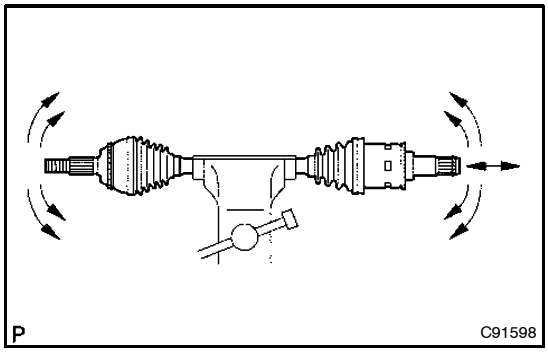
12. FIX FRONT AXLE ASSY LH

NOTICE:

The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed.

Therefore, make sure to support the hub bearing with SST when the vehicle weight is applied.

SST 09608-16042 (09608-02021, 09608-02041)



13. INSPECT FRONT DRIVE SHAFT

NOTICE:

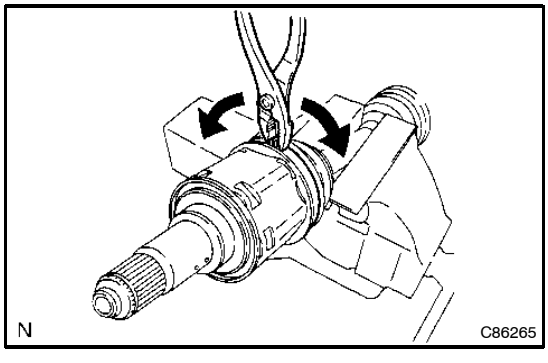
Keep the drive shaft assy level during inspection.

(a) Check that there is no remarkable play in the outboard joint.

(b) Check that the inboard joint slides smoothly in the thrust direction.

(c) Check that there is no remarkable play in the radial direction of the inboard joint.

(d) Check the boots for damage.



14. REMOVE FRONT AXLE INBOARD JOINT BOOT LH NO.2 CLAMP

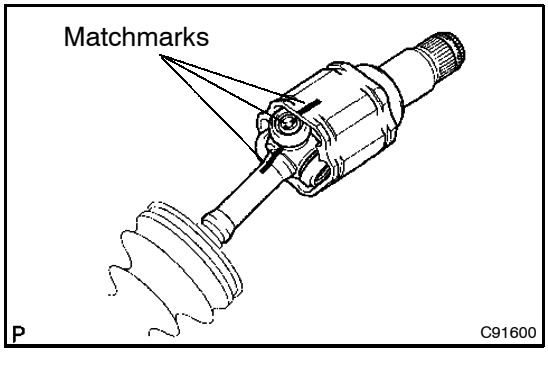
(a) Using pliers, remove the inboard joint boot LH No.2 clamp, as shown in the illustration.

15. REMOVE FRONT AXLE INBOARD JOINT BOOT LH CLAMP

(a) Remove the inboard joint boot LH clamp by the same procedures as for the inboard joint boot LH No.2 clamp.

16. SEPARATE FR AXLE INBOARD JOINT BOOT

(a) Separate the inboard joint boot from the inboard joint assy LH.



17. REMOVE FRONT DRIVE INBOARD JOINT ASSY LH

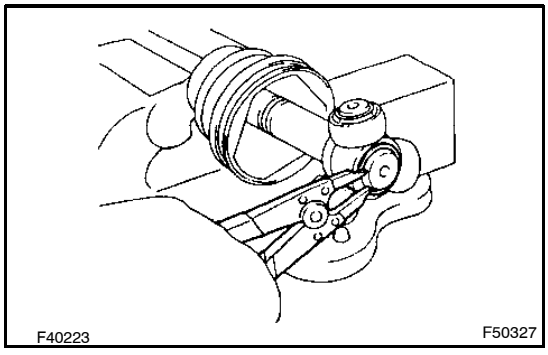
(a) Remove the old grease from the inboard joint sub-assy LH.

(b) Put matchmarks on the inboard joint sub-assy LH and outboard joint shaft assy.

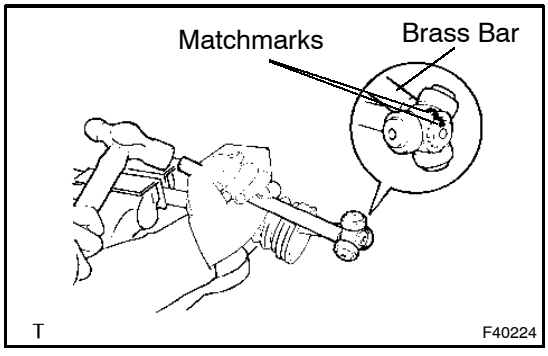
NOTICE:

Do not punch for the marks.

(c) Remove the inboard joint sub-assy LH from the outboard joint shaft assy.



(d) Using a snap ring expander, remove the inner LH shaft snap ring.



(e) Put matchmarks on the outboard joint shaft assy and tripod joint assy.

NOTICE:

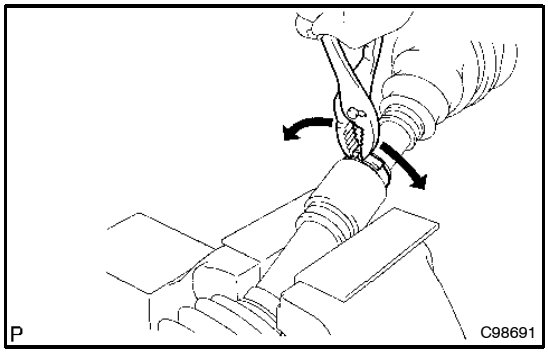
Do not punch for the marks.

(f) Using a brass bar and a hammer, remove the tripod joint assy from the outboard joint shaft assy.

NOTICE:

Do not tap the roller.

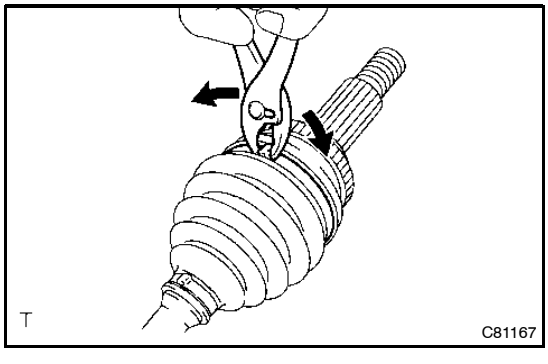
(g) Remove the inboard joint boot from the outborad joint shaft.



18. REMOVE DRIVE SHAFT DAMPER

(a) Using pliers, remove the damper clamp, as shown in the illustration.

(b) Remove the drive shaft damper.



19. REMOVE FRONT AXLE OUTBOARD JOINT BOOT LH NO.2 CLAMP

(a) Using pliers, remove the outboard joint boot LH No.2 clamp, as shown in the illustration.

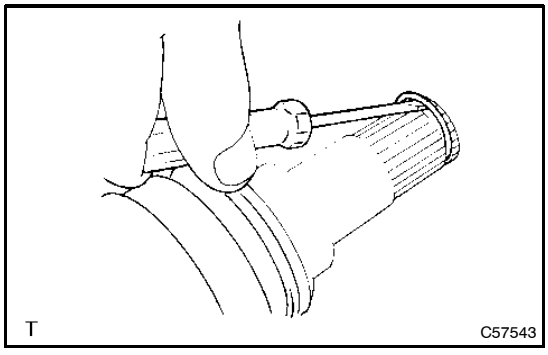
20. REMOVE FRONT AXLE OUTBOARD JOINT BOOT LH CLAMP

(a) Remove the outboard joint boot LH clamp by the same procedures as for the outboard joint boot LH No.2 clamp.

21. REMOVE OUTBOARD JOINT BOOT

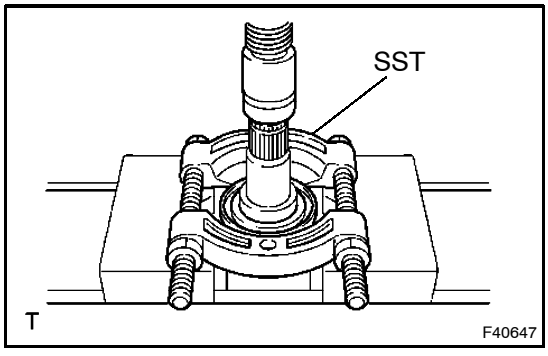
(a) Remove the outboard joint boot from the outboard joint shaft.

(b) Remove the old grease from the outboard joint.



22. REMOVE FRONT DRIVE SHAFT LH HOLE SNAP RING

(a) Using a screwdriver, remove the LH hole snap ring.



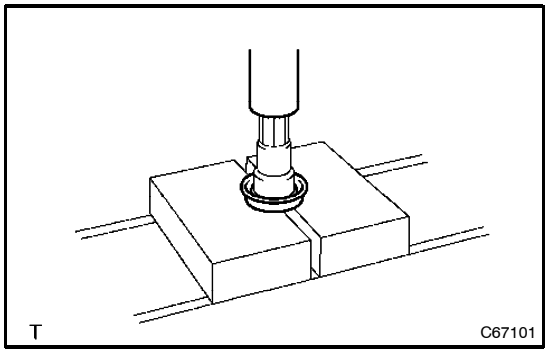
23. REMOVE FRONT DRIVE SHAFT DUST COVER LH

(a) Using SST and a press, remove the dust cover LH.

SST 09950-00020

NOTICE:

Be careful not to drop the inboard joint.

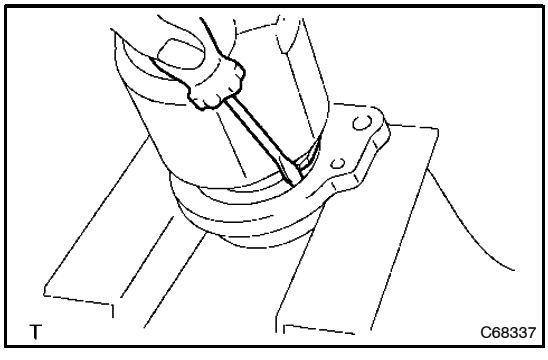


24. REMOVE FRONT DRIVE SHAFT DUST COVER RH

(a) Using a press, remove the dust cover RH.

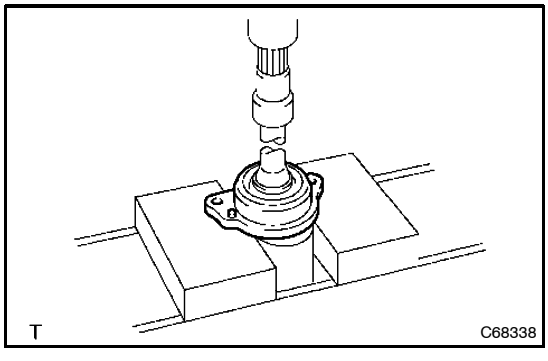
NOTICE:

Be careful not to drop the inboard joint.



25. REMOVE DRIVE SHAFT BEARING CASE SUB ASSY SNAP RING (RH DRIVE SHAFT)

(a) Using a screwdriver, remove the drive shaft bearing snap ring.



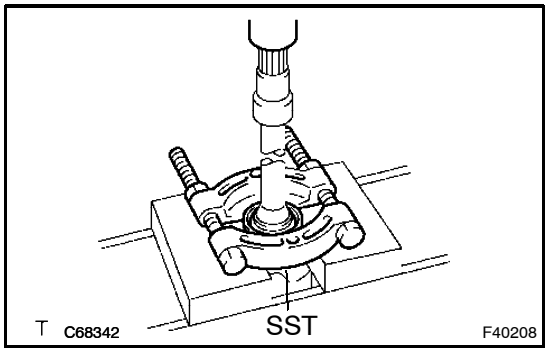
26. REMOVE DRIVE SHAFT BEARING CASE SUB ASSY (RH DRIVE SHAFT)

(a) Using a press, remove the drive shaft bearing case.

NOTICE:

Be careful not to drop the inboard joint.

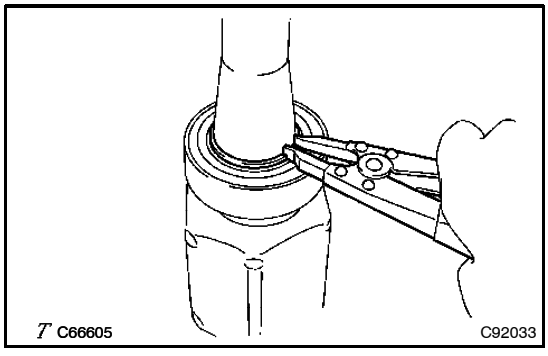
(b) Remove the straight pin.



27. REMOVE FRONT DRIVE SHAFT DUST COVER (RH DRIVE SHAFT)

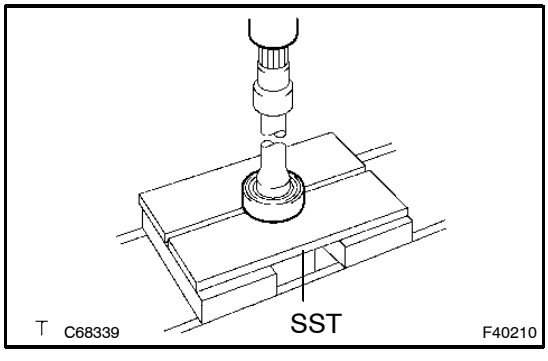
(a) Using SST and a press, remove the dust cover.
SST 09950-00020

NOTICE:
Be careful not to drop the inboard joint.



28. REMOVE FRONT DRIVE SHAFT BEARING (RH DRIVE SHAFT)

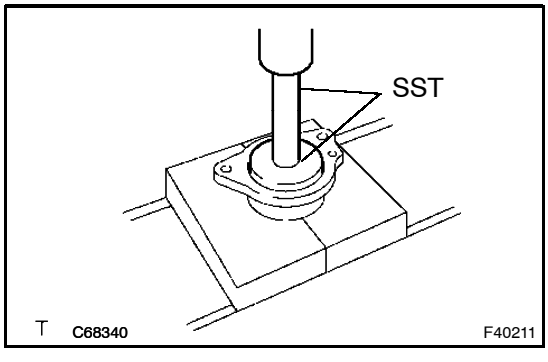
(a) Using a snap ring expander, remove the front drive shaft hole snap ring RH.



(b) Using SST and a press, remove the drive shaft bearing.
SST 09527-10011

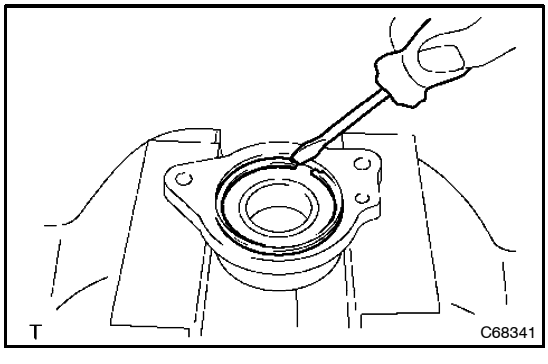
NOTICE:
Be careful not to drop the inboard joint.

(c) Remove the drive shaft bearing snap ring.



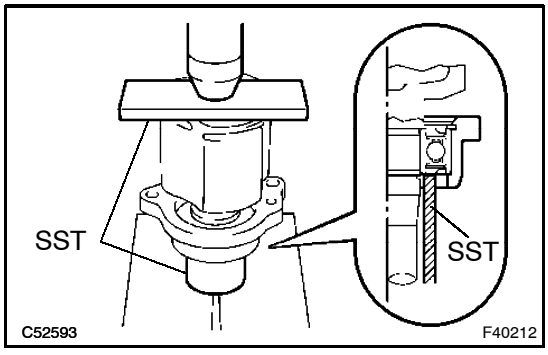
29. INSTALL FRONT DRIVE SHAFT BEARING (RH DRIVE SHAFT)

(a) Using SST and a press, install a new drive shaft bearing.
SST 09950-60020 (09951-00710), 09950-70010 (09951-07100)



30. INSTALL DRIVE SHAFT BEARING CASE SUB ASSY SNAP RING (RH DRIVE SHAFT)

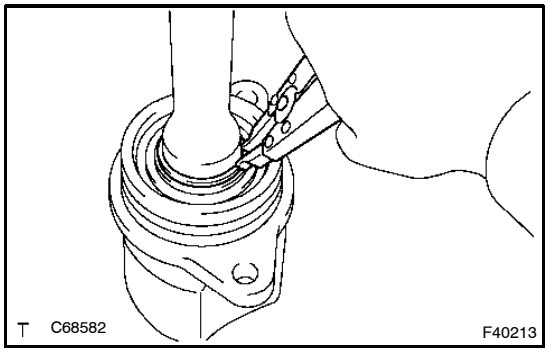
(a) Using a screwdriver, install a new drive shaft bearing snap ring.



31. INSTALL DRIVE SHAFT BEARING CASE SUB ASSY (RH DRIVE SHAFT)

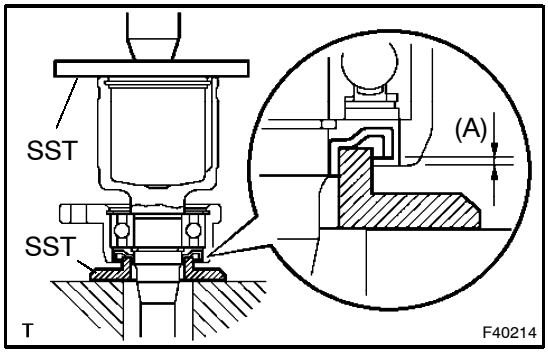
(a) Using SST and a press, install the bearing case sub-assy to the inboard joint.

SST 09527-10011, 09710-04081



(b) Using a snap ring expander, install a new front drive shaft hole snap ring RH.

(c) Install a new straight pin.



32. INSTALL FRONT DRIVE SHAFT DUST COVER (RH DRIVE SHAFT)

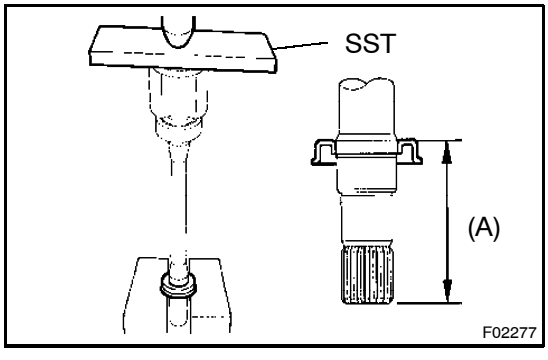
(a) Using SST and a press, install a new dust cover until the distance (A) from the tip of the bearing case sub-assy to the dust cover reaches the specification, as shown in the illustration.

SST 09726-40010, 09527-10011

Distance (A): 1.0 mm (0.039 in.)

NOTICE:

- **Dust cover should be installed completely.**
- **Be careful not to damage the dust cover.**



33. INSTALL FRONT DRIVE SHAFT DUST COVER RH

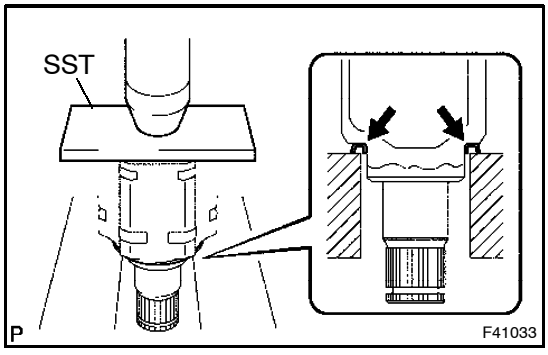
(a) Using SST and a press, install a new dust cover RH until the distance (A) from the tip of center drive shaft to the dust cover RH reaches the specification, as shown in the illustration.

SST 09527-10011

Distance (A): 86.0 to 87.0 mm (3.386 to 3.425 in.)

NOTICE:

- **Dust cover should be installed completely.**
- **Be careful not to damage the dust cover.**



34. INSTALL FRONT DRIVE SHAFT DUST COVER LH

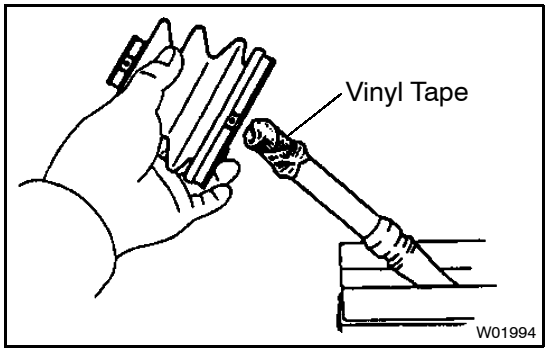
(a) Using SST and a press, install a new dust cover LH as shown in the illustration.
SST 09527-10011

NOTICE:

- **Dust cover should be installed completely.**
- **Be careful not to damage the dust cover.**

35. INSTALL FRONT DRIVE SHAFT LH HOLE SNAP RING

(a) Install a new LH hole snap ring.

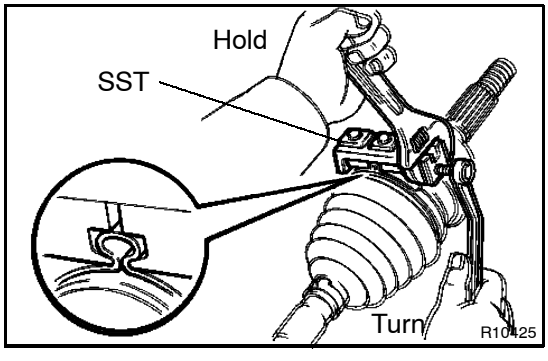


36. INSTALL OUTBOARD JOINT BOOT

HINT:
Before installing the boot, wrap the spline of the drive shaft with vinyl tape to prevent the boot from being damaged.

(a) Install new parts to the outboard joint shaft assy in the following order.
(1) Outboard joint boot LH No.2 clamp
(2) Outboard joint boot
(3) Outboard joint boot LH clamp

(b) Pack the outboard joint shaft and boot with grease in the boot kit.
Grease capacity: 152 to 162 g (5.4 to 5.7 oz.)



37. INSTALL FRONT AXLE OUTBOARD JOINT BOOT LH NO.2 CLAMP

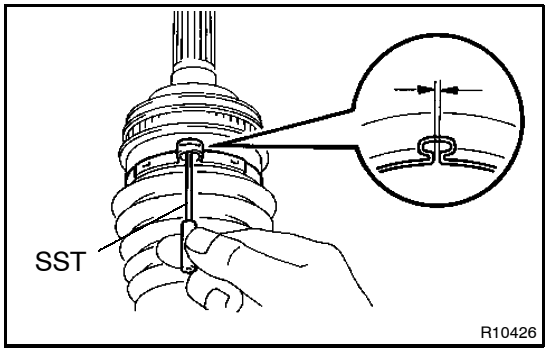
(a) Mount the drive shaft in a soft vise between two aluminum plates.

(b) Secure the clamp onto the boot.

(c) Place SST onto the clamp.
SST 09521-24010

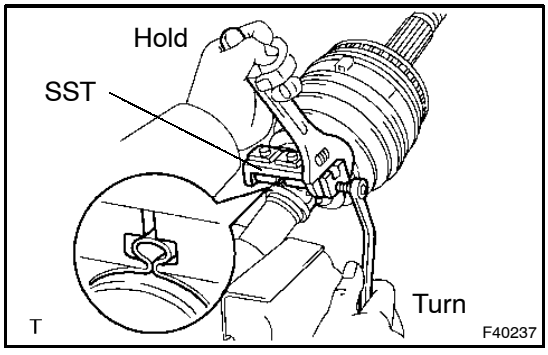
(d) Tighten the SST so that the clamp is pinched.

NOTICE:
Do not overtighten the SST.



(e) Using SST, measure the clearance of the clamp.
SST 09240-00020 (09242-00080)
Clearance: 0.8 mm (0.031 in.) or less

NOTICE:
When the measured value exceeds the specified value, re-tighten the clamp.



38. INSTALL FRONT AXLE OUTBOARD JOINT BOOT LH CLAMP

(a) Secure the clamp onto the boot.

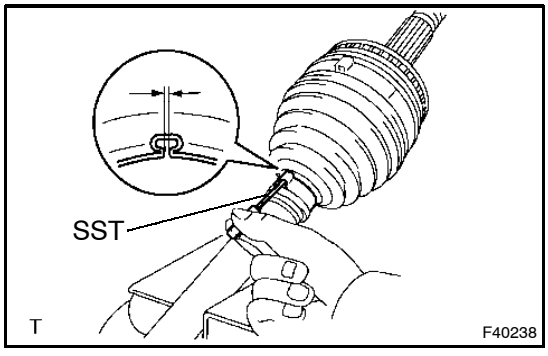
(b) Place SST onto the clamp.

SST 09521-24010

(c) Tighten the SST so that the clamp is pinched.

NOTICE:

Do not overtighten the SST.



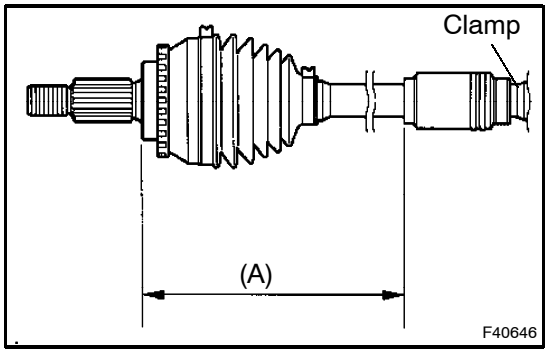
(d) Using SST, measure the clearance of the clamp.

SST 09240-00020 (09242-00080)

Clearance: 0.8 mm (0.031 in.) or less

NOTICE:

When the measured value exceeds the specified value, re-tighten the clamp.



39. INSTALL DRIVE SHAFT DAMPER

(a) Set the distance (A), as described below.

Distance (A): 198 to 202 mm (7.795 to 7.953 in.)

(b) Set the damper setting clamp to the drive shaft damper.

NOTICE:

Be sure to install the clamp in the correct position.

(c) Mount the drive shaft in a soft vise between two aluminum plates.

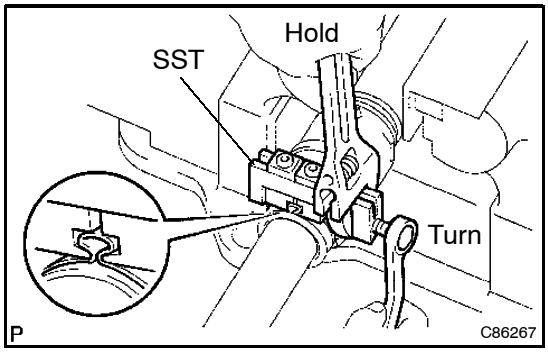
(d) Secure the damper setting clamp onto the damper.

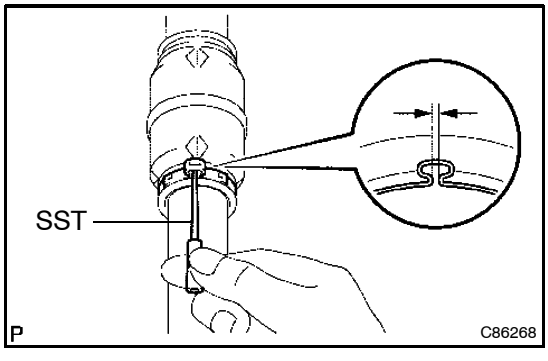
(e) Place SST onto the damper setting clamp.

(f) Tighten the SST so that the clamp is pinched.

NOTICE:

Do not overtighten the SST.





(g) Using SST, measure the clearance of the damper setting clamp.

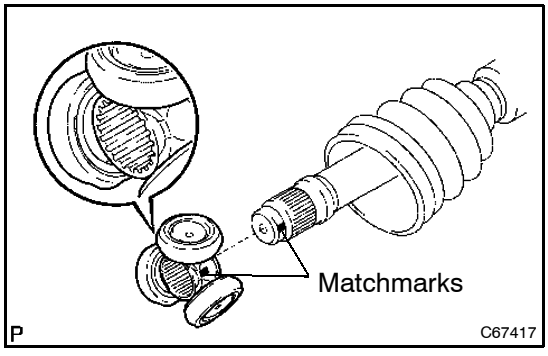
Clearance: 0.8 mm (0.031 in.) or less

NOTICE:

When the measured value exceeds the specified value, re-tighten the clamp.

40. INSTALL FRONT DRIVE INBOARD JOINT ASSY LH

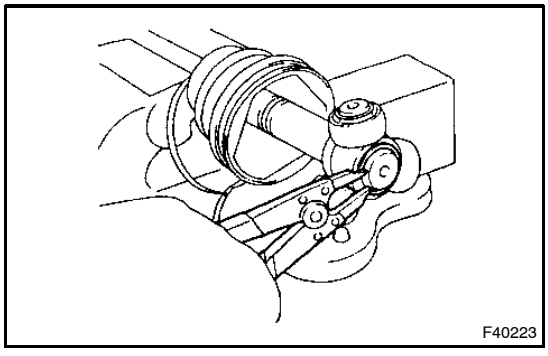
(a) Install new parts to the outboard joint shaft assy in the following order.
   (1) Inboard joint boot LH clamp
   (2) Inboard joint boot LH No.2 clamp
   (3) Inboard joint boot



(b) Align the matchmarks, and install the tripod joint assy to the outboard joint assy.

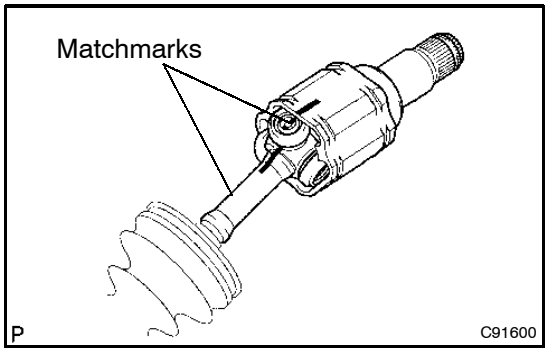
(c) Using a brass bar and a hammer, install the tripod joint assy.

NOTICE:
Do not tap the roller.



(d) Using a snap ring expander, install a new inner LH shaft snap ring.

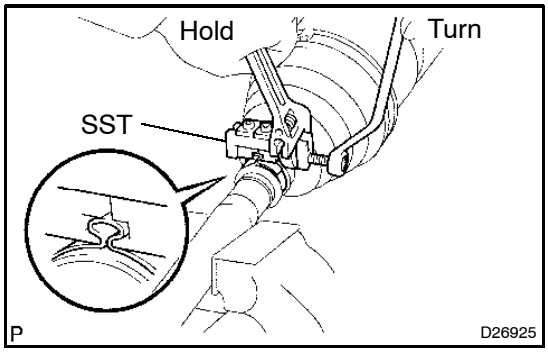
(e) Pack the inboard joint sub-assy LH with grease in the boot kit.
Grease capacity: 160 to 180 g (5.6 to 6.3 oz.)



(f) Align the matchmarks, and install the inboard joint sub-assy LH to the outboard joint shaft assy.

41. INSTALL FR AXLE INBOARD JOINT BOOT

(a) Install the inboard joint boot to the inboard joint assy and outboard joint shaft assy.



42. INSTALL FRONT AXLE INBOARD JOINT BOOT LH CLAMP

(a) Mount the drive shaft in a soft vise between two aluminum plates.

(b) Secure the clamp onto the boot.

(c) Place SST onto the clamp.

SST 09521-24010

(d) Tighten the SST so that the clamp is pinched.

NOTICE:

Do not overtighten the SST.

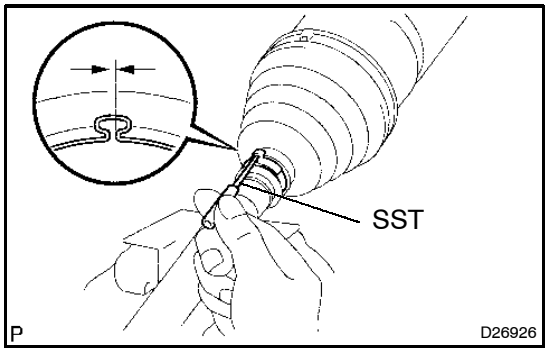
(e) Using SST, measure the clearance of the clamp.

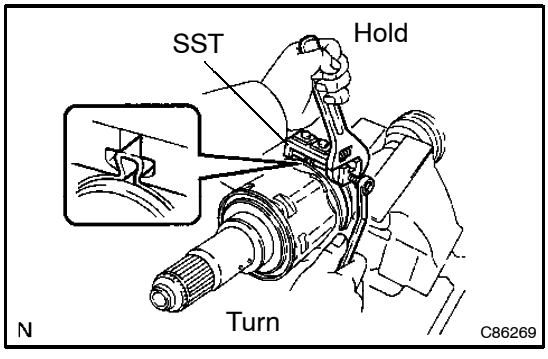
SST 09240-00020 (09242-00080)

Clearance: 0.8 mm (0.031 in.) or less

NOTICE:

When the measured value exceeds the specified value, re-tighten the clamp.





43. INSTALL FRONT AXLE INBOARD JOINT BOOT LH NO.2 CLAMP

(a) Secure the clamp onto the boot.

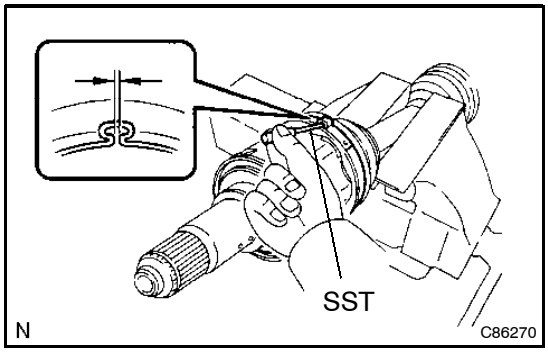
(b) Place SST onto the clamp.

SST 09521-24010

(c) Tighten the SST so that the clamp is pinched.

NOTICE:

Do not overtighten the SST.



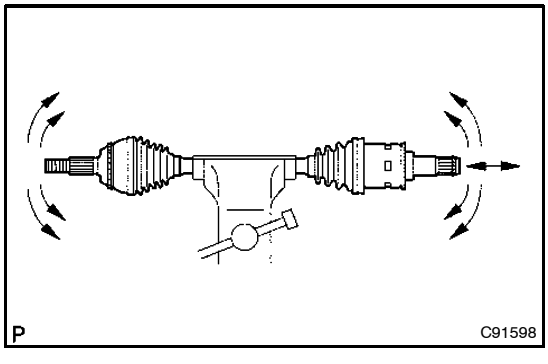
(d) Using SST, measure the clearance of the clamp.

SST 09240-00020 (09242-00080)

Clearance: 0.8 mm (0.031 in.) or less

NOTICE:

When the measured value exceeds the specified value, re-tighten the clamp.



44. INSPECT FRONT DRIVE SHAFT

NOTICE:

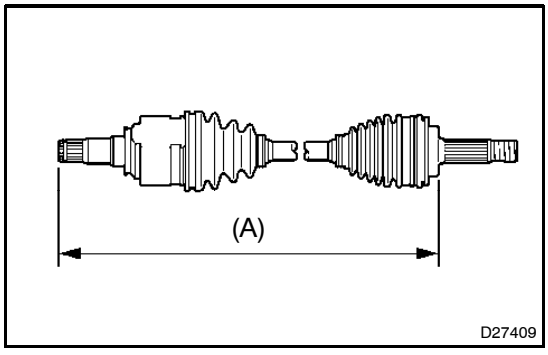
Keep the drive shaft assy level during inspection.

(a) Check that there is no remarkable play in the outboard joint.

(b) Check that the inboard joint slides smoothly in the thrust direction.

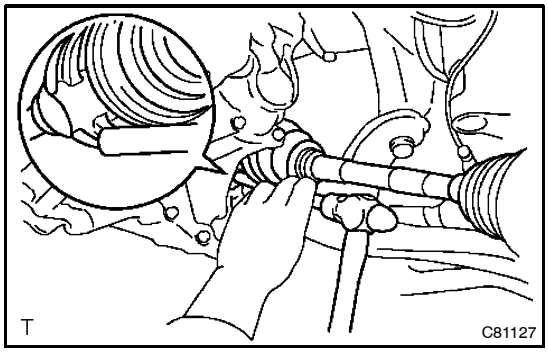
(c) Check that there is no remarkable play in the radial direction of the inboard joint.

(d) Check the boots for damage.



HINT:
For dimension (A), refer to the following table.

RH	845.0 to 855.0 mm (33.268 to 33.661 in.)
LH	558.7 to 568.7 mm (21.996 to 23.390 in.)



45. INSTALL FRONT DRIVE SHAFT ASSY LH

(a) Coat the spline of the inboard joint shaft assy with gear oil.

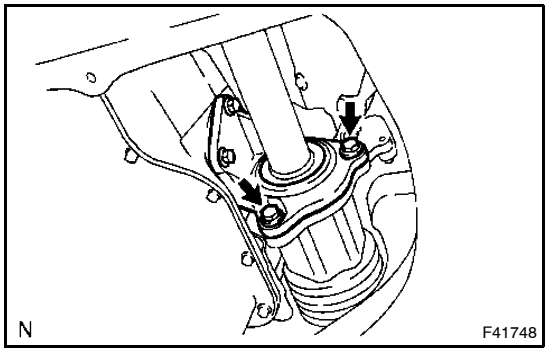
(b) Align the shaft splines, and install the drive shaft assy LH with a brass bar and a hammer.

NOTICE:

- **Set the hole snap ring with opening side facing downwards.**
- **Be careful not to damage the oil seal, boot or dust cover.**

HINT:
Whether the inboard joint shaft is in contact with the pinion shaft or not can be known from the sound or feeling when driving it in.

(c) Install the fender apron seal LH.



46. INSTALL FRONT DRIVE SHAFT ASSY RH

(a) Coat the spline of the inboard joint shaft assy with gear oil.

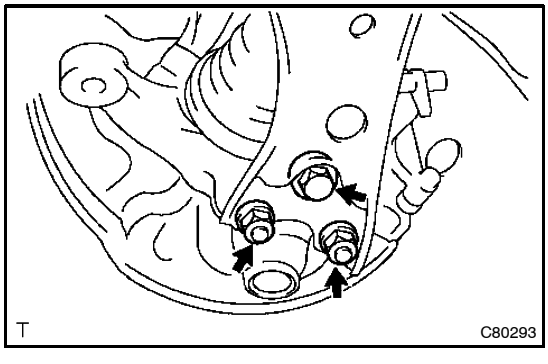
(b) Aline the shaft splines, and install the drive shaft assy RH with the 2 bearing lock bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

NOTICE:
Be careful not to damage the oil seal, boot or dust cover.

47. INSTALL FRONT AXLE ASSY LH

(a) Install the drive shaft assy LH to the front axle assy LH.

NOTICE:
Be careful not to damage the outboard joint boot or speed sensor rotor.



48. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH

(a) Install the lower ball joint to the front suspension arm sub-assy lower No.1 LH with the bolt and 2 nuts.
Torque: 89 N·m (908 kgf·cm, 66 ft·lbf)

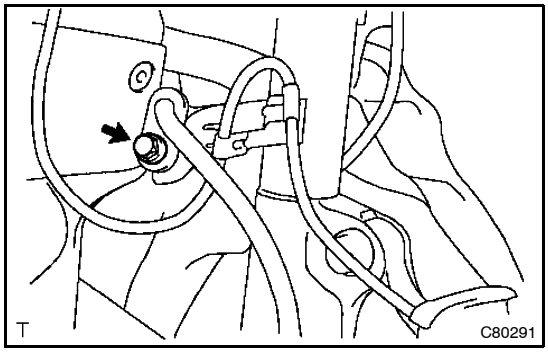
49. INSTALL TIE ROD END SUB-ASSY LH

(a) Install the tie rod end sub-assy LH to the steering knuckle with the nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install a new cotter pin.

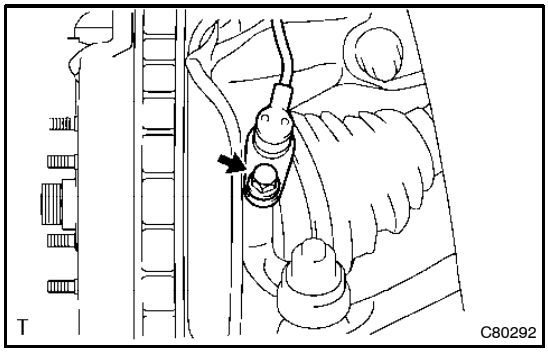
NOTICE:

If the holes for the cotter pin are not aligned, tighten the nut further to 60°.



50. INSTALL SPEED SENSOR FRONT LH

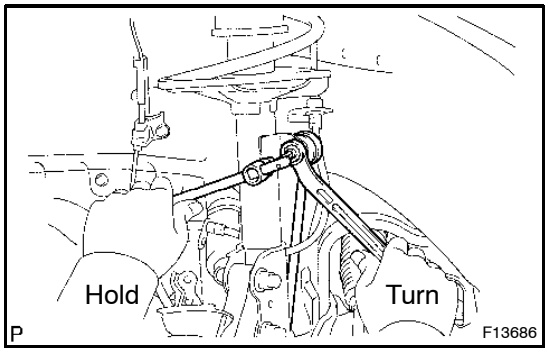
(a) Install the speed sensor front LH and flexible hose to the shock absorber assy front LH with the bolt.
Torque:
TMC/TMMT made:
29 N·m (296 kgf·cm, 21 ft·lbf)
TMUK made:
19 N·m (194 kgf·cm, 14 ft·lbf)



(b) Install the speed sensor front LH to the steering knuckle with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NOTICE:

- **Be careful not to damage the speed sensor.**
- **Keep the speed sensor clean.**
- **Do not twist the sensor wire when installing the sensor.**

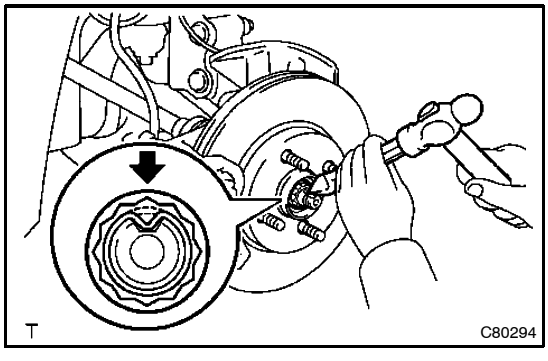


51. INSTALL FRONT STABILIZER LINK ASSY LH

(a) Install the front stabilizer link assy LH with the nut.
Torque:
TMUK/TMMT made:
44 N·m (449 kgf·cm, 32 ft·lbf)
TMC made:
74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon wrench (6 mm) to hold the stud.



52. INSTALL FRONT AXLE HUB LH NUT

(a) Install a new hub LH nut.
Torque: 216 N·m (2,200 kgf·cm, 159 ft·lbf)

(b) Using a chisel and a hammer, stake the hub LH nut.

53. INSTALL FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

54. ADD MANUAL TRANSAXLE OIL (SEE PAGE 41-5)

55. INSPECT MANUAL TRANSAXLE OIL (SEE PAGE 41-4)

56. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (SEE PUB. No. RM1106E, PAGE 26-1)

57. CHECK ABS SPEED SENSOR SIGNAL

(a) TMC made (See pub. No. RM925E, page 05-561)

(b) TMUK, TMMT made

(1) w/ VSC (See pub. No. RM925E, page 05-666)

(2) w/o VSC (See pub. No. RM925E, page 05-614)

BRAKE

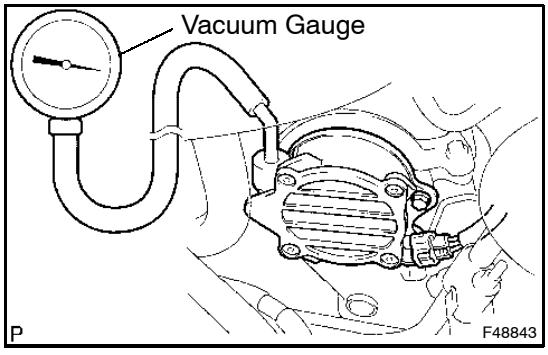
REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)

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

VACUUM PUMP ASSY (1ND-TV)

ON-VEHICLE INSPECTION

321CK-01



OPERATION CHECK

(c) Disconnect the vacuum hose and connect the vacuum gauge to the vacuum pump.

(d) Start the engine.

(e) Measure the vacuum with the engine at idle.

Vacuum at standard (sea-level) atmospheric pressure (1,013 mbar) when 2 minutes or more have elapsed after engine is started:

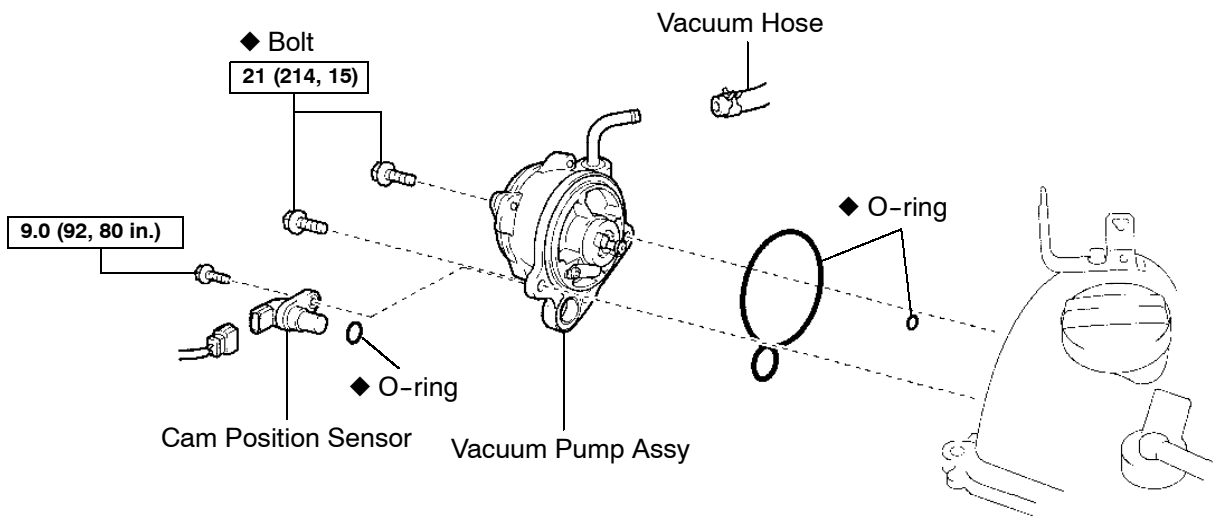
More than 86 kpa (650 mmHg)

HINT:

Replace the vacuum pump every 200,000 km (124,000 miles).

321CL-01

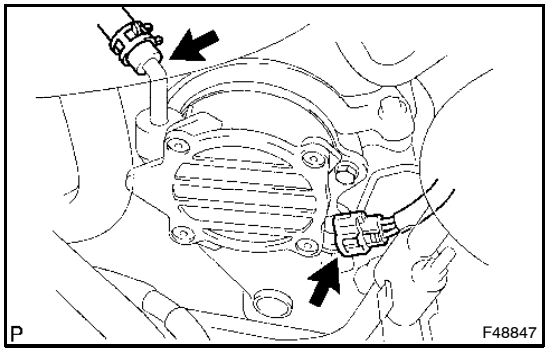
COMPONENTS



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

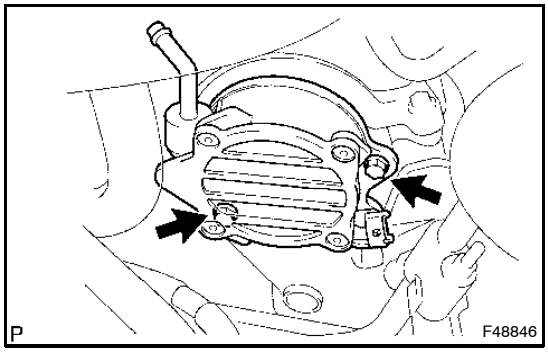
F48842

REPLACEMENT

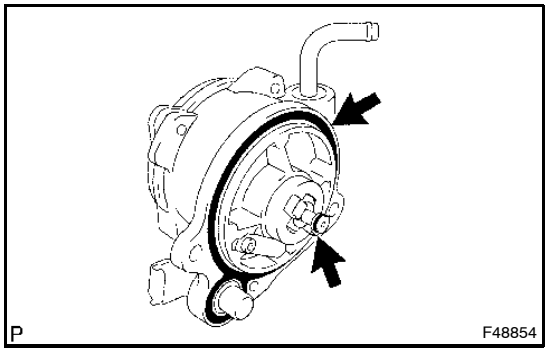


1. REMOVE VACUUM PUMP ASSY

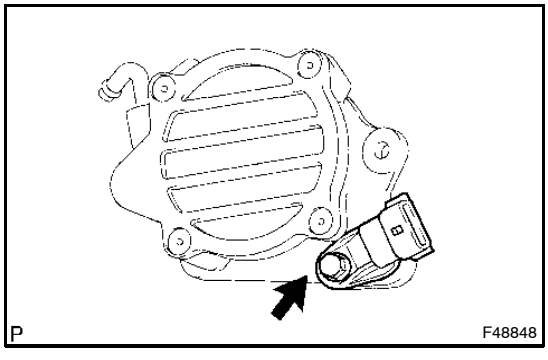
(a) Slide the clip, then disconnect the vacuum hose and cam position sensor connector.



(b) Remove the 2 bolts and vacuum pump.

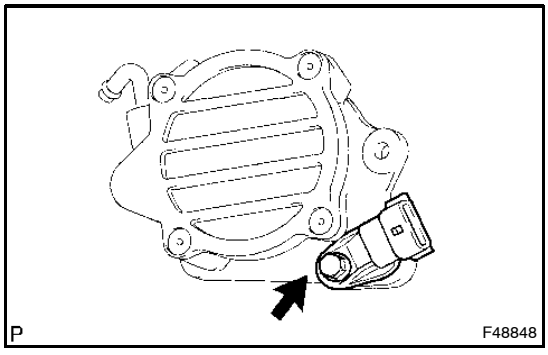


(c) Remove the 2 O-rings from the vacuum pump.



2. REMOVE CAM POSITION SENSOR

(a) Remove the bolt, cam position sensor and O-ring from the vacuum pump.



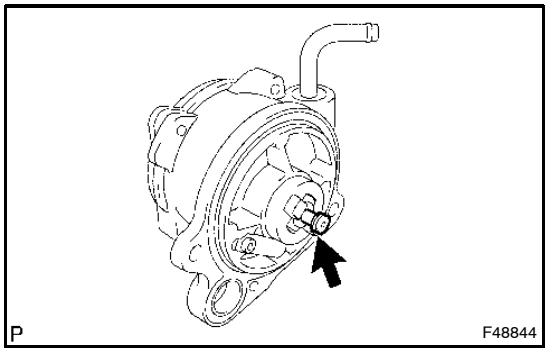
3. INSTALL CAM POSITION SENSOR

(a) Install a new O-ring to the cam position sensor.

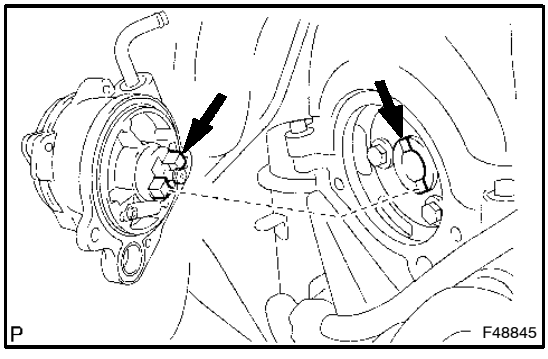
(b) Install the cam position sensor to the vacuum pump.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

4. INSTALL VACUUM PUMP ASSY

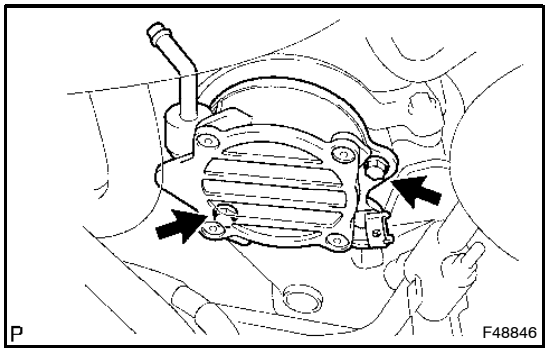
(a) Coat the 2 new O-rings with engine oil, and place them on the vacuum pump assy.



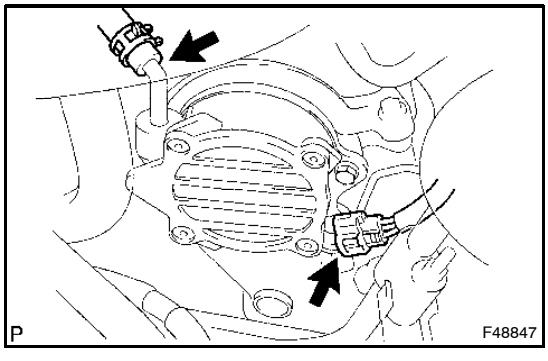
(b) Apply engine oil to the oil pipe at the tip of the vacuum pump assy.



(c) Install the vacuum pump assy so that the coupling teeth "A" on the side of the vacuum pump assy can engage with the tip groove of cam shaft "B".



(d) Install the 2 new bolts to the vacuum pump.
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)



(e) Connect the vacuum hose with the clip to the vacuum pump.

(f) Connect the cam position sensor connector.

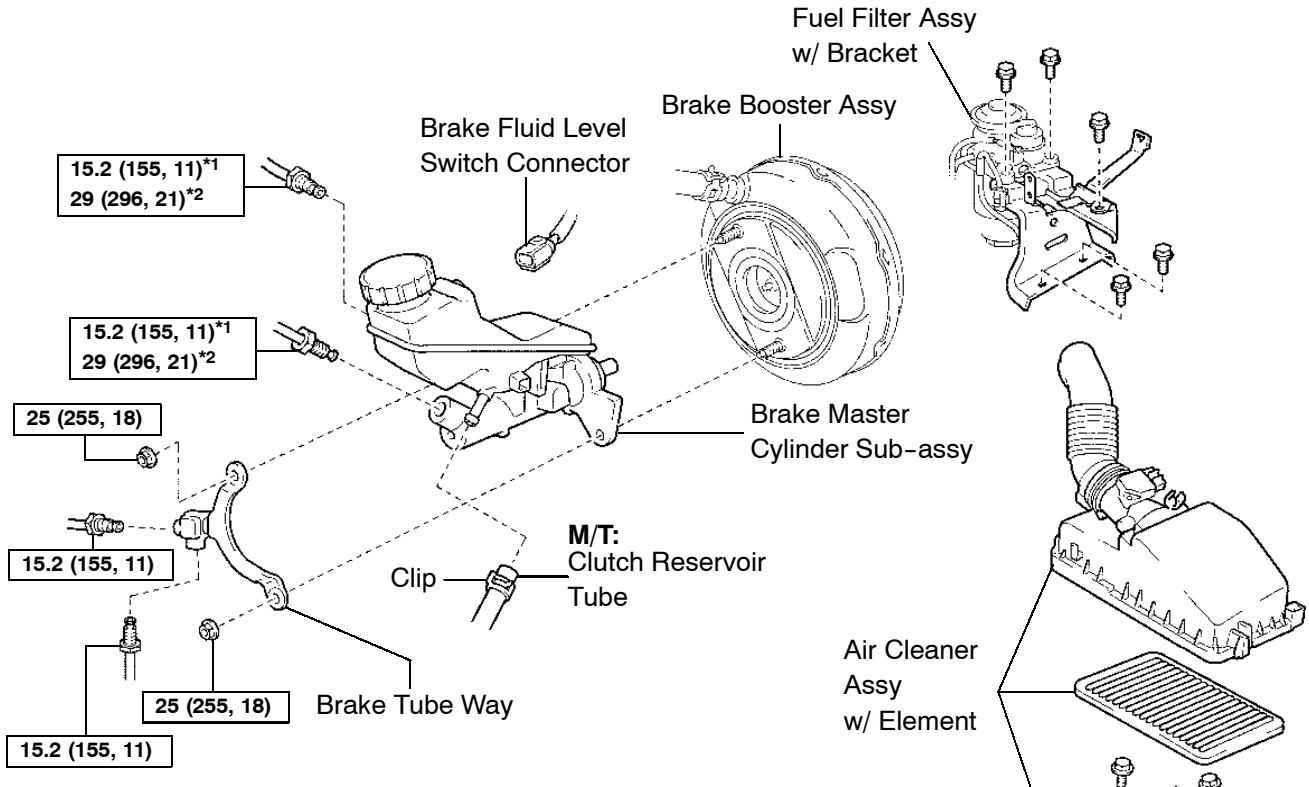
5. CHECK VACUUM PUMP OPERATION
(SEE PAGE 32-1)

BRAKE MASTER CYLINDER SUB-ASSY (1ND-TV)

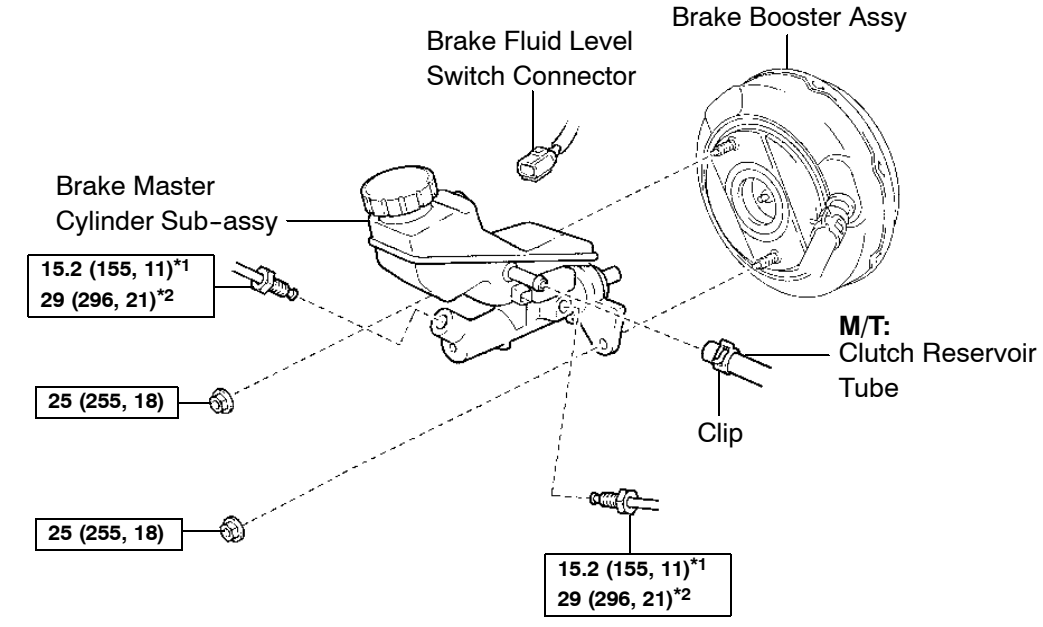
COMPONENTS

321CN-01

LHD Steering Position Type:



RHD Steering Position Type:



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

*1 w/ ABS:

*2 w/ VSC:

P

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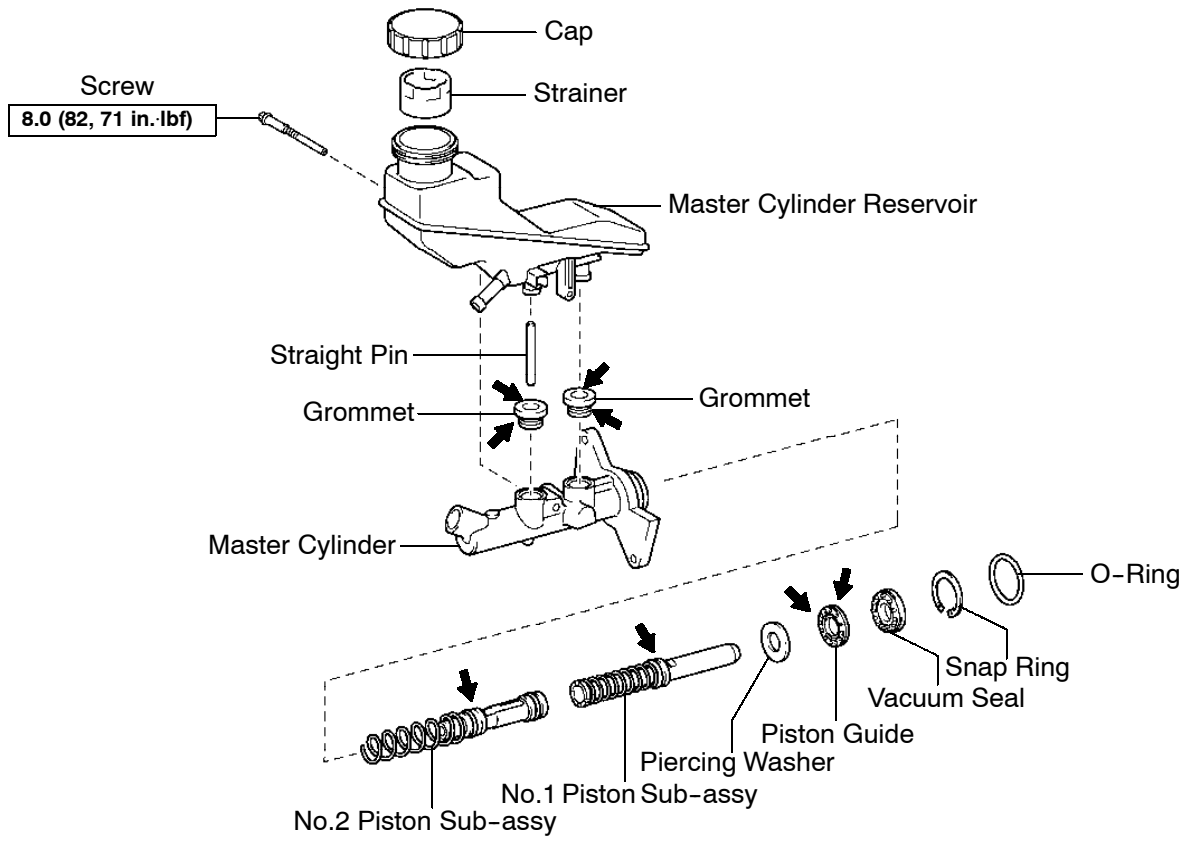


N·m (kgf·cm, ft·lbf) : Specified torque
Lithium soap base glycol grease

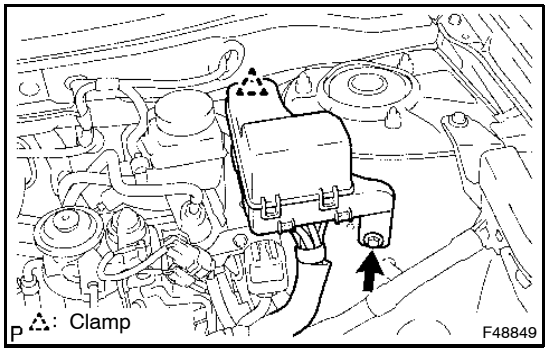
T F42616

G36445

321CO-01

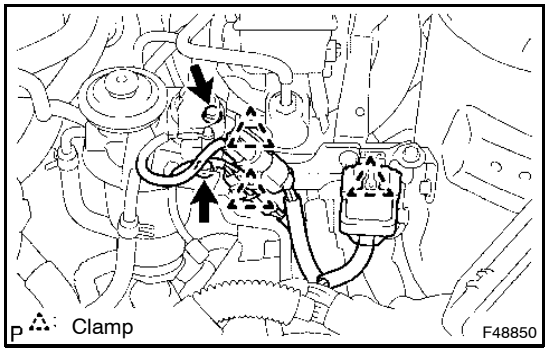
REPLACEMENT

1. DRAIN BRAKE FLUID
2. REMOVE AIR CLEANER ASSY (LHD STEERING POSITION TYPE)

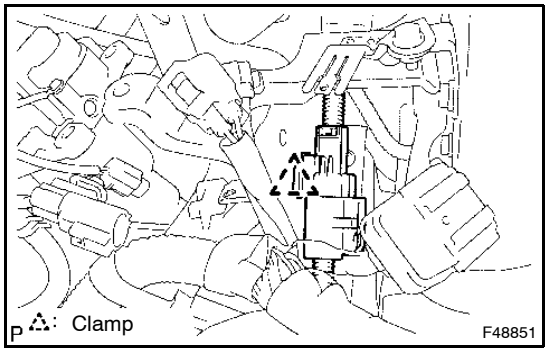


3. SEPARATE FUEL FILTER ASSY W/BRACKET (LHD STEERING POSITION TYPE)

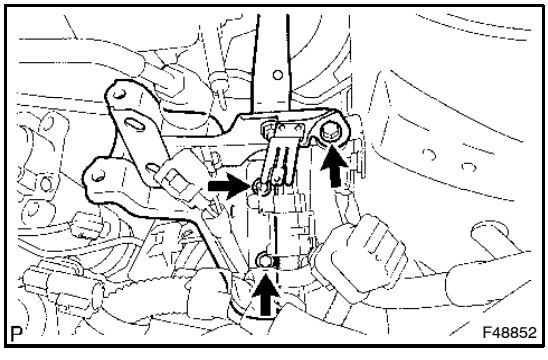
(a) Remove the bolt and disengage the clamp.
(b) Separate the relay block.



(c) Disengage the 3 clamps.
(d) Remove the 2 bolts and separate the fuel filter assy.



(e) Disengage the clamp.

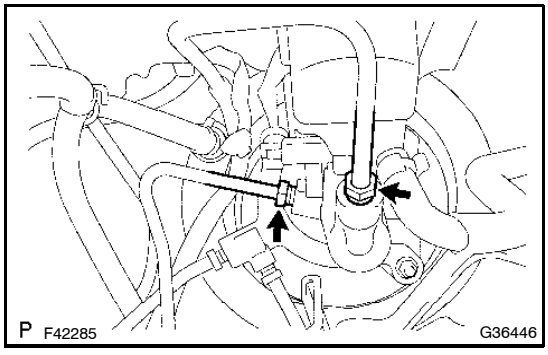


(f) Remove the 3 bolts and the bracket.

4. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE)

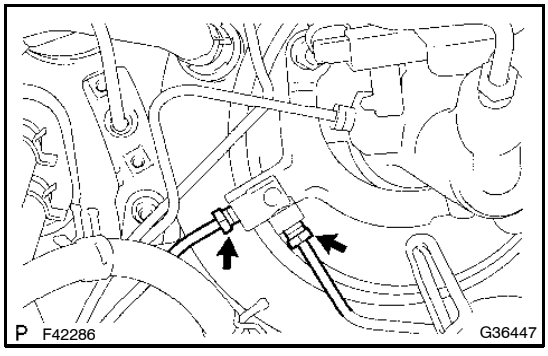
(a) Disconnect the brake fluid level switch connector.

(b) M/T:
Slide the clip and disconnect the clutch reservoir tube.



(c) w/ ABS:
Using SST, disconnect the 2 brake lines from the master cylinder.
SST 09023-00101

(d) w/ VSC:
Using SST, disconnect the 2 brake lines from the master cylinder.
SST 09023-38401



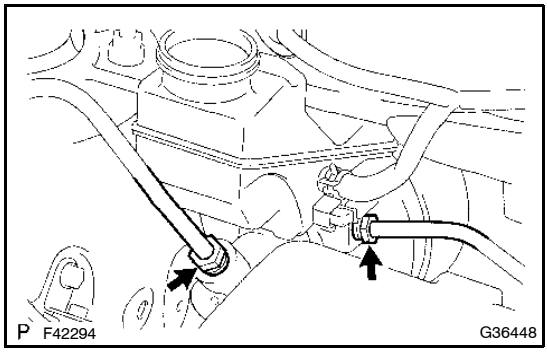
(e) Using SST, disconnect the 2 brake lines from the brake tube way.
SST 09023-00101

(f) Remove the 2 nuts, and pull out the brake tube way and brake master cylinder.

5. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (RHD STEERING POSITION TYPE)

(a) Disconnect the brake fluid level switch connector.

(b) M/T:
Slide the clip and disconnect the clutch reservoir tube.



(c) w/ ABS:
Using SST, disconnect the 2 brake lines from the master cylinder.
SST 09023-00101

(d) w/ VSC:
Using SST, disconnect the 2 brake lines from the master cylinder.
SST 09023-38401

(e) Remove the 2 nuts and pull out the master cylinder.

6. REMOVE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSY

(a) Using a torx® driver (T30), remove the screw.

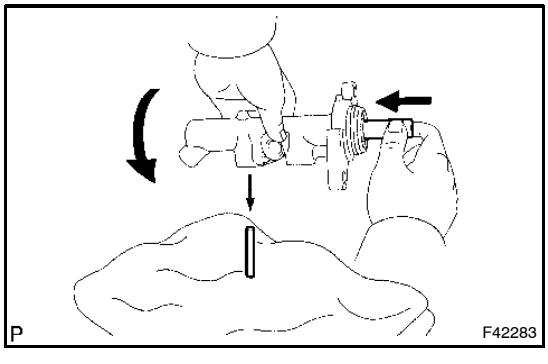
(b) Remove the master cylinder reservoir and 2 grommets from the master cylinder.

7. REMOVE BRAKE MASTER CYLINDER KIT

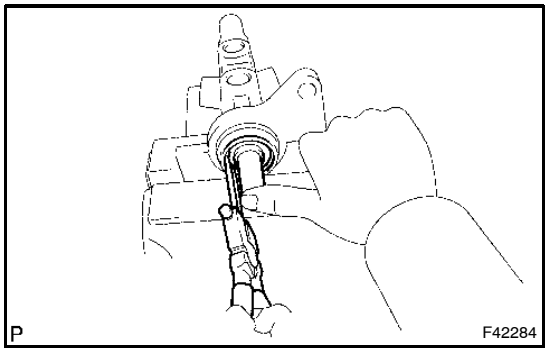
(a) Remove the O-ring.

(b) Push in the piston by hand and remove the straight pin by turning over the cylinder body.

NOTICE:
When pushing into the piston by hand, the oil left in the cylinder may spatter.



(c) Hold the master cylinder in the vise placing aluminum plates in between.



(d) Push in the piston by hand and remove the snap ring with snap ring pliers.

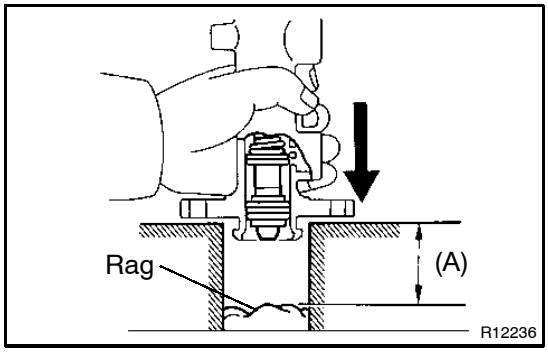
NOTICE:

When pushing into the piston by hand, the oil left in the cylinder may spatter.

(e) Remove the No.1 piston sub-assy, piercing washer, piston guide and vacuum seal by hand, pulling straight out, not at an angle.

NOTICE:

If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.



(f) Place a rag and 2 wooden blocks on the work table and tap the flange edges lightly on the blocks until the No.2 piston sub-assy drops out of the cylinder.

NOTICE:

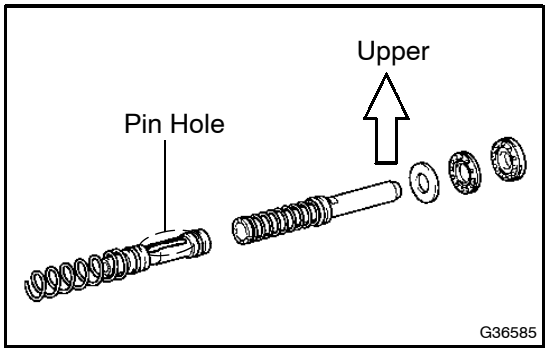
If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.

HINT:

Make sure the distance (A), from the rag to the top of the blocks, is at least 100 mm (3.94 in.).

8. INSPECT BRAKE MASTER CYLINDER

(a) Check the cylinder bore for rust or scoring.



9. INSTALL BRAKE MASTER CYLINDER KIT

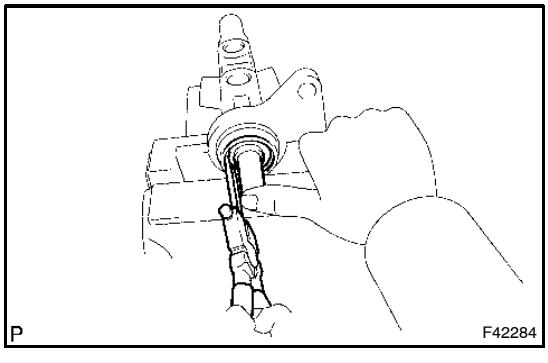
(a) Apply lithium soap base glycol grease to the No.1, No.2 piston sub-assy and piston guide.

(b) Install the No.2 and No.1 piston sub-assy with piercing washer, piston guide and vacuum seal as shown in the illustration.

NOTICE:

- **If the piston is inserted at an angle, there is a possibility that the cylinder bore could be damaged.**
- **Be careful not to damage the rubber lips on the pistons.**

(c) Push in the piston and install a straight pin.



(d) Push in the piston and install the snap ring with snap ring pliers.

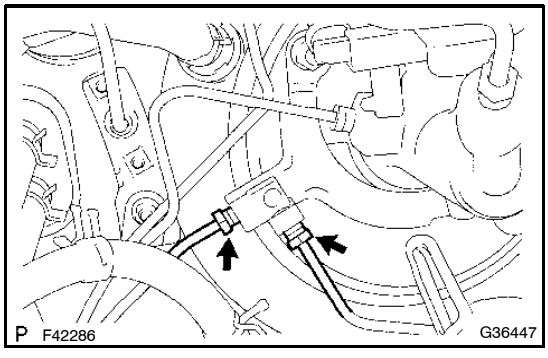
10. INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSY

(a) Apply lithium soap base glycol grease to the 2 brake master cylinder reservoir grommets and install them to the master cylinder.

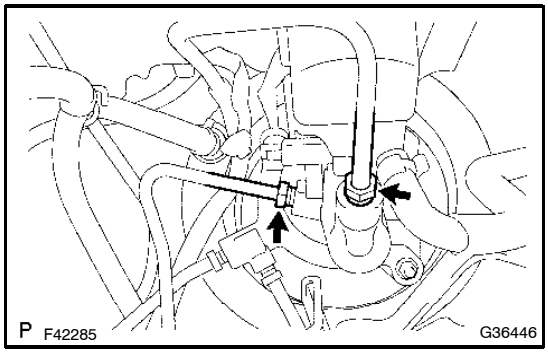
(b) Using a torx® driver (T30), instal the master cylinder reservoir with the screw.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

11. INSTALL BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE)

(a) Install the master cylinder and brake tube way with the 2 nuts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



(b) Using SST, connect the 2 brake lines to the brake tube way.
SST 09023-00101
Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)



(c) w/ ABS:
Using SST, connect the 2 brake lines to the master cylinder.
SST 09023-00101
Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)

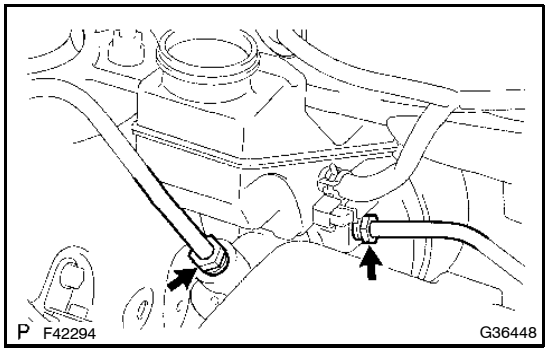
(d) w/ VSC:
Using SST, connect the 2 brake lines to the master cylinder.
SST 09023-38401
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

(e) M/T:
Connect the clutch reservoir tube.

(f) Connect the brake fluid level switch connector.

12. INSTALL BRAKE MASTER CYLINDER SUB-ASSY (RHD STEERING POSITION TYPE)

(a) Install the master cylinder with the 2 nuts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

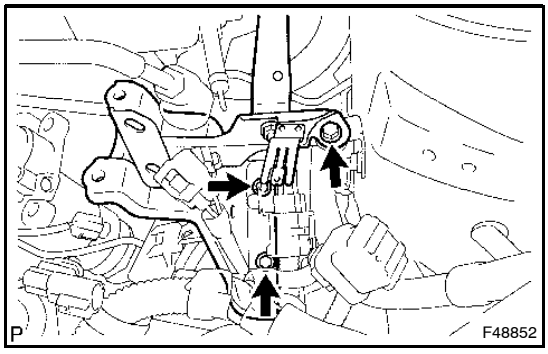


(b) w/ ABS:
Using SST, connect the 2 brake lines to the master cylinder.
SST 09023-00101
Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)

(c) w/ VSC:
Using SST, connect the 2 brake lines to the master cylinder.
SST 09023-38401
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

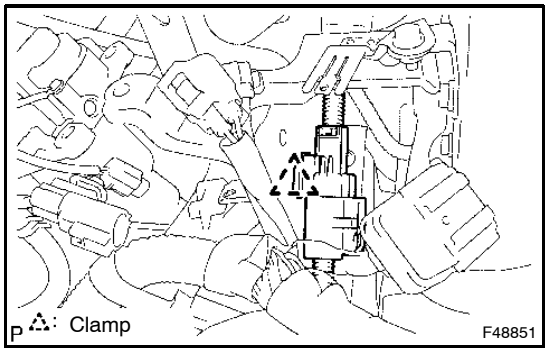
(d) M/T:
Connect the clutch reservoir tube.

(e) Connect the brake fluid level switch connector.

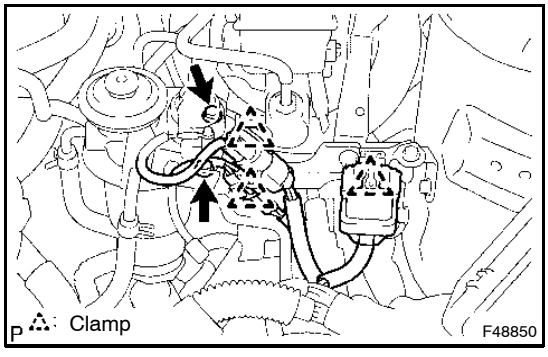


13. INSTALL FUEL FILTER ASSY W/BRACKET (LHD STEERING POSITION TYPE)

(a) Install the 3 bolts to the bracket.

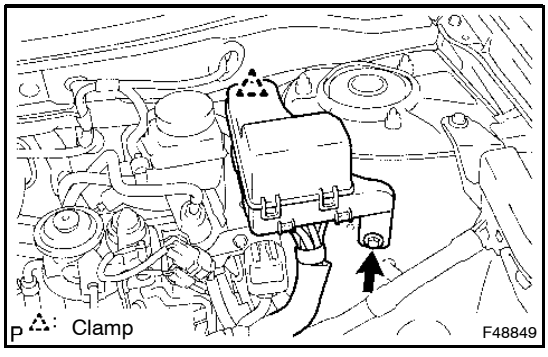


(b) Engage the clamp.



(c) Install the 2 bolts to the fuel filter assy.

(d) Engage the 3 clamps.



(e) Install the bolt and engage the clamp.

14. INSTALL AIR CLEANER ASSY (LHD STEERING POSITION TYPE)

15. FILL RESERVOIR WITH BRAKE FLUID

16. BLEED MASTER CYLINDER

SST 09023-00101

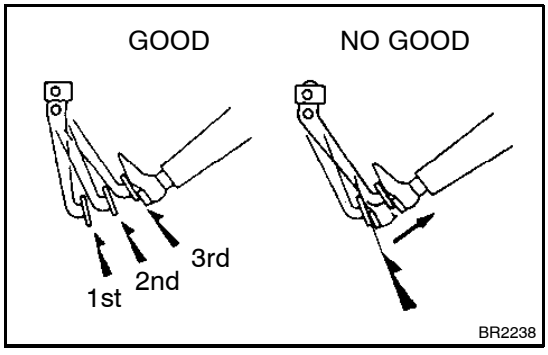
17. BLEED BRAKE LINE **(SEE PUB. NO. RM925E, PAGE 32-5)**

18. BLEED CLUTCH PIPE LINE (MANUAL TRANSAXLE) (SEE PAGE 42-14)
19. CHECK FLUID LEVEL IN RESERVOIR
20. CHECK BRAKE FLUID LEAKAGE

BRAKE BOOSTER ASSY (1ND-TV)

ON-VEHICLE INSPECTION

321CP-01



1. INSPECT BRAKE BOOSTER

(a) Airtightness check.

(1) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

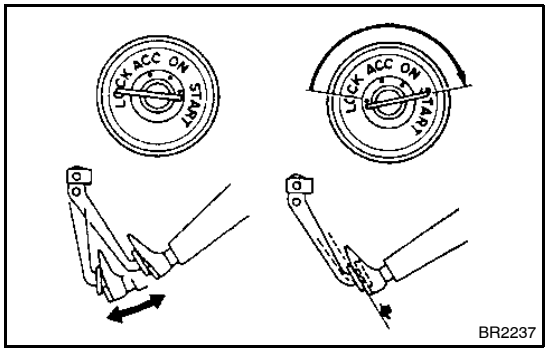
HINT:

If the pedal goes down farthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is airtight.

(2) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed.

HINT:

If there is no change in the pedal reserve distance after holding the pedal for 30 seconds, the booster is airtight.



(b) Operating check.

(1) Depress the brake pedal several times with the ignition switch OFF and check that there is no change in the pedal reserve distance.

(2) Depress the brake pedal and start the engine.

HINT:

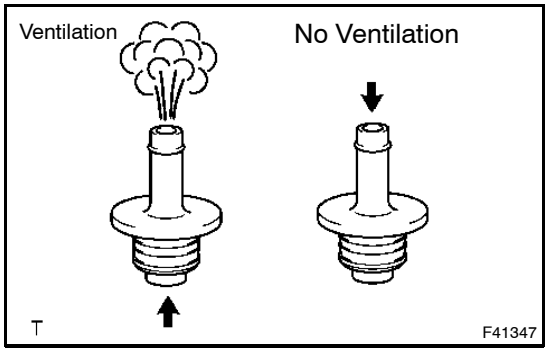
If the pedal goes down slightly, operation is normal.

2. INSPECT VACUUM CHECK VALVE

(a) Check vacuum check valve.

(1) Slide the clip and disconnect the vacuum hose.

(2) Remove the vacuum check valve.



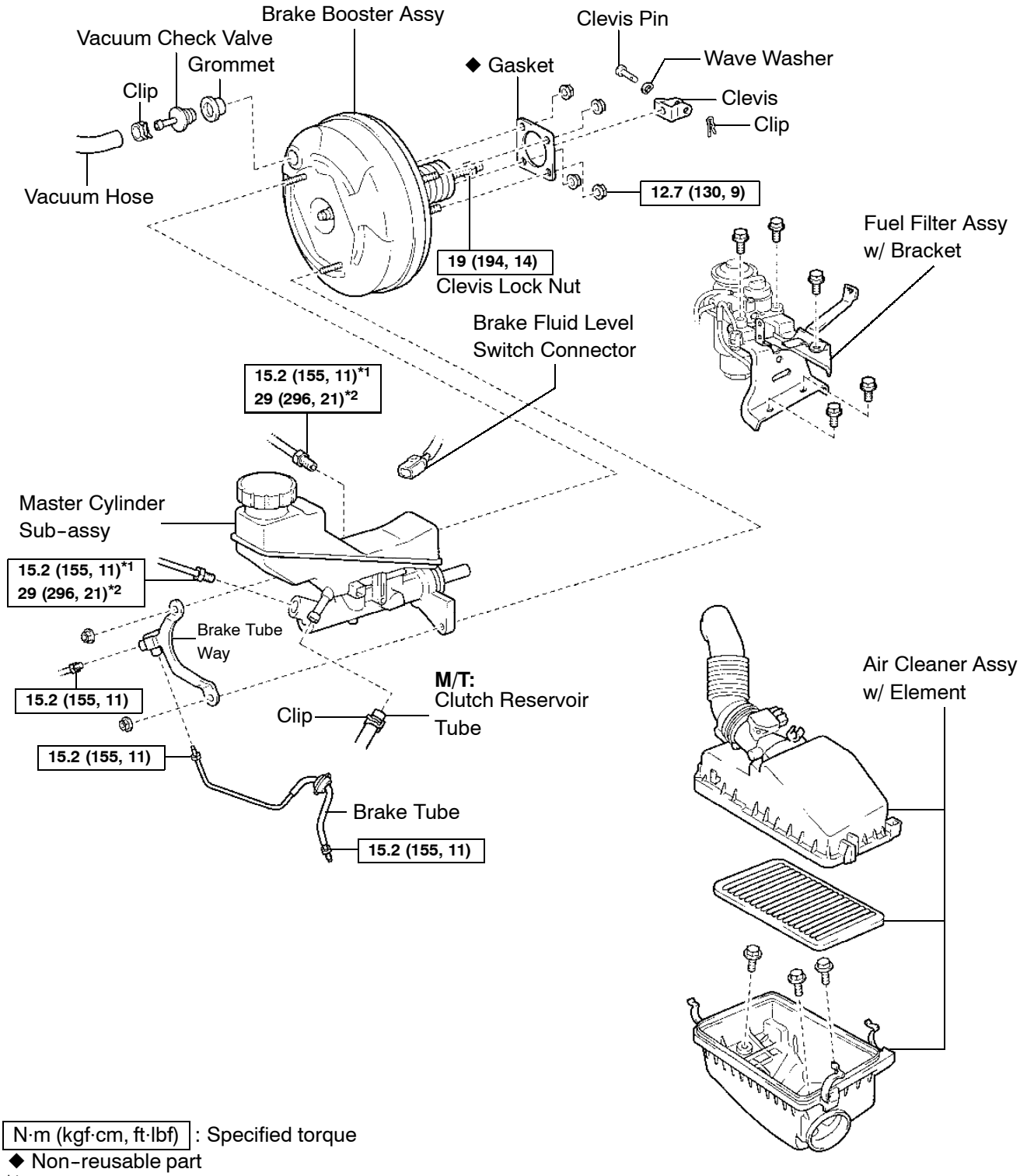
(3) Check that there is ventilation from the booster to engine, and no ventilation from the engine to the booster.

(4) If any fault is found, replace the vacuum check valve.

321CQ-01

COMPONENTS

LHD Steering Position Type:

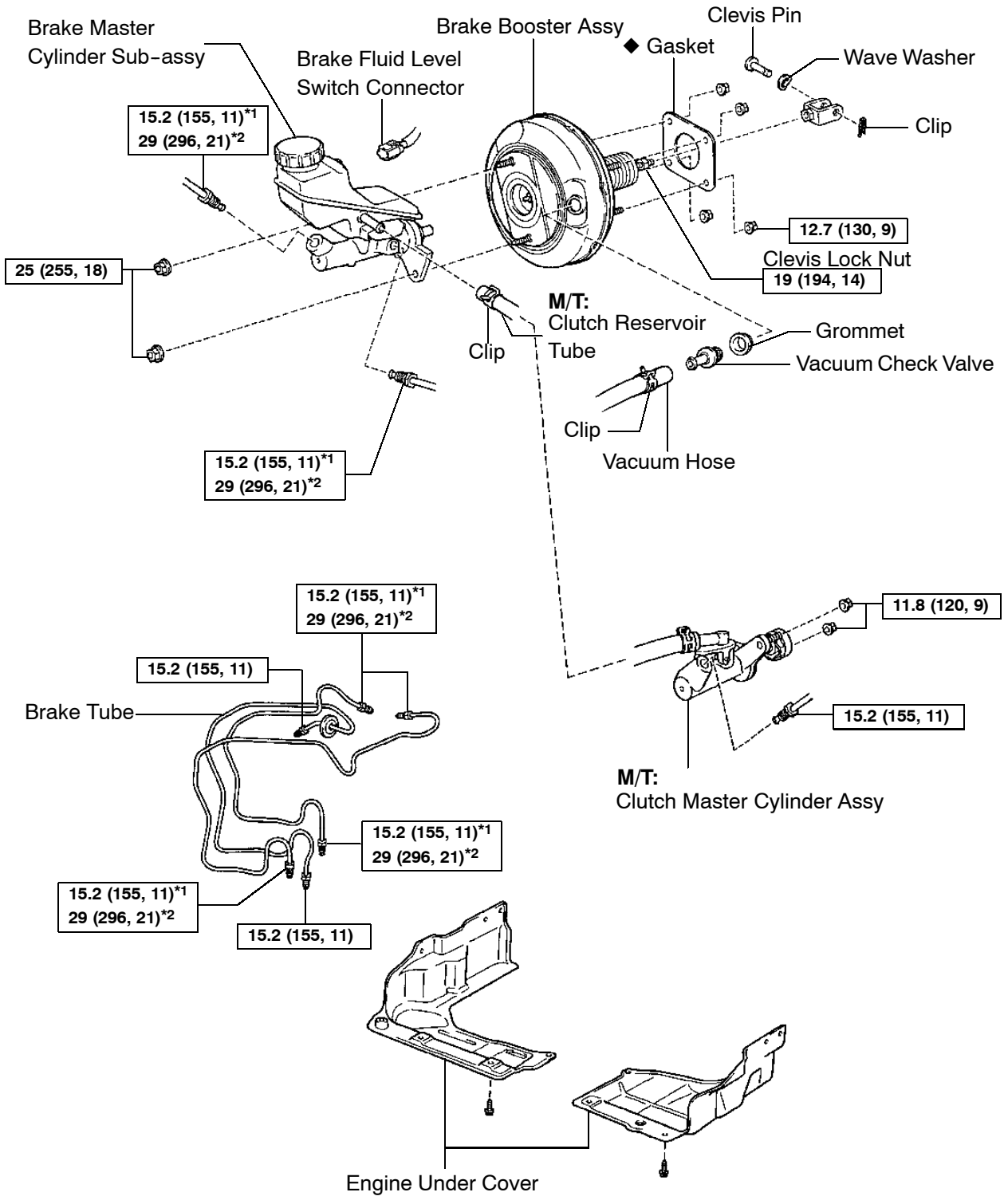


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
*1 w/ ABS:
*2 w/ VSC:

P

F48856

RHD Steering Position Type:



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
*1 w/ ABS:
*2 w/ VSC:

N F42300

G36449

REPLACEMENT

1. DRAIN BRAKE FLUID

NOTICE:

Wash the brake fluid off immediately if it comes into contact with any painted surface.

2. REMOVE AIR CLEANER ASSY (LHD STEERING POSITION TYPE)

3. SEPARATE FUEL FILTER ASSY W/BRACKET (LHD STEERING POSITION TYPE)
(SEE PAGE 32-7)

4. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE (RHD STEERING POSITION TYPE)
(SEE PAGE 14-26)

5. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE)
(SEE PAGE 32-7)
SST 09023-00101

6. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (RHD STEERING POSITION TYPE)
(SEE PAGE 32-7)
SST 09023-00101

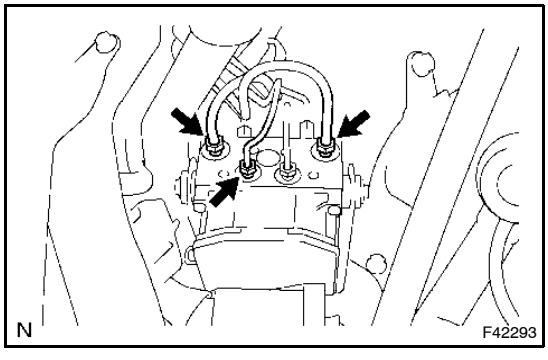
7. DISCONNECT MASTER CYLINDER PUSH ROD CLEVIS

(a) Loosen the push rod clevis lock nut.

(b) Remove the clip, wave washer and clevis pin.

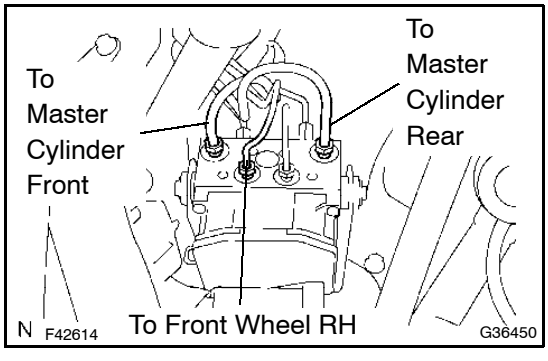
8. REMOVE FRONT WHEEL LH (LHD STEERING POSITION TYPE)

9. REMOVE FRONT WHEEL RH (RHD STEERING POSITION TYPE)

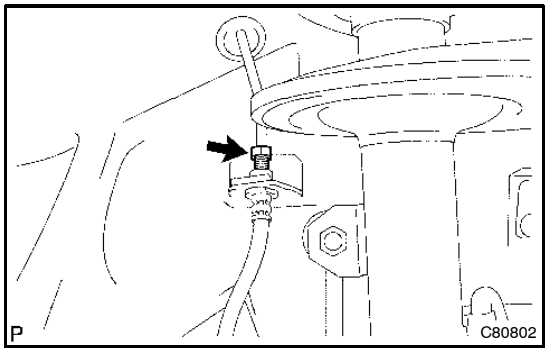


10. REMOVE BRAKE TUBE (RHD STEERING POSITION TYPE)

(a) Using SST, disconnect the 3 brake tubes from the brake actuator.
SST 09023-00101, 09023-38401

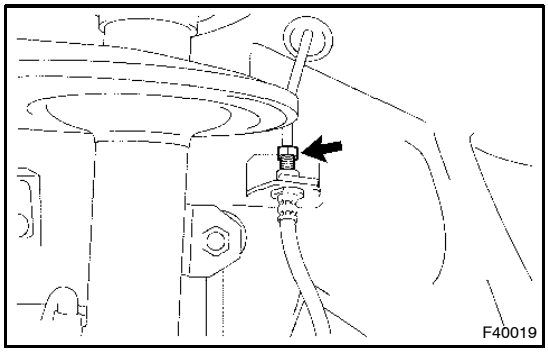


(b) Use tags or make a memo to identify the place to reconnect.



(c) Using SST and a spanner, disconnect the brake tube from the flexible hose of the front brake RH.
SST 09023-00101

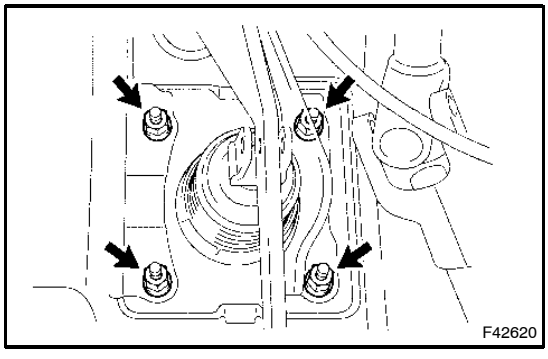
(d) Disconnect the 3 brake tubes from the clamp and remove the brake tubes.



11. REMOVE BRAKE BOOSTER ASSY

(a) LHD STEERING POSITION TYPE:
(1) Using SST and a spanner, disconnect the brake tube from the flexible hose of the front brake LH.

(b) Disconnect the vacuum hose from the brake booster.

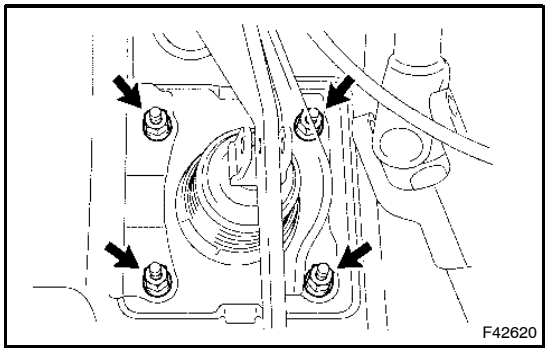


(c) Remove the 4 nuts and clevis.

(d) Pull out the brake booster and gasket.

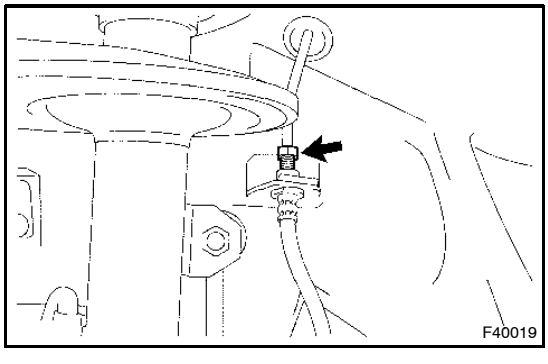
12. INSTALL BRAKE BOOSTER ASSY

(a) Install the clevis to the booster push rod.



(b) Install a new gasket and the brake booster with the 4 nuts.
Torque: 12.7 N·m (130 kgf·cm, 9 ft·lbf)

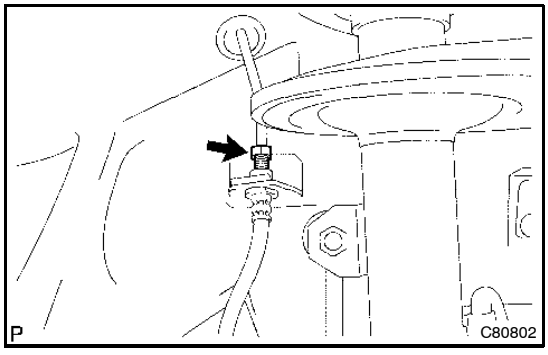
(c) Connect the vacuum hose to the brake booster.



(d) LHD STEERING POSITION TYPE:
(1) Using SST and a spanner, connect the brake tube to the flexible hose.
SST 09023-00101
Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)

13. **INSTALL FRONT WHEEL LH (LHD STEERING POSITION TYPE)**
14. **CONNECT MASTER CYLINDER PUSH ROD CLEVIS**
15. **INSTALL BRAKE TUBE (RHD STEERING POSITION TYPE)**

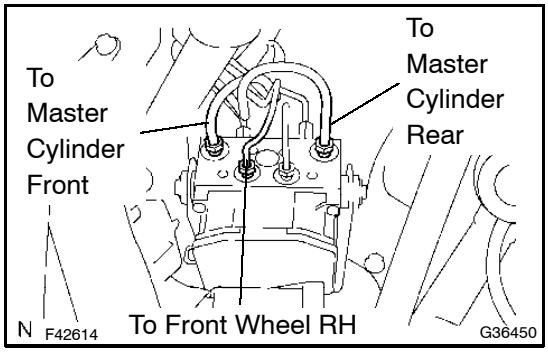
(a) Connect the brake tube to the clamp.



(b) Using SST and a spanner, connect the brake tube to the flexible hose of the front brake RH.

SST 09023-00101

Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)

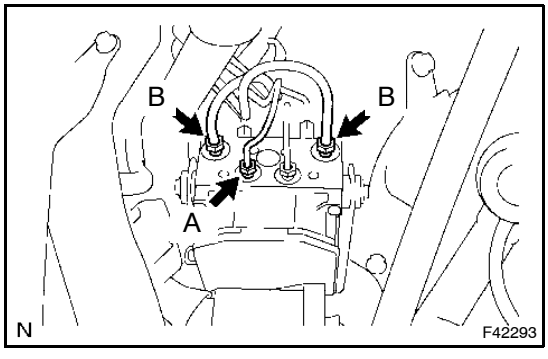


(c) w/ ABS:

Using SST, connect the 3 brake tubes to the brake actuator as shown in the illustration.

SST 09023-00101

Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)



(d) w/ VSC:

Using SST, connect the 3 brake tubes to the brake actuator as shown in the illustration.

SST 09023-00101, 09023-38401

Torque:

A: 15.2 N·m (155 kgf·cm, 11 ft·lbf)

B: 29 N·m (296 kgf·cm, 21 ft·lbf)

(e) Connect the 3 brake lines to the clamp and install the brake tube.

16. **INSTALL FRONT WHEEL RH (RHD STEERING POSITION TYPE)**
17. **INSTALL BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE)**
    (SEE PAGE 32-7)
    SST 09023-00101
18. **INSTALL BRAKE MASTER CYLINDER SUB-ASSY (RHD STEERING POSITION TYPE)**
    (SEE PAGE 32-7)
    SST 09023-00101
19. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE (RHD STEERING POSITION TYPE)**
    (SEE PAGE 14-26)
20. **INSTALL FUEL FILTER ASSY W/BRACKET (LHD STEERING POSITION TYPE)**
    (SEE PAGE 32-7)
21. **INSTALL AIR CLEANER ASSY (LHD STEERING POSITION TYPE)**
22. **FILL RESERVOIR WITH BRAKE FLUID**
23. **BLEED MASTER CYLINDER**
    SST 09023-00101

24. BLEED BRAKE LINE (SEE PUB. NO. RM925E, PAGE 32-5)
25. CHECK FLUID LEVEL IN RESERVOIR
26. BLEED CLUTCH PIPE LINE (MANUAL TRANSAXLE) (SEE PAGE 42-14)
27. CHECK BRAKE FLUID LEAKAGE

MANUAL TRANSMISSION/TRANSAXLE

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM1106E

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

MANUAL TRANSAXLE SYSTEM (C53A)

410GQ-02

PRECAUTION

(a) When racing the engine, make sure that the gear is in neutral.

(b) If the multi-mode manual transmission system stops with the transmission set in any gear, the vehicle can be moved by disconnecting the shift & select actuator plug and setting the transmission to neutral.

(c) When replacing the following parts, proceed with the operation according to the order listed in the table below.

Operation timing	Parts to be replaced or removed and installed	Operation	See page
Before removal	CLUTCH ACTUATOR TRANSMISSION ASSY TRANSMISSION PARTS (INSIDE GEAR BOX) CLUTCH COVER AND CLUTCH DISC CLUTCH RELEASE BEARING CLUTCH RELEASE FORK FLYWHEEL END PLATE CRANKSHAFT	CLUTCH POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
Additional operation when installing new clutch actuator	CLUTCH ACTUATOR New	CLUTCH POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
After installation	TRANSMISSION CONTROL ECU CLUTCH ACTUATOR CLUTCH DISC AND CLUTCH DISC COVER FLYWHEEL CRANKSHAFT CLUTCH RELEASE BEARING CLUTCH RELEASE FORK END PLATE • When the clutch actuator is removed from the transmission assy during installation of any of the following parts. TRANSMISSION ASSY TRANSMISSION PARTS (INSIDE GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (ECU) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196
	CLUTCH STROKE SENSOR	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (CLUTCH) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM	05-190 05-190
	SHIFT STROKE SENSOR SELECT STROKE SENSOR SHIFT AND SELECT ACTUATOR TRANSMISSION PARTS (INSIDE GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (TRANSMISSION) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196

NOTICE:

- **Make sure to always replace the clutch cover and the clutch disc together. If either is replaced without the other, the adjustment system of the clutch cover does not function properly. It may cause clutch drag or clutch slipping, which can result in deterioration of driveability or a defect in the system parts.**
- **Before proceeding with calibration of the multi-mode manual transmission system, be sure to clear the previously stored calibration values.**

410GR-02

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.
- For the troubleshooting of the multi-mode manual transmission system, refer to the problem symptoms table on page 05-219.

★: (C53, C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)

Symptom	Suspected Area	See page
Noise	1. Oil (Level low)	41-4
	2. Oil (Wrong)	41-5
	3. Gear (Worn or damaged)	★
	4. Bearing (Worn or damaged)	★
Oil leakage	1. Oil (Level too high)	41-4
	2. Gasket (Damaged)	★
	3. Oil seal (Worn or damaged)	41-5
	4. O-ring (Worn or damaged)	★
Hard to shift or will not shift	1. Shift lever (Worn or damaged)	41-7 41-11
	2. Synchronizer ring (Worn or damaged)	★
	3. Shift key spring (Damaged)	★
Jumps out of gear	1. Shift fork (Worn)	★
	2. Gear (Worn or damaged)	★
	3. Bearing (Worn or damaged)	★

MANUAL TRANSAXLE SYSTEM (C53)

PROBLEM SYMPTOMS TABLE

4100Y-10

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

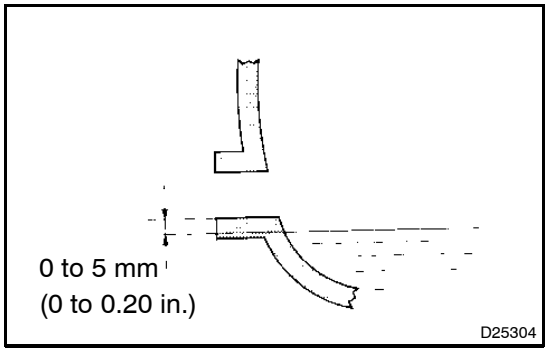
★: (C53, C53A MANUAL TRANSAXLE Repair Manual Pub. No. RM1117E)

Symptom	Suspected Area	See page
Noise	1. Oil (Level low)	41-4
	2. Oil (Wrong)	41-5
	3. Gear (Worn or damaged)	★
	4. Bearing (Worn or damaged)	★
Oil leakage	1. Oil (Level too high)	41-4
	2. Gasket (Damaged)	★
	3. Oil seal (Worn or damaged)	41-5
	4. O-Ring (Worn or damaged)	★
Hard to shift or will not shift	1. Control cable (Faulty)	41-20
	2. Synchronizer ring (Worn or damaged)	★
	3. Shift key spring (Damaged)	★
Jumps out of gear	1. Locking ball spring (Damaged)	★
	2. Shift fork (Worn)	★
	3. Gear (Worn or damaged)	★
	4. Bearing (Worn or damaged)	★

MANUAL TRANSAXLE OIL (C53A/C53)

4100Z-10

ON-VEHICLE INSPECTION



1. INSPECT MANUAL TRANSAXLE OIL

(a) Stop the vehicle on a level place.

(b) Remove the filler plug and gasket.

(c) Check that the oil surface is within 5 mm (0.20 in.) from the lowest position of the inner surface of the filler plug opening.

NOTICE:

- **An excessively large or small amount of oil may cause problems.**
- **After replacing the oil, drive the vehicle and check the oil level.**

(d) Check for oil leakage when the oil level is low.

(e) Install the filler plug and a new gasket.

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

FRONT DIFFERENTIAL OIL SEAL (C53A/C53)

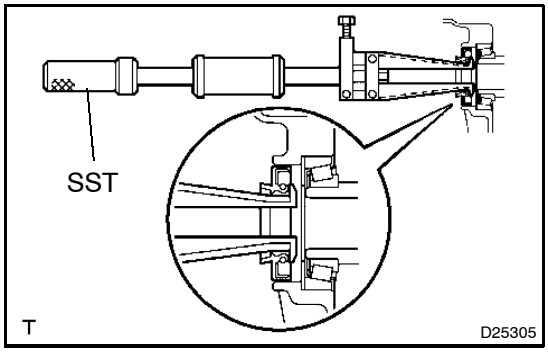
41046-18

REPLACEMENT

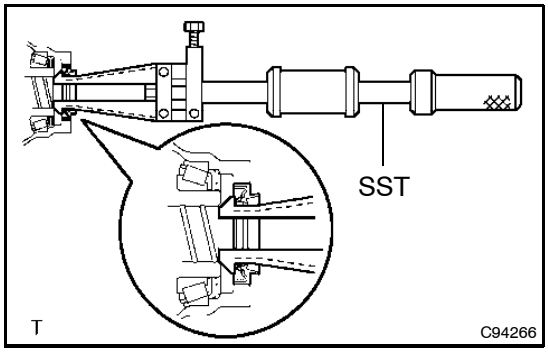
1. **REMOVE FRONT WHEELS**
2. **REMOVE ENGINE UNDER COVER LH**
3. **REMOVE ENGINE UNDER COVER RH**
4. **DRAIN MANUAL TRANSAXLE OIL**

(a) Remove the filler plug and gasket.
(b) Remove the drain plug and gasket, and drain the oil.
(c) Install the drain plug with a new gasket.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

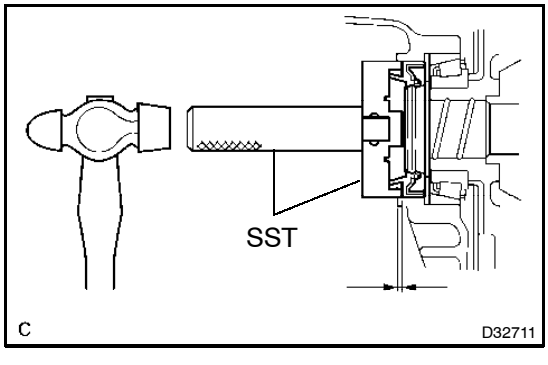
5. **REMOVE FRONT DRIVE SHAFT ASSY LH** **(SEE PAGE 30-3)**
SST 09520-01010, 09520-24010 (09520-32040)
6. **REMOVE FRONT DRIVE SHAFT ASSY RH** **(SEE PAGE 30-3)**
SST 09520-01010, 09520-24010 (09520-32040)



7. **REMOVE TRANSMISSION CASE OIL SEAL**
(a) Using SST, remove the oil seal.
SST 09308-00010

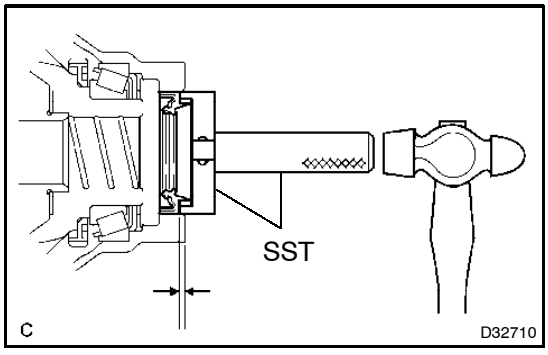


8. **REMOVE TRANSAXLE CASE OIL SEAL**
(a) Using SST, remove the oil seal.
SST 09308-00010



9. **INSTALL TRANSMISSION CASE OIL SEAL**
(a) Coat a new oil seal lip with MP grease.
(b) Using SST and a hammer, install the oil seal.
SST 09726-36010, 09950-70010 (09951-07200)
Drive in depth: 9.6 to 10.2 mm (0.378 to 0.402 in.)

NOTICE:
Be careful not to damage the oil seal lip.



10. INSTALL TRANSAXLE CASE OIL SEAL

(a) Coat a new oil seal lip with MP grease.

(b) Using SST and a hammer, install the oil seal.

SST 09710-20011 (09710-06071), 09950-70010 (09951-07200)

Drive in depth: 1.6 to 2.2 mm (0.063 to 0.087 in.)

NOTICE:

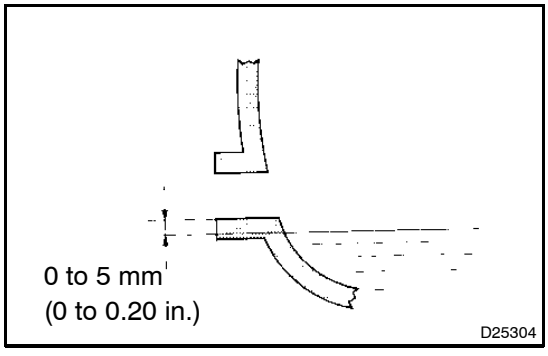
Be careful not to damage the oil seal lip.

11. INSTALL FRONT DRIVE SHAFT ASSY LH **(SEE PAGE 30-3)**

12. INSTALL FRONT DRIVE SHAFT ASSY RH **(SEE PAGE 30-3)**

13. INSTALL FRONT WHEELS

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



14. ADD MANUAL TRANSAXLE OIL

Oil grade: API GL-4 or GL-5

Viscosity: SAE 75 W-90

Capacity: 1.9 liters (2.0 US qts, 1.7 Imp. qts)

15. INSPECT MANUAL TRANSAXLE OIL **(SEE PAGE 41-4)**

16. INSPECT FRONT WHEEL ALIGNMENT **(SEE PUB. NO. RM1106E, PAGE 26-1)**

17. INSTALL ENGINE UNDER COVER LH

18. INSTALL ENGINE UNDER COVER RH

19. CHECK ABS SPEED SENSOR SIGNAL

(a) TMC made (See pub. No. RM925E, page 05-561)

(b) TMUK, TMMT made

(1) w/ VSC (See pub. No. RM925E, page 05-666)

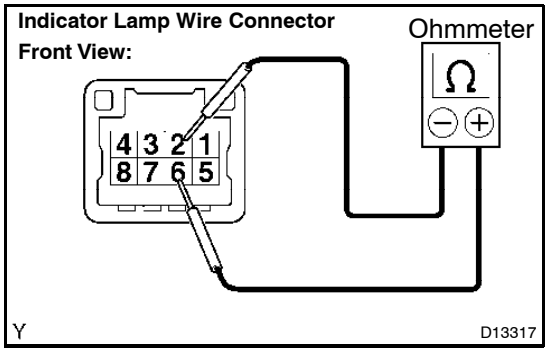
(2) w/o VSC (See pub. No. RM925E, page 05-614)

FLOOR SHIFT SHIFT LEVER ASSY (C53A)

410GS-02

ON-VEHICLE INSPECTION

1. REMOVE SHIFT LEVER KNOB SUB-ASSY (SEE PAGE 41-11)
2. REMOVE CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)
3. REMOVE PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)
4. REMOVE CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)



5. INSPECT SHIFT LOCK SOLENOID

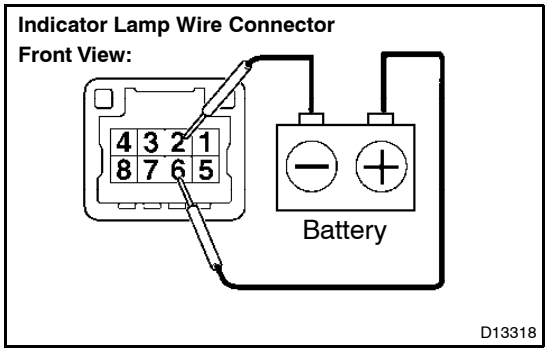
(a) Disconnect the indicator lamp wire connector.

(b) Using an ohmmeter, measure the resistance between terminals 2 and 6.

Resistance:

30 to 35 Ω at 20°C (68°F)

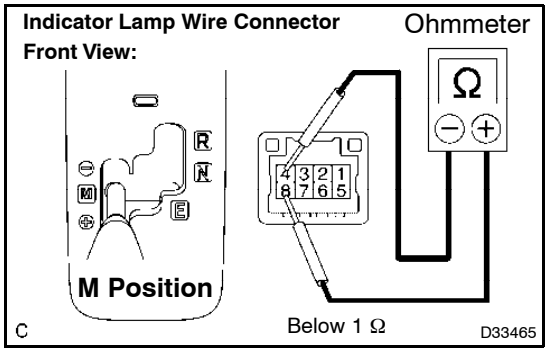
If the resistance is not as specified, replace the shift lever assy.



(c) Check the solenoid operating sound when applying battery voltage across terminals 2 and 6.

If the solenoid does not operate, replace the shift lever assy.

(d) Connect the indicator lamp wire connector.



6. INSPECT TRANSMISSION SHIFT MAIN SWITCH

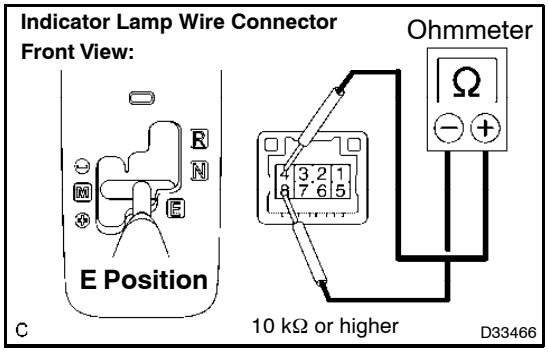
(a) Disconnect the indicator lamp wire connector.

(b) Move the shift lever to the M position.

(c) Using an ohmmeter, measure the resistance according to the value(s) in the table below.

Standard :

Shift position	Terminals	Specified condition
M	4 - 8	Below 1 Ω



(d) Move the shift lever to the E position.

(e) Using an ohmmeter, measure the resistance according to the value(s) in the table below.

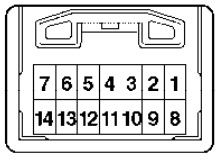
Standard :

Shift position	Terminals	Specified condition
E	4 - 8	10 kΩ or higher

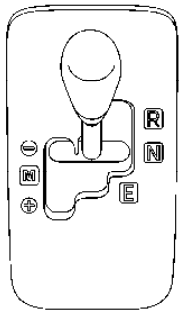
If the result is not as specified, replace the shift lever assy.

(f) Connect the indicator lamp wire connector.

Shift Lever Position Sensor
Front View:



Y D13321



C D33467

7. INSPECT SHIFT LEVER POSITION SENSOR

(a) Disconnect the shift lever position sensor connector.

(b) Using an ohmmeter, measure the resistance according to the value(s) in the table below.

Standard :

Shift position	Terminals	Specified condition
R	4 - 9 - 10 - 13	Below 1 Ω
N	4 - 2 - 10 - 6	Below 1 Ω
E, M	4 - 2 - 3 - 13	Below 1 Ω
+	11 - 5	Below 1 Ω
M	11 - 5 - 12	10 kΩ or higher
-	11 - 12	Below 1 Ω

If the result is not as specified, replace the shift lever assy.

(c) Connect the shift lever position sensor connector.

8. INSTALL CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)

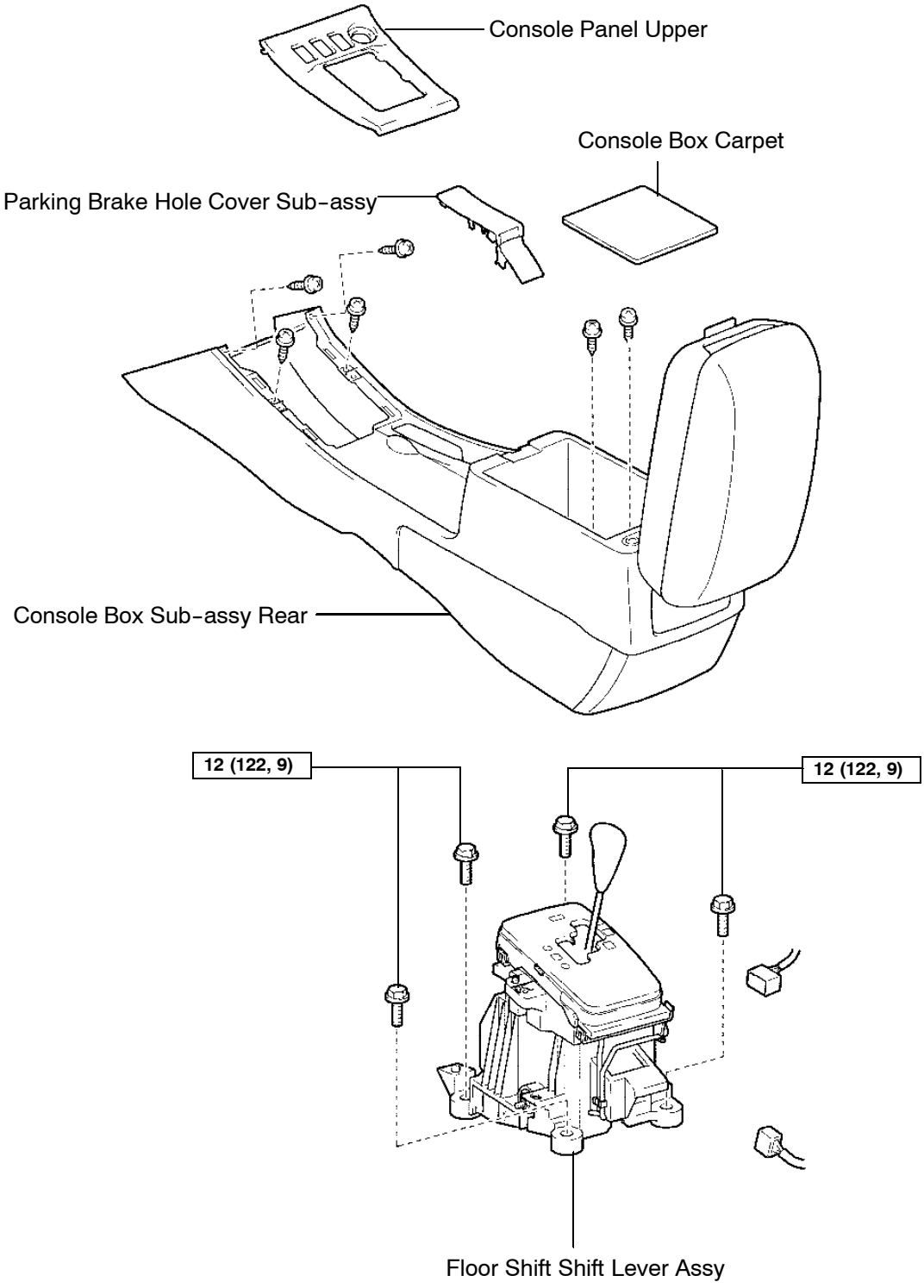
9. INSTALL PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)

10. INSTALL CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)

11. INSTALL SHIFT LEVER KNOB SUB-ASSY (SEE PAGE 41-11)

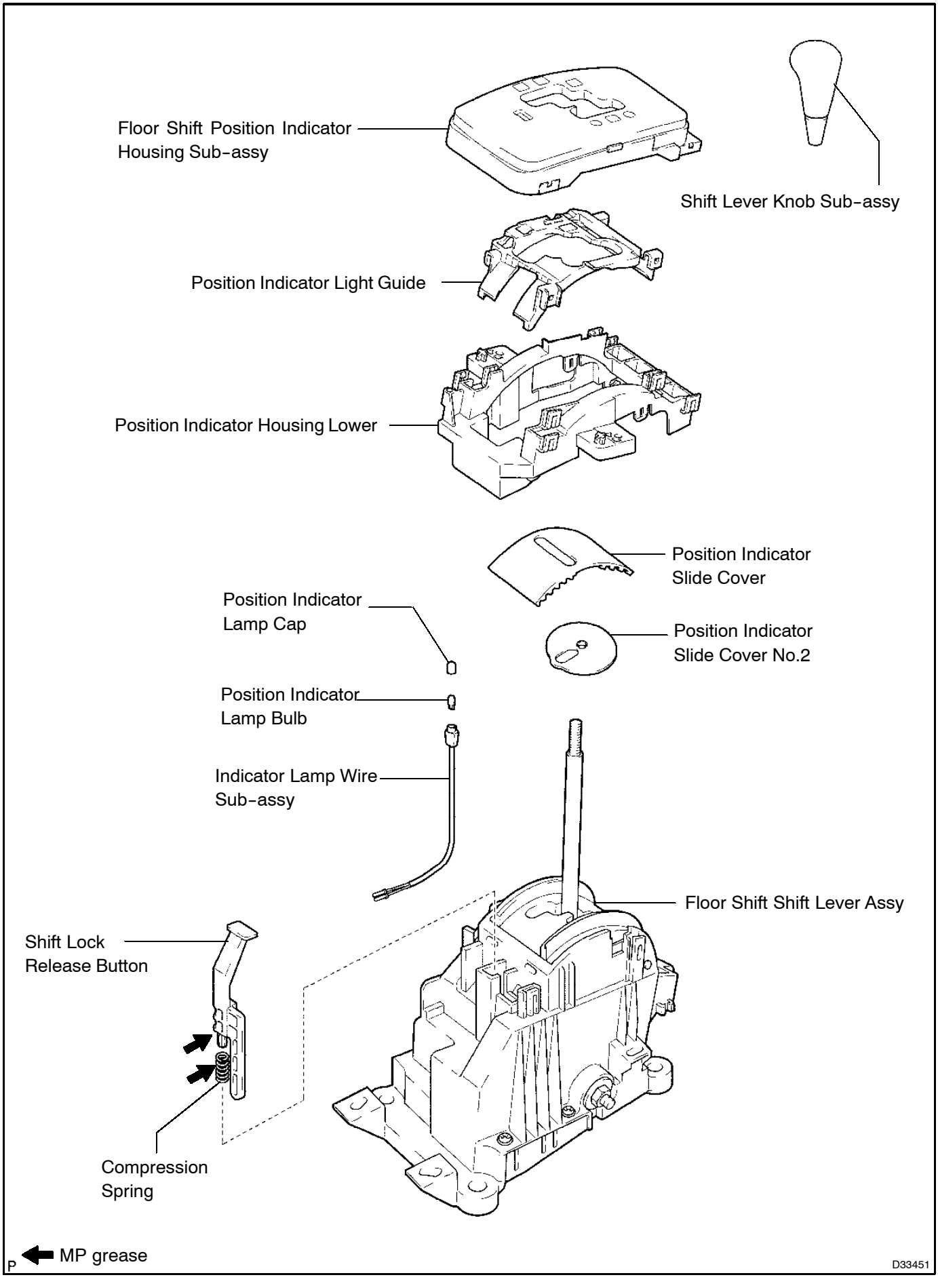
410GT-02

COMPONENTS



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

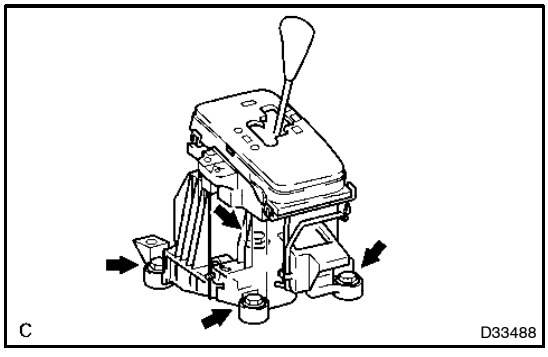
D33450


Floor Shift Position Indicator Housing Sub-assy
Shift Lever Knob Sub-assy
Position Indicator Light Guide
Position Indicator Housing Lower
Position Indicator Slide Cover
Position Indicator Lamp Cap
Position Indicator Slide Cover No.2
Position Indicator Lamp Bulb
Indicator Lamp Wire Sub-assy
Floor Shift Shift Lever Assy
Shift Lock Release Button
Compression Spring
P
MP grease
D33451

410JU-01

OVERHAUL

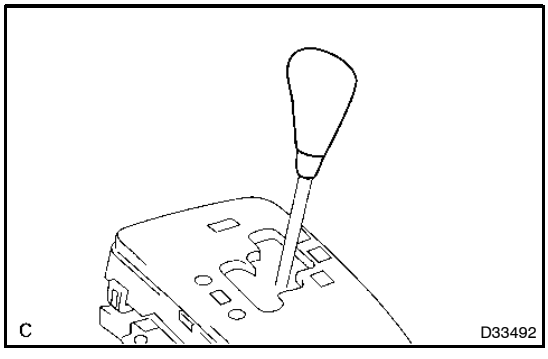
1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)**
3. **REMOVE PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)**
4. **REMOVE CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)**



5. REMOVE FLOOR SHIFT SHIFT LEVER ASSY

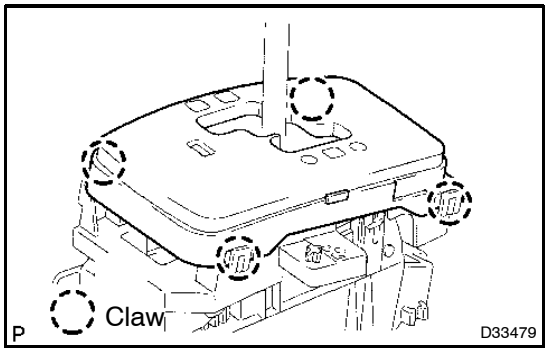
(a) Disconnect the 2 connectors.

(b) Remove the 4 bolts and shift lever assy.



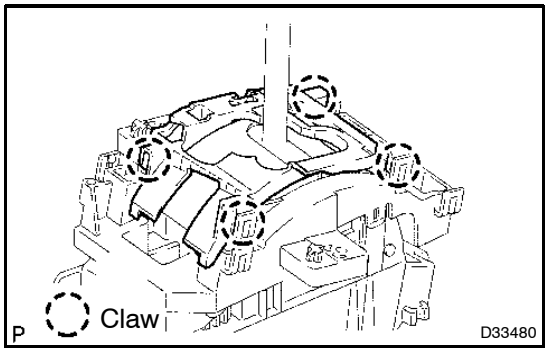
6. REMOVE SHIFT LEVER KNOB SUB-ASSY

(a) Remove the shift lever knob.



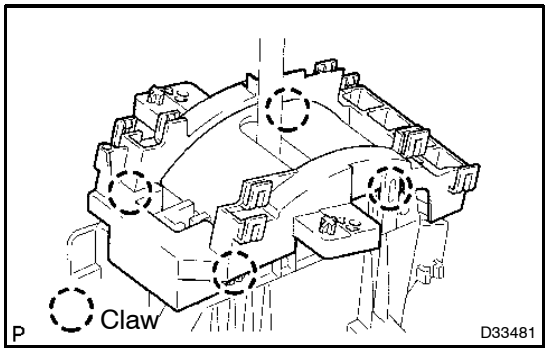
7. REMOVE FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSY

(a) Disengage the 4 claws and remove the position indicator housing sub-assy from the shift lever assy.



8. REMOVE POSITION INDICATOR LIGHT GUIDE

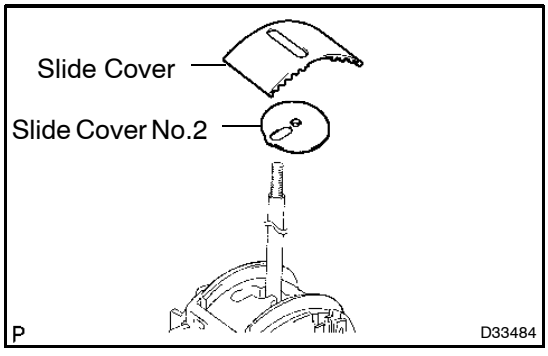
(a) Disengage the 4 claws and remove the position indicator light guide from the shift lever assy.



9. REMOVE POSITION INDICATOR HOUSING LOWER

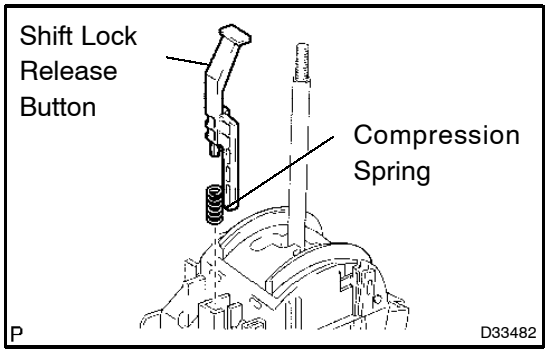
(a) Disconnect the indicator lamp wire from the position indicator housing lower.

(b) Disengage the 4 claws and remove the position indicator housing lower from the shift lever assy.



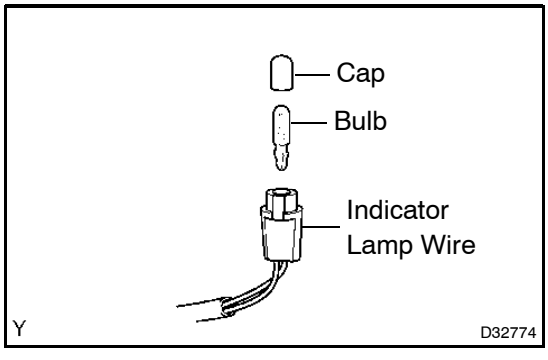
10. REMOVE POSITION INDICATOR SLIDE COVER

(a) Remove the 2 slide covers from the shift lever assy.



11. REMOVE SHIFT LOCK RELEASE BUTTON

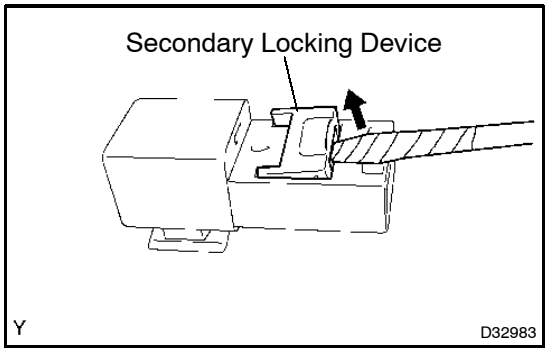
(a) Remove the shift lock release button and compression spring from the shift lever assy.



12. REMOVE INDICATOR LAMP WIRE SUB-ASSY

(a) Disconnect the indicator lamp wire connector from the shift lever assy.

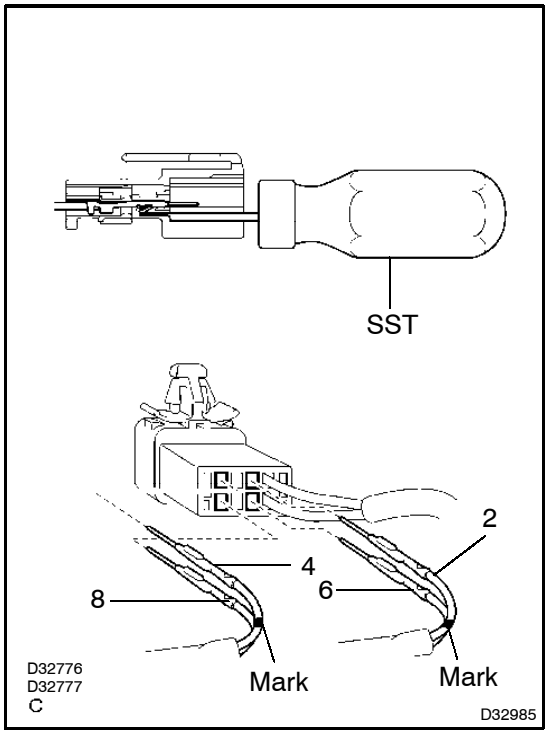
(b) Remove the bulb and cap from the indicator lamp wire.



(c) Using a screwdriver, release the secondary locking device.

HINT:

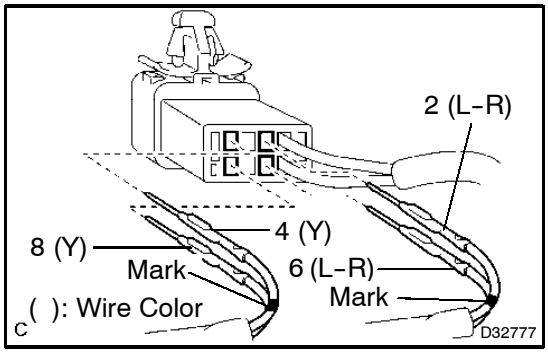
Tape up the screwdriver tip before use.



(d) Put marks on wire harnesses 2 and 4.

(e) Using SST, release the locking lugs of terminals 2, 4, 6 and 8, and pull out the terminals.

SST 09991-00510



13. INSTALL INDICATOR LAMP WIRE SUB-ASSY

(a) Install the marked wire harnesses 2 and 4 to the indicator lamp wire connector as shown in the illustration.

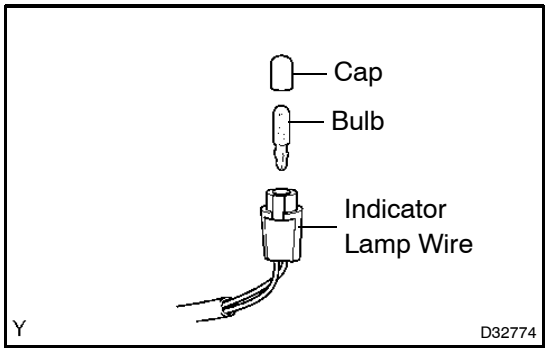
(b) Install wire harnesses 6 and 8 to the indicator lamp wire connector as shown in the illustration.

(c) Lock the secondary locking device.

HINT:

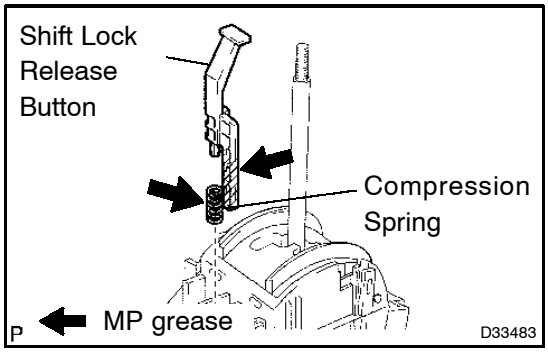
Wire color

Y	Yellow
L-R	Blue - Red



(d) Install the cap and bulb to the indicator lamp wire.

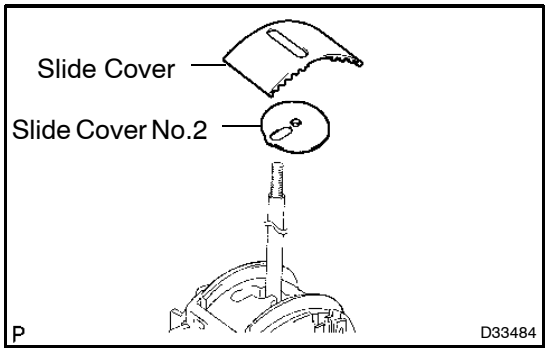
(e) Connect the indicator lamp wire connector to the shift lever assy.



14. INSTALL SHIFT LOCK RELEASE BUTTON

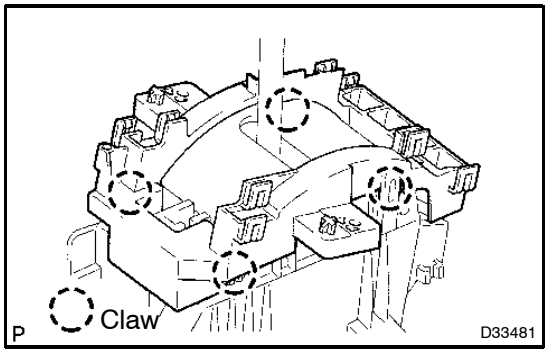
(a) Apply MP grease to the shift lock release button and compression spring.

(b) Install the shift lock release button and compression spring to the shift lever assy.



15. INSTALL POSITION INDICATOR SLIDE COVER

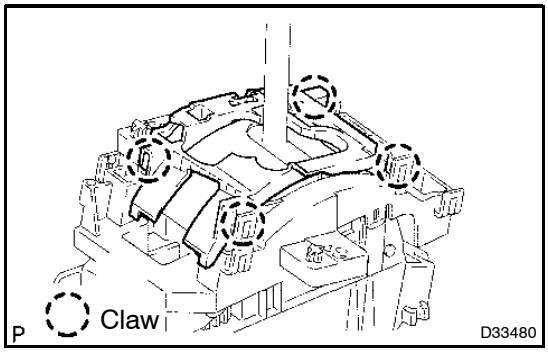
(a) Install the 2 slide covers to the shift lever assy.



16. INSTALL POSITION INDICATOR HOUSING LOWER

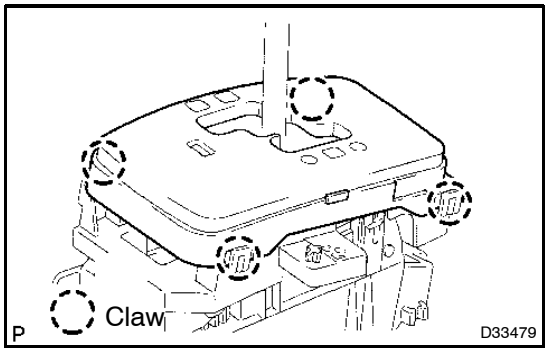
(a) Install the position indicator housing lower to the shift lever assy.

(b) Connect the indicator lamp wire to the position indicator housing lower.



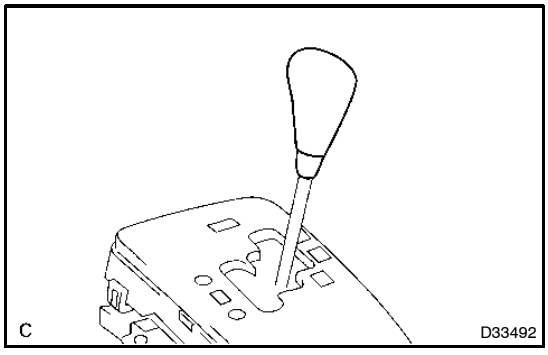
17. INSTALL POSITION INDICATOR LIGHT GUIDE

(a) Install the position indicator light guide to the shift lever assy.



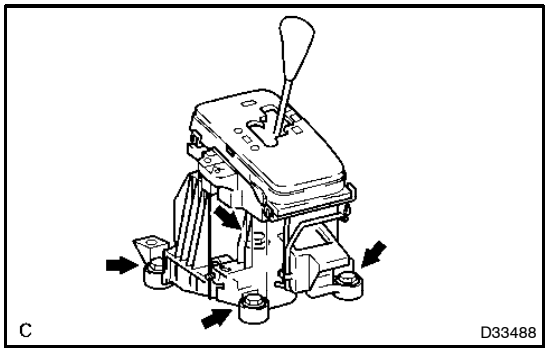
18. INSTALL FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSY

(a) Install the floor shift position indicator housing sub-assy to the shift lever assy.



19. INSTALL SHIFT LEVER KNOB SUB-ASSY

(a) Install the shift lever knob.



20. INSTALL FLOOR SHIFT SHIFT LEVER ASSY

(a) Install the shift lever assy with the 4 bolts.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

(b) Connect the 2 connectors.

21. INSTALL CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)

22. INSTALL PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)

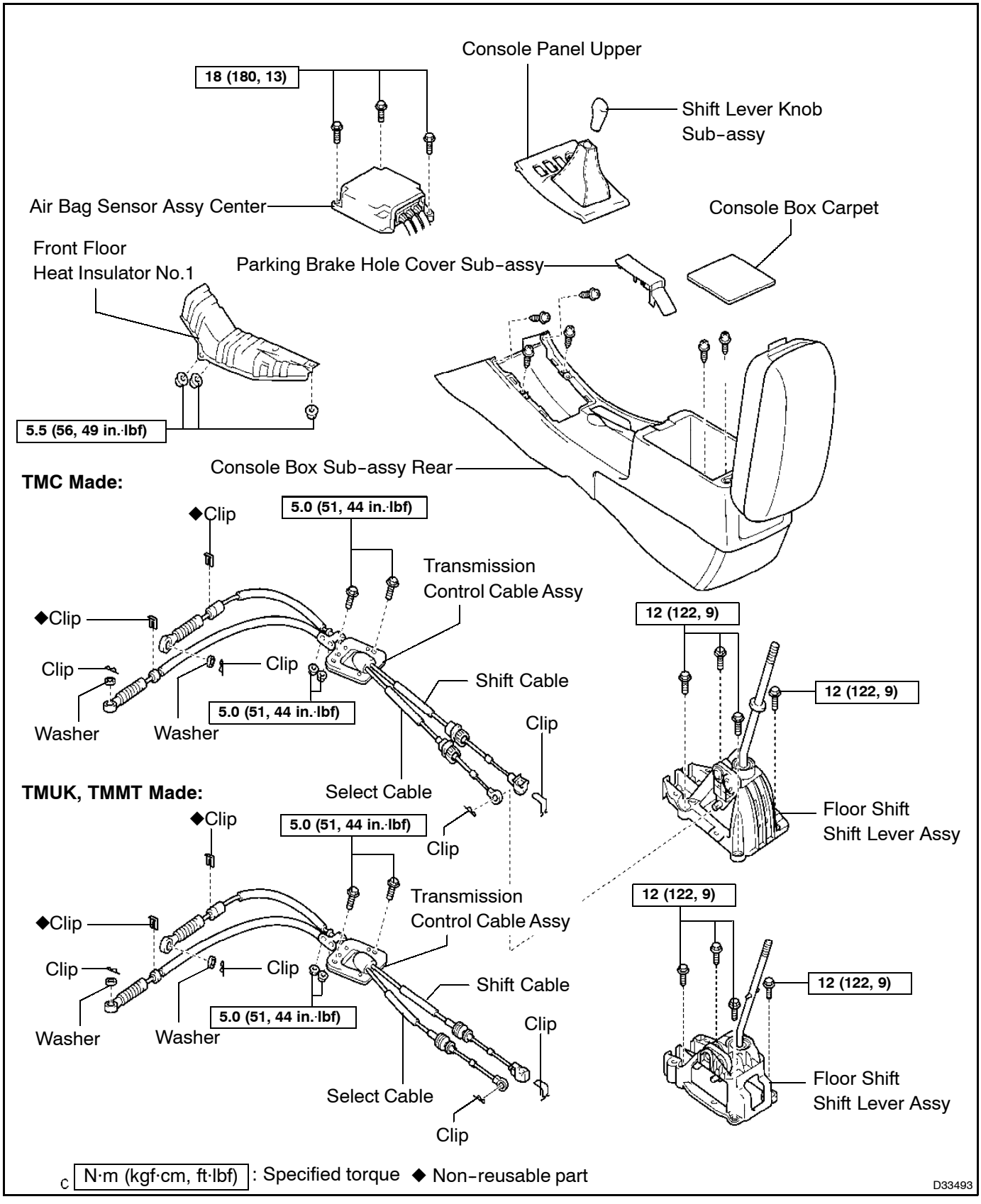
23. INSTALL CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)

24. CONNECT BATTERY NEGATIVE TERMINAL

FLOOR SHIFT SHIFT LEVER ASSY (C53)

COMPONENTS

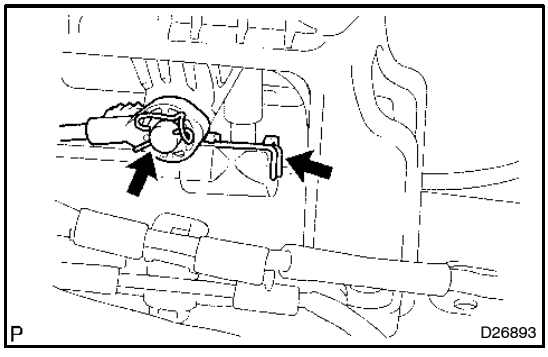
4105U-07



4105V-02

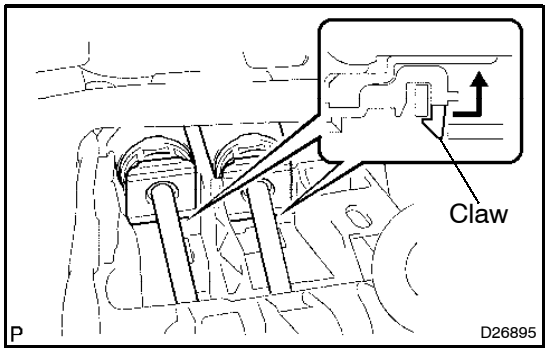
REPLACEMENT

1. REMOVE SHIFT LEVER KNOB SUB-ASSY
2. REMOVE CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)
3. REMOVE PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)
4. REMOVE CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)

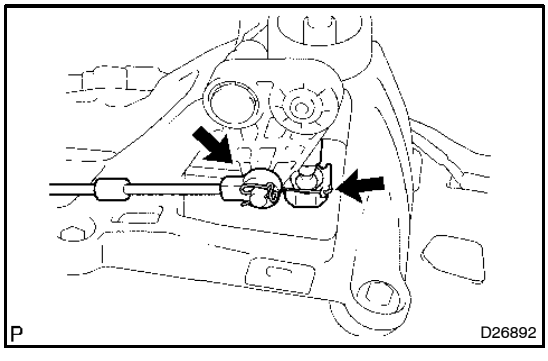


5. SEPARATE TRANSMISSION CONTROL CABLE ASSY (TMUK, TMMT MADE)

(a) Remove the 2 clips, and separate the cable ends of the control cable assy.

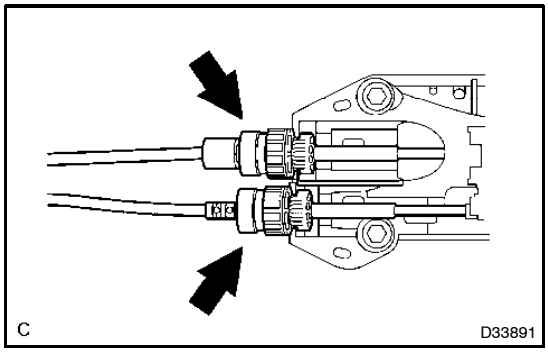


(b) Release the claws, and separate the control cable assy.

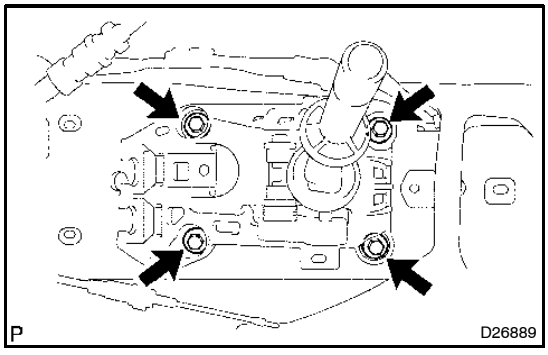


6. SEPARATE TRANSMISSION CONTROL CABLE ASSY (TMC MADE)

(a) Remove the 2 clips, and separate the cable ends of the control cable assy.

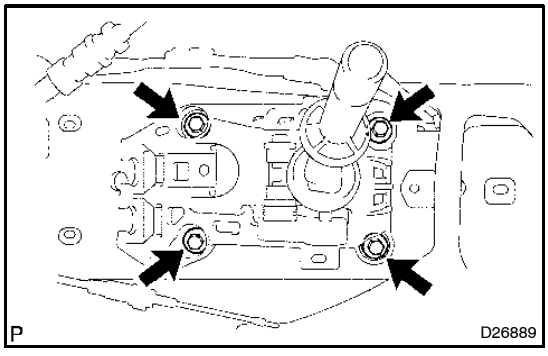


(b) Turn the locks and separate the control cable assy from the shift lever retainer.



7. REMOVE FLOOR SHIFT SHIFT LEVER ASSY

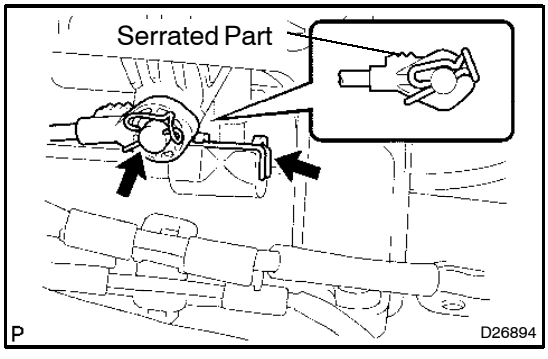
(a) Remove the 4 bolts and shift lever assy.



8. INSTALL FLOOR SHIFT SHIFT LEVER ASSY

(a) Install the shift lever assy with the 4 bolts.

Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)



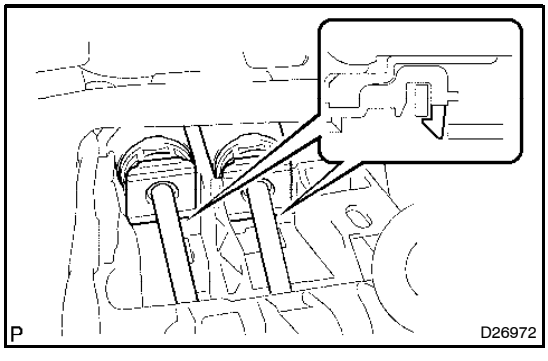
9. CONNECT TRANSMISSION CONTROL CABLE ASSY (TMUK, TMMT MADE)

(a) Connect the end of the select cable to the shift lever assy, and install the clip.

NOTICE:

- **The serrate part of the select cable should face upward when the select cable is connected.**
- **The clip should be installed in the direction shown in the illustration.**

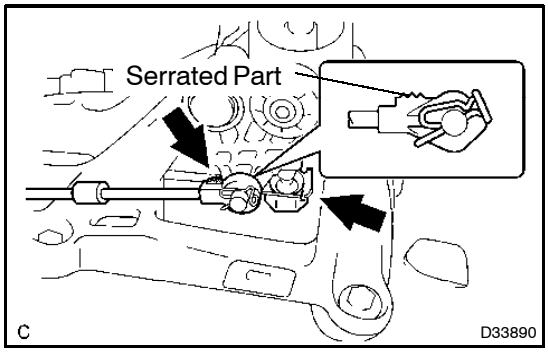
(b) Connect the end of the shift cable to the shift lever assy, and install the clip.



(c) Connect the control cable assy to the shift lever assy.

NOTICE:

Make sure that the claws are firmly engaged.



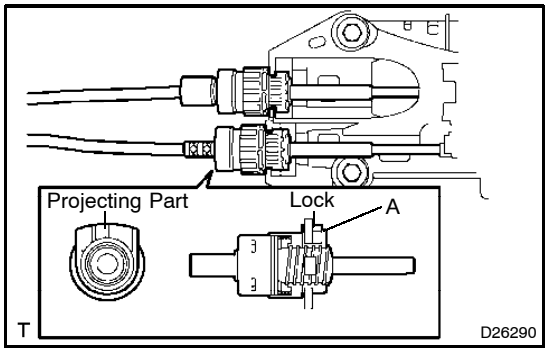
10. CONNECT TRANSMISSION CONTROL CABLE ASSY (TMC MADE)

(a) Connect the end of the select cable to the shift lever assy, and install the clip.

NOTICE:

- **The serrate part of the select cable should face upward when the select cable is connected.**
- **The clip should be installed in the direction shown in the illustration.**

(b) Connect the end of the shift cable to the shift lever assy, and install the clip.



(c) Connect the control cable assy to the shift lever retainer.

NOTICE:

- **The projecting part of the cable outer should face upward when the control cable assy is connected.**
- **After installation, make sure that the cable outer lock is projecting from A as shown in the illustration.**

11. INSTALL CONSOLE BOX SUB-ASSY REAR (SEE PUB. NO. RM1106E, PAGE 71-6)

12. INSTALL PARKING BRAKE HOLE COVER SUB-ASSY (SEE PUB. NO. RM1106E, PAGE 71-6)

13. INSTALL CONSOLE PANEL UPPER (SEE PUB. NO. RM1106E, PAGE 71-6)

14. INSTALL SHIFT LEVER KNOB SUB-ASSY

TRANSMISSION CONTROL CABLE ASSY (C53)

410JV-01

REPLACEMENT

HINT:

COMPONENTS: SEE PAGE 41-16

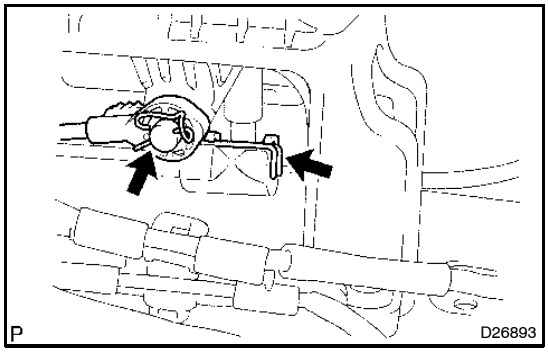
1. REMOVE AIR CONDITIONER UNIT ASSY (SEE PUB. NO. RM1106E, PAGE 55-18)

2. SEPARATE AIR BAG SENSOR ASSY CENTER (SEE PUB. NO. RM1106E, PAGE 60-74)

3. REMOVE EXHAUST PIPE ASSY (SEE PAGE 15-2)

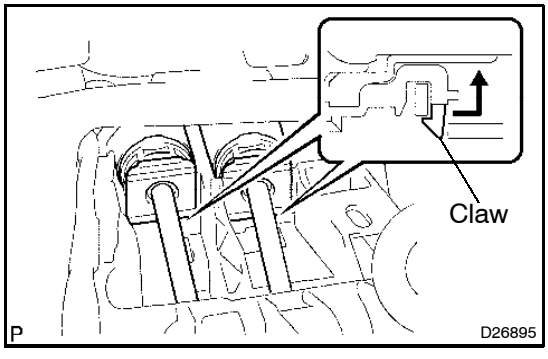
4. REMOVE FRONT FLOOR HEAT INSULATOR NO.1

(a) Remove the 3 nuts and heat insulator No.1.

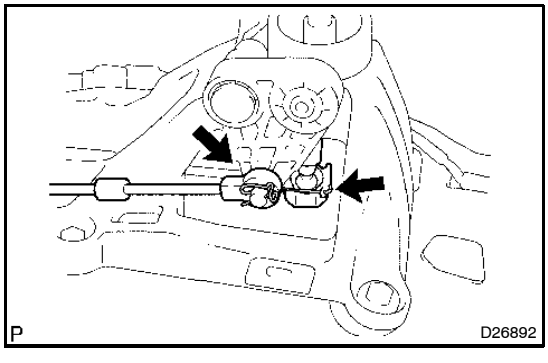


5. SEPARATE TRANSMISSION CONTROL CABLE ASSY (TMUK, TMMT MADE)

(a) Remove the 2 clips, and separate the cable ends of the control cable assy.

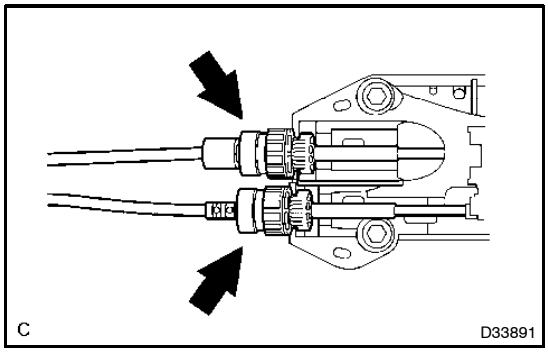


(b) Release the claws, and separate the control cable assy.

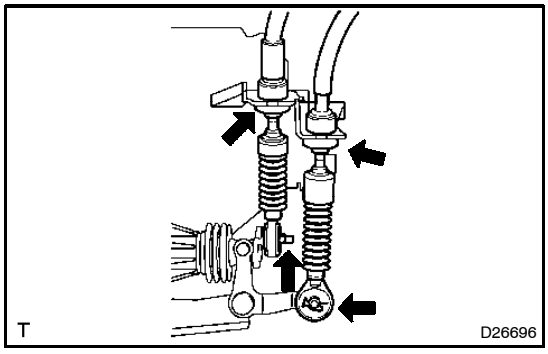


6. SEPARATE TRANSMISSION CONTROL CABLE ASSY (TMC MADE)

(a) Remove the 2 clips, and separate the cable ends of the control cable assy.



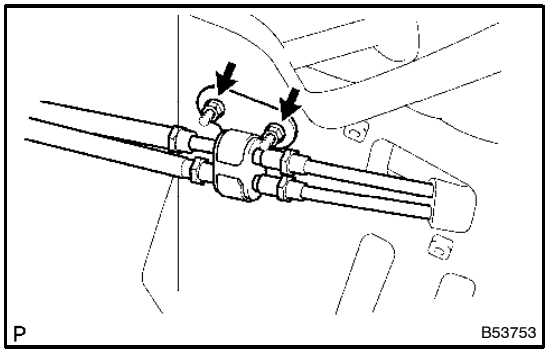
(b) Turn the locks and separate the control cable assy from the shift lever retainer.



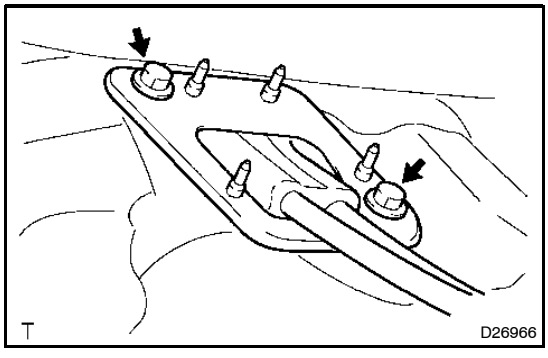
7. REMOVE TRANSMISSION CONTROL CABLE ASSY

(a) Remove the 2 clips and 2 washers, and separate the top ends of the control cable assy from the transaxle.

(b) Remove the 2 clips, and separate the control cable assy from the control cable bracket.

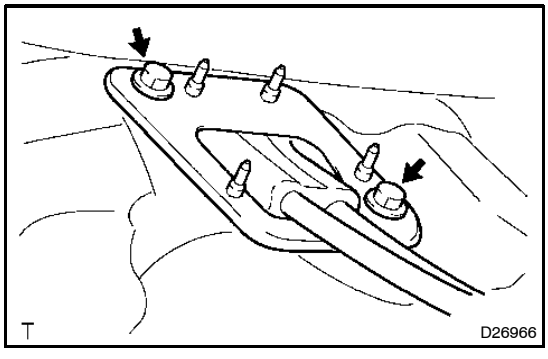


(c) Remove the 2 nuts.



(d) Remove the 2 bolts from the retainer.

(e) Pull out the control cable assy from the floor.

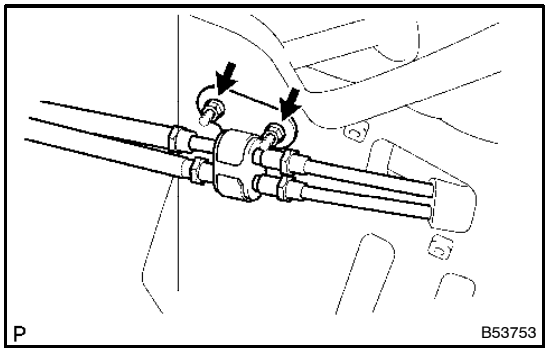


8. INSTALL TRANSMISSION CONTROL CABLE ASSY

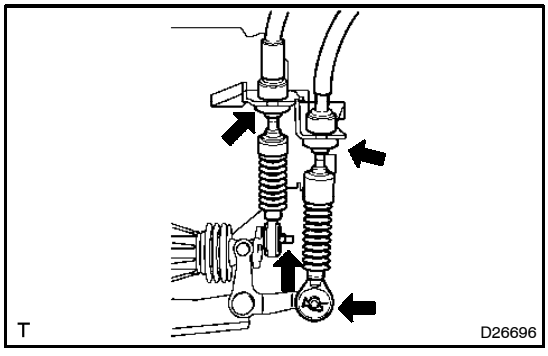
(a) Push in the control cable assy to the floor.

(b) Install the control cable assy with the 2 bolts.

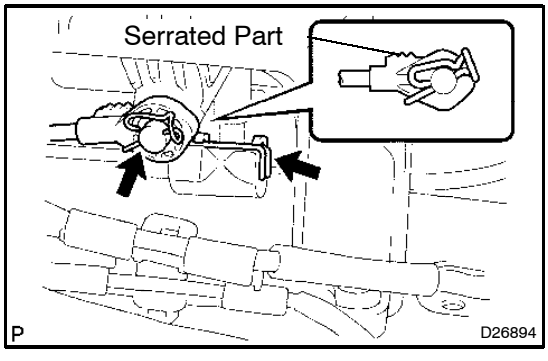
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)



(c) Install the cable clamp with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)



(d) Connect the control cable assy to the control cable bracket, and install 2 new clips.
(e) Connect the control cable assy to the transaxle, and install the 2 washers and 2 clips.



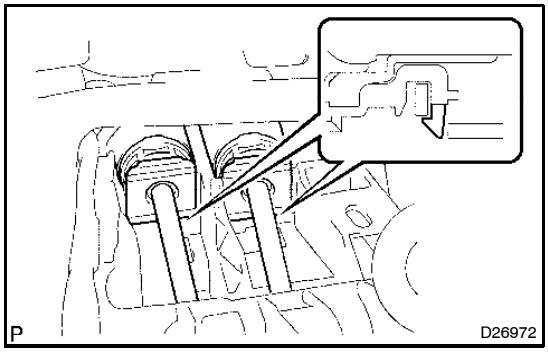
9. CONNECT TRANSMISSION CONTROL CABLE ASSY (TMUK, TMMT MADE)

(a) Connect the end of the select cable to the shift lever assy, and install the clip.

NOTICE:

- **The serrated part of the select cable should face upward when the select cable is connected.**
- **The clip should be installed in the direction shown in the illustration.**

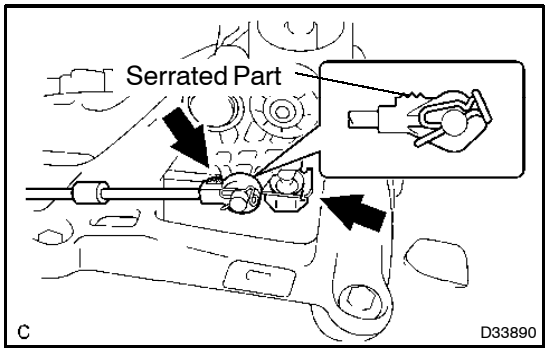
(b) Connect the end of the shift cable to the shift lever assy, and install the clip.



(c) Connect the control cable assy to the shift lever assy.

NOTICE:

Make sure that the claws are firmly engaged.



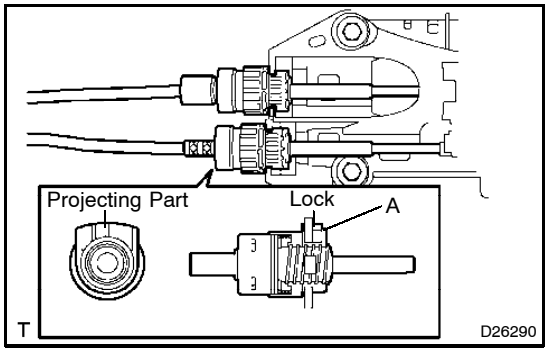
10. CONNECT TRANSMISSION CONTROL CABLE ASSY (TMC MADE)

(a) Connect the end of the select cable to the shift lever assy, and install the clip.

NOTICE:

- **The serrate part of the select cable should face upward when the select cable is connected.**
- **The clip should be installed in the direction shown in the illustration.**

(b) Connect the end of the shift cable to the shift lever assy, and install the clip.



(c) Connect the control cable assy to the shift lever retainer.

NOTICE:

- **The projecting part of the cable outer should face upward when the control cable assy is connected.**
- **After installation, make sure that the cable outer lock is projecting from A as shown in the illustration.**

11. INSTALL FRONT FLOOR HEAT INSULATOR NO.1

(a) Install the heat insulator No.1 with the 3 nuts.

12. INSTALL EXHAUST PIPE ASSY **(SEE PAGE 15-2)**

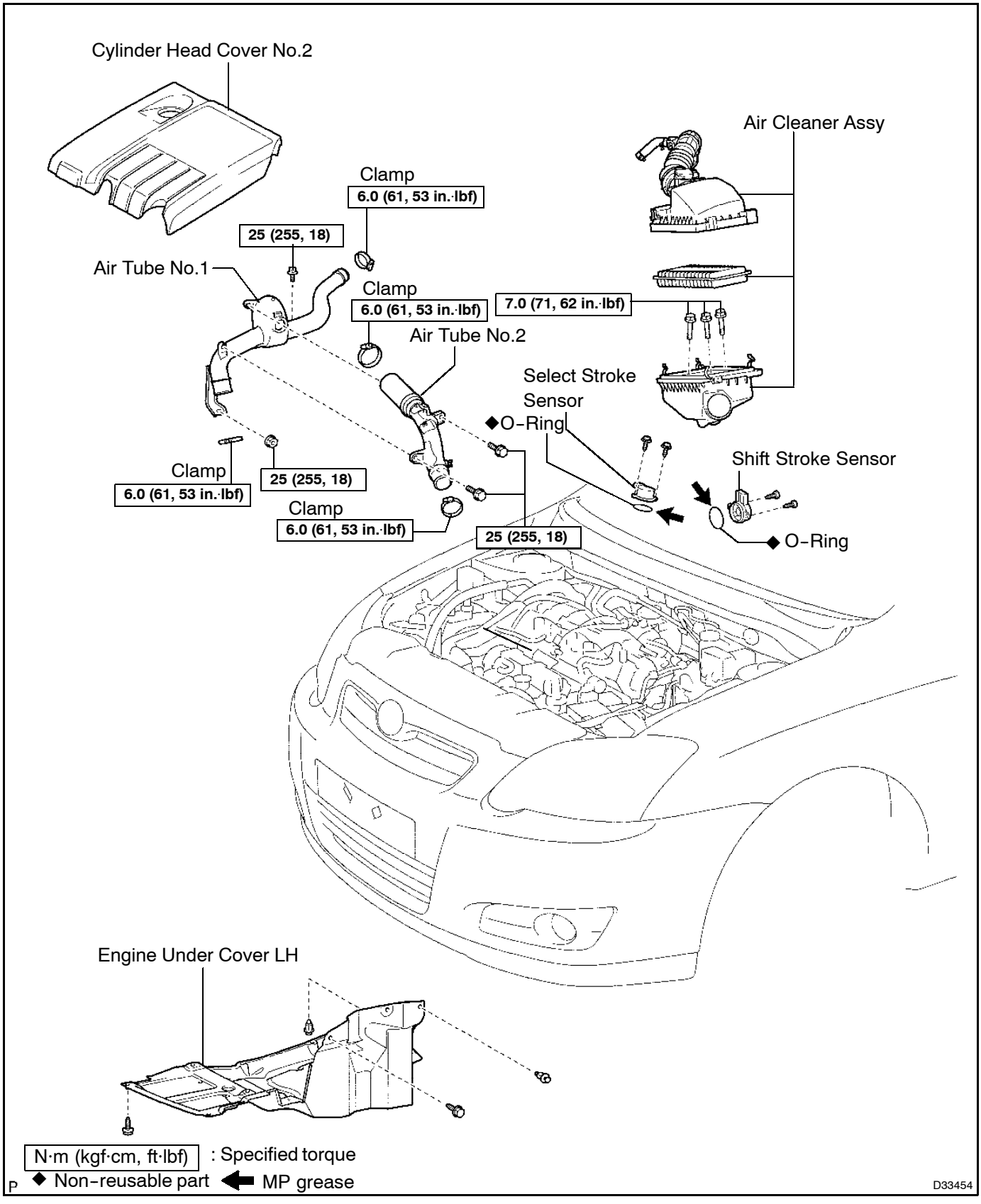
13. CONNECT AIR BAG SENSOR ASSY CENTER **(SEE PUB. NO. RM1106E, PAGE 60-74)**

14. INSTALL AIR CONDITIONER UNIT ASSY **(SEE PUB. NO. RM1106E, PAGE 55-18)**

SHIFT STROKE SENSOR (C53A)

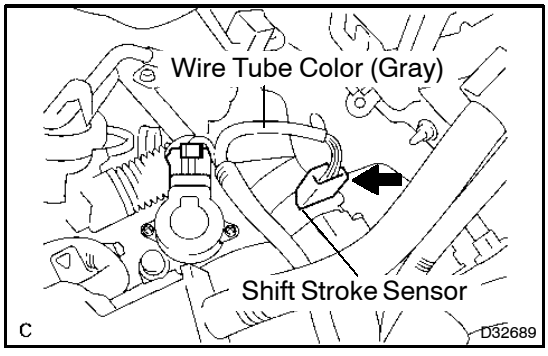
COMPONENTS

410GX-02



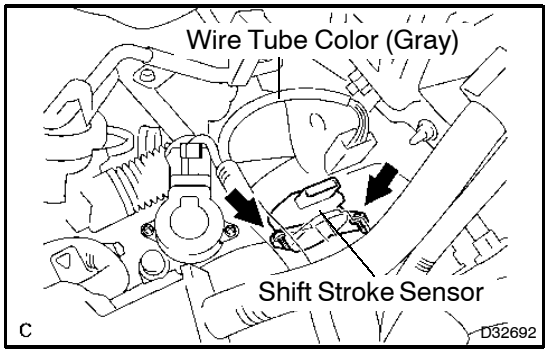
REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. REMOVE FRONT WHEEL LH
3. REMOVE ENGINE UNDER COVER LH
4. REMOVE CYLINDER HEAD COVER NO.2
5. REMOVE AIR CLEANER ASSY
6. REMOVE AIR TUBE NO.2 (SEE PAGE 41-36)
7. REMOVE AIR TUBE NO.1 (SEE PAGE 41-36)
8. SEPARATE FUEL FILTER ASSY (SEE PAGE 41-36)



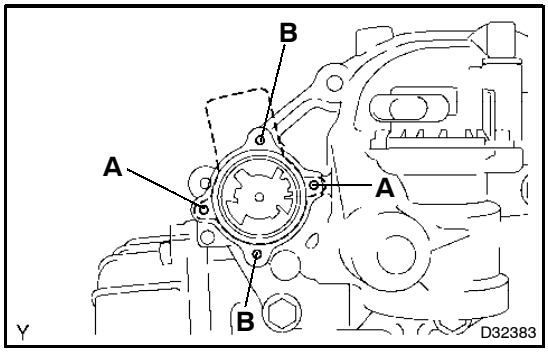
9. REMOVE SHIFT STROKE SENSOR

(a) Disconnect the shift stroke sensor connector.



(b) Remove the 2 screws and shift stroke sensor from the shift and select actuator.

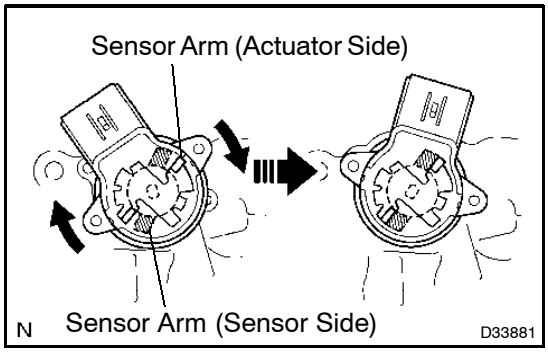
(c) Remove the O-ring from the shift stroke sensor.



10. INSTALL SHIFT STROKE SENSOR

NOTICE:

Use the A holes to install the shift stroke sensor. Do not use the B holes.



(a) Apply MP grease to a new O-ring.

(b) Install the O-ring to the shift stroke sensor.

(c) Set the shift stroke sensor so that the sensor arms are positioned as shown in the illustration.

(d) Turn the shift stroke sensor clockwise and fix it with the 2 screws.

(e) Connect the shift stroke sensor connector.

11. CONNECT FUEL FILTER ASSY (SEE PAGE 41-36)
12. INSTALL AIR TUBE NO.1 (SEE PAGE 41-36)
13. INSTALL AIR TUBE NO.2 (SEE PAGE 41-36)
14. INSTALL AIR CLEANER ASSY
15. INSTALL CYLINDER HEAD COVER NO.2
16. INSTALL ENGINE UNDER COVER LH
17. INSTALL FRONT WHEEL LH
18. CONNECT BATTERY NEGATIVE TERMINAL
19. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU (SEE PAGE 05-190)
20. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (SEE PAGE 05-190)
21. SYNCHRONIZATION POSITION CALIBRATION (SEE PAGE 05-196)

SELECT STROKE SENSOR (C53A)

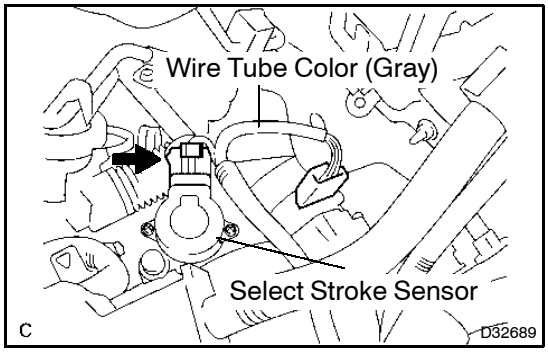
410GZ-02

REPLACEMENT

HINT:

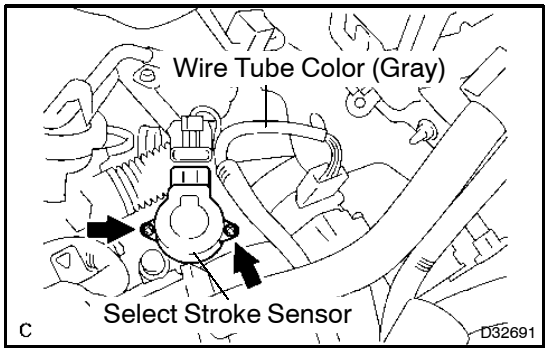
COMPONENTS: SEE PAGE 41-24

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE FRONT WHEEL LH**
3. **REMOVE ENGINE UNDER COVER LH**
4. **REMOVE CYLINDER HEAD COVER NO.2**
5. **REMOVE AIR CLEANER ASSY**
6. **REMOVE AIR TUBE NO.2** **(SEE PAGE 41-36)**
7. **REMOVE AIR TUBE NO.1** **(SEE PAGE 41-36)**
8. **SEPARATE FUEL FILTER ASSY** **(SEE PAGE 41-36)**



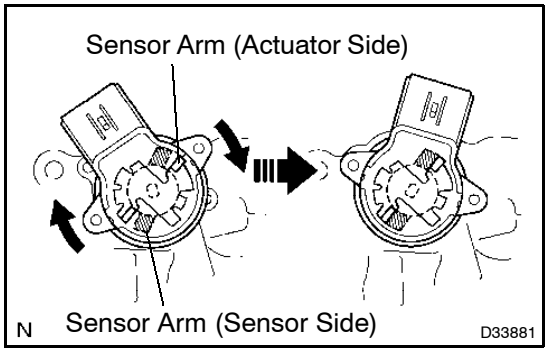
9. **REMOVE SELECT STROKE SENSOR**

(a) Disconnect the select stroke sensor connector.



(b) Remove the 2 screws and select stroke sensor from the shift and select actuator.

(c) Remove the O-ring from the select stroke sensor.



10. **INSTALL SELECT STROKE SENSOR**

(a) Apply MP grease to a new O-ring.

(b) Install the O-ring to the select stroke sensor.

(c) Set the select stroke sensor so that the sensor arms are positioned as shown in the illustration.

(d) Turn the select stroke sensor clockwise and fix it with the 2 screws.

(e) Connect the select stroke sensor connector.

11. **CONNECT FUEL FILTER ASSY** **(SEE PAGE 41-36)**
12. **INSTALL AIR TUBE NO.1** **(SEE PAGE 41-36)**
13. **INSTALL AIR TUBE NO.2** **(SEE PAGE 41-36)**
14. **INSTALL AIR CLEANER ASSY**
15. **INSTALL CYLINDER HEAD COVER NO.2**

16. INSTALL ENGINE UNDER COVER LH
17. INSTALL FRONT WHEEL LH
18. CONNECT BATTERY NEGATIVE TERMINAL
19. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU (SEE PAGE 05-190)
20. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (SEE PAGE 05-190)
21. SYNCHRONIZATION POSITION CALIBRATION (SEE PAGE 05-196)

TRANSMISSION REVOLUTION SENSOR (C53A)

410H0-02

REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL

2. REMOVE FRONT WHEEL LH

3. REMOVE ENGINE UNDER COVER LH

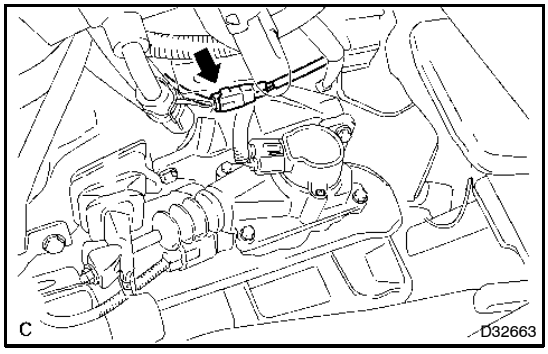
4. DRAIN TRANSAXLE OIL

(a) Remove the filler plug and gasket.

(b) Remove the drain plug and gasket, and drain the oil.

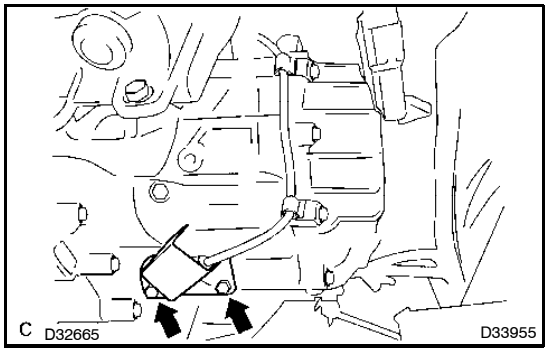
(c) Install the drain plug with a new gasket.

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

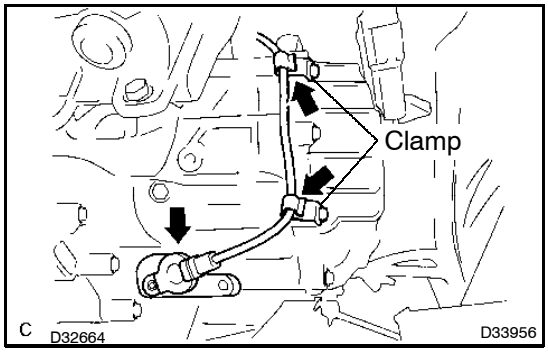


5. REMOVE TRANSMISSION REVOLUTION SENSOR

(a) Disconnect the transmission revolution sensor connector.

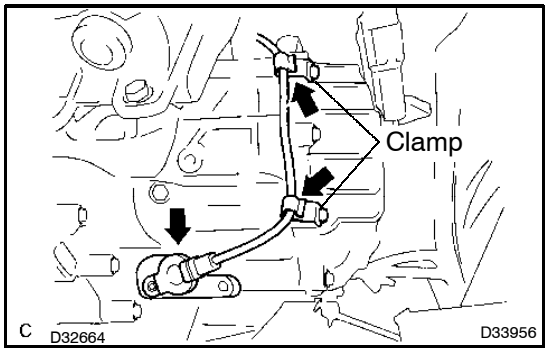


(b) Remove the 2 bolts and manual transmission case protector from the transaxle.



(c) Separate the transmission revolution sensor wire harness from the 2 clamps.

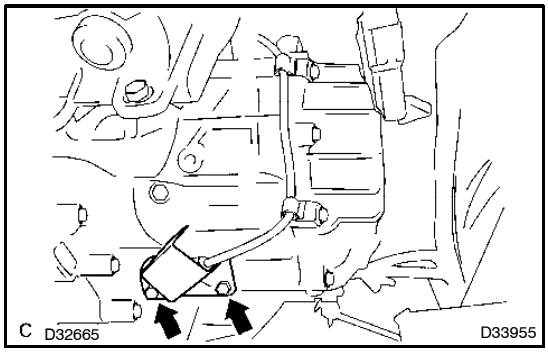
(d) Remove the transmission revolution sensor from the transaxle.



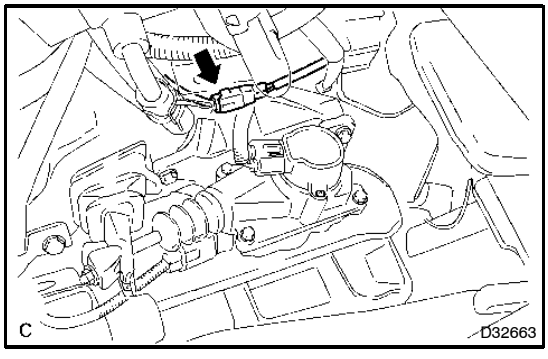
6. INSTALL TRANSMISSION REVOLUTION SENSOR

(a) Install the transmission revolution sensor to the transaxle.

(b) Install the transmission revolution sensor wire harness to the 2 clamps.



(c) Install the manual transmission case protector to the transaxle with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



(d) Connect the transmission revolution sensor connector.

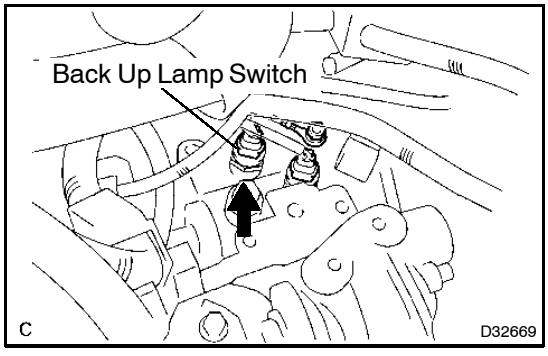
7. ADD MANUAL TRANSAXLE OIL **(SEE PAGE 41-5)**
8. INSPECT MANUAL TRANSAXLE OIL **(SEE PAGE 41-4)**
9. INSTALL ENGINE UNDER COVER LH
10. INSTALL FRONT WHEEL LH
11. CONNECT BATTERY NEGATIVE TERMINAL

BACK UP LAMP SWITCH ASSY (C53A/C53)

410H1-02

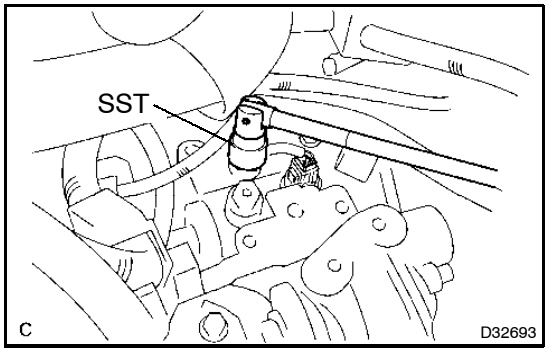
REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. REMOVE AIR CLEANER ASSY
3. REMOVE AIR TUBE NO.2 (SEE PAGE 41-36)
4. REMOVE AIR TUBE NO.1 (SEE PAGE 41-36)



5. DISCONNECT CONNECTOR

(a) Disconnect the back up lamp switch connector.



6. REMOVE BACK UP LAMP SWITCH ASSY

(a) Using SST, remove the back up lamp switch and gasket from the manual transmission case.

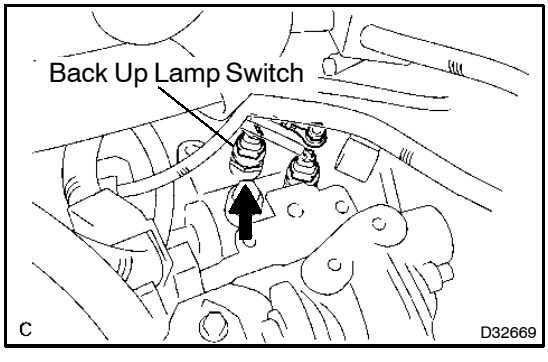
SST 09817-16011

7. INSTALL BACK UP LAMP SWITCH ASSY

(a) Using SST, install the back up lamp switch to the manual transmission case with a new gasket.

SST 09817-16011

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)



8. CONNECT CONNECTOR

(a) Connect the back up lamp switch connector.

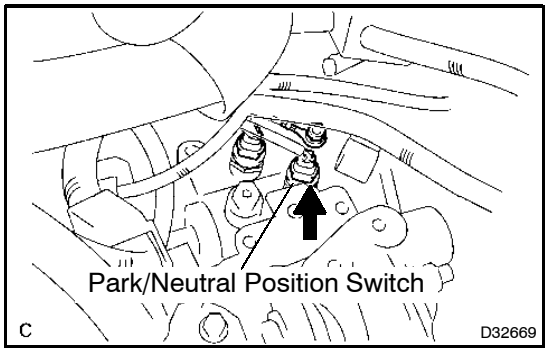
9. INSTALL AIR TUBE NO.1 (SEE PAGE 41-36)
10. INSTALL AIR TUBE NO.2 (SEE PAGE 41-36)
11. INSTALL AIR CLEANER ASSY
12. CONNECT BATTERY NEGATIVE TERMINAL

PARK/NEUTRAL POSITION SWITCH ASSY (C53A)

410H3-02

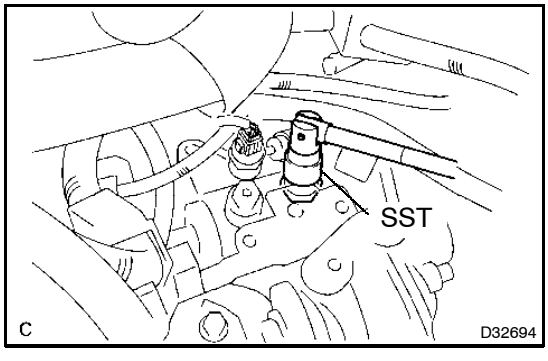
REPLACEMENT

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE AIR CLEANER ASSY**
3. **REMOVE AIR TUBE NO.2** **(SEE PAGE 41-36)**
4. **REMOVE AIR TUBE NO.1** **(SEE PAGE 41-36)**



5. **DISCONNECT CONNECTOR**

(a) Disconnect the park/neutral position switch connector.



6. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSY**

(a) Using SST, remove the park/neutral position switch and gasket from the manual transmission case.

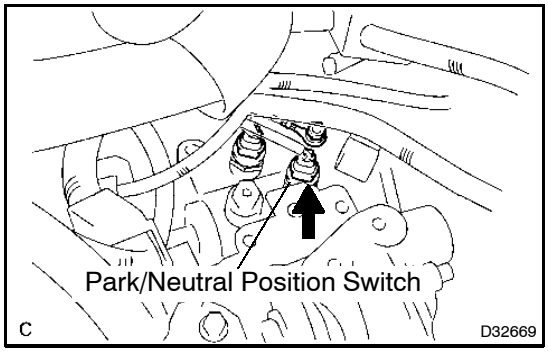
SST 09817-16011

7. **INSTALL PARK/NEUTRAL POSITION SWITCH ASSY**

(a) Using SST, install the park/neutral position switch to the manual transmission case with a new gasket.

SST 09817-16011

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



8. **CONNECT CONNECTOR**

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

9. **INSTALL AIR TUBE NO.1** **(SEE PAGE 41-36)**
10. **INSTALL AIR TUBE NO.2** **(SEE PAGE 41-36)**
11. **INSTALL AIR CLEANER ASSY**
12. **CONNECT BATTERY NEGATIVE TERMINAL**

TRANSMISSION CONTROL ECU ASSY (C53A)

410JW-01

REPLACEMENT

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE GLOVE COMPARTMENT DOOR ASSY** **(SEE PUB. NO. RM1106E, PAGE 71-6)**
3. **REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2** **(SEE PUB. NO. RM1106E, PAGE 71-6)**
4. **REMOVE TRANSMISSION CONTROL ECU ASSY**

(a) Disconnect the 2 connectors.

(b) Remove the screw, bolt and transmission control ECU assy.

5. **INSTALL TRANSMISSION CONTROL ECU ASSY**

(a) Install the transmission control ECU assy with the screw and bolt.

Torque:
Bolt: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

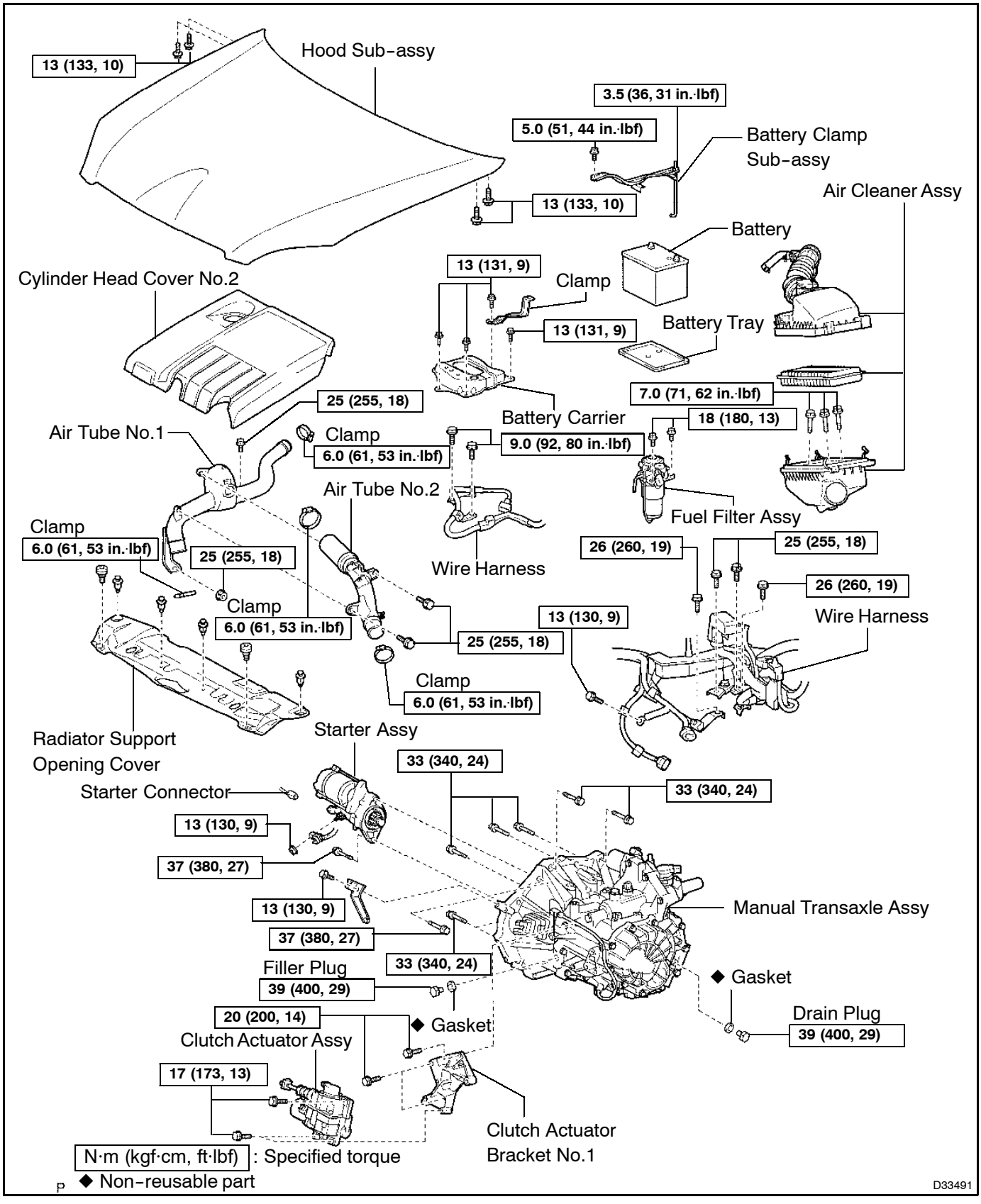
(b) Connect the 2 connectors.

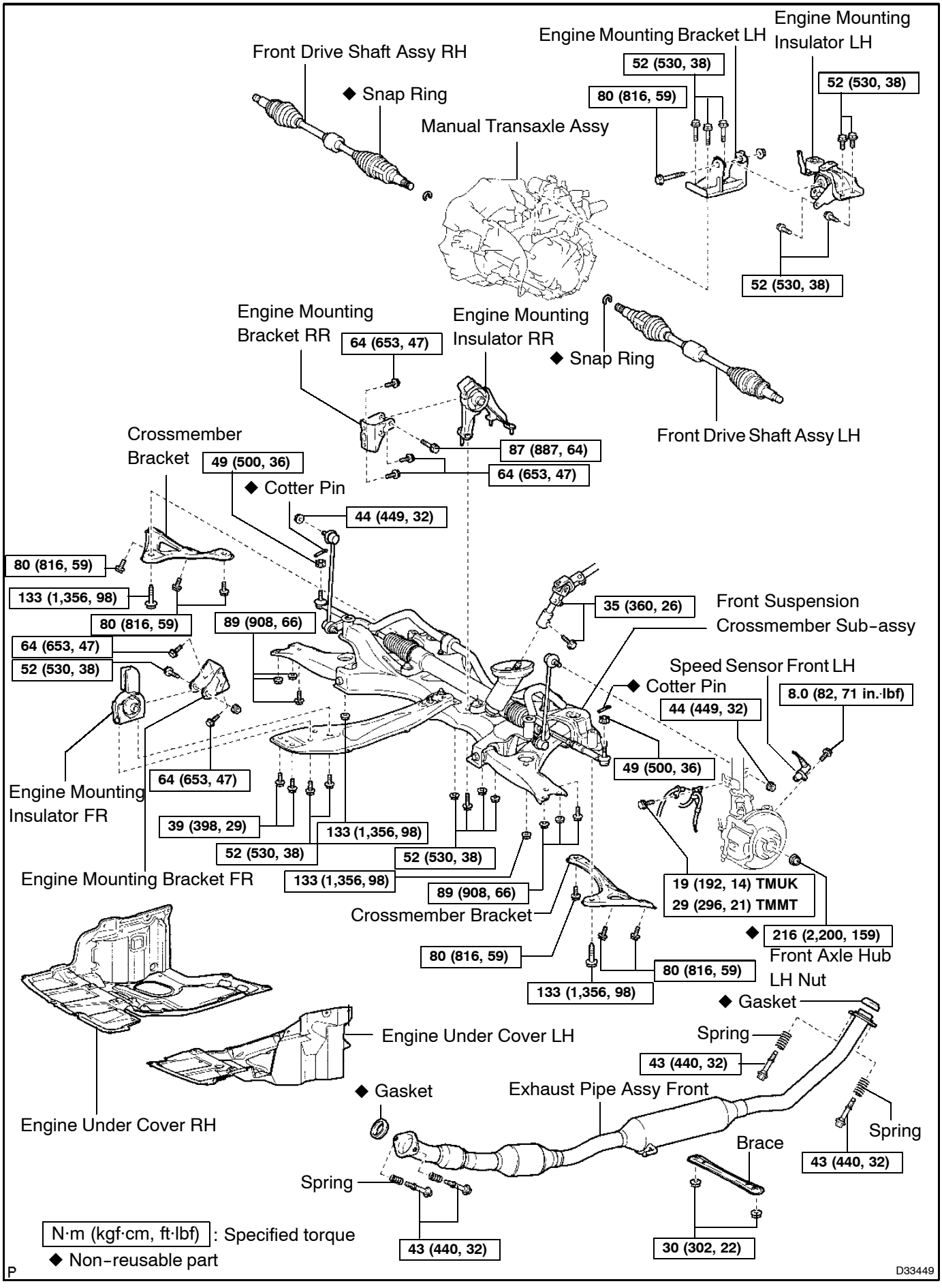
6. **INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2** **(SEE PUB. NO. RM1106E, PAGE 71-6)**
7. **INSTALL GLOVE COMPARTMENT DOOR ASSY** **(SEE PUB. NO. RM1106E, PAGE 71-6)**
8. **CONNECT BATTERY NEGATIVE TERMINAL**
9. **INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU** **(SEE PAGE 05-190)**
10. **LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM** **(SEE PAGE 05-190)**
11. **SYNCHRONIZATION POSITION CALIBRATION** **(SEE PAGE 05-196)**

MANUAL TRANSAXLE ASSY (C53A)

COMPONENTS

410H5-02




Front Drive Shaft Assy RH
◆ Snap Ring
Manual Transaxle Assy
Engine Mounting Bracket LH
Engine Mounting Insulator LH
52 (530, 38)
80 (816, 59)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket RR
64 (653, 47)
Engine Mounting Insulator RR
◆ Snap Ring
Front Drive Shaft Assy LH
87 (887, 64)
64 (653, 47)
Crossmember Bracket
49 (500, 36)
◆ Cotter Pin
44 (449, 32)
80 (816, 59)
133 (1,356, 98)
80 (816, 59)
89 (908, 66)
64 (653, 47)
52 (530, 38)
35 (360, 26)
Front Suspension Crossmember Sub-assy
Speed Sensor Front LH
◆ Cotter Pin
8.0 (82, 71 in.·lbf)
44 (449, 32)
49 (500, 36)
Engine Mounting Insulator FR
64 (653, 47)
39 (398, 29)
133 (1,356, 98)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket FR
133 (1,356, 98)
89 (908, 66)
Crossmember Bracket
19 (192, 14) TMUK
29 (296, 21) TMMT
◆ 216 (2,200, 159)
Front Axle Hub LH Nut
80 (816, 59)
80 (816, 59)
133 (1,356, 98)
◆ Gasket
Engine Under Cover LH
Spring
43 (440, 32)
Engine Under Cover RH
◆ Gasket
Exhaust Pipe Assy Front
Spring
Brace
43 (440, 32)
Spring
43 (440, 32)
30 (302, 22)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
D33449

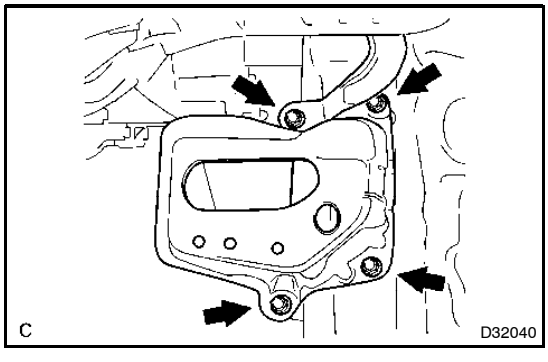
410JT-01

REPLACEMENT

1. CLUTCH POSITION ADJUSTMENT(CLUTCH CLAMP POSITION) (SEE PAGE 05-186)
2. DISCONNECT BATTERY NEGATIVE TERMINAL
3. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
4. REMOVE HORN BUTTON ASSY (SEE PUB. NO. RM1106E, PAGE 60-31)
5. REMOVE STEERING WHEEL ASSY (SEE PUB. NO. RM1106E, PAGE 50-6)
6. REMOVE COLUMN HOLE COVER SILENCER SHEET (SEE PUB. NO. RM1106E, PAGE 50-6)
7. SEPARATE STEERING INTERMEDIATE SHAFT ASSY NO.2 (RHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 50-6)
8. SEPARATE STEERING SLIDING YOKE SUB-ASSY (LHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 50-6)
9. REMOVE FRONT WHEELS
10. REMOVE ENGINE UNDER COVER LH
11. REMOVE ENGINE UNDER COVER RH
12. DRAIN TRANSAXLE OIL

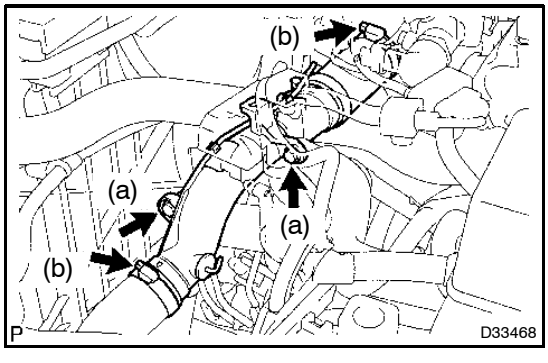
(a) Remove the filler plug and gasket.
(b) Remove the drain plug and gasket, and drain the oil.
(c) Install the drain plug with a new gasket.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

13. REMOVE HOOD SUB-ASSY
14. REMOVE RADIATOR SUPPORT OPENING COVER
15. REMOVE CYLINDER HEAD COVER NO.2
16. REMOVE AIR CLEANER ASSY
17. REMOVE BATTERY CLAMP SUB-ASSY
18. REMOVE BATTERY
19. REMOVE BATTERY TRAY



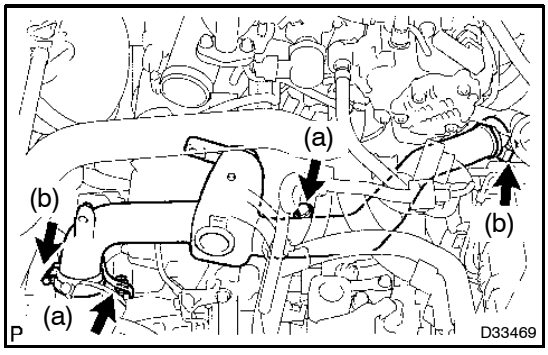
20. REMOVE BATTERY CARRIER

(a) Remove the 4 bolts, battery carrier and clamp.



21. REMOVE AIR TUBE NO.2

(a) Remove the 2 bolts from the air tube No.2.
(b) Remove the 2 clamps and air tube No.2.

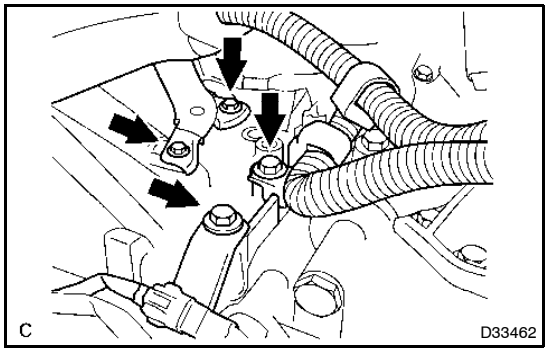


22. REMOVE AIR TUBE NO.1

(a) Remove the bolt and nut from the air tube No.1.

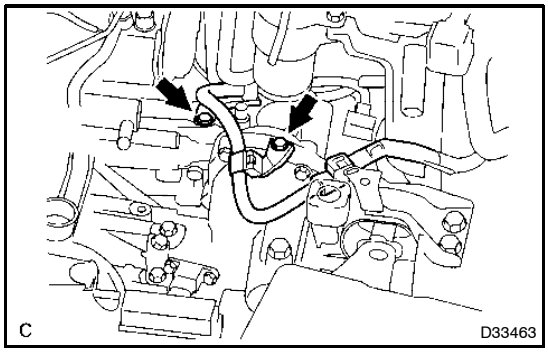
(b) Remove the 2 clamps and air tube No.1.

23. REMOVE CLUTCH ACTUATOR ASSY **(SEE PAGE 42-20)**

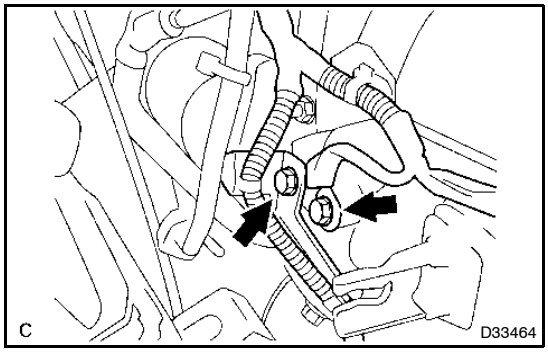


24. DISCONNECT WIRE HARNESS

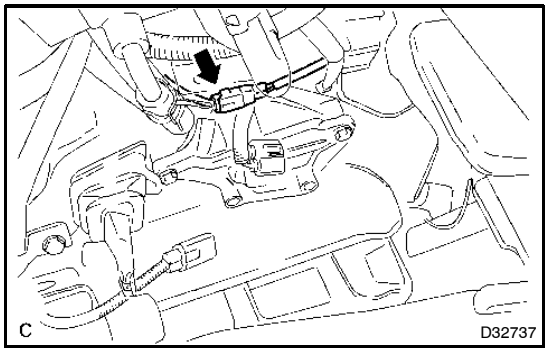
(a) Remove the 4 bolts and disconnect the 3 wire harness clamp brackets.



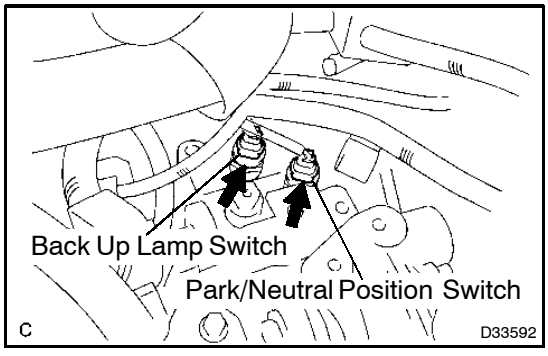
(b) Remove the 2 bolts and disconnect the 2 wire harness clamp brackets.



(c) Remove the 2 bolts and disconnect the wire harness.

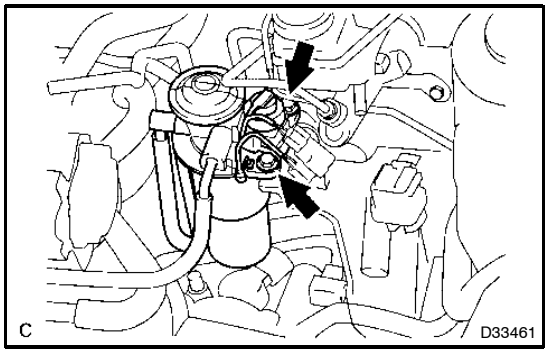


(d) Disconnect the transmission revolution sensor connector.



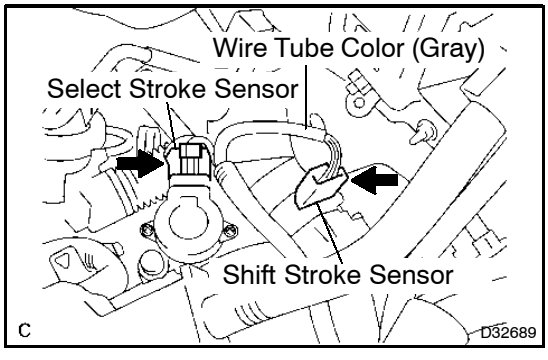
25. DISCONNECT CONNECTOR

(a) Disconnect the back up lamp switch connector and park/neutral position switch connector.



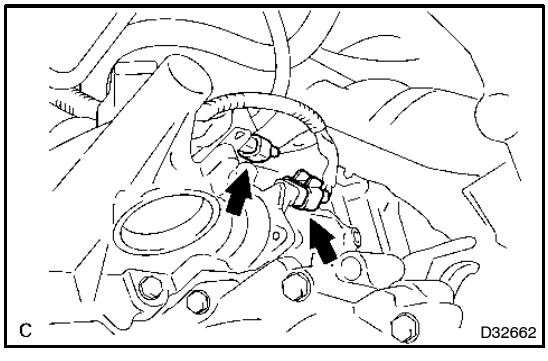
26. SEPARATE FUEL FILTER ASSY

(a) Remove the 2 bolts and disconnect the fuel filter assy.



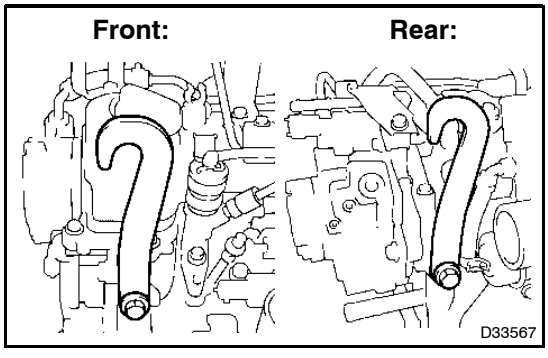
27. DISCONNECT SHIFT & SELECT ACTUATOR ASSY

(a) Disconnect the shift stroke sensor connector and select stroke sensor connector.



(b) Disconnect the 2 connectors from the shift and select actuator.

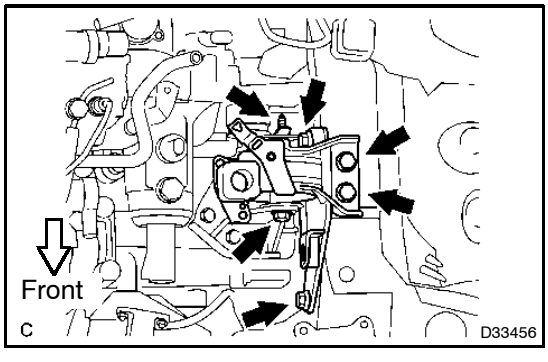
28. **REMOVE STARTER ASSY (SEE PAGE 19-3)**
29. **REMOVE FRONT DRIVE SHAFT ASSY LH (SEE PAGE 30-3)**
    SST 09520-01010, 09520-24010 (09520-32040)
30. **REMOVE FRONT DRIVE SHAFT ASSY RH (SEE PAGE 30-3)**
    SST 09520-01010, 09520-24010 (09520-32040)
31. **REMOVE EXHAUST PIPE ASSY FRONT (SEE PAGE 15-2)**



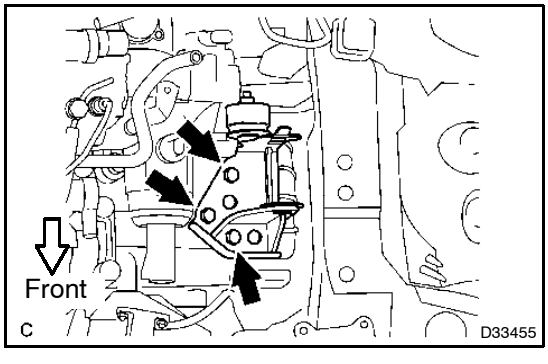
32. **SUSPEND ENGINE ASSY**
(a) Install 2 hangers in the correct direction.
Engine hanger: 12281-21010
Bolt: 91672-81025
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)
(b) Attach an engine chain hoist to the hangers.

CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.

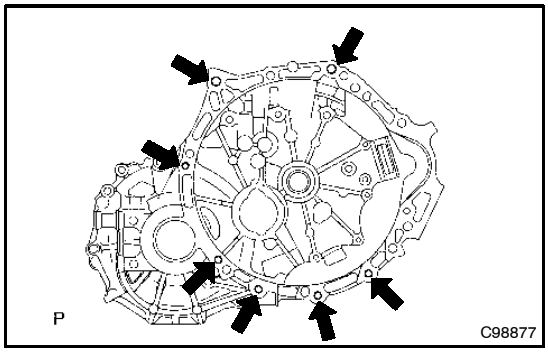
33. **REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSY (SEE PUB. No. RM925E, PAGE 51-6)**
34. **SUPPORT MANUAL TRANSAXLE ASSY**
(a) Support the transaxle with a transmission jack.



35. **REMOVE ENGINE MOUNTING INSULATOR LH**
(a) Remove the 5 bolts, nut and engine mounting insulator LH from the body.

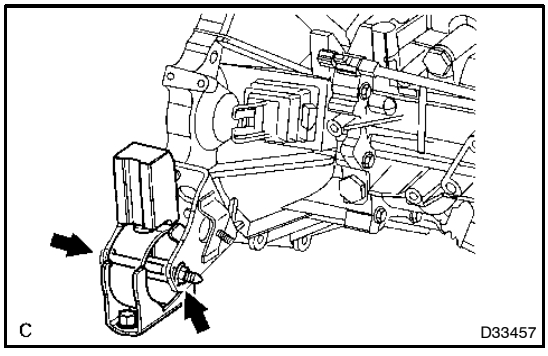


36. **REMOVE ENGINE MOUNTING BRACKET LH**
(a) Remove the 3 bolts and engine mounting bracket LH from the transaxle.



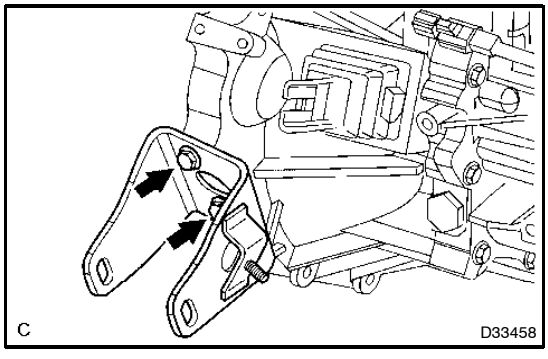
37. REMOVE MANUAL TRANSAXLE ASSY

(a) Remove the 7 bolts and transaxle from the engine.



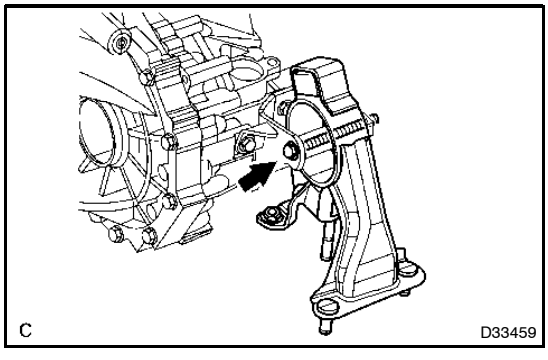
38. REMOVE ENGINE MOUNTING INSULATOR FR

(a) Remove the bolt, nut and engine mounting insulator FR from the engine mounting bracket FR.



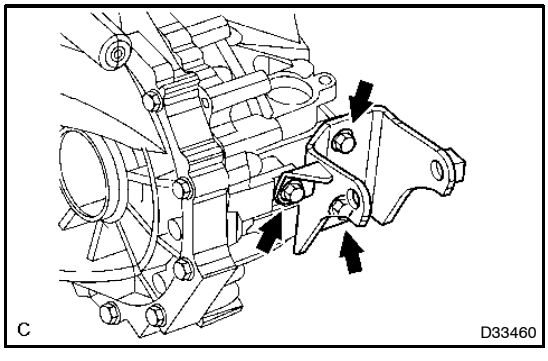
39. REMOVE ENGINE MOUNTING BRACKET FR

(a) Remove the 2 bolts and engine mounting bracket FR from the transaxle.



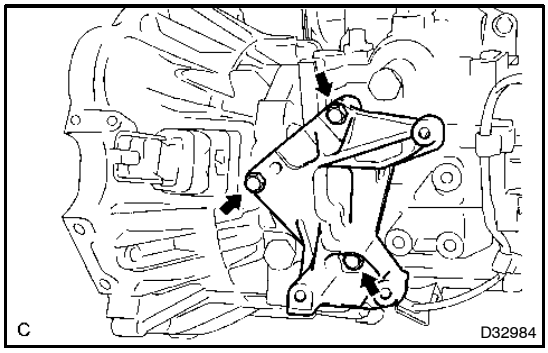
40. REMOVE ENGINE MOUNTING INSULATOR RR

(a) Remove the bolt and engine mounting insulator RR from the engine mounting bracket RR.



41. REMOVE ENGINE MOUNTING BRACKET RR

(a) Remove the 3 bolts and engine mounting bracket RR from the transaxle.



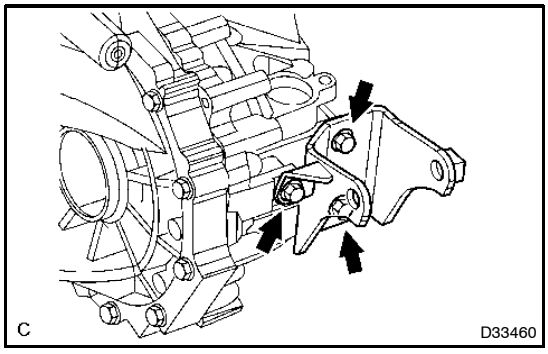
42. REMOVE CLUTCH ACTUATOR BRACKET NO.1

(a) Remove the 3 bolts and clutch actuator bracket No.1 from the transaxle.

43. INSTALL CLUTCH ACTUATOR BRACKET NO.1

(a) Install the clutch actuator bracket No.1 to the transaxle with the 3 bolts.

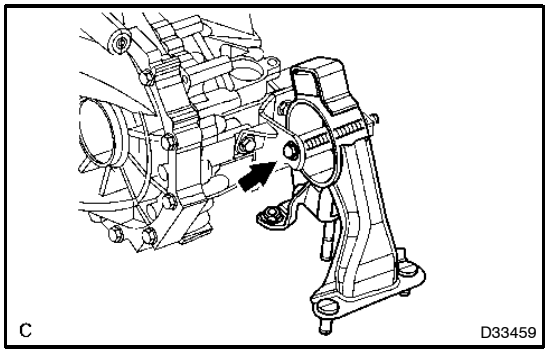
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



44. INSTALL ENGINE MOUNTING BRACKET RR

(a) Install the engine mounting bracket RR to the transaxle with the 3 bolts.

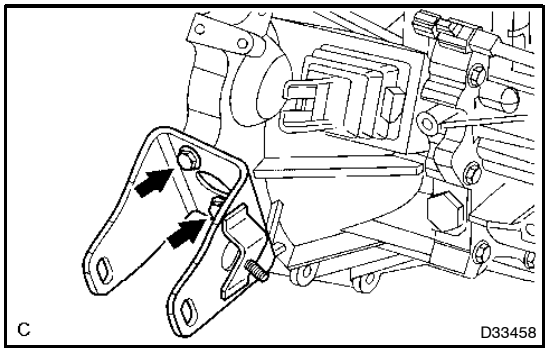
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



45. INSTALL ENGINE MOUNTING INSULATOR RR

(a) Install the engine mounting insulator RR to the engine mounting bracket RR with the bolt.

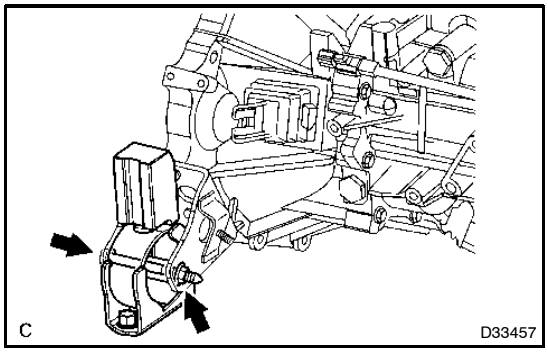
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



46. INSTALL ENGINE MOUNTING BRACKET FR

(a) Install the engine mounting bracket FR to the transaxle with the 2 bolts.

Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



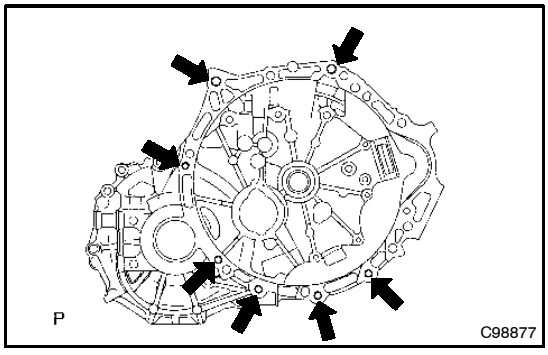
47. INSTALL ENGINE MOUNTING INSULATOR FR

(a) Install the engine mounting insulator FR to the engine mounting bracket FR with the bolt and nut.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

HINT:

Insert the bolt from the right side of the vehicle and torque the nut without turning the bolt.

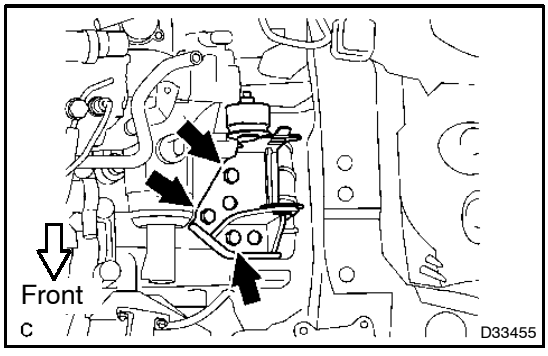


48. INSTALL MANUAL TRANSAXLE ASSY

(a) Align the input shaft with the clutch disc and install the transaxle to the engine.

(b) Install the 7 bolts.

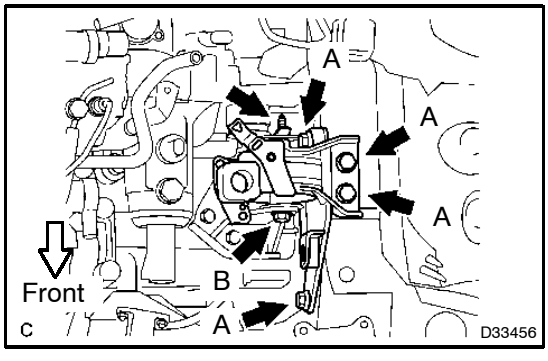
Torque: 33 N·m (340 kgf·cm, 24 ft·lbf)



49. INSTALL ENGINE MOUNTING BRACKET LH

(a) Install the engine mounting bracket LH to the transaxle with the 3 bolts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



50. INSTALL ENGINE MOUNTING INSULATOR LH

(a) Install the engine mounting insulator LH with the 5 bolts and nut.

Torque:

Bolt A: 52 N·m (530 kgf·cm, 38 ft·lbf)

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

HINT:

Insert the bolt from the front side of the vehicle.

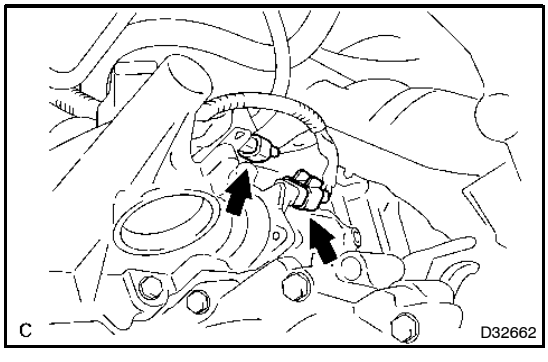
51. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSY
(SEE PUB. No. RM925E, PAGE 51-6)
SST 09670-00010

52. INSTALL EXHAUST PIPE ASSY FRONT (SEE PAGE 15-2)

53. INSTALL FRONT DRIVE SHAFT ASSY LH (SEE PAGE 30-3)

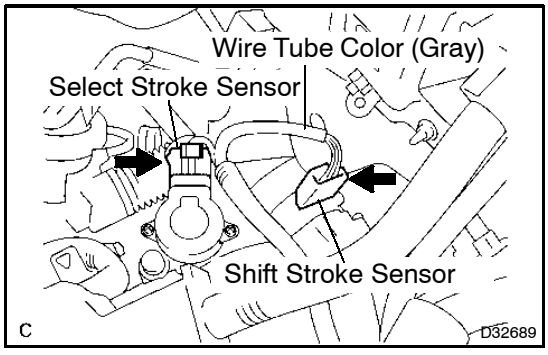
54. INSTALL FRONT DRIVE SHAFT ASSY RH (SEE PAGE 30-3)

55. INSTALL STARTER ASSY (SEE PAGE 19-3)

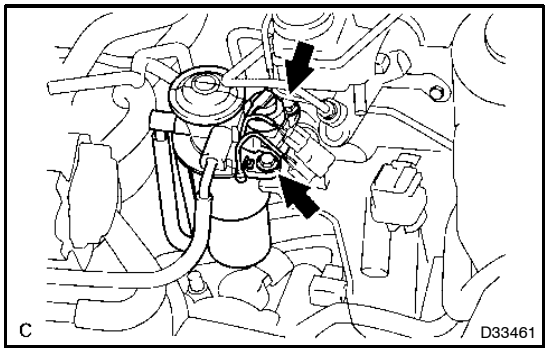


56. CONNECT SHIFT & SELECT ACTUATOR ASSY

(a) Connect the 2 connectors to the shift and select actuator.

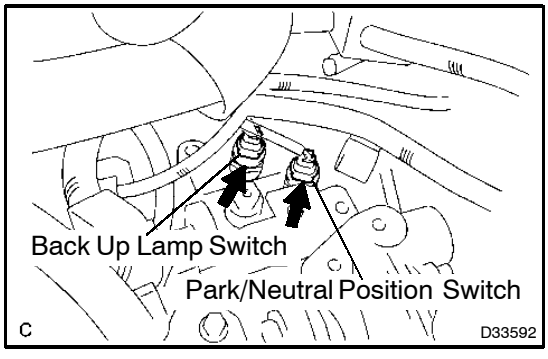


(b) Connect the shift stroke sensor connector and select stroke sensor connector.



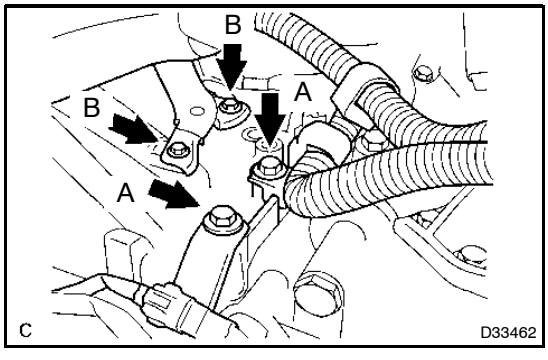
57. INSTALL FUEL FILTER ASSY

(a) Install the fuel filter assy with the 2 bolts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



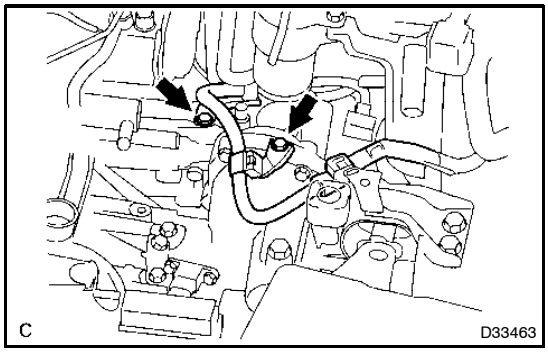
58. CONNECT CONNECTOR

(a) Connect the back up lamp switch connector and park/neutral position switch connector.

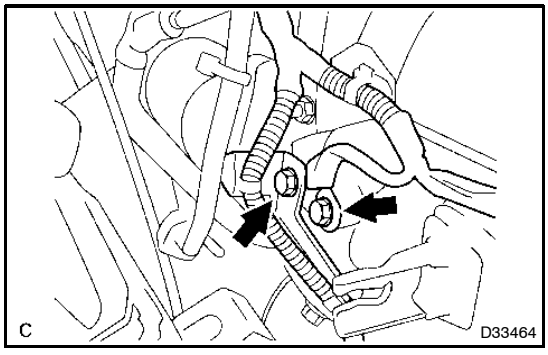


59. CONNECT WIRE HARNESS

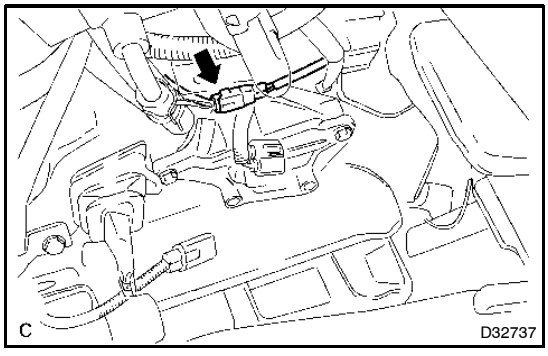
(a) Install the 3 wire harness clamp brackets to the transaxle with the 4 bolts.
Torque:
Bolt A: 26 N·m (260 kgf·cm, 19 ft·lbf)
Bolt B: 25 N·m (255 kgf·cm, 18 ft·lbf)



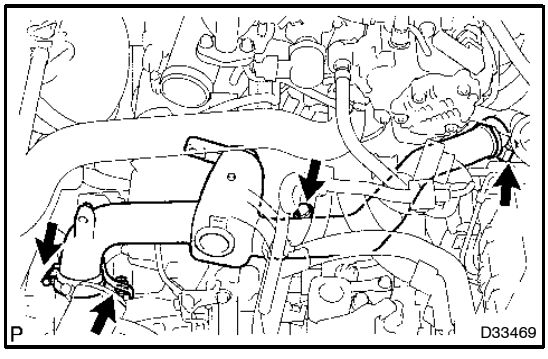
(b) Install the 2 wire harness clamp brackets to the transaxle with the 2 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



(c) Install the 2 wire harness to the transaxle with the 2 bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

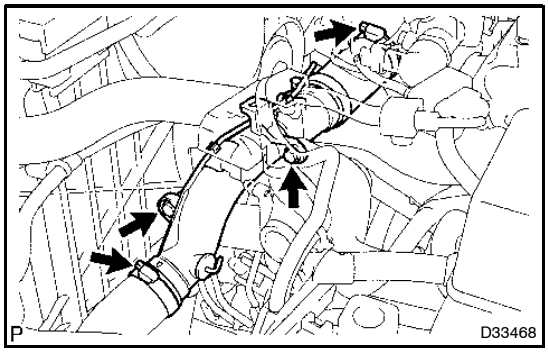


(d) Connect the transmission revolution sensor connector.



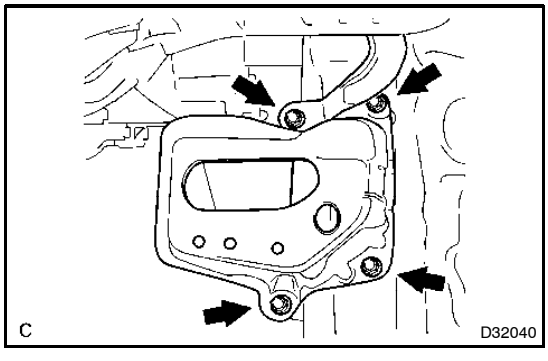
60. INSTALL AIR TUBE NO.1

(a) Install the air tube No.1 with the bolt, nut and 2 clamps as shown in the illustration.
Torque:
Bolt, Nut: 25 N·m (255 kgf·cm, 18 ft·lbf)
Clamp: 6.0 N·m (61 kgf·cm, 53 in.·lbf)



61. INSTALL AIR TUBE NO.2

(a) Install the air tube No.2 with the 2 bolts and 2 clamps as shown in the illustration.
Torque:
Bolt: 25 N·m (255 kgf·cm, 18 ft·lbf)
Clamp: 6.0 N·m (61 kgf·cm, 53 in.·lbf)



62. INSTALL BATTERY CARRIER

(a) Install the battery carrier and clamp with the 4 bolts.
Torque: 13 N·m (131 kgf·cm, 9 ft·lbf)

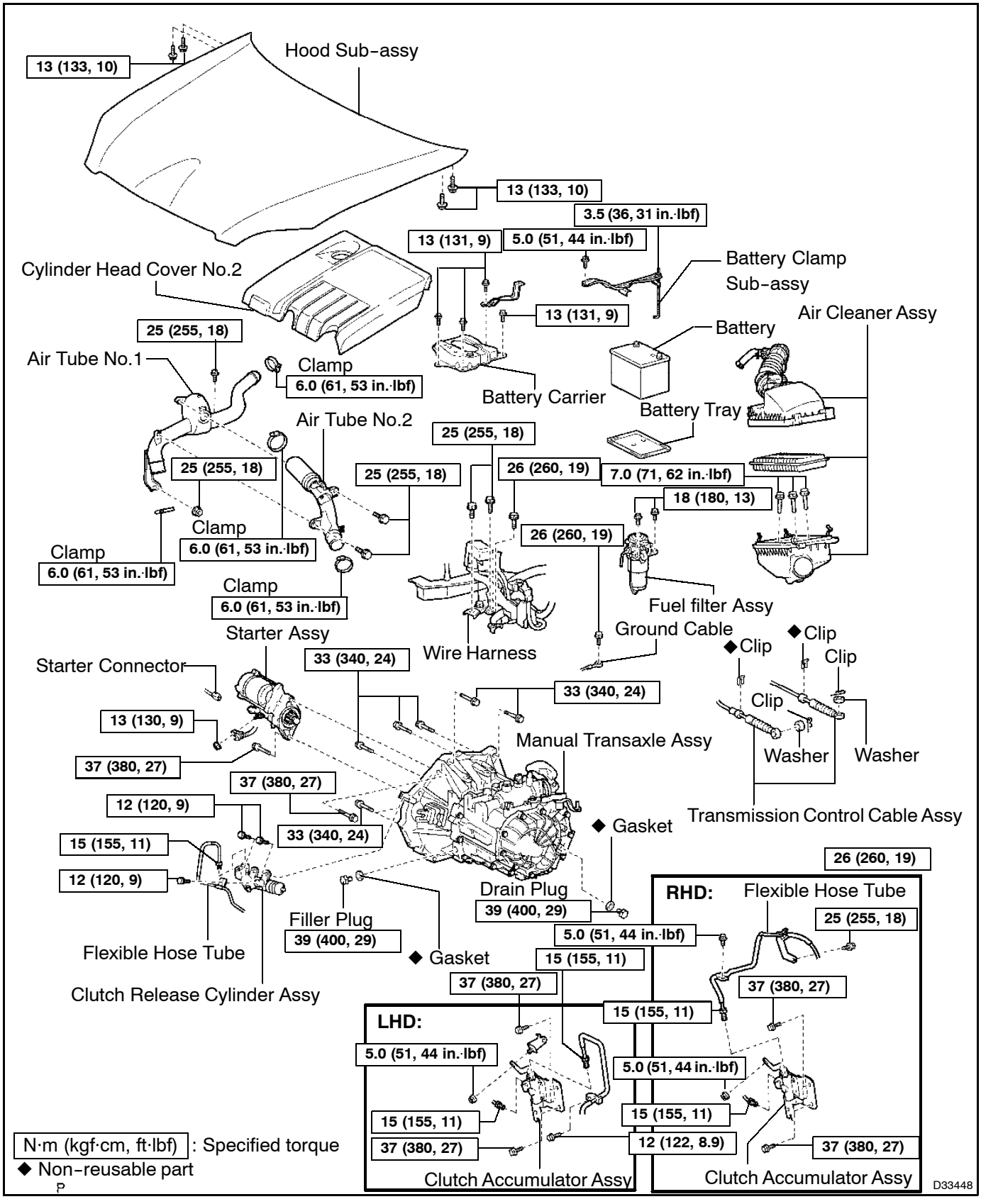
63. INSTALL BATTERY TRAY
64. INSTALL BATTERY
65. INSTALL BATTERY CLAMP SUB-ASSY
    Torque:
    Bolt: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
    Nut: 3.5 N·m (36 kgf·cm, 31 in.·lbf)
66. INSTALL CLUTCH ACTUATOR ASSY (SEE PAGE 42-20)
67. INSTALL AIR CLEANER ASSY
68. INSTALL CYLINDER HEAD COVER NO.2
69. INSTALL RADIATOR SUPPORT OPENING COVER
70. INSTALL HOOD SUB-ASSY
    Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)
71. INSPECT HOOD SUB-ASSY (SEE PUB. No. RM925E, PAGE 75-1)
72. ADJUST HOOD SUB-ASSY (SEE PUB. No. RM925E, PAGE 75-1)
73. ADD MANUAL TRANSAXLE OIL (SEE PAGE 41-5)
74. INSPECT MANUAL TRANSAXLE OIL (SEE PAGE 41-4)
75. INSTALL FRONT WHEELS
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
76. INSTALL STEERING COLUMN HOLE COVER SUB-ASSY NO.1
    (SEE PUB. NO. RM1106E, PAGE 50-6)
77. CONNECT STEERING INTERMEDIATE SHAFT ASSY NO.2 (RHD STEERING POSITION TYPE)
    (SEE PUB. NO. RM1106E, PAGE 50-6)
78. CONNECT STEERING SLIDING YOKE SUB-ASSY (LHD STEERING POSITION TYPE)
    (SEE PUB. NO. RM1106E, PAGE 50-6)
79. INSTALL COLUMN HOLE COVER SILENCER SHEET (SEE PUB. NO. RM1106E, PAGE 50-6)
80. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
81. CENTER SPIRAL CABLE (SEE PUB. NO. RM1106E, PAGE 60-40)
82. INSTALL STEERING WHEEL ASSY (SEE PUB. NO. RM1106E, PAGE 50-6)
83. INSPECT STEERING WHEEL CENTER POINT
84. INSTALL HORN BUTTON ASSY (SEE PUB. NO. RM1106E, PAGE 60-31)
85. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (SEE PUB. NO. RM1106E, PAGE 26-1)
86. INSTALL ENGINE UNDER COVER LH
87. INSTALL ENGINE UNDER COVER RH
88. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU (SEE PAGE 05-190)
89. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (SEE PAGE 05-190)
90. SYNCHRONIZATION POSITION CALIBRATION (SEE PAGE 05-196)
91. CHECK ABS SPEED SENSOR SIGNAL

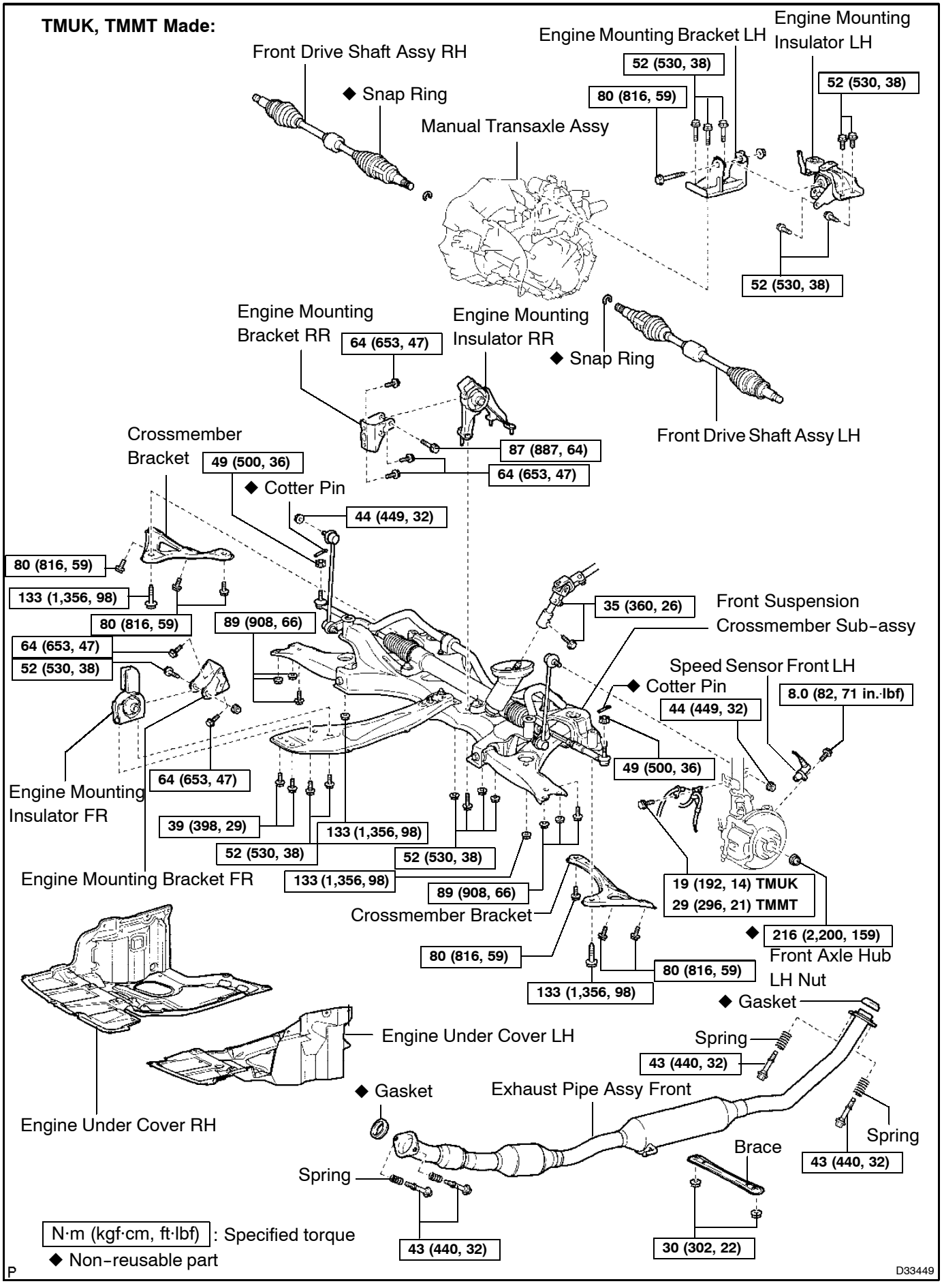
(a) w/ VSC (See pub. No. RM925E, page 05-666)
(b) w/o VSC (See pub. No. RM925E, page 05-614)

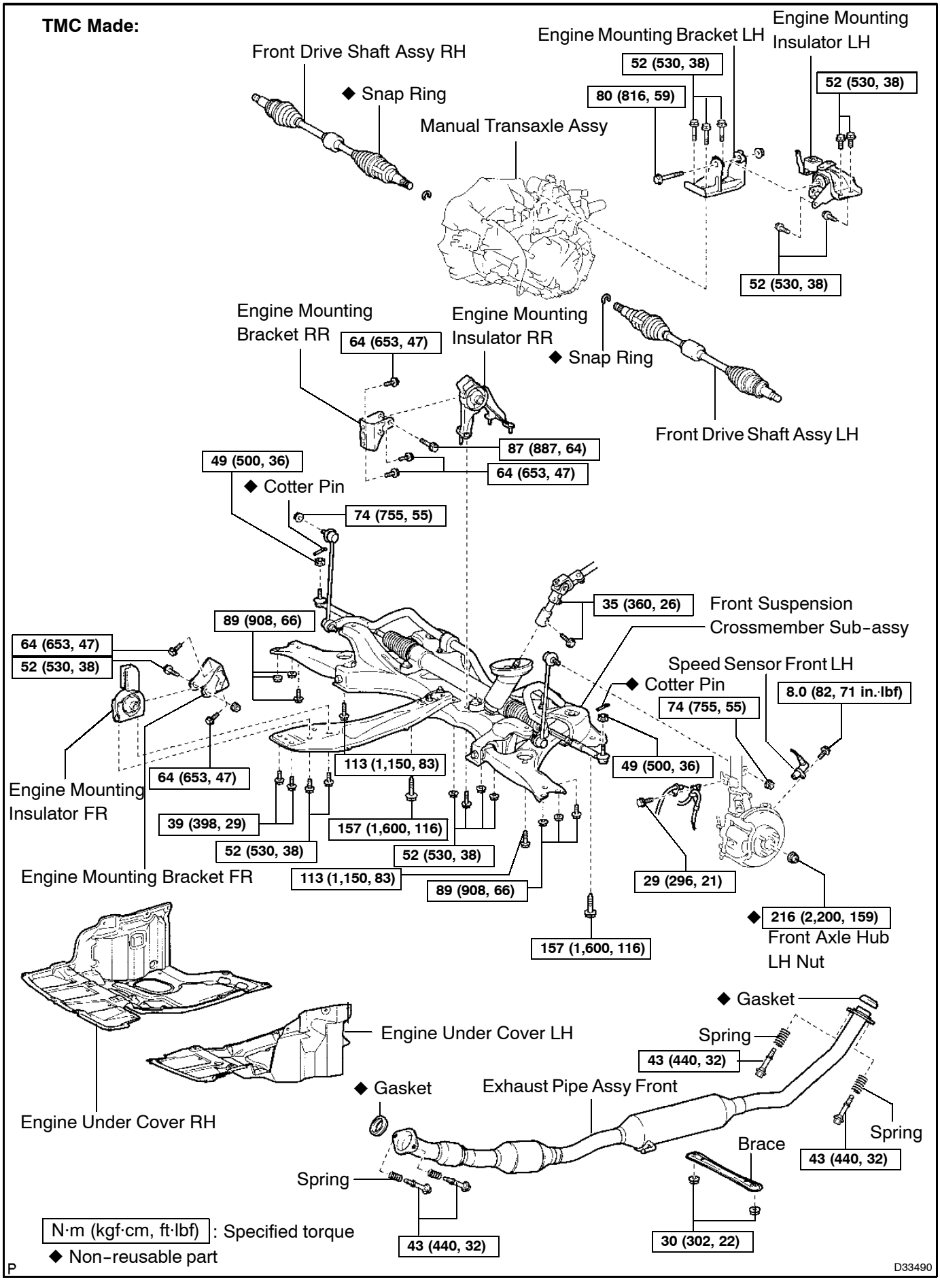
MANUAL TRANSAXLE ASSY (C53)

COMPONENTS

4105W-04




TMUK, TMMT Made:
Front Drive Shaft Assy RH
◆ Snap Ring
Manual Transaxle Assy
Engine Mounting Bracket LH
Engine Mounting Insulator LH
52 (530, 38)
80 (816, 59)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket RR
64 (653, 47)
Engine Mounting Insulator RR
◆ Snap Ring
Front Drive Shaft Assy LH
87 (887, 64)
64 (653, 47)
Crossmember Bracket
49 (500, 36)
◆ Cotter Pin
44 (449, 32)
80 (816, 59)
133 (1,356, 98)
80 (816, 59)
89 (908, 66)
64 (653, 47)
52 (530, 38)
35 (360, 26)
Front Suspension Crossmember Sub-assy
Speed Sensor Front LH
◆ Cotter Pin
8.0 (82, 71 in.·lbf)
44 (449, 32)
49 (500, 36)
Engine Mounting Insulator FR
64 (653, 47)
39 (398, 29)
133 (1,356, 98)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket FR
133 (1,356, 98)
89 (908, 66)
Crossmember Bracket
19 (192, 14) TMUK
29 (296, 21) TMMT
◆ 216 (2,200, 159)
Front Axle Hub LH Nut
80 (816, 59)
80 (816, 59)
133 (1,356, 98)
◆ Gasket
Engine Under Cover LH
Spring
43 (440, 32)
Engine Under Cover RH
◆ Gasket
Exhaust Pipe Assy Front
Spring
43 (440, 32)
Brace
Spring
43 (440, 32)
30 (302, 22)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
D33449


TMC Made:
Front Drive Shaft Assy RH
◆ Snap Ring
Manual Transaxle Assy
Engine Mounting Bracket LH
Engine Mounting Insulator LH
52 (530, 38)
80 (816, 59)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket RR
64 (653, 47)
Engine Mounting Insulator RR
◆ Snap Ring
Front Drive Shaft Assy LH
87 (887, 64)
64 (653, 47)
49 (500, 36)
◆ Cotter Pin
74 (755, 55)
89 (908, 66)
35 (360, 26)
Front Suspension Crossmember Sub-assy
64 (653, 47)
52 (530, 38)
Speed Sensor Front LH
◆ Cotter Pin
8.0 (82, 71 in.·lbf)
74 (755, 55)
49 (500, 36)
64 (653, 47)
113 (1,150, 83)
Engine Mounting Insulator FR
39 (398, 29)
157 (1,600, 116)
52 (530, 38)
52 (530, 38)
Engine Mounting Bracket FR
113 (1,150, 83)
89 (908, 66)
29 (296, 21)
◆ 216 (2,200, 159)
Front Axle Hub LH Nut
157 (1,600, 116)
◆ Gasket
Engine Under Cover LH
Spring
43 (440, 32)
Engine Under Cover RH
◆ Gasket
Exhaust Pipe Assy Front
Spring
43 (440, 32)
Brace
Spring
43 (440, 32)
30 (302, 22)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P
D33490

410JS-01

REPLACEMENT

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

2. REMOVE HORN BUTTON ASSY

(a) TMC made (See pub. No. RM1106E, page 60-21)

(b) TMUK, TMMT made (See pub. No. RM1106E, page 60-31)

3. REMOVE STEERING WHEEL ASSY (SEE PUB. NO. RM1106E, PAGE 50-6)

4. REMOVE COLUMN HOLE COVER SILENCER SHEET (SEE PUB. NO. RM1106E, PAGE 50-6)

5. SEPARATE STEERING INTERMEDIATE SHAFT ASSY NO.2 (RHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 50-6)

6. SEPARATE STEERING SLIDING YOKE SUB-ASSY (LHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 50-6)

7. REMOVE FRONT WHEELS

8. REMOVE ENGINE UNDER COVER LH

9. REMOVE ENGINE UNDER COVER RH

10. DRAIN TRANSAXLE OIL

(a) Remove the filler plug and gasket.

(b) Remove the drain plug and gasket, and drain the oil.

(c) Install the drain plug with a new gasket.

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

11. REMOVE HOOD SUB-ASSY

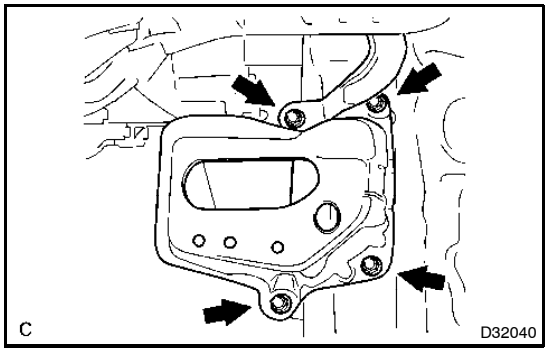
12. REMOVE CYLINDER HEAD COVER NO.2

13. REMOVE AIR CLEANER ASSY

14. REMOVE BATTERY CLAMP SUB-ASSY

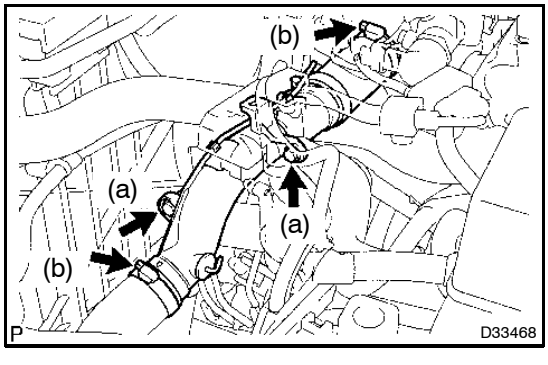
15. REMOVE BATTERY

16. REMOVE BATTERY TRAY



17. REMOVE BATTERY CARRIER

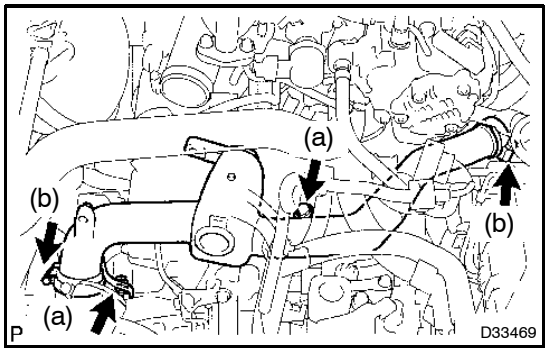
(a) Remove the 4 bolts, battery carrier and clamp.



18. REMOVE AIR TUBE NO.2

(a) Remove the 2 bolts from the air tube No.2.

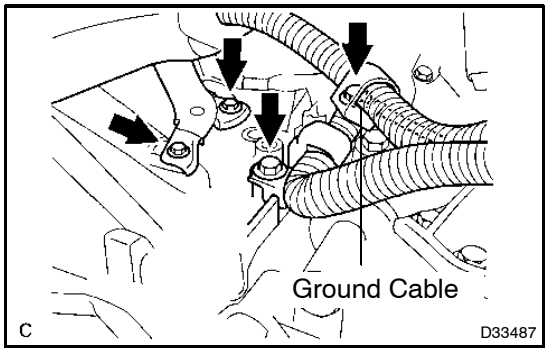
(b) Remove the 2 clamps and air tube No.2.



19. REMOVE AIR TUBE NO.1

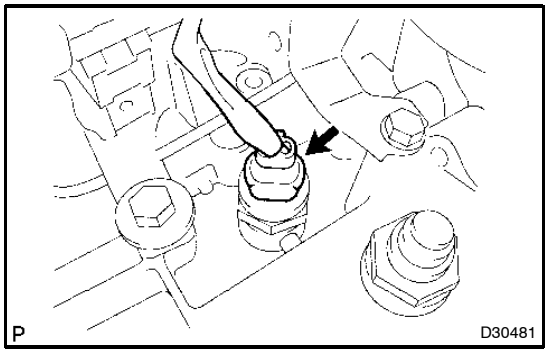
(a) Remove the bolt and nut from the air tube No.1.

(b) Remove the 2 clamps and air tube No.1.



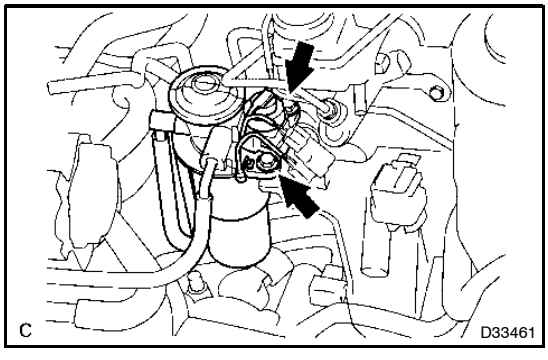
20. DISCONNECT WIRE HARNESS

(a) Remove the 4 bolts and disconnect the 2 wire harness clamp brackets and ground cable.



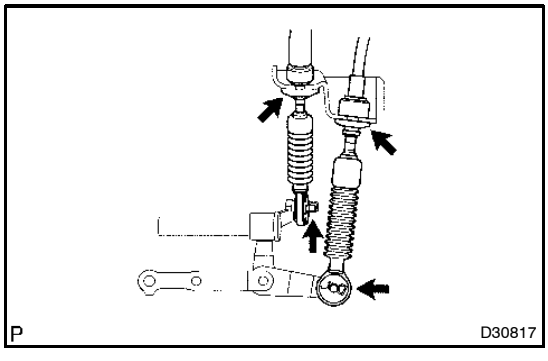
21. DISCONNECT CONNECTOR

(a) Disconnect the back up lamp switch connector.



22. SEPARATE FUEL FILTER ASSY

(a) Remove the 2 bolts and disconnect the fuel filter assy.



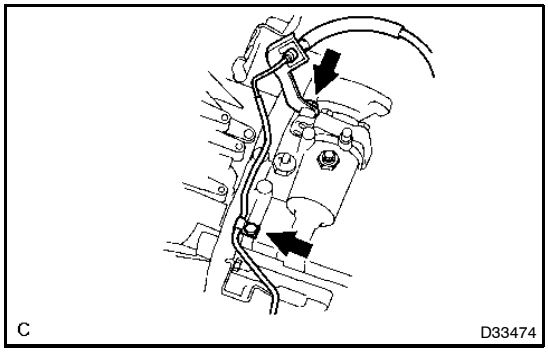
23. SEPARATE TRANSMISSION CONTROL CABLE ASSY

(a) Remove the 2 clips and the 2 washers, and disconnect the 2 cables from the transaxle.

(b) Remove the 2 clips, and disconnect the 2 cables from the control cable bracket.

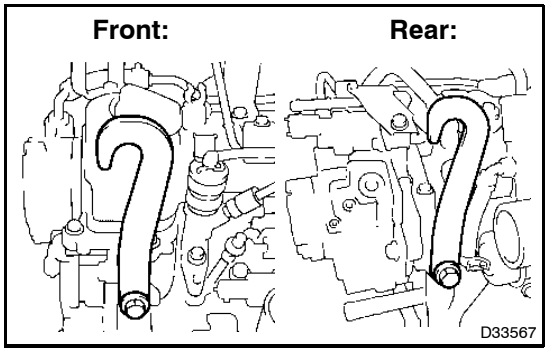
24. REMOVE CLUTCH ACCUMULATOR ASSY (SEE PAGE 42-26)
SST 09023-00101

25. REMOVE CLUTCH RELEASE CYLINDER ASSY (SEE PAGE 42-17)
SST 09023-00101



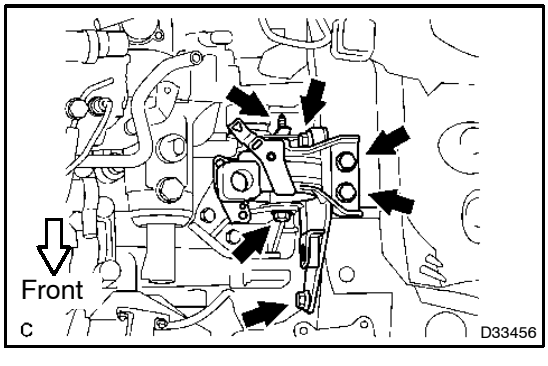
26. SEPARATE CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE (RHD STEERING POSITION TYPE)
(a) Remove the 2 bolts and separate the flexible hose tube.

27. REMOVE STARTER ASSY (SEE PAGE 19-3)
28. REMOVE FRONT DRIVE SHAFT ASSY LH (SEE PAGE 30-3)
SST 09520-01010, 09520-24010 (09520-32040)
29. REMOVE FRONT DRIVE SHAFT ASSY RH (SEE PAGE 30-3)
SST 09520-01010, 09520-24010 (09520-32040)
30. REMOVE EXHAUST PIPE ASSY FRONT (SEE PAGE 15-2)

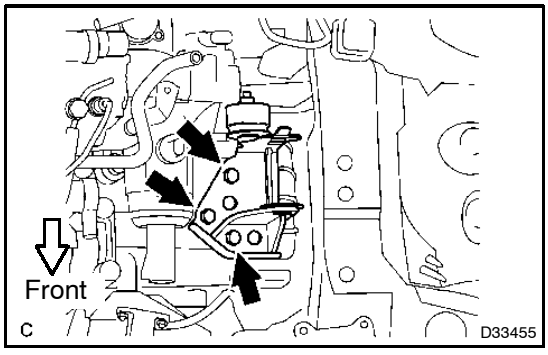


31. SUSPEND ENGINE ASSY
(a) Install 2 hangers in the correct direction.
Engine hanger: 12281-21010
Bolt: 91672-81025
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)
(b) Attach an engine chain hoist to the hangers.
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.

32. REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSY (SEE PUB. No. RM925E, PAGE 51-6)
33. SUPPORT MANUAL TRANSAXLE ASSY
(a) Support the transaxle with a transmission jack.

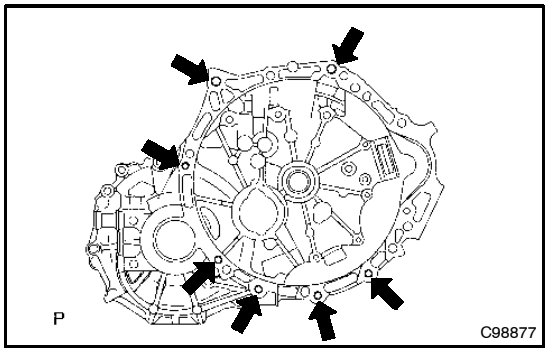


34. REMOVE ENGINE MOUNTING INSULATOR LH
(a) Remove the 5 bolts, nut and engine mounting insulator LH from the body.



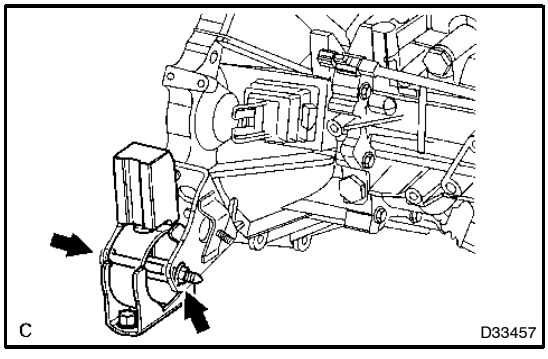
35. REMOVE ENGINE MOUNTING BRACKET LH

(a) Remove the 3 bolts and engine mounting bracket LH from the transaxle.



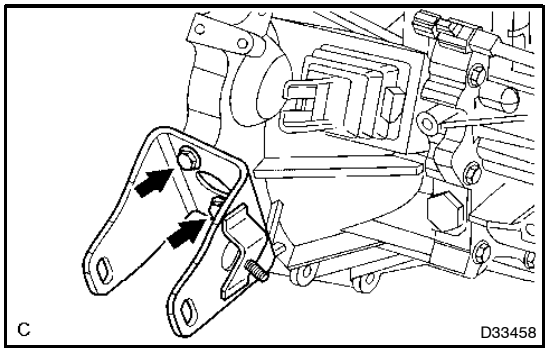
36. REMOVE MANUAL TRANSAXLE ASSY

(a) Remove the 7 bolts and transaxle from the engine.



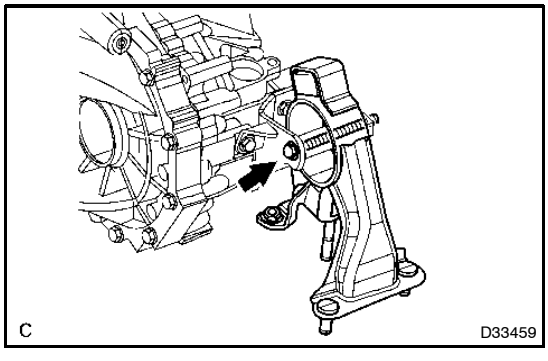
37. REMOVE ENGINE MOUNTING INSULATOR FR

(a) Remove the bolt, nut and engine mounting insulator FR from the engine mounting bracket FR.



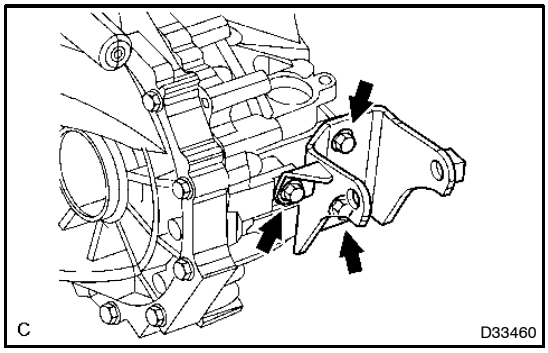
38. REMOVE ENGINE MOUNTING BRACKET FR

(a) Remove the 2 bolts and engine mounting bracket FR from the transaxle.



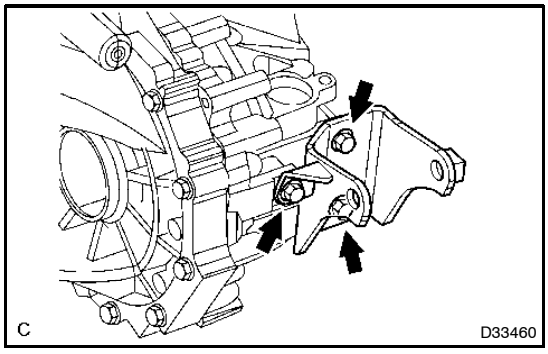
39. REMOVE ENGINE MOUNTING INSULATOR RR

(a) Remove the bolt and engine mounting insulator RR from the engine mounting bracket RR.



40. REMOVE ENGINE MOUNTING BRACKET RR

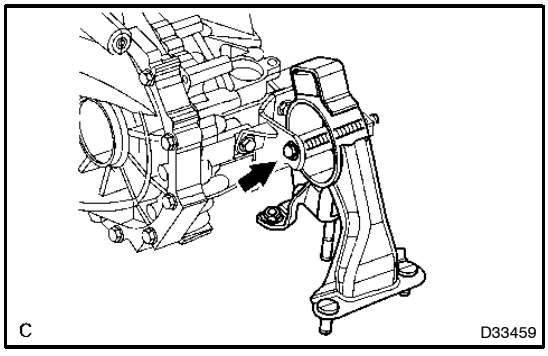
(a) Remove the 3 bolts and engine mounting bracket RR from the transaxle.



41. INSTALL ENGINE MOUNTING BRACKET RR

(a) Install the engine mounting bracket RR to the transaxle with the 3 bolts.

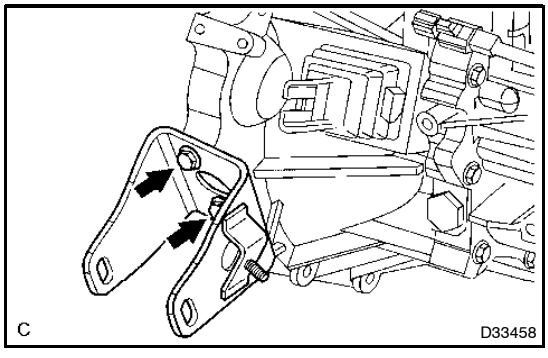
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



42. INSTALL ENGINE MOUNTING INSULATOR RR

(a) Install the engine mounting insulator RR to the engine mounting bracket RR with the bolt.

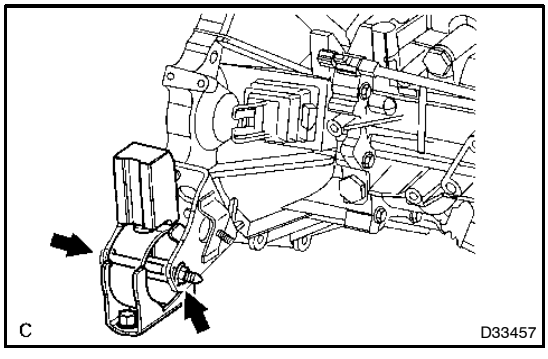
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



43. INSTALL ENGINE MOUNTING BRACKET FR

(a) Install the engine mounting bracket FR to the transaxle with the 2 bolts.

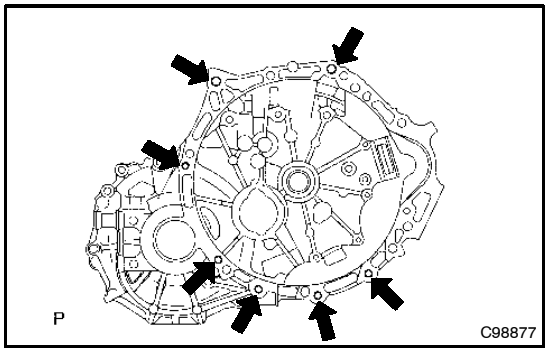
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



44. INSTALL ENGINE MOUNTING INSULATOR FR

(a) Install the engine mounting insulator FR to the engine mounting bracket FR with the bolt and nut.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

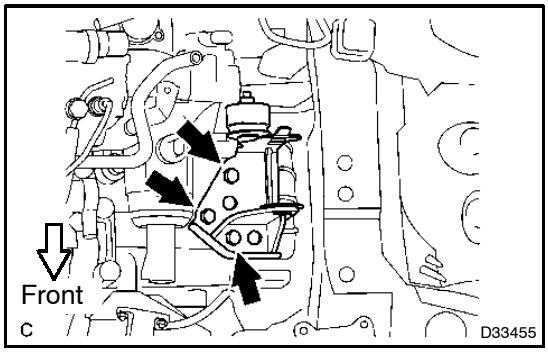


45. INSTALL MANUAL TRANSAXLE ASSY

(a) Align the input shaft with the clutch disc and install the transaxle to the engine.

(b) Install the 7 bolts.

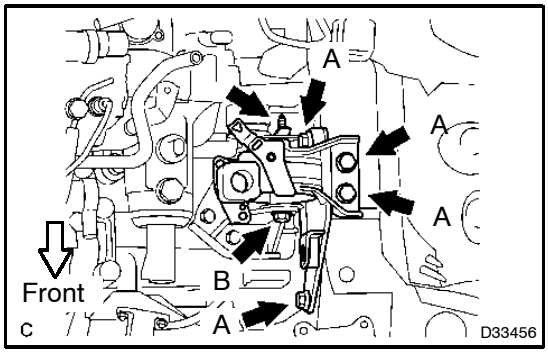
Torque: 33 N·m (340 kgf·cm, 24 ft·lbf)



46. INSTALL ENGINE MOUNTING BRACKET LH

(a) Install the engine mounting bracket LH to the transaxle with the 3 bolts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



47. INSTALL ENGINE MOUNTING INSULATOR LH

(a) Install the engine mounting insulator LH with the 5 bolts and nut.

Torque:

Bolt A: 52 N·m (530 kgf·cm, 38 ft·lbf)

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

HINT:

Insert the bolt from the front side of the vehicle and torque the bolt without turning the nut.

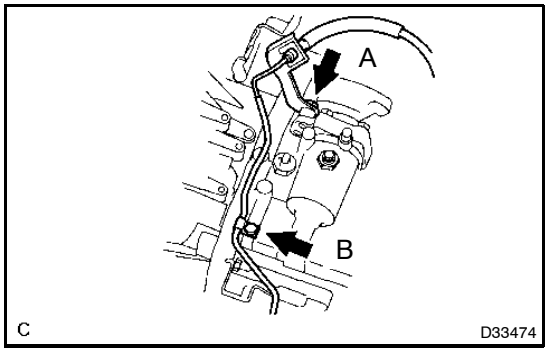
48. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSY
(SEE PUB. No. RM925E, PAGE 51-6)
SST 09670-00010

49. INSTALL EXHAUST PIPE ASSY FRONT (SEE PAGE 15-2)

50. INSTALL FRONT DRIVE SHAFT ASSY LH (SEE PAGE 30-3)

51. INSTALL FRONT DRIVE SHAFT ASSY RH (SEE PAGE 30-3)

52. INSTALL STARTER ASSY (SEE PAGE 19-3)



53. CONNECT CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE (RHD STEERING POSITION TYPE)

(a) Install the flexible hose tube with the 2 bolts.

Torque:

Bolt A: 25 N·m (255 kgf·cm, 18 ft·lbf)

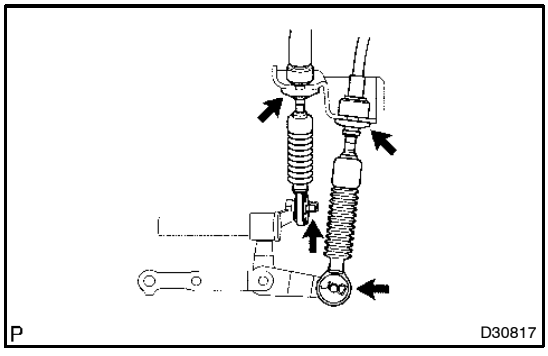
Bolt B: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

54. INSTALL CLUTCH RELEASE CYLINDER ASSY **(SEE PAGE 42-17)**

SST 09023-00101

55. INSTALL CLUTCH ACCUMULATOR ASSY **(SEE PAGE 42-26)**

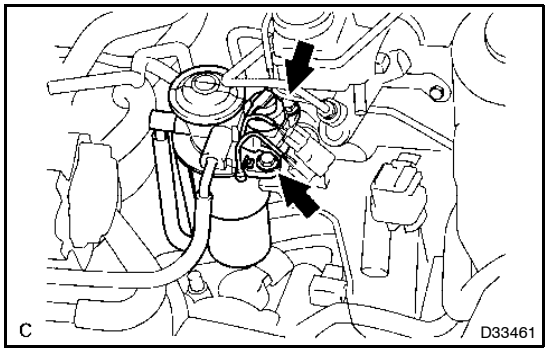
SST 09023-00101



56. CONNECT TRANSMISSION CONTROL CABLE ASSY

(a) Connect the 2 cable ends, and install the 2 washers and the 2 clips.

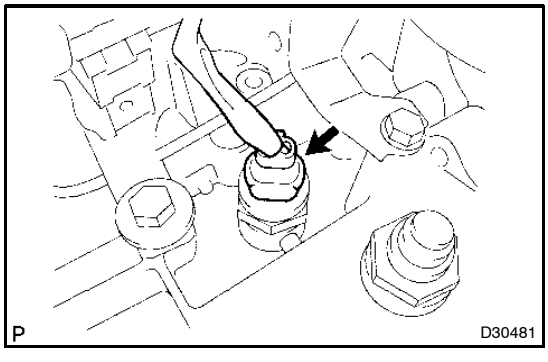
(b) Install 2 new clips on the control cable bracket.



57. INSTALL FUEL FILTER ASSY

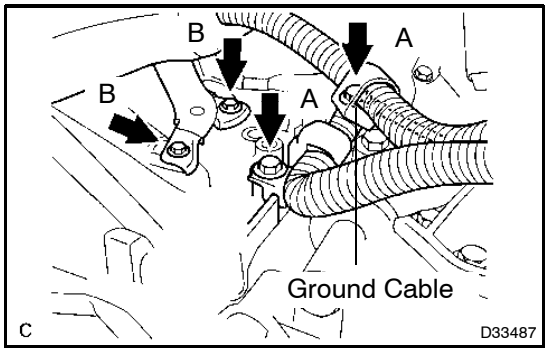
(a) Install the fuel filter assy with the 2 bolts.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



58. CONNECT CONNECTOR

(a) Connect the back up lamp switch connector.



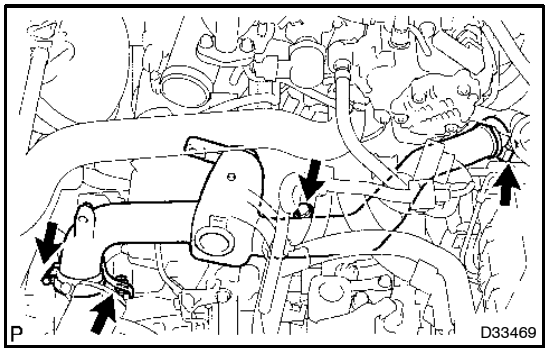
59. CONNECT WIRE HARNESS

(a) Install the 2 wire harness clamp brackets and ground cable to the transaxle with the 4 bolts.

Torque:

Bolt A: 26 N·m (260 kgf·cm, 19 ft·lbf)

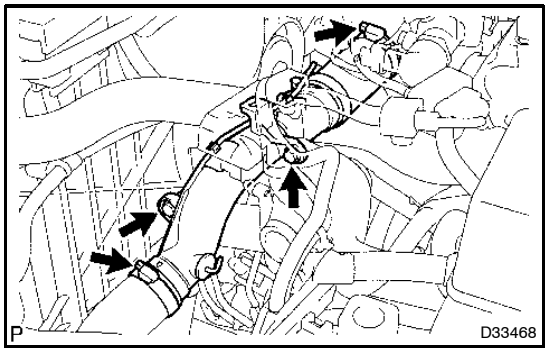
Bolt B: 25 N·m (255 kgf·cm, 18 ft·lbf)



60. INSTALL AIR TUBE NO.1

(a) Install the air tube No.1 with the bolt, nut and 2 clamps as shown in the illustration.

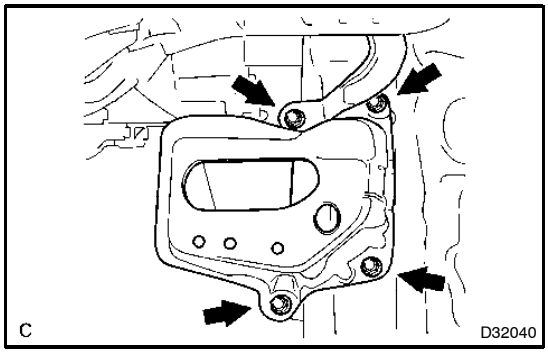
Torque:
Bolt: 25 N·m (255 kgf·cm, 18 ft·lbf)
Clamp: 6.0 N·m (61 kgf·cm, 53 in.·lbf)



61. INSTALL AIR TUBE NO.2

(a) Install the air tube No.2 with the 2 bolts and 2 clamps as shown in the illustration.

Torque:
Bolt: 25 N·m (255 kgf·cm, 18 ft·lbf)
Clamp: 6.0 N·m (61 kgf·cm, 53 in.·lbf)



62. INSTALL BATTERY CARRIER

(a) Install the battery carrier and clamp with the 4 bolts.

Torque: 13 N·m (131 kgf·cm, 9 ft·lbf)

63. INSTALL BATTERY TRAY
64. INSTALL BATTERY
65. INSTALL BATTERY CLAMP SUB-ASSY
Torque:
Bolt: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
Nut: 3.5 N·m (36 kgf·cm, 31 in.·lbf)
66. INSTALL AIR CLEANER ASSY
67. INSTALL CYLINDER HEAD COVER NO.2
68. INSTALL HOOD SUB-ASSY
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)
69. INSPECT HOOD SUB-ASSY (SEE PUB. No. RM925E, PAGE 75-1)
70. ADJUST HOOD SUB-ASSY (SEE PUB. No. RM925E, PAGE 75-1)
71. ADD MANUAL TRANSAXLE OIL (SEE PAGE 41-5)
72. INSPECT MANUAL TRANSAXLE OIL (SEE PAGE 41-4)
73. INSTALL FRONT WHEELS
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
74. INSTALL STEERING COLUMN HOLE COVER SUB-ASSY NO.1
(SEE PUB. NO. RM1106E, PAGE 50-6)
75. CONNECT STEERING INTERMEDIATE SHAFT ASSY NO.2 (RHD STEERING POSITION TYPE)
(SEE PUB. NO. RM1106E, PAGE 50-6)

76. CONNECT STEERING SLIDING YOKE SUB-ASSY (LHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 50-6)
77. INSTALL COLUMN HOLE COVER SILENCER SHEET (SEE PUB. NO. RM1106E, PAGE 50-6)
78. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
79. CENTER SPIRAL CABLE (SEE PUB. NO. RM1106E, PAGE 60-4)
80. INSTALL STEERING WHEEL ASSY (SEE PUB. NO. RM1106E, PAGE 50-6)
81. INSPECT STEERING WHEEL CENTER POINT
82. INSTALL HORN BUTTON ASSY
(a) TMC made (See pub. No. RM1106E, page 60-21)
(b) TMUK, TMMT made (See pub. No. RM1106E, page 60-31)
83. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (SEE PUB. NO. RM1106E, PAGE 26-1)
84. INSTALL ENGINE UNDER COVER LH
85. INSTALL ENGINE UNDER COVER RH
86. CHECK ABS SPEED SENSOR SIGNAL
(a) TMC made (See pub. No. RM925E, page 05-561)
(b) TMUK, TMMT made
    (1) w/ VSC (See pub. No. RM925E, page 05-666)
    (2) w/o VSC (See pub. No. RM925E, page 05-614)

CLUTCH

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM1106E

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

CLUTCH SYSTEM (C53A)

42080-02

PRECAUTION

(c) When racing the engine, make sure that the gear is in neutral.

(d) If the multi-mode manual transmission system stops with the transmission set in any gear, the vehicle can be moved by disconnecting the shift & select actuator plug and setting the transmission to neutral.

(e) When replacing the following parts, proceed with the operation according to the order listed in the table below.

Operation timing	Parts to be replaced or removed and installed	Operation	See page
Before removal	CLUTCH ACTUATOR TRANSMISSION ASSY TRANSMISSION PARTS (INSIDE GEAR BOX) CLUTCH COVER AND CLUTCH DISC CLUTCH RELEASE BEARING CLUTCH RELEASE FORK FLYWHEEL END PLATE CRANKSHAFT	CLUTCH POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
Additional operation when installing new clutch actuator	CLUTCH ACTUATOR New	CLUTCH POSITION ADJUSTMENT (CLUTCH CLAMP POSITION)	05-186
After installation	TRANSMISSION CONTROL ECU CLUTCH ACTUATOR CLUTCH DISC AND CLUTCH DISC COVER FLYWHEEL CRANKSHAFT CLUTCH RELEASE BEARING CLUTCH RELEASE FORK END PLATE • When the clutch actuator is removed from the transmission assy during installation of any of the following parts. TRANSMISSION ASSY TRANSMISSION PARTS (INSIDE GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (ECU) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196
	CLUTCH STROKE SENSOR	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (CLUTCH) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM	05-190 05-190
	SHIFT STROKE SENSOR SELECT STROKE SENSOR SHIFT AND SELECT ACTUATOR TRANSMISSION PARTS (INSIDE GEAR BOX)	1. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (TRANSMISSION) 2. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM 3. SYNCHRONIZATION POSITION CALIBRATION	05-190 05-190 05-196

NOTICE:

- **Make sure to always replace the clutch cover and the clutch disc together. If either is replaced without the other, the adjustment system of the clutch cover does not function properly. It may cause clutch drag or clutch slipping, which can result in deterioration of driveability or a defect in the system parts.**
- **Before proceeding with calibration of the multi-mode manual transmission system, be sure to clear the previously stored calibration values.**

4209D-01

PROBLEM SYMPTOMS TABLE

HINT:

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

Symptom	Suspected Area	See page
Clutch grabs/chatters	1. Engine mounting (Loose)	-
	2. Clutch disc assy (Runout is excessive)	42-29
	3. Clutch disc assy (Oily)	42-29
	4. Clutch disc assy (Worn out)	42-29
	5. Clutch disc torsion rubber (Damaged)	42-29
	6. Clutch disc assy (Glazed)	42-29
	7. Diaphragm spring (Out of tip alignment)	42-29
Clutch is noisy	1. Clutch release bearing assy (Worn, dirty, or damaged)	42-29
	2. Clutch disc torsion rubber (Damaged)	42-29
Clutch slips	1. Multi-mode transmission system (Faulty)	05-172
	2. Clutch disc assy (Oily)	42-29
	3. Clutch disc assy (Worn out)	42-29
	4. Diaphragm spring (Damaged)	42-29
	5. Pressure plate (Distortion)	42-29
	6. Flywheel sub-assy (Distortion)	42-29
Clutch does not disengage	1. Clutch actuator (Damaged)	42-20
	2. Clutch disc assy (Out of true)	42-29
	3. Clutch disc assy (Runout is excessive)	42-29
	4. Clutch disc assy (Lining broken)	42-29
	5. Clutch disc assy (Dirty or burned)	42-29
	6. Clutch disc assy (Oily)	42-29
	7. Clutch disc assy (Lack of spline grease)	42-29

CLUTCH SYSTEM (C53)

PROBLEM SYMPTOMS TABLE

42081-02

HINT:

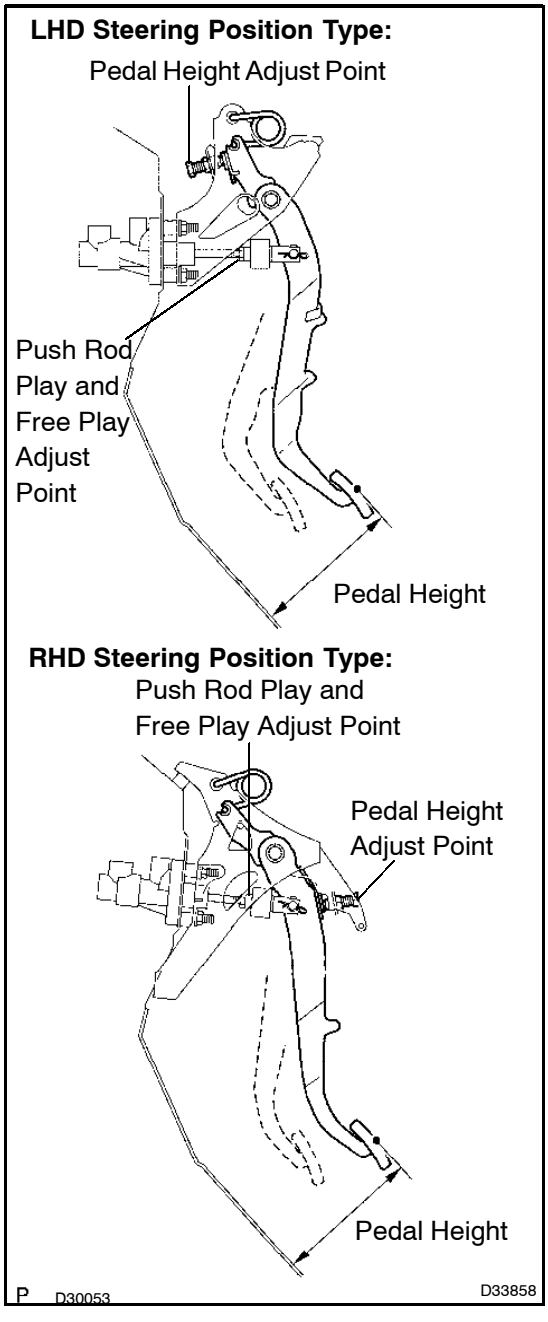
Use the table below to help determine the cause of the problem. The numbers indicate the priority of the likely causes of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspected Area	See page
Clutch grabs/chatters	1. Engine mounting (Loose)	-
	2. Clutch disc assy (Runout is excessive)	42-29
	3. Clutch disc assy (Oily)	42-29
	4. Clutch disc assy (Worn out)	42-29
	5. Clutch disc torsion rubber (Damaged)	42-29
	6. Clutch disc assy (Glazed)	42-29
	7. Diaphragm spring (Out of tip alignment)	42-29
Clutch pedal is spongy	1. Clutch Line (Air in line)	-
	2. Master cylinder (Damaged)	42-14
	3. Release cylinder rubber (Damaged)	42-17
Clutch is noisy	1. Clutch release bearing assy (Worn, dirty, or damaged)	42-29
	2. Clutch disc torsion rubber (Damaged)	42-29
Clutch slips	3. Clutch pedal (Free play is out of adjustment)	42-4
	4. Clutch disc assy (Oily)	42-29
	5. Clutch disc assy (Worn out)	42-29
	6. Diaphragm spring (Damaged)	42-29
	7. Pressure plate (Distortion)	42-29
	8. Flywheel sub-assy (Distortion)	42-29
Clutch does not disengage	9. Clutch pedal (Free play is out of adjustment)	42-4
	10.Clutch line (Air in line)	-
	11.Master cylinder (Damaged)	42-14
	12.Release cylinder cup (Damaged)	42-17
	13.Clutch disc assy (Out of true)	42-29
	14.Clutch disc assy (Runout is excessive)	42-29
	15.Clutch disc assy (Lining broken)	42-29
	16.Clutch disc assy (Dirty or burned)	42-29
	17.Clutch disc assy (Oily)	42-29
	18.Clutch disc assy (Lack of spline grease)	42-29

CLUTCH PEDAL SUB-ASSY (C53)

ADJUSTMENT

42082-02



1. INSPECT AND ADJUST CLUTCH PEDAL HEIGHT

(a) Turn back the floor carpet to expose the asphalt sheet under the pedal.

(b) Check that the pedal height is correct.

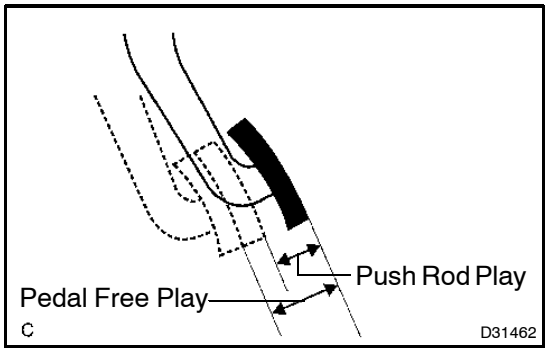
Pedal height from asphalt sheet:
LHD Steering Position Type:
139.5 to 149.5 mm (5.492 to 5.886 in.)
RHD Steering Position Type:
147.6 to 157.6 mm (5.811 to 6.205 in.)

(c) Adjust pedal height.

(1) Loosen the lock nut and turn the stopper bolt until the correct height is obtained.

(2) Tighten the lock nut.

Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)



2. INSPECT PEDAL FREE PLAY AND PUSH ROD PLAY

(a) Check that pedal free play and push rod play are correct.

(1) Depress the pedal until clutch resistance begins to be felt.

Pedal free play: 5.0 to 15.0 mm (0.197 to 0.591 in.)

(2) Gently depress the pedal until resistance begins to increase a little.

Push rod play at pedal top:
1.0 to 5.0 mm (0.039 to 0.197 in.)

(b) Adjust the pedal free play and push rod play.

(1) Remove the instrument panel air bag assy lower No.1 (see pub. No.RM1106E, page 71-6).

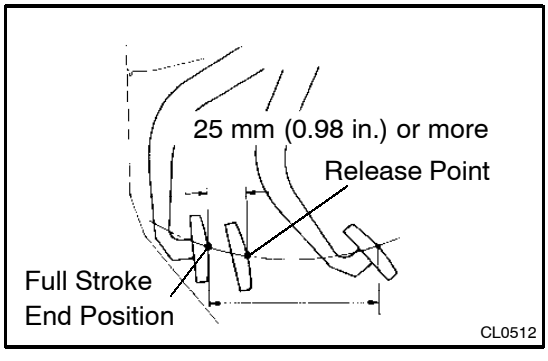
(2) Loosen the lock nut and turn the push rod until the correct free play and push rod play are obtained.

(3) Tighten the lock nut.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

(4) After adjusting the pedal free play, check pedal height.

(5) Install the instrument panel air bag assy lower No.1. (see pub. No.RM1106E, page 71-6).



3. INSPECT CLUTCH RELEASE POINT

(a) Check the clutch release point.

(1) Pull the parking brake lever and install wheel stoppers.

(2) Start the engine and run at idle.

(3) Without depressing the clutch pedal, slowly move the shift lever into reverse until the gears contact.

(4) Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

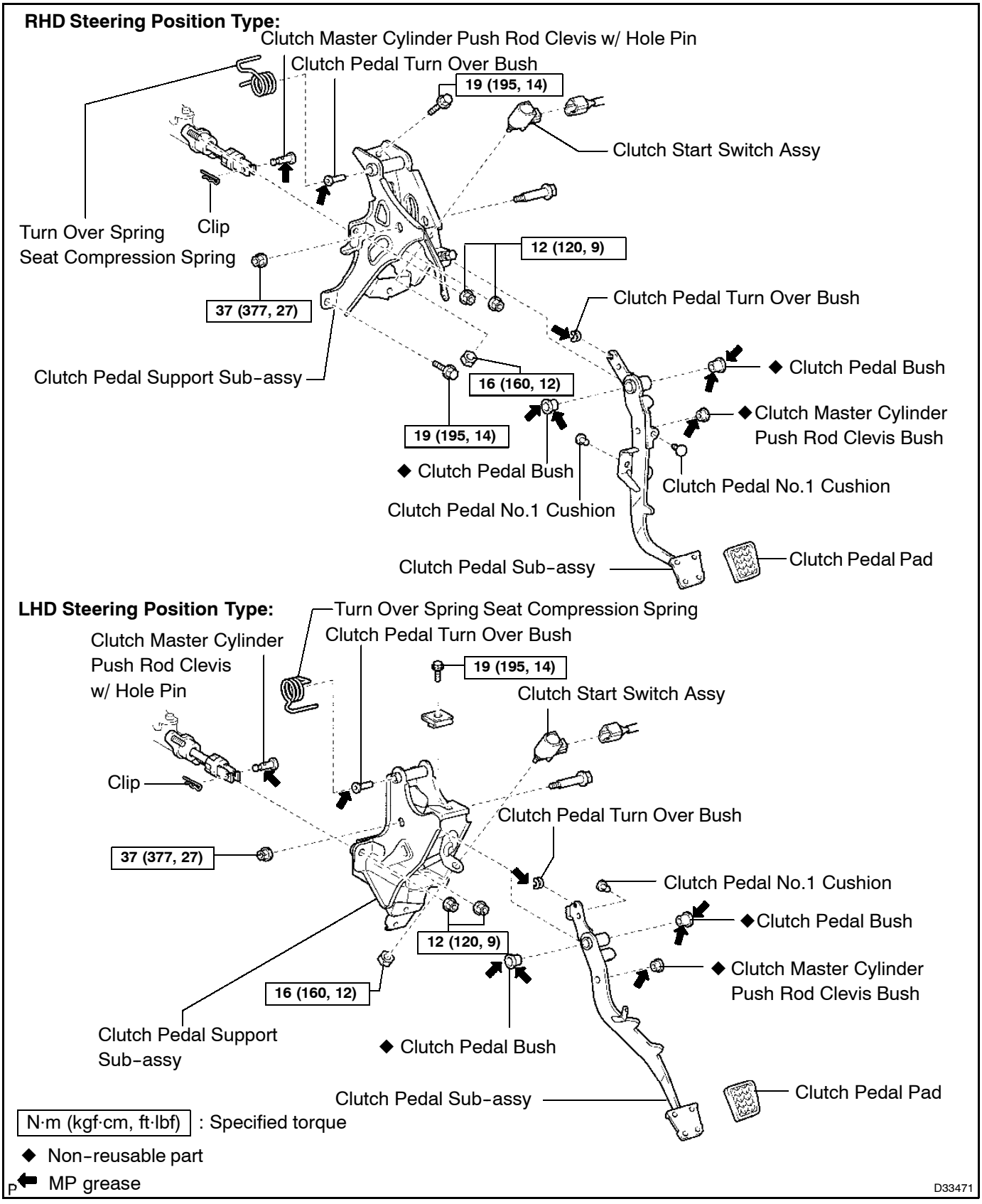
Standard distance: 25 mm (0.98 in.) or more
(From pedal stroke end position to release point)

If the distance is not as specified, perform the following operations.

- Check pedal height.
- Check push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover assy and disc assy.

4209E-01

COMPONENTS



42084-02

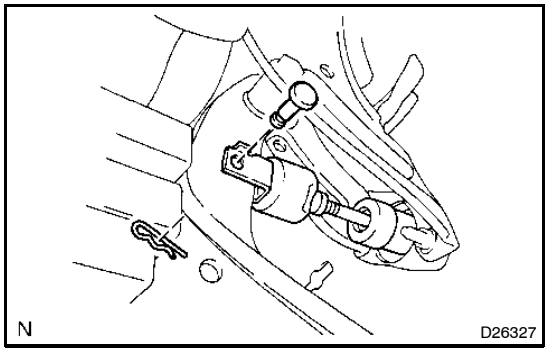
OVERHAUL

1. REMOVE INSTRUMENT PANEL SUB-ASSY LOWER (LHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 71-6)

2. REMOVE COMBINATION METER ASSY (RHD STEERING POSITION TYPE) (SEE PUB. NO. RM1106E, PAGE 71-6)

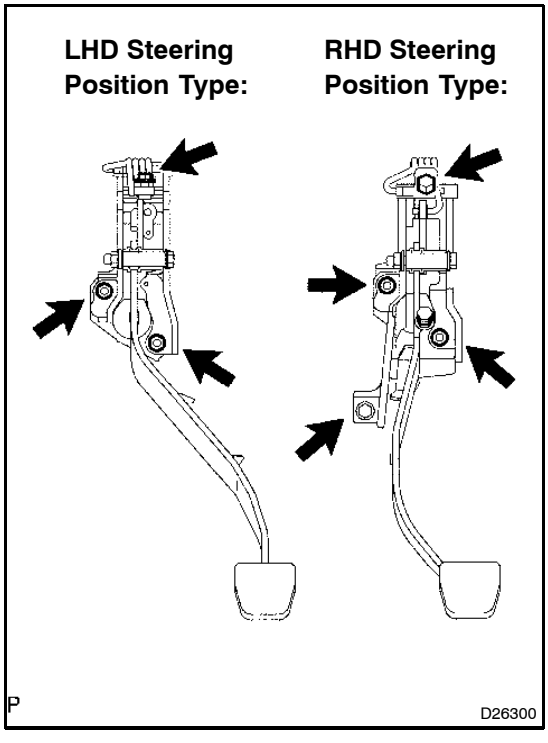
3. DISCONNECT CONNECTOR

(a) Disconnect the clutch start switch connector.



4. REMOVE CLUTCH MASTER CYLINDER PUSH ROD CLEVIS W/HOLE PIN

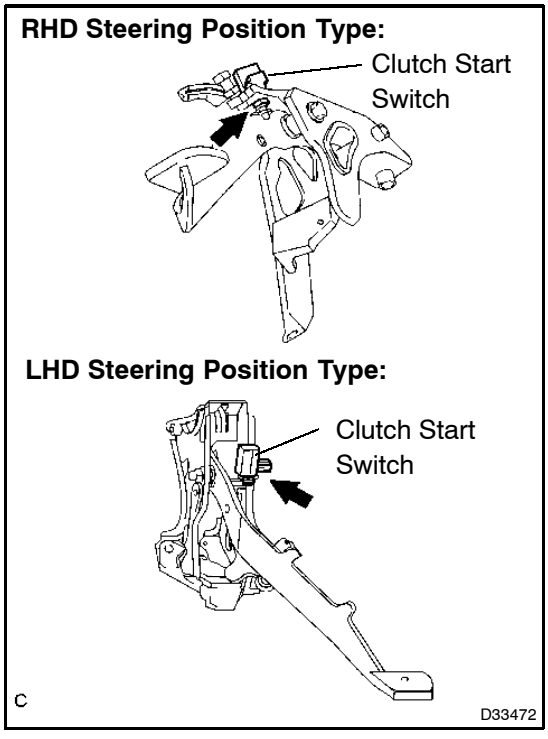
(a) Remove the clip and hole pin.



5. REMOVE CLUTCH PEDAL SUPPORT SUB-ASSY

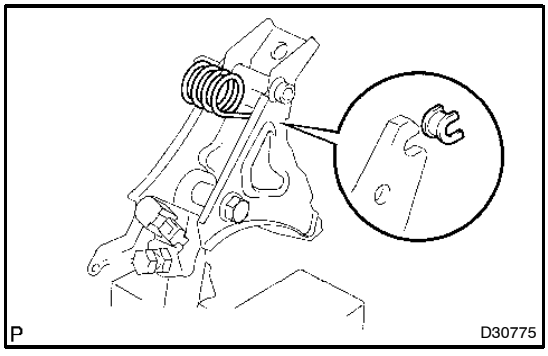
(a) LHD steering position type:
Remove the 2 nuts, bolt and clutch pedal support assy.

(b) RHD steering position type:
Remove the 2 bolts, 2 nuts and clutch pedal support assy.



6. REMOVE CLUTCH START SWITCH ASSY

(a) Remove the nut and clutch start switch assy.

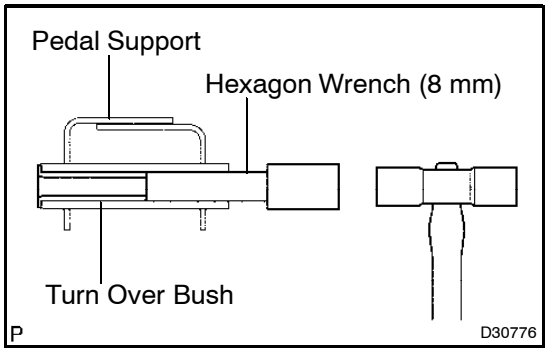


7. REMOVE TURN OVER SPRING SEAT COMPRESSION SPRING

(a) Mount the clutch pedal in a soft jaw vise.

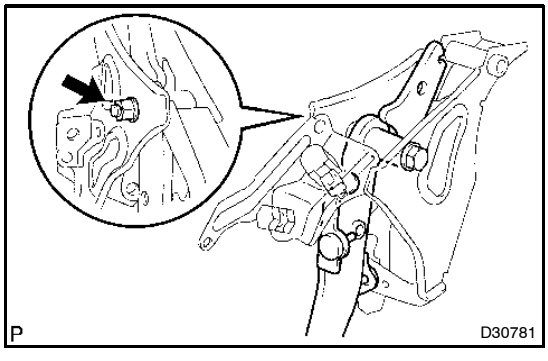
(b) Using a screwdriver, remove the spring.

8. REMOVE CLUTCH PEDAL TURNOVER BUSH



9. REMOVE CLUTCH PEDAL TURNOVER BUSH

(a) Using a 8 mm hexagon wrench and a hammer, remove the turn over bush.

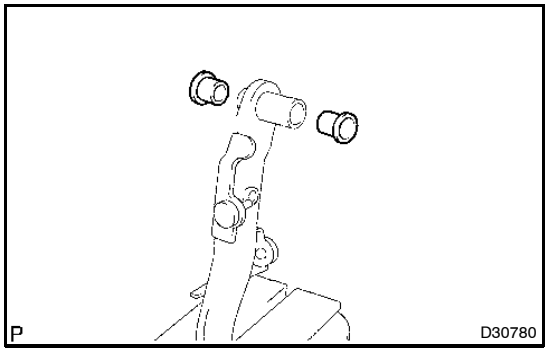


10. REMOVE CLUTCH PEDAL SUB-ASSY

(a) Remove the bolt and nut.

(b) Remove the clutch pedal from the clutch pedal support.

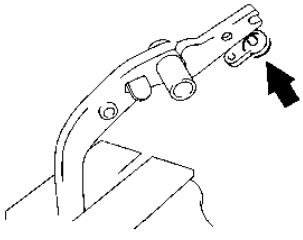
11. REMOVE CLUTCH PEDAL PAD



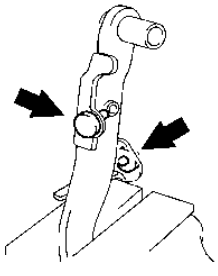
12. REMOVE CLUTCH PEDAL BUSH

(a) Remove the 2 bushes from the clutch pedal.

LHD Steering Position Type:



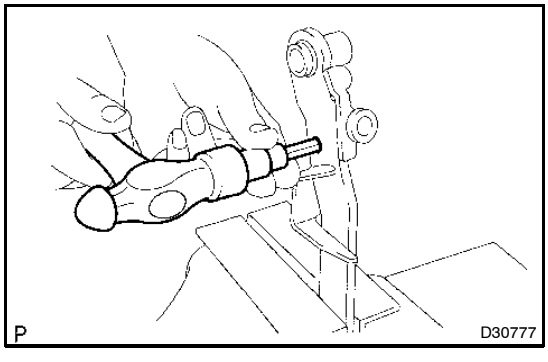
RHD Steering Position Type:



13. REMOVE CLUTCH PEDAL NO.1 CUSHION

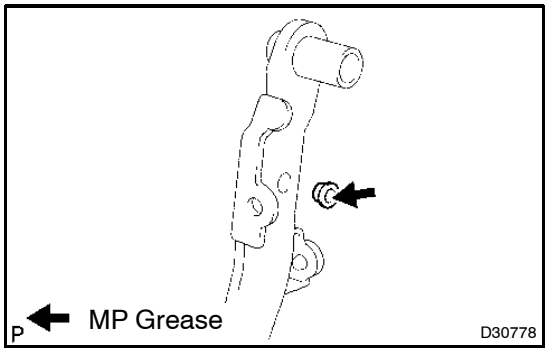
(a) LHD steering position type:
Using needle-nose pliers, remove the No.1 cushion from the clutch pedal.

(b) RHD steering position type:
Using needle-nose pliers, remove the 2 No.1 cushions from the clutch pedal.



14. REMOVE CLUTCH MASTER CYLINDER PUSH ROD CLEVIS BUSH

(a) Using a 8 mm hexagon wrench and a hammer, remove the clevis bush from the clutch pedal.



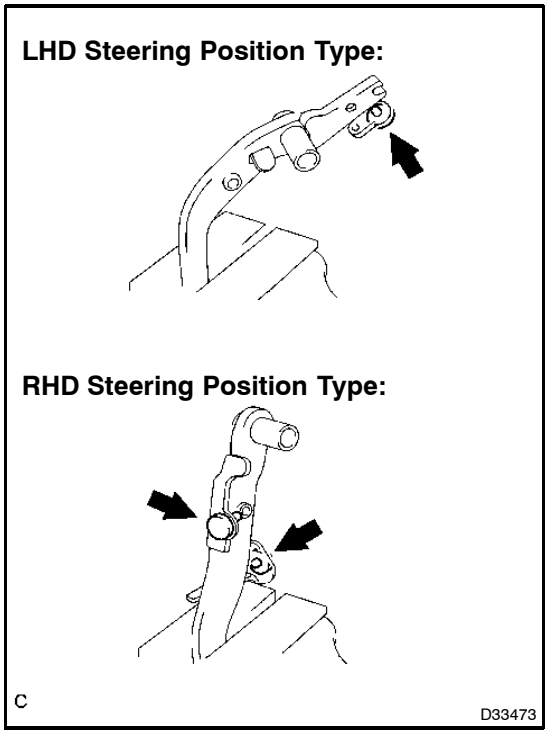
15. INSTALL CLUTCH MASTER CYLINDER PUSH ROD CLEVIS BUSH

(a) Apply MP grease to the inside of a new clevis bush.

(b) Install the clevis bush to the clutch pedal.

HINT:

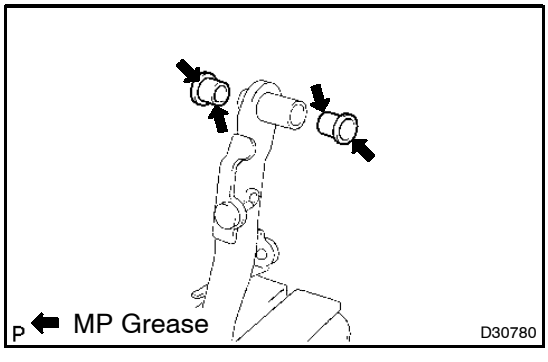
Install the clevis bush from the right side of the vehicle.



16. INSTALL CLUTCH PEDAL NO.1 CUSHION

(a) LHD steering position type:
Using needle-nose pliers, install the No.1 cushion to the clutch pedal.

(b) RHD steering position type:
Using needle-nose pliers, install the 2 No.1 cushions to the clutch pedal.

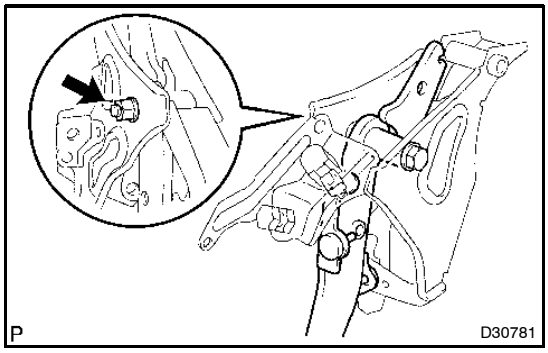


17. INSTALL CLUTCH PEDAL BUSH

(a) Apply MP grease to the inner, outer and end surfaces of 2 new bushes.

(b) Install the 2 bushes to the clutch pedal.

18. INSTALL CLUTCH PEDAL PAD



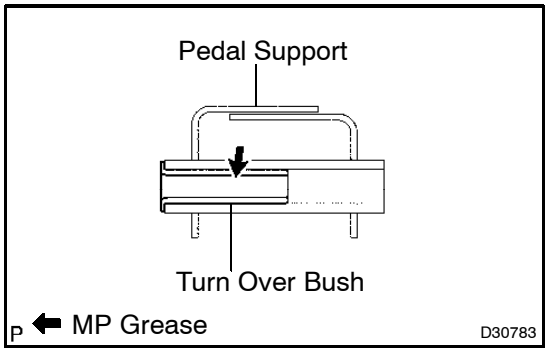
19. INSTALL CLUTCH PEDAL SUB-ASSY

(a) Install the clutch pedal to the clutch pedal support with the bolt and nut.

Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

HINT:

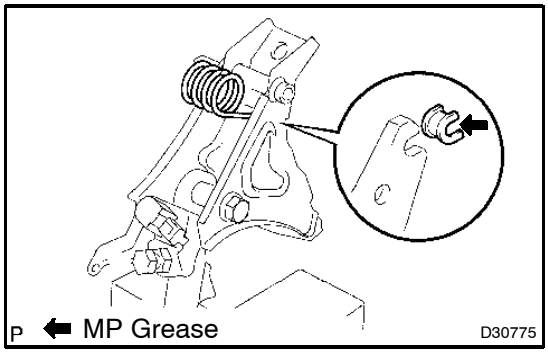
Install the bolt from the right side of the vehicle.



20. INSTALL CLUTCH PEDAL TURNOVER BUSH

(a) Apply MP grease to the inside of a new turn over bush.

(b) Install the turn over bush to the clutch pedal support.



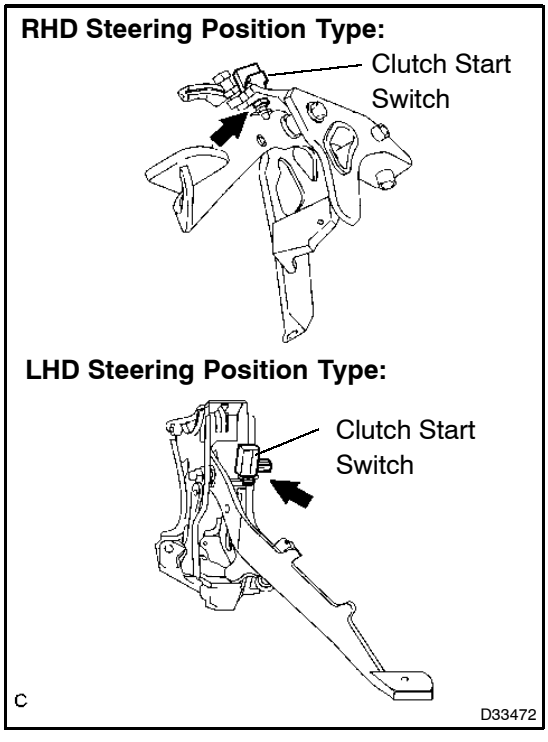
21. INSTALL CLUTCH PEDAL TURNOVER BUSH

(a) Apply MP grease to the inside of the turn over bush.

(b) Install the turn over bush to the clutch pedal.

22. INSTALL TURN OVER SPRING SEAT COMPRESSION SPRING

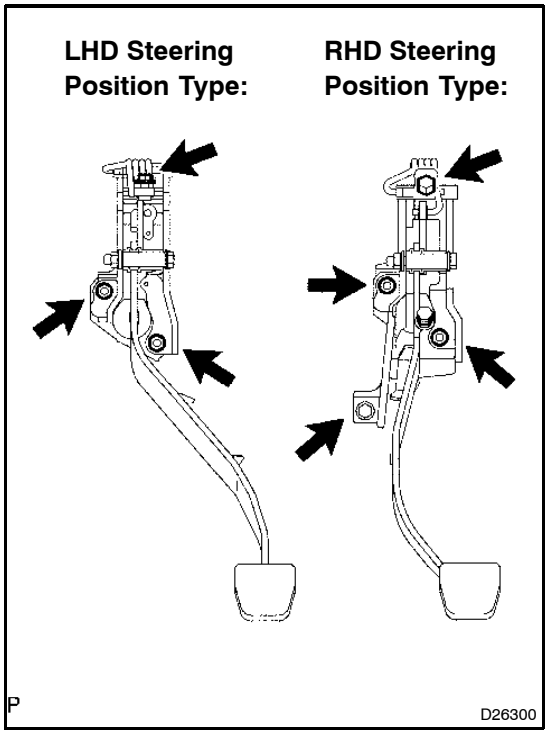
(a) Install the spring to the clutch pedal and clutch pedal support.



23. INSTALL CLUTCH START SWITCH ASSY

(a) Install the clutch start switch assy to the clutch pedal support sub-assy with the nut.

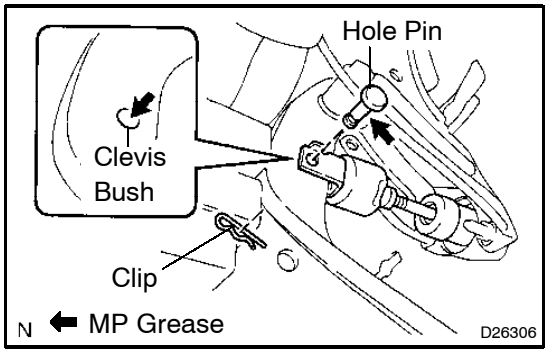
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



24. INSTALL CLUTCH PEDAL SUPPORT SUB-ASSY

(a) LHD steering position type:
Install the clutch pedal support to the vehicle with the 2 nuts and bolt.
Torque:
Bolt: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

(b) RHD steering position type:
Install the clutch pedal support to the vehicle with the 2 bolts and 2 nuts.
Torque:
Bolt: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)



25. INSTALL CLUTCH MASTER CYLINDER PUSH ROD CLEVIS W/HOLE PIN

(a) Apply MP grease to the contact surfaces of the hole pin and clevis bush.

(b) Connect the clevis to the clutch pedal with the hole pin.

HINT:
Install the hole pin from the right side of the vehicle.

(c) Install the clip to the hole pin.

26. CONNECT CONNECTOR

(a) Connect the clutch start switch connector.

27. INSTALL INSTRUMENT PANEL SUB-ASSY LOWER (LHD STEERING POSITION TYPE)
(SEE PUB. NO. RM1106E, PAGE 71-6)

28. INSTALL COMBINATION METER ASSY (RHD STEERING POSITION TYPE)
(SEE PUB. NO. RM1106E, PAGE 71-6)

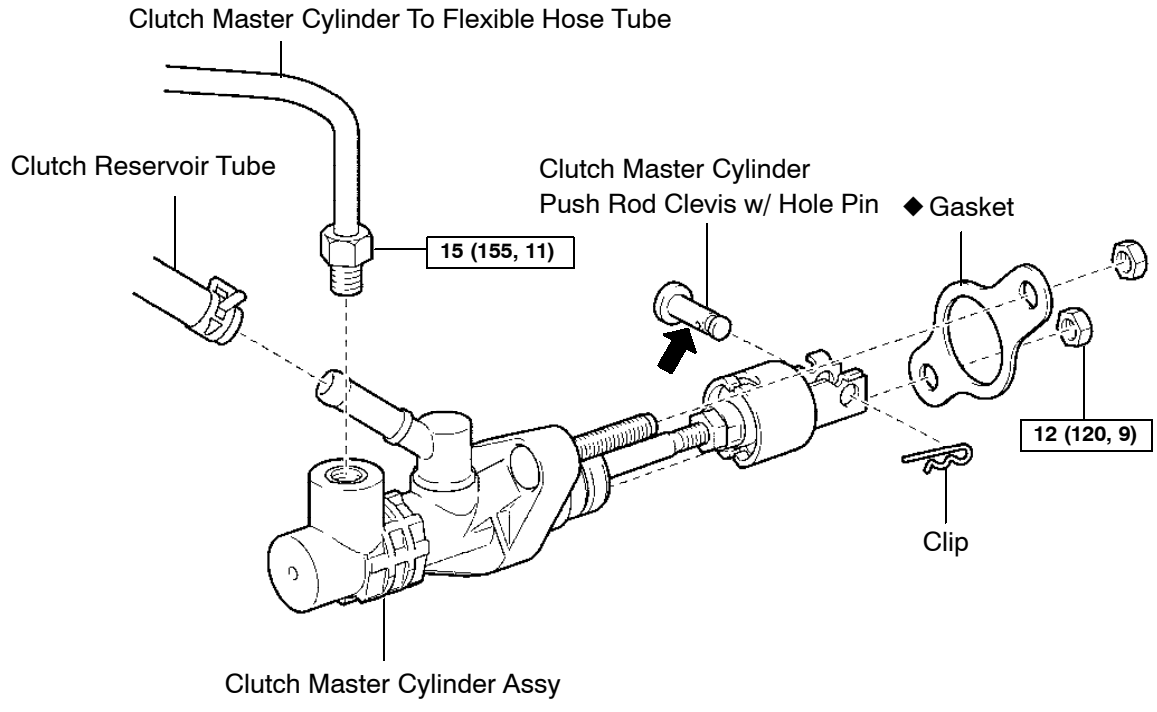
29. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSY (SEE PAGE 42-4)

CLUTCH MASTER CYLINDER ASSY (C53)

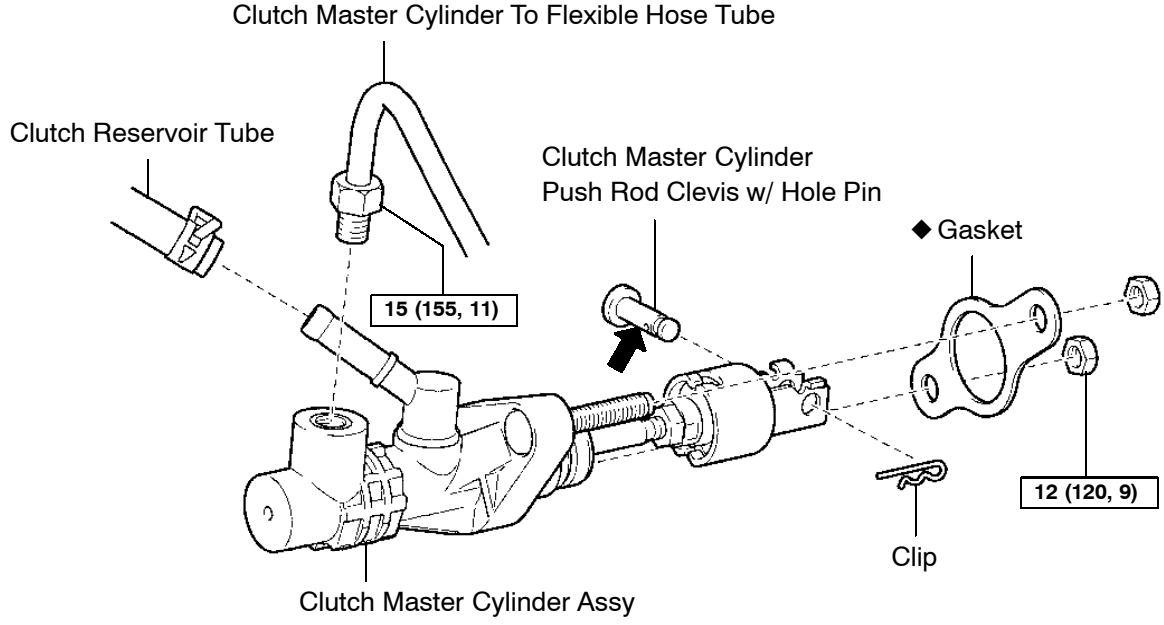
COMPONENTS

4202V-08

LHD Steering Position Type:



RHD Steering PositionType:



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
⬅ MP grease

P

D33892

REPLACEMENT

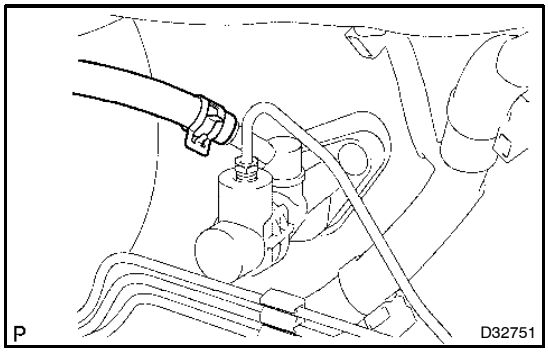
1. DRAIN CLUTCH FLUID

NOTICE:

Wash brake fluid off immediately if it adheres to any painted surface.

2. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE) **(SEE PAGE 32-7)**

3. REMOVE BRAKE BOOSTER ASSY (LHD STEERING POSITION TYPE) **(SEE PAGE 32-16)**

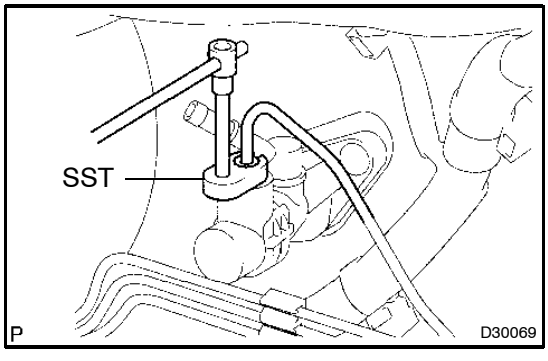


4. DISCONNECT CLUTCH RESERVOIR TUBE

(a) Loosen the clip and disconnect the clutch reservoir tube from the clutch master cylinder assy.

HINT:

Use a container to catch the fluid.



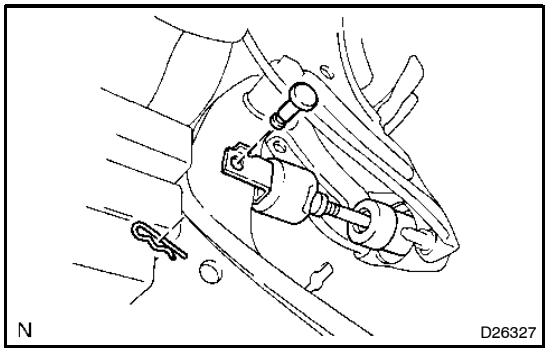
5. DISCONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

(a) Using SST, disconnect the flexible hose tube.

SST 09023-00101

HINT:

Use a container to catch the fluid.



6. REMOVE CLUTCH MASTER CYLINDER PUSH ROD CLEVIS W/HOLE PIN

(a) Remove the clip and hole pin.

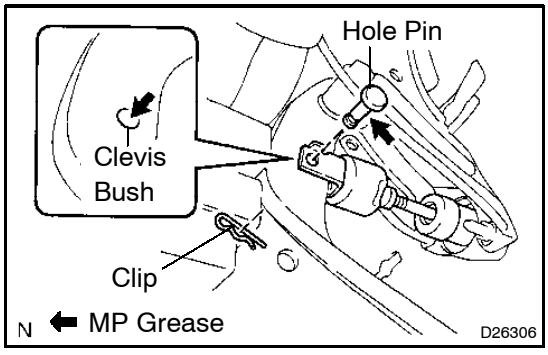
7. REMOVE CLUTCH MASTER CYLINDER ASSY

(a) Remove the 2 nuts, clutch master cylinder assy and gasket.

8. INSTALL CLUTCH MASTER CYLINDER ASSY

(a) Install the clutch master cylinder assy and a new gasket with the 2 nuts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



9. INSTALL CLUTCH MASTER CYLINDER PUSH ROD CLEVIS W/HOLE PIN

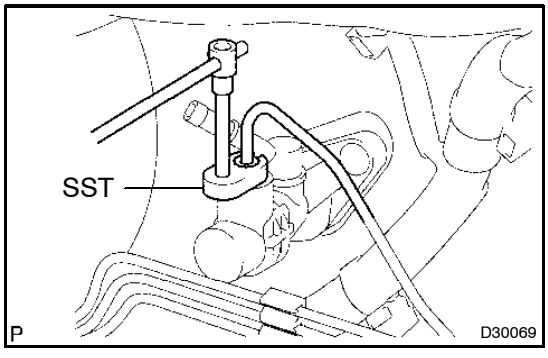
(a) Apply MP grease to the contact surfaces of the hole pin and clevis bush.

(b) Connect the clevis to the clutch pedal assy with the hole pin.

HINT:

Install the hole pin from the right side of the vehicle.

(c) Install the clip to the hole pin.

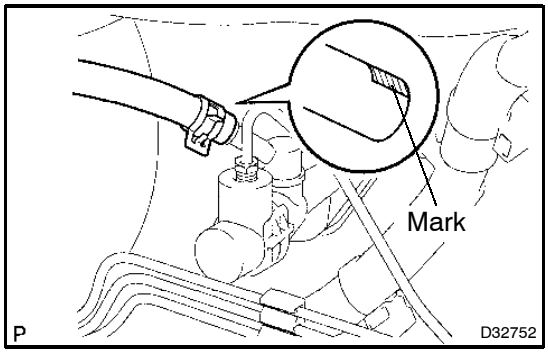


10. CONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

(a) Using SST, connect the flexible hose tube.

SST 09023-00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



11. CONNECT CLUTCH RESERVOIR TUBE

(a) Connect the clutch reservoir tube with the clip to the clutch master cylinder assy.

NOTICE:

- **TMUK, TMMT made:**
  Face the white mark upward.
- **TMC made:**
  Face the pink mark upward.
- **Ensure that the clutch reservoir tube is not twisted.**

12. INSTALL BRAKE BOOSTER ASSY (LHD STEERING POSITION TYPE) **(SEE PAGE 32-16)**

13. INSTALL BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE) **(SEE PAGE 32-7)**

14. BLEED BRAKE LINE (LHD STEERING POSITION TYPE) **(SEE PUB. NO. RM925E, PAGE 32-5)**

15. BLEED CLUTCH PIPE LINE

(a) Fill the brake reservoir tank with brake fluid and bleed the clutch system.

Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)

16. CHECK AND ADJUST BRAKE PEDAL HEIGHT (LHD STEERING POSITION TYPE) **(SEE PUB. NO. RM925E, PAGE 32-7)**

17. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSY **(SEE PAGE 42-4)**

18. CHECK FOR BRAKE FLUID LEAKAGE

HINT:

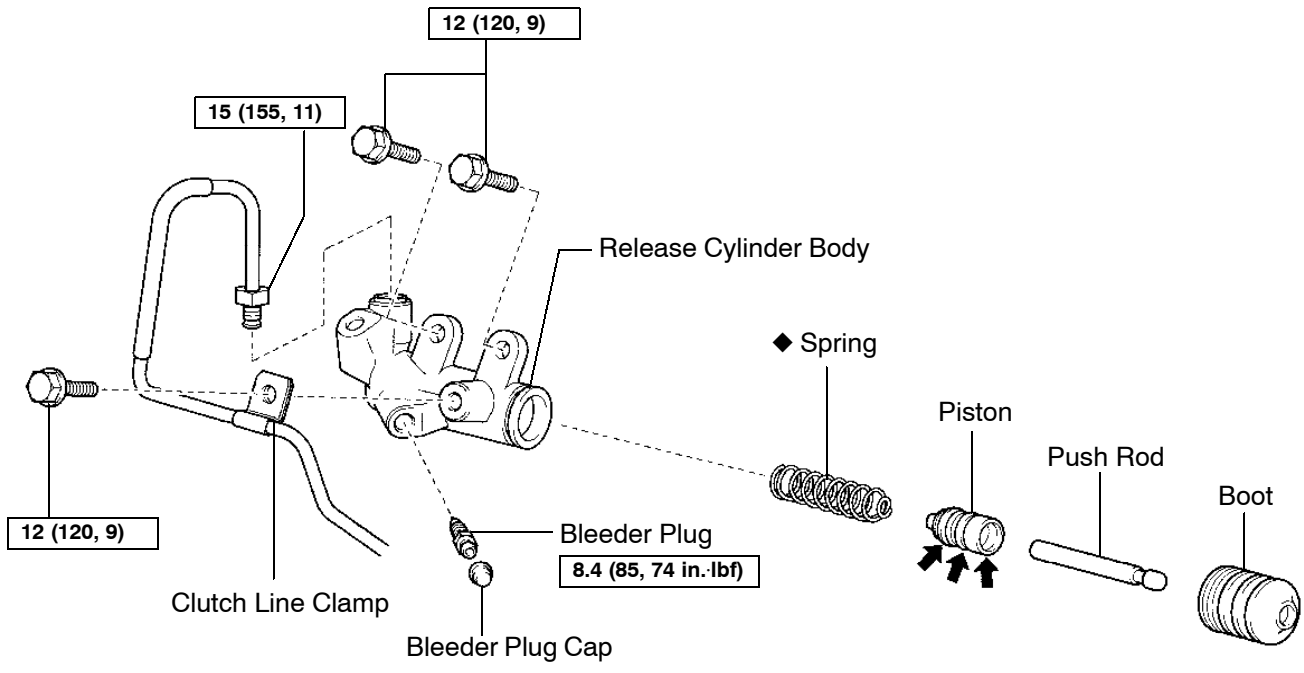
- Check for leakage in the brake system.
- Check for leakage in the clutch system.

19. CHECK FLUID LEVEL IN RESERVOIR

CLUTCH RELEASE CYLINDER ASSY (C53)

COMPONENTS

4202X-05



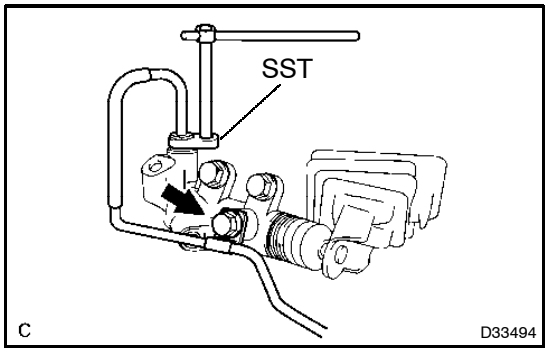
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P ⬅ Lithium soap base glycol grease

D33478

4209F-01

OVERHAUL

1. REMOVE CYLINDER HEAD COVER NO.2
2. REMOVE AIR CLEANER ASSY
3. REMOVE BATTERY CLAMP SUB-ASSY
4. REMOVE BATTERY
5. REMOVE BATTERY TRAY
6. REMOVE BATTERY CARRIER (SEE PAGE 41-49)
7. REMOVE AIR TUBE NO.2 (SEE PAGE 41-49)
8. REMOVE AIR TUBE NO.1 (SEE PAGE 41-49)



9. DISCONNECT CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE

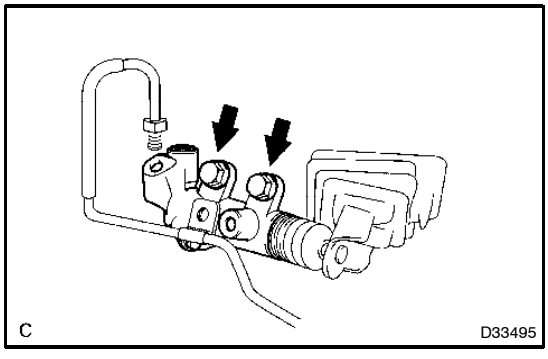
(a) Using SST, disconnect the flexible hose tube.

SST 09023-00101

HINT:

Use a container to catch the fluid.

(b) Remove the bolt and disconnect the flexible hose tube.



10. REMOVE CLUTCH RELEASE CYLINDER ASSY

(a) Remove the 2 bolts and clutch release cylinder assy.

11. REMOVE CLUTCH RELEASE CYLINDER KIT

(a) Remove the boot from the cylinder body.

(b) Remove the push rod from the cylinder body.

(c) Remove the piston from the cylinder body.

NOTICE:

Be careful not to damage the inside of the cylinder body.

(d) Remove the spring from the cylinder body.

(e) Remove the bleeder plug cap from the bleeder plug.

12. REMOVE RELEASE CYLINDER BLEEDER PLUG

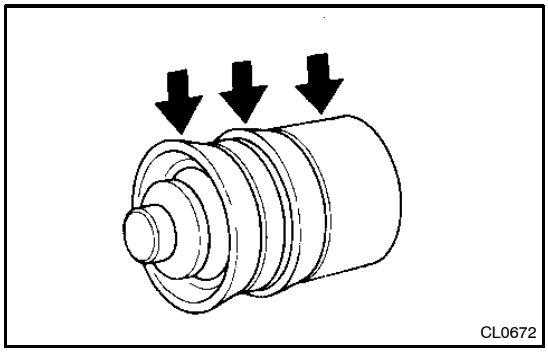
13. INSTALL RELEASE CYLINDER BLEEDER PLUG

Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)

14. INSTALL CLUTCH RELEASE CYLINDER KIT

(a) Install the bleeder plug cap to the bleeder plug.

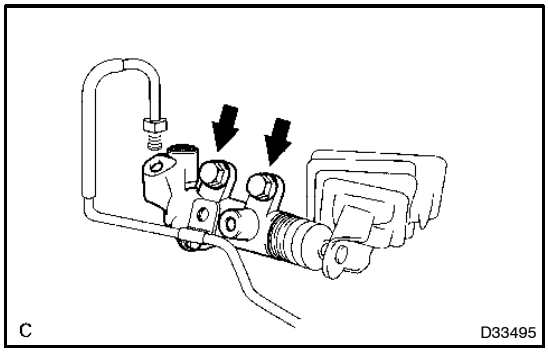
(b) Install a new spring to the cylinder body.



(c) Coat the piston with lithium soap base glycol grease, as shown in the illustration.
(d) Install the piston to the cylinder body.

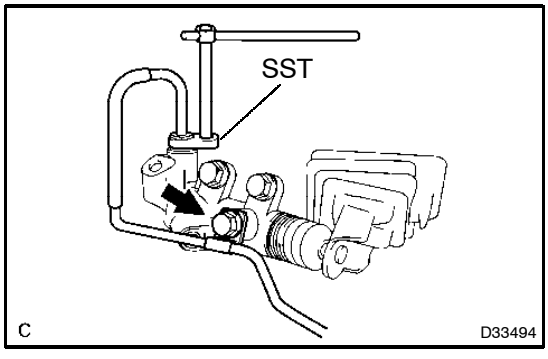
NOTICE:
Be careful not to damage the inside of the cylinder body.

(e) Install the push rod to the cylinder body.
(f) Install the boot to the cylinder body.



15. INSTALL CLUTCH RELEASE CYLINDER ASSY

(a) Install the clutch release cylinder assy with the 2 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



16. CONNECT CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE

(a) Using SST, connect the flexible hose tube.
SST 09023-00100
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)
(b) Connect the flexible hose tube with the bolt.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

17. INSTALL AIR TUBE NO.1 **(SEE PAGE 41-49)**
18. INSTALL AIR TUBE NO.2 **(SEE PAGE 41-49)**
19. INSTALL BATTERY CARRIER **(SEE PAGE 41-49)**
20. INSTALL BATTERY TRAY
21. INSTALL BATTERY
22. INSTALL BATTERY CLAMP SUB-ASSY
23. INSTALL AIR CLEANER ASSY
24. INSTALL CYLINDER HEAD COVER NO.2
25. BLEED CLUTCH PIPE LINE

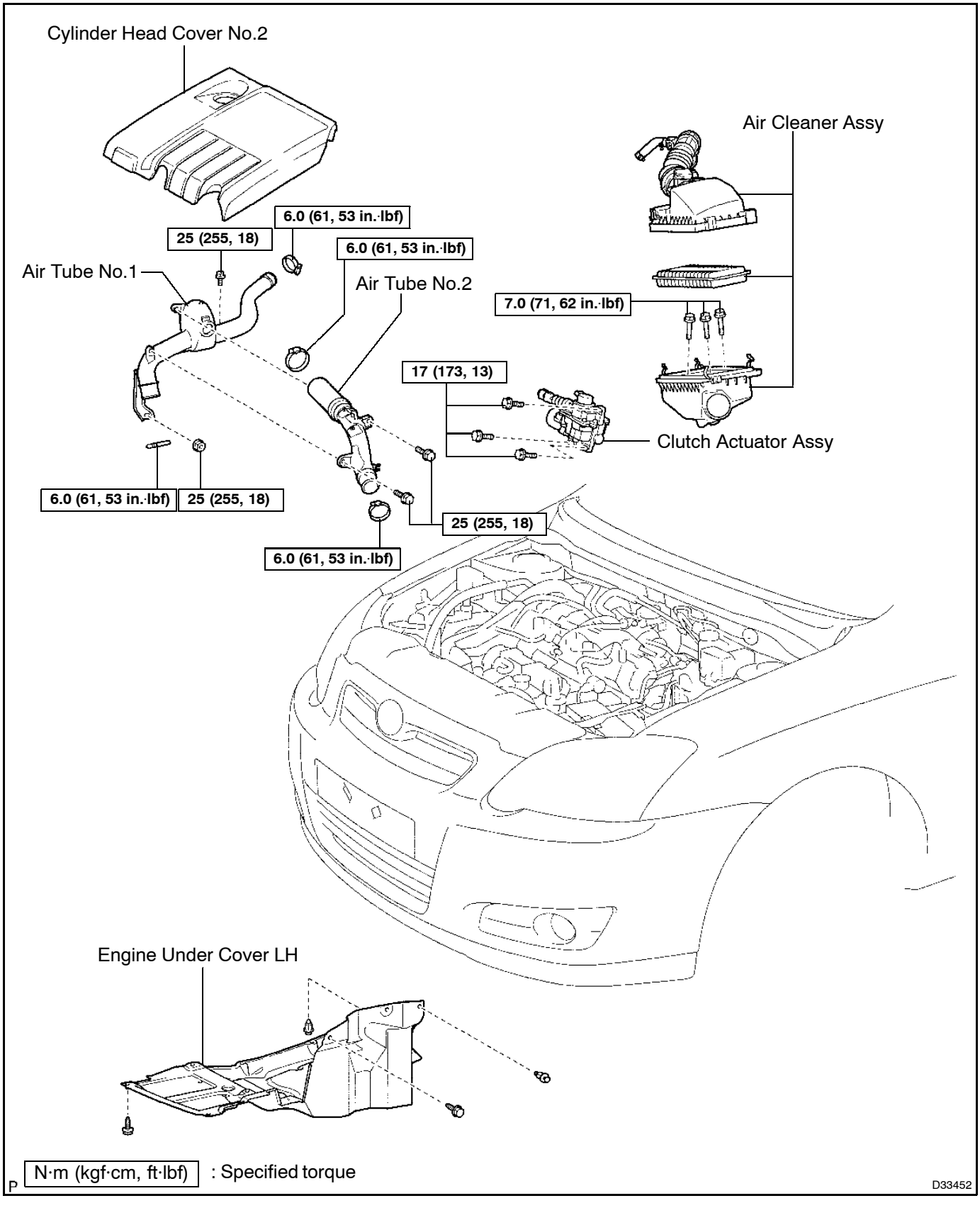
(a) Fill the brake reservoir tank with brake fluid and bleed the clutch system.
Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)

26. CHECK FOR CLUTCH FLUID LEAKAGE

CLUTCH ACTUATOR ASSY (C53A)

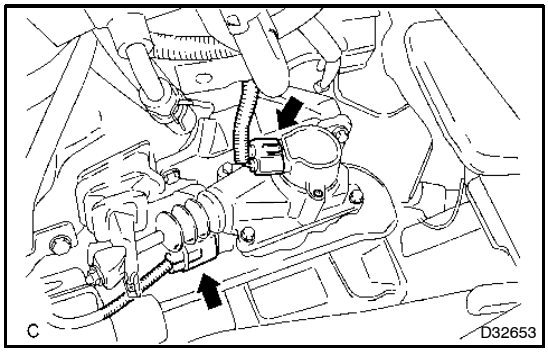
COMPONENTS

42085-02



REPLACEMENT

1. CLUTCH POSITION ADJUSTMENT(CLUTCH CLAMP POSITION) (SEE PAGE 05-186)
2. DISCONNECT BATTERY NEGATIVE TERMINAL
3. REMOVE FRONT WHEEL LH
4. REMOVE ENGINE UNDER COVER LH
5. REMOVE CYLINDER HEAD COVER NO.2
6. REMOVE AIR CLEANER ASSY
7. REMOVE AIR TUBE NO.2 (SEE PAGE 41-36)
8. REMOVE AIR TUBE NO.1 (SEE PAGE 41-49)

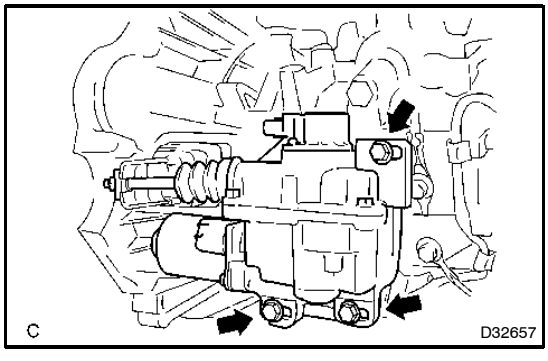


9. REMOVE CLUTCH ACTUATOR ASSY

(a) Disconnect the clutch stroke sensor connector and motor connector.

NOTICE:

Do not forcibly pull the connectors as this may damage the wire harness.



(b) Remove the 3 bolts and clutch actuator assy.

NOTICE:

- **Loosen the bolts slowly, and be careful not to get your fingers caught as the clutch actuator assy moves due to reaction force from the clutch cover.**
- **Do not drop the removed clutch actuator assy or impact it in any way.**
- **Do not loosen the nut on the rod tip.**

10. INSTALL CLUTCH ACTUATOR ASSY

NOTICE:

Perform the following operations (a) to (e) only when installing a new clutch actuator.

(a) Connect the clutch stroke sensor connector and motor connector to the clutch actuator assy.

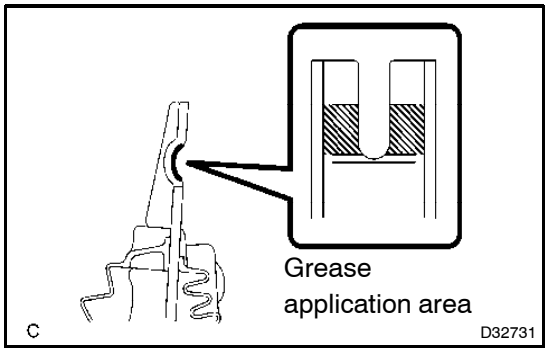
(b) Connect the battery negative terminal.

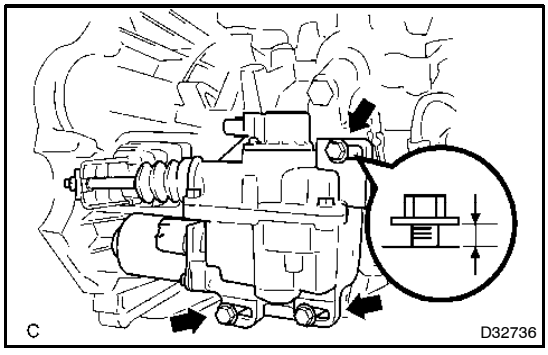
(c) Perform clutch position adjustment (clutch clamp position) (see page 05-186).

(d) Disconnect the battery negative terminal.

(e) Disconnect the clutch stroke sensor connector and motor connector.

(f) Apply grease to the shaded area of the release fork.

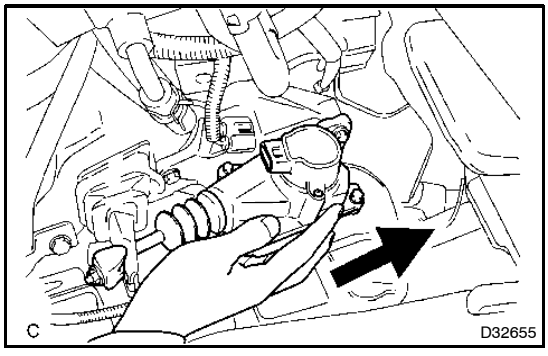




(g) Install the 3 bolts to the clutch actuator assy after placing the rod in the U-shaped part of the release fork.

NOTICE:

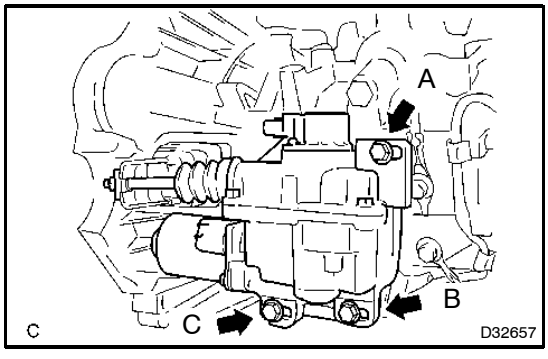
Ensure that there is a clearance of 3 mm between the clutch actuator assy and each bolt.



(h) Lightly move the clutch actuator assy toward the left of the vehicle while holding it lightly to prevent tilting until the convex part of the rod nut and the concave part of the release fork make contact.

NOTICE:

- **Do not apply strong force until the convex part of the rod nut and the concave part of the release fork make contact.**
- **Ensure that the convex part is securely fitted to the concave part.**



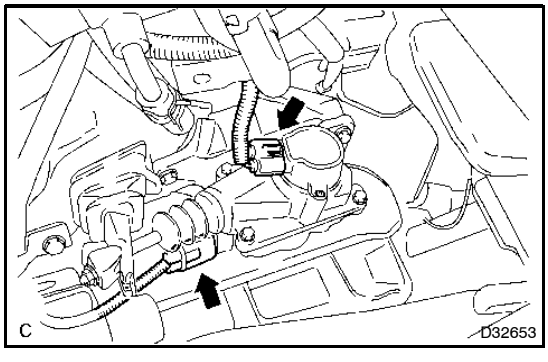
(i) Tighten the 3 bolts by hand while holding the clutch actuator assy.

NOTICE:

Support the clutch actuator assy until all 3 bolts are tightened.

(j) Tighten the 3 bolts to the specified torque in the order of A, B, and C.

Torque: 17 N·m (173 kgf·cm, 13 ft·lbf)



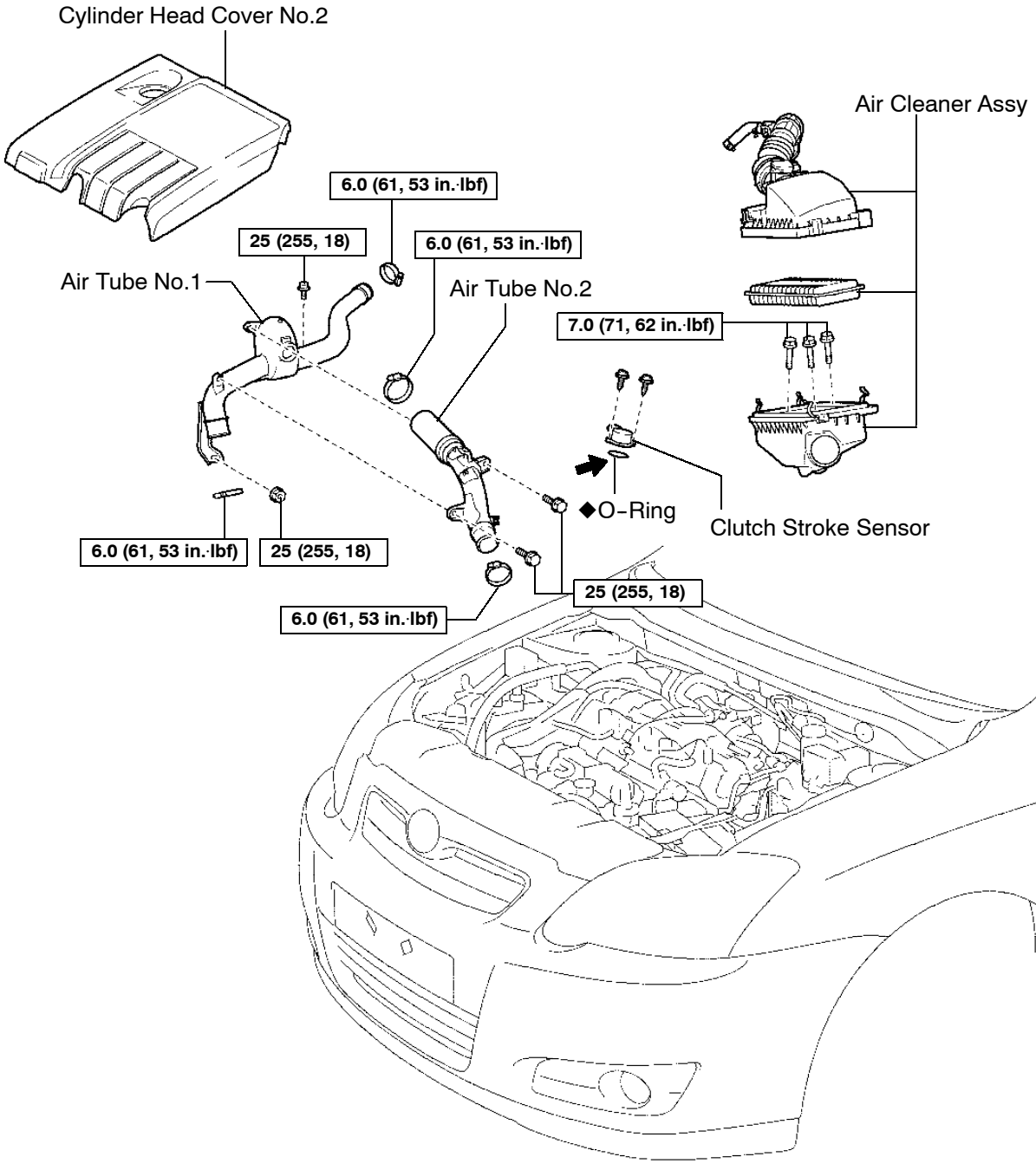
(k) Connect the clutch stroke sensor connector and motor connector.

11. **INSTALL AIR TUBE NO.1** **(SEE PAGE 41-49)**
12. **INSTALL AIR TUBE NO.2** **(SEE PAGE 41-36)**
13. **INSTALL AIR CLEANER ASSY**
14. **INSTALL CYLINDER HEAD COVER NO.2**
15. **INSTALL ENGINE UNDER COVER LH**
16. **INSTALL FRONT WHEEL LH**
17. **CONNECT BATTERY NEGATIVE TERMINAL**
18. **INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU** **(SEE PAGE 05-190)**
19. **LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM** **(SEE PAGE 05-190)**
20. **SYNCHRONIZATION POSITION CALIBRATION** **(SEE PAGE 05-196)**

CLUTCH STROKE SENSOR (C53A)

COMPONENTS

42087-02



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part ⬅ MP grease

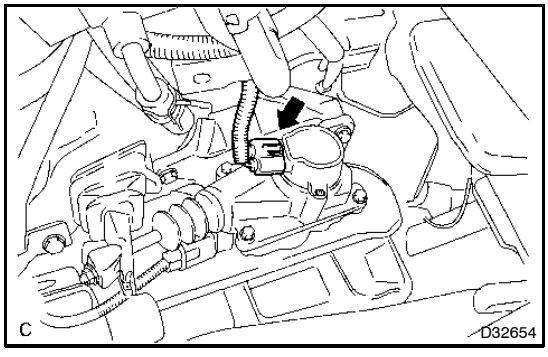
P

D33453

REPLACEMENT

1. DISCONNECT BATTERY NEGATIVE TERMINAL
2. REMOVE CYLINDER HEAD COVER NO.2
3. REMOVE AIR CLEANER ASSY
4. REMOVE AIR TUBE NO.2 (SEE PAGE 41-36)
5. REMOVE AIR TUBE NO.1 (SEE PAGE 41-36)

42088-02

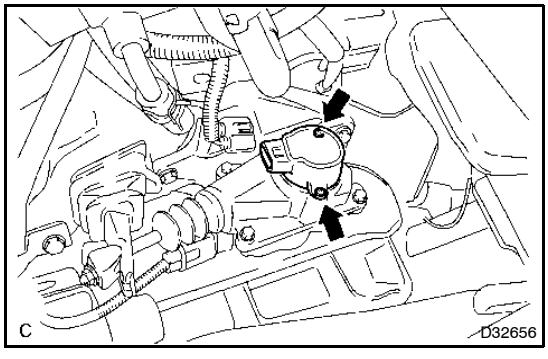


6. REMOVE CLUTCH STROKE SENSOR

(a) Disconnect the clutch stroke sensor connector.

NOTICE:

Do not forcibly pull the connector as this may damage the wire harness.



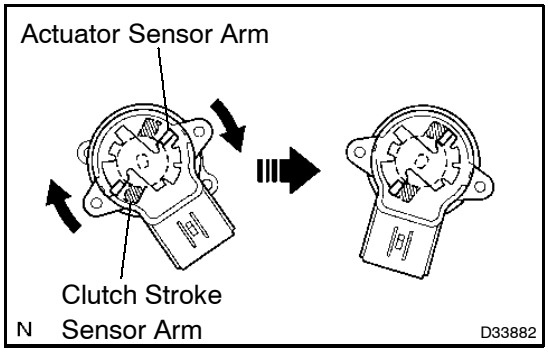
(b) Remove the 2 screws and stroke sensor from the clutch actuator assy.

(c) Remove the O-ring.

7. INSTALL CLUTCH STROKE SENSOR

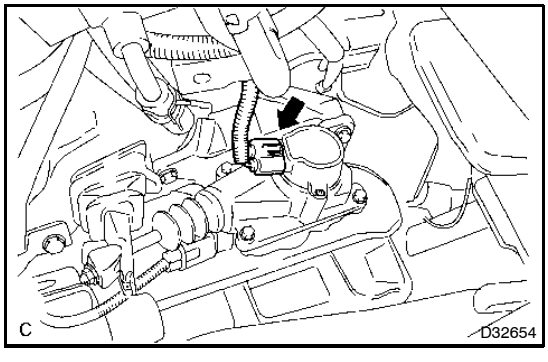
(a) Apply MP grease to a new O-ring.

(b) Install the O-ring to the stroke sensor.



(c) Set the stroke sensor so that the clutch stroke sensor arm and the actuator sensor arm are positioned as shown in the illustration.

(d) Turn the stroke sensor clockwise and fix it with the 2 screws.



(e) Connect the clutch stroke sensor connector.

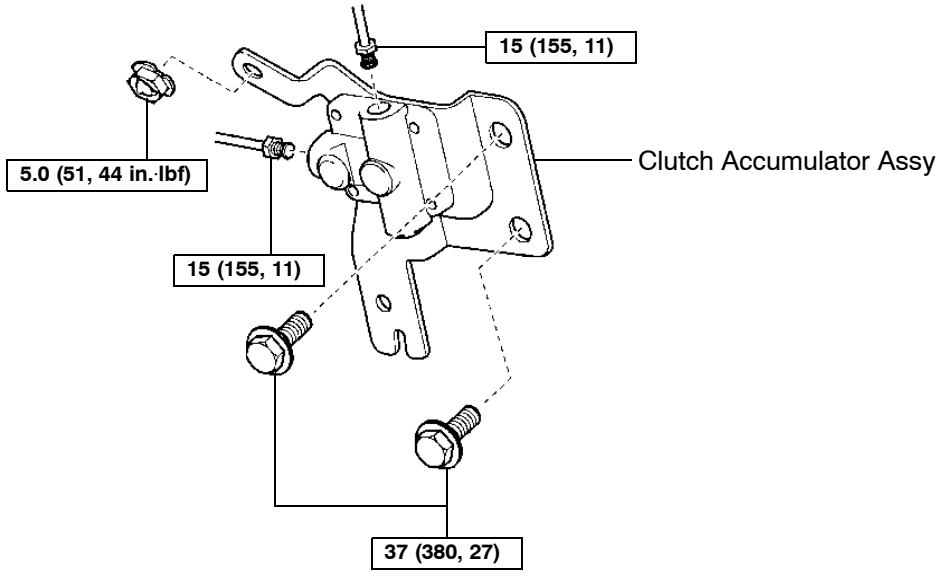
8. INSTALL AIR TUBE NO.1 (SEE PAGE 41-36)
9. INSTALL AIR TUBE NO.2 (SEE PAGE 41-36)
10. INSTALL AIR CLEANER ASSY
11. INSTALL CYLINDER HEAD COVER NO.2
12. CONNECT BATTERY NEGATIVE TERMINAL
13. INITIALIZATION OF MULTI-MODE MANUAL TRANSMISSION ECU (SEE PAGE 05-190)
14. LEARNING OF MULTI-MODE MANUAL TRANSMISSION SYSTEM (SEE PAGE 05-190)
15. SYNCHRONIZATION POSITION CALIBRATION (SEE PAGE 05-196)

CLUTCH ACCUMULATOR ASSY (C53)

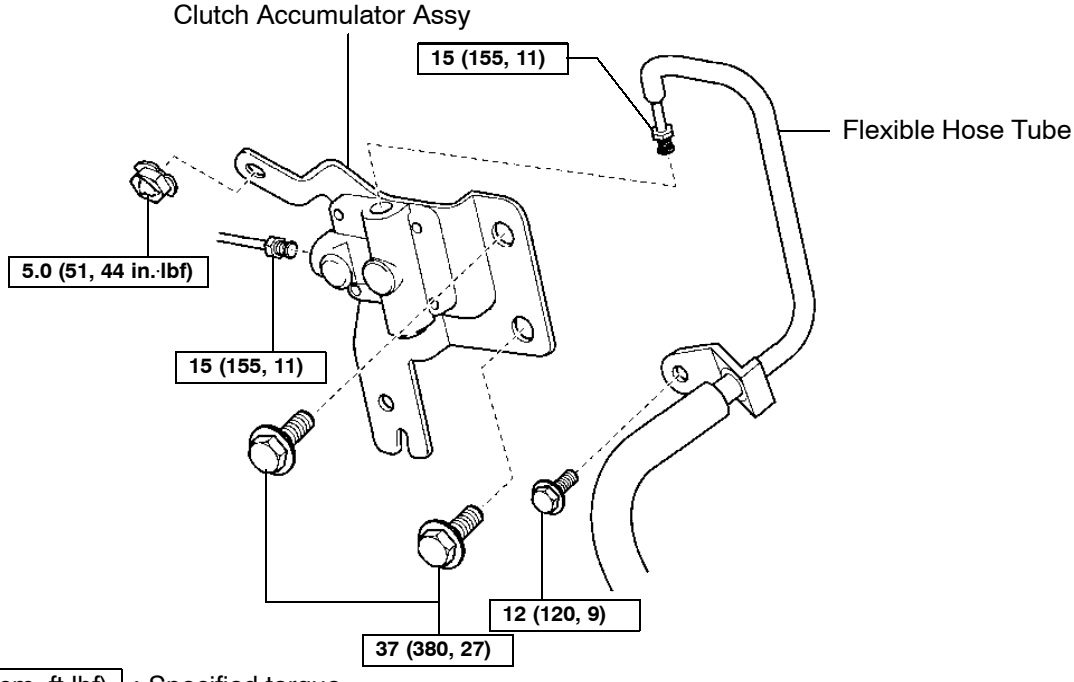
COMPONENTS

4202Z-05

RHD Steering Position Type:



LHD Steering Position Type:



C

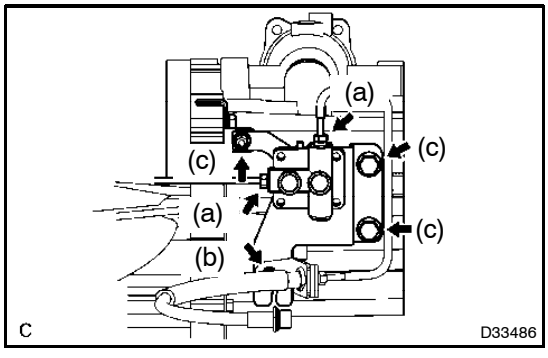
N·m (kgf·cm, ft·lbf) : Specified torque

D33477

4209H-01

REPLACEMENT

1. REMOVE CYLINDER HEAD COVER NO.2
2. REMOVE AIR CLEANER ASSY
3. REMOVE BATTERY CLAMP SUB-ASSY
4. REMOVE BATTERY
5. REMOVE BATTERY TRAY
6. REMOVE BATTERY CARRIER (SEE PAGE 41-49)
7. REMOVE AIR TUBE NO.2 (SEE PAGE 41-49)
8. REMOVE AIR TUBE NO.1 (SEE PAGE 41-49)



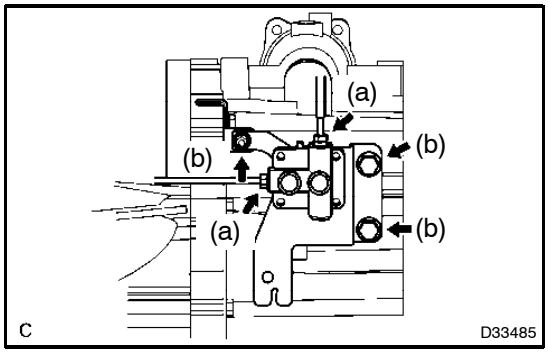
9. REMOVE CLUTCH ACCUMULATOR ASSY (LHD STEERING POSITION TYPE)

(a) Using SST, disconnect the 2 flexible hose tubes.
SST 09023-00101

HINT:
Use a container to catch the fluid.

(b) Remove the bolt and disconnect the flexible hose tube.

(c) Remove the 2 bolts, nut and clutch accumulator assy.

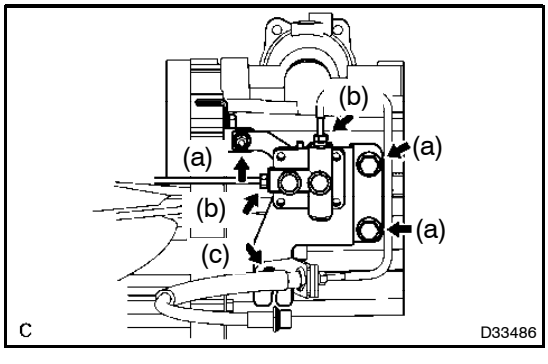


10. REMOVE CLUTCH ACCUMULATOR ASSY (RHD STEERING POSITION TYPE)

(a) Using SST, disconnect the 2 flexible hose tubes.
SST 09023-00101

HINT:
Use a container to catch the fluid.

(b) Remove the 2 bolts, nut and clutch accumulator assy.

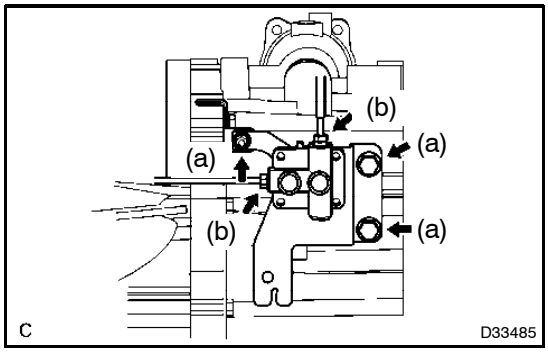


11. INSTALL CLUTCH ACCUMULATOR ASSY (LHD STEERING POSITION TYPE)

(a) Install the clutch accumulator assy with the nut and the 2 bolts.
Torque:
Nut: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
Bolt: 37 N·m (380 kgf·cm, 27 ft·lbf)

(b) Using SST, connect the 2 flexible hose tubes to the clutch accumulator assy.
SST 09023-00101
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(c) Connect the flexible hose tube with the bolt.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



12. INSTALL CLUTCH ACCUMULATOR ASSY (RHD STEERING POSITION TYPE)

(a) Install the clutch accumulator assy with the nut and the 2 bolts.

Torque:
Nut: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
Bolt: 37 N·m (380 kgf·cm, 27 ft·lbf)

(b) Using SST, connect the 2 flexible hose tubes to the clutch accumulator assy.

SST 09023-00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

13. INSTALL AIR TUBE NO.1 **(SEE PAGE 41-49)**
14. INSTALL AIR TUBE NO.2 **(SEE PAGE 41-49)**
15. INSTALL BATTERY CARRIER **(SEE PAGE 41-49)**
16. INSTALL BATTERY TRAY
17. INSTALL BATTERY
18. INSTALL BATTERY CLAMP SUB-ASSY
19. INSTALL AIR CLEANER ASSY
20. INSTALL CYLINDER HEAD COVER NO.2
21. BLEED CLUTCH PIPE LINE

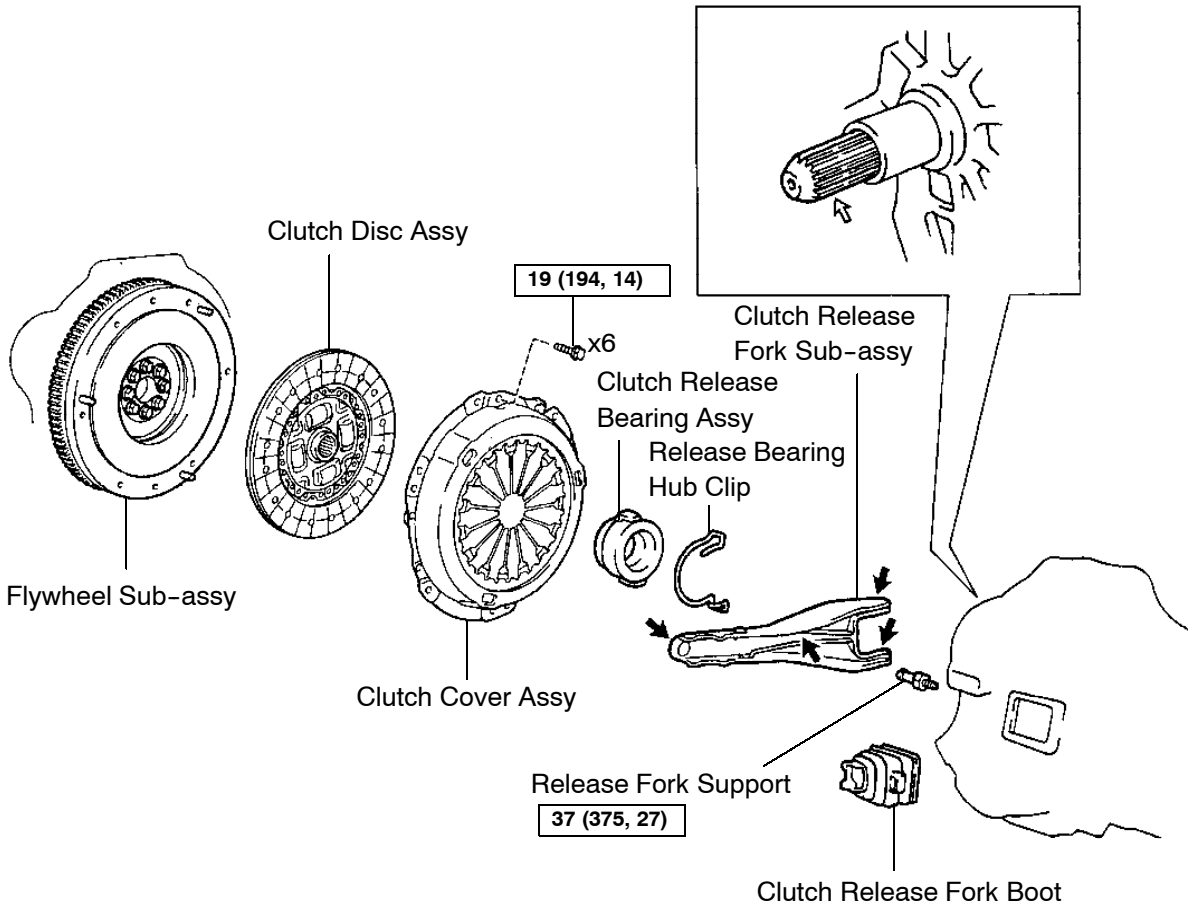
(a) Fill the brake reservoir tank with brake fluid and bleed the clutch system.

22. CHECK FOR CLUTCH FLUID LEAKAGE
23. CONNECT BATTERY NEGATIVE TERMINAL

CLUTCH UNIT (C53A/C53)

COMPONENTS

4209G-01



N·m (kgf·cm, ft·lbf) : Specified torque
⇦ Clutch spline grease
⬅ Release hub grease

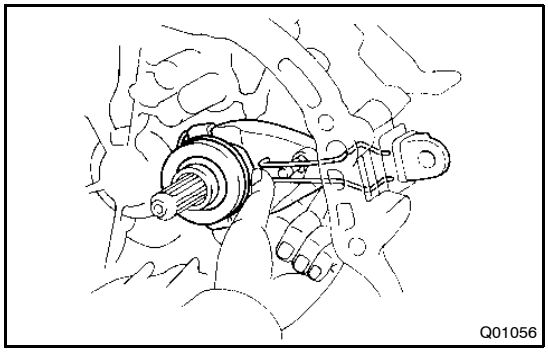
D26321

OVERHAUL

1. REMOVE MANUAL TRANSAXLE ASSY

HINT:

- Manual transaxle type C53A: (See page 41-36)
- Manual transaxle type C53: (See page 41-49)



2. REMOVE CLUTCH RELEASE FORK SUB-ASSY

(a) Remove the clutch release fork with the clutch release bearing from the transaxle assy.

3. REMOVE CLUTCH RELEASE BEARING ASSY

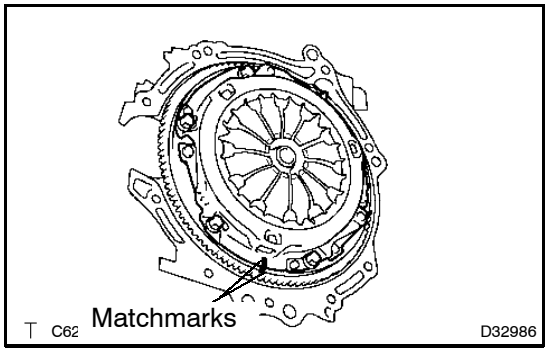
(a) Remove the clutch release bearing assy from the clutch release fork.

4. REMOVE RELEASE FORK SUPPORT

(a) Remove the release fork support from the transaxle assy.

5. REMOVE RELEASE BEARING HUB CLIP

6. REMOVE CLUTCH RELEASE FORK BOOT



7. REMOVE CLUTCH COVER ASSY

(a) Put matchmarks on the clutch cover assy and the flywheel sub-assy.

(b) Loosen each set bolt one turn at a time until the spring tension is released.

(c) Remove the set bolts, and pull off the clutch cover assy.

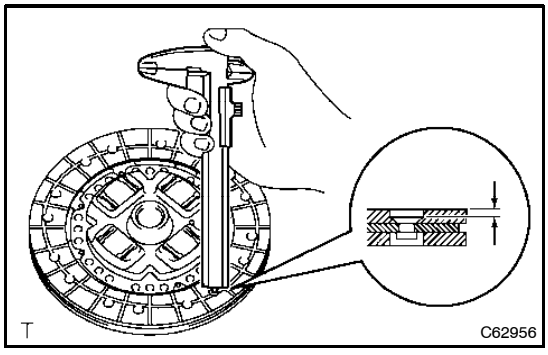
NOTICE:

Do not drop the clutch disc assy.

8. REMOVE CLUTCH DISC ASSY

NOTICE:

Keep the lining part of the clutch disc assy, the pressure plate and surface of the flywheel sub-assy away from oil and foreign matter.



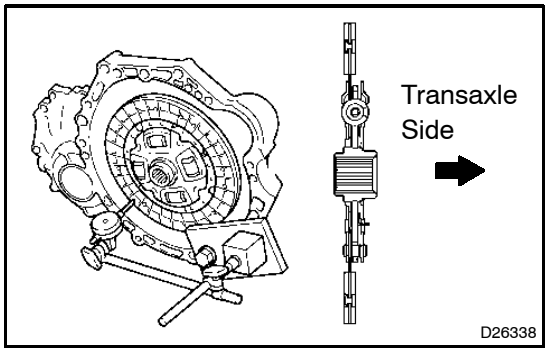
9. INSPECT CLUTCH DISC ASSY

(a) Using vernier calipers, measure the rivet head depth.
Minimum rivet depth: 0.3 mm (0.012 in.)

HINT:
Replace the clutch disc assy as necessary.

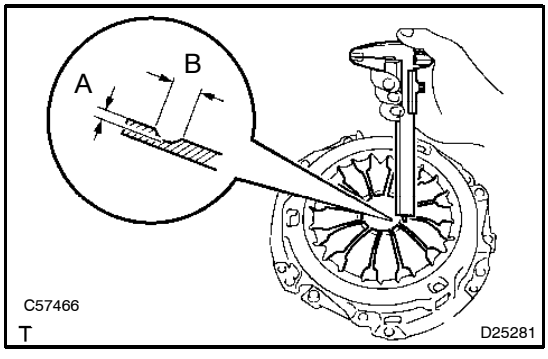
(b) Install the clutch disc assy to the transaxle assy.

NOTICE:
Take care not to insert the clutch disc assy in the wrong direction.



(c) Using a dial indicator, check the clutch disc assy runout.
Maximum runout: 0.8 mm (0.031 in.)

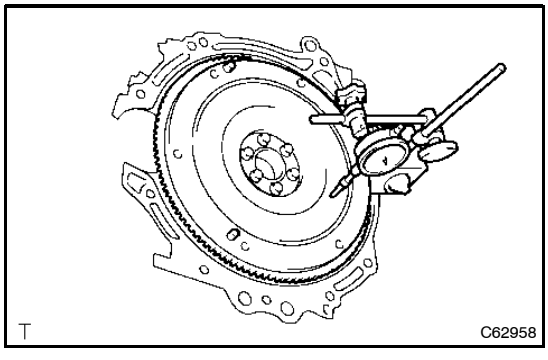
HINT:
Replace the clutch disc assy as necessary.



10. INSPECT CLUTCH COVER ASSY

(a) Using vernier calipers, inspect the diaphragm spring for the depth and width of wear.
Maximum:
A (Depth): 0.5 mm (0.020 in.)
B (Width): 6.0 mm (0.236 in.)

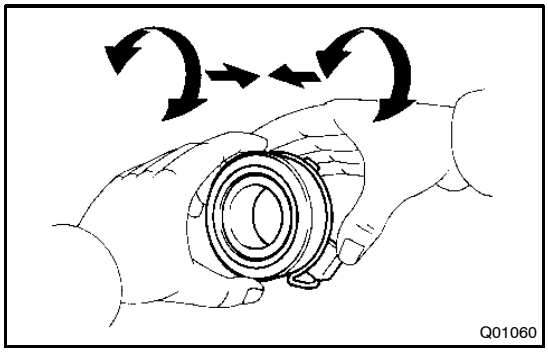
HINT:
Replace the clutch cover assy as necessary.



11. INSPECT FLYWHEEL SUB-ASSY

(a) Using a dial indicator, inspect the flywheel sub-assy runout.
Maximum runout: 0.1 mm (0.004 in.)

HINT:
Replace the flywheel sub-assy as necessary.

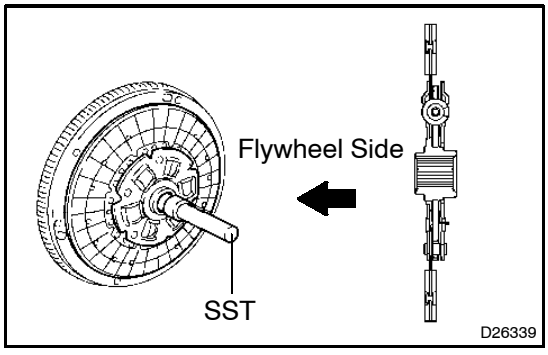


12. INSPECT CLUTCH RELEASE BEARING ASSY

(a) Check that the clutch release bearing assy moves smoothly without abnormal resistance by turning the sliding parts of the clutch release bearing assy (contact surfaces with the clutch cover) while applying force in the axial direction.

(b) Inspect the clutch release bearing assy for damage or wear.

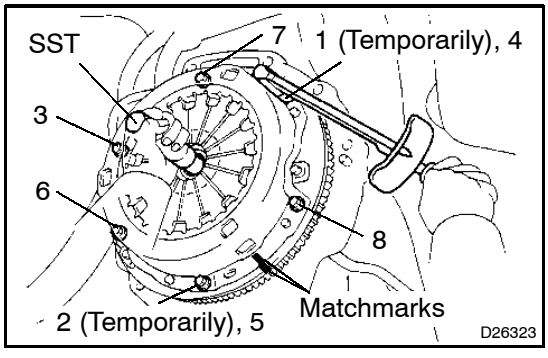
HINT:
Replace the release bearing assy as necessary.



13. INSTALL CLUTCH DISC ASSY

(a) Insert SST in the clutch disc assy, then insert them in the flywheel sub-assy.
SST 09301-00220

NOTICE:
Take care not to insert the clutch disc assy in the wrong direction.

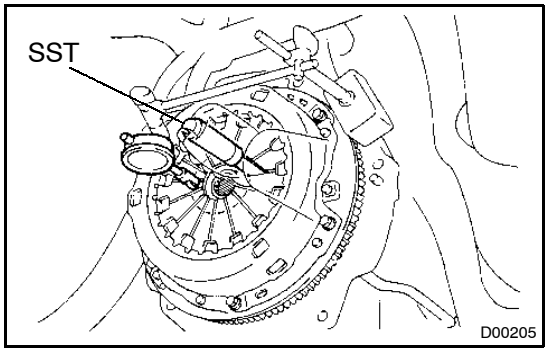


14. INSTALL CLUTCH COVER ASSY

(a) Align the matchmarks on the clutch cover assy and flywheel sub-assy.

(b) Following the oder shown in the illustration, tighten the 6 bolts starting from the bolt located near the knock pin on the top.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

HINT:
- Evenly tighten the bolts by following the order shown in the illustration.
- Tighten the bolts after checking that the disc is in the center by lightly moving the SST up and down, left and right.



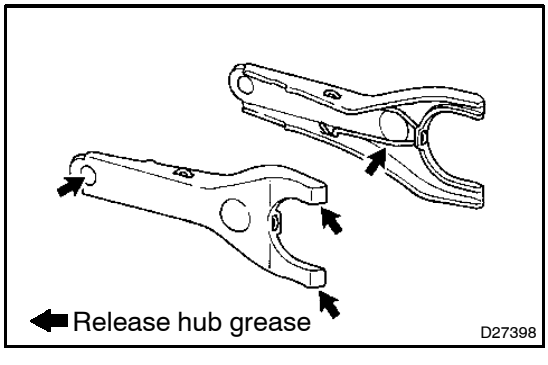
15. INSPECT AND ADJUST CLUTCH COVER ASSY

(a) Using a dial indicator with a roller instrument, check the diaphragm spring tip alignment.
Maximum non-alignment: 0.5 mm (0.020 in.)

If the alignment is not as specified, adjust the diaphragm spring tip alignment using SST.
SST 09333-00013

16. INSTALL RELEASE FORK SUPPORT

(a) Install the release fork support to the transaxle assy.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)



17. INSTALL CLUTCH RELEASE FORK SUB-ASSY

(a) Apply release hub grease to the contact surfaces of, the release fork and release bearing assy, release fork and push rod, and release fork and fork support .
Sealant:
Part No. 08887-01806, RELEASE HUB GREASE or equivalent

(b) Install the release fork to the release bearing assy.

(c) Install the release bearing hub clip.

18. INSTALL CLUTCH RELEASE BEARING ASSY

(a) Apply clutch spline grease to the input shaft spline.

Sealant:

Part No. 08887-01706, CLUTCH SPLINE GREASE or equivalent

(b) Install the clutch release bearing w/ release fork to the transaxle assy.

NOTICE:

After installation, move the fork forward and backward to check that the release bearing slides smoothly.

19. INSTALL CLUTCH RELEASE FORK BOOT

20. INSTALL MANUAL TRANSAXLE ASSY

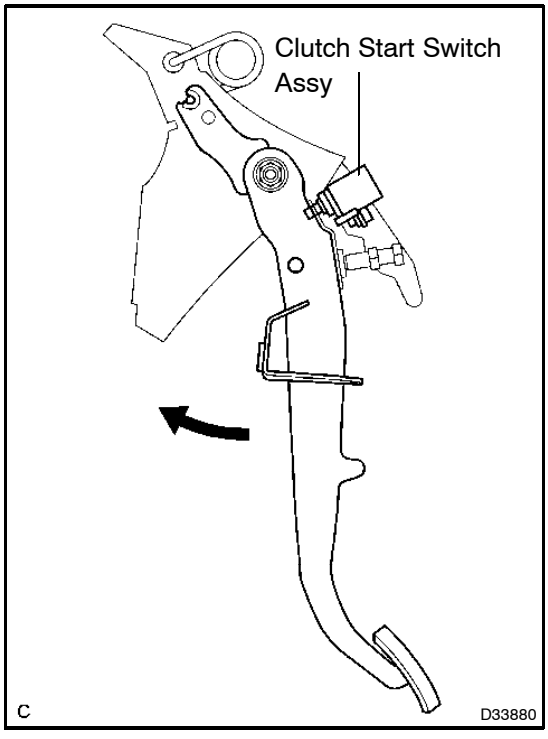
HINT:

- Manual transaxle type C53A: (See page 41-36)
- Manual transaxle type C53: (See page 41-49)

CLUTCH START SWITCH ASSY (C53)

4208B-02

ON-VEHICLE INSPECTION



1. CHECK CLUTCH START SYSTEM

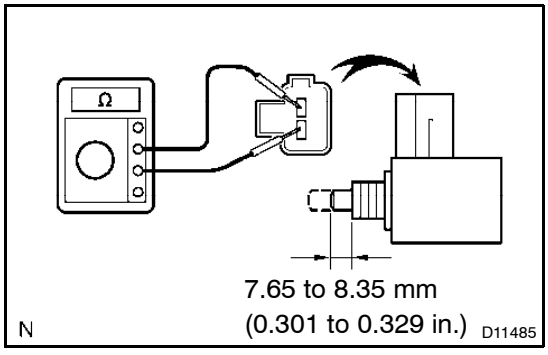
(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

If necessary, replace the clutch start switch assy.

4208C-02

INSPECTION



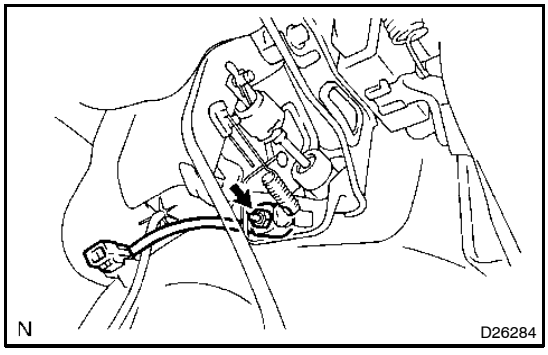
1. INSPECT CLUTCH START SWITCH ASSY

(a) Measure the resistance between the terminals when the switch is ON and when it is OFF.

Switch position	Condition
ON (pushed)	Below 1 Ω
OFF (free)	10 kΩ or higher

4208D-02

REPLACEMENT



1. **REMOVE CLUTCH START SWITCH ASSY**

(a) Disconnect the clutch start switch connector.

(b) Remove the nut and clutch start switch assy from the clutch pedal support.

2. **INSTALL CLUTCH START SWITCH ASSY**

(a) Install the clutch start switch assy with the nut.

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

(b) Connect the clutch start switch connector.

3. **INSPECT CLUTCH START SWITCH ASSY** (SEE PAGE 42-33)

HEATER & AIR CONDITIONER

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM1106E

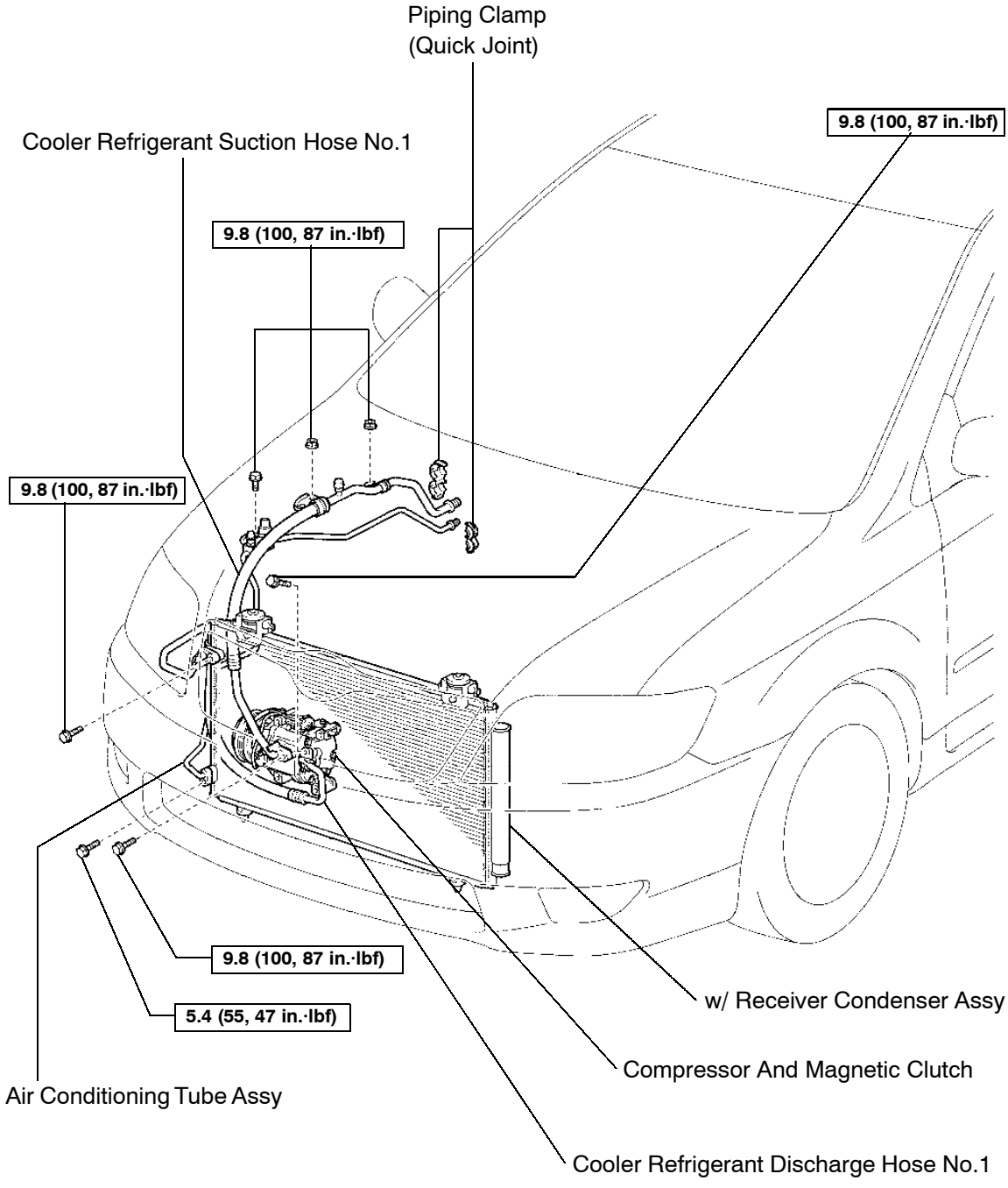
NOTE: The above pages contain only the points which differ from the above listed manuals.

REFRIGERANT LINE (1ND-TV)

COMPONENTS

551J0-01

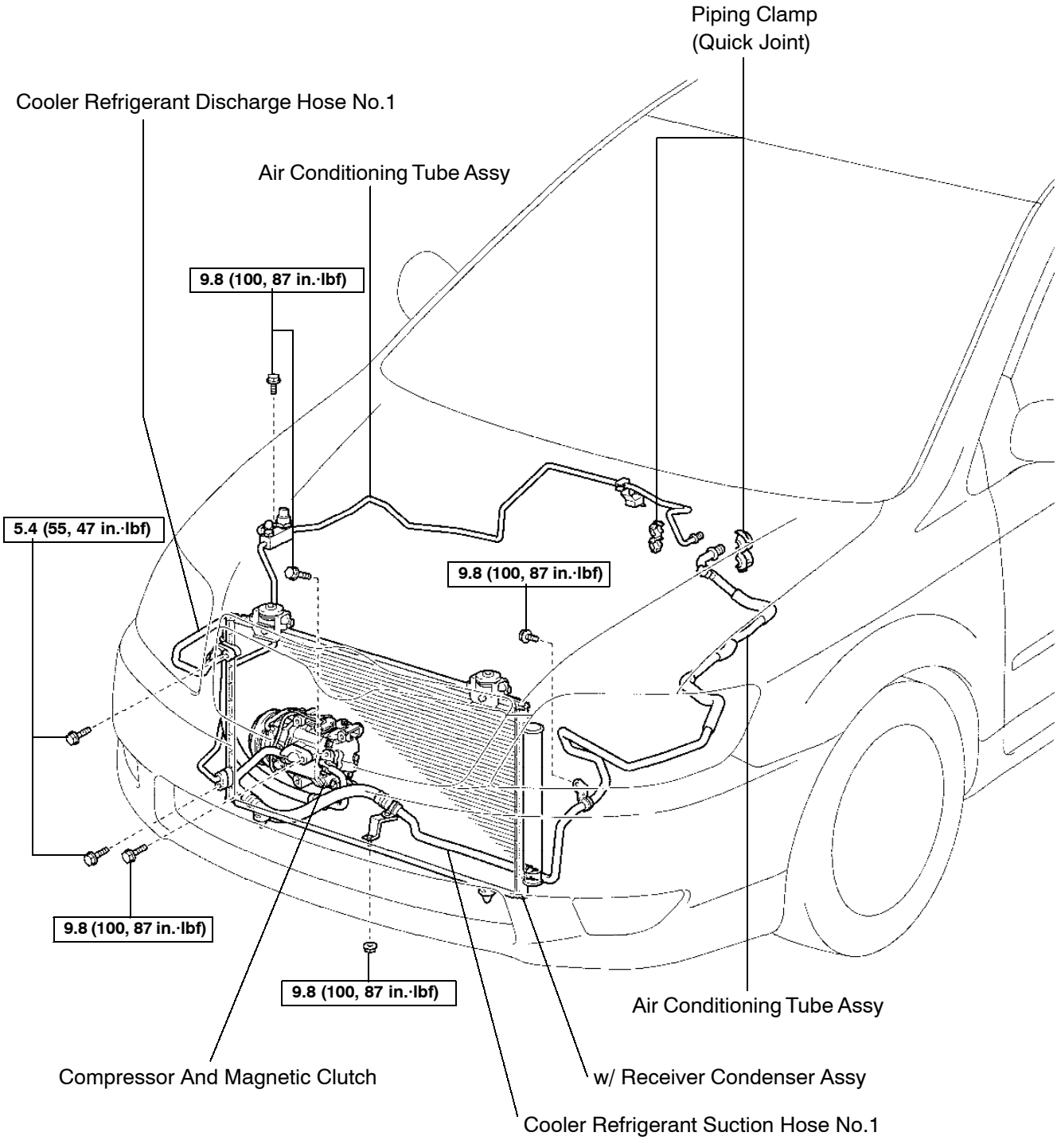
LHD:



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

I42935

RHD:



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

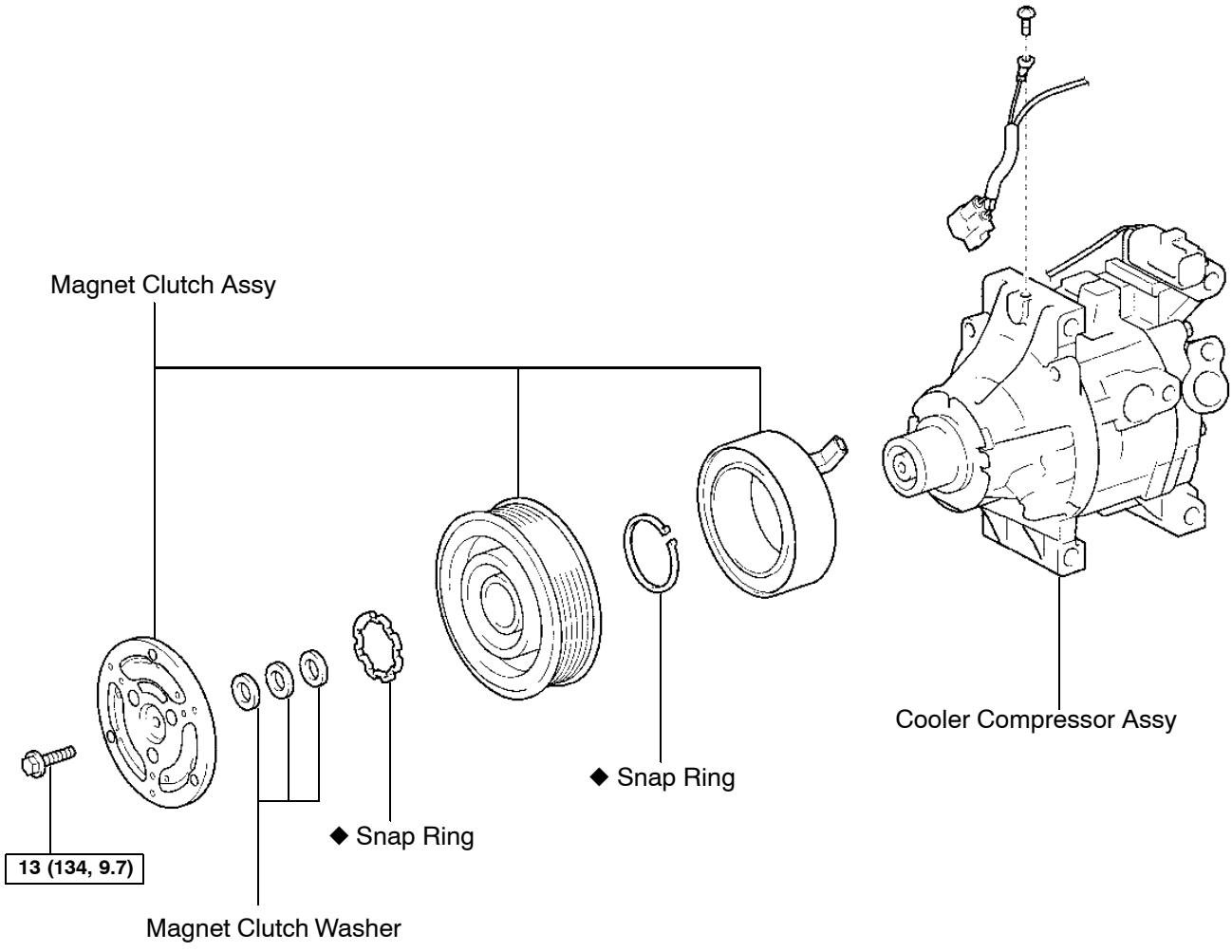
P

I42936

COOLER COMPRESSOR ASSY (1ND-TV)

COMPONENTS

551J1-01



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

◆ Non-reusable part

I31962

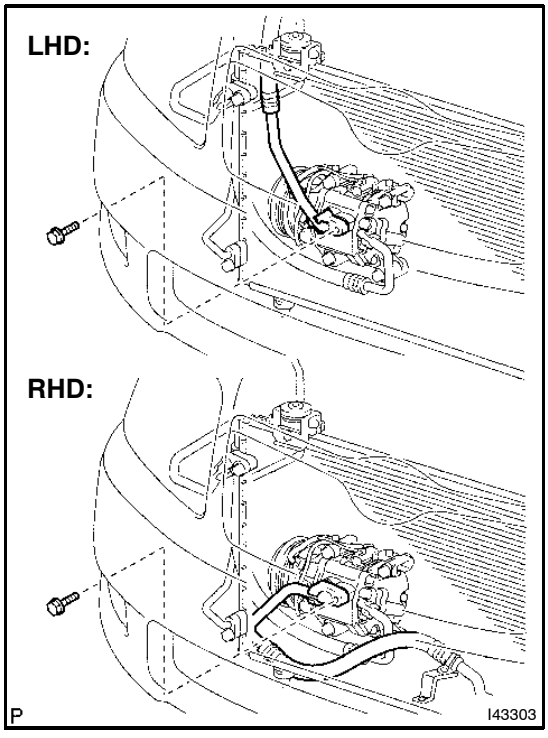
551J2-01

REPLACEMENT

HINT:

- COMPONENTS: See page 55-3.
- Installation is in the reverse order of removal.

1. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**
   (SEE PUB. NO. RM1106E, PAGE 55-7)
   SST 07110-58060 (07117-58080, 07117-58090, 07117-78050, 07117-88060, 07117-88070, 07117-88080)



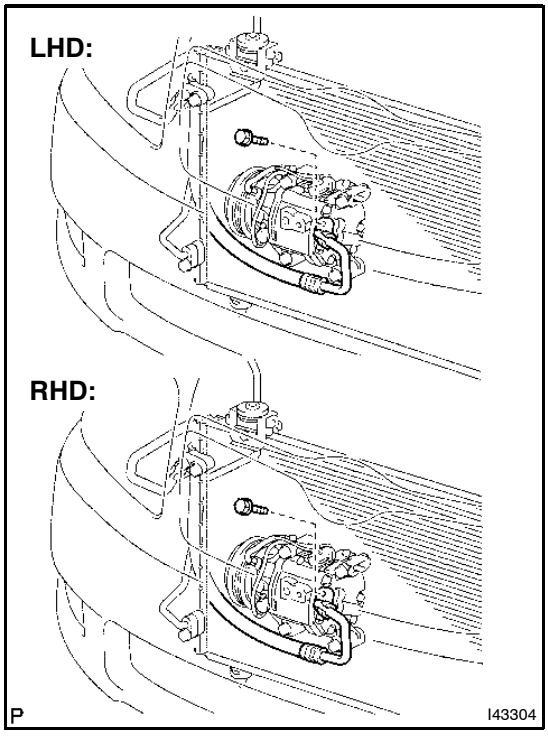
2. **DISCONNECT COOLER REFRIGERANT SUCTION HOSE NO.1**

(a) Remove the bolt and disconnect the cooler refrigerant suction hose No.1 from the compressor and magnetic clutch.

(b) Remove the O-ring from the cooler refrigerant suction hose No.1.

NOTICE:

Seal the openings of the disconnected parts using vinyl tape to prevent moisture and foreign matter from entering.



3. **DISCONNECT COOLER REFRIGERANT DISCHARGE HOSE NO.1**

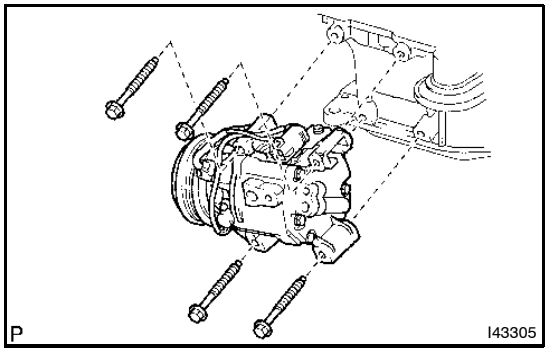
(a) Remove the bolt and disconnect the cooler refrigerant discharge hose No.1 from the compressor and magnetic clutch.

(b) Remove the O-ring from the cooler refrigerant discharge hose No.1.

NOTICE:

Seal the openings of the disconnected parts using vinyl tape to prevent moisture and foreign matter from entering.

4. REMOVE ENGINE UNDER COVER RH (SEE PAGE 14-4)
5. REMOVE FAN AND GENERATOR V BELT (SEE PAGE 14-4)



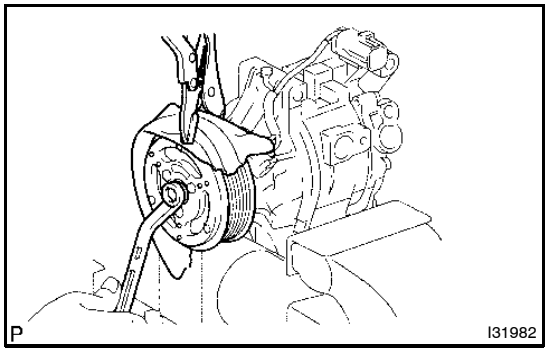
6. REMOVE COMPRESSOR AND MAGNETIC CLUTCH

(a) Disconnect the connector.

(b) Remove the 4 bolts and the compressor and magnetic clutch.

7. REMOVE MAGNET CLUTCH ASSY

(a) Place the compressor and magnetic clutch in a vise.



(b) Using vise pliers, hold the magnet clutch hub.

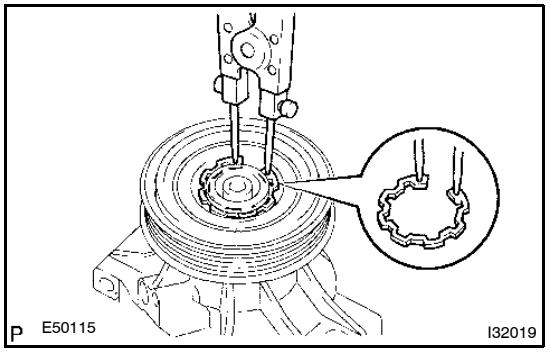
HINT:

Cover the magnet clutch with a shop rag when holding the magnet clutch hub to prevent it from being damaged.

(c) Remove the bolt, magnet clutch hub and magnet clutch washer.

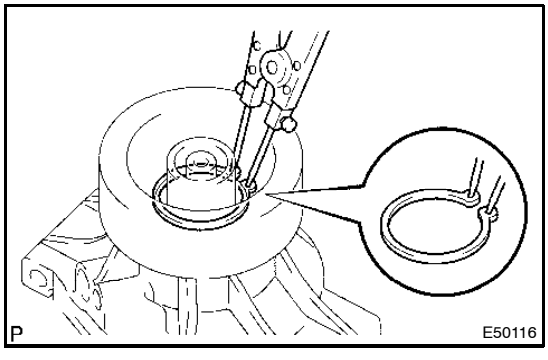
HINT:

There is no set number of magnet clutch washers since they are used for adjustment.

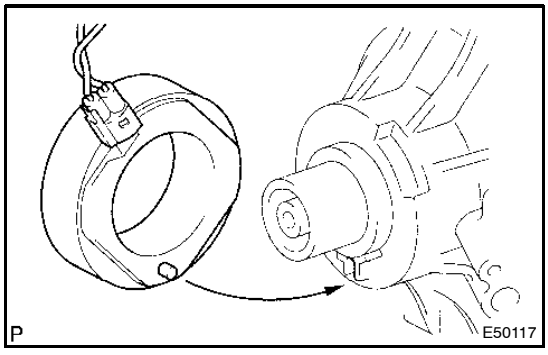


(d) Using a snap ring expander, remove the snap ring and magnet clutch rotor.

(e) Remove the screw, and disconnect the connector.

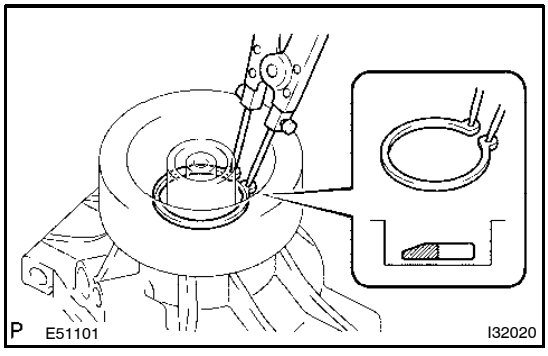


(f) Using a snap ring expander, remove the snap ring and magnet clutch stator.



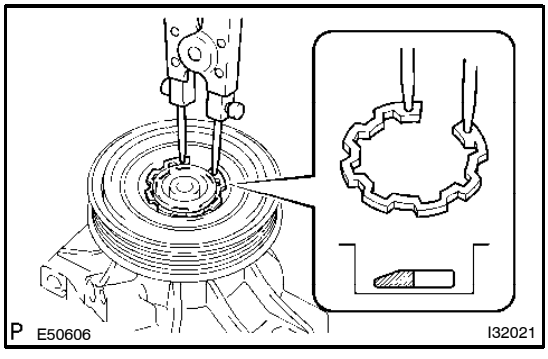
8. INSTALL MAGNET CLUTCH ASSY

(a) Matching the parts shown in the illustration, install the magnet clutch stator.



(b) Using a snap ring expander, install a new snap ring with the chamfered side facing up.

(c) Install the screw, and connect the connector.

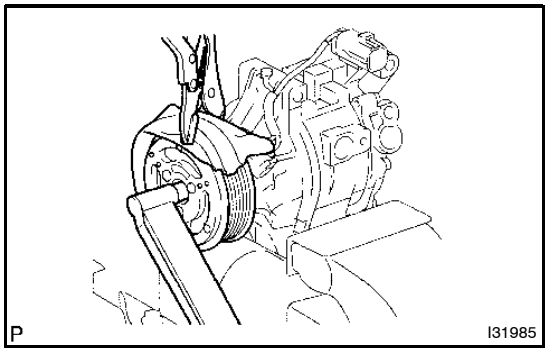


(d) Using a snap ring expander, install the magnet clutch rotor and a new snap ring with the chamfered side facing up.

(e) Install the magnet clutch washer and magnet clutch hub.

NOTICE:

Do not change the combination of the magnet clutch washers used before disassembly.



(f) Using vise pliers, hold the magnet clutch hub and install the bolt.

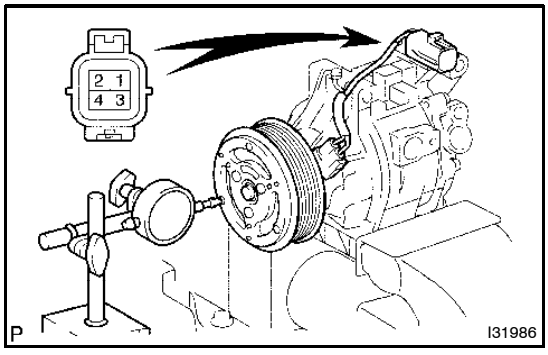
Torque: 13 N·m (134 kgf·cm, 9.7 ft·lbf)

NOTICE:

Ensure that there is no foreign matter or oil on the compressor shaft, bolt, and clutch hub.

HINT:

Cover the magnet clutch with a shop rag when holding the magnet clutch hub to prevent it from being damaged.



9. INSPECT MAGNETIC CLUTCH CLEARANCE

(a) Set the dial indicator to the magnet clutch hub.

(b) Connect the battery positive lead to terminal 1 of the magnet clutch connector and the negative lead to the earth wire. Turn on and off the magnet clutch and measure the clearance.

Standard clearance:

0.20 to 0.45 mm (0.008 to 0.018 in.)

If the measured value is out of the standard range, remove the magnet clutch hub and adjust it with magnet clutch washers.

NOTICE:

Adjustment shall be performed with 3 or less magnet clutch washers.

10. ADJUST COMPRESSOR OIL

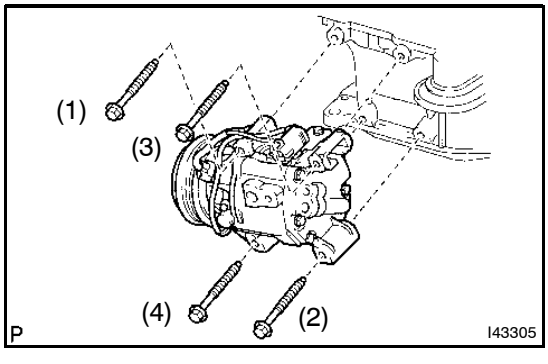
(a) When replacing the compressor and magnetic clutch with a new one, after gradually removing the refrigerant gas from the service valve, drain the following amount of oil from the new compressor and magnetic clutch before installation.

Standard:

(Oil capacity inside new compressor and magnetic clutch: 60 ± 10 cc (2.0 ± 0.3 fl. oz.)) - (Remaining oil amount in the removed compressor and magnetic clutch) = (Oil amount to be removed when replacing)

NOTICE:

- **When checking the compressor oil level, observe the precautions on the cooler removal/installation.**
- **Because compressor oil remains in the pipes of the vehicle, if a new compressor and magnetic clutch is installed without removing some oil inside, the oil amount becomes too much, preventing heat exchange in the refrigerant cycle and causing refrigerant failure.**
- **If the remaining oil in the removed compressor and magnetic clutch is too small in volume, check for oil leakage.**
- **Be sure to use ND-OIL8 or equivalent for compressor oil.**



11. INSTALL COMPRESSOR AND MAGNETIC CLUTCH

(a) Install the compressor and magnetic clutch with the 4 bolts.

Torque: 29 N·m (295 kgf·cm, 21 ft·lbf)

NOTICE:

Tighten the bolts in the order shown in the illustration to install the compressor and magnetic clutch.

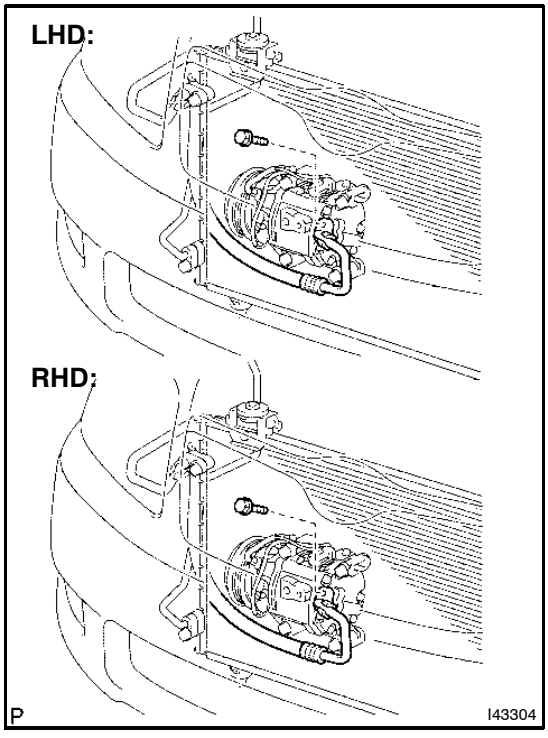
(b) Connect the connector.

12. INSTALL COOLER REFRIGERANT DISCHARGE HOSE NO.1

(a) Remove the attached vinyl tape from the hose.

(b) Sufficiently apply compressor oil to a new O-ring and the fitting surface of the compressor and magnetic clutch.
Compressor oil: ND-OIL8 or equivalent

(c) Install the O-ring to the cooler refrigerant discharge hose No.1.



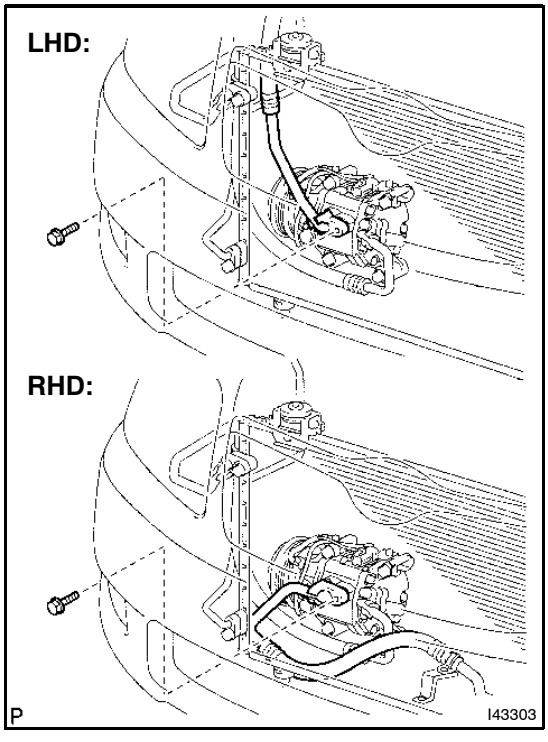
(d) Install the cooler refrigerant discharge hose No.1 to the compressor and magnetic clutch with the bolt.
Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)

13. INSTALL COOLER REFRIGERANT SUCTION HOSE NO.1

(a) Remove the attached vinyl tape from the hose.

(b) Sufficiently apply compressor oil to a new O-ring and the fitting surface of the compressor and magnetic clutch.
Compressor oil: ND-OIL8 or equivalent

(c) Install the O-ring to the cooler refrigerant suction hose No.1.



(d) Install the cooler refrigerant suction hose No.1 to the compressor and magnetic clutch with the bolt.
Torque: 9.8 N·m (100 kgf·cm, 87 in.·lbf)

14. CHARGE REFRIGERANT (SEE PUB. NO. RM1106E, PAGE 55-7)

SST 07110-58060 (07117-58060, 07117-58070, 07117-58080, 07117-58090, 07117-78050, 07117-88060, 07117-88070, 07117-88080), 07117-48130, 07117-48140

15. WARM UP ENGINE (SEE PUB. NO. RM1106E, PAGE 55-7)

16. CHECK FOR LEAKAGE OF REFRIGERANT (SEE PUB. NO. RM1106E, PAGE 55-7)

INSTRUMENT PANEL/METER

REFER TO FOLLOWING REPAIR MANUALS:

ManualName	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM939E
COROLLA Repair Manual Supplement	RM1106E

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

COMBINATION METER

PROBLEM SYMPTOMS TABLE

710PT-01

Indicator Lights:

Symptom	Suspected Area	See page
MMT indicator light does not come on.	1. Refer to troubleshooting procedures 2. MMT ECU 3. Wire Harness or Connector 4. Combination Meter Assy	05-219 05-219 - 71-32 (*1)
ES (Economy sports) indicator light does not come on.	1. Refer to troubleshooting procedures 2. MMT ECU 3. Wire Harness or Connector 4. Combination Meter Assy	05-219 05-219 - 71-32 (*1)

HINT:

(*1): Refer to repair manual RM925E.

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