FOREWORD

This supplement has been prepared to provide information covering general service repairs for COROLLA which underwent changes in May, 2003.

Applicable models: ZZE120, 121, 123 series
CDE120 series

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.
S COROLLA Repair Manual	RM925E
S COROLLA Repair Manual Supplement	RM939E
S COROLLA Repair Manual Supplement	RM1028E
S 3ZZ-FE, 4ZZ-FE Engine Repair Manual	RM928E
S 2ZZ-GE Engine Repair Manual	RM929E
S 1CD-FTV Engine Repair Manual	RM927E
S C51, C52 Manual Transaxle Repair Manual	RM826E
S C150 Manual Transaxle Repair Manual	RM827E
S C64 Manual Transaxle Repair Manual	RM930E
S E355, E356 Manual Transaxle Repair Manual	RM867E
S A245E, A246E Automatic Transaxle Repair Manual	RM847E
S COROLLA Electrical Wiring Diagram	EWD480E
S COROLLA Electrical Wiring Diagram Supplement	EWD485E
S COROLLA Electrical Wiring Diagram Supplement	EWD535E

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

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First Printing: May 13, 2003 01-030513-00

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CAUTION

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

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

- Must read this manual thoroughly. It is especially important to have 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 ENGINE SUPP RM1039E
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HOW TO USE THIS MANUAL

010NH-01

GENERAL INFORMATION

1. GENERAL DESCRIPTION

(a) This manual is made in accordance with SAE J2008.

(b) Generally, repair operations can be separated in the following 3 main processes:
1. Diagnosis
2. Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting
3. Final Inspection

(c) This manual explains the 1st process of "Diagnosis" (placed in the "Diagnostics" section), the 2nd process of "Removing and Installing, Replacing, Disassembling, Installing and Checking, Adjusting", but the 3rd process of "Final Inspection" is omitted.

(d) The following essential operations are not written in this manual. However, these operations must be done in the practical situation.
(1) Operation with a jack or lift
(2) Cleaning of a removed part when necessary
(3) Visual check

2. INDEX

(a) An alphabetical INDEX is provided as a section on the end of the book to guide you to 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 repairing condition. 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.

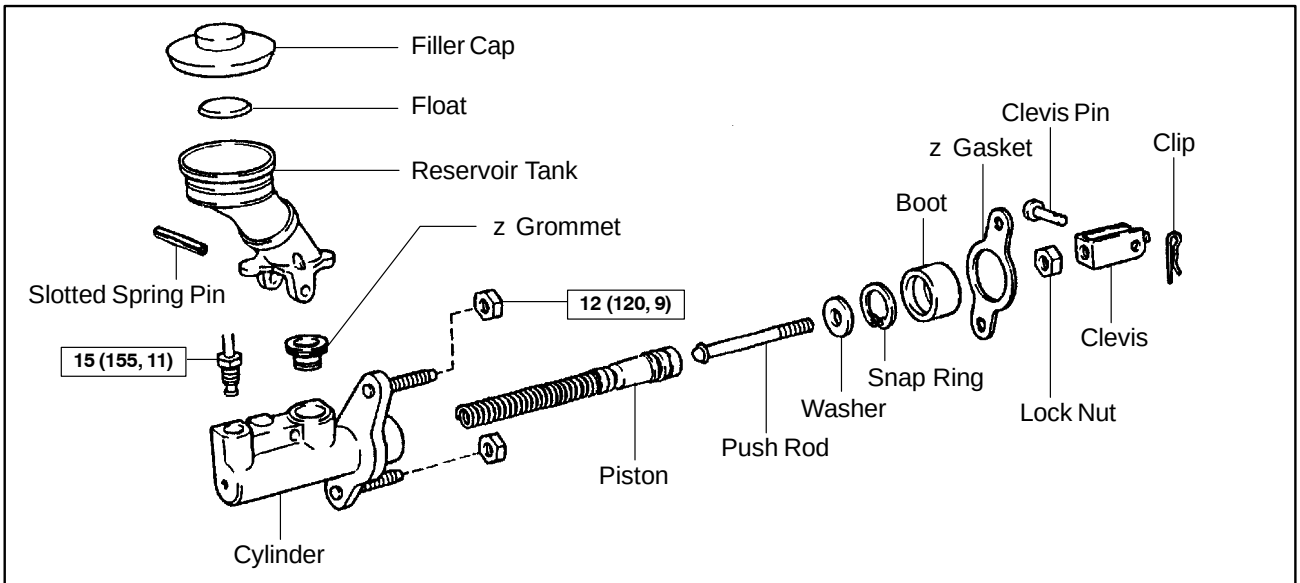
4. REPAIR PROCEDURES

(a) Component drawing is placed under the title when necessary.

(b) Illustrations are placed as "disassembled parts drawing" so that it enables you to understand the fitting condition of the components.

(c) Non-reusable parts, grease applied parts, precoated parts and tightening torque are specified in the components drawing.

Example:



(d) Tightening torque, oil applying position, and non-reusable parts are described as important points in the procedure.

NOTICE:

There are cases where such information can only be indicated by an illustration. In that case, all the information such as torque, oil, etc. are described in the illustration.

(e) Installing procedure of operation items is performed in the reverse order of the removal, and only the important points are described.

(f) Only items with points are described in the procedure, and the operational portion and content are placed using an illustration. In the explanations, details of the operational method, standard value and notice are placed.

(g) There may be a case where the illustrations of the similar models are used. In that case the details may be different from the actual vehicle.

(h) The procedures are presented in a step-by-step format:

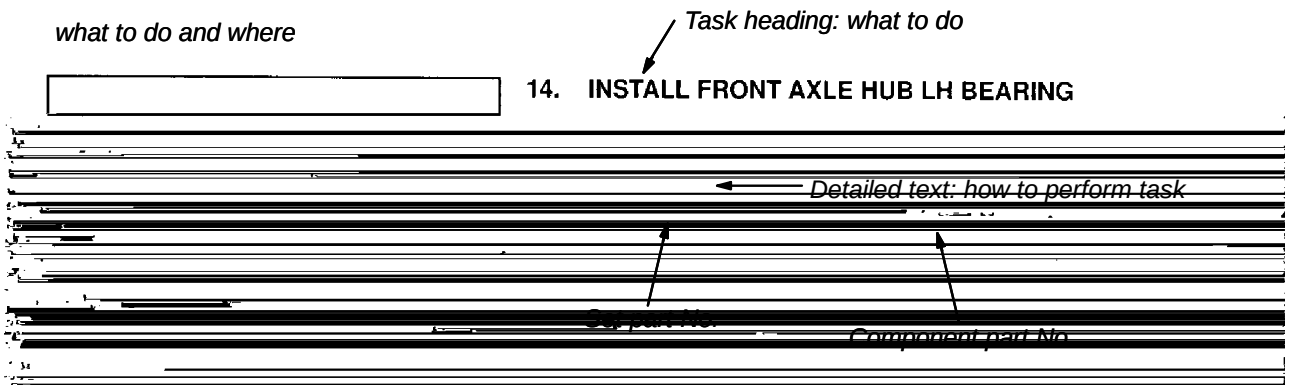
(1) The illustration shows what to do and where to do it.

(2) The task heading tells what to do.

(3) The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:

Illustration:



D26745

HINT:

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

5. SERVICE SPECIFICATIONS

(a) Specifications are presented in bold type throughout the manual. You never have to leave the procedure to look up your specifications. The specifications are also found in the Service Specifications section for a quick reference.

6. TERMS DEFINITION

CAUTION	Indicate the possibility of injury to you or other people.
NOTICE	Indicate the possibility of damage to the components being repaired.
HINT	Provide additional information to help you to perform the repair efficiently.

7. SI UNIT

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

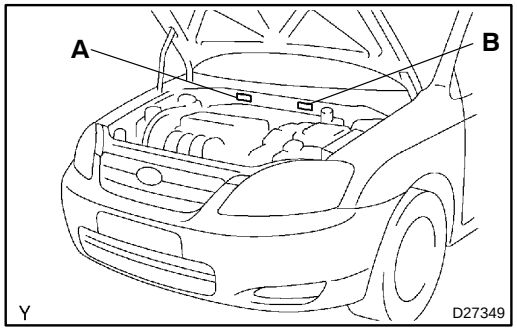
Example:

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

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION AND SERIAL NUMBERS

010NI-01

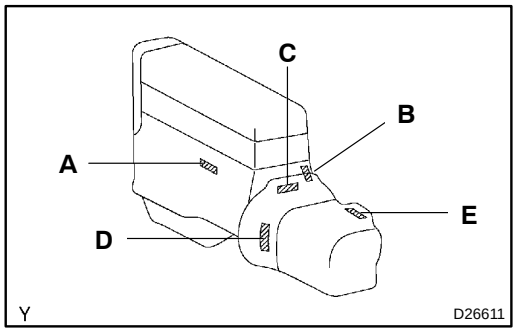


1. VEHICLE IDENTIFICATION NUMBER

(a) The vehicle identification number is stamped on the vehicle identification number plate and manufacturer's plate, as shown in the illustration.

A: Vehicle Identification Number Plate

B: Manufacturer's Plate



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

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

C: C50, C64, C150

D: E351, E357

E: A246E

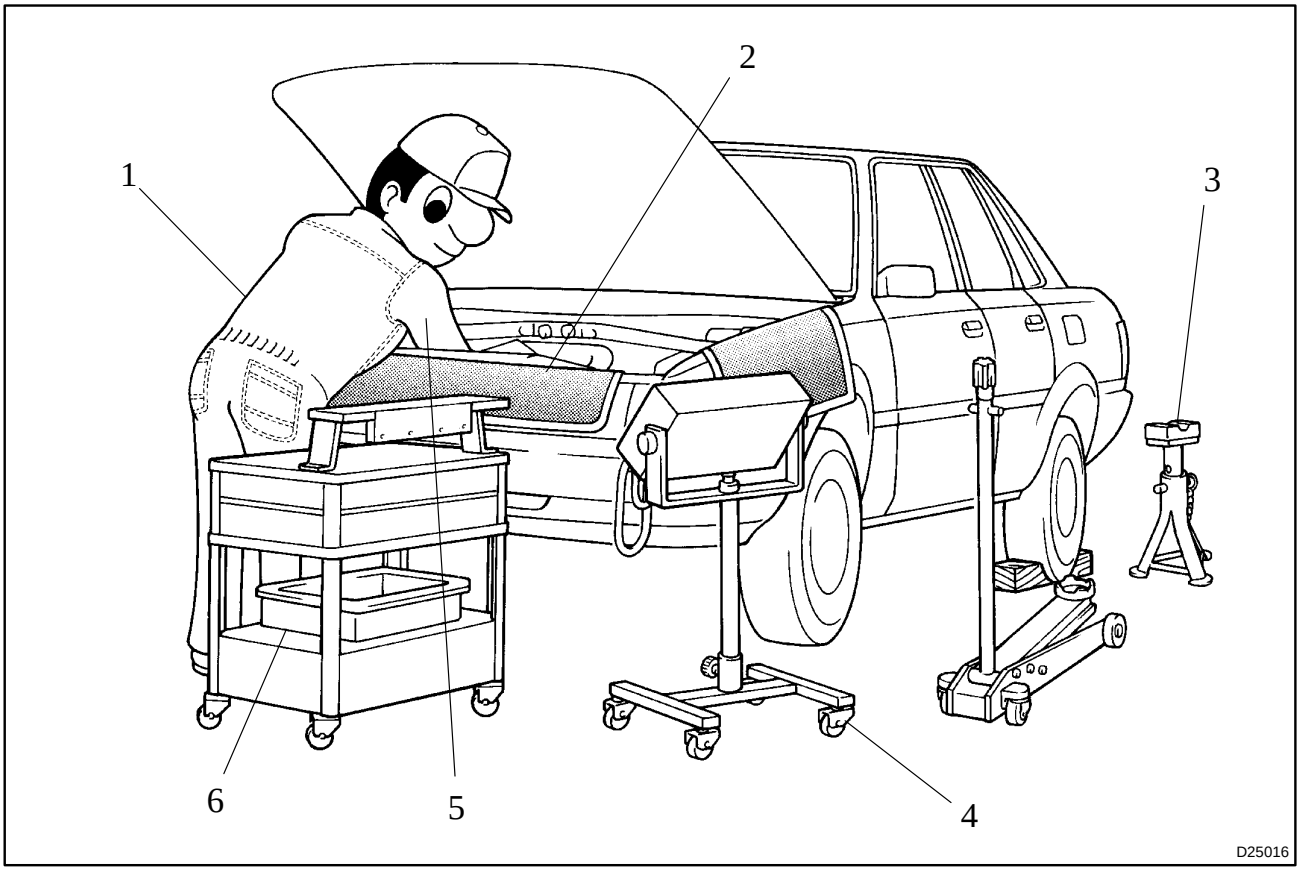
REPAIR INSTRUCTION

PRECAUTION

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1. BASIC REPAIR HINT

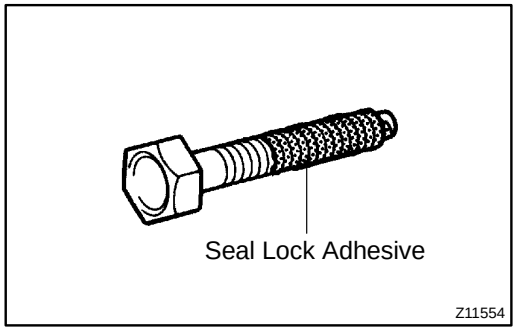
(a) HINTS ON OPERATIONS



1	Looks	S Always wear a clean uniform. S Hat and safety shoes must be worn.
2	Vehicle protection	S Set a grill cover, fender cover, seat cover and floor mat before starting the operation.
3	Safe operation	S In case of working with more than 2 persons, be sure to check safety of one another. S When working with the engine running, pay attention to the ventilation of the workshop. S In case of operating on high-temperature parts, rotating, moving and vibrating parts, pay attention not to burn or injure yourself. S When jacking up the vehicle, be sure to support the specified location with a safety stand. S When lifting up the vehicle, apply a safety equipment.
4	Preparation of tools and measuring gauge	S Before starting operation, prepare a tool stand, SST, gauge, oil, shop rag and parts for replacement.
5	Removal and Installation, Disassembly and Assembly operations	S Diagnose with a thorough understanding of the trouble phenomenon and perform effective operations. S Before removing the parts, check the assembly condition, deformation and damage condition. S When the structure is complicated, take a note or put matchmarks that will not affect its function. S Clean and wash the removed parts if necessary, and assemble them after a thorough check.
6	Removed parts	S Place the removed parts in the correct order to avoid mixing up or making them dirty. S As for non-reusable parts such as gasket, O-ring, and self lock nut, change them to new ones following the instruction of this manual. S Sort out the parts for replacement in a box and show them to the customer.

(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 01-17).



(c) PRECOATED PARTS

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

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

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

NOTICE:

Perform the torque checking with the lower limit value of the torque tolerance.

(4) Depending on the seal lock agent to apply, there may be a case where it is necessary to leave it for a specified time until it hardens.

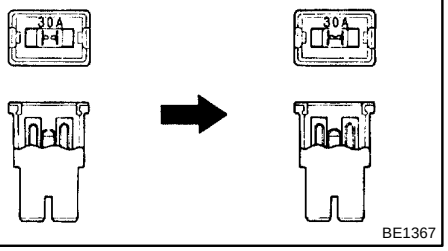
(d) GASKETS

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

(e) BOLTS, NUTS AND SCREWS

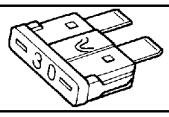
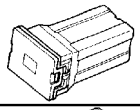
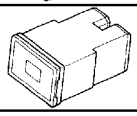
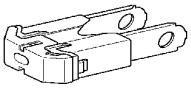
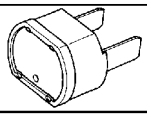
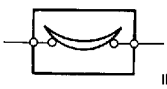
(1) Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

Medium Current Fuse and High Current Fuse Equal Amperage Rating



(f) FUSES

(1) When replacing fuses, be sure that a new fuse has the correct amperage rating. DO NOT exceed the rating nor 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

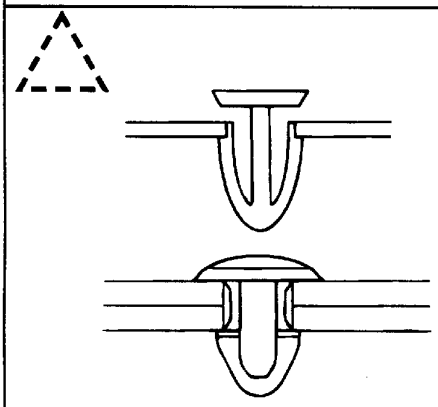
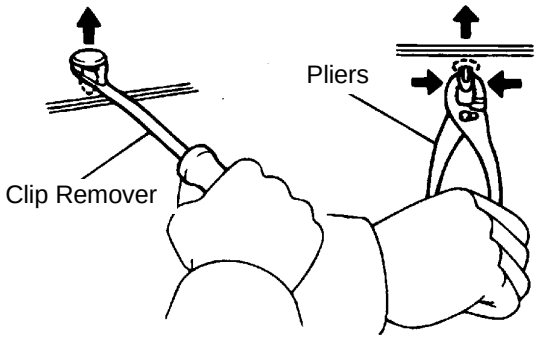
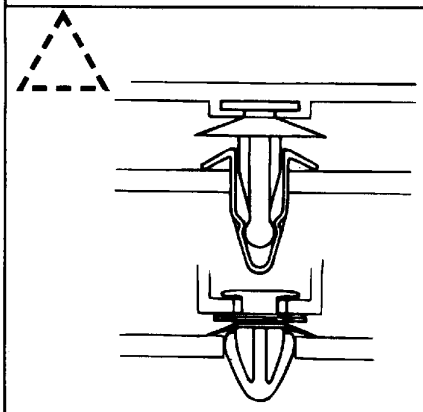
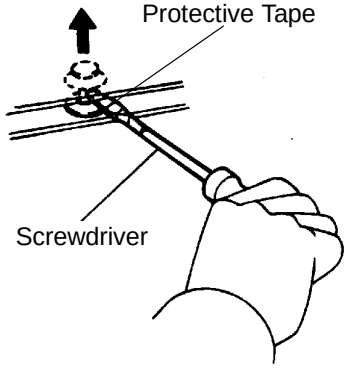
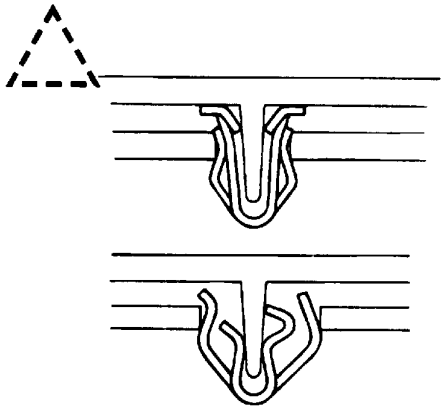
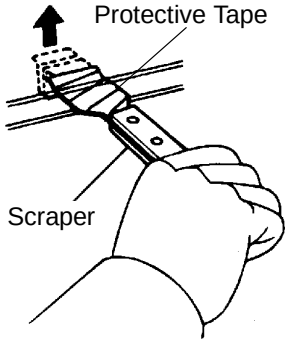
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(g) CLIPS

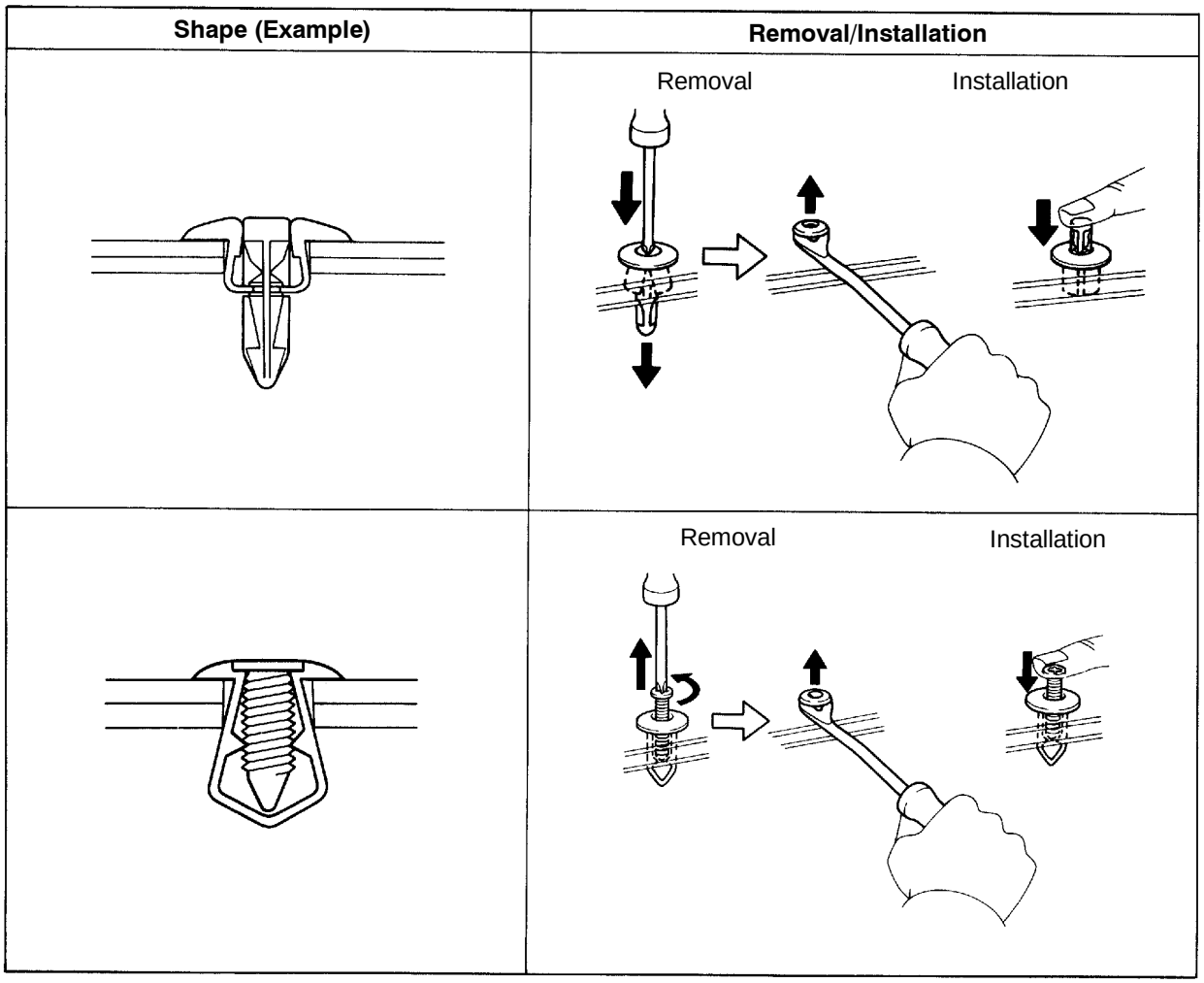
(1) The removal methods of typical clips used in body parts are shown in the table below.

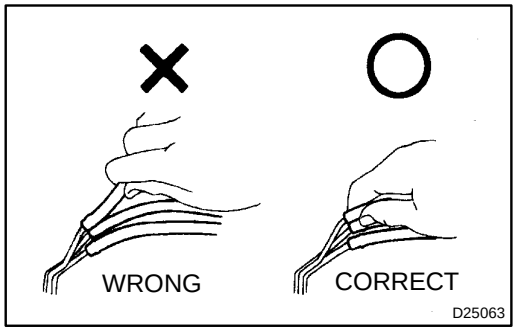
HINT:

If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal/Installation
	
	
	

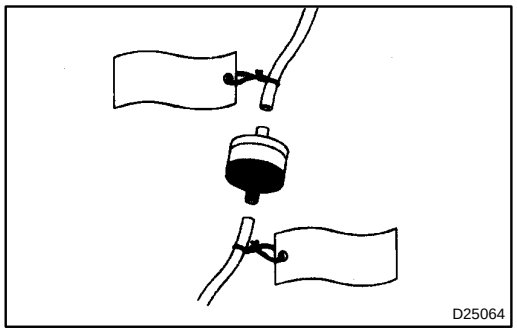
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(h) REMOVAL AND INSTALLATION OF VACUUM HOSES

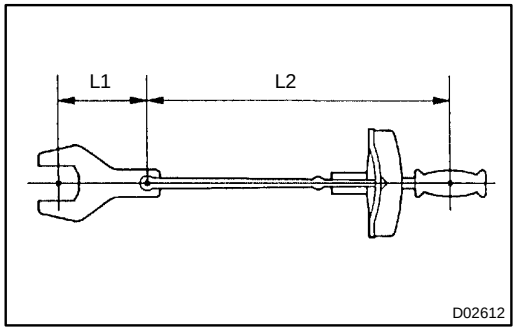
(1) To disconnect vacuum hoses, pull them by holding the end, not the middle of the hose.

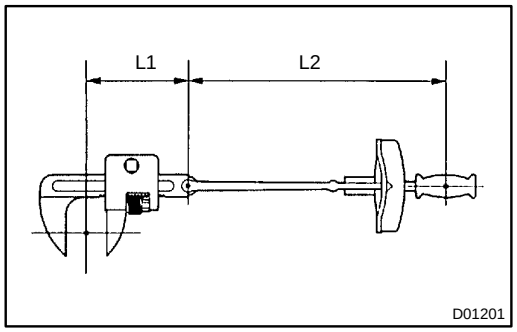


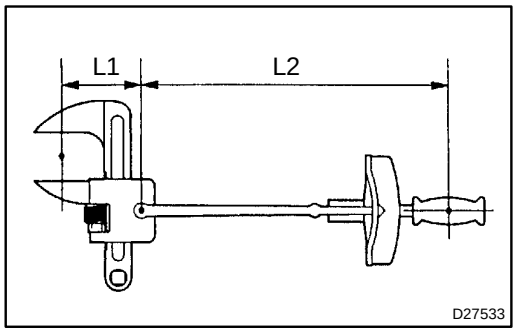
(2) When disconnecting vacuum hoses, use tags to identify where they should be reconnected.

(3) After completing the job, make a double check whether the vacuum hoses are properly connected. A 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. Use a step-down adapter for adjustment. Once the hose has been stretched, it may leak air.







(i) TORQUE WHEN USING TORQUE WRENCH WITH EXTENSION TOOL

(1) In case of tightening with a torque wrench which has an extended length by combining the torque wrench with SST or tool, tightening until the reading on the torque wrench reaches the specified torque value actually is excessive torque.

(2) In this manual, only the specified torque is described. In case of using SST or an extension tool, calculate the reading of the torque wrench by the formula.

(3) 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 tool (cm)
L2	Length of torque wrench (cm)

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

HINT:

The vehicle is equipped with an SRS (Supplemental Restraint System), such as the horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly, center airbag sensor assembly, front airbag sensor, side airbag sensor and seat belt pretensioner.

Failure to carry out the service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing. It may possibly lead to a serious accident.

Furthermore, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.

(a) GENERAL NOTICE

(1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page 05-942 of pub. No. RM925E COROLLA).

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

(3) Even in case of a minor collision where the SRS does not deploy, the horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly and seat belt pretensioner should be should be inspected (See pages 60–14, 60–27, 60–32, and 61–12 of pub. No. RM925E COROLLA).

(4) Never use SRS relating parts from another vehicle. When replacing parts, replace them with new parts.

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

(6) Never disassemble and repair the airbag sensor assembly, horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly or seat belt pretensioner.

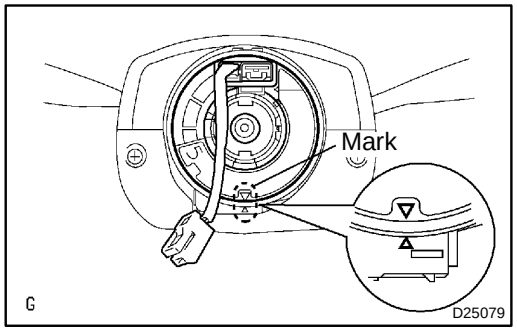
(7) If the airbag sensor assembly, side airbag sensor assembly, horn button assembly, instrument panel passenger airbag assembly, front seat airbag assembly, seat belt pretensioner have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.

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

(9) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting an electrical circuit.

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

(11) After work on the supplemental restraint system is completed, check the SRS warning light (See page 05–942 of pub. No. RM925E COROLLA).



(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 troubles may occur. Refer to 60–22 of pub. No. RM925E COROLLA concerning the correct installation of steering wheel.

(c) HORN BUTTON ASSEMBLY (with Airbag)

(1) When removing the horn button assembly or handling a new horn button, it should be placed with the pad top surface facing upward.
Placing it with the pad surface facing downward may lead to a serious accident if the airbag accidently inflates. Also, do not place horn button on top of one another.

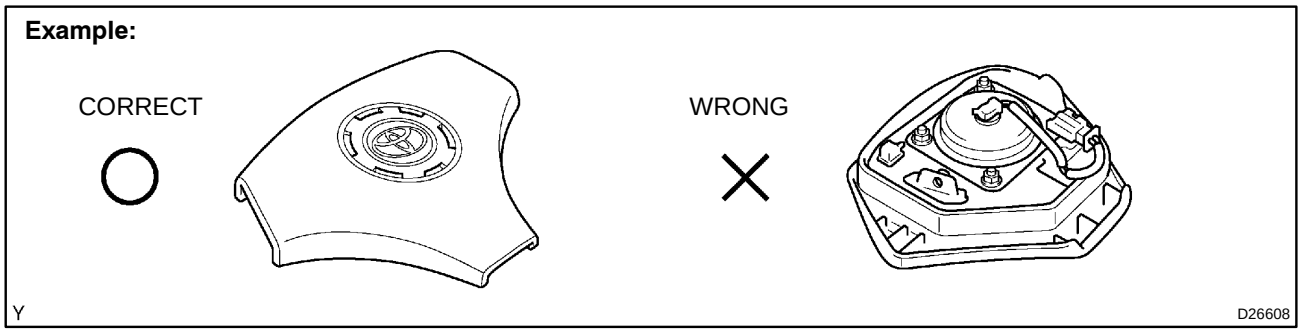
(2) Never measure the resistance of the airbag squib (This may cause the airbag to inflate, which is very dangerous.).

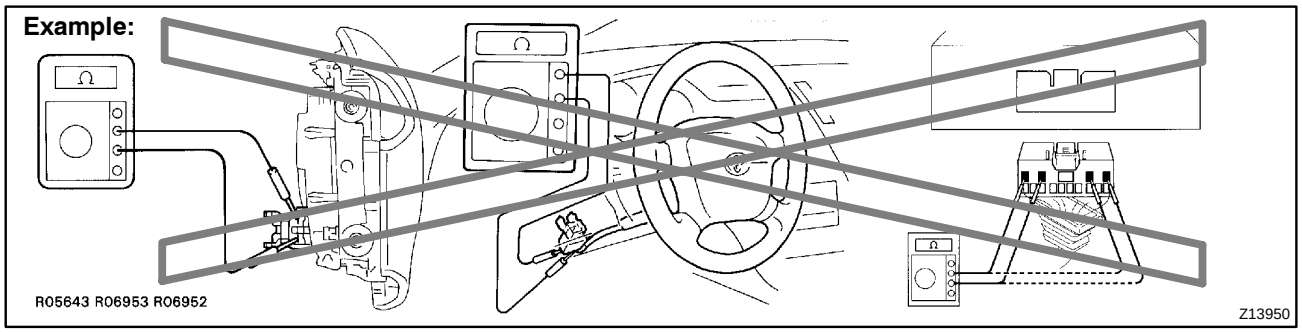
(3) Grease should not be applied to the horn button assembly and the pad should not be cleaned with detergents of any kinds.

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

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

(6) When disposing the vehicle or the horn button assembly alone, the airbag should be inflated using an SST before disposal (See page 60-14 of pub. No. RM925E COROLLA).
Perform the operation in a safe place away from electrical noise.





(d) INSTRUMENT PANEL PASSENGER AIRBAG ASSEMBLY

(1) Always store a removed or new instrument panel passenger airbag assembly with the airbag inflating direction facing upward.
Placing the airbag assembly with the airbag inflation direction facing downward could cause a serious accident if the airbag inflates.

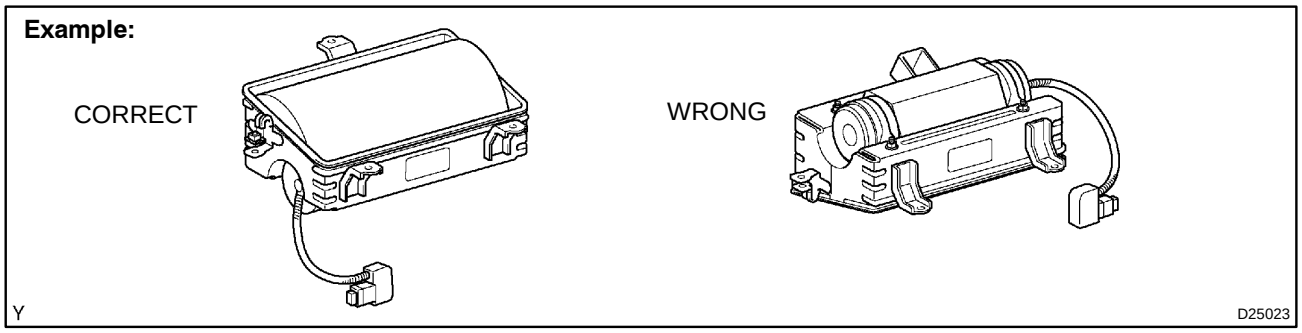
(2) Never measure the resistance of the airbag squib (This may cause the airbag to inflate, which is very dangerous.).

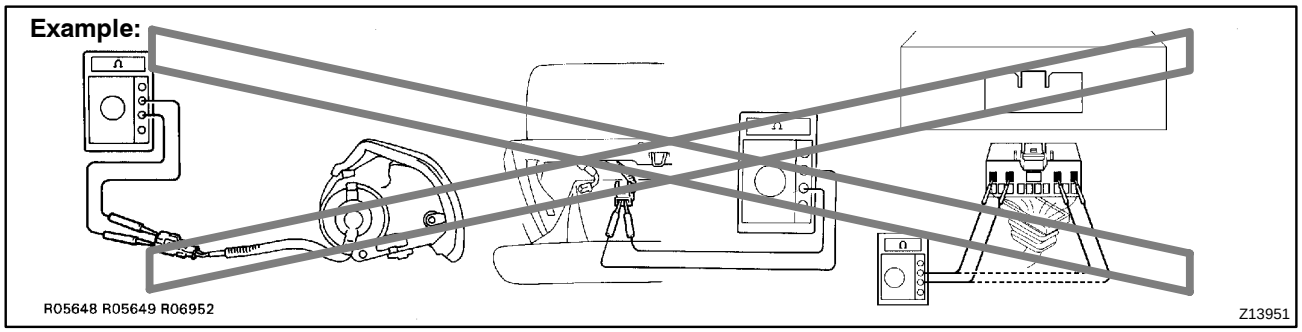
(3) Grease should not be applied to the instrument panel passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.

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

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

(6) When disposing of a vehicle or the airbag assembly alone, the airbag should be inflated using an SST before disposal (See page 60-27 of pub. No. RM925E COROLLA).
Perform the operation in a safe place away from electrical noise.





(e) FRONT SEAT AIRBAG ASSEMBLY

(1) Always store a removed or new front seat airbag assembly with the airbag inflating direction facing upward.
Placing the airbag assembly with the airbag inflation direction facing downward 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 is very dangerous.).

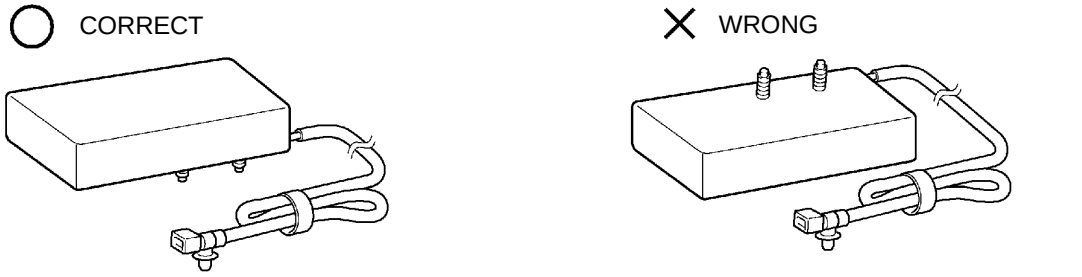
(3) Grease should not be applied to the front seat airbag assembly and the airbag door should not be cleaned with detergents of any kind.

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

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

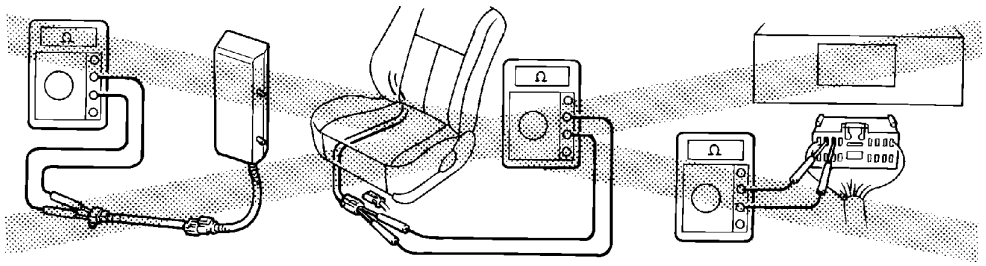
(6) When disposing of a vehicle or the side airbag assembly alone, the airbag should be inflated using an SST before disposal (See page 60-32 of pub. No. RM925E COROLLA).
Perform the operation in a safe place away from electrical noise.

Example:



Y D26612

Example:

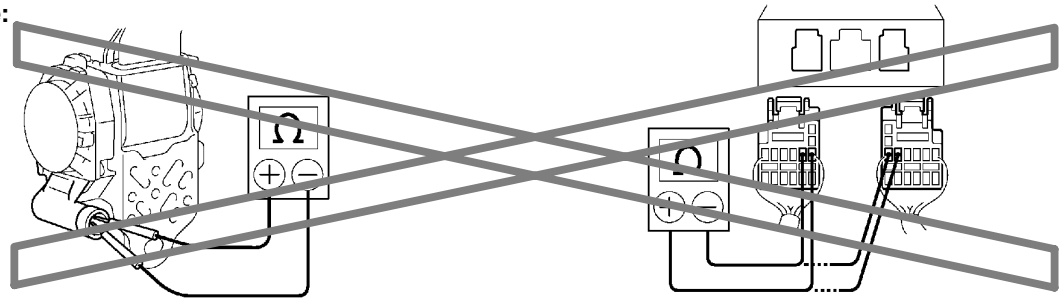


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(f) SEAT BELT PRETENSIONER

(1) Never measure the resistance of the seat belt pretensioner (This may cause the seat belt pretensioner to activate, which is very dangerous.).
(2) Never disassemble the seat belt pretensioner.
(3) Never install the seat belt pretensioner in another vehicle.
(4) Store the seat belt pretensioner where the ambient temperature remains below 80˚C (176˚F) without high humidity and away from electrical noise.
(5) When using electric welding, first disconnect the connector (2 yellow pins) before starting work.
(6) When disposing of a vehicle or the seat belt pretensioner alone, the seat belt pretensioner should be activated before disposal (See page 61–12 of pub. No. RM925E COROLLA). Perform the operation in a safe place away from electrical noise.
(7) The seat belt pretensioner is hot after activation, so let it cool down sufficiently before disposal. Never apply water to cool down the seat belt pretensioner.
(8) Oil or water should not be put on the front seat outer belt and the front seat outer belt should be cleaned with the appropriate detergents.

Example:

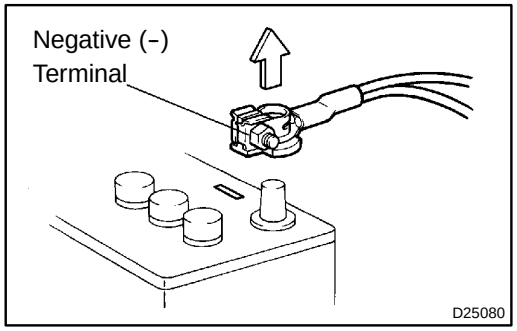


(g) AIRBAG SENSOR ASSEMBLY

(1) Never reuse the airbag sensor assembly 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 to the floor, it could cause an undesired ignition of the supplemental restraint system.
(3) Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery, even if only loosening the set bolts of the airbag sensor assembly.

(h) WIRE HARNESS AND CONNECTOR

(1) The SRS wire harness is integrated with the instrument panel wire harness assembly. All connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it.



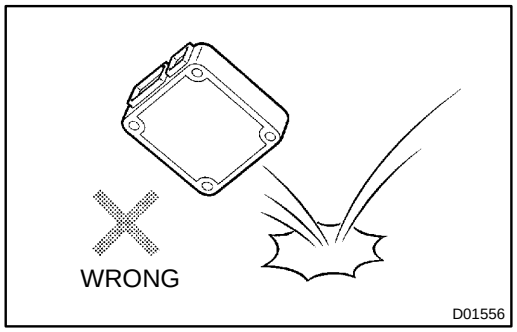
3. ELECTRONIC CONTROL

(a) REMOVAL AND INSTALLATION OF BATTERY TERMINAL

(1) Before performing electrical work, disconnect the battery negative (-) terminal cable beforehand so as to prevent burnt-out damage by short.

(2) When disconnecting and installing the terminal cable, turn the ignition switch and lighting switch OFF, and loosen the terminal nut completely. Perform these operations without twisting or prying the terminal.

(3) When the battery terminal is removed, all the memories of the clock, radio, DTCs, etc. will be erased. So before removing it, check them and note them down.



(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 destroyed by static electricity.)

(2) To disconnect electrical connectors, pull the connector itself, not the wires.

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

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

4. REMOVAL AND INSTALLATION OF FUEL CONTROL PARTS

(a) PLACE FOR REMOVING AND INSTALLING FUEL SYSTEM PARTS

(1) Work in a place with good air ventilation and without anything flammable such as welder, grinder, drill, electric motor or stove in the surroundings.

(2) Never work in a place such as a pit or nearby a pit as there is a possibility that vaporized fuel is filled in those places.

(b) REMOVING AND INSTALLING OF FUEL SYSTEM PARTS

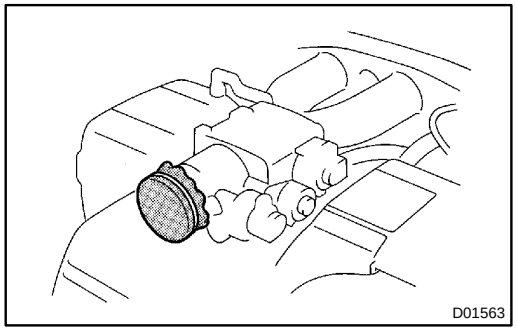
(1) Prepare a fire extinguisher before starting the operation.

(2) For prevention of static electricity, install a ground on the fuel changer, vehicle and fuel tank, and do not spray much water so as to prevent slipping.

(3) Never use any electric equipment like an electric motor or a working light as they may cause a spark or high temperature.

(4) Never use an iron hammer as it may cause a spark.

(5) Dispose the shop rag separately from any fuel deposit.

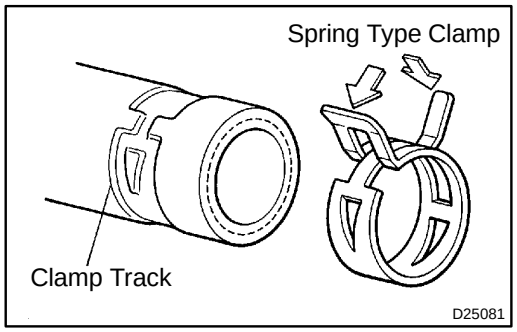


5. REMOVAL AND INSTALLATION OF ENGINE INTAKE PARTS

(a) If any metal tip is mixed in the inlet pass, this may give a bad effect to the engine and turbocharger.

(b) When removing and installing the inlet system parts, close the opening of the removed inlet system parts and the engine with a clean waste cloth or gummed tape.

(c) When installing the inlet system parts, check that there is no mixing of a metal tip.



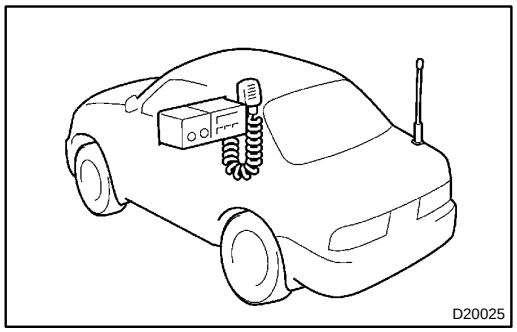
6. HANDLING OF HOSE CLAMPS

(a) Before removing the hose, check the depth of the inserting portion and the clamp position to restore it surely.

(b) Change a deformed or dented clamp for a new one.

(c) In case of reusing the hose, install the clamp on the hose where it has a clamp track.

(d) For a spring type clamp, adjust it by adding force to the arrow mark direction after the installation.



7. FOR VEHICLES EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

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

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

(c) Prevent the antenna feeder from getting entangled with the other wirings and keep the antenna feeder separate from the other wirings as much as possible.

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

(e) Do not install any powerful mobile communication system.

8. FOR VEHICLES EQUIPPED WITH CATALYTIC CONVERTER

CAUTION:

If large amount of unburned fuel flows into the converter, it may cause overheating and a fire hazard. To prevent this, observe the following precautions.

(a) Use only diesel fuel for 1CD-FTV engine and unleaded fuel for other engines.

(b) Avoid prolonged idling.
Avoid running the engine at idle speed 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 done as rapidly as possible.

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

010NK-01

VEHICLE LIFT AND SUPPORT LOCATIONS

1. NOTICE ABOUT VEHICLE CONDITION WHEN JACKING UP

(a) As a rule, the vehicle must be in an unloaded when jacking up. Never jack up or lift up the vehicle loaded with heavy weight.

(b) When removing any parts of heavy weight like the engine and transmission, the center of gravity of the vehicle moves. Place a balance weight so as to keep it from rolling, or hold the jacking support location using the mission jack.

2. NOTICE FOR USING 4 POST LIFT

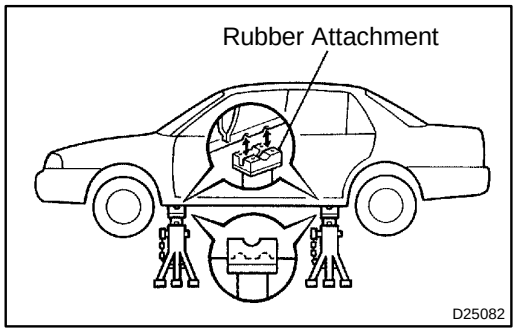
(a) Follow the instruction manual for a safety operation.

(b) Do not damage tires or wheels with a free wheel beam.

(c) Using a wheel stopper, fix the vehicle.

3. NOTICE FOR USING JACK AND SAFETY STAND

(a) Work in a flat place using a wheel stopper at all times.



(b) Use a safety stand with a rubber attachment, as shown in the illustration.

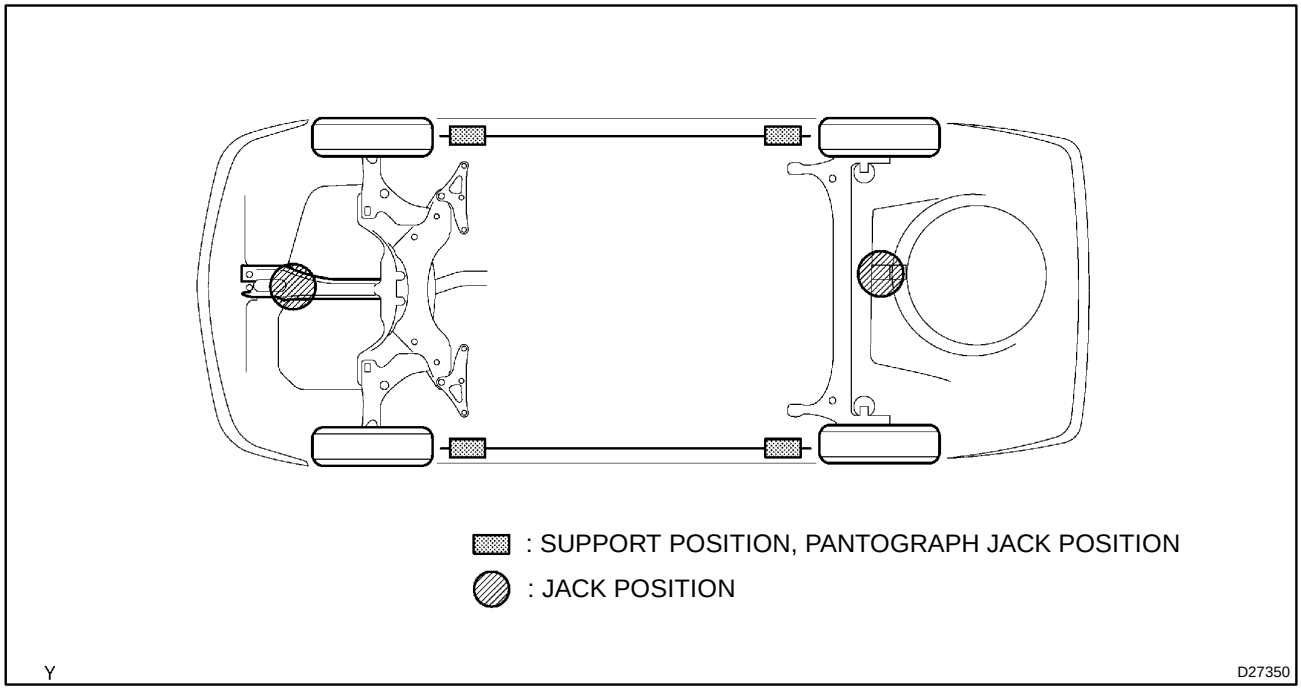
(c) Support the specified location with a jack and safety stand accurately.

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

(e) Do not work or leave the vehicle supported only by a jack. Be sure to support the vehicle with the safety stand.

(f) When jacking up only the front wheels or only the rear wheels, place wheel stoppers to both sides of the wheels.

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



4. NOTICE FOR USING SWING ARM TYPE LIFT

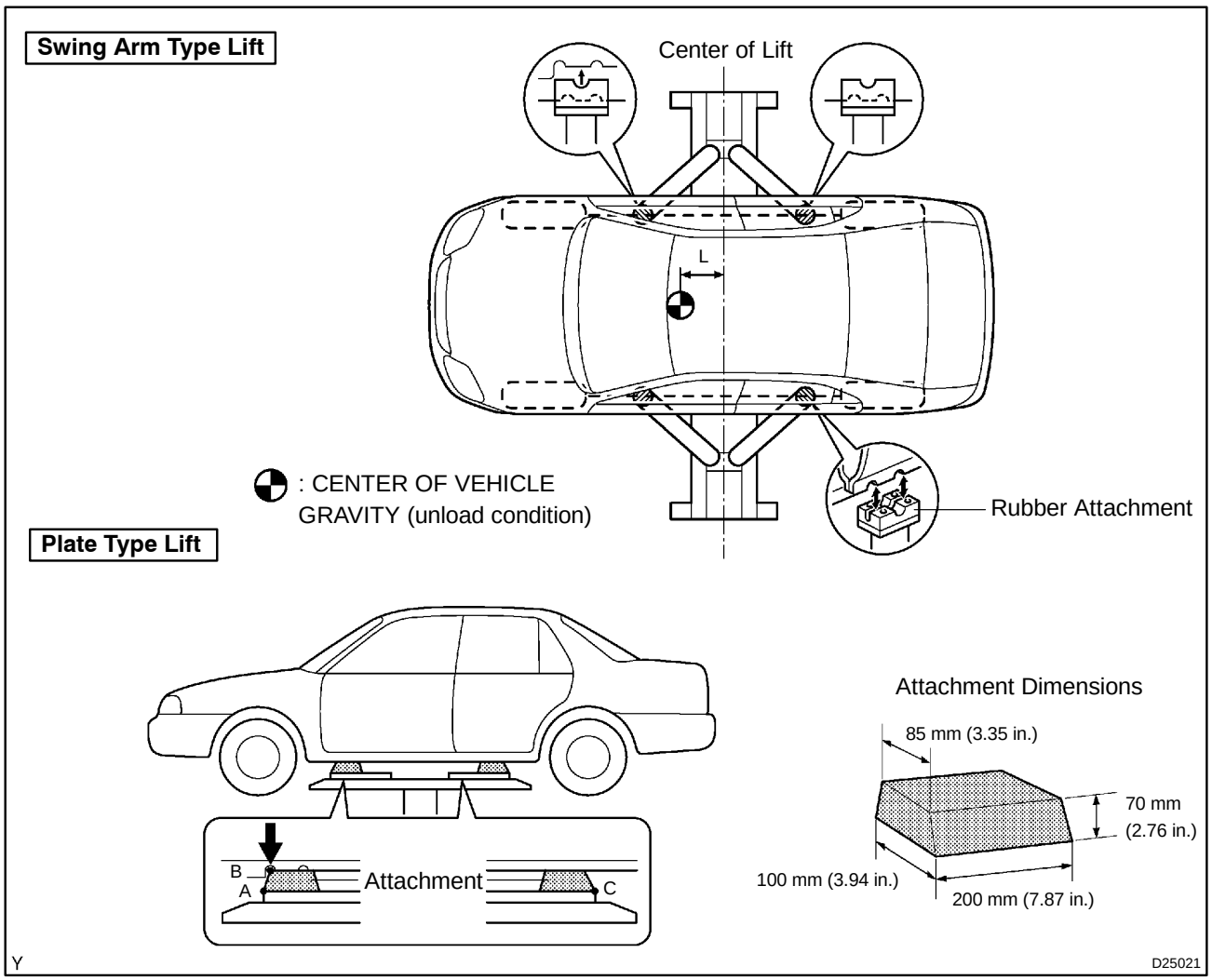
(a) Follow the instruction manual of the lift for a safety operation.
(b) Use a cradle with a rubber attachment, as shown in the illustration.
(c) Set in the vehicle so as to make its center of gravity as closer as the center of the lift. (”L” becomes short.)
(d) Make the vehicle horizontal by adjusting the height of the cradle, and match the groove of the cradle and the safety stand support location accurately.
(e) Be sure to lock the swing arm during the operation.
(f) Lift the vehicle up until the tires float and shake the vehicle to make sure that the vehicle is stable.

5. NOTICE FOR USING PLATE TYPE LIFT

(a) Follow the instruction manual of the lift for a safety operation.
(b) Use a plate lift attachment.
(c) Be sure to set the vehicle to the specified position.

Right and left set position	$ Place the vehicle over the center of the lift.
Front and rear set position	$ Align the cushion gum ends of the plate with the attachment lower ends (A and C). $ Align the attachment upper end (B) with the rocker flange front side notch.

(d) Lift the vehicle up until the tires float a bit and shake the vehicle to make sure that the vehicle is stable.



HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

010NL-01

GENERAL INFORMATION

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

System	Page
1. ECD System (1CD-FTV (CDE120#-##M#XW Models))	05-1
2. ECD System (1CD-FTV (CDE120#-##M#YW Models))	05-206

FOR USING HAND-HELD TESTER

HINT:

- Before using the tester, the tester's operator manual should be read thoroughly.
- If the tester cannot communicate with ECU controlled systems when you have connected the cable of the tester to the DLC3, turn the ignition switch ON and operatate the tester to check whether there is a problem on the vehicle side or tester side.
  (1) If the 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 the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself, so perform the Self Test procedures outline in the Tester Operator's Manual.

010NM-01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1	Vehicle brought to workshop

2	Customer problem analysis

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

3	Symptom confirmation and DTC (and freeze frame data) check

(a) Check the battery positive voltage.
Voltage: 10 - 14 V (Engine stopped)
(b) Visually check the wire harness, connectors and fuses for open and short, etc.
(c) Warm up the engine to the normal operating temperature.
(d) Confirm the problem symptoms and conditions, and check the DTCs according to the applicable chart.

OK → **Go to step 5**

NG

4	DTC chart

(a) Check the results obtained in step 3, then confirm the inspection procedure for the system or the part which should be checked using the DTC chart.

→ **Go to step 6**

5	Problem symptoms chart

(a) Check the results obtained in step 3, then confirm the inspection procedure for the system or the part which should be checked using the problem symptoms table.

6	Circuit inspection or parts inspection

(a) Confirm the circuit for the system or the part which should be checked using the problem symptoms table or the results obtained in step 4.

7	Repair

(a) Repair the affected system or part in accordance with the instructions in step 6.

8	Confirmation test

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

END

CUSTOMER PROBLEM ANALYSIS

HINT:

- In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared in order to give an accurate judgment. To ascertain what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions when it occurred.
- The following 5 items are important points in the problem analysis. Past problems which are thought to be unrelated and the repair history, etc. may also help in some cases, so as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for a reference in troubleshooting. A customer problem analysis table is provided in Diagnostics section for each system for your use.

Important Points in the Customer Problem Analysis

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

(Sample) Supplemental restraint system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem 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 COROLLA has various functions. The first function is the Diagnostic Trouble Code (DTC) Check in which a malfunction in the signal circuits to the ECU is stored in code form in the ECU memory. Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly. By using these check functions, possible areas of the problem can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in COROLLA.

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
ECD System (1CD-FTV (CDE120#-##M#XW Models))	(with Check Mode)		
ECD System (1CD-FTV (CDE120#-##M#YW Models))	(with Check Mode)		

- In the DTC check, it is very important to determine whether the problem indicated by the DTC is still occurring or has occurred in the past but returned to normal at present. In addition, it must be checked in the problem symptom check whether the malfunction indicated by the DTC is directly related to the problem symptom or not. For this reason, the DTC should be checked before and after the symptom confirmation to determine the current conditions. If this is not done, it may, depending on the case, result in unnecessary troubleshooting for normally operating systems, making it more difficult to detect the problem area, or trying to repair irrelevant areas. Therefore always follow the procedure in the correct order and perform the DTC check.
- A flow chart showing how to proceed with the troubleshooting using the diagnostic trouble code (DTC) check is shown below. This flow chart shows how to utilize the DTC check effectively, then by carefully checking the results, indicates how to proceed either to the DTC troubleshooting or to the troubleshooting of problem symptoms table.

1 DTC check

2 Making a note and clear the DTCs

3 Symptom confirmation

	Problem symptoms exist
	No problem symptoms exist

a → **Go to step 5**

b

4 Simulation test using the symptom simulation methods

5	DTC check

	DTC displayed
	Normal code displayed

a → **Troubleshooting of problem indicated by DTC**

b

6	Symptom confirmation

	No problem symptoms exist
	Problem symptoms exist

If a DTC was displayed in the initial DTC check, it indicates that a trouble may have occurred in a wire harness or connector in that circuit in the past, therefore check the wire harness and connectors (See page 01-30).

a → **System normal**

b

Troubleshooting of each problem symptom

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

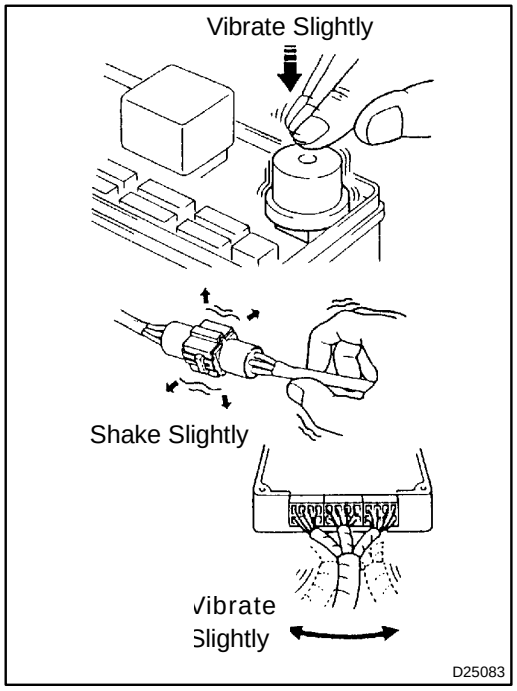
SYMPTOM SIMULATION

HINT:

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

Important points in the symptom simulation test:

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



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 problem cause and check that the malfunction occurs.

HINT:

Applying strong vibration to relays may result in open relays.

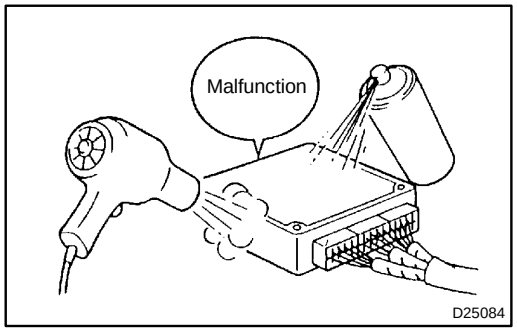
(b) CONNECTORS

(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 to be checked thoroughly.

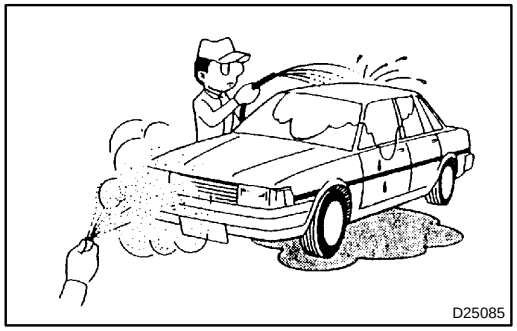


2. HEAT METHOD: When the problem seems to occur when the suspect area is heated.

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

NOTICE:

- **Do not heat to more than 60_C (140_F). (Temperature is limited so as not to damage the 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 a high-humidity condition.

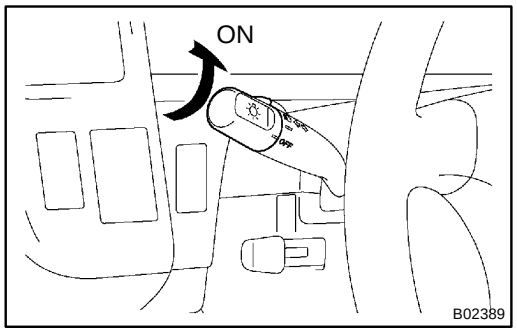
(a) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE:

- **Never sprinkle water directly onto the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.**
- **Never apply water directly onto the electronic components.**

HINT:

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



4. OTHERS: When the malfunction seems to occur when electrical load is excessive.

(a) Turn on all electrical loads including the heater blower, headlights, rear window defogger, etc. and check if the malfunction occurs.

DIAGNOSTIC TROUBLE CODE CHART

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

D DTC No.
Indicates the diagnostic trouble code.

D Page or Instructions
Indicates the page where the inspection procedure for each circuit is to be found, or gives instructions for checking and repairs.

D Trouble Area
Indicates the suspect area of the problem.

D Detection Item
Indicates the system of the problem or contents 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 Warming Light
B0100/13 (05-119)	D Short in D squib circuit	D Steering wheel pad (squib) D Spiral cable D Airbag sensor assembly D Wire harness	ON
B0101/14 (05-124)	D Open in D squib circuit	D Steering wheel pad (squib) D Spiral cable D Airbag sensor assembly D Wire harness	ON
B0102/11 (05-128)	D Short in D squib circuit (to ground)	D Steering wheel pad (squib) D Spiral cable D Airbag sensor assembly D Wire harness	ON
B0103/12 (05-132)	D Short in D squib circuit (to B+)	D Steering wheel pad (squib) D Spiral cable D Airbag sensor assembly D Wire harness	ON
B0105/53 (05-136)	D Short in P squib circuit	D Front Passenger airbag assembly (squib) D Airbag sensor assembly D Wire harness	ON
B0106/54	D Open in P squib circuit	D Front Passenger airbag assembly (squib) D Airbag sensor assembly D Wire harness	
	circuit (to Ground)	D Front Passenger airbag assembly (squib) D Airbag sensor assembly D 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 the problem when a "Normal" code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT:

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

D Page
Indicates the page where the flow chart for each circuit is located.

D Circuit Inspection, Inspection Order
Indicates the circuit which needs to be checked for each problem symptom. Check in the order indicated by the numbers.

Problem Symptom

D Circuit or Part Name
Indicates the circuit or part which needs to be checked.

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspected Area	See page
1. With the ignition switch in ACC or ON position, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed. 2. SRS warning light is always lit up even when ignition switch is in the LOCK position	1. SRS warning light circuit (Always lights up when ignition switch is in LOCK position.)	05-180
1. With the ignition switch in the ACC or ON position, the SRS warning light does not light up.	1. SRS warning light circuit (Dose not light up when ignition switch is turned to ACC or ON.)	05-183
1. DTC is not displayed. 2. SRS warning light is always lit up at the time of DTC check procedure. 3. DTC is displayed without Tc and CG terminal connection.	1. Tc terminal circuit	05-187

CIRCUIT INSPECTION

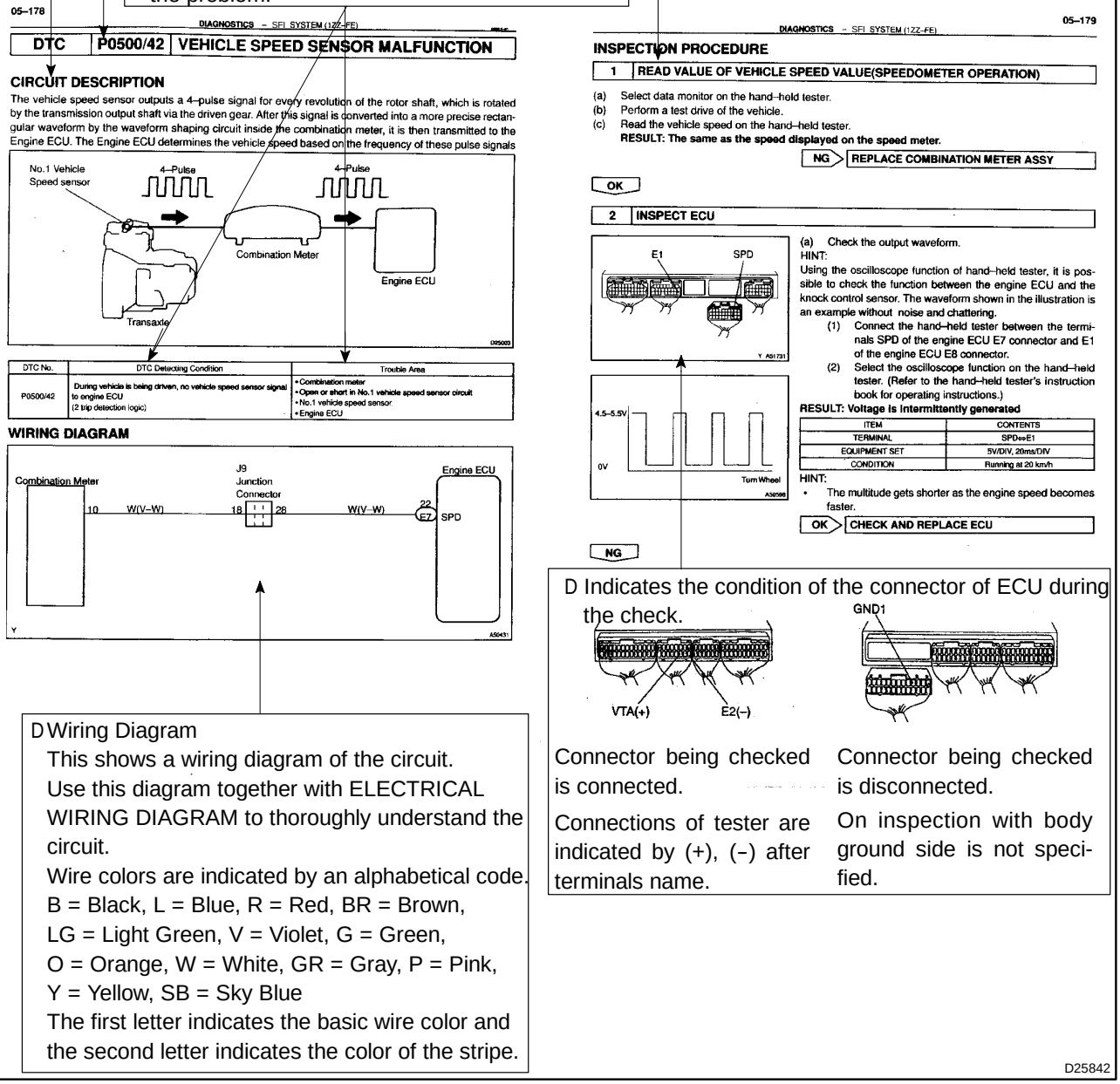
How to read and use each page is shown below.

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

D Diagnostic Trouble Code No. and Detection Item

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

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



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

05-179

DIAGNOSTICS - SFI SYSTEM (1ZZ-FE)

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

D25842

D 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.

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

Connector being checked is connected.
Connections of tester are indicated by (+), (-) after terminals name.

Connector being checked is disconnected.
On inspection with body ground side is not specified.

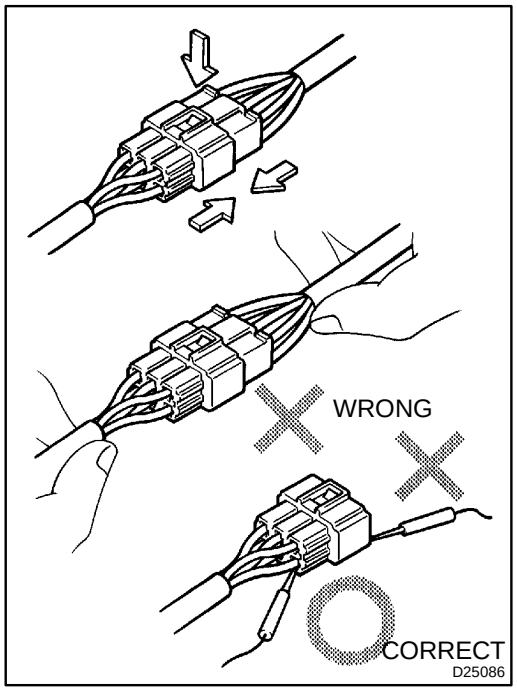
010NN-01

ELECTRONIC CIRCUIT INSPECTION PROCEDURE

1. BASIC INSPECTION

(a) RESISTANCE MEASURING CONDITION OF ELECTRONIC PARTS

(1) Unless stated, all resistance is measured at an ambient temperature of 20_C (68_F). Because the resistance may be outside the specifications if measured at high temperatures immediately after the vehicle has been running, measurements should be made when the engine has cooled down.



(b) HANDLING OF CONNECTOR

(1) When removing the connector with a lock, press the connector toward the engagement and remove the lock by making the lock claw movable easily.

(2) When removing the connector, do not hold the harness, but hold the connector.

(3) Before connecting the connector, check that there are no deformation, damage and missing of the terminals.

(4) Connection of the connector with a lock should be securely done until it makes a click sound.

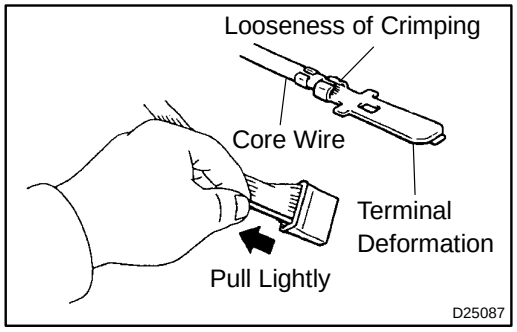
(5) In case of checking the connector with a Toyota electrical tester, perform it at the back side (harness side) of the connector using a mini test lead.

NOTICE:

- **As a water proof connector cannot be checked from its back side, check by connecting the sub-harness.**
- **Do not damage the terminals by moving the inserted tester needle.**

(c) CONNECTOR CHECKING POINTS

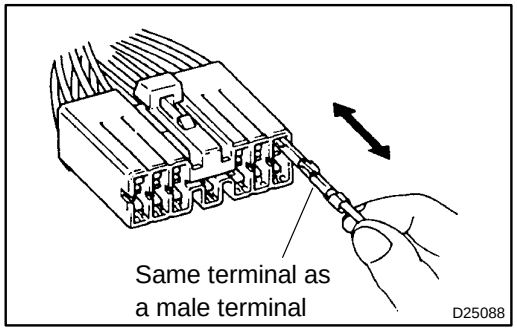
(1) Checking when the connector is connected:
By holding the connector, check the inserted condition and locking efficiency (engaged condition).



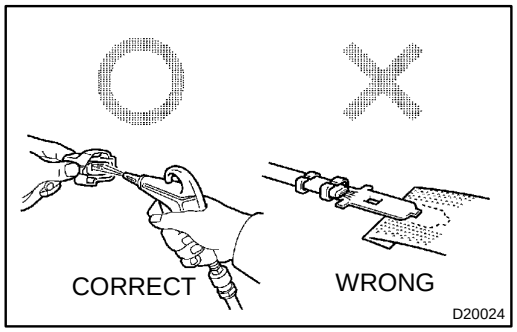
(2) Checking when the connector is removed:
Check the wire harness by pulling lightly (missing terminal, terminal crimping condition, core wire break).
Check visually if there is any rust, metal tip, water and bend of terminal (rust, mixing of foreign object, terminal deformation).

NOTICE:

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



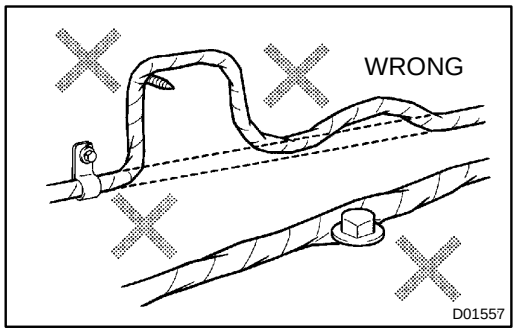
(3) Checking of the contact pressure of the terminal:
Prepare the same terminal as a male terminal.
By inserting it to a female terminal, check the engaged condition and sliding load.



(d) REPAIR METHOD OF CONNECTOR TERMINAL

(1) In case that there is any soil at the contact point, clean the contact point using an air gun or shop rag. At this time, never polish the contact point using a sand paper as the platings may come off.

(2) In case of abnormal contact pressure, replace the female terminal. At this time, if a male terminal is gold-plated (gold color), use gold-plated female terminals and if it is silver-plated (silver color), use silver-plated female terminals.



(e) HANDLING OF WIRE HARNESS

(1) In case of removing the wire harness, check the wiring and clamping condition before the work so as to restore it correctly.

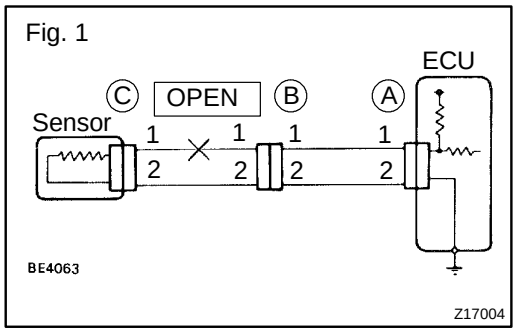
(2) Never twist, pull or slack off the wire harness more than necessary.

(3) Never make the wire harness come into contact with a high-temperature part, rotating, moving, vibrating or acute-angled part (edge of the panel, tip of the screw, etc.).

(4) When installing parts, never sandwich the wire harness between them.

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

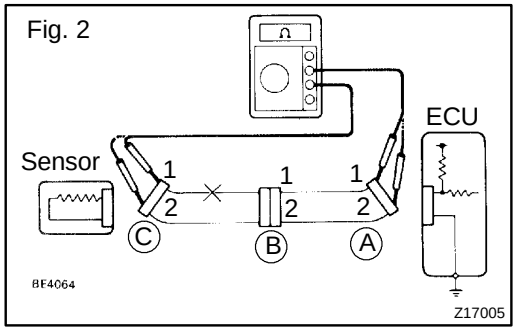
Fig. 1



2. CHECK OPEN CIRCUIT

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

Fig. 2



(b) Check the continuity.

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

Resistance: 1 Ω or less

HINT:

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

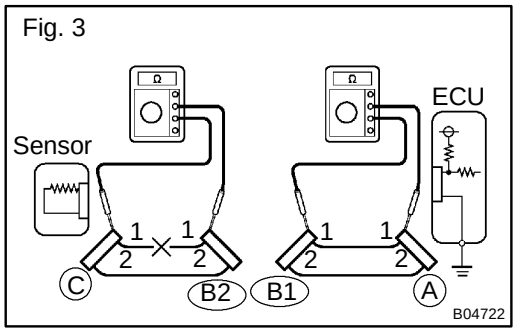
In the case of Fig. 2:

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

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

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

Fig. 3



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

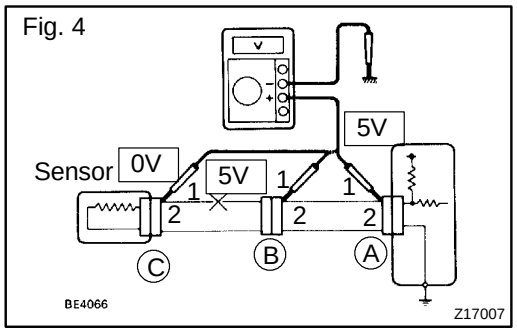
In the case of Fig. 3:

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

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

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

Fig. 4



(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.

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

(2) If the results are:

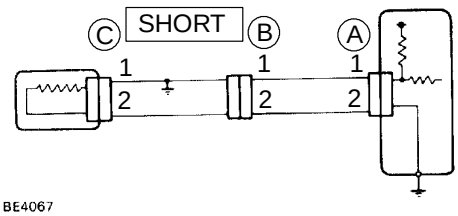
5 V: Between terminal 1 of connector "A" and body ground

5 V: Between terminal 1 of connector "B" and body ground

0 V: Between terminal 1 of connector "C" and body ground

Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C".

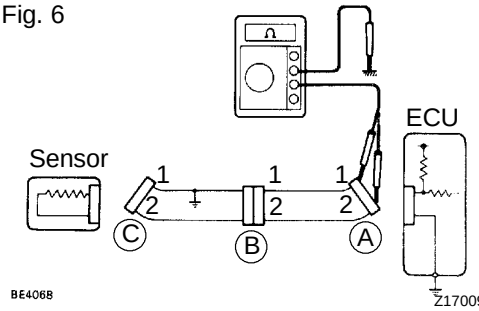
Fig. 5



3. CHECK SHORT CIRCUIT

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

Fig. 6



(b) Check continuity with the body ground.

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

Resistance: 1 MΩ or higher

HINT:

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

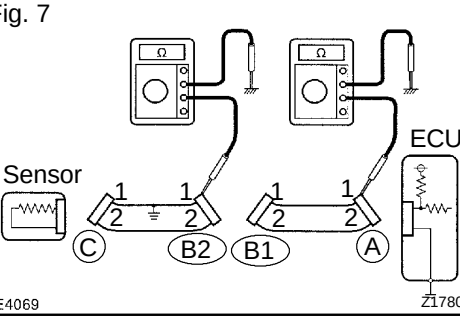
In the case of Fig. 6:

Between terminal 1 of connector "A" and body ground → Continuity (short)

Between terminal 2 of connector "A" and body ground → No continuity

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

Fig. 7



(2) Disconnect connector "B" and measure the resistance between terminal 1 of connector "A" and the body ground, and terminal 1 of connector "B2" and the body ground.

In the case of Fig. 7:

Between terminal 1 of connector "A" and body ground → No continuity

Between terminal 1 of connector "B2" and body ground → Continuity (short)

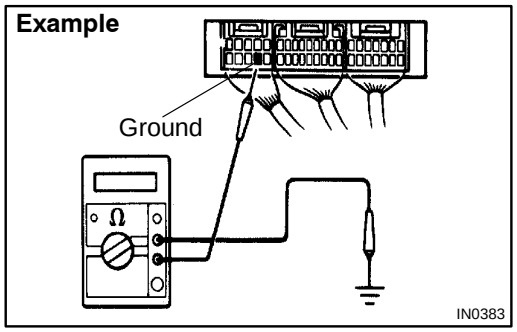
Therefore, it is found out that there is a short circuit between terminal 1 of connector "B2" and terminal 1 of connector "C".

4. CHECK AND REPLACE ECU

NOTICE:

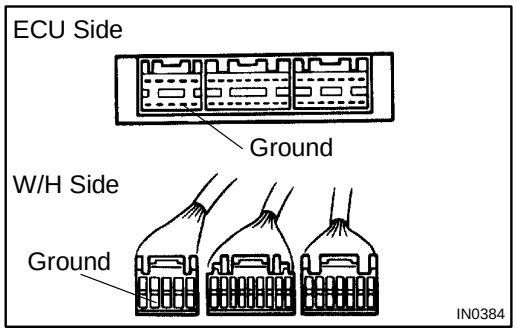
- **Start an inspection of the connector from the back-side of the connector at the wire harness side with the connector connected to the ECU.**
- **When no measuring condition is specified, perform the inspection with the engine stopped and also the ignition switched ON.**

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



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

Resistance: 1 Ω or less



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

TERMS

ABBREVIATIONS USED IN THIS MANUAL

010NO-01

Abbreviations	Meaning
ABS	Anti-Lock Brake System
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACSD	Automatic Cold Start Device
A.D.D.	Automatic Disconnecting Differential
A/F	Air-Fuel Ratio
AHC	Active Height Control Suspension
ALR	Automatic Locking Retractor
ALT	Alternator
AMP	Amplifier
ANT	Antenna
APPROX.	Approximately
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
Calif.	California
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
COMB.	Combination
CPE	Coupe
CPS	Combustion Pressure Sensor
CPU	Central Processing Unit
CRS	Child Restraint System
CTR	Center
C/V	Check Valve
CV	Control Valve
CW	Curb Weight
DC	Direct Current
DEF	Defogger
DFL	Deflector

Abbreviations	Meaning
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLC	Data Link Connector
DLI	Distributorless Ignition
DOHC	Double Overhead Cam
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
DTC	Diagnostic Trouble Code
DVD	Digital Versatible Disc
EBD	Electric Brake force Distribution
ECAM	Engine Control And Measurement System
ECD	Electronic Controlled Diesel
ECDY	Eddy Current Dynamometer
ECU	Electronic Control Unit
ED	Electro-Deposited Coating
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, EXH	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
FR	Front-Engine Rear-Wheel-Drive
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GND	Ground
GPS	Global Positioning System
HAC	High Altitude Compensator
H/B	Hatchback
H-FUSE	High Current Fuse
HI	High

Abbreviations	Meaning
HID	High Intensity Discharge (Head Lamp)
HPU	Hydrraulic Power Unit
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IAC	Idle Air Control
IC	Integrated Circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
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
M-FUSE	Mediam Current Fuse
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
MT	Mount
MTG	Mounting
N	Neutral
NA	Natural Aspiration
No.	Number
O/D	Overdrive

Abbreviations	Meaning
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
RR	Rear-Engine Rear-Wheel-Drive
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
TEMS	TOYOTA Electronic Modulated Suspension

Abbreviations	Meaning
TFT	Toyota Free-Tronic
TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
TRC	Traction Control System
TURBO	Turbocharge
TWC	Three-Way Catalyst
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIN	Vehicle Identification Number
VPS	Variable Power Steering
VSC	Vehicle Stability 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
WU-TWC	Warm Up Three-Way Catalytic Converter
WU-OC	Warm Up Oxidation Catalytic Converter
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

010NP-01

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	Carburettor	Carburettor
CFI	Continuous Fuel Injection	-
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	-
CTOX	Continuous Trap Oxidizer	-
CTP	Closed Throttle Position	LL ON, Idle ON
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	-
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Total Diagnosis Comunication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	-
ECL	Engine Control Level	-
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	TOYOTA Distributorless Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	-
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	-
FEPROM	Flash Erasable Programmable Read Only Memory	-
FF	Flexible Fuel	-
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)

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

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

PREPARATION

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REFER TO FOLLOWING REPAIR MANUALS:

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

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

ENGINE CONTROL SYSTEM

PREPARATION

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Equipment

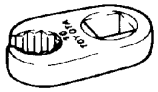
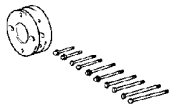
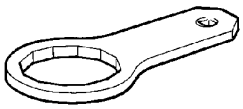
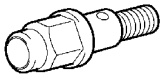
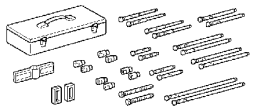
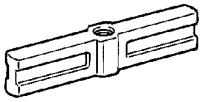
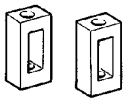
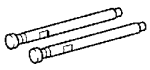
Ohmmeter	
Service Wire Harness	
Torque wrench	
Voltmeter	

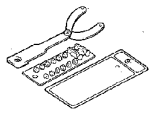
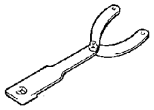
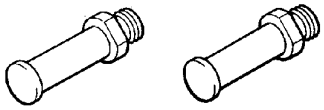
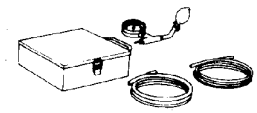
FUEL

PREPARATION

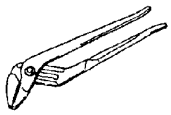
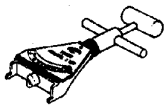
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SST

	09023-12700	Union Nut Wrench 17mm	INJECTOR ASSY(1CD-FTV) (May, 2003) INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003) COMMON RAIL ASSY(1CD-FTV) (May, 2003)
	09213-54015	Crankshaft Pulley Holding Tool	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(90105-08076)	Bolt	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	09228-64030	Fuel Filter Wrench	FUEL FILTER ASSY(1CD-FTV) (May, 2003)
	09280-00010	Union Bolt,inspection	INJECTOR ASSY(1CD-FTV) (May, 2003)
	09330-00021	Companion Flange Holding Tool	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	09950-50013	Puller C Set	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09951-05010)	Hanger 150	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09952-05010)	Slide Arm	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09953-05020)	Center Bolt 150	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05021)	Claw No.2	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05031)	Claw No.3	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)

	09960-10010	Variable Pin Wrench Set	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09962-01000)	Variable Pin Wrench Arm Assy	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	(09963-01000)	Pin 10	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)
	09992-00242	Turbocharger Pressure Gauge	INJECTOR ASSY(1CD-FTV) (May, 2003)

Recomended Tools

	09082-00040	TOYOTA Electrical Tester	FUEL SYSTEM(1CD-FTV) (May, 2003)
	09130-00150	Water Pump Pliers	FUEL FILTER ASSY(1CD-FTV) (May, 2003)
	09216-00021	Belt Tension Gauge	INJECTION OR SUPPLY PUMP ASSY(1CD-FTV) (May, 2003)

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	INJECTOR ASSY(1CD-FTV) (May, 2003)

Equipment

Hexagon wrench (6 mm)	
Ohmmeter	
Radiator cap tester	
Torque wrench	
Wooden block	

EMISSION CONTROL

PREPARATION

022Y4-01

Equipment

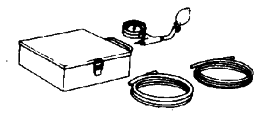
Vacuum gauge	
Ohmmeter	
Service wire harness	

INTAKE

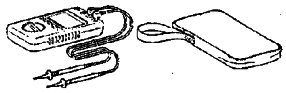
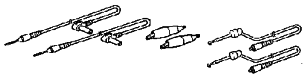
PREPARATION

022Y5-01

SST

	09992-00242	Turbocharger Pressure Gauge	TURBO CHARGER SYSTEM (1CD-FTV)

Recomended Tools

	09082-00040	TOYOTA Electrical Tester	TURBO CHARGER SYSTEM (1CD-FTV)
	(09083-00150)	Test Lead Set	TURBO CHARGER SYSTEM (1CD-FTV)

Equipment

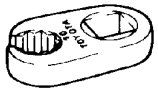
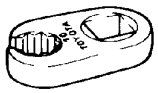
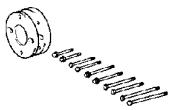
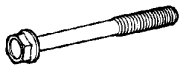
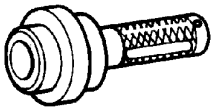
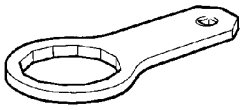
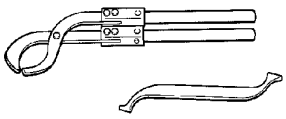
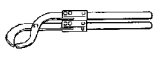
Vacuum gauge	
Voltmeter	
Ohmmeter	
Service wire harness	
Torque wrench	
Radiator cap testor	
Vernier calipers	
Hand-held vacuum pump	
Wooden block	

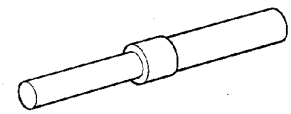
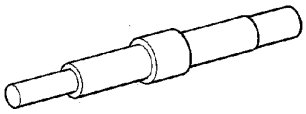
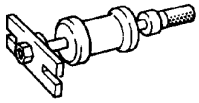
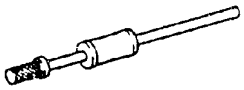
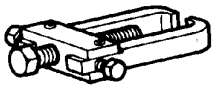
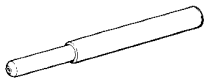
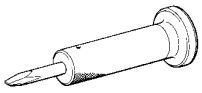
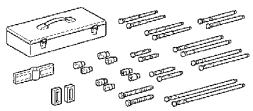
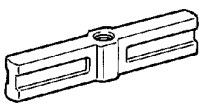
ENGINE MECHANICAL

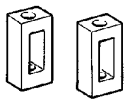
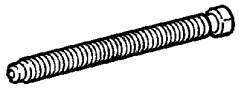
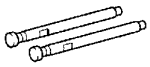
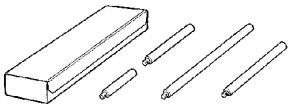
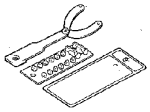
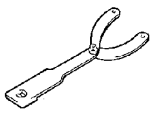
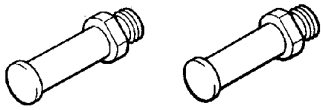
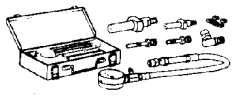
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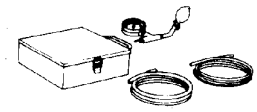
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SST

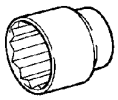
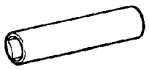
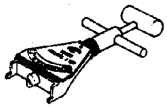
	09023-00100	Union Nut Wrench 10 mm	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003)
	09023-12700	Union Nut Wrench 17mm	VALVE CLEARANCE(1CD-FTV) (May, 2003) PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	09213-54015	Crankshaft Pulley Holding Tool	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	(90105-08076)	Bolt	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09223-15030	Oil Seal & Bearing Replacer	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09223-46011	Crankshaft Front Oil Seal Replacer	CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	09228-64030	Fuel Filter Wrench	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003)
	09248-55050	Valve Clearance Adjust Tool Set	VALVE CLEARANCE(1CD-FTV) (May, 2003)
	(09248-05510)	Valve Lifter Press	VALVE CLEARANCE(1CD-FTV) (May, 2003)
	(09248-05520)	Valve Lifter Stopper	VALVE CLEARANCE(1CD-FTV) (May, 2003)

	09301-00210	Clutch Guide Tool	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003)
	09301-00220	Clutch Guide Tool	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09330-00021	Companion Flange Holding Tool	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09520-01010	Drive Shaft Remover Attachment	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09520-24010	Differential Side Gear Shaft Puller	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	(09520-32040)	Shocker Set	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09628-62011	Boll Joint Puller	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09670-00010	Front Crossmember Guide Tool	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09843-18040	Diagnosis Check Wire No.2	ENGINE(1CD-FTV) (May, 2003)
	09930-00010	Drive Shaft Nut Chisel	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09950-50013	Puller C Set	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	(09951-05010)	Hanger 150	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)

	(09952-05010)	Slide Arm	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	(09953-05020)	Center Bolt 150	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	(09954-05031)	Claw No.3	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	09950-70010	Handle Set	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	(09951-07100)	Handle 100	ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09960-10010	Variable Pin Wrench Set	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	(09962-01000)	Variable Pin Wrench Arm Assy	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	(09963-01000)	Pin 10	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
	09992-00025	Cylinder Compression Check Gauge Set	ENGINE(1CD-FTV) (May, 2003)
	(09992-00121)	No. 4 Attachment	ENGINE(1CD-FTV) (May, 2003)
	(09992-00211)	Gauge Assy	ENGINE(1CD-FTV) (May, 2003)

	09992-00242	Turbocharger Pressure Gauge	VALVE CLEARANCE(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)

Recomended Tools

	09011-12301	Socket Wrench 30 mm	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)
	09017-38120	Deep Socket Wrench 12 mm	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003)
	09090-04020	Engine Sling Device	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003)
	09216-00021	Belt Tension Gauge	ENGINE(1CD-FTV) (May, 2003) DRIVE BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)

Equipment

Hexagon wrench (6mm)	
Socket wrench 27mm	
Feeler gauge	
Dial indicator	
Dial indicator or dial indicator with magnetic base	
Micro meter	
Radiator cap tester	
Tachometer	
Torque wrench	
Vernier calipers	
Tire pressure gauge	
Alignment tester	
Toe-in gauge	
OBD II scan tool	
Slide calipers	
Sand paper (#400)	
Wooden block	
Chain block	
Spark plug cleaner	
Angle gauge	
Universal engine lifter	

SSM

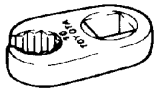
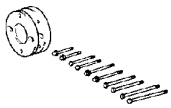
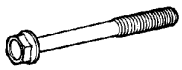
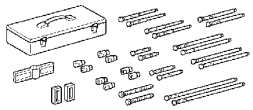
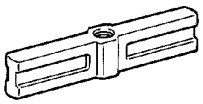
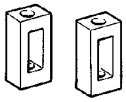
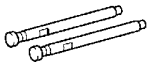
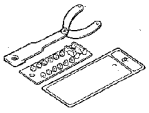
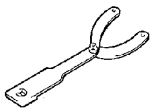
08826-00080	Seal Packing Black or equivalent (FIPG)	VALVE CLEARANCE(1CD-FTV) (May, 2003) PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) TIMING BELT(1CD-FTV) (May, 2003) CAMSHAFT(1CD-FTV) (May, 2003) CYLINDER HEAD GASKET(1CD-FTV) (May, 2003)
08833-00070	"Adhesive 1324," THREE BOND 1324 or equivalent	PARTIAL ENGINE ASSY(1CD-FTV) (May, 2003) ENGINE REAR OIL SEAL(1CD-FTV) (May, 2003)

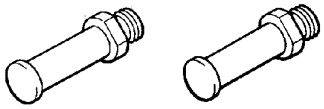
COOLING

PREPARATION

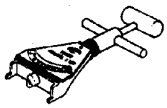
022Y8-01

SST

	09023-12700	Union Nut Wrench 17mm	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	09213-54015	Crankshaft Pulley Holding Tool	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(90105-08076)	Bolt	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	09330-00021	Companion Flange Holding Tool	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	09950-50013	Puller C Set	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09951-05010)	Hanger 150	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09952-05010)	Slide Arm	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09953-05020)	Center Bolt 150	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05021)	Claw No.2	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05031)	Claw No.3	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	09960-10010	Variable Pin Wrench Set	WATER PUMP ASSY(1CD-FTV) (May, 2003)
	(09962-01000)	Variable Pin Wrench Arm Assy	WATER PUMP ASSY(1CD-FTV) (May, 2003)

	(09963-01000)	Pin 10	WATER PUMP ASSY(1CD-FTV) (May, 2003)

Recomended Tools

	09216-00021	Belt Tension Gauge	WATER PUMP ASSY(1CD-FTV) (May, 2003)

Equipment

Hexagon wrench (8mm)	
Radiator cap tester	
Torque wrench	
Wooden block	

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	WATER PUMP ASSY(1CD-FTV) (May, 2003)

Coolant

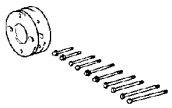
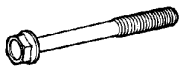
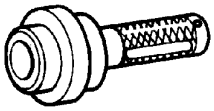
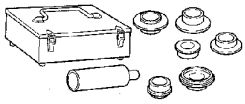
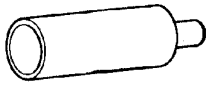
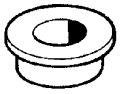
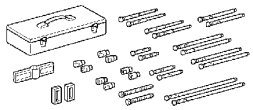
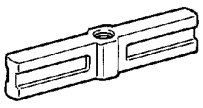
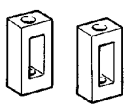
Item	Capacity	Classification
Engine coolant (1CD-FTV)		TOYOTA long life coolant
w/ power heater	7.6 liters (8.0 US qts, 6.7 lmp. qts)	
w/o power heater	7.4 liters (7.8 US qts, 6.5 lmp. qts)	

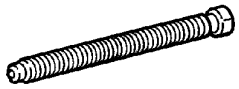
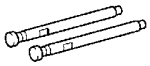
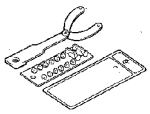
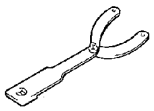
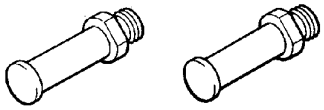
LUBRICATION

PREPARATION

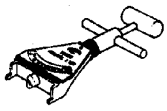
022Y9-01

SST

	09032-00100	Oil Pan Seal Cutter	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09213-54015	Crankshaft Pulley Holding Tool	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(90105-08076)	Bolt	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09223-46011	Crankshaft Front Oil Seal Replacer	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09228-10002	Oil Filter Wrench	OIL FILTER SUB-ASSY(1CD-FTV) (May, 2003)
	09316-60011	Transmission & Transfer Bearing Replacer	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09316-00011)	Replacer Pipe	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09316-00021)	Replacer "A"	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09330-00021	Companion Flange Holding Tool	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09950-50013	Puller C Set	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09951-05010)	Hanger 150	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09952-05010)	Slide Arm	OIL PUMP ASSY(1CD-FTV) (May, 2003)

	(09953-05010)	Center Bolt 100	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09953-05020)	Center Bolt 150	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05021)	Claw No.2	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09954-05031)	Claw No.3	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	09960-10010	Variable Pin Wrench Set	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09962-01000)	Variable Pin Wrench Arm Assy	OIL PUMP ASSY(1CD-FTV) (May, 2003)
	(09963-01000)	Pin 10	OIL PUMP ASSY(1CD-FTV) (May, 2003)

Recomended Tools

	09216-00021	Belt Tension Gauge	OIL PUMP ASSY(1CD-FTV) (May, 2003)

Equipment

Torque wrench	
Wooden block	

SSM

	08826-00080	Seal Packing Black or equivalent (FIPG)	OIL PUMP ASSY(1CD-FTV) (May, 2003)

Lubricant

Drain and refill (1CD-FTV) w/ oil filter change w/o oil filter change	 5.9 liters (6.2 US qts, 5.2 lmp. qts) 5.3 liters (5.6 US qts, 4.7 lmp. qts)	 -
Dry fill (1CD-FTV)	6.7 liters (7.1 US qts, 5.9 lmp. qts)	-

STARTING & CHARGING

PREPARATION

022Y6-01

Equipment

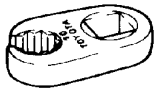
Ohmmeter	
Torque wrench	
Service Wire Harness	

CLUTCH

PREPARATION

022YG-01

SST

	09023-00100 Union Nut Wrench 10 mm	CLUTCH MASTER CYLINDER ASSY(MTM - May, 2003)

Equipment

Torque wrench	

Lubricant

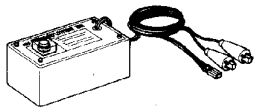
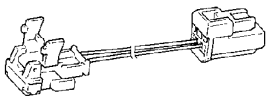
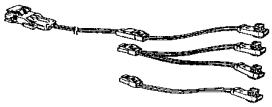
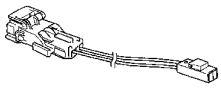
Item	Capacity	Classification
Brake fluid	-	SAE J1704 or FMVSS No.116 DOT 4

SUPPLEMENTAL RESTRAINT SYSTEM

022YH-01

PREPARATION

SST

	09082-00700	SRS Airbag Deployment Tool	HORN BUTTON ASSY(May, 2003)
	09082-00760	Airbag Deployment Wire Sub-harness No.4	HORN BUTTON ASSY(May, 2003)
	09082-00802	Airbag Deployment Wire Sub-Harness No. 8	HORN BUTTON ASSY(May, 2003)
	(09082-10801)	Wire A	HORN BUTTON ASSY(May, 2003)
	(09082-40800)	Wire D	HORN BUTTON ASSY(May, 2003)

SERVICE SPECIFICATIONS

STANDARD BOLT 03–1
HOW TO DETERMINE BOLT STRENGTH 03–1
SPECIFIED TORQUE FOR STANDARD BOLTS 03–2
HOW TO DETERMINE NUT STRENGTH 03–3
ENGINE CONTROL SYSTEM 03–4
SERVICE DATA 03–4
TORQUE SPECIFICATION 03–5
FUEL 03–6
SERVICE DATA 03–6
TORQUE SPECIFICATION 03–7
INTAKE 03–8
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ENGINE MECHANICAL 03–10
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TORQUE SPECIFICATION 03–11
COOLING 03–13
TORQUE SPECIFICATION 03–13
LUBRICATION 03–14
TORQUE SPECIFICATION 03–14
STARTING & CHARGING 03–15
SERVICE DATA 03–15
TORQUE SPECIFICATION 03–16
CLUTCH 03–17
TORQUE SPECIFICATION 03–17

REFER TO FOLLOWING REPAIR MANUALS:

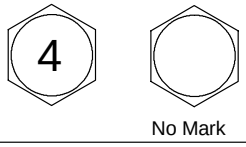
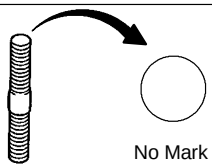
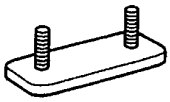
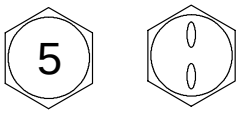
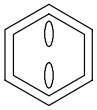
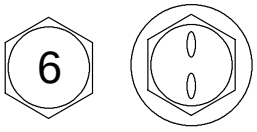
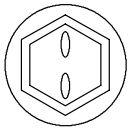
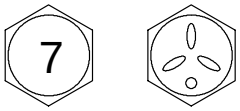
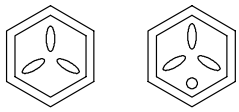
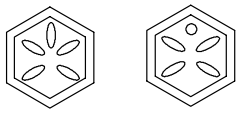
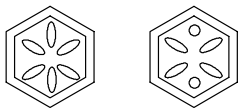
Manual Name	Pub. No.
COROLLA Repair Manual	RM925E
COROLLA Repair Manual Supplement	RM939E
COROLLA Repair Manual Supplement	RM1028E

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

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

030LK-06

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

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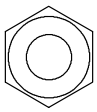
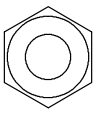
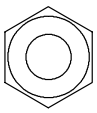
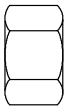
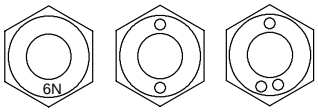
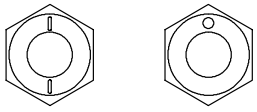
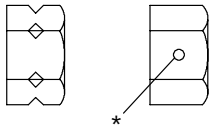
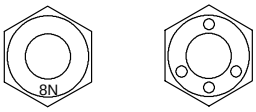
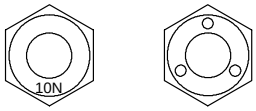
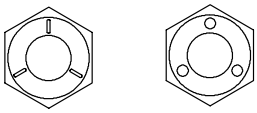
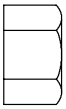
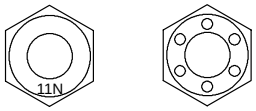
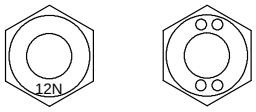
030LL-06

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

030LM-06

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/ Washer)	 No Mark (w/ Washer)	 No Mark	5N (4T)
 6N			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 the 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

030LV-03

SERVICE DATA

1CD-FTV:

Mass air flow meter		
Resistance	2 (THA) - 1 (E2)	
	at -20_C (-4_F)	12.5 to 16.9 kΩ
	at 20_C (68_F)	2.19 to 2.67 kΩ
	at 60_C (140_F)	0.50 to 0.68 kΩ
Intake shutter assy		
Resistance	at 20_C (68_F)	
	2 (BCOM) - 1 (B̄), 3 (B)	18 to 22 Ω
	5 (ACOM) - 4 (Ā), 6 (A)	18 to 22 Ω
Accelerator pedal assy		
Resistance	VPA1 - EP1	5.0 kΩ or less
	VPA2 - EP2	5.0 kΩ or less
	VCP1 - EP1	1.5 to 6.0 kΩ
	VCP2 - EP2	1.5 to 6.0 kΩ
Diesel turbo inlet air temperature sensor		
Resistance	Approximately 20_C (68_F)	2.21 to 2.65 kΩ
Crankshaft position sensor		
Resistance	at cold	1630 to 2740 Ω
	at hot	2065 to 3225 Ω
Camshaft position sensor		
Resistance	at cold	1630 to 2740 Ω
	at hot	2065 to 3225 Ω
Diesel engine engine coolant temperature sensor		
Resistance	Approximately 20_C (68_F)	2.32 to 2.59 kΩ
	Approximately 80_C (176_F)	0.310 to 0.326 kΩ
Fuel temperature sensor		
Resistance	THF - E2	
	Approximately 20_C (68_F)	2.21 to 2.69 kΩ
	Approximately 80_C (176_F)	0.287 to 0.349 kΩ
EDU relay		
Specified condition	1 - 2	Continuity
	3 - 5	No Continuity
		Continuity (Apply battery voltage terminals 1 and 2)
EFI MAIN relay		
Specified condition	1 - 2	Continuity
	3 - 5	No Continuity
		Continuity (Apply battery voltage terminals 1 and 2)

030LW-03

TORQUE SPECIFICATION

Part Tightened	N·m	kgf·cm	ft·lbf
ECM × ECM bracket	3.0	31	27 in.·lbf
ECM × ECM bracket No. 2	3.0	31	27 in.·lbf
ECM × ECM bracket No. 3	3.0	31	27 in.·lbf
ECM × Body	3.0	31	27 in.·lbf

1CD-FTV:

Accelerator pedal × Body	5.4	55	48 in.·lbf

FUEL

030LX-03

SERVICE DATA

1CD-FTV:

Supply pump assy		
Resistance	at 20_C (68_F)	1.5 to 2.3 Ω
Injector assy		
Resistance	at 20_C (68_F)	0.85 to 1.05 Ω
Common rail assy		
Resistance (Fuel pressure sensor)	5 (PR) – 4 (E2)	16.4 kΩ or less
	2 (PR2) – 3 (E2S)	16.4 kΩ or less
	6 (VC) – 5 (PR)	3 kΩ or less
	1 (VCS) – 2 (PR2)	3 kΩ or less
Resistance (Pressure discharge valve)	at 20_C (68_F)	0.85 to 1.05 Ω
Fuel heater assy		
Resistance	at 20_C (68_F)	0.5 to 2.0 Ω
Fuel temperature sensor		
Resistance	Approximately 20_C (68_F)	2.21 to 2.69 Ω
	Approximately 80_C (176_F)	0.287 to 0.349 Ω

030LY-03

TORQUE SPECIFICATION

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Nozzle holder camp x Cylinder head sub-assy		26	265	19
Nozzle leakage pipe assy x Injector assy	Hollow screw	18	184	13
	Union bolt	22	224	16
Nozzle leakage pipe No. 2 x Cylinder head sub-assy	SST	21	214	16
	Bolt	8.8	90	79 in.·lbf
Nozzle leakage pipe No. 2 x Cylinder head sub-assy	Check valve	21	214	16
	Bolt	8.8	90	079 in.·lbf
Cylinder head cover x cylinder head sub-assy		13	135	9.7
Injection pipe sub-assy No. 1 - No. 4 x Injector assy				
	Used pipe using SST	42	428	31
	Used pipe not using SST	46	469	34
	New pipe using SST	31	316	23
	New pipe not using SST	34	347	25
Injection pipe sub-assy No. 1 - No. 4 x Common rail assy				
	Using SST	31	316	23
	Not using SST	34	347	25
Injection pipe clamp No. 2 x Intake manifold		5.0	51	44 in.·lbf
Fuel inlet pipe sub-assy x Common rail assy				
	Using SST	31	316	23
	Not using SST	34	347	25
Fuel inlet pipe sub-assy x Injection pump assy				
	Using SST	31	316	23
	Not using SST	34	347	25
Air cleaner case x Body		7.0	71	62 in.·lbf
Air cleaner case x Transverse engine engine mounting bracket		7.0	71	62 in.·lbf
Engine cover No. 1 x Cylinder head cover sub-assy		8.0	82	71 in.·lbf
Engine cover No. 1 x Intake manifold		8.0	82	71 in.·lbf
Vacuum reservoir sub-assy x Cowl top panel outer		8.3	85	74 in.·lbf
Supply pump assy x Water pump assy		21	210	15
Injection pump drive pulley x Injection pump assy		64	650	47
Injector drive x Body		5.0	51	44 in.·lbf
Intake manifold insulator No. 1 x Intake manifold		5.0	51	44 in.·lbf
Common rail assy x Cylinder head sub-assy		43	438	32
Transverse engine engine mounting bracket x Water pump assy		64	650	47
Transverse engine engine mounting bracket x Cylinder block sub-assy		37	375	27
Idler pulley sub-assy x V-ribbed belt tensioner assy		40	408	30
Battery clamp sub-assy x Body	Bolt	5.0	51	44 in.·lbf
	Nut	3.0 to 4.0	34 to 41	27 to 35 in.·lbf
Front wheel		103	1,050	76
Fuel filter assy x Fuel filter support		18	178	13

INTAKE

030M1-03

SERVICE DATA

1CD-FTV:

Turbocharging pressure Standard pressure		15 to 45 kPa (0.15 to 0.46 kgf/cm^2, 2.2 to 6.5 psi)
Turbo pressure sensor		
Voltage	3 (VC) – 1 (E2)	4.5 to 5.5 V
Voltage drop	apply vacuum 13.3 kPa (100 mmHg, 3.94 in.Hg)	0.1 to 0.3 V
	apply vacuum 26.7 kPa (200 mmHg, 7.87 in.Hg)	0.3 to 0.5 V
	apply vacuum 40.0 kPa (300 mmHg, 11.81 in.Hg)	0.5 to 0.7 V
	apply vacuum 57.3 kPa (400 mmHg, 15.75 in.Hg)	0. 7 to 0.9 V
	apply vacuum 66.7 kPa (500 mmHg, 19.96 in.Hg)	0. 9 to 1.0 V
Voltage up	applied vacuum 19.6 kPa (0.20 kgf/cm2, 2.84 psi)	0.1 to 0.4 V
	applied vacuum 39.2 kPa (0.40 kgf/cm2, 5.69psi)	0.4 to 0.7 V
	applied vacuum 58.8 kPa (0.60 kgf/cm2, 8.53psi)	0.7 to 1.0 V
	applied vacuum 78.5 kPa (0.80 kgf/cm2, 11.4psi)	1.0 to 1.3 V
	applied vacuum 98.0 kPa (1.00 kgf/cm2, 14.2psi)	1.3 to 1.6 V

030M2-03

TORQUE SPECIFICATION

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Turbo water pipe sub-assy No.1 x Turbocharger sub-assy		13	135	9.7
Turbocharger sub-assy x Exhaust manifold		53	540	39
Turbo oil inlet pipe x Turbocharger sub-assy	Nut A Bolt B Nut C	13 36 8.8	135 367 90	9.7 27 6.5 in.·lbf
Manifold converter sub-assy x Turbocharger sub-assy	1st 2nd	8.0 25	82 255	71 in.·lbf 18
Manifold stay x Manifold converter sub-assy	1st 2nd	8.0 61	82 622	71 in.·lbf 45
Manifold stay x Cylinder block sub-assy	1st 2nd	8.0 61	82 622	71 in.·lbf 45
Turbohcharger stay x Turbocharger sub-assy	1st 2nd	8.0 56	82 571	71 in.·lbf 41
Turbocharger stay x Cylinder head sub-assy	1st 2nd	8.0 56	82 571	71 in.·lbf 41
Manifold stay No. 2 x Manifold converter sub-assy	1st 2nd	8.0 56	82 571	71 in.·lbf 41
Manifold stay No. 2 x Cylinder head sub-assy	1st 2nd	8.0 56	82 571	71 in.·lbf 41
Exhaust manifold heat insulator No. 2 x Turbocharger sub-assy		12	122	8.9
Turbo insulator No. 1 x Manifold converter sub-assy		20	204	15
Turbo insulator No. 1 x Turbocharger sub-assy		20	204	15
Turbo insulator No. 2 x Manifold converter sub-assy		20	204	15
Exhaust pipe assy x Heater bracket sub-assy	w/ Cold area	7.5	76	66 in.·lbf
Exhaust pipe assy x Body	w/ Cold area	7.5	76	66 in.·lbf
Floor panel brace front x Body		30	302	22
Heater bracket x Body	w/ Cold area	7.5	76	66 in.·lbf
Heater pump assy x Heater bracket	w/ Cold area	7.5	76	66 in.·lbf
Air tube No. 1 x Air tube No. 2		25	255	18
Air tube No. 1 x Intake air connector		25	255	18
Air tube No. 1 x Cylinder head cover		25	255	18
Air tube No. 1 x Engine mounting bracket FR		25	255	18
Air cleaner case x Body		7.0	71	62 in.·lbf
Intercooler assy x Body		7.0	71	62 in.·lbf
Intercooler cooling air duct x Intercooler assy		5.0	51	44 in.·lbf
Air cleaner case x Engine mounting insulator LH		7.0	71	62 in.·lbf
Engine cover No. 1 x Cylinder head cover sub-assy		8.0	82	71 in.·lbf
Engine cover No. 1 x Intake manifold		8.0	82	71 in.·lbf
Vacuum reservoir sub-assy x Cowl top panel outer		8.3	85	73 in.·lbf
Battery clamp sub-assy x Body	Bolt Nut	5.0 3.0 to 4.0	51 34 to 41	44 in.·lbf 27 to 35 in.·lbf

ENGINE MECHANICAL

0300O-12

SERVICE DATA

1CD-FTV:

New drive belt deflection	Pressing force: 98 N (10 kgf, 22 lbf)	
	For cooler compressor V-ribbed belt (A/C equipped)	9.5 to 11.5 mm (0.37 to 0.45 in.)
Used drive belt deflection	Pressing force: 98 N (10 kgf, 22 lbf)	
	For cooler compressor V-ribbed belt (A/C equipped)	12.5 to 15.5 mm (0.49 to 0.61 in.)
New drive belt tension		
	For cooler compressor V-ribbed belt (A/C equipped)	519 to 755 N (53 to 77 kgf, 117 to 170 lbf)
Used drive belt tension		
	For cooler compressor V-ribbed belt (A/C equipped)	196 to 392 N (20 to 40 kgf, 44 to 88 lbf)
Idle speed		750 to 850 rpm.
Maximum speed		5,100 to 5,250 rpm.
Compression pressure	at 250 rpm.	
	Standard	2,628 kPa (26.8 kgf/cm2, 381 psi) or more
	Minimum	2,157 kPa (22.0 kgf/cm2, 312 psi) or more
	Difference between each cylinder	490 kPa (5.0 kgf/cm2, 71 psi) or less
Valve clearance		
Intake	(cold)	0.20 to 0.30 mm (0.008 to 0.012 in.)
Exhaust		0.35 to 0.45 mm (0.014 to 0.018 in.)
Adjusting shim thickness	Mark 01	2.500 mm (0.0984 in.)
	Mark 03	2.550 mm (0.1004 in.)
	Mark 05	2.600 mm (0.1024 in.)
	Mark 07	2.650 mm (0.1043 in.)
	Mark 09	2.700 mm (0.1063 in.)
	Mark 11	2.750 mm (0.1083 in.)
	Mark 13	2.800 mm (0.1102 in.)
	Mark 15	2.850 mm (0.1122 in.)
	Mark 17	2.900 mm (0.1142 in.)
	Mark 19	2.950 mm (0.1161 in.)
	Mark 21	3.000 mm (0.1181 in.)
	Mark 23	3.050 mm (0.1201 in.)
	Mark 25	3.100 mm (0.1220 in.)
	Mark 27	3.150 mm (0.1240 in.)
	Mark 29	3.200 mm (0.1260 in.)
	Mark 31	3.250 mm (0.1280 in.)
	Mark 33	3.300 mm (0.1299 in.)
Cylinder head set bolt		
Outside diameter	Standard	10.75 to 11.00 mm (0.4232 to 0.4331 in.)
	Minimum	10.40 mm (0.4904 in.)

0300P-12

TORQUE SPECIFICATION

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Idle pulley set nut		44	449	32
Air tube No. 1 x Air tube No. 2		25	255	18
Air tube No. 1 x Intake air connector		25	255	18
Air tube No. 1 x Cylinder head sub-assy		25	255	18
Air tube No. 1 x Engine mounting bracket FR		25	255	18
Engine cover No. 1 x Cylinder head cover sub-assy		8.0	82	71 in.·lbf
Engine cover No. 1 x Intake manifold		8.0	82	71 in.·lbf
Front wheel		103	1,050	76
Drain plug (Manual transaxle)		49	500	36
Engine hanger No.1 x Cylinder head		37	377	27
Engine hanger No.2 x Cylinder head		37	377	27
Engine hanger No. 1 UPR x Engine hanger No. 1		37	377	27
Engine coolant temperature sensor x Cylinder head		20	204	15
Camshaft position sensor x Camshaft oil seal retainer		8.8	90	78 in.·lbf
Crankshaft position sensor x Oil pump assy		8.8	90	78 in.·lbf
Fuel filler to injection pump fuel pipe x Cylinder block	M6	8.8	90	78 in.·lbf
	M8	21	209	15
Oil cooler pipe x Cylinder block		59	600	43
Compressor mounting bracket x Cylinder block		42	428	31
Injection pump x Water pump		21	214	15
Oil level gage guide x Cylinder block		18	184	13
Timing belt No.3 cover x Cylinder head		7.4	75	65 in.·lbf
Intake manifold x Cylinder head		21	214	15
Intake manifold insulator No. 1 x Intake manifold		5.0	51	44 in.·lbf
Injection pipe x Common rail	Using SST	31	316	23
	Not using SST	34	347	25
Injection pipe x Injector	Used pipe using SST	42	428	31
	Used pipe not using SST	46	469	34
	New pipe using SST	31	316	23
	New pipe not using SST	34	347	25
Injection pipe clamp x Intake manifold		5.0	51	44 in.·lbf
Fuel inlet pipe x Common rail	Using SST	31	316	23
	Not using SST	34	347	25
Fuel inlet pipe x injection pump	Using SST	31	316	23
	Not using SST	34	347	25
Nozzle leakage pipe No.2 x Cylinder head	Check valve	21	214	15
	Bolt	8.8	90	78 in.·lbf
Vacuum pump x Cylinder head		21	214	15
EGR valve assy x Cylinder head		18	184	13
Intake air connector with diesel throttle body x Intake manifold		21	214	15
Water inlet x Cylinder block		8.8	90	78 in.·lbf
Water outlet sub-assy x Cylinder head		21	214	15
Vacuum pump oil pipe x Cylinder block	Bolt	21	214	15
	Nut	8.8	90	78 in.·lbf
Exhaust manifold x Cylinder head		47	479	35
EGR pipe sub-assy x Cylinder head	Bolt	37	375	27
	Nut	25	250	18
Oil filter bracket x Oil pan sub-assy		34	347	25
V-ribbed belt tensioner bracket x Cylinder block		21	214	15
V-ribbed belt tensioner assy x Oil pump		31	316	23

SERVICE SPECIFICATIONS - ENGINE MECHANICAL

Part Tightened	N·m	kgf·cm	ft·lbf
Generator bracket No.1 x Cylinder block	37	377	27
Idle w/ bracket pulley x Transverse engine engine mounting bracket (See page 14-24) Bolt A	88	897	65
Bolt B	46	469	34
Idler pulley Sub-assy x V-ribbed belt tensioner assy	40	408	30
Engine mounting bracket RR x Engine mounting insulator RR	64	653	47
Engine mounting bracket FR x Engine mounting insulator FR	64	653	47
Drive shaft bearing bracket x Cylinder block	64	653	47
Rear end plate x Cylinder block	8.4	86	74 in.·lbf
Flywheel x Crankshaft	71	720	52
Front suspension crossmember sub-assy x Rear engine mounting bracket	87	887	64
Front suspension crossmember sub-assy x Front engine mounting bracket	52	530	38
Front suspension crossmember sub-assy x Body	133	1,356	98
Engine mounting member sub-assy center x Body	39	398	29
Front suspension member brace x Front suspension crossmember sub-assy	133	1,356	98
Front suspension member brace x Body	80	816	59
Engine mounting insulator RH x Body	52	530	38
Engine mounting bracket LH x Engine mounting insulator LH	80	816	59
Injector driver x Engine mounting insulator RH	5.0	51	44 in.·lbf
Engine wire x Body	8.4	85	74 in.·lbf
Engine room relay block No. 3 x Body	5.3	54	47 in.·lbf
Air tube No.2 x Manual transaxle	25	255	18
Engine room relay block No. 2 x Radiator assy	5.3	54	47 in.·lbf
Air cleaner assy x Body x Engine mounting bracket LH	7.0	71	62 in.·lbf
Timing belt tensioner x Cylinder block	21	214	15
Timing chain cover plate x Cylinder block	9.0	92	80 in.·lbf
Transverse engine engine mounting bracket x Cylinder block (See page 14-47) Bolt A	37	375	27
Bolt B	64	650	47
Timing belt No. 1 cover x Transverse engine engine mounting bracket	7.4	75	65 in.·lbf
Timing belt No. 1 cover x Oil pump assy	7.4	75	65 in.·lbf
Timing belt No. 2 cover x Transverse engine engine mounting bracket	7.4	75	65 in.·lbf
Timing belt No. 2 cover x Cylinder head cover sub-assy	7.4	75	65 in.·lbf
Timing belt No. 2 cover x Camshaft oil seal retainer	7.4	75	65 in.·lbf
Timing belt No. 2 cover x Timing belt cover No. 3	7.4	75	65 in.·lbf
Crankshaft pulley x Crankshaft	180	1,835	133
Engine mounting bracket No.2 RH x Transverse engine engine mounting bracket	52	530	38
Camshaft bearing cap x Cylinder head	20	204	15
Camshaft oil seal retainer x Cylinder head	8.8	90	78 in.·lbf
Camshaft timing pulley x Camshaft	88	899	65
Cylinder head cover x Cylinder head	13	135	9.7
Vacuum reservoir sub-assy x Cowl top panel outer	8.3	85	73 in.·lbf
Cylinder head x Cylinder block	45	459	33

COOLING

TORQUE SPECIFICATION

030M6-03

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Drain plug		13	133	10
Water pump x Cylinder block		31	320	23
Timing belt idler Sub-assy No.1 x Cylinder block		35	357	26
Fuel inlet pipe sub-assy x Common rail assy	Using SST	31	316	23
	Not using SST	34	347	25
Fuel inlet pipe sub-assy x Injection pump	Using SST	31	316	23
	Not using SST	34	347	25
Engine cover No. 1 x Cylinder head cover sub-assy		8.0	82	71 in.·lbf
Engine cover No. 1 x Intake manifold		8.0	82	71 in.·lbf
Water inlet x Cylinder block		8.8	90	78 in.·lbf
Radiator reserve tank assy x Radiator assy		6.0	61	53 in.·lbf
Front wheel		103	1,050	76

LUBRICATION

TORQUE SPECIFICATION

030MJ-03

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Oil drain plug x Oil pan sub-assy No. 2		34	350	25
Oil pump x Cylinder block		31	320	23
Oil pan sub-assy x Cylinder block (See page 17-1)	Bolt A	42	428	31
	Bolt B	21	214	15
	Bolt C	11	112	8
	Nut D	12	122	9
Oil pan insulator x Oil pan sub-assy		7.5	76	66 in.·lbf
Oil strainer sub-assy x Oil pan sub-assy	Bolt	21	209	15
	Nut	13	135	10
Oil pan Sub-assy No.2 x Oil pan sub-assy		12	119	9
Engine oil level sensor x Oil pan sub-assy No.2		7.0	71	62 in.·lbf
Oil level gage guide x Cylinder block		18	184	13
Front wheel RH		103	1,050	76

STARTING & CHARGING

030MK-03

SERVICE DATA

1CD-FTV:

Glow plugs Resistance	at 20 ˚C (68 ˚F)	Approx. 0.72 Ω
Glow plug relay Specified condition	1 - 2 3 - 5	Continuity No Continuity Continuity (Apply battery voltage terminals 1 and 2)

030ML-03

TORQUE SPECIFICATION

1CD-FTV:

Part Tightened		N·m	kgf·cm	ft·lbf
Glow plug assy x Cylinder head	Glow plug	12.3	125	9
	Nut	2.2	22	19 in.·lbf
Engine cover No. 1 x Cylinder head cover sub-assy		8.0	82	71 in.·lbf
Engine cover No. 1 x Intake manifold		8.0	82	71 in.·lbf

CLUTCH

TORQUE SPECIFICATION

031N1-01

Part Tightened	N·m	kgf·cm	ft·lbf
Clutch master cylinder x Flexible hose tube	15	155	11
Clutch master cylinder x Body	12	120	9

DIAGNOSTICS

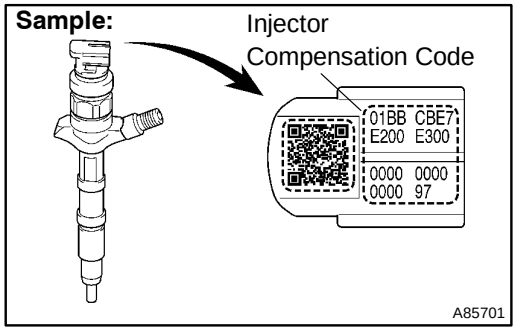
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ECD SYSTEM (1CD-FTV(CDE120#-##M#XW Models))

PRECAUTION

05DVP-01



1. Since each injector has its own fuel injection characteristic, the ECM compensates this by slightly modifying injection duration in order to optimize fuel injection volume. Compensating data for the optimum injection volume, in the form of a 30-digit-alphanumeric value, has been imprinted on the head portion of each injector as the injector compensation code.

2. The injector compensation code will be required to register to the ECM when replacing the injectors or the ECM.

3. If an incorrect injector compensation code was registered to the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.

4. If the customer's problem description is applicable to one of the following problems, refer to the troubleshooting on the pages shown below:

(a) Engine start difficulties, or engine stall, see page 05-184.

(b) Black smoke, see page 05-193.

05CP9-02

SYSTEM DESCRIPTION

1. COMMON RAIL SYSTEM

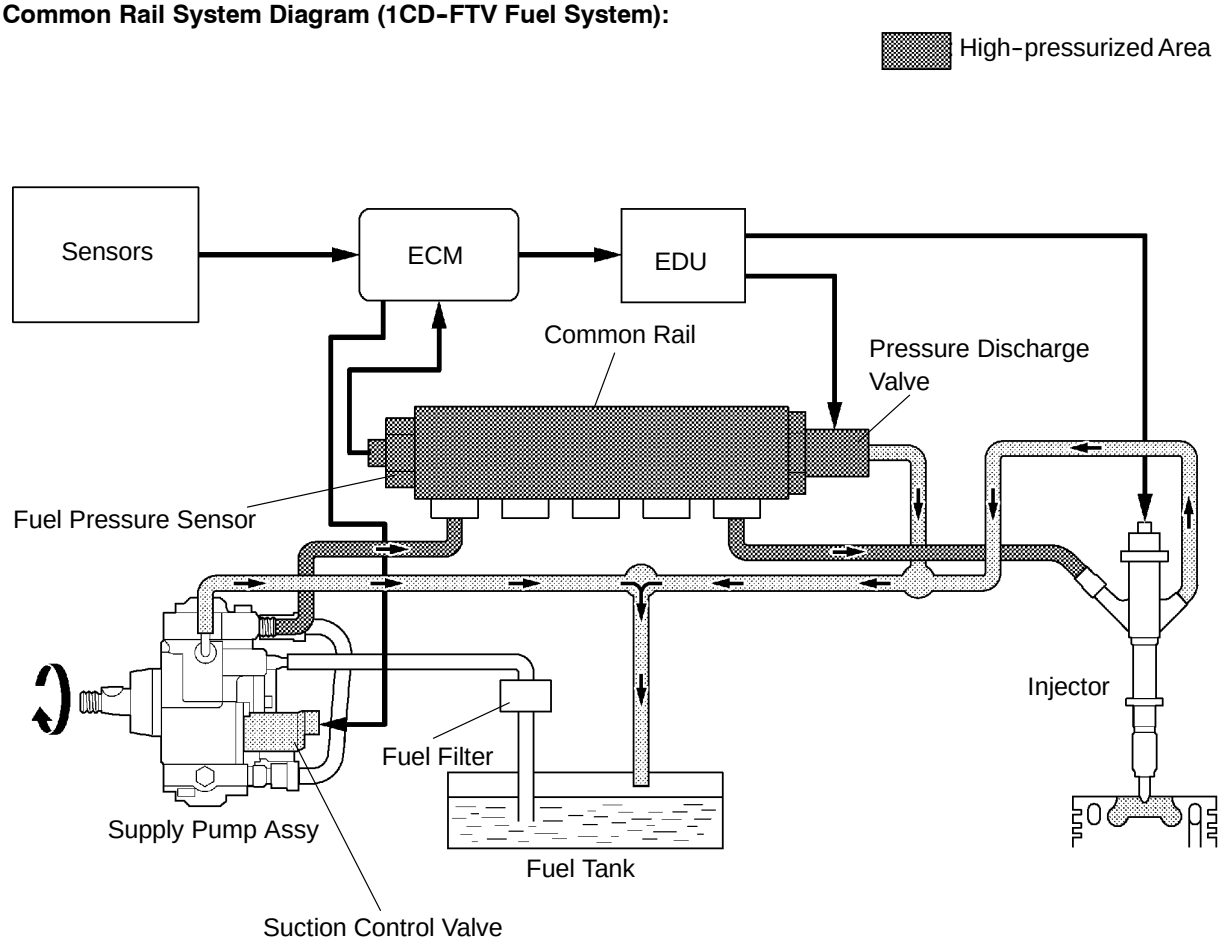
The common rail system stores high-pressurized fuel supplied from the supply pump in the common rail and injects it using the injectors. Fuel injection timing and fuel injection volume are regulated by the ECM; it provides an electric current to the solenoid valve of the injector with the EDU to regulate them.

By storing high-pressurized fuel produced in the supply pump in the common rail, this system can always offer stable fuel injection pressure regardless of the engine speed and engine load, even if a driving speed is low. In addition, this system uses the injector that opens and closes its fuel passage with the Two-Way-Valve (TWV) therefore both the fuel injection time and volume are precisely regulated by the ECM.

The ECM monitors internal fuel pressure of the common rail with the fuel pressure sensor and commands the supply pump to supply fuel to obtain a target internal pressure, approximately 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4,351 to 26,106 psi). The ECM opens and closes the pressure discharge valve to improve controllability for the common rail internal fuel pressure.

This system has two split fuel injections. It performs "pilot-injection" as subsidiary fuel injection prior to the main fuel injection to make combustion soft, and this helps to reduce engine vibration and noise.

Common Rail System Diagram (1CD-FTV Fuel System):

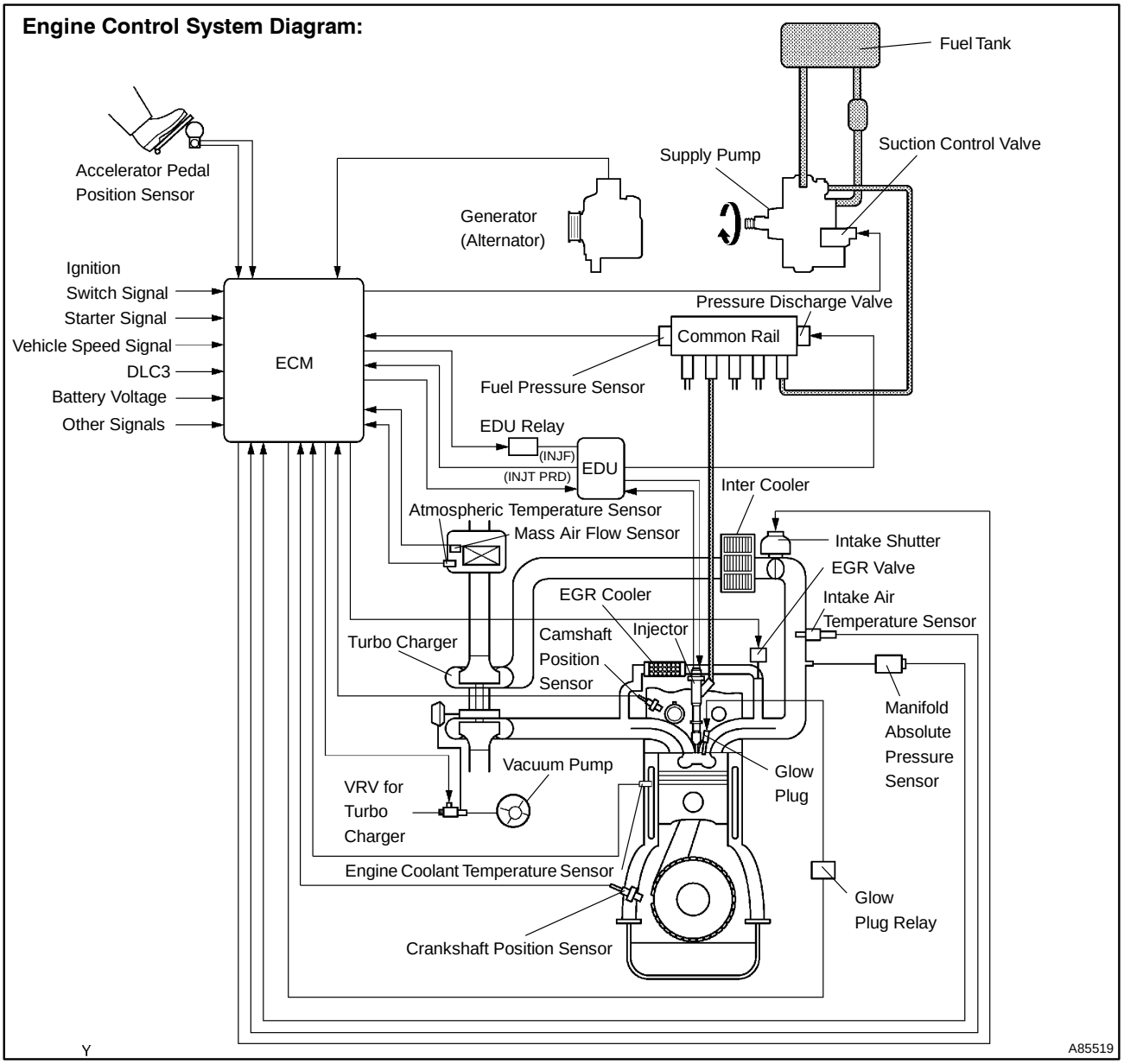


COMMON RAIL SYSTEM COMPONENTS:

Component	Description
Common rail	Stores high-pressurized fuel produced by the supply pump
Supply pump	Operated by the crankshaft, and supplies high-pressure fuel to the common rail
Injector	Injects fuel to the combustion chamber based on signals from the ECM
Fuel pressure sensor	Monitors internal fuel pressure of the common rail and sends signals to the ECM
Pressure discharge valve	Based on signals from the ECM, opens the valve when sudden deceleration is occurred, or when the ignition switch is OFF to prevent the fuel pressure from becoming too high
Suction control valve	Based on signals from the ECM, adjusts fuel volume supplied to the common rail and regulates the internal fuel pressure

2. ENGINE CONTROL SYSTEM

Engine Control System Diagram:

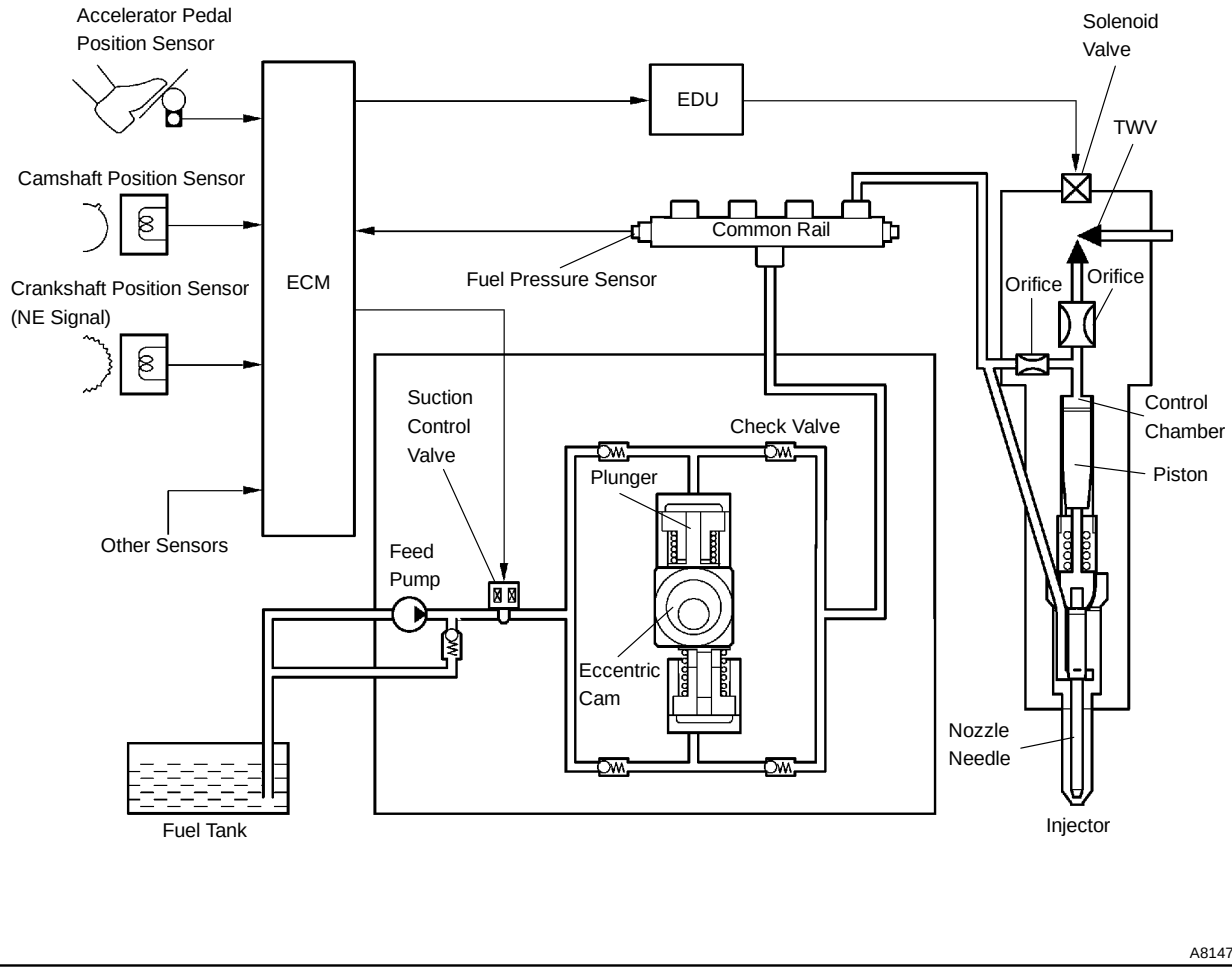


3. INJECTION CONTROL SYSTEM

The ECM controls the fuel injection system by using the injectors and supply pump. The ECM determines the fuel injection volume and timing by controlling both duration and timing of energization to the solenoid valve in the injector, and determines the injection pressure by controlling the suction control valve located on the supply pump.

The feed pump is used to pump fuel from the fuel tank into the supply pump.

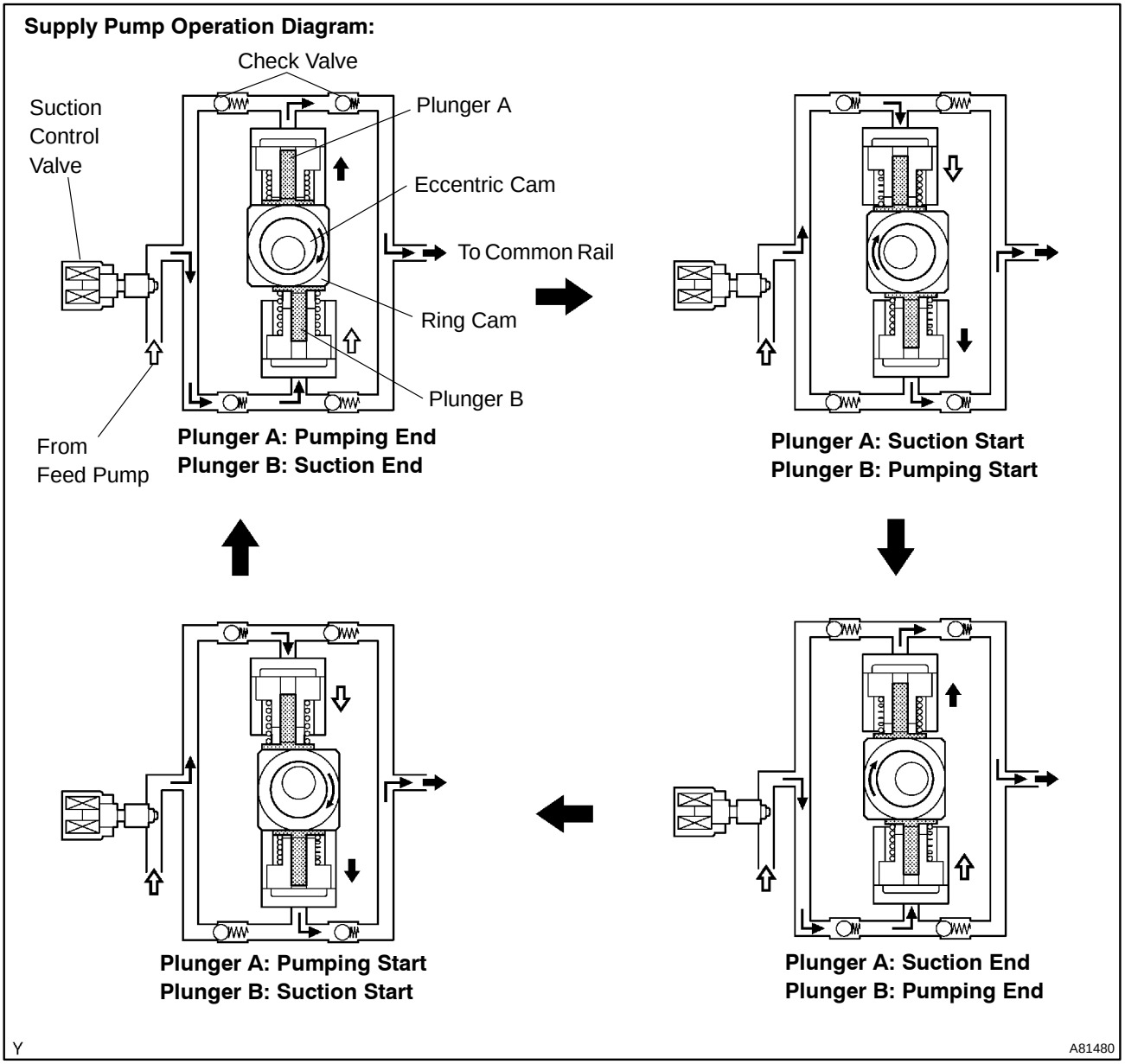
Injection Control Diagram:



4. SUPPLY PUMP OPERATION

The rotation of the eccentric cam causes the ring cam pushes plunger A upward as illustrated below. The spring force pulls plunger B (located on the opposite of plunger A) upward. As a result, plunger B draws the fuel in, and plunger A pumps the fuel at the same time.

Supply Pump Operation Diagram:



5. SUCTION CONTROL VALVE OPERATION

HINT:

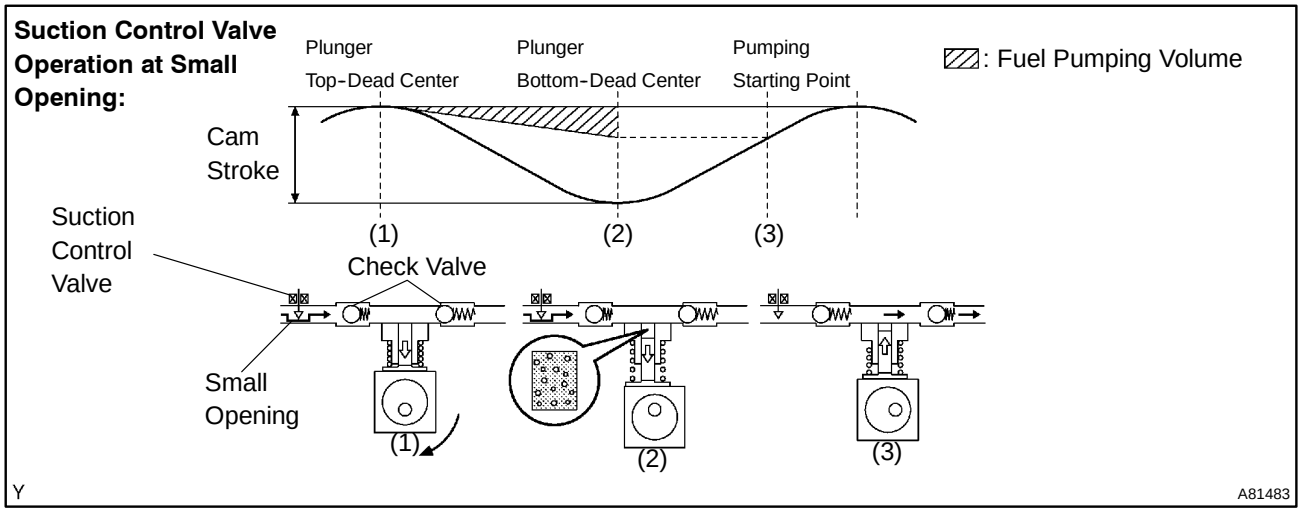
The ECM controls the suction control valve operation to regulate the fuel volume that is pumped by the supply pump to the common rail. This control is performed to adjust the internal fuel pressure of the common rail to the targeted injection pressure.

(a) Small opening of the suction control valve:

(1) When the opening of the suction control valve is small, the fuel suction path is kept narrow. Therefore the transferable fuel volume is reduced.

(2) The suction volume becomes small due to the narrow path despite the plunger stroke being full. The difference between the geometrical volume and suction volume creates vacuum.

(3) Pumping will start at the time when the fuel pressure becomes higher than the common rail pressure.

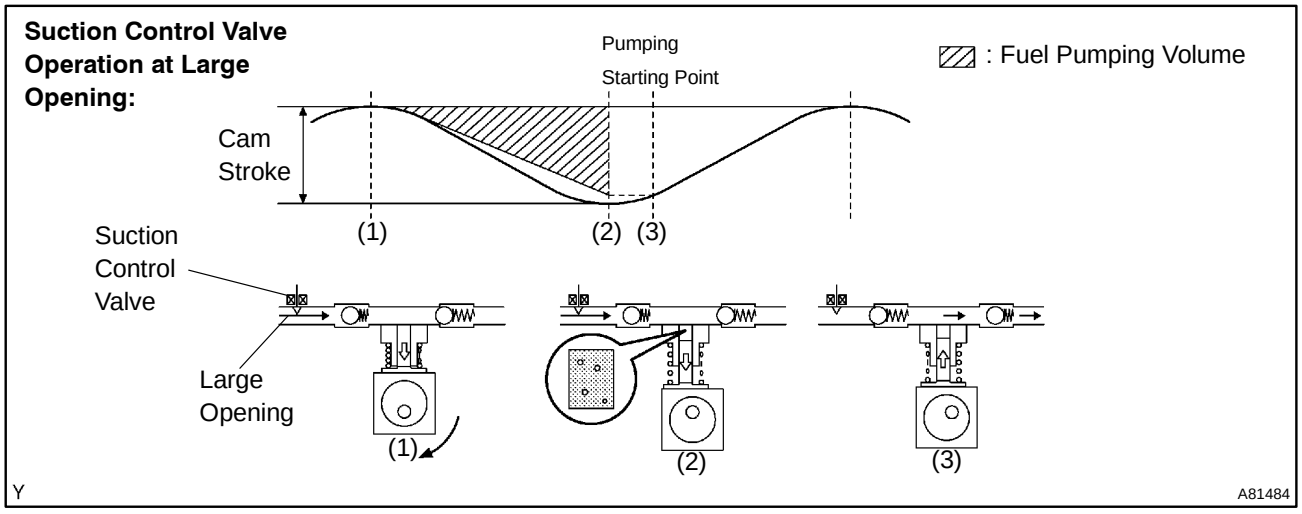


(b) Large opening of the suction control valve:

(1) When the opening of the suction control valve is large, the fuel suction path is kept wide. Therefore the transferable fuel volume is increased.

(2) If the plunger stroke is full, the suction volume becomes large because of the wide path.

(3) Pumping will start at the time when the fuel pressure becomes higher than the common rail pressure.



6. DIAGNOSTIC TROUBLE CODES (DTCS) TABLE FOR FUEL SYSTEM

HINT:

This table indicates typical DTC combinations for each malfunction occurrence.

( ): Potential DTCs

DTC No.	A	B	C	D	E	F	G	H	I	J	K	L
P0087 (See page 05-47)				F								
P0088 (See page 05-54)					(F)		(F)	(F)	(F)			
P0093 (See page 05-61)	(F)	F			(F)	F					(F)	F
P0190 (See page 05-47)				F								
P0191 (See page 05-96)				F								
P0192 (See page 05-47)				F								
P0193 (See page 05-47)				F								
P0200 (See page 05-97)	F										(F)	
P0627 (See page 05-147)								F				
P1229 (See page 05-54)					(F)			F	F			
P1238 (See page 05-150)	F	F	F								(F)	
P1271 (See page 05-154)					F						(F)	
P1272 (See page 05-154)					F		F				(F)	

Trouble area	Malfunction	Refer to
Injector	Open or short in injector circuit	A
	Stuck open	B
	Stuck close	C
Fuel pressure sensor	Open or short in fuel pressure sensor circuit or pressure sensor output fixed	D
Pressure discharge valve	Open or short in pressure discharge valve circuit	E
	Stuck open	F
	Stuck close	G
Suction control valve	Open or short in suction control valve circuit	H
	Stuck open	I
	Stuck close	J
EDU	Faulty EDU	K
Common rail system (Fuel system)	Fuel leaks in high-pressurized area	L

7. DIAGNOSTICS TROUBLE CODE DESCRIPTION

DTC No.	Description
P0087	Fuel pressure sensor output status at fixed value
P0088	Internal fuel pressure too high (200 MPa (2,039 kgf/cm^2, 29,007 psi) or more)
P0093	Fuel leaks in high-pressurized area
P0190	Open or short in fuel pressure sensor circuit (Low or high output)
P0191	Fuel pressure sensor out of range (Low output)
P0192	Open or short in fuel pressure sensor circuit (High output)
P0193	Open or short in fuel pressure sensor circuit (Sensor 1 and/or 2 relation)
P0200	Open or short in EDU or injector circuit
P0627	Open or short in suction control valve circuit
P1229	Fuel over-feed
P1238	Injection malfunction, exclude open or short in injector circuit
P1271	Open or short in pressure discharge valve circuit
P1272	Closed malfunction of the pressure discharge valve

054JB-08

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05-11)

3	CONNECT THE HAND-HELD TESTER TO DLC3

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

4	CHECK DTC AND FREEZE FRAME DATA (See page 05-16)

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

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05-16)

6	VISUAL INSPECTION

7	SET THE CHECK (TEST) MODE DIAGNOSIS (See page 05-17)

8	PROBLEM SYMPTOM CONFIRMATION

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

A	Malfunction does not occur
B	Malfunction occurs

B	GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05-16)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	GO TO DTC CHART (See page 05-35)

GO TO STEP 14

12	BASIC INSPECTION (See page 05-19)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	GO TO PROBLEM SYMPTOMS TABLE (See page 05-42)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05-175)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

GO TO STEP 18

17	PARTS INSPECTION

18	PROBLEM IDENTIFICATION

19	ADJUSTMENT AND/OR REPAIR

20	CONFIRMATION TEST

END

054JC-08

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

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

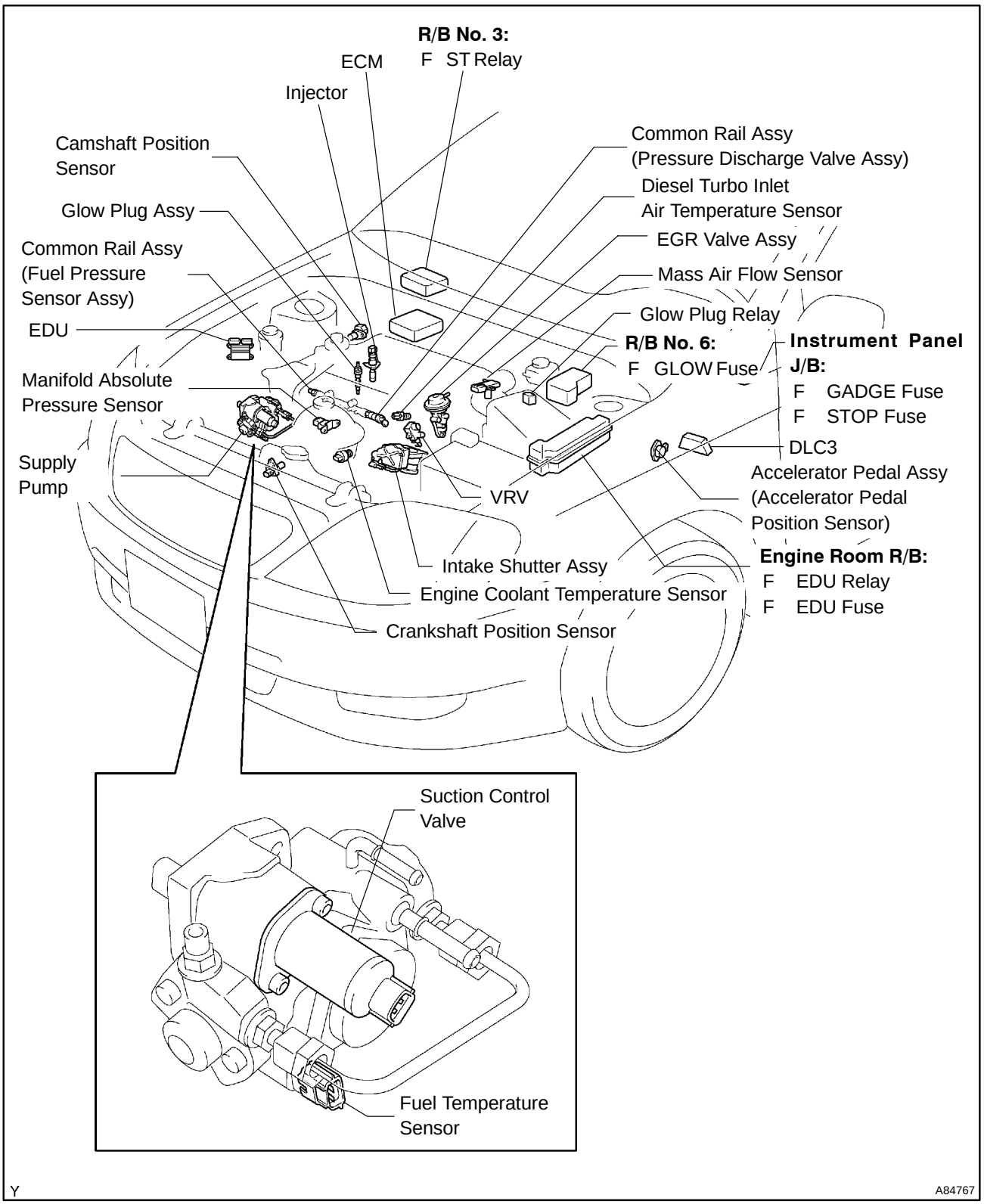
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Drivability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

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

Condition of check engine warning light (CHK ENG)		☐ 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 ( )

054JE-07

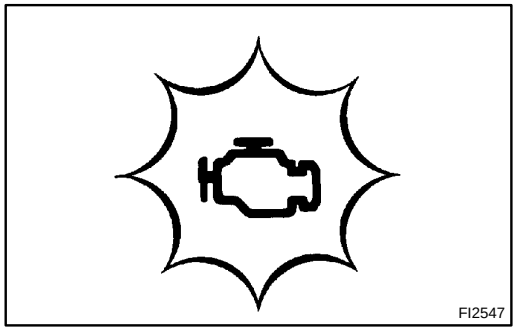
LOCATION



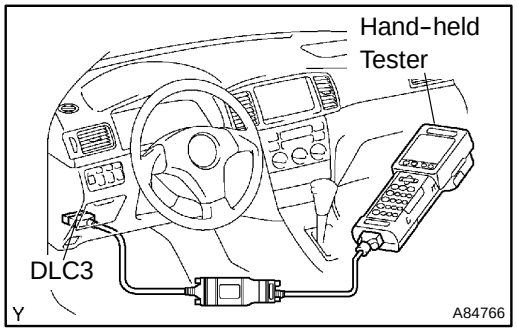
05DVQ-01

DIAGNOSIS SYSTEM

1. DESCRIPTION


FI2547

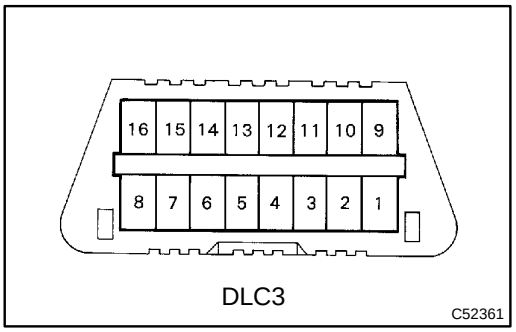
- When troubleshooting Euro-OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031-4 or a hand-held tester to the vehicle, and read the various data output from the vehicle's ECM.
- Euro-OBD regulations require that the vehicle's on-board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031-4 are recorded in the ECM memory (See page 05-35). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.



Y A84766

- To check the DTCs, connect the OBD scan tool or hand-held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand-held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's instruction book.)
- 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 freely by the manufacturer within the prescribed limits (See DTC chart on page 05-35).
- The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check mode using hand-held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand-held tester only) (See page 05-17).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.



DLC3

2. CHECK DLC3

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

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

3. INSPECT BATTERY VOLTAGE

Battery voltage: 11 to 14 V

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

4. CHECK CHK ENG

(a) The check engine warning light (CHK ENG) comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the CHK ENG is not illuminated, troubleshoot the combination meter.

(b) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

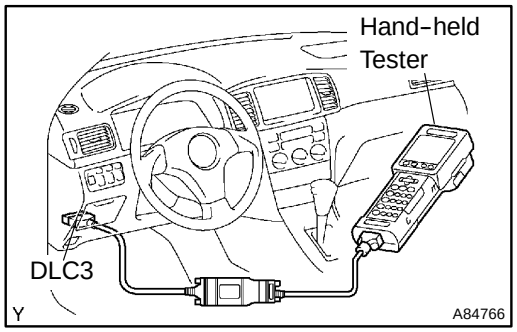
05DVR-01

DTC CHECK/CLEAR

NOTICE:

Hand-held tester only:

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



1. DTC CHECK (using the hand-held tester)

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".

(d) Read the DTCs.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

(e) See page 05-35 to confirm the details of the DTCs.

2. FREEZE FRAME DATA

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / FREEZE FRAME DATA".

(d) Read the freeze frame data.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

3. CLEAR DTCs AND FREEZE FRAME DATA (using the hand-held tester)

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

(b) Turn the ignition switch ON and push the hand-held tester main switch ON. (Do not the engine start)

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".

(d) Clear the DTCs and freeze frame data.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

4. CLEAR DTCs AND FREEZE FRAME DATA (not using the hand-held tester)

(a) Disconnect the battery terminal or remove the ECD fuse from the engine room R/B for more than 60 seconds.

05DVS-01

CHECK MODE PROCEDURE

HINT:

Hand-held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

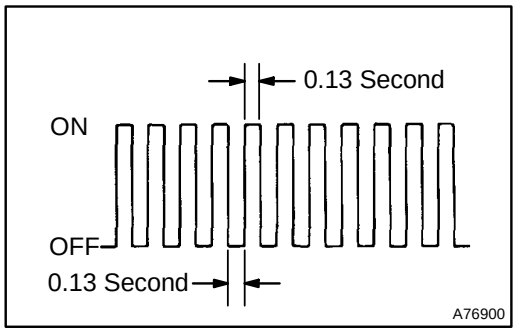
1. CHECK MODE PROCEDURE (using the hand-held tester)

(a) Check the initial conditions.
  (1) Battery positive voltage 11V 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 hand-held tester to the DLC3.

(d) Turn the ignition switch ON and switch the hand-held tester main switch ON.



(e) Select the item "DIAGNOSIS / OBD/MOBD / CHECK MODE". The check engine warning light (CHK ENG) blinks in 0.13 second intervals as shown in the illustration.

NOTICE:

If the hand-held tester switches the ECM from the normal mode to the check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freeze frame data will be erased.

(f) Start the engine. (The CHK ENG goes off after the engine start.)

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

NOTICE:

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

(h) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Do not turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

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

2. CLEAR DTCs (using the hand-held tester)

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".

(d) Clear the DTCs.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

3. CLEAR DTCs (not using the hand-held tester)

(a) Disconnect the battery terminal or remove the EDU fuses from the engine room R/B for more than 60 seconds.

05DVT-01

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the 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**

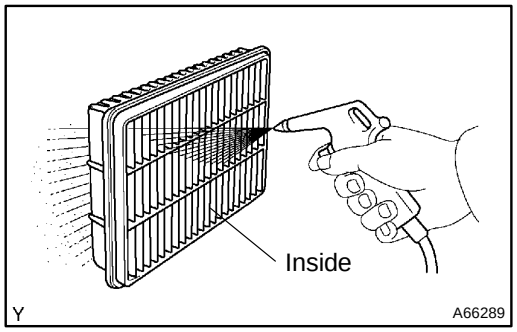
OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-42**

OK

3	CHECK AIR FILTER



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

NOTICE:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

4	CHECK FUEL QUALITY

(a) Check that only diesel fuel is used
(b) Check that the fuel does not contain any impurity.

NG → **REPLACE FUEL**

OK

5	CHECK ENGINE OIL (See page 17-10 of Pub. No. RM925E COROLLA)

NG → ADD OR REPLACE

OK

6	CHECK ENGINE COOLANT (See page 16-3)

NG → REPLACE ENGINE COOLANT (See page 16-3)

OK

7	CHECK IDLE SPEED AND MAXIMUM SPEED (See page 14-1)

NG → REPLACE INJECTION OR SUPPLY PUMP ASSY (See page 11-15)

OK

8	CHECK DIAGNOSTIC CIRCUIT

NG → REPAIR OR REPLACE

OK

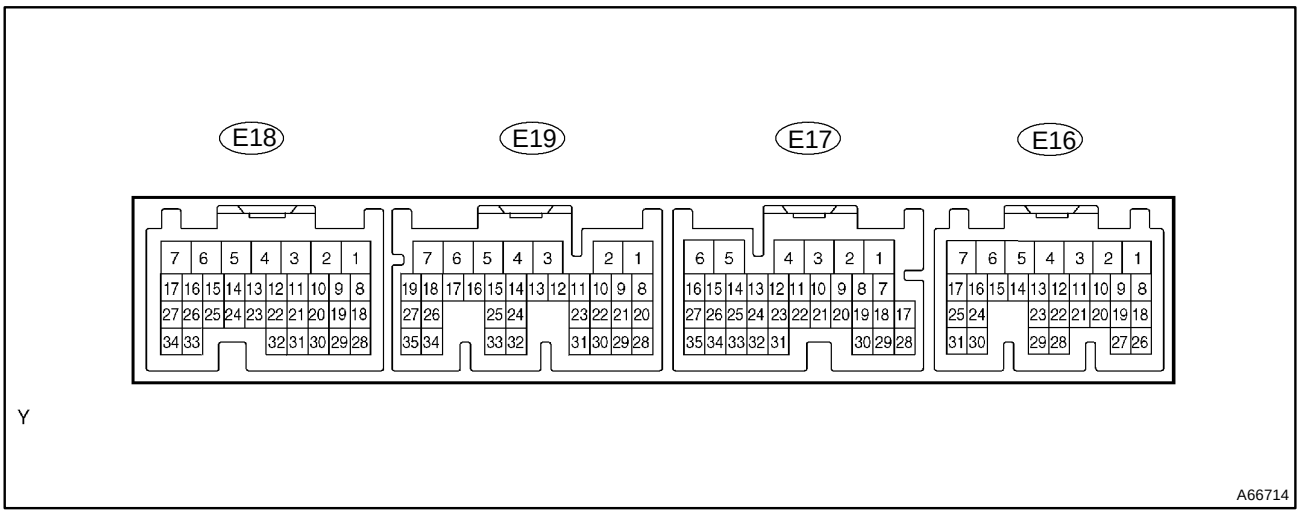
9	CHECK VACUUM PUMP

NG → REPAIR OR REPLACE VACUUM PUMP

OK

PROCEED TO PROBLEM SYMPTOMS TABLE (See page 05-42)

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
BATT (E17-2) - E1 (E19-7)	R-W - BR	Battery (for measuring the battery voltage and for the ECM memory)	Always	9 to 14
IGSW (E16-9) - E1 (E19-7)	SB (B-O) - BR	Ignition switch	Ignition switch ON	9 to 14
+B (E16-1) - E1 (E19-7)	B - BR	Power source of ECM	Ignition switch ON	9 to 14
MREL (E16-8) - E1 (E19-7)	B-W - BR	ECD relay	Ignition switch ON	9 to 14
			Ignition switch OFF	0 to 1.5
VC (E18-18) - E1 (E19-7)	R-W - BR	Power source of sensor (a specific voltage)	Ignition switch ON	4.5 to 5.5
VPA (E16-22) - EPA (E16-28)	G - Y	Accelerator pedal position sensor (for the engine control)	Ignition switch ON, accelerator pedal fully released	0.5 to 1.1
			Ignition switch ON, accelerator pedal fully depressed	2.6 to 4.5
VPA2 (E16-23) - EPA2 (E16-29)	R (LHD) - L L (RHD) - L	Accelerator pedal position sensor (for the sensor malfunction detection)	Ignition switch ON, accelerator pedal fully released	1.2 to 2.0
			Ignition switch ON, accelerator pedal fully depressed	3.4 to 5.3
VCPA (E16-26) - EPA (E16-28)	W - Y	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	4.5 to 5.5
VCP2 (E16-27) - EPA2 (E16-29)	B - L	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5
VG (E19-24) - EVG (E19-32)	G - L-Y	Mass air flow sensor	Idling	0.5 to 3.4
THA (E18-31) - E2 (E18-28)	G-R - BR	Intake air temperature sensor	Idling, intake air temperature at 20 °C (68 °F)	0.5 to 3.4
THW (E18-19) - E2 (E18-28)	B-W - BR	Engine coolant temperature sensor	Idling, engine coolant temperature at 80°C (176°F)	0.2 to 1.0
STA (E16-7) - E1 (E19-7)	SB (BR - R) - BR	Starter signal	Cranking	6.0 or more
#1 (E18-24) - E1 (E19-7) #2 (E18-23) - E1 (E19-7) #3 (E18-22) - E1 (E19-7) #4 (E18-21) - E1 (E19-7)	G-W - BR W-R - BR R-W - BR W-L - BR	Injector	Idling	Pulse generation (See page 05-97)
G1 (E19-23) - G- (E19-31)	P - L	Camshaft position sensor	Idling	Pulse generation (See page 05-109)
NE+ (E18-27) - NE- (E18-34)	G - B	Crankshaft position sensor	Idling	Pulse generation (See page 05-109)

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
STP (E17-19) - E1 (E19-7)	SB (G-W) - BR	Stop lamp switch	Ignition switch on, brake pedal is depressed	7.5 to 14
			Ignition switch on, brake pedal is released	0 to 1.5
ST1- (E17-12) - E1 (E19-7)	G-R - BR	Stop lamp switch (opposite to stop)	Brake pedal is depressed	0 to 1.5
			Brake pedal is released	7.5 to 14
TC (E16-11) - E1 (E19-7)	W (P-B) - BR	Terminal TC of DLC 3	Ignition switch ON	9 to 14
W (E16-12) - E1 (E19-7)	W (R-Y) - BR	Check engine warning light (CHK ENG)	Check engine warning light (CHK ENG) light up	0 to 3
			Except check engine warning light (CHK ENG) light up	9 to 14
SPD (E17-17) - E1 (E19-7)	W (V-W) - BR	Speed signal from combination meter	Ignition switch ON, rotate driving wheel slowly	Pulse generation (See page 05-133)
SIL (E16-18) - E1 (E19-7)	W (L-R) - BR	Terminal SIL of DLC3	Connect the hand-held tester to the DLC3	Pulse generation
PIM (E19-28) - E2 (E18-28)	W-R - BR	Turbo pressure sensor	Applied negative pressure of 40 kPa (300 mmHg, 11.8 in. hg)	0.2 to 0.8
			Same as atmosphere	1.3 to 1.9
			Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi)	3.2 to 3.8
IREL (E16-10) - E1 (E19-7)	SB (B-W) - BR	EDU relay	Ignition switch OFF	9 to 14
			Idling	0 to 1.5
TACH (E16-5) - E1 (E19-7)	W (B) - BR	Engine speed	Idling	Pulse generation
VCS (E19-2) - E2S (E19-1)	R-W - BR	Common rail pressure sensor	Ignition switch ON	4.5 to 5.5
GREL (E16-14) - E1 (E19-7)	G-R - BR	Glow plug relay	Cranking	9 to 14
			Idling	0 to 1.5
THIA (E18-20) - E2 (E18-28)	GR - BR	Intake air temperature sensor	Idling, intake air temperature at 80 °C (176 °F)	0.5 to 3.4
THF (E18-29) - E2 (E18-28)	L - BR	Fuel temperature sensor	Ignition switch ON	0.5 to 3.4
PCR1 (E18-26) - E2 (E18-28)	P - BR	Common rail pressure sensor (main)	Idling	1.8 to 2.1
PCR2 (E18-33) - E2 (E18-28)	P-B - BR	Common rail pressure sensor (sub)	Idling	1.2 to 1.5
ALT (E18-8) - E1 (E19-7)	B-L - BR	Generator (Alternator) duty signal	Idling	Pulse generation
PCV+ (E18-2) - PCV- (E18-1)	LG-R - LG	Suction control valve	Idling	Pulse generation (See page 05-147)
PRD (E18-32) - E1 (E19-7)	R-L - BR	Pressure relief valve drive signal	Ignition switch OFF	4 to 6.5
INJF (E18-25) - E1 (E19-7)	R-B - BR	EDU	Idling	Pulse generation (See page 05-97)
EG+A (E19-6) - E1 (E19-7) EG-A (E19-5) - E1 (E19-7) EG+B (E19-4) - E1 (E19-7) EG-B (E19-3) - E1 (E19-7)	G - BR Y-G - BR R-L - BR G-B - BR	EGR valve	Idling	Pulse generation (See page 05-123)
LU+A (E18-15) - E1 (E19-7) LU-A (E18-14) - E1 (E19-7) LU+B (E18-13) - E1 (E19-7) LU-B (E18-12) - E1 (E19-7)	B - BR G - BR Y - BR L - BR	Intake shutter	Engine acceleration	Pulse generation (See page 05-127)
THOP (E18-11) - E1 (E19-7)	P-L - BR	Intake shutter fully opened switch	Idling	9 to 14
			Ignition switch ON	0 to 3
VN (E18-10) - E1 (E19-7)	W - BR	VRV (for VN turbo)	Ignition switch ON	Pulse generation (See page 05-45)

05DVU-01

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using the DATA LIST displayed by the hand-held tester, you can read the value of the switches, sensors, actuators and other data without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. Do not solely depend on the normal condition here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand-held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on the tester, read the "DATA LIST".

Hand-held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
INJ VOLUME	Injection volume/ Min.: 0 mm^3, Max.: 1279.98 mm^3	Idling: 3 to 10 mm^3	—
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383.75 rpm	Idling: 750 to 850 rpm	—
MAF	Air flow rate from MAF sensor status/ Min.: 0 gm/s, Max.: 655.35 gm/s	S Idling: 3.2 to 4.7 gm/s S Running without load (2,500 rpm): 13.1 to 18.9 gm/s	If the value is approximately 0.0 gm/s: S Mass air flow sensor power source circuit open S VG circuit open or short If the valve is 160 gm/s or more: S E2G circuit open
PIM	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 255 kPa	S Idling: 85 to 110 kPa S Engine running at 2,000 rpm: 80 to 110 kPa S Engine running at 3,000 rpm: 90 to 130 kPa	—
COOLANT TEMP	Coolant temperature/ Min.: -40 _C, Max.: 215 _C	After warming up: 80 to 95˚C (176 to 203˚F)	If the value is "-40 _C" or "140 _C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: -40 _C, Max.: 215 _C	Equivalent to temperature at the intake manifold	
FUEL TEMP	Fuel temperature status/ Min.: -40 _C, Max.: 215 _C	Actual fuel temperature	
ACCEL POSITION	Accel position status/ Min.: 0 %, Max.: 100 %	S Accelerator pedal released: 10 to 22 % S Accelerator pedal depressed: 52 to 90 %	Read the value with ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer
THROTTLE POS	Throttle step position status/ Min.: 1 step, Max.: 255 step	S Throttle fully closed: 1 step S Throttle fully open: 255 step	Read the value with ignition switch ON (Do not start engine).

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

Hand-held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
COMN RAIL PRESS	Common rail pressure status/ Min.: 0 MPa, Max.: 255 MPa	Idling: 30 to 40 MPa	—
AMBI TEMP SENS	Ambient temperature sensor status/ Min.: -40 _C, Max.: 215 _C	Actual atmospheric temperature	If the value is "-40 _C" or "140 _C", sensor circuit is open or shorted.
INJ VOL FB #1	Injection volume correction for cylinder 1/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #2	Injection volume correction for cylinder 2/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #3	Injection volume correction for cylinder 3/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #4	Injection volume correction for cylinder 4/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
M-INJ/PILOT ON	M-INJ/PILOT ON/ Min.: 0 μs Max.: 65,535 μs	Idling: 600 to 1,200 μs	—
PILOT-INJ	Pilot-Injection/ Min.: 0 μs, Max.: 65,535 μs	Idling: 400 to 700 μs	—
INJ FB VALUE	Injection volume feedback learning value/ Min.: -10 mm^3, Max.: 9.92 mm^3	Idling: -4.0 to 4.0 mm^3	—
STOP LIGHT SW	Stop light switch/ ON or OFF	S Brake pedal depressed: ON S Brake pedal released: OFF	—
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C CUT SIG	A/C cut signal/ ON or OFF	A/C ON: OFF	—
ACCEL OPEN SW	Accel open switch/ ON or OFF	Accelerator pedal fully depressed: ON	—
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	—
EGR STEP POS	EGR step position status/ Min.: 0 step, Max.: 125 step	Idling: 0 to 125 step	—
DIST TRAV	Travel distance after check engine warning light (CHK ENG) was illuminated/ Min.: 0 km, Max.: 65,535 km	Actual travel distance after check engine warning light (CKH ENG) was illuminated	—

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

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of the troubleshooting is one of the methods to shorten diagnostic 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 hand-held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand-held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST"
(g) According to the display on tester, perform the "ACTIVE TEST".

Hand-held Tester Display	Test Details	Diagnostic Note
EGR STEP POS	[Test Details] Change step of EGR motor Min.: 0 step, Max.: 125 step	—
TC/TE1	[Test Details] Same condition as the connection of TC and TE1 ON or OFF	—
FUEL LEAK TEST	[Test Details] Maintain the engine speed at 2,000 rpm, and pressurize the common rail internal fuel pressure to 135 MPa ON or OFF	Confirm that there is no leak in the fuel system when the common rail internal fuel pressure is pressurized high
INJECTOR CUT #1	[Test Details] Injector cut #1 ON or OFF	—
INJECTOR CUT #2	[Test Details] Injector cut #2 ON or OFF	—
INJECTOR CUT #3	[Test Details] Injector cut #3 ON or OFF	—
INJECTOR CUT #4	[Test Details] Injector cut #4 ON or OFF	—

05DVV-01

READING REGISTERED DATA

NOTICE:

- **If an incorrect injector compensation code was registered with the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.**
- **If you replace the ECM with a new one, register all the injectors' injector compensation codes with the new ECM as follows:**

(a) Prior to replacing the ECM, read all the compensation codes stored in the existing ECM using the hand-held tester, and then write them down. (See page 05-26)

(b) After replacing the ECM, enter the written compensation codes into the ECM using the hand-held tester. (See page 05-30)

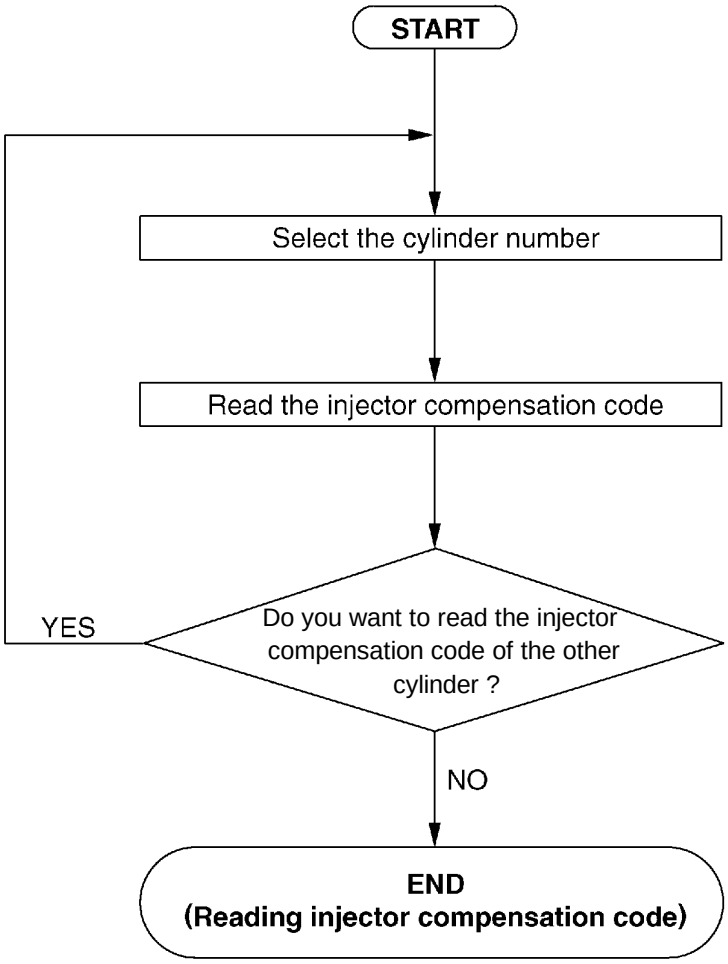
(c) Turn the ignition switch OFF and wait for 30 seconds or more.

(d) Turn the ignition switch ON, then clear DTC P1601 using the hand-held tester. (See page 05-16)

HINT:

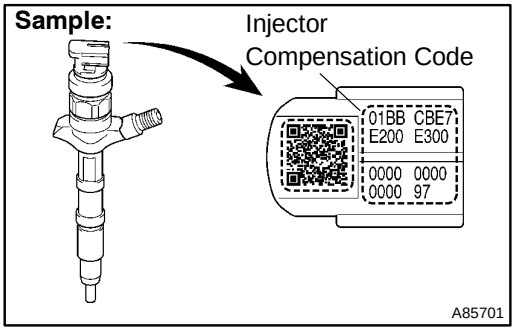
- In order to optimize the injector's fuel injection characteristic, the ECM compensates the injection duration by each cylinder. The ECM stores and uses compensating data in the form of a 30-digit-alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- If you installed a new injector, its own injector compensation code is needed to register with the ECM. Also, if you replaced the ECM, the compensation codes of all the injectors are needed to register because the new ECM dose not have the codes until they are registered.
- Once the ECM is replaced, DTC P1601 will be present when turning the ignition switch ON. This is to inform you that the injector compensation codes are required to register with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch OFF and wait for 30 seconds or more.

Process of reading injector compensation code(s):



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A85518



1. READ INJECTOR COMPENSATION CODE

(a) Connect the hand-held tester to the DLC 3.

(b) Turn the ignition switch ON.

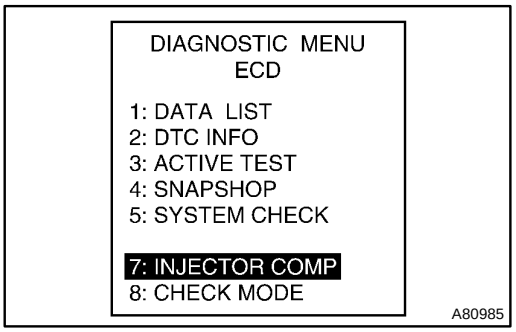
(c) Turn the main switch of the hand-held tester ON.

NOTICE:

Do not start the engine in this operation.

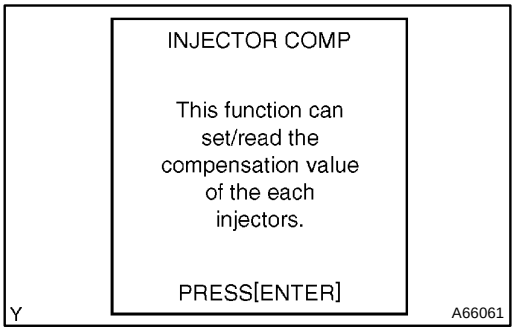
HINT:

Injector compensation code is imprinted on the head portion of the injector.

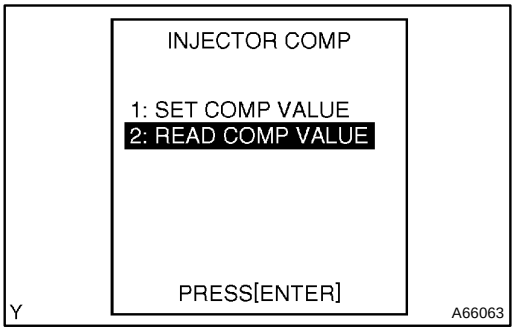


(d) Enter "DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD" and select the item "INJECTOR COMP."

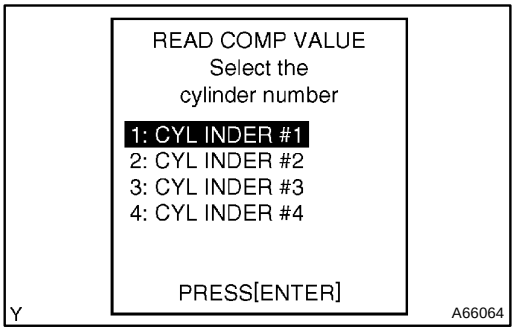
(e) Press the "ENTER" button on the hand-held tester.



(f) Press the "ENTER" button again.

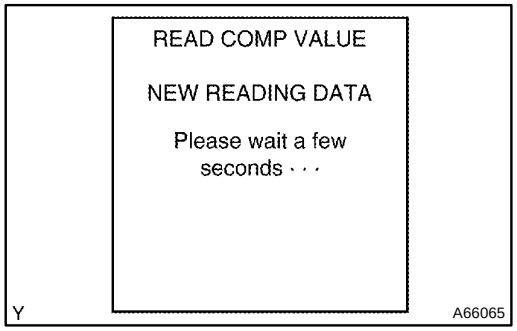


(g) Select "READ COMP VALUE" and press the "ENTER" button.

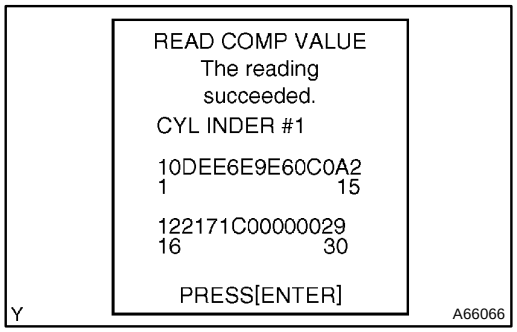


(h) Select a cylinder number which you want to read the compensation code.

(i) Press the "ENTER" button.



(j) Wait until the next screen comes up.

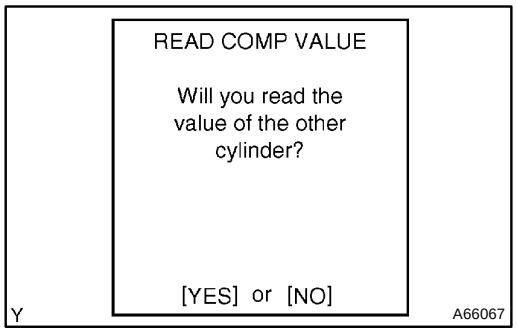


(k) Confirm the 30-digit-alphanumeric code which is displayed on the hand-held tester. This is the injection compensation code for the cylinder.

HINT:

The code shown in the illustration is an example.

(l) Press the "ENTER" button to exit this screen.



(m) Press the "NO" button to complete the confirmation.

HINT:

- If you want to read other compensation codes for the other cylinders, press the "YES" button instead of "NO."
- By pressing the "NO" button, the hand-held tester returns to the "DIAGNOSTIC MENU ECD" screen.

05DVW-01

REGISTRATION

NOTICE:

- **If an incorrect injector compensation code was registered with the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.**
- **If you replace the ECM with a new one, register all the injectors' injector compensation codes with the new ECM as follows:**

(a) Prior to replacing the ECM, read all the compensation codes stored in the existing ECM using the hand-held tester, and then write them down. (See page 05-26)

(b) After replacing the ECM, enter the written compensation codes into the ECM using the hand-held tester. (See page 05-30)

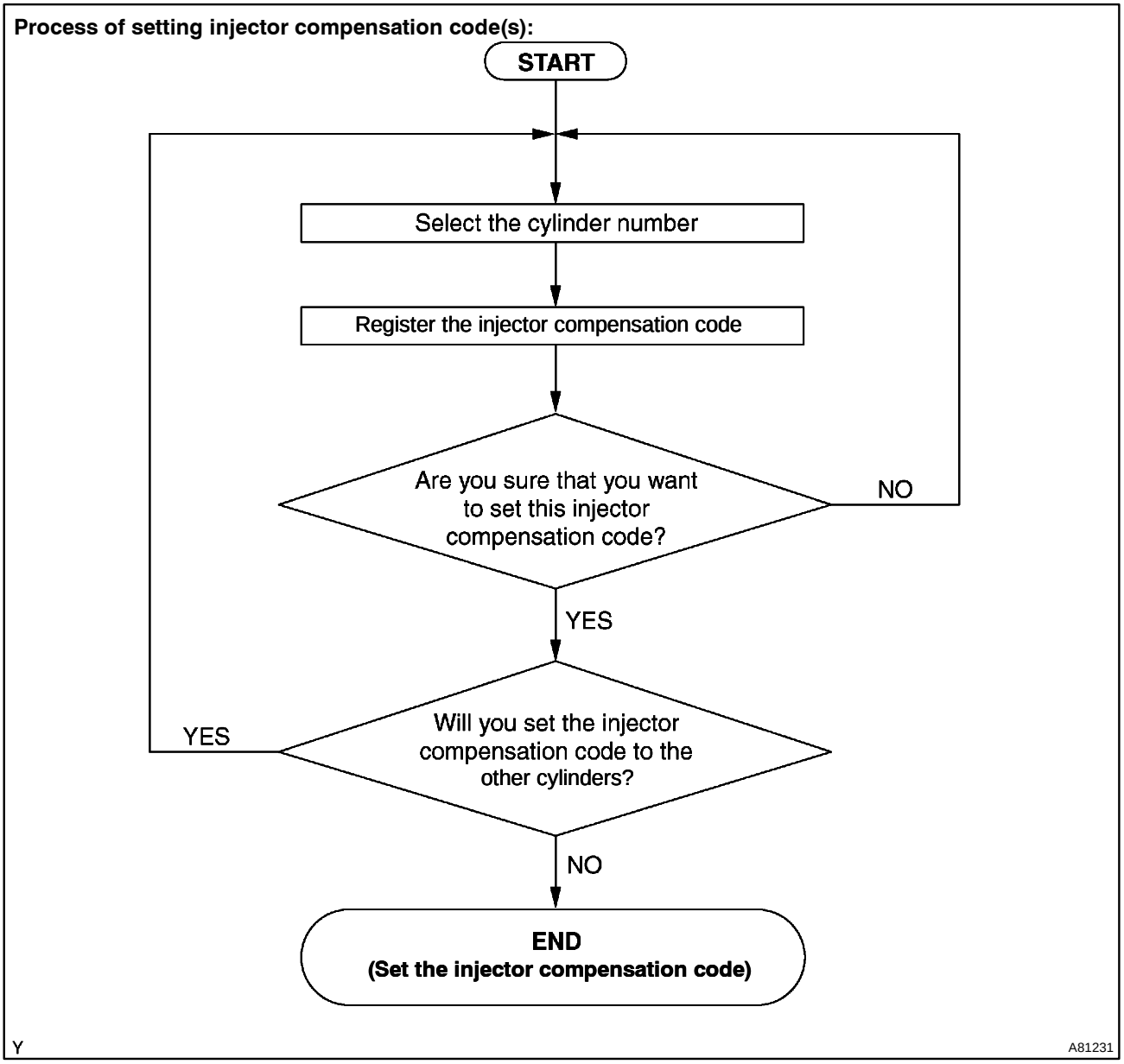
(c) Turn the ignition switch OFF and wait for 30 seconds or more.

(d) Turn the ignition switch ON, then clear DTC P1601 using the hand-held tester. (See page 05-16)

HINT:

- In order to optimize the injector's fuel injection characteristic, the ECM compensates the injection duration by each cylinder. The ECM stores and uses compensating data in the form of a 30-digit-alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- If you installed a new injector, its own injector compensation code is needed to register with the ECM. Also, if you replaced the ECM, the compensation codes of all the injectors are needed to register because the new ECM dose not have the codes until they are registered.
- Once the ECM is replaced, DTC P1601 will be present when turning the ignition switch ON. This is to inform you that the injector compensation codes are required to register with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch OFF and wait for 30 seconds or more.

Process of setting injector compensation code(s):



1. SET INJECTOR COMPENSATION CODE

(a) Connect the hand-held tester to the DLC 3.

(b) Turn the ignition switch ON.

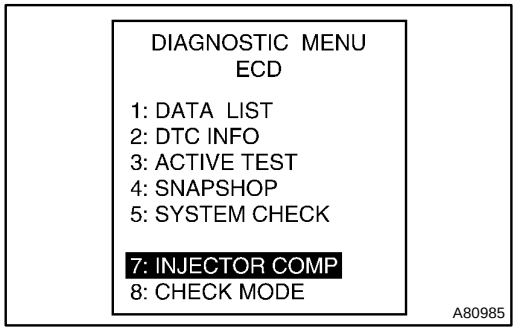
(c) Turn the main switch of the hand-held tester ON.

NOTICE:

Do not start the engine in this operation.

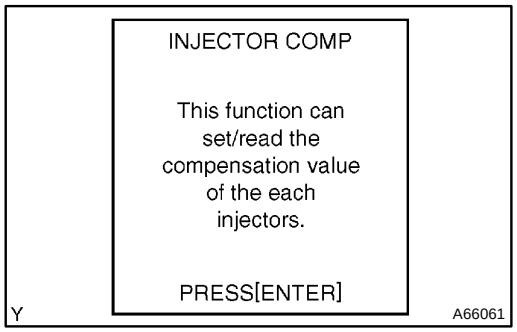
HINT:

Injector compensation code is imprinted on the head portion of the injector.

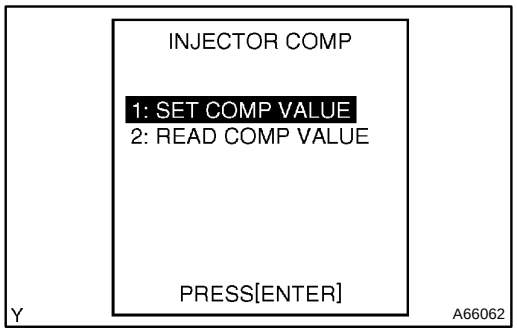


(d) Enter "DIAGNOSIS / OBD/MOBD / DIAGNOSTIC MENU ECD" and select the item "INJECTOR COMP."

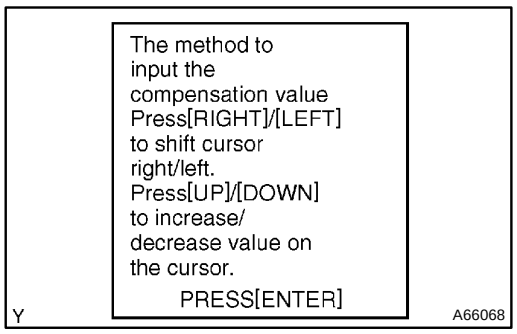
(e) Press the "ENTER" button on the hand-held tester.



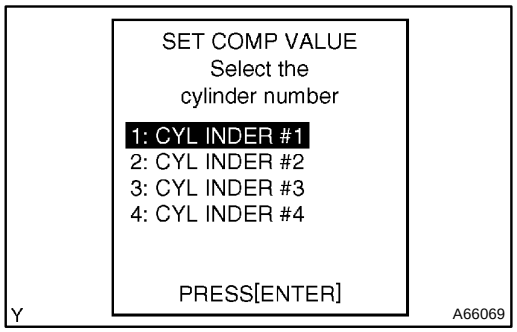
(f) Press the "Enter" button again.



(g) Select "SET COMP VALUE" and press the "ENTER" button.

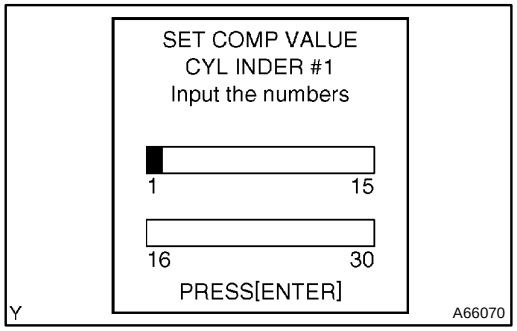


(h) Press the "ENTER" button.



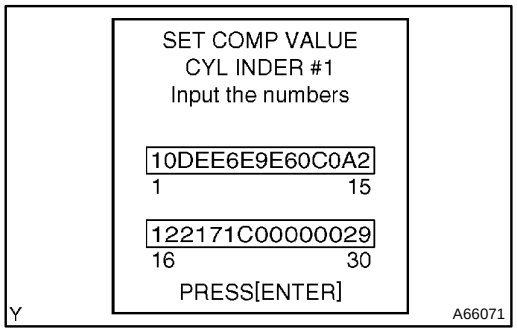
(i) Select a cylinder number which you want to register the compensation code.

(j) Press the "ENTER" button.

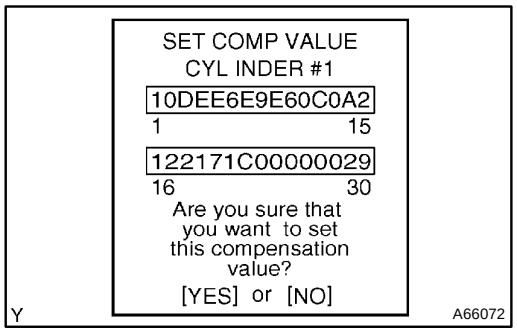


(k) Input the compensation code (30-digit-alphanumeric value).

(l) After inputting, press the "ENTER" button.



(m) Press the "ENTER" button again.



(n) Confirm the injection compensation code displayed on the hand-held tester.

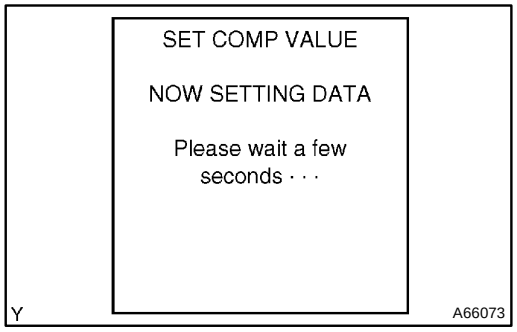
NOTICE:

Be careful not to register a wrong compensation code to the ECM. If a wrong code is set to the ECM, rough idling or engine rattling may result. In addition, it may become a cause of engine failure or shorten the life of the engine.

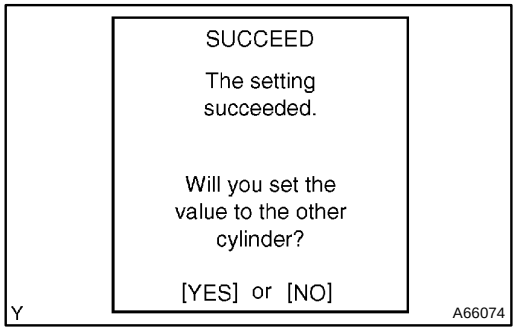
HINT:

- The code shown in the illustration is an example.
- If a wrong compensation code was entered on the hand-held tester, select the "NO" button to correct the error (Back to step (g)).

(o) Press the "YES" button to set the code to the ECM.



(p) Wait until the next screen comes up.



(q) Press the "NO" button to complete the registration.

HINT:

- If you want to register other compensation code for the other cylinders, press the "YES" button instead of "NO."
- By pressing the "NO" button, the hand-held tester returns to the "DIAGNOSTIC MENU ECD" screen.

(r) Turn the ignition switch OFF and wait for 30 seconds or more.

054JD-08

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

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

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0045 (05-45)	Turbo/Super Charger Boost Control Solenoid Circuit / Open	S VRV S Open or short in VRV circuit S ECM	f	f
P0087 (05-47)	Fuel Rail/System Pressure - Too Low	S Open or short in fuel pressure sensor circuit S Fuel pressure sensor S ECM	f	f
P0088 (05-54)	Fuel Rail/System Pressure - Too High	S Supply pump (Suction control valve) S Pressure discharge valve S Short in supply pump (suction control valve) circuit S Open in pressure discharge valve circuit S ECM	f	f
P0093 (05-61)	Fuel System Leak Detected - Large Leak	S Fuel line between supply pump and common rail S Fuel line between common rail and injector S Supply pump S Common rail S Injector (P1238 is set simultaneously) S Pressure discharge valve S Open or short in EDU circuit (P0200 is set simultaneously) S Open or short in injector circuit (P0200 and P1238 are set simultaneously) S EDU (P0200 is set simultaneously) S ECM	f	f
P0095 (05-64)	Intake Air Temperature Sensor 2 Circuit	S Open or short in diesel turbo inlet air temperature sensor circuit S Diesel turbo inlet air temperature sensor S ECM	f	f
P0097 (05-64)	Intake Air Temperature Sensor 2 Circuit Low		f	f
P0098 (05-64)	Intake Air Temperature Sensor 2 Circuit High		f	f
P0100 (05-69)	Mass or Volume Air Flow Circuit	S Open or short in mass air flow sensor circuit S Mass air flow sensor S ECM	f	f
P0101 (05-74)	Mass or Volume Air Flow Circuit Range/Performance Problem	S Mass air flow sensor	f	f
P0102 (05-69)	Mass or Volume Air Flow Meter Circuit Low Input	S Open or short in mass air flow sensor circuit S Mass air flow sensor S ECM	f	f
P0103 (05-69)	Mass or Volume Air Flow Meter Circuit High Input		f	f
P0105 (05-75)	Manifold Absolute Pressure/ Barometric Pressure Circuit	S Open or short in manifold absolute pressure sensor circuit S Manifold absolute pressure sensor S Turbocharger assembly S EGR valve assembly S ECM	f	f
P0106 (05-79)	Manifold Absolute Pressure/ Barometric Pressure Circuit Range/Performance Problem	S Manifold absolute pressure sensor	f	f

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0107 (05-75)	Manifold Absolute Pressure/ Barometric Pressure Circuit Low Input	$ Open or short in manifold absolute pressure sensor circuit $ Manifold absolute pressure sensor $ Turbocharger assy $ EGR valve assy $ ECM	f	f
P0108 (05-75)	Manifold Absolute Pressure/ Barometric Pressure Circuit High Input		f	f
P0110 (05-80)	Intake Air Temperature Circuit	$ Open or short in intake air temperature sensor circuit $ Intake air temperature sensor (built in mass air flow sensor) $ ECM	f	f
P0112 (05-80)	Intake Air Temperature Circuit Low Input		f	f
P0113 (05-80)	Intake Air Temperature Circuit High Input		f	f
P0115 (05-85)	Engine Coolant Temperature Circuit	$ Open or short in engine coolant temperature sensor circuit $ Engine coolant temperature sensor $ ECM	f	f
P0116 (05-89)	Engine Coolant Temperature Circuit Range/Performance Problem	$ Engine coolant temperature sensor	f	f
P0117 (05-85)	Engine Coolant temperature Circuit Low Input	$ Open or short in engine coolant temperature sensor circuit $ Engine coolant temperature sensor $ ECM	f	f
P0118 (05-85)	Engine Coolant temperature Circuit High Input		f	f
P0168 (05-90)	Fuel Temperature Too High	$ Fuel temperature sensor	f	f
P0180 (05-91)	Fuel Temperature Sensor "A" Circuit	$ Open or short in fuel temperature sensor circuit $ Fuel temperature sensor $ ECM	f	f
P0182 (05-91)	Fuel Temperature Sensor "A" Circuit Low Input		f	f
P0183 (05-91)	Fuel Temperature Sensor "A" Circuit High Input		f	f
P0190 (05-47)	Fuel Rail Pressure Sensor Circuit	$ Open or short in fuel pressure sensor circuit $ Fuel pressure sensor $ ECM	f	f
P0191 (05-96)	Fuel Rail Pressure Sensor Circuit Range/Performance	$ Fuel pressure sensor	f	f
P0192 (05-47)	Fuel Rail Pressure Sensor Circuit Low Input	$ Open or short in fuel pressure sensor circuit $ Fuel pressure sensor $ ECM	f	f
P0193 (05-47)	Fuel Rail Pressure Sensor Circuit High Input		f	f
P0200 (05-97)	Injector Circuit / Open	$ Open or short in EDU circuit $ Injector $ EDU $ ECM	f	f
P0234 (05-105)	Turbo/Super Charger Overboost Condition	$ VRV $ Open or short in VRV circuit $ Turbocharger $ EGR valve $ Vacuum hose $ ECM	f	f
P0299 (05-105)	Turbo/Super Charger Underboost		f	f
P0335 (05-109)	Crankshaft Position Sensor "A" Circuit	$ Open or short in crankshaft position sensor circuit $ Crankshaft position sensor $ Signal plate (crankshaft timing pulley) $ ECM	f	f
P0339 (05-109)	Crankshaft Position Sensor "A" Circuit Intermittent		—	f

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0340 (05-113)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	S Open or short in camshaft position sensor circuit S Camshaft position sensor S Camshaft timing pulley S ECM	f	f
P0380 (05-116)	Glow Plug/Heater Circuit "A"	S Open or short in glow plug circuit S Glow fuse S Glow plug relay S Glow plug S ECM	f	f
P0400 (05-123)	Exhaust Gas Recirculation Flow	S EGR valve assy S EGR passage S Open or short in EGR circuit S ECM	f	f
P0403 (05-123)	Exhaust Gas Recirculation Control Circuit		f	f
P0488 (05-127)	Exhaust Gas Recirculation Throttle Position Control Range/ Performance	S Open or short in intake shutter circuit S Open or short in fully opened switch circuit S Intake shutter S ECM	f	f
P0500 (05-133)	Vehicle Speed Sensor "A"	S Open or short in speed sensor circuit S Speed sensor S Combination meter S ECM S Stability control ECU	f	f
P0504 (05-136)	Brake Switch "A"/"B" Correlation	S Short in stop lamp switch signal circuit S Stop lamp switch S ECM	—	f
P0560 (05-140)	System Voltage	S Open in back-up power source circuit S ECM	f	f
P0606 (05-143)	ECM/PCM Processor	S ECM	—	—
P0607 (05-143)	Control Module Performance		f	f
P0622 (05-144)	Generator Field "F" Terminal Circuit	S Open in generator circuit S Generator S Drive belt S ECM	f	f
P0627 (05-147)	Fuel Pump Control Circuit / Open	S Open or shot in suction control valve circuit S Suction control valve S ECM	f	f
P1229 (05-54)	Fuel Pump System	S Short in supply pump (suction control valve) circuit S Suction control valve S ECM	f	f
P1238 (05-150)	Injector Malfunction	S Injector S EDU (P0200 is set simultaneously) S Open or short in engine wire harness (P0200 is set simultaneously) S Connector connection (P0200 is set simultaneously) S Compression pressure S Valve clearance S Valve timing S ECM	f	f
P1251 (05-105)	Turbo/Super Charger Overboost Condition (Too High)	S VRV S Open or short in VRV circuit S Turbocharger S EGR valve S Vacuum hose S ECM	f	f

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P1271 (05-154)	Fuel Regulator Circuit Malfunction (EDU Drive)	$ Open or short in pressure discharge valve circuit $ Open or short in pressure discharge valve it self $ EDU $ ECM	f	f
P1272 (05-154)	Fuel Pressure Regulator Malfunction	$ Open or short in pressure discharge valve circuit (P1271 is set simultaneously) $ Pressure discharge valve $ Supply pump $ ECM	f	f
P1601 (05-164)	Injector Correction Circuit Malfunction (EEPROM)	$ Injector compensation code $ ECM	f	f
P1611 (05-143)	IC Circuit Malfunction	$ ECM	f	f
P2120 (05-165)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	$ Open or short in accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM	f	f
P2121 (05-171)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	$ Accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM	f	f
P2122 (05-165)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	$ Open or short in accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM	f	f
P2123 (05-165)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input		f	f
P2125 (05-165)	Throttle/Pedal Position Sensor/ Switch "E" Circuit		f	f
P2127 (05-165)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input		f	f
P2128 (05-165)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input		f	f
P2138 (05-165)	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation		f	f
P2226 (05-173)	Barometric Pressure Circuit	$ ECM	f	f
P2227 (05-174)	Barometric Pressure Circuit Range/Performance		f	f
P2228 (05-173)	Barometric Pressure Circuit Low Input		f	f
P2229 (05-173)	Barometric Pressure Circuit High Input		f	f
B2799 (*2)	Engine Immobilizer System Malfunction	$ Immobilizer system	—	f

*1: Check that the check engine warning light (CHK ENG) is illuminated.
*2: See page 05-1395 of Pub. No. RM925E COROLLA.

05DVX-01

FAIL-SAFE CHART

1. FAIL-SAFE CHART

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

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0087	Fuel Rail/System Pressure - Too Low	Limits the engine power	Ignition switch OFF
P0088	Fuel Rail/System Pressure - Too High	Limits the engine power	Ignition switch OFF
P0093	Fuel System Leak Detected - Large Leak	After fail-safe driving control is performed for 1 minute, engine stalls	Ignition switch OFF
P0095	Intake Air Temperature Sensor 2 Circuit	Intake air temperature is fixed at 145_C (293_F)	"Pass" condition detected
P0097	Intake Air Temperature Sensor 2 Circuit Low		
P0098	Intake Air Temperature Sensor 2 Circuit High		
P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	Turbo pressure is set at fixed value	"Pass" condition detected
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input		
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input		
P0115	Engine Coolant Temperature Circuit	When fuel temperature sensor operates normal and intake air temperature is less than 15_C (59_F), value of fuel temperature sensor is substituted	"Pass" condition detected
P0117	Engine Coolant Temperature Circuit Low Input	When fuel temperature sensor operates normal and intake air temperature is more than 20_C (68_F), value is fixed at 120_C (248_F)	
P0118	Engine Coolant Temperature Circuit High Input	When the fuel temperature sensor is abnormal, value is fixed at 40_C (104_F)	
P0168	Fuel Temperature Too High	Output limit	"Pass" condition detected
P0180	Fuel Temperature Sensor "A" Circuit	Fuel temperature is fixed at 40_C (104_F)	"Pass" condition detected
P0182	Fuel Temperature Sensor "A" Circuit Low Input		
P0183	Fuel Temperature Sensor "A" Circuit High Input		
P0190	Fuel Rail Pressure Sensor Circuit	Limits the engine power	Ignition switch OFF
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance		
P0192	Fuel Rail Pressure Sensor Circuit Low Input		
P0193	Fuel Rail Pressure Sensor Circuit High Input		
P0200	Injector Circuit / Open	Limits the engine power	Ignition switch OFF
P0335	Crankshaft Position Sensor "A" Circuit	Output limit	"Pass" condition detected
P0488	Exhaust Gas Recirculation Throttle Position Control Range/Performance	Limits the engine power	Ignition switch OFF
P0500	Vehicle Speed Sensor "A"	Vehicle speed is fixed at 0 km/h (0 mph)	Vehicle speed less than 10 km/h (6 mph)
P1229	Fuel Pump System	Limits the engine power	Ignition switch OFF
P1271	Fuel Regulator Circuit Malfunction (EDU Drive)	Limits the engine power	Ignition switch OFF
P1272	Fuel Pressure Regulator Malfunction	Limits the engine power	Ignition switch OFF

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit	Limits the engine power	Ignition switch OFF
P2121	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance		
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input		
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input		
P2125	Throttle/Pedal Position Sensor/Switch "E" Circuit		
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input		
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input		
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation		

05DVY–01

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

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

(a) Clear the DTCs (See page 05–16).
(b) Set the check mode (See page 05–17).
(c) Perform a simulation test (See page 01–20).
(d) Check the connector and terminal (See page 01–30).
(e) Wiggle the harness and connector (See page 01–30).

054JF-08

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform the troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not crank (Difficult to start)	3. Starter	*
	4. Starter relay	*
	5. Engine coolant temperature sensor	*
Difficult to start with cold engine	1. STA signal circuit	05-180
	2. Injector	11-1
	3. Fuel filter	11-28
	4. Compression	14-1
	5. EC	10-8
	6. Supply pump	11-15
	7. Fuel pressure sensor	05-54
	8. Intake shutter	10-4
	9. Glow system	19-1
Difficult to start with warm engine	1. STA signal circuit	05-180
	2. Injector	11-1
	3. Fuel filter	11-28
	4. Compression	14-1
	5. EC	10-8
	6. Supply pump	11-15
	7. Fuel pressure sensor	05-54
	8. Intake shutter	10-4
Engine stalls soon after starting	1. Fuel filter	11-28
	2. Injector	11-1
	3. EC power source circuit	05-175
	4. EC	10-8
	5. Supply pump	11-15
	6. Fuel pressure sensor	05-54
	7. Intake shutter	10-4
Engine stalls (Other than the condition listed above)	1. EC power source circuit	05-175
	2. Injector	11-1
	3. EC	10-8
	4. Supply pump	11-15
	5. Fuel pressure sensor	05-54
	6. Intake shutter	10-4
Incorrect first idle (Poor idling)	1. Fuel filter	11-28
	2. Injector	11-1
	3. EC	10-8
	4. Supply pump	11-15
	5. Fuel pressure sensor	05-54
High engine idle speed (Poor idling)	1. A/C signal circuit	*
	2. Injector	11-1
	3. STA signal circuit	05-180
	4. EC	10-8
	5. Supply pump	11-15
	6. Fuel pressure sensor	05-54

Symptom	Suspect Area	See page
Lower engine idle speed (Poor idling)	1. A/C signal circuit	*
	2. Injector	11-1
	3. EGR system	05-123
	4. Compression	14-1
	5. Valve clearance	14-5
	6. Fuel line (Air bleed)	-
	7. EC	10-8
	8. Supply pump	11-15
	9. Fuel pressure sensor	05-54
	10. Intake shutter	10-4
Rough idling (Poor idling)	1. Injector	11-1
	2. Fuel line (Air bleed)	-
	3. EGR system	05-123
	4. Compression	14-1
	5. Valve clearance	14-5
	6. EC	10-8
	7. Supply pump	11-15
	8. Fuel pressure sensor	05-54
	9. Intake shutter	10-4
Hunting at hot engine (Poor idling)	1. Injector	11-1
	2. EC power source circuit	05-175
	3. Compression	14-1
	4. Fuel line (Air bleed)	-
	5. Valve clearance	14-5
	6. EC	10-8
	7. Supply pump	11-15
	8. Fuel pressure sensor	05-54
	9. Intake shutter	10-4
Hunting at cold engine (Poor idling)	1. Injector	11-1
	2. EC power source circuit	05-175
	3. Compression	14-1
	4. Fuel line (Air bleed)	-
	5. Valve clearance	14-5
	6. EC	10-8
	7. Supply pump	11-15
	8. Fuel pressure sensor	05-54
	9. Intake shutter	10-4
Hesitation/ Poor acceleration (Poor drivability)	1. Injector	11-1
	2. Fuel filter	11-28
	3. EGR system	05-123
	4. Compression	14-1
	5. EC	10-8
	6. Supply pump	11-15
	7. Fuel pressure sensor	05-54
	8. Intake shutter	10-4
Knocking (Poor drivability)	1. Injector	11-1
	2. EGR system	05-123
	3. EC	10-8
	4. Supply pump	11-15
	5. Fuel pressure sensor	05-54
Black smoke (Poor drivability)	1. Injector	11-1
	2. EGR system	05-123
	3. EC	10-8
	4. Supply pump	11-15
	5. Fuel pressure sensor	05-54
	6. Intake shutter	10-4





Symptom	Suspect Area	See page
White smoke (Poor drivability)	1. EGR system	05-123
	2. Injector	11-1
	3. Fuel filter	11-28
	4. EC	10-8
	5. Supply pump	11-15
	6. Fuel pressure sensor	05-54
	7. Intake shutter	10-4
Surging/ Hunting (Poor drivability)	1. Injector	11-1
	2. EC	10-8
	3. Supply pump	11-15
	4. Fuel pressure sensor	05-54

*: See page 05-438 of Pub. No. RM925E COROLLA.

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

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0045	Open or short in VRV circuit for 0.5 second or more (1 trip detection logic)	$VRV $Open or short in VRV circuit $ECM

WIRING DIAGRAM

Refer to DTC P0234 on page 05-105.

INSPECTION PROCEDURE

HINT:

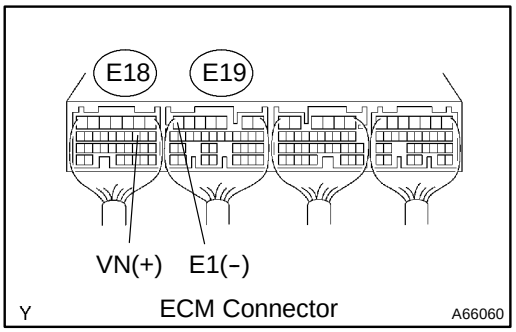
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT VACUUM REGULATING VALVE ASSY (See page 12-2)

NG → REPLACE VACUUM REGULATING VALVE ASSY

OK

2	INSPECT ECM(VN VOLTAGE)

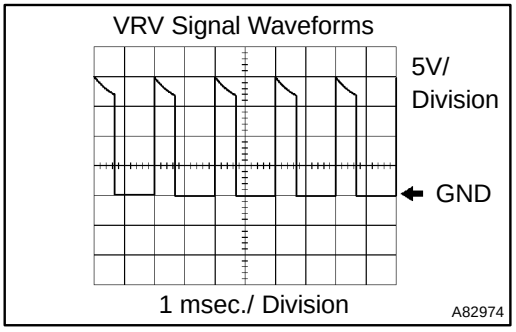


(a) Inspect using the oscilloscope.

(b) During idling, check the waveform between terminals E18 and E19 of the ECM connectors.

Standard:

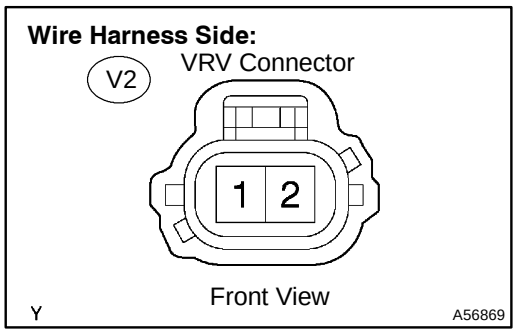
Tester Connection	Specified Condition
VN (E18-10) - E1 (E19-7)	Correct waveform is as shown

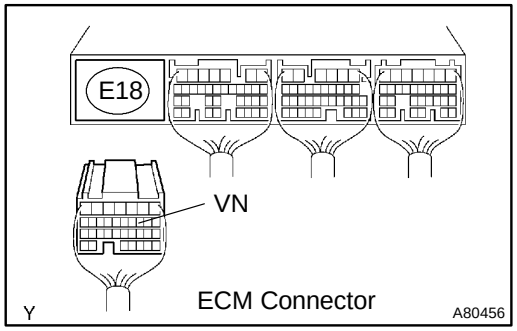


NG → REPLACE ECM (See page 10-8)

OK

3 CHECK HARNESS AND CONNECTOR(VRV - ECM)





(a) Disconnect the V2 VRV connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
VN (E18-10) - (V2-2)	Below 1 Ω

Standard (Check for short):

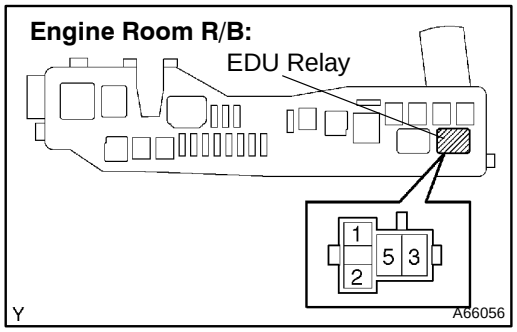
Tester Connection	Specified Condition
VN (E18-10) or (V2-2) - Body ground	10 kΩ or higher

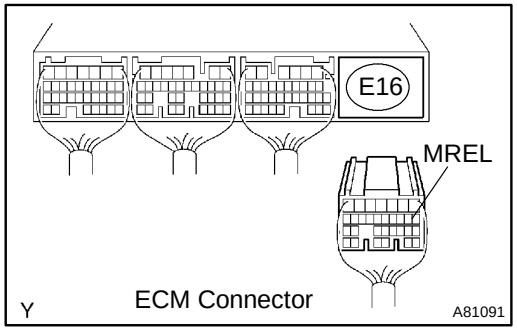
(d) Reconnect the VRV connector.
(e) Reconnect the ECM connector.

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

OK

4 CHECK HARNESS AND CONNECTOR(VRV - EDU RELAY)





(a) Remove the EDU relay from the engine room R/B.
(b) Disconnect the E16 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EDU relay (1) - MREL (E16-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EDU relay (1) or MREL (E16-8) - Body ground	10 kΩ or higher

(d) Reinstall the EDU relay.
(e) Reconnect the ECM connector.

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

OK

REPLACE ECM (See page 10-8)

DTC	P0087	FUEL RAIL/SYSTEM PRESSURE - TOO LOW

DTC	P0190	FUEL RAIL PRESSURE SENSOR CIRCUIT

DTC	P0192	FUEL RAIL PRESSURE SENSOR CIRCUIT LOW INPUT

DTC	P0193	FUEL RAIL PRESSURE SENSOR CIRCUIT HIGH INPUT

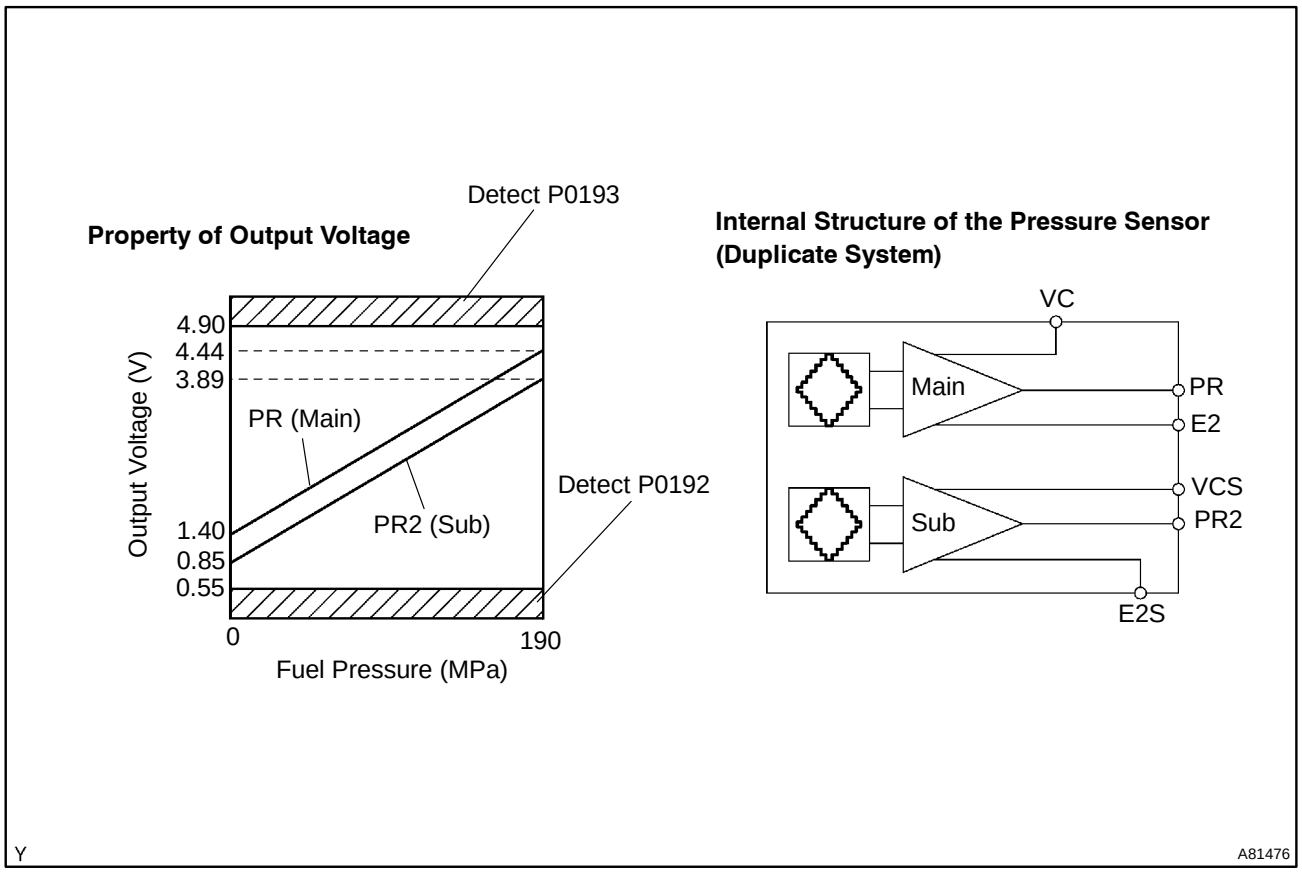
HINT:

- For more information on the fuel pressure sensor and the common rail system, see page 05-2.
- If P0087, P0190, P0192 and/or P0193 are present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

The ECM monitors internal fuel pressure of the common rail using the fuel pressure sensor and controls the suction control valve to regulate the internal fuel pressure to the target pressure, approximately 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi).

The pressure sensor is a semiconductor pressure sensor that varies electric resistance when applying pressure to its silicon. This sensor outputs voltage in proportion to the internal fuel pressure. The sensor has been designed as a duplicate circuit, and its main (PR) circuit is used under normal condition. Even if either sensor is failed, another normal sensor will be used to monitor the internal fuel pressure.



DTC No.	DTC Detection Condition	Trouble Area
P0087	Fuel pressure sensor output stays at fixed value. (1 trip detection logic)	$ Open or short in fuel pressure sensor circuit $ Fuel pressure sensor $ ECM
P0190	Fuel pressure sensor output voltage is 0.55 V or less, or 4.9 V or more for 0.5 second (1 trip detection logic)	
P0192	Fuel pressure sensor output voltage is 0.55 V or less for 0.5 second (1 trip detection logic)	
P0193	Fuel pressure sensor output voltage is 4.9 V or more for 0.5 second (1 trip detection logic)	

HINT:

After confirming DTC P0087, P0190, P0192 and P0193, check the internal fuel pressure of the common rail in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
Running the engine at 2,500 rpm (No engine load)	Approximately 50 to 100

MONITOR DESCRIPTION

P0087 (Fuel pressure sensor output stays at fixed value):

Under normal condition, an internal fuel pressure of the common rail usually fluctuates 1 to 2 MPa (10 to 20 kgf/cm^2, 145 to 290 psi) even if the driving condition is constant. The internal fuel pressure is approximately 30 to 40 MPa (306 to 408 kgf/cm^2, 4,351 to 5,801 psi) at idling, and it increases to approximately 50 to 100 MPa (510 to 1,020 kgf/cm^2, 7,251 to 14,503 psi) when running the engine at 2,500 rpm. This DTC is set if there is no fluctuation in the internal fuel pressure.

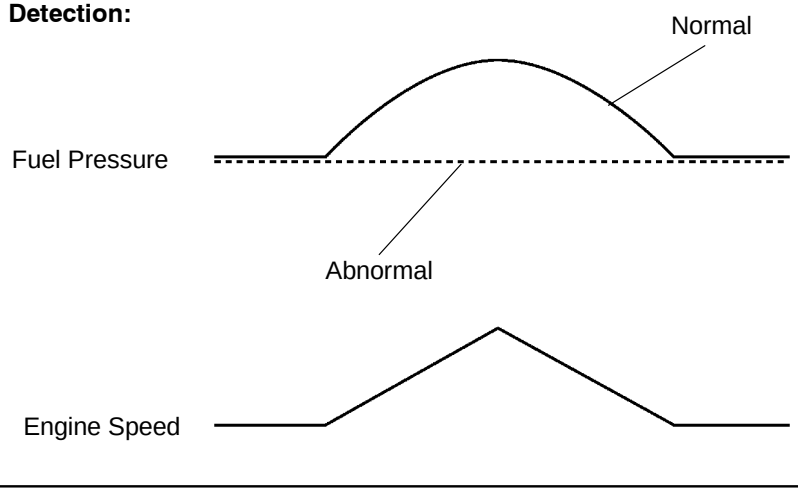
If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

P0190, P0192 and P0193 (Open or short in fuel pressure sensor circuit):

These DTCs are set if the fuel pressure sensor output voltage is out of the standard range. The DTCs stand for open or short malfunction of the sensor circuit.

If these DTCs are present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

P0087 Malfunction Detection:



MONITOR STRATEGY

P0087:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 second
CHK ENG operation	1 driving cycle

P0190:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 second
CHK ENG operation	1 driving cycle

P0192:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 second
CHK ENG operation	1 driving cycle

P0193:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 second
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0087:

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	-
Battery voltage	8 V	-
Fuel quantify	5 mm^3	-
The monitor will not run if the fuel pressure sensor circuit (P0190, P0192 and P0193) is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

P0087:

Detection Criteria	Threshold
Changing value of fuel pressure	Virtually no fluctuation

P0190:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V or more than 4.9 V

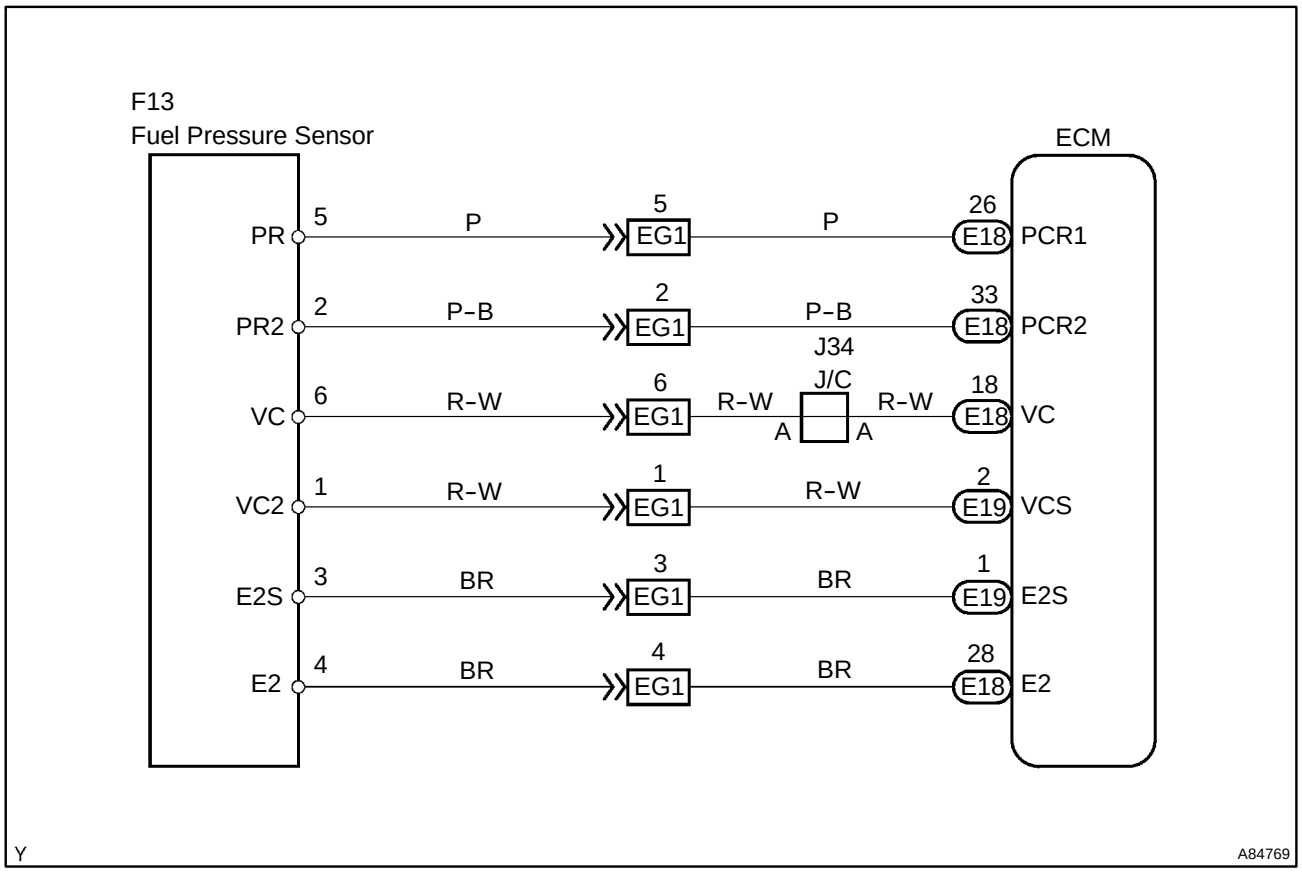
P0192:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V

P0193:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	More than 4.9 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- After completing repair, check that P0087 is not present again.
- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(FUEL PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".
(e) Check that internal fuel pressure of the common rail is within the specification below.
Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

NG → **Go to step 3**

OK

2	CHECK IF DTCS OUTPUT RECUR(FUEL PRESSURE SENSOR DTCS ARE OUTPUT AGAIN)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(d) Clear the DTCs.
(e) Let the engine idle for 60 seconds, and repeat a quick RPM acceleration (to 2,500 rpm) for 30 seconds.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

Result:

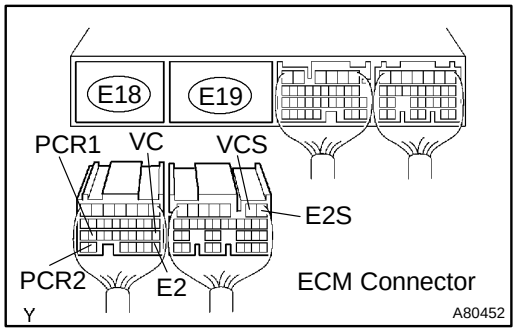
Display (DTC output)	Proceed to
P0087, P0190, P0192 and/or P0193	A
No output	B

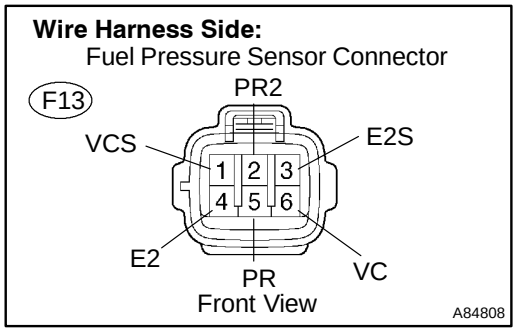
B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)**

A

REPLACE ECM (See page 10-8)

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





(a) Disconnect the E18 and E19 ECM connectors.
(b) Disconnect the F13 fuel pressure sensor connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCR1 (E18-26) - PR (F13-5)	Below 1 Ω
PCR2 (E18-33) - PR2 (F13-2)	
VCS (E19-2) - VCS (F13-1)	
VC (E18-18) - VC (F13-6)	
E2 (E18-28) - E2 (F13-4)	
E2S (E19-1) - E2S (F13-3)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR1 (E18-26) or PR (F13-5) - Body ground	10 kΩ or higher
PCR2 (E18-33) or PR2 (F13-2) - Body ground	
VCS (E19-2) or VCS (F13-1) - Body ground	
VC (E18-18) or VC (F13-6) - Body ground	
E2 (E18-28) or E2 (F13-4) - Body ground	
E2S (E19-1) or E2S (F13-3) - Body ground	

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

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11-24)

DTC	P0088	FUEL RAIL/SYSTEM PRESSURE - TOO HIGH

DTC	P1229	FUEL PUMP SYSTEM

HINT:

- For more information on the supply pump (suction control valve) and the common rail system, see page 05-2.
- If P0088 and/or P1229 are present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

Refer to description on page 05-2.

DTC No.	DTC Detection Condition	Trouble Area
P0088	Internal fuel pressure of the common rail is too high The fuel pressure exceeds 200 MPa (2,039 kgf/cm^2, 29,007 psi) (1 trip detection logic)	• Supply pump (Suction control valve) • Pressure discharge valve • Short in supply pump (Suction control valve) circuit • Open in pressure discharge valve circuit • ECM
P1229	Fuel over-feed. Internal fuel pressure is beyond the target fuel pressure despite the ECM closing the suction control valve (1 trip detection logic)	• Short in supply pump (Suction control valve) circuit • Supply pump (Suction control valve) • ECM

HINT:

After confirming DTC P0088 and P1229, check the fuel rail pressure in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

MONITOR DESCRIPTION

P0088 (Internal fuel pressure too high):

The ECM will set this DTC if the fuel pressure inside the common rail is beyond 200 MPa (2,039 kgf/cm^2, 29,007 psi). This DTC indicates that the suction control valve may be stuck open, or there may be short in its circuit, and the pressure discharge valve may be stuck closed, or there may be open in its circuit.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

P1229 (Fuel over-feed):

The ECM will set this DTC if the actual fuel pressure inside the common rail stays higher than the target fuel pressure, despite the ECM closing the suction control valve. This DTC represents that the suction control valve may be stuck open, or there may be short in its circuit. Under this condition, the pressure discharge valve operates frequently.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

P0088:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 second
CHK ENG operation	1 driving cycle

P1229:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 minute
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0088:

Specification
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning

P1229:

Item	Specification
Target fuel pressure variation	Small
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning	

TYPICAL MALFUNCTION THRESHOLDS

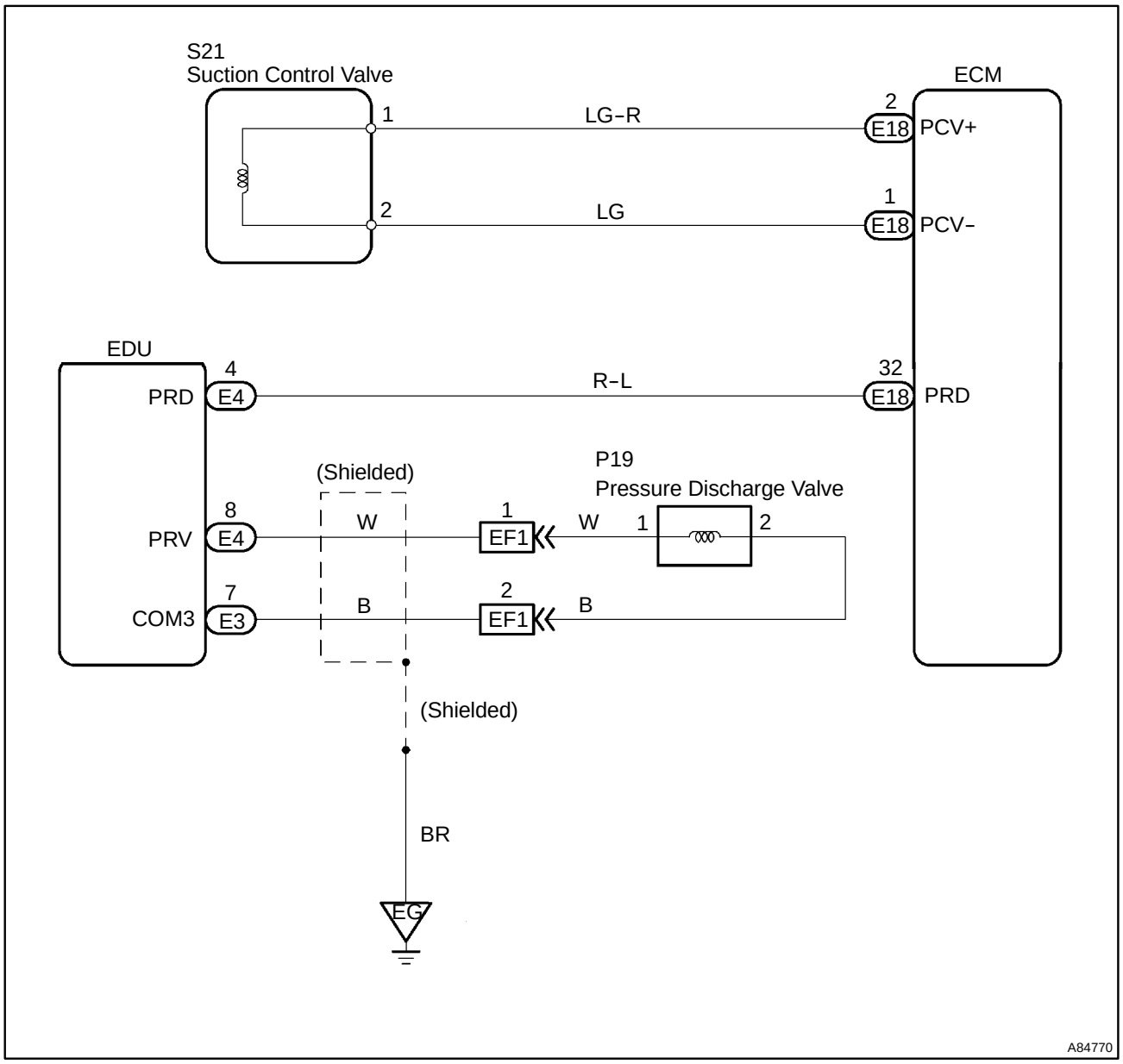
P0088:

Detection Criteria	Threshold
Fuel pressure sensor	200 MPa (2,039 kgf/cm^2, 29,007 psi) or more

P1229:

Item	Threshold
The internal fuel pressure of the common rail with the suction control valve closed	Stays at higher than targeted fuel pressure
Behavior of the pressure discharge valve	Frequently operates

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0088 AND/OR P1229)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0088, or P0088 and P1229	A
P1229	B
P0190, P0191, P0192, P0193 and/or P1271	C
P1272	D

B → **Go to step 4**

C → **GO TO RELEVANT DTC CHART (See page 05-35)**

D → **Go to step 3**

A

2	READ OUTPUT DTC(DTC P1272 OUTPUT)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(d) Clear the DTCs.
(e) Start the engine and turn the ignition switch OFF. Wait for 10 seconds and then restart the engine and turn the ignition switch OFF again.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P1272	A
No output	B

B → **Go to step 4**

A

3	READ VALUE OF HAND-HELD TESTER(FUEL PRESSURE)

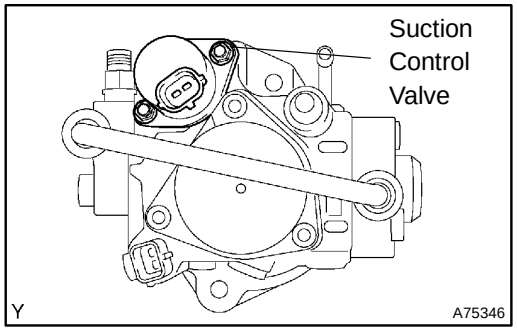
(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand-held tester.
(e) Check that the internal fuel pressure of the common rail drops below approximately 5 MPa within approximately 1 second as the ignition switch is turned OFF at the engine in an idle.
Result:

Pressure Displayed (MPa)	Proceed to
Approximately 5 or less	A
Approximately 5 or more	B

B → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14-24)**
PROCEED TO STEP 4 AFTER REPLACEMENT

A

4	INSPECT INJECTION OR SUPPLY PUMP ASSY(SUCTION CONTROL VALVE)



(a) Measure the resistance in the suction control valve.
(1) Measure the resistance between the terminals.
Standard: 1.9 to 2.3 Ω at 20_C (68_F)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-15)**

OK

5 READ OUTPUT DTC(DTC P1229 OUTPUT)

(a) Disconnect the suction control valve connector and then start the engine. Wait for 1 minute.

HINT:

If the engine does not start, the suction control valve is normal. Therefore proceed to step 6.

(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(e) Clear the DTCs.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

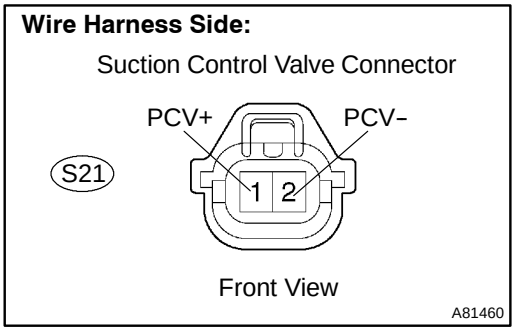
Result:

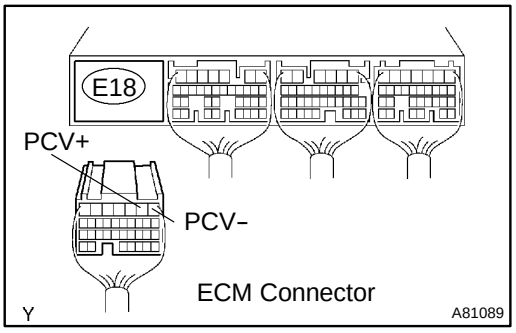
Display (DTC output)	Proceed to
No output	A
P1229	B

B → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-15)**

A

6 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE - ECM)





(a) Disconnect the S21 suction control valve connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCV+ (S21-1) - PCV+ (E18-2)	Below 1 Ω
PCV- (S21-2) - PCV- (E18-1)	

Standard (Check for short):

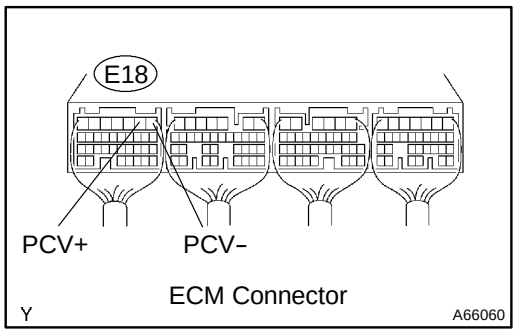
Tester Connection	Specified Condition
PCV+ (S21-1) or PCV+ (E18-2) - Body ground	10 kΩ higher
PCV- (S21-2) or PCV- (E18-1) - Body ground	

(d) Reconnect the suction control valve connector.
(e) Reconnect the ECM connector.

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

OK

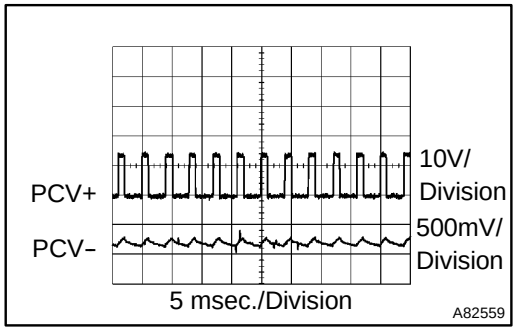
7	INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard :

Tester Connection	Specified Condition
PCV+ (E18-2) - PCV- (E18-1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10-8)**

OK

CHECK IF DTCS OUTPUT RECUR (DTC P0088 AND/OR P1229 OUTPUT AGAIN)

HINT:
After clearing the DTCs, drive the vehicle at 50 km/h (31 mph) for 5 minutes, and then confirm that P0088 and/or P1229 is not present again.

DTC	P0093	FUEL SYSTEM LEAK DETECTED - LARGE LEAK

HINT:

- If DTC P1229 is detected, P0093 (Fuel leaks in high-pressurized area) may be detected simultaneously. Because of the extremely high internal fuel pressure in the common rail opens the pressure limiter, and the ECM may interpret this as a fault and set P0093.
- For more information on the common rail system, see page 05-2.
- If P0093 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

Refer to the description on page 05-2.

DTC No.	DTC Detection Condition	Trouble Area
P0093	Fuel leaks in high-pressurized area (1 trip detection logic)	S Fuel line between supply pump and common rail S Fuel line between common rail and injector S Supply pump S Common rail S Injector (P1238 is set simultaneously) S Pressure discharge valve S Open or short in EDU circuit (P0200 is set simultaneously S Open or short in injector circuit (P0200 and P1238 are set simultaneously) S EDU (P0200 is set simultaneously S ECM

HINT:

After confirming DTC P0093, check the internal fuel pressure of the common rail in the "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

MONITOR DESCRIPTION

P0093 (Fuel leaks in high-pressurized area):

This DTC stands for fuel leaks are existing in high-pressurized area in the common rail system. The ECM constantly monitors the internal fuel pressure of the common rail after the engine is started, and the ECM then will set this DTC if the drop of the internal fuel pressure is large when injecting the fuel.

In the common rail system, high-pressurized fuel, approximately 30 to 180 MPa (306 to 1,835 kgf/cm^2, 4.351 to 26,106 psi), is always applied to the high-pressurized area including the supply pump, common rail, injector and piping. The ECM adjusts the ECM adjusts the suction control valve control current (by applying duty ratio signal) to obtain the target internal fuel pressure.

If this DTC is present, the ECM enters the fail-safe mode. The fail-safe mode suspends both fuel injection and supply pump operation, and then stops the engine. Before stopping the engine, the ECM permits driving the vehicle for 1 minute. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 second
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	-
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Drop of the internal fuel pressure is large when injecting fuel

INSPECTION PROCEDURE

HINT:

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

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0093)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0093	A
P0093 and P1238	B
P0093 and P0200 and/or P1271	C

HINT:

If any other codes besides P0093 are output, perform the troubleshooting for those DTCs first.

B → **Go to step 3**

C → **GO TO RELEVANT DTC CHART (See page 05-35)**

A

2 CHECK FUEL LEAKAGE(IN HIGH-PRESSURIZED FUEL PARTS AND AREA)

(a) Visually check the supply pump, injector and fuel line located between the supply pump and common rail for fuel leaks or fuel pressure leaks. Also, perform the same on the fuel line between the common rail and the injector (See page 11–5, 11–15).

HINT:

There is possibility that fuel leaks inside the components (supply pump, etc) have been occurred.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND-HELD TESTER(COMPENSATION OF INJECTION VOLUME FOR EACH CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB" and read its value displayed on the hand-held tester.

Result:

Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

NG → **REPLACE INJECTOR ASSY (See page 11-5)**

OK

4	PERFORM ACTIVE TEST USING HAND-HELD TESTER(FUEL LEAK TEST)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL LEAK TEST".
(e) Check for fuel leaks in the high-pressurized area.

GO

CHECK IF DTC OUTPUT RECURS (DTC P0093 OUTPUT AGAIN)

HINT:

- After clearing the DTC, let the engine idle for 1 minute and then run it at 2,500 rpm for 30 seconds.
- At the same time, check the fuel pressure inside the common rail in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.
- The internal fuel pressure of the common rail must be stable under each driving condition.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

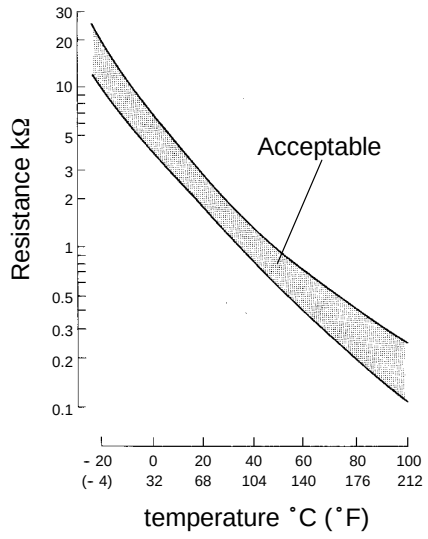
DTC	P0095	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT

DTC	P0097	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT LOW

DTC	P0098	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT HIGH

CIRCUIT DESCRIPTION

(Figure. 1)



The diesel turbo inlet air temperature sensor is built into the intake air connector and senses the inlet air temperature. A thermistor built in the sensor changes the resistance value according to the inlet air temperature. The lower the inlet air temperature, the greater the thermistor resistance value, and the higher the inlet air temperature, the lower the thermistor resistance value (See figure. 1).

The inlet air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the inlet air temperature sensor from terminal THIA via a resistor R. This is the resistor R and the inlet air temperature sensor are connected in series. When the resistance value of the inlet air temperature sensor changes in accordance with changes in the inlet air temperature, the potential at the terminal THIA also changes. Based on this signal, the ECM corrects the fuel injection volume to improve the driveability with a cold engine.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0095	Step 1	Open or short in diesel turbo inlet air temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in diesel turbo inlet air temperature sensor circuit S Diesel turbo inlet air temperature sensor S ECM
P0097	Step 4	Short in diesel turbo inlet air temperature sensor circuit for 0.5 second (1 trip detection logic)	
P0098	Step 2	Open in diesel turbo inlet air temperature sensor circuit for 0.5 second (1 trip detection logic)	

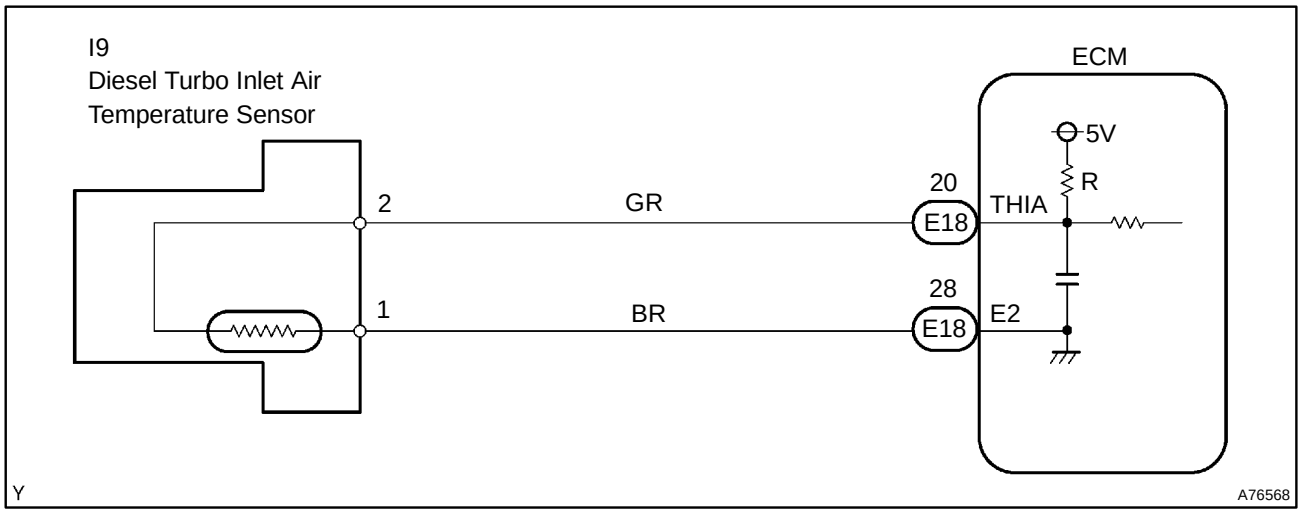
HINT:

After confirming DTC P0095, P0097 or P0098, check the intake air temperature in the ”DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / AMBI TEMP SENS” using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(INLET AIR TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: Same value as the actual diesel turbo inlet air temperature.
Result:

Temperature Displayed	Proceed to
-40˚C (-40˚F)	A
140˚C (284˚F) or more	B
OK (Same as air temperature near to intake)	C

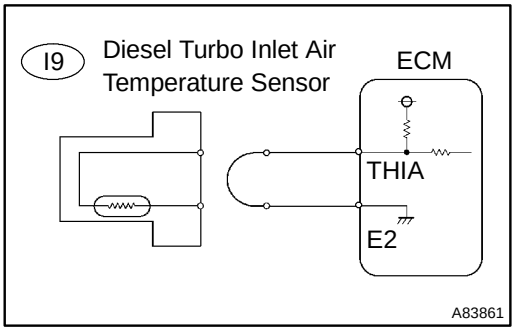
HINT:

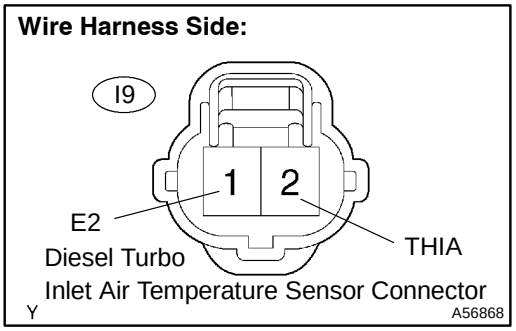
- If there is an open circuit, the hand-held tester indicates -40˚C (-40˚F).
- If there is a short circuit, the hand-held tester indicates 140˚C (284˚F) or more.

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

A

2	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



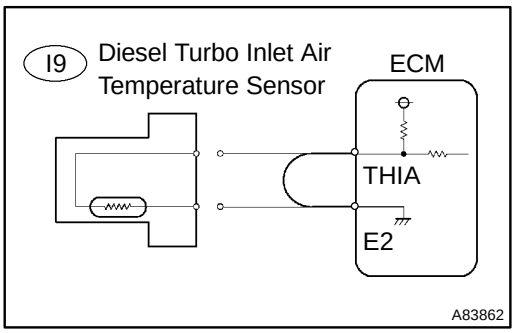


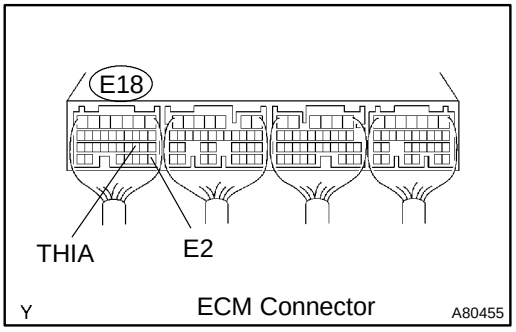
(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals 1 and 2 of the diesel turbo inlet air temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the diesel turbo inlet air temperature sensor connector.

OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE DIESEL TURBO INLET AIR TEMPERATURE SENSOR

NG

3	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THIA and E2 of the E18 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

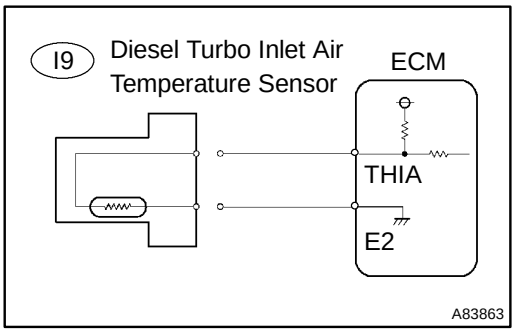
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the diesel turbo inlet air temperature sensor connector.

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

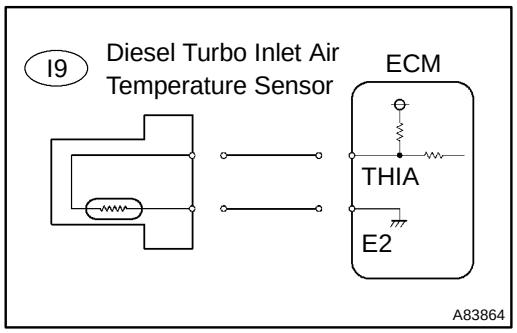


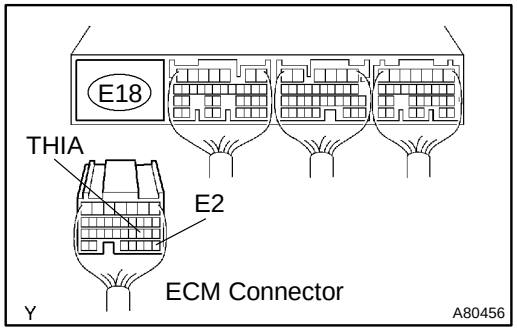
(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect the hand-held tester to the DLC 3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the diesel turbo inlet air temperature sensor connector.

OK	REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)





(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the diesel turbo inlet air temperature sensor connector.
(g) Reconnect the ECM connector.

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

NG

REPLACE ECM (See page 10-8)

DTC	P0100	MASS OR VOLUME AIR FLOW CIRCUIT

DTC	P0102	MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

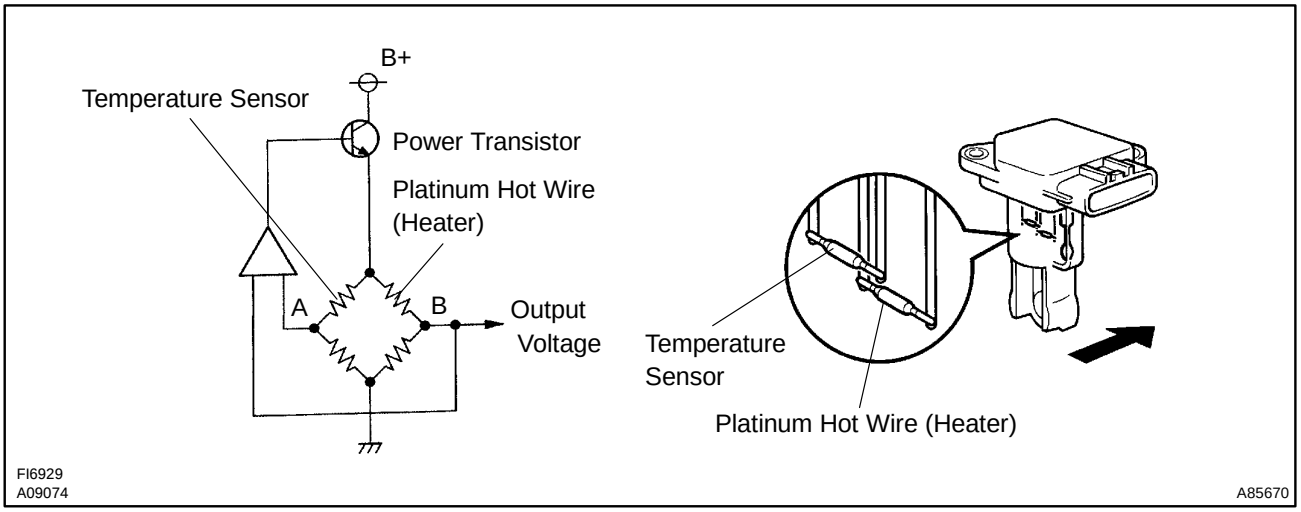
DTC	P0103	MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The mass air flow sensor uses a platinum hot wire. The mass air flow sensor consists of a platinum hot wire, a temperature sensor and a control circuit installed in a plastic housing. The mass air flow sensor works on the principle that the hot wire and temperature sensor located in the intake air by-pass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the predetermined temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow sensor.

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



DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow sensor circuit for more than 3 seconds with engine speed at 4,000 rpm or less (1 trip detection logic)	$ Open or short in mass air flow sensor circuit $ Mass air flow sensor $ ECM
P0102	Open in mass air flow sensor circuit for more than 3 seconds with engine speed at 4,000 rpm or less (1 trip detection logic)	
P0103	Short in mass air flow sensor circuit for more than 3 seconds with engine speed at 4,000 rpm or less (1 trip detection logic)	

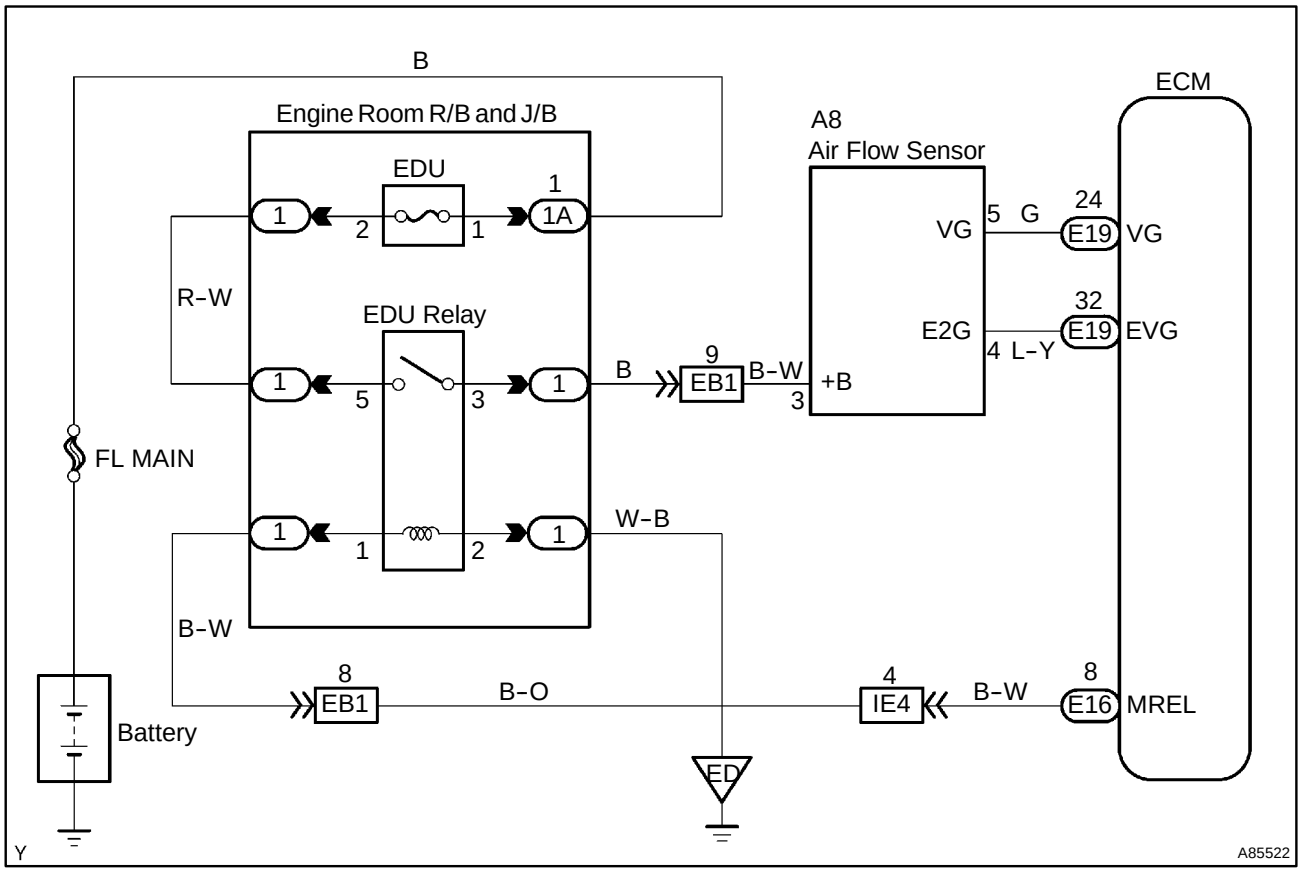
HINT:

After confirming DTC P0100, P0102 or P0103, check the mass air flow ratio in the "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / MAF" using the hand-held tester.

Reference:

Air Flow Value (gm/s)	Malfunction
Approximately 0.0	S Mass air flow sensor power source circuit open S VG circuit open or short
174.0 or more	S EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF" and read its value displayed on the hand-held tester.

Result:

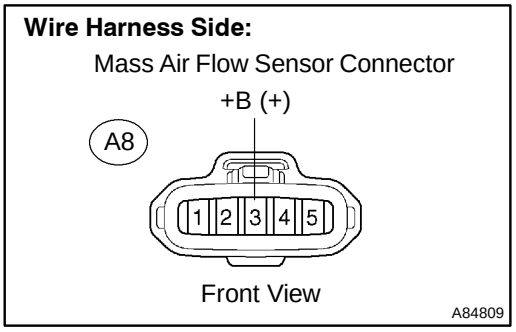
Air flow rate (gm/s)	Proceed to
0.0	A
174.0 or more	B
Between 1 and 173.0 (*1)	C

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

B	Go to step 6
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

A

2 INSPECT MASS AIR FLOW SENSOR(POWER SOURCE)



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

Standard:

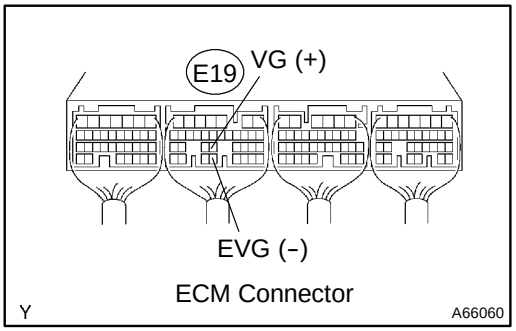
Tester Connection	Specified Condition
+B (A8-3) - Body ground	9 to 14 V

(d) Reconnect the mass air flow sensor connector.

NG	Go to step 5

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

HINT:
The A/C switch should be turned OFF.

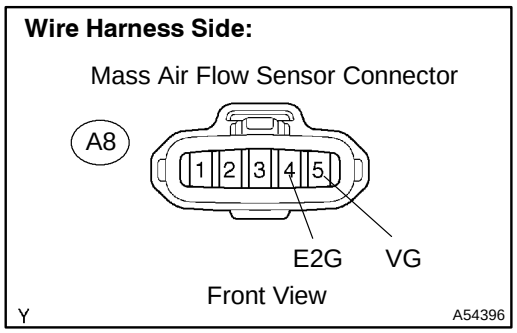
Standard:

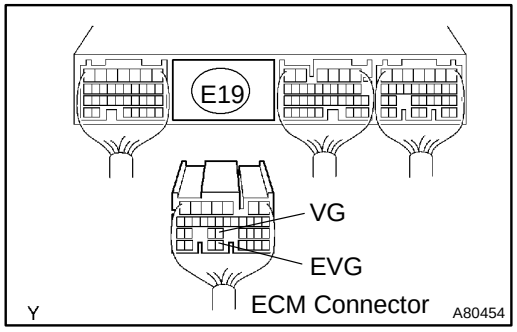
Tester Connection	Condition	Specified Condition
VG (E19-24) - EVG (E19-32)	Engine is idling	0.5 to 3.4 V

OK	REPLACE ECM (See page 10-8)

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - ECM)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (A8-5) - VG (E19-24)	Below 1 Ω
E2G (A8-4) - EVG (E19-32)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (A8-5) or VG (E19-24) - Body ground	10 kΩ or higher

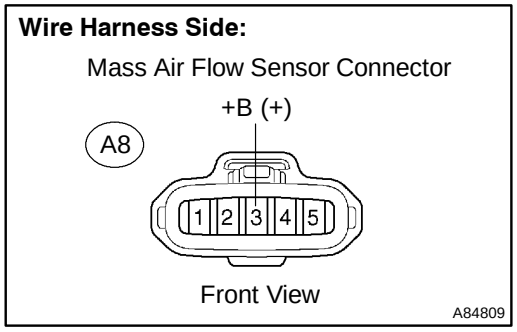
(d) Reconnect the mass air flow sensor connector.
(e) Reconnect the ECM connector.

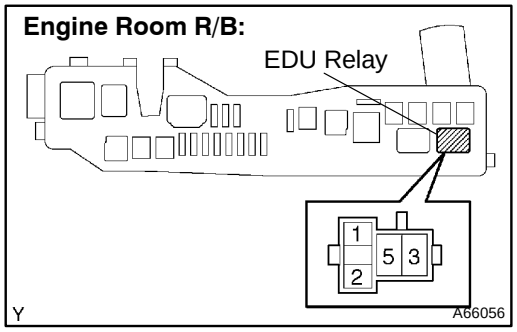
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW SENSOR

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - EDU RELAY)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Remove the EDU relay from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

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

Standard (Check for short):

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

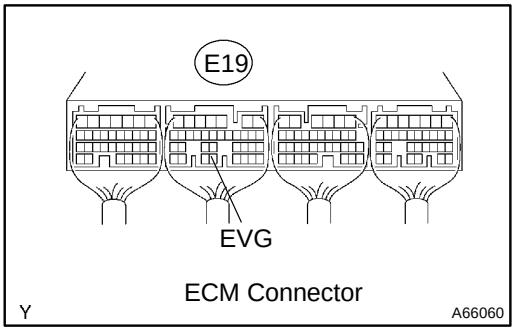
(d) Reconnect the mass air flow sensor connector.
(e) Reinstall the EDU relay.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05-175)

6 INSPECT ECM(SENSOR GROUND)



(a) Check the resistance between the terminal of the E19 ECM connector and body ground.

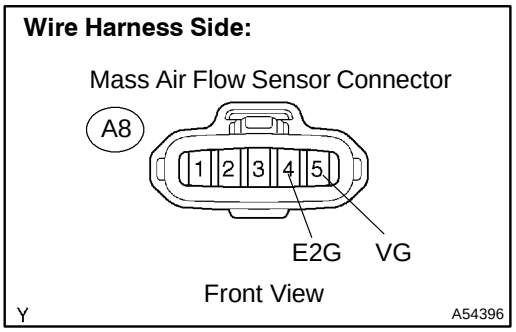
Standard:

Tester Connection	Specified Condition
EVG (E19-32) - Body ground	Below 1 Ω

NG → **REPLACE ECM (See page 10-8)**

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - ECM)



(a) Disconnect the A8 mass air flow sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

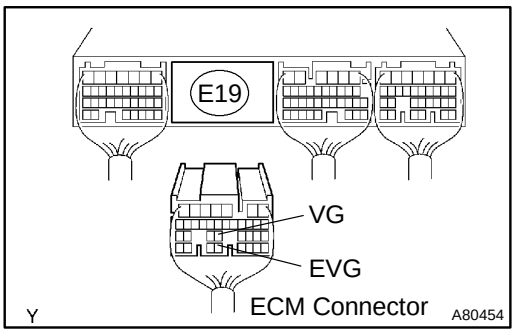
Standard (Check for open):

Tester Connection	Specified Condition
VG (A8-5) - VG (E19-24)	Below 1 Ω
E2G (A8-4) - EVG (E19-32)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (A8-5) or VG (E19-24) - Body ground	10 kΩ or higher

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



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

OK

REPLACE MASS AIR FLOW SENSOR

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

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05-69.

DTC No.	DTC Detection Condition	Trouble Area
P0101	After engine is warmed up, condition (a) continues for more than 10 seconds at idling: (2 trip detection logic) (a) Mass air flow sensor output greater than 2.2 V	S Mass air flow sensor
	Conditions (a) and (b) continue for more than 6 seconds with engine speed at 2000 rpm or more: (2 trip detection logic) (a) VTA greater than 0.1 V (b) Mass air flow sensor output less than 0.25 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

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

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
P0101	B

HINT:

If any other codes besides P0101 are output, perform the troubleshoot for those DTCs first.

B → REPLACE MASS AIR FLOW SENSOR

A

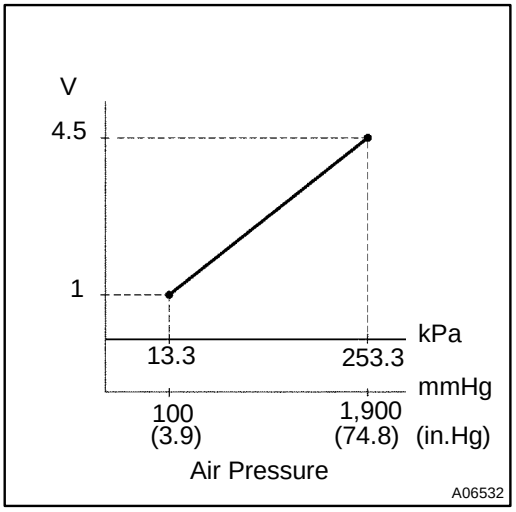
GO TO RELEVANT DTC CHART (See page 05-35)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P0107	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P0108	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION



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

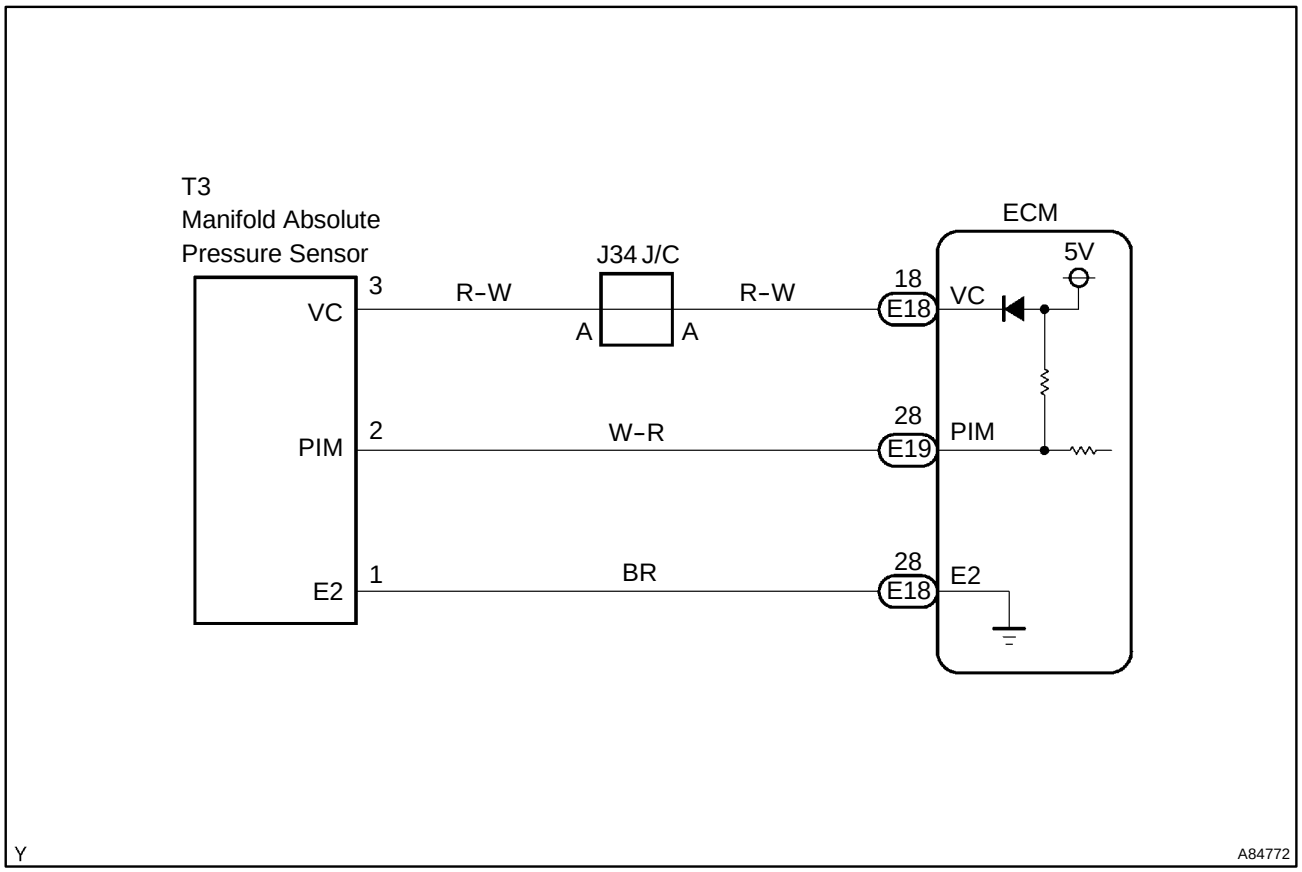
DTC No.	DTC Detection Condition	Trouble Area
P0105 P0107 P0108	Open or short in manifold absolute pressure sensor circuit for 0.5 second or more (1 trip detection logic)	$ Open or short in manifold absolute pressure sensor circuit $ Manifold absolute pressure sensor $ Turbocharger assembly $ EGR valve assembly $ ECM

HINT:
After confirming DTC P0105, P0107 or P0108, check the intake air temperature in the "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / PIM" using the hand-held tester.

Reference:

Intake Manifold Pressure (kPa)	Malfunction
Approximately 0	$ PIM circuit short
250 or more	$ VC circuit open or short $ PIM circuit open $ E2 circuit open

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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

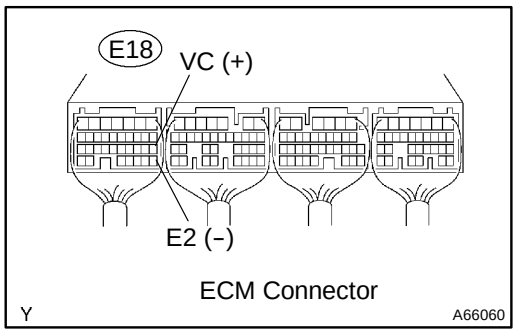
1	READ VALUE OF HAND-HELD TESTER(MANIFOLD ABSOLUTE PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM" and read its value displayed on the hand-held tester.
Standard: Same value as the actual atmospheric pressure.

OK	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

NG

2 INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.

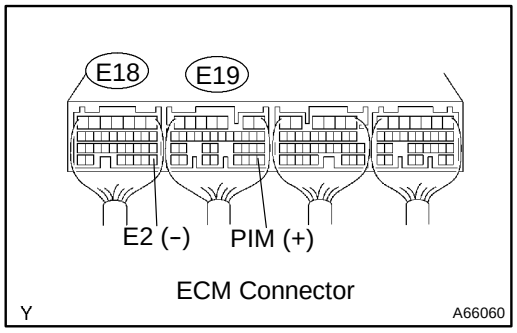
Standard:

Tester Connection	Specified Condition
VC (E18-18) - E2 (E18-28)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-8)**

OK

3 INSPECT ECM(PIM VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the terminals of the E18 and E19 ECM connectors.

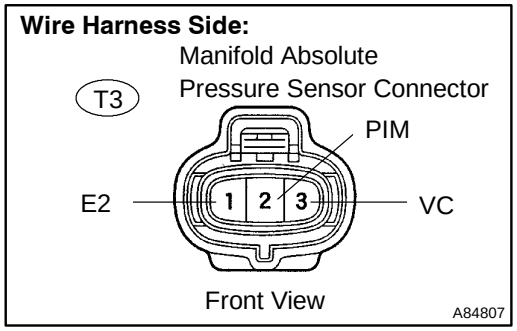
Standard:

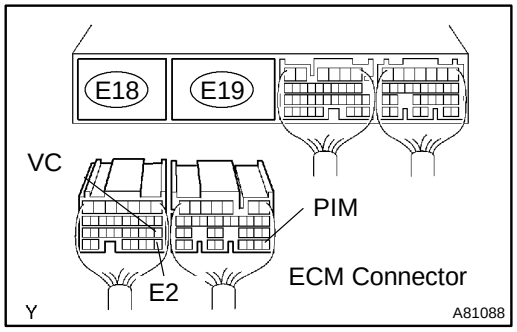
Tester Connection	Condition	Specified Condition
PIM (E19-28) - E2 (E18-28)	Applied negative pressure of 40kPa (300 mmHg, 11.8 in.Hg)	0.2 to 0.8 V
PIM (E19 - 28) - E2 (E18-28)	Same as atmospheric pressure	1.3 to 1.9 V
PIM (E19 - 28) - E2 (E18-28)	Applied positive pressure of 69kPa (0.7 kg/cm^{3}, 10.0 psi	3.2 to 3.8 V

NG → **REPLACE ECM (See page 10-8)**

OK

4	CHECK HARNESS AND CONNECTOR(MANIFOLD ABSOLUTE PRESSURE SENSOR - ECM)





(a) Disconnect the T3 manifold absolute pressure sensor connector.
(b) Disconnect the E18 and E19 ECM connectors.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E19-28)	Below 1 Ω
VC (T3-3) - VC (E18-18)	
E2 (T3-1) - E2 (E18-28)	

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E19-28) - Body ground	10 kΩ higher
VC (T3-3) or VC (E18-18) - Body ground	
E2 (T3-1) or E2 (E18-28) - Body ground	

(d) Reconnect the manifold absolute pressure sensor connector.
(e) Reconnect the ECM connectors.

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

OK

5	INSPECT TURBOCHARGER SUB-ASSY (See page 13-3)

NG → **REPLACE TURBOCHARGER SUB-ASSY (See page 13-8)**

OK

6	INSPECT EGR VALVE ASSY (See page 12-2)

NG → **REPLACE EGR VALVE ASSY (See page 14-24)**

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC	P0106	MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT RANGE/ PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0105 on page 05-75.

DTC No.	DTC Detection Condition	Trouble Area
P0106	Voltage output of the manifold absolute pressure sensor is out of the standard range (2 trip detection logic)	S Manifold absolute pressure sensor

INSPECTION PROCEDURE

HINT:

- If DTCs P0105, P0107, and P0108 are output simultaneously, the manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of those DTCs first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0106)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0106	A
P0106 and other DTCs	B

HINT:

If any other codes besides P0106 are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-35)

A

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

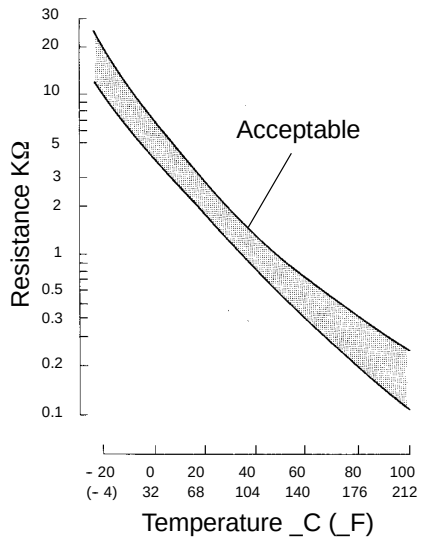
DTC	P0110	INTAKE AIR TEMPERATURE CIRCUIT

DTC	P0112	INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC	P0113	INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

(Figure. 1)



The intake air temperature sensor is built in the mass air flow sensor and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is, the greater the thermistor resistance value becomes, and the higher the intake air temperature is, the lower the thermistor resistance value becomes (See figure 1).
The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
The resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the drivability with a cold engine.

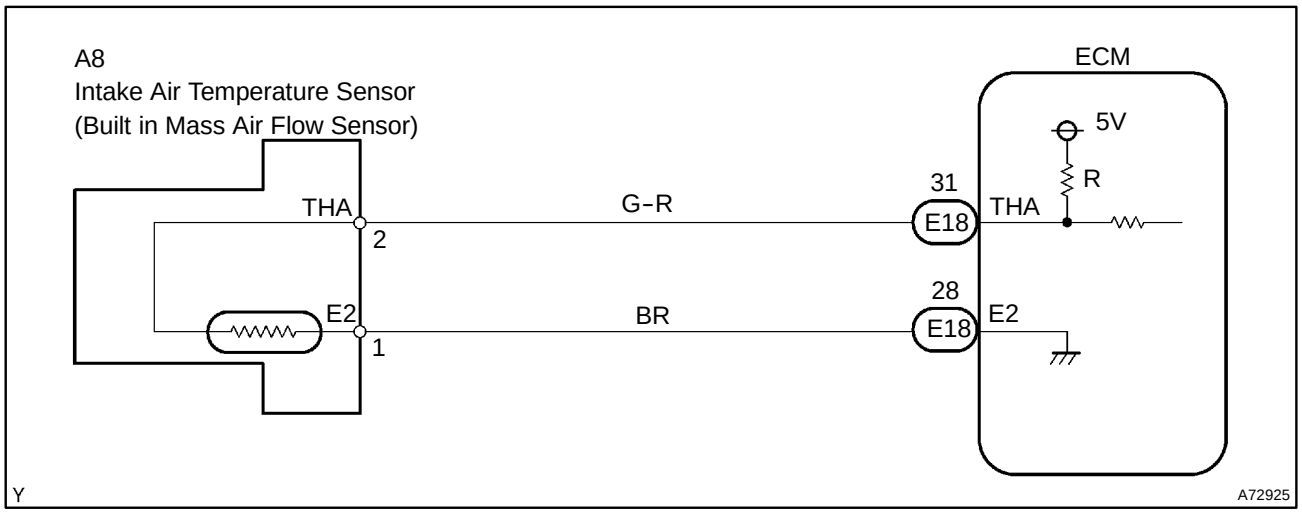
DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in intake air temperature sensor circuit S Intake air temperature sensor (built in mass air flow sensor) S ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 second (1 trip detection logic)	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 second (1 trip detection logic)	

HINT:
After confirming DTC P0110, P0112 or P0113, check the intake air temperature in the "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Temperature: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
-40˚C (-40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

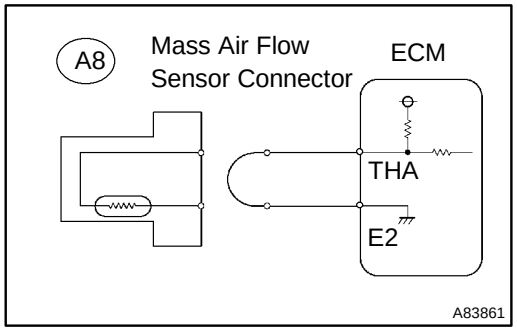
HINT:

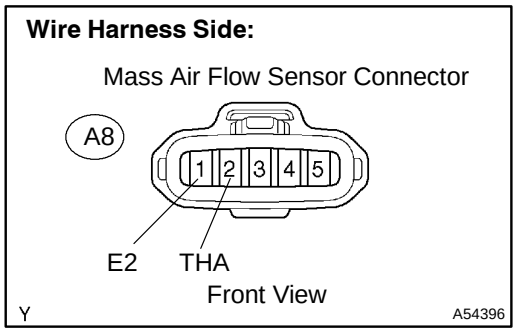
- If there is an open circuit, the hand-held tester indicates -40˚C (-40˚F).
- If there is a short circuit, the hand-held tester indicates 140˚C (284˚F) or more.

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

A

2 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



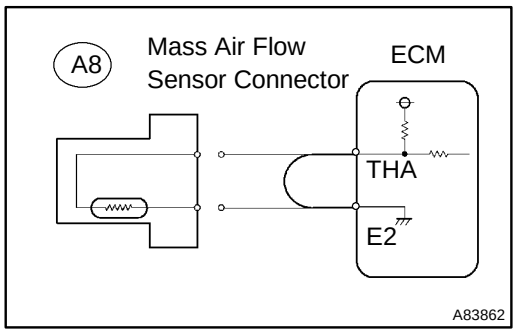


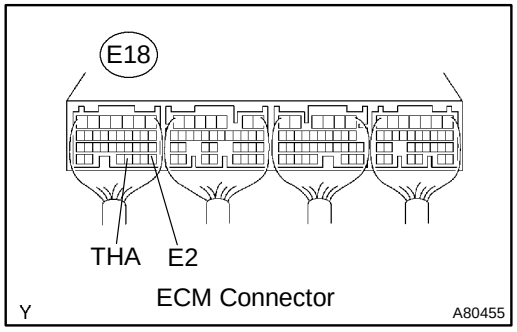
(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect terminals 1 and 2 of the mass air flow sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the and-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the mass air flow sensor connector.

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

NG

3	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect terminals THA and E2 of the E18 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

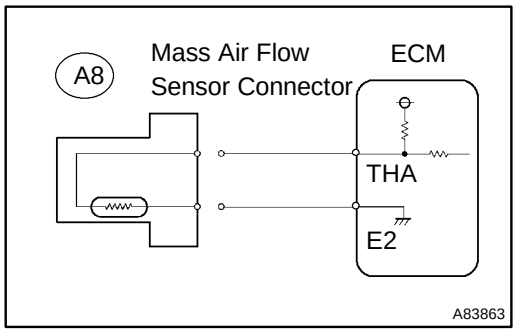
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the and-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the mass air flow sensor connector.

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

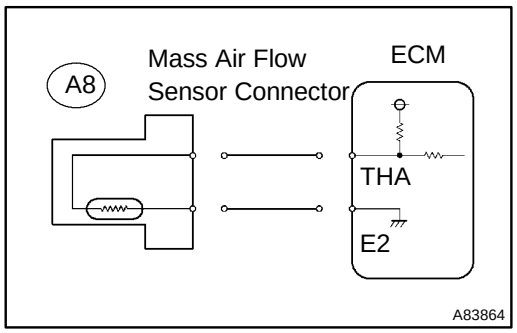


(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect the hand-held tester to the DLC 3.
(c) Turn the ignition switch ON and push the and-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the mass air flow sensor connector.

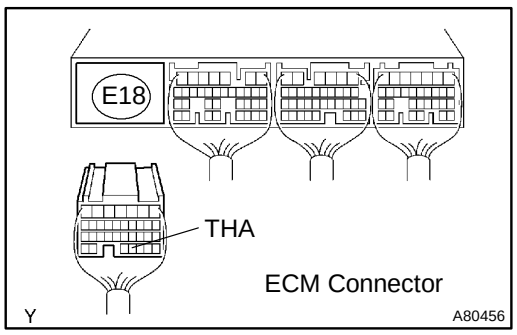
OK	REPLACE MASS AIR FLOW METER

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the A8 mass air flow sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the and-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the ECM sensor connector.
(g) Reconnect the mass air flow sensor connector.



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

NG

REPLACE ECM (See page 10-8)

DTC	P0115	ENGINE COOLANT TEMPERATURE CIRCUIT

DTC	P0117	ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC	P0118	ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

A thermistor built in the engine coolant temperature sensor 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.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in engine coolant temperature sensor circuit S Engine coolant temperature sensor S ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 second (1 trip detection logic)	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 second (1 trip detection logic)	

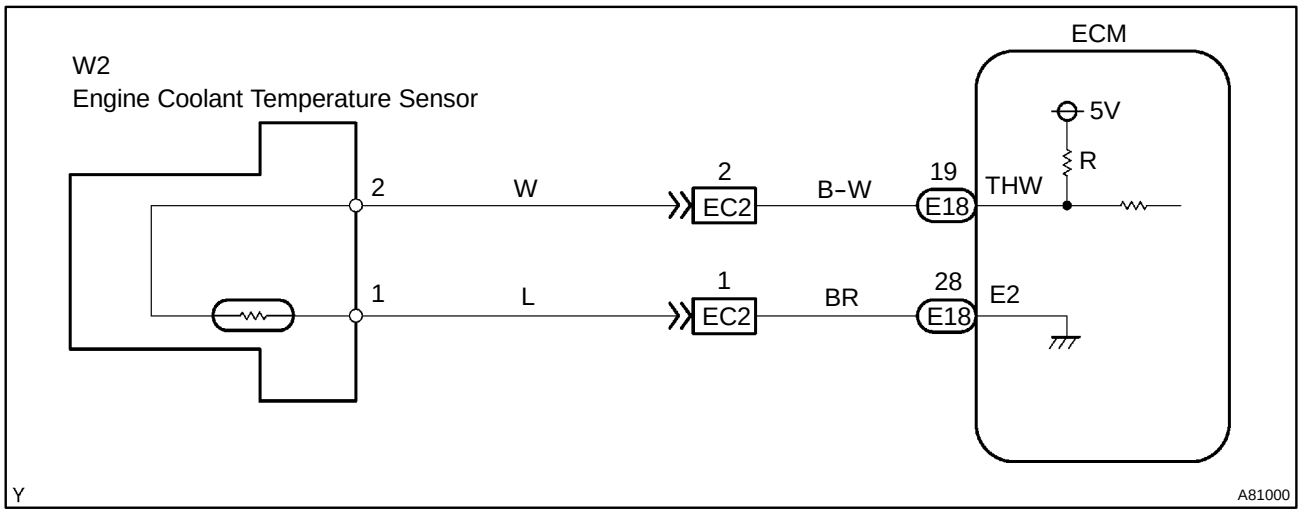
HINT:

After confirming DTC P0115, P0117 or P0118, check the engine coolant temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	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 be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
-40˚C (-40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

HINT:

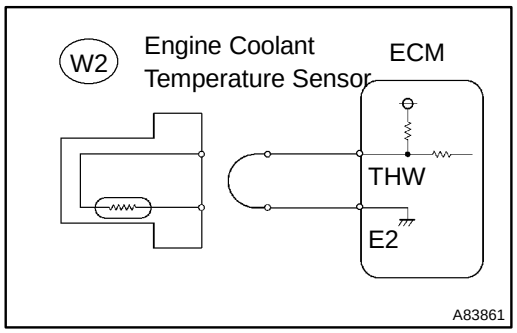
- If there is an open circuit, the hand-held tester indicates -40˚C (-40˚F).
- If there is a short circuit, the hand-held tester indicates 140˚C (284˚F) or more.

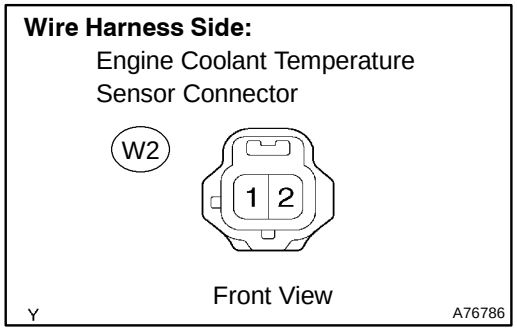
B	Go to step 4

C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

A

2 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



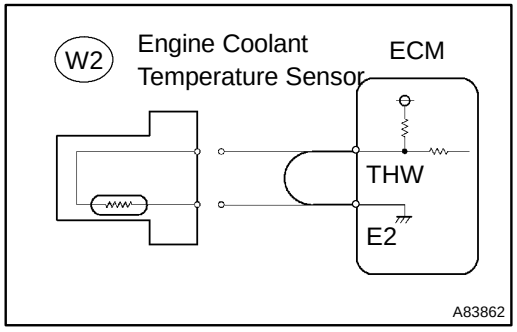


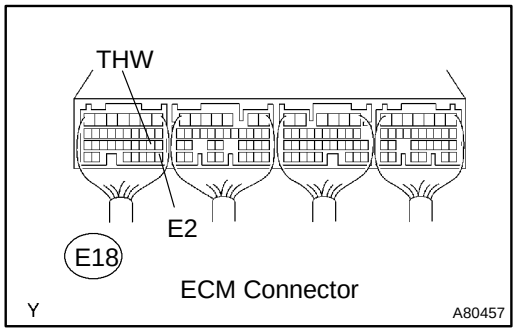
(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

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

NG

3 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E18 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

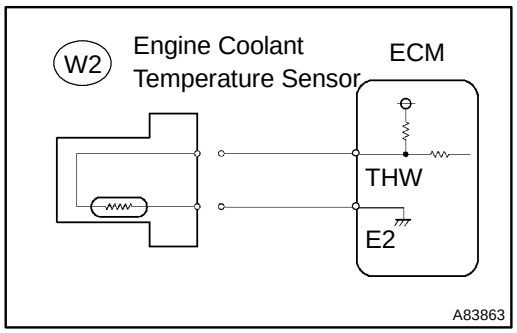
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

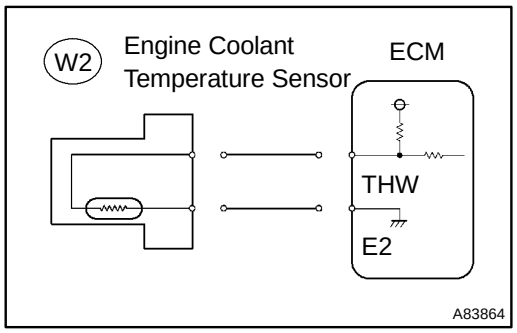


(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect the hand-held tester to the DLC 3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the engine coolant temperature sensor connector.

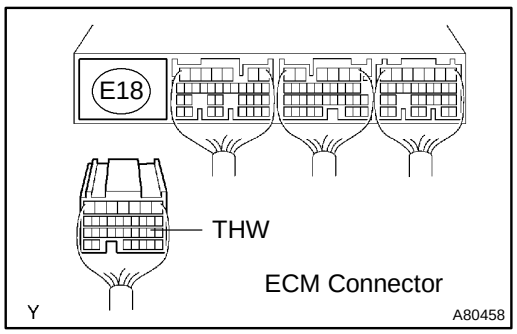
OK → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
StandardT: -40°C (-40°F)
(f) Reconnect the engine coolant temperature sensor connector.
(g) Reconnect the ECM connector.



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

NG

REPLACE ECM (See page 10-8)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05-85.

DTC No.	DTC Detection Condition	Trouble Area
P0116	If the engine coolant temperature was between -40°C (-40°F) and 60°C (140°F) at engine start, and condition (a) and (b) are met (2 trip detection logic): (a) Vehicle runs with acceleration and deceleration (b) Engine coolant temperature remains within 3°C (5.4°F) of the engine starting temperature	S Engine coolant temperature sensor
	If the engine coolant temperature was more than 90°C (194°F) at engine start, and conditions (a) and (b) are met (6 trip detection logic): (a) Vehicle runs with acceleration and deceleration (b) Engine coolant temperature remains within 1°C (1.8°F) of the engine starting temperature, and this is successively recorded 6 times	

MONITOR DESCRIPTION

The engine coolant temperature sensor is used to monitor the engine coolant temperature. The engine coolant temperature sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor's voltage output is virtually in no variation, the ECM interprets this as a fault in the engine coolant temperature sensor and sets a DTC.

Examples:

1) Upon starting the engine, the engine coolant temperature was between -40_C (-40_F) and 60_C (140_F). If after driving for a few minutes, the engine coolant temperature still remains within 3_C (5.4_F) of the staring temperature, a DTC will be set. (2 trip detection logic)

2) Upon starting the engine, the engine coolant temperature was over 90_C (194_F). If after driving for a few minutes, the engine coolant temperature still remains within 1_C (1.8_F) of the starting temperature, a DTC will be set. (6 trip detection logic)

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117 and P0118 are output simultaneously, the engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of those DTCs first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0168	FUEL TEMPERATURE TOO HIGH

CIRCUIT DESCRIPTION

Refer to DTC P0180 on page 05-91.

DTC No.	DTC Detection Condition	Trouble Area
P0168	If the fuel temperature was between 35°C (95°F) and 60°C (140°F) at engine start, and condition (a) and (b) are met: (a) Vehicle runs with acceleration and deceleration (b) Fuel temperature remains within 3°C (5.4°F) of the starting temperature	S Fuel temperature sensor
	After the engine is started, if the fuel temperature is more than 60°C (140°F) and the fuel temperature sensor indication remains within 1°C (1.8°F) of that temperature, and this is successively recorded 6 times	

INSPECTION PROCEDURE

HINT:

- If DTCs P0180, P0182 and P0183 are output simultaneously, the fuel temperature sensor circuit may be open or short. Perform the troubleshooting of those DTCs first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(BESIDES DTC P0168)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0168	A
P0168 and other DTCs	B

HINT:

If any other codes besides P0168 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-35)**

A

REPLACE FUEL TEMPERATURE SENSOR

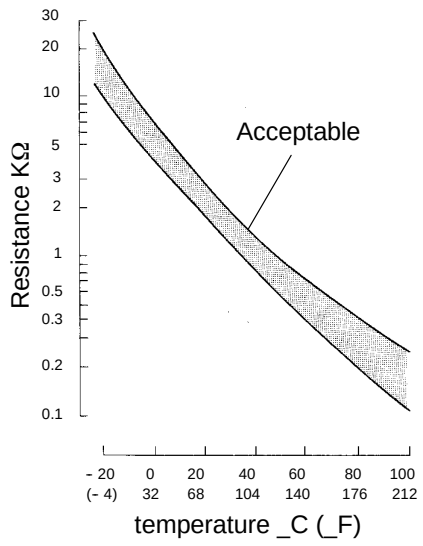
DTC	P0180	FUEL TEMPERATURE SENSOR "A" CIRCUIT

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 senses 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 fuel temperature is, the lower the thermistor 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 a resistor R. The resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with changes in the fuel temperature, the potential at terminal THF also changes. Based on this signal, the ECM corrects the pressure control compensation of the supply pump and error detection compensation of the highly pressurized fuel system.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0180	Step 1	Open or short in fuel temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in fuel temperature sensor circuit S Fuel temperature sensor S ECM
P0182	Step 4	Short in fuel temperature sensor circuit for 0.5 second (1 trip detection logic)	
P0183	Step 2	Open in fuel temperature sensor circuit for 0.5 second (1 trip detection logic)	

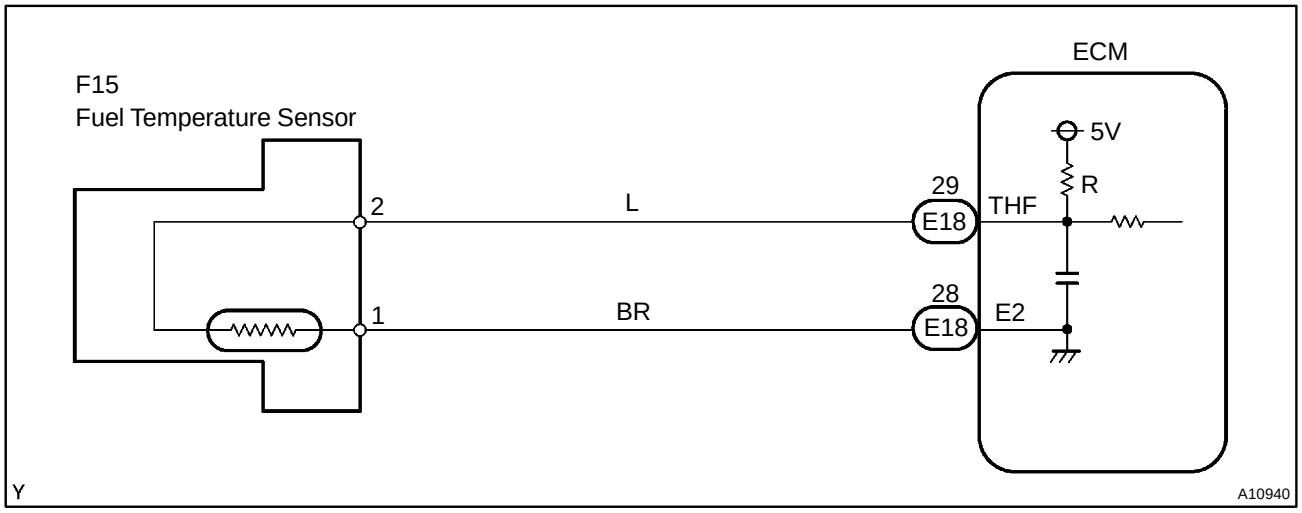
HINT:

After confirming DTC P0180, P0182 or P0183, check the fuel temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(FUEL TEMPARATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Temperature: Same value as the actual fuel temperature.
Result:

Temperature Displayed	Proceed to
-40˚C (-40˚F)	A
140˚C (284˚F) or more	B
OK (Same as present temperature)	C

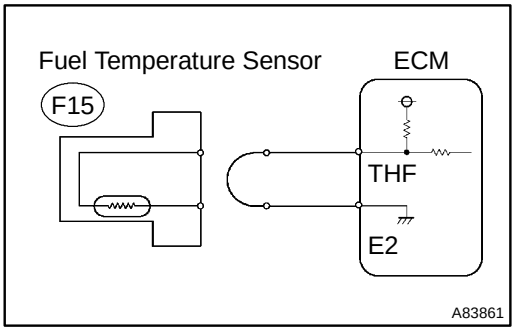
HINT:

- If there is an open circuit, the hand-held tester indicates -40˚C (-40˚F).
- If there is a short circuit, the hand-held tester indicates 140˚C (284˚F) or more.

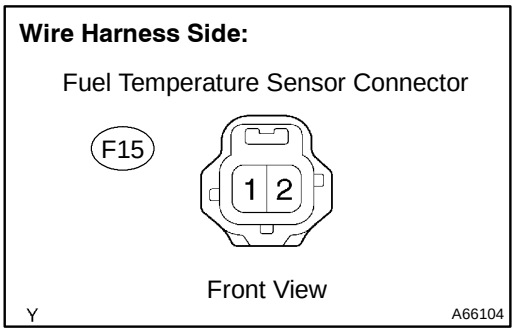
B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

A

2	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



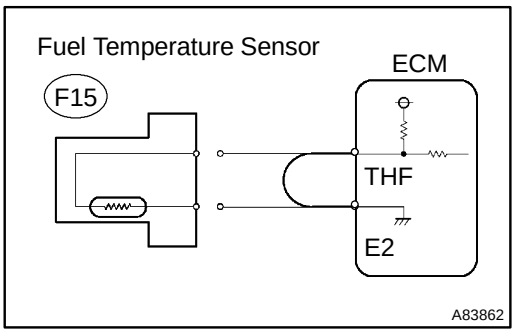
(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect terminals 1 and 2 of the fuel temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the fuel temperature sensor connector.

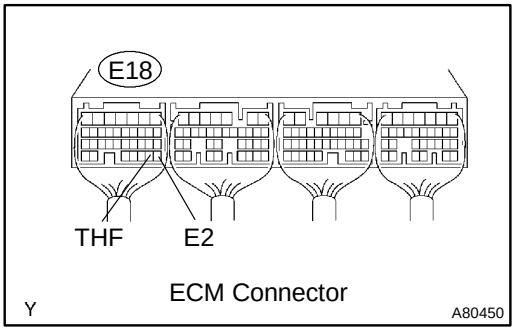


OK	CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE FUEL TEMPERATURE SENSOR

NG

3 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect terminals THF and E2 of the E18 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

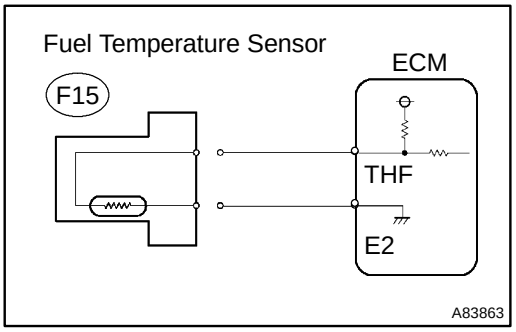
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the fuel temperature sensor connector.

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

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4 READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

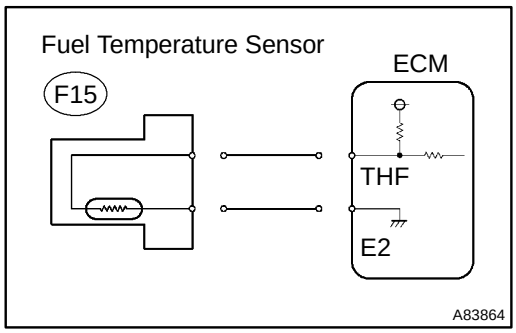


(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect the hand-held tester to the DLC 3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the fuel temperature sensor connector.

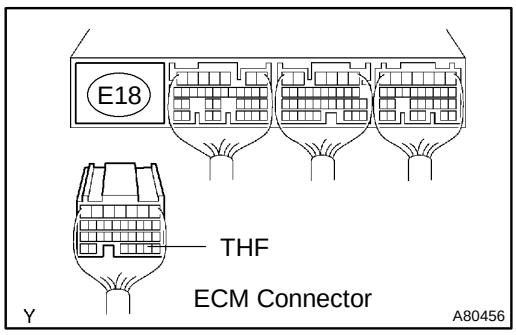
OK → **REPLACE FUEL TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the F15 fuel temperature sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Connect the hand-held tester to the DLC 3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the fuel temperature sensor connector.
(g) Reconnect the ECM connector.



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

NG

REPLACE ECM (See page 10-8)

DTC	P0191	FUEL RAIL PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0087 on page 05-47.

INSPECTION PROCEDURE

HINT:

- If DTCs P0087, P0190, P0192, and P0193 are output simultaneously, the manifold absolute pressure sensor circuit may be open or short. Perform the troubleshooting of those DTCs first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

DTC No.	DTC Detection Condition	Trouble Area
P0191	Voltage output of the fuel pressure sensor for the common rail is out of the standard range. (1 trip detection logic)	Fuel pressure sensor

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

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0191	A
P0191 and other DTCs	B

HINT:

If any other codes besides P0191 are output, perform the troubleshoot for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-35)**

A

REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR) (See page 11-24)

DTC	P0200	INJECTOR CIRCUIT / OPEN

HINT:

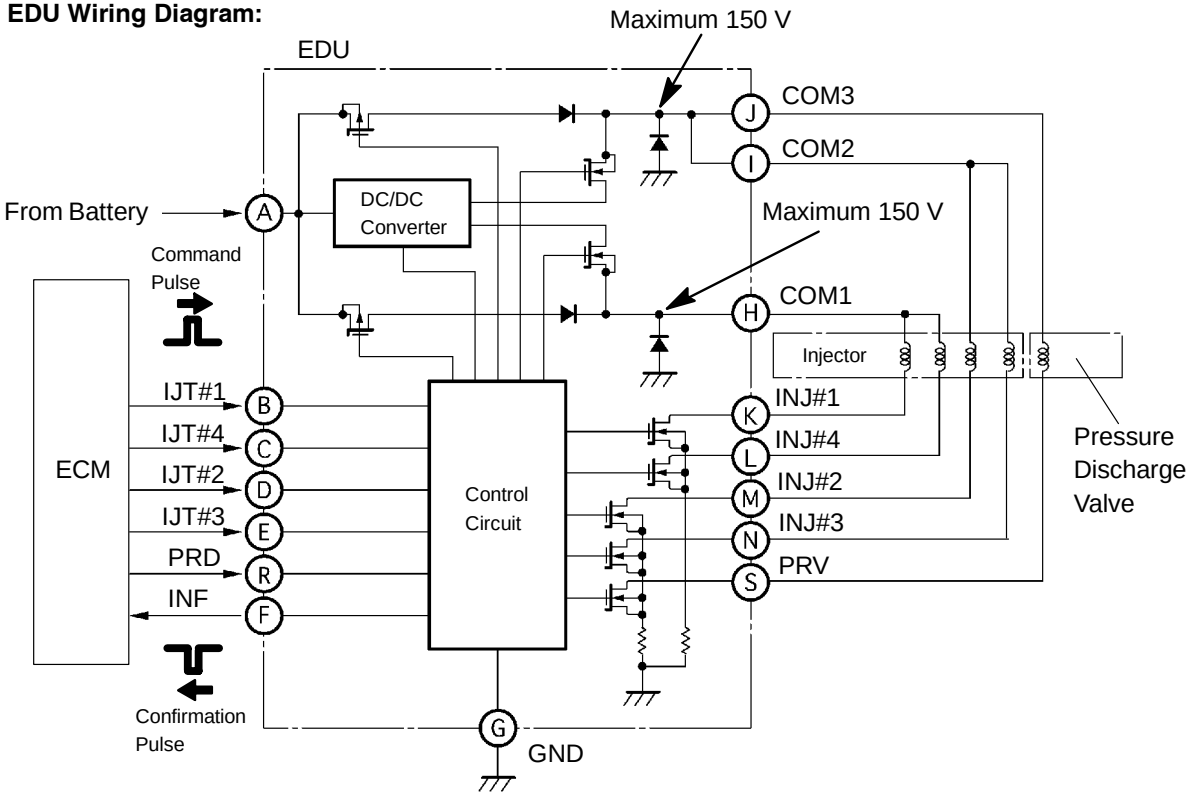
- For more information on the EDU, see page 05-2.
- If P0200 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

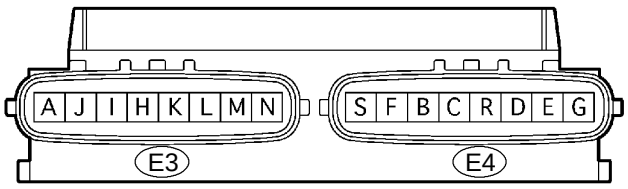
The EDU has been adopted to drive the injector at high speeds. The EDU has realized the high-speed driving under high-pressurized fuel conditions using the DC/DC converter that provides a high-voltage, and the quick-charging system.

Soon after the EDU receives an injection command signal (IJT) from the ECM, the EDU responds to the command with injector injection confirmation signal (IJF) when the current is applied to the injector.

EDU Wiring Diagram:



EDU Connector



Warning: Terminal J, I, H, K, L, M, N and S are high voltage

Y

A81481

DTC No.	DTC Detection Condition	Trouble Area
P0200	Open or short in EDU or injector circuit. After engine is started, there is no injection confirmation signal (IJF) from EDU to ECM, despite the ECM sending injection command signal (IJT) to the EDU. (1 trip detection logic)	$ Open or short in EDU circuit $ Injector $ EDU $ ECM

MONITOR DESCRIPTION

P0200 (Open or short in EDU or injector circuit):

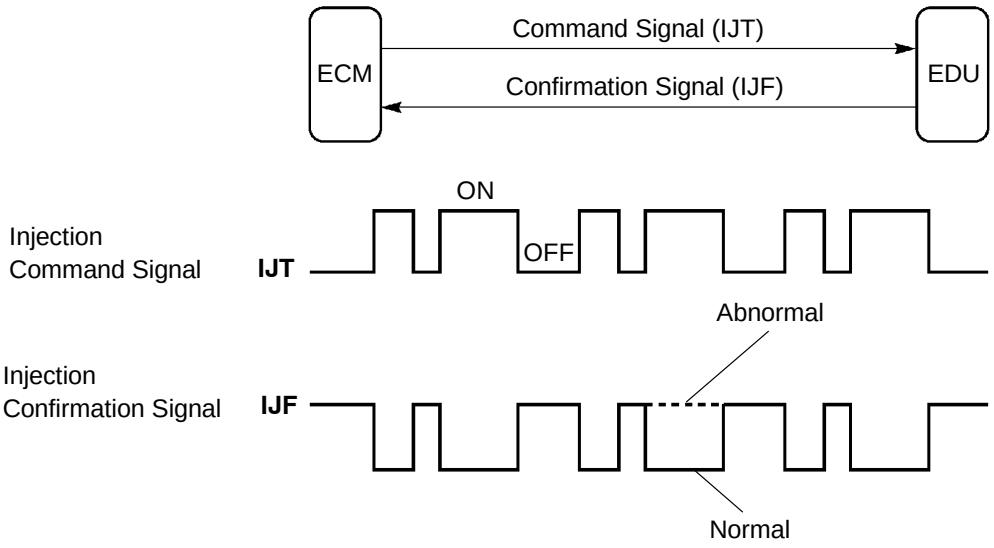
ECM continuously monitors both injection command (IJT) signal and injection confirmation (IJF) signal. This DTC will be set if the ECM judges that the number of IJT signals and IJF signals are inconsistent.

The injectors are grounded over a FET (field effect transistor) and a serial resister. This resister creates a voltage drop, which is monitored by the EDU, in relation to the current drawn by the injector. When the injector current becomes too high, the voltage drop over the resister becomes higher than a specified level and for that injector no IJF signal is sent to the ECM.

P0200 refers to a malfunction of injector drive circuit (EDU) or injector circuit.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

Malfunction Detection:



MONITOR STRATEGY

Required Sensors	IJF signal from EDU
Frequency of operation	Continuous
Duration	10 seconds
CHK ENG Operation	1 driving cycle

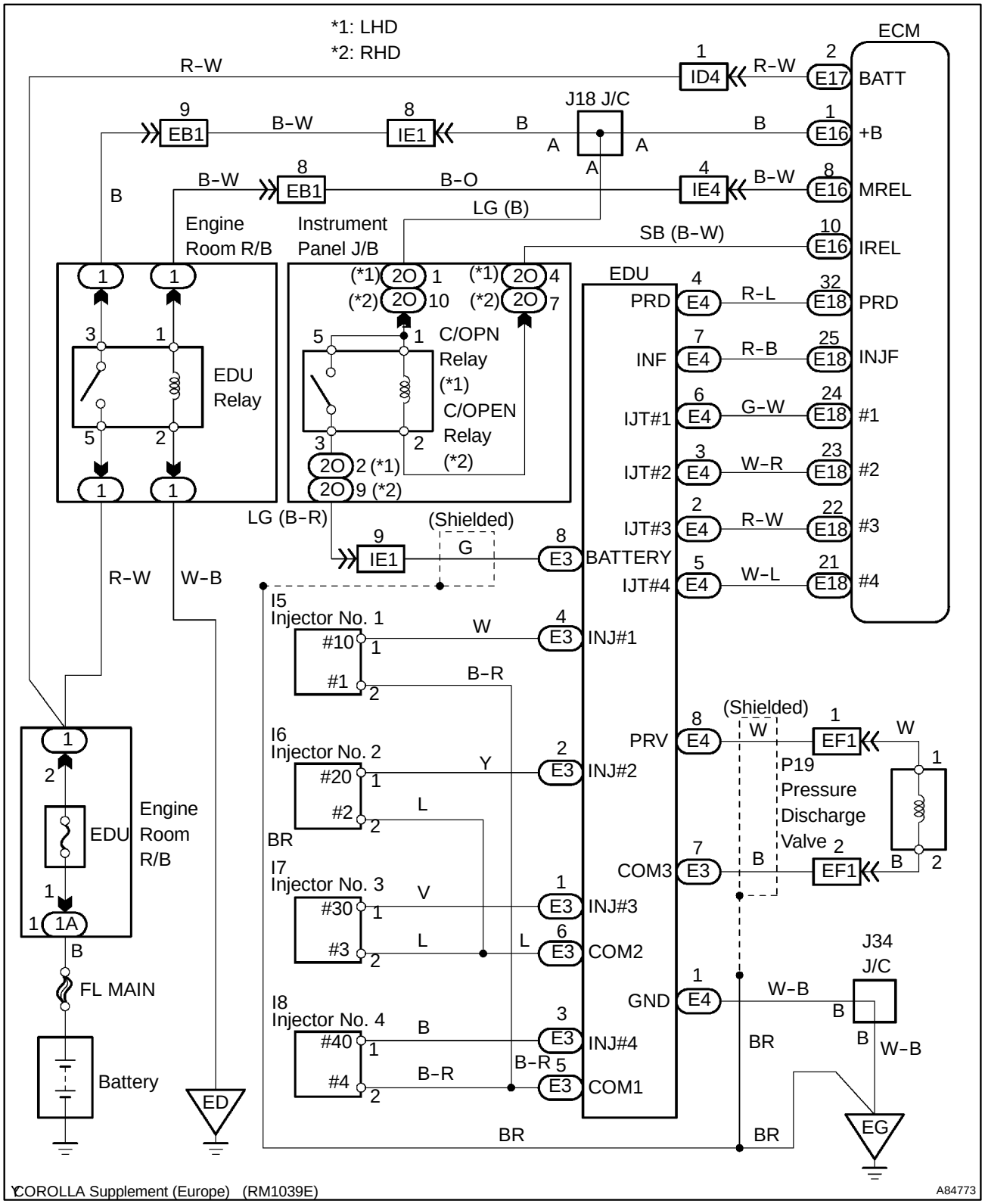
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	-
Battery voltage	11 V	-
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
If injection missing counter* is accumulated the specified number of times successively, or if injection missing counter for one of the cylinders is accumulated the specified number of times successively (Approximately 1 second or more). *: Injection missing counter increments when no IJF signal from the EDU despite the ECM sending the IJT signals.

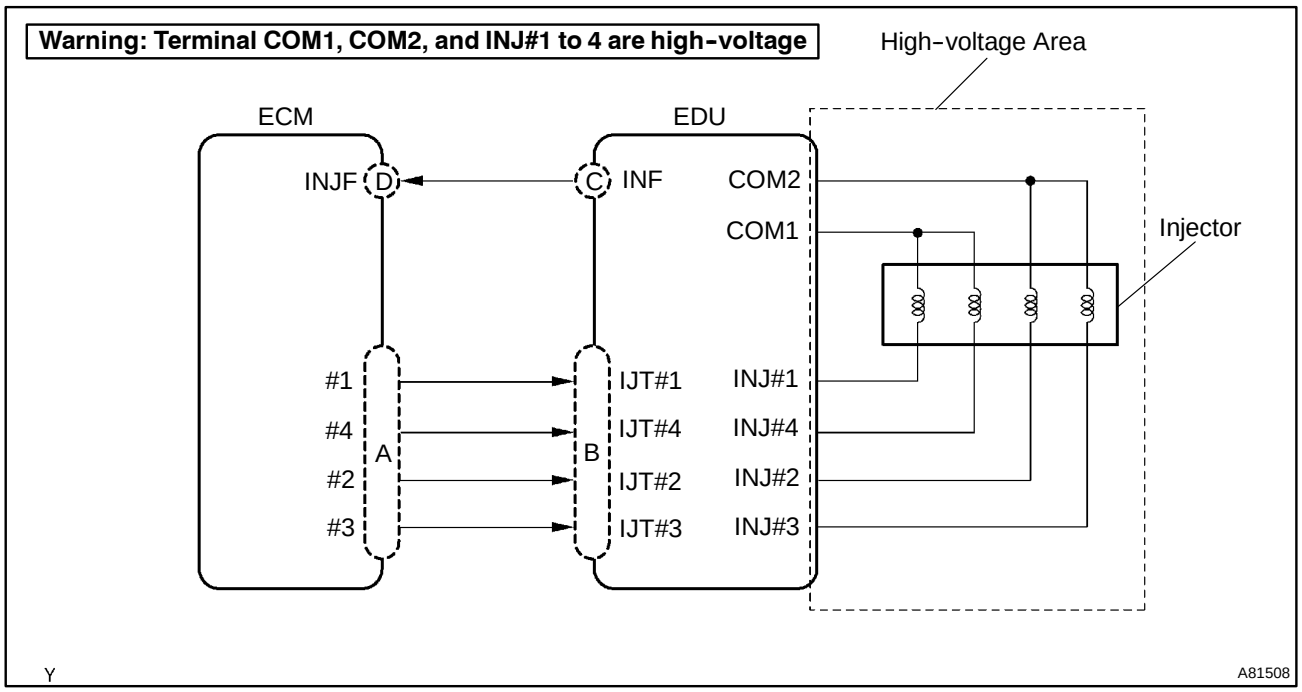
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

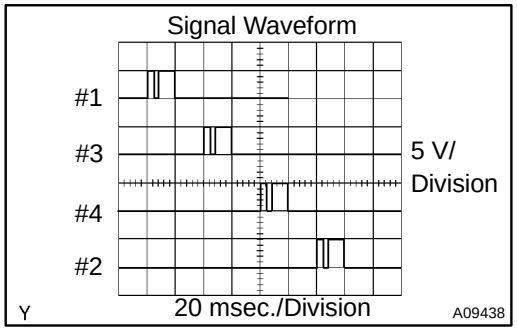
Problem area can be identified by checking the waveform at the following terminals.



HINT:

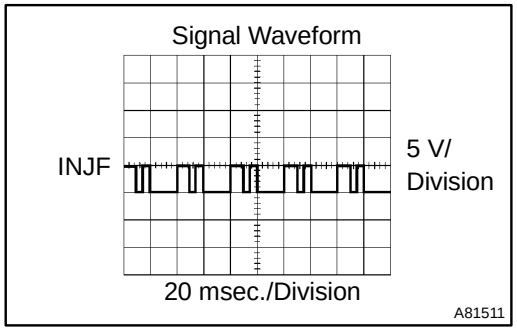
If you check the ECM side first, inspect the following A and D in sequence. If you check the EDU side first, inspect the following B and C in sequence. This shortens inspecting time.

Malfunction Point	Trouble Area
A	$ ECM
B (if A is normal)	$ Open or short in "#1 to #4 (ECM)" - "IJT#1 to IJT#4 (EDU)" harness or connector
C (if A and B are normal)	$ Open or short in "INJ#1 to INJ#4 (EDU)" - "COM1 and/or COM2" (EDU) circuit $ Injector $ EDU
D (if A, B and C are normal)	$ Open or short in "INJ (EDU)" - "INJF (ECM)" circuit (P1271 is set simultaneously)



(a) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
A and B	Correct waveform is as shown



(b) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both injector and pressure discharge valve.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(IN ADDTION TO DTC P0200)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0200 and P1238	A
P0200	B

B → **Go to step 3**

A

2 READ VALUE OF HAND-HELD TESTER(COMPENSATION OF INJECTION VOLUME BETWEEN CYLINDERS)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB" and read its value displayed on the hand-held tester.

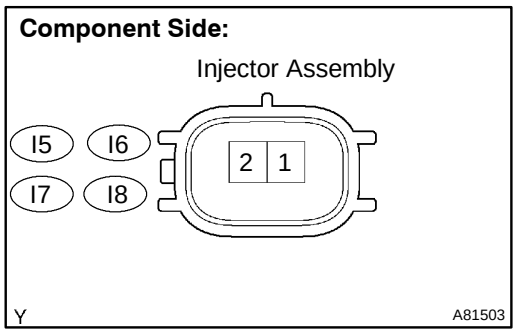
Result:

Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

(e) Inspect and repair the cylinder that has an improper compensation value according to the following steps.

GO

3 INSPECT INJECTOR ASSY



(a) Disconnect the I5, I6, I7 and I8 injector connectors.
(b) Measure the resistance between the terminals of the injection assembly.

Standard:

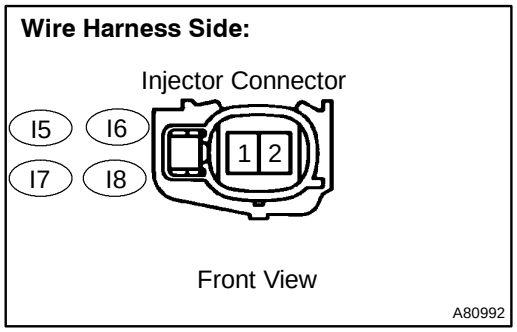
Tester Connection	Specified Condition
1 - 2	0.85 to 1.05 Ω at 20_C (68_F)

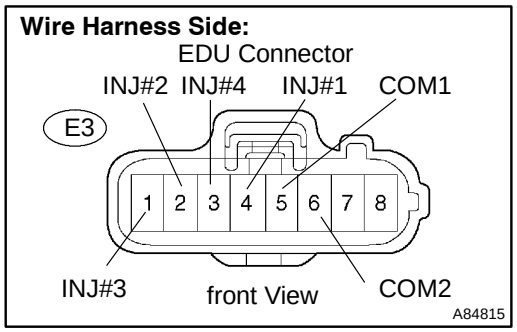
(c) Reconnect the injector connector.

NG → **REPLACE INJECTOR ASSY (See page 11-5)**

OK

4 CHECK HARNESS AND CONNECTOR(EDU - INJECTOR ASSY)





(a) Check the harness and connector between the injector and EDU (INJ terminal).
(1) Disconnect the I5, I6, I7, or I8 injector connector.
(2) Disconnect the E3 EDU connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I5-1) - INJ#1 (E3-4)	Below 1 Ω
Injector (I6-1) - INJ#2 (E3-2)	
Injector (I7-1) - INJ#3 (E3-1)	
Injector (I8-1) - INJ#4 (E3-3)	
Injector (I5-2) - COM1 (E3-5)	
Injector (I6-2) - COM2 (E3-6)	
Injector (I7-2) - COM2 (E3-6)	
Injector (I8-2) - COM1 (E3-5)	

Standard (Check for short):

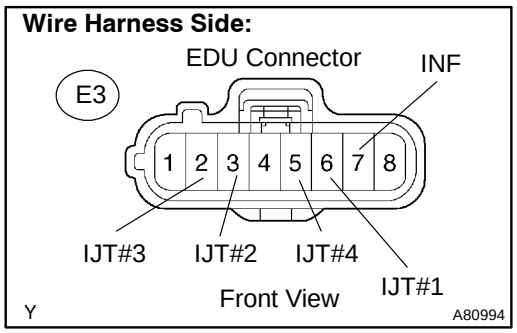
Tester Connection	Specified Condition
Injector (I5-1) or INJ#1 (E3-4) - Body ground	10 kΩ or higher
Injector (I6-1) or INJ#2 (E3-2) - Body ground	
Injector (I7-1) or INJ#3 (E3-1) - Body ground	
Injector (I8-1) or INJ#4 (E3-3) - Body ground	
Injector (I5-2) or COM1 (E3-5) - Body ground	
Injector (I6-2) or COM2 (E3-6) - Body ground	
Injector (I7-2) or COM2 (E3-6) - Body ground	
Injector (I8-2) or COM1 (E3-5) - Body ground	

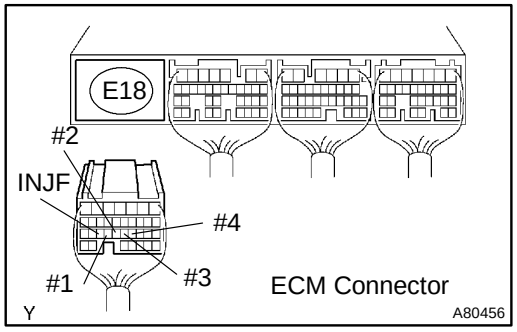
(4) Reconnect the injector connector.
(5) Reconnect the EDU connector.

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

OK

5 CHECK HARNESS AND CONNECTOR(EDU - ECM)





(a) Disconnect the E3 EDU connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the terminals of the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
IJT#1 (E3-6) - #1 (E18-24)	Below 1 Ω
IJT#2 (E3-3) - #2 (E18-23)	
IJT#3 (E3-2) - #3 (E18-22)	
IJT#4 (E3-5) - #4 (E18-21)	
INF (E3-7) - INJF (E18-25)	

Standard (Check for short):

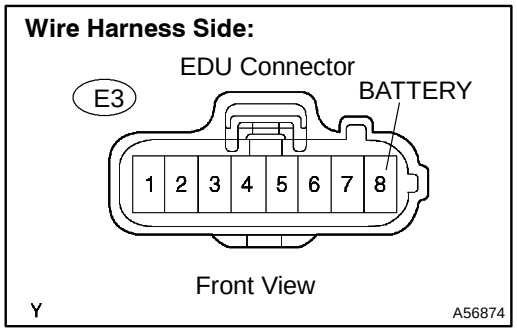
Tester Connection	Specified Condition
#1 (E18-24) or IJT#1 (E3-6) - Body ground	10 kΩ or higher
#2 (E18-23) or IJT#2 (E3-3) - Body ground	
#3 (E18-22) or IJT#3 (E3-2) - Body ground	
#4 (E18-21) or IJT#4 (E3-5) - Body ground	
INJF (E18-25) or INF (E3-7) - Body ground	

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

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

OK

6 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)

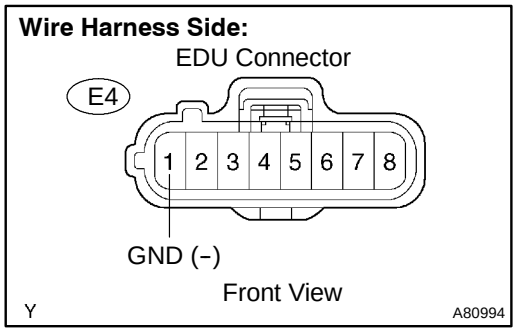


(a) Disconnect the E3 and E4 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Standard:

Tester Connection	Specified Condition
BATTERY (E3-8) - GND (E4-1)	9 to 14 V

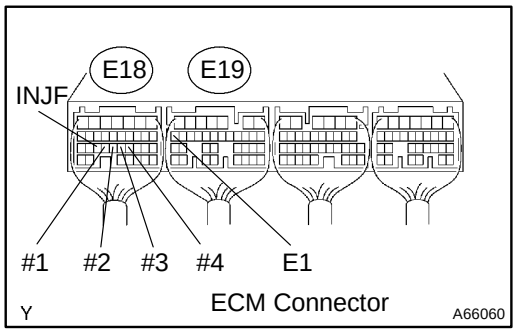
(d) Reconnect the EDU connectors.



NG → CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (BATTERY - EDU)

OK

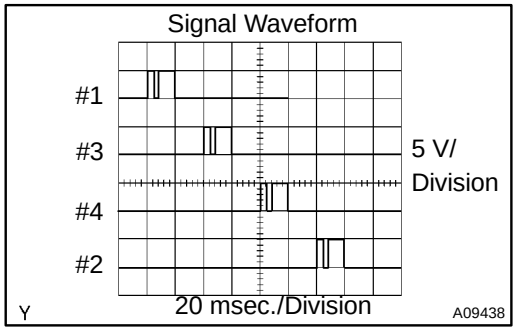
7 INSPECT ECM(INJECTOR VOLTAGE)

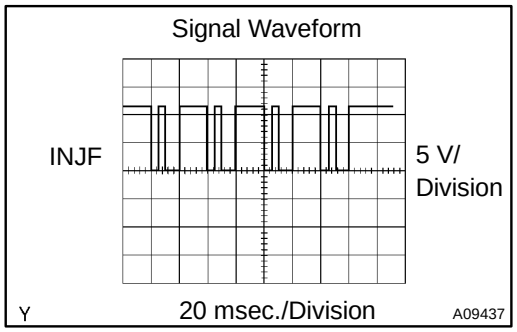


(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 and E19 ECM connectors.

Standard:

Tester Connection	Specified Condition
#1 (E18-24) - E1 (E18-7)	Correct waveform is as shown
#2 (E18-23) - E1 (E18-7)	
#3 (E18-22) - E1 (E18-7)	
#4 (E18-21) - E1 (E18-7)	
INJF (E18-25) - E1 (E18-7)	





NG → REPLACE ECM(See page 10-8)

OK

8 REPLACE INJECTOR DRIVER

GO

CHECK IF DTC OUTPUT RECURS

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds, and then confirm that P0200 is not present again.

DTC	P0234	TURBO/SUPER CHARGER OVERBOOST CONDITION

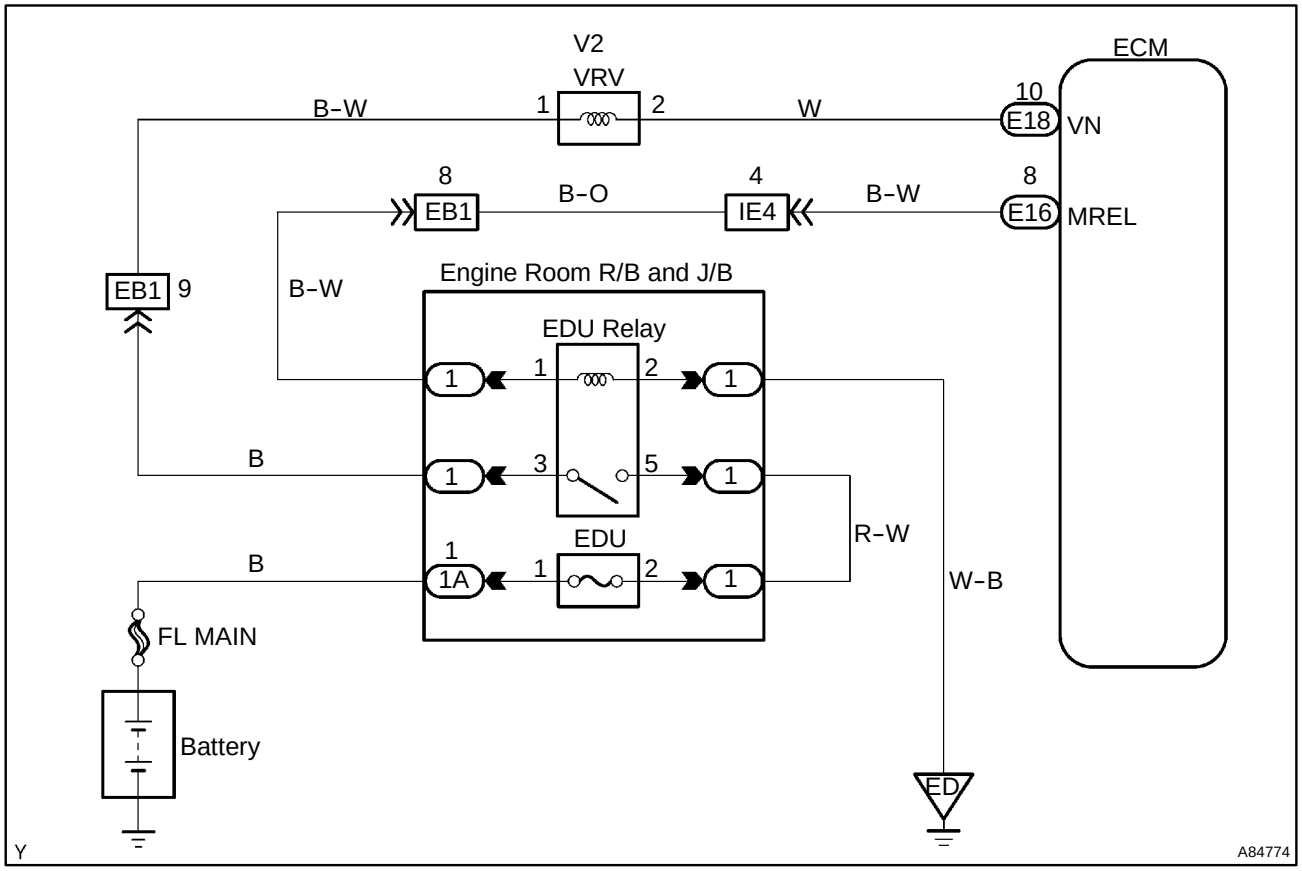
DTC	P0299	TURBO/SUPER CHARGER UNDERBOOST

DTC	P1251	TURBO/SUPER CHARGER OVERBOOST CONDITION (TOO HIGH)

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0234 P0299 P1251	When the condition that the turbocharger pressure exceeds the standard value for 0.5 second or more (1 trip detection logic)	$S VRV $S Open or short in VRV circuit $S Turbocharger $S Vacuum hose $S EGR valve $S ECM
	Actual turbocharger pressure is deviated 20 kPa (0.2 kgf/cm^2, 2.9 psi) or more from the simulated target pressure based on the engine speed and fuel injection volume for 60 seconds	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

1	**CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0234, P0299 AND/OR P1251)**

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0234, P0299 and/or P1251	A
P0234, P0299 and/or P1251 and other DTCs	B

B → **GO TO RELEVANT DTC CHART (See page 05-35)**

A

2	**CHECK CONNECTION OF VACUUM HOSE**

NG → **REPAIR OR REPLACE VACUUM HOSES**

OK

3	**CHECK VACUUM HOSES(CHECK VACUUM BETWEEN TURBOCHARGER - VRV FOR TURBO CHARGER)**

(a) Using a three-way connector, connect a vacuum gauge to the hose between the E-VRV and turbocharger.
(b) Warm up the engine to above 80˚C (176˚F).
(c) Check the vacuum at 900 rpm.

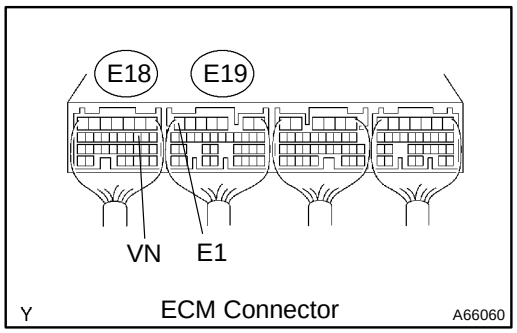
Result:

Proceed to	Vacuum
A	0 kPa (0 mmHg, 0 in.Hg) to 50 kPa (375 mmHg, 14.8 in.Hg)
B	Above 50 kPa (375 mmHg, 14.8 in.Hg)

B → **Go to step 8**

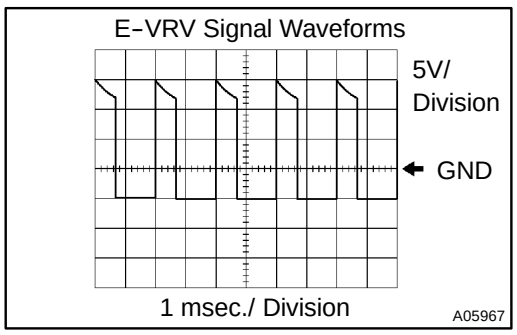
A

4 INSPECT ECM(VN VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 and E19 ECM connectors.
Standard:

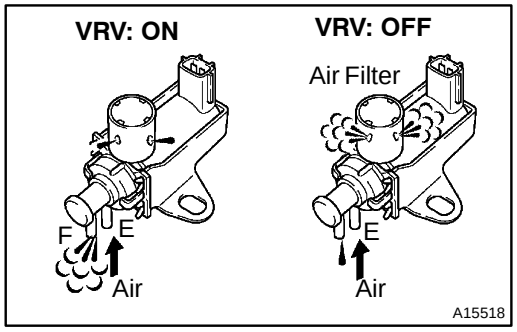
Tester Connection	Specified Condition
VN (E18-10) - E1 (E19-7)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10-8)**

OK

5 INSPECT VACUUM REGULATING VALVE ASSY(OPERATION)



(a) Disconnect the vacuum hoses from the VRV.
(b) Turn the ignition switch ON.
(c) Check the operation of the E-VRV when it is operated by the hand-held tester.
VRV ON:
Air from port E flows out through port F.
VRV OFF:
Air from port E flows out through air filter.
(d) Reconnect the vacuum hoses.

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

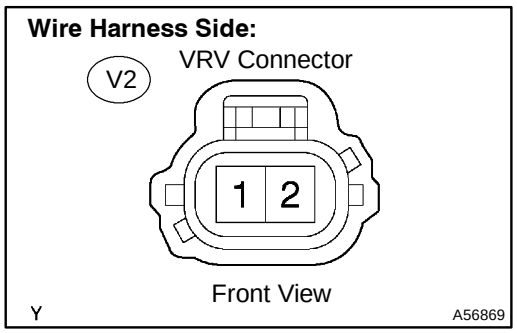
OK

6 INSPECT VACUUM REGULATING VALVE ASSY(RESISTANCE) (See page 12-2)

NG → **REPLACE VACUUM REGULATING VALVE ASSY**

OK

7	CHECK HARNESS AND CONNECTOR(VRV - ECM)



(a) Disconnect the V2 VRV connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

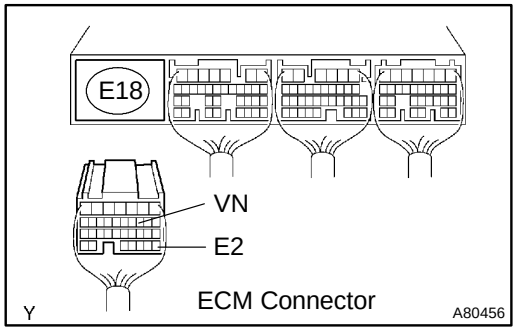
Standard (Check for open):

Tester Connection	Specified Condition
VN (E18-10) - (V2-2)	Below 1 Ω
E2 (E18-28) - (V2-1)	

Standard (Check for short):

Tester Connection	Specified Condition
VN (E18-10) or (V2-2) - Body ground	10 kΩ or higher
E2 (E18-28) or (V2-1) - Body ground	

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



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

OK

8	INSPECT TURBOCHARGER SUB-ASSY (See page 13-3)

NG → **REPLACE TURBOCHARGER SUB-ASSY (See page 13-8)**

OK

9	INSPECT EGR VALVE ASSY (See page 12-2)

NG → **REPLACE EGR VALVE ASSY (See page 14-24)**

OK

REPLACE ECM (See page 10-8)

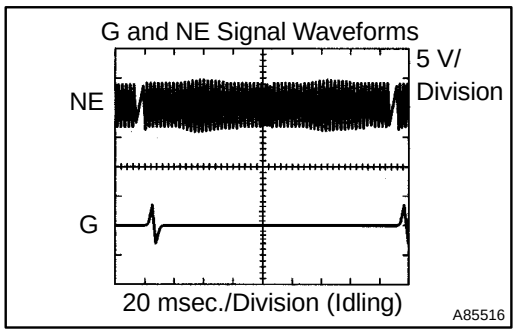
DTC	P0335	CRANKSHAFT POSITION SENSOR "A" CIRCUIT

DTC	P0339	CRANKSHAFT POSITION SENSOR "A" CIRCUIT INTERMITTENT

CIRCUIT DESCRIPTION

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

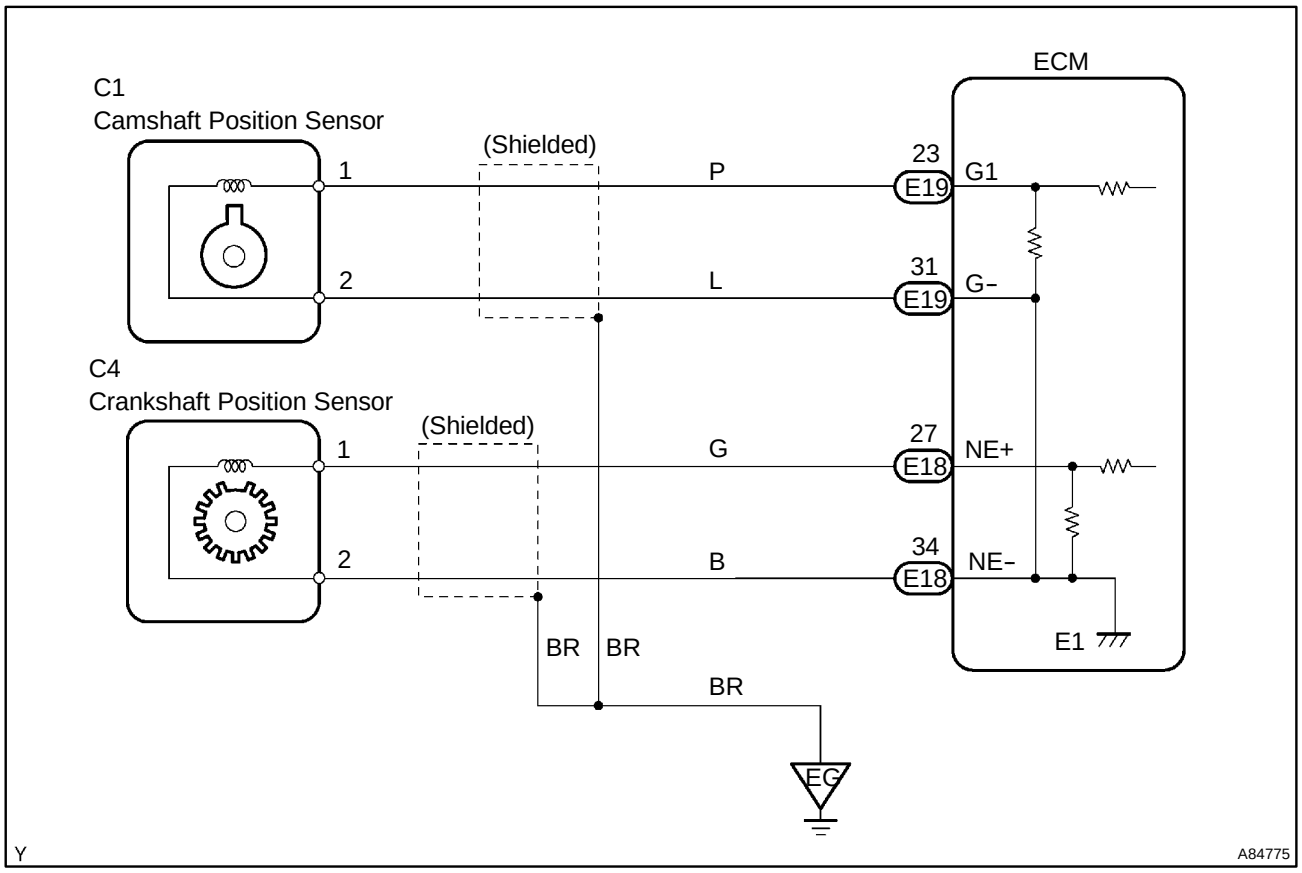
DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	$ Open or short in crankshaft position sensor circuit $ Crankshaft position sensor $ Signal plate (crankshaft timing pulley) $ ECM
	No crankshaft position sensor signal to ECM with engine speed 650 rpm or more (2 trip detection logic)	
P0339	In conditions (a), (b) and (c), no crankshaft position sensor (NE) signal is for 0.05 second or more (1 trip detection logic) (a) Engine revolution 1,000 rpm or more (b) STA signal is OFF (c) 3 seconds or more has lapsed after STA signal is switched from ON to OFF	



Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Tester Connection	Specified Condition
NE+ (E18-27) - NE- (E18-34)	Correct waveform is as shown

WIRING DIAGRAM



INSPECTION PROCEDURE

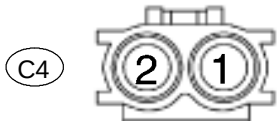
HINT:

- Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT CRANKSHAFT POSITION SENSOR(RESISTANCE)

Component Side:

Crankshaft Position Sensor



A78431

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

(c) Reconnect the crankshaft position sensor connector.

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR - ECM)

Wire Harness Side:

Crankshaft Position Sensor Connector



Front View

A76790

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

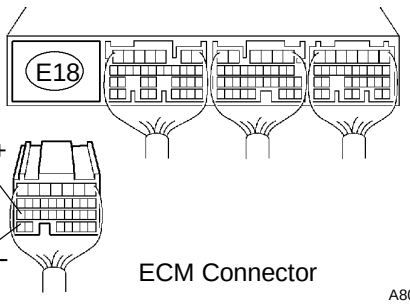
Standard (Check for open):

Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) - NE+ (E18-27)	Below 1 Ω
Crankshaft position sensor (C4-2) - NE- (E18-34)	

Standard (Check for short):

Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) or NE+ (E18-27) - Body ground	10 kΩ or higher
Crankshaft position sensor (C4-2) or NE- (E18-34) - Body ground	

(d) Reconnect the crankshaft position sensor connector.
(e) Reconnect the ECM connector.



ECM Connector

A80459

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

OK

3 CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT TIMING PULLEY))

(a) Check the teeth of the sensor plate.

NG → REPLACE CRANKSHAFT POSITION SENSOR PLATE (CAMSHAFT TIMING PULLEY)

OK

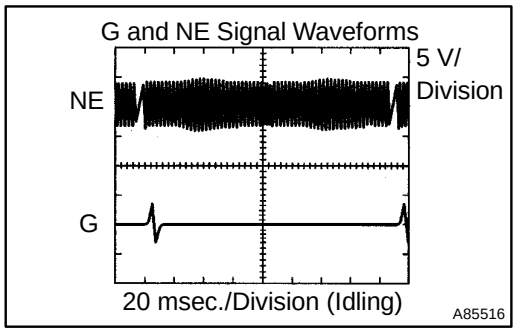
REPLACE ECM (See page 10-8)

DTC	P0340	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM
	No camshaft position sensor signal to ECM with engine speed 650 rpm or more (1 trip detection logic)	



Reference: Inspection using the oscilloscope.
During idling the correct waveform is as shown in the diagram on the left.

Tester Connection	Specified Condition
G1 (E19–23) – G– (E19–31)	Correct waveform is as shown

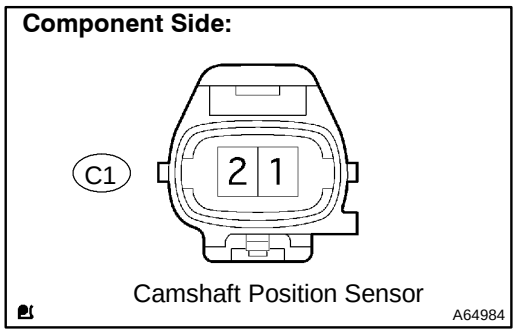
WIRING DIAGRAM

Refer to DTC P0335 on page 05–109.

INSPECTION PROCEDURE

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

1 INSPECT CAMSHAFT POSITION SENSOR



(a) Disconnect the C1 camshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	835 to 1,400 Ω at cold
	1,060 to 1,645 Ω at hot

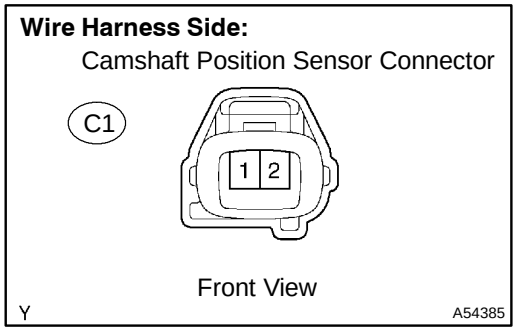
NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

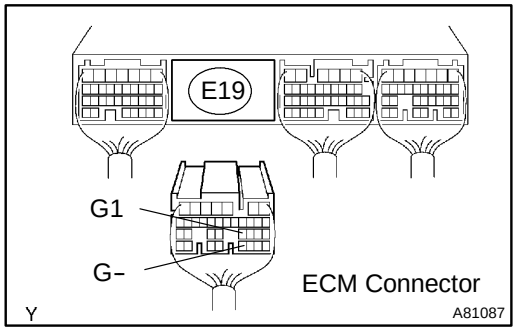
(c) Reconnect the camshaft position sensor.

NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR - ECM)





(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Camshaft position sensor (C1-1) - G1 (E19-23)	Below 1 Ω
Camshaft position sensor (C1-2) - G- (E19-31)	

Standard (Check for short):

Tester Connection	Specified Condition
Camshaft position sensor (C1-1) or G1 (E19-23) - Body ground	10 kΩ or higher
Camshaft position sensor (C1-2) or G- (E19-31) - Body ground	

(d) Reconnect the camshaft position sensor connector.
(e) Reconnect the ECM connector.

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

OK

3	CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

NG → TIGHTEN SENSOR

OK

4	CHECK CAMSHAFT TIMING PULLEY(TEETH OF PLATE)

(a) Check the teeth of the signal plate.

NG → REPLACE CAMSHAFT TIMING PULLEY

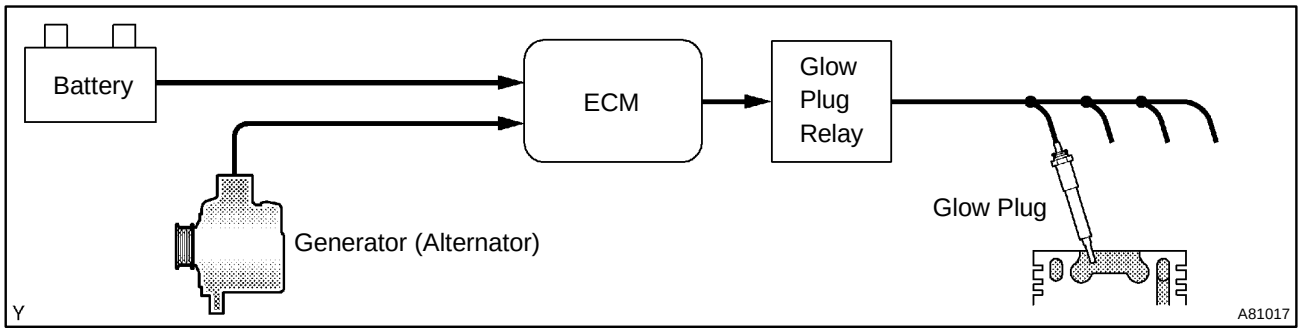
OK

REPLACE ECM (See page 10-8)

DTC	P0380	GLOW PLUG/HEATER CIRCUIT "A"

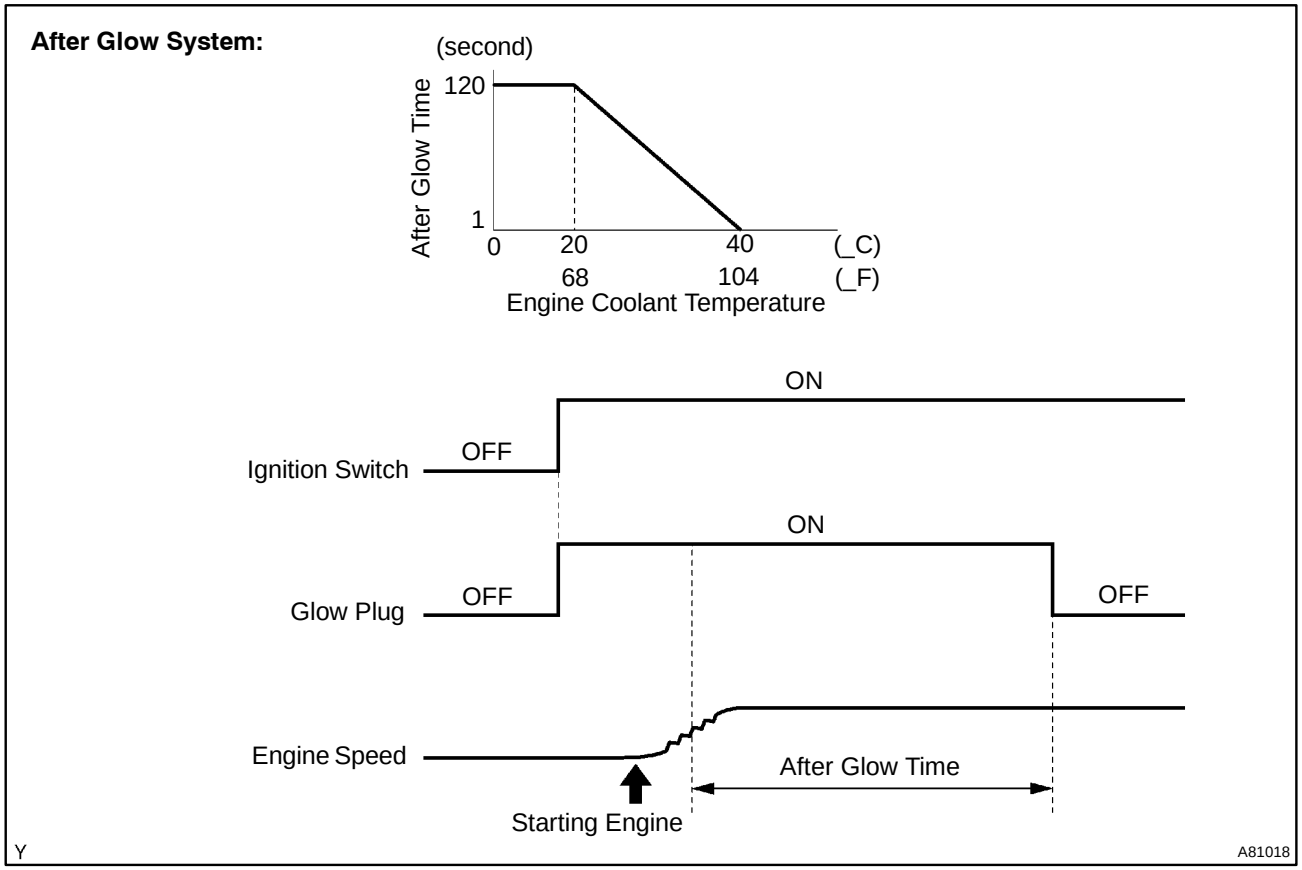
CIRCUIT DESCRIPTION

The glow plug is mounted inside the engine combustion chamber. To ensure the efficient engine starting with a cold engine, the ECM calculates a time interval of the current needs to flow through the glow plug depending on the starting engine coolant temperature when the ignition switch is turned 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.
This DTC will be set if there is open in glow plug itself or its circuit.



After the engine is started, the ECM performs an "after-glow" for a certain period of time. In proportion as the actual engine coolant temperature, the time period varies. The after-grow reduces diesel engine knocking, white smoke and engine noises with a cold engine.

After Glow System:



DTC No.	DTC Detection Condition	Trouble Area
P0380	When the glow plug is turned from ON to OFF, or vice versa, conditions (a) and (b) are satisfied: (2 trip detection logic) (a) Battery voltage does not change (b) Duty signal from terminal M of the generator (alternator) does not change	$ Open or short in glow plug circuit $ Glow fuse $ Glow plug relay $ Glow plug $ ECM

MONITOR DESCRIPTION

When starting a cold engine, the ECM supplies the current to the glow plug for a certain period of time. As supplying the current to the glow plug is terminated, the large current is suddenly cut off, therefore the battery voltage then varies and also the output (duty ratio) from terminal M of the generator (alternator) varies. If these variations are not occurred when the glow plug is turned from ON to OFF, or vice versa, the ECM judges the current has not been supplied to the glow plug, and interprets this as open malfunction of the glow plug or glow plug circuit.

MONITOR STRATEGY

Required Sensors	Glow plug circuit
Frequency of operation	Twice per driving cycle
Duration	3 minutes
CHK ENG Operation	2 driving cycles

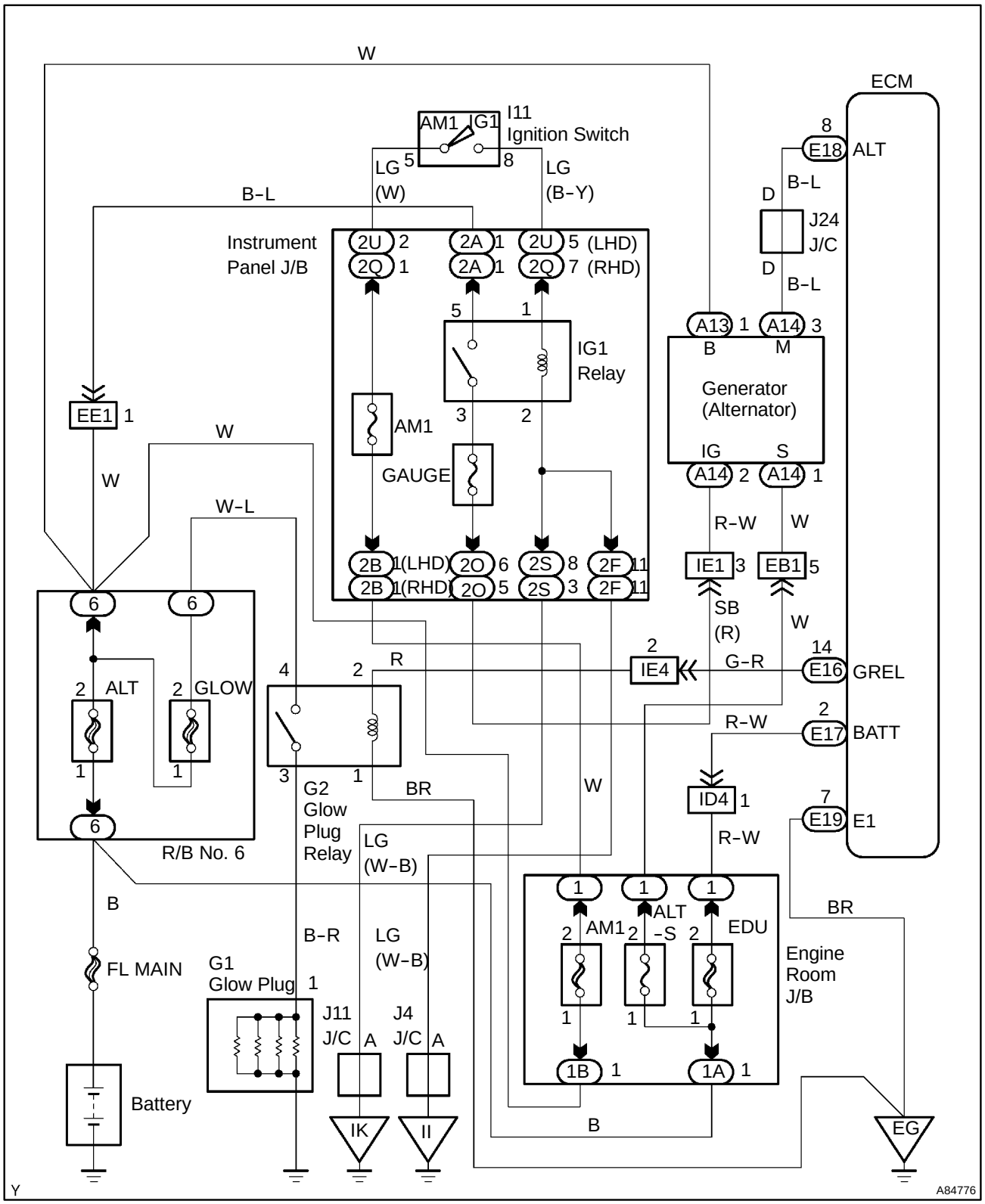
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	-
Engine speed	700 rpm	2,000 rpm
Engine coolant temperature	-	40_C (104_F)
Engine speed is stable	-	
Time after engine start	8 seconds	-
Any switches that vary electrical load have not been being operated	-	
The monitor will not run if the generator (alternator) circuit is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
When the battery voltage, or output (duty ratio) from terminal M of the generator (alternator) does not change, despite the ECM turning the glow plug from ON to OFF, or vice versa

WIRING DIAGRAM

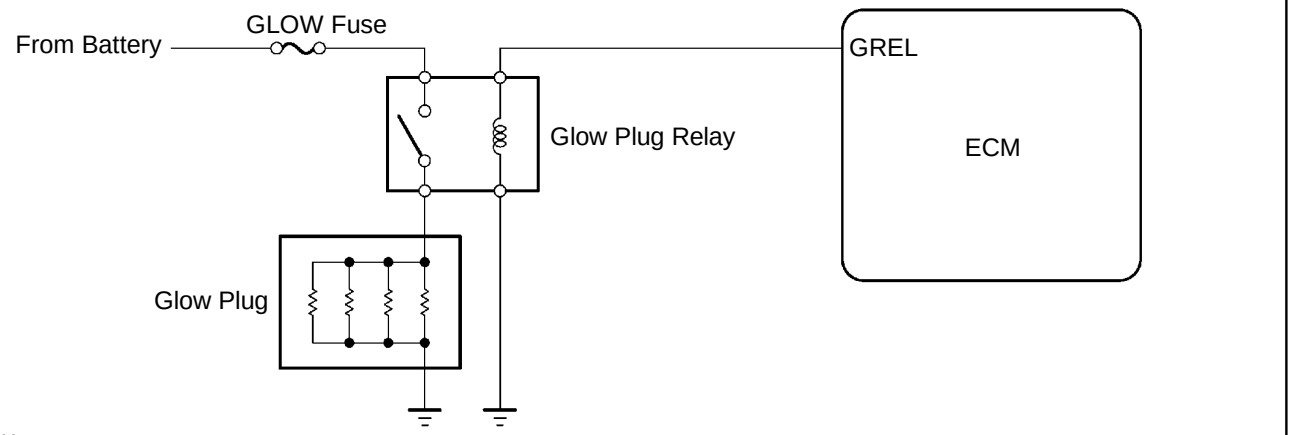


INSPECTION PROCEDURE

HINT:

- After completing repair, confirm that P0380 is not present again.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

Glow System Wiring Diagram:



1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0380)

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0380	A
P0380 and P0622	B

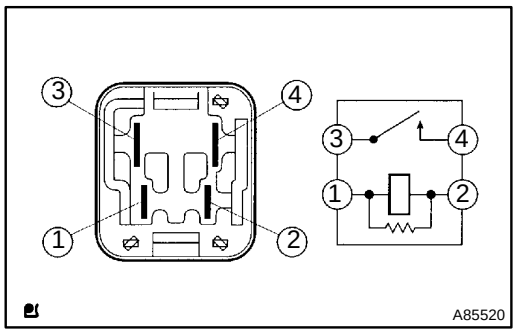
HINT:

If any other codes besides P0380 and P0622 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05–35)**

A

2 INSPECT GLOW PLUG RELAY ASSY



(a) Remove the glow plug relay.
(b) Check for continuity in the glow plug relay.
(1) Check that there is continuity between and terminal.
Standard:

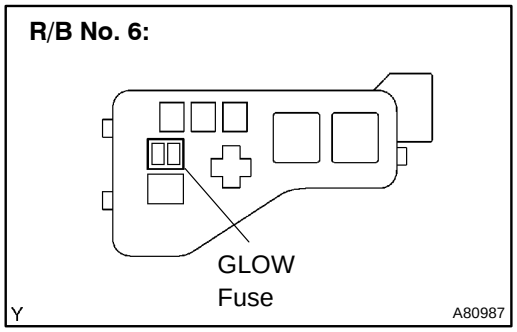
Tester Connection	Specified Condition
3 - 4	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)
1 - 2	Continuity

(c) Reinstall the glow plug relay.

NG → **REPLACE GLOW PLUG RELAY ASSY**

OK

3 INSPECT FUSE(GLOW FUSE)

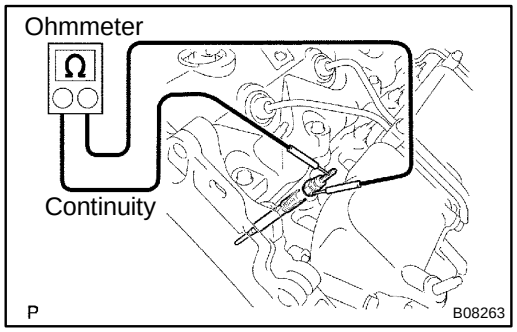


(a) Remove the GLOW fuse from the R/B No. 6.
(b) Check for continuity in the GLOW fuse.
Standard: Continuity
(c) Reinstall the GLOW fuse.

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT GLOW PLUG ASSY



(a) Disconnect the glow plug wire.
(b) Measure the resistance in the glow plug.
Standard:

Tester Connection	Specified Condition
Glow plug terminal - Body ground	Approximately 1.1 Ω at 20_C (68_F)

NOTICE:

- **Exercise extreme care not to damage the glow plug pipes. Damaging them could cause an open circuit, or shorten the life of the glow plugs.**
- **Keep the glow plug free of oil and fuel while cleaning.**
- **Wipe any oil off the terminal and Bakelite washer with a clean-dry cloth during inspection.**
- **Do not apply more than 11 V to the glow plug as it could cause an open circuit.**

(c) Reconnect the glow plug wire.

NG → REPLACE GLOW PLUG ASSY (See page 19-4)

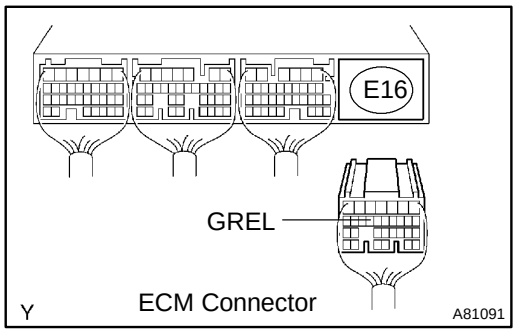
OK

5 INSPECT GLOW PLUG ASSY(INSTALLATION)

NG → TIGHTEN GLOW PLUG

OK

6 CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY - ECM, AND GLOW PLUG RELAY - BODY GROUND)



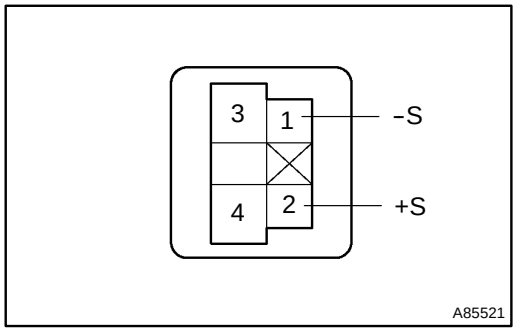
(a) Disconnect the E16 ECM connector.
(b) Remove the glow plug relay.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
+S (Glow plug relay terminal 2) - GREL (E16-14)	Below 1 Ω
-S (Glow plug relay terminal 1) - Body ground	

Standard (Check for short):

Tester Connection	Specified Condition
GREL (E16-14) - Body ground	10 kΩ or higher

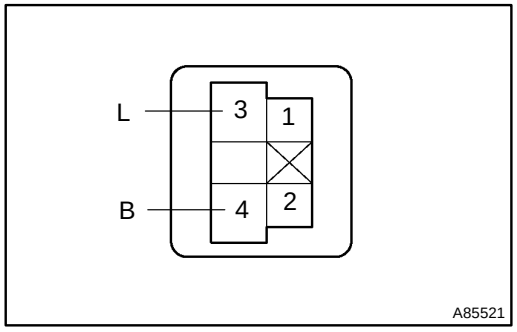


(d) Reconnect the ECM connector.
(e) Reinstall the glow plug relay.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7 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 between the wire harness.

Standard (Check for open):

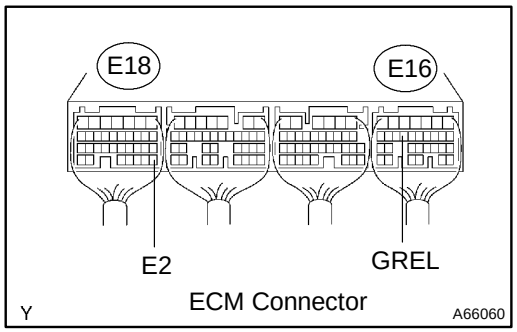
Tester Connection	Specified Condition
L (Glow plug relay terminal 3) - Glow plug wire	Below 1 Ω
B (Glow plug relay terminal 4) - Positive terminal of the battery	

(d) Reinstall the glow plug relay.
(e) Reconnect the glow plug wire.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8 INSPECT ECM(GREL VOLTAGE)



(a) Turn the ignition switch START.
(b) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.

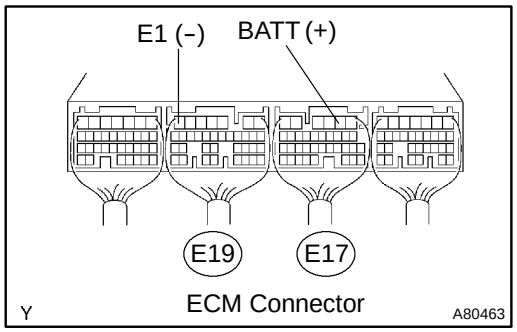
Standard:

Tester Connection	Condition	Specified Condition
GREL (E16-14) - E2 (E18-28)	Engine coolant temperature is 40_C (104_F) or less	9 to 14 V

NG → REPLACE ECM (See page 10-8)

OK

9 INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E17 and E19 ECM connectors.

Standard:

Tester Connection	Specified Condition
BATT (E17-2) - E1 (E19-7)	9 to 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY - ECM)

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

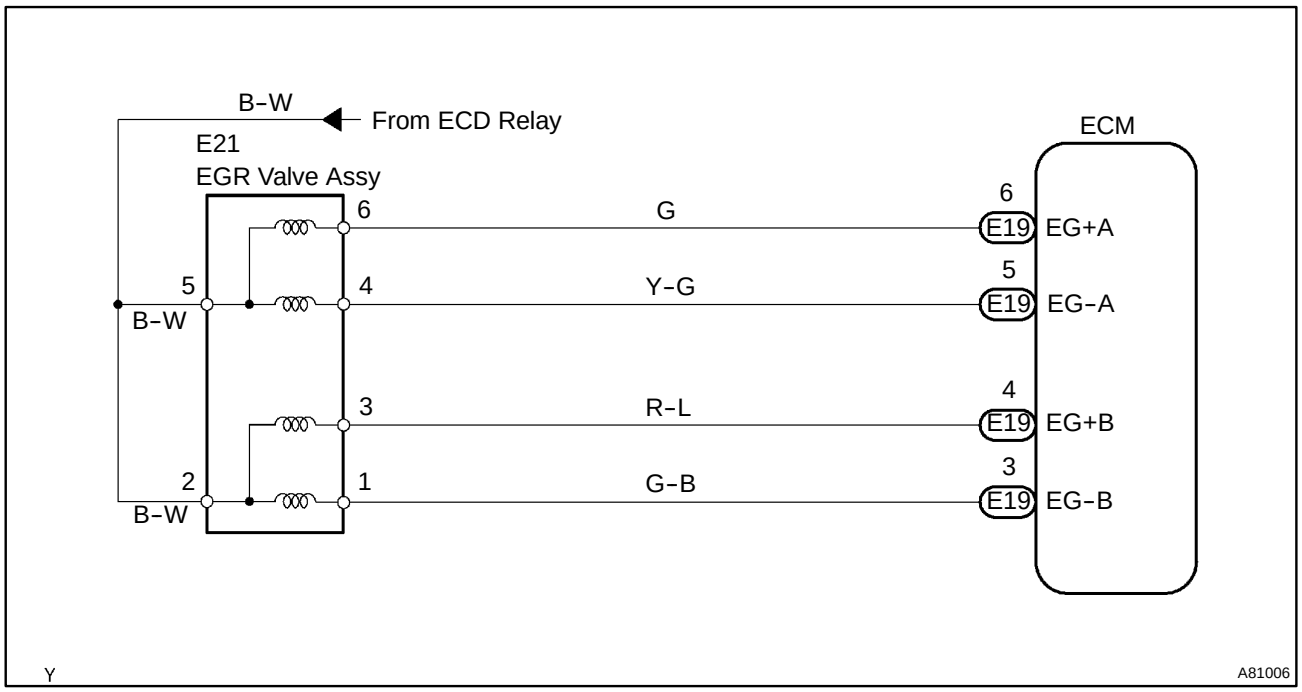
DTC	P0400	EXHAUST GAS RECIRCULATION FLOW

DTC	P0403	EXHAUST GAS RECIRCULATION CONTROL CIRCUIT

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0400	Mass air flow rate is not changed when turning on EGR valve	$ EGR valve assy $ Open or short in EGR circuit $ EGR passage $ ECM
P0403	EGR valve assy motor malfunction	

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO P0400 AND/OR P0403)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed
P0400 and/or P0403	A
P0400 and/or P0403 and other DTCs	B

HINT:
If any other codes besides P0400 and/or P0403 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-35)**

A

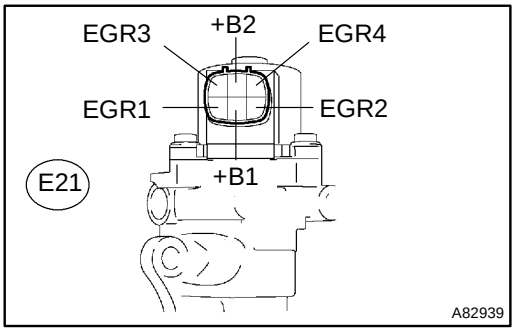
2	READ VALUE OF HAND-HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Warm up the engine, the engine coolant temperature should be between 75_C (167_F) and 90_C (194_F).
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF".
(f) Check the MAF reading during idling.
Standard: MAF greater than 4 g/s but less than 16 g/s
(g) Force the EGR valve to operate with a hand-held tester, make the valve opening 0, and check the AFM reading during idling.
Standard: MAF greater than 10 g/s but less than 16 g/s

NG → **REPLACE EGR VALVE ASSY (See page 14-24)**

OK

3	INSPECT EGR VALVE ASSY



(a) Disconnect the E21 EGR valve connector.
(b) Measure the resistance between the specified terminals.
Resistance:

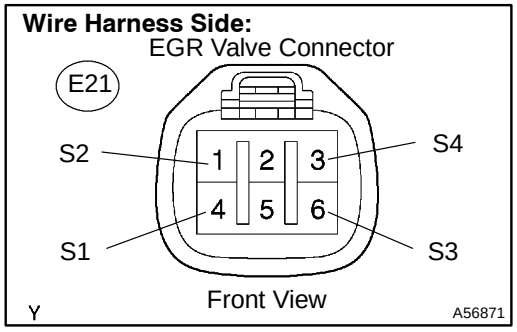
Tester Connection	Specified Condition
+B1 - EGR1	19.6 ± 1.4 Ω
+B1 - EGR2	19.6 ± 1.4 Ω
+B2 - EGR3	19.6 ± 1.4 Ω
+B2 - EGR4	19.6 ± 1.4 Ω

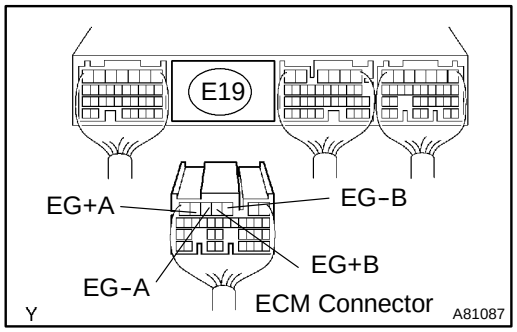
(c) Reconnect the EGR valve connector.

NG	REPLACE EGR VALVE ASSY (See page 14-24)

OK

4	CHECK HARNESS AND CONNECTOR(EGR VALVE ASSY - ECM)





(a) Disconnect the E21 EGR valve connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EG+A (E19-6) - S3 (E21-6)	Below 1 Ω
EG-A (E19-5) - S1 (E21-4)	
EG+B (E19-4) - S4 (E21-3)	
EG-B (E19-3) - S2 (E21-1)	

Standard (Check for short):

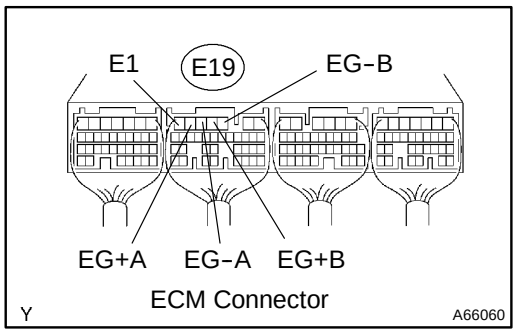
Tester Connection	Specified Condition
EG+A (E19-6) or S3 (E21-6) - Body ground	10 kΩ or higher
EG-A (E19-5) or S1 (E21-4) - Body ground	
EG+B (E19-4) or S4 (E21-3) - Body ground	
EG-B (E19-3) or S2 (E21-1) - Body ground	

(d) Reconnect the EGR valve connector.
(e) Reconnect the ECM connector.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

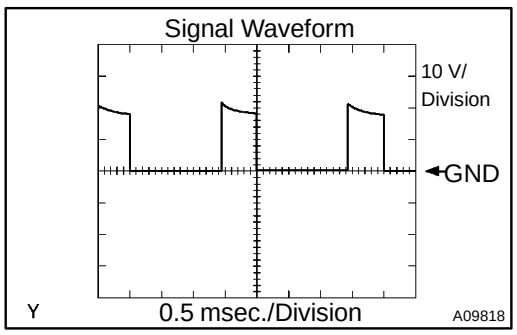
5	INSPECT ECM(EGR VALVE ASSY VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E19 ECM connector.

Standard:

Tester Connection	Specified Condition
EG+A (E19-6) - E1 (E19-7)	Correct waveform is as shown
EG-A (E19-5) - E1 (E19-7)	
EG+B (E19-4) - E1 (E19-7)	
EG-B (E19-3) - E1 (E19-7)	



NG → **REPLACE ECM (See page 10-8)**

OK

6	CHECK FOR DEPOSIT(EGR VALVE ASSY)

NG → **REMOVE FOREIGN OBJECT AND CLEAN EGR VALVE**

OK

7	CHECK FOR DEPOSIT(EGR PASSAGE)

NG → **REPAIR OR REPLACE**

OK

8	CHECK FOR EXHAUST GAS LEAKS

NG → **REPAIR EXHAUST GAS LEAKAGE POINT**

OK

REPLACE ECM (See page 10-8)

DTC	P0488	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL RANGE/PERFORMANCE

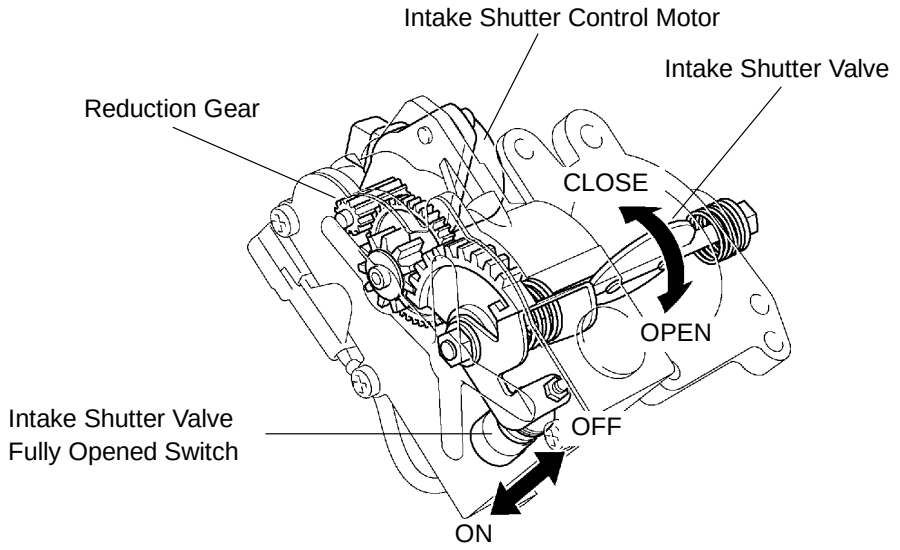
CIRCUIT DESCRIPTION

The ECM opens and closes the intake shutter valve using the step motor. Upon opening and closing the valve, the exhaust gas recirculation volume is properly controlled. Also, the engine vibration and noise will be reduced by closing the valve when the engine is stopped.

HINT:

The ECM detects fully open position of the intake shutter valve by the intake shutter valve fully opened switch which is mounted on the intake shutter.

Intake Shutter Internal Structure:



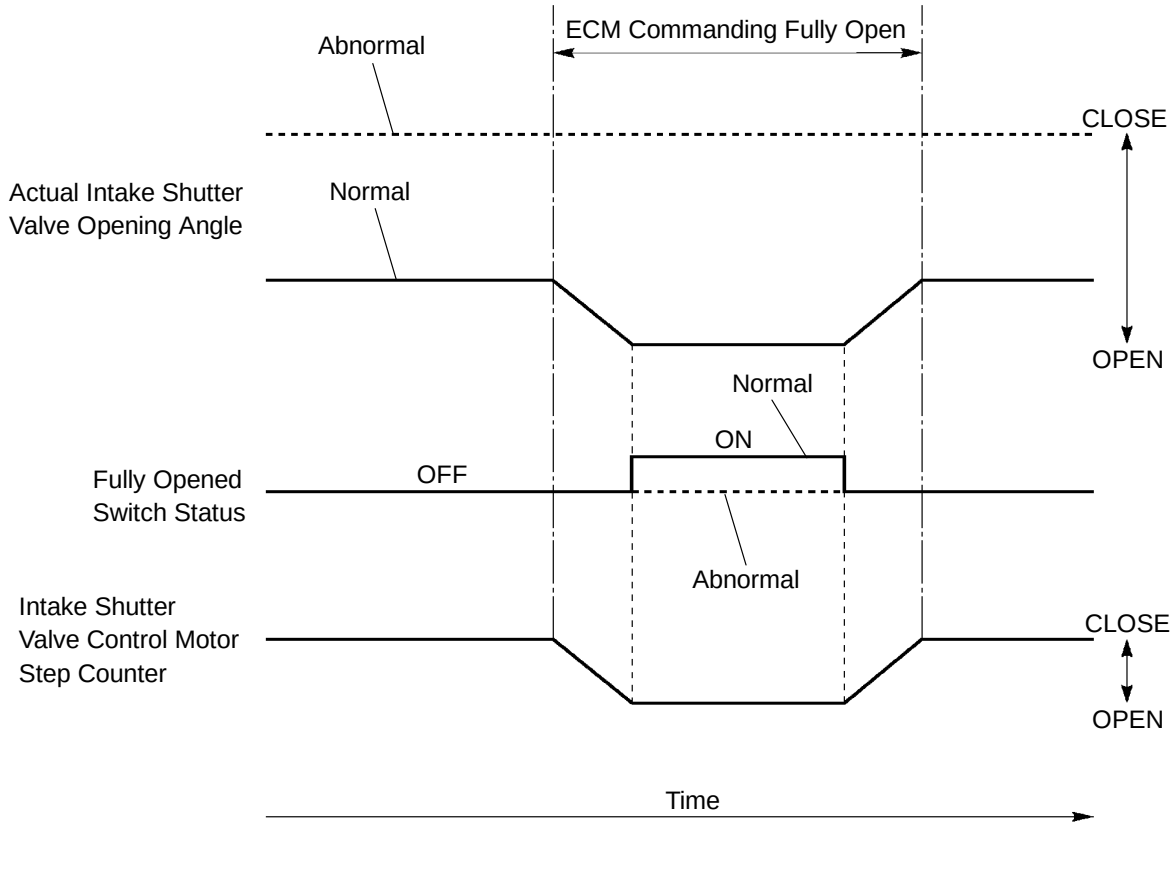
A81482

DTC No.	DTC Detection Condition	Trouble Area
P0488	Intake shutter valve fully opened switch is not turned on, despite commanding the intake shutter valve to fully open (1 trip detection logic)	S Open or short in intake shutter circuit S Open or short in fully opened switch circuit S Intake shutter S ECM

MONITOR DESCRIPTION

This DTC will be set if the actual opening angle of the intake shutter valve varies from the target opening angle. The ECM forces the valve to fully open within 2 to 3 seconds as the ignition switch is turned ON, and then checks if the intake shutter valve fully opened switch is turned on. In addition, the ECM also forces the valve to fully open when accelerating the engine (high engine load) and checks if the switch is turned ON. When starting and/or accelerating the engine, the ECM sets this DTC if the switch is not turned ON.
If the DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

Malfunction Detection:



Y A81510

MONITOR STRATEGY

Required Sensors	Intake shutter valve fully opened switch
Frequency of operation	Continuous
Duration	3 seconds
CHK ENG Operation	1 driving cycle

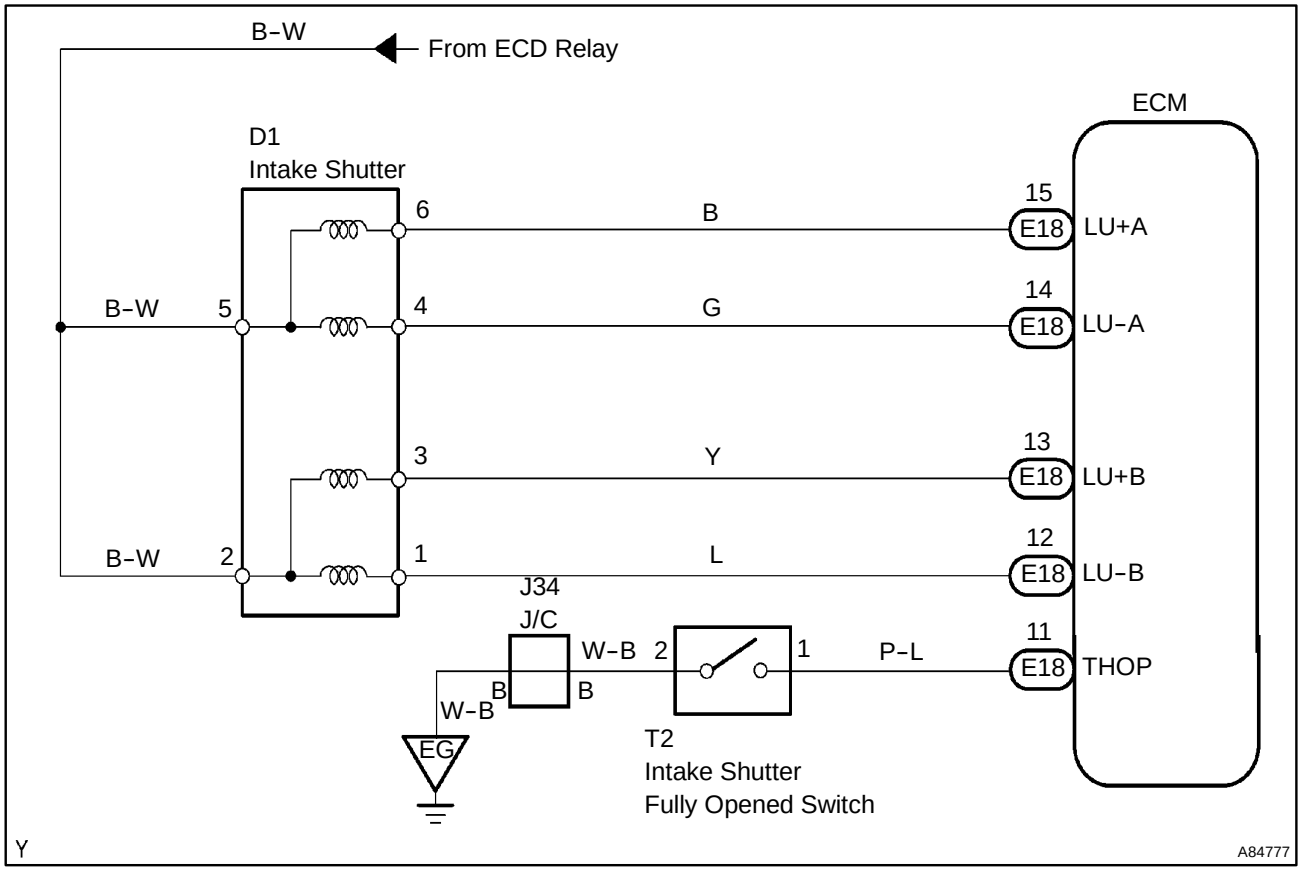
TYPICAL ENABLING CONDITIONS

Specification
Start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than half angle

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Intake shutter valve fully opened switch is not turned ON, despite the ECM commanding the intake shutter valve to open fully

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INTAKE SHUTTER ASSY

(a) Visually check that the intake shutter valve moves within approximately 2 to 3 seconds after the ignition switch is turned ON.

Result:

Intake Shutter	Proceed to
Does not move	A
Smoothly move to full-open position	B

B → **Go to step 6**

A

2 CHECK INTAKE SHUTTER ASSY

(a) Check if the intake shutter valve moves as the lever is rotated by hand.
Result:

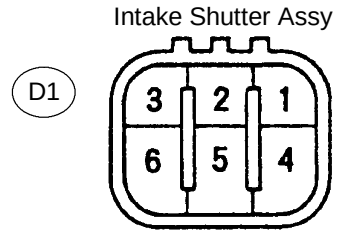
Intake Shutter	Proceed to
Smoothly moved	A
Difficult to move smoothly	B

B → **REPLACE INTAKE SHUTTER ASSY**

A

3 INSPECT INTAKE SHUTTER ASSY

Component Side:



(a) Disconnect the D1 intake shutter assy connector.
(b) Measure the resistance between the terminals of the intake shutter.
Standard:

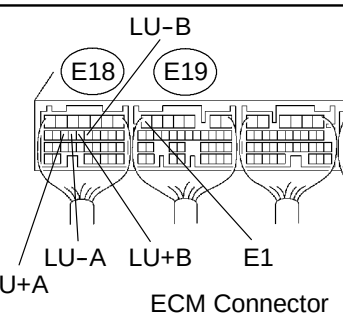
Tester Connection	Temperature	Specified Condition
1 - 2	at 20_C (68_F)	18 to 22 Ω
2 - 3		
4 - 5		
5 - 6		

(c) Reconnect the intake shutter assy connector.

NG → **REPLACE INTAKE SHUTTER ASSY**

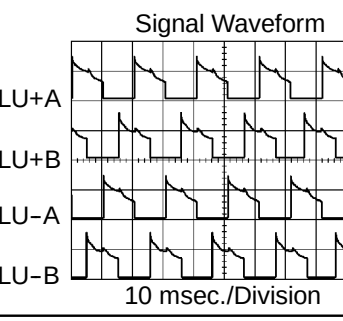
OK

4 INSPECT ECM(LU VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During racing, check the waveform between the specified terminals of the E18 and E19 ECM connectors.
Standard:

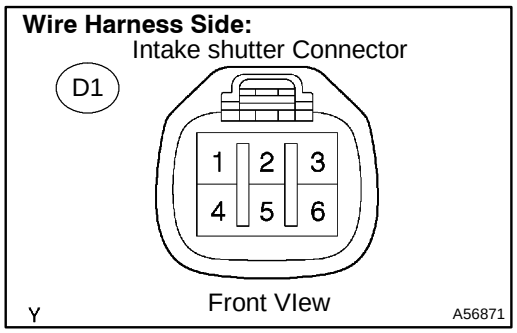
Tester Connection	Specified Condition
LU+A (E18-15) - E1 (E19-7)	Correct waveform is as shown
LU-A (E18-14) - E1 (E19-7)	
LU+B (E18-13) - E1 (E19-7)	
LU-B (E18-12) - E1 (E19-7)	

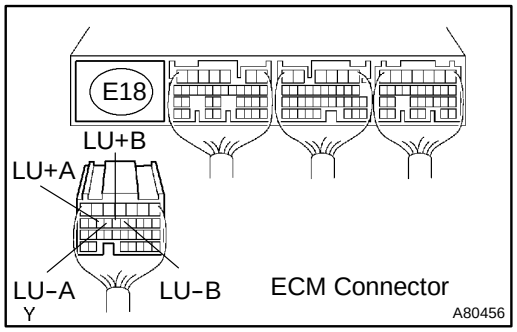


OK	Go to step 6

NG

5 CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER ASSY - ECM)





(a) Disconnect the D1 intake shutter connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
LU+A (E18-15) - Intake shutter (D1-6)	Below 1 Ω
LU-A (E18-14) - Intake shutter (D1-4)	
LU+B (E18-13) - Intake shutter (D1-3)	
LU-B (E18-12) - Intake shutter (D1-1)	

Standard (Check for short):

Tester Connection	Specified Condition
LU+A (E18-15) or Intake shutter (D1-6) - Body ground	10 kΩ or higher
LU-A (E18-14) or Intake shutter (D1-4) - Body ground	
LU+B (E18-13) or Intake shutter (D1-3) - Body ground	
LU-B (E18-12) or Intake shutter (D1-1) - Body ground	

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

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Fully open the intake shutter valve by hand.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / ACCEL OPEN SW" and read its value displayed on the hand-held tester.

Result:

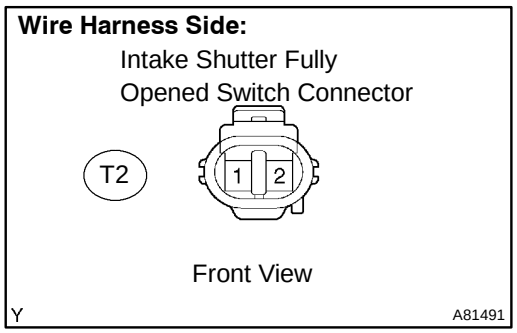
Switch Condition Displayed	Proceed to
OFF	A
ON	B

B	CHECK IF DTC OUTPUT RECURS (DTC P0488 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds. Then, accelerate the vehicle to 60 km/h (37 mph) with the accelerator pedal opened more than half angle. Reconfirm that P0488 is not present.

A

7	CHECK HARNESS AND CONNECTOR(FULLY OPENED SWITCH - ECM)



(a) Disconnect T2 the intake shutter fully opened switch connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

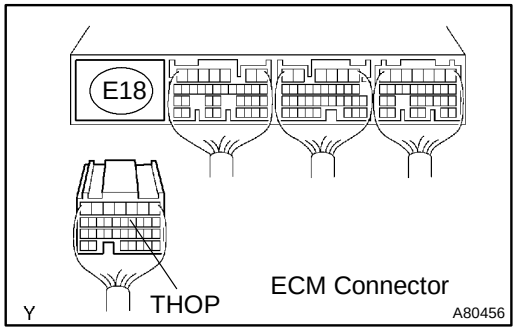
Standard (Check for open):

Tester Connection	Specified Condition
THOP (E18-11) - Intake shutter (T2-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
THOP (E18-11) or Intake shutter (T2-1) - Body ground	10 kΩ or higher

(d) Reconnect the intake shutter fully opened switch connection.
(e) Reconnect the ECM connector.



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

OK

CHECK IF DTC OUTPUT RECURS (DTC P0488 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds. Then, accelerate the vehicle to 60 km/h (37 mph) with the accelerator pedal opened more than half angle. Reconfirm that P0488 is not present.

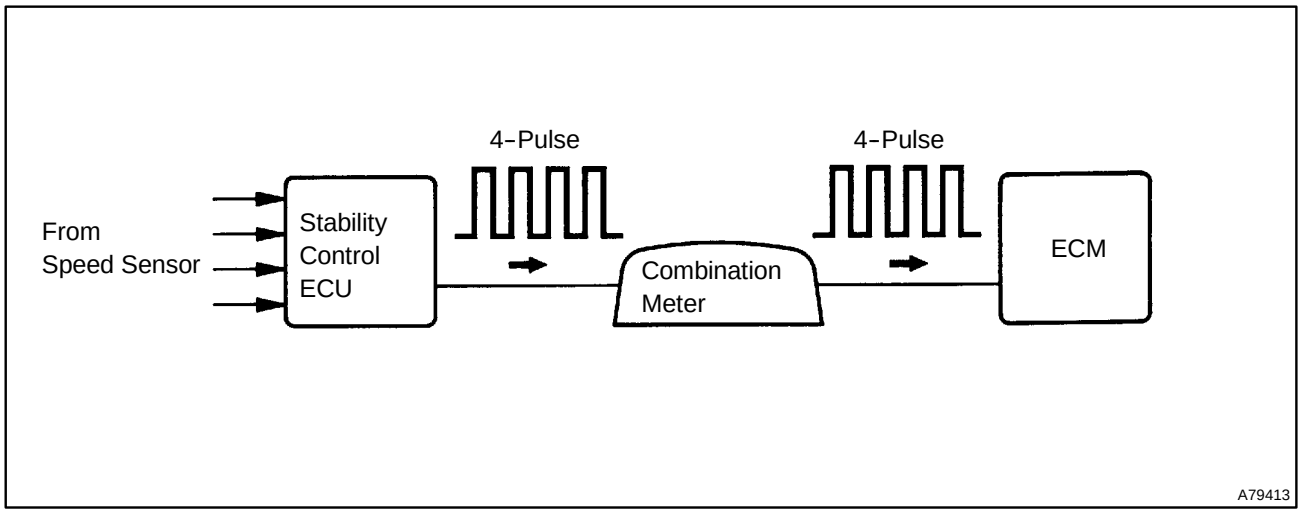
DTC	P0500	VEHICLE SPEED SENSOR "A"

CIRCUIT DESCRIPTION

The speed sensor for skid control ECU detects the wheel speed and sends the appropriate signals to the stability control ECU.

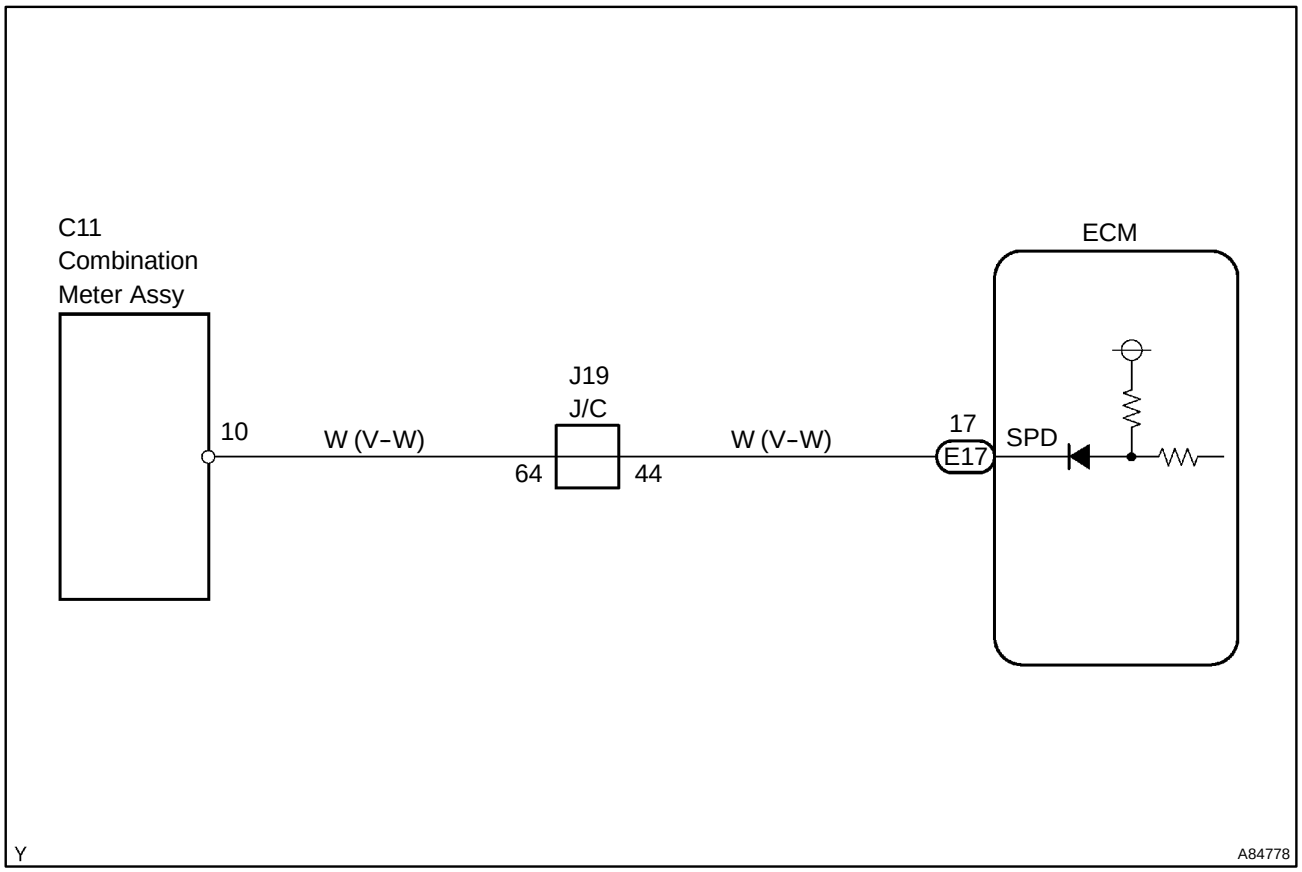
The stability control ECU converts these signals into a 4-pulse signal and outputs it to the combination meter.

After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detection Condition	Trouble Area
P0500	Conditions (a) and (c) continue for 7 seconds or more: (2 trip detection logic) (a) Engine coolant temperature is less than 70_C (158_F) (b) Engine speed is between 2,000 and 3,500 rpm (c) Speed signal is not entering to ECM	$ Open or short in speed sensor circuit $ Speed sensor $ Combination meter $ ECM $ Stability control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

1	CHECK OPERATION OF SPEEDOMETER

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

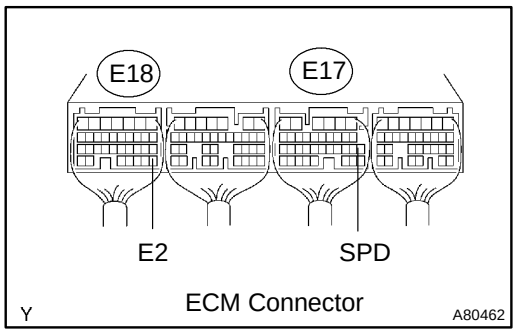
HINT:

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

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05-1298 of Pub. No. RM925E COROLLA)**

OK

2	INSPECT ECM(SP1 VOLTAGE)

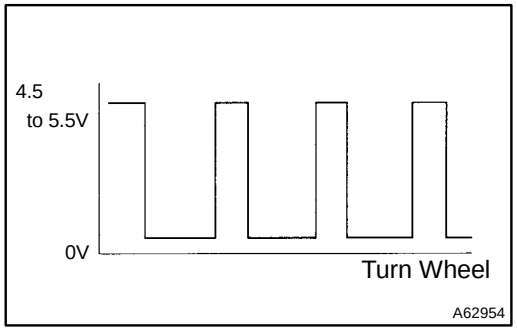


(a) Shift the transmission to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Check the voltage between the specified terminals of the E17 and E18 ECM connectors as the wheel is turned slowly.

Standard:

Tester Connection	Specified Condition
SPD (E17-17) - E2 (E18-28)	Generated intermittently

HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



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

OK

REPLACE ECM (See page 10-8)

DTC	P0504	BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop lamp switch is used to judge whether the brake system is abnormal or not.

The stop lamp switch has a duplex system (signals STP and ST1-) to detect the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

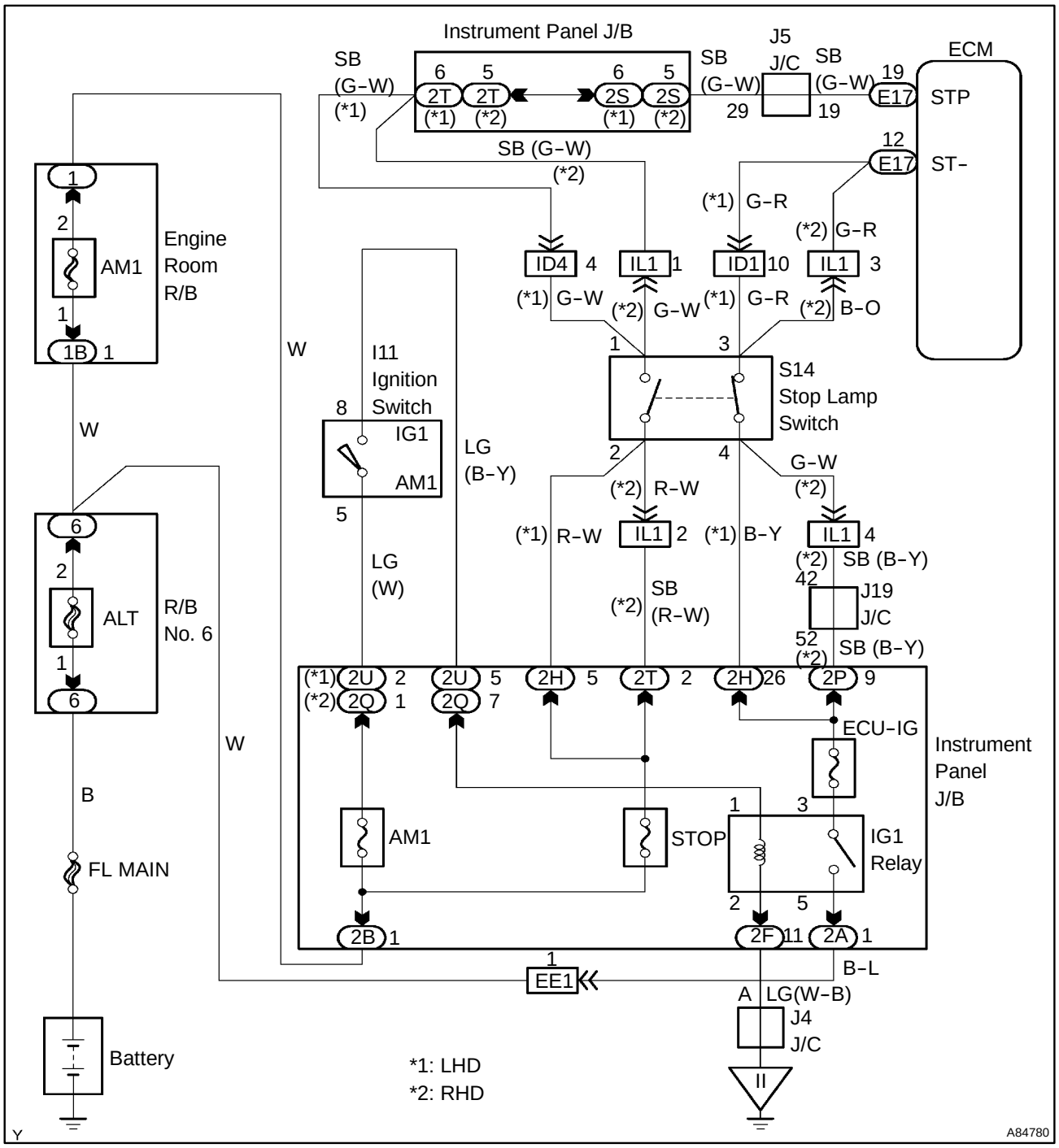
HINT:

Normal condition is as shown in the table below.

Signal	Brake Pedal Released	In Transition	Brake Pedal Depressed
STP	OFF	ON	ON
ST1-	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 second or more: (1 trip detection logic) (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1- signal is OFF	$ Short in stop lamp switch signal circuit $ Stop lamp switch $ ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

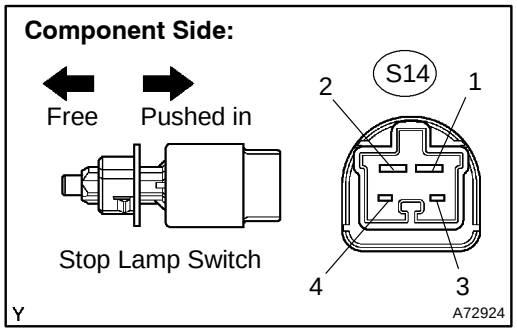
1 CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → **REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT**

OK

2 INSPECT STOP LAMP SWITCH ASSY



(a) Remove the S14 stop lamp switch.

(b) Check for continuity between each pair of the terminals.

Standard:

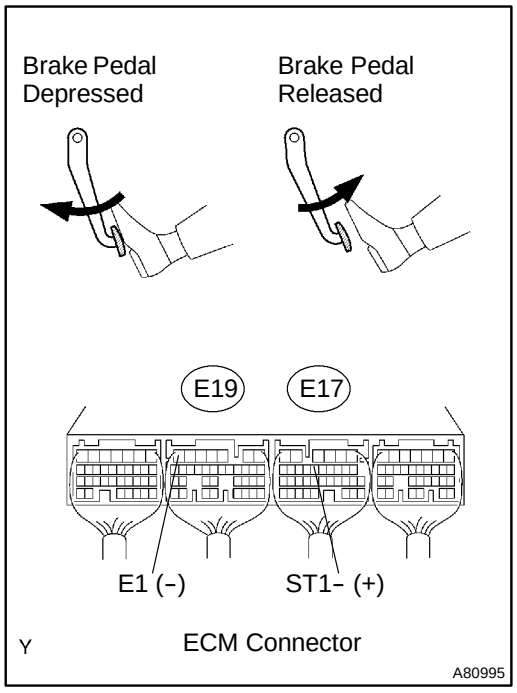
Switch Position	Tester Connection	Specified Condition
Switch pin free	1 - 2	Continuity
	3 - 4	No continuity
Switch pin pushed in	1 - 2	No continuity
	3 - 4	Continuity

(c) Reinstall the stop lamp switch.

NG → **REPLACE STOP LAMP SWITCH ASSY**

OK

3 READ VALUE OF HAND-HELD TESTER(STP SIGNAL AND ST1- VOLTAGE)



(a) Turn the ignition switch ON.

(b) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW" and read its value displayed on the hand-held tester.

Standard:

Brake Pedal	Specified Condition
Depressed	STP signal ON
Released	STP signal OFF

(c) Measure the voltage between the specified terminals of the E17 and E19 ECM connectors.

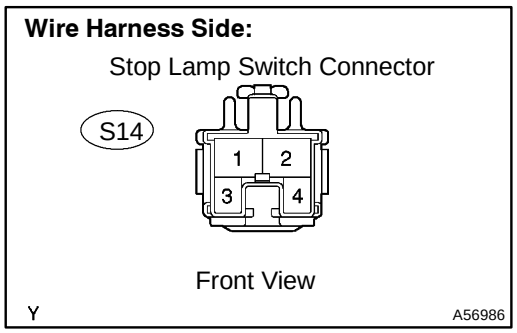
Standard:

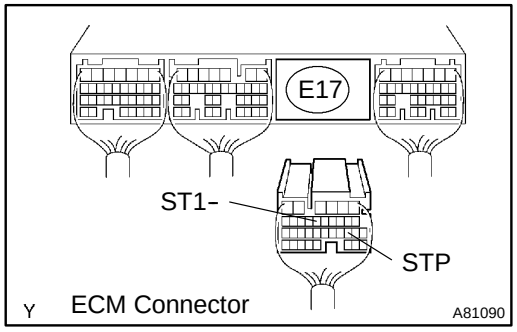
Tester Connection	Brake Pedal	Specified Condition
ST1- (E17-12) - E1 (E19-7)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)**

NG

4	CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH - ECM)





(a) Disconnect the S14 stop lamp switch connector.
(b) Disconnect the E17 ECM connector.
(c) Measure the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) - STP (E17-19)	Below 1 Ω
Stop lamp switch (S14-3) - ST1- (E17-12)	

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) or STP (E17-19) - Body ground	10 kΩ or higher
Stop lamp switch (S14-3) or ST1- (E17-12) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the stop lamp switch connector.

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

OK

REPLACE ECM (See page 10-8)

DTC P0560 SYSTEM VOLTAGE

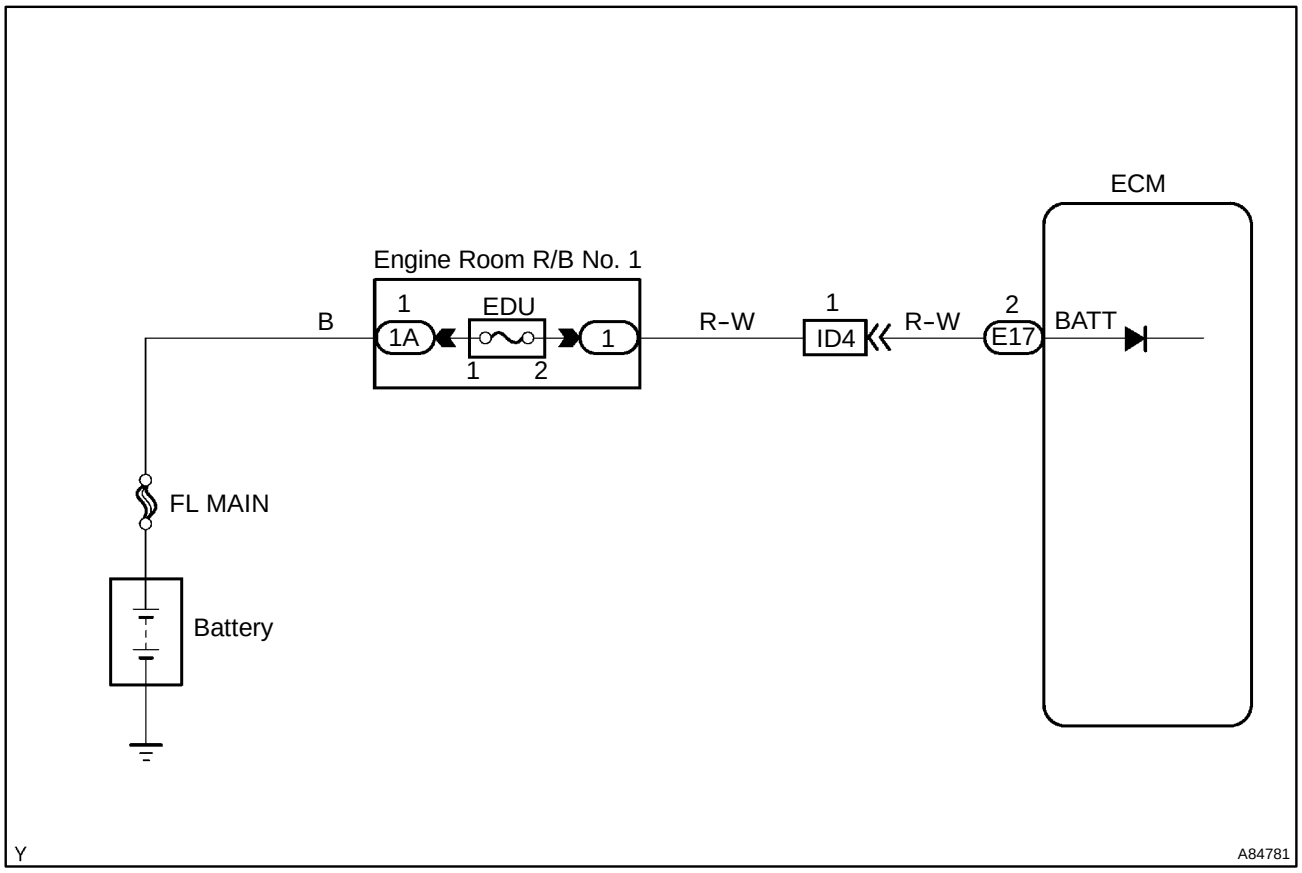
CIRCUIT DESCRIPTION

While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and fuel injection feedback learning valves.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back-up power source circuit (1 trip detection logic)	• Open in back-up power source circuit • ECM

HINT:
If DTC P0560 appears, the ECM does not store other DTCs.

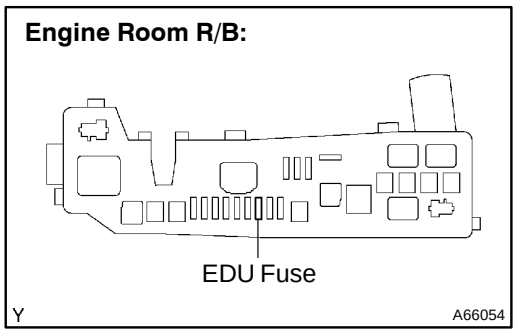
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK FUSE(EDU FUSE)

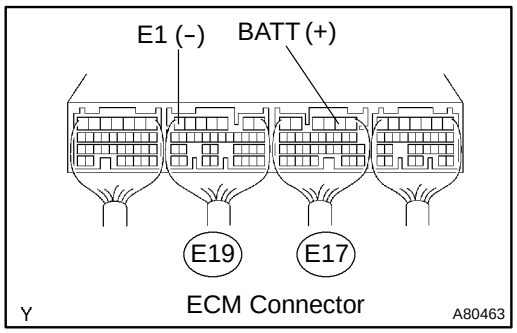


(a) Remove the EDU fuse from the engine room R/B.
(b) Check for continuity in the EDU fuse.
Standard: Continuity
(c) Reinstall the EDU fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



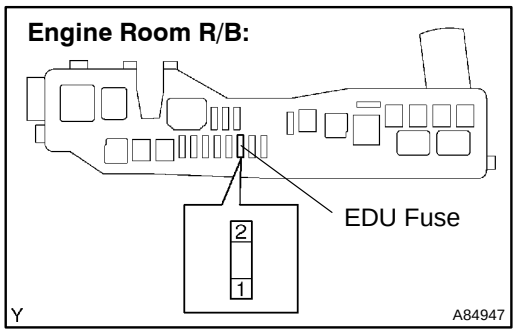
(a) Measure the voltage between the specified terminals of the E17 and E19 ECM connectors.
Standard:

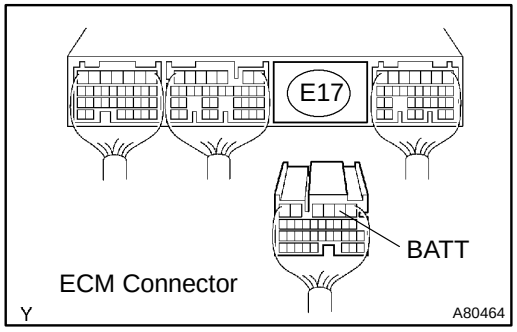
Tester Connection	Specified Condition
BATT (E17-2) - E1 (E19-7)	9 to 14 V

OK → **REPLACE ECM (See page 10-8)**

NG

3	CHECK HARNESS AND CONNECTOR(EDU FUSE - ECM, EDU FUSE - BATTERY)





(a) Check the harness and connector between the EDU fuse and ECM.
(1) Remove the EDU fuse from the engine room R/B.
(2) Disconnect the E17 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EDU fuse (2) - BATT (E17-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EDU fuse (2) or BATT (E17-2) - Body ground	10 kΩ or higher

(4) Reinstall the EDU fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EDU fuse and battery.
(1) Remove the EDU fuse from the engine room R/B.
(2) Disconnect the battery positive terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal - EDU fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or EDU fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the EDU fuse.
(5) Reconnect the battery positive terminal.

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

OK

REPLACE JUNCTION BLOCK

DTC	P0606	ECM/PCM PROCESSOR

DTC	P0607	CONTROL MODULE PERFORMANCE

DTC	P1611	IC CIRCUIT MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606	ECM internal error (1 trip detection logic)	$ECM
P0607		
P1611		

INSPECTION PROCEDURE

HINT:

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

REPLACE ECM (See page 10-8)

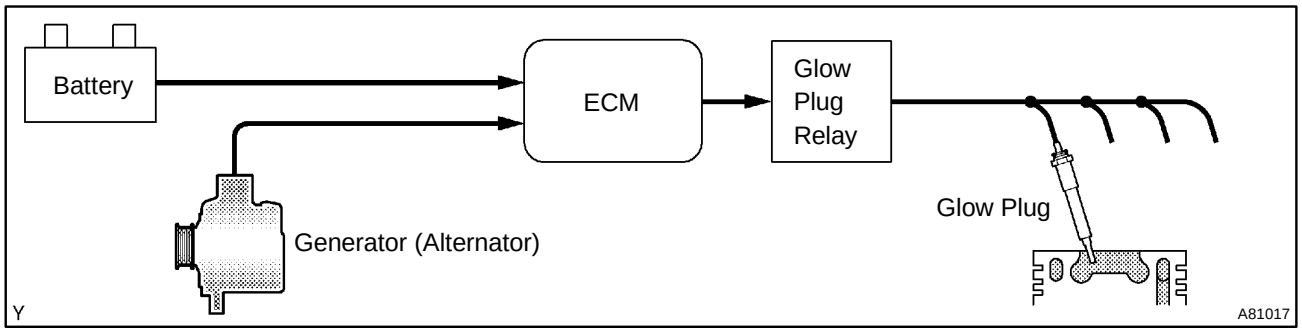
DTC P0622 GENERATOR FIELD "F" TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

While the generator (alternator) is generating the current, the duty signal is sent from terminal M of the generator to the ECM terminal ALT. This duty signal is used for detecting an open malfunction of the generator circuit and DTC P0380.

HINT:

DTC P0380 is prepared for indicating an open or short malfunction in the glow plug circuit. If this DTC is detected, inspect the glow plug circuit. (See Page 05-116)



DTC No.	DTC Detection Condition	Trouble Area
P0622	No duty signal from terminal M of the generator (alternator) at the engine running	$ Open in generator (alternator) circuit $ Generator (Alternator) $ Drive belt $ ECM

MONITOR DESCRIPTION

The ECM will detect a generator (alternator) failure or an open malfunction of the circuit, if the duty signal is not output from terminal M of the generator (alternator) despite running the engine.

MONITOR STRATEGY

Required Sensors	generator (alternator) circuit
Frequency of operation	Continuous
Duration	10 seconds
CHK ENG Operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	-
Engine speed	700 rpm	2,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Threshold
There is no signal output from terminal M of the generator (alternator)

WIRING DIAGRAM

Refer to DTC P0380 on page 05-116.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK IF CHARGE LAMP IS ILLUMINATED

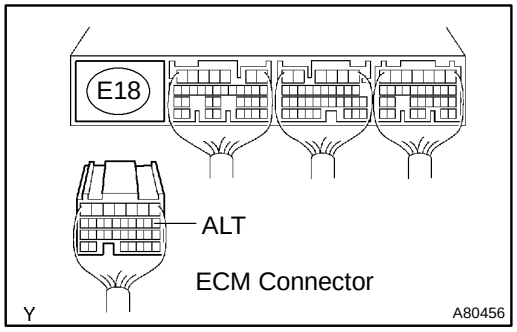
HINT:

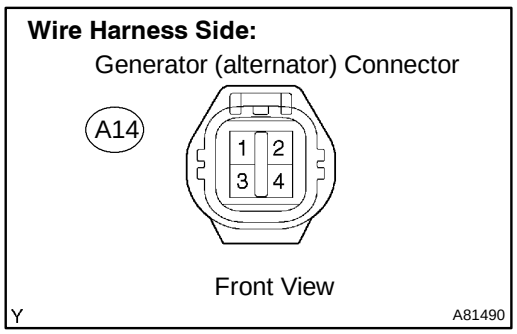
Run the engine at 2,000 rpm, and check if the charge lamp located in the combination meter remains illuminated.

YES → **Go to step 3**

NO

2	CHECK HARNESS AND CONNECTOR(GENERATOR - ECM)





(a) Disconnect the E18 ECM connector.
(b) Disconnect the A14 generator (alternator) connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
ALT (E18-8) - M (A14-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ALT (E18-8) or M (A14-3) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the generator (alternator) connector.

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

OK

3	INSPECT DRIVE BELT (See page 14-1)

NG → **REPAIR OR REPLACE DRIVE BELT (See page 14-4)**

OK

4	INSPECT CHARGING SYSTEM (See page 19-27 of Pub. No. RM925E COROLLA)

GO

CHECK IF DTC OUTPUT RECURS (DTC P0622 OUTPUT AGAIN)

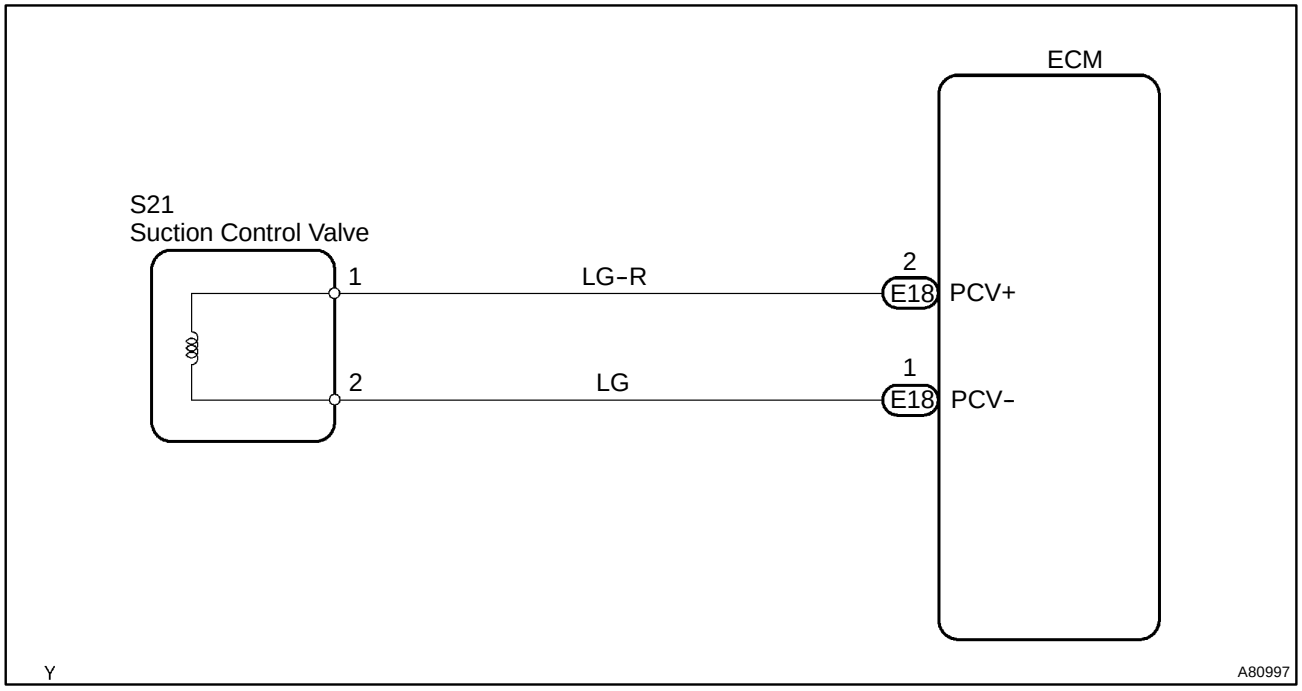
HINT:
After clearing the DTC, start the engine and let it idle for 10 seconds or more, and then confirm that P0622 is not present again.

DTC	P0627	FUEL PUMP CONTROL CIRCUIT / OPEN

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0627	Open or short in suction control valve circuit for more than 0.5 second (1 trip detection logic)	$ Open or short in suction control valve circuit $ Suction control valve $ ECM

WIRING DIAGRAM

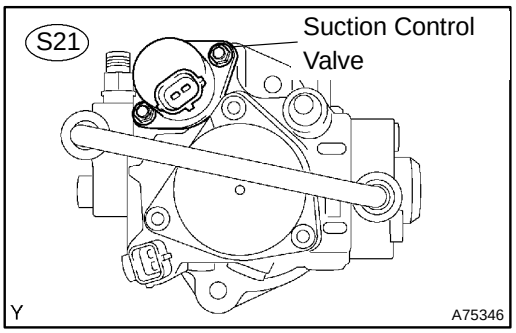


INSPECTION PROCEDURE

HINT:

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

1 INSPECT INJECTION OR SUPPLY PUMP ASSY



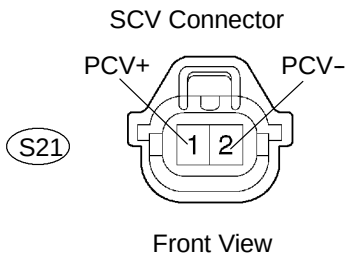
(a) Disconnect the S21 suction control valve connector.
(b) Measure the resistance between the terminals of the suction control valve.
Standard: 1.9 to 2.3 Ω at 20_C (68_F)
(c) Reconnect the suction control valve connector.

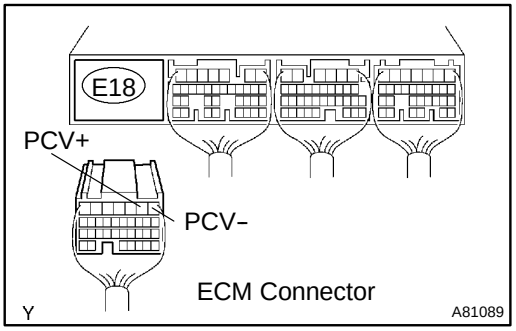
NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-15)**

OK

2 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE - ECM)

Wire Harness Side:





(a) Disconnect the S21 suction control valve connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCV+ (S21-1) - PCV+ (E18-2)	Below 1 Ω
PCV- (S21-2) - PCV- (E18-1)	

Standard (Check for short):

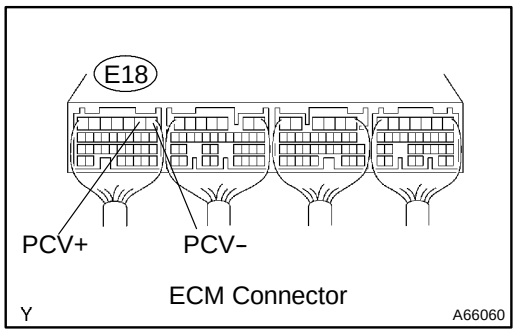
Tester Connection	Specified Condition
PCV+ (S21-1) or PCV+ (E18-2) - Body ground	10 kΩ or higher
PCV- (S21-2) or PCV- (E18-1) - Body ground	

(d) Reconnect the suction control valve connector.
(e) Reconnect ECM connector.

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

OK

3	INSPECT ECM(PCV VOLTAGE)

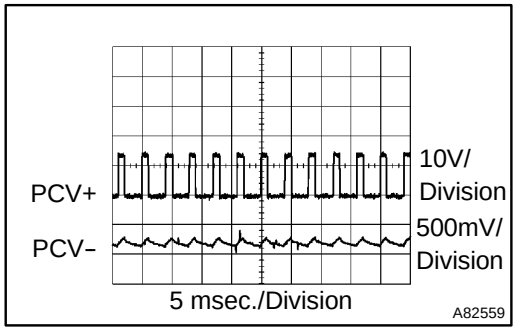


(a) Inspect using the oscilloscope.

(b) During cranking or idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard :

Tester Connection	Specified Condition
PCV+ (E18-2) - PCV- (E18-1)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10-8)**

OK

CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

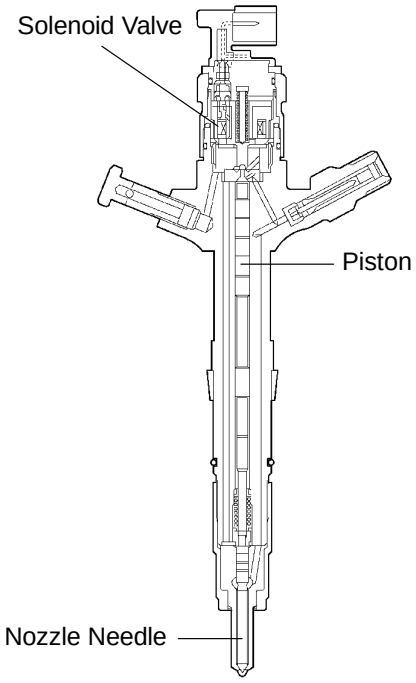
DTC P1238 INJECTOR MALFUNCTION

HINT:

- For more information on the injector and the common rail system, see page 05-2.
- If P1238 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

Injector Cross Section Diagram



The ECM detects combustion deterioration for a specific cylinder.

HINT:

- The cylinder, which has compensation value for INJ VOL that varies from other cylinders, may be malfunctioning.
- If DTC P0093 (Fuel leaks in high-pressure area) is present simultaneously, leakage malfunction of the cylinder probably be occurred.
- If DTC P0200 (Open or short in EDU or injector circuit) is present simultaneously, there probably be faulty circuit located between the ECM and the injector including the EDU.
- If only DTC P1238 (Injector malfunction) is present, probably injector mechanical malfunction or insufficient compression (valve clearance, etc) has occurred, not an open or short malfunction of the ECM, EDU and injector circuit.
- Solenoid valve of the injector is the same type that of the pressure discharge valve.

DTC No.	DTC Detection Condition	Main Trouble Area	Related Trouble Area
P1238	Engine speed fluctuation is large when idling (2 trip detection logic)	S Injector S EDU (P0200 is set simultaneously) S Open or short in engine wire harness (P0200 is set simultaneously) S Connector connection (P0200 is set simultaneously) S Compression pressure S Valve clearance	S Valve timing S ECM

HINT:

After confirming DTC P1238, check the internal fuel pressure in "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

MONITOR DESCRIPTION

P1238 (Injection malfunction, exclude open or short in injector circuit):

This DTC will be set if the engine speed fluctuation between each cylinder is large. The ECM monitors changes in the crankshaft rotation speed using the crankshaft position sensor for detecting poor combustion. Also, it identifies a faulty cylinder using the camshaft position sensor. The fluctuation counter increments when irregular crankshaft rotation speed variation exceeds the threshold at idling. Therefore, either one of the cylinders has very poor combustion (Rough idle), the ECM sets this DTC.

MONITOR STRATEGY

Required Sensors	Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 minutes
CHK ENG Operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine	At idling	
Engine speed	500 rpm	-
Engine coolant temperature	20_C (68_F)	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
The number of irregular changes in the crankshaft rotation speed

HINT:

The number of irregular changes in the crankshaft rotation speed indicates the insufficient combustion.

WIRING DIAGRAM

Refer to DTC P0200 on page 05-97.

INSPECTION PROCEDURE

HINT:

- If DTCs other than P1238 are present simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1238)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P1238	A
P1238 and other DTCs	B

HINT:

If any other codes besides P1238 are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-35)

A

2	CHECK WIRE HARNESS AND CONNECTOR IN ENGINE ROOM

HINT:
Check the wire harness and connector connections.

NG → REPAIR OR REPLACE

OK

3	READ VALUE OF HAND-HELD TESTER(COMPENSATION OF INJECTION VOLUME BETWEEN CYLINDERS FOR IDENTIFYING MALFUNCTION CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB #1, #2, #3 and #4" and read its value displayed on the hand-held tester.
Standard:

Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

(d) Cylinders that have a compensation value which is outside of the specification range are considered to be faulty cylinders. Use the following steps to inspect and repair the cylinder.
Result:

Result	Proceed to
Faulty cylinder can not be identified	A
Faulty cylinder can be identified	B

B → Go to step 5

A

4	PERFORM ACTIVE TEST USING HAND-HELD TESTER(INJECTION CUT FOR IDENTIFYING MALFUNCTION CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1, #2, #3 and #4".
(e) Check the four cylinders in sequence to identify a faulty cylinder by performing the power-balance inspection.

HINT:
If the engine idling becomes normal despite cutting off the fuel injection, the cylinder is malfunctioning.

GO

5	CHECK CYLINDER COMPRESSION PRESSURE OF MALFUNCTION CYLINDER (See page 14-1)

NG → REPAIR OR REPLACE

OK

6	CHECK VALVE CLEARANCE OF MALFUNCTION CYLINDER (See page 14-5)

NG → ADJUST VALVE CLEARANCE (See page 14-5)

OK

7	CHECK IF DTC OUTPUT RECURS(DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warm-up, and then confirm that P1238 is not present again.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05-41)

NG

8	REPLACE INJECTOR ASSY (See page 11-5)

GO

CHECK IF DTC OUTPUT RECURS (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warm-up, and then confirm that P1238 is not present again.

DTC	P1271	FUEL REGULATOR CIRCUIT MALFUNCTION (EDU DRIVE)

DTC	P1272	FUEL PRESSURE REGULATOR MALFUNCTION

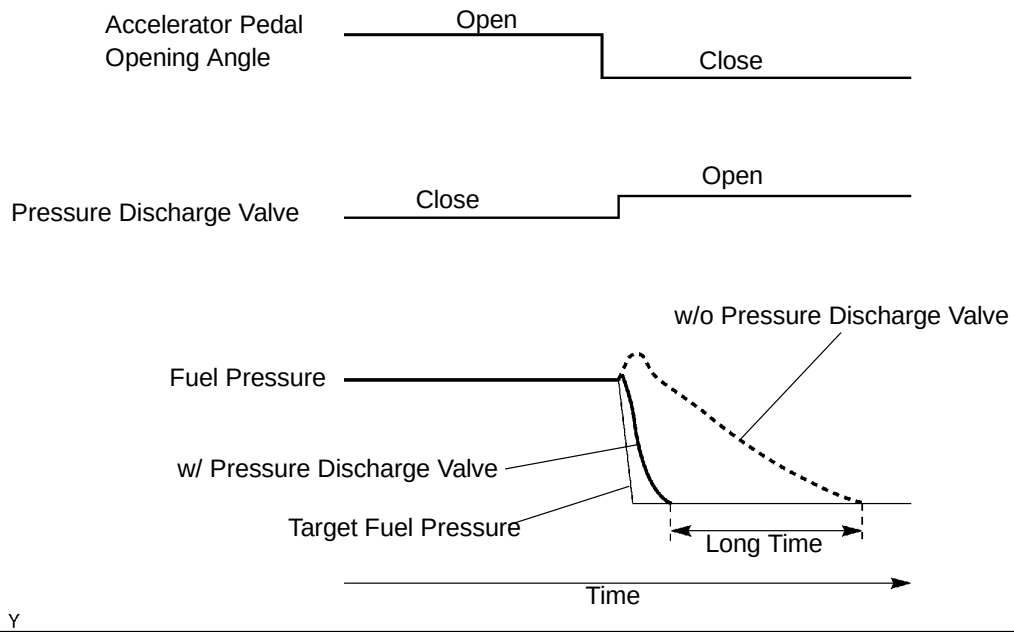
HINT:

- For more information on the pressure discharge valve and the common rail system, see page 05-2.
- For more information on the EDU, see page 05-97.
- If P1271 and/or P1272 are present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-2.

CIRCUIT DESCRIPTION

The ECM controls the internal fuel pressure of the common rail by opening and closing the pressure discharge valve. When sudden deceleration is occurred, the internal fuel pressure will temporarily become higher than usual and combustion noise may result, therefore the ECM will open the valve temporarily to discharge the pressure inside the common rail. Also, the pressure discharge valve opens when the ignition switch is turned OFF, and the internal pressure is then promptly discharged.

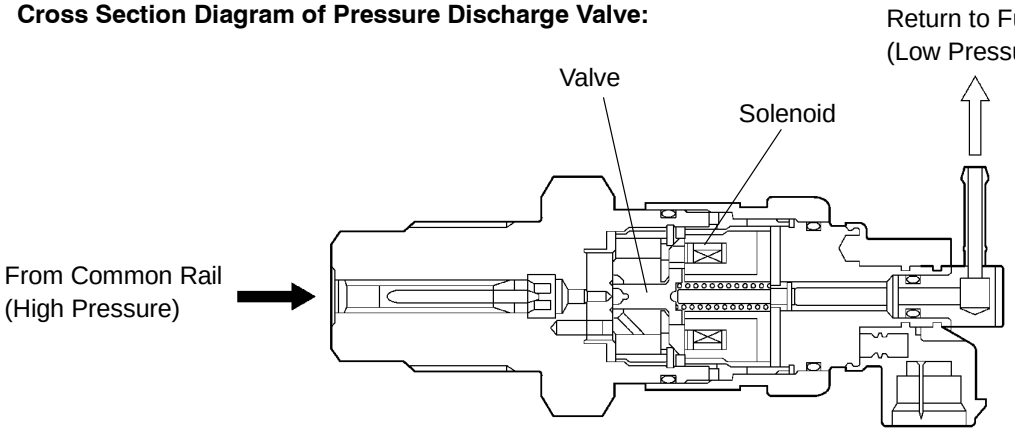
Pressure Discharge Valve Operation by Sudden Deceleration:



HINT:

The solenoid valve of the pressure discharge valve is the same type that of the injector solenoid valve.

Cross Section Diagram of Pressure Discharge Valve:



DTC No.	DTC Detection condition	Trouble Area
P1271	Open or short in pressure discharge valve circuit There is no valve opening confirmation signal (IJF) from EDU to ECM despite the ECM sending valve opening command signal (PRD) after the engine is started (1 trip detection)	$ Open or short in pressure discharge valve circuit $ Open or short in pressure discharge valve itself $ EDU $ ECM
P1272	Pressure discharge valve closed malfunction Actual pressure decreasing rate deviates from the simulated pressure decreasing rate after the ignition switch is turned OFF (2 trip detection)	$ Open or short in pressure discharge valve circuit (P1271 is set simultaneously) $ Pressure discharge valve $ Supply pump $ ECM

HINT:

After confirming DTC P1271 and/or P1272, check the fuel pressure inside common rail in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

MONITOR DESCRIPTION

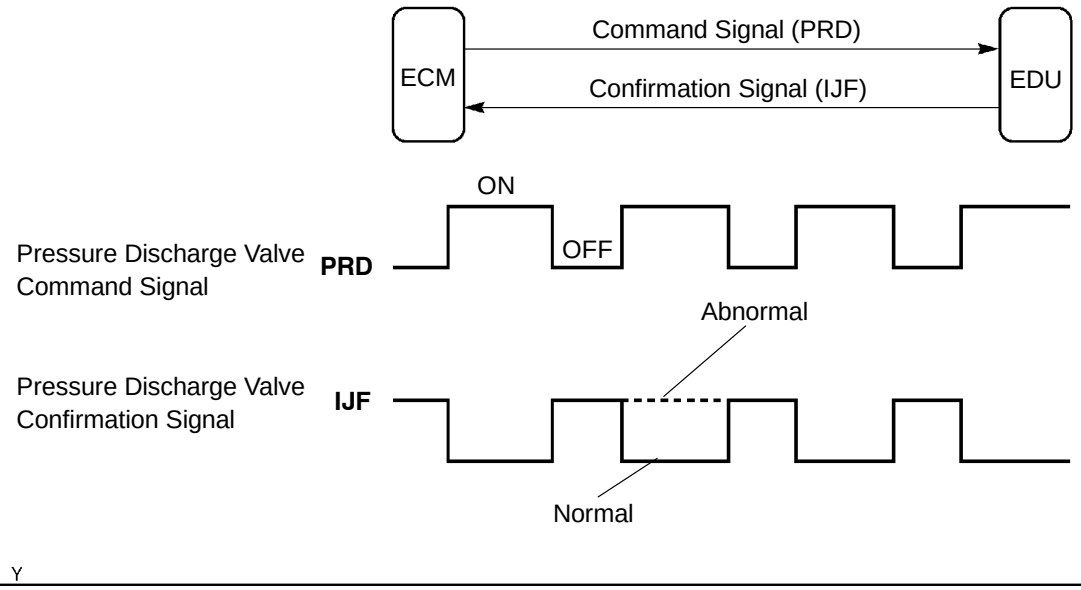
P1271 (Open or short in pressure discharge valve circuit):

This DTC will be set if there is no valve opening confirmation signal (IJF) from the EDU to the ECM, despite the ECM commanding the pressure discharge valve to open with the EDU. This DTC refers to an open or short malfunction of the pressure discharge valve circuit, therefore the malfunction that the valve is stuck open or closed can be excluded.

The EDU monitors the current supplied to the pressure discharge valve and indicates that the current flows into the valve. If the current exceeds the specified level, the EDU interprets this as the IJF signal is low.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

P1271 Malfunction:



P1272 (Closed malfunction of the pressure discharge valve):

The pressure discharge valve will open and discharge the internal fuel pressure from the common rail to the fuel tank when the ignition switch is turned OFF. In this event, the ECM compares the actual dropping rate of the internal fuel pressure and the simulated dropping rate. If the ECM judges the actual dropping rate is smaller than the simulation, the ECM then interprets this as the valve has stuck closed and sets this DTC. This DTC detection will be activated if the internal fuel pressure does not drop below the specified level after the ignition switch has been turned OFF.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

P1271:

Required sensors	EDU
Frequency of operation	Continuous
Duration	3 seconds
CHK ENG operation	1 driving cycles

P1272:

Required sensors	Fuel pressure sensor
Frequency of operation	Once per driving cycle
Duration	1 second
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

P1271:

Specification
Drive the vehicle at 50 km/h with the 3 rd gear and then decelerate it by completely releasing the accelerator pedal

P1272:

Item	Specification	
	Minimum	Maximum
Fuel pressure	30 MPa (306 kgf/cm^2, 4,351 psi)	-
Fuel temperature	0_C	-
Battery voltage	11 V	-
The monitor will not run if the fuel pressure sensor, or pressure discharge valve circuit, or fuel temperature sensor is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

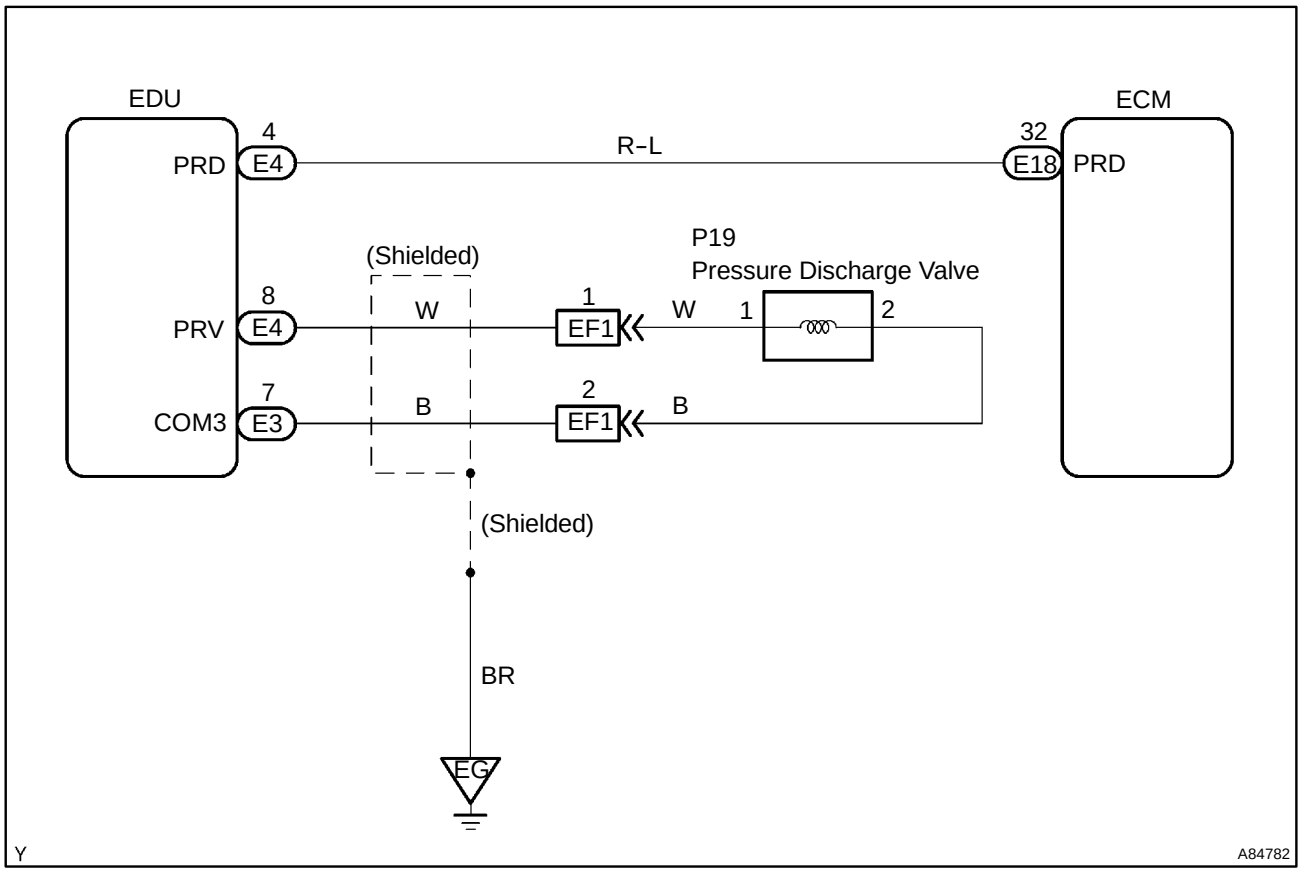
P1271:

Threshold
If the confirmation signals from the EDU is not present, despite the ECM sending the command signals regularly during decelerating

P1272:

Threshold
If the internal pressure stays beyond the specified level after the ignition switch was turned OFF

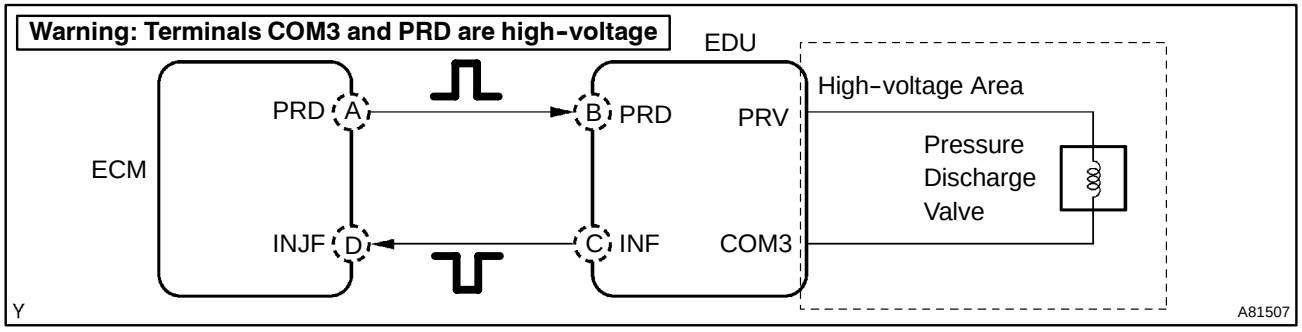
WIRING DIAGRAM



PULSE GENERATION INSPECTION

HINT:

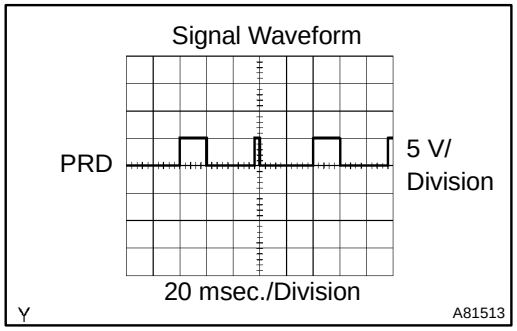
Problem area can be identified by checking the waveform at the following terminals.



HINT:

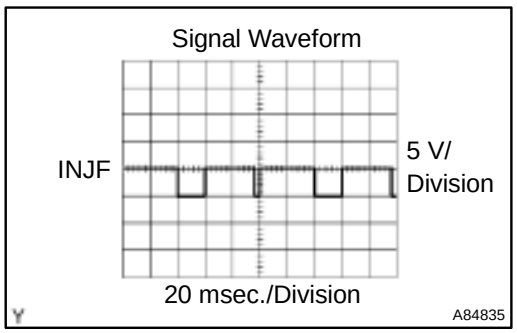
If you check the ECM side first, inspect the following A and D in sequence. If you check the EDU side first, inspect the following B and C in sequence. This shortens inspecting time.

Inspection Point	Trouble Area
A	S ECM
B (If A is normal)	S Open or short in "PRD (ECM)" - "PRD (EDU)" circuit
C (If A and B are normal)	S Open or short in "PRV (EDU)" - "COM3 (EDU)" circuit S Pressure discharge valve S EDU
D (If A, B and C are normal)	S Open or short in "INF (EDU)" - "INJF (ECM)" circuit (P0200 is set simultaneously)



(a) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Point	Specified Condition
A and B	Correct waveform is as shown



(b) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Point	Specified Condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:

- After completing repair, confirm that P1271 and/or P1272 are not present again.
- If P0200 and P1271 are present simultaneously, there is open in the INJF wire harness between the EDU and ECM, or there is open in the wire harness for both injector and pressure discharge valve.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ OUTPUT DTC(DTC P1271 AND/OR P1272)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

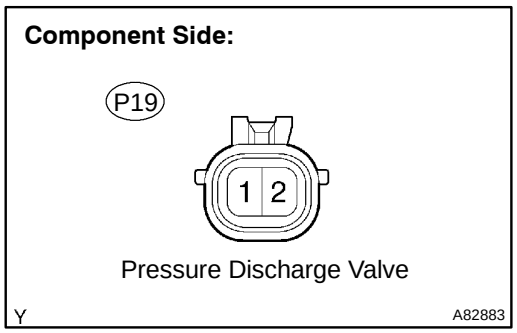
Result:

Display (DTC output)	Proceed to
P1271 and/or P1272	A
P1272	B

B → **Go to step 8**

A

2 INSPECT COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE)

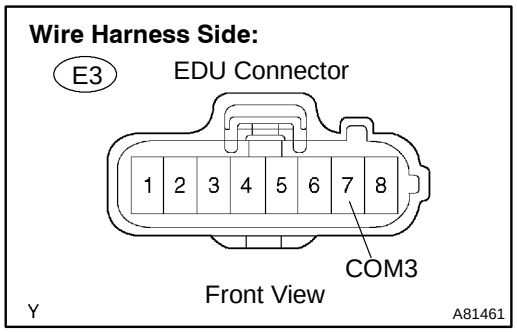


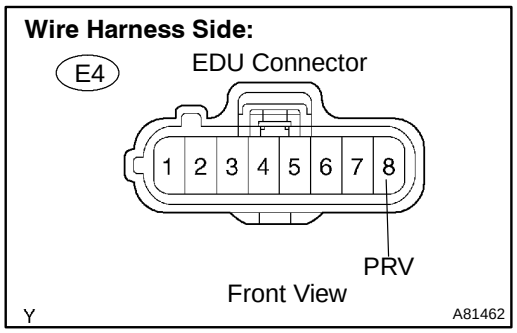
(a) Disconnect the P19 pressure discharge valve connector.
(b) Measure the resistance between the terminals of the pressure discharge valve.
Standard: 0.85 to 1.05 Ω at 20_C (68_F)
(c) Reconnect the pressure discharge valve connector.

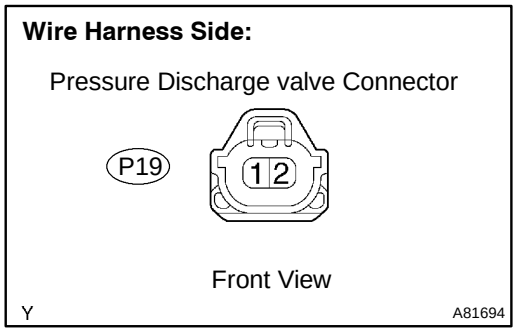
NG → **REPLACE COMMON RAIL ASSY (PRESSURE DISCHARGE VALVE) (See page 14-24)**

OK

3 CHECK HARNESS AND CONNECTOR(PRESSURE DISCHARGE VALVE - EDU)







(a) Disconnect the E3 and E4 EDU connectors.
(b) Disconnect the P19 pressure discharge valve connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
COM3 (E3-7) - (P19-2)	Below 1 Ω
PRV (E4-8) - (P19-1)	

Standard (Check for short):

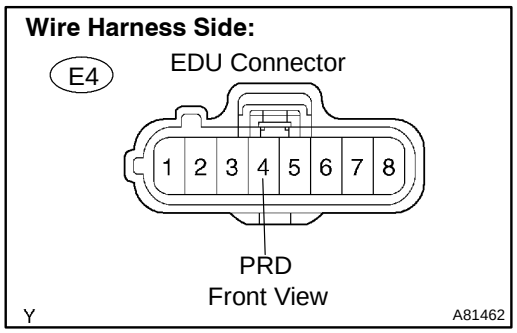
Tester Connection	Specified Condition
COM3 (E3-7) or (P19-2) - Body ground	10 kΩ or higher
PRV (E4-8) or (P19-1) - Body ground	

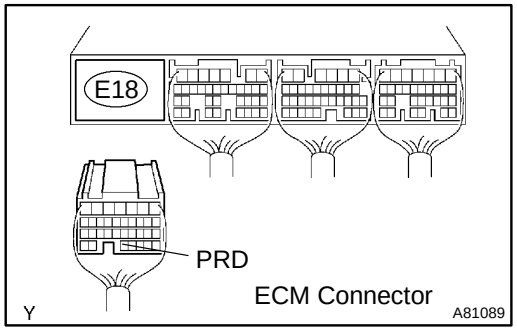
(d) Reconnect the EDU connectors.
(e) Reconnect the pressure discharge valve connector.

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

OK

4 CHECK HARNESS AND CONNECTOR(EDU - ECM)





(a) Disconnect the E4 EDU connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PRD (E4-4) - PRD-(E18-32)	Below 1 Ω

Standard (Check for short):

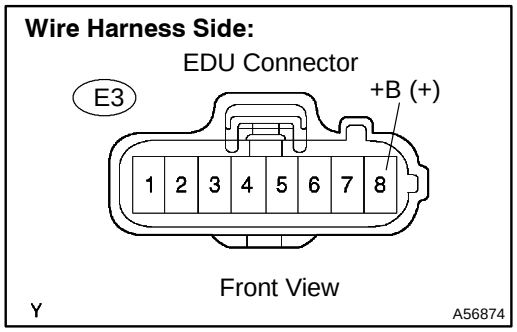
Tester Connection	Specified Condition
PRD (E4-4) or PRD (E18-32) - Body ground	10 kΩ or higher

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

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

OK

5 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)

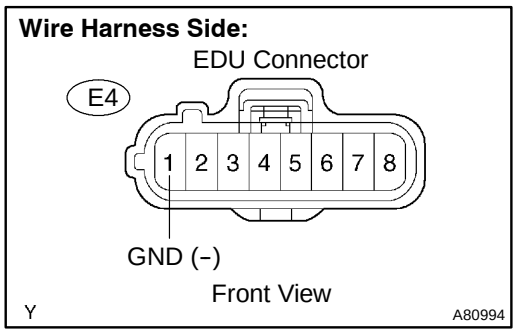


(a) Disconnect the E3 and E4 EDU connectors.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Standard:

Tester Connection	Specified Condition
+B (E3-8) - GND (E4-1)	9 to 14 V

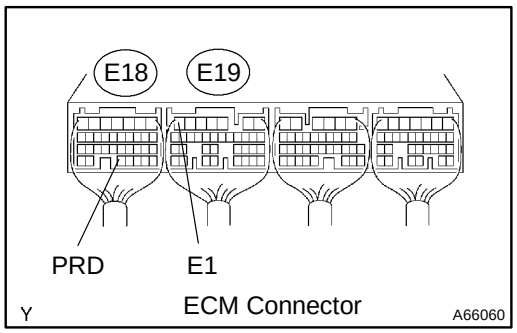
(d) Reconnect the EDU connectors.



NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (EDU - BATTERY)**

OK

6	INSPECT ECM(PRD VOLTAGE)

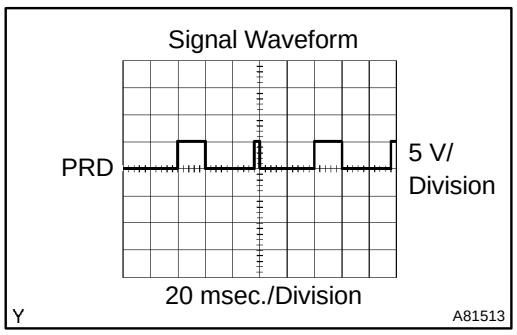


(a) Inspect using the oscilloscope.
(b) Drive the vehicle at 50 km/h (31 mph) with the third gear, and then decelerate by releasing the accelerator pedal.
(c) Check the waveform between the specified terminal of the E18 and E19 ECM connectors.

Standard:

Tester Connection	Specified Condition
PRD (E18-32) - E1 (E19-7)	Correct waveform is as shown

HINT:
Alternative Inspection:
Run the engine at 2,500 rpm for 10 seconds and then decrease the engine speed to an idle with the accelerator pedal completely released.



NG → **REPLACE ECM (See page 10-8)**

OK

7	REPLACE INJECTOR DRIVER

GO

CHECK IF DTCS OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the third gear and then decelerate by releasing the accelerator pedal. Check that P1271 is not present.
P1272:
After clearing the DTC, repeat the engine start and stop twice, and then confirm that P1272 is not present.

8	**REPLACE COMMON RAIL ASSY(PRESSURE DISCHARGE VALVE) (See page 11-24)**

GO

CHECK IF DTCS OUTPUT RECUR (DTC P1271 AND/OR P1272)

HINT:
P1271:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) with the third gear and then decelerate by releasing the accelerator pedal. Check that P1271 is not present.
P1272:
After clearing the DTC, repeat the engine start and stop twice, and then confirm that P1272 is not present.

DTC	P1601	INJECTOR CORRECTION CIRCUIT MALFUNCTION (EEPROM)

NOTICE:

- **If an incorrect injector compensation code was registered with the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.**
- **If you replace the ECM with a new one, register all the injectors' injector compensation codes with the new ECM as follows:**

(a) Prior to replacing the ECM, read all the compensation codes stored in the existing ECM using the hand-held tester, and then write them down. (See page 05-26)

(b) After replacing the ECM, enter the written compensation codes into the ECM using the hand-held tester. (See page 05-30)

(c) Turn the ignition switch OFF and wait for 30 seconds or more.

(d) Turn the ignition switch ON, then clear DTC P1601 using the hand-held tester. (See page 05-16)

HINT:

- In order to optimize the injector's fuel injection characteristic, the ECM compensates the injection duration by each cylinder. The ECM stores and uses compensating data in the form of a 30-digit-alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- If you installed a new injector, its own injector compensation code is needed to register with the ECM. Also, if you replaced the ECM, the compensation codes of all the injectors are needed to register because the new ECM dose not have the codes until they are registered.
- Once the ECM is replaced, DTC P1601 will be present when turning the ignition switch ON. This is to inform you that the injector compensation codes are required to register with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch OFF and wait for 30 seconds or more.

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P1601	Injector compensation code is not registered (1 trip detection logic)	• Injector compensation code • ECM
	Wrong injector compensation code is registered (1 trip detection logic)	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK INJECTOR COMPENSATION CODE (See page 05-26)

NG → **SET INJECTOR COMPENSATION CODE (See page 05-30)**

OK

REPLACE ECM (See page 10-8)

DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT
DTC	P2122	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT
DTC	P2123	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT
DTC	P2125	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT
DTC	P2127	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT
DTC	P2128	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT
DTC	P2138	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION

HINT:
This is the procedure of the accelerator pedal position sensor.

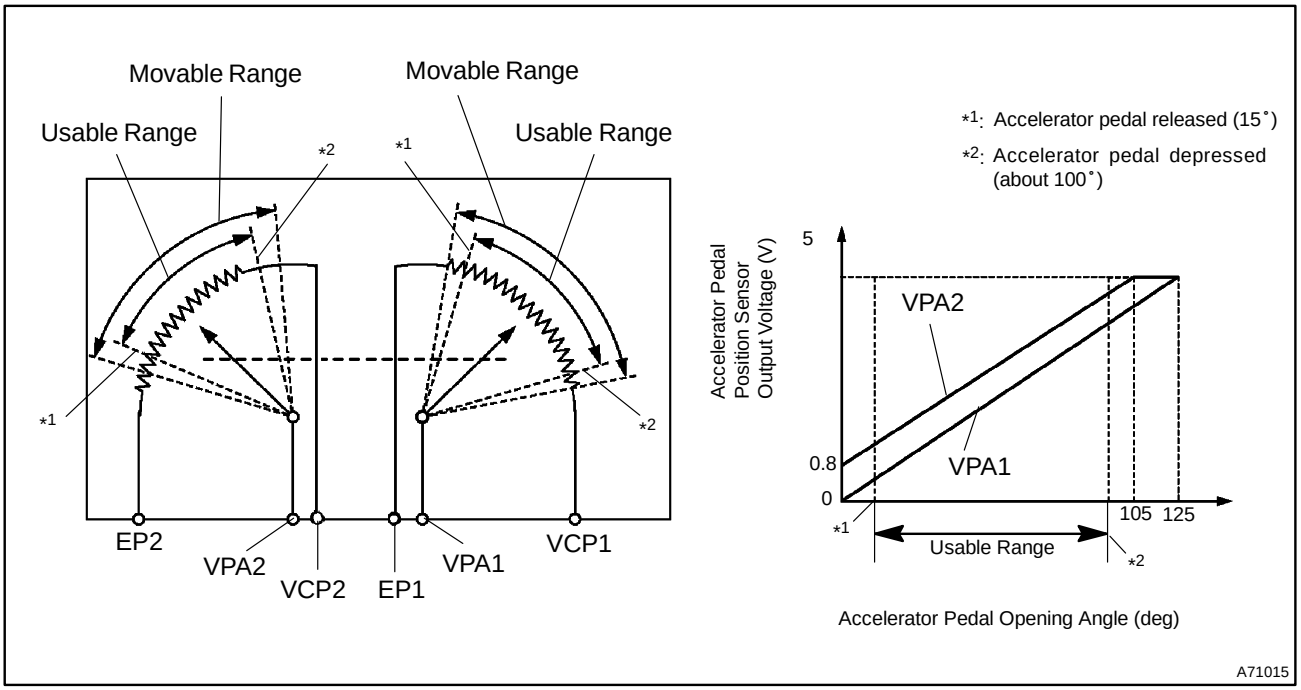
CIRCUIT DESCRIPTION

HINT:

This electrical throttle system does not use a throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has the 2 sensors to detect the accelerator position and malfunction of the accelerator position sensor.

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 the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting malfunction. The ECM judges the current accelerator pedal opening angle with the signals from pedal terminals VPA1 and VPA2, and the ECM controls the throttle motor based on these signals.



DTC No.	DTC Detecting Condition	Trouble Area
P2120	Condition (a) continues for 0.5 second or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	$S Open or short in accelerator pedal position sensor circuit $S Accelerator pedal position sensor $S ECM
P2122	Conditions (a) and (b) continue for 0.5 second or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	
P2123	Condition (a) continues for 2.0 seconds or more: (a) VPA greater than 4.8 V	
P2125	Condition (a) continues for 0.5 second or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA between 0.2 V and 3.45 V	
P2127	Conditions (a) and (b) continue for 0.5 second or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	
P2128	Conditions (a) and (b) continue for 2.0 seconds or more: (a) VPA2 greater than 4.8 V (b) VPA between 0.2 V and 3.45 V	
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	

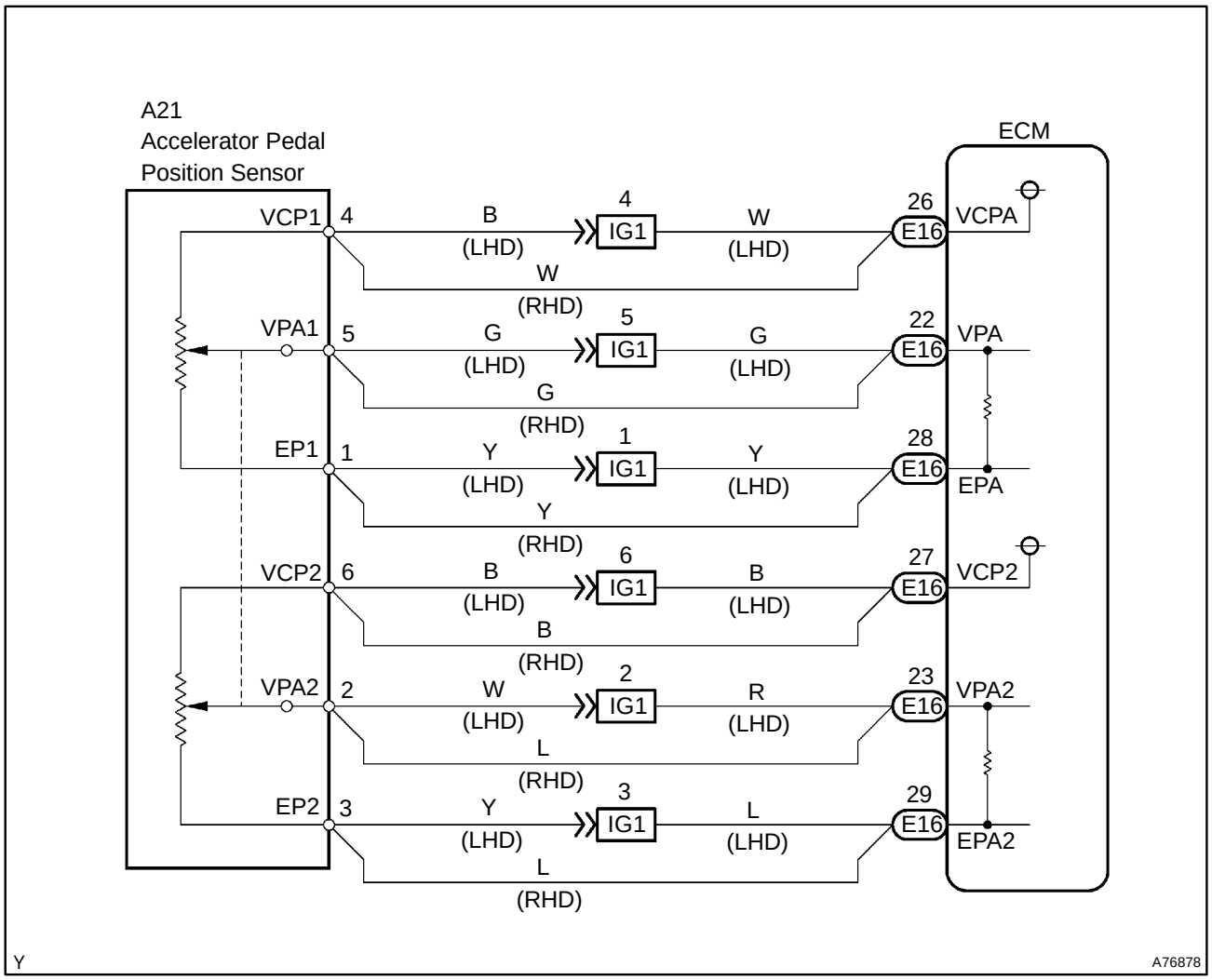
HINT:

After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138, check the accelerator pedal position sensor output voltage using the hand-held tester.

Reference:

Trouble Area	Accelerator Pedal Position (Voltage Output)			
	Accelerator Pedal Released		Accelerator Pedal Depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 5.3 V
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EP circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

WIRING DIAGRAM

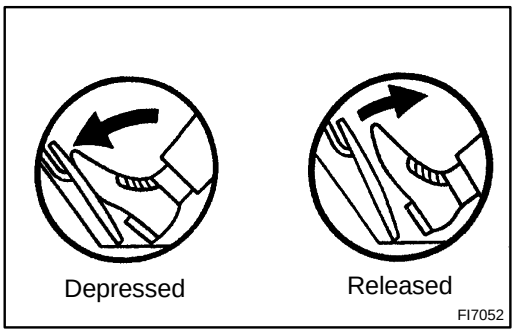


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 READ VALUE OF HAND-HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2" and read its value displayed on the hand-held tester.

Standard:

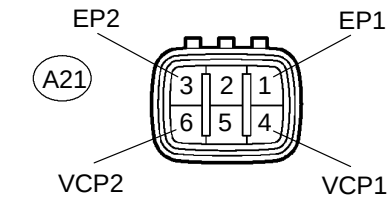
Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

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 terminal.

Standard:

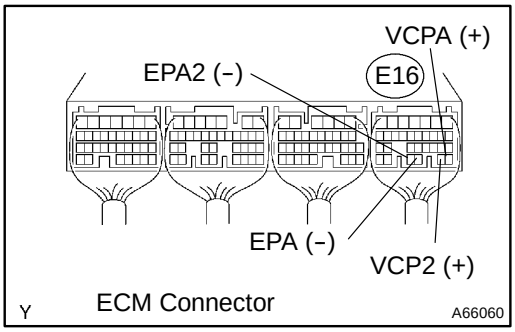
Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20_C (68_F)
EP2 (3) - VCP2 (6)	

(c) Reconnect the accelerator pedal position sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 ECM connector.

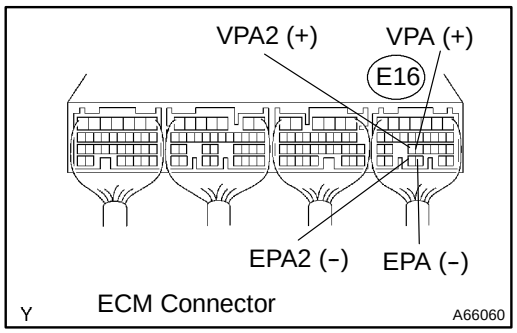
Standard:

Tester Connection	Specified Condition
VCPA (E16-26) - EPA (E16-28)	4.5 to 5.5 V
VCP2 (E16-27) - EPA2 (E16-29)	

NG → **REPLACE ECM (See page 10-8)**

OK

4 INSPECT ECM(VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 ECM connector.

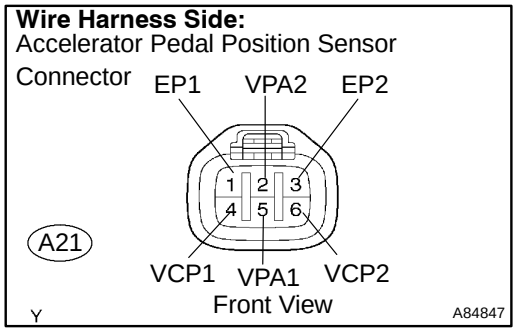
Standard:

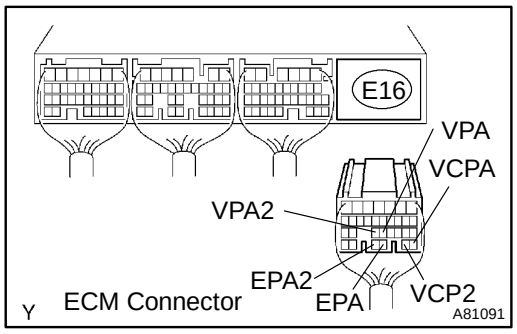
Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VPA (E16-22) - EPA (E16-28)	0.5 to 1.1 V
Depressed		2.6 to 4.5 V
Released	VPA2 (E16-23) - EPA2 (E16-29)	1.2 to 2.0 V
Depressed		3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

5 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.
(b) Disconnect E16 the ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard:

(Check for open)

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA (E16-22)	Below 1 Ω
EP1 (A21-1) - EPA (E16-28)	
VCP1 (A21-4) - VCPA (E16-26)	
VPA2 (A21-2) - VPA2 (E16-23)	
EP2 (A21-3) - EPA2 (E16-29)	
VCP2 (A21-6) - VCP2 (E16-27)	

(Check for Short)

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA (E16-22) - Body ground	10 kΩ or higher
EP1 (A21-1) or EPA (E16-28) - Body ground	
VCP1 (A21-4) or VCPA (E16-26) - Body ground	
VPA2 (A21-2) or VPA2 (E16-23) - Body ground	
EP2 (A21-3) or EPA2 (E16-29) - Body ground	
VCP2 (A21-6) or VCP2 (E16-27) - Body ground	

(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 10-8)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05-165.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (b) continue for 0.5 second: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	$ Accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM

HINT:

After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138, check the accelerator pedal position sensor output voltage using the hand-held tester.

Reference:

Trouble Area	Accelerator Pedal Position (Voltage Output)			
	Accelerator Pedal Released		Accelerator Pedal Depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 5.3 V
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EP circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

WIRING DIAGRAM

Refer to DTC P2120 on page 05-165.

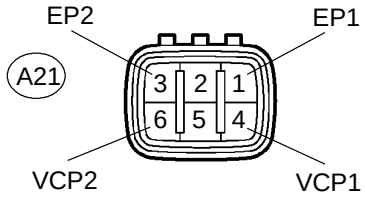
INSPECTION PROCEDURE

HINT:

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

1	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 terminal.

Standard:

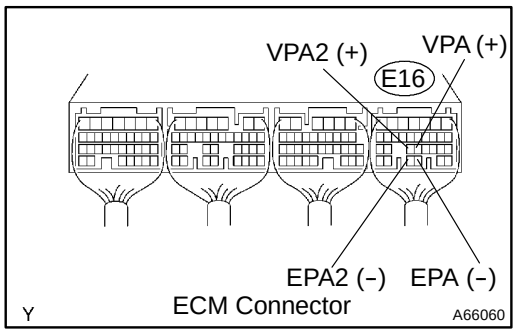
Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20_C (68_F)
EP2 (3) - VCP2 (6)	

(c) Reconnect the accelerator pedal position sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

2 INSPECT ECM(VPA AND VPA2 VOLTAGE)



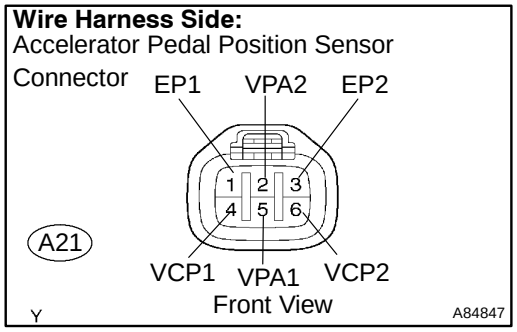
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 ECM connector.

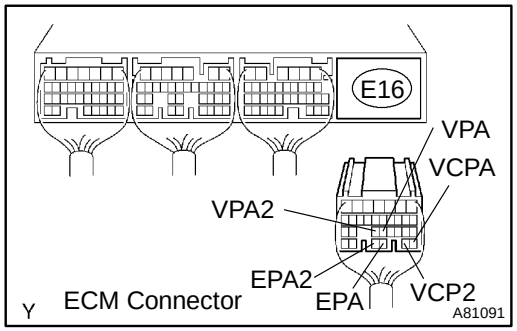
Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VPA (E16-22) - EPA (E16-28)	0.5 to 1.1 V
Depressed		2.6 to 4.5 V
Released	VPA2 (E16-23) - EPA2 (E16-29)	1.2 to 2.0 V
Depressed		3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.
(b) Disconnect the E16 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard:

(Check for open)

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA (E16-22)	Below 1 Ω
EP1 (A21-1) - EPA (E16-28)	
VCP1 (A21-4) - VCPA (E16-26)	
VPA2 (A21-2) - VPA2 (E16-23)	
EP2 (A21-3) - EPA2 (E16-29)	
VCP2 (A21-6) - VCP2 (E16-27)	

(Check for Short)

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA (E16-22) - Body ground	10 kΩ or higher
EP1 (A21-1) or EPA (E16-28) - Body ground	
VCP1 (A21-4) or VCPA (E16-26) - Body ground	
VPA2 (A21-2) or VPA2 (E16-23) - Body ground	
EP2 (A21-3) or EPA2 (E16-29) - Body ground	
VCP2 (A21-6) or VCP2 (E16-27) - Body ground	

(d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

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

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)

DTC	P2226	BAROMETRIC PRESSURE CIRCUIT

DTC	P2228	BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC	P2229	BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

To detect atmospheric pressure, the atmospheric pressure sensor built in the ECM is used in the common rail system. Following the changes in the atmospheric pressure, the ECM corrects the fuel injection volume, timing and duration, and adjusts the common rail internal fuel pressure for optimizing combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2226 P2228 P2229	ECM malfunction (1 trip detection logic)	$ ECM

INSPECTION PROCEDURE

HINT:

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

REPLACE ECM (See page 10-8)

DTC	P2227	BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

To detect atmospheric pressure, the atmospheric pressure sensor built in the ECM is used in the common rail system. Following the changes in the atmospheric pressure, the ECM corrects the fuel injection volume, timing and duration, and adjusts the common rail internal fuel pressure for optimizing combustion.

DTC No.	DTC Detection Condition	Trouble Area
P2227	Atmospheric pressure sensor malfunction (2 trip detection logic)	SECM

INSPECTION PROCEDURE

HINT:

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

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P2227)

(a) Read the DTCs using the hand-held tester.

Result:

Display (DTC output)	Proceed to
P2227 and other DTCs	A
P2227	B

HINT:

If any other codes besides P2227 are output, perform the troubleshooting for those DTCs first.

B → **REPLACE ECM (See page 10-8)**

A

GO TO RELEVANT DTC CHART (See page 05-35)

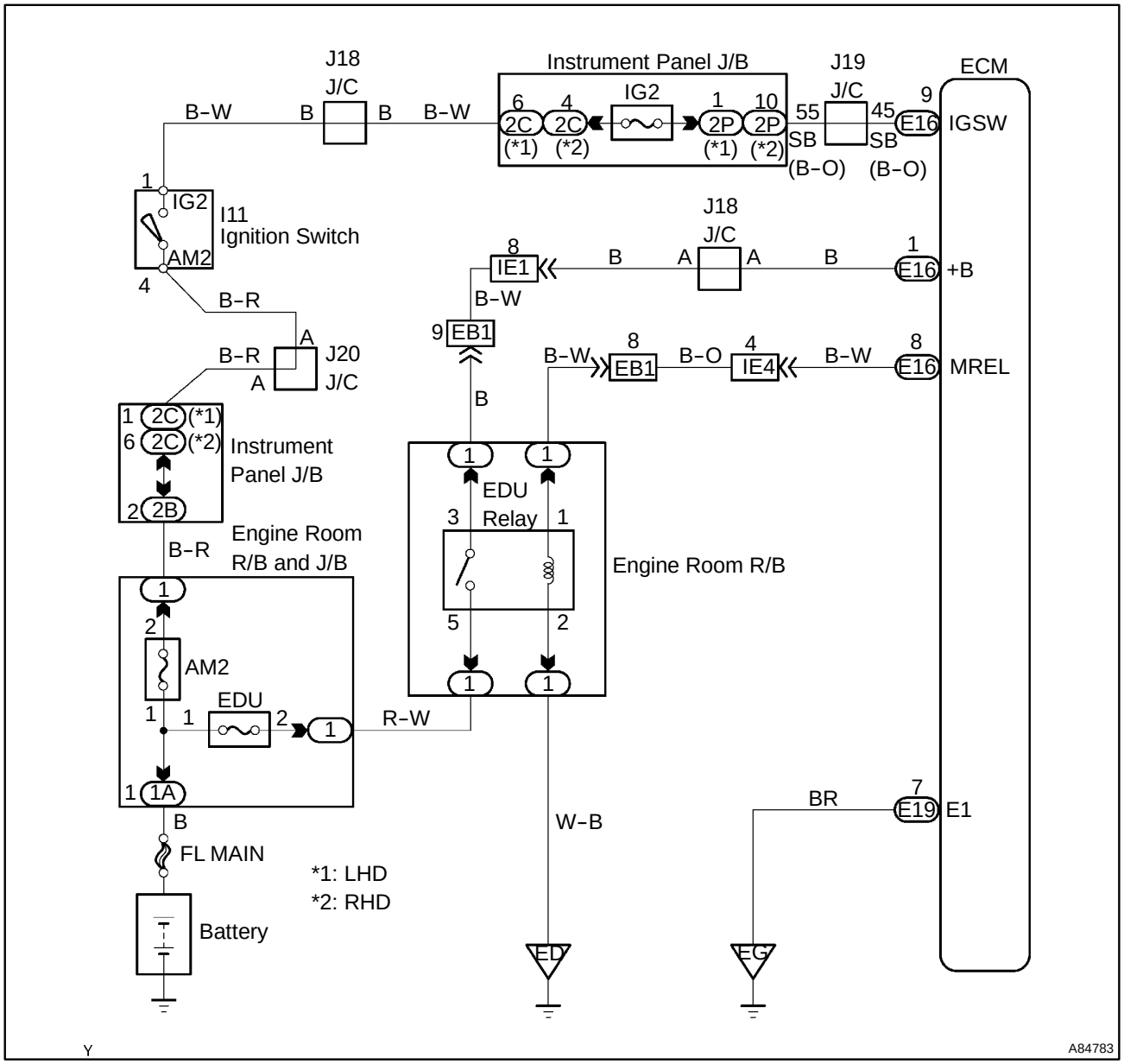
ECM POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, the battery positive voltage is applied to terminal IGSW of the ECM and the EDU relay control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EDU relay.

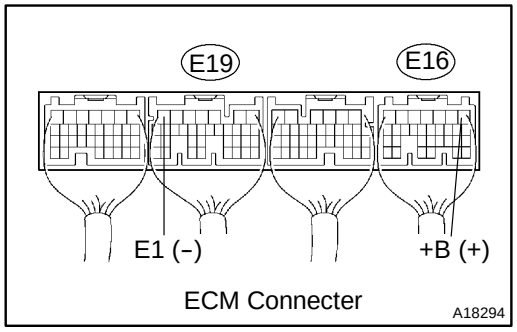
This signal causes current to flow to the coil, closing the contacts of the EDU relay and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



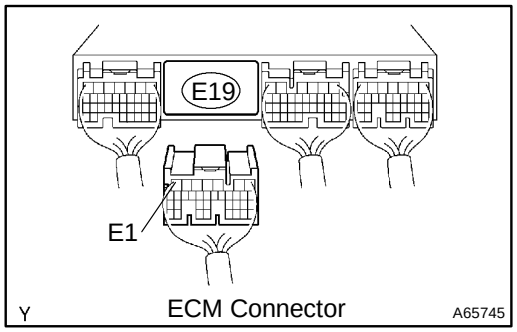
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E19 ECM connectors.
Standard:

Tester Connection	Specified Condition
+B (E16-1) - E1 (E19-7)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05-42)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM - BODY GROUND)



(a) Disconnect the E19 ECM connector.
(b) Check the resistance between the wire harness side connectors.
Standard (Check for open):

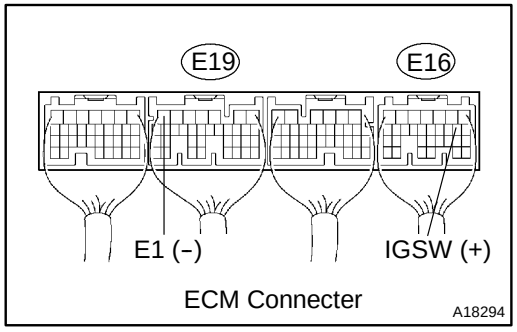
Tester Connection	Specified Condition
E1 (E19-7) - Body ground	Below 1 Ω

(c) Reconnect the ECM connector.

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

OK

3 INSPECT ECM(IGSW VOLTAGE)



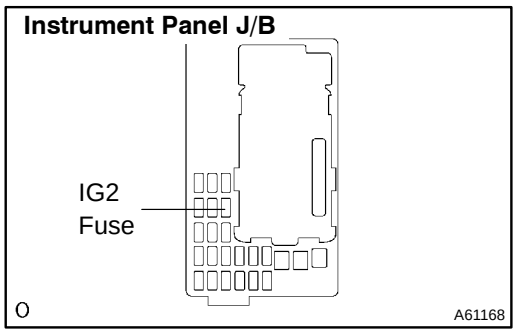
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E19 ECM connectors.
Standard:

Tester Connection	Specified Condition
IGSW (E16-9) - E1 (E19-7)	9 to 14 V

OK → **Go to step 6**

NG

4 INSPECT FUSE(IG2 FUSE)

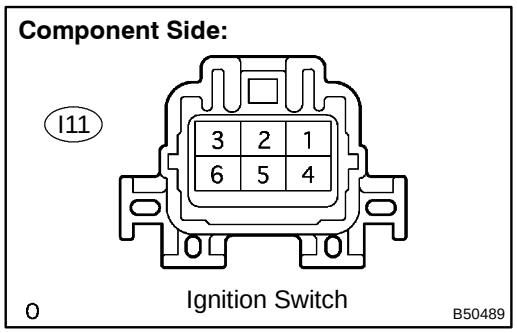


(a) Remove the IG2 fuse from the instrument panel J/B.
(b) Check for continuity in the IG2 fuse.
Standard: Continuity
(c) Reinstall the IG2 fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

5 INSPECT IGNITION OR STARTER SWITCH ASSY



(a) Disconnect the I11 ignition switch connector.
(b) Check for continuity between the connector terminals shown in the chart below.
Standard:

Switch	Tester Connection	Specified Condition
LOCK	All Terminals	No continuity
ACC	1-3	Continuity
ON	1-2, 1-3, 2-3, 5-6	Continuity
START	4-5, 4-6, 5-6, 1-2	Continuity

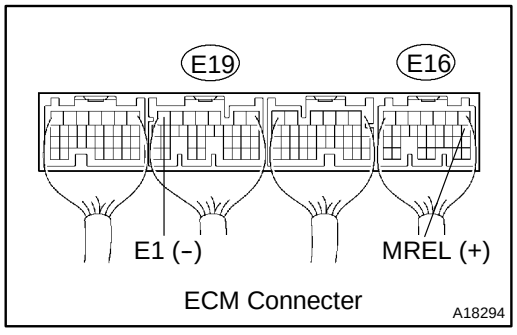
(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY - IGNITION SWITCH, IGNITION SWITCH - ECM)

6 INSPECT ECM(MREL VOLTAGE)



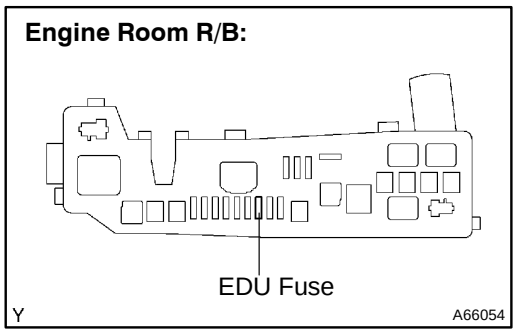
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E19 ECM connectors.
Standard:

Tester Connection	Specified Condition
MREL (E16-8) - E1 (E19-7)	9 to 14 V

NG → **REPLACE ECM (See page 10-8)**

OK

7 INSPECT FUSE(EDU FUSE)

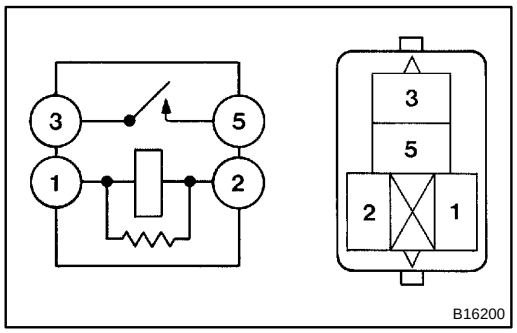


(a) Remove the EDU fuse from the engine room R/B.
(b) Check for continuity in the EDU fuse.
Standard: Continuity
(c) Reinstall the EDU fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

8 INSPECT EDU RELAY



(a) Remove the EDU relay from the engine room R/B.
(b) Check for continuity in the EDU relay.
Standard:

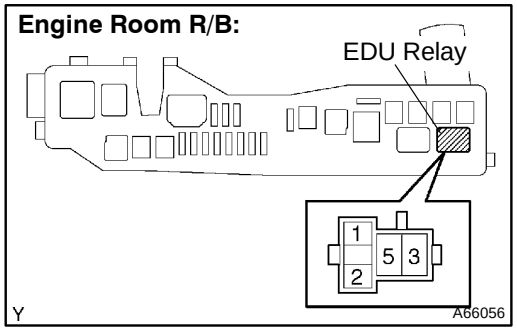
Tester Connection	Specified Condition
1 - 2	Continuity
3 - 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

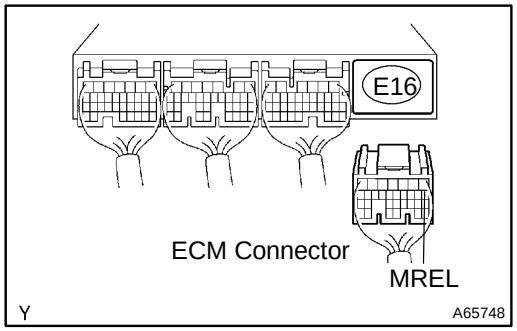
(c) Reinstall the EDU relay.

NG → **REPLACE EDU RELAY**

OK

9	CHECK HARNESS AND CONNECTOR(EDU RELAY - ECM, EDU RELAY - BODY GROUND)





(a) Check the harness and connector between the EDU relay and ECM.
(1) Remove the EDU relay from the engine room R/B.
(2) Disconnect the E16 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EDU relay (1) - MREL (E16-8)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EDU relay (1) or MREL (E16-8) - Body ground	10 kΩ or higher

(4) Reinstall the EDU relay.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EDU relay and body ground.
(1) Remove the EDU relay from the engine room R/B.
(2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
EDU relay (2) - Body ground	Below 1 Ω

(3) Reinstall the EDU relay.

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

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM - BATTERY POSITIVE TERMINAL)

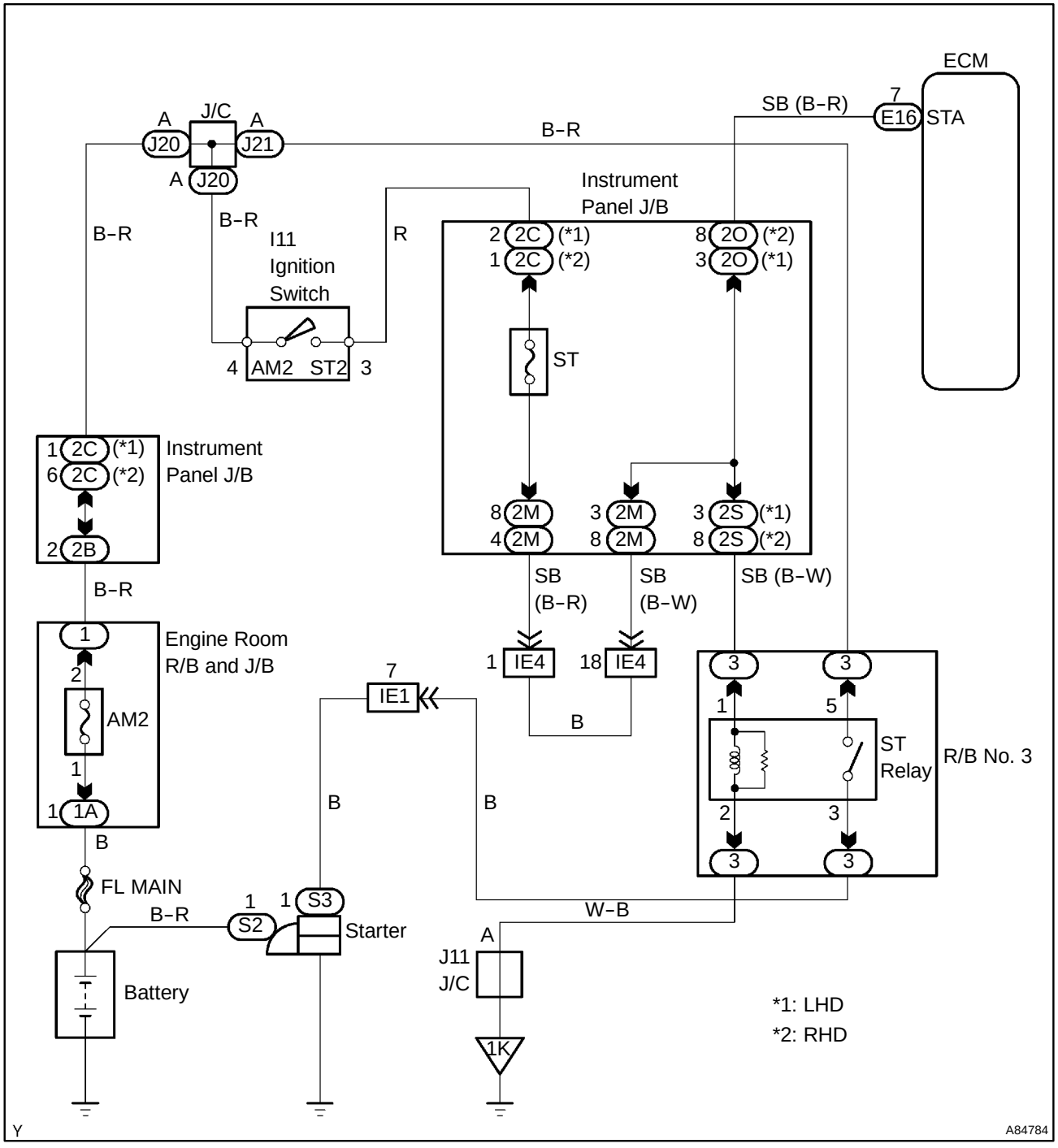
STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

HINT:

While the engine is being cranked, current flows from terminal ST2 of the ignition switch to the ST relay coil and also current flows to terminal STA of the ECM (STA signal).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05-42.

1	READ VALUE OF HAND-HELD TESTER(STA SIGNAL)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand-held tester.

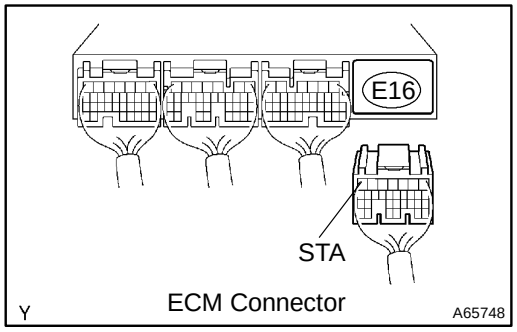
Standard:

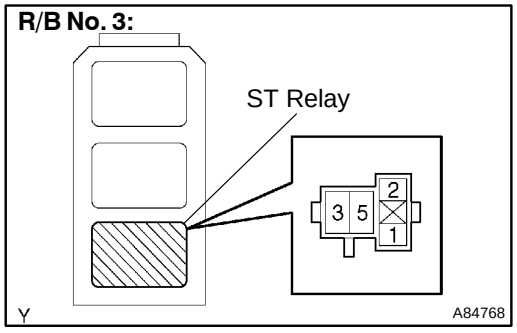
Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05-42)**

NG

2	CHECK HARNESS AND CONNECTOR(ECM - ST RELAY)





(a) Disconnect the E16 ECM connector.
(b) Remove the ST relay from the R/B NO. 3.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ST relay (1) - STA (E16-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ST relay (1) or STA (E16-7) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reinstall the ST relay.

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

OK

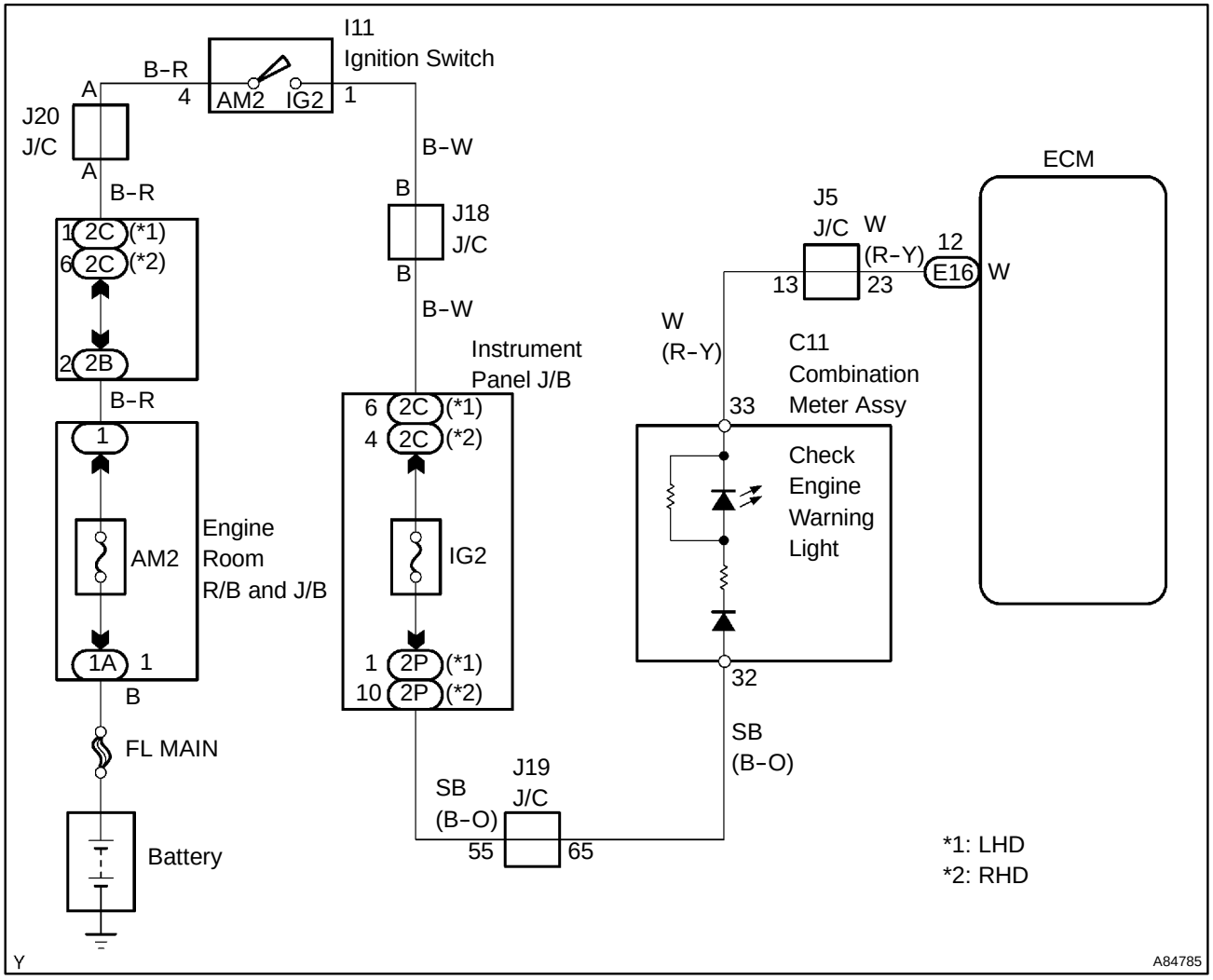
REPLACE ECM (See page 10-8)

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the CHK ENG 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:

Result	Proceed to
CHK ENG remains on	Start inspection from step 1
CHK ENG is not illuminated	Start inspection from step 3

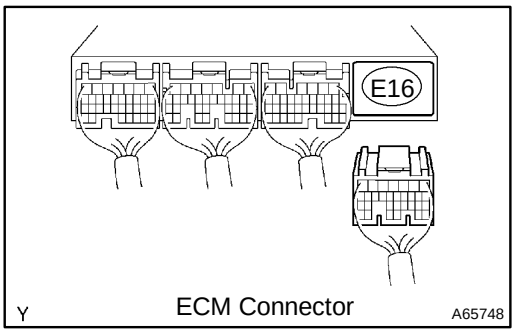
1	CLEAR DTC

(a) Connect the hand-held tester to the DLC 3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Read the DTC (See page 05-16).
(d) Clear the DTC (See page 05-16).
(e) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK	REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05-35)

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E16 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated
(d) Reconnect the ECM connector.

OK	REPLACE ECM (See page 10-8)

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK CHK ENG CONDITION

(a) Check that the CHK ENG is illuminated when the ignition switch is turned ON.
Standard: CHK ENG is illuminated

OK	SYSTEM OK

NG

4	INSPECT COMBINATION METER ASSY(CHECK ENGINE WARNING LIGHT CIRCUIT)

(a) See the combination meter troubleshooting on page 05-1297 of Pub. No. RM925E COROLLA.

NG	REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER - ECM)

DIFFICULT TO ENGINE START AND ENGINE STALL

HINT:
Specified values in the following troubleshooting flowchart are the reference information.
Because of resultant values in DATA LIST vary depending on measuring conditions, or vehicle's model years. Do not judge the vehicle normal even if the DATA LIST values indicate a standard level. There is a possibility that factors of the malfunction are hiding.

INSPECTION PROCEDURE

1 READ OUTPUT DTCS(RELATED TO ENGINE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
Other than engine-related DTCs (See page 05-35)	A
DTCs related to the engine (See page 05-35)	B

B → **REPAIR OR REPLACE ENGINE CONTROL SYSTEM ACCORDING TO DTC OUTPUT (See page 05-35)**

A

2 CHECK OPERATION OF ENGINE CRANKING

(a) Check the operation of the engine cranking.
(b) Compare the operation with the one of a normal engine of the same model, and carefully check if there is no difference between them.

NG → **CHECK AND REPAIR BATTERY, CHARGING SYSTEM, STARTER ASSY AND STARTING SYSYTEM**

OK

3 READ VALUE OF HAND-HELD TESTER(COMN RAIL PRESS)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand-held tester.

Reference:

Item	Inspection Condition	Reference Value
COMN RAIL PRESS	Cranking, engine coolant temperature at 0°C (32°F) or more	30 MPa

NG → **BLEED AIR FOR FUEL SYSTEM**

OK

4	CHECK INITIAL COMBUSTION

(a) Check that initial combustion occurs.
Result:

Result	Proceed to
NG (Cold engine)	A
NG (Hot engine)	B
OK	C

B → **Go to step 6**

C → **Go to step 7**

A

5	CHECK INDICATOR LIGHTING TIME AND AFTER GLOW TIME (See page 05-116)

HINT:
DTC P0380 (2 trip detection logic when the engine coolant temperature is less than 40_C/104_F) will be present if there is an open or short malfunction in the glow plug circuit.

NG → **REPAIR OR REPLACE PRE-HEATING SYSTEM**

OK

6	READ VALUE OF HAND-HELD TESTER(FUEL PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".
(e) Check that an internal fuel pressure of the common rail is within specification below.
Standard:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 30 to 40
2,500 rpm (No engine load)	Approximately 50 to 100

NG → **Go to step 12**

OK

7	CHECK AIR INTAKE SYSTEM AND EXHAUST SYSTEM

(a) Remove the air cleaner filter.
(b) Inspect the EGR valve operation.
  (1) Connect the hand-held tester to the DLC3.
  (2) Turn the ignition switch ON and push the hand-held tester main switch ON.
  (3) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / EGR STEP POS".
  (4) Check that the EGR valve operates by the hand-held tester.
(c) Turn the ignition switch OFF, and then disconnect the connector from the EGR valve in order to close the EGR valve.
(d) Inspect the intake shutter operation.
  (1) Start the engine.
  (2) Check if the intake shutter fully opens when accelerating the engine speed.

HINT:
Under quick accelerating of the engine speed, the EGR valve is fully closed and the intake shutter is fully opened. If the systems are normal, the volume of the black smoke will result in decrease.

NG → **CHECK AND REPAIR LOCATION WHERE MALFUNCTION EXIST**

OK

8	READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS, INJ VOLUME and INJ TIMING" and read its value displayed on the hand-held tester.

Standard:

Item	Engine Speed *	Reference Value
COMN RAIL PRESS	Idling	30 to 40 MPa
COMN RAIL PRESS	2,000 rpm (No engine load)	35 to 80 MPa
COMN RAIL PRESS	3,000 rpm (No engine load)	50 to 100 MPa
INJ VOLUME	Idling	3 to 10 mm^3
INJ VOLUME	2,000 rpm (No engine load)	3 to 10 mm^3
INJ VOLUME	3,000 rpm (No engine load)	5 to 12 mm^3
INJ TIMING	Idling	-1 to 5_CA
INJ TIMING	2,000 rpm (No engine load)	0 to 4_CA
INJ TIMING	3,000 rpm (No engine load)	1 to 5_CA

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

NG → **Go to step 13**

OK

9	INSPECT CYLINDER COMPRESSION PRESSURE (See page 14-1)

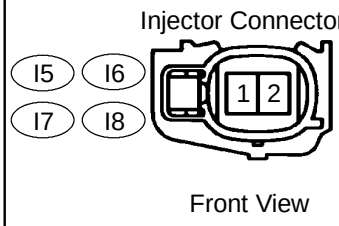
NG → CHECK AND REPAIR ENGINE

OK

10	CHECK HARNESS AND CONNECTOR(INJECTOR - EDU)

HINT:
DTC P0200 (1 trip detection logic) will be present if there is an open or short malfunction in the EDU circuit.

Wire Harness Side:

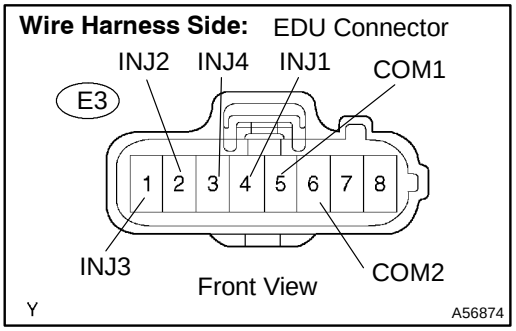


(a) Disconnect the I5, I6, I7, or I8 injector connector.
(b) Disconnect the E3 EDU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I5-1) - INJ1 (E3-4)	Below 1 Ω
Injector (I6-1) - INJ2 (E3-2)	
Injector (I7-1) - INJ3 (E3-1)	
Injector (I8-1) - INJ4 (E3-3)	
Injector (I5-2) - COM1 (E3-5)	
Injector (I6-2) - COM2 (E3-6)	
Injector (I7-2) - COM2 (E3-6)	
Injector (I8-2) - COM1 (E3-5)	

Wire Harness Side:



Standard (Check for short):

Tester Connection	Specified Condition
Injector (I5-1) or INJ1 (E3-4) - Body ground	10 kΩ or higher
Injector (I6-1) or INJ2 (E3-2) - Body ground	
Injector (I7-1) or INJ3 (E3-1) - Body ground	
Injector (I8-1) or INJ4 (E3-3) - Body ground	
Injector (I5-2) or COM1 (E3-5) - Body ground	
Injector (I6-2) or COM2 (E3-6) - Body ground	
Injector (I7-2) or COM2 (E3-6) - Body ground	
Injector (I8-2) or COM1 (E3-5) - Body ground	

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

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

11	PERFORM ACTIVE TEST BY HAND-HELD TESTER(INJECTOR CUT #1 TO #4)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1 to #4".
(d) Check the engine idling condition while the fuel injection of each cylinder is cut by the hand-held tester.

Result:

Engine Idle Condition	Proceed to
Becomes unstable	A
Does not change	B

HINT:
Replace the injector mounted on the cylinder that causes the rough idling.

B → **GO TO DTC P1238 (See page 05-150)**

A

REPLACE INJECTOR DRIVER

12	CHECK IF FUEL IS BEING SUPPLIED TO SUPPLY PUMP

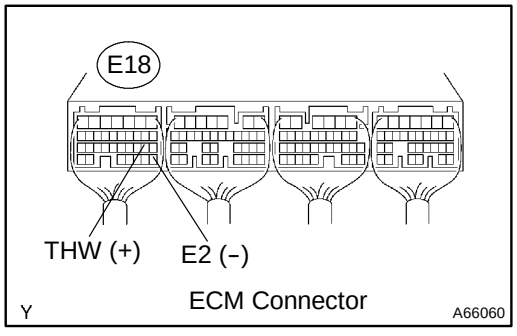
(a) Disconnect the inlet hose from the supply pump.
(b) Operate the priming pump and check that the fuel is being supplied to the supply pump.

OK → **REPLACE INJECTION OR SUPPLY PUMP ASSY (See page 11-15)**

NG

CHECK AND REPAIR FUEL PIPING CLOG (INCLUDING FUEL FREEZING) (FUEL TANK - SUPPLY PUMP)

13	INSPECT ECM(THW VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.

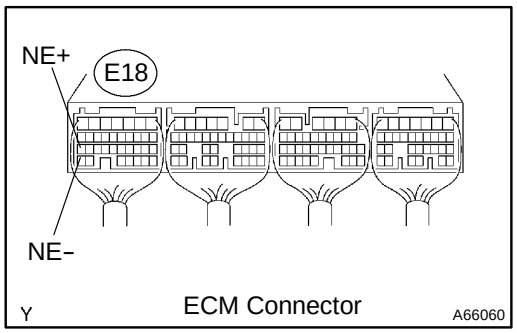
Standard:

Tester Connection	Condition	Specified Condition
THW (E18-19) - E2 (E18-28)	Idling, engine coolant temperature at 60 to 120°C (140 to 248°F)	0.2 to 1.0 V

NG → **Go to step 17**

OK

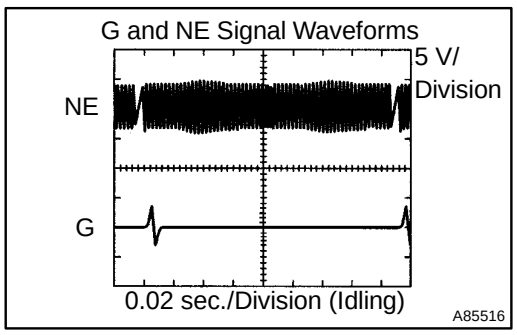
14 INSPECT ECM(NE SIGNAL)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

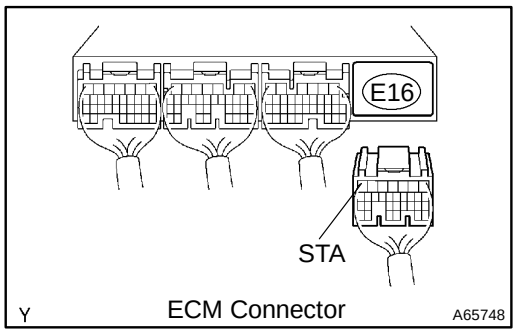
Tester Connection	Specified Condition
NE+ (E18-27) - NE- (E18-34)	Correct waveform is as shown



NG → **Go to step 18**

OK

15 CHECK HARNESS AND CONNECTOR(ECM - STARTER RELAY)



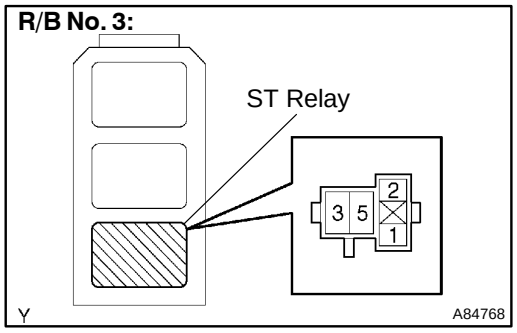
(a) Disconnect the E16 ECM connector.
(b) Remove the ST relay from the R/B No. 3.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ST relay (1) - STA (E16-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ST relay (1) or STA (E16-7) - Body ground	10 kΩ or higher

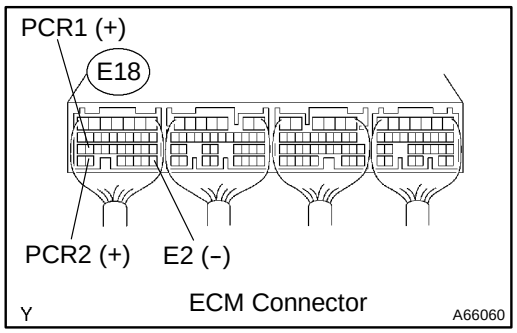


(d) Reconnect the ECM connector.
(e) Reinstall the ST relay.

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

OK

16 INSPECT ECM(PCR1 AND PCR2 VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.
Standard:

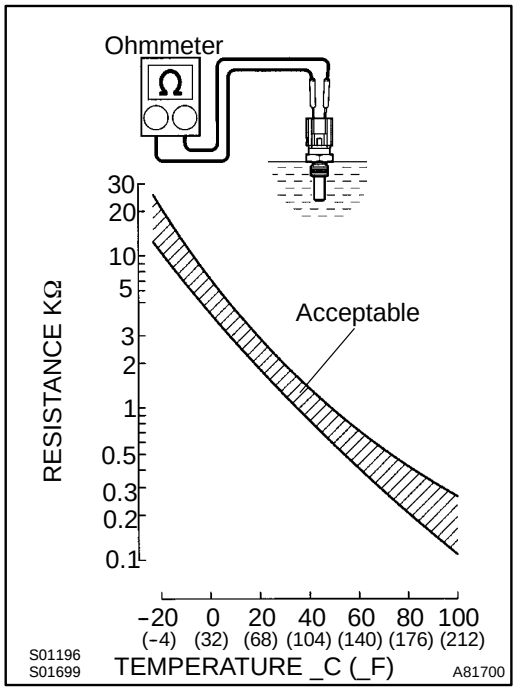
Tester Connection	Condition	Specified Condition
PCR1 (E18-26) - E2 (E18-28)	Idling	1.8 to 2.1 V
PCR2 (E18-33) - E2 (E18-28)	Idling	1.2 to 1.5 V

NG → **Go to step 19**

OK

REPLACE ECM (See page 10-8)

17 INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Standard:
2.32 to 2.59 kΩ at 20_C (68_F)
0.310 to 0.326 kΩ at 80_C (176_F)

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.
(c) Reinstall the engine coolant temperature sensor.

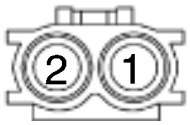
NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

18 INSPECT CRANKSHAFT POSITION SENSOR

Component Side:



Crankshaft Position Sensor

A78431

(a) Remove the crankshaft position sensor.
(b) Measure the resistance between terminals 1 and 2.
Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).
(c) Reinstall the crankshaft position sensor.

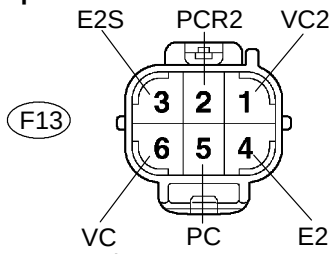
NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

19 INSPECT COMMON RAIL ASSY(FUEL PRESSURE SENSOR)

Component Side:



Y
Fuel Pressure Sensor

A79038

(a) Disconnect the fuel pressure sensor connector.
(b) Measure the resistance between each pair of the terminals of the fuel pressure sensor.
Standard:

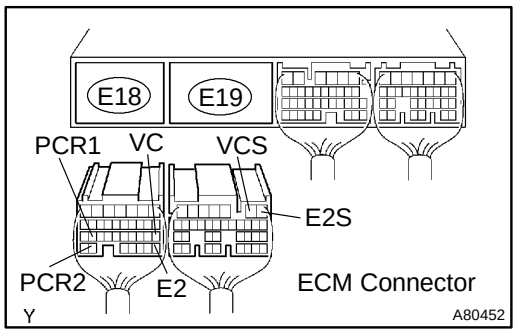
Tester Connection	Specified Condition
PC (F13-5) - E2 (F13-4)	16.4 kΩ or less
PCR2 (F13-2) - E2S (F13-3)	16.4 kΩ or less
PC (F13-5) - VC (F13-6)	3 kΩ or less
PCR2 (F13-2) - VC2 (F13-1)	3 kΩ or less

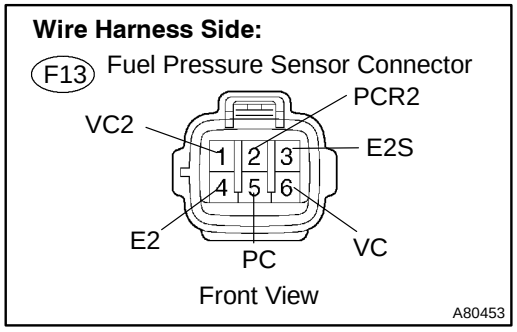
(c) Reconnect the fuel pressure sensor connector.

NG → **REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR)**

OK

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





(a) Disconnect the F13 fuel pressure sensor connector.
(b) Disconnect the E18 and E19 ECM connectors.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCR1 (E18-26) - PC (F13-5)	Below 1 Ω
PCR2 (E18-33) - PCR2 (F13-2)	
VCS (E19-2) - VC2 (F13-1)	
VC (E18-18) - VC (F13-6)	
E2 (E18-28) - E2 (F13-4)	
E2S (E19-1) - E2S (F13-3)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR1 (E18-26) or PC (F13-5) - Body ground	10 kΩ or higher
PCR2 (E18-33) or PCR2 (F13-2) - Body ground	
VCS (E19-2) or VC2 (F13-1) - Body ground	
VC (E18-18) or VC (F13-6) - Body ground	
E2 (E18-28) or E2 (F13-4) - Body ground	
E2S (E19-1) or E2S (F13-3) - Body ground	

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

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

OK

21	REPLACE ECM (See page 10-8)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (See page 11-15)**

OK

END

BLACK SMOKE

HINT:
Specified values in the following troubleshooting flowchart are the reference information.
Because of resultant values in DATA LIST vary depending on measuring conditions, or vehicle's model years. Do not judge the vehicle normal even if the DATA LIST values indicate a standard level. There is a possibility that factors of the malfunction are hiding.

INSPECTION PROCEDURE

1 READ OUTPUT DTCS(RELATED TO ENGINE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
Other than engine-related DTCs (See page 05-35)	A
DTCs related to the engine. (See page 05-35)	B

B → **REPAIR OR REPLACE ENGINE CONTROL SYSTEM ACCORDING TO DTC OUTPUT (See page 05-35)**

A

2 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME and INJ VOL FB #1 to #4" and read its value displayed on the hand-held tester.

Standard:

Item	Engine Speed *	Reference Value
INJ VOLUME	Idling (No engine load)	3 to 10 mm^3
INJ VOL FB #1	Idling (No engine load)	-4.9 to 4.9 mm^3
INJ VOL FB #2	Idling (No engine load)	-4.9 to 4.9 mm^3
INJ VOL FB #3	Idling (No engine load)	-4.9 to 4.9 mm^3
INJ VOL FB #4	Idling (No engine load)	-4.9 to 4.9 mm^3

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

NG → **Go to step 11**

OK

3	PERFORM ENGINE RPM ACCELERATION

HINT:
If exhaust gas contain excessive black smoke, perform the following steps.
(a) Accelerate the engine speed up to the maximum RPM with no load 20 times.
(b) Check the volume of the black smoke in the exhaust gas.
Result:

Result	Proceed to
Black smoke is faded	OK
Black smoke remains in the exhaust gas	NG

HINT:
Deposited soot in the exhaust system is a source of the excessive black smoke.

NG → **Go to step 4**

OK

END

4	CHECK AIR INTAKE SYSTEM AND EXHAUST SYSTEM

(a) Remove the air cleaner filter.
(b) Inspect the EGR valve operation.
  (1) Connect the hand-held tester to the DLC3.
  (2) Turn the ignition switch ON and push the hand-held tester main switch ON.
  (3) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / EGR STEP POS".
  (4) Check that the EGR valve operates by the hand-held tester.
(c) Turn the ignition switch OFF, and then disconnect the connector from EGR valve in order to close the EGR valve.
(d) Inspect the intake shutter operation.
  (1) Start the engine.
  (2) Check if the intake shutter fully opens when accelerating the engine speed.

HINT:
Under quick accelerating of the engine speed, the EGR valve is fully closed and the intake shutter is fully opened. If the systems are normal, the volume of the black smoke will result in decrease.

NG → **Go to step 5**

OK

CHECK AND REPAIR LOCATION WHERE MALFUNCTION EXIST

5	READ VALUE OF HAND-HELD TESTER(MASS AIR FLOW RATE)

HINT:
DTC P0100, P0102 or P0103 (1 trip detection logic) will be present if there is an open or short malfunction in the mass air flow (MAF) sensor, or P0101 (2 trip detection logic) will be present if there is malfunction in the MAF sensor.

(a) Disconnect the throttle control motor connector.
(b) Disconnect the EGR valve connector.
(c) Connect the hand-held tester to the DLC3.
(d) Start the engine and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF" and read its value displayed on the hand-held tester.

Result:

Engine Speed Condition	Air Flow Rate (gm/s)
800 rpm	4 to 9

(f) Reconnect the throttle control motor connector.
(g) Reconnect the EGR valve connector.

NG → **REPLACE MASS AIR FLOW SENSOR**

OK

6	CHECK TURBOCHARGING PRESSURE (See on page 13-3)

NG → **REPLACE TURBOCHARGER SUB-ASSY**

OK

7 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS, PUMP VCM ANGLE, INJ VOLUME, M-INJ/PILOT ON, M-INJ/PILOT OFF, PILOT-INJ, INJ TIMING and INJ VOL FB #1 to #4" and read its value displayed on the hand-held tester.

Reference:

Item	Engine Speed *	Reference Value
COMN RAIL PRESS	Idling	30 to 40 MPa
COMN RAIL PRESS	2,000 rpm (No engine load)	35 to 80 MPa
COMN RAIL PRESS	3,000 rpm (No engine load)	50 to 100 MPa
INJ VOLUME	Idling	3 to 10 mm^3
INJ VOLUME	2,000 rpm (No engine load)	3 to 10 mm^3
INJ VOLUME	3,000 rpm (No engine load)	5 to 12 mm^3
M-INJ/PILOT ON	Idling	600 to 1,200 μs
M-INJ/PILOT OFF	Idling	0 μs
PILOT-INJ	Idling	400 to 700 μs
INJ TIMING	Idling	-1 to 5_CA
INJ TIMING	2,000 rpm (No engine load)	0 to 4_CA
INJ TIMING	3,000 rpm (No engine load)	1 to 5_CA
INJ VOL FB #1	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #2	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #3	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #4	Idling	-4.9 to 4.9 mm^3

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

Result:

Result	Proceed to
Within the reference value	A
One of the INJ VOL FB #1 to #4 indicates out of the reference value	B
Other than above	C

B → **GO TO DTC P1238 (See page 05-150)**

C → **Go to step 11**

A

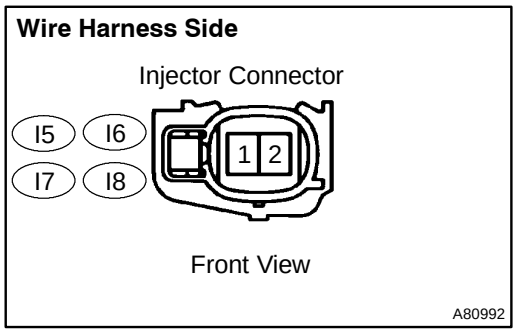
8 INSPECT CYLINDER COMPRESSION PRESSURE (See page 14-1)

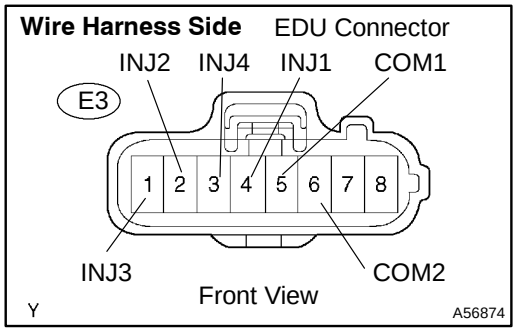
NG → **CHECK AND REPAIR ENGINE**

OK

9 CHECK HARNESS AND CONNECTOR(INJECTOR - EDU)

HINT:
DTC P0200 (1 trip detection logic) will be present if there is an open or short malfunction in the EDU circuit.





(a) Disconnect the I5, I6, I7, or I8 injector connector.
(b) Disconnect the E3 EDU connector.
(c) Measure the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Injector (I5-1) - INJ1 (E3-4)	Below 1 Ω
Injector (I6-1) - INJ2 (E3-2)	
Injector (I7-1) - INJ3 (E3-1)	
Injector (I8-1) - INJ4 (E3-3)	
Injector (I5-2) - COM1 (E3-5)	
Injector (I6-2) - COM2 (E3-6)	
Injector (I7-2) - COM2 (E3-6)	
Injector (I8-2) - COM1 (E3-5)	

Standard (Check for short):

Tester Connection	Specified Condition
Injector (I5-1) or INJ1 (E3-4) - Body ground	10 kΩ or higher
Injector (I6-1) or INJ2 (E3-2) - Body ground	
Injector (I7-1) or INJ3 (E3-1) - Body ground	
Injector (I8-1) or INJ4 (E3-3) - Body ground	
Injector (I5-2) or COM1 (E3-5) - Body ground	
Injector (I6-2) or COM2 (E3-6) - Body ground	
Injector (I7-2) or COM2 (E3-6) - Body ground	
Injector (I8-2) or COM1 (E3-5) - Body ground	

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

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

OK

10 PERFORM ACTIVE TEST BY HAND-HELD TESTER(INJECTOR CUT #1 TO #4)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1 to #4".
(d) Check the engine idling condition while the fuel injection of each cylinder is cut by the hand-held tester.

Result:

Engine Idle Condition	Proceed to
Becomes unstable	A
Does not change	B

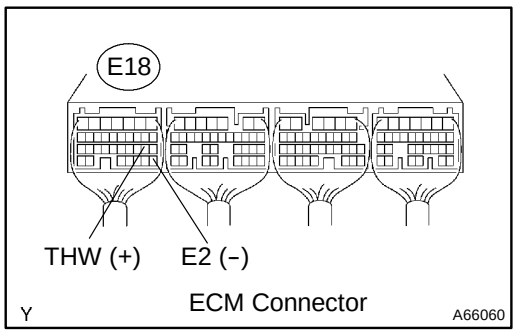
HINT:
Replace the injector mounted on the cylinder that causes the rough idling.

B → GO TO DTC P1238

A

REPLACE INJECTOR DRIVER

11 INSPECT ECM(THW VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.

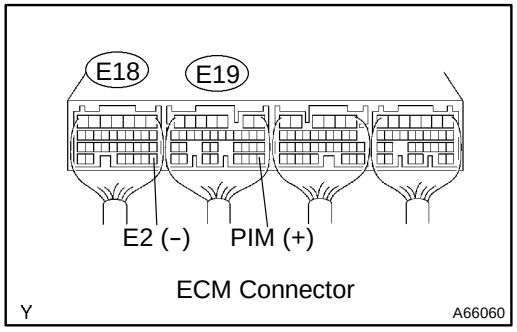
Standard:

Tester Connection	Condition	Specified Condition
THW (E18-19) - E2 (E18-28)	Idling, engine coolant temperature at 60 to 120°C (140 to 248°F)	0.2 to 1.0 V

NG → **Go to step 17**

OK

12 INSPECT ECM(PIM VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E18 and E19 ECM connectors.

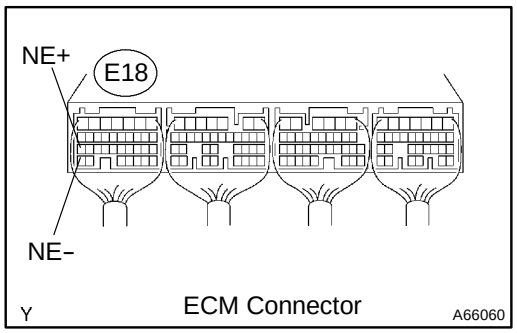
Standard:

Tester Connection	Condition	Specified Condition
PIM (E19-28) - E2 (E18-28)	Applied negative pressure of 40 kPa (300 mmHg, 11.8 in.Hg)	0.2 to 0.8 V
PIM (E19 - 28) - E2 (E18-28)	Same as atmosphere	1.3 to 1.9 V
PIM (E19 - 28) - E2 (E18-28)	Applied positive pressure of 69 kPa (0.7 kgf/cm^2, 10.0 psi)	3.2 to 3.8 V

NG → **Go to step 18**

OK

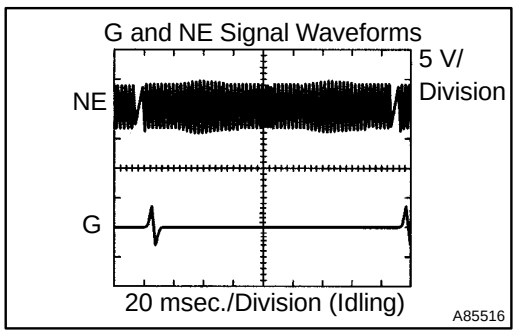
13 INSPECT ECM(NE SIGNAL)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

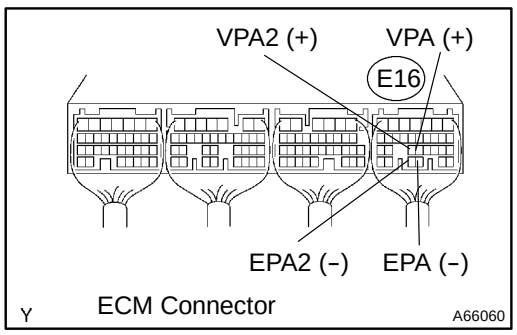
Tester Connection	Specified Condition
NE+ (E18-27) - NE- (E18-34)	Correct waveform is as shown



NG → **Go to step 19**

OK

14 INSPECT ECM(VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 ECM connector.

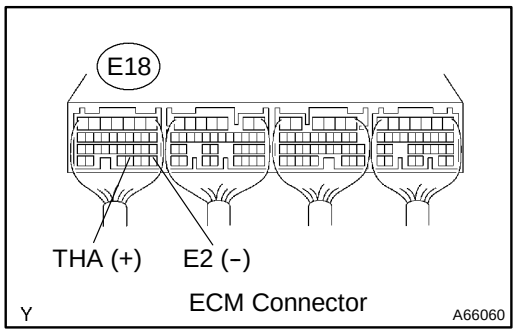
Standard:

Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VPA (E16-22) - EPA (E16-28)	0.5 to 1.1 V
Depressed		2.5 to 4.6 V
Released	VPA2 (E16-23) - EPA2 (E16-29)	1.5 to 2.9 V
Depressed		3.5 to 5.5 V

NG → **Go to step 20**

OK

15 INSPECT ECM(THA VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.

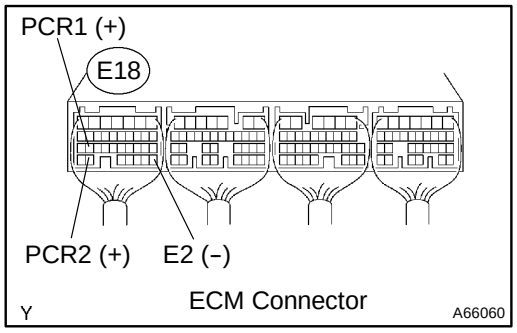
Standard:

Tester Connection	Condition	Specified Condition
THA (E18-31) - E2 (E18-28)	Idling, intake air temp. at 20°C (68°F)	0.5 to 3.4 V

NG → **Go to step 21**

OK

16 INSPECT ECM(PCR1 AND PCR2 VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E18 ECM connector.

Standard:

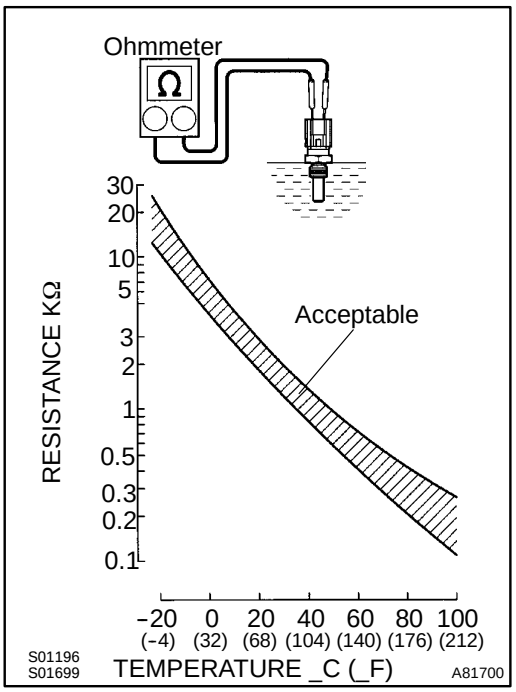
Tester Connection	Condition	Specified Condition
PCR1 (E18-26) - E2 (E18-28)	Idling	1.8 to 2.1 V
PCR2 (E18-33) - E2 (E18-28)	Idling	1.2 to 1.5 V

NG → **Go to step 22**

OK

REPLACE ECM (See page 10-8)

17 INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Standard:
2.32 to 2.59 kΩ at 20_C (68_F)
0.310 to 0.326 kΩ at 80_C (176_F)

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

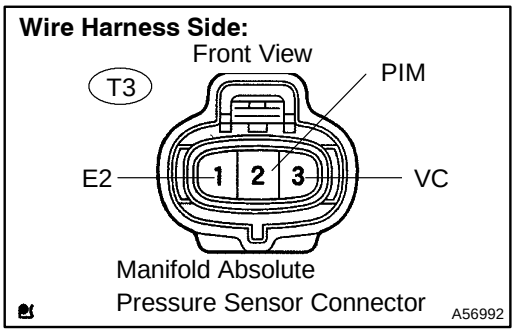
(c) Reinstall the engine coolant temperature sensor.

NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

18 CHECK HARNESS AND CONNECTOR(MANIFOLD ABSOLUTE PRESSURE SENSOR - ECM)



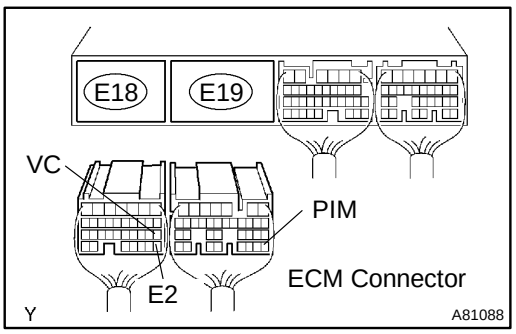
(a) Disconnect the T3 manifold absolute pressure sensor connector.
(b) Disconnect the E18 and E19 ECM connectors.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E19-28)	Below 1 Ω
VC (T3-3) - VC (E18-18)	
E2 (T3-1) - E2 (E18-28)	

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E19-28) - Body ground	10 kΩ or higher
VC (T3-3) or VC (E18-18) - Body ground	
E2 (T3-1) or E2 (E18-28) - Body ground	



(d) Reconnect the manifold absolute pressure sensor connector.
(e) Reconnect the ECM connectors.

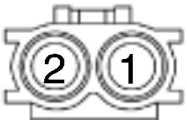
NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

19 INSPECT CRANKSHAFT POSITION SENSOR

Component Side:



Crankshaft Position Sensor

A78431

(a) Remove the crankshaft position sensor.

(b) Measure the resistance between terminals 1 and 2.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

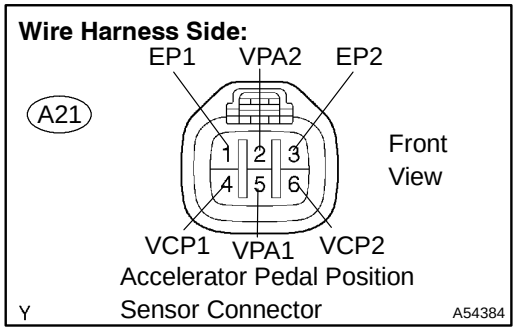
(c) Reinstall the crankshaft position sensor.

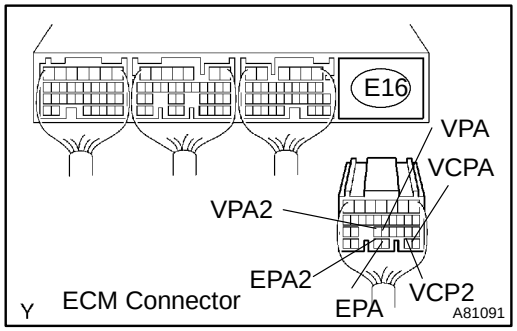
NG	REPLACE CRANKSHAFT POSITION SENSOR

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

20	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect the E16 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VPA (E16-22)	Below 1 Ω
EP1 (A21-1) - EPA (E16-28)	
VCP1 (A21-4) - VCPA (E16-26)	
VPA2 (A21-2) - VPA2 (E16-23)	
EP2 (A21-3) - EPA2 (E16-29)	
VCP2 (A21-6) - VCP2 (E16-27)	

Standard (Check for Short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VPA (E16-22) - Body ground	10 kΩ or higher
EP1 (A21-1) or EPA (E16-28) - Body ground	
VCP1 (A21-4) or VCPA (E16-26) - Body ground	
VPA2 (A21-2) or VPA2 (E16-23) - Body ground	
EP2 (A21-3) or EPA2 (E16-29) - Body ground	
VCP2 (A21-6) or VCP2 (E16-27) - Body ground	

(d) Reconnect the accelerator pedal position sensor connector.

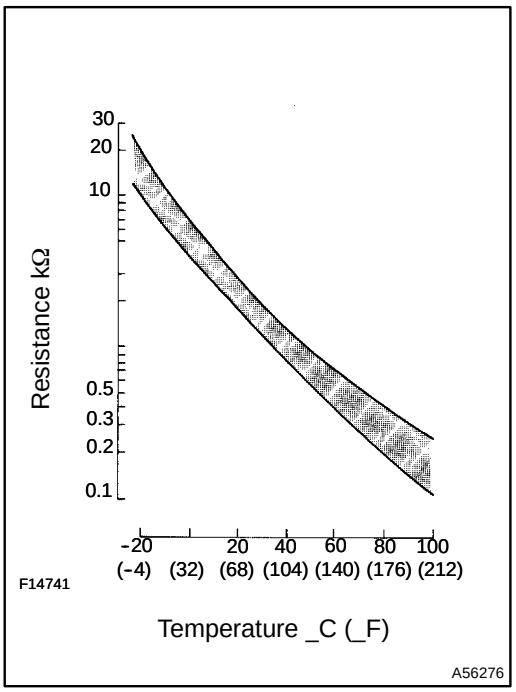
(e) Reconnect the ECM connector.

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

OK

REPLACE ACCELERATOR PEDAL ASSY (ACCELERATOR PEDAL POSITION SENSOR)

21 INSPECT DIESEL TURBO INLET AIR TENPERATURE SENSOR



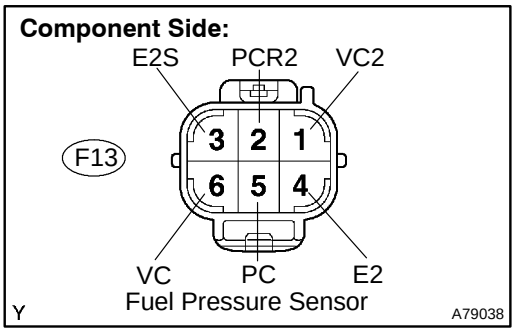
(a) Remove the diesel turbo inlet air temperature sensor.
(b) Measure the resistance between each terminal.
Standard:
2.21 to 2.65 kΩ at 20_C (68_F)
(c) Reinstall the diesel turbo inlet air temperature sensor.

NG → **REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

22 INSPECT COMMON RAIL ASSY(FUEL PRESSURE SENSOR)



(a) Remove the common rail assy.
(b) Measure the resistance between each terminal of the fuel pressure sensor.
Standard:

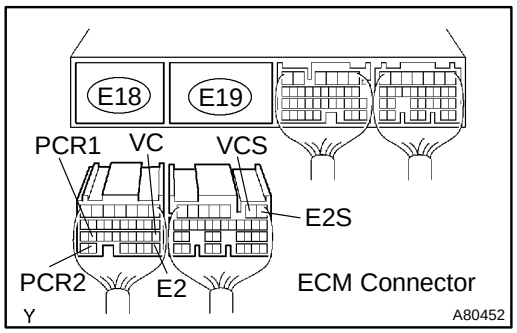
Tester Connection	Specified Condition
PC (F13-5) - E2 (F13-4)	16.4 kΩ or less
PCR2 (F13-2) - E2S (F13-3)	16.4 kΩ or less
PC (F13-5) - VC (F13-6)	3 kΩ or less
PCR2 (F13-2) - VC2 (F13-1)	3 kΩ or less

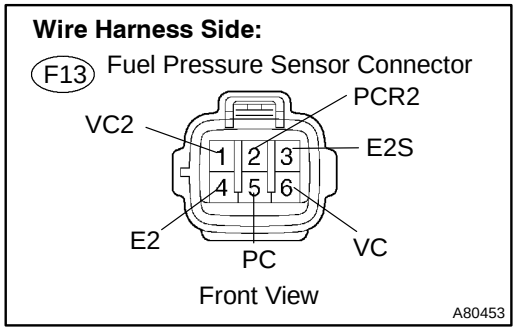
(c) Reinstall the common rail assy.

NG → **REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR)**

OK

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





(a) Disconnect the F13 fuel pressure sensor connector.
(b) Disconnect the E18 and E19 ECM connectors.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCR1 (E18-26) - PC (F13-5)	Below 1 Ω
PCR2 (E18-33) - PCR2 (F13-2)	
VCS (E19-2) - VC2 (F13-1)	
VC (E18-18) - VC (F13-6)	
E2 (E18-28) - E2 (F13-4)	
E2S (E19-1) - E2S (F13-3)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR1 (E18-26) or PC (F13-5) - Body ground	10 kΩ or higher
PCR2 (E18-33) or PCR2 (F13-2) - Body ground	
VCS (E19-2) or VC2 (F13-1) - Body ground	
VC (E18-18) or VC (F13-6) - Body ground	
E2 (E18-28) or E2 (F13-4) - Body ground	
E2S (E19-1) or E2S (F13-3) - Body ground	

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

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

OK

24	REPLACE ECM (See page 10-8)

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY**

OK

END

ECD SYSTEM (1CD-FTV(CDE120#-##M#YW Models))

05DVL-01

PRECAUTION

1. If the customer's problem description is applicable to one of the following problems, refer to the troubleshooting on the pages shown below:

(a) Engine start difficulties, or engine stall, see page 05-360.

(b) Black smoke, see page 05-370.

05DUX-01

SYSTEM DESCRIPTION

1. COMMON RAIL SYSTEM

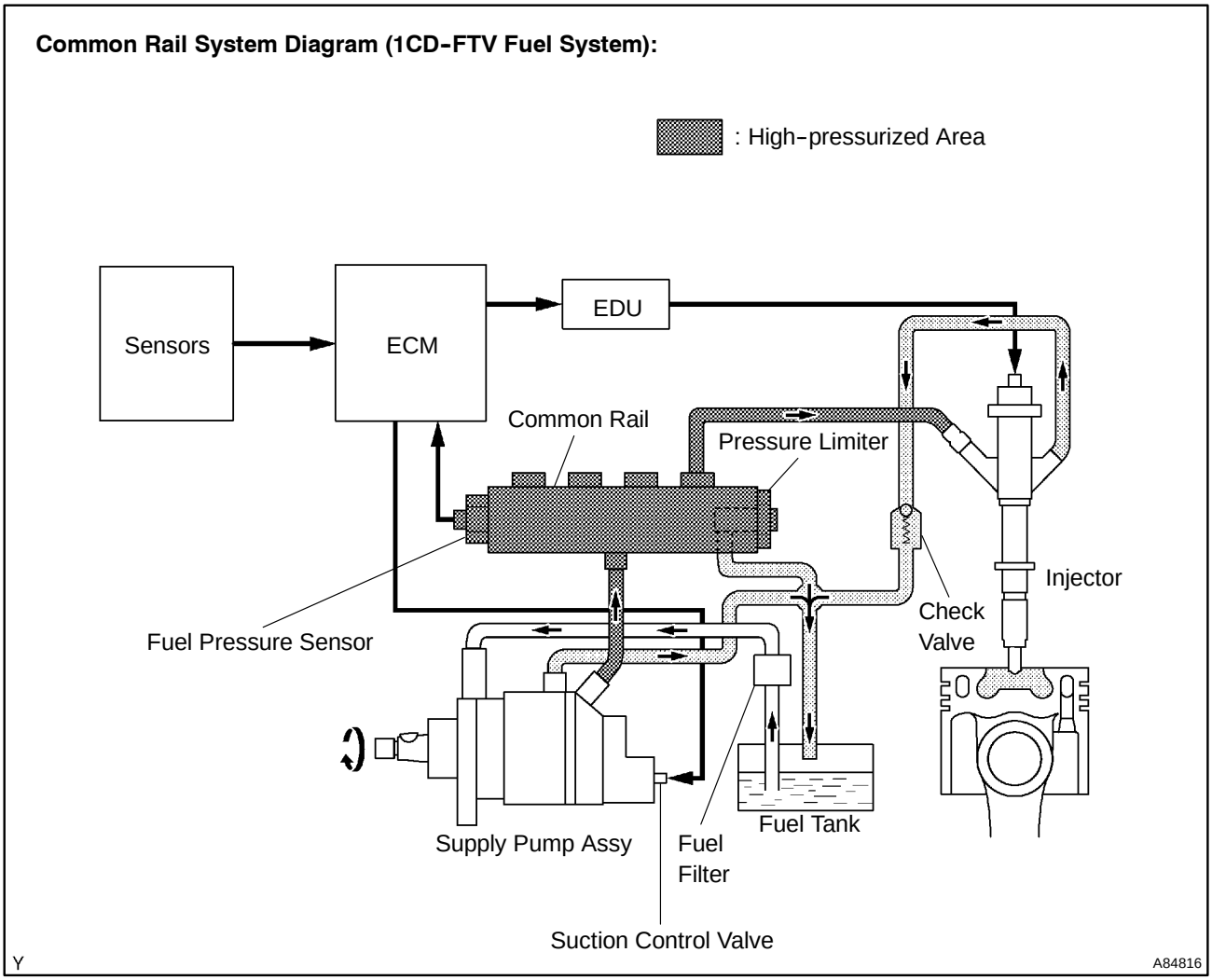
The common rail system uses a high-pressurized fuel for improving a good fuel economy, and providing a robust engine power while suppressing engine vibrations and noises.

This system stores a high-pressurized fuel, which is pressurized and supplied by the supply pump, in the common rail. By storing the high-pressurized fuel, the common rail system can always offer stable fuel injection pressures regardless of engine speeds or engine loads.

The ECM provides an electric current to the solenoid valve in the injector using the EDU to regulate the fuel injection timing and volume, and also monitors the internal fuel pressure in the common rail using the fuel pressure sensor. The ECM commands the supply pump to supply the fuel to obtain a target fuel pressure, approximately 20 to 135 MPa (204 to 1,377 kgf/cm, 2,901 to 19,580 psi). In addition, this system uses the injector that opens and closes the fuel passage with the Two-Way Valve (TWV), therefore both fuel injection time and volume can be precisely regulated by the ECM.

The common rail system provides two split fuel injections. In order to make combustion soft, this system performs "pilot-injection" as the subsidiary fuel injection prior to the main fuel injection. This helps to reduce the engine vibrations and noises.

Common Rail System Diagram (1CD-FTV Fuel System):

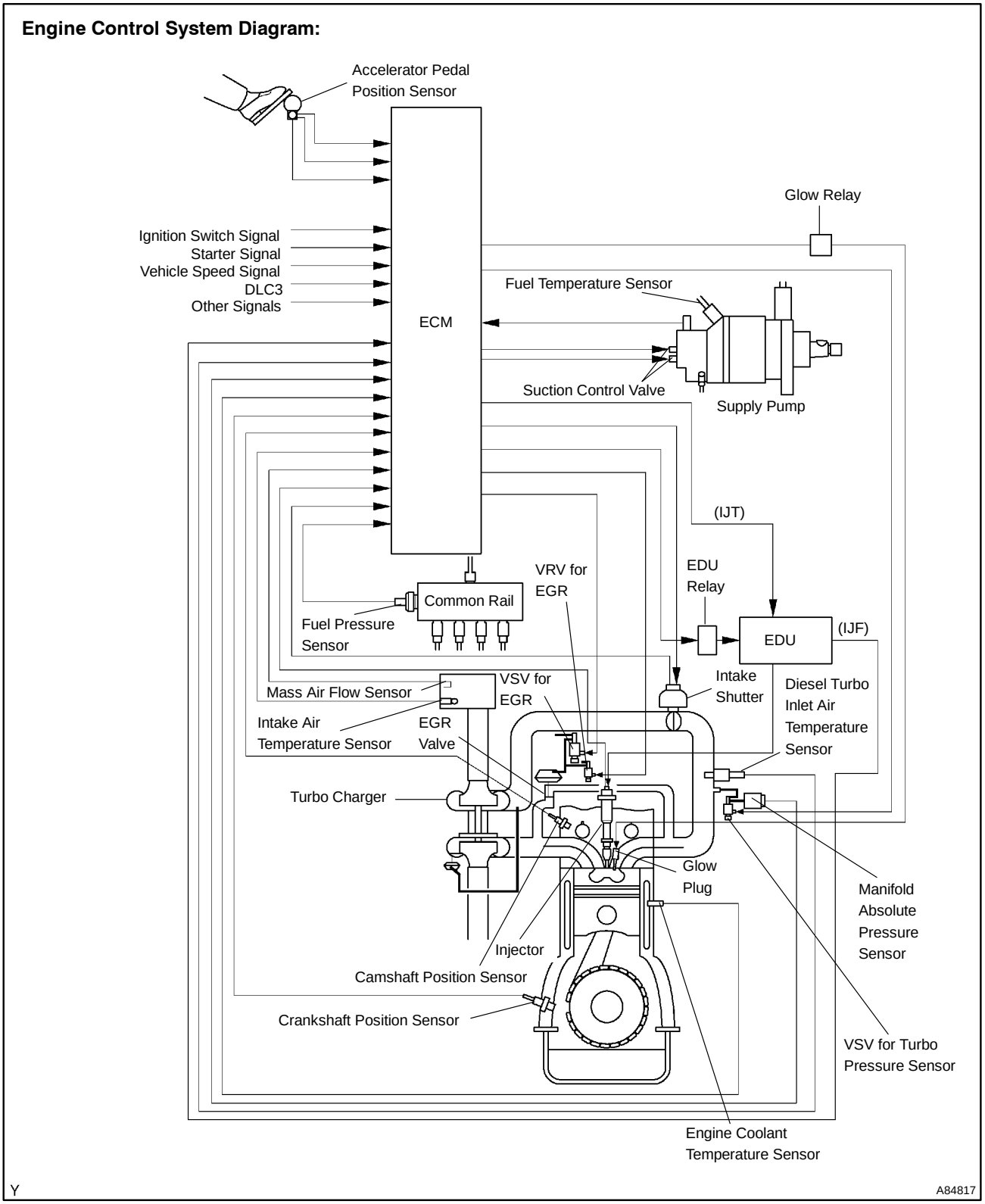


COMMON RAIL SYSTEM COMPONENTS:

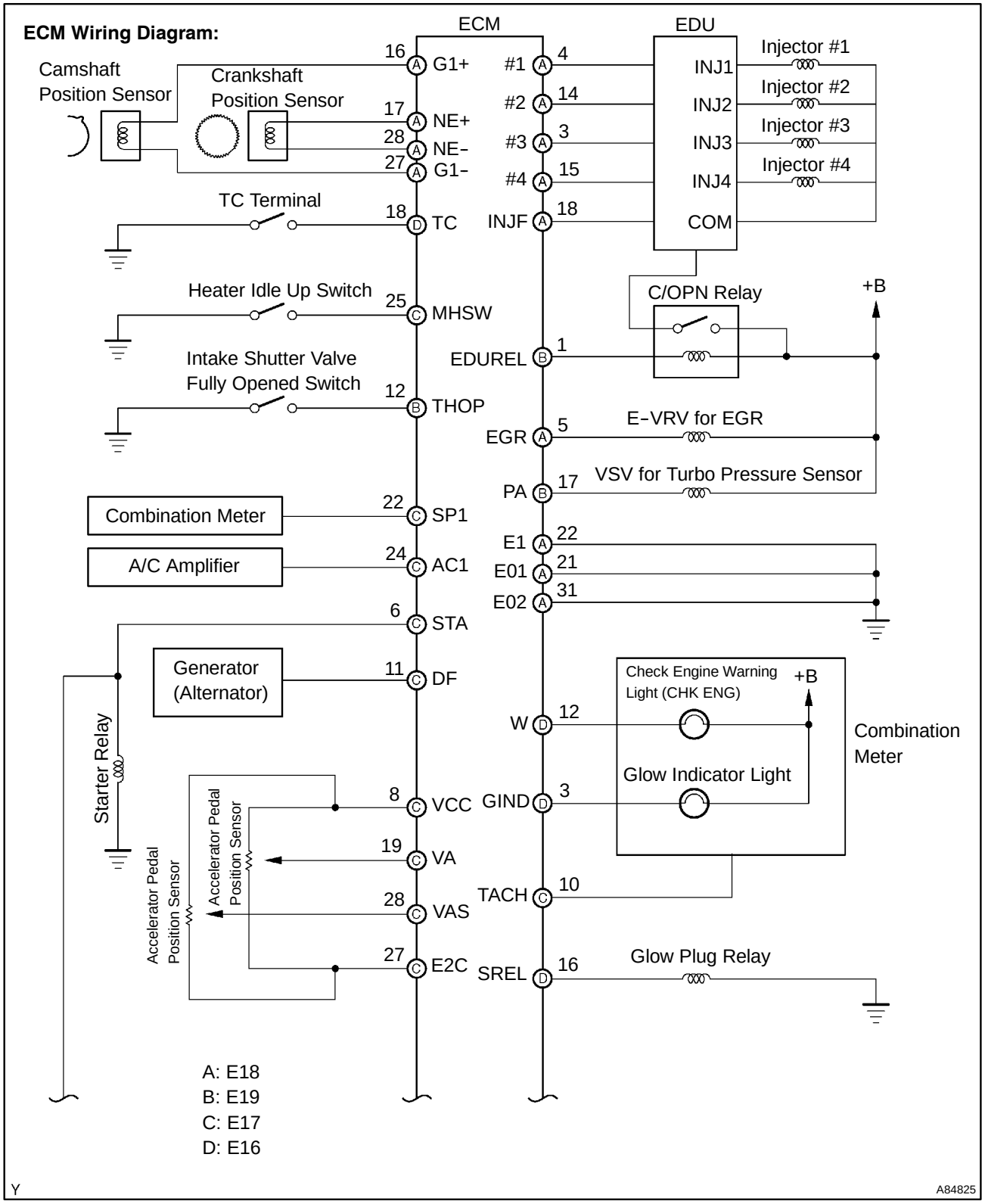
Component	Description
Common rail	Stores high-pressurized fuel produced by the supply pump
Supply pump	Operated by the crankshaft, and supplies high-pressure fuel to the common rail
Injector	Injects fuel to the combustion chamber based on signals from the ECM
Fuel pressure sensor	Monitors internal fuel pressure of the common rail and sends signals to the ECM
Pressure limiter	Opens the pressure limiter valve to reduce the internal pressure in the common rail when the common rail pressure exceeds the specified level
Suction control valve	Based on signals from the ECM, adjusts fuel volume supplied to the common rail and regulates the internal fuel pressure

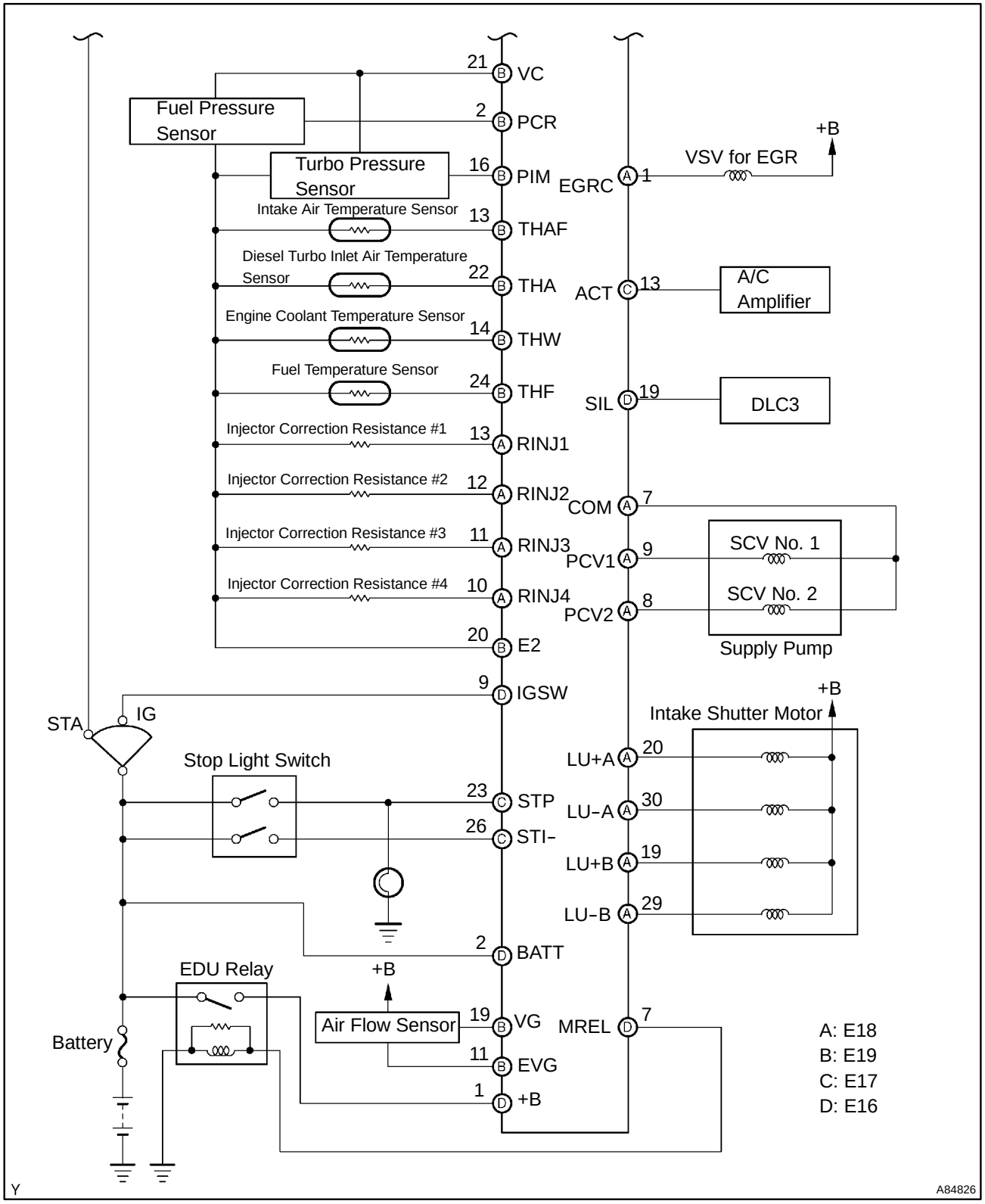
2. ENGINE CONTROL SYSTEM

Engine Control System Diagram:



3. ECM WIRING DIAGRAM



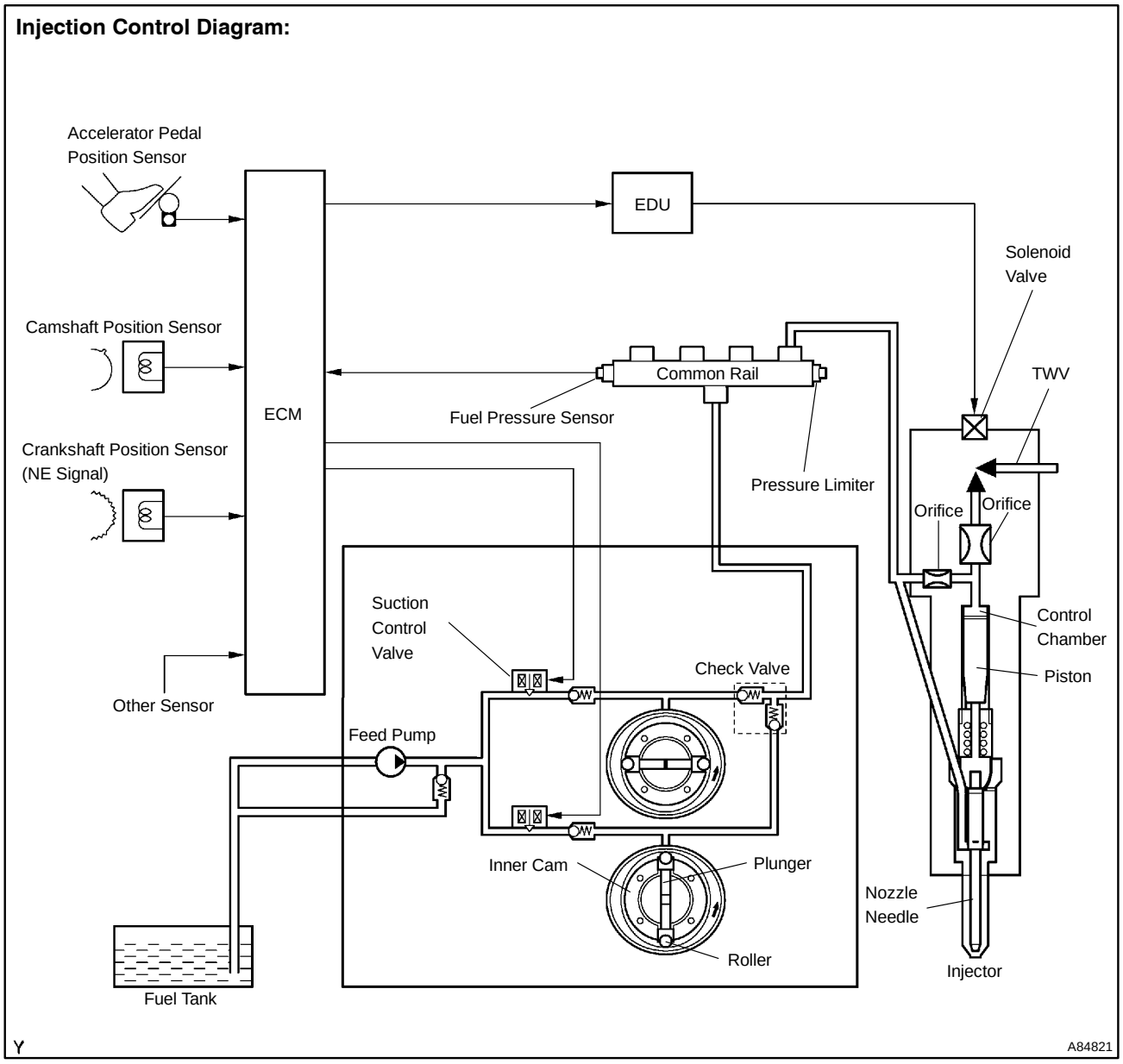

21 VC
2 PCR
16 PIM
13 THAF
22 THA
14 THW
24 THF
13 RINJ1
12 RINJ2
11 RINJ3
10 RINJ4
20 E2
9 IGSW
23 STP
26 STI-
2 BATT
19 VG
11 EVG
1 +B
Fuel Pressure Sensor
Turbo Pressure Sensor
Intake Air Temperature Sensor
Diesel Turbo Inlet Air Temperature Sensor
Engine Coolant Temperature Sensor
Fuel Temperature Sensor
Injector Correction Resistance #1
Injector Correction Resistance #2
Injector Correction Resistance #3
Injector Correction Resistance #4
STA
IG
Stop Light Switch
EDU Relay
Battery
+B
Air Flow Sensor
EGRC A 1
VSV for EGR
+B
ACT C 13
A/C Amplifier
SIL D 19
DLC3
COM A 7
PCV1 A 9
PCV2 A 8
SCV No. 1
SCV No. 2
Supply Pump
+B
Intake Shutter Motor
LU+A A 20
LU-A A 30
LU+B A 19
LU-B A 29
MREL D 7
A: E18
B: E19
C: E17
D: E16
Y
A84826

4. INJECTION CONTROL SYSTEM

The ECM controls the fuel injection system by using the injectors and supply pump. The ECM determines the fuel injection volume and timing by controlling both duration and timing of energization to the solenoid valve in the injector, and determines the injection pressure by controlling the suction control valve located on the supply pump.

The feed pump is used to pump fuel from the fuel tank into the supply pump.

Injection Control Diagram:



5. DIAGNOSTIC TROUBLE CODES (DTCs) TABLE FOR FUEL SYSTEM

HINT:

This table indicates typical DTC combinations for each malfunction occurrence.

( ): Potential DTCs

DTC No.	A	B	C	D	E	F	G	H	I
P0087 (See page 05-241)				F					
P0093 (See page 05-245)	(F)	F						(F)	F
P0190 (See page 05-241)				F					
P0200 (See page 05-277)	F							(F)	
P0627 (See page 05-328)					F		F		
P1229 (See page 05-331)					(F)	F			
P1238 (See page 05-335)	F	F	F					(F)	

Trouble Area	Malfunction	Refer to
Injector	Open or short in injector circuit	A
	Stuck open	B
	Stuck close	C
Fuel pressure sensor	Open or short in fuel pressure sensor circuit or pressure sensor output fixed	D
Suction control valve	Open or short in suction control valve circuit	E
	Stuck open	F
	Stuck close	G
EDU	Faulty EDU	H
Common rail system (Fuel system)	Fuel leaks in high-pressurized area	I

6. DIAGNOSTICS TROUBLE CODE DESCRIPTION

DTC No.	Description
P0087	Fuel pressure sensor output status at fixed value
P0093	Fuel leaks in high-pressurized area
P0190	Open or short in fuel pressure sensor circuit (Low or high output)
P0200	Open or short in EDU or injector circuit
P0627	Open or short in suction control valve circuit
P1229	Fuel over-feed
P1238	Injection malfunction, exclude open or short in injector circuit

054JB-06

HOW TO PROCEED WITH TROUBLESHOOTING

The hand-held tester can be used at step 3, 4, 5, 7 and 10.

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS (See page 05-217)

3	CONNECT THE HAND-HELD TESTER TO DLC3

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

4	CHECK DTC AND FREEZE FRAME DATA (See page 05-222)

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

5	CLEAR DTC AND FREEZE FRAME DATA (See page 05-222)

6	VISUAL INSPECTION

7	SET THE CHECK (TEST) MODE DIAGNOSIS (See page 05-223)

8	PROBLEM SYMPTOM CONFIRMATION

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

A	Malfunction does not occur
B	Malfunction occurs

B	GO TO STEP 10

A

9	SYMPTOM SIMULATION

10	DTC CHECK (See page 05-222)

A	Malfunction code
B	No code

B → GO TO STEP 12

A

11	GO TO DTC CHART (See page 05-233)

GO TO STEP 14

12	BASIC INSPECTION (See page 05-225)

A	Wrong parts not confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

13	GO TO PROBLEM SYMPTOMS TABLE (See page 05-238)

A	Wrong circuit confirmed
B	Wrong parts confirmed

B → GO TO STEP 17

A

14	CHECK ECM POWER SOURCE CIRCUIT (See page 05-348)

15	CIRCUIT INSPECTION

A	Malfunction not confirmed
B	Malfunction confirmed

B → GO TO STEP 18

A

16	CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)

GO TO STEP 18

17	PARTS INSPECTION

18	PROBLEM IDENTIFICATION

19	ADJUSTMENT AND / OR REPAIR

20	CONFIRMATION TEST

END

054JC-06

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

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

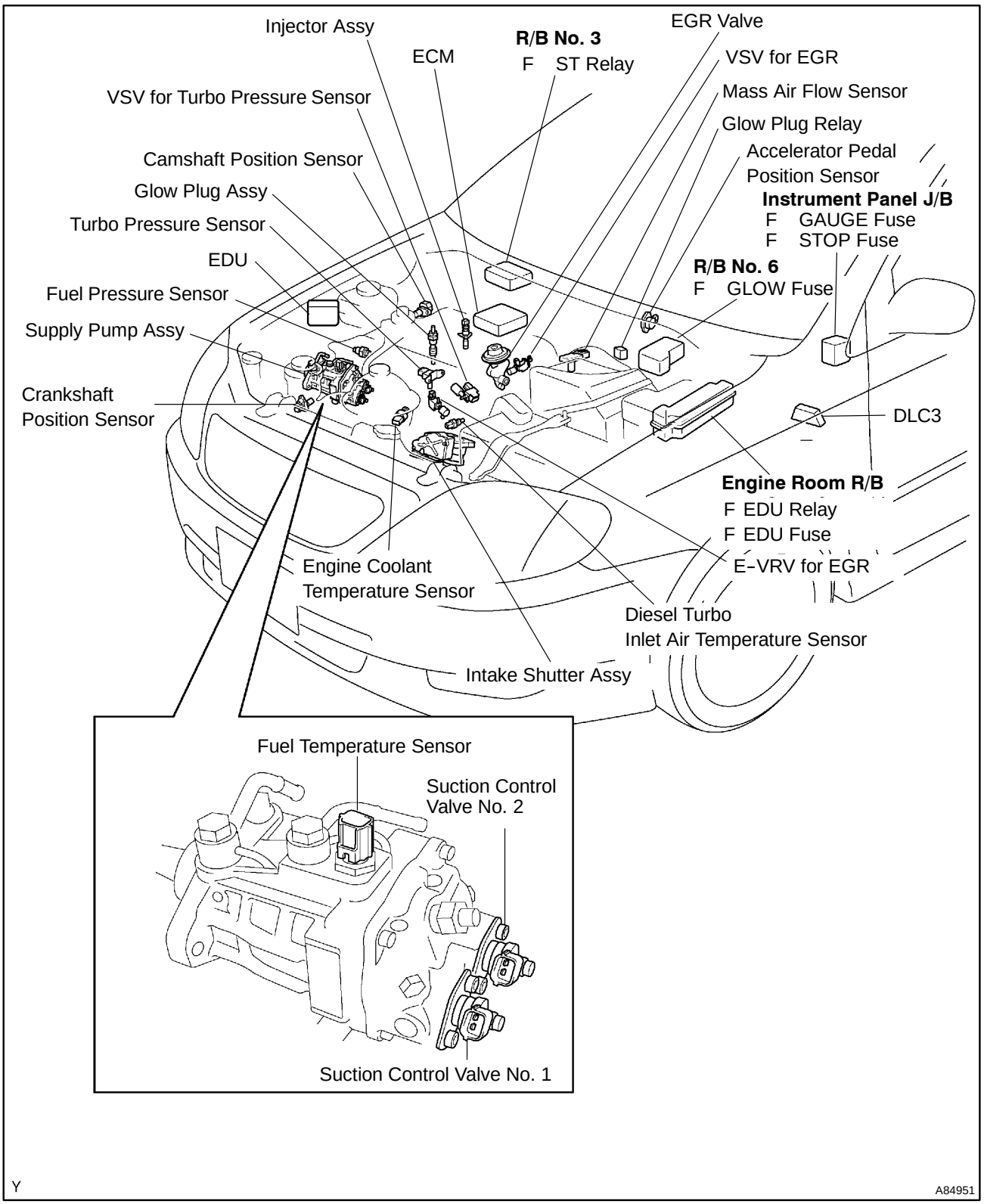
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Drivability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

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

Condition of check engine warning light (CHK ENG)		☐ 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 ( )

054JE-05

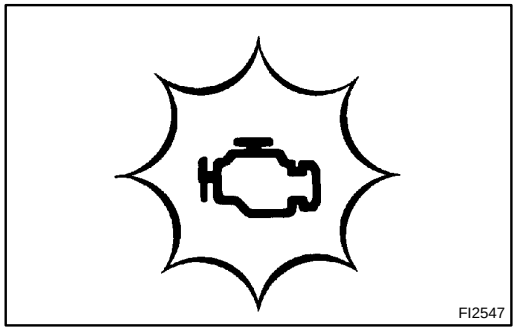
LOCATION



05DUY-01

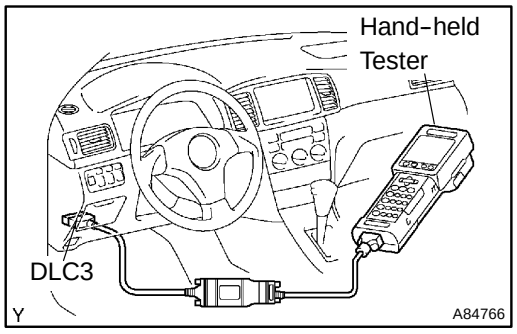
DIAGNOSIS SYSTEM

1. DESCRIPTION


FI2547

S When troubleshooting Euro-OBD vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD scan tool complying with ISO 15031-4 or a hand-held tester to the vehicle, and read the various data output from the vehicle's ECM.

S Euro-OBD regulations require that the vehicle's on-board computer illuminates the check engine warning light (CHK ENG) on the instrument panel when the computer detects a malfunction in the emission control system / components or in the power train control components which affect vehicle emissions, or a malfunction in the computer. In addition to an illumination of the CHK ENG when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15031-4 are recorded in the ECM memory (See page 05-233). If the malfunction does not reoccur in 3 consecutive trips, the CHK ENG goes off automatically but the DTCs remain recorded in the ECM memory.

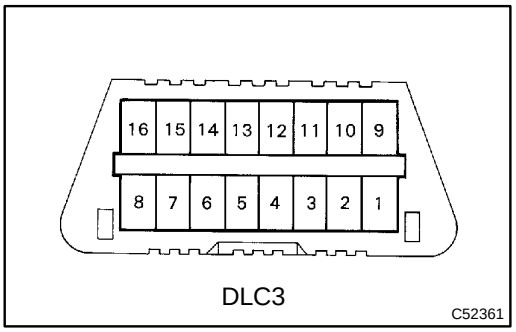


S To check the DTCs, connect the OBD scan tool or hand-held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD scan tool or hand-held tester also enables you to erase the DTCs and check the freeze frame data and various forms of engine data. (For operating instructions, see the OBD scan tool's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

S 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 freely by the manufacturer within the prescribed limits (See DTC chart on page 05-233).

S The diagnosis system operates in the normal mode during normal vehicle use. It also has a check (test) mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and to ensure a thorough malfunction detection. By switching the ECM to the check mode using hand-held tester when troubleshooting, a technician can cause the CHK ENG to illuminate for a malfunction that is only detected once or momentarily (Hand-held tester only) (See page 05-223).

- * 2 trip detection logic
  When a logic malfunction is first detected, the pending fault code is stored in the ECM memory (1st trip). If the same malfunction is detected again during the second drive test, this second detection causes the CHK ENG to illuminate (2nd trip) (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, engine speed, vehicle speed, etc.) when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.



DLC3

2. CHECK DLC3

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

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

3. INSPECT BATTERY VOLTAGE

Battery voltage: 11 to 14 V

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

4. CHECK CHK ENG

(a) The check engine warning light (CHK ENG) comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the CHK ENG is not illuminated, troubleshoot the combination meter.

(b) When the engine is started, the CHK ENG should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

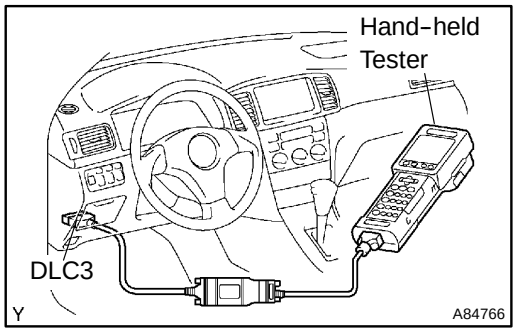
05DUZ-01

DTC CHECK/CLEAR

NOTICE:

Hand-held tester only:

When the diagnosis system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and then write them down.



1. DTC CHECK (using the hand-held tester)

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".

(d) Read the DTCs.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

(e) See page 05-233 to confirm the details of the DTCs.

2. FREEZE FRAME DATA

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / FREEZE FRAME DATA".

(d) Read the freeze frame data.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

3. CLEAR DTCs AND FREEZE FRAME DATA (using the hand-held tester)

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

(b) Turn the ignition switch ON and push the hand-held tester main switch ON. (Do not the engine start)

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".

(d) Clear the DTCs and freeze frame data.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

4. CLEAR DTCs AND FREEZE FRAME DATA (not using the hand-held tester)

(a) Disconnect the battery terminal or remove the ECD fuse from the engine room R/B for more than 60 seconds.

05DV0-01

CHECK MODE PROCEDURE

HINT:

Hand-held tester only:

Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

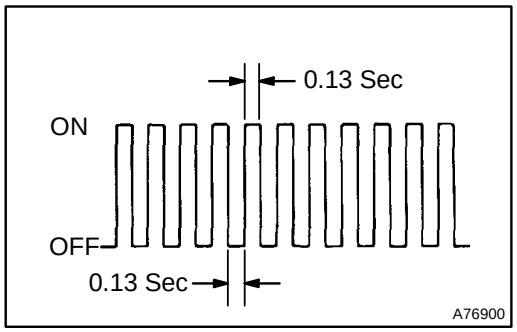
1. PROCEDURE FOR CHECK MODE (using the hand-held tester)

(a) Check the initial conditions.
  (1) Battery positive voltage 11V 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 hand-held tester to the DLC3.

(d) Turn the ignition switch ON and switch the hand-held tester main switch ON.



(e) Select the item "DIAGNOSIS / OBD/MOBD / CHECK MODE". The check engine warning light (CHK ENG) blinks in 0.13 second intervals as shown in the illustration.

NOTICE:

If the hand-held tester switches the ECM from the normal mode to the check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freeze frame data will be erased.

(f) Start the engine. (The CHK ENG goes off after the engine start.)

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

NOTICE:

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

(h) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Do not turn the ignition switch OFF, because the diagnosis system is changed from the check mode to the normal mode and will result in all of the DTCs and freeze frame data being erased.

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

2. CLEAR DTCs (using the hand-held tester)

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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".

(d) Clear the DTCs.

HINT:

If you need help with the hand-held tester, refer to the hand-held tester's instruction book.

3. CLEAR DTCs (not using the hand-held tester)

(a) Disconnect the battery terminal or remove the EDU fuses from the engine room R/B for more than 60 seconds.

05DV1-01

BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the 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**

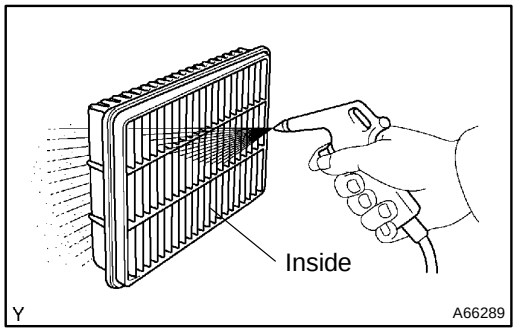
OK

2	CHECK IF ENGINE WILL CRANK

NG → **PROCEED TO PROBLEM SYMPTOMS TABLE ON PAGE 05-238**

OK

3	CHECK AIR FILTER



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

NOTICE:
If necessary, clean the filter with compressed air. First blow from the inside thoroughly, then blow from the outside of the filter.

NG → **CLEAN OR REPLACE**

OK

4	CHECK FUEL QUALITY

(a) Check that only diesel fuel is used
(b) Check that the fuel does not contain any impurity.

NG → **REPLACE FUEL**

OK

5	CHECK ENGINE OIL (See page 17-10 of Pub. No. RM925E COROLLA)

NG → ADD OR REPLACE

OK

6	CHECK ENGINE COOLANT (See page 16-3)

NG → REPLACE ENGINE COOLANT (See page 16-3)

OK

7	CHECK IDLE SPEED AND MAXIMUM SPEED (See page 14-1 of Pub. No. RM925E COROLLA)

NG → REPAIR OR REPLACE SUPPLY PUMP (See page 11-74 of Pub. No. RM925E COROLLA)

OK

8	CHECK DIAGNOSTIC CIRCUIT

NG → REPAIR OR REPLACE

OK

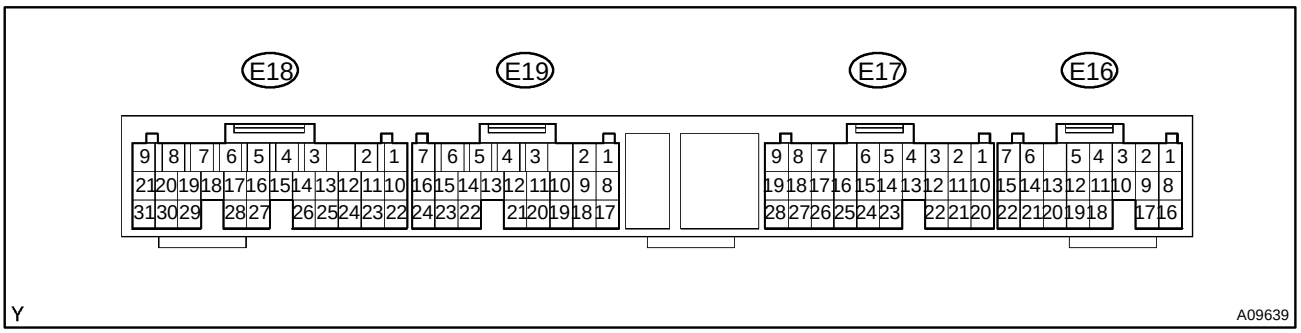
9	CHECK VACUUM PUMP

NG → REPAIR OR REPLACE VACUUM PUMP

OK

PROCEED TO PROBLEM SYMPTOMS TABLE (See page 05-238)

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
BATT (E16-2) - E1 (E18-22)	R-W - BR	Battery (for measuring the battery voltage and for the ECM memory)	Always	9 to 14
+B (E16-1) - E1 (E18-22)	LG(B) - BR *1 B - BR *2	Power source of ECM	Ignition switch ON	9 to 14
VC (E19-21) - E2 (E19-20)	Y - BR	Power source of sensor (a specific voltage)	Ignition switch ON	4.5 to 5.5
VCC (E17-8) - E2C (E17-27)	B - R *3 B - Y *4	Throttle position sensor (for the engine control)	Ignition switch ON	4.5 to 5.5
VA (E17-19) - E2C (E17-27)	G - R *3 G - Y *4	Accelerator pedal position sensor (for the engine control)	Accelerator pedal fully closed	0.5 to 1.1
VA (E17-19) - E2C (E17-27)	G - R *3 G - Y *4		Accelerator pedal fully opened	2.6 to 4.5
VAS (E17-28) - E2C (E17-27)	W - R *3 W - Y *4	Accelerator pedal position sensor (for the sensor malfunction detection)	Accelerator pedal fully closed	1.2 to 2.0
VAS (E17-28) - E2C (E17-27)	W - R *3 W - Y *4		Accelerator pedal fully opened	3.4 to 5.3
PCR (E19-2) - E2 (E19-20)	G-W - BR	Fuel pressure sensor	Ignition switch ON	1.0 to 4.0
THAF (E19-13) - E2 (E19-20)	Y-R - BR *5 L - O - BR *6	Intake air temperature sensor	Atmospheric temperature	0.5 to 3.8
PIM (E19-16) - E2 (E19-20)	LG-R - BR	Turbo pressure sensor	Apply vacuum 40 kPa (300 mmHg, 11.8 in.Hg)	1.0 to 1.8
PIM (E19-16) - E2 (E19-20)	LG-R - BR		Apply vacuum 135 kPa (1,000 mmHg, 39.4 in.Hg)	2.3 to 3.2
THA (E19-22) - E2 (E19-20)	L - BR *5 Y - B - BR *6	Intake air temperature sensor	Idling, air intake temperature 0°C (32°F) to 60°C (140°F)	0.2 to 3.8
THW (E19-14) - E2 (E19-20)	W - BR	Engine coolant temperature sensor	Idling, engine coolant temperature 60°C (140°F) to 120°C (248°F)	0.1 to 1.5
THF (E19-24) - E2 (E19-20)	Y-R - BR	Fuel temperature sensor	Ignition switch ON (at engine cold)	0.5 to 3.8
VG (E19-19) - EVG (E19-11)	G - L-W *5 G - L *6	Mass air flow sensor	Idling, A/C switch OFF	0.5 to 3.0
IGSW (E16-9) - E1 (E18-22)	SB(B-O) - BR	Ignition switch	Ignition switch ON	9 to 14
STA (E17-6) - E1 (E18-22)	SB(B-W) - BR *7 SB(B-R) - BR *8	Starter signal	Cranking	6.0 or more
NE+ (E18-17) - NE- (E18-28)	B - W	Crankshaft position sensor	Idling	Pulse generation (See page 05-286)
G1+ (E18-16) - G- (E18-27)	B - W *5 R - G *6	Camshaft position sensor	Idling	Pulse generation (See page 05-286)
SP1 (E17-22) - E1 (E18-22)	W(V-W) - BR	Speed signal from combination meter	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (See page 05-315)

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
PA (E19-17) - E01 (E18-21)	B-R - W-B	VSV for turbo pressure sensor	VSV for atmospheric pressure leaning OFF	9 to 14
PA (E19-17) - E01 (E18-21)	B-R - W-B		VSV for atmospheric pressure leaning ON	0 to 3
STP (E17-23) - E2 (E19 - 20)	SB(G-W) - BR	Stop light switch	Ignition switch ON, Brake pedal depressed	7.5 to 14
	SB(G-W) - BR		Ignition switch ON, Brake pedal released	Below 1.5
ST1- (E17-26) - E2 (E19 - 20)	G-R - BR	Stop light switch (opposite to STP)	Ignition switch ON, Brake pedal depressed	Below 1.5
	G-R - BR		Ignition switch ON, Brake pedal released	7.5 to 14
#1 (E18-4) - E01 (E18-21)	L - W-B	Injector	Idling	Pulse generation (See page 05-277)
#2 (E18-14) - E01 (E18-21)	L-W - W-B *5 L-O - W-B *6			
#3 (E18-3) - E01 (E18-21)	L-R - W-B			
#4 (E18-15) - E01 (E18-21)	L-B - W-B			
INJF (E18-18) - E01 (E18-21)	R-Y - W-B *5 Y-G - W-B *6	EDU	Idling	
MREL (E16-7) - E01 (E18-21)	B-W - W-B	EDU relay	Ignition switch ON	9 to 14
TACH (E17-10) - E1 (E18-22)	W(B) - BR	Engine speed	Idling	9 to 14
SREL (E16-16) - E01 (E18-21)	G-R - W-B	Glow plug	Cranking	9 to 14
			Idling	0 to 1.5
DF (E17-11) - E1 (E18-22)	R - W-B *3 L - W-B *4	Generator (alternator) duty signal	Idling	Pulse generation
W (E16-12) - E01 (E18-21)	W(R-Y) - W-B	Check engine warning light (CHK ENG)	Check engine warning light (CHK ENG) lights up	0 to 3
	W(R-Y) - W-B		Except check engine warning light (CHK ENG) lights up	9 to 14
GIND (E16-3) - E01 (E18-21)	W(R) - W-B	Ground	Glow indicator light lights up	0 to 3
	W(R) - W-B		Except glow indicator light lights up	9 to 14
LU+A (E18-20) - E01 (E18-21)	W-R - W-B	Intake shutter	Ignition switch ON	Pulse generation (See page 05-305)
LU-A (E18-30) - E01 (E18-21)	W-L - W-B			
LU+B (E18-19) - E01 (E18-21)	L-R - W-B *5 R-W - W-B *6			
LU-B (E18-29) - E01 (E18-21)	L-Y - W-B			
TC (E16-18) - E1 (E18-22)	W(P-B) - BR	Terminal TC of DLC 3	Ignition switch ON	9 to 14
THOP (E19-12) - E1 (E18-22)	G-W - BR *5 R-L - BR *6	Intake shutter fully opened switch	Idling	9 to 14
			Ignition switch ON	0 to 3
RINJ1 (E18 - 13) - E1 (E18-22)	R-L - BR *5 LG - BR *6	Injector correction resistance	Idling	0.5 to 4.5
RINJ2 (E18 - 12) - E1 (E18-22)	L-R - BR *5 R-B - BR *6			
RINJ3 (E18 - 11) - E1 (E18-22)	R - BR *5 P - BR *6			
RINJ4 (E18 - 10) - E1 (E18-22)	L - BR			
PCV1 (E18-9) - COM (E18-7)	G-R - L-R	Suction control valve No. 1	Idling	Pulse generation (See page 05-328)
PCV2 (E18-8) - COM (E18-7)	Y-R - L-R	Suction control valve No. 2	Idling	Pulse generation (See page 05-328)

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	STD Voltage (V)
EGR (E18-5) - E01 (E18-21)	L-W - W-B	E-VRV for EGR	Ignition switch ON EGR ON	9 to 14 Pulse generation (See page 05-299)
EGRC (E18-1) - E01 (E18-21)	L-B - W-B	VSV for EGR	Ignition switch ON Maintain engine speed at 1500 rpm after warming up	0 to 3 9 to 14

*1: LHD
*2: RHD
*3: LHD TMC Made Except H/B
*4: LHD TMC Made H/B, RHD
*5: TMC Made, TMMT Made
*6: TMUK Made
*7: LHD TMC Made, RHD TMC Made H/B
*8: Except *7

05DV2-01

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using the DATA LIST displayed by the hand-held tester, you can read the value of the switches, sensors, actuators and other data without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten diagnostic time.

NOTICE:

The values given below for "Normal Condition" are representative values. A vehicle may still be normal even if its value differs from those listed here. Do not solely depend on the normal condition here when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand-held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST".
(g) According to the display on the tester, read the "DATA LIST".

Hand-held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
INJ VOLUME	Injection volume/ Min.: 0 mm^3, Max.: 1279.98 mm^3	Idling: 3 to 10 mm^3	—
INJ TIMING	Injection timing/ Min.: 0_CA, Max.: 51_CA	Idling: -1 to 5˚CA	—
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16383.75 rpm	Idling: 700 to 800 rpm	—
MAF	Air flow rate from MAF sensor status/ Min.: 0 gm/s, Max.: 655.35 gm/s	S Idling: 7.7 to 10.6 gm/s S Running without load (2,500 rpm): 26.3 to 43.8 gm/s	If the value is approximately 0.0 gm/s: S Mass air flow sensor power source circuit open S VG circuit open or short If the valve is 135 gm/s or more: S E2G circuit open
PIM	Absolute pressure inside intake manifold/ Min.: 0 kPa, Max.: 255 kPa	S Idling: 85 to 110 kPa S Engine running at 2,000 rpm: 80 to 110 kPa S Engine running at 3,000 rpm: 90 to 130 kPa	—
COOLANT TEMP	Coolant temperature/ Min.: -40 _C, Max.: 215 _C	After warming up: 80 to 95˚C (176 to 203˚F)	If the value is "-40 _C" or "140 _C", sensor circuit is open or shorted.
INTAKE AIR	Intake air temperature/ Min.: -40 _C, Max.: 215 _C	Equivalent to temperature at the intake manifold	
FUEL TEMP	Fuel temperature status/ Min.: -40 _C, Max.: 215 _C	Actual fuel temperature	
ACCEL POSITION	Accel position status/ Min.: 0 %, Max.: 100 %	S Accelerator pedal released: 0 % S Accelerator pedal depressed: 100 %	Read the value with ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Actual vehicle speed	Speed indicated on speedometer

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

Hand-held Tester Display	Measurement Item/Range (Display)	Normal Condition *	Diagnostic Note
THROTTLE POS	Throttle step position status/ Min.: 1 step, Max.: 255 step	S Throttle fully closed: 162 step S Throttle fully open: 0 step	Read the value with ignition switch ON (Do not start engine).
COMN RAIL PRESS	Common rail pressure status/ Min.: 0 MPa, Max.: 255 MPa	Idling: 20 to 40 MPa	—
AMBI TEMP SENS	Ambient temperature sensor status/ Min.: -40 _C, Max.: 215 _C	Actual atmospheric temperature	If the value is "-40 _C" or "140 _C", sensor circuit is open or shorted.
ACCEL OPEN SW	Accel open switch/ ON or OFF	Accelerator pedal fully depressed: ON	—
INJ VOL FB #1	Injection volume correction for cylinder 1/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #2	Injection volume correction for cylinder 2/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #3	Injection volume correction for cylinder 3/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
INJ VOL FB #4	Injection volume correction for cylinder 4/ Min.: -10 mm^3, Max.: 10 mm^3	Idling: -3.0 to 3.0 mm^3	—
M-INJ/PILOT ON	M-INJ/PILOT ON/ Min.: 0 µs, Max.: 65,535 µs	Idling: 600 to 1,200 us	—
M-INJ/PILOT OFF	M-INJ/PILOT OFF/ Min.: 0 µs, Max.: 65,535 µs	Idling: 0 µs	—
PILOT-INJ	Pilot-Injection/ Min.: 0 µs, Max.: 65,535 µs	Idling: 400 to 700 µs	—
STOP LIGHT SW	Stop light switch/ ON or OFF	S Brake pedal depressed: ON S Brake pedal released: OFF	—
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	—
A/C SIG	A/C signal/ ON or OFF	A/C ON: OFF	—
A/C CUT SIG	A/C cut signal/ ON or OFF	A/C ON: OFF	—
CHECK MODE	Check mode/ ON or OFF	Check mode ON: ON	—
DIST TRAV	Travel distance after check engine warning light (CHK ENG) was illuminated/ Min.: 0 km, Max.: 65,535 km	Actual travel distance after check engine warning light (CHK ENG) was illuminated	—

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

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of the troubleshooting is one of the methods to shorten diagnostic 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 hand-held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand-held tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST"
(g) According to the display on tester, perform the "ACTIVE TEST".

Hand-held Tester Display	Test Details	Diagnostic Note
TC/TE1	[Test Details] Same condition as the connection of TC and TE1 ON or OFF	—
EGR CLOSE VSV	[Test Details] Activate the VSV for EGR ON or OFF	—
FUEL LEAK TEST	[Test Details] Maintain the engine speed at 2,000 rpm, and pressurize the common rail internal fuel pressure to 115 MPa ON or OFF	Confirm that there is no leak in the fuel system when the common rail internal fuel pressure is pressurized high.
INJECTOR CUT #1	[Test Details] Injector cut #1 ON or OFF	—
INJECTOR CUT #2	[Test Details] Injector cut #2 ON or OFF	—
INJECTOR CUT #3	[Test Details] Injector cut #3 ON or OFF	—
INJECTOR CUT #4	[Test Details] Injector cut #4 ON or OFF	—

054JD-06

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

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

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0087 (05-241)	Fuel Rail/System Pressure - Too Low	$ Open or short in fuel pressure sensor circuit $ Fuel pressure sensor $ ECM	f	f
P0093 (05-245)	Fuel System Leak Detected - Large Leak	$ Fuel line between supply pump and common rail $ Fuel line between common rail and injector $ Supply pump $ Common rail $ Injector (P1238 is set simultaneously) $ Pressure Limiter $ Open or short in EDU circuit (P0200 is set simultaneously) $ Open or short in injector circuit (P0200 and P1238 are set simultaneously) $ EDU (P0200 is set simultaneously) $ ECM	f	f
P0095 (05-248)	Intake Air Temperature Sensor 2 Circuit	$ Open or short in diesel turbo inlet air temperature sensor circuit $ Diesel turbo inlet air temperature sensor $ ECM	f	f
P0100 (05-252)	Mass or Volume Air Flow Circuit	$ Open or short in mass air flow sensor circuit $ Mass air flow sensor $ ECM	f	f
P0101 (05-257)	Mass or Volume Air Flow Circuit Range/Performance Problem	$ Mass air flow sensor	f	f
P0105 (05-258)	Manifold Absolute Pressure/ Barometric Pressure Circuit	$ Open or short in turbo pressure sensor circuit $ Turbo pressure sensor $ Open or short in VSV for turbo pressure sensor circuit $ VSV for turbo pressure sensor $ Vacuum hose is disconnected or blocked $ ECM	f	f
P0106 (05-263)	Manifold Absolute Pressure/ Barometric Pressure Circuit Range/Performance Problem	$ Turbo pressure sensor	f	f
P0110 (05-264)	Intake Air Temperature Circuit	$ Open or short in intake air temperature sensor circuit $ Intake air temperature sensor (built in mass air flow meter) $ ECM	f	f
P0115 (05-268)	Engine Coolant Temperature Circuit	$ Open or short in engine coolant temperature sensor circuit $ Engine coolant temperature sensor $ ECM	f	f
P0116 (05-272)	Engine Coolant Temperature Circuit Range/Performance Problem	$ Cooling system $ Engine coolant temperature sensor $ Thermostat	f	f
P0180 (05-273)	Fuel Temperature Sensor "A" Circuit	$ Fuel temperature sensor	f	f
P0190 (05-241)	Fuel Rail Pressure Sensor Circuit	$ Open or short in fuel pressure sensor circuit $ Fuel pressure sensor $ ECM	f	f





DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P0200 (05-277)	Injector Circuit / Open	S Open or short in EDU circuit S Injector S EDU S ECM	f	f
P0335 (05-286)	Crankshaft Position Sensor "A" Circuit	S Open or short in crankshaft position sensor circuit S Crankshaft position sensor S Signal plate (crankshaft timing pulley) S ECM	f	f
P0340 (05-289)	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	S Open or short in camshaft position sensor circuit S Camshaft position sensor S Camshaft timing pulley S ECM	f	f
P0380 (05-292)	Glow Plug/Heater Circuit "A"	S Open or short in glow plug circuit S Glow fuse S Glow Plug relay S Glow plug S ECM	f	f
P0400 (05-299)	Exhaust Gas Recirculation Flow	S Vacuum hose connection S Open or short in EGR circuit S VSV for EGR S E-VRV for EGR S ECM	f	f
P0487 (05-305)	Exhaust Gas Recirculation Throttle Position Control Circuit	S Open or short in intake shutter circuit S Intake shutter S ECM	f	f
P0488 (05-309)	Exhaust Gas Recirculation Throttle Position Control Range/ Performance	S Open or short in intake shutter circuit S Open or short in fully opened switch circuit S Intake shutter S ECM	f	f
P0500 (05-315)	Vehicle Speed Sensor "A"	S Open or short in speed sensor circuit S Speed sensor S Combination meter S ECM	f	f
P0504 (05-317)	Brake Switch "A"/"B" Correlation	S Short in stop lamp switch signal circuit S Stop lamp switch S ECM	—	f
P0560 (05-321)	System Voltage	S Open in back-up power source circuit S ECM	f	f
P0606 (05-324)	ECM/PCM Processor	S ECM	—	—
P0622 (05-325)	Generator Field "F" Terminal Circuit	S Open in alternator (generator) circuit S Alternator (generator) S Drive belt S ECM	f	f
P0627 (05-328)	Fuel Pump Control Circuit / Open	S Open or short in supply pump (suction control valve) circuit S Supply pump (suction control valve) S ECM	f	f
P1229 (05-331)	Fuel Pump System	S Short in supply pump (suction control valve) circuit S Supply pump (suction control valve) S ECM	f	f

DTC No. (See Page)	Detection Item	Trouble Area	*1 CHK ENG	Memory
P1238 (05–335)	Injector Malfunction	S Injector S EDU (P0200 is set simultaneously) S Open or short in engine wire harness (P0200 is set simultaneously) S Connector connection (P0200 is set simultaneously) S Compression pressure S Valve clearance S Valve timing S ECM	f	f
P1611 (05–324)	IC Circuit Malfunction	S ECM	f	f
P1670 (05–339)	Correction Resistance Malfunction	S Injector correction resistance circuit S Injector correction resistance (built into injector) S ECM	f	f
P2120 (05–340)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	S Open or short in accelerator pedal position sensor circuit S Accelerator pedal position sensor S ECM	f	f
P2121 (05–346)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	S Accelerator pedal position sensor circuit S Accelerator pedal position sensor S ECM	f	f
P2226 (05–258)	Barometric Pressure Circuit	S Open or short in turbo pressure sensor circuit S Turbo pressure sensor S Open or short in VSV for turbo pressure sensor circuit S VSV for turbo pressure sensor S Vacuum hose disconnected or blocked S ECM	f	f
B2799 (*2)	Engine Immobilizer System Malfunction	S Immobilizer system	—	f

*1: Check that the check engine warning light (CHK ENG) is illuminated
*2: See page 05–1395 of Pub. No. RM925E COROLLA.

05DV3-01

FAIL-SAFE CHART

1. FAIL-SAFE CHART

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

DTC No.	Detection Item	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0093	Fuel System Leak Detected - Large Leak	After fail safe driving control is performed for 1 minute, engine stalls	Ignition switch OFF
P0095	Intake Air Temperature Sensor 2 Circuit	Intake air temperature is fixed at 145_C (293_F)	"Pass" condition detected
P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	Turbo pressure is set at fixed value	"Pass" condition detected
P0115	Engine Coolant Temperature Circuit	When fuel temperature sensor operates normally and fuel temperature is less than 15_C (59_F), value of fuel temp. sensor is substituted When fuel temperature sensor operates normally and fuel temperature is more than 20_C (68_F), value is fixed at 120_C (248_F) When the fuel temperature sensor is abnormal, value is fixed at 40_C (104_F)	"Pass" condition detected
P0180	Fuel Temperature Sensor "A" Circuit	Fuel temperature is fixed at 40_C (104_F)	"Pass" condition detected
P0190	Fuel Rail Pressure Sensor Circuit	Limits the engine power	Ignition switch OFF
P0200	Injector Circuit / Open	Limits the engine power	Ignition switch OFF
P0335	Crankshaft Position Sensor "A" Circuit	Output limit	"Pass" condition detected
P0488	Exhaust Gas Recirculation Throttle Position Control Range/Performance	Limits the engine power	Ignition switch OFF
P0500	Vehicle Speed Sensor "A"	Vehicle speed is fixed at 0 km/h (0 mph)	Vehicle speed less than 10 km/h (6 mph)
P1229	Fuel Pump System	Limits the engine power	Ignition switch OFF
P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit	Limits the engine power	Ignition switch OFF
P2121	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance	Limits the engine power	Ignition switch OFF

05DV4-01

CHECK FOR INTERMITTENT PROBLEMS

1. CHECK FOR INTERMITTENT PROBLEMS

Hand-held tester only:

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

(a) Clear the DTCs (See page 05-222).
(b) Set the check mode (See page 05-223).
(c) Perform a simulation test (See page 01-20).
(d) Check the connector and terminal (See page 01-30).
(e) Wiggle the harness and connector (See page 01-30).

054JF-06

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform the troubleshooting according to the numbered order given in the table below.

Symptom	Suspect Area	See page
Does not crank (Difficult to start)	5. Starter 6. Starter relay 7. Engine coolant temperature sensor	* * *
Difficult to start with cold engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. EC 6. Supply pump 7. Fuel pressure sensor 8. Intake shutter 9. Glow system	05-353 * * * 10-8 * 05-241 * *
Difficult to start with warm engine	1. STA signal circuit 2. Injector 3. Fuel filter 4. Compression 5. EC 6. Supply pump 7. Fuel pressure sensor 8. Intake shutter	05-353 * * * 10-8 * 05-241 *
Engine stalls soon after starting	1. Fuel filter 2. Injector 3. EC power source circuit 4. EC 5. Supply pump 6. Fuel pressure sensor 7. Intake shutter	 * * 05-348 10-8 * 05-241 *
Engine stalls (Other than the condition listed above)	1. EC power source circuit 2. Injector 3. EC 4. Supply pump 5. Fuel pressure sensor 6. Intake shutter	 05-348 * 10-8 * 05-241 *
Incorrect first idle (Poor idling)	1. Fuel filter 2. Injector 3. EC 4. Supply pump 5. Fuel pressure sensor	* * 10-8 * 05-241

Symptom	Suspect Area	See page
High engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. STA signal circuit 4. EC 5. Supply pump 6. Fuel pressure sensor	* * 05-353 10-8 * 05-241
Lower engine idle speed (Poor idling)	1. A/C signal circuit 2. Injector 3. EGR system 4. Compression 5. Valve clearance 6. Fuel line (Air bleed) 7. EC 8. Supply pump 9. Fuel pressure sensor 10. Intake shutter	* * * * * - 10-8 * 05-241 *
Rough idling (Poor idling)	1. Injector 2. Fuel line (Air bleed) 3. EGR system 4. Compression 5. Valve clearance 6. EC 7. Supply pump 8. Fuel pressure sensor 9. Intake shutter	* - * * * 10-8 * 05-241 *
Hunting at hot engine (Poor idling)	1. Injector 2. EC power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. EC 7. Supply pump 8. Fuel pressure sensor 9. Intake shutter	* 05-348 * - * 10-8 * 05-241 *
Hunting at cold engine (Poor idling)	1. Injector 2. EC power source circuit 3. Compression 4. Fuel line (Air bleed) 5. Valve clearance 6. EC 7. Supply pump 8. Fuel pressure sensor 9. Intake shutter	* 05-348 * - * 10-8 * 05-241 *





Symptom	Suspect Area	See page
Hesitation/ Poor acceleration (Poor drivability)	1. Injector 2. Fuel filter 3. EGR system 4. Compression 5. EC 6. Supply pump 7. Fuel pressure sensor 8. Intake shutter	* * * * 10-8 * 05-241 *
Knocking (Poor drivability)	1. Injector 2. EGR system 3. EC 4. Supply pump 5. Fuel pressure sensor	* * 10-8 * 05-241
Black smoke (Poor drivability)	1. Injector 2. EGR system 3. EC 4. Supply pump 5. Fuel pressure sensor 6. Intake shutter	* * 10-8 * 05-241 *
White smoke (Poor drivability)	1. EGR system 2. Injector 3. Fuel filter 4. EC 5. Supply pump 6. Fuel pressure sensor 7. Intake shutter	* * * 10-8 * 05-241 *
Surging/ Hunting (Poor drivability)	1. Injector 2. EC 3. Supply pump 4. Fuel pressure sensor	* 10-8 * 05-241

*: See page 05-439 of Pub. No. RM925E COROLLA.

DTC	P0087	FUEL RAIL/SYSTEM PRESSURE - TOO LOW

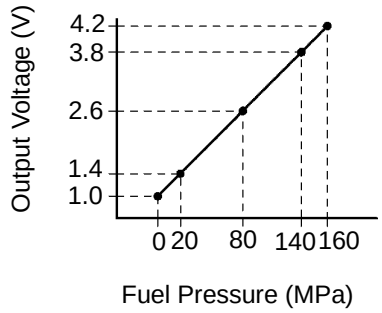
DTC	P0190	FUEL RAIL PRESSURE SENSOR CIRCUIT

HINT:

- For more information on the fuel pressure sensor and the common rail system, see page 05-207.
- If P0087 and / or P0190 are present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-207.

CIRCUIT DESCRIPTION

Property of Output Voltage:



The ECM monitors internal fuel pressure of common rail using the fuel pressure sensor and controls the suction control valve to regulate the internal pressure to the target pressure (approximately 20 to 135 MPa (204 to 1,377 kgf/cm^2, 2,901 to 19,580 psi)).

The pressure sensor is a semiconductor pressure sensor that varies electric resistance when applying the pressure to its silicon. This sensor outputs the voltage in proportion to the internal fuel pressure.

DTC No.	DTC Detection Condition	Trouble Area
P0087	Fuel pressure sensor output stays at fixed value (2 trip detection logic)	• Open or short in fuel pressure sensor circuit • Fuel pressure sensor • ECM
P0190	Fuel pressure sensor output voltage is 0.55 V or less, or 4.9 V or more for 0.5 second (1 trip detection logic)	

HINT:

After confirming DTC P0087 and / or P0190, check the internal fuel pressure of the common rail in "DIAGNOSIS / OBD / MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

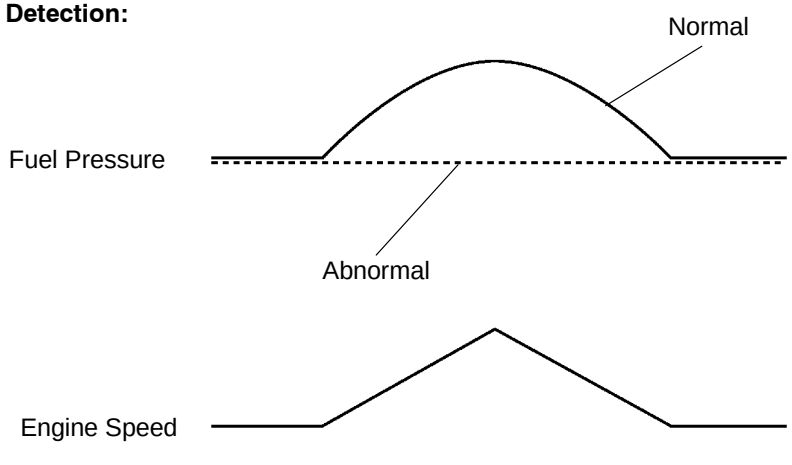
Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

MONITOR DESCRIPTION

P0087 (Fuel pressure sensor output stays at fixed value):

Under normal condition, an internal fuel pressure of the common rail usually fluctuates 1 to 2 MPa (10 to 20 kgf/cm^2, 145 to 290 psi) even if the driving condition is constant. The internal fuel pressure is approximately 20 to 40 MPa (204 to 408 kgf/cm^2, 2,901 to 5,801 psi) at idling, and it increases to approximately 40 to 80 MPa (408 to 816 kgf/cm^2, 5,801 to 11,603 psi) when running the engine at 2,500 rpm. This DTC is set if there is no fluctuation in the internal fuel pressure.

P0087 Malfunction Detection:



P0190 (Open or short in fuel pressure sensor circuit):

This DTC is set if the fuel pressure sensor output voltage is out of the standard range. The DTC stands for open or short malfunction of the sensor circuit.

If this DTC is present, the ECM enters fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

P0087:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 second
CHK ENG operation	2 driving cycles

P0190:

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	0.5 second
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

P0087:

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	-
Battery voltage	8 V	-
Fuel quantify	5 mm^3/st	-
The monitor will not run if the fuel pressure sensor circuit (P0190, P0192 and P0193) is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

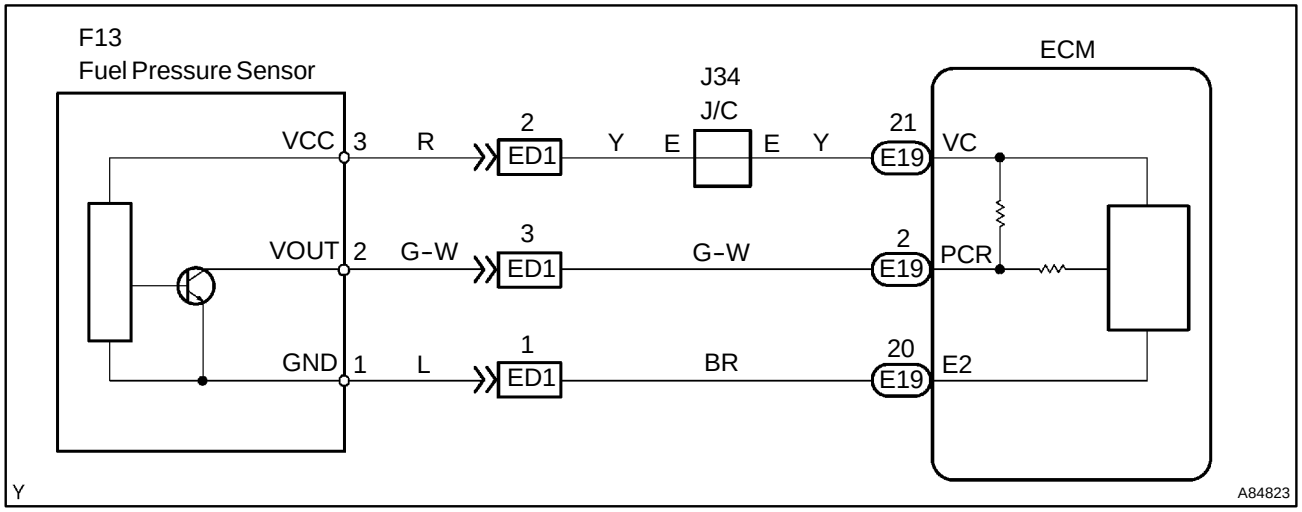
P0087:

Detection Criteria	Threshold
Changing value of fuel pressure	Virtually no fluctuation

P0190:

Detection Criteria	Threshold
Fuel pressure sensor output voltage	Less than 0.55 V or more than 4.9 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- After completing repair, check that P0087 and/or P0190 are not present again.
- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(FUEL PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".
(e) Check that internal fuel pressure of the common rail is within the specification below.

Standard:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

NG → **Go to step 3**

OK

2	CHECK IF DTCS OUTPUT RECUR(DTCS RELATED TO FUEL PRESSURE SENSOR)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(d) Clear the DTCs.
(e) Let the engine idle for 60 seconds, and repeat a quick RPM acceleration (to 2,500 rpm) for 30seconds.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

Result:

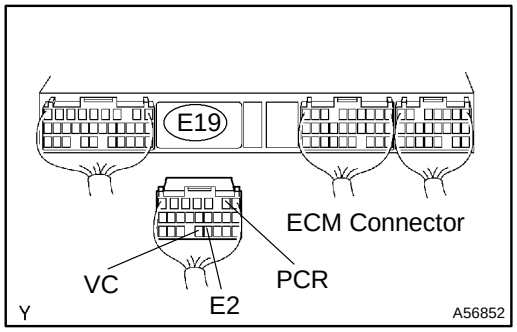
Display (DTC Output)	Proceed to
P0087 and/or P0190	A
No output	B

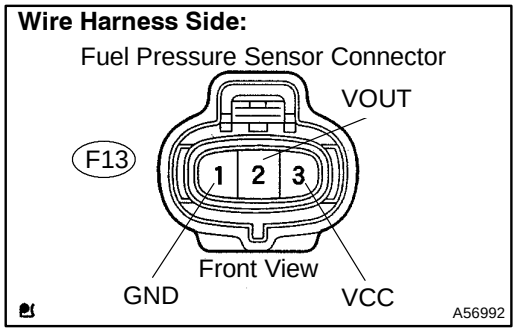
B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

REPLACE ECM (See page 10-8)

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





(a) Disconnect the F13 fuel pressure sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCR (E19-2) - VOUT (F13-2)	Below 1 Ω
VC (E19-21) - VCC (F13-3)	
E2 (E19-20) - GND (F13-1)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR (E19-2) or VOUT (F13-2) - Body ground	10 kΩ or higher
VC (E19-21) or VCC (F13-3) - Body ground	
E2 (E19-20) or E2 (F13-1) - 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 11-82 of Pub. No. RM925E COROLLA)

DTC	P0093	FUEL SYSTEM LEAK DETECTED - LARGE LEAK

HINT:

- If DTC P1229 is detected, P0093 (Fuel leaks in high-pressurized area) may be detected simultaneously. Because of the extremely high internal fuel pressure in the common rail opens the pressure limiter, and the ECM may interpret this as a fault and set P0093.
- For more information on the common rail system, see page 05-207.
- If P0093 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-207.

CIRCUIT DESCRIPTION

Refer to the description on page 05-207.

DTC No.	DTC Detection Condition	Trouble Area
P0093	Fuel leaks in high-pressurized area (1 trip detection logic)	S Fuel line between supply pump and common rail S Fuel line between common rail and injector S Supply pump S Common rail S Injector (P1238 is set simultaneously) S Pressure limiter S Open or short in EDU circuit (P0200 is set simultaneously S Open or short in injector circuit (P0200 and P1238 are set simultaneously) S EDU (P0200 is set simultaneously S ECM

HINT:

After confirming DTC P0093, check the internal fuel pressure of the common rail in "DIAGNOSIS / OBD / MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

MONITOR DESCRIPTION

P0093 (Fuel leaks in high-pressurized area):

This DTC stands for fuel leaks that are existing in high-pressurized area in the common rail system. The ECM constantly monitors the internal fuel pressure of the common rail after the engine is started, and the ECM then will set this DTC if the drop of the internal fuel pressure is large when injecting the fuel.

In the common rail system, high-pressurized fuel, approximately 20 to 135 MPa (204 to 1,377 kgf/cm^2, 2,901 to 19,580 psi), is always applied to the high-pressurized area including the supply pump, common rail, injector and piping. The ECM adjusts the suction control valve opening angle to obtain the target internal fuel pressure.

If this DTC is present, the ECM enters the fail-safe mode. The fail-safe mode suspends both fuel injection and supply pump operation, and then stops the engine. Before stopping the engine, the ECM permits driving the vehicle for 1 minute. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 second
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	-
The monitor will not run if the fuel pressure sensor, or suction control valve circuit, or pressure discharge valve is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Drop of the internal fuel pressure is large when injecting fuel

INSPECTION PROCEDURE

HINT:

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

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0093)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0093	A
P0093 and P1238	B
P0093 and P0200	C

HINT:

If any other codes besides P0093 are output, perform the troubleshooting for those DTCs first.

B → **Go to step 3**

C → **GO TO RELEVANT DTC CHART (See page 05-233)**

A

2 CHECK FOR FUEL LEAKS(IN HIGH-PRESSURIZED FUEL PARTS AND AREA)

(a) Visually check the supply pump, injector and fuel line located between the supply pump and common rail for fuel leaks or fuel pressure leaks. Also, perform the same on the fuel line between the common rail and injector (See page 11-64 and/or 11-82 of Pub. No. RM925E COROLLA).

HINT:

There is possibility that fuel leaks inside the components (supply pump, etc) have been occurred.

NG → **REPAIR OR REPLACE**

OK

3	READ VALUE OF HAND-HELD TESTER(COMPENSATORY INJECTION VOLUME FOR EACH CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB #1, #2, #3 and #4" and read its value displayed on the hand-held tester.

Result:

Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

NG → **REPLACE INJECTOR ASSY (See page 11-64 of Pub. No. RM925E COROLLA)**

OK

4	PERFORM ACTIVE TEST USING HAND-HELD TESTER(FUEL LEAK TEST)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / FUEL LEAK TEST".
(e) Check for fuel leaks in the high-pressurized area.

GO

CHECK DTC OUTPUT RECUR (DTC P0093 OUTPUT AGAIN)

HINT:

- After clearing the DTC, let the engine idle for 1 minute and then run it at 2,500 rpm for 30 seconds.
- At the same time, check the fuel pressure inside the common rail in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.
- The internal fuel pressure of the common rail must be stable under each driving condition.

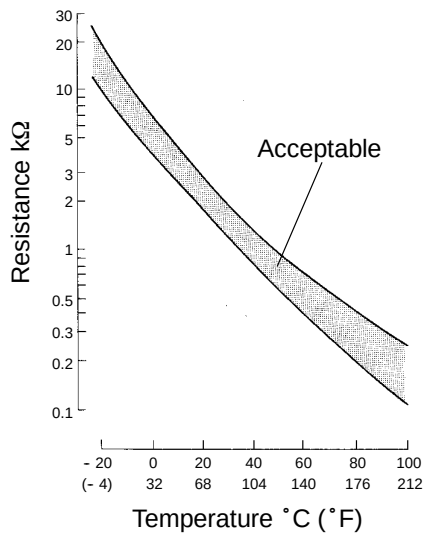
Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

DTC	P0095	INTAKE AIR TEMPERATURE SENSOR 2 CIRCUIT

CIRCUIT DESCRIPTION

(Figure 1)



The diesel turbo inlet air temperature sensor is built into the intake air connector and senses the inlet air temperature. A thermistor built in the sensor changes the resistance value according to the inlet air temperature. The lower the inlet air temperature, the greater the thermistor resistance value, and the higher the inlet air temperature, the lower the thermistor resistance value (See figure 1).

The inlet air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the inlet air temperature sensor from terminal THIA via a resistor R. That is the resistor R and the inlet air temperature sensor are connected in series. When the resistance value of the inlet air temperature sensor changes in accordance with changes in the inlet air temperature, the potential at the terminal THIA also changes. Based on this signal, the ECM corrects the fuel injection volume to improve the drivability with a cold engine.

DTC No.	DTC Detection Condition	Trouble Area
P0095	Open or short in diesel turbo inlet air temperature sensor circuit for 0.5 second (1 trip detection logic)	$ Open or short in diesel turbo inlet air temperature sensor circuit $ Diesel turbo inlet air temperature sensor $ ECM

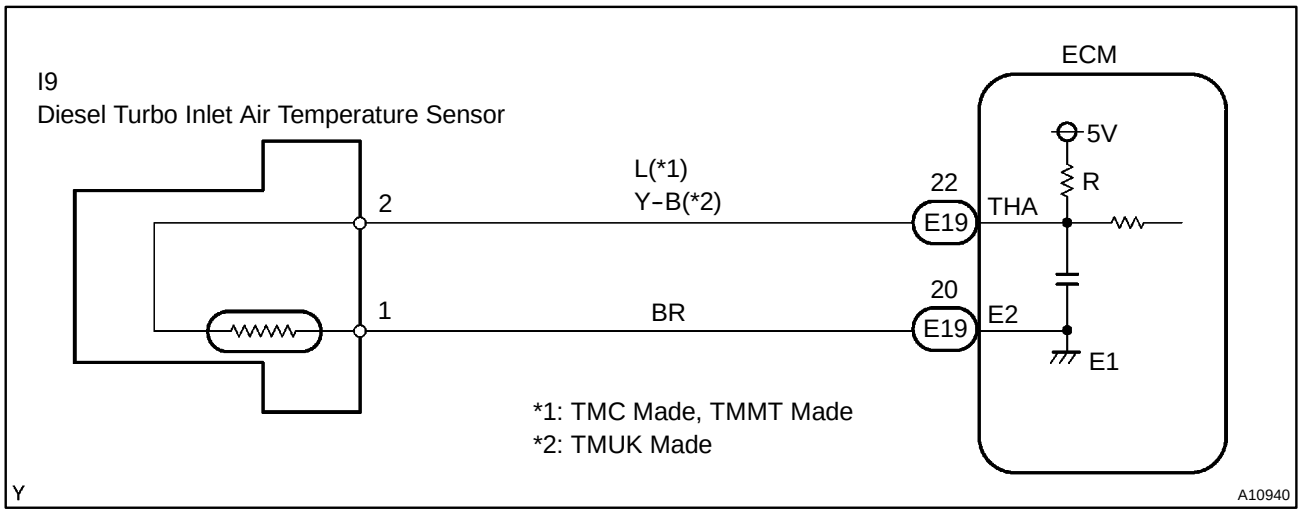
HINT:

After confirming DTC P0095, check the inlet air temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(INLET AIR TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Temperature: Same value as the actual diesel turbo inlet air temperature.
Result:

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as air temperature near to the intake)	C

HINT:

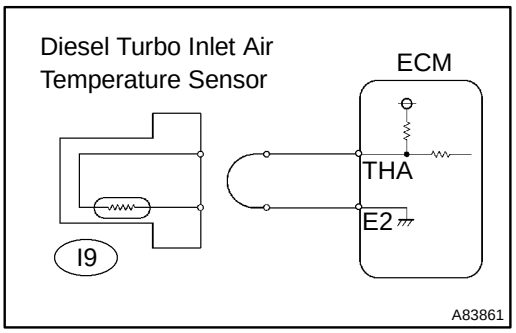
- If there is an open circuit, the hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester indicates 140°C (284°F) or more.

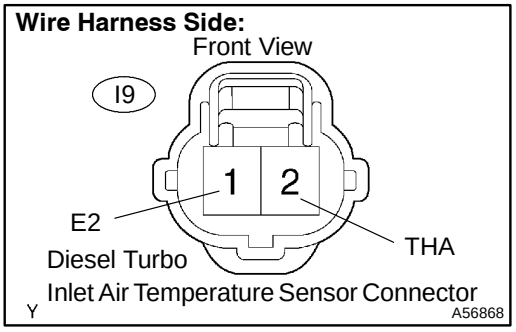
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

2 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



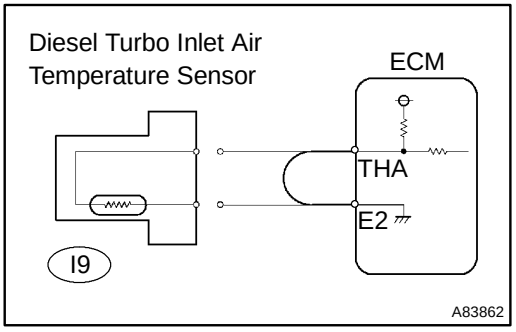


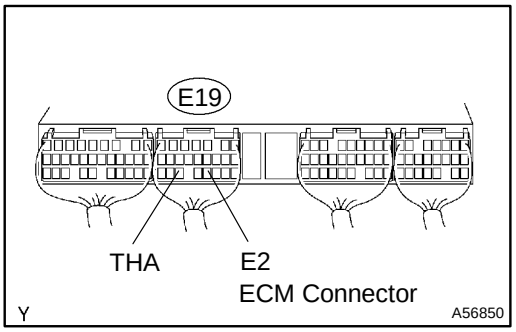
(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals 1 and 2 of the diesel turbo inlet air temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the diesel turbo inlet air temperature sensor connector.

OK	**CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE DIESEL TURBO INLET AIR TEMPERATURE SENSOR**

NG

3 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect terminals THA and E2 of the E19 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

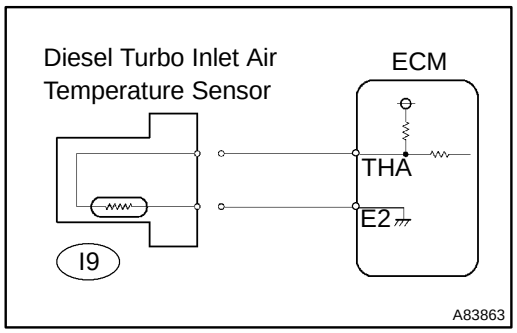
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the diesel turbo inlet air temperature sensor connector.

OK	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

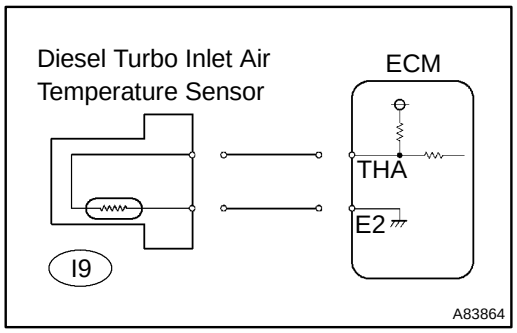


(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the diesel turbo inlet air temperature sensor connector.

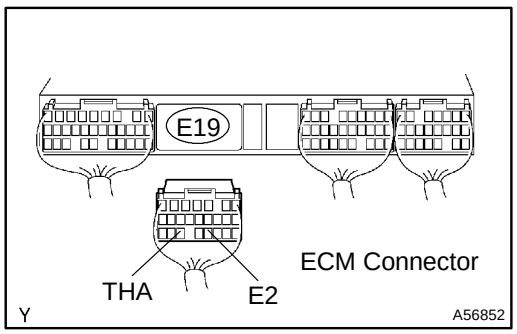
OK → **REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR**

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the I9 diesel turbo inlet air temperature sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / AMBI TEMP SENS" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the ECM connector.
(g) Reconnect the diesel turbo inlet air temperature sensor connector.



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

NG

REPLACE ECM (See page 10-8)

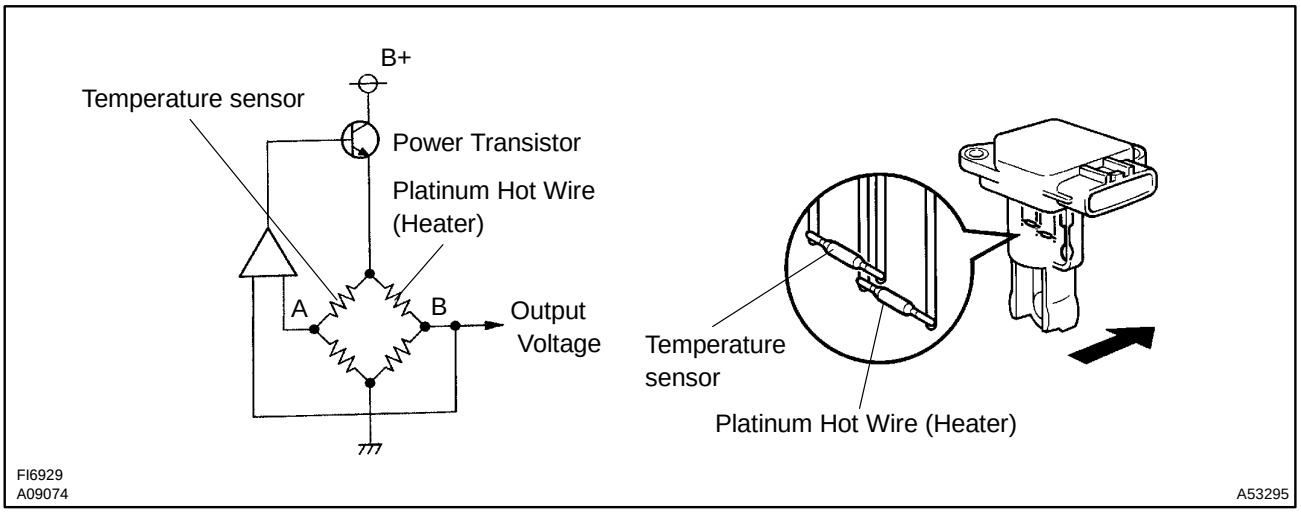
DTC P0100 MASS OR VOLUME AIR FLOW CIRCUIT

CIRCUIT DESCRIPTION

The mass air flow sensor uses a platinum hot wire. The mass air flow sensor consists of a platinum hot wire, temperature sensor and control circuit installed in a plastic housing. The mass air flow sensor works on the principle that the hot wire and temperature sensor located in the intake air by-pass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the predetermined temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the mass air flow sensor.

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



DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in mass air flow sensor circuit for more than 3 seconds with engine speed at 4,000 rpm or less (1 trip detection logic)	·Open or short in mass air flow sensor circuit ·Mass air flow sensor ·ECM

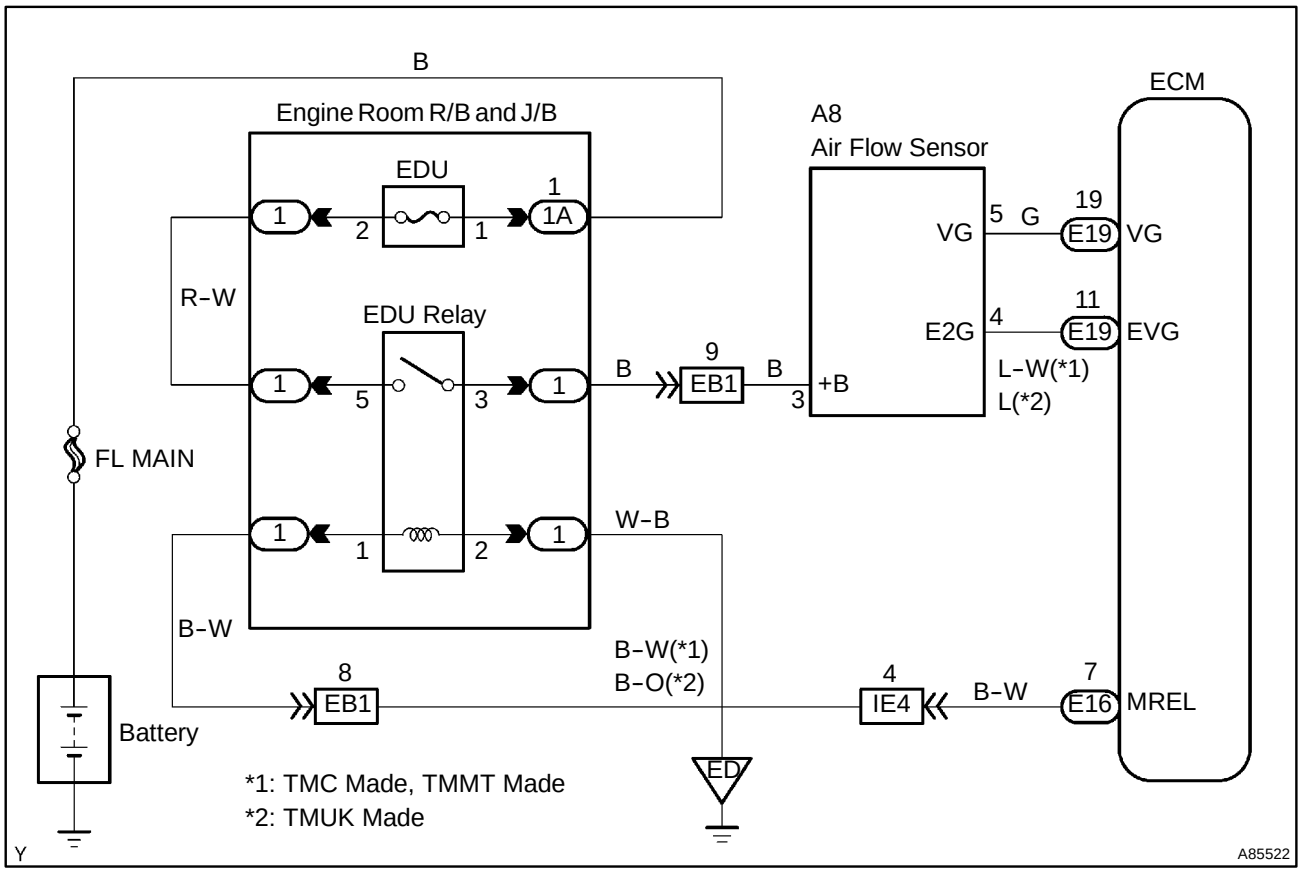
HINT:

After confirming DTC P0100, check the mass air flow ratio in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF" using the hand-held tester.

Reference:

Air Flow Value (gm/s)	Malfunction
Approximately 0.0	·Mass air flow sensor power source circuit open ·VG circuit open or short
135.0 or more	·EVG circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

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

1	READ VALUE OF HAND-HELD TESTER(MASS AIR FLOW RATE)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Push the hand-held tester main switch ON.
(d) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF” and read its value displayed on the hand-held tester.

Result:

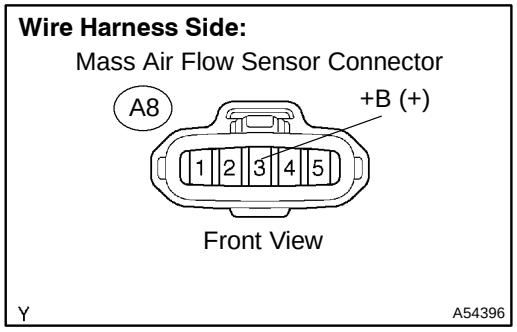
Air flow Rate (gm/s)	Proceed to
0.0	A
135.0 or more	B
Between 1 and 135.0 (*1)	C

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

B	Go to step 6
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)

A

2 INSPECT MASS AIR FLOW SENSOR(POWER SOURCE)



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

Standard:

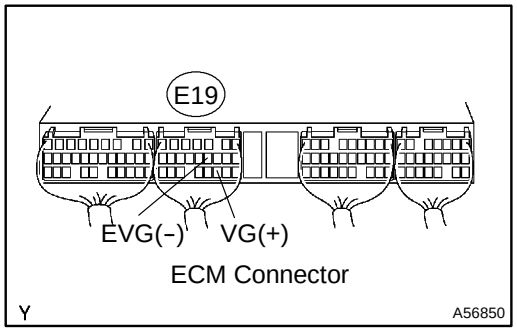
Tester Connection	Specified Condition
+B (A8-3) - Body ground	9 to 14 V

(d) Reconnect the mass air flow sensor connector.

NG	Go to step 5

OK

3 INSPECT ECM(VG VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

HINT:
The A/C switch should be turned OFF.

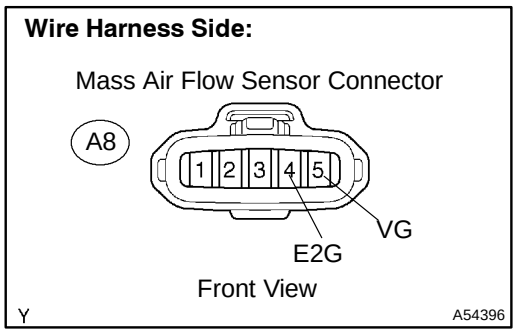
Standard:

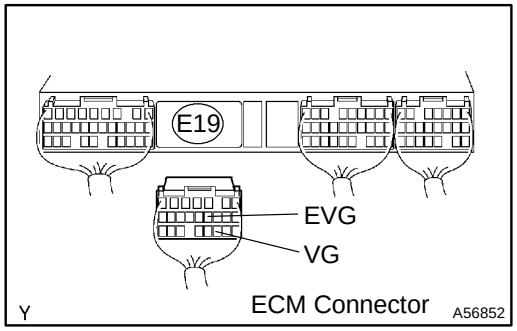
Tester Connection	Condition	Specified Condition
VG (E19-19) - EVG (E19-11)	Engine is idling	0.5 to 3.4 V

OK	REPLACE ECM (See page 10-8)

NG

4 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - ECM)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VG (A8-5) - VG (E19-19)	Below 1 Ω
E2G (A8-4) - EVG (E19-11)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (A8-5) or VG (E19-19) - Body ground	10 kΩ or higher
E2G (A8-4) or EVG (E19-11) - Body ground	

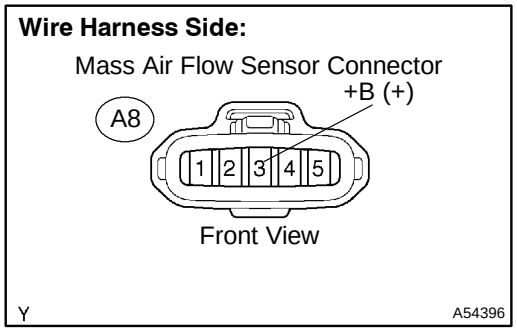
(d) Reconnect the ECM connector.
(e) Reconnect the mass air flow sensor connector.

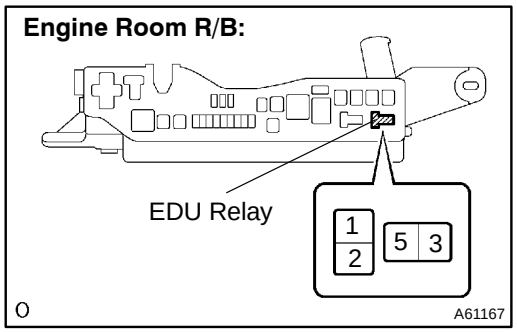
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE MASS AIR FLOW SENSOR

5 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - EDU RELAY)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Remove the EDU relay from the engine room R/B.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

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

Standard (Check for short):

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

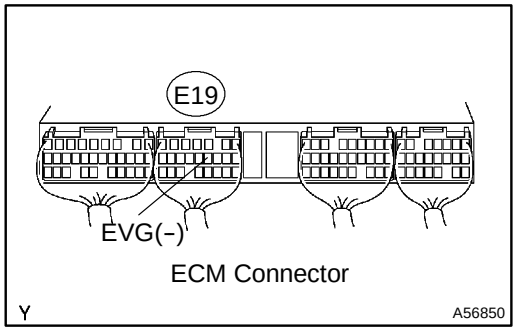
(d) Reinstall the EDU relay.
(e) Reconnect the mass air flow sensor connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

CHECK ECM POWER SOURCE CIRCUIT (See page 05-348)

6 INSPECT ECM(SENSOR GROUND)



(a) Check the resistance between the terminal of the E19 ECM connector and body ground.

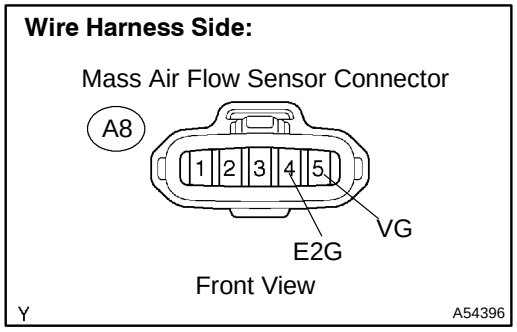
Standard:

Tester Connection	Specified Condition
EVG (E19-11) - Body ground	Below 1 Ω

NG → REPLACE ECM (See page 10-8)

OK

7 CHECK HARNESS AND CONNECTOR(MASS AIR FLOW SENSOR - ECM)



(a) Disconnect the A8 mass air flow meter connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

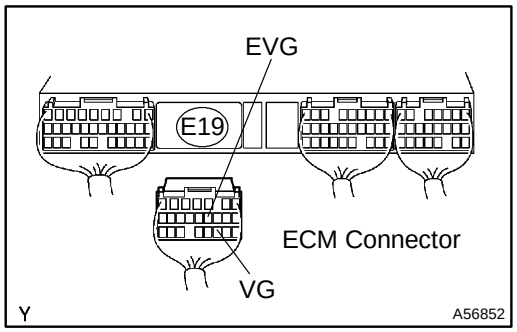
Standard (Check for open):

Tester Connection	Specified Condition
VG (A8-5) - VG (E19-19)	Below 1 Ω
E2G (A8-4) - EVG (E19-11)	

Standard (Check for short):

Tester Connection	Specified Condition
VG (A8-5) or VG (E19-19) - Body ground	10 kΩ or higher
E2G (A8-4) or EVG (E19-11) - Body ground	

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



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MASS AIR FLOW SENSOR

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

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page 05-252.

DTC No.	DTC Detection Condition	Trouble Area
P0101	After engine is warmed up, condition (a) continues for more than 10 seconds at idling: (2 trip detection logic) (a) Mass air flow sensor output greater than 2.2 V	S Mass air flow sensor
	Conditions (a) and (b) continue for more than 6 seconds with engine speed at 2000 rpm or more: (2 trip detection logic) (a) VTA greater than 0.1 V (b) Mass air flow sensor output less than 0.25 V	

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

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

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

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

HINT:

If any other codes besides P0101 are output, perform the troubleshoot for those DTCs first.

B → REPLACE MASS AIR FLOW SENSOR

A

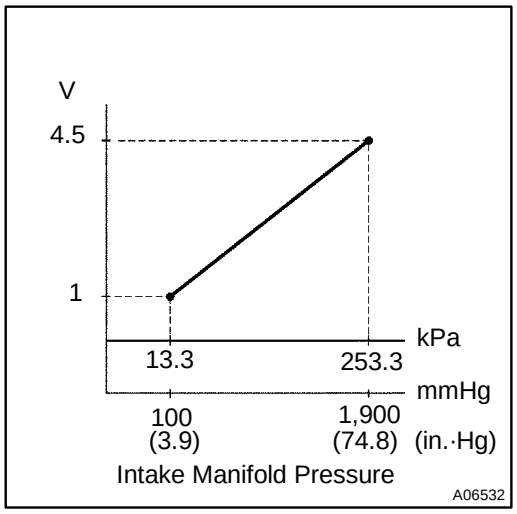
GO TO RELEVANT DTC CHART (See page 05-233)

DTC	P0105	MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT

DTC	P2226	BAROMETRIC PRESSURE CIRCUIT

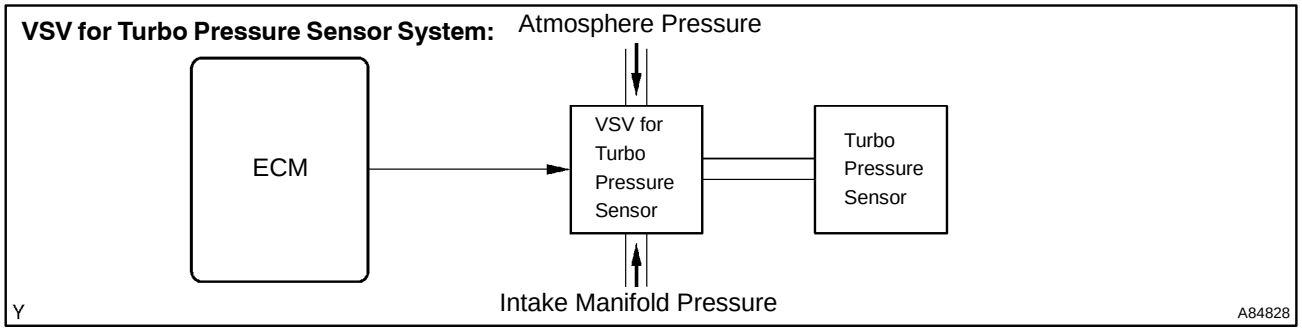
HINT:
For more information on the turbo pressure sensor, see page 05-207.

CIRCUIT DESCRIPTION



The turbo pressure sensor is connected to the intake manifold. The ECM detects the intake manifold pressure as the voltage by the sensor. The ECM uses the intake manifold pressure signal for correction of injection volume control and injection timing control.
Atmosphere and intake manifold pressure can be monitored by operating the VSV for turbo pressure sensor. The turbo pressure sensor monitors both atmospheric pressure and intake manifold pressure and transmits the output voltage to the ECM. The ECM uses this atmospheric pressure value for correcting the injection volume.

HINT:
The ECM measures the atmosphere by turning the VSV for turbo pressure sensor ON before and after the engine is started. Other than this, the ECM measures the intake manifold pressure by turning the VSV for turbo pressure sensor OFF.



DTC No.	DTC Detection Condition	Trouble Area
P0105	Open or short in turbo pressure sensor circuit for 2 seconds or more	S Open or short in turbo pressure sensor circuit S Turbo pressure sensor S Open or short in VSV for turbo pressure sensor circuit S VSV for turbo pressure sensor S Vacuum hose is disconnected or blocked S ECM
	Turbo pressure sensor output voltage is 0.2 V or less, or 4.5 V or more (1 trip detection logic)	
P2226	Pressure detected by VSV for turbo pressure sensor does not vary when switching VSV for turbo pressure sensor (2 trip detection logic)	S Open or short in turbo pressure sensor circuit S Turbo pressure sensor S Open or short in VSV for turbo pressure sensor circuit S VSV for turbo pressure sensor S Vacuum hose is disconnected or blocked S ECM

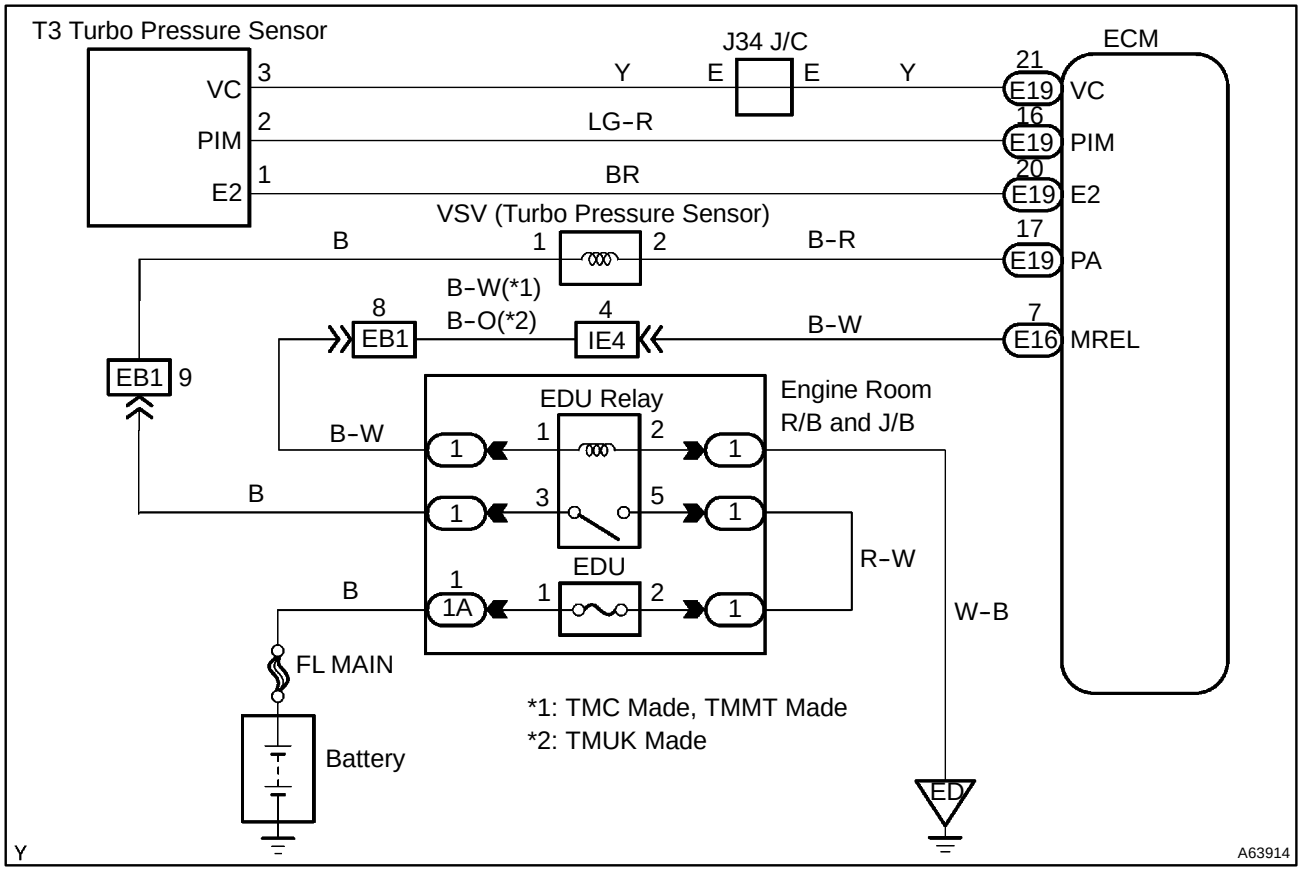
HINT:

After confirming DTC P0105, check the intake air temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM" using the hand-held tester.

Reference:

Intake Manifold Pressure (kPa)	Malfunction
Approximately 0	S PIM circuit short
250 or more	S VC circuit open or short S PIM circuit open S E2 circuit open

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 be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ OUTPUT DTC

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0105, or P0105 and P2226	A
P2226	B

B → **Go to step 6**

A

2	READ VALUE OF HAND-HELD TESTER(INTAKE MANIFOLD PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / PIM" and read its value displayed on the hand-held tester.

Standard: Same value as the actual atmospheric pressure.

OK → **Go to step 6**

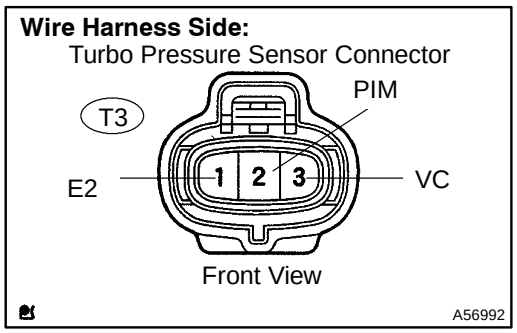
NG

3	INSPECT DIESEL TURBO TURBO PRESSURE SENSOR (See page 13-3 of Pub. No. RM925E COROLLA)

NG → **REPLACE DIESEL TURBO TURBO PRESSURE SENSOR**

OK

4 CHECK HARNESS AND CONNECTOR(TURBO PRESSURE SENSOR - ECM)



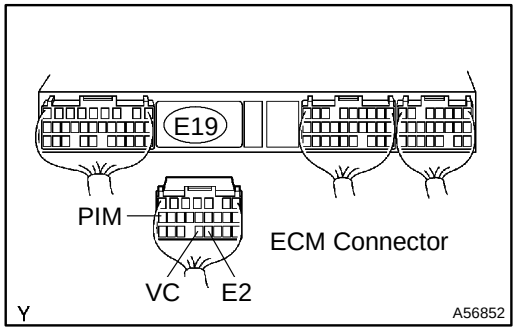
(a) Disconnect the T3 turbo pressure sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E19-16)	Below 1 Ω
VC (T3-3) - VC (E19-21)	
E2 (T3-1) - E2 (E19-20)	

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E19-16) - Body ground	10 kΩ or higher
VC (T3-3) or VC (E19-21) - Body ground	
E2 (T3-1) or E2 (E19-20) - Body ground	

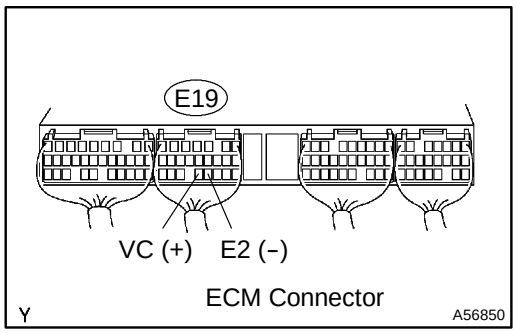


(d) Reconnect the ECM connector.
(e) Reconnect the turbo pressure sensor connector.

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

OK

5 INSPECT ECM(VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E19-21) - E2 (E19-20)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-8)**

OK

REPLACE DIESEL TURBO TURBO PRESSURE SENSOR

6 CHECK CONNECTION OF VACUUM HOSE(TURBO PRESSURE SENSOR - INTAKE MANIFOLD)

NG → **REPAIR OR REPLACE VACUUM HOSE**

OK

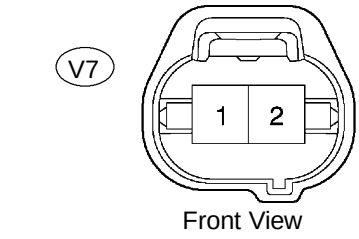
7	INSPECT VSV FOR TURBO PRESSURE SENSOR (See page 13-5 of Pub. No. RM925E COROLLA)

NG → REPLACE VSV FOR TURBO PRESSURE SENSOR

OK

8	CHECK HARNESS AND CONNECTOR(ECM - VSV FOR TURBO PRESSURE SENSOR AND VSV FOR TURBO PRESSURE - EDU RELAY)

Wire Harness Side:
VSV for Turbo Pressure Sensor Connector



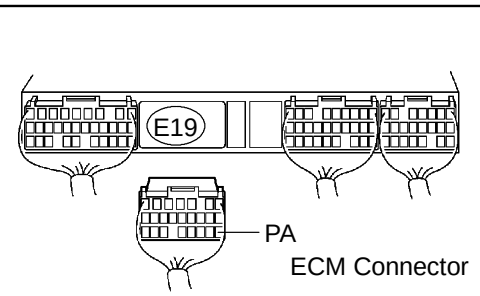
(a) Disconnect the V7 VSV for turbo pressure sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Remove the EDU relay from the engine room R/B.
(d) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VSV for turbo pressure sensor (V7-1) - EDU relay (3)	Below 1 Ω
VSV for turbo pressure sensor (V7-2) - PA (E19-17)	

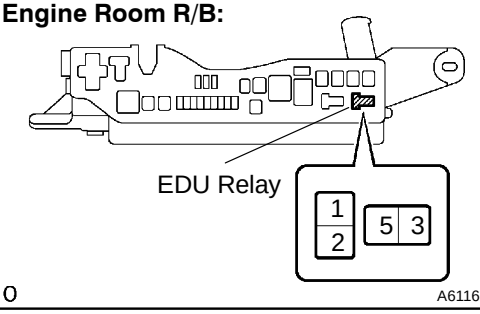
Standard (Check for short):

Tester Connection	Specified Condition
VSV for turbo pressure sensor (V7-1) or EDU relay (3) - Body ground	10 kΩ or higher
VSV for turbo pressure sensor (V7-2) or PA (E19-17) - Body ground	



(e) Reconnect the ECM connector.
(f) Reconnect the VSV for turbo pressure sensor connector.
(g) Reinstall the EDU relay.

Engine Room R/B:



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE VSV FOR TURBO PRESSURE SENSOR

DTC	P0106	MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT RANGE/ PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0105 on page 05-258.

DTC No.	DTC Detection Condition	Trouble Area
P0106	Condition (a) or (b) continues for more than 10 seconds: (2 trip detection logic) (a) After the engine is warmed up, voltage output of the turbo pressure sensor is 3.3 V or more during idling (b) Voltage output of the turbo pressure sensor is 1.5 V or less at 2,500 rpm, and the accelerator pedal opening angle is 25% or more	S Turbo pressure sensor

INSPECTION PROCEDURE

HINT:

- If DTC P0105 is output simultaneously, the turbo pressure sensor circuit may be open or short. Perform the troubleshooting of DTC P0105 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0106)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
P0106	A
P0106 and other DTCs	B

HINT:

If any other codes besides P0106 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-233)**

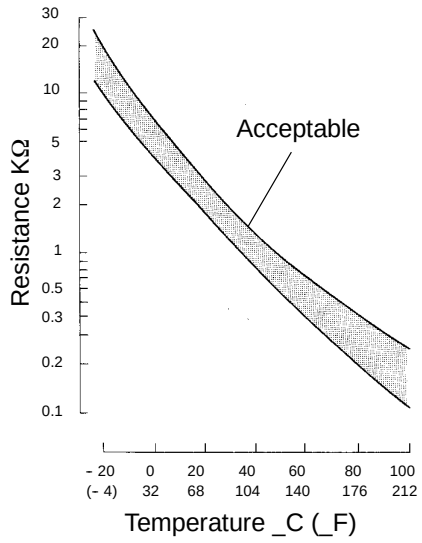
A

REPLACE DIESEL TURBO TURBO PRESSURE SENSOR

DTC P0110 INTAKE AIR TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

(Figure 1)



The intake air temperature sensor is built in the mass air flow sensor and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature is, the greater the thermistor resistance value becomes, and the higher the intake air temperature is, the lower the thermistor resistance value becomes (See figure 1).
The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
The resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the drivability with a cold engine.

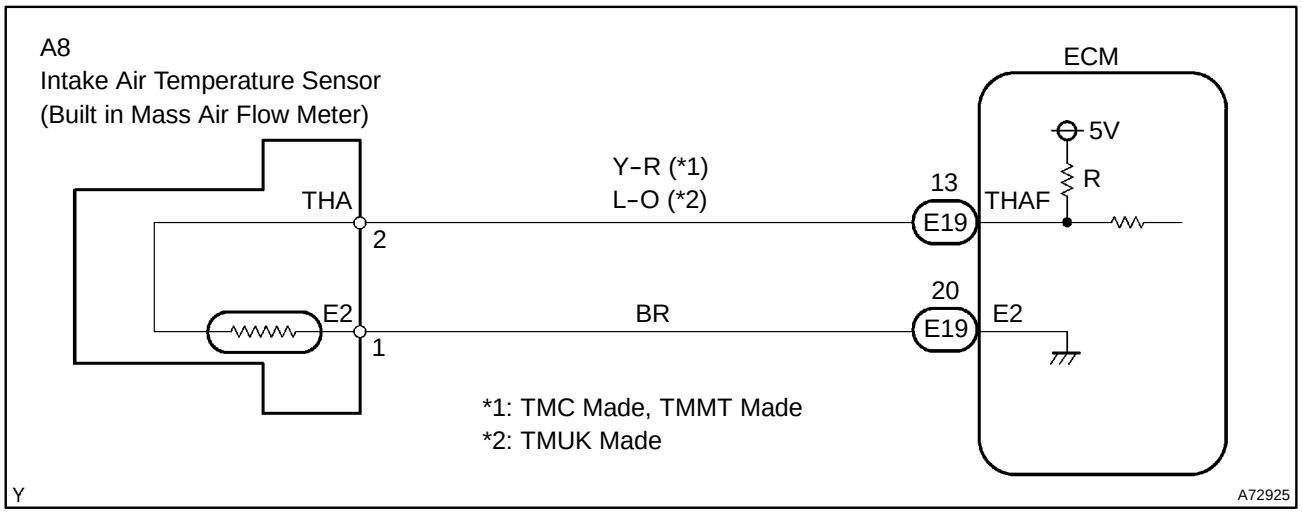
DTC No.	DTC Detection Condition	Trouble Area
P0110	Open or short in intake air temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in intake air temperature sensor circuit S Intake air temperature sensor (built in mass air flow sensor) S ECM

HINT:
After confirming DTC P0110, check the intake air temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(INTAKE AIR TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.

Standard: Same value as the actual intake air temperature.

Result:

Temperature Displayed	Proceed to
-40˚C (-40˚F)	A
140˚C (284˚F) or more	B
OK (Same as air temperature near to the intake)	C

HINT:

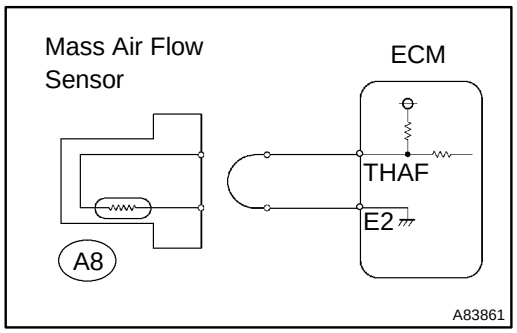
- If there is an open circuit, the hand-held tester indicates -40˚C (-40˚F).
- If there is a short circuit, the hand-held tester indicates 140˚C (284˚F) or more.

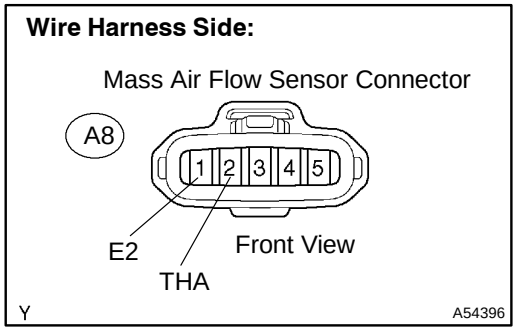
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

2 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



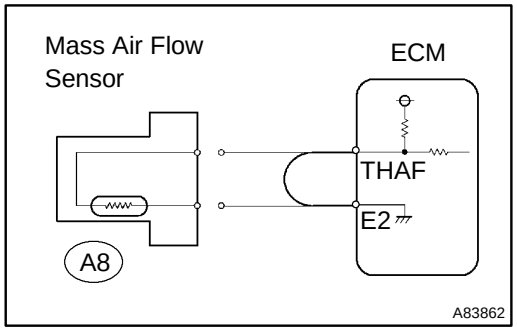


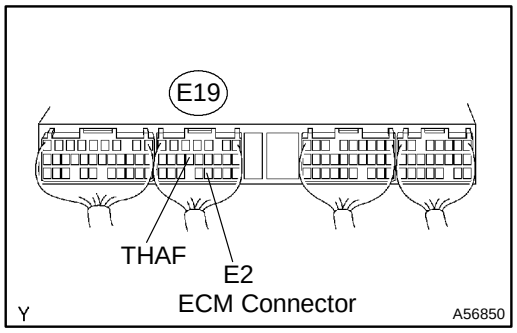
(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect terminals 1 and 2 of the mass air flow sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the mass air flow sensor connector.

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

NG

3 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect terminals THAF and E2 of the E19 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

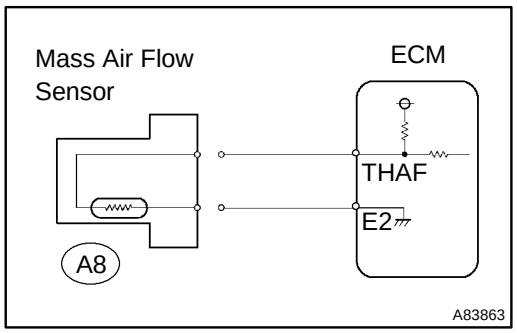
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the mass air flow sensor connector.

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

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

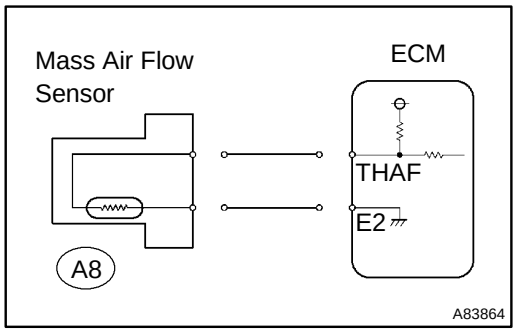


(a) Disconnect the A8 mass air flow sensor connector.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the mass air flow sensor connector.

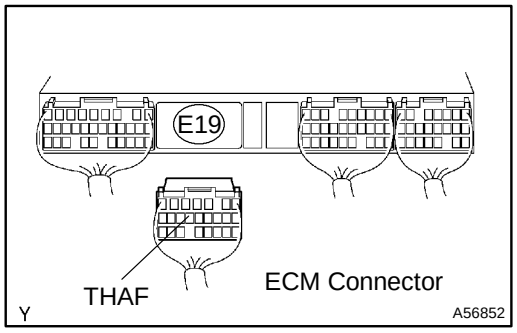
OK	REPLACE MASS AIR FLOW SENSOR

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the A8 mass air flow sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INTAKE AIR" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the ECM connector.
(g) Reconnect the mass air flow sensor connector.



OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM (See page 10-8)

DTC P0115 ENGINE COOLANT TEMPERATURE CIRCUIT

CIRCUIT DESCRIPTION

A thermistor built in the engine coolant temperature sensor 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.

DTC No.	DTC Detection Condition	Trouble Area
P0115	Open or short in engine coolant temperature sensor circuit for 0.5 second (1 trip detection logic)	S Open or short in engine coolant temperature sensor circuit S Engine coolant temperature sensor S ECM

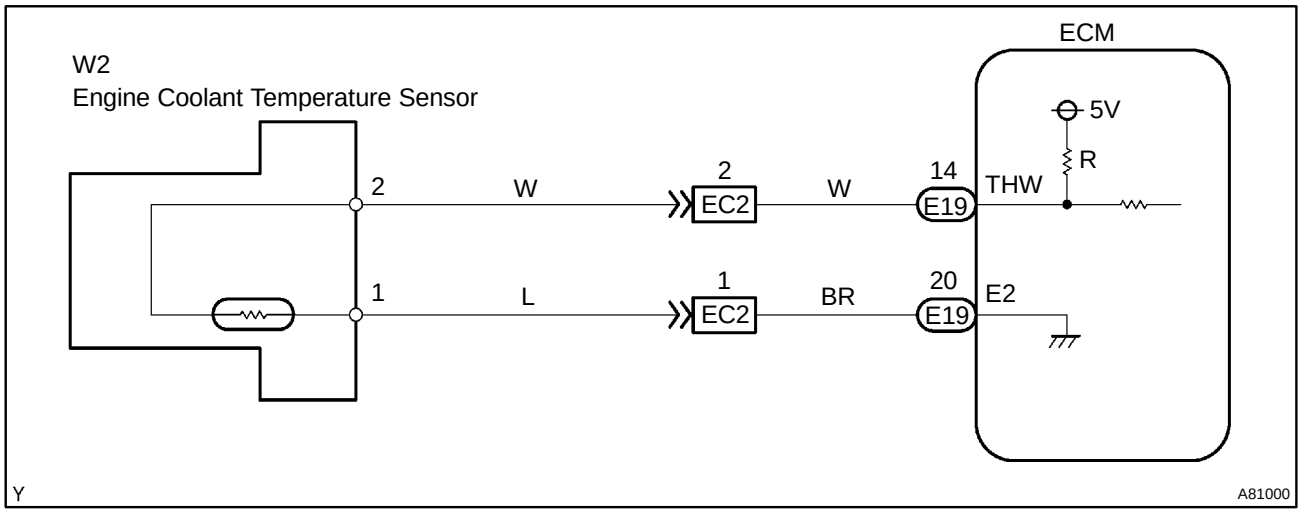
HINT:

After confirming DTC P0115, check the engine coolant temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 READ VALUE OF HAND-HELD TESTER(ENGINE COOLANT TEMPERATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: Same value as the actual intake air temperature.
Result:

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

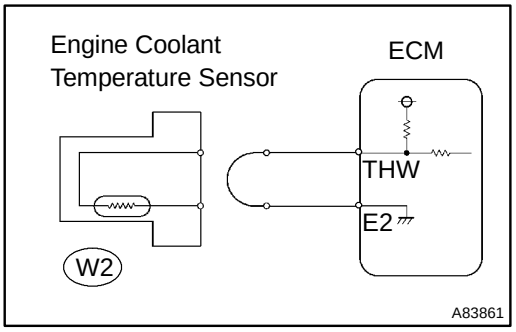
HINT:
- If there is an open circuit, the hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester indicates 140°C (284°F) or more.

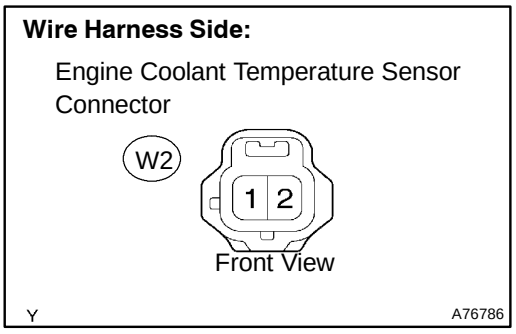
B → **Go to step 4**

C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

2 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



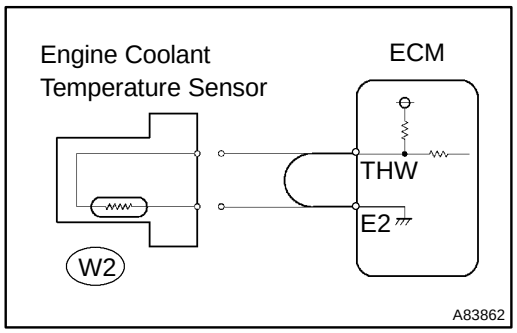


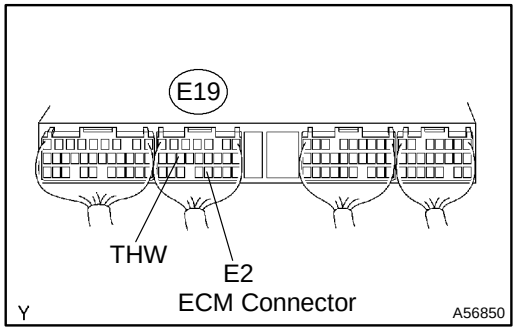
(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect terminals 1 and 2 of the engine coolant temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE ENGINE COOLANT TEPMERATURE SENSOR**

NG

3 READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)





(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect terminals THW and E2 of the E19 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

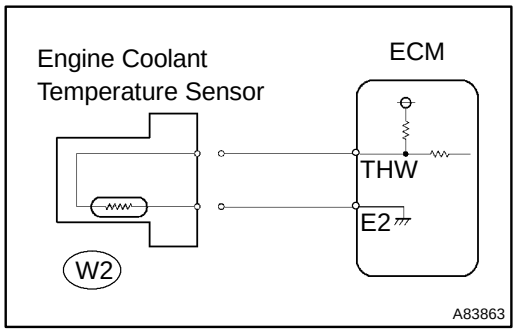
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the engine coolant temperature sensor connector.

OK	REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-8)

4 READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

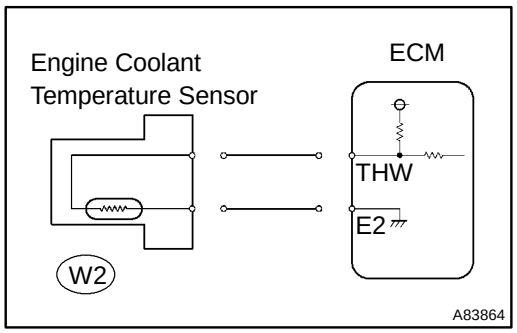


(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the engine coolant temperature sensor connector.

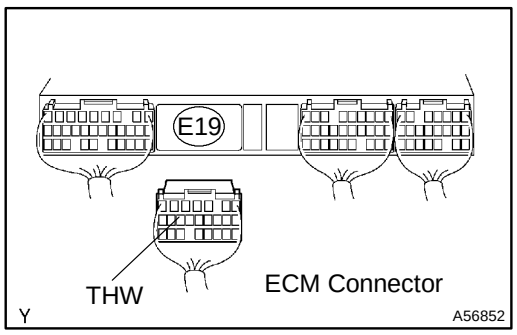
OK	REPLACE ENGINE COOLANT TEMPERATURE SENSOR

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the W2 engine coolant temperature sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COOLANT TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the engine coolant temperature sensor connector.
(g) Reconnect the ECM connector.



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

NG

REPLACE ECM (See page 10-8)

DTC	P0116	ENGINE COOLANT TEMPERATURE CIRCUIT RANGE/PERFORMANCE PROBLEM

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page 05-268.

DTC No.	DTC Detection Condition	Trouble Area
P0116	If the engine coolant temperature was between -40°C (-40°F) and 60°C (140°F) at engine start, and condition (a) and (b) are met (2 trip detection logic): (a) Vehicle runs with acceleration and deceleration (b) Engine coolant temperature remains within 3°C (5.4°F) of the engine starting temperature	S Engine coolant temperature sensor
	If the engine coolant temperature was more than 90°C (194°F) at engine start, and conditions (a) and (b) are met (6 trip detection logic): (a) Vehicle runs with acceleration and deceleration (b) Engine coolant temperature remains within 1°C (1.8°F) of the engine starting temperature, and this is successively recorded 6 times	

MONITOR DESCRIPTION

The engine coolant temperature sensor is used to monitor the engine coolant temperature. The engine coolant temperature sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor's voltage output is virtually in no variation, the ECM interprets this as a fault in the engine coolant temperature sensor and sets a DTC.

Examples:

1) Upon starting the engine, the engine coolant temperature was between -40_C (-40_F) and 60_C (140_F). If after driving for a few minutes, the engine coolant temperature still remains within 3_C (5.4_F) of the staring temperature, a DTC will be set. (2 trip detection logic)

2) Upon starting the engine, the engine coolant temperature was over 90_C (194_F). If after driving for a few minutes, the engine coolant temperature still remains within 1_C (1.8_F) of the starting temperature, a DTC will be set. (6 trip detection logic)

INSPECTION PROCEDURE

HINT:

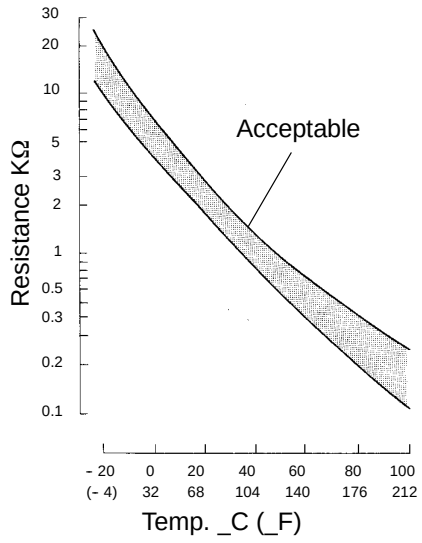
- If DTCs P0115 is output simultaneously, the engine coolant temperature sensor circuit may be open or short. Perform the troubleshooting of DTC P0115 first.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.

REPLACE ENGINE COOLANT TEMPERATURE SENSOR

DTC	P0180	FUEL TEMPERATURE SENSOR "A" CIRCUIT

CIRCUIT DESCRIPTION

(Figure 1)



The fuel temperature sensor senses the fuel temperature. A thermistor built in the sensor changes its resistance value according to the fuel temperature. The lower the fuel temperature is, the greater the thermistor resistance becomes, and the higher the fuel temperature is, the lower the thermistor 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 a resistor R. The resistor R and the fuel temperature sensor are connected in series. When the resistance value of the fuel temperature sensor changes in accordance with changes in the fuel temperature, the potential at terminal THF also changes. Based on this signal, the ECM corrects the pressure control compensation of the supply pump and error detection compensation of the highly pressurized fuel system.

DTC No.	DTC Detection Condition	Trouble Area
P0180	Open or short in fuel temperature sensor circuit for 0.5 second (1 trip detection logic)	$ Open or short in fuel temperature sensor circuit $ Fuel temperature sensor $ ECM

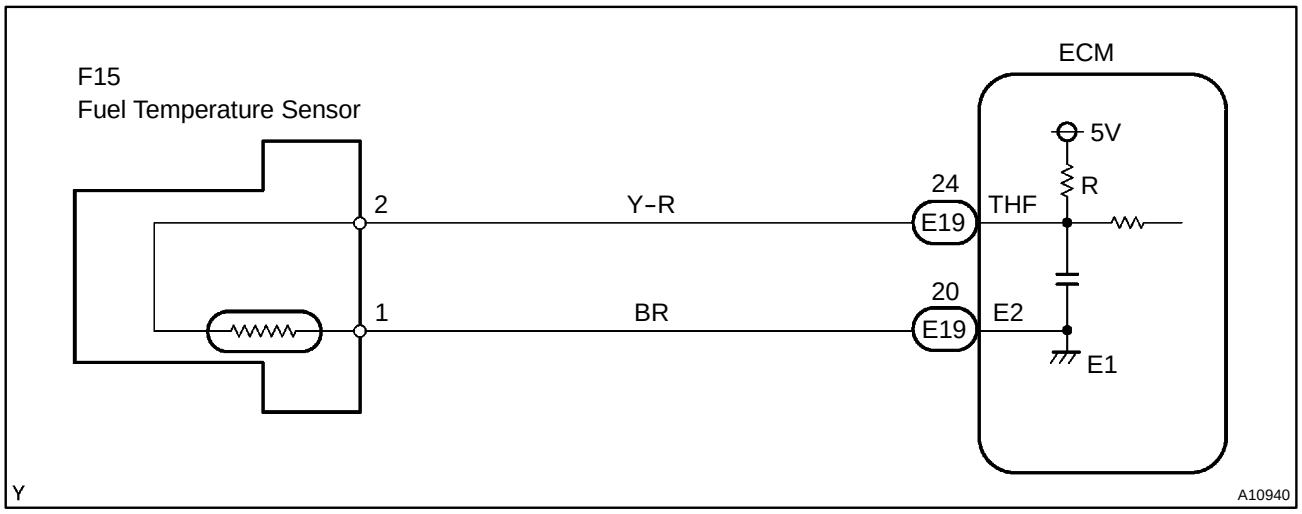
HINT:

After confirming DTC P0180, check the fuel temperature in the "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" using the hand-held tester.

Reference:

Temperature Displayed	Malfunction
-40˚C (-40˚F)	Open circuit
140˚C (284˚F) or more	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 be open.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(FUEL TEMPARATURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: Same value as the actual fuel temperature.
Result:

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F) or more	B
OK (Same as fuel temperature)	C

HINT:

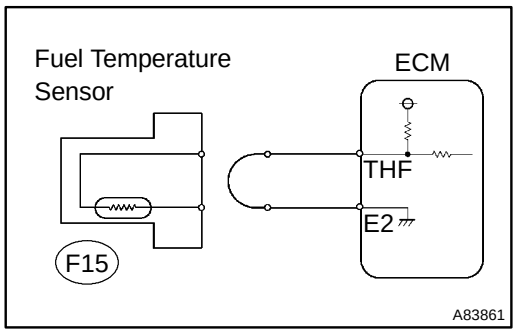
- If there is an open circuit, the hand-held tester indicates -40°C (-40°F).
- If there is a short circuit, the hand-held tester indicates 140°C (284°F) or more.

B → **Go to step 4**

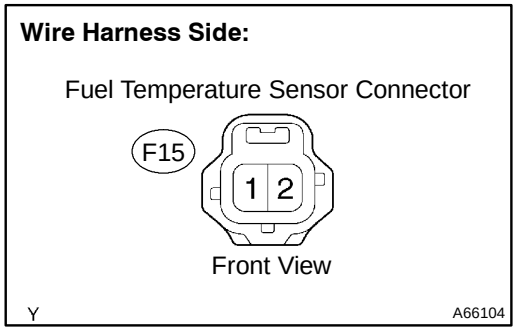
C → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

2	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN WIRE HARNESS)



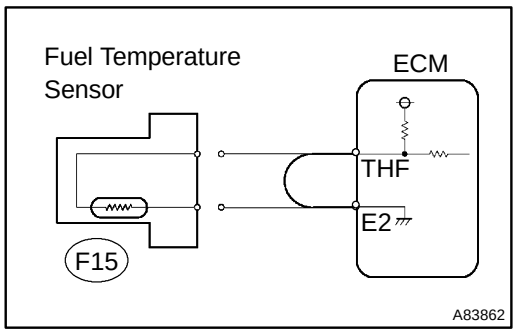
(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect terminals 1 and 2 of the fuel temperature sensor wire harness side connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the fuel temperature sensor connector.



OK → **CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE FUEL TEMPERATURE SENSOR**

NG

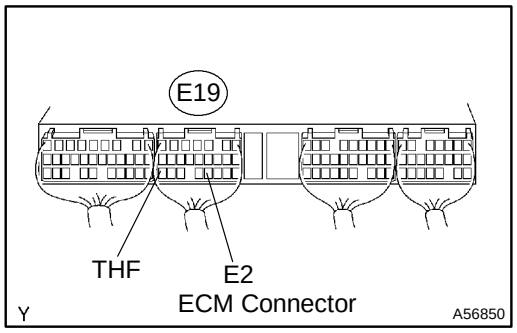
3	READ VALUE OF HAND-HELD TESTER(CHECK FOR OPEN IN ECM)



(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect terminals THF and E2 of the E19 ECM connector.

HINT:
Before checking, do a visual and contact pressure check on the ECM connector.

(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: 140°C (284°F) or more
(f) Reconnect the fuel temperature sensor connector.

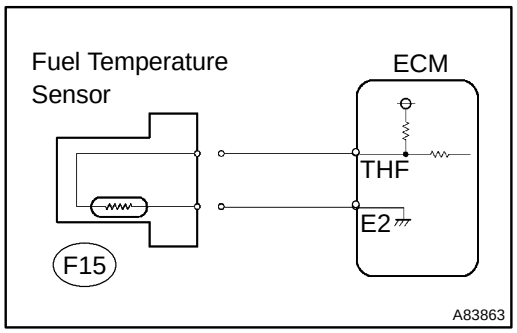


OK → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

NG

CONFIRM GOOD CONNECTION AT ECM. IF OK, CHECK AND REPLACE ECM (See page 10-8)

4	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN WIRE HARNESS)

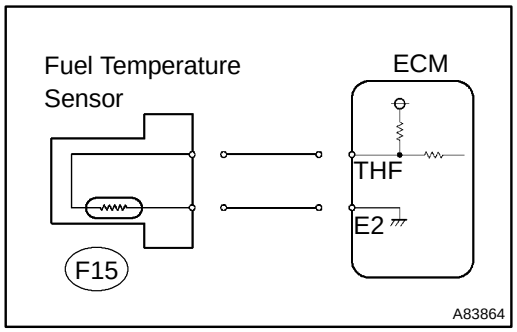


(a) Disconnect the F15 fuel temperature sensor connector.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(e) Reconnect the fuel temperature sensor connector.

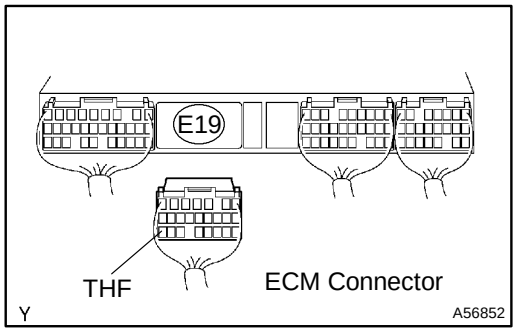
OK → **REPLACE FUEL TEMPERATURE SENSOR**

NG

5	READ VALUE OF HAND-HELD TESTER(CHECK FOR SHORT IN ECM)



(a) Disconnect the F15 fuel temperature sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Connect the hand-held tester to the DLC3.
(d) Turn the ignition switch ON and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / FUEL TEMP" and read its value displayed on the hand-held tester.
Standard: -40°C (-40°F)
(f) Reconnect the ECM connector.
(g) Reconnect the fuel temperature sensor connector.



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

NG

REPLACE ECM (See page 10-8)

DTC	P0200	INJECTOR CIRCUIT / OPEN

HINT:

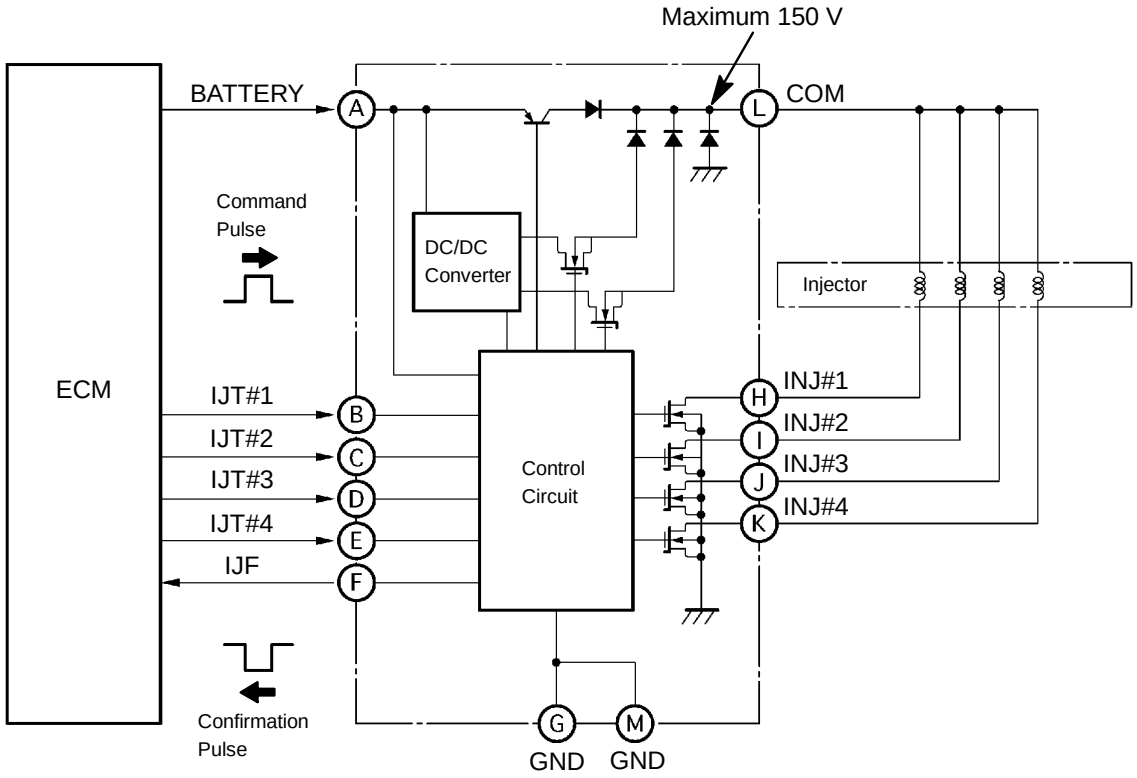
- For more information on the EDU, see page 05-207.
- If P0200 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-207.

CIRCUIT DESCRIPTION

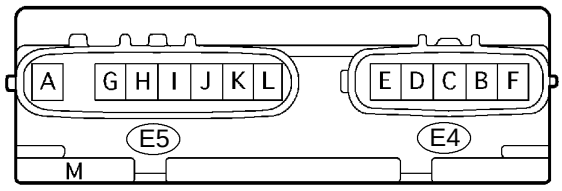
The EDU has been adopted to drive the injector at high speeds. The EDU has realized the high-speed driving under high pressurized fuel conditions using the DC/DC converter that provides a high-voltage, and the quick-charging system.

Soon after the EDU receives an injection command signal (IJT) from the ECM, the EDU responds to the command with injector injection confirmation signal (IJF) when the current is applied to the injector.

EDU Wiring Diagram:



EDU Connector



Warning: Terminal H, I, J, K and L are high voltage

Y

A84822

DTC No.	DTC Detection Condition	Trouble Area
P0200	Open or short in EDU or injector circuit. After engine is started, there is no injection confirmation signal (IJF) from EDU to ECM, despite the ECM sending injection command signal (IJT) to the EDU. (1 trip detection logic)	$ Open or short in EDU circuit $ Injector $ EDU $ ECM

MONITOR DESCRIPTION

P0200 (Open or short in EDU or injector circuit):

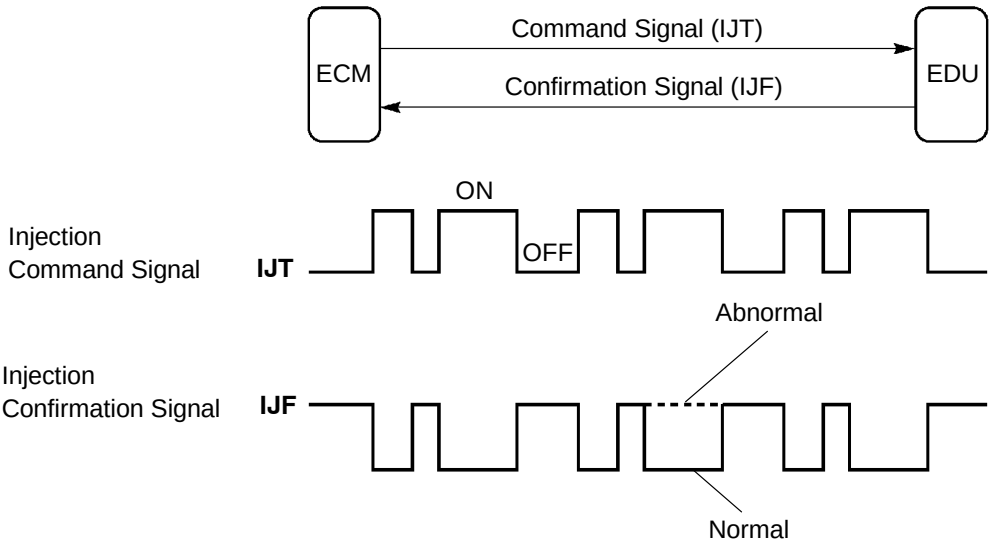
ECM continuously monitors both injection command (IJT) signal and injection confirmation (IJF) signal. This DTC will be set if the ECM judges that the number of IJT signals and IJF signals are inconsistent.

The injectors are grounded over a FET (field effect transistor) and a serial resister. This resister creates a voltage drop, which is monitored by the EDU, in relation to the current drawn by the injector. When the injector current becomes too high, the voltage drop over the resister becomes higher than a specified level and for that injector no IJF signal is sent to the ECM.

P0200 refers to a malfunction of injector drive circuit (EDU) or injector circuit.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

Malfunction Detection:



MONITOR STRATEGY

Required sensors	IJF signal from EDU
Frequency of operation	Continuous
Duration	10 seconds
CHK ENG operation	1 driving cycle

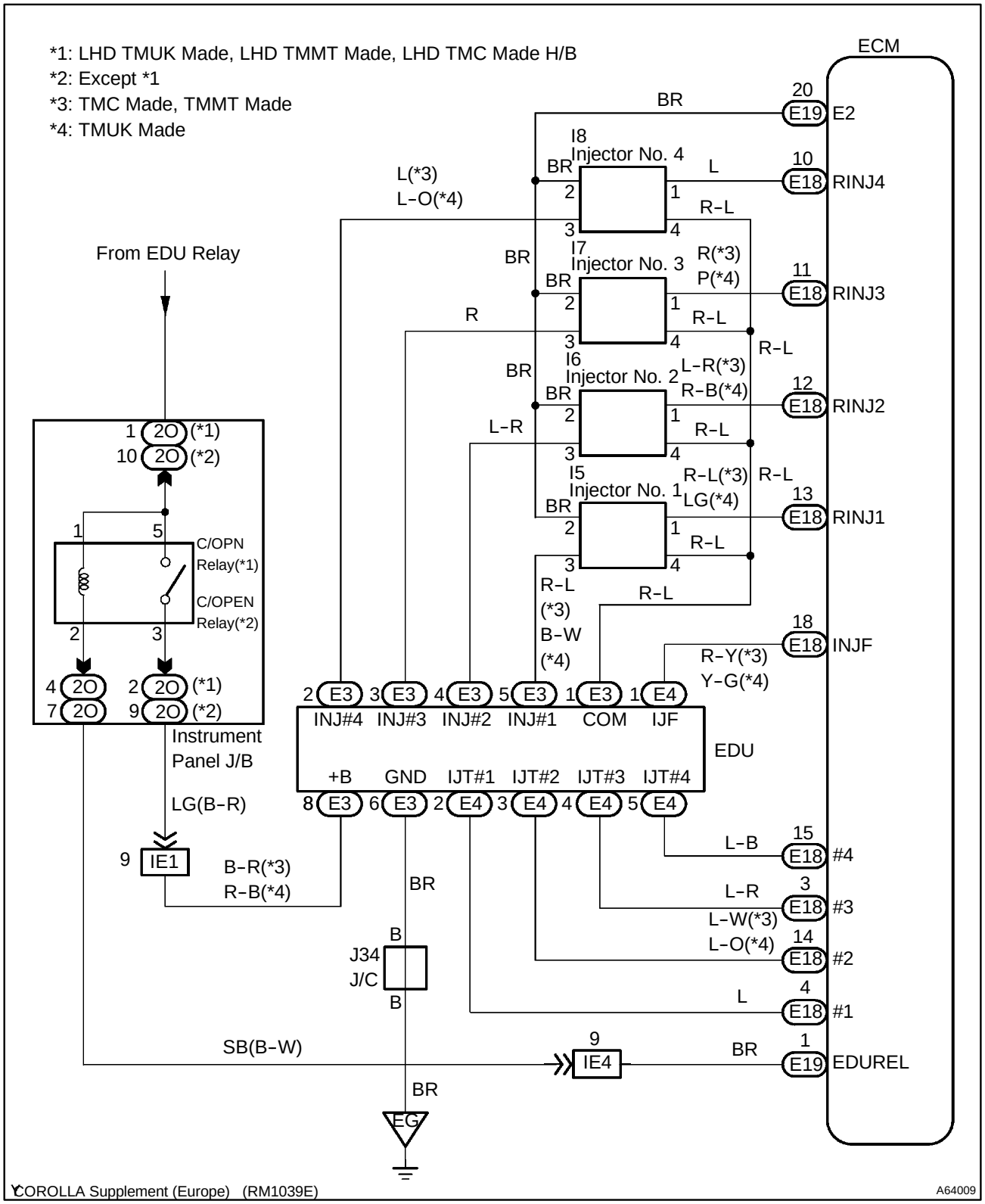
TYPICAL ENABLING CONDITIONS

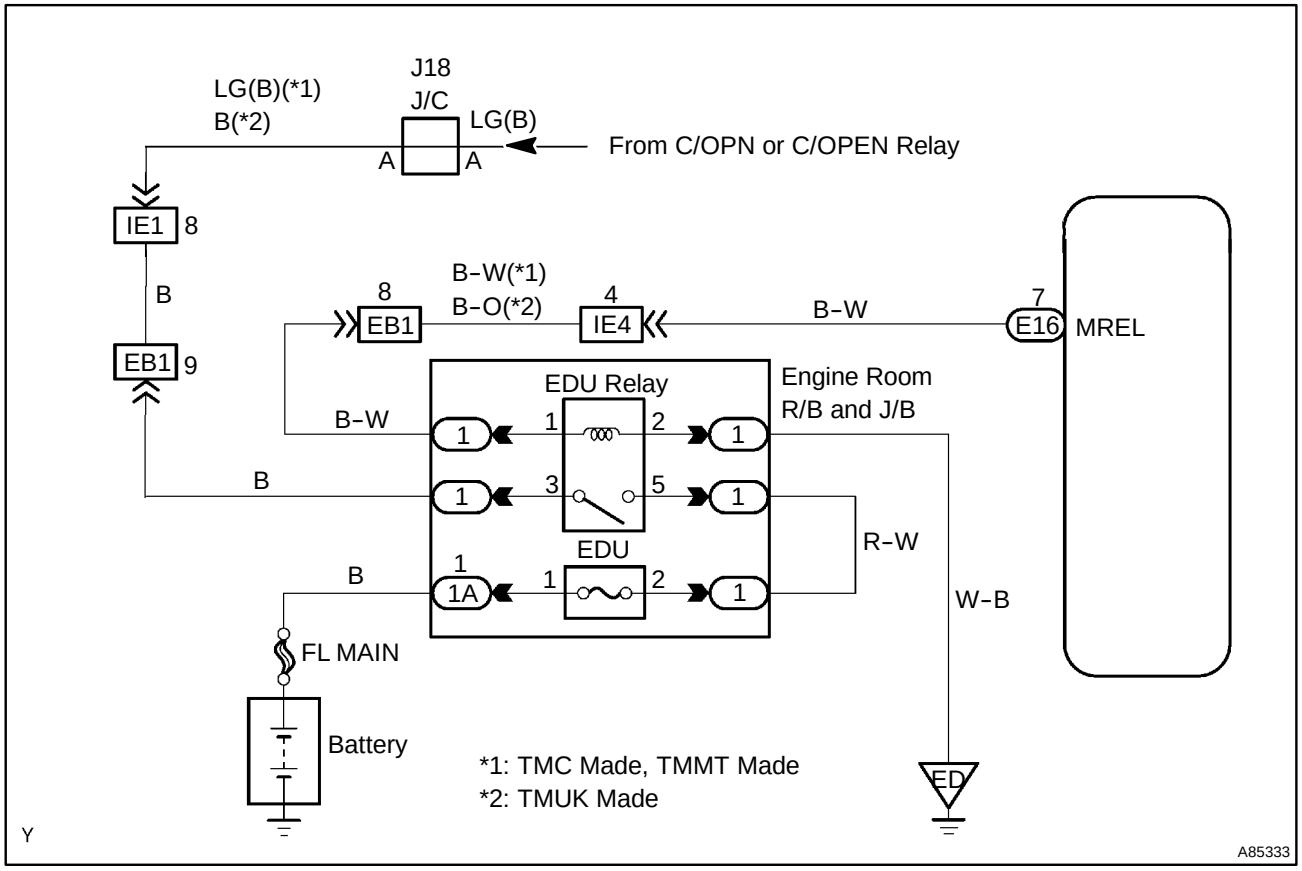
Item	Specification	
	Minimum	Maximum
Engine speed	500 rpm	-
Battery voltage	11 V	-
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
If injection missing counter* is accumulated the specified number of times successively, or if injection missing counter for one of the cylinders is accumulated the specified number of times successively (Approximately 1 second or more). *: Injection missing counter increments when no IJF signal from the EDU despite the ECM sending the IJT signals.

WIRING DIAGRAM

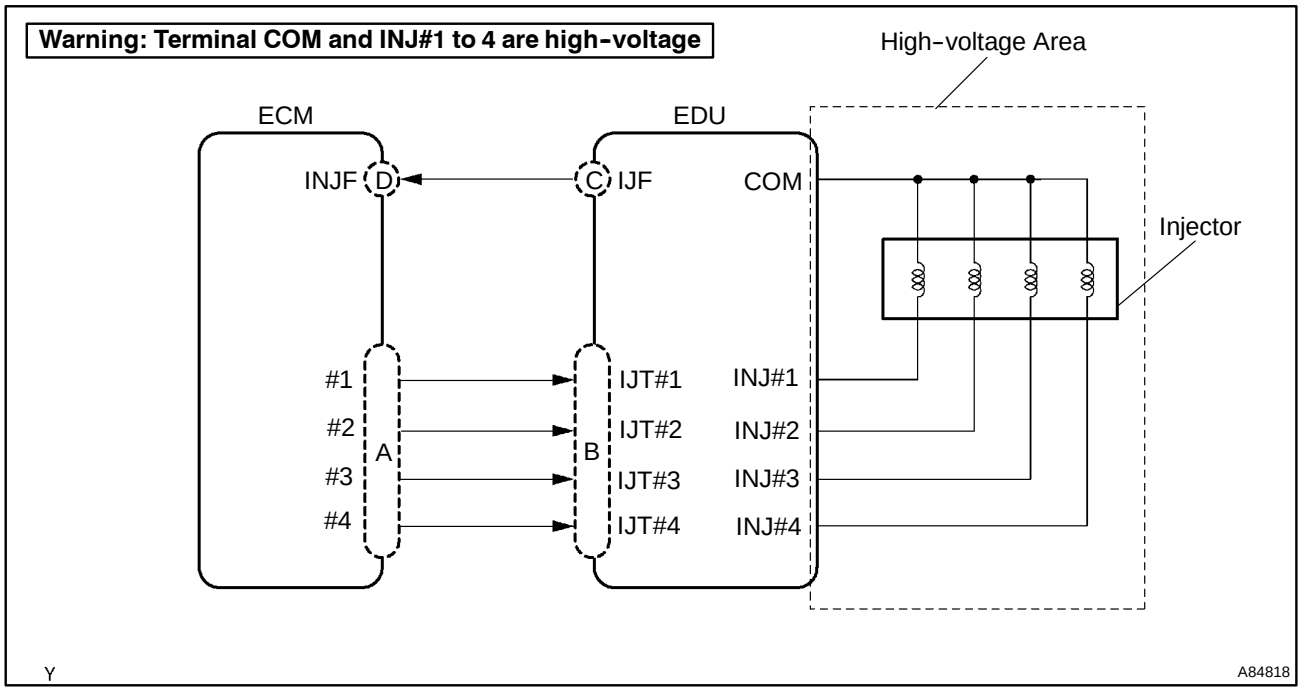




PULSE GENERATION INSPECTION

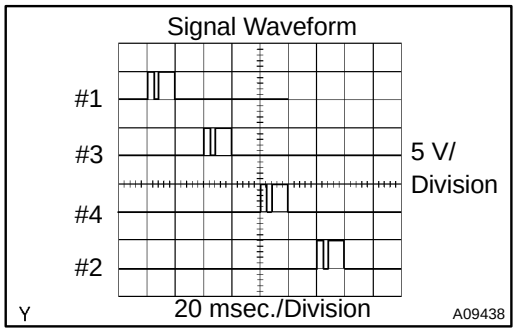
HINT:

Problem area can be identified by checking the waveform at the following inspection points.



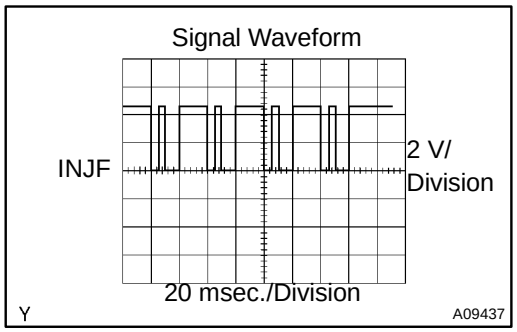
HINT:
If you check the ECM side first, inspect the following A and D in sequence. If you check the EDU side first, inspect the following B and C in sequence. This shortens inspecting time.

Malfunction Point	Trouble Area
A	$ ECM
B (if A is normal)	$ Open or short in "#1 to #4 (ECM)" - "IJT#1 to #4 (EDU)" harness or connector
C (if A and B are normal)	$ Open or short in "INJ#1 to #4 (EDU)" - "COM (EDU)" circuit $ Injector $ EDU
D (if A, B and C are normal)	$ Open or short in "IJF (EDU)" - "INJF (ECM)" circuit (P1271 is set simultaneously)



(a) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
A and B	Correct waveform is as shown



(b) Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Inspection Points	Specified Condition
C and D	Correct waveform is as shown

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0200)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P0200 and P1238	A
P0200	B

B → **Go to step 3**

A

2	READ VALUE OF HAND-HELD TESTER(COMPENSATION OF INJECTION QUANTIFY BETWEEN CYLINDERS)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB" and read its value displayed on the hand-held tester.
Result:

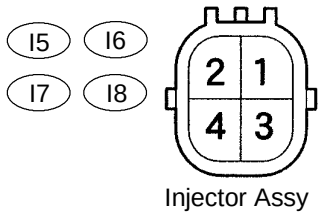
Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

(e) Inspect and repair the cylinder that has an improper compensation value according to the steps below.

GO

3	INSPECT INJECTOR ASSY

Component Side:



Injector Assy

A38631

(a) Disconnect the I5, I6, I7 and I8 injector connector.
(b) Measure the resistance between terminals of the injector.
Standard:

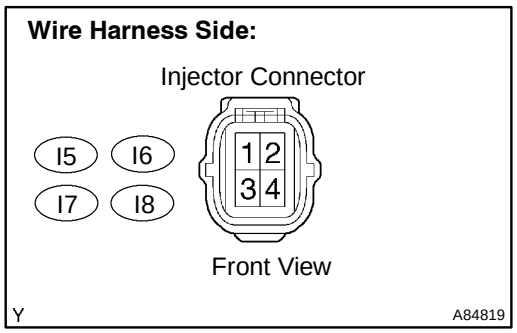
Tester Connection	Specified Condition
3 - 4	2.5 to 3.1 Ω at 20_C (68_F)

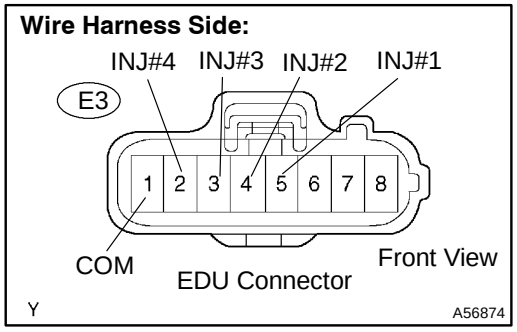
(c) Reconnect the injector connectors.

NG → **REPLACE INJECTOR ASSY (See page 11-64 of Pub. No. RM925E COROLLA)**

OK

4	CHECK HARNESS AND CONNECTOR(EDU - INJECTOR ASSY)





(a) Disconnect the I5, I6, I7 and I8 injector connector.
(b) Disconnect the E3 EDU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I5-3) - INJ#1 (E3-5)	Below 1 Ω
IGF (I6-3) - INJ#2 (E3-4)	
IGF (I7-3) - INJ#3 (E3-3)	
IGF (I8-3) - INJ#4 (E3-2)	
+B (I5-4) - COM (E3-1)	
+B (I6-4) - COM (E3-1)	
+B (I7-4) - COM (E3-1)	
+B (I8-4) - COM (E3-1)	

Standard (Check for short):

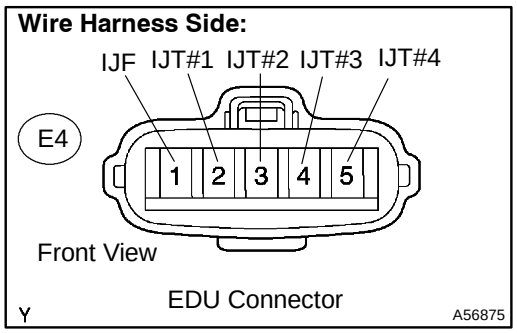
Tester Connection	Specified Condition
IGF (I5-3) or INJ#1 (E3-5) - Body ground	10 kΩ or higher
IGF (I6-3) or INJ#2 (E3-4) - Body ground	
IGF (I7-3) or INJ#3 (E3-3) - Body ground	
IGF (I8-3) or INJ#4 (E3-2) - Body ground	
+B (I5-4) or COM (E3-1) - Body ground	
+B (I6-4) or COM (E3-1) - Body ground	
+B (I7-4) or COM (E3-1) - Body ground	
+B (I8-4) or COM (E3-1) - Body ground	

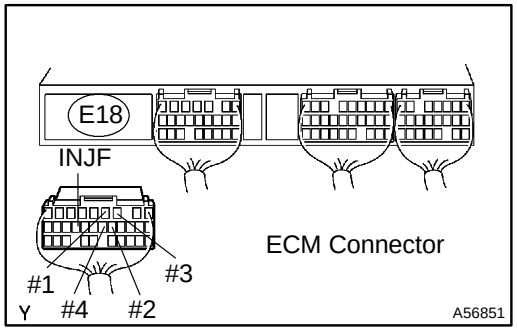
(d) Reconnect the EDU connector.
(e) Reconnect the injector connectors.

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

OK

5 CHECK HARNESS AND CONNECTOR(EDU - ECM)





(a) Disconnect the E4 EDU connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the terminals of the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
IJT#1 (E4-2) - #1 (E18-4)	Below 1 Ω
IJT#2 (E4-3) - #2 (E18-14)	
IJT#3 (E4-4) - #3 (E18-3)	
IJT#4 (E4-5) - #4 (E18-15)	
IJF (E4-1) - INJF (E18-18)	

Standard (Check for short):

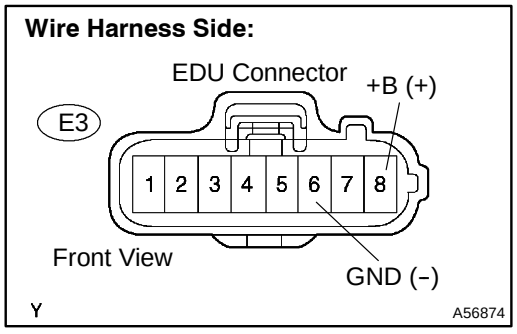
Tester Connection	Specified Condition
IJT#1 (E4-2) or #1 (E18-4) - Body ground	10 kΩ or higher
IJT#2 (E4-3) or #2 (E18-14) - Body ground	
IJT#3 (E4-4) or #3 (E18-3) - Body ground	
IJT#4 (E4-5) or #4 (E18-15) - Body ground	
IJF (E4-1) or INJF (E18-18) - Body ground	

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

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

OK

6 INSPECT INJECTOR DRIVER(BATTERY VOLTAGE)



(a) Disconnect the E3 EDU connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the specified terminals of the EDU connector.

Standard:

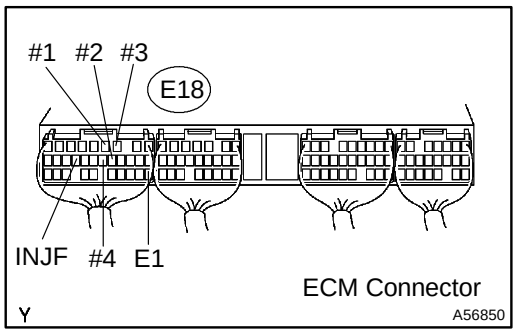
Tester Connection	Specified Condition
+B (E3-8) - GND (E3-6)	9 to 14 V

(d) Reconnect the EDU connector.

NG → **CHECK INJECTOR DRIVER POWER SOURCE CIRCUIT (BATTERY - EDU)**

OK

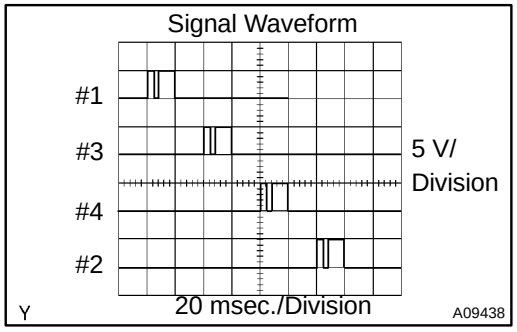
7	INSPECT ECM(INJECTOR VOLTAGE)

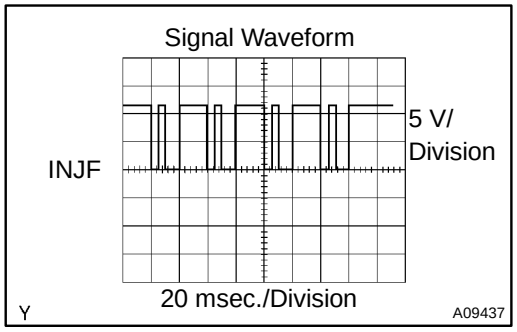


(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

Tester Connection	Specified Condition
#1 (E18-4) - E1 (E18-22)	Correct waveform is as shown
#2 (E18-14) - E1 (E18-22)	
#3 (E18-3) - E1 (E18-22)	
#4 (E18-15) - E1 (E18-22)	
INJF (E18-18) - E1 (E18-22)	





NG → **REPLACE ECM(See page 10-8)**

OK

8	REPLACE INJECTOR DRIVER

GO

CHECK IF DTC OUTPUT RECURS (DTC P0200 OUTPUT AGAIN)

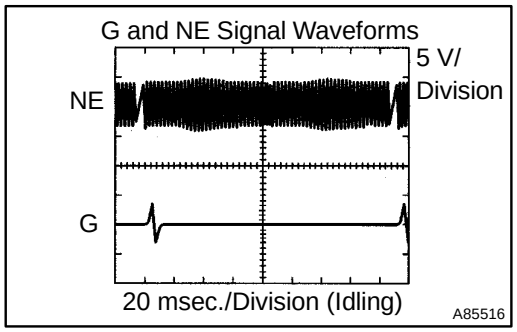
HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds, and then confirm that P0200 is not set again.

DTC	P0335	CRANKSHAFT POSITION SENSOR "A" CIRCUIT

CIRCUIT DESCRIPTION

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

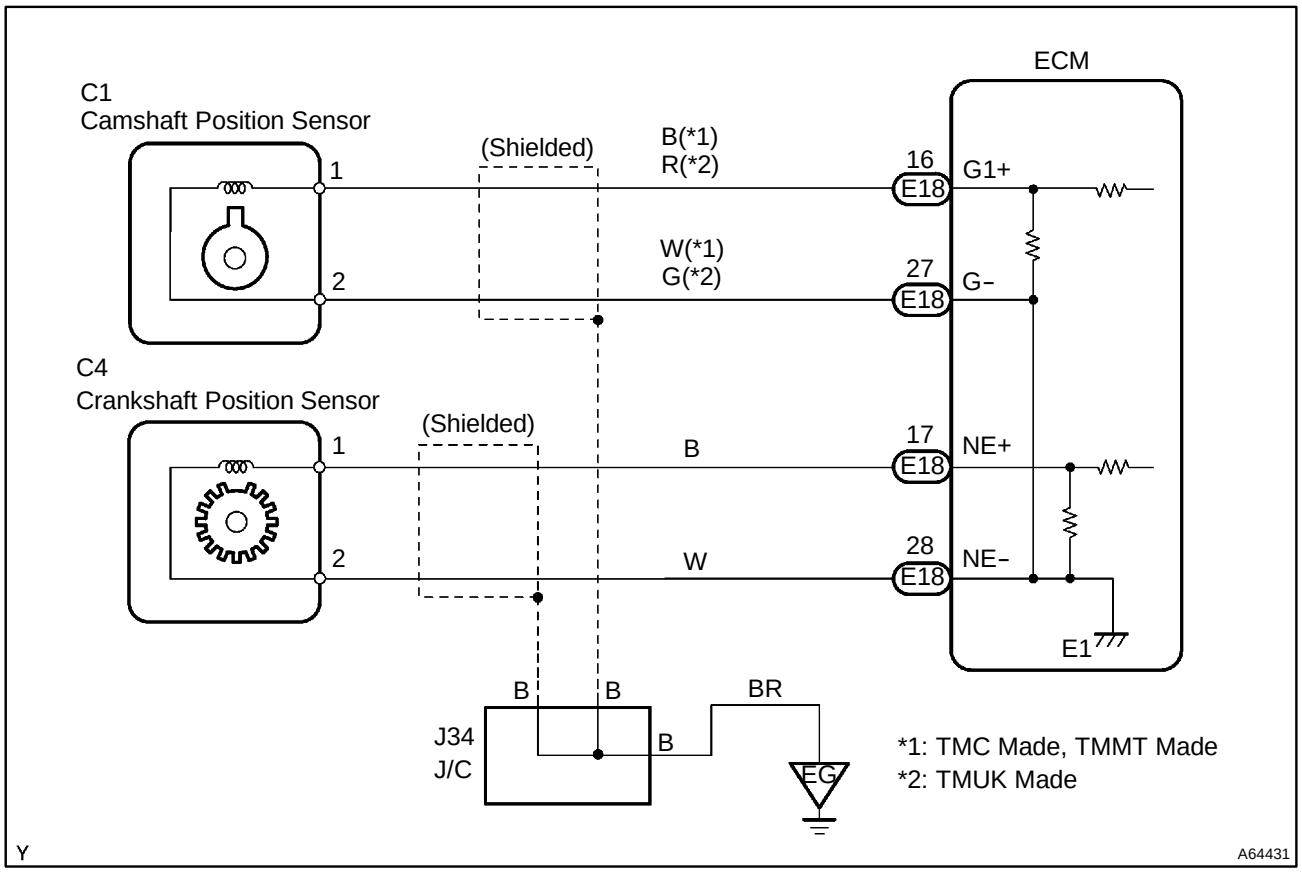
DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM for 0.5 second or more at 650 rpm or more (2 trip detection logic)	$ Open or short in crankshaft position sensor circuit $ Crankshaft position sensor $ Signal plate (crankshaft timing pulley) $ ECM
	No crankshaft position sensor signal to ECM for 2.0 second or more during cranking (2 trip detection logic)	



Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Tester Connection	Specified Condition
NE+ (E18-17) - NE- (E18-28)	Correct waveform is as shown

WIRING DIAGRAM



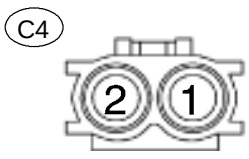
INSPECTION PROCEDURE

HINT:

- If no trouble is found despite performing the troubleshooting of DTC P0335, troubleshoot the engine mechanical systems.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	INSPECT CRANKSHAFT POSITION SENSOR

Component Side:



Crankshaft Position Sensor

A78431

(a) Disconnect the C4 crankshaft position sensor connector.

(b) Measure the resistance between terminals of the crankshaft position sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

(c) Reconnect the crankshaft position sensor connector.

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

(d) Reconnect the crankshaft position sensor connector.

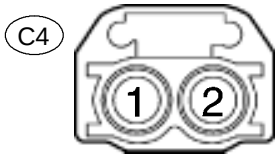
NG → REPLACE CRANKSHAFT POSITION SENSOR

OK

2	CHECK HARNESS AND CONNECTOR(CRANKSHAFT POSITION SENSOR - ECM)

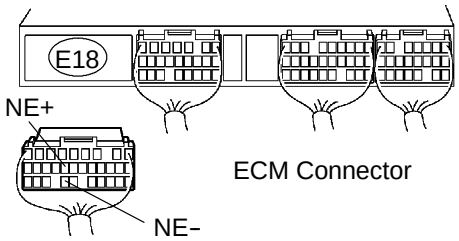
Wire Harness Side:

Crankshaft Position Sensor Connector



Front View

A76790



A56851

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) - NE+ (E18-17)	Below 1 Ω
Crankshaft position sensor (C4-2) - NE- (E18-28)	

Standard (Check for short):

Tester Connection	Specified Condition
Crankshaft position sensor (C4-1) or NE+ (E18-17) - Body ground	10 kΩ or higher
Crankshaft position sensor (C4-2) or NE- (E18-28) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the crankshaft position sensor connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK SENSOR INSTALLATION(CRANKSHAFT POSITION SENSOR)

NG → TIGHTEN SENSOR

OK

4	CHECK CRANKSHAFT POSITION SENSOR PLATE(TEETH OF SENSOR PLATE(CRANKSHAFT TIMING PULLEY))

(a) Remove the timing belt No. 1 cover. (See page 14-213 of Pub. No. RM925E COROLLA)
(b) Check the teeth of the signal plate.

NG → REPLACE CRANKSHAFT POSITION SENSOR PLATE (CAMSHAFT TIMING PULLEY)

OK

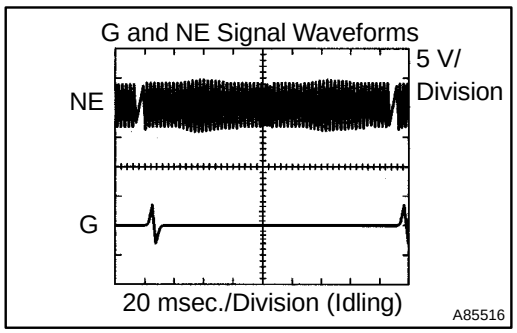
REPLACE ECM (See page 10-8)

DTC	P0340	CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

CIRCUIT DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • ECM
	No camshaft position sensor signal to ECM with engine speed 650 rpm or more (1 trip detection logic)	



Reference: Inspection using the oscilloscope.
During idling, the correct waveform is as shown in the diagram on the left.

Tester Connection	Specified Condition
G1+ (E18-16) - G- (E18-27)	Correct waveform is as shown

WIRING DIAGRAM

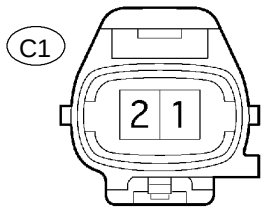
Refer to DTC P0335 on page 05-286.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT CAMSHAFT POSITION SENSOR

Component Side:



Camshaft Position Sensor

A64984

(a) Disconnect the C1 camshaft position sensor connector.
(b) Measure the resistance between terminals of the camshaft position sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

(c) Reconnect the camshaft position sensor connector.

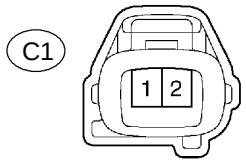
NG → **REPLACE CAMSHAFT POSITION SENSOR**

OK

2 CHECK HARNESS AND CONNECTOR(CAMSHAFT POSITION SENSOR - ECM)

Wire Harness Side:

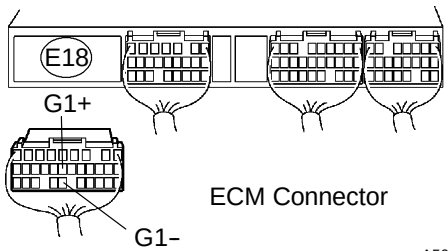
Camshaft Position Sensor Connector



Front View

Y

A54385



ECM Connector

Y

A56851

(a) Disconnect the C1 camshaft position sensor connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Camshaft position sensor (C1-1) - G1+ (E18-16)	Below 1 Ω
Camshaft position sensor (C1-2) - G- (E18-27)	

Standard (Check for short):

Tester Connection	Specified Condition
Camshaft position sensor (C1-1) or G1+ (E18-16) - Body ground	10 kΩ or higher
Camshaft position sensor (C1-2) or G- (E18-27) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the camshaft position sensor connector.

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

OK

3 CHECK SENSOR INSTALLATION(CAMSHAFT POSITION SENSOR)

NG → **TIGHTEN SENSOR**

OK

4	CHECK CAMSHAFT TIMING PULLEY(TEETH OF PLATE)

(a) Remove the timing belt No. 2 cover. (See Page 14-213 of Pub. No. RM925E COROLLA)
(b) Check the camshaft timing pulley teeth.

NG → REPLACE CAMSHAFT TIMING PULLEY

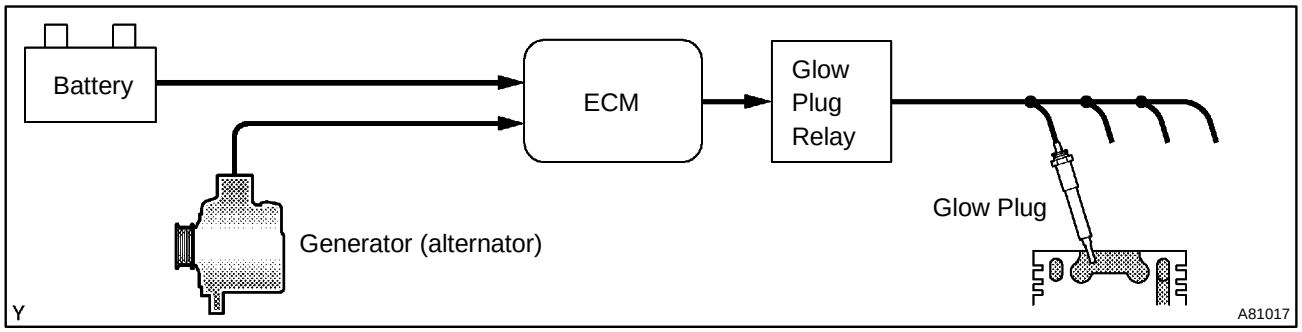
OK

REPLACE ECM (See page 10-8)

DTC	P0380	GLOW PLUG/HEATER CIRCUIT "A"

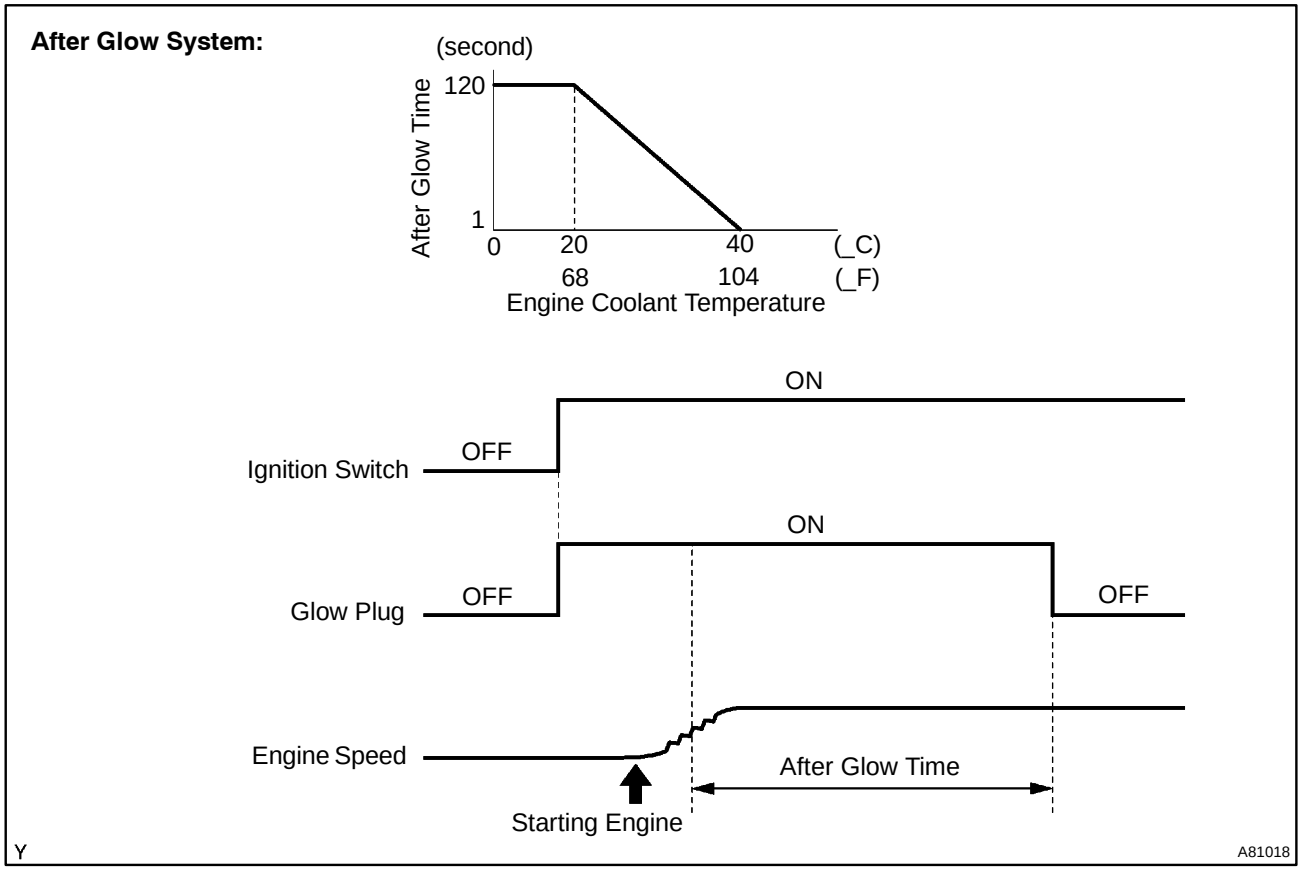
CIRCUIT DESCRIPTION

The glow plug is mounted inside the engine combustion chamber. To ensure the efficient engine starting with a cold engine, the ECM calculates a time interval of the current needs to flow through the glow plug depending on the starting engine coolant temperature once the ignition switch is turned ON. The ECM then turns on the glow 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 the cold engine.
This DTC will be set if there is open in glow plug itself or its circuit.



After the engine is started, the ECM performs an "after-glow" for a certain period of time.
In proportion as the actual engine coolant temperature, the time period varies. The after-glow reduces diesel engine knocking, white smoke and engine noises with a cold engine.

After Glow System:



DTC No.	DTC Detection Condition	Trouble Area
P0380	When the glow plug is turned from ON to OFF, or vice versa, conditions (a) and (b) are satisfied: (2 trip detection logic) (a) Battery voltage does not change (b) Duty signal from terminal M of the alternator (generator) does not change	$ Open or short in glow plug circuit $ Glow fuse $ Glow Plug relay $ Glow plug $ ECM

MONITOR DESCRIPTION

When starting a cold engine, the ECM supplies the current to the glow plug for a certain period of time. As supplying the current to the glow plug is terminated, the large current is suddenly cut off, therefore the battery voltage then varies and also the output (duty ratio) from terminal M of the generator (alternator) varies. If these variations are not occurred when the glow plug is turned from ON to OFF, or vice versa, the ECM judges the current has not been supplied to the glow plug. The ECM will interpret this as open malfunction of the glow plug or glow plug circuit.

MONITOR STRATEGY

Required Sensors	Glow plug circuit
Frequency of operation	Twice per driving cycle
Duration	3 minutes
CHK ENG Operation	2 driving cycles

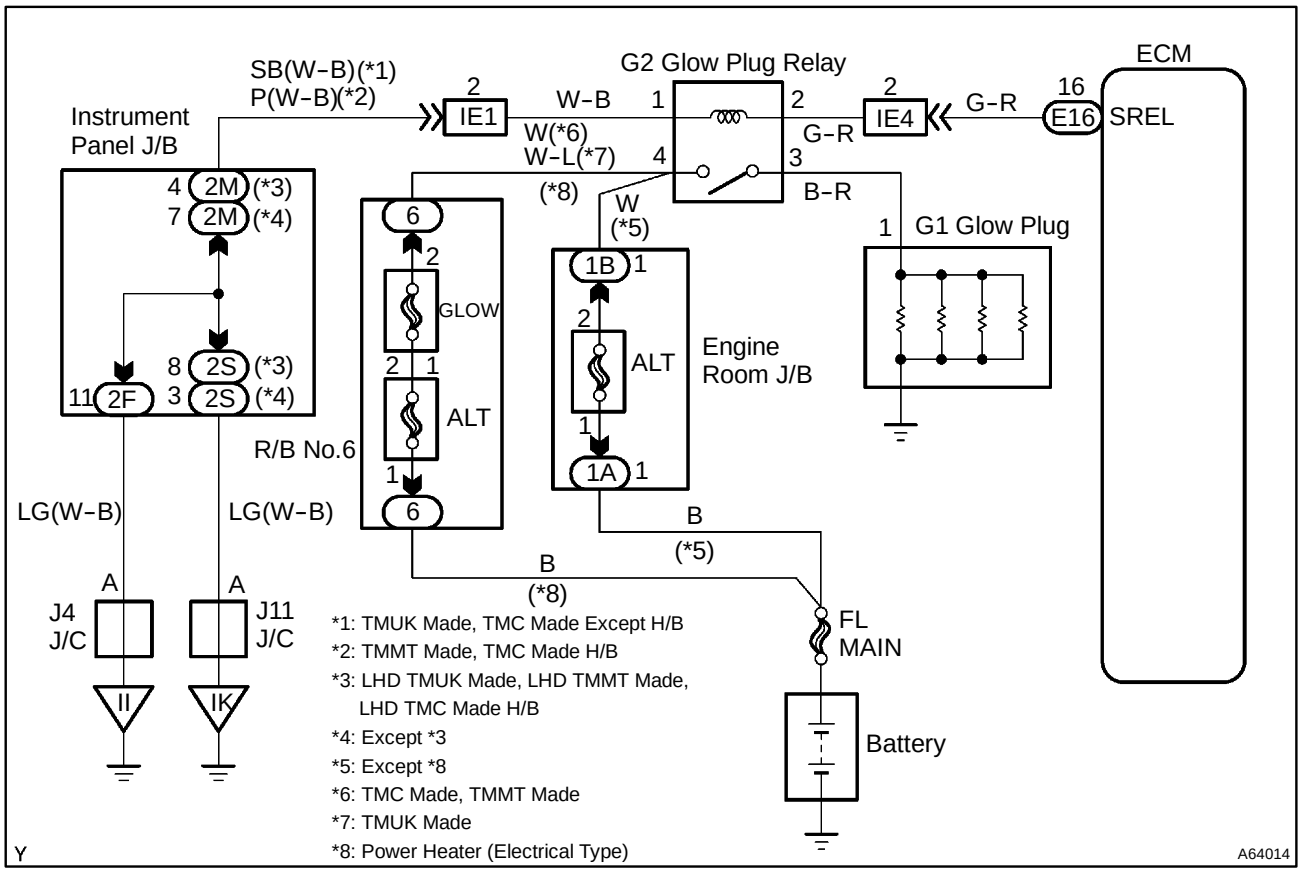
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	-
Engine speed	700 rpm	2,000 rpm
Engine coolant temperature	-	40_C (104_F)
Engine speed is stable	-	
Time after engine start	8 seconds	-
Any switches that vary electrical load have not been being operated	-	
The monitor will not run if the generator circuit is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
When the battery voltage, or output (duty ratio) from terminal M of the generator does not change, despite the ECM turning the glow plug from ON to OFF, or vice versa

WIRING DIAGRAM

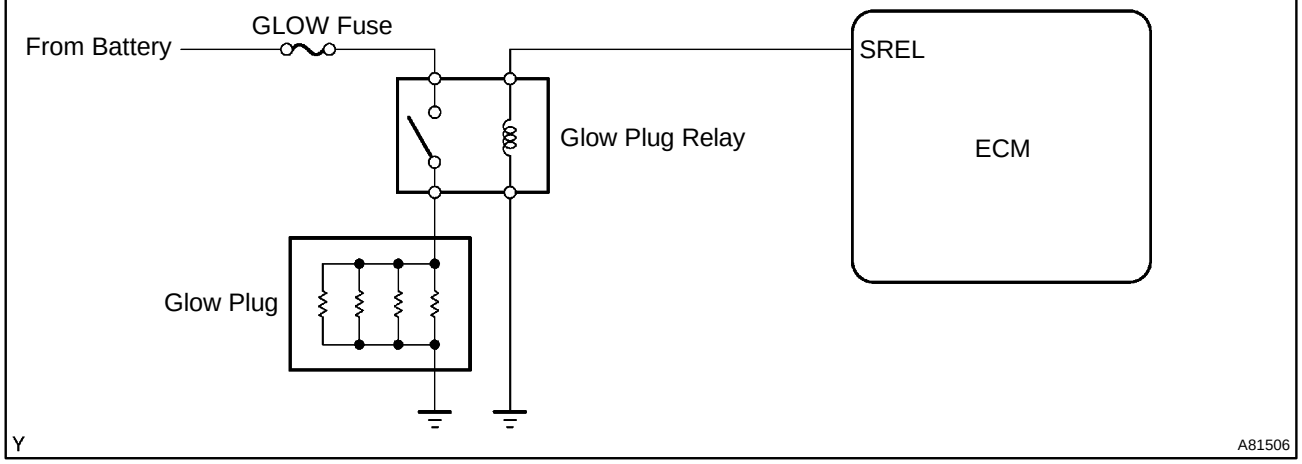


INSPECTION PROCEDURE

HINT:

- After completing repair, confirm P0380 is not set again.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

Glow System Wiring Diagram:



1 CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P0380)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

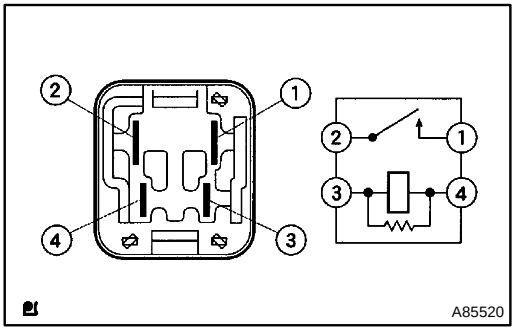
Display (DTC output)	Proceed to
P0380	A
P0380 and P0622	B

HINT:
If any other codes besides P0380 are output, perform the troubleshooting for those DTCs first.

B → **GO TO RELEVANT DTC CHART (See page 05-233)**

A

2 INSPECT GLOW PLUG RELAY ASSY



(a) Remove the glow plug relay.
(b) Check for continuity in the glow plug relay.
Standard:

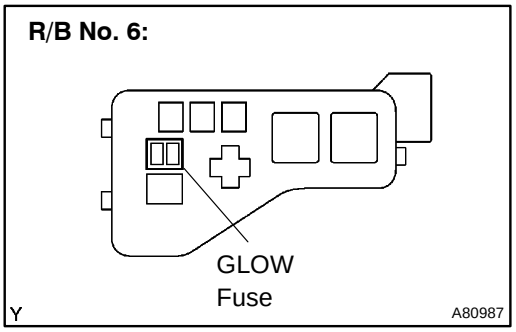
Tester Connection	Specified Condition
3 - 4	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)
1 - 2	Continuity

(c) Reinstall the glow plug relay.

NG → **REPLACE GLOW PLUG RELAY ASSY**

OK

3 INSPECT FUSE(GLOW FUSE)

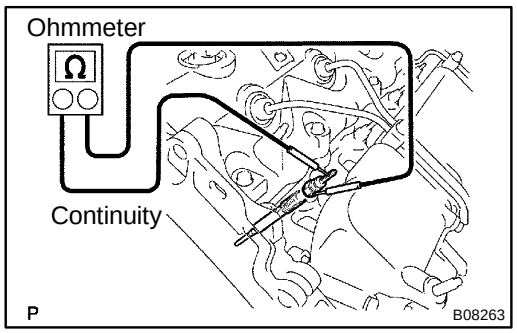


(a) Remove the GLOW fuse from the R/B No. 6.
(b) Check for continuity in the GLOW fuse.
Standard: Continuity

NG → **CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FUSE**

OK

4 INSPECT GLOW PLUG ASSY



(a) Measure the resistance in the glow plug.

Standard:

Tester Connection	Specified Condition
Glow plug terminal - Body ground	Approximately 0.72 Ω at 20_C (68_F)

NOTICE:

- **Exercise extreme care not to damage the glow plug pipes. Damaging them could cause an open circuit, or shorten the life of the glow plugs.**
- **Keep the glow plug free of oil and fuel while cleaning.**
- **Wipe any oil off the terminal and Bakelite washer with a clean-dry cloth during inspection.**

NG → **REPLACE GLOW PLUG ASSY (See page 19-33 of Pub. No. RM925E COROLLA)**

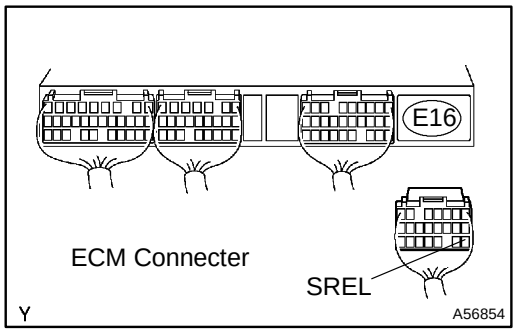
OK

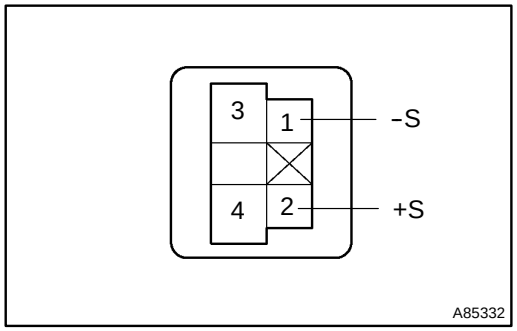
5 INSPECT GLOW PLUG ASSY(INSTALLATION)

NG → **TIGHTEN GLOW PLUG**

OK

6 CHECK HARNESS AND CONNECTOR(GLOW PLUG RELAY - ECM, AND GLOW PLUG RELAY - BODY GROUND)





(a) Disconnect the E16 ECM connector.
(b) Remove the glow plug relay.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
+S (Glow plug relay terminal 2) - SREL (E16-16)	Below 1 Ω
-S (Glow plug relay terminal 1) - Body ground	

Standard (Check for short):

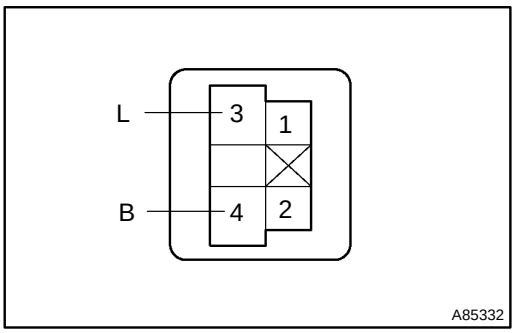
Tester Connection	Specified Condition
+S (Glow plug relay terminal 2) or SREL (E16-16) - Body ground	10 kΩ or higher

(d) Reinstall the glow plug relay.
(e) Reconnect the ECM connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7	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 between the wire harness.
Standard (Check for open):

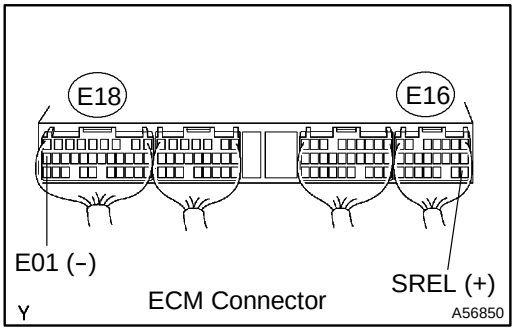
Tester Connection	Specified Condition
L (Glow plug relay terminal 3) - Glow plug wire	Below 1 Ω
B (Glow plug relay terminal 4) - Positive terminal of the battery	

(d) Reconnect the glow plug wire.
(e) Reinstall the glow plug relay.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8	INSPECT ECM(SREL VOLTAGE)



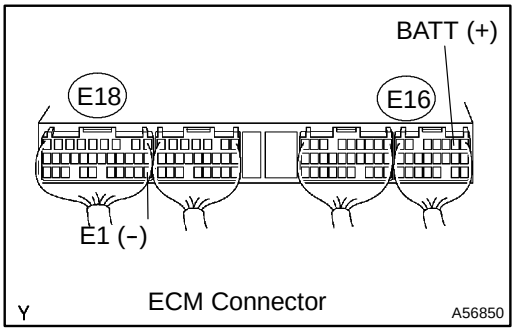
(a) Turn the ignition switch START.
(b) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

Tester Connection	Condition	Specified Condition
SREL (E16-16) - E01 (E18-21)	Engine coolant temperature is 40_C (104_F) or less	9 to 14 V

NG → REPLACE ECM(See page 10-8)

OK

9	INSPECT ECM(BATT VOLTAGE)



(a) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

Tester Connection	Specified Condition
BATT (E16-2) - E1 (E18-22)	9 to 14 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

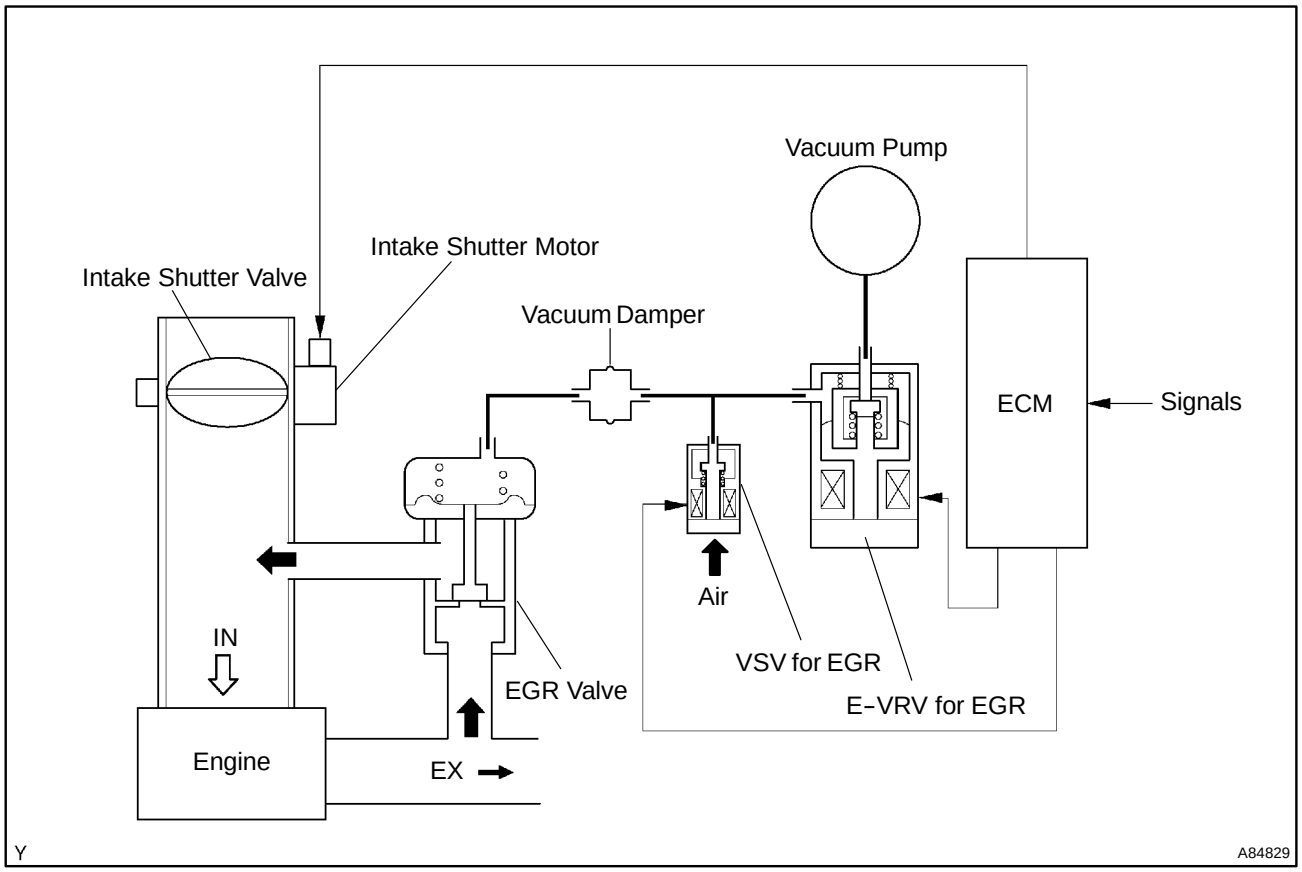
CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)

DTC	P0400	EXHAUST GAS RECIRCULATION FLOW

HINT:
For more information on the EGR system, see page 05-207.

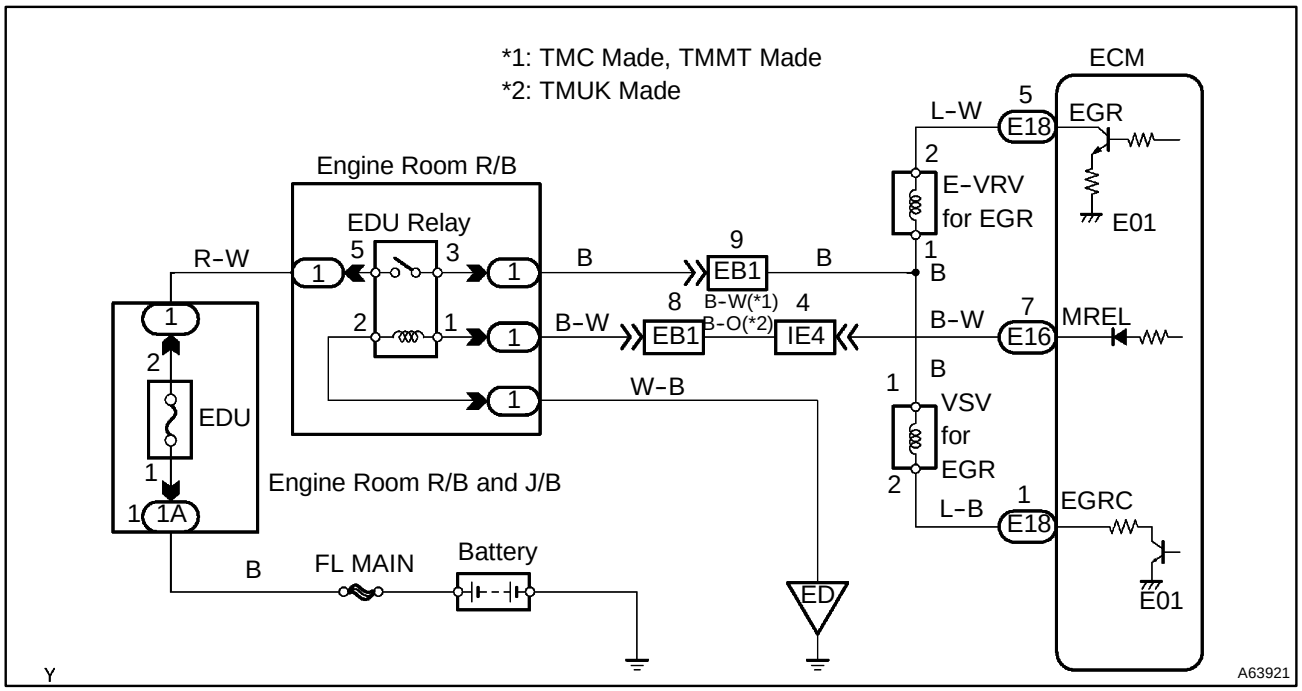
CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, and which is controlled to the proper volume to be suited every driving condition. The recirculated gas mingles with the intake air, therefore the EGR system can slow down the engine combustion and let the combustion temperature down. This helps reduce a NOx emission.
In order to increase a circulatory efficiency, the ECM adjusts the lift amount of the EGR valve and intake shutter valve. The ECM regulates EGR valve by using the E-VRV for EGR.
The E-VRV for EGR opens and closes the EGR valve with the vacuum.
Before the engine is warmed up, or if the engine speed exceeds 4,000 rpm, the VSV for EGR will be turned ON by a signal from the ECM. This results in EGR cut-off; closing the EGR valve and shutting off the exhaust gas.



DTC No.	DTC Detection Condition	Trouble Area
P0400	Mass air flow rate is not changed when turning on EGR valve (2 trip detection logic)	$ Vacuum hose connection $ Open or short in EGR circuit $ VSV for EGR $ E-VRV for EGR $ ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

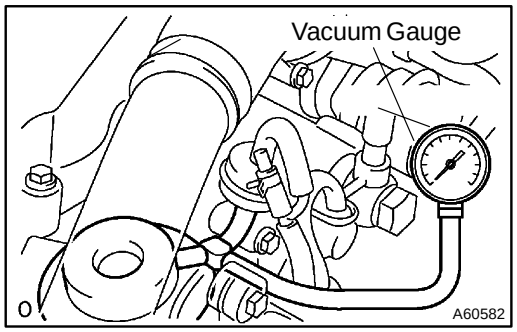
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK CONNECTION OF VACUUM HOSE

NG → REPAIR OR REPLACE VACUUM HOSE

OK

2	CHECK VACUUM HOSE(EGR VALVE-VSV FOR EGR AT 1,500 RPM)



(a) Using a 3-way connector, connect a vacuum gauge to the hose between the V5 VSV for EGR and EGR valve.

(b) Warm up the engine to approximately 80˚C (176˚F).

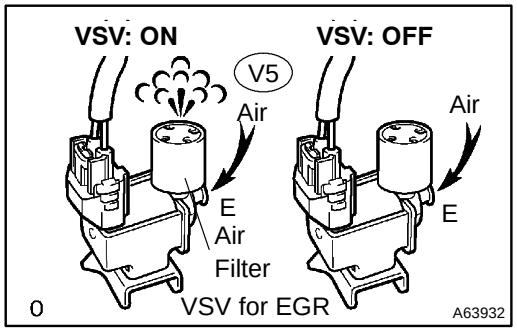
(c) Check the vacuum at 1,500 rpm.

Proceed to	Vacuum
A	Approximately 0 kPa (0 mmHg, in. Hg) to 28 kPa (210 mmHg, 8.3 in. Hg)
B	0 kPa (0 mmHg, 0 in. Hg)
C	Above 28 kPa (210 mmHg, 8.3 in. Hg)

B	Go to step 7
C	Go to step 9

A

3	CHECK OPERATION OF VSV



(a) Disconnect the vacuum hose from the V5 VSV for EGR.
(b) Connect the hand-held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / EGR CLOSE VSV".
(e) Check the operation of VSV for EGR when it is operated by the hand-held tester.
VSV is ON:
Air from port E flows out through air filter.
VSV is OFF:
Air does not flow from port E to air filter.
(f) Reconnect the VSV for EGR connector.

OK	REPAIR OR REPLACE VACUUM HOSE

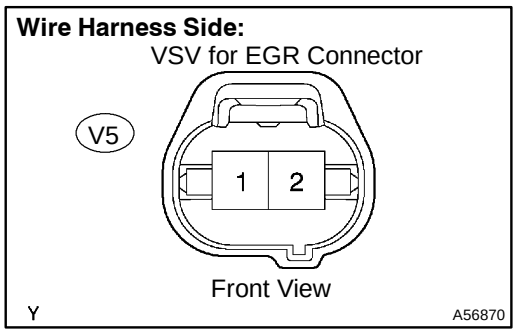
NG

4	INSPECT VSV FOR EGR (See page 12-16 of Pub. No. RM925E COROLLA)

NG	REPLACE VSV FOR EGR

OK

5 CHECK HARNESS AND CONNECTOR(VSV FOR EGR - ECM)



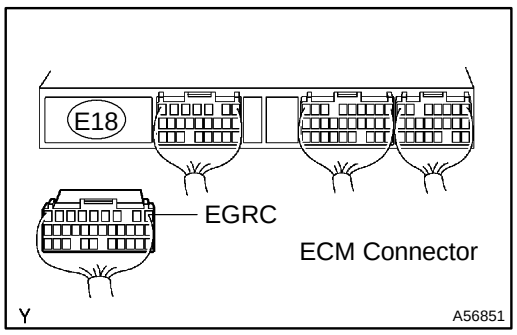
(a) Disconnect the V5 VSV for EGR connector.
(b) Disconnect the E18 ECM connector.
(c) Remove the EDU relay from the engine room R/B.
(d) Check the resistance between the wire harness side connectors.

Standard (Check for open):

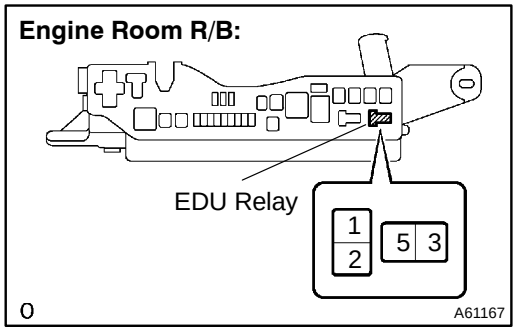
Tester Connection	Specified Condition
VSV for EGR (V5-1) - EDU relay (3)	Below 1 Ω
VSV for EGR (V5-2) - EGRC (E18-1)	

Standard (Check for short):

Tester Connection	Specified Condition
VSV for EGR (V5-1) or EDU relay (3) - Body ground	10 kΩ or higher
VSV for EGR (V5-2) or EGRC (E18-1) - Body ground	



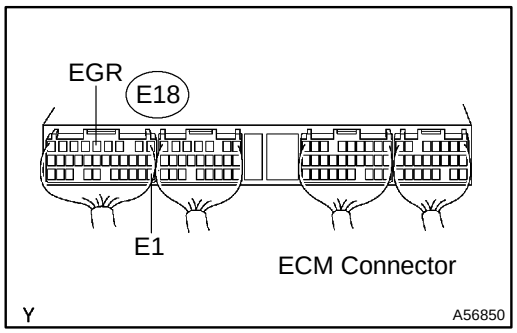
(e) Reconnect the ECM connector.
(f) Reconnect the VSV for EGR connector.
(g) Reinstall the EDU relay.



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

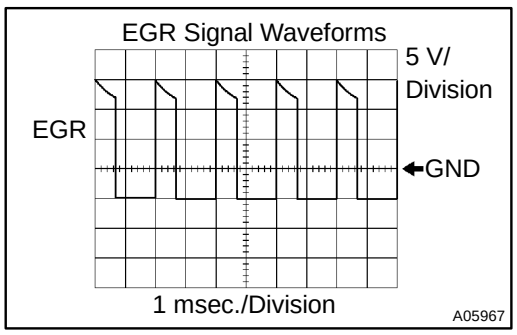
OK

6	INSPECT ECM



(a) Inspect using the oscilloscope.
(b) After warm-up, check the waveform between the specified terminals of the E18 ECM connector during idling.
Standard:

Tester Connection	Specified Condition
EGR (E18-5) - E1 (E18-22)	Correct waveform is as shown



NG → **REPLACE ECM (See page 10-8)**

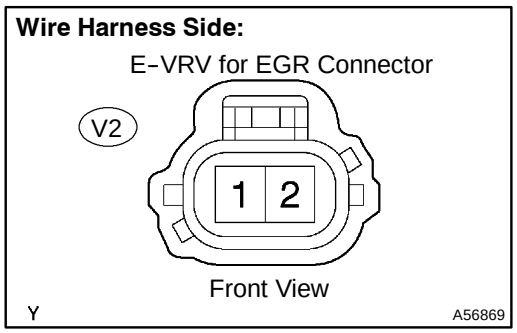
OK

7	INSPECT E-VRV (See page 12-16 of Pub. No. RM925E COROLLA)

NG → **REPLACE E-VRV**

OK

8	CHECK HARNESS AND CONNECTOR(E-VRV - ECM)



(a) Disconnect the V2 E-VRV for EGR connector.
(b) Disconnect the E18 ECM connector.
(c) Remove the EDU relay from the engine room R/B.
(d) Check the resistance between the wire harness side connectors.

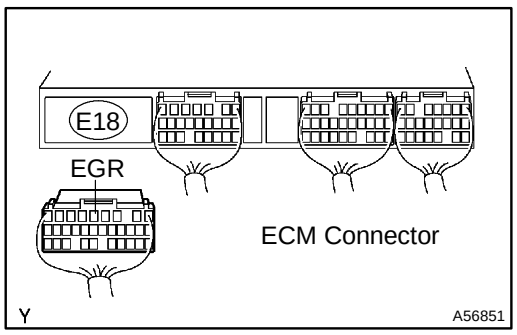
Standard (Check for open):

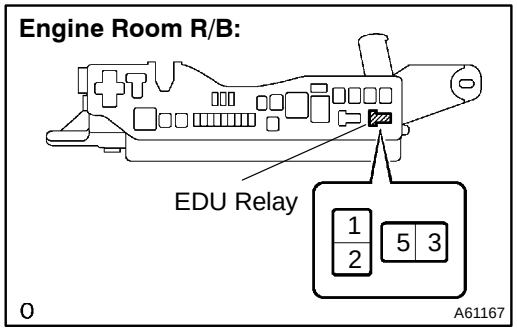
Tester Connection	Specified Condition
E-VRV for EGR (V2-1) - EDU relay (3)	Below 1 Ω
E-VRV for EGR (V2-2) - EGR (E18-5)	

Standard (Check for short):

Tester Connection	Specified Condition
E-VRV for EGR (V2-1) or EDU relay (3) - Body ground	10 kΩ or higher
E-VRV for EGR (V2-2) or EGR (E18-5) - Body ground	

(e) Reconnect the ECM connector.
(f) Reconnect the E-VRV for EGR connector.
(g) Reinstall the EDU relay.





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

OK

9	CHECK EGR VALVE ASSY (See page 12-14 of Pub. No. RM925E COROLLA)

NG → **REPLACE EGR VALVE ASSY (See page 14-190 of Pub. No. RM925E COROLLA)**

OK

REPLACE ECM (See page 10-8)

DTC	P0487	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL CIRCUIT

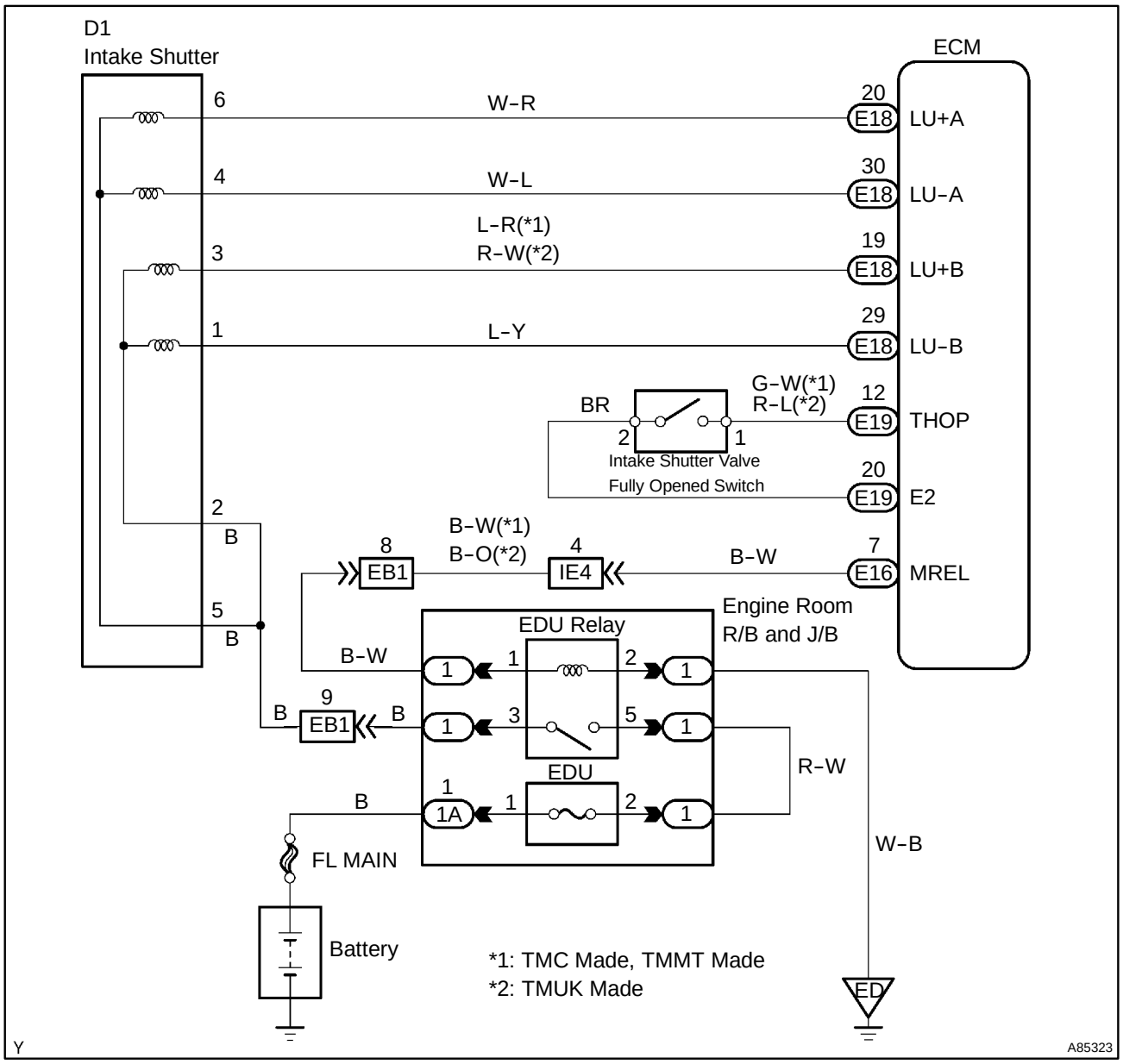
HINT:
For more information on the intake shutter, see page 05-207.

CIRCUIT DESCRIPTION

The ECM opens and closes the intake shutter valve using the step motor. Upon opening and closing the valve, the exhaust gas recirculation volume is properly controlled. Also, the engine vibration and noise will be reduced by closing the valve when the engine is stopped.
HINT:
The ECM detects fully open position of the intake shutter valve by the intake shutter valve fully opened switch which is mounted on a intake shutter.

DTC No.	DTC Detection Condition	Trouble Area
P0487	Open or short in intake shutter circuit (1 trip detection logic)	$ Open or short in intake shutter circuit $ Intake shutter $ ECM

WIRING DIAGRAM

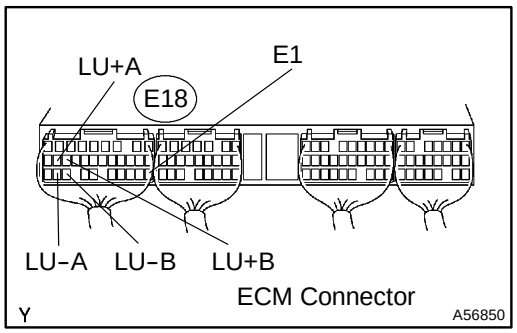


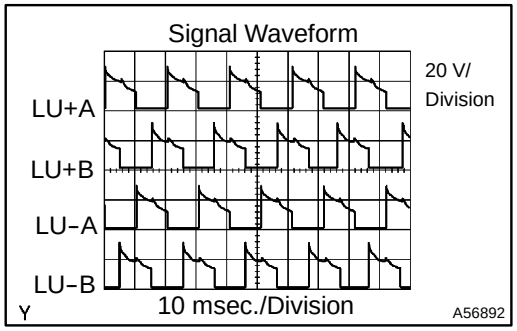
INSPECTION PROCEDURE

HINT:

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

1 INSPECT ECM(LU VOLTAGE)





(a) Inspect using the oscilloscope.
(b) While repeating quick engine RPM acceleration, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

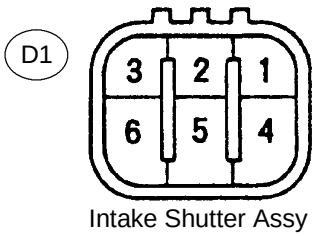
Tester Connection	Specified Condition
LU+A (E18-20) - E1 (E18-22)	Correct waveform is as shown
LU-A (E18-30) - E1 (E18-22)	
LU+B (E18-19) - E1 (E18-22)	
LU-B (E18-29) - E1 (E18-22)	

NG → **REPLACE ECM (See page 10-8)**

OK

2 INSPECT INTAKE SHUTTER ASSY

Component Side:



(a) Disconnect the D1 intake shutter connector.
(b) Measure the resistance between the terminals.

Standard:

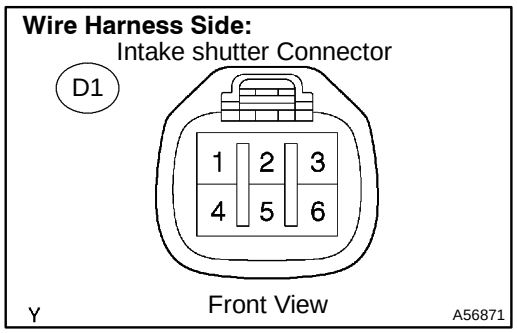
Tester Connection	Specified Condition
1 - 2	18 to 22 Ω at 20_C (68_F)
2 - 3	
4 - 5	
5 - 6	

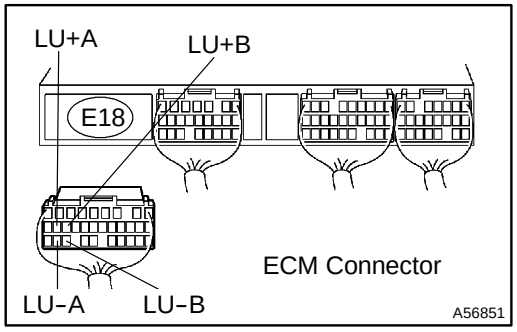
(c) Reconnect the intake shutter connector.

NG → **REPLACE INTAKE SHUTTER ASSY (See page 14-190 of Pub. No. RM925E COROLLA)**

OK

3 CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER ASSY - ECM)





(a) Disconnect the D1 intake shutter connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
LU+A (E18-20) - Intake shutter (D1-6)	Below 1 Ω
LU-A (E18-30) - Intake shutter (D1-4)	
LU+B (E18-19) - Intake shutter (D1-3)	
LU-B (E18-29) - Intake shutter (D1-1)	

Standard (Check for short):

Tester Connection	Specified Condition
LU+A (E18-20) or Intake shutter (D1-6) - Body ground	10 kΩ or higher
LU-A (E18-30) or Intake shutter (D1-4) - Body ground	
LU+B (E18-19) or Intake shutter (D1-3) - Body ground	
LU-B (E18-29) or Intake shutter (D1-1) - Body ground	

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

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

OK

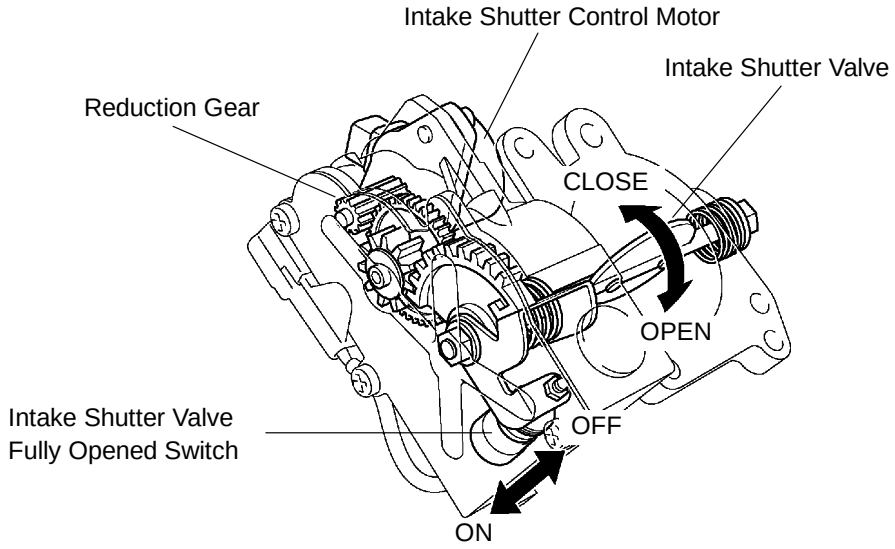
REPLACE ECM (See page 10-8)

DTC	P0488	EXHAUST GAS RECIRCULATION THROTTLE POSITION CONTROL RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0487 on page 05-305.

Intake Shutter Internal Structure:



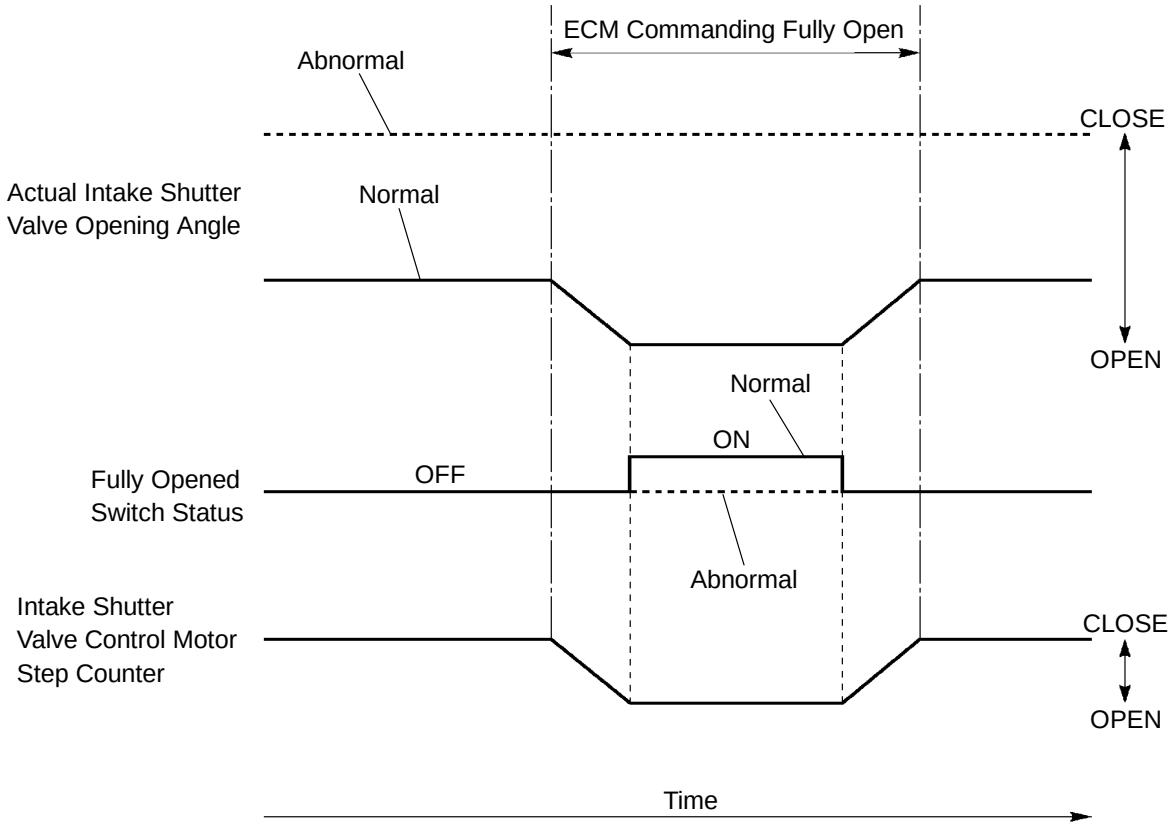
A81482

DTC No.	DTC Detection Condition	Trouble Area
P0488	Intake shutter valve fully opened switch is not turned on, despite the ECM commanding the intake shutter valve to fully open (1 trip detection)	S Open or short in intake shutter circuit S Open or short in fully opened switch circuit S Intake shutter S ECM

MONITOR DESCRIPTION

This DTC will be set if the actual opening angle of the intake shutter valve varies from the target opening angle. The ECM forces the valve to fully open within 2 to 3 seconds as the ignition switch is turned ON, and then checks if the intake shutter valve fully opened switch is turned on. In addition, the ECM also forces the valve to fully open when accelerating the engine (high engine load) and checks if the switch is turned ON. When starting and/or accelerating the engine, the ECM sets this DTC if the switch is not turned on.
If the DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

Malfunction Detection:



Y A81510

MONITOR STRATEGY

Required sensors	Intake shutter valve fully opened switch
Frequency of operation	Continuous
Duration	3 seconds
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Specification
Start the engine and let it idle for 30 seconds and accelerate the vehicle speed to 60 km/h (37 mph) with the accelerator pedal opened more than half angle

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Intake shutter valve fully opened switch is not turned ON, despite the ECM commanding the intake shutter valve to open fully

WIRING DIAGRAM

Refer to DTC P0487 on page 05-305.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 CHECK INTAKE SHUTTER ASSY

(a) Visually check that the intake shutter valve moves within approximately 2 to 3 seconds after the ignition switch is turned ON.

Result:

Intake Shutter	Proceed to
Does not move	A
Smoothly move to full-open position	B

B → **Go to step 6**

A

2 CHECK INTAKE SHUTTER ASSY

(a) Check if the intake shutter valve moves as the lever is rotated by hand.

Result:

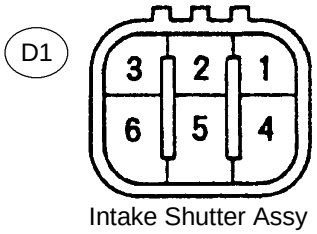
Intake Shutter	Proceed to
Smoothly moved	A
Difficult to move smoothly	B

B → **REPLACE INTAKE SHUTTER ASSY (See page 14-190 of Pub. No. RM925E COROLLA)**

A

3 INSPECT INTAKE SHUTTER ASSY

Component Side:



Intake Shutter Assy

A31135

(a) Disconnect the D1 intake shutter connector.

(b) Measure the resistance between the terminals.

Standard:

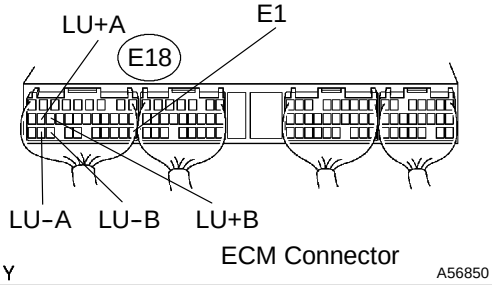
Tester Connection	Specified Condition
1 - 2	18 to 22 Ω at 20_C (68_F)
2 - 3	
4 - 5	
5 - 6	

(c) Reconnect the intake shutter connector.

NG → **REPLACE INTAKE SHUTTER ASSY (See page 14-190 of Pub. No. RM925E COROLLA)**

OK

4 INSPECT ECM(LU VOLTAGE)

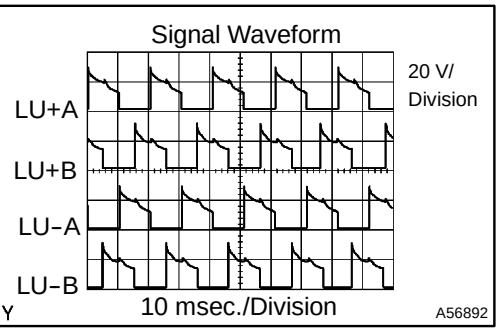


(a) Inspect using the oscilloscope.

(b) While repeating quick engine RPM acceleration, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

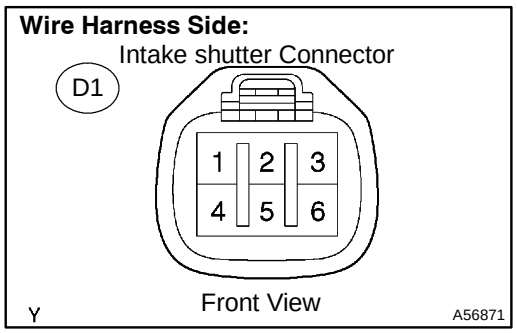
Tester Connection	Specified Condition
LU+A (E18-20) - E1 (E18-22)	Correct waveform is as shown
LU-A (E18-30) - E1 (E18-22)	
LU+B (E18-19) - E1 (E18-22)	
LU-B (E18-29) - E1 (E18-22)	

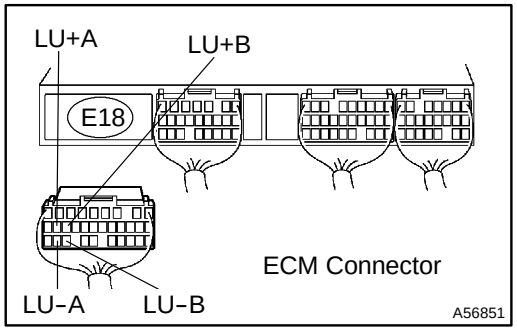


OK → **Go to step 6**

NG

5 CHECK HARNESS AND CONNECTOR(INTAKE SHUTTER ASSY - ECM)





(a) Disconnect the D1 intake shutter connector.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
LU+A (E18-20) - Intake shutter (D1-6)	Below 1 Ω
LU-A (E18-30) - Intake shutter (D1-4)	
LU+B (E18-19) - Intake shutter (D1-3)	
LU-B (E18-29) - Intake shutter (D1-1)	

Standard (Check for short):

Tester Connection	Specified Condition
LU+A (E18-20) or Intake shutter (D1-6) - Body ground	10 kΩ or higher
LU-A (E18-30) or Intake shutter (D1-4) - Body ground	
LU+B (E18-19) or Intake shutter (D1-3) - Body ground	
LU-B (E18-29) or Intake shutter (D1-1) - Body ground	

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

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

OK

6 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Fully open the intake shutter valve by hand.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / ACCEL OPEN SW" and read its value displayed on the hand-held tester.

Result:

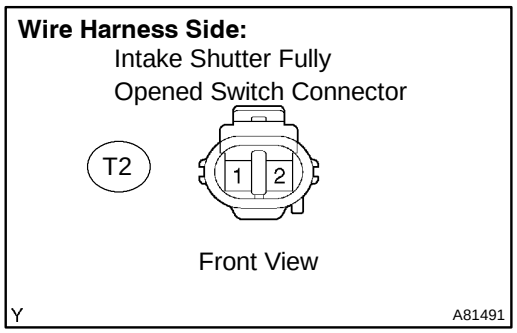
Switch Condition Display	Proceed to
OFF	A
ON	B

B → **CHECK IF DTC OUTPUT RECURS (DTC P0488 OUTPUT AGAIN)**

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds. Then, accelerate the vehicle to 60 km/h (37 mph) with the accelerator pedal opened more than half angle. Reconfirm that P0488 is not present.

A

7	CHECK HARNESS AND CONNECTOR(FULLY OPENED SWITCH - ECM)



(a) Disconnect T2 the intake shutter fully opened switch connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connectors.

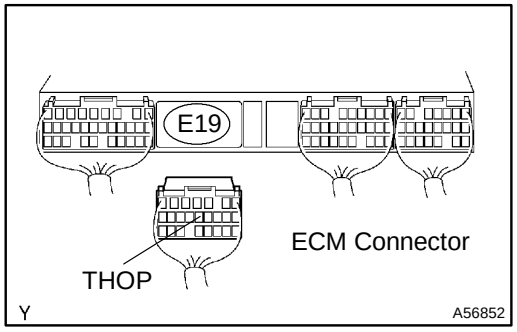
Standard (Check for open):

Tester Connection	Specified Condition
THOP (E19-12) - Intake shutter (T2-1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
THOP (E19-12) or Intake shutter (T2-1) - Body ground	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the intake shutter fully opened switch connector.



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

OK

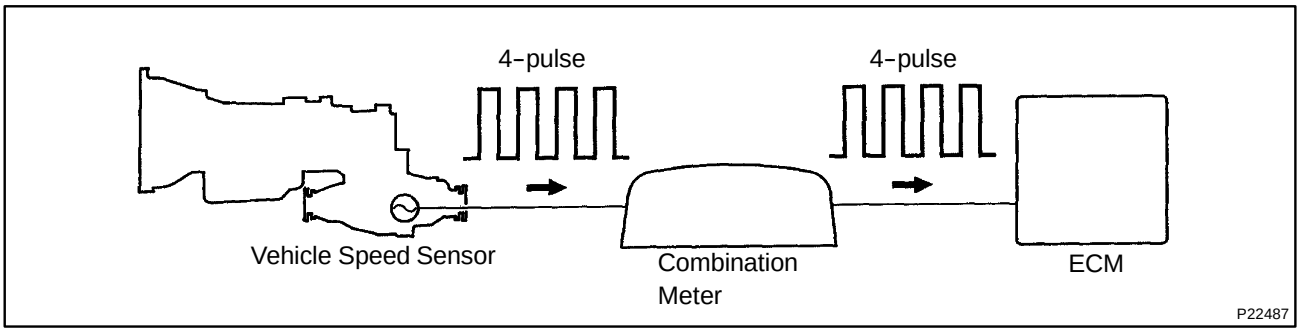
CHECK IF DTC OUTPUT RECURS (DTC P0488 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 30 seconds. Then, accelerate the vehicle to 60 km/h (37 mph) with the accelerator pedal opened more than half angle. Reconfirm that P0488 is not present.

DTC P0500 VEHICLE SPEED SENSOR "A"

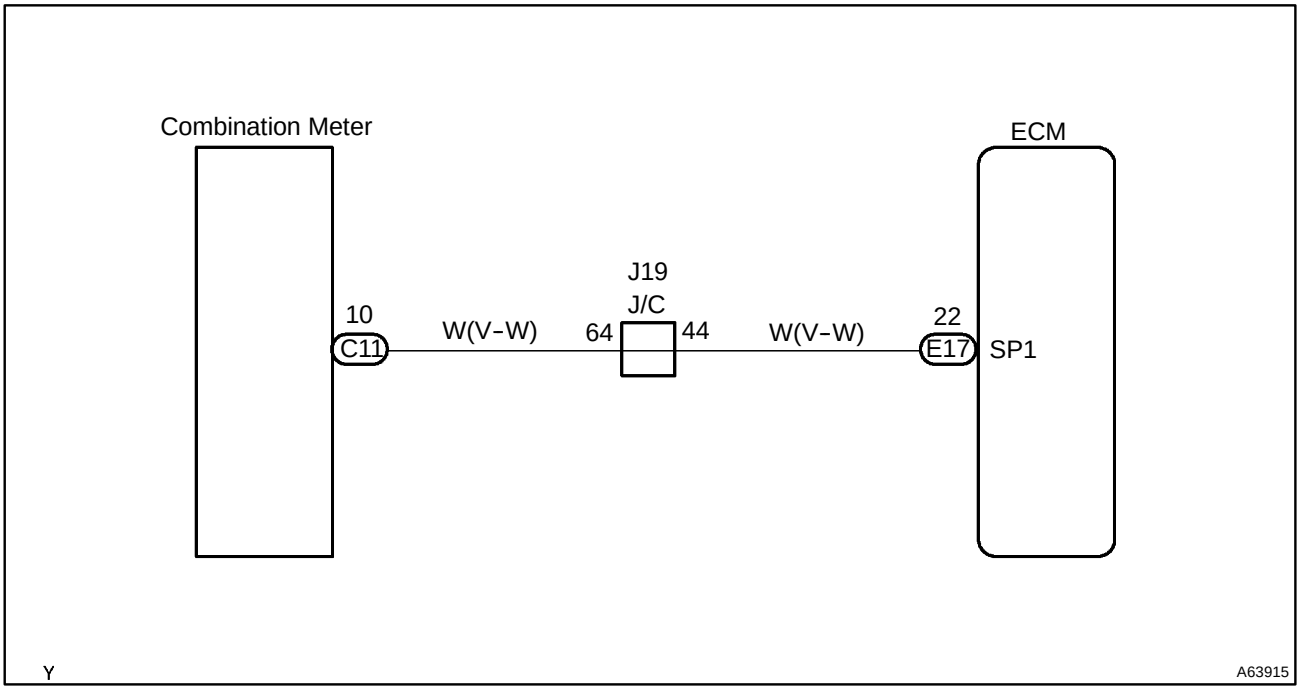
CIRCUIT DESCRIPTION

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	All conditions below are detected simultaneously for 8 seconds or more (2 trip detection logic): (a) Vehicle speed signal: 0 km/h (0 mph) (b) Engine speed: 2,000 to 4,000 rpm (c) Engine coolant temperature: 60°C (176°F) or more (d) Engine load: 20 mm^3/st or more (e) Speed signal is not entering to ECM	$ Open or short in vehicle speed sensor circuit $ Vehicle speed sensor $ Combination meter $ ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

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

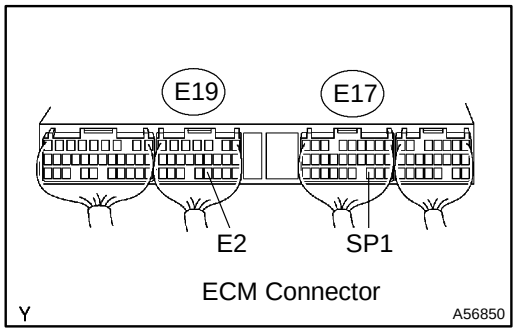
1	CHECK OPERATION OF SPEEDOMETER

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

NG → **CHECK SPEEDOMETER CIRCUIT (See page 05-1298 of Pub. No. RM925E COROLLA)**

OK

2	INSPECT ECM(SP1 VOLTAGE)

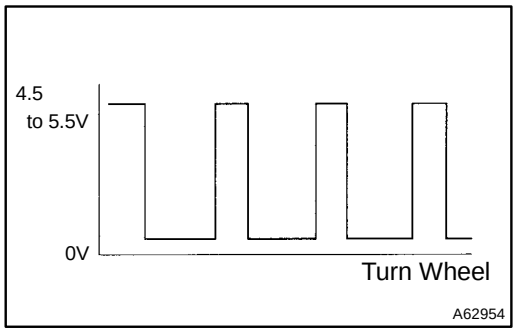


(a) Shift the transmission to the neutral position.
(b) Jack up the vehicle.
(c) Turn the ignition switch ON.
(d) Check the voltage between the specified terminals of the E17 and E19 ECM connectors as the wheel is turned slowly.

Standard:

Tester Connection	Specified Condition
SP1 (E17-22) - E2 (E19-20)	Generated intermittently

HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



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

OK

REPLACE ECM (See page 10-8)

DTC	P0504	BRAKE SWITCH "A"/"B" CORRELATION

CIRCUIT DESCRIPTION

In this system, the signal of the stop lamp switch is used to judge whether the brake system is abnormal or not.

The stop lamp switch has a duplex system (signals STP and ST1-) to detect the abnormality when the signals of depressing and releasing the brake pedal are detected simultaneously.

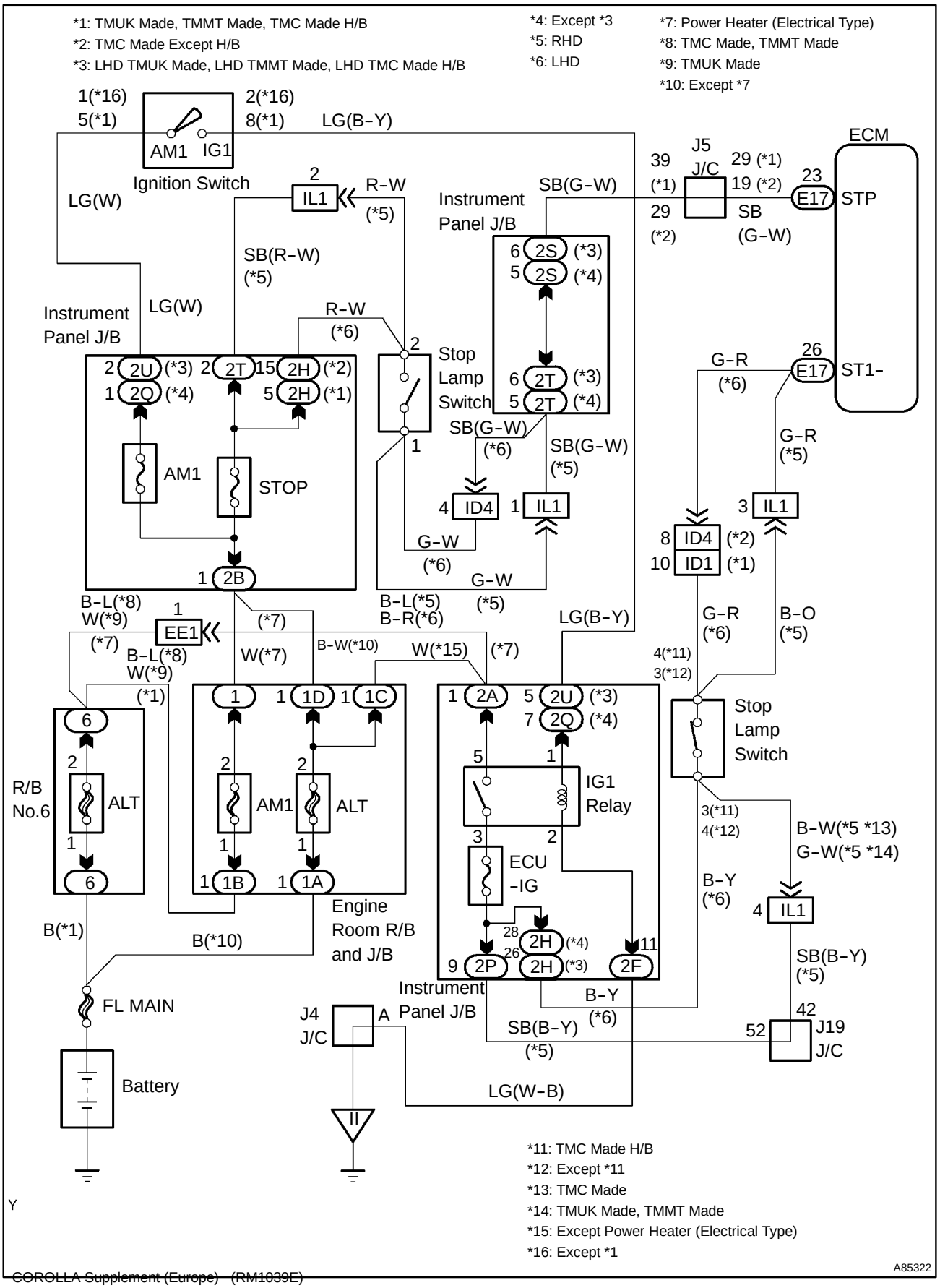
HINT:

Normal condition is as shown in the table below.

Signal	Brake Pedal Released	In Transition	Brake Pedal Depressed
STP	OFF	ON	ON
ST1-	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 second or more: (1 trip detection logic) (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1- signal is OFF	$ Short in stop lamp switch signal circuit $ Stop lamp switch $ ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

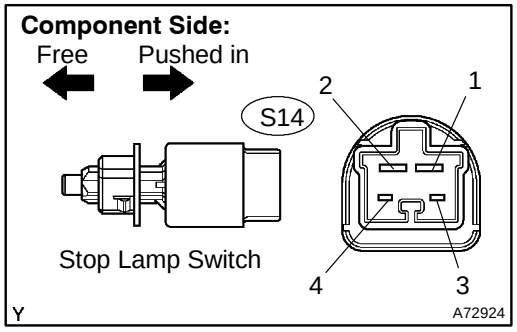
1	CHECK OPERATION OF STOP LIGHT

(a) Check if the stop lights go on and off normally when the brake pedal is depressed and released.

NG → REPAIR OR REPLACE STOP LAMP SWITCH CIRCUIT

OK

2	INSPECT STOP LAMP SWITCH ASSY



(a) Disconnect the S14 stop lamp switch connector.

(b) Check for continuity between each pair of the terminals.

Standard:

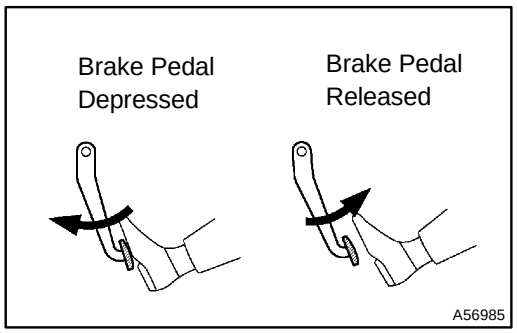
Switch Position	Tester Connection	Specified Condition
Switch pin free	1 - 2	Continuity
	3 - 4	No continuity
Switch pin pushed in	1 - 2	No continuity
	3 - 4	Continuity

(c) Reconnect the stop lamp switch connector.

NG → REPLACE STOP LAMP SWITCH ASSY

OK

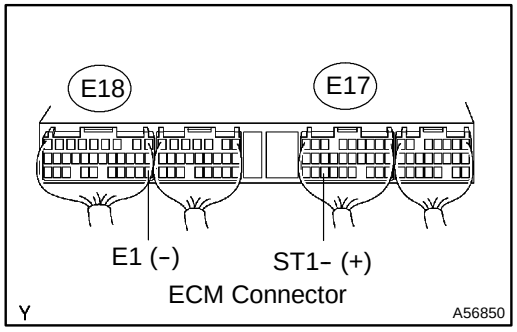
3 READ VALUE OF HAND-HELD TESTER(STP SIGNAL AND ST1- VOLTAGE)



(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STOP LIGHT SW" and read its value displayed on the hand-held tester.

Standard:

Brake Pedal	Specified Condition
Depressed	STP signal ON
Released	STP signal OFF



(d) Measure the voltage between the specified terminals of the E17 and E18 ECM connectors.

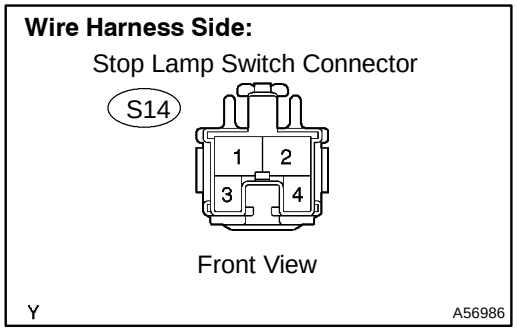
Standard:

Tester Connection	Brake Pedal	Specified Condition
ST1- (E17-26) - E1- (E18-22)	Depressed	Below 1.5 V
	Released	7.5 to 14 V

OK → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

NG

4 CHECK HARNESS AND CONNECTOR(STOP LAMP SWITCH - ECM)



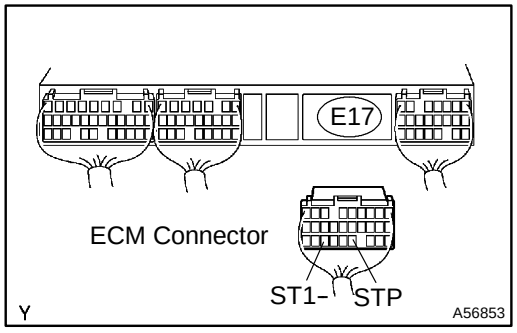
(a) Disconnect the S14 stop lamp switch connector.
(b) Disconnect the E17 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) - STP (E17-23)	Below 1 Ω
Stop lamp switch (S14-4) - ST1- (E17-26)	

Standard (Check for short):

Tester Connection	Specified Condition
Stop lamp switch (S14-1) or STP (E17-23) - Body ground	10 kΩ or higher
Stop lamp switch (S14-4) or ST1- (E17-26) - Body ground	



(d) Reconnect the ECM connector.
(e) Reconnect the stop lamp switch connector.

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

OK

REPLACE ECM(See page 10-8)

DTC	P0560	SYSTEM VOLTAGE

CIRCUIT DESCRIPTION

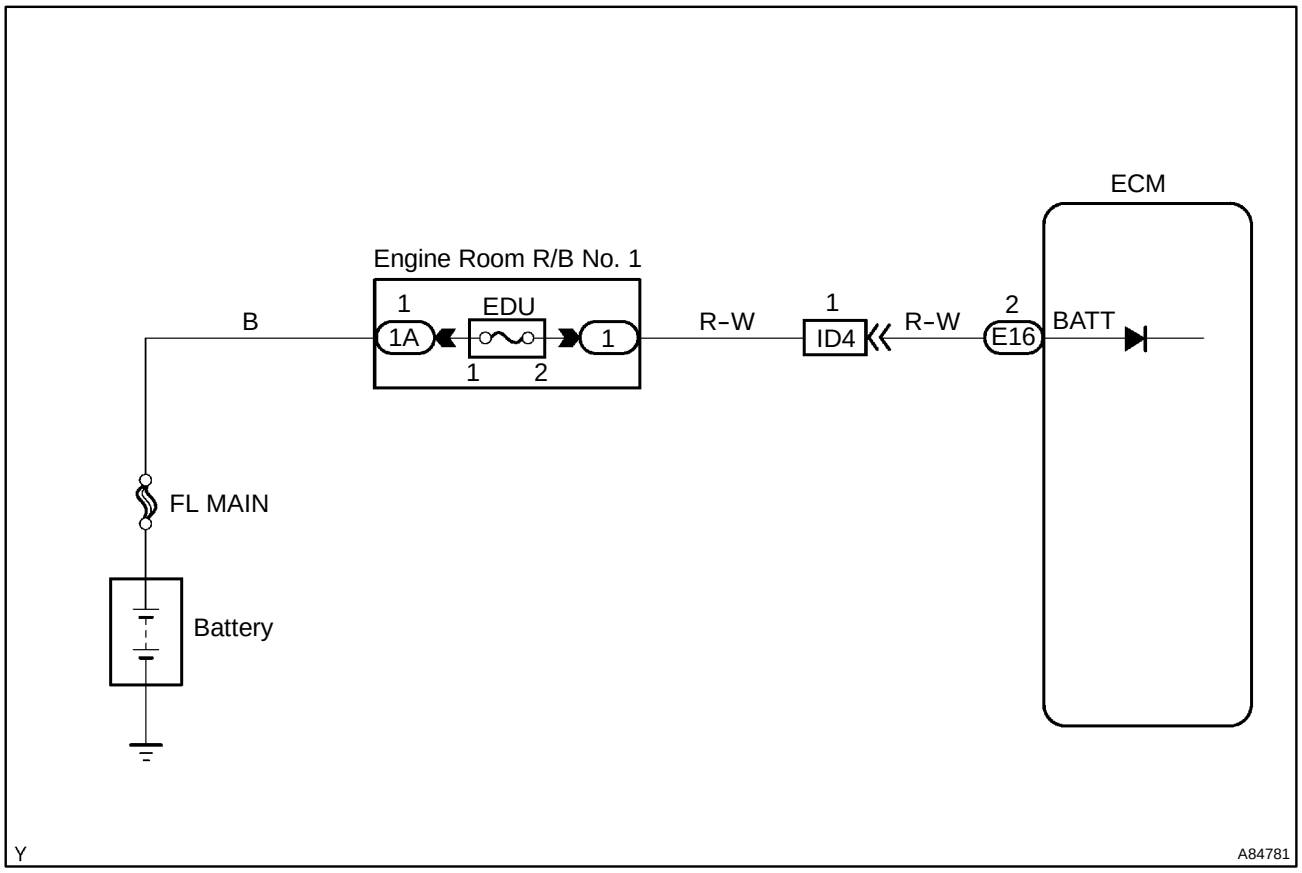
While the ignition switch is OFF, the battery positive voltage is supplied to terminal BATT of the ECM for the DTCs memory and fuel injection feedback learning values.

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in back-up power source circuit (1 trip detection logic)	• Open in back-up power source circuit • ECM

HINT:

If DTC P0560 appears, the ECM does not store other DTCs.

WIRING DIAGRAM

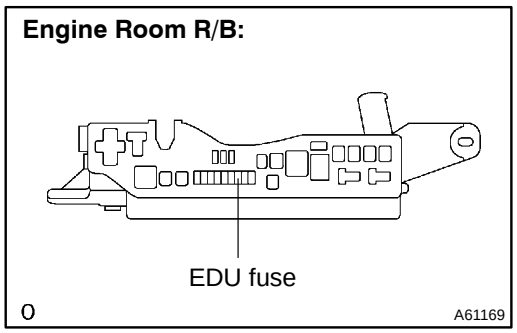


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT FUSE(EDU FUSE)

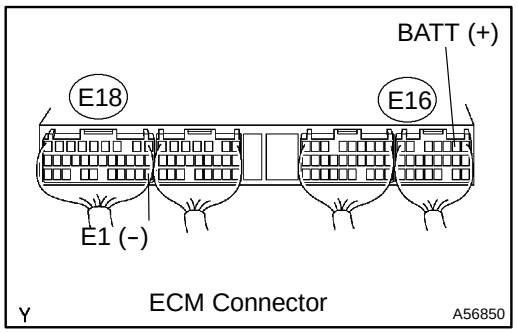


(a) Remove the EDU fuse from the engine room R/B.
(b) Check for continuity in the EDU fuse.
Standard: Continuity
(c) Reinstall the EDU fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

2 INSPECT ECM(BATT VOLTAGE)



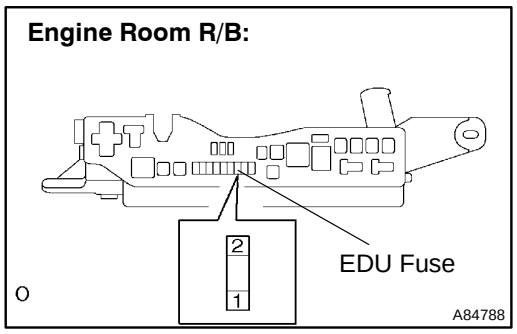
(a) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

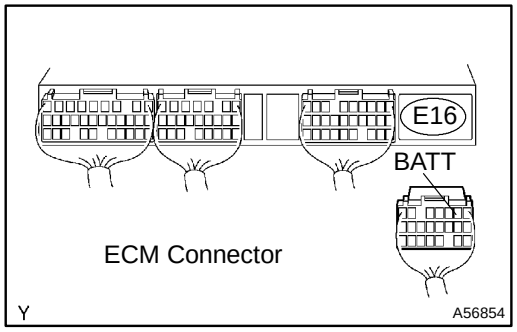
Tester Connection	Specified Condition
BATT (E16-2) - E1 (E18-22)	9 to 14 V

OK → **REPLACE ECM (See page 10-8)**

NG

3	CHECK HARNESS AND CONNECTOR(EDU FUSE - ECM, AND EDU FUSE - BATTERY)





(a) Check the harness and connector between the EDU fuse and ECM.
(1) Remove the EDU fuse from the engine room R/B.
(2) Disconnect the E16 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EDU fuse (2) - BATT (E16-2)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EDU fuse (2) or BATT (E16-2) - Body ground	10 kΩ or higher

(4) Reinstall the EDU fuse.
(5) Reconnect the ECM connector.

(b) Check the harness and connector between the EDU fuse and battery.
(1) Remove the EDU fuse from the engine room R/B.
(2) Disconnect the battery positive terminal.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Battery positive terminal - EDU fuse (1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Battery positive terminal or EDU fuse (1) - Body ground	10 kΩ or higher

(4) Reinstall the EDU fuse.
(5) Reconnect the battery positive terminal.

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

OK

REPLACE JUNCTION BLOCK

DTC	P0606	ECM/PCM PROCESSOR

DTC	P1611	INTERIOR IC MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
P0606	ECM internal error (1 trip detection logic)	ECM
P1611		

INSPECTION PROCEDURE

HINT:

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

REPLACE ECM (See page 10-8)

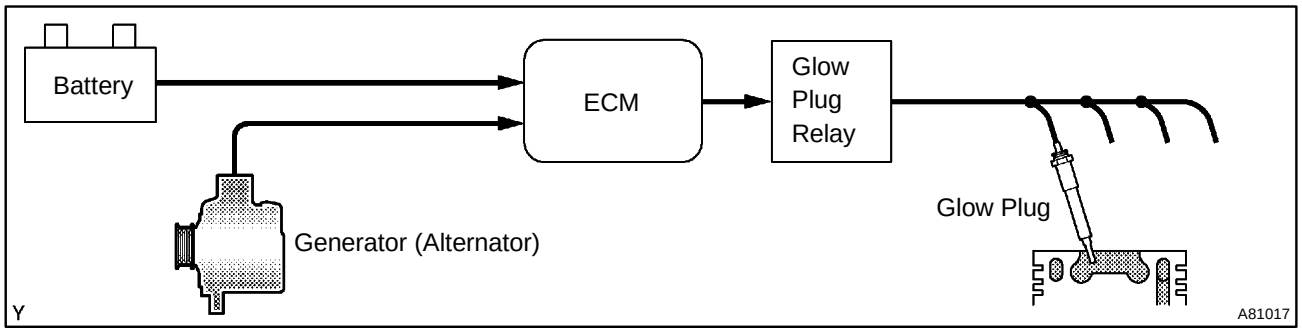
DTC P0622 GENERATOR FIELD "F" TERMINAL CIRCUIT

CIRCUIT DESCRIPTION

While the generator (alternator) is generating the current, the duty signal is sent from terminal M of the alternator to the ECM terminal ALT. This duty signal is used for detecting an open malfunction of the alternator circuit and DTC P0380.

HINT:

DTC P0380 is prepared for indicating an open or short malfunction in the glow plug circuit. If this DTC is detected, inspect the glow plug circuit. (See Page 05-292)



DTC No.	DTC Detection Condition	Trouble Area
P0622	No duty signal from terminal M of the generator (alternator) at the engine running (1 trip detection logic)	$ Open in generator (alternator) circuit $ Generator (alternator) $ Drive belt $ ECM

MONITOR DESCRIPTION

The ECM will detect a generator (alternator) failure or an open malfunction of the circuit, if the duty signal is not output from terminal M of the generator (alternator) despite running the engine.

MONITOR STRATEGY

Required sensors	Generator circuit
Frequency of operation	Continuous
Duration	10 seconds
CHK ENG operation	1 driving cycle

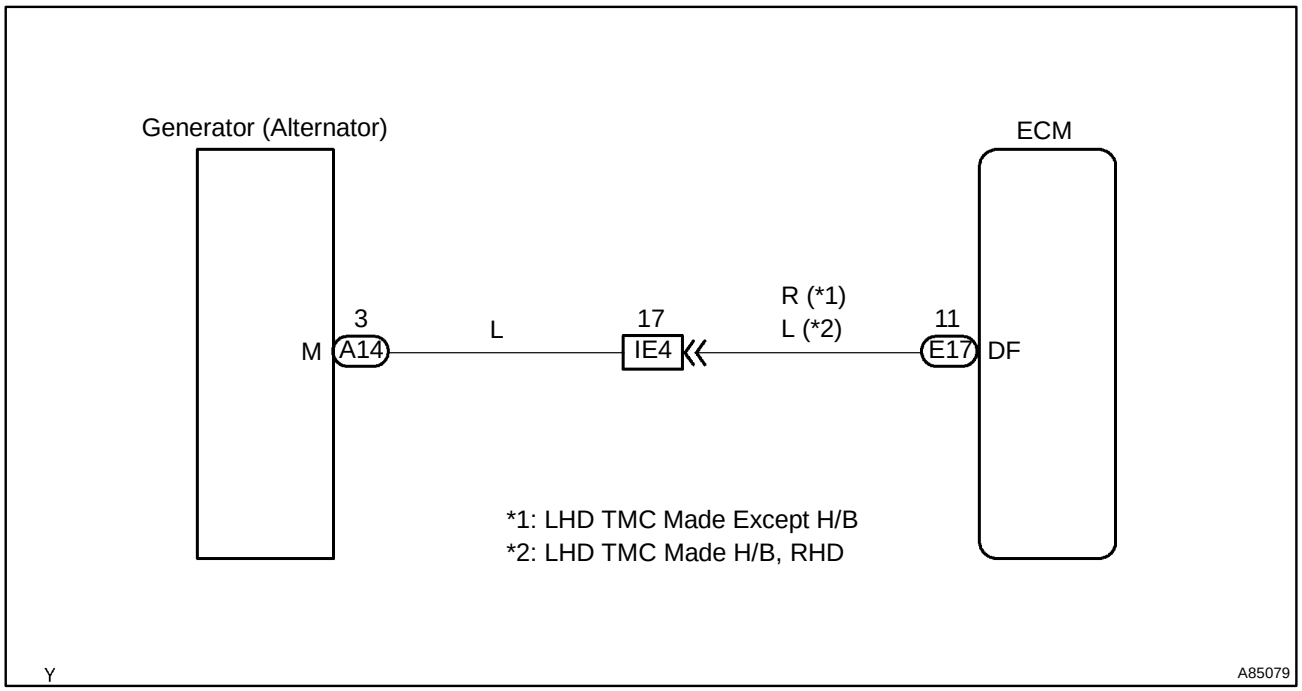
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Battery voltage	11 V	-
Engine speed	700 rpm	2,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Threshold
There is no signal output from terminal M of the generator (alternator)

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 be open.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK IF CHARGE LAMP IS ILLUMINATED

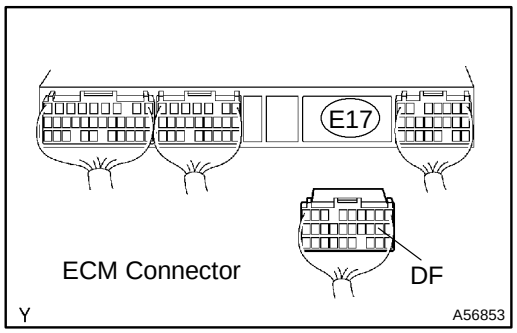
HINT:

Run the engine at 2,000 rpm, and check if the charge lamp located in the combination meter remains illuminated.

YES → Go to step 3

NO

2	CHECK HARNESS AND CONNECTOR(GENERATOR - ECM)



(a) Disconnect the E17 ECM connector.
(b) Disconnect the A14 generator (alternator) connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

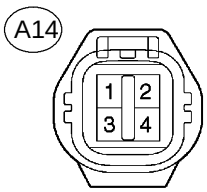
Tester Connection	Specified Condition
DF (E17-11) - M (A14-3)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
DF (E17-11) or M (A14-3) - Body ground	10 kΩ or higher

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

Wire Harness Side:



Generator Connector

Y A81490

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

OK

3	INSPECT DRIVE BELT (See page 14-169 of Pub. No. RM925E COROLLA)

NG → **REPAIR OR REPLACE DRIVE BELT (See page 14-172 of Pub. No. RM925E COROLLA)**

OK

4	INSPECT CHARGING SYSTEM (See page 19-27 of Pub. No. RM925E COROLLA)

GO

CHECK IF DTC OUTPUT RECURS (DTC P0622 OUTPUT AGAIN)

HINT:
After clearing the DTC, start the engine and let it idle for 10 seconds or more, and then confirm that P0622 is not present again.

DTC	P0627	FUEL PUMP CONTROL CIRCUIT / OPEN

HINT:
For more information on the supply pump (suction control valve) and the common rail system, see page 05-207.

CIRCUIT DESCRIPTION

Refer to the description on page 05-207.

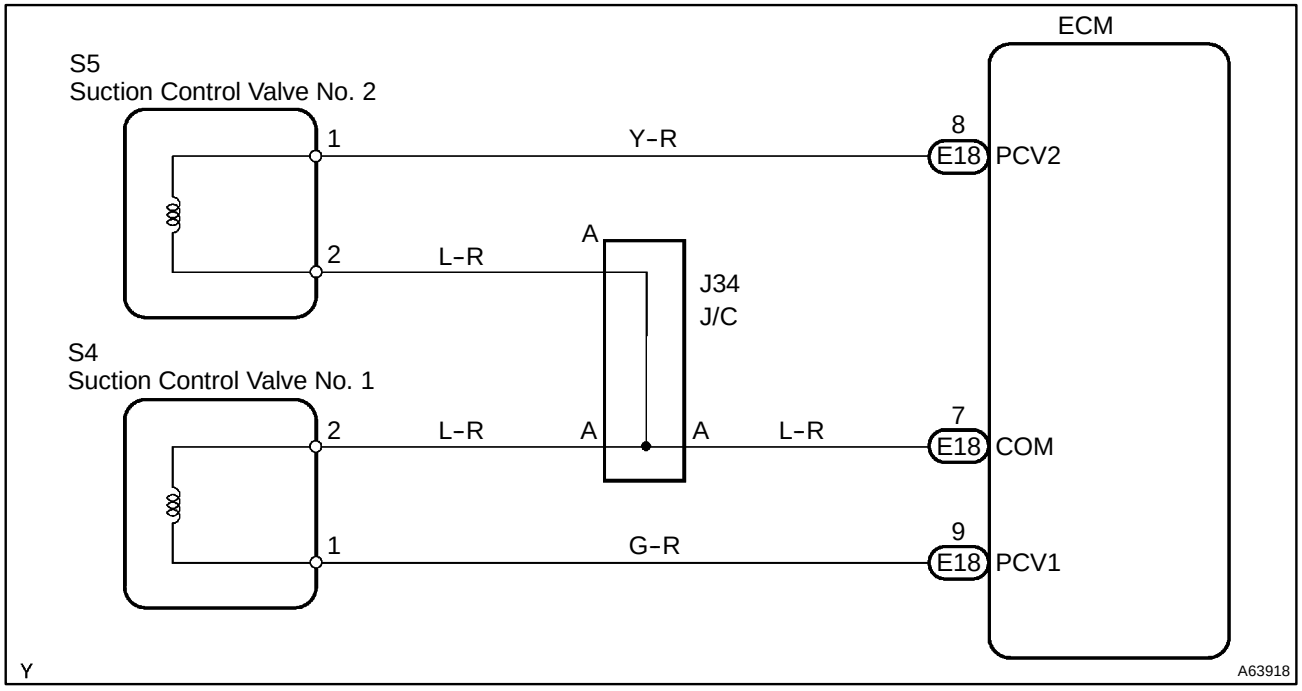
DTC No.	DTC Detection Condition	Trouble Area
P0627	Open or short in suction control valve circuit for more than 0.5 second (1 trip detection logic)	$ Short in supply pump (Suction control valve) circuit $ Supply pump (Suction control valve) $ Supply pump (Suction control valve stuck closed) $ ECM

HINT:
After confirming DTC P0627, check the internal fuel pressure of the common rail in "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / COMN RAIL PRESS" using hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

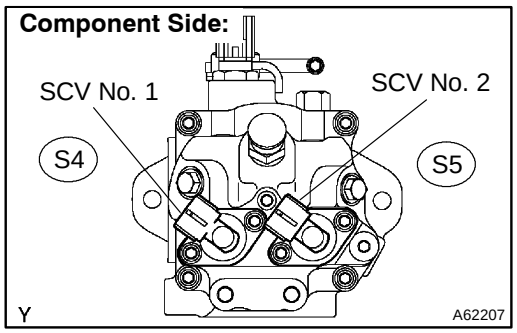
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT INJECTION OR SUPPLY PUMP ASSY(SUCTION CONTROL VALVE)

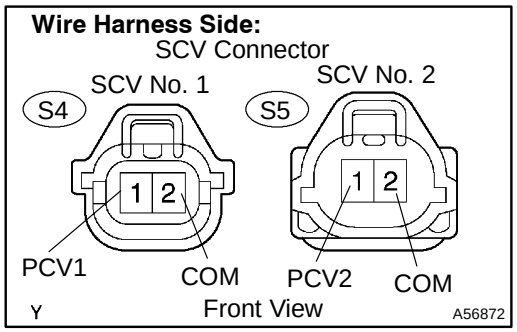


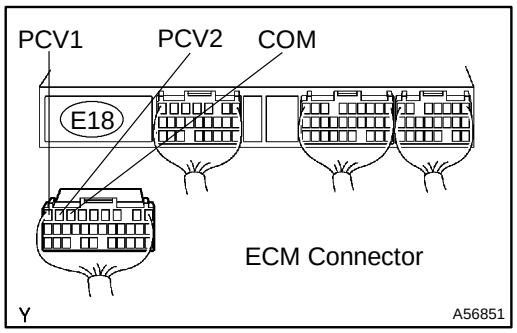
(a) Disconnect the S4 and S5 suction control valve connector.
(b) Measure the resistance between the terminals of the suction control valve No. 1 and suction control valve No. 2.
Standard: 1.5 to 1.7 Ω at 20_C (68_F)
(c) Reconnect the suction control valve connectors.

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-74 of Pub. No. RM925E COROLLA)**

OK

2 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE - ECM)





(a) Disconnect the S4 and S5 suction control valve connectors.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCV1 (S4-1) - PCV1 (E18-9)	Below 1 Ω
PCV2 (S5-1) - PCV2 (E18-8)	
COM (S4-2) - COM (E18-7)	
COM (S5-2) - COM (E18-7)	

Standard (Check for short):

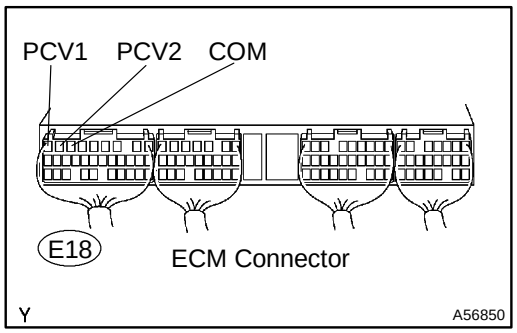
Tester Connection	Specified Condition
PCV1 (S4-1) or PCV1 (E18-9) - Body ground	10 kΩ or higher
PCV2 (S5-1) or PCV2 (E18-8) - Body ground	
COM (S4-2) or COM (E18-7) - Body ground	
COM (S5-2) or COM (E18-7) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the suction control valve connectors.

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

OK

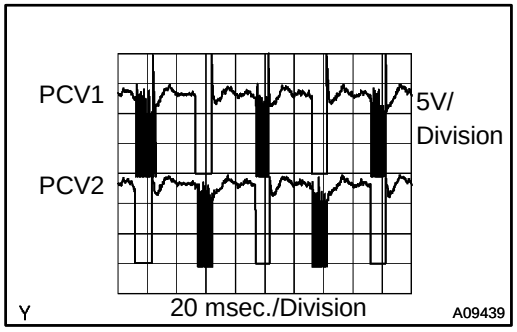
3 INSPECT ECM(PCV VOLTAGE)



(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard :

Tester Connection	Specified Condition
PCV1 (S4-1) - COM (E18-7)	Correct waveform is as shown
PCV2 (S5-1) - COM (E18-7)	



NG → **REPLACE ECM (See page 10-8)**

OK

4 READ OUTPUT DTC(DTC P0627 OUTPUT AGAIN)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD /DTC INFO / CLEAR CODES".
(d) Clear the DTCs.
(e) Drive the vehicle at 70 km/h (43 mph) for 40 seconds or more.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
P0627	A
No output	B

B → **CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)**

A

REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-74 of Pub. No. RM925E COROLLA)

DTC	P1229	FUEL PUMP SYSTEM

HINT:

- If DTC P1229 is detected, P0093 (Fuel leaks in high-pressurized area) may be detected simultaneously. Because of the extremely high internal fuel pressure in the common rail opens the pressure limiter, and the ECM may interpret this as a fault and set P0093.
- For more information on the supply pump (suction control valve) and the common rail system, see page 05-207.
- If P1229 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-207.

CIRCUIT DESCRIPTION

Refer to the system description on page 05-207.

DTC No.	DTC Detection Condition	Trouble Area
P1229	• Fuel over-feed • Internal fuel pressure is beyond the target fuel pressure despite the ECM closing the suction control valve. (1 trip detection logic)	• Short in supply pump (Suction control valve) circuit • Supply pump (Suction control valve) • ECM

HINT:

After confirming DTC P1229, check the internal fuel rail pressure of the common rail in "DIAGNOSIS / OBD/ MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

MONITOR DESCRIPTION

P1229 (Fuel over-feed):

The ECM will set this DTC if the actual fuel pressure inside the common rail stays higher than the target fuel pressure. This DTC represents a possiblity that the suction control valve is stuck open, or there is short in its circuit.

If this DTC is present, the ECM enters the fail-safe mode and limits the engine power. The fail-safe mode continues until the ignition switch is turned OFF.

MONITOR STRATEGY

Required sensors	Fuel pressure sensor
Frequency of operation	Continuous
Duration	1 minute
CHK ENG operation	1 driving cycle

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine speed	600 rpm	-
The monitor will not run if the fuel pressure sensor is malfunctioning		

TYPICAL MALFUNCTION THRESHOLDS

Threshold
Internal fuel pressure of the common rail stays higher than the target fuel pressure

WIRING DIAGRAM

Refer to DTC P0627 on page 05-328.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITON TO DTC P1229)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

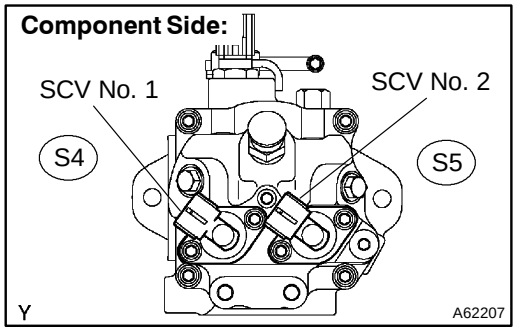
Result:

Display (DTC output)	Proceed to
P1229	A
P1229 and other DTCs	B

B → **GO TO RELEVANT DTC CHART (See page 05-233)**

A

2	INSPECT INJECTION OR SUPPLY PUMP ASSY(SUCTION CONTROL VALVE)

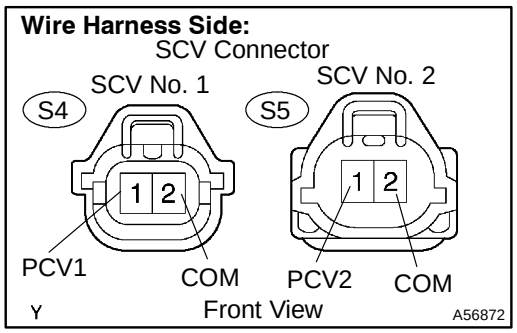


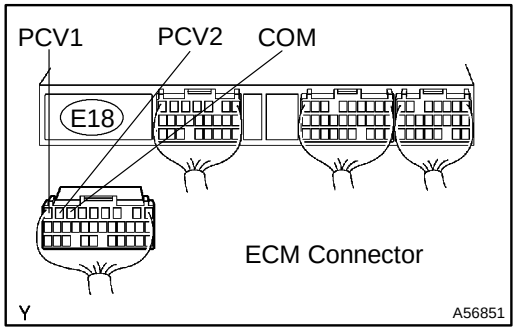
(a) Disconnect the S4 and S5 suction control valve connectors.
(b) Measure the resistance between the terminals of the suction control valve No. 1 and suction control valve No. 2.
Standard: 1.5 to 1.7 Ω at 20_C (68_F)
(c) Reconnect the suction control valve connectors.

NG → **REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE) (See page 11-74 of Pub. No. RM925E COROLLA)**

OK

3 CHECK HARNESS AND CONNECTOR(SUCTION CONTROL VALVE - ECM)





(a) Disconnect the S4 and S5 suction control valve connectors.
(b) Disconnect the E18 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCV1 (S4-1) - PCV1 (E18-9)	Below 1 Ω
PCV2 (S5-1) - PCV2 (E18-8)	
COM (S4-2) - COM (E18-7)	
COM (S5-2) - COM (E18-7)	

Standard (Check for short):

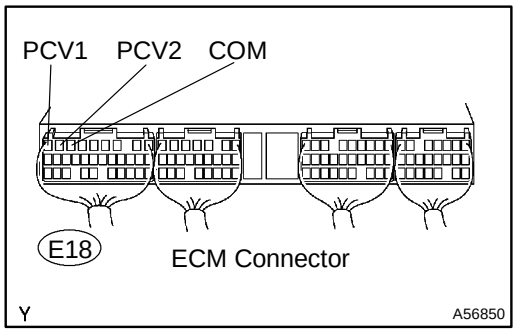
Tester Connection	Specified Condition
PCV1 (S4-1) or PCV1 (E18-9) - Body ground	10 kΩ or higher
PCV2 (S5-1) or PCV2 (E18-8) - Body ground	
COM (S4-2) or COM (E18-7) - Body ground	
COM (S5-2) or COM (E18-7) - Body ground	

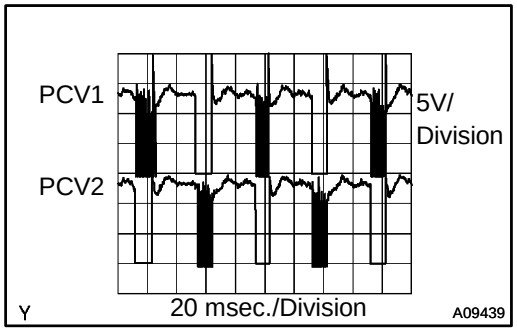
(d) Reconnect the ECM connector.
(e) Reconnect the suction control valve connectors.

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

OK

4 INSPECT ECM(PCV VOLTAGE)





(a) Inspect using the oscilloscope.
(b) During cranking or idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard :

Tester Connection	Specified Condition
PCV1 (S4-1) - COM (E18-7)	Correct waveform is as shown
PCV2 (S5-1) - COM (E18-7)	

NG → REPLACE ECM (See page 10-8)

OK

5	READ OUTPUT DTC (DTC P1229 OUTPUT AGAIN)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD /DTC INFO / CLEAR CODES".
(d) Clear the DTCs.
(e) Drive the vehicle at 50 km/h (31 mph) for 5 minutes.
(f) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(g) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
P1229	A
No output	B

B → CHECK FOR INTERMITTENT PROBLEMS (See page 05-328)

A

6	REPLACE INJECTION OR SUPPLY PUMP ASSY (SUCTION CONTROL VALVE)

GO

CHECK IF DTC OUTPUT RECURS (DTC P1229 OUTPUT AGAIN)

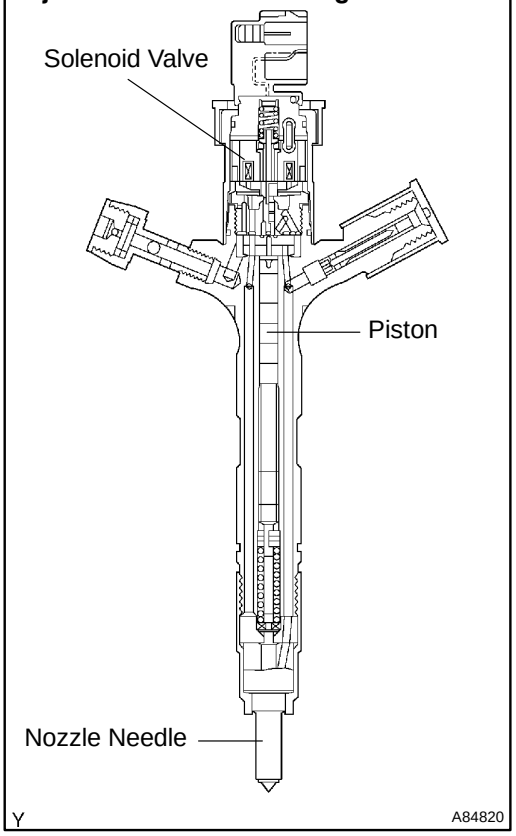
HINT:
After clearing the DTC, drive the vehicle at 50 km/h (31 mph) for 5 minutes, and then confirm that P1229 is not present again.

DTC P1238 INJECTOR MALFUNCTION

HINT:

- For more information on the injector and the common rail system, see page 05-207.
- If P1238 is present, refer to the diagnostic trouble codes (DTCs) table for fuel system on page 05-207.

Injector Cross Section Diagram:



CIRCUIT DESCRIPTION

The ECM detects combustion deterioration for a specific cylinder.

HINT:

- The cylinder, which has the compensation value for INJ VOL that varies from other cylinders, may be malfunctioning.
- If DTC P0093 (Fuel leaks in high-pressurized area) is present simultaneously, leakage malfunction of the cylinder probably be occurred.
- If DTC P0200 (Open or short in EDU or injector circuit) is present simultaneously, there probably be faulty circuit located between the ECM and the injector including the EDU.
- If only DTC P1238 (Injector malfunction) is present, probably injector mechanical malfunction or insufficient compression (valve clearance, etc) has occurred, not an open or short malfunction of the ECM, EDU and injector circuit.

DTC No.	DTC Detection Condition	Main Trouble Area	Related Trouble Area
P1238	Engine speed fluctuation is large when idling (2 trip detection logic)	- Injector - EDU (P0200 is set simultaneously) - Open or short in engine wire harness (P0200 is set simultaneously) - Connector connection (P0200 is set simultaneously) - Compression pressure - Valve clearance	- Valve timing - ECM

HINT:

After confirming DTC P1238, check the internal fuel pressure in "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" using the hand-held tester.

Reference:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

MONITOR DESCRIPTION

P1238 (Injection malfunction, exclude open or short in injector circuit):

This DTC will be set if the engine speed fluctuation between each cylinder is large. The ECM monitors changes in the crankshaft rotation speed using the crankshaft position sensor for detecting poor combustion. Also, it identifies a faulty cylinder using the camshaft position sensor. The fluctuation counter increments when irregular crankshaft rotation speed variation exceeds the threshold at idling. Therefore, either one of the cylinders has very poor combustion (Rough idle), the ECM sets this DTC.

MONITOR STRATEGY

Required sensors	Crankshaft position sensor
Frequency of operation	Continuous
Duration	10 minutes
CHK ENG operation	2 driving cycles

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
Engine	Idling	
Engine speed	500 rpm	-
Engine coolant temperature	20_C (68_F)	

TYPICAL MALFUNCTION THRESHOLDS

Threshold
The number of irregular changes in the crankshaft rotation speed

HINT:

The number of irregular changes in the crankshaft rotation speed indicates the insufficient combustion.

WIRING DIAGRAM

Refer to DTC P0200 on page 05-277.

INSPECTION PROCEDURE

HINT:

- If DTCs other than P1238 are present simultaneously, first perform the troubleshooting for them.
- Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	CHECK OTHER DTC OUTPUT(IN ADDITION TO DTC P1238)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC output)	Proceed to
P1238	A
P1238 and other DTCs	B

HINT:

If any other codes besides P1238 are output, perform the troubleshooting for those DTCs first.

B → GO TO RELEVANT DTC CHART (See page 05-233)

A

2	CHECK WIRE HARNESS AND CONNECTOR IN ENGINE ROOM

HINT:
Check the wire harness and connector connections.

NG → REPAIR OR REPLACE

OK

3	READ VALUE OF HAND-HELD TESTER(COMPENSATION OF INJECTION QUANTITY BETWEEN CYLINDERS FOR IDENTIFYING MALFUNCTION CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME FB #1, #2, #3 and #4" and read its value displayed on the hand-held tester.
Result:

Result	Compensatory Injection Volume (mm^3)
Standard	-3 to 3
Maximum	-4.9 to 4.9

(d) Cylinders that have a compensation value which is outside of the specification range are considered to be faulty cylinders. Use the following step to inspect and repair the cylinder.
Result:

Result	Proceed to
Faulty cylinder can not identified	A
Faulty cylinder can be identified	B

B → Go to step 5

A

4	PERFORM ACTIVE TEST USING HAND-HELD TESTER(INJECTION CUT FOR IDENTIFYING MALFUNCTION CYLINDER)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine.
(c) Push the hand-held tester main switch ON.
(d) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1, #2, #3 and #4".
(e) Check the four cylinders in sequence to identify a faulty cylinder by performing the power-balance inspection.

HINT:
If the engine idling becomes normal despite cutting off the fuel injection, the cylinder is malfunctioning.

GO

5	CHECK CYLINDER COMPRESSION PRESSURE OF MALFUNCTION CYLINDER (See page 14-169 of Pub. No. RM925E COROLLA)

NG → REPAIR OR REPLACE

OK

6	CHECK VALVE CLEARANCE OF MALFUNCTION CYLINDER (See page 14-173 of Pub. No. RM925E COROLLA)

NG → ADJUST VALVE CLEARANCE (See page 14-173 of Pub. No. RM925E COROLLA)

OK

7	CHECK IF DTC OUTPUT RECURS (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warm-up, and confirm that P1238 is not present again.

OK → CHECK FOR INTERMITTENT PROBLEMS (See page 05-237)

NG

8	REPLACE INJECTOR ASSY (See page 11-64 of Pub. No. RM925E COROLLA)

GO

CHECK IF DTC OUTPUT RECURS (DTC P1238 OUTPUT AGAIN)

HINT:
After clearing the DTC, let the engine idle for 10 minutes after warm-up, and confirm that P1238 is not present again.

DTC P1670 CORRECTION RESISTANCE MALFUNCTION

CIRCUIT DESCRIPTION

The correction system is correcting a small unevenness of characteristic fuel injecting behavior between each injectors.

DTC No.	DTC Detection Condition	Trouble Area
P1670	Open or short in injector circuit (2 trip detection logic)	$ Injector correction resistance circuit $ Injector correction resistance (built into injector) $ ECM

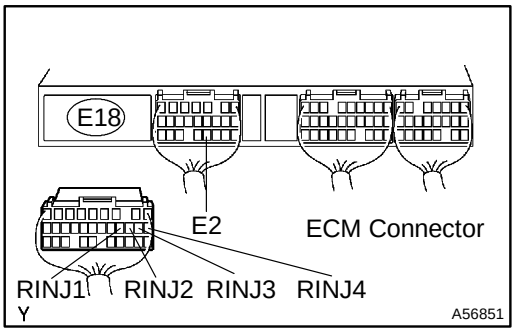
WIRING DIAGRAM

Refer to DTC P0200 on page 05-277.

INSPECTION PROCEDURE

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 INSPECT ECM



(a) Disconnect the ECM E18 connector.
(b) Measure the resistance between the terminals of the ECM connector.
Standard:

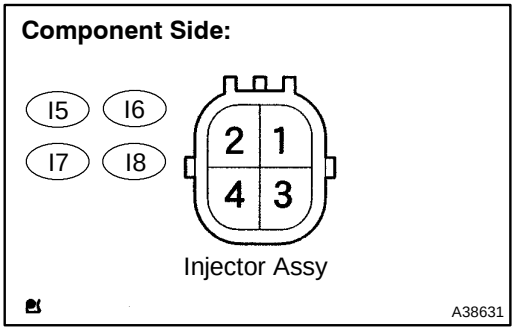
Tester Connection	Specified Condition
RINJ1 (E18-13) - E2 (E19-20)	30 to 9,600Ω at 20_C (68_F)
RINJ2 (E18-12) - E2 (E19-20)	
RINJ3 (E18-11) - E2 (E19-20)	
RINJ4 (E18-10) - E2 (E19-20)	

(c) Reconnect the ECM connector.

OK → **REPLACE ECM (See page 10-8)**

NG

2 INSPECT INJECTOR ASSY



(a) Disconnect the I5, I6, I7 and I8 injector connector.
(b) Measure the resistance between terminals of the injector.
Standard:

Tester Connection	Specified Condition
3 - 4	30 to 9,600 Ω at 20_C (68_F)

(c) Reconnect the injector connectors.

NG → **REPLACE INJECTOR ASSY (See page 11-64 of Pub. No. RM925E COROLLA)**

OK

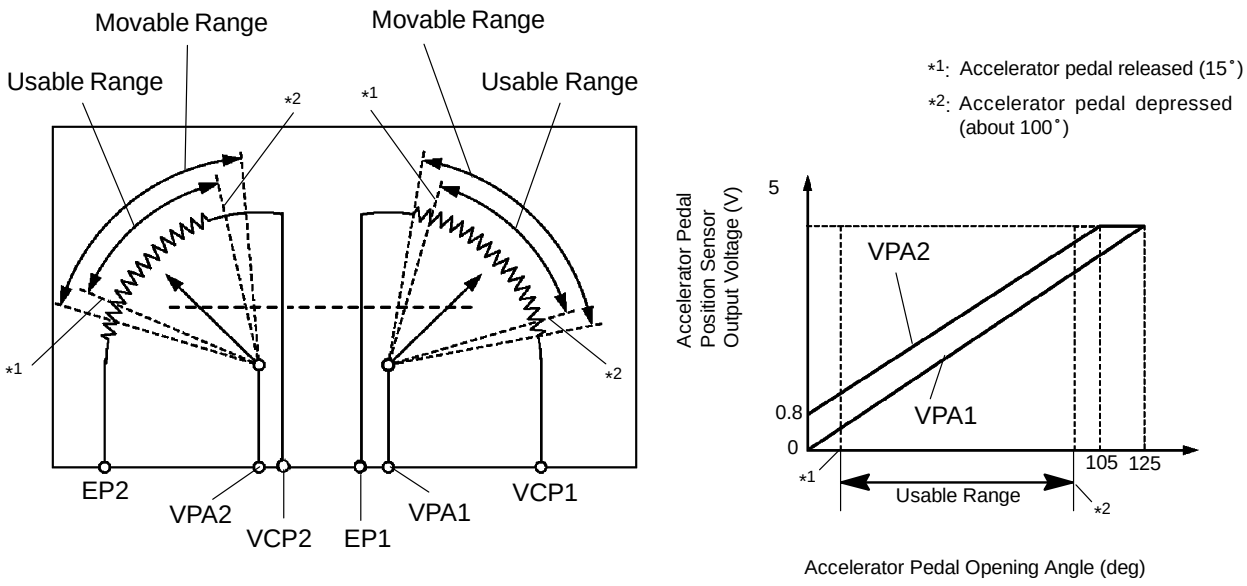
REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P2120	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT

HINT:
This is the procedure of the accelerator pedal position sensor.

CIRCUIT DESCRIPTION

HINT:
This electrical throttle system does not use a throttle cable.
The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has the 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.
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 the engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction.
The ECM judges the current accelerator pedal opening angle with the signals from pedal terminals VPA1 and VPA2, and the ECM controls the throttle motor based on these signals.



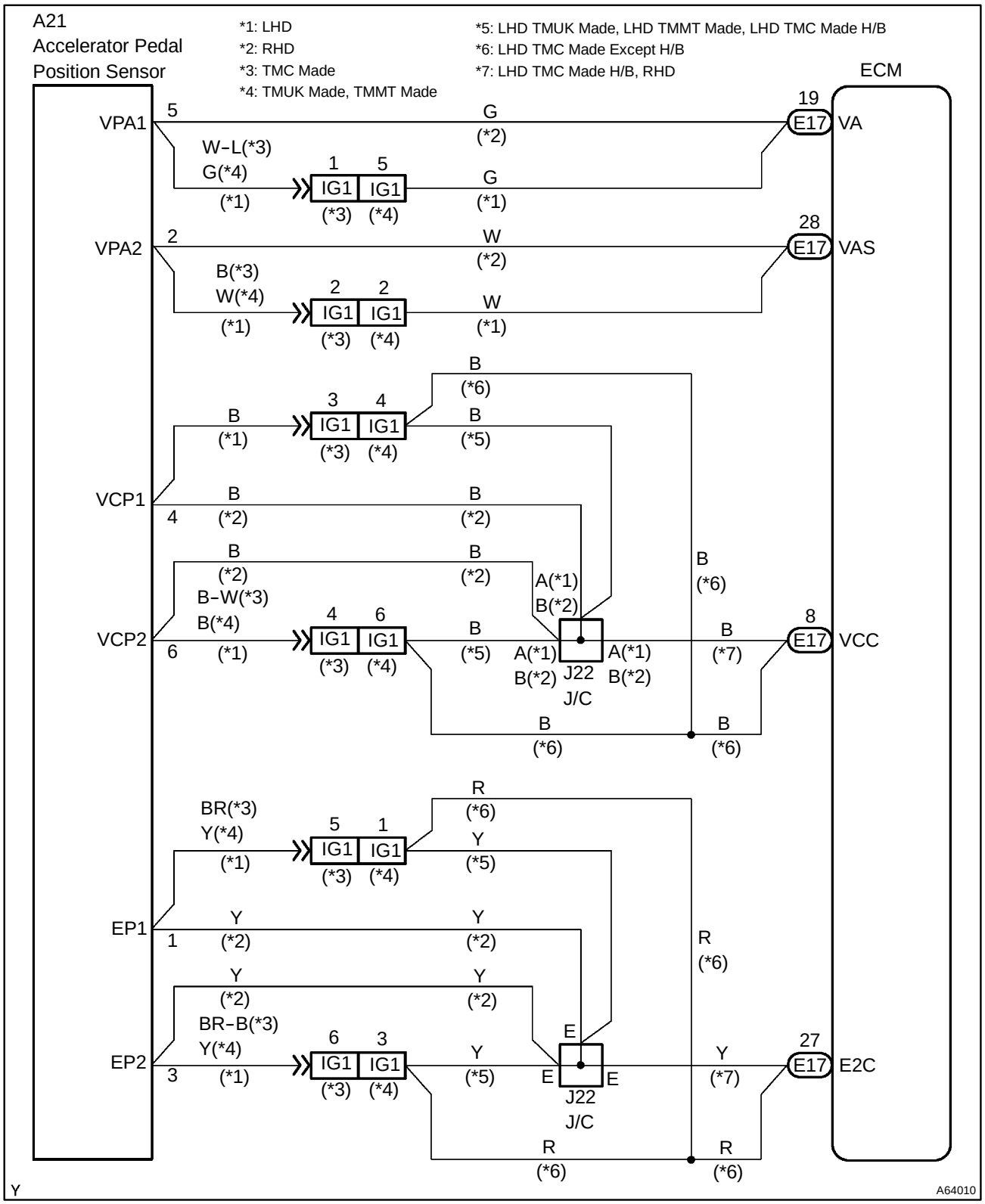
DTC No.	DTC Detecting Condition	Trouble Area
P2120	Condition (a), (b), (c) or (d) continues for 2 seconds or more: (1 trip detection logic) (a) VPA1 is greater than 4.8 V (b) VPA2 is greater than 4.8 V, and VPA1 is between 0.2 V and 3.45 V (c) Difference between VPA1 and VPA2 is less than 0.02 V (d) VPA1 is less than 0.2 V, and VPA2 is less than 0.5 V	$ Open or short in accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM
	Conditions (a) or (b) continue for 0.5 second or more: (1 trip detection logic) (a) VPA1 is less than 0.2 V (b) VPA2 is less than 0.5 V	

HINT:
After confirming DTC P2120, check the accelerator pedal position sensor's output voltage using the hand-held tester.

Reference:

Trouble Area	Accelerator Pedal Position (Voltage Output)			
	Accelerator Pedal Released		Accelerator Pedal Depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 5.3 V
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA1 circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EP circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

WIRING DIAGRAM

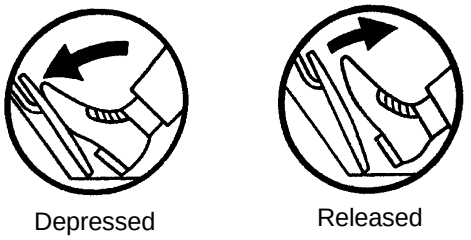


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand-held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1	READ VALUE OF HAND-HELD TESTER(ACCEL POS #1 AND ACCEL POS #2)



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

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

(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2" and read its value displayed on the hand-held tester.

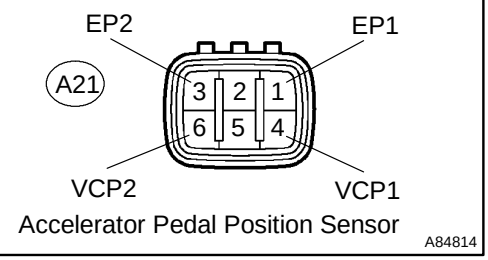
Standard:

Accelerator Pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

2	INSPECT ACCELERATOR PEDAL ASSY(ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Measure the resistance between each terminal.

Standard:

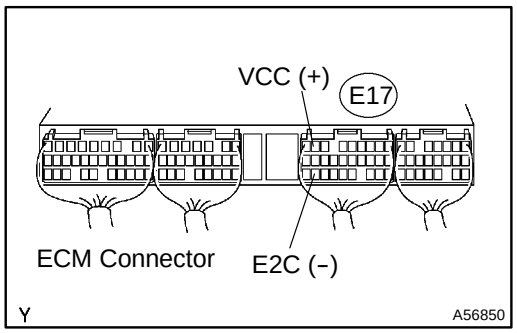
Tester Connection	Resistance
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20_C (68_F)
EP2 (3) - VCP2 (6)	

(c) Reconnect the accelerator pedal position sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

3 INSPECT ECM(VCC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E17 ECM connector.

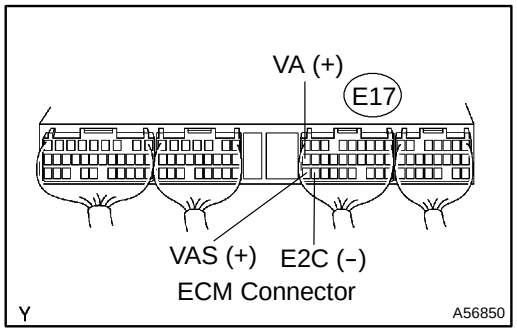
Standard:

Tester Connection	Specified Condition
VCC (E17-8) - E2C (E17-27)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10-8)**

OK

4 INSPECT ECM(VA AND VAS VOLTAGE)



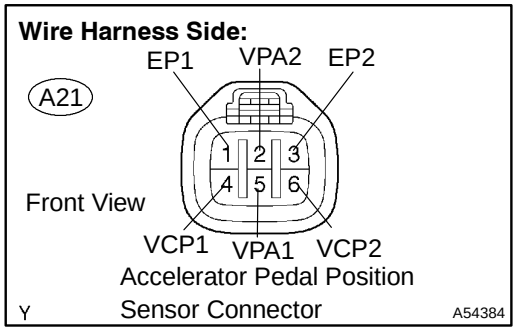
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E17 ECM connector.

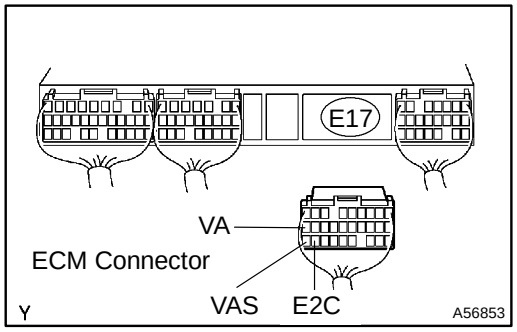
Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VA (E17-19) - E2C (E17-27)	0.5 to 1.1 V
Depressed		2.6 to 4.5 V
Released	VAS (E17-28) - E2C (E17-27)	1.2 to 2.0 V
Depressed		3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

5	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect E17 the ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard:

(Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VA (E17-19)	Below 1 Ω
EP1 (A21-1) - E2C (E17-27)	
VCP1 (A21-4) - VCC (E17-8)	
VPA2 (A21-2) - VAS (E17-28)	
EP2 (A21-3) - E2C (E17-27)	
VCP2 (A21-6) - VCC (E17-8)	

(Check for Short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VA (E17-19) - Body ground	10 kΩ or higher
EP1 (A21-1) or E2C (E17-27) - Body ground	
VCP1 (A21-4) or VCC (E17-8) - Body ground	
VPA2 (A21-2) or VAS (E17-28) - Body ground	
EP2 (A21-3) or E2C (E17-27) - Body ground	
VCP2 (A21-6) or VCC (E17-8) - Body ground	

(d) Reconnect the ECM connector.

(e) Reconnect the accelerator pedal position sensor connector.

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

OK →

REPLACE ECM (See page 10-8)

DTC	P2121	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page 05-340.

DTC No.	DTC Detection Condition	Trouble Area
P2121	Conditions (a) and (B) continue for 0.5 second: (1 trip detection logic) (a) Difference between VPA1 and VPA2 exceeds the threshold (b) IDL is OFF	$ Accelerator pedal position sensor circuit $ Accelerator pedal position sensor $ ECM

HINT:

After confirming DTC P2121, check the accelerator pedal position sensor's output voltage using the hand-held tester.

Reference:

Trouble Area	Accelerator Pedal Position (Voltage Output)			
	Accelerator Pedal Released		Accelerator Pedal Depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 5.3 V
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA1 circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EP circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

WIRING DIAGRAM

Refer to DTC P2120 on page 05-340.

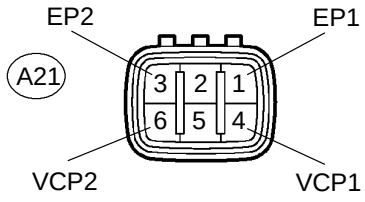
INSPECTION PROCEDURE

HINT:

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

1	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 terminal.

Standard:

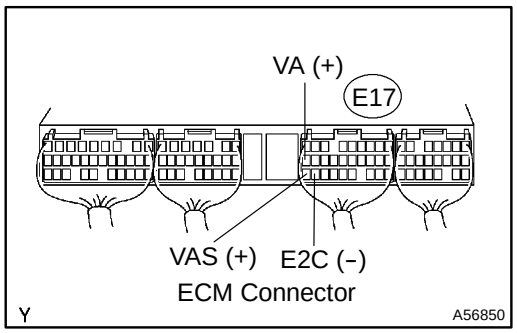
Tester Connection	Resistance
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20_C (68_F)
EP2 (3) - VCP2 (6)	

(c) Reconnect the accelerator pedal position sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)**

OK

2 INSPECT ECM(VA AND VAS VOLTAGE)



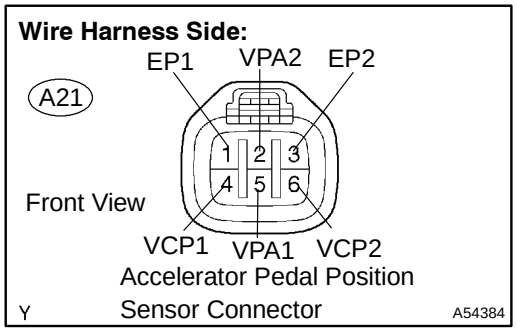
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E17 ECM connector.

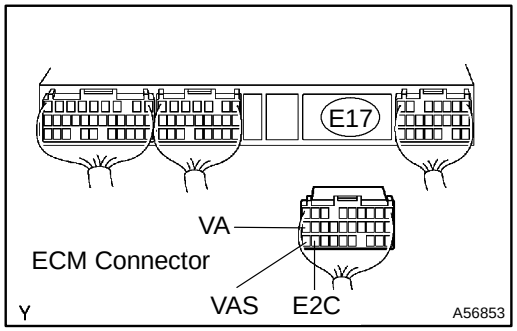
Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VA (E17-19) - E2C (E17-27)	0.5 to 1.1 V
Depressed		2.6 to 4.5 V
Released	VAS (E17-28) - E2C (E17-27)	1.2 to 2.0 V
Depressed		3.4 to 5.3 V

OK → **REPLACE ECM (See page 10-8)**

NG

3 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.
(b) Disconnect E17 the ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard:

(Check for open)

Tester Connection	Specified Condition
VPA1 (A21-5) - VA (E17-19)	Below 1 Ω
EP1 (A21-1) - E2C (E17-27)	
VCP1 (A21-4) - VCC (E17-8)	
VPA2 (A21-2) - VAS (E17-28)	
EP2 (A21-3) - E2C (E17-27)	
VCP2 (A21-6) - VCC (E17-8)	

(Check for Short)

Tester Connection	Specified Condition
VPA1 (A21-5) or VA (E17-19) - Body ground	10 kΩ or higher
EP1 (A21-1) or E2C (E17-27) - Body ground	
VCP1 (A21-4) or VCC (E17-8) - Body ground	
VPA2 (A21-2) or VAS (E17-28) - Body ground	
EP2 (A21-3) or E2C (E17-27) - Body ground	
VCP2 (A21-6) or VCC (E17-8) - Body ground	

(d) Reconnect the ECM connector.
(e) Reconnect the accelerator pedal position sensor connector.

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

OK

REPLACE ACCELERATOR PEDAL ASSY (See page 10-14)

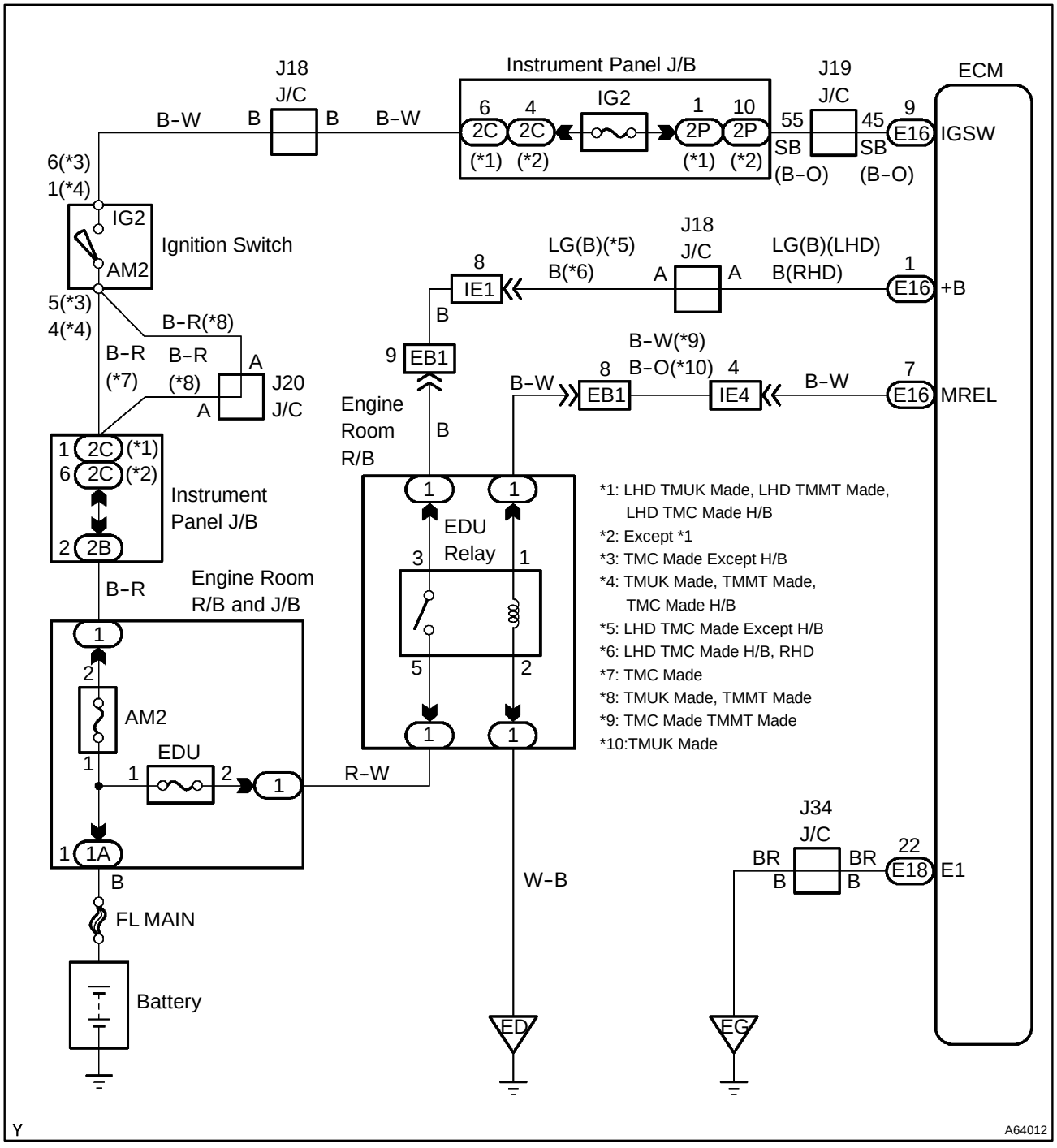
ECM POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to terminal IGSW of the ECM and the EDU relay control circuit in the ECM sends a signal to terminal MREL of the ECM switching on the EDU relay.

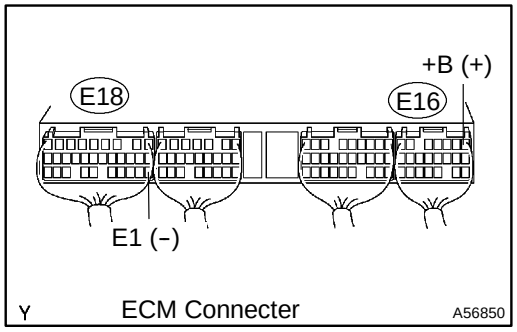
This signal causes current to flow to the coil, closing the contacts of the EDU relay and supplying power to terminal +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ECM(+B VOLTAGE)



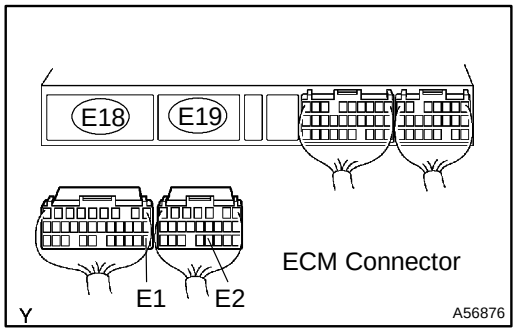
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

Tester Connection	Specified Condition
+B (E16-1) - E1 (E18-22)	9 to 14 V

OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05-238)**

NG

2 CHECK HARNESS AND CONNECTOR(ECM - BODY GROUND)



(a) Disconnect the E18 and E19 ECM connectors.
(b) Check the resistance between the wire harness side connectors.
Standard (Check for open):

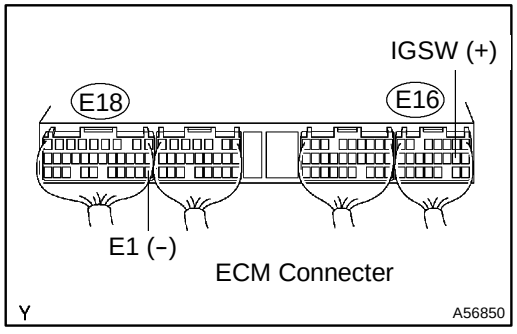
Tester Connection	Specified Condition
E1 (E18-22) - Body ground	Below 1 Ω
E2 (E19-20) - Body ground	Below 1 Ω

(c) Reconnect the ECM connectors.

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

OK

3 INSPECT ECM(IGSW VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

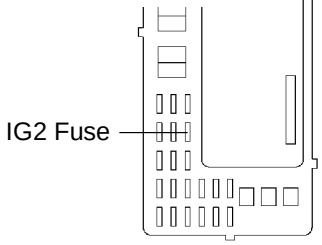
Tester Connection	Specified Condition
IGSW (E16-9) - E1 (E18-22)	9 to 14 V

OK → **Go to step 6**

NG

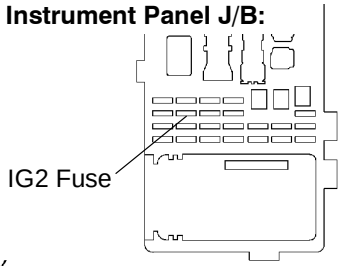
4	INSPECT FUSE(IG2 FUSE)

LHD TMC Made Except H/B, RHD:
Instrument Panel J/B:



(a) Remove the IG2 fuse from the instrument panel J/B.
(b) Check for continuity in the IG2 fuse.
Standard: Continuity
(c) Reinstall the IG2 fuse.

LHD TMC Made H/B, LHD:
Instrument Panel J/B:

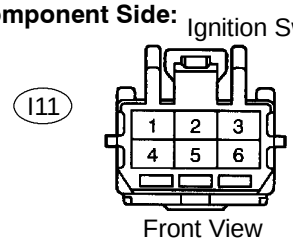


NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

5	INSPECT IGNITION OR STARTER SWITCH ASSY

Component Side:



(a) Disconnect the I11 ignition switch connector.
(b) Check for continuity in the ignition switch.
Standard:

Switch	Tester Connection	Specified Condition
LOCK	All Terminals	No continuity
ACC	1-3	Continuity
ON	1-2, 1-3, 2-3, 5-6	Continuity
START	4-5, 4-6, 5-6, 1-2	Continuity

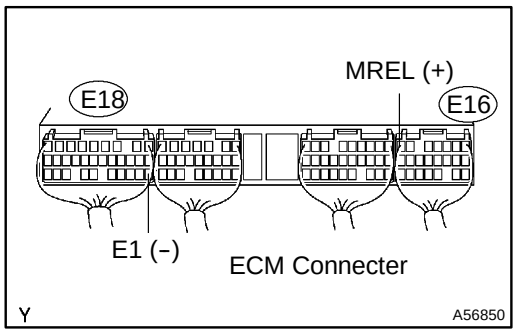
(c) Reconnect the ignition switch connector.

NG → **REPLACE IGNITION OR STARTER SWITCH ASSY**

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (BATTERY - IGNITION SWITCH, IGNITION SWITCH - ECM)

6 INSPECT ECM(MREL VOLTAGE)



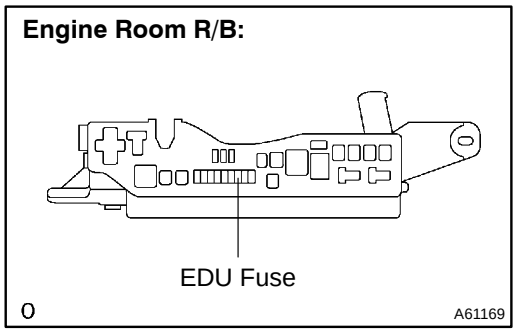
(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E16 and E18 ECM connectors.
Standard:

Tester Connection	Specified Condition
MREL (E16-7) - E1 (E18-22)	9 to 14 V

NG → **REPLACE ECM (See page 10-8)**

OK

7 INSPECT FUSE(EDU FUSE)

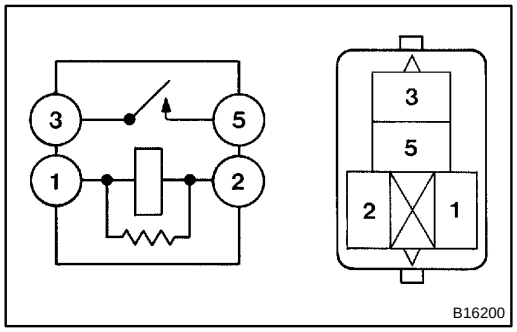


(a) Remove the EDU fuse from the engine room R/B.
(b) Check for continuity in the EDU fuse.
Standard: Continuity
(c) Reinstall the EDU fuse.

NG → **CHECK FOR SHORT IN ALL HARNESSES AND COMPONENTS CONNECTED TO FUSE**

OK

8 INSPECT EDU RELAY



(a) Remove the EDU relay from the engine room R/B.
(b) Check for continuity in the EDU relay.
Standard:

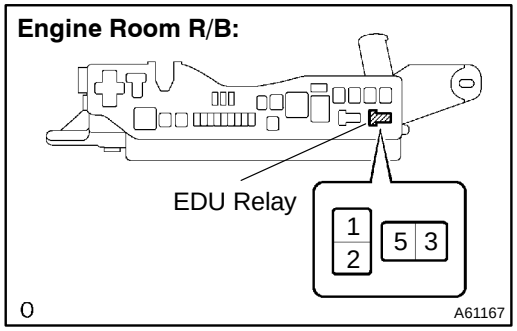
Tester Connection	Specified Condition
1 - 2	Continuity
3 - 5	No Continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

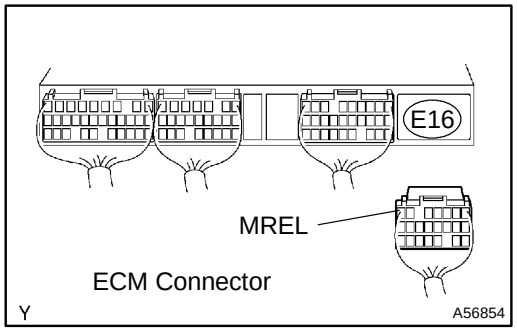
(c) Reinstall the EDU relay.

NG → **REPLACE EDU RELAY**

OK

9	CHECK HARNESS AND CONNECTOR(EDU RELAY - ECM, EDU RELAY - BODY GROUND)





(a) Check the harness and connector between the EDU relay and ECM connector.
(1) Remove the EDU relay from the engine room R/B.
(2) Disconnect the E16 ECM connector.
(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
EDU relay (1) - MREL (E16-7)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
EDU relay (1) or MREL (E16-7) - Body ground	10 kΩ or higher

(b) Reinstall the EDU relay.
(c) Reconnect the ECM connector.
(d) Check the harness and connector between the EDU relay and body ground.
(1) Remove the EDU relay from the engine room R/B.
(2) Check the resistance between the wire harness side connector and body ground.

Standard (Check for open):

Tester Connection	Specified Condition
EDU relay (2) - Body ground	Below 1 Ω

(e) Reinstall the EDU relay.

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

NG

CHECK AND REPAIR HARNESS AND CONNECTOR (TERMINAL +B OF ECM - BATTERY POSITIVE TERMINAL)

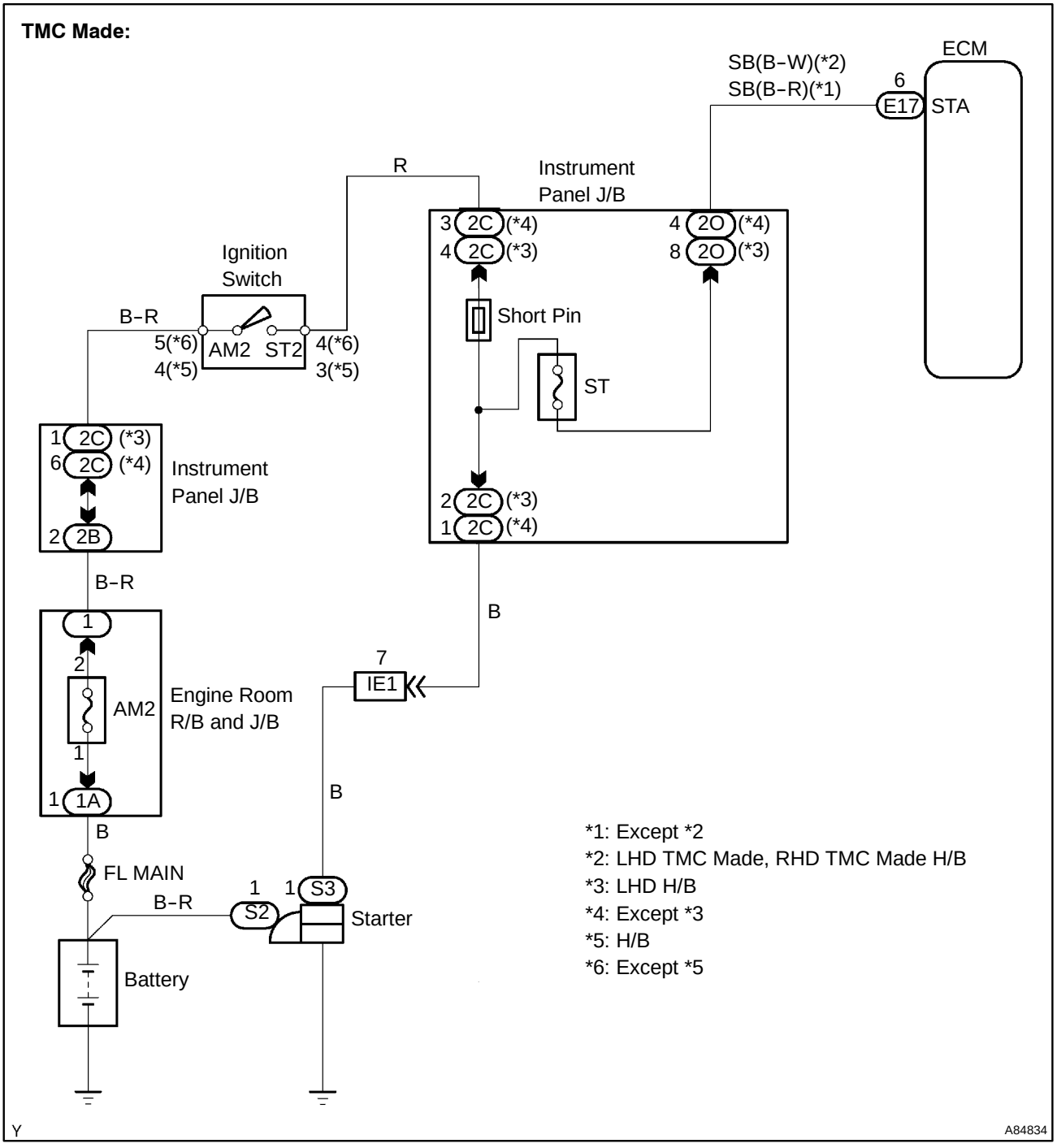
STARTER SIGNAL CIRCUIT

CIRCUIT DESCRIPTION

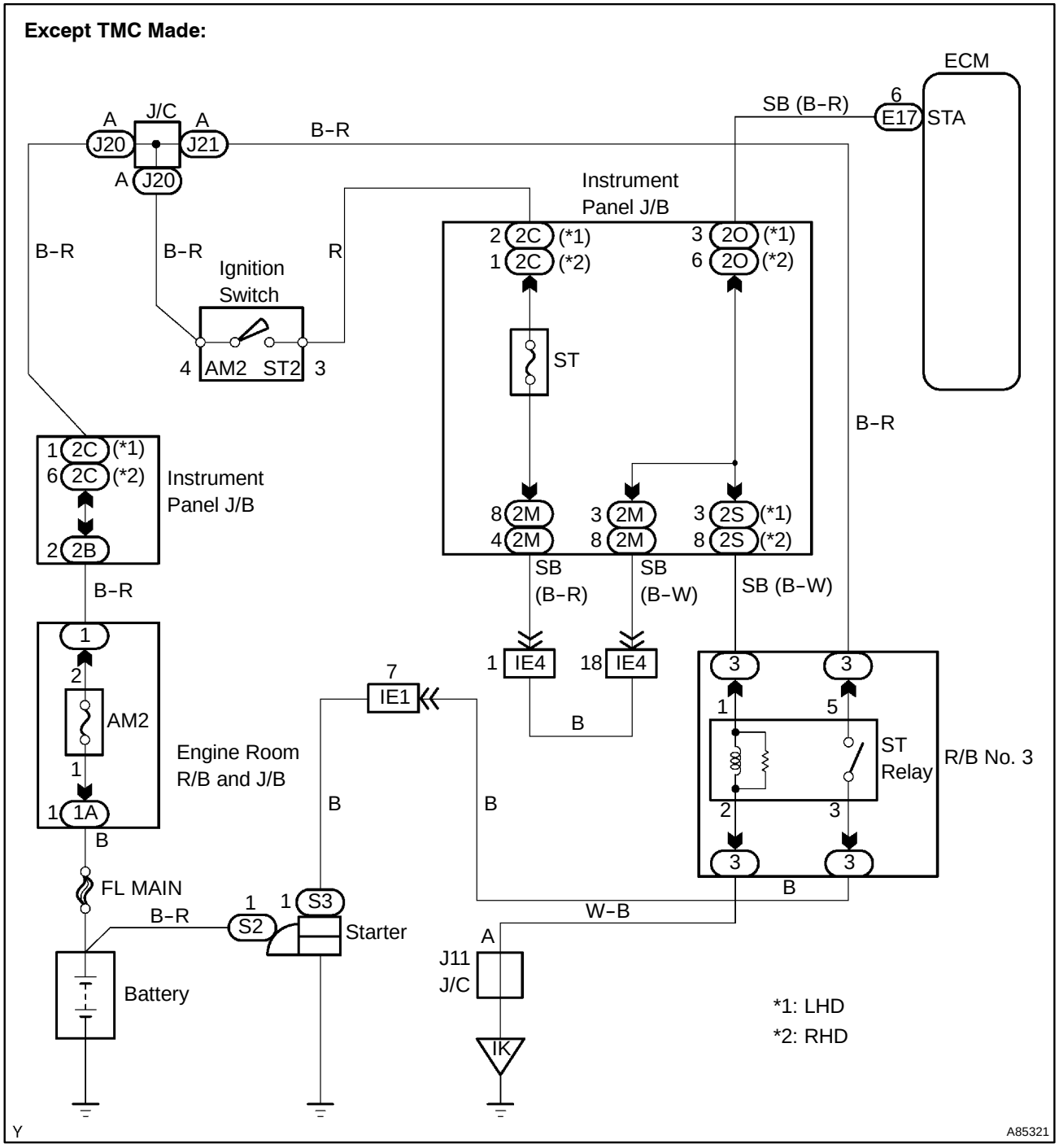
HINT:

While the engine is being cranked, current flows from terminal ST2 of the ignition switch to the ST relay coil and also current flows to terminal STA of the ECM (STA signal).

WIRING DIAGRAM



Except TMC Made:



INSPECTION PROCEDURE

HINT:

This chart is on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page 05-238.

1	READ VALUE OF HAND-HELD TESTER(STA SIGNAL)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / STARTER SIG" and read its value displayed on the hand-held tester.

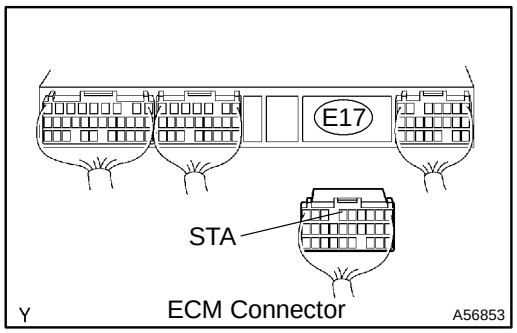
Standard:

Ignition Switch Position	ON	START
STARTER SIG	OFF	ON

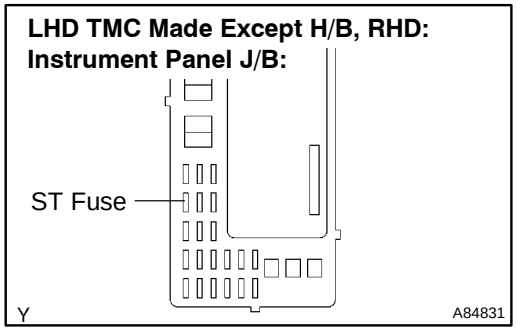
OK → **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE (See page 05-238)**

NG

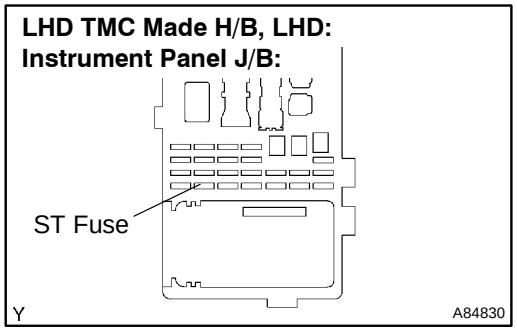
2 CHECK HARNESS AND CONNECTOR(ECM - ST RELAY OR SHORT PIN)



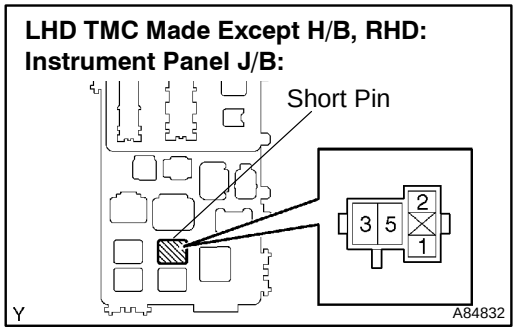
LHD TMC Made Except H/B, RHD:
Instrument Panel J/B:



LHD TMC Made H/B, LHD:
Instrument Panel J/B:



LHD TMC Made Except H/B, RHD:
Instrument Panel J/B:



(a) TMC made:

(1) Inspect the ST fuse.

- Remove the ST fuse from the instrument panel J/B.
- Check for continuity in the ST fuse.

Standard: Continuity

- Reinstall the ST fuse.

(2) Disconnect the E17 ECM connector.

(3) Remove the short pin from the instrument panel J/B.

(4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Short pin (3) - STA (E17-6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Short pin (3) or STA (E17-6) - Body ground	10 kΩ or higher

(5) Reconnect the ECM connector.

(6) Reinstall the short pin.

(b) Except TMC made:

(1) Disconnect the E17 ECM connector.

(2) Remove the ST relay from the R/B No. 3.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

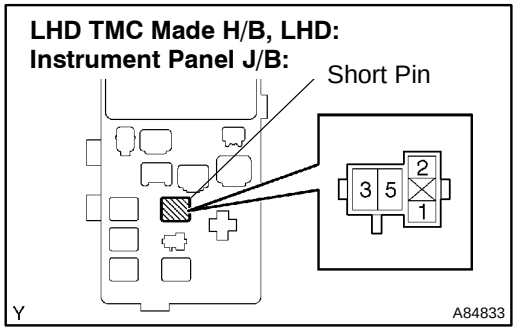
Tester Connection	Specified Condition
ST relay (1) - STA (E17-6)	Below 1 Ω

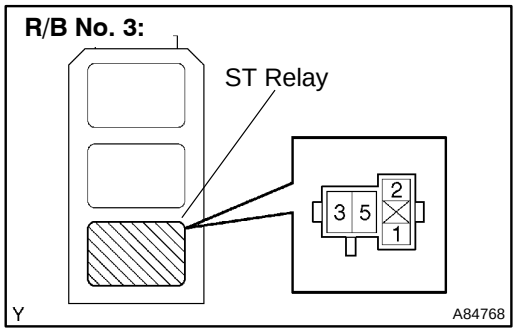
Standard (Check for short):

Tester Connection	Specified Condition
ST relay (1) or STA (E17-6) - Body ground	10 kΩ or higher

(4) Reconnect the ECM connector.

(5) Reinstall the ST relay.





NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

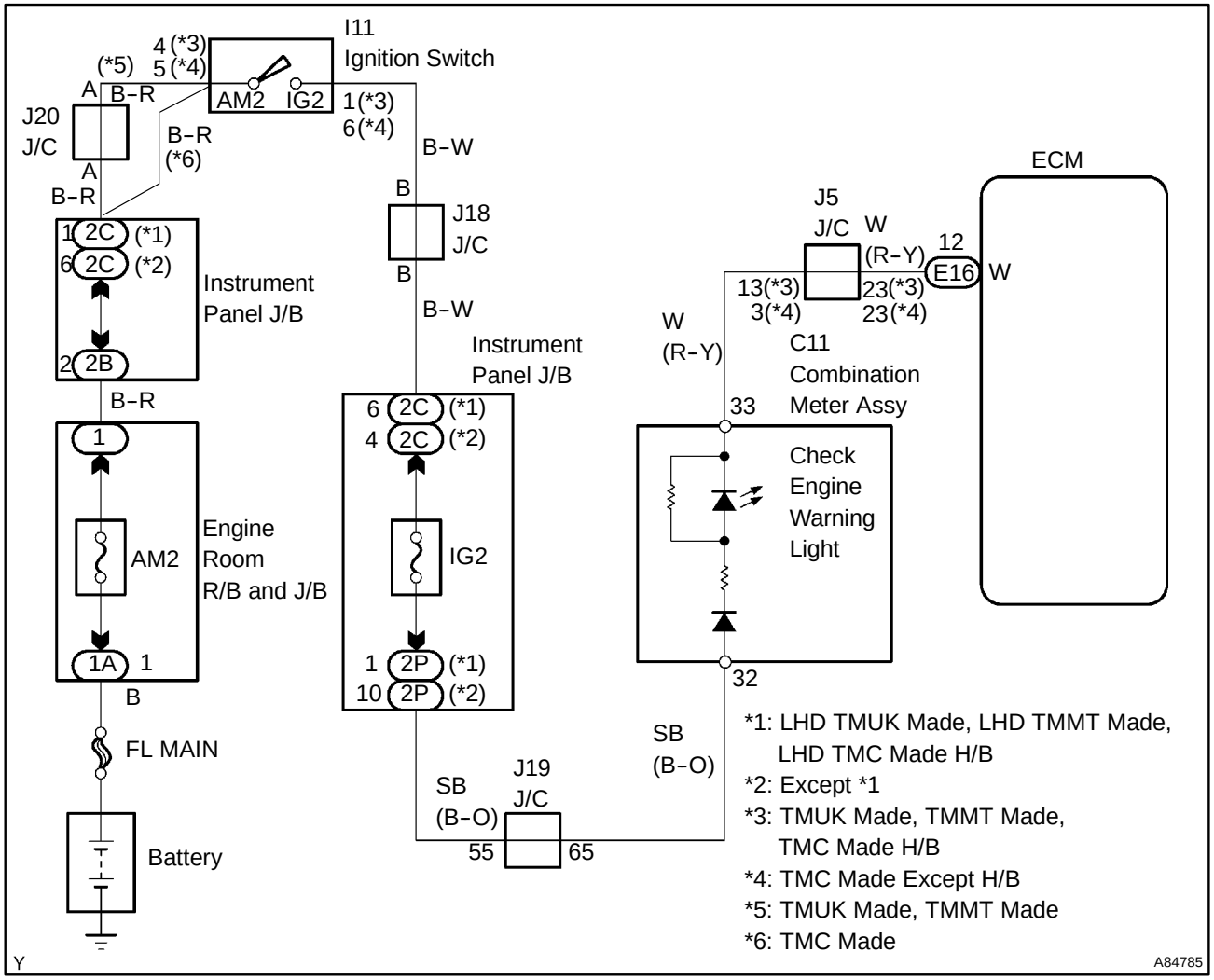
REPLACE ECM (See page 10-8)

CHECK ENGINE WARNING LIGHT CIRCUIT

CIRCUIT DESCRIPTION

If the ECM detects a trouble, the check engine warning light (CHK ENG) 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:

Result	Proceed to
CHK ENG remains on	step 1
CHK ENG is not illuminated	step 3

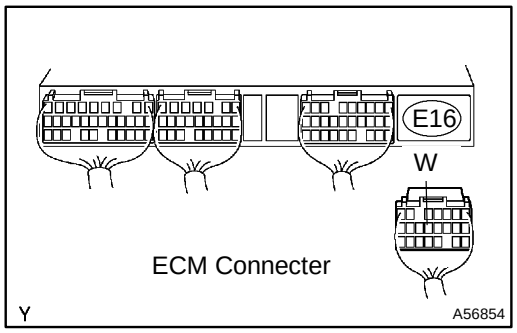
1	CLEAR DTC

(a) Connect the hand-held tester to the DLC3.
(b) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CLEAR CODES".
(d) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK	REPAIR CIRCUIT INDICATED BY OUTPUT CODE (See page 05-233)

NG

2	CHECK HARNESS AND CONNECTOR(CHECK FOR SHORT IN WIRE HARNESS)



(a) Disconnect the E16 ECM connector.
(b) Turn the ignition switch ON.
(c) Check that the CHK ENG is not illuminated.
Standard: CHK ENG is not illuminated

OK	REPLACE ECM (See page 10-8)

NG

CHECK AND REPAIR HARNESS AND CONNECTOR

3	CHECK ENGINE WARNING LIGHT CONDITION(CHK ENG CONDITION)

(a) Check that the CHK ENG is illuminated when the ignition switch is turned ON.
Standard: CHK ENG is illuminated

OK	SYSTEM OK

NG

4	INSPECT COMBINATION METER ASSY(CHECK ENGINE WARNING LIGHT CIRCUIT)

(a) See the combination meter troubleshooting on page 05-1302 of Pub. No. RM925E COROLLA.

NG	REPAIR OR REPLACE BULB OR COMBINATION METER ASSEMBLY

OK

CHECK AND REPAIR HARNESS AND CONNECTOR (COMBINATION METER - ECM)

DIFFICULT TO ENGINE START AND ENGINE STALL

HINT:
Specified values in the following troubleshooting flowchart are the reference information.
Because of resultant values in DATA LIST vary depending on measuring conditions, or vehicle's model years. Do not judge the vehicle normal even if the DATA LIST values indicate a standard level. There is a possibility that factors of the malfunction are hiding.

INSPECTION PROCEDURE

1 READ OUTPUT DTC(RELATED ENGINE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
Other than engine-related DTCs (See page 05-233)	A
DTCs related to the engine (See page 05-233)	B

B → **REPAIR OR REPLACE ENGINE CONTROL SYSTEM ACCORDING TO DTC OUTPUT (See page 05-233)**

A

2 CHECK OPERATION OF ENGINE CRANKING

(a) Check the operation of the engine cranking.
(b) Compare the operation with the one of a normal engine of the same model, and carefully check if there is no difference between them.

NG → **CHECK AND REPAIR BATTERY, CHARGING SYSTEM, STARTER ASSY AND STARTING SYSYTEM**

OK

3 READ VALUE OF HAND-HELD TESTER(COMN RAIL PRESS)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS" and read its value displayed on the hand-held tester.

Standard:

Item	Inspection Condition	Reference Value
COMN RAIL PRESS	Cranking, engine coolant temperature at 0°C (32°F) or more	20 MPa or more

NG → BLEED AIR FOR FUEL SYSTEM

OK

4	CHECK INITIAL COMBUSTION

(a) Check that initial combustion occurs.
Result:

Result	Proceed to
NG (Cold engine)	A
NG (Hot engine)	B
OK	C

B → Go to step 6

C → Go to step 7

A

5	CHECK INDICATOR LIGHTING TIME AND AFTER GLOW TIME (See page 05-292)

HINT:
DTC P0380 (2 trip detection logic when the engine coolant temperature is less than 40_C / 104_C) will be present if there is an open or short malfunction in the glow plug circuit.

NG → REPAIR OR REPLACE PRE-HEATING SYSTEM

OK

6	READ VALUE OF HAND-HELD TESTER(FUEL PRESSURE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Start the engine.
(d) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS".
(e) Check that internal fuel pressure of the common rail is within the specification below.
Standard:

Engine Speed	Fuel Pressure (MPa)
Idling	Approximately 20 to 40
2,500 rpm (No engine load)	Approximately 40 to 80

NG → Go to step 12

OK

7	CHECK AIR INTAKE SYSTEM AND EXHAUST SYSTEM

(a) Remove the air cleaner filter.
(b) Inspect the EGR valve operation.
  (1) Start the engine and warm it up.
  (2) Check that a clicking sound is heard from the EGR valve when the vacuum hose is disconnected from EGR valve with the engine at idle.
(c) Inspect the intake shutter operation.
  (1) Start the engine.
  (2) Check if the intake shutter fully opens when accelerating the engine speed.

HINT:
Under quick accelerating of the engine speed, the EGR valve is fully closed and the intake shutter is fully opened. If the systems are normal, the volume of the black smoke will result in decrease.

NG → **CHECK AND REPAIR LOCATION WHERE MALFUNCTION EXIST**

OK

8	READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Start and warm up the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS, INJ VOLUME and INJ TIMING" and read its value displayed on the hand-held tester.
  Standard:

Item	Engine Speed *	Reference Value
COMN RAIL PRESS	Idling	20 to 40 MPa
COMN RAIL PRESS	2,000 rpm (No engine load)	40 to 80 MPa
COMN RAIL PRESS	3,000 rpm (No engine load)	50 to 85 MPa
INJ VOLUME	Idling	3 to 10 mm^3
INJ VOLUME	2,000 rpm (No engine load)	3 to 10 mm^3
INJ VOLUME	3,000 rpm (No engine load)	3 to 15 mm^3
INJ TIMING	Idling	-1 to 5_CA
INJ TIMING	2,000 rpm (No engine load)	-3 to 1_CA
INJ TIMING	3,000 rpm (No engine load)	0 to 5_CA

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

NG → **Go to step 13**

OK

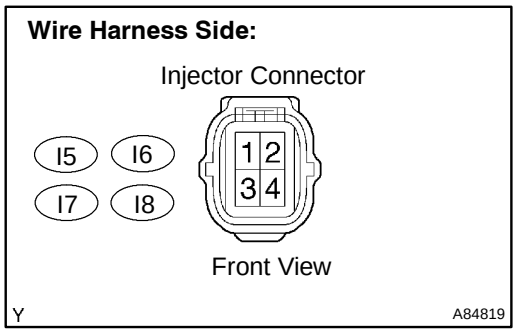
9	INSPECT CYLINDER COMPRESSION PRESSURE (See page 14-169 of Pub. No. RM 925E COROLLA)

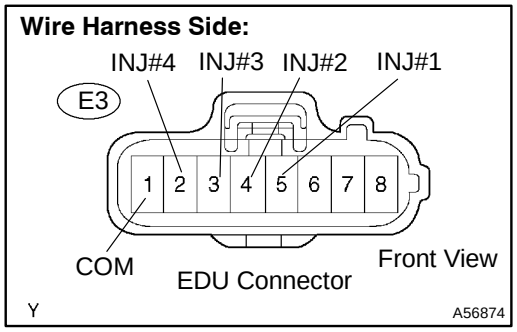
NG → **CHECK AND REPAIR ENGINE**

OK

10 CHECK HARNESS AND CONNECTOR(INJECTOR - EDU)

HINT:
DTC P0200 (1 trip detection logic) will be present if there is an open or short malfunction in the EDU circuit.





(a) Disconnect the I5, I6, I7 and I8 injector connector.
(b) Disconnect the E3 EDU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I5-3) - INJ#1 (E3-5)	Below 1 Ω
IGF (I6-3) - INJ#2 (E3-4)	
IGF (I7-3) - INJ#3 (E3-3)	
IGF (I8-3) - INJ#4 (E3-2)	
+B (I5-4) - COM (E3-1)	
+B (I6-4) - COM (E3-1)	
+B (I7-4) - COM (E3-1)	
+B (I8-4) - COM (E3-1)	

Standard (Check for short):

Tester Connection	Specified Condition
IGF (I5-3) or INJ#1 (E3-5) - Body ground	10 kΩ or higher
IGF (I6-3) or INJ#2 (E3-4) - Body ground	
IGF (I7-3) or INJ#3 (E3-3) - Body ground	
IGF (I8-3) or INJ#4 (E3-2) - Body ground	
+B (I5-4) or COM (E3-1) - Body ground	
+B (I6-4) or COM (E3-1) - Body ground	
+B (I7-4) or COM (E3-1) - Body ground	
+B (I8-4) or COM (E3-1) - Body ground	

(d) Reconnect the EDU connector.
(e) Reconnect the injector connectors.

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

OK

11 PERFORM ACTIVE TEST BY HAND-HELD TESTER(INJECTOR CUT #1, #2, #3 AND #4)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1, #2, #3 and #4.
(d) Check the engine idling condition while the fuel injection of each cylinder is cut by the hand-held tester.

Result:

Engine Idle Condition	Proceed to
Becomes unstable	A
Does not change	B

HINT:
Replace the injector mounted on the cylinder that causes the rough idling.

B → GO TO DTC P1238 (See page 05-335)

A

REPLACE INJECTOR DRIVER

12 CHECK IF FUEL IS BEING SUPPLIED TO SUPPLY PUMP

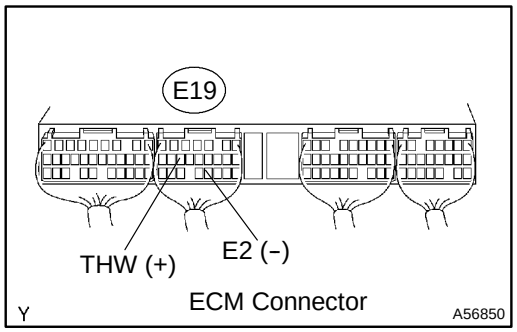
(a) Disconnect the inlet hose from the supply pump.
(b) Operate the priming pump and check that the fuel is being supplied to the supply pump.

OK → **REPLACE INJECTION OR SUPPLY PUMP ASSY (See page 11-82 of Pub. No. RM925E COROLLA)**

NG

CHECK AND REPAIR FUEL PIPING CLOG (INCLUDING FUEL FREEZING) (FUEL TANK - SUPPLY PUMP)

13 INSPECT ECM(THW VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

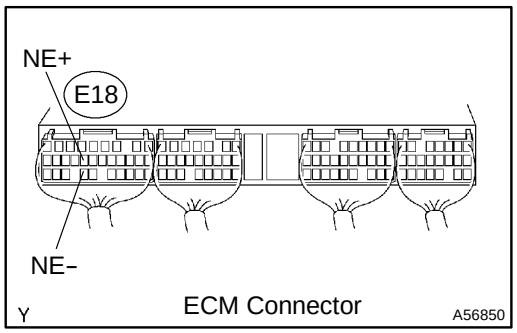
Standard:

Tester Connection	Condition	Specified Condition
THW (E19-14) - E2 (E19-20)	Idling, engine coolant temperature at 60 to 120°C (140 to 248°F)	0.2 to 1.0 V

NG → **Go to step 17**

OK

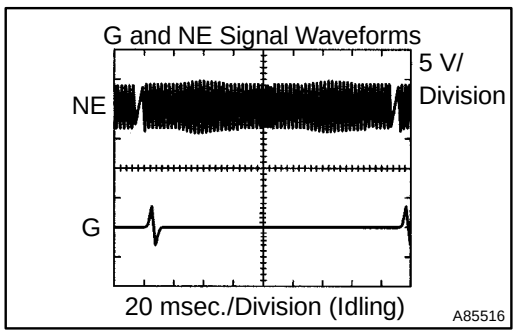
14	INSPECT ECM(NE SIGNAL)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

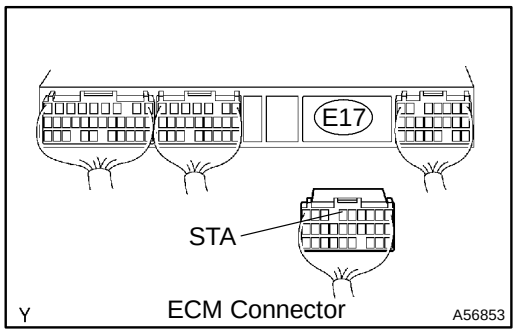
Tester Connection	Specified Condition
NE+ (E18-17) - NE- (E18-28)	Correct waveform is as shown



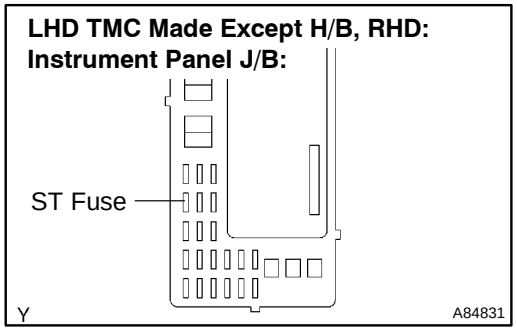
NG → **Go to step 18**

OK

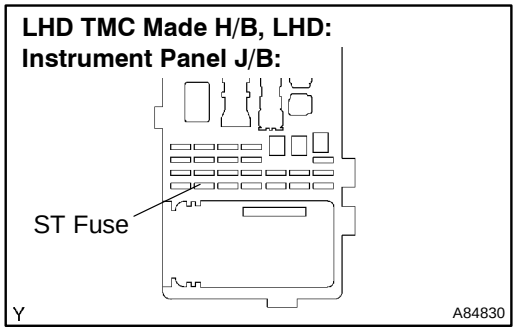
15 CHECK HARNESS AND CONNECTOR(ECM - STARTER RELAY OR SHORT PIN)



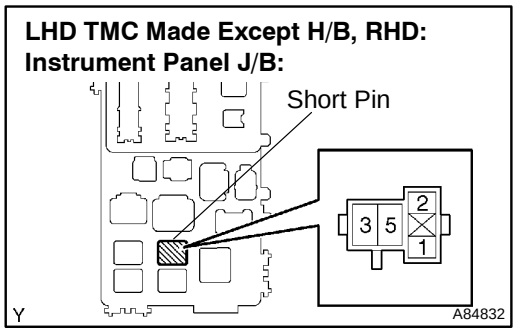
LHD TMC Made Except H/B, RHD:
Instrument Panel J/B:



LHD TMC Made H/B, LHD:
Instrument Panel J/B:



LHD TMC Made Except H/B, RHD:
Instrument Panel J/B:



(a) TMC made:

(1) Inspect the ST fuse.

- Remove the ST fuse from the instrument panel J/B.
- Check for continuity in the ST fuse.

Standard: Continuity

- Reinstall the ST fuse.

(2) Disconnect the E17 ECM connector.

(3) Remove the short pin from the instrument panel J/B.

(4) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Short pin (3) - STA (E17-6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
Short pin (3) or STA (E17-6) - Body ground	10 kΩ or higher

(5) Reconnect the ECM connector.

(6) Reinstall the short pin.

(b) Except TMC made:

(1) Disconnect the E17 ECM connector.

(2) Remove the ST relay from the R/B No. 3.

(3) Check the resistance between the wire harness side connectors.

Standard (Check for open):

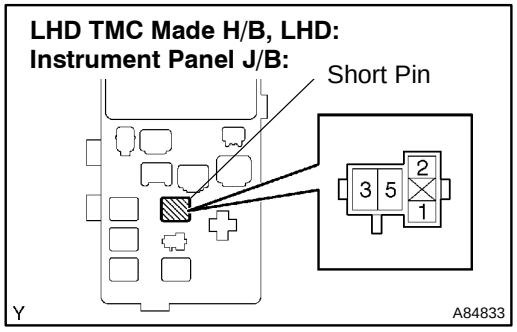
Tester Connection	Specified Condition
ST relay (1) - STA (E17-6)	Below 1 Ω

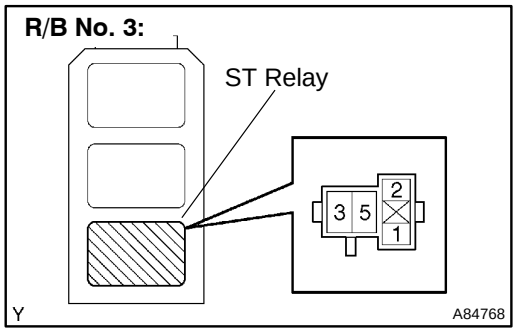
Standard (Check for short):

Tester Connection	Specified Condition
ST relay (1) or STA (E17-6) - Body ground	10 kΩ or higher

(4) Reconnect the ECM connector.

(5) Reinstall the ST relay.

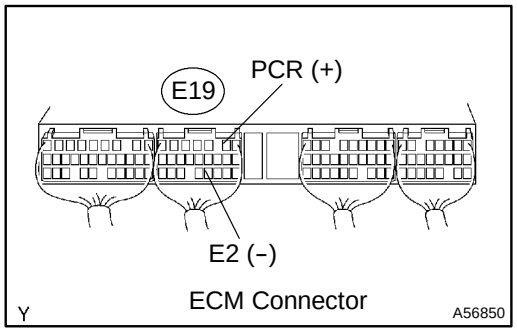




NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

16 INSPECT ECM(PCR VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.
Standard:

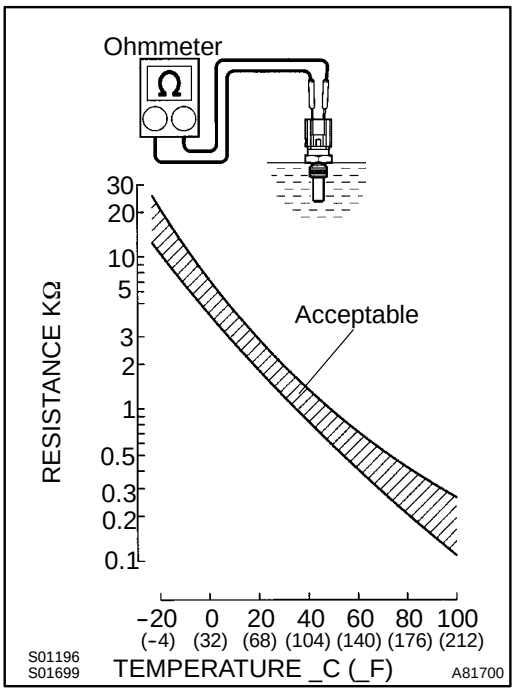
Tester Connection	Specified Condition
PCR (E19-2) - E2 (E19-20)	1.0 to 4.0 V

NG → Go to step 19

OK

REPLACE ECM (See page 10-8)

17 INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Standard:
2.32 to 2.59 kΩ at 20_C (68_F)
0.310 to 0.326 kΩ at 80_C (176_F)

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

(c) Reinstall the engine coolant temperature sensor.

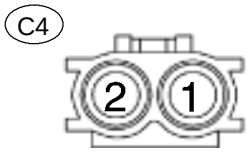
NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

18 INSPECT CRANKSHAFT POSITION SENSOR

Component Side:



Crankshaft Position Sensor

A78431

(a) Disconnect the C4 crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor.
Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

(c) Reconnect the crankshaft position sensor connector.

NG → **REPLACE CRANKSHAFT POSITION SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

BLACK SMOKE

HINT:
Specified values in the following troubleshooting flowchart are the reference information.
Because of resultant values in DATA LIST vary depending on measuring conditions, or vehicle's model years. Do not judge the vehicle normal even if the DATA LIST values indicate a standard level. There is a possibility that factors of the malfunction are hiding.

INSPECTION PROCEDURE

1 READ OUTPUT DTC(RELATED TO ENGINE)

(a) Connect the hand-held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DTC INFO / CURRENT CODES".
(d) Read the DTCs.

Result:

Display (DTC Output)	Proceed to
Other than engine-related DTCs (See page 05-233)	A
DTCs related to the engine (See page 05-233)	B

B → **REPAIR OR REPLACE ENGINE CONTROL SYSTEM ACCORDING TO DTC OUTPUT (See page 05-233)**

A

2 READ VALUE OF HAND-HELD TESTER

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / INJ VOLUME and INJ VOL FB #1 to #4" and read its value displayed on the hand-held tester.

Standard:

Item	Engine Speed *	Reference Value
INJ VOLUME	Idling (No engine load)	3 to 10 mm^3
INJ VOL FB #1		-4.9 to 4.9 mm^3
INJ VOL FB #2		-4.9 to 4.9 mm^3
INJ VOL FB #3		-4.9 to 4.9 mm^3
INJ VOL FB #4		-4.9 to 4.9 mm^3

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

NG → **Go to step 11**

OK

3	PERFORM ENGINE RPM ACCELERATION

HINT:
If exhaust gas contain excessive black smoke, perform the following steps.
(a) Accelerate the engine speed up to the maximum RPM with no load 20 times.
(b) Check the volume of the black smoke in the exhaust gas.
Result:

Result	Proceed to
Black smoke is faded	OK
Black smoke remains in the exhaust gas	NG

HINT:
Deposited soot in the exhaust system is a source of the excessive black smoke.

NG → **Go to step 4**

OK

END

4	CHECK AIR INTAKE SYSTEM AND EXHAUST SYSTEM

(a) Remove the air cleaner filter.
(b) Inspect the EGR valve operation.
  (1) Start the engine and warm it up.
  (2) Check that a clicking sound is heard from the EGR valve when the vacuum hose is disconnected from EGR valve with the engine at idle.
(c) Inspect the intake shutter operation.
  (1) Start the engine.
  (2) Check if the intake shutter fully opens when accelerating the engine speed.

HINT:
Under quick accelerating of the engine speed, the EGR valve is fully closed and the intake shutter is fully opened. If the systems are normal, the volume of the black smoke will result in decrease.

NG → **Go to step 5**

OK

CHECK AND REPAIR LOCATION WHERE MALFUNCTION EXIST

5	READ VALUE OF HAND-HELD TESTER(MASS AIR FLOW RATE)

HINT:
DTC P0100 (1 trip detection logic) will be present if there is an open or short malfunction in the mass air flow (MAF) sensor, or P0101 (2 trip detection logic) will be present if there is malfunction in the MAF sensor.
(a) Disconnect the throttle control motor connector.
(b) Disconnect the vacuum hose from the EGR valve.
(c) Connect the hand-held tester to the DLC3.
(d) Start the engine and push the hand-held tester main switch ON.
(e) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / MAF" and read its value displayed on the hand-held tester.

Result:

Engine Speed	Air Flow Rate (gm/s)
750 rpm	7.7 to 10.6

(f) Reconnect the throttle control motor connector.
(g) Reconnect the vacuum hose.

NG → **REPLACE MASS AIR FLOW SENSOR**

OK

6	**CHECK TURBOCHARGING PRESSURE (See page 13-3 of Pub. No. RM 925E COROLLA)**

NG → **REPLACE TURBOCHARGER SUB-ASSY**

OK

7	**READ VALUE OF HAND-HELD TESTER**

(a) Connect the hand-held tester to the DLC3.
(b) Start and warm up the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / DATA LIST / ALL / COMN RAIL PRESS, PUMP VCM ANGLE, INJ VOLUME, M-INJ/PILOT ON, M-INJ/PILOT OFF, PILOT-INJ, INJ TIMING and INJ VOL FB #1 to #4" and read its value displayed on the hand-held tester.

Reference:

Item	Engine Speed *	Reference Value
COMN RAIL PRESS	Idling	20 to 40 MPa
COMN RAIL PRESS	2,000 rpm (No engine load)	40 to 80 MPa
COMN RAIL PRESS	3,000 rpm (No engine load)	50 to 85 MPa
INJ VOLUME	Idling	3 to 10 mm^3
INJ VOLUME	2,000 rpm (No engine load)	3 to 10 mm^3
INJ VOLUME	3,000 rpm (No engine load)	3 to 15 mm^3
M-INJ/PILOT ON	Idling	600 to 1,200 μs
M-INJ/PILOT OFF	Idling	0 μs
PILOT-INJ	Idling	400 to 700 μs
INJ TIMING	Idling	-1 to 5_CA
INJ TIMING	2,000 rpm (No engine load)	-3 to 1_CA
INJ TIMING	3,000 rpm (No engine load)	0 to 5_CA
INJ VOL FB #1	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #2	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #3	Idling	-4.9 to 4.9 mm^3
INJ VOL FB #4	Idling	-4.9 to 4.9 mm^3

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

Result:

Result	Proceed to
Within the reference value	A
One of the INJ VOL FB #1 to #4 indicates out of the reference value	B
Other than above	C

B	GO TO DTC P1238 (See page 05-335)
C	Go to step 11

A

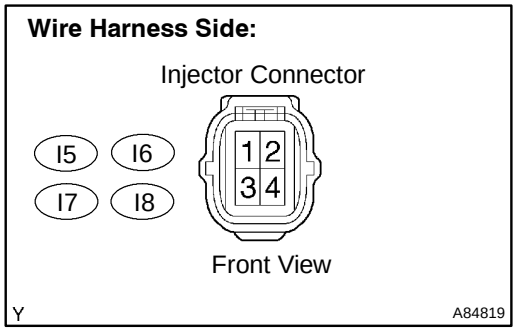
8	INSPECT CYLINDER COMPRESSION PRESSURE (See page 14-169 of Pub. No. RM 925E COROLLA)

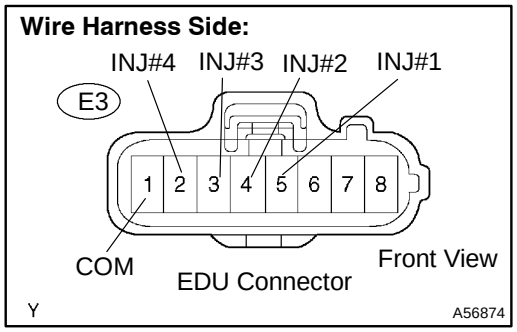
NG	CHECK AND REPAIR ENGINE

OK

9	CHECK HARNESS AND CONNECTOR(INJECTOR - EDU)

HINT:
DTC P0200 (1 trip detection logic) will be present if there is an open or short malfunction in the EDU circuit.





(a) Disconnect the I5, I6, I7 and I8 injector connector.
(b) Disconnect the E3 EDU connector.
(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
IGF (I5-3) - INJ#1 (E3-5)	Below 1 Ω
IGF (I6-3) - INJ#2 (E3-4)	
IGF (I7-3) - INJ#3 (E3-3)	
IGF (I8-3) - INJ#4 (E3-2)	
+B (I5-4) - COM (E3-1)	
+B (I6-4) - COM (E3-1)	
+B (I7-4) - COM (E3-1)	
+B (I8-4) - COM (E3-1)	

Standard (Check for short):

Tester Connection	Specified Condition
IGF (I5-3) or INJ#1 (E3-5) - Body ground	10 kΩ or higher
IGF (I6-3) or INJ#2 (E3-4) - Body ground	
IGF (I7-3) or INJ#3 (E3-3) - Body ground	
IGF (I8-3) or INJ#4 (E3-2) - Body ground	
+B (I5-4) or COM (E3-1) - Body ground	
+B (I6-4) or COM (E3-1) - Body ground	
+B (I7-4) or COM (E3-1) - Body ground	
+B (I8-4) or COM (E3-1) - Body ground	

(d) Reconnect the EDU connector.
(e) Reconnect the injector connectors.

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

10	PERFORM ACTIVE TEST BY HAND-HELD TESTER(INJECTOR CUT #1, #2, #3 AND #4)

(a) Connect the hand-held tester to the DLC3.
(b) Start the engine and push the hand-held tester main switch ON.
(c) Select the item "DIAGNOSIS / OBD/MOBD / ACTIVE TEST / INJECTOR CUT #1 to #4".
(d) Check the engine idling condition while the fuel injection of each cylinder is cut by the hand-held tester.

Result:

Engine Idle Condition	Proceed to
Becomes unstable	A
Does not change	B

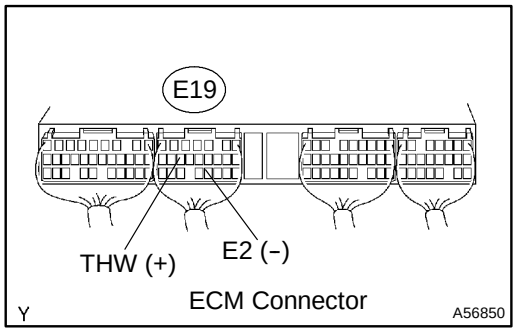
HINT:
Replace the injector mounted on the cylinder that causes the rough idling.

B → **GO TO DTC P1238 (See page 05-335)**

A

REPLACE INJECTOR DRIVER

11	INSPECT ECM(THW VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

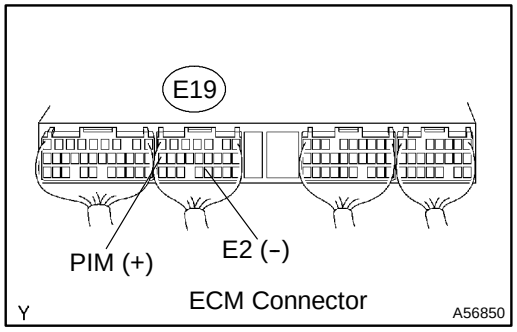
Standard:

Tester Connection	Condition	Specified Condition
THW (E19-14) - E2 (E19-20)	Idling, engine coolant temperature at 60 to 120°C (140 to 248°F)	0.2 to 1.0 V

NG → **Go to step 17**

OK

12	INSPECT ECM(PIM VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

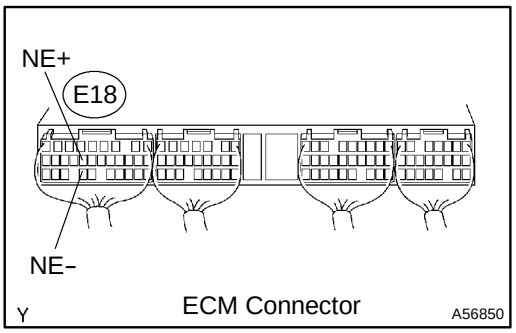
Standard:

Tester Connection	Condition	Specified Condition
PIM (E19-16) - E2 (E19-20)	Applied negative pressure of 40 kPa (300 mmHg, 11.8 in.Hg)	1.0 to 1.8 V
PIM (E19-16) - E2 (E19-20)	Same as atmospheric pressure	1.7 to 2.9 V
PIM (E19-16) - E2 (E19-20)	Applied positive pressure of 135 kPa (1.4 kgf/cm^2, 19.6 psi)	2.3 to 3.2 V

NG → Go to step 18

OK

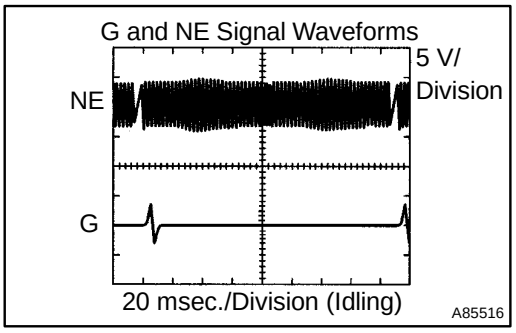
13 INSPECT ECM(NE SIGNAL)



(a) Inspect using the oscilloscope.
(b) During idling, check the waveform between the specified terminals of the E18 ECM connector.

Standard:

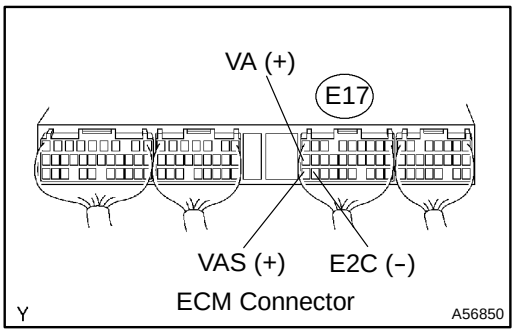
Tester Connection	Specified Condition
NE+ (E18-17) - NE- (E18-28)	Correct waveform is as shown



NG → Go to step 19

OK

14 INSPECT ECM(VA AND VAS VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E17 ECM connector.

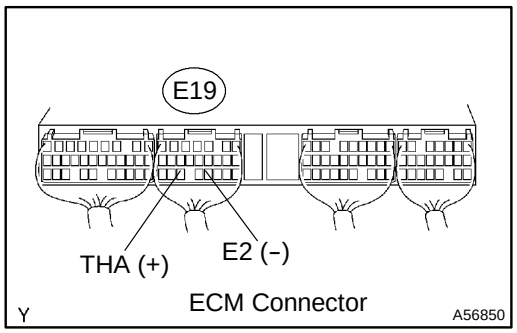
Standard:

Accelerator Pedal Position	Tester Connection	Specified Condition
Released	VA (E17-19) - E2C (E17-27)	0.5 to 1.1 V
Depressed		3.0 to 4.6 V
Released	VAS (E17-28) - E2C (E17-27)	0.9 to 2.3 V
Depressed		3.4 to 5.0 V

NG → Go to step 20

OK

15 INSPECT ECM(THA VOLTAGE)



(a) Start the engine.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

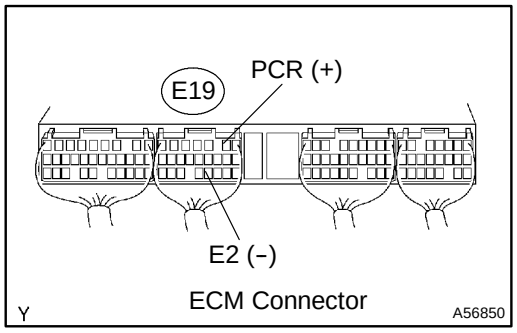
Standard:

Tester Connection	Condition	Specified Condition
THA (E19-22) - E2 (E19-20)	Idling, intake air temp. at 20°C (68°F)	0.5 to 3.4 V

NG → **Go to step 21**

OK

16 INSPECT ECM(PCR VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage between the specified terminals of the E19 ECM connector.

Standard:

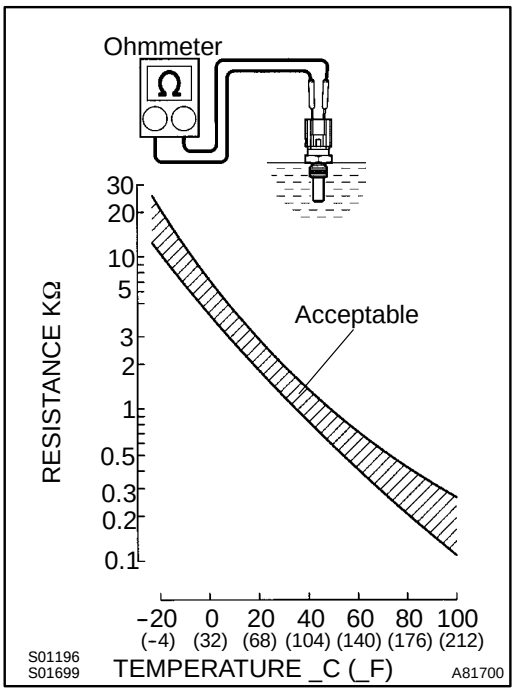
Tester Connection	Specified Condition
PCR (E19-2) - E2 (E19-20)	1.0 to 4.0 V

NG → **Go to step 22**

OK

REPLACE ECM (See page 10-8)

17 INSPECT ENGINE COOLANT TEMPERATURE SENSOR



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals.
Standard:
2.32 to 2.59 kΩ at 20_C (68_F)
0.310 to 0.326 kΩ at 80_C (176_F)

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

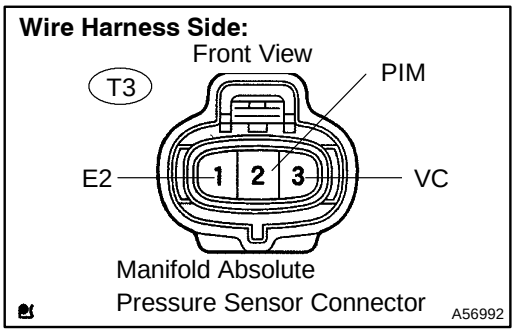
(c) Reinstall the engine coolant temperature sensor.

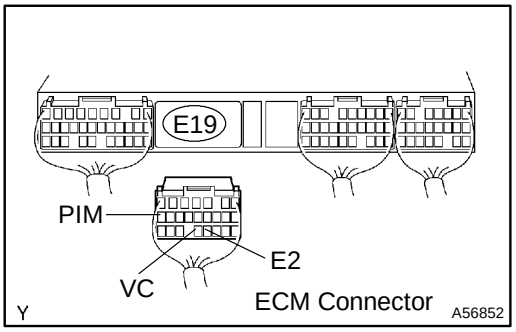
NG → **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

18 CHECK HARNESS AND CONNECTOR(MANIFOLD ABSOLUTE PRESSURE SENSOR - ECM)





(a) Disconnect the T3 manifold absolute pressure sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PIM (T3-2) - PIM (E19-16)	Below 1 Ω
VC (T3-3) - VC (E19-21)	
E2 (T3-1) - E2 (E19-20)	

Standard (Check for short):

Tester Connection	Specified Condition
PIM (T3-2) or PIM (E19-16) - Body ground	10 kΩ or higher
VC (T3-3) or VC (E19-21) - Body ground	
E2 (T3-1) or E2 (E19-20) - Body ground	

(d) Reconnect the manifold absolute pressure sensor connector.
(e) Reconnect the ECM connector.

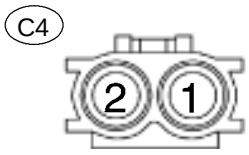
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR

19	INSPECT CRANKSHAFT POSITION SENSOR

Component Side:



Crankshaft Position Sensor

A78431

(a) Disconnect the C4 crankshaft position sensor connector.

(b) Measure the resistance between the terminals of the crankshaft position sensor.

Standard:

Tester Connection	Specified Condition
1 - 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from -10_C (14_F) to 50 _C (122 _F) and "Hot" is from 50 _C (122 _F) to 100 _C (212 _F).

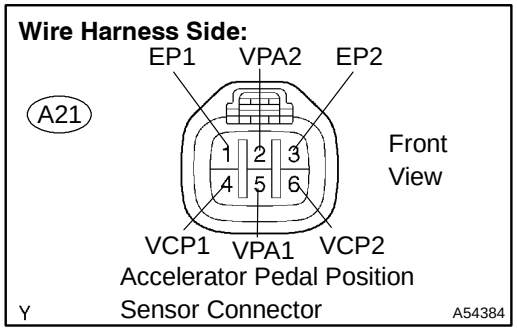
(c) Reconnect the crankshaft position sensor connector.

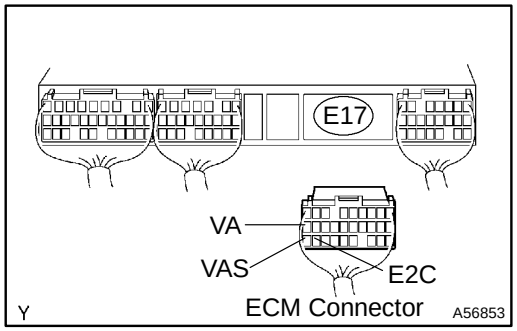
NG → REPLACE CRANKSHAFT POSITION SENSOR

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

20	CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR - ECM)





(a) Disconnect the A21 accelerator pedal position sensor connector.

(b) Disconnect the E17 ECM connector.

(c) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A21-5) - VA (E17-19)	Below 1 Ω
EP1 (A21-1) - E2C (E17-27)	
VCP1 (A21-4) - VCC (E17-8)	
VPA2 (A21-2) - VAS (E17-28)	
EP2 (A21-3) - E2C (E17-27)	
VCP2 (A21-6) - VCC (E17-8)	

Standard (Check for Short):

Tester Connection	Specified Condition
VPA1 (A21-5) or VA (E17-19) - Body ground	10 kΩ or higher
EP1 (A21-1) or E2C (E17-27) - Body ground	
VCP1 (A21-4) or VCC (E17-8) - Body ground	
VPA2 (A21-2) or VAS (E17-28) - Body ground	
EP2 (A21-3) or E2C (E17-27) - Body ground	
VCP2 (A21-6) or VCC (E17-8) - Body ground	

(d) Reconnect the accelerator pedal position sensor connector.

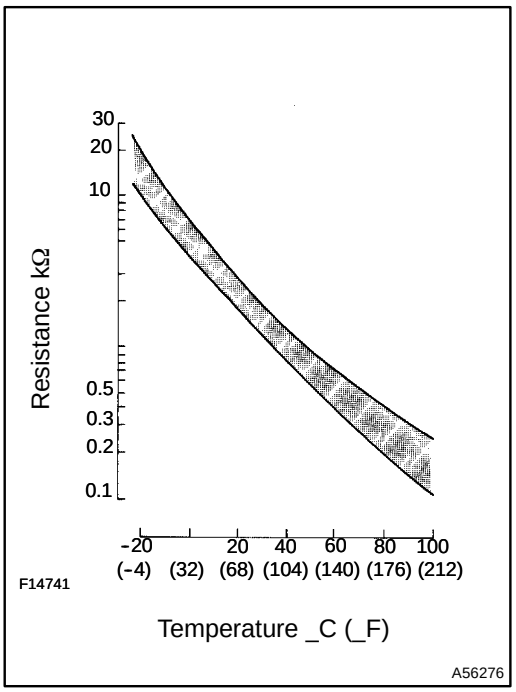
(e) Reconnect the ECM connector.

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

OK

REPLACE ACCELERATOR PEDAL ASSY (ACCELERATOR PEDAL POSITION SENSOR) (See page 10-14)

21 INSPECT DIESEL TURBO INLET AIR TENPERATURE SENSOR



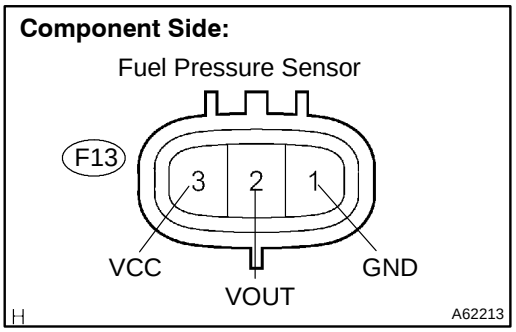
(a) Remove the diesel turbo inlet air temperature sensor.
(b) Measure the resistance between each terminal.
Standard:
2.21 to 2.65 kΩ at 20_C (68_F)
(c) Reinstall the diesel turbo inlet air temperature sensor.

NG → **REPLACE DIESEL TURBO INLET AIR TENPERATURE SENSOR**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

22 INSPECT COMMON RAIL ASSY(FUEL PRESSURE SENSOR)



(a) Remove the fuel pressure sensor connector.
(b) Measure the resistance between terminals of the fuel pressure sensor.
Standard:

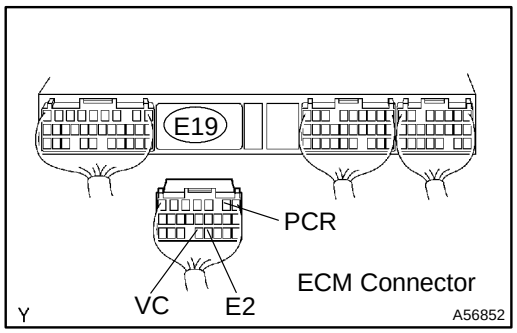
Tester Connection	Specified Condition
GND (F13-1) - VOUT (F13-2)	16.4 kΩ or less
VOUT (F13-2) - VCC (F13-3)	3 kΩ or less

(c) Reinstall the fuel pressure sensor connector.

NG → **REPLACE COMMON RAIL ASSY (FUEL PRESSURE SENSOR)**
(See page 11-82 of Pub. No. RM925E COROLLA)

OK

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



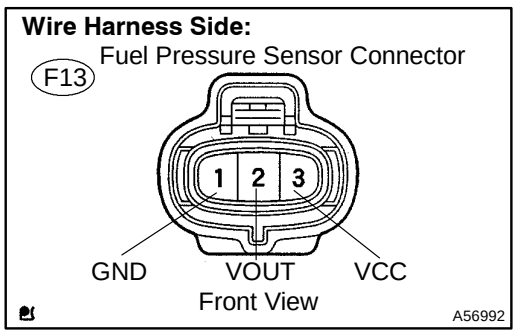
(a) Disconnect the F13 fuel pressure sensor connector.
(b) Disconnect the E19 ECM connector.
(c) Check the resistance between the wire harness side connector.

Standard (Check for open):

Tester Connection	Specified Condition
PCR (E19-2) - VOUT (F13-2)	Below 1 Ω
VC (E19-21) - VCC (F13-3)	
E2 (E19-20) - GND (F13-1)	

Standard (Check for short):

Tester Connection	Specified Condition
PCR (E19-2) or VOUT (F13-2) - Body ground	10 kΩ or higher
VC (E19-21) or VCC (F13-3) - Body ground	
E2 (E19-20) or GND (F13-1) - Body ground	



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

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

24	REPLACE ECM (See page 10-8)

NG → REPLACE INJECTION OR SUPPLY PUMP ASSY

OK

END

ENGINE CONTROL SYSTEM

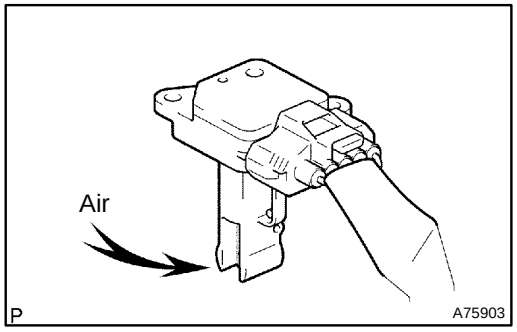
ECD SYSTEM (1CD-FTV)
(May, 2003) 10-1
ON-VEHICLE INSPECTION 10-1
INSPECTION 10-4
ECM (May, 2003) 10-8
REPLACEMENT 10-8
ACCELERATOR PEDAL ASSY (1CD-FTV)
(May, 2003) 10-14
REPLACEMENT 10-14

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 (1CD-FTV) (May, 2003)

ON-VEHICLE INSPECTION

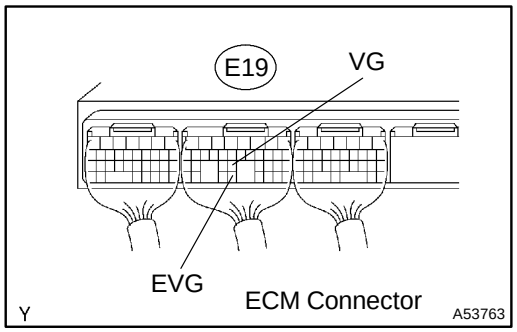
100HW-01



1. INSPECT MASS AIR FLOW SENSOR

(a) If you have the hand-held tester:
Inspect the operation.
(1) Connect the hand-held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Select the item "DIAGNOSIS / OBD / MOBD / DATA LIST" on the hand-held tester.
(4) Blow air into the mass air flow (MAF) sensor, then check that the MAF reading in the DATA LIST fluctuates.

If operation is not as specified, check the MAF sensor (See page 10-4) , wiring and ECM.



(b) If you have no hand-held tester:
Inspect the operation.
(1) Turn the ignition switch ON.
(2) Connect the positive tester probe of a voltmeter to terminal VG of the ECM, and the negative tester probe of the voltmeter to terminal EVG of the ECM.
(3) Blow air into the MAF sensor, then check that the voltage fluctuates.

If operation is not as specified, check the MAF sensor (See page 10-4) , wiring and ECM.

2. INSPECT INTAKE SHUTTER

(a) Listen to the operation sound of the throttle control motor.
(1) Turn the ignition switch ON.
(2) Listen to the operating sounds when turning the accelerator pedal position sensor lever.

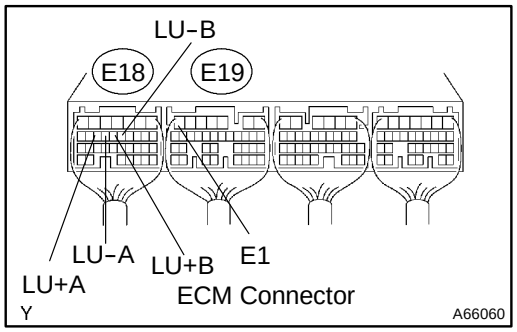
If a collision sound is heard, check the throttle control motor.
If no sound is heard, check the wire harness and ECM (See page 10-4) .

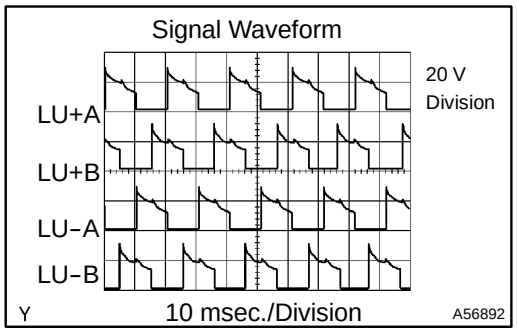
(b) If you have the hand-held tester:
Inspect the throttle position sensor.
(1) Connect the hand-held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Select the item "DIAGNOSIS / OBD/MOBD / DATE LIST" on the hand held-tester.

(4) When turning the accelerator pedal position sensor lever to the full-open position, check that the throttle valve opening percentage (THROTTLE POS) of the DATA LIST shows the standard value.

Standard throttle valve opening percentage:
60 % or higher

If operation is not as specified, check the accelerator pedal position sensor (See page 10-4) , wiring and ECM.





(c) If you have no hand-held tester:
Inspect the throttle position sensor.
(1) Inspect the throttle position sensor using the oscilloscope.
(2) During idling, check the waveform between the specified terminals of the E18 and E19 ECM connectors.

Standard:

Tester Connection	Specified Condition
LU+A (E18-15) - E1 (E19-7)	Correct waveform is as shown on the left
LU-A (E18-14) - E1 (E19-7)	
LU+B (E18-13) - E1 (E19-7)	
LU-B (E18-12) - E1 (E19-7)	

If operation is not as specified, check that the accelerator pedal position sensor (See page 10-4) , wiring and ECM.

(d) Inspect the air assist system.
(1) Start the engine, then check that the check engine warning light does not light up.
(2) Allow the engine to warm up to the normal operating temperature.
(3) Turn the A/C compressor ON to OFF, then check the idle speed.

Idle speed (Transmission in neutral): 800 ± 50 rpm

NOTICE:
Perform the inspection under condition without electrical load.

(e) After checking the above (b) to (c), perform the driving test.
(f) Check that there is no sense of incongruity.

3. INSPECT ACCELERATOR PEDAL POSITION SENSOR

(a) If you have the hand-held tester:
Inspect the accelerator pedal position sensor.
(1) Connect the hand-held tester to the DLC3.
(2) Turn the ignition switch ON.

(b) Select the item "DIAGNOSIS / OBD/MOBD / DATE LIST" on the hand-held tester.

(1) Check that the voltage (ACCEL POS) of the DATA LIST shows the standard value.

Accelerator pedal released: 0.5 to 1.1 V

Accelerator pedal depress: 2.5 to 4.6 V

(2) Check that the voltage (ACCEL POS #2) of the DATA LIST shows the standard value.

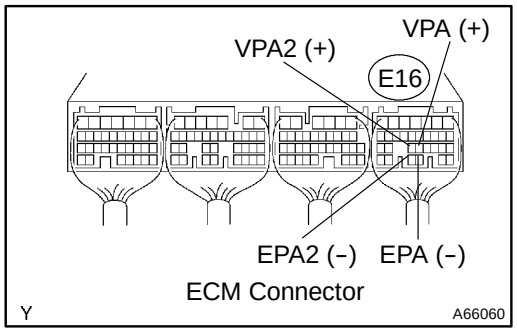
Accelerator pedal released: 1.5 to 2.9 V

Accelerator pedal depress: 3.5 to 5.5 V

If the result is not as specified, check the accelerator pedal position sensor (See Page 10-4) , wiring and ECM.

(c) If you have no hand-held tester:

Inspect the accelerator pedal position sensor.



(1) Turn the ignition switch ON.

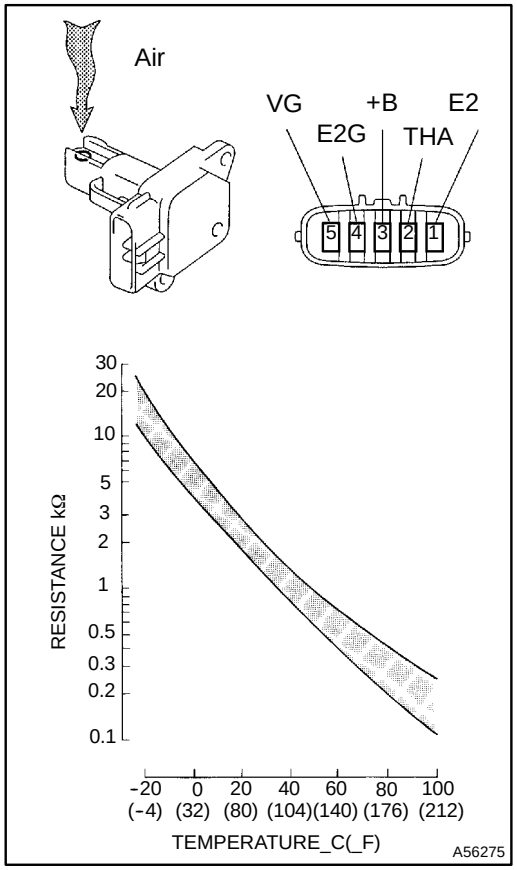
(2) Measure the voltage between the specified terminals of the E16 ECM connector.

Accelerator Pedal Position	Tester Connection	Specified Condition	Tester Connection	Specified Condition
Released	VPA (E16-22) -EPA (E16-28)	0.5 to 1.1 V	VPA2 (E16-23) -EPA2 (E16-29)	1.5 to 2.9 V
Depressed	VPA (E16-22) -EPA (E16-28)	2.5 to 4.6 V	VPA2 (E16-23) -EPA2 (E16-29)	3.5 to 5.5 V

If the result is not as specified, check the accelerator pedal position sensor (See Page 10-4) , wiring and ECM.

100HX-01

INSPECTION



1. INSPECT MASS AIR FLOW SENSOR

(a) Output voltage inspection.

(1) Apply battery voltage across terminals 3 (+B) and 4 (E2G)

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

(3) Blow air into the mass air flow (MAF) sensor, then check that the voltage fluctuates.

If operation is not as specified, replace MAF sensor.

(b) Resistance inspection.

(1) Using an ohmmeter, measure the resistance between terminals 2 (THA) and 1 (E2).

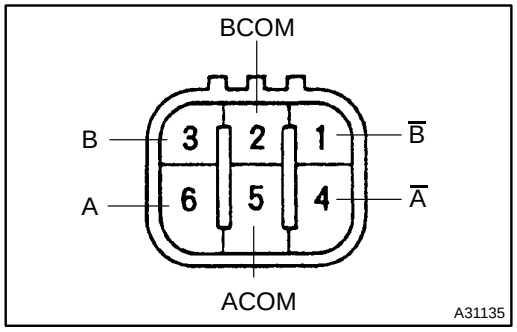
Resistance:

-20_C (-4_F) 12.5 to 16.9 kΩ

20_C (68_F) 2.19 to 2.67 kΩ

60_C (140_F) 0.50 to 0.68 kΩ

If the result is not as specified, replace the MAF sensor.



2. INSPECT INTAKE SHUTTER ASSY

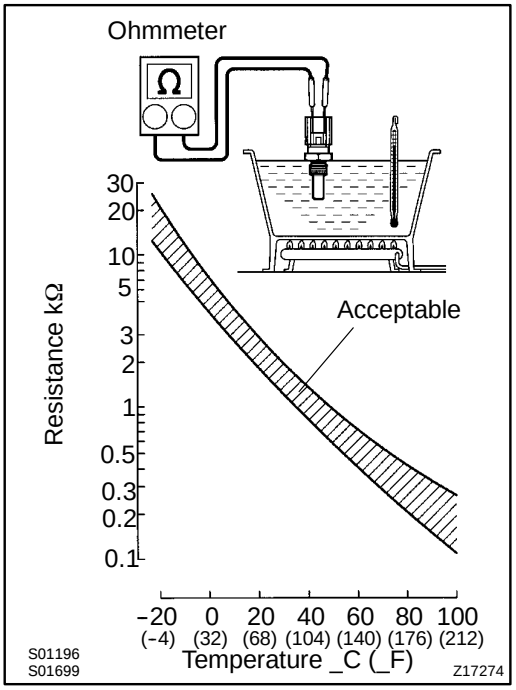
(a) Resistance inspection (Throttle control motor).

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

Resistance:

Terminals	Temperature	Resistance
2 (BCOM) - 1 ($\overline{B}$),3 (B)	at 20_C (68_F)	18 to 22 kΩ
5 (ACOM) - 4 ($\overline{A}$), 6 (A)	at 20_C (68_F)	18 to 22 kΩ

If the result is not as specified, replace the intake shutter assembly.



3. INSPECT DIESEL ENGINE ENGINE COOLANT TEMPERATURE SENSOR

(a) Resistance inspection.

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

Resistance:

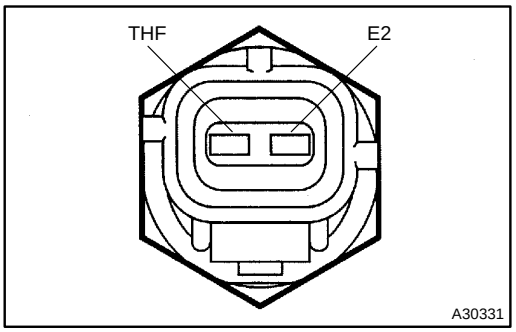
Approximately 20_C (68_F) 2.32 to 2.59 kΩ

Approximately 80_C (176_F) 0.310 to 0.326 kΩ

If the result is not as specified, replace the diesel engine engine coolant temperature sensor.

NOTICE:

In case of checking the water temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.



4. INSPECT FUEL TEMPERATURE SENSOR

(a) Resistance inspection.

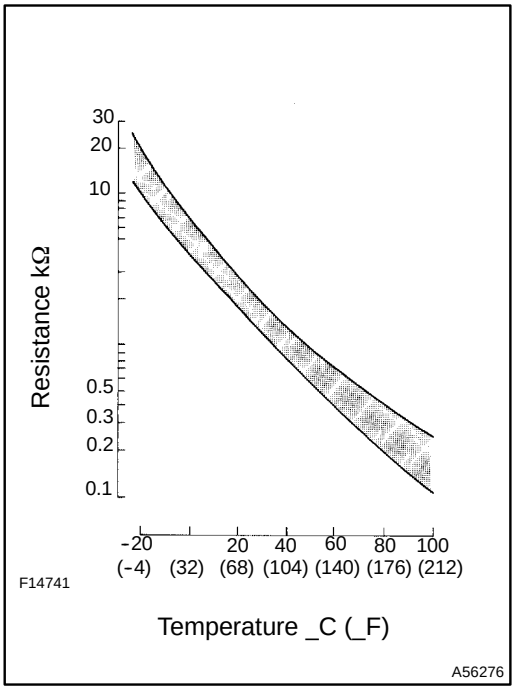
(1) Using an ohmmeter, measure the resistance between each terminal.

Resistance:

Approximately 20_C (68_F) 2.21 to 2.69 kΩ

Approximately 80_C (176_F) 0.287 to 0.349 kΩ

If the result is not as specified, replace the fuel temperature sensor.



5. INSPECT DIESEL TURBO INLET AIR TENPERATURE SENSOR

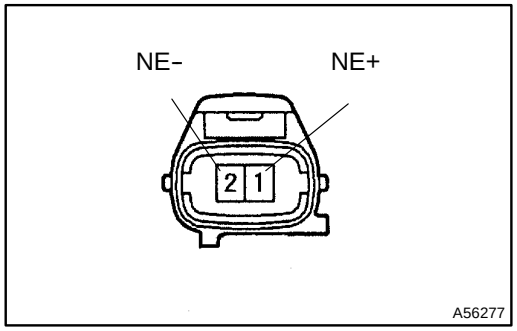
(a) Resistance inspection.

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

Resistance:

Approximately 20_C (68_F) 2.21 to 2.65 kΩ

If the result is not as specified, replace the diesel turbo inlet air temperature sensor.



6. INSPECT CRANKSHAFT POSITION SENSOR

(a) Resistance inspection.

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

Resistance:

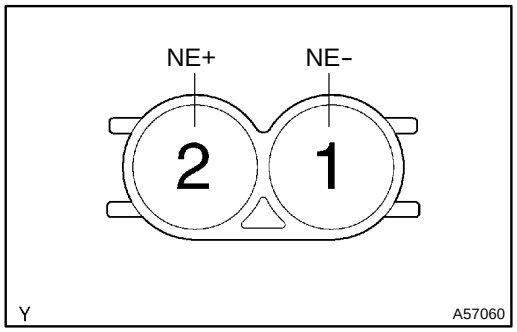
At cold: 1630 to 2740 Ω

At hot: 2065 to 3225 Ω

If the result is not as specified, replace the crankshaft position sensor.

NOTICE:

"Cold" and "Hot" in the following sentences mean the temperature of the sensor itself. "Cold" is from -10_C (14_F) to 50_C (122_F) and "Hot" is from 50_C (122_F) to 100_C (212_F).



7. INSPECT CAMSHAFT POSITION SENSOR

(a) Resistance inspection.

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

Resistance:

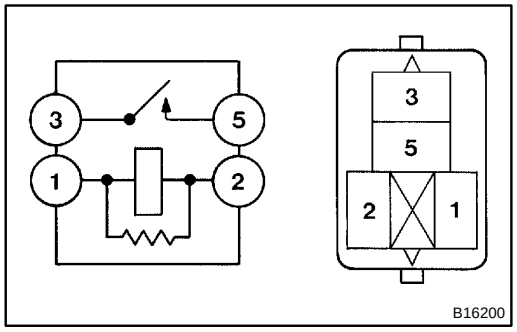
At cold: 1630 to 2740 Ω

At hot: 2065 to 3225 Ω

If the result is not as specified, replace the camshaft position sensor.

NOTICE:

"Cold" and "Hot" in the following sentences mean the temperature of the sensor itself. "Cold" is from -10_C (14_F) to 50_C (122_F) and "Hot" is from 50_C (122_F) to 100_C (212_F).



8. INSPECT EDU RELAY

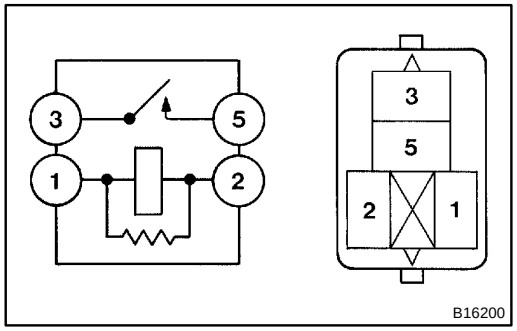
(a) Inspect the relay continuity.

(1) Using an ohmmeter, check for continuity between the terminals.

Specified condition:

Terminal No.	Specified Condition
1-2	Continuity
3-5	No continuity
	Continuity (Apply batter voltage to terminals 1 and 2)

If the result is not as specified, replace the EDU relay.



9. INSPECT EFI MAIN RELAY

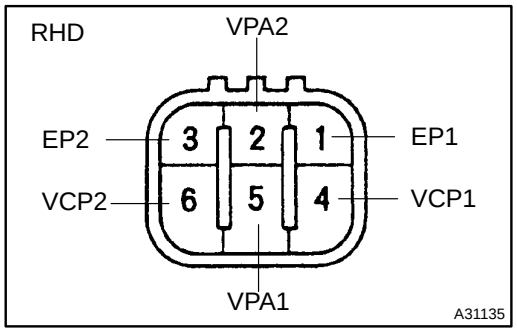
(a) Inspect the relay continuity.

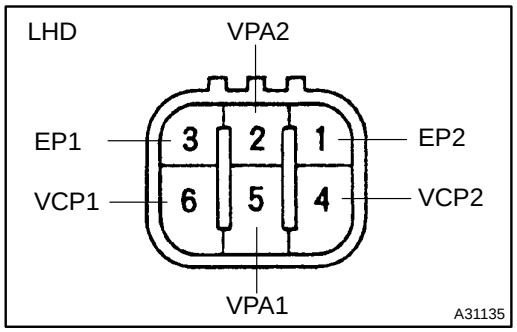
(1) Using an ohmmeter, check for continuity between the terminals.

Specified condition:

Terminal No.	Specified Condition
1-2	Continuity
3-5	No continuity
	Continuity (Apply batter voltage to terminals 1 and 2)

If the result is not as specified, replace the EFI MAIN relay.





10. INSPECT ACCELERATOR PEDAL ASSY

(a) Inspect the accelerator position sensor.

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

Resistance:

RHD:

Between Terminals	Resistance
5 (VPA1) - 1 (EP1)	5.0 kΩ or less
2 (VPA2) - 3 (EP2)	5.0 kΩ or less
4 (VCP1) - 1 (EP1)	1.5 to 6.0 kΩ
6 (VCP2) - 3 (EP2)	1.5 to 6.0 kΩ

LHD:

Between Terminals	Resistance
5 (VPA1) - 3 (EP1)	5.0 kΩ or less
2 (VPA2) - 1 (EP2)	5.0 kΩ or less
6 (VCP1) - 3 (EP1)	1.5 to 6.0 kΩ
4 (VCP2) - 1 (EP2)	1.5 to 6.0 kΩ

If the result is not as specified, replace the accelerator pedal assembly.

ECM (May, 2003)

100HV-02

REPLACEMENT

NOTICE:

- **If an incorrect injector compensation code was registered with the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.**
- **If you replace the ECM with a new one, register all the injectors' injector compensation codes with the new ECM as follows:**

(a) Prior to replacing the ECM, read all the compensation codes stored in the existing ECM using the hand-held tester, and then write them down. (See page 05-26)

(b) After replacing the ECM, enter the written compensation codes into the ECM using the hand-held tester. (See page 05-30)

(c) Turn the ignition switch OFF and wait for 30 seconds or more.

(d) Turn the ignition switch ON, then clear DTC P1601 using the hand-held tester. (See page 05-222)

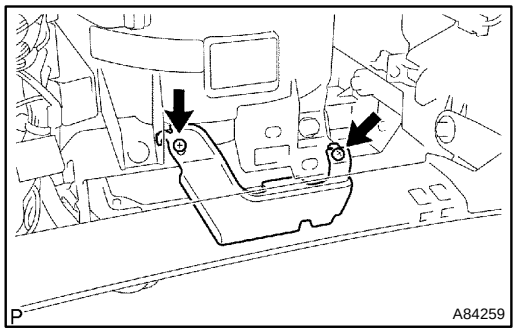
HINT:

- In order to optimize the injector's fuel injection characteristic, the ECM compensates the injection duration by each cylinder. The ECM stores and uses compensating data in the form of a 30–digit–alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- If you installed a new injector, its own injector compensation code is needed to register with the ECM. Also, if you replaced the ECM, the compensation codes of all the injectors are needed to register because the new ECM dose not have the codes until they are registered.
- Once the ECM is replaced, DTC P1601 will be present when turning the ignition switch ON. This is to inform you that the injector compensation codes are required to register with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch OFF and wait for 30 seconds or more.

1. REMOVE GLOVE COMPARTMENT DOOR ASSY (SEDAN/STATION WAGON BODY TYPE) (See Pub. No. RM925E on page 71-14)

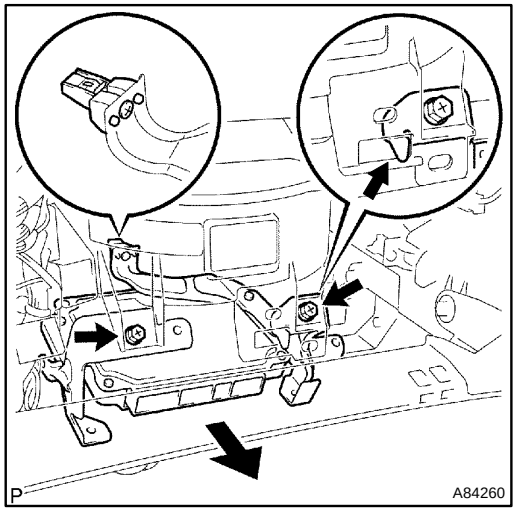
2. REMOVE GLOVE COMPARTMENT DOOR ASSY (HATCH BACK BODY TYPE) (See Pub. No. RM925E on page 71-23)

3. REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2 (HATCH BACK BODY TYPE) (See Pub. No. RM925E on page 71-23)



4. REMOVE ECM BRACKET NO.1

(a) Remove the 2 screws and ECM bracket No. 1.



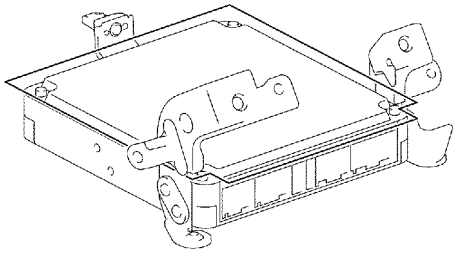
5. REMOVE ECM

(a) Disconnect the 4 ECM connectors.
(b) Remove the wire harness from the wire harness clamp.
(c) Remove the 2 bolts.
(d) Unfasten the claw and clip shown in the illustration, then remove the ECM keeping it horizontal.

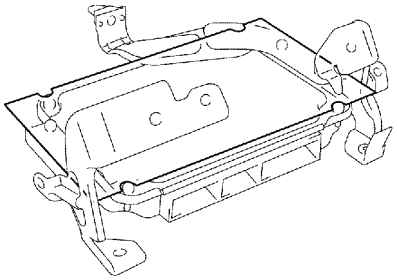
6. REMOVE ECM COVER

(a) Remove the ECM cover from the ECM.

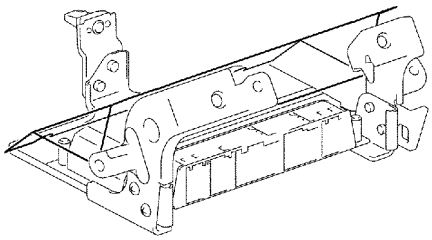
2ZZ-GE (MT), 3ZZ-FE (AT), 1CD-FTV (MT) Engine Type:



3ZZ-FE (MT) Engine Type:



4ZZ-FE (MT) Engine Type:



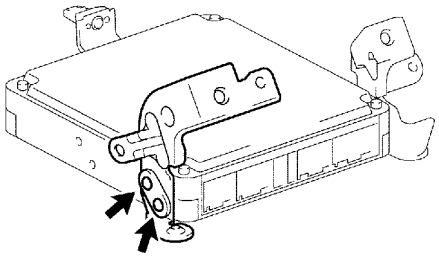
A84264 A84261 A84269

A85188

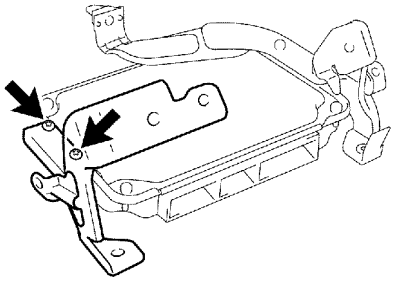
7. REMOVE ECM BRACKET

(a) Remove the 2 security screws and the ECM bracket from the ECM.

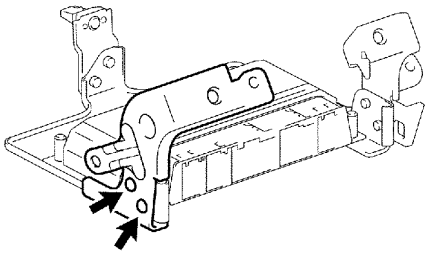
2ZZ-GE (MT),
3ZZ-FE (AT),
1CD-FTV (MT) Engine Type:



3ZZ-FE (MT) Engine Type:



4ZZ-FE (MT) Engine Type:



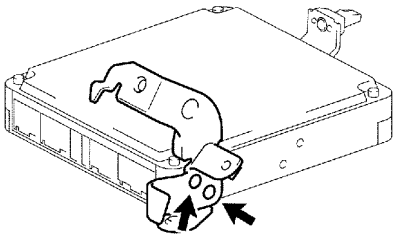
A84265 A84262 A84270

A85189

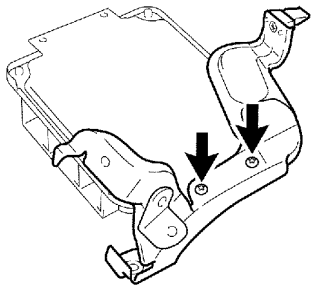
8. REMOVE ECM BRACKET NO.2

(a) Remove the 2 security screws and the ECM bracket No. 2 from the ECM.

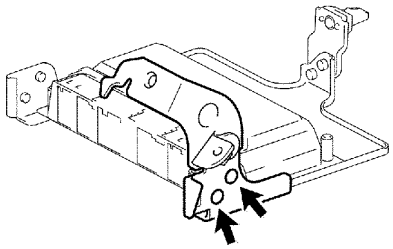
2ZZ-GE (MT),
3ZZ-FE (AT),
1CD-FTV (MT) Engine Type:



3ZZ-FE (MT) Engine Type:



4ZZ-FE (MT) Engine Type:



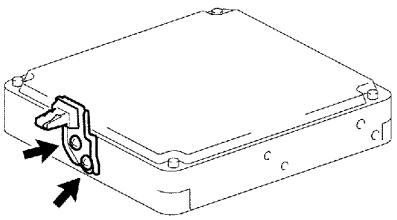
A84266 A84263 A84271

A85190

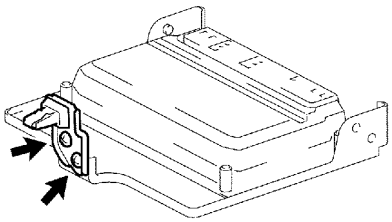
9. REMOVE ECM BRACKET NO.3

(a) Remove the 2 screws and the ECM bracket No. 3 from the ECM.

2ZZ-GE (MT),
3ZZ-FE (AT),
1CD-FTV (MT) Engine Type:



4ZZ-FE (MT) Engine Type:



A84267 A84272

A85191

10. INSTALL ECM BRACKET NO.3
Torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf)

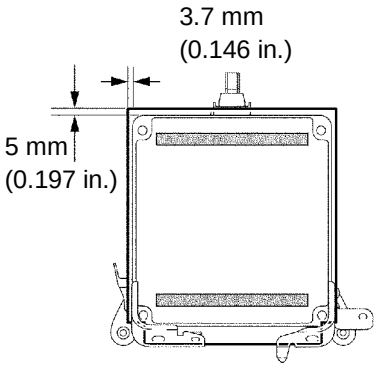
11. INSTALL ECM BRACKET NO.2
Torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf)

12. INSTALL ECM BRACKET
Torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf)

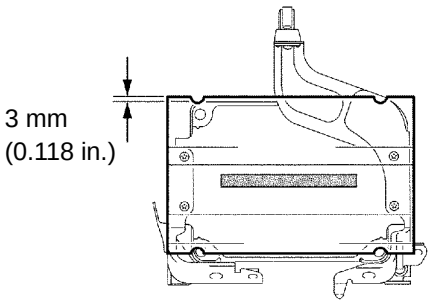
13. INSTALL ECM COVER

(a) Install a new ECM cover to the ECM as shown in the illustration.

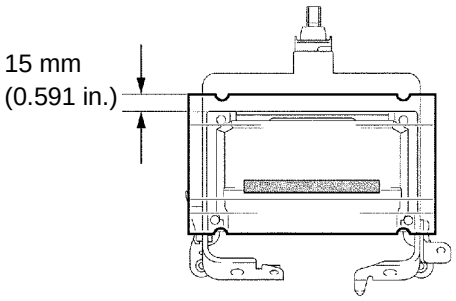
2ZZ-GE (MT),
3ZZ-FE (AT),
1CD-FTV (MT) Engine Type:



3ZZ-FE (MT) Engine Type:



4ZZ-FE (MT) Engine Type:



A84268 A84274 A84273

A85192

14. INSTALL ECM
Torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf)

15. INSTALL ECM BRACKET NO.1

16. INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO.2 (HATCH BACK BODY TYPE)

17. INSTALL GLOVE COMPARTMENT DOOR ASSY

18. REGISTRATION OF INJECTOR COMPENSATION CODE (1CD-FTV ENGINE TYPE)
(See page 05-30)

19. CLEAR DTC (1CD–FTV ENGINE TYPE)

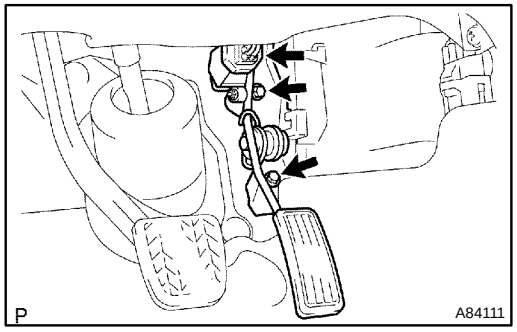
(a) Turn the ignition switch OFF and wait for 30 seconds or more.

(b) Turn the ignition switch ON, then clear DTC P1601 using the hand–held tester.
(See page 05–16)

ACCELERATOR PEDAL ASSY (1CD-FTV) (May, 2003)

REPLACEMENT

100HY-01



1. REMOVE ACCELERATOR PEDAL

(a) Disconnect the accelerator pedal position sensor connector.

(b) Remove the 2 bolts, then remove the accelerator pedal.

2. INSTALL ACCELERATOR PEDAL

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

FUEL

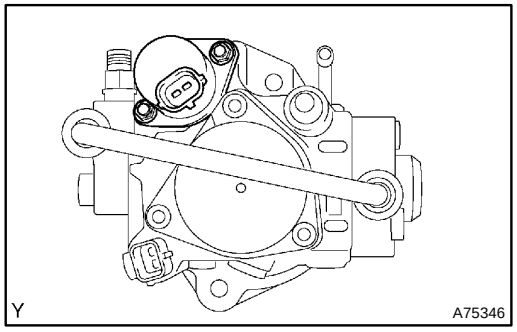
FUEL SYSTEM
(1CD-FTV) (May, 2003) 11-1
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INJECTOR ASSY
(1CD-FTV) (May, 2003) 11-3
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REPLACEMENT 11-28

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 (1CD-FTV) (May, 2003)

INSPECTION

110WJ-01



1. INSPECT SUPPLY PUMP ASSY

(a) Resistance inspection.

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

Resistance: 1.5 to 2.3 Ω at 20_C (68_F)

If the result is not as specified, replace the supply pump assembly.

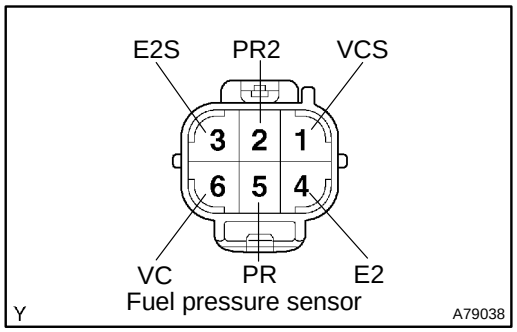
2. INSPECT INJECTOR ASSY

(a) Resistance inspection.

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

Resistance: 0.85 to 1.05 Ω at 20_C (68_F)

If the result is not as specified, replace the injector assembly.



3. INSPECT COMMON RAIL ASSY

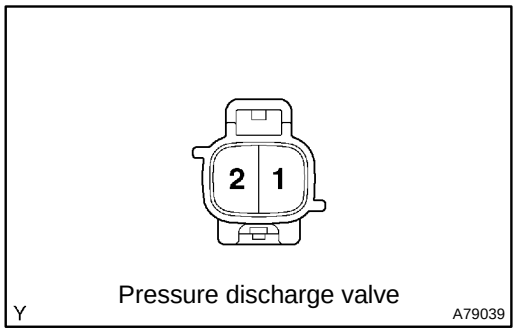
(a) Resistance inspection. (Fuel pressure sensor)

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

Resistance:

Terminals	Resistance
5 (PR) - 4 (E2)	16.4 kΩ or less
2 (PR2) - 3 (E2S)	16.4 kΩ or less
6 (VC) - 5 (PR)	3 kΩ or less
1 (VCS) - 2 (PR2)	3 kΩ or less

If the result is not as specified, replace the common rail assembly.

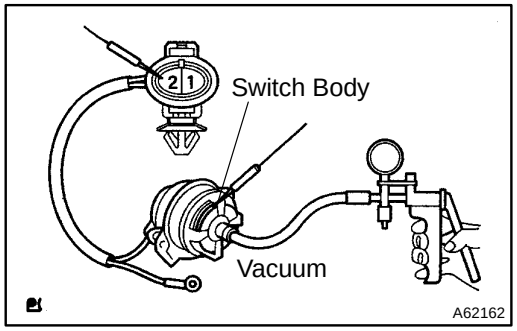


(b) Resistance inspection. (Pressure discharge valve)

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

Resistance: 0.85 to 1.05 Ω at 20_C (68_F)

If the result is not as specified, replace the common rail assembly.



4. INSPECT FUEL HEATER ASSY

(a) Resistance inspection.

(1) Apply 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.

Resistance: 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) Continuity inspection.

(1) Using an ohmmeter, check if there is continuity between terminals.

Specified condition:

There is continuity when raising the float.

There is no continuity when letting the float down.

If the result is not as specified, replace the level warning switch.

6. INSPECT FUEL TEMPERATURE SENSOR

(a) Resistance inspection.

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

Resistance:

Approximately 20_C (68_F) 2.21 to 2.69 Ω

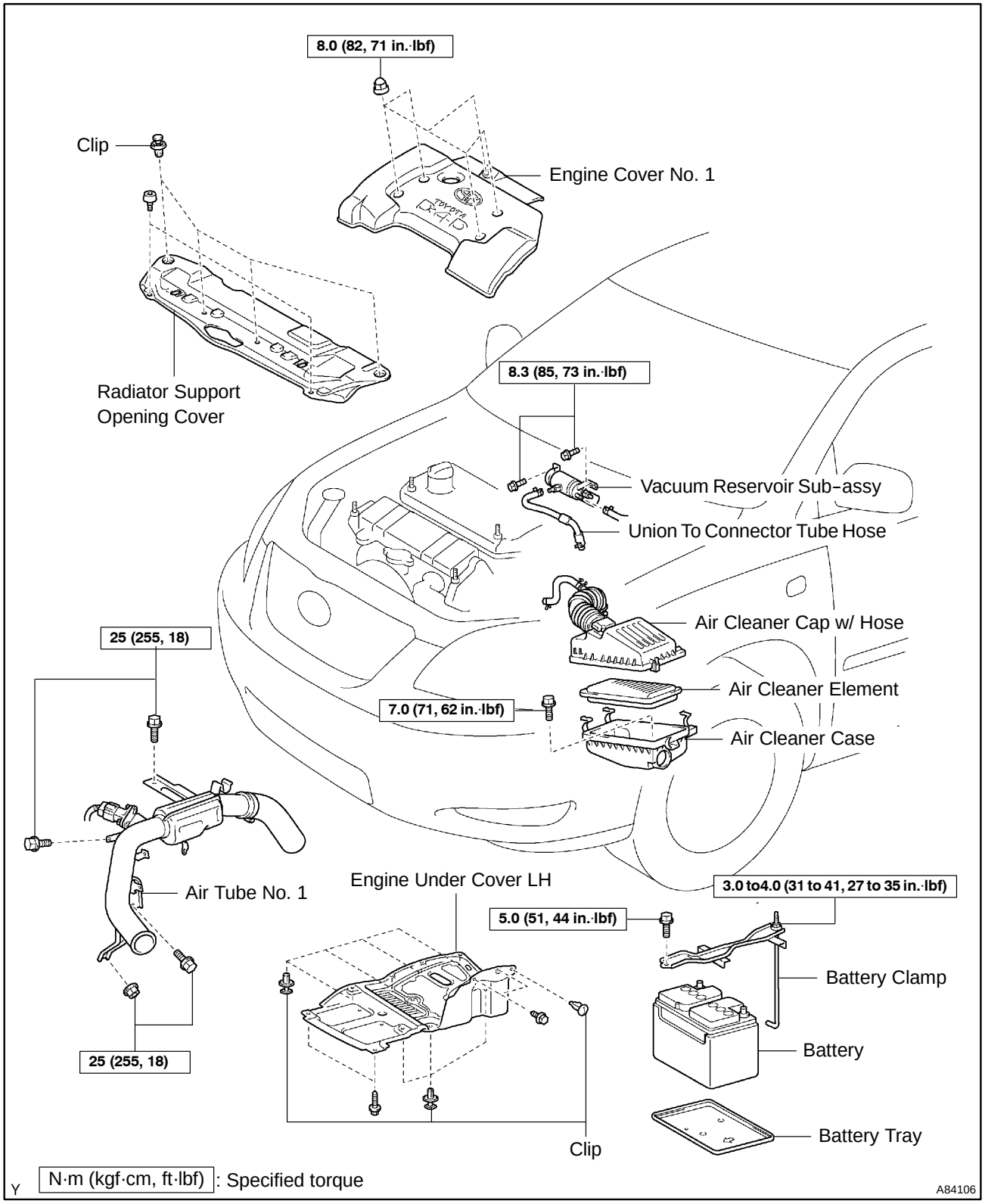
Approximately 80_C (176_F) 0.287 to 0.349 Ω

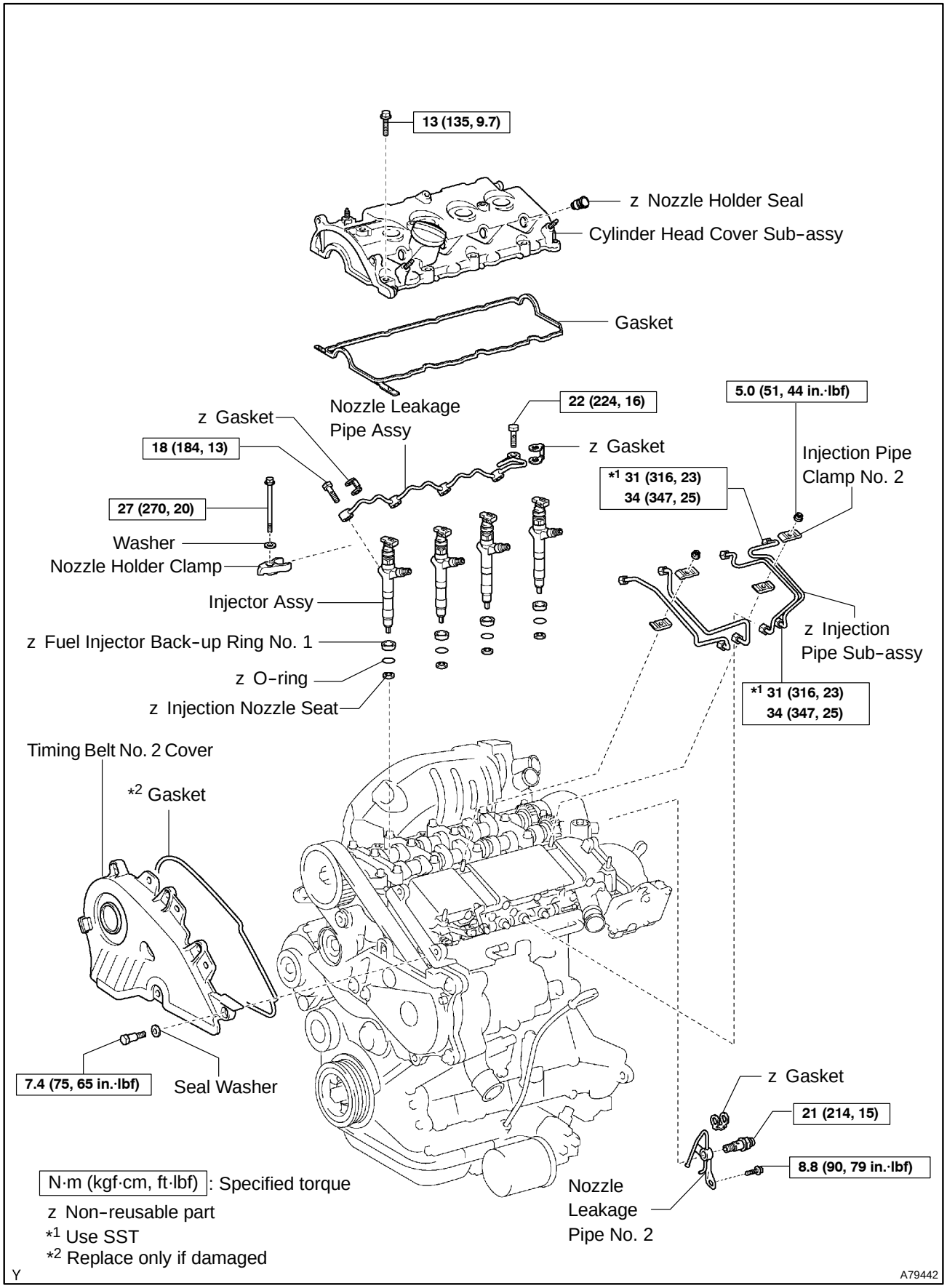
If the result is not as specified, replace the fuel temperature sensor.

INJECTOR ASSY (1CD-FTV) (May, 2003)

COMPONENTS

110WK-01




13 (135, 9.7)
z Nozzle Holder Seal
Cylinder Head Cover Sub-assy
Gasket
z Gasket
Nozzle Leakage Pipe Assy
22 (224, 16)
z Gasket
18 (184, 13)
5.0 (51, 44 in.·lbf)
Injection Pipe Clamp No. 2
*1 31 (316, 23)
34 (347, 25)
27 (270, 20)
Washer
Nozzle Holder Clamp
Injector Assy
z Fuel Injector Back-up Ring No. 1
z O-ring
z Injection Nozzle Seat
z Injection Pipe Sub-assy
*1 31 (316, 23)
34 (347, 25)
Timing Belt No. 2 Cover
*2 Gasket
7.4 (75, 65 in.·lbf)
Seal Washer
z Gasket
21 (214, 15)
8.8 (90, 79 in.·lbf)
Nozzle Leakage Pipe No. 2
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
*1 Use SST
*2 Replace only if damaged
Y
A79442

110WL-01

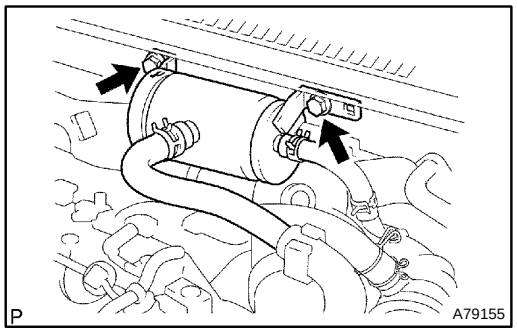
REPLACEMENT

NOTICE:

If an incorrect injector compensation code was registered with the ECM, it may rattle the engine assembly or the engine idling may become rough. In addition, it may become a cause of engine failure or shorten the life of the engine.

HINT:

- In order to optimize the injector's fuel injection characteristic, the ECM compensates the injection duration by each cylinder. The ECM stores and uses compensating data in the form of a 30-digit-alphanumeric value that is imprinted on the head portion of each injector as the injector compensation code.
- If you installed a new injector, its own injector compensation code is needed to register with the ECM. Also, if you replaced the ECM, the compensation codes of all the injectors are needed to register because the new ECM dose not have the codes until they are registered.
- Once the ECM is replaced, DTC P1601 will be present when turning the ignition switch ON. This is to inform you that the injector compensation codes are required to register with the ECM. In order to clear the DTC, register the compensation codes first, then turn the ignition switch OFF and wait for 30 seconds or more.



1. REMOVE VACUUM RESERVOIR SUB-ASSY

(a) Disconnect the 2 vacuum hoses and connector.

(b) Remove the 2 bolts and vacuum reservoir.

2. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)

3. REMOVE ENGINE COVER NO.1 (See page 14-5)

4. REMOVE AIR CLEANER ASSY

(a) Disconnect the connector.

(b) Remove the air cleaner cap together with the air cleaner hose.

(c) Remove the air cleaner filter element.

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

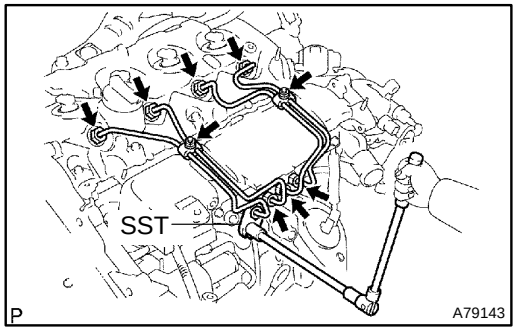
5. REMOVE BATTERY

6. REMOVE ENGINE UNDER COVER LH (See page 14-5)

7. REMOVE AIR TUBE NO.1 (See page 14-24)

8. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.



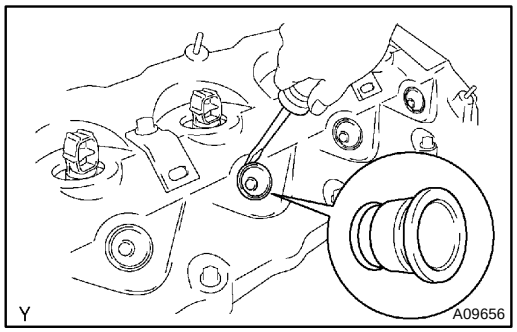
(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700
(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700
(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

9. REMOVE INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

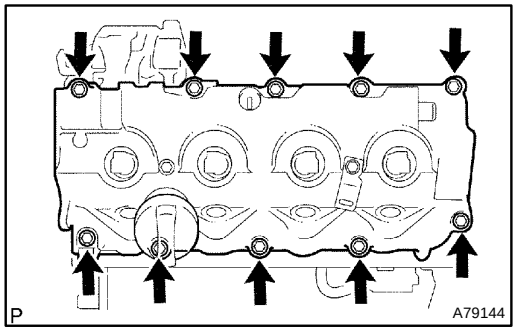
10. REMOVE INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

11. REMOVE INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

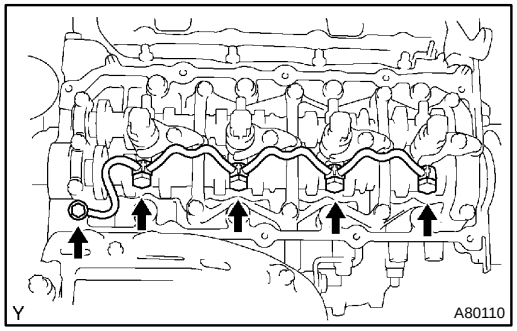
12. REMOVE TIMING BELT NO.2 COVER
(a) Remove the 7 bolts and 7 seal washers, then remove the timing belt cover.



13. REMOVE NOZZLE HOLDER SEAL
(a) Using a screwdriver, pry out the 4 nozzle holder seals.



14. REMOVE CYLINDER HEAD COVER SUB-ASSY
(a) Remove the 10 bolts and cylinder head cover.



15. REMOVE NOZZLE LEAKAGE PIPE ASSY

(a) Remove the union bolt and 4 hollow screws, then remove the nozzle leakage pipe and 5 gaskets.

NOTICE:

When removing the nozzle leakage pipe, place a shop rag under the pipe to protect the cylinder head from the fuel remaining inside the pipe.

16. REMOVE NOZZLE HOLDER CLAMP

(a) Remove the 4 bolts, 4 washers and 4 nozzle holder clamps.

17. REMOVE INJECTOR ASSY

HINT:

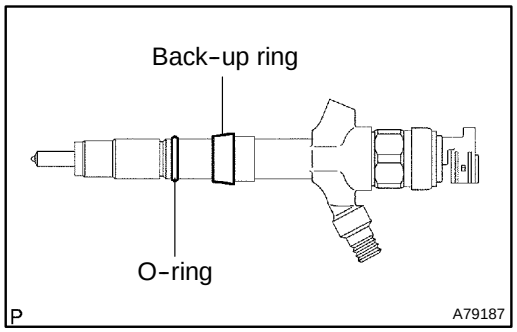
Each injector assembly has its own fuel injection characteristic. When replacing the injector assembly, store them in the correct order so that they can be returned to the original locations when reassembling.

(a) Remove the 4 injectors from the cylinder head.

(b) Remove the O-rings and back-up rings from each injector.

(c) Remove the 4 nozzle seats from the cylinder head.

18. REGISTRATION OF INJECTOR COMPENSATION CODE (REPLACEMENT OF THE NEW INJECTORS)(See page 05-30)



19. INSTALL INJECTOR ASSY

(a) Install the 4 new nozzle seats to the cylinder head.

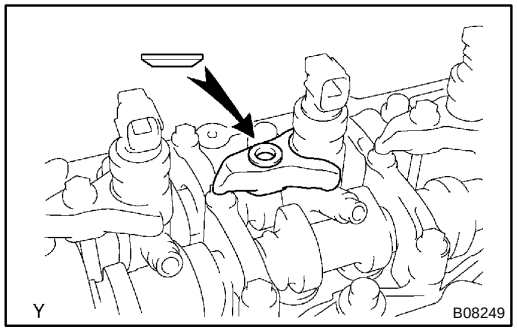
(b) Install new back-up rings and the O-rings to each injector.

(c) Apply a light coat of engine oil onto the O-rings on each injector.

(d) Install the injector to the cylinder head.

NOTICE:

Fit the injectors to the nozzle seat.



(e) Install the nozzle holder clamp as shown in the illustration. Tighten the camshaft bearing cap bolt by hand to fix the nozzle holder clamp.

NOTICE:

- **Pay attention to the mounting orientation of the washer.**
- **When temporarily attaching the nozzle holder clamp and mounting bolt, be careful not to orient them at an angle.**

HINT:

Apply a light coat of engine oil on the threads of the nozzle holder clamp bolts.

(f) Install the injection pipe No. 1, No. 2, No. 3 and No. 4, then tighten the nuts by hand.

(g) Install new 5 gaskets and the leakage pipe No. 1. Tighten the 4 hollow screws by hand.

(h) Tighten the 4 nozzle holder clamp bolts.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

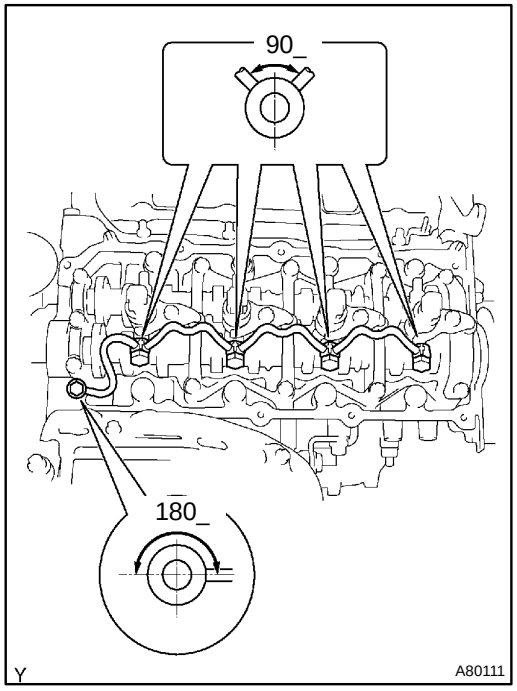
(i) Remove the 4 injection pipes.

20. INSTALL NOZZLE LEAKAGE PIPE ASSY

(a) Install the nozzle leakage pipe and 5 new gaskets.

NOTICE:

When installing the gaskets, pay attention to the mounting orientation. Install the gasket so that the joint portion of the gasket comes within the ranges shown in the illustration.



(b) Apply a light coat of oil onto the 4 hollow screws and union bolt.

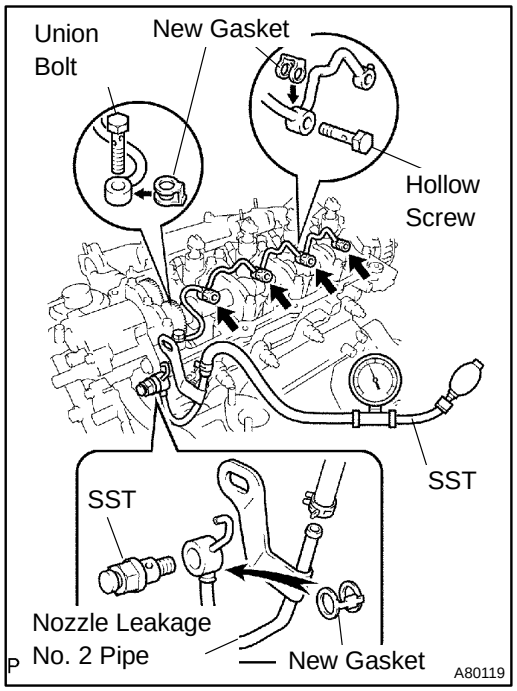
(c) Temporarily tighten the 4 hollow screws and union bolt by hand.

(d) Tighten the 4 hollow screws and union bolt to the specified torque.

Torque:

18 N·m (184 kgf·cm, 13 ft·lbf) for hollow screw

22 N·m (224 kgf·cm, 16 ft·lbf) for union bolt



(e) Check that there are no leaks from the nozzle leakage pipe connection.

(1) Disconnect the fuel hose, then remove the bolt, check valve, nozzle leakage No. 2 pipe and gasket.

(2) Install the bolt, nozzle leakage No. 2 pipe and gasket to the cylinder head with SST.

SST 09280-00010

Torque:

8.8 N·m (90 kgf·cm, 79 in.·lbf) for bolt

21 N·m (214 kgf·cm, 15 ft·lbf) for SST

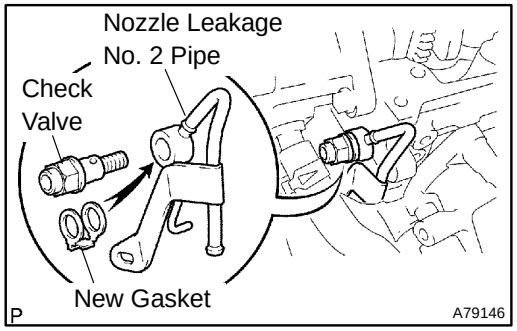
(3) Apply a light coat of soapy water (any fluid to detect fuel leakage) on the nozzle leakage pipe No. 2 connection.

(4) Using SST (turbocharger pressure gauge), attach SST to the fuel return side of the nozzle leakage No. 2 pipe. Then maintain 100 kPa (1.0 kgf/cm^2, 14.5 psi) of pressure for 60 seconds to check that there are no bubbles from the pipe connection.

SST 09992-00242

(5) After checking for fuel leaks, wipe off soapy water from the pipe connection.

(6) Remove 2 SSTs, then remove the bolt, nozzle leakage No. 2 pipe and gasket.

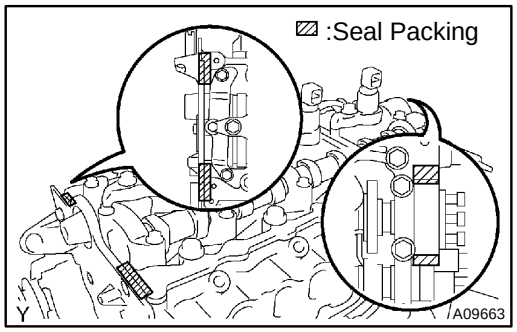


(7) Place a new gasket and reinstall the nozzle leakage No. 2 pipe together with the check valve and bolt.

Torque:
8.8 N·m (90 kgf·cm, 79 in.·lbf) for bolt
21 N·m (214 kgf·cm, 15 ft·lbf) for check valve

HINT:
Do not disassemble the check valve on the engine.

(8) Reconnect the fuel hose to the nozzle leakage No. 2 pipe.



21. INSTALL CYLINDER HEAD COVER SUB-ASSY

(a) Remove any old packing (FIPG) material.
(b) Apply the seal packing to the cylinder head.
Seal packing: Part No. 08826-00080 or equivalent
(c) Install the gasket to the cylinder head cover.
(d) Install the cylinder head cover with the 10 bolts.
Torque: 13 N·m (135 kgf·cm, 9.7 ft·lbf)

22. INSTALL NOZZLE HOLDER SEAL

(a) Install new 4 nozzle holder seals.

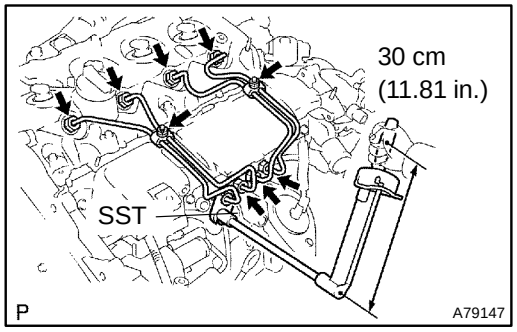
23. INSTALL TIMING BELT NO.2 COVER

24. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:

- **In case of having the injectors replaced, the injection pipes must be replaced, too.**
- **When assembling the pipes, perform the operation with the engine cold under room temperature.**

(a) Remove the vinyl or plastic bag from the injector, then remove the vinyl tape from the common rail.
(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.

25. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

26. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

27. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

28. INSTALL AIR TUBE NO.1(See page 14-24)

29. INSTALL BATTERY
Torque:
5.0 N m (51 kgf·cm, 44 in·lbf) for bolt
3.0 to 4.0 N m (34 to41 kgf·cm, 27 to 35 in·lbf) for nut

30. INSTALL AIR CLEANER ASSY
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

31. INSTALL ENGINE COVER NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

32. INSTALL VACUUM RESERVOIR SUB-ASSY
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

33. CHECK FOR FUEL LEAKS

NOTICE:
Under the ACTIVE TEST mode, the fuel pressure increases. Take precautions to prevent fuel from spraying on you or inside the engine compartment.

HINT:
During the ACTIVE TEST mode, engine speed goes higher and combustion noise becomes louder.

(a) Check that there are no fuel leaks from any part of the fuel system at the engine stop.

HINT:

If fuel leakage could be found on specific parts, replace them with new parts.

(b) While cranking or starting the engine, check that there are no leaks from any part of the fuel system.

HINT:

If fuel leakage could be found on specific parts, replace them with new parts.

(c) Disconnect the fuel hose from the common rail.

(d) While cranking the engine, check for fuel leaks from the return pipe.

HINT:

If there is fuel leakage, replace the common rail.

(e) Connect the hand-held tester to the DLC3.

(f) Start the engine, then push the hand-held tester main switch ON.

(g) Select the FUEL LEAK test of the ACTIVE TEST mode on the hand-held tester.

(h) If you do not have the hand-held tester, depress the accelerator pedal quickly and fully to increase the engine speed to its maximum and keep it for 2 seconds. Repeat this operation several times.

(i) Check that there are no leaks from any part of the fuel system.

NOTICE:

If the leakage from the return pipe is less than 10 cc (0.6 cu in.) in a minute, it is acceptable.

HINT:

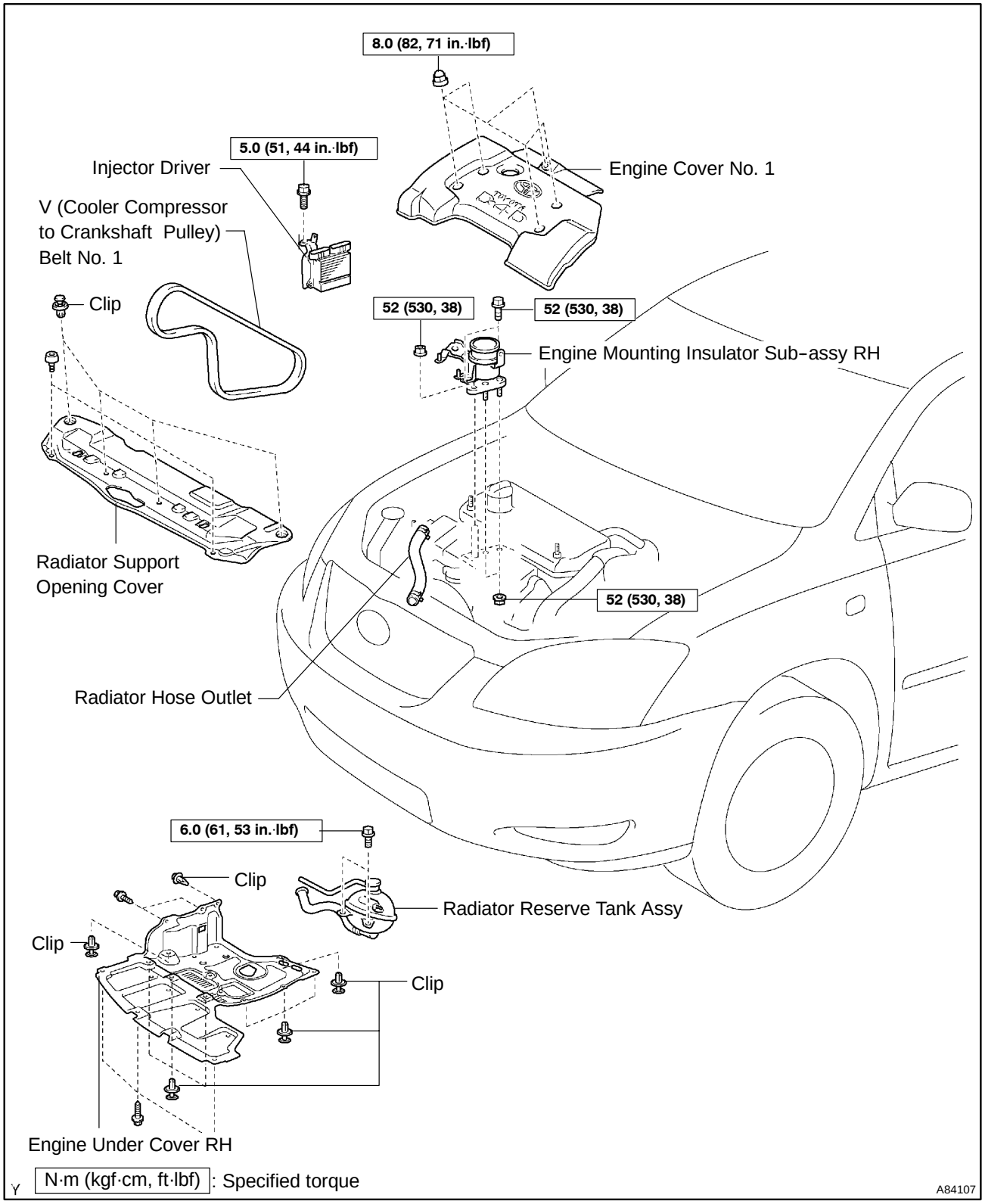
If fuel leakage could be found on specific parts, replace them with new parts.

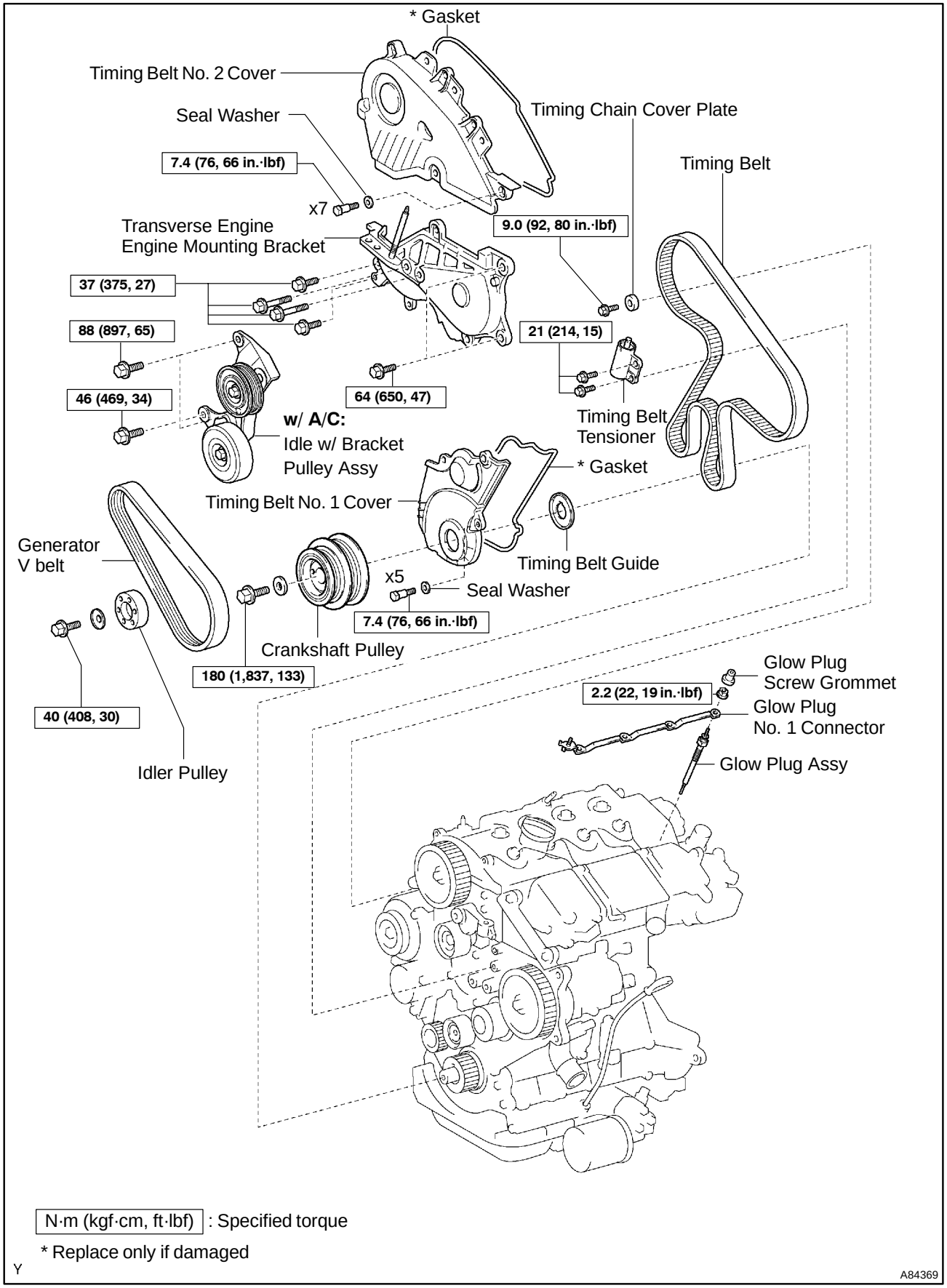
(j) Reconnect the fuel hose to the common rail.

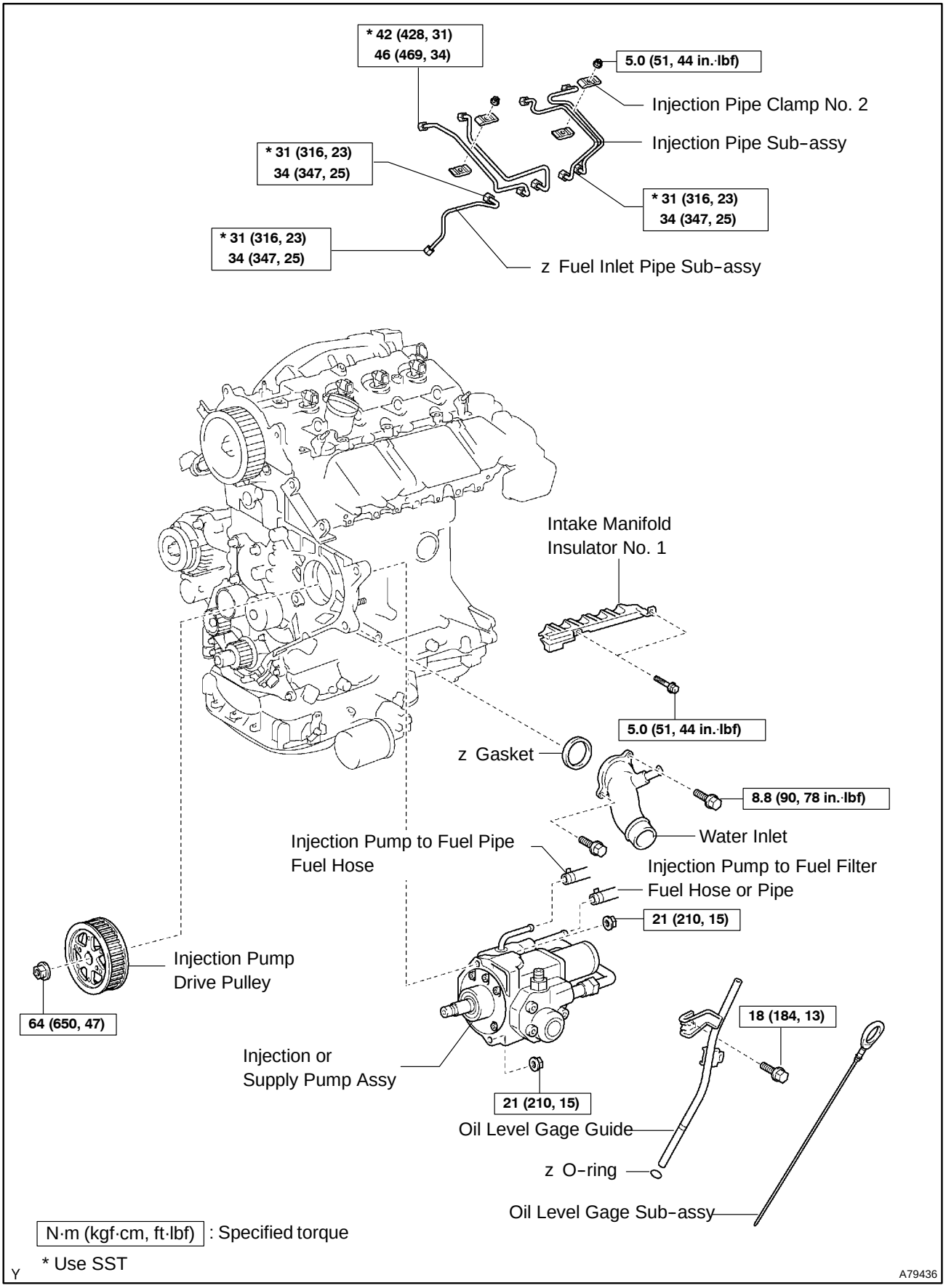
INJECTION OR SUPPLY PUMP ASSY (1CD-FTV) (May, 2003)

110WM-01

COMPONENTS




* Gasket
Timing Belt No. 2 Cover
Seal Washer
7.4 (76, 66 in.·lbf)
x7
Timing Chain Cover Plate
Timing Belt
9.0 (92, 80 in.·lbf)
Transverse Engine
Engine Mounting Bracket
37 (375, 27)
88 (897, 65)
46 (469, 34)
64 (650, 47)
21 (214, 15)
w/ A/C:
Idle w/ Bracket
Pulley Assy
Timing Belt
Tensioner
* Gasket
Timing Belt No. 1 Cover
Timing Belt Guide
Generator
V belt
x5
Seal Washer
7.4 (76, 66 in.·lbf)
Crankshaft Pulley
180 (1,837, 133)
40 (408, 30)
Idler Pulley
2.2 (22, 19 in.·lbf)
Glow Plug
Screw Grommet
Glow Plug
No. 1 Connector
Glow Plug Assy
N·m (kgf·cm, ft·lbf) : Specified torque
* Replace only if damaged
A84369


* 42 (428, 31)
46 (469, 34)
5.0 (51, 44 in.·lbf)
Injection Pipe Clamp No. 2
Injection Pipe Sub-assy
* 31 (316, 23)
34 (347, 25)
* 31 (316, 23)
34 (347, 25)
* 31 (316, 23)
34 (347, 25)
z Fuel Inlet Pipe Sub-assy
Intake Manifold
Insulator No. 1
5.0 (51, 44 in.·lbf)
z Gasket
8.8 (90, 78 in.·lbf)
Water Inlet
Injection Pump to Fuel Pipe
Fuel Hose
Injection Pump to Fuel Filter
Fuel Hose or Pipe
21 (210, 15)
Injection Pump
Drive Pulley
64 (650, 47)
Injection or
Supply Pump Assy
21 (210, 15)
18 (184, 13)
Oil Level Gage Guide
z O-ring
Oil Level Gage Sub-assy
N·m (kgf·cm, ft·lbf) : Specified torque
* Use SST
Y
A79436

110WN-01

REPLACEMENT

1. **REMOVE FRONT WHEEL RH**
2. **DRAIN ENGINE COOLANT(See page 16-3)**
3. **REMOVE ENGINE UNDER COVER RH (See page 14-5)**
4. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)**
5. **REMOVE ENGINE COVER NO.1 (See page 14-5)**
6. **REMOVE RADIATOR RESERVE TANK ASSY (See page 16-9)**
7. **DISCONNECT RADIATOR HOSE OUTLET**

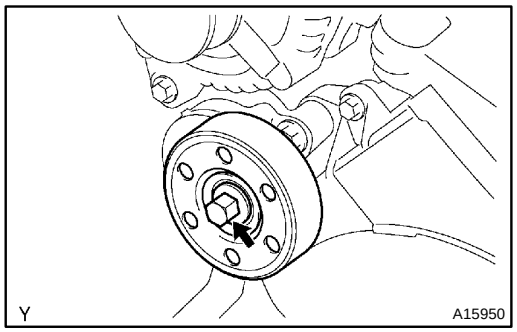
(a) Disconnect the radiator hose outlet from the water inlet.

8. **REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-4)**
9. **REMOVE GENERATOR V BELT (See page 14-4)**
10. **REMOVE INJECTOR DRIVER**

(a) Remove the 2 nuts which are used to secure the injector driver.
(b) Disconnect the injector driver connector and harness clamp.
(c) Remove the injector driver.

11. **REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING)(See page 14-24)**
12. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
13. **REMOVE CRANKSHAFT PULLEY (See page 14-47)**

SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)



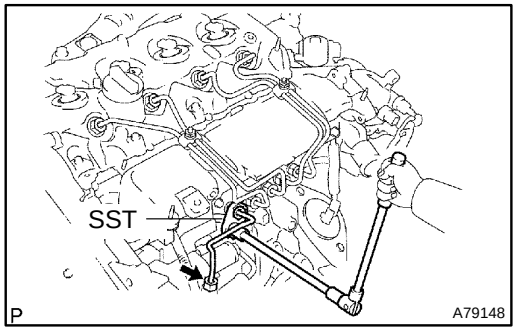
14. **REMOVE IDLER PULLEY SUB-ASSY**

(a) Remove the bolt and washer, then remove the idler pulley.

15. **REMOVE TIMING BELT NO.2 COVER (See page 14-47)**
16. **REMOVE TIMING BELT NO.1 COVER (See page 14-47)**
17. **REMOVE TIMING BELT GUIDE**
18. **REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET**

(a) Remove the 6 bolts and engine mounting bracket.

19. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)**
20. **REMOVE TIMING CHAIN COVER PLATE (See page 14-47)**
21. **REMOVE TIMING BELT (See page 14-47)**



22. REMOVE FUEL INLET PIPE SUB-ASSY

NOTICE:

After removing the fuel inlet pipe, cover the common rail and injection pump with vinyl tape to prevent dust from being introduced.

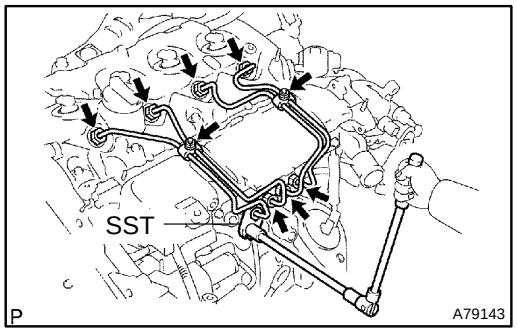
(a) Remove the wire bracket and slide the engine wire.

(b) Using SST, remove the fuel inlet pipe from the common rail.

SST 09023-12700

(c) Using SST, remove the fuel inlet pipe from the injection pump.

SST 09023-12700



23. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts, then remove the 2 upper infection pipe clamps from the intake manifold.

(b) Using SST, remove the injection pipe from the common rail side.

SST 09023-12700

(c) Using SST, remove the injection pipe from the injector side.

SST 09023-12700

(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

24. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

25. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

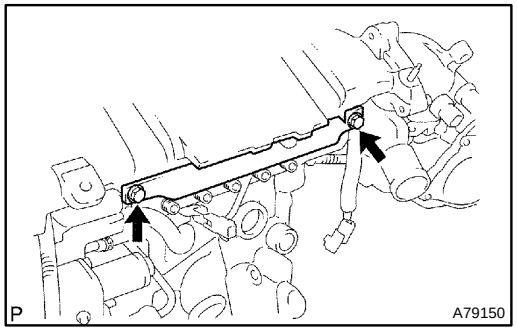
Perform the same procedures as injection pipe No. 1.

26. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.



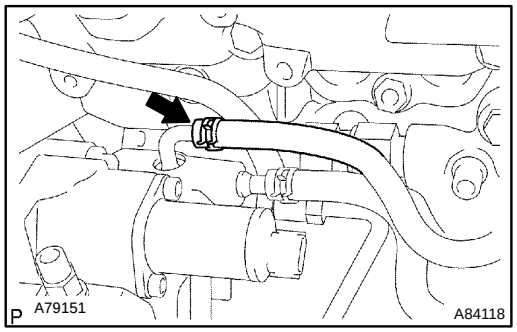
27. REMOVE INTAKE MANIFOLD INSULATOR NO.1

(a) Remove the 2 bolts and intake manifold insulator.

28. REMOVE OIL LEVEL GAGE SUB-ASSY

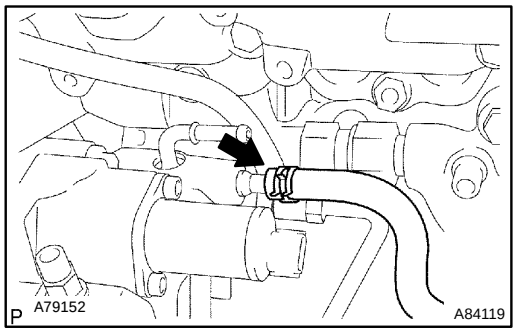
29. REMOVE OIL LEVEL GAGE GUIDE (See page 17-1)

30. REMOVE WATER INLET (See page 16-9)



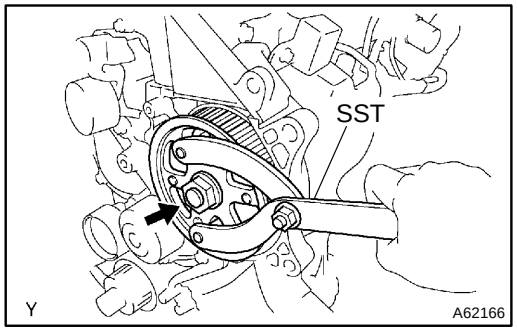
31. DISCONNECT INJECTION PUMP TO FUEL PIPE FUEL HOSE

(a) Disconnect the injection pump to fuel pipe fuel hose from the supply pump.



32. DISCONNECT INJECTION PUMP TO FUEL FILTER FUEL HOSE OR PIPE

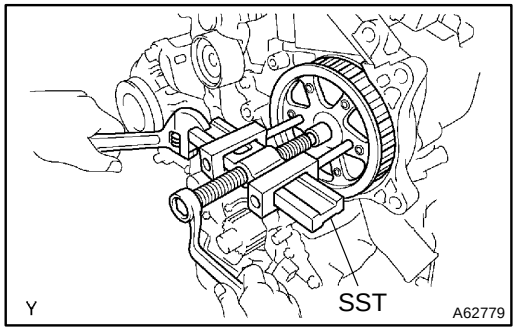
(a) Disconnect the injection pump to fuel filter fuel hose or pipe from the supply pump.



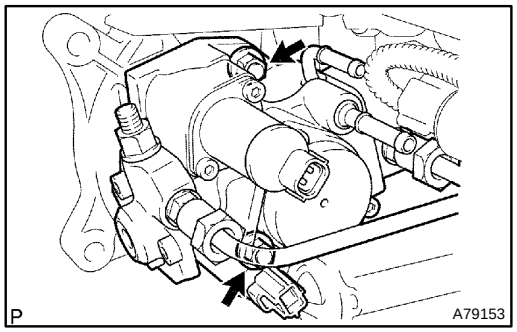
33. REMOVE INJECTION PUMP DRIVE PULLEY

(a) Using SST, remove the pulley nut.

SST 09960-10010 (09962-01000, 09963-01000)

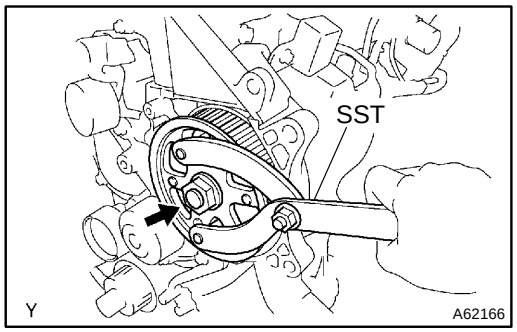


(b) Using SST, remove the injection pump drive pulley.
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)



34. REMOVE INJECTION OR SUPPLY PUMP ASSY

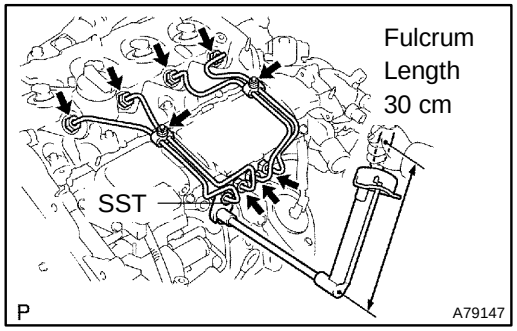
35. INSTALL INJECTION OR SUPPLY PUMP ASSY
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



36. INSTALL INJECTION PUMP DRIVE PULLEY
(a) Using SST, install the pulley nut.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

37. INSTALL WATER INLET (See page 16-9)
38. INSTALL OIL LEVEL GAGE GUIDE (See page 17-1)
39. INSTALL INTAKE MANIFOLD INSULATOR NO.1
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

40. INSTALL INJECTION PIPE SUB-ASSY NO.1
NOTICE:
When assembling the pipes, perform the operation with the engine cold under room temperature.
(a) Remove the vinyl or the plastic bag from the injector and vinyl tape from the common rail.
(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail side.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

41. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

42. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

43. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700

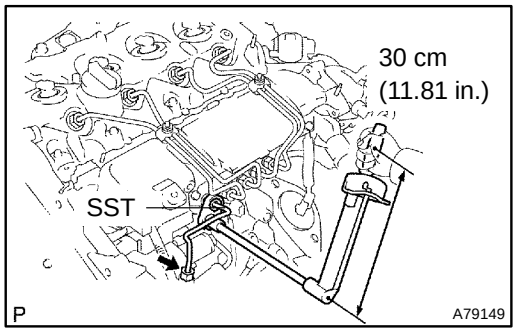
HINT:
Perform the same procedures as injection pipe No. 1.

44. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

- **In case of having the injection pump replaced, the fuel inlet pipe must be replaced, too.**
- **When assembling the pipe, perform the operation with the engine cold under room temperature.**

(a) Temporarily install the fuel inlet pipe.



(b) Using SST, tighten the nut of the fuel inlet pipe to the common rail side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(c) Using SST, tighten the nut of the fuel inlet pipe to the injection pump side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

45. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)

SST 09960-10010 (09962-01000, 09963-01000)

46. INSTALL TIMING BELT (See page 14-47)

47. CHECK VALVE TIMING (See page 14-47)

48. INSTALL TIMING CHAIN COVER PLATE (See page 14-47)

49. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

Torque:

37 N·m (375 kgf·cm, 27 ft·lbf) for 14 mm head bolt

64 N·m (650 kgf·cm, 47 ft·lbf) for 17 mm head bolt

50. INSTALL TIMING BELT GUIDE (See page 14-47)

51. INSTALL TIMING BELT NO.1 COVER (See page 14-47)

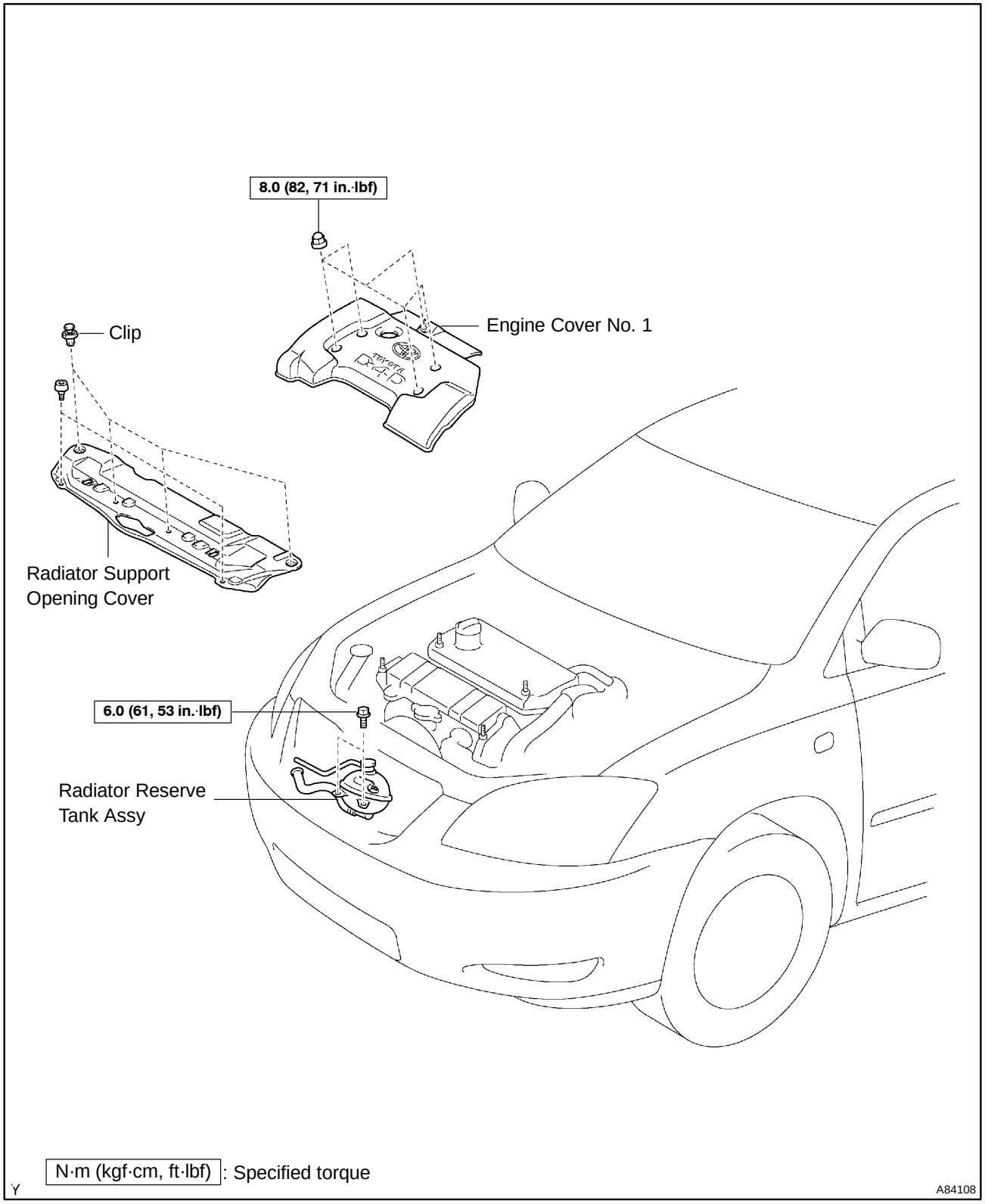
52. INSTALL TIMING BELT NO.2 COVER (See page 14-47)

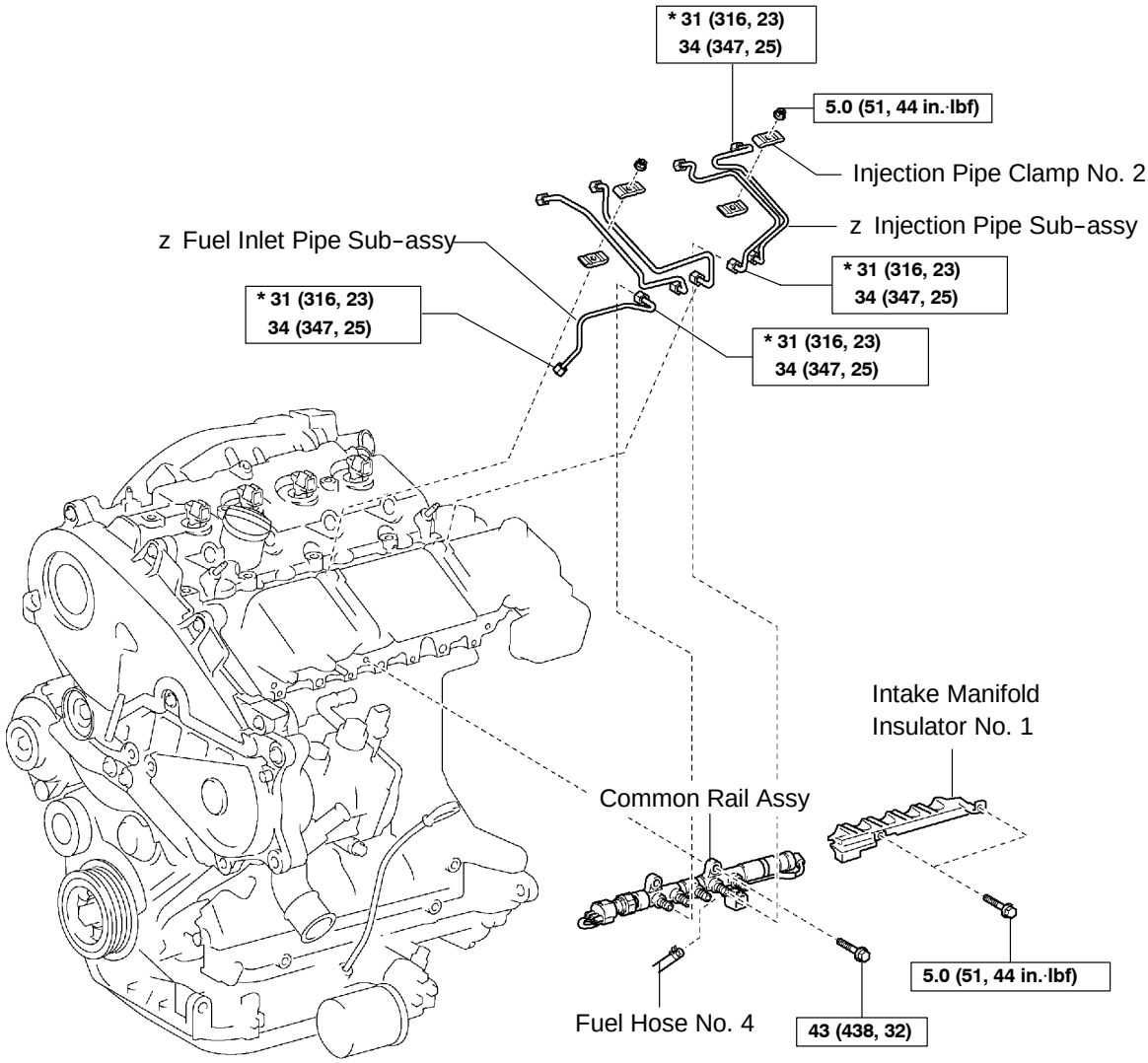
53. INSTALL IDLER PULLEY SUB-ASSY
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)
54. INSTALL CRANKSHAFT PULLEY (See page 14-47)
SST 09213-54015 (90105-08076), 09330-00021
55. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)
56. INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING)(See page 14-24)
57. INSTALL INJECTOR DRIVER
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
58. ADJUST GENERATOR V BELT (See page 14-4)
59. INSTALL RADIATOR RESERVE TANK ASSY (See page 16-9)
60. INSTALL ENGINE COVER NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
61. INSTALL FRONT WHEEL RH
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
62. ADD ENGINE COOLANT (See page 16-3)
63. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1)
64. CHECK FOR FUEL LEAKS (See page 11-5)

COMMON RAIL ASSY (1CD-FTV) (May, 2003)

COMPONENTS

110WO-01





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

z Non-reusable part

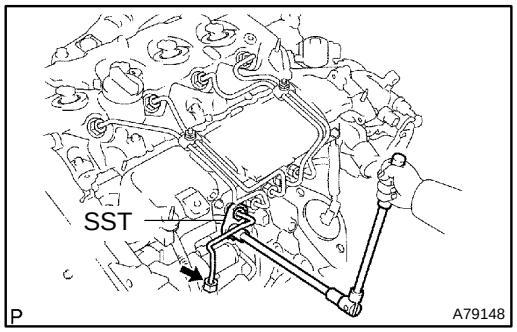
* Use SST

Y

A79438

REPLACEMENT

1. DRAIN ENGINE COOLANT (See page 16-3)
2. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)
3. REMOVE ENGINE COVER NO.1 (See page 14-5)
4. REMOVE RADIATOR RESERVE TANK ASSY (See page 16-9)



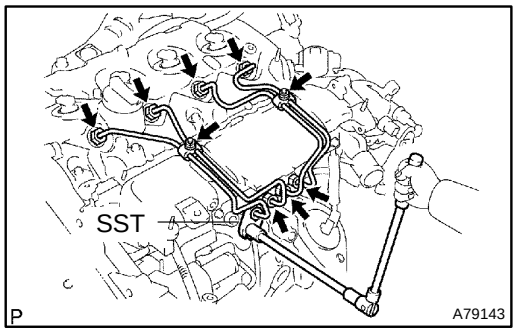
5. REMOVE FUEL INLET PIPE SUB-ASSY

NOTICE:

After removing the fuel inlet pipe, cover the common rail and injection pump with vinyl tape to prevent dust from being introduced.

(a) Using SST, remove the fuel inlet pipe from the common rail.
SST 09023-12700

(b) Using SST, remove the fuel inlet pipe from the injection pump.
SST 09023-12700



6. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.

(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700

(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700

(d) After removing the fuel pipe,in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

7. REMOVE INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

8. REMOVE INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

9. REMOVE INJECTION PIPE SUB-ASSY NO.4

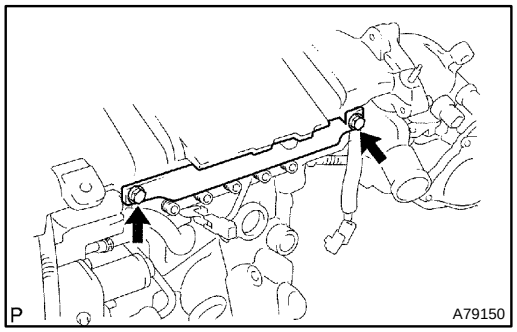
SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

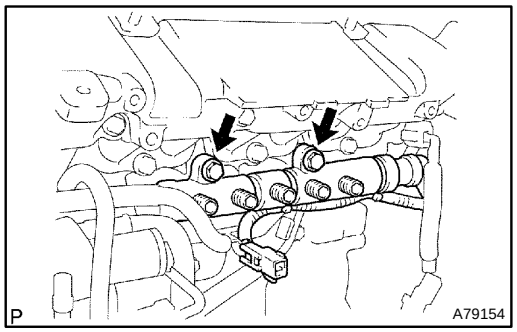
10. DISCONNECT FUEL HOSE NO.4

(a) Disconnect the fuel hose from the common rail.



11. REMOVE INTAKE MANIFOLD INSULATOR NO.1

(a) Remove the 2 bolts and intake manifold insulator.



12. REMOVE COMMON RAIL ASSY

(a) Disconnect the engine wire connector from the bracket.

(b) Remove the 2 bolts and common rail.

13. INSTALL COMMON RAIL ASSY

Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

14. INSTALL INTAKE MANIFOLD INSULATOR NO.1

Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

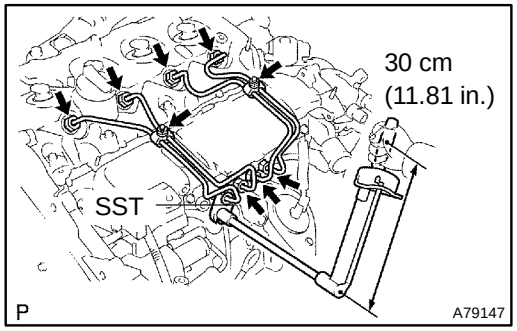
15. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:

- **In case of having the common rail replaced, the injection pipes must be replaced, too.**
- **When assembling the pipes, perform the operation with the engine cold under room temperature.**

(a) Remove the vinyl or plastic bag from the injector and vinyl tape from the common rail.

(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail side.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

16. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700

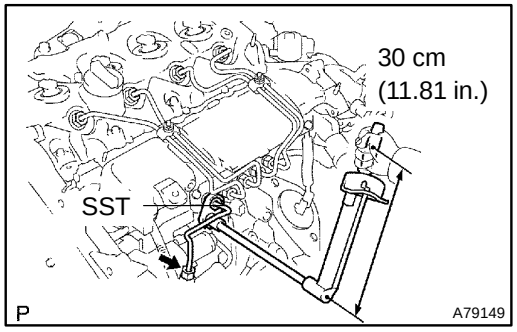
HINT:
Perform the same procedures as injection pipe No. 1.

17. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

18. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.



19. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

- **In case of having the common rail replaced, fuel inlet pipe must be replaced, too.**
- **When assembling the pipe, perform the operation with the engine cold under room temperature.**

(a) Temporarily install the fuel inlet pipe.

(b) Using SST, tighten the nut of the fuel inlet pipe to the common rail side.

SST 09023-12700

Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(c) Using SST, tighten the nut of the fuel inlet pipe to the injection pump side.

SST 09023-12700

Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

20. INSTALL RADIATOR RESERVE TANK ASSY (See page 16-9)

21. INSTALL ENGINE COVER NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

22. ADD ENGINE COOLANT (See page 16-3)

23. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1)

24. CHECK FOR FUEL LEAKS (See page 11-5)

FUEL FILTER ASSY (1CD-FTV) (May, 2003)

110WQ-01

REPLACEMENT

1. REMOVE AIR CLEANER ASSY

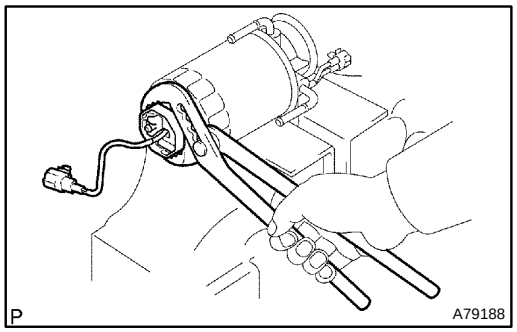
(a) Disconnect the connector.
(b) Remove the air cleaner cap together with the air cleaner hose.
(c) Remove the air cleaner filter element.
(d) Remove the 3 bolts and air cleaner case.

2. REMOVE FUEL FILTER ASSY

(a) Disconnect the 2 fuel hose from the fuel filter. (STD or COLD)
(b) Disconnect the 3 fuel hose from the fuel filter. (W/ ADDITIONAL HEATER)
(c) Disconnect the 2 connectors.
(d) Remove the 2 bolts and fuel filter.

3. DRAIN FUEL

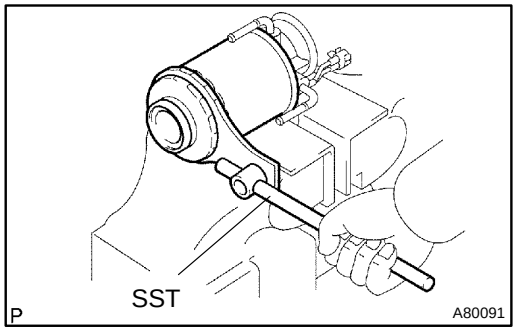
(a) Loosen the drain plug, then drain the fuel from the fuel filter.



4. REMOVE LEVEL WARNING SWITCH

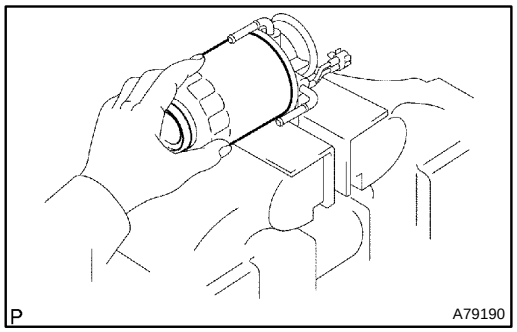
(a) Clamp the fuel filter in a soft jaw vise.
(b) Using pliers, remove the level warning switch.

NOTICE:
Be careful not to damage the level warning switch.



5. REMOVE FUEL FILTER ELEMENT

(a) Using SST, remove the fuel filter element.
SST 09228-64030



6. INSTALL FUEL FILTER ELEMENT

(a) Check and clean the fuel filter installation surface.
(b) Apply fuel to a 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.

7. INSTALL LEVEL WARNING SWITCH

(a) Install a new O-ring to the level warning switch.

(b) Apply fuel to the O-ring of the level warning switch.

(c) Install the level warning switch to the fuel filter by hand.

8. INSTALL FUEL FILTER ASSY

Torque: 18 N·m (178 kgf·cm, 13 ft·lbf)

9. INSTALL AIR CLEANER ASSY

Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

10. CHECK FOR FUEL LEAKS (See page 11-5)

EMISSION CONTROL

EGR SYSTEM (1CD-FTV) (May, 2003) 12-1
ON-VEHICLE INSPECTION 12-1
INSPECTION 12-2

REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

EGR SYSTEM (1CD-FTV) (May, 2003)

120AW-01

ON-VEHICLE INSPECTION

HINT:

In a malfunction where the EGR system is always on, black or white smoke may be emitted from the exhaust pipe. If this occurs, inspect the EGR system as well.

1. INSPECT SEATING OF EGR VALVE

(a) Start the engine, then check that it starts and runs at idle.

2. INSPECT HOT ENGINE CONDITION (WHEN USING HAND-HELD TESTER)

(a) Warm up the engine.

(b) Turn the ignition switch OFF.

(c) Connect the hand-held tester to the DLC3.

(d) Start the engine, then run it at idle.

(e) Push the "ON" button of the hand-held tester.

(f) To confirm the following information in the DATA LIST, select "DIAGNOSIS / OBD / MOBD / ACTIVE TEST / EGR STEP POS / ALL" on the hand-held tester.

(g) Warm up the engine, the coolant temperature should be above 75_C (109_F) and below 90_C (194_F).

(h) Check the MAF reading with the engine idling.

Result: MAF reading is between 4 g/s and 16 g/s.

(i) Operate the EGR valve with the hand-held tester. Regulate the valve opening angle to 0_, then check the MAF reading.

Result: MAF reading is between 10 g/s and 16 g/s.

If the AFM reading is out of range in either (h) or (i), replace the EGR valve.

If the AFM is out of range in both (h) and (i), replace the air flow sensor (air cleaner) , then check the EGR valve operation again.

3. INSPECT HOT ENGINE CONDITION (WHEN NOT USING HAND-HELD TESTER)

(a) Install the vacuum gauge.

(1) Using a 3-way connector, connect a vacuum gauge to the hose between the intake manifold and turbo pressure sensor.

(b) Warm up the engine, the coolant temperature should be above 75_C (109_F) and below 90_C (194_F).

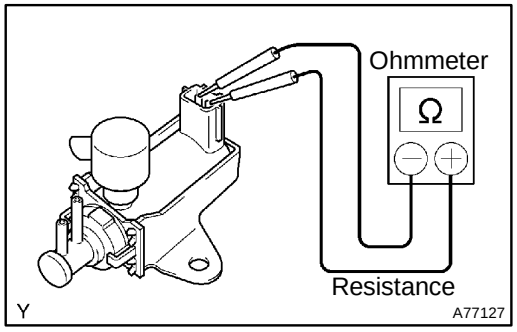
(c) Check that the vacuum gauge indicates higher than 2.5 kPa (19 mmHg 0.7 in Hg).

(d) Stop the engine with the ignition switch OFF, then remove the EGR valve connector.

(e) Restart the engine, then check that the load under idling is lower than 2.5 kPa (19 mmHg 0.7 in Hg).

If the load pressure exceeds the above value, replace the EGR valve.

INSPECTION



1. INSPECT VACUUM REGULATING VALVE ASSY

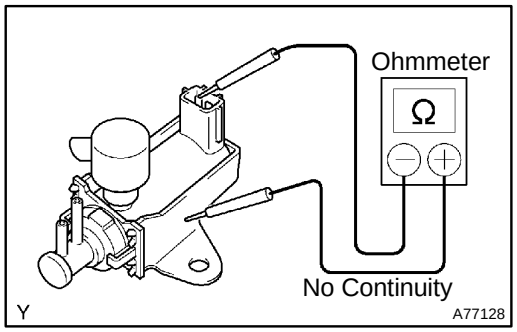
(a) Inspect the vacuum regulating valve for open circuit.

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

Resistance:

10 to 14 Ω at 20˚C (68˚F)

If the result is not as specified, replace the vacuum regulating valve.

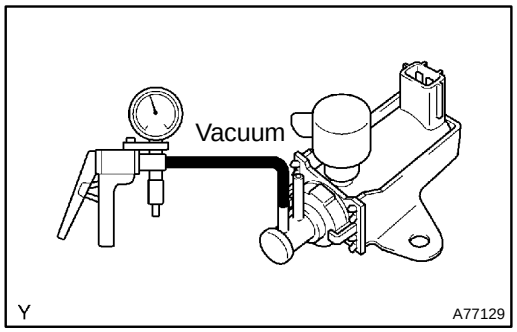


(b) Inspect the vacuum regulating valve for ground.

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

Specified condition : No continuity

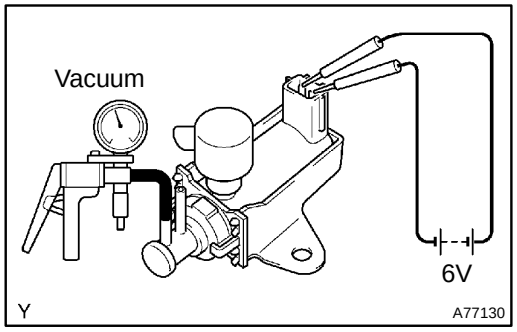
If the result is not as specified, replace the vacuum regulating valve.



(c) Inspect the vacuum regulating valve for air tightness.

(1) Apply vacuum to the vacuum output port. Check that the needle of the vacuum pump indicates an increase of 66.7 kPa (500 mmHg, 19.7 in.Hg) or more.

If the air tightness is not as specified, replace the vacuum regulating valve.

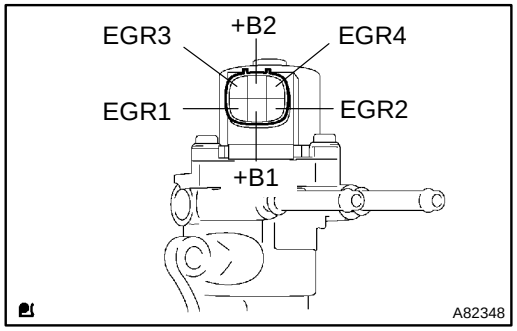


(d) Inspect the vacuum regulating valve operation.

(1) Apply about 4 dry batteries of 1.5V in series.

(2) Check that the needle does not move when vacuum is applied to the vacuum outlet port.

If operation is not as specified, replace the vacuum regulating valve.



2. INSPECT EGR VALVE ASSY

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

Terminal	Resistance at 20 ˚C (68 ˚F)
5 (+B1) - 6 (EGR1)	19.6 ± 1.4 Ω
5 (+B1) - 4 (EGR2)	19.6 ± 1.4 Ω
2 (+B2) - 3 (EGR3)	19.6 ± 1.4 Ω
2 (+B2) - 1 (EGR4)	19.6 ± 1.4 Ω

If the result is not as specified, replace the EGR valve assembly.

INTAKE

TURBO CHARGER SYSTEM
(1CD-FTV) (May, 2003) 13-1
PRECAUTION 13-1
ON-VEHICLE INSPECTION 13-3
TURBOCHARGER SUB-ASSY
(1CD-FTV) (May, 2003) 13-5
COMPONENTS 13-5
REPLACEMENT 13-8
INTERCOOLER ASSY
(1CD-FTV) (May, 2003) 13-15
REPLACEMENT 13-15

REFER TO FOLLOWING REPAIR MANUALS:

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

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

TURBO CHARGER SYSTEM (1CD-FTV) (May, 2003)

PRECAUTION

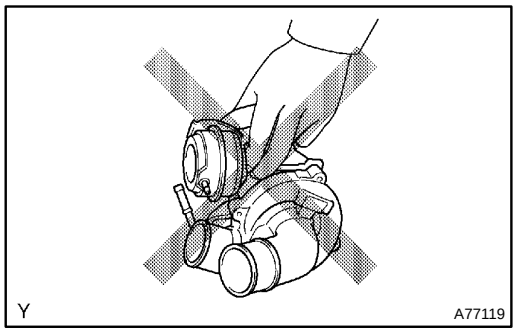
1307E-01

1. MAINTENANCE PRECAUTION

(a) Do not stop the engine immediately after pulling a trailer, or after driving at a high speed, or uphill drive. Keep the engine idle for 20 to 120 seconds before turning the ignition switch OFF (Depending on the driving condition, the idling time varies).

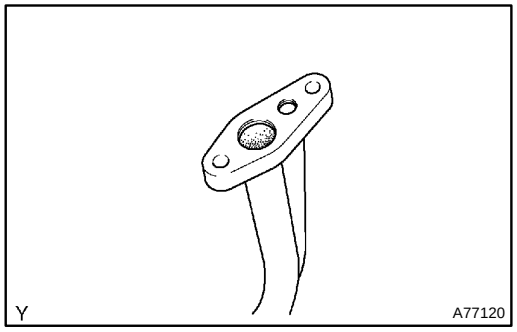
(b) Avoid quick acceleration or quickly accelerating the engine rpm immediately after the starting the cold engine.

(c) If the turbocharger is found defective, it must be replaced. Also, inspect a source of the trouble including conditions of the turbocharger that has been used. Repair or replace the followings 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, or do not give shock, or do not grasp easily-deformed assembly parts such as the actuator or push rod when removing and reinstalling.

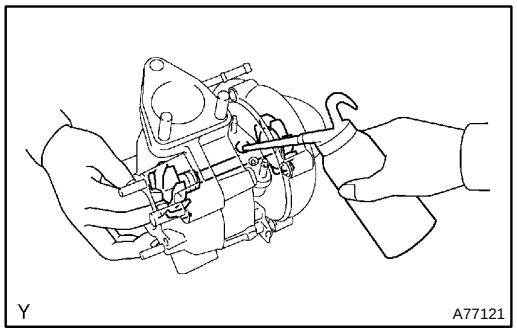
(e) Before removal, cover both the intake and exhaust ports and oil inlet to prevent dirt or foreign objects from being introduced.



(f) If replacing the turbocharger, check for deposits in the oil pipe. If necessary, replace the oil pipe, too.

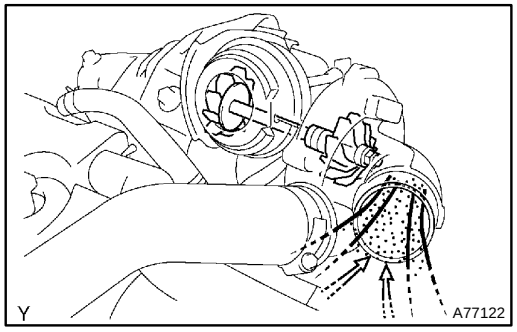
(g) Thoroughly remove the old gasket sticking to the lubrication oil pipe flange and turbocharger oil flange.

(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, then crank the engine for 30 seconds to feed oil throughout the engine. Run the engine at idle for 60 seconds.



(k) Since the turbine wheels run at an extremely high speed, if the engine runs without the air cleaner, case cover and hose, damage to the turbine wheel will result from introduced foreign particles.

1307F-01

ON-VEHICLE INSPECTION

1. INSPECT INTAKE AIR SYSTEM

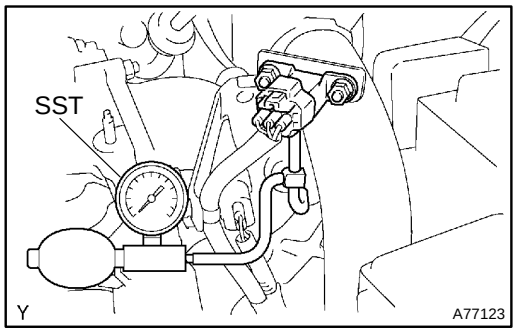
(a) Check for leakage or clogging between the air cleaner housing and turbocharger inlet and between the turbocharger outlet and cylinder head.

Condition	Operation
Clogged air cleaner	Clean or replace the element
Collapsed or deformed hoses	Repair or replace
Leakage from connections	Check each connection and repair
Cracks 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 material in passages	Remove
Leakage from components	Repair or replace
Cracks 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).

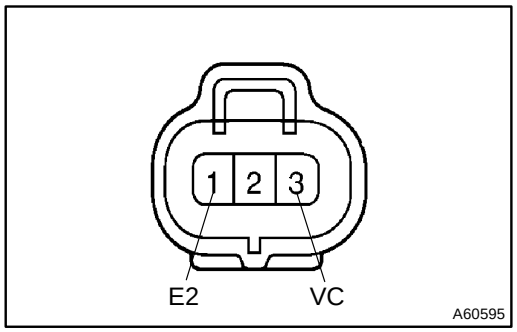
Standard pressure:

15 to 45 kPa (0.15 to 0.46 kgf/cm^2, 2.2 to 6.5 psi)

If the pressure is less than the specification, check both the intake air and exhaust systems for leakage.

If there is no leakage, check if the actuator hose is disconnected. If not, check the turbocharger.

If the pressure is greater than the specification, check if the actuator hose is disconnected or cracked. If not, check the turbocharger.



4. INSPECT TURBO PRESSURE SENSOR

(a) Inspect the power source voltage.

(1) Disconnect the turbo pressure sensor connector.

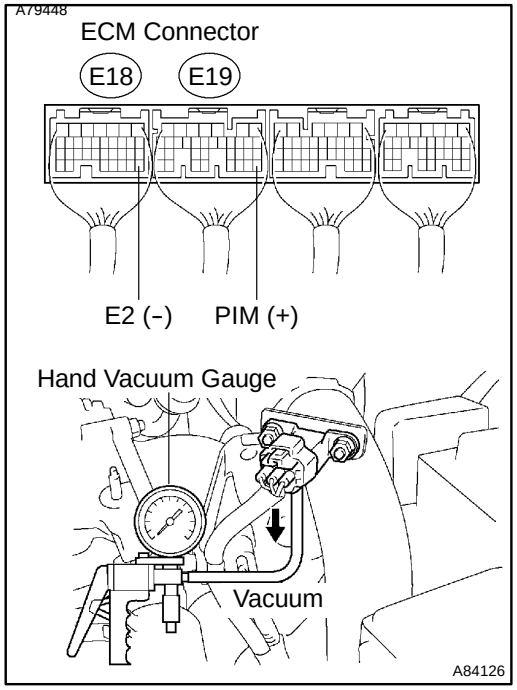
(2) Turn the ignition switch ON.

(3) Using a voltmeter, measure the voltage between connector terminals 3 (VC) and 1 (E2) of the wiring harness side.

Voltage: 4.5 to 5.5 V

If the result is not as specified, check that the wiring and ECM.

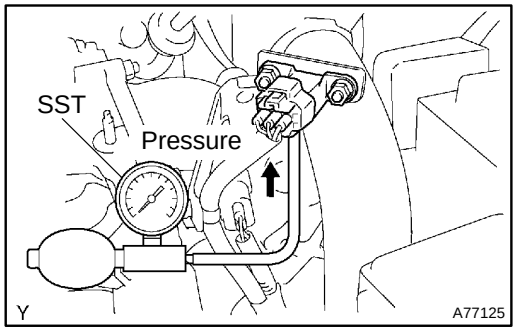
(4) Turn the ignition switch OFF.
(5) Reconnect the turbo pressure sensor connector.



(b) Inspect the supply power.
(1) Turn the ignition switch ON.
(2) Disconnect the vacuum hose from the turbo pressure sensor.
(3) Connect a voltmeter to terminals 35 (PIM) and 28 (E2) of the ECM, then measure the output voltage under atmospheric pressure.
(4) Apply vacuum to the turbo pressure sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.96 in.Hg).
(5) Measure the voltage decrease from step (3) above for each segment.

Voltage drop:

Apply Vacuum [kPa (mmHg, in.Hg)]	Voltage Decrease [V]
13.3 (100, 3.94)	0.1 to 0.3
26.7 (200, 7.87)	0.3 to 0.5
40.0 (300, 11.81)	0.5 to 0.7
57.3 (400, 15.75)	0.7 to 0.9
66.7 (500, 19.96)	0.9 to 1.0



(6) Using SST (turbocharger pressure gauge), apply pressure to the turbo pressure sensor in 19.6 kPa (0.20 kgf/cm^2, 2.84 psi) segments to 98.0 kPa (1.00 kgf/cm^2, 14.2 psi).

SST 09992-00242

(7) Measure the voltage increase from step (3) above for each segment.

Voltage up:

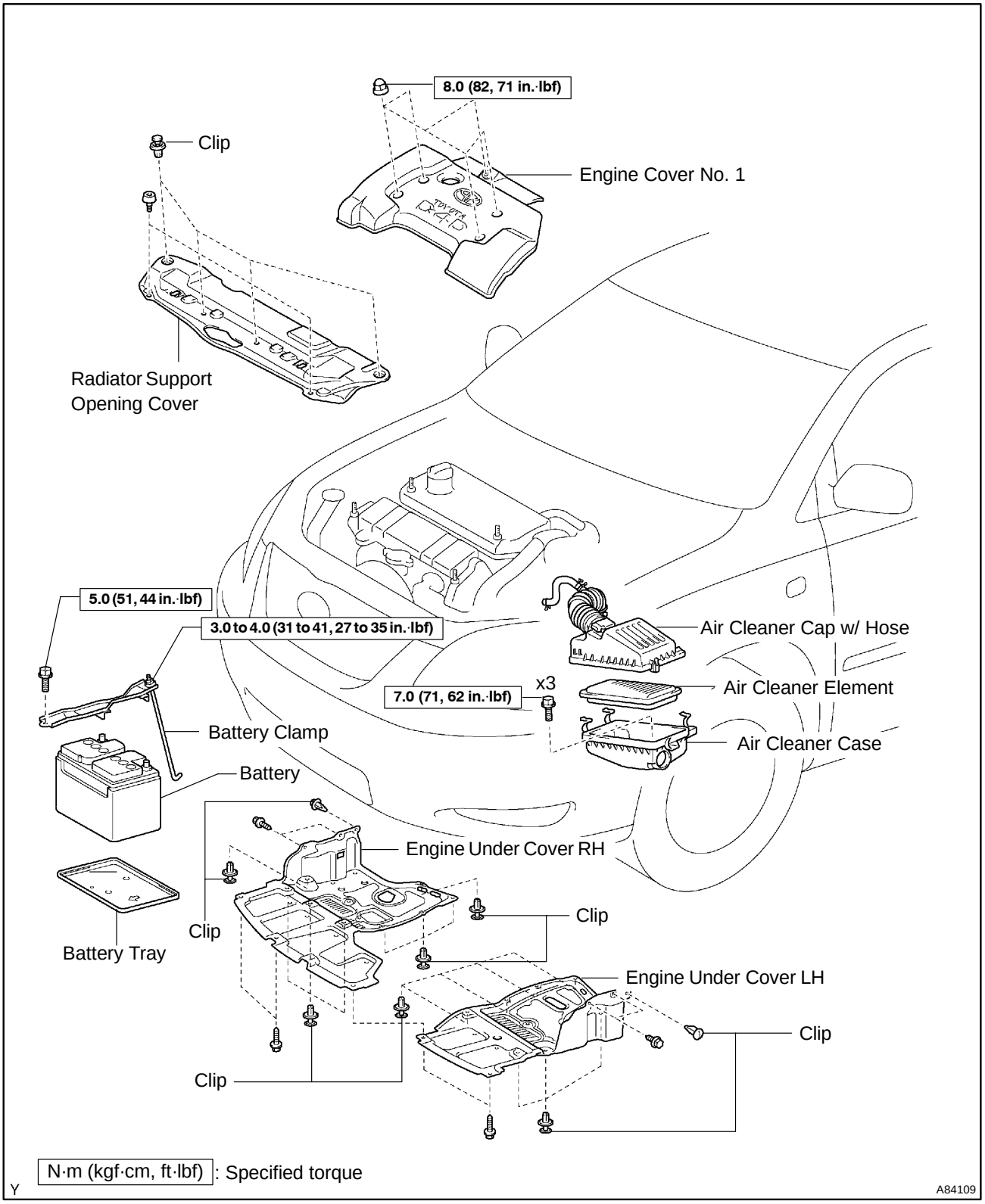
Applied Pressure [kPa (kgf/cm^2, psi)]	Voltage Increase [V]
19.6 (0.20, 2.84)	0.1 to 0.4
39.2 (0.40, 5.69)	0.4 to 0.7
58.8 (0.60, 8.53)	0.7 to 1.0
78.5 (0.80, 11.4)	1.0 to 1.3
98.0 (1.00, 14.2)	1.3 to 1.6

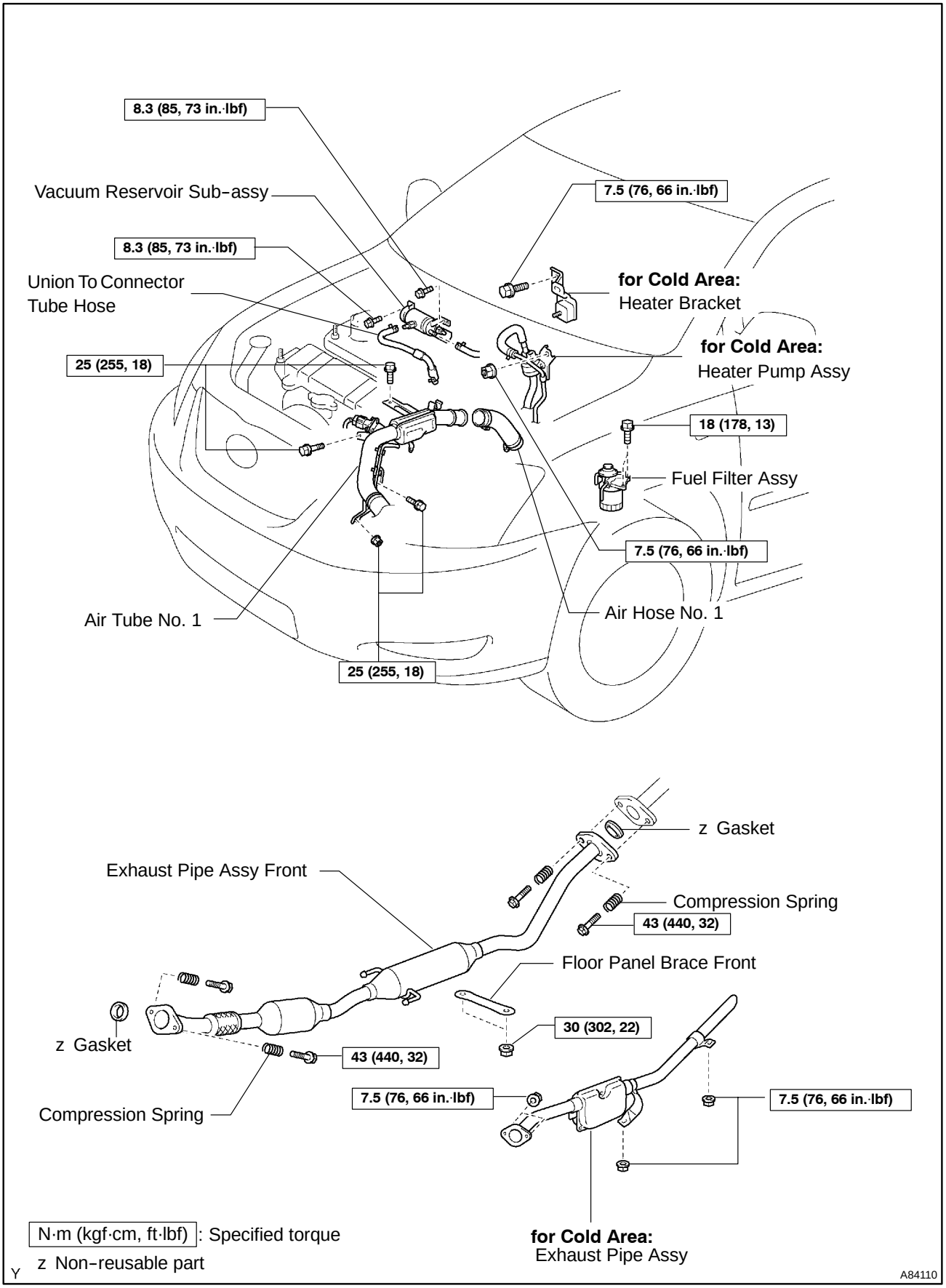
If the result is not as specified, check that the wiring and ECM.

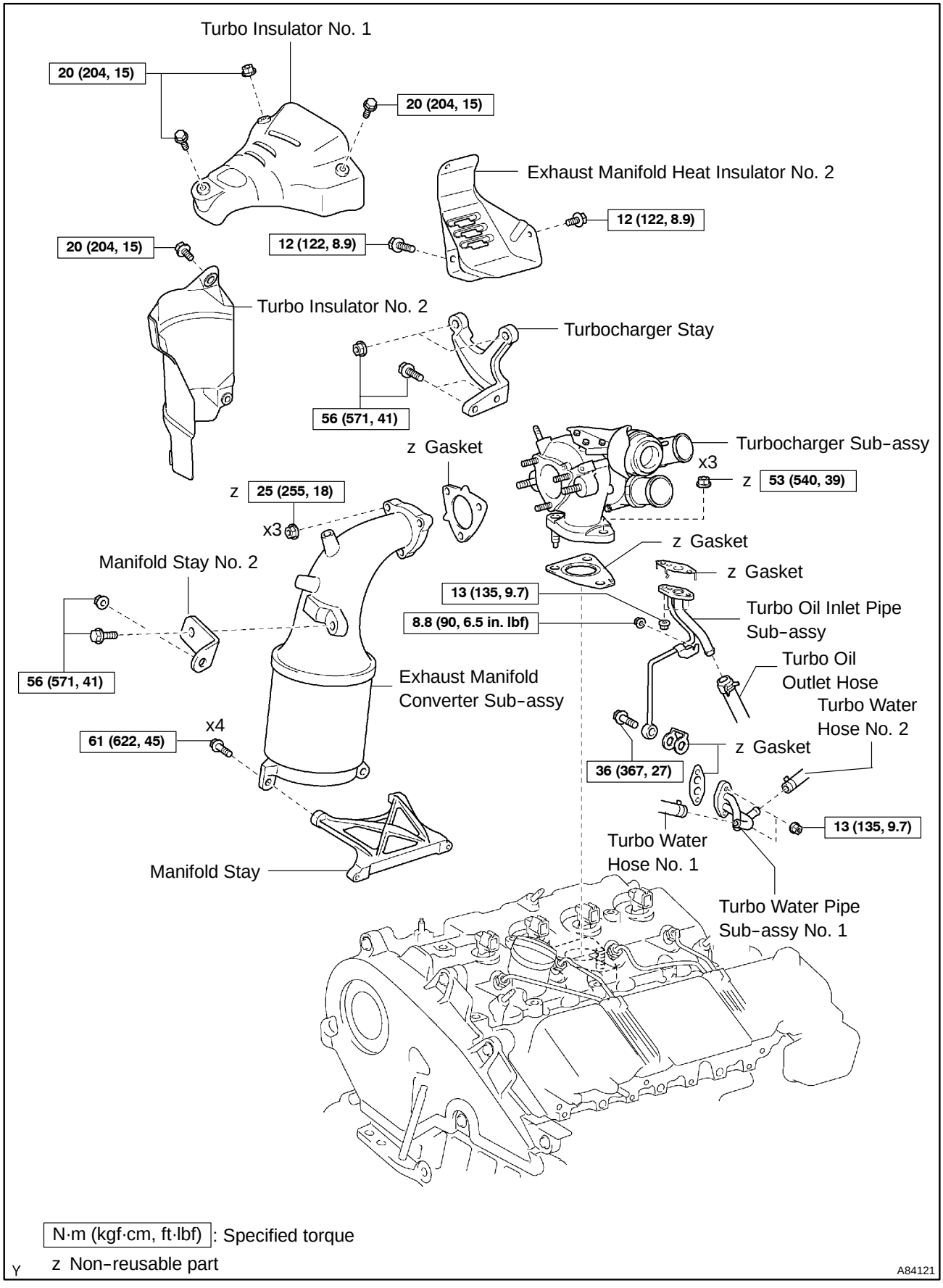
TURBOCHARGER SUB-ASSY (1CD-FTV) (May, 2003)

1307G-01

COMPONENTS

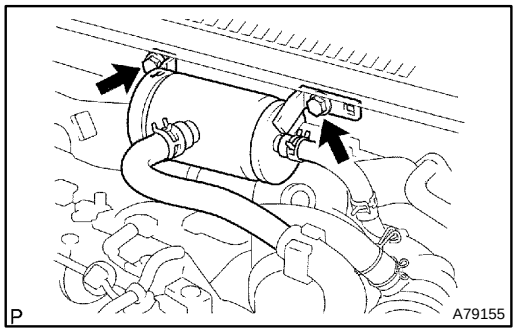


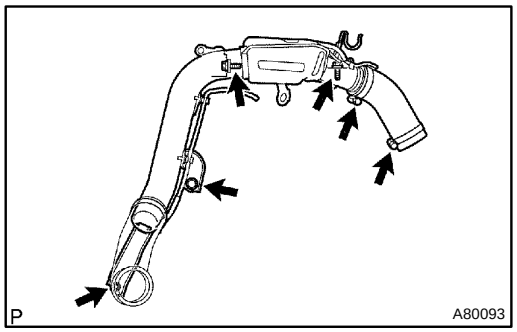

8.3 (85, 73 in.·lbf)
Vacuum Reservoir Sub-assy
8.3 (85, 73 in.·lbf)
Union To Connector Tube Hose
25 (255, 18)
Air Tube No. 1
25 (255, 18)
7.5 (76, 66 in.·lbf)
for Cold Area:
Heater Bracket
for Cold Area:
Heater Pump Assy
18 (178, 13)
Fuel Filter Assy
7.5 (76, 66 in.·lbf)
Air Hose No. 1
z Gasket
Exhaust Pipe Assy Front
Compression Spring
43 (440, 32)
Floor Panel Brace Front
30 (302, 22)
z Gasket
43 (440, 32)
7.5 (76, 66 in.·lbf)
7.5 (76, 66 in.·lbf)
Compression Spring
for Cold Area:
Exhaust Pipe Assy
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
Y
A84110


Turbo Insulator No. 1
20 (204, 15)
20 (204, 15)
Exhaust Manifold Heat Insulator No. 2
12 (122, 8.9)
12 (122, 8.9)
20 (204, 15)
Turbo Insulator No. 2
Turbocharger Stay
56 (571, 41)
z Gasket
Turbocharger Sub-assy
x3
z 53 (540, 39)
z 25 (255, 18)
x3
z Gasket
Manifold Stay No. 2
z Gasket
13 (135, 9.7)
8.8 (90, 6.5 in. lbf)
Turbo Oil Inlet Pipe Sub-assy
Turbo Oil Outlet Hose
Turbo Water Hose No. 2
56 (571, 41)
Exhaust Manifold Converter Sub-assy
x4
61 (622, 45)
z Gasket
36 (367, 27)
13 (135, 9.7)
Turbo Water Hose No. 1
Manifold Stay
Turbo Water Pipe Sub-assy No. 1
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
A84121

REPLACEMENT

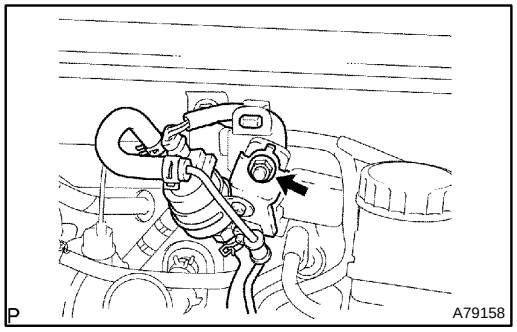
1. REMOVE ENGINE UNDER COVER LH (See page 14-5)
2. REMOVE ENGINE UNDER COVER RH (See page 14-5)
3. DRAIN ENGINE COOLANT (See page 16-3)
4. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)
5. REMOVE ENGINE COVER NO.1 (See page 14-5)



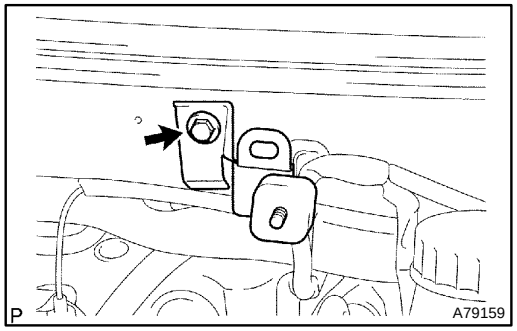


6. REMOVE VACUUM RESERVOIR SUB-ASSY
(a) Disconnect the 2 vacuum hoses and connector.
(b) Remove the 2 bolts and vacuum reservoir.
7. REMOVE BATTERY
8. REMOVE AIR CLEANER ASSY
(a) Disconnect the PCV hose and connector.
(b) Remove the air cleaner cap together with the air cleaner hose.
(c) Remove the air cleaner filter element.
(d) Remove the 3 bolts and air cleaner case.
9. REMOVE INTERCOOLER AIR HOSE
(a) Remove the 3 bolts and nut, then separate the air tube No. 1.
(b) Loosen the 2 hose clamp bolts, then remove the air hose No. 1.

10. REMOVE FUEL FILTER ASSY (See page 11-28)



11. SEPARATE HEATER PUMP ASSY (W/ COLD AREA)
(a) Remove the nut, then disconnect the connector.
(b) Separate the heater pump.



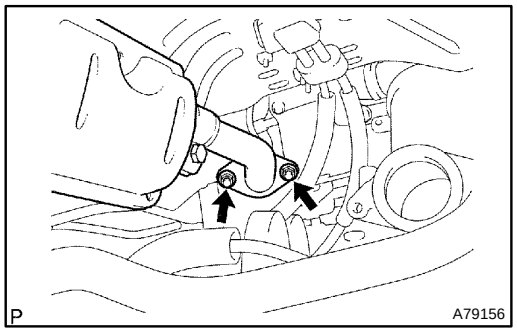
12. REMOVE BRACKET, HEATER (W/ COLD AREA)

(a) Remove the bolt and heater bracket.

13. REMOVE FLOOR PANEL BRACE FRONT

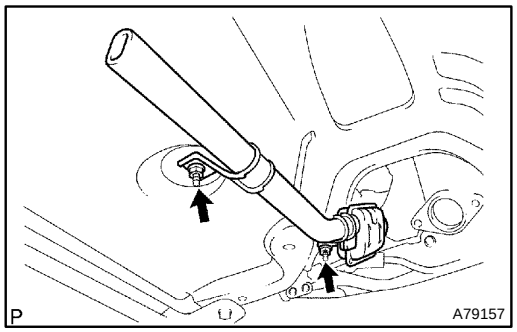
(a) Remove the 2 nuts and floor panel brace front.

14. REMOVE EXHAUST PIPE ASSY FRONT (See Pub No. RM925E2 on page 15-8)

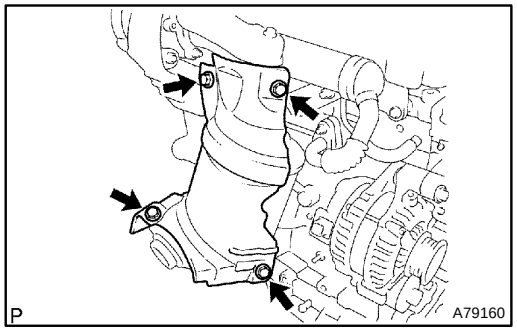


15. REMOVE EXHAUST PIPE ASSY (W/ COLD AREA)

(a) Remove the 2 nuts.

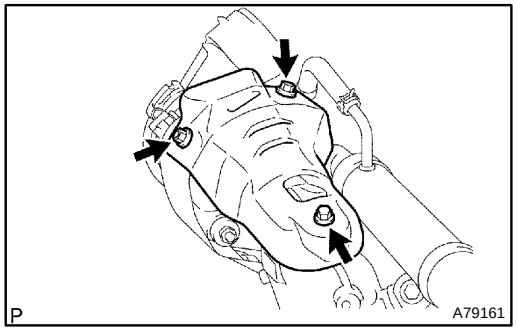


(b) Remove the 2 nuts and exhaust pipe sub-assembly.



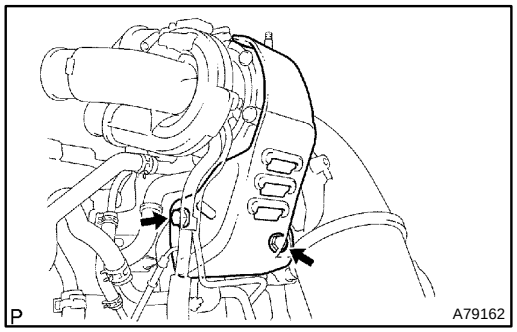
16. REMOVE TURBO INSULATOR NO.2

(a) Remove the 4 bolts and turbo insulator.



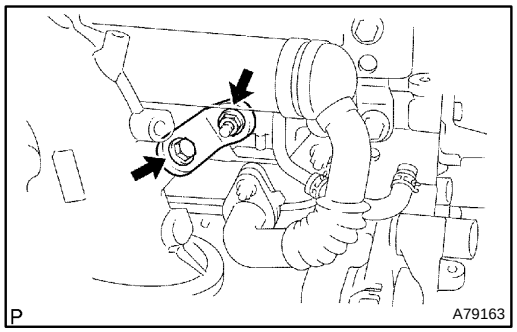
17. REMOVE TURBO INSULATOR NO.1

(a) Remove the 2 bolts and nut, then remove the turbo insulator.



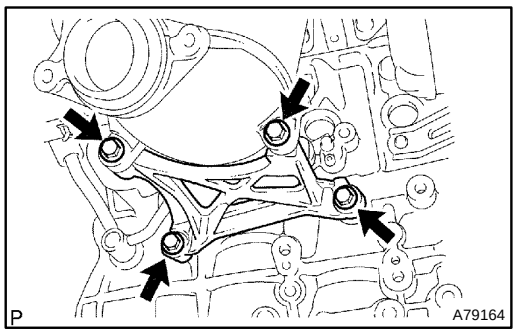
18. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.2

(a) Remove the 2 bolts and exhaust manifold heat insulator.



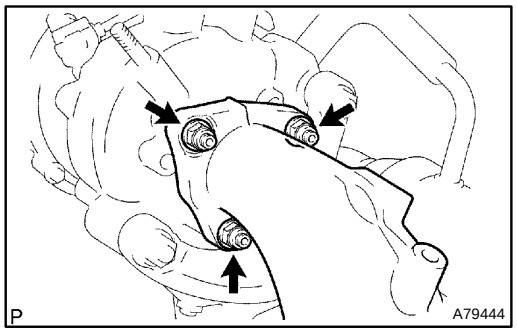
19. REMOVE MANIFOLD STAY NO.2

(a) Remove the bolt and nut, then remove the manifold stay.



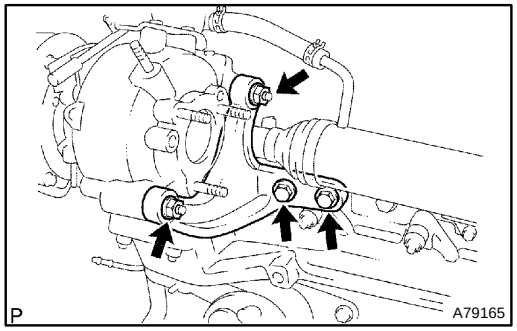
20. REMOVE MANIFOLD STAY

(a) Remove the 4 bolts and manifold stay.



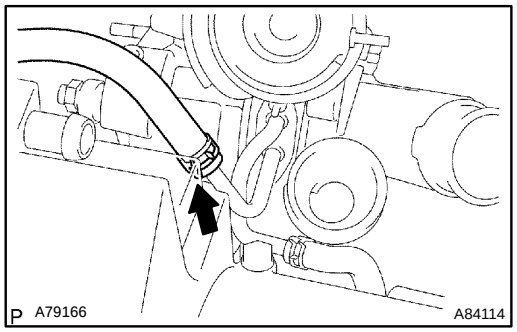
21. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY

(a) Remove the 3 nuts, manifold converter and gasket.

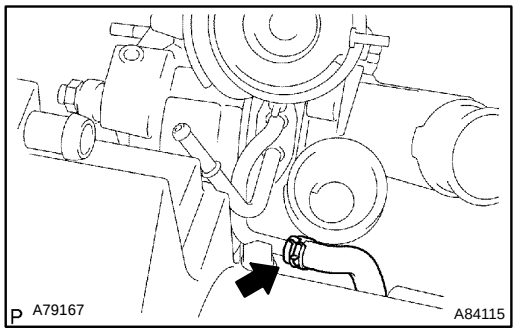


22. REMOVE TURBOCHARGER STAY

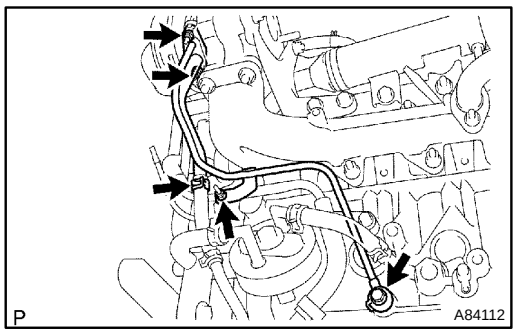
(a) Remove the 2 bolts and 2 nuts, then remove the turbocharger stay.



23. DISCONNECT TURBO WATER HOSE NO.1



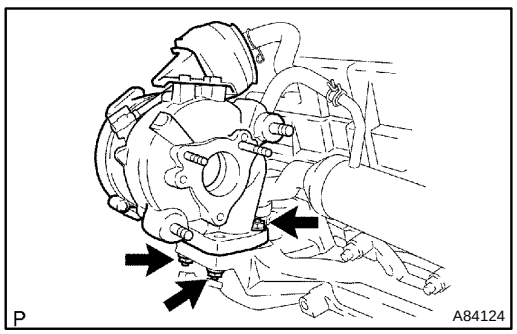
24. DISCONNECT TURBO WATER HOSE NO.2



25. REMOVE TURBO OIL INLET PIPE SUB-ASSY

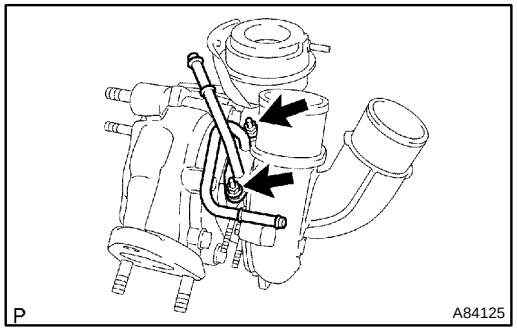
(a) Disconnect the turbo oil outlet hose.

(b) Remove the bolt and 3 nuts, turbo oil inlet pipe and gasket.



26. REMOVE TURBOCHARGER SUB-ASSY

(a) Remove the 3 nuts, turbocharger and gasket.



27. REMOVE TURBO WATER PIPE SUB-ASSY NO.1

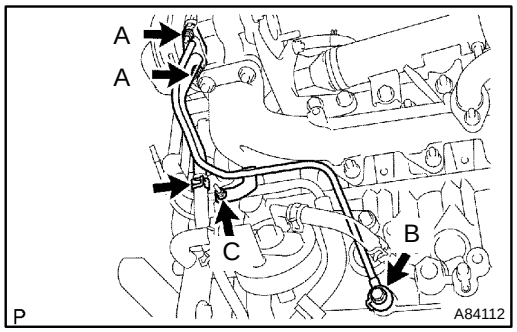
(a) Remove the 2 nuts, turbo water pipe and gasket.

28. INSTALL TURBO WATER PIPE SUB-ASSY NO.1

(a) Install a new gasket and turbo water pipe with the 2 nuts.
Torque: 13 N·m (135 kgf·cm, 9.7 ft·lbf)

29. INSTALL TURBOCHARGER SUB-ASSY

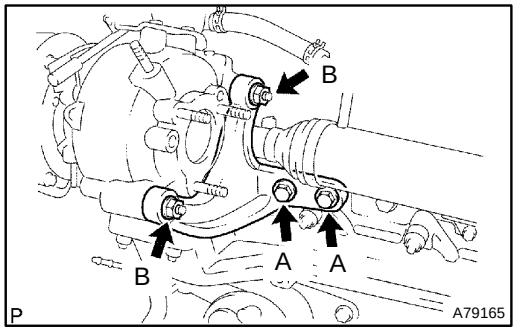
(a) Install a new gasket and turbocharger with the new 3 nuts.
Torque: 53 N·m (540 kgf·cm, 39 ft·lbf)



30. INSTALL TURBO OIL INLET PIPE SUB-ASSY

(a) Install a new gasket and the oil pipe with the bolt and 3 nuts.
Torque:
13 N·m (135 kgf·cm, 9.7 ft·lbf) for nut A
36 N·m (367 kgf·cm, 27 ft·lbf) for bolt B
8.8 N·m (90 kgf·cm, 6.5 in.·lbf) for nut C

(b) Connect the turbo oil outlet hose.



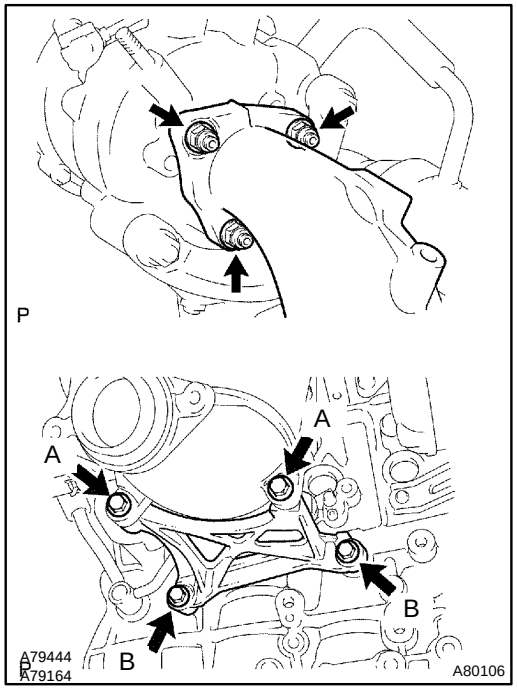
31. INSTALL TURBOCHARGER STAY

(a) Install the turbocharger stay, then temporarily tighten bolt A.

(b) Temporarily tighten nut B while pushing the cylinder head toward the turbocharger stay.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

(c) Tighten bolt A.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)

(d) Tighten nut B.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)



32. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY

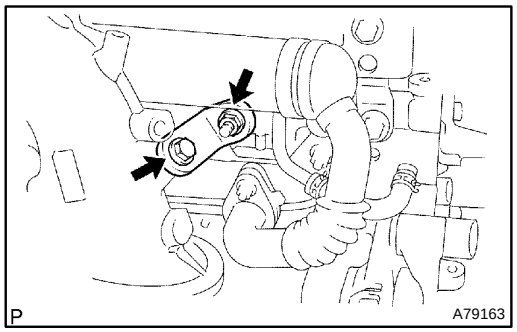
(a) Install the manifold stay, then temporarily tighten the cylinder block side of the manifold stay.

(b) Install a new gasket and the manifold converter, then temporarily tighten bolts A and B while pushing the upper portion of the converter toward the turbocharger.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

(c) Tighten the 3 new nuts to install the upper portion of the converter toward the turbocharger.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

(d) Tighten bolt A.
Torque: 61 N·m (622 kgf·cm, 45 ft·lbf)

(e) Tighten bolt B.
Torque: 61 N·m (622 kgf·cm, 45 ft·lbf)



33. INSTALL MANIFOLD STAY NO.2

(a) Install the manifold stay No. 2, then temporarily tighten the bolt.

(b) Temporarily tighten the nut while pushing the manifold stay No. 2 toward the cylinder head.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

HINT:
No clearance between the stay and cylinder head should be confirmed.

(c) Tighten the bolt.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)

(d) Tighten the nut.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)

34. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.2
Torque: 12 N·m (122 kgf·cm, 8.9 ft·lbf)

35. INSTALL TURBO INSULATOR NO.1
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

36. INSTALL TURBO INSULATOR NO.2
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

37. INSTALL EXHAUST PIPE ASSY (W/ COLD AREA)
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)

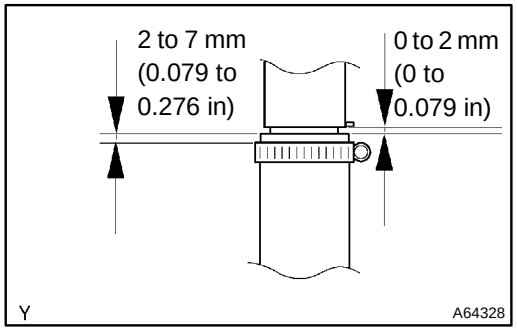
38. INSTALL EXHAUST PIPE ASSY FRONT (See Pub No. RM925E on page 15-8)

39. INSTALL FLOOR PANEL BRACE FRONT
Torque: 30 N·m (302 kgf·cm, 22 ft.·lbf)

40. INSTALL BRACKET, HEATER (W/ COLD AREA)
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)

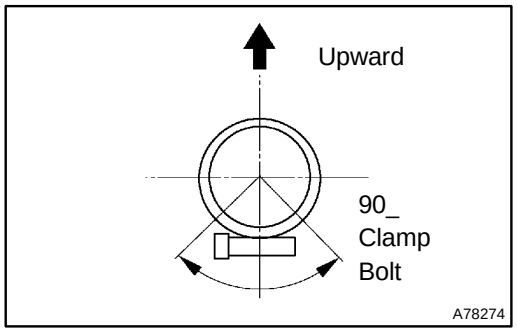
41. INSTALL HEATER PUMP ASSY (W/ COLD AREA)
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)

42. INSTALL FUEL FILTER ASSY (See page 11-28)



43. INSTALL INTERCOOLER AIR HOSE

(a) Install the air hose and hose clamps as shown in the illustration.



(b) Tighten the hose clamps as shown in the illustration.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

(c) Install the air tube No. 1 with the 3 bolts and nut.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

44. INSTALL BATTERY
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt
3.0 to 4.0 N·m (31 to 41 kgf·cm, 27 to 35 in.·lbf) for nut

45. INSTALL AIR CLEANER ASSY
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

46. INSTALL VACUUM RESERVOIR SUB-ASSY
Torque: 8.3 N·m (85 kgf·cm, 73 in.·lbf)

47. INSTALL ENGINE COVER NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

48. ADD ENGINE COOLANT (See page 16-3)

49. CHECK ENGINE OIL LEVEL

50. CHECK FOR ENGINE COOLANT LEAKS (See page 16-1)

51. CHECK FOR ENGINE OIL LEAKS

52. CHECK FOR FUEL LEAKS (See page 11-5)

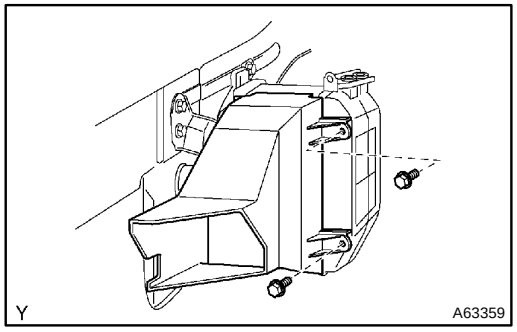
53. CHECK FOR EXHAUST GAS LEAKS

INTERCOOLER ASSY (1CD-FTV) (May, 2003)

1307I-01

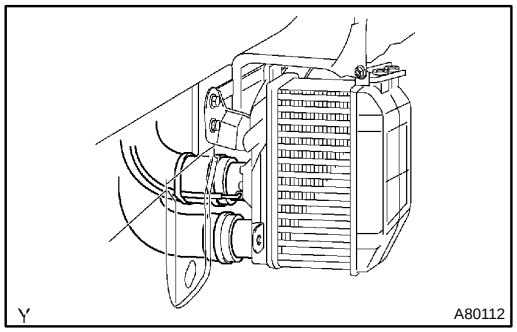
REPLACEMENT

1. REMOVE FRONT BUMPER COVER (See Pub No. RM1028E on page 76-5)



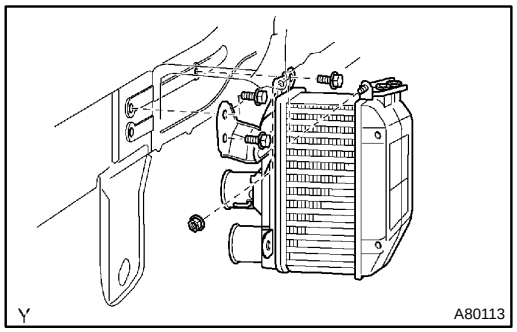
2. REMOVE INTERCOOLER COOLING AIR DUCT SUB-ASSY

(a) Remove the 2 bolts and cooling air duct.



3. REMOVE INTERCOOLER ASSY

(a) Disconnect the vacuum hose, air hose No. 1 and No. 2 from the intercooler.

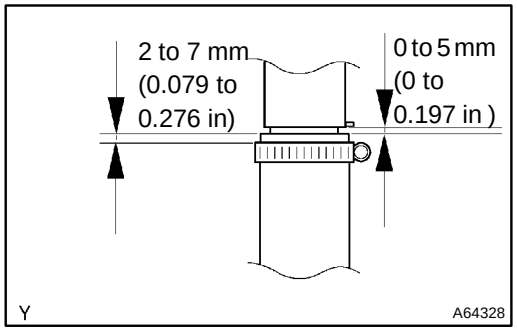


(b) Remove the 3 bolts and nut, then detach the intercooler assembly.

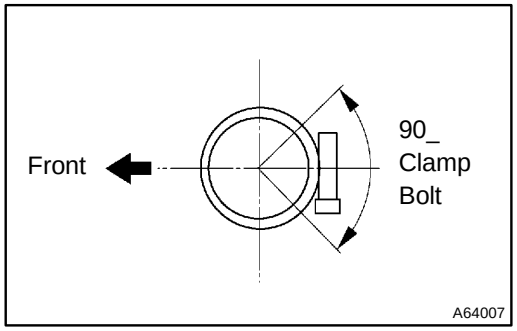
4. INSTALL INTERCOOLER ASSY

(a) Install the intercooler assembly with the 3 bolts and a new nut.

Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)



(b) Install the air hose and hose clamps as shown in the illustration.



(c) Tighten the hose clamps as shown in the illustration.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

5. **INSTALL INTERCOOLER COOLING AIR DUCT SUB-ASSY**
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
6. **INSTALL FRONT BUMPER COVER (See Pub No. RM1028E on page 76-5)**

ENGINE MECHANICAL

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DRIVE BELT (1CD-FTV) (May, 2003) 14-4
REPLACEMENT 14-4
VALVE CLEARANCE
(1CD-FTV) (May, 2003) 14-5
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PARTIAL ENGINE ASSY
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TIMING BELT (1CD-FTV) (May, 2003) 14-45
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CYLINDER HEAD GASKET
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REPLACEMENT 14-81

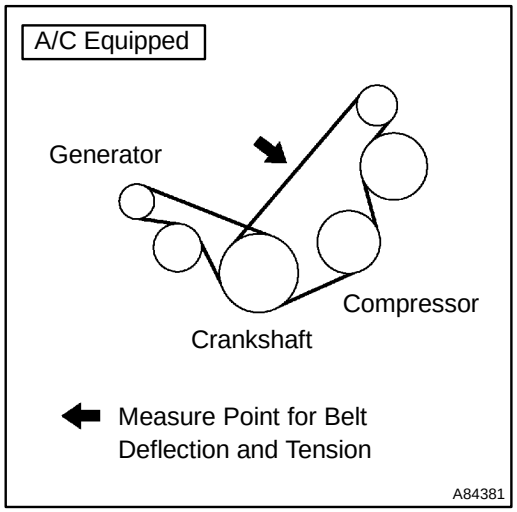
REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

ENGINE (1CD-FTV) (May, 2003)

141GU-01

INSPECTION

1. **INSPECT ENGINE COOLANT (See page 16-1)**
2. **INSPECT ENGINE OIL (See Pub. No. RM925E on page 17-10)**
3. **INSPECT BATTERY (See Pub. No. RM925E on page 19-27)**
4. **INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSY**



5. INSPECT DRIVE BELT

(a) Inspect the cooler compressor V-ribbed belt. (w/ A/C equipped)

(1) Measure the belt deflection.

Pressing force: 98 N·m (10 kgf, 22 lbf)

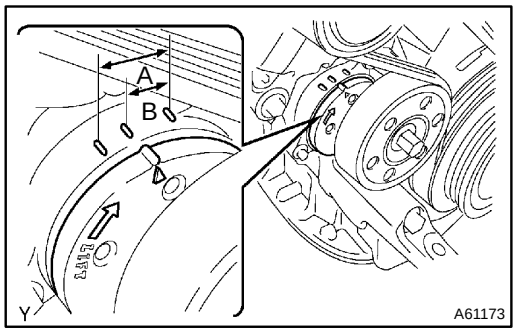
	New Belt mm (in.)	Used Belt mm (in.)
A/C Equipped	9.5 to 11.5 (0.37 to 0.45)	12.5 to 15.5 (0.49 to 0.61)

(2) Measure the belt tension.

	New Belt N (kgf, lbf)	Used Belt N (kgf, lbf)
A/C Equipped	519 to 755 (53 to 77, 117 to 170)	196 to 392 (20 to 40, 44 to 88)

NOTICE:

- **Check the drive belt deflection at the specified point.**
- **When installing a new belt, set its tension value as specified.**
- **When inspecting the belt which is used over 5 minutes, apply the specifications of "Used Belt."**
- **When reinstalling the belt which is used over 5 minutes, adjust its deflection and tension to the intermediate value in each specification of "Used Belt."**
- **V-ribbed belt tension and deflection should be checked after 2 revolutions of engine cranking.**
- **When using a belt tension gauge, confirm the accuracy by using a master gauge first.**



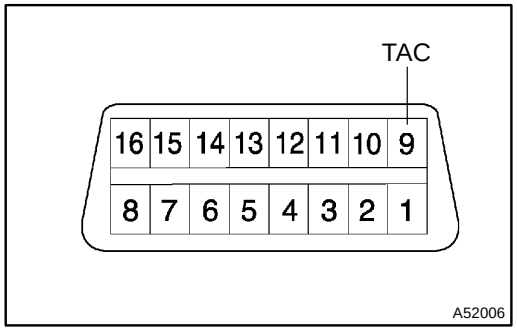
(b) Inspect the generator V-ribbed belt.

(1) Check that the tension indicator is within range A on the auto tensioner scale.

If the tension is not within range A, replace the belt with a new one.

HINT:

When replacing the drive belt with a new one, the belt tension should be within range B.



6. INSPECT ENGINE IDLE SPEED

(a) Using SST, connect a tachometer test prove to terminal 9 (TAC) of the DLC3.
SST 09843-18040

(b) Check the idle speed.
Idle speed: 750 to 850 rpm

NOTICE:

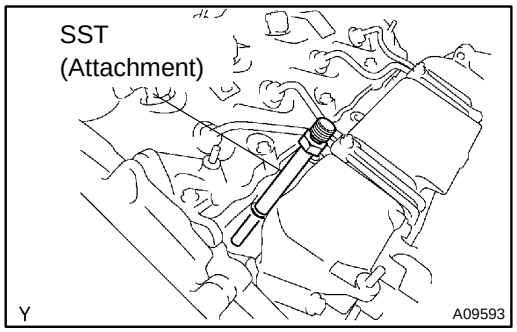
- **Check the idle speed with the cooling fan OFF.**
- **Switch off all accessories and air conditioning before connecting the test prove to the terminal.**

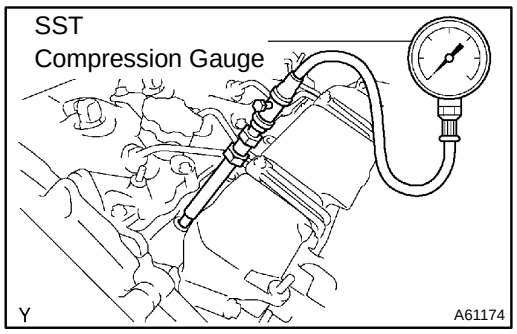
7. INSPECT MAXIMUM SPEED

(a) Start the engine.
(b) Fully depress the accelerator pedal.
(c) Check the maximum speed.
Maximum speed: 5,100 to 5,250 rpm

8. INSPECT COMPRESSION

(a) Warm up the engine to the normal operating temperature, then stop the engine.
(b) Remove the glow plugs. (See page 19-4)
(c) Disconnect the injector connectors.
(d) Inspect cylinder compression pressure.
(1) Install SST (attachment) to the glow plug hole.
SST 09992-00025 (09992-00121, 09992-00211)
Torque: 12 N·m (125 kgf·cm, 95 ft·lbf)





(2) Connect SST (compression gauge) to the SST (attachment).
SST 09992-00025 (09992-00121, 09992-00211)
(3) Fully open the throttle valve, then start the engine.
(4) While cranking the engine, measure the compression pressure.

NOTICE:

- **Always use a fully-charged battery to obtain engine speed of 250 rpm or more.**
- **Check the other cylinder compression pressure in the same way.**
- **This measurement must be done as shortly as possible.**

Compression pressure:
2,628 kPa (26.8 kgf/cm^2, 381 psi) or more
Minimum pressure:
2,157 kPa (22.0 kgf/cm^2, 312 psi) or more
Difference between each cylinder:
490 kPa (5.0 kgf/cm^2, 71 psi) or less

(5) If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the glow plug hole, then measure the compression again.

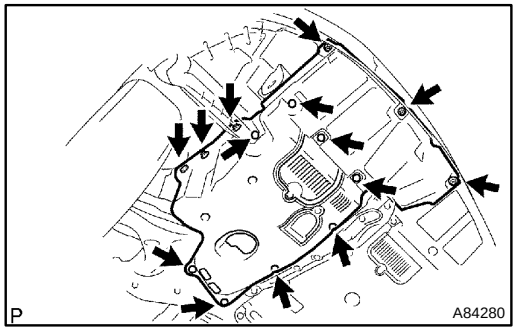
HINT:

- If adding oil raises the compression, there are chances of wear or damage on the piston rings and/or cylinder bore.
- If pressure stays low, the valve may be sticking or seating improperly, or there may be leakage past the gasket.

DRIVE BELT (1CD-FTV) (May, 2003)

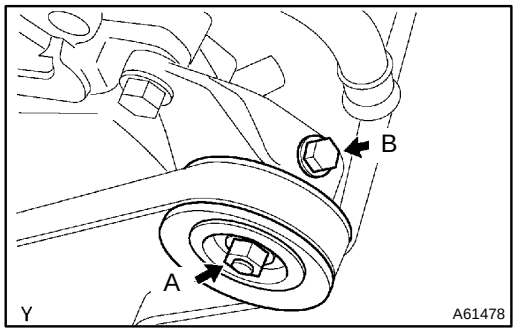
REPLACEMENT

141GV-01



1. REMOVE ENGINE UNDER COVER RH

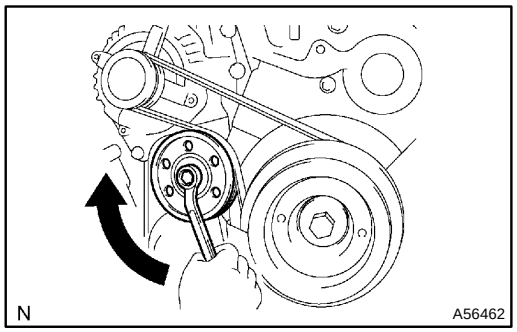
(a) Remove the 5 screws and 9 clips, then remove the engine under cover.



2. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING)

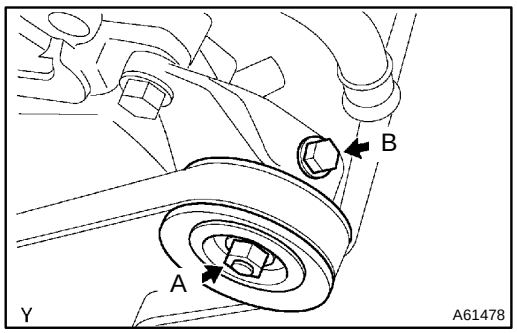
(a) Loosen nut A and bolt B.

(b) Remove the V-ribbed belt.



3. REMOVE GENERATOR V BELT

(a) Turn the V-ribbed belt tensioner assembly clockwise slowly, then remove the V-ribbed belt.



4. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING)

(a) Install the V-ribbed belt.

(b) Tighten bolt B, then adjust the drive belt tension.
(See page 14-1)

(c) Tighten nut A.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

VALVE CLEARANCE (1CD-FTV) (May, 2003)

141GW-01

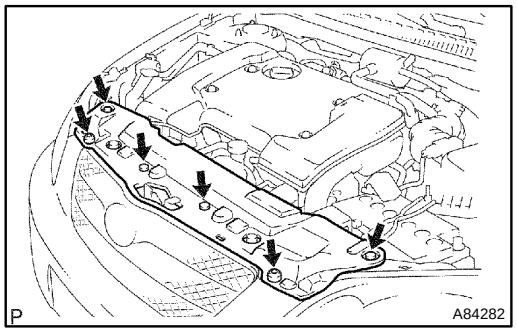
ADJUSTMENT

NOTICE:

- **Before removing the injection pipes, clean them up with a soft brush and compressed air.**
- **After removing the injection pipe, cover the supply pump, common rail and injector mounting area of the cylinder head cover with vinyl tape to prevent dust from being introduced.**
- **After removing the cylinder head cover, protect the injector inlet with a vinyl or plastic bag to prevent foreign objects from being introduced.**

HINT:

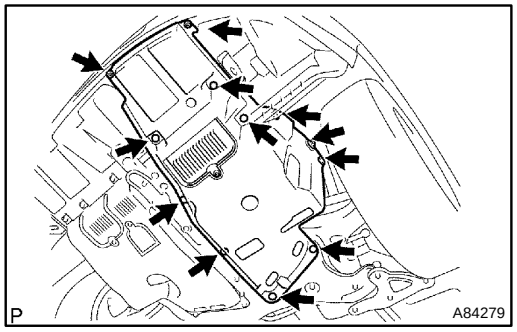
Inspect and adjust the valve clearance after the engine becomes cold.



1. REMOVE RADIATOR SUPPORT OPENING COVER

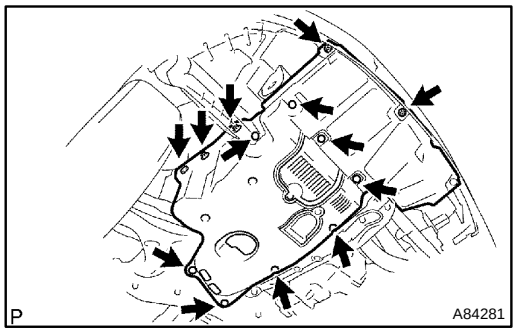
(a) Remove the 2 screws and 4 clips, then remove the radiator cover.

2. REMOVE FRONT WHEEL RH



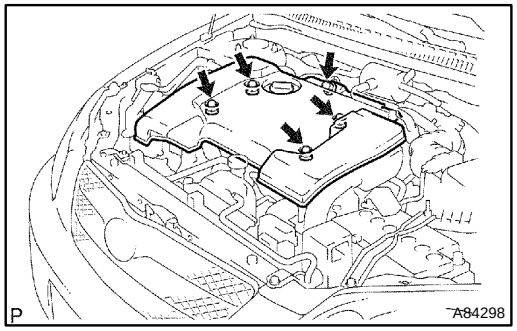
3. REMOVE ENGINE UNDER COVER LH

(a) Remove the 4 screws and 8 clips, then remove the engine under cover.



4. REMOVE ENGINE UNDER COVER RH

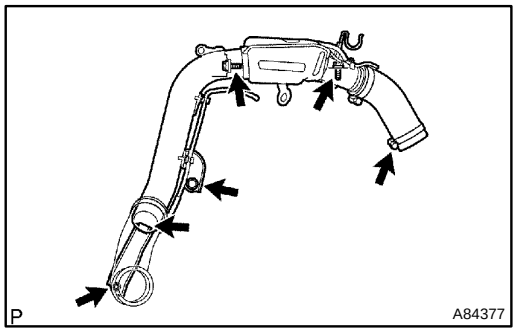
(a) Remove the 4 screws and 9 clips, then remove the engine under cover.



5. REMOVE ENGINE COVER SUB-ASSY NO.1

(a) Remove the 5 nuts, then remove the engine cover.

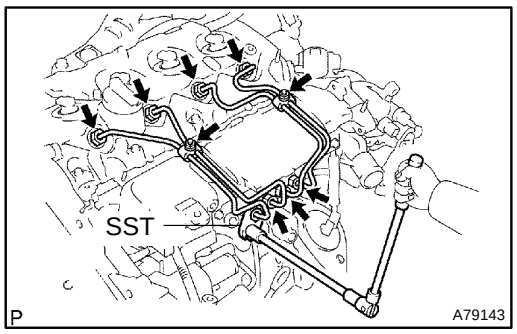
6. REMOVE BATTERY



7. REMOVE AIR TUBE NO.1

(a) Disconnect the vacuum hoses and the connectors.
(b) Loosen the hose clamps.
(c) Remove the 3 bolts and nut, then detach the air tube No. 1.

8. REMOVE TIMING BELT NO.2 COVER (See Page 14-47)



9. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.
(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700
(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700
(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

10. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

11. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

12. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

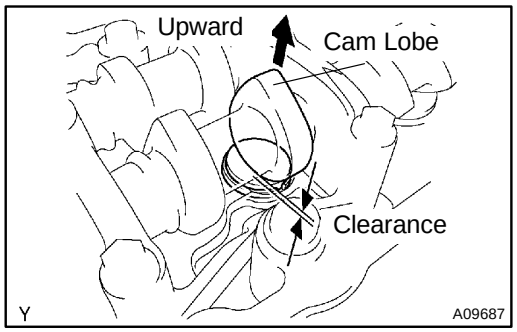
13. REMOVE CYLINDER HEAD COVER SUB-ASSY (See page 11-5)

14. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-5)

15. REMOVE INJECTOR ASSY (See page 11-5)

HINT:

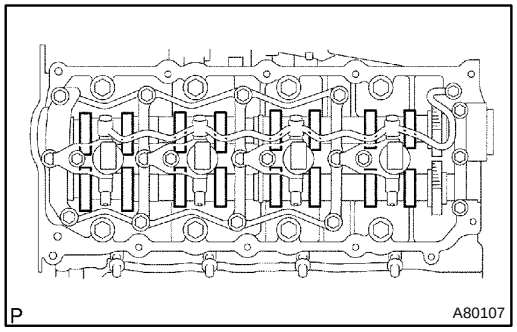
Since each injector assembly has characteristic fuel injecting behavior, keep them in the correct order so that they can be returned to the original locations when reassembling.



16. INSPECT VALVE CLEARANCE

(a) Turn the crankshaft so that the cam lobe located over the inspecting valve faces upward.

(b) Using a feeler gauge, measure the clearance between the valve lifter and camshaft.

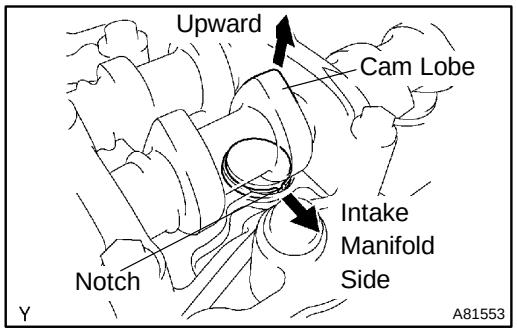


(c) Measure the clearance at 16 places.

(d) Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

Intake	0.20 to 0.30 mm (0.008 to 0.012 in.)
Exhaust	0.35 to 0.45 mm (0.014 to 0.018 in.)

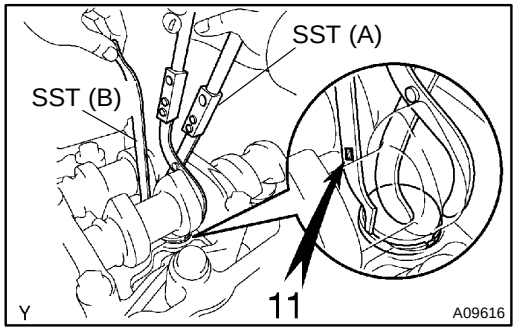


17. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

(1) Turn the crankshaft so that the cam lobe located over the adjusting valve faces upward.

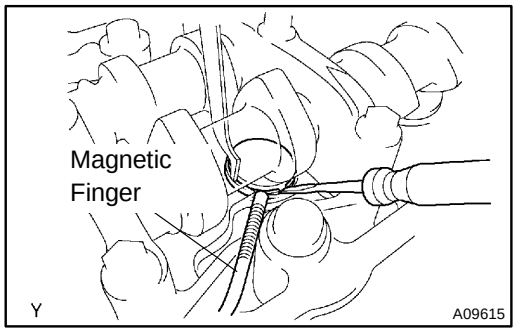
(2) Position the notch of the valve lifter toward the intake manifold side.



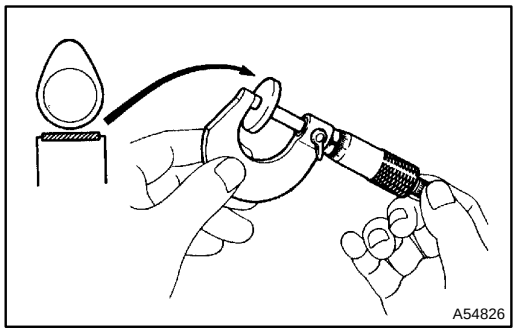
(3) Using SST (A), press down the valve lifter, then place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55050 (09248-05510, 09248-05520)

HINT:
Apply SST (B) marked "11".



(4) Remove the adjusting shim with a small screwdriver and magnetic finger.



(b) Determine the replacement adjusting shim size using the following formula or matrix attached to the end of this section.

(1) Using a micrometer, measure the thickness of the removed shim.

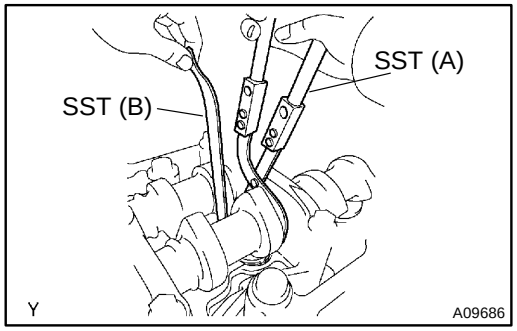
(2) Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

HINT:
T ..... Thickness of the removed adjusting shim
A ..... Measured valve clearance
N ..... Thickness of a new adjusting shim
Intake: N = T + (A - 0.25 mm (0.010 in.))
Exhaust: N = T + (A - 0.40 mm (0.016 in.))

(3) Select a new shim with a thickness as close to the calculated value as possible.

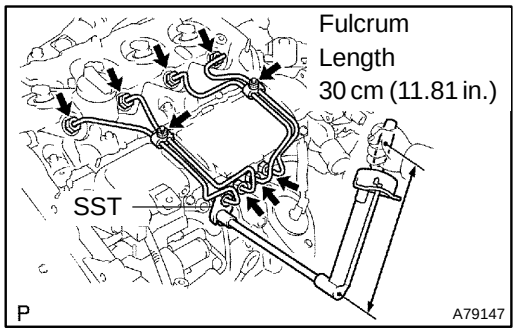
EXAMPLE (Intake):
Measured valve clearance = 0.45 mm (0.0177 in.)
0.45 mm (0.0177 in.) - 0.25 mm (0.0098 in.) = 0.20 mm (0.0078 in.)
(Measured - Specification = Excess clearance)
Used shim measurement = 2.80 mm (0.1102 in.)
0.20 mm (0.0078 in.) + 2.80 mm (0.1102 in.) = 3.00 mm (0.1181 in.)
(Excess clearance + Used shim = Ideal new shim)
Closest new shim = 3.00 mm (0.1181 in.)
Select No. 21 Shim

HINT:
Shims are available in 17 sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



(c) Install a new adjusting shim.
(1) Place a new adjusting shim on the valve lifter.
(2) Using SST (A), press down the valve lifter, then remove SST (B).
SST 09248-55050 (09248-05510, 09248-05520)
(d) Recheck the valve clearance.
SST 09248-55050 (09248-05510, 09248-05520)

18. INSTALL INJECTOR ASSY (See page 11-5)
19. INSTALL NOZZLE LEAKAGE PIPE ASSY (See page 11-5)
SST 09992-00242
20. INSTALL CYLINDER HEAD COVER SUB-ASSY (See page 11-5)
21. INSTALL INJECTION PIPE SUB-ASSY NO.1
NOTICE:
When assembling the pipes, perform the operation with the engine cold under room temperature.
(a) Remove the vinyl or plastic bag from the injector and the vinyl tape from the common rail.
(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail side.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST
HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

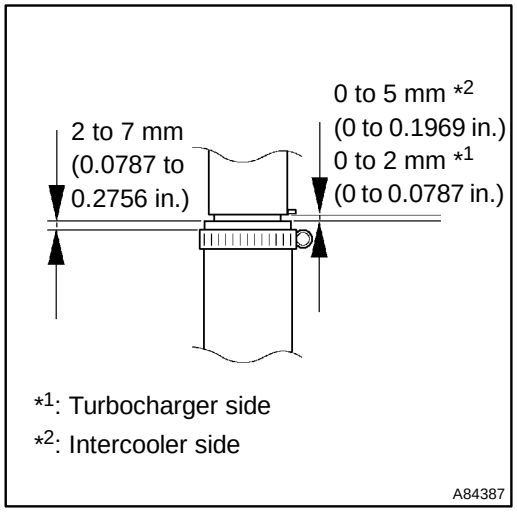
(e) Install the 2 upper injection pipe clamps with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

22. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

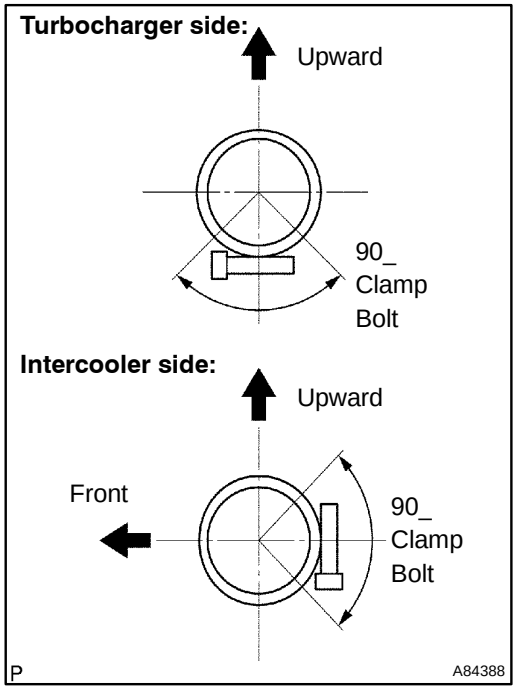
23. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

24. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.

25. INSTALL TIMING BELT NO.2 COVER (See page 11-5)



26. INSTALL AIR TUBE NO.1
(a) Install the new air hose No. 1 and new hose clamp as shown in the illustration.



(b) Tighten the hose clamp as shown in the illustration.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

(c) Install the air tube No. 1 with the 3 bolts and nut.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

27. INSTALL BATTERY (See page 14-24)
28. INSTALL ENGINE COVER SUB-ASSY NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
29. INSTALL FRONT WHEEL RH
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
30. CHECK FOR FUEL LEAKS (See page 11-5)

Adjusting Shim Selection Chart (Intake)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.525 (0.0994)	2.550 (0.1004)	2.575 (0.1014)	2.600 (0.1024)	2.625 (0.1033)	2.650 (0.1043)	2.675 (0.1053)	2.700 (0.1063)	2.725 (0.1073)	2.750 (0.1083)	2.775 (0.1093)	2.800 (0.1102)	2.825 (0.1112)	2.850 (0.1122)	2.875 (0.1132)	2.900 (0.1142)	2.925 (0.1152)	2.950 (0.1161)	2.975 (0.1171)	3.000 (0.1181)	3.025 (0.1191)	3.050 (0.1201)	3.075 (0.1211)	3.100 (0.1220)	3.125 (0.1230)	3.150 (0.1240)	3.175 (0.1250)	3.200 (0.1260)	3.225 (0.1270)	3.250 (0.1280)	3.275 (0.1289)	3.300 (0.1299)
0.000 ~ 0.020 (0.0000 ~ 0.0008)									01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23
0.021 ~ 0.040 (0.0008 ~ 0.0016)									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	
0.041 ~ 0.060 (0.0016 ~ 0.0024)								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	
0.061 ~ 0.080 (0.0024 ~ 0.0031)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	
0.081 ~ 0.100 (0.0032 ~ 0.0039)						01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	
0.101 ~ 0.120 (0.0040 ~ 0.0047)					01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	
0.121 ~ 0.140 (0.0048 ~ 0.0055)					01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	
0.141 ~ 0.160 (0.0056 ~ 0.0063)				01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.161 ~ 0.180 (0.0063 ~ 0.0071)			01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.181 ~ 0.199 (0.0071 ~ 0.0078)		01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	
0.200 ~ 0.300 (0.0079 ~ 0.0118)																																		
0.301 ~ 0.320 (0.0119 ~ 0.0126)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33		
0.321 ~ 0.340 (0.0126 ~ 0.0134)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33			
0.341 ~ 0.360 (0.0134 ~ 0.0142)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33				
0.361 ~ 0.380 (0.0142 ~ 0.0150)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33					
0.381 ~ 0.400 (0.0150 ~ 0.0157)	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33					
0.401 ~ 0.420 (0.0158 ~ 0.0165)	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33						
0.421 ~ 0.440 (0.0166 ~ 0.0173)	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33							
0.441 ~ 0.460 (0.0174 ~ 0.0181)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33								
0.461 ~ 0.480 (0.0181 ~ 0.0189)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33									
0.481 ~ 0.500 (0.0189 ~ 0.0197)	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33									
0.501 ~ 0.520 (0.0197 ~ 0.0205)	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33										
0.521 ~ 0.540 (0.0205 ~ 0.0213)	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33											
0.541 ~ 0.560 (0.0213 ~ 0.0220)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33												
0.561 ~ 0.580 (0.0221 ~ 0.0228)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33													
0.581 ~ 0.600 (0.0229 ~ 0.0236)	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33													
0.601 ~ 0.620 (0.0237 ~ 0.0244)	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33														
0.621 ~ 0.640 (0.0244 ~ 0.0252)	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33															
0.641 ~ 0.660 (0.0252 ~ 0.0260)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																
0.661 ~ 0.680 (0.0260 ~ 0.0268)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33																	
0.681 ~ 0.700 (0.0268 ~ 0.0276)	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																	
0.701 ~ 0.720 (0.0276 ~ 0.0283)	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																		
0.721 ~ 0.740 (0.0284 ~ 0.0291)	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																			
0.741 ~ 0.760 (0.0292 ~ 0.0299)	21	23	23	25	25	27	27	29	29	31	31	33	33	33																				
0.761 ~ 0.780 (0.0300 ~ 0.0307)	21	23	23	25	25	27	27	29	29	31	31	33	33																					
0.781 ~ 0.800 (0.0307 ~ 0.0315)	23	23	25	25	27	27	29	29	31	31	33	33	33																					
0.801 ~ 0.820 (0.0315 ~ 0.0323)	23	25	25	27	27	29	29	31	31	33	33	33																						
0.821 ~ 0.840 (0.0323 ~ 0.0331)	25	25	27	27	29	29	31	31	33	33	33																							
0.841 ~ 0.860 (0.0331 ~ 0.0339)	25	27	27	29	29	31	31	33	33	33																								
0.861 ~ 0.880 (0.0339 ~ 0.0346)	25	27	27	29	29	31	31	33	33																									
0.881 ~ 0.900 (0.0347 ~ 0.0354)	27	27	29	29	31	31	33	33	33																									
0.901 ~ 0.920 (0.0355 ~ 0.0362)	27	29	29	31	31	33	33	33																										
0.921 ~ 0.940 (0.0363 ~ 0.0370)	29	29	31	31	33	33	33																											
0.941 ~ 0.960 (0.0370 ~ 0.0378)	29	31	31	33	33	33																												
0.961 ~ 0.980 (0.0378 ~ 0.0386)	29	31	31	33	33																													
0.981 ~ 1.000 (0.0386 ~ 0.0394)	31	31	33	33	33																													
1.001 ~ 1.020 (0.0394 ~ 0.0402)	31	33	33	33																														
1.121 ~ 1.040 (0.0402 ~ 0.0409)	33	33	33																															
1.041 ~ 1.060 (0.0410 ~ 0.0417)	33	33																																
1.161 ~ 1.080 (0.0418 ~ 0.0425)	33																																	
1.081 ~ 1.100 (0.0426 ~ 0.0433)	33																																	

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
01	2.500 (0.0984)	19	2.950 (0.1161)
03	2.550 (0.1004)	21	3.000 (0.1181)
05	2.600 (0.1024)	23	3.050 (0.1201)
07	2.650 (0.1043)	25	3.100 (0.1220)
09	2.700 (0.1063)	27	3.150 (0.1240)
11	2.750 (0.1083)	29	3.200 (0.1260)
13	2.800 (0.1102)	31	3.250 (0.1280)
15	2.850 (0.1122)	33	3.300 (0.1299)
17	2.900 (0.1142)		

Intake valve clearance (Cold):

0.20 - 0.30 mm (0.008 - 0.012 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 21 shim.

Y

A57526

Adjusting Shim Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.525 (0.0994)	2.550 (0.1004)	2.575 (0.1014)	2.600 (0.1024)	2.625 (0.1033)	2.650 (0.1043)	2.675 (0.1053)	2.700 (0.1063)	2.725 (0.1073)	2.750 (0.1073)	2.775 (0.1083)	2.800 (0.1102)	2.825 (0.1112)	2.850 (0.1122)	2.875 (0.1132)	2.900 (0.1142)	2.925 (0.1152)	2.950 (0.1161)	2.975 (0.1171)	3.000 (0.1181)	3.025 (0.1191)	3.050 (0.1201)	3.075 (0.1211)	3.100 (0.1220)	3.125 (0.1230)	3.150 (0.1240)	3.175 (0.1250)	3.200 (0.1260)	3.225 (0.1270)	3.250 (0.1280)	3.275 (0.1289)	3.300 (0.1299)
0.000 ~ 0.020 (0.0000 ~ 0.0008)														01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17		
0.021 ~ 0.040 (0.0008 ~ 0.0016)														01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19		
0.041 ~ 0.060 (0.0016 ~ 0.0024)													01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19		
0.061 ~ 0.080 (0.0024 ~ 0.0031)												01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19		
0.081 ~ 0.100 (0.0032 ~ 0.0039)											01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21		
0.101 ~ 0.120 (0.0040 ~ 0.0047)										01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21		
0.121 ~ 0.140 (0.0048 ~ 0.0055)										01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23		
0.141 ~ 0.160 (0.0056 ~ 0.0063)									01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	
0.161 ~ 0.180 (0.0063 ~ 0.0071)								01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	
0.181 ~ 0.200 (0.0071 ~ 0.0079)							01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	
0.201 ~ 0.220 (0.0079 ~ 0.0087)						01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	
0.221 ~ 0.240 (0.0087 ~ 0.0094)						01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	
0.241 ~ 0.260 (0.0095 ~ 0.0102)					01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	
0.261 ~ 0.280 (0.0103 ~ 0.0110)				01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	
0.281 ~ 0.300 (0.0111 ~ 0.0118)			01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.301 ~ 0.320 (0.0119 ~ 0.0126)			01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.321 ~ 0.340 (0.0126 ~ 0.0134)			01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.341 ~ 0.349 (0.0134 ~ 0.0137)		01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	
0.350 ~ 0.450 (0.0138 ~ 0.0177)																																		
0.451 ~ 0.460 (0.0178 ~ 0.0181)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33		
0.461 ~ 0.480 (0.0181 ~ 0.0189)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33			
0.481 ~ 0.500 (0.0189 ~ 0.0197)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33			
0.501 ~ 0.520 (0.0197 ~ 0.0205)	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33				
0.521 ~ 0.540 (0.0205 ~ 0.0213)	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33					
0.541 ~ 0.560 (0.0213 ~ 0.0220)	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33						
0.561 ~ 0.580 (0.0221 ~ 0.0228)	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33							
0.581 ~ 0.600 (0.0229 ~ 0.0236)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33							
0.601 ~ 0.620 (0.0237 ~ 0.0244)	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33								
0.621 ~ 0.640 (0.0244 ~ 0.0252)	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33									
0.641 ~ 0.660 (0.0252 ~ 0.0260)	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33										
0.661 ~ 0.680 (0.0260 ~ 0.0268)	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33											
0.681 ~ 0.700 (0.0268 ~ 0.0276)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33											
0.701 ~ 0.720 (0.0276 ~ 0.0283)	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33												
0.721 ~ 0.740 (0.0284 ~ 0.0291)	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33													
0.741 ~ 0.760 (0.0292 ~ 0.0299)	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33														
0.761 ~ 0.780 (0.0300 ~ 0.0307)	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33															
0.781 ~ 0.800 (0.0307 ~ 0.0315)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33															
0.801 ~ 0.820 (0.0315 ~ 0.0323)	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																
0.821 ~ 0.840 (0.0323 ~ 0.0331)	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																	
0.841 ~ 0.860 (0.0331 ~ 0.0339)	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																		
0.861 ~ 0.880 (0.0339 ~ 0.0346)	21	21	23	23	25	25	27	27	29	29	31	31	33	33	33																			
0.881 ~ 0.900 (0.0347 ~ 0.0354)	21	23	23	25	25	27	27	29	29	31	31	33	33	33	33																			
0.901 ~ 0.920 (0.0355 ~ 0.0362)	21	23	23	25	25	27	27	29	29	31	31	33	33	33																				
0.921 ~ 0.940 (0.0363 ~ 0.0370)	23	23	25	25	27	27	29	29	31	31	33	33	33																					
0.941 ~ 0.960 (0.0370 ~ 0.0378)	23	25	25	27	27	29	29	31	31	33	33	33																						
0.961 ~ 0.980 (0.0378 ~ 0.0386)	25	25	27	27	29	29	31	31	33	33	33																							
0.981 ~ 1.000 (0.0386 ~ 0.0394)	25	27	27	29	29	31	31	33	33	33	33																							
1.001 ~ 1.020 (0.0394 ~ 0.0402)	25	27	27	29	29	31	31	33	33	33																								
1.021 ~ 1.040 (0.0402 ~ 0.0409)	27	27	29	29	31	31	33	33	33																									
1.041 ~ 1.060 (0.0410 ~ 0.0417)	27	29	29	31	31	33	33	33																										
1.061 ~ 1.080 (0.0418 ~ 0.0425)	29	29	31	31	33	33	33																											
1.081 ~ 1.100 (0.0426 ~ 0.0433)	29	31	31	33	33	33	33																											
1.101 ~ 1.120 (0.0433 ~ 0.0441)	29	31	31	33	33	33																												
1.121 ~ 1.140 (0.0441 ~ 0.0449)	31	31	33	33	33																													
1.141 ~ 1.160 (0.0449 ~ 0.0457)	31	33	33	33																														
1.161 ~ 1.180 (0.0457 ~ 0.0465)	33	33	33																															
1.181 ~ 1.200 (0.0465 ~ 0.0472)	33	33	33																															
1.201 ~ 1.220 (0.0473 ~ 0.0480)	33	33																																
1.221 ~ 1.240 (0.0481 ~ 0.0488)	33																																	

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
01	2.500 (0.0984)	19	2.950 (0.1161)
03	2.550 (0.1004)	21	3.000 (0.1181)
05	2.600 (0.1024)	23	3.050 (0.1201)
07	2.650 (0.1043)	25	3.100 (0.1220)
09	2.700 (0.1063)	27	3.150 (0.1240)
11	2.750 (0.1083)	29	3.200 (0.1260)
13	2.800 (0.1102)	31	3.250 (0.1280)
15	2.850 (0.1122)	33	3.300 (0.1299)
17	2.900 (0.1142)		

Exhaust valve clearance (Cold):
0.35 - 0.45 mm (0.014 - 0.018 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.590 mm (0.0232 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No. 21 shim.

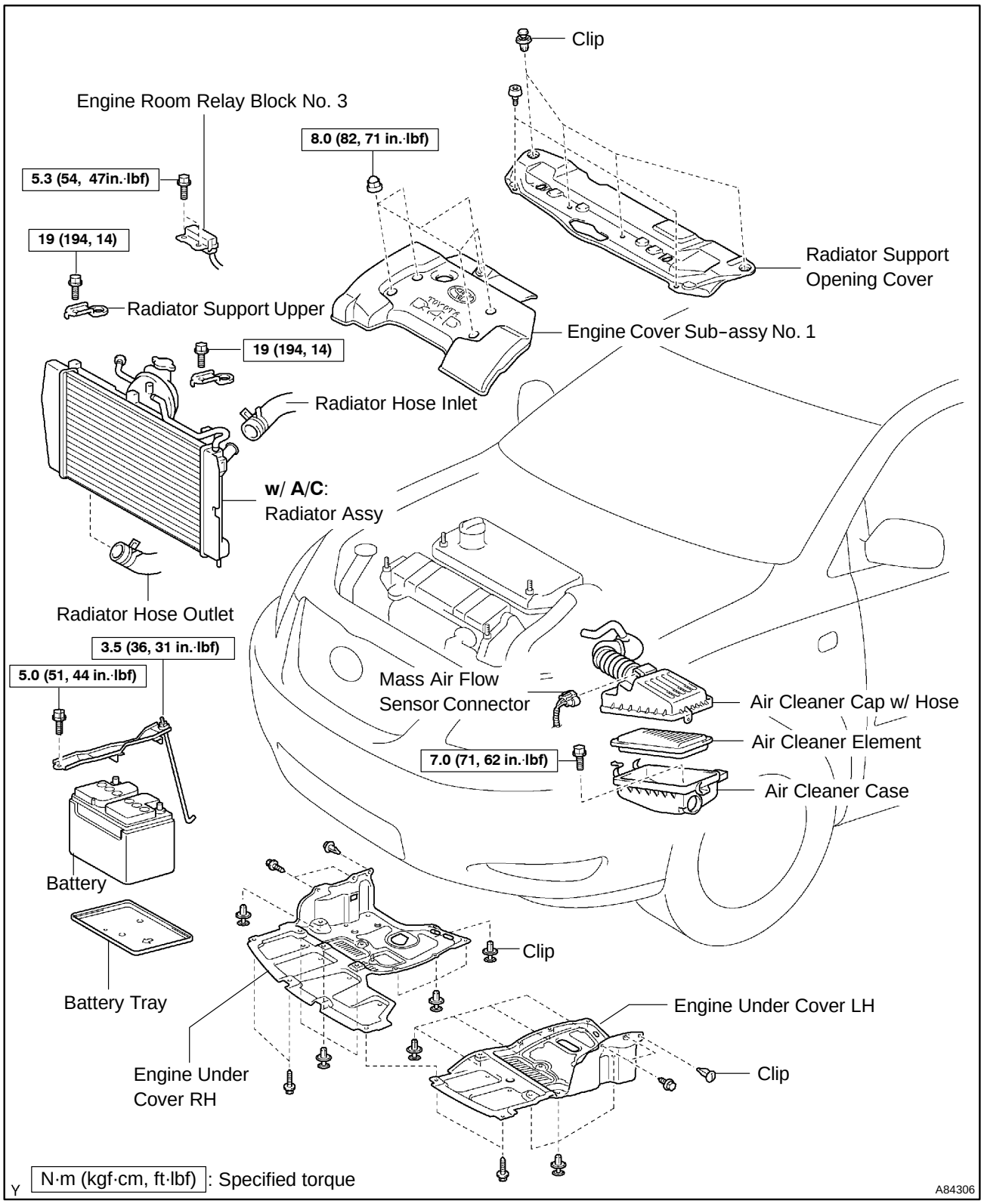
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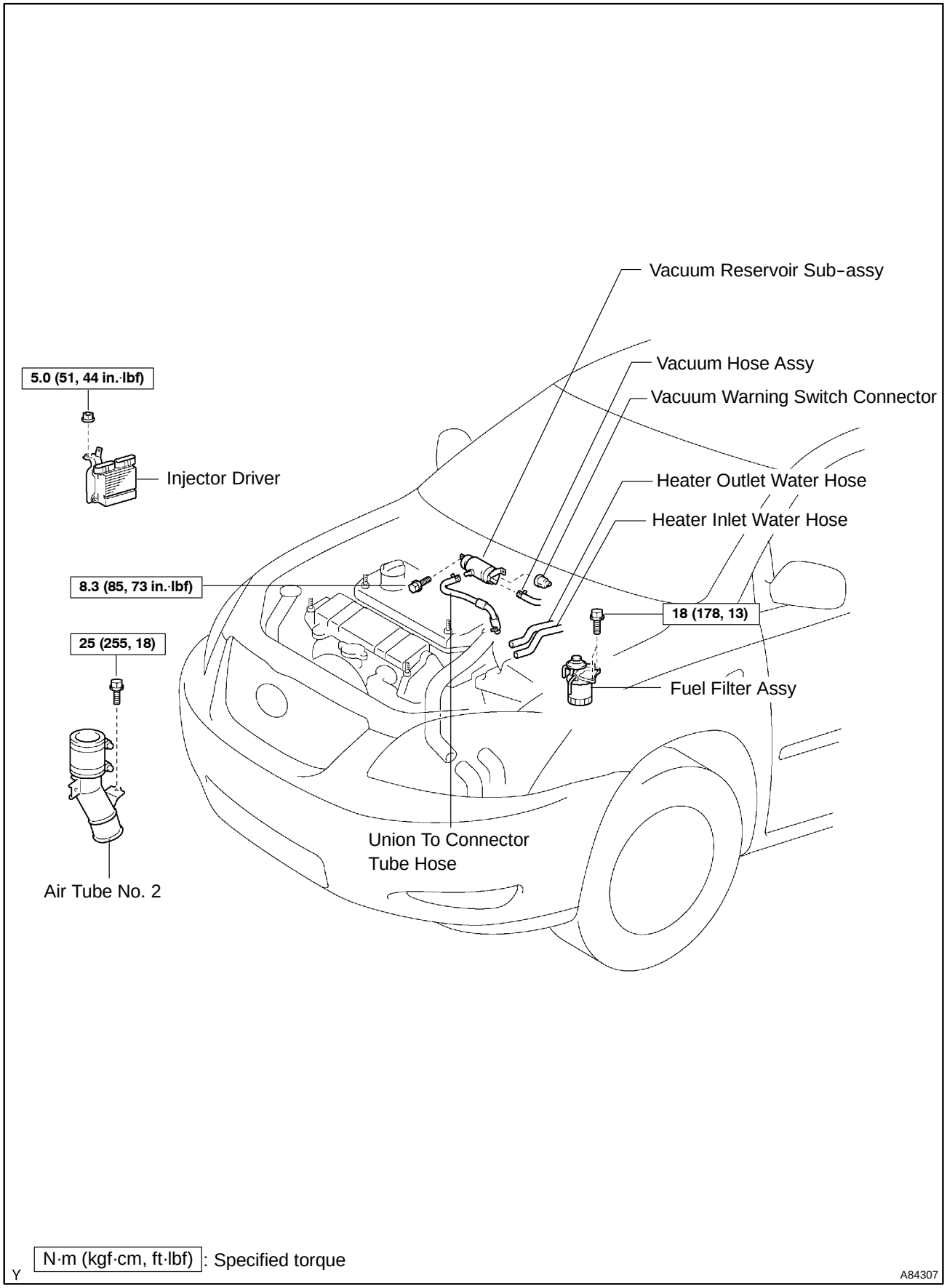
A57527

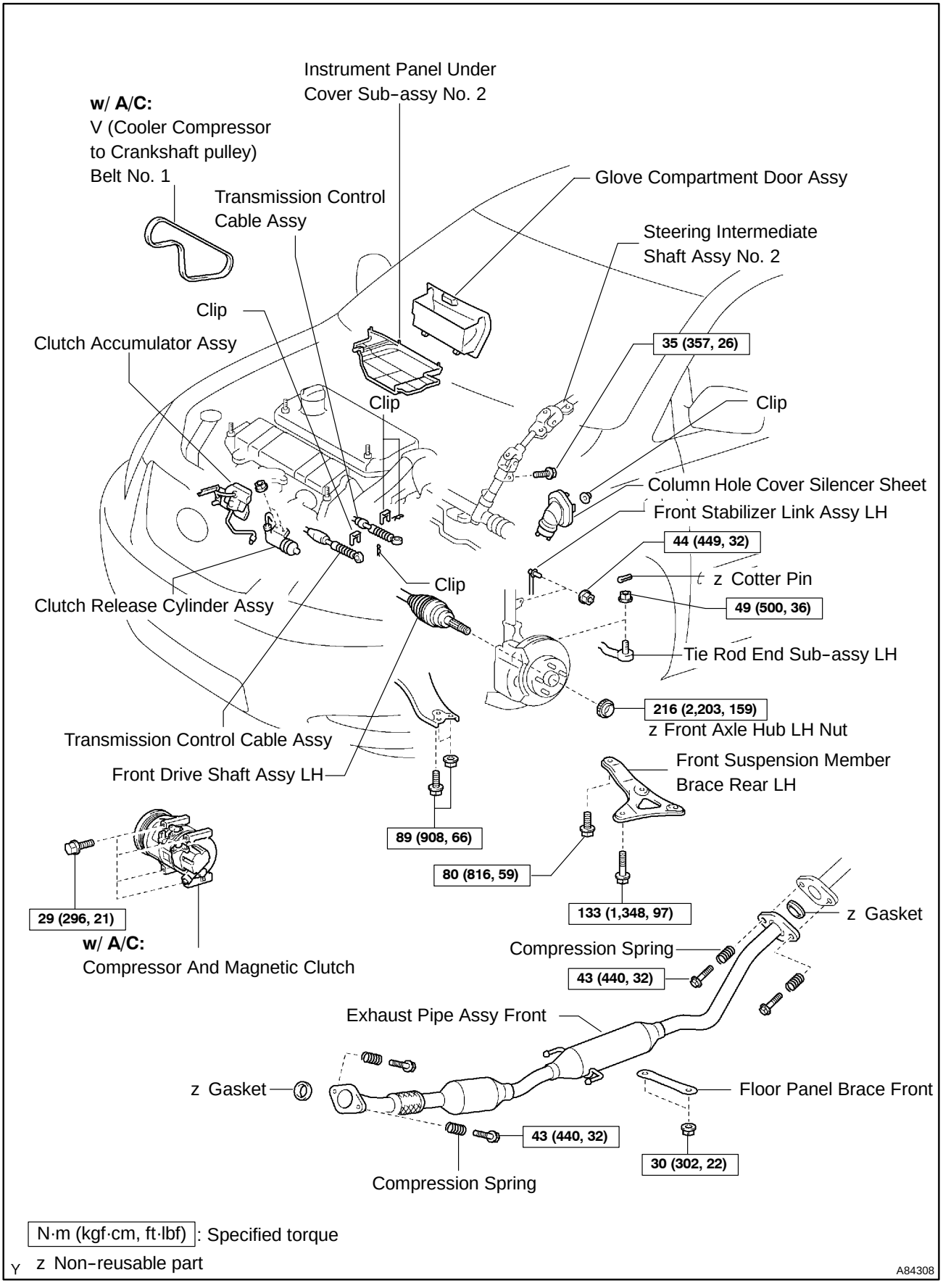
PARTIAL ENGINE ASSY (1CD-FTV) (May, 2003)

COMPONENTS

141GX-01



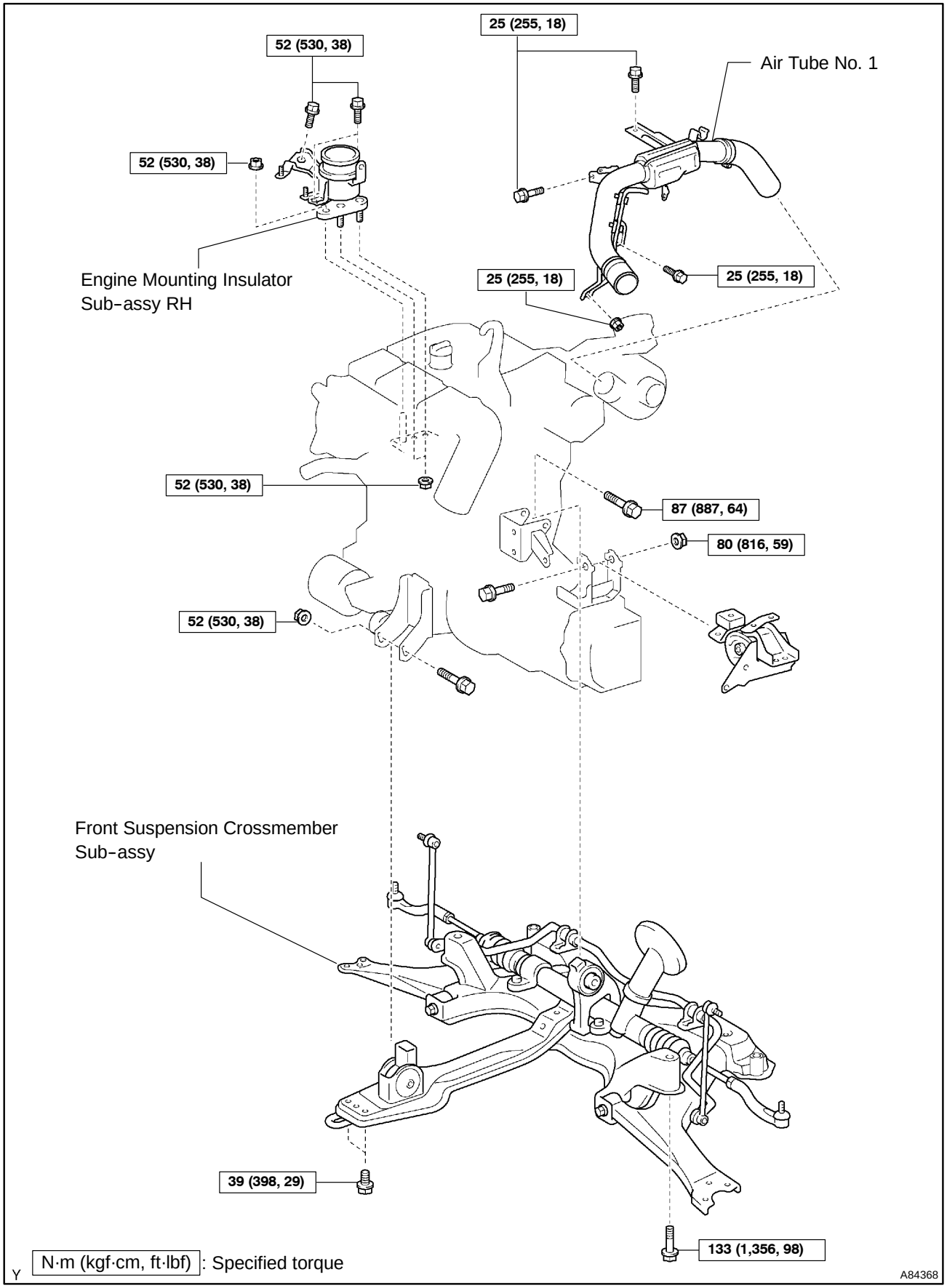

Vacuum Reservoir Sub-assy
Vacuum Hose Assy
Vacuum Warning Switch Connector
5.0 (51, 44 in.·lbf)
Injector Driver
Heater Outlet Water Hose
Heater Inlet Water Hose
8.3 (85, 73 in.·lbf)
18 (178, 13)
25 (255, 18)
Fuel Filter Assy
Union To Connector Tube Hose
Air Tube No. 2
N·m (kgf·cm, ft·lbf): Specified torque
Y
A84307

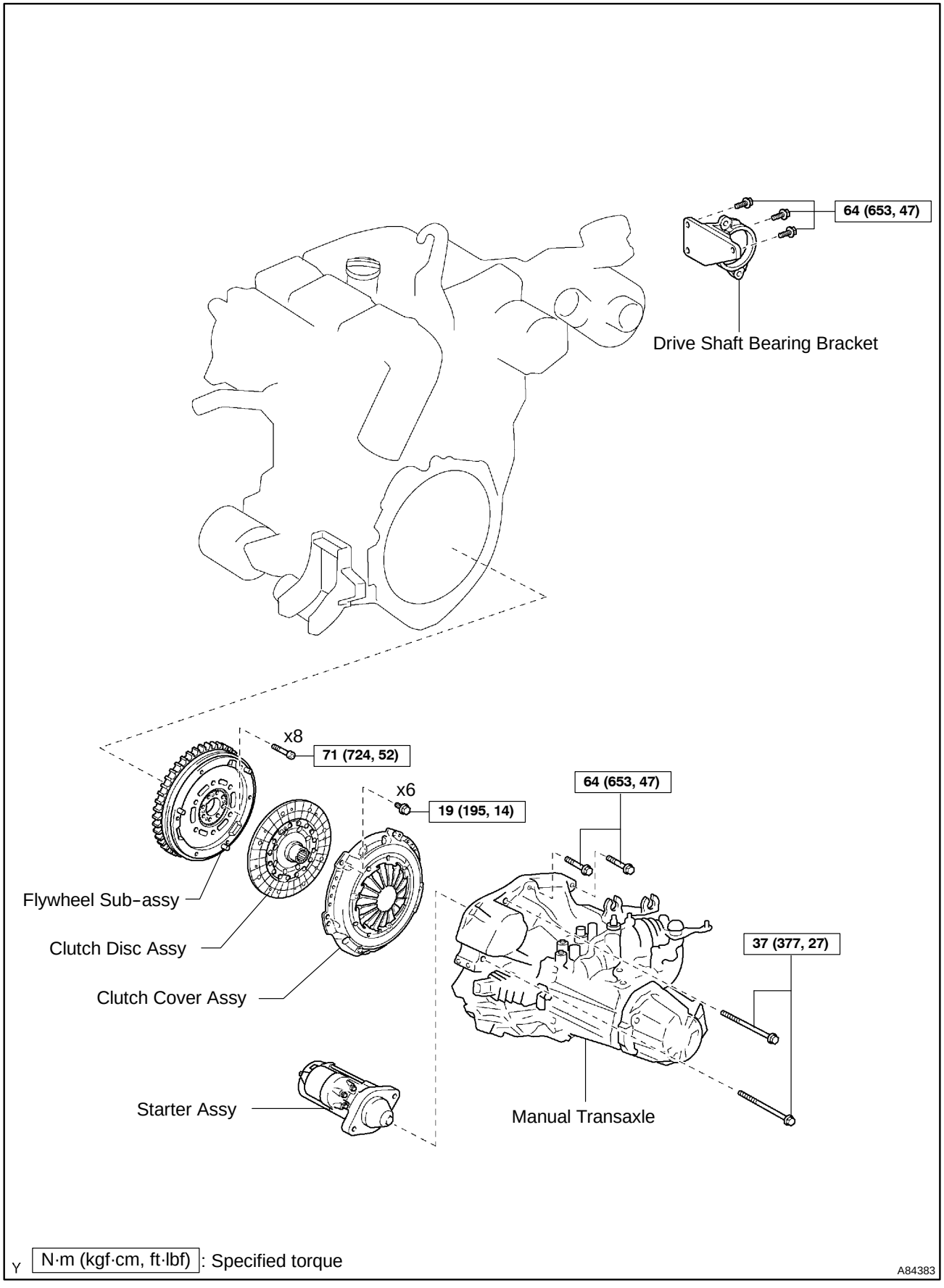


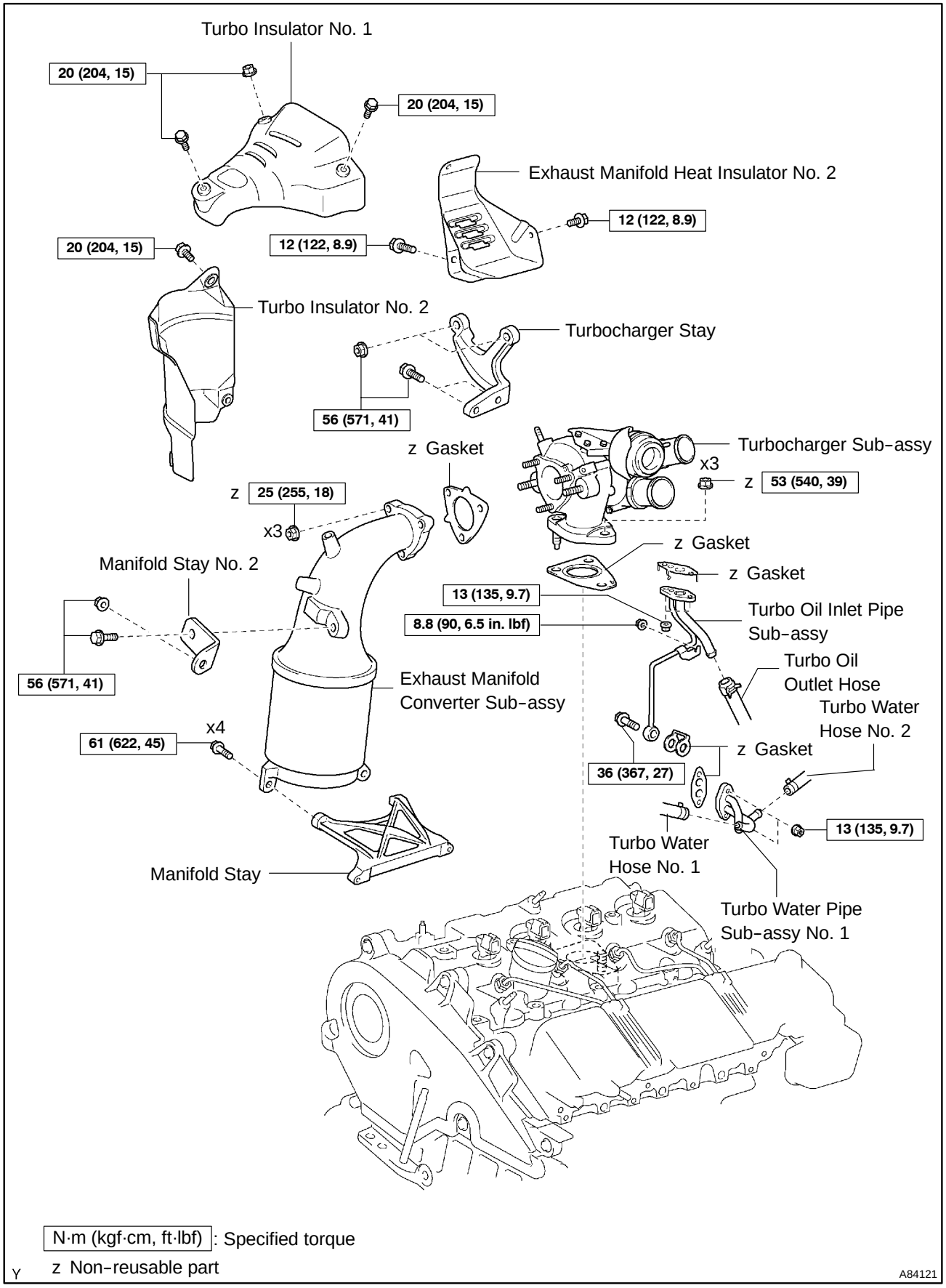
N·m (kgf·cm, ft·lbf): Specified torque

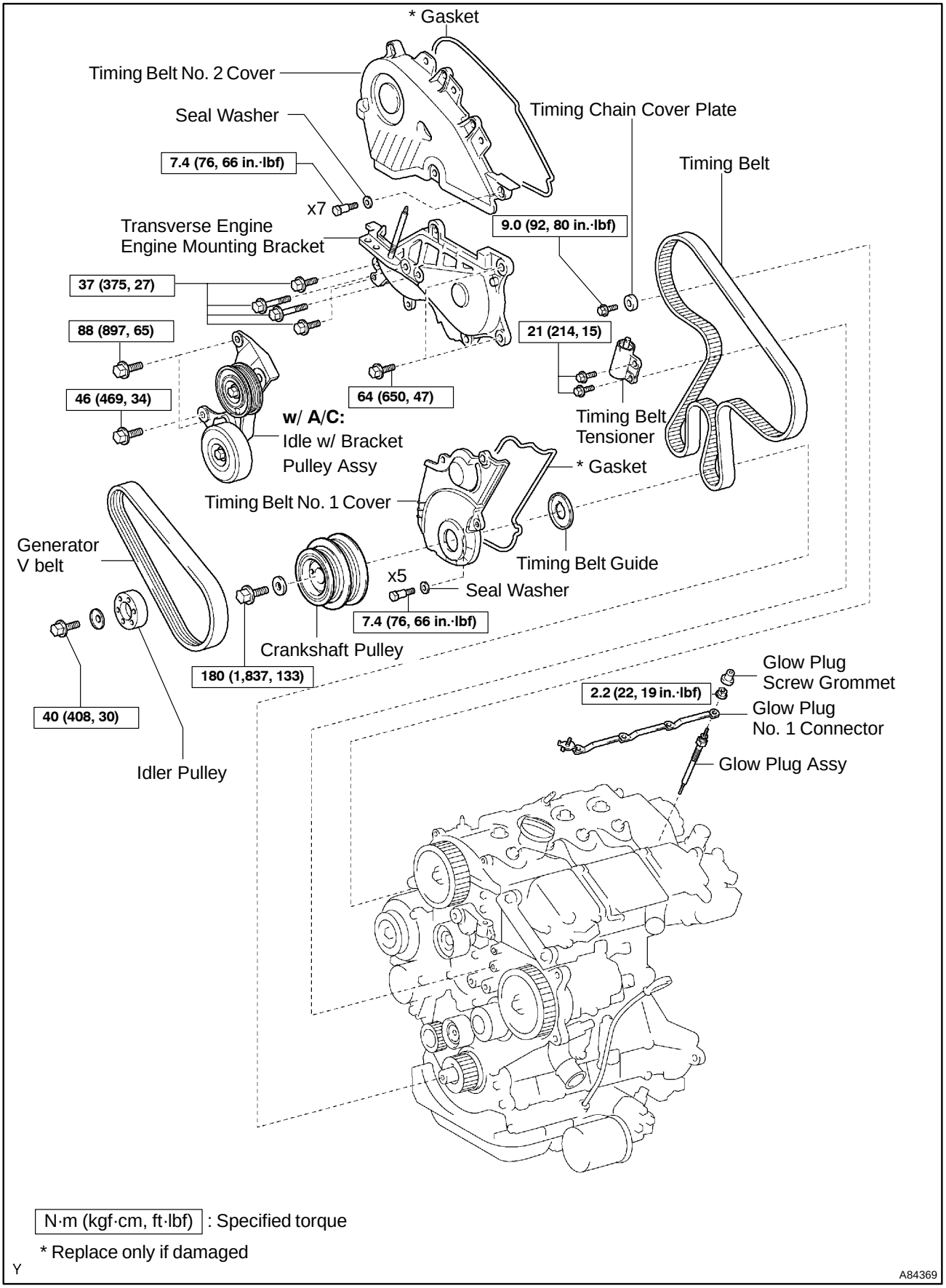
Y z Non-reusable part

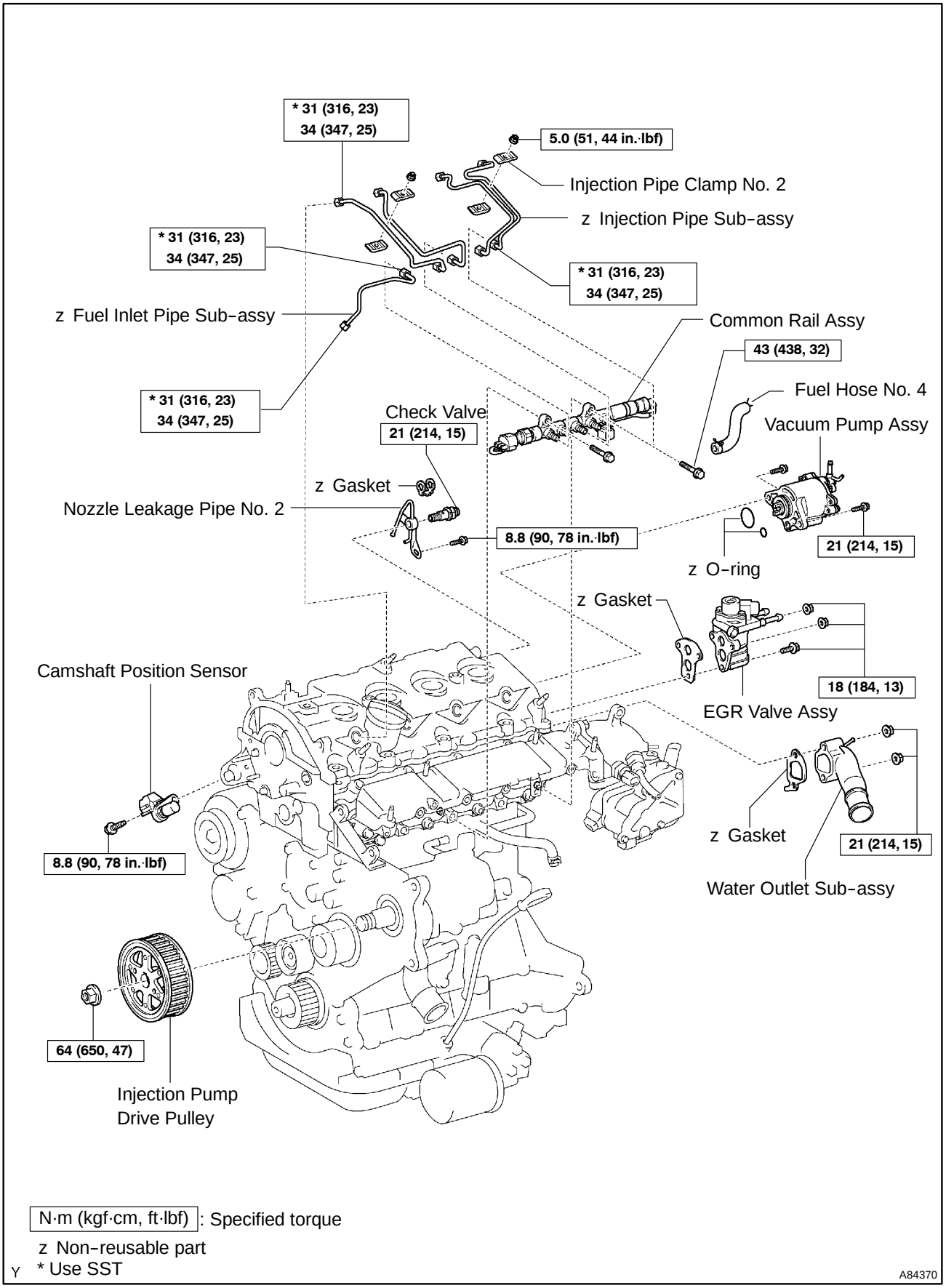
A84308


25 (255, 18)
52 (530, 38)
Air Tube No. 1
52 (530, 38)
Engine Mounting Insulator
Sub-assy RH
25 (255, 18)
25 (255, 18)
52 (530, 38)
87 (887, 64)
80 (816, 59)
52 (530, 38)
Front Suspension Crossmember
Sub-assy
39 (398, 29)
133 (1,356, 98)
Y
N·m (kgf·cm, ft·lbf): Specified torque
A84368


64 (653, 47)
Drive Shaft Bearing Bracket
x8
71 (724, 52)
x6
19 (195, 14)
64 (653, 47)
Flywheel Sub-assy
Clutch Disc Assy
Clutch Cover Assy
37 (377, 27)
Starter Assy
Manual Transaxle
Y N·m (kgf·cm, ft·lbf): Specified torque
A84383


Turbo Insulator No. 1
20 (204, 15)
20 (204, 15)
Exhaust Manifold Heat Insulator No. 2
12 (122, 8.9)
12 (122, 8.9)
20 (204, 15)
Turbo Insulator No. 2
Turbocharger Stay
56 (571, 41)
z Gasket
Turbocharger Sub-assy
x3
z 53 (540, 39)
z 25 (255, 18)
x3
z Gasket
Manifold Stay No. 2
z Gasket
13 (135, 9.7)
8.8 (90, 6.5 in. lbf)
Turbo Oil Inlet Pipe Sub-assy
Turbo Oil Outlet Hose
Turbo Water Hose No. 2
56 (571, 41)
Exhaust Manifold Converter Sub-assy
x4
61 (622, 45)
z Gasket
36 (367, 27)
13 (135, 9.7)
Turbo Water Hose No. 1
Manifold Stay
Turbo Water Pipe Sub-assy No. 1
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
A84121


* Gasket
Timing Belt No. 2 Cover
Seal Washer
7.4 (76, 66 in.·lbf)
x7
Timing Chain Cover Plate
Timing Belt
Transverse Engine
Engine Mounting Bracket
9.0 (92, 80 in.·lbf)
37 (375, 27)
88 (897, 65)
21 (214, 15)
46 (469, 34)
64 (650, 47)
w/ A/C:
Idle w/ Bracket
Pulley Assy
Timing Belt
Tensioner
* Gasket
Timing Belt No. 1 Cover
Timing Belt Guide
Generator
V belt
x5
Seal Washer
7.4 (76, 66 in.·lbf)
Crankshaft Pulley
180 (1,837, 133)
Glow Plug
Screw Grommet
2.2 (22, 19 in.·lbf)
Glow Plug
No. 1 Connector
40 (408, 30)
Idler Pulley
Glow Plug Assy
N·m (kgf·cm, ft·lbf) : Specified torque
* Replace only if damaged
Y
A84369

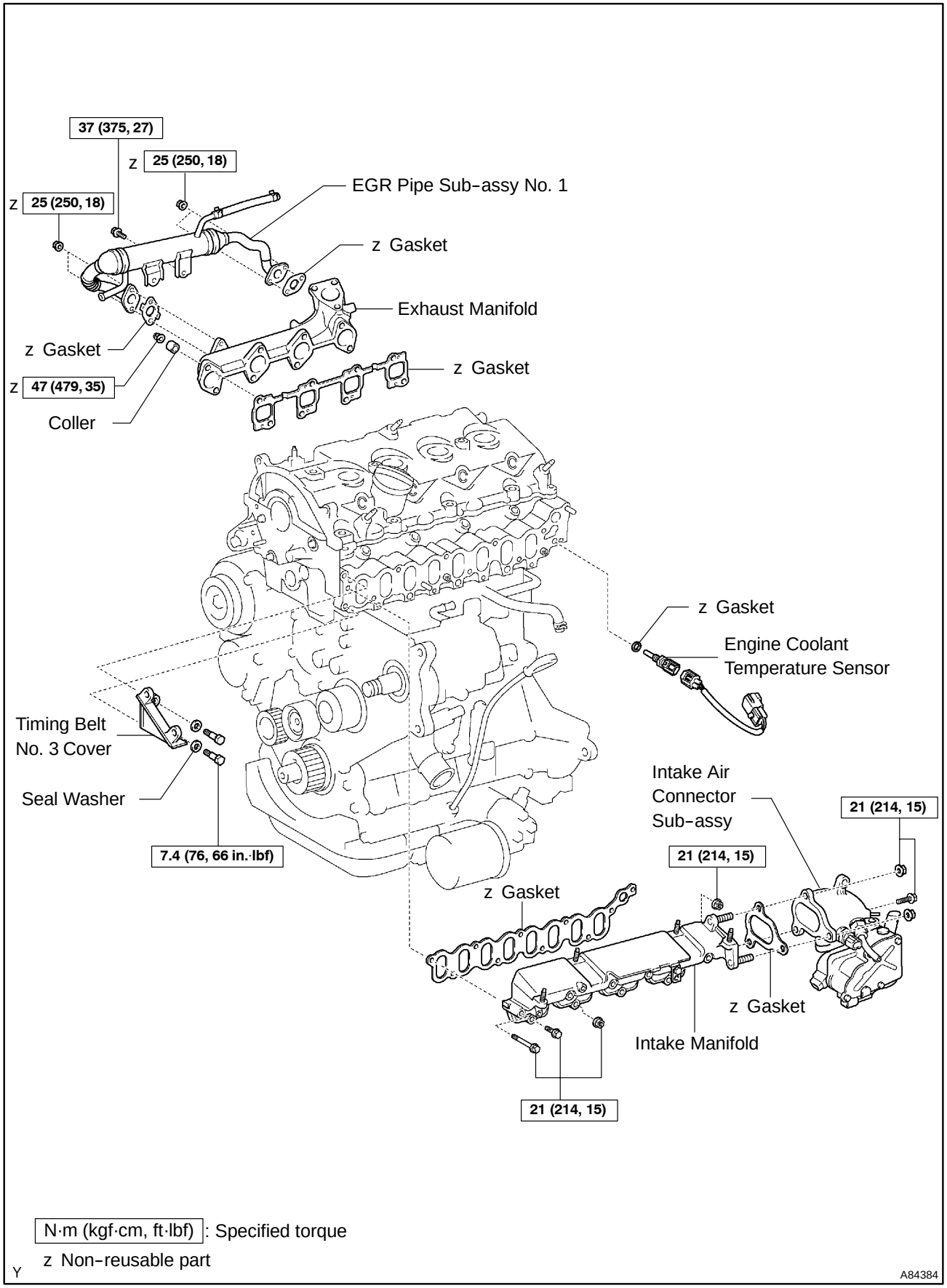


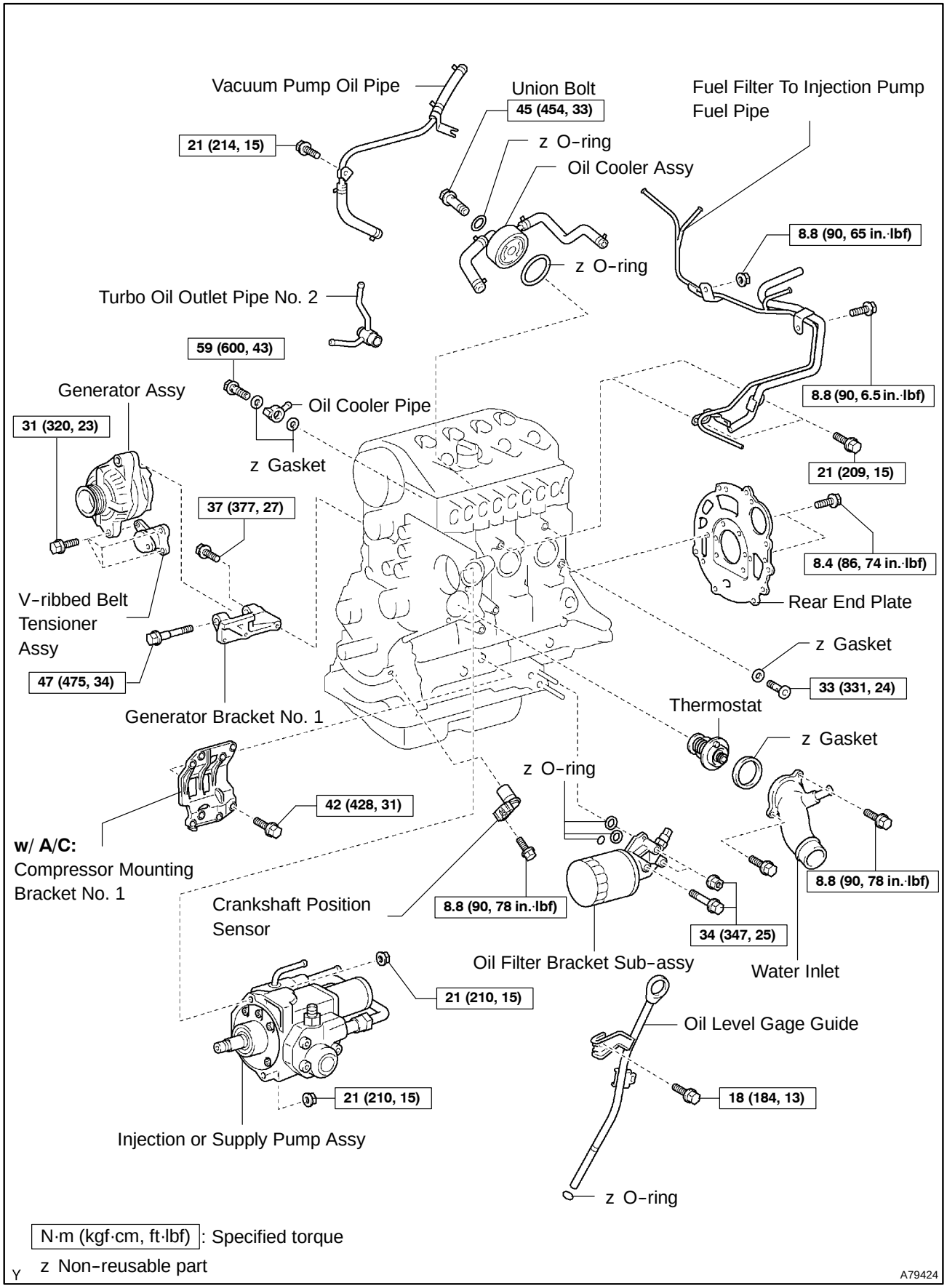
N·m (kgf·cm, ft·lbf): Specified torque

z Non-reusable part

Y * Use SST

A84370

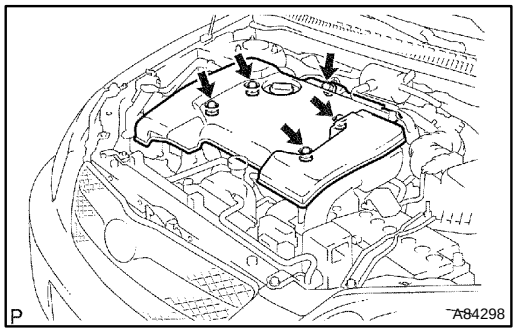

37 (375, 27)
z 25 (250, 18)
z 25 (250, 18)
EGR Pipe Sub-assy No. 1
z Gasket
Exhaust Manifold
z Gasket
z Gasket
z 47 (479, 35)
Coller
z Gasket
Engine Coolant Temperature Sensor
Timing Belt No. 3 Cover
Seal Washer
7.4 (76, 66 in.·lbf)
Intake Air Connector Sub-assy
21 (214, 15)
21 (214, 15)
z Gasket
z Gasket
Intake Manifold
21 (214, 15)
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
Y
A84384


Vacuum Pump Oil Pipe
21 (214, 15)
Union Bolt
45 (454, 33)
z O-ring
Oil Cooler Assy
z O-ring
Fuel Filter To Injection Pump Fuel Pipe
8.8 (90, 65 in.·lbf)
Turbo Oil Outlet Pipe No. 2
59 (600, 43)
Oil Cooler Pipe
z Gasket
8.8 (90, 6.5 in.·lbf)
21 (209, 15)
Generator Assy
31 (320, 23)
37 (377, 27)
8.4 (86, 74 in.·lbf)
Rear End Plate
V-ribbed Belt Tensioner Assy
47 (475, 34)
z Gasket
33 (331, 24)
Generator Bracket No. 1
Thermostat
z Gasket
z O-ring
42 (428, 31)
w/ A/C:
Compressor Mounting Bracket No. 1
8.8 (90, 78 in.·lbf)
Crankshaft Position Sensor
8.8 (90, 78 in.·lbf)
34 (347, 25)
Oil Filter Bracket Sub-assy
Water Inlet
21 (210, 15)
Oil Level Gage Guide
21 (210, 15)
18 (184, 13)
Injection or Supply Pump Assy
z O-ring
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
A79424

141GY-01

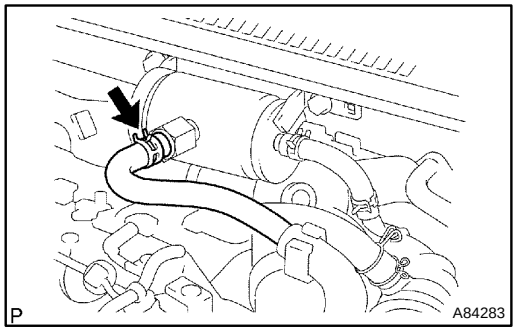
REPLACEMENT

1. **REMOVE FRONT WHEELS**
2. **REMOVE ENGINE UNDER COVER LH(See page 14-5)**
3. **REMOVE ENGINE UNDER COVER RH (See page 14-5)**
4. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)**
5. **DRAIN ENGINE COOLANT (See page 16-3)**
6. **DRAIN ENGINE OIL (See page 17-9)**
7. **DRAIN MANUAL TRANSAXLE OIL**
   Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



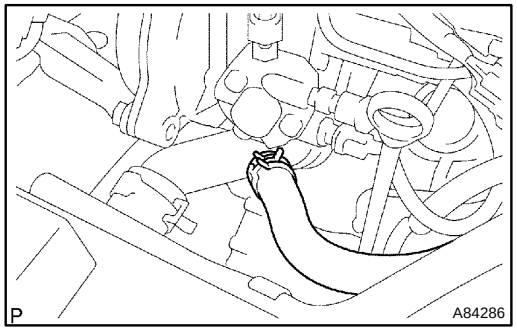
8. **REMOVE ENGINE COVER SUB-ASSY NO.1**
   (a) Remove the 5 nuts, then remove the engine cover.

9. **REMOVE BATTERY**
10. **REMOVE AIR CLEANER ASSY**
    (a) Disconnect the mass air flow sensor connector.
    (b) Remove the air cleaner cap together with the air cleaner hose.
    (c) Remove the air cleaner filter element.
    (d) Remove the 3 bolts and air cleaner case.

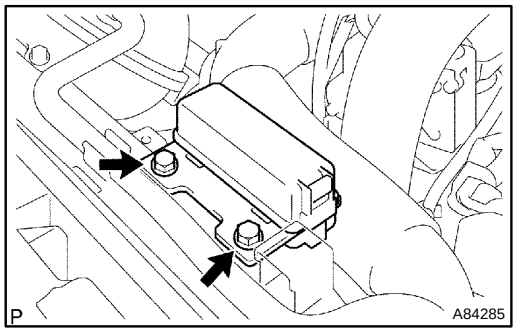


11. **DISCONNECT UNION TO CONNECTOR TUBE HOSE**

12. **REMOVE FUEL FILTER ASSY (See page 11-28)**
    SST 09228-64030
13. **REMOVE RADIATOR HOSE INLET**
14. **REMOVE RADIATOR HOSE OUTLET**



15. DISCONNECT WATER BY-PASS HOSE NO.2



16. REMOVE ENGINE ROOM RELAY BLOCK NO.2

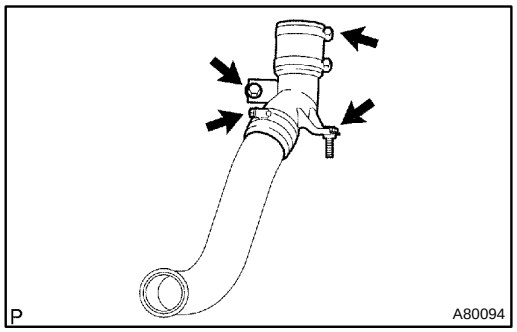
(a) Remove the 2 bolts, then remove the engine room relay block.

17. REMOVE RADIATOR ASSY (W/ AIR CONDITIONING) (See Pub. No. RM925E on page 16-40)

18. DISCONNECT HEATER INLET WATER HOSE

19. DISCONNECT HEATER OUTLET WATER HOSE

20. DISCONNECT FUEL HOSE NO.2



21. REMOVE AIR TUBE NO.2

(a) Loosen the hose clamp, disconnect the air hose No. 3.

(b) Remove the 2 bolts and air tube No. 2.

22. SEPARATE TRANSMISSION CONTROL CABLE ASSY

(a) Remove the 2 clips, separate the control cable assembly.

23. REMOVE INJECTOR DRIVER

(a) Remove the 2 nuts which is used to secure the injector driver.

(b) Disconnect the injector driver connector and harness clamp.

(c) Remove the injector driver.

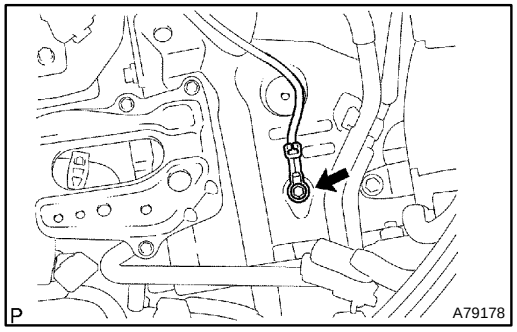
24. DISCONNECT ENGINE WIRE

(a) Remove the glove compartment door.

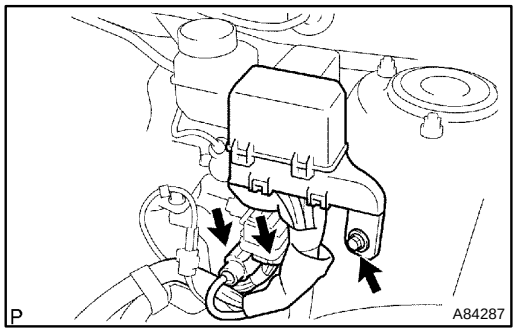
(b) Disconnect the engine wire from the ECM and junction block.

(c) Pull out the engine wire.

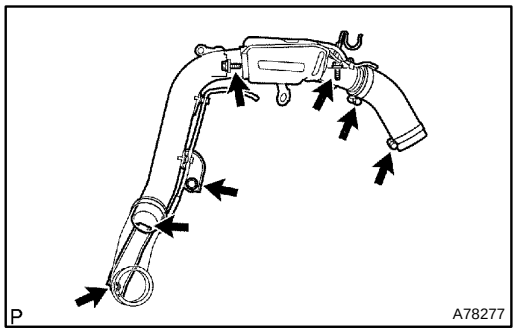
(d) Disconnect the engine wire from the engine room junction block.



(e) Remove the bolt and disconnect the wire harness from the body.



(f) Remove the bolt and engine room relay block No. 3.
(g) Disconnect the 2 connectors.
(h) Disconnect the wire harness from the fuel filter support.



25. REMOVE AIR TUBE NO.1
(a) Loosen the hose clamps.
(b) Remove the 3 bolts and nut, then detach the air tube No. 1.

26. REMOVE CLUTCH ACCUMULATOR ASSY (See Pub. No. RM925E on page 42-17)
SST 09023-00100
27. REMOVE CLUTCH RELEASE CYLINDER ASSY (See Pub. No. RM925E on page 42-17)
28. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
29. SEPARATE COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING) (See Pub. No. RM925E on page 55-92)
HINT:
Secure the hoses off to the side instead of detaching.
30. REMOVE FLOOR PANEL BRACE FRONT (See Pub. No. RM925E on page 15-8)
31. REMOVE EXHAUST PIPE ASSY FRONT (See Pub. No. RM925E on page 15-8)
32. REMOVE FRONT AXLE HUB LH NUT (See Pub. No. RM925E on page 30-18)
SST 09930-00010
HINT:
Perform the same procedure as above on the opposite side.
33. SEPARATE TIE ROD END SUB-ASSY LH (See Pub. No. RM925E on page 30-18)
SST 09628-62011
HINT:
Perform the same procedure as above on the opposite side.

34. SEPARATE FRONT STABILIZER LINK ASSY LH (See Pub. No. RM925E on page 26-7)

HINT:

Perform the same procedure as above on the opposite side.

35. REMOVE COLUMN HOLE COVER SILENCER SHEET

(a) Remove the 2 clips and column hole cover silencer sheet.

36. REMOVE STEERING INTERMEDIATE SHAFT ASSY NO.2 (See Pub. No. RM925E on page 51-6)

37. SEPARATE FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH (See Pub. No. RM925E on page 26-14)

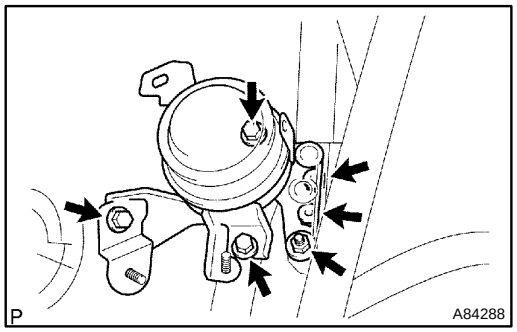
HINT:

Perform the same procedure as above on the opposite side.

38. SEPARATE FRONT DRIVE SHAFT ASSY LH (See Pub. No. RM925E on page 30-18)

HINT:

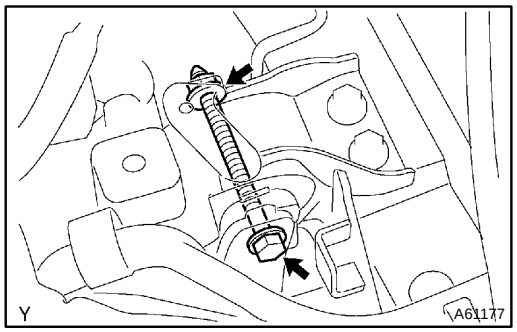
Perform the same procedure as above on the opposite side.



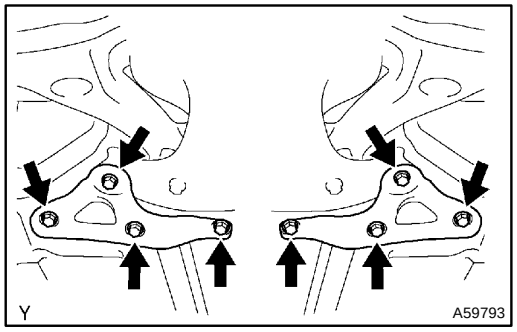
39. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

(a) Set the engine lifter.

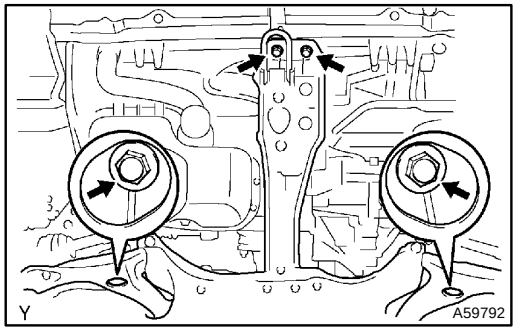
(b) Remove the 3 bolts, 3 nuts and engine mounting insulator sub-assembly RH.



(c) Remove the through bolt and nut, then detach the engine mounting insulator LH from the vehicle.

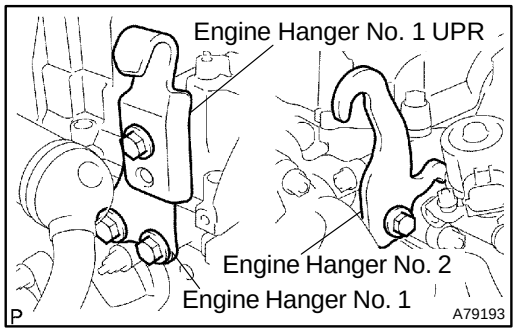


(d) Remove the 8 bolts and front suspension member brace rear RH and LH.



(e) Remove the 2 bolts and 2 nuts.

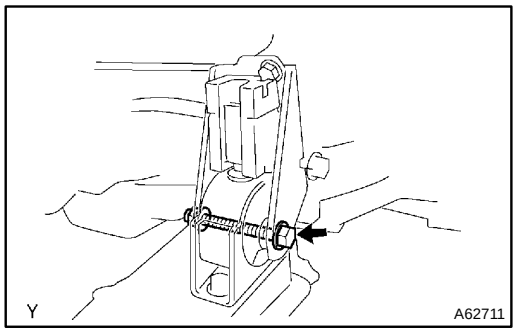
(f) Carefully remove the engine together with the transaxle from the vehicle.



(g) Install the 2 engine hangers with the 2 bolts.

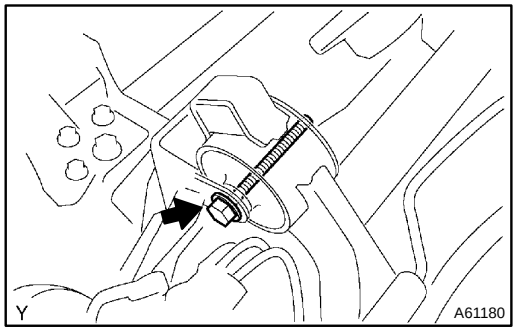
Part No.:
No. 1 engine hanger UPR (yellow) 12284-27020
No. 1 engine hanger UPR (black) 12284-27030
No. 1 engine hanger 12281-27050
No. 2 engine hanger (yellow) 12282-27060
No. 2 engine hanger (black) 12282-27070
Bolt 91642-81025
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

(h) Attach the engine sling, then hang the engine with the chain block.



40. REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSY

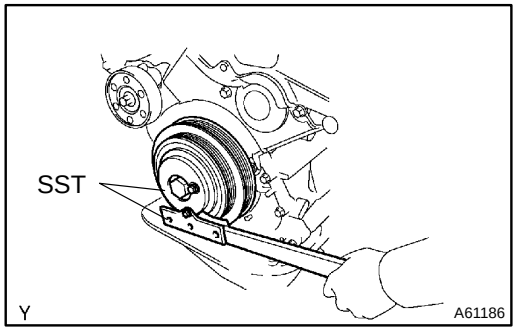
(a) Remove the through bolt and nut, then detach the engine mounting insulator FR from the engine mounting bracket.



(b) Remove the through bolt, then detach the engine mounting insulator RR from the suspension crossmember.

(c) Separate the engine together with the transaxle from the suspension crossmember and engine mounting member.

41. REMOVE STARTER ASSY (See Pub. No. RM925E on page 19-25)
42. REMOVE MANUAL TRANSAXLE (See Pub. No. RM925E on page 41-36)
43. REMOVE CLUTCH COVER ASSY (See Pub. No. RM925E on page 42-29)
44. REMOVE CLUTCH DISC ASSY (See Pub. No. RM925E on page 42-29)



45. REMOVE FLYWHEEL SUB-ASSY

(a) Hold the crankshaft with SST.
SST 09213-54015 (90105-08076), 09330-00021

(b) Using a Torx socket wrench (T55), then remove the 8 Torx screws and flywheel.

46. REMOVE REAR END PLATE

(a) Remove the 2 bolts and rear end plate.

47. REMOVE DRIVE SHAFT BEARING BRACKET

48. REMOVE ENGINE MOUNTING BRACKET FR

49. REMOVE ENGINE MOUNTING BRACKET RR

50. REMOVE GLOW PLUG ASSY (See page 19-4)

51. REMOVE GENERATOR V BELT (See page 14-4)

52. REMOVE CRANKSHAFT PULLEY (See page 14-47)

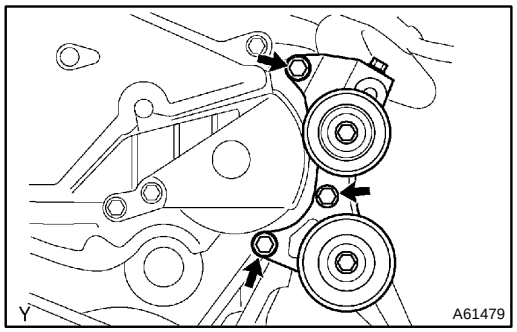
SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

53. REMOVE IDLER PULLEY SUB-ASSY (See page 14-47)

54. REMOVE TIMING BELT NO.2 COVER (See page 14-47)

55. REMOVE TIMING BELT NO.1 COVER (See page 14-47)

56. REMOVE TIMING BELT GUIDE



57. REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING)

(a) Remove the 3 bolts and idle w/ bracket pulley.

58. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET(See page 14-47)

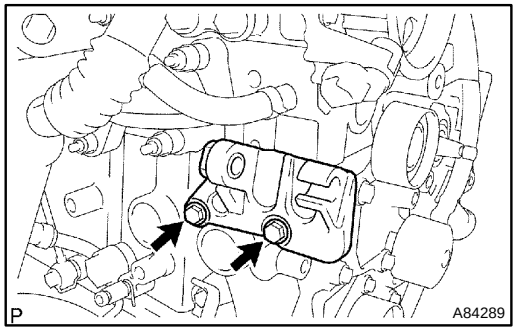
59. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)

60. REMOVE TIMING BELT (See page 14-47)

HINT:

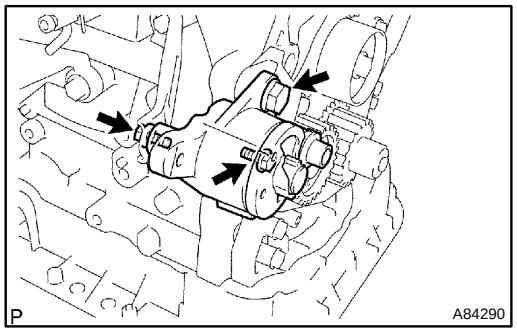
If reusing the timing belt, draw an arrow on the belt which indicates the engine revolution direction, then put match marks on the pulleys and belt before removing. This operation will be very helpful when reinstalling the timing belt.

61. REMOVE GENERATOR ASSY (See Pub. No. RM925E on page 19-30)



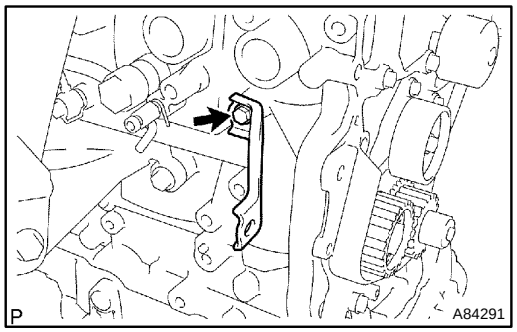
62. REMOVE GENERATOR BRACKET NO.1

(a) Remove the 2 bolts and generator bracket.



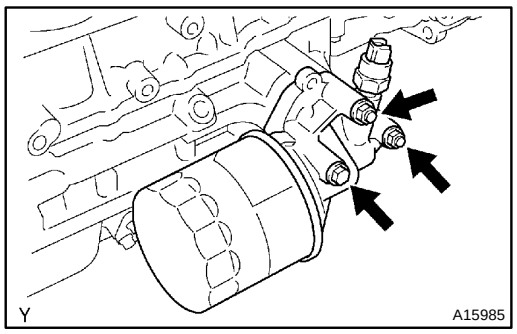
63. REMOVE V-RIBBED BELT TENSIONER ASSY

(a) Remove the 3 bolts and V-ribbed belt tensioner.



64. REMOVE V-RIBBED BELT TENSIONER BRACKET

(a) Remove the bolt and V-ribbed belt tensioner bracket.



65. REMOVE OIL FILTER BRACKET SUB-ASSY

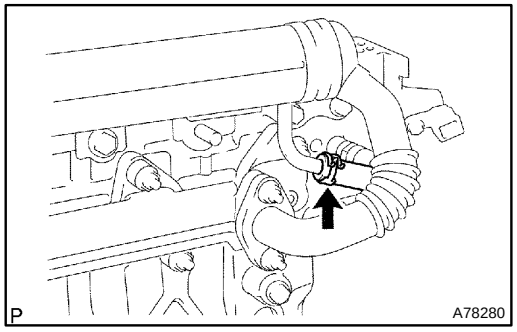
(a) Remove the bolt and 2 nuts, then remove the oil filter bracket and gasket.

66. REMOVE TURBO INSULATOR NO.2 (See page 13-8)
67. REMOVE TURBO INSULATOR NO.1 (See page 13-8)
68. REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.2 (See page 13-8)
69. REMOVE MANIFOLD STAY NO.2 (See page 13-8)
70. REMOVE MANIFOLD STAY (See page 13-8)
71. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-8)
72. REMOVE TURBOCHARGER STAY (See page 13-8)
73. DISCONNECT TURBO WATER HOSE NO.1 (See page 13-8)
74. DISCONNECT TURBO WATER HOSE NO.2 (See page 13-8)

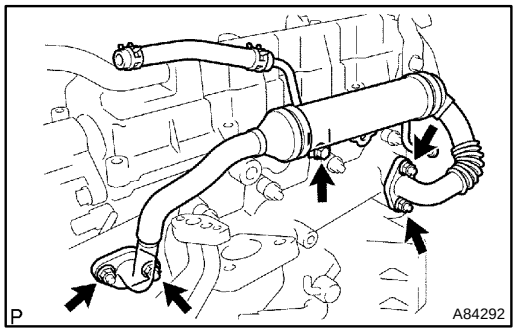
75. REMOVE TURBO OIL INLET PIPE SUB-ASSY (See page 13-8)

76. REMOVE TURBO OIL OUTLET PIPE NO.2 (See page 13-8)

77. REMOVE TURBOCHARGER SUB-ASSY (See page 13-8)

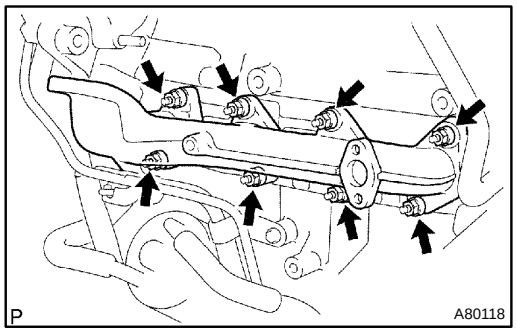


78. DISCONNECT WATER BY-PASS HOSE NO.3



79. REMOVE EGR PIPE SUB-ASSY NO.1

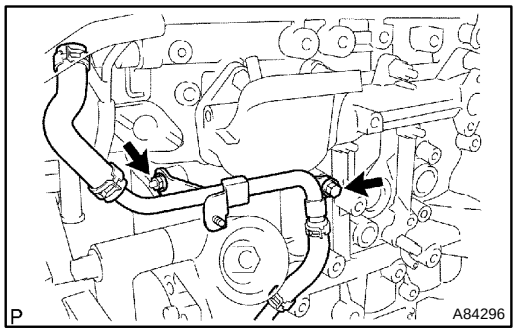
(a) Remove the bolt and 4 nut, then detach the EGR pipe and 2 gaskets.



80. REMOVE EXHAUST MANIFOLD

(a) Remove the 8 nuts, exhaust manifold and gasket.

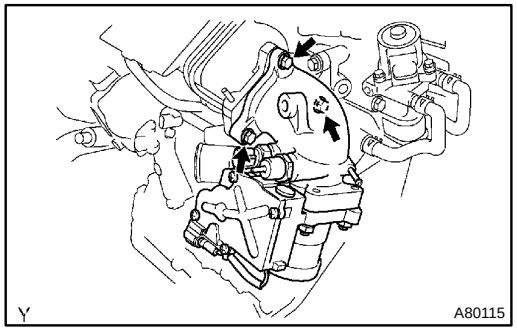
81. REMOVE OIL COOLER ASSY (See Pub. No. RM925E on page 17-22)



82. REMOVE VACUUM PUMP OIL PIPE

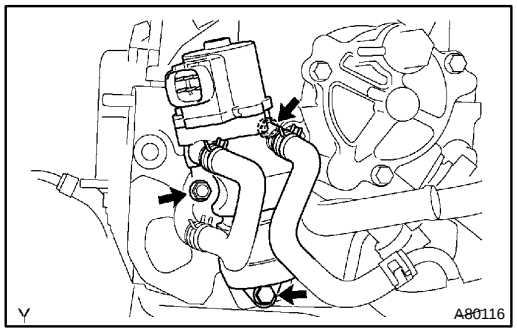
(a) Disconnect the 2 hoses.

(b) Remove the bolt and nut, then remove the vacuum pump oil pipe.



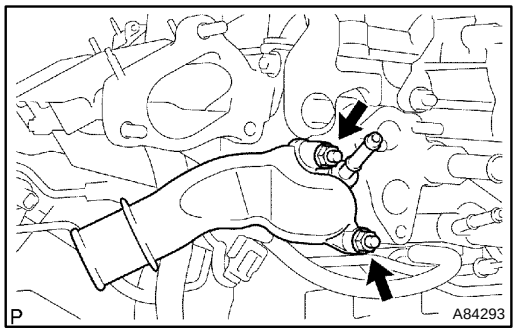
83. REMOVE INTAKE AIR CONNECTOR SUB-ASSY

(a) Remove the bolt and 2 nuts, then remove the intake air connector and gasket.



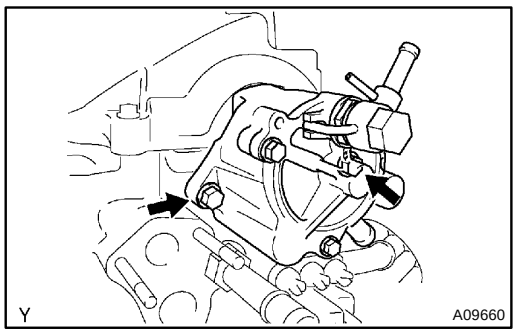
84. REMOVE EGR VALVE ASSY

(a) Remove the bolt and 2 nuts, then remove the EGR valve and gasket.



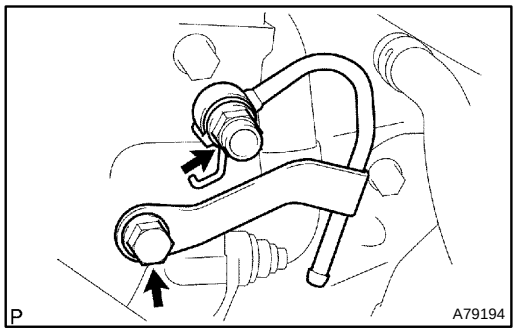
85. REMOVE WATER OUTLET SUB-ASSY

(a) Remove the 2 nut, water outlet and gasket.



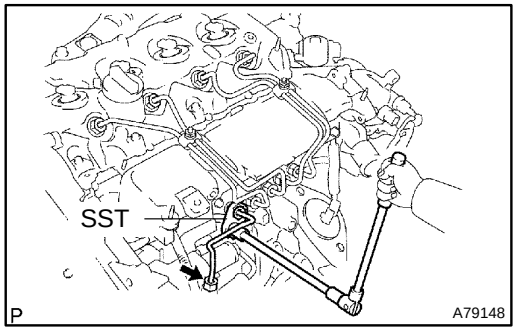
86. REMOVE VACUUM PUMP ASSY

(a) Remove the 2 bolts, vacuum pump and 2 O-rings.



87. REMOVE NOZZLE LEAKAGE PIPE NO.2

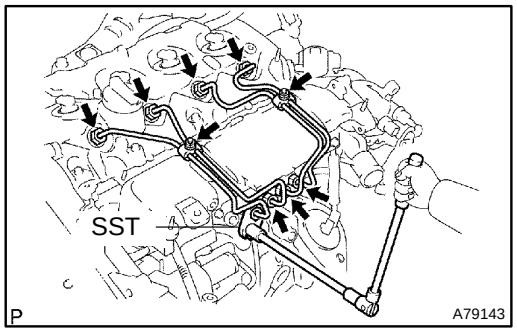
(a) Remove the check valve and bolt, then detach the leakage pipe and gasket.



88. REMOVE FUEL INLET PIPE SUB-ASSY

(a) Using SST, remove the fuel inlet pipe from the common rail side.
SST 09023-12700

(b) Using SST, remove the fuel inlet pipe from the pump side.
SST 09023-12700



89. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.

(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700

(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700

(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

(e) Remove the 2 lower injection pipe clamps from the intake manifold.

90. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

91. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

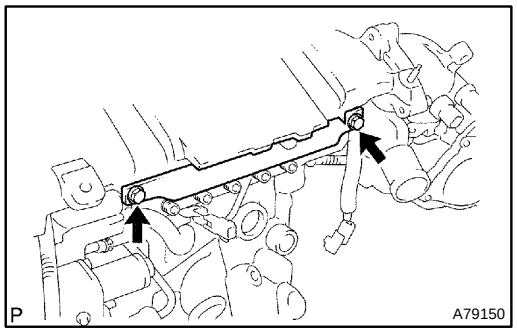
Perform the same procedures as injection pipe No. 1.

92. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

HINT:

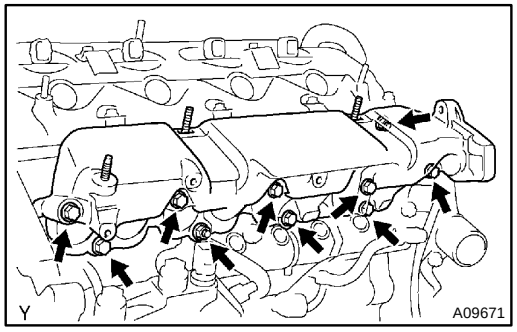
Perform the same procedures as injection pipe No. 1.



93. REMOVE INTAKE MANIFOLD INSULATOR NO.1

(a) Remove the 2 bolts and intake manifold insulator.

94. REMOVE COMMON RAIL ASSY (See page 11-24)



95. REMOVE INTAKE MANIFOLD

(a) Remove the 2 bolts and wiring harness clamp bracket.

(b) Remove the 8 bolts and 2 nuts, then remove the intake manifold and gasket.

96. REMOVE INJECTION PUMP DRIVE PULLEY (See page 11-15)

SST 09960-10010 (09962-01000, 09963-01000)

97. REMOVE TIMING BELT NO.3 COVER

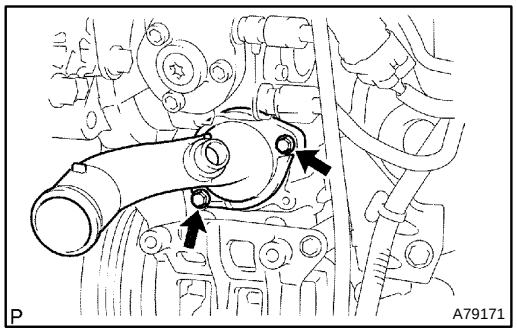
(a) Remove the 2 bolts and 2 seal washers, then remove the timing belt cover.

98. REMOVE OIL LEVEL GAGE GUIDE (See page 17-1)

99. REMOVE INJECTION OR SUPPLY PUMP ASSY (See page 11-15)

100. REMOVE COMPRESSOR MOUNTING BRACKET NO.1 (W/ AIR CONDITIONING)

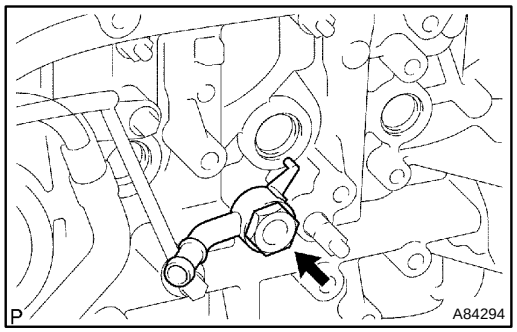
(a) Remove the 4 bolts and compressor mounting bracket.



101. REMOVE WATER INLET

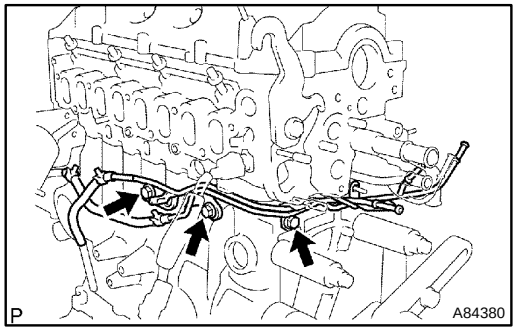
(a) Remove the 2 bolts and water inlet.

102. REMOVE THERMOSTAT



103. REMOVE OIL COOLER PIPE

(a) Using a socket wrench 27 mm, remove the union bolt, oil cooler pipe and gasket.



104. REMOVE FUEL FILTER TO INJECTION PUMP FUEL PIPE

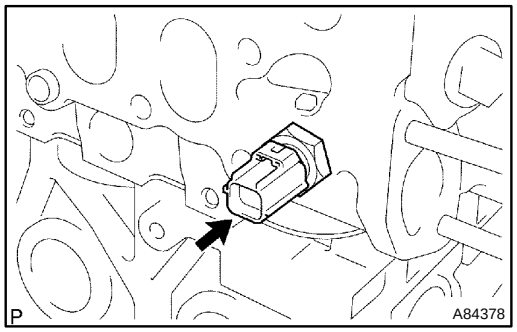
(a) Remove the 3 bolts and fuel pipe.

105. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and crankshaft position sensor.

106. REMOVE CAMSHAFT POSITION SENSOR

(a) Remove the bolt and camshaft position sensor.



107. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

108. REPLACE PARTIAL ENGINE ASSY

109. INSTALL ENGINE COOLANT TEMPERATURE SENSOR
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

110. INSTALL CAMSHAFT POSITION SENSOR
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

111. INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

112. INSTALL FUEL FILTER TO INJECTION PUMP FUEL PIPE
Torque:
8.8 N·m (90 kgf·cm, 78 ft·lbf) for M6
21 N·m (209 kgf·cm, 15 ft·lbf) for M8

113. INSTALL OIL COOLER PIPE

(a) Using a socket wrench 27 mm, install 2 new gaskets and the oil cooler pipe with the union bolt.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

114. INSTALL THERMOSTAT (See page 16-9)

115. INSTALL WATER INLET (See page 16-9)

116. INSTALL COMPRESSOR MOUNTING BRACKET NO.1 (W/ AIR CONDITIONING)
Torque: 42 N·m (428 kgf·cm, 31 ft·lbf)

117. INSTALL INJECTION OR SUPPLY PUMP ASSY (See page 11-15)

118. INSTALL OIL LEVEL GAGE GUIDE (See page 17-1)

119. INSTALL TIMING BELT NO.3 COVER
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

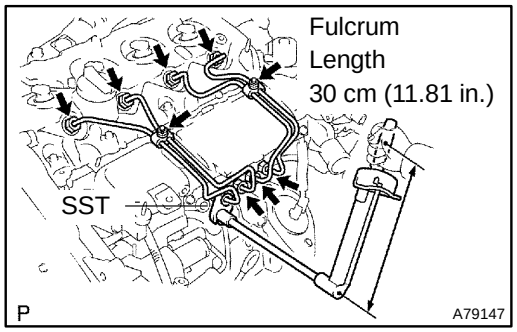
120. INSTALL INJECTION PUMP DRIVE PULLEY (See page 11-15)
SST 09960-10010 (09962-01000, 09963-01000)

121. INSTALL INTAKE MANIFOLD

(a) Install a new gasket and the intake manifold with the 8 bolts and 2 nuts.
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

122. INSTALL COMMON RAIL ASSY (See page 11-24)

123. INSTALL INTAKE MANIFOLD INSULATOR NO.1
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)



124. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:

- **In case of having the injectors replaced, the injection pipes must be replaced, too.**
- **When assembling the pipes, perform the operation with the engine cold under room temperature.**

(a) Install the 2 lower injection pipe clamps to the intake manifold.

(b) Temporarily install the new injection pipe.

(c) Using SST, tighten the nut of the injection pipe to the common rail side.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

125. INSTALL INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

126. INSTALL INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

127. INSTALL INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

HINT:

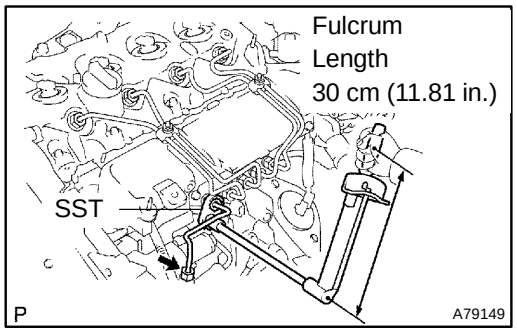
Perform the same procedures as injection pipe No. 1.

128. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

- **In case of having the cylinder head replaced, the fuel inlet pipe must be replaced, too.**
- **When assembling the pipe, perform the operation with the engine cold under room temperature.**

(a) Temporarily install the new fuel inlet pipe.



(b) Using SST, tighten the nut of the fuel inlet pipe to the common rail side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(c) Using SST, tighten the nut of the fuel inlet pipe to the pump side.

SST 09023-12700

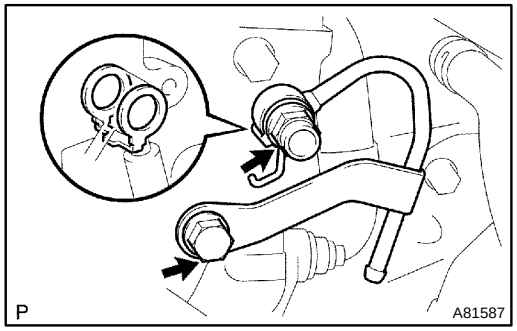
Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

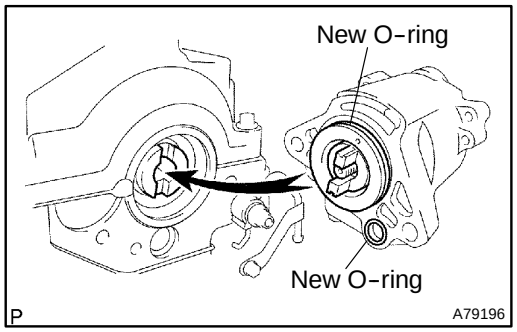
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.



129. INSTALL NOZZLE LEAKAGE PIPE NO.2

(a) Install a new gasket and the leakage pipe with the check valve.

Torque:
21 N·m (214 kgf·cm, 15 ft·lbf) for check valve
8.8 N·m (90 kgf·cm, 78 in.·lbf) for bolt



130. INSTALL VACUUM PUMP ASSY

(a) Install 2 new O-rings to the vacuum pump.

(b) Align the key of the vacuum pump with the keyway of the exhaust camshaft, then insert the vacuum pump into place. Secure the pump with the 2 bolts.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

131. INSTALL WATER OUTLET SUB-ASSY

(a) Install a new gasket and the water outlet with the 2 bolts.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

132. INSTALL EGR VALVE ASSY

(a) Install a new gasket and the EGR valve with the bolt and 2 nuts.

Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

133. INSTALL INTAKE AIR CONNECTOR SUB-ASSY

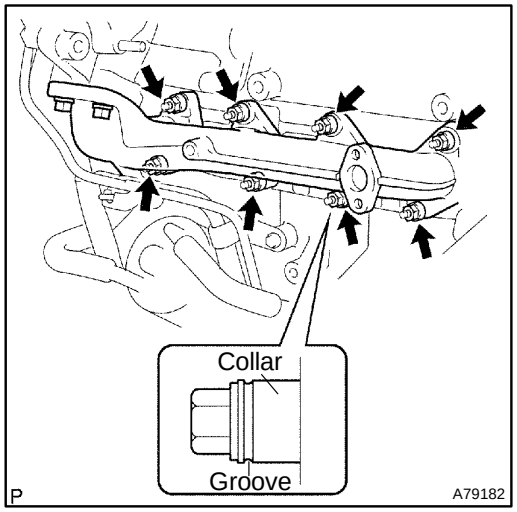
(a) Install a new gasket and the intake air connector together with diesel throttle body with the bolt and 2 nuts.

Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)

134. INSTALL VACUUM PUMP OIL PIPE

Torque:
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt
8.8 N·m (90 kgf·cm, 78 in.·lbf) for nut

135. INSTALL OIL COOLER ASSY (See Pub. No. RM925E on page 17-22)



136. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket, the exhaust manifold and 8 collars with new 8 nuts.

Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

HINT:

When installing the collars, pay attention to the mounting orientation. The ring groove of the collar should be outside. Refer to the illustration on the left.

137. INSTALL EGR PIPE SUB-ASSY NO.1

(a) Install 2 new gaskets and the EGR pipe with the bolt and 4 new nuts.

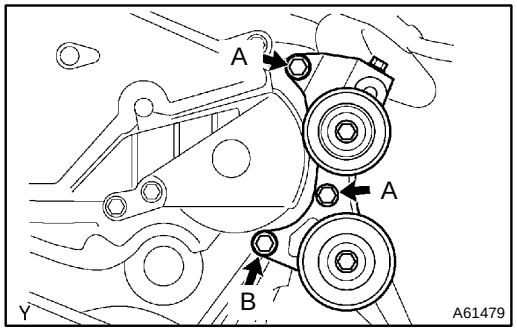
Torque:
37 N·m (375 kgf·cm, 27 ft·lbf) for bolt
25 N·m (250 kgf·cm, 18 ft·lbf) for nut

138. INSTALL TURBOCHARGER SUB-ASSY(See page 13-8)
139. INSTALL TURBO OIL INLET PIPE SUB-ASSY (See page 13-8)
140. INSTALL TURBOCHARGER STAY (See page 13-8)
141. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-8)
142. INSTALL MANIFOLD STAY NO.2 (See page 13-8)
143. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.2 (See page 13-8)
144. INSTALL TURBO INSULATOR NO.1 (See page 13-8)
145. INSTALL TURBO INSULATOR NO.2 (See page 13-8)
146. INSTALL OIL FILTER BRACKET SUB-ASSY

(a) Install a new gasket and oil filter bracket with the bolt and 2 nuts.

Torque: 34 N·m (347 kgf·cm, 25 ft·lbf)

147. INSTALL V-RIBBED BELT TENSIONER BRACKET
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)
148. INSTALL V-RIBBED BELT TENSIONER ASSY
Torque: 31 N·m (316 kgf·cm, 23 ft·lbf)
149. INSTALL GENERATOR BRACKET NO.1
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)
150. INSTALL GENERATOR ASSY (See Pub. No. RM925E on page 19-30)
151. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)
SST 09960-10010 (09962-01000, 09963-01000)
152. INSTALL TIMING BELT (See page 14-47)
153. CHECK VALVE TIMING (See page 14-47)
154. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)



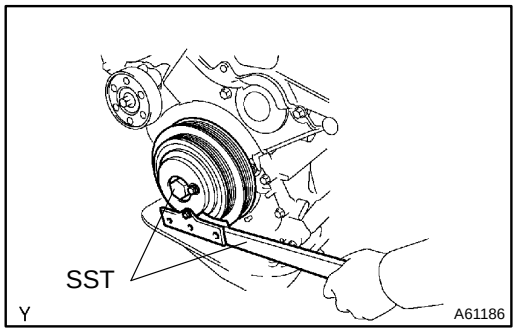
155. INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING)

(a) Install the idle w/ bracket pulley with the 3 bolts.

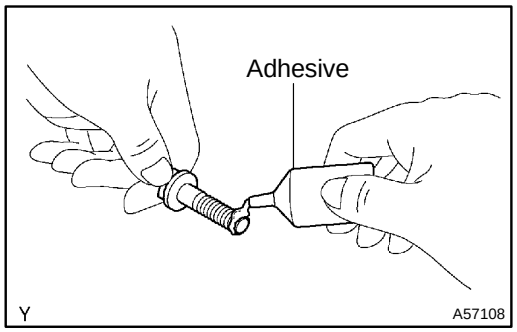
Torque:
88 N·m (897 kgf·cm, 65 ft·lbf) for bolt A
46 N·m (469 kgf·cm, 34 ft·lbf) for bolt B

156. INSTALL TIMING BELT GUIDE (See page 14-47)
157. INSTALL TIMING BELT NO.1 COVER(See page 14-47)
158. INSTALL TIMING BELT NO.2 COVER (See page 14-47)
159. INSTALL IDLER PULLEY SUB-ASSY
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)
160. INSTALL CRANKSHAFT PULLEY (See page 14-47)
SST 09213-54015 (90105-08076), 09330-00021
161. INSTALL GLOW PLUG ASSY (See page 19-4)
162. INSTALL ENGINE MOUNTING BRACKET RR
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

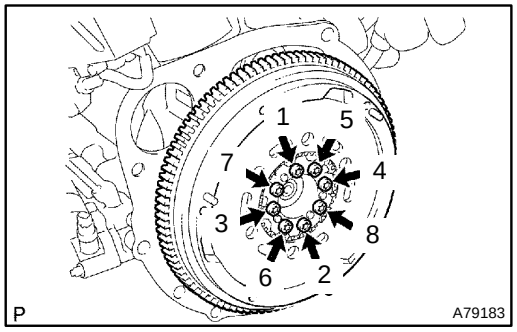
163. INSTALL ENGINE MOUNTING BRACKET FR
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
164. INSTALL DRIVE SHAFT BEARING BRACKET
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)
165. INSTALL REAR END PLATE
Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)



166. INSTALL FLYWHEEL SUB-ASSY
(a) Using SST, hold the crankshaft.
SST 09213-54015 (90105-08076), 09330-00021
(b) Clean the bolts and their bolt holes.

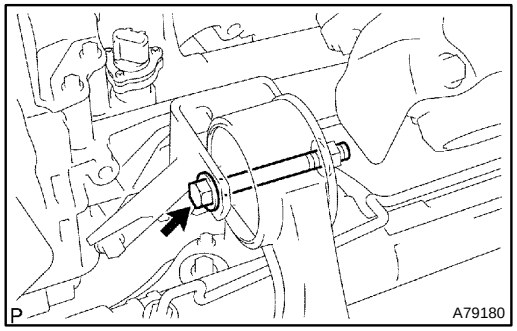


(c) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent



(d) Using several steps, install and tighten the 8 screws with a Torx socket wrench (T55) uniformly in the sequence shown in the illustration.
Torque: 71 N·m (720 kgf·cm, 52 ft·lbf)

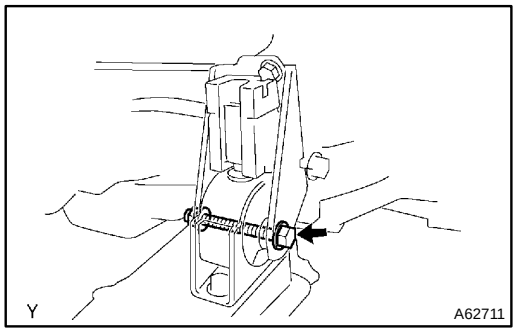
167. INSTALL CLUTCH DISC ASSY (See Pub. No. RM925E on page 42-29)
SST 09301-00210
168. INSTALL CLUTCH COVER ASSY (See Pub. No. RM925E on page 42-29)
169. INSTALL MANUAL TRANSAXLE (See Pub. No. RM925E on page 41-36)
170. INSTALL STARTER ASSY (See Pub. No. RM925E on page 19-25)



171. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSY

(a) Attach the engine together with the transaxle to the suspension crossmember and engine mounting member.

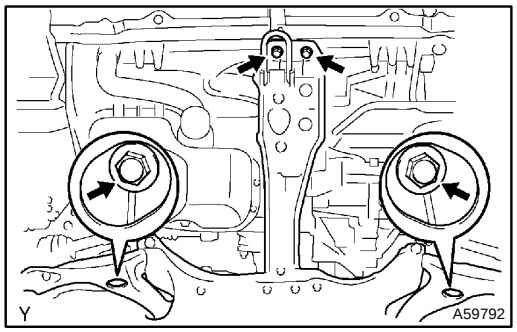
(b) Install the bolt which is used to secure the rear engine mounting bracket to the mounting insulator.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)



(c) Install the bolt which is used to secure the front engine mounting bracket to the mounting insulator.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

172. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

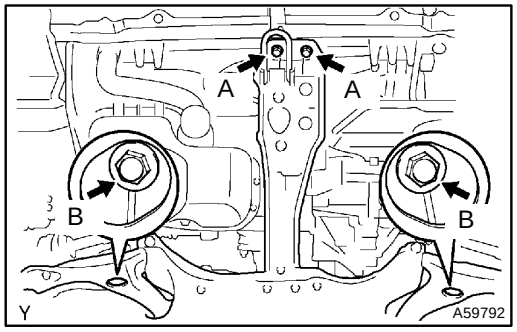
(a) Set the engine together with the transaxle on the engine lifter.



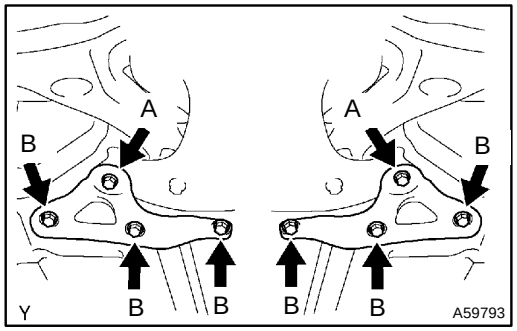
(b) Temporarily, install the suspension crossmember with the 2 bolts and 2 nuts.

(c) Install the engine mounting insulator LH.
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

(d) Install the engine mounting insulator RH.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



(e) Install the front suspension crossmember with the 2 bolts and 2 nuts.
Torque:
39 N·m (398 kgf·cm, 29 ft·lbf) for bolt A
133 N·m (1,356 kgf·cm, 98 ft·lbf) for nut B



(f) Install the front suspension member brace LH and RH with the 8 bolts.
Torque:
133 N·m (1,356 kgf·cm, 98 ft·lbf) for bolt A
80 N·m (816 kgf·cm, 59 ft·lbf) for bolt B

NOTICE:
After installing the crossmember, check that the positioning holes on the crossmember and vehicle are aligned.

173. INSTALL FRONT DRIVE SHAFT ASSY LH (See Pub. No. RM925E on page 30-18)

HINT:

Perform the same procedure as above on the opposite side.

174. INSTALL FRONT SUSPENSION ARM SUB-ASSY LOWER NO.1 LH (See Pub. No. RM925E on page 26-14)

HINT:

Perform the same procedure as above on the opposite side.

175. INSTALL STEERING INTERMEDIATE SHAFT ASSY NO.2 (See Pub. No. RM925E on page 51-6)

176. INSTALL FRONT STABILIZER LINK ASSY LH (See Pub. No. RM925E on page 26-7)

HINT:

Perform the same procedure as above on the opposite side.

177. INSTALL TIE ROD END SUB-ASSY LH (See Pub. No. RM925E on page 30-18)

HINT:

Perform the same procedure as above on the opposite side.

178. INSTALL FRONT AXLE HUB LH NUT (See Pub. No. RM925E on page 30-18)

HINT:

Perform the same procedure as above on the opposite side.

179. INSTALL EXHAUST PIPE ASSY FRONT (See Pub. No. RM925E on page 15-8)

180. INSTALL FLOOR PANEL BRACE FRONT (See Pub. No. RM925E on page 15-8)

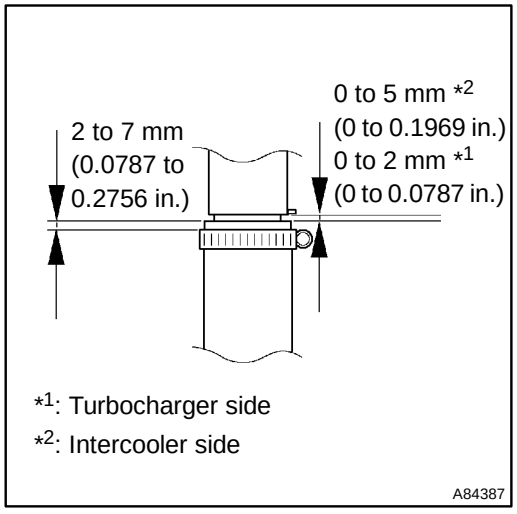
181. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING) (See Pub. No. RM925E on page 55-92)

182. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)

183. INSTALL CLUTCH RELEASE CYLINDER ASSY (See Pub. No. RM925E on page 42-17)

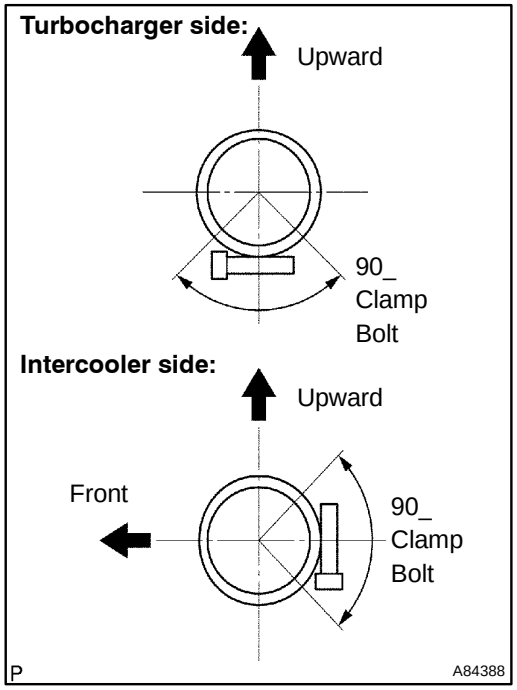
184. INSTALL CLUTCH ACCUMULATOR ASSY (See Pub. No. RM925E on page 42-17)

SST 09023-00100



185. INSTALL AIR TUBE NO.1

(a) Install a new air hose No. 1 and new hose clamp as shown in the illustration.

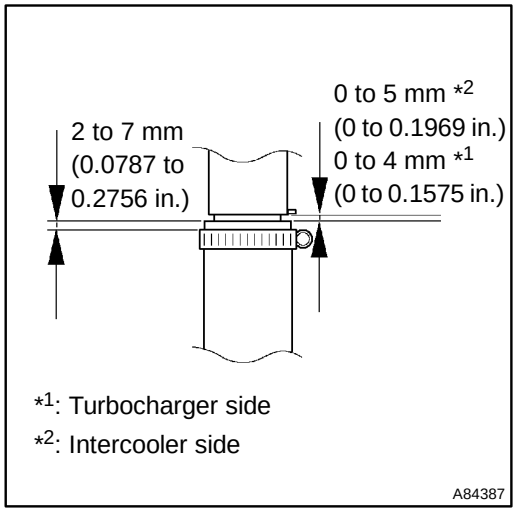


(b) Tighten the hose clamp as shown in the illustration.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

(c) Install the air tube No. 1 with the 3 bolts and nut.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

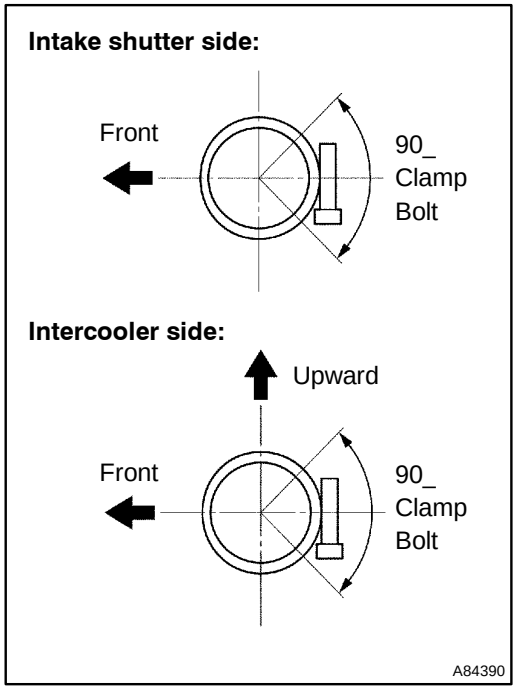
186. CONNECT ENGINE WIRE
Torque:
8.4 N·m (85 kgf·cm, 74 in.·lbf) for wire harness
5.3 N·m (54 kgf·cm, 47 in.·lbf) for engine room relay block No.3

187. INSTALL INJECTOR DRIVER
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)



188. INSTALL AIR TUBE NO.2

(a) Install the air hose and hose clamps as shown in the illustration.



(b) Tighten the hose clamps as shown in the illustration.
Torque: 6.0 N·m (61 kgf·cm, 53 ft·lbf)

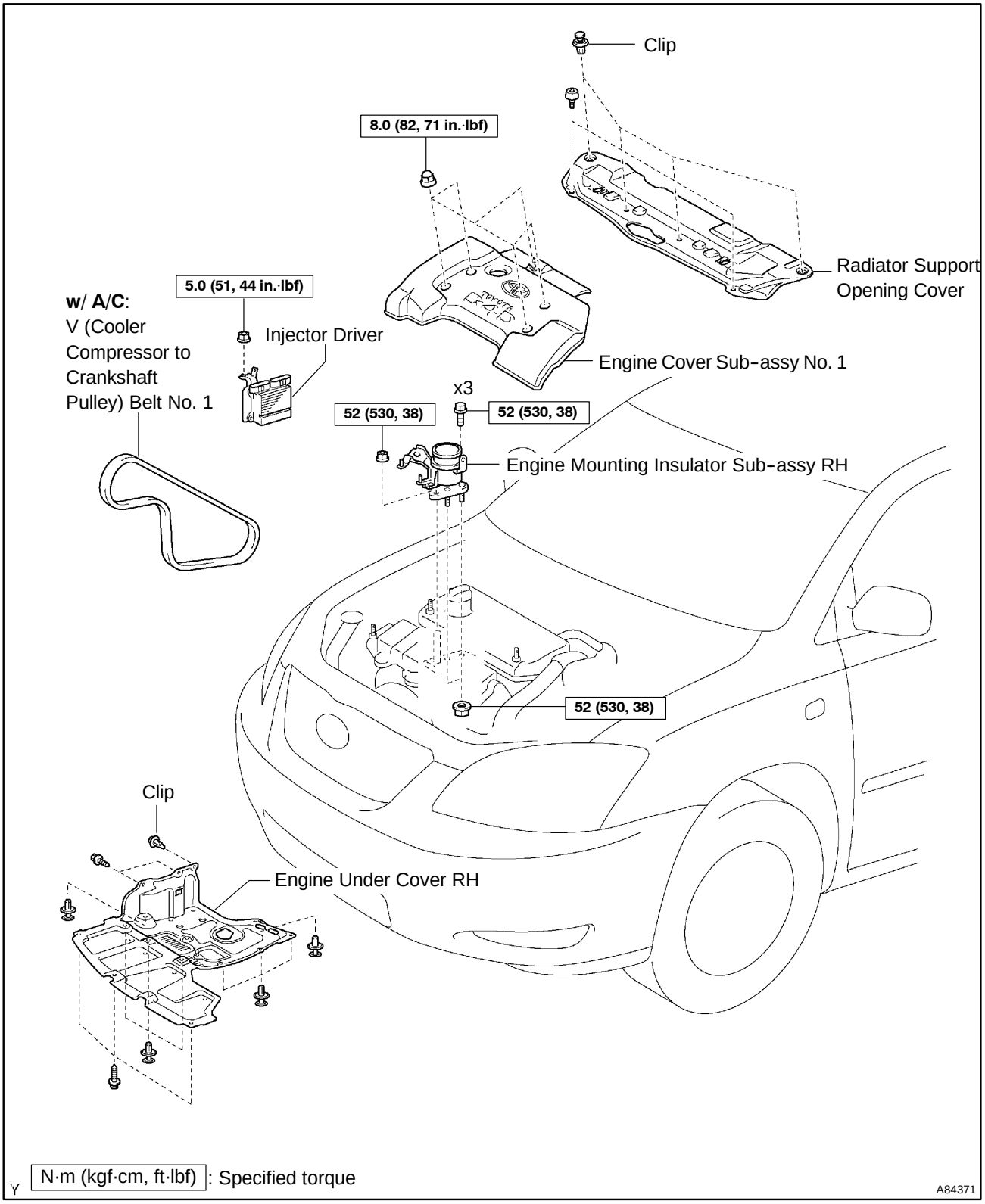
(c) Install the 2 bolts and air tube No. 2 assembly.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

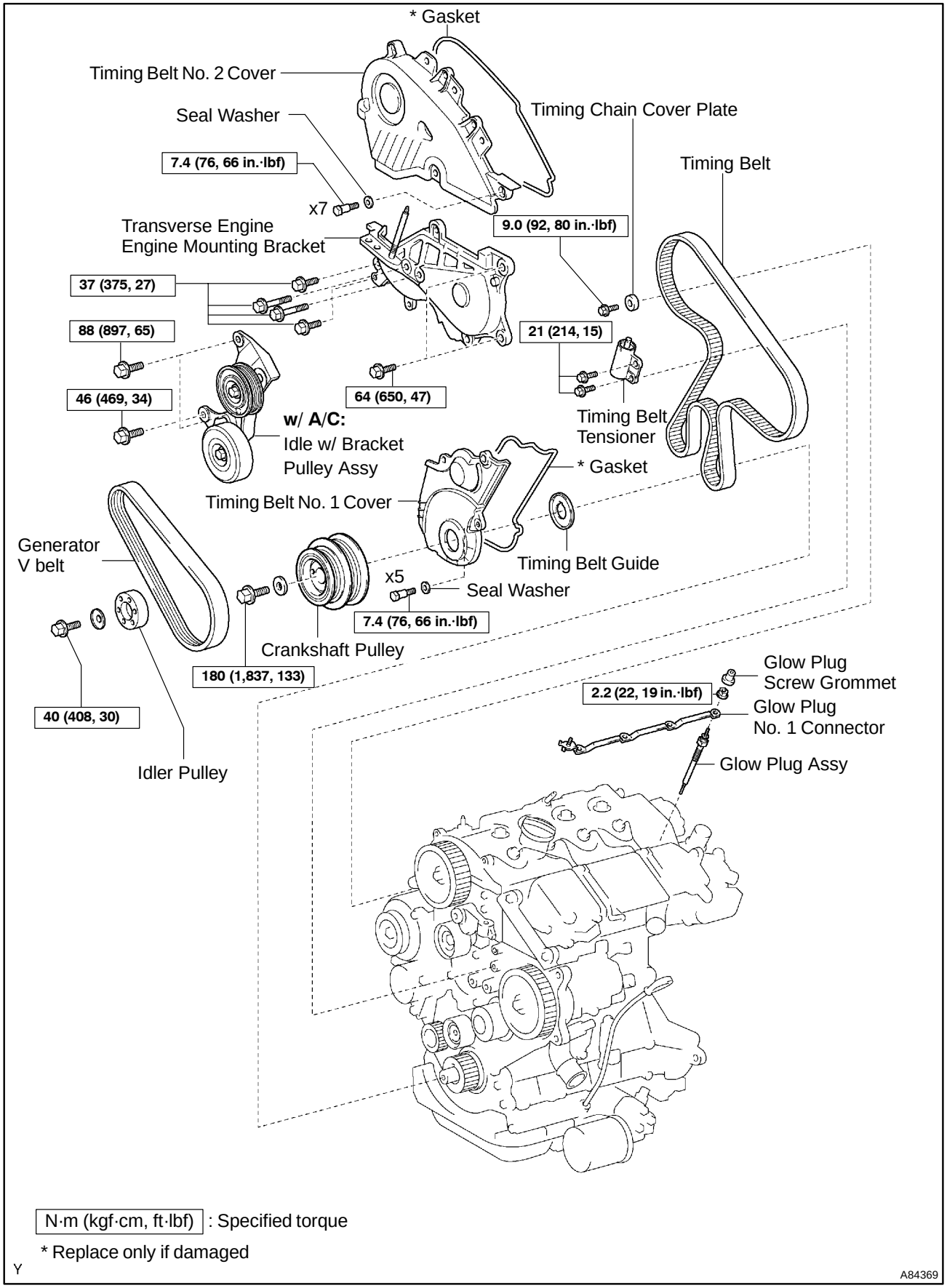
189. INSTALL RADIATOR ASSY (W/ AIR CONDITIONING) (See Pub. No. RM925E on page 16-40)
190. INSTALL ENGINE ROOM RELAY BLOCK NO.2
Torque: 5.3 N·m (54 kgf·cm, 47 in.·lbf)
191. INSTALL FUEL FILTER ASSY (See page 11-28)
192. INSTALL AIR CLEANER ASSY
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)
193. INSTALL BATTERY
Torque:
5.0 N·m (51 kgf·cm, 44 in.·lbf) for bolt
3.5 N·m (36 kgf·cm, 31 in.·lbf) for nut
5.4 N·m (55 kgf·cm, 48 in.·lbf) for terminal
194. INSTALL ENGINE COVER SUB-ASSY NO.1
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)
195. BLEED CLUTCH PIPE LINE (See Pub. No. RM925E on page 42-17)
196. INSTALL FRONT WHEELS
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
197. ADD MANUAL TRANSAXLE OIL (See Pub. No. RM925E on page 41-5)
198. ADD ENGINE OIL (See page 17-9)
199. ADD ENGINE COOLANT (See page 16-3)
200. CHECK CLUTCH FLUID LEAKAGE
201. CHECK FLUID LEVEL IN RESERVOIR
202. CHECK BRAKE FLUID LEAKAGE
203. CHECK FOR ENGINE OIL LEAKS
204. CHECK FOR FUEL LEAKS (See page 11-5)
205. CHECK FOR ENGINE COOLANT LEAKS (See page 16-3)
206. CHECK FOR EXHAUST GAS LEAKS
207. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See Pub. No. RM925E on page 26-2)
208. INSPECT ENGINE IDLE SPEED (See page 14-1)
209. CHECK ABS SPEED SENSOR SIGNAL (See Pub. No. RM925E on page 05-614)

TIMING BELT (1CD-FTV) (May, 2003)

COMPONENTS

141GZ-01

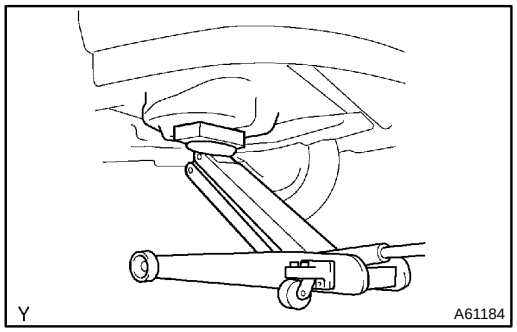



* Gasket
Timing Belt No. 2 Cover
Seal Washer
7.4 (76, 66 in.·lbf)
x7
Timing Chain Cover Plate
Timing Belt
Transverse Engine
Engine Mounting Bracket
9.0 (92, 80 in.·lbf)
37 (375, 27)
88 (897, 65)
21 (214, 15)
46 (469, 34)
64 (650, 47)
w/ A/C:
Idle w/ Bracket
Pulley Assy
Timing Belt
Tensioner
* Gasket
Timing Belt No. 1 Cover
Timing Belt Guide
Generator
V belt
x5
Seal Washer
7.4 (76, 66 in.·lbf)
Crankshaft Pulley
180 (1,837, 133)
40 (408, 30)
Idler Pulley
Glow Plug
Screw Grommet
2.2 (22, 19 in.·lbf)
Glow Plug
No. 1 Connector
Glow Plug Assy
N·m (kgf·cm, ft·lbf) : Specified torque
* Replace only if damaged
Y
A84369

141H0-01

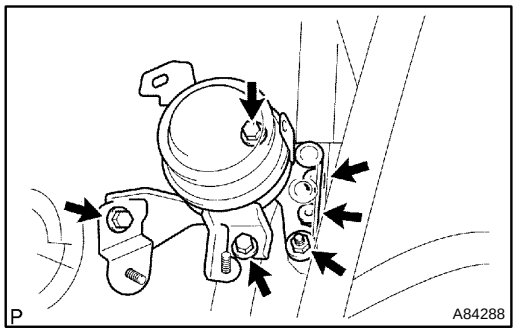
REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER RH (See page 14-5)
3. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)
4. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-5)
5. REMOVE INJECTOR DRIVER (See page 14-24)
6. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
7. REMOVE GENERATOR V BELT (See page 14-4)
8. REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)

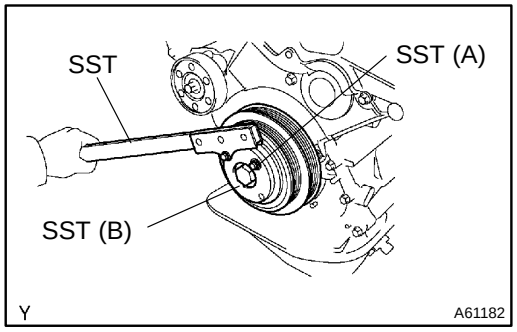


9. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH

(a) Place a wooden block on a jack underneath the engine.



(b) Remove the 3 bolts and 3 nuts, then detach the engine mounting insulator sub-assembly RH.



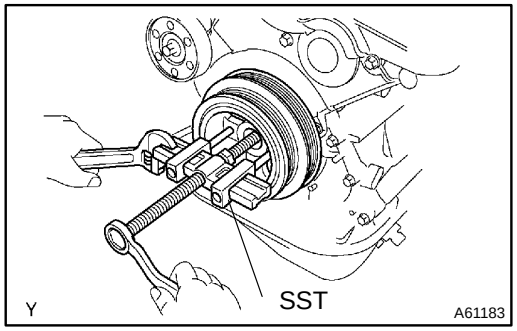
10. REMOVE CRANKSHAFT PULLEY

(a) Using SSTs, remove the pulley bolt.

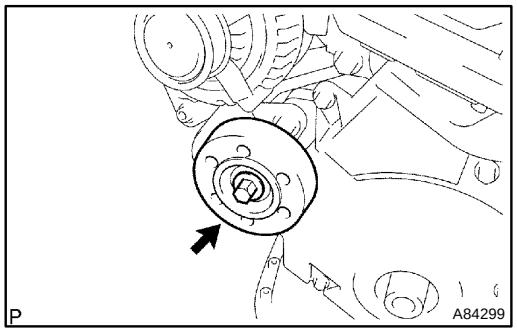
SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)

HINT:

When using SST (A) (90105-08076), a plate washer (5 mm or 0.20 in.) must be inserted between SST (A) and SST (B).

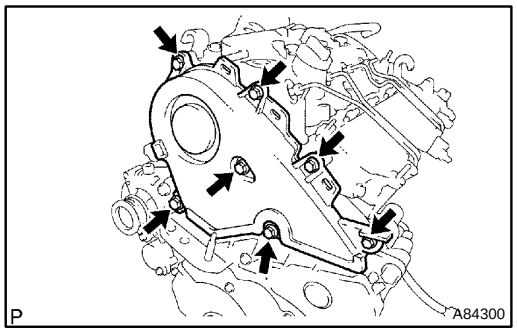


(b) Using SST, remove the pulley.
SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)



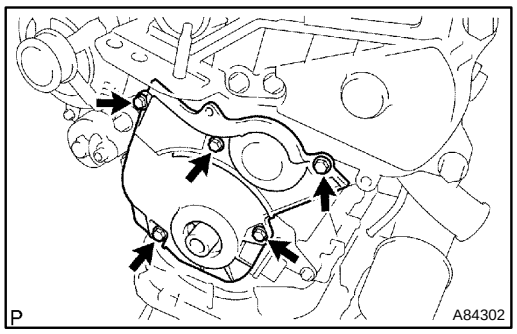
11. REMOVE IDLER PULLEY SUB-ASSY

(a) Remove the bolt and washer, then remove the pulley.



12. REMOVE TIMING BELT NO.2 COVER

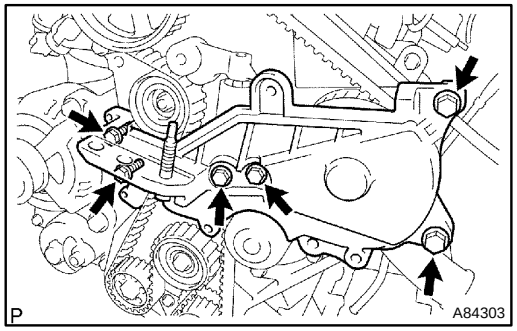
(a) Remove the 7 bolts and 7 seal washers, then remove the timing belt cover.



13. REMOVE TIMING BELT NO.1 COVER

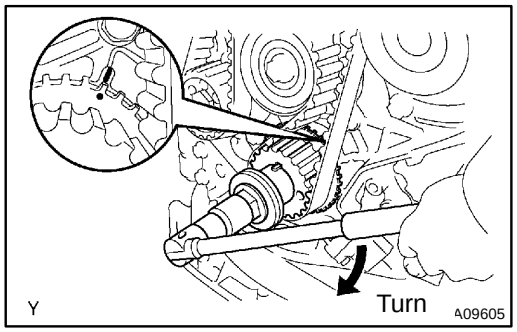
(a) Remove the 5 bolts and 5 seal washers, then remove the timing belt cover.

14. REMOVE TIMING BELT GUIDE



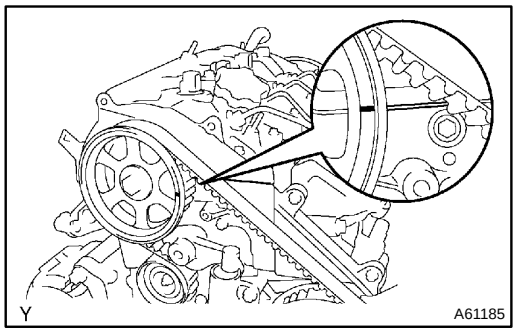
15. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 6 bolts and engine mounting bracket.

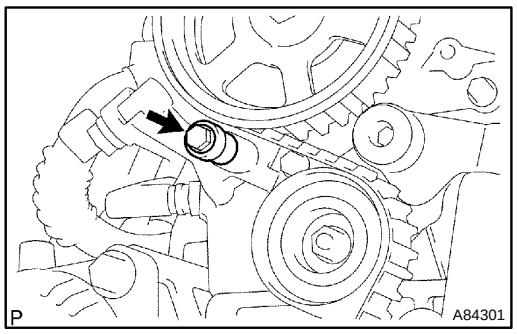


16. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Using the crankshaft pulley bolt, align the dot mark of the crankshaft timing gear with the TDC mark of the oil pump by turning the crankshaft.

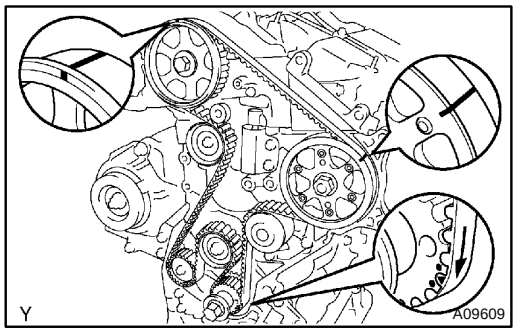


(b) Check that the timing mark of the camshaft timing pulley is aligned with a joint of the cylinder head and cylinder head cover.



17. REMOVE TIMING CHAIN COVER PLATE

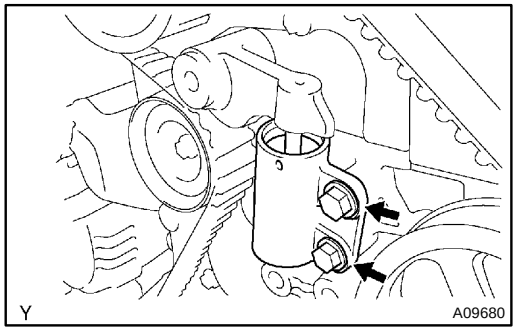
(a) Remove the bolt and timing chain cover plate.



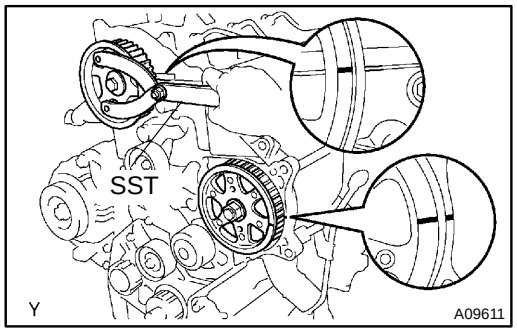
18. REMOVE TIMING BELT

HINT:

If reusing the timing belt, draw an arrow on the belt which indicates the engine revolution direction, then put match marks on the pulleys and belt before removing. This operation will be very helpful when reinstalling the timing belt.

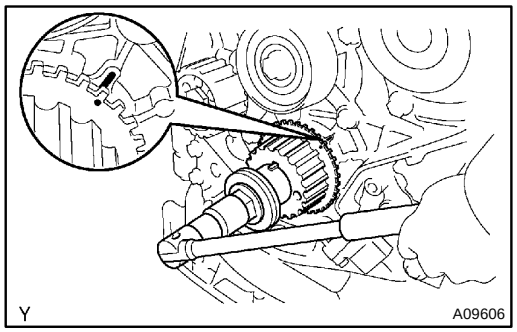


(a) Alternately loosen the 2 bolts to remove the timing belt tensioner.
(b) Remove the timing belt.



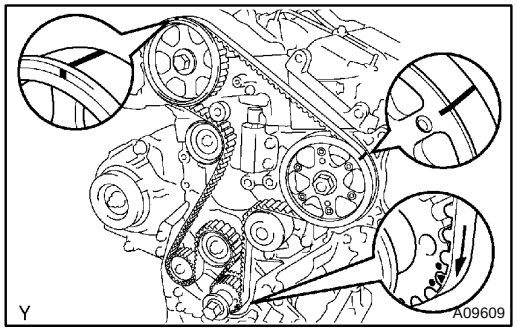
19. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Using SST, set the pulleys of the camshaft and injection pump so that each timing mark of the pulleys is aligned with its timing mark on the cylinder head assembly and water pump assembly.
SST 09960-10010 (09962-01000, 09963-01000)



(b) Using the crankshaft pulley bolt, align the dot mark of the crankshaft timing gear with the TDC mark of the oil pump by turning the crankshaft.

NOTICE:
Be very careful in turning the camshaft and crankshaft. Since the valve head and piston head are sensitive, contact of the piston head with the valve heads may damage them.

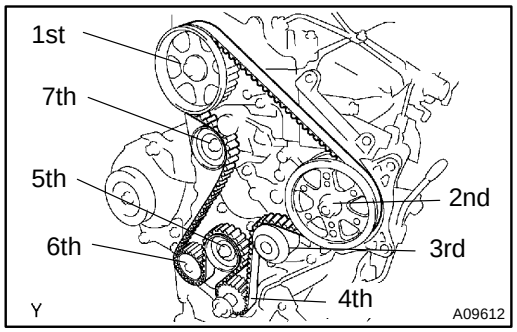


20. INSTALL TIMING BELT

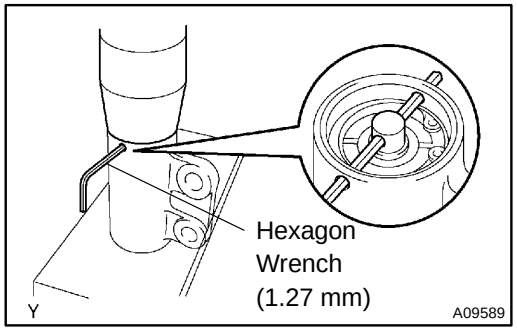
NOTICE:
The engine should be cold.

(a) Remove any oil or water on each pulley, then keep them clean.

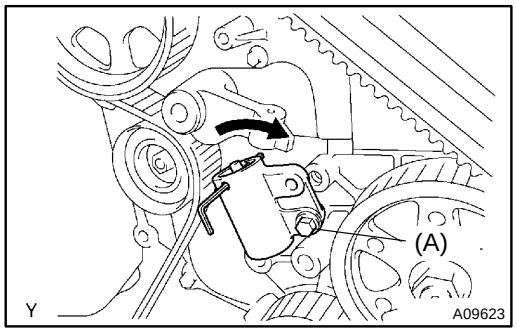
NOTICE:
Do not use any cleaning agent.



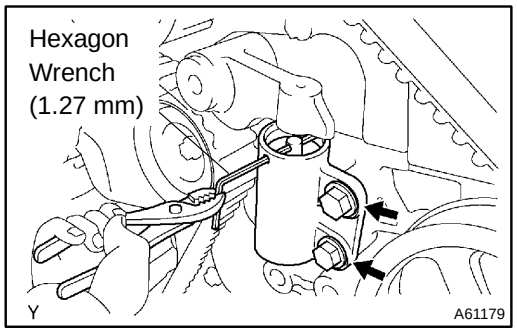
(b) Install the timing belt in the following order:
1. Camshaft timing pulley
2. Supply pump drive pulley
3. Water pump pulley
4. Crankshaft timing pulley
5. No. 2 idler pulley
6. Oil pump pulley
7. No. 1 idler pulley



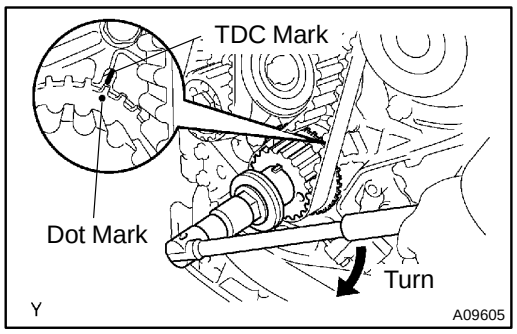
(c) Install the timing belt tensioner.
(1) Using a press, slowly press in the push rod with pressure 981 to 9,807 N (100 to 1,000 kgf, 200 to 2,205 lbf).
(2) Align the holes of the push rod and housing, then insert hexagon wrench (1.27 mm) through the holes to keep the setting position of the push rod.
(3) Release the press.



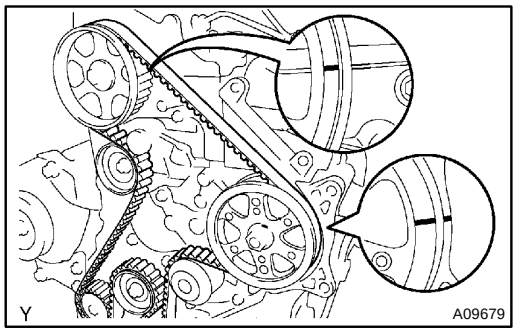
(4) Temporarily install the tensioner with bolt (A).
(5) Turn the tensioner clockwise, then temporarily install the other bolt.



(6) Alternately tighten the 2 bolts.
Torque: 21 N·m (214 kgf·cm, 15 ft·lbf)
(7) Remove the hexagon wrench from the tensioner.

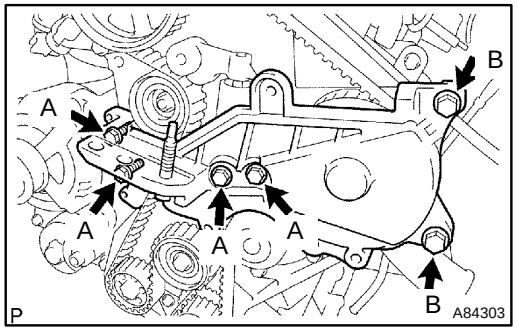


21. CHECK VALVE TIMING
(a) Slowly turn the crankshaft 2 complete revolutions (720_) from the TDC to TDC.
NOTICE:
Always turn the crankshaft clockwise.

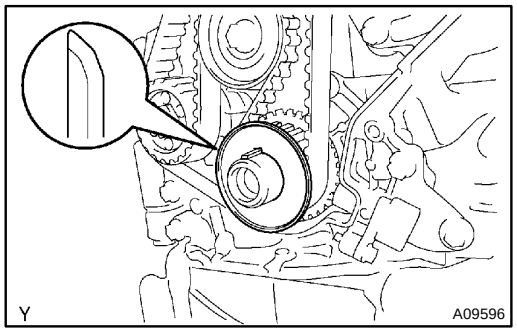


(b) Check that each timing mark of the pulleys is aligned with the timing marks of the engine assembly as shown in the illustration.
If the timing marks are not aligned, remove the timing belt, then reinstall it.
(c) Remove the crankshaft pulley bolt.

22. INSTALL TIMING CHAIN COVER PLATE
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



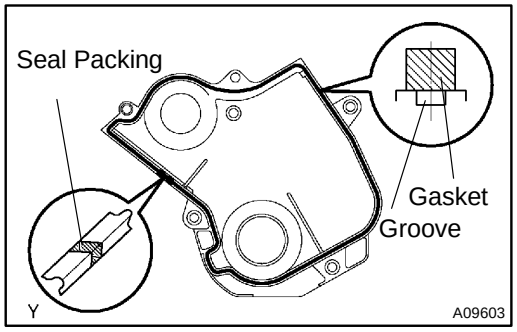
23. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET
Torque:
37 N·m (375 kgf·cm, 27 ft·lbf) for bolt A
64 N·m (650 kgf·cm, 47 ft·lbf) for bolt B



24. INSTALL TIMING BELT GUIDE
(a) Install the belt guide with the cap side facing outward.

25. INSTALL TIMING BELT NO.1 COVER
(a) Check the timing belt cover gasket for cracks or deteriorations etc.

If the gasket has cracked or deteriorated, replace it by the following steps:
(1) Using a screwdriver and gasket scraper, remove all the old gaskets.
(2) Thoroughly clean all components to remove all the loose material.



(3) Remove the backing paper from a new gasket, then affix the gasket to the timing belt cover as shown in the illustration.

NOTICE:
- **Affix the gasket at the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

(4) After installing the gasket, press it down so that the adhesive firmly sticks to the timing belt cover.
(5) If there is a gap where the end of the gasket meets, use seal packing to close the gap.
Seal packing: Part No. 08826-00080 or equivalent

(b) Install the No. 1 timing belt cover and gasket with the 5 bolts and 5 seal washers.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

(c) After installing the belt cover, check that there is no peelings of the gasket.

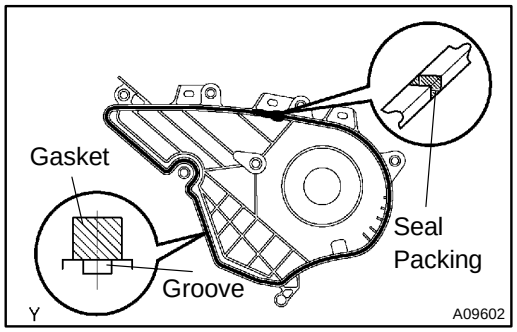
26. INSTALL TIMING BELT NO.2 COVER

(a) Check the timing belt cover gasket for cracks or deteriorations etc.

If the gasket has cracked or deteriorated, replace it by the following steps:

(1) Using a screwdriver and gasket scraper, remove all the old gasket.

(2) Thoroughly clean all components to remove all the loose material.



(3) Remove the backing paper from a new gasket, then affix the gasket to the timing belt cover as shown in the illustration.

NOTICE:

- **Affix the gasket at the center of the groove.**
- **At the corners, try to keep the gasket thickness uniform.**

(4) After installing the gasket, press it down so that the adhesive firmly sticks to the timing belt cover.

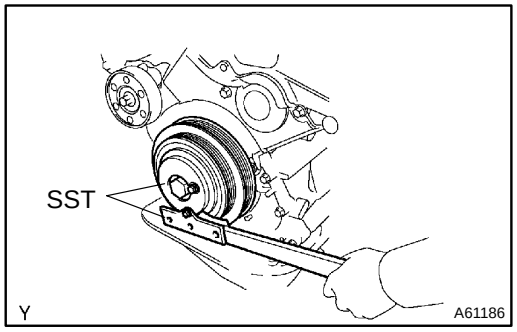
(5) If there is a gap where the end of the gasket meets, use a seal packing to close the gap.

Seal packing: Part No. 08826-00080 or equivalent

(b) Install the No. 2 timing belt cover and gasket with the 7 bolts and 7 seal washers.

Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

27. INSTALL IDLER PULLEY SUB-ASSY
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)



28. INSTALL CRANKSHAFT PULLEY

(a) Align the keyway of the pulley with the key located on the crankshaft, then slide the pulley into place.

(b) Using SST, install the pulley bolt.

SST 09213-54015 (90105-08076), 09330-00021

Torque: 180 N·m (1,835 kgf·cm, 133 ft·lbf)

HINT:

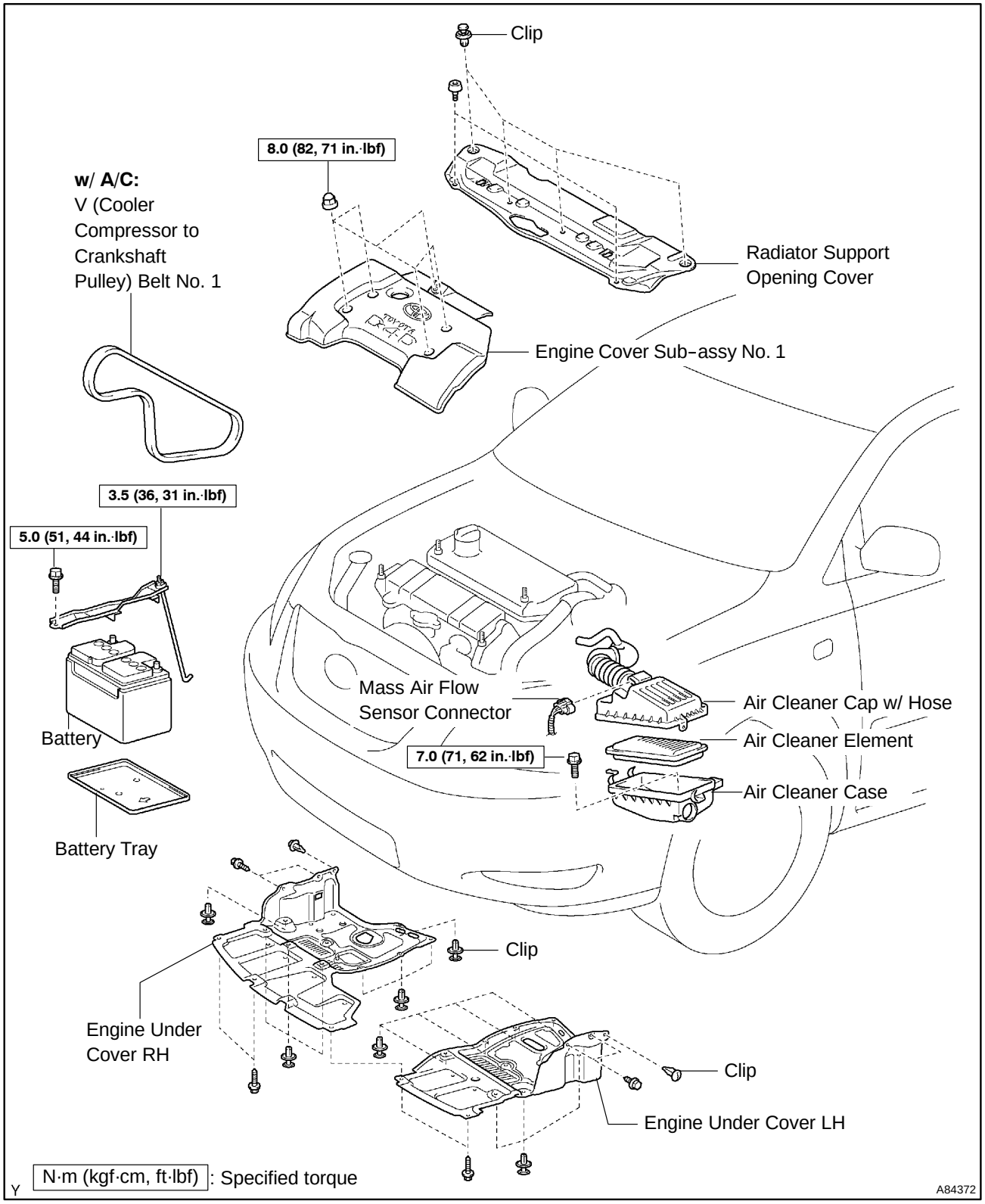
When using a bolt (91651-60855), a plate washer (5 mm or 0.20 in.) must be inserted between the pulley bolt and SST.

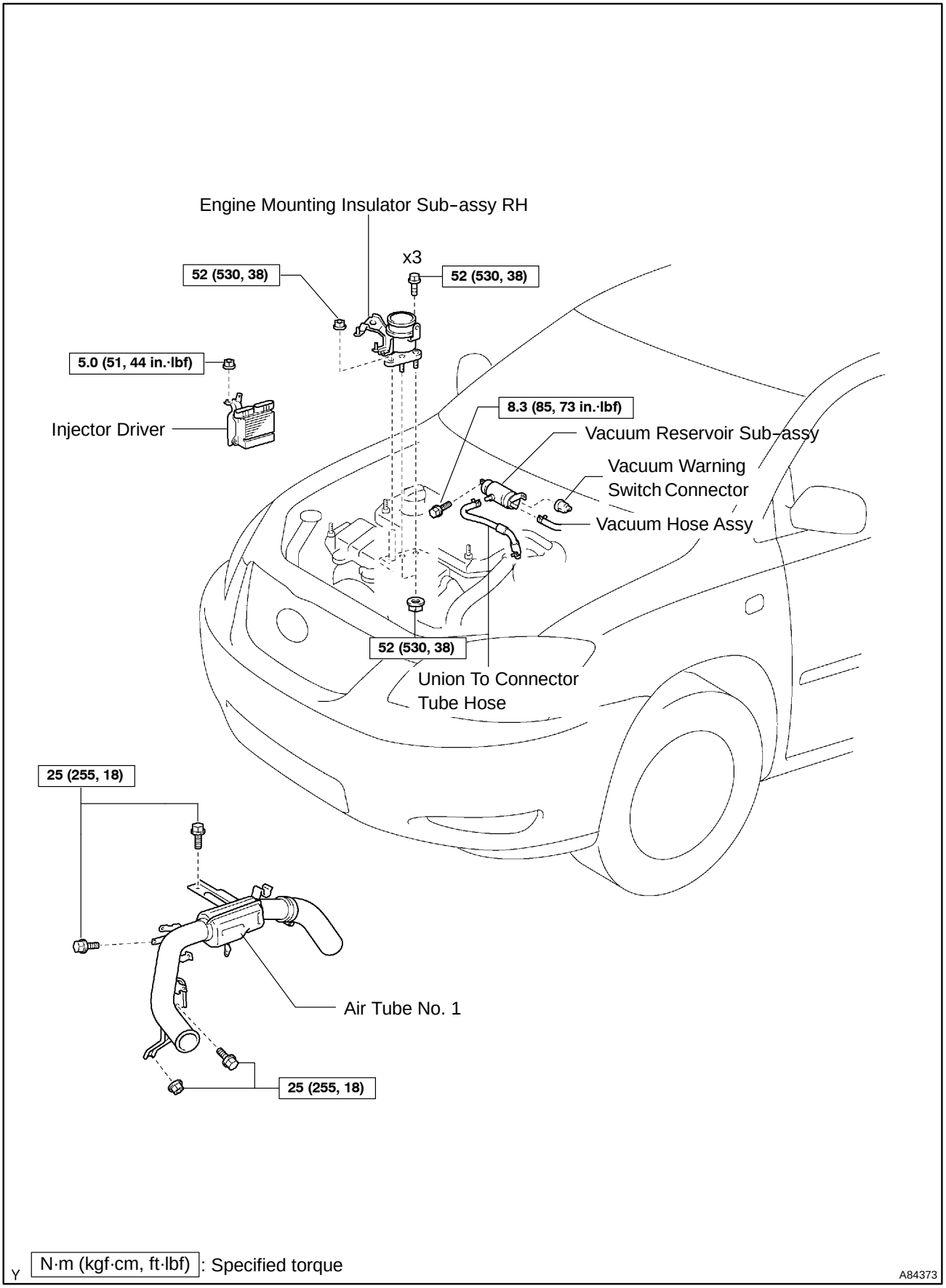
29. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)
30. INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)
31. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
32. INSTALL INJECTOR DRIVER (See page 14-24)
33. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-5)
34. INSTALL FRONT WHEELS
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

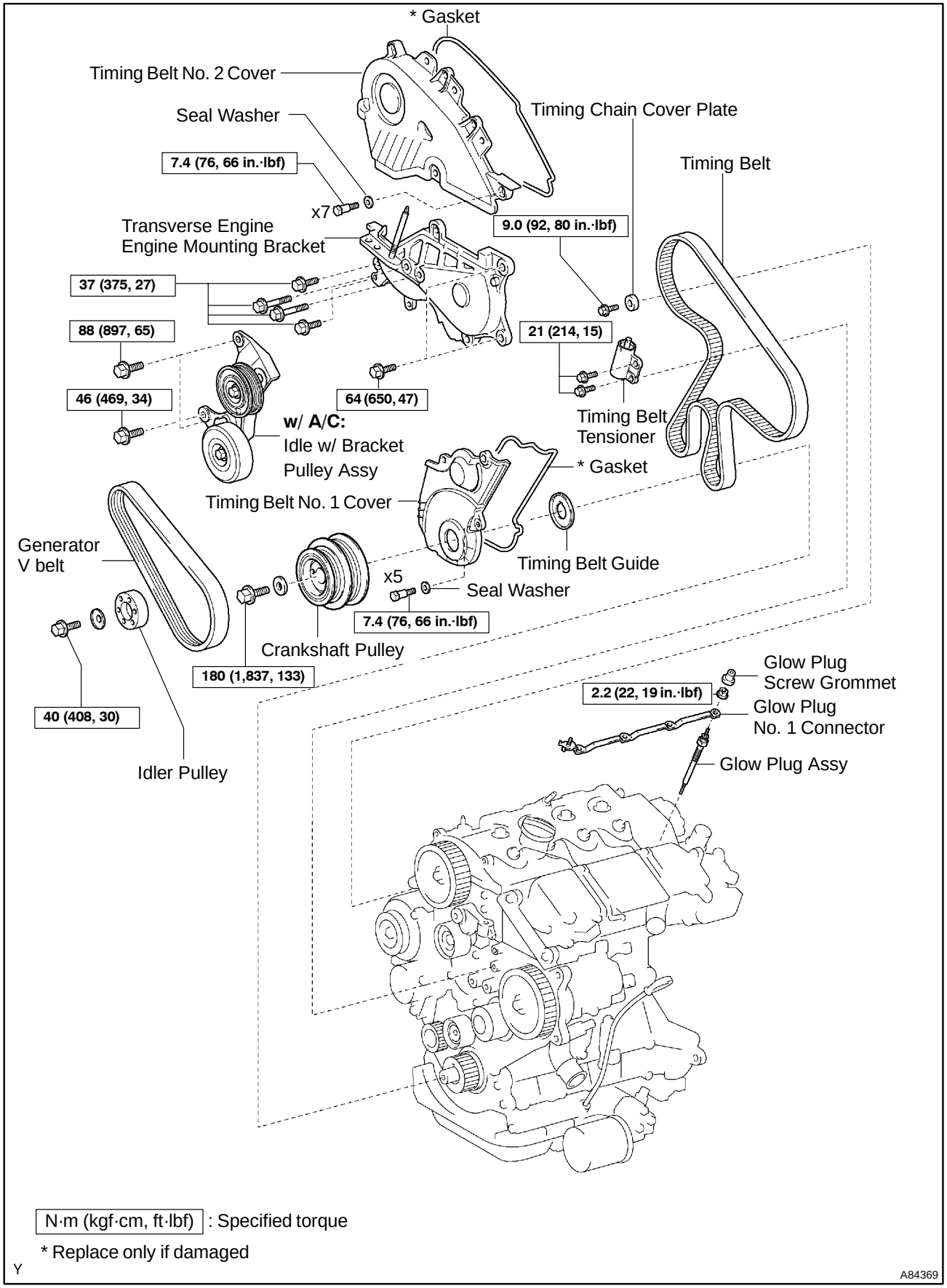
CAMSHAFT (1CD-FTV) (May, 2003)

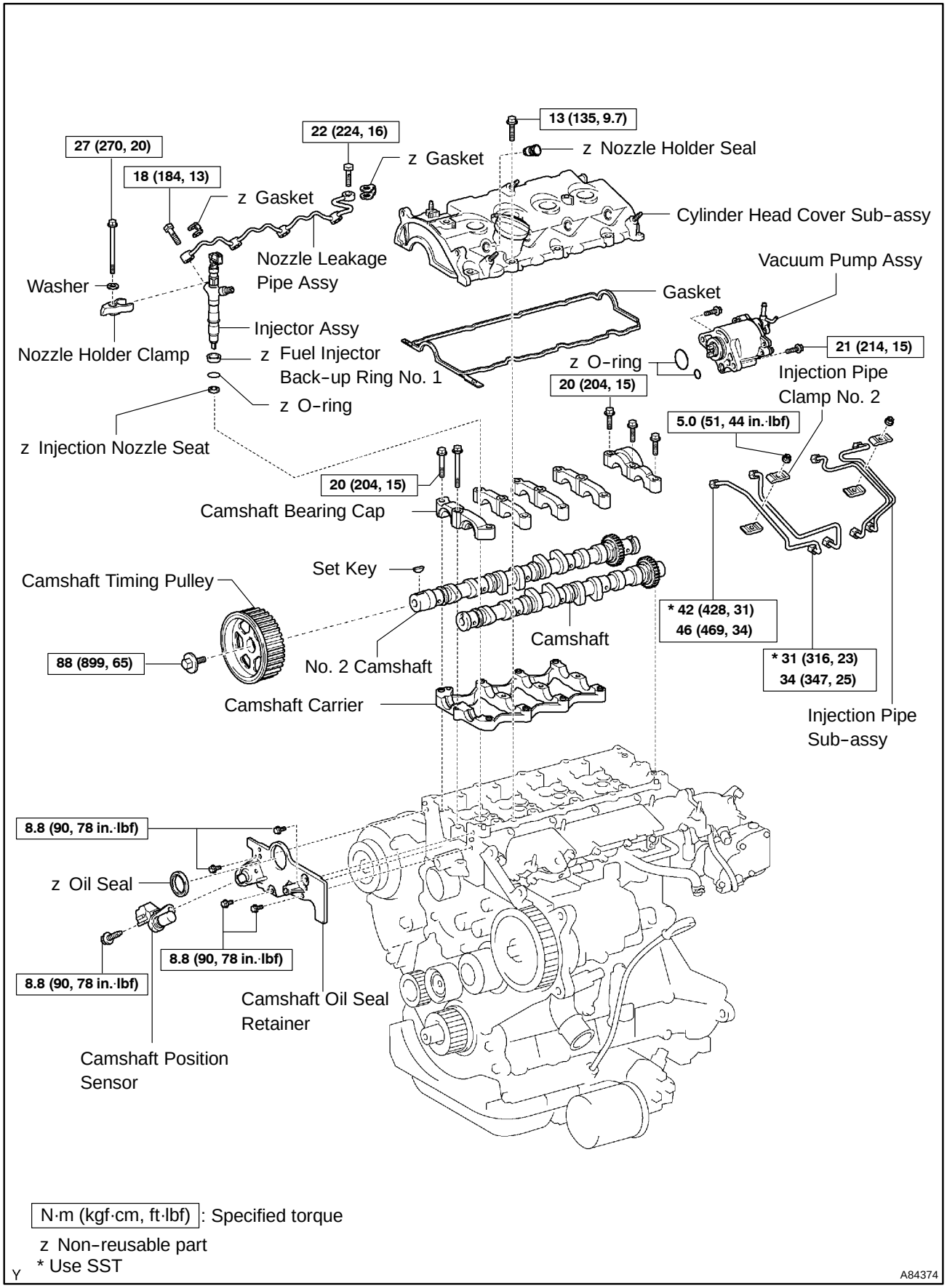
COMPONENTS

141H1-01




Engine Mounting Insulator Sub-assy RH
x3
52 (530, 38)
52 (530, 38)
5.0 (51, 44 in.·lbf)
Injector Driver
8.3 (85, 73 in.·lbf)
Vacuum Reservoir Sub-assy
Vacuum Warning Switch Connector
Vacuum Hose Assy
52 (530, 38)
Union To Connector Tube Hose
25 (255, 18)
Air Tube No. 1
25 (255, 18)
Y N·m (kgf·cm, ft·lbf): Specified torque
A84373

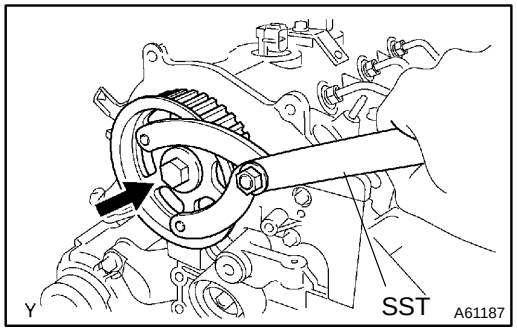

* Gasket
Timing Belt No. 2 Cover
Seal Washer
7.4 (76, 66 in.·lbf)
x7
Timing Chain Cover Plate
Timing Belt
Transverse Engine
Engine Mounting Bracket
9.0 (92, 80 in.·lbf)
37 (375, 27)
88 (897, 65)
21 (214, 15)
46 (469, 34)
64 (650, 47)
w/ A/C:
Idle w/ Bracket
Pulley Assy
Timing Belt
Tensioner
* Gasket
Timing Belt No. 1 Cover
Timing Belt Guide
Generator
V belt
x5
Seal Washer
7.4 (76, 66 in.·lbf)
Crankshaft Pulley
180 (1,837, 133)
40 (408, 30)
Idler Pulley
Glow Plug
Screw Grommet
2.2 (22, 19 in.·lbf)
Glow Plug
No. 1 Connector
Glow Plug Assy
N·m (kgf·cm, ft·lbf) : Specified torque
* Replace only if damaged
Y
A84369


27 (270, 20)
18 (184, 13)
22 (224, 16)
z Gasket
z Gasket
13 (135, 9.7)
z Nozzle Holder Seal
Cylinder Head Cover Sub-assy
Nozzle Leakage Pipe Assy
Washer
Nozzle Holder Clamp
Injector Assy
z Fuel Injector Back-up Ring No. 1
z O-ring
z Injection Nozzle Seat
Gasket
Vacuum Pump Assy
21 (214, 15)
z O-ring
20 (204, 15)
Injection Pipe Clamp No. 2
5.0 (51, 44 in.·lbf)
20 (204, 15)
Camshaft Bearing Cap
Set Key
Camshaft Timing Pulley
88 (899, 65)
No. 2 Camshaft
Camshaft
* 42 (428, 31)
46 (469, 34)
* 31 (316, 23)
34 (347, 25)
Camshaft Carrier
Injection Pipe Sub-assy
8.8 (90, 78 in.·lbf)
z Oil Seal
8.8 (90, 78 in.·lbf)
8.8 (90, 78 in.·lbf)
Camshaft Oil Seal Retainer
Camshaft Position Sensor
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
* Use SST
A84374

141H2-01

REPLACEMENT

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER LH (See page 14-5)
3. REMOVE ENGINE UNDER COVER RH (See page 14-5)
4. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)
5. REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-5)
6. REMOVE AIR CLEANER ASSY (See page 14-24)
7. REMOVE BATTERY
8. REMOVE VACUUM RESERVOIR SUB-ASSY (See page 13-8)
9. REMOVE AIR TUBE NO.1 (See page 14-5)
10. REMOVE INJECTOR DRIVER (See page 14-24)
11. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
12. REMOVE GENERATOR V BELT (See page 14-4)
13. REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)
14. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)
15. REMOVE CRANKSHAFT PULLEY (See page 14-47)
    SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
16. REMOVE IDLER PULLEY SUB-ASSY (See page 14-47)
17. REMOVE TIMING BELT NO.2 COVER (See page 14-47)
18. REMOVE TIMING BELT NO.1 COVER (See page 14-47)
19. REMOVE TIMING BELT GUIDE
20. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)
21. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)
22. REMOVE TIMING CHAIN COVER PLATE (See page 14-47)
23. REMOVE TIMING BELT (See page 14-47)
24. REMOVE CAMSHAFT POSITION SENSOR (See page 14-24)



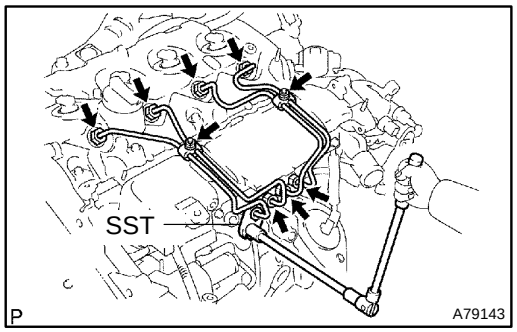
25. REMOVE CAMSHAFT TIMING PULLEY

(a) Using SST, remove the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)

(b) Remove the timing pulley.

HINT:
Using a plastic-faced hammer, tap out the pulley.

(c) Remove the set key.



26. REMOVE INJECTION PIPE SUB-ASSY NO.1

(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.

(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700

(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700

(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

27. REMOVE INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

28. REMOVE INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

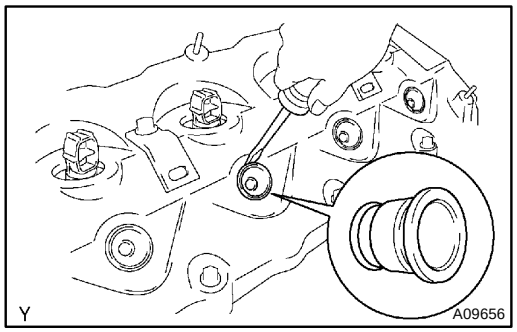
29. REMOVE INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

HINT:

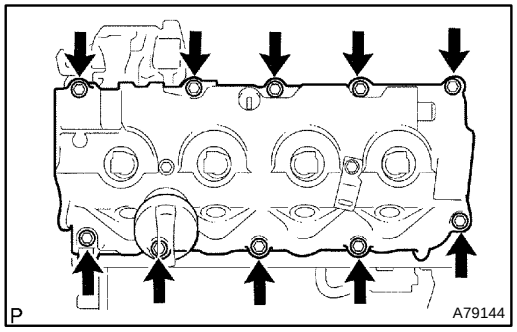
Perform the same procedures as injection pipe No. 1.

30. REMOVE VACUUM PUMP ASSY (See page 14-24)



31. REMOVE NOZZLE HOLDER SEAL

(a) Using a screwdriver, pry out the 4 nozzle holder seals.



32. REMOVE CYLINDER HEAD COVER SUB-ASSY

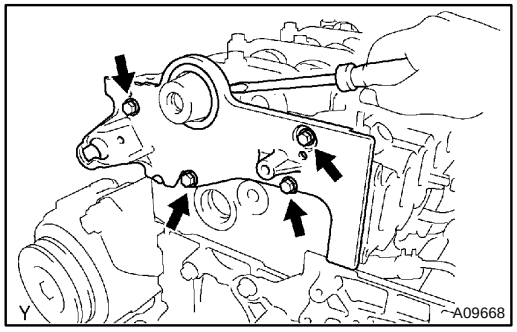
(a) Remove the 10 bolts, cylinder head cover and gasket.

33. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-5)

34. REMOVE INJECTOR ASSY (See page 11-5)

HINT:

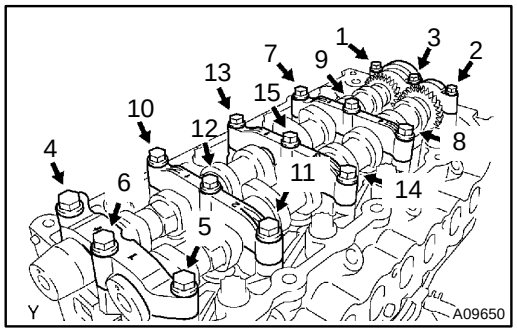
Since each injector assembly has a characteristic fuel injecting behavior, keep them in the correct order so that they can be returned to the original locations when reassembling.



35. REMOVE CAMSHAFT OIL SEAL RETAINER

(a) Remove the 4 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying between the oil seal retainer and camshaft bearing cap.



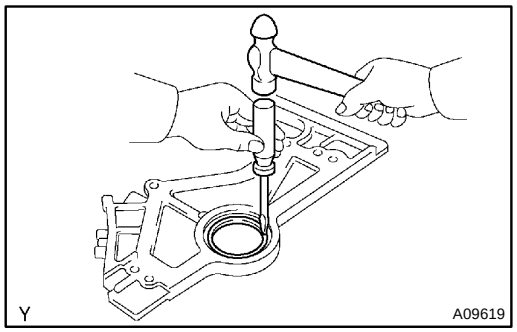
36. REMOVE CAMSHAFT

(a) Using several steps, loosen and remove the 15 bearing cap bolts uniformly in the sequence shown in the illustration.

(b) Remove the 5 bearing caps and camshaft sub-assembly.

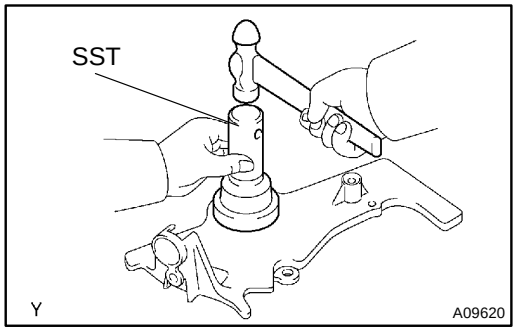
37. REMOVE NO.2 CAMSHAFT

(a) Remove the camshaft sub-assembly and camshaft carrier.



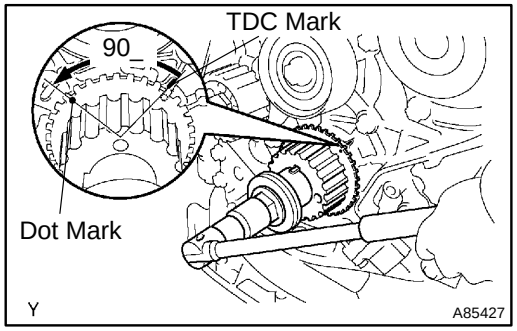
38. REMOVE CAMSHAFT OIL SEAL

(a) Using a screwdriver and hammer, tap out the oil seal.



39. INSTALL CAMSHAFT OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the camshaft oil seal retainer edge.
SST 09223-46011



40. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Using the crankshaft pulley bolt, turn the crankshaft to set the dot mark of the crankshaft timing gear at the position of 90_ BTDC.

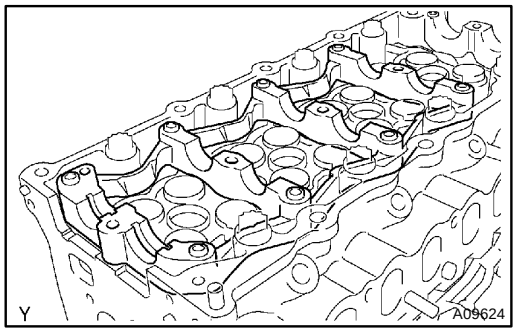
NOTICE:

If the timing belt is disengaged, the crankshaft timing gear placed at wrong angle can cause contact of the piston head with the valve head.

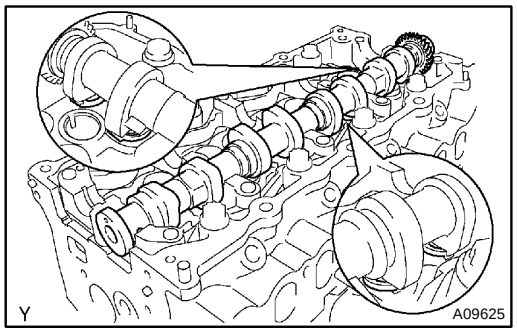
41. INSTALL CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the cylinder head or camshaft may be damaged. To avoid this, the following procedures should be carried out.



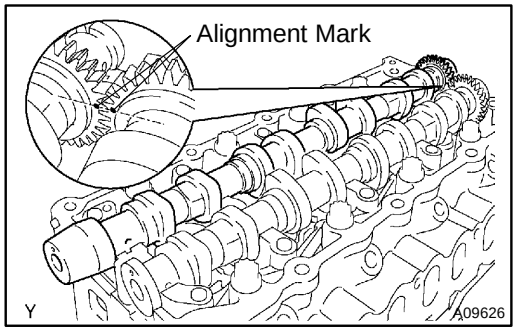
(a) Place the camshaft carrier on the cylinder head.



(b) Install the camshaft.

(c) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.

(d) Place the intake camshaft on the camshaft carrier as shown in the illustration so that the No. 3 and No. 4 of the cylinder cam lobes face downward.



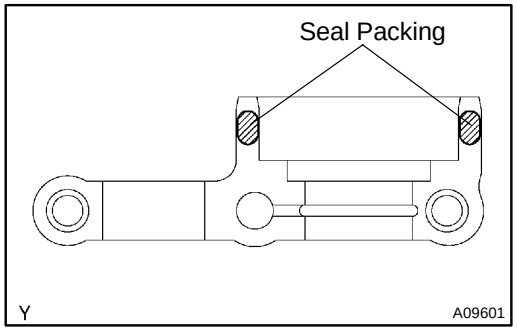
42. INSTALL NO.2 CAMSHAFT

(a) Install the No. 2 camshaft.

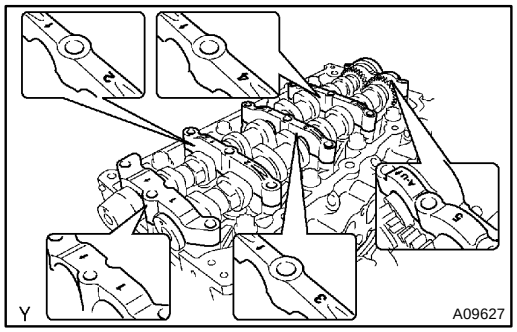
(b) Apply engine oil to the cam and gear of the camshaft, and the journal of the camshaft carrier.

(c) Engage the exhaust camshaft gear and intake camshaft gear by aligning the alignment marks on each gear.

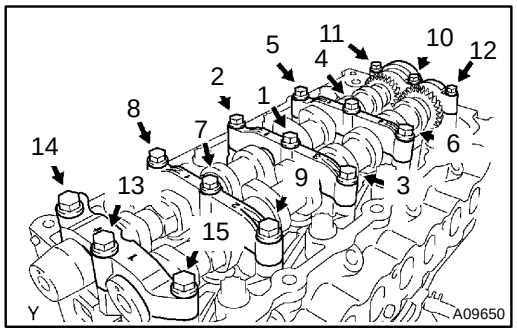
(d) Roll down the exhaust camshaft onto the bearing journals while engaging the gears with each other.



(e) Install the camshaft bearing caps.
(1) Remove any oil packing (FIPG) material from the No. 5 camshaft bearing cap.
(2) Apply seal packing to the No. 5 camshaft bearing cap as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent



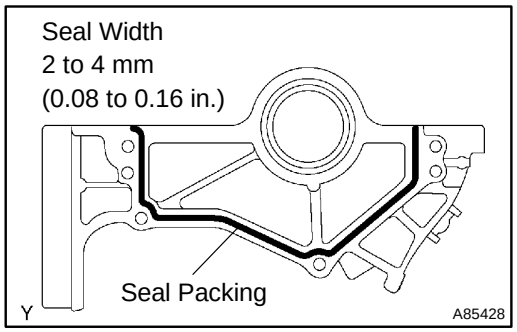
(3) Place the 5 bearing caps in their proper locations.



(4) Using several steps, install and tighten the 15 bearing cap bolts uniformly in the sequence shown in the illustration.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

43. INSPECT VALVE CLEARANCE(See page 14-5)
44. ADJUST VALVE CLEARANCE (See page 14-5)

45. INSTALL CAMSHAFT OIL SEAL RETAINER
(a) Remove any old packing (FIPG) material, then be careful not to drop any oil on the contact surfaces of the oil seal retainer and cylinder block.
(1) Thoroughly clean all components to remove all the loose material.
(2) Using non-residue solvent, clean both sealing surfaces.

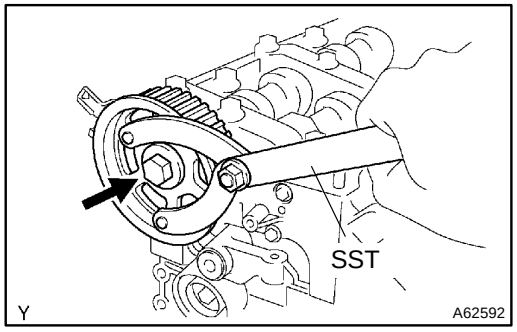


(b) Apply seal packing to the oil seal retainer as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent
(1) Install a nozzle that has been cut to a 2 to 4 mm (0.08 to 0.16 in.) opening.
(2) Parts must be assembled within 15 minutes after applying. Otherwise the material must be removed and reapplied.

(3) Immediately remove the nozzle from the tube, then reinstall the cap.

(c) Install the oil seal retainer with the 4 bolts. Tighten the 4 bolts uniformly in several steps.

Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)



46. INSTALL CAMSHAFT TIMING PULLEY

(a) Install the pulley set key to the groove of the camshaft.

(b) Align the keyway of the timing pulley with the key located on the camshaft, then slide the pulley into place.

(c) Using SST, install the pulley bolt.

SST 09960-10010 (09962-01000, 09963-01000)

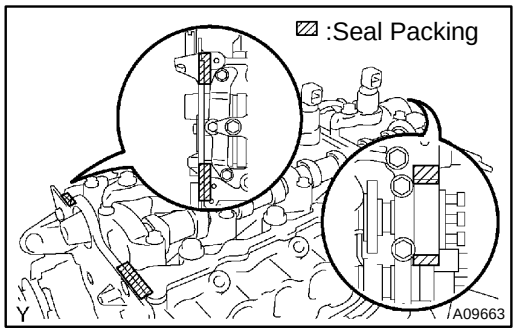
Torque: 88 N·m (899 kgf·cm, 65 ft·lbf)

47. INSTALL CAMSHAFT POSITION SENSOR (See page 14-24)

48. INSTALL INJECTOR ASSY (See page 11-5)

49. INSTALL NOZZLE LEAKAGE PIPE ASSY (See page 11-5)

SST 09992-00242



50. INSTALL CYLINDER HEAD COVER SUB-ASSY

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head.

Seal packing: Part No. 08826-00080 or equivalent

(c) Install the gasket to the cylinder head cover.

(d) Install the cylinder head cover with the 10 bolts.

Torque: 13 N·m (135 kgf·cm, 9.7 ft·lbf)

51. INSTALL NOZZLE HOLDER SEAL

(a) Install 4 new nozzle holder seals.

52. INSTALL VACUUM PUMP ASSY (See page 14-24)

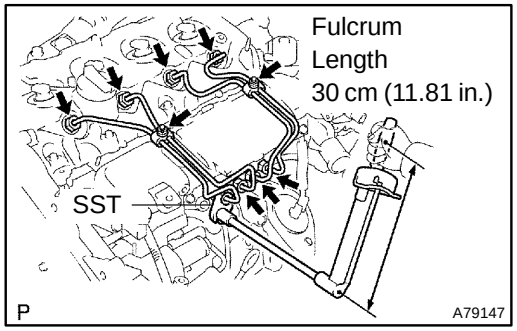
53. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:

When assembling the pipes, perform the operation with the engine cold under room temperature.

(a) Remove the vinyl or plastic bag from the injector and the vinyl tape from the common rail.

(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail side.
SST 09023-12700
Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.
SST 09023-12700
Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST
46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST
31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:
- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

54. INSTALL INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

55. INSTALL INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

56. INSTALL INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700

HINT:
Perform the same procedures as injection pipe No. 1.

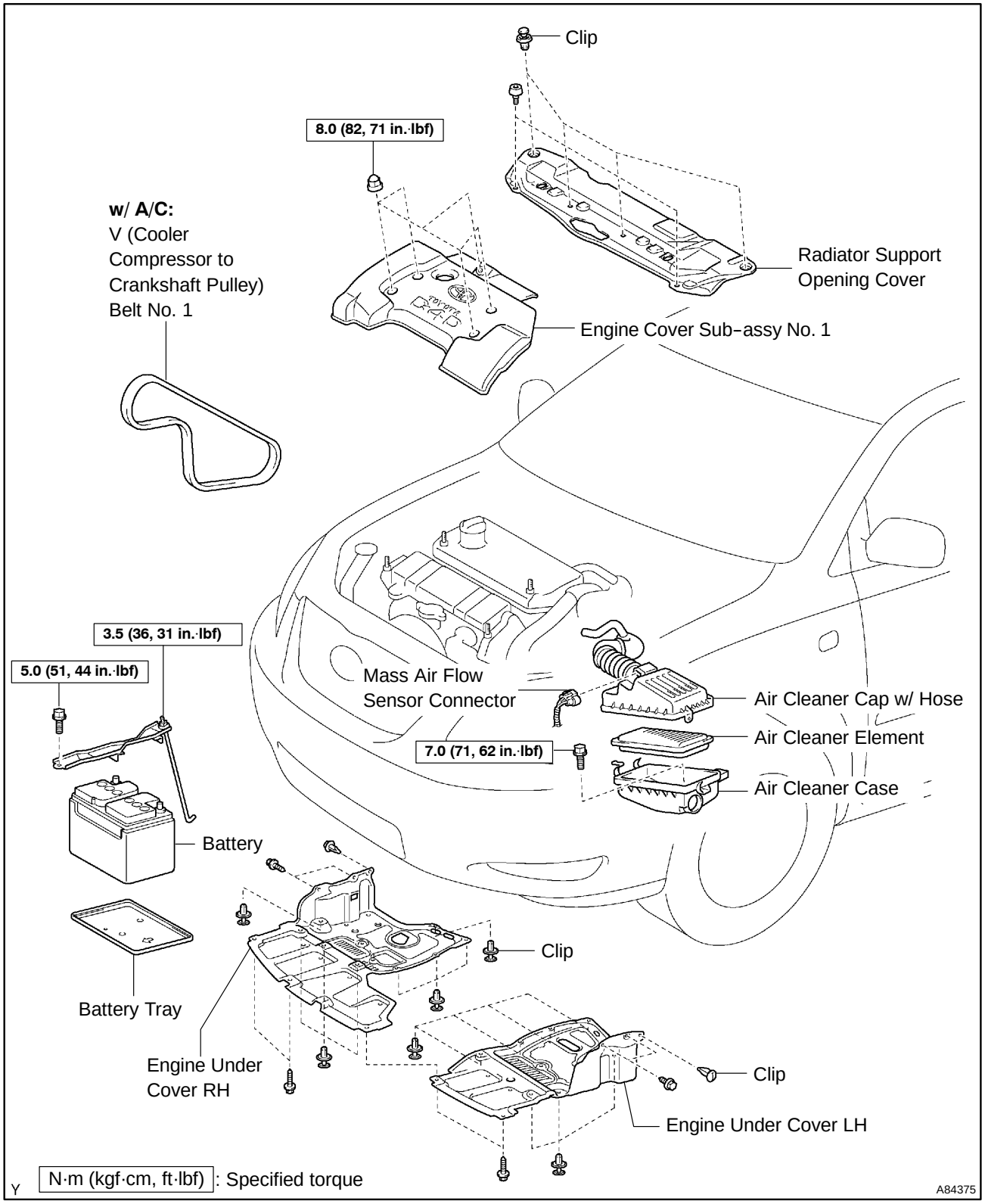
57. INSTALL TIMING BELT (See page 14-47)
58. CHECK VALVE TIMING (See page 14-47)
59. INSTALL TIMING CHAIN COVER PLATE (See page 14-47)
60. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)
61. INSTALL TIMING BELT GUIDE (See page 14-47)

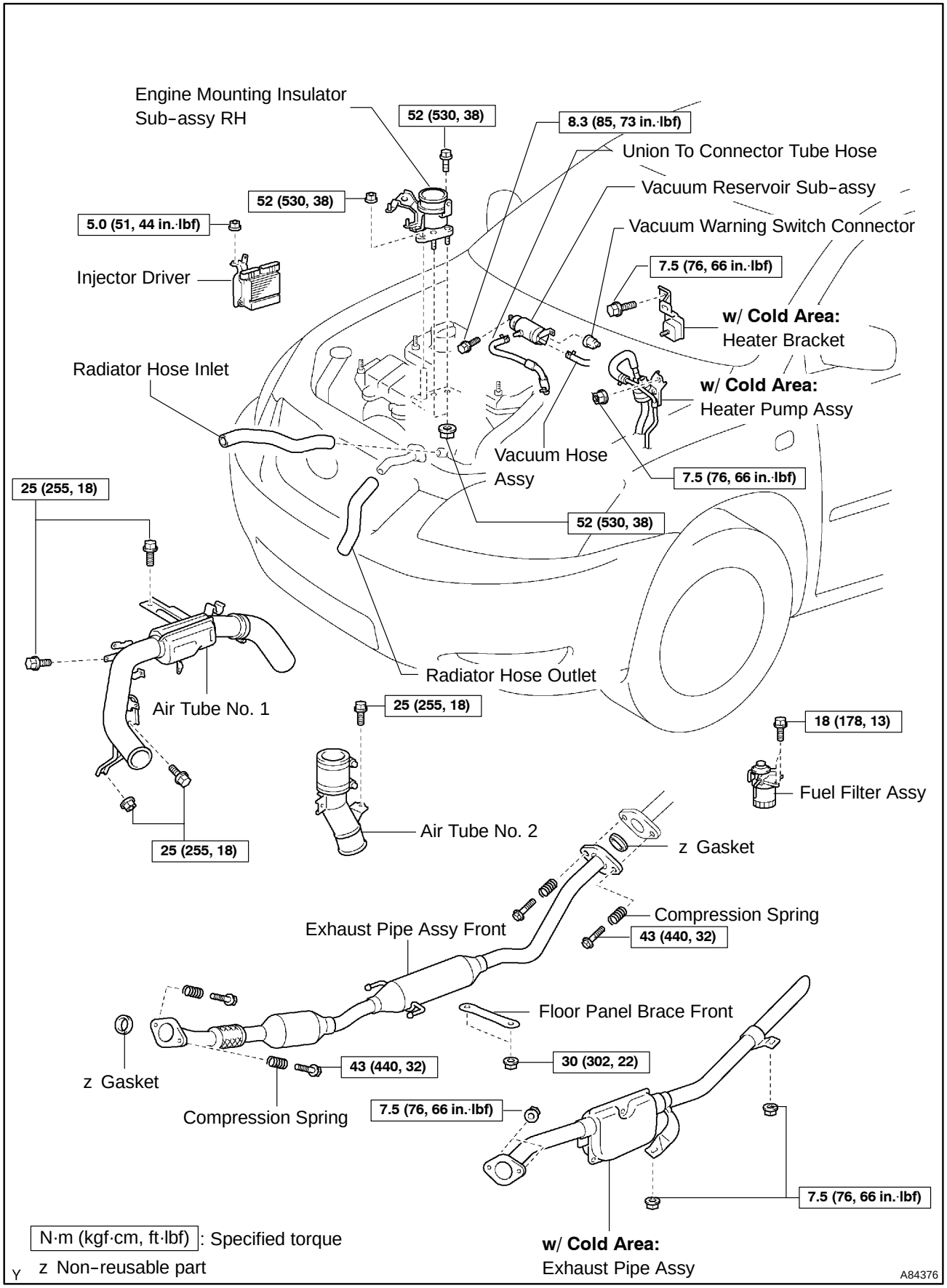
62. **INSTALL TIMING BELT NO.1 COVER (See page 14-47)**
63. **INSTALL TIMING BELT NO.2 COVER (See page 14-47)**
64. **INSTALL IDLER PULLEY SUB-ASSY (See page 14-47)**
65. **INSTALL CRANKSHAFT PULLEY (See page 14-47)**
    SST 09213-54015 (90105-08076), 09330-00021
66. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
67. **INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)**
68. **ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)**
69. **INSTALL INJECTOR DRIVER (See page 14-24)**
70. **INSTALL AIR TUBE NO.1 (See page 14-5)**
71. **INSTALL VACUUM RESERVOIR SUB-ASSY (See page 13-8)**
72. **INSTALL BATTERY (See page 14-24)**
73. **INSTALL AIR CLEANER ASSY (See page 14-24)**
74. **INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-5)**
75. **INSTALL FRONT WHEEL RH**
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
76. **CHECK FOR FUEL LEAKS (See page 11-5)**

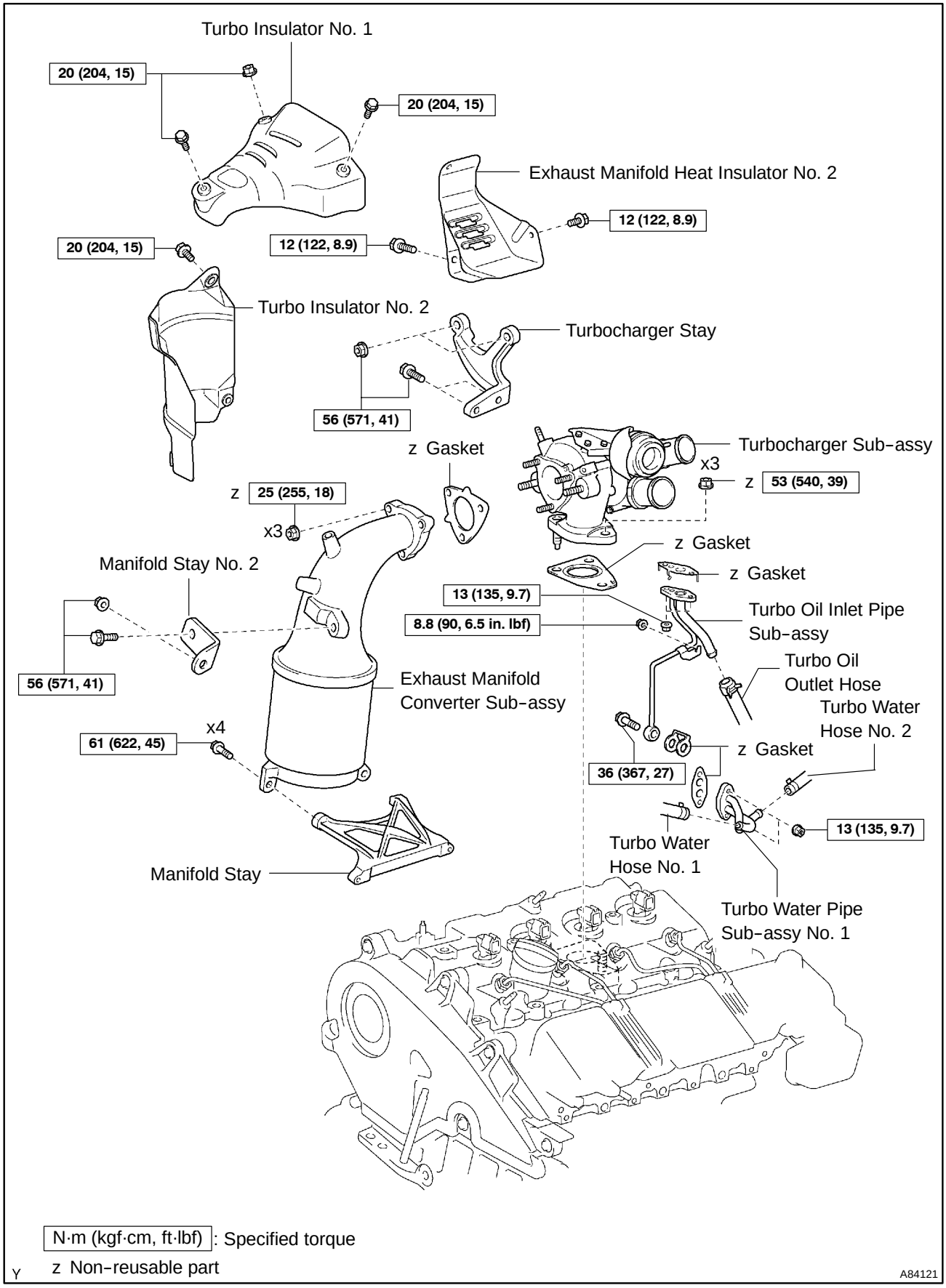
CYLINDER HEAD GASKET (1CD-FTV) (May, 2003)

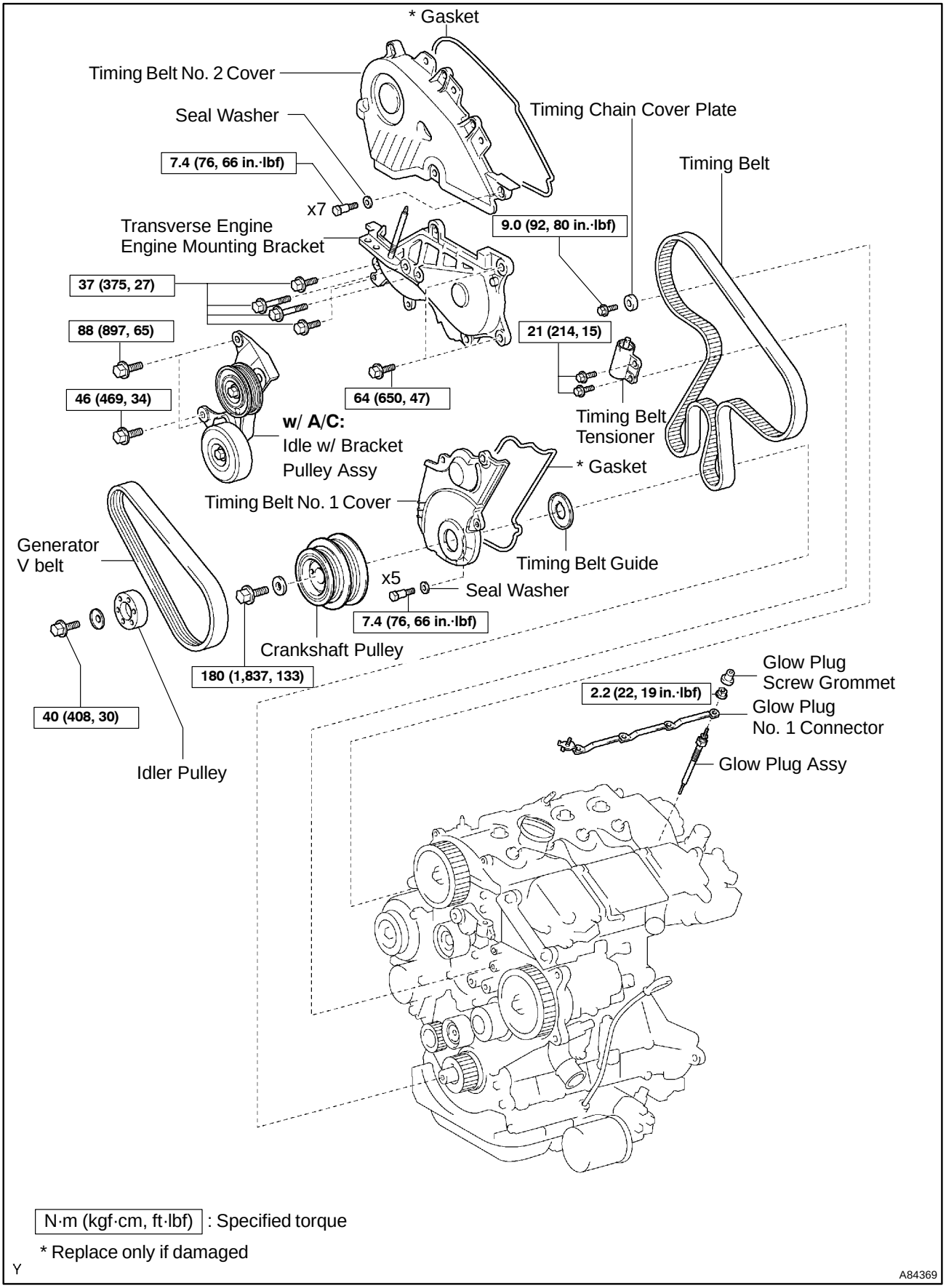
COMPONENTS

141H3-01




Engine Mounting Insulator Sub-assy RH
52 (530, 38)
8.3 (85, 73 in.·lbf)
Union To Connector Tube Hose
Vacuum Reservoir Sub-assy
52 (530, 38)
5.0 (51, 44 in.·lbf)
Vacuum Warning Switch Connector
Injector Driver
7.5 (76, 66 in.·lbf)
w/ Cold Area:
Heater Bracket
Radiator Hose Inlet
w/ Cold Area:
Heater Pump Assy
Vacuum Hose Assy
7.5 (76, 66 in.·lbf)
25 (255, 18)
52 (530, 38)
Radiator Hose Outlet
Air Tube No. 1
25 (255, 18)
18 (178, 13)
Fuel Filter Assy
Air Tube No. 2
z Gasket
Compression Spring
Exhaust Pipe Assy Front
43 (440, 32)
Floor Panel Brace Front
30 (302, 22)
z Gasket
43 (440, 32)
Compression Spring
7.5 (76, 66 in.·lbf)
7.5 (76, 66 in.·lbf)
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
w/ Cold Area:
Exhaust Pipe Assy
A84376


Turbo Insulator No. 1
20 (204, 15)
20 (204, 15)
Exhaust Manifold Heat Insulator No. 2
12 (122, 8.9)
12 (122, 8.9)
20 (204, 15)
Turbo Insulator No. 2
Turbocharger Stay
56 (571, 41)
z Gasket
Turbocharger Sub-assy
x3
z 53 (540, 39)
z 25 (255, 18)
x3
z Gasket
Manifold Stay No. 2
z Gasket
13 (135, 9.7)
8.8 (90, 6.5 in. lbf)
Turbo Oil Inlet Pipe Sub-assy
Turbo Oil Outlet Hose
Turbo Water Hose No. 2
56 (571, 41)
Exhaust Manifold Converter Sub-assy
x4
61 (622, 45)
z Gasket
36 (367, 27)
13 (135, 9.7)
Turbo Water Hose No. 1
Manifold Stay
Turbo Water Pipe Sub-assy No. 1
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
A84121

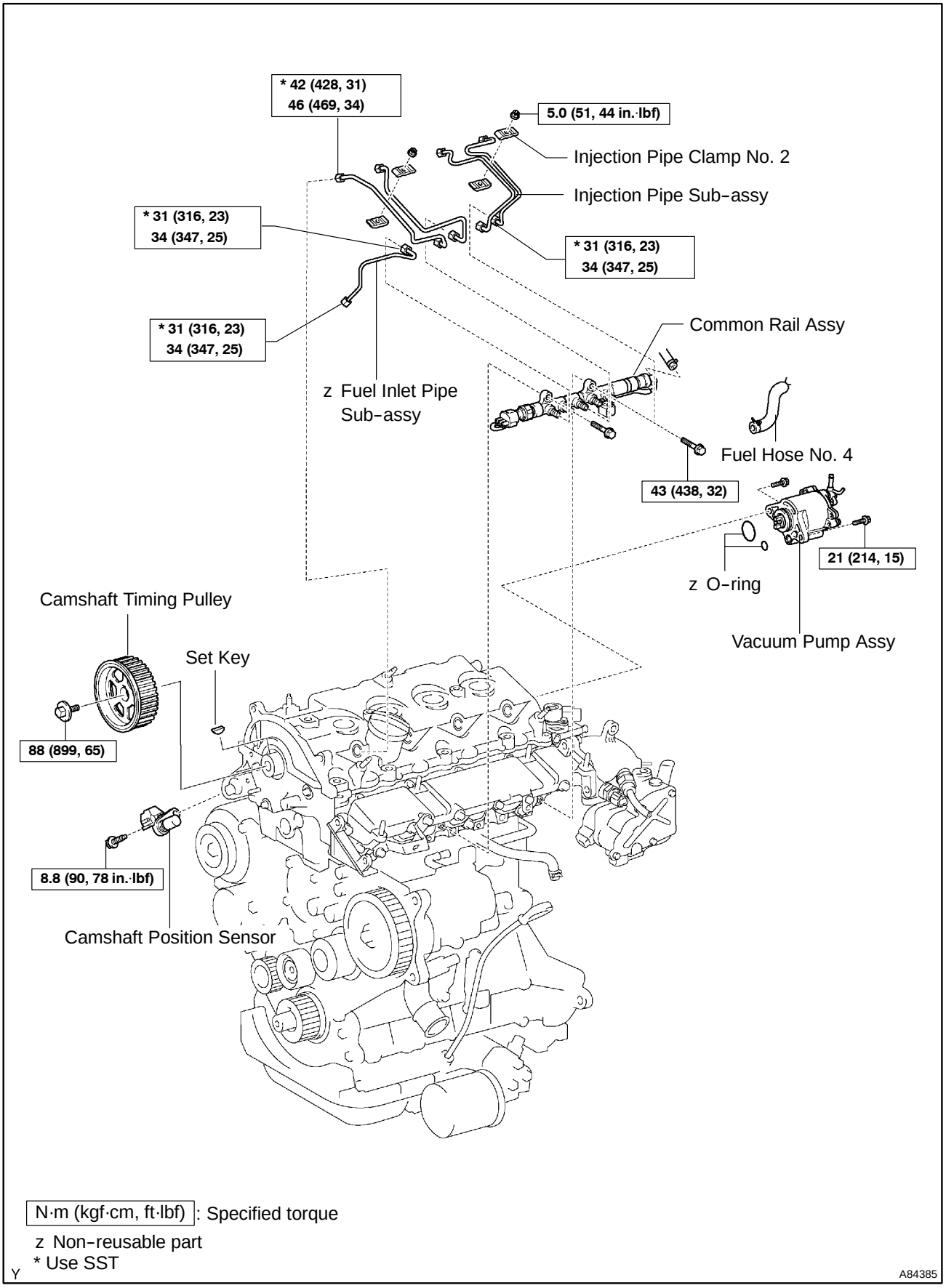


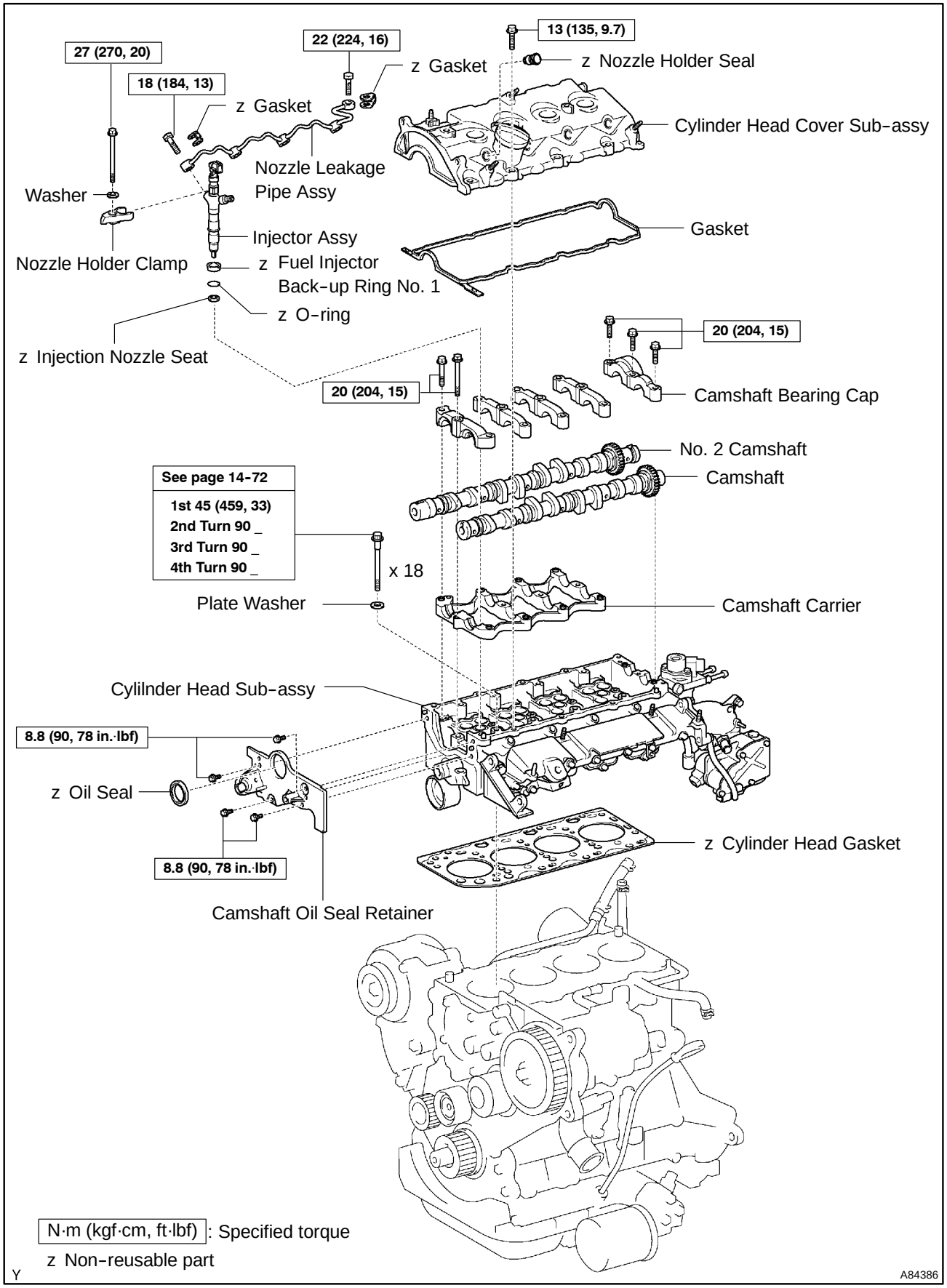
N·m (kgf·cm, ft·lbf) : Specified torque

* Replace only if damaged

Y

A84369


* 42 (428, 31)
46 (469, 34)
5.0 (51, 44 in.·lbf)
Injection Pipe Clamp No. 2
Injection Pipe Sub-assy
* 31 (316, 23)
34 (347, 25)
* 31 (316, 23)
34 (347, 25)
* 31 (316, 23)
34 (347, 25)
Common Rail Assy
z Fuel Inlet Pipe
Sub-assy
Fuel Hose No. 4
43 (438, 32)
21 (214, 15)
z O-ring
Vacuum Pump Assy
Camshaft Timing Pulley
Set Key
88 (899, 65)
8.8 (90, 78 in.·lbf)
Camshaft Position Sensor
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
* Use SST
A84385


27 (270, 20)
18 (184, 13)
22 (224, 16)
z Gasket
z Gasket
13 (135, 9.7)
z Nozzle Holder Seal
Cylinder Head Cover Sub-assy
Nozzle Leakage Pipe Assy
Washer
Gasket
Injector Assy
Nozzle Holder Clamp
z Fuel Injector
Back-up Ring No. 1
z O-ring
z Injection Nozzle Seat
20 (204, 15)
20 (204, 15)
Camshaft Bearing Cap
No. 2 Camshaft
Camshaft
See page 14-72
1st 45 (459, 33)
2nd Turn 90 _
3rd Turn 90 _
4th Turn 90 _
x 18
Plate Washer
Camshaft Carrier
Cylilnder Head Sub-assy
8.8 (90, 78 in.·lbf)
z Oil Seal
z Cylinder Head Gasket
8.8 (90, 78 in.·lbf)
Camshaft Oil Seal Retainer
N·m (kgf·cm, ft·lbf): Specified torque
z Non-reusable part
Y
A84386

141H4-01

REPLACEMENT

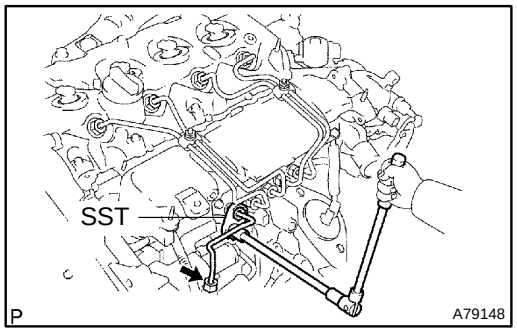
1. **REMOVE FRONT WHEEL RH**
2. **REMOVE ENGINE UNDER COVER LH (See page 14-5)**
3. **REMOVE ENGINE UNDER COVER RH (See page 14-5)**
4. **DRAIN ENGINE COOLANT (See page 16-3)**
5. **DRAIN ENGINE OIL (See page 17-9)**
6. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)**
7. **REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-5)**
8. **REMOVE VACUUM RESERVOIR SUB-ASSY (See page 13-8)**
9. **REMOVE AIR CLEANER ASSY (See page 14-24)**
10. **REMOVE BATTERY**
11. **REMOVE AIR TUBE NO.2 (See page 14-24)**
12. **REMOVE AIR TUBE NO.1 (See page 14-5)**
13. **REMOVE INJECTOR DRIVER (See page 14-24)**
14. **REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)**
15. **REMOVE GENERATOR V BELT (See page 14-4)**
16. **REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)**
17. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
18. **REMOVE CRANKSHAFT PULLEY (See page 14-47)**
    SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
19. **REMOVE IDLER PULLEY SUB-ASSY (See page 14-47)**
20. **REMOVE TIMING BELT NO.2 COVER (See page 14-47)**
21. **REMOVE TIMING BELT NO.1 COVER (See page 14-47)**
22. **REMOVE TIMING BELT GUIDE**
23. **REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)**
24. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)**
25. **REMOVE TIMING CHAIN COVER PLATE (See page 14-47)**
26. **REMOVE TIMING BELT (See page 14-47)**

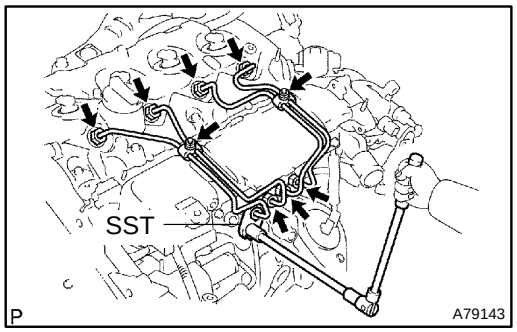
HINT:

If reusing the timing belt, draw an arrow on the timing belt which indicates the engine revolution direction, then put match marks on the pulleys and timing belt.

27. **REMOVE FUEL FILTER ASSY (See page 11-28)**
28. **REMOVE HEATER PUMP ASSY (W/ COLD AREA) (See page 13-8)**
29. **REMOVE BRACKET, HEATER (W/ COLD AREA) (See page 13-8)**
30. **REMOVE FLOOR PANEL BRACE FRONT (See Pub. No. RM925E on page 15-8)**
31. **REMOVE EXHAUST PIPE ASSY FRONT (See Pub. No. RM925E on page 15-8)**
32. **REMOVE EXHAUST PIPE ASSY (W/ COLD AREA) (See page 13-8)**
33. **DISCONNECT RADIATOR HOSE INLET**
34. **DISCONNECT HEATER INLET WATER HOSE**
35. **DISCONNECT HEATER OUTLET WATER HOSE**
36. **DISCONNECT FUEL PIPE TO FUEL TUBE FUEL HOSE**
37. **DISCONNECT OIL COOLER HOSE**
38. **REMOVE TURBO INSULATOR NO.2 (See page 13-8)**
39. **REMOVE TURBO INSULATOR NO.1 (See page 13-8)**
40. **REMOVE EXHAUST MANIFOLD HEAT INSULATOR NO.2 (See page 13-8)**
41. **REMOVE MANIFOLD STAY NO.2 (See page 13-8)**
42. **REMOVE MANIFOLD STAY (See page 13-8)**

43. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-8)
44. REMOVE TURBOCHARGER STAY (See page 13-8)
45. REMOVE TURBO WATER HOSE NO.1 (See page 13-8)
46. REMOVE TURBO WATER HOSE NO.2 (See page 13-8)
47. REMOVE TURBO OIL INLET PIPE SUB-ASSY (See page 13-8)
48. REMOVE TURBOCHARGER SUB-ASSY (See page 13-8)
49. REMOVE CAMSHAFT POSITION SENSOR (See page 14-24)
50. REMOVE CAMSHAFT TIMING PULLEY (See page 14-58)
SST 09960-10010 (09962-01000, 09963-01000)



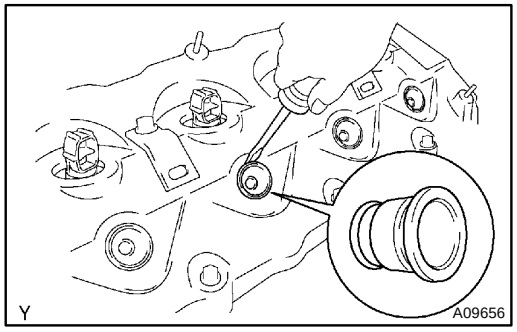


51. REMOVE FUEL INLET PIPE SUB-ASSY
(a) Using SST, remove the fuel inlet pipe from the common rail side.
SST 09023-12700
(b) Using SST, remove the fuel inlet pipe from the pump side.
SST 09023-12700

NOTICE:
After removing the fuel pipe, cover the common rail and injector mounting holes with vinyl tape to prevent dust from being introduced.

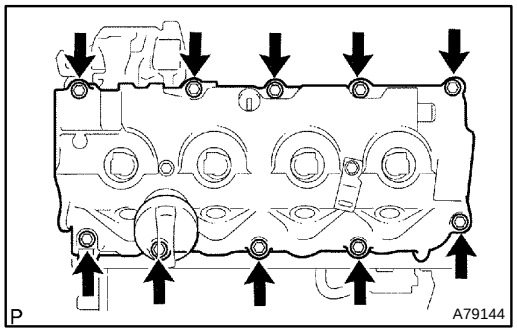
52. REMOVE INJECTION PIPE SUB-ASSY NO.1
(a) Remove the 2 nuts and 2 upper injection pipe clamps from the intake manifold.
(b) Using SST, remove the injection pipe from the common rail side.
SST 09023-12700
(c) Using SST, remove the injection pipe from the injector side.
SST 09023-12700
(d) After removing the fuel pipe, in order to prevent dust or foreign objects from being introduced, cover the common rail with vinyl tape and protect the injector inlet with a vinyl or plastic bag.

53. REMOVE INJECTION PIPE SUB-ASSY NO.2
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.
54. REMOVE INJECTION PIPE SUB-ASSY NO.3
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.
55. REMOVE INJECTION PIPE SUB-ASSY NO.4
SST 09023-12700
HINT:
Perform the same procedures as injection pipe No. 1.
56. REMOVE VACUUM PUMP ASSY (See page 14-24)



57. REMOVE NOZZLE HOLDER SEAL

(a) Using a screwdriver, pry out the 4 nozzle holder seals.



58. REMOVE CYLINDER HEAD COVER SUB-ASSY

(a) Remove the 10 bolts, cylinder head cover and gasket.

59. REMOVE NOZZLE LEAKAGE PIPE ASSY (See page 11-5)

60. REMOVE INJECTOR ASSY (See page 11-5)

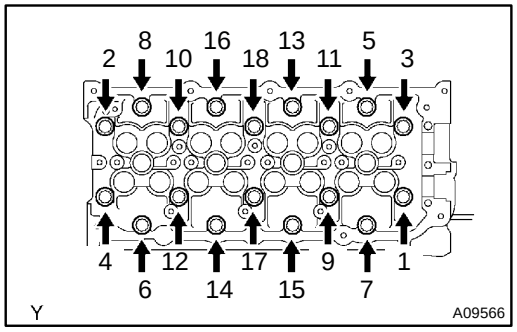
HINT:

Since each injector assembly has a characteristic fuel injecting behavior, keep them in the correct order so that they can be returned to the original locations when reassembling.

61. REMOVE CAMSHAFT OIL SEAL RETAINER (See page 14-58)

62. REMOVE CAMSHAFT (See page 14-58)

63. REMOVE NO.2 CAMSHAFT (See page 14-58)

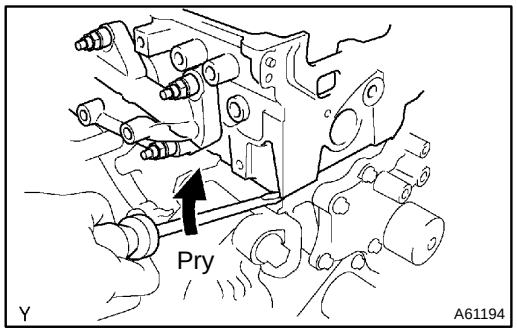


64. REMOVE CYLINDER HEAD SUB-ASSY

(a) Using several steps, loosen the 18 cylinder head bolts uniformly in the sequence shown in the illustration. Remove the 18 cylinder head bolts and plate washers.

NOTICE:

Cylinder head warpage or cracking could result from removing bolts in incorrect order.



(b) Lift the cylinder head from the dowels on the cylinder block, then place the cylinder head on wooden blocks on a work bench.

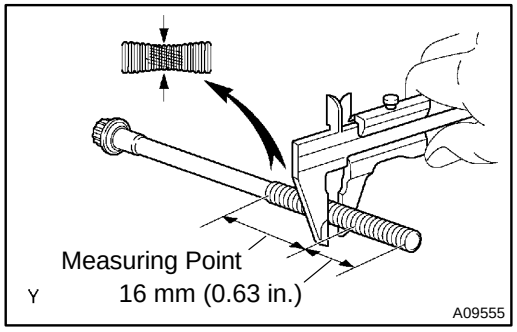
NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

HINT:

If the cylinder head is lifted off, pry between the cylinder head and cylinder block with a screwdriver.

65. REMOVE CYLINDER HEAD GASKET

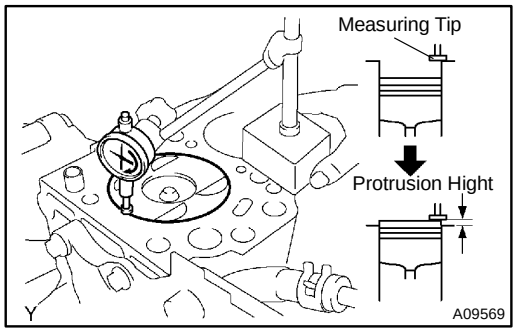


66. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the tension portion diameter of the bolts.

Standard outside diameter:
10.75 to 11.00 mm (0.4232 to 0.4331 in.)
Minimum outside diameter: 10.40 mm (0.4094 in.)

If the diameter is less than minimum, replace the bolt.



67. INSTALL CYLINDER HEAD GASKET

(a) Measure the protrusion height of the piston heads.
  (1) Clean the cylinder block with solvent.
  (2) Set the piston to be measured to slightly before the TDC.
  (3) Place a dial indicator on the cylinder block, then calibrate the dial indicator at 0 mm (0 in.).

HINT:

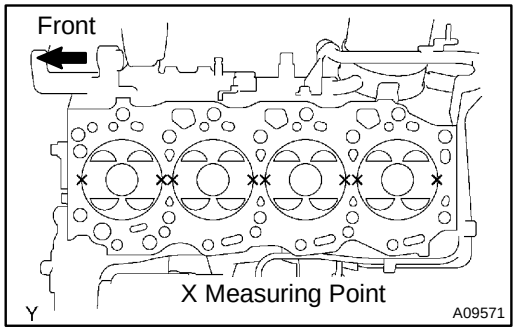
- Place the measuring tip of the dial indicator as shown in the illustration.
- Make sure that the measuring tip is square to the cylinder block gasket and piston head when measuring.

  (4) Find the most overhung position of the piston head by slowly turning the crankshaft clockwise and counterclockwise.
  (5) Measure protrusion height of the piston head for each cylinder at 2 places as shown in the illustration. (Total of 8 measurements.)
  (6) Record the highest protrusion height from the 2 measurements at each cylinder.

(b) Select a new cylinder head gasket.

HINT:

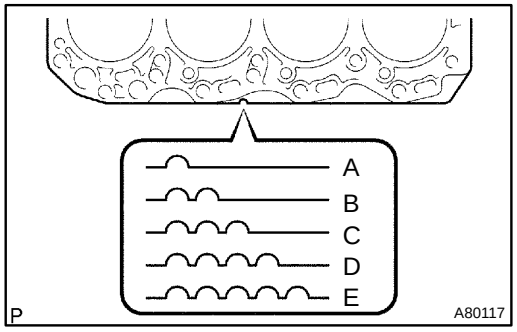
There are 5 sizes of new cylinder head gaskets, marked "A", "B", "C", "D", and "E".



New cylinder head gasket thickness:

A	0.85 to 0.95 mm (0.0335 to 0.0374 in.)
B	0.90 to 1.00 mm (0.0354 to 0.0394 in.)
C	0.95 to 1.05 mm (0.0374 to 0.0413 in.)
D	1.00 to 1.10 mm (0.0394 to 0.0433 in.)
E	1.05 to 1.15 mm (0.0413 to 0.0453 in.)

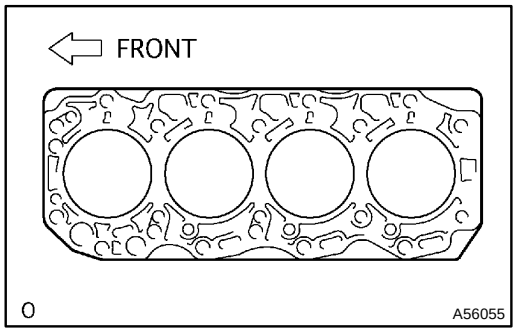
  (1) Find the highest protrusion height among the 4 measurement records. It is used to select a new cylinder head gasket.



(2) Select a new gasket among A to E using the matrix below.

New gasket matrix:

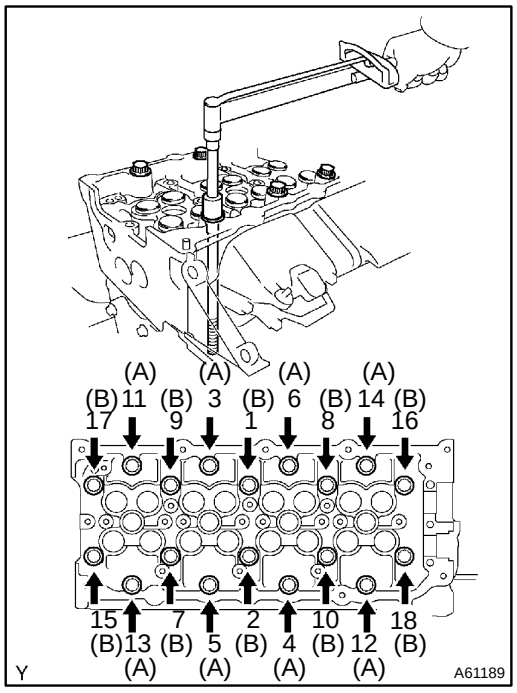
Piston Protrusion mm (in.)	Gasket Size
0.165 to 0.220 (0.0065 to 0.0087)	A
0.220 to 0.270 (0.0087 to 0.0106)	B
0.270 to 0.320 (0.0106 to 0.0126)	C
0.320 to 0.370 (0.0126 to 0.0146)	D
0.370 to 0.425 (0.0146 to 0.0167)	E



(c) Place the new cylinder head gasket on the cylinder block.

NOTICE:

Pay attention to the mounting orientation.



68. INSTALL CYLINDER HEAD SUB-ASSY

HINT:

- The cylinder head bolts are tightened in 4 successive steps (steps (c), (e), (f) and (g)).
- If the cylinder head bolt is broken or deformed, replace it with a new bolt.

(a) Apply a light coat of engine oil on the threads of the cylinder head bolts and the plate washers.

(b) Install the plate washer to the cylinder head bolt.

(c) Using several steps, install and tighten the 18 cylinder head bolts uniformly in the sequence shown in the illustration.

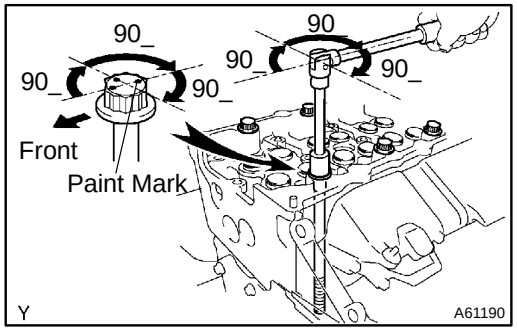
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

HINT:

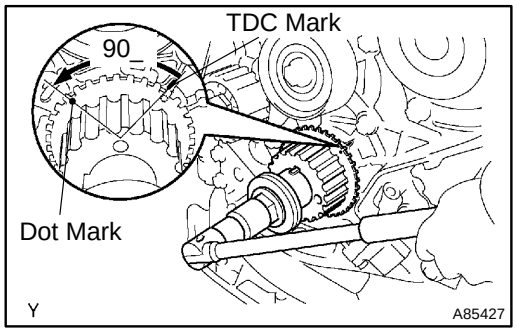
See the table below for the bolt length.

Bolt Type	Bolt Length
(A)	160mm (6.30 in.)
(B)	104mm (4.09 in.)

If the cylinder head bolt does not meet the torque specification, replace the cylinder head bolt with a new bolt.



(d) Mark the front of the cylinder head bolt with paint.
(e) Retighten the cylinder head bolts by 90_ in the same sequence as step (c).
(f) Retighten the cylinder head bolts by an additional 90_ in the same sequence as step (c).
(g) Retighten the cylinder head bolts by one more additional 90_ in the same sequence as step (c).
(h) Check that each painted mark is now at the intake manifold side.

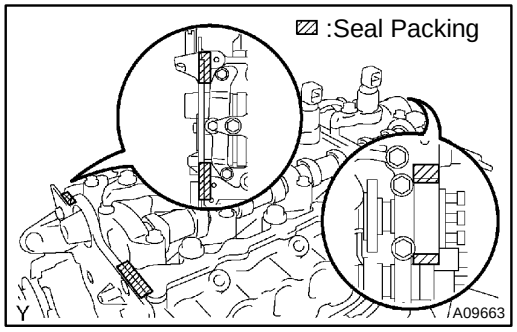


69. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Using the crankshaft pulley bolt, turn the crankshaft to set the dot mark of the crankshaft timing gear at the position of 90_ BTDC.

NOTICE:
If the timing belt is disengaged, the crankshaft timing gear placed at wrong angle can cause contact of the piston head with the valve head.

70. INSTALL CAMSHAFT (See page 14-58)
71. INSTALL NO.2 CAMSHAFT (See page 14-58)
72. REMOVE CAMSHAFT OIL SEAL (See page 14-58)
73. INSTALL CAMSHAFT OIL SEAL (See page 14-58)
SST 09223-46011
74. INSTALL CAMSHAFT OIL SEAL RETAINER (See page 14-58)
75. INSTALL CAMSHAFT TIMING PULLEY (See page 14-58)
SST 09960-10010 (09962-01000, 09963-01000)
76. INSTALL CAMSHAFT POSITION SENSOR (See page 14-24)
77. INSTALL INJECTOR ASSY (See page 11-5)
78. INSTALL NOZZLE LEAKAGE PIPE ASSY (See page 11-5)
SST 09992-00242



79. INSTALL CYLINDER HEAD COVER SUB-ASSY

(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the cylinder head.
Seal packing: Part No. 08826-00080 or equivalent
(c) Install the gasket to the head cover.
(d) Install the cylinder head cover with the 10 bolts.
Torque: 13 N·m (135 kgf·cm, 9.7 ft·lbf)

80. INSTALL NOZZLE HOLDER SEAL

(a) Install 4 new nozzle holder seals.

81. INSTALL VACUUM PUMP ASSY (See page 14-24)

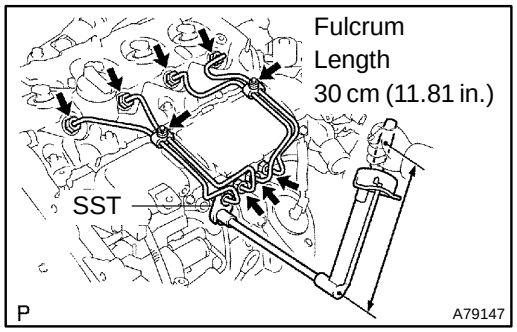
82. INSTALL INJECTION PIPE SUB-ASSY NO.1

NOTICE:

When assembling the pipes, perform the operation with the engine cold under room temperature.

(a) Remove the vinyl or plastic bag from the injector and the vinyl tape from the common rail.

(b) Temporarily install the injection pipe.



(c) Using SST, tighten the nut of the injection pipe to the common rail side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(d) Using SST, tighten the nut of the injection pipe to the injector side.

SST 09023-12700

Torque:

42 N·m (428 kgf·cm, 31 ft·lbf) for a used pipe using SST

46 N·m (469 kgf·cm, 34 ft·lbf) for a used pipe not using SST

31 N·m (316 kgf·cm, 23 ft·lbf) for a new pipe using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for a new pipe not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the injection pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(e) Install the 2 upper injection pipe clamps with the 2 nuts.

Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

83. INSTALL INJECTION PIPE SUB-ASSY NO.2

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

84. INSTALL INJECTION PIPE SUB-ASSY NO.3

SST 09023-12700

HINT:

Perform the same procedures as injection pipe No. 1.

85. INSTALL INJECTION PIPE SUB-ASSY NO.4

SST 09023-12700

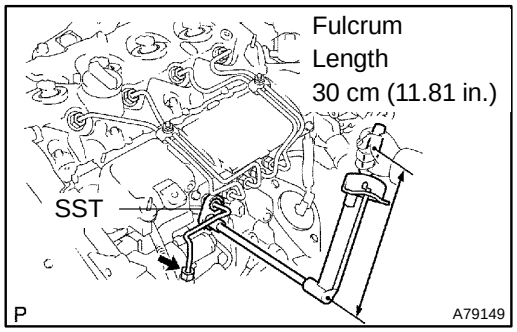
HINT:

Perform the same procedures as injection pipe No. 1.

86. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

- **In case of having the cylinder head gasket replaced, the fuel inlet pipe must be replaced, too.**
- **When assembling the pipe, perform the operation with the engine cold under room temperature.**



(a) Temporarily install the new fuel inlet pipe.

(b) Using SST, tighten the nut of the fuel inlet pipe to the common rail side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(c) Using SST, tighten the nut of the fuel inlet pipe to the pump side.

SST 09023-12700

Torque:

31 N·m (316 kgf·cm, 23 ft·lbf) for using SST

34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

87. INSTALL TURBOCHARGER SUB-ASSY (See page 13-8)

88. INSTALL TURBO OIL INLET PIPE SUB-ASSY (See page 13-8)

89. INSTALL TURBOCHARGER STAY (See page 13-8)

90. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSY (See page 13-8)

91. INSTALL MANIFOLD STAY NO.2 (See page 13-8)

92. INSTALL EXHAUST MANIFOLD HEAT INSULATOR NO.2 (See page 13-8)

93. INSTALL TURBO INSULATOR NO.1 (See page 13-8)

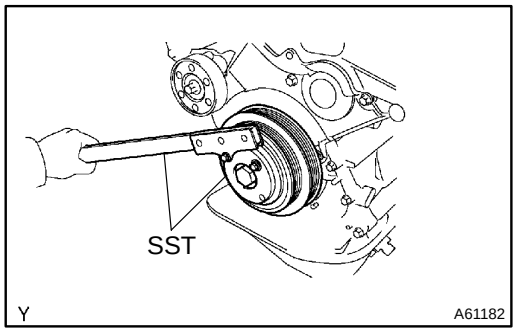
94. **INSTALL TURBO INSULATOR NO.2 (See page 13-8)**
95. **INSTALL EXHAUST PIPE ASSY (W/ COLD AREA) (See page 13-8)**
96. **INSTALL EXHAUST PIPE ASSY FRONT (See Pub. No. RM925E on page 15-8)**
97. **INSTALL FLOOR PANEL BRACE FRONT (See Pub. No. RM925E on page 15-8)**
98. **INSTALL BRACKET, HEATER (W/ COLD AREA) (See page 13-8)**
99. **INSTALL HEATER PUMP ASSY (W/ COLD AREA) (See page 13-8)**
100. **INSTALL FUEL FILTER ASSY (See page 11-28)**
101. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)**
    SST 09960-10010 (09962-01000, 09963-01000)
102. **INSTALL TIMING BELT (See page 14-47)**
103. **CHECK VALVE TIMING (See page 14-47)**
104. **TIMING CHAIN COVER PLATE (See page 14-47)**
105. **INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)**
106. **INSTALL TIMING BELT GUIDE (See page 14-47)**
107. **INSTALL TIMING BELT NO.1 COVER (See page 14-47)**
108. **INSTALL TIMING BELT NO.2 COVER (See page 14-47)**
109. **INSTALL IDLER PULLEY SUB-ASSY (See page 14-47)**
110. **INSTALL CRANKSHAFT PULLEY (See page 14-47)**
    SST 09213-54015 (90105-08076), 09330-00021
111. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
112. **INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)**
113. **ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)**
114. **INSTALL INJECTOR DRIVER (See page 14-24)**
115. **INSTALL AIR TUBE NO.1 (See page 14-5)**
116. **INSTALL AIR TUBE NO.2 (See page 14-24)**
117. **INSTALL BATTERY (See page 14-24)**
118. **INSTALL AIR CLEANER ASSY (See page 14-24)**
119. **INSTALL VACUUM RESERVOIR SUB-ASSY (See page 13-8)**
120. **INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-5)**
121. **INSTALL FRONT WHEEL RH**
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
122. **ADD ENGINE OIL**
123. **ADD ENGINE COOLANT (See page 16-3)**
124. **CHECK FOR FUEL LEAKS (See page 11-5)**
125. **CHECK FOR ENGINE OIL LEAKS**
126. **CHECK FOR ENGINE COOLANT LEAKS (See page 16-3)**
127. **CHECK FOR EXHAUST GAS LEAKS**

ENGINE REAR OIL SEAL (1CD-FTV) (May, 2003)

141H5-01

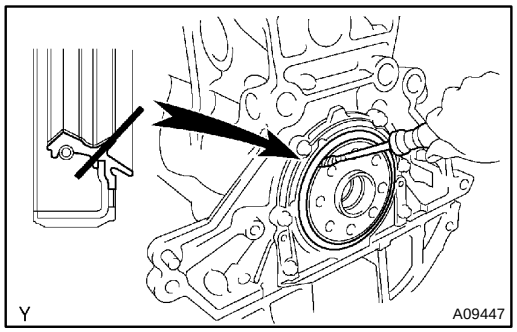
REPLACEMENT

1. **REMOVE MANUAL TRANSAXLE ASSY (See Pub. No. RM925E on page 41-36)**
   SST 09930-00010, 09628-62011, 09520-01010, 09520-24010 (09520-32040)
2. **REMOVE CLUTCH COVER ASSY (See Pub. No. RM925E on page 42-29)**
3. **REMOVE CLUTCH DISC ASSY (See Pub. No. RM925E on page 42-29)**



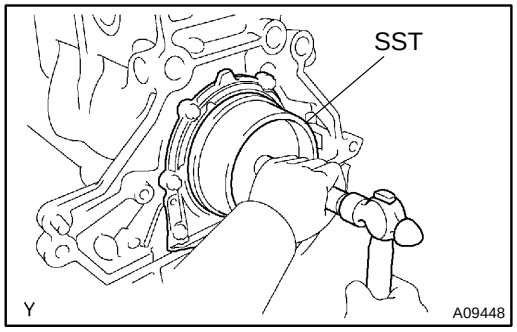
4. **REMOVE FLYWHEEL SUB-ASSY**
   (a) Hold the crankshaft with SST.
   SST 09213-54015 (90105-08076), 09330-00021
   (b) Using a Torx socket wrench (T55), remove the 8 Torx screws and flywheel.

5. **REMOVE REAR END PLATE**
   (a) Remove the 2 bolts and rear end plate.



6. **REMOVE ENGINE REAR OIL SEAL**
   (a) Using a knife, cut off the oil seal lip.
   (b) Using a screwdriver, pry out the oil seal.

NOTICE:
After the removal, check if the crankshaft is not damaged. If it is damaged, smooth the surface with 400-grit sandpaper.



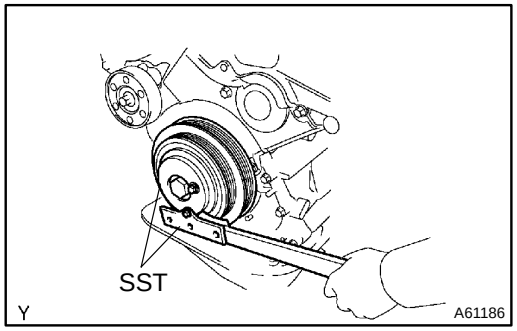
7. **INSTALL ENGINE REAR OIL SEAL**
   (a) Apply multi-purpose grease to a new oil seal lip.

NOTICE:
Keep the lip free of foreign objects.

   (b) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
   SST 09223-15030, 09950-70010 (09951-07100)

NOTICE:
Wipe off extra grease on the crankshaft.

8. **INSTALL REAR END PLATE**
   Torque: 8.4 N·m (86 kgf·cm, 74 in.·lbf)

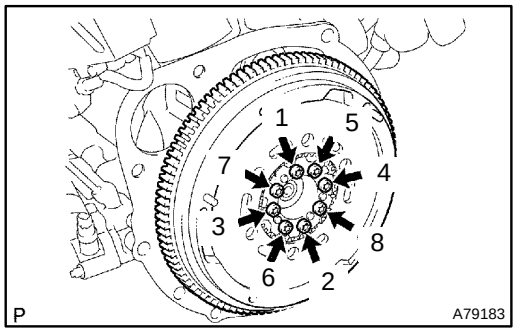


9. INSTALL FLYWHEEL SUB-ASSY

(a) Hold the crankshaft with SST.
SST 09213-54015 (90105-08076), 09330-00021

(b) Clean the bolt and bolt hole.

(c) Apply adhesive to the bolts.
Adhesive:
Part No. 08833-00070, THREE BOND or equivalent



(d) Using several steps, install and tighten the 8 screws with a Torx socket wrench (T55) uniformly in the sequence shown in the illustration.
Torque: 71 N·m (720 kgf·cm, 52 ft·lbf)

10. INSTALL CLUTCH DISC ASSY (See Pub. No. RM925E on page 42-29)
SST 09301-00220

11. INSTALL CLUTCH COVER ASSY (See Pub. No. RM925E on page 42-29)

12. INSTALL MANUAL TRANSAXLE ASSY (See Pub. No. RM925E on page 41-36)
SST 09670-00010

COOLING

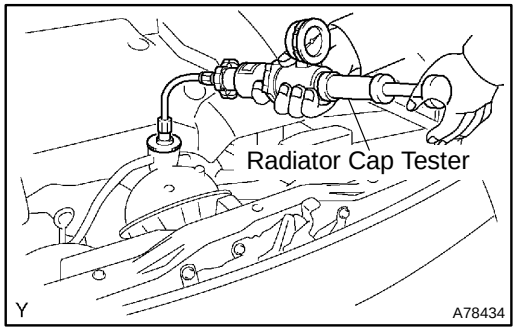
COOLING SYSTEM
(1CD–FTV) (May, 2003) 16–1
ON–VEHICLE INSPECTION 16–1
ENGINE COOLANT
(1CD–FTV) (May, 2003) 16–3
REPLACEMENT 16–3
WATER PUMP ASSY
(1CD–FTV) (May, 2003) 16–5
REPLACEMENT 16–5
THERMOSTAT (1CD–FTV) (May, 2003) 16–9
REPLACEMENT 16–9

REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

COOLING SYSTEM (1CD-FTV) (May, 2003)

ON-VEHICLE INSPECTION

160P2-01



1. INSPECT COOLING SYSTEM FOR LEAKS

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) Remove the radiator support opening cover.
(b) Remove the engine room cover side.
(c) Fill the radiator with coolant, then attach a radiator cap tester.
(d) Warm up the engine.
(e) Pump it to 137 kPa (1.4 kgf/cm^2, 19.9 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator and water pump for leaks. If there are no signs or traces of external coolant leaks, check the heater core, cylinder block and head.

(f) Reinstall the engine room cover side.
(g) Reinstall the radiator support opening cover.

2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

(a) The engine coolant level should be between the "LOW" and "FULL" lines, when the engine is cold.

If low, check for leaks and add "Toyota Long Life Coolant" or equivalent up to the "FULL" line.

3. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

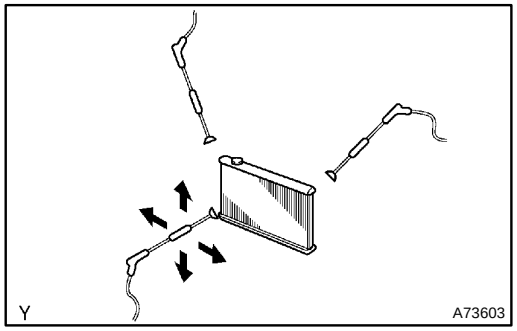
CAUTION:

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 is any excessive deposit of rust or scale around the radiator cap and radiator filler hole; the coolant should be free from oil.

If excessively dirty, replace the coolant.

(c) Reinstall the radiator cap.



4. INSPECT FINS BLOCKAGE

(a) If fins are clogged, wash them with water or a steam cleaner and dry with compressed air.

NOTICE:

- **If the distance between the steam cleaner and core is too close, there is a possibility of damaging the fins, so keep the following injection distance.**

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.**
- **Do not expose the electronic components to water.**

ENGINE COOLANT (1CD-FTV) (May, 2003)

160P3-01

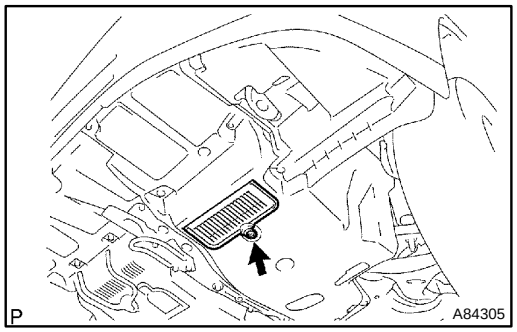
REPLACEMENT

1. DRAIN ENGINE COOLANT

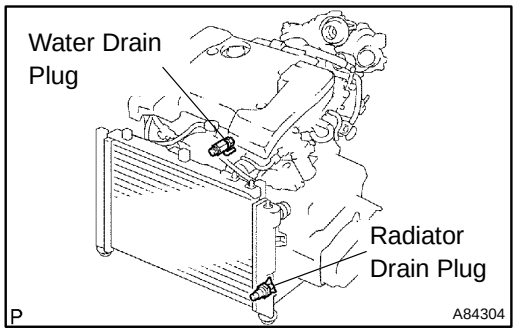
CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(a) Remove the radiator cap.



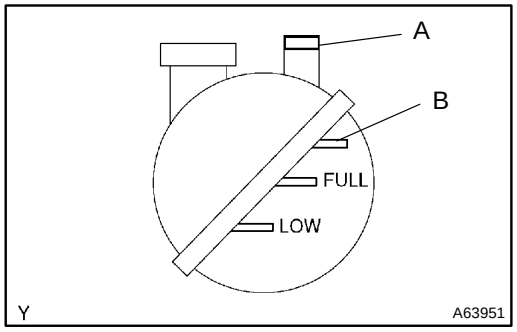
(b) Remove the screw, then open the engine under cover.



(c) Loosen the radiator and engine drain plugs, then drain the coolant.

(d) Close the drain plugs.

Torque: 13 N·m (133 kgf·cm, 10 ft·lbf) for engine



2. ADD ENGINE COOLANT

(a) Loosen air bleed valve A.

(b) Fill the cooling system with coolant up to line B.

Capacity:

With heater: 7.6 liters (8.0 US qts, 6.7 Imp. qts)

Without heater: 7.4 liters (7.8 US qts, 6.5 Imp. qts)

HINT:

- Use of improper coolants may damage the engine cooling system.
- Use "Toyota Long Life Coolant" or equivalent and mix it with plain water according to the manufacturer's instruction.
- Use of coolant which includes more than 50 % (freezing protection down to -35_C (-31_F)) or 60 % (freezing protection down to -50_C (-58_F)) of ethylene-glycol is recommended, but not more than 70 %.

(c) Tighten the air bleed valve A securely.

(d) Install the radiator cap securely.

(e) Warm up the engine.

HINT:

Run the engine at 2,000 rpm or more. Then keep the warm-up until the thermostat opens and the radiator reservoir becomes hot.

(f) Run the engine intermittently at 3,000 rpm for 5 seconds and at idle for 45 seconds.

(g) Do the above operation for 7 minutes or longer.

(h) After the engine becomes cold, check that the coolant level is between "LOW" and "FULL" lines.

3. CHECK FOR ENGINE COOLANT LEAKS

(a) Fill the radiator with coolant, then attach a radiator cap tester.

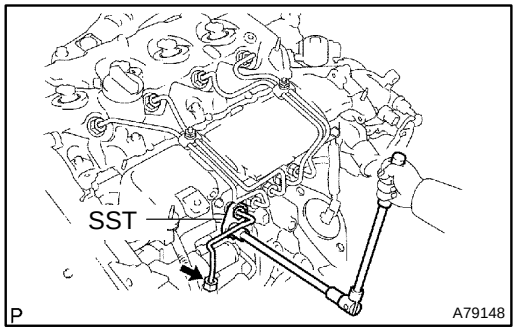
(b) Pump it to 137 kPa (1.4 kgf/cm^{2,} 19.9 psi), then check that the pressure does not drop.

WATER PUMP ASSY (1CD-FTV) (May, 2003)

160P4-01

REPLACEMENT

1. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)**
2. **DRAIN ENGINE COOLANT (See page 16-3)**
3. **REMOVE FRONT WHEEL RH**
4. **REMOVE ENGINE UNDER COVER RH (See page 14-5)**
5. **REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-5)**
6. **REMOVE INJECTOR DRIVER (See page 14-24)**
7. **REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)**
8. **REMOVE GENERATOR V BELT (See page 14-4)**
9. **REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)**
10. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
11. **REMOVE CRANKSHAFT PULLEY (See page 14-47)**
    SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
12. **REMOVE IDLER PULLEY SUB-ASSY (See page 14-47)**
13. **REMOVE TIMING BELT NO.2 COVER (See page 14-47)**
14. **REMOVE TIMING BELT NO.1 COVER (See page 14-47)**
15. **REMOVE TIMING BELT GUIDE**
16. **REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)**
17. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)**
18. **REMOVE TIMING CHAIN COVER PLATE (See page 14-47)**
19. **REMOVE TIMING BELT (See page 14-47)**



20. **REMOVE FUEL INLET PIPE SUB-ASSY**

NOTICE:

After removing the fuel inlet pipe, cover the common rail and injection pump with vinyl tape to prevent dust from being introduced.

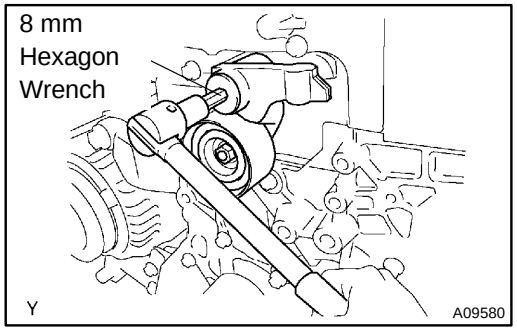
(a) Remove the wire bracket, then slide the engine wire.
(b) Using SST, remove the fuel inlet pipe from the common rail.
    SST 09023-12700
(c) Using SST, remove the fuel inlet pipe from the injection pump.
    SST 09023-12700

21. **REMOVE INTAKE MANIFOLD INSULATOR NO.1 (See page 11-15)**
22. **REMOVE OIL LEVEL GAGE SUB-ASSY**
23. **REMOVE OIL LEVEL GAGE GUIDE (See page 17-1)**
24. **REMOVE WATER INLET (See page 16-9)**
25. **DISCONNECT INJECTION PUMP TO FUEL PIPE FUEL HOSE (See page 11-15)**
26. **DISCONNECT INJECTION PUMP TO FUEL FILTER FUEL HOSE OR PIPE (See page 11-15)**

27. REMOVE INJECTION PUMP DRIVE PULLEY (See page 11-15)

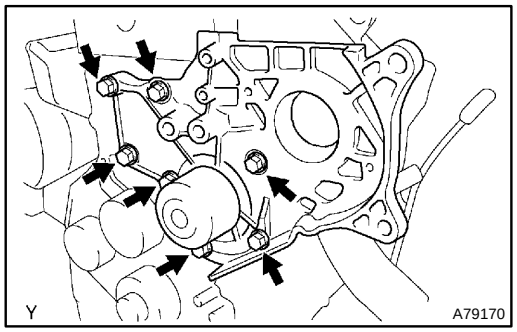
SST 09960-10010 (09962-01000, 09963-01000), 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

28. REMOVE INJECTION OR SUPPLY PUMP ASSY (See page 11-15)



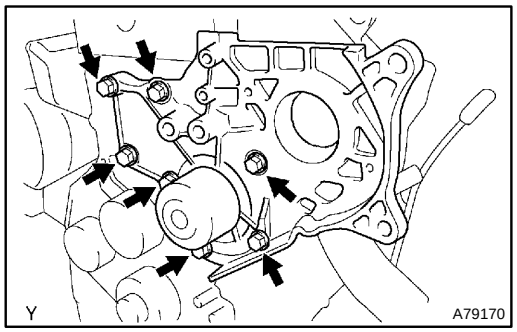
29. REMOVE TIMING BELT IDLER SUB-ASSY NO.1

(a) Using an 8 mm hexagon wrench, remove the idler pulley shaft, idler pulley and plate washer.



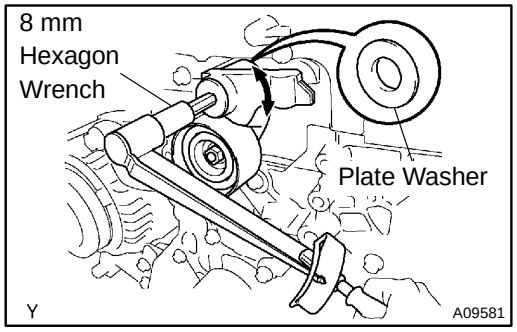
30. REMOVE WATER PUMP ASSY

(a) Remove the 7 bolts, then remove the water pump and gasket.



31. INSTALL WATER PUMP ASSY

(a) Install a new gasket and water pump with the 7 bolts.
Torque: 31 N·m (320 kgf·cm, 23 ft.·lbf)



32. INSTALL TIMING BELT IDLER SUB-ASSY NO.1

(a) Using an 8 mm hexagon wrench, install the plate washer and idler pulley with the idler pulley shaft.
Torque: 35 N·m (357 kgf·cm, 26 ft·lbf)

(b) Check that the pulley bracket moves smoothly.

33. INSTALL INJECTION OR SUPPLY PUMP ASSY (See page 11-15)

34. INSTALL INJECTION PUMP DRIVE PULLEY (See page 11-15)

SST 09960-10010 (09962-01000, 09963-01000)

35. INSTALL WATER INLET (See page 16-9)

36. INSTALL OIL LEVEL GAGE GUIDE (See page 17-1)

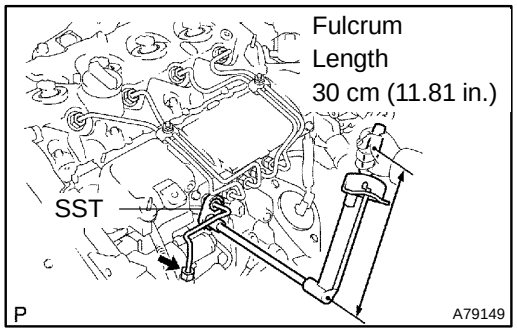
37. INSTALL INTAKE MANIFOLD INSULATOR NO.1 (See page 11-15)

38. INSTALL FUEL INLET PIPE SUB-ASSY

NOTICE:

- **In case of having the water pump replaced, the fuel inlet pipe must be replaced, too.**
- **When assembling the pipe, perform the operation with the engine cold under room temperature.**

(a) Temporarily install the new fuel inlet pipe.



(b) Using SST, tighten the nut of the fuel inlet pipe to the common rail side.

SST 09023-12700

Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

(c) Using SST, tighten the nut of the fuel inlet pipe to the injection pump side.

SST 09023-12700

Torque:
31 N·m (316 kgf·cm, 23 ft·lbf) for using SST
34 N·m (347 kgf·cm, 25 ft·lbf) for not using SST

HINT:

- Use a torque wrench with the fulcrum length of 30 cm (11.81 in.).
- Check if the used pipe has deflection or is installed properly after the inlet pipe is reassembled. If there is deflection or if it cannot be installed properly, replace the used pipe with a new pipe.

39. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)

SST 09960-10010 (09962-01000, 09963-01000)

40. INSTALL TIMING BELT (See page 14-47)

41. CHECK VALVE TIMING (See page 14-47)

42. INSTALL TIMING CHAIN COVER PLATE (See page 14-47)

43. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)

44. INSTALL TIMING BELT GUIDE (See page 14-47)

45. INSTALL TIMING BELT NO.1 COVER (See page 14-47)

46. INSTALL TIMING BELT NO.2 COVER (See page 14-47)

47. INSTALL IDLER PULLEY SUB-ASSY (See page 14-47)

48. INSTALL CRANKSHAFT PULLEY (See page 14-47)

SST 09213-54015 (90105-08076), 09330-00021

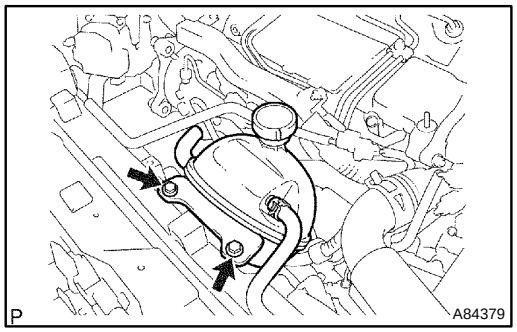
49. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)
50. INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)
51. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
52. INSTALL INJECTOR DRIVER (See page 14-24)
53. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
54. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-5)
55. ADD ENGINE COOLANT (See page 16-3)
56. CHECK FOR ENGINE COOLANT LEAKS (See page 16-3)
57. CHECK FOR FUEL LEAKS (See page 11-5)

THERMOSTAT (1CD-FTV) (May, 2003)

160P5-01

REPLACEMENT

1. REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)
2. DRAIN ENGINE COOLANT (See page 16-3)

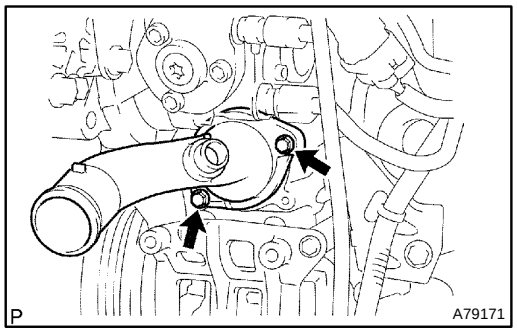


3. REMOVE RADIATOR RESERVE TANK ASSY

(a) Disconnect the water by-pass hose No. 1 and water by-pass hose No. 2.

(b) Remove the 2 bolts and reserve tank assembly.

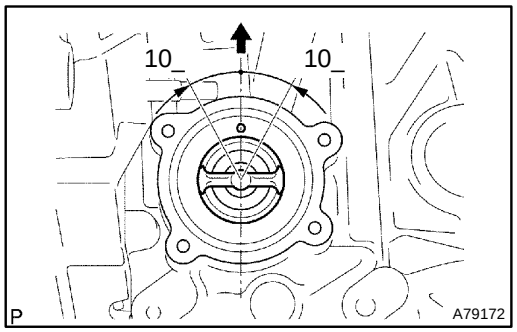
4. REMOVE RADIATOR HOSE OUTLET



5. REMOVE WATER INLET

(a) Remove the 2 bolts and water inlet.

6. REMOVE THERMOSTAT



7. INSTALL THERMOSTAT

(a) Install a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve facing upward.

HINT:

The jiggle valve may be set within 10_ on either side as shown in the illustration.

8. INSTALL WATER INLET
   Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)
9. INSTALL RADIATOR RESERVE TANK ASSY
   Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)
10. ADD ENGINE COOLANT (See page 16-3)
11. CHECK FOR ENGINE COOLANT LEAKS (See page 16-3)

LUBRICATION

OIL PUMP ASSY (1CD-FTV) (May, 2003) . . . 17-1
REPLACEMENT 17-1
OIL FILTER SUB-ASSY
(1CD-FTV) (May, 2003) 17-9
REPLACEMENT 17-9

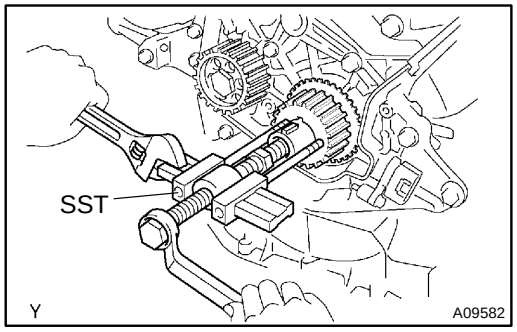
REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

OIL PUMP ASSY (1CD-FTV) (May, 2003)

170H2-01

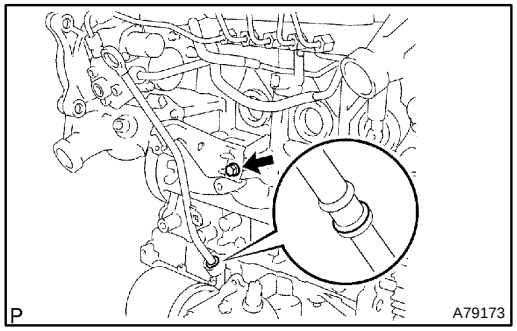
REPLACEMENT

1. **DRAIN ENGINE OIL (See page 17-9)**
2. **REMOVE RADIATOR SUPPORT OPENING COVER (See page 14-5)**
3. **REMOVE FRONT WHEEL RH**
4. **REMOVE ENGINE UNDER COVER RH (See page 14-5)**
5. **REMOVE ENGINE COVER SUB-ASSY NO.1 (See page 14-5)**
6. **REMOVE INJECTOR DRIVER (See page 14-24)**
7. **REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)**
8. **REMOVE GENERATOR V BELT (See page 14-4)**
9. **REMOVE IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)**
10. **REMOVE ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)**
11. **REMOVE CRANKSHAFT PULLEY (See page 14-47)**
    SST 09213-54015 (90105-08076), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
12. **REMOVE IDLER PULLEY SUB-ASSY (See page 14-47)**
13. **REMOVE TIMING BELT NO.2 COVER (See page 14-47)**
14. **REMOVE TIMING BELT NO.1 COVER (See page 14-47)**
15. **REMOVE TIMING BELT GUIDE**
16. **REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)**
17. **SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)**
18. **REMOVE TIMING CHAIN COVER PLATE (See page 14-47)**
19. **REMOVE TIMING BELT (See page 14-47)**
20. **REMOVE TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-47)**



21. **REMOVE CRANKSHAFT TIMING PULLEY**
    (a) If the timing pulley cannot be removed by hand, use SST to remove the pulley.
    SST 09950-50013 (09951-05010, 09952-05010, 09953-05010, 09953-05020, 09954-05021)

22. **REMOVE GENERATOR ASSY (See Pub. No. RM925E on page 19-30)**
23. **REMOVE TIMING BELT IDLER SUB-ASSY NO.1 (See page 16-5)**
24. **REMOVE V-RIBBED BELT TENSIONER ASSY (See page 14-24)**

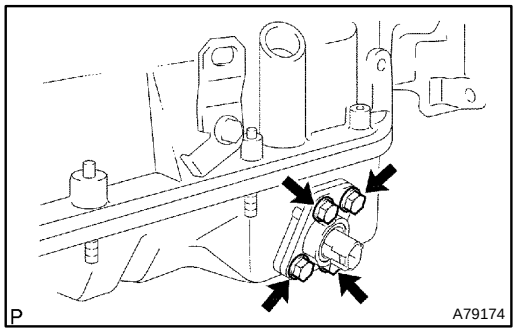


25. REMOVE OIL LEVEL GAGE GUIDE

(a) Remove the bolt which is used to secure the oil level gage guide to the cylinder block.

(b) Pull out the oil level gage guide together with the oil level gage from the No. 1 oil pan.

(c) Remove the O-ring from the oil level gage guide.

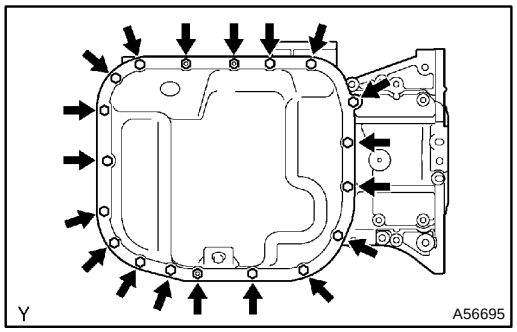


26. REMOVE ENGINE OIL LEVEL SENSOR

(a) Remove the 4 bolts and level sensor.

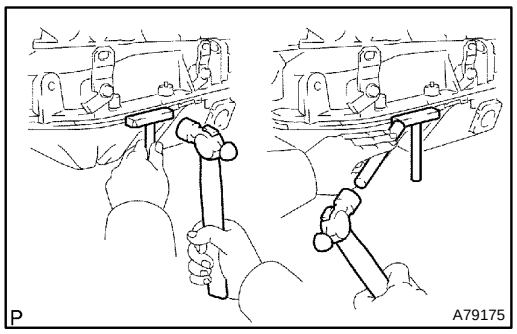
NOTICE:

Be careful not to drop the oil level sensor when removing.



27. REMOVE OIL PAN SUB-ASSY NO.2

(a) Remove the 16 bolts and 3 nuts.

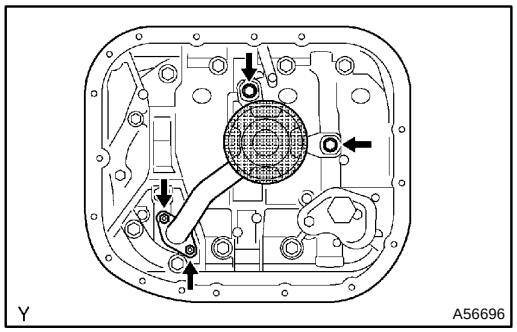


(b) Insert the blade of SST between the No. 1 and No. 2 oil pans, then cut off the applied sealer and remove the No. 2 oil pan.

SST 09032-00100

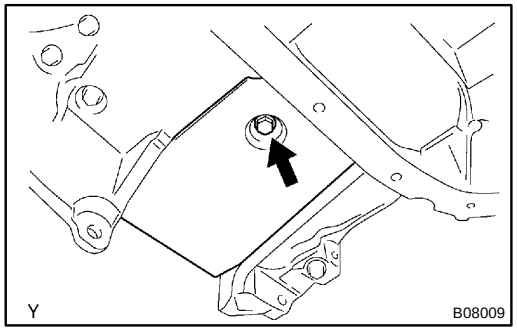
NOTICE:

Be careful not to damage the No. 1 and No. 2 oil pans.



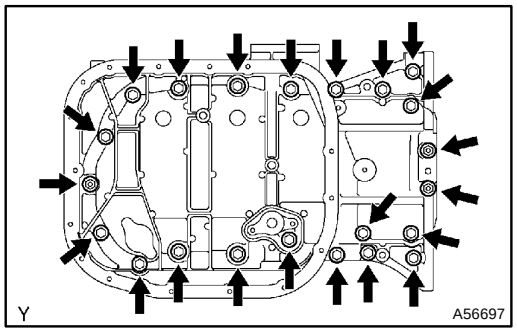
28. REMOVE OIL STRAINER SUB-ASSY

(a) Remove the 2 bolts and 2 nuts, then remove the oil strainer and gasket.



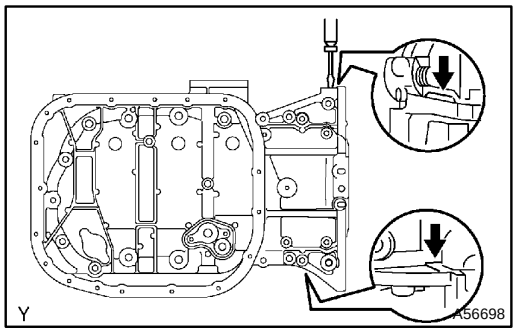
29. REMOVE OIL PAN INSULATOR

(a) Remove the bolt and oil pan insulator.



30. REMOVE OIL PAN SUB-ASSY

(a) Remove the 19 bolts and 3 nuts.

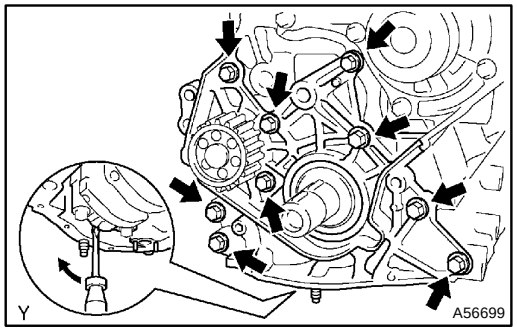


(b) Using a screwdriver, remove the oil pan by prying between the cylinder block and No. 1 oil pan.

NOTICE:

Be careful not to damage the cylinder block and No. 1 oil pan.

31. REMOVE CRANKSHAFT POSITION SENSOR (See page 14-24)

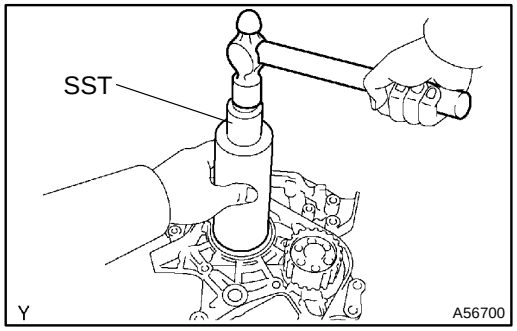


32. REMOVE OIL PUMP ASSY

(a) Remove the 9 bolts.

(b) Remove the oil pump by prying between the oil pump and main bearing cap with a screwdriver.

(c) Remove the gasket.

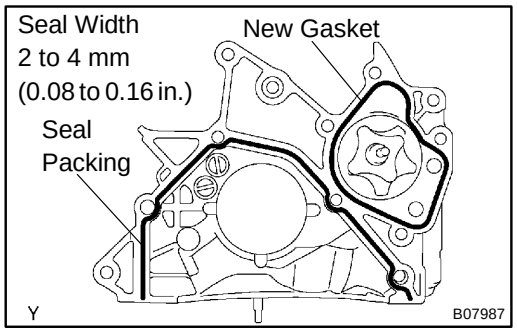


33. INSTALL CRANKSHAFT SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump edge.
SST 09316-60011 (09316-00011, 09316-00021)

34. INSTALL OIL PUMP ASSY

(a) Remove any old packing (FIPG). Careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.
(1) Using a razor blade and gasket scraper, remove all the old packing from the gasket surfaces and sealing groove.
(2) Thoroughly clean all components to remove all the loose material.
(3) Using a non-residue solvent, clean both sealing surfaces.

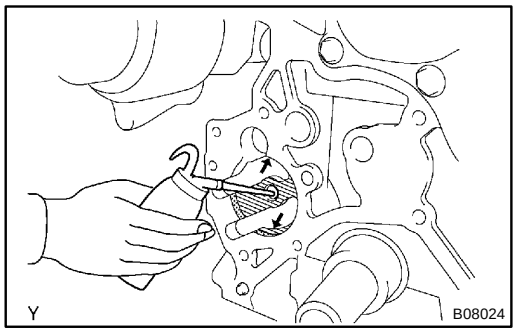


(b) Apply the seal packing to the oil pump as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:
Avoid applying an excessive amount to the surface.

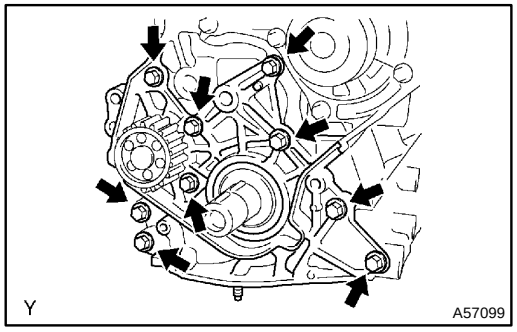
(1) Install a nozzle that has been cut to a 2 to 4 mm (0.08 to 0.16 in.) opening.
(2) Parts must be set within 3 minutes, then assembled within 15 minutes after applying. Otherwise the material must be removed and reapplied.
(3) Immediately remove the nozzle from the tube, then reinstall the cap.

(c) Install a new gasket to the oil pump.

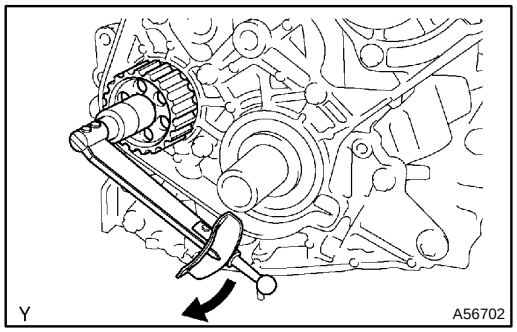


(d) Pour 0.5 cm^3 (0.03 cu in.) or more of engine oil into the bushing of the cylinder block.

(e) Apply engine oil to the cylinder block side where it contacts the oil pump driven rotor.



(f) Install the oil pump with the 9 bolts.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)

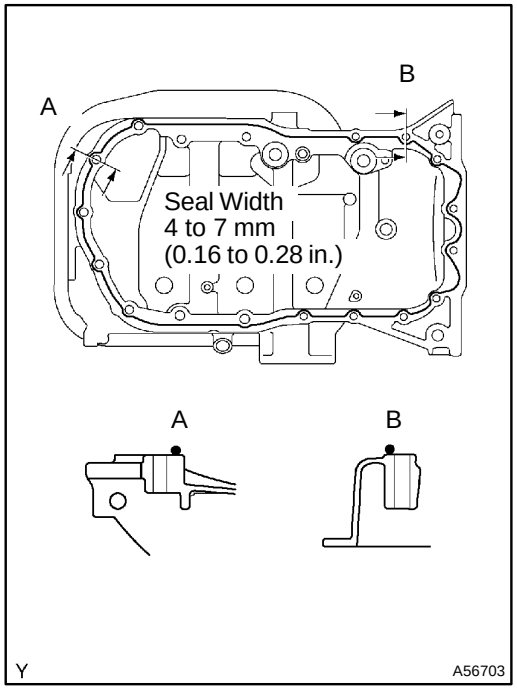


(g) Measure the oil pump rotating torque.
(1) Check that the pump rotates smoothly without noise.
(2) Using a torque wrench, check the pump rotating torque.
Rotating torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf) or less

35. INSTALL CRANKSHAFT POSITION SENSOR (See page 14-24)

36. INSTALL OIL PAN SUB-ASSY

(a) Remove any old packing (FIPG). Careful not to drop any oil on the contact surfaces of the No. 1 oil pan, cylinder block, oil pump and rear oil seal retainer.
(1) Using a razor blade and gasket scraper, remove all the old packing from the gasket surfaces.
(2) Thoroughly clean all components to remove all the loose material.
(3) Using a non-residue solvent, clean both sealing surfaces.



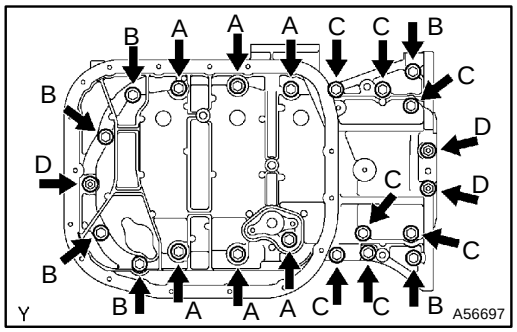
(b) Apply a seal packing to the No. 1 oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

(1) Install a nozzle that has been cut to a 4 to 7 mm (0.16 to 0.28 in.) opening.

(2) Parts must be set within 3 minutes, then assembled within 15 minutes after applying. Otherwise the material must be removed and reapplied.

(3) Immediately remove the nozzle from the tube, then reinstall the cap.



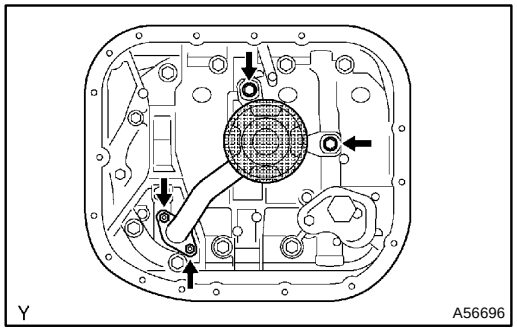
(c) Install the oil pan with the 19 bolts and 3 nuts.

Torque:
42 N·m (428 kgf·cm, 31 ft·lbf) for bolt A
21 N·m (214 kgf·cm, 15 ft·lbf) for bolt B
11 N·m (112 kgf·cm, 8 ft·lbf) for bolt C
12 N·m (122 kgf·cm, 9 ft·lbf) for nut D

37. INSTALL OIL PAN INSULATOR

(a) Install the oil pan insulator with the bolt.

Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)



38. INSTALL OIL STRAINER SUB-ASSY

(a) Install a new gasket and the oil strainer with the 2 bolts and 2 nuts.

Torque:
21 N·m (209 kgf·cm, 15 ft·lbf) for bolt
13 N·m (135 kgf·cm, 10 ft·lbf) for nut

39. INSTALL OIL PAN SUB-ASSY NO.2

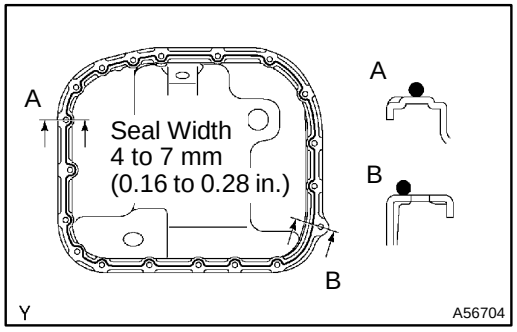
(a) Remove any old packing (FIPG) and be careful not to drop any oil on the contact surfaces of the No. 1 and No. 2 oil pans.

(1) Using a razor blade and gasket scraper, remove all the old packing from the gasket surfaces.

(2) Thoroughly clean all components to remove all the loose material.

(3) Using a non-residue solvent, clean both sealing surfaces.

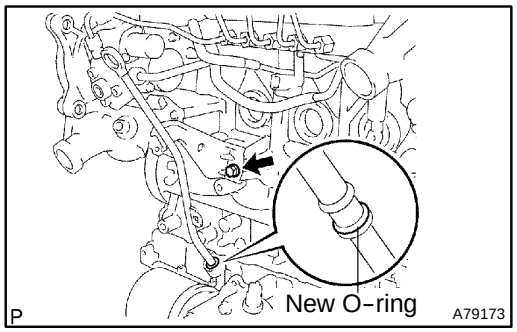
NOTICE:
Do not use a solvent, which will affect the painted surfaces.



(b) Apply a seal packing to the oil pan as shown in the illustration.
Seal packing: Part No. 08826-00080 or equivalent
(1) Install a nozzle that has been cut to a 4 to 7 mm (0.16 to 0.28 in.) opening.
(2) Parts must be set within 3 minutes, then assembled within 15 minutes after applying. Otherwise the material must be removed and reapplied.
(3) Immediately remove the nozzle from the tube, then reinstall the cap.

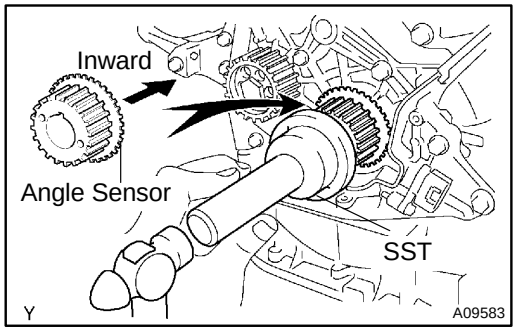
(c) Install the oil pan with the 17 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.
Torque: 12 N·m (119 kgf·cm, 9 ft·lbf)

40. INSTALL ENGINE OIL LEVEL SENSOR
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)



41. INSTALL OIL LEVEL GAGE GUIDE
(a) Install a new O-ring to the oil level gage guide.
(b) Apply engine oil to the O-ring.
(c) Push the oil level gage guide end into the guide hole of the No. 1 oil pan.
(d) Install the oil level gage guide with the bolt.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)
(e) Apply engine oil to the O-ring on the oil level gage.
(f) Install the oil level gage.

42. INSTALL V-RIBBED BELT TENSIONER ASSY (See page 14-24)
43. INSTALL TIMING BELT IDLER SUB-ASSY NO.1 (See page 16-5)
44. INSTALL GENERATOR ASSY (See Pub. No. RM925E on page 19-30)



45. INSTALL CRANKSHAFT TIMING PULLEY
(a) Align the keyway of the timing pulley with the key located on the camshaft, then slide the pulley into place.
(b) Using SST and a hammer, tap in the timing pulley with the angle sensor facing inward.
SST 09223-46011

46. INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page 14-47)
47. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See page 14-47)
SST 09960-10010 (09962-01000, 09963-01000)
48. INSTALL TIMING BELT (See page 14-47)

49. CHECK VALVE TIMING (See page 14-47)
50. INSTALL TIMING CHAIN COVER PLATE (See page 14-47)
51. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET (See page 14-47)
52. INSTALL TIMING BELT GUIDE (See page 14-47)
53. INSTALL TIMING BELT NO.1 COVER (See page 14-47)
54. INSTALL TIMING BELT NO.2 COVER (See page 14-47)
55. INSTALL IDLER PULLEY SUB-ASSY (See page 14-47)
56. INSTALL CRANKSHAFT PULLEY (See page 14-47)
    SST 09213-54015 (90105-08076), 09330-00021
57. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSY RH (See page 14-47)
58. INSTALL IDLE W/BRACKET PULLEY ASSY (W/ AIR CONDITIONING) (See page 14-24)
59. ADJUST V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (W/ AIR CONDITIONING) (See page 14-4)
60. INSTALL INJECTOR DRIVER (See page 14-47)
61. INSTALL ENGINE COVER SUB-ASSY NO.1 (See page 14-5)
62. INSTALL FRONT WHEEL RH
    Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
63. ADD ENGINE OIL (See page 17-9)
64. CHECK FOR ENGINE OIL LEAKS

OIL FILTER SUB-ASSY (1CD-FTV) (May, 2003)

170H3-01

REPLACEMENT

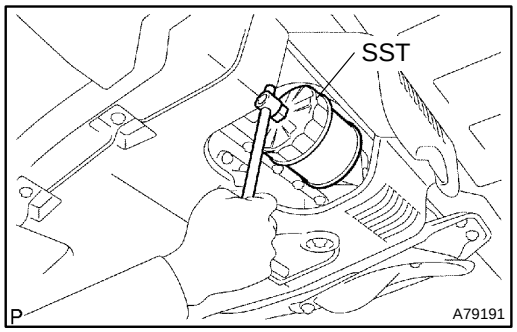
NOTICE:

- **Prolonged and repeated contact with engine oil will result in the 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 making contact with used engine oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **For environmental protection, used oil and oil filter must be disposed of at designated disposal sites.**

1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

(b) Remove the oil drain plug, then drain the oil into a container.



2. REMOVE OIL FILTER SUB-ASSY

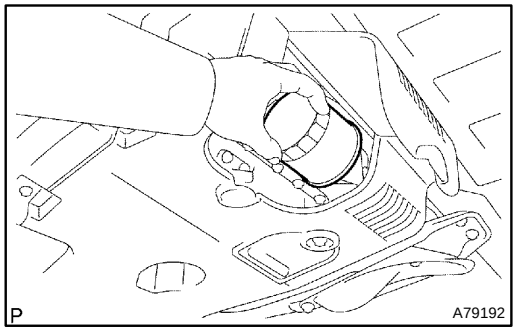
(a) Remove the clip, then open the engine under cover.

(b) Using SST, remove the oil filter.
SST 09228-10002

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, and tighten it until the gasket contacts the seat.

(d) Using SST, tighten it an additional 3/4 turn.
SST 09228-10002

4. ADD ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

(b) Fill the tank with fresh engine oil.
Capacity:
With the oil filter replacement: 5.9 liters (6.2 US qts, 5.2 Imp. qts)
Without the oil filter replacement: 5.3 liters (5.6 US qts, 4.7 Imp. qts)
Dry fill: 6.7 liters (7.1 US qts, 5.9 Imp. qts)

(c) Install the oil filler cap.

5. CHECK FOR ENGINE OIL LEAKS

STARTING & CHARGING

PRE–HEATING SYSTEM
(1CD–FTV) (May, 2003) 19–1
ON–VEHICLE INSPECTION 19–1
INSPECTION 19–3
GLOW PLUG ASSY
(1CD–FTV) (May, 2003) 19–4
REPLACEMENT 19–4

REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

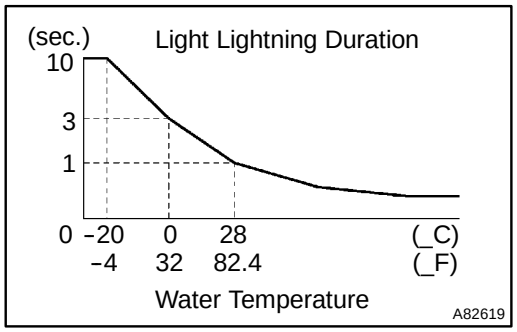
PRE-HEATING SYSTEM (1CD-FTV) (May, 2003)

190QZ-01

ON-VEHICLE INSPECTION

NOTICE:

Turn the ignition switch OFF for 60 seconds before performing the following inspections.

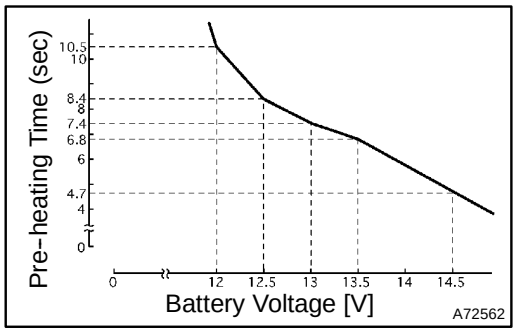


1. INSPECT LIGHTING DURATION OF GLOW INDICATOR LIGHT

(a) Turn the ignition switch ON, then measure the lighting duration.

Light lighting duration: Refer to the graph

If the result is not as specified, inspect the ECM, engine coolant temperature sensor, glow plug and glow plug relay.



2. INSPECT PRE-HEATING

(a) Turn the ignition switch ON, then measure how long it takes that the battery voltage is applied to the glow plugs.

SST 09082-00030, 09083-00150

Pre-heating time:

Engine Coolant Temperature	Pre-heating Time
40 _C or higher	1 second
40 _C or lower	Refer to the graph (15 seconds at the longest)

If the result is not as specified, inspect the ECM, engine coolant temperature sensor, glow plug and glow plug relay.

(b) Turn the ignition switch to STA, then check the battery voltage is applied to the glow plugs.

SST 09082-00030, 09083-00150

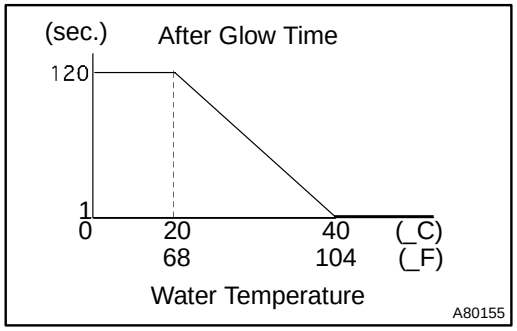
(c) While cranking the engine, measure how long it takes that the battery voltage is applied to the glow plugs.

SST 09082-00030, 09083-00150

Pre-heating time:

Engine Coolant Temperature	Pre-heating Time
40 _C or higher	1 second
40 _C or lower	Refer to the graph (15 seconds at the longest)

If the result is not as specified, inspect the ECM, engine coolant temperature sensor, glow plug and glow plug relay.

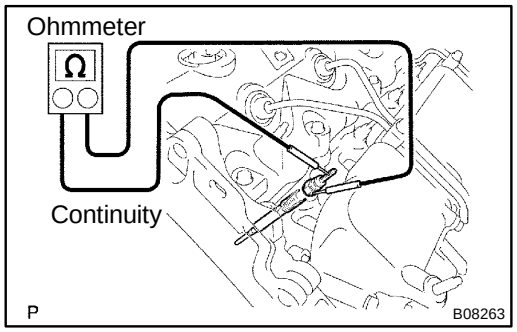


3. INSPECT AFTER GLOW TIME

(a) After the engine starts, measure how long it takes that the battery voltage is applied to the terminal SREL of the ECM.

After glow time: Refer to the graph

If the result is not as specified, inspect the ECM, engine coolant temperature sensor, glow plug and glow plug relay.



4. INSPECT GLOW PLUGS

(a) Using an ohmmeter, check the continuity between the glow plug terminal and ground.

Standard resistance: Approximately 0.72 Ω at 20_C (68_F)

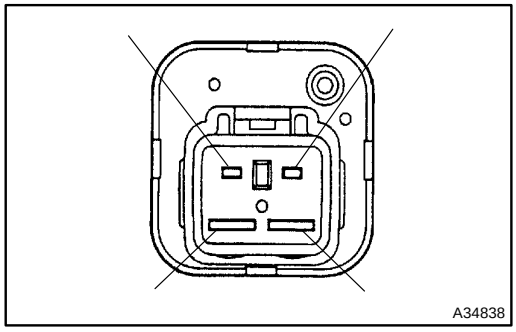
If the result is not as specified, replace the glow plug.

NOTICE:

- **Be careful not to damage the glow plug pipes as it could cause an open circuit or short life of the glow plugs.**
- **Be careful to prevent oil and gasoline from spraying on the glow plug when cleaning.**
- **Wipe up any oil on 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 plug as it could cause an open circuit.**

190R0-01

INSPECTION



1. INSPECT GLOW PLUG RELAY ASSY

(a) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

Tester Connection	Specified Condition
1 - 2	No continuity
1 - 2	Continuity (Apply battery voltage to terminals 3 and 4)

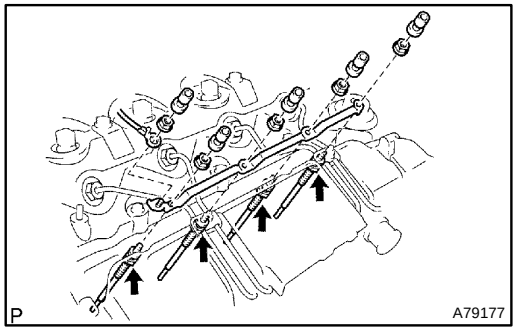
If the result is not as specified, replace the glow plug relay.

GLOW PLUG ASSY (1CD-FTV) (May, 2003)

190R1-01

REPLACEMENT

1. REMOVE ENGINE COVER NO.1 (See page 14-5)



2. REMOVE GLOW PLUG ASSY

(a) Remove the 5 grommets.
(b) Remove the 5 nuts and glow plug connector.
(c) Remove the 4 glow plugs.

3. INSTALL GLOW PLUG ASSY

Torque:
12.3 N·m (125 kgf·cm, 9 ft·lbf) for glow plug
2.2 N·m (22 kgf·cm, 19 in.·lbf) for nut

4. INSTALL ENGINE COVER NO.1

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

CLUTCH

CLUTCH MASTER CYLINDER ASSY
(MTM – May, 2003) 42–1
COMPONENTS 42–1
REPLACEMENT 42–2

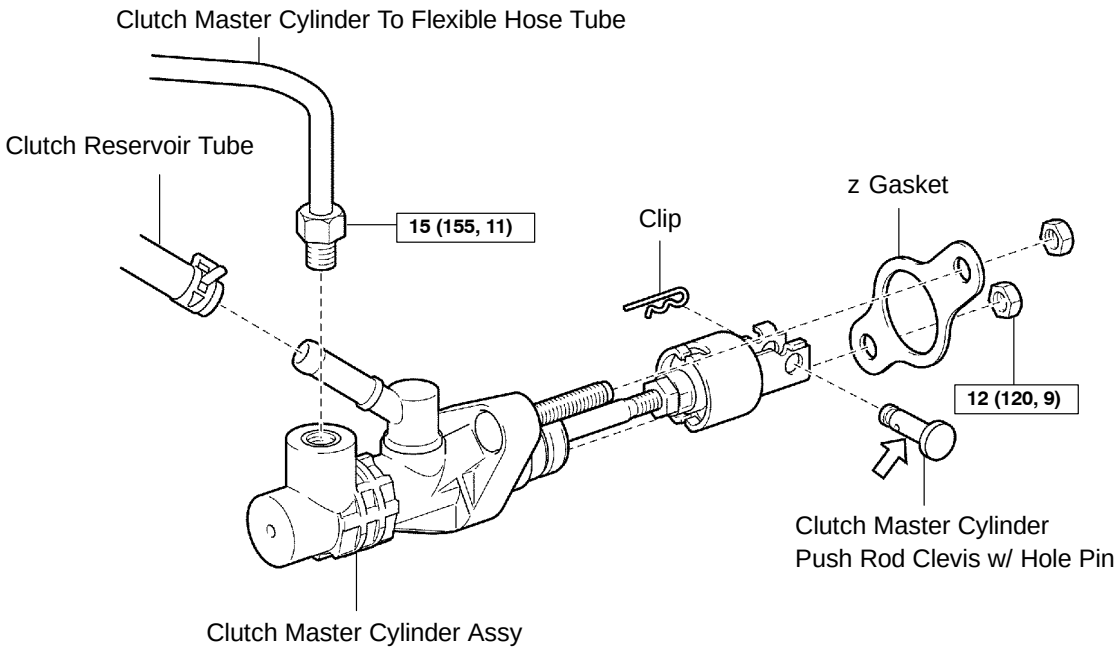
REFER TO COROLLA REPAIR MANUAL (Pub. No. RM925E)
NOTE: The above pages contain only the points which differ from the above listed manual.

CLUTCH MASTER CYLINDER ASSY (MTM – May, 2003)

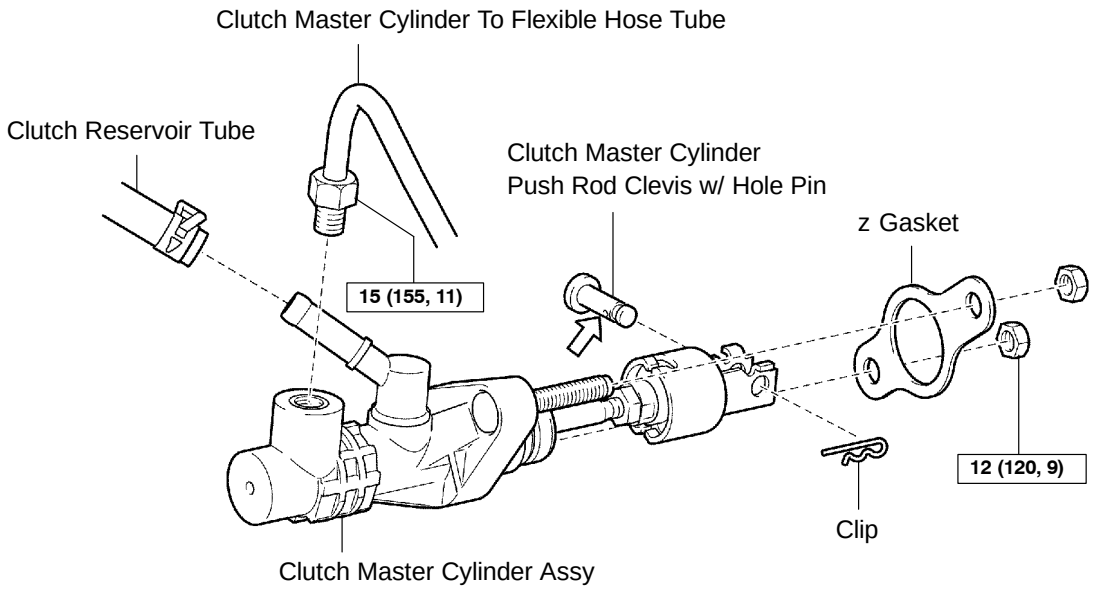
COMPONENTS

4202V–05

TMUK and TMMT Made
LHD Steering Position Type:



TMUK and TMMT Made
RHD Steering PositionType:



N·m (kgf·cm, ft·lbf) : Specified torque
z Non–reusable part
⇦ MP grease

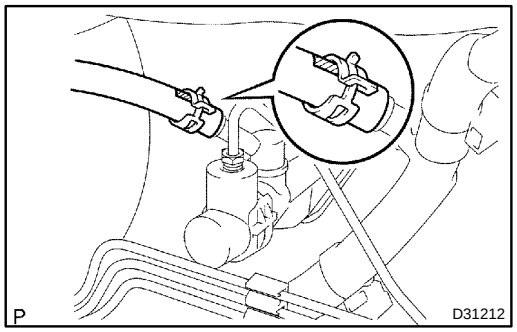
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4206E-02

REPLACEMENT

1. DRAIN CLUTCH FLUID
2. REMOVE BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE) (See page 32-15 of Pub. No. RM925E COROLLA)
3. REMOVE BRAKE BOOSTER ASSY (LHD STEERING POSITION TYPE) (See page 32-26 of Pub. No. RM925E COROLLA)

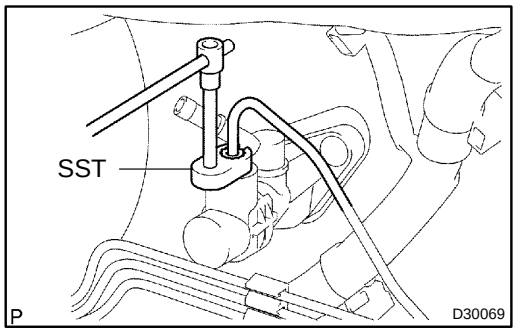


4. DISCONNECT CLUTCH RESERVOIR TUBE

(a) Loosen the clip and disconnect the clutch reservoir tube from the clutch master cylinder assembly.

HINT:

Put a container underneath the disconnection point to catch the fluid.

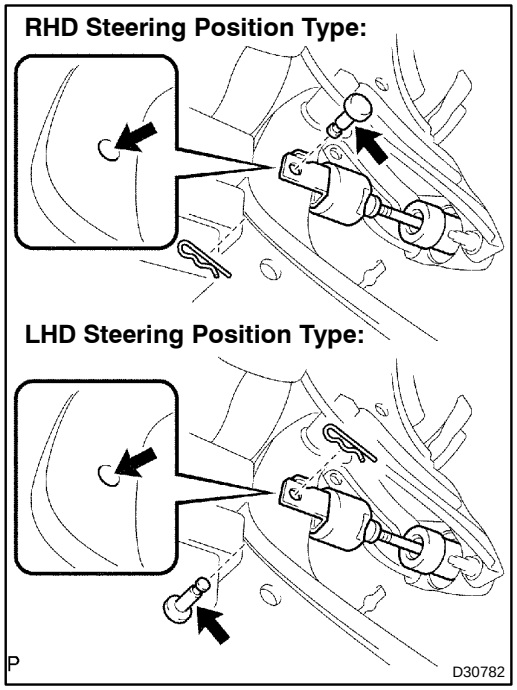


5. DISCONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

(a) Using SST, disconnect the flexible hose tube.
SST 09023-00100

HINT:

Put a container underneath the disconnection point to catch the fluid.



6. REMOVE CLUTCH MASTER CYLINDER PUSH ROD CLEVIS W/HOLE PIN

(a) Remove the clip and hole pin.

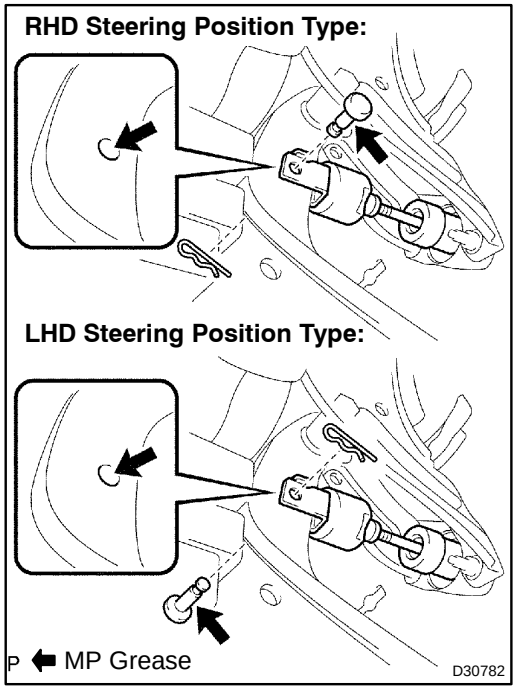
7. REMOVE CLUTCH MASTER CYLINDER ASSY

(a) Remove the 2 nuts, clutch master cylinder assembly and gasket.

8. INSTALL CLUTCH MASTER CYLINDER ASSY

(a) Install the clutch master cylinder assembly and 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

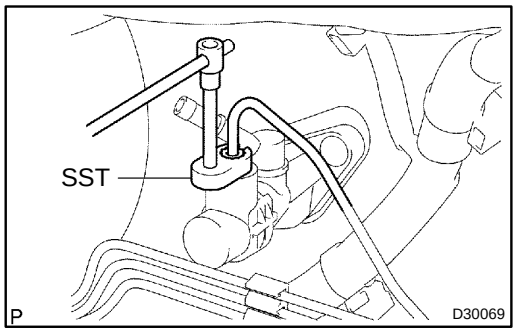
(a) Apply MP grease to the contact surface of the hole pin and clevis bush.

(b) Connect the clevis to the clutch pedal assembly with the hole pin.

HINT:

- RHD steering position type:
  Install the hole pin from the right side of the vehicle.
- LHD steering position type:
  Install the hole pin from the left side of the vehicle.

(c) Install the clip to the hole pin.

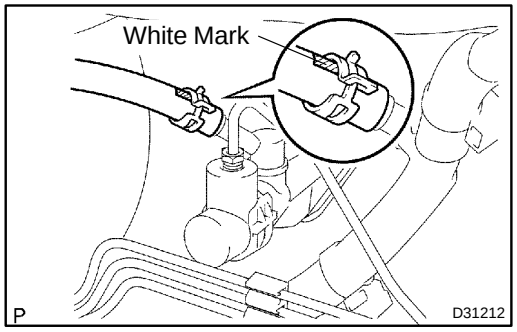


10. CONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

(a) Using SST, connect the flexible hose tube.

SST 09023-00100

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 assembly.

NOTICE:

Be careful not to twist the clutch reservoir tube when installing it.

12. INSTALL BRAKE BOOSTER ASSY (LHD STEERING POSITION TYPE)
(See page 32-26 of Pub. No. RM925E COROLLA)

13. INSTALL BRAKE MASTER CYLINDER SUB-ASSY (LHD STEERING POSITION TYPE)
(See page 32-15 of Pub. No. RM925E COROLLA)

14. BLEED BRAKE LINE (LHD STEERING POSITION TYPE)
(See page 32-5 of Pub. No. RM925E COROLLA)

15. BLEED CLUTCH PIPE LINE

(a) Fill the brake reservoir tank with the clutch fluid, then bleed the clutch system.
Torque: 8.4 N·m (85 kgf·cm, 73 in.·lbf)

16. CHECK AND ADJUST BRAKE PEDAL HEIGHT (LHD STEERING POSITION TYPE)
(See page 32-7 of Pub. No. RM925E COROLLA)

17. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSY
(See page 42-2 of Pub. No. RM925E COROLLA)

18. CHECK FOR BRAKE FLUID LEAKAGE (LHD STEERING POSITION TYPE)

19. CHECK FOR CLUTCH FLUID LEAKAGE

20. CHECK FLUID LEVEL IN RESERVOIR

SUPPLEMENTAL RESTRAINT SYSTEM

HORN BUTTON ASSY (May, 2003) 60–1
DISPOSAL 60–1

REFER TO FOLLOWING REPAIR MANUALS:

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

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

HORN BUTTON ASSY (May, 2003)

600NI-01

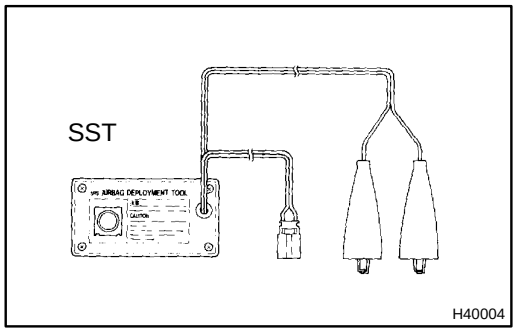
DISPOSAL

HINT:

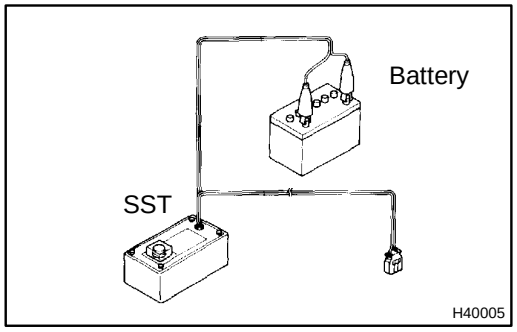
When scrapping a vehicle equipped with the supplemental restrain system (SRS) or disposing of a horn button assembly, be sure to deploy the airbag first in accordance with the procedures described below. If any abnormality occurs with the airbag deployment, contact the service department of your distributor.

CAUTION:

- **Never dispose of the horn button assembly until you deployed the airbag.**
- **Deploying the airbag emits a big explosive sound. Perform the airbag deployment in the outdoors and take great care not to disturb the peace of nearby residents.**



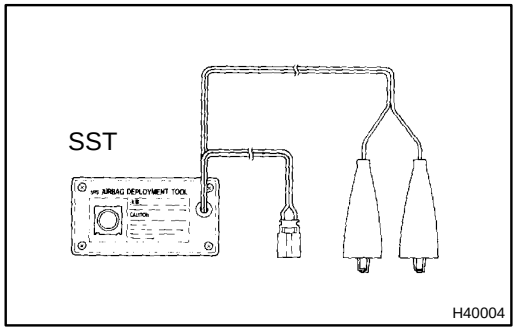
- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place free of electrical noise.**
- **When deploying the airbag, perform the operation at least 10 m (33 ft) away from the horn button assembly.**
- **The horn button assembly will be very hot after the airbag is deployed. Do not touch the horn button assembly. Wait at least 30 minutes before touching the assembly.**
- **Use protective gloves and safety glasses when handling the horn button assembly with the deployed airbag.**
- **Do not apply water etc. to the horn button assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**



1. DISPOSE OF HORN BUTTON ASSY (AIRBAG DEPLOYMENT METHOD WHEN SCRAPPING VEHICLE)

HINT:

Prepare a battery as the power source to deploy the airbag.

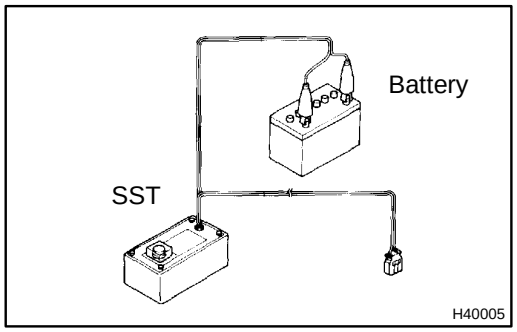


(a) Check the function of SST.

CAUTION:

When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.

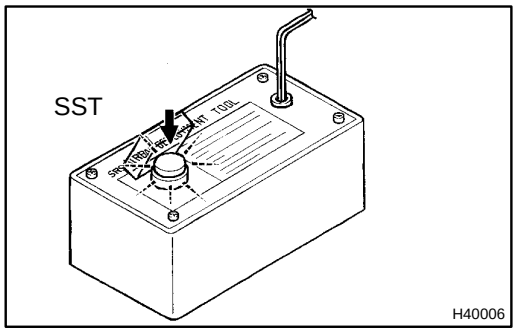
SST 09082-00700



(1) Connect the red clip of SST to the battery positive (+) terminal and the black clip of SST to the battery negative (-) terminal.

HINT:

Do not connect the yellow connector of SST. This will be connected with the supplemental restraint system.

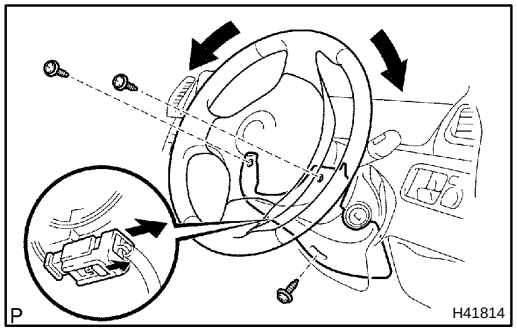


(2) Press the SST activation switch, then check that the LED indicator of the SST activation switch comes on.

CAUTION:

If the LED indicator comes on before pressing the activation switch, SST is probably malfunctioning. Prepare another SST.

(3) Disconnect SST from the battery.



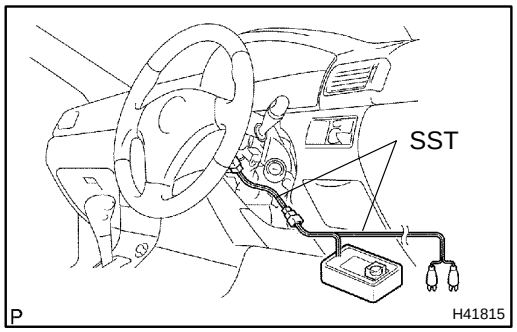
(b) Install SST.

CAUTION:

Check that the steering wheel and horn button assembly are not loosened.

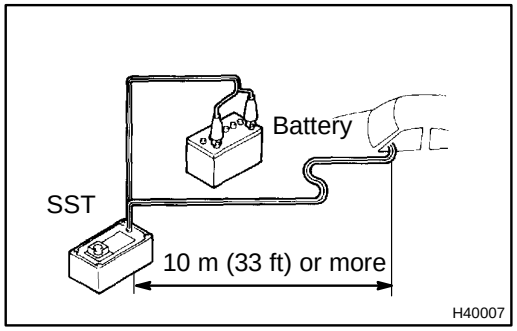
(1) While turning the steering wheel assembly right and left, remove the 3 screws and steering column cover lower.

(2) Disconnect the airbag connector of the spiral cable sub-assembly.



(3) Connect the connectors of SST to the airbag connector of the spiral cable sub-assembly.

SST 09082-00700, 09082-00760



(4) Place SST at least 10 m (33 ft) away from the vehicle front.
(5) Close all the doors and windows of the vehicle.

NOTICE:
Take care not to damage the SST wire harness.

(6) Connect the red clip of SST to the battery positive (+) terminal and the black clip of SST to the negative (–) terminal.

CAUTION:
Confirm that no one is inside the vehicle and within 10 m (33 ft) of the vehicle.

(c) Deploy the airbag by pressing the activation switch of SST.

HINT:
The airbag is deployed as the LED indicator of the SST activation switch comes on.

(d) Dispose of the horn button assembly (with airbag).

CAUTION:

- **The horn button assembly will be very hot after the airbag is deployed. Do not touch the horn button assembly. Wait at least 30 minutes before touching the assembly.**
- **When moving the vehicle which has the horn button assembly with deployed airbag for scrapping, use protective gloves and safety glasses.**
- **Use protective gloves and safety glasses when handling the horn button assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water etc. to the horn button assembly with the deployed airbag.**

HINT:
When scrapping a vehicle, deploy the airbag and scrap the vehicle with the horn button assembly installed.

2. DISPOSE OF HORN BUTTON ASSY (AIRBAG DEPLOYMENT WHEN DISPOSING OF HORN BUTTON ASSY ONLY)

NOTICE:

- **When disposing of the horn button assembly (airbag assembly) only, never use the customer's vehicle to deploy the airbag.**
- **Observe the procedure detailed below when deploying the airbag.**

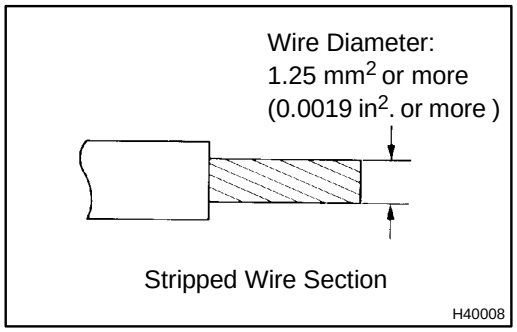
HINT:
Prepare a battery as the power source to deploy the airbag.

(a) Check the function of SST (See step 1(a)).

(b) Remove the horn button assembly
(See page 60-13 of Pub. No. RM925E COROLLA).

CAUTION:

- **When removing the horn button assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.**
- **When storing the horn button assembly, keep the upper surface of the airbag deployment side facing upward.**



(c) Using a service-purpose wire, tie down the horn button assembly to the disc wheel.

Diameter of the wire:
1.25 mm^2 or more (0.0019 in^2 or more)

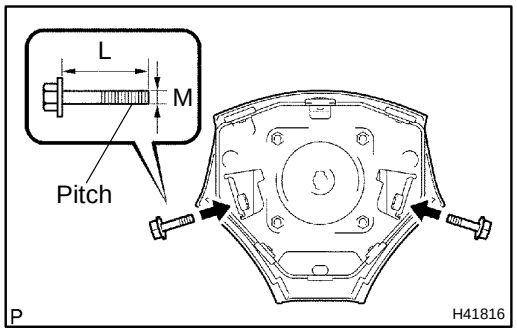
CAUTION:

Always use the service-purpose wire of at least 1.25 mm^2 (0.0019 in^2.). If a wire other than specified here is used to tie down the horn button assembly, it may be snapped by the shock of the airbag deployment. This may be in danger of being injured or damaged.

HINT:

The following formula is how you can find out the optimum stripped wire section:

The square is 3.14 times (Diameter)^2 divided by 4



(1) Install the 2 bolts with the washers in the 2 bolt holes in the horn button assembly.

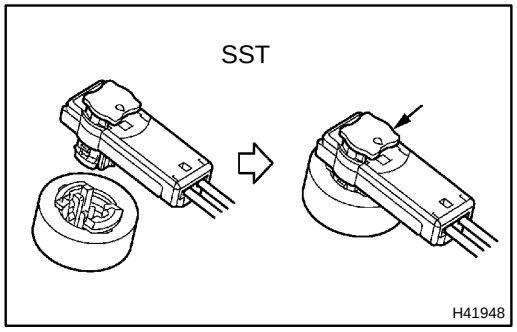
Bolt:
L: 35.0 mm (1.378 in.)
M: 6.0 mm (0.236 in.)
Pitch: 1.0 mm (0.039 in.)

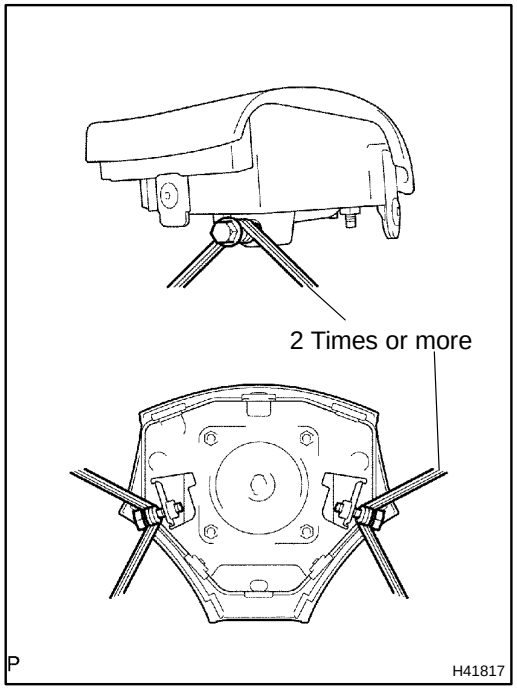
NOTICE:

- **Tighten the bolts by hand until the bolts become difficult to turn.**
- **Do not tighten the bolts excessively.**

(2) After connecting SST each other, connect them to the horn button assembly.

SST 09082-00802 (09082-10801, 09082-40800)

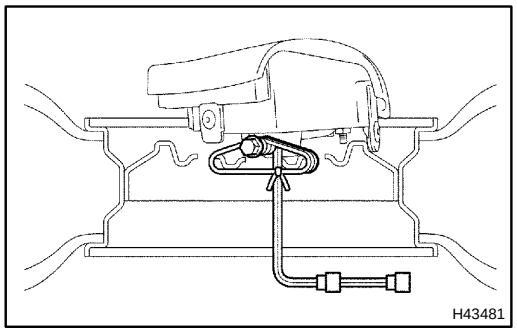




(3) Using the 3 wires, wind the wires around the bolts installed on the left and right sides of the horn button assembly at least two times each .

CAUTION:

- **Tightly wind the wires around the bolts so that there is no slack.**
- **If there is slack in the wires, the horn button assembly may become loose due to the shock of the airbag deployment. This is highly dangerous.**



(4) Face the upper surface of the horn button assembly upward.

(5) Separately tie the left and right sides of the horn button assembly to the disc wheel through the hub nut holes.

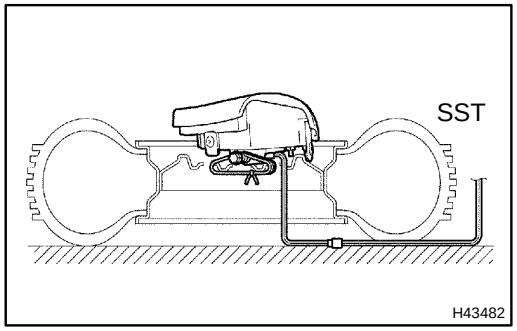
(6) Position the SST connector so that it hangs downward through a hub hole in the disc wheel.

CAUTION:

- **Make sure that the wires is tight. It is highly dangerous when looseness in the wires results in the horn button assembly coming free due to the shock of the airbag deployment.**
- **Always tie down the horn button assembly with the pad side facing upward. It is highly dangerous if the horn button assembly is tied down with the metal surface facing upward as the wires will be broken by the shock of the airbag deployment and the horn button assembly will be thrown out.**

NOTICE:

Deploying the airbag will leave marks on the disc wheel. Use a discarded wheel.



(d) Install SST.

CAUTION:

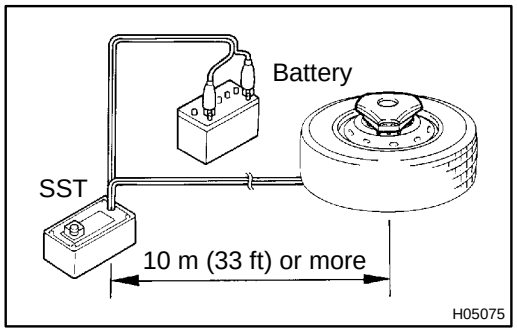
Place the disc wheel on level ground.

(1) Connect the connector of SST.

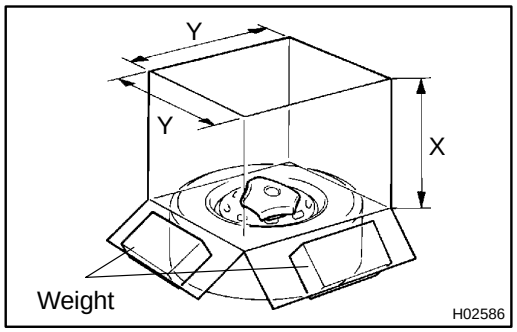
SST 09082-00700

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, eliminate slack in the SST wire harness inside the disc wheel.



(2) Place SST to at least 10 m (33 ft) of the horn button assembly tied to the disc wheel.



(e) Cover the horn button assembly with a cardboard box or tires.

S Covering method by using a cardboard box:
Cover the horn button assembly with the cardboard box and weight the cardboard box down at four places with at least 190 N (20 kg, 44 lb) weight.

Minimum dimensions of cardboard box:

X = 460 mm (18.11 in.)

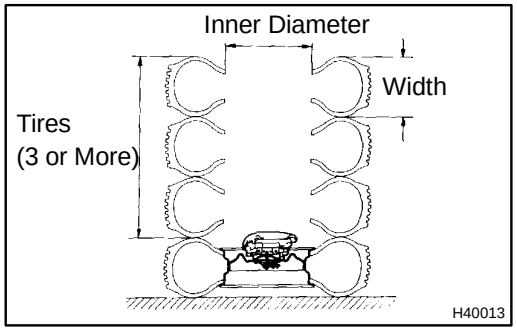
Y = 650 mm (25.59 in.)

NOTICE:

S **When dimension Y of the cardboard box exceeds the diameter of the disc wheel with tire to which the horn button assembly is tied, X should be the following size.**

X = 460 mm (18.11 in.) + width of tire

S **If a cardboard box which is smaller than the specified size is used, the cardboard box will be broken by the shock from the airbag deployment.**



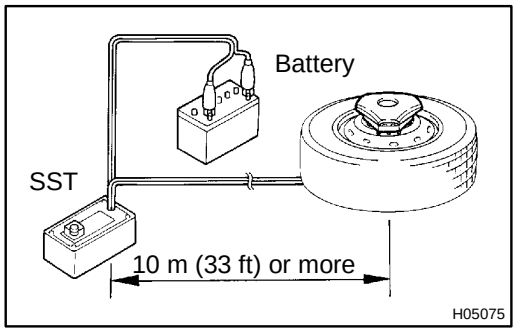
S Covering method by using tires:
Place at least 3 tires without a wheel on the tire that holds the horn button assembly.

Minimum dimensions of a tire
Width: 185 mm (7.28 in.)
Inner diameter: 360 mm (14.17 in.)

CAUTION:
Do not use tires that have a wheel.

NOTICE:

- **Deploying the airbag will leave marks on the tires. Use discarded tires.**
- **Do not place the SST connector under the tire because the SST connector could be damaged.**

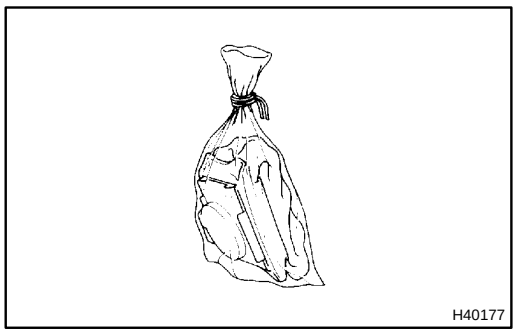


(f) Deploy the airbag.
(1) Connect the red clip of SST to the battery positive (+) terminal and the black clip of SST to the battery negative (–) terminal.

CAUTION:
Confirm that no one is within 10 m (33 ft) of the tires before deploying the airbag.

(2) Press the activation switch of SST to deploy the airbag.

HINT:
The airbag is deployed as the LED indicator of the SST activation switch comes on.



(g) Dispose of the horn button assembly (with airbag).

CAUTION:

- **The horn button assembly will be very hot after the airbag is deployed. Do not touch the horn button assembly. Wait at least 30 minutes before touching the assembly.**
- **Use protective gloves and safety glasses when handling the horn button assembly with the airbag deployed.**
- **Do not apply water etc. to the horn button assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**

(1) Remove the horn button assembly from the wheel.
(2) The horn button assembly in a plastic bag, tie it tightly and dispose of it as other general parts disposal.

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